

Table 1. Geologic and hydrostratigraphic units of Southern Maryland

[Modified from Hansen and Wilson, 1984; McCartan, 1989b; and Achmad and Hansen, 1997; Fm, formation]

ERATHEM	SYSTEM	SERIES	FORMATION	THICKNESS (feet)	LITHOLOGY	HYDROSTRATIGRAPHIC UNIT			
CENOZOIC	QUATERNARY	Holocene & Pleistocene	Lowland deposits	0-150	Sand, gravel, sandy clay, and clay.	SURFICIAL AQUIFER			
		NEOGENE	Pliocene	Upland deposits			0-85	Irregularly stratified cobbles, gravel, sand, and clay lenses.	
	Miocene			Chesapeake Group	Yorktown Fm.	0-20	Fine-grained glauconitic sand.	CHESAPEAKE CONFINING UNIT	
			Eastover Fm.		0.5-40	Clayey silt with thin laminae of silt, clay, or sand.			
			St. Marys Fm.		0-335	Sand, clayey sand, and sandy clay; fossiliferous and diatomaceous.			
			Choptank Fm.						
	Calvert Fm.								
	PALEOGENE	Oligocene		Old Church Fm.	0-5	Patchy distribution; clayey, glauconitic sand.	PINEY POINT AQUIFER		
		Eocene	Pamunkey Group	Piney Point Fm.	0-90	Sand, slightly glauconitic, with intercalated indurated layers; fossiliferous.			
				Nanjemoy Fm.	0-240	Glauconitic sand with clayey layers.	NANJEMOY CONFINING UNIT		
		Paleocene	Pamunkey Group	Marlboro Clay	0-30	Pink and gray clay.	AQUIA AQUIFER		
				Aquia Fm.	30-205	Glauconitic, greenish to brown sand with indurated layers; fossiliferous.			
	Brightseat Fm.		Brightseat Fm.	0-40	Gray to dark-gray micaceous silty and sandy clay.	BRIGHTSEAT CONFINING UNIT			
MESOZOIC	CRETACEOUS	Upper	Matawan Group	Monmouth Group	Formations undifferentiated		0-135	Sandy clay and sand, dark gray to black, with minor glauconite; fossiliferous.	
									?
		Lower	Potomac Group	Patapsco Fm.	0-1,200		Interbedded sand, clay, and sandy clay; color variegated, but chiefly hues of red, brown and gray; consists of several sandy intervals that function as separate aquifers.	Patapsco aquifer system UPPER PATAPSCO CONFINING UNIT UPPER PATAPSCO AQUIFER MIDDLE PATAPSCO CONFINING UNIT LOWER PATAPSCO AQUIFER	
				Arundel Fm.	0-400		Red, brown, and gray clay; in places contains ironstone nodules, carbonaceous remains, and lignite.		ARUNDEL CONFINING UNIT
				Patuxent Fm.	100-650		Interbedded gray and yellow sand and clay; kaolinized feldspar and lignite common. Locally clay layers predominate.		PATUXENT AQUIFER
				"Waste Gate Fm."	32*		Light gray to gray tan, fine to medium, clayey sands and clayey silts; feldspathic.		Not a fresh-water aquifer
		PALEOZOIC	Undifferentiated pre-Cretaceous consolidated-rock basement				Unknown	Igneous and metamorphic rocks; sandstone and shale.	NOT RECOGNIZED
		PRECAMBRIAN							

* at Lexington Park

Table 2. Construction and yield characteristics of the six test wells

[deg, degree; min, minute; sec, second; ft, feet; gal/min, gallons per minute; (gal/min)/ft, gallons per minute per foot; Md., Maryland]

Well number	State permit number	Location	Latitude Longitude (deg min sec)	Driller	Date completed	Altitude of land surface (ft above sea level)	Depth of hole (ft below land surface)
CA Db 96	CA-94-4191	Prince Frederick	38 32 44 76 35 42	A.C. Schultes of Md.	12/12/2002	151.56	1,660
CA Fd 85	CA-94-3305	Chesapeake Ranch Estates	38 22 36 76 25 54	Sydnor Hydrodynamics	11/14/2001	105.98	1,664
CH Bg 17	CH-94-5325	Malcolm	38 37 06 76 47 54	A.C. Schultes of Md.	3/3/2003	199.16	1,660
CH Cg 24	CH-94-4194	Hughesville	38 32 54 76 48 14	Sydnor Hydrodynamics	1/16/2002	171.04	1,667
SM Bc 39	SM-94-3921	Persimmon Hills	38 26 05 76 43 02	Sydnor Hydrodynamics	3/18/2002	161.54	1,600
SM Dd 72	SM-94-3616	Paw Paw Hollow	38 16 26 76 39 34	A.C. Schultes of Md.	5/16/2001	109.99	1,650

Well number	Depth of well (ft below land surface)	Screened intervals ¹ (ft below land surface)	Aquifer	Pumping test			
				Discharge (gal/min)	Static level (ft below land surface)	Drawdown at 24 hours (ft below land surface)	Specific capacity ((gal/min)/ft)
CA Db 96	970	930-960	Upper Patapsco	73.2	190.66	35.49	2.06
CA Fd 85	1,643	1,535-1,545 1,560-1,570 1,623-1,633	Lower Patapsco	82.5	120.51	18.24	4.52
CH Bg 17	1,353	1,299-1,314 1,328-1,343	Lower Patapsco	60.4	253.21	39.98	1.51
CH Cg 24	835	795-825	Upper Patapsco	56.3	219.25	33.90	1.66
SM Bc 39	1,542	1,492-1,512 1,522-1,532	Lower Patapsco	66.3	190.61	35.72	1.86
SM Dd 72	1,340	1,300-1,330	Lower Patapsco	70.0	131.00	28.51	2.46

¹ All casing and screen intervals are 4-inch diameter

Table 3. Estimated widths of sand bodies in the Patapsco Formation calculated from sand thickness for three types of fluvial channel deposits (from Fielding and Crane, 1987)

[ST_f, sand thickness (feet); ST_m, sand thickness (meters); CBW_m, channel belt width (meters); CBW_f, channel belt width (feet)]

		Average (Case 2a) ¹		Meandering (Case 2b) ²		Braided (Case 3) ³	
ST _f	ST _m	CBW _m	CBW _f	CBW _m	CBW _f	CBW _m	CBW _f
10.00	3.05	31	103	143	470	1,030	3,381
20.00	6.10	113	372	416	1,366	2,627	8,618
30.00	9.14	240	788	777	2,550	4,541	14,898
40.00	12.19	409	1,342	1,210	3,971	6,696	21,968
50.00	15.24	618	2,028	1,707	5,600	9,050	29,691

¹ Case 2a (average of all types)

$$CBW_m = 12.1 (0.55ST_m)^{1.85}$$

² Case 2b (meandering stream channels)

$$CBW_m = 64.6 (0.55ST_m)^{1.54}$$

³ Case 3 (braided stream channels)

$$CBW_m = 513 (0.55ST_m)^{1.35}$$

Table 4. Historical population of Calvert, Charles, and St. Mary's Counties

Historical population										
<u>County</u>	<u>1950</u> ¹	<u>1952</u> ²	<u>1960</u> ¹	<u>1970</u> ¹	<u>1980</u> ¹	<u>1982</u> ³	<u>1990</u> ¹	<u>1994</u> ⁴	<u>2000</u> ⁵	<u>2002</u> ⁶
Calvert	12,100	12,845	15,826	20,682	34,638	36,225	51,372	60,046	74,563	80,906
Charles	23,415	25,246	32,572	47,678	72,751	77,897	101,154	109,039	120,546	129,040
St. Mary's	29,111	31,072	38,915	47,388	59,895	61,697	75,974	79,998	86,211	90,044
Total	64,626	69,163	87,313	115,748	167,284	175,819	228,500	251,083	281,320	299,990

Population as a fraction of 2002 population										
<u>County</u>	<u>1950</u>	<u>1952</u>	<u>1960</u>	<u>1970</u>	<u>1980</u>	<u>1982</u>	<u>1990</u>	<u>1994</u>	<u>2000</u>	<u>2002</u>
Calvert	0.150	0.159	0.196	0.256	0.428	0.448	0.635	0.767	0.922	1.000
Charles	0.181	0.196	0.252	0.369	0.564	0.604	0.784	0.845	0.934	1.000
St. Mary's	0.323	0.345	0.432	0.526	0.665	0.685	0.844	0.888	0.957	1.000

Sources of population data:

¹ U.S. Census Bureau, 1995

² Interpolated from 1950 and 1960 data

³ U.S. Census Bureau, 1992

⁴ U.S. Census Bureau, 2000

⁵ U.S. Census Bureau, 2007

⁶ U.S. Census Bureau, 2003

Table 5. Projected population of Calvert, Charles, and St. Mary's Counties by election district

[See figures 57-61 for locations of election districts]

CALVERT Election District	Census population ¹ <u>2000</u>	Estimated population ² <u>2002</u>	Projected population ³ <u>2010</u>	Projected population ³ <u>2020</u>	Projected population ³ <u>2030</u>	Fraction of 2002 population		
						<u>2010</u>	<u>2020</u>	<u>2030</u>
1	29,552	32,066	32,995	34,387	35,686	1.03	1.07	1.11
2	22,769	24,706	29,311	31,433	33,162	1.19	1.27	1.34
3	22,242	24,134	28,695	30,180	31,152	1.19	1.25	1.29
Total	74,563	80,906	91,000	96,000	100,000	1.12	1.19	1.24
CHARLES Election District	Census population ¹ <u>2000</u>	Estimated population ² <u>2002</u>	Projected population ⁴ <u>2010</u>	Projected population ⁴ <u>2020</u>	Projected population ⁴ <u>2030</u>	Fraction of 2002 population		
						<u>2010</u>	<u>2020</u>	<u>2030</u>
1	11,997	12,842	13,732	15,152	16,606	1.07	1.18	1.29
2	1,912	2,047	2,119	2,325	2,553	1.04	1.14	1.25
3	3,169	3,392	3,376	3,579	3,853	1.00	1.06	1.14
4	4,774	5,110	5,837	7,851	9,846	1.14	1.54	1.93
5	3,682	3,941	3,958	4,209	4,509	1.00	1.07	1.14
6	62,532	66,938	82,192	107,996	120,145	1.23	1.61	1.79
7	11,859	12,695	12,564	14,379	16,329	0.99	1.13	1.29
8	12,603	13,491	13,236	14,956	16,912	0.98	1.11	1.25
9	4,784	5,121	7,017	8,970	10,431	1.37	1.75	2.04
10	3,234	3,462	3,369	3,583	3,816	0.97	1.03	1.10
Total	120,546	129,040	147,400	183,000	205,000	1.14	1.42	1.59
ST. MARY'S Election District	Census population ¹ <u>2000</u>	Estimated population ² <u>2002</u>	Projected population ⁵ <u>2010</u>	Projected population ⁵ <u>2020</u>	Projected population ⁵ <u>2030</u>	Fraction of 2002 population		
						<u>2010</u>	<u>2020</u>	<u>2030</u>
1	5,664	5,916	6,550	7,055	7,695	1.11	1.19	1.30
2	6,074	6,344	6,638	7,629	8,518	1.05	1.20	1.34
3	10,785	11,265	13,109	14,663	16,219	1.16	1.30	1.44
4	8,819	9,211	10,579	12,148	13,535	1.15	1.32	1.47
5	10,677	11,152	12,420	14,882	17,566	1.11	1.33	1.58
6	10,704	11,180	12,016	13,626	15,081	1.07	1.22	1.35
7	3,136	3,275	3,607	3,863	4,136	1.10	1.18	1.26
8	30,084	31,422	35,592	40,599	44,453	1.13	1.29	1.41
9	268	280	289	335	397	1.03	1.20	1.42
Total	86,211	90,044	100,800	114,800	127,600	1.12	1.27	1.42

¹ U.S. Census Bureau, 2007

² U.S. Census Bureau, 2003

³ Calvert County Department of Planning and Zoning, written commun., 2004

⁴ Charles County Department of Planning and Growth Management, written commun., 2004

⁵ St. Mary's County Department of Land Use and Growth Management, written commun., 2004

Table 6. Historical pumpage totals simulated in the ground-water flow model

	<u>Simulated pumpage, in million gallons per day¹</u>			
	<u>1901-1952</u>	<u>1953-1982</u>	<u>1983-1994</u>	<u>1995-2002</u>
<u>Calvert County</u>				
Major user				
Piney Point	0.00	0.27	0.18	0.20
Aquia	0.58	0.70	1.84	3.03
Magothy	0.00	0.09	0.10	0.12
Major-user Total	0.59	1.06	2.13	3.36
Domestic				
Piney Point	0.31	0.87	1.49	1.94
Aquia	0.15	0.42	0.71	0.93
Domestic Total	0.46	1.28	2.20	2.87
Calvert County Total	1.04	2.35	4.32	6.23
<u>Charles County</u>				
Major user				
Aquia	0.00	0.04	0.03	0.02
Magothy	0.00	2.59	2.31	2.99
Upper Patapsco	0.00	0.15	0.21	0.27
Lower Patapsco	1.12	2.14	5.88	5.73
Major-user Total	1.12	4.93	8.43	9.02
Domestic				
Aquia	0.33	1.02	1.43	1.70
Magothy	0.06	0.17	0.24	0.28
Upper Patapsco	0.06	0.20	0.27	0.32
Lower Patapsco	0.09	0.29	0.41	0.48
Domestic Total	0.55	1.68	2.36	2.79
Charles County Total	1.66	6.61	10.78	11.80
<u>St. Mary's County</u>				
Major user				
Piney Point	0.31	0.48	0.77	0.42
Aquia	1.64	2.72	3.74	4.54
Magothy	0.00	0.00	0.00	0.00
Upper Patapsco	0.00	0.02	0.06	0.32
Major-user Total	1.94	3.22	4.57	5.29
Domestic				
Piney Point	0.54	1.08	1.40	1.58
Aquia	0.38	0.75	0.97	1.09
Domestic Total	0.92	1.83	2.37	2.67
St. Mary's County Total	2.86	5.04	6.93	7.96
<u>Major users in other counties within model area</u>				
Piney Point	3.07	1.78	1.59	1.29
Aquia	0.39	1.13	1.24	1.93
Magothy	3.78	5.08	4.60	5.35
Upper Patapsco	1.42	3.83	4.22	3.26
Lower Patapsco	0.00	1.78	5.06	5.61
Total other counties	8.65	13.61	16.70	17.44
Model Total	14.22	27.61	38.75	43.43

¹ Discrepancies in totals are due to rounding.

Table 7a. Simulated pumpage, 2003-2010 (in million gallons per day)

[Discrepancies due to rounding]

	Simulation number											
	<u>1</u>	<u>2a</u>	<u>2b</u>	<u>3a</u>	<u>3b</u>	<u>4</u>	<u>5a</u>	<u>5b</u>	<u>6</u>	<u>7a</u>	<u>7b</u>	<u>8</u>
<u>Calvert County</u>												
Major users												
Piney Point	0.21	0.24	0.26	0.19	0.17	0.24	0.21	0.21	0.21	0.21	0.21	0.21
Aquia	3.30	3.63	3.96	2.97	2.64	3.16	2.63	1.96	3.30	3.30	3.30	3.30
Magothy	0.14	0.15	0.17	0.12	0.11	0.13	0.14	0.14	0.14	0.14	0.14	0.14
Upper Patapsco	0.00	0.00	0.00	0.00	0.00	0.00	0.67	1.34	0.00	0.00	0.00	0.00
Major-user Total	3.65	4.02	4.38	3.29	2.92	3.53	3.65	3.65	3.65	3.65	3.65	3.65
Domestic												
Piney Point	2.35	2.59	2.82	2.12	1.88	2.35	2.35	2.35	2.35	2.35	2.35	2.35
Aquia	1.20	1.32	1.44	1.08	0.96	1.20	1.20	1.20	1.20	1.20	1.20	1.20
Domestic Total	3.55	3.90	4.26	3.19	2.84	3.55	3.55	3.55	3.55	3.55	3.55	3.55
Hypothetical new users												
Upper Patapsco	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00
Lower Patapsco	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50
Hypothetical new users Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.50
Calvert County Total	7.20	7.92	8.64	6.48	5.76	7.08	7.20	7.20	7.70	7.20	7.20	7.70
<u>Charles County</u>												
Major users												
Aquia	0.03	0.03	0.04	0.03	0.02	0.08	0.02	0.02	0.03	0.03	0.03	0.03
Magothy	3.51	3.86	4.21	3.16	2.81	3.03	2.68	1.84	3.51	3.51	3.51	3.51
Upper Patapsco	0.28	0.31	0.34	0.26	0.23	0.33	0.28	0.28	0.28	0.28	0.28	0.28
Lower Patapsco	6.45	7.09	7.74	5.80	5.16	6.55	7.28	8.11	6.45	6.45	6.45	6.45
Major-user Total	10.27	11.30	12.33	9.25	8.22	10.00	10.26	10.25	10.27	10.27	10.27	10.27
Domestic												
Aquia	2.10	2.31	2.51	1.89	1.68	2.10	2.10	2.10	2.10	2.10	2.10	2.10
Magothy	0.35	0.39	0.42	0.32	0.28	0.35	0.35	0.35	0.35	0.35	0.35	0.35
Upper Patapsco	0.37	0.41	0.45	0.33	0.30	0.37	0.37	0.37	0.37	0.37	0.37	0.37
Lower Patapsco	0.53	0.58	0.64	0.48	0.42	0.53	0.53	0.53	0.53	0.53	0.53	0.53
Domestic Total	3.35	3.68	4.02	3.01	2.68	3.35	3.35	3.35	3.35	3.35	3.35	3.35
Hypothetical new users												
Lower Patapsco	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.75
Hypothetical new users Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.75
Charles County Total	13.62	14.98	16.35	12.26	10.90	13.35	13.61	13.60	14.62	13.62	13.62	14.37

Table 7a. Continued

	Simulation number											
	<u>1</u>	<u>2a</u>	<u>2b</u>	<u>3a</u>	<u>3b</u>	<u>4</u>	<u>5a</u>	<u>5b</u>	<u>6</u>	<u>7a</u>	<u>7b</u>	<u>8</u>
<u>St. Mary's County</u>												
Major users												
Piney Point	0.48	0.53	0.58	0.43	0.38	0.46	0.48	0.48	0.48	0.48	0.48	0.48
Aquia	5.02	5.52	6.02	4.52	4.02	4.67	4.03	3.04	5.02	5.04	5.06	5.02
Magothy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Upper Patapsco	0.36	0.40	0.44	0.33	0.29	0.41	1.36	2.35	0.36	0.36	0.36	0.36
Major-user Total	5.87	6.45	7.04	5.28	4.69	5.55	5.87	5.87	5.87	5.89	5.91	5.87
Domestic												
Piney Point	1.81	1.99	2.17	1.63	1.45	1.81	1.81	1.81	1.81	1.81	1.81	1.81
Aquia	1.28	1.41	1.54	1.15	1.03	1.28	1.28	1.28	1.28	1.28	1.28	1.28
Domestic Total	3.09	3.40	3.71	2.78	2.47	3.09	3.09	3.09	3.09	3.09	3.09	3.09
Hypothetical new users												
Upper Patapsco	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.92
Hypothetical new users Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.20
St. Mary's County Total	8.96	9.85	10.75	8.06	7.16	8.64	8.96	8.96	9.16	8.98	9.00	9.16
Major users in other counties <u>within model area</u>												
Piney Point	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29
Aquia	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93
Magothy	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37
Upper Patapsco	3.26	3.26	3.26	3.26	3.26	3.26	3.26	3.26	3.26	3.26	3.26	3.26
Lower Patapsco	5.59	5.59	5.59	5.59	5.59	5.59	5.59	5.59	5.59	5.59	5.59	5.59
Total other counties	17.44	17.44	17.44	17.44	17.44	17.44	17.44	17.44	17.44	17.44	17.44	17.44
Model Total	47.22	50.20	53.18	44.25	41.27	46.51	47.21	47.21	48.92	47.25	47.27	48.67

Table 7b. Simulated pumpage, 2011-2020 (in million gallons per day)

[Discrepancies due to rounding]

	Simulation number											
	<u>1</u>	<u>2a</u>	<u>2b</u>	<u>3a</u>	<u>3b</u>	<u>4</u>	<u>5a</u>	<u>5b</u>	<u>6</u>	<u>7a</u>	<u>7b</u>	<u>8</u>
<u>Calvert County</u>												
Major users												
Piney Point	0.22	0.25	0.27	0.20	0.18	0.28	0.22	0.22	0.22	0.22	0.22	0.22
Aquia	3.44	3.78	4.13	3.09	2.75	3.31	2.73	2.03	3.44	3.44	3.44	3.44
Magothy	0.14	0.16	0.17	0.13	0.11	0.14	0.14	0.14	0.14	0.14	0.14	0.14
Upper Patapsco	0.00	0.00	0.00	0.00	0.00	0.00	0.71	1.41	0.00	0.00	0.00	0.00
Major-user Total	3.81	4.19	4.57	3.43	3.05	3.73	3.81	3.81	3.81	3.81	3.81	3.81
Domestic												
Piney Point	2.48	2.73	2.98	2.24	1.99	2.48	2.48	2.48	2.48	2.48	2.48	2.48
Aquia	1.27	1.40	1.52	1.14	1.02	1.27	1.27	1.27	1.27	1.27	1.27	1.27
Domestic Total	3.75	4.13	4.50	3.38	3.00	3.75	3.75	3.75	3.75	3.75	3.75	3.75
Hypothetical new users												
Upper Patapsco	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00
Lower Patapsco	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50
Hypothetical new users Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.50
Calvert County Total	7.56	8.32	9.07	6.80	6.05	7.49	7.56	7.56	8.06	7.56	7.56	8.06
<u>Charles County</u>												
Major users												
Aquia	0.04	0.04	0.05	0.03	0.03	0.16	0.03	0.02	0.04	0.04	0.04	0.04
Magothy	4.47	4.92	5.36	4.02	3.58	3.10	3.40	2.32	4.47	4.47	4.47	4.47
Upper Patapsco	0.32	0.35	0.38	0.29	0.25	0.43	0.32	0.32	0.32	0.32	0.32	0.32
Lower Patapsco	7.76	8.53	9.31	6.98	6.21	7.57	8.83	9.90	7.76	7.76	7.76	7.76
Major-user Total	12.58	13.84	15.10	11.33	10.07	11.26	12.57	12.56	12.58	12.58	12.58	12.58
Domestic												
Aquia	2.57	2.83	3.09	2.32	2.06	2.57	2.57	2.57	2.57	2.57	2.57	2.57
Magothy	0.44	0.49	0.53	0.40	0.36	0.44	0.44	0.44	0.44	0.44	0.44	0.44
Upper Patapsco	0.43	0.47	0.52	0.39	0.34	0.43	0.43	0.43	0.43	0.43	0.43	0.43
Lower Patapsco	0.59	0.65	0.71	0.53	0.47	0.59	0.59	0.59	0.59	0.59	0.59	0.59
Domestic Total	4.04	4.44	4.85	3.63	3.23	4.04	4.04	4.04	4.04	4.04	4.04	4.04
Hypothetical new users												
Lower Patapsco	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.75
Hypothetical new users Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.75
Charles County Total	16.62	18.28	19.95	14.96	13.30	15.30	16.61	16.60	17.62	16.62	16.62	17.37

Table 7b. Continued

	Simulation number											
	<u>1</u>	<u>2a</u>	<u>2b</u>	<u>3a</u>	<u>3b</u>	<u>4</u>	<u>5a</u>	<u>5b</u>	<u>6</u>	<u>7a</u>	<u>7b</u>	<u>8</u>
<u>St. Mary's County</u>												
Major users												
Piney Point	0.55	0.60	0.66	0.49	0.44	0.50	0.55	0.55	0.55	0.55	0.55	0.55
Aquia	5.58	6.14	6.70	5.03	4.47	4.84	4.45	3.32	5.58	5.63	5.68	5.58
Magothy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Upper Patapsco	0.41	0.45	0.50	0.37	0.33	0.53	1.54	2.67	0.41	0.41	0.41	0.41
Major-user Total	6.55	7.20	7.86	5.89	5.24	5.87	6.55	6.55	6.55	6.60	6.64	6.55
Domestic												
Piney Point	2.03	2.24	2.44	1.83	1.63	2.03	2.03	2.03	2.03	2.03	2.03	2.03
Aquia	1.49	1.63	1.78	1.34	1.19	1.49	1.49	1.49	1.49	1.49	1.49	1.49
Domestic Total	3.52	3.87	4.22	3.17	2.82	3.52	3.52	3.52	3.52	3.52	3.52	3.52
Hypothetical new users												
Upper Patapsco	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.92
Hypothetical new users Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.92
St. Mary's County Total	10.07	11.07	12.08	9.06	8.05	9.39	10.07	10.07	10.27	10.11	10.16	10.99
Major users in other counties												
<u>within model area</u>												
Piney Point	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29
Aquia	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93
Magothy	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37
Upper Patapsco	3.26	3.26	3.26	3.26	3.26	3.26	3.26	3.26	3.26	3.26	3.26	3.26
Lower Patapsco	5.59	5.59	5.59	5.59	5.59	5.59	5.59	5.59	5.59	5.59	5.59	5.59
Total other counties	17.44	17.44	17.44	17.44	17.44	17.44	17.44	17.44	17.44	17.44	17.44	17.44
Total	51.69	55.12	58.54	48.27	44.84	49.63	51.68	51.67	53.39	51.74	51.79	53.86

Table 7c. Simulated pumpage, 2021-2030 (in million gallons per day)

[Discrepancies due to rounding]

	Simulation number											
	<u>1</u>	<u>2a</u>	<u>2b</u>	<u>3a</u>	<u>3b</u>	<u>4</u>	<u>5a</u>	<u>5b</u>	<u>6</u>	<u>7a</u>	<u>7b</u>	<u>8</u>
<u>Calvert County</u>												
Major users												
Piney Point	0.23	0.26	0.28	0.21	0.19	0.33	0.23	0.23	0.23	0.23	0.23	0.23
Aquia	3.55	3.91	4.26	3.20	2.84	3.46	2.82	2.08	3.55	3.55	3.55	3.55
Magothy	0.15	0.16	0.18	0.13	0.12	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Upper Patapsco	0.00	0.00	0.00	0.00	0.00	0.00	0.73	1.47	0.00	0.00	0.00	0.00
Major-user Total	3.93	4.32	4.72	3.54	3.14	3.94	3.93	3.93	3.93	3.93	3.93	3.93
Domestic												
Piney Point	2.59	2.85	3.11	2.33	2.07	2.59	2.59	2.59	2.59	2.59	2.59	2.59
Aquia	1.32	1.45	1.59	1.19	1.06	1.32	1.32	1.32	1.32	1.32	1.32	1.32
Domestic Total	3.91	4.31	4.70	3.52	3.13	3.91	3.91	3.91	3.91	3.91	3.91	3.91
Hypothetical new users												
Upper Patapsco	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00
Lower Patapsco	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50
Hypothetical new users Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.50
Calvert County Total	7.84	8.63	9.41	7.06	6.28	7.86	7.84	7.84	8.34	7.84	7.84	8.34
<u>Charles County</u>												
Major users												
Aquia	0.05	0.05	0.05	0.04	0.04	0.24	0.03	0.02	0.05	0.05	0.05	0.05
Magothy	4.96	5.46	5.96	4.47	3.97	3.18	3.77	2.57	4.96	4.96	4.96	4.96
Upper Patapsco	0.34	0.38	0.41	0.31	0.27	0.53	0.34	0.34	0.34	0.34	0.34	0.34
Lower Patapsco	8.48	9.33	10.18	7.64	6.79	8.59	9.68	10.88	8.48	8.48	8.48	8.48
Major-user Total	13.83	15.22	16.60	12.45	11.07	12.54	13.82	13.81	13.83	13.83	13.83	13.83
Domestic												
Aquia	3.00	3.30	3.60	2.70	2.40	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Magothy	0.50	0.55	0.60	0.45	0.40	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Upper Patapsco	0.47	0.52	0.57	0.43	0.38	0.47	0.47	0.47	0.47	0.47	0.47	0.47
Lower Patapsco	0.64	0.71	0.77	0.58	0.52	0.64	0.64	0.64	0.64	0.64	0.64	0.64
Domestic Total	4.61	5.07	5.53	4.15	3.69	4.61	4.61	4.61	4.61	4.61	4.61	4.61
Hypothetical new users												
Lower Patapsco	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.75
Hypothetical new users Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.75
Charles County Total	18.45	20.29	22.14	16.60	14.76	17.16	18.43	18.42	19.45	18.45	18.45	19.20

Table 7c. Continued

	Simulation number											
	<u>1</u>	<u>2a</u>	<u>2b</u>	<u>3a</u>	<u>3b</u>	<u>4</u>	<u>5a</u>	<u>5b</u>	<u>6</u>	<u>7a</u>	<u>7b</u>	<u>8</u>
<u>St. Mary's County</u>												
Major users												
Piney Point	0.60	0.66	0.72	0.54	0.48	0.55	0.60	0.60	0.60	0.60	0.60	0.60
Aquia	6.07	6.67	7.28	5.46	4.85	5.01	4.82	3.57	6.07	6.14	6.21	6.07
Magothy	0.00	0.01	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Upper Patapsco	0.45	0.50	0.54	0.41	0.36	0.64	1.70	2.95	0.45	0.45	0.45	0.45
Major-user Total	7.12	7.83	8.54	6.41	5.70	6.20	7.12	7.12	7.12	7.19	7.27	7.12
Domestic												
Piney Point	2.24	2.46	2.69	2.02	1.79	2.24	2.24	2.24	2.24	2.24	2.24	2.24
Aquia	1.70	1.87	2.03	1.53	1.36	1.70	1.70	1.70	1.70	1.70	1.70	1.70
Domestic Total	3.93	4.33	4.72	3.54	3.15	3.93	3.93	3.93	3.93	3.93	3.93	3.93
Hypothetical new users												
Upper Patapsco	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.92
Hypothetical new users Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.92
St. Mary's County Total	11.05	12.16	13.27	9.95	8.84	10.13	11.05	11.05	11.25	11.13	11.20	11.97
Major users in other counties within model area												
Piney Point	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29
Aquia	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93
Magothy	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37
Upper Patapsco	3.26	3.26	3.26	3.26	3.26	3.26	3.26	3.26	3.26	3.26	3.26	3.26
Lower Patapsco	5.59	5.59	5.59	5.59	5.59	5.59	5.59	5.59	5.59	5.59	5.59	5.59
Total other counties	17.44	17.44	17.44	17.44	17.44	17.44	17.44	17.44	17.44	17.44	17.44	17.44
Total	54.79	58.52	62.26	51.06	47.32	52.59	54.78	54.76	56.49	54.86	54.94	56.96

Table 8. Ranges of horizontal and vertical hydraulic conductivities entered for aquifer layers and confining layers in the ground-water flow model

[K_h , horizontal hydraulic conductivity;
 K_v , vertical hydraulic conductivity; ft/d, feet per day]

Aquifer	Range of K_h (ft/d) for aquifer	Range of K_v (ft/d) for underlying confining layer
Surficial	11	5×10^{-5} - 2×10^{-3}
Piney Point	1-100	1.5×10^{-6} - 2×10^{-3}
Aquia	0.1-50	2×10^{-4}
Magothy	10-100	1×10^{-4} - 5×10^{-8}
Upper Patapsco	0.5-50	5×10^{-5} - 1×10^{-3}
Lower Patapsco	1-100	*

* In the ground-water flow model, the base of the Lower Patapsco aquifer is a no-flow boundary

Table 9. Mean error and root-mean-square for the flow-model calibration

[ME, mean error; RMS, root-mean-square; see text for explanation]

Aquifer	Stress period									
	1		2		3		4		5	
	ME	RMS	ME	RMS	ME	RMS	ME	RMS	ME	RMS
Piney Point	0.7	4.0	-3.8	17.9	-4.5	10.8	-2.9	9.4	1.9	12.0
Aquia	3.8	6.5	-16.5	24.4	-9.6	14.1	-0.6	7.5	2.7	9.1
Magothy	0.5	10.9	7.4	7.4	1.3	9.9	3.2	9.0	1.2	7.5
Upper Patapsco	0.5	8.1	*	*	3.2	16.6	-5.2	15.4	-1.0	10.5
Lower Patapsco	6.8	6.8	6.3	12.6	6.5	11.8	-9.7	22.2	-3.4	16.7
All Aquifers	2.6	6.3	-11.9	22.3	-2.0	12.6	-1.8	13.1	0.5	11.0

* No water-level measurements available

Table 10. Results of the sensitivity analysis

[K_h , horizontal hydraulic conductivity; K_v , vertical hydraulic conductivity; S_s , specific storage; C_b , conductance at lateral boundary; H_b , head at lateral boundary; H_c , head at constant head boundary; see text for explanation]

Model run ¹	Multiply by K_h , K_v , S_s , C_b	Root mean square (RMS)				Mean error (ME)			
		K_h	K_v	S_s	C_b	K_h	K_v	S_s	C_b
A	0.50	43.3	26.3	11.8	11.2	-26.5	-18.8	-2.2	-0.2
B	0.75	18.4	14.4	11.2	11.1	-6.7	-7.1	-0.8	0.3
C (calibration)	1.00	11.0	11.0	11.0	11.0	0.6	0.6	0.6	0.6
D	1.50	19.7	16.9	11.3	10.9	12.6	10.8	3.3	0.9
E	2.00	27.5	23.8	12.5	10.8	18.9	17.6	5.7	1.1

¹ Results for model runs A through E are shown in figure 70.
 K_h , K_v , S_s , and C_b were multiplied by values of 0.5, 0.75, 1.5, and 2.0.

Model run ¹	Add to H_b , H_c	Root mean square (RMS)		Mean error (ME)	
		H_b	H_c	H_b	H_c
A	-5.0	11.1	11.2	-1.5	-2.3
B	-2.0	11.0	11.0	-0.2	-0.6
C (calibration)	0.0	11.0	11.0	0.6	0.6
D	2.0	11.1	11.1	1.4	1.7
E	5.0	11.3	11.5	2.6	3.5

¹ Results for model runs A through E are shown in figure 81.
 H_b and H_c were increased or decreased by 2 and 5 feet.

Table 11. Mass-balance flux components for the ground-water flow model, simulation years 1900 (prepumping), 1952, 1982, 1994, and 2002

[Discrepancies due to rounding]

	Thousand cubic feet per day					Percentage of total				
	<u>1900</u>	<u>1952</u>	<u>1982</u>	<u>1994</u>	<u>2002</u>	<u>1900</u>	<u>1952</u>	<u>1982</u>	<u>1994</u>	<u>2002</u>
<u>Influx</u>										
Storage	6.75	40.32	87.08	399.47	650.79	0.25	1.14	1.90	6.49	9.04
Constant head	2,098.91	2,648.64	3,450.00	4,136.01	4,673.55	78.16	74.81	75.12	67.17	64.95
Wells	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lateral boundaries	579.82	851.56	1,055.28	1,622.28	1,870.82	21.59	24.05	22.98	26.35	26.00
Total	2,685.47	3,540.53	4,592.37	6,157.76	7,195.17	100.00	100.00	100.00	100.00	100.00
<u>Outflux</u>										
Storage	8.88	0.00	0.01	0.10	0.11	0.33	0.00	0.00	0.00	0.00
Constant head	1,730.49	978.07	517.38	396.38	311.31	64.44	27.62	11.27	6.44	4.33
Wells	0.00	1,954.13	3,548.20	5,172.28	5,798.16	0.00	55.19	77.26	84.00	80.58
Lateral boundaries	946.97	608.33	526.77	589.00	1,085.59	35.26	17.18	11.47	9.57	15.09
Total	2,686.34	3,540.52	4,592.37	6,157.76	7,195.17	100.03	100.00	100.00	100.00	100.00
Influx-outflux	-0.87	0.00	0.00	0.00	0.00					

Table 12. Net flow components for individual aquifers simulated in the flow model

[ft³/d, cubic feet per day; GHB, General Head Boundary;
negative values indicate flow out of the aquifer; positive values indicate flow into the aquifer]

Prepumping conditions

<u>Aquifer</u>	Flow component, in ft ³ /d						
	<u>Recharge</u>	<u>Leakage overlying</u>	<u>Leakage underlying</u>	<u>Pumpage</u>	<u>Storage</u>	<u>GHB</u>	<u>Other</u>
Piney Point	0	-344,060	256,907	0	-9	79,483	7,667
Aquia	22,315	-88,480	129,730	0	0	-62,283	-1,287
Magothy	55,399	76,780	83,191	0	10	-225,541	10,163
Upper Patapsco	54,855	-103,370	10,328	0	243	37,940	0
Lower Patapsco	27,343	-2,140	0	0	302	-25,510	0
Total	159,912	-461,270	480,156	0	546	-195,911	16,543

2002 (Calibration)

<u>Aquifer</u>	Flow component, in ft ³ /d						
	<u>Recharge</u>	<u>Leakage overlying</u>	<u>Leakage underlying</u>	<u>Pumpage</u>	<u>Storage</u>	<u>GHB</u>	<u>Other</u>
Piney Point	0	1,271,054	-737,983	-722,530	5,071	173,604	10,830
Aquia	95,730	2,050,348	-453,080	-1,756,400	28,357	29,188	5,770
Magothy	107,114	948,790	-356,688	-1,172,400	8,548	450,614	14,076
Upper Patapsco	159,600	679,500	-210,700	-558,530	116,520	-186,400	0
Lower Patapsco	371,256	631,768	0	-1,578,200	114,130	461,020	0
Total	733,700	5,581,460	-1,758,451	-5,788,060	272,626	928,026	30,676

2030 (Scenario 1)

<u>Aquifer</u>	Flow component, in ft ³ /d						
	<u>Recharge</u>	<u>Leakage overlying</u>	<u>Leakage underlying</u>	<u>Pumpage</u>	<u>Storage</u>	<u>GHB</u>	<u>Other</u>
Piney Point	0	1,761,502	-1,049,795	-924,650	966	201,706	10,240
Aquia	124,254	2,767,114	-622,070	-2,339,600	8,500	52,380	9,417
Magothy	113,690	1,156,580	-364,400	-1,468,000	2,679	544,769	14,690
Upper Patapsco	193,528	692,870	-349,070	-605,740	33,903	34,470	0
Lower Patapsco	477,652	640,190	0	-1,967,100	38,120	811,080	0
Total	909,124	7,018,256	-2,385,335	-7,305,090	84,168	1,644,405	34,347

Table 13. Descriptions of pumping scenarios used in future model simulations

[mgd, million gallons per day]

Scenario	Description
0	Maintain all pumpage at 2002 levels
1	Increase pumpage at public-supply and domestic wells proportionally with population projections in Calvert, Charles, and St. Mary's Counties through 2030
2a	Increase all pumpage in Calvert, Charles, and St. Mary's Counties over amounts in Scenario 1 by 10 percent
2b	Increase all pumpage in Calvert, Charles, and St. Mary's Counties over amounts in Scenario 1 by 20 percent
3a	Decrease all pumpage in Calvert, Charles, and St. Mary's Counties under amounts in Scenario 1 by 10 percent
3b	Decrease all pumpage in Calvert, Charles, and St. Mary's Counties under amounts in Scenario 1 by 20 percent
4	Pump all major users at their average appropriated amounts while increasing domestic pumpage as in Scenario 1
5a	Shift 25 percent of public-supply pumpage from the Aquia aquifer to the Upper Patapsco aquifer in Calvert and St. Mary's Counties, and from the Magothy aquifer to the Lower Patapsco aquifer in Charles County.
5b	Shift 50 percent of public-supply pumpage from the Aquia aquifer to the Upper Patapsco aquifer in Calvert and St. Mary's Counties, and from the Magothy aquifer to the Lower Patapsco aquifer in Charles County.
6	Add six hypothetical public-supply wells, two in each county, pumping between 0.1 and 0.5 mgd each, while increasing other pumpage as in Scenario 1.
7a	Increase pumpage at the NAS Patuxent River by 10 percent while increasing other pumpage as in Scenario 1.
7b	Increase pumpage at the NAS Patuxent River by 20 percent while increasing other pumpage as in Scenario 1.
8	Add three hypothetical major-user wells, one in each county, pumping between 0.5 and 0.92 mgd each, while increasing other pumpage as in Scenario 1.

Table 14. Summary of critical-location information

[GAP, Ground-water appropriation permit]

Map ID ¹	GAP or identifier	Aquifer	Location	Prepumping head ²	Altitude of aquifer top ²	Management level ²
Calvert County						
1	CA60G002	Aquia	Chesapeake Ranch	12.5	-456.9	-363.0
2	Hypothetical shift to Patapsco	Upper Patapsco	Chesapeake Ranch	18.6	-625.4	-496.6
3	CA74G005	Aquia	Prince Frederick	19.4	-333.0	-262.6
4	CA84G003	Aquia	Solomons	13.3	-451.8	-358.8
5	Hypothetical shift to Patapsco	Upper Patapsco	Solomons	18.4	-595.5	-472.7
6	Domestic observation	Aquia	Huntingtown	20.3	-292.3	-229.8
7	Hypothetical major user	Lower Patapsco	Huntingtown	33.4	-1,169.1	-928.6
8	Hypothetical public supply	Upper Patapsco	Prince Frederick	22.5	-667.0	-537.1
9	Hypothetical public supply	Upper Patapsco	Solomons	18.4	-594.0	-471.6
Charles County						
10	CH68G001	Upper Patapsco	La Plata	32.9	-264.0	-204.6
11	CH70G003	Lower Patapsco	La Plata	31.5	-725.1	-573.8
12	CH70G109	Magothy	Waldorf	53.8	-234.6	-176.9
13	CH71G005	Lower Patapsco	Indian Head	20.1	-166.3	-129.0
14	CH83G312	Lower Patapsco	Waldorf	33.4	-751.3	-594.4
15	CH89G032	Lower Patapsco	Bensville	30.9	-507.7	-400.0
16	Hypothetical major user	Lower Patapsco	Billingsley Road Landfill	33.2	-874.6	-693.0
17	Hypothetical public supply	Lower Patapsco	Waldorf Fire Station	34.6	-802.9	-635.4
18	Hypothetical public supply	Lower Patapsco	Barrington Drive	33.9	-810.9	-641.9
St. Mary's County						
19	SM46G001	Aquia	Lexington Park, Pegg Road	13.2	-449.1	-356.6
20	Hypothetical shift to Patapsco	Upper Patapsco	Lexington Park, Pegg Road	18.1	-572.0	-453.9
21	SM46G001	Aquia	Lexington Park, Essex Drive	13.1	-450.8	-358.0
22	Hypothetical shift to Patapsco	Upper Patapsco	Lexington Park, Essex Drive	18.1	-569.2	-451.7
23	SM66G006	Aquia	Charlotte Hall	32.0	-249.2	-193.0
24	SM67G003	Aquia	Leonardtwn	13.8	-343.0	-271.6
25	Hypothetical shift to Patapsco	Upper Patapsco	Leonardtwn	18.4	-543.6	-431.2
26	SM76G004	Piney Point	Town Creek	15.8	-168.5	-131.6
27	SM98G021	Upper Patapsco	Lexington Park, First Colony	18.2	-568.9	-451.5
28	Hypothetical major user	Upper Patapsco	Elms Property	18.5	-586.0	-465.1
29	Hypothetical public supply	Upper Patapsco	Broad Creek/Twin Ponds	18.6	-578.5	-459.1
30	Hypothetical public supply	Upper Patapsco	Forrest Farms	18.3	-557.4	-442.3

¹ Map ID refers to locations shown in Figure 68.

² Feet relative to sea level.

Table 15. Simulated heads at critical locations, 2030

Map ID ¹	Simulated head, in feet relative to sea level												
	Scenario number												
	<u>0</u>	<u>1</u>	<u>2a</u>	<u>2b</u>	<u>3a</u>	<u>3b</u>	<u>4</u>	<u>5a</u>	<u>5b</u>	<u>6</u>	<u>7a</u>	<u>7b</u>	<u>8</u>
Calvert County													
1	-163.2	-197.2	-216.7	-236.1	-177.7	-158.3	-188.0	-168.5	-139.8	-201.0	-198.3	-199.4	-201.9
2	-56.3	-72.0	-78.4	-84.7	-65.6	-59.2	-68.2	-84.4	-96.9	-80.0	-72.4	-72.8	-79.9
3	-83.3	-121.3	-134.3	-147.3	-108.4	-95.4	-96.1	-105.6	-89.8	-123.6	-121.5	-121.6	-123.2
4	-161.2	-200.0	-219.7	-239.5	-180.2	-160.4	-182.2	-172.8	-145.6	-204.0	-201.7	-203.3	-205.3
5	-58.6	-74.9	-81.6	-88.3	-68.2	-61.5	-71.1	-87.7	-100.6	-84.8	-75.4	-75.8	-83.6
6	-48.5	-74.9	-83.3	-91.7	-66.4	-58.0	-67.0	-68.1	-61.4	-76.7	-74.9	-75.0	-76.4
7	-45.2	-63.9	-69.5	-75.1	-58.3	-52.7	-57.6	-73.6	-83.3	-72.6	-63.9	-64.0	-113.0
8	-48.9	-66.9	-73.0	-79.0	-60.8	-54.8	-62.2	-75.7	-84.5	-93.4	-67.0	-67.2	-72.5
9	-59.0	-75.6	-82.4	-89.2	-68.9	-62.1	-71.8	-87.9	-100.3	-89.7	-76.1	-76.6	-84.1
Charles County													
10	-130.7	-194.8	-214.9*	-235.0*	-174.7	-154.6	-197.8	-207.3*	-219.9*	-205.9*	-194.8	-194.8	-204.8*
11	-195.3	-291.5	-321.2	-350.9	-261.8	-232.0	-284.9	-320.7	-350.0	-316.4	-291.5	-291.5	-317.3
12	-105.9	-215.7*	-242.7 [†]	-269.6 [†]	-188.8*	-161.9	-117.4	-163.7	-111.7	-217.0*	-215.8*	-215.8*	-216.8*
13	-140.6*	-166.4 [†]	-183.9 [†]	-201.4 [†]	-148.9*	-131.4*	-216.2 [†]	-172.5 [†]	-178.5 [†]	-171.7 [†]	-166.4 [†]	-166.4 [†]	-171.0 [†]
14	-190.0	-313.8	-345.9	-378.0	-281.7	-249.6	-267.6	-366.4	-419.0	-352.9	-313.8	-313.9	-343.6
15	-165.7	-267.2	-295.0	-322.8	-239.4	-211.5	-255.7	-290.7	-314.3	-287.4	-267.2	-267.2	-283.7
16	-145.9	-234.3	-258.2	-282.1	-210.4	-186.5	-210.6	-271.5	-308.6	-267.1	-234.4	-234.4	-310.0
17	-127.9	-210.6	-232.5	-254.4	-188.8	-166.9	-179.0	-257.0	-303.4	-274.4	-210.7	-210.7	-235.5
18	-148.2	-242.7	-267.6	-292.6	-217.7	-192.8	-210.8	-292.5	-342.3	-309.5	-242.7	-242.7	-273.2
St. Mary's County													
19	-188.4	-247.6	-272.2	-296.7	-223.1	-198.5	-202.6	-209.6	-171.6	-251.3	-250.3	-253.0	-253.7
20	-59.2	-75.5	-82.3	-89.0	-68.8	-62.1	-72.5	-94.1	-112.8	-83.1	-76.1	-76.6	-86.3
21	-183.7	-240.5	-264.3	-288.1	-216.7	-192.9	-198.3	-204.4	-168.3	-244.1	-243.4	-246.2	-247.0
22	-58.4	-74.2	-80.8	-87.3	-67.6	-61.1	-71.0	-91.9	-109.6	-81.1	-74.7	-75.3	-86.0
23	-71.1	-122.0	-136.5	-151.1	-107.4	-92.9	-104.2	-109.7	-97.5	-124.0	-122.1	-122.2	-123.7
24	-91.4	-127.6	-140.5	-153.5	-114.6	-101.6	-112.9	-111.7	-95.8	-130.2	-128.1	-128.5	-130.5
25	-52.5	-68.8	-74.9	-81.1	-62.6	-56.4	-65.7	-82.4	-96.0	-76.3	-69.0	-69.3	-74.9
26	-37.1	-57.6	-64.7	-71.7	-50.5	-43.5	-55.1	-56.2	-54.8	-57.9	-57.7	-57.7	-58.0
27	-62.9	-81.5	-88.9	-96.2	-74.2	-66.8	-76.7	-96.3	-111.1	-90.3	-82.0	-82.4	-90.2
28	-48.5	-59.9	-64.8	-69.8	-55.0	-50.0	-57.0	-65.6	-71.3	-63.9	-60.4	-60.8	-125.6
29	-57.0	-74.4	-81.1	-87.8	-67.7	-61.0	-70.6	-85.5	-96.5	-86.0	-74.8	-75.1	-81.6
30	-56.0	-73.0	-79.5	-86.1	-66.4	-59.9	-70.0	-84.7	-96.4	-84.2	-73.3	-73.7	-80.1

* Values exceed the management level

[†] Values exceed the aquifer top

¹ Map ID refers to locations shown in figure 68.

Table 16. Simulated remaining available drawdown at critical locations, 2030

Map ID ¹	Remaining available drawdown, in feet												
	Scenario number												
	<u>0</u>	<u>1</u>	<u>2a</u>	<u>2b</u>	<u>3a</u>	<u>3b</u>	<u>4</u>	<u>5a</u>	<u>5b</u>	<u>6</u>	<u>7a</u>	<u>7b</u>	<u>8</u>
Calvert County													
1	199.9	165.8	146.4	126.9	185.3	204.8	175.1	194.5	223.2	162.1	164.7	163.7	161.2
2	440.3	424.7	418.3	411.9	431.1	437.5	428.5	412.2	399.7	416.6	424.2	423.8	416.7
3	179.2	141.2	128.2	115.2	154.2	167.2	166.4	157.0	172.7	139.0	141.1	141.0	139.4
4	197.6	158.8	139.1	119.3	178.6	198.4	176.6	186.0	213.2	154.8	157.1	155.5	153.5
5	414.2	397.9	391.2	384.5	404.6	411.2	401.7	385.0	372.2	387.9	397.4	396.9	389.1
6	181.3	154.9	146.5	138.1	163.4	171.8	162.8	161.7	168.4	153.1	154.9	154.8	153.4
7	883.4	864.7	859.1	853.5	870.3	875.9	871.0	855.0	845.3	856.0	864.7	864.6	815.6
8	488.3	470.2	464.2	458.1	476.3	482.4	474.9	461.5	452.7	443.7	470.1	470.0	464.6
9	412.6	395.9	389.1	382.4	402.7	409.5	399.8	383.6	371.3	381.9	395.5	395.0	387.4
Charles County													
10	73.9	9.8	-10.3*	-30.4*	29.9	50.1	6.8	-2.7*	-15.3*	-1.3*	9.8	9.8	-0.2*
11	378.5	282.3	252.6	222.9	312.0	341.7	288.9	253.1	223.8	257.4	282.3	282.3	256.5
12	71.0	-38.8*	-65.7 [†]	-92.7 [†]	-11.9*	15.1	59.5	13.2	65.2	-40.1*	-38.8*	-38.9*	-39.9*
13	-11.6*	-37.4 [†]	-54.9 [†]	-72.4 [†]	-19.9*	-2.4*	-87.2 [†]	-43.4 [†]	-49.5 [†]	-42.7 [†]	-37.4 [†]	-37.4 [†]	-42.0 [†]
14	404.4	280.6	248.5	216.4	312.7	344.8	326.8	228.0	175.4	241.5	280.5	280.5	250.7
15	234.3	132.8	105.0	77.2	160.7	188.5	144.3	109.3	85.7	112.7	132.8	132.8	116.3
16	547.1	458.7	434.8	410.9	482.6	506.5	482.4	421.5	384.4	425.9	458.7	458.6	383.0
17	507.5	424.8	402.9	381.1	446.7	468.5	456.5	378.4	332.1	361.0	424.8	424.8	399.9
18	493.7	399.3	374.3	349.3	424.2	449.1	431.1	349.4	299.6	332.4	399.2	399.2	368.7
St. Mary's County													
19	168.2	109.0	84.5	59.9	133.5	158.1	154.0	147.0	185.0	105.4	106.3	103.6	102.9
20	394.7	378.4	371.7	365.0	385.1	391.8	381.5	359.8	341.2	370.8	377.9	377.4	367.7
21	174.3	117.5	93.7	69.9	141.3	165.1	159.7	153.6	189.8	114.0	114.6	111.8	111.0
22	393.3	377.5	371.0	364.4	384.1	390.6	380.7	359.8	342.1	370.6	377.0	376.5	365.7
23	121.9	71.0	56.5	41.9	85.6	100.1	88.8	83.3	95.5	68.9	70.9	70.8	69.3
24	180.2	144.1	131.1	118.1	157.0	170.0	158.7	160.0	175.9	141.4	143.6	143.1	141.2
25	378.7	362.5	356.3	350.1	368.6	374.8	365.5	348.8	335.2	354.9	362.2	361.9	356.3
26	94.5	74.0	66.9	59.9	81.1	88.2	76.5	75.4	76.8	73.7	73.9	73.9	73.6
27	388.6	370.0	362.6	355.3	377.4	384.7	374.8	355.2	340.4	361.2	369.5	369.1	361.3
28	416.6	405.2	400.2	395.3	410.1	415.1	408.1	399.5	393.8	401.2	404.7	404.3	339.5
29	402.0	384.7	377.9	371.2	391.4	398.1	388.4	373.6	362.5	373.0	384.3	383.9	377.5
30	386.2	369.3	362.7	356.2	375.8	382.4	372.3	357.6	345.9	358.1	368.9	368.6	362.1

* Values exceed the management level

[†] Values exceed the aquifer top

¹ Map ID refers to locations shown in figure 68.

Table 17. Hypothetical wells simulated in Scenarios 6 and 8

[gpd, gallons per day]

County	Map ID ¹	Type	Location	Aquifer	Pumping rate (gpd)
Calvert	7	Major user	Huntingtown	Lower Patapsco	500,000
Calvert	8	Public supply	Prince Frederick	Upper Patapsco	250,000
Calvert	9	Public supply	Solomons	Upper Patapsco	250,000
Charles	16	Major user	Billingsley Road landfill	Lower Patapsco	750,000
Charles	17	Public supply	Waldorf Fire Station	Lower Patapsco	500,000
Charles	18	Public supply	Barrington Drive	Lower Patapsco	500,000
St. Mary's	28	Major user	Elms property	Upper Patapsco	920,000
St. Mary's	29	Public supply	Broad Creek/Twin Ponds	Upper Patapsco	100,000
St. Mary's	30	Public supply	Forrest Farms	Upper Patapsco	100,000

¹ Map ID refers to locations shown in Figure 68.