

Potentiometric Surface of the McQueen Branch and Charleston Aquifers in South Carolina, November–December 2025

by

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The McQueen Branch and Charleston aquifers are two of the deepest aquifers in the South Carolina Coastal Plain, and together they serve as an important water resource for many public, industrial, and agricultural users. Routine monitoring of static (non-pumping) water-levels in these aquifers allows the South Carolina Department of Environmental Services (SCDES) to identify areas of overpumping, indicated by local cones of depression, and regional changes in aquifer storage related to groundwater development.

The map shown here depicts the potentiometric surface of the McQueen Branch and Charleston aquifers based on water level measurements collected in November and December 2025. The boundaries of the McQueen Branch and Charleston aquifers used for this map are those defined by Gellici and Lautier (2010). The McQueen Branch is a late Cretaceous-age aquifer extending over most of the Coastal Plain. The aquifer, which consists primarily of interbedded quartz sand and clay, outcrops along the Fall Line. In up dip areas, the aquifer is composed of unconsolidated medium to very-coarse grained sand interbedded with clay lenses; down-dip, it becomes very-fine grained.

The Charleston aquifer occurs only in the lower half of the Coastal Plain and is hydraulically connected to the overlying McQueen Branch aquifer in the middle part of the Coastal Plain. Down dip, the two aquifers are separated by clay beds up to 200 feet (ft) thick. The Charleston aquifer consists of unconsolidated fine to very-coarse quartz sand, clayey sand, and clay. A detailed description of the McQueen and Charleston aquifers (formerly Middendorf), the Coastal Plain hydrogeologic framework, and previous potentiometric maps are provided in Wachob and others (2017).

The map presented here was constructed using static water levels measured in 140 wells during late 2025. Of those 140 wells, 108 are screened solely in the McQueen Branch aquifer, 27 are screened in the Charleston aquifer, and 5 are screened in both the McQueen Branch and Charleston aquifers. The wells measured are mix of dedicated observation wells and privately-owned production wells that serve public-supply systems and agricultural or industrial facilities. The authors are grateful for the cooperation of well-owners in obtaining the water-level measurements necessary to produce this map.

Measurements of depth to water in feet were transformed to water level elevation by subtracting the depth to water from the land surface elevation; the resulting information was contoured to represent the aquifers' potentiometric surface in feet above or below the North American Vertical Datum 1988 (NAVD 88).

The 2022 McQueen Branch-Charleston potentiometric surface map shows a generally southeastward groundwater flow affected by potentiometric lows in Charleston, Williamsburg, Georgetown, and Florence Counties. Potentiometric levels range from more than 400 ft near the Fall Line to ~156 ft in Georgetown County. A cone of depression centered at Mount Pleasant continues to affect the Charleston aquifer in the coastal counties. The water-level elevation at the center of the cone is ~94 feet. Generally, water levels are stable in the cone of depression and eastward barrier islands, but water levels in southern Dorchester County near Summerville have declined an average of 10 ft since 2022. The 20-ft water level recovery observed in well CHN-173 in central Mt. Pleasant suggests the measurement shown on the 2022 map was affected by pumping from a nearby well. Water levels on Seabrook Island and Kiawah Island continue to indicate a local potentiometric low centered at those islands.

Water levels in four wells that define the center of a cone of depression in the McQueen Branch aquifer in Georgetown County have been relatively unchanged since 2002, but the cone continues to expand inland into Williamsburg County and southern Horry County. The localized cone of depression around the City of Florence has been further defined by the addition of a dedicated monitoring well, which defines the center of the cone at -61 ft.

The 2025 McQueen Branch-Charleston-Gramling potentiometric map suggests that downdip from the recharge areas and outside of the western edge of the aquifer, water levels throughout much of this aquifer have declined 50 to 100 ft below predevelopment levels (Aucott and Speiran, 1985), and in parts of Charleston and Georgetown Counties, more than 200 ft.

References

Aucott, W.R., and Speiran, G.K., 1985, Potentiometric surfaces of the Coastal Plain aquifers of South Carolina prior to development: U.S. Geological Survey Water-Resources Investigations Report 84-4208, 5 sheets.

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Gellicci, J.A., and Lantier, J.C., 2010, Hydrogeologic framework of the Atlantic Coastal Plain, North and South Carolina, in Campbell, B.G., and Coes, A.L., eds., Groundwater availability in the Atlantic Coastal Plain of North and South Carolina: U.S. Geological Survey Professional Paper 1773, p. 49–162.

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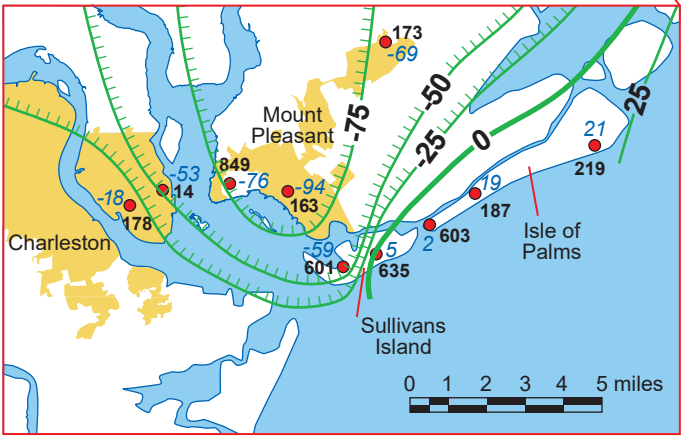
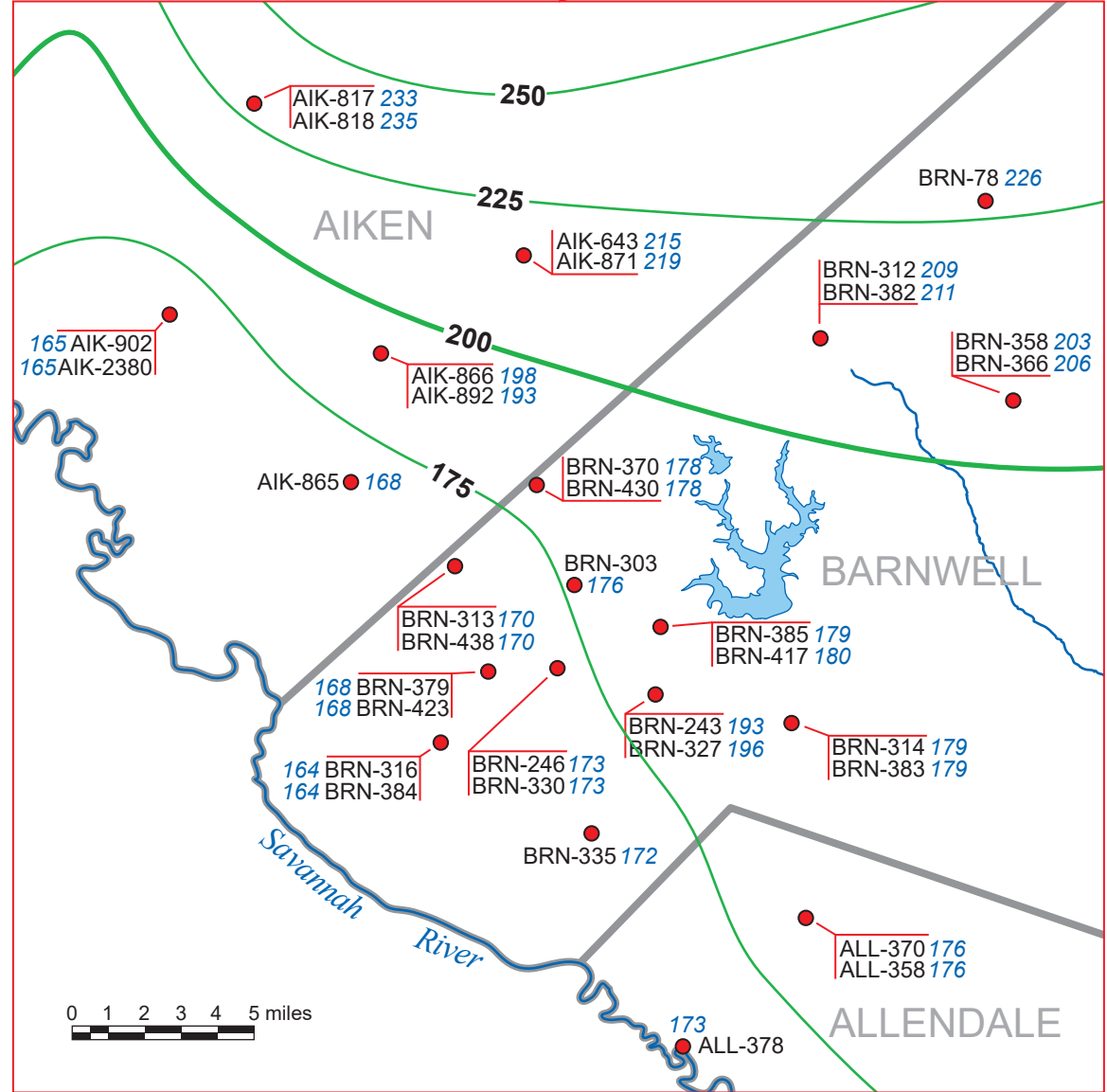
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Well ID	2025 potentiometric level (ft (NAD83))	2025 water level (ft) ^a	Change in water level (ft) ^b 2022**	Aquifer
AIQ-643	215	46	4 ^c	McQueen Branch
AIQ-817	233	185	2 ^c	McQueen Branch
AIQ-818	233	186	1 ^c	McQueen Branch
AIQ-845	269	23	0 ^c	McQueen Branch
AIQ-845	269	27	0 ^c	McQueen Branch
AIQ-865	168	97	0 ^c	McQueen Branch
AIQ-866	198	156	0 ^c	McQueen Branch
AIQ-871	219	41	1	McQueen Branch
AIQ-892	199	41	1	McQueen Branch
AIQ-902	165	68	1 ^c	McQueen Branch
AIQ-2380	165	63	0	McQueen Branch
AIQ-2449	235	207	0	McQueen Branch
AIQ-2544	431	81	4	McQueen Branch
AIQ-2711	289	178	10	McQueen Branch
AIQ-2892	176	103	-1	McQueen Branch
AIQ-1358	176	66	-1	McQueen Branch
AIQ-1370	176	68	1 ^c	McQueen Branch
AIQ-1377	177	103	-1	McQueen Branch
AIQ-1278	173	-87	-1	McQueen Branch
EA07-7	170	-9	-1	McQueen Branch
BR-429	170	5	-4 ^c	Charleston
BR-654	178	112	-5	Charleston
BRP-264	9	60	6 ^c	Charleston
BRP-278	226	114	0	McQueen Branch
BRP-243	193	55	2	McQueen Branch
BRP-246	173	79	-2	McQueen Branch
BRP-247	173	124	-1	McQueen Branch
BRP-312	209	122	-1	McQueen Branch
BRP-313	170	126	0	McQueen Branch
BRP-314	779	35	-1	McQueen Branch
BRP-165	164	19	-1	McQueen Branch
BRP-327	196	55	-1	McQueen Branch
BRP-328	173	124	-1	McQueen Branch
BRP-1335	172	34	0	McQueen Branch
BRP-349	182	26	-1	McQueen Branch

Well ID	2025 potentiometric redox (mV fNADDS)	2025 water level (ft*)	Change in water level (ft) vs 2022*	Aquifer
BPM-356	182	26	-1*	McQueen Branch
BPM-358	203	61	-1	McQueen Branch
BPM-360	203	64	-4*	McQueen Branch
BPM-370	178	95	1	McQueen Branch
BPM-379	168	95	-1	McQueen Branch
BPM-384	211	122	0	McQueen Branch
BPM-385	179	36	-1	McQueen Branch
BPM-384	164	19	-1	McQueen Branch
BPM-385	164	19	0	McQueen Branch
BPM-477	160	133	1	McQueen Branch
BPM-422	166	97	0	McQueen Branch
BPM-430	178	95	1	McQueen Branch
BPM-438	170	126	0	McQueen Branch
CAI-195	104	48	-8	McQueen Branch
CAI-272	91	44	8	McQueen Branch
CHP-663	133	60	1	Charleston
CHP-663	-94	120	6	Charleston
CHP-172	-28	37	-4	Charleston
CHP-173	-69	74	22	Charleston
CHP-174	-61	69	-25	Charleston
CHP-175	-48	26	1	Charleston
CHP-183	-54	78	1	Charleston
CHP-186	-70	82	-17	Charleston
CHP-187	19	-5	1	Charleston
CHP-219	21	-14	-5	Charleston
CHP-601	-59	65	6	Charleston
CHP-602	-59	7	3	Charleston
CHP-633	5	1	2	Charleston
CHP-801	-44	51	-3	Charleston
CHP-849	-76	89	30	Charleston
CLA-27	33	88	-8	McQueen Branch
CLA-29	34	107	n/a	McQueen Branch
CLA-148	39	105	-8	McQueen Branch
CLA-49	69	-5	-4	Charleston
COO-50	74	12	-3	Charleston

Well ID	2025 potential elevation (ft NAD83)	2025 water level (ft) ^a	Change in water level 2022**	Aquifer
CTT-189	239	14	0	McQueen Branch
CTT-197	439	130	-9	McQueen Branch
D-02-121	262	121	-6	McQueen Branch
CTT-327	438	160	-4	McQueen Branch
CTT-327	107	85	0	McQueen Branch
BAR-208	129	39	-1 ^b	McQueen Branch
DLI-79	59	32	0	McQueen Branch
DLI-121	32	60	-3	McQueen Branch
D-02-132	24	59	-2	McQueen Branch
DLI-700	73	83	-14	McQueen Branch
DLI-700	29	53	-3	McQueen Branch
D-02-132	26	56	-3	McQueen Branch
DOR-88	-7	36	+10	Charleston
DOR-221	-14	36	-9	Charleston
D-02-132	-5	60	-11	Charleston
FLO-165	99	30	-1	McQueen Branch
FLO-165	133	118	-7	McQueen Branch
FLO-165	76	69	6	McQueen Branch
FLO-209	-31	154	5	McQueen Branch
FLO-489	-61	169	n/a ^c	McQueen Branch
FLO-489	-54	186	n/a	McQueen Branch
GEO-77	-145	162	8	McQueen Branch
GEO-90	-145	170	+1	McQueen Branch
GEO-211	-130	141	+10	McQueen Branch
GEO-214	-165	191	4	McQueen Branch
GEO-394	-156	174	n/a	McQueen Branch
GEO-394	-145	186	n/a	McQueen Branch
HOK-419	-71	95	-9	McQueen Branch
HOK-419	-71	95	-9	McQueen Branch
HOK-1171	-48	84	-4	McQueen Branch
HOK-1365	-79	96	-7	McQueen Branch
JE-26	145	154	-2	Charleston
LE-35	241	113	-9	McQueen Branch
LE-45	145	113	-4	McQueen Branch
LE-79	199	17	0	McQueen Branch
LEE-79	182	47	-6	McQueen Branch

Well ID	2025 potentiometric level (ft NAD83)	2025 water level (ft) ^a	Change in water level (ft since 2022 ^a)	Aquifer
LEE-179	151	81	0	McQueen Branch
LEE-238	143	80	-2	McQueen Branch
RC-442	299	75	0	McQueen Branch
MLB-101	104	75	-1	McQueen Branch
MLB-110	59	32	0	McQueen Branch
MLB-112	127	4	1	McQueen Branch
MRN-9	-1	66	-3	McQueen Branch
MRN-48	30	34	12	McQueen Branch
RC-175	146	33	3	McQueen Branch
ORC-383	170	4	12 ^b	McQueen Branch
ORC-389	173	2	6 ^b	McQueen Branch
ORC-661	146	-27	-4	McQueen Branch
RC-543	135	47	0	McQueen Branch
RC-585	207	120	2	McQueen Branch
RC-707	195	104	2	McQueen Branch
SUM-199	130	90	n/a	McQueen Branch
SUM-199	83	62	-5	McQueen Branch
SUM-132	82	63	-7	McQueen Branch
SUM-146	114	56	4	McQueen Branch
SUM-163	67	108	9	McQueen Branch
SUM-164	104	75	9	McQueen Branch
SUM-488	900	79	0	McQueen Branch
SUM-492	41	80	-5	McQueen Branch
SUM-504	139	27	-2	McQueen Branch
SUM-505	140	25	-1	McQueen Branch
WL-176	139	157	2	McQueen Branch
WL-198	-18	93	n/a	Charleston
WL-203	-40	93	n/a	Charleston
WL-203	-259	136	-6	MB / Charleston
WL-207	-25	97	-13	MB / Charleston
WL-208	-34	102	-7	MB / Charleston
WL-211	-34	88	-7	MB / Charleston
WL-212	-34	93	-3	Charleston
WL-213	-43	98	2	Charleston
WB-355	-47	102	-3	McQueen Branch



• Depth to water from land surface. Negative value indicates flowing well.

•• Change in water level compared to measurement made for 2022 potentiometric map. Positive number indicates higher water level in 2025.

¹ Change in water level compared to measurement made for 2019 potentiometric map.