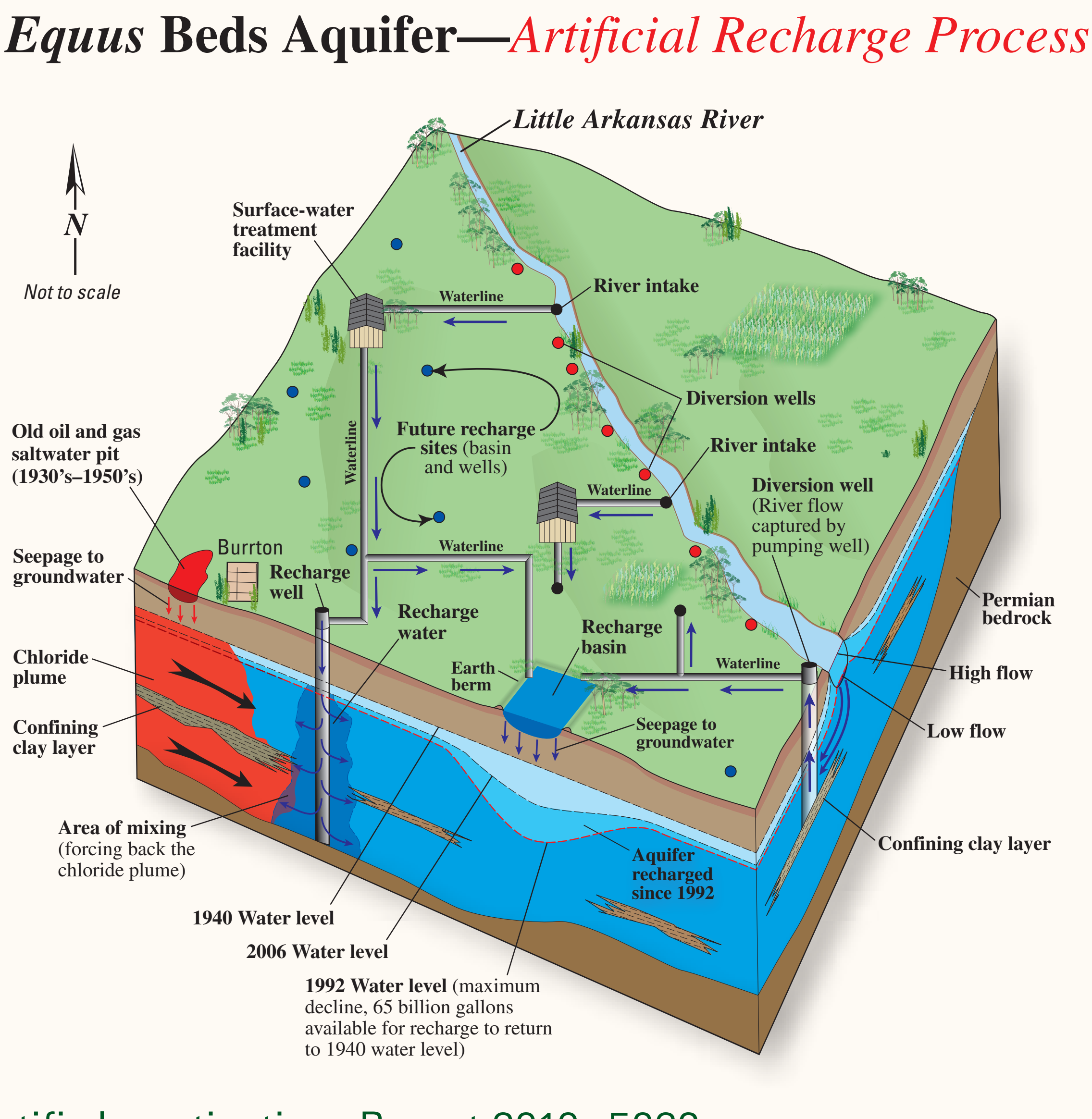
USGS
science for a changing world

Prepared in cooperation with the City of Wichita, Kansas, as part of the *Equus* Beds Groundwater Recharge Project

Water Quality in the *Equus* Beds Aquifer and the Little Arkansas River Before Implementation of Large-Scale Artificial Recharge, South-Central Kansas, 1995–2005



Scientific Investigations Report 2010–5023

U.S. Department of the Interior
U.S. Geological Survey

Cover. Graphic showing the *Equus* Beds Aquifer artificial recharge process.

Water Quality in the *Equus* Beds Aquifer and the Little Arkansas River Before Implementation of Large-Scale Artificial Recharge, South-Central Kansas, 1995–2005

By Andrew C. Ziegler, Cristi V. Hansen, and Daniel A. Finn

Prepared in cooperation with the City of Wichita, Kansas,
as part of the *Equus* Beds Groundwater Recharge Project

Scientific Investigations Report 2010–5023

U.S. Department of the Interior
U.S. Geological Survey

U.S. Department of the Interior
KEN SALAZAR, Secretary

U.S. Geological Survey
Marcia K. McNutt, Director

U.S. Geological Survey, Reston, Virginia: 2010

For more information on the USGS—the Federal source for science about the Earth, its natural and living resources, natural hazards, and the environment, visit http://www.usgs.gov or call 1-888-ASK-USGS

For an overview of USGS information products, including maps, imagery, and publications, visit http://www.usgs.gov/pubprod

To order this and other USGS information products, visit http://store.usgs.gov

Suggested citation:
Ziegler, A.C., Hansen, C.V., and Finn, D.A., 2010, Water quality in the *Equus* Beds aquifer and the Little Arkansas River before implementation of large-scale artificial recharge, south-central Kansas, 1995–2005: U.S. Geological Survey Scientific Investigations Report 2010–5023, 143 p.

Contents

Figures

Tables

Appendix

Tables

Figures

Conversion Factors and Datums

Multiply	By	To obtain
	Length	
foot (ft)	0.3048	meter (m)
micron (µm)	?	inch (in.)
mile (mi)	1.609	kilometer (km)
	Area	
square mile (mi^2)	2.590	square kilometer (km^2)
	Volume	
gallon (gal)	0.003785	cubic meter (m^3)
milliliter (mL)	0.033814	ounce (oz)
million gallons (Mgal)	3,785	cubic meter (m^3)
acre-foot (acre-ft)	0.325851	million gallons (Mgal)
	Flow rate	
acre-foot per year (acre-ft/yr)	1,233	cubic meter per year (m^3/yr)
cubic foot per second (ft^3/s)	0.02832	cubic meter per second (m^3/s)
million gallons per day (Mgal/d)	0.04381	cubic meters per second (m^3/s)
Hydraulic gradient		
foot per mile (ft/mi)	0.1894	meter per kilometer (m/km)

Temperature in degrees Celsius (°C) may be converted to degrees Fahrenheit (°F) as follows:

$$°F = (1.8 \times °C) + 32$$

Temperature in degrees Fahrenheit (°F) may be converted to degrees Celsius (°C) as follows:

$$°C = (°F - 32)/1.8$$

Vertical coordinate information is referenced to the North American Vertical Datum of 1988 (NAVD 88) or the National Geodetic Vertical Datum of 1929 (NGVD 29).

Horizontal coordinate information is referenced to the North American Datum of 1983 (NAD 83).

Altitude, as used in this report, refers to distance above the vertical datum.

Water-quality constituents described in this report were measured or estimated in milligrams per liter (mg/L), micrograms per liter (µg/L), microsiemens per centimeter at 25 degrees Celsius (µS/cm), colonies per 100 milliliters (col/100 mL), colony-forming units per 100 milliliters (CFU/100 mL), plaque forming units per 100 milliliters (pfu/100 mL), and picocuries per liter (pCi/L).

Acronyms and Abbreviations Used in This Report

ASR	aquifer storage and recovery
CFU	colony-forming unit
DCP	data-collection platform
DWA	Drinking-Water Advisory, U.S. Environmental Protection Agency
E. coli	*Escherichia coli*
ELISA	enzyme-linked immunosorbent assay
GC/MS	gas chromatography/mass spectrometry
GIS	geographic information system
GMD2	*Equus* Beds Groundwater Management District No. 2
HAL	Health Advisory Level, U.S. Environmental Protection Agency
KDA-DWR	Kansas Department of Agriculture, Division of Water Resources
KDHE	Kansas Department of Health and Environment
KWO	Kansas Water Office
MCL	Maximum Contaminant Level, U.S. Environmental Protection Agency
MCLG	Maximum Contaminant Level Goal, U.S. Environmental Protection Agency
(mg/L)/yr	milligrams per liter per year
mV	millivolt
NTU	nephelometric turbidity unit
NWIS	National Water Information System, U.S. Geological Survey
ORP	oxidation-reduction potential
PVC	polyvinyl chloride
QA/QC	quality assurance/quality control
R^2	coefficient of determination
RMSE	root mean square error
SDWR	Secondary Drinking-Water Regulation, U.S. Environmental Protection Agency
BOR	Bureau of Reclamation, U.S. Department of the Interior
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey

Water Quality in the *Equus* Beds Aquifer and the Little Arkansas River Before Implementation of Large-Scale Artificial Recharge, South-Central Kansas, 1995–2005

By Andrew C. Ziegler, Cristi V. Hansen, and Daniel A. Finn

Abstract

Artificial recharge of the *Equus* Beds aquifer using runoff from the Little Arkansas River in south-central Kansas was first proposed in 1956 and was one of many options considered by the city of Wichita to preserve its water supply. Declining aquifer water levels of as much as 50 feet exacerbated concerns about future water availability and enhanced migration of saltwater into the aquifer from past oil and gas activities near Burrton and from the Arkansas River. Because Wichita changed water-management strategies and decreased pumping from the *Equus* Beds aquifer in 1992, water storage in the aquifer recovered by about 50 percent. This recovery is the result of increased reliance on Cheney Reservoir for Wichita water supply, decreased aquifer pumping, and larger than normal precipitation. Accompanying the water-level recovery, the average water-level gradient in the aquifer decreased from about 12 feet per mile in 1992 to about 8 feet per mile in January 2006.

An important component of artificial recharge is the water quality of the receiving aquifer and the water being recharged (source water). Water quality within the Little Arkansas River was defined using data from two real-time surface-water-quality sites and discrete samples. Water quality in the *Equus* Beds aquifer was defined using sample analyses collected at 38 index sites, each with a well completed in the shallow and deep parts of the *Equus* Beds aquifer. In addition, data were collected at diversion well sites, recharge sites, background wells, and prototype wells for the aquifer storage and recovery project. Samples were analyzed for major ions, nutrients, trace metals, radionuclides, organic compounds, and bacterial and viral indicators.

Water-quality constituents of concern for artificial recharge are those constituents that frequently (more than 5 percent of samples) may exceed Federal [U.S. Environmental Protection Agency (USEPA)] and State drinking-water criteria in water samples from the receiving aquifer or in samples from the source water. Constituents of concern include major ions (sulfate and chloride), nutrients (nitrite plus nitrate), trace elements (arsenic, iron, and manganese), organic compounds (atrazine), and fecal bacterial indicators. This report describes the water quality in the *Equus* Beds aquifer and the Little Arkansas River from 1995 through 2005 before implementation of large-scale recharge activities.

Sulfate concentrations in water samples from the Little Arkansas River rarely exceeded Federal secondary drinking water regulation (SDWR) of 250 milligrams per liter (mg/L). Sulfate concentrations in groundwater were exceeded in about 18 percent of the wells in the shallow (less than or equal to 80 feet deep) parts of the aquifer and in about 13 percent of the wells in the deep parts the aquifer. Larger sulfate concentrations were associated with parts of the aquifer with the largest water-level declines. Water-quality changes in the *Equus* Beds aquifer likely were caused by dewatering and oxidation of aquifer material that subsequently resulted in increased sulfate concentrations as water levels recovered.

The primary sources of chloride to the *Equus* Beds aquifer are from past oil and gas activities near Burrton and from the Arkansas River. Computed chloride concentrations in the Little Arkansas River near Halstead exceeded the Federal SDWR of 250 mg/L about 27 percent of the time (primarily during low-flow conditions). Chloride concentrations in groundwater exceeded 250 mg/L in about 8 percent or less of the study area, primarily near Burrton and along the Arkansas River. Chloride in groundwater near Burrton has migrated downgradient about 3 miles during the past 40 to 45 years. The downward and horizontal migration of the chloride is controlled by the hydraulic gradient in the aquifer, dispersion of chloride, and discontinuous clay layers that can inhibit further downward migration. Chloride in the shallow parts of the *Equus* Beds aquifer migrated less than 0.5 mile during the past decade. Migration is slower because of the decrease in the hydraulic gradient since 1992. On the basis of these results, artificial recharge (especially at depths of 100 to 150 feet) could create an effective barrier to saltwater migration.

Nutrients, such as nitrite plus nitrate (hereinafter referred to as nitrate), are a water-quality concern because of the predominantly agricultural land use in the 150-square-mile study area. All nitrate concentrations in water samples collected at the two surface-water monitoring sites on the Little Arkansas River from 1995 through 2005 were less than the Federal maximum contaminant level (MCL) of 10 mg/L for

nitrate. Groundwater sampling results indicated that average nitrate concentrations exceeding the MCL were detected in 13 percent of the wells in 9 percent of the shallow parts of the aquifer in the study area. Little nitrate is present in the deeper parts of the aquifer because of chemical reducing conditions.

Several trace elements frequently exceeded drinking-water criteria, including arsenic, iron, and manganese. Computed arsenic concentrations in the Little Arkansas River exceeded the Federal drinking-water MCL of 10 micrograms per liter (µg/L) about 14 percent of the time primarily during low-flow conditions. In shallow groundwater, average arsenic concentrations exceeded the MCL in 10 percent of the wells (6 percent of the study area), whereas at depths of more than 80 feet, average arsenic concentrations exceeded the MCL in 34 percent of the wells (35 percent of the study area). In the Little Arkansas River, dissolved iron concentrations exceeded the Federal SDWR of 300 µg/L in 2 percent of water samples, and manganese concentrations exceeded the SDWR of 50 µg/L in about half of the samples collected. In shallow parts of the aquifer, average iron concentrations exceeded the SDWR of 300 µg/L in 44 percent of the study area, and average manganese concentrations exceeded the SDWR of 50 µg/L in 60 percent of the study area. In deep parts of the aquifer, average iron concentrations exceeded the SDWR in 44 percent of the study area, and manganese concentrations exceeded the SDWR in 97 percent of the area.

The areal distribution of larger dissolved arsenic, iron, and manganese concentrations were similar. Larger naturally-occurring concentrations of arsenic, iron, and manganese in groundwater are associated with more reducing conditions, areas where more clay is present in the aquifer material, and areas that had large water-level declines and subsequent recovery. Effects of artificial recharge on natural dissolved concentrations of arsenic in the aquifer potentially can be minimized by maintaining the oxidation-reduction potential as near 1995–2005 baseline conditions as possible. However, in many areas of the aquifer, especially the deeper parts, the natural geochemical conditions are conducive to large arsenic concentrations. It may be possible to use artificial recharge of oxygenated water to create a less reducing geochemical environment, decreasing some of the arsenic and iron dissolved in the water, potentially improving the overall water quality in the aquifer.

Atrazine was the most commonly detected organic compound in the study area. The Federal MCL for atrazine in drinking water is 3 µg/L an annual average. Computed concentrations of atrazine in the Little Arkansas River exceeded the Federal MCL value of 3.0 µg/L about 27 percent of the time, mostly during the late spring to early fall. Atrazine was detected in about 55 percent of the samples collected from shallow wells, which indicates infiltration from field applications to the shallow groundwater, but concentrations were much less than the MCL.

Large concentrations of coliform bacterial indicators (total coliform, fecal coliform, and *Escherichia coli*) were detected in all water samples from the Little Arkansas River. These large bacterial indicator densities are typical in central and eastern Kansas streams, especially during runoff conditions. Total coliform detections exceeded the USEPA Federal Maximum Contaminant Level Goal (MCLG) of 0 colonies in water samples from 95 percent of the shallow index wells and in 87 percent of the deep wells in the *Equus* Beds aquifer. Many of these detections were in the first samples collected from the wells after they were developed, indicating that at least some of these detections may be related to drilling. Almost all wells sampled for this study had at least 1 sample with a total coliform detection; however, the median densities for most of these wells were less than 1 colony per 100 milliliter (col./100 mL). Viral indicators (*Clostridium perfringens* and *E. coli* coliphage) were present in samples from the Little Arkansas River during storm runoff but were not detected in any samples of groundwater. These data indicated that natural infiltration of water through the soil removes most bacterial and viral indicator organisms.

Water quality in surface water and groundwater is controlled by the geology of the underlying bedrock and aquifer materials, the hydraulic permeability (porosity) and geochemical (oxidation and reduction) properties of the aquifer, and the effects of humans related to past oil and gas activities and agriculture. When the proposed full-scale artificial recharge of the *Equus* Beds aquifer is implemented, changes in concentrations of water-quality constituents are expected. The increased water levels from artificial recharge are expected to slow the saltwater migration from the northwest and south of the study area, potentially limiting further chloride migration and improving the quality of water in the aquifer. Continued monitoring and interpretation of these recharge water-quality data relative to drinking-water criteria will help ensure the usable quality of water in the *Equus* Beds aquifer.

Introduction

Background and Description of Study Area

The study area encompasses approximately 150 square miles (mi^2) in south-central Kansas, northwest of Wichita in Harvey and Sedgwick Counties. The area is bounded by the Arkansas River on the southwest and includes the Little Arkansas River on the northeast (fig. 1). The Little Arkansas River drains an area of about 1,200 mi^2 of primarily agricultural land. Crops produced include corn, sorghum, soybeans, and wheat. Common agricultural chemicals applied to these crops include fertilizers and herbicides, such as alachlor and atrazine. Livestock raised in the area include cattle and hogs (Kansas Department of Agriculture, 2006).

The study area is underlain by the *Equus* Beds aquifer, considered a part of the larger High Plains aquifer (fig. 1). The aquifer is named for Pleistocene horse fossils in the aquifer sediments. *Equus* is latin for horse. The *Equus* Beds aquifer

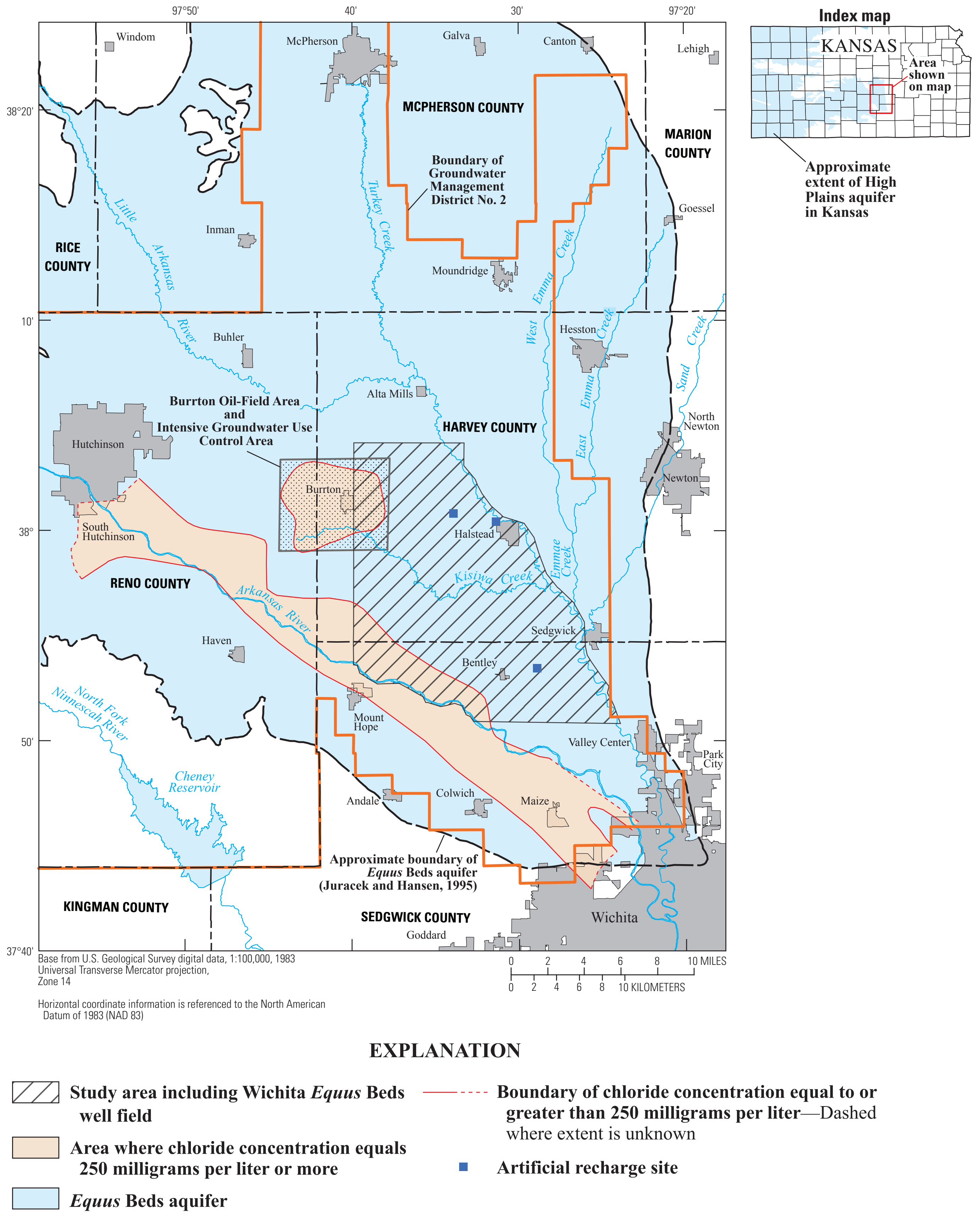


Figure 1. Extent of *Equus* Beds aquifer, area where chloride concentrations equal 250 milligrams per liter or more, and location of artificial recharge sites and study area near Wichita, south-central Kansas.

[about 300 feet (ft) thick] consists of alluvial deposits of sand and gravel interbedded with clay or silt and is an important source of groundwater because of the good water quality, shallow depth to the water table, and large saturated thickness (Williams and Lohman, 1949). The general direction of groundwater movement within the study area is to the east-northeast (Aucott and others, 1998) except where the hydraulic gradient is altered by pumping wells and near a low-head dam on the Little Arkansas River at Halstead.

The well field developed by the city of Wichita in the *Equus* Beds aquifer during the 1940s and 1950s is one of the primary sources of water for the city and the surrounding area. As of 2005, there were 55 active city public-supply wells in the Wichita *Equus* Beds well field within the study area. Numerous irrigation wells also withdraw water from the aquifer within the boundaries of Groundwater Management District No. 2 (GMD2) (*Equus* Beds Groundwater Management District No. 2, 1990) (fig. 1).

The city of Wichita began using water from Cheney Reservoir (fig. 1) in 1965 to supplement its supply from the *Equus* Beds aquifer. Water use by the city of Wichita and irrigation withdrawals are illustrated in figure 2. The proportion of the water supply obtained from Cheney Reservoir increased from 20 percent in 1965 to 44 percent in 1994. From 1995 through 2005, water from Cheney Reservoir ranged from 51 to 69 percent of Wichita's water supply. The increased reliance on surface water from Cheney Reservoir was part of Wichita's Integrated Local Water Supply Plan implemented in 1993 (Warren and others, 1995; city of Wichita, written commun., 2000). This plan was initiated to ensure that the city's water-supply needs are met through 2050 by promoting conservation, increasing water use from Cheney Reservoir, and decreasing pumping from city wells in Wichita *Equus* Beds well field. The plan also calls for investigating the *Equus* Beds aquifer storage and recovery (ASR) using excess water from the Little Arkansas River. As the population in the Wichita area increases, demands for water could exceed existing supplies as early as 2050 if no additional water supply is acquired (Jerry Blain, city of Wichita, oral commun., 2005).

Substantial water-level declines in the *Equus* Beds aquifer have resulted from pumping groundwater for agricultural and municipal needs, as well as periodic drought conditions. The lowest water levels to date were recorded in October 1992 (fig. 3) and were as much as 50 ft lower than the predevelopment (1940) water levels in some locations (Hansen and Aucott, 2001, 2004; Hansen, 2007). Water-level declines caused concern about the adequacy of the city's future water supply. Another concern is saltwater migration into the aquifer. Sources of saltwater include the Arkansas River, oil-field brines that leaked from surface disposal pits or injection wells in the Burrton oil-field area northwest of the study area (fig. 1), municipal wastewater facility discharges, and mineralized water from the underlying Wellington Formation (Ziegler and others, 1999; Whittemore, 2007).

Groundwater levels in the aquifer increased by more than 20 ft in some areas by January 2006 compared to 1992 levels (fig. 4). Water storage increased by about 50 percent since 1992 because of natural recharge of larger than normal precipitation, increased reliance on Cheney Reservoir for Wichita water supply, and decreased aquifer pumping (Hansen, 2007). Accompanying the water-level recovery, the water-level gradient in the aquifer decreased from about 12 feet per mile (ft/mi) in 1992 to about 8 ft/mi in January 2006. Other factors contributing to water-level increases include subsurface inflow, streamflow losses, and irrigation return flow (Myers and others, 1996). Groundwater levels in the study area in January 2006 are shown in figure 5.

Groundwater Recharge Demonstration Project

In 1956, Stramel (1956, 1962a, b, 1967) proposed the artificial recharge of the *Equus* Beds groundwater reservoir by recharging the aquifer with runoff during periods of abundant precipitation. This artificially recharged water then could be recovered by pumping from the aquifer during periods of drought. Stramel proposed using a variety of techniques including water spreading, recharge pits or ponds, recharge wells, and induced recharge by pumping. He also suggested investigation of the relation between streamflow or stage and water quality for the Arkansas River, Little Arkansas River, and Kisiwa Creek as sources for artificial recharge. Of these streams, the Little Arkansas River had the best known water quality.

The *Equus* Beds Groundwater Recharge Demonstration Project began in 1995 to test artificial recharge as a method for increasing water supply and preventing water-quality degradation (Ziegler and others, 1999). The purpose of the demonstration project was to investigate the feasibility of artificial recharge and its effects on the water quantity and quality of the *Equus* Beds aquifer. The project was a cooperative effort between the city of Wichita, the U.S. Geological Survey (USGS), and the Bureau of Reclamation (BOR, U.S. Department of the Interior), with additional participation from the *Equus* Beds GMD2 and the U.S. Environmental Protection Agency (USEPA). The USGS roles in the cooperative study were to document changes in hydrologic and water-quality conditions in the study area, to identify the probable causes of the changes, and to develop a baseline condition for evaluating the effects of larger full-scale artificial recharge. Project work was coordinated with the Kansas Department of Health and Environment (KDHE), the Kansas Water Office (KWO), and the Kansas Department of Agriculture, Division of Water Resources (KDA-DWR). Burns and McDonnell Engineering Consultants (Kansas City, Missouri) and Mid-Kansas Engineering Consultants (Wichita, Kansas) provided engineering expertise and project management. The construction, maintenance, and operation of the recharge facilities were performed by the city of Wichita.

Recharge sites were constructed near the towns of Halstead and Sedgwick (fig. 1) to divert water from the Little Arkansas River for the recharge demonstration project (Ziegler

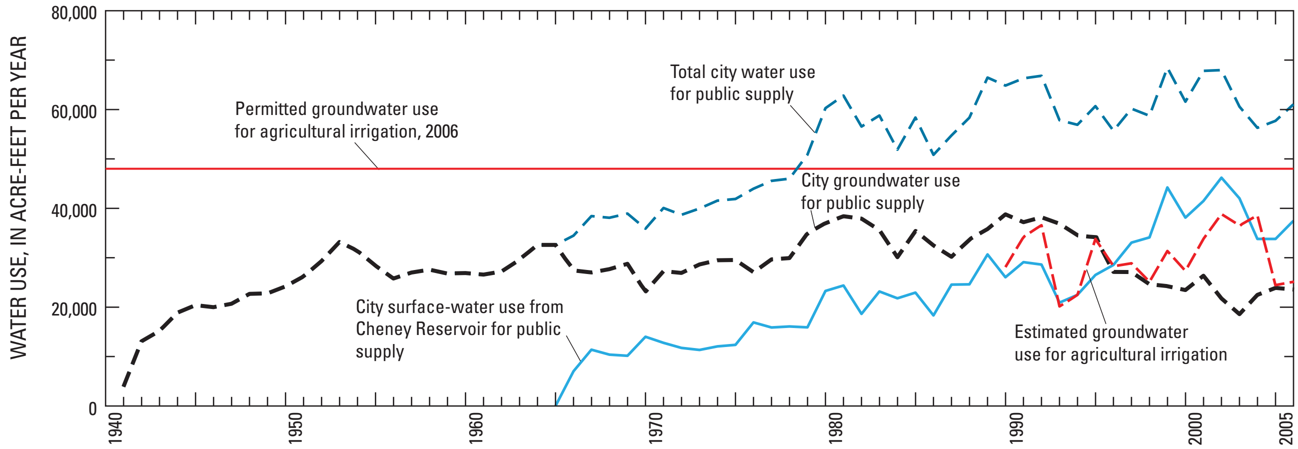


Figure 2. Water use for the city of Wichita municipal supply and agricultural irrigation, 1941–2005 (modified from Hansen, 2007).

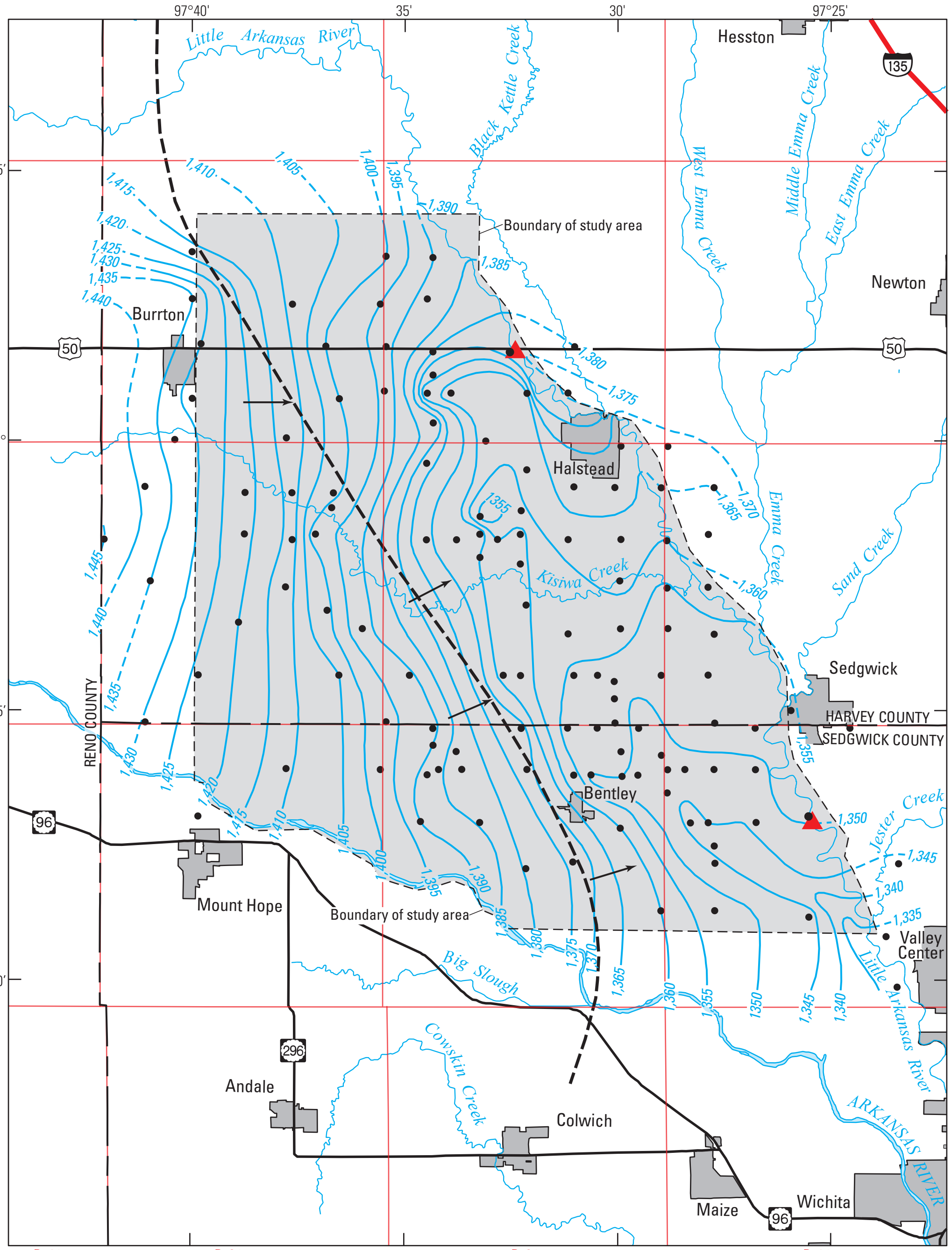
and others, 1999; Schmidt and others, 2007). At each site, water from the river was diverted when streamflow exceeded base-flow requirements established by KDA-DWR permit conditions. Different methods of diverting river water and recharging the aquifer were used at each site. At the Halstead diversion site, water could be pumped from a well adjacent to the Little Arkansas River when streamflow exceeded 42 cubic feet per second (ft^3/s) (minimum streamflow requirement established by KDA-DWA) from April 1 through September 30, and 20 ft^3/s from October 1 through March 31 (Burns and McDonnell, 1996). This water was recharged to the aquifer through recharge basins, trench, or injection well at the Halstead recharge site. The recharge activity continued from May 1997 to June 2002. During this time, the number of days per year that minimum streamflow requirements in the Little Arkansas River were large enough to allow withdrawal of water for recharge from the well adjacent to the Little Arkansas River ranged from 99 days in 2002 to 349 days in 1999 (*http://ks.water.usgs.gov/studies/equus/equus_hilites.html*).

At the Sedgwick recharge site, water can be withdrawn directly from the Little Arkansas River when streamflow exceeded 40 ft^3/s (minimum streamflow requirement) regardless of season. This water was treated to decrease turbidity and total fecal coliform bacteria, and to remove organic compounds prior to being recharged to the aquifer through recharge basins. Recharge activities at the Sedgwick site continued from April 1998 to November 2000. During this time, the number of days per year that minimum flow requirements in the Little Arkansas River were large enough to allow withdrawal of recharge water from the river ranged from a low of 290 days in 2000 to a high of 365 days in 1999 (*http://ks.water.usgs.gov/studies/equus/equus_hilites.html*).

Water samples were collected by USGS personnel from the Little Arkansas River and from numerous wells in the study area. These water samples were analyzed for dissolved solids, total and dissolved inorganic constituents, nutrients, organic and volatile organic compounds, radionuclides, and bacterial indicators (Ziegler and others, 1999). Primary constituents of concern for artificial recharge were sodium, chloride, nitrite plus nitrate (hereinafter referred to as nitrate), iron, manganese, atrazine, and total coliform bacteria. Constituents of concern were defined as those constituents with concentrations exceeding 20 percent of the USEPA established Federal drinking-water criteria (Ziegler and others, 1999). Chloride and atrazine were of particular concern because concentrations of these constituents in the Little Arkansas River frequently exceeded the Federal SDWR for chloride and the Federal MCL value for atrazine established by the USEPA (Ziegler and others, 1999). The Federal MCL for atrazine in drinking water is 3 µg/L an annual average. Arsenic was added to the constituents of concern list (Ziegler and others, 2001) because in 2001 USEPA lowered the arsenic MCL from 50 to 10 µg/L (micrograms per liter) effective January 2006 (U.S. Environmental Protection Agency, 2001b). In this report, sodium is not discussed in detail because the USEPA drinking-water equivalence level is an advisory recommended dietary level.

Related Water-Quality Studies

Ziegler and others (1999) described the baseline water quality (1995–98) and preliminary effects of artificial recharge on the water quality of the *Equus* Beds aquifer. The report indicated that the initial effects of artificial recharge were minimal, that the recharge and aquifer water types were compatible, and that sodium, chloride, nitrate, iron, manganese, atrazine, and total coliform bacteria were constituents of concern. Concentrations of chloride and atrazine in water from some wells increased minimally after the artificial recharge project began to concentrations approximating the recharge water concentrations. However, these concentrations were within the variance of baseline concentrations in the aquifer and considerably less than the USEPA Federal SDWR and MCL. Ziegler and others (2001) reported that the overall effects of 3 years of recharge did not substantially change groundwater quality.



Base from U.S. Geological Survey digital data, 1:100,000, 1983
Universal Transverse Mercator projection,
Zone 14

Horizontal coordinate information is referenced to the North American Datum of 1983 (NAD 83)

EXPLANATION

Study area

Water-level contour—Shows altitude of water level, October 1992. Dashed where approximately located. Contour interval 5 feet. Datum is National Geodetic Vertical Datum of 1929

Approximate location of bedrock low (McPherson channel)

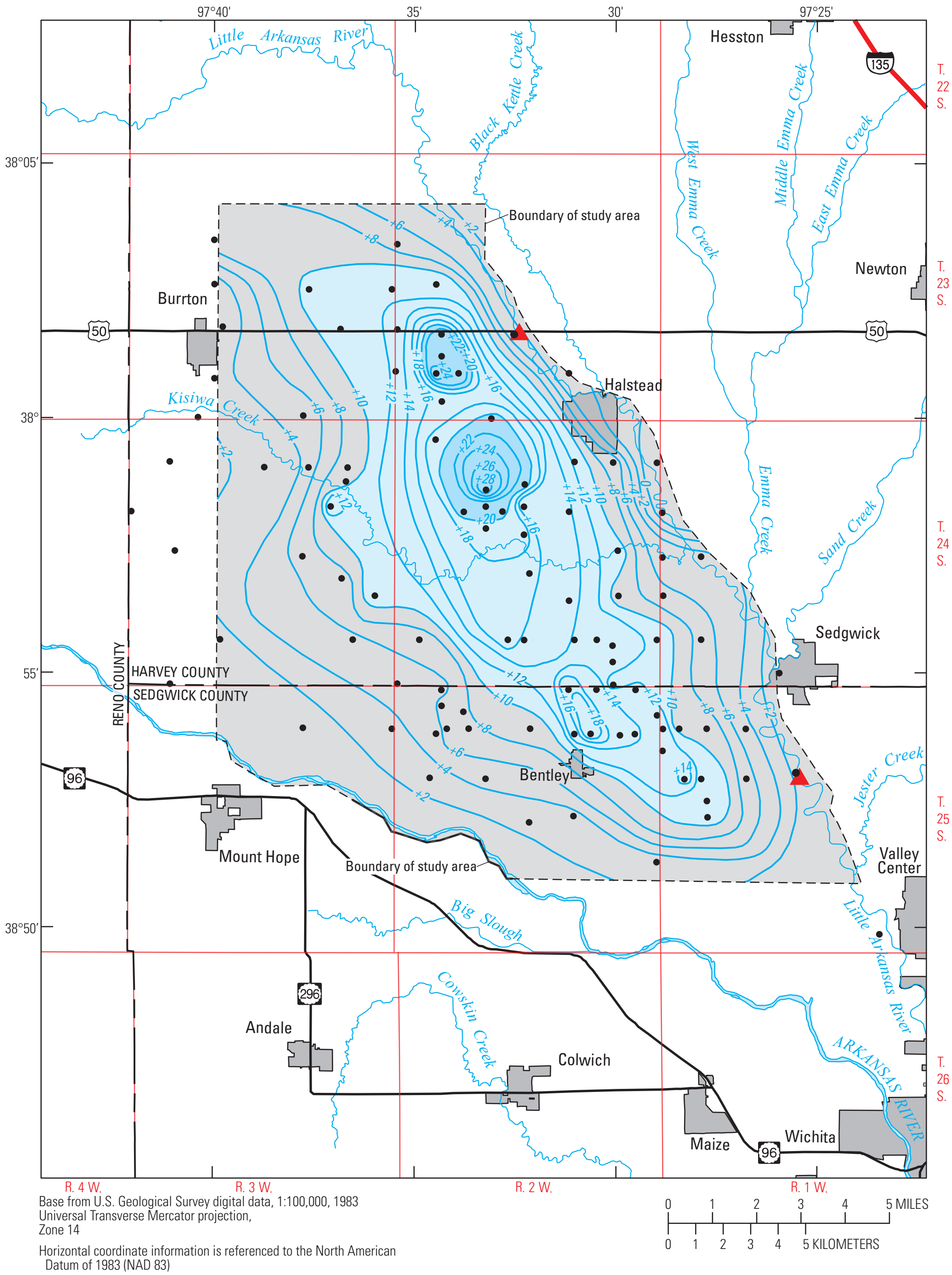
Approximate direction of groundwater flow

U.S. Geological Survey streamflow-gaging station

***Equus* beds historic observation well**

Water-level measurements were made by city of Wichita personnel

Figure 3. Water-level altitudes in *Equus* Beds aquifer, October 1992 (modified from Hansen and Aucott, 2001).

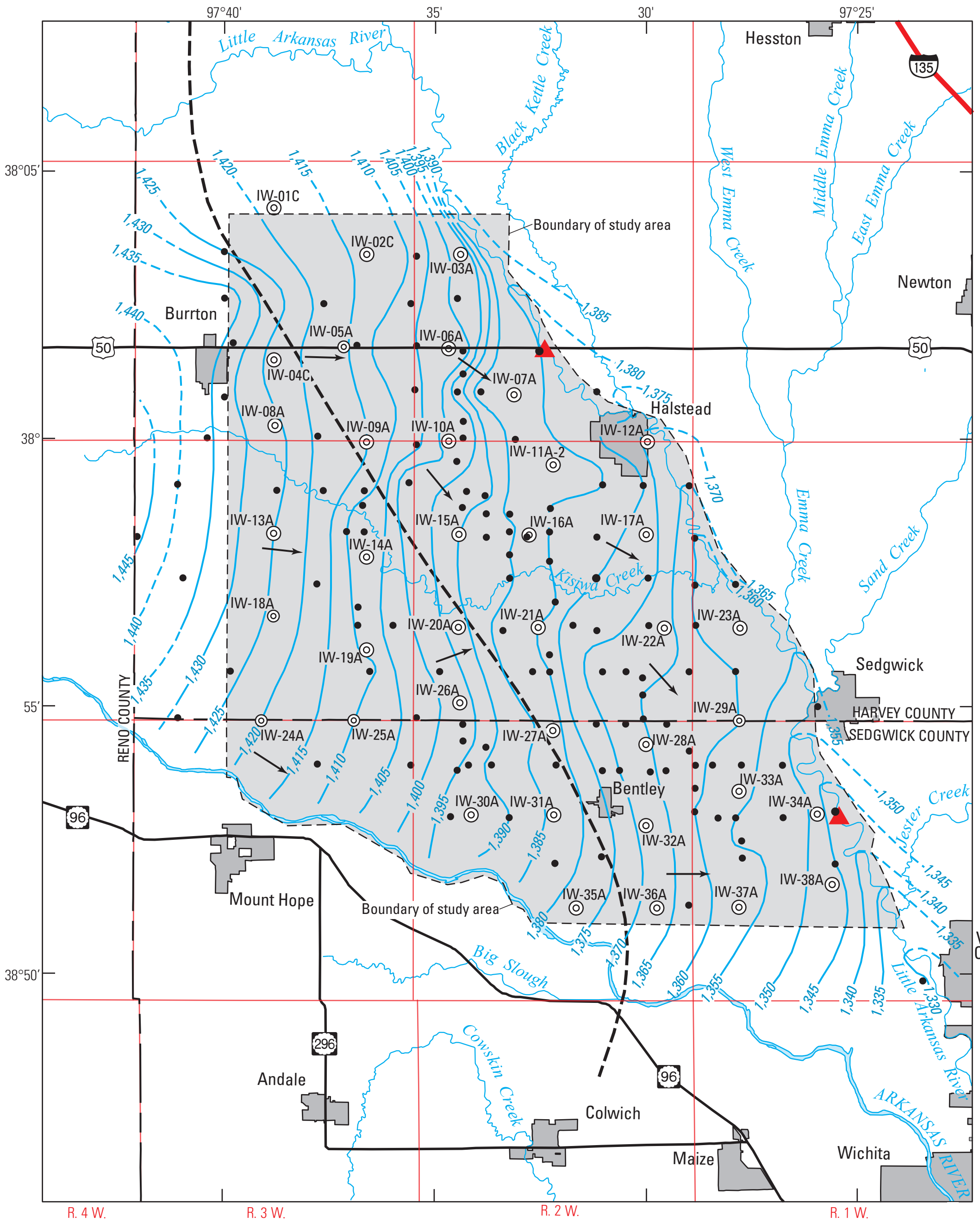


EXPLANATION

- **Study area**
- **Area of water-level recovery between:**
  - +10 and +20 feet
  - +20 and +30 feet
- **Line of equal water-level change—** Interval 2 feet
- **U.S. Geological Survey streamflow-gaging station**
- ***Equus* beds historic observation well**

Water-level measurements were made by city of Wichita personnel

Figure 4. Water-level recovery in *Equus* Beds aquifer in study area, October 1992–January 2006 (modified from Hansen, 2007).



Base from U.S. Geological Survey digital data, 1:100,000, 1983
Universal Transverse Mercator projection,
Zone 14

Horizontal coordinate information is referenced to the North American Datum of 1983 (NAD 83)

0 1 2 3 4 5 MILES
0 1 2 3 4 5 KILOMETERS

EXPLANATION

Study area

1,355 **Water-level contour**—Shows altitude of water level, January 2006. Dashed where approximately located. Contour interval 5 feet. Datum is North American Vertical Datum of 1988

Approximate location of bedrock low (McPherson channel)

Approximate direction of groundwater flow

U.S. Geological Survey streamflow-gaging station

IW-37A **Index well and site identifier**

***Equus* beds historic observation well**

Water-level measurements in wells were made by city of Wichita and *Equus* Beds Groundwater Management District No. 2 personnel. Water-level measurements at gaging stations were collected by U.S. Geological Survey.

Figure 5. Water-level altitudes in *Equus* Beds aquifer in study area, January 2006 (modified from Hansen, 2007).

Schmidt and others (2007) presented the results from a simple mixing model using chloride as a tracer that indicated that the water in shallow (less than 80 ft) monitoring wells adjacent to the Little Arkansas River was 80 percent stream water. The mixing model also indicated that about 25 percent of the pumping well water at Halstead was from the shallow part of the aquifer.

Christensen and others (2000, 2003) developed site-specific regression models to relate constituent concentrations from laboratory-analyzed samples to continuous in-stream sensor measurements by plotting each explanatory variable against the response variable. Regression models were developed on the basis of physical properties and water-quality analyses of water samples collected from 1995 through 2002. These models were used to compute alkalinity, dissolved solids, total suspended solids, sulfate, chloride, arsenic, and atrazine concentrations, and fecal coliform bacteria densities (Christensen and others, 2000, 2003). Computed water-quality data were compared to measured data to determine errors and limitations of the regression models. Differences between computed data and laboratory results were less than 25 percent for alkalinity, dissolved solids, sulfate, and chloride concentrations and more than 25 percent for total suspended solids, arsenic, and atrazine concentrations, and bacteria densities (Christensen and others, 2000). The use of these models eliminates the wait for laboratory analyses and provides continuous hourly computations of constituent concentrations and loads. These computed concentrations and loads are available on the World Wide Web for the two Little Arkansas River surface-water monitoring sites at *http://nrtwq.usgs.gov/ks/*.

Purpose and Scope

The purpose of this report is to describe the water quality in the *Equus* Beds aquifer and the Little Arkansas River from 1995 through 2005, before implementation of large-scale [design capacity of 100 million gallons per day (Mgal/d)] recharge activities (Kansas Underground Injection Control Area Permit Class V Injection Well, Kansas Permit No. *KS-05-079-001*). This report includes water-quality data collected from 1995 through 2005. The study described herein is part of a long-term cooperative study (since 1940) between the city of Wichita and USGS to describe the water quantity and quality conditions in the *Equus* Beds aquifer and the Little Arkansas River and more recently, the potential effects of artificial recharge on water resources in south-central Kansas. This description of water-quality conditions serves as a baseline to detect any subsequent changes in the water quality in the *Equus* Beds aquifer and the Little Arkansas River.

The quality of water was assessed through laboratory analysis of water samples collected at two surface-water monitoring sites on the Little Arkansas River and from a network of monitoring wells in shallow and deep parts of the aquifer. Additional water-quality determinations were made from continuous regression-model computations for chloride, arsenic, and atrazine concentrations and fecal bacterial indicators in the Little Arkansas River (Christensen and others, 2000). Water-quality constituents discussed in this report include those listed in the primary and secondary USEPA Federal drinking-water criteria, as well as onsite measurements such as specific conductance and oxidation-reduction potential (ORP), that are used in the interpretation of water-quality data. Maps showing average concentrations of constituents illustrate their distribution in groundwater throughout the study area for shallow and deep parts of the aquifer.

Acknowledgments

The authors acknowledge the invaluable assistance of several city of Wichita, Groundwater Management District 2 personnel, and USGS employees working on this study. Technical colleague reviews by Dale Blevins (USGS), Brenda Smith (USGS), and Jerry Blain and Deb Ary (city of Wichita) contributed to improved technical and editorial clarity of the report. Trudy Bennett and Allen Bewsher of the USGS Kansas Water Science Center collected water samples, measured water levels, and maintained automated equipment at the monitoring sites. Joan Kenny, Heather Ross Schmidt, and Myrna Gouw (all USGS personnel) assisted with early drafts of the text, tables, and illustrations. Deneise Schneider (USGS) performed data entry, database maintenance, and quality assurance. Appreciation is expressed for "P" and "EB" well data from GMD2 managers Mike Dealy and Tim Boese. Terryl Pajor, Vernon Strasser, and laboratory staff for the city of Wichita Municipal Water and Wastewater Laboratory conducted laboratory analyses. And lastly, many thanks to David Warren, Wichita Director of Utilities, and Jerry Blain, Water Supply Projects Administrator and Superintendent of pumping and production, city of Wichita Water and Sewer Department, who led the overall study design and provided invaluable technical input for all of the published reports associated with the study.

Methods

Sampling Sites

Streamflow, water-level, and water-quality data were collected from the Little Arkansas River and from the *Equus* Beds aquifer before, during, and after the artificial recharge demonstration project to evaluate the effects of artificially recharging surface water into the aquifer. Data-collection sites used to describe water quality in the Little Arkansas River and in the *Equus* Beds aquifer for this report are listed in table A-1 in the Appendix (at the back of this report). Locations of the surface-water sites and monitoring wells are shown in figures 6*A* and 6*B*. Well data for "EB" and "P" wells are not

A. Shallow wells

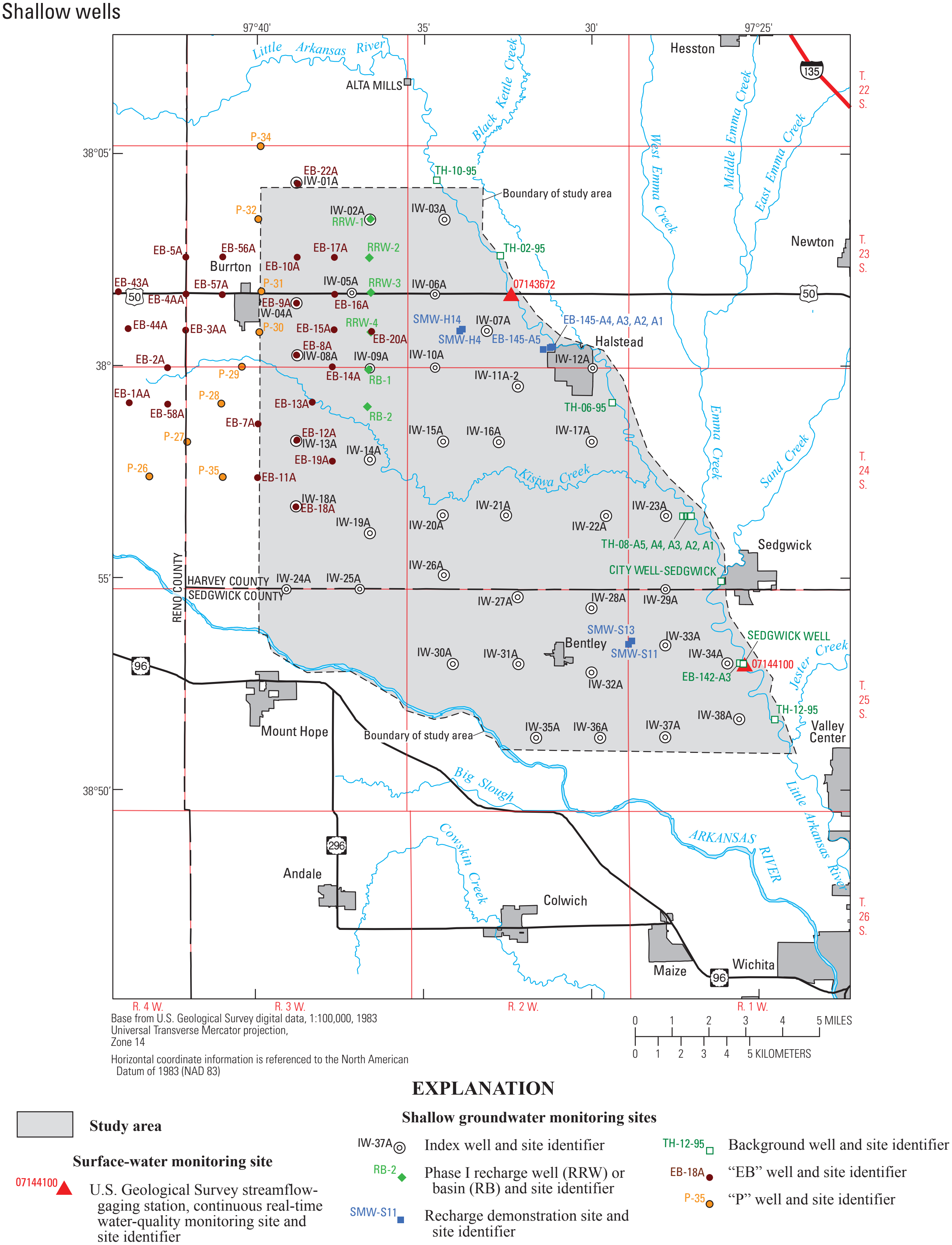


Figure 6. Location in and near the study area of *(A)* surface-water and shallow groundwater monitoring sites and *(B)* surface-water and deep groundwater monitoring sites.

B. Deep wells

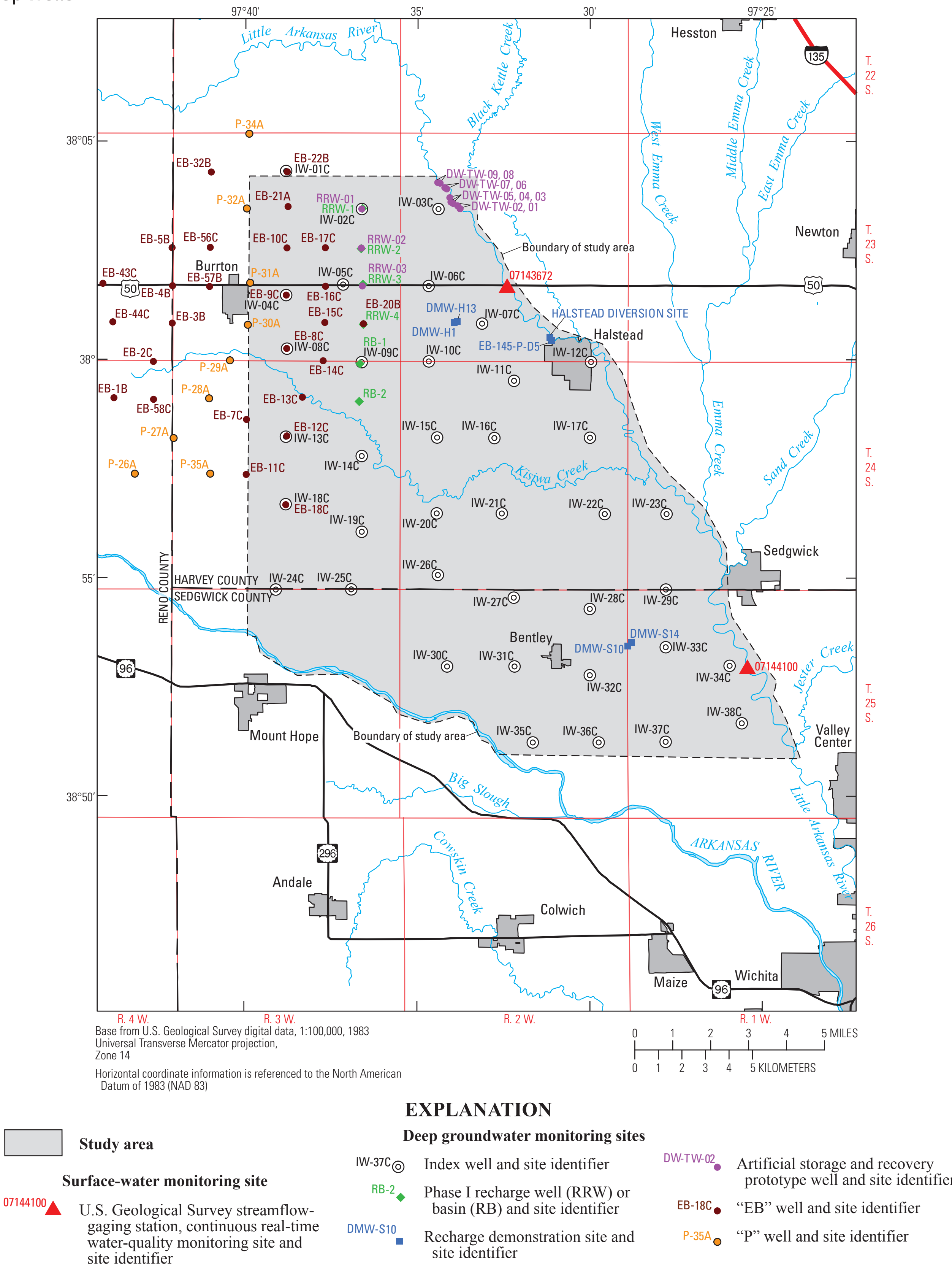


Figure 6. Location in and near the study area of *(A)* surface-water and shallow groundwater monitoring sites and *(B)* surface-water and deep groundwater monitoring sites.—Continued

provided in table A-1, but are available through GMD2 (Mike Dealy, Manager, written communication, 2006). Surface-water samples were collected at USGS streamflow-gaging stations on the Little Arkansas River at Highway 50 near Halstead (site 07143672) and near Sedgwick (site 07144100). These two stations also are continuous real-time water-quality monitoring sites.

Monitoring wells discussed in this report were divided into two groups by depth to describe differences in the water quality of shallow and deep parts of the *Equus* Beds aquifer within the study area. For the purposes of this report, shallow wells were completed and screened at depths below land surface that were equal to or less than 80 ft and were open to the shallow part of the *Equus* Bed aquifer (fig. 6*A*). Deep wells (fig. 6*B*) were screened at depths of more than 80 ft deep and were completed in deep parts of the aquifer. All monitoring wells were constructed of polyvinyl chloride (PVC) pipe and typically are screened in the lowermost 10 to 20 ft of the casing (table A-1). Table A-1 provides information for the sites sampled for this study and groupings and subgroupings of these sites. The GMD2 "EB" and "P" well data (not listed in table A-1) also were used to describe the distribution of specific conductance and chloride concentrations and also were grouped into shallow and deep wells on the basis of well depths (figs. 6*A* and 6*B*). These data are available through GMD2 (Mike Dealy, Manager, written communication, 2006).

Some of the monitoring sites are located in areas where water either was diverted for artificial recharge or was recharged into the *Equus* Beds aquifer as part of the recharge demonstration project and have been described in more detail by Ziegler and others (1999) and Schmidt and others (2007). The Halstead diversion well site (fig. 6*B*) includes a pumping deep well immediately adjacent to the Little Arkansas River to induce streamflow into the aquifer for artificial recharge, three shallow monitoring wells within 500 ft of the Little Arkansas River, two shallow monitoring wells more than 500 ft from the Little Arkansas River, and a deep monitoring well near the diversion well (table A-1). The Halstead recharge site includes the water diverted at the Halstead diversion site that then was piped to the Halstead recharge control building where it was sampled before being recharged into the aquifer and two shallow and two deep (table A-1) monitoring wells near the recharge basins, trench, and injection well. The Sedgwick recharge site includes the water diverted for recharge from the Little Arkansas River near Sedgwick that then was treated and piped to a settling basin at the recharge site before being sampled and recharged into the aquifer, two shallow, and two deep (table A-1) monitoring wells near the recharge basins.

Ziegler and others (1999) also described the background wells, which include 13 shallow monitoring wells along the Little Arkansas River (table A-1). The aquifer storage and recovery (ASR) prototype sites include 12 deep monitoring wells (table A-1) installed by the city of Wichita in 2002 and 2004 near potential locations for large-scale withdrawal and artificial recharge. In addition, 38 index monitoring well (IW) sites were established by the city of Wichita throughout the study area in 2001; each index site included a shallow and a deep monitoring well for a total of 76 monitoring wells (table A-1). Additionally, locations of the large-scale recharge facilities (Phase I recharge wells RRW-1 through 4 and Phase I recharge basins RB-1 and 2) are shown for future reference in figures 6*A* and 6*B*. These sites were constructed in 2006 after the sampling period described in this report.

Water-Sample Collection

Discrete (one time) and continuous real-time water-quality data are used in this report to describe water quality in the Little Arkansas River and the groundwater. Discrete water-quality samples were collected from two surface-water monitoring sites on the Little Arkansas River (sites 07143672 and 07144100; fig. 1), from demonstration diversion and recharge sites, and from index and other wells. Continuous real-time water-quality data also were collected at the two surface-water monitoring sites.

Discrete Surface and Groundwater-Quality Samples

Discrete surface- and groundwater-quality samples were collected from 1995 through 2005 throughout the study area. Surface-water samples were collected using depth- and width-integrating techniques (Wilde and Radtke, 1998). Groundwater samples were collected with a noncontaminating submersible pump using methods described in Wood (1976), Koterba and others (1995), and Puls and Barcelona (1996). To obtain representative samples, at least three to five well volumes were purged prior to sample collection. Specific conductance, pH, water temperature, dissolved oxygen, ORP, and turbidity were measured at 5-minute intervals. Water samples were collected after these constituents were stable (within 10 percent for three consecutive readings) and turbidity was less than 10 nephelometric turbidity units (NTUs).

Sampling frequency varied depending on the type of site. Samples were collected at least six times per year over a range of hydrologic conditions from two surface-water monitoring sites on the Little Arkansas River from 1995 through 2005. During the recharge demonstration project (1995–2002), water-quality samples were collected at least quarterly from all monitoring wells at the Halstead and Sedgwick recharge sites and from selected monitoring wells at the Halstead diversion site. Water from the diversion well was sampled at least monthly while the well was in operation. The treated stream water at the Sedgwick recharge site also was sampled at least monthly during active artificial recharge activities. Sampling frequency from 1995 through 1998 for background wells was described in Ziegler and Combs (1997) and Ziegler and others (1999). Those background wells that were sampled after 1998 were sampled at least annually. Water samples from index wells were collected at least six times from 2001 through 2005. On the basis of analytical results and generally small variability in concentrations, sampling frequency for the index wells was decreased to annual samples in 2004. The ASR prototype wells were sampled at least five times during 2002 through 2005. In previous studies, water samples were collected from background wells near the Halstead and Sedgwick recharge sites prior to artificial recharge (Ziegler and others, 1999, 2001). Analyses of these samples were used for determining any effects on water quality in the *Equus* Beds aquifer during the demonstration phase of the recharge project (reported herein).

Water samples collected for the recharge project at designated data-collection sites during 1995 through 2005 were analyzed for the constituents listed in table A-2 (in the Appendix at the back of this report). All samples were analyzed for "key" selected physical properties, major ions, nutrients, dissolved trace elements, organic compounds, and bacterial and viral indicators (table A-2). Dissolved concentrations of trace elements were defined operationally by filtering the water samples through a 0.45-µm pore-size filter. Selected samples were analyzed for additional constituents (also listed in table A-2), including inorganic compounds, radionuclides, organic compounds, and bacterial and viral indicators. The radionuclides and additional organic compounds included pesticides and their metabolites, volatile organic compounds (VOCs), acid and base/neutral compounds, and pharmaceutical and personal care compounds (shown in table A-2, but not discussed in this report). Those constituents that were not detected in any of the analyses performed for this study are noted in table A-2. Summaries of water-quality data collected from 1995 through 2005 as part of the *Equus* Beds Groundwater Recharge Project and constituents that had at least one detection in water samples from at least one site sampled for this study are presented in the Appendix (at the back of this report) in table A-3 (physical properties, dissolved solids, and sediment), table A-4 (major ions and nutrients), table A-5 (dissolved trace elements), table A-6 (organic compounds), table A-7 (triazine herbicides and bacterial and viral indicators), and table A-8 (radionuclide constituents).

Methods used to analyze water samples for physical properties and to determine concentrations of dissolved solids, major ions, nutrients, dissolved trace elements, radionuclides, organic compounds, and coliform bacteria in water samples were described by Ziegler and Combs (1997). Arsenic speciation data also were collected and analyzed using methods described in Garbarino and others (2002). Additional fecal and viral indicator bacteria analyses were done using methods described by Bisson and Cabelli (1979, 1980), Britton and Greeson (1987), Armon and Payment (1988), Payment and Franco (1993), and United States Environmental Protection Agency (1996, 2000, 2001a, 2006b-e). Samples were analyzed by the city of Wichita laboratory (Wichita, Kansas), the USGS National Water Quality Laboratory (Denver, Colorado), and the USGS Organic Geochemistry Research Laboratory (Lawrence, Kansas). Further information regarding data-collection methods, preservation, sample holding times, analytical methods, and reporting levels can be found in Ziegler and Combs (1997).

In addition to the summary data presented in this report, individual sample analyses are available on the World Wide Web at *http://waterdata.usgs.gov/ks/nwis/qw.* Statistical summaries of these water-quality data are available at *http://ks.water.usgs.gov/Kansas/studies/equus/* (accessed December 2006). Average and median concentrations of water-quality constituents from discrete samples presented in this report were calculated using the summary statistics program that is part of the USGS National Water Information System (NWIS). The program uses statistical methods described in Helsel (2005). This program did not compute an average or median concentration for a data set (a site or group of sites) if there were five or fewer observations (samples analyzed for a particular constituent). A median concentration was determined for the data set if six or more observations were available, even if some of the observations were censored. Censored observations were those concentrations reported in samples in which a constituent is absent or is present at concentrations less than the reporting level of the analysis method. If a constituent was present at or above the reporting level of the analysis method, it was referred to as uncensored. Censored and uncensored observations commonly were referred to as nondetections and detections. A data set must contain at least six detections for its average to be computed by the NWIS program; if there were fewer than six detections, the average was not computed. If the number of observations in a data set included at least six detections but more than 5 percent of the observations were nondetections, then the program estimated the average using a log-probability regression procedure (Helsel, 2005). Where the program did not compute an average for a groundwater site for a constituent mapped in this report, one was calculated or assigned. If there was only one observation or measurement for the particular constituent at a site, then the value of that observation was used. If there was more than one observation for a constituent at a site, a value of one-half the reporting level was assigned to those observations that were less than the reporting level. The average then was calculated as the sum of all the observations divided by the number of observations. Where the resulting average was less than the reporting level for the constituent, it was assigned a concentration indicating that the average was less than the reporting level.

Continuous Surface-Water-Quality Monitoring

Beginning in 1998, the streamflow-gaging stations on the Little Arkansas River at Highway 50 near Halstead and near Sedgwick were each equipped with a multisensor monitor to continuously measure specific conductance, pH, water temperature, dissolved oxygen, and turbidity in the stream. The sensors were calibrated and maintained according to methods presented in Wilde and Radke (1998) and Wagner and others (2000). Measurements from continuous monitoring sensors were checked against a calibrated field meter during site visits.

Continuous monitoring sensors were cleaned of any mud or debris, checked against known standards, and calibrated as needed. Continuous monitoring sensors collected data every 15 to 60 minutes daily. The data then were transmitted by satellite from a data-collection platform (DCP) to the USGS computer in Lawrence, Kansas. Data are available on the World Wide Web at *http://nrtwq.usgs.gov/ks*.

Quality Assurance and Quality Control

Replicate, blank, and standard reference samples were collected as a part of quality assurance/quality control (QA/QC) measures. More than 200 quality-control samples were collected from 1995 through 2004; most of these were replicate and blank samples (data available on request from the U.S. Geological Survey, Lawrence, Kansas).

Replicate samples were collected to identify the variability in the sampling and analysis methods (Wilde and Radke, 1998). A replicate sample is a set of two (or more) samples from the same location that are collected close in time so that they are thought to be representative of the ambient water composition at one collection time (Wilde and Radke, 1998). Replicate samples were compared with their respective original sample, and the percentage differences were calculated as the difference between the replicate and original sample concentrations divided by the average of the two values multiplied by 100. The generally good agreement (less than 10-percent difference) of original and replicate results for constituent concentration substantially larger than the reporting level indicated that sampling and analysis methods were consistent and did not introduce large or biased variability into the data set (fig. A-1 in the Appendix at the back of this report).

Blank samples composed of deionized water were prepared for QA/QC from 1995 through 2004. Blank samples were analyzed to check for contamination through all of the sampling, processing, and analytical procedures. Dissolved solids and sodium were detected in about 7 and 11 percent of the blank samples at concentrations more than 1.0 and 0.03 mg/L [figs. A-2 (1995–2004) and A-3 (1999–2004) in the Appendix, at the back of this report]. The detections of sodium were near reporting levels and were likely caused by impurities in the acid used to the preserve the samples. Fluoride was detected in about 8 percent (1995–2004) of blank samples and recently is more prevalent (15 percent, 1999–2004, fig. A-3) at concentrations that ranged from less than 0.02 to 0.1 mg/L. Fluoride detected in environmental samples ranged from less than 0.02 to 0.82 mg/L; therefore, fluoride concentrations in environmental samples could be affected by sampling and analytical errors in about 10 percent of the samples.

Standard reference samples were analyzed by the Wichita Municipal Water and Wastewater Laboratory at least annually and submitted to the USGS Branch of Quality Systems for sample analysis and evaluation of laboratory performance. Evaluations of the Wichita laboratory indicated consistently good to excellent ratings (within 2 to 5 percent) in major ion and trace-element analysis. However, nutrient analysis was rated marginal for total nitrogen and phosphorus but was within 20 percent of the most probable value during the *Equus* Beds artificial recharge project. Results are available on the World Wide Web at *http://bqs.usgs.gov/srs/*.

Regression Analysis

Data for selected water-quality constituents were analyzed further using linear regression statistical analysis methods. Statistical methods presented in Helsel and Hirsch (1992, 2002) were used by Christensen and others (2000, 2003) to develop regression models between water-quality constituent concentrations in water samples in surface water and physical properties such as specific conductance, pH, water temperature, and turbidity. These models are used to provide real-time computations of concentrations and loads for selected major ions, nutrients, arsenic, atrazine, and fecal indicator bacteria in the Little Arkansas River. These computed concentrations are available on the World Wide Web at *http://nrtwq.usgs.gov/ks/*.

Data also were analyzed using ordinary least-square regression (Helsel and Hirsch, 2002) to develop models for estimating concentrations of water-quality constituents in groundwater. These models help explain the current distribution of these constituents in the study area and also provided the ability to compute concentrations of constituents in groundwater for future use or in parts of the *Equus* Beds aquifer without complete chemical analyses using easily measured onsite sensors. For each index well, individual sample concentrations of selected constituents were plotted against sampled onsite water-quality constituents measured during sampling, such as specific conductance, dissolved oxygen, and ORP. Graphs were examined visually to detect any relations between response and explanatory variables. Three relatively strong relations (coefficient of determination, R^2, between 0.5 and 1.0) for groundwater were developed through statistical regression—(1) specific conductance and sulfate concentration, (2) specific conductance and chloride concentration, and (3) ORP and arsenic concentration.

Effective Porosity

Effective porosity is a measure of the interconnected pore volume within a rock layer that contributes to fluid flow (Lohman, 1972) and is expressed as a percentage of the total volume. Effective porosity for the entire thickness of the aquifer was computed for this study from the examination of water-well drillers' logs (Water Well Completion Forms WWC5) for the 38 deep index wells (data on file with the Kansas Geological Survey, Lawrence, Kansas) and from tables of location, total thickness, and sand thickness of 78 soil borings made in the study area (Robert Jacques, Burns and McDonnell Engineering Consultants, Kansas City, Missouri, written commun., November 22, 2004). Only the sand and gravel layers at each site were considered to have useful porosity because clay and silt layers were considered to be much more restrictive to groundwater flow. An effective porosity of 25 percent was estimated by Burns and McDonnell Engineering Consultants for the city of Wichita for the sand and gravel layers. This value was within the range of average effective porosity values reported for sand and gravel by McWhorter and Sunada (1977). Effective porosity for the aquifer was estimated as the thickness of sand and gravel encountered at each well or soil boring divided by the total thickness of unconsolidated deposits penetrated at each site multiplied by the estimated effective porosity for sand and gravel of 25 percent.

Area Calculations

The percentage of the study area considered to have a constituent concentration exceeding a particular concentration was computed on the basis of manually drawn contours of equal concentration. These contours were based on average values of constituent concentrations in water samples from wells in and near the study area. The area within each contour of equal concentration was calculated using a geographic information system (GIS). The percentage of area was determined by dividing the sum of the areas with concentrations more than the chosen concentration in the study area by the total study area and multiplying the result by 100.

Water Quality of the *Equus* Beds Aquifer and Little Arkansas River, 1995–2005

The chemical composition of natural water is determined primarily by the lithology in which the water resides or passes through (Hem, 1992). Other factors affecting water quality include precipitation, mixing with water from other sources, geochemical and biochemical processes, and human activities that contribute additional constituents or produce chemical reactions such as ion exchange or oxidation-reduction processes.

The *Equus* Beds aquifer consists of alluvial deposits as much as 250 ft thick that lie on top of the shale in the Wellington Formation, which occurs throughout most of the study area. Dissolution of the underlying Hutchinson Salt Member of the Wellington Formation and the subsequent collapse of overlying rock created a depression in much of the study area and allowed the accumulation of materials that make up the *Equus* Beds aquifer. These materials consist of sand and gravel interbedded with clay and silt. A trough or bedrock low filled with unconsolidated deposits about 200 ft thick in the center of the study area (commonly referred to as the McPherson channel) (figs. 3, 5, 7, and 8) represents the deepest part of the aquifer and is a primary flow path for water within the *Equus* Beds aquifer. Flow of groundwater in the study area generally is from west to east or northeast and becomes more southerly near and to the east of the bedrock low (fig. 5) because of the effects of city pumpage and discharge to the Little Arkansas River (Aucott and others, 1998). Generally, water altitudes in the shallow index wells are higher than those in deep index wells indicating there is a downward gradient throughout the aquifer (Data on file with the U.S. Geological Survey, Lawrence, Kansas).

Water-quality changes may be more rapid in areas with larger effective porosity. Estimated effective porosity of the entire thickness of the *Equus* Beds aquifer in the study area is illustrated in figure 8. Areas with the largest estimated effective porosity, more than 15 percent, are along the western part of the study area, along the Arkansas and Little Arkansas Rivers, and in an area stretching from Halstead to the deepest part of the bedrock low. The presence of clay layers and the depth below land surface also affect effective porosity and, in turn, water chemistry in the aquifer.

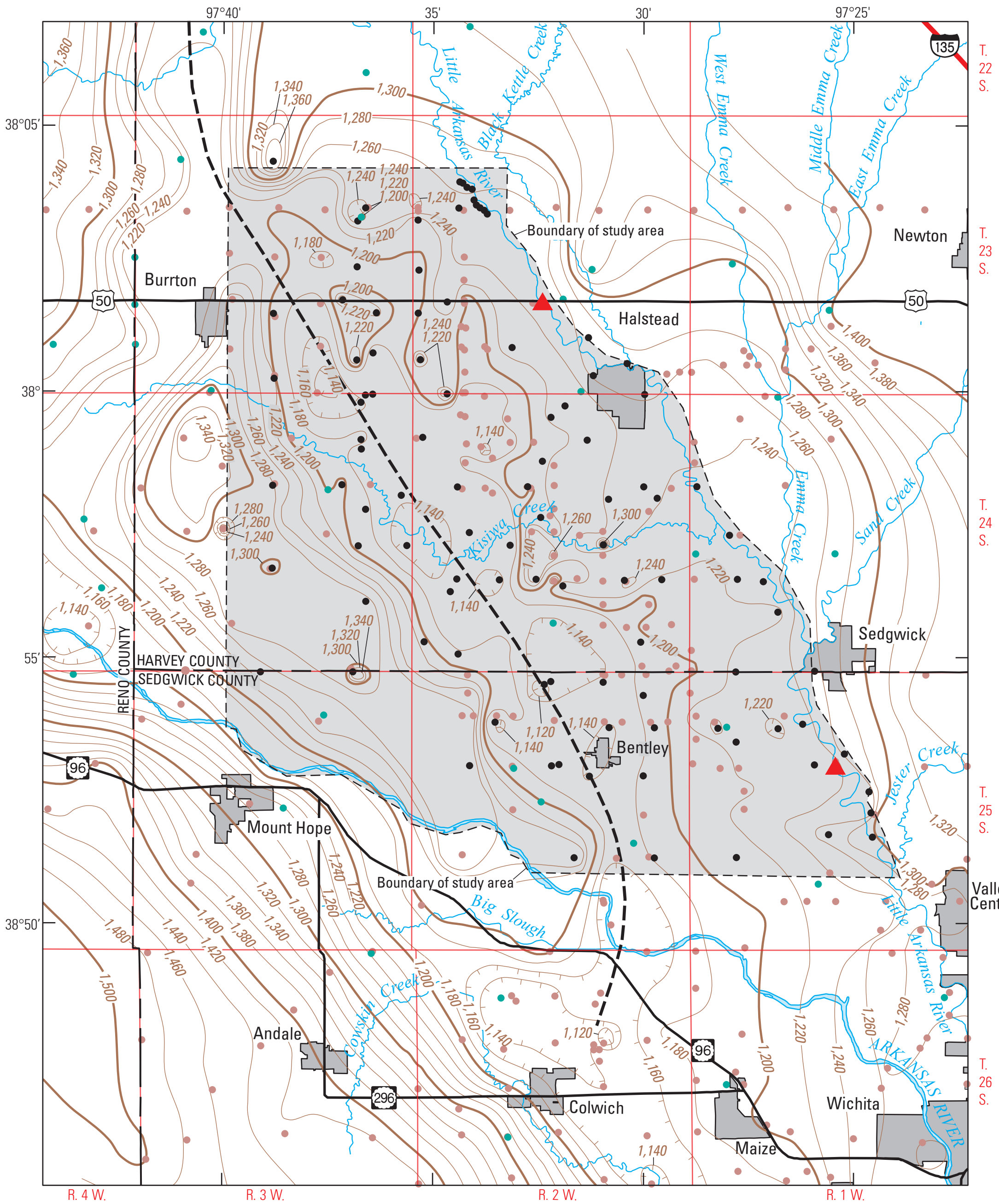
Of all the constituents analyzed, only those that frequently exceeded USEPA Federal drinking-water-quality criteria, those that are of potential concern for artificial recharge operations, and those that may change as a result of artificial recharge are discussed in this report. These constituents include dissolved ions (sulfate and chloride), nutrients, trace elements (arsenic, iron, and manganese), triazine herbicides (atrazine), and alachlor, and bacterial (fecal coliform, *Escherichia coli*, and total coliform) and viral (*Clostridium perfringens* and *E. coli* coliphage) indicators. Summaries of these constituents are presented in table 1 for the two surface-water monitoring sites on the Little Arkansas River and in table 2 for background wells, ARS prototype wells, and shallow and deep index wells. Detailed summaries of all water-quality monitoring results are presented in Appendix tables A-3 through A-8. Water-quality constituents that were monitored included physical properties, major ions, nutrients, trace elements, radionuclides, organic compounds, fecal bacterial and viral indicators, and suspended sediment.

Physical Properties

Physical properties were measured onsite during sample collection and include streamflow discharge, groundwater level, specific conductance, pH, water temperature, turbidity, dissolved oxygen, and ORP. Specific conductance and ORP are examined in detail in this report because of their relation to many of the potential water-quality constituents of concern for artificial recharge.

Specific Conductance

Specific conductance measures the ability of water to conduct an electrical current and is an indirect measurement of the presence of inorganic dissolved solids in water (Hem, 1992). Previous studies have successfully used specific conductance to compute concentrations of water-quality



Base from U.S. Geological Survey digital data, 1:100,000, 1983
Universal Transverse Mercator projection,
Zone 14

Horizontal coordinate information is referenced to the North American Datum of 1983 (NAD 83)

0 1 2 3 4 5 MILES

0 1 2 3 4 5 KILOMETERS

EXPLANATION

Study area

Bedrock contour—Shows altitude of bedrock surface. Interval 100 feet. Datum is National Geodetic Vertical Datum of 1929 (1,400)

Intermediate bedrock contour—Altitude of bedrock surface. Interval 20 feet. Datum is National Geodetic Vertical Datum of 1929 (1,420)

Bedrock depression contour

Approximate location of bedrock low (McPherson channel)

U.S. Geological Survey streamflow-gaging station and continuous real-time water-quality monitoring site

Bedrock data point from:

- Myers and others, 1996
- Burns and McDonnell, 2004
- U.S. Geological Survey, data on file, 1988

Figure 7. Altitude of bedrock surface below *Equus* Beds aquifer and approximate location of bedrock low in study area. Bedrock contours are modified from Myers and others, 1996. Point data are from Myers and others, 1996; Robert Jacques, Burns and McDonnell, written commun., 2004; and data on file with U.S. Geological Survey, Lawrence, Kansas.

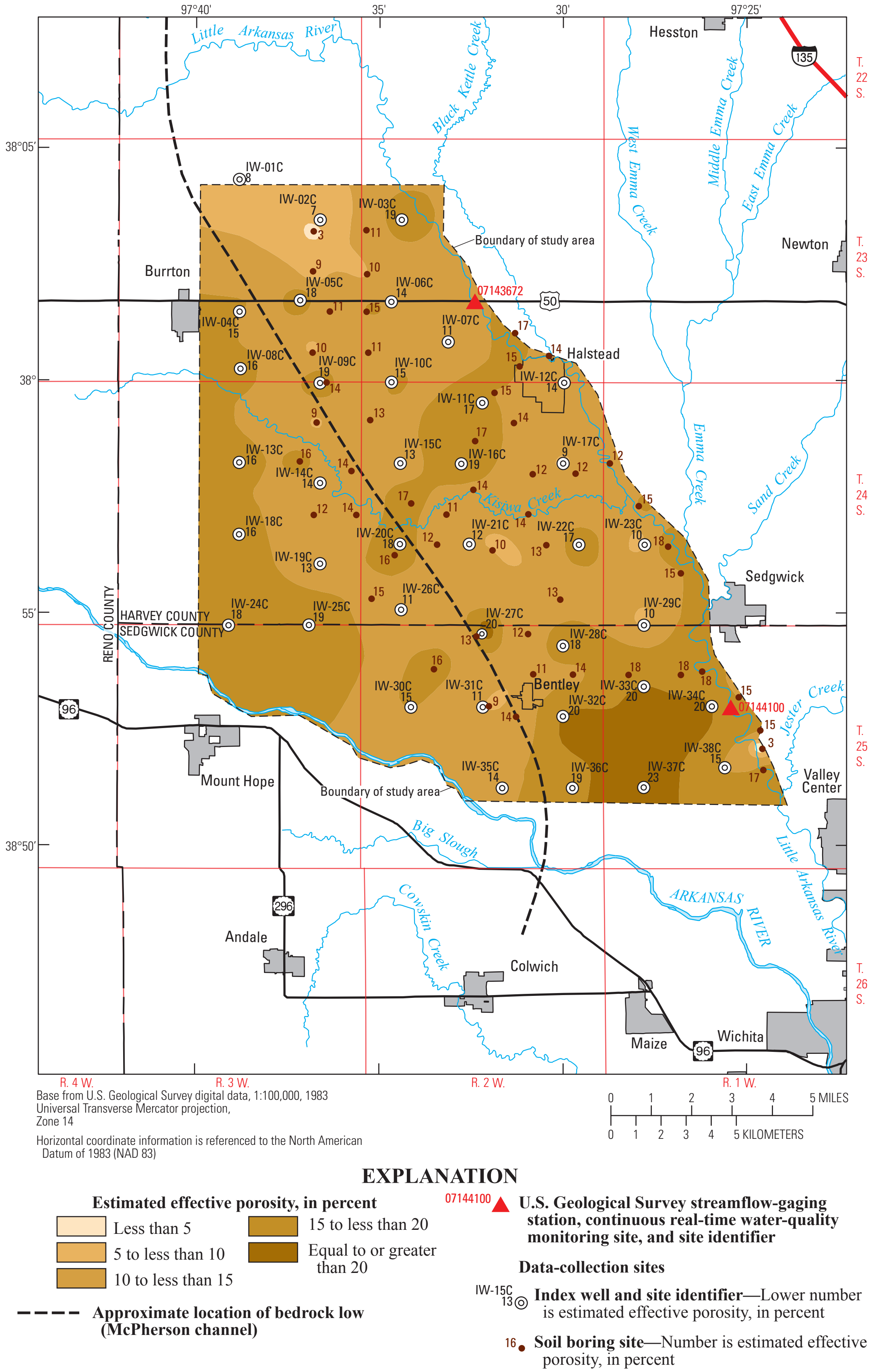


Figure 8. Estimated effective porosity in study area. Soil boring data are from Robert Jacques, Burns and McDonnell, written commun., November 11, 2004; index well data are on file with U.S. Geological Survey, Lawrence, Kansas.

Table 1. Summary of selected water-quality data from surface-water samples collected from February 1995 through December 2005 as a part of the *Equus* Beds Groundwater Recharge Project, south-central Kansas.

[mg/L, milligrams per liter; DWA, Drinking Water Advisory; SDWR, Secondary Drinking-Water Regulation; MCL, Maximum Contaminant Level; <, less than; µg/L, micrograms per liter; cols/100 mL, colonies per 100 milliliters; MCLG, Maximum Contaminant Level Goal]

Water-quality constituent	Water-quality criteria	Number of samples	Minimum	Maximum	Average	Median	Detected in percentage of samples	Percentage of samples exceeding criteria	Percentage of replicate samples exceeding criteria
Surface-water monitoring sites Sites: Little Arkansas River at Highway 50 near Halstead (07143672) and Little Arkansas River at Sedgwick (07144100), Kansas									
Sodium, dissolved (mg/L)	20 mg/L (DWA)[1]	347	1.5	498	70.0	59	100	77.5	72.3
Sulfate, dissolved (mg/L)	250 mg/L (SDWR)[1]	347	5	312	39.6	40	97.7	.288	0
Chloride, dissolved (mg/L)	250 mg/L (SDWR)[1]	352	5	932	125	91	99.1	14.5	6.52
Nitrite plus nitrate as nitrogen, dissolved (mg/L)	10 mg/L (MCL)[1]	306	<.02	9.4	[2].94	.85	89.9	0	0
Arsenic, dissolved (µg/L)	10 µg/L (MCL)[1]	166	1	14.1	5.00	5	98.8	8.43	11.1
Iron, dissolved (µg/L)	300 µg/L (SDWR)[1]	347	<5.00	860	[2]33.1	10	65.7	1.73	2.13
Manganese, dissolved (µg/L)	50 µg/L (SDWR)[1]	346	<1	1,140	[2]147	60	80.1	48.0	53.2
Total coliform bacteria (cols/100 mL)	0 cols/100 mL (MCLG)[1]	297	<1	9,000,000	[2]46,200	1,700	92.9	92.9	86
Fecal coliform bacteria[3](cols/100 mL)	200 cols/100 mL (Guideline)[4]	345	<1	4,000,000	25,500	860	98.3	76.2	78.4
	2,000 cols/100 mL (Guideline)[4]	113	4	20,000	1,270	170	96.5	15.9	5.9
Escherichia coli (cols/100 mL)	262 cols/100 mL (Guideline)[6]	56	32	41,000	2,470	215	100	48.2	0
	2,358 cols/100 mL (Guideline)[6]	10	21	2,200	609	345	100	0	0
Atrazine herbicide	3 µg/L as an annual average[1] (MCL)	495	.030	48	5.81	3.45	97.8	54.1	45.0
Triazine herbicide screen, dissolved (µg/L as atrazine)	3 µg/L as an annual average[1] (MCL)	3,165	.1	50	3.71	2	96.2	30.7	36.3
Alachlor (µg/L)	2 µg/L (MCL)[1]	490	<.002	28	[2].544	.13	70.2	4.90	2.56

[1] U.S. Environmental Protection Agency (2006a).

[2] Value is estimated by using a log-probability regression to predict the values of data below the detection level.

[3] For fecal coliform bacteria, the primary contact recreation surface-water criterion of 200 colonies per 100 milliliters was used from April 1 to October 31 (when most water-contact recreation occurs); from November 1 to March 31, the criterion of 2,358 colonies per 100 milliliters was used.

[4] Recreational-use guideline (Kansas Department of Health and Environment, 2001).

[5] For *Escherichia coli*, the primary contact recreation surface-water quality criterion of 262 colonies per 100 milliliters was used from April 1 to October 31 for Class B (public access) stream segments; from November 1 to March 31, the criterion of 2,358 colonies per 100 milliliters was used.

[6] Recreational-use guideline (Kansas Department of Health and Environment, 2004).

Table 2. Summary of selected water-quality data from groundwater samples collected from February 1995 through December 2005 as a part of the *Equus* Beds Groundwater Recharge Project, south-central Kansas.

[mg/L, milligrams per liter; DWA, Drinking Water Advisory; SDWR, Secondary Drinking-Water Regulation; <, less than; MCL, Maximum Contaminant Level; µg/L, micrograms per liter; cols/100 mL, colonies per 100 milliliters; MCLG, Maximum Contaminant Level Goal; --, not determined]

Water-quality constituent	Water-quality criteria	Number of samples	Minimum	Maximum	Average	Median	Detected in percentage of samples	Percentage of samples exceeding criteria	Percentage of replicate samples exceeding criteria	Percentage of wells with average exceeding criteria
Background wells Wells: TH-02-95, TH-06-95, TH-10-95, TH-12-95, Sedgwick well, EB-142-A3, city well-Sedgwick, Alta Mills well, TH-08-A1, TH-08-A2, TH-08-A3, TH-08-A4, TH-08-A5										
Sodium, dissolved (mg/L)	20 mg/L (DWA)[1]	205	17.8	90.7	43.2	43.6	100	95.1	94.1	100
Sulfate, dissolved (mg/L)	250 mg/L (SDWR)[1]	205	5	186	57.3	55	98	0	0	0
Chloride, dissolved (mg/L)	250 mg/L (SDWR)[1]	205	<5.00	65	[2]20.6	21	90.7	0	0	0
Nitrite plus nitrate as nitrogen, dissolved (mg/L)	10 mg/L (MCL)[1]	205	<.010	11.7	[2].837	<.020	31.2	2.44	5.88	0
Arsenic, dissolved (µg/L)	10 µg/L (MCL)[1]	155	<1.00	15.4	[2]6.19	6.6	84.5	21.3	14.3	23.1
Iron, dissolved (µg/L)	300 µg/L (SDWR)[1]	205	<5.00	1,850	[2]607	620	82.4	73.7	76.5	69.2
Manganese, dissolved (µg/L)	50 µg/L (SDWR)[1]	205	0	4,320	322	250	99.5	88.8	88.2	92.3
Total coliform bacteria (cols/100 mL)	0 cols/100 mL (MCLG)[1]	204	<1.00	636	[2]9.60	<1.00	28.9	28.9	47.1	--
Fecal coliform bacteria[3] (cols/100 mL)	200 cols/100 mL (Guideline)[4]	152	<1.00	6	<1.00	<1.00	3.29	0	0	0
	2,000 cols/100 mL (Guideline)[4]	52	<1.00	<4.00	<1.00	<1.00	0	0	0	0
Atrazine herbicide	3 µg/L as an annual average[1] (MCL)	82	<.001	1.6	[2].056	<.050	39.0	0	0	0
Triazine herbicide screen, dissolved (µg/L as atrazine)	3 µg/L as an annual average[1] (MCL)	214	<.010	2	[2].069	<.100	17.3	0	0	0
Alachlor (µg/L)	2 µg/L (MCL)[1]	81	<.002	.017	<.009	<.004	1.23	0	0	0

Table 2. Summary of selected water-quality data from groundwater samples collected from February 1995 through December 2005 as a part of the *Equus* Beds Groundwater Recharge Project, south-central Kansas.—Continued

[mg/L, milligrams per liter; DWA, Drinking Water Advisory; SDWR, Secondary Drinking-Water Regulation; <, less than; MCL, Maximum Contaminant Level; µg/L, micrograms per liter; cols/100 mL, colonies per 100 milliliters; MCLG, Maximum Contaminant Level Goal; --, not determined]

Water-quality constituent	Water-quality criteria	Number of samples	Minimum	Maximum	Average	Median	Detected in percentage of samples	Percentage of samples exceeding criteria	Percentage of replicate samples exceeding criteria	Percentage of wells with average exceeding criteria
Aquifer storage and recovery prototype wells Wells: DW-TW-01 through DW-TW-09, RRW-01, RRW-02, RRW-03										
Sodium, dissolved (mg/L)	20 mg/L (DWA)[1]	76	14.9	44.4	30.5	30.9	100	90.8	100	91.7
Sulfate, dissolved (mg/L)	250 mg/L (SDWR)[1]	76	7.1	135	17.3	15.1	100	0	0	0
Chloride, dissolved (mg/L)	250 mg/L (SDWR)[1]	76	<5.00	57	[2]8.90	6	93.4	0	0	0
Nitrite plus nitrate as nitrogen, dissolved (mg/L)	10 mg/L (MCL)[1]	76	<.020	1.07	[2].054	<.020	43.4	0	0	0
Arsenic, dissolved (µg/L)	10 µg/L (MCL)[1]	76	1	21.4	7.46	7.05	98.7	27.6	20	25
Iron, dissolved (µg/L)	300 µg/L (SDWR)[1]	76	<5.00	470	[2]27.7	<5.00	36.8	1.32	0	0
Manganese, dissolved (µg/L)	50 µg/L (SDWR)[1]	76	40	330	198	190	100	97.4	0	100
Total coliform bacteria (cols/100 mL)	0 cols/100 mL (MCLG)[1]	76	<1.00	224	[2]8.33	<1.00	23.7	23.7	0	--
Fecal coliform bacteria[3] (cols/100 mL)	200 cols/100 mL (Guideline)[4]	34	<1.00	<1.00	<1.00	<1.00	0	0	0	0
	2,000 cols/100 mL (Guideline)[4]	42	<1.00	1	<1.00	<1.00	2.38	0	0	0
Atrazine herbicide	3 µg/L as an annual average[1] (MCL)	53	<.007	<.050	<.030	<.007	0	0	0	0
Triazine herbicide screen, dissolved (µg/L as atrazine)	3 µg/L as an annual average[1] (MCL)	76	<.100	.8	[2].026	<.100	7.89	0	0	0
Alachlor (µg/L)	2 µg/L (MCL)[1]	43	<.004	<.050	<.050	<.005	0	0	0	0

Table 2. Summary of selected water-quality data from groundwater samples collected from February 1995 through December 2005 as a part of the *Equus* Beds Groundwater Recharge Project, south-central Kansas.—Continued

[mg/L, milligrams per liter; DWA, Drinking Water Advisory; SDWR, Secondary Drinking-Water Regulation; <, less than; MCL, Maximum Contaminant Level; µg/L, micrograms per liter; cols/100 mL, colonies per 100 milliliters; MCLG, Maximum Contaminant Level Goal; --, not determined]

Water-quality constituent	Water-quality criteria	Number of samples	Minimum	Maximum	Average	Median	Detected in percentage of samples	Percentage of samples exceeding criteria	Percentage of replicate samples exceeding criteria	Percentage of wells with average exceeding criteria
Areal assessment index wells (shallow monitoring wells) Wells: IW-01A through IW-38A										
Sodium, dissolved (mg/L)	20 mg/L (DWA)[1]	284	12.5	330	87.6	64.7	100	95.1	91.7	94.7
Sulfate, dissolved (mg/L)	250 mg/L (SDWR)[1]	284	5	760	155	115	98.9	19.4	16.7	18.4
Chloride, dissolved (mg/L)	250 mg/L (SDWR)[1]	284	5	773	79.1	40.5	99.3	7.04	16.7	5.26
Nitrite plus nitrate as nitrogen, dissolved (mg/L)	10 mg/L (MCL)[1]	284	<.020	23.8	[2]3.61	.19	70.4	15.1	31	13.2
Arsenic, dissolved (µg/L)	10 µg/L (MCL)[1]	281	<1.00	55	[2]4	<1.00	47.7	10.7	12	10.5
Iron, dissolved (µg/L)	300 ug/L (SDWR)[1]	284	<5.00	40,700	[2]2,440	78	60.6	37.3	33.3	39.5
Manganese, dissolved (µg/L)	50 µg/L (SDWR)[1]	284	<1.00	1,490	[2]282	110	73.9	55.6	54.3	57.9
Total coliform bacteria (cols/100 mL)	0 cols/100 mL (MCLG)[1]	271	<1.00	368	[2]8.72	<1.00	32.8	32.8	23.1	--
Fecal coliform bacteria[3] (cols/100 mL)	200 cols/100 mL (Guideline)[4]	203	<1.00	120	1.15	<1.00	1.97	0	0	0
	2,000 cols/100 mL (Guideline)[4]	82	<1.00	24	<1.00	<1.00	5	0	0	0
Escherichia coli (cols/100 mL)	262 cols/100 mL (Guideline)[6]	9	<1.00	1	<1.00	<1.00	0	0	0	0
Atrazine herbicide	3 µg/L as an annual average (MCL)	105	<.007	1.2	[2].048	.005	55.2	0	0	0
Triazine herbicide screen, dissolved (µg/L as atrazine)	3 µg/L as an annual averagea (MCL)	272	<.100	2	[2].057	<.100	14	0	0	0
Alachlor (µg/L)	2 µg/L (MCL)[1]	99	<.004	.013	<.020	<.005	3.03	0	0	0

Table 2. Summary of selected water-quality data from groundwater samples collected from February 1995 through December 2005 as a part of the *Equus* Beds Groundwater Recharge Project, south-central Kansas.—Continued

[mg/L, milligrams per liter; DWA, Drinking Water Advisory; SDWR, Secondary Drinking-Water Regulation; <, less than; MCL, Maximum Contaminant Level; µg/L, micrograms per liter; cols/100 mL, colonies per 100 milliliters; MCLG, Maximum Contaminant Level Goal; --, not determined]

Water-quality constituent	Water-quality criteria	Number of samples	Minimum	Maximum	Average	Median	Detected in percentage of samples	Percentage of samples exceeding criteria	Percentage of replicate samples exceeding criteria	Percentage of wells with average exceeding criteria
Areal assessment index wells (deep monitoring wells) Wells: IW-01C through IW-38C										
Sodium, dissolved (mg/L)	20 mg/L (DWA)[1]	288	17.4	409	97.3	91.8	100	95.5	95.2	94.7
Sulfate, dissolved (mg/L)	250 mg/L (SDWR)[1]	288	5	890	111	70	99.3	13.9	14.3	13.2
Chloride, dissolved (mg/L)	250 mg/L (SDWR)[1]	287	5	1460	125	70	97.6	8.36	28.6	5.26
Nitrite plus nitrate as nitrogen, dissolved (mg/L)	10 mg/L (MCL)[1]	288	<.020	9.61	[2].419	.01	50.3	0	0	0
Arsenic, dissolved (µg/L)	10 µg/L (MCL)[1]	286	<1.00	23.9	[2]7.43	5.9	83.2	34.3	27.3	34.2
Iron, dissolved (µg/L)	300 µg/L (SDWR)[1]	288	<5.00	15,800	[2]1,470	120	70.5	43.4	52.4	44.7
Manganese, dissolved (µg/L)	50 µg/L (SDWR)[1]	288	0	1,450	441	310	99.3	92	76.2	94.7
Total coliform bacteria (cols/100 mL)	0 cols/100 mL (MCLG)[1]	273	<1.00	84	[2]1.77	<1.00	18.3	18.3	0	--
Fecal coliform bacteria[3] (cols/100 mL)	200 cols/100 mL (Guideline)[4]	204	<1.00	4	<1.00	<1.00	.98	0	0	0
	2,000 cols/100 mL (Guideline)[4]	81	<1.00	21	<1.00	<1.00	2.47	0	0	0
Escherichia coli (cols/100 mL)	262 cols/100 mL (Guideline)[6]	10	<1.00	1	<1.00	<1.00	10	0	0	0
Atrazine herbicide	3 µg/L as an annual average (MCL)[1]	51	<.007	.07	[2].010	<.050	21.6	0	0	0
Triazine herbicide screen, dissolved (µg/L as atrazine)	3 µg/L as an annual average (MCL)[1]	272	<.100	.3	<.100	<.100	1.47	0	0	0
Alachlor (µg/L)	2 µg/L (MCL)[1]	41	<.004	<.050	<.050	<.005	0	0	0	0

[1] U.S. Environmental Protection Agency (2006a).

[2] Value is estimated by using a log-probability regression to predict the values of data below the detection level.

[3] For fecal coliform bacteria, the primary contact recreation surface-water criterion of 200 cols/100 mL was used from April 1 to October 31 (when most water-contact recreation occurs); from November 1 to March 31, the criterion of 2,358 colonies per 100 milliliters was used.

[4] Recreational-use guideline (Kansas Department of Health and Environment, 2001).

[5] For *Escherichia coli*, the primary contact recreation surface-water quality criterion of 262 colonies per 100 milliliters was used from April 1 to October 31 for Class B (public access) stream segments; from November 1 to March 31, the criterion of 2,358 colonies per 100 milliliters was used.

[6] Recreational-use guideline (Kansas Department of Health and Environment, 2004).

constituents, such as sulfate and chloride, in surface water (Christensen and others, 2000, 2003).

Specific conductance at 25 degrees Celsius (°C) was measured in water samples collected from surface-water sites during 1995 through 2005 ranged from 40 to 3,550 microsiemens per centimeter at 25 °C (µS/cm), with median values of 864 µS/cm in the Little Arkansas River near Halstead and 657 µS/cm near Sedgwick (table A-3). Specific conductance in the treated stream water used for recharge at the Sedgwick recharge site ranged from 212 to 1,300 µS/cm, with a median value of 570 µS/cm.

Specific conductance measurements by the continuous monitoring sensors during 1999 through 2005 at the surface-water monitoring sites on the Little Arkansas River near Halstead and near Sedgwick were within the range of those measured in water samples collected at these sites. However, the specific conductance median values of 1,020 µS/cm near Halstead and 816 µS/cm near Sedgwick from the continuous monitoring data were larger than those from the collected samples because of a more complete (hourly measurements) data set and a larger part of continuous monitoring measurements were made during lower flow conditions.

Specific conductance measurements of groundwater ranged from 108 µS/cm in well IW-01A to 4,520 µS/cm in well IW-08C (table A-3). Average values of specific conductance in groundwater are shown in figures 9*A* for the shallow parts of the aquifer and in figure 9*B* for the deep parts of the aquifer. The area of largest specific conductance in both shallow and deep parts of the aquifer was near Burrton and is associated with past oil and gas activities (Williams and Lohman, 1949; Whittemore, 2007). Large specific conductance values (larger than 1,000 µS/cm) were measured along parts of Kisiwa Creek and the Arkansas River in both shallow and deep parts of the aquifer. Areas of larger specific conductance generally corresponded to areas of larger effective porosity near Burrton and along the Arkansas River. Distribution of specific conductance in the *Equus* Beds aquifer has not changed substantially since 1979 and 1980 when Hathaway and others (1981) reported the largest specific conductance values were near Burrton, south of Kisiwa Creek, and along the Arkansas River, and smaller values occurred in the northern and eastern parts of the study area of the *Equus* Beds Groundwater Recharge Project.

Oxidation-Reduction Potential

ORP is measured in millivolts (mV) relative to the standard hydrogen electrode and indicates the ability of constituents in water to cause oxidation or reduction reactions. ORP was reported only in groundwater samples. The larger the ORP, the more oxidizing are the conditions. For example, ORP values of more than 250 mV indicated that the dominant iron species in groundwater was ferric iron, which can lead to chemical precipitation of iron hydroxides in aquifer material and can decrease the effective porosity. If ORP is less than 250 mV, more reducing conditions may cause reduction of nitrate and dissolution of arsenic, iron, and manganese in aquifer materials, thereby leading to larger dissolved concentrations of these constituents in groundwater. Even more reducing conditions involve geochemical and biological processes that convert dissolved sulfate to hydrogen sulfide gas. As a result, highly reduced areas (small ORP values) are expected to have smaller dissolved sulfate or nitrate concentrations.

Average values for ORP measured in wells in the study area from 1995 through 2005 are shown in figure 10*A* for the shallow parts of the aquifer and in figure10*B* for the deep parts of the aquifer. Average ORP in the shallow parts of the aquifer indicated more reducing conditions (ORP less than 250 mV) along parts of Kisiwa Creek and the Little Arkansas River. In the deep parts of the aquifer, most of the southern part of the study area (Sedgwick County) was more oxidizing than the northern part (Harvey County). This generally corresponded to larger effective porosity values (more sandy material) in the southern part of the study area.

Major Ions

Dissolution of rocks and minerals is the primary source for most major ions in water (Hem, 1992). However, primary sources of chloride in the study area are from past oil and gas activities near Burrton, Kansas, the Arkansas River, and municipal wastewater and industrial discharges (Whittemore, 2007). Major ion constituents analyzed in water samples collected for this study include calcium, magnesium, potassium, sodium, bicarbonate, carbonate, bromide, chloride, fluoride, and sulfate. Summaries of these constituent concentrations for the study area are presented in table A-4.

Groundwater in the *Equus* Beds aquifer is predominantly a calcium bicarbonate type, changing to a sodium chloride type in some areas (Leonard and Kleinschmidt, 1976). The groundwater near the Arkansas River is a calcium sodium chloride type. Farther away from the Arkansas River, the dominant groundwater is a calcium bicarbonate type.

Large concentrations of major ions are objectionable in drinking water because of possible physiological effects, unpalatable mineral tastes, and greater costs because of corrosion or the need for additional treatment (U.S. Environmental Protection Agency, 1986). The major ions that frequently exceeded water-quality criteria include sodium, sulfate, and chloride. Sulfate and chloride are discussed in detail because of the potential for saltwater migration from the Burrton oil field and the Arkansas River into the *Equus* Beds aquifer.

Sulfate

Sulfate is a major ion of importance for artificial recharge. Natural sources of sulfate in surface water and groundwater are rock weathering, oxidation of sulfide minerals, and biological processes. The primary anthropogenic (human-related) sources of sulfate in water are atmospheric deposition of the combustion of coal and petroleum products

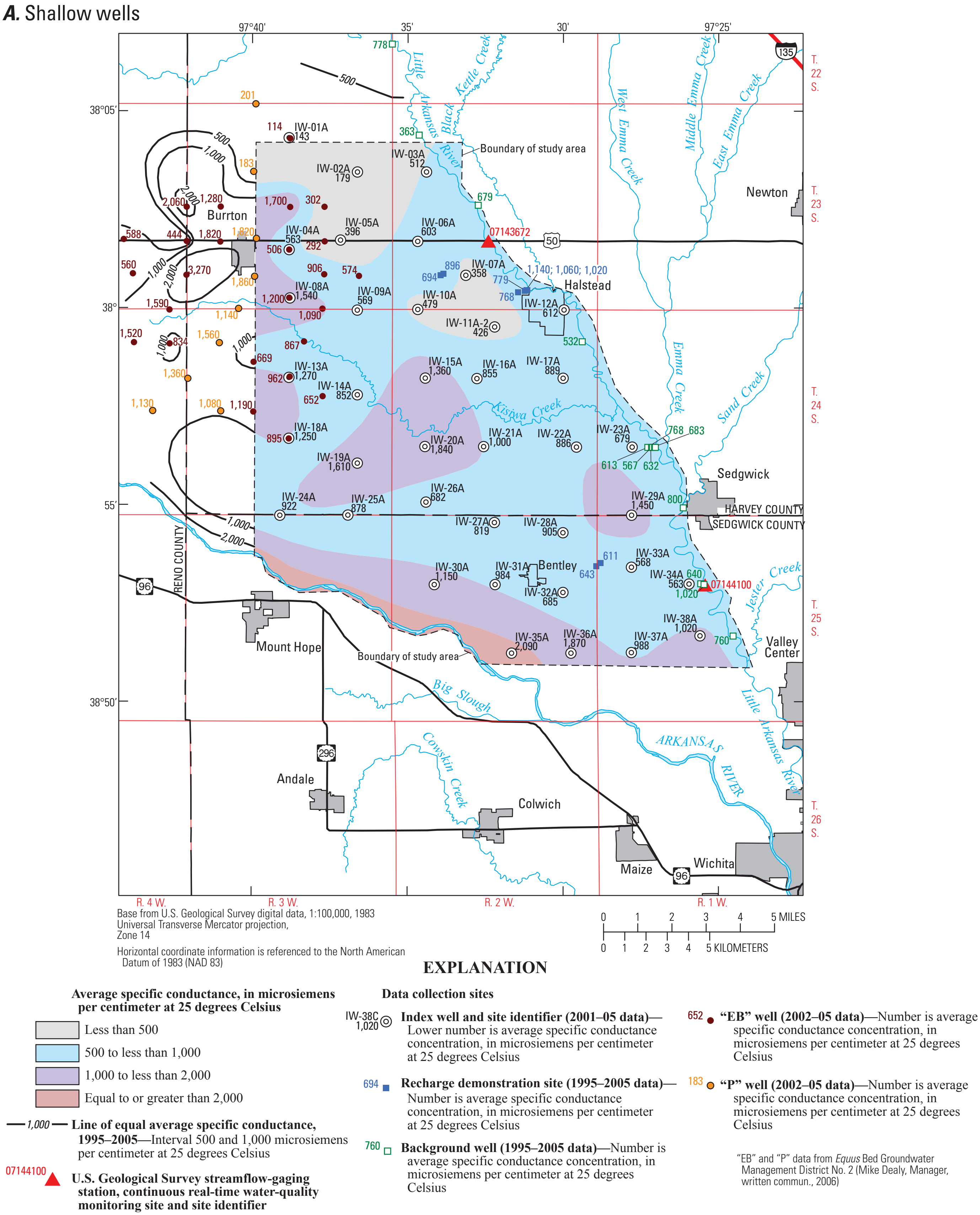
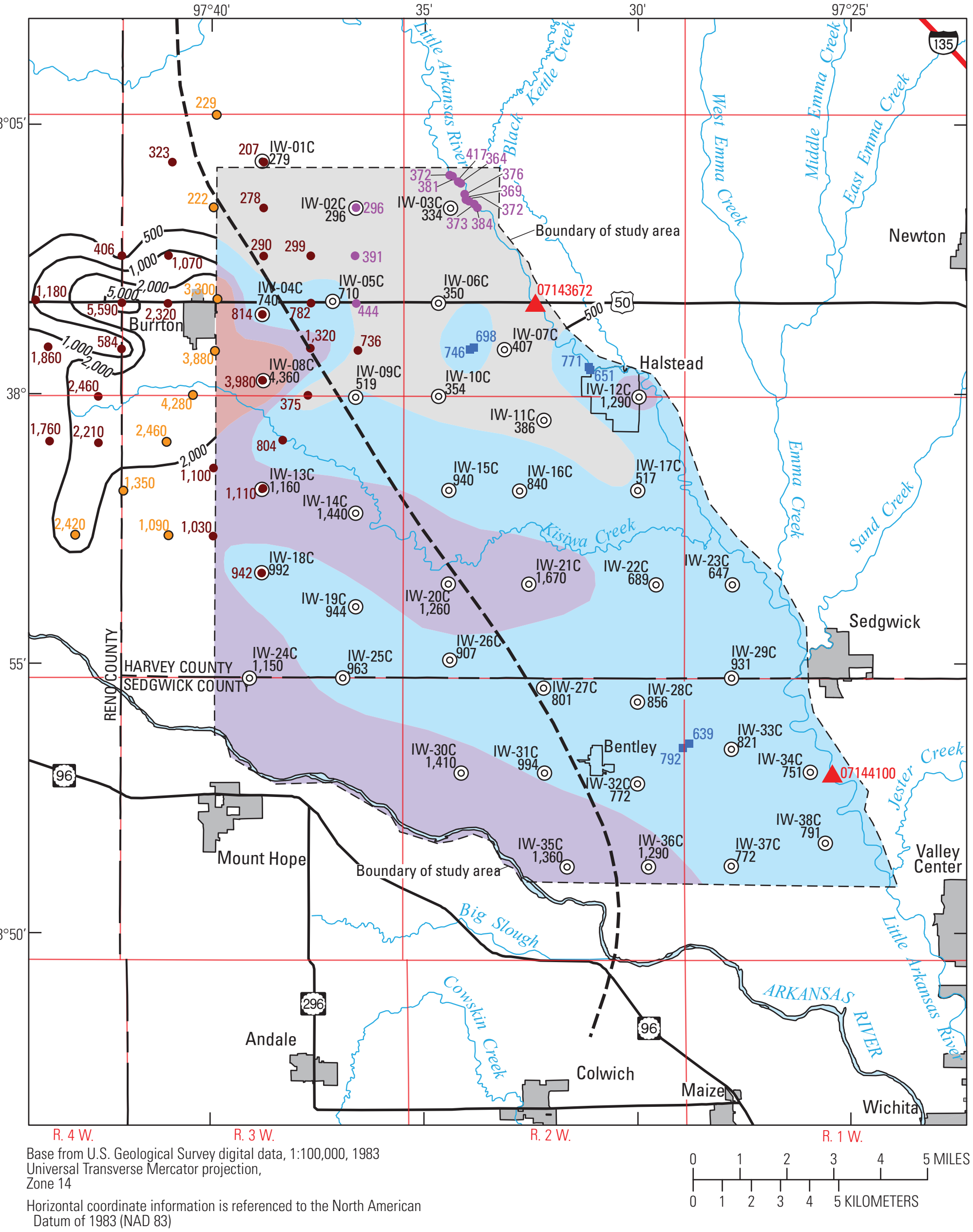


Figure 9. Average specific conductance in and near the study area, 1995–2005, in *(A)* shallow wells and *(B)* deep wells ("EB" and "P" well data for 2002–05 from Mike Dealy, Manager, *Equus* Beds Groundwater Management District No. 2, written commun., 2006).

B. Deep wells



EXPLANATION

Average specific conductance, in microsiemens per centimeter at 25 degrees Celsius

- Less than 500
- 500 to less than 1,000
- 1,000 to less than 2,000
- Equal to or greater than 2,000

Approximate location of bedrock low (McPherson channel)

1,000 — **Line of equal average specific conductance, 1995–2005**—Interval 500 and 1,000 microsiemens per centimeter at 25 degrees Celsius

07144100 ▲ **U.S. Geological Survey streamflow-gaging station, continuous real-time water-quality monitoring site and site identifier**

Data collection sites

IW-38C 791 ◎ **Index well and site identifier (2001–05 data)**—Lower number is average specific conductance, in microsiemens per centimeter at 25 degrees Celsius

639 ■ **Recharge demonstration site (1995–2005 data)**—Number is average specific conductance, in microsiemens per centimeter at 25 degrees Celsius

391 ● **Artificial storage and recovery prototype site (2002–05 data)**—Number is average specific conductance, in microsiemens per centimeter at 25 degrees Celsius

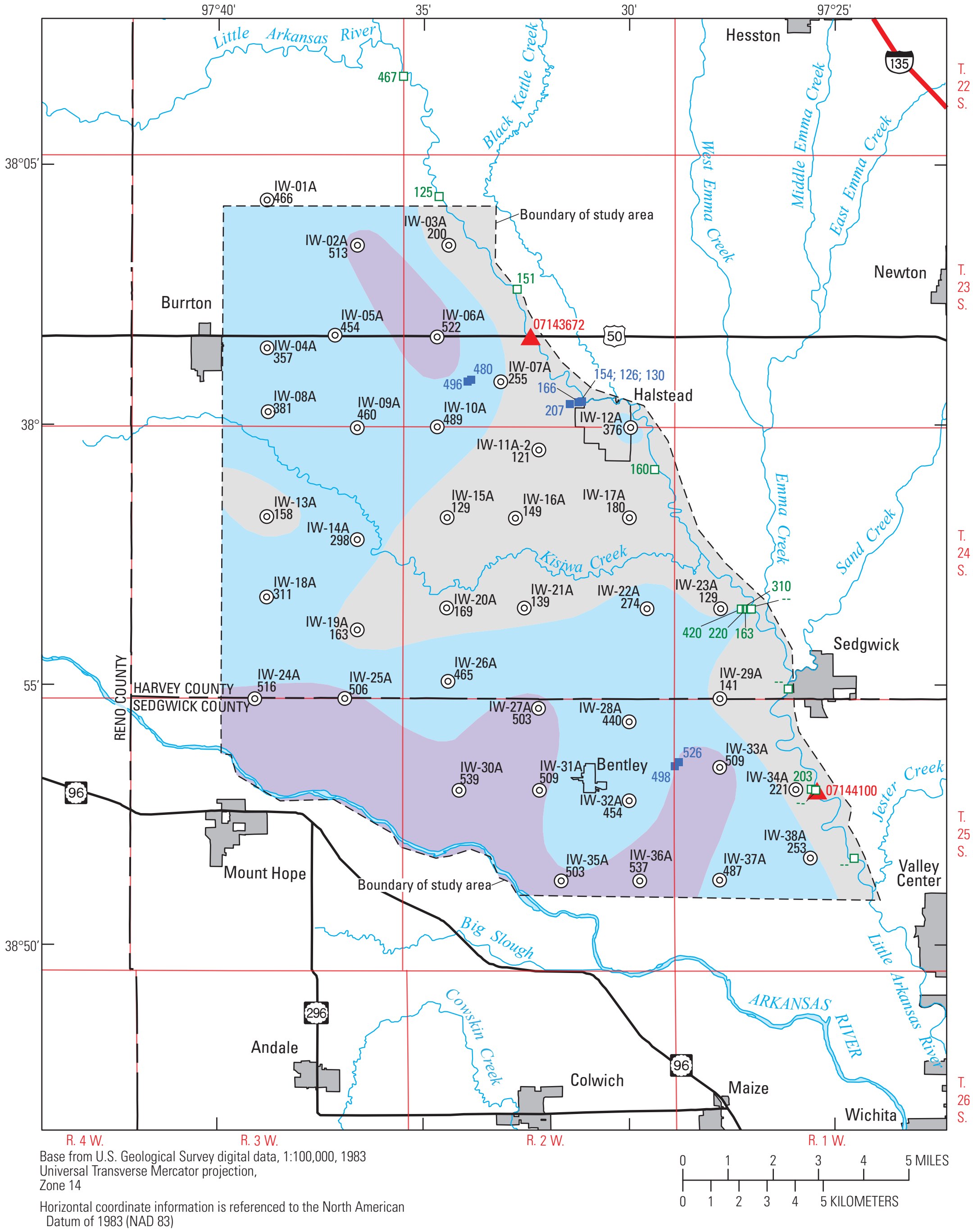
804 ● **"EB" well (2002–05 data)**—Number is average specific conductance, in microsiemens per centimeter at 25 degrees Celsius

229 ● **"P" well (2002–05 data)**—Number is average specific conductance, in microsiemens per centimeter at 25 degrees Celsius

"EB" and "P" data from *Equus* Bed Groundwater Management District No. 2 (Mike Dealy, Manager, written commun., 2006)

Figure 9. Average specific conductance in and near the study area, 1995–2005, in *(A)* shallow wells and *(B)* deep wells ("EB" and "P" well data for 2002–05 from Mike Dealy, Manager, *Equus* Beds Groundwater Management District No. 2, written commun., 2006).—Continued

A. Shallow wells



EXPLANATION

Average oxidation-reduction potential, in millivolts

- Less than 250
- 250 to less than 500
- Equal to or greater than 500

07144100 **U.S. Geological Survey streamflow-gaging station, continuous real-time water-quality monitoring site and site identifier**

Data-collection sites

IW-38A 253 **Index well and site identifier (2001–05 data)**—Lower number is average oxidation-reduction potential, in millivolts

498 **Recharge demonstration site (1995–2005 data)**—Number is average oxidation-reduction potential, in millivolts

203 **Background well (1995–2005 data)**—Number is average oxidation-reduction potential, in millivolts

-- **Indicates not measured**

Figure 10. Average oxidation-reduction potential in the study area, 1995–2005, in *(A)* shallow wells and *(B)* deep wells.

B. Deep wells

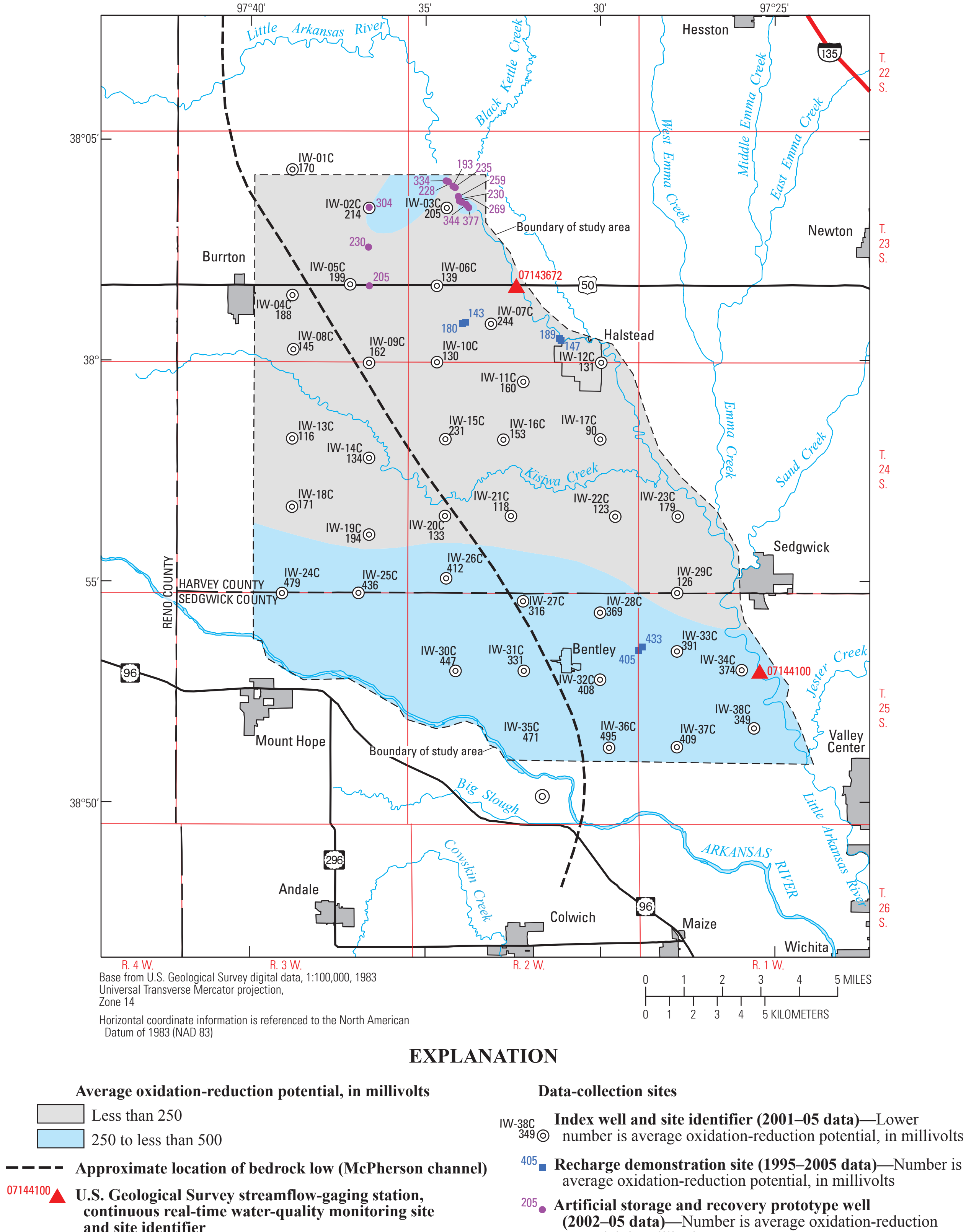


Figure 10. Average oxidation-reduction potential in the study area, 1995–2005, in *(A)* shallow wells and *(B)* deep wells.—Continued

and irrigation return flows. Sulfate contributes to the dissolved-solids concentrations in water and is considered undesirable when exceeding 250 mg/L according to the Federal SDWR established by the USEPA (U.S. Environmental Protection Agency, 2005). At concentrations exceeding the Federal SDWR, consumers start to notice odor, bitter taste, and a laxative effect.

Water samples collected from the Little Arkansas River near Halstead and near Sedgwick from 1995 through 2005 had a median sulfate concentration of about 40 mg/L (table 1), which was much less than the Federal SDWR (table 1). Sulfate concentrations ranged from about 5 to 312 mg/L. The Federal SDWR for sulfate was exceeded in less than 1 percent of the stream-water samples. Concentrations were less than the Federal SDWR for sulfate in all samples of the treated source water at the Sedgwick recharge site (table A-4).

Christensen and others (2000, 2003) developed a regression model to compute concentrations of sulfate in the Little Arkansas River on the basis of specific conductance of the stream water. This model was used to compute concentrations of sulfate in the Little Arkansas River for 1999 through 2005. Data and regression models are available on the World Wide Web at *http://nrtwq.usgs.gov/ks/.* Computed sulfate concentrations in the Little Arkansas River from 1999 through 2005 ranged from 3 to 93 mg/L near Halstead and from 2 to 104 mg/L near Sedgwick. Computed median sulfate concentrations in the Little Arkansas River for this 7-year period were 45 mg/L near Halstead and near Sedgwick. The largest sulfate concentration computed at either surface-water site on the Little Arkansas River was 104 mg/L, much less than the Federal SDWR of 250 mg/L. The largest sampled concentrations at both surface-water sites were collected under complete ice cover and relative low-flow conditions that likely affected the concentrations in the water. The next largest concentrations sampled were about 90 mg/L, very similar to the largest computed concentrations, which demonstrated that, during typical streamflow and temperature conditions, the computed values describe sulfate conditions well, especially considering the more complete measurements on an hourly basis (8,760 values per year) of specific conductance compared to samples collected less than 20 times per year.

The distribution of average sulfate concentrations in groundwater in the study area is shown in figure 11. The areas shown in figure 11 indicate that about 11 percent of the shallow parts of the aquifer and about 9 percent of the deep parts of the aquifer have average sulfate concentrations exceeding the Federal SDWR. In the shallow parts of the aquifer, average concentrations of sulfate in water samples from 18 percent of the wells exceeded the Federal SDWR (table 2). These wells are located mostly near the center of the study area (fig. 11*A*; wells IW-08A, 15A, 16A, 19A, 20A, 21A, and 29A). The average concentration of sulfate in the shallow parts of the aquifer exceeded 500 mg/L in water from well IW-20A. In the deep parts of the aquifer, water samples from 13 percent of the index wells had average sulfate concentrations that exceeded 250 mg/L (table 2). The average sulfate concentration in the deep parts of the aquifer exceeds 500 mg/L in water from well IW-21C (fig. 11*B*). Those wells with average sulfate concentrations exceeding SWDR are located along Kisiwa Creek where the aquifer is thickest (figs. 5 and 7) and generally are associated with areas of the aquifer that were dewatered (through 1992) and have subsequently recovered (fig. 4).

Hathaway and others (1981) reported that sulfate concentrations during 1979 through 1980 of less than 50 mg/L occurred in shallow groundwater in the northern part of the study area. Concentrations of more than 50 mg/L occurred in the middle and southern parts of the study area and near Burrton, with isolated areas of concentrations larger than 120 mg/L occurring near Burrton, along the Arkansas River, and near or south of Kisiwa Creek. This pattern of sulfate concentrations as compared with those in figure 11*A* indicates that sulfate concentrations in the *Equus* Beds aquifer have increased in the past 20 years. These changes likely were caused by dewatering of the aquifer material and subsequent oxidation that resulted in increased sulfate concentrations as water levels increased since 1992.

Sulfate is a charged ionic species that increases the specific conductance of water (Hem, 1992). An increase in sulfate concentration results in a corresponding increase in specific conductance in both surface and groundwater. Sulfur concentrations also can be strongly related to oxidation-reduction properties of water (Hem, 1992); however, in the study described herein, statistical analysis of ORP was not shown to be strongly related to sulfate in the *Equus* Beds aquifer.

Regression plots showing the statistical relation between specific conductance and sulfate concentrations are shown for shallow index wells (fig. 12*A*), deep index wells (fig. 12*B*), and the average of shallow and deep wells at each index well site (fig. 12*C*). The regression models and their respective coefficients of determination (R^2) and root mean square errors (RMSE) for figures 12*A-C* follow:

Shallow index wells:
$sulfate = 0.0074\ specific\ conductance^{1.414}$;
$R^2 = 0.583$; RMSE = 116;

Deep index wells:
$sulfate = 0.0123\ specific\ conductance^{1.276}$;
$R^2 = 0.466$; RMSE = 142; and

Combined shallow and deep index wells:
$sulfate = 0.0103\ specific\ conductance^{1.334}$
$R^2 = 0.501$; RMSE = 146;

where *sulfate* is in milligrams per liter and *specific conductance* is in microsiemens per centimeter at 25 degrees Celsius. The coefficients of determination for these regressions indicate that specific conductance explains about 50 percent of the variability in sulfate concentrations in groundwater and is an acceptable predictor of sulfate in groundwater.

A. Shallow wells

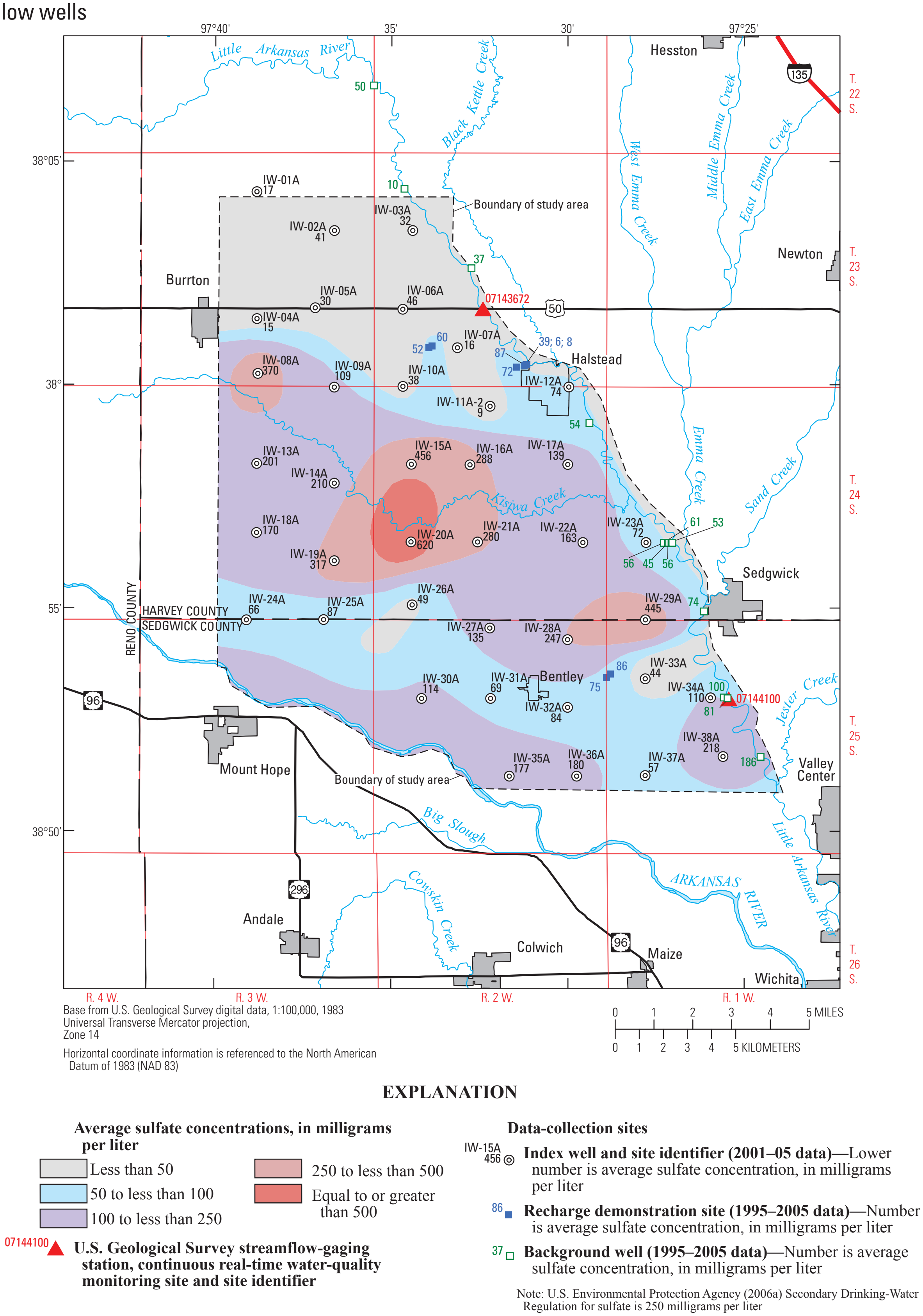
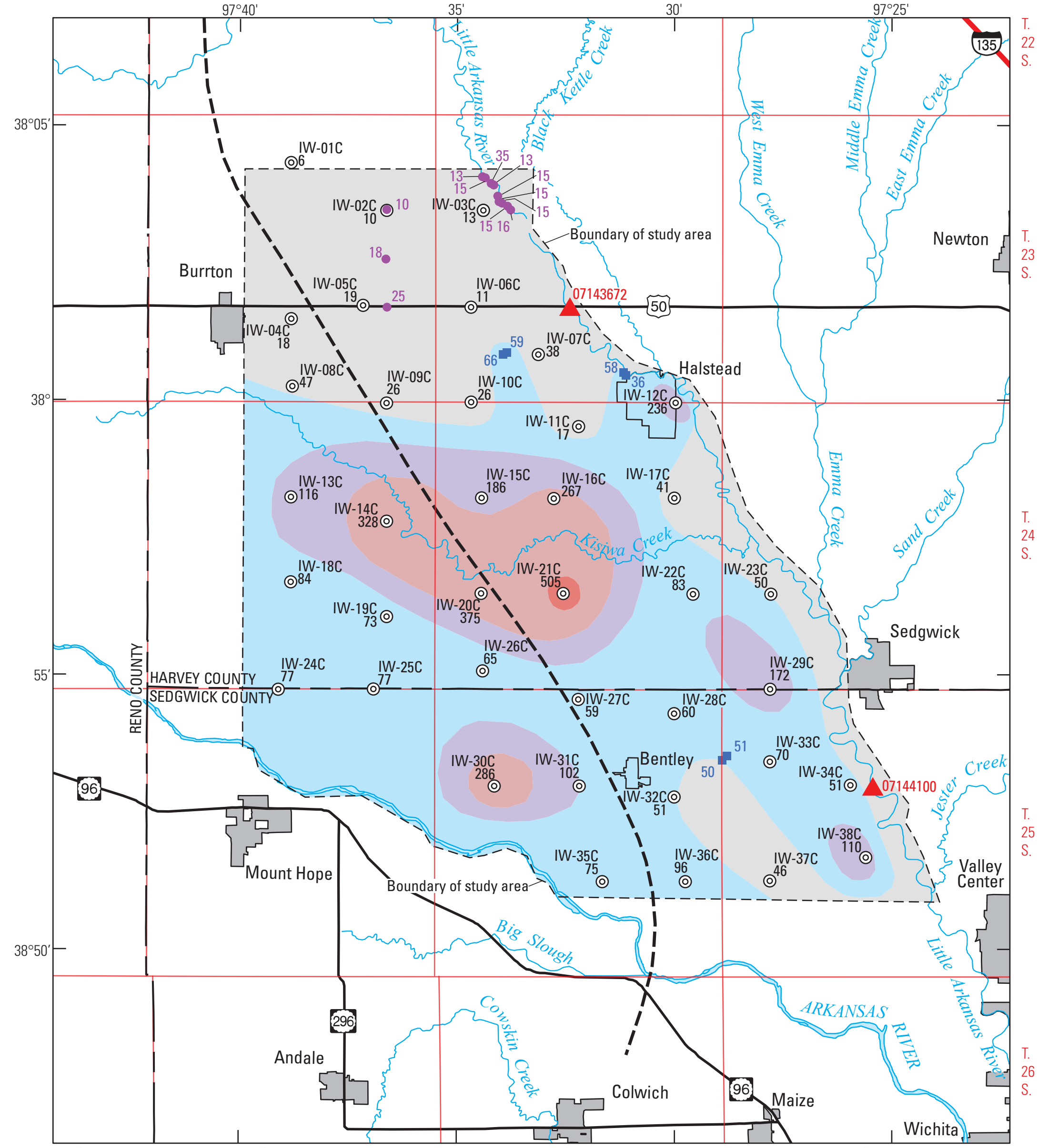


Figure 11. Average sulfate concentrations in the study area, 1995–2005, in *(A)* shallow wells and *(B)* deep wells.

B. Deep wells



Base from U.S. Geological Survey digital data, 1:100,000, 1983
Universal Transverse Mercator projection,
Zone 14

Horizontal coordinate information is referenced to the North American Datum of 1983 (NAD 83)

EXPLANATION

Average sulfate concentrations, in milligrams per liter

- Less than 50
- 50 to less than 100
- 100 to less than 250
- 250 to less than 500
- Equal to or greater than 500

Approximate location of bedrock low (McPherson channel)

07144100 **U.S. Geological Survey streamflow-gaging station, continuous real-time water-quality monitoring site and site identifier**

Data collection sites

IW-15C 186 **Index well and site identifier (2001–05 data)**—Lower number is average sulfate concentration, in milligrams per liter

51 **Recharge demonstration site (1995–2005 data)**—Number is average sulfate concentration, in milligrams per liter

13 **Artificial storage and recovery prototype well (2002–05 data)**—Number is average sulfate concentration, in milligrams per liter

Note: U.S. Environmental Protection Agency (2006a) Secondary Drinking-Water Regulation for sulfate is 250 milligrams per liter

Figure 11. Average sulfate concentrations in the study area, 1995–2005, in *(A)* shallow wells and *(B)* deep wells.—Continued

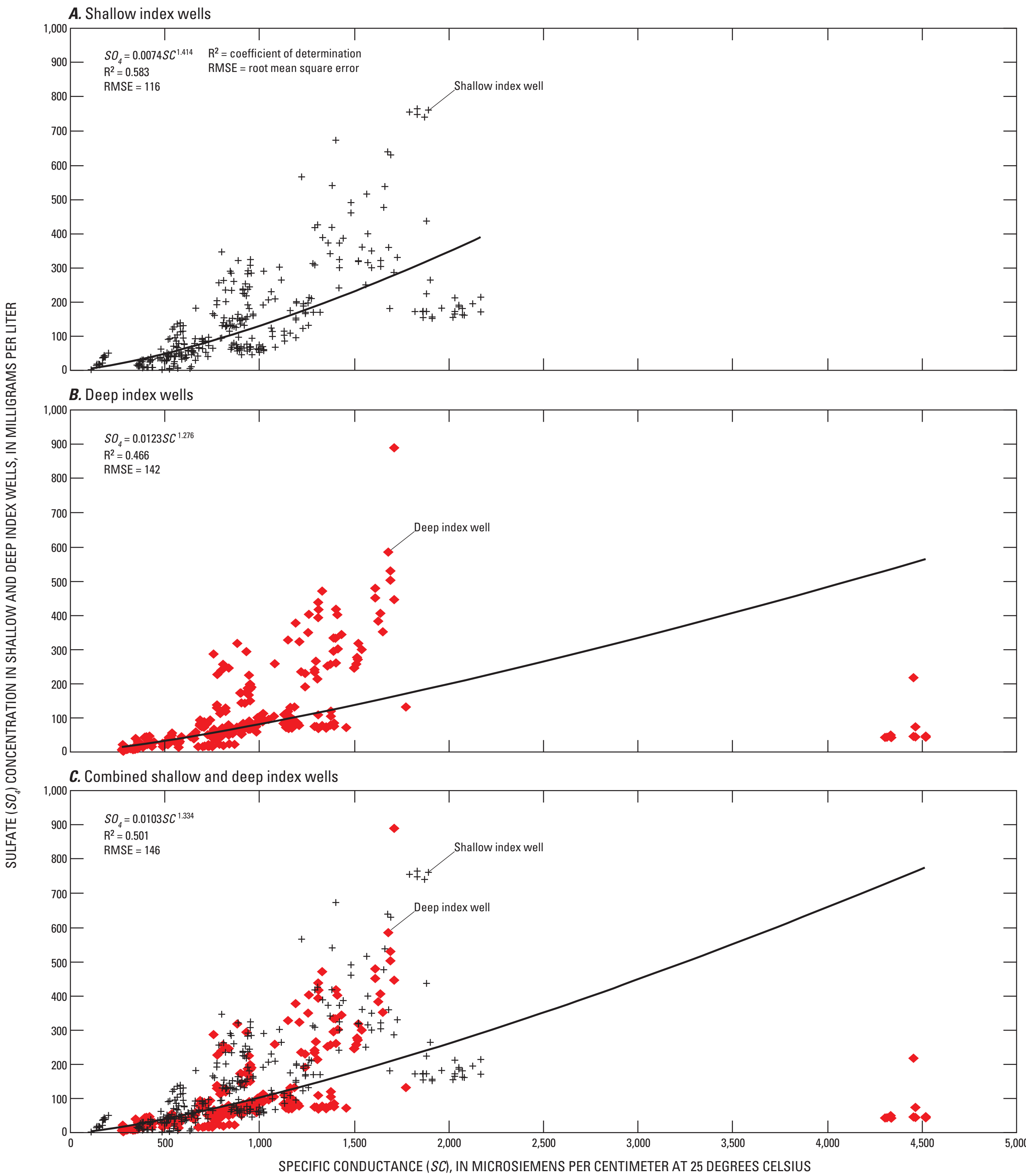


Figure 12. Statistical relation between specific conductance and sulfate concentrations in *(A)* shallow index wells, *(B)* deep index wells, and *(C)* combined shallow and deep index wells.

Chloride

Sources of chloride in the *Equus* Beds aquifer include underlying rocks and past disposal of oil-field brines. Natural water from the unconsolidated aquifer normally contains less than 100 mg/L chloride, whereas larger concentrations (100 to 500 mg/L) are common in the western part of the study area near the Burrton oil field and along the Arkansas River. Chloride concentrations in the Arkansas River averaged about 600 mg/L from 1988 through 1991 (Myers and others, 1996). From 1997 through 2006, concentrations of chloride in the Arkansas River between Hutchison and Maize averaged about 500 mg/L (Kansas Department of Health and Environment, 2006a). Upwelling of brines from the underlying Permian salt beds enter tributaries upstream from Hutchison, Kansas that flow into the Arkansas River (Kansas Department of Health and Environment, 2006a; Whittemore, 2007). From 1985 through 2005, chloride concentrations averaged 267 mg/L in the Little Arkansas River near Alta Mills, Kansas (upstream of Halstead) (Kansas Department of Health and Environment, 2006b). Sources of chloride in the Little Arkansas River include contamination from past oil and gas activities near McPherson and municipal and industrial wastewater discharges (Leonard and Kleinschmidt, 1976; Kansas Department of Health and Environment, 2006b; Schmidt and others, 2007; Whittemore, 2007).

The USEPA established a Federal SDWR of 250 mg/L for chloride (U.S. Environmental Protection Agency, 1986). Constituents listed under the Federal SDWRs do not create health issues for humans, but limits are set for aesthetic reasons, such as taste and odor. When chloride concentrations are larger than 250 mg/L, consumers notice a bleach odor and salty taste in the water. In addition, large concentrations of chloride also can contribute to corrosion and staining of plumbing and fixtures (U.S. Environmental Protection Agency, 2005). Irrigation water with concentrations exceeding 350 mg/L chloride is likely to cause severe effects on crops (Bauder and others, 2007).

Water samples collected at the two surface-water sites on the Little Arkansas River from 1995 through 2005 had a median chloride concentration of 91 mg/L, which is less than the Federal SDWR for chloride of 250 mg/L (table 1). Chloride concentrations in water samples collected from the Little Arkansas River near Halstead and near Sedgwick ranged from 5 to 932 mg/L. The Federal SDWR for chloride was exceeded in about 14 percent of the samples collected from the two surface-water monitoring sites on the Little Arkansas River during 1995 through 2005 (table 1). Chloride concentrations were less than the Federal SDWR for all samples of the treated water at the Sedgwick recharge site (table A-4).

Continuous real-time chloride concentrations in the Little Arkansas River were computed on the basis of specific conductance measurements using regression models from Christensen and others (2003) for the period 1999 through 2005. Duration curves indicated that during 1999 through 2005, the median computed chloride concentration was 180 mg/L in the Little Arkansas River near Halstead and exceeded 250 mg/L about 27 percent of the time (fig. 13). The median computed chloride concentration in the Little Arkansas River near Sedgwick from 1999 through 2005 was about 94 mg/L and exceeded 250 mg/L less than 1 percent of the time (fig 13). Larger specific conductance and chloride concentrations generally correspond with low-flow conditions. Chloride concentrations likely are smaller at the downstream Sedgwick site because of dilution from groundwater inflow containing smaller chloride concentrations.

In groundwater, the 1995–2005 average concentrations of chloride exceeded 250 mg/L in water samples from about 5 percent of the index wells in the shallow parts of the aquifer (table 2). Shallow wells with average concentrations of chloride larger than 250 mg/L are near Burrton and along the Arkansas River (fig. 14*A*). Average chloride concentrations in the shallow parts of the *Equus* Beds aquifer for 1995 through 2005 along with additional data gathered by GMD2 from 2002 through 2005 are shown in figure 14*A*. This map shows that about 7 percent of the shallow parts of the aquifer in the study area had average concentrations of chloride exceeding 250 mg/L from 1995 through 2005. Comparison of 1995–2005 concentrations to those of 1989-90 published by Myers and others (1996) indicates that chloride concentrations in the southern part of the study area along the Arkansas River have not changed substantially. In the area east of Burrton, chloride concentrations larger than 500 mf/L in the shallow parts of the aquifer have moved slightly less than 0.5 mi farther into the study area compared to 1982–84.

Average chloride concentrations in the deep parts of the *Equus* Beds aquifer are shown in figure 14*B*. Average chloride concentrations exceeded 250 mg/L in water samples from about 5 percent of the index wells (table 2). As was the case in the shallow parts of the aquifer, concentrations exceeding 250 mg/L were detected in wells located near Burrton and along the Arkansas River. About 8 percent of the deep parts of the aquifer in the study area had average chloride concentrations that exceeded the Federal SDWR for 1995–2005. Average chloride concentrations for 1989-90 from Myers and others (1996) indicate that concentrations in the deep parts of the aquifer were larger near the Arkansas River than during 1995–2005.

The area near Burrton with average chloride concentrations exceeding 500 mg/L is larger in the deep parts of the aquifer than it is in the shallow parts (fig. 14). This difference is likely caused by the downward migration of saltwater from disposal brines in surface pits during 1910-40s (Whittemore, 2007). Larger chloride concentrations in the deep parts of the aquifer also could be caused by upward movement of saltwater through natural fractures in the bedrock or wells, or could be the result of infiltration of dilute rainfall and the greater density of saltwater than freshwater (Leonard and Kleinschmidt, 1976). Additional sources of chloride include the Arkansas River and Burrton oil-field brines that were recharged into the aquifer through shallow disposal wells and pits before these disposal practices were banned. Whittemore (2007) attributes

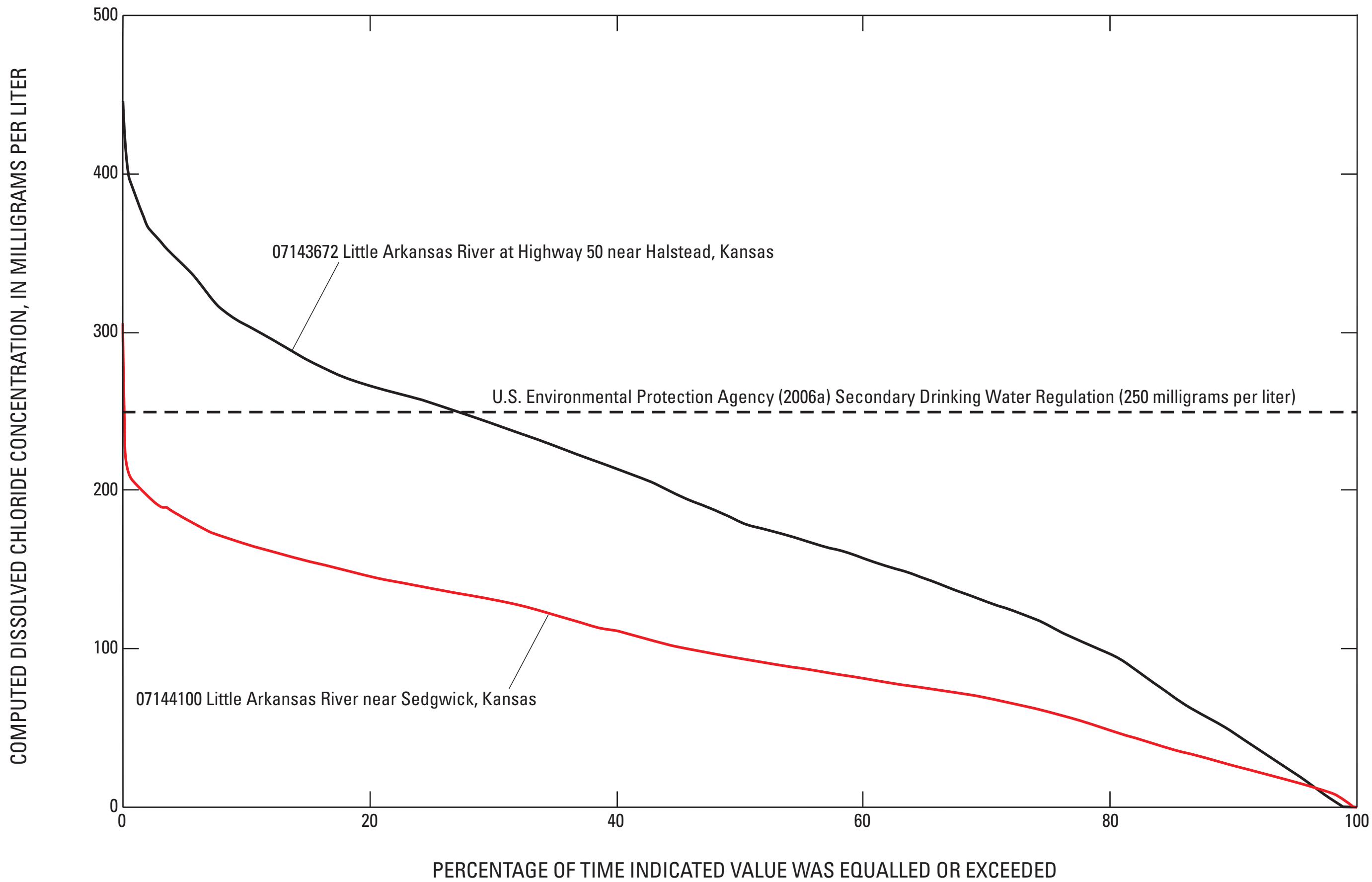


Figure 13. Duration curves of computed dissolved chloride concentrations, 1995–2005, Little Arkansas River near Halstead and near Sedgwick, Kansas.

the larger chloride concentrations in the deeper parts of the aquifer near Burrton to the migration of dense oil-field brines into the deeper parts of the aquifer. Whittemore (2007) also concludes it will take many centuries for this deep saltwater to be flushed from the aquifer.

A decrease in water-level gradient in the aquifer slows the movement of water and constituents in the aquifer. Water levels in the study area increased as compared to lows recorded in October 1992 because of larger than average precipitation, decreased pumping from the aquifer for Wichita supply, and increased use of Cheney Reservoir for municipal supplies. The increase in water levels decreased the gradient near Burrton from about 12 ft/mi in October 1992 to about 8 ft/mi in January 2006, slowing the migration of saltwater from the Burrton area into the aquifer (figs. 3 and 5). Along the Arkansas River near Bentley, the gradient decreased from about 8 ft/mi in October 1992 to about 6 ft/mi in January 2006.

Generally, during the past 40-45 years (since about 1960), chloride concentrations in both the shallow and deep parts of the aquifer have increased, migrating southward and eastward from the Burrton area about 3 mi. In the shallow parts of the aquifer, chloride concentrations have migrated eastward less that 0.5 mi since 1992 and have slowed at least partly because of the decreased hydraulic gradient in the aquifer. A more detailed description of the movement of chloride concentrations is provided in the following paragraphs.

The graphs of chloride concentrations during 1939 through 2005 shown in figure 15*B* indicate both the changes in chloride concentrations through time and the differences in chloride concentrations in the shallow and deep parts of the aquifer. Chloride concentrations to the west of Burrton decreased or remained stable in well clusters EB-5, EB-43, and EB-44, whereas in well clusters EB-1 and P-26 chloride concentrations increased to concentrations exceeding the Federal SDWR of 250 mg/L. This indicates some southward movement of the Burrton oil-field brines or possibly infiltration of water with larger chloride concentrations from the Arkansas River. Most of the wells have larger chloride concentrations in the deep wells than in the shallow wells. However, in well cluster EB-5, the largest chloride concentrations are in the shallow parts of the aquifer (55-ft depth) with smaller concentrations both above (18-ft depth) and below (180-ft depth). This indicates that less permeable clay layers are preventing the more dense water with the larger chloride concentrations in well EB-5A from moving to the deeper parts of the aquifer.

Well cluster P-31 is near the center of the area with the largest concentrations near Burrton, presumably where the

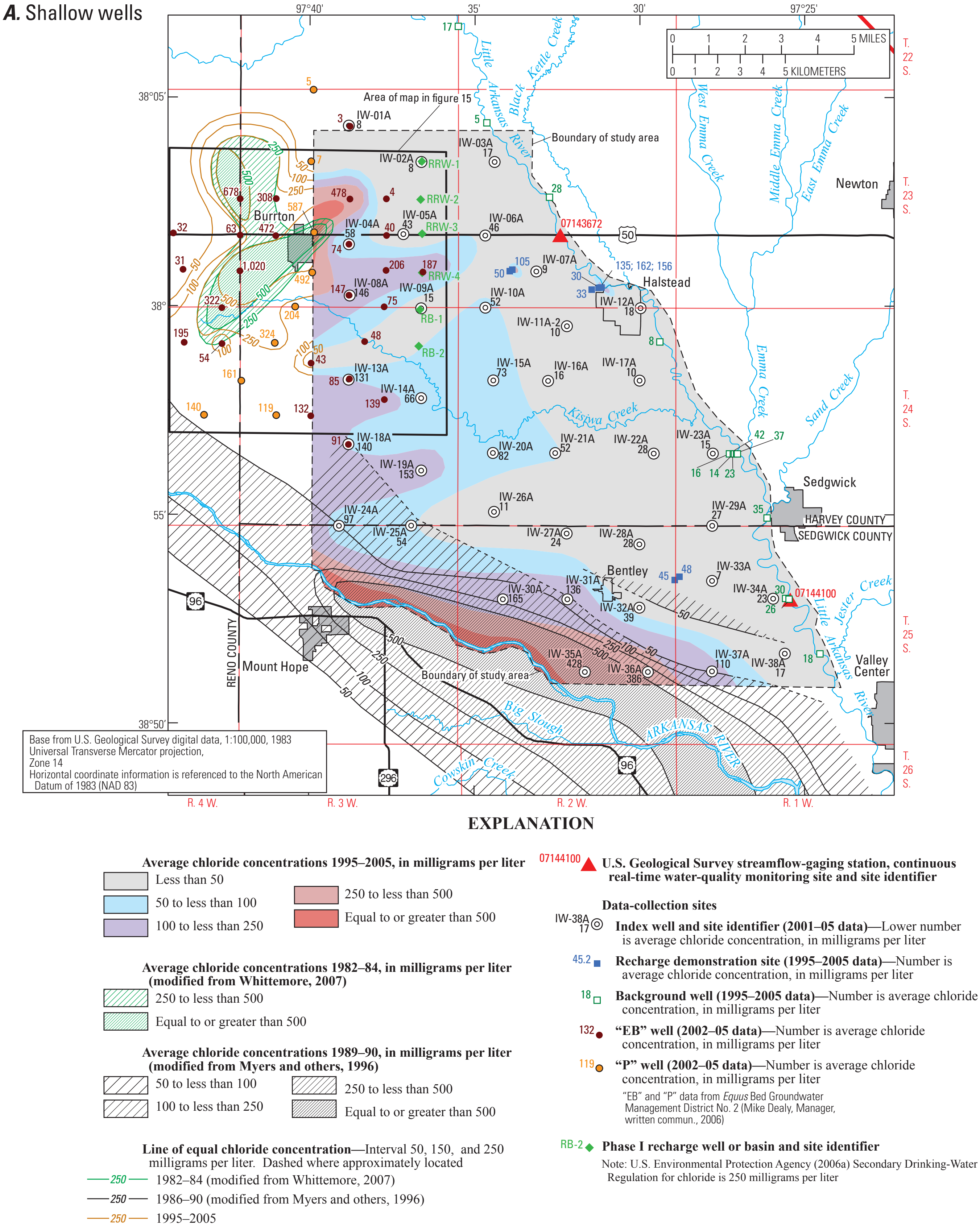
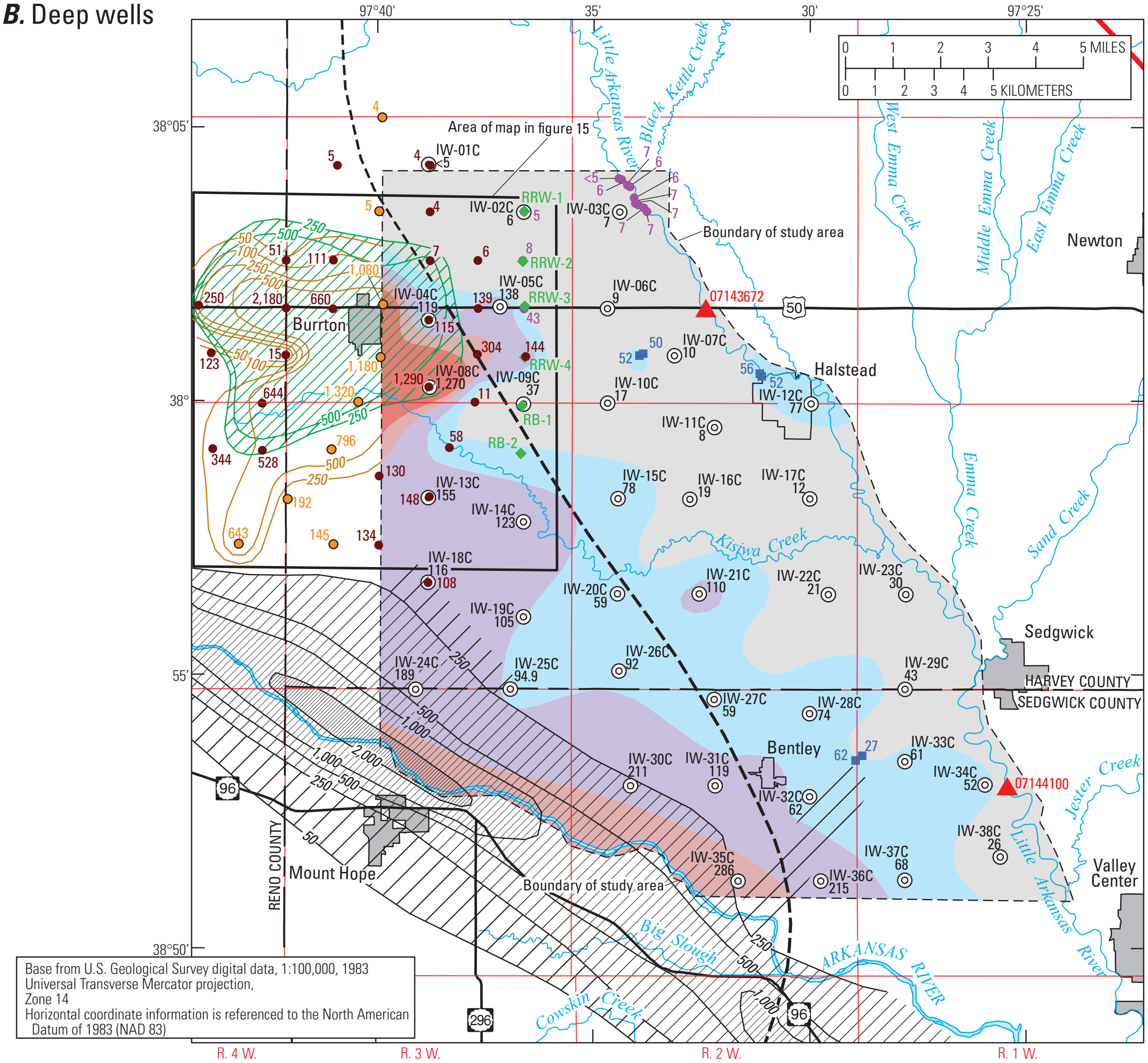


Figure 14. Average chloride concentrations in and near the study area, 1982–84, 1989–90, and 1995–2005, for *(A)* shallow wells and *(B)* deep wells (“EB” and “P” well data from Mike Dealy, Manager, *Equus* Beds Groundwater Management District No. 2, written commun. 2006; 1982–84 lines of equal chloride concentration modified from Whittemore and others, 2007; 1989–90 lines of equal chloride concentration modified from Myers and others, 1996).

B. Deep wells



EXPLANATION

Average chloride concentrations 1995–2005, in milligrams per liter

- Less than 50
- 50 to less than 100
- 100 to less than 250
- 250 to less than 500
- Equal to or greater than 500

Average chloride concentrations 1982–84, in milligrams per liter (modified from Whittemore, 2007)

- 250 to less than 500
- Equal to or greater than 500

Average chloride concentrations 1989–90, in milligrams per liter (modified from Myers and others, 1996)

- 50 to less than 250
- 250 to less than 500
- 500 to less than 1,000
- 1,000 to less than 2,000
- Equal to or greater than 2,000

Line of equal chloride concentration—Interval 50, 150, 200, 250, 500, and 1,000 milligrams per liter

- 250 — 1982–84 (modified from Whittemore, 2007)
- 250 — 1986–90 (modified from Myers and others, 1996)
- 250 — 1995–2005

07144100 **U.S. Geological Survey streamflow-gaging station, continuous real-time water-quality monitoring site and site identifier**

Data-collection sites

- IW-38C 26 **Index well and site identifier (2001–05 data)**—Lower number is average chloride concentration, in milligrams per liter
- 62 **Recharge demonstration site (1995–2005 data)**—Number is average chloride concentration, in milligrams per liter
- 7 **Artificial storage and recovery prototype well (2002–05 data)**—Number is average chloride concentration, in milligrams per liter
- 130 **"EB" well (2002–05 data)**—Number is average chloride concentration, in milligrams per liter
- 140 **"P" well (2002–05 data)**—Number is average chloride concentration, in milligrams per liter

"EB" and "P" data from *Equus* Bed Groundwater Management District No. 2 (Mike Dealy, Manager, written commun., 2006)

RB-2 **Phase I recharge well or basin and site identifier**

Note: U.S. Environmental Protection Agency (2006a) Secondary Drinking-Water Regulation for chloride is 250 milligrams per liter

Figure 14. Average chloride concentrations in and near the study area, 1982–84, 1989–90, and 1995–2005, for *(A)* shallow wells and *(B)* deep wells ("EB" and "P" well data from Mike Dealy, Manager, *Equus* Beds Groundwater Management District No. 2, written commun. 2006; 1982–84 lines of equal chloride concentration modified from Whittemore and others, 2007; 1989–90 lines of equal chloride concentration modified from Myers and others, 1996).—Continued

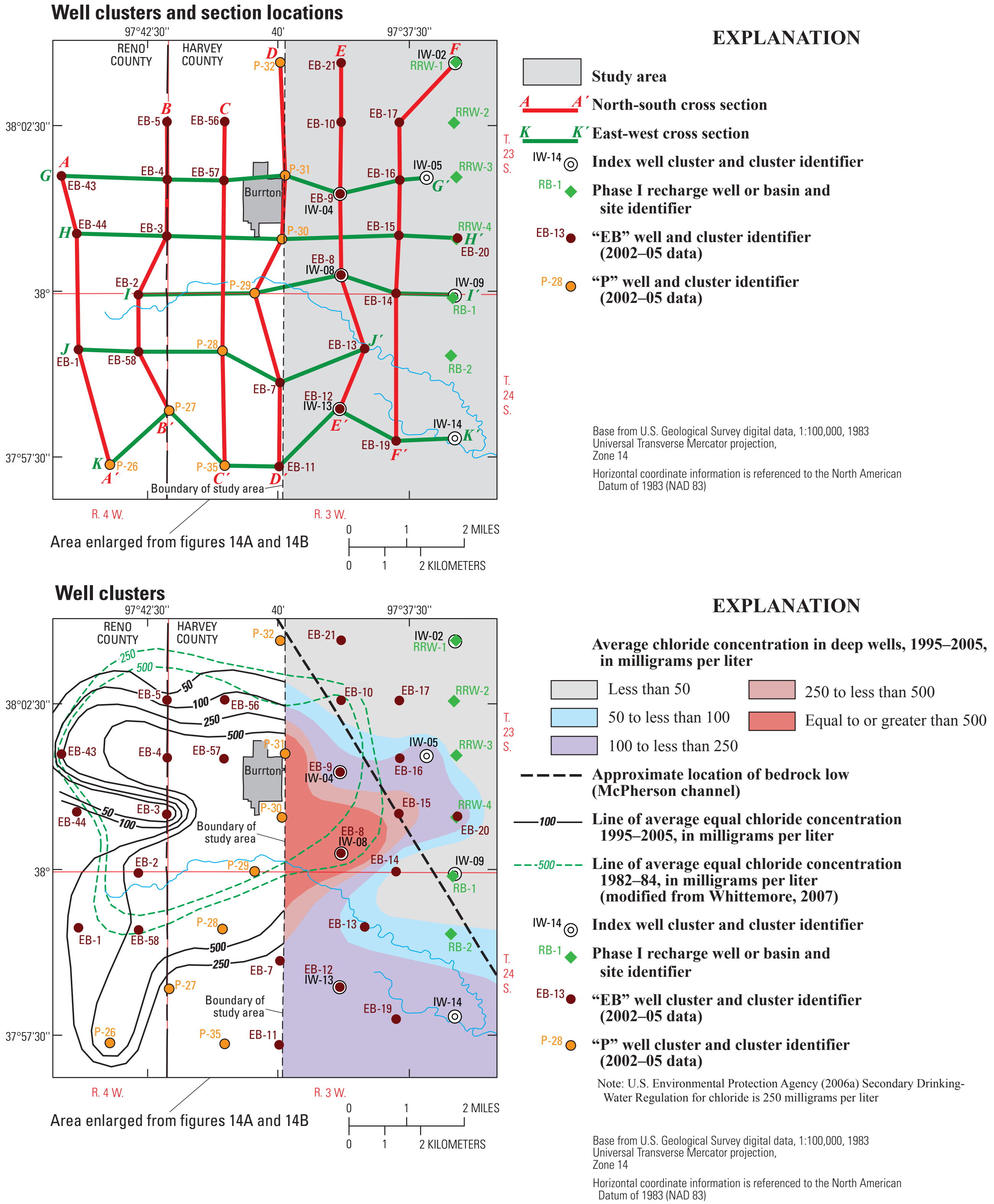


Figure 15. Changes in chloride concentrations in the *Equus* Beds aquifer near Burrton, Kansas, during 1939–2005 ("EB" well and recent "P" well chloride concentration data from Mike Dealy, Manager, *Equus* Beds Groundwater Management District No. 2, written commun. 2006).

Figure 15. Changes in chloride concentrations in the *Equus* Beds aquifer near Burrton, Kansas, during 1939–2005 ("EB" well and recent "P" well chloride concentration data from Mike Dealy, Manager, *Equus* Beds Groundwater Management District No. 2, written commun. 2006).—Continued (This figure is oversized, access by clicking here.)

oil-field brine contamination began. Chloride concentrations in well cluster P-31 increased from about 10 mg/L in 1948 to almost 10,000 mg/L in 1950 and then rapidly decreased to about 1,000 mg/L in 1957 and remain at about 1,000 mg/L in well P31A (68-ft depth) in 2005. The decrease in concentrations in the more shallow well P31 (40-ft depth) and increase in the deeper well P31A indicate that the more dense oil-field brine migrated through the shallow part of the aquifer into the deep part. The deeper wells in well clusters P-31, P-30, P-29, and P-28 show the southward and eastward movement of the brines from the Burrton area—arriving at well P-31A in the mid- to late-1940s, at well P-30A in the mid-1950s, at well P-29A in the mid-1960s, and at well P-28A in the early 1990s. Although chloride concentrations decreased in shallow well P-31 since the mid-1950s, concentrations remained above the Federal SDWR. In shallow wells P-28, P-29, and P-30, the chloride concentrations have increased but not as much as in the deeper well in each cluster. Chloride concentrations in these shallow wells have approached or exceeded the Federal SDWR in recent years. During the early 1940s, chloride concentrations in well clusters P-26, P-28, and P-35 were about 100 mg/L, but only about 10 mg/L in well clusters P-29, P-31, and P-32.

Infiltration of water with larger chloride concentrations (about 500-600 mg/L) from the Arkansas River is the likely source of larger chloride concentrations in the southern part of this area. Chloride concentrations in well clusters EB-21 and EB-13 (E-E’, fig. 15*B*) remained less than the Federal SDWR for chloride of 250 mg/L since the mid-1970s (beginning of data collection), which indicates that the Burrton oil-field brines have had minimal effect on chloride in groundwater in these areas. Well clusters EB-10, EB-9, EB-8, and EB-12 had chloride concentrations exceeding the Federal SDWR for at least part of the period in at least one well in each cluster. The largest chloride concentrations did not occur in the deepest well in each of these clusters, which indicates that less permeable discontinuous clay layers were restricting the migration of the denser saline water into the deepest part of the aquifer. Chloride concentrations in well EB-10B have decreased since the 1980s, whereas concentrations in wells EB-9B and EB-8B have increased. The abrupt increase in chloride concentrations in water from shallow well EB-10A in about 1990 probably is the arrival of Burrton oil-field brines in the shallow aquifer. Chloride concentrations in well EB-12B temporarily exceeded the Federal SDWR in the late 1990s and early 2000s. Chloride concentrations in the shallow and deep wells in clusters IW-04, IW-08, and IW-13 were similar to those in wells of similar depths in clusters EB-9, EB-8, and EB-12. Therefore, the chloride concentrations in water from the EB wells during the late 1970s to 2001 were used as estimates of chloride concentrations at the IW wells during this period.

Well clusters IW-02 (F-F’, fig.15*B*), P-32 (D-D’, fig. 15*B*), and P-35 (C-C’, fig. 15*B*) had chloride concentrations of less than the Federal SDWR, indicating no advance of the Burrton oil-field brines into these areas. In well clusters EB-16 (F-F’, fig.15*B*), EB-20 (H-H’, fig.15*B*), and EB-14 (I-I’ fig.15*B*), the chloride concentrations in the deep wells increased since about 1980, whereas water in the shallow wells had smaller increases. In well clusters EB-16 and EB-15, chloride concentrations in the deep wells now (2005) exceed those in the shallow wells and the Federal SDWR. Differing trends in chloride concentrations during the 1990s in wells EB-16B and EB-16C, which are both in the deep parts of the aquifer, indicate that hydraulic conditions are not homogenous in the deep parts of the aquifer. Shallow wells EB-16A and IW-05A and deep wells EB-16C and IW-05C are near each other and have similar chloride concentrations; therefore, chloride concentrations in water from the EB-16 wells were used as estimates of the chloride concentrations in water from the IW-05 wells during the 1980s through early 2000s. Chloride concentrations in the shallow and deep wells at well clusters EB-14 and EB-19 and concentrations in water from well clusters IW-09 and IW-14 indicate that it may have been problematic to do a similar backward-in-time extension of the chloride concentrations for the deep and shallow wells at clusters IW-09 and IW-14 because they were about 1 mi apart and were near the front of the brine movement from Burrton toward the south and east.

During the past 40 to 45 years (since about 1960), increased chloride concentrations originating from brine disposal related to past oil and gas activities near Burrton (assumed to be centered at well cluster P-31) have migrated about 3 mi downgradient toward the southeast in both shallow and deep groundwater. Historical downward migration/transport has progressed from an area centered near Burrton and from the shallow to deep parts of the aquifer. The downward migration of the chloride is controlled by the hydraulic gradient in the aquifer, dispersion of chloride, and discontinuous clay layers that can limit downward migration for short lateral distances. The rate of change in chloride concentrations in the upper 100 to 150 ft of the aquifer from Burrton (well cluster P-31) to well cluster P-29 was about 40 (mg/L)/yr as the plume reached the well cluster location (mid-1950s). Since about 1970, the increased concentrations in well cluster P30 continued to be about 15 (mg/L)/yr, but at well P-29A there was little change during the past 10 years. The chloride concentration increase since about 1979 from well cluster EB-8 to well cluster EB-14 also was about 20 to 50 (mg/L)/yr. Increased chloride concentrations progressed about 1 mi in 15 years from a baseline concentration in the aquifer of about 50 to 250 mg/L. The 2005 rates of increase near Phase 1 recharge locations RRW-3, RRW4, and RB-1 and at well cluster EB-15 (fig. 15) were about 40 (mg/L)/yr compared to about 8 (mg/L)/yr at downgradient well cluster EB-20. At well EB-15B, chloride concentrations increased from 15 mg/L in 1979 to more than 250 mg/L in 1986. Chloride concentrations in well EB-15C in 2005 were about 1,000 mg/L. In downgradient well cluster EB-20, chloride concentrations increased from about 30 to 150 mg/L in 15 years.

Increased chloride concentrations in the shallow parts of the aquifer migrated less than 0.5 mi during the past decade. The 2005 slower rate of movement probably is caused by the decrease in the hydraulic gradient, which slows the movement of the chloride plume. However, the aquifer heterogeneity and clay-rich layers at monitoring depths for the index wells near well IW-09A (53-ft depth) may miss the primary movement of chloride at about 100 to 120 ft below ground surface (well EB-14B). The rates of chloride movement and concentration increase in that area were about 1 mi in 15 years and 40 (mg/L)/yr, respectively. On the basis of these results, artificial recharge near Phase-I recharge locations RRW-3, RRW-4, and RB-1(fig. 15*A*) (especially at depths of 100 to 150 ft) could create a barrier to saltwater migration.

Data also indicate that chloride concentrations in deep parts of the aquifer in the southern part of the study area decreased and appeared to migrate toward the Arkansas River. Migration of chloride along the Arkansas River is controlled by the hydraulic gradient in the aquifer, which also decreased from 1992 through 2006, and the chloride concentrations in the Arkansas River (typically about 500 to 600 mg/L) (Myers and others, 1996; Kansas Department of Health and Environment, 2006b).

With increasing chloride concentration, the specific conductance value of water (ability of water to conduct electricity) also will increase (Hem, 1992). Regression analysis of the statistical relation between sampled specific conductance and chloride concentrations is shown for shallow index wells (fig. 16*A*), deep index wells (fig. 16*B*), and the average of shallow and deep wells at each index well site (fig. 16*C*). The regression models and their respective coefficients of determination (R^2) and root mean square error (RMSE) for figures 16*A*, *B*, and *C* follow:

Shallow index wells:
$chloride = 0.164\ specific\ conductance - 73.17$;
$R^2 = 0.550$; RMSE = 71.9;

Deep index wells:
$chloride = 0.298\ specific\ conductance - 171$;
$R^2 = 0.888$; RMSE =80.6;

Combined shallow and deep index wells:
$chloride = 0.260\ specific\ conductance - 148$;
$R^2 = 0.783$; RMSE = 86.8;

where *chloride* is in milligrams per liter and *specific conductance* is in microsiemens per centimeter at 25 degrees Celsius. The coefficients of determination for these regressions indicate that specific conductance explains at least 55 percent of the variability in chloride concentrations, which indicates that it is an acceptable predictor of chloride in groundwater.

Nutrients

Nutrients such as nitrogen and phosphorus are closely related to agricultural activities because of their presence in fertilizers and animal waste. Nutrient-rich water from farms and feedlots can run off into streams or percolate into groundwater. Other sources of nutrients in water include wastewater treatment plants, sewage lagoons, and domestic septic tanks (Ziegler and others, 1999; 2001).

Nitrite plus nitrate (hereafter referred to as nitrate) in drinking water can cause adverse effects in humans. The Federal MCL for nitrate is 10 mg/L as nitrogen, which is the concentration above which methemoglobinemia, or blue baby syndrome, may occur in infants (U.S. Environmental Protection Agency, 2005). Nitrate concentrations from samples analyzed for this study are summarized in table A-4.

All nitrate concentrations in water samples collected at the two surface-water monitoring sites on the Little Arkansas River from 1995 through 2005 were less than the MCL for nitrate (table 1). The median nitrate concentration in water samples collected during this period from the Little Arkansas River near Halstead and near Sedgwick was 0.85 mg/L. Nitrate concentration in samples collected from 1995 through 2005 from the two sites on the Little Arkansas River ranged from less than 0.02 to 9.4 mg/L (table 1). The maximum nitrate concentration of 9.4 mg/L occurred near Sedgwick (table A-4). All nitrate concentrations were less than the MCL in the samples of treated source water at the Sedgwick recharge site (table A-4). No regression models currently (2009) exist to compute nitrate concentration in the Little Arkansas River from continuously measured data at the monitoring sites near Halstead and near Sedgwick.

Average nitrate concentrations exceeded the MCL in water samples from about 13 percent of the shallow index wells (table 2). Nitrate concentrations exceeded the MCL at least once in the shallow parts of the aquifer in the northern part of the study area between Burrton and the Little Arkansas River (wells SMW-H4, IW-06A, and IW-09A; fig. 6, table A-4) and in the southern part of the study area between Sedgwick and the Arkansas River (wells SMW-S11 and SMW-S13, IW-30A, 31A, 33A, 36A, and 37A; fig. 6, table A-4). The distribution of average nitrate concentrations in the shallow parts of the aquifer is shown in figure 17*A*. This figure shows that average nitrate concentrations exceeded the MCL in about 9 percent of the shallow aquifer in the study area. In the shallow parts of the aquifer, nitrate from sewage lagoons, feedlots, and fertilizer runoff is more likely to increase concentrations. Larger nitrate concentrations in the shallow and deep groundwater likely were at least partly the result of more rapid percolation from agricultural land uses in areas of larger effective porosity (fig. 8) and geochemical controls, especially in deep groundwater.

All measured nitrate concentrations in water from wells in the deep parts of the aquifer were less than the MCL of 10 mg/L (tables 2 and A-4). In the deep parts of the aquifer, average nitrate concentrations of less than 1.0 mg/L occurred in

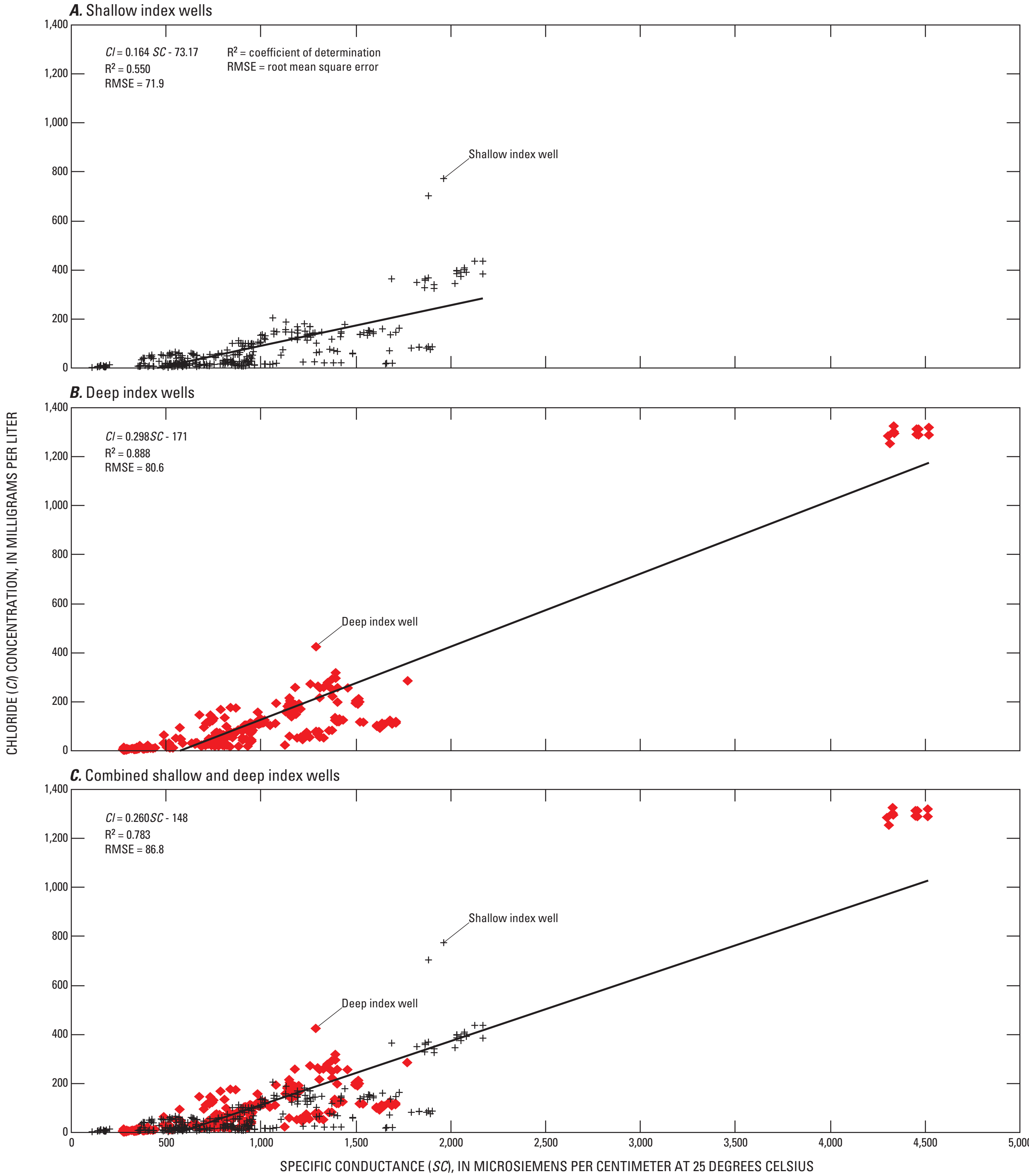


Figure 16. Statistical relation between specific conductance and chloride concentrations in *(A)* shallow index wells, *(B)* deep index wells, and *(C)* combined shallow and deep index wells.

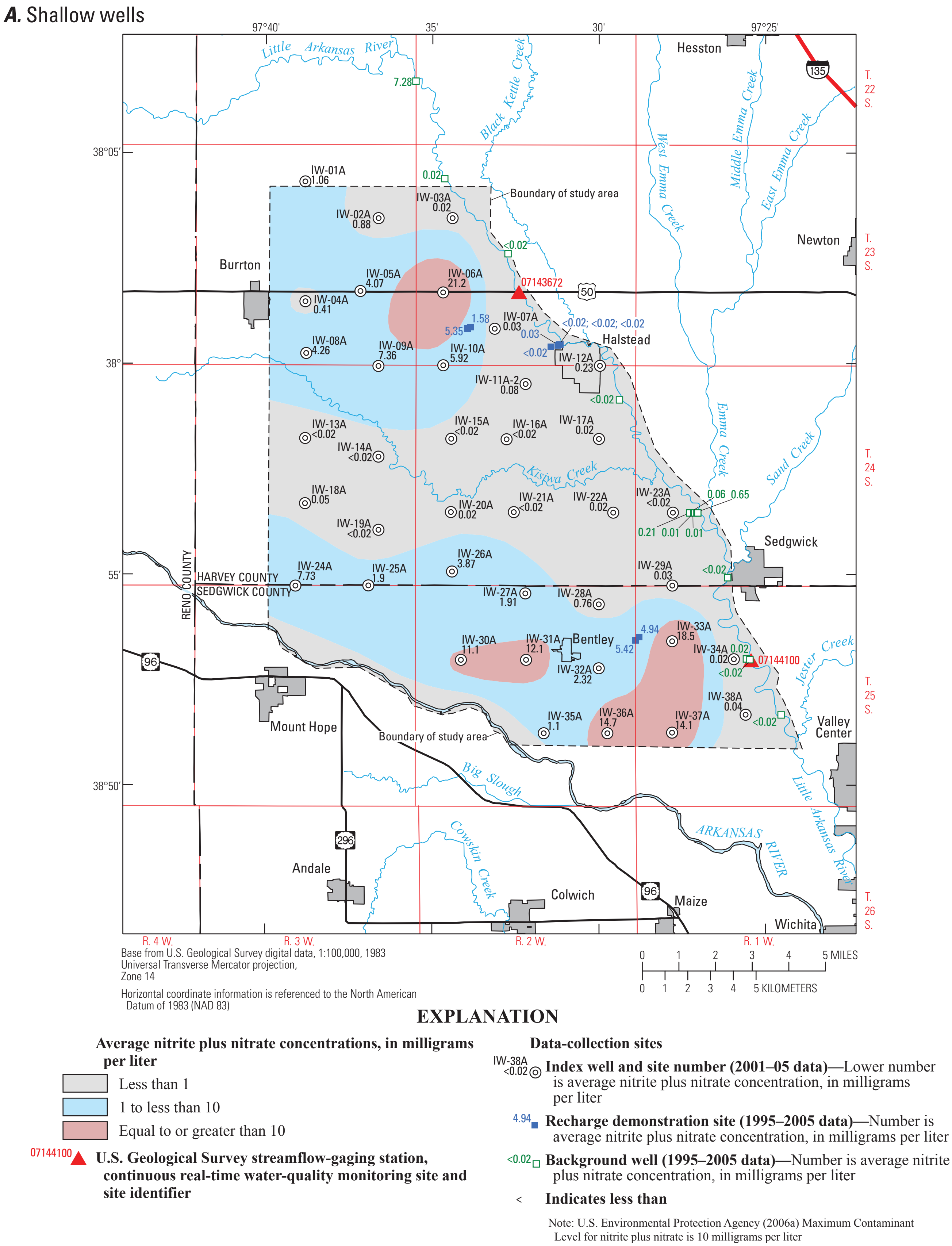


Figure 17. Average nitrite plus nitrate concentrations in the study area, 1995–2005, in *(A)* shallow wells and *(B)* deep wells.

B. Deep wells

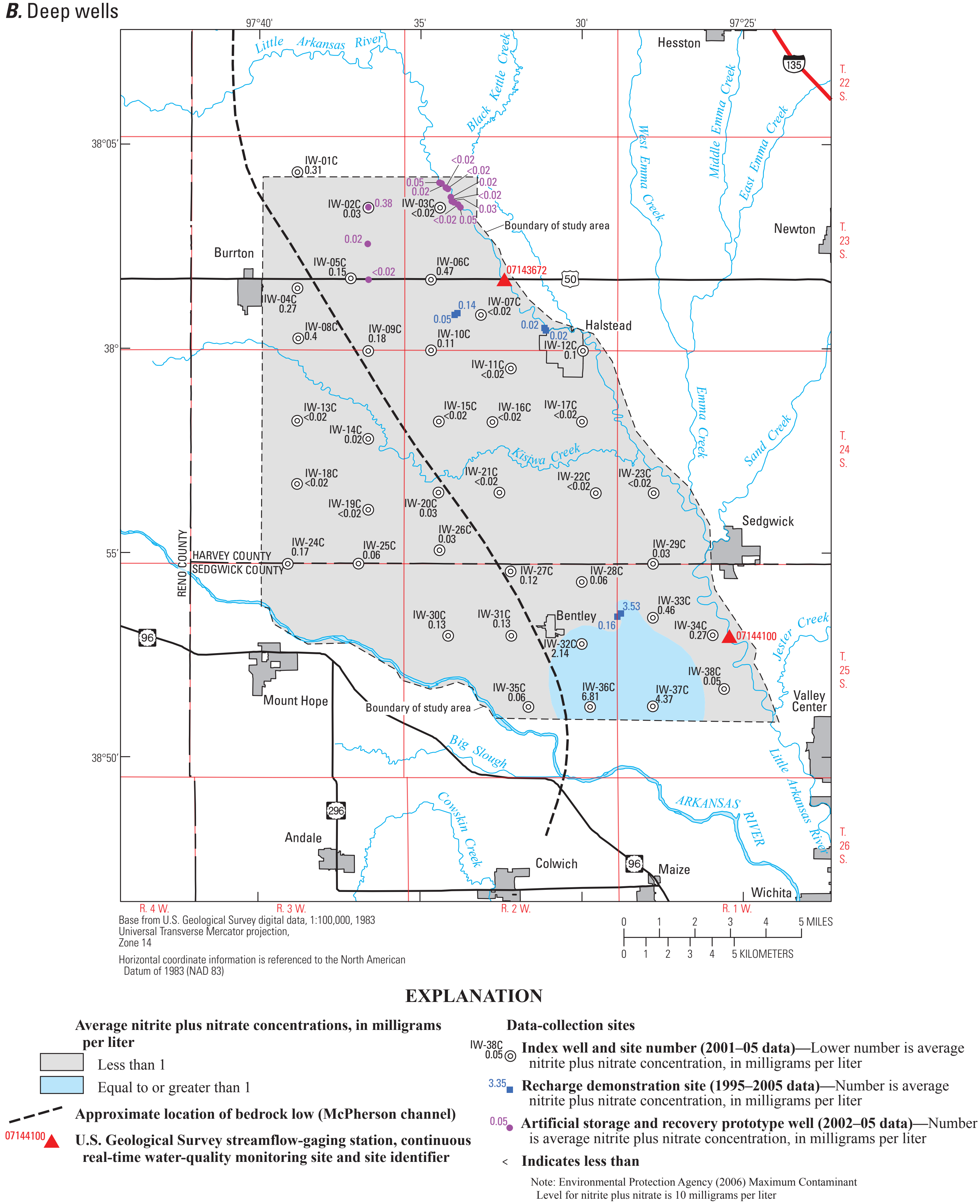


Figure 17. Average nitrite plus nitrate concentrations in the study area, 1995–2005, in *(A)* shallow wells and *(B)* deep wells.—Continued

about 90 percent of the study area (fig. 17*B*). Average nitrate concentrations between 1.0 and 10 mg/L were measured in wells in the southern part of study area southeast of Bentley. Here larger concentrations of nitrate are associated with larger effective porosity (fig. 8). In general, nitrate concentrations were smaller in deeper parts of the aquifer because of more reducing conditions where nitrate is reduced to nitrogen gas through denitrification (see reducing conditions shown in fig 10).

The larger nitrate concentrations in water from shallow wells were consistent with a study of larger areal extent done by Spruill (1982) that reported about 20 percent of water samples from wells less than 100 ft deep in Quaternary fluvial (stream-borne) and eolian (windblown) deposits in central Kansas (including the *Equus* Beds aquifer) had nitrate concentrations exceeding 10 mg/L. None of the water samples from wells more than 100 ft deep in these same deposits had nitrate concentrations exceeding 10 mg/L. Townsend and Young (2000) also reported that water samples from shallower wells were more likely to have larger nitrate concentrations than those from deeper wells. Townsend and Young (2000) further indicated that groundwater in Kansas with nitrate concentrations greater than 3.0 mg/L have been affected by anthropogenic (human-related) activities. Pope and others (2001, 2002) reported nitrate concentrations as large as 18 mg/L in water from shallow wells in the central High Plains aquifer (which includes the *Equus* Beds aquifer, fig. 1). In these previous studies, nitrate concentrations in individual water samples from wells nearest to the *Equus* Beds study area were 0.56 mg/L (northeast of the Little Arkansas River in McPherson County) and 7.5 mg/L (southwest of the Arkansas River in Reno County) (Pope and others, 2001), and 0.82 and 5.6 mg/L (south of the study area in Sedgwick County) (Pope and others, 2002). These concentrations were within the range of nitrate concentrations detected in this study, which indicates that nitrate concentrations measured in the *Equus* Beds aquifer were similar to concentrations of nitrate detected in the rest of the central High Plains aquifer.

Trace Elements

Dissolved concentrations of trace elements discussed in this report include arsenic, iron, and manganese. Dissolved concentrations are defined operationally by filtering the water samples through a 0.45-µm pore-size filter. Arsenic is a potential carcinogen, and iron and manganese precipitates can plug wells and give water a bad taste and color. Summaries of dissolved trace element analyses for this study are shown in table A-5. The infiltration of stream water or treated water into the *Equus* Beds aquifer by artificial recharge operations could affect the mobility of dissolved arsenic or could stimulate the growth of bacteria and cause precipitation of iron and manganese minerals from groundwater.

The areal distributions of larger dissolved arsenic, iron, and manganese concentrations in the *Equus* Beds aquifer in the study area during 1995–2005 were similar. In the shallow parts of the aquifer, the larger dissolved concentrations of these trace elements correspond to the areas that have been dewatered. Minerals in the aquifer material are oxidized resulting in the formation of oxyhdroxides. When water levels increase, these oxyhydroxides subsequently are reduced and arsenic, iron and manganese that formed after dewatering of the shallow parts of the aquifer go into solution and increase concentrations in the water if the water remains reduced. In the deep parts of the aquifer, reducing conditions are more conducive to larger dissolved concentrations of arsenic, iron, and manganese.

Arsenic

Although arsenic is considered to be naturally occurring in clay layers associated with iron sulfide minerals (Hem, 1992), it may be a health concern in drinking water because it can cause skin damage, affect the circulatory system, and increase cancer risk (U.S. Environmental Protection Agency, 2005). In 2001, the USEPA proposed lowering the Federal MCL for arsenic from 50 to10 micrograms per liter (µg/L), and the new lower MCL took effect January 2006 (U.S. Environmental Protection Agency, 2001b). The revised arsenic Federal MCL of 10 µg/L caused water providers across the United States to more closely evaluate their source water for arsenic or to increase treatment to meet the criterion.

Water samples collected from the Little Arkansas River near Halstead and near Sedgwick from 1995 through 2005 had a median dissolved arsenic concentration of 5 µg/L, which is one-half the MCL for arsenic of 10 µg/L (table 1). Dissolved arsenic concentrations ranged from 1 to 14 µg/L. Dissolved arsenic concentrations exceeded the MCL in about 8 percent of the samples collected from 1995 through 2005 from the Little Arkansas River (table 1, table A-5). All dissolved arsenic concentrations were less than the MCL in the samples of treated source water at the Sedgwick recharge site (table A-5).

A regression model was developed to compute dissolved arsenic concentrations in the Little Arkansas River on the basis of streamflow (Christensen and others, 2003). Computed dissolved arsenic concentrations as large as 18 µg/L occurred at both surface-water monitoring sites on the Little Arkansas River from 1999 through 2005. Larger dissolved arsenic concentrations in stream water generally occurred during low streamflow when base flow to the stream was supplied from groundwater. Duration curves for computed dissolved arsenic are shown in figure 18. In the Little Arkansas River near Halstead, computed dissolved arsenic concentrations exceeded the MCL of 10 µg/L about 14 percent of the time and at the Little Arkansas River near Sedgwick about 10 percent of the time. Computed dissolved arsenic concentrations are available on the World Wide Web at *http://nrtwq.usgs.gov/ks/*.

Dissolved arsenic concentrations exceeded 10 µg/L in water samples from about 10 percent of the index wells completed in the shallow parts of the *Equus* Beds aquifer (table 2). Some background wells and some shallow monitoring

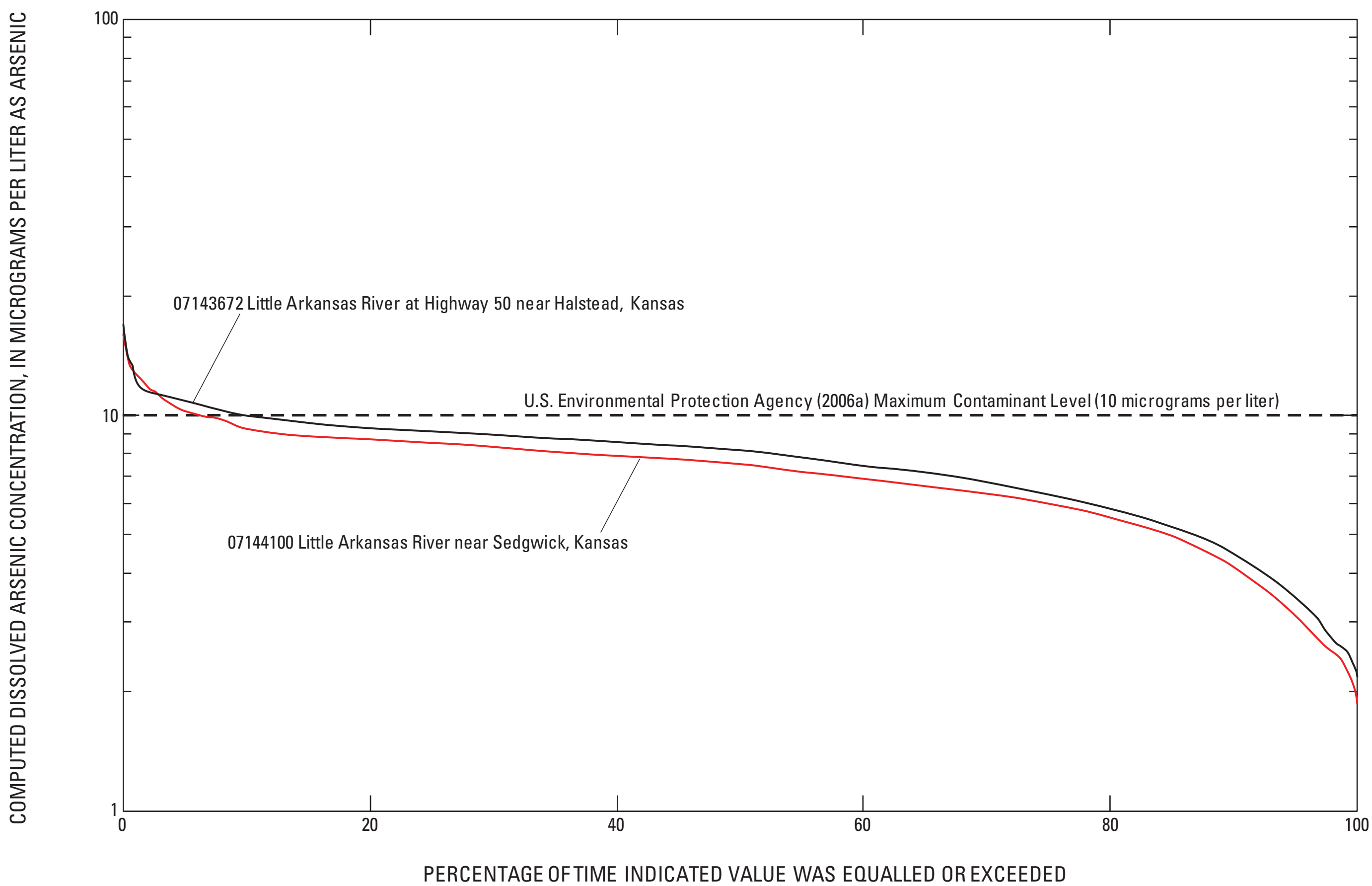


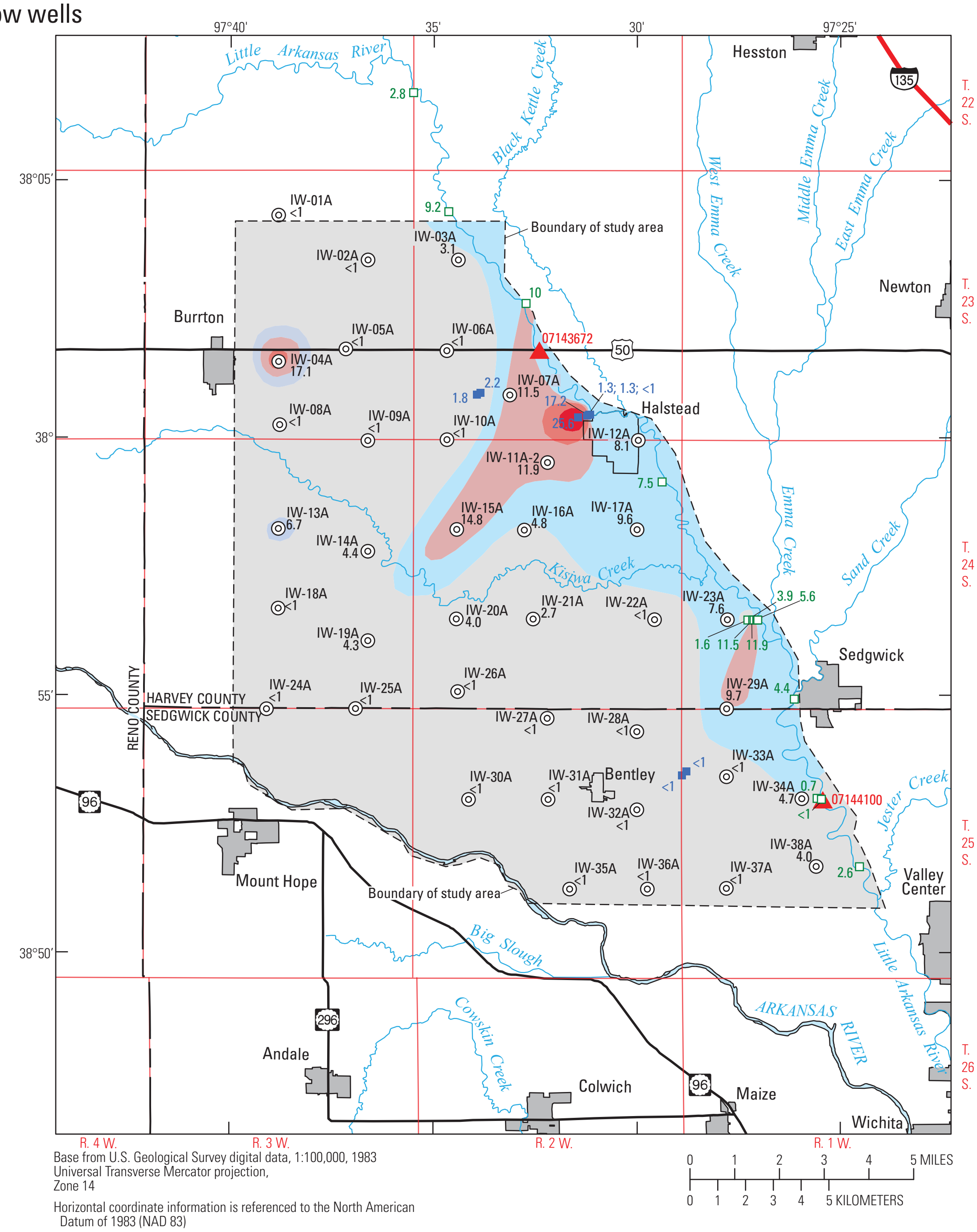
Figure. 18 Duration curves of computed dissolved arsenic concentrations, 1995–2005; Little Arkansas River near Halstead and near Sedgwick, Kansas.

wells at the diversion well site near Halstead had average dissolved arsenic concentrations exceeding the MCL of 10 µg/L before and after artificial recharge during 1997 through 2002 (table A-5). Some index wells with average dissolved arsenic concentrations less than the MCL had at least one sample with arsenic detected at a concentration greater than the MCL (table A-5). In the shallow parts of the aquifer, the largest average dissolved arsenic concentration was 26 µg/L at well EB-145-A5 near Halstead (fig. 6; table A-5), and the largest arsenic concentration in a single sample was 55 µg/L at well IW-04A (table A-5). Arsenic concentrations in water samples from the shallow parts of the aquifer generally were larger near the Little Arkansas River and near Burrton (fig. 19*A*). Average dissolved arsenic concentrations exceeded the MCL near Burrton, northwest of Sedgwick, and in an area extending diagonally to the southwest from near Halstead (fig. 19*A*). Average dissolved concentrations of arsenic in the shallow parts of the aquifer exceeded the MCL in 6 percent of the study area from 1995 through 2005 (fig. 19*A*).

Thirty-four percent of water samples from the deep index wells had dissolved arsenic concentrations that exceeded the MCL (table 2). Average dissolved arsenic concentrations exceeding the MCL also occurred in some of the ASR prototype wells and deep wells associated with the Halstead diversion and recharge sites (table A-5). Some deep wells with average dissolved arsenic concentrations less than the MCL had at least one sample with arsenic concentrations detected that exceeded the MCL (table A-5). The largest average (29.1 µg/L) and single-sample (48.9 µg/L) dissolved arsenic concentrations occurred in the deep parts of the aquifer in samples from well EB-145-P-D5 near Halstead (table A-5). Larger concentrations of arsenic in the deep parts of the aquifer occurred on the west side of the study area near Kisiwa Creek and on the eastern side of the study area along the Little Arkansas River (fig. 19*B*). Arsenic concentrations were smallest in the southern part of the study area along the Arkansas River. Average dissolved concentrations of arsenic in the deep parts of the aquifer exceeded the MCL in 35 percent of the study area from 1995 through 2005 (fig. 19*B*).

The mobility of arsenic in the hydrologic environment generally is controlled by two categories of processes—adsorption and desorption reactions and solid-phase precipitation and dissolution reactions (Hem, 1992; Hinkle and Polette, 1999; Smedley and Kinniburgh, 2002; McMahon and Chapelle, 2008). These processes are affected by pH, oxidation/reduction reactions, and the presence of competing anions in the water, all of which could be altered as a result of artificial recharge activities. The adsorption of arsenic to iron-oxide

A. Shallow wells



EXPLANATION

Average arsenic concentrations, in micrograms per liter

- Less than 5
- 5 to less than 10
- 10 to less than 15
- 15 to less than 20
- Equal to or greater than 20

07144100 ▲ **U.S. Geological Survey streamflow-gaging station, continuous real-time water-quality monitoring site and site identifier**

Data-collection sites

IW-15A 14.8 ◎ **Index well and site identifier (2001–05 data)**—Lower number is average arsenic concentration, in micrograms per liter

<1 ■ **Recharge demonstration site (1995–2005 data)**—Number is average arsenic concentration, in micrograms per liter

10 □ **Background well (1995–2005 data)**—Number is average arsenic concentration, in micrograms per liter

< **Indicates less than**

Note: U.S. Environmental Protection Agency (2006a) Maximum Contaminant Level for arsenic is 10 micrograms per liter

Figure 19. Average arsenic concentrations in the study area, 1995–2005, in *(A)* shallow wells and *(B)* deep wells.

B. Deep wells

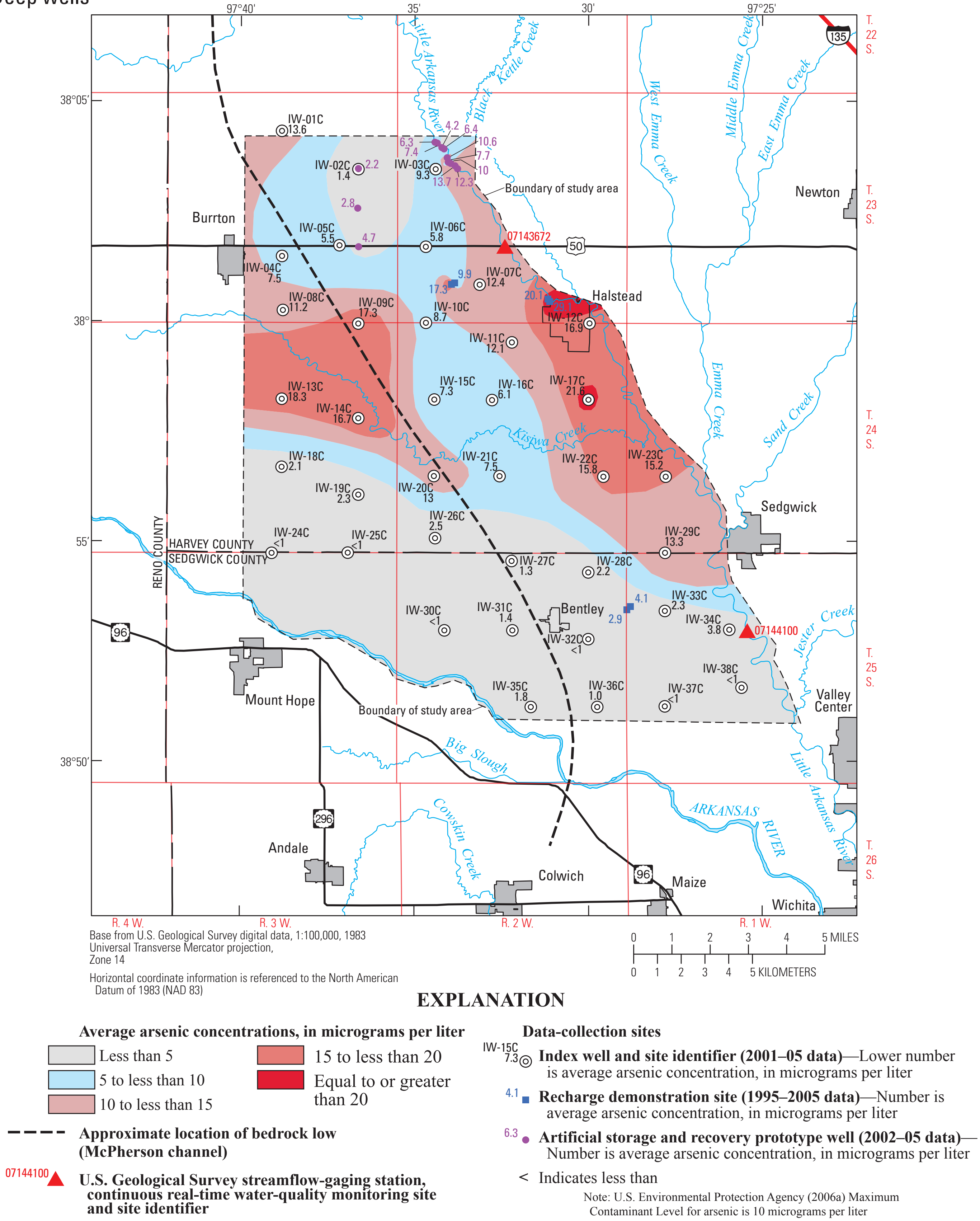


Figure 19. Average arsenic concentrations in the study area, 1995–2005, in *(A)* shallow wells and *(B)* deep wells.—Continued

surfaces tends to decrease as pH increases; therefore, changes in pH of the groundwater can promote adsorption or desorption of arsenic. The oxidation state in which arsenic occurs has an important effect on the mobility of arsenic. Arsenate (As^{5+}; $H_2AsO_4^-$) is dominant under oxidizing conditions and pH values between 3 and 7, and arsenite (As^{3+}; $HAsO_2$) is dominant under more reducing conditions.

Dissolved arsenate and arsenite concentrations detected in the *Equus* Beds aquifer from 1995 through 2005 are presented in table A-5. Adsorption or coprecipitation by iron oxyhydroxide and release from sulfide mineral dissolution in chemically reduced clay appear to be primary factors that can maintain arsenic at small concentrations in water (Hem, 1992). Effects of artificial recharge on concentrations of arsenic in the aquifer potentially can be minimized by maintaining the oxidation-reduction potentials as near 1995–2005 baseline conditions as possible (Schmidt and others, 2007). However, in many areas of the aquifer, especially the deeper parts, the geochemical conditions are conducive to large dissolved arsenic concentrations, and it may be possible to use artificial recharge to create a less reducing geochemical environment, which decreases some of the arsenic and iron dissolved in the water thereby improving the overall water quality in the aquifer.

Dissolved arsenic concentrations generally were larger in deep parts of the aquifer than in shallow parts. The differences in arsenic concentration in water samples from shallow and deep index wells were because of the different geologic composition of the aquifer zones and differences in the reduction-oxidation potentials in the aquifer. Dissolved arsenic concentrations were larger than 10 µg/L in the northern two-thirds of the study area (mostly in Harvey County), where effective porosities were smaller (clay layers abundant) (fig. 8). In the southern one-third of the study area, the *Equus* Beds aquifer consists of mostly sand and gravel. The northern two-thirds of the study area also had water-level declines of nearly 50 ft through 1992, which subsequently have recovered by almost 20 ft in 2005. Dissolved arsenic concentrations also were inversely related to ORP. The larger dissolved arsenic concentrations in deep wells were most common in areas with reducing conditions where the ORP was less than 250 mV. Clay is a natural source of arsenic because arsenic can occur as an impurity in the mineral pyrite (Hem, 1992; Welch and others, 2000), which commonly occurs in clay. These findings are corroborated by Gotkowitz and others (2004), who investigated the relation between larger concentrations of arsenic in borehole water under no or small pumping rates and reported that large concentrations of arsenic were caused by the reducing condition of arsenic-bearing iron (hydroxide) oxides in the borehole wall.

Behavior of stable forms of arsenic (arsenate and arsenite oxyanions) in water corresponds to changes in pH and ORP (Hem, 1992). Although pH did not have a strong relation to concentration of arsenic in groundwater in the *Equus* Beds aquifer, dissolved arsenic concentrations decreased overall as ORP increased. Regression plots showing the relation between measured ORP and sampled dissolved arsenic concentrations are shown for shallow index wells (fig. 20), deep index wells (fig. 20*B*), and the average of shallow and deep wells at index well sites (fig. 20*C*). The regression models and their respective coefficients of determination (R^2) and root mean square error (RMSE) for figures 20*A*, *B*, and *C* follow:

Shallow index wells:
$arsenic = 32{,}600\ ORP^{-1.730}$;
$R^2 = 0.619$; RMSE = 4.36;

Deep index wells:
$arsenic = 21{,}400\ ORP^{-1.593}$;
$R^2 = 0.567$; RMSE = 5.17; and

Combined shallow and deep index wells:
$arsenic = 41{,}700\ ORP^{-.1.747}$;
$R^2 = 0.630$; RMSE = 5.19;

where *arsenic* is in micrograms per liter and ORP is in millivolts relative to the standard hydrogen electrode. The coefficients of determination for these regressions indicate that ORP was useful estimating dissolved arsenic concentrations and that ORP explains about 60 percent of the variability in dissolved arsenic concentrations in groundwater.

Iron

Iron in water is derived from rocks and soils and is commonly measured in chemical analyses. Water containing excessive concentrations of iron is unpleasant to drink because of its odor, metallic taste, and rusty color. The Federal SDWR for iron is 300 µg/L (U.S. Environmental Protection Agency, 2005). At concentrations exceeding the Federal SDWR, iron forms red oxyhydroxide precipitates in water that stain laundry and plumbing fixtures and causes corrosion. Iron becomes more soluble in water at small pH and small ORP values. Bacterial activity also may affect the concentration of iron in water (Hem, 1992) and can be of particular concern in artificial recharge operations. The addition of oxygenated water to a system could create favorable conditions for increased bacterial activity. In turn, increased biological activity can produce a biofilm that can clog well screens and decrease the efficiency of injection wells (Schmidt and others, 2007).

Water samples collected from the Little Arkansas River from 1995 through 2005 had a median dissolved iron concentration of 10 µg/L, which was much less than the Federal SDWR of 300 µg/L (table 1). Dissolved iron concentrations ranged from less than 5 to 860 µg/L. Samples with dissolved iron concentrations that exceeded the Federal SDWR were collected from both surface-water monitoring sites on the Little Arkansas River (table A-5). Generally, larger concentrations of iron likely were caused by colloids that pass through the 0.45-µm filters when sediment concentrations are larger.

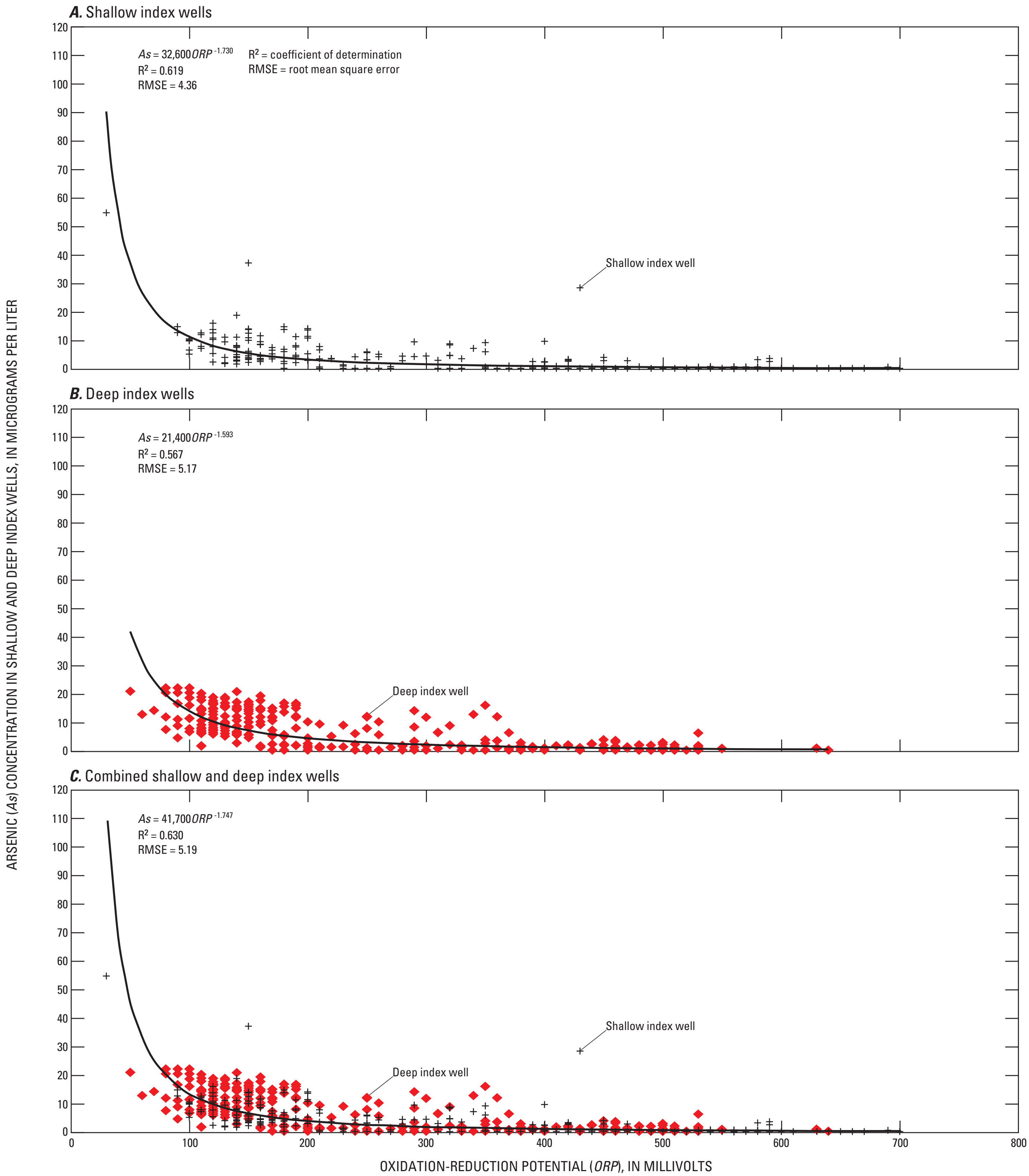


Figure 20. Statistical relation between oxidation-reduction potential and arsenic concentrations in *(A)* shallow index wells, *(B)* deep index wells, and *(C)* combined shallow and deep index wells.

However, the Federal SDWR was exceeded in less than 2 percent of water samples collected. Dissolved iron concentrations were all less than the Federal SDWR in the samples collected from the treated source water at the Sedgwick recharge site during 1997-2000 (table A-5). No computations of dissolved iron concentrations from continuously measured constituents in the Little Arkansas River were made.

The average concentration of dissolved iron in groundwater exceeded the Federal SDWR in water samples from about 40 and 45 percent of the index wells in the shallow and deep parts of the aquifer, respectively (table 2). Single-sample dissolved concentrations of iron were as large as 40,700 µg/L in the shallow part of the aquifer at well IW-20A and as large as 15,800 µg/L in the deep part of the aquifer at well IW-08C (table A-5). Areal distributions of average dissolved iron concentrations in shallow and deep wells from 1995 through 2005 are shown in figure 21. Dissolved concentrations of iron that exceeded 300 µg/L in the shallow and deep parts of the aquifer occurred mostly in the central part of study area and along the Little Arkansas River. About 44 percent of the study area had average dissolved iron concentrations that exceeded the Federal SDWR in water from both shallow and deep wells.

Iron in the *Equus* Beds aquifer most likely occurs naturally from oxidation of pyrite, which occurs in clay in the aquifer. Very large dissolved concentrations of iron (greater than 3,000 µg/L) generally corresponded with areas of larger water-level declines and subsequent recovery (figs. 21 and 4). These larger concentrations likely were caused by oxidation of the aquifer material. After an increase in water levels, ferric oxyhydroxides that formed during the period of dewatering and oxidation of the aquifer material are reduced and are dissolved in the water. These areas also had larger sulfate concentrations, which also indicated that oxidation occurred during the period of dewatering. Previously published data by Hathaway and others (1981) indicated dissolved iron concentrations larger than 1,500 µg/L in groundwater near Burrton and Kisiwa Creek, and concentrations less than 50 µg/L occurred near the Arkansas River. On the basis of the data collected by Hathaway and others and the study described herein, iron concentrations have not changed substantially during the past 20 years.

Manganese

Manganese is another trace element that is commonly analyzed in water because of its undesirable tendency to deposit black oxide stains. Like iron, manganese originates from rocks and soil, but it is much less abundant than iron (Hem, 1992). The Federal SDWR for manganese is 50 µg/L (U.S. Environmental Protection Agency, 2005). At concentrations larger than the Federal SDWR, consumers may notice a bitter metallic taste, black to brown water, and black staining on plumbing fixtures (U.S. Environmental Protection Agency, 2005).

Water samples collected from 1995 through 2005 at the two surface-water monitoring sites on the Little Arkansas River had a median dissolved manganese concentration of 60 µg/L, which exceeds the Federal SDWR (table 1). Dissolved manganese concentrations in water samples collected from the Little Arkansas River ranged from less than 1 to 1,140 µg/L. Water samples from both sites on the Little Arkansas River exceeded the Federal SDWR (table A-5). Dissolved concentrations exceeded the Federal SDWR in 48 percent of the water samples collected from the Little Arkansas River (table 1). Median dissolved manganese concentrations in samples of the treated source water at the Sedgwick recharge site collected during the 1997-2000 recharge demonstration period were less than 5 µg/L; however, dissolved manganese concentrations in some samples of treated source water at the Sedgwick recharge site were as large as 180 µg/L and exceeded the Federal SDWR (table A-5). No concentrations were computed on the basis of continuously measured constituents in the Little Arkansas River.

Average dissolved manganese concentrations exceeded the Federal SDWR in water samples from about 58 percent of the index wells in the shallow parts of the *Equus* Beds aquifer in the study area (fig. 22*A*, table 2). The largest single-sample dissolved manganese concentration in the shallow parts of the aquifer was 4,320 µg/L in water from well TH-08-A1 (table A-5). In shallow groundwater, average dissolved concentrations of manganese exceeded 50 µg/L in 60 percent of the study area (fig. 22*A*). In shallow parts of the aquifer, almost all of the study area located in Harvey County had average dissolved manganese concentrations that exceeded 50 µg/L (fig. 22*A*). Average dissolved manganese concentrations larger than 500 µg/L were detected near Burrton, in a large area about 5 mi southwest of Halstead, and areas near the Little Arkansas and Arkansas Rivers.

Average dissolved manganese concentrations exceeded the Federal SDWR in water samples from about 95 percent of the index wells in the deep parts of the aquifer (table 2). A dissolved manganese concentration of 1,450 µg/L in water from well IW-12C was the largest for a single sample from the deep parts of the aquifer (table A-5). About 97 percent of the study area had average dissolved manganese concentrations that exceeded 50 µg/L in water from deep wells (fig. 22*B*). Average dissolved manganese concentrations exceeded 500 µg/L in water from the deep parts of the aquifer in a large area in the center of the study area and two smaller areas near Halstead (fig. 22*B*).

The area with average manganese concentrations that exceeded 50 µg/L was larger in the deep parts of the aquifer than in the shallow parts of the aquifer probably because of the difference in ORP between the two depths. In the shallow parts of the aquifer where more oxidizing conditions exist, manganese likely is oxidized to form manganese oxide, which is insoluble in water. This precipitate is removed when filtering the water samples, which results in smaller dissolved manganese concentrations in water collected from shallow wells. Figure 22 shows a similar distribution of manganese concentrations in the *Equus* Beds aquifer to that published by Hathaway and others (1981). That report and this study had

A. Shallow wells

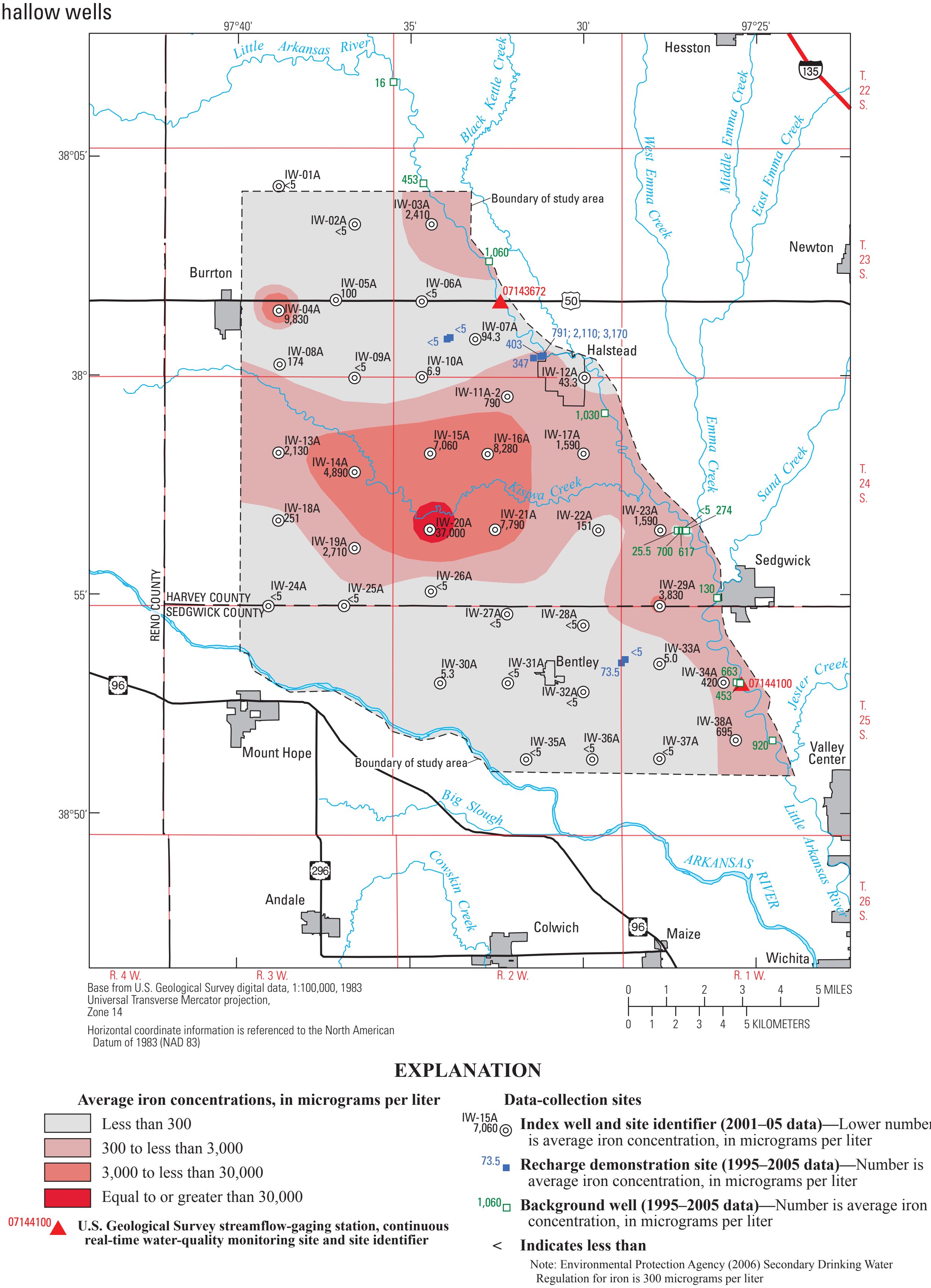
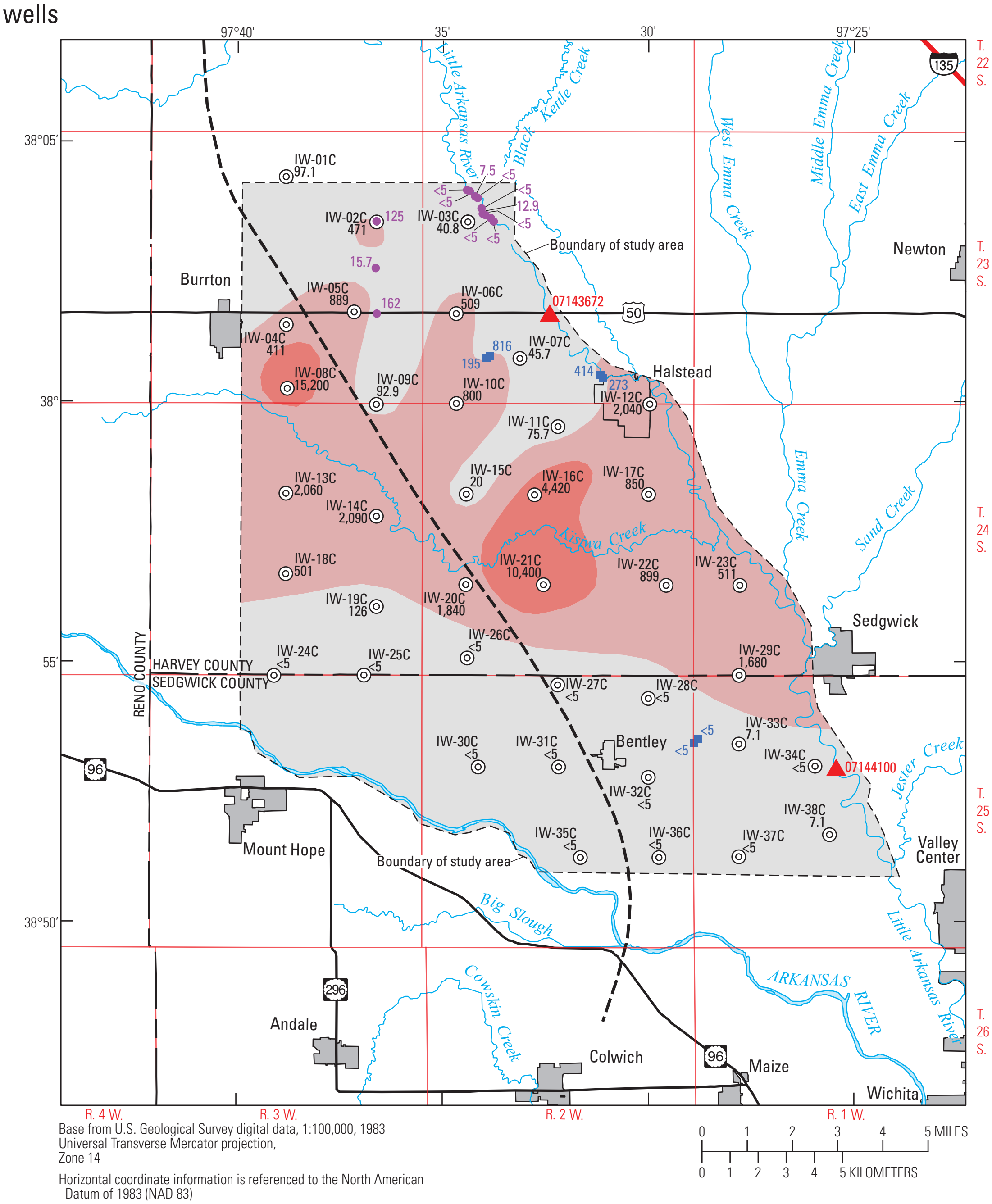


Figure 21. Average dissolved iron concentrations in the study area, 1995–2005, in *(A)* shallow wells and *(B)* deep wells.

B. Deep wells



EXPLANATION

Average iron concentrations, in micrograms per liter

- Less than 300
- 300 to less than 3,000
- Equal to or greater than 3,000

Approximate location of bedrock low (McPherson channel)

07144100 **U.S. Geological Survey streamflow-gaging station, continuous real-time water-quality monitoring site and site identifier**

Data-collection sites

IW-15C 20 **Index well and site identifier (2001–05 data)**—Lower number is average iron concentration, in micrograms per liter

<5 **Recharge demonstration site (1995–2005 data)**—Number is average iron concentration, in micrograms per liter

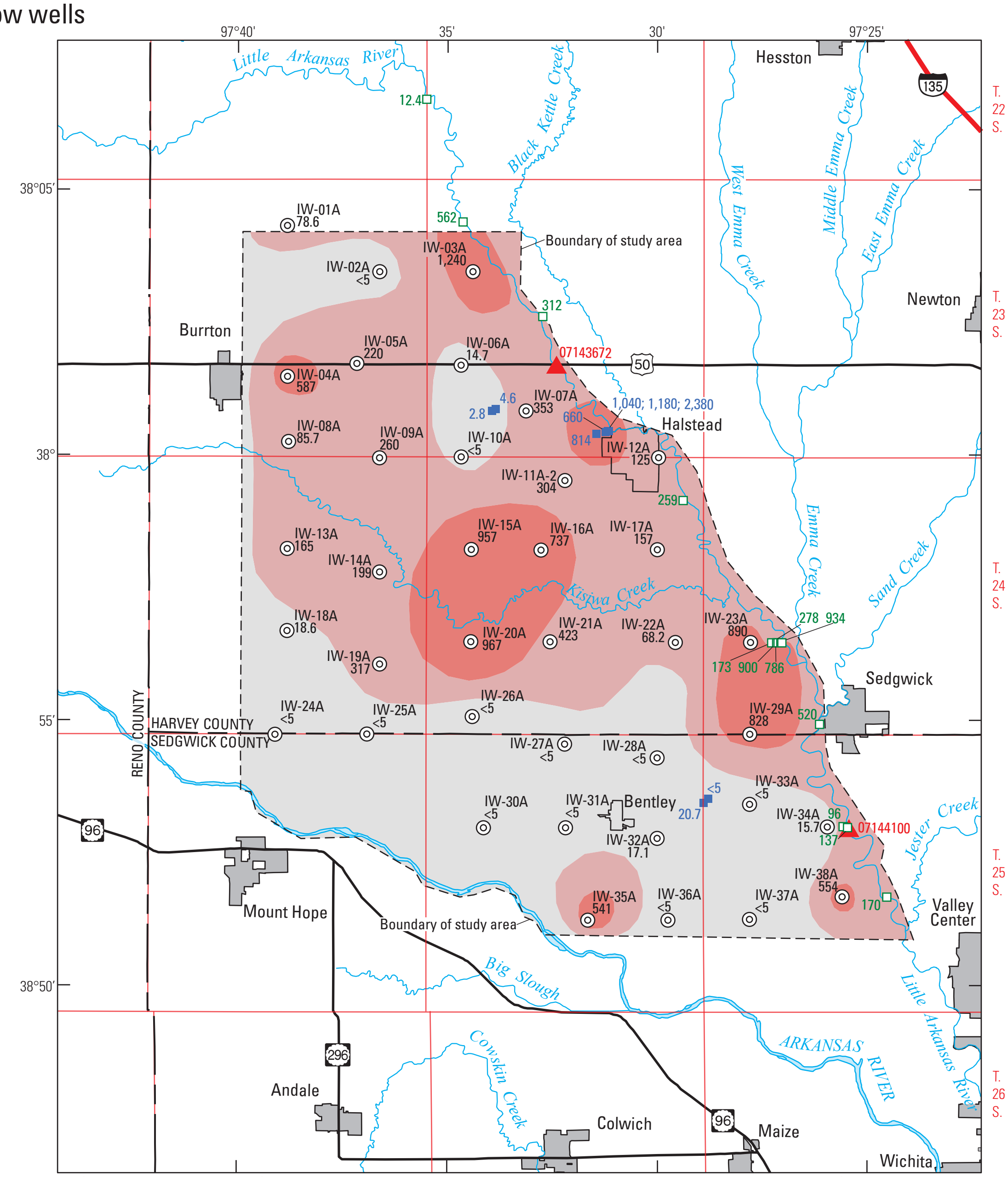
<5 **Artificial storage and recovery prototype well (2002–05 data)**—Number is average iron concentration, in micrograms per liter

< **Indicates less than**

Note: Environmental Protection Agency (2006) Secondary Drinking Water Regulation for iron is 300 micrograms per liter

Figure 21. Average dissolved iron concentrations in the study area, 1995–2005, in *(A)* shallow wells and *(B)* deep wells.—Continued

A. Shallow wells



Base from U.S. Geological Survey digital data, 1:100,000, 1983
Universal Transverse Mercator projection,
Zone 14

Horizontal coordinate information is referenced to the North American Datum of 1983 (NAD 83)

0 1 2 3 4 5 MILES
0 1 2 3 4 5 KILOMETERS

EXPLANATION

Average manganese concentrations, in micrograms per liter

- Less than 50
- 50 to less than 500
- Equal to or greater than 500

07144100 **U.S. Geological Survey streamflow-gaging station, continuous real-time water-quality monitoring site and site identifier**

Data-collection sites

IW-15A 957 **Index well and site identifier (2001–05 data)**—Lower number is average manganese concentration, in micrograms per liter

3 **Recharge demonstration site (1995–2005 data)**—Number is average manganese concentration, in micrograms per liter

312 **Background well (1995–2005 data)**—Number is average manganese concentration, in micrograms per liter

Note: U.S. Environmental Protection Agency (2006a) Secondary Drinking-Water Regulation for manganese is 50 micrograms per liter

Figure 22. Average dissolved manganese concentrations in the study area, 1995–2005, in *(A)* shallow wells and *(B)* deep wells.

B. Deep wells

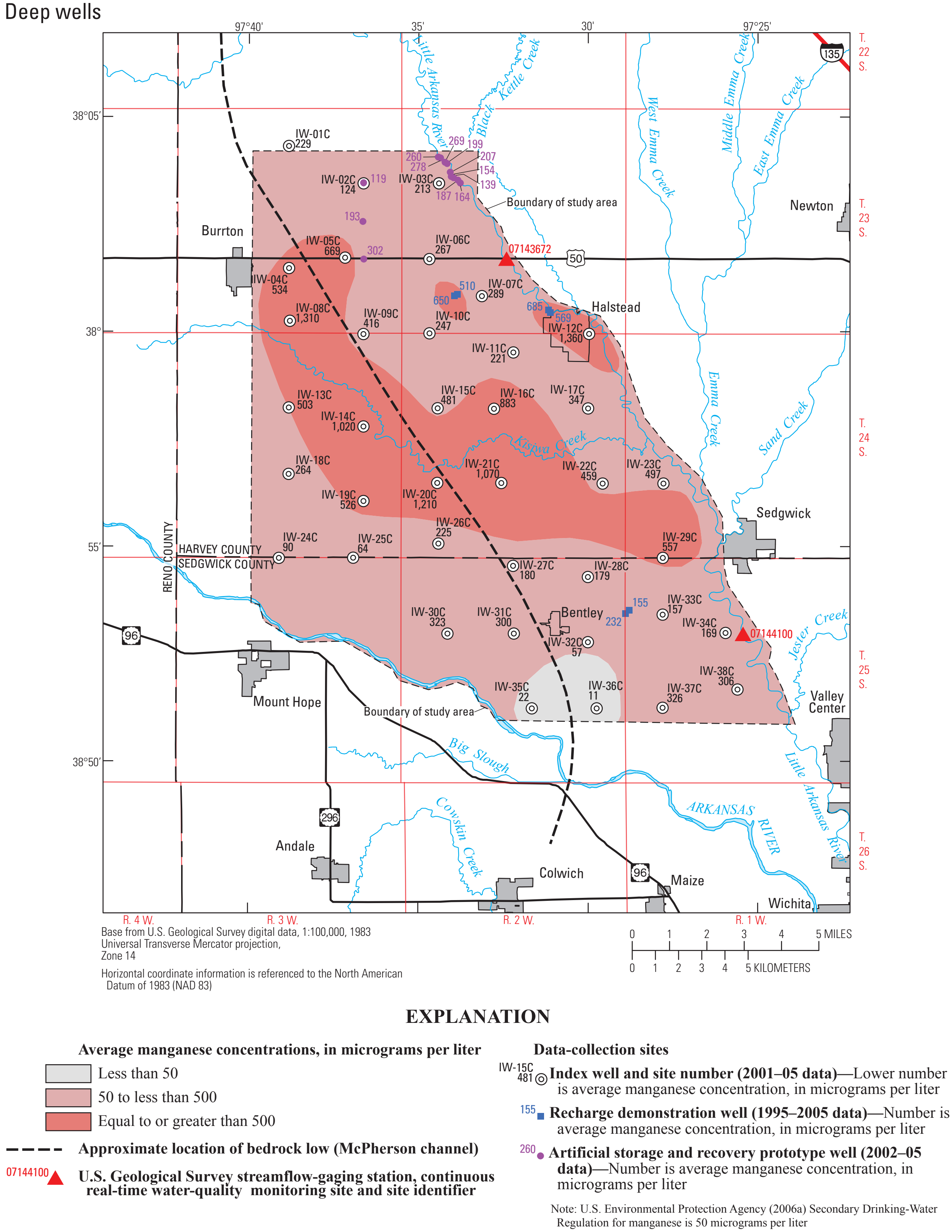


Figure 22. Average dissolved manganese concentrations in the study area, 1995–2005, in *(A)* shallow wells and *(B)* deep wells.—Continued

shallow aquifer concentrations between 50 and 500 µg/L in much of the study area with concentrations exceeding 500 µg/L near Kisiwa Creek and concentrations less than 50 µg/L along the Arkansas River.

Organic Compounds

Many of the organic compounds detected in surface and groundwater in the study area are chemicals used in agricultural pesticides and herbicides. These compounds enter streams or slowly infiltrate into the aquifer from the application on fields or through irrigation return flow and surface runoff. All organic compounds for which at least one analysis was performed in surface or groundwater samples collected at study sites from 1995 through 2005 are listed in table A-2. Those organic compounds that were never detected at any sites from 1995 through 2005 also are noted in table A-2. Of the more than 300 organic compounds (which included pesticides, herbicides, metabolites, volatile organic compounds, acid compounds, base/neutral compounds, and pharmaceutical compounds) listed, 88 were detected in at least one sample. The criterion for detection was any concentration larger than the reporting level for the constituent. Those compounds detected in the samples were summarized for groups of data-collection sites in table A-6.

Alachlor was the only organic compound other than atrazine frequently detected (five percent of surface-water samples) at levels exceeding USEPA Federal drinking-water criterion value (table 1). Alachlor is an herbicide used to control weeds in soybeans. Dissolved concentrations of alachlor in the Little Arkansas River near Halstead were as large as 28 µg/L (table A-6) but rarely exceeded the Federal MCL for alachlor of 2.0 µg/L (U.S. Environmental Protection Agency, 2006a).

The organic compounds for which the most water samples were analyzed were pesticides, especially atrazine and triazine herbicides. Ziegler and others (1999) analyzed water samples from the Little Arkansas River for dissolved triazine herbicides using the enzyme-linked immunosorbent assay (ELISA) method and used gas chromatography/mass spectrometry (GC/MS) to confirm and quantify the presence of atrazine. Using these methods, Ziegler and others (1999) reported that atrazine made up 81 percent of triazine compound concentrations analyzed by ELISA for water samples collected from the Little Arkansas River. For the purposes of this report, dissolved triazine compounds detected by ELISA method in surface-water samples are referred to as atrazine.

In groundwater, the relation between atrazine and triazine analysis by ELISA was not as well defined because of the small concentrations of atrazine in groundwater that commonly were less than the reporting level for the ELISA method of 0.1 µg/L (Ziegler and others, 1999). Therefore, the atrazine concentrations in groundwater discussed in this report were determined by the GC/MS method (table 2).

Atrazine does not occur naturally in the environment; it is an herbicide used on corn and grain sorghum, which are crops commonly grown in the study area. Atrazine can cause damage to internal organs in humans (USEPA Web site *http://www.epa.gov/ogwdw/dwh/c-soc/atrazine.html*). The Federal MCL in drinking water for atrazine is 3.0 µg/L as an annual average (U.S. Environmental Protection Agency, 2006a). The USEPA continues to investigate whether atrazine should be listed as a carcinogen (USEPA Web site *http://www.cdc.gov/nasd/docs/d001601-d001700/d001664/d001664.html*).

Atrazine was detected in about 96 percent of the surface-water samples collected for this study and exceeded the Federal MCL of 3.0 µg/L in about 31 percent of the samples analyzed for triazine herbicides (table 1). Average rather than median concentrations of atrazine are discussed in this report to facilitate a direct comparison of measured and computed atrazine concentrations to the Federal MCL, which is defined as an annual average. The summary of concentrations of atrazine in surface-water samples collected from 1995 through 2005 at the two monitoring sites on the Little Arkansas River had an average concentration of 3.7 µg/L, which exceeded the MCL (table 1). The average atrazine concentration in water samples collected from the Little Arkansas River was 3.1 µg/L near Halstead and 3.5 µg/L near Sedgwick, both exceeded the MCL (table 1). Atrazine (triazine by ELISA) concentrations in water samples collected from the Little Arkansas River were as large as 50 µg/L near Halstead and as large as 40 µg/L near Sedgwick (table A-6). Atrazine concentrations larger than the MCL of 3.0 µg/L generally occur in the Little Arkansas River during late spring to early fall. Atrazine concentrations in treated stream water from the Sedgwick recharge site were as large as 6.7 µg/L, but the average concentration was 0.52 µg/L (table A-6).

Regression models for computing concentrations of atrazine in the Little Arkansas River were developed using specific conductance measurements in the stream and day of year (Christensen and others, 2003). The largest concentrations computed for 1999-2005 were about 23 µg/L near Halstead and about 18 µg/L near Sedgwick (USGS Web site *http:nrtwq.usgs.gov/ks/*). Duration curves of computed atrazine concentrations exceeded the MCL of 3.0 µg/L about 24 percent of the time from 1999 through 2005 in the Little Arkansas River near Halstead and 28 percent of the time near Sedgwick (fig. 23).

In groundwater, the percentage of samples with atrazine detections ranged from 0 percent in water from the prototype wells to about 55 percent in water from the shallow index wells (table 2). Average atrazine concentrations were much less than 3.0 µg/L in both the shallow and deep parts of the aquifer (table A-7). However, atrazine was detected in about 55 percent of the samples collected from the shallow wells, which indicates infiltration from field applications.

The largest atrazine concentration in groundwater in the study area was 2.2 µg/L in water from well EB-145-A1 (table A-7). This well is located immediately adjacent to the Little Arkansas River and is affected by infiltrating water (Schmidt and others, 2007). Schmidt and others (2007) indicated that

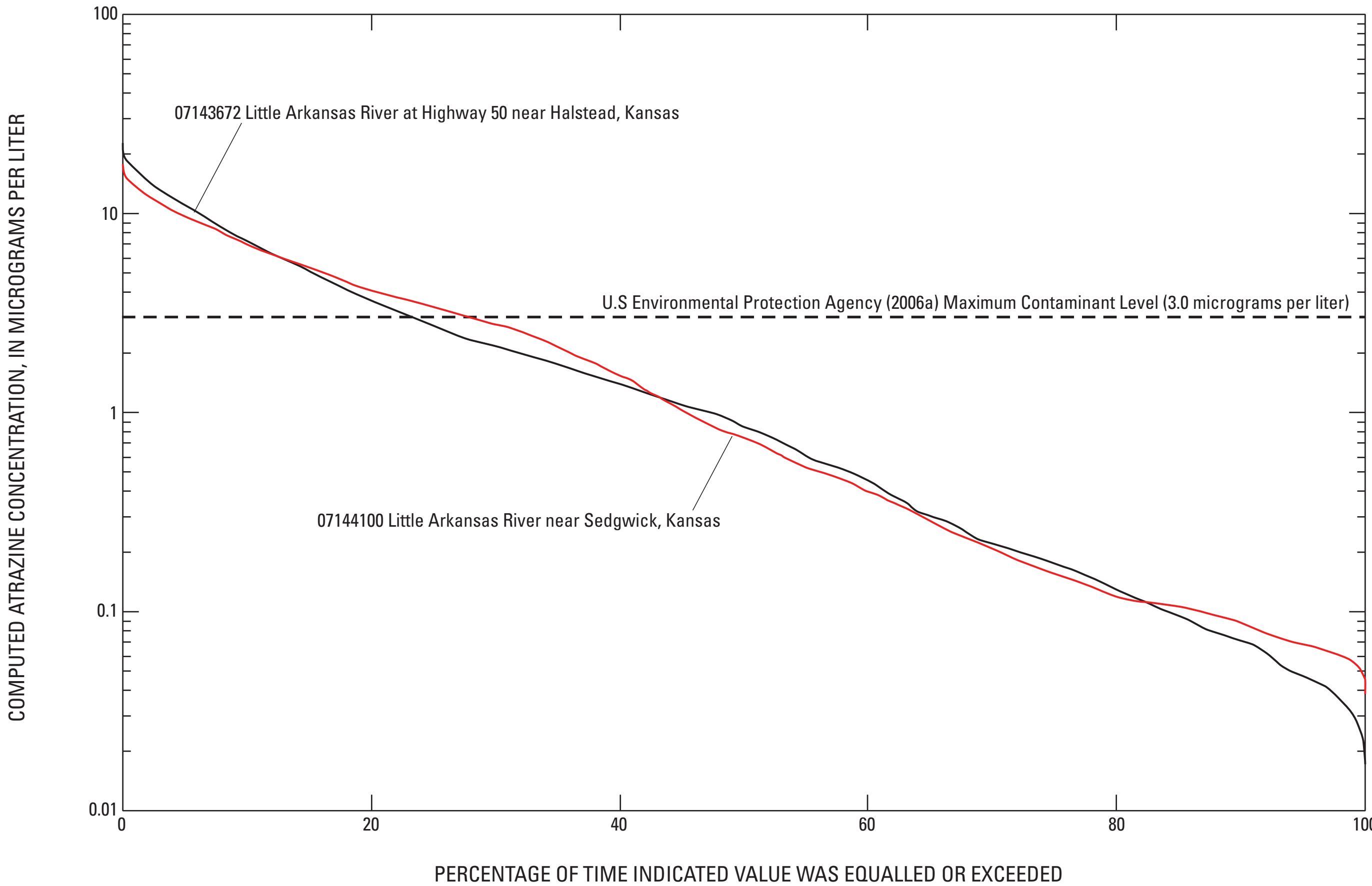


Figure 23. Duration curves of computed dissolved atrazine concentrations, 1999–2005, Little Arkansas River near Halstead and near Sedgwick, Kansas.

atrazine may be moving with the shallow groundwater into the deep part of the aquifer at well EB-145-P-D5.

Bacterial and Viral Indicators

Measuring the concentrations or densities of bacterial indicators and viruses in water is challenging because these organisms depend on specific conditions for growth. Additionally, the presence of bacteria and viruses in water is affected by runoff into waterways; therefore, sampling must quantify concentrations during storm runoff to describe the variability in surface water.

To indicate the presence of disease-causing organisms in water, a bacterial indicator such as coliform is measured. Fecal coliform and *Escherichia coli* (*E. coli*) are two types of coliform bacterial indicators that come only from the intestines and waste material of warm blooded animals. *E. coli* are a specific type of fecal coliform. They are carried into water from septic systems, sewer pipes, wastewater treatment plants, farms, and yards. The presence of fecal coliform and *E. coli* indicates that the water may be contaminated with human or animal wastes and may indicate that other harmful bacteria or viruses are present (Dufour and others, 1981; Dufour, 1984). These bacteria indicate the potential for pathogens that may cause diarrhea, nausea, headaches, and abdominal cramps, and may pose a special health risk for infants, young children, and people with compromised immune systems (U.S. Environmental Protection Agency, 2005).

Total Coliform

The USEPA Federal Maximum Contaminant Level Goal (MCLG) in drinking water for total coliform bacteria is that no more than 5 percent of samples test positive during 1 month for water systems that collect at least 40 routine samples per month (U.S. Environmental Protection Agency, 2005). If fewer than 40 samples are collected per month, only 1 sample can test positive for total coliform.

The median total coliform density of 1,700 colonies per 100 milliliters (col/100 mL) for water samples collected from 1995 through 2005 at the two surface-water monitoring sites on the Little Arkansas River (table 1) was much larger than the MCLG for total coliform of 0 col/100 mL. About 93 percent of the samples collected from the two sites on the Little Arkansas River had total coliform detections (table 1), which indicates that the MCLG for total coliform was rarely met at these sites.

Coliform detections in water samples collected from the Little Arkansas River during this period were as large as 2,000,000 col/100 mL near Halstead and as large as 9,000,000 col/100 mL near Sedgwick (table A-7). Large detections in surface water probably resulted from municipal wastewater discharge or runoff from livestock-producing areas. These large bacterial indicator densities are typical in central and eastern Kansas streams, especially during runoff conditions (Kansas Department of Health and Environment, 2006a,b). The median total coliform detections was 80 col/100 mL in treated source water at the Sedgwick recharge site during the 1997 through 2000 recharge demonstration period; however, total coliform detections as large as 7,000 col/100 mL occurred in some samples (table A-7). Methods were not available to compute total coliform from continuously monitored constituents in the Little Arkansas River.

Total coliform densities in groundwater were much less than in samples from the Little Arkansas River (table A-7). Total coliform detections exceeded the USEPA Federal MCLG of 0 colonies in water samples from 95 percent of the shallow index wells and in 87 percent of the deep index wells in the *Equus* Beds aquifer. Many of these detections were in the first samples collected from the wells after they were developed, indicating that at least some of these detections may be related to drilling. Almost all wells sampled for this study had at least 1 sample with a total coliform detection; however, the median densities for most of these wells were less than 1 col/100 mL (table A-7). The largest total coliform bacteria detection in the shallow part of the aquifer was 636 col/100 mL at background well TH-08-A3, and the largest total coliform bacteria detection in the deep aquifer was 224 col/100mL at ASR prototype well DW-TW-08 (table A-7). No specific areal distribution pattern was observed for total coliform detections in the study area for either part of the aquifer.

Fecal Coliform

No USEPA Federal drinking-water criterion for fecal coliform bacteria has been established for drinking water. However, the State of Kansas had established recreational-use guidelines for water in Kansas streams of 200 col/100 mL for primary contact (swimming) during April 1 through October 31 of each year and 2,000 col/100mL for primary contact during the rest of the year and for secondary contact (boating or wading) (Kansas Department of Health and Environment, 2001).

Median fecal coliform bacteria densities in water samples collected from 1995 through 2005 at the two sites on the Little Arkansas River were 860 col/100 mL for April through October and 170 col/100 mL for November through March (table 1). About 76 percent of the samples collected from the Little Arkansas River for April through October exceeded the criterion, and about 16 percent of the samples collected exceeded the criterion during November-March from 1995 through 2005 (table 1). Although fecal coliform bacteria were detected at densities as large as 3,200 col/100 mL in treated source water collected at the Sedgwick recharge site during the 1997 through 2000, the median fecal coliform bacteria density of 120 col/100 mL in samples from this site was less than the April through October primary contact criterion (table A-7).

Concentrations (or densities) of fecal coliform bacteria can be computed using continuous measurements of turbidity in streams (Rasmussen and Ziegler, 2003). The duration curves for the Little Arkansas River near Halstead (fig. 24) show that computed fecal coliform concentrations exceeded the primary contact recreational criterion about 71 percent of the time and exceeded the secondary contact recreational criterion about 18 percent of the time. At the Little Arkansas River near Sedgwick (fig. 24), computed fecal coliform concentrations exceeded the primary contact recreational criterion about 51 percent of the time and exceeded the secondary contact recreational criterion about 15 percent of the time.

The fecal coliform criterion does not apply to groundwater. Fecal coliform bacteria were rarely detected in water from background, ASR prototype, or index wells (table A-7). Fecal coliform detections in the index wells may be related to drilling activities because the only detections generally occurred shortly after the wells were completed. Fecal coliform bacteria may be detected more commonly in water from wells associated with the Halstead and Sedgwick recharge sites and may be associated with artificial recharge activities during the demonstration project from 1997 through 2002. However, all wells associated with the Halstead and Sedgwick recharge sites had median densities of fecal coliform bacteria of less than 1 col/100 mL (table A-7). Bacterial indicators that reach groundwater are expected to die off because they require dissolved oxygen to remain viable and there is little dissolved oxygen in groundwater.

Escherichia Coli

E. Coli is a specific type of fecal coliform bacteria. There also is no USEPA Federal drinking-water criterion for *E. coli* bacteria; however, in 2004 the State of Kansas established surface-water recreational-use criteria. The criteria for publicly accessible (Class B) Kansas streams with flows of at least 1 ft^3/s require that the geometric mean of at least five samples collected during separate 24-hour periods within a 30-day period not exceed 262 colony forming units per 100 milliliters (CFU/100 mL) for primary contact during April 1 through October 31 of each year and 2,358 CFU/100 mL for primary contact during the rest of the year; for secondary contact, the geometric mean will not exceed 2,358 CFU/100 mL at any time of year (Kansas Department of Health and Environment, 2004). For the purposes of this report, CFU/100 mL are equivalent to colonies per 100 mL.

Median *E. coli* bacteria densities in water samples collected from 1995 through 2005 at the two sites on the Little Arkansas River were 215 col/100 mL for April through October and 345 col/100 mL for November through March (table 1). Of the samples collected from the Little Arkansas River from 1995 through 2005, about 48 percent of those

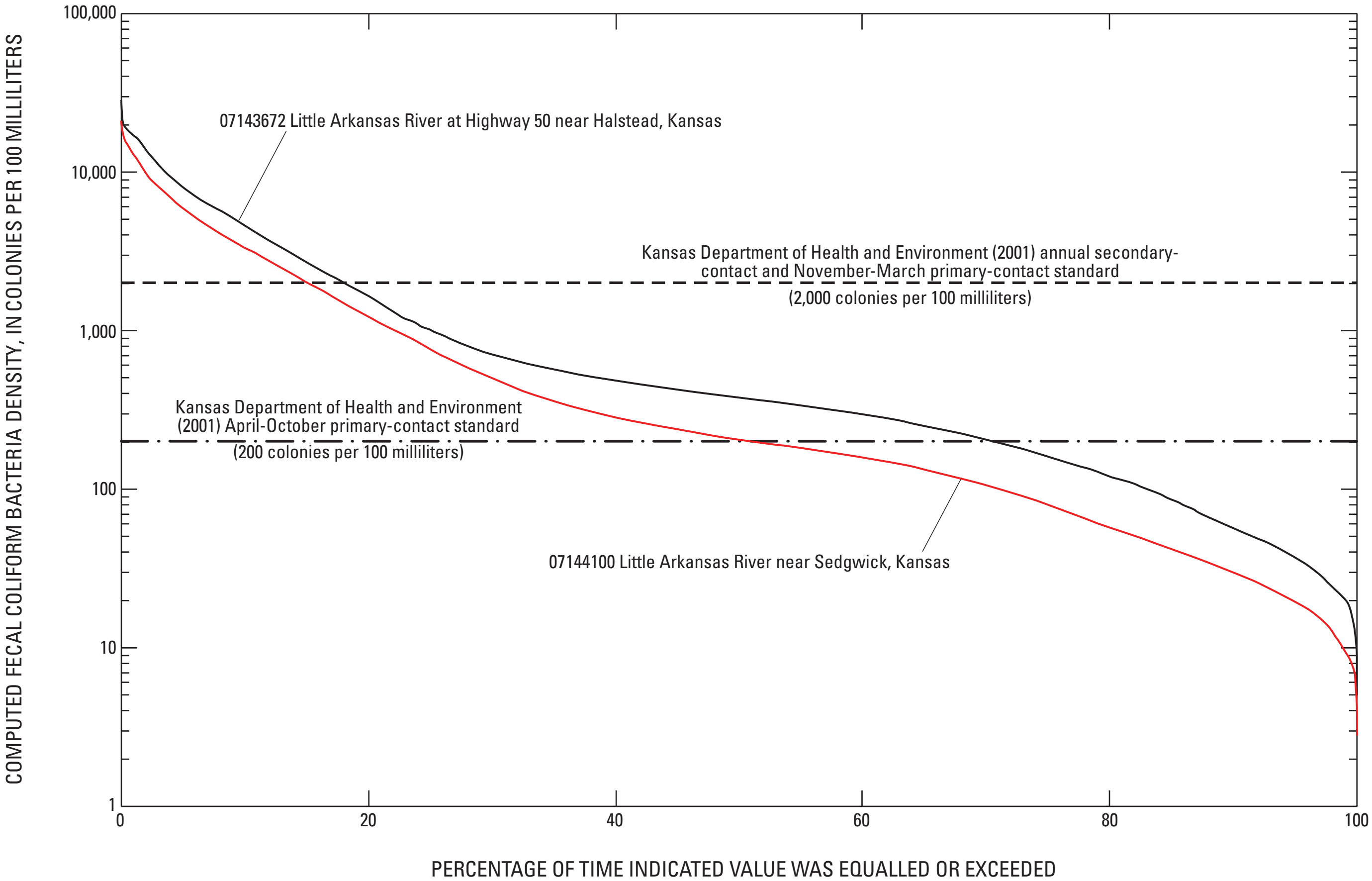


Figure 24. Duration curves of computed fecal coliform bacteria densities, 1999–2005, Little Arkansas River near Halstead and near Sedgwick, Kansas.

collected during April-October exceeded the public-access primary contact standard for *E. coli* of 262 col/100 mL. None of the samples collected from the Little Arkansas River during November through March exceeded the public-access primary and secondary standard for *E. coli* of 2,358 col/100 mL (table 1). The treated source water at the Sedgwick recharge site exceeded the April through October primary contact standard for *E. coli* once (October 2000) out of two samples collected (table A-7).

Densities of *E. coli* bacteria were computed using continuous measurements of turbidity in streams (Rasmussen and Ziegler, 2003). The duration curve for the Little Arkansas River near Halstead (fig. 25) shows that from 1999 through 2005 computed *E. coli* concentrations exceeded the public-access primary contact recreational criterion about 54 percent of the time and exceeded the public-access secondary contact recreational criterion about 11 percent of the time. At the Little Arkansas River near Sedgwick from 1999 through 2005, computed *E. coli* densities exceeded the public-access primary contact recreational criterion about 40 percent of the time and exceeded the public-access secondary contact recreational criterion about 12 percent of the time (fig. 25). Computed *E. coli* data and regression models are available on the World Wide Web at *http://nrtwq.usgs.gov/ks/* .

The recreational-use criteria for *E. coli* do not apply to groundwater, and only a few groundwater samples were analyzed for *E. coli.* None of the analyzed groundwater samples had detections of *E. coli* that exceeded 1 col/100 mL (table A-7).

Viral Indicators

Viral indicators *Clostridium perfringens* and *E. coli* coliphage were analyzed in water samples from the Little Arkansas River and selected groundwater samples. *Clostridium perfringens* was detected at concentrations from 120 to 360 col/100 mL, and *E. coli* coliphage was detected at concentrations varying from 40 to 1,300 plaques per 100 mL (pfu/100 mL) in storm-water samples from the Little Arkansas River (table A-7). These viral indicators were not detected in any samples of groundwater. These data indicate that natural infiltration of water through the soil removes viral indicator organisms.

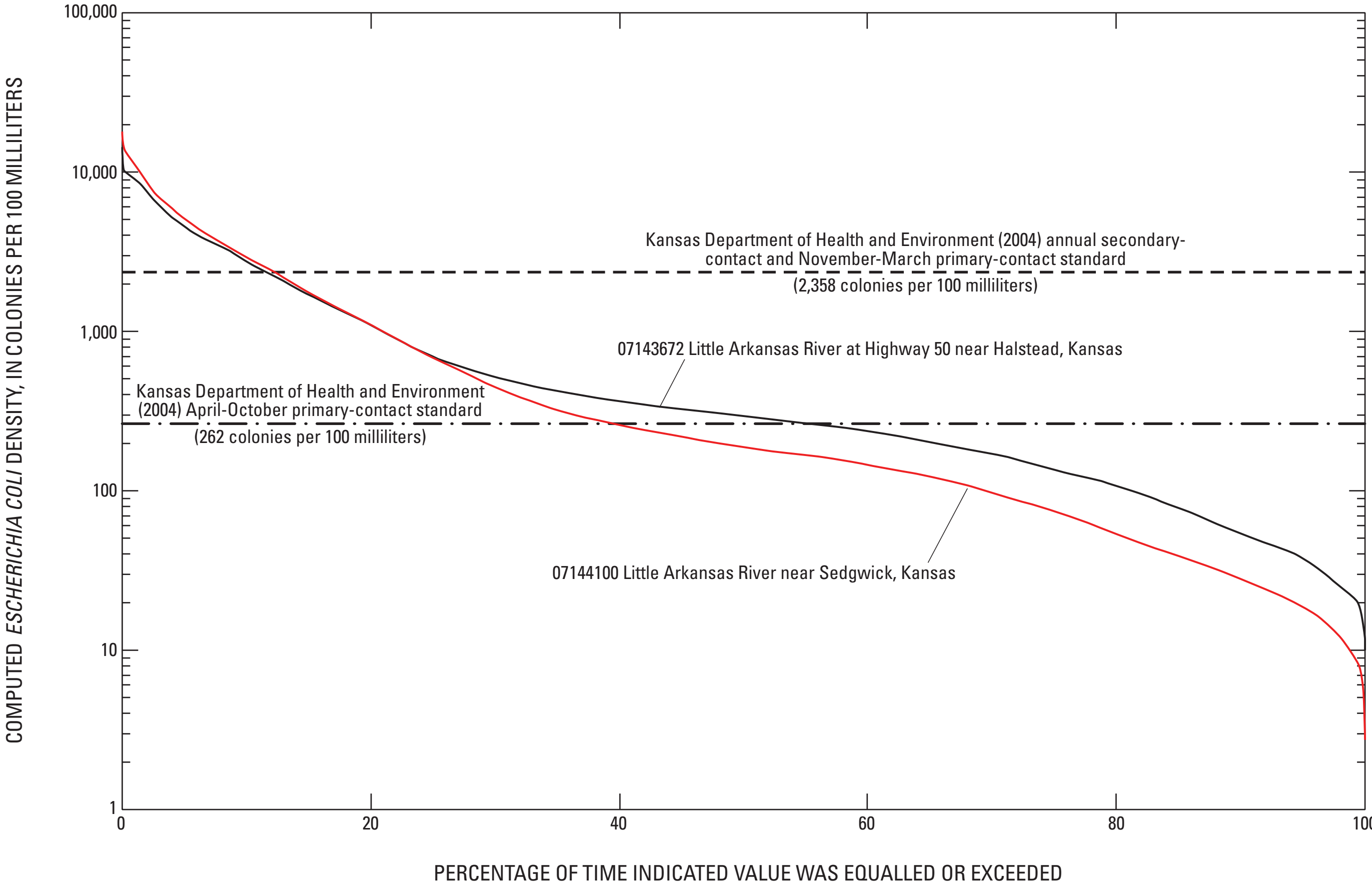


Figure 25. Duration curves of computed *Escherichia coli* bacteria, 1999–2005; Little Arkansas River near Halstead and near Sedgwick, Kansas.

Summary and Conclusions

Artificial recharge of the *Equus* Beds aquifer in south-central Kansas using runoff from the Little Arkansas River was first proposed in 1956 and was one of the many options considered by the city of Wichita to preserve its water supply. Declining aquifer water levels of as much as 50 ft exacerbated concerns about future water availability and enhanced migration of saltwater from past oil and gas activities near Burrton and from the Arkansas River into the aquifer. Since Wichita changed water-management strategies and decreased pumping from the *Equus* Beds aquifer in 1992, water storage in the aquifer recovered by about 50 percent. This recovery is the result of increased reliance on Cheney Reservoir for Wichita water supply, decreased aquifer pumping, and larger than normal precipitation. Accompanying the water-level recovery, the water-level gradient in the aquifer decreased from about 12 ft/mi in 1992 to about 8 ft/mi in January 2006.

Artificial recharge using runoff from the Little Arkansas River was one of the many options considered to preserve the city's water supply in the *Equus* Beds aquifer since first proposed in 1956. Demonstration recharge sites were operated from 1995-2002 near Halstead and Sedgwick to evaluate the feasibility of artificially recharging the aquifer using the Little Arkansas River as source water.

Water quality within the Little Arkansas River was defined using data from two real-time surface-water-quality sites and discrete samples. Water quality in the *Equus* Beds aquifer was defined using sample analyses collected at 38 index sites, each with a well completed in the shallow and deep parts of the *Equus* Beds aquifer. In addition, data were collected at diversion well sites, recharge sites, background wells, and prototype wells for the aquifer storage and recovery project. Samples were analyzed for major ions, nutrients, trace metals, radionuclides, organic compounds, and bacterial and viral indicators. Federal and State drinking-water criteria were used to evaluate the quality of water in the aquifer.

Constituents of concern for artificial recharge are those that frequently (more than 5 percent of samples) exceed Federal and State drinking-water criteria in water samples from surface water and the aquifer. Constituents of concern for artificial recharge are major ions (sulfate, chloride), nutrients (nitrite plus nitrate), trace elements (arsenic, iron, and manganese), triazine herbicides (atrazine), and fecal bacterial indicators. Water chemistry in the surface water and groundwater are controlled by the geology of the underlying bedrock and aquifer materials, the hydrologic (effective porosity) and geochemical (oxidation-reduction potential) properties of the aquifer, and the effects of humans related to past oil and gas activities and agriculture.

Sulfate concentrations in water samples from the Little Arkansas River rarely exceeded Federal secondary drinking water regulation (SDWR) of 250 milligrams per liter (mg/L). Sulfate concentrations in groundwater were exceeded in about 18 percent of the wells in the shallow (less than or equal to 80 feet deep) parts of the aquifer and in about 13 percent of the wells in the deep parts the aquifer. Larger sulfate concentrations were associated with parts of the aquifer with the largest water-level declines. Water-quality changes in the *Equus* Beds aquifer likely were caused by dewatering and oxidation of aquifer material that subsequently resulted in increased sulfate concentrations as water levels recovered.

The primary sources of chloride to the *Equus* Beds aquifer are from past oil and gas activities near Burrton and from the Arkansas River. Computed chloride concentrations in the Little Arkansas River near Halstead exceeded the Federal SDWR of 250 mg/L about 27 percent of the time (primarily during low-flow conditions). Chloride concentrations in groundwater exceeded 250 mg/L in about 8 percent or less of the study area, primarily near Burrton and along the Arkansas River. Chloride in groundwater near Burrton has migrated downgradient about 3 miles during the past 40 to 45 years. The downward and horizontal migration of the chloride is controlled by the hydraulic gradient in the aquifer, dispersion of chloride, and discontinuous clay layers that can inhibit further downward migration. Chloride in the shallow parts of the *Equus* Beds aquifer migrated less than 0.5 mile during the past decade. Migration is slower because of the decrease in the hydraulic gradient since 1992. On the basis of these results, artificial recharge (especially at depths of 100 to 150 feet) could create an effective barrier to saltwater migration.

Nutrients, such as nitrite plus nitrate (hereinafter referred to as nitrate), are a water-quality concern because of the predominantly agricultural land use in the 150-square-mile study area. All nitrate concentrations in water samples collected at the two surface-water monitoring sites on the Little Arkansas River from 1995 through 2005 were less than the Federal maximum contaminant level (MCL) of 10 mg/L for nitrate. Groundwater sampling results indicated that average nitrate concentrations exceeding the MCL were detected in 13 percent of the wells in 9 percent of the shallow parts of the aquifer in the study area. Little nitrate is present in the deeper parts of the aquifer because of chemical reducing conditions. Larger nitrate concentrations in shallow and deep groundwater likely were at least partly controlled by more rapid percolation from agricultural land uses in these areas of larger effective porosity and geochemical controls, especially in deep groundwater.

Several trace elements frequently exceeded drinking-water criteria, including arsenic, iron, and manganese. Computed arsenic concentrations in the Little Arkansas River exceeded the Federal drinking-water MCL of 10 micrograms per liter (µg/L) about 14 percent of the time primarily during low-flow conditions. In shallow groundwater, average arsenic concentrations exceeded the MCL in 10 percent of the wells (6 percent of the study area), whereas at depths of more than 80 feet, average arsenic concentrations exceeded the MCL in 34 percent of the wells (35 percent of the study area). Average arsenic concentrations exceeding the MCL in the shallow parts of the aquifer generally were located in the northern parts of the study area where more clay is present in the aquifer materials. These areas also correspond to the areas that had water-level declines of nearly 50 ft that have recovered by almost 20 ft. The larger arsenic concentrations in deep wells were most common in areas with reducing conditions where the oxidation-reduction potential (ORP) was less than 250 mV.

Other dissolved trace elements of concern in the study area were iron and manganese, which exceeded the USEPA Federal SDWR in both surface and groundwater. In the Little Arkansas River, dissolved iron concentrations exceeded the Federal SDWR of 300 µg/L only during one summer, and manganese concentrations exceeded the Federal SDWR of 50 µg/L about half the time. In the shallow parts of the aquifer, average iron concentrations exceeded the Federal SDWR in about 44 percent of the study area, and average manganese concentrations exceeded the Federal SDWR in about 60 percent of the study area. In the deep parts of the aquifer, average iron concentrations were exceeded in about 44 percent of the area, and average manganese concentrations were exceeded throughout 97 percent of the area. Areas with the largest concentrations of both iron and manganese corresponded to areas with the largest water-level declines that have subsequently recovered and the areas with the more chemically reducing conditions.

The areal distribution of larger dissolved arsenic, iron, and manganese concentrations were similar. Larger naturally-occurring concentrations of arsenic, iron, and manganese in groundwater are associated with more reducing conditions, areas where more clay is present in the aquifer material, and areas that had large water-level declines and subsequent recovery. Effects of artificial recharge on natural dissolved concentrations of arsenic in the aquifer potentially can be minimized by maintaining the oxidation-reduction potential as near 1995–2005 baseline conditions as possible. However, in many areas of the aquifer, especially the deeper parts, the natural geochemical conditions are conducive to large arsenic concentrations. It may be possible to use artificial recharge of oxygenated water to create a less reducing geochemical environment, decreasing some of the arsenic and iron dissolved in the water, potentially improving the overall water quality in the aquifer.

Atrazine was the most commonly detected organic compound in the study area. The Federal MCL for atrazine in drinking water is 3 µg/L an annual average. Computed concentrations of atrazine in the Little Arkansas River exceeded the Federal MCL value of 3.0 µg/L about 27 percent of the time, mostly during the late spring to early fall. Atrazine was detected in about 55 percent of the samples collected from shallow wells, which indicates infiltration from field applications to the shallow groundwater, but all concentrations were much less than the MCL.

Large concentrations of coliform bacterial indicators (total coliform, fecal coliform, and *Escherichia coli*) were detected in all water samples from the Little Arkansas River. These large bacterial indicator densities are typical in central and eastern Kansas streams, especially during runoff conditions. Total coliform detections exceeded the USEPA Federal MCLG of 0 colonies in water samples from 95 percent of the shallow index wells and in 87 percent of the deep wells in the *Equus* Beds aquifer. Many of these detections were in the first samples collected from the wells after they were developed, indicating that at least some of these detections may be related to drilling. Almost all wells sampled for this study had at least 1 sample with a total coliform detection; however, the median densities for most of these wells were less than 1 colony per100 mL. Viral indicators (*Clostridium perfringens* and *E. coli* coliphage) were present in samples from the Little Arkansas River during storm runoff but were not detected in any samples of groundwater. These data indicated that natural infiltration of water through the soil removes bacterial and viral indicator organisms.

Regression models for groundwater were developed to assist in estimation of water-quality constituents. Regressions between specific conductance and sulfate, specific conductance and chloride, and ORP and arsenic resulted in coefficients of determination greater than 0.50, which indicates that the use of specific conductance and ORP as explanatory variables is useful for estimating concentrations of sulfate, chloride, and arsenic in groundwater. These regression models may be useful for monitoring water quality in the aquifer after the full-scale recharge project has begun.

Water quality in surface water and groundwater is controlled by the geology of the underlying bedrock and aquifer materials, the hydraulic permeability (porosity) and geochemical (oxidation and reduction) properties of the aquifer, and the effects of humans related to past oil and gas activities and agriculture. When the proposed full-scale artificial recharge of the *Equus* Beds aquifer is implemented, changes in concentrations of water-quality constituents are expected. The increased water levels from artificial recharge are expected to slow the saltwater migration from the northwest and south of the study area, potentially limiting further chloride migration and improving the quality of water in the aquifer. Continued monitoring and interpretation of these recharge water-quality data relative to drinking-water criteria will help ensure the usable quality of water in the *Equus* Beds aquifer.

Selected References

American Public Health Association, American Water Works Association, and Water Environment Federation, 2005, Standard methods for examination of water and wastewater (20th ed.): American Public Health Association, part 9222B, p. 9–57 to 9–62.

Armon, R., and Payment, P., 1988, A modified m-CP medium for enumerating *Clostridium perfringens* from water samples: Canadian Journal of Microbiology, v. 34, p. 78–79.

Aucott, W.R., Myers, N.C., and Dague, B.J., 1998, Status of groundwater levels and storage in the Wichita well field area, south-central Kansas, 1997: U.S. Geological Survey Water-Resources Investigations Report 98–4095, 15 p.

Bauder, T.A., Waskom, R.M., and Davis, J.G., 2007, Irrigation water quality criteria: Colorado State University Extension, information available on Web, accessed July 14, 2008, at *http://www.ext.colostate.edu/PUBS/crops/00506.html.*

Bisson, J.W.,and Cabelli, V.J., 1979, Membrane filter enumeration method for *Clostridium perfringens*: Applied and Environmental Microbiology, v. 37, no. 1, p. 55–66.

Bisson, J.W., and Cabelli, V.J., 1980, *Clostridium perfringens* as a water pollution indicator: Journal of the Water Pollution Control Federation, v. 52, no. 2, p. 241–248.

Britton, L.J., and Greeson, P.E., eds, 1987, Methods for collection and analysis of aquatic biological and microbiological samples: U.S. Geological Survey Techniques of Water-Resources Investigations, book 5, chap. A4, various pagination, accessed March 13, 2008, at *http://pubs.usgs.gov/twri/twri5a4/html/pdf.html.*

Burns and McDonnell, 1996, *Equus* Beds Groundwater Recharge Demonstration Project: Kansas City, Missouri, Burns and McDonnell Engineering Consultants, prepared for the city of Wichita Water and Sewer Department, various pagination.

Christensen, V.G., Jian Xiaodong, and Ziegler, A.C., 2000, Regression analysis and real-time water-quality monitoring to estimate constituent concentrations, loads, and yields in the Little Arkansas River, south-central Kansas, 1995–99: U.S. Geological Survey Water-Resources Investigations Report 00–4126, 36 p.

Christensen, V.G., Ziegler, A.C., Rasmussen, P.P., and Jian Xiaodong, 2003, Continuous real-time water-quality monitoring of Kansas streams, *in* Proceedings of 2003 Spring Specialty Conference on Agricultural Hydrology and Water Quality, May 12–14, 2003, Kansas City, Missouri: Middleburg, Virginia, American Water Resources Association Technical Publication Series No. TPS-03-1, compact disc.

Dufour, A.P., 1984, Bacterial indicators of recreational water quality: Canadian Journal of Public Health, v. 75, no. 1, p. 49–56.

Dufour, A.P., Strickland, E.R., and Cabelli, V.J., 1981, Membrane filter method for enumerating *Escherichia coli*: Applied and Environmental Microbiology, v. 41, no. 5, p. 1,152–1,158.

Equus Beds Groundwater Management District No. 2, 1990, *Equus* Beds Groundwater Management District No. 2 management program: Halstead, Kansas, 91 p.

Garbarino, J.R., Bedner, A.J., and Burkhardt, M.R., 2002, Methods of analysis by the U.S. Geological Survey National Water Quality Laboratory and field methods—arsenic speciation in natural-water samples using laboratory and field methods: U.S. Geological Survey Water-Resources Investigations Report 2002–4144, 40 p.

Gotkowitz, M.B., Schreiber, M.E., and Simo, J.A., 2004, Geochemical and hydrologic controls on arsenic release in water wells: Groundwater, v. 42, no. 4, p. 568–576.

Hansen, C.V., 2007, Status of groundwater levels and storage volume in the Wichita well field area, south-central Kansas, January 2003–January 2006: U.S. Geological Survey Scientific Investigations Report 2006–5321, 34 p.

Hansen, C.V., and Aucott, W.R., 2001, Status of groundwater levels and storage volume in the Wichita well field area, south-central Kansas, 1998–2000: U.S. Geological Survey Water-Resources Investigations Report 00–4267, 27 p.

Hansen, C.V., and Aucott, W.R., 2004, Status of groundwater levels and storage volume in the *Equus* Beds aquifer near Wichita, Kansas, January 2000–January 2003: U.S. Geological Survey Water-Resources Investigations Report 03–4298, 36 p.

Hathaway, L.R., Waugh, T.C., Galle, O.K., and Dickey, H.P., 1981, Chemical quality of irrigation waters in the *Equus* Beds area, south-central Kansas: Kansas Geological Survey Chemical Quality Series 10, 45 p.

Helsel, D.R., 2005, Nondetects and data analysis—statistics for censored environmental data: Hoboken, New Jersey, John Wiley and Sons, 250 p.

Helsel, D.R., and Hirsch, R.M., 1992, Statistical methods in water resources: New York, Elsevier, 522 p.

Helsel, D.R., and Hirsch, R.M., 2002, Statistical methods in water resources: U.S. Geological Survey Techniques of Water-Resources Investigation, book 4, chap. A3, 523 p., accessed July 1, 2008, at *http://pubs.usgs. gov/twri/twri4a3/#pdf* .

Hem, J.D., 1992, Study and interpretation of chemical characteristics of natural water (3rd ed.): U.S. Geological Survey Water-Supply Paper 2254, 263 p.

Hinkle, S.R., and Polette, D.J., 1999, Arsenic in groundwater of the Willamette Basin, Oregon: U.S. Geological Survey Water-Resources Investigations Report 98–4204, 28 p.

Juracek and Hansen, 1995, Digital hypsography maps created from 1:100,000-scale digital line Graph hypsography data for Kansas: U.S. Geological Survey Open-File Report 95–448, digital data set.

Kansas Department of Agriculture, 2006, Kansas farm facts 2006: Topeka, Kansas, 103 p.

Kansas Department of Health and Environment, 2001, Kansas Administrative Regulation, article 28-16-28e, Surface water quality standards: Topeka, Kansas, Secretary of State, 16 p.

Kansas Department of Health and Environment, 2004, Kansas Administrative Regulation, article 28-16-28e, Surface water-quality standards: Topeka, Kansas Department of Health and Environment, Bureau of Water, 2004, accessed November 27, 2007, at *http://www.kdheks.gov/water/index.html#Adopted%20Regulations*.

Kansas Department of Health and Environment, 2006a, Lower Arkansas Basin total maximum daily load—Hutchison to Maize water-quality impairment—chloride: Topeka, Kansas Department of Health and Environment, Bureau of Water, 2006, accessed June 17, 2009, at *http://www.kdheks gov/tmdl/la/2006_Ark_Hutch_to_MaizeCl.pdf.*

Kansas Department of Health and Environment, 2006b, Lower Arkansas River Basin total maximum daily load—Upper Little Arkansas River, water-quality impairment—chloride: Topeka, Kansas Department of Health and Environment, Bureau of Water, 2006, accessed June 17, 2009, at *http://www.kdheks.gov/tmdl/la/UpperLittleArk-ClTMDLFinal.pdf.*

Koterba, M.T., Wilde, F.D., and Lapham, W.W., 1995, Groundwater data-collection protocols and procedures for the National Water-Quality Assessment Program—collection and documentation of water-quality samples and related data: U.S. Geological Survey Open-File Report 95–399, 113 p.

Leonard, R.B., and Kleinschmidt, M.K., 1976, Saline water in the Little Arkansas River Basin area, south-central Kansas: Kansas Geological Survey Chemical Quality Series No. 3, 24 p.

Lohman, S.W., 1972, Definitions of selected groundwater terms—revisions and conceptual refinements: U.S. Geological Survey Water-Supply Paper 1988, 21 p.

McMahon, P.B., and Chapelle, F.H., 2008, Redox processes and water quality of selected principal aquifer systems: Groundwater, v. 46, no. 2, p. 259–271.

McWhorter, D.B., and Sunada, D.K., 1977, Groundwater hydrology and hydraulics: Fort Collins, Colorado, Water Resources Publications, 304 p.

Myers, N.C., Haragadine, G.D., and Gillespie, J.B., 1996, Hydrologic and chemical interactions of the Arkansas River and the *Equus* Beds aquifer between Hutchinson and Wichita, south-central Kansas: U.S. Geological Survey Water-Resources Investigations Report 95–4191, 100 p.

Payment, P., and Franco, E., 1993, *Clostridium perfringens* and somatic coliphages as indicators of the efficiency of drinking water treatment for viruses and protozoan cysts: Applied and Environmental Microbiology, v. 59, no. 8, p. 2,418–2,424.

Pope, L.M., Bruce, B.W., and Hansen, C.V., 2001, Groundwater quality in Quaternary deposits of the Central High Plains aquifer, south-central Kansas, 1999: U.S. Geological Survey Water-Resources Investigations Report 00–4259, 44 p.

Pope, L.M., Bruce, B.W., Rasmussen, P.P., and Milligan, C.R., 2002, Quality of shallow groundwater in areas of recent residential and commercial development, Wichita, Kansas: U.S. Geological Survey Water-Resources Investigations Report 02–4228, 67 p.

Puls, R.W., and Barcelona, M.J., 1996, Low-flow (minimal drawdown) groundwater sampling procedures: U.S. Environmental Protection Agency Groundwater Issue, EPA 540/S-95/504, 12 p.

Rasmussen, P.P., and Ziegler, A.C., 2003, Comparison and continuous estimates of fecal coliform and Escherichia coli bacteria in selected Kansas streams, May 1999 through April 2002: U.S. Geological Survey Water-Resources Investigations Report 03–4056, 80 p.

Schmidt, H.C.R., Ziegler, A.C., and Parkhurst, D.L., 2007, Geochemical effects of induced stream-water and artificial recharge on the *Equus* Beds aquifer, south-central Kansas, 1995–2004: U.S. Geological Survey Scientific Investigations Report 2007–5025, 58 p.

Smedley, P.L., and Kinniburgh, D.G., 2002, A review of the source, behavior and distribution of arsenic in natural waters: Applied Geochemistry, v. 17, p. 517–568.

Spinazola, J.M., Gillespie, J.B., and Hart, R.J., 1985, Groundwater flow and solute transport in the *Equus* beds area, south-central Kansas, 1940–79: U.S. Geological Survey Water-Resources Investigations Report 85–4336, 68 p.

Spruill, T.B., 1982, Nitrate-nitrogen concentrations in groundwater from three selected areas in Kansas: U.S. Geological Survey Water-Resources Investigations Report 82–11, 32 p.

Stramel, G.J., 1956, Progress report on the groundwater hydrology of the *Equus* beds area, Kansas: Kansas Geological Survey Bulletin 119, part 1, 59 p.

Stramel, G.J., 1962a, A review of the geology and hydrology of the Wichita well field: Wichita, Kansas, City of Wichita Water Department, 29 p.

Stramel, G.J., 1962b, A preliminary review of artificial recharge potential in the area between Hutchinson and Wichita, Kansas: Wichita, Kansas, City of Wichita Water Department, 21 p.

Stramel, G.J., 1967, Progress report on the groundwater hydrology of the *Equus* beds area, Kansas—1966: Kansas Geological Survey Bulletin 187, part 2, 27 p.

Townsend, M.A., and Young, D.P., 2000, Assessment of nitrate-nitrogen distribution in Kansas groundwater, 1990–1998: Natural Resources Research, v. 9, no. 2, p. 125–134.

Thurman, E.M., Meyer, M.T., Pomes, M., Perry, C.A., and Schwab, A.P., 1990, Enzyme-linked immunosorbent assay compared with gas chromatography/mass spectrometry for the determination of triazine herbicides in water: Analytical Chemistry, v. 62, no. 18, p. 2,043–2,048.

U.S. Environmental Protection Agency, 1986, Quality criterion for water, 1986: U.S. Environmental Protection Agency Report 440/5-86-001, unnumbered pages.

U.S. Environmental Protection Agency, 1989, Drinking water—National Primary Drinking Water Regulations—total coliforms (including fecal coliforms and *E. coli*): Federal Register, v. 54, no. 124, p. 27544.

U.S. Environmental Protection Agency, 1996, EPA Information Collection Rule microbial laboratory manual: Washington, D.C., EPA-600-R-95-178, section XI.

U.S. Environmental Protection Agency, 2000, Improved enumeration methods for the recreational water quality indicators—enterococci and Escherichia coli: Washington D.C., Office of Science and Technology, EPA 821-R-97-04, 40 p., accessed March 13, 2008, at *http://www.epa.gov/nerlcwww/online.htm.*

U.S. Environmental Protection Agency, 2001a, Method 1602—male-specific (F+) and somatic coliphage in water by single agar layer (SAL) procedure: Office of Water, Washington, D.C., EPA 821-4-01-029, 30 p., accessed March 13, 2008, at URL *http://www.epa.gov/nerlcwww/online.htm.*

U.S. Environmental Protection Agency, 2001b, National primary drinking water regulations—arsenic and clarifications to compliance and new source contaminants monitoring—final rule: Federal Register, v. 66, no. 14, p. 6,975-7,066, accessed January 28, 2008, at *http://www.epa.gov/fedrgstr/EPA-WATER/2001/January/Day-22/w1668.htm.*

U.S. Environmental Protection Agency, 2004, Final rule, water quality standards for coastal and Great Lakes recreation waters: Title 40, part 131, 67218 p.

U.S. Environmental Protection Agency, 2005, Current drinking-water standards: Information available on Web, accessed August 17, 2005, at *http://www.epa.gov/safewater/mcl.html.*

U.S. Environmental Protection Agency, 2006a, 2006 Edition of the drinking water standards and health advisories: Office of Water, EPA 822-R-06-013, August 2006, 12 p., accessed December 13, 2007, at *http://www.epa.gov/waterscience/criteria/drinking/dwstandards.html.*

U.S. Environmental Protection Agency, 2006b, Method 1103.1—*E. coli* in water by membrane filtration using membrane-thermotolerant *Escherichia coli* agar (mTEC): Washington, D.C., EPA 821-R-06-010, 45 p., accessed March 13, 2008, at *http://www.epa.gov/waterscience/methods/method/biological/.*

U.S. Environmental Protection Agency, 2006c, Method 1106.1—Enterococci in water by membrane filtration using membrane enterococcus esculin iron agar (mE-EIA): Washington, D.C., EPA 821-R-06-008, 42 p., accessed March 13, 2008, at *http://www.epa.gov/waterscience/methods/method/biological/.*

U.S. Environmental Protection Agency, 2006d, Method 1600—Enterococci in water by membrane filtration using membrane enterococcus indoxyl-b-D-glucoside agar (mEI): Washington, D.C., EPA 821-R-06-009, 42 p., accessed March 13, 2008, at *http://www.epa.gov/waterscience/methods/method/biological/.*

U.S. Environmental Protection Agency, 2006e, Method 1603—*Escherichia coli* in water by membrane filtration using modified membrane-thermotolerant Escherichia coli: Washington, D.C., EPA 821-R-06-011, 42 p., accessed March 13, 2008, at *http://www.epa.gov/waterscience/methods/method/biological/.*

U.S. Environmental Protection Agency, 2006f, Occurrence and monitoring document for the final groundwater rule: Office of Water, EPA 815-R-06-012, various pagination., accessed March 13, 2008, at *http://www.epa.gov/safewater/disinfection/gwr/regulation.html.*

Wagner, R.J., Mattraw, H.C., Ritz, G.F., and Smith, B.A., 2000, Guidelines and standard procedures for continuous water-quality monitors—site selection, field operation, calibration, record computation, and reporting: U.S. Geological Survey Water-Resources Investigations Report 00–4252, 53 p.

Warren, D.R., Blain, G.T., Shorney, F.L., and Klein, L.J., 1995, IRP-A case study from Kansas: Journal of the American Water Works Association, p. 57–71.

Welch, A.H., Westjohn, D.B., Helsel, D.R., and Wanty, R.B., 2000, Arsenic in groundwater of the United States—occurrence and geochemistry: Groundwater, v. 38, no. 4, p. 568–604.

Whittemore, D.O., 2007, Fate and identification of oil-brine contamination in different hydrogeologic settings: Applied Geochemistry, v. 22, no. 10, p. 2,099–2,114.

Wilde, F.D., and Radke, D.B., eds., 1998, Field measurements, in National field manual for the collection of water-quality data: U.S. Geological Survey Techniques of Water-Resources Investigations, book 9, chap. A6, p. 3–20.

Williams, C.C., and Lohman, S.W., 1949, Geology and groundwater resources of a part of south-central Kansas with a special reference to the Wichita municipal water supply: Kansas Geological Survey Bulletin 79, 455 p.

Wood, W.W., 1976, Guidelines for collection and field analysis of groundwater samples for selected unstable constituents: U.S. Geological Survey Techniques of Water-Resources Investigations, book 1, chap. D2, 24 p.

Ziegler, A.C., and Combs, L.J., 1997, Baseline data-collection and quality control protocols and procedures for the *Equus* Beds Groundwater Recharge Demonstration Project near Wichita, Kansas, 1995–96: U.S. Geological Survey Open-File Report 97–235, 57 p.

Ziegler, A.C., Christensen, V.G., and Ross, H.C., 1999, Baseline water-quality and preliminary effects of artificial recharge on groundwater, south-central Kansas, 1995–98: U.S. Geological Survey Water-Resources Investigations Report 99–4250, 74 p.

Ziegler, A.C., Ross, H.C., Trombley, T.J., and Christensen, V.C., 2001, Effects of artificial recharge on water quality in the *Equus* Beds aquifer, south-central Kansas, 1995–2000: U.S. Geological Survey Fact Sheet 096-01, 4 p.

Appendix

Table A–1. Data-collection sites for the *Equus* Beds Groundwater Recharge Project, south-central Kansas, 1995–2005.

[USGS, U.S. Geological Survey; NAVD 88, North American Vertical Datum of 1988; NA, not applicable]

Data-collection site number (fig. 6)	USGS site identification number	Site name	Gage datum or altitude of top of well casing (feet above NAVD 88)	Approximate well depth (feet)	Approximate depth of screened interval (feet)
		Surface-water monitoring sites			
07143672	07143672	Little Arkansas River at Highway 50 near Halstead, Kansas	1,370.55	NA	NA
07144100	07144100	Little Arkansas River near Sedgwick, Kansas	1,340.00	NA	NA
		Halstead diversion well site			
Diversion well	380031097311001	Diversion well at TH-04-95	NA	136	76–136
EB-145-A1[1]	380028097311001	23S 02W 34ADD 01 TH-04-A1 EB-145-A1	1,392.87	48	38–48
EB-145-A2[1]	380028097310901	23S 02W 34ADDA01 TH-04-A2 EB-145-A2	1,392.68	47	37–47
EB-145-A3[1]	380028097311101	23S 02W 34ADDB01 TH-04-A3 EB-145-A3	1,392.82	70	60–70
EB-145-A4[2]	380027097311401	23S 02W 34ADCD01 TH-04-A4 EB-145-A4	1,394.00	60	50–60
EB-145-A5[2]	380025097312701	23S 02W 34ACDC01 TH-04-A5 EB-145-A5	1,394.26	43	32–42
EB-145-P-D5[3]	380028097311002	23S 02W 34ADDA02 EB-145-P-D5	1,392.40	120	112–117
		Halstead recharge site			
Source water diverted for recharge	380051097335501	Source water diverted for recharge	NA	NA	NA
SMW-H4[4]	380051097335601	23S 02W 29CDDC01 Shallow monitoring well SMW-H4	1,429.22	29	19–29
SMW-H14[4]	380053097335101	23S 02W 29CDDD01 Shallow monitoring well SMW-H14	1,424.25	27	17–27
DMW-H1[5]	380052097335701	23S 02W 29CDDC01 Deep monitoring well DMW-H1	1,428.16	220	210–220
DMW-H13[5]	380053097335102	23S 02W 29CDDD02 Deep monitoring well DMW-H13	1,424.31	220	210–220
		Sedgwick recharge site			
Treated stream water	375331097285301	Diverted water Sedgwick recharge site	NA	NA	NA
SMW-S11[6]	375327097285401	25S 01W 07BCCC01 Shallow monitoring well SMW-S11	1,384.64	59	49–59
SMW-S13[6]	375332097284801	25S 01W 07BCCA01 Shallow monitoring well SMW-S13	1,384.90	34	24–34
DMW-S14[7]	375332097284802	25S 01W 07BCCA02 Deep monitoring well DMW-S14	1,384.00	190	180–190
DMW-S10[7]	375327097285402	25S 01W 07BCCC02 Deep monitoring well DMW-S10	1,385.52	195	185–195
		Background wells			
EB-142-A3	375300097253501	25S 01W 10CCCC01 Sedgwick well A3 EB-142-A3	1,363.65	58	47–57
Sedgwick well	375259097252901	25S 01W 15BBBA01 Sedgwick well	1,370.38	49	39–49
City well-Sedgwick	375456097260901	24S 01W 33DDA 01 City well-Sedgwick	NA	NA	NA
TH-02-95	380237097324401	23S 02W 16CDD 01 TH-02-95	1,403.04	54	44–54
TH-06-95	375304097291301	24S 02W 01DCC 01 TH-06-95	1,381.87	41	31–41
TH-10-95	380424097343801	23S 02W 06DDD 01 TH-10-95	1,409.49	59	49–59
TH-12-95	375140097243301	24S 01W 23BCC 01 TH-12-95	1,359.00	50	40–50
TH-08-A1	375628097270201	24S 01W 29ABAA01 TH-08-A1	1,359.58	40	30–40
TH-08-A2	375628097270401	24S 01W 29ABAB01 TH-08-A2	1,379.26	53	43–53
TH-08-A3	375628097270801	24S 01W 29ABAB01 TH-08-A3	1,379.96	59	48–58
TH-08-A4	375628097271001	24S 01W 29ABBA01 TH-08-A4	1,380.08	58	46–56
TH-08-A5	375628097271701	24S 01W 29BAAA01 TH-08-A5	1,378.53	53	42–52
Alta Mills	380643097353001	22S 02W 30BCBB01 Alta Mills	1,416.07	40	30–40

Table A–1. Data-collection sites for the *Equus* Beds Groundwater Recharge Project, south-central Kansas, 1995–2005.—Continued

[USGS, U.S. Geological Survey; NAVD 88, North American Vertical Datum of 1988; NA, not applicable]

Data-collection site number (fig. 6)	USGS site identification number	Site name	Gage datum or altitude of top of well casing (feet above NAVD 88)	Approximate well depth (feet)	Approximate depth of screened interval (feet)
		Aquifer storage and recovery prototype wells			
DW-TW-01	380329097334601	23S 02W 08DCCD01 DW-TW-01	NA	148	108–148
DW-TW-02	380333097335001	23S 02W 08DCCB01 DW-TW-02	NA	148	108–148
DW-TW-03	380336097335801	23S 02W 08CDAC01 DW-TW-03	NA	160	100–160
DW-TW-04	380338097340201	23S 02W 08CDBA01 DW-TW-04	NA	140	100–140
DW-TW-05	380344097340401	23S 02W 08CACC01 DW-TW-05	NA	145	105–145
DW-TW-06	380356097340901	23S 02W 08BCDD01 DW-TW-06	NA	130	98–130
DW-TW-07	380358097341301	23S 02W 08BCDB01 DW-TW-07	NA	138	98–138
DW-TW-08	380404097342101	23S 02W 08BCBB01 DW-TW-08	1,407.00	124	85–124
DW-TW-09	380405097342501	23S 02W 08BCBB02 DW-TW-09	1,407.00	121	83–121
RRW-01	380329097363703	23S 03W 12CCCC03 RRW-01	NA	124	84–124
RRW-02	380235097363801	23S 03W 23AAAA01 RRW-02	NA	253	233–253
RRW-03	380142097363601	23S 03W 25BBBB01 RRW-03	NA	189	169–189
		Shallow index wells			
IW-01A	380421097385001	23S 03W 03CCCC01 IW-01A	1,471.63	41	20–40
IW-02A	380329097363701	23S 03W 12CCCC01 IW-02A	1,451.82	27	16–26
IW-03A	380328097342501	23S 02W 17BBBB01 IW-03A	1,409.51	35	24–34
IW-04A	380130097385001	23S 03W 27BCBB01 IW-04A	1,446.77	29	10–30
IW-05A	380144097371101	23S 03W 23DCCC01 IW-05A	1,441.46	66	45–65
IW-06A	380143097344201	23S 02W 30AAAB01 IW-06A	1,434.70	69	47–67
IW-07A	380051097330901	23S 02W 28CCDC01 IW-07A	1,427.53	80	58–78
IW-08A	380016097384901	23S 03W 34CBCB01 IW-08A	1,441.79	38	18–38
IW-09A	375958097363801	24S 03W 02AAAA01 IW-09A	1,431.70	53	33–53
IW-10A	375959097344201	23S 02W 31DDCC01 IW-10A	1,435.45	78	58–78
IW-11A-2	375932097321301	24S 02W 03CBBB01 IW-11A-2	1,415.70	68	48–68
IW-12A	375958097300001	24S 02W 01BBBB01 IW-12A	1,390.59	40	20–40
IW-13A	375815097385001	24S 03W 09DDDD01 IW-13A	1,436.82	41	20–40
IW-14A	375748097363801	24S 03W 14ADDD01 IW-14A	1,424.93	53	33–53
IW-15A	375814097342701	24S 02W 18AAAA01 IW-15A	1,421.36	75	54–74
IW-16A	375814097324701	24S 02W 16BAAA01 IW-16A	1,405.02	66	45–65
IW-17A	375814097300001	24S 02W 13BBBB01 IW-17A	1,387.57	51	30–50
IW-18A	375642097385304	24S 03W 21DDAA04 IW-18A	1,434.66	28	8–28
IW-19A	375604097363601	24S 03W 25BCCB01 IW-19A	1,421.79	43	23–43
IW-20A	375630097342701	24S 02W 19DDDD01 IW-20A	1,416.74	46	25–45
IW-21A	375629097323501	24S 02W 21DCDC01 IW-21A	1,410.58	56	45–55
IW-22A	375629097293701	24S 02W 25BBAB01 IW-22A	1,387.70	54	33–53

Table A–1. Data-collection sites for the *Equus* Beds Groundwater Recharge Project, south-central Kansas, 1995–2005.—Continued

[USGS, U.S. Geological Survey; NAVD 88, North American Vertical Datum of 1988; NA, not applicable]

Data-collection site number (fig. 6)	USGS site identification number	Site name	Gage datum or altitude of top of well casing (feet above NAVD 88)	Approximate well depth (feet)	Approximate depth of screened interval (feet)
		Shallow index wells—Continued			
IW-23A	375629097274801	24S 01W 29BBBB01 IW-23A	1,381.66	66	45–65
IW-24A	375446097390701	24S 03W 33DDCC01 IW-24A	1,430.79	40	19–39
IW-25A	375445097365404	24S 03W 35DCDD04 IW-25A	1,419.69	30	9–29
IW-26A	375508097342401	24S 02W 32CBBB01 IW-26A	1,409.47	29	8–28
IW-27A	375434097321301	25S 02W 04AADA01 IW-27A	1,400.15	41	20–40
IW-28A	375420097300201	25S 02W 02ADDA01 IW-28A	1,389.50	63	41–61
IW-29A	375445097274801	24S 01W 32CCCC01 IW-29A	1,376.33	61	40–60
IW-30A	375258097340601	25S 02W 17BBAA01 IW-30A	1,376.79	27	6–26
IW-31A	375300097321101	25S 02W 15BBBB01 IW-31A	1,391.43	29	8–28
IW-32A	375247097300101	25S 02W 13BCBB01 IW-32A	1,381.45	25	5–25
IW-33A	375326097274501	25S 01W 08CBBB01 IW-33A	1,376.51	34	13–33
IW-34A	375300097255801	25S 01W 09DCDD01 IW-34A	1,366.61	45	25–45
IW-35A	375115097313601	25S 02W 22DCDC01 IW-35A	1,384.94	26	6–26
IW-36A	375115097294601	25S 02W 25BBAA01 IW-36A	1,376.72	25	5–25
IW-37A	375116097274701	25S 01W 20CCCC01 IW-37A	1,371.43	26	5–25
IW-38A	375141097253801	25S 01W 21DAAA01 IW-38A	1,370.40	44	23–43
		Deep index wells			
IW-01C	380421097385002	23S 03W 03CCCC02 IW-01C	1,472.29	104	82–102
IW-02C	380329097363702	23S 03W 12CCCC02 IW-02C	1,451.90	97	75–95
IW-03C	380328097342502	23S 02W 17BBBB02 IW-03C	1,409.76	141	118–138
IW-04C	380130097385002	23S 03W 27BCBB02 IW-04C	1,446.84	217	194–214
IW-05C	380144097371102	23S 03W 23DCCC02 IW-05C	1,441.32	194	170–190
IW-06C	380143097344202	23S 02W 30AAAB02 IW-06C	1,434.57	121.75	100–120
IW-07C	380051097330902	23S 02W 28CCDC02 IW-07C	1,427.43	196	173–193
IW-08C	380016097384902	23S 03W 34CBCB02 IW-08C	1,441.66	161	138–158
IW-09C	375958097363802	24S 03W 02AAAA02 IW-09C	1,431.99	257	233–253
IW-10C	375959097344202	23S 02W 31DDCC02 IW-10C	1,435.32	177	155–175
IW-11C	375932097321302	24S 02W 03CBBB02 IW-11C	1,416.13	142	120–140
IW-12C	375958097300002	24S 02W 01BBBB02 IW-12C	1,390.61	78	56–76
IW-13C	375815097385002	24S 03W 09DDDD02 IW-13C	1,436.85	102	80–100
IW-14C	375748097363802	24S 03W 14ADDD02 IW-14C	1,424.93	153	130–150
IW-15C	375814097342702	24S 02W 18AAAA02 IW-15C	1,421.43	213	188-208
IW-16C	375814097324702	24S 02W 16BAAA02 IW-16C	1,404.83	129	106–126

Table A–1. Data-collection sites for the *Equus* Beds Groundwater Recharge Project, south-central Kansas, 1995–2005.—Continued

[USGS, U.S. Geological Survey; NAVD 88, North American Vertical Datum of 1988; NA, not applicable]

Data-collection site number (fig. 6)	USGS site identification number	Site name	Gage datum or altitude of top of well casing (feet above NAVD 88)	Approximate well depth (feet)	Approximate depth of screened interval (feet)
		Deep index wells—Continued			
IW-17C	375814097300002	24S 02W 13BBBB02 IW-17C	1,387.48	113	100–110
IW-18C	375642097385305	24S 03W 21DDAA05 IW-18C	1,434.50	86	65–85
IW-19C	375604097363602	24S 03W 25BCCB02 IW-19C	1,421.42	86	65–85
IW-20C	375630097342702	24S 02W 19DDDD02 IW-20C	1,416.18	163.1	140–160
IW-21C	375629097323502	24S 02W 21DCDC02 IW-21C	1,410.91	92	70–90
IW-22C	375629097293702	24S 02W 25BBAB02 IW-22C	1,387.55	138	115–135
IW-23C	375629097274802	24S 01W 29BBBB02 IW-23C	1,381.54	112	90–110
IW-24C	375446097390702	24S 03W 33DDCC02 IW-24C	1,430.67	160	137–157
IW-25C	375445097365405	24S 03W 35DCDD05 IW-25C	1,419.46	76	65–75
IW-26C	375508097342402	24S 02W 32CBBB02 IW-26C	1,409.61	200	188–198
IW-27C	375434097321302	25S 02W 04AADA02 IW-27C	1,400.11	248	227–247
IW-28C	375420097300202	25S 02W 02ADDA02 IW-28C	1,389.56	176	155–175
IW-29C	375445097274802	24S 01W 32CCCC02 IW-29C	1,376.34	116	95–115
IW-30C	375258097340602	25S 02W 17BBAA02 IW-30C	1,376.81	122	100–120
IW-31C	375300097321102	25S 02W 15BBBB02 IW-31C	1,391.64	230	204–224
IW-32C	375247097300102	25S 02W 13BCBB02 IW-32C	1,381.79	163	140–160
IW-33C	375326097274502	25S 01W 08CBBB02 IW-33C	1,376.50	122	100–120
IW-34C	375300097255802	25S 01W 09DCDD02 IW-34C	1,366.91	125	103–123
IW-35C	375115097313602	25S 02W 22DCDC02 IW-35C	1,384.87	118	96–116
IW-36C	375115097294602	25S 02W 25BBAA02 IW-36C	1,376.47	118	95–115
IW-37C	375116097274702	25S 01W 20CCCC02 IW-37C	1,371.60	129	107–127
IW-38C	375141097253802	25S 01W 21DAAA02 IW-38C	1,370.18	80	58–78

[1] Shallow monitoring wells within 500 feet of Little Arkansas River at diversion well site near Halstead.

[2] Shallow monitoring wells more than 500 feet from Little Arkansas River at diversion well site near Halstead.

[3] Deep monitoring well at diversion well site near Halstead.

[4] Shallow monitoring wells at Halstead recharge site near Halstead.

[5] Deep monitoring wells at Halstead recharge site near Halstead.

[6] Shallow monitoring wells at Sedgwick recharge site near Sedgwick.

[7] Deep monitoring wells at Sedgwick recharge site near Sedgwick.

Table A–2. Constituents analyzed in water samples for the *Equus* Beds Groundwater Recharge Project, 1995–2005.

[<, less than; µm, micron; ELISA, enzyme-linked immunosorbent assay; m-TEC, membrane-thermotolerant *Escherichia coli*; MF, membrane filter]

Physical properties, dissolved and suspended solids, and suspended sediment (table A–3)			
Oxidation-reduction potential[1]	Specific conductance[1]	Alkalinity, dissolved[1]	Suspended sediment
Turbidity[1]	Water temperature[1]	Dissolved solids[1]	
Oxygen, dissolved[1]	Carbonate hardness, total	Suspended solids, total[1]	
pH[1]	Hardness[1]	Suspended sediment <63 µm	
Major ions and nutrients (table A–4)			
Calcium, dissolved[1]	Bromide, dissolved	Nitrate, total	Orthophosphate, dissolved
Magnesium, dissolved[1]	Chloride, dissolved[1]	Nitrite plus nitrate, dissolved[1]	Orthophosphate as phosphorus, dissolved
Potassium, dissolved[1]	Fluoride, dissolved	Nitrite plus nitrate, total	Organic carbon, total
Sodium, dissolved[1]	Sulfate, dissolved[1]	Nitrite, dissolved	
Bicarbonate, dissolved[1]	Ammonia, dissolved	Nitrite, total	
Carbonate, dissolved[1]	Nitrate, dissolved	Phosphorous, total[1]	
Trace elements (table A–5)			
Aluminum, dissolved	Boron, dissolved	Manganese, dissolved[1]	Thallium, dissolved
Antinomy, dissolved	Cadmium, dissolved	Mercury, dissolved	Vanadium, dissolved
Arsenate, dissolved	Chromium, dissolved	Molybdenum, dissolved	Zinc, dissolved
Arsenic, dissolved[1]	Copper, dissolved	Nickel, dissolved	Dimethylarsinate, dissolved
Arsenite, dissolved	Cyanide, dissolved	Selenium, dissolved	Monomethylarsonate, dissolved
Barium, dissolved	Iron, dissolved[1]	Silver, dissolved	
Beryllium, dissolved	Lead, dissolved	Strontium, dissolved	
Organic compounds (table A–6)			
1,2-Diphenylhydrazine, total[3]	2-Chloro-6-ethylamino-4-amino-s-triazine, total	9H-Fluorene, total[3]	alpha-Hexachlorocyclohexane, total[3]
1-Naphthol, dissolved[2,3]	2-Chloroethyl vinyl ether, total[3]	Acenaphthene, total[3]	Ametryn, dissolved
2,4,5-T, dissolved[3]	2-Chloronaphthalene, total[3]	Acenaphthylene, total[3]	Ametryn, total
2,4,5-T, total[3]	2-Chlorophenol, total[3]	Acetochlor ethanesulfonic acid, dissolved[2]	Aminomethylphosphonic acid, dissolved[2]
2,4,6-Trichlorophenol, total[3]	2-Ethyl-6-methylaniline, dissolved	Acetochlor oxanilic acid, dissolved[2]	Amoxicillin, dissolved[3]
2,4-D methyl ester, dissolved[3]	2-Hydroxy-4-isopropylamino-6-amino-s-triazine, dissolved[2]	Acetochlor sulfynilacetic acid, dissolved[3]	Ampicillin, dissolved[3]
2,4-D, dissolved	2-Hydroxy-4-isopropylamino-6-ethylamino-s-triazine, dissolved	Acetochlor, dissolved	Anhydrochlortetracycline, dissolved[3]
2,4-D, total	2-Hydroxy-6-ethylamino-4-amino-s-triazine, dissolved[2,3]	Acifluorfen, dissolved[2,3]	Anhydrotetracycline, dissolved[2,3]
2,4-DB, dissolved[2,3]	2-Methyl-4,6-dinitrophenol, dissolved[2,3]	Alachlor ethanesulfonic acid, dissolved[2]	Anthracene, total[3]
2,4-Dichlorophenol, total[3]	2-Methyl-4,6-dinitrophenol, total[3]	Alachlor oxanilic acid, dissolved[2]	Aroclor 1016 plus Aroclor 1242, total[3]
2,4-Dimethylphenol, total[3]	2-Nitrophenol, total[3]	Alachlor sulfynilacetic acid, dissolved[3]	Aroclor 1221, total[3]
2,4-Dinitrophenol, total[3]	3,3’-Dichlorobenzidine, total[3]	Alachlor, dissolved	Aroclor 1232, total[3]
2,4-Dinitrotoluene, total[3]	3,4-Dichloroaniline, dissolved	Alachlor, total	Aroclor 1248, total[3]
2,6-Diethylaniline, dissolved[2]	3-Hydroxy carbofuran, dissolved[2,3]	Aldicarb sulfone, dissolved[2,3]	Aroclor 1254, total[3]
2,6-Dinitrotoluene, total[3]	3-Ketocarbofuran, dissolved[3]	Aldicarb sulfoxide, dissolved[2,3]	Aroclor 1260, total[3]
2-[(2-Ethyl-6-methylphenyl)-amino]-1-propanol, dissolved[3]	4-Bromophenyl phenyl ether, total[3]	Aldicarb, dissolved[2,3]	Atrazine, dissolved
2-Chloro-2’,6’-diethylacetanilide, dissolved	4-Chloro-2-methylphenol, dissolved[3]	Aldicarb, total[3]	Atrazine, total
2-Chloro-4-isopropylamino-6-amino-s-triazine, dissolved	4-Chloro-3-methylphenol, total[3]	Aldrin, total[3]	Triazine screen, dissolved, ELISA (table A–7)
2-Chloro-4-isopropylamino-6-amino-s-triazine, total	4-Chlorophenyl phenyl ether, total[3]	alpha-Endosulfan, total[3]	Triazine screen, total, ELISA (table A–7)
2-Chloro-6-ethylamino-4-amino-s-triazine, dissolved	4-Nitrophenol, total[3]	alpha-Hexachlorocyclohexane, dissolved[3]	Azinphos-methyl oxygen analog, dissolved[3]

Table A–2. Constituents analyzed in water samples for the *Equus* Beds Groundwater Recharge Project, 1995–2005.—Continued

[<, less than; µm, micron; ELISA, enzyme-linked immunosorbent assay; m-TEC, membrane-thermotolerant *Escherichia coli*; MF, membrane filter]

Organic compounds (table A–6)—Continued			
Azinphos-methyl, dissolved[2,3]	Chlordane (technical), total[3]	Diazinon, total	Ethion, total[3]
Bendiocarb, dissolved[3]	Chlorimuron, dissolved[3]	Dibenzo[a,h]anthracene, total[3]	Ethoprop, dissolved[2]
Benfluralin, dissolved[2,3]	Chlorodiamino-s-triazine, dissolved[2]	Dicamba, dissolved[2,3]	Fenamiphos sulfone, dissolved[3]
Benomyl, dissolved[3]	Chlorodiamino-s-triazine, dissolved	Dicamba, total	Fenamiphos sulfoxide, dissolved[3]
Bensulfuron-methyl, dissolved[3]	Chlorotetracycline, dissolved	Dichlobenil, dissolved[2,3]	Fenamiphos, dissolved[3]
Bentazon, dissolved[2]	Chlorothalonil, dissolved[2]	Dichlorprop, dissolved[2,3]	Fenuron, dissolved[2,3]
Benzidine, total[3]	Chlorpyrifos oxygen analog, dissolved[3]	Dichlorprop, total[3]	Desulfinylfipronil amide, dissolved[3]
Benzo[a]anthracene, total[3]	Chlorpyrifos, dissolved	Dicrotophos, dissolved[3]	Fipronil sulfide, dissolved
Benzo[a]pyrene, total[3]	Chlorpyrifos, total[3]	Dieldrin, dissolved[3]	Fipronil sulfone, dissolved[3]
Benzo[b]fluoranthene, total[3]	Chrysene, total[3]	Dieldrin, total[3]	Fipronil, dissolved
Benzo[ghi]perylene, total[3]	Ciprofloxacin, dissolved[3]	Diethyl phthalate, total[3]	Flufenacet ethanesulfonic acid, dissolved[3]
Benzo[k]fluoranthene, total[3]	cis-Chlordane, total[3]	Dimethenamid ethanesulfonic acid, dissolved[3]	Flufenacet oxanilic acid, dissolved[3]
Benzyl n-butyl phthalate, total[3]	cis-Permethrin, dissolved[2,3]	Dimethenamid oxanilic acid, dissolved[3]	Flufenacet, dissolved[3]
beta-Endosulfan, total[3]	Clinafloxacin, dissolved[3]	Dimethenamid, dissolved	Flumequine, dissolved[2,3]
beta-Hexachlorocyclohexane, total[3]	Clopyralid, dissolved[2,3]	Dimethoate, dissolved[2,3]	Flumetsulam, dissolved
Bis(2-chloroethoxy)methane, total[3]	Cloxacillin, dissolved[3]	Dimethyl phthalate, total[3]	Fluometuron, dissolved[2,3]
Bis(2-chloroethyl) ether, total[3]	Cyanazine acid, dissolved	Di-n-butyl phthalate, total[3]	Fluoranthene, total[3]
Bis(2-chloroisopropyl) ether, total[3]	Cyanazine amide, dissolved	Di-n-octyl phthalate, total[3]	Fonofos oxygen analog, dissolved[3]
Bis(2-ethylhexyl) phthalate, total	Cyanazine, dissolved	Dinoseb, dissolved[2,3]	Fonofos, dissolved[3]
Bromacil, dissolved	Cyanazine, total	Diphenamid, dissolved[3]	Fonofos, total[3]
Bromacil, total	Cycloate, dissolved[3]	Diphenamid, total[3]	Glufosinate, dissolved[2,3]
Bromoxynil, dissolved[2,3]	Cycloate, total[3]	Disulfoton, dissolved[2,3]	Glyphosate, dissolved[2]
Butachlor, total[3]	Cyfluthrin, dissolved[3]	Disulfoton, total[3]	Heptachlor epoxide, total[3]
Butylate, dissolved	Cypermethrin, dissolved[3]	Diuron, dissolved[2]	Heptachlor, total[3]
Butylate, total[3]	Dacthal monoacid, dissolved[3]	Diuron, dissolved	Hexachlorobenzene, total[3]
Caffeine, dissolved	Dimethyl tetrachloroterephthalate, dissolved[2]	Doxycycline, dissolved[2,3]	Hexachlorocyclopentadiene, total[3]
Carbadox, dissolved[2,3]	Deethyl cyanazine acid, dissolved	Endosulfan sulfate, total[3]	Hexazinone, dissolved
Carbaryl, dissolved[2]	Deethyl cyanazine amide, dissolved[3]	Endrin aldehyde, total[3]	Hexazinone, total[3]
Carbaryl, total[3]	Deethyl cyanazine, dissolved[3]	Endrin, total[3]	Imazaquin, dissolved
Carbofuran, dissolved[2]	delta-Hexachlorocyclohexane, total[3]	S-Ethyl dipropylthiocarbamate, dissolved[2]	Imazethapyr, dissolved[3]
Carbofuran, total[3]	Demeclocycline, dissolved[2,3]	Erythromycin, dissolved[3]	Imidacloprid, dissolved[3]
Carbophenothion, total[3]	Demethyl fluometuron, dissolved[3]	Esfenvalerate, dissolved[2,3]	Indeno[1,2,3-cd]pyrene, total[3]
Carboxin, total[3]	Desulfinylfipronil, dissolved	Ethalfluralin, dissolved[2]	Iprodione, dissolved[3]
Cefotaxime, dissolved[3]	Diazinon oxygen analog, dissolved[3]	Ethion monoxon, dissolved[3]	Isofenphos, dissolved[3]
Chloramben methyl ester, dissolved[3]	Diazinon, dissolved	Ethion, dissolved[3]	Isophorone, total[3]

Table A–2. Constituents analyzed in water samples for the *Equus* Beds Groundwater Recharge Project, 1995–2005.—Continued

[<, less than; µm, micron; ELISA, enzyme-linked immunosorbent assay; m-TEC, membrane-thermotolerant *Escherichia coli*; MF, membrane filter]

Organic compounds (table A–6)—Continued			
Lincomycin, dissolved[3]	Nitrobenzene, total[3]	Picloram, total	Sulfamethoxazole, dissolved[3]
Lindane, dissolved	N-Nitrosodimethylamine, total[3]	Polychlorinated naphthalenes, total[3]	Sulfathiazole, dissolved[2,3]
Lindane, total[3]	N-Nitrosodi-n-propylamine, total[3]	Prometon, dissolved	Sulfometuron, dissolved[3]
Linuron, dissolved[2]	N-Nitrosodiphenylamine, total[3]	Prometon, total[3]	Tebuthiuron, dissolved[2]
Lomefloxacin, dissolved[3]	Norfloxacin, dissolved[2,3]	Prometryn, dissolved	Terbacil, dissolved[2]
Malaoxon, dissolved	Norflurazon, dissolved[2,3]	Prometryn, total[3]	Terbacil, dissolved[3]
Malathion, dissolved	Ofloxacin, dissolved[3]	Propyzamide, dissolved[2]	Terbacil, total[3]
Malathion, total[3]	Ormetoprim, dissolved[3]	Propachlor ethanesulfonic acid, dissolved[2,3]	Terbufos oxygen analog sulfone, dissolved[3]
2-Methye-4-chlorophenoxyacetic acid, dissolved[2,3]	Oryzalin, dissolved[2,3]	Propachlor oxanilic acid, dissolved[2,3]	Terbufos, dissolved[2,3]
4-(2-Methye-4-chlorophenoxy) butric acid, dissolved[2,3]	Oxacillin, dissolved[3]	Propachlor, dissolved	Terbuthylazine, dissolved
Metalaxyl, dissolved[3]	Oxamyl, dissolved[2,3]	Propachlor, total[3]	Terbutryn, dissolved[3]
Methidathion, dissolved[3]	Oxolinic acid, dissolved[2,3]	Propanil, dissolved[2,3]	Tetracycline, dissolved[2,3]
Methiocarb, dissolved[2,3]	Oxytetracycline, dissolved[3]	Propargite, dissolved[2,3]	Thiobencarb, dissolved[2,3]
Methiocarb, total[3]	p,p’-dichlorodiphenyldichloro-ethane, total[3]	Propazine, dissolved	Toxaphene, total[3]
Methomyl, dissolved[2,3]	p,p’-dichlorodiphenyldichloro-ethylene, dissolved	Propazine, total	trans-Chlordane, total[3]
Methomyl, total[3]	p,p’-dichlorodiphenyldichloro-ethylene, total[3]	Propham, dissolved[2,3]	Triallate, dissolved[2,3]
Methyl paraoxon, dissolved[3]	p,p’-dichlorodiphenyltrichloroethane, total[3]	Propham, total[3]	Tribuphos, total[3]
Methyl parathion, dissolved[2]	p,p’-Ethyl-dichlorodiphenyldichloroethane, total[3]	Propiconazole, dissolved[3]	Triclopyr, dissolved[2,3]
Methyl parathion, total[3]	p,p’-Methoxychlor, total[3]	Propoxur, dissolved[2,3]	Trifluralin, dissolved[2]
Metolachlor ethanesulfonic acid, dissolved[2]	Parathion, dissolved[3]	Propoxur, total[3]	Trifluralin, total[3]
Metolachlor oxanilic acid, dissolved[2]	Parathion, total[3]	Pyrene, total[3]	Trimethoprim, dissolved[3]
Metolachlor, dissolved	Polychlorinated biphenyls, total[3]	Roxithromycin, dissolved	Tylosin, dissolved[3]
Metolachlor, total	Pebulate, dissolved[2,3]	Sarafloxacin, dissolved[2,3]	Vernolate, total[3]
Metribuzin, dissolved	Pendimethalin, dissolved[2]	Siduron, dissolved[3]	Virginiamycin, dissolved[3]
Metribuzin, total[3]	Penicillin G, dissolved[3]	Silvex, dissolved[3]	Xylene (all isomers), total[3]
Metsulfuron, dissolved	Penicillin V, dissolved[3]	Silvex, total[3]	1,1,1,2-Tetrachloroethane, total[3]
Minocycline, dissolved[2,3]	Pentachlorophenol, total[3]	Simazine, dissolved	1,1,1-Trichloroethane, total[3]
Mirex, total[3]	Phenanthrene, total[3]	Simazine, total	1,1,2,2-Tetrachloroethane, total[3]
Molinate, dissolved[2]	Phenol, total[3]	Simetryn, total[3]	1,1,2-Trichloro-1,2,2-trifluoroethane, total[3]
Myclobutanil, dissolved[3]	Phorate oxygen analog, dissolved[3]	Sulfachlorpyridazine, dissolved[2,3]	1,1,2-Trichloroethane, total[3]
N-(3,4-Dichlorophenyl)-N’-methylurea, dissolved[3]	Phorate, dissolved[2,3]	Sulfadiazine, dissolved[3]	1,1-Dichloroethane, total[3]
N-(4-Chlorophenyl)-N’-methylurea, dissolved[3]	Phorate, total[3]	Sulfadimethoxine, dissolved[2,3]	1,1-Dichloroethene, total[3]
Napropamide, dissolved[2]	Phosmet oxygen analog, dissolved[3]	Sulfamerazine, dissolved[2,3]	1,1-Dichloropropene, total[3]
Neburon, dissolved[2,3]	Phosmet, dissolved[3]	Sulfamethazine, dissolved[3]	1,2,3-Trichlorobenzene, total[3]
Nicosulfuron, dissolved	Picloram, dissolved[2,3]	Sulfamethoxazole, dissolved[2,3]	1,2,3-Trichloropropane, total[3]

Table A–2. Constituents analyzed in water samples for the *Equus* Beds Groundwater Recharge Project, 1995–2005.—Continued

[<, less than; µm, micron; ELISA, enzyme-linked immunosorbent assay; m-TEC, membrane-thermotolerant *Escherichia coli*; MF, membrane filter]

Organic compounds (table A–6)—Continued			
1,2,4-Trichlorobenzene, total[3]	Acrylonitrile, total[3]	Ethylbenzene, total[3]	trans-1,3-Dichloropropene, total[3]
1,2,4-Trimethylbenzene, total[3]	Benzene, total[3]	Hexachlorobutadiene, total[3]	Tribromomethane, total[3]
1,2-Dibromo-3-chloropropane, total[3]	Bromobenzene, total[3]	Hexachloroethane, total[3]	Trichloroethene, total[3]
1,2-Dibromoethane, total[3]	Bromochloromethane, total[3]	Isopropylbenzene, total[3]	Trichlorofluoromethane, total[3]
1,2-Dichlorobenzene, total[3]	Bromodichloromethane, total	Naphthalene, total[3]	Trichloromethane, total
1,2-Dichloroethane, total	Bromomethane, total[3]	n-Butylbenzene, total[3]	Vinyl chloride, total[3]
1,2-Dichloropropane, total[3]	Chlorobenzene, total[3]	n-Propylbenzene, total[3]	Dichlorvos, dissolved[3]
1,3,5-Trimethylbenzene, total[3]	Chloroethane, total[3]	sec-Butylbenzene, total[3]	
1,3-Dichlorobenzene, total[3]	Chloromethane, total[3]	Styrene, total[3]	
1,3-Dichloropropane, total[3]	cis-1,2-Dichloroethene, total[3]	Methyl tert-butyl ether, total	
1,4-Dichlorobenzene, total[3]	cis-1,3-Dichloropropene, total[3]	tert-Butylbenzene, total[3]	
2,2-Dichloropropane, total[3]	Dibromochloromethane, total	Tetrachloroethene, total	
2-Chlorotoluene, total[3]	Dibromomethane, total[3]	Tetrachloromethane, total[3]	
4-Chlorotoluene, total[3]	Dichlorodifluoromethane, total[3]	Toluene, total[3]	
4-Isopropyltoluene, total[3]	Dichloromethane, total[3]	trans-1,2-Dichloroethene, total[3]	
Bacterial and viral indicators and triazine herbicides (table A–7)			
Clostridium perfringens	*Enterococci*	Fecal coliform[1]	Atrazine
Coliphage, *Escherichia coli*, C13 Host	*Escherichia coli*, modified m-TEC MF Method	Fecal *streptococci*	Triazine screen, ELISA
Coliphage, *Escherichia coli*, Famp Host	*Escherichia coli*, m-TEC MF Method	Total coliform[1]	
Radionuclides (table A–8)			
Alpha radioactivity, 2-sigma combined uncertainty, natural uranium curve, dissolved	Beta radioactivity, 2-sigma combined uncertainty, Cesium-137 curve, dissolved	Gross alpha radioactivity, natural uranium curve, dissolved	Gross beta radioactivity, Strontium-90/Yttrium-90 curve, dissolved
Alpha radioactivity, 2-sigma combined uncertainty, Thorium-230 curve, dissolved	Beta radioactivity, 2-sigma combined uncertainty, Strontium-90/Yttrium-90 curve, dissolved	Gross beta radioactivity, Cesium-137 curve, dissolved	Uranium (natural), dissolved
Alpha radioactivity, Thorium-230 curve, dissolved			

[1] Key constituent analyzed in most samples.

[2] Constituent was analyzed using a 0.7-micron glass-fiber filter.

[3] Constituent concentration never exceeded the reporting level.

Table A–3. Summary of physical properties and analysis of selected constituents in water samples collected as part of the *Equus* Beds Groundwater Recharge Project, 1995–2005.

[mV, millivolts; NTU, nephelometric turbidity units; NephRatio, nephelometric ratio; NTRU, nephelometric turbidity ratio units; mg/L, milligrams per liter; µS/cm, microsiemens per centimeter at 25 degrees Celsius; $CaCO_3$, calcium carbonate; --, not determined; MCL, Maximum Contaminant Level; SDWR, Secondary Drinking-Water Regulation; NA, not analyzed; <, less than; µm, micron; %, percent. The first set of numbers under each heading; for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the reporting level.]

Data-collection site (fig. 6)	Oxidation-reduction potential (mV)	Turbidity (NTU)	Turbidity, NephRatio (NTRU)	Dissolved oxygen (mg/L)	pH (standard units)	Specific conductance (µS/cm)	Temperature (degrees Celsius)	Carbonate hardness (mg/L $CaCO_3$)	Hardness (mg/L $CaCO_3$)
Drinking-water criteria	--	5 (MCL)	0.5–1.0 (SDWR)	--	6.5–8.5 (SDWR)	--	--	--	--
Reporting level	1.0	0.1	0.1	0.1	0.1	1.0	-5.0	1.0	1.0
Surface-water monitoring sites (Little Arkansas River)									
7143672	NA	0.3–1,780 (153)	3.3–1,150 (50)	2.5–16.2 (197)	6.2–8.5 (213)	99–3,550 (500)	0.2–29 (214)	27–520 (167)	27–580 (186)
(near Halstead)	NA	236; 85	232; 125	8.14; 7.7	7.58; 7.7	915; 864	15.5; 16.8	254; 280	267; 290
7144100	NA	1.4–1,100 (170)	2.9–1,190 (69)	3.6–18.7 (210)	6–8.7 (227)	40–1,760 (2236)	-0.2–32 (232)	16–420 (152)	16–420 (161)
(near Sedgwick)	NA	213; 75.5	211; 45	8.86; 8.35	7.67; 7.7	650; 657	17.1; 18	194; 190	200; 200
Diversion well site near Halstead									
Diversion well	140–420 (41)	0.2–5.2 (111)	0.2–5.2 (111)	0–4.7 (353)	6.2–7.4 (397)	535–838 (397)	9.7–19.4 (394)	180–330 (141)	170–330 (152)
	189; 170	1.88; 1.5	1.88; 1.5	0.477; 0.2	7.07; 7.1	771; 780	14.9; 14.8	267; 280	268; 280
EB-145-A1	90–190 (28)	0.6–970 (65)	<0.1–31 (62)	0.1–2.2 (61)	6.2–7.1 (66)	407–1,390 (66)	10.5–18.9 (66)	150–430 (65)	150–440 (66)
	130; 125	26.1; 10	1.32*; 0.1	0.321; 0.2	6.68; 6.7	1020; 1070	15.5; 15.7	317; 320	317; 325
EB-145-A2	80–170 (9)	1.1–21 (28)	<0.1–0.9 (25)	0.1–0.7 (28)	6.4–7 (28)	951–1,220 (27)	14.3–17 (28)	280–430 (28)	280–430 (28)
	126; 130	8.01; 6.7	0.266*; 0.2	0.268; 0.2	6.74; 6.75	1,060; 1,040	15.7; 15.6	340; 330	340; 330
EB-145-A3	120–190 (9)	0.2–110 (33)	<0.1–1 (28)	0.1–1.1 (33)	6–7 (33)	990–1,240 (32)	15–16.2 (33)	340–450 (33)	350–450 (33)
	154; 150	5.27; 2	0.241*; 0.1	0.239; 0.2	6.71; 6.7	1,140; 1,160	15.7; 15.7	398; 400	398; 400
EB-145-A4	120–190 (8)	0.1–4.1 (21)	<0.1–0.5 (20)	0.1–1.1 (22)	6.7–7.3 (22)	528–1,060 (21)	14.8–15.8 (22)	170–430 (21)	170–430 (21)
	166; 170	1.64; 1.5	0.132*; 0.1	0.218; 0.15	6.99; 7	779; 769	15.4; 15.4	282; 280	286; 280
EB-145-A5	130–380 (19)	0.3–7.4 (32)	<0.1–0.6 (30)	0.1–0.7 (33)	6.6–7.2 (33)	641–865 (32)	14.9–16.2 (33)	240–370 (32)	260–370 (32)
	207; 180	1.5; 1.05	0.183*; 0.1	0.242; 0.2	6.95; 7	768; 784	15.6; 15.6	318; 320	320; 320
EB-145-P-D5	110–270 (27)	0.2–4.5 (58)	<0.1–3.3 (55)	0–0.7 (56)	6.2–7.3 (58)	449–908 (58)	15.2–16.5 (58)	140–320 (58)	140–320 (58)
	147; 140	1.13; 0.8	0.320*; 0.1	0.2; 0.1	7.04; 7.1	651; 667	15.8; 15.8	211; 210	212; 215
Halstead recharge site									
SMW-H4	260–670 (25)	0.1–1.1 (47)	<0.1–3.3 (45)	0.1–7.8 (46)	5.3–7.2 (47)	473–841 (47)	14.7–17.3 (47)	150–310 (47)	150–310 (47)
	496; 500	0.443; 0.4	0.409*; 0.3	4.68; 4.8	6.6; 6.6	694; 703	15.8; 15.7	253; 250	253; 250
SMW-H14	170–670 (22)	0.1–7.8 (46)	0.2–12 (42)	2.3–10.8 (46)	5.4–7.5 (46)	670–1,880 (46)	11–19.1 (46)	200–360 (46)	200–350 (46)
	480; 525	1.04; 0.7	1.27; 0.8	6.01; 6.1	6.86; 6.85	896; 800	14.4; 14.3	279; 280	279; 280
DMW-H1	130–280 (26)	0.2–8.5 (46)	0–4.9 (44)	0–1.9 (44)	6.2–7.2 (46)	352–843 (46)	14.9–16.5 (46)	120–320 (46)	120–320 (46)
	180; 180	1.68; 1.1	1.04; 0.6	0.236; 0.1	7; 7	746; 812	15.8; 15.8	268; 290	269; 290
DMW-H13	20–290 (22)	0.2–10 (46)	<0.1–2.9 (42)	0–0.8 (46)	6–7.2 (46)	333–834 (46)	15.2–16.4 (46)	110–320 (46)	110–320 (46)
	143; 135	3.1; 2.55	0.181*; 0.1	0.178; 0.1	7.01; 7.05	698; 804	15.7; 15.8	249; 280	249; 280
Sedgwick recharge site									
Treated stream water	NA	0.3–980 (48)	0–14 (9)	0.5–19.8 (196)	6.1–9.3 (229)	212–1,300 (230)	5.9–31 (215)	72–410 (48)	72–410 (48)
	NA	42.3; 6.4	6; 5.7	10.3; 10.2	7.96; 8	617; 570	19.7; 20	193; 175	193; 175
SMW-S11	320–680 (31)	0.1–79 (52)	0.2–26 (51)	1.6–10.8 (51)	6.1–7.6 (52)	396–1,060 (52)	11.8–30 (52)	150–440 (52)	150–440 (52)
	498; 520	3.28; 0.6	1.63; 0.6	6.03; 6.2	6.84; 6.8	643; 617	18.3; 16.2	242; 230	242; 230
SMW-S13	200–670 (32)	0.1–1260 (47)	<0.1–8.5 (45)	4–8.4 (47)	6–7 (47)	467–772 (46)	12.5–22.5 (47)	150–360 (47)	150–350 (47)
	526; 550	27.5; 0.5	0.658*; 0.4	5.94; 5.9	6.41; 6.4	611; 590	17.1; 16.6	232; 230	232; 230
DMW-S10	170–610 (22)	<0.1–18 (40)	<0.1–3.7 (40)	0.1–0.7 (36)	6.5–7.4 (40)	718–824 (40)	15.7–16.4 (40)	230–260 (40)	230–260 (40)
	405; 430	1.34*; 0.4	0.635*; 0.3	0.2; 0.1	7.12; 7.2	792; 798	16.1; 16.1	245; 240	245; 240
DMW-S14	140–620 (23)	<0.1–4 (36)	<0.1–2.1 (34)	0.1–1 (32)	6.6–7.4 (36)	582–775 (36)	15.9–16.9 (36)	160–220 (36)	160–230 (36)
	433; 480	0.419*; 0.2	0.333*; 0.1	0.234; 0.2	7.22; 7.3	639; 618	16.4; 16.3	181; 180	181; 180

Table A–3. Summary of physical properties and analysis of selected constituents in water samples collected as part of the *Equus* Beds Groundwater Recharge Project, 1995–2005.—Continued

[mV, millivolts; NTU, nephelometric turbidity units; NephRatio, nephelometric ratio; NTRU, nephelometric turbidity ratio units; mg/L, milligrams per liter; µS/cm, microsiemens per centimeter at 25 degrees Celsius; $CaCO_3$, calcium carbonate; --, not determined; MCL, Maximum Contaminant Level; SDWR, Secondary Drinking-Water Regulation; NA, not analyzed; <, less than; µm, micron; %, percent. The first set of numbers under each heading; for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the reporting level.]

Data-collection site (fig. 6)	Alkalinity (mg/L $CaCO_3$)	Dissolved solids (mg/L)	Suspended solids (mg/L)	Suspended sediment <63 µm (% <63 µm)	Suspended sediment (mg/L)
Drinking-water criteria	--	500 (SDWR)	--	--	--
Reporting level	2.0	1.0	4.0	0.1	0.5
Surface-water monitoring sites (Little Arkansas River)					
7143672	3–310 (185)	85–1,960 (186)	4–2,240 (153)	16–100 (70)	18–2,950 (72)
(near Halstead)	175; 205	550; 570	263; 90	91.6; 97	384; 223
7144100	18–292 (160)	50–759 (155)	4–1,820 (161)	41–100 (74)	4–1,970 (78)
(near Sedgwick)	153; 148	368; 359	260; 116	95.1; 98	405; 243
Diversion well site near Halstead					
Diversion well	101–280 (150)	292–552 (150)	<4.00–167 (111)	NA	NA
	258; 264	457; 479	--; <4.00	NA	NA
EB-145-A1	166–389 (65)	348–942 (66)	<4.00–17 (64)	NA	NA
	282; 292	598; 605	5.29*; <4.00	NA	NA
EB-145-A2	248–360 (28)	523–706 (28)	<1.00–7 (28)	NA	NA
	296; 296	612; 603	3.68*; <4.00	NA	NA
EB-145-A3	312–420 (33)	605–768 (33)	<4.00–5 (32)	NA	NA
	360; 360	672; 670	--; <4.00	NA	NA
EB-145-A4	219–327 (21)	307–680 (21)	<4.00–<20.0 (21)	NA	NA
	268; 253	464; 420	--; <4.00	NA	NA
EB-145-A5	260–330 (32)	402–586 (32)	<4.00–7 (32)	NA	NA
	306; 309	494; 498	--; <4.00	NA	NA
EB-145-P-D5	186–288 (58)	275–534 (58)	<4.00–2 (58)	NA	NA
	230; 238	389; 413	--; <4.00	NA	NA
Halstead recharge site					
SMW-H4	144–268 (47)	278–538 (47)	<4.00–68 (47)	NA	NA
	214; 214	424; 424	--; <4.00	NA	NA
SMW-H14	186–298 (46)	172–1,060 (46)	<4.00–24 (46)	NA	NA
	239; 247	511; 481	--; <4.00	NA	NA
DMW-H1	148–278 (46)	213–525 (46)	<4.00–36 (46)	NA	NA
	250; 266	453; 492	2.23*; <4.00	NA	NA
DMW-H13	151–276 (46)	178–528 (46)	<4.00–24 (46)	NA	NA
	240; 264	422; 487	--; <4.00	NA	NA
Sedgwick recharge site					
Treated stream water	4–264 (48)	130–737 (48)	<4.00–1,790 (226)	NA	NA
	149; 136	344; 317	24.8*; 10	NA	NA
SMW-S11	106–248 (52)	235–771 (52)	<4.00–238 (52)	NA	NA
	157; 154	404; 388	--; <4.00	NA	NA
SMW-S13	108–184 (47)	223–506 (47)	<4.00–4,010 (47)	NA	NA
	134; 131	373; 366	--; <4.00	NA	NA
DMW-S10	196–298 (40)	443–512 (40)	<4.00–7 (40)	NA	NA
	275; 276	472; 472	--; <4.00	NA	NA
DMW-S14	148–272 (36)	188–467 (36)	<4.00–<4.00 (36)	NA	NA
	227; 224	383; 381	--; <4.00	NA	NA

Table A–3. Summary of physical properties and analysis of selected constituents in water samples collected as part of the *Equus* Beds Groundwater Recharge Project, 1995–2005.—Continued

[mV, millivolts; NTU, nephelometric turbidity units; NephRatio, nephelometric ratio; NTRU, nephelometric turbidity ratio units; mg/L, milligrams per liter; µS/cm, microsiemens per centimeter at 25 degrees Celsius; $CaCO_3$, calcium carbonate; --, not determined; MCL, Maximum Contaminant Level; SDWR, Secondary Drinking-Water Regulation; NA, not analyzed; <, less than; µm, micron; %, percent. The first set of numbers under each heading; for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the reporting level.]

Data-collection site (fig. 6)	Oxidation-reduction potential (mV)	Turbidity (NTU)	Turbidity, NephRatio (NTRU)	Dissolved oxygen (mg/L)	pH (standard units)	Specific conductance (µS/cm)	Temperature (degrees Celsius)	Carbonate hardness (mg/L $CaCO_3$)	Hardness (mg/L $CaCO_3$)
Drinking-water criteria	--	5 (MCL)	0.5–1.0 (SDWR)	--	6.5–8.5 (SDWR)	--	--	--	--
Reporting level	1.0	0.1	0.1	0.1	0.1	1.0	-5.0	1.0	1.0
Background wells									
EB-142-A3	NA	0.2–0.2 (3)	0.2–0.6 (3)	0.1–0.2 (3)	6.6–6.8 (3)	618–638 (3)	15.8–16.8 (3)	220–240 (3)	220–240 (3)
	NA	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
Sedgwick well	110–350 (24)	0.3–160 (45)	<0.1–4.4 (44)	0.1–1.2 (45)	6.1–7 (46)	504–686 (46)	14.9–16.6 (46)	210–280 (45)	220–280 (45)
	203; 195	5.26; 1.3	0.771*; 0.4	0.251; 0.2	6.78; 6.8	640; 637	15.7; 15.8	251; 260	251; 260
City well-Sedgwick	NA	--–2 (1)	--–0.4 (1)	--–0.5 (1)	--–7 (1)	--–800 (1)	--–14.9 (1)	--–290 (1)	--–280 (1)
	NA	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
TH-02-95	100–270 (24)	0.6–13 (25)	<0.1–3.2 (26)	0–1.3 (26)	6.7–7.2 (26)	631–732 (26)	14.8–16.1 (26)	260–300 (25)	270–300 (25)
	151; 140	4.85; 4.8	0.235*; <0.1	0.285; 0.2	7.01; 7	679; 687	15.5; 15.5	286; 290	287; 290
TH-06-95	90–260 (25)	1–37 (27)	0.1–7.5 (28)	0–0.7 (28)	6.5–7.1 (28)	434–602 (29)	15.2–29 (28)	210–420 (27)	230–260 (27)
	160; 160	3.84; 2.4	1.45; 0.55	0.243; 0.2	6.84; 6.85	532; 530	16.2; 15.8	250; 250	244; 250
TH-10-95	90–200 (26)	0.4–3.5 (27)	<0.1–3.7 (28)	0–0.6 (28)	6.9–7.4 (28)	315–419 (28)	15–16.1 (28)	130–190 (27)	140–190 (27)
	125; 120	1.91; 1.9	0.610*; 0.3	0.196; 0.15	7.19; 7.2	363; 362	15.6; 15.6	153; 150	154; 150
TH-12-95	NA	--–0.2 (1)	0.5–0.5 (2)	0.1–0.1 (2)	6.6–6.8 (2)	685–834 (2)	15.3–15.8 (2)	--–310 (1)	--–340 (1)
	NA	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
TH-08-A1	NA	0.2–48 (7)	0.2–26 (5)	0.1–0.5 (7)	6.6–7 (7)	625–740 (7)	15–16.9 (7)	190–240 (7)	200–230 (7)
	NA	7.64; 0.4	--; --	0.243; 0.2	6.83; 6.9	683; 663	15.8; 15.6	216; 220	217; 220
TH-08-A2	--–310 (1)	0.1–2 (10)	<0.1–0.5 (10)	0–0.8 (10)	6.2–7.2 (10)	680–906 (10)	14.7–16.4 (10)	230–360 (10)	230–360 (10)
	--; --	0.42; 0.2	0.152*; 0.1	0.28; 0.2	6.97; 7.1	768; 762	15.5; 15.5	285; 290	285; 290
TH-08-A3	30–290 (20)	0.5–4.7 (23)	0.2–8.7 (23)	0.1–1.2 (24)	6.6–7.2 (24)	583–817 (24)	15.1–17.4 (24)	180–240 (23)	180–240 (23)
	163; 155	2.37; 2.4	1.7; 0.8	0.275; 0.2	7.03; 7.1	632; 608	16.1; 16.2	193; 190	193; 190
TH-08-A4	--–220 (1)	--–2 (1)	--–<0.1 (1)	--–0.1 (1)	--–7 (1)	--–567 (1)	--–16.6 (1)	--–180 (1)	--–180 (1)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
TH-08-A5	290–560 (12)	0.1–0.8 (12)	<0.1–4 (12)	0–2 (13)	6.6–7 (13)	483–682 (13)	15–16.3 (13)	190–260 (12)	190–260 (12)
	420; 455	0.367; 0.35	0.529*; 0.1	0.438; 0.2	6.82; 6.8	613; 653	15.7; 15.8	214; 210	214; 210
Alta Mills	200–600 (23)	0.9–3.4 (23)	0.4–7.2 (23)	0.2–1.1 (23)	6.7–7.1 (23)	714–820 (23)	15–15.6 (23)	320–360 (23)	320–360 (23)
	467; 480	2; 1.9	2.66; 2.2	0.587; 0.6	6.91; 6.9	778; 785	15.2; 15.2	338; 340	338; 340
Aquifer storage and recovery prototype wells									
DW-TW-01	160–530 (7)	<0.1–1.1 (7)	0.4–13 (7)	0.1–0.3 (7)	7–7.5 (7)	361–405 (7)	15.6–16.4 (7)	130–140 (7)	130–140 (7)
	377; 400	0.279*; 0.2	3.39; 2	0.129; 0.1	7.31; 7.4	384; 382	16; 15.8	131; 130	131; 130
DW-TW-02	140–500 (7)	0.2–0.5 (7)	0.1–0.9 (7)	0.1–0.2 (7)	7–7.5 (7)	364–387 (7)	15.5–16.2 (7)	120–140 (7)	120–140 (7)
	344; 320	0.286; 0.3	0.429; 0.4	0.114; 0.1	7.34; 7.5	373; 370	15.8; 15.7	131; 130	131; 130
DW-TW-03	160–480 (8)	<0.1–0.4 (7)	<0.1–0.3 (8)	0.1–0.2 (8)	7.1–7.6 (8)	358–387 (8)	15.5–16.3 (8)	130–140 (7)	130–140 (7)
	269; 230	0.125*; 0.1	--; <0.1	0.113; 0.1	7.39; 7.4	372; 369	15.8; 15.9	131; 130	131; 130
DW-TW-04	140–480 (7)	<0.1–0.6 (7)	<0.1–2.3 (7)	0.1–0.2 (7)	7.1–7.5 (7)	361–390 (7)	15.4–16.1 (7)	130–140 (7)	130–140 (7)
	230; 190	0.199*; 0.2	0.662*; 0.4	0.114; 0.1	7.41; 7.5	369; 367	15.7; 15.6	133; 130	133; 130
DW-TW-05	110–510 (8)	<0.1–0.2 (7)	<0.1–1 (8)	0.1–0.1 (8)	7.1–7.5 (8)	346–394 (8)	15.6–16.4 (8)	130–140 (7)	130–140 (7)
	259; 240	0.123*; 0.1	0.374*; 0.1	0.1; 0.1	7.38; 7.4	376; 379	15.9; 15.9	134; 130	137; 140
DW-TW-06	160–300 (8)	<0.1–0.1 (7)	<0.1–2.7 (8)	0.1–0.1 (8)	6.9–7.5 (8)	355–386 (8)	15.2–15.8 (8)	130–150 (7)	130–150 (7)
	235; 235	0.100*; 0.1	0.498*; 0.2	0.1; 0.1	7.38; 7.45	364; 362	15.7; 15.8	134; 130	134; 130
DW-TW-07	110–260 (8)	0.1–1.5 (7)	<0.1–2.5 (8)	0.1–0.2 (8)	6.9–7.5 (8)	370–640 (8)	15.4–16 (8)	140–240 (7)	140–240 (7)
	193; 195	0.329; 0.1	0.465*; 0.1	0.113; 0.1	7.38; 7.45	417; 379	15.8; 15.9	159; 140	160; 150
DW-TW-08	190–340 (5)	0.1–0.2 (4)	<2–0.2 (6)	0.1–0.1 (5)	7.4–7.5 (5)	377–388 (5)	15.6–16 (5)	140–140 (4)	140–140 (4)
	--; --	--; --	0.179*; 0.2	--; --	--; --	--; --	--; --	--; --	--; --
DW-TW-09	290–370 (5)	0.1–0.3 (4)	<2–1.9 (6)	0.1–0.1 (5)	7.4–7.5 (5)	365–382 (5)	15.6–16 (5)	130–140 (4)	130–140 (4)
	--; --	--; --	0.665*; 0.2	--; --	--; --	--; --	--; --	--; --	--; --
RRW-01	180–500 (8)	0.5–8.3 (7)	0.8–5.9 (8)	0.1–0.3 (8)	6.5–7 (8)	285–307 (8)	15–16.7 (8)	110–140 (7)	110–140 (7)
	304; 275	3.64; 3.4	2.8; 2.3	0.138; 0.1	6.91; 7	296; 300	15.7; 15.7	119; 110	119; 110
RRW-02	120–430 (8)	0.5–9.5 (7)	0.9–4.1 (8)	0.1–0.1 (7)	7.4–7.7 (8)	382–402 (8)	16.3–17.4 (8)	130–140 (7)	130–140 (7)
	230; 200	3.2; 1	1.8; 1.3	0.1; 0.1	7.51; 7.5	391; 389	16.7; 16.7	137; 140	137; 140
RRW-03	40–320 (5)	0.1–1.9 (5)	0.1–0.9 (5)	0.1–0.3 (5)	6.9–7.2 (5)	420–470 (5)	16–17.3 (5)	130–160 (5)	140–160 (5)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --

Table A–3. Summary of physical properties and analysis of selected constituents in water samples collected as part of the *Equus* Beds Groundwater Recharge Project, 1995–2005.—Continued

[mV, millivolts; NTU, nephelometric turbidity units; NephRatio, nephelometric ratio; NTRU, nephelometric turbidity ratio units; mg/L, milligrams per liter; µS/cm, microsiemens per centimeter at 25 degrees Celsius; $CaCO_3$, calcium carbonate; --, not determined; MCL, Maximum Contaminant Level; SDWR, Secondary Drinking-Water Regulation; NA, not analyzed; <, less than; µm, micron; %, percent. The first set of numbers under each heading; for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the reporting level.]

Data-collection site (fig. 6)	Alkalinity (mg/L $CaCO_3$)	Dissolved solids (mg/L)	Suspended solids (mg/L)	Suspended sediment <63 µm (% <63 µm)	Suspended sediment (mg/L)
Drinking-water criteria	--	500 (SDWR)	--	--	--
Reporting level	2.0	1.0	4.0	0.1	0.5
			Background wells		
EB-142-A3	198–200 (3)	381–393 (3)	<4.00–<4.00 (3)	NA	NA
	--; --	--; --	--; --	NA	NA
Sedgwick well	182–280 (45)	369–454 (45)	<4.00–11 (45)	NA	NA
	204; 204	407; 406	1.95*; <4.00	NA	NA
City well-Sedgwick	---285 (1)	---479 (1)	---<4.00 (1)	NA	NA
	--; --	--; --	--; --	NA	NA
TH-02-95	280–316 (25)	386–503 (25)	<4.00–2 (25)	NA	NA
	292; 290	423; 421	--; <4.00	NA	NA
TH-06-95	206–236 (27)	330–440 (27)	<4.00–53 (27)	NA	NA
	223; 224	350; 348	5.22*; <4.00	NA	NA
TH-10-95	174–318 (27)	197–513 (27)	<4.00–2 (27)	NA	NA
	190; 184	237; 226	--; <4.00	NA	NA
TH-12-95	---232 (1)	---560 (1)	---<4.00 (1)	NA	NA
	--; --	--; --	--; --	NA	NA
TH-08-A1	230–246 (7)	332–449 (7)	<4.00–101 (7)	NA	NA
	241; 242	397; 389	--; <4.00	NA	NA
TH-08-A2	260–292 (10)	389–553 (10)	<4.00–<4.00 (10)	NA	NA
	280; 282	458; 455	--; <4.00	NA	NA
TH-08-A3	236–288 (23)	339–479 (23)	<4.00–13 (23)	NA	NA
	250; 246	388; 374	3.12*; <4.00	NA	NA
TH-08-A4	---233 (1)	---345 (1)	---<4.00 (1)	NA	NA
	--; --	--; --	--; --	NA	NA
TH-08-A5	206–273 (12)	301–430 (12)	<4.00–<4.00 (12)	NA	NA
	251; 265	378; 400	--; <4.00	NA	NA
Alta Mills	180–340 (23)	211–560 (23)	<4.00–5 (23)	NA	NA
	308; 316	486; 498	--; <4.00	NA	NA
			Aquifer storage and recovery prototype wells		
DW-TW-01	169–180 (7)	225–244 (7)	<4.00–<4.00 (7)	NA	NA
	177; 180	232; 231	--; <4.00	NA	NA
DW-TW-02	172–178 (7)	222–249 (7)	<4.00–<4.00 (7)	NA	NA
	175; 175	231; 229	--; <4.00	NA	NA
DW-TW-03	170–180 (7)	209–232 (7)	<4.00–<4.00 (7)	NA	NA
	174; 174	223; 228	--; <4.00	NA	NA
DW-TW-04	168–184 (7)	221–238 (7)	<4.00–<4.00 (7)	NA	NA
	176; 178	231; 232	--; <4.00	NA	NA
DW-TW-05	176–184 (7)	211–245 (7)	<4.00–<4.00 (7)	NA	NA
	179; 178	233; 237	--; <4.00	NA	NA
DW-TW-06	168–178 (7)	222–239 (7)	<4.00–<4.00 (7)	NA	NA
	174; 176	228; 227	--; <4.00	NA	NA
DW-TW-07	170–178 (7)	148–389 (7)	<4.00–<4.00 (7)	NA	NA
	175; 178	248; 241	--; <4.00	NA	NA
DW-TW-08	174–187 (4)	225–238 (4)	<4.00–<4.00 (4)	NA	NA
	--; --	--; --	--; --	NA	NA
DW-TW-09	177–189 (4)	210–238 (4)	<4.00–<4.00 (4)	NA	NA
	--; --	--; --	--; --	NA	NA
RRW-01	132–155 (7)	146–195 (7)	<4.00–12 (7)	NA	NA
	140; 138	181; 189	--; <4.00	NA	NA
RRW-02	169–192 (7)	232–268 (7)	<4.00–5 (7)	NA	NA
	178; 177	246; 242	--; <4.00	NA	NA
RRW-03	127–144 (5)	252–271 (5)	<4.00–<4.00 (5)	NA	NA
	--; --	--; --	--; --	NA	NA

Table A–3. Summary of physical properties and analysis of selected constituents in water samples collected as part of the *Equus* Beds Groundwater Recharge Project, 1995–2005.—Continued

[mV, millivolts; NTU, nephelometric turbidity units; NephRatio, nephelometric ratio; NTRU, nephelometric turbidity ratio units; mg/L, milligrams per liter; µS/cm, microsiemens per centimeter at 25 degrees Celsius; $CaCO_3$, calcium carbonate; --, not determined; MCL, Maximum Contaminant Level; SDWR, Secondary Drinking-Water Regulation; NA, not analyzed; <, less than; µm, micron; %, percent. The first set of numbers under each heading; for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the reporting level.]

Data-collection site (fig. 6)	Oxidation-reduction potential (mV)	Turbidity (NTU)	Turbidity, NephRatio (NTRU)	Dissolved oxygen (mg/L)	pH (standard units)	Specific conductance (µS/cm)	Temperature (degrees Celsius)	Carbonate hardness (mg/L $CaCO_3$)	Hardness (mg/L $CaCO_3$)
Drinking-water criteria	--	5 (MCL)	0.5–1.0 (SDWR)	--	6.5–8.5 (SDWR)	--	--	--	--
Reporting level	1.0	0.1	0.1	0.1	0.1	1.0	-5.0	1.0	1.0
Shallow index wells									
IW-01A	250–600 (8)	0.8–3.4 (7)	1.2–3.6 (8)	0.1–0.6 (8)	5.8–6.1 (8)	108–168 (8)	14.8–15 (8)	26–44 (7)	26–44 (7)
	466; 465	2.29; 2.7	1.86; 1.65	0.25; 0.2	5.94; 5.95	143; 144	14.9; 14.8	36.9; 37	36.9; 37
IW-02A	420–700 (8)	0.4–5 (7)	<0.1–9.3 (8)	0.9–1.3 (8)	5.8–6.2 (8)	168–200 (8)	15–17.9 (8)	40–53 (7)	40–53 (7)
	513; 495	1.33; 0.7	2.03*; 1	0.987; 0.95	5.98; 6	179; 177	15.7; 15.4	43.9; 42	44.1; 43
IW-03A	140–310 (8)	0.7–2.9 (7)	<0.1–4.1 (8)	0.1–0.5 (8)	6.5–6.7 (8)	461–547 (8)	14.6–16.7 (8)	130–180 (7)	130–180 (7)
	200; 190	1.53; 1.4	1.10*; 0.1	0.237; 0.2	6.59; 6.55	512; 514	15.2; 15.2	156; 150	156; 150
IW-04A	30–580 (9)	2.3–110 (7)	0.6–21 (10)	0.2–3.5 (9)	6.1–7.1 (9)	506–638 (9)	15.3–18.9 (9)	93–150 (7)	93–150 (7)
	357; 400	31.4; 6.7	5.36; 3.7	2.1; 2.2	6.36; 6.3	563; 548	17.2; 17.2	119; 110	119; 110
IW-05A	270–600 (7)	1.5–20 (7)	3.3–26 (7)	0.7–1.8 (7)	6–6.3 (7)	368–423 (7)	14.9–16.2 (7)	110–140 (7)	110–140 (7)
	454; 530	8.3; 4.9	8.86; 5.2	1.16; 1.1	6.17; 6.2	396; 384	15.7; 15.8	124; 120	124; 120
IW-06A	360–630 (10)	0.1–1.2 (7)	<2–1.9 (12)	4.5–6 (10)	6–6.3 (10)	553–645 (10)	14.9–16.7 (10)	190–220 (7)	190–220 (8)
	522; 535	0.414; 0.3	0.645*; 0.6	5.27; 5.25	6.17; 6.2	603; 598	15.7; 15.9	199; 200	199; 195
IW-07A	200–400 (8)	0.4–3.4 (7)	0.2–6.9 (8)	0.2–0.6 (8)	7–7.2 (8)	350–363 (8)	14.9–17.1 (8)	120–130 (7)	130–130 (7)
	255; 200	1.21; 1	1.4; 0.6	0.312; 0.2	7.14; 7.15	358; 359	15.8; 16.1	129; 130	130; 130
IW-08A	270–560 (8)	1.2–6.1 (7)	1.1–11 (8)	0.3–6.2 (8)	6.7–6.8 (8)	1,420–1,680 (8)	14.6–15.6 (8)	490–550 (7)	490–550 (7)
	381; 310	3.14; 2.6	3.31; 1.9	1.36; 0.65	6.76; 6.8	1,540; 1,550	15; 15	529; 540	529; 540
IW-09A	320–600 (8)	0.2–1 (7)	<0.1–2.4 (8)	0.3–1.5 (8)	6.9–7 (8)	546–595 (8)	15.2–16.1 (8)	210–230 (7)	210–230 (7)
	460; 470	0.4; 0.3	0.544*; 0.3	0.875; 0.85	6.98; 7	569; 567	15.7; 15.7	216; 210	217; 220
IW-10A	420–600 (7)	0.3–2.2 (7)	<0.1–2.6 (7)	2.5–3.8 (7)	6.3–6.6 (7)	409–529 (7)	14.6–16.1 (7)	140–180 (7)	150–180 (7)
	489; 470	0.957; 1	1.23*; 1.3	3.27; 3.4	6.43; 6.4	479; 482	15.4; 15.2	160; 160	161; 160
IW-11A	100–190 (8)	1.5–6.3 (7)	<0.1–4.1 (8)	0.1–0.4 (8)	7–7.5 (8)	380–483 (8)	14.4–16.4 (8)	120–170 (7)	120–170 (7)
	121; 115	4.1; 4.6	--; <0.1	0.212; 0.2	7.28; 7.25	426; 420	15.8; 16	136; 130	137; 130
IW-12A	250–590 (9)	0.3–1.7 (8)	<0.1–2.3 (10)	0.6–1.9 (9)	6.5–6.8 (9)	477–819 (9)	15.8–16.6 (9)	190–310 (8)	190–310 (9)
	376; 320	0.938; 1.1	0.879*; 0.5	0.911; 0.8	6.67; 6.7	612; 600	16.2; 16.3	146; 250	240; 250
IW-13A	140–190 (8)	1.4–5.2 (7)	<0.1–18 (9)	0.1–0.3 (8)	6.6–7 (8)	1,160–1,420 (8)	14.5–16.3 (8)	390–440 (7)	390–440 (8)
	158; 150	3.4; 3.5	3.44*; 1.2	0.213; 0.2	6.85; 6.9	1,270; 1,250	15.4; 15.5	399; 390	398; 390
IW-14A	210–470 (8)	0.2–3.9 (8)	0.4–11 (8)	0.1–0.3 (8)	5.6–6.6 (8)	661–1,370 (8)	15.3–16.2 (8)	140–440 (8)	140–440 (8)
	298; 270	1.06; 0.7	4.29; 1.85	0.2; 0.2	6.01; 5.95	852; 773	15.6; 15.5	233; 210	233; 210
IW-15A	90–160 (8)	1.9–5.7 (7)	<0.1–70 (9)	0.1–0.3 (8)	6.7–6.9 (8)	1,290–1,480 (8)	14.5–16.7 (8)	560–680 (7)	560–680 (7)
	129; 130	3.64; 3.5	8.53*; 0.5	0.162; 0.15	6.81; 6.8	1,360; 1,370	15.5; 15.6	599; 590	600; 600
IW-16A	100–180 (9)	2–3.7 (7)	<0.1–0.8 (9)	0.1–0.4 (9)	6.3–6.8 (9)	783–935 (9)	14.7–16.2 (9)	350–390 (7)	350–390 (7)
	149; 150	2.74; 2.8	0.387*; 0.3	0.178; 0.2	6.59; 6.6	855; 843	15.5; 15.5	364; 360	364; 360
IW-17A	120–320 (8)	1–13 (7)	<0.1–1.4 (7)	0.1–0.6 (8)	6.7–7 (9)	863–917 (9)	15.4–17.5 (9)	310–340 (7)	310–340 (7)
	180; 160	3.81; 2	0.847*; 0.9	0.262; 0.2	6.86; 6.9	889; 894	16.2; 16.3	324; 320	324; 320
IW-18A	180–510 (8)	0.6–6.6 (7)	<0.1–8.2 (8)	0.3–1.4 (9)	6.8–7.2 (9)	1,190–1,320 (9)	13.1–15.2 (9)	420–480 (7)	420–480 (7)
	311; 305	2.34; 2.4	2.97*; 0.6	0.856; 0.8	6.98; 7	1250; 1250	14.3; 14.3	440; 430	440; 430
IW-19A	140–210 (8)	2–6.5 (7)	<0.1–1.1 (8)	0.1–0.4 (8)	6.6–6.9 (8)	1,440–1,730 (8)	14.7–15.7 (8)	500–590 (7)	500–590 (7)
	163; 155	4.5; 4.4	--; <0.1	0.225; 0.2	6.79; 6.8	1610; 1620	15.3; 15.3	550; 550	550; 550
IW-20A	140–200 (9)	3.5–49 (7)	1–8.8 (9)	0.1–0.3 (9)	6.2–6.4 (9)	1,680–1,900 (9)	14.3–15.6 (9)	610–720 (7)	610–720 (7)
	169; 160	13.3; 5.9	5.14; 6.2	0.211; 0.3	6.31; 6.3	1,840; 1,870	15.1; 15.3	667; 670	667; 670
IW-21A	120–160 (8)	2–9.2 (7)	<0.1–3.1 (8)	0.1–0.5 (8)	6.6–6.7 (8)	923–1,110 (8)	14.6–16.1 (8)	360–470 (7)	360–470 (7)
	139; 140	3.43; 2.3	0.965*; 0.4	0.213; 0.15	6.68; 6.7	1,000; 952	15.4; 15.3	400; 380	400; 380

Table A–3. Summary of physical properties and analysis of selected constituents in water samples collected as part of the *Equus* Beds Groundwater Recharge Project, 1995–2005.—Continued

[mV, millivolts; NTU, nephelometric turbidity units; NephRatio, nephelometric ratio; NTRU, nephelometric turbidity ratio units; mg/L, milligrams per liter; µS/cm, microsiemens per centimeter at 25 degrees Celsius; $CaCO_3$, calcium carbonate; --, not determined; MCL, Maximum Contaminant Level; SDWR, Secondary Drinking-Water Regulation; NA, not analyzed; <, less than; µm, micron; %, percent. The first set of numbers under each heading; for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the reporting level.]

Data-collection site (fig. 6)	Alkalinity (mg/L $CaCO_3$)	Dissolved solids (mg/L)	Suspended solids (mg/L)	Suspended sediment <63 µm (% <63 µm)	Suspended sediment (mg/L)
Drinking-water criteria	--	500 (SDWR)	--	--	--
Reporting level	2.0	1.0	4.0	0.1	0.5
			Shallow index wells		
IW-01A	32–57 (7)	100–114 (7)	<4.00–4 (7)	NA	NA
	42.1; 41	107; 106	--; <4.00	NA	NA
IW-02A	28–39 (7)	98–144 (7)	<4.00–<4.00 (7)	NA	NA
	32.6; 31	122; 123	--; <4.00	NA	NA
IW-03A	202–228 (7)	283–342 (7)	<4.00–5 (7)	NA	NA
	217; 215	315; 315	--; <4.00	NA	NA
IW-04A	132–220 (7)	300–373 (7)	<4.00–46 (7)	NA	NA
	181; 180	327; 315	--; <4.00	NA	NA
IW-05A	76–90 (7)	211–282 (7)	<4.00–16 (7)	NA	NA
	82.7; 82	240; 230	--; 9	NA	NA
IW-06A	80–100 (7)	351–429 (8)	<4.00–<4.00 (7)	NA	NA
	90.3; 88	396; 390	--; <4.00	NA	NA
IW-07A	164–170 (7)	202–221 (7)	<4.00–<4.00 (7)	NA	NA
	167; 167	214; 213	--; <4.00	NA	NA
IW-08A	228–278 (7)	935–1,100 (7)	<4.00–10 (7)	NA	NA
	255; 256	1,050; 1,060	--; <4.00	NA	NA
IW-09A	110–144 (7)	362–392 (7)	<4.00–4 (7)	NA	NA
	128; 126	375; 374	--; <4.00	NA	NA
IW-10A	87–94 (7)	232–320 (7)	<4.00–44 (7)	NA	NA
	91.1; 91	286; 300	--; <4.00	NA	NA
IW-11A	186–254 (7)	220–287 (7)	<4.00–<4.00 (7)	NA	NA
	210; 208	249; 255	--; <4.00	NA	NA
IW-12A	184–289 (8)	295–527 (9)	<4.00–<4.00 (8)	NA	NA
	239; 236	391; 356	--; <4.00	NA	NA
IW-13A	272–294 (7)	724–881 (8)	<4.00–8 (7)	NA	NA
	279; 278	784; 785	5.59*; 6	NA	NA
IW-14A	61–220 (8)	406–875 (8)	<4.00–7 (8)	NA	NA
	127; 120	542; 495	--; <4.00	NA	NA
IW-15A	208–235 (7)	887–1,060 (7)	<4.00–11 (7)	NA	NA
	219; 220	969; 976	7.08*; 7	NA	NA
IW-16A	137–166 (7)	529–657 (7)	<4.00–12 (7)	NA	NA
	148; 146	601; 597	5.20*; 4	NA	NA
IW-17A	328–359 (7)	554–604 (7)	<4.00–6 (7)	NA	NA
	345; 346	582; 581	--; <4.00	NA	NA
IW-18A	295–308 (7)	725–812 (7)	<4.00–6 (7)	NA	NA
	300; 300	771; 774	--; <4.00	NA	NA
IW-19A	302–367 (7)	943–1,160 (7)	<4.00–5 (7)	NA	NA
	343; 347	1,070; 1,050	4.19*; 4	NA	NA
IW-20A	169–180 (7)	1,280–1,520 (7)	5–18 (7)	NA	NA
	174; 172	1,420; 1,430	10; 9	NA	NA
IW-21A	169–232 (7)	611–799 (7)	5–9 (7)	NA	NA
	193; 188	679; 648	6.71; 6	NA	NA

Table A–3. Summary of physical properties and analysis of selected constituents in water samples collected as part of the *Equus* Beds Groundwater Recharge Project, 1995–2005.—Continued

[mV, millivolts; NTU, nephelometric turbidity units; NephRatio, nephelometric ratio; NTRU, nephelometric turbidity ratio units; mg/L, milligrams per liter; µS/cm, microsiemens per centimeter at 25 degrees Celsius; $CaCO_3$, calcium carbonate; --, not determined; MCL, Maximum Contaminant Level; SDWR, Secondary Drinking-Water Regulation; NA, not analyzed; <, less than; µm, micron; %, percent. The first set of numbers under each heading; for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the reporting level.]

Data-collection site (fig. 6)	Oxidation-reduction potential (mV)	Turbidity (NTU)	Turbidity, NephRatio (NTRU)	Dissolved oxygen (mg/L)	pH (standard units)	Specific conductance (µS/cm)	Temperature (degrees Celsius)	Carbonate hardness (mg/L $CaCO_3$)	Hardness (mg/L $CaCO_3$)
Drinking-water criteria	--	5 (MCL)	0.5–1.0 (SDWR)	--	6.5–8.5 (SDWR)	--	--	--	--
Reporting level	1.0	0.1	0.1	0.1	0.1	1.0	-5.0	1.0	1.0
Shallow index wells—Continued									
IW-22A	210–400 (8)	0.1–0.7 (7)	<0.1–3 (9)	0.1–0.5 (8)	6.5–7 (8)	818–943 (8)	15.3–16 (8)	350–410 (7)	340–410 (8)
	274; 240	0.3; 0.2	0.815*; 0.3	0.275; 0.2	6.85; 6.9	886; 884	15.7; 15.7	374; 370	371; 365
IW-23A	100–190 (8)	2.1–12 (7)	<0.1–0.5 (8)	0.1–1.5 (7)	6.9–7.3 (9)	544–751 (9)	15–16.9 (9)	190–240 (7)	190–240 (7)
	129; 115	6.01; 4.3	0.369*; 0.3	0.4; 0.3	7.12; 7.1	679; 701	16; 16.2	221; 220	221; 220
IW-24A	240–650 (10)	0.1–0.3 (7)	<0.1–1.4 (10)	1.2–2.5 (10)	6.6–7.1 (10)	847–950 (10)	15.2–16.1 (10)	320–350 (7)	310–350 (8)
	516; 550	0.2; 0.2	--; <0.1	1.89; 1.9	6.9; 7	922; 931	15.7; 15.8	329; 320	328; 320
IW-25A	320–660 (8)	0.1–0.4 (7)	<0.1–2.9 (8)	0.1–2.2 (8)	6.6–7.2 (8)	852–958 (8)	15.1–15.6 (8)	290–330 (7)	290–330 (7)
	506; 525	0.243; 0.2	0.539*; 0.2	0.6; 0.3	6.96; 7.05	878; 869	15.3; 15.4	300; 290	300; 290
IW-26A	360–550 (8)	0.2–1 (7)	<0.1–4.8 (8)	0.4–3.8 (8)	7.1–7.2 (8)	620–725 (8)	15.4–15.9 (8)	250–320 (7)	250–320 (7)
	465; 470	0.571; 0.5	1.19*; 0.5	1.75; 1.35	7.16; 7.2	682; 685	15.7; 15.7	281; 280	283; 280
IW-27A	420–580 (8)	0.2–0.7 (7)	<0.1–3.8 (8)	0.7–1.4 (8)	6.5–7 (8)	800–839 (8)	15.2–15.9 (8)	360–390 (7)	360–390 (7)
	503; 505	0.343; 0.3	--; <0.1	1.01; 0.95	6.85; 6.9	819; 817	15.6; 15.6	377; 380	377; 380
IW-28A	330–540 (8)	0.1–14 (7)	<0.1–3.1 (8)	0.5–1.7 (7)	6–6.9 (8)	848–949 (8)	15.2–16.5 (8)	370–420 (7)	370–420 (7)
	440; 430	2.13; 0.1	0.569*; 0.3	0.814; 0.7	6.61; 6.65	905; 914	15.8; 15.9	396; 400	397; 400
IW-29A	100–210 (8)	4.1–16 (8)	<0.1–42 (10)	0.1–0.3 (7)	6.8–7 (8)	1,220–1,690 (8)	15.3–16.8 (8)	390–550 (8)	390–550 (10)
	141; 135	10.2; 11	8.64*; 0.3	0.157; 0.1	6.89; 6.9	1,450; 1,400	16; 16	480; 465	472; 460
IW-30A	370–610 (8)	0.2–0.9 (7)	<0.1–5.3 (11)	4.2–6.5 (8)	6.4–6.9 (8)	1,060–1,260 (8)	14.3–16.2 (8)	250–340 (7)	260–340 (9)
	539; 565	0.5; 0.5	1.23*; 0.5	5.68; 5.8	6.7; 6.75	1,150; 1,150	15.6; 16	296; 290	293; 290
IW-31A	390–600 (8)	0.3–1.7 (7)	<2–1.9 (9)	3.7–7.9 (9)	6.4–6.9 (9)	880–1,130 (9)	14.1–17.4 (9)	290–400 (7)	290–400 (7)
	509; 550	0.729; 0.6	0.770*; 0.5	5.64; 5.8	6.73; 6.8	984; 996	15.8; 16	341; 340	343; 350
IW-32A	270–670 (8)	0.2–0.9 (7)	<0.1–3.4 (8)	1.4–2 (8)	6.6–7 (8)	559–791 (8)	14.8–17.3 (8)	230–320 (7)	230–320 (7)
	454; 390	0.414; 0.4	0.793*; 0.3	1.75; 1.7	6.8; 6.8	685; 695	16.4; 16.8	274; 280	274; 280
IW-33A	420–590 (7)	0.1–0.8 (7)	<0.1–3 (8)	5.6–5.9 (7)	6.7–6.9 (7)	509–607 (7)	15.5–17.4 (7)	220–280 (7)	220–280 (7)
	509; 540	0.386; 0.4	--; <2	5.8; 5.8	6.8; 6.8	568; 584	16; 15.7	250; 250	250; 250
IW-34A	150–340 (8)	0.3–1.4 (7)	<0.1–3.1 (8)	0.1–0.5 (8)	6.7–7.1 (9)	515–595 (9)	15.7–16.7 (8)	200–220 (7)	200–220 (6)
	221; 210	0.7; 0.7	0.521*; 0.2	0.237; 0.2	6.83; 6.8	563; 581	16.4; 16.4	213; 220	212; 215
IW-35A	350–640 (9)	0.2–0.9 (8)	<0.1–3.3 (12)	0.1–0.4 (10)	6.8–7.4 (10)	1,960–2,310 (10)	12.8–17.6 (10)	310–340 (8)	310–340 (10)
	503; 560	0.463; 0.45	0.902*; <2	0.23; 0.2	7.06; 7.05	2,090; 2,060	15.1; 15.7	323; 320	322; 320
IW-36A	370–690 (9)	0.1–0.4 (8)	<0.1–2.8 (12)	3.3–6.1 (10)	6.4–6.9 (10)	1,690–2,030 (10)	14.4–16.9 (10)	320–430 (8)	320–440 (10)
	537; 570	0.213; 0.2	0.602*; <1	4.26; 3.8	6.73; 6.8	1,870; 1,880	15.5; 15.5	364; 355	360; 350
IW-37A	440–570 (7)	0.2–0.7 (7)	<0.1–3.1 (7)	2.6–7.2 (8)	6.7–6.9 (8)	903–1,030 (8)	13.7–16.8 (8)	370–390 (7)	370–390 (7)
	487; 460	0.371; 0.4	--; 0.8	6.25; 6.75	6.84; 6.85	988; 995	15.3; 15.3	379; 380	379; 380
IW-38A	140–420 (8)	1.3–6.5 (7)	0.2–8.3 (8)	0.1–0.5 (9)	6.8–7.1 (9)	936–1,160 (9)	14.8–15.8 (9)	390–430 (7)	390–430 (7)
	253; 235	3.07; 3.1	1.9; 0.45	0.267; 0.3	6.98; 7	1,020; 1,020	15.3; 15.3	407; 400	409; 400
Deep index wells									
IW-01C	60–350 (8)	0.7–4.8 (7)	0.1–1.1 (8)	0.1–0.7 (8)	7.7–8.6 (8)	274–282 (8)	15.5–16.7 (8)	110–110 (7)	110–110 (7)
	170; 150	2.04; 2	0.55; 0.5	0.312; 0.25	8.16; 8.2	279; 279	16.2; 16.3	110; 110	110; 110
IW-02C	170–300 (9)	0.3–1.6 (7)	<0.1–1.6 (9)	0.1–0.3 (9)	6.7–7 (9)	284–318 (9)	15.2–15.8 (9)	110–130 (7)	110–130 (7)
	214; 210	0.786; 0.7	0.698*; 0.7	0.189; 0.1	6.81; 6.8	296; 294	15.6; 15.8	119; 120	119; 120
IW-03C	120–320 (8)	0.2–0.6 (7)	0.4–4 (9)	0.1–0.3 (8)	7.3–7.5 (8)	325–346 (8)	15.6–16.1 (8)	120–130 (7)	120–130 (8)
	205; 180	0.4; 0.4	1.9; 0.6	0.15; 0.1	7.4; 7.4	334; 334	15.8; 15.9	129; 130	129; 130

Table A–3. Summary of physical properties and analysis of selected constituents in water samples collected as part of the *Equus* Beds Groundwater Recharge Project, 1995–2005.—Continued

[mV, millivolts; NTU, nephelometric turbidity units; NephRatio, nephelometric ratio; NTRU, nephelometric turbidity ratio units; mg/L, milligrams per liter; µS/cm, microsiemens per centimeter at 25 degrees Celsius; $CaCO_3$, calcium carbonate; --, not determined; MCL, Maximum Contaminant Level; SDWR, Secondary Drinking-Water Regulation; NA, not analyzed; <, less than; µm, micron; %, percent. The first set of numbers under each heading; for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the reporting level.]

Data-collection site (fig. 6)	Alkalinity (mg/L $CaCO_3$)	Dissolved solids (mg/L)	Suspended solids (mg/L)	Suspended sediment <63 µm (% <63 µm)	Suspended sediment (mg/L)
Drinking-water criteria	--	500 (SDWR)	--	--	--
Reporting level	2.0	1.0	4.0	0.1	0.5
Shallow index wells–Continued					
IW-22A	282–307 (7)	520–627 (8)	<4.00–<4.00 (7)	NA	NA
	296; 294	572; 565	--; <4.00	NA	NA
IW-23A	248–307 (7)	375–461 (7)	<4.00–5 (7)	NA	NA
	275; 268	427; 423	--; <4.00	NA	NA
IW-24A	230–238 (7)	536–576 (8)	<4.00–<4.00 (7)	NA	NA
	235; 236	559; 564	--; <4.00	NA	NA
IW-25A	244–290 (7)	502–574 (7)	<4.00–<4.00 (7)	NA	NA
	277; 281	535; 536	--; <4.00	NA	NA
IW-26A	253–305 (7)	396–469 (7)	<4.00–<4.00 (7)	NA	NA
	288; 296	419; 405	--; <4.00	NA	NA
IW-27A	260–276 (7)	528–558 (7)	<4.00–<4.00 (7)	NA	NA
	269; 270	538; 534	--; <4.00	NA	NA
IW-28A	204–238 (7)	580–656 (7)	<4.00–<4.00 (7)	NA	NA
	217; 213	623; 628	--; <4.00	NA	NA
IW-29A	309–340 (8)	843–1,280 (10)	<4.00–10 (8)	NA	NA
	322; 319	1,050; 1,010	6.59*; 6	NA	NA
IW-30A	173–200 (7)	634–785 (9)	<4.00–<4.00 (7)	NA	NA
	192; 196	715; 716	--; <4.00	NA	NA
IW-31A	189–225 (7)	520–691 (7)	<4.00–<4.00 (7)	NA	NA
	199; 192	602; 620	--; <4.00	NA	NA
IW-32A	172–218 (7)	356–498 (7)	<4.00–<4.00 (7)	NA	NA
	202; 211	418; 415	--; <4.00	NA	NA
IW-33A	160–180 (7)	341–420 (7)	<4.00–<4.00 (7)	NA	NA
	173; 176	386; 391	--; <4.00	NA	NA
IW-34A	144–157 (7)	322–388 (7)	<4.00–<4.00 (7)	NA	NA
	149; 150	360; 368	--; <4.00	NA	NA
IW-35A	245–271 (8)	1,080–1,260 (10)	<4.00–5 (8)	NA	NA
	257; 255	1,190; 1,190	--; <4.00	NA	NA
IW-36A	156–185 (8)	1,060–1,220 (10)	<4.00–<4.00 (8)	NA	NA
	177; 181	1,120; 1,110	--; <4.00	NA	NA
IW-37A	220–249 (7)	521–689 (7)	<4.00–<4.00 (7)	NA	NA
	231; 230	614; 626	--; <4.00	NA	NA
IW-38A	346–364 (7)	648–733 (7)	<4.00–<4.00 (7)	NA	NA
	354; 350	684; 675	--; <4.00	NA	NA
Deep index wells					
IW-01C	140–148 (7)	164–185 (7)	<4.00–4 (7)	NA	NA
	144; 144	176; 173	--; <4.00	NA	NA
IW-02C	138–158 (7)	161–192 (7)	<4.00–<4.00 (7)	NA	NA
	144; 142	183; 184	--; <4.00	NA	NA
IW-03C	165–171 (7)	193–209 (8)	<4.00–<4.00 (7)	NA	NA
	167; 167	203; 204	--; <4.00	NA	NA

Table A–3. Summary of physical properties and analysis of selected constituents in water samples collected as part of the *Equus* Beds Groundwater Recharge Project, 1995–2005.—Continued

[mV, millivolts; NTU, nephelometric turbidity units; NephRatio, nephelometric ratio; NTRU, nephelometric turbidity ratio units; mg/L, milligrams per liter; µS/cm, microsiemens per centimeter at 25 degrees Celsius; $CaCO_3$, calcium carbonate; --, not determined; MCL, Maximum Contaminant Level; SDWR, Secondary Drinking-Water Regulation; NA, not analyzed; <, less than; µm, micron; %, percent. The first set of numbers under each heading; for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the reporting level.]

Data-collection site (fig. 6)	Oxidation-reduction potential (mV)	Turbidity (NTU)	Turbidity, NephRatio (NTRU)	Dissolved oxygen (mg/L)	pH (standard units)	Specific conductance (µS/cm)	Temperature (degrees Celsius)	Carbonate hardness (mg/L $CaCO_3$)	Hardness (mg/L $CaCO_3$)
Drinking-water criteria	--	5 (MCL)	0.5–1.0 (SDWR)	--	6.5–8.5 (SDWR)	--	--	--	--
Reporting level	1.0	0.1	0.1	0.1	0.1	1.0	-5.0	1.0	1.0
Deep index wells—Continued									
IW-04C	80–530 (8)	1.1–5.8 (7)	<0.1–1.2 (8)	0.1–0.8 (8)	7.1–7.6 (7)	700–809 (8)	15.8–16.5 (8)	240–270 (7)	240–270 (7)
	188; 120	2.43; 1.8	0.774*; 0.8	0.312; 0.2	7.29; 7.2	740; 738	16.2; 16.3	244.286; 240	244; 240
IW-05C	150–310 (7)	1–6.4 (7)	0.2–5.9 (7)	0.1–1.1 (7)	6.6–6.9 (7)	489–868 (7)	15.8–16.7 (7)	170–300 (7)	170–300 (7)
	199; 180	2.61; 2.4	2.43; 2.4	0.286; 0.1	6.7; 6.7	710; 734	16.3; 16.4	247; 250	247; 250
IW-06C	90–180 (9)	1–4.5 (7)	0.1–5.4 (9)	0.1–0.2 (9)	7.1–7.4 (9)	342–359 (9)	15.4–16.4 (9)	130–140 (7)	130–140 (7)
	139; 140	2.8; 2.8	1.32; 0.9	0.111; 0.1	7.21; 7.2	350; 348	15.9; 15.8	137; 140	137; 140
IW-07C	140–360 (8)	0.2–1.5 (7)	<0.1–1.6 (8)	0.1–0.2 (8)	7–7.3 (8)	394–432 (8)	15.9–16.6 (8)	140–150 (7)	140–150 (7)
	244; 220	0.786; 0.7	0.576*; 0.3	0.113; 0.1	7.2; 7.2	407; 404	16.3; 16.5	146; 150	146; 150
IW-08C	90–260 (10)	3.7–150 (8)	<0.1–120 (14)	0.1–1.6 (10)	6.6–6.8 (10)	4,140–4,520 (10)	15.3–16.1 (10)	1,200–1,300 (8)	1,200–1,300 (11)
	145; 115	26.1; 6.95	31.1*; 1.6	0.29; 0.1	6.73; 6.75	4,360; 4,330	15.7; 15.7	1,290; 1,300	1,280; 1,300
IW-09C	120–190 (9)	2.5–27 (7)	1.1–15 (9)	0–0.2 (9)	7.2–7.6 (9)	404–579 (9)	15.7–16.2 (9)	180–220 (7)	180–210 (7)
	162; 160	10.8; 3.6	4.8; 4.2	0.111; 0.1	7.34; 7.3	519; 516	16; 16.1	197; 190	196; 190
IW-10C	110–150 (7)	0.6–3.2 (7)	<0.1–6 (8)	0.1–0.3 (7)	6.9–7.3 (7)	278–395 (7)	15.2–15.9 (7)	120–130 (7)	120–130 (7)
	130; 130	1.9; 2	1.04*; 0.3	0.157; 0.1	7.17; 7.2	354; 361	15.6; 15.5	121; 120	121; 120
IW-11C	130–190 (8)	0.3–1.4 (7)	0.2–4 (8)	0.1–0.1 (8)	7.2–7.6 (8)	379–407 (8)	15.1–16.4 (8)	84–110 (7)	84–110 (7)
	160; 165	0.671; 0.5	0.863; 0.3	0.1; 0.1	7.36; 7.35	386; 384	15.9; 16.2	105; 110	105; 110
IW-12C	100–170 (10)	2.5–14 (8)	<0.1–1.7 (10)	0.1–0.4 (10)	6.9–7 (10)	1,240–1,370 (10)	15.8–17.6 (10)	430–490 (8)	430–490 (8)
	131; 120	6.33; 4.6	0.742*; 0.6	0.21; 0.2	6.95; 6.95	1,290; 1,290	16.4; 16.4	459; 460	460; 460
IW-13C	90–130 (8)	1.8–10 (7)	<0.1–3.6 (8)	0.1–0.2 (8)	6.7–7.2 (8)	1,130–1,180 (8)	14.6–15.9 (8)	330–350 (7)	330–350 (7)
	116; 120	5.31; 3.7	1.44*; 0.7	0.138; 0.1	6.96; 7	1,160; 1,160	15.4; 15.5	340; 340	341; 340
IW-14C	100–160 (8)	2.1–12 (8)	<0.1–1.9 (8)	0.1–0.2 (8)	6.7–7 (8)	1,390–1,540 (8)	15.5–16.2 (8)	470–530 (8)	470–530 (8)
	134; 130	6.1; 4.9	0.821*; 0.6	0.138; 0.1	6.93; 7	1,440; 1,410	15.9; 16	495; 490	496; 490
IW-15C	130–370 (8)	<0.1–0.2 (7)	<0.1–4.2 (8)	0.1–0.2 (8)	7–7.3 (8)	898–957 (8)	15.7–16.5 (8)	340–360 (7)	340–360 (7)
	231; 230	0.123*; 0.1	--; <0.1	0.113; 0.1	7.16; 7.2	940; 945	16.2; 16.3	349; 350	349; 350
IW-16C	120–180 (8)	0.9–5.7 (7)	<0.1–3.4 (8)	0.1–0.3 (8)	6.4–6.8 (8)	757–930 (8)	15–16.2 (8)	320–380 (7)	320–380 (7)
	153; 150	2.86; 2.1	2.59*; 2.4	0.162; 0.15	6.69; 6.8	840; 822	15.5; 15.5	349; 340	349; 340
IW-17C	50–120 (8)	1.3–7.8 (7)	0.3–3.1 (8)	0.1–0.2 (8)	7.1–7.4 (9)	443–538 (9)	15–16.5 (9)	160–190 (7)	160–190 (7)
	90; 90	4.7; 4.7	1.16; 0.65	0.125; 0.1	7.28; 7.3	517; 525	15.9; 16.1	169; 160	169; 160
IW-18C	110–280 (8)	0.7–3.3 (7)	<0.1–6.4 (8)	0–0.5 (9)	7–7.3 (9)	972–1,020 (9)	14.4–16.3 (9)	290–320 (7)	290–320 (7)
	171; 160	2.16; 1.8	2.77*; 1.2	0.167; 0.1	7.11; 7.1	992; 993	15.6; 15.8	307; 310	307; 310
IW-19C	170–240 (7)	0.9–18 (7)	0.6–9.7 (7)	0.1–0.2 (7)	6.9–7.2 (7)	917–952 (7)	14.8–15.7 (7)	250–260 (7)	250–260 (7)
	194; 190	5.03; 3.1	4.89; 3.8	0.157; 0.2	7.06; 7.1	944; 949	15.3; 15.3	259; 260	259; 260
IW-20C	120–170 (9)	1.4–12 (8)	<0.1–22 (12)	0.1–0.2 (9)	6.9–7.1 (9)	1,150–1,330 (9)	15.4–16.2 (9)	460–530 (8)	450–530 (10)
	133; 120	4.94; 4.4	5.61*; 0.2	0.133; 0.1	7; 7	1,260; 1,260	15.9; 15.9	496; 500	493; 495
IW-21C	100–140 (8)	3.1–27 (8)	0.1–110 (9)	0.1–0.3 (8)	6.7–6.9 (8)	1,610–1,710 (8)	15.2–15.9 (8)	650–680 (8)	650–680 (8)
	118; 115	12.1; 9.1	12.8; 0.5	0.175; 0.1	6.79; 6.8	1,670; 1,670	15.6; 15.6	664; 665	665; 670
IW-22C	90–140 (9)	0.3–4.5 (7)	<0.1–5.1 (9)	0.1–0.4 (9)	6.7–7.3 (9)	684–708 (9)	15.8–16.4 (9)	230–250 (7)	230–250 (7)
	123; 120	2.51; 2.3	0.939*; 0.5	0.167; 0.1	7.13; 7.2	689; 686	16.1; 16.1	239; 240	239; 240
IW-23C	140–290 (7)	1.1–4.7 (7)	0.1–2.8 (7)	0.1–1.7 (6)	7–7.3 (8)	588–663 (8)	15–17.1 (8)	190–210 (7)	190–210 (7)
	179; 160	2.13; 1.7	1.26; 0.7	0.383; 0.1	7.15; 7.15	647; 656	16.2; 16.2	203; 200	204; 210
IW-24C	390–530 (9)	0.1–1.6 (7)	<0.1–0.9 (10)	<0.010–0.2 (10)	7–7.4 (10)	1,040–1,210 (10)	15.3–16.6 (10)	180–200 (7)	180–200 (8)
	479; 480	0.657; 0.6	0.754*; 0.6	0.122*; 0.1	7.27; 7.35	1,150; 1,150	16.1; 16.2	186; 180	186; 185

Table A–3. Summary of physical properties and analysis of selected constituents in water samples collected as part of the *Equus* Beds Groundwater Recharge Project, 1995–2005.—Continued

[mV, millivolts; NTU, nephelometric turbidity units; NephRatio, nephelometric ratio; NTRU, nephelometric turbidity ratio units; mg/L, milligrams per liter; µS/cm, microsiemens per centimeter at 25 degrees Celsius; $CaCO_3$, calcium carbonate; --, not determined; MCL, Maximum Contaminant Level; SDWR, Secondary Drinking-Water Regulation; NA, not analyzed; <, less than; µm, micron; %, percent. The first set of numbers under each heading; for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the reporting level.]

Data-collection site (fig. 6)	Alkalinity (mg/L $CaCO_3$)	Dissolved solids (mg/L)	Suspended solids (mg/L)	Suspended sediment <63 µm (% <63 µm)	Suspended sediment (mg/L)
Drinking-water criteria	--	500 (SDWR)	--	--	--
Reporting level	2.0	1.0	4.0	0.1	0.5
		Deep index wells—Continued			
IW-04C	164–173 (7)	394–491 (7)	<4.00–9 (7)	NA	NA
	169; 168	434; 443	--; <4.00	NA	NA
IW-05C	121–139 (7)	291–613 (7)	<4.00–11 (7)	NA	NA
	129; 128	461; 453	6.18*; 6	NA	NA
IW-06C	17–175 (7)	201–223 (7)	<4.00–4 (7)	NA	NA
	147; 165	212; 211	--; <4.00	NA	NA
IW-07C	151–169 (7)	236–262 (7)	<4.00–<4.00 (7)	NA	NA
	155; 153	248; 245	--; <4.00	NA	NA
IW-08C	189–199 (8)	2,380–3,230 (11)	8–24 (8)	NA	NA
	195; 195	2,690; 2,710	13.9; 12.5	NA	NA
IW-09C	188–197 (7)	292–336 (7)	4–40 (7)	NA	NA
	194; 195	310; 306	15.3; 10	NA	NA
IW-10C	136–148 (7)	206–254 (7)	<4.00–<4.00 (7)	NA	NA
	140; 140	219; 210	--; <4.00	NA	NA
IW-11C	171–186 (7)	229–264 (7)	<4.00–<4.00 (7)	NA	NA
	180; 182	242; 244	--; <4.00	NA	NA
IW-12C	350–395 (8)	792–912 (8)	<4.00–12 (8)	NA	NA
	372; 374	860; 870	5.92*; 6	NA	NA
IW-13C	246–270 (7)	651–704 (7)	<4.00–10 (7)	NA	NA
	253; 252	683; 688	5.91*; 6	NA	NA
IW-14C	263–284 (8)	928–1,010 (8)	<4.00–8 (8)	NA	NA
	272; 271	966; 968	--; <4.00	NA	NA
IW-15C	200–212 (7)	571–616 (7)	<4.00–<4.00 (7)	NA	NA
	206; 206	596; 600	--; <4.00	NA	NA
IW-16C	144–170 (7)	541–640 (7)	<4.00–12 (7)	NA	NA
	156; 155	582; 565	7.55*; 7	NA	NA
IW-17C	220–337 (7)	315–330 (7)	<4.00–12 (7)	NA	NA
	240; 226	321; 321	--; <4.00	NA	NA
IW-18C	252–264 (7)	567–596 (7)	<4.00–6 (7)	NA	NA
	256; 255	580; 581	--; <4.00	NA	NA
IW-19C	267–274 (7)	539–568 (7)	<4.00–26 (7)	NA	NA
	271; 272	557; 563	--; <4.00	NA	NA
IW-20C	226–247 (8)	830–986 (10)	<4.00–5 (8)	NA	NA
	238; 238	893; 898	--; <4.00	NA	NA
IW-21C	262–292 (8)	1,150–1,240 (8)	7–19 (8)	NA	NA
	275; 276	1,200; 1,210	13.8; 12.5	NA	NA
IW-22C	244–256 (7)	420–453 (7)	<4.00–4 (7)	NA	NA
	252; 254	434; 432	--; <4.00	NA	NA
IW-23C	238–266 (7)	382–416 (7)	<4.00–14 (7)	NA	NA
	255; 255	400; 396	--; <4.00	NA	NA
IW-24C	235–246 (7)	646–677 (8)	<4.00–<4.00 (7)	NA	NA
	242; 242	663; 664	--; <4.00	NA	NA

Table A–3. Summary of physical properties and analysis of selected constituents in water samples collected as part of the *Equus* Beds Groundwater Recharge Project, 1995–2005.—Continued

[mV, millivolts; NTU, nephelometric turbidity units; NephRatio, nephelometric ratio; NTRU, nephelometric turbidity ratio units; mg/L, milligrams per liter; µS/cm, microsiemens per centimeter at 25 degrees Celsius; $CaCO_3$, calcium carbonate; --, not determined; MCL, Maximum Contaminant Level; SDWR, Secondary Drinking-Water Regulation; NA, not analyzed; <, less than; µm, micron; %, percent. The first set of numbers under each heading; for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the reporting level.]

Data-collection site (fig. 6)	Oxidation-reduction potential (mV)	Turbidity (NTU)	Turbidity, NephRatio (NTRU)	Dissolved oxygen (mg/L)	pH (standard units)	Specific conductance (µS/cm)	Temperature (degrees Celsius)	Carbonate hardness (mg/L $CaCO_3$)	Hardness (mg/L $CaCO_3$)
Drinking-water criteria	--	5 (MCL)	0.5–1.0 (SDWR)	--	6.5–8.5 (SDWR)	--	--	--	--
Reporting level	1.0	0.1	0.1	0.1	0.1	1.0	-5.0	1.0	1.0
Deep index wells—Continued									
IW-25C	300–550 (9)	0.2–1.7 (8)	<0.1–4.8 (11)	0.1–0.3 (9)	6.7–7.4 (9)	818–1,130 (9)	15.2–16 (9)	190–300 (8)	190–300 (10)
	436; 430	0.488; 0.35	0.846*; 0.4	0.167; 0.2	7.13; 7.2	963; 952	15.7; 15.7	258; 260	252; 240
IW-26C	330–500 (6)	0.1–0.2 (6)	<0.1–2.9 (6)	0.1–0.2 (6)	7.2–7.3 (6)	903–913 (6)	16–16.8 (6)	260–280 (6)	260–280 (6)
	412; 425	0.167; 0.2	--; 0.1	0.133; 0.1	7.22; 7.2	907; 905	16.4; 16.4	265; 260	265; 260
IW-27C	220–460 (8)	0.1–28 (7)	<0.1–50 (8)	0–0.4 (8)	6.8–7.3 (8)	756–850 (8)	15.9–16.4 (8)	220–230 (7)	220–230 (7)
	316; 310	4.47; 0.7	7.31*; 0.3	0.138; 0.1	7.18; 7.2	801; 801	16.2; 16.2	223; 220	226; 230
IW-28C	200–480 (8)	0.2–0.7 (7)	<0.1–3.4 (8)	0.1–0.2 (7)	6.7–7.4 (8)	837–880 (8)	16.1–16.6 (8)	220–240 (7)	220–240 (7)
	369; 380	0.386; 0.4	0.605*; 0.3	0.143; 0.1	7.2; 7.25	856; 857	16.4; 16.5	231; 230	233; 230
IW-29C	100–150 (7)	1.8–8.4 (7)	<0.1–4 (7)	0.1–0.2 (6)	6.9–7.1 (7)	902–950 (7)	15.5–16.7 (7)	260–300 (7)	260–310 (7)
	126; 140	5.21; 4	1.53*; 1.1	0.133; 0.1	7.01; 7	931; 943	16.1; 16.1	286; 290	287; 290
IW-30C	250–520 (9)	0.1–0.8 (8)	<0.1–4 (12)	0.1–0.4 (9)	6.9–7.4 (9)	1,080–1,520 (9)	15.8–16.5 (9)	350–390 (8)	350–390 (11)
	447; 490	0.375; 0.4	1.01*; 0.2	0.156; 0.1	7.21; 7.2	1,410; 1,500	16.2; 16.3	366; 365	365; 360
IW-31C	230–470 (8)	0.2–1.4 (7)	<0.1–4.2 (9)	0–1.6 (9)	6.8–7.3 (8)	790–1,080 (9)	15.1–17 (9)	300–320 (7)	290–320 (8)
	331; 330	0.629; 0.6	1.39*; 1.2	0.3; 0.1	7.11; 7.15	994; 1,010	16.6; 16.7	310; 310	309; 310
IW-32C	200–530 (8)	0.2–3.2 (7)	<0.1–3.9 (8)	<0.010–0.2 (8)	7–7.3 (8)	761–783 (8)	15.9–16.5 (8)	240–260 (7)	240–260 (7)
	408; 415	0.914; 0.5	0.681*; 0.2	0.109*; 0.1	7.18; 7.2	772; 772	16.3; 16.3	247; 250	247; 250
IW-33C	200–510 (7)	0.4–4 (7)	<0.1–4.1 (7)	0.1–0.4 (7)	7.1–7.3 (7)	759–838 (7)	15.9–16.5 (7)	240–260 (7)	240–260 (7)
	391; 450	1.14; 0.8	1.48*; 1.1	0.214; 0.2	7.2; 7.2	821; 832	16.2; 16.1	251; 250	251; 250
IW-34C	290–500 (8)	<0.1–0.4 (7)	<0.1–3.6 (8)	0.1–0.5 (9)	7–7.4 (9)	726–771 (9)	15.6–16.7 (9)	230–260 (7)	240–260 (6)
	374; 355	0.191*; 0.1	--; <0.1	0.2; 0.2	7.19; 7.2	751; 751	16.3; 16.4	247; 250	250; 250
IW-35C	330–630 (9)	<0.1–5.5 (8)	<0.1–3.7 (11)	0.1–0.3 (10)	6.7–7.2 (10)	1,290–1,460 (10)	14.8–16.1 (10)	340–370 (8)	340–370 (10)
	471; 490	1.08*; 0.2	1.57*; 0.3	0.18; 0.2	7.01; 7.05	1,360; 1,360	15.5; 15.6	353; 350	352; 350
IW-36C	370–640 (8)	0.1–2.8 (7)	<0.1–3.1 (8)	0.5–1.7 (8)	6.7–7.2 (9)	983–1,770 (9)	15.4–16.6 (9)	320–560 (7)	320–560 (7)
	495; 495	0.686; 0.3	0.973*; 0.2	1.23; 1.3	7.01; 7.1	1,290; 1,300	16.1; 16.3	409; 390	410; 400
IW-37C	310–500 (7)	0.2–0.5 (7)	<0.1–4.5 (7)	0.1–0.2 (8)	7–7.2 (8)	759–801 (8)	15.4–16.7 (8)	220–240 (7)	220–240 (7)
	409; 400	0.314; 0.3	--; 0.5	0.125; 0.1	7.16; 7.2	772; 767	16.1; 16.1	234; 240	234; 240
IW-38C	240–500 (9)	0.1–0.8 (7)	<0.1–3.4 (9)	0.1–0.3 (10)	6.8–7.2 (10)	722–833 (10)	14.5–15.7 (10)	310–340 (7)	310–350 (7)
	349; 380	0.457; 0.4	0.790*; 0.5	0.14; 0.1	7.04; 7.1	791; 804	15.3; 15.3	319; 320	320; 320

Table A–3. Summary of physical properties and analysis of selected constituents in water samples collected as part of the *Equus* Beds Groundwater Recharge Project, 1995–2005.—Continued

[mV, millivolts; NTU, nephelometric turbidity units; NephRatio, nephelometric ratio; NTRU, nephelometric turbidity ratio units; mg/L, milligrams per liter; µS/cm, microsiemens per centimeter at 25 degrees Celsius; $CaCO_3$, calcium carbonate; --, not determined; MCL, Maximum Contaminant Level; SDWR, Secondary Drinking-Water Regulation; NA, not analyzed; <, less than; µm, micron; %, percent. The first set of numbers under each heading; for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the reporting level.]

Data-collection site (fig. 6)	Alkalinity (mg/L $CaCO_3$)	Dissolved solids (mg/L)	Suspended solids (mg/L)	Suspended sediment <63 µm (% <63 µm)	Suspended sediment (mg/L)
Drinking-water criteria	--	500 (SDWR)	--	--	--
Reporting level	2.0	1.0	4.0	0.1	0.5
Deep index wells—Continued					
IW-25C	247–284 (8)	520–661 (10)	<4.00–<4.00 (8)	NA	NA
	262; 261	565; 553	--; <4.00	NA	NA
IW-26C	263–283 (6)	525–580 (6)	<4.00–<4.00 (6)	NA	NA
	273; 273	544; 537	--; <4.00	NA	NA
IW-27C	266–274 (7)	450–494 (7)	<4.00–514 (7)	NA	NA
	271; 272	478; 484	--; <4.00	NA	NA
IW-28C	263–282 (7)	517–538 (7)	<4.00–<4.00 (7)	NA	NA
	275; 277	524; 524	--; <4.00	NA	NA
IW-29C	265–284 (7)	554–622 (7)	<4.00–6 (7)	NA	NA
	275; 274	593; 590	--; <4.00	NA	NA
IW-30C	214–226 (8)	928–953 (11)	<4.00–<4.00 (8)	NA	NA
	222; 223	942; 946	--; <4.00	NA	NA
IW-31C	247–262 (7)	601–637 (8)	<4.00–<4.00 (7)	NA	NA
	257; 258	618; 616	--; <4.00	NA	NA
IW-32C	245–260 (7)	450–476 (7)	<4.00–<4.00 (7)	NA	NA
	252; 250	462; 460	--; <4.00	NA	NA
IW-33C	259–274 (7)	471–518 (7)	<4.00–5 (7)	NA	NA
	268; 270	506; 513	--; <4.00	NA	NA
IW-34C	260–274 (7)	438–478 (7)	<4.00–<4.00 (7)	NA	NA
	269; 270	456; 455	--; <4.00	NA	NA
IW-35C	167–192 (8)	726–891 (10)	<4.00–9 (8)	NA	NA
	182; 186	798; 788	--; <4.00	NA	NA
IW-36C	213–241 (7)	592–1090 (7)	<4.00–5 (7)	NA	NA
	227; 228	770; 740	--; <4.00	NA	NA
IW-37C	234–250 (7)	445–474 (7)	<4.00–<4.00 (7)	NA	NA
	241; 240	457; 459	--; <4.00	NA	NA
IW-38C	278–310 (7)	475–546 (7)	<4.00–<4.00 (7)	NA	NA
	290; 286	511; 505	--; <4.00	NA	NA

Table A–4. Summary of major-ion and nutrient concentrations in water samples collected as part of the *Equus* Beds Groundwater Recharge Project, 1995–2005.

[mg/L, milligrams per liter; --, not determined; DWA, Drinking-Water Advisory; SDWR, Secondary Drinking-Water Regulation; <, less than; MCL, Maximum Contaminant Level; NA, not analyzed. The first set of numbers under each heading, for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the reporting level.]

Data-collection site (fig. 6)	Calcium (mg/L)	Magnesium (mg/L)	Potassium (mg/L)	Sodium (mg/L)	Bicarbonate (mg/L)	Carbonate (mg/L)	Bromide (mg/L)	Chloride (mg/L)	Fluoride (mg/L)
Drinking-water criteria	--	--	--	20 (DWA)	--	--	--	250 (SDWR)	2 (SDWR)
Reporting level	0.03	0.05	0.07	0.05	2.0	1.0	0.03	5.0	0.02
Surface-water monitoring sites (Little Arkansas River)									
7143672	8.25–174 (186)	1.6–36.2 (186)	4.4–18.1 (186)	4.38–498 (186)	3.7–460 (185)	0–16 (185)	0–1.7 (84)	8–932 (187)	0.04–2.74 (85)
(near Halstead)	84.2; 93.8	13.7; 14.5	7.96; 8	86.9; 83.4	215; 250	0.556; 0	0.462; 0.3	165; 150	0.32; 0.25
7144100	4.74–128 (161)	1.01–23.9 (161)	4.43–10.6 (161)	1.5–132 (161)	22–360 (160)	0–12 (160)	0–1 (86)	5–305 (165)	0.11–0.82 (87)
(near Sedgwick)	61.3; 60.7	11.3; 11.2	7.24; 7.35	49.3; 47.1	187; 180	0.842; 0	0.239; 0.2	80.1; 68	0.27; 0.24
Diversion well site near Halstead									
Diversion well	57.4–108 (150)	8.16–14.8 (150)	1.84–2.82 (150)	51.2–74.5 (150)	120–340 (150)	0–4 (150)	0.03–0.3 (35)	22–77.8 (315)	0.02–0.32 (35)
	87.1; 91.1	12.5; 13.3	2.34; 2.36	63.3; 63.8	314; 320	0.073; 0	0.187; 0.2	56.4; 59.6	0.219; 0.23
EB-145-A1	49.5–141 (66)	6.93–22.7 (66)	4.41–9.87 (66)	60.2–125 (66)	200–470 (65)	0–1 (65)	0.3–0.8 (32)	80–275 (66)	0.15–0.52 (33)
	102; 106	15; 15	7.11; 7.13	84.4; 81.5	342; 360	0.046; 0	0.553; 0.6	156; 158	0.33; 0.33
EB-145-A2	89.7–140 (28)	12.6–18.6 (28)	2.82–4.62 (28)	78.4–112 (28)	300–440 (28)	0–1 (28)	0.4–0.6 (13)	138–203 (28)	0.1–0.26 (13)
	112; 110	14.9; 14.7	3.4; 3.39	91.2; 91.9	360; 360	0.036; 0	0.477; 0.5	162; 160	0.2; 0.2
EB-145-A3	114–151 (33)	14.8–19.2 (33)	2.56–3.5 (33)	84.6–113 (33)	300–510 (33)	---0 (33)	0.2–0.5 (13)	59.9–178 (33)	0.02–0.32 (13)
	131; 129	17.1; 17.3	2.91; 2.9	96.6; 96.3	435; 440	--; --	0.354; 0.4	135; 145	0.17; 0.17
EB-145-A4	56.5–142 (21)	7.17–18 (21)	1.78–2.85 (21)	49.8–74.2 (21)	270–400 (21)	0–1 (21)	0.1–0.3 (9)	10–58 (21)	0.13–0.3 (9)
	94.7; 93.9	12; 11.1	2.34; 2.31	59.9; 56.3	327; 310	0.048; 0	0.133; 0.1	30.5; 23.1	0.23; 0.25
EB-145-A5	86.2–123 (32)	10.1–16 (32)	2.09–2.79 (32)	48.8–76 (32)	320–400 (32)	---0 (32)	0.1–0.1 (15)	26.7–54 (32)	0.13–0.31 (15)
	106; 108	13; 13.1	2.47; 2.5	53.3; 52.6	372; 375	--; --	0.1; 0.1	33.3; 32	0.23; 0.25
EB-145-P-D5	44.8–102 (58)	6.45–15.2 (58)	1.74–3.09 (58)	48.7–79.4 (58)	230–350 (58)	<1–<1 (58)	0–17 (28)	14–134 (58)	0.1–0.38 (28)
	68.3; 69.4	10.1; 10.3	2.24; 2.25	62.4; 63.2	280; 290	--; <1	0.79; 0.2	52; 50.5	0.28; 0.29
Halstead recharge site									
SMW-H4	46.9–100 (47)	7.79–19.8 (47)	1.39–3.49 (47)	29.8–82.6 (47)	180–330 (47)	---0 (47)	0.1–0.2 (27)	19.9–87 (47)	0.11–0.4 (27)
	79.3; 79.5	13.3; 13.4	2.36; 2.32	54.3; 54	262; 260	--; --	0.193; 0.2	49.7; 52	0.29; 0.32
SMW-H14	61.8–113 (46)	11.4–20.5 (46)	2.05–4.55 (46)	54.8–247 (46)	230–360 (46)	0–1 (46)	0.03–0.3 (28)	54.7–412 (46)	0.02–0.54 (28)
	87.9; 88.8	14.4; 14.4	2.96; 2.89	87.3; 68.6	291; 300	0.043; 0	0.197; 0.2	105; 66.1	0.26; 0.25
DMW-H1	37.3–103 (46)	6.06–16.8 (46)	2.04–3.22 (46)	29.4–74.5 (46)	180–340 (46)	---0 (46)	0–0.2 (27)	7.3–79 (46)	0.15–0.42 (27)
	85.7; 91.8	13.2; 14.1	2.65; 2.68	62.1; 67	305; 320	--; --	0.156; 0.2	52.3; 59	0.26; 0.25
DMW-H13	37.2–105 (46)	4.41–13.9 (46)	1.89–3.46 (46)	27.3–73.4 (46)	180–340 (46)	0–1 (46)	<0.03–0.2 (28)	5.8–133 (46)	0.02–0.32 (28)
	81.6; 91.5	11.1; 12.9	2.66; 2.76	57.8; 65.3	293; 320	0.043; 0	0.184*; 0.2	50; 59.4	0.23; 0.24
Sedgwick recharge site									
Treated stream water	21.7–126 (48)	4.15–23.7 (48)	3.41–10.2 (48)	11.9–127 (48)	5.3–320 (48)	0–19 (48)	0.1–0.4 (15)	13–227 (227)	0.15–0.31 (15)
	58.8; 54	11.1; 10	6.97; 6.91	44.3; 37.1	182; 170	1.94; 0	0.173; 0.1	76.8; 62.3	0.22; 0.21
SMW-S11	45.7–143 (52)	7.93–20.3 (52)	2.18–7.03 (52)	13.6–104 (52)	130–300 (52)	<1–<1 (52)	0.1–0.4 (23)	4.5–156 (52)	0.17–0.63 (23)
	77.2; 72.8	12; 11.2	3.88; 3.64	42; 38.3	192; 190	--; <1	0.143; 0.1	45.2; 28.8	0.34; 0.32
SMW-S13	47.7–111 (47)	8.55–18.8 (47)	2.17–5.24 (47)	19.6–56.6 (47)	130–220 (47)	0–1 (47)	0–0.3 (22)	7.7–105 (47)	0.3–0.61 (21)
	72.6; 72.5	12.3; 11.5	3.34; 2.84	37.2; 35.6	163; 160	0.043; 0	0.136; 0.1	48; 46	0.41; 0.41
DMW-S10	69.4–80.5 (40)	13.8–15.8 (40)	3.17–3.79 (40)	77.9–92.7 (40)	240–360 (40)	<1–<1 (40)	0.1–0.1 (22)	49–70.5 (40)	0.3–0.51 (22)
	74.4; 74	14.5; 14.4	3.45; 3.44	83.6; 83.2	335; 340	--; <1	0.1; 0.1	62.4; 63	0.39; 0.39
DMW-S14	47.3–68.2 (36)	9.4–13.1 (36)	2.53–3.25 (36)	59.6–88.8 (36)	180–330 (36)	<1–<1 (36)	0–0.1 (20)	19–51.7 (36)	0.25–0.45 (20)
	54.1; 53.3	10.9; 10.7	2.87; 2.88	73.5; 72.5	276; 270	--; <1	0.09; 0.1	27.2; 24	0.34; 0.35

Table A–4. Summary of major-ion and nutrient concentrations in water samples collected as part of the *Equus* Beds Groundwater Recharge Project, 1995–2005.—Continued

[mg/L, milligrams per liter; --, not determined; DWA, Drinking-Water Advisory; SDWR, Secondary Drinking-Water Regulation; <, less than; MCL, Maximum Contaminant Level; NA, not analyzed. The first set of numbers under each heading, for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the reporting level.]

Data-collection site (fig. 6)	Sulfate (mg/L)	Ammonia as nitrogen (mg/L)	Nitrate as nitrogen, dissolved (mg/L)	Nitrate as nitrogen, total (mg/L)	Nitrite plus nitrate as nitrogen, dissolved (mg/L)	Nitrite plus nitrate as nitrogen, total (mg/L)	Nitrite as nitrogen, dissolved (mg/L)	Nitrite as nitrogen, total (mg/L)	Phosphorus, total (mg/L)
Drinking-water criteria	250 (SDWR)	--	10 (MCL)	10 (MCL)	10 (MCL)	10 (MCL)	1 (MCL)	1 (MCL)	--
Reporting level	5.0	0.03	0.01	0.01	0.02	0.02	0.02	0.02	0.01
Surface-water monitoring sites (Little Arkansas River)									
7143672	5–312 (186)	<0.03–0.64 (168)	<0.01–2.76 (80)	0.1–0.76 (6)	<0.02–2.86 (153)	<0.02–0.78 (10)	<0.008–1.18 (85)	<0.01–0.09 (7)	0.21–2.3 (72)
(near Halstead)	40.9; 42.2	0.112*; 0.07	0.756*; 0.76	0.307; 0.21	0.696*; 0.51	0.246*; 0.17	0.050*; <0.02	--; <0.01	0.62; 0.495
7144100	5–211 (161)	<0.03–0.86 (153)	0.01–9.36 (84)	0.64–1.26 (5)	0.01–9.42 (153)	0.67–1.36 (5)	<0.01–1.46 (87)	0.01–0.1 (5)	0.07–2.03 (69)
(near Sedgwick)	38; 37	0.117*; 0.08	1.25; 1.11	--; --	1.18; 1.07	--; --	0.074*; 0.02	--; --	0.758; 0.67
Diversion well site near Halstead									
Diversion well	5–111 (150)	0.03–0.47 (142)	<0.01–0.01 (33)	<0.01–<0.01 (3)	<0.02–0.78 (111)	<0.02–<0.02 (6)	<0.01–0.02 (34)	<0.01–<0.01 (3)	NA
	57.6; 64.6	0.244; 0.245	--; <0.01	--; --	0.018; <0.02	--; <0.02	--; <0.02	--; --	NA
EB-145-A1	<5–35 (66)	1.04–12.6 (66)	<0.01–0.02 (29)	---<0.01 (1)	<0.02–0.79 (65)	<0.02–<0.02 (3)	<0.008–<0.02 (32)	<0.01–<0.01 (3)	0.09–2.55 (4)
	7.67*; <5	2.11; 1.9	--; <0.01	--; --	<0.02; <0.02	--; --	--; <0.02	--; --	--; --
EB-145-A2	<5–22.4 (27)	0.47–1.13 (28)	<0.01–0.02 (12)	---<0.01 (1)	<0.02–0.02 (28)	---<0.02 (1)	<0.01–<0.02 (12)	---<0.01 (1)	---0.58 (1)
	6.083*; <5	0.734; 0.696	--; <0.01	--; --	--; <0.02	--; --	--; <0.02	--; --	--; --
EB-145-A3	<5–163 (32)	0.19–0.33 (33)	<0.01–0.01 (13)	NA	<0.02–0.03 (32)	NA	<0.01–<0.02 (12)	NA	NA
	39.154*; 21.6	0.261; 0.26	--; <0.01	NA	--; <0.02	NA	--; <0.02	NA	NA
EB-145-A4	30–177 (21)	0.16–0.291 (21)	<0.01–0.02 (8)	NA	<0.02–0.53 (21)	NA	<0.01–0.01 (9)	NA	NA
	87.4; 64	0.228; 0.22	--; <0.01	NA	--; <0.02	NA	--; <0.02	NA	NA
EB-145-A5	46.8–116 (32)	0.166–0.343 (32)	<0.01–0.02 (15)	NA	<0.02–0.02 (32)	NA	<0.01–<0.02 (14)	NA	NA
	72.1; 72	0.239; 0.24	--; <0.01	NA	--; <0.02	NA	--; <0.02	NA	NA
EB-145-P-D5	5–70 (58)	0.172–2.56 (58)	<0.01–0.11 (27)	---<0.01 (1)	<0.02–0.15 (58)	---<0.02 (1)	<0.01–<0.02 (27)	---<0.01 (1)	---0.26 (1)
	35.9; 33	0.324; 0.27	<0.01; <0.01	--; --	0.018*; <0.02	--; --	--; <0.02	--; --	--; --
Halstead recharge site									
SMW-H4	29–76 (47)	<0.03–0.26 (47)	0.01–19.4 (27)	NA	0.02–19.4 (47)	NA	<0.02–0.02 (26)	NA	NA
	52.2; 47.9	0.054*; 0.04	7.22; 6.13	NA	5.35; 2	NA	--; <0.02	NA	NA
SMW-H14	25.6–91 (46)	<0.03–0.18 (46)	0.01–9.5 (28)	NA	0.01–9.5 (46)	NA	<0.02–0.04 (27)	NA	NA
	60.5; 61	0.049*; 0.04	2.48; 1.31	NA	1.58; 0.64	NA	--; <0.02	NA	NA
DMW-H1	19.4–110 (46)	0.03–1.64 (46)	<0.01–1 (26)	NA	<0.02–1.02 (46)	NA	<0.02–0.02 (26)	NA	NA
	66; 72.5	0.242; 0.23	<0.01; <0.01	NA	0.050*; <0.02	NA	--; <0.02	NA	NA
DMW-H13	9.7–107 (46)	0.033–0.275 (46)	<0.01–3.89 (26)	NA	<0.02–3.89 (46)	NA	<0.02–0.02 (26)	NA	NA
	59.5; 70.1	0.189; 0.2	<0.01; <0.01	NA	0.145*; <0.02	NA	--; <0.02	NA	NA
Sedgwick recharge site									
Treated stream water	14–105 (48)	<0.03–0.21 (48)	0.4–2.27 (15)	NA	0.05–2.78 (48)	NA	<0.02–0.06 (15)	NA	NA
	37.9; 33.8	0.056*; 0.05	1.18; 1.14	NA	1.13; 1	NA	0.025*; 0.02	NA	NA
SMW-S11	4.6–274 (52)	<0.03–0.18 (52)	0.01–15 (23)	NA	<0.02–15.3 (52)	NA	<0.02–0.08 (23)	NA	NA
	74.6; 61.1	0.038*; 0.02	7.37; 9.7	NA	5.418*; 3.02	NA	--; <0.02	NA	NA
SMW-S13	31–196 (47)	<0.01–0.12 (47)	0.86–11 (22)	NA	0.02–11 (47)	NA	<0.02–0.15 (22)	NA	NA
	85.7; 69	0.032*; <0.03	6.21; 7.54	NA	4.94; 3.38	NA	--; <0.02	NA	NA
DMW-S10	41–60 (40)	<0.03–0.18 (40)	0.01–1.47 (22)	NA	0.02–1.47 (40)	NA	<0.02–<0.02 (22)	NA	NA
	50.3; 50.1	0.041*; 0.03	0.16; 0.095	NA	0.16; 0.12	NA	--; <0.02	NA	NA
DMW-S14	41–63.3 (36)	<0.01–0.11 (36)	1.04–4.91 (20)	NA	0.04–5.5 (36)	NA	<0.02–0.07 (20)	NA	NA
	51.1; 51.9	0.034*; <0.03	3.98; 4.14	NA	3.53; 3.92	NA	0.033*; 0.03	NA	NA

Table A–4. Summary of major-ion and nutrient concentrations in water samples collected as part of the *Equus* Beds Groundwater Recharge Project, 1995–2005.—Continued

[mg/L, milligrams per liter; --, not determined; DWA, Drinking-Water Advisory; SDWR, Secondary Drinking-Water Regulation; <, less than; MCL, Maximum Contaminant Level; NA, not analyzed. The first set of numbers under each heading, for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the reporting level.]

Data-collection site (fig. 6)	Orthophosphate (mg/L)	Orthophosphate as phosphorous (mg/L)	Organic carbon, total (mg/L)
Drinking-water criteria	--	--	--
Reporting level	0.01	0.01	0.2
Surface-water monitoring sites (Little Arkansas River)			
7143672 (near Halstead)	0.123–1.38 (83)	0.01–0.45 (86)	3.9–26.7 (52)
	0.699; 0.675	0.226; 0.22	9.87; 8.7
7144100 (near Sedgwick)	0.113–4.75 (86)	0.037–1.55 (87)	0.6–30.4 (54)
	1.01; 0.874	0.331; 0.29	9.65; 8.1
Diversion well site near Halstead			
Diversion well	0.184–0.8 (33)	0.01–0.26 (36)	1–2.2 (31)
	0.353; 0.307	0.114; 0.1	1.34; 1.3
EB-145-A1	0.061–6.71 (32)	0.02–2.19 (33)	3–6.8 (19)
	2.07; 2.29	0.685; 0.75	4.79; 4.7
EB-145-A2	0.061–1.17 (12)	0.02–0.38 (13)	3.4–4.4 (10)
	0.481; 0.414	0.148; 0.13	3.88; 3.8
EB-145-A3	0.092–0.767 (13)	0.03–0.25 (13)	2.1–3.3 (10)
	0.366; 0.337	0.119; 0.11	2.83; 3
EB-145-A4	0.215–0.552 (9)	0.07–0.18 (9)	0.6–1.7 (7)
	0.389; 0.368	0.127; 0.12	1.13; 1.1
EB-145-A5	0.307–0.521 (15)	0.1–0.17 (15)	0.8–1 (8)
	0.38; 0.337	0.124; 0.11	0.9; 0.9
EB-145-P-D5	0.061–0.705 (26)	0.02–0.26 (28)	0.8–2.4 (15)
	0.469; 0.491	0.157; 0.16	1.17; 1.1
Halstead recharge site			
SMW-H4	0.061–0.399 (27)	0.02–0.13 (27)	0.7–1.5 (19)
	0.285; 0.307	0.093; 0.1	1.01; 0.9
SMW-H14	0.184–0.644 (27)	0.01–0.21 (28)	0.8–1.5 (20)
	0.405; 0.429	0.128; 0.14	1.03; 1
DMW-H1	0.153–0.552 (27)	0.05–0.18 (27)	0.4–1.6 (19)
	0.398; 0.399	0.13; 0.13	1.05; 1.3
DMW-H13	0.061–0.399 (27)	0.01–0.13 (28)	0.4–1.5 (20)
	0.191; 0.153	0.06; 0.05	0.98; 1.2
Sedgwick recharge site			
Treated stream water	0.031–0.92 (15)	0.01–0.3 (15)	0.5–6.8 (13)
	0.486; 0.429	0.159; 0.14	4.62; 5
SMW-S11	0.061–0.215 (22)	0.01–0.07 (23)	0.5–3.6 (15)
	0.139; 0.138	0.044; 0.04	1.32; 0.8
SMW-S13	0.061–0.245 (20)	<0.01–0.08 (22)	0.4–8.2 (15)
	0.146; 0.153	0.045*; 0.04	1.13; 0.6
DMW-S10	0.031–0.153 (15)	<0.01–0.05 (22)	0.3–0.6 (14)
	0.082; 0.061	0.021*; 0.02	0.407; 0.4
DMW-S14	0.031–0.153 (14)	<0.01–0.05 (20)	0.4–0.6 (13)
	0.07; 0.061	0.018*; 0.02	0.431; 0.4

Table A–4. Summary of major-ion and nutrient concentrations in water samples collected as part of the *Equus* Beds Groundwater Recharge Project, 1995–2005.—Continued

[mg/L, milligrams per liter; --, not determined; DWA, Drinking-Water Advisory; SDWR, Secondary Drinking-Water Regulation; <, less than; MCL, Maximum Contaminant Level; NA, not analyzed. The first set of numbers under each heading, for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the reporting level.]

Data-collection site (fig. 6)	Calcium (mg/L)	Magnesium (mg/L)	Potassium (mg/L)	Sodium (mg/L)	Bicarbonate (mg/L)	Carbonate (mg/L)	Bromide (mg/L)	Chloride (mg/L)	Fluoride (mg/L)
Drinking-water criteria	--	--	--	20 (DWA)	--	--	--	250 (SDWR)	2 (SDWR)
Reporting level	0.03	0.05	0.07	0.05	2.0	1.0	0.03	5.0	0.02
Background wells									
EB-142-A3	71.3–75.8 (3)	11.2–11.9 (3)	3.41–3.63 (3)	42.2–45.9 (3)	240–240 (3)	--–0 (3)	<0.02–0.1 (3)	30–30 (3)	0.31–0.33 (3)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
Sedgwick well	67.4–87.6 (45)	10.8–14.7 (45)	2.8–3.67 (45)	39.3–49 (45)	220–340 (45)	0–1 (45)	0.1–0.3 (28)	22–30 (45)	0.02–0.47 (28)
	78.9; 79.9	13; 13.3	3.34; 3.31	44; 44	249; 250	0.022; 0	0.107; 0.1	25.8; 25.1	0.37; 0.39
City well-Sedgwick	--–87.5 (1)	--–16.2 (1)	--–2.42 (1)	--–72 (1)	--–350 (1)	--–0 (1)	--–0.1 (1)	--–34.8 (1)	--–0.31 (1)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
TH-02-95	90.3–101 (25)	9.23–10.9 (25)	1.85–2.27 (25)	35.8–44.3 (25)	340–380 (25)	0–1 (25)	<0.02–0.1 (20)	24–32.3 (25)	0.07–0.31 (20)
	97.3; 97.8	10.2; 10.2	2.1; 2.12	40.2; 39.9	355; 350	0.04; 0	0.100*; 0.1	28.2; 28	0.17; 0.17
TH-06-95	71.9–90.8 (27)	6.81–8.45 (27)	1.55–2.3 (27)	19.9–32.5 (27)	250–290 (27)	0–1 (27)	<0.02–0.5 (22)	5–12 (27)	0.08–0.24 (22)
	84.2; 84.7	7.99; 8.09	1.83; 1.83	22.6; 21.8	272; 270	0.037; 0	0.117*; 0.1	7.67; 7	0.17; 0.17
TH-10-95	44.8–63.6 (27)	4.37–6.4 (27)	1.37–1.87 (27)	17.8–21.9 (27)	210–390 (27)	--–0 (27)	<0.02–0.3 (22)	<5–37 (27)	0.16–0.38 (22)
	52.7; 52.9	5.19; 5.18	1.72; 1.72	20.4; 20.4	231; 220	--; --	--; <0.03	5.089*; <5	0.3; 0.29
TH-12-95	--–98.5 (1)	--–15 (1)	--–2.57 (1)	--–54.4 (1)	--–280 (1)	--–0 (1)	--–0.1 (1)	--–18 (1)	--–0.27 (1)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
TH-08-A1	62.2–73.3 (7)	9.77–12.5 (7)	2.38–5.67 (7)	54.9–71.6 (7)	280–300 (7)	--–0 (7)	0.1–0.1 (5)	30–44 (7)	0.28–0.38 (5)
	67.8; 68	11.4; 11.4	2.9; 2.42	64.3; 64	294; 300	--; --	--; --	37; 37	--; --
TH-08-A2	73.3–115 (10)	12.1–18.3 (10)	2.69–3.41 (10)	48.5–73.8 (10)	320–360 (10)	<1–<1 (10)	<0.03–0.1 (3)	25–65 (10)	<0.02–0.41 (3)
	90.8; 92.5	14.2; 14.2	2.88; 2.86	62.8; 61.2	342; 345	--; <1	--; --	43.9; 44	--; --
TH-08-A3	53.5–75 (23)	10.2–13.8 (23)	1.99–2.51 (23)	58.7–90.7 (23)	290–350 (23)	--–0 (23)	0–0.1 (20)	16–47 (23)	0.22–0.57 (20)
	59.1; 58	11.2; 10.9	2.3; 2.31	69.1; 66.7	306; 300	--; --	0.095; 0.1	22.7; 20	0.4; 0.42
TH-08-A4	--–55.8 (1)	--–10.9 (1)	--–2.12 (1)	--–59.4 (1)	--–280 (1)	--–0 (1)	--–0.1 (1)	--–14 (1)	--–0.38 (1)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
TH-08-A5	57.9–79 (12)	9.91–14.4 (12)	2.65–4.8 (12)	31.3–73.7 (12)	250–330 (12)	--–0 (12)	0.1–0.1 (12)	9–21 (12)	0.14–0.46 (12)
	65.1; 64	12.1; 12.1	3.44; 3.24	56.7; 62.6	306; 325	--; --	0.1; 0.1	16; 17	0.32; 0.36
Alta Mills	103–117 (23)	13.9–15.7 (23)	2.06–2.38 (23)	40–53.7 (23)	220–410 (23)	--–0 (23)	<0.3–0.2 (18)	5–21.9 (23)	0.09–0.31 (18)
	110; 111	14.9; 15	2.19; 2.17	45.4; 44.7	374; 380	--; --	0.106*; 0.1	16.8; 18	0.22; 0.23
Aquifer storage and recovery prototype wells									
DW-TW-01	42.3–45 (7)	5.6–6.1 (7)	2.11–2.27 (7)	33.7–36.6 (7)	210–220 (7)	--–0 (7)	<0.03–<0.03 (6)	<5–11 (7)	0.21–0.34 (6)
	43.2; 43	5.81; 5.83	2.18; 2.16	34.7; 34.4	217; 220	--; --	--; --	6.645*; 6	0.27; 0.26
DW-TW-02	40.3–44 (7)	5.8–6.53 (7)	1.99–2.23 (7)	31–34.7 (7)	210–220 (7)	--–0 (7)	<0.03–0.1 (6)	5–8.7 (7)	0.13–0.3 (6)
	41.9; 41.8	6.14; 6.16	2.09; 2.09	32.7; 32.3	214; 210	--; --	--; --	6.76; 6	0.26; 0.29
DW-TW-03	42.5–44.5 (7)	5.5–6.04 (7)	1.94–2.13 (7)	30.7–33.7 (7)	210–220 (7)	--–0 (7)	<0.03–0.1 (6)	5.6–11 (7)	0.15–0.56 (6)
	43.2; 43.2	5.73; 5.73	2.04; 2.03	31.8; 31.5	213; 210	--; --	--; --	6.87; 6	0.29; 0.25
DW-TW-04	43.4–45.7 (7)	5.19–5.85 (7)	1.93–2.15 (7)	30.1–33.1 (7)	200–220 (7)	--–0 (7)	<0.03–0.1 (6)	6–9.8 (7)	0.12–0.25 (6)
	44.5; 44.6	5.52; 5.55	2.04; 2.03	31.2; 31.2	214; 220	--; --	--; --	7.14; 6	0.22; 0.24
DW-TW-05	44.8–49 (7)	4.63–5.18 (7)	1.99–2.14 (7)	29.7–33.1 (7)	220–220 (7)	--–0 (7)	<0.03–0.3 (7)	5.6–8.3 (7)	0.11–0.29 (7)
	46.4; 46.1	4.88; 4.86	2.05; 2.05	30.9; 30.2	220; 220	--; --	--; <0.03	6.2; 6	0.22; 0.24
DW-TW-06	43.2–48.2 (7)	5.18–6 (7)	1.84–1.96 (7)	28.2–32.4 (7)	200–220 (7)	--–0 (7)	<0.03–<0.03 (7)	5–9 (7)	0.12–0.28 (7)
	44.9; 44.2	5.56; 5.53	1.9; 1.9	29.8; 29.3	214; 220	--; --	--; --	5.9; 5.6	0.23; 0.25
DW-TW-07	44.8–69.6 (7)	5.69–15.4 (7)	1.88–2.36 (7)	26.7–40.4 (7)	210–220 (7)	--–0 (7)	<0.03–0.1 (7)	5.1–13 (7)	<0.1–0.29 (7)
	51; 48.3	7.7; 6.23	2; 1.97	30.6; 28.9	216; 220	--; --	--; <0.03	7.33; 6	0.254*; 0.25
DW-TW-08	46.8–49 (4)	4.7–5.04 (4)	1.67–1.77 (4)	28.8–30.1 (4)	210–230 (4)	--–0 (4)	<0.03–<0.03 (4)	5–7.8 (4)	0.22–0.31 (4)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
DW-TW-09	45.1–46.2 (4)	5.33–5.71 (4)	1.81–1.87 (4)	29–30 (4)	220–230 (4)	--–0 (4)	<0.03–<0.03 (4)	<5–7.1 (4)	0.25–0.31 (4)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
RRW-01	37.1–48.8 (7)	3.76–4.51 (7)	1.44–1.98 (7)	14.9–19.7 (7)	160–190 (7)	--–0 (7)	<0.03–<0.03 (6)	<5–6 (7)	0.11–0.29 (6)
	41.1; 39.2	4.08; 4.12	1.75; 1.82	17.4; 17.5	173; 170	--; --	--; --	5.051*; 5	0.17; 0.15
RRW-02	41.7–47 (7)	5.43–6.26 (7)	2.37–2.58 (7)	30.1–44.4 (7)	210–230 (7)	--–0 (7)	<0.03–0.1 (7)	6.8–12 (7)	0.23–0.47 (7)
	44.7; 45.3	5.87; 5.89	2.44; 2.41	33.7; 31	220; 220	--; --	--; <0.03	8.16; 7.7	0.33; 0.32
RRW-03	43.3–49.3 (5)	6.47–7.78 (5)	2.6–2.98 (5)	32–36.1 (5)	160–180 (5)	--–0 (5)	0.1–0.5 (5)	31–57 (5)	0.17–0.3 (5)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --

Table A–4. Summary of major-ion and nutrient concentrations in water samples collected as part of the *Equus* Beds Groundwater Recharge Project, 1995–2005.—Continued

[mg/L, milligrams per liter; --, not determined; DWA, Drinking-Water Advisory; SDWR, Secondary Drinking-Water Regulation; <, less than; MCL, Maximum Contaminant Level; NA, not analyzed. The first set of numbers under each heading, for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the reporting level.]

Data-collection site (fig. 6)	Sulfate (mg/L)	Ammonia as nitrogen (mg/L)	Nitrate as nitrogen, dissolved (mg/L)	Nitrate as nitrogen, total (mg/L)	Nitrite plus nitrate as nitrogen, dissolved (mg/L)	Nitrite plus nitrate as nitrogen, total (mg/L)	Nitrite as nitrogen, dissolved (mg/L)	Nitrite as nitrogen, total (mg/L)	Phosphorus, total (mg/L)
Drinking-water criteria	250 (SDWR)	--	10 (MCL)	10 (MCL)	10 (MCL)	10 (MCL)	1 (MCL)	1 (MCL)	--
Reporting level	5.0	0.03	0.01	0.01	0.02	0.02	0.02	0.02	0.01
Background wells									
EB-142-A3	77–86 (3)	0.018–0.04 (3)	<0.01–<0.01 (3)	--–<0.01 (1)	<0.02–<0.02 (3)	--–<0.02 (1)	<0.01–<0.01 (3)	--–<0.01 (1)	--–0.07 (1)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
Sedgwick well	76–137 (45)	<0.01–0.01 (27)	<0.01–0.38 (26)	--–<0.01 (1)	<0.02–0.38 (45)	<0.02–0.03 (3)	17.6–21.3 (27)	<0.01–<0.01 (3)	NA
	99.9; 103	--; <0.02	<0.01; <0.01	--; --	0.022*; <0.02	--; --	19.7; 19.7	--; --	NA
City well-Sedgwick	--–74.5 (1)	--–0.184 (1)	NA	NA	--–<0.02 (1)	--–<0.02 (1)	--–<0.01 (1)	--–<0.01 (1)	--–0.07 (1)
	--; --	--; --	NA	NA	--; --	--; --	--; --	--; --	--; --
TH-02-95	5–52 (25)	<0.03–0.35 (25)	<0.01–0.01 (19)	NA	<0.02–0.02 (25)	--–<0.02 (1)	<0.01–<0.02 (20)	--–<0.01 (1)	--–0.09 (1)
	36.9; 39	0.080*; 0.068	--; <0.01	NA	--; <0.02	--; --	--; <0.02	--; --	--; --
TH-06-95	10–64.5 (27)	0.03–0.56 (27)	<0.01–0.06 (21)	NA	<0.02–0.07 (27)	<0.02–0.05 (2)	<0.01–0.01 (22)	<0.01–<0.01 (2)	0.17–0.19 (2)
	54.4; 56	0.119; 0.08	--; <0.01	NA	--; <0.02	--; --	--; <0.02	--; --	--; --
TH-10-95	<5–14 (27)	0.072–2.21 (27)	<0.01–0.11 (21)	NA	<0.02–0.11 (27)	--–<0.02 (1)	<0.01–<0.02 (22)	--–<0.01 (1)	--–0.31 (1)
	9.595*; 9.5	0.365; 0.24	0.026*; <0.01	NA	0.025*; <0.02	--; --	--; <0.02	--; --	--; --
TH-12-95	--–186 (1)	--–0.055 (1)	NA	NA	--–<0.02 (1)	--–<0.02 (1)	--–<0.01 (1)	--–<0.01 (1)	--–0.08 (1)
	--; --	--; --	NA	NA	--; --	--; --	--; --	--; --	--; --
TH-08-A1	44–64 (7)	0.108–0.702 (7)	0.01–2.61 (5)	--–0.18 (1)	<0.01–2.61 (7)	--–0.18 (1)	<0.01–<0.01 (5)	--–<0.01 (1)	--–0.23 (1)
	53.3; 53	0.199; 0.115	--; --	--; --	0.652*; 0.23	--; --	--; --	--; --	--; --
TH-08-A2	41–89 (10)	0.029–0.207 (10)	<0.01–0.11 (3)	--–<0.01 (1)	<0.02–0.17 (10)	--–<0.02 (1)	<0.01–<0.02 (3)	--–<0.01 (1)	--–0.14 (1)
	60.8; 60.7	0.093; 0.068	--; --	--; --	0.062*; 0.01	--; --	--; --	--; --	--; --
TH-08-A3	49–73 (23)	0.05–1.76 (23)	<0.01–0.03 (20)	NA	<0.02–0.03 (23)	NA	<0.01–<0.02 (20)	NA	NA
	55.8; 54	0.332; 0.28	0.007*; <0.01	NA	0.012*; <0.02	NA	--; <0.02	NA	NA
TH-08-A4	--–45 (1)	--–0.32 (1)	--–0.01 (1)	NA	--–0.01 (1)	NA	--–<0.02 (1)	NA	NA
	--; --	--; --	--; --	NA	--; --	NA	--; --	NA	NA
TH-08-A5	<5–70 (12)	0.04–0.22 (12)	<0.01–1.14 (12)	NA	<0.02–1.14 (12)	NA	<0.02–<0.02 (12)	NA	NA
	55.804*; 62	0.125; 0.12	0.211*; <0.01	NA	0.211*; <0.02	NA	--; <0.02	NA	NA
Alta Mills	6–68 (23)	<0.03–0.23 (23)	3.59–11.5 (18)	NA	<0.02–11.7 (23)	NA	<0.02–6.76 (18)	NA	NA
	50.4; 52	0.043*; <0.03	6.8; 6.54	NA	7.284*; 6.65	NA	--; <0.02	NA	NA
Aquifer storage and recovery prototype wells									
DW-TW-01	8.3–19 (7)	0.09–0.14 (7)	<0.01–0.2 (6)	NA	<0.02–0.2 (7)	NA	<0.02–<0.02 (6)	NA	NA
	15.7; 16.7	0.119; 0.12	--; <0.01	NA	--; <0.02	NA	--; <0.02	NA	NA
DW-TW-02	13–20 (7)	0.12–0.16 (7)	<0.01–0.03 (6)	NA	<0.02–0.03 (7)	NA	<0.02–<0.02 (6)	NA	NA
	15.2; 15	0.14; 0.14	--; <0.01	NA	--; <0.02	NA	--; <0.02	NA	NA
DW-TW-03	11.8–19.1 (7)	0.15–0.19 (7)	<0.01–0.07 (6)	NA	<0.02–0.07 (7)	NA	<0.02–<0.02 (6)	NA	NA
	15.2; 15.1	0.164; 0.16	--; 0.02	NA	--; 0.02	NA	--; <0.02	NA	NA
DW-TW-04	12–17 (7)	0.12–0.18 (7)	<0.01–0.05 (6)	NA	<0.02–0.05 (7)	NA	<0.02–<0.02 (6)	NA	NA
	14.9; 14	0.154; 0.16	--; <0.01	NA	--; <0.02	NA	--; <0.02	NA	NA
DW-TW-05	12.8–18 (7)	0.14–0.2 (7)	<0.01–0.05 (7)	NA	<0.02–0.05 (7)	NA	<0.02–<0.02 (7)	NA	NA
	15.5; 16	0.164; 0.16	--; <0.01	NA	--; <0.02	NA	--; <0.02	NA	NA
DW-TW-06	11–15.3 (7)	0.18–0.23 (7)	<0.01–0.05 (7)	NA	<0.02–0.05 (7)	NA	<0.02–<0.02 (7)	NA	NA
	13.2; 13.5	0.206; 0.21	--; <0.01	NA	--; <0.02	NA	--; <0.02	NA	NA
DW-TW-07	9.7–135 (7)	0.19–0.26 (7)	<0.01–0.04 (7)	NA	<0.02–0.04 (7)	NA	<0.02–<0.02 (7)	NA	NA
	35.5; 14.6	0.209; 0.2	--; <0.01	NA	--; <0.02	NA	--; <0.02	NA	NA
DW-TW-08	12.6–18.4 (4)	0.16–0.2 (4)	<0.01–0.04 (4)	NA	<0.02–0.04 (4)	NA	<0.02–<0.02 (4)	NA	NA
	--; --	--; --	--; --	NA	--; --	NA	--; --	NA	NA
DW-TW-09	12.4–15.4 (4)	0.19–0.28 (4)	<0.01–0.12 (4)	NA	<0.02–0.12 (4)	NA	<0.02–<0.02 (4)	NA	NA
	--; --	--; --	--; --	NA	--; --	NA	--; --	NA	NA
RRW-01	7.1–16.1 (7)	0.03–0.07 (7)	<0.01–1.07 (6)	NA	<0.02–1.07 (7)	NA	<0.02–0.02 (6)	NA	NA
	10.2; 9.4	0.051; 0.06	0.372*; 0.19	NA	0.375*; 0.3	NA	--; <0.02	NA	NA
RRW-02	17–22 (7)	0.12–0.15 (7)	<0.01–0.05 (7)	NA	<0.02–0.05 (7)	NA	<0.02–<0.02 (7)	NA	NA
	18.4; 17.8	0.134; 0.14	--; <0.01	NA	--; <0.02	NA	--; <0.02	NA	NA
RRW-03	22–30 (5)	0.09–0.15 (5)	<0.01–0.01 (5)	NA	<0.02–0.01 (5)	NA	<0.02–<0.02 (5)	NA	NA
	--; --	--; --	--; --	NA	--; --	NA	--; --	NA	NA

Table A–4. Summary of major-ion and nutrient concentrations in water samples collected as part of the *Equus* Beds Groundwater Recharge Project, 1995–2005.—Continued

[mg/L, milligrams per liter; --, not determined; DWA, Drinking-Water Advisory; SDWR, Secondary Drinking-Water Regulation; <, less than; MCL, Maximum Contaminant Level; NA, not analyzed. The first set of numbers under each heading, for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the reporting level.]

Data-collection site (fig. 6)	Orthophosphate (mg/L)	Orthophosphate as phosphorous (mg/L)	Organic carbon, total (mg/L)
Drinking-water criteria	--	--	--
Reporting level	0.01	0.01	0.2
	Background wells		
EB-142-A3	NA	<0.01–<0.01 (3)	0.5–0.7 (3)
	NA	--; --	--; --
Sedgwick well	0.061–0.153 (14)	<0.03–0.15 (45)	0.6–1.3 (15)
	0.107; 0.123	0.043*; 0.033	0.753; 0.6
City well-Sedgwick	-–0.061 (1)	-–0.02 (1)	-–1.2 (1)
	--; --	--; --	--; --
TH-02-95	0.031–0.245 (10)	<0.01–0.08 (20)	0.5–0.8 (7)
	0.104; 0.092	0.021*; 0.01	0.643; 0.6
TH-06-95	0.123–0.583 (14)	<0.01–0.19 (22)	0.5–1 (8)
	0.3; 0.292	0.070*; 0.06	0.775; 0.75
TH-10-95	0.368–0.767 (21)	0.12–0.25 (22)	0.7–1.1 (7)
	0.57; 0.583	0.185; 0.185	0.857; 0.8
TH-12-95	NA	-–<0.02 (1)	-–1.3 (1)
	NA	--; --	--; --
TH-08-A1	0.276–0.736 (5)	0.09–0.24 (5)	0.6–1.9 (5)
	--; --	--; --	--; --
TH-08-A2	0.245–0.337 (2)	<0.01–0.11 (3)	0.7–0.8 (3)
	--; --	--; --	--; --
TH-08-A3	0.215–0.644 (19)	0.07–0.21 (20)	0.7–1.1 (7)
	0.405; 0.399	0.132; 0.125	0.843; 0.8
TH-08-A4	-–0.521 (1)	-–0.17 (1)	-–0.7 (1)
	--; --	--; --	--; --
TH-08-A5	0.153–0.767 (11)	0.05–0.25 (12)	0.5–1.2 (3)
	0.463; 0.46	0.156; 0.15	--; --
Alta Mills	0.307–0.797 (17)	0.1–0.26 (18)	0.7–1.1 (6)
	0.638; 0.705	0.209; 0.23	0.95; 0.95
	Aquifer storage and recovery prototype wells		
DW-TW-01	0.276–0.429 (6)	0.09–0.14 (6)	0.5–0.5 (6)
	0.378; 0.399	0.123; 0.13	0.5; 0.5
DW-TW-02	0.368–0.399 (6)	0.12–0.13 (6)	0.5–0.5 (6)
	0.389; 0.399	0.127; 0.13	0.5; 0.5
DW-TW-03	0.368–0.552 (6)	0.12–0.18 (6)	0.4–0.5 (6)
	0.429; 0.399	0.14; 0.13	0.483; 0.5
DW-TW-04	0.337–0.399 (6)	0.11–0.13 (6)	0.4–0.5 (6)
	0.368; 0.368	0.12; 0.12	0.433; 0.4
DW-TW-05	0.46–0.675 (6)	<0.01–0.22 (7)	0.4–0.5 (6)
	0.572; 0.567	0.179*; 0.18	0.45; 0.45
DW-TW-06	0.215–0.583 (7)	0.07–0.19 (7)	0.4–0.6 (6)
	0.416; 0.429	0.136; 0.14	0.517; 0.5
DW-TW-07	0.276–0.521 (7)	0.09–0.17 (7)	0.5–0.5 (6)
	0.416; 0.429	0.136; 0.14	0.5; 0.5
DW-TW-08	0.521–0.675 (4)	0.17–0.22 (4)	0.5–0.6 (4)
	--; --	--; --	--; --
DW-TW-09	0.552–0.797 (4)	0.18–0.26 (4)	0.5–0.6 (4)
	--; --	--; --	--; --
RRW-01	0.153–0.399 (6)	0.05–0.13 (6)	0.3–0.4 (6)
	0.261; 0.245	0.085; 0.08	0.333; 0.3
RRW-02	0.767–4.81 (7)	0.25–1.57 (7)	0.4–0.8 (6)
	1.703; 1.07	0.556; 0.35	0.533; 0.5
RRW-03	0.429–0.521 (5)	0.14–0.17 (5)	0.3–0.4 (4)
	--; --	--; --	--; --

Table A–4. Summary of major-ion and nutrient concentrations in water samples collected as part of the *Equus* Beds Groundwater Recharge Project, 1995–2005.—Continued

[mg/L, milligrams per liter; --, not determined; DWA, Drinking-Water Advisory; SDWR, Secondary Drinking-Water Regulation; <, less than; MCL, Maximum Contaminant Level; NA, not analyzed. The first set of numbers under each heading, for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the reporting level.]

Data-collection site (fig. 6)	Calcium (mg/L)	Magnesium (mg/L)	Potassium (mg/L)	Sodium (mg/L)	Bicarbonate (mg/L)	Carbonate (mg/L)	Bromide (mg/L)	Chloride (mg/L)	Fluoride (mg/L)
Drinking-water criteria	--	--	--	20 (DWA)	--	--	--	250 (SDWR)	2 (SDWR)
Reporting level	0.03	0.05	0.07	0.05	2.0	1.0	0.03	5.0	0.02
Shallow index wells									
IW-01A	7.41–12.5 (7)	1.85–3.14 (7)	1.06–1.31 (7)	12.5–15.6 (7)	39–69 (7)	--–0 (7)	<0.03–0.1 (6)	<5–11 (7)	0.07–0.32 (6)
	10.5; 10.5	2.58; 2.61	1.19; 1.2	14.1; 13.8	51.3; 50	--; --	--; --	7.658*; 7.1	0.16; 0.14
IW-02A	11.7–16.3 (7)	2.63–3.02 (7)	2.16–2.63 (7)	16–19 (7)	34–48 (7)	--–0 (7)	<0.03–<0.03 (6)	5–14 (7)	0.07–0.26 (6)
	13; 12.6	2.76; 2.76	2.33; 2.36	17.4; 17	39.9; 38	--; --	--; <0.03	7.66; 6	0.13; 0.11
IW-03A	40.3–57 (7)	7.35–10.1 (7)	1.32–1.52 (7)	49–57.9 (7)	250–280 (7)	--–0 (7)	<0.03–0.1 (6)	7.3–28 (7)	0.25–0.43 (6)
	48.4; 47.2	8.9; 8.99	1.39; 1.37	53.6; 53.8	266; 260	--; --	--; --	18.6; 20	0.32; 0.3
IW-04A	27.9–42.2 (7)	5.76–10.1 (7)	8.8–12.7 (7)	50.5–71.5 (7)	160–270 (7)	--–0 (7)	0.1–0.1 (6)	53–66 (7)	0.04–0.2 (6)
	34.9; 32.3	7.65; 7.76	9.96; 9.65	64.2; 67.9	221; 220	--; --	0.1; 0.1	57.7; 56	0.12; 0.11
IW-05A	35.2–41.2 (7)	6.33–7.87 (7)	3.06–3.48 (7)	26.2–31.8 (7)	93–110 (7)	--–0 (7)	<0.03–0.2 (7)	34–54 (7)	0.1–0.26 (7)
	38.5; 38.3	7.09; 6.94	3.24; 3.25	28.9; 28	100; 100	--; --	0.154*; 0.2	42.6; 41.2	0.16; 0.14
IW-06A	58.2–66.9 (8)	9.7–11.8 (8)	1.85–2.25 (8)	38.6–49.1 (8)	98–120 (7)	--–0 (7)	0.2–0.3 (7)	40–59 (8)	0.09–0.24 (8)
	61.7; 61	10.6; 10.4	2.06; 2.05	42.4; 39.9	110; 110	--; --	0.271; 0.3	45.9; 42.3	0.16; 0.16
IW-07A	41.8–44.6 (7)	5.01–5.3 (7)	1.7–1.95 (7)	28.2–32.2 (7)	200–210 (7)	--–0 (7)	<0.03–0.1 (7)	7–11 (7)	0.25–0.38 (7)
	43.2; 43	5.14; 5.15	1.85; 1.87	29.7; 29	203; 200	--; --	--; --	8.69; 8	0.33; 0.34
IW-08A	144–161 (7)	31.2–37.2 (7)	5.21–6.54 (7)	137–191 (7)	280–340 (7)	--–0 (7)	0.4–0.6 (6)	136–154 (7)	0.29–0.56 (6)
	154; 155	34.7; 35	5.68; 5.58	157; 154	310; 310	--; --	0.5; 0.5	146; 147	0.4; 0.42
IW-09A	63.5–69.9 (7)	12.1–12.9 (7)	3.45–3.82 (7)	30.8–45.1 (7)	130–180 (7)	--–0 (7)	0.1–0.2 (7)	10.5–19 (7)	0.26–0.51 (7)
	66.7; 65.5	12.5; 12.5	3.61; 3.55	36.7; 34.2	154; 150	--; --	0.114; 0.1	15.5; 16	0.42; 0.47
IW-10A	43–52.6 (7)	9.09–11.3 (7)	3.39–3.87 (7)	29.1–37.4 (7)	110–120 (7)	--–0 (7)	0.1–0.3 (7)	39–61 (7)	0.15–0.25 (7)
	47.4; 47.7	10; 9.93	3.58; 3.52	32.6; 33.2	113; 110	--; --	0.214; 0.2	52.3; 53	0.18; 0.18
IW-11A-2	38.9–57.2 (7)	5.37–7.6 (7)	1.83–2.16 (7)	39.1–51.9 (7)	230–310 (7)	--–0 (7)	<0.03–0.1 (7)	6–19 (7)	0.25–0.39 (7)
	44.7; 43.3	5.98; 5.78	2.01; 2.04	43; 41.3	256; 250	--; --	--; <0.03	9.57; 8	0.3; 0.3
IW-12A	58.2–95.9 (9)	10.5–17.2 (9)	1.16–2.02 (9)	33.2–70.6 (9)	220–350 (8)	--–0 (8)	0–0.2 (8)	6.3–36 (9)	0.18–0.3 (9)
	73.7; 75.8	13.3; 13.3	1.49; 1.4	50.5; 44.9	291; 290	--; --	0.1; 0.1	18; 19	0.24; 0.24
IW-13A	112–129 (8)	24.9–28.8 (8)	3.48–4.51 (8)	115–141 (8)	330–360 (7)	--–0 (7)	0.1–0.2 (7)	114–155 (8)	0.4–0.62 (8)
	116; 114	26.2; 26.1	4.08; 4.17	127; 128	340; 340	--; --	0.143; 0.1	131; 128	0.53; 0.52
IW-14A	43.5–131 (8)	8.71–26.5 (8)	3.48–4.67 (8)	80.9–137 (8)	74–270 (8)	--–0 (8)	0.1–0.1 (8)	43–118 (8)	0.55–0.92 (8)
	69.2; 61.8	14.6; 13.4	3.84; 3.73	94.1; 87.3	153; 145	--; --	0.1; 0.1	66.4; 58.5	0.67; 0.65
IW-15A	170–208 (7)	31.6–39.5 (7)	4.63–5.17 (7)	80.6–89.2 (7)	250–290 (7)	<1–<1 (7)	0.1–0.2 (7)	61–102 (7)	0.05–0.42 (7)
	184; 183	34; 33.4	4.88; 4.91	84.6; 83.7	269; 270	--; <1	0.157; 0.2	72.7; 68	0.31; 0.34
IW-16A	111–124 (7)	16.9–18.7 (7)	3.74–4 (7)	38.9–42.6 (7)	170–200 (7)	<1–<1 (7)	0–0.1 (7)	14–17 (7)	0.08–0.25 (7)
	117; 116	17.7; 17.6	3.87; 3.87	41.1; 41.6	181; 180	--; <1	0.086; 0.1	15.7; 16	0.18; 0.19
IW-17A	100–109 (7)	15.5–16.9 (7)	3.13–3.27 (7)	78.4–92.7 (7)	300–440 (7)	--–0 (7)	<0.03–0.1 (7)	8–11 (7)	0.05–0.41 (7)
	104; 103	16; 16	3.21; 3.22	85.5; 84.5	404; 420	--; --	0.100*; 0.1	9.57; 9	0.29; 0.32
IW-18A	132–151 (7)	21.2–24.3 (7)	4.47–4.83 (7)	104–127 (7)	360–370 (7)	--–0 (7)	0.2–0.2 (7)	116–151 (7)	0.41–0.54 (7)
	138; 136	22.5; 22.3	4.61; 4.57	114; 113	366; 370	--; --	0.2; 0.2	140; 143	0.5; 0.51
IW-19A	152–177 (7)	30.4–38.6 (7)	5.17–6.34 (7)	138–169 (7)	370–450 (7)	<1–<1 (7)	0.1–0.3 (7)	134–178 (7)	0.52–0.74 (7)
	163; 162	34.2; 34.4	5.91; 5.94	158; 161	417; 420	--; <1	0.2; 0.2	153; 148	0.62; 0.6
IW-20A	187–219 (7)	35–41.4 (7)	5.16–5.67 (7)	154–179 (7)	210–220 (7)	--–0 (7)	0.1–0.2 (7)	71–88 (7)	0.07–0.66 (7)
	202; 204	39.5; 39.3	5.34; 5.34	168; 171	213; 210	--; --	0.171; 0.2	81.7; 82	0.44; 0.56
IW-21A	110–146 (7)	20.4–26 (7)	3.66–4.67 (7)	55.7–72 (7)	210–280 (7)	<1–<1 (7)	0.1–0.1 (7)	38–75 (7)	0.07–0.36 (7)
	123; 118	22.5; 21.6	3.95; 3.79	63; 61.7	234; 230	--; <1	0.1; 0.1	51.9; 52	0.26; 0.27
IW-22A	110–130 (8)	15.9–19.8 (8)	2.81–3.61 (8)	50.7–63.5 (8)	340–370 (7)	--–0 (7)	0.1–0.1 (7)	20–50 (8)	0.32–0.49 (8)
	119; 117	18.1; 17.8	3.25; 3.3	56.4; 56.4	359; 360	--; --	0.1; 0.1	27.8; 24.6	0.41; 0.42
IW-23A	57.8–71.6 (7)	11.9–14.6 (7)	2.27–2.55 (7)	67.9–79.1 (7)	300–370 (7)	--–0 (7)	0.1–0.1 (7)	12–18 (7)	0.35–0.48 (7)
	66.7; 67	13.5; 13.4	2.41; 2.44	72.9; 70.5	336; 330	--; --	0.1; 0.1	15.3; 15	0.44; 0.45
IW-24A	97.8–108 (8)	16.7–18.9 (8)	3.06–3.54 (8)	65.2–74.9 (8)	280–290 (7)	--–0 (7)	0.1–0.2 (7)	89–101 (8)	0.3–0.51 (8)
	102; 101	17.8; 17.6	3.39; 3.46	70.9; 71.1	286; 290	--; --	0.143; 0.1	97.4; 99.4	0.45; 0.49
IW-25A	93.2–103 (7)	13.3–17.7 (7)	3.4–5.84 (7)	69.2–87.8 (7)	300–350 (7)	--–0 (7)	0.1–0.2 (7)	28–67.5 (7)	0.05–0.67 (7)
	96.5; 95.1	14.2; 13.5	5.14; 5.31	80.2; 81.1	337; 340	--; --	0.114; 0.1	54.2; 56	0.41; 0.44
IW-26A	77.6–98.2 (7)	13.5–17 (7)	3.42–4.27 (7)	39.1–48.1 (7)	310–370 (7)	--–0 (7)	<0.03–0.1 (7)	6–17 (7)	0.38–0.81 (7)
	87.5; 86.8	15.5; 15.7	3.82; 3.9	44.3; 45	351; 360	--; --	--; <0.03	10.9; 10	0.57; 0.51

Table A–4. Summary of major-ion and nutrient concentrations in water samples collected as part of the *Equus* Beds Groundwater Recharge Project, 1995–2005.—Continued

[mg/L, milligrams per liter; --, not determined; DWA, Drinking-Water Advisory; SDWR, Secondary Drinking-Water Regulation; <, less than; MCL, Maximum Contaminant Level; NA, not analyzed. The first set of numbers under each heading, for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the reporting level.]

Data-collection site (fig. 6)	Sulfate (mg/L)	Ammonia as nitrogen (mg/L)	Nitrate as nitrogen, dissolved (mg/L)	Nitrate as nitrogen, total (mg/L)	Nitrite plus nitrate as nitrogen, dissolved (mg/L)	Nitrite plus nitrate as nitrogen, total (mg/L)	Nitrite as nitrogen, dissolved (mg/L)	Nitrite as nitrogen, total (mg/L)	Phosphorus, total (mg/L)
Drinking-water criteria	250 (SDWR)	--	10 (MCL)	10 (MCL)	10 (MCL)	10 (MCL)	1 (MCL)	1 (MCL)	--
Reporting level	5.0	0.03	0.01	0.01	0.02	0.02	0.02	0.02	0.01
Shallow index wells—Continued									
IW-01A	<5–22 (7)	<0.03–0.66 (7)	0.08–2.04 (6)	NA	0.08–2.04 (7)	NA	<0.02–<0.02 (6)	NA	NA
	17.369*; 18	--; <0.03	1.08; 1.09	NA	1.06; 1	NA	--; <0.02	NA	NA
IW-02A	36.9–51 (7)	<0.03–0.069 (7)	0.66–1.05 (6)	NA	0.66–1.05 (7)	NA	<0.02–0.66 (6)	NA	NA
	41.1; 39	--; <0.03	0.872; 0.915	NA	0.88; 0.93	NA	--; <0.02	NA	NA
IW-03A	12.6–42 (7)	0.1–0.18 (7)	<0.01–0.07 (6)	NA	<0.02–0.07 (7)	NA	<0.02–<0.02 (6)	NA	NA
	32.5; 36	0.137; 0.14	--; <0.01	NA	--; <0.02	NA	--; <0.02	NA	NA
IW-04A	6–29 (7)	0.04–3.22 (7)	<0.01–1.65 (6)	NA	<0.02–1.65 (7)	NA	<0.02–0.02 (6)	NA	NA
	15.2; 11	1.01; 0.28	0.388*; 0.02	NA	0.409*; 0.03	NA	--; <0.02	NA	NA
IW-05A	25–39 (7)	<0.03–0.07 (7)	0.12–6.61 (7)	NA	0.19–6.61 (7)	NA	<0.02–3.52 (7)	NA	NA
	29.9; 29	0.043*; 0.04	4.06; 4.15	NA	4.07; 4.15	NA	--; <0.02	NA	NA
IW-06A	38–55.5 (8)	<0.03–0.06 (8)	17.2–23.8 (7)	NA	17.2–23.8 (8)	NA	<0.008–<0.02 (8)	NA	--–0.11 (1)
	46.1; 45.8	--; <0.04	20.9; 21.3	NA	21.2; 21.6	NA	--; <0.02	NA	--; --
IW-07A	13–20 (7)	0.14–0.24 (7)	<0.01–0.08 (7)	NA	<0.02–0.08 (7)	NA	<0.02–0.01 (7)	NA	NA
	15.6; 16	0.2; 0.2	--; 0.01	NA	--; <0.02	NA	--; <0.02	NA	NA
IW-08A	315–515 (7)	<0.03–0.208 (7)	2.26–6.22 (6)	NA	2.26–6.22 (7)	NA	<0.02–<0.02 (6)	NA	NA
	370; 359	--; 0.03	4.47; 4.6	NA	4.26; 3.87	NA	--; <0.02	NA	NA
IW-09A	79–139 (7)	<0.03–0.06 (7)	<0.01–13.2 (7)	NA	0.06–13.3 (7)	NA	<0.02–0.06 (7)	NA	NA
	109; 104	--; <0.03	7.79*; 6.96	NA	7.36; 6.96	NA	--; 0.05	NA	NA
IW-10A	31–48 (7)	<0.03–0.06 (7)	3.73–8.46 (7)	NA	3.73–8.46 (7)	NA	<0.02–<0.02 (7)	NA	NA
	38.3; 38	--; <0.03	5.92; 5.29	NA	5.92; 5.29	NA	--; <0.02	NA	NA
IW-11A-2	<5–11 (7)	0.23–0.27 (7)	<0.01–0.28 (7)	NA	<0.02–0.28 (7)	NA	<0.02–<0.02 (7)	NA	NA
	8.895*; 9	0.246; 0.24	--; 0.02	NA	--; 0.02	NA	--; <0.02	NA	NA
IW-12A	46–128 (9)	<0.03–0.09 (9)	0.05–0.48 (8)	NA	0.05–0.48 (9)	NA	<0.02–0.004 (9)	NA	--–0.11 (1)
	74.1; 64	0.045*; 0.04	0.226; 0.185	NA	0.23; 0.23	NA	--; <0.02	NA	--; --
IW-13A	170–241 (8)	0.04–0.14 (8)	<0.01–0.03 (7)	NA	<0.02–0.03 (8)	NA	<0.008–<0.02 (8)	NA	--–0.1 (1)
	201; 200	0.065; 0.045	--; <0.01	NA	--; <0.02	NA	--; <0.02	NA	--; --
IW-14A	161–341 (8)	0.04–0.12 (8)	<0.01–0.01 (8)	NA	<0.02–0.01 (8)	NA	<0.02–<0.02 (8)	NA	NA
	210; 197	0.069; 0.06	--; <0.01	NA	--; <0.02	NA	--; <0.02	NA	NA
IW-15A	308–672 (7)	0.1–0.26 (7)	<0.01–0.02 (7)	NA	<0.02–0.05 (7)	NA	<0.02–0.05 (7)	NA	NA
	456; 425	0.151; 0.13	--; <0.01	NA	--; <0.02	NA	--; <0.02	NA	NA
IW-16A	256–346 (7)	0.15–0.23 (7)	<0.01–0.01 (7)	NA	<0.02–0.01 (7)	NA	<0.02–<0.02 (7)	NA	NA
	288; 282	0.189; 0.19	--; <0.01	NA	--; <0.02	NA	--; <0.02	NA	NA
IW-17A	126–153 (7)	0.05–0.17 (7)	<0.01–0.08 (7)	NA	<0.02–0.08 (7)	NA	<0.02–<0.02 (7)	NA	NA
	139; 136	0.123; 0.14	--; <0.01	NA	--; <0.02	NA	--; <0.02	NA	NA
IW-18A	148–197 (7)	<0.03–0.05 (7)	0.01–0.12 (7)	NA	<0.02–0.12 (7)	NA	<0.02–<0.02 (7)	NA	NA
	170; 170	0.036*; 0.04	0.049; 0.04	NA	0.049*; 0.04	NA	--; <0.02	NA	NA
IW-19A	250–386 (7)	0.04–0.16 (7)	<0.01–0.02 (7)	NA	<0.02–0.02 (7)	NA	<0.02–<0.02 (7)	NA	NA
	317; 321	0.093; 0.08	--; <0.01	NA	--; <0.02	NA	--; <0.02	NA	NA
IW-20A	264–760 (7)	0.1–0.28 (7)	<0.01–0.04 (7)	NA	<0.02–0.06 (7)	NA	<0.02–0.06 (7)	NA	NA
	620; 739	0.15; 0.13	--; <0.01	NA	--; 0.01	NA	--; <0.02	NA	NA
IW-21A	244–324 (7)	0.06–0.11 (7)	<0.01–0.06 (7)	NA	<0.02–0.06 (7)	NA	<0.02–<0.02 (7)	NA	NA
	280; 284	0.087; 0.09	--; <0.01	NA	--; <0.02	NA	--; <0.02	NA	NA
IW-22A	129–235 (8)	0.03–0.27 (8)	<0.01–0.05 (7)	NA	<0.02–0.05 (8)	NA	<0.02–0.007 (8)	NA	--–0.06 (1)
	163; 155	0.066; 0.04	--; <0.01	NA	--; <0.02	NA	--; <0.02	NA	--; --
IW-23A	57–86 (7)	0.14–0.34 (7)	<0.01–0.01 (7)	NA	<0.02–0.01 (7)	NA	<0.02–<0.02 (7)	NA	NA
	72.1; 71	0.244; 0.25	--; <0.01	NA	--; <0.02	NA	--; <0.02	NA	NA
IW-24A	57–77 (8)	<0.03–0.06 (8)	<0.01–8.96 (7)	NA	<0.02–8.96 (8)	NA	<0.008–<0.02 (8)	NA	--–0.03 (1)
	66.5; 67.3	--; <0.03	7.62*; 7.51	NA	7.733*; 7.51	NA	--; <0.02	NA	--; --
IW-25A	66–130 (7)	<0.03–0.06 (7)	<0.01–3.95 (7)	NA	<0.02–3.95 (7)	NA	<0.02–<0.02 (7)	NA	NA
	87.3; 80	--; 0.04	1.89*; 2.21	NA	1.898*; 2.21	NA	--; <0.02	NA	NA
IW-26A	30–64 (7)	<0.03–0.05 (7)	<0.01–6.12 (7)	NA	2.07–6.12 (7)	NA	<0.02–2.07 (7)	NA	NA
	48.7; 51.8	--; <0.03	3.84*; 3.75	NA	3.87; 3.75	NA	--; <0.02	NA	NA

Table A–4. Summary of major-ion and nutrient concentrations in water samples collected as part of the *Equus* Beds Groundwater Recharge Project, 1995–2005.—Continued

[mg/L, milligrams per liter; --, not determined; DWA, Drinking-Water Advisory; SDWR, Secondary Drinking-Water Regulation; <, less than; MCL, Maximum Contaminant Level; NA, not analyzed. The first set of numbers under each heading, for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the reporting level.]

Data-collection site (fig. 6)	Orthophosphate (mg/L)	Orthophosphate as phosphorous (mg/L)	Organic carbon, total (mg/L)
Drinking-water criteria	--	--	--
Reporting level	0.01	0.01	0.2
Shallow index wells—Continued			
IW-01A	0.184–0.644 (6)	0.06–0.21 (6)	0.8–1.2 (3)
	0.296; 0.23	0.097; 0.075	--; --
IW-02A	0.123–0.399 (6)	0.04–0.13 (6)	0.8–1.6 (3)
	0.225; 0.215	0.073; 0.07	--; --
IW-03A	0.368–0.951 (5)	<0.01–0.31 (6)	1.1–1.6 (3)
	--; --	0.204*; 0.19	--; --
IW-04A	0.123–6.84 (6)	0.04–2.23 (6)	3.9–8.6 (3)
	2.55; 1.6	0.832; 0.52	--; --
IW-05A	0.092–0.276 (6)	<0.01–0.09 (7)	0.4–1 (3)
	0.183; 0.169	0.054*; 0.05	--; --
IW-06A	0.123–0.368 (7)	<0.01–0.12 (8)	1–1.5 (4)
	0.251; 0.276	0.075*; 0.06	--; --
IW-07A	0.491–0.859 (7)	0.16–0.28 (7)	0.6–1.1 (3)
	0.666; 0.705	0.217; 0.23	--; --
IW-08A	0.092–0.215 (5)	<0.01–0.07 (6)	1.6–2 (3)
	--; --	0.045*; 0.04	--; --
IW-09A	0.215–0.736 (6)	<0.01–0.24 (7)	0.6–1.3 (3)
	0.378; 0.276	0.110*; 0.09	--; --
IW-10A	0.061–0.215 (6)	<0.01–0.07 (7)	0.5–0.9 (3)
	0.164; 0.184	0.048*; 0.06	--; --
IW-11A-2	0.245–0.552 (7)	0.08–0.18 (7)	0.8–1 (4)
	0.429; 0.46	0.14; 0.15	--; --
IW-12A	0.092–0.491 (7)	<0.01–0.16 (9)	0.5–1.3 (4)
	0.27; 0.276	0.073*; 0.08	--; --
IW-13A	0.061–0.215 (4)	<0.01–0.07 (8)	1–1.7 (5)
	--; --	--; <0.01	--; --
IW-14A	0.123–0.368 (7)	<0.01–0.12 (8)	1.6–2.1 (4)
	0.28; 0.307	0.085*; 0.09	--; --
IW-15A	0.031–0.613 (3)	<0.01–0.2 (7)	1–1.8 (3)
	--; --	--; <0.01	--; --
IW-16A	0.061–0.276 (4)	<0.01–0.09 (7)	0.7–1.4 (4)
	--; --	--; 0.02	--; --
IW-17A	0.031–0.613 (6)	<0.01–0.2 (7)	0.6–1.2 (3)
	0.215; 0.123	0.060*; 0.03	--; --
IW-18A	-–0.061 (1)	<0.01–0.02 (7)	0.8–1.5 (3)
	--; --	--; <0.01	--; --
IW-19A	0.092–0.153 (4)	<0.01–0.05 (7)	0.9–1.6 (3)
	--; --	--; 0.03	--; --
IW-20A	0.061–0.276 (4)	<0.01–0.09 (7)	1–1.9 (3)
	--; --	--; 0.02	--; --
IW-21A	0.031–0.245 (2)	<0.01–0.08 (7)	1–1.8 (4)
	--; --	--; <0.01	--; --
IW-22A	0.092–1.5 (7)	<0.01–0.49 (8)	0.8–2.2 (4)
	0.35; 0.156	0.101*; 0.05	--; --
IW-23A	0.031–0.521 (7)	0.01–0.17 (7)	0.8–1.6 (3)
	0.294; 0.307	0.096; 0.1	--; --
IW-24A	0.092–0.123 (5)	<0.01–0.04 (8)	0.5–2.7 (4)
	--; --	0.032*; 0.03	--; --
IW-25A	0.092–0.123 (5)	<0.01–0.04 (7)	0.5–1.2 (3)
	--; --	0.026* ; 0.03	--; --
IW-26A	0.092–0.276 (7)	0.03–0.09 (7)	0.5–1.2 (3)
	0.171; 0.153	0.056; 0.05	--; --

Table A–4. Summary of major-ion and nutrient concentrations in water samples collected as part of the *Equus* Beds Groundwater Recharge Project, 1995–2005.—Continued

[mg/L, milligrams per liter; --, not determined; DWA, Drinking-Water Advisory; SDWR, Secondary Drinking-Water Regulation; <, less than; MCL, Maximum Contaminant Level; NA, not analyzed. The first set of numbers under each heading, for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the reporting level.]

Data-collection site (fig. 6)	Calcium (mg/L)	Magnesium (mg/L)	Potassium (mg/L)	Sodium (mg/L)	Bicarbonate (mg/L)	Carbonate (mg/L)	Bromide (mg/L)	Chloride (mg/L)	Fluoride (mg/L)
Drinking-water criteria	--	--	--	20 (DWA)	--	--	--	250 (SDWR)	2 (SDWR)
Reporting level	0.03	0.05	0.07	0.05	2.0	1.0	0.03	5.0	0.02
Shallow index wells—Continued									
IW-27A	112–121 (7)	19.6–20.4 (7)	2.47–2.71 (7)	35.6–43.1 (7)	320–340 (7)	--–0 (7)	<0.03–0.6 (7)	20–32.7 (7)	0.41–0.63 (7)
	117; 119	20.1; 20.3	2.63; 2.66	39.6; 39.1	329; 330	--; --	--; --	24.5; 24	0.54; 0.56
IW-28A	117–133 (7)	17.6–20.9 (7)	3.13–3.55 (7)	47.6–62.4 (7)	250–290 (7)	--–0 (7)	0–123 (7)	24–33 (7)	0.16–0.32 (7)
	126; 128	19.4; 19.2	3.31; 3.28	51.4; 49.9	266; 260	--; --	17.6; 0.1	28.1; 28	0.25; 0.26
IW-29A	119–170 (10)	23.3–30.5 (10)	2.86–4.78 (10)	140–211 (10)	380–410 (8)	--–0 (8)	0.1–0.1 (8)	17.7–59 (10)	0.11–0.42 (10)
	145; 140	26.8; 26.4	3.98; 3.97	163; 150	393; 390	--; --	0.1; 0.1	26.8; 21.9	0.31; 0.36
IW-30A	75.6–101 (9)	15.9–21 (9)	5.64–7.84 (9)	126–150 (9)	210–240 (7)	--–0 (7)	<0.03–0.1 (7)	147–205 (9)	0.25–0.47 (9)
	87.1; 86.5	18.5; 18.5	6.74; 6.8	134; 133	233; 240	--; --	0.100*; 0.1	165; 157	0.35; 0.37
IW-31A	93.9–127 (7)	13.2–20.7 (7)	4.19–4.96 (7)	67.3–86.8 (7)	230–270 (7)	--–0 (7)	0–0.1 (7)	102–188 (7)	0.28–0.57 (7)
	109; 110	16.8; 16.9	4.7; 4.86	77; 78.6	241; 230	--; --	0.086; 0.1	136; 134	0.46; 0.52
IW-32A	70.7–97.5 (7)	13–17.6 (7)	2.5–3.41 (7)	29.6–53.2 (7)	210–270 (7)	--–0 (7)	<0.03–0.1 (7)	19–61 (7)	0.58–0.72 (7)
	84.4; 86.8	15.4; 16.2	2.78; 2.67	38.6; 37.1	249; 260	--; --	--; --	38.7; 36	0.65; 0.65
IW-33A	72.9–91.8 (7)	9.26–11.7 (7)	2.05–2.22 (7)	20.6–26.2 (7)	200–220 (7)	--–0 (7)	0.1–0.1 (7)	<5–13 (7)	0.23–0.44 (7)
	82.8; 82.5	10.5; 10.4	2.15; 2.14	23.9; 24.2	213; 220	--; --	0.1; 0.1	7.519*; 6	0.33; 0.35
IW-34A	62.4–70.5 (7)	10.7–11.9 (7)	3.19–3.57 (7)	35.4–38.2 (7)	170–180 (7)	--–0 (7)	0.1–0.1 (7)	17–34 (7)	0.3–0.4 (7)
	66.9; 68	11.3; 11.2	3.36; 3.31	36.5; 36.3	179; 180	--; --	0.1; 0.1	23.3; 22	0.36; 0.36
IW-35A	85.6–93.3 (10)	21.3–25.1 (10)	4.74–6.96 (10)	313–330 (10)	300–330 (8)	--–0 (8)	0.2–0.4 (8)	345–773 (10)	0.02–0.82 (10)
	89.8; 89.5	23.5; 23.5	6.19; 6.33	321; 322	314; 310	--; --	0.237; 0.2	428; 389	0.39; 0.39
IW-36A	96.8–130 (10)	19.8–26.7 (10)	0.84–4.97 (10)	249–271 (10)	190–230 (8)	--–0 (8)	<0.03–0.2 (8)	314–702 (10)	0.02–0.47 (10)
	108; 106	21.9; 21.6	4.26; 4.76	260; 260	216; 220	--; --	0.200*; 0.2	386; 364	0.27; 0.36
IW-37A	122–129 (7)	15.3–16.4 (7)	3.95–4.71 (7)	55.3–65.1 (7)	270–300 (7)	--–0 (7)	0.1–0.1 (7)	98–122 (7)	0.2–0.42 (7)
	125; 126	15.8; 15.8	4.31; 4.43	60.7; 61.5	283; 280	--; --	0.1; 0.1	107; 106	0.3; 0.31
IW-38A	108–119 (7)	29.9–33.2 (7)	3.04–3.46 (7)	85.2–104 (7)	420–440 (7)	--–0 (7)	<0.03–0.1 (7)	13.5–20 (7)	0.46–0.85 (7)
	113; 111	31; 30.7	3.24; 3.25	90.7; 88.6	430; 430	--; --	0.100*; 0.1	16.8; 17	0.68; 0.7
Deep index wells									
IW-01C	37.6–39.1 (7)	3.4–4.11 (7)	1.52–2.22 (7)	17.6–21.3 (7)	170–180 (7)	--–0 (7)	<0.03–<0.03 (6)	<5–8 (7)	0.13–0.39 (6)
	38.4; 38.2	3.88; 3.9	1.84; 1.87	18.8; 18.7	176; 180	--; --	--; --	--; <5	0.27; 0.26
IW-02C	38.1–44.9 (7)	4.02–4.33 (7)	1.93–2.17 (7)	17.4–19.8 (7)	170–190 (7)	--–0 (7)	<0.03–<0.03 (6)	<5–9 (7)	0.11–0.35 (6)
	40.6; 40.2	4.14; 4.1	2.05; 2.04	18.6; 18.1	176; 170	--; --	--; --	6.217*; 6	0.2; 0.19
IW-03C	39.7–46.9 (8)	3.94–4.32 (8)	1.5–1.91 (8)	21.9–34.4 (8)	200–210 (7)	--–0 (7)	<0.03–0.1 (6)	5–14 (8)	0.16–0.38 (7)
	44.7; 45.4	4.19; 4.23	1.74; 1.78	25; 23.4	203; 200	--; --	--; --	7.3; 5.7	0.25; 0.25
IW-04C	79.1–91.3 (7)	9.45–11.1 (7)	3.48–5.07 (7)	51.1–59.6 (7)	200–210 (7)	--–0 (7)	0.4–0.5 (6)	95–134 (7)	0.03–0.39 (6)
	81.9; 80.4	9.87; 9.68	3.9; 3.73	52.9; 51.6	204; 200	--; --	0.433; 0.4	119; 122	0.22; 0.26
IW-05C	52.7–96 (7)	8.2–15.5 (7)	3.09–4.7 (7)	37.2–49.9 (7)	150–170 (7)	--–0 (7)	0.3–0.7 (7)	64–176 (7)	0.13–0.34 (7)
	78.5; 80.3	12.6; 12.8	3.94; 4.03	44.2; 44.9	159; 160	--; --	0.529; 0.6	138; 146	0.22; 0.21
IW-06C	46.2–49.1 (7)	3.84–4.49 (7)	2.09–2.45 (7)	21.7–28.9 (7)	21–210 (7)	--–0 (7)	<0.03–0.2 (7)	6–14.8 (7)	0.17–0.31 (7)
	47.8; 48	4.18; 4.2	2.31; 2.31	24.2; 23.4	179; 200	--; --	--; <0.03	8.69; 8	0.25; 0.27
IW-07C	43.3–47.1 (7)	7.56–8.63 (7)	2.08–2.43 (7)	31.3–35.3 (7)	180–210 (7)	--–0 (7)	--–<0.03 (7)	8.9–12 (7)	0.14–0.38 (7)
	44.8; 45	8.08; 8.04	2.26; 2.29	32.9; 32.6	189; 190	--; --	--; --	10.1; 10	0.29; 0.31
IW-08C	373–392 (11)	71–81.7 (11)	7.09–10.9 (11)	333–409 (11)	230–240 (8)	--–0 (8)	<0.03–5.3 (7)	865–1,460 (10)	0.05–0.34 (10)
	385; 388	76.9; 77.2	9.62; 10.2	367; 368	238; 240	--; --	3.48*; 3.1	1,270; 1,290	0.2; 0.26
IW-09C	57.9–68.1 (7)	8.71–10.2 (7)	2.45–2.74 (7)	37.9–41.9 (7)	230–240 (7)	--–0 (7)	0.1–0.2 (7)	22–51 (7)	0.27–0.44 (7)
	62.9; 62	9.49; 9.34	2.6; 2.61	39.4; 39.3	237; 240	--; --	0.114; 0.1	37.1; 31	0.35; 0.37
IW-10C	37.5–41.2 (7)	5.63–6.14 (7)	2.19–2.63 (7)	27.9–31.5 (7)	170–180 (7)	--–0 (7)	0.1–0.1 (7)	14–21 (7)	0.29–0.47 (7)
	39; 39	5.82; 5.8	2.38; 2.35	29.9; 29.5	171; 170	--; --	0.1; 0.1	16.7; 17	0.36; 0.37
IW-11C	27.3–37.5 (7)	3.78–5 (7)	1.73–2.25 (7)	43–64.8 (7)	210–230 (7)	--–0 (7)	<0.03–<0.03 (7)	7–10 (7)	0.21–0.4 (7)
	34.8; 36.3	4.66; 4.82	2; 2.03	48.8; 45.9	220; 220	--; --	--; <0.03	8; 7	0.33; 0.35
IW-12C	140–160 (8)	20–22.8 (8)	2.44–2.81 (8)	122–136 (8)	430–480 (8)	--–0 (8)	0.2–0.3 (8)	68–83 (8)	0.24–0.35 (8)
	149; 150	21.3; 21.2	2.67; 2.69	131; 131	455; 460	--; --	0.25; 0.25	76.7; 77.5	0.28; 0.26
IW-13C	99.6–105 (7)	20–21.5 (7)	3.76–4.08 (7)	115–120 (7)	300–330 (7)	--–0 (7)	0.1–0.1 (7)	138–165 (7)	0.06–0.57 (7)
	102; 101	21; 21	3.96; 4.03	117; 117	309; 310	--; --	0.1; 0.1	155; 158	0.44; 0.5
IW-14C	142–158 (8)	27.8–32.4 (8)	4.12–4.69 (8)	133–155 (8)	320–350 (8)	--–0 (8)	0.1–0.2 (8)	116–135 (8)	0.06–0.56 (8)
	149; 148	29.7; 29.2	4.41; 4.4	142; 140	331; 330	--; --	0.125; 0.1	123; 121	0.4; 0.43
IW-15C	111–117 (7)	15.8–16.5 (7)	3.45–3.68 (7)	71.7–80.1 (7)	240–260 (7)	<1–<1 (7)	0.1–0.1 (7)	71–83 (7)	0.14–0.34 (7)
	113; 113	16.1; 16.2	3.59; 3.6	74.4; 73.2	250; 250	--; <1	0.1; 0.1	78.4; 79	0.27; 0.31

Table A–4. Summary of major-ion and nutrient concentrations in water samples collected as part of the *Equus* Beds Groundwater Recharge Project, 1995–2005.—Continued

[mg/L, milligrams per liter; --, not determined; DWA, Drinking-Water Advisory; SDWR, Secondary Drinking-Water Regulation; <, less than; MCL, Maximum Contaminant Level; NA, not analyzed. The first set of numbers under each heading, for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the reporting level.]

Data-collection site (fig. 6)	Sulfate (mg/L)	Ammonia as nitrogen (mg/L)	Nitrate as nitrogen, dissolved (mg/L)	Nitrate as nitrogen, total (mg/L)	Nitrite plus nitrate as nitrogen, dissolved (mg/L)	Nitrite plus nitrate as nitrogen, total (mg/L)	Nitrite as nitrogen, dissolved (mg/L)	Nitrite as nitrogen, total (mg/L)	Phosphorus, total (mg/L)
Drinking-water criteria	250 (SDWR)	--	10 (MCL)	10 (MCL)	10 (MCL)	10 (MCL)	1 (MCL)	1 (MCL)	--
Reporting level	5.0	0.03	0.01	0.01	0.02	0.02	0.02	0.02	0.01
Shallow index wells—Continued									
IW-27A	115–154 (7)	<0.03–0.11 (7)	1.59–2.49 (7)	NA	1.59–2.49 (7)	NA	<0.02–<0.02 (7)	NA	NA
	135; 132	--; <0.03	1.91; 1.71	NA	1.91; 1.71	NA	--; <0.02	NA	NA
IW-28A	218–307 (7)	<0.03–0.07 (7)	0.17–2.42 (7)	NA	0.17–2.42 (7)	NA	<0.02–<0.02 (7)	NA	NA
	247; 234	--; 0.03	0.757; 0.46	NA	0.76; 0.46	NA	--; <0.02	NA	NA
IW-29A	312–629 (10)	0.13–0.24 (10)	<0.01–<0.01 (8)	NA	<0.02–0.06 (10)	NA	<0.01–0.06 (10)	NA	0.18–0.22 (2)
	445; 425	0.172; 0.17	--; <0.01	NA	--; <0.02	NA	--; <0.02	NA	--; --
IW-30A	96–132 (9)	<0.03–0.05 (9)	0.04–14.3 (7)	NA	0.04–16.7 (9)	NA	<0.008–<0.02 (9)	NA	<0.06–0.03 (2)
	114; 114	--; <0.04	9.84; 11.4	NA	11.1; 12.1	NA	--; <0.02	NA	--; --
IW-31A	61–86 (7)	<0.03–0.04 (7)	<0.01–17.2 (7)	NA	<0.02–17.2 (7)	NA	<0.02–<0.02 (7)	NA	NA
	68.8; 65	--; 0.03	12.1*; 13	NA	12.095*; 13	NA	--; <0.02	NA	NA
IW-32A	67–97 (7)	<0.03–0.04 (7)	0.73–4.8 (7)	NA	0.73–4.8 (7)	NA	<0.02–<0.02 (7)	NA	NA
	83.6; 85	--; <0.03	2.32; 1.39	NA	2.32; 1.39	NA	--; <0.02	NA	NA
IW-33A	35–52 (7)	<0.03–0.04 (7)	<0.01–20.8 (7)	NA	<0.02–20.8 (7)	NA	<0.02–<0.02 (7)	NA	NA
	43.6; 44	--; <0.03	18.5*; 18.7	NA	18.469*; 18.7	NA	--; <0.02	NA	NA
IW-34A	91–131 (7)	<0.03–0.12 (7)	<0.01–0.07 (7)	NA	<0.02–0.07 (7)	NA	<0.02–<0.02 (7)	NA	NA
	109; 113	0.045*; 0.03	--; 0.01	NA	--; 0.01	NA	--; <0.02	NA	NA
IW-35A	155–214 (10)	<0.03–0.06 (10)	0.44–1.61 (10)	NA	0.44–1.63 (10)	NA	<0.02–0.03 (10)	NA	0.03–0.03 (2)
	177; 178	--; <0.03	1.09; 1.04	NA	1.1; 1.04	NA	--; <0.02	NA	--; --
IW-36A	152–224 (10)	<0.03–0.09 (10)	12.2–20.7 (8)	NA	12.2–20.7 (10)	NA	<0.008–<0.02 (10)	NA	<0.04–0.03 (2)
	180; 173	--; <0.03	15.1; 13.1	NA	14.7; 13.1	NA	--; <0.02	NA	--; --
IW-37A	46–70 (7)	<0.03–0.04 (7)	11.1–16.3 (7)	NA	11.1–16.3 (7)	NA	<0.02–<0.02 (7)	NA	NA
	56.7; 58	--; <0.03	14.1; 14.3	NA	14.1; 14.3	NA	--; <0.02	NA	NA
IW-38A	160–290 (7)	0.07–0.14 (7)	<0.01–0.13 (7)	NA	<0.02–0.13 (7)	NA	<0.02–<0.02 (7)	NA	NA
	218; 209	0.113; 0.12	--; 0.03	NA	--; 0.03	NA	--; <0.02	NA	NA
Deep index wells									
IW-01C	<5–11.2 (7)	0.15–0.2 (7)	0.03–1.94 (6)	NA	<0.02–1.94 (7)	NA	<0.02–<0.02 (6)	NA	NA
	6.503*; 6.2	0.174; 0.17	0.363; 0.05	NA	0.312*; 0.05	NA	--; <0.02	NA	NA
IW-02C	8–11.4 (7)	0.03–0.07 (7)	0.01–0.08 (6)	NA	<0.02–0.08 (7)	NA	<0.02–0.03 (6)	NA	NA
	9.83; 10	0.05; 0.05	0.04; 0.035	NA	0.033*; 0.03	NA	--; <0.02	NA	NA
IW-03C	7.31–40 (8)	0.07–0.23 (8)	<0.01–<0.01 (6)	NA	<0.02–<0.05 (8)	NA	<0.008–<0.02 (7)	NA	---0.2 (1)
	13.5; 10	0.168; 0.175	--; <0.01	NA	--; <0.02	NA	--; <0.02	NA	--; --
IW-04C	16–22 (7)	0.12–0.33 (7)	<0.01–1.83 (6)	NA	<0.02–1.83 (7)	NA	<0.02–<0.02 (6)	NA	NA
	18.4; 18	0.201; 0.16	--; <0.01	NA	--; <0.02	NA	--; <0.02	NA	NA
IW-05C	14–24 (7)	0.06–0.13 (7)	<0.01–0.37 (7)	NA	<0.02–0.37 (7)	NA	<0.02–0.02 (7)	NA	NA
	19; 17	0.104; 0.11	0.143*; 0.11	NA	0.150*; 0.11	NA	--; <0.02	NA	NA
IW-06C	8–13 (7)	0.05–0.13 (7)	0.14–1.2 (7)	NA	0.14–1.2 (7)	NA	<0.02–0.03 (7)	NA	NA
	10.6; 10	0.074; 0.07	0.467; 0.26	NA	0.47; 0.29	NA	--; <0.02	NA	NA
IW-07C	16.2–47 (7)	0.1–0.15 (7)	<0.01–0.05 (7)	NA	<0.02–0.05 (7)	NA	<0.02–<0.02 (7)	NA	NA
	38.5; 41	0.117; 0.11	--; <0.01	NA	--; <0.02	NA	--; <0.02	NA	NA
IW-08C	40–74 (11)	0.04–0.18 (11)	<0.01–0.96 (8)	NA	<0.02–0.98 (11)	NA	<0.02–0.023 (10)	NA	0.11–0.15 (3)
	47; 44	0.128; 0.14	0.522*; 0.31	NA	0.402*; 0.13	NA	--; <0.02	NA	--; --
IW-09C	22–31.1 (7)	0.17–0.26 (7)	<0.01–0.41 (7)	NA	<0.02–0.41 (7)	NA	<0.02–<0.02 (7)	NA	NA
	26.3; 25	0.21; 0.2	0.181*; 0.13	NA	0.181*; 0.13	NA	--; <0.02	NA	NA
IW-10C	20–30 (7)	0.09–0.14 (7)	<0.01–0.46 (7)	NA	<0.02–0.46 (7)	NA	<0.02–<0.02 (7)	NA	NA
	25.7; 25	0.116; 0.12	0.108*; 0.06	NA	0.108*; 0.06	NA	--; <0.02	NA	NA
IW-11C	15–22 (7)	0.16–0.22 (7)	<0.01–0.02 (7)	NA	<0.02–0.02 (7)	NA	<0.02–<0.02 (7)	NA	NA
	17.4; 17	0.193; 0.19	--; <0.01	NA	--; <0.02	NA	--; <0.02	NA	NA
IW-12C	191–266 (8)	0.33–0.44 (8)	<0.01–0.57 (8)	NA	<0.02–0.57 (8)	NA	<0.02–0.12 (8)	NA	NA
	236; 238	0.375; 0.375	--; <0.01	NA	0.104*; 0.02	NA	--; <0.02	NA	NA
IW-13C	103–132 (7)	0.08–0.2 (7)	<0.01–0.02 (7)	NA	<0.02–0.02 (7)	NA	<0.02–<0.02 (7)	NA	NA
	116; 111	0.134; 0.12	--; <0.01	NA	--; <0.02	NA	--; <0.02	NA	NA
IW-14C	295–402 (8)	0.12–0.24 (8)	<0.01–0.09 (8)	NA	<0.02–0.09 (8)	NA	<0.02–<0.02 (8)	NA	NA
	329; 326	0.19; 0.195	--; <0.01	NA	--; <0.02	NA	--; <0.02	NA	NA
IW-15C	173–198 (7)	0.19–0.26 (7)	<0.01–<0.01 (7)	NA	<0.02–<0.02 (7)	NA	<0.02–<0.02 (7)	NA	NA
	186; 187	0.226; 0.23	--; <0.01	NA	--; <0.02	NA	--; <0.02	NA	NA

Table A–4. Summary of major-ion and nutrient concentrations in water samples collected as part of the *Equus* Beds Groundwater Recharge Project, 1995–2005.—Continued

[mg/L, milligrams per liter; --, not determined; DWA, Drinking-Water Advisory; SDWR, Secondary Drinking-Water Regulation; <, less than; MCL, Maximum Contaminant Level; NA, not analyzed. The first set of numbers under each heading, for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the reporting level.]

Data-collection site (fig. 6)	Orthophosphate (mg/L)	Orthophosphate as phosphorous (mg/L)	Organic carbon, total (mg/L)
Drinking-water criteria	--	--	--
Reporting level	0.01	0.01	0.2
Shallow index wells—Continued			
IW-27A	0.061–0.153 (4) --; --	<0.01–0.05 (7) --; 0.02	0.4–1.2 (3) --; --
IW-28A	0.031–0.159 (6) 0.118; 0.138	<0.01–0.052 (7) 0.034*; 0.04	0.4–1 (4) --; --
IW-29A	0.261–0.506 (3) --; --	<0.01–0.17 (10) --; <0.01	0.8–1.7 (5) --; --
IW-30A	0.089–0.123 (7) 0.096; 0.092	<0.01–0.04 (9) 0.030*; 0.03	0.7–1.7 (5) --; --
IW-31A	0.061–0.092 (4) --; --	<0.01–0.03 (7) --; 0.02	0.6–1.2 (3) --; --
IW-32A	0.123–0.123 (5) --; --	<0.01–0.04 (7) 0.040*; 0.04	0.6–1.1 (4) --; --
IW-33A	0.123–0.215 (6) 0.149; 0.123	<0.01–0.07 (7) 0.045*; 0.04	0.4–1.1 (3) --; --
IW-34A	0.031–0.092 (2) --; --	<0.01–0.03 (7) --; <0.01	0.6–1.2 (4) --; --
IW-35A	0.061–0.123 (3) --; --	<0.01–0.04 (10) --; <0.01	1–1.7 (6) 1.35; 1.35
IW-36A	0.031–0.123 (5) --; --	<0.01–0.04 (10) 0.016*; <0.01	0.6–1.4 (5) --; --
IW-37A	0.031–0.123 (5) --; --	<0.01–0.04 (7) 0.017*; 0.02	0.7–1.1 (3) --; --
IW-38A	0.061–0.184 (6) 0.102; 0.092	<0.01–0.06 (7) 0.030*; 0.03	0.6–1.2 (3) --; --
Deep index wells			
IW-01C	0.276–0.767 (6) 0.583; 0.613	0.09–0.25 (6) 0.19; 0.2	0.4–0.5 (3) --; --
IW-02C	0.215–0.46 (6) 0.348; 0.353	0.07–0.15 (6) 0.113; 0.115	0.3–0.9 (3) --; --
IW-03C	0.552–1.07 (6) 0.713; 0.644	<0.210–0.35 (7) 0.224*; 0.21	0.4–1 (4) --; --
IW-04C	0.123–0.736 (6) 0.302; 0.245	0.04–0.24 (6) 0.098; 0.08	0.4–1.1 (3) --; --
IW-05C	0.092–0.356 (6) 0.223; 0.23	<0.01–0.116 (7) 0.066*; 0.07	0.3–0.9 (3) --; --
IW-06C	0.061–0.276 (5) --; --	<0.01–0.09 (7) 0.048*; 0.04	0.4–0.9 (3) --; --
IW-07C	0.184–0.491 (7) 0.386; 0.399	0.06–0.16 (7) 0.126; 0.13	0.4–1 (3) --; --
IW-08C	0.067–0.368 (5) --; --	<0.01–0.12 (10) 0.028*; <0.01	0.3–1 (6) 0.683; 0.7
IW-09C	0.429–0.552 (6) 0.48; 0.46	<0.01–0.18 (7) 0.152*; 0.15	0.5–0.7 (3) --; --
IW-10C	0.153–0.491 (6) 0.337; 0.353	<0.01–0.16 (7) 0.099*; 0.1	0.4–0.9 (3) --; --
IW-11C	0.307–0.767 (7) 0.635; 0.705	0.1–0.25 (7) 0.207; 0.23	0.7–0.8 (4) --; --
IW-12C	0.061–0.429 (6) 0.184; 0.153	<0.01–0.14 (8) 0.047*; 0.03	1.4–2.2 (3) --; --
IW-13C	0.031–0.184 (3) --; --	<0.01–0.06 (7) --; <0.01	0.5–1.2 (4) --; --
IW-14C	0.092–0.092 (3) --; --	<0.01–0.03 (8) --; <0.01	0.9–1.4 (4) --; --
IW-15C	0.153–0.215 (5) --; --	<0.01–0.07 (7) 0.053*; 0.05	0.7–1.3 (3) --; --

Table A–4. Summary of major-ion and nutrient concentrations in water samples collected as part of the *Equus* Beds Groundwater Recharge Project, 1995–2005.—Continued

[mg/L, milligrams per liter; --, not determined; DWA, Drinking-Water Advisory; SDWR, Secondary Drinking-Water Regulation; <, less than; MCL, Maximum Contaminant Level; NA, not analyzed. The first set of numbers under each heading, for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the reporting level.]

Data-collection site (fig. 6)	Calcium (mg/L)	Magnesium (mg/L)	Potassium (mg/L)	Sodium (mg/L)	Bicarbonate (mg/L)	Carbonate (mg/L)	Bromide (mg/L)	Chloride (mg/L)	Fluoride (mg/L)
Drinking-water criteria	--	--	--	20 (DWA)	--	--	--	250 (SDWR)	2 (SDWR)
Reporting level	0.03	0.05	0.07	0.05	2.0	1.0	0.03	5.0	0.02
Deep index wells—Continued									
IW-16C	103–123 (7)	15.5–18.5 (7)	3.24–3.63 (7)	42.9–45.2 (7)	180–210 (7)	<1–<1 (7)	0–0.1 (7)	16–22 (7)	0.16–0.32 (7)
	112; 108	16.9; 16.4	3.42; 3.45	44; 43.8	191; 190	--; <1	0.086; 0.1	18.7; 18	0.22; 0.22
IW-17C	50–59.7 (7)	7.48–8.93 (7)	2.02–2.1 (7)	52.6–57.1 (7)	270–410 (7)	--–0 (7)	0–0.1 (7)	11–14 (7)	0.05–0.4 (7)
	53.8; 52.4	8.06; 7.91	2.06; 2.07	55.8; 56.1	294; 280	--; --	0.043; 0	12.4; 12	0.31; 0.35
IW-18C	88.5–98.7 (7)	17.3–18.7 (7)	3.73–4.09 (7)	94.8–104 (7)	310–320 (7)	--–0 (7)	0.1–0.1 (7)	110–124 (7)	0.55–0.68 (7)
	93.6; 92.9	18; 17.8	3.89; 3.85	99.4; 99.1	313; 310	--; --	0.1; 0.1	116; 115	0.6; 0.59
IW-19C	75.6–76.8 (7)	15.8–16.6 (7)	3.6–3.9 (7)	104–115 (7)	330–330 (7)	<1–<1 (7)	0.1–0.1 (7)	94–113 (7)	0.3–0.53 (7)
	76.1; 76	16.3; 16.4	3.76; 3.8	110; 111	330; 330	--; <1	0.1; 0.1	105; 108	0.43; 0.45
IW-20C	139–164 (10)	25.1–31.2 (10)	3.49–4.69 (10)	96.3–109 (10)	280–300 (8)	--–0 (8)	<0.03–0.3 (8)	45–105 (10)	0.08–0.54 (10)
	151; 153	27.9; 27.4	4.42; 4.59	101; 100	291; 290	--; --	0.120*; 0.1	58.9; 55.3	0.43; 0.46
IW-21C	200–209 (8)	36–38.9 (8)	4.7–4.96 (8)	131–145 (8)	320–360 (8)	<1–<1 (8)	0.1–0.2 (8)	91.4–124 (8)	0.06–0.48 (8)
	205; 206	37; 36.7	4.85; 4.86	137; 137	338; 340	--; <1	0.163; 0.2	110; 113	0.3; 0.32
IW-22C	73.7–79.9 (7)	11.8–12.5 (7)	2.63–3.01 (7)	60.6–65.5 (7)	300–310 (7)	--–0 (7)	0–0.1 (7)	18–23 (7)	0.43–0.59 (7)
	75.2; 74.4	12.2; 12.3	2.81; 2.8	63; 62.8	307; 310	--; --	0.057; 0.1	20.9; 21	0.51; 0.51
IW-23C	60.5–66 (7)	10.4–11.1 (7)	2.66–2.83 (7)	68.2–73.1 (7)	290–320 (7)	--–0 (7)	0–0.1 (7)	26–33 (7)	0.38–0.51 (7)
	63.7; 63.8	10.9; 11.1	2.74; 2.77	70.4; 69.8	309; 310	--; --	0.071; 0.1	30.5; 31	0.46; 0.47
IW-24C	52–57.9 (8)	11.8–13.3 (8)	2.96–3.93 (8)	170–191 (8)	290–300 (7)	--–0 (7)	0.1–0.1 (7)	170–215 (8)	0.55–0.73 (8)
	54.2; 53.6	12.3; 12.2	3.55; 3.61	179; 180	297; 300	--; --	0.1; 0.1	189; 191	0.66; 0.67
IW-25C	55.2–93.8 (10)	12.4–16.7 (10)	2.76–4.18 (10)	104–195 (10)	300–350 (8)	--–0 (8)	0.1–0.1 (8)	23–126 (10)	<0.02–0.71 (10)
	75.7; 71.5	15.2; 15.1	3.69; 3.83	117; 108	320; 320	--; --	0.1; 0.1	94.9; 99	0.616*; 0.6
IW-26C	76–81.8 (6)	16.4–17.5 (6)	3.74–5.61 (6)	92.3–99.6 (6)	320–340 (6)	--–0 (6)	0–0.1 (6)	81–104 (6)	0.42–0.49 (6)
	78.1; 77.5	17; 17	4.24; 4.01	97.1; 97.9	333; 335	--; --	0.083; 0.1	92.1; 91	0.45; 0.45
IW-27C	66.6–70.7 (7)	12.9–13.5 (7)	3.13–3.51 (7)	88.6–97.3 (7)	320–330 (7)	--–0 (7)	0–0.1 (7)	51–65 (7)	0.34–0.45 (7)
	68.2; 68	13.3; 13.4	3.37; 3.39	92.5; 92.7	329; 330	--; --	0.086; 0.1	58.6; 60	0.4; 0.4
IW-28C	67.1–73.2 (7)	13.4–14.5 (7)	3.36–3.65 (7)	99.6–109 (7)	320–340 (7)	--–0 (7)	0–0.1 (7)	65–85 (7)	0.17–0.4 (7)
	70.2; 70	13.9; 13.8	3.53; 3.58	104; 104	334; 340	--; --	0.071; 0.1	74.3; 73	0.32; 0.34
IW-29C	82.2–96.1 (7)	14.1–15.7 (7)	3.03–3.43 (7)	98.9–107 (7)	320–350 (7)	--–0 (7)	<0.03–0.1 (7)	36–53 (7)	0.27–0.43 (7)
	89.4; 90.2	15.1; 15.2	3.25; 3.26	103; 103	334; 330	--; --	0.100*; 0.1	43.4; 43	0.36; 0.38
IW-30C	88.4–100 (11)	30.1–33.3 (11)	2.92–4.15 (11)	185–196 (11)	260–280 (8)	--–0 (8)	0.1–0.1 (8)	184–272 (11)	0.29–0.45 (11)
	92.3; 91.5	32.1; 32.4	3.75; 3.96	192; 193	270; 270	--; --	0.1; 0.1	211; 199	0.38; 0.39
IW-31C	86.4–93 (8)	18.8–20.8 (8)	3.6–4.2 (8)	95.9–108 (8)	300–320 (7)	--–0 (7)	0.1–0.1 (7)	111–130 (8)	0.23–0.38 (8)
	90; 90.5	20; 20.1	3.96; 4.03	102; 103	314; 320	--; --	0.1; 0.1	119; 119	0.31; 0.34
IW-32C	77.1–82.8 (7)	12–13.1 (7)	2.93–3.38 (7)	70.6–80.4 (7)	300–320 (7)	--–0 (7)	0.1–0.1 (7)	50–70 (7)	0.52–0.65 (7)
	79.2; 78.7	12.3; 12.1	3.15; 3.17	73.8; 71.4	306; 300	--; --	0.1; 0.1	61.9; 62	0.59; 0.62
IW-33C	72.8–80 (7)	13.9–15 (7)	3.2–3.71 (7)	82.6–91.2 (7)	320–330 (7)	--–0 (7)	0.1–0.1 (7)	59–66 (7)	0.33–0.42 (7)
	76.5; 77.4	14.6; 14.7	3.46; 3.47	86.1; 86	326; 330	--; --	0.1; 0.1	61.4; 60	0.4; 0.41
IW-34C	70.8–79 (7)	13.2–15.5 (7)	3.37–3.82 (7)	67.6–77.5 (7)	320–330 (7)	--–0 (7)	0–0.1 (7)	48–57 (7)	0.39–0.51 (7)
	75.5; 76.3	14.5; 14.7	3.56; 3.57	72.4; 72	327; 330	--; --	0.057; 0.1	52.3; 53	0.46; 0.46
IW-35C	106–115 (10)	18.2–20.7 (10)	4.57–5.94 (10)	132–150 (10)	200–230 (8)	--–0 (8)	0.1–0.1 (8)	256–424 (10)	0.07–0.51 (10)
	109; 109	19.7; 19.9	5.3; 5.33	138; 138	221; 225	--; --	0.1; 0.1	286; 265	0.34; 0.37
IW-36C	96.4–174 (7)	18.5–31.4 (7)	4.3–5.81 (7)	95.5–127 (7)	260–290 (7)	--–0 (7)	0.1–0.2 (7)	157–285 (7)	0.28–0.41 (7)
	125; 120	23.6; 23	4.85; 4.77	106; 103	276; 280	--; --	0.114; 0.1	215; 216	0.35; 0.35
IW-37C	69.8–75.5 (7)	12–13 (7)	3.25–3.46 (7)	74.1–78 (7)	280–300 (7)	--–0 (7)	0.1–0.1 (7)	61–75.4 (7)	0.44–0.59 (7)
	73.5; 74.2	12.6; 12.8	3.38; 3.39	76.6; 76.8	291; 290	--; --	0.1; 0.1	67.6; 65	0.53; 0.54
IW-38C	93.8–105 (7)	18.2–19.9 (7)	3.34–3.81 (7)	56.2–63.6 (7)	340–380 (7)	--–0 (7)	<0.03–0.1 (7)	21–37.8 (7)	0.55–0.67 (7)
	97.1; 95.5	18.7; 18.4	3.53; 3.58	60.6; 61.8	354; 350	--; --	0.100*; 0.1	26; 26	0.61; 0.62

Table A–4. Summary of major-ion and nutrient concentrations in water samples collected as part of the *Equus* Beds Groundwater Recharge Project, 1995–2005.—Continued

[mg/L, milligrams per liter; --, not determined; DWA, Drinking-Water Advisory; SDWR, Secondary Drinking-Water Regulation; <, less than; MCL, Maximum Contaminant Level; NA, not analyzed. The first set of numbers under each heading, for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the reporting level.]

Data-collection site (fig. 6)	Sulfate (mg/L)	Ammonia as nitrogen (mg/L)	Nitrate as nitrogen, dissolved (mg/L)	Nitrate as nitrogen, total (mg/L)	Nitrite plus nitrate as nitrogen, dissolved (mg/L)	Nitrite plus nitrate as nitrogen, total (mg/L)	Nitrite as nitrogen, dissolved (mg/L)	Nitrite as nitrogen, total (mg/L)	Phosphorus, total (mg/L)
Drinking-water criteria	250 (SDWR)	--	10 (MCL)	10 (MCL)	10 (MCL)	10 (MCL)	1 (MCL)	1 (MCL)	--
Reporting level	5.0	0.03	0.01	0.01	0.02	0.02	0.02	0.02	0.01
				Deep index wells—Continued					
IW-16C	227–318 (7)	0.17–0.27 (7)	<0.01–0.02 (7)	NA	<0.02–0.02 (7)	NA	<0.02–<0.02 (7)	NA	NA
	267; 257	0.229; 0.24	--; <0.01	NA	--; <0.02	NA	--; <0.02	NA	NA
IW-17C	29–56 (7)	0.12–0.24 (7)	<0.01–0.01 (7)	NA	<0.02–0.01 (7)	NA	<0.02–<0.02 (7)	NA	NA
	41.3; 43	0.164; 0.17	--; <0.01	NA	--; <0.02	NA	--; <0.02	NA	NA
IW-18C	72–100 (7)	0.04–0.08 (7)	<0.01–0.02 (7)	NA	<0.02–0.02 (7)	NA	<0.02–<0.02 (7)	NA	NA
	84.1; 87	0.054; 0.05	--; <0.01	NA	--; <0.02	NA	--; <0.02	NA	NA
IW-19C	67–91 (7)	0.1–0.17 (7)	<0.01–0.02 (7)	NA	<0.02–0.02 (7)	NA	<0.02–<0.02 (7)	NA	NA
	72.9; 71	0.14; 0.14	--; <0.01	NA	--; <0.02	NA	--; <0.02	NA	NA
IW-20C	235–489 (10)	0.16–0.27 (10)	<0.01–0.09 (8)	NA	<0.02–0.21 (10)	NA	<0.008–0.12 (10)	NA	0.18–0.19 (2)
	375; 364	0.22; 0.235	--; <0.01	NA	--; <0.02	NA	--; <0.02	NA	--; --
IW-21C	352–890 (8)	0.09–0.22 (8)	<0.01–<0.01 (8)	NA	<0.02–<0.02 (8)	NA	<0.02–<0.02 (8)	NA	NA
	505; 449	0.171; 0.19	--; <0.01	NA	--; <0.02	NA	--; <0.02	NA	NA
IW-22C	74–94 (7)	0.06–0.12 (7)	<0.01–<0.01 (7)	NA	<0.02–<0.02 (7)	NA	<0.02–<0.02 (7)	NA	NA
	82.7; 83	0.091; 0.08	--; <0.01	NA	--; <0.02	NA	--; <0.02	NA	NA
IW-23C	39–72.8 (7)	0.11–0.22 (7)	<0.01–<0.01 (7)	NA	<0.02–<0.02 (7)	NA	<0.02–<0.02 (7)	NA	NA
	50.4; 45	0.153; 0.14	--; <0.01	NA	--; <0.02	NA	--; <0.02	NA	NA
IW-24C	69–88 (8)	<0.03–0.03 (8)	0.02–0.29 (7)	NA	0.02–0.29 (8)	NA	<0.008–<0.02 (8)	NA	---0.03 (1)
	76.7; 75.7	--; <0.03	0.173; 0.15	NA	0.17; 0.15	NA	--; <0.02	NA	--; --
IW-25C	58–101 (10)	<0.03–0.05 (10)	<0.01–0.12 (8)	NA	<0.02–0.12 (10)	NA	<0.008–<0.02 (10)	NA	0.03–0.03 (2)
	76.9; 73.5	--; <0.03	0.063*; 0.05	NA	0.057*; <0.06	NA	--; <0.02	NA	--; --
IW-26C	52–84 (6)	0.08–0.14 (6)	<0.01–0.12 (6)	NA	<0.02–0.12 (6)	NA	<0.02–<0.02 (6)	NA	NA
	65.2; 63.5	0.097; 0.09	--; <0.01	NA	--; <0.02	NA	--; <0.02	NA	NA
IW-27C	46–72.6 (7)	0.11–0.16 (7)	<0.01–0.35 (7)	NA	<0.02–0.35 (7)	NA	<0.02–<0.02 (7)	NA	NA
	58.8; 55	0.133; 0.14	0.115*; 0.06	NA	0.115*; 0.06	NA	--; <0.02	NA	NA
IW-28C	50–73 (7)	0.04–0.11 (7)	<0.01–0.21 (7)	NA	<0.02–0.21 (7)	NA	<0.02–<0.02 (7)	NA	NA
	60.3; 62	0.056; 0.05	0.063*; 0.05	NA	0.063*; 0.05	NA	--; <0.02	NA	NA
IW-29C	143–225 (7)	0.11–0.17 (7)	<0.01–0.16 (7)	NA	<0.02–0.16 (7)	NA	<0.02–<0.02 (7)	NA	NA
	172; 167	0.146; 0.15	--; <0.01	NA	--; <0.02	NA	--; <0.02	NA	NA
IW-30C	216–418 (11)	<0.03–0.07 (11)	<0.01–0.71 (8)	NA	<0.02–0.71 (11)	NA	<0.008–<0.02 (11)	NA	0.04–0.06 (3)
	286; 261	0.040*; 0.04	--; <0.01	NA	0.126*; <0.06	NA	--; <0.02	NA	--; --
IW-31C	91–113 (8)	0.06–0.12 (8)	<0.01–0.63 (7)	NA	<0.02–0.63 (8)	NA	<0.008–<0.02 (8)	NA	---0.03 (1)
	102; 103	0.08; 0.08	0.142*; 0.05	NA	0.126*; 0.01	NA	--; <0.02	NA	--; --
IW-32C	38–63 (7)	<0.03–0.08 (7)	<0.01–2.93 (7)	NA	<0.02–2.93 (7)	NA	<0.02–<0.02 (7)	NA	NA
	50.7; 48	--; <0.03	2.14*; 2.18	NA	2.142*; 2.18	NA	--; <0.02	NA	NA
IW-33C	61–80 (7)	<0.03–0.06 (7)	<0.01–1.18 (7)	NA	<0.02–1.18 (7)	NA	<0.02–<0.02 (7)	NA	NA
	70; 67	--; <0.03	0.461*; 0.35	NA	0.461*; 0.35	NA	--; <0.02	NA	NA
IW-34C	42–58 (7)	<0.03–0.04 (7)	0.06–0.51 (7)	NA	0.06–0.51 (7)	NA	<0.02–0.09 (7)	NA	NA
	51.3; 51	--; <0.03	0.247; 0.26	NA	0.27; 0.26	NA	--; <0.02	NA	NA
IW-35C	69–85 (10)	<0.03–0.04 (10)	<0.01–0.46 (8)	NA	<0.02–0.46 (10)	NA	<0.008–<0.02 (10)	NA	0.03–0.04 (2)
	74.9; 74.9	--; <0.03	0.074*; 0.02	NA	0.065*; 0.02	NA	--; <0.02	NA	--; --
IW-36C	59–132 (7)	<0.03–0.13 (7)	4.93–9.61 (7)	NA	4.93–9.61 (7)	NA	<0.02–<0.02 (7)	NA	NA
	95.9; 95	--; <0.03	6.81; 6.67	NA	6.81; 6.67	NA	--; <0.02	NA	NA
IW-37C	38–55 (7)	<0.03–0.07 (7)	3.37–7.09 (7)	NA	3.45–7.09 (7)	NA	<0.02–0.2 (7)	NA	NA
	45.9; 42	--; <0.03	4.31; 3.92	NA	4.37; 3.93	NA	0.066*; 0.05	NA	NA
IW-38C	83–138 (7)	0.04–0.08 (7)	<0.01–0.3 (7)	NA	<0.02–0.3 (7)	NA	<0.02–<0.02 (7)	NA	NA
	114; 119	0.057; 0.06	--; <0.01	NA	--; <0.02	NA	--; <0.02	NA	NA

Table A–4. Summary of major-ion and nutrient concentrations in water samples collected as part of the *Equus* Beds Groundwater Recharge Project, 1995–2005.—Continued

[mg/L, milligrams per liter; --, not determined; DWA, Drinking-Water Advisory; SDWR, Secondary Drinking-Water Regulation; <, less than; MCL, Maximum Contaminant Level; NA, not analyzed. The first set of numbers under each heading, for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the reporting level.]

Data-collection site (fig. 6)	Orthophosphate (mg/L)	Orthophosphate as phosphorous (mg/L)	Organic carbon, total (mg/L)
Drinking-water criteria	--	--	--
Reporting level	0.01	0.01	0.2
Deep index wells—Continued			
IW-16C	0.184–0.276 (3)	<0.01–0.09 (7)	0.8–1.5 (4)
	--; --	--; <0.01	--; --
IW-17C	0.061–0.368 (5)	<0.01–0.12 (7)	0.7–1.2 (3)
	--; --	0.042*; 0.03	--; --
IW-18C	---0.153 (1)	<0.01–0.05 (7)	0.4–1 (3)
	--; --	--; <0.01	--; --
IW-19C	0.123–0.184 (6)	<0.01–0.06 (7)	0.5–1.2 (3)
	0.148; 0.153	0.046*; 0.05	--; --
IW-20C	0.061–0.46 (9)	<0.01–0.15 (10)	0.8–2.4 (5)
	0.241; 0.276	0.072*; 0.05	--; --
IW-21C	0.092–0.153 (3)	<0.01–0.05 (8)	1–1.8 (4)
	--; --	--; <0.01	--; --
IW-22C	0.061–0.245 (6)	<0.01–0.08 (7)	0.8–1.8 (3)
	0.163; 0.154	0.048*; 0.04	--; --
IW-23C	0.184–0.399 (7)	0.06–0.13 (7)	0.6–1.3 (3)
	0.25; 0.215	0.081; 0.07	--; --
IW-24C	0.061–0.153 (5)	<0.01–0.05 (8)	0.2–1 (4)
	--; --	0.029*; 0.03	--; --
IW-25C	0.061–0.184 (9)	<0.01–0.06 (10)	0.3–2.5 (5)
	0.109; 0.095	0.033*; 0.03	--; --
IW-26C	0.061–0.123 (3)	<0.01–0.04 (6)	0.5–1.1 (3)
	--; --	--; <0.01	--; --
IW-27C	0.092–0.092 (3)	<0.01–0.03 (7)	0.5–1.2 (3)
	--; --	--; <0.01	--; --
IW-28C	0.061–0.123 (4)	<0.01–0.04 (7)	0.4–1.1 (4)
	--; --	--; 0.02	--; --
IW-29C	0.061–0.276 (3)	<0.01–0.09 (7)	0.7–1.4 (3)
	--; --	--; <0.01	--; --
IW-30C	0.061–0.184 (8)	<0.01–0.06 (11)	<0.2–4.3 (6)
	0.139; 0.153	0.038*; 0.05	1.26*; 0.8
IW-31C	0.061–0.092 (5)	<0.01–0.03 (8)	0.4–0.9 (4)
	--; --	0.020*; 0.02	--; --
IW-32C	0.061–0.092 (4)	<0.01–0.03 (7)	0.3–0.9 (4)
	--; --	--; 0.02	--; --
IW-33C	0.092–0.123 (5)	<0.01–0.04 (7)	0.3–0.9 (3)
	--; --	0.030*; 0.03	--; --
IW-34C	0.092–0.245 (4)	<0.01–0.08 (7)	0.3–0.9 (4)
	--; --	0.035*; 0.03	--; --
IW-35C	0.031–0.184 (8)	<0.01–0.06 (10)	0.2–0.9 (6)
	0.101; 0.083	0.027*; 0.02	0.433; 0.35
IW-36C	0.061–0.153 (2)	<0.01–0.05 (7)	0.3–0.7 (3)
	--; --	--; <0.01	--; --
IW-37C	0.061–0.123 (6)	<0.01–0.04 (7)	0.3–1 (3)
	0.076; 0.061	0.023*; 0.02	--; --
IW-38C	0.031–0.337 (7)	0.01–0.11 (7)	0.5–1 (3)
	0.171; 0.153	0.056; 0.05	--; --

Table A–5. Summary of dissolved trace element concentrations in water samples collected as part of the *Equus* Beds Groundwater Recharge Project during 1995–2005.

[µg/L, micrograms per liter; SDWR, Secondary Drinking-Water Regulation; MCL, Maximum Contaminant Level; --, not determined; HAL, Health Advisory Level; <, less than; NA, not analyzed. The first set of numbers under each heading, for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the reporting level.]

Data-collection site (fig. 6)	Aluminum (µg/L)	Antimony (µg/L)	Arsenate as arsenic (µg/L)	Arsenic (µg/L)	Arsenite as arsenic (µg/L)	Barium (µg/L)	Beryllium (µg/L)	Boron (µg/L)	Cadmium (µg/L)
Drinking-water criteria	50–200 (SDWR)	6 (MCL)	--	10 (MCL)	--	2,000 (MCL)	4 (MCL)	1,000 (HAL)	5 (MCL)
Reporting level	10.0	2	0.2	1.0	0.1	5.0	1.0	10.0	0.1
Surface-water monitoring sites (Little Arkansas River)									
7143672	<0.01–273 (52)	<2–3 (52)	1.4–10.1 (8)	1.2–14.1 (82)	<0.1–0.3 (8)	45.4–358 (52)	<0.06–<1 (52)	20–130 (52)	<0.1–0.05 (52)
(near Halstead)	14.4*; <10	--; <2	3.75; 3.05	5.54; 5.05	--; <0.6	161; 126	--; <1	60.3; 50	--; <0.1
7144100	<8–841 (56)	<2–0.27 (55)	1.5–12.5 (8)	1–14.1 (84)	<0.1–0.3 (8)	43.8–270 (56)	<0.06–<1 (56)	20–200 (56)	<0.1–0.06 (56)
(near Sedgwick)	28.7*; <10	--; <2	4.21; 3.3	5.34; 4.75	--; <0.6	122; 95.6	--; <1	63.2; 50	--; <0.1
Diversion well site near Halstead									
Diversion well	<10–11 (31)	<2–3 (31)	---1.8 (1)	15.7–24.4 (35)	---15.9 (1)	82.8–337 (31)	<1–<1 (31)	40–60 (31)	<0.1–<0.5 (31)
	--; <10	--; <2	--; --	20.1; 20	--; --	140; 137	--; <1	52.6; 50	--; <0.1
EB-145-A1	<8–14 (19)	<0.3–<2 (20)	<0.2–<0.8 (5)	<1–10 (33)	<0.1–0.5 (5)	342–835 (19)	<0.06–<1 (19)	40–120 (19)	<0.01–<0.5 (19)
	7.31*; <10	--; <2	--; --	--; <1	--; --	580; 588	--; <1	72.6; 70	--; <0.1
EB-145-A2	<10–10 (10)	<2–<2 (10)	0.4–1.2 (2)	<1–3.7 (13)	<0.1–0.7 (2)	391–496 (10)	<1–<1 (10)	60–80 (10)	<0.1–<0.5 (10)
	--; <10	--; <2	--; --	1.34*; 1.2	--; --	429; 426	--; <1	70; 70	--; <0.1
EB-145-A3	<10–<10 (10)	<2–4 (10)	<0.8–0.4 (2)	<1–2.4 (13)	0.5–1 (2)	228–310 (10)	<1–<1 (10)	50–80 (10)	<0.01–<0.5 (10)
	--; <10	--; <2	--; --	1.26*; <1	--; --	268; 261	--; <1	66; 70	--; <0.1
EB-145-A4	<10–<10 (7)	<2–<2 (7)	5.7–5.8 (2)	14.8–22.3 (9)	11.1–11.8 (2)	102–279 (7)	<1–<1 (7)	40–50 (7)	<0.1–<0.5 (7)
	--; <10	--; <2	--; --	17.2; 16.8	--; --	202; 225	--; <1	48.6; 50	--; --
EB-145-A5	<10–<10 (8)	<2–3 (8)	2.4–5 (3)	19.2–31.8 (15)	17–19 (3)	189–268 (8)	<1–<1 (8)	40–50 (8)	<0.1–<0.5 (8)
	--; <10	--; <2	--; --	25.6; 25.2	--; --	225; 220	--; <1	47.5; 50	--; <0.1
EB-145-P-D5	<1–<10 (15)	<2–<2 (15)	0.5–3.4 (5)	18.5–48.9 (28)	28.4–40.7 (5)	67.8–144 (15)	<1–<1 (15)	40–60 (15)	<0.1–<0.5 (15)
	--; <10	--; <2	--; --	29.1; 26.7	--; --	95.7; 88.5	--; <1	50; 50	--; <0.1
Halstead recharge site									
SMW-H4	<10–<10 (19)	<2–<2 (19)	1.3–1.8 (3)	<1–2.9 (26)	<0.1–<0.6 (3)	161–331 (19)	<1–<1 (19)	30–60 (19)	<0.1–<0.5 (19)
	--; <10	--; <2	--; --	1.78*; 1.7	--; --	277; 289	--; <1	48.9; 50	--; <0.1
SMW-H14	<10–<10 (20)	<2–3 (20)	1.6–2.2 (3)	<1–4.3 (28)	<0.1–<0.6 (3)	203–488 (20)	<1–<1 (20)	40–100 (20)	<0.1–<0.5 (20)
	--; <10	--; <2	--; --	2.25*; 2.2	--; --	279; 272	--; <1	57; 50	--; <0.1
DMW-H1	<10–<10 (19)	<2–3 (19)	0.4–1.5 (3)	8.1–23.4 (27)	16.1–16.9 (3)	75.7–155 (19)	<1–<1 (19)	40–60 (19)	<0.1–<0.5 (19)
	--; <10	--; <2	--; --	17.3; 19.1	--; --	125; 141	--; <1	50; 50	--; <0.1
DMW-H13	<10–<10 (20)	<2–3 (20)	0.4–2.3 (3)	4.6–13.7 (28)	8.9–10.3 (3)	146–388 (20)	<1–<1 (20)	40–70 (20)	<0.1–<0.5 (20)
	--; <10	--; <2	--; --	9.89; 10.6	--; --	270; 328	--; <1	47.5; 50	--; <0.1
Sedgwick recharge site									
Treated stream water	<10–23 (13)	<2–9 (13)	NA	2.1–5.9 (13)	NA	57.5–211 (13)	<1–<1 (13)	40–70 (13)	<0.1–<0.1 (13)
	--; <10	--; <2	NA	3.81; 3.6	NA	120; 105	--; <1	55.4; 50	--; <0.1
SMW-S11	<10–<10 (15)	<2–<2 (16)	<0.2–2.8 (3)	<1–2.7 (23)	<0.1–<0.6 (3)	89–152 (15)	<1–<1 (15)	20–80 (15)	<0.1–<0.5 (15)
	--; <10	--; <2	--; --	--; <1	--; --	119; 117	--; <1	51.3; 50	--; <0.1
SMW-S13	<10–<10 (15)	<2–<2 (15)	<0.8–0.4 (3)	<1–1.3 (22)	<0.1–<0.6 (3)	57.2–144 (15)	<1–<1 (15)	20–60 (15)	<0.1–<0.5 (15)
	--; <10	--; <2	--; --	--; <1	--; --	95.6; 89.3	--; <1	48; 50	--; <0.1
DMW-S10	<10–<10 (14)	<2–<2 (15)	2.2–2.7 (3)	1.8–3.6 (22)	<0.1–<0.6 (3)	51–66.3 (14)	<1–<1 (14)	30–60 (14)	<0.1–<0.5 (14)
	--; <10	--; <2	--; --	2.91; 3.05	--; --	57; 55.9	--; <1	47.1; 50	--; <0.1
DMW-S14	<10–11 (13)	<2–<2 (13)	3.6–3.7 (3)	2.7–5 (20)	<0.1–<0.6 (3)	23–53.3 (13)	<1–<1 (13)	30–50 (13)	<0.1–<0.5 (13)
	--; <10	--; <2	--; --	4.12; 4.05	--; --	32.4; 29.4	--; <1	43.8; 50	--; <0.1

Table A–5. Summary of dissolved trace element concentrations in water samples collected as part of the *Equus* Beds Groundwater Recharge Project during 1995–2005.—Continued.

[µg/L, micrograms per liter; SDWR, Secondary Drinking-Water Regulation; MCL, Maximum Contaminant Level; --, not determined; HAL, Health Advisory Level; <, less than; NA, not analyzed. The first set of numbers under each heading, for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the reporting level.]

Data-collection site (fig. 6)	Chromium (µg/L)	Copper (µg/L)	Cyanide (µg/L)	Iron (µg/L)	Lead (µg/L)	Manganese (µg/L)	Mercury (µg/L)	Molybdenum (µg/L)	Nickel (µg/L)
Drinking-water criteria	100 (MCL)	1,300 (MCL)	200 (MCL)	300 (SDWR)	15 (MCL)	50 (SDWR)	2 (MCL)	--	100 (HAL)
Reporting level	10.0	5.0	0.001	5.0	1.0	1.0	0.02	--	1.0
Surface-water monitoring sites (Little Arkansas River)									
7143672	<0.8–<10 (52)	<5–1.7 (52)	<0.001–6 (50)	<5–860 (186)	<1–0.39 (52)	<1–1,140 (185)	<0.02–0.14 (51)	---7.2 (1)	<1–7.5 (52)
(near Halstead)	--; <10	--; <5	--; <0.01	28.8*; 10	--; <1	193*; 120	0.038*; <0.1	--; --	--; --
7144100	<0.8–<10 (56)	<3–1.9 (56)	<0.001–5 (54)	<5–620 (161)	<1–0.09 (56)	<1–740 (161)	<0.02–0.45 (54)	---5.6 (1)	<1–6.69 (56)
(near Sedgwick)	--; <10	--; <5	--; <0.01	37.9*; 20	--; <1	94.2*; 40	0.051*; <0.1	--; --	--; <1
Diversion well site near Halstead									
Diversion well	<8–<10 (31)	<5–<5 (31)	<0.001–<5 (31)	30–1,150 (150)	<1–<1 (31)	450–830 (150)	<0.02–0.17 (31)	NA	<1–<1 (31)
	--; <10	--; <5	--; <0.01	414; 430	--; <1	685; 725	--; <0.1	NA	--; <1
EB-145-A1	<8–0.7 (19)	<5–0.4 (19)	<0.001–1 (18)	1,630–6,250 (66)	<0.08–<1 (19)	1,180–3,850 (66)	<0.02–0.04 (18)	---0.5 (1)	<1–2.5 (19)
	--; <10	--; <5	--; <0.01	3,170; 3,010	--; <1	2,380; 2,350	--; <0.1	--; --	--; <1
EB-145-A2	<8–<10 (10)	<5–<5 (10)	<0.001–1 (10)	1,640–2,670 (28)	<1–<1 (10)	900–1,510 (28)	<0.02–0.03 (10)	NA	<1–<1 (10)
	--; <8	--; <5	--; <0.01	2,110; 2,050	--; <1	1,180; 1,160	--; <0.1	NA	--; <1
EB-145-A3	<8–<10 (10)	<5–<5 (10)	<0.001–1 (10)	260–1,240 (33)	<1–<1 (10)	800–1,280 (33)	<0.02–<0.1 (10)	NA	<1–<3 (10)
	--; <8	--; <5	--; <0.01	791; 770	--; <1	1,040; 1,030	--; <0.1	NA	--; <1
EB-145-A4	<8–<10 (7)	<5–<5 (7)	<0.001–<0.01 (7)	80–590 (21)	<1–<1 (7)	380–1,010 (21)	<0.02–<0.1 (7)	NA	<0.1–<1 (7)
	--; --	--; <5	--; <0.01	403; 370	--; <1	660; 680	--; <0.1	NA	--; --
EB-145-A5	<8–<10 (8)	<5–<5 (8)	<0.001–0.01 (8)	70–540 (32)	<1–<1 (8)	640–980 (32)	<0.02–<0.1 (8)	NA	<1–<1 (8)
	--; <10	--; <5	--; <0.01	347; 380	--; <1	814; 825	--; <0.1	NA	--; --
EB-145-P-D5	<1–<10 (15)	<5–<5 (15)	<0.001–<0.01 (15)	10–740 (58)	<1–<1 (15)	380–1,000 (58)	<0.02–0.1 (15)	NA	<1–<3 (15)
	--; <10	--; <5	--; <0.01	273; 240	--; <1	569; 575	--; <0.1	NA	--; <1
Halstead recharge site									
SMW-H4	<10–<10 (19)	<5–<5 (19)	<0.001–0.01 (19)	<5–50 (47)	<1–<1 (19)	<1–20 (47)	<0.02–0.08 (19)	NA	<1–<1 (19)
	--; <10	--; <5	--; <0.01	--; <5	--; <1	--; <5	--; <0.1	NA	--; --
SMW-H14	<10–<10 (20)	<5–<5 (20)	<0.001–0.01 (20)	<5–20 (46)	<1–<1 (20)	<5–70 (46)	<0.02–0.27 (20)	NA	---<1 (20)
	--; <10	--; <5	--; <0.01	--; <5	--; <1	--; <5	--; <0.1	NA	--; --
DMW-H1	<1–<10 (19)	<5–<5 (19)	<0.001–0.01 (19)	0–360 (46)	<1–<1 (19)	210–790 (46)	<0.02–0.13 (19)	NA	<1–<1 (19)
	--; <10	--; <5	--; <0.01	195; 210	--; <1	650; 720	--; <0.1	NA	--; <1
DMW-H13	<1–<10 (20)	<5–<5 (20)	<0.001–0.01 (20)	300–1,260 (46)	<1–<1 (20)	260–690 (46)	<0.02–0.25 (20)	NA	<1–<1 (20)
	--; <10	--; <5	--; <0.01	816; 835	--; <1	510; 560	--; <0.1	NA	--; <1
Sedgwick recharge site									
Treated stream water	<10–<10 (13)	<5–<5 (13)	<0.001–0.01 (13)	<5–10 (48)	<1–<1 (13)	<5–180 (48)	<0.1–0.25 (13)	NA	<1–<1 (13)
	--; <10	--; <5	--; <0.01	--; <5	--; <1	23.2*; <5	--; <0.1	NA	--; --
SMW-S11	<1–<10 (15)	<5–<5 (15)	<0.001–0.01 (15)	<5–1370 (52)	<1–<1 (15)	<5–180 (52)	<0.1–0.07 (15)	NA	<1–<1 (15)
	--; <10	--; <5	--; <0.01	73.5*; 20	--; <1	20.7*; <5	--; <0.1	NA	--; <1
SMW-S13	<1–<10 (15)	<5–<5 (15)	<0.001–<0.01 (15)	<5–20 (47)	<1–<1 (15)	<1–30 (47)	<0.02–0.1 (15)	NA	<1–<1 (15)
	--; <10	--; <5	--; <0.01	--; <5	--; <1	--; <5	--; <0.1	NA	--; --
DMW-S10	<10–<10 (14)	<5–<5 (14)	<0.001–<0.01 (14)	<5–100 (40)	<1–<1 (14)	210–250 (40)	<0.02–<0.1 (14)	NA	<1–<1 (14)
	--; <10	--; <5	--; <0.01	--; <5	--; <1	232; 230	--; <0.1	NA	--; <1
DMW-S14	<1–<10 (13)	<5–20 (13)	<0.001–0.01 (13)	<5–50 (36)	<1–<1 (13)	140–200 (36)	<0.02–<0.1 (13)	NA	<1–<1 (13)
	--; <10	--; <5	--; <0.01	--; <5	--; <1	155; 155	--; <0.1	NA	--; <1

Table A–5. Summary of dissolved trace element concentrations in water samples collected as part of the *Equus* Beds Groundwater Recharge Project during 1995–2005.—Continued.

[µg/L, micrograms per liter; SDWR, Secondary Drinking-Water Regulation; MCL, Maximum Contaminant Level; --, not determined; HAL, Health Advisory Level; <, less than; NA, not analyzed. The first set of numbers under each heading, for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the reporting level.]

Data-collection site (fig. 6)	Selenium (µg/L)	Silver (µg/L)	Strontium (µg/L)	Thallium (µg/L)	Vanadium (µg/L)	Zinc (µg/L)	Dimethylarsinate as arsenic (µg/L)	Monomethylarsonate as arsenic (µg/L)
Drinking-water criteria	50 (MCL)	100 (SDWR)	4,000 (HAL)	2 (MCL)	--	2,000 (HAL)	--	--
Reporting level	2.0	10.0	1.0	1.7	20.0	5.0	0.1	1.2
Surface-water monitoring sites (Little Arkansas River)								
7143672	<2–3 (51)	<0.2–23 (52)	0–1,330 (51)	<1.7–<1.7 (51)	<9–15.8 (51)	<3–10 (52)	<0.1–0.1 (8)	<0.1–0.3 (8)
(near Halstead)	1.18*; <2	--; <10	454; 260	--; <1.7	7.84*; <20	4.15*; <5	--; <0.1	--; <0.1
7144100	<2–3 (54)	<0.2–28 (56)	50–1,280 (55)	<1.7–<1.7 (54)	<9–26.4 (55)	<3–20 (56)	<0.1–0.1 (8)	<0.1–0.3 (8)
(near Sedgwick)	--; <2	3.47*; <10	348; 220	--; <1.7	7.99*; <20	--; <5	--; <0.1	--; <1.2
Diversion well site near Halstead								
Diversion well	<2–<2 (31)	<10–14 (31)	370–870 (31)	<1.7–<1.7 (31)	<9–<20 (31)	<5–20 (31)	-–0.8 (1)	-–<0.1 (1)
	--; <2	--; <10	590; 590	--; <1.7	--; <20	--; <5	--; --	--; --
EB-145-A1	<2–<2 (18)	<0.2–<10 (19)	440–1,070 (18)	<1.7–<1.7 (18)	<2–<20 (18)	<3–0.6 (19)	<0.1–<0.6 (5)	<0.1–<1.2 (5)
	--; <2	--; <10	757; 720	--; <1.7	--; <9	--; <5	--; --	--; --
EB-145-A2	<2–<2 (10)	<10–<10 (10)	610–970 (10)	<1.7–<1.7 (10)	<2–<20 (10)	<5–20 (10)	<0.1–<0.6 (2)	<0.1–<1.2 (2)
	--; <2	--; <10	758; 750	--; <1.7	--; <9	--; <5	--; --	--; --
EB-145-A3	<2–<2 (10)	<1–<10 (10)	680–1,180 (10)	<1.7–<1.7 (10)	<2–<20 (10)	<5–<5 (10)	<0.1–<0.6 (2)	<1.2–0.1 (2)
	--; <2	--; <10	866; 835	--; <1.7	--; <9	--; <5	--; --	--; --
EB-145-A4	<2–<2 (7)	<10–<10 (7)	340–940 (7)	<1.7–<1.7 (7)	<2–<20 (7)	<5–<5 (7)	<0.1–0.7 (2)	<0.1–<1.2 (2)
	--; <2	--; <10	671; 760	--; <1.7	--; <20	--; <5	--; --	--; --
EB-145-A5	<2–<2 (9)	<10–<10 (8)	490–940 (8)	<1.7–<1.7 (8)	<2–<20 (8)	<5–<5 (8)	0.2–1.8 (3)	<1.2–1.2 (3)
	--; <2	--; <10	654; 605	--; <1.7	--; <20	--; <5	--; --	--; --
EB-145-P-D5	<2–<2 (15)	<10–<10 (15)	310–740 (15)	<1.7–<1.7 (15)	<2–<20 (15)	<5–10 (15)	0.4–3.2 (5)	<1.2–2.2 (5)
	--; <2	--; <10	483; 510	--; <1.7	--; <20	--; <5	--; --	--; --
Halstead recharge site								
SMW-H4	<2–2 (19)	<10–21 (19)	280–620 (19)	<1.7–<1.7 (19)	<20–37.5 (19)	<5–<6 (19)	<0.1–<0.6 (3)	<0.1–<1.2 (3)
	--; <2	--; <10	475; 470	--; <1.7	--; <20	--; <5	--; --	--; --
SMW-H14	<2–4 (20)	<10–20 (20)	360–740 (20)	<1.7–<1.7 (20)	<20–6.2 (20)	<5–10 (20)	<0.1–<0.6 (3)	<0.1–<1.2 (3)
	1.35*; <2	--; <10	568; 595	--; <1.7	--; <20	--; <5	--; --	--; --
DMW-H1	<2–<2 (19)	<10–21 (19)	300–840 (19)	<1.7–1.7 (19)	<2–<20 (19)	<5–<5 (19)	<0.1–0.4 (3)	<0.1–<1.2 (3)
	--; <2	--; <10	559; 640	--; <1.7	--; <20	--; <5	--; --	--; --
DMW-H13	<2–<2 (20)	<10–23 (20)	210–650 (20)	<1.7–<1.7 (20)	<2–28.6 (20)	<5–<5 (20)	<0.1–<0.6 (3)	<0.1–<1.2 (3)
	--; <2	--; <10	433; 530	--; <1.7	--; <20	--; <5	--; --	--; --
Sedgwick recharge site								
Treated stream water	<2–6 (13)	<10–18 (13)	170–690 (13)	<1.7–<1.7 (13)	<20–29.2 (13)	<5–20 (13)	NA	NA
	--; <2	--; <10	349; 280	--; <1.7	--; <20	--; <5	NA	NA
SMW-S11	<2–12 (16)	<10–28 (15)	350–840 (15)	<1.7–<1.7 (16)	<2–30.2 (15)	<5–<5 (15)	<0.1–<0.6 (3)	<0.1–<1.2 (3)
	5.77*; 4	--; <10	512; 490	--; <1.7	--; <20	--; <5	--; --	--; --
SMW-S13	<2–14 (15)	<10–15 (15)	<1–650 (15)	<1.7–<1.7 (15)	<2–20.1 (15)	<5–<5 (15)	<0.1–<0.6 (3)	<0.1–<1.2 (3)
	4.29*; <2	--; <10	507*; 490	--; <1.7	--; <20	--; <5	--; --	--; --
DMW-S10	<2–<2 (15)	<10–22 (14)	760–1,120 (14)	<1.7–<1.7 (15)	<20–4.7 (14)	<5–<5 (14)	<0.1–<0.6 (3)	<0.1–<1.2 (3)
	--; <2	--; <10	859; 810	--; <1.7	--; <20	--; <5	--; --	--; --
DMW-S14	3–10 (13)	<10–23 (13)	570–870 (13)	<1.7–1.7 (13)	<20–34.4 (13)	<5–<5 (13)	<0.1–<0.6 (3)	<0.1–<1.2 (3)
	7.77; 8	--; <10	688; 680	--; <1.7	--; <20	--; <5	--; --	--; --

Table A–5. Summary of dissolved trace element concentrations in water samples collected as part of the *Equus* Beds Groundwater Recharge Project during 1995–2005.—Continued.

[µg/L, micrograms per liter; SDWR, Secondary Drinking-Water Regulation; MCL, Maximum Contaminant Level; --, not determined; HAL, Health Advisory Level; <, less than; NA, not analyzed. The first set of numbers under each heading, for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the reporting level.]

Data-collection site (fig. 6)	Aluminum (µg/L)	Antimony (µg/L)	Arsenate as arsenic (µg/L)	Arsenic (µg/L)	Arsenite as arsenic (µg/L)	Barium (µg/L)	Beryllium (µg/L)	Boron (µg/L)	Cadmium (µg/L)
Drinking-water criteria	50–200 (SDWR)	6 (MCL)	--	10 (MCL)	--	2,000 (MCL)	4 (MCL)	1,000 (HAL)	5 (MCL)
Reporting level	10.0	2	0.8	1.0	0.1	5.0	1.0	10.0	0.5
Background wells									
EB-142-A3	<10–<10 (3)	<2–<2 (3)	<4–11 (45)	<1–1.3 (3)	<0.2–0.3 (5)	143–155 (3)	<1–<1 (3)	40–40 (3)	<0.01–<0.1 (3)
	--; --	--; --	1.95*; <4	--; --	--; --	--; --	--; --	--; --	--; --
Sedgwick well	<10–11 (15)	<2–80 (16)	NA	<1–2 (28)	NA	109–141 (15)	<1–<1 (15)	30–60 (14)	<0.01–0.05 (27)
	--; <10	--; <2	NA	0.744*; <1	NA	127; 125	--; <1	45; 50	0.024*; 0.02
City well-Sedgwick	---<8 (1)	---<2 (1)	2.3–3.8 (5)	---4.4 (1)	4.8–6.5 (5)	---51 (1)	---<1 (1)	---50 (1)	---<0.1 (1)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
TH-02-95	<8–<10 (7)	<2–<2 (7)	1.3–2.3 (5)	7.3–15.4 (20)	3.1–9.5 (5)	176–190 (7)	<1–<1 (7)	30–50 (7)	<0.1–<0.5 (7)
	--; <10	--; <2	--; --	10; 9.9	--; --	184; 185	--; <1	40; 40	--; <0.5
TH-06-95	<8–<10 (8)	<2–<2 (8)	0.5–0.8 (5)	4.2–14.1 (22)	7.2–7.8 (5)	164–199 (8)	<1–<1 (8)	20–40 (8)	<0.1–<0.5 (8)
	--; <10	--; <2	--; --	7.51; 7.05	--; --	183; 184	--; <1	27.5; 30	--; <0.5
TH-10-95	<8–<10 (7)	<2–<2 (7)	NA	6.1–10.9 (22)	NA	238–385 (7)	<1–<1 (7)	10–30 (7)	<0.1–<0.5 (7)
	--; <10	--; <2	NA	9.15; 9.2	NA	310; 302	--; <1	21.4; 20	--; <0.5
TH-12-95	---<8 (1)	---<2 (1)	NA	---2.6 (1)	NA	---112 (1)	---<1 (1)	---40 (1)	---<0.1 (1)
	--; --	--; --	NA	--; --	NA	--; --	--; --	--; --	--; --
TH-08-A1	<10–<10 (5)	<2–<2 (5)	NA	4.8–7.9 (5)	NA	102–283 (5)	<1–<1 (5)	50–60 (5)	<0.1–<0.1 (5)
	--; --	--; --	NA	--; --	NA	--; --	--; --	--; --	--; --
TH-08-A2	<10–<10 (3)	<2–<2 (3)	1.4–2.2 (4)	2.3–6.8 (3)	7.4–8.7 (4)	166–188 (3)	<1–<1 (3)	50–50 (3)	<0.1–<0.1 (3)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
TH-08-A3	<10–<10 (7)	<2–<2 (7)	---2.4 (1)	9.3–15.1 (19)	---6.9 (1)	56.9–88.1 (7)	<1–<1 (7)	40–60 (7)	<0.1–<0.5 (7)
	--; <10	--; <2	--; --	11.9; 12	--; --	70.5; 68.5	--; <1	52.9; 50	--; <0.1
TH-08-A4	---<10 (1)	---<2 (1)	0.8–2 (4)	---11.5 (1)	<0.1–<0.6 (4)	---59.2 (1)	---<1 (1)	---40 (1)	---<0.5 (1)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
TH-08-A5	<10–<10 (3)	<2–<2 (3)	2.5–2.7 (5)	<1–2.2 (12)	<0.1–<0.6 (5)	80.6–102 (3)	<1–<1 (3)	40–50 (3)	<0.5–<0.5 (3)
	--; --	--; --	--; --	1.61*; 1.7	--; --	--; --	--; --	--; --	--; --
Alta Mills	<10–<10 (6)	<2–<2 (8)	NA	1.9–3.4 (18)	NA	305–342 (6)	<1–<1 (6)	40–60 (6)	<0.1–<0.5 (6)
	--; <10	--; <2	NA	2.8; 2.9	NA	327; 332	--; <1	48.3; 50	--; <0.5
Aquifer storage and recovery prototype wells									
DW-TW-01	<10–<10 (6)	<2–<2 (6)	10.2–10.8 (6)	10–15.1 (7)	<0.6–0.5 (6)	51–58.7 (6)	<1–<1 (6)	20–40 (6)	<0.5–<0.5 (6)
	--; <10	--; <2	10.6; 10.7	12.3; 12.1	--; 0.2	55.5; 55.7	--; <1	31.7; 35	--; <0.5
DW-TW-02	<10–<10 (6)	<2–<2 (6)	10.1–13.9 (6)	11–21.4 (7)	0.3–1 (6)	35.6–60.2 (6)	<1–<1 (6)	20–40 (6)	<0.5–<0.5 (6)
	--; <10	--; <2	11.8; 11.8	13.7; 12	0.6; 0.6	42.8; 40.1	--; <1	28.3; 30	--; <0.5
DW-TW-03	<10–<10 (6)	<2–<2 (6)	2.4–6.5 (6)	7.3–17.4 (7)	1.5–9.9 (6)	56–59.7 (6)	<1–<1 (6)	20–40 (6)	<0.5–<0.5 (6)
	--; <10	--; <2	5.62; 6.2	9.97; 8.9	3.22; 1.95	57.7; 57.6	--; <1	30; 30	--; <0.5
DW-TW-04	<10–<10 (6)	<2–<2 (6)	2.6–4.2 (6)	5.2–11.3 (7)	2.7–4.7 (6)	72–81.9 (6)	<1–<1 (6)	20–40 (6)	<0.5–<0.5 (6)
	--; <10	--; <2	3.33; 3.3	7.66; 7.3	3.62; 3.6	76.9; 76.2	--; <1	28.3; 30	--; <0.5
DW-TW-05	<10–<10 (6)	<2–<2 (6)	6.5–8.8 (6)	8.3–12.8 (7)	0.7–3.5 (6)	88.5–97.4 (6)	<1–<1 (6)	10–40 (6)	<0.5–<0.5 (6)
	--; <10	--; <2	8.12; 8.5	10.6; 10.4	1.38; 1	93.7; 94.4	--; <1	26.7; 30	--; <0.5
DW-TW-06	<10–<10 (6)	<2–<2 (6)	2.9–4.9 (5)	4.4–9.1 (7)	0.6–3.6 (5)	80.8–100 (6)	<1–<1 (6)	20–40 (6)	<0.5–<0.5 (6)
	--; <10	--; <2	--; --	6.4; 6.2	--; --	88.3; 87.6	--; <1	30; 30	--; <0.5
DW-TW-07	<10–<10 (6)	<2–<2 (6)	<0.8–3.4 (5)	2.5–6 (7)	<0.6–3.3 (5)	87–104 (6)	<1–<1 (6)	30–60 (6)	<0.5–<0.5 (6)
	--; <10	--; <2	--; --	4.2; 4	--; --	94.2; 91.1	--; <1	38.3; 35	--; <0.5
DW-TW-08	<10–<10 (4)	<2–<2 (4)	5.3–6.7 (3)	5.6–8.4 (4)	0.6–1.6 (3)	131–148 (4)	<1–<1 (4)	30–30 (4)	<0.5–<0.5 (4)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
DW-TW-09	<10–<10 (4)	<2–<2 (4)	4.9–5.7 (3)	4.8–7 (4)	<0.6–0.9 (3)	116–120 (4)	<1–<1 (4)	30–30 (4)	<0.5–<0.5 (4)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
RRW-01	<10–<10 (6)	<2–<2 (6)	0.9–2 (6)	<1–3.2 (7)	<0.6–1.7 (6)	178–207 (6)	<1–<1 (6)	<10–30 (6)	<0.5–<0.5 (6)
	--; <10	--; <2	1.52; 1.6	2.24*; 2	--; <0.6	193; 195	--; <1	15.8*; 10	--; <0.5
RRW-02	<10–<10 (6)	<2–<2 (6)	<0.2–1.9 (6)	1.2–4.6 (7)	2.1–2.4 (6)	85–94 (6)	<1–<1 (6)	20–40 (6)	<0.5–<0.5 (6)
	--; <10	--; <2	--; <0.8	2.8; 2.8	2.2; 2.15	90.9; 91.7	--; <1	33.3; 35	--; <0.5
RRW-03	<10–<10 (4)	<2–<2 (4)	<0.2–<0.8 (4)	4.3–5 (5)	3.7–3.9 (4)	121–161 (4)	<1–<1 (4)	20–40 (4)	<0.5–<0.5 (4)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --

Table A–5. Summary of dissolved trace element concentrations in water samples collected as part of the *Equus* Beds Groundwater Recharge Project during 1995–2005.—Continued.

[µg/L, micrograms per liter; SDWR, Secondary Drinking-Water Regulation; MCL, Maximum Contaminant Level; --, not determined; HAL, Health Advisory Level; <, less than; NA, not analyzed. The first set of numbers under each heading, for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the reporting level.]

Data-collection site (fig. 6)	Chromium (µg/L)	Copper (µg/L)	Cyanide (µg/L)	Iron (µg/L)	Lead (µg/L)	Manganese (µg/L)	Mercury (µg/L)	Molybdenum (µg/L)	Nickel (µg/L)
Drinking-water criteria	100 (MCL)	1,300 (MCL)	200 (MCL)	300 (SDWR)	15 (MCL)	50 (SDWR)	2 (MCL)	--	100 (HAL)
Reporting level	10.0	5.0	0.01	10.0	1.0	5.0	0.1	0.1	1.0
Background wells									
EB-142-A3	<8–<8 (3)	<5–<5 (3)	<0.001–<1 (3)	420–480 (3)	<1–<1 (3)	120–150 (3)	<0.02–<0.02 (3)	NA	<1–<1 (3)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	NA	--; --
Sedgwick well	<0.01–<0.5 (15)	<8–<10 (15)	<5–<5 (15)	540–810 (45)	<1–<1 (15)	80–110 (45)	<0.02–<0.2 (15)	<0.1–<0.6 (5)	<1–<3 (15)
	--; <0.1	--; <8	--; <5	663; 660	--; <1	96; 100	--; <0.1	--; --	--; <1
City well-Sedgwick	---<1 (1)	---<5 (1)	---<0.01 (1)	---130 (1)	---0 (1)	---520 (1)	---<0.2 (1)	NA	---<1 (1)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	NA	--; --
TH-02-95	<8–<10 (7)	<5–<5 (7)	<0.01–<0.01 (7)	280–1,190 (25)	<1–<1 (7)	290–340 (25)	<0.1–<0.2 (7)	NA	<1–<1 (7)
	--; --	--; <5	--; <0.01	1,060; 1,090	--; <1	312; 310	--; <0.1	NA	--; <1
TH-06-95	<1–<10 (8)	<5–<5 (8)	<0.01–<0.01 (8)	210–1,730 (27)	<1–<1 (8)	220–360 (27)	<0.1–<0.2 (8)	NA	<1–<1 (8)
	--; <8	--; <5	--; <0.01	1,030; 1,020	--; <1	259; 240	--; <0.1	NA	--; <1
TH-10-95	<1–<10 (7)	<5–<5 (7)	<0.01–<0.01 (7)	390–800 (27)	<1–<1 (7)	500–690 (27)	<0.1–<0.2 (7)	NA	<1–<1 (7)
	--; <10	--; <5	--; <0.01	453; 440	--; <1	562; 560	--; <0.1	NA	--; <1
TH-12-95	---<8 (1)	---<5 (1)	---<0.01 (1)	---920 (1)	---<1 (1)	---170 (1)	---<0.2 (1)	NA	---0 (1)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	NA	--; --
TH-08-A1	<8–<8 (5)	<5–<5 (5)	<0.001–1 (5)	<10–1,850 (7)	<1–<1 (5)	310–4,320 (7)	<0.02–0.05 (5)	NA	<1–<3 (5)
	--; --	--; --	--; --	--; 10	--; --	934; 360	--; --	NA	--; --
TH-08-A2	<8–<10 (3)	<5–<5 (3)	<0.001–<0.01 (3)	<5–<10 (10)	<1–<1 (3)	90–620 (10)	<0.1–0.03 (3)	NA	<1–<1 (3)
	--; --	--; --	--; --	--; <5	--; --	278; 250	--; --	NA	--; --
TH-08-A3	<8–<10 (7)	<5–<5 (7)	<0.001–2 (7)	360–700 (23)	<1–<1 (7)	700–990 (23)	<0.02–<0.1 (7)	NA	<1–<1 (7)
	--; <10	--; <5	--; <0.01	617; 620	--; <1	786; 780	--; <0.1	NA	--; --
TH-08-A4	---<10 (1)	---<5 (1)	---<0.01 (1)	---700 (1)	---<1 (1)	---900 (1)	---<0.1 (1)	NA	---<1 (1)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	NA	--; --
TH-08-A5	<10–<10 (3)	<5–<5 (3)	<0.01–<0.01 (3)	<5–80 (12)	<1–<1 (3)	70–290 (12)	<0.1–<0.1 (3)	NA	---<1 (3)
	--; --	--; --	--; --	25.5*; 10	--; --	173; 185	--; --	NA	--; --
Alta Mills	<10–<10 (6)	<5–<5 (6)	<0.01–<0.01 (6)	<5–300 (23)	<1–<1 (6)	0–40 (23)	<0.1–<0.1 (6)	NA	<1–<1 (6)
	--; --	--; <5	--; <0.01	--; <5	--; --	12.4; 10	--; <0.1	NA	--; <1
Aquifer storage and recovery prototype wells									
DW-TW-01	<1–<10 (6)	<5–<5 (6)	<0.01–<0.01 (6)	<5–<5 (7)	<1–<1 (6)	160–180 (7)	<0.1–<0.1 (6)	NA	<1–<1 (6)
	--; --	--; <5	--; <0.01	--; <5	--; <1	164; 160	--; <0.1	NA	--; <1
DW-TW-02	<1–<10 (6)	<5–<5 (6)	<0.01–<0.01 (6)	<5–<5 (7)	<1–<1 (6)	170–230 (7)	<0.1–<0.1 (6)	NA	<1–<1 (6)
	--; --	--; <5	--; <0.01	--; <5	--; <1	187; 180	--; <0.1	NA	--; <1
DW-TW-03	<1–<10 (6)	<5–<5 (6)	<0.01–<0.01 (6)	<5–<5 (7)	<1–<1 (6)	130–150 (7)	<0.1–<0.1 (6)	NA	<1–<1 (6)
	--; --	--; <5	--; <0.01	--; <5	--; <1	139; 140	--; <0.1	NA	--; <1
DW-TW-04	<1–<10 (6)	<5–<5 (6)	<0.01–<0.01 (6)	10–20 (7)	<1–<1 (6)	150–170 (7)	<0.1–<0.1 (6)	NA	<1–<1 (6)
	--; --	--; <5	--; <0.01	12.9; 10	--; <1	154; 150	--; <0.1	NA	--; <1
DW-TW-05	<1–<10 (6)	<5–<5 (6)	<0.01–<0.01 (6)	<5–<5 (7)	<1–<1 (6)	200–240 (7)	<0.1–<0.1 (6)	NA	<1–<1 (6)
	--; --	--; <5	--; <0.01	--; <5	--; <1	207; 200	--; <0.1	NA	--; <1
DW-TW-06	<1–<10 (6)	<5–<5 (6)	<0.01–<0.01 (6)	<5–<5 (7)	<1–<1 (6)	190–220 (7)	<0.1–<0.1 (6)	NA	<1–<1 (6)
	--; --	--; <5	--; <0.01	--; --	--; <1	199; 190	--; <0.1	NA	--; --
DW-TW-07	<1–<10 (6)	<5–<5 (6)	<0.005–<0.01 (6)	<5–20 (7)	<1–<1 (6)	240–330 (7)	<0.1–<0.1 (6)	NA	<1–<1 (6)
	--; --	--; <5	--; <0.01	--; <5	--; <1	269; 250	--; <0.1	NA	--; --
DW-TW-08	<1–<1 (4)	<5–<5 (4)	<0.01–<0.01 (4)	<5–<5 (4)	<1–<1 (4)	270–280 (4)	<0.1–<0.1 (4)	NA	<1–<1 (4)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	NA	--; --
DW-TW-09	<1–<1 (4)	<5–<5 (4)	<0.01–<0.01 (4)	<5–<5 (4)	<1–<1 (4)	260–260 (4)	<0.1–<0.1 (4)	NA	<1–<1 (4)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	NA	--; --
RRW-01	<1–<10 (6)	<5–<5 (6)	<0.01–<0.01 (6)	<5–470 (7)	<1–<1 (6)	40–170 (7)	<0.1–<0.1 (6)	NA	<1–<1 (6)
	--; --	--; <5	--; <0.01	--; 20	--; <1	119; 130	--; <0.1	NA	--; --
RRW-02	<1–<10 (6)	<5–<5 (6)	<0.01–<0.01 (6)	0–20 (7)	<1–<1 (6)	180–200 (7)	<0.1–0.1 (6)	NA	<1–<1 (6)
	--; --	--; <5	--; <0.01	15.7; 20	--; <1	193; 190	--; <0.1	NA	--; --
RRW-03	<10–<10 (4)	<5–<5 (4)	<0.01–<0.01 (4)	50–230 (5)	<1–<1 (4)	270–320 (5)	<0.1–<0.1 (4)	NA	<1–<1 (4)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	NA	--; --

Table A–5. Summary of dissolved trace element concentrations in water samples collected as part of the *Equus* Beds Groundwater Recharge Project during 1995–2005.—Continued.

[µg/L, micrograms per liter; SDWR, Secondary Drinking-Water Regulation; MCL, Maximum Contaminant Level; --, not determined; HAL, Health Advisory Level; <, less than; NA, not analyzed. The first set of numbers under each heading, for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the reporting level.]

Data-collection site (fig. 6)	Selenium (µg/L)	Silver (µg/L)	Strontium (µg/L)	Thallium (µg/L)	Vanadium (µg/L)	Zinc (µg/L)	Dimethylarsinate as arsenic (µg/L)	Monomethylarsonate as arsenic (µg/L)
Drinking-water criteria	50 (MCL)	100 (SDWR)	4,000 (HAL)	2 (MCL)	--	2,000 (HAL)	--	--
Reporting level	2.0	10.0	1.0	1.7	20.0	5.0	0.6	1.2
Background wells								
EB-142-A3	<1–<2 (3)	<10–<10 (3)	580–610 (3)	<1.7–<1.7 (3)	<9–<9 (3)	<5–<5 (3)	NA	NA
	--; --	--; --	--; --	--; --	--; --	--; --	NA	NA
Sedgwick well	<2–2 (16)	<1–<10 (15)	<0.001–1 (15)	540–860 (15)	<2–<20 (15)	<3–20 (15)	0.4–0.7 (5)	<0.1–<1.2 (5)
	--; <2	--; <10	--; <0.01	652; 590	--; <9	--; <5	--; --	--; --
City well-Sedgwick	---<2 (1)	---<7 (1)	---700 (1)	---<1.7 (1)	---<9 (1)	---10 (1)	NA	NA
	--; --	--; --	--; --	--; --	--; --	--; --	NA	NA
TH-02-95	<2–<2 (8)	<7–<10 (7)	430–600 (7)	<1.7–<1.7 (7)	<2–<20 (7)	<3–10 (7)	<0.1–0.4 (5)	<0.1–<1.2 (5)
	--; <2	--; <10	484; 470	--; <1.7	--; <20	--; --	--; --	--; --
TH-06-95	<2–<2 (9)	<7–<10 (8)	310–450 (8)	<1.7–<1.7 (8)	<2–<20 (8)	<3–<5 (8)	<0.1–0.6 (5)	<0.1–0.2 (5)
	--; <2	--; <10	369; 370	--; <1.7	--; <9	--; <5	--; --	--; --
TH-10-95	<2–2 (8)	<7–<10 (7)	220–310 (7)	<1.7–<1.7 (7)	<2–<20 (7)	<3–<5 (7)	<0.1–0.7 (5)	<0.1–0.2 (5)
	--; <2	--; <10	267; 280	--; <1.7	--; <20	--; <5	--; --	--; --
TH-12-95	---<2 (1)	---<7 (1)	---650 (1)	---<1.7 (1)	---<9 (1)	---<3 (1)	NA	NA
	--; --	--; --	--; --	--; --	--; --	--; --	NA	NA
TH-08-A1	<2–<2 (5)	<10–<10 (5)	380–520 (5)	<1.7–<1.7 (5)	<9–14.7 (5)	<5–10 (5)	NA	NA
	--; --	--; --	--; --	--; --	--; --	--; --	NA	NA
TH-08-A2	<2–<2 (3)	<10–<10 (3)	510–560 (3)	<1.7–<1.7 (3)	<9–<20 (3)	<5–<5 (3)	NA	NA
	--; --	--; --	--; --	--; --	--; --	--; --	NA	NA
TH-08-A3	<2–<2 (7)	<10–<10 (7)	410–530 (7)	<1.7–<1.7 (7)	<2–<20 (7)	<5–10 (7)	<0.1–0.7 (4)	<0.1–0.1 (4)
	--; <2	--; <10	473; 470	--; <1.7	--; <20	--; <5	--; --	--; --
TH-08-A4	---<2 (1)	---<10 (1)	---440 (1)	---<1.7 (1)	---<20 (1)	---0 (1)	---<0.1 (1)	---<0.1 (1)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
TH-08-A5	<2–<2 (3)	<10–<10 (3)	420–630 (3)	<1.7–<1.7 (3)	<20–4 (3)	<5–<5 (3)	<0.1–<0.6 (4)	<0.1–<1.2 (4)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
Alta Mills	6–22 (8)	<10–<10 (6)	610–780 (6)	<1.7–<1.7 (8)	<20–7.6 (6)	<5–<5 (6)	<0.1–<0.6 (5)	<0.1–<1.2 (5)
	15.5; 16	--; <10	662; 650	--; <1.7	--; <20	--; --	--; --	--; --
Aquifer storage and recovery prototype wells								
DW-TW-01	<2–<2 (6)	<10–<10 (6)	260–280 (6)	<1.7–<1.7 (6)	<2–<20 (6)	<5–<5 (6)	<0.1–0.1 (6)	<0.1–<1.2 (6)
	--; <2	--; <10	273; 275	--; <1.7	--; <2	--; --	--; <0.6	--; <1.2
DW-TW-02	<2–<2 (6)	<10–<10 (6)	280–290 (6)	<1.7–<1.7 (6)	<2–<20 (6)	<5–<5 (6)	<0.1–0.1 (6)	<0.1–<1.2 (6)
	--; <2	--; <10	283; 280	--; <1.7	--; <2	--; --	--; <0.6	--; <1.2
DW-TW-03	<2–<2 (6)	<10–<10 (6)	270–290 (6)	<1.7–<1.7 (6)	<2–<20 (6)	<5–<5 (6)	<0.6–0.3 (6)	<0.1–<1.2 (6)
	--; <2	--; <10	283; 285	--; <1.7	--; <2	--; <5	--; <0.6	--; <1.2
DW-TW-04	<2–<2 (6)	<10–<10 (6)	260–290 (6)	<1.7–<1.7 (6)	<2–<20 (6)	<5–<5 (6)	<0.1–0.2 (6)	<0.1–0.1 (6)
	--; <2	--; <10	278; 280	--; <1.7	--; <2	--; --	--; <0.6	--; <1.2
DW-TW-05	<2–<2 (6)	<10–<10 (6)	240–260 (6)	<1.7–<1.7 (6)	<2–<20 (6)	<5–<5 (6)	<0.1–0.2 (6)	<0.1–0.1 (6)
	--; <2	--; <10	253; 255	--; <1.7	--; <2	--; --	--; <0.6	--; <1.2
DW-TW-06	<2–<2 (6)	<10–<10 (6)	250–280 (6)	<1.7–<1.7 (6)	<2–<20 (6)	<5–<5 (6)	<0.1–0.2 (6)	<0.1–<1.2 (6)
	--; <2	--; <10	265; 265	--; <1.7	--; <2	--; --	--; <0.6	--; <1.2
DW-TW-07	<2–<2 (6)	<10–<10 (6)	280–760 (6)	<1.7–<1.7 (6)	<2–<20 (6)	<5–<5 (6)	<0.1–0.1 (6)	<0.1–<1.2 (6)
	--; <2	--; <10	393; 325	--; <1.7	--; <2	--; --	--; <0.6	--; <1.2
DW-TW-08	<2–<2 (4)	<10–<10 (4)	250–270 (4)	<1.7–<1.7 (4)	<2–<2 (4)	<5–10 (4)	<0.6–<0.6 (3)	<1.2–<1.2 (3)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
DW-TW-09	<2–<2 (4)	<10–<10 (4)	270–280 (4)	<1.7–<1.7 (4)	<2–<2 (4)	<5–<5 (4)	<0.6–<0.6 (3)	<1.2–<1.2 (3)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
RRW-01	<2–<2 (6)	<10–<10 (6)	180–210 (6)	<1.7–<1.7 (6)	<20–11 (6)	<5–<5 (6)	<0.1–0.1 (6)	<0.1–<1.2 (6)
	--; <2	--; <10	197; 200	--; <1.7	--; 4.1	--; --	--; <0.6	--; <1.2
RRW-02	<2–<2 (6)	<10–<10 (6)	260–290 (6)	<1.7–<1.7 (6)	<2–<20 (6)	<5–<5 (6)	<0.1–<0.6 (6)	<0.1–<1.2 (6)
	--; <2	--; <10	278; 280	--; <1.7	--; <2	--; --	--; <0.6	--; <1.2
RRW-03	<2–<2 (4)	<10–<10 (4)	320–410 (4)	<1.7–<1.7 (4)	<2–<20 (4)	<5–<5 (4)	<0.1–0.2 (4)	<0.1–<1.2 (4)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --

Table A–5. Summary of dissolved trace element concentrations in water samples collected as part of the *Equus* Beds Groundwater Recharge Project during 1995–2005.—Continued.

[µg/L, micrograms per liter; SDWR, Secondary Drinking-Water Regulation; MCL, Maximum Contaminant Level; --, not determined; HAL, Health Advisory Level; <, less than; NA, not analyzed. The first set of numbers under each heading, for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the reporting level.]

Data-collection site (fig. 6)	Aluminum (µg/L)	Antimony (µg/L)	Arsenate as arsenic (µg/L)	Arsenic (µg/L)	Arsenite as arsenic (µg/L)	Barium (µg/L)	Beryllium (µg/L)	Boron (µg/L)	Cadmium (µg/L)
Drinking-water criteria	50–200 (SDWR)	6 (MCL)	--	10 (MCL)	--	2,000 (MCL)	4 (MCL)	1,000 (HAL)	5 (MCL)
Reporting level	10.0	2	0.8	1.0	0.6	5.0	1.0	10.0	0.5
				Shallow index wells					
IW-01A	<10–<10 (3)	<2–<2 (3)	<0.2–0.7 (5)	<1–<1 (7)	<0.1–0.4 (5)	62.7–80.3 (3)	<1–<1 (3)	<10–10 (3)	<0.5–<0.5 (3)
	--; --	--; --	--; --	--; <1	--; --	--; --	--; --	--; --	--; --
IW-02A	<10–<10 (3)	<2–<2 (3)	<0.8–0.2 (4)	<1–<1 (7)	<0.1–<0.6 (4)	82.2–88.7 (3)	<1–<1 (3)	<10–10 (3)	<0.5–<0.5 (3)
	--; --	--; --	--; --	--; <1	--; --	--; --	--; --	--; --	--; --
IW-03A	<10–<10 (3)	<2–<2 (3)	0.7–3.4 (5)	1.3–4.8 (7)	0.7–2.4 (5)	342–427 (3)	<1–<1 (3)	30–30 (3)	<0.5–<0.5 (3)
	--; --	--; --	--; --	3.09; 3	--; --	--; --	--; --	--; --	--; --
IW-04A	<10–<10 (3)	<2–<2 (3)	0.5–3.1 (4)	2.8–55 (7)	<0.6–2 (4)	53.1–72.2 (3)	<1–<1 (3)	170–270 (3)	<0.5–<0.5 (3)
	--; --	--; --	--; --	17.1; 4.3	--; --	--; --	--; --	--; --	--; --
IW-05A	<10–<10 (3)	<2–<2 (3)	0.5–0.6 (4)	<1–1.1 (7)	<0.1–<0.6 (4)	341–400 (3)	<1–<1 (3)	10–20 (3)	---0 (3)
	--; --	--; --	--; --	--; <1	--; --	--; --	--; --	--; --	--; --
IW-06A	<10–5.3 (4)	<2–0.11 (4)	0.6–1.1 (5)	<1–2.9 (8)	<0.1–0.4 (5)	312–345 (4)	<0.06–<1 (4)	30–34 (4)	<0.5–0.19 (4)
	--; --	--; --	--; --	--; <1	--; --	--; --	--; --	--; --	--; --
IW-07A	<10–<10 (3)	<2–<2 (3)	3.9–6.3 (4)	9.5–14.4 (7)	4.8–6.1 (4)	202–214 (3)	<1–<1 (3)	30–40 (3)	<0.5–<0.5 (3)
	--; --	--; --	--; --	11.5; 11.1	--; --	--; --	--; --	--; --	--; --
IW-08A	<10–<10 (3)	<2–<2 (3)	0.5–0.9 (5)	<1–1.1 (7)	<0.6–0.5 (5)	88–106 (3)	<1–<1 (3)	50–50 (3)	<0.5–<0.5 (3)
	--; --	--; --	--; --	--; <1	--; --	--; --	--; --	--; --	--; --
IW-09A	<10–<10 (3)	<2–<2 (3)	0.5–0.8 (4)	<1–1.2 (7)	<0.1–<0.6 (4)	108–147 (3)	<1–<1 (3)	40–60 (3)	<0.5–<0.5 (3)
	--; --	--; --	--; --	--; <1	--; --	--; --	--; --	--; --	--; --
IW-10A	<10–<10 (3)	<2–<2 (3)	<0.2–<0.8 (4)	<1–1.1 (7)	<0.1–<0.6 (4)	215–272 (3)	<1–<1 (3)	60–70 (3)	<0.5–<0.5 (3)
	--; --	--; --	--; --	--; <1	--; --	--; --	--; --	--; --	--; --
IW-11A-2	<10–<10 (4)	<2–<2 (4)	1.9–2.8 (5)	10.4–14.1 (7)	6.7–9.7 (5)	176–359 (4)	<1–<1 (4)	40–50 (4)	<0.5–<0.5 (4)
	--; --	--; --	--; --	11.9; 11.6	--; --	--; --	--; --	--; --	--; --
IW-12A	<10–5.4 (4)	<2–0.6 (4)	3.2–4.1 (6)	3.9–28.7 (8)	<0.1–2 (6)	109–141 (4)	<0.06–<1 (4)	60–70 (4)	<0.5–0.03 (4)
	--; --	--; --	3.65; 3.7	8.13; 5.2	--; 0.4	--; --	--; --	--; --	--; --
IW-13A	<10–5.3 (5)	<0.05–<2 (5)	1.5–3.8 (5)	5.1–8.2 (8)	2–4.9 (5)	107–120 (5)	<0.06–<1 (5)	60–72 (5)	<0.5–0.03 (5)
	--; --	--; --	--; --	6.7; 6.45	--; --	--; --	--; --	--; --	--; --
IW-14A	<10–51 (4)	<2–<2 (4)	1.5–5 (5)	3–8.1 (8)	0.2–1.6 (5)	36–49.3 (4)	<1–<1 (4)	80–90 (4)	<0.5–<0.5 (4)
	--; --	--; --	--; --	4.41; 4.25	--; --	--; --	--; --	--; --	--; --
IW-15A	<10–<10 (3)	<2–<2 (3)	<0.8–4.9 (4)	11.9–19.1 (7)	7.7–8.9 (4)	66–68 (3)	<1–<1 (3)	60–70 (3)	<0.5–<0.5 (3)
	--; --	--; --	--; --	14.8; 14.3	--; --	--; --	--; --	--; --	--; --
IW-16A	<10–<10 (4)	<2–<2 (4)	<0.8–1.6 (5)	3.6–6.3 (7)	2.4–4 (5)	150–221 (4)	<1–<1 (4)	50–60 (4)	<0.5–<0.5 (4)
	--; --	--; --	--; --	4.77; 4.7	--; --	--; --	--; --	--; --	--; --
IW-17A	<10–<10 (3)	<2–<2 (3)	1.9–3.6 (4)	7.2–11.1 (7)	4.8–6.7 (4)	136–148 (3)	<1–<1 (3)	40–50 (3)	<0.5–<0.5 (3)
	--; --	--; --	--; --	9.56; 9.8	--; --	--; --	--; --	--; --	--; --
IW-18A	<10–<10 (3)	<2–<2 (3)	<0.2–0.3 (4)	<1–<1 (7)	<0.1–<0.6 (4)	153–157 (3)	<1–<1 (3)	50–70 (3)	<0.5–<0.5 (3)
	--; --	--; --	--; --	--; <1	--; --	--; --	--; --	--; --	--; --
IW-19A	<10–<10 (3)	<2–<2 (3)	1.5–2.1 (4)	3.8–5.6 (7)	1.5–1.7 (4)	136–166 (3)	<1–<1 (3)	70–90 (3)	<0.5–<0.5 (3)
	--; --	--; --	--; --	4.27; 3.9	--; --	--; --	--; --	--; --	--; --
IW-20A	<10–<10 (3)	<2–<2 (3)	0.8–2.1 (6)	2.9–5.6 (7)	1.3–3 (6)	48.1–54.4 (3)	<1–<1 (3)	80–110 (3)	<0.5–<0.5 (3)
	--; --	--; --	1.42; 1.4	4.03; 3.8	2.38; 2.65	--; --	--; --	--; --	--; --
IW-21A	<10–<10 (4)	<2–<2 (4)	0.4–2.6 (5)	2–3.4 (7)	1.3–2.3 (5)	113–145 (4)	<1–<1 (4)	50–60 (4)	<0.5–<0.5 (4)
	--; --	--; --	--; --	2.67; 2.6	--; --	--; --	--; --	--; --	--; --
IW-22A	<10–3.1 (4)	<2–0.13 (4)	<0.2–0.4 (5)	<1–1.7 (8)	<0.6–0.6 (5)	151–207 (4)	<0.06–<1 (4)	40–70 (4)	<0.5–0.05 (4)
	--; --	--; --	--; --	--; <1	--; --	--; --	--; --	--; --	--; --
IW-23A	<10–<10 (3)	<2–<2 (3)	1.3–2.4 (4)	5.7–8.8 (7)	4.9–5.4 (4)	66.4–80.6 (3)	<1–<1 (3)	60–80 (3)	<0.5–<0.5 (3)
	--; --	--; --	--; --	7.56; 7.8	--; --	--; --	--; --	--; --	--; --
IW-24A	<10–5.6 (4)	<0.3–<2 (4)	<0.8–0.8 (5)	<1–<1 (7)	<0.1–<0.6 (5)	161–171 (4)	<0.06–<1 (4)	40–60 (4)	<0.5–0.07 (4)
	--; --	--; --	--; --	--; <1	--; --	--; --	--; --	--; --	--; --
IW-25A	<10–<10 (3)	<2–<2 (3)	<0.8–0.5 (4)	<1–<1 (7)	<0.1–<0.6 (4)	123–133 (3)	<1–<1 (3)	40–70 (3)	<0.5–<0.5 (3)
	--; --	--; --	--; --	--; <1	--; --	--; --	--; --	--; --	--; --
IW-26A	<10–<10 (3)	<2–<2 (3)	<0.8–0.6 (4)	<1–<1 (7)	<0.1–<0.6 (4)	135–160 (3)	<1–<1 (3)	50–70 (3)	<0.5–<0.5 (3)
	--; --	--; --	--; --	--; <1	--; --	--; --	--; --	--; --	--; --

Table A–5. Summary of dissolved trace element concentrations in water samples collected as part of the *Equus* Beds Groundwater Recharge Project during 1995–2005.—Continued.

[µg/L, micrograms per liter; SDWR, Secondary Drinking-Water Regulation; MCL, Maximum Contaminant Level; --, not determined; HAL, Health Advisory Level; <, less than; NA, not analyzed. The first set of numbers under each heading, for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the reporting level.]

Data-collection site (fig. 6)	Chromium (µg/L)	Copper (µg/L)	Cyanide (µg/L)	Iron (µg/L)	Lead (µg/L)	Manganese (µg/L)	Mercury (µg/L)	Molybdenum (µg/L)	Nickel (µg/L)
Drinking-water criteria	100 (MCL)	1,300 (MCL)	200 (MCL)	300 (SDWR)	15 (MCL)	50 (SDWR)	2 (MCL)	--	100 (HAL)
Reporting level	10.0	5.0	0.01	10.0	1.0	5.0	0.1	--	1.0
Shallow index wells									
IW-01A	<10–<10 (3)	<5–<5 (3)	<0.01–<0.01 (3)	<5–<5 (7)	<1–<1 (3)	60–90 (7)	<0.1–<0.1 (3)	NA	---<1 (3)
	--; --	--; --	--; --	--; <5	--; --	78.6; 80	--; --	NA	--; --
IW-02A	<10–<10 (3)	<5–<5 (3)	<0.01–<0.01 (3)	<5–<5 (7)	<1–<1 (3)	<5–20 (7)	<0.1–<0.1 (3)	NA	---<1 (3)
	--; --	--; --	--; --	--; <5	--; --	--; --	--; --	NA	--; --
IW-03A	<10–<10 (3)	<5–<5 (3)	<0.01–<0.01 (3)	2,090–3,040 (7)	<1–<1 (3)	950–1,490 (7)	<0.1–<0.1 (3)	NA	<1–<1 (3)
	--; --	--; --	--; --	2,410; 2,340	--; --	1,240; 1,190	--; --	NA	--; --
IW-04A	<1–<10 (3)	<5–<5 (3)	<0.01–<0.01 (3)	0–34,500 (7)	<1–<1 (3)	100–1,390 (7)	<0.1–<0.1 (3)	NA	---0 (3)
	--; --	--; --	--; --	9,830; 370	--; --	587; 310	--; --	NA	--; --
IW-05A	<10–<10 (3)	<5–<5 (3)	<0.01–<0.01 (3)	10–260 (7)	<1–<1 (3)	120–300 (7)	<0.1–<0.1 (3)	NA	---0 (3)
	--; --	--; --	--; --	100; 60	--; --	220; 220	--; --	NA	--; --
IW-06A	<10–0.8 (4)	<5–0.6 (4)	<0.01–<0.01 (3)	<5–10 (8)	<0.08–<1 (4)	0–30 (8)	<0.1–<0.1 (3)	---1.4 (1)	0–4.21 (4)
	--; --	--; --	--; --	--; <5	--; --	14.7; 18.9	--; --	--; --	--; --
IW-07A	<1–<10 (3)	<5–<5 (3)	<0.01–<0.01 (3)	40–170 (7)	<1–<1 (3)	330–370 (7)	<0.1–<0.1 (3)	NA	<1–<1 (3)
	--; --	--; --	--; --	94.3; 90	--; --	353; 350	--; --	NA	--; --
IW-08A	<10–<10 (3)	<5–<5 (3)	<0.01–<0.01 (3)	30–270 (7)	<1–<1 (3)	30–110 (7)	<0.1–<0.1 (3)	NA	---0 (3)
	--; --	--; --	--; --	174; 170	--; --	85.7; 100	--; --	NA	--; --
IW-09A	<10–<10 (3)	<5–<5 (3)	<0.01–<0.01 (3)	<5–<5 (7)	<1–<1 (3)	100–360 (7)	<0.1–<0.1 (3)	NA	---0 (3)
	--; --	--; --	--; --	--; <5	--; --	260; 300	--; --	NA	--; --
IW-10A	<10–<10 (3)	<5–<5 (3)	<0.01–<0.01 (3)	<5–20 (7)	<1–<1 (3)	<1–<5 (7)	<0.1–<0.1 (3)	NA	---<1 (3)
	--; --	--; --	--; --	--; --	--; --	--; <5	--; --	NA	--; --
IW-11A-2	<1–<10 (4)	<5–<5 (4)	<0.01–<0.01 (4)	370–1270 (7)	<1–<1 (4)	240–330 (7)	<0.1–<0.1 (4)	NA	<1–<1 (4)
	--; --	--; --	--; --	790; 720	--; --	304; 310	--; --	NA	--; --
IW-12A	<0.8–<10 (4)	<5–0.8 (4)	<0.01–<0.01 (3)	10–80 (9)	<0.08–<1 (4)	0–380 (9)	<0.1–0.13 (3)	---3.1 (1)	0–1.78 (4)
	--; --	--; --	--; --	43.3; 40	--; --	125; 30	--; --	--; --	--; --
IW-13A	<0.8–<10 (5)	<5–1.5 (5)	<0.01–<0.01 (4)	1,600–2,490 (8)	<0.08–<1 (5)	150–190 (8)	<0.1–<0.1 (4)	---9.4 (1)	<1–1.48 (5)
	--; --	--; --	--; --	2,130; 2,180	--; --	165; 166	--; --	--; --	--; --
IW-14A	<1–<10 (4)	<5–<5 (4)	<0.01–<0.01 (4)	2,440–8,440 (8)	<1–<1 (4)	130–350 (8)	<0.1–<0.1 (4)	NA	0–200 (4)
	--; --	--; --	--; --	4,890; 4,410	--; --	199; 165	--; --	NA	--; --
IW-15A	<10–<10 (3)	<5–<5 (3)	<0.01–<0.01 (3)	6,440–8,200 (7)	<1–<1 (3)	870–1,040 (7)	<0.1–<0.1 (3)	NA	---0 (3)
	--; --	--; --	--; --	7,060; 6,780	--; --	957; 950	--; --	NA	--; --
IW-16A	<10–<10 (4)	<5–<5 (4)	<0.01–<0.01 (4)	7,540–9,040 (7)	<1–<1 (4)	700–780 (7)	<0.1–<0.1 (4)	NA	<1–<1 (4)
	--; --	--; --	--; --	8,280; 8,260	--; --	737; 740	--; --	NA	--; --
IW-17A	<10–<10 (3)	<5–<5 (3)	<0.01–<0.01 (3)	1,350–1,940 (7)	<1–<1 (3)	130–180 (7)	<0.1–<0.1 (3)	NA	<1–<1 (3)
	--; --	--; --	--; --	1,560; 1,520	--; --	157; 160	--; --	NA	--; --
IW-18A	<10–<10 (3)	<5–<5 (3)	<0.01–<0.01 (2)	210–270 (7)	<1–<1 (3)	10–30 (7)	<0.1–<0.1 (3)	NA	<1–<1 (3)
	--; --	--; --	--; --	251; 260	--; --	18.6; 20	--; --	NA	--; --
IW-19A	<10–<10 (3)	<5–<5 (3)	<0.01–<0.01 (3)	2,440–2,980 (7)	<1–<1 (3)	250–340 (7)	<0.1–<0.1 (3)	NA	<1–<1 (3)
	--; --	--; --	--; --	2,710; 2,680	--; --	317; 330	--; --	NA	--; --
IW-20A	<10–<10 (3)	<5–<5 (3)	<0.01–<0.01 (3)	34,900–40,700 (7)	<1–<1 (3)	860–1,070 (7)	<0.1–<0.1 (3)	NA	<1–<1 (3)
	--; --	--; --	--; --	37,000; 36,700	--; --	967; 940	--; --	NA	--; --
IW-21A	<10–<10 (4)	<5–<5 (4)	<0.01–<0.01 (4)	6,870–9,130 (7)	<1–<1 (4)	380–530 (7)	<0.1–<0.1 (4)	NA	<1–<1 (4)
	--; --	--; --	--; --	7,790; 7,460	--; --	423; 400	--; --	NA	--; --
IW-22A	<10–1.4 (4)	<5–1 (4)	<0.01–<0.01 (3)	78–210 (8)	<0.08–<1 (4)	50–90 (8)	<0.1–<0.1 (3)	---3.4 (1)	<1–1.4 (4)
	--; --	--; --	--; --	151; 170	--; --	68.2; 65	--; --	--; --	--; --
IW-23A	<1–<10 (3)	<5–<5 (3)	<0.01–<0.01 (3)	800–1,870 (7)	<1–<1 (3)	730–960 (7)	<0.1–<0.1 (3)	NA	<1–<1 (3)
	--; --	--; --	--; --	1,590; 1,760	--; --	890; 930	--; --	NA	--; --
IW-24A	<0.8–<10 (4)	<5–0.5 (4)	<0.01–<0.01 (3)	<5–<8 (8)	<0.08–<1 (4)	<1–1.9 (8)	<0.1–<0.1 (3)	---2.3 (1)	<1–2.9 (4)
	--; --	--; --	--; --	--; <5	--; --	--; <5	--; --	--; --	--; --
IW-25A	<1–<10 (3)	<5–<5 (3)	<0.01–<0.01 (3)	<5–<5 (7)	<1–<1 (3)	<1–20 (7)	<0.1–<0.1 (3)	NA	<1–<1 (3)
	--; --	--; --	--; --	--; <5	--; --	--; <5	--; --	NA	--; --
IW-26A	<10–<10 (3)	<5–<5 (3)	<0.01–<0.01 (3)	<5–10 (7)	<1–<1 (3)	<1–<5 (7)	<0.1–<0.1 (3)	NA	<1–<1 (3)
	--; --	--; --	--; --	--; <5	--; --	--; <5	--; --	NA	--; --

Table A–5. Summary of dissolved trace element concentrations in water samples collected as part of the *Equus* Beds Groundwater Recharge Project during 1995–2005.—Continued.

[µg/L, micrograms per liter; SDWR, Secondary Drinking-Water Regulation; MCL, Maximum Contaminant Level; --, not determined; HAL, Health Advisory Level; <, less than; NA, not analyzed. The first set of numbers under each heading, for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the reporting level.]

Data-collection site (fig. 6)	Selenium (µg/L)	Silver (µg/L)	Strontium (µg/L)	Thallium (µg/L)	Vanadium (µg/L)	Zinc (µg/L)	Dimethylarsinate as arsenic (µg/L)	Monomethylarsonate as arsenic (µg/L)
Drinking-water criteria	50 (MCL)	100 (SDWR)	4,000 (HAL)	2 (MCL)	--	2,000 (HAL)	--	--
Reporting level	2.0	10.0	1.0	1.7	20.0	5.0	0.6	1.2
Shallow index wells								
IW-01A	<2–<2 (3)	<10–<10 (3)	70–100 (3)	<1.7–<1.7 (3)	<2–<20 (3)	<5–<5 (3)	<0.1–0.4 (5)	<0.1–0.4 (5)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-02A	<2–<2 (3)	<10–<10 (3)	80–90 (3)	<1.7–<1.7 (3)	<2–<20 (3)	<5–<5 (3)	<0.1–<0.6 (4)	<0.1–<1.2 (4)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-03A	<2–<2 (3)	<10–<10 (3)	320–370 (3)	<1.7–<1.7 (3)	<2–<20 (3)	<5–<5 (3)	<0.1–0.4 (5)	<0.1–0.5 (5)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-04A	<2–<2 (3)	<10–<10 (3)	340–430 (3)	<1.7–<1.7 (3)	<20–6.3 (3)	<5–10 (3)	<0.1–<0.6 (4)	<0.1–<1.2 (4)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-05A	<2–<2 (3)	<10–<10 (3)	230–270 (3)	<1.7–<1.7 (3)	<2–<20 (3)	<5–<5 (3)	<0.1–0.1 (4)	<0.1–0.2 (4)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-06A	2–3 (4)	<1–<10 (4)	360–380 (3)	<1.7–<1.7 (3)	<20–3.5 (3)	<5–1.9 (4)	<0.1–0.4 (5)	<1.2–0.3 (5)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-07A	<2–<2 (3)	<10–<10 (3)	250–260 (3)	<1.7–<1.7 (3)	<2–<20 (3)	<5–<5 (3)	<0.1–0.5 (4)	<0.1–0.5 (4)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-08A	<2–3 (3)	<10–<10 (3)	1,240–1,400 (3)	<1.7–<1.7 (3)	<20–4.1 (3)	0–10 (3)	<0.1–0.3 (5)	<0.1–0.3 (5)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-09A	11–14 (3)	<10–<10 (3)	500–500 (3)	<1.7–<1.7 (3)	<20–7.9 (3)	<5–<5 (3)	<0.1–<0.6 (4)	<0.1–<1.2 (4)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-10A	<2–2 (3)	<10–<10 (3)	340–420 (3)	<1.7–<1.7 (3)	<20–4.5 (3)	<5–<5 (3)	<0.1–<0.6 (4)	<0.1–<1.2 (4)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-11A-2	<2–<2 (4)	<10–<10 (4)	240–430 (4)	<1.7–<1.7 (4)	<2–<20 (4)	<5–<5 (4)	<0.1–0.6 (5)	<0.1–<1.2 (5)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-12A	<2–<2 (4)	<1–<10 (4)	400–560 (3)	<1.7–<1.7 (3)	<20–6.5 (3)	<1–<5 (4)	<0.1–<0.6 (6)	<0.1–<1.2 (6)
	--; --	--; --	--; --	--; --	--; --	--; --	--; <0.1	--; <0.1
IW-13A	<2–<2 (4)	<1–<10 (5)	1,070–1,520 (4)	<1.7–<1.7 (4)	<2–<20 (4)	<5–1.7 (5)	<0.1–<0.6 (5)	<0.1–<1.2 (5)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-14A	<2–2 (4)	<10–<10 (4)	460–640 (4)	<1.7–<1.7 (4)	<2–<20 (4)	30–90 (4)	<0.1–<0.6 (5)	<0.1–<1.2 (5)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-15A	<2–<2 (3)	<10–<10 (3)	1,320–1,360 (3)	<1.7–<1.7 (3)	<2–<20 (3)	---0 (3)	<0.1–1 (4)	<0.1–<1.2 (4)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-16A	<2–<2 (4)	<10–<10 (4)	650–810 (4)	<1.7–<1.7 (4)	<2–<20 (4)	<5–10 (4)	<0.1–<0.6 (5)	<0.1–<1.2 (5)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-17A	<2–4 (3)	<10–<10 (3)	620–640 (3)	<1.7–<1.7 (3)	<2–<20 (3)	<5–<5 (3)	<0.1–0.5 (4)	<0.1–0.3 (4)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-18A	<2–<2 (3)	<10–<10 (3)	1,090–1,130 (3)	<1.7–<1.7 (3)	<2–<20 (3)	---<5 (3)	<0.1–<0.6 (4)	<0.1–<1.2 (4)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-19A	<2–<2 (3)	<10–<10 (3)	1,600–1,880 (3)	<1.7–<1.7 (3)	<2–<20 (3)	---0 (3)	<0.1–<0.6 (4)	<0.1–0.2 (4)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-20A	<2–<2 (3)	<10–<10 (3)	1,730–1,800 (3)	<1.7–<1.7 (3)	<2–<20 (3)	0–10 (3)	<0.1–0.1 (6)	<0.1–0.3 (6)
	--; --	--; --	--; --	--; --	--; --	--; --	--; <0.6	--; <1.2
IW-21A	<2–<2 (4)	<10–<10 (4)	860–1,290 (4)	<1.7–<1.7 (4)	<2–<20 (4)	<5–<5 (4)	<0.1–<0.6 (5)	<1.2–0.2 (5)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-22A	<2–<2 (3)	<1–<10 (4)	920–1,090 (3)	<1.7–<1.7 (3)	<2–<20 (3)	<5–1 (4)	<0.1–<0.6 (5)	<0.1–0.2 (5)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-23A	<2–<2 (3)	<10–<10 (3)	480–620 (3)	<1.7–<1.7 (3)	<2–<20 (3)	<5–<5 (3)	<0.1–0.4 (4)	<0.1–0.4 (4)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-24A	<2–4 (4)	<0.2–<10 (4)	860–930 (3)	<1.7–<1.7 (3)	<2–<20 (3)	<5–0.9 (4)	<0.1–<0.6 (5)	<0.1–0.3 (5)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-25A	54–76 (3)	<10–<10 (3)	610–710 (3)	<1.7–<1.7 (3)	<2–<20 (3)	---<5 (3)	<0.1–<0.6 (4)	<0.1–0.2 (4)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-26A	13–39 (3)	<10–<10 (3)	720–790 (3)	<1.7–<1.7 (3)	<2–<20 (3)	<5–<5 (3)	<0.1–<0.6 (4)	<1.2–0.3 (4)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --

Table A–5. Summary of dissolved trace element concentrations in water samples collected as part of the *Equus* Beds Groundwater Recharge Project during 1995–2005.—Continued.

[µg/L, micrograms per liter; SDWR, Secondary Drinking-Water Regulation; MCL, Maximum Contaminant Level; --, not determined; HAL, Health Advisory Level; <, less than; NA, not analyzed. The first set of numbers under each heading, for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the reporting level.]

Data-collection site (fig. 6)	Aluminum (µg/L)	Antimony (µg/L)	Arsenate as arsenic (µg/L)	Arsenic (µg/L)	Arsenite as arsenic (µg/L)	Barium (µg/L)	Beryllium (µg/L)	Boron (µg/L)	Cadmium (µg/L)
Drinking-water criteria	50–200 (SDWR)	6 (MCL)	--	10 (MCL)	--	2,000 (MCL)	4 (MCL)	1,000 (HAL)	5 (MCL)
Reporting level	10.0	2.5	0.8	1.0	0.6	5.0	1.0	10.0	0.5
Shallow index wells—Continued									
IW-27A	<10–<10 (3)	<2–<2 (3)	<0.8–1 (4)	<1–<1 (7)	<0.1–<0.6 (4)	160–170 (3)	<1–<1 (3)	40–60 (3)	<0.5–<0.5 (3)
	--; --	--; --	--; --	--; <1	--; --	--; --	--; --	--; --	--; --
IW-28A	<10–<10 (4)	<2–<2 (4)	0.7–1.2 (5)	<1–1.4 (7)	<0.1–<0.6 (5)	56.6–65 (4)	<1–<1 (4)	30–60 (4)	<0.5–<0.5 (4)
	--; --	--; --	--; --	--; <1	--; --	--; --	--; --	--; --	--; --
IW-29A	<10–5.1 (5)	<0.3–<2 (5)	3.4–5.1 (4)	7–11.4 (10)	5.7–7.4 (4)	83.9–112 (5)	<0.06–<1 (5)	40–60 (5)	<0.5–0.03 (5)
	--; --	--; --	--; --	9.67; 10.1	--; --	--; --	--; --	--; --	--; --
IW-30A	<10–6.3 (5)	<0.3–0.11 (5)	<0.2–0.5 (5)	<1–<2 (8)	<0.1–0.2 (5)	62.8–71.5 (5)	<0.06–<1 (5)	30–50 (5)	<0.04–<0.5 (5)
	--; --	--; --	--; --	--; <1	--; --	--; --	--; --	--; --	--; --
IW-31A	<10–<10 (3)	<2–<2 (3)	<0.2–0.4 (4)	<1–<1 (7)	<0.1–0.2 (4)	141–159 (3)	<1–<1 (3)	30–40 (3)	<0.5–<0.5 (3)
	--; --	--; --	--; --	--; <1	--; --	--; --	--; --	--; --	--; --
IW-32A	<10–<10 (4)	<2–<2 (4)	<0.8–0.8 (5)	<1–<1 (7)	<0.1–0.2 (5)	82.5–112 (4)	<1–<1 (4)	30–50 (4)	<0.5–<0.5 (4)
	--; --	--; --	--; --	--; <1	--; --	--; --	--; --	--; --	--; --
IW-33A	<10–<10 (3)	<2–<2 (3)	<0.8–0.4 (4)	<1–<1 (7)	<0.1–<0.6 (4)	153–171 (3)	<1–<1 (3)	30–40 (3)	<0.5–<0.5 (3)
	--; --	--; --	--; --	--; <1	--; --	--; --	--; --	--; --	--; --
IW-34A	<10–<10 (4)	<2–<2 (4)	<0.2–0.8 (5)	2.9–7.5 (7)	2–4.1 (5)	117–137 (4)	<1–<1 (4)	40–60 (4)	<0.5–<0.5 (4)
	--; --	--; --	--; --	4.74; 4	--; --	--; --	--; --	--; --	--; --
IW-35A	<10–6.5 (6)	<0.3–<2 (6)	<0.2–0.3 (5)	<1–<2 (10)	<0.1–0.1 (5)	40–44.7 (6)	<0.06–<1 (6)	110–140 (6)	<0.5–0.21 (6)
	--; <10	--; <2	--; --	--; <1	--; --	43.2; 44	--; <1	129; 130	--; <0.5
IW-36A	<10–6.4 (5)	<0.3–<2 (5)	<0.2–0.3 (4)	<1–<2 (10)	<0.1–0.1 (4)	83.7–103 (5)	<0.06–<1 (5)	70–90 (5)	<0.5–0.04 (5)
	--; --	--; --	--; --	--; <1	--; --	--; --	--; --	--; --	--; --
IW-37A	<10–<10 (3)	<2–<2 (3)	<0.2–0.5 (5)	<1–<1 (7)	<0.1–0.1 (5)	381–427 (3)	<1–<1 (3)	30–40 (3)	<0.5–<0.5 (3)
	--; --	--; --	--; --	--; <1	--; --	--; --	--; --	--; --	--; --
IW-38A	<10–<10 (3)	<2–<2 (3)	0.8–1.8 (4)	3.3–5.3 (7)	2.3–2.8 (4)	118–136 (3)	<1–<1 (3)	70–80 (3)	<0.5–<0.5 (3)
	--; --	--; --	--; --	4.01; 3.9	--; --	--; --	--; --	--; --	--; --
Deep index wells									
IW-01C	36–56 (3)	<2–<2 (3)	3.6–4 (5)	12–16.2 (7)	8.2–9.9 (5)	149–152 (3)	<1–<1 (3)	20–30 (3)	<0.5–<0.5 (3)
	--; --	--; --	--; --	13.6; 13	--; --	--; --	--; --	--; --	--; --
IW-02C	<10–10 (3)	<2–<2 (3)	0.3–0.7 (4)	<1–2 (7)	0.7–1.1 (4)	207–221 (3)	<1–<1 (3)	<10–20 (3)	<0.5–<0.5 (3)
	--; --	--; --	--; --	1.37*; 1.40	--; --	--; --	--; --	--; --	--; --
IW-03C	<10–4.6 (4)	<2–0.11 (4)	<0.2–1.2 (5)	8.4–10.4 (8)	7.1–7.9 (5)	118–123 (4)	<0.06–<1 (4)	20–36 (4)	<0.5–0.02 (4)
	--; --	--; --	--; --	9.33; 9.2	--; --	--; --	--; --	--; --	--; --
IW-04C	<10–<10 (3)	<2–<2 (3)	0.5–2 (4)	6.1–10.1 (7)	4.4–6.6 (4)	191–201 (3)	<1–<1 (3)	40–40 (3)	<0.5–<0.5 (3)
	--; --	--; --	--; --	7.5; 7.4	--; --	--; --	--; --	--; --	--; --
IW-05C	<10–<10 (3)	<2–<2 (3)	0.8–0.9 (4)	4.8–6.6 (7)	3.5–4.3 (4)	271–414 (3)	<1–<1 (3)	20–30 (3)	<0.5–<0.5 (3)
	--; --	--; --	--; --	5.53; 5.4	--; --	--; --	--; --	--; --	--; --
IW-06C	<10–<10 (3)	<2–<2 (3)	1.9–3.8 (5)	4.8–6.7 (7)	1.6–3.5 (5)	160–167 (3)	<1–<1 (3)	20–30 (3)	<0.5–<0.5 (3)
	--; --	--; --	--; --	5.83; 5.9	--; --	--; --	--; --	--; --	--; --
IW-07C	<10–<10 (3)	<2–<2 (3)	1.3–1.7 (4)	10.9–13.8 (7)	9.3–11 (4)	53–62.2 (3)	<1–<1 (3)	50–50 (3)	<0.5–<0.5 (3)
	--; --	--; --	--; --	12.4; 12.3	--; --	--; --	--; --	--; --	--; --
IW-08C	<10–5.1 (6)	<0.6–0.07 (6)	2.6–6 (5)	7–14.9 (11)	4.1–8.1 (5)	993–1,150 (6)	<0.1–<1 (6)	41–60 (6)	<0.07–0.05 (6)
	--; <10	--; <2	--; --	11.2; 10.6	--; --	1,090; 1,090	--; --	50.2; 48	--; --
IW-09C	<10–<10 (3)	<2–<2 (3)	1.4–4.5 (4)	14–21 (7)	10.7–14.2 (4)	131–144 (3)	<1–<1 (3)	30–40 (3)	<0.5–<0.5 (3)
	--; --	--; --	--; --	17.3; 16.9	--; --	--; --	--; --	--; --	--; --
IW-10C	<10–<10 (3)	<2–<2 (3)	0.6–1.6 (4)	8–9.8 (7)	6–6.8 (4)	98.6–109 (3)	<1–<1 (3)	30–40 (3)	<0.5–<0.5 (3)
	--; --	--; --	--; --	8.73; 8.8	--; --	--; --	--; --	--; --	--; --
IW-11C	<10–<10 (4)	<2–<2 (4)	3.6–4.7 (5)	8.2–15.2 (7)	6.8–7.6 (5)	70–77.4 (4)	<1–<1 (4)	40–50 (4)	<0.5–<0.5 (4)
	--; --	--; --	--; --	12.1; 12.1	--; --	--; --	--; --	--; --	--; --
IW-12C	<10–<10 (3)	<2–<2 (3)	3.2–5.1 (6)	14.4–19.1 (8)	8.7–10.8 (6)	259–277 (3)	<1–<1 (3)	60–70 (3)	<0.5–<0.5 (3)
	--; --	--; --	4.08; 4.15	16.9; 16.9	9.67; 9.75	--; --	--; --	--; --	--; --
IW-13C	<10–<10 (4)	<2–<2 (4)	2–4.9 (5)	15.5–22.3 (7)	10.8–13.4 (5)	86–90.4 (4)	<1–<1 (4)	50–50 (4)	<0.5–<0.5 (4)
	--; --	--; --	--; --	18.3; 17.8	--; --	--; --	--; --	--; --	--; --
IW-14C	<10–<10 (4)	<2–<2 (4)	0.7–3.9 (5)	14.5–19 (8)	10.5–13.7 (5)	143–151 (4)	<1–<1 (4)	60–70 (4)	<0.5–<0.5 (4)
	--; --	--; --	--; --	16.7; 16.4	--; --	--; --	--; --	--; --	--; --
IW-15C	<10–<10 (3)	<2–<2 (3)	4.8–5 (4)	5.9–9.6 (7)	0.5–0.8 (4)	84–86.6 (3)	<1–<1 (3)	40–50 (3)	<0.5–<0.5 (3)
	--; --	--; --	--; --	7.33; 7.3	--; --	--; --	--; --	--; --	--; --

Table A–5. Summary of dissolved trace element concentrations in water samples collected as part of the *Equus* Beds Groundwater Recharge Project during 1995–2005.—Continued.

[µg/L, micrograms per liter; SDWR, Secondary Drinking-Water Regulation; MCL, Maximum Contaminant Level; --, not determined; HAL, Health Advisory Level; <, less than; NA, not analyzed; The first set of numbers under each heading, for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the reporting level.]

Data-collection site (fig. 6)	Chromium (µg/L)	Copper (µg/L)	Cyanide (µg/L)	Iron (µg/L)	Lead (µg/L)	Manganese (µg/L)	Mercury (µg/L)	Molybdenum (µg/L)	Nickel (µg/L)
Drinking-water criteria	100 (MCL)	1,300 (MCL)	200 (MCL)	300 (SDWR)	15 (MCL)	50 (SDWR)	2 (MCL)	--	100 (HAL)
Reporting level	10.0	5.0	0.01	10.0	1.0	5.0	0.1	--	1.0
Shallow index wells—Continued									
IW-27A	<10–<10 (3)	<5–<5 (3)	<0.01–<0.01 (3)	<5–<5 (7)	<1–<1 (3)	<1–<5 (7)	<0.1–<0.1 (3)	NA	<1–<1 (3)
	--; --	--; --	--; --	--; <5	--; --	--; --	--; --	NA	--; --
IW-28A	<10–<10 (4)	<5–<5 (4)	<0.01–<0.01 (4)	<5–<5 (7)	<1–<1 (4)	<1–<5 (7)	<0.1–<0.1 (4)	NA	---<1 (4)
	--; --	--; --	--; --	--; <5	--; --	--; <1	--; --	NA	--; --
IW-29A	<0.8–0.8 (5)	<5–1.9 (5)	<0.01–<0.01 (3)	1,520–5,340 (10)	<0.08–0.12 (5)	740–910 (10)	<0.1–<0.1 (3)	5.3–5.5 (2)	0–6.16 (5)
	--; --	--; --	--; --	3,830; 3,960	--; --	828; 810	--; --	--; --	--; --
IW-30A	<0.8–<10 (5)	<5–1 (5)	<0.01–<0.01 (3)	<5–20 (9)	<0.08–<1 (5)	<1–0.5 (9)	<0.1–<0.1 (3)	1.4–1.5 (2)	<1–2.83 (5)
	--; --	--; --	--; --	--; <5	--; --	--; <5	--; --	--; --	--; --
IW-31A	<10–<10 (3)	<5–<5 (3)	<0.01–<0.01 (3)	<5–<5 (7)	<1–<1 (3)	<1–<5 (7)	<0.1–<0.1 (3)	NA	<1–<1 (3)
	--; --	--; --	--; --	--; <5	--; --	--; <5	--; --	NA	--; --
IW-32A	<10–<10 (4)	<5–<5 (4)	<0.01–<0.01 (4)	<5–<5 (7)	<1–<1 (4)	10–20 (7)	<0.1–<0.1 (4)	NA	<1–<1 (4)
	--; --	--; --	--; --	--; --	--; --	17.1; 20	--; --	NA	--; --
IW-33A	<10–<10 (3)	<5–<5 (3)	<0.01–<0.01 (3)	<5–20 (7)	<1–<1 (3)	<1–<5 (7)	<0.1–<0.1 (3)	NA	<1–<1 (3)
	--; --	--; --	--; --	--; <5	--; --	--; <5	--; --	NA	--; --
IW-34A	<1–<10 (4)	<5–<5 (4)	<0.01–<0.01 (4)	380–460 (7)	<1–<1 (4)	0–50 (7)	<0.1–<0.1 (4)	NA	<1–<1 (4)
	--; --	--; --	--; --	420; 410	--; --	15.7; 10	--; --	NA	--; --
IW-35A	<0.8–<10 (6)	<5–1.6 (6)	<0.01–<0.01 (4)	<5–14 (10)	<1–3.43 (6)	500–590 (10)	<0.1–<0.1 (4)	8.5–9.3 (2)	<1–5.15 (6)
	--; --	--; <5	--; --	--; <5	--; <1	541; 535	--; --	--; --	--; --
IW-36A	<0.8–<10 (5)	<5–1.3 (5)	<0.01–<0.01 (3)	<5–<10 (10)	<0.08–0.07 (5)	<1–1 (10)	<0.1–<0.1 (3)	1.8–2 (2)	<1–3.84 (5)
	--; --	--; --	--; --	--; <5	--; --	--; <5	--; --	--; --	--; --
IW-37A	<10–<10 (3)	<5–<5 (3)	<0.01–<0.01 (3)	<5–<5 (7)	<1–<1 (3)	<1–<5 (7)	<0.1–<0.1 (3)	NA	---<1 (3)
	--; --	--; --	--; --	--; <5	--; --	--; <5	--; --	NA	--; --
IW-38A	<10–<10 (3)	<5–<5 (3)	<0.01–<0.01 (3)	370–970 (7)	<1–<1 (3)	510–650 (7)	<0.1–<0.1 (3)	NA	<1–<1 (3)
	--; --	--; --	--; --	659; 690	--; --	554; 550	--; --	NA	--; --
Deep index wells									
IW-01C	<1–<10 (3)	<5–<5 (3)	<0.01–<0.01 (3)	20–190 (7)	<1–<1 (3)	140–300 (7)	<0.1–<0.1 (3)	NA	<1–<1 (3)
	--; --	--; --	--; --	97.1; 80	--; --	229; 240	--; --	NA	--; --
IW-02C	<1–<10 (3)	<5–<5 (3)	<0.01–<0.01 (3)	180–640 (7)	<1–<1 (3)	100–160 (7)	<0.1–<0.1 (3)	NA	<1–<1 (3)
	--; --	--; --	--; --	471; 510	--; --	124; 120	--; --	NA	--; --
IW-03C	<0.8–<10 (4)	<5–0.2 (4)	<0.01–<0.01 (3)	20–50 (8)	<0.08–<1 (4)	160–230 (8)	<0.1–<0.1 (3)	---3.3 (1)	<1–0.65 (4)
	--; --	--; --	--; --	40.8; 40	--; --	213; 225	--; --	--; --	--; --
IW-04C	<10–<10 (3)	<5–<5 (3)	<0.01–<0.01 (3)	290–510 (7)	<1–<1 (3)	490–560 (7)	<0.1–<0.1 (3)	NA	<1–<1 (3)
	--; --	--; --	--; --	411; 430	--; --	534; 530	--; --	NA	--; --
IW-05C	<10–<10 (3)	<5–<5 (3)	<0.01–<0.01 (3)	560–1170 (7)	<1–<1 (3)	450–800 (7)	<0.1–<0.1 (3)	NA	<1–<1 (3)
	--; --	--; --	--; --	889; 940	--; --	669; 710	--; --	NA	--; --
IW-06C	<1–<10 (3)	<5–<5 (3)	<0.01–<0.01 (3)	290–720 (7)	<1–<1 (3)	210–300 (7)	<0.1–<0.1 (3)	NA	<1–<1 (3)
	--; --	--; --	--; --	509; 510	--; --	267; 280	--; --	NA	--; --
IW-07C	<10–<10 (3)	<5–<5 (3)	<0.01–<0.01 (3)	40–50 (7)	<1–<1 (3)	260–320 (7)	<0.1–<0.1 (3)	NA	<1–<1 (3)
	--; --	--; --	--; --	45.7; 50	--; --	289; 290	--; --	NA	--; --
IW-08C	<0.8–0.4 (6)	<5–1.4 (6)	<0.01–<0.01 (3)	14,300–15,800 (11)	<0.160–<1 (6)	1,250–1,420 (11)	<0.1–<0.1 (3)	2.1–2.1 (3)	0–15 (6)
	--; --	--; <5	--; --	15,200; 15,300	--; --	1,310; 1,310	--; --	--; --	5.14; 2.96
IW-09C	<10–<10 (3)	<5–<5 (3)	<0.01–<0.01 (3)	70–120 (7)	<1–<1 (3)	380–440 (7)	<0.1–<0.1 (3)	NA	<1–<1 (3)
	--; --	--; --	--; --	92.9; 100	--; --	416; 420	--; --	NA	--; --
IW-10C	<1–<10 (3)	<5–<5 (3)	<0.01–<0.01 (3)	670–900 (7)	<1–<1 (3)	240–260 (7)	<0.1–<0.1 (3)	NA	<1–<1 (3)
	--; --	--; --	--; --	800; 790	--; --	247; 250	--; --	NA	--; --
IW-11C	<1–<10 (4)	<5–<5 (4)	<0.01–0.01 (4)	20–140 (7)	<1–<1 (4)	90–280 (7)	<0.1–<0.1 (4)	NA	<1–<1 (4)
	--; --	--; --	--; --	75.7; 60	--; --	221; 240	--; --	NA	--; --
IW-12C	<10–<10 (3)	<5–<5 (3)	<0.01–<0.01 (3)	1,590–2,350 (8)	<1–<1 (3)	1,180–1,450 (8)	<0.1–<0.1 (3)	NA	<1–<1 (3)
	--; --	--; --	--; --	2,040; 2,050	--; --	1,360; 1,400	--; --	NA	--; --
IW-13C	<10–<10 (4)	<5–<5 (4)	<0.01–<0.01 (4)	1,670–2,210 (7)	<1–<1 (4)	490–530 (7)	<0.1–<0.1 (4)	NA	<1–<1 (4)
	--; --	--; --	--; --	2,060; 2,160	--; --	503; 500	--; --	NA	--; --
IW-14C	<10–<10 (4)	<5–<5 (4)	<0.01–<0.01 (4)	1,900–2,240 (8)	<1–<1 (4)	970–1,070 (8)	<0.1–<0.1 (4)	NA	<1–<1 (4)
	--; --	--; --	--; --	2,090; 2,100	--; --	1,020; 1,020	--; --	NA	--; --
IW-15C	<10–<10 (3)	<5–<5 (3)	<0.01–<0.01 (3)	10–30 (7)	<1–<1 (3)	460–500 (7)	<0.1–<0.1 (3)	NA	<1–<1 (3)
	--; --	--; --	--; --	20; 20	--; --	481; 480	--; --	NA	--; --

Table A–5. Summary of dissolved trace element concentrations in water samples collected as part of the *Equus* Beds Groundwater Recharge Project during 1995–2005.—Continued.

[µg/L, micrograms per liter; SDWR, Secondary Drinking-Water Regulation; MCL, Maximum Contaminant Level; --, not determined; HAL, Health Advisory Level; <, less than; NA, not analyzed. The first set of numbers under each heading, for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the reporting level.]

Data-collection site (fig. 6)	Selenium (µg/L)	Silver (µg/L)	Strontium (µg/L)	Thallium (µg/L)	Vanadium (µg/L)	Zinc (µg/L)	Dimethylarsinate as arsenic (µg/L)	Monomethylarsonate as arsenic (µg/L)
Drinking-water criteria	50 (MCL)	100 (SDWR)	4,000 (HAL)	2 (MCL)	--	2,000 (HAL)	--	--
Reporting level	2.0	10.0	1.0	1.7	20.0	5.0	0.6	1.2
Shallow index wells—Continued								
IW-27A	5–8 (3)	<10–<10 (3)	900–1,010 (3)	<1.7–<1.7 (3)	<20–2.7 (3)	0–10 (3)	<0.1–<0.6 (4)	<1.2–0.4 (4)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-28A	5–33 (4)	<10–<10 (4)	770–960 (4)	<1.7–<1.7 (4)	<2–<20 (4)	--–0 (4)	<0.1–<0.6 (5)	<0.1–0.2 (5)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-29A	<2–<2 (3)	<10–0.2 (5)	1,120–1,620 (3)	<1.7–<1.7 (3)	<2–<20 (3)	0–1.9 (5)	<0.1–0.6 (4)	<0.1–0.5 (4)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-30A	<2–2 (4)	<0.2–<10 (5)	710–780 (3)	<1.7–<1.7 (3)	<2–<20 (3)	<1–10 (5)	<0.1–0.1 (5)	<0.1–0.4 (5)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-31A	<2–2 (3)	<10–<10 (3)	760–880 (3)	<1.7–<1.7 (3)	<2–<20 (3)	--–0 (3)	<0.1–0.2 (4)	<0.1–0.6 (4)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-32A	<2–2 (4)	<10–<10 (4)	620–1,080 (4)	<1.7–<1.7 (4)	<2–<20 (4)	<5–<5 (4)	<0.1–0.1 (5)	<0.1–0.4 (5)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-33A	3–5 (3)	<10–<10 (3)	550–620 (3)	<1.7–<1.7 (3)	<2–<20 (3)	<5–20 (3)	<0.1–<0.6 (4)	<0.1–<1.2 (4)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-34A	<2–<2 (4)	<10–<10 (4)	520–690 (4)	<1.7–<1.7 (4)	<2–<20 (4)	<5–<5 (4)	<0.1–0.2 (5)	<0.1–0.4 (5)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-35A	<2–<2 (4)	<10–0.2 (6)	1,000–1,440 (4)	<1.7–<1.7 (4)	<2–<20 (4)	<5–1.3 (6)	<0.1–<0.6 (5)	<0.1–0.1 (5)
	--; --	--; <10	--; --	--; --	--; --	--; --	--; --	--; --
IW-36A	<2–3 (3)	<10–0.3 (5)	960–1,120 (3)	<1.7–<1.7 (3)	<2–<20 (3)	<5–1.6 (5)	<0.1–<0.6 (4)	<0.1–0.2 (4)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-37A	<2–2 (3)	<10–<10 (3)	750–890 (3)	<1.7–<1.7 (3)	<2–<20 (3)	--–0 (3)	<0.1–<0.6 (5)	<0.1–0.2 (5)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-38A	<2–<2 (3)	<10–<10 (3)	1,280–1,430 (3)	<1.7–<1.7 (3)	<2–<20 (3)	--–0 (3)	<0.1–0.2 (4)	<1.2–0.4 (4)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
Deep index wells								
IW-01C	<2–<2 (3)	<10–<10 (3)	250–310 (3)	<1.7–<1.7 (3)	<2–<20 (3)	<5–<5 (3)	<0.1–0.8 (5)	<0.1–0.4 (5)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-02C	<2–<2 (3)	<10–<10 (3)	190–220 (3)	<1.7–<1.7 (3)	<2–<20 (3)	<5–<5 (3)	<0.1–0.1 (4)	<0.1–0.1 (4)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-03C	<2–2 (4)	<1–<10 (4)	220–230 (3)	<1.7–1.7 (3)	<2–<20 (3)	<1–<5 (4)	<0.1–1.9 (5)	<0.1–0.4 (5)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-04C	<2–<2 (3)	<10–<10 (3)	550–600 (3)	<1.7–<1.7 (3)	<2–<20 (3)	<5–<5 (3)	<0.1–0.4 (4)	<0.1–0.4 (4)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-05C	<2–<2 (3)	<10–<10 (3)	420–680 (3)	<1.7–<1.7 (3)	<2–<20 (3)	<5–<5 (3)	<0.1–0.5 (4)	<0.1–0.2 (4)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-06C	<2–<2 (3)	<10–<10 (3)	210–230 (3)	<1.7–<1.7 (3)	<2–<20 (3)	<5–<5 (3)	<0.1–0.5 (5)	<0.1–0.4 (5)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-07C	<2–<2 (3)	<10–<10 (3)	370–390 (3)	<1.7–<1.7 (3)	<2–<20 (3)	<5–<5 (3)	<0.1–0.8 (4)	<1.2–0.6 (4)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-08C	<2–<2 (4)	<2–1.5 (6)	4,380–4,760 (3)	<1.7–<1.7 (3)	<2–<20 (3)	0–10 (6)	<0.1–0.6 (5)	<0.1–0.4 (5)
	--; --	--; <10	--; --	--; --	--; --	4.95; 3.45	--; --	--; --
IW-09C	<2–<2 (3)	<10–<10 (3)	360–450 (3)	<1.7–<1.7 (3)	<2–<20 (3)	<5–<5 (3)	<0.1–0.9 (4)	<0.1–0.7 (4)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-10C	<2–<2 (3)	<1–<10 (3)	250–270 (3)	<1.7–<1.7 (3)	<2–<20 (3)	<5–<5 (3)	<0.1–0.8 (4)	<0.1–<1.2 (4)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-11C	<2–<2 (4)	<10–<10 (4)	240–260 (4)	<1.7–<1.7 (4)	<2–<20 (4)	<5–<5 (4)	<0.1–0.5 (5)	<0.1–<1.2 (5)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-12C	<2–<2 (3)	<10–<10 (3)	970–1,040 (3)	<1.7–<1.7 (3)	<2–<20 (3)	--–<5 (3)	<0.1–0.8 (6)	<0.1–0.6 (6)
	--; --	--; --	--; --	--; --	--; --	--; --	--; 0.5	--; <1.2
IW-13C	<2–2 (4)	<10–<10 (4)	1,000–1,230 (4)	<1.7–<1.7 (4)	<2–<20 (4)	<5–<5 (4)	<0.1–0.8 (5)	<0.1–0.6 (5)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-14C	<2–<2 (4)	<10–<10 (4)	1,500–1,880 (4)	<1.7–<1.7 (4)	<2–<20 (4)	0–10 (4)	<0.1–0.8 (5)	<0.1–0.5 (5)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-15C	<2–<2 (3)	<10–<10 (3)	840–910 (3)	<1.7–<1.7 (3)	<2–<20 (3)	--–0 (3)	<0.1–<0.6 (4)	<0.1–<1.2 (4)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --

Table A–5. Summary of dissolved trace element concentrations in water samples collected as part of the *Equus* Beds Groundwater Recharge Project during 1995–2005.—Continued.

[µg/L, micrograms per liter; SDWR, Secondary Drinking-Water Regulation; MCL, Maximum Contaminant Level; --, not determined; HAL, Health Advisory Level; <, less than; NA, not analyzed. The first set of numbers under each heading, for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the reporting level.]

Data-collection site (fig. 6)	Aluminum (µg/L)	Antimony (µg/L)	Arsenate as arsenic (µg/L)	Arsenic (µg/L)	Arsenite as arsenic (µg/L)	Barium (µg/L)	Beryllium (µg/L)	Boron (µg/L)	Cadmium (µg/L)
Drinking-water criteria	50–200 (SDWR)	6 (MCL)	--	10 (MCL)	--	2,000 (MCL)	4 (MCL)	1,000 (HAL)	5 (MCL)
Reporting level	10.0	2.5	0.8	1.0	0.6	5.0	1.0	10.0	0.5
Deep index wells—Continued									
IW-16C	<10–<10 (4)	<2–<2 (4)	0.4–1.5 (5)	5.5–7 (7)	3.8–5 (5)	72.7–83.8 (4)	<1–<1 (4)	40–50 (4)	<0.5–<0.5 (4)
	--; --	--; --	--; --	6.07; 6	--; --	--; --	--; --	--; --	--; --
IW-17C	<10–<10 (3)	<2–<2 (3)	1.9–3.5 (4)	20.4–23.9 (7)	16.9–17.5 (4)	64.1–72.7 (3)	<1–<1 (3)	40–60 (3)	<0.5–<0.5 (3)
	--; --	--; --	--; --	21.6; 21.1	--; --	--; --	--; --	--; --	--; --
IW-18C	<10–<10 (3)	<2–<2 (3)	<0.8–0.5 (4)	1.5–3 (7)	1.2–1.3 (4)	85.8–92.1 (3)	<1–<1 (3)	40–50 (3)	<0.5–<0.5 (3)
	--; --	--; --	--; --	2.09; 2	--; --	--; --	--; --	--; --	--; --
IW-19C	<10–<10 (3)	<2–<2 (3)	<0.8–0.4 (4)	1.6–2.6 (7)	1.6–2 (4)	67.4–70.5 (3)	<1–<1 (3)	50–60 (3)	<0.5–<0.5 (3)
	--; --	--; --	--; --	2.26; 2.2	--; --	--; --	--; --	--; --	--; --
IW-20C	<10–4.7 (5)	<0.3–<2 (5)	2.2–3.6 (5)	10–15.7 (10)	7.9–10.5 (5)	101–127 (5)	<0.06–<1 (5)	50–60 (5)	<0.5–0.04 (5)
	--; --	--; --	--; --	13; 12.7	--; --	--; --	--; --	--; --	--; --
IW-21C	<10–<10 (4)	<2–<2 (4)	0.7–3.6 (5)	6.3–9.3 (8)	3.5–6.1 (5)	116–130 (4)	<1–<1 (4)	60–60 (4)	<0.5–<0.5 (4)
	--; --	--; --	--; --	7.49; 7.1	--; --	--; --	--; --	--; --	--; --
IW-22C	<10–<10 (3)	<2–<2 (3)	1.6–3 (5)	14.6–17.3 (7)	0.3–12.1 (5)	60.7–64.7 (3)	<1–<1 (3)	40–60 (3)	<0.5–<0.5 (3)
	--; --	--; --	--; --	15.8; 15.6	--; --	--; --	--; --	--; --	--; --
IW-23C	<10–<10 (3)	<2–<2 (3)	1.7–2.3 (4)	14.3–16.6 (7)	10.2–11.7 (4)	64.2–67.7 (3)	<1–<1 (3)	40–60 (3)	<0.5–<0.5 (3)
	--; --	--; --	--; --	15.2; 15	--; --	--; --	--; --	--; --	--; --
IW-24C	<10–5.6 (4)	<0.3–<2 (4)	<0.8–0.6 (5)	<1–<1 (7)	<0.1–0.1 (5)	42–43.9 (4)	<0.06–<1 (4)	50–70 (4)	<0.5–0.12 (4)
	--; --	--; --	--; --	--; <1	--; --	--; --	--; --	--; --	--; --
IW-25C	<10–5.4 (5)	<0.3–<2 (5)	0.5–0.8 (4)	<1–1 (10)	<0.1–0.1 (4)	40.4–49.1 (5)	<0.06–<1 (5)	40–64 (5)	<0.04–0.03 (5)
	--; --	--; --	--; --	--; <1	--; --	--; --	--; --	--; --	--; --
IW-26C	<10–<10 (3)	<2–<2 (3)	2.2–2.7 (4)	2–2.9 (6)	<0.6–12.7 (4)	42.2–44.3 (3)	<1–<1 (3)	40–70 (3)	<0.5–<0.5 (3)
	--; --	--; --	--; --	2.52; 2.6	--; --	--; --	--; --	--; --	--; --
IW-27C	<10–<10 (3)	<2–<2 (3)	0.4–1.5 (4)	<1–1.6 (7)	<0.1–<0.6 (4)	41–48.4 (3)	<1–<1 (3)	50–60 (3)	<0.5–<0.5 (3)
	--; --	--; --	--; --	1.30*; 1.30	--; --	--; --	--; --	--; --	--; --
IW-28C	<10–<10 (4)	<2–<2 (4)	1.4–2.1 (5)	1.6–3.1 (7)	<0.1–0.2 (5)	43–49.4 (4)	<1–<1 (4)	40–70 (4)	<0.5–<0.5 (4)
	--; --	--; --	--; --	2.19; 2	--; --	--; --	--; --	--; --	--; --
IW-29C	<10–25 (3)	<2–<2 (3)	1.5–9.2 (4)	11.6–15.8 (7)	<0.6–9.6 (4)	91.9–94 (3)	<1–<1 (3)	40–50 (3)	<0.5–<0.5 (3)
	--; --	--; --	--; --	13.3; 13.2	--; --	--; --	--; --	--; --	--; --
IW-30C	<10–9.1 (6)	<0.3–<2 (6)	<0.8–0.7 (5)	<1–1 (10)	<0.1–0.3 (5)	28–36 (6)	<0.06–<1 (6)	104–115 (6)	<0.5–0.04 (6)
	--; <10	--; <10	--; --	--; <1	--; --	31.7; 30.7	--; <0.06	109; 110	--; <0.5
IW-31C	<10–5.2 (4)	<2–0.13 (4)	1–1.6 (4)	1–1.7 (8)	<0.1–0.3 (4)	33.7–40 (4)	<0.06–<1 (4)	50–71 (4)	<0.5–0.03 (4)
	--; --	--; --	--; --	1.36; 1.35	--; --	--; --	--; --	--; --	--; --
IW-32C	<10–<10 (4)	<2–<2 (4)	<0.8–1.2 (5)	<1–1.2 (7)	<0.1–0.2 (5)	100–105 (4)	<1–<1 (4)	30–40 (4)	<0.5–<0.5 (4)
	--; --	--; --	--; --	--; <1	--; --	--; --	--; --	--; --	--; --
IW-33C	<10–<10 (3)	<2–<2 (3)	<0.8–1.1 (4)	1.8–3.4 (7)	<0.6–1 (4)	56.8–60.9 (3)	<1–<1 (3)	40–50 (3)	<0.5–<0.5 (3)
	--; --	--; --	--; --	2.33; 2.2	--; --	--; --	--; --	--; --	--; --
IW-34C	<10–<10 (4)	<2–<2 (4)	2.2–3.3 (5)	3.2–4.2 (7)	<0.1–0.2 (5)	59.1–81 (4)	<1–<1 (4)	40–60 (4)	<0.5–<0.5 (4)
	--; --	--; --	--; --	3.84; 3.9	--; --	--; --	--; --	--; --	--; --
IW-35C	<10–6.4 (6)	<0.3–<2 (6)	1.3–2 (5)	1.2–2.2 (10)	<0.1–0.1 (5)	74–83 (6)	<0.06–<1 (6)	40–60 (6)	<0.04–<0.5 (6)
	--; <10	--; <2	--; --	1.75; 1.8	--; --	80.2; 80.7	--; <1	52.5; 53.5	--; <0.5
IW-36C	<10–<10 (3)	<2–<2 (3)	0.5–1.2 (4)	<1–2.4 (7)	<0.1–0.1 (4)	93.9–105 (3)	<1–<1 (3)	40–60 (3)	<0.5–<0.5 (3)
	--; --	--; --	--; --	--; 1.1	--; --	--; --	--; --	--; --	--; --
IW-37C	<10–<10 (3)	<2–<2 (3)	<0.8–1 (5)	<1–1.2 (7)	<0.1–0.1 (5)	73.9–76.4 (3)	<1–<1 (3)	30–40 (3)	<0.5–<0.5 (3)
	--; --	--; --	--; --	--; <1	--; --	--; --	--; --	--; --	--; --
IW-38C	<10–<10 (3)	<2–<2 (3)	<0.2–0.4 (4)	<1–<1 (7)	<0.1–0.3 (4)	114–115 (3)	<1–<1 (3)	40–50 (3)	<0.5–<0.5 (3)
	--; --	--; --	--; --	--; <1	--; --	--; --	--; --	--; --	--; --

Table A–5. Summary of dissolved trace element concentrations in water samples collected as part of the *Equus* Beds Groundwater Recharge Project during 1995–2005.—Continued.

[µg/L, micrograms per liter; SDWR, Secondary Drinking-Water Regulation; MCL, Maximum Contaminant Level; --, not determined; HAL, Health Advisory Level; <, less than; NA, not analyzed. The first set of numbers under each heading, for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the reporting level.]

Data-collection site (fig. 6)	Chromium (µg/L)	Copper (µg/L)	Cyanide (µg/L)	Iron (µg/L)	Lead (µg/L)	Manganese (µg/L)	Mercury (µg/L)	Molybdenum (µg/L)	Nickel (µg/L)
Drinking-water criteria	100 (MCL)	1,300 (MCL)	200 (MCL)	300 (SDWR)	15 (MCL)	50 (SDWR)	2 (MCL)	--	100 (HAL)
Reporting level	10.0	5.0	0.01	10.0	1.0	5.0	0.1	--	1.0
Deep index wells—Continued									
IW-16C	<10–<10 (4)	<5–<5 (4)	<0.01–<0.01 (4)	3,110–5,840 (7)	<1–<1 (4)	810–980 (7)	<0.1–<0.1 (4)	NA	<1–<1 (4)
	--; --	--; --	--; --	4,420; 4,250	--; --	883; 860	--; --	NA	--; --
IW-17C	<10–<10 (3)	<5–<5 (3)	<0.01–<0.01 (3)	730–960 (7)	<1–<1 (3)	330–360 (7)	<0.1–<0.1 (3)	NA	<1–<1 (3)
	--; --	--; --	--; --	850; 860	--; --	347; 350	--; --	NA	--; --
IW-18C	<10–<10 (3)	<5–<5 (3)	<0.01–<0.01 (3)	290–590 (7)	<1–<1 (3)	260–270 (7)	<0.1–<0.1 (3)	NA	<1–<1 (3)
	--; --	--; --	--; --	501; 540	--; --	264; 260	--; --	NA	--; --
IW-19C	<10–<10 (3)	<5–<5 (3)	<0.01–<0.01 (3)	60–140 (7)	<1–<1 (3)	510–550 (7)	<0.1–<0.1 (3)	NA	<1–<1 (3)
	--; --	--; --	--; --	126; 140	--; --	526; 520	--; --	NA	--; --
IW-20C	<0.8–0.5 (5)	<5–1.7 (5)	<0.01–<0.01 (3)	1,420–2,260 (10)	<0.08–<1 (5)	1,100–1,390 (10)	<0.1–<0.1 (3)	3.7–4.1 (2)	<1–3.69 (5)
	--; --	--; --	--; --	1,840; 1,690	--; --	1,210; 1,180	--; --	--; --	--; --
IW-21C	<10–<10 (4)	<5–<5 (4)	<0.01–<0.01 (4)	7,600–11,500 (8)	<1–<1 (4)	1,000–1,210 (8)	<0.1–<0.1 (4)	NA	<1–<1 (4)
	--; --	--; --	--; --	10,400; 11,000	--; --	1,070; 1,070	--; --	NA	--; --
IW-22C	<1–<10 (3)	<5–<5 (3)	<0.01–<0.01 (3)	600–1,120 (7)	<1–<1 (3)	440–490 (7)	<0.1–<0.1 (3)	NA	<1–<1 (3)
	--; --	--; --	--; --	899; 900	--; --	459; 450	--; --	NA	--; --
IW-23C	<1–<10 (3)	<5–<5 (3)	<0.01–<0.01 (3)	430–720 (7)	<1–<1 (3)	470–520 (7)	<0.1–<0.1 (3)	NA	<1–<1 (3)
	--; --	--; --	--; --	511; 490	--; --	497; 500	--; --	NA	--; --
IW-24C	<0.8–<10 (4)	<5–0.4 (4)	<0.01–<0.01 (3)	<5–20 (8)	<0.08–<1 (4)	60–120 (8)	<0.1–<0.1 (3)	---6.3 (1)	<1–1.76 (4)
	--; --	--; --	--; --	--; <5	--; --	89.9; 89.7	--; --	--; --	--; --
IW-25C	<0.8–<10 (5)	<5–0.6 (5)	<0.01–<0.01 (3)	<5–<10 (10)	<1–0.04 (5)	38.4–140 (10)	<0.1–<0.1 (3)	6.2–6.3 (2)	<1–1.7 (5)
	--; --	--; --	--; --	--; <5	--; --	64; 60	--; --	--; --	--; --
IW-26C	<10–<10 (3)	<5–<5 (3)	<0.01–<0.01 (3)	<5–<5 (6)	<1–<1 (3)	220–240 (6)	<0.1–<0.1 (3)	NA	<1–<1 (3)
	--; --	--; --	--; --	--; --	--; --	225; 220	--; --	NA	--; --
IW-27C	<1–<10 (3)	<5–<5 (3)	<0.01–<0.01 (3)	<5–10 (7)	<1–<1 (3)	170–190 (7)	<0.1–<0.1 (3)	NA	<1–<1 (3)
	--; --	--; --	--; --	--; --	--; --	180; 180	--; --	NA	--; --
IW-28C	<10–<10 (4)	<5–<5 (4)	<0.01–<0.01 (4)	<5–<5 (7)	<1–<1 (4)	160–210 (7)	<0.1–<0.1 (4)	NA	<1–<1 (4)
	--; --	--; --	--; --	--; <5	--; --	179; 170	--; --	NA	--; --
IW-29C	<10–<10 (3)	<5–<5 (3)	<0.01–<0.01 (3)	1,320–2,000 (7)	<1–<1 (3)	500–610 (7)	<0.1–<0.1 (3)	NA	---<1 (3)
	--; --	--; --	--; --	1,680; 1,720	--; --	557; 550	--; --	NA	--; --
IW-30C	<0.8–<10 (6)	<5–1.3 (6)	<0.01–<0.01 (3)	<5–5 (11)	<0.08–0.05 (6)	310–340 (11)	<0.1–<0.1 (3)	5.7–6 (3)	<1–3.19 (6)
	--; --	--; <5	--; --	--; <5	--; <1	323; 322	--; --	--; --	--; <1
IW-31C	<0.8–<10 (4)	<5–0.6 (4)	<0.01–<0.01 (3)	<5–<10 (8)	<0.08–<1 (4)	289–320 (8)	<0.1–<0.1 (3)	---5.8 (1)	<1–1.43 (4)
	--; --	--; --	--; --	--; --	--; --	300; 295	--; --	--; --	--; --
IW-32C	<10–<10 (4)	<5–<5 (4)	<0.01–<0.01 (4)	<5–<5 (7)	<1–<1 (4)	50–70 (7)	<0.1–<0.1 (4)	NA	<1–<1 (4)
	--; --	--; --	--; --	--; <5	--; --	57.1; 60	--; --	NA	--; --
IW-33C	<10–<10 (3)	<5–<5 (3)	<0.01–<0.01 (3)	<5–20 (7)	<1–<1 (3)	140–170 (7)	<0.1–<0.1 (3)	NA	<1–<1 (3)
	--; --	--; --	--; --	--; <5	--; --	157; 160	--; --	NA	--; --
IW-34C	<10–<10 (4)	<5–<5 (4)	<0.01–<0.01 (4)	<5–<5 (7)	<1–<1 (4)	110–190 (7)	<0.1–<0.1 (4)	NA	<1–<1 (4)
	--; --	--; --	--; --	--; <5	--; --	169; 180	--; --	NA	--; --
IW-35C	<0.8–<10 (6)	<5–0.7 (6)	<0.01–<0.01 (4)	<5–<10 (10)	<0.08–0.07 (6)	0–40 (10)	<0.1–<0.1 (4)	3.4–3.4 (2)	<1–3.33 (6)
	--; --	--; <5	--; --	--; <5	--; <1	21.6; 20.5	--; --	--; --	--; <1
IW-36C	<10–<10 (3)	<5–<5 (3)	<0.01–<0.01 (3)	<5–<5 (7)	<1–<1 (3)	<1–30 (7)	<0.1–<0.1 (3)	NA	<1–<1 (3)
	--; --	--; --	--; --	--; <5	--; --	--; --	--; --	NA	--; --
IW-37C	<10–<10 (3)	<5–<5 (3)	<0.01–<0.01 (3)	<5–<5 (7)	<1–<1 (3)	310–340 (7)	<0.1–<0.1 (3)	NA	<1–<1 (3)
	--; --	--; --	--; --	--; <5	--; --	326; 330	--; --	NA	--; --
IW-38C	<10–<10 (3)	<5–<5 (3)	<0.01–<0.01 (3)	0–10 (7)	<1–<1 (3)	290–330 (7)	<0.1–<0.1 (3)	NA	<1–<1 (3)
	--; --	--; --	--; --	7.14; 10	--; --	306; 300	--; --	NA	--; --

Table A–5. Summary of dissolved trace element concentrations in water samples collected as part of the *Equus* Beds Groundwater Recharge Project during 1995–2005.—Continued.

[µg/L, micrograms per liter; SDWR, Secondary Drinking-Water Regulation; MCL, Maximum Contaminant Level; --, not determined; HAL, Health Advisory Level; <, less than; NA, not analyzed. The first set of numbers under each heading, for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the reporting level.]

Data-collection site (fig. 6)	Selenium (µg/L)	Silver (µg/L)	Strontium (µg/L)	Thallium (µg/L)	Vanadium (µg/L)	Zinc (µg/L)	Dimethylarsinate as arsenic (µg/L)	Monomethylarsonate as arsenic (µg/L)
Drinking-water criteria	50 (MCL)	100 (SDWR)	4,000 (HAL)	2 (MCL)	--	2,000 (HAL)	--	--
Reporting level	2.0	10.0	1.0	1.7	20.0	5.0	0.6	1.2
Deep index wells—Continued								
IW-16C	<2–<2 (4)	<10–<10 (4)	670–900 (4)	<1.7–<1.7 (4)	<2–<20 (4)	<5–<5 (4)	<0.1–<0.6 (5)	<0.1–<1.2 (5)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-17C	<2–<2 (3)	<10–<10 (3)	330–390 (3)	<1.7–<1.7 (3)	<2–<20 (3)	<5–<5 (3)	<0.1–1.6 (4)	<0.1–1 (4)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-18C	<2–<2 (3)	<10–<10 (3)	880–940 (3)	<1.7–<1.7 (3)	<2–<20 (3)	<5–<5 (3)	<0.1–<0.6 (4)	<0.1–0.1 (4)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-19C	<2–<2 (3)	<10–<10 (3)	800–850 (3)	<1.7–<1.7 (3)	<2–<20 (3)	<5–<5 (3)	<0.1–<0.6 (4)	<1.2–0.2 (4)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-20C	<2–<2 (3)	<0.2–<10 (5)	1,330–1,580 (3)	<1.7–<1.7 (3)	<2–<20 (3)	0–2.2 (5)	0.2–0.6 (5)	<0.1–0.4 (5)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-21C	<2–<2 (4)	<10–<10 (4)	1,760–1,880 (4)	<1.7–<1.7 (4)	<2–<20 (4)	---0 (4)	<0.1–0.3 (5)	<1.2–0.3 (5)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-22C	<2–<2 (3)	<10–<10 (3)	570–610 (3)	<1.7–1.7 (3)	<2–<20 (3)	<5–<5 (3)	<0.1–0.9 (5)	<0.1–0.6 (5)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-23C	<2–<2 (3)	<10–<10 (3)	490–540 (3)	<1.7–<1.7 (3)	<2–<20 (3)	<5–<5 (3)	<0.1–1 (4)	<0.1–0.5 (4)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-24C	<2–<3 (4)	<0.2–<10 (4)	600–690 (3)	<1.7–<1.7 (3)	<2–<20 (3)	<1–<5 (4)	<0.1–<0.6 (5)	<0.1–0.2 (5)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-25C	<2–<2 (3)	<0.2–0.2 (5)	790–920 (3)	<1.7–<1.7 (3)	<20–3.4 (3)	<1–0.7 (5)	<0.1–<0.6 (4)	<0.1–0.2 (4)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-26C	<2–<2 (3)	<10–<10 (3)	960–1,090 (3)	<1.7–<1.7 (3)	<20–4.5 (3)	<5–<5 (3)	<0.6–0.2 (4)	<1.2–0.4 (4)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-27C	<2–<2 (3)	<10–<10 (3)	830–930 (3)	<1.7–<1.7 (3)	<20–2.2 (3)	---<5 (3)	<0.1–<0.6 (4)	<1.2–0.2 (4)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-28C	<2–<2 (4)	<10–<10 (4)	920–1,040 (4)	<1.7–<1.7 (4)	<2–<20 (4)	<5–<5 (4)	<0.1–<0.6 (5)	<0.1–0.3 (5)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-29C	<2–<2 (3)	<10–<10 (3)	760–810 (3)	<1.7–<1.7 (3)	<2–<20 (3)	---<5 (3)	<0.1–0.6 (4)	<0.1–0.8 (4)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-30C	<2–<3 (4)	<0.2–0.2 (6)	2,050–2,300 (3)	<1.7–<1.7 (3)	<2–<20 (3)	<5–0.9 (6)	<0.1–0.2 (5)	<0.1–0.6 (5)
	--; --	--; <10	--; --	--; --	--; --	--; --	--; --	--; --
IW-31C	<2–<2 (3)	<1–<10 (4)	1,260–1,430 (3)	<1.7–<1.7 (3)	<20–2.6 (3)	<1–<5 (4)	<0.1–0.2 (4)	<0.1–0.4 (4)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-32C	5–7 (4)	<10–<10 (4)	620–770 (4)	<1.7–<1.7 (4)	<2–<20 (4)	<5–<5 (4)	<0.1–0.1 (5)	<0.1–0.5 (5)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-33C	<2–<2 (3)	<10–<10 (3)	770–880 (3)	<1.7–<1.7 (3)	<20–2.1 (3)	<5–10 (3)	<0.1–<0.6 (4)	<0.1–0.2 (4)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-34C	<2–<2 (4)	<10–<10 (4)	800–970 (4)	<1.7–<1.7 (4)	<20–5.6 (4)	<5–<5 (4)	<0.1–<0.6 (5)	<0.1–0.4 (5)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-35C	<2–<2 (4)	<10–0.1 (6)	1,010–1,380 (4)	<1.7–<1.7 (4)	<2–3.5 (4)	<5–0.8 (6)	<0.1–<0.6 (5)	<0.1–0.2 (5)
	--; --	--; <10	--; --	--; --	--; --	--; --	--; --	--; --
IW-36C	<2–2 (3)	<10–<10 (3)	1,210–1,670 (3)	<1.7–<1.7 (3)	<20–2.1 (3)	---0 (3)	<0.1–<0.6 (4)	<0.1–0.2 (4)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-37C	9–12 (3)	<10–<10 (3)	650–730 (3)	<1.7–<1.7 (3)	<20–2.7 (3)	<5–<5 (3)	<0.1–<0.6 (5)	<0.1–0.2 (5)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
IW-38C	<2–<2 (3)	<10–<10 (3)	940–1,040 (3)	<1.7–<1.7 (3)	<2–<20 (3)	---<5 (3)	<0.1–<0.6 (4)	<0.1–0.3 (4)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --

Table A–6. Summary of detections of organic compounds in water samples collected as part of the *Equus* Beds Groundwater Recharge Project during 1995–2005.

[µg/L, micrograms per liter; MCL, Maximum Contaminant Level; --, not determined; <, less than; NA, not analyzed; HAL, Health Advisory Level; ELISA, enzyme-linked immunosorbent assay; ft, feet. The first set of numbers under each heading, for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the reporting level.]

Data-collection site (fig. 6)	2,4-D, dissolved (µg/L)	2,4-D, total (µg/L)	2,6-Diethylaniline, dissolved (µg/L)[1]	2-Chloro-2′,6′-diethyl-acetanilide, dissolved (µg/L)	2-Chloro-4-isopro-pylamno-6-amino-s-triazine, dissolved (µg/L)	2-Chloro-4-isopro-pylamino-6-amino-s-triazine, total (µg/L)	2-Chloro-6-ethyl-amino-4-amino-s-triazine, dissolved (µg/L)	2-Chloro-6-ethyl-amino-4-amino-s-triazine, total (µg/L)	2-Ethyl-6-methylaniline, dissolved (µg/L)
Drinking-water criteria	70 (MCL)	70 (MCL)	--	--	--	--	--	--	6 (MCL)
Reporting level	0.36	0.01	0.009	0.005	0.05	0.2	0.08	0.2	5.0
07143672 (near Halstead)	<0.01–1.07 (4)	<0.01–0.18 (5)	<0.002–<0.009 (50)	<0.005–0.032 (9)	<0.006–1.85 (144)	<0.2–0.4 (3)	<0.05–1.25 (90)	<0.2–0.2 (3)	<0.004–<0.004 (9)
	--; --	--; --	--; <0.003	--; <0.005	0.357*; 0.2	--; --	0.228*; 0.15	--; --	--; <0.004
07144100 (near Sedgwick)	<0.04–0.34 (5)	<0.01–0.46 (5)	<0.002–<0.009 (52)	<0.005–0.021 (9)	0.008–5.81 (353)	0.2–0.4 (2)	<0.05–1.71 (298)	0.2–0.2 (2)	<0.004–<0.004 (9)
	--; --	--; --	--; <0.003	--; <0.005	0.543; 0.37	--; --	0.31; 0.23	--; --	--; <0.004
Halstead diversion well	<0.04–<0.340 (6)	---<0.01 (1)	<0.002–0.003 (30)	NA	<0.002–0.021 (100)	---<0.2 (1)	<0.05–<0.05 (70)	---<0.2 (1)	NA
	--; <0.04	--; --	0.002*; 0.002	NA	0.004*; <0.05	--; --	--; <0.05	--; --	NA
HAL2[2]	<0.04–<0.15 (2)	---<0.01 (1)	<0.003–0.007 (14)	<0.005–<0.005 (2)	<0.002–0.009 (34)	NA	<0.05–<0.05 (19)	NA	<0.004–0.002 (2)
	--; --	--; --	0.004*; 0.003	--; --	0.004*; <0.05	NA	--; <0.05	NA	--; --
HAL3[3]	<0.04–<0.15 (3)	<0.01–<0.01 (4)	<0.004–0.015 (32)	<0.005–<0.005 (2)	<0.002–0.17 (95)	NA	<0.05–0.06 (63)	NA	0.007–0.011 (2)
	--; --	--; --	0.007*; 0.007	--; --	0.013*; <0.05	NA	--; <0.05	NA	--; --
HAL4[4]	NA	NA	<0.002–0.001 (11)	NA	<0.002–0.002 (29)	NA	<0.05–<0.05 (18)	NA	NA
	NA	NA	--; <0.003	NA	--; <0.05	NA	--; <0.05	NA	NA
HAL7[5]	<0.04–<0.15 (11)	NA	<0.002–<0.003 (35)	NA	<0.05–0.43 (65)	NA	<0.05–0.09 (30)	NA	NA
	--; <0.04	NA	--; <0.003	NA	0.031*; 0.005	NA	--; <0.05	NA	NA
HAL8[6]	<0.04–<0.15 (11)	NA	<0.002–0.003 (35)	NA	<0.002–0.008 (71)	NA	<0.05–<0.05 (36)	NA	NA
	--; <0.04	NA	0.002*; <0.003	NA	0.004*; <0.05	NA	--; <0.05	NA	NA
Sedgwick treated stream water	<0.04–0.09 (4)	NA	<0.002–<0.003 (13)	NA	<0.05–0.39 (65)	NA	<0.05–0.19 (52)	NA	NA
	--; --	NA	--; <0.003	NA	0.049*; <0.05	NA	--; <0.05	NA	NA
SED5[7]	<0.04–<0.15 (6)	NA	<0.002–<0.003 (26)	NA	<0.05–0.21 (70)	NA	<0.05–0.06 (44)	NA	NA
	--; <0.15	NA	--; <0.003	NA	0.041*; 0.017	NA	--; <0.05	NA	NA
SED6[8]	<0.04–<0.15 (7)	NA	<0.002–<0.003 (23)	NA	<0.002–0.018 (39)	NA	<0.05–<0.05 (17)	NA	NA
	--; <0.15	NA	--; <0.003	NA	0.004*; <0.05	NA	--; <0.05	NA	NA
Prototype	<0.04–<0.160 (18)	NA	<0.006–<0.006 (32)	<0.005–<0.005 (23)	<0.006–<0.05 (53)	NA	<0.05–<0.08 (19)	NA	<0.004–<0.004 (23)
	--; <0.160	NA	--; <0.006	--; <0.005	--; <0.006	NA	--; <0.05	NA	--; <0.004
Background	<0.04–<0.04 (2)	<0.01–<0.01 (12)	<0.002–<0.006 (62)	<0.005–<0.005 (15)	<0.002–0.58 (82)	NA	<0.05–0.08 (19)	NA	<0.004–<0.004 (15)
	--; --	--; <0.01	--; <0.003	--; <0.005	0.046*; <0.05	NA	--; <0.05	NA	--; <0.004
Shallow index wells	<0.02–<0.360 (67)	NA	<0.006–0.003 (66)	<0.005–<0.005 (18)	<0.006–1.08 (105)	NA	<0.01–0.28 (59)	NA	<0.004–<0.004 (18)
	--; <0.160	NA	0.002*; <0.006	--; <0.005	0.103*; 0.013	NA	0.034*; <0.05	NA	--; <0.004
Deep index wells	<0.02–<0.04 (29)	NA	<0.006–0.002 (29)	<0.005–<0.005 (19)	<0.006–0.39 (51)	NA	<0.01–0.07 (41)	NA	<0.004–<0.004 (19)
	--; <0.02	NA	--; <0.006	--; <0.005	0.022*; <0.05	NA	--; <0.05	NA	--; <0.004

Table A–6. Summary of detections of organic compounds in water samples collected as part of the *Equus* Beds Groundwater Recharge Project during 1995–2005.—Continued

[µg/L, micrograms per liter; MCL, Maximum Contaminant Level; --, not determined; <, less than; NA, not analyzed; HAL, Health Advisory Level; ELISA, enzyme-linked immunosorbent assay; ft, feet. The first set of numbers under each heading, for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the reporting level.]

Data-collection site (fig. 6)	2-Hydroxy-4-isopropylamino-6-amino-s-triazine, dissolved (µg/L)[1]	2-Hydroxy-4-isopropylamino-6-ethylamino-s-triazine, dissolved (µg/L)	3,4-Dichloroaniline, dissolved (µg/L)	Acetochlor ethanesulfonic acid, dissolved (µg/L)[1]	Acetochlor oxanilic acid, dissolved (µg/L)[1]	Acetochlor, dissolved (µg/L)	Alachlor ethanesulfonic acid, dissolved (µg/L)[1]	Alachlor oxanilic acid, dissolved (µg/L)[1]	Alachlor, dissolved (µg/L)
Drinking-water criteria	--	--	--	--	--	--	--	--	2.0 (MCL)
Reporting level	0.05	0.05	0.004	0.1	0.1	0.1	0.1	0.1	0.05
07143672 (near Halstead)	<0.03–0.4 (4)	<0.025–1.99 (4)	<0.004–0.036 (9)	<0.1–<0.1 (6)	<0.1–<0.1 (6)	<0.002–2.2 (140)	<0.1–0.3 (6)	<0.1–0.3 (6)	<0.002–28 (140)
	--; --	--; --	--; <0.004	--; <0.1	--; <0.1	--; <0.05	--; <0.1	--; <0.1	0.597*; 0.05
07144100 (near Sedgwick)	<0.03–0.66 (3)	<0.05–1.23 (3)	<0.004–0.064 (9)	<0.1–<0.1 (5)	<0.1–<0.1 (5)	<0.002–0.755 (350)	<0.1–0.6 (5)	0.1–0.6 (5)	<0.002–12.7 (350)
	--; --	--; --	0.018; 0.015	--; --	--; --	0.022; <0.05	--; --	--; --	0.523; 0.16
Halstead diversion well	NA	NA	NA	--–<0.1 (1)	--–<0.1 (1)	<0.002–0.003 (100)	--–0.2 (1)	--–0.1 (1)	<0.002–<0.05 (100)
	NA	NA	NA	--; --	--; --	--; <0.05	--; --	--; --	--; <0.05
HAL2[2]	--–<0.05 (1)	--–<0.05 (1)	<0.004–<0.004 (2)	--–<0.1 (1)	--–<0.1 (1)	<0.002–<0.05 (33)	--–0.1 (1)	--–0.1 (1)	<0.002–<0.05 (33)
	--; --	--; --	--; --	--; --	--; --	--; <0.05	--; --	--; --	--; <0.05
HAL3[3]	--–<0.05 (1)	--–0.91 (1)	<0.015–0.019 (2)	--–<0.1 (1)	--–<0.1 (1)	<0.002–<0.05 (94)	--–0.1 (1)	--–0.1 (1)	<0.002–0.24 (94)
	--; --	--; --	--; --	--; --	--; --	--; <0.05	--; --	--; --	--; <0.05
HAL4[4]	NA	NA	NA	NA	NA	<0.002–<0.05 (29)	NA	NA	<0.002–<0.05 (29)
	NA	NA	NA	NA	NA	--; <0.05	NA	NA	--; <0.05
HAL7[5]	NA	NA	NA	<0.1–0.1 (2)	<0.1–<0.1 (2)	<0.002–<0.05 (65)	<0.1–0.1 (2)	<0.1–0.1 (2)	<0.002–0.017 (65)
	NA	NA	NA	--; --	--; --	--; <0.002	--; --	--; --	--; <0.05
HAL8[6]	NA	NA	NA	<0.1–<0.1 (2)	<0.1–<0.1 (2)	<0.002–<0.05 (71)	0.2–0.2 (2)	0.1–0.1 (2)	<0.002–<0.05 (71)
	NA	NA	NA	--; --	--; --	--; <0.05	--; --	--; --	--; <0.05
Sedgwick treated stream water	NA	NA	NA	--–<0.1 (1)	--–0.1 (1)	<0.002–0.022 (65)	--–<0.1 (1)	--–0.1 (1)	<0.002–0.72 (65)
	NA	NA	NA	--; --	--; --	--; <0.05	--; --	--; --	0.037*; <0.05
SED5[7]	NA	NA	NA	<0.1–<0.1 (3)	<0.1–<0.1 (3)	<0.002–0.009 (70)	<0.1–<0.1 (3)	<0.1–<0.1 (3)	<0.002–0.034 (70)
	NA	NA	NA	--; --	--; --	--; <0.05	--; --	--; --	--; <0.05
SED6[8]	NA	NA	NA	<0.1–<0.1 (2)	<0.1–<0.1 (2)	<0.002–<0.05 (39)	<0.1–<0.1 (2)	<0.1–<0.1 (2)	<0.002–<0.05 (39)
	NA	NA	NA	--; --	--; --	--; <0.004	--; --	--; --	--; <0.002
Prototype	<0.03–<0.03 (10)	<0.025–<0.032 (18)	<0.004–<0.004 (23)	<0.1–<0.1 (10)	<0.1–<0.1 (10)	<0.006–<0.05 (43)	<0.1–<0.1 (10)	<0.1–<0.1 (10)	<0.004–<0.05 (43)
	--; <0.03	--; <0.025	--; <0.004	--; <0.1	--; <0.1	--; <0.006	--; <0.1	--; <0.1	--; <0.005
Background	--–<0.05 (1)	--–<0.05 (1)	<0.004–<0.004 (15)	<0.1–<0.1 (7)	<0.1–<0.1 (7)	<0.002–0.004 (81)	<0.1–0.9 (7)	<0.1–<0.1 (7)	<0.002–0.017 (81)
	--; --	--; --	--; <0.004	--; <0.1	--; <0.1	--; <0.006	--; <0.1	--; <0.1	--; <0.004
Shallow index wells	<0.05–<0.05 (10)	<0.008–0.159 (40)	<0.004–0.017 (18)	<0.1–<0.1 (10)	<0.1–<0.1 (10)	<0.006–<0.05 (95)	<0.1–1.5 (10)	<0.1–0.1 (10)	<0.004–0.013 (95)
	--; <0.05	0.012*; <0.032	--; <0.004	--; <0.1	--; <0.1	--; <0.006	0.349*; <0.1	--; <0.1	--; <0.005
Deep index wells	<0.05–<0.05 (10)	<0.008–0.004 (39)	<0.004–<0.004 (19)	<0.1–<0.1 (10)	<0.1–<0.1 (10)	<0.006–<0.05 (41)	<0.1–0.2 (10)	<0.1–<0.1 (10)	<0.004–<0.05 (41)
	--; <0.05	--; <0.032	--; <0.004	--; <0.1	--; <0.1	--; <0.006	--; <0.1	--; <0.1	--; <0.005

Table A–6. Summary of detections of organic compounds in water samples collected as part of the *Equus* Beds Groundwater Recharge Project during 1995–2005.—Continued

[µg/L, micrograms per liter; MCL, Maximum Contaminant Level; --, not determined; <, less than; NA, not analyzed; HAL, Health Advisory Level; ELISA, enzyme-linked immunosorbent assay; ft, feet. The first set of numbers under each heading, for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the reporting level.]

Data-collection site (fig. 6)	Alachlor, total (µg/L)	Ametryn, dissolved (µg/L)	Ametryn, total (µg/L)	Aminomethylphosphonic acid, dissolved (µg/L)[1]	Atrazine, dissolved (µg/L)	Atrazine, total (µg/L)	Triazine screen, ELISA, dissolved (µg/L as atrazine)	Triazine screen, ELISA, total (µg/L as atrazine)	Bentazon, dissolved (µg/L)[1]
Drinking-water criteria	2.0 (MCL)	60 (HAL)	60 (HAL)	--	3.0 (MCL)	3.0 (MCL)	--	--	20 (HAL)
Reporting level	0.1	0.1	0.1	10.0	0.05	0.1	0.1	0.1	0.05
07143672 (near Halstead)	<0.1–0.4 (3)	<0.05–0.09 (90)	<0.1–0.2 (3)	0.3–0.5 (5)	0.028–46.2 (144)	0.3–1.6 (3)	<0.1–50 (696)	<0.1–3 (10)	<0.01–<0.01 (4)
	--; --	0.042*; <0.05	--; --	--; --	5.55; 3.105	--; --	2.63* ;1	0.657* ;0.2	--; --
07144100 (near Sedgwick)	<0.1–0.2 (2)	<0.05–0.92 (298)	<0.1–0.1 (2)	0.3–0.5 (5)	0.04–48 (351)	1.1–2.5 (2)	0.1–40 (2,469)	<0.1–4 (6)	<0.01–<0.05 (5)
	--; --	--; <0.05	--; --	--; --	5.922; 3.47	--; --	4.01 ;2	1.97* ;2	--; --
Halstead diversion well	---<0.1 (1)	<0.05–<0.05 (70)	---<0.1 (1)	NA	<0.05–0.101 (100)	---<0.1 (1)	<0.1–0.4 (283)	<0.1–0.3 (102)	<0.01–<0.01 (6)
	--; --	--; <0.05	--; --	NA	0.060*; 0.07	--; --	0.064* ;<0.1	-- ;<0.1	--; <0.01
HAL2[2]	NA	<0.05–<0.05 (19)	NA	---<0.1 (1)	<0.001–0.18 (34)	NA	<0.1–0.3 (57)	<0.1–<0.1 (2)	<0.01–<0.01 (2)
	NA	--; <0.05	NA	--; --	0.063*; 0.059	NA	0.078* ;<0.1	-- ;--	--; --
HAL3[3]	NA	<0.05–0.05 (63)	NA	---<0.1 (1)	<0.001–2.2 (95)	NA	<0.1–3 (128)	0.1–0.2 (4)	<0.01–<0.01 (3)
	NA	--; <0.05	NA	--; --	0.210*; 0.05	NA	0.361* ;0.2	-- ;--	--; --
HAL4[4]	NA	<0.05–<0.05 (18)	NA	NA	<0.001–0.01 (29)	NA	<0.1–0.3 (55)	NA	NA
	NA	--; <0.05	NA	NA	--; <0.05	NA	-- ;<0.1	NA	NA
HAL7[5]	NA	<0.05–<0.05 (30)	NA	NA	<0.05–0.52 (65)	NA	<0.1–0.5 (92)	NA	<0.01–<0.01 (11)
	NA	--; <0.05	NA	NA	0.059*; 0.038	NA	0.058* ;<0.1	NA	--; <0.01
HAL8[6]	NA	<0.05–<0.05 (36)	NA	NA	<0.001–0.1 (71)	NA	<0.1–0.2 (92)	NA	<0.01–<0.01 (11)
	NA	--; <0.05	NA	NA	0.051*; 0.063	NA	0.063* ;<0.1	NA	--; <0.01
Sedgwick treated stream water	NA	<0.05–<0.05 (52)	NA	NA	<0.05–6.71 (65)	NA	<0.1–7 (228)	---<0.1 (1)	<0.01–<0.01 (4)
	NA	--; <0.05	NA	NA	0.517*; 0.22	NA	0.265* ;<0.1	-- ;--	--; --
SED5[7]	NA	<0.05–<0.05 (44)	NA	NA	<0.05–0.39 (70)	NA	<0.1–1 (99)	NA	<0.01–<0.01 (6)
	NA	--; <0.05	NA	NA	0.099*; 0.035	NA	0.115* ;<0.1	NA	--; <0.01
SED6[8]	NA	<0.05–<0.05 (17)	NA	NA	<0.001–0.004 (39)	NA	<0.1–0.1 (79)	NA	<0.01–<0.01 (7)
	NA	--; <0.05	NA	NA	--; <0.007	NA	-- ;<0.1	NA	--; <0.01
Prototype	NA	<0.05–<0.05 (11)	NA	<0.1–<0.1 (10)	<0.007–<0.05 (53)	NA	<0.1–0.8 (76)	NA	<0.01–<0.05 (18)
	NA	--; <0.05	NA	--; <0.1	--; <0.007	NA	0.026* ;<0.1	NA	--; <0.05
Background	NA	<0.05–<0.05 (19)	NA	<0.1–<0.1 (7)	<0.001–1.6 (82)	NA	<0.01–2 (214)	<0.1–<0.1 (13)	<0.01–<0.01 (2)
	NA	--; <0.05	NA	--; <0.1	0.056*; <0.05	NA	0.069* ;<0.1	-- ;<0.1	--; --
Shallow index wells	NA	<0.05–0.09 (29)	NA	<0.1–0.3 (10)	<0.007–1.2 (105)	NA	<0.1–2 (272)	NA	<0.01–0.06 (67)
	NA	--; <0.05	NA	--; <0.1	0.048*; 0.005	NA	0.057* ;<0.1	NA	--; <0.05
Deep index wells	NA	<0.05–<0.05 (12)	NA	<0.1–<10 (10)	<0.007–0.07 (51)	NA	<0.1–0.3 (272)	NA	<0.01–<0.01 (29)
	NA	--; <0.05	NA	--; <0.1	0.010*; <0.05	NA	-- ;<0.1	NA	--; <0.01

Table A–6. Summary of detections of organic compounds in water samples collected as part of the *Equus* Beds Groundwater Recharge Project during 1995–2005.—Continued

[µg/L, micrograms per liter; MCL, Maximum Contaminant Level; --, not determined; <, less than; NA, not analyzed; HAL, Health Advisory Level; ELISA, enzyme-linked immunosorbent assay; ft, feet. The first set of numbers under each heading, for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the reporting level.]

Data-collection site (fig. 6)	Bis(2-ethylhexyl) phthalate, total (µg/L)	Bromacil, dissolved (µg/L)	Bromacil, total (µg/L)	Butylate, dissolved (µg/L)	Caffeine, dissolved (µg/L)	Carbaryl, dissolved (µg/L)[1]	Carbofuran, dissolved µg/L)[1]	Chlorodiamino-s-triazine, dissolved (µg/L)[1]	Chlorodiamino-s-triazine, dissolved (µg/L)
Drinking-water criteria	--	90 (HAL)	90 (HAL)	350 (HAL)	--	700 (HAL)	40 (MCL)	--	--
Reporting level	5.0	0.09	0.2	0.01	0.018	0.041	0.054	0.05	0.05
07143672 (near Halstead)	<5–<15 (3)	<0.01–<0.04 (4)	<0.2–0.5 (3)	<0.002–0.007 (41)	NA	<0.003–0.083 (54)	<0.003–0.93 (41)	<0.03–0.44 (4)	<0.03–0.8 (4)
	--; --	--; --	--; --	--; <0.002	NA	0.0134*; <0.041	0.060*; <0.03	--; --	--; --
07144100 (near Sedgwick)	<5–<5 (3)	<0.01–<0.05 (5)	0.6–0.6 (2)	<0.002–<0.01 (43)	NA	<0.003–0.089 (57)	<0.003–0.952 (43)	<0.03–0.47 (3)	<0.03–1.97 (3)
	--; --	--; --	--; --	--; <0.002	NA	0.008; <0.041	0.079; 0.009	--; --	--; --
Halstead diversion well	---<5 (1)	<0.04–<0.04 (6)	---<0.2 (1)	<0.002–<0.002 (30)	NA	<0.003–<0.041 (36)	<0.003–<0.02 (30)	NA	NA
	--; --	--; <0.04	--; --	--; <0.002	NA	--; <0.003	--; <0.003	NA	NA
HAL2[2]	---<5 (1)	<0.04–<0.130 (2)	NA	<0.002–<0.002 (12)	NA	<0.003–<0.041 (16)	<0.003–0.004 (12)	---<0.05 (1)	---<0.05 (1)
	--; --	--; --	NA	--; <0.002	NA	--; <0.003	--; <0.003	--; --	--; --
HAL3[3]	<5–<5 (4)	<0.04–<0.180 (3)	NA	<0.002–0.008 (30)	NA	<0.003–<0.046 (35)	<0.003–0.1 (30)	---<0.05 (1)	---<0.05 (1)
	--; --	--; --	NA	0.001*; <0.002	NA	--; <0.003	0.006*; <0.003	--; --	--; --
HAL4[4]	NA	NA	NA	<0.002–<0.002 (11)	NA	<0.003–<0.041 (11)	<0.003–<0.02 (11)	NA	NA
	NA	NA	NA	--; <0.002	NA	--; <0.003	--; <0.003	NA	NA
HAL7[5]	NA	<0.04–<0.04 (11)	NA	<0.002–<0.002 (35)	NA	<0.003–<0.041 (46)	<0.003–<0.02 (35)	NA	NA
	NA	--; <0.04	NA	--; <0.002	NA	--; <0.003	--; <0.003	NA	NA
HAL8[6]	NA	<0.04–<0.04 (11)	NA	<0.002–<0.002 (35)	NA	<0.003–<0.041 (46)	<0.003–<0.02 (35)	NA	NA
	NA	--; <0.04	NA	--; <0.002	NA	--; <0.003	--; <0.003	NA	NA
Sedgwick treated stream water	NA	<0.04–0.07 (4)	NA	<0.002–<0.002 (13)	NA	<0.003–0.016 (17)	<0.003–0.211 (13)	NA	NA
	NA	--; --	NA	--; <0.002	NA	--; <0.003	--; <0.008	NA	NA
SED5[7]	NA	<0.04–<0.04 (6)	NA	<0.002–<0.002 (26)	NA	<0.003–<0.041 (32)	<0.003–0.054 (26)	NA	NA
	NA	--; <0.04	NA	--; <0.002	NA	--; <0.003	--; <0.003	NA	NA
SED6[8]	NA	<0.04–<0.04 (7)	NA	<0.002–<0.002 (23)	NA	<0.003–<0.041 (30)	<0.003–<0.02 (23)	NA	NA
	NA	--; <0.04	NA	--; <0.002	NA	--; <0.003	--; <0.003	NA	NA
Prototype	NA	<0.02–<0.09 (18)	NA	<0.002–<0.002 (9)	<0.018–<0.018 (8)	<0.02–<0.08 (50)	<0.02–<0.02 (9)	<0.03–<0.03 (10)	<0.03–<0.04 (18)
	NA	--; <0.09	NA	--; <0.002	--; <0.018	--; <0.041	--; <0.02	--; <0.03	--; <0.03
Background	<5–<5 (12)	<0.04–<0.04 (2)	NA	<0.002–<0.008 (47)	NA	<0.003–<0.046 (64)	<0.003–<0.02 (47)	---<0.05 (1)	---<0.05 (1)
	--; <5	--; --	NA	--; <0.002	NA	--; <0.041	--; <0.003	--; --	--; --
Shallow index wells	---3 (1)	<0.02–<0.450 (61)	NA	<0.002–<0.002 (48)	<0.01–0.007 (28)	<0.02–<0.08 (127)	<0.02–<0.02 (48)	<0.05–0.17 (10)	<0.01–0.05 (38)
	--; --	--; <0.09	NA	--; <0.002	--; <0.01	--; <0.041	--; <0.02	--; <0.05	--; <0.04
Deep index wells	NA	<0.02–<0.03 (29)	NA	<0.002–<0.002 (10)	<0.01–0.004 (27)	<0.02–<0.041 (58)	<0.02–<0.02 (10)	<0.05–<0.05 (10)	<0.01–<0.05 (37)
	NA	--; <0.03	NA	--; <0.002	--; <0.01	--; <0.041	--; <0.02	--; <0.05	--; <0.04

Table A–6. Summary of detections of organic compounds in water samples collected as part of the *Equus* Beds Groundwater Recharge Project during 1995–2005.—Continued

[µg/L, micrograms per liter; MCL, Maximum Contaminant Level; --, not determined; <, less than; NA, not analyzed; HAL, Health Advisory Level; ELISA, enzyme-linked immunosorbent assay; ft, feet. The first set of numbers under each heading, for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the reporting level.]

Data-collection site (fig. 6)	Chlorotetracycline, dissolved (µg/L)	Chlorothalonil, dissolved (µg/L)[1]	Chlorpyrifos, dissolved (µg/L)	Cyanazine acid, dissolved (µg/L)	Cyanazine amide, dissolved (µg/L)	Cyanazine, dissolved (µg/L)	Cyanazine, total (µg/L)	Dimethyl tetrachloroterephthalate, dissolved (µg/L)[1]	Deethyl cyanazine acid, dissolved (µg/L)
Drinking-water criteria	--	500 (HAL)	20 (HAL)	--	--	1.0 (HAL)	1.0 (HAL)	--	--
Reporting level	0.2	0.48	0.005	0.05	0.05	0.05	0.2	0.004	0.05
07143672 (near Halstead)	<0.2–<0.2 (3)	<0.01–<0.04 (4)	<0.004–0.004 (50)	<0.03–<0.05 (4)	<0.03–0.06 (94)	<0.004–0.53 (135)	<0.2–0.4 (3)	<0.002–0.011 (50)	<0.03–<0.05 (4)
	--; --	--; --	--; <0.004	--; --	--; <0.05	0.034*; <0.05	--; --	0.001*; <0.003	--; --
07144100 (near Sedgwick)	<0.2–<0.2 (3)	<0.01–0.09 (5)	<0.004–<0.025 (52)	<0.03–<0.05 (3)	<0.03–0.18 (284)	<0.004–2.07 (342)	<0.2–0.3 (2)	<0.002–0.005 (52)	<0.03–<0.05 (3)
	--; --	--; --	--; <0.004	--; --	--; <0.05	0.035; <0.05	--; --	0.001; <0.003	--; --
Halstead diversion well	NA	<0.04–<0.480 (6)	<0.004–<0.005 (30)	NA	<0.05–<0.05 (61)	<0.004–<0.05 (100)	--–<0.2 (1)	<0.002–<0.003 (30)	NA
	NA	--; <0.04	--; <0.004	NA	--; <0.05	--; <0.05	--; --	--; <0.002	NA
HAL2[2]	--–<0.2 (1)	<0.04–<0.480 (2)	<0.004–<0.005 (14)	--–<0.05 (1)	<0.05–<0.05 (20)	<0.004–0.07 (32)	NA	<0.002–<0.003 (14)	--–<0.05 (1)
	--; --	--; --	--; <0.004	--; --	--; <0.05	--; <0.05	NA	--; <0.002	--; --
HAL3[3]	--–<0.2 (1)	<0.04–<0.480 (3)	<0.004–<0.005 (32)	--–<0.05 (1)	<0.05–<0.05 (64)	<0.004–<0.05 (93)	NA	<0.002–<0.004 (32)	--–<0.05 (1)
	--; --	--; --	--; <0.004	--; --	--; <0.05	--; <0.05	NA	--; <0.002	--; --
HAL4[4]	NA	NA	<0.004–<0.005 (11)	NA	<0.05–<0.05 (18)	<0.004–<0.05 (29)	NA	<0.002–<0.003 (11)	NA
	NA	NA	--; <0.004	NA	--; <0.05	--; <0.05	NA	--; <0.002	NA
HAL7[5]	NA	<0.04–<0.480 (11)	<0.004–<0.005 (35)	NA	<0.05–<0.05 (30)	<0.004–0.74 (65)	NA	<0.002–<0.003 (35)	NA
	NA	--; <0.04	--; <0.004	NA	--; <0.05	--; <0.004	NA	--; <0.002	NA
HAL8[6]	NA	<0.04–0.29 (11)	<0.004–<0.005 (35)	NA	<0.05–<0.05 (35)	<0.004–<0.05 (71)	NA	<0.002–<0.003 (35)	NA
	NA	--; <0.04	--; <0.004	NA	--; <0.05	--; <0.05	NA	--; <0.002	NA
Sedgwick treated stream water	NA	<0.04–<0.480 (4)	<0.004–<0.005 (13)	NA	<0.05–<0.05 (52)	<0.004–<0.05 (65)	NA	<0.002–<0.003 (13)	NA
	NA	--; --	--; <0.004	NA	--; <0.05	--; <0.05	NA	--; <0.002	NA
SED5[7]	NA	<0.04–0.02 (6)	<0.004–0.001 (26)	NA	<0.05–<0.05 (44)	<0.004–0.008 (70)	NA	<0.002–<0.003 (26)	NA
	NA	--; <0.480	--; <0.004	NA	--; <0.05	--; <0.05	NA	--; <0.002	NA
SED6[8]	NA	<0.04–<0.480 (7)	<0.004–<0.005 (23)	NA	<0.05–<0.05 (17)	<0.004–<0.05 (39)	NA	<0.002–<0.003 (23)	NA
	NA	--; <0.480	--; <0.004	NA	--; <0.05	--; <0.018	NA	--; <0.002	NA
Prototype	<0.1–<0.1 (9)	<0.04–<0.250 (18)	<0.005–<0.05 (32)	<0.03–<0.03 (10)	<0.03–<0.05 (21)	<0.018–<0.05 (30)	NA	<0.003–<0.003 (32)	<0.03–<0.03 (10)
	--; <0.1	--; <0.250	--; <0.005	--; <0.03	--; <0.05	--; <0.03	NA	--; <0.003	--; <0.03
Background	<0.2–<0.2 (7)	<0.04–<0.04 (2)	<0.004–<0.005 (62)	--–<0.05 (1)	<0.05–<0.05 (20)	<0.004–0.017 (67)	NA	<0.002–<0.004 (62)	--–<0.05 (1)
	--; <0.2	--; --	--; <0.005	--; --	--; <0.05	--; <0.018	NA	--; <0.003	--; --
Shallow index wells	<0.1–0.1 (10)	<0.04–<0.250 (61)	<0.005–<0.005 (66)	<0.05–<0.05 (10)	<0.05–<0.05 (39)	<0.018–<0.05 (87)	NA	<0.003–<0.003 (66)	<0.05–<0.05 (10)
	--; <0.1	--; <0.250	--; <0.005	--; <0.05	--; <0.05	--; <0.018	NA	--; <0.003	--; <0.05
Deep index wells	<0.1–<0.1 (9)	<0.04–<0.04 (29)	<0.005–<0.005 (29)	<0.05–0.06 (10)	<0.05–<0.05 (22)	<0.018–<0.05 (32)	NA	<0.003–<0.003 (29)	<0.05–0.17 (10)
	--; <0.1	--; <0.04	--; <0.005	--; <0.05	--; <0.05	--; <0.05	NA	--; <0.003	--; <0.05

Table A–6. Summary of detections of organic compounds in water samples collected as part of the *Equus* Beds Groundwater Recharge Project during 1995–2005.—Continued

[µg/L, micrograms per liter; MCL, Maximum Contaminant Level; --, not determined; <, less than; NA, not analyzed; HAL, Health Advisory Level; ELISA, enzyme-linked immunosorbent assay; ft, feet. The first set of numbers under each heading, for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the reporting level.]

Data-collection site (fig. 6)	Desulfinylfipronil, dissolved (µg/L)	Diazinon, dissolved (µg/L)	Diazinon, total (µg/L)	Dicamba, total (µg/L)	Dimethenamid, dissolved (µg/L)	Diuron, dissolved (µg/L)[1]	Diuron, dissolved (µg/L)	S-Ethyl dipropyl-thiocarbamate, dissolved (µg/L)[1]	Ethalfluralin, dissolved (µg/L)[1]
Drinking-water criteria	--	0.600 (HAL)	0.600 (HAL)	200 (HAL)	--	10 (HAL)	10 (HAL)	--	--
Reporting level	0.012	0.079	0.04	0.01	0.05	0.02	0.2	0.005	0.013
07143672 (near Halstead)	<0.004–0.006 (9)	<0.002–0.079 (50)	<0.01–<0.01 (3)	<0.01–0.09 (5)	<0.05–1.94 (21)	<0.02–0.26 (4)	<0.05–0.38 (4)	<0.002–0.061 (41)	<0.004–0.007 (41)
	--; <0.012	0.009*; <0.005	--; --	--; --	0.201*; <0.05	--; --	--; --	--; <0.002	--; <0.004
07144100 (near Sedgwick)	<0.004–0.006 (9)	<0.002–0.054 (52)	<0.01–0.01 (3)	<0.01–0.19 (5)	<0.05–7.65 (89)	<0.02–0.28 (5)	<0.05–<0.2 (3)	<0.002–0.061 (43)	<0.004–0.007 (43)
	--; <0.012	0.01; 0.004	--; --	--; --	0.642; 0.11	--; --	--; --	--; <0.002	--; <0.004
Halstead diversion well	NA	<0.002–<0.005 (30)	--–<0.01 (1)	--–<0.01 (1)	<0.05–<0.05 (8)	<0.02–<0.02 (6)	NA	<0.002–<0.002 (30)	<0.004–<0.009 (30)
	NA	--; <0.002	--; --	--; --	--; <0.05	--; <0.02	NA	--; <0.002	--; <0.004
HAL2[2]	<0.004–<0.012 (2)	<0.002–<0.005 (14)	--–<0.01 (1)	--–<0.01 (1)	<0.05–<0.05 (7)	<0.02–0.02 (2)	--–<0.05 (1)	<0.002–<0.002 (12)	<0.004–<0.009 (12)
	--; --	--; <0.002	--; --	--; --	--; <0.05	--; --	--; --	--; <0.002	--; <0.004
HAL3[3]	<0.004–<0.012 (2)	<0.002–<0.008 (32)	<0.01–<0.01 (4)	<0.01–<0.01 (4)	<0.05–<0.05 (11)	<0.02–0.05 (3)	--–<0.05 (1)	<0.002–0.002 (30)	<0.004–<0.013 (30)
	--; --	--; <0.002	--; --	--; --	--; <0.05	--; --	--; --	--; <0.002	--; <0.004
HAL4[4]	NA	<0.002–<0.005 (11)	NA	NA	<0.05–<0.05 (3)	NA	NA	<0.002–<0.002 (11)	<0.004–<0.009 (11)
	NA	--; <0.002	NA	NA	--; --	NA	NA	--; <0.002	--; <0.004
HAL7[5]	NA	<0.002–<0.005 (35)	NA	NA	<0.05–<0.05 (11)	<0.02–<0.02 (11)	NA	<0.002–<0.002 (35)	<0.004–<0.009 (35)
	NA	--; <0.002	NA	NA	--; <0.05	--; <0.02	NA	--; <0.002	--; <0.004
HAL8[6]	NA	<0.002–<0.005 (35)	NA	NA	<0.05–<0.05 (11)	<0.02–<0.02 (11)	NA	<0.002–<0.002 (35)	<0.004–<0.009 (35)
	NA	--; <0.002	NA	NA	--; <0.05	--; <0.02	NA	--; <0.002	--; <0.004
Sedgwick treated stream water	NA	<0.002–<0.005 (13)	NA	NA	<0.05–<0.05 (6)	<0.02–<0.02 (4)	NA	<0.002–<0.002 (13)	<0.004–<0.009 (13)
	NA	--; <0.002	NA	NA	--; <0.05	--; --	NA	--; <0.002	--; <0.004
SED5[7]	NA	<0.002–<0.005 (26)	NA	NA	<0.05–<0.05 (10)	<0.02–<0.02 (6)	NA	<0.002–0.014 (26)	<0.004–<0.009 (26)
	NA	--; <0.002	NA	NA	--; <0.05	--; <0.02	NA	--; <0.002	--; <0.004
SED6[8]	NA	<0.002–<0.005 (23)	NA	NA	<0.05–<0.05 (5)	<0.02–<0.02 (7)	NA	<0.002–<0.002 (23)	<0.004–<0.009 (23)
	NA	--; <0.002	NA	NA	--; --	--; <0.02	NA	--; <0.002	--; <0.004
Prototype	<0.004–<0.012 (32)	<0.005–<0.005 (32)	NA	NA	<0.05–<0.05 (11)	<0.01–<0.12 (18)	<0.2–<0.2 (10)	<0.002–<0.002 (9)	<0.009–<0.009 (9)
	--; <0.012	--; <0.005	NA	NA	--; <0.05	--; <0.12	--; <0.2	--; <0.002	--; <0.009
Background	<0.004–<0.012 (15)	<0.002–<0.008 (62)	<0.01–<0.01 (12)	<0.01–<0.01 (12)	<0.05–<0.05 (15)	<0.02–<0.02 (2)	--–<0.05 (1)	<0.002–<0.005 (47)	<0.004–<0.013 (47)
	--; <0.004	--; <0.005	--; <0.01	--; <0.01	--; <0.05	--; --	--; --	--; <0.002	--; <0.004
Shallow index wells	<0.004–0.007 (28)	<0.005–<0.005 (66)	<0.02–<0.04 (58)	NA	<0.05–<0.05 (29)	<0.01–0.03 (61)	<0.05–0.12 (10)	<0.002–<0.002 (48)	<0.009–<0.009 (48)
	--; <0.012	--; <0.005	--; <0.02	NA	--; <0.05	--; <0.12	--; <0.05	--; <0.002	--; <0.009
Deep index wells	<0.004–<0.012 (29)	<0.005–<0.008 (29)	<0.02–<0.02 (20)	NA	<0.05–<0.05 (12)	<0.01–<0.01 (29)	<0.05–0.05 (10)	<0.002–<0.002 (10)	<0.009–<0.009 (10)
	--; <0.012	--; <0.005	--; <0.02	NA	--; <0.05	--; <0.01	--; <0.05	--; <0.002	--; <0.009

Table A–6. Summary of detections of organic compounds in water samples collected as part of the *Equus* Beds Groundwater Recharge Project during 1995–2005.—Continued

[µg/L, micrograms per liter; MCL, Maximum Contaminant Level; --, not determined; <, less than; NA, not analyzed; HAL, Health Advisory Level; ELISA, enzyme-linked immunosorbent assay; ft, feet. The first set of numbers under each heading, for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the reporting level.]

Data-collection site (fig. 6)	Fipronil sulfide, dissolved (µg/L)	Fipronil, dissolved (µg/L)	Flumetsulam, dissolved (µg/L)	Glyphosate, dissolved (µg/L)[1]	Hexazinone, dissolved (µg/L)	Imazaquin, dissolved (µg/L)	Lindane, dissolved (µg/L)	Linuron, dissolved (µg/L)[1]	Malaoxon, dissolved (µg/L)
Drinking-water criteria	--	--	--	--	200 (HAL)	--	0.2 (MCL)	--	--
Reporting level	0.013	0.016	0.04	0.1	0.013	0.04	0.02	0.175	0.03
07143672 (near Halstead)	<0.005–0.002 (9)	<0.007–0.006 (9)	NA	<0.1–0.8 (5)	<0.013–<0.013 (7)	NA	<0.004–<0.02 (40)	<0.002–<0.175 (41)	<0.008–0.049 (9)
	--; <0.013	--; <0.016	NA	--; --	--; <0.013	NA	--; <0.004	--; <0.002	--; <0.008
07144100 (near Sedgwick)	<0.005–<0.013 (9)	<0.007–0.012 (9)	NA	<0.1–1 (5)	<0.013–<0.013 (7)	NA	<0.004–0.009 (42)	<0.002–0.008 (43)	<0.008–<0.03 (9)
	--; <0.013	--; <0.016	NA	--; --	--; <0.013	NA	--; <0.004	--; <0.002	--; <0.008
Halstead diversion well	NA	NA	NA	NA	NA	NA	<0.004–0.018 (30)	<0.002–<0.035 (30)	NA
	NA	NA	NA	NA	NA	NA	--; <0.004	--; <0.002	NA
HAL2[2]	<0.005–<0.013 (2)	<0.007–<0.016 (2)	NA	-–<0.1 (1)	<0.013–<0.013 (2)	NA	<0.004–<0.004 (12)	<0.002–<0.035 (12)	<0.008–<0.03 (2)
	--; --	--; --	NA	--; --	--; --	NA	--; <0.004	--; <0.002	--; --
HAL3[3]	<0.005–<0.013 (2)	<0.007–<0.016 (2)	NA	-–<0.1 (1)	<0.013–<0.013 (2)	NA	<0.004–<0.011 (30)	<0.002–<0.039 (30)	<0.008–<0.03 (2)
	--; --	--; --	NA	--; --	--; --	NA	--; <0.004	--; <0.002	--; --
HAL4[4]	NA	NA	NA	NA	NA	NA	<0.004–<0.004 (11)	<0.002–<0.035 (11)	NA
	NA	NA	NA	NA	NA	NA	--; <0.004	--; <0.002	NA
HAL7[5]	NA	NA	NA	NA	NA	NA	<0.004–<0.004 (35)	<0.002–<0.035 (35)	NA
	NA	NA	NA	NA	NA	NA	--; <0.004	--; <0.002	NA
HAL8[6]	NA	NA	NA	NA	NA	NA	<0.004–<0.004 (35)	<0.002–<0.035 (35)	NA
	NA	NA	NA	NA	NA	NA	--; <0.004	--; <0.002	NA
Sedgwick treated stream water	NA	NA	NA	NA	NA	NA	<0.004–<0.004 (13)	<0.002–<0.035 (13)	NA
	NA	NA	NA	NA	NA	NA	--; <0.004	--; <0.002	NA
SED5[7]	NA	NA	NA	NA	NA	NA	<0.004–<0.004 (26)	<0.002–<0.035 (26)	NA
	NA	NA	NA	NA	NA	NA	--; <0.004	--; <0.002	NA
SED6[8]	NA	NA	NA	NA	NA	NA	<0.004–<0.004 (23)	<0.002–<0.035 (23)	NA
	NA	NA	NA	NA	NA	NA	--; <0.004	--; <0.002	NA
Prototype	<0.005–<0.013 (32)	<0.007–<0.016 (32)	<0.04–<0.04 (8)	<0.1–<0.1 (10)	<0.013–<0.013 (22)	<0.04–<0.04 (8)	<0.004–<0.004 (9)	<0.035–<0.035 (9)	<0.008–<0.03 (23)
	--; <0.013	--; <0.016	--; <0.04	--; <0.1	--; <0.013	--; <0.04	--; <0.004	--; <0.035	--; <0.03
Background	<0.005–<0.013 (15)	<0.007–<0.016 (15)	NA	<0.1–<0.1 (7)	<0.013–<0.013 (15)	NA	<0.004–<0.011 (47)	<0.002–<0.039 (47)	<0.008–<0.03 (15)
	--; <0.005	--; <0.007	NA	--; <0.1	--; <0.013	NA	--; <0.004	--; <0.002	--; <0.008
Shallow index wells	<0.005–0.005 (28)	<0.007–<0.016 (28)	<0.01–0.01 (30)	<0.1–<0.1 (10)	<0.013–0.02 (18)	<0.02–0.04 (30)	<0.004–<0.004 (48)	<0.035–<0.035 (48)	<0.008–<0.03 (18)
	--; <0.013	--; <0.016	--; <0.01	--; <0.1	--; <0.013	0.012*; <0.02	--; <0.004	--; <0.035	--; <0.03
Deep index wells	<0.005–<0.013 (29)	<0.007–<0.016 (29)	<0.01–<0.04 (29)	<0.1–<0.1 (10)	<0.013–<0.013 (19)	<0.02–0.01 (29)	<0.004–<0.004 (10)	<0.035–<0.035 (10)	<0.008–<0.03 (19)
	--; <0.013	--; <0.016	--; <0.01	--; <0.1	--; <0.013	--; <0.02	--; <0.004	--; <0.035	--; <0.03

Table A–6. Summary of detections of organic compounds in water samples collected as part of the *Equus* Beds Groundwater Recharge Project during 1995–2005.—Continued

[µg/L, micrograms per liter; MCL, Maximum Contaminant Level; --, not determined; <, less than; NA, not analyzed; HAL, Health Advisory Level; ELISA, enzyme-linked immunosorbent assay; ft, feet. The first set of numbers under each heading, for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the reporting level.]

Data-collection site (fig. 6)	Malathion, dissolved (µg/L)	Methyl parathion, dissolved (µg/L)[1]	Metolachlor ethanesulfonic acid, dissolved (µg/L)[1]	Metolachlor oxanilic acid, dissolved (µg/L)[1]	Metolachlor, dissolved (µg/L)	Metolachlor, total (µg/L)	Metribuzin, dissolved (µg/L)	Metsulfuron, dissolved (µg/L)	Molinate, dissolved (µg/L)[1]
Drinking-water criteria	--	2 (HAL)	--	--	70 (HAL)	70 (HAL)	100 (HAL)	--	--
Reporting level	0.027	0.015	0.1	0.1	0.05	0.2	0.05	0.03	0.008
07143672 (near Halstead)	<0.005–0.132 (50)	<0.006–0.011 (50)	0.3–0.8 (6)	0.3–1.1 (6)	0.002–44.9 (140)	<0.2–0.4 (3)	<0.004–0.871 (140)	NA	<0.002–<0.008 (41)
	0.006*; <0.014	--; <0.006	0.583; 0.65	0.733; 0.75	3.275; 1.105	--; --	0.046*; <0.05	NA	--; <0.004
07144100 (near Sedgwick)	<0.005–0.214 (52)	<0.006–<0.035 (52)	0.4–0.8 (5)	0.5–1.1 (5)	0.009–21.9 (350)	0.5–0.6 (2)	<0.004–0.58 (350)	NA	<0.002–<0.008 (43)
	0.006; <0.014	--; <0.006	--; --	--; --	2.746; 1.41	--; --	0.036; <0.05	NA	--; <0.004
Halstead diversion well	<0.005–<0.027 (30)	<0.006–<0.006 (30)	---0.1 (1)	---0.1 (1)	<0.002–0.025 (100)	---<0.2 (1)	<0.004–<0.05 (100)	NA	<0.002–0.001 (30)
	--; <0.005	--; <0.006	--; --	--; --	0.014*; <0.05	--; --	--; <0.05	NA	--; <0.004
HAL2[2]	<0.005–<0.027 (14)	<0.006–<0.015 (14)	---0.1 (1)	---0.2 (1)	<0.002–0.045 (33)	NA	<0.004–<0.05 (33)	NA	<0.002–<0.004 (12)
	--; <0.005	--; <0.006	--; --	--; --	0.014*; <0.05	NA	--; <0.05	NA	--; <0.004
HAL3[3]	<0.005–<0.027 (32)	<0.006–<0.035 (32)	---0.5 (1)	---0.5 (1)	<0.002–1 (94)	NA	<0.004–0.021 (94)	NA	<0.002–<0.007 (30)
	--; <0.005	--; <0.006	--; --	--; --	0.079*; 0.012	NA	--; <0.05	NA	--; <0.004
HAL4[4]	<0.005–<0.027 (11)	<0.006–<0.006 (11)	NA	NA	<0.002–<0.05 (29)	NA	<0.004–<0.05 (29)	NA	<0.002–<0.004 (11)
	--; <0.005	--; <0.006	NA	NA	--; <0.05	NA	--; <0.05	NA	--; <0.004
HAL7[5]	<0.005–<0.027 (35)	<0.006–<0.006 (35)	<0.1–0.1 (2)	<0.1–<0.1 (2)	<0.002–0.02 (65)	NA	<0.004–<0.05 (65)	NA	<0.002–<0.004 (35)
	--; <0.005	--; <0.006	--; --	--; --	0.008*; <0.05	NA	--; <0.004	NA	--; <0.004
HAL8[6]	<0.005–<0.027 (35)	<0.006–<0.006 (35)	0.1–0.1 (2)	0.1–0.1 (2)	<0.002–0.023 (71)	NA	<0.004–<0.05 (71)	NA	<0.002–<0.004 (35)
	--; <0.005	--; <0.006	--; --	--; --	0.016*; <0.05	NA	--; <0.05	NA	--; <0.004
Sedgwick treated stream water	<0.005–<0.027 (13)	<0.006–<0.006 (13)	---0.6 (1)	---0.8 (1)	<0.05–3.82 (65)	NA	<0.004–0.06 (65)	NA	<0.002–<0.004 (13)
	--; <0.005	--; <0.006	--; --	--; --	0.326*; 0.11	NA	0.011*; <0.05	NA	--; <0.004
SED5[7]	<0.005–<0.027 (26)	<0.006–<0.006 (26)	0.1–0.6 (3)	<0.1–0.1 (3)	<0.05–7.01 (70)	NA	<0.004–0.007 (70)	NA	<0.002–<0.004 (26)
	--; <0.005	--; <0.006	--; --	--; --	0.949*; 0.133	NA	--; <0.05	NA	--; <0.004
SED6[8]	<0.005–<0.027 (23)	<0.006–<0.006 (23)	<0.1–<0.1 (2)	<0.1–<0.1 (2)	<0.002–0.01 (39)	NA	<0.004–<0.05 (39)	NA	<0.002–<0.004 (23)
	--; <0.005	--; <0.006	--; --	--; --	--; <0.05	NA	--; <0.006	NA	--; <0.004
Prototype	<0.027–<0.027 (32)	<0.006–<0.015 (32)	<0.1–<0.1 (10)	<0.1–<0.1 (10)	<0.006–0.003 (43)	NA	<0.006–<0.05 (43)	<0.03–<0.03 (8)	<0.002–<0.002 (9)
	--; <0.027	--; <0.015	--; <0.1	--; <0.1	--; <0.013	NA	--; <0.006	--; <0.03	--; <0.002
Background	<0.005–<0.027 (62)	<0.006–<0.035 (62)	<0.1–0.2 (7)	<0.1–0.1 (7)	<0.002–0.77 (81)	NA	<0.004–0.01 (81)	NA	<0.002–<0.007 (47)
	--; <0.014	--; <0.006	--; 0.1	--; <0.1	0.020*; <0.013	NA	--; <0.006	NA	--; <0.004
Shallow index wells	<0.027–<0.027 (66)	<0.006–<0.015 (66)	<0.1–3.8 (10)	<0.1–0.7 (10)	<0.006–2.61 (95)	NA	<0.006–<0.05 (95)	<0.03–0.02 (29)	<0.002–0.005 (48)
	--; <0.027	--; <0.006	0.764*; 0.2	--; <0.1	0.093*; <0.013	NA	--; <0.006	--; <0.03	--; <0.002
Deep index wells	<0.027–<0.027 (29)	<0.006–<0.015 (29)	<0.1–<0.1 (10)	<0.1–<0.1 (10)	<0.006–0.015 (41)	NA	<0.006–<0.05 (41)	<0.03–<0.03 (28)	<0.002–<0.002 (10)
	--; <0.027	--; <0.015	--; <0.1	--; <0.1	--; <0.013	NA	--; <0.006	--; <0.03	--; <0.002

Table A–6. Summary of detections of organic compounds in water samples collected as part of the *Equus* Beds Groundwater Recharge Project during 1995–2005.—Continued

[µg/L, micrograms per liter; MCL, Maximum Contaminant Level; --, not determined; <, less than; NA, not analyzed; HAL, Health Advisory Level; ELISA, enzyme-linked immunosorbent assay; ft, feet. The first set of numbers under each heading, for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the reporting level.]

Data-collection site (fig. 6)	Napropamide, dissolved (µg/L)[1]	Nicosulfuron, dissolved (µg/L)	p,p'-dichlorodiphenyldichloro-ethylene, dissolved (µg/L)	Pendimethalin, dissolved (µg/L)[1]	Picloram, total (µg/L)	Prometon, dissolved (µg/L)	Prometryn, dissolved (µg/L)	Propyzamide, dissolved (µg/L)[1]	Propachlor, dissolved (µg/L)
Drinking-water criteria	--	--	--	--	500 (MCL)	100 (HAL)	--	50 (HAL)	90 (HAL)
Reporting level	0.035	0.04	0.013	0.075	0.01	0.05	0.05	0.021	0.05
07143672 (near Halstead)	<0.003–<0.035 (41)	NA	<0.003–0.002 (41)	<0.004–0.89 (72)	<0.01–0.06 (5)	<0.01–0.32 (140)	<0.005–0.12 (99)	<0.003–0.007 (50)	<0.007–0.2 (131)
	--; <0.003	NA	--; <0.006	--; <0.022	--; --	0.030*; <0.05	--; <0.05	--; <0.003	0.010*; <0.05
07144100 (near Sedgwick)	<0.003–<0.035 (43)	NA	<0.003–<0.013 (43)	<0.004–0.015 (141)	<0.01–0.09 (5)	<0.01–0.8 (350)	<0.005–0.2 (307)	<0.003–<0.021 (52)	<0.007–1.13 (335)
	--; <0.003	NA	--; <0.006	--; <0.05	--; --	0.032; <0.05	--; <0.05	--; <0.003	--; <0.05
Halstead diversion well	<0.003–<0.007 (30)	NA	<0.003–0.001 (30)	<0.004–<0.05 (38)	---<0.01 (1)	<0.01–0.02 (100)	<0.05–<0.05 (70)	<0.003–<0.004 (30)	<0.007–<0.05 (100)
	--; <0.003	NA	--; <0.006	--; <0.004	--; --	--; <0.05	--; <0.05	--; <0.003	--; <0.05
HAL2[2]	<0.003–<0.007 (12)	NA	<0.003–<0.006 (12)	<0.004–<0.05 (21)	---<0.01 (1)	<0.01–0.01 (33)	<0.005–0.006 (21)	<0.003–<0.004 (14)	<0.007–<0.05 (31)
	--; <0.003	NA	--; <0.006	--; <0.01	--; --	0.010*; <0.05	--; <0.05	--; <0.003	--; <0.05
HAL3[3]	<0.003–<0.01 (30)	NA	<0.003–<0.01 (30)	<0.004–<0.05 (43)	<0.01–<0.01 (4)	<0.01–0.02 (94)	<0.005–<0.05 (65)	<0.003–<0.009 (32)	<0.007–<0.05 (92)
	--; <0.003	NA	--; <0.006	--; <0.004	--; --	0.009*; <0.05	--; <0.05	--; <0.003	--; <0.05
HAL4[4]	<0.003–<0.007 (11)	NA	<0.003–0.002 (11)	<0.004–<0.05 (14)	NA	<0.01–<0.05 (29)	<0.05–<0.05 (18)	<0.003–<0.004 (11)	<0.007–<0.05 (29)
	--; <0.003	NA	--; <0.006	--; <0.004	NA	--; <0.05	--; <0.05	--; <0.003	--; <0.05
HAL7[5]	<0.003–<0.016 (35)	NA	<0.003–<0.006 (35)	<0.004–<0.05 (46)	NA	<0.02–0.01 (65)	<0.05–0.29 (30)	<0.003–<0.004 (35)	<0.007–<0.05 (65)
	--; <0.003	NA	--; <0.006	--; <0.004	NA	0.010*; <0.05	--; <0.05	--; <0.003	--; <0.007
HAL8[6]	<0.003–0.004 (35)	NA	<0.003–0.002 (35)	<0.004–<0.05 (46)	NA	<0.01–0.05 (71)	<0.05–<0.05 (36)	<0.003–<0.004 (35)	<0.007–<0.05 (71)
	--; <0.003	NA	--; <0.006	--; <0.004	NA	--; <0.05	--; <0.05	--; <0.003	--; <0.05
Sedgwick treated stream water	<0.003–<0.007 (13)	NA	<0.003–<0.006 (13)	<0.004–<0.05 (20)	NA	<0.02–0.06 (65)	<0.05–<0.05 (52)	<0.003–<0.004 (13)	<0.007–<0.05 (65)
	--; <0.003	NA	--; <0.006	--; <0.004	NA	0.014*; <0.05	--; <0.05	--; <0.003	--; <0.05
SED5[7]	<0.003–<0.007 (26)	NA	<0.003–0.001 (26)	<0.004–<0.05 (37)	NA	<0.01–0.01 (70)	<0.05–<0.05 (44)	<0.003–<0.004 (26)	<0.007–<0.05 (70)
	--; <0.003	NA	--; <0.006	--; <0.004	NA	--; <0.05	--; <0.05	--; <0.003	--; <0.05
SED6[8]	<0.003–<0.007 (23)	NA	<0.003–0.001 (23)	<0.004–<0.05 (28)	NA	<0.01–<0.05 (39)	<0.05–<0.05 (17)	<0.003–<0.004 (23)	<0.007–<0.05 (39)
	--; <0.003	NA	--; <0.006	--; <0.004	NA	--; <0.02	--; <0.05	--; <0.003	--; <0.01
Prototype	<0.007–<0.009 (9)	<0.04–<0.04 (8)	<0.003–<0.003 (9)	<0.022–<0.075 (43)	NA	<0.01–<0.05 (43)	<0.005–<0.05 (34)	<0.004–<0.004 (32)	<0.01–<0.05 (20)
	--; <0.007	--; <0.04	--; <0.003	--; <0.022	NA	--; <0.01	--; <0.005	--; <0.004	--; <0.05
Background	<0.003–<0.01 (47)	NA	<0.003–0.001 (47)	<0.004–<0.05 (77)	<0.01–<0.01 (12)	<0.01–0.01 (81)	<0.005–<0.05 (34)	<0.003–<0.009 (62)	<0.007–<0.05 (66)
	--; <0.003	NA	--; <0.006	--; <0.018	--; <0.01	--; <0.02	--; <0.05	--; <0.004	--; <0.01
Shallow index wells	<0.007–<0.007 (48)	<0.01–0.03 (30)	<0.003–<0.003 (48)	<0.022–<0.05 (95)	NA	<0.01–0.14 (95)	<0.005–0.012 (47)	<0.004–<0.004 (66)	<0.01–<0.05 (77)
	--; <0.007	--; <0.01	--; <0.003	--; <0.022	NA	0.010*; <0.01	--; <0.05	--; <0.004	--; <0.01
Deep index wells	<0.007–<0.007 (10)	<0.01–<0.04 (29)	<0.003–<0.003 (10)	<0.022–<0.05 (41)	NA	<0.01–<0.05 (41)	<0.005–<0.05 (31)	<0.004–<0.004 (29)	<0.01–<0.05 (22)
	--; <0.007	--; <0.01	--; <0.003	--; <0.022	NA	--; <0.01	--; <0.005	--; <0.004	--; <0.05

Table A–6. Summary of detections of organic compounds in water samples collected as part of the *Equus* Beds Groundwater Recharge Project during 1995–2005.—Continued

[µg/L, micrograms per liter; MCL, Maximum Contaminant Level; --, not determined; <, less than; NA, not analyzed; HAL, Health Advisory Level; ELISA, enzyme-linked immunosorbent assay; ft, feet. The first set of numbers under each heading, for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the reporting level.]

Data-collection site (fig. 6)	Propazine, dissolved (µg/L)	Propazine, total (µg/L)	Roxithromycin, dissolved (µg/L)	Simazine, dissolved (µg/L)	Simazine, total (µg/L)	Tebuthiuron, dissolved (µg/L)[1]	Terbacil, dissolved (µg/L)[1]	Terbuthylazine, dissolved (µg/L)	Trifluralin, dissolved (µg/L)[1]
Drinking-water criteria	10 (HAL)	10 (HAL)	--	4.0 (MCL)	4.0 (MCL)	500 (HAL)	90 (HAL)	--	5.0 (HAL)
Reporting level	0.05	0.1	0.1	0.05	0.1	0.02	0.17	0.01	0.012
07143672 (near Halstead)	<0.03–2.46 (94)	<0.1–0.1 (3)	NA	<0.005–0.11 (144)	<0.1–0.2 (3)	<0.01–0.24 (50)	<0.007–0.009 (41)	<0.01–0.1 (12)	<0.002–0.028 (50)
	0.087*; <0.05	--; --	NA	0.020*; <0.05	--; --	0.023*; <0.02	--; <0.007	--; <0.01	0.006*; <0.012
07144100 (near Sedgwick)	<0.03–5.22 (301)	<0.1–0.1 (2)	NA	<0.005–1.67 (353)	0.2–0.2 (2)	<0.01–0.2 (52)	<0.007–<0.170 (43)	<0.01–0.2 (14)	<0.002–0.045 (52)
	0.082; <0.05	--; --	NA	0.027; <0.05	--; --	0.026; 0.01	--; <0.007	--; <0.01	0.006; <0.012
Halstead diversion well	<0.05–<0.05 (70)	---<0.1 (1)	NA	<0.005–0.015 (100)	---<0.1 (1)	<0.01–0.02 (30)	<0.007–<0.034 (30)	NA	<0.002–<0.009 (30)
	--; <0.05	--; --	NA	--; <0.05	--; --	0.008*; <0.01	--; <0.007	NA	--; <0.002
HAL2[2]	<0.05–<0.05 (20)	NA	NA	<0.005–<0.05 (34)	NA	<0.01–0.01 (14)	<0.007–<0.034 (12)	<0.01–<0.01 (2)	<0.002–<0.009 (14)
	--; <0.05	NA	NA	--; <0.05	NA	0.010*; <0.02	--; <0.007	--; --	--; <0.002
HAL3[3]	<0.05–<0.05 (64)	NA	NA	<0.005–<0.05 (95)	NA	<0.01–0.05 (32)	<0.007–<0.034 (30)	<0.01–<0.01 (3)	<0.002–<0.012 (32)
	--; <0.05	NA	NA	--; <0.05	NA	0.014*; 0.01	--; <0.007	--; --	--; <0.002
HAL4[4]	<0.05–<0.05 (18)	NA	NA	<0.005–<0.05 (29)	NA	<0.01–<0.02 (11)	<0.007–<0.034 (11)	NA	<0.002–<0.009 (11)
	--; <0.05	NA	NA	--; <0.05	NA	--; <0.01	--; <0.007	NA	--; <0.002
HAL7[5]	<0.05–<0.05 (30)	NA	NA	<0.005–0.003 (65)	NA	<0.01–<0.02 (35)	<0.007–<0.034 (35)	NA	<0.002–0.004 (35)
	--; <0.05	NA	NA	--; <0.011	NA	--; <0.01	--; <0.007	NA	--; <0.002
HAL8[6]	<0.05–<0.5 (36)	NA	NA	<0.005–<0.05 (71)	NA	<0.01–0.01 (35)	<0.007–<0.034 (35)	NA	<0.002–<0.009 (35)
	--; <0.05	NA	NA	--; <0.05	NA	--; <0.01	--; <0.007	NA	--; <0.002
Sedgwick treated stream water	<0.05–0.07 (52)	NA	NA	<0.005–0.033 (65)	NA	<0.01–0.02 (13)	<0.007–<0.034 (13)	---0 (1)	<0.002–0.004 (13)
	--; <0.05	NA	NA	--; <0.05	NA	--; <0.01	--; <0.007	--; --	--; <0.002
SED5[7]	<0.05–0.07 (44)	NA	NA	<0.005–0.006 (70)	NA	<0.01–<0.02 (26)	<0.007–<0.034 (26)	---0.1 (1)	<0.002–0.001 (26)
	0.036*; <0.05	NA	NA	--; <0.05	NA	--; <0.01	--; <0.007	--; --	--; <0.002
SED6[8]	<0.05–<0.05 (17)	NA	NA	<0.005–<0.05 (39)	NA	<0.01–<0.02 (23)	<0.007–<0.034 (23)	NA	<0.002–<0.009 (23)
	--; <0.05	NA	NA	--; <0.011	NA	--; <0.01	--; <0.007	NA	--; <0.002
Prototype	<0.03–<0.05 (21)	NA	<0.1–<0.1 (9)	<0.005–<0.05 (53)	NA	<0.02–<0.02 (32)	<0.034–<0.034 (9)	<0.01–<0.01 (23)	<0.009–<0.009 (32)
	--; <0.05	NA	--; <0.1	--; <0.005	NA	--; <0.02	--; <0.034	--; <0.01	--; <0.009
Background	<0.05–<0.05 (20)	NA	NA	<0.005–0.007 (82)	NA	<0.01–0.01 (62)	<0.007–<0.034 (47)	<0.01–<0.01 (15)	<0.002–<0.012 (62)
	--; <0.05	NA	NA	--; <0.005	NA	--; <0.01	--; <0.007	--; <0.01	--; <0.009
Shallow index wells	<0.05–<0.05 (39)	NA	<0.1–<0.1 (10)	<0.005–0.007 (105)	NA	<0.02–0.02 (67)	<0.034–<0.034 (48)	<0.01–<0.01 (18)	<0.009–<0.009 (66)
	--; <0.05	NA	--; <0.1	--; <0.005	NA	--; <0.02	--; <0.034	--; <0.01	--; <0.009
Deep index wells	<0.05–<0.05 (22)	NA	<0.1–0.1 (9)	<0.005–<0.05 (51)	NA	<0.02–<0.02 (29)	<0.034–<0.034 (10)	<0.01–<0.01 (19)	<0.009–<0.009 (29)
	--; <0.05	NA	--; <0.1	--; <0.005	NA	--; <0.02	--; <0.034	--; <0.01	--; <0.009

Table A–6. Summary of detections of organic compounds in water samples collected as part of the *Equus* Beds Groundwater Recharge Project during 1995–2005.—Continued

[µg/L, micrograms per liter; MCL, Maximum Contaminant Level; --, not determined; <, less than; NA, not analyzed; HAL, Health Advisory Level; ELISA, enzyme-linked immunosorbent assay; ft, feet. The first set of numbers under each heading, for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the reporting level.]

Data-collection site (fig. 6)	1,2-Dichloroethane, total, (µg/L)	Bromodichloromethane, total, (µg/L)	Dibromochloromethane, total (µg/L)	Methyl tert-butyl ether, total (µg/L)	Tetrachloroethene, total, (µg/L)	Trichloromethane, total, (µg/L)
Drinking-water criteria	5 (MCL)	--	100 (MCL)	--	5 (MCL)	100 (MCL)
Reporting level	3.0	3.0	3.0	3.0	3.0	3.0
07143672 (near Halstead)	<0.2–<3 (9)	<0.2–<3 (9)	<0.2–<3 (9)	<0.2–<3 (9)	<0.2–<3 (9)	<0.2–<3 (9)
	--; <0.2	--; <0.2	--; <0.2	--; <0.2	--; <0.2	--; <0.2
07144100 (near Sedgwick)	<0.2–<3 (7)	<0.2–<3 (7)	<0.2–<3 (7)	<0.2–<3 (7)	<0.2–<3 (7)	<0.2–<3 (7)
	--; <3	--; <3	--; <3	--; <3	--; <3	--; <3
Halstead diversion well	<0.2–<0.2 (13)	<0.2–<0.2 (12)	<0.2–<0.2 (13)	<0.2–<0.2 (13)	<0.2–<0.2 (13)	<0.2–<0.2 (13)
	--; <0.2	--; <0.2	--; <0.2	--; <0.2	--; <0.2	--; <0.2
HAL2[2]	<0.2–<0.2 (4)	<0.2–<0.2 (4)	<0.2–<0.2 (4)	<0.2–<0.2 (4)	<0.2–<0.2 (4)	<0.2–<0.2 (4)
	--; --	--; --	--; --	--; --	--; --	--; --
HAL3[3]	<0.2–<3 (10)	<0.2–<3 (10)	<0.2–<3 (10)	<0.2–<3 (10)	<0.2–<3 (10)	<0.2–<3 (10)
	--; <0.2	--; <0.2	--; <0.2	--; <0.2	--; <0.2	--; <0.2
HAL4[4]	<0.2–<0.2 (2)	<0.2–<0.2 (2)	<0.2–<0.2 (2)	<0.2–<0.2 (2)	<0.2–<0.2 (2)	<0.2–<0.2 (2)
	--; --	--; --	--; --	--; --	--; --	--; --
HAL7[5]	<0.2–<0.2 (21)	<0.2–0.3 (21)	<0.2–0.3 (21)	<0.2–<0.2 (21)	<0.2–0.9 (21)	<0.2–0.5 (21)
	--; <0.2	--; <0.2	--; <0.2	--; <0.2	--; <0.2	--; <0.2
HAL8[6]	<0.2–<0.2 (21)	<0.2–<0.2 (21)	<0.2–<0.2 (21)	<0.2–<0.2 (21)	<0.2–<0.2 (21)	<0.2–0.3 (21)
	--; <0.2	--; <0.2	--; <0.2	--; <0.2	--; <0.2	--; <0.2
Sedgwick treated stream water	<0.2–<0.2 (4)	<0.2–<0.2 (4)	<0.2–<0.2 (4)	<0.2–<0.2 (4)	<0.2–<0.2 (4)	<0.2–<0.2 (4)
	--; --	--; --	--; --	--; --	--; --	--; --
SED5[7]	<0.2–<0.4 (8)	<0.2–<0.4 (8)	<0.2–<0.4 (8)	<0.2–<0.4 (8)	<0.2–<0.4 (8)	<0.2–<0.4 (8)
	--; <0.2	--; <0.2	--; <0.2	--; <0.2	--; <0.2	--; <0.2
SED6[8]	<0.2–<0.2 (7)	<0.2–<0.2 (7)	<0.2–<0.2 (7)	<0.2–<0.2 (7)	<0.2–<0.2 (7)	<0.2–<0.2 (7)
	--; <0.2	--; <0.2	--; <0.2	--; <0.2	--; <0.2	--; <0.2
Prototype	<0.2–<0.2 (8)	<0.1–<0.1 (8)	<0.2–<0.2 (8)	<0.2–<0.2 (8)	<0.1–<0.1 (8)	<0.1–<0.1 (8)
	--; <0.2	--; <0.1	--; <0.2	--; <0.2	--; <0.1	--; <0.1
Background	<0.2–<3 (14)	<0.2–<3 (14)	<0.2–<3 (14)	<0.2–<3 (14)	<0.2–<3 (14)	<0.2–<3 (14)
	--; <3	--; <3	--; <3	--; <3	--; <3	--; <3
Shallow index wells	<0.2–0.8 (67)	<0.1–<0.2 (67)	<0.2–<0.2 (67)	<0.2–0.2 (67)	<0.1–<0.2 (67)	<0.1–1 (67)
	--; <0.2	--; <0.2	--; <0.2	--; <0.2	--; <0.2	--; <0.2
Deep index wells	<0.2–1.7 (39)	<0.1–<0.2 (39)	<0.2–<0.2 (39)	<0.2–5.8 (39)	<0.1–<0.2 (39)	<0.1–0.2 (39)
	--; <0.2	--; <0.2	--; <0.2	--; <0.2	--; <0.2	--; <0.2

[1] Constituent was analyzed using a 0.7-micron glass fiber filter.
[2] Deep monitoring well at diversion well site near Halstead, Kansas.
[3] Shallow monitoring wells within 500 feet of Little Arkansas River at diversion well site near Halstead, Kansas.
[4] Shallow monitoring wells more than 500 feet from Little Arkansas River at diversion well site near Halstead, Kansas.
[5] Shallow monitoring wells at Halstead recharge site near Halstead, Kansas.
[6] Deep monitoring wells at Halstead recharge site near Halstead, Kansas.
[7] Shallow monitoring wells at Sedgwick recharge site near Sedgwick, Kansas.
[8] Deep monitoring wells at Sedgwick recharge site near Sedgwick, Kansas.

Table A–7. Summary of bacteria and viral indicator detections and triazine herbicide concentrations in water samples collected as part of the *Equus* Beds Groundwater Recharge Project during 1995–2005.

[cfu/100 mL, colony forming units per 100 milliliters; pfu/100 mL, plaque forming units per 100 milliliters; m-TEC, membrane-thermotolerant *Escherichia coli*; MF, membrane filter; col/100 mL, colonies per 100 milliliters; µg/L, micrograms per liter; ELISA, enzyme-linked immunosorbent assay; --, not determined; MCLG, Maximum Contaminant Level Goal; MCL, Maximum Contaminant Level; <, less than; NA, not analyzed. The first set of numbers under each heading, for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the detection level.]

Data-collection site (fig. 6)	*Clostridium perfringens* (cfu/100 mL)	Coliphage, *Escherichia coli*, C13 host (pfu/100 mL)	Coliphage, *Escherichia coli*, Famp host (pfu/100 mL)	*Enterococci* (cfu/100 mL)	*Escherichia coli*, modified m-TEC MF method (cfu/100 mL)	*Escherichia coli*, m-TEC MF method (cfu/100 mL)	Fecal coliform (col/100 mL)	Fecal *streptococci* (cfu/100 mL)
Drinking-water criteria	--	--	--	--	--	--	--	--
Reporting level	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Surface-water monitoring sites (Little Arkansas River)								
7143672 (near Halstead)	150–270 (4)	600–1,200 (5)	<1–73 (5)	34–26,500 (25)	20–12,000 (47)	36–41,000 (21)	4–3,000,000 (219)	-- –440 (1)
	--; --	--; --	--; --	4,330; 690	1,870; 820	3,420; 425	17,200; 560	--; --
7144100 (near Sedgwick)	120–360 (3)	40–1,300 (4)	<1–290 (4)	27–198,000 (48)	4–38,000 (49)	21–23,000 (45)	1–4,000,000 (239)	2,570–7,400 (2)
	--; --	--; --	--; --	10,000; 635	5,290; 1,700	1,610; 144	21,600; 680	--; --
Diversion well site near Halstead								
Diversion well	NA	NA	NA	NA	NA	NA	<1–36 (111)	NA
	NA	NA	NA	NA	NA	NA	--; <1	NA
EB-145-A1	NA	<1–<1 (2)	<1–<1 (2)	NA	NA	NA	<1–1 (62)	NA
	NA	--; --	--; --	NA	NA	NA	--; <1	NA
EB-145-A2	NA	---<1 (1)	---<1 (1)	NA	NA	NA	<1–15 (28)	NA
	NA	--; --	--; --	NA	NA	NA	--; <1	NA
EB-145-A3	NA	---<1 (1)	---1 (1)	NA	NA	NA	<1–17 (32)	NA
	NA	--; --	--; --	NA	NA	NA	--; <1	NA
EB-145-A4	NA	NA	NA	NA	NA	NA	<1–<2 (21)	NA
	NA	NA	NA	NA	NA	NA	--; <1	NA
EB-145-A5	NA	<1–<1 (2)	<1–<1 (2)	NA	NA	NA	<1–<4 (31)	NA
	NA	--; --	--; --	NA	NA	NA	--; <1	NA
EB-145-P-D5	NA	<1–<1 (2)	<1–<1 (2)	NA	NA	NA	<1–29 (56)	NA
	NA	--; --	--; --	NA	NA	NA	--; <1	NA
Halstead recharge site								
SMW-H4	NA	---<1 (1)	---<1 (1)	NA	NA	NA	<1–1 (47)	NA
	NA	--; --	--; --	NA	NA	NA	--; <1	NA
SMW-H14	NA	---<1 (1)	---<1 (1)	NA	NA	NA	<1–21 (46)	NA
	NA	--; --	--; --	NA	NA	NA	--; <1	NA
DMW-H1	NA	---<1 (1)	---<1 (1)	NA	NA	NA	<1–2 (46)	NA
	NA	--; --	--; --	NA	NA	NA	--; <1	NA
DMW-H13	NA	---<1 (1)	---<1 (1)	NA	NA	NA	<1–7 (46)	NA
	NA	--; --	--; --	NA	NA	NA	--; <1	NA
Sedgwick recharge site								
Treated stream water	NA	NA	NA	NA	NA	96–650 (2)	<1–3,200 (50)	NA
	NA	NA	NA	NA	NA	--; --	336*; 120	NA
SMW-S11	NA	---<1 (1)	---<1 (1)	NA	NA	NA	<1–14 (52)	NA
	NA	--; --	--; --	NA	NA	NA	0.437*; <1	NA
SMW-S13	NA	---<1 (1)	---<1 (1)	NA	NA	NA	<1–65 (47)	NA
	NA	--; --	--; --	NA	NA	NA	--; <1	NA
DMW-S10	NA	---<1 (1)	---<1 (1)	NA	NA	NA	<1–<2 (40)	NA
	NA	--; --	--; --	NA	NA	NA	--; <1	NA
DMW-S14	NA	---<1 (1)	---<1 (1)	NA	NA	NA	<1–17 (36)	NA
	NA	--; --	--; --	NA	NA	NA	--; <1	NA

Table A–7. Summary of bacteria and viral indicator detections and triazine herbicide concentrations in water samples collected as part of the *Equus* Beds Groundwater Recharge Project during 1995–2005.—Continued

[cfu/100 mL, colony forming units per 100 milliliters; pfu/100 mL, plaque forming units per 100 milliliters; m-TEC, membrane-thermotolerant *Escherichia coli*; MF, membrane filter; col/100 mL, colonies per 100 milliliters; µg/L, micrograms per liter; ELISA, enzyme-linked immunosorbent assay; --, not determined; MCLG, Maximum Contaminant Level Goal; MCL, Maximum Contaminant Level; <, less than; NA, not analyzed. The first set of numbers under each heading, for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the detection level.]

Data-collection site (fig. 6)	Total coliform (col/100 mL)	Atrazine (µg/L)	Triazine screen, ELISA (µg/L as atrazine)
Drinking-water criteria	0 (MCLG)	3.0 (MCL)	--
Reporting level	1.0	0.05	0.1
Surface-water monitoring sites (Little Arkansas River)			
7143672 (near Halstead)	1–2,000,000 (150)	0.028–46.2 (144)	<0.1–50 (696)
	22,000; 1,500	5.55; 3.11	2.6*; 1
7144100 (near Sedgwick)	<1–9,000,000 (147)	0.04–48 (351)	0.1–40 (2469)
	71,100*; 1,800	5.92; 3.47	4.0; 2
Diversion well site near Halstead			
Diversion well	<1–21 (111)	<0.05–0.101 (100)	<0.1–0.4 (283)
	0.628; <1	0.06; 0.07	0.06; <0.1
EB-145-A1	<1–26 (62)	<0.007–2.2 (51)	<0.1–3 (67)
	0.851*; <1	0.289*; 0.05	0.5*; 0.2
EB-145-A2	<1–7 (28)	<0.05–0.91 (22)	<0.1–2 (28)
	--; <1	0.193*; 0.08	0.5*; 0.2
EB-145-A3	<1–14 (31)	<0.001–0.13 (22)	<0.1–0.2 (33)
	--; <1	0.046*; 0.01	0.1*; <0.1
EB-145-A4	<1–<2 (21)	<0.001–0.01 (12)	<0.1–<0.1 (22)
	--; <1	--; <0.05	--; <0.1
EB-145-A5	<1–2 (31)	<0.001–<0.05 (17)	<0.1–0.3 (33)
	--; <1	--; <0.05	--; <0.1
EB-145-P-D5	<1–56 (56)	<0.001–0.18 (34)	<0.1–0.3 (57)
	1.72*; <1	0.063*; 0.06	0.08*; <0.1
Halstead recharge site			
SMW-H4	<1–10 (47)	<0.05–0.142 (31)	<0.1–0.4 (46)
	0.448*; <1	0.046*; 0.04	0.07*; <0.1
SMW-H14	<1–99 (46)	<0.05–0.52 (34)	<0.1–0.5 (46)
	3.13*; <1	0.070*; 0.04	0.03*; <0.1
DMW-H1	<1–2 (46)	<0.05–0.1 (34)	<0.1–0.2 (46)
	--; <1	0.053*; 0.07	0.07*; <0.1
DMW-H13	<1–80 (46)	<0.001–0.09 (37)	<0.1–0.2 (46)
	2.47*; <1	0.060*; 0.06	0.06*; <0.1
Sedgwick recharge site			
Treated stream water	<1–7000 (48)	<0.05–6.71 (65)	<0.1–7 (228)
	393*; 80	0.517*; 0.22	0.3*; <0.1
SMW-S11	<1–196 (52)	<0.05–0.39 (41)	<0.1–1 (52)
	5.82*; <1	0.142*; 0.11	0.2*; 0.1
SMW-S13	<1–56 (47)	<0.05–0.16 (29)	<0.1–0.2 (47)
	3.16*; <1	0.037*; 0.01	0.04*; <0.1
DMW-S10	<1–8 (40)	<0.001–<0.05 (18)	<0.1–<0.1 (40)
	0.451*; <1	--; <0.001	--; <0.1
DMW-S14	<1–4 (36)	<0.001–0.004 (20)	<0.1–0.1 (36)
	0.524*; <1	--; <0.05	--; <0.1

Table A–7. Summary of bacteria and viral indicator detections and triazine herbicide concentrations in water samples collected as part of the *Equus* Beds Groundwater Recharge Project during 1995–2005.—Continued

[cfu/100 mL, colony forming units per 100 milliliters; pfu/100 mL, plaque forming units per 100 milliliters; m-TEC, membrane-thermotolerant *Escherichia coli*; MF, membrane filter; col/100 mL, colonies per 100 milliliters; µg/L, micrograms per liter; ELISA, enzyme-linked immunosorbent assay; --, not determined; MCLG, Maximum Contaminant Level Goal; MCL, Maximum Contaminant Level; <, less than; NA, not analyzed. The first set of numbers under each heading, for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the detection level.]

Data-collection site (fig. 6)	*Clostridium perfringens* (cfu/100 mL)	Coliphage, *Escherichia coli*, C13 host (pfu/100 mL)	Coliphage, *Escherichia coli*, Famp host (pfu/100 mL)	*Enterococci* (cfu/100 mL)	*Escherichia coli*, modified m-TEC MF method (cfu/100 mL)	*Escherichia coli*, m-TEC MF method (cfu/100 mL)	Fecal coliform (col/100 mL)	Fecal *streptococci* (cfu/100 mL)
Drinking-water criteria	--	--	--	--	--	--	--	--
Reporting level	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Background wells								
EB-142-A3	NA	NA	NA	NA	NA	NA	<2–<2 (3)	NA
	NA	NA	NA	NA	NA	NA	--; --	NA
Sedgwick well	NA	--–<1 (1)	--–<1 (1)	NA	NA	NA	<1–<10 (45)	NA
	NA	--; --	--; --	NA	NA	NA	--; <1	NA
City well-Sedgwick	NA	NA	NA	NA	NA	NA	--–<1 (1)	NA
	NA	NA	NA	NA	NA	NA	--; --	NA
TH-02-95	NA	--–<1 (1)	--–<1 (1)	NA	NA	NA	<1–6 (25)	NA
	NA	--; --	--; --	NA	NA	NA	--; <1	NA
TH-06-95	NA	--–<1 (1)	--–<1 (1)	NA	NA	NA	<1–<2 (27)	NA
	NA	--; --	--; --	NA	NA	NA	--; <1	NA
TH-10-95	NA	--–<1 (1)	--–<1 (1)	NA	NA	NA	<1–3 (26)	NA
	NA	--; --	--; --	NA	NA	NA	--; <1	NA
TH-12-95	NA	NA	NA	NA	NA	NA	--–<1 (1)	NA
	NA	NA	NA	NA	NA	NA	--; --	NA
TH-08-A1	NA	NA	NA	NA	NA	NA	<1–<4 (7)	NA
	NA	NA	NA	NA	NA	NA	--; <2	NA
TH-08-A2	NA	NA	NA	NA	NA	NA	<1–<2 (10)	NA
	NA	NA	NA	NA	NA	NA	--; <1	NA
TH-08-A3	NA	--–<1 (1)	--–1 (1)	NA	NA	NA	<1–<2 (23)	NA
	NA	--; --	--; --	NA	NA	NA	--; <1	NA
TH-08-A4	NA	NA	NA	NA	NA	NA	--–<1 (1)	NA
	NA	NA	NA	NA	NA	NA	--; --	NA
TH-08-A5	NA	NA	NA	NA	NA	NA	<1–<1 (12)	NA
	NA	NA	NA	NA	NA	NA	--; <1	NA
Alta Mills	NA	--–<1 (1)	--–<1 (1)	NA	NA	NA	<1–<10 (23)	NA
	NA	--; --	--; --	NA	NA	NA	--; <1	NA
Aquifer storage and recovery prototype wells								
DW-TW-01	NA	--–<1 (1)	--–<1 (1)	NA	NA	NA	<1–1 (7)	NA
	NA	--; --	--; --	NA	NA	NA	--; <1	NA
DW-TW-02	NA	--–<1 (1)	--–<1 (1)	NA	NA	NA	<1–<1 (7)	NA
	NA	--; --	--; --	NA	NA	NA	--; <1	NA
DW-TW-03	NA	--–<1 (1)	--–<1 (1)	NA	NA	NA	<1–<1 (7)	NA
	NA	--; --	--; --	NA	NA	NA	--; <1	NA
DW-TW-04	NA	--–<1 (1)	--–<1 (1)	NA	NA	NA	<1–<1 (7)	NA
	NA	--; --	--; --	NA	NA	NA	--; <1	NA
DW-TW-05	NA	--–<1 (1)	--–<1 (1)	NA	NA	NA	<1–<1 (7)	NA
	NA	--; --	--; --	NA	NA	NA	--; <1	NA
DW-TW-06	NA	--–<1 (1)	--–<1 (1)	NA	NA	NA	<1–<1 (7)	NA
	NA	--; --	--; --	NA	NA	NA	--; <1	NA
DW-TW-07	NA	--–<1 (1)	--–<1 (1)	NA	NA	NA	<1–<1 (7)	NA
	NA	--; --	--; --	NA	NA	NA	--; <1	NA
DW-TW-08	NA	--–<1 (1)	--–<1 (1)	NA	NA	NA	<1–<1 (4)	NA
	NA	--; --	--; --	NA	NA	NA	--; --	NA
DW-TW-09	NA	--–<1 (1)	--–<1 (1)	NA	NA	NA	<1–<1 (4)	NA
	NA	--; --	--; --	NA	NA	NA	--; --	NA
RRW-01	NA	--–<1 (1)	--–<1 (1)	NA	NA	NA	<1–<1 (7)	NA
	NA	--; --	--; --	NA	NA	NA	--; <1	NA
RRW-02	NA	--–<1 (1)	--–<1 (1)	NA	NA	NA	<1–<1 (7)	NA
	NA	--; --	--; --	NA	NA	NA	--; <1	NA
RRW-03	NA	NA	NA	NA	NA	NA	<1–<1 (5)	NA
	NA	NA	NA	NA	NA	NA	--; --	NA

Table A–7. Summary of bacteria and viral indicator detections and triazine herbicide concentrations in water samples collected as part of the *Equus* Beds Groundwater Recharge Project during 1995–2005.—Continued

[cfu/100 mL, colony forming units per 100 milliliters; pfu/100 mL, plaque forming units per 100 milliliters; m-TEC, membrane-thermotolerant *Escherichia coli*; MF, membrane filter; col/100 mL, colonies per 100 milliliters; µg/L, micrograms per liter; ELISA, enzyme-linked immunosorbent assay; --, not determined; MCLG, Maximum Contaminant Level Goal; MCL, Maximum Contaminant Level; <, less than; NA, not analyzed. The first set of numbers under each heading, for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the detection level.]

Data-collection site (fig. 6)	Total coliform (col/100 mL)	Atrazine (µg/L)	Triazine screen, ELISA (µg/L as atrazine)
Drinking-water criteria	0 (MCLG)	3.0 (MCL)	--
Reporting level	1.0	0.05	0.1
Background wells			
EB-142-A3	<2–<2 (3)	<0.001–0.002 (3)	<0.1–<0.1 (4)
	--; --	--; --	--; --
Sedgwick well	<1–490 (45)	<0.001–0.006 (17)	<0.01–0.3 (47)
	23.4*; <1	--; <0.007	--; <0.1
City well-Sedgwick	---<10 (1)	---<0.017 (1)	---<0.1 (1)
	--; --	--; --	--; --
TH-02-95	<1–22 (25)	<0.001–<0.05 (8)	<0.01–0.1 (26)
	1.29*; <1	--; <0.007	--; <0.1
TH-06-95	<1–20 (27)	<0.001–0.004 (9)	<0.1–0.3 (28)
	2.31*; <1	--; <0.017	--; <0.1
TH-10-95	<1–19 (26)	<0.001–<0.05 (9)	<0.01–0.1 (28)
	1.30*; <1	--; <0.007	--; <0.1
TH-12-95	---<2 (1)	---<0.017 (1)	<0.01–<0.1 (2)
	--; --	--; --	--; --
TH-08-A1	<1–8 (7)	0.013–1.6 (6)	<0.1–2 (9)
	--; <2	0.56; 0.11	--; <0.1
TH-08-A2	<1–3 (10)	<0.05–0.17 (5)	<0.1–0.1 (10)
	--; <1	--; --	--; <0.1
TH-08-A3	<1–636 (23)	<0.007–0.02 (9)	<0.1–0.2 (23)
	28.7*; <1	0.011*; 0.01	--; <0.1
TH-08-A4	---<1 (1)	---0.006 (1)	---<0.1 (1)
	--; --	--; --	--; --
TH-08-A5	<1–4 (12)	<0.007–0.007 (4)	<0.1–0.1 (12)
	--; <1	--; --	--; <0.1
Alta Mills	<1–33 (23)	<0.05–0.171 (9)	<0.1–1 (23)
	4.63*; 1	0.089*; 0.09	0.3*; 0.2
Aquifer storage and recovery prototype wells			
DW-TW-01	<1–15 (7)	<0.007–<0.05 (5)	<0.1–<0.1 (7)
	--; <1	--; --	--; <0.1
DW-TW-02	<1–8 (7)	<0.007–<0.05 (4)	<0.1–<0.1 (7)
	--; 1	--; --	--; <0.1
DW-TW-03	<1–48 (7)	<0.007–<0.05 (5)	<0.1–0.1 (7)
	--; <1	--; --	--; <0.1
DW-TW-04	<1–6 (7)	<0.007–<0.05 (4)	<0.1–0.2 (7)
	--; <1	--; --	--; <0.1
DW-TW-05	<1–10 (7)	<0.007–<0.05 (5)	<0.1–<0.1 (7)
	--; <1	--; --	--; <0.1
DW-TW-06	<1–8 (7)	<0.007–<0.05 (5)	<0.1–0.1 (7)
	--; <1	--; --	--; <0.1
DW-TW-07	<1–28 (7)	<0.007–<0.05 (5)	<0.1–0.8 (7)
	--; <1	--; --	--; <0.1
DW-TW-08	<1–224 (4)	<0.007–<0.007 (3)	<0.1–<0.1 (4)
	--; --	--; --	--; --
DW-TW-09	<1–140 (4)	<0.007–<0.007 (3)	<0.1–<0.1 (4)
	--; --	--; --	--; --
RRW-01	<1–98 (7)	<0.007–<0.05 (5)	<0.1–0.1 (7)
	--; <1	--; --	--; <0.1
RRW-02	<1–12 (7)	<0.007–<0.05 (5)	<0.1–0.3 (7)
	--; <1	--; --	--; <0.1
RRW-03	<1–8 (5)	<0.007–<0.05 (4)	<0.1–<0.1 (5)
	--; --	--; --	--; --

Table A–7. Summary of bacteria and viral indicator detections and triazine herbicide concentrations in water samples collected as part of the *Equus* Beds Groundwater Recharge Project during 1995–2005.—Continued

[cfu/100 mL, colony forming units per 100 milliliters; pfu/100 mL, plaque forming units per 100 milliliters; m-TEC, membrane-thermotolerant *Escherichia coli*; MF, membrane filter; col/100 mL, colonies per 100 milliliters; µg/L, micrograms per liter; ELISA, enzyme-linked immunosorbent assay; --, not determined; MCLG, Maximum Contaminant Level Goal; MCL, Maximum Contaminant Level; <, less than; NA, not analyzed. The first set of numbers under each heading, for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the detection level.]

Data-collection site (fig. 6)	*Clostridium perfringens* (cfu/100 mL)	Coliphage, *Escherichia coli*, C13 host (pfu/100 mL)	Coliphage, *Escherichia coli*, Famp host (pfu/100 mL)	*Enterococci* (cfu/100 mL)	*Escherichia coli*, modified m-TEC MF method (cfu/100 mL)	*Escherichia coli*, m-TEC MF method (cfu/100 mL)	Fecal coliform (col/100 mL)	Fecal *streptococci* (cfu/100 mL)
Drinking-water criteria	--	--	--	--	--	--	--	--
Reporting level	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
				Shallow index wells				
IW-01A	--–<1 (1)	--–<1 (1)	--–<1 (1)	NA	NA	--–<1 (1)	<1–<1 (8)	NA
	--; --	--; --	--; --	NA	NA	--; --	--; <1	NA
IW-02A	--–<1 (1)	--–<1 (1)	--–<1 (1)	NA	NA	NA	<1–<1 (7)	NA
	--; --	--; --	--; --	NA	NA	NA	--; <1	NA
IW-03A	--–<1 (1)	--–1 (1)	--–<1 (1)	NA	NA	--–<1 (1)	<1–<1 (8)	NA
	--; --	--; --	--; --	NA	NA	--; --	--; <1	NA
IW-04A	--–<1 (1)	--–<1 (1)	--–<1 (1)	NA	NA	NA	<1–10 (7)	NA
	--; --	--; --	--; --	NA	NA	NA	--; <1	NA
IW-05A	--–<1 (1)	--–<1 (1)	--–<1 (1)	NA	--–<1 (1)	NA	<1–24 (8)	NA
	--; --	--; --	--; --	NA	--; --	NA	--; <1	NA
IW-06A	--–<1 (1)	--–<1 (1)	--–<1 (1)	NA	NA	NA	<1–<1 (7)	NA
	--; --	--; --	--; --	NA	NA	NA	--; <1	NA
IW-07A	--–<1 (1)	--–<1 (1)	--–<1 (1)	NA	NA	NA	<1–<1 (7)	NA
	--; --	--; --	--; --	NA	NA	NA	--; <1	NA
IW-08A	--–<1 (1)	--–<1 (1)	--–<1 (1)	NA	--–<1 (1)	--–<1 (1)	<1–4 (9)	NA
	--; --	--; --	--; --	NA	--; --	--; --	--; <1	NA
IW-09A	--–<1 (1)	--–<1 (1)	--–<1 (1)	NA	NA	NA	<1–1 (7)	NA
	--; --	--; --	--; --	NA	NA	NA	--; <1	NA
IW-10A	--–1 (1)	--–<1 (1)	--–<1 (1)	NA	NA	NA	<1–<1 (7)	NA
	--; --	--; --	--; --	NA	NA	NA	--; <1	NA
IW-11A-2	--–<1 (1)	<1–<1 (2)	<1–<1 (2)	NA	NA	NA	<1–<1 (7)	NA
	--; --	--; --	--; --	NA	NA	NA	--; <1	NA
IW-12A	--–<1 (1)	--–<1 (1)	--–<1 (1)	NA	--–<1 (1)	--–<1 (1)	<1–<1 (10)	NA
	--; --	--; --	--; --	NA	--; --	--; --	--; <1	NA
IW-13A	--–<1 (1)	<1–<1 (2)	<1–<1 (2)	NA	NA	NA	<1–<1 (7)	NA
	--; --	--; --	--; --	NA	NA	NA	--; <1	NA
IW-14A	--–<1 (1)	<1–<1 (2)	<1–<1 (2)	NA	NA	NA	<1–<1 (8)	NA
	--; --	--; --	--; --	NA	NA	NA	--; <1	NA
IW-15A	--–<1 (1)	--–<1 (1)	--–<1 (1)	NA	NA	NA	<1–<1 (7)	NA
	--; --	--; --	--; --	NA	NA	NA	--; <1	NA
IW-16A	--–<1 (1)	<1–<1 (2)	<1–<1 (2)	NA	NA	NA	<1–<1 (7)	NA
	--; --	--; --	--; --	NA	NA	NA	--; <1	NA
IW-17A	--–<1 (1)	--–<1 (1)	--–<1 (1)	NA	NA	NA	<1–<1 (7)	NA
	--; --	--; --	--; --	NA	NA	NA	--; <1	NA
IW-18A	--–<1 (1)	--–<1 (1)	--–1 (1)	NA	NA	NA	<1–<1 (7)	NA
	--; --	--; --	--; --	NA	NA	NA	--; <1	NA
IW-19A	--–<1 (1)	--–<1 (1)	--–<1 (1)	NA	NA	NA	<1–<1 (7)	NA
	--; --	--; --	--; --	NA	NA	NA	--; <1	NA
IW-20A	<1–<1 (2)	<1–<1 (2)	<1–<1 (2)	NA	NA	--–<1 (1)	<1–120 (8)	NA
	--; --	--; --	--; --	NA	NA	--; --	--; <1	NA
IW-21A	--–<1 (1)	<1–<1 (2)	<1–<1 (2)	NA	NA	NA	<1–<1 (7)	NA
	--; --	--; --	--; --	NA	NA	NA	--; <1	NA
IW-22A	--–<1 (1)	--–<1 (1)	--–<1 (1)	NA	NA	--–<1 (1)	<1–<1 (8)	NA
	--; --	--; --	--; --	NA	NA	--; --	--; <1	NA
IW-23A	--–<1 (1)	--–<1 (1)	--–<1 (1)	NA	NA	NA	<1–2 (7)	NA
	--; --	--; --	--; --	NA	NA	NA	--; <1	NA
IW-24A	--–<1 (1)	--–<1 (1)	--–<1 (1)	NA	NA	--–<1 (1)	<1–<1 (8)	NA
	--; --	--; --	--; --	NA	NA	--; --	--; <1	NA
IW-25A	--–<1 (1)	--–<1 (1)	--–<1 (1)	NA	NA	NA	<1–<1 (7)	NA
	--; --	--; --	--; --	NA	NA	NA	--; <1	NA
IW-26A	--–<1 (1)	--–<1 (1)	--–<1 (1)	NA	NA	NA	<1–<1 (7)	NA
	--; --	--; --	--; --	NA	NA	NA	--; <1	NA
IW-27A	--–<1 (1)	--–<1 (1)	--–<1 (1)	NA	NA	NA	<1–<20 (7)	NA
	--; --	--; --	--; --	NA	NA	NA	--; <1	NA
IW-28A	--–<1 (1)	<1–<1 (2)	<1–<1 (2)	NA	NA	NA	<1–<1 (7)	NA
	--; --	--; --	--; --	NA	NA	NA	--; <1	NA

Table A–7. Summary of bacteria and viral indicator detections and triazine herbicide concentrations in water samples collected as part of the *Equus* Beds Groundwater Recharge Project during 1995–2005.—Continued

[cfu/100 mL, colony forming units per 100 milliliters; pfu/100 mL, plaque forming units per 100 milliliters; m-TEC, membrane-thermotolerant *Escherichia coli*; MF, membrane filter; col/100 mL, colonies per 100 milliliters; µg/L, micrograms per liter; ELISA, enzyme-linked immunosorbent assay; --, not determined; MCLG, Maximum Contaminant Level Goal; MCL, Maximum Contaminant Level; <, less than; NA, not analyzed. The first set of numbers under each heading, for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the detection level.]

Data-collection site (fig. 6)	Total coliform (col/100 mL)	Atrazine (µg/L)	Triazine screen, ELISA (µg/L as atrazine)
Drinking-water criteria	0 (MCLG)	3.0 (MCL)	--
Reporting level	1.0	0.05	0.1
		Shallow index wells	
IW-01A	<1–7 (7) --; <1	<0.007–<0.05 (3) --; --	<0.1–<0.1 (7) --; <0.1
IW-02A	<1–2 (7) --; <1	<0.007–<0.007 (2) --; --	<0.1–<0.1 (7) --; <0.1
IW-03A	<1–3 (7) --; <1	<0.007–<0.05 (4) --; --	<0.1–<0.1 (7) --; <0.1
IW-04A	<4–84 (7) 14.6*; 4	0.07–1.2 (5) --; --	<0.1–2 (7) 0.7*; 0.3
IW-05A	<1–156 (7) --; <1	---0.005 (1) --; --	<0.1–<0.1 (7) --; <0.1
IW-06A	<1–14 (7) --; <1	0.05–0.16 (6) 0.09; 0.07	<0.1–0.3 (7) 0.2*; 0.2
IW-07A	<1–3 (7) --; <1	<0.007–<0.05 (2) --; --	<0.1–<0.1 (7) --; <0.1
IW-08A	<1–60 (7) --; <1	<0.05–0.028 (4) --; --	<0.1–<0.1 (7) --; <0.1
IW-09A	<1–99 (7) --; 2	0.009–0.011 (2) --; --	<0.1–<0.1 (7) --; <0.1
IW-10A	<1–12 (7) --; <1	0.21–0.27 (3) --; --	0.2–0.5 (7) 0.3; 0.3
IW-11A-2	<1–7 (7) --; <1	<0.007–<0.007 (2) --; --	<0.1–<0.1 (7) --; <0.1
IW-12A	<1–324 (8) --; <1	<0.05–0.064 (4) --; --	<0.1–<0.1 (8) --; <0.1
IW-13A	<1–15 (7) --; <1	0.005–0.005 (2) --; --	<0.1–<0.1 (7) --; <0.1
IW-14A	<1–18 (8) --; <1	0.004–0.006 (2) --; --	<0.1–<0.1 (8) --; <0.1
IW-15A	<1–10 (7) --; <1	---0.022 (1) --; --	<0.1–<0.1 (7) --; <0.1
IW-16A	<1–<1 (7) --; <1	<0.007–<0.007 (2) --; --	<0.1–<0.1 (7) --; <0.1
IW-17A	<1–7 (7) --; <1	<0.007–<0.007 (2) --; --	<0.1–<0.1 (7) --; <0.1
IW-18A	<1–10 (7) --; <1	0.006–0.007 (2) --; --	<0.1–<0.1 (7) --; <0.1
IW-19A	<1–1 (7) --; <1	---0.024 (1) --; --	<0.1–<0.1 (7) --; <0.1
IW-20A	<1–<1 (7) --; <1	<0.007–<0.05 (5) --; --	<0.1–<0.1 (8) --; <0.1
IW-21A	<1–1 (7) --; <1	0.009–0.011 (2) --; --	<0.1–<0.1 (7) --; <0.1
IW-22A	<1–2 (7) --; <1	0.047–0.09 (5) --; --	<0.1–0.2 (7) --; <0.1
IW-23A	<1–18 (7) --; <1	<0.007–<0.007 (2) --; --	<0.1–<0.1 (7) --; <0.1
IW-24A	<1–10 (7) --; <1	<0.007–<0.05 (5) --; --	<0.1–<0.1 (7) --; <0.1
IW-25A	<1–12 (7) --; <1	0.007–0.013 (2) --; --	<0.1–0.3 (7) --; <0.1
IW-26A	<1–37 (7) --; <1	---<0.007 (1) --; --	<0.1–<0.1 (7) --; <0.1
IW-27A	<1–300 (7) --; 3	<0.007–<0.007 (2) --; --	<0.1–<0.1 (7) --; <0.1
IW-28A	<1–26 (7) --; <1	0.005–0.009 (2) --; --	<0.1–<0.1 (7) --; <0.1

Table A–7. Summary of bacteria and viral indicator detections and triazine herbicide concentrations in water samples collected as part of the *Equus* Beds Groundwater Recharge Project during 1995–2005.—Continued

[cfu/100 mL, colony forming units per 100 milliliters; pfu/100 mL, plaque forming units per 100 milliliters; m-TEC, membrane-thermotolerant *Escherichia coli*; MF, membrane filter; col/100 mL, colonies per 100 milliliters; µg/L, micrograms per liter; ELISA, enzyme-linked immunosorbent assay; --, not determined; MCLG, Maximum Contaminant Level Goal; MCL, Maximum Contaminant Level; <, less than; NA, not analyzed. The first set of numbers under each heading, for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the detection level.]

Data-collection site (fig. 6)	*Clostridium perfringens* (cfu/100 mL)	Coliphage, *Escherichia coli*, C13 host (pfu/100 mL)	Coliphage, *Escherichia coli*, Famp host (pfu/100 mL)	*Enterococci* (cfu/100 mL)	*Escherichia coli*, modified m-TEC MF method (cfu/100 mL)	*Escherichia coli*, m-TEC MF method (cfu/100 mL)	Fecal coliform (col/100 mL)	Fecal *streptococci* (cfu/100 mL)
Drinking-water criteria	--	--	--	--	--	--	--	--
Reporting level	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Shallow index wells—Continued								
IW-29A	--–<1 (1)	--–<1 (1)	--–<1 (1)	NA	NA	NA	<1–<2 (8)	NA
	--; --	--; --	--; --	NA	NA	NA	--; <1	NA
IW-30A	--–<1 (1)	--–<1 (1)	--–<1 (1)	NA	NA	--–1 (1)	<1–1 (8)	NA
	--; --	--; --	--; --	NA	NA	--; --	--; <1	NA
IW-31A	--–<1 (1)	--–<1 (1)	--–<1 (1)	NA	NA	NA	<1–<1 (7)	NA
	--; --	--; --	--; --	NA	NA	NA	--; <1	NA
IW-32A	--–<1 (1)	<1–<1 (2)	<1–<1 (2)	NA	NA	NA	<1–<1 (7)	NA
	--; --	--; --	--; --	NA	NA	NA	--; <1	NA
IW-33A	--–<1 (1)	--–<1 (1)	--–<1 (1)	NA	--–<1 (1)	NA	<1–<1 (8)	NA
	--; --	--; --	--; --	NA	--; --	NA	--; <1	NA
IW-34A	--–<1 (1)	<1–<1 (2)	<1–<1 (2)	NA	NA	NA	<1–<1 (7)	NA
	--; --	--; --	--; --	NA	NA	NA	--; <1	NA
IW-35A	--–<1 (1)	<1–<1 (2)	<1–<1 (2)	NA	NA	NA	<1–<1 (8)	NA
	--; --	--; --	--; --	NA	NA	NA	--; <1	NA
IW-36A	--–<1 (1)	--–<1 (1)	--–<1 (1)	NA	NA	NA	<1–<1 (8)	NA
	--; --	--; --	--; --	NA	NA	NA	--; <1	NA
IW-37A	--–<1 (1)	--–<1 (1)	--–<1 (1)	NA	--–1 (1)	--–<1 (1)	<1–1 (9)	NA
	--; --	--; --	--; --	NA	--; --	--; --	--; <1	NA
IW-38A	--–<1 (1)	--–<1 (1)	--–<1 (1)	NA	NA	NA	<1–<1 (7)	NA
	--; --	--; --	--; --	NA	NA	NA	--; <1	NA
Deep index wells								
IW-01C	--–<1 (1)	--–<1 (1)	--–<1 (1)	NA	NA	--–<1 (1)	<1–<1 (8)	NA
	--; --	--; --	--; --	NA	NA	--; --	--; <1	NA
IW-02C	--–<1 (1)	--–<1 (1)	--–<1 (1)	NA	NA	NA	<1–<1 (7)	NA
	--; --	--; --	--; --	NA	NA	NA	--; <1	NA
IW-03C	--–<1 (1)	--–<1 (1)	--–<1 (1)	NA	NA	--–<1 (1)	<1–<1 (8)	NA
	--; --	--; --	--; --	NA	NA	--; --	--; <1	NA
IW-04C	--–<1 (1)	--–<1 (1)	--–<1 (1)	NA	NA	NA	<1–<1 (7)	NA
	--; --	--; --	--; --	NA	NA	NA	--; <1	NA
IW-05C	--–<1 (1)	--–<1 (1)	--–<1 (1)	NA	NA	NA	<1–2 (7)	NA
	--; --	--; --	--; --	NA	NA	NA	--; <1	NA
IW-06C	--–<1 (1)	--–<1 (1)	--–<1 (1)	NA	NA	--–<1 (1)	<1–<1 (8)	NA
	--; --	--; --	--; --	NA	NA	--; --	--; <1	NA
IW-07C	--–<1 (1)	--–<1 (1)	--–<1 (1)	NA	NA	NA	<1–<1 (7)	NA
	--; --	--; --	--; --	NA	NA	NA	--; <1	NA
IW-08C	--–<1 (1)	--–<1 (1)	--–<1 (1)	NA	NA	--–<1 (1)	<1–<1 (9)	NA
	--; --	--; --	--; --	NA	NA	--; --	--; <1	NA
IW-09C	--–<1 (1)	--–<1 (1)	--–<1 (1)	NA	NA	NA	<1–<1 (7)	NA
	--; --	--; --	--; --	NA	NA	NA	--; <1	NA
IW-10C	--–<1 (1)	--–<1 (1)	--–<1 (1)	NA	NA	NA	<1–<1 (7)	NA
	--; --	--; --	--; --	NA	NA	NA	--; <1	NA
IW-11C	--–<1 (1)	<1–<1 (2)	<1–<1 (2)	NA	NA	NA	<1–<1 (7)	NA
	--; --	--; --	--; --	NA	NA	NA	--; <1	NA
IW-12C	--–<1 (1)	--–<1 (1)	--–<1 (1)	NA	--–<1 (1)	--–<1 (1)	<1–21 (10)	NA
	--; --	--; --	--; --	NA	--; --	--; --	--; <1	NA
IW-13C	--–<1 (1)	<1–<1 (2)	<1–<1 (2)	NA	NA	NA	<1–<1 (7)	NA
	--; --	--; --	--; --	NA	NA	NA	--; <1	NA
IW-14C	--–<1 (1)	<1–<1 (2)	<1–<1 (2)	NA	NA	NA	<1–<1 (8)	NA
	--; --	--; --	--; --	NA	NA	NA	--; <1	NA

Table A–7. Summary of bacteria and viral indicator detections and triazine herbicide concentrations in water samples collected as part of the *Equus* Beds Groundwater Recharge Project during 1995–2005.—Continued

[cfu/100 mL, colony forming units per 100 milliliters; pfu/100 mL, plaque forming units per 100 milliliters; m-TEC, membrane-thermotolerant *Escherichia coli*; MF, membrane filter; col/100 mL, colonies per 100 milliliters; µg/L, micrograms per liter; ELISA, enzyme-linked immunosorbent assay; --, not determined; MCLG, Maximum Contaminant Level Goal; MCL, Maximum Contaminant Level; <, less than; NA, not analyzed. The first set of numbers under each heading, for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the detection level.]

Data-collection site (fig. 6)	Total coliform (col/100 mL)	Atrazine (µg/L)	Triazine screen, ELISA (µg/L as atrazine)
Drinking-water criteria	0 (MCLG)	3.0 (MCL)	--
Reporting level	1.0	0.05	0.1
Shallow index wells—Continued			
IW-29A	<1–6 (8)	---0.015 (1)	<0.1–0.1 (8)
	--; <1	--; --	--; <0.1
IW-30A	<1–368 (7)	<0.05–0.05 (5)	<0.1–0.1 (7)
	--; <1	--; --	--; <0.1
IW-31A	<1–6 (7)	0.06–0.212 (4)	<0.1–0.4 (7)
	--; 2	--; --	0.2*; 0.1
IW-32A	<1–78 (7)	<0.007–0.004 (2)	<0.1–<0.1 (7)
	--; <1	--; --	--; <0.1
IW-33A	<1–83 (7)	<0.05–0.031 (2)	<0.1–0.2 (7)
	--; <1	--; --	--; <0.1
IW-34A	<1–136 (7)	0.004–0.006 (2)	<0.1–<0.1 (7)
	--; <1	--; --	--; <0.1
IW-35A	<1–34 (8)	0.051–0.054 (2)	<0.1–0.1 (8)
	--; <1	--; --	--; <0.1
IW-36A	<1–6 (8)	<0.05–0.13 (5)	<0.1–0.3 (8)
	1.84*; 1	--; --	0.1*; 0.1
IW-37A	<1–54 (7)	<0.007–<0.05 (4)	<0.1–<0.1 (7)
	--; 2	--; --	--; <0.1
IW-38A	<1–11 (7)	<0.007–<0.007 (2)	<0.1–<0.1 (7)
	--; <1	--; --	--; <0.1
Deep index wells			
IW-01C	<1–4 (7)	<0.007–0.06 (3)	<0.1–<0.1 (7)
	--; <1	--; --	--; <0.1
IW-02C	<1–9 (7)	---<0.007 (1)	<0.1–<0.1 (7)
	--; <1	--; --	--; <0.1
IW-03C	<1–6 (7)	<0.007–<0.05 (3)	<0.1–<0.1 (7)
	--; <1	--; --	--; <0.1
IW-04C	<1–<1 (7)	---<0.007 (1)	<0.1–<0.1 (7)
	--; <1	--; --	--; <0.1
IW-05C	<1–7 (7)	--	<0.1–<0.1 (7)
	--; <1	--	--; <0.1
IW-06C	<1–1 (7)	<0.007–<0.05 (3)	<0.1–<0.1 (7)
	--; <1	--; --	--; <0.1
IW-07C	<1–1 (7)	---0.007 (1)	<0.1–<0.1 (7)
	--; <1	--; --	--; <0.1
IW-08C	<1–1 (8)	<0.007–<0.05 (3)	<0.1–<0.1 (8)
	--; <1	--; --	--; <0.1
IW-09C	<1–20 (7)	---<0.007 (1)	<0.1–<0.1 (7)
	--; <1	--; --	--; <0.1
IW-10C	<1–15 (7)	--	<0.1–<0.1 (7)
	--; <1	--	--; <0.1
IW-11C	<1–5 (7)	---<0.007 (1)	<0.1–<0.1 (7)
	--; <1	--; --	--; <0.1
IW-12C	<1–51 (8)	<0.007–<0.05 (3)	<0.1–<0.1 (8)
	--; <1	--; --	--; <0.1
IW-13C	<1–<1 (7)	---<0.007 (1)	<0.1–<0.1 (7)
	--; <1	--; --	--; <0.1
IW-14C	<1–2 (8)	---0.009 (1)	<0.1–<0.1 (8)
	--; <1	--; --	--; <0.1

Table A–7. Summary of bacteria and viral indicator detections and triazine herbicide concentrations in water samples collected as part of the *Equus* Beds Groundwater Recharge Project during 1995–2005.—Continued

[cfu/100 mL, colony forming units per 100 milliliters; pfu/100 mL, plaque forming units per 100 milliliters; m-TEC, membrane-thermotolerant *Escherichia coli*; MF, membrane filter; col/100 mL, colonies per 100 milliliters; µg/L, micrograms per liter; ELISA, enzyme-linked immunosorbent assay; --, not determined; MCLG, Maximum Contaminant Level Goal; MCL, Maximum Contaminant Level; <, less than; NA, not analyzed. The first set of numbers under each heading, for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the detection level.]

Data-collection site (fig. 6)	*Clostridium perfringens* (cfu/100 mL)	Coliphage, *Escherichia coli*, C13 host (pfu/100 mL)	Coliphage, *Escherichia coli*, Famp host (pfu/100 mL)	*Enterococci* (cfu/100 mL)	*Escherichia coli*, modified m-TEC MF method (cfu/100 mL)	*Escherichia coli*, m-TEC MF method (cfu/100 mL)	Fecal coliform (col/100 mL)	Fecal *streptococci* (cfu/100 mL)
Drinking-water criteria	--	--	--	--	--	--	--	--
Reporting level	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Deep index wells—Continued								
IW-15C	--–<1 (1)	--–<1 (1)	--–<1 (1)	NA	NA	NA	<1–<1 (7)	NA
	--; --	--; --	--; --	NA	NA	NA	--; <1	NA
IW-16C	--–<1 (1)	<1–<1 (2)	<1–<1 (2)	NA	NA	NA	<1–<1 (7)	NA
	--; --	--; --	--; --	NA	NA	NA	--; <1	NA
IW-17C	--–<1 (1)	--–<1 (1)	--–<1 (1)	NA	NA	NA	<1–<1 (7)	NA
	--; --	--; --	--; --	NA	NA	NA	--; <1	NA
IW-18C	--–<1 (1)	--–<1 (1)	--–<1 (1)	NA	NA	NA	<1–<1 (7)	NA
	--; --	--; --	--; --	NA	NA	NA	--; <1	NA
IW-19C	--–<1 (1)	--–<1 (1)	--–<1 (1)	NA	NA	NA	<1–<1 (7)	NA
	--; --	--; --	--; --	NA	NA	NA	--; <1	NA
IW-20C	--–<1 (1)	--–<1 (1)	--–<1 (1)	NA	NA	--–<1 (1)	<1–<1 (9)	NA
	--; --	--; --	--; --	NA	NA	--; --	--; <1	NA
IW-21C	--–<1 (1)	<1–<1 (2)	<1–<1 (2)	NA	NA	NA	<1–<1 (8)	NA
	--; --	--; --	--; --	NA	NA	NA	--; <1	NA
IW-22C	--–<1 (1)	--–<1 (1)	--–<1 (1)	NA	NA	--–<1 (1)	<1–<1 (8)	NA
	--; --	--; --	--; --	NA	NA	--; --	--; <1	NA
IW-23C	--–<1 (1)	--–<1 (1)	--–<1 (1)	NA	NA	NA	<1–<1 (7)	NA
	--; --	--; --	--; --	NA	NA	NA	--; <1	NA
IW-24C	--–<1 (1)	--–<1 (1)	--–<1 (1)	NA	NA	--–<1 (1)	<1–<1 (8)	NA
	--; --	--; --	--; --	NA	NA	--; --	--; <1	NA
IW-25C	--–<1 (1)	--–<1 (1)	--–<1 (1)	NA	NA	NA	<1–<1 (8)	NA
	--; --	--; --	--; --	NA	NA	NA	--; <1	NA
IW-26C	--–<1 (1)	--–<1 (1)	--–<1 (1)	NA	NA	NA	<1–<1 (6)	NA
	--; --	--; --	--; --	NA	NA	NA	--; <1	NA
IW-27C	--–<1 (1)	--–<1 (1)	--–<1 (1)	NA	NA	NA	<1–<20 (7)	NA
	--; --	--; --	--; --	NA	NA	NA	--; <1	NA
IW-28C	--–<1 (1)	<1–<1 (2)	<1–<1 (2)	NA	NA	NA	<1–<1 (7)	NA
	--; --	--; --	--; --	NA	NA	NA	--; <1	NA
IW-29C	--–<1 (1)	--–<1 (1)	--–<1 (1)	NA	NA	NA	<1–<1 (7)	NA
	--; --	--; --	--; --	NA	NA	NA	--; <1	NA
IW-30C	--–<1 (1)	--–<1 (1)	--–<1 (1)	NA	NA	--–1 (1)	<1–1 (9)	NA
	--; --	--; --	--; --	NA	NA	--; --	--; <1	NA
IW-31C	--–<1 (1)	--–<1 (1)	--–<1 (1)	NA	NA	NA	<1–<1 (7)	NA
	--; --	--; --	--; --	NA	NA	NA	--; <1	NA
IW-32C	--–<1 (1)	<1–<1 (2)	<1–<1 (2)	NA	NA	NA	<1–<1 (7)	NA
	--; --	--; --	--; --	NA	NA	NA	--; <1	NA
IW-33C	--–<1 (1)	--–<1 (1)	--–<1 (1)	NA	NA	NA	<1–<1 (7)	NA
	--; --	--; --	--; --	NA	NA	NA	--; <1	NA
IW-34C	--–<1 (1)	<1–<1 (2)	<1–<1 (2)	NA	NA	NA	<1–4 (7)	NA
	--; --	--; --	--; --	NA	NA	NA	--; <1	NA
IW-35C	--–<1 (1)	<1–<1 (2)	<1–<1 (2)	NA	NA	NA	<1–<1 (8)	NA
	--; --	--; --	--; --	NA	NA	NA	--; <1	NA
IW-36C	--–<1 (1)	--–<1 (1)	--–<1 (1)	NA	NA	NA	<1–<1 (7)	NA
	--; --	--; --	--; --	NA	NA	NA	--; <1	NA
IW-37C	--–<1 (1)	--–<1 (1)	--–<1 (1)	NA	--–<1 (1)	--–<1 (1)	<1–<1 (9)	NA
	--; --	--; --	--; --	NA	--; --	--; --	--; <1	NA
IW-38C	--–<1 (1)	--–<1 (1)	--–<1 (1)	NA	NA	NA	<1–<1 (7)	NA
	--; --	--; --	--; --	NA	NA	NA	--; <1	NA

Table A–7. Summary of bacteria and viral indicator detections and triazine herbicide concentrations in water samples collected as part of the *Equus* Beds Groundwater Recharge Project during 1995–2005.—Continued

[cfu/100 mL, colony forming units per 100 milliliters; pfu/100 mL, plaque forming units per 100 milliliters; m-TEC, membrane-thermotolerant *Escherichia coli*; MF, membrane filter; col/100 mL, colonies per 100 milliliters; µg/L, micrograms per liter; ELISA, enzyme-linked immunosorbent assay; --, not determined; MCLG, Maximum Contaminant Level Goal; MCL, Maximum Contaminant Level; <, less than; NA, not analyzed. The first set of numbers under each heading, for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the detection level.]

Data-collection site (fig. 6)	Total coliform (col/100 mL)	Atrazine (µg/L)	Triazine screen, ELISA (µg/L as atrazine)
Drinking-water criteria	0 (MCLG)	3.0 (MCL)	--
Reporting level	1.0	0.05	0.1
Deep index wells—Continued			
IW-15C	<1–12 (7)	--	<0.1–<0.1 (7)
	--; <1	--	--; <0.1
IW-16C	<1–1 (7)	--–0.004 (1)	<0.1–<0.1 (7)
	--; <1	--; --	--; <0.1
IW-17C	<1–8 (7)	--–<0.007 (1)	<0.1–<0.1 (7)
	--; <1	--; --	--; <0.1
IW-18C	<1–46 (7)	--–<0.007 (1)	<0.1–<0.1 (7)
	--; <1	--; --	--; <0.1
IW-19C	<1–<1 (7)	--	<0.1–<0.1 (7)
	--; <1	--	--; <0.1
IW-20C	<1–1 (8)	<0.007–<0.05 (3)	<0.1–<0.1 (8)
	--; <1	--; --	--; <0.1
IW-21C	<1–<1 (8)	--–<0.007 (1)	<0.1–<0.1 (8)
	--; <1	--; --	--; <0.1
IW-22C	<1–4 (7)	<0.05–0.013 (3)	<0.1–0.1 (7)
	--; <1	--; --	--; <0.1
IW-23C	<1–<1 (7)	--–<0.007 (1)	<0.1–<0.1 (6)
	--; <1	--; --	--; <0.1
IW-24C	<1–2 (7)	<0.007–<0.05 (3)	<0.1–<0.1 (7)
	--; <1	--; --	--; <0.1
IW-25C	<1–6 (8)	--–0.013 (1)	<0.1–<0.1 (8)
	--; <1	--; --	--; <0.1
IW-26C	<1–4 (6)	--	<0.1–<0.1 (6)
	--; <1	--	--; <0.1
IW-27C	<1–84 (7)	--–<0.007 (1)	<0.1–<0.1 (7)
	--; <1	--; --	--; <0.1
IW-28C	<1–1 (7)	--–<0.007 (1)	<0.1–<0.1 (7)
	--; <1	--; --	--; <0.1
IW-29C	<1–1 (7)	--	<0.1–<0.1 (7)
	--; <1	--	--; <0.1
IW-30C	<1–13 (8)	<0.05–<0.05 (2)	<0.1–<0.1 (8)
	--; <1	--; --	--; <0.1
IW-31C	<1–2 (7)	--–<0.007 (1)	<0.1–<0.1 (7)
	--; <1	--; --	--; <0.1
IW-32C	<1–3 (7)	--–0.004 (1)	<0.1–<0.1 (7)
	--; <1	--; --	--; <0.1
IW-33C	<1–7 (7)	--	<0.1–<0.1 (7)
	--; <1	--	--; <0.1
IW-34C	<1–10 (7)	--–0.005 (1)	<0.1–<0.1 (7)
	--; <1	--; --	--; <0.1
IW-35C	<1–41 (8)	--–<0.007 (1)	<0.1–<0.1 (8)
	--; <1	--; --	--; <0.1
IW-36C	<1–1 (7)	0.035–0.07 (3)	<0.1–0.3 (7)
	--; <1	--; --	--; <0.1
IW-37C	<1–26 (7)	<0.05–<0.05 (2)	<0.1–<0.1 (7)
	--; <1	--; --	--; <0.1
IW-38C	<1–5 (7)	--–<0.007 (1)	<0.1–<0.1 (7)
	--; <1	--; --	--; <0.1

Table A–8. Summary of radionuclide analysis in water samples collected as part of the *Equus* Beds Groundwater Recharge Project, 1995–2005.

[µg/L, micrograms per liter; pCi/L, picocuries per liter; --, not determined; MCL, Maximum Contaminant Level; mrem/yr, millirem per year; <, less than, NA; not analyzed; The first set of numbers under each heading, for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the detection level.]

Data-collection site (fig. 6)	Alpha radioactivity 2-sigma combined uncertainty, natural uranium curve (µg/L)	Alpha radioactivity 2-sigma combined uncertainty, Thorium-230 curve (pCi/L)	Alpha radioactivity, Thorium-230 curve (pCi/L)	Beta radioactivity 2-sigma combined uncertainty, Cesium-137 curve (pCi/L)	Beta radioactivity 2-sigma combined uncertainty, Strontium-90/ Yttrium-90 curve (pCi/L)	Gross alpha radioactivity, natural uranium curve (µg/L)	Gross beta radioactivity, Cesium-137 curve (pCi/L)	Gross beta radioactivity, Strontium-90/ Yttrium-90 curve (pCi/L)	Uranium (µg/L)
Drinking-water criteria	--	--	--	--	--	15 pCi/L (MCL)	4 mrem/yr (MCL)	4 mrem/yr (MCL)	30 (MCL)
Reporting level	--	--	3.0	--	--	3.0	4.0	4.0	--
Surface-water monitoring sites (Little Arkansas River)									
7143672	2.9–9.7 (4)	2.1–5.3 (5)	<3–3.5 (5)	2.2–9.5 (5)	1.7–3.7 (4)	<3–6.3 (4)	7.6–20 (5)	5.8–8.8 (4)	--–3.75 (1)
(near Halstead)	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
7144100	2.4–7.2 (4)	1.4–5.5 (6)	<3–4.2 (6)	1.1–7.6 (6)	1.7–4.4 (4)	<3–5.5 (4)	7–17 (6)	6.7–10 (4)	--–3.68 (1)
(near Sedgwick)	--; --	52.53; 1.95	--; <3	3.77; 3.25	--; --	--; --	10.9; 10.4	--; --	--; --
Diversion well site near Halstead									
Diversion well	--–3.9 (1)	1.8–4.1 (6)	<3–8.9 (6)	2.1–5.2 (6)	--–4.4 (1)	--–<3 (1)	<4–9.7 (6)	--–6.6 (1)	NA
	--; --	2.75; 2.85	--; <3	3.73; 4.05	--; --	--; --	--; 4.6	--; --	NA
EB-145-A1	1.9–12 (4)	1.3–5.8 (5)	<3–7.3 (5)	2.1–7.5 (5)	1.6–3.7 (4)	<3–17 (4)	8.5–18 (5)	5.8–10 (4)	--–0.02 (1)
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --
EB-145-A2	--–7.7 (1)	--–2.4 (1)	--–<3 (1)	--–6.1 (1)	--–4.2 (1)	--–<3 (1)	--–<4 (1)	--–<4 (1)	NA
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --	NA
EB-145-A3	--–3.9 (1)	--–2.9 (1)	--–4 (1)	--–1.9 (1)	--–1.4 (1)	--–5.3 (1)	--–4.4 (1)	--–<4 (1)	NA
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --	NA
EB-145-A4	NA	NA	NA	NA	NA	NA	NA	NA	NA
	NA	NA	NA	NA	NA	NA	NA	NA	NA
EB-145-A5	NA	NA	NA	NA	NA	NA	NA	NA	NA
	NA	NA	NA	NA	NA	NA	NA	NA	NA
EB-145-P-D5	1.4–1.6 (2)	1–3.1 (3)	<3–3 (3)	0.98–2.5 (3)	0.74–0.89 (2)	<3–<3 (2)	<4–<4 (3)	<4–<4 (2)	NA
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --	NA
Halstead recharge site									
SMW-H4	NA	1.3–4.4 (5)	<3–10 (5)	1.9–4.9 (5)	NA	NA	<4–9 (5)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
SMW-H14	NA	1–3.9 (4)	<3–5.5 (4)	4.1–4.7 (4)	NA	NA	<4–9.6 (4)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
DMW-H1	NA	1.3–3.1 (5)	<3–<3 (5)	2.2–4.8 (5)	NA	NA	<4–4.8 (5)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
DMW-H13	NA	1.1–3.2 (4)	<3–<3 (4)	3.5–4.9 (4)	NA	NA	<4–6.6 (4)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
Sedgwick recharge site									
Treated stream water	NA	1.8–2.9 (4)	<3–<3 (4)	1.2–4.1 (4)	NA	NA	5.4–10.5 (4)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
SMW-S11	NA	2.4–4.1 (3)	<3–8.8 (3)	1.5–4.3 (3)	NA	NA	5–12.7 (3)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
SMW-S13	NA	2.5–3.2 (3)	<3–3.7 (3)	1.6–2.2 (3)	NA	NA	<4–5.3 (3)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
DMW-S10	NA	2.8–4.8 (4)	<3–10.4 (4)	2.3–4.8 (4)	NA	NA	4.3–8.2 (4)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
DMW-S14	NA	2.8–3.2 (3)	<3–<3 (3)	1.7–4.1 (3)	NA	NA	<4–5.1 (3)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA

Table A–8. Summary of radionuclide analysis in water samples collected as part of the *Equus* Beds Groundwater Recharge Project, 1995–2005.—Continued

[µg/L, micrograms per liter; pCi/L, picocuries per liter; --, not determined; MCL, Maximum Contaminant Level; mrem/yr, millirem per year; <, less than, NA; not analyzed. The first set of numbers under each heading, for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the detection level.]

Data-collection site (fig. 6)	Alpha radioactivity 2-sigma combined uncertainty, natural uranium curve (µg/L)	Alpha radioactivity 2-sigma combined uncertainty, Thorium-230 curve (pCi/L)	Alpha radioactivity, Thorium-230 curve (pCi/L)	Beta radioactivity 2-sigma combined uncertainty, Cesium-137 curve (pCi/L)	Beta radioactivity 2-sigma combined uncertainty, Strontium-90/ Yttrium-90 curve (pCi/L)	Gross alpha radioactivity, natural uranium curve (µg/L)	Gross beta radioactivity, Cesium-137 curve (pCi/L)	Gross beta radioactivity, Strontium-90/ Yttrium-90 curve (pCi/L)	Uranium (µg/L)
Drinking-water criteria	--	--	--	--	--	15 pCi/L (MCL)	4 mrem/yr (MCL)	4 mrem/yr (MCL)	30 (MCL)
Reporting level	--	--	3.0	--	--	3.0	4.0	4.0	--
Background wells									
EB-142-A3	--–1.7 (1)	--–1.2 (1)	--–<3 (1)	--–1.3 (1)	--–0.99 (1)	--–<3 (1)	--–5 (1)	--–<4 (1)	NA
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --	NA
Sedgwick well	1.6–3.4 (4)	1.2–2.2 (4)	<0.6–0.9 (4)	1.3–5.3 (4)	0.96–3.5 (4)	<3–3.9 (4)	4.1–11 (4)	<4–7.9 (4)	NA
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --	NA
City well-Sedgwick	--–6.1 (1)	--–3.1 (1)	--–2.7 (1)	--–5.6 (1)	--–3.3 (1)	--–5.2 (1)	--–8.2 (1)	--–5 (1)	NA
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --	NA
TH-02-95	--–4.4 (1)	--–2.8 (1)	--–2.8 (1)	--–3.3 (1)	--–1.4 (1)	--–4.4 (1)	--–5.3 (1)	--–2.3 (1)	NA
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --	NA
TH-06-95	4.5–5.7 (2)	3.8–4 (2)	4–8.9 (2)	3.4–4.7 (2)	1.3–3.2 (2)	4.8–13 (2)	5.7–9.6 (2)	3.9–4.5 (2)	NA
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --	NA
TH-10-95	--–2.4 (1)	--–1.3 (1)	--–0.7 (1)	--–2.5 (1)	--–1.6 (1)	--–1.3 (1)	--–2.3 (1)	--–1.5 (1)	NA
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --	NA
TH-12-95	--–12 (1)	--–6.6 (1)	--–19 (1)	--–6 (1)	--–2.1 (1)	--–33 (1)	--–19 (1)	--–9.2 (1)	NA
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --	NA
TH-08-A1	1.9–2.9 (2)	1.5–2.2 (2)	<3–<3 (2)	1.1–1.3 (2)	0.76–0.99 (2)	<3–<3 (2)	<4–<4 (2)	<4–<4 (2)	NA
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --	NA
TH-08-A2	--–5.8 (1)	--–3.7 (1)	--–11 (1)	--–1.8 (1)	--–1.3 (1)	--–17 (1)	--–8.6 (1)	--–6.5 (1)	NA
	--; --	--; --	--; --	--; --	--; --	--; --	--; --	--; --	NA
TH-08-A3	NA	NA	NA	NA	NA	NA	NA	NA	NA
	NA	NA	NA	NA	NA	NA	NA	NA	NA
TH-08-A4	NA	NA	NA	NA	NA	NA	NA	NA	NA
	NA	NA	NA	NA	NA	NA	NA	NA	NA
TH-08-A5	NA	NA	NA	NA	NA	NA	NA	NA	NA
	NA	NA	NA	NA	NA	NA	NA	NA	NA
Alta Mills	NA	NA	NA	NA	NA	NA	NA	NA	NA
	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aquifer storage and recovery prototype wells									
DW-TW-01	NA	--–2.4 (1)	1.2–1.7 (2)	--–3.6 (1)	NA	NA	1.6–4 (2)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
DW-TW-02	NA	--–1.5 (1)	1–1.3 (2)	--–1.4 (1)	NA	NA	2.6–3.4 (2)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
DW-TW-03	NA	--–2.2 (1)	1.5–1.7 (2)	--–3.4 (1)	NA	NA	1.8–3.5 (2)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
DW-TW-04	NA	--–1.6 (1)	1.5–1.5 (2)	--–1.4 (1)	NA	NA	2.2–3.2 (2)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
DW-TW-05	NA	--–1.1 (1)	-0.1–0.1 (2)	--–1.4 (1)	NA	NA	2.5–2.8 (2)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
DW-TW-06	NA	--–2.2 (1)	0.4–1.7 (2)	--–3.4 (1)	NA	NA	2.4–4.2 (2)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
DW-TW-07	NA	--–2.3 (1)	0.9–1.6 (2)	--–3.5 (1)	NA	NA	2.4–2.5 (2)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
DW-TW-08	NA	NA	--–1.3 (1)	NA	NA	NA	--–2.3 (1)	NA	NA
	NA	NA	--; --	NA	NA	NA	--; --	NA	NA
DW-TW-09	NA	NA	--–1.5 (1)	NA	NA	NA	--–3 (1)	NA	NA
	NA	NA	--; --	NA	NA	NA	--; --	NA	NA
RRW-01	NA	--–2 (1)	1–1.9 (2)	--–3 (1)	NA	NA	1.6–3.2 (2)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
RRW-02	NA	--–1.8 (1)	0.3–0.8 (2)	--–1.6 (1)	NA	NA	3.4–4.2 (2)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
RRW-03	NA	--–2.9 (1)	--–3.4 (1)	--–4 (1)	NA	NA	--–5.4 (1)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA

Table A–8. Summary of radionuclide analysis in water samples collected as part of the *Equus* Beds Groundwater Recharge Project, 1995–2005.—Continued

[µg/L, micrograms per liter; pCi/L, picocuries per liter; --, not determined; MCL, Maximum Contaminant Level; mrem/yr, millirem per year; <, less than, NA; not analyzed. The first set of numbers under each heading, for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the detection level.]

Data-collection site (fig. 6)	Alpha radioactivity 2-sigma combined uncertainty, natural uranium curve (µg/L)	Alpha radioactivity 2-sigma combined uncertainty, Thorium-230 curve (pCi/L)	Alpha radioactivity, Thorium-230 curve (pCi/L)	Beta radioactivity 2-sigma combined uncertainty, Cesium-137 curve (pCi/L)	Beta radioactivity 2-sigma combined uncertainty, Strontium-90/ Yttrium-90 curve (pCi/L)	Gross alpha radioactivity, natural uranium curve (µg/L)	Gross beta radioactivity, Cesium-137 curve (pCi/L)	Gross beta radioactivity, Strontium-90/ Yttrium-90 curve (pCi/L)	Uranium (µg/L)
Drinking-water criteria	--	--	--	--	--	15 pCi/L (MCL)	4 mrem/yr (MCL)	4 mrem/yr (MCL)	30 (MCL)
Reporting level	--	--	3.0	--	--	3.0	4.0	4.0	--
Shallow index wells									
IW-01A	NA	0.4–0.56 (2)	0.1–0.2 (2)	0.79–1.1 (2)	NA	NA	1.1–2.5 (2)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
IW-02A	NA	0.54–0.69 (2)	0.5–0.6 (2)	0.91–1.1 (2)	NA	NA	2.5–3 (2)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
IW-03A	NA	--–3.1 (1)	--–1 (1)	--–1.6 (1)	NA	NA	--–1.4 (1)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
IW-04A	NA	--–3 (1)	--–1 (1)	--–2.7 (1)	NA	NA	--–10.9 (1)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
IW-05A	NA	--–1.9 (1)	--–1.2 (1)	--–1.3 (1)	NA	NA	--–4 (1)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
IW-06A	NA	2.7–3.1 (2)	-0.3–0.8 (2)	2.1–2.1 (2)	NA	NA	2.1–3.2 (2)	NA	--–0.16 (1)
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	--; --
IW-07A	NA	--–2 (1)	--–0.7 (1)	--–1.4 (1)	NA	NA	--–2.2 (1)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
IW-08A	NA	8.2–9.5 (2)	8.2–12.6 (2)	4.5–5.3 (2)	NA	NA	8.3–10.6 (2)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
IW-09A	NA	2.9–3.3 (2)	2.4–2.4 (2)	2.3–2.5 (2)	NA	NA	6.1–6.4 (2)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
IW-10A	NA	--–2.3 (1)	--–0.5 (1)	--–1.6 (1)	NA	NA	--–4.4 (1)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
IW-11A-2	NA	--–1.9 (1)	-0.1–1 (2)	--–1.3 (1)	NA	NA	2–3 (2)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
IW-12A	NA	2–4.1 (2)	1.4–3.7 (2)	1.7–2.1 (2)	NA	NA	2–4.3 (2)	NA	--–3.88 (1)
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	--; --
IW-13A	NA	--–5.2 (1)	1.4–1.5 (2)	--–4.4 (1)	NA	NA	7.1–7.7 (2)	NA	--–0.15 (1)
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	--; --
IW-14A	NA	--–5 (1)	1.6–3.6 (2)	--–3.1 (1)	NA	NA	4.3–6.2 (2)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
IW-15A	NA	--–6.7 (1)	--–6.1 (1)	--–4.2 (1)	NA	NA	--–6.1 (1)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
IW-16A	NA	--–4.8 (1)	3.2–4.7 (2)	--–2.7 (1)	NA	NA	4.9–7 (2)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
IW-17A	NA	--–4.2 (1)	--–3.7 (1)	--–2.9 (1)	NA	NA	--–5.8 (1)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
IW-18A	NA	--–13 (1)	12.7–43.7 (2)	--–5.5 (1)	NA	NA	19–44.1 (2)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
IW-19A	NA	--–8.5 (1)	--–8.5 (1)	--–5.5 (1)	NA	NA	--–7.8 (1)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
IW-20A	NA	6.6–6.8 (2)	3.9–4.4 (2)	5.1–5.4 (2)	NA	NA	7–7.6 (2)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
IW-21A	NA	--–5.3 (1)	4.3–4.5 (2)	--–3.2 (1)	NA	NA	5.2–7.6 (2)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
IW-22A	NA	3.2–4.7 (2)	1.3–6.1 (2)	3–3.1 (2)	NA	NA	7.9–9.8 (2)	NA	--–2.94 (1)
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	--; --
IW-23A	NA	--–4.3 (1)	--–2.5 (1)	--–2 (1)	NA	NA	--–2 (1)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
IW-24A	NA	--–3.4 (1)	--–2.4 (1)	--–3.8 (1)	NA	NA	--–8.5 (1)	NA	--–5.7 (1)
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	--; --
IW-25A	NA	5.1–5.2 (2)	9.8–11.4 (2)	4.1–4.2 (2)	NA	NA	13.9–15.8 (2)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
IW-26A	NA	--–5.5 (1)	--–9.4 (1)	--–2.6 (1)	NA	NA	--–13.5 (1)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA

Table A–8. Summary of radionuclide analysis in water samples collected as part of the *Equus* Beds Groundwater Recharge Project, 1995–2005.—Continued

[µg/L, micrograms per liter; pCi/L, picocuries per liter; --, not determined; MCL, Maximum Contaminant Level; mrem/yr, millirem per year; <, less than, NA; not analyzed. The first set of numbers under each heading, for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the detection level.]

Data-collection site (fig. 6)	Alpha radioactivity 2-sigma combined uncertainty, natural uranium curve (µg/L)	Alpha radioactivity 2-sigma combined uncertainty, Thorium-230 curve (pCi/L)	Alpha radioactivity, Thorium-230 curve (pCi/L)	Beta radioactivity 2-sigma combined uncertainty, Cesium-137 curve (pCi/L)	Beta radioactivity 2-sigma combined uncertainty, Strontium-90/ Yttrium-90 curve (pCi/L)	Gross alpha radioactivity, natural uranium curve (µg/L)	Gross beta radioactivity, Cesium-137 curve (pCi/L)	Gross beta radioactivity, Strontium-90/ Yttrium-90 curve (pCi/L)	Uranium (µg/L)
Drinking-water criteria	--	--	--	--	--	15 pCi/L (MCL)	4 mrem/yr (MCL)	4 mrem/yr (MCL)	30 (MCL)
Reporting level	--	--	3.0	--	--	3.0	4.0	4.0	--
Shallow index wells—Continued									
IW-27A	NA	---4.6 (1)	---8 (1)	---3.8 (1)	NA	NA	---9.5 (1)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
IW-28A	NA	4.2–5.3 (2)	6.8–9.6 (3)	3.7–4 (2)	NA	NA	6.9–7.6 (3)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
IW-29A	NA	---5.6 (1)	---4.2 (1)	---3.7 (1)	NA	NA	---4.6 (1)	NA	1.26–1.59 (2)
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	--; --
IW-30A	NA	---5.7 (1)	---4.8 (1)	---3.7 (1)	NA	NA	---9.9 (1)	NA	2.22–2.34 (2)
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	--; --
IW-31A	NA	---5.3 (1)	---3.8 (1)	---3.7 (1)	NA	NA	---6.9 (1)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
IW-32A	NA	4.2–5.3 (3)	13.6–20 (4)	2.1–3.7 (3)	NA	NA	6–19.4 (4)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
IW-33A	NA	---2.6 (1)	---2.4 (1)	---3.6 (1)	NA	NA	---6 (1)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
IW-34A	NA	---3.4 (1)	3.2–5.2 (2)	---2.1 (1)	NA	NA	3.9–6 (2)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
IW-35A	NA	---8.3 (1)	6.3–8.9 (2)	---11 (1)	NA	NA	10–13.1 (2)	NA	5.51–7.45 (2)
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	--; --
IW-36A	NA	---8.7 (1)	---5.6 (1)	---6.9 (1)	NA	NA	---5.7 (1)	NA	1.69–1.91 (2)
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	--; --
IW-37A	NA	---4.7 (1)	---2.2 (1)	---3.6 (1)	NA	NA	---5.9 (1)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
IW-38A	NA	3.8–5.1 (2)	2–2.6 (2)	3.5–4.1 (2)	NA	NA	8.7–9.8 (2)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
Deep index wells									
IW-01C	NA	1.6–5 (2)	-0.4–2.1 (2)	1.6–3.5 (2)	NA	NA	1.7–3.9 (2)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
IW-02C	NA	1.2–1.5 (2)	0.8–1 (2)	1.1–1.3 (2)	NA	NA	2.5–3 (2)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
IW-03C	NA	---1.7 (1)	----0.5 (1)	---1.1 (1)	NA	NA	---2.8 (1)	NA	---0.21 (1)
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	--; --
IW-04C	NA	---4.2 (1)	---2.2 (1)	---2.9 (1)	NA	NA	---6 (1)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
IW-05C	NA	---2.5 (1)	---0.8 (1)	---2 (1)	NA	NA	---5 (1)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
IW-06C	NA	1.7–2 (2)	0.7–1.2 (2)	1.4–2 (2)	NA	NA	2.6–3.9 (2)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
IW-07C	NA	---2.3 (1)	---1.2 (1)	---1.6 (1)	NA	NA	---3.4 (1)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
IW-08C	NA	7.3–19 (2)	2.2–9.6 (2)	5.3–14 (2)	NA	NA	10.3–16.8 (2)	NA	0.12–0.15 (3)
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	--; --
IW-09C	NA	2–3.3 (2)	0.2–2.4 (2)	1.9–2 (2)	NA	NA	2.2–4.4 (2)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
IW-10C	NA	---1.4 (1)	---0.3 (1)	---1.3 (1)	NA	NA	---4 (1)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
IW-11C	NA	---2.2 (1)	0.4–0.5 (2)	---1.3 (1)	NA	NA	1.5–2.8 (2)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
IW-12C	NA	4.8–6.5 (2)	-1.9–0.5 (2)	4–4 (2)	NA	NA	3.3–3.8 (2)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
IW-13C	NA	---2.1 (1)	0.8–1.7 (2)	---1.3 (1)	NA	NA	3–3.1 (2)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
IW-14C	NA	---7.5 (1)	2.5–3.8 (2)	---4.8 (1)	NA	NA	5.1–6 (2)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
IW-15C	NA	---5.2 (1)	---3.8 (1)	---3.2 (1)	NA	NA	---5.7 (1)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA

Table A–8. Summary of radionuclide analysis in water samples collected as part of the *Equus* Beds Groundwater Recharge Project, 1995–2005.—Continued

[µg/L, micrograms per liter; pCi/L, picocuries per liter; --, not determined; MCL, Maximum Contaminant Level; mrem/yr, millirem per year; <, less than, NA; not analyzed. The first set of numbers under each heading, for example 99–3,350, indicates the range in concentration. The number in parentheses () indicates the number of samples collected. The numbers below indicate the average followed by the median. Asterisk * is value estimated by using a log-probability regression to predict the values of data below the detection level.]

Data-collection site (fig. 6)	Alpha radioactivity 2-sigma combined uncertainty, natural uranium curve (µg/L)	Alpha radioactivity 2-sigma combined uncertainty, Thorium-230 curve (pCi/L)	Alpha radioactivity, Thorium-230 curve (pCi/L)	Beta radioactivity 2-sigma combined uncertainty, Cesium-137 curve (pCi/L)	Beta radioactivity 2-sigma combined uncertainty, Strontium-90/ Yttrium-90 curve (pCi/L)	Gross alpha radioactivity, natural uranium curve (µg/L)	Gross beta radioactivity, Cesium-137 curve (pCi/L)	Gross beta radioactivity, Strontium-90/ Yttrium-90 curve (pCi/L)	Uranium (µg/L)
Drinking-water criteria	--	--	--	--	--	15 pCi/L (MCL)	4 mrem/yr (MCL)	4 mrem/yr (MCL)	30 (MCL)
Reporting level	--	--	3.0	--	--	3.0	4.0	4.0	--
				Deep index wells—Continued					
IW-16C	NA	---3.4 (1)	-0.8–0.9 (2)	---2.8 (1)	NA	NA	4.2–6.8 (2)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
IW-17C	NA	1.5–2.2 (2)	-0.6–1.5 (2)	1.7–1.8 (2)	NA	NA	3.8–4.9 (2)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
IW-18C	NA	---6.1 (1)	---2 (1)	---3 (1)	NA	NA	---4.3 (1)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
IW-19C	NA	---5.7 (1)	---5.7 (1)	---3.4 (1)	NA	NA	---4.7 (1)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
IW-20C	NA	5.8–6 (2)	5.2–5.7 (2)	3.5–4.2 (2)	NA	NA	6.5–10.7 (2)	NA	0.28–0.31 (2)
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	--; --
IW-21C	NA	---7.3 (1)	2.6–3.1 (2)	---5.5 (1)	NA	NA	6.7–7.9 (2)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
IW-22C	NA	2.1–2.5 (2)	-0.4–0.3 (2)	2.3–2.3 (2)	NA	NA	4–5.5 (2)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
IW-23C	NA	---3.9 (1)	---0.2 (1)	---2.1 (1)	NA	NA	---3.1 (1)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
IW-24C	NA	---5.2 (1)	---5.1 (1)	---4.7 (1)	NA	NA	---5.1 (1)	NA	---5.15 (1)
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	--; --
IW-25C	NA	4.8–5.2 (2)	8–9.1 (2)	4.1–4.1 (2)	NA	NA	9–9.1 (2)	NA	3.94–3.97 (2)
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	--; --
IW-26C	NA	---6.1 (1)	---2.6 (1)	---3 (1)	NA	NA	---7.5 (1)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
IW-27C	NA	---3.1 (1)	---1.6 (1)	---3.4 (1)	NA	NA	---3.8 (1)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
IW-28C	NA	---3.7 (1)	3.6–3.7 (2)	---3.6 (1)	NA	NA	4.5–6.5 (2)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
IW-29C	NA	---3.4 (1)	---0.5 (1)	---3.9 (1)	NA	NA	---3.9 (1)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
IW-30C	NA	---7.2 (1)	---8.8 (1)	---6.2 (1)	NA	NA	---8.6 (1)	NA	4.66–5.54 (3)
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	--; --
IW-31C	NA	---5.4 (1)	---5.4 (1)	---3.9 (1)	NA	NA	---10.5 (1)	NA	---3.27 (1)
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	--; --
IW-32C	NA	---3.9 (1)	2.8–4.3 (2)	---3 (1)	NA	NA	4.8–6.3 (2)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
IW-33C	NA	---3.3 (1)	---2.1 (1)	---4.7 (1)	NA	NA	---5.2 (1)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
IW-34C	NA	---4.7 (1)	5.8–7.1 (2)	---2.6 (1)	NA	NA	5.5–7.6 (2)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
IW-35C	NA	---5.3 (1)	4.9–5.2 (2)	---7 (1)	NA	NA	7.1–7.5 (2)	NA	5–5.34 (2)
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	--; --
IW-36C	NA	---5.4 (1)	---1.9 (1)	---4.7 (1)	NA	NA	---8.9 (1)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
IW-37C	NA	---3.6 (1)	---2.6 (1)	---3.1 (1)	NA	NA	---6.1 (1)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA
IW-38C	NA	4–4.5 (2)	4.6–7.2 (2)	2.4–3.1 (2)	NA	NA	6.2–7.4 (2)	NA	NA
	NA	--; --	--; --	--; --	NA	NA	--; --	NA	NA

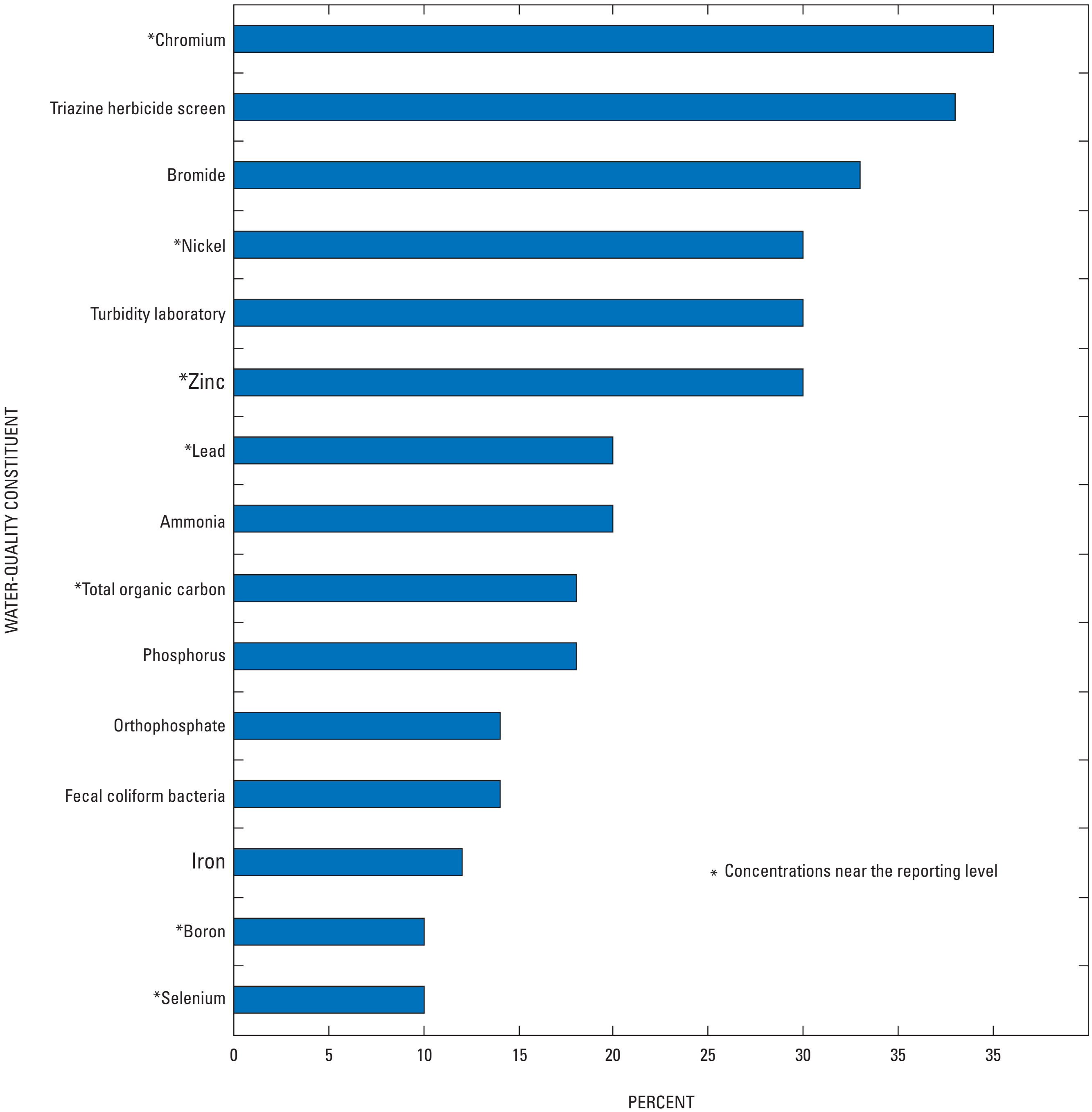


Figure A-1. Relative percentage difference (RPDs) for replicate sample collected during 1995–2004 that exceeded 10 percent. All other constituents had less than 10-percent difference.

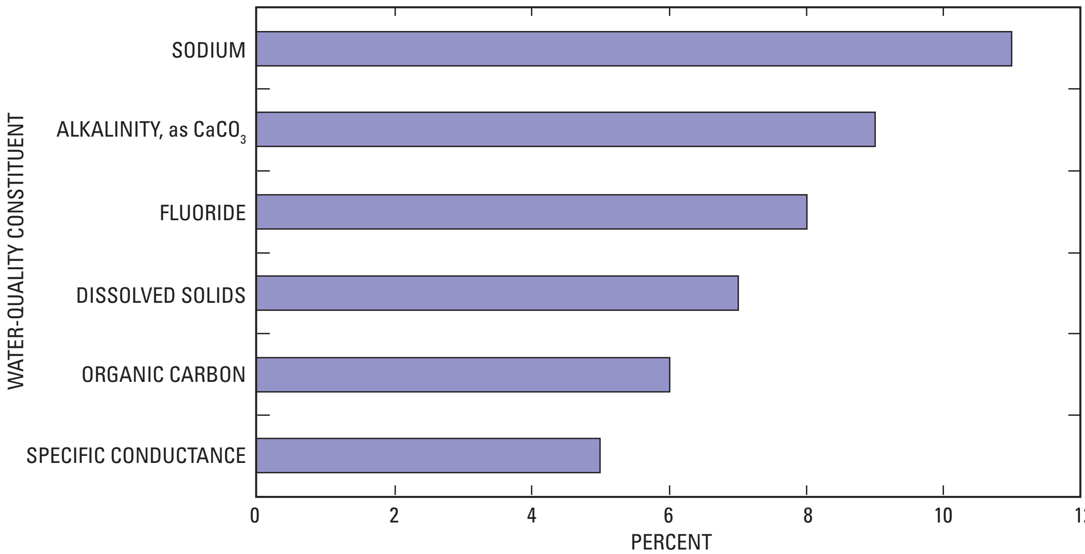


Figure A-2. Detection frequency of various water-quality constituents in blank samples collected during 1995–2004 from sites in study area used for this report. All other constituents detected in less than 1 percent of blank samples.

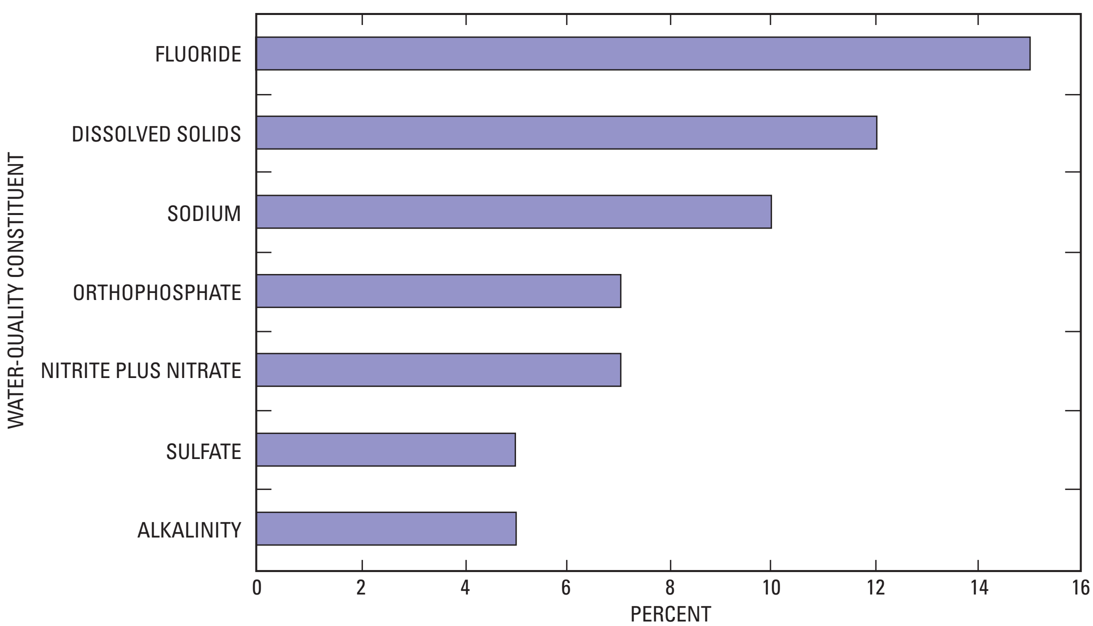


Figure A-3. Detection frequency of various water-quality constituents in blank samples collected during 1999–2004 from sites in study area used for this report. All other constituents detected in less than1 percent of blank samples.

Publishing support provided by:
Rolla Publishing Service Center

For additional information concerning this publication, contact:
Director, USGS Kansas Water Science Center
4821 Quail Crest Place
Lawrence, KS 66049
(785) 842–9909

Or visit the Kansas Water Science Center Web site at:
http://ks.water.usgs.gov

Ziegler and others—**Water Quality in the *Equus* Beds Aquifer and the Little Arkansas River Before Implementation of Large-Scale Artificial Recharge**—SIR 2010–5023

ISBN 978-1-4113-2835-8