

Potentiometric Surface of the Middendorf Aquifer in South Carolina, November 2014

by
 Andrew Wachob
 Land, Water and Conservation Division
 South Carolina Department of Natural Resources



The Middendorf aquifer is the source of water for many public, industrial, and agricultural supplies in the Coastal Plain of South Carolina. This important water resource is monitored by regularly measuring the nonpumping water levels in wells in order to contour the aquifer's potentiometric surface, which is defined by the elevations at which water stands in tightly cased wells completed in the aquifer.

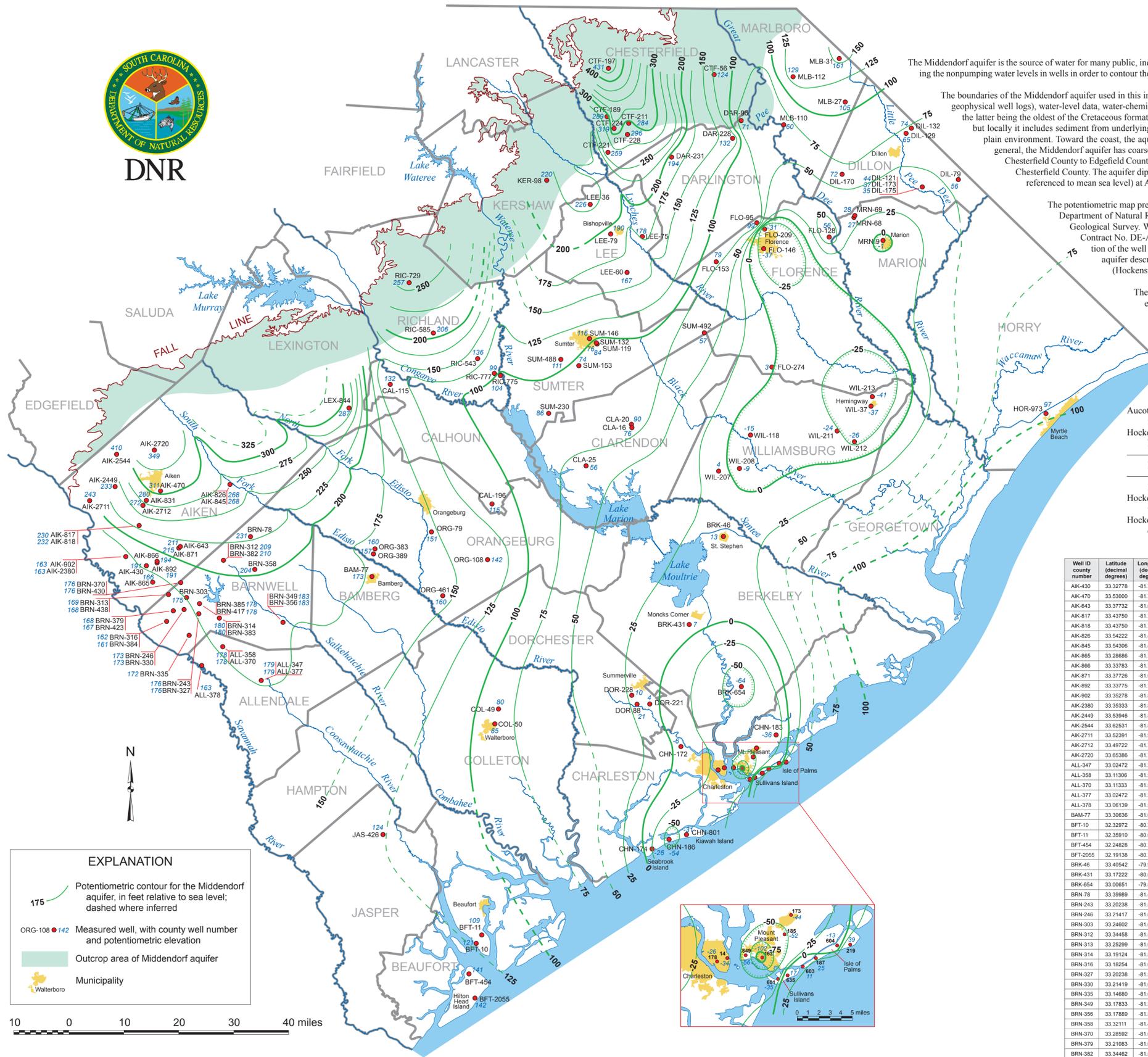
The boundaries of the Middendorf aquifer used in this investigation are those defined by Aucott, Davis, and Speiran (1987), who delineated the aquifer on the basis of geologic data (primarily geophysical well logs), water-level data, water-chemistry data, and previous investigations. The Middendorf Formation is between the Black Creek Formation and the Cape Fear Formation, the latter being the oldest of the Cretaceous formations in the region. The Middendorf aquifer is composed mostly of permeable sediments of the Middendorf Formation (hence its name), but locally it includes sediment from underlying or overlying formations. In the upland areas, the aquifer is composed of sand interbedded with clay lenses deposited in an upper delta plain environment. Toward the coast, the aquifer is composed of thin- to thick-bedded sand and clay that were deposited in marginal marine or lower delta plain environments. In general, the Middendorf aquifer has coarser sand and less clay in the western part of the Coastal Plain than in the eastern part. The Middendorf crops out along the Fall Line from Chesterfield County to Edgefield County, except for some areas in Aiken County where it is not exposed. Its outcrop is narrowest in southwestern Edgefield County and widest in Chesterfield County. The aquifer dips southeastward near the Fall Line and southward along the coast. The top of the aquifer is at elevation 100, -800, and -1,700 feet msl (feet, referenced to mean sea level) at Aiken, Myrtle Beach, and Charleston, respectively. Thickness ranges from 0 ft at the Fall Line to more than 300 ft in Dorchester County.

The potentiometric map presented here was constructed using water levels measured in 143 wells in late 2014 (see table). Data were collected by the South Carolina Department of Natural Resources, the Savannah River National Laboratory, the South Carolina Department of Health and Environmental Control, and the U.S. Geological Survey. Water level data for 25 P-wells at the Savannah River Site were collected and provided by Savannah River National Laboratory under Contract No. DE-AC09-08SR22470 with the U.S. Department of Energy. The author is grateful for the assistance of these other agencies and the cooperation of the well owners in obtaining the water-level measurements necessary to produce this map. Similar maps have been produced for the Middendorf aquifer describing the potentiometric surface in 2011 (Hockensmith and others, 2013), 2009 (Hockensmith, 2012), 2004 (Hockensmith, 2008), 2001 (Hockensmith, 2003), and 1996 (Hockensmith and Waters, 1998).

The potentiometric surface of the Middendorf aquifer for November 2014 shows that the generally southeastward groundwater flow is affected by several potentiometric lows. These cones of depression have developed because of groundwater pumping in Florence and Williamsburg Counties and Berkeley and Charleston Counties. Of the 119 wells measured for both the 2011 and 2014 maps, 71 wells (60%) had lower water levels in 2014; 19 wells (16%) had no change from 2011; and 29 wells (24%) had higher water levels in 2014. Water levels in 59% of these 119 wells changed by 2 ft or less from 2011, and by 5 ft or less in 77% of these wells. The most substantial changes from 2011 occurred in Charleston County: Water levels in 3 wells measured at Kiawah Island recovered 8, 21, and 56 ft, significantly reducing the depth and extent of the cone of depression in that area, while water levels in the Mount Pleasant area showed a significant decline, with 4 wells having water levels 17 to 20 ft lower than in 2011.

References

- Aucott, W.R., Davis, M.E., and Speiran, G.K., 1987, Geohydrologic framework of the Coastal Plain aquifers of South Carolina: U.S. Geological Survey Water-Resources Investigations Report 85-4271, 7 sheets.
- Hockensmith, B.L., 2003, Potentiometric surface of the Middendorf aquifer in South Carolina, November 2001: South Carolina Department of Natural Resources, Water Resources Report 28, 1 sheet.
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- Hockensmith, B.L., Wachob, A., Howard, C.S., and Koch, E., 2013, Potentiometric surface of the Middendorf aquifer in South Carolina, November 2011: South Carolina Department of Natural Resources, Water Resources Report 54, 1 sheet.
- Hockensmith, B.L., and Waters, K.E., 1998, Potentiometric surface of the Middendorf aquifer in South Carolina, November 1996: South Carolina Department of Natural Resources, Water Resources Report 19, 1 sheet.



Well ID county number	Latitude (decimal degrees)	Longitude (decimal degrees)	2014 WL elevation (ft NAVD83)	WL change from 2011 (ft)
AIK-430	33.32778	-81.74306	191	-2
AIK-470	33.53000	-81.70583	211	n/a
AIK-643	33.37732	-81.64081	211	-2
AIK-817	33.43750	-81.77000	230	-1
AIK-818	33.43750	-81.77000	232	-1
AIK-826	33.54222	-81.48556	238	0
AIK-845	33.54306	-81.48556	268	1
AIK-865	33.28686	-81.72210	166	-1
AIK-866	33.33783	-81.70867	194	0
AIK-871	33.37726	-81.64080	215	-1
AIK-892	33.33775	-81.70864	193	0
AIK-902	33.35278	-81.80972	163	0
AIK-2380	33.35333	-81.80917	163	0
AIK-2449	33.53946	-81.85498	233	n/a
AIK-2544	33.62531	-81.84964	410	n/a
AIK-2711	33.52391	-81.92077	243	n/a
AIK-2712	33.49722	-81.74750	272	n/a
AIK-2720	33.65386	-81.71552	349	0
ALL-347	33.02472	-81.38444	179	-1
ALL-358	33.11306	-81.50639	178	-1
ALL-370	33.11333	-81.50556	179	-1
ALL-377	33.02472	-81.38444	179	-1
ALL-378	33.06139	-81.56389	163	-3
BAM-77	33.30636	-81.03567	173	-7
BFT-10	32.32972	-80.70779	121	-4
BFT-11	32.35910	-80.69029	109	-2
BFT-454	32.24828	-80.73262	141	29
BFT-2055	32.19138	-80.70385	142	n/a
BRK-46	33.40542	-79.92556	13	n/a
BRK-431	33.17222	-80.03861	7	1
BRK-654	33.00651	-79.88090	-64	18
BRN-78	33.39989	-81.42186	231	n/a
BRN-243	33.20238	-81.57804	176	-1
BRN-246	33.21417	-81.62394	173	-1
BRN-303	33.24602	-81.61615	175	-1
BRN-312	33.34458	-81.50035	209	0
BRN-313	33.25299	-81.67259	169	-1
BRN-314	33.19124	-81.51327	180	-1
BRN-316	33.18254	-81.67869	162	-1
BRN-327	33.20238	-81.57804	176	0
BRN-330	33.21419	-81.62390	173	-2
BRN-335	33.14680	-81.60754	172	-2
BRN-349	33.17833	-81.31444	183	-1
BRN-356	33.17889	-81.31444	183	-1
BRN-358	33.32111	-81.40667	204	0
BRN-370	33.28592	-81.63497	176	-1
BRN-379	33.21083	-81.65749	168	-1
BRN-382	33.34462	-81.50032	210	0

Well ID county number	Latitude (decimal degrees)	Longitude (decimal degrees)	2014 WL elevation (ft NAVD83)	WL change from 2011 (ft)
BRN-383	33.19122	-81.51331	180	-1
BRN-384	33.18256	-81.67874	161	-1
BRN-385	33.22969	-81.57532	178	-1
BRN-417	33.22967	-81.57529	178	-1
BRN-423	33.21086	-81.65752	167	-1
BRN-430	33.28590	-81.63493	176	-3
BRN-438	33.25303	-81.67259	168	-1
CAL-115	33.81111	-80.98278	132	-8
CAL-196	33.48578	-80.98278	115	n/a
CHN-14	32.79139	-79.92861	-34	4
CHN-163	32.78823	-79.87189	-102	-20
CHN-172	32.84723	-80.06480	-6	8
CHN-173	32.84366	-79.82683	-44	-20
CHN-174	32.58065	-80.15975	-26	8
CHN-178	32.78476	-79.94778	-26	0
CHN-183	32.87759	-79.76543	-36	-17
CHN-185	32.82043	-79.83715	-52	-18
CHN-186	32.60083	-80.10583	-54	21
CHN-187	32.78728	-79.78819	25	24
CHN-219	32.80495	-79.73392	39	7
CHN-601	32.75965	-79.84879	-35	-4
CHN-603	32.77687	-79.80984	11	0
CHN-604	32.80256	-79.75482	-13	-5
CHN-635	32.76476	-79.83282	17	-5
CHN-801	32.61443	-80.05244	-31	66
CHN-849	32.79180	-79.89877	-56	-6
CLA-16	33.69406	-80.21245	76	n/a
CLA-20	33.70015	-80.21331	90	2
CLA-25	33.59408	-80.35486	56	-22
COL-49	32.95069	-80.63461	80	-2
COL-50	32.91178	-80.64733	85	-25
CTF-56	34.62678	-79.94067	124	0
CTF-189	34.51811	-80.28942	289	n/a
CTF-197	34.65194	-80.27889	431	-3
CTF-211	34.50639	-80.21833	284	-1
CTF-224	34.49156	-80.26497	319	-1
CTF-228	34.47461	-80.22211	296	-2
DAR-96	34.50583	-79.85611	71	3
DAR-228	34.45889	-79.80000	132	2
DAR-231	34.41528	-80.08194	194	0
DIL-79	34.34554	-79.16781	56	-2
DIL-121	34.32860	-79.28390	44	0
DIL-129	34.46853	-79.31156	65	-3
DIL-132	34.48263	-79.31456	74	-2
DIL-170	34.36335	-79.53422	72	n/a
DIL-173	34.33029	-79.28696	37	n/a
DIL-175	34.33032	-79.28702	35	n/a
DOR-88	32.95975	-80.20160	21	6

Well ID county number	Latitude (decimal degrees)	Longitude (decimal degrees)	2014 WL elevation (ft NAVD83)	WL change from 2011 (ft)
DOR-221	32.96039	-80.16278	4	7
DOR-228	32.98360	-80.21829	10	6
FLO-95	34.23724	-79.81236	99	1
FLO-128	34.19556	-79.58056	56	5
FLO-146	34.16986	-79.78804	-37	4
FLO-153	34.13674	-79.93910	79	7
FLO-209	34.21970	-79.78812	-31	21
FLO-274	33.85556	-79.76639	3	-3
HOR-973	33.72139	-78.90278	97	0
JAS-426	32.61833	-80.95528	124	-2
KER-98	34.35417	-80.47833	220	2
LEE-36	34.29028	-80.34167	226	-12
LEE-60	34.11000	-80.22811	167	0
LEE-75	34.20239	-80.17500	178	1
LEE-79	34.21111	-80.27361	190	4
LEX-844	33.74611	-81.10750	287	-2
MLB-27	34.54722	-79.52083	105	-4
MLB-31	34.67381	-79.54164	161	5
MLB-110	34.49306	-79.19444	60	-1
MLB-112	34.62000	-79.68917	129	0
MRN-9	34.18493	-79.40545	-1	n/a
MRN-68	34.24679	-79.50017	27	-1
MRN-69	34.25113	-79.49738	28	-1
ORG-79	33.41319	-80.84757	151	-1
ORG-108	33.34972	-80.67925	142	n/a
ORG-383	33.36806	-80.03111	160	n/a
ORG-389	33.36250	-80.03306	157	n/a
ORG-461	33.24736	-80.81933	160	n/a
RIC-543	33.87500	-80.70250	136	0
RIC-585	33.94889	-80.84083	206	1
RIC-729	34.08289	-80.91719	257	4
RIC-775	33.83744	-80.62550	104	n/a
SUM-119	33.91750	-80.32111	84	-8
SUM-132	33.91833	-80.32333	76	n/a
SUM-146	33.93606	-80.34513	116	n/a
SUM-153	33.86524	-80.37647	74	n/a
SUM-230	33.73718	-80.46925	86	-10
SUM-488	33.87444	-80.43778	111	-2
SUM-492	33.94556	-79.98000	57	-3
WIL-37	33.74758	-79.45121	-37	5
WIL-118	33.67272	-79.83617	-15	-6
WIL-207	33.57653	-79.93653	4	-3
WIL-208	33.58322	-79.87039	-9	-3
WIL-211	33.68156	-79.55717	-24	-2
WIL-212	33.65361	-79.50206	-26	-3
WIL-213	33.77292	-79.44781	-41	-6

EXPLANATION

- 175 Potentiometric contour for the Middendorf aquifer, in feet relative to sea level; dashed where inferred
- ORG-108 ● 142 Measured well, with county well number and potentiometric elevation
- Outcrop area of Middendorf aquifer
- Municipality

