

Prepared in cooperation with the West Virginia Department of Health and Human Resources, Bureau for Public Health, Office of Environmental Health Services, Environmental Engineering Division, and the West Virginia Department of Environmental Protection, Division of Water and Waste Management

Dissolved-Gas Concentrations in Ground Water in West Virginia, 1997–2005

Data Series 156

Dissolved-Gas Concentrations in Ground Water in West Virginia, 1997–2005

By Jeremy S. White and Melvin V. Mathes

Prepared in cooperation with the West Virginia Department of Health and Human Resources, Bureau for Public Health, Office of Environmental Health Services, Environmental Engineering Division, and the West Virginia Department of Environmental Protection, Division of Water and Waste Management

Data Series 156

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

U.S. Department of the Interior
Gale A. Norton, Secretary

U.S. Geological Survey
P. Patrick Leahy, Acting Director

U.S. Geological Survey, Reston, Virginia: 2006

For more information about the USGS and its products:

Telephone: 1-888-ASK-USGS

World Wide Web: <http://www.usgs.gov/>

Any use of trade, product, or firm names in this publication is for descriptive purposes only and does not imply endorsement by the U.S. Government.

Although this report is in the public domain, permission must be secured from the individual copyright owners to reproduce any copyrighted materials contained within this report.

Suggested citation:

White, J.S., and Mathes, M.V., 2006, Dissolved-gas concentrations in ground water in West Virginia, 1997–2005: U.S. Geological Survey Data Series 156, 8 p.

Contents

Abstract.....	1
Introduction.....	1
Data-Collection Methods.....	1
Summary.....	2
References Cited.....	2

Figure

1. Map showing sampling locations	3
---	---

Table

1. Summary of averaged dissolved-gas compositions in water samples from wells and springs in West Virginia, 1997–2005.....	4
--	---

Conversion Factors, Datum, and Abbreviations

Multiply	By	To obtain
foot (ft)	0.3048	meter (m)
cubic centimeter (cm ³)	0.06102	cubic inch (in ³)
liter (L)	0.2642	gallon (gal)

Vertical coordinate information is referenced to the National Geodetic Vertical Datum of 1929 (NGVD 29). Recharge elevation, as used in this report, refers to distance above the vertical datum.

Concentrations of gases are given in milligrams per liter (mg/L).

Dissolved-Gas Concentrations in Ground Water in West Virginia, 1997–2005

By Jeremy S. White and Melvin V. Mathes

Abstract

Dissolved-gas samples were collected from 170 wells and 1 spring in West Virginia during 1997–2005. Gas concentrations in milligrams per liter ranged from 3.66 to 53.98 for nitrogen, 0.150 to 1.234 for argon, 0.00 to 9.11 for oxygen, 0.2 to 198.8 for carbon dioxide, and 0.00 to 68.50 for methane.

Introduction

This report presents previously unpublished dissolved-gas data for nitrogen (N_2), argon (Ar), oxygen (O_2), carbon dioxide (CO_2), and methane (CH_4) from ground water collected in water wells and one spring in West Virginia during 1997–2005. Sample sites (fig. 1) included both public-supply and privately owned wells. Samples were taken from untreated water and were collected as part of several hydrologic studies including the Allegheny-Monongahela National Water Quality Assessment (NAWQA) (Anderson and others, 2000), the Kanawha-New River NAWQA (Paybins and others, 2000), the West Virginia Ambient Ground-Water-Quality-Monitoring Network (Kozar and Brown, 1995), a current ground-water investigation in Leetown, W. Va., and an additional 30 samples collected during this investigation to supplement deficiencies in sampling coverage. Additional water-quality parameters were collected at most sites, and sample data for 1997–2004 are published in eight Water Resources Data reports for West Virginia (Ward and others, 1998–2005). These reports contain data for major ions, nutrients, trace metals, pesticides, indicator bacteria, and VOCs (volatile organic compounds). Water-quality data collected in 2005 were not published at the time of this report.

Data-Collection Methods

Wells were sampled by connecting a flowthrough chamber and sampling lines to the raw-water tap closest to the wellhead so that field measurements and water samples could be obtained without exposing the ground water to the atmosphere. Prior to sample collection, wells were purged for several minutes until field measurements stabilized (Koterba and others, 1995). Dissolved-gas samples were collected by placing a water line into the bottom of a 160-cm³ septum bottle and filling the bottle to overflowing. The septum bottle while still overflowing was then submerged into a 2-L plastic beaker that had been previously filled with ground water from the sampling site. Then the sample line was removed, and all air bubbles adhering to the sides of the bottle were allowed to escape. A rubber stopper through which a syringe needle had been inserted was then pushed tightly into the bottle, and the needle was withdrawn while the bottle was still submerged in the beaker (U.S. Geological Survey, 2005b). Multiple bottles were filled to safeguard against bottle breakage or contamination. Filled bottles were shipped inverted and chilled to the U.S. Geological Survey Chlorofluorocarbon Laboratory (Reston, Va.). Water temperature and estimated elevation of recharge to the well were submitted with the samples to aid the laboratory analysis. All samples received in good condition were analyzed using dual gas chromatography (U.S. Geological Survey, 2005a). Average values for dissolved-gas concentrations are reported for each ground-water sampling site (table 1). N_2 concentrations ranged from 3.66 to 53.98 mg/L, Ar from 0.150 to 1.234 mg/L, O_2 from 0.00 to 9.11 mg/L, CO_2 from 0.2 to 198.8 mg/L, and CH_4 from 0.00 to 68.50 mg/L.

Summary

The data presented in this report were collected during 1997–2005 as part of the Allegheny-Monongahela NAWQA, the Kanawha-New River NAWQA, the West Virginia Ambient Ground-Water-Quality-Monitoring Network, ground-water studies in Leetown, W. Va., and during this investigation. N₂ concentrations ranged from 3.66 to 53.98 mg/L, Ar from 0.150 to 1.234 mg/L, O₂ from 0.00 to 9.11 mg/L, CO₂ from 0.2 to 198.8 mg/L, and CH₄ from 0.00 to 68.50 mg/L.

References Cited

- Anderson, R.M., Beer, K.M., Buckwalter, T.F., Clark, M.E., McAuley, S.D., Sams, J.I., III, and Williams, D.R., 2000, Water quality in the Allegheny and Monongahela River Basins, Pennsylvania, West Virginia, New York, and Maryland, 1996–98: U.S. Geological Survey Circular 1202, 32 p.
- Koterba, M.T., Wilde, F.D., and Lapham, W.W., 1995, Ground-water 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.
- Kozar, M.D., and Brown, D.P., 1995, Location and site characteristics of the ambient ground-water-quality-monitoring network in West Virginia: U.S. Geological Survey Open-File Report 95–130, 48 p.
- Paybins, K.S., Messinger, Terence, Eychaner, J.H., Chambers, D.B., and Kozar, M.D., 2000, Water quality in the Kanawha-New River Basin, West Virginia, Virginia, and North Carolina, 1996–98: U.S. Geological Survey Circular 1204, 32 p.
- U.S. Geological Survey, 2005a, Analytical procedures for dissolved gas, accessed November 17, 2005, at <http://water.usgs.gov/lab/dissolved-gas/sampling/>
- U.S. Geological Survey, 2005b, Dissolved gas sampling instructions, accessed November 17, 2005, at <http://water.usgs.gov/lab/dissolved-gas/sampling/>
- Ward, S.M., Rosier, M.T., and Crosby, G.R., 2003, Water resources data, West Virginia, water year 2002: U.S. Geological Survey Water-Data Report WV–02–1, p. 238–245.
- Ward, S.M., Rosier, M.T., and Crosby, G.R., 2004, Water resources data, West Virginia, water year 2003: U.S. Geological Survey Water-Data Report WV–03–1, p. 260–273.
- Ward, S.M., Rosier, M.T., and Crosby, G.R., 2005, Water resources data, West Virginia, water year 2004: U.S. Geological Survey Water-Data Report WV–04–1, p. 252–261.
- Ward, S.M., Taylor, B.C., and Crosby, G.R., 1998, Water resources data, West Virginia, water year 1997: U.S. Geological Survey Water-Data Report WV–97–1, p. 342–351.
- Ward, S.M., Taylor, B.C., and Crosby, G.R., 1999, Water resources data, West Virginia, water year 1998: U.S. Geological Survey Water-Data Report WV–98–1, p. 446–454.
- Ward, S.M., Taylor, B.C., and Crosby, G.R., 2000, Water resources data, West Virginia, water year 1999: U.S. Geological Survey Water-Data Report WV–99–1, p. 239–250.
- Ward, S.M., Taylor, B.C., and Crosby, G.R., 2001, Water resources data, West Virginia, water year 2000: U.S. Geological Survey Water-Data Report WV–00–1, p. 239–255.
- Ward, S.M., Taylor, B.C., and Crosby, G.R., 2002, Water resources data, West Virginia, water year 2001: U.S. Geological Survey Water-Data Report WV–01–1, p. 240–249.

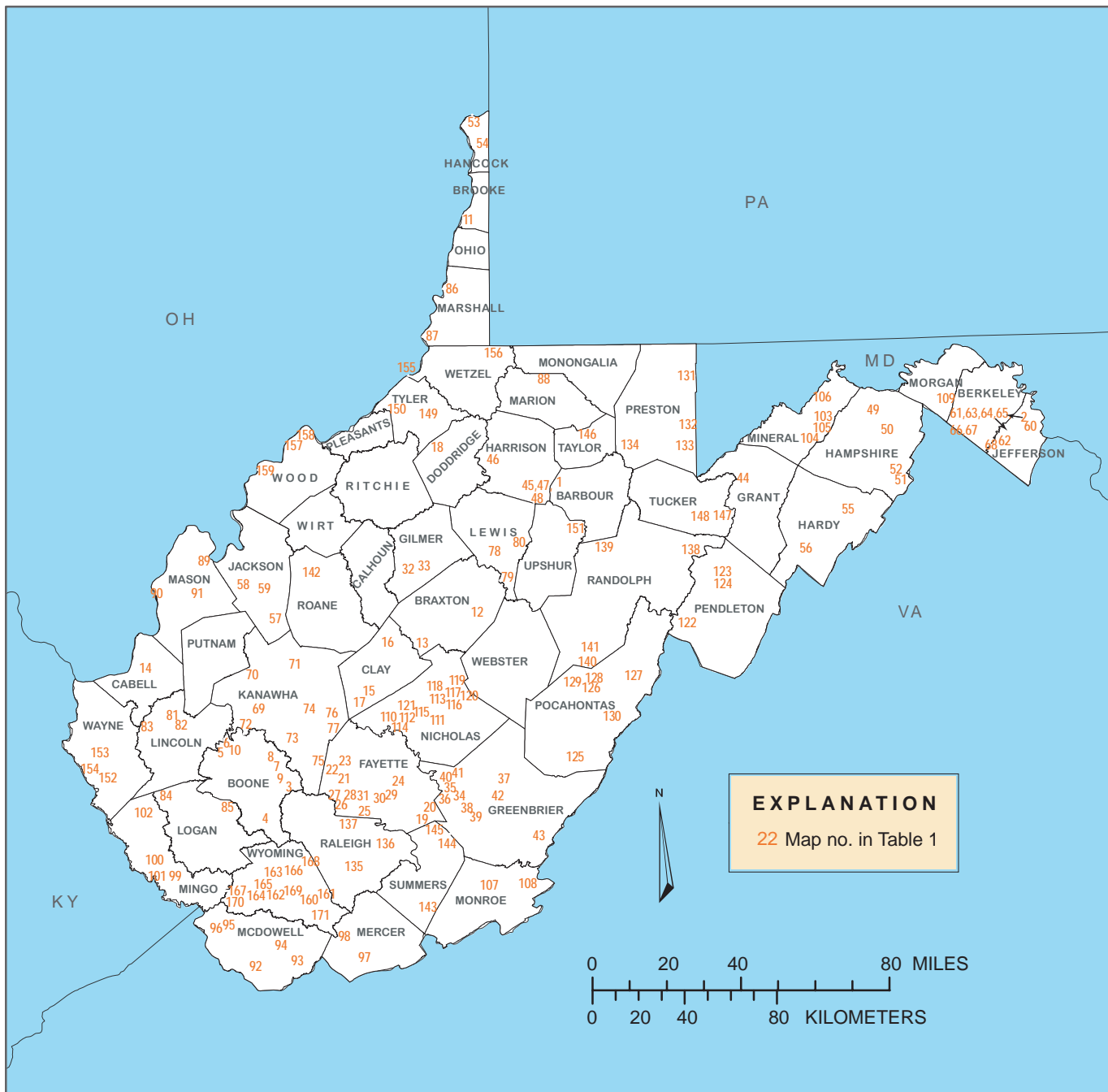


Figure 1. Sampling locations.

4 Dissolved-Gas Concentrations in Ground Water in West Virginia, 1997–2005

Table 1. Summary of averaged dissolved-gas compositions (nitrogen, argon, oxygen, carbon dioxide, and methane) in water samples from wells and springs in West Virginia, 1997–2005.

[Map no., general reference number for map; Rech. elev., recharge elevation is land surface; ft, feet; n_{dg}, number of dissolved-gas samples averaged; N₂, nitrogen; Ar, argon; O₂, oxygen; CO₂, carbon dioxide; CH₄, methane; mg/L, milligrams per liter; *, spring site]

Map no.	Station name	Date	Rech. elev. (ft)	n _{dg}	N ₂ (mg/L)	Ar (mg/L)	O ₂ (mg/L)	CO ₂ (mg/L)	CH ₄ (mg/L)
1	Bar-0149	8/18/2005	1,500	4	17.57	0.632	0.01	13.6	1.5370
2	Ber-0150	4/14/1999	520	1	22.51	0.736	0.93	53.5	0.0000
3	Boo-0253	6/3/1997	2,150	1	13.00	0.505	0.02	16.9	14.2564
4	Boo-0254	5/7/1997	2,200	2	17.24	0.628	0.10	4.2	22.7825
5	Boo-0256	5/4/1998	1,160	2	20.19	0.691	0.25	78.1	0.2789
6	Boo-0257	5/29/1998	1,180	2	7.95	0.291	0.00	113.2	12.1966
7	Boo-0258	5/6/1998	1,640	2	18.29	0.666	0.97	37.7	0.0000
8	Boo-0259	6/23/1998	1,560	2	24.68	0.887	0.00	5.8	8.2377
9	Boo-0260	5/15/1998	1,760	2	20.79	0.756	0.00	14.8	7.7542
10	Boo-0261	7/10/2003	980	3	6.51	0.249	0.00	9.1	37.1809
11	Brk-0077	3/16/2005	1,240	3	20.60	0.695	0.03	53.2	0.0094
12	Brx-0269	6/10/1997	1,400	1	21.55	0.738	0.15	23.1	0.0022
13	Brx-0270	6/9/1997	1,564	1	17.73	0.643	3.61	17.7	0.0000
14	Cab-0233	4/9/1999	900	1	21.56	0.722	0.00	6.4	0.6060
15	Cla-0141	5/8/1997	1,400	1	16.27	0.625	0.07	23.5	6.7144
16	Cla-0142	6/4/1997	1,220	1	10.43	0.371	0.05	4.5	5.1290
17	Cla-0143	6/9/2003	1,280	4	25.60	0.774	0.10	34.1	1.9190
18	Dod-0066	5/5/2004	1,080	4	21.67	0.673	0.03	2.4	0.1035
19	Fay-0233	7/20/2000	3,040	3	19.98	0.685	0.00	0.2	5.8524
20	Fay-0234	4/28/1999	2,880	1	49.10	1.234	5.46	2.6	0.0020
21	Fay-0242	7/11/2002	1,920	4	21.34	0.694	0.07	44.0	0.3059
22	Fay-0267	6/2/1997	2,345	1	20.09	0.689	0.00	26.2	0.0103
23	Fay-0270	5/22/1998	2,000	2	21.52	0.703	0.09	50.6	0.0318
24	Fay-0272	5/13/1998	2,480	2	19.37	0.686	0.07	77.6	0.0024
25	Fay-0274	5/21/1998	2,000	2	16.45	0.614	7.19	64.2	0.0000
26	Fay-0275	5/12/1998	2,440	2	17.50	0.653	3.94	16.8	0.0000
27	Fay-0276	5/8/1998	2,400	2	18.10	0.640	0.58	70.4	0.0000
28	Fay-0279	5/26/1998	2,240	2	24.07	0.767	0.38	42.4	0.4088
29	Fay-0281	8/1/2000	1,840	2	14.74	0.510	0.03	0.3	35.4037
30	Fay-0282	8/4/2000	1,840	2	18.73	0.644	0.00	17.1	2.7393
31	Fay-0285	8/10/2000	2,000	2	23.89	0.782	0.00	35.4	1.1943
32	Gil-0045	7/6/2000	1,160	3	19.89	0.644	0.00	17.0	8.1758
33	Gil-0198	7/6/2000	1,060	2	19.51	0.676	0.02	0.6	0.5395
34	Grb-0167	4/26/1999	3,440	2	22.51	0.746	0.30	24.9	0.3457
35	Grb-0172	6/22/2004	3,040	3	12.95	0.536	0.20	81.9	0.9788
36	Grb-0208	4/27/1999	3,080	1	23.04	0.737	0.26	62.8	0.2998
37	Grb-0280	5/13/1997	2,850	1	19.84	0.707	0.02	5.5	0.0007
38	Grb-0281	5/12/1997	2,600	1	20.77	0.700	0.06	4.1	0.0004

Table 1. Summary of averaged dissolved-gas compositions (nitrogen, argon, oxygen, carbon dioxide, and methane) in water samples from wells and springs in West Virginia, 1997–2005.—Continued

[Map no., general reference number for map; Rech. elev., recharge elevation is land surface; ft, feet; n_{dg} , number of dissolved-gas samples averaged; N_2 , nitrogen; Ar, argon; O_2 , oxygen; CO_2 , carbon dioxide; CH_4 , methane; mg/L, milligrams per liter; *, spring site]

Map no.	Station name	Date	Rech. elev. (ft)	n_{dg}	N_2 (mg/L)	Ar (mg/L)	O_2 (mg/L)	CO_2 (mg/L)	CH_4 (mg/L)
39	Grb-0283	5/19/1997	2,680	1	16.70	0.621	1.06	7.5	0.0000
40	Grb-0284	6/16/1998	3,320	1	26.48	0.818	1.13	46.5	0.0017
41	Grb-0285	4/27/1999	3,500	1	21.40	0.736	0.20	11.6	0.5438
42	Grb-0287	7/13/2000	2,440	2	21.76	0.696	0.08	13.6	0.1831
43	Grb-0291	3/24/2005	3,280	3	19.46	0.688	1.77	55.0	0.0035
44	Grt-0106	6/25/2003	3,600	4	20.64	0.674	0.05	16.8	0.2689
45	Har-0170	4/11/2005	1,600	3	20.61	0.703	0.00	12.8	2.3103
46	Har-0173	8/16/2005	1,300	4	18.17	0.638	0.00	3.9	14.9208
47	Har-0175	8/17/2005	1,400	4	20.99	0.715	0.06	6.0	0.0131
48	Har-0176	8/17/2005	1,460	4	22.27	0.763	0.11	0.3	7.0059
49	Hmp-0379	6/11/2001	1,240	4	19.89	0.744	0.58	23.8	0.0000
50	Hmp-0380	6/12/2001	1,220	4	22.62	0.751	0.07	13.1	0.0000
51	Hmp-0382	6/13/2001	1,220	2	30.66	0.942	0.09	54.2	0.0000
52	Hmp-0383	6/13/2001	1,700	4	20.33	0.727	0.07	16.4	0.0197
53	Hnc-0042	7/23/2002	1,200	4	21.06	0.718	0.27	9.3	0.0022
54	Hnc-0046	3/16/2005	1,260	3	22.50	0.770	0.07	31.5	0.9123
55	Hrd-0300	6/14/2001	1,780	4	23.11	0.743	0.08	33.4	0.0000
56	Hrd-0303	6/27/2005	2,250	4	22.66	0.749	0.07	10.3	0.0019
57	Jac-0166	5/27/1997	960	1	20.99	0.734	0.02	15.1	0.0000
58	Jac-0167	5/3/2004	820	4	25.63	0.813	0.10	1.2	0.0405
59	Jac-0168	6/14/2004	770	3	21.76	0.745	0.58	0.9	0.0000
60	Jef-0312	4/15/1999	480	1	23.06	0.797	8.08	15.9	0.0004
61*	Jef-0327S	9/14/2004	500	4	20.67	0.701	0.37	56.3	0.0000
62	Jef-0579	7/15/2002	600	4	18.36	0.650	5.29	75.5	0.0000
63	Jef-0581	7/16/2002	540	3	18.34	0.642	3.46	85.8	0.0000
64	Jef-0585	7/21/2004	540	4	21.17	0.691	0.06	39.5	0.0000
65	Jef-0590	9/16/2004	500	4	20.30	0.690	0.55	67.1	0.0000
66	Jef-0592	7/27/2004	540	4	20.79	0.676	1.26	56.7	0.0000
67	Jef-0603	9/16/2004	510	4	25.74	0.797	0.06	29.3	3.3090
68	Jef-0641	5/20/2004	540	4	24.79	0.777	0.06	42.3	0.0000
69	Kan-0927	5/28/1997	1,000	1	20.62	0.722	0.04	48.0	0.0000
70	Kan-0928	5/29/1997	700	1	20.47	0.707	0.06	2.4	1.0421
71	Kan-0932	5/5/1997	1,120	2	22.14	0.729	9.11	51.2	0.0002
72	Kan-0934	5/6/1997	870	2	16.15	0.622	0.03	30.0	4.9371
73	Kan-0935	5/5/1998	1,440	1	20.37	0.699	0.08	24.5	0.0042
74	Kan-0938	6/22/1998	1,580	2	19.45	0.677	0.29	16.7	0.3759
75	Kan-0939	6/26/2002	1,920	4	15.95	0.545	0.04	3.7	37.3493
76	Kan-0940	7/10/2002	1,580	4	22.85	0.723	0.09	113.0	0.3097

6 Dissolved-Gas Concentrations in Ground Water in West Virginia, 1997–2005

Table 1. Summary of averaged dissolved-gas compositions (nitrogen, argon, oxygen, carbon dioxide, and methane) in water samples from wells and springs in West Virginia, 1997–2005.—Continued

[Map no., general reference number for map; Rech. elev., recharge elevation is land surface; ft, feet; n_{dg}, number of dissolved-gas samples averaged; N₂, nitrogen; Ar, argon; O₂, oxygen; CO₂, carbon dioxide; CH₄, methane; mg/L, milligrams per liter; *, spring site]

Map no.	Station name	Date	Rech. elev. (ft)	n _{dg}	N ₂ (mg/L)	Ar (mg/L)	O ₂ (mg/L)	CO ₂ (mg/L)	CH ₄ (mg/L)
77	Kan-0941	7/11/2002	1,520	4	22.83	0.750	0.07	44.0	1.3788
78	Lew-0215	4/11/2005	1,300	3	21.40	0.723	0.00	11.4	0.2589
79	Lew-0217	3/10/2005	1,360	1	21.05	0.775	0.00	0.5	21.1730
80	Lew-0221	8/15/2005	1,280	4	10.39	0.395	0.00	15.4	22.6376
81	Lin-0179	4/6/1999	660	2	19.47	0.637	1.66	34.7	9.9004
82	Lin-0180	4/5/1999	1,000	1	21.38	0.730	1.24	11.5	6.0110
83	Lin-0185	6/3/2004	950	3	21.22	0.735	0.13	45.4	0.0968
84	Log-0198	4/8/1999	1,300	1	17.02	0.558	1.89	13.6	30.1577
85	Log-0220	7/10/2003	1,400	4	7.75	0.317	0.00	14.7	32.4456
86	Mal-0407	3/16/2005	1,160	3	20.32	0.713	4.13	29.8	0.0000
87	Mal-0409	3/17/2005	1,220	2	20.22	0.670	0.05	20.1	0.0025
88	Mar-0296	6/27/2000	1,440	2	20.40	0.687	0.08	42.7	0.0000
89	Mas-0917	5/11/1999	620	1	19.31	0.676	0.06	28.3	0.0000
90	Mas-0930	4/1/2005	780	3	20.98	0.686	0.70	73.9	0.0004
91	Mas-0960	4/1/2005	880	3	23.11	0.773	0.00	60.3	0.1248
92	Mcd-0042	5/13/1999	2,300	2	5.84	0.227	0.43	18.4	55.6290
93	Mcd-0048	6/17/2004	2,280	4	20.44	0.681	0.28	4.4	0.8544
94	Mcd-0109	5/19/1999	2,240	2	20.36	0.680	0.31	137.4	0.7071
95	Mcd-0149	5/13/1999	1,760	2	3.66	0.150	0.43	14.6	68.5010
96	Mcd-0202	5/12/2004	2,080	3	10.65	0.440	1.17	12.3	24.2676
97	Mer-0162	8/2/2000	2,600	2	27.72	0.868	0.03	19.7	0.3902
98	Mer-0163	7/18/2000	2,680	2	18.27	0.635	0.00	41.3	2.0132
99	Mig-0140	5/18/1999	1,800	1	16.80	0.620	6.14	33.7	0.0006
100	Mig-0141	5/17/1999	1,800	2	11.53	0.416	0.32	8.6	47.2949
101	Mig-0142	5/13/2004	1,520	4	12.13	0.535	0.60	23.7	16.8967
102	Mig-0143	6/23/2005	1,450	4	12.41	0.515	0.00	6.5	34.5185
103	Min-0168	6/24/2003	840	4	32.13	0.940	1.34	52.0	0.0142
104	Min-0169	6/24/2003	960	4	28.58	0.903	0.14	32.9	0.0949
105	Min-0170	6/25/2003	860	4	25.48	0.789	0.06	50.0	0.0073
106	Min-0171	6/26/2003	1,960	1	20.95	0.712	4.83	19.2	0.0000
107	Mnr-0148	7/19/2000	2,240	2	19.02	0.653	3.18	26.0	0.0014
108	Mnr-0156	3/24/2005	3,200	3	22.57	0.741	0.04	2.7	0.0063
109	Mrg-0086	5/19/2004	1,020	4	28.01	0.872	0.10	71.1	0.0179
110	Nic-0207	6/5/1997	1,600	1	21.38	0.745	0.00	37.1	0.4314
111	Nic-0208	6/16/1997	2,200	1	20.95	0.739	0.03	32.3	1.9742
112	Nic-0209	6/8/1998	1,880	2	21.16	0.736	0.12	26.7	0.0717
113	Nic-0211	6/10/1998	2,480	2	16.08	0.620	0.00	37.5	5.4159
114	Nic-0212	5/19/1998	1,680	2	19.17	0.688	1.84	52.3	0.0000

Table 1. Summary of averaged dissolved-gas compositions (nitrogen, argon, oxygen, carbon dioxide, and methane) in water samples from wells and springs in West Virginia, 1997–2005.—Continued

[Map no., general reference number for map; Rech. elev., recharge elevation is land surface; ft, feet; n_{dg} , number of dissolved-gas samples averaged; N_2 , nitrogen; Ar, argon; O_2 , oxygen; CO_2 , carbon dioxide; CH_4 , methane; mg/L, milligrams per liter; *, spring site]

Map no.	Station name	Date	Rech. elev. (ft)	n_{dg}	N_2 (mg/L)	Ar (mg/L)	O_2 (mg/L)	CO_2 (mg/L)	CH_4 (mg/L)
115	Nic-0213	5/28/1998	2,200	2	25.13	0.779	0.21	78.0	0.1959
116	Nic-0214	6/3/1998	2,440	2	20.04	0.661	0.30	83.1	0.3831
117	Nic-0215	6/2/1998	2,440	2	23.88	0.819	0.00	11.6	6.2457
118	Nic-0217	6/12/1998	2,520	1	23.41	0.752	0.60	59.8	0.6122
119	Nic-0218	6/17/1998	2,560	1	18.13	0.630	3.12	198.8	0.0000
120	Nic-0219	6/4/1998	2,800	2	20.77	0.718	0.23	59.0	0.2528
121	Nic-0220	4/28/1999	2,120	1	20.02	0.705	1.40	6.8	7.6906
122	Pen-0145	8/7/2002	4,600	3	21.58	0.722	0.07	0.9	0.9386
123	Pen-0163	7/18/2002	2,840	4	18.36	0.656	1.59	23.2	0.0000
124	Pen-0164	8/6/2002	2,840	2	43.78	1.136	4.07	8.1	0.0000
125	Poc-0234	3/23/2005	3,000	3	22.51	0.729	0.00	7.2	1.8904
126	Poc-0257	5/20/1997	3,900	1	19.87	0.706	0.11	4.8	0.0000
127	Poc-0262	7/11/2000	3,360	2	21.10	0.717	0.21	8.2	0.0000
128	Poc-0263	7/8/2003	4,700	4	21.24	0.702	0.06	3.8	0.0000
129	Poc-0265	7/9/2003	3,600	3	17.12	0.623	2.78	1.4	0.0000
130	Poc-0266	3/23/2005	3,680	3	25.02	0.819	0.00	47.4	0.3520
131	Pre-0163	4/13/2005	2,660	3	18.08	0.666	8.03	52.0	0.0009
132	Pre-0164	4/12/2005	3,020	3	19.46	0.680	2.70	13.0	0.0083
133	Pre-0166	3/8/2005	2,840	4	20.12	0.684	0.06	16.3	0.0038
134	Pre-0171	4/12/2005	1,640	3	19.42	0.655	0.00	27.7	0.2865
135	Ral-0196	3/25/2005	2,680	3	17.77	0.652	1.32	130.1	0.0000
136	Ral-0220	5/13/1997	2,850	1	17.88	0.652	0.10	34.1	0.0000
137	Ral-0221	5/27/1998	2,584	2	15.93	0.576	0.07	77.5	0.0000
138	Ran-0260	3/10/2005	4,400	3	19.19	0.657	0.26	3.7	1.2004
139	Ran-0275	3/7/2005	2,120	2	19.06	0.669	0.06	18.3	0.1470
140	Ran-0276	6/19/2003	3,130	1	5.63	0.242	0.00	0.4	44.9857
141	Ran-0278	7/9/2003	2,800	3	18.22	0.639	0.16	0.6	8.5474
142	Roa-0093	4/11/2005	1,000	3	23.63	0.765	0.00	0.4	0.2310
143	Sum-0099	5/22/1997	1,956	1	19.14	0.683	0.22	28.9	0.0004
144	Sum-0103	6/18/1997	2,658	1	20.13	0.685	0.09	4.7	0.0024
145	Sum-0105	6/18/1998	2,380	1	32.88	0.918	2.54	41.1	0.0021
146	Tay-0127	4/12/2005	1,320	3	24.24	0.793	0.00	25.6	0.0473
147	Tuc-0124	3/9/2005	4,260	3	20.28	0.705	5.69	20.3	0.0000
148	Tuc-0125	3/9/2005	3,280	4	18.66	0.670	3.01	4.0	0.0000
149	Tyl-0092	5/5/2004	1,020	3	30.09	0.948	8.58	9.4	0.0000
150	Tyl-0093	5/6/2004	850	4	20.34	0.698	0.15	99.3	0.0002
151	Ups-0181	3/7/2005	2,060	4	19.90	0.691	0.13	54.2	0.0010

8 Dissolved-Gas Concentrations in Ground Water in West Virginia, 1997–2005

Table 1. Summary of averaged dissolved-gas compositions (nitrogen, argon, oxygen, carbon dioxide, and methane) in water samples from wells and springs in West Virginia, 1997–2005.—Continued

[Map no., general reference number for map; rech. elev., recharge elevation is land surface; ft, feet; n_{dg} , number of dissolved-gas samples averaged; N_2 , nitrogen; Ar, argon; O_2 , oxygen; CO_2 , carbon dioxide; CH_4 , methane; mg/L, milligrams per liter; *, spring site]

Map no.	Station name	Date	Rech. elev. (ft)	n_{dg}	N_2 (mg/L)	Ar (mg/L)	O_2 (mg/L)	CO_2 (mg/L)	CH_4 (mg/L)
152	Way-0140	3/22/2005	1,100	3	19.76	0.683	0.00	12.6	14.4221
153	Way-0143	3/22/2005	1,000	3	22.43	0.786	0.00	9.3	9.7212
154	Way-0146	3/22/2005	1,020	3	17.63	0.650	0.00	3.7	21.9988
155	Wet-0111	5/3/1999	1,220	1	22.24	0.729	0.07	111.3	0.0012
156	Wet-0133	4/13/2005	1,080	3	15.30	0.593	0.00	0.2	7.9887
157	Woo-0185	5/6/1999	700	1	22.26	0.759	0.07	25.6	0.0009
158	Woo-0196	4/29/1999	780	1	20.03	0.687	0.06	33.2	0.0014
159	Woo-0213	3/15/2005	700	4	18.74	0.649	1.23	23.3	0.0226
160	Wyo-0060	6/6/2001	2,240	2	15.16	0.524	0.00	3.5	23.5714
161	Wyo-0062	6/6/2001	2,120	4	53.98	1.124	0.14	40.1	18.2007
162	Wyo-0263	6/5/2001	1,880	4	13.82	0.449	0.00	16.5	34.6053
163	Wyo-0265	6/7/2001	1,800	3	19.70	0.645	0.01	47.9	7.0480
164	Wyo-0268	6/4/2001	1,560	1	8.37	0.322	0.00	12.8	57.4555
165	Wyo-0269	6/5/2001	1,720	3	13.97	0.496	0.00	15.9	35.3647
166	Wyo-0270	6/7/2001	2,520	4	18.58	0.669	0.03	44.0	3.4398
167	Wyo-0271	6/22/2005	1,170	4	18.00	0.645	0.00	29.5	11.8826
168	Wyo-0273	7/18/2005	2,360	4	19.46	0.679	0.08	27.4	0.0000
169	Wyo-0274	8/2/2005	2,050	4	17.87	0.674	0.09	23.5	6.1080
170	Wyo-0275	8/2/2005	1,800	4	19.33	0.679	0.00	32.6	0.5580
171	Wyo-0276	8/3/2005	2,500	4	18.37	0.630	0.15	38.6	2.6887

