

**Appendix 1.** Physicochemical properties and results of major ions, trace elements, and radionuclide analyses in water samples collected from municipal supply wells in Houston, Texas, 2010–11.

[Radiochemical data are rounded on the basis of American Standards Institute's (ANSI) standard N42.23 and reported following policy defined by McCurdy and others (2008). °C, degrees Celsius; --, no data; mg/L, milligrams per liter; <, less than; sequential replicate samples are shown in *italicized* text; nm, nanometers; NTRU, Nephelometric Turbidity Ratio Unit; CaCO<sub>3</sub>, calcium carbonate; SiO<sub>2</sub>, silicon dioxide; M, presence verified but not quantified; U, analyzed for but not detected; µg/L, micrograms per liter; µg-As/L, micrograms arsenic per liter; Th, thorium; pCi/L, picocuries per liter; ssL<sub>C</sub>, sample-specific critical level; e, laboratory blank greater than the ssL<sub>C</sub>; b, sample-specific minimum detectable concentration greater than contractual a priori method detectable concentration; c, analyses counted 4 days after sample collection; d, laboratory control sample recovery outside of acceptable range; R, radchem nondetect, below ssL<sub>C</sub>; Cs, cesium; LT-MDL, long term method detection level]

U.S. Geological Survey site number	State well number	Date	Sample start time	Sample type	Barometric pressure (millimeters of mercury)	Temperature, air (°C)	Dissolved oxygen, water, unfiltered (mg/L)	pH, water, unfiltered, field (standard units)	Specific conductance, water, unfiltered (microsiemens per centimeter at 25 °C)	Temperature, water (°C)
294735095344001 <sup>1</sup>	LJ-65-12-521	4/6/2010	1042	Environmental	--	--	--	--	--	--
293636095300401 <sup>1</sup>	JY-65-28-309	10/28/2010	1011	Environmental	--	--	--	--	--	--
293635095294101 <sup>1</sup>	JY-65-29-107	10/28/2010	1225	Environmental	--	--	--	--	--	--
293652095293601 <sup>1</sup>	LJ-65-29-108	10/28/2010	1350	Environmental	--	--	--	--	--	--
293543095274901	JY-65-29-109	11/2/2010	1023	Environmental	760	17.5	<0.10	7.4	1,110	25.6
293527095271501	JY-65-29-209	11/2/2010	1152	Environmental	760	19.0	<.10	7.4	896	26.1
293934095342201	LJ-65-20-811	11/3/2010	1236	Environmental	758	13.5	0.47	7.4	495	25.6
294326095293002	LJ-65-21-144	11/9/2010	0955	Environmental	760	23.0	0.84	7.6	491	25.0
294702095394001	LJ-65-11-917	11/17/2010	1102	Environmental	760	23.0	<.10	7.5	499	25.9
294452095354501	LJ-65-20-104	11/17/2010	1416	Environmental	759	28.0	<.10	7.6	485	27.4
295616095170101	LJ-65-06-601	12/1/2010	1000	Environmental	764	9.0	0.50	7.4	436	22.7
300331095092201	LJ-60-63-603	12/1/2010	1225	Environmental	765	17.0	2.4	7.6	319	25.1
295850095201301	LJ-65-06-103	12/2/2010	1140	Environmental	766	22.5	2.0	7.4	448	25.3
295855095204301	LJ-65-06-102	12/2/2010	1252	Environmental	765	21.0	2.1	7.4	453	25.1
294529095371801	LJ-65-12-735	12/9/2010	1041	Environmental	767	11.5	3.5	7.3	494	24.2
<i>294529095371801</i>	<i>LJ-65-12-735</i>	<i>12/9/2010</i>	<i>1042</i>	<i>Sequential replicate<sup>2</sup></i>	--	--	--	--	--	--
294029095354301	LJ-65-20-410	12/9/2010	1215	Environmental	766	15.5	4.0	7.2	564	24.6
300223095142101	LJ-60-63-715	12/16/2010	0911	Environmental	756	20.0	<.10	7.2	391	25.3
295247095344701	LJ-65-04-811	12/19/2011	1010	Environmental	759	20.0	1.1	7.4	524	23.9
294329095284603	LJ-65-21-150	12/19/2011	1425	Environmental	759	22.5	1.3	7.3	561	--
294108095324702	LJ-65-20-520	12/20/2011	1045	Environmental	759	17.0	1.7	7.5	491	24.8
<i>294108095324702</i>	<i>LJ-65-20-520</i>	<i>12/20/2011</i>	<i>1046</i>	<i>Sequential replicate<sup>2</sup></i>	--	--	--	--	--	--

**Appendix 1.** Physicochemical properties and results of major ions, trace elements, and radionuclide analyses in water samples collected from municipal supply wells in Houston, Texas, 2010–11—Continued.

U.S. Geological Survey site number	State well number	Date	Sample start time	Sample type	Turbidity, water, unfiltered, broad band light source (400–680 nm), detectors at multiple angles including 90 +30 degrees, ratiometric correction (NTRU)	Oxidation reduction potential, reference electrode not specified (millivolts)	Dissolved solids dried at 180 °C, water, filtered (mg/L)	Calcium, water, filtered (mg/L)	Magnesium, water, filtered (mg/L)	Potassium, water, filtered (mg/L)
294735095344001	LJ-65-12-521	4/6/2010	1042	Environmental	--	--	--	--	--	--
293636095300401	JY-65-28-309	10/28/2010	1011	Environmental	--	--	--	--	--	--
293635095294101	JY-65-29-107	10/28/2010	1225	Environmental	--	--	--	--	--	--
293652095293601	LJ-65-29-108	10/28/2010	1350	Environmental	--	--	--	--	--	--
293543095274901	JY-65-29-109	11/2/2010	1023	Environmental	0.5	--	612	65.9	11.6	2.53
293527095271501	JY-65-29-209	11/2/2010	1152	Environmental	.1	--	469	55.7	9.44	2.34
293934095342201	LJ-65-20-811	11/3/2010	1236	Environmental	.2	--	293	47.8	9.00	2.14
294326095293002	LJ-65-21-144	11/9/2010	0955	Environmental	1.0	--	275	38.7	7.73	1.85
294702095394001	LJ-65-11-917	11/17/2010	1102	Environmental	.1	--	280	37.3	6.86	2.02
294452095354501	LJ-65-20-104	11/17/2010	1416	Environmental	.5	--	285	31.7	7.93	2.19
295616095170101	LJ-65-06-601	12/1/2010	1000	Environmental	1.3	--	253	48.8	6.43	1.98
300331095092201	LJ-60-63-603	12/1/2010	1225	Environmental	.2	--	175	39.4	3.29	2.68
295850095201301	LJ-65-06-103	12/2/2010	1140	Environmental	.2	--	263	41.2	5.65	2.36
295855095204301	LJ-65-06-102	12/2/2010	1252	Environmental	1.8	--	281	43.3	5.98	2.43
294529095371801	LJ-65-12-735	12/9/2010	1041	Environmental	.4	--	306	53.8	8.47	1.67
294529095371801	LJ-65-12-735	12/9/2010	1042	Sequential replicate	--	--	--	--	--	--
294029095354301	LJ-65-20-410	12/9/2010	1215	Environmental	.3	--	331	64.7	11.4	1.93
300223095142101	LJ-60-63-715	12/16/2010	0911	Environmental	.5	--	237	48.8	5.44	2.25
295247095344701	LJ-65-04-811	12/19/2011	1010	Environmental	.6	84.8	283	57.0	9.08	2.22
294329095284603	LJ-65-21-150	12/19/2011	1425	Environmental	.8	-3.5	313	69.9	11.0	1.56
294108095324702	LJ-65-20-520	12/20/2011	1045	Environmental	.2	165	287	47.8	8.90	1.98
294108095324702	LJ-65-20-520	12/20/2011	1046	Sequential replicate	--	--	285	46.8	8.84	2.03

**Appendix 1.** Physicochemical properties and results of major ions, trace elements, and radionuclide analyses in water samples collected from municipal supply wells in Houston, Texas, 2010–11—Continued.

U.S. Geological Survey site number	State well number	Date	Sample start time	Sample type	Sodium, water, filtered (mg/L)	Alkalinity, water, filtered, inflection-point titration method (incremental titration method), field (mg/L as CaCO <sub>3</sub> )	Bicarbonate, water, filtered, inflection-point titration method (incremental titration method), field (mg/L)	Bromide, water, filtered (mg/L)	Chloride, water, filtered (mg/L)	Fluoride, water, filtered (mg/L)
294735095344001	LJ-65-12-521	4/6/2010	1042	Environmental	--	--	--	--	--	--
293636095300401	JY-65-28-309	10/28/2010	1011	Environmental	--	--	--	--	--	--
293635095294101	JY-65-29-107	10/28/2010	1225	Environmental	--	--	--	--	--	--
293652095293601	LJ-65-29-108	10/28/2010	1350	Environmental	--	--	--	--	--	--
293543095274901	JY-65-29-109	11/2/2010	1023	Environmental	134	225	274	0.207	216	0.40
293527095271501	JY-65-29-209	11/2/2010	1152	Environmental	101	184	224	.185	142	.46
293934095342201	LJ-65-20-811	11/3/2010	1236	Environmental	40.4	174	212	.131	35.7	.24
294326095293002	LJ-65-21-144	11/9/2010	0955	Environmental	50.3	164	200	.126	35.1	.29
294702095394001	LJ-65-11-917	11/17/2010	1102	Environmental	57.2	215	261	.163	44.9	.29
294452095354501	LJ-65-20-104	11/17/2010	1416	Environmental	60.3	174	212	.144	35.9	.29
295616095170101	LJ-65-06-601	12/1/2010	1000	Environmental	35.0	179	218	.092	27.3	.18
300331095092201	LJ-60-63-603	12/1/2010	1225	Environmental	20.5	149	181	.074	19.8	.12
295850095201301	LJ-65-06-103	12/2/2010	1140	Environmental	45.4	225	274	.132	35.0	.22
295855095204301	LJ-65-06-102	12/2/2010	1252	Environmental	46.5	164	200	.135	35.7	.21
294529095371801	LJ-65-12-735	12/9/2010	1041	Environmental	33.9	169	206	.154	43.8	.19
294529095371801	LJ-65-12-735	12/9/2010	1042	Sequential replicate	--	169	206	--	--	--
294029095354301	LJ-65-20-410	12/9/2010	1215	Environmental	34.1	190	230	.194	55.2	.22
300223095142101	LJ-60-63-715	12/16/2010	0911	Environmental	22.1	154	188	.088	25.3	.11
295247095344701	LJ-65-04-811	12/19/2011	1010	Environmental	39.9	179	218	.164	49.7	.20
294329095284603	LJ-65-21-150	12/19/2011	1425	Environmental	33.9	199	242	.158	50.3	.21
294108095324702	LJ-65-20-520	12/20/2011	1045	Environmental	46.3	163	198	.123	36.6	.27
294108095324702	LJ-65-20-520	12/20/2011	1046	Sequential replicate	45.9	175	212	.128	36.4	.27

**Appendix 1.** Physicochemical properties and results of major ions, trace elements, and radionuclide analyses in water samples collected from municipal supply wells in Houston, Texas, 2010–11—Continued.

U.S. Geological Survey site number	State well number	Date	Sample start time	Sample type	Hydrogen sulfide, water, unfiltered (mg/L) <sup>3</sup>	Silica, water, filtered (mg/L as SiO <sub>2</sub> )	Sulfate, water, filtered (mg/L)	Sulfide, water, unfiltered, field (mg/L)	Barium, water, filtered (µg/L)	Chromium, water, filtered (µg/L)
294735095344001	LJ-65-12-521	4/6/2010	1042	Environmental	--	--	--	--	--	--
293636095300401	JY-65-28-309	10/28/2010	1011	Environmental	--	--	--	--	--	--
293635095294101	JY-65-29-107	10/28/2010	1225	Environmental	--	--	--	--	--	--
293652095293601	LJ-65-29-108	10/28/2010	1350	Environmental	--	--	--	--	--	--
293543095274901	JY-65-29-109	11/2/2010	1023	Environmental	M	23.2	14.6	<0.2	472	<0.06
293527095271501	JY-65-29-209	11/2/2010	1152	Environmental	M	24.0	13.5	<.2	326	<.06
293934095342201	LJ-65-20-811	11/3/2010	1236	Environmental	U	31.0	13.4	<.2	239	1.7
294326095293002	LJ-65-21-144	11/9/2010	0955	Environmental	U	25.3	13.3	<.2	207	.85
294702095394001	LJ-65-11-917	11/17/2010	1102	Environmental	U	20.0	14.9	<.2	202	<.06
294452095354501	LJ-65-20-104	11/17/2010	1416	Environmental	U	18.6	15.4	<.2	241	<.06
295616095170101	LJ-65-06-601	12/1/2010	1000	Environmental	U	31.6	10.0	<.2	291	.24
300331095092201	LJ-60-63-603	12/1/2010	1225	Environmental	U	25.0	5.58	--	323	.85
295850095201301	LJ-65-06-103	12/2/2010	1140	Environmental	U	26.1	6.28	--	369	1.2
295855095204301	LJ-65-06-102	12/2/2010	1252	Environmental	U	26.1	6.36	--	387	1.2
294529095371801	LJ-65-12-735	12/9/2010	1041	Environmental	U	28.2	9.14	--	249	1.5
294529095371801	LJ-65-12-735	12/9/2010	1042	Sequential replicate	--	--	--	--	--	--
294029095354301	LJ-65-20-410	12/9/2010	1215	Environmental	U	27.4	9.38	--	238	6.1
300223095142101	LJ-60-63-715	12/16/2010	0911	Environmental	U	27.4	11.5	<.2	278	<.06
295247095344701	LJ-65-04-811	12/19/2011	1010	Environmental	U	25.0	13.6	<.2	232	.53
294329095284603	LJ-65-21-150	12/19/2011	1425	Environmental	U	24.9	8.83	--	233	.92
294108095324702	LJ-65-20-520	12/20/2011	1045	Environmental	U	27.0	12.6	--	210	3.7
294108095324702	LJ-65-20-520	12/20/2011	1046	Sequential replicate	--	26.9	12.6	--	211	3.6

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U.S. Geological Survey site number	State well number	Date	Sample start time	Sample type	Iron, water, filtered (µg/L)	Lithium, water, filtered (µg/L)	Manganese, water, filtered (µg/L)	Molybdenum, water, filtered (µg/L)	Strontium, water, filtered (µg/L)	Vanadium, water, filtered (µg/L)
294735095344001	LJ-65-12-521	4/6/2010	1042	Environmental	--	--	--	--	--	--
293636095300401	JY-65-28-309	10/28/2010	1011	Environmental	--	--	--	--	--	--
293635095294101	JY-65-29-107	10/28/2010	1225	Environmental	--	--	--	--	--	--
293652095293601	LJ-65-29-108	10/28/2010	1350	Environmental	--	--	--	--	--	--
293543095274901	JY-65-29-109	11/2/2010	1023	Environmental	612	24.6	45.6	7.04	687	0.28
293527095271501	JY-65-29-209	11/2/2010	1152	Environmental	266	24.1	40.9	4.84	603	.14
293934095342201	LJ-65-20-811	11/3/2010	1236	Environmental	<3.2	14.4	<3.8	1.25	588	12.6
294326095293002	LJ-65-21-144	11/9/2010	0955	Environmental	25.6	13.9	<3.8	1.82	498	18.0
294702095394001	LJ-65-11-917	11/17/2010	1102	Environmental	115	21.5	11.3	3.53	549	<.08
294452095354501	LJ-65-20-104	11/17/2010	1416	Environmental	260	24.2	18.6	2.35	651	<.08
295616095170101	LJ-65-06-601	12/1/2010	1000	Environmental	52.4	16.5	<3.8	1.20	412	5.7
300331095092201	LJ-60-63-603	12/1/2010	1225	Environmental	3.4	11.0	9.18	1.60	284	1.5
295850095201301	LJ-65-06-103	12/2/2010	1140	Environmental	4.9	17.9	<3.8	2.03	431	3.8
295855095204301	LJ-65-06-102	12/2/2010	1252	Environmental	4.4	17.5	<3.8	1.96	440	3.7
294529095371801	LJ-65-12-735	12/9/2010	1041	Environmental	<3.2	15.7	<3.8	1.03	510	6.0
294529095371801	LJ-65-12-735	12/9/2010	1042	Sequential replicate	--	--	--	--	--	--
294029095354301	LJ-65-20-410	12/9/2010	1215	Environmental	5.9	14.5	<3.8	.438	564	6.0
300223095142101	LJ-60-63-715	12/16/2010	0911	Environmental	255	8.36	25.1	4.01	358	1.1
295247095344701	LJ-65-04-811	12/19/2011	1010	Environmental	13.3	17.7	3.64	1.36	547	3.1
294329095284603	LJ-65-21-150	12/19/2011	1425	Environmental	108	11.8	8.96	.447	456	4.2
294108095324702	LJ-65-20-520	12/20/2011	1045	Environmental	<3.2	18.8	1.27	1.55	525	11.8
294108095324702	LJ-65-20-520	12/20/2011	1046	Sequential replicate	<3.2	15.0	1.36	1.51	536	11.7

**Appendix 1.** Physicochemical properties and results of major ions, trace elements, and radionuclide analyses in water samples collected from municipal supply wells in Houston, Texas, 2010–11—Continued.

U.S. Geological Survey site number	State well number	Date	Sample start time	Sample type	Arsenate, water, filtered (µg-As/L)	Arsenic, water, filtered (µg/L)	Arsenite, water, filtered (µg-As/L)	Boron, water, filtered (µg/L)	Selenium, water, filtered (µg/L)	Dimethylarsinate ((CH <sub>3</sub> ) <sub>2</sub> HAsO <sub>2</sub> ), water, filtered, recoverable (µg-As/L)
294735095344001	LJ-65-12-521	4/6/2010	1042	Environmental	--	--	--	--	--	--
293636095300401	JY-65-28-309	10/28/2010	1011	Environmental	--	--	--	--	--	--
293635095294101	JY-65-29-107	10/28/2010	1225	Environmental	--	--	--	--	--	--
293652095293601	LJ-65-29-108	10/28/2010	1350	Environmental	--	--	--	--	--	--
293543095274901	JY-65-29-109	11/2/2010	1023	Environmental	--	2.2	--	206	<0.03	--
293527095271501	JY-65-29-209	11/2/2010	1152	Environmental	--	3.3	--	124	<.03	--
293934095342201	LJ-65-20-811	11/3/2010	1236	Environmental	--	2.8	--	42	3.0	--
294326095293002	LJ-65-21-144	11/9/2010	0955	Environmental	--	4.0	--	49	10.2	--
294702095394001	LJ-65-11-917	11/17/2010	1102	Environmental	--	3.6	--	78	<.03	--
294452095354501	LJ-65-20-104	11/17/2010	1416	Environmental	--	4.3	--	81	<.03	--
295616095170101	LJ-65-06-601	12/1/2010	1000	Environmental	--	2.4	--	54	1.3	--
300331095092201	LJ-60-63-603	12/1/2010	1225	Environmental	--	2.0	--	37	.91	--
295850095201301	LJ-65-06-103	12/2/2010	1140	Environmental	--	2.2	--	70	.95	--
295855095204301	LJ-65-06-102	12/2/2010	1252	Environmental	--	2.4	--	68	.47	--
294529095371801	LJ-65-12-735	12/9/2010	1041	Environmental	--	2.4	--	53	6.2	--
294529095371801	LJ-65-12-735	12/9/2010	1042	Sequential replicate	--	--	--	--	--	--
294029095354301	LJ-65-20-410	12/9/2010	1215	Environmental	--	3.4	--	53	3.2	--
300223095142101	LJ-60-63-715	12/16/2010	0911	Environmental	--	1.3	--	32	<.03	--
295247095344701	LJ-65-04-811	12/19/2011	1010	Environmental	0.8	.86	<.4	49	18.2	<.6
294329095284603	LJ-65-21-150	12/19/2011	1425	Environmental	<.3	1.3	<.4	49	2.2	<.6
294108095324702	LJ-65-20-520	12/20/2011	1045	Environmental	3.5	4.6	<.4	65	7.3	<.6
294108095324702	LJ-65-20-520	12/20/2011	1046	Sequential replicate	4.2	4.5	<.4	56	7.5	<.6

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U.S. Geological Survey site number	State well number	Date	Sample start time	Sample type	Monomethylarsonate ((CH <sub>3</sub> )HAsO <sub>3</sub> <sup>-</sup> ), water, filtered, recoverable (µg-As/L)	Gross alpha radioactivity, 30-day count, water, filtered, Th-230 curve (pCi/L) <sup>4</sup>	Alpha radioactivity, 30-day count, 1-sigma CSU, water, filtered, Th-230 curve (pCi/L)	Alpha radioactivity, 30-day count, ssL <sub>C</sub> , water, filtered, Th-230 curve (pCi/L)	Alpha radioactivity, 30-day count (remark code)	Gross alpha radioactivity, 72-hour count, water, filtered, Th-230 curve (pCi/L) <sup>4</sup>
294735095344001	LJ-65-12-521	4/6/2010	1042	Environmental	--	--	--	--	--	--
293636095300401	JY-65-28-309	10/28/2010	1011	Environmental	--	--	--	--	--	--
293635095294101	JY-65-29-107	10/28/2010	1225	Environmental	--	--	--	--	--	--
293652095293601	LJ-65-29-108	10/28/2010	1350	Environmental	--	--	--	--	--	--
293543095274901	JY-65-29-109	11/2/2010	1023	Environmental	--	10.1	1.9	1.1	e	12.2
293527095271501	JY-65-29-209	11/2/2010	1152	Environmental	--	7.1	1.4	1.1	e	15.1
293934095342201	LJ-65-20-811	11/3/2010	1236	Environmental	--	6.5	1.5	1.1	e	12.2
294326095293002	LJ-65-21-144	11/9/2010	0955	Environmental	--	10.0	1.7	.78	--	16.6
294702095394001	LJ-65-11-917	11/17/2010	1102	Environmental	--	3	1	.85	--	10.7
294452095354501	LJ-65-20-104	11/17/2010	1416	Environmental	--	1.19	.66	.74	--	5.48
295616095170101	LJ-65-06-601	12/1/2010	1000	Environmental	--	4	1	.76	--	13.4
300331095092201	LJ-60-63-603	12/1/2010	1225	Environmental	--	2.24	.74	.66	--	4.85
295850095201301	LJ-65-06-103	12/2/2010	1140	Environmental	--	2.41	.89	.86	--	8.6
295855095204301	LJ-65-06-102	12/2/2010	1252	Environmental	--	2.7	.85	.78	--	8.6
294529095371801	LJ-65-12-735	12/9/2010	1041	Environmental	--	7.5	1.6	1	--	15
294529095371801	LJ-65-12-735	12/9/2010	1042	Sequential replicate	--	12.5	2.2	1.2	--	13.9
294029095354301	LJ-65-20-410	12/9/2010	1215	Environmental	--	4.1	1.2	1.1	--	12.4
300223095142101	LJ-60-63-715	12/16/2010	0911	Environmental	--	-.1	.4	.66	R	5.99
295247095344701	LJ-65-04-811	12/19/2011	1010	Environmental	<3.2	13.7	1.9	.79	--	20.9
294329095284603	LJ-65-21-150	12/19/2011	1425	Environmental	<3.2	4.01	.81	.49	--	9.5
294108095324702	LJ-65-20-520	12/20/2011	1045	Environmental	<3.2	6	1	.66	--	22.2
294108095324702	LJ-65-20-520	12/20/2011	1046	Sequential replicate	<3.2	6	1	.53	--	18.4

**Appendix 1.** Physicochemical properties and results of major ions, trace elements, and radionuclide analyses in water samples collected from municipal supply wells in Houston, Texas, 2010–11—Continued.

U.S. Geological Survey site number	State well number	Date	Sample start time	Sample type	Alpha radioactivity, 72-hour count, 1-sigma CSU, water, filtered, Th-230 curve (pCi/L)	Alpha radioactivity, 72-hour count, ssL <sub>C</sub> , water, filtered, Th-230 curve (pCi/L)	Alpha radioactivity, 72-hour count (remark code)	Gross beta radioactivity, 30-day count, water, filtered, Cs-137 curve (pCi/L) <sup>4</sup>	Beta radioactivity, 30-day count, 1-sigma CSU, water, filtered, Cs-137 curve (pCi/L)	Beta radioactivity, 30-day count, ssL <sub>C</sub> , water, filtered, Cs-137 curve (pCi/L)
294735095344001	LJ-65-12-521	4/6/2010	1042	Environmental	--	--	--	--	--	--
293636095300401	JY-65-28-309	10/28/2010	1011	Environmental	--	--	--	--	--	--
293635095294101	JY-65-29-107	10/28/2010	1225	Environmental	--	--	--	--	--	--
293652095293601	LJ-65-29-108	10/28/2010	1350	Environmental	--	--	--	--	--	--
293543095274901	JY-65-29-109	11/2/2010	1023	Environmental	2.3	1.7	b	4.76	0.84	1
293527095271501	JY-65-29-209	11/2/2010	1152	Environmental	2.3	1.1	--	2.44	.71	1
293934095342201	LJ-65-20-811	11/3/2010	1236	Environmental	1.7	.67	c	5.83	.77	.88
294326095293002	LJ-65-21-144	11/9/2010	0955	Environmental	2.4	.81	--	5.59	.67	.79
294702095394001	LJ-65-11-917	11/17/2010	1102	Environmental	1.5	.51	--	3.07	.58	.82
294452095354501	LJ-65-20-104	11/17/2010	1416	Environmental	.94	.58	--	2.33	.51	.71
295616095170101	LJ-65-06-601	12/1/2010	1000	Environmental	1.7	.53	--	4.1	.54	.65
300331095092201	LJ-60-63-603	12/1/2010	1225	Environmental	.82	.45	--	2.75	.49	.65
295850095201301	LJ-65-06-103	12/2/2010	1140	Environmental	1.2	.47	--	2.64	.51	.73
295855095204301	LJ-65-06-102	12/2/2010	1252	Environmental	1.3	.63	--	2.2	.5	.72
294529095371801	LJ-65-12-735	12/9/2010	1041	Environmental	2	.69	d	5.2	.9	1.2
294529095371801	LJ-65-12-735	12/9/2010	1042	Sequential replicate	1.9	.63	d	4.39	.84	1.2
294029095354301	LJ-65-20-410	12/9/2010	1215	Environmental	1.8	.86	d	4.4	1.2	1.8
300223095142101	LJ-60-63-715	12/16/2010	0911	Environmental	.93	.51	d	2.36	.46	.64
295247095344701	LJ-65-04-811	12/19/2011	1010	Environmental	2.6	.53	--	9.23	.79	.75
294329095284603	LJ-65-21-150	12/19/2011	1425	Environmental	1.5	.7	--	3.36	.68	1
294108095324702	LJ-65-20-520	12/20/2011	1045	Environmental	2.7	.69	--	4.6	.5	.56
294108095324702	LJ-65-20-520	12/20/2011	1046	Sequential replicate	2.3	.46	--	4.8	.51	.58



**Appendix 1.** Physicochemical properties and results of major ions, trace elements, and radionuclide analyses in water samples collected from municipal supply wells in Houston, Texas, 2010–11—Continued.

U.S. Geological Survey site number	State well number	Date	Sample start time	Sample type	Beta radioactivity, 30-day count (remark code)	Gross beta radioactivity, 72-hour count, water, filtered, Cs-137 curve (pCi/L) <sup>4</sup>	Beta radioactivity, 72-hour count, 1-sigma CSU, water, filtered, Cs-137 curve (pCi/L)	Beta radioactivity, 72-hour count, ssL <sub>C</sub> , water, filtered, Cs-137 curve (pCi/L)	Beta radioactivity, 72-hour count (remark code)	Radium-226, water, filtered, radon method (pCi/L)
294735095344001	LJ-65-12-521	4/6/2010	1042	Environmental	--	--	--	--	--	1.23
293636095300401	JY-65-28-309	10/28/2010	1011	Environmental	--	--	--	--	--	1.57
293635095294101	JY-65-29-107	10/28/2010	1225	Environmental	--	--	--	--	--	2.84
293652095293601	LJ-65-29-108	10/28/2010	1350	Environmental	--	--	--	--	--	4.34
293543095274901	JY-65-29-109	11/2/2010	1023	Environmental	--	4.72	0.79	0.97	--	3.07
293527095271501	JY-65-29-209	11/2/2010	1152	Environmental	--	4.09	.78	.97	--	2.4
293934095342201	LJ-65-20-811	11/3/2010	1236	Environmental	--	3.47	.68	1	c	--
294326095293002	LJ-65-21-144	11/9/2010	0955	Environmental	--	4.84	.66	.78	--	--
294702095394001	LJ-65-11-917	11/17/2010	1102	Environmental	--	1.94	.44	.62	--	1.84
294452095354501	LJ-65-20-104	11/17/2010	1416	Environmental	--	3.18	.58	.78	--	--
295616095170101	LJ-65-06-601	12/1/2010	1000	Environmental	--	3.93	.41	.45	--	--
300331095092201	LJ-60-63-603	12/1/2010	1225	Environmental	--	3.04	.37	.45	--	--
295850095201301	LJ-65-06-103	12/2/2010	1140	Environmental	--	3.17	.48	.71	--	--
295855095204301	LJ-65-06-102	12/2/2010	1252	Environmental	--	2.53	.35	.47	--	--
294529095371801	LJ-65-12-735	12/9/2010	1041	Environmental	--	2.61	.52	.72	--	--
294529095371801	LJ-65-12-735	12/9/2010	1042	Sequential replicate	--	3.05	.67	.94	--	--
294029095354301	LJ-65-20-410	12/9/2010	1215	Environmental	--	3.14	.53	.74	--	--
300223095142101	LJ-60-63-715	12/16/2010	0911	Environmental	--	2.42	.44	.64	--	--
295247095344701	LJ-65-04-811	12/19/2011	1010	Environmental	--	1.97	.56	.83	--	--
294329095284603	LJ-65-21-150	12/19/2011	1425	Environmental	--	2.09	.56	.84	--	--
294108095324702	LJ-65-20-520	12/20/2011	1045	Environmental	--	2.41	.41	.54	--	--
294108095324702	LJ-65-20-520	12/20/2011	1046	Sequential replicate	--	2.04	.47	.7	--	--

**Appendix 1.** Physicochemical properties and results of major ions, trace elements, and radionuclide analyses in water samples collected from municipal supply wells in Houston, Texas, 2010–11—Continued.

U.S. Geological Survey site number	State well number	Date	Sample start time	Sample type	Radium-226, 1-sigma CSU, water, filtered, radon method (pCi/L)	Radium-226, ssL <sub>C</sub> , water, filtered, radon method (pCi/L)	Radium-226 (remark code)	Uranium (natural), water, filtered(µg/L)	Uranium (natural), LT-MDL, water, filtered (µg/L)	Uranium (natural) (remark code)
294735095344001	LJ-65-12-521	4/6/2010	1042	Environmental	0.11	0.032	--	--	--	--
293636095300401	JY-65-28-309	10/28/2010	1011	Environmental	.14	.023	--	--	--	--
293635095294101	JY-65-29-107	10/28/2010	1225	Environmental	.24	.028	--	--	--	--
293652095293601	LJ-65-29-108	10/28/2010	1350	Environmental	.36	.03	--	--	--	--
293543095274901	JY-65-29-109	11/2/2010	1023	Environmental	.26	.023	--	0.518	0.004	--
293527095271501	JY-65-29-209	11/2/2010	1152	Environmental	.2	.029	--	.737	0.004	--
293934095342201	LJ-65-20-811	11/3/2010	1236	Environmental	--	--	--	13.3	0.004	--
294326095293002	LJ-65-21-144	11/9/2010	0955	Environmental	--	--	--	9.41	0.004	--
294702095394001	LJ-65-11-917	11/17/2010	1102	Environmental	.16	.035	--	.676	0.004	--
294452095354501	LJ-65-20-104	11/17/2010	1416	Environmental	--	--	--	.056	0.004	--
295616095170101	LJ-65-06-601	12/1/2010	1000	Environmental	--	--	--	4.92	0.004	--
300331095092201	LJ-60-63-603	12/1/2010	1225	Environmental	--	--	--	1.44	0.004	--
295850095201301	LJ-65-06-103	12/2/2010	1140	Environmental	--	--	--	1.20	0.004	--
295855095204301	LJ-65-06-102	12/2/2010	1252	Environmental	--	--	--	1.32	0.004	--
294529095371801	LJ-65-12-735	12/9/2010	1041	Environmental	--	--	--	10.5	0.004	--
294529095371801	LJ-65-12-735	12/9/2010	1042	Sequential replicate	--	--	--	--	--	--
294029095354301	LJ-65-20-410	12/9/2010	1215	Environmental	--	--	--	4.68	0.004	--
300223095142101	LJ-60-63-715	12/16/2010	0911	Environmental	--	--	--	.247	0.004	--
295247095344701	LJ-65-04-811	12/19/2011	1010	Environmental	--	--	--	20.3	0.004	--
294329095284603	LJ-65-21-150	12/19/2011	1425	Environmental	--	--	--	3.47	0.004	--
294108095324702	LJ-65-20-520	12/20/2011	1045	Environmental	--	--	--	7.61	0.004	--
294108095324702	LJ-65-20-520	12/20/2011	1046	Sequential replicate	--	--	--	7.68	0.004	--

<sup>1</sup>Physicochemical properties, major ions, trace elements, and radionuclide results for these wells published in Oden and others (2011) except for radium-226, which is included here.

<sup>2</sup>Replicate samples were compared with associated environmental samples by computing the relative percent difference (RPD) for each constituent with the following equation. RPD of 10 percent or less indicate good agreement between the paired results for major ion or trace element analyses. The acceptable RPD for radionuclide results was not set to a value but instead determined as acceptable if the unrounded, paired results were within 1 standard deviation (as represented by the 1-sigma CSU for each radionuclide).

$$RPD = |C_1 - C_2| / ((C_1 + C_2) / 2) \times 100$$

where

C<sub>1</sub> is constituent concentration, in milligrams per liter, from the environmental sample; and

C<sub>2</sub> is constituent concentration, in milligrams per liter, from the replicate sample.

<sup>3</sup>Serendipitous sniff test, unacidified sample.

<sup>4</sup>All time dependent analyses were completed within holding time limit except where otherwise noted.

**Appendix 2.** Well information for municipal supply wells sampled in Houston, Texas, 2010–11.

[ft bls, feet below land surface; 112CEVG, Chicot and Evangeline aquifers; --, no data available; 121EVGL, Evangeline aquifer; SDCL, sand clay; SNCL, sand with some clay; 112CHCT, Chicot aquifer.]

U.S. Geological Survey site number	State well number	County	Well depth (ft bls)	Depth to top of open interval (ft bls)	Depth to bottom of open interval (ft bls)	Date of construction	Aquifer code	Lithologic code							
Sampled in 2010															
294529095371801	LJ-65-12-735	Harris	1,220	622	654	11/19/1984	112CEVG	--							
				668	728										
				812	826										
				844	898										
				912	932										
				946	970										
				998	1,028										
				1,038	1,080										
293527095271501	JY-65-29-209	Fort Bend	1,050	766	806	9/1/1969*	121EVGL	--							
				820	850										
				870	890										
				910	920										
				970	990										
				1,015	1,035										
				293543095274901	JY-65-29-109				Fort Bend	1,220	650	764	7/28/1982	121EVGL	--
											780	796			
810	920														
950	966														
970	984														
1,010	1,022														
1,042	1,056														
1,062	1,082														
293934095342201	LJ-65-20-811	Harris	1,030	739	759	10/25/1967	121EVGL	--							
				791	865										
				930	950										
				962	997										
294326095293002	LJ-65-21-144	Harris	1,397	652	672	12/12/1974	121EVGL	--							
				685	740										
				790	830										
				855	870										
				890	940										
				970	1,050										
				1,080	1,097										
				1,110	1,142										
1,170	1,230														
294702095394001	LJ-65-11-917	Harris	1,288	636		5/26/1983	121EVGL	--							

**Appendix 2.** Well information for municipal supply wells sampled in Houston, Texas, 2010–11—Continued.

U.S. Geological Survey site number	State well number	County	Well depth (ft bls)	Depth to top	Depth to	Date of construction	Aquifer code	Lithologic code
				of open interval (ft bls)	bottom of open interval (ft bls)			
294452095354501	LJ-65-20-104	Harris	1,450	995	1,015	2/7/1973	121EVGL	--
				1,045	1,115			
				1,150	1,160			
				1,165	1,205			
				1,230	1,235			
				1,290	1,300			
				1,315	1,320			
				1,370	1,390			
				1,405	1,415			
				1,420	1,435			
295616095170101	LJ-65-06-601	Harris	600	440	450	7/23/1958	112CEVG	--
				470	490			
				545	565			
				585	595			
300331095092201	LJ-60-63-603	Harris	900	752	790	08/01/1991*	121EVGL	SDCL
				798	876			
295850095201301	LJ-65-06-103	Harris	1,545	660	725	12/17/1965	121EVGL	--
				750	840			
				860	905			
				925	935			
				1,040	1,075			
				1,150	1,175			
				1,250	1,260			
				1,280	1,300			
				1,335	1,370			
				1,410	1,420			
295855095204301	LJ-65-06-102	Harris	1,540	645	700	11/1/1965	121EVGL	--
				730	760			
				780	830			
				860	890			
				905	935			
				1,020	1,060			
				1,230	1,255			
				1,270	1,300			
				1,315	1,330			
				1,350	1,370			
1,400	1,450							
1,500	1,520							
294029095354301	LJ-65-20-410	Harris	1,195	700	1,180	1/1/1972*	121EVGL	--
300223095142101	LJ-60-63-715	Harris	410	364	384	7/2/1984	112CEVG	--
				392	402			

**Appendix 2.** Well information for municipal supply wells sampled in Houston, Texas, 2010–11—Continued.

U.S. Geological Survey site number	State well number	County	Well depth (ft bls)	Depth to top of open interval (ft bls)	Depth to bottom of open interval (ft bls)	Date of construction	Aquifer code	Lithologic code
Sampled in 2011								
295247095344701	LJ-65-04-811	Harris	1,480	448	502	8/23/1981	112CEVG	SNCL
				513	521			
				526	588			
				612	642			
				664	670			
				676	686			
				712	742			
				758	784			
				790	1,460			
294108095324702	LJ-65-20-520	Harris	785	565	675	4/12/1984	112CHCT	--
294329095284603	LJ-65-21-150	Harris	646	330	346	3/29/1982	112CHCT	--
				351	410			
				415	474			
				480	490			
				495	514			
				522	550			
				570	586			
				592	614			
				622	631			

\*The day of the date of construction was not reported, so the first day of the month was assigned arbitrarily.

**Appendix 3A.** Results of major-ion and trace-element analyses from quality-control samples, equipment blanks, and field blanks collected in association with municipal supply wells sampled in Houston, Texas, 2010–11.

[°C, degrees Celsius; mg/L, milligrams per liter; USGS TWSC, U.S. Geological Survey Texas Water Science Center; TQC, topical quality-control blank; <, less than; ; --, no data; SiO<sub>2</sub>, silicon dioxide; µg/L, micrograms per liter; E, estimated, result is greater than long-term method detection level (LT-MDL) and less than laboratory reporting level (LRL) (Childress and others, 1999)]

U.S. Geological Survey site number	Site name or State well number	Date	Sample start time	Sample type	Dissolved solids dried at 180 °C, water, filtered (mg/L)	Calcium, water, filtered (mg/L)	Magnesium, water, filtered (mg/L)	Potassium, water, filtered (mg/L)	Sodium, water, filtered (mg/L)	Bromide, water, filtered (mg/L)
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	8/5/2010	0857	TQC blank -tubing plus sampling manifold	<10	0.045	< 0.016	<0.06	<0.10	<0.020
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	8/5/2010	0858	TQC blank - tubing before sampling manifold	<10	<.044	<.016	<.06	<.10	<.020
294702095394001	LJ-65-11-917	11/17/2010	0959	Field blank	<12	0.072	<.008	.03	<.06	<.010
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	8/31/2011	1253	TQC blank - before capsule filter	--	--	--	--	--	--
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	8/31/2011	1254	TQC blank -tubing plus sampling manifold plus tubing	--	--	--	--	--	--
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	8/31/2011	1255	TQC blank -tubing plus sampling manifold	--	--	--	--	--	--
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	8/31/2011	1256	TQC blank - tubing before sampling manifold	--	--	--	--	--	--
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	8/31/2011	1257	TQC blank - Cflex tubing+standpipe	--	--	--	--	--	--
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	8/31/2011	1258	Source solution blank	--	<.022	<.008	<.02	<.06	--
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	8/31/2011	1259	Equipment blank	--	<.022	<.008	<.02	<.06	--
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	11/7/2011	1055	Source solution blank	<20	<.022	<.011	<.03	<.06	<.010
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	11/7/2011	1056	TQC blank- standpipe	<20	<.022	<.011	<.03	<.06	<.010
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	11/7/2011	1057	TQC blank - Cflex tubing+standpipe	<20	<.022	<.011	<.03	<.06	<.010
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	11/7/2011	1058	TQC blank- tubing plus sampling manifold	<20	<.022	<.011	<.03	<.06	<.010
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	11/7/2011	1059	Equipment blank	<20	<.022	<.011	<.03	<.06	<.010
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	12/12/2011	0959	Equipment blank	<20	<.022	<.011	<.03	<.06	<.010

**Appendix 3A.** Results of major-ion and trace-element analyses from quality-control samples, equipment blanks, and field blanks collected in association with municipal supply wells sampled in Houston, Texas, 2010–11—Continued.

U.S. Geological Survey site number	Site name or State well number	Date	Sample start time	Sample type	Chloride, water, filtered (mg/L)	Fluoride, water, filtered (mg/L)	Silica, water, filtered (mg/L as SiO <sub>2</sub> )	Sulfate, water, filtered (mg/L)	Barium, water, filtered (µg/L)	Chromium, water, filtered (µg/L)
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	8/5/2010	0857	TQC blank -tubing plus sampling manifold	<0.12	<0.08	0.067	<0.18	E0.12	<0.12
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	8/5/2010	0858	TQC blank - tubing before sampling manifold	<.12	<.08	<.058	<.18	<.14	E.06
294702095394001	LJ-65-11-917	11/17/2010	0959	Field blank	<.06	<.04	<.029	<.09	<.07	<.06
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	8/31/2011	1253	TQC blank - before capsule filter	--	--	--	--	--	--
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	8/31/2011	1254	TQC blank -tubing plus sampling manifold plus tubing	--	--	--	--	--	--
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	8/31/2011	1255	TQC blank -tubing plus sampling manifold	--	--	--	--	--	--
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	8/31/2011	1256	TQC blank - tubing before sampling manifold	--	--	--	--	--	--
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	8/31/2011	1257	TQC blank - Cflex tubing+standpipe	--	--	--	--	--	--
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	8/31/2011	1258	Source solution blank	--	--	<.029	--	<.07	<.06
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	8/31/2011	1259	Equipment blank	--	--	<.029	--	<.07	<.06
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	11/7/2011	1055	Source solution blank	<.06	<.04	<.018	<.09	<.07	<.07
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	11/7/2011	1056	TQC blank- standpipe	<.06	<.04	.028	<.09	.09	<.07
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	11/7/2011	1057	TQC blank - Cflex tubing+standpipe	<.06	<.04	<.018	<.09	.12	<.07
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	11/7/2011	1058	TQC blank- tubing plus sampling manifold	<.06	<.04	.025	<.09	.09	<.07
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	11/7/2011	1059	Equipment blank	<.06	<.04	.064	<.09	<.07	<.07
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	12/12/2011	0959	Equipment blank	<.06	<.04	<.018	<.09	<.07	.15

**Appendix 3A.** Results of major-ion and trace-element analyses from quality-control samples, equipment blanks, and field blanks collected in association with municipal supply wells sampled in Houston, Texas, 2010–11—Continued.

U.S. Geological Survey site number	Site name or State well number	Date	Sample start time	Sample type	Iron, water, filtered (µg/L)	Lithium, water, filtered (µg/L)	Manganese, water, filtered (µg/L)	Molybdenum, water, filtered (µg/L)	Strontium, water, filtered (µg/L)	Vanadium, water, filtered (µg/L)
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	8/5/2010	0857	TQC blank -tubing plus sampling manifold	E5.0	<0.44	1.01	E0.017	0.70	<0.16
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	8/5/2010	0858	TQC blank - tubing before sampling manifold	<6.0	<.44	.42	E.019	<.40	<.16
294702095394001	LJ-65-11-917	11/17/2010	0959	Field blank	6.6	<.22	<.13	<.014	<.20	<.08
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	8/31/2011	1253	TQC blank - before capsule filter	--	--	.59	--	--	--
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	8/31/2011	1254	TQC blank -tubing plus sampling manifold plus tubing	--	--	.72	--	--	--
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	8/31/2011	1255	TQC blank -tubing plus sampling manifold	--	--	.25	--	--	--
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	8/31/2011	1256	TQC blank - tubing before sampling manifold	--	--	.28	--	--	--
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	8/31/2011	1257	TQC blank - Cflex tubing+standpipe	--	--	<.13	--	--	--
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	8/31/2011	1258	Source solution blank	<3.2	<.22	<.13	<.014	<.20	<.08
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	8/31/2011	1259	Equipment blank	<3.2	<.22	.27	<.014	<.20	<.08
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	11/7/2011	1055	Source solution blank	<3.2	<.22	<.13	<.014	<.20	<.08
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	11/7/2011	1056	TQC blank- standpipe	3.3	<.22	<.13	<.014	<.20	<.08
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	11/7/2011	1057	TQC blank - Cflex tubing+standpipe	<3.2	<.22	.30	<.014	<.20	<.08
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	11/7/2011	1058	TQC blank- tubing plus sampling manifold	<3.2	<.22	.39	<.014	<.20	<.08
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	11/7/2011	1059	Equipment blank	<3.2	<.22	.76	<.014	<.20	<.08
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	12/12/2011	0959	Equipment blank	5.0	<.22	.50	.014	<.20	<.08



**Appendix 3A.** Results of major-ion and trace-element analyses from quality-control samples, equipment blanks, and field blanks collected in association with municipal supply wells sampled in Houston, Texas, 2010–11—Continued.

U.S. Geological Survey site number	Site name or State well number	Date	Sample start time	Sample type	Arsenic, water, filtered (µg/L)	Boron, water, filtered (µg/L)	Selenium, water, filtered (µg/L)	Uranium (natural), water, filtered (µg/L)
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	8/5/2010	0857	TQC blank -tubing plus sampling manifold	<0.04	<3	<0.04	<0.008
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	8/5/2010	0858	TQC blank - tubing before sampling manifold	<.04	<3	<.04	<.008
294702095394001	LJ-65-11-917	11/17/2010	0959	Field blank	<.02	<3	<.03	<.004
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	8/31/2011	1253	TQC blank - before capsule filter	--	--	--	--
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	8/31/2011	1254	TQC blank -tubing plus sampling manifold plus tubing	--	--	--	--
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	8/31/2011	1255	TQC blank -tubing plus sampling manifold	--	--	--	--
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	8/31/2011	1256	TQC blank - tubing before sampling manifold	--	--	--	--
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	8/31/2011	1257	TQC blank - Cflex tubing+standpipe	--	--	--	--
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	8/31/2011	1258	Source solution blank	<.02	<3	<.03	<.004
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	8/31/2011	1259	Equipment blank	<.02	<3	<.03	<.004
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	11/7/2011	1055	Source solution blank	<.03	<3	<.03	<.004
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	11/7/2011	1056	TQC blank- standpipe	<.03	<3	<.03	<.004
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	11/7/2011	1057	TQC blank - Cflex tubing+standpipe	<.03	<3	<.03	<.004
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	11/7/2011	1058	TQC blank- tubing plus sampling manifold	<.03	<3	<.03	<.004
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	11/7/2011	1059	Equipment blank	<.03	<3	<.03	<.004
88480502	USGS TWSC, Gulf Coast Program Office Laboratory, Shenandoah, Texas	12/12/2011	0959	Equipment blank	<.03	<3	<.03	<.004

**Appendix 3B.** Discussion of results of major ion, trace element, and radionuclide analyses from quality-control samples, equipment blanks, and field blanks collected in association with municipal supply wells sampled in Houston, Texas, 2010–11.

This section provides context and interpretation of the quality-assurance results presented in appendix 3A, which includes quality-control data collected during 2010–11 that were not previously published. Quality-control data indicate that, with a few minor exceptions which are explained, the data are reproducible, unbiased, and of sufficient quality to allow for evaluation of variability of low concentrations of trace elements.

For the replicated results included in appendix 2, the relative percent differences (RPDs) ranged from 0 to 14 percent; lithium and arsenate, with an RPD of 14 and 12 percent, respectively, were the only constituents with RPDs greater than 10 percent. All of the radionuclide results were within one standard deviation (1-sigma combined standard uncertainty [CSU] or 68 percent confidence level) except for the gross alpha-particle activities measured at 30 days after sample collection from well LJ-65-12-735. To determine if the two samples are statistically the same or different, the normalized absolute difference is computed with the following equation (McCurdy and others, 2008):

$$| R_1 - R_2 | / \sqrt{(CSU_1^2 + CSU_2^2)} > 2 \quad (1)$$

where

$R_1$  is constituent concentration, in picocuries per liter, from the environmental sample;

$R_2$  is constituent concentration, in picocuries per liter, from the replicate sample;  
 $CSU_1$  is the associated CSU from the environmental sample; and  
 $CSU_2$  is the associated CSU from the replicate sample.

This difference tests the null hypothesis that the results do not differ significantly when compared to their respective CSUs (McCurdy and others, 2008). The contract between the U.S. Geological Survey (USGS) National Water Quality Laboratory and the contract laboratory, Eberline Services, for radionuclide analyses states that the difference between duplicate results shall be less than two times the square root of the sum of each CSU squared and that a result greater than three times the square root of the sum of each CSU squared is unacceptable (Ann H. Mullin, U.S. Geological Survey, written commun., 2013). For the sample from well, LJ-65-12-735, the gross alpha-particle activities measured 30 days after sample collection were not within one standard deviation but were less than two times the square root of the sum of each CSU squared, and therefore, statistically the same.

Analytical data for the blanks collected during 2010–11 are listed in appendix 3A, which includes 2 topical quality-control samples, 1 equipment blank, and 1 field blank collected in 2010, along with 2 source-solution blanks, 8 topical quality-control samples, and 3 equipment blanks collected in 2011. Topical quality-control samples address specific quality-control needs (U.S. Geological Survey, variously dated). The topical quality-control samples collected for this study were designed to identify equipment contributing to low-level contamination in the equipment blank results. Each set of topical samples represented a specific component of the sampling system; for example, a tubing blank before manifold and a sample tubing plus manifold blank. Source-solution blanks were collected to verify that the certified artificial water used to blank the equipment was free of contamination. The topical quality-control samples and field

blank results from 2010, as well as the equipment blanks and associated topical quality-control samples from 2011, indicate that with few exceptions, the sampling equipment did not introduce appreciable amounts of the constituents of interest to the samples; most of the blank results were less than the applicable laboratory reporting limit (LRL). Low-level manganese contamination in blank samples collected during 2010 was large enough to be of concern when assessing the lowest levels of detected concentration results for the environmental samples from 2010. As described in Oden and others (2011), a detectable concentration of manganese was measured in a blank sample collected in 2010. Additional data from blank samples collected during 2010–11 substantiate low-level manganese contamination. The average manganese concentration in the equipment and field blanks between March and November 2010 was 1.26 micrograms per liter ( $\mu\text{g/L}$ ). The topical quality-control blank assessment in August 2010, consisting of a tubing plus sampling manifold blank and a tubing blank, resulted in manganese concentrations of 1.01 and 0.42  $\mu\text{g/L}$ , respectively. A manganese concentration of 1.3  $\mu\text{g/L}$  was in the associated equipment-blank sample, which represented the overall sampling system (Oden and others, 2011). These results indicate that the potential source of manganese contamination may be the sampling manifold. Another source of manganese contamination may be related to the process of filtering samples in the field for laboratory analysis. In January 2015, the USGS Office of Water Quality reported random, low-level detections of manganese in blank samples submitted to the National Water Quality Laboratory have been observed since 2009 and attributed these detections to the high-capacity capsule filters used during field processing (U.S. Geological Survey Office of Water Quality, unpublished information note). A manganese concentration less than the LRL of 0.13  $\mu\text{g/L}$  was measured in the subsequent field blank collected in November 2010. The sampling manifolds were subsequently subjected to additional rinsing and cleaning.

In 2011, a considerably lower average manganese concentration was measured in the blank samples (0.51 µg/L) compared to most of the blank samples collected in 2010, indicating that the revised equipment rinsing and cleaning process were effective. The 2010 environmental-sample manganese data were censored at three times the average manganese contamination concentration in the blanks (3.8 µg/L). This approach to censoring the data was considered to be conservative and had a minimal effect on the statistical analysis because of the large range in manganese concentrations in the environmental samples. The concentrations of manganese measured in the 60 environmental samples collected in 2010 ranged from less than 0.2 to 56.3 µg/L. Concentrations of manganese less than or equal to 1.3 µg/L were measured in 12 of the 60 samples collected (20 percent), and concentrations less than 3.8 µg/L were measured in 21 of the 60 samples (app. 4A).

Small concentrations of calcium, potassium, and iron were detected in the field blank collected in 2010, and small concentrations of calcium, silica, barium, chromium, iron, molybdenum, and strontium were detected in the topical quality-control samples from 2010 (app. 3A). Small concentrations of chromium, iron, and molybdenum were detected in the equipment blanks from 2011. Small concentrations of silica, barium, and iron were detected in the topical quality-control samples from 2011 (app. 3A). Compared to the concentrations for these constituents in environmental samples, these small concentrations detected in the blank samples were not large enough to be of concern.

**Appendix 4A.** Summary statistics for open interval altitudes, physicochemical properties, major ions, arsenic, 11 trace elements, and selected radionuclide analyses of water samples collected from 91 municipal supply wells in Houston, Texas, grouped by area, 2007–11.

[N, number of samples; min, minimum; 1st, 25th percentile; med, median; 3rd, 75th percentile; max, maximum; NAVD 88, North American Vertical Datum 1988; ORP, oxidation-reduction potential; NTRU, Nephelometric Turbidity Ratio Unit; mg/L, milligrams per liter; <, less than;  $\mu\text{S}/\text{cm}$  at 25°C, microsiemens per centimeter at 25°C; °C, degrees Celsius;  $\text{CaCO}_3$ , calcium carbonate;  $\text{SiO}_2$ , silicon dioxide; ROE, residue on evaporation;  $\mu\text{g}/\text{L}$ , micrograms per liter; pCi/L, picocuries per liter; R, nondetect, result below sample specific critical level(ssL<sub>C</sub>)

Constituents	Northeast						Northwest						Southwest					
	N	Min	1 <sup>st</sup>	Med	3 <sup>rd</sup>	Max	N	Min	1 <sup>st</sup>	Med	3 <sup>rd</sup>	Max	N	Min	1 <sup>st</sup>	Med	3 <sup>rd</sup>	Max
Altitude of top of open interval (feet NAVD 88)	20	-1,073	-703	-670	-608	-280	29	-1,078	-686	-553	-510	-231	42	-1,070	-683	-590	-541	-270
Altitude of bottom of open interval (feet NAVD 88)	20	-1,602	-1,073	-972	-792	-318	29	-1,596	-1,408	-1,346	-1,136	-466	42	-1,881	-1,372	-1,140	-986	-571
Distance of top of open interval to top of Burkeville (feet)	20	344	746	896	939	1,315	29	524	925	1,055	1,143	1,366	42	1,086	1,422	1,608	1,731	1,975
Distance of bottom of open interval to top of Burkeville (feet)	20	58	387	522	718	1,160	29	14	162	228	532	1,131	42	333	725	845	1,374	1,642
ORP (millivolts)	15	-203	-151	-137	-115	167	28	-212	-135	-90.8	55.4	222	28	-173	-9.25	90.8	160.4	466
Turbidity (NTRU)	20	0.1	0.1	0.1	0.3	1.8	29	0.1	0.1	0.2	0.5	2.0	42	0.1	0.1	0.2	0.3	1.9
Dissolved oxygen (DO) (mg/L)	20	<0.1	0.08(<0.1)*	0.21	1.2	4.2	29	<0.1	0.23	0.45	1.1	4.5	42	<0.1	0.20	0.61	2.6	4.4
pH (standard units)	20	7.2	7.5	7.6	7.6	8.0	29	7.2	7.4	7.5	7.6	8.1	42	7.2	7.3	7.4	7.6	7.9
Specific conductance, ( $\mu\text{S}/\text{cm}$ at 25°C)	20	314	326	336	418	688	29	472	493	516	539	856	42	469	495	520	536	1,110
Temperature, water (°C)	20	22.7	25.1	25.5	25.7	28.1	29	22.9	25.0	25.6	26.7	29.9	42	23.9	24.7	25.4	26.0	28.9
Calcium, filtered (mg/L)	20	11.8	37.9	39.4	42.6	48.8	29	8.23	35.3	42.2	47.4	66.4	42	14.4	33.8	47.8	53.7	69.9
Magnesium, filtered (mg/L)	20	2.67	3.40	3.90	5.56	6.43	29	1.99	6.77	7.68	8.78	12.0	42	3.73	7.03	8.11	9.33	12.3
Potassium, filtered (mg/L)	20	1.82	2.21	2.36	2.42	2.66	29	1.47	2.19	2.30	2.48	2.76	42	1.53	1.83	1.92	2.14	2.53
Sodium, filtered (mg/L)	20	14.2	20.2	24.4	33.2	136	29	27.6	39.1	43.4	56.5	182	42	30.5	35.1	48.4	68.0	134
Alkalinity (mg/L as $\text{CaCO}_3$ )	20	126	131	139	164	225	29	159	169	182	210	324	42	163	174	188	200	276
Bicarbonate, field (mg/L)	20	154	160	170	200	274	29	193	206	221	255	394	42	198	212	229	243	333
Bromide, filtered (mg/L)	20	0.06	0.07	0.08	0.10	0.32	29	0.11	0.14	0.16	0.17	0.27	42	0.10	0.13	0.14	0.15	0.21
Chloride, filtered (mg/L)	20	15.3	18.0	21.2	26.5	83.3	29	31.2	41.3	45.5	49.8	85.4	42	29.0	35.7	41.2	45.3	216
Fluoride, filtered (mg/L)	20	0.11	0.14	0.18	0.21	1.34	29	<0.12	0.21	0.23	0.30	1.32	42	0.19	0.23	0.28	0.43	0.65
Silica, filtered (mg/L as $\text{SiO}_2$ )	20	15.7	22.6	24.0	26.1	31.6	29	14.2	20.0	22.6	24.1	30.2	42	16.2	21.8	25.0	27.3	32.1
Sulfate, filtered (mg/L)	20	<0.18	5.93	7.40	10.5	11.7	29	<0.18	10.1	12.5	14.1	16.8	42	8.40	10.3	13.2	14.8	17.2
ROE, dried at 180 °C, filtered (mg/L)	20	175	190	200	234	379	29	269	280	289	307	496	42	272	287	306	313	612
Arsenic, filtered ( $\mu\text{g}/\text{L}$ )	20	0.58	1.4	1.8	2.5	15.3	29	0.86	2.4	2.9	3.4	23.5	42	1.34	2.5	3.0	4.0	5.1
Barium, filtered ( $\mu\text{g}/\text{L}$ )	20	146	276	294	330	411	29	110	205	230	260	408	42	168	207	233	238	472
Boron, filtered ( $\mu\text{g}/\text{L}$ )	20	20	32	38	55	548	29	38	47	55	71	465	42	38	49	61	99	206
Chromium, filtered ( $\mu\text{g}/\text{L}$ )	20	<0.06	0.16	0.25	0.60	1.2	29	<0.06	0.07(<0.12)*	0.14	0.29	1.5	42	<0.06	0.33	0.94	2.0	6.1
Iron, filtered ( $\mu\text{g}/\text{L}$ )	20	<6	23	116	170	277	29	<8	27	77	154	391	42	<3	2(<3)*	7(<8)*	57	612
Lithium, filtered ( $\mu\text{g}/\text{L}$ )	20	5.0	6.6	8.3	13.2	17.9	29	7.2	16.8	19.1	20.8	24.0	42	9.2	13.5	16.6	19.5	24.6
Manganese, filtered ( $\mu\text{g}/\text{L}$ )	20	<0.2	6.7	20.7	60.6	109	29	<3.8	4.5	9.0	11.3	14.9	42	<0.2	0.4(<3.8)*	1.9(<3.8)*	9.0	56.3
Molybdenum, filtered ( $\mu\text{g}/\text{L}$ )	20	1.2	1.8	2.0	3.6	18.1	29	<0.2	1.4	1.9	2.7	12.9	42	0.3	1.0	2.1	2.9	13.2

**Appendix 4A.** Summary statistics for open interval altitudes, physicochemical properties, major ions, arsenic, 11 trace elements, and selected radionuclide analyses of water samples collected from 91 municipal supply wells in Houston, Texas, grouped by area, 2007–11—Continued.

Constituents	Northeast						Northwest						Southwest					
	N	Min	1 <sup>st</sup>	Med	3 <sup>rd</sup>	Max	N	Min	1 <sup>st</sup>	Med	3 <sup>rd</sup>	Max	N	Min	1 <sup>st</sup>	Med	3 <sup>rd</sup>	Max
Selenium, filtered (µg/L)	20	<0.03	0.36	0.47	0.82	1.3	29	<0.03	0.04	0.15	4.3	25.1	42	<0.03	0.55	2.4	4.6	15.7
Strontium, filtered (µg/L)	20	202	246	289	392	478	29	216	507	597	640	738	42	316	415	511	570	731
Vanadium, filtered (µg/L)	20	<0.04	0.04	0.10	1.9	5.7	29	<0.08	0.12(<0.16)*	0.20	2.5	7.6	42	<0.08	0.47	4.9	8.1	18.0
Alpha radioactivity, 30-day count, filtered (pCi/L)	20	R-0.94	-0.12	1.47	2.89	6.3	29	R-0.24	3.88	7.20	10.6	25.5	42	R0.60	4.45	6.60	8.20	20.9
Alpha radioactivity, 72-hour count, filtered (pCi/L)	20	R-1.1	2.65	4.92	5.84	13.4	29	1.19	7.00	10.4	13.1	39.7	42	2.58	8.60	12.3	15.1	29.1
Beta radioactivity, 30-day count, filtered (pCi/L)	20	R-0.78	2.18	2.81	3.88	8.3	29	R0.16	2.94	3.72	5.33	14.4	42	R-1.04	2.74	3.78	4.76	10.4
Beta radioactivity, 72-hour count, filtered (pCi/L)	20	1.96	2.48	3.02	3.66	6.60	29	1.48	2.68	3.22	3.66	4.55	42	1.97	2.50	2.96	3.54	4.84
Radium-226, filtered (pCi/L)	14	0.204	0.381	0.442	0.853	2.655	14	0.273	0.389	1.104	1.97	2.59	13	0.732	0.826	1.57	2.39	4.34
Radon-222, unfiltered (pCi/L)	14	240	370	500	730	830	8	161	412	715	1,035	2,230	9	273	470	560	1,620	2,380
Uranium (natural), filtered (µg/L)	20	<0.04	<0.04	0.10	0.93	4.92	29	<0.02	0.45	1.15	6.47	42.7	42	0.03	1.62	4.20	7.04	17.5

\*Adjusted maximum likelihood estimation statistical method calculates interquartile range below a single reporting level and between multiple reporting levels.

**Appendix 4B.** Summary statistics for major ions in primary cation and anion predominant water types in samples collected from 91 municipal supply wells sampled in Houston, Texas, 2007–11.

[mg/L, milligrams per liter]

<b>Calcium-dominant water type</b>								
	<b>Calcium, water, filtered (mg/L)</b>	<b>Magnesium, water, filtered (mg/L)</b>	<b>Potassium, water, filtered (mg/L)</b>	<b>Sodium, water, filtered (mg/L)</b>	<b>Bicarbonate, water, filtered, inflection-point titration method (incremental titration method), field (mg/L)</b>	<b>Chloride, water, filtered (mg/L)</b>	<b>Fluoride, water, filtered (mg/L)</b>	<b>Sulfate, water, filtered (mg/L)</b>
Number of samples	56	56	56	56	56	56	56	56
Minimum	35.8	3.10	1.47	14.2	154	15.3	0.11	3.19
Median	47.3	8.06	2.22	34.8	206	41.1	0.22	10.3
Maximum	69.9	12.3	2.68	51.0	292	62.6	0.38	15.5
<b>Sodium-dominant water type</b>								
	<b>Calcium, water, filtered (mg/L)</b>	<b>Magnesium, water, filtered (mg/L)</b>	<b>Potassium, water, filtered (mg/L)</b>	<b>Sodium, water, filtered (mg/L)</b>	<b>Bicarbonate, water, filtered, inflection-point titration method (incremental titration method), field (mg/L)</b>	<b>Chloride, water, filtered (mg/L)</b>	<b>Fluoride, water, filtered (mg/L)</b>	<b>Sulfate, water, filtered (mg/L)</b>
Number of samples	35	35	35	35	35	35	35	35
Minimum	8.23	1.99	1.58	40.9	200	29.0	0.22	<0.18
Median	33.5	6.86	1.97	65.6	230	38.8	0.40	14.4
Maximum	65.9	11.6	2.76	182	394	216	1.34	17.2
<b>Bicarbonate-dominant water type</b>								
	<b>Calcium, water, filtered (mg/L)</b>	<b>Magnesium, water, filtered (mg/L)</b>	<b>Potassium, water, filtered (mg/L)</b>	<b>Sodium, water, filtered (mg/L)</b>	<b>Bicarbonate, water, filtered, inflection-point titration method (incremental titration method), field (mg/L)</b>	<b>Chloride, water, filtered (mg/L)</b>	<b>Fluoride, water, filtered (mg/L)</b>	<b>Sulfate, water, filtered (mg/L)</b>
Number of samples	89	89	89	89	89	89	89	89
Minimum	8.23	1.99	1.47	14.2	154	15.3	0.11	<0.18
Median	41.2	7.28	2.17	41.5	217	40.9	0.23	11.8
Maximum	69.9	12.3	2.76	182	394	85.4	1.34	17.2
<b>Chloride-dominant water type</b>								
	<b>Calcium, water, filtered (mg/L)</b>	<b>Magnesium, water, filtered (mg/L)</b>	<b>Potassium, water, filtered (mg/L)</b>	<b>Sodium, water, filtered (mg/L)</b>	<b>Bicarbonate, water, filtered, inflection-point titration method (incremental titration method), field (mg/L)</b>	<b>Chloride, water, filtered (mg/L)</b>	<b>Fluoride, water, filtered (mg/L)</b>	<b>Sulfate, water, filtered (mg/L)</b>
Number of samples	2	2	2	2	2	2	2	2
Minimum	55.7	9.44	2.34	101	224	142	0.40	13.5
Maximum	65.9	11.6	2.53	134	274	216	0.46	14.6



**Appendix 4C.** Summary statistics for physicochemical properties, major ions, arsenic, 11 trace elements, and selected radionuclide analyses of water samples collected from 91 municipal supply wells in Houston, Texas, grouped by aquifer designation, 2007–11.

[min, minimum; 1st, 25th percentile; med, median; 3rd, 75th percentile; max, maximum; CHCT, Chicot aquifer; EVGL, Evangeline aquifer; ORP, oxidation-reduction potential; mg/L, milligrams per liter; <, less than; NTRU, Nephelometric Turbidity Ratio Unit;  $\mu\text{S}/\text{cm}$  at 25°C, microsiemens per centimeter at 25°C; °C, degrees celsius;  $\text{CaCO}_3$ , calcium carbonate;  $\text{SiO}_2$ , silicon dioxide; ROE, residue on evaporation;  $\mu\text{g}/\text{L}$ , micrograms per liter;  $\mu\text{g-As}/\text{L}$ , micrograms arsenic per liter;  $\text{pCi}/\text{L}$ , picocuries per liter; R, nondetect, result below sample specific critical level(ssL<sub>c</sub>)]

Aquifer designation	Constituents	Number	Min	1st	Med	3rd	Max
LowerCHCT, upperEVGL	ORP, millivolts	36	-147	-79.6	47.2	155	466
	Dissolved oxygen (DO), mg/L	51	<0.10	0.08(<0.10)*	0.54	2.6	4.4
	Turbidity, NTRU	51	0.1	0.1	0.2	0.4	2
	pH, standard units	51	7.2	7.3	7.4	7.5	7.8
	Specific conductance, $\mu\text{S}/\text{cm}$ at 25°C	51	391	493	504	531	1,110
	Temperature, water, °C	50	22.7	24.7	25.3	25.9	27.5
	Alkalinity, mg/L as $\text{CaCO}_3$	51	154	174	184	200	240
	Bicarbonate, field, mg/L	51	188	212	224	243	292
	Calcium, filtered, mg/L	51	20.2	37.3	47.8	53.7	69.9
	Magnesium filtered, mg/L	51	4.22	6.86	8.02	9.33	12.3
	Potassium filtered, mg/L	51	1.47	1.85	1.98	2.19	2.53
	Sodium filtered, mg/L	51	22.1	34.7	41.6	59.4	134
	Bromide filtered, mg/L	51	0.09	0.12	0.14	0.16	0.21
	Chloride filtered, mg/L	51	25.3	35.1	41.4	47.1	216
	Fluoride filtered, mg/L	51	0.11	0.22	0.26	0.38	0.56
	Silica filtered, mg/L as $\text{SiO}_2$	51	16.8	22.2	25.1	27.4	32.1
	Sulfate filtered, mg/L	51	4.82	10.0	13.0	14.6	17.1
	ROE, dried at 180 °C, filtered, mg/L	51	237	283	298	307	612
	Arsenic, filtered, $\mu\text{g}/\text{L}$	51	1.0	2.4	2.8	3.8	5.2
	Arsenate, filtered, $\mu\text{g-As}/\text{L}$	9	<0.3	0.96	2.4	2.5	3.5
	Arsenite, filtered, $\mu\text{g-As}/\text{L}$	9	unable to calculate, fewer than 3 uncensored values.				
	Barium, filtered, $\mu\text{g}/\text{L}$	51	150	202	233	241	472
	Chromium, filtered, $\mu\text{g}/\text{L}$	51	<0.06	0.09 (<0.12)*	0.79	1.8	6.1
	Boron, filtered, $\mu\text{g}/\text{L}$	51	32	48	56	85	206
	Iron, filtered, $\mu\text{g}/\text{L}$	51	<3	2.6 (<3)*	11	108	612
	Lithium, filtered, $\mu\text{g}/\text{L}$	51	7.2	13.3	16.5	19.7	24.6
	Manganese, filtered, $\mu\text{g}/\text{L}$	51	<0.2	0.70 (<3.8)*	2.6 (<3.8)*	11.3	56.3
	Molybdenum, filtered, $\mu\text{g}/\text{L}$	51	<0.2	1.0	1.9	2.8	13.2
	Selenium, filtered, $\mu\text{g}/\text{L}$	51	<0.03	0.07	2.1	4.6	15.7
	Strontium, filtered, $\mu\text{g}/\text{L}$	51	236	415	522	588	731
	Vanadium, filtered, $\mu\text{g}/\text{L}$	51	<0.08	0.28	4.6	6.5	18.0
	Alpha radioactivity, 30-day count, filtered, $\text{pCi}/\text{L}$	51	R-0.1	4.32	6.5	8.4	21.7
Alpha radioactivity, 72-hour count, filtered, $\text{pCi}/\text{L}$	51	5.7	9.5	12.2	15.1	39.7	
Beta radioactivity, 30-day count, filtered, $\text{pCi}/\text{L}$	51	R-1.04	3.03	3.72	4.76	14.4	
Beta radioactivity, 72-hour count, filtered, $\text{pCi}/\text{L}$	51	1.94	2.56	3.03	3.64	4.84	
Radium-226, filtered, $\text{pCi}/\text{L}$	16	0.389	0.812	1.61	2.42	4.34	
Radon-222, unfiltered, $\text{pCi}/\text{L}$	10	161	280	550	1,700	2,380	
Uranium (natural), filtered, $\mu\text{g}/\text{L}$	51	0.25	1.40	3.92	6.96	42.7	
LowerCHCT, fullyEVGL	ORP, millivolts	7	-135	-55.7	24.0	167	222
	Dissolved oxygen (DO), mg/L	7	<0.10	0.53	1.1	1.2	1.8
	Turbidity, NTRU	7	0.1	0.2	0.5	0.7	0.9
	pH, standard units	7	7.4	7.4	7.4	7.42	7.6
	Specific conductance, $\mu\text{S}/\text{cm}$ at 25°C	7	473	496	515	519	533
	Temperature, water, °C	7	23.86	24.5	25	25.3	25.8
	Alkalinity, mg/L as $\text{CaCO}_3$	7	169	169	172	179	215
	Bicarbonate, field, mg/L	7	206	206	210	218	261
	Calcium, filtered(mg/L)	7	42.9	43.3	47.4	52.5	57.04
	Magnesium filtered, mg/L	7	6.26	7.07	8.84	11.2	12
	Potassium filtered, mg/L	7	2.18	2.19	2.3	2.48	2.59
	Sodium filtered, mg/L	7	31.1	36.7	39.1	43.1	46
	Bromide filtered, mg/L	7	0.14	0.15	0.1637	0.17	0.18
	Chloride filtered, mg/L	7	42.1	44.7	47.3	49.69	53.5
	Fluoride filtered, mg/L	7	0.19	0.2	0.21	0.22	0.22
	Silica filtered, mg/L as $\text{SiO}_2$	7	21.9	23.4	24.5	24.5	25
	Sulfate filtered, mg/L	7	9.3	11.6	12.6	13.563	14.6
	ROE, dried at 180 °C, filtered, mg/L	7	278	281	284	294	301
	Arsenic, filtered, $\mu\text{g}/\text{L}$	7	0.8603	1.9	2.7	3.1	3.4
	Arsenate, filtered, $\mu\text{g-As}/\text{L}$	3	0.77	0.77	2.7	3.1	3.1
	Arsenite, filtered, $\mu\text{g-As}/\text{L}$	3	unable to calculate, fewer than 3 uncensored values.				
	Barium, filtered, $\mu\text{g}/\text{L}$	7	205	214	228	232.4	288
	Chromium, filtered, $\mu\text{g}/\text{L}$	7	<0.12	0.22	0.27	0.31	0.53
	Boron, filtered, $\mu\text{g}/\text{L}$	7	41	46	47	49.18	50
	Iron, filtered, $\mu\text{g}/\text{L}$	7	<8	8	13	44	162
	Lithium, filtered, $\mu\text{g}/\text{L}$	7	14.9	15.4	17.3	18.4	19.1
	Manganese, filtered, $\mu\text{g}/\text{L}$	7	1.0	1.2	5.4	7.3	13.2
	Molybdenum, filtered, $\mu\text{g}/\text{L}$	7	1.1	1.2	1.3	2.2	4.1
	Selenium, filtered, $\mu\text{g}/\text{L}$	7	<0.04	2.3	14.1	18.2	25.1
	Strontium, filtered, $\mu\text{g}/\text{L}$	7	423	547	618	659	738
	Vanadium, filtered, $\mu\text{g}/\text{L}$	7	<0.16	0.91	2.8	5.7	7.6
	Alpha radioactivity, 30-day count, filtered, $\text{pCi}/\text{L}$	7	5.8	8.0	9.5	13.7	25.5
Alpha radioactivity, 72-hour count, filtered, $\text{pCi}/\text{L}$	7	9.9	11.4	12.8	20.9	31	
Beta radioactivity, 30-day count, filtered, $\text{pCi}/\text{L}$	7	2.67	4.00	4.75	9.23	9.31	
Beta radioactivity, 72-hour count, filtered, $\text{pCi}/\text{L}$	7	1.97	2.64	3.22	4.29	4.55	
Radium-226, filtered, $\text{pCi}/\text{L}$	3	0.384	0.384	0.397	1.97	1.97	
Radon-222, unfiltered, $\text{pCi}/\text{L}$	2	254	--	--	--	1,200	
Uranium (natural), filtered, $\mu\text{g}/\text{L}$	7	0.73	4.01	7.77	20.3	23.2	

**Appendix 4C.** Summary statistics for physicochemical properties, major ions, arsenic, 11 trace elements, and selected radionuclide analyses of water samples collected from 91 municipal supply wells in Houston, Texas, grouped by aquifer designation, 2007–11—Continued.

Aquifer designation	Constituents	Number	Min	1st	Med	3rd	Max
FullyEVGL	ORP, millivolts	8	-163	-142	-121	-16.4	137
	Dissolved oxygen (DO), mg/L	10	<0.10	0.15	0.35	2.0	4.5
	Turbidity, NTRU	10	0.1	0.2	0.35	0.52	1.8
	pH, standard units	10	7.4	7.4	7.5	7.5	7.7
	Specific conductance, $\mu\text{S}/\text{cm}$ at 25°C	10	439	453	502.5	531	550
	Temperature, water, °C	10	25.1	25.5	25.9	26.7	27.2
	Alkalinity, mg/L as $\text{CaCO}_3$	10	164	167	176.5	190	235
	Bicarbonate, field, mg/L	10	200	203	215	230	285
	Calcium, filtered, mg/L	10	28.7	35.3	40.75	44.5	49.8
	Magnesium filtered, mg/L	10	5.65	6.287	7.54	8.03	8.37
	Potassium filtered, mg/L	10	1.972	2.36	2.485	2.57	2.76
	Sodium filtered, mg/L	10	40.9	43.2	45.95	51	72
	Bromide filtered, mg/L	10	0.1209	0.13	0.15	0.16	0.19
	Chloride filtered, mg/L	10	33.855	35.7	41.9	45.5	62.6
	Fluoride filtered, mg/L	10	0.19	0.22	0.227	0.26	0.33
	Silica filtered, mg/L as $\text{SiO}_2$	10	19.1	20.1	21.8	23.6	26.1
	Sulfate filtered, mg/L	10	6.28	6.447	11.05	13.3	14.4
	ROE, dried at 180 °C, filtered, mg/L	10	225.45	276	287.5	307	324
	Arsenic, filtered, $\mu\text{g}/\text{L}$	10	2.2	2.5	2.8	3.2	4.1
	Arsenate, filtered, $\mu\text{g-As}/\text{L}$	2	2.2	--	--	--	2.3
	Arsenite, filtered, $\mu\text{g-As}/\text{L}$	2	unable to calculate, fewer than 3 uncensored values.				
	Barium, filtered, $\mu\text{g}/\text{L}$	10	227	250	286	369	411.3
	Chromium, filtered, $\mu\text{g}/\text{L}$	10	<0.12	0.02 (<0.12)*	0.09 (<0.12)*	0.67	1.2
	Boron, filtered, $\mu\text{g}/\text{L}$	10	44	55.86	65	70	79
	Iron, filtered, $\mu\text{g}/\text{L}$	10	<8	16	108	183	277
	Lithium, filtered, $\mu\text{g}/\text{L}$	10	13.89	17.2	17.9	20.3	20.9
	Manganese, filtered, $\mu\text{g}/\text{L}$	10	<3.8	2.9 (<3.8)*	9.4	12.7	36.4
	Molybdenum, filtered, $\mu\text{g}/\text{L}$	10	1.4	1.7	1.85	2	2.3
	Selenium, filtered, $\mu\text{g}/\text{L}$	10	<0.04	0.07	0.36	1.0	12.7
	Strontium, filtered, $\mu\text{g}/\text{L}$	10	431	477.9	603	640	704
	Vanadium, filtered, $\mu\text{g}/\text{L}$	10	<0.16	0.12 (<0.16)*	0.42	2.4	3.8
	Alpha radioactivity, 30-day count, filtered, pCi/L	10	2.41	2.70	7.45	12.4	16.5
	Alpha radioactivity, 72-hour count, filtered, pCi/L	10	5.03	6.8	8.1	8.8	14.7
Beta radioactivity, 30-day count, filtered, pCi/L	10	1.76	2.48	3.36	5.33	7.5	
Beta radioactivity, 72-hour count, filtered, pCi/L	10	1.99	2.84	3.25	3.66	3.91	
Radium-226, filtered, pCi/L	5	0.676	0.978	1.60	1.65	2.60	
Radon-222, unfiltered, pCi/L	2	570	--	--	--	870	
Uranium (natural), filtered, $\mu\text{g}/\text{L}$	10	0.12	0.32	1.00	1.32	10.1	
MiddleEVGL	ORP, millivolts	16	-173	-148	-137	-84.6	167
	Dissolved oxygen (DO), mg/L	19	<0.10	0.03 (<0.10)*	0.13	0.39	4.2
	Turbidity, NTRU	19	0.1	0.1	0.1	0.2	0.5
	pH, standard units	19	7.5	7.6	7.6	7.7	7.9
	Specific conductance, $\mu\text{S}/\text{cm}$ at 25°C	19	314	325	332	485	575
	Temperature, water, °C	19	25.1	25.2	25.7	26.5	28.9
	Alkalinity, mg/L as $\text{CaCO}_3$	19	126	131	136	169	276
	Bicarbonate, field, mg/L	19	154	160	166	205	333
	Calcium, filtered, mg/L	19	14.4	35.8	38	40.5	46.4
	Magnesium filtered, mg/L	19	3.1	3.43	3.85	5.22	7.95
	Potassium filtered, mg/L	19	1.82	2.19	2.35	2.42	2.68
	Sodium filtered, mg/L	19	14.2	19.8	25.7	47.9	110
	Bromide filtered, mg/L	19	0.06	0.07	0.08	0.13	0.14
	Chloride filtered, mg/L	19	15.3	17.7	20.6	35.8	43.7
	Fluoride filtered, mg/L	19	0.12	0.15	0.18	0.27	0.65
	Silica filtered, mg/L as $\text{SiO}_2$	19	16.2	21.1	23.1	24.8	26.7
	Sulfate filtered, mg/L	19	3.19	6.94	10.4	11.7	17.2
	ROE, dried at 180 °C, filtered, mg/L	19	175	190	200	272	340
	Arsenic, filtered, $\mu\text{g}/\text{L}$	19	0.58	1.4	1.7	3.0	4.9
	Arsenate, filtered, $\mu\text{g-As}/\text{L}$	14	<0.8	0.29 (<0.8)*	0.48 (<0.8)*	0.78 (<0.8)*	1.7
	Arsenite, filtered, $\mu\text{g-As}/\text{L}$	14	<1.0	1.0	1.6	2.5	4.2
	Barium, filtered, $\mu\text{g}/\text{L}$	19	195	241	278	323	337
	Chromium, filtered, $\mu\text{g}/\text{L}$	19	<0.06	0.26	0.40	0.58	1.2
	Boron, filtered, $\mu\text{g}/\text{L}$	19	20	31	38	59	173
	Iron, filtered, $\mu\text{g}/\text{L}$	19	<6	29	114	175	448
	Lithium, filtered, $\mu\text{g}/\text{L}$	19	5	6.5	8.3	19.5	24.2
	Manganese, filtered, $\mu\text{g}/\text{L}$	19	<0.2	9.2	18.6	65.7	109
	Molybdenum, filtered, $\mu\text{g}/\text{L}$	19	1.4	1.9	2.4	3.9	7.3
	Selenium, filtered, $\mu\text{g}/\text{L}$	19	<0.03	0.01 (<0.03)*	0.06 (<0.08)*	0.11	1.0
	Strontium, filtered, $\mu\text{g}/\text{L}$	19	233	252	294	407	683
	Vanadium, filtered, $\mu\text{g}/\text{L}$	19	<0.04	0.01 (<0.04)*	0.04 (<0.08)*	0.20	2.6
	Alpha radioactivity, 30-day count, filtered, pCi/L	19	R-0.47	R-0.03	1.19	3.68	6.3
	Alpha radioactivity, 72-hour count, filtered, pCi/L	19	R0.75	2.58	4.36	5.40	6.10
Beta radioactivity, 30-day count, filtered, pCi/L	19	1.31	2.20	2.75	3.80	8.30	
Beta radioactivity, 72-hour count, filtered, pCi/L	19	1.97	2.42	3.00	3.38	6.60	
Radium-226, filtered, pCi/L	14	0.262	0.397	0.598	0.912	2.66	
Radon-222, unfiltered, pCi/L	14	240	370	500	760	1,140	
Uranium (natural), filtered, $\mu\text{g}/\text{L}$	19	<0.04	0.02 (<0.04)*	0.06	0.38	3.97	

**Appendix 4C.** Summary statistics for physicochemical properties, major ions, arsenic, 11 trace elements, and selected radionuclide analyses of water samples collected from 91 municipal supply wells in Houston, Texas, grouped by aquifer designation, 2007–11—Continued.

Aquifer Designation	Constituents	Number	Min	1st	Med	3rd	Max
LowerEVGL	ORP, millivolts	4	-212	-210	-206	-167	-131
	Dissolved oxygen (DO), mg/L	4	unable to calculate, fewer than 3 uncensored values.				
	Turbidity, NTRU	4	0.1	0.1	0.15	0.2	0.2
	pH, standard units	4	7.7	7.8	7.95	8.05	8.1
	Specific conductance, $\mu\text{S}/\text{cm}$ at 25°C	4	649	668.5	759	843	856
	Temperature, water, °C	4	24.1	26.1	28.9	29.8	29.9
	Alkalinity, mg/L as $\text{CaCO}_3$	4	222	228.5	274	318.5	324
	Bicarbonate, field, mg/L	4	267	276	333.5	388	394
	Calcium, filtered, mg/L	4	8.23	8.365	10.15	15.2	18.6
	Magnesium filtered, mg/L	4	1.99	2.04	2.38	3.885	5.1
	Potassium filtered, mg/L	4	1.8	1.81	1.865	2.195	2.48
	Sodium filtered, mg/L	4	108	122	157	180	182
	Bromide filtered, mg/L	4	0.22	0.235	0.26	0.295	0.32
	Chloride filtered, mg/L	4	54.5	68.8	83.2	84.35	85.4
	Fluoride filtered, mg/L	4	0.62	0.92	1.27	1.33	1.34
	Silica filtered, mg/L as $\text{SiO}_2$	4	14.2	14.65	15.4	17.45	19.2
	Sulfate filtered, mg/L	4	unable to calculate, fewer than 3 uncensored values.				
	ROE, dried at 180 °C, filtered, mg/L	4	379	382	435.5	491	496
	Arsenic, filtered, $\mu\text{g}/\text{L}$	4	7.8	8.95	12.7	19.4	23.5
	Arsenate, filtered, $\mu\text{g-As}/\text{L}$	3	unable to calculate, fewer than 3 uncensored values.				
	Arsenite, filtered, $\mu\text{g-As}/\text{L}$	3	7.0	7.0	9.3	14.9	14.9
	Barium, filtered, $\mu\text{g}/\text{L}$	4	110	117.5	135.5	233	320
	Chromium, filtered, $\mu\text{g}/\text{L}$	4	unable to calculate, fewer than 3 uncensored values.				
	Boron, filtered, $\mu\text{g}/\text{L}$	4	182	294.5	436	506.5	548
	Iron, filtered, $\mu\text{g}/\text{L}$	4	77	94	138	195	225
	Lithium, filtered, $\mu\text{g}/\text{L}$	4	17.7	20.45	23.3	23.6	23.8
	Manganese, filtered, $\mu\text{g}/\text{L}$	4	5.9	6.3	6.9	8.7	10.3
	Molybdenum, filtered, $\mu\text{g}/\text{L}$	4	5.7	6.85	10.45	15.5	18.1
	Selenium, filtered, $\mu\text{g}/\text{L}$	4	unable to calculate, fewer than 3 uncensored values.				
	Strontium, filtered, $\mu\text{g}/\text{L}$	4	202	209	219	364.5	507
	Vanadium, filtered, $\mu\text{g}/\text{L}$	4	0.08	0.10	0.14	0.17	0.19
	Alpha radioactivity, 30-day count, filtered, pCi/L	4	R-0.94	R-0.59	1.13	3.47	4.43
	Alpha radioactivity, 72-hour count, filtered, pCi/L	4	R-1.1	0.04	1.80	4.50	6.60
	Beta radioactivity, 30-day count, filtered, pCi/L	4	R-0.78	0.02	1.35	2.50	3.11
	Beta radioactivity, 72-hour count, filtered, pCi/L	4	1.48	1.72	2.03	2.91	3.73
	Radium-226, filtered, pCi/L	3	0.204	0.204	0.273	0.281	0.281
	Radon-222, unfiltered, pCi/L	3	630	630	700	800	800
	Uranium (natural), filtered, $\mu\text{g}/\text{L}$	4	unable to calculate, fewer than 3 uncensored values.				

\*Regression on order statistics of log-transformed data statistical method estimates interquartile range below a single reporting limit and between multiple reporting limits.

**Appendix 4D.** Summary statistics for major ions, arsenic, arsenic species, selected trace elements and selected radionuclide analyses of water samples collected from 91 municipal supply wells in Houston, Texas, 2007–11, grouped by reduction-oxidation category and anoxic process.

[min, minimum; 1st, 25th percentile; med, median; 3rd, 75th percentile; max, maximum; CH4gen, methanogenic-anoxic process; mg/L, milligrams per liter; SiO<sub>2</sub>, silicon dioxide; ROE, residue on evaporation; °C, degrees celsius; µg/L, micrograms per liter; µg-As/L, micrograms arsenic per liter; pCi/L, picocuries per liter; R, nondetect, result below sample specific critical level(ssL<sub>c</sub>); <, less than]

Redox category	Constituents	Number	Min	1st	Med	3rd	Max
<b>Anoxic (CH4gen)</b>	Bicarbonate, field, mg/L	3	267	267	382	394	394
	Calcium, filtered, mg/L	3	8.23	8.23	8.50	11.8	11.8
	Magnesium filtered, mg/L	3	1.99	1.99	2.09	2.67	2.67
	Potassium filtered, mg/L	3	1.80	1.80	1.82	1.91	1.91
	Sodium filtered, mg/L	3	136	136	178	182	182
	Bromide filtered, mg/L	3	0.25	0.25	0.27	0.32	0.32
	Chloride filtered, mg/L	3	83.1	83.1	83.3	85.4	85.4
	Fluoride filtered, mg/L	3	1.22	1.22	1.32	1.34	1.34
	Silica filtered, mg/L as SiO <sub>2</sub>	3	14.2	14.2	15.1	15.7	15.7
	Sulfate filtered, mg/L	3	unable to compute, fewer than 3 uncensored values.				
	ROE, dried at 180 °C, filtered, mg/L	3	379	379	486	496	496
	Arsenic, filtered, µg/L	3	7.8	7.8	10.1	15.3	15.3
	Arsenate, filtered, µg-As/L	3	unable to compute, fewer than 3 uncensored values.				
	Arsenite, filtered, µg-As/L	3	7.00	7.00	9.30	14.9	14.9
	Iron, filtered, µg/L	3	77	77	112	165	165
	Manganese, filtered, µg/L	3	5.9	5.9	7.1	10.3	10.3
	Alpha radioactivity, 30-day count, filtered, pCi/L	3	R-0.94	R-0.94	R-0.24	2.50	2.50
	Alpha radioactivity, 72-hour count, filtered, pCi/L	3	R-1.1	R-1.1	1.19	2.40	2.40
	Beta radioactivity, 30-day count, filtered, pCi/L	3	R-0.78	R-0.78	R0.81	1.88	1.88
	Beta radioactivity, 72-hour count, filtered, pCi/L	3	1.48	1.48	1.96	2.09	2.09
	Radium-226, filtered, pCi/L	3	0.204	0.204	0.273	0.281	0.281
	Radon-222, unfiltered, pCi/L	3	630	630	700	800	800
Uranium (natural), filtered, µg/L	3	unable to compute, fewer than 3 uncensored values.					
<b>Anoxic</b>	Bicarbonate, field, mg/L	39	154	174	212	230	285
	Calcium, filtered, mg/L	39	16.1	35.3	38.3	44.5	65.9
	Magnesium filtered, mg/L	39	3.31	4.40	6.86	7.93	11.6
	Potassium filtered, mg/L	39	1.58	2.17	2.25	2.42	2.76
	Sodium filtered, mg/L	39	14.2	26.6	44.8	61.7	134
	Bromide filtered, mg/L	39	0.06	0.09	0.13	0.16	0.21
	Chloride filtered, mg/L	39	15.3	23.6	36.3	44.7	216
	Fluoride filtered, mg/L	39	0.11	0.19	0.27	0.34	0.65
	Silica filtered, mg/L as SiO <sub>2</sub>	39	16.2	20.0	22.2	23.5	27.4
	Sulfate filtered, mg/L	39	5.57	10.6	13.5	14.9	17.2
	ROE, dried at 180 °C, filtered, mg/L	39	182	216	279	299	612
	Arsenic, filtered, µg/L	39	0.58	1.6	2.8	3.4	5.2
	Arsenate, filtered, µg-As/L	13	unable to compute, fewer than 3 uncensored values.				
	Arsenite, filtered, µg-As/L	13	<1.00	1.20	1.60	2.50	4.20
	Iron, filtered, µg/L	39	29	107	148	260	612
	Manganese, filtered, µg/L	39	3.4	11.3	14.5	42.3	109
	Alpha radioactivity, 30-day count, filtered, pCi/L	39	R-0.47	1.19	3.73	7.20	20.4
	Alpha radioactivity, 72-hour count, filtered, pCi/L	39	R0.75	4.81	6.10	10.7	29.1
	Beta radioactivity, 30-day count, filtered, pCi/L	39	R0.16	2.36	3.01	3.80	8.30
	Beta radioactivity, 72-hour count, filtered, pCi/L	39	1.94	2.47	3.00	3.49	5.60
	Radium-226, filtered, pCi/L	25	0.371	0.733	1.57	2.39	4.34
	Radon-222, unfiltered, pCi/L	16	240	430	745	1,380	2,380
Uranium (natural), filtered, µg/L	39	<0.04	0.07	0.38	0.90	6.4	

**Appendix 4D.** Summary statistics for major ions, arsenic, arsenic species, selected trace elements and selected radionuclide analyses of water samples collected from 91 municipal supply wells in Houston, Texas, 2007–11, grouped by reduction-oxidation category—Continued.

Redox category	Constituents	Number	Min	1st	Med	3rd	Max	
<b>Suboxic</b>	Bicarbonate, field, mg/L	8	206	215	237	261	333	
	Calcium, filtered, mg/L	8	14.4	21.6	28.7	39.0	47.8	
	Magnesium filtered, mg/L	8	3.73	4.60	5.75	7.29	9.00	
	Potassium filtered, mg/L	8	1.59	1.76	1.88	1.99	2.14	
	Sodium filtered, mg/L	8	40.4	55.4	68.4	73.9	110	
	Bromide filtered, mg/L	8	0.10	0.12	0.12	0.13	0.14	
	Chloride filtered, mg/L	8	29.0	32.3	34.7	35.8	38.8	
	Fluoride filtered, mg/L	8	0.24	0.40	0.44	0.47	0.61	
	Silica filtered, mg/L as SiO <sub>2</sub>	8	17.5	19.9	22.1	25.4	31.0	
	Sulfate filtered, mg/L	8	10.5	13.2	13.7	15.1	15.5	
	ROE, dried at 180 °C, filtered, mg/L	8	282	286	293	311	340	
	Arsenic, filtered, µg/L	8	2.7	3.1	4.0	4.8	5.1	
	Arsenate, filtered, µg-As/L	0	--	--	--	--	--	
	Arsenite, filtered, µg-As/L	0	--	--	--	--	--	
	Iron, filtered, µg/L	8	<3	5 (<6)*	7	12	22	
	Manganese, filtered, µg/L	8	<3.8	3.5(<3.8)*	4.4	7.1	8.3	
	Alpha radioactivity, 30-day count, filtered, pCi/L	8	4.26	4.66	6.60	7.60	8.40	
	Alpha radioactivity, 72-hour count, filtered, pCi/L	8	4.36	7.06	9.65	12.05	15.48	
	Beta radioactivity, 30-day count, filtered, pCi/L	8	2.31	3.22	4.50	5.24	5.90	
	Beta radioactivity, 72-hour count, filtered, pCi/L	8	1.97	2.43	2.65	3.10	3.47	
	Radium-226, filtered, pCi/L	0	--	--	--	--	--	
	Radon-222, unfiltered, pCi/L	0	--	--	--	--	--	
	Uranium (natural), filtered, µg/L	8	0.38	1.54	3.14	7.00	13.3	
	<b>Mixed (oxic-anoxic)</b>	Bicarbonate, field, mg/L	8	193	204	212	252	285
		Calcium, filtered, mg/L	8	18.6	44.9	48.0	51.3	69.9
Magnesium filtered, mg/L		8	5.10	6.25	7.26	11.1	12.0	
Potassium filtered, mg/L		8	1.56	2.08	2.24	2.39	2.57	
Sodium filtered, mg/L		8	31.1	34.1	35.8	45.0	108	
Bromide filtered, mg/L		8	0.09	0.14	0.16	0.18	0.22	
Chloride filtered, mg/L		8	27.3	41.6	47.2	52.4	62.6	
Fluoride filtered, mg/L		8	0.18	0.20	0.22	0.23	0.62	
Silica filtered, mg/L as SiO <sub>2</sub>		8	19.2	23.4	24.5	24.7	31.6	
Sulfate filtered, mg/L		8	4.93	9.42	11.4	12.8	13.1	
ROE, dried at 180 °C, filtered, mg/L		8	253	276	289	318	385	
Arsenic, filtered, µg/L		8	1.3	2.2	2.4	2.8	23.5	
Arsenate, filtered, µg-As/L		2	unable to compute, fewer than 3 uncensored values.					
Arsenite, filtered, µg-As/L		2	unable to compute, fewer than 3 uncensored values.					
Iron, filtered, µg/L		8	10	31	48	84	225	
Manganese, filtered, µg/L		8	<3.8	4.4	6.1	8.1	10.9	
Alpha radioactivity, 30-day count, filtered, pCi/L		8	4.00	4.22	8.40	15.6	25.5	
Alpha radioactivity, 72-hour count, filtered, pCi/L		8	6.60	10.9	13.4	23.0	39.7	
Beta radioactivity, 30-day count, filtered, pCi/L		8	3.11	3.68	4.50	7.98	14.4	
Beta radioactivity, 72-hour count, filtered, pCi/L		8	2.09	2.93	3.73	3.92	4.29	
Radium-226, filtered, pCi/L		1	0.978	--	--	--	0.978	
Radon-222, unfiltered, pCi/L		1	870	--	--	--	870	
Uranium (natural), filtered, µg/L		8	0.32	3.74	5.70	17.6	42.7	
<b>Oxic</b>		Bicarbonate, field, mg/L	33	154	206	218	230	292
		Calcium, filtered, mg/L	33	28.8	42.2	49.5	54.3	69.7
	Magnesium filtered, mg/L	33	3.10	7.08	8.64	9.33	12.3	
	Potassium filtered, mg/L	33	1.47	1.85	1.98	2.31	2.68	
	Sodium filtered, mg/L	33	19.8	33.9	38.3	44.0	64.4	
	Bromide filtered, mg/L	33	0.07	0.13	0.14	0.16	0.19	
	Chloride filtered, mg/L	33	19.2	36.6	42.9	47.2	56.6	
	Fluoride filtered, mg/L	33	<0.12	0.20	0.22	0.24	0.39	
	Silica filtered, mg/L as SiO <sub>2</sub>	33	21.8	25.0	26.2	28.2	32.1	
	Sulfate filtered, mg/L	33	3.19	8.61	9.88	12.1	14.8	
	ROE, dried at 180 °C, filtered, mg/L	33	175	283	301	307	334	
	Arsenic, filtered, µg/L	33	0.86	2.20	2.50	3.40	4.56	
	Arsenate, filtered, µg-As/L	13	0.77	1.70	2.40	2.70	3.53	
	Arsenite, filtered, µg-As/L	13	unable to compute, fewer than 3 uncensored values.					
	Iron, filtered, µg/L	33	<3	3 (<6)*	4 (<6)*	7 (<8)*	27	
	Manganese, filtered, µg/L	33	<0.2	0.3(<3.8)*	0.9(<3.8)*	1.6(<3.8)*	12.0	
	Alpha radioactivity, 30-day count, filtered, pCi/L	33	R-0.19	4.9	6.0	8.6	20.9	
	Alpha radioactivity, 72-hour count, filtered, pCi/L	33	2.75	10.3	12.5	15.9	22.2	
	Beta radioactivity, 30-day count, filtered, pCi/L	33	R-1.04	3.06	4.13	5.59	10.4	
	Beta radioactivity, 72-hour count, filtered, pCi/L	33	1.97	2.62	3.17	3.68	6.60	
	Radium-226, filtered, pCi/L	12	0.262	0.393	0.733	0.812	1.65	
	Radon-222, unfiltered, pCi/L	11	161	273	380	560	1,200	
	Uranium (natural), filtered, µg/L	33	0.38	3.91	6.48	7.82	20.3	

\*Regression on order statistics of log-transformed data statistical method estimates interquartile range below a single reporting limit and between multiple reporting limits.