

CHLORIDE CONDITIONS IN THE FLORIDAN AQUIFER, BEAUFORT COUNTY,  
SOUTH CAROLINA: DATA COLLECTED DURING MAY 1985

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South Carolina Water Resources Commission  
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ABSTRACT

Chloride levels in the ground water of the Floridan aquifer are causing serious concern in coastal Beaufort County. For this reason, a network of 140 wells is monitored every May and December to chart changes in chloride concentrations. Data collected in May 1985 indicate that little change has occurred, in general, since the time of previous reports (Hayes, 1979 and Spencer, 1984). There are, however, widely separated localities, such as Cat Island, Datha Island, and Victoria Bluff, that have shown increased chlorides owing to upconing and lateral encroachment.

In general, the chloride concentrations tend to be greatest at the edges of the smaller sea islands and least at the centers, where recharge occurs. This situation exists on Ladies, St. Helena, and Port Royal Islands.

## CHLORIDE MONITORING IN THE GROUND WATER OF BEAUFORT COUNTY

During the first week of May 1985, 140 wells were sampled in Beaufort County to determine the chloride concentrations in the Floridan aquifer (Table 1). The data obtained were compared to those published by Hayes (1979) and Spencer (1984) and indicate that little change has occurred in general. There have been local changes where chlorides have increased as a result of upconing or encroachment.

Five wells on Cat Island showed marked changes in chloride concentrations as a result of intensive pumping during April 1985. Chlorides in well 26II-pl increased from 160 mg/L (milligrams per liter) in April 1984 to 1,300 mg/L in May 1985, and then they declined to 130 mg/L in June 1985 when pumping stopped. This rise and fall of chloride concentration is indicative of saltwater upconing.

A similar situation may exist on Datha Island. There, chloride concentrations ranged from 160 mg/L near the center of the island to 6,700 mg/L near the north end of the island. When pumping is stopped or decreased, chloride concentrations tend to decrease, but not as drastically as on Cat Island. The increased chlorides are probably a result of upconing as well as encroachment, owing to the withdrawal (16,000 gallons per day) from Datha's 10 producing limestone wells.

The area adjacent to the Beaufort River has traditionally shown high chloride values (Figure 1). A new well (26II-d4), drilled at the intersection of U.S. Highway 21 and S.C. Highway 802 on Ladies Island, had chlorides of 760 mg/L. This was unexpected, since most similarly constructed wells in this area contain chlorides between 20 and 40 mg/L.

The well is located approximately 250 feet from a saltwater marsh, so vertical leakage may be affecting the well.

Wells on Parris Island showed chlorides ranging from 290 to 4,500 mg/L. A small freshwater lens exists at the south end of the island (Figure 1). Wells in this area probably would salt up if pumped intensively.

A wide range of chloride concentrations was observed at St. Helena Island and the surrounding area (Figure 1). The wells south of Lands End on St. Helena Island showed chlorides as high as 3,300 mg/L. All wells southeast of St. Helena Island, including Fripp Island, had high chlorides, ranging from 6,000 to 7,400 mg/L. Four wells near Coffin Point had chlorides ranging from 57 to 170 mg/L, and the interior of St. Helena Island had relatively low chlorides, ranging from 17 to 47 mg/L.

Port Royal Island showed rather low chloride values, ranging from 5 to 28 mg/L. The only high chlorides were identified at the Port Royal Clay Company and in the area adjacent to the Coosaw River. These values were as high as 7,600 mg/L and 1,400 mg/L respectively (Figure 1).

Chloride concentrations south of the Broad River have not changed much in recent years. A number of new wells sampled at Callawassie Island indicated chlorides to be about 5 mg/L. The highest concentration found at nearby Indigo Plantation was 7 mg/L. However, well 29JJ-d2, located directly across the Colleton River at Pinckney Colony, had chlorides of 150 mg/L. This well might have been cased improperly, allowing saltwater from above the confining unit to enter the limestone (Spencer, 1984).

Samples taken from the production and potable wells at the Waddell Mariculture Center indicate increasing chlorides. The chloride levels

were measured at 2,400 mg/L and 650 mg/L, respectively. In April 1984, chlorides in the production well were 1,800 mg/L; in April 1983, chlorides in the potable well were 120 mg/L. Saltwater is believed to be entering these wells because of encroachment (Spencer, 1984).

Chloride levels in the Bluffton area were relatively low, ranging from 4 to 36 mg/L. The only high value sampled in the area was at Moss Creek Plantation where well 28KK-d1 had chlorides of 140 mg/L.

Of the 35 wells sampled on Hilton Head Island, 22 of them showed chlorides greater than 50 mg/L. Chlorides toward the center of the island were relatively low and ranged from 9 to 39 mg/L. The highest chlorides occurred in the east-central and northeastern portions of the island. Chloride concentrations in this area ranged from 51 to 150 mg/L (Figure 1). This trend is similar to that identified by Hayes.

Very little is known about the chloride levels on Daufuskie Island, but future development will provide greater knowledge. Sampling from the lower half of the Floridan aquifer (600-700 feet), well 29LL-j1 at Haig Point, indicated chlorides of 480 mg/L.

In general, chloride levels have remained fairly low in Beaufort County. There are widely separated localities that have been affected by upconing or encroachment, and these areas should be monitored on a regular basis. Overall coverage is good, but wells should be added to increase control in the following areas (figure 2):

1. Chisholm Island
2. Northern Ladies Island
3. Coosaw Island
4. Northern St. Helena Island
5. Pritchards Island
6. St. Phillips Island
7. Shell Point area
8. Lemon Island
9. Spring Island
10. Town of Bluffton

Table 1. Chloride concentrations in the Floridan aquifer, May 1985  
 (Analyses by Lawrence H. Lagman, South Carolina Water Resources Commission Laboratory)

Well No.	SCWRC grid No.	Chloride mg/L	Location	Remarks
507	24III-x2	31	Coffin Point Area	
506	24III-y1	20	"	
512	24III-y4	67	"	
1758	24II-d2	160	St. Helena Island	
472	24II-e1	170	"	
495	24II-f1	46	"	
449	24JJ-c1	6000	Fripp Island	
455	24JJ-d1	6000	"	
456	24JJ-e1	7400	"	
1457	25III-p3	4400	Datha Island	Affected by upconing/encroachment.
1458	25III-p4	6700	"	
1459	25III-p5	160	"	
1567	25III-p13	620	"	
1559	25III-p31	500	"	

Table 1. Chloride concentrations in the Floridan aquifer, May 1985 (Continued)  
 (Analyses by Lawrence H. Lagman, South Carolina Water Resources Commission Laboratory)

Well No.	SCWRC grid No.	Chloride mg/L	Location	Remarks
509	25II-a1	31	St. Helena Island	
517	25II-i2	21	"	
510	25II-j1	57	"	
523	25II-n2	26	"	
524	25II-y1	24	"	
492	?	47	"	
1754	26II-d4	760	Ladies Island	Referenced in text.
470	26II-11	21	St. Helena Island	
1610	26II-o4	1300	Cat Island	Affected by upconing.
845	26II-o1	140	"	"
982	26II-p1	1300	"	"
1754	26II-p4	570	"	"
545	26II-r2	17	St. Helena Island	
1429	26II-w6	21	"	
1427	26II-w7	19	"	
1740	26II-w11	20	"	

Table 1. Chloride concentrations in the Floridan aquifer, May 1985 (Continued)  
 (Analyses by Lawrence H. Lagman, South Carolina Water Resources Commission Laboratory)

Well No.	SCWRC grid No.	Chloride mg/L	Location	Remarks
1760	26II-w14	18	St. Helena Island	
1428	26II-x3	30	"	
1747	26II-x4	360	"	
528	26JJ-b1	41	"	
791	26JJ-d1	29	" (Lands End)	
534	26JJ-g1	29	" (Lands End)	
532	26JJ-g2	42	" (Lands End)	
430	26JJ-n1	3300	" (Lands End)	
195	27GG-c1	11	Chisholm Island	
1577	27GG-m1	1400	"	
1700	27GG-p2	6	Port Royal Island	
1534	27GG-q2	5	"	
1709	27GG-r1	60	"	
1311	27GG-w3	12	Marine Corps Air Station	
1204	27GG-y1	17	Port Royal Island	



Table 1. Chloride concentrations in the Floridan aquifer, May 1985 (Continued)  
 (Analyses by Lawrence H. Lagman, South Carolina Water Resources Commission Laboratory)

Well No.	SCWRC grid No.	Chloride mg/L	Location	Remarks
1733	27GG-y3	8	Marine Corps Air Station	
1746	27III-c2	10	"	
132	27III-g2	7	"	
170	27III-h1	8	"	
131	27III-n1	8	"	
445	27III-o2	6	Port Royal Island	
474	27III-r1	19	"	
783	27III-w1	21	"	
118	27III-y1	28	"	
471	27II-a1	290	Ladies Island	
1611	27II-a7	17	Port Royal Island	
1710	27II-b17	27	"	
1722	27II-f5	16	"	
1716	27II-h10	15	"	
793	27II-13	7600	"	

Table 1. Chloride concentrations in the Floridan aquifer, May 1985 (Continued)  
 (Analyses by Lawrence H. Lagman, South Carolina Water Resources Commission Laboratory)

Well No.	SCWRC grid No.	Chloride mg/L	Location	Remarks
566	27II-s1	4500	Parris Island	
365	27JJ-a1	2500	"	
459	27JJ-i1	290	"	
181	27JJ-j1	320	"	
628	27KK-b6	150	Port Royal Plantation	May have been chlorinated.
809	27KK-b12	110	"	"
441	27KK-d2	27	Hilton Head Plantation	
561	27KK-e5	52	"	
644	27KK-f10	20	"	
696	27KK-g3	30	"	
652	27KK-h1	31	"	
771	27KK-i2	84	Port Royal Plantation	
741	27KK-i3	83	"	
742	27KK-i4	77	"	
778	27KK-j3	89	"	
342	27KK-12	10	"	

Table 1. Chloride concentrations in the Floridan aquifer, May 1985 (Continued)  
 (Analyses by Lawrence H. Lagman, South Carolina Water Resources Commission Laboratory)

Well No.	SCWRC grid No.	Chloride mg/L	Location	Remarks
604	27KK-m3	76	Broad Creek area	
769	27KK-m4	77	"	
317	27KK-o1	32	Hilton Head Plantation	
835	27KK-p2	51	Broad Creek area	
636	27KK-q2	57	"	
832	27KK-r8	63	Palmetto Dunes	
720	27KK-x2	130	"	May have been chlorinated.
758	27KK-x8	62	"	
1756	28GG-a10	14	Lobeco	
582	28GG-k3	5	Port Royal Island	
1692	28GG-v2	6	Clarendon Plantation	
1712	28GG-w3	7	"	
350	28III-b3	5	"	
174	28III-m3	7	Laurel Bay	
1749	28II-b5	16	Port Royal Island	
1110	28II-i2	14	"	

Table 1. Chloride concentrations in the Floridan aquifer, May 1985 (Continued)  
 (Analyses by Lawrence H. Lagman, South Carolina Water Resources Commission Laboratory)

Well No.	SCWRC grid No.	Chloride mg/L	Location	Remarks
1389	28JJ-n2	2400	Waddell Mariculture Center	Affected by lateral encroachment.
493	28JJ-n3	650	" " "	" " " "
1761	28JJ-p4	4	Foot Point Plantation	
1524	28JJ-p3	5	"	
338	28JJ-q2	10	"	
1325	28KK-d1	140	Moss Creek Plantation	May have been chlorinated.
1326	28KK-d2	36	"	
374	28KK-f3	12	Bluffton area	
207	28KK-g1	32	"	
676	28KK-i7	27	Windmill Harbour	
677	28KK-i8	110	"	
653	28KK-k7	39	Broad Creek area	
774	28KK-s10	25	"	
337	28KK-w1	26	Spanish Wells	

11

Table 1. Chloride concentrations in the Floridan aquifer, May 1985 (Continued)  
 (Analyses by Lawrence H. Lagman, South Carolina Water Resources Commission Laboratory)

Well No.	SCWRC grid No.	Chloride mg/L	Location	Remarks
704	28LL-a1	54	Sea Pines Plantation	
744	28LL-b1	28	"	
703	28LL-b2	51	"	
754	28LL-g3	140	"	May have been chlorinated.
755	28LL-h5	71	"	
713	28LL-h7	27	"	
706	28LL-m1	130	"	May have been chlorinated.
346	28LL-n8	94	"	May have been chlorinated.
700	28LL-p1	24	"	
844	29II-v1	4	Callawassie Island	
1471	29II-v2	4	"	
301	29II-x8	4	Camp St. Mary	
1768	29II-y1	4	Indigo Plantation	
1764	29JJ-e9	4	"	
1765	29JJ-e10	7	"	

Table 1. Chloride concentrations in the Floridan aquifer, May 1985 (Continued)  
 (Analyses by Lawrence H. Lagman, South Carolina Water Resources Commission Laboratory)

Well No.	SCWRC grid No.	Chloride mg/L	Location	Remarks
821	29JJ-d1	5	Pinckney Colony	
826	29JJ-d2	150	"	Improper construction.
1452	29JJ-m2	4	Bluffton area	
1418	29JJ-q2	6	"	
1500	29JJ-t2	4	Oak Island	
1501	29JJ-t3	28	"	
1502	29JJ-t4	5	"	
357	29KK-a1	4	Bluffton area	

31 30 29 28 27 26 25 24

E  
E

F  
F

G  
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H  
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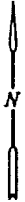
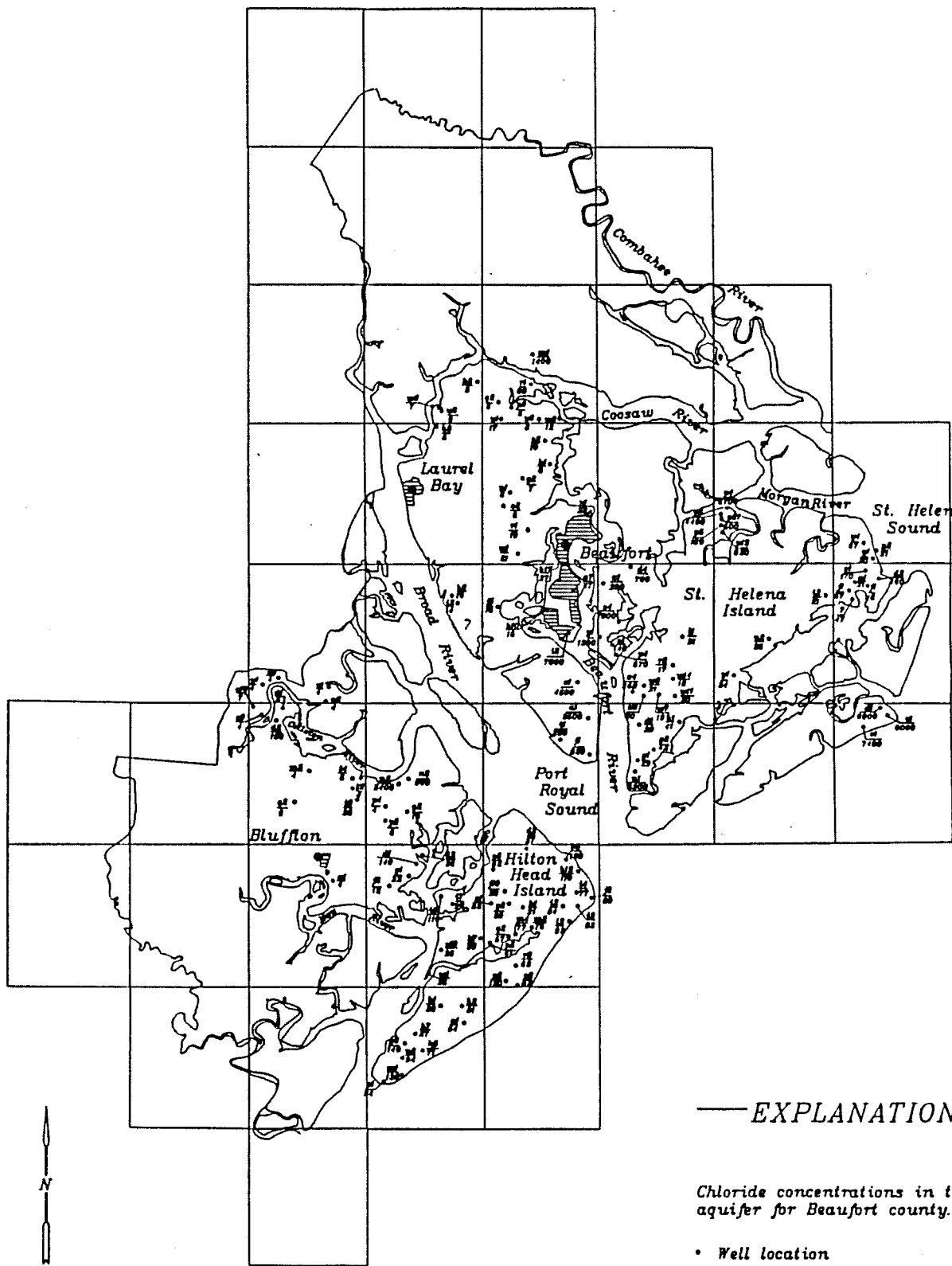
I  
I

J  
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L  
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M



— EXPLANATION —

Chloride concentrations in the Floridan aquifer for Beaufort county.

• Well location

$$\frac{a3}{1200} = \frac{\text{Well number}}{\text{chloride in milligrams per liter}}$$

SCALE



Figure 1.

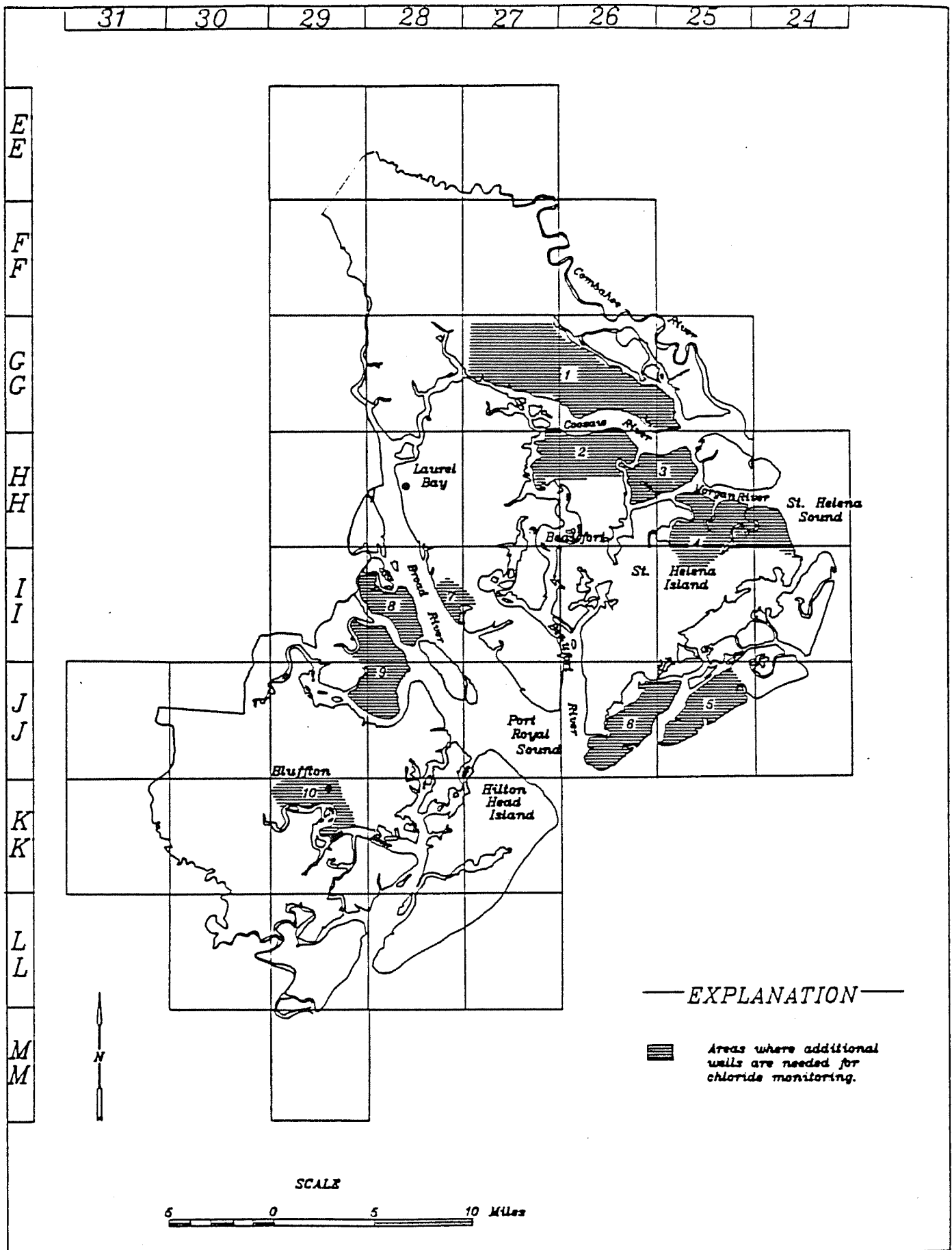


Figure 2.