PRELIMINARY GEOHYDROLOGIC FRAMEWORK
For
COLLETON COUNTY, SOUTH CAROLINA

W. Brian Hughes

State of South Carolina
Water Resources Commission

Alfred H. Vang
Executive Director

June 8, 1987

MEMORANDUM

TO: Colleton County File

FROM: W. Brian Hughes

SUBJECT: Preliminary Geohydrologic Framework for Colleton County, South Carolina.

In recent months, some confusion has occurred over which geologic and hydrologic units are tapped by wells in Colleton County, South Carolina. This confusion prompted the author to develop a working model of the geohydrologic framework for the area. This model should be further refined, extended, and altered as future data are collected.

Colleton County has not received a great deal of attention by previous investigators. Gohn and others (1977) examined the lithostratigraphy of a corehole in nearby Dorchester County. Hayes (1979) drilled 25 test wells in Colleton and Hampton Counties as part of his project, providing well cuttings and geophysical logs for much of the county. Park (1985) studied the geology and hydrology of Charleston, Dorchester, and Berkeley Counties. His sections are useful for establishing trends of the geologic units in adjacent Colleton County. Reid and others (1986) provided a geologic and hydrologic analysis of a well in northern Dorchester County. The two wells examined by the U. S. Geological Survey, 23CC-il (Gohn and others, 1977) and 25Z-bl (Reid and others, 1986) provided the basis for the geologic correlations in this study.

The results of this study are based on the aforementioned previous studies, brief examinations of the lithologic samples collected during the Hayes (1979) investigation, and file data such as geophysical logs and drillers logs.

Geologic Units

Because of the limitations of the preexisting data, only those units considered to be part of the Floridan aquifer or Tertiary sand aquifer (Aucott and Speiran, 1986) were examined. Five geologic sections,

covering as much of the county as possible were constructed. The purpose of these sections is to provide a general idea of the units that might be encountered in the subsurface.

The Floridan aquifer in Colleton County is composed of the Lower Eocene and Paleocene Black Mingo Formation, the Middle Eocene Santee Limestone, and the Upper Eocene and Oligocene Cooper Formation. The Santee Limestone as used in this report includes the Fishburne Formation as described by Reid and others (1986).

Black Mingo Formation

In most of the county, the top of the Black Mingo Formation is identified by a coarse, phosphatic sand zone about 10-20 feet thick. This phosphate produces a distinctive kick on a gamma-ray log. In the southern half of the county, the sand is not always present and the contact is only identifiable with a gamma-ray log. The lithology of the Black Mingo varies considerably in Colleton County. In general, in updip areas, the unit is composed of coarse sand approximately 50-100 feet thick underlain by dark sandy clay. In downdip areas the upper 50-100 feet are composed of coarse, fossiliferous, sandy limestone, also underlain by dark sandy clay.

Santee Limestone

The Santee Limestone overlies the Black Mingo Formation. The top of the Santee Limestone is marked by an accumulation of phosphate or by a thin zone of fine-grained, quartz sand. The Santee can be divided into two lithologic units. The lower unit is composed of a coarse, fossiliferous limestone which is similar to the Black Mingo Limestone in downdip areas. This lower unit grades laterally into coarse sand in the extreme western portion of the county. The upper unit is a gray, fine to medium grained limestone.

Cooper Formation

Overlying the Santee Limestone is the Cooper Formation. The lower part of the Cooper Formation is a gray, fine-grained limestone that is almost indistinguishable from the top of the Santee Limestone. The upper 50-75 feet of Cooper is composed of calcareous silty clay or silty sand. The top of the formation is marked by the occurrence of these fine-grained calcareous sediments and a phosphate accumulation.

Permeable Zones

The most permeable section of the Floridan aquifer appears to be the coarse grained limestone lithology of the Santee Limestone and the upper Black Mingo sand or sandy limestone lithology. This is substantiated by flow logs conducted during the Hayes (1979) investigation. These flow logs were run in wells 25GG-d1 and 24EE-c1. In well 25GG-d1 the permeable

zone identified by Hayes corresponds to the coarse limestone of the Santee Limestone and in 24EE-c1 the permeable zone correlates with the sandy limestone lithology of the Black Mingo Formation.

In the northwestern part of the county, the sandy facies equivalents of the Cooper Formation and Santee Limestone may yield significant quantities of water. Because this report is limited to the Floridan aquifer, the shallow well field being developed at Edisto Beach and the Cretaceous formations utilized in Walterboro are not discussed.

Well Construction

For much of Colleton County the standard well construction practice consists of:

1. drilling through the sandy part of the Cooper Formation and younger formations;

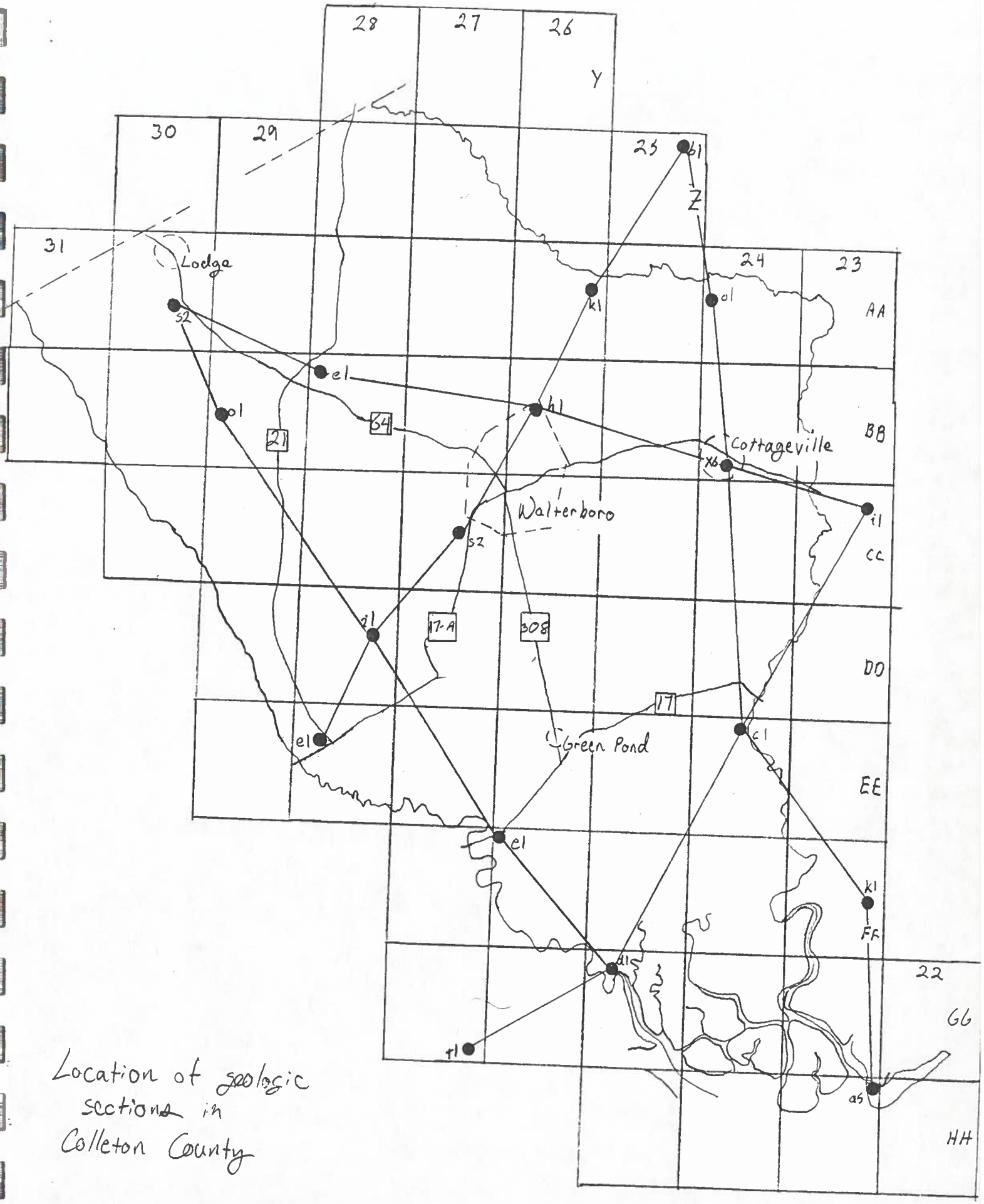
2. setting casing in the top of the fine-grained lithology of the Cooper Formation (called "good marl" on drillers logs);

3. drilling an open hole through the lower Cooper Formation, Santee Limestone, and upper Black Mingo Formation;

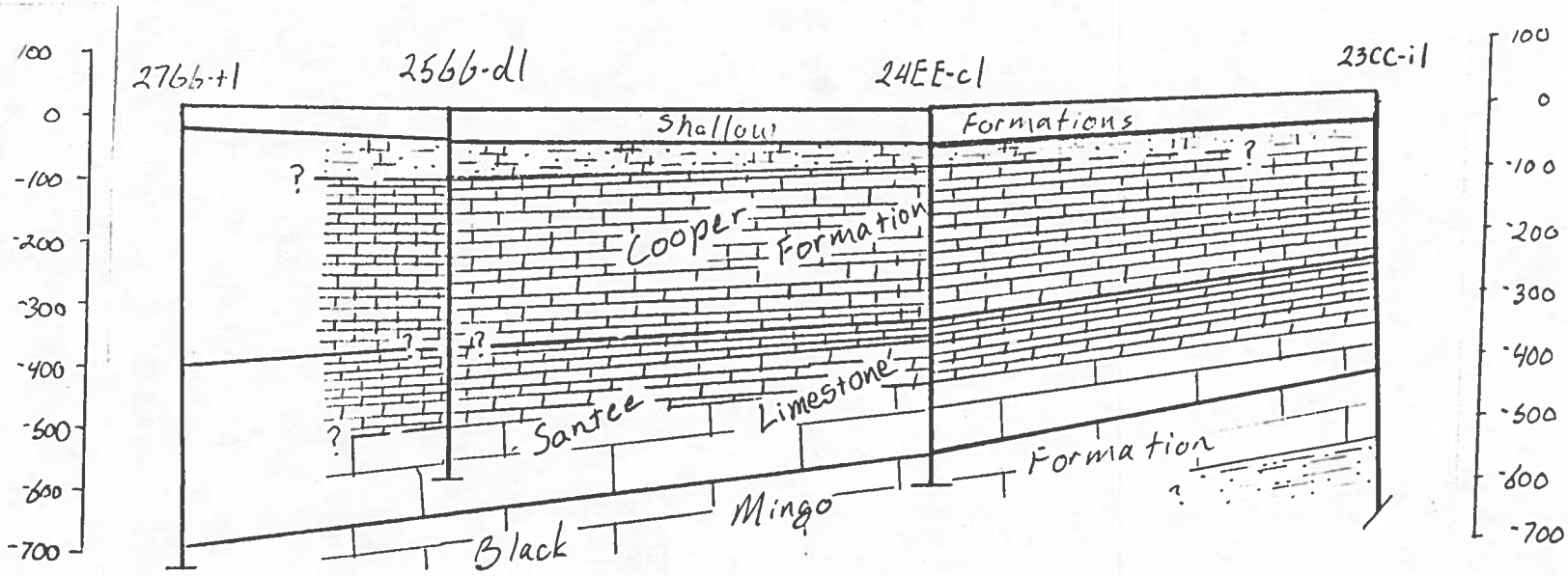
4. completion in the Black Mingo Formation, generally with some collapse at the base of the well.

Future Investigations

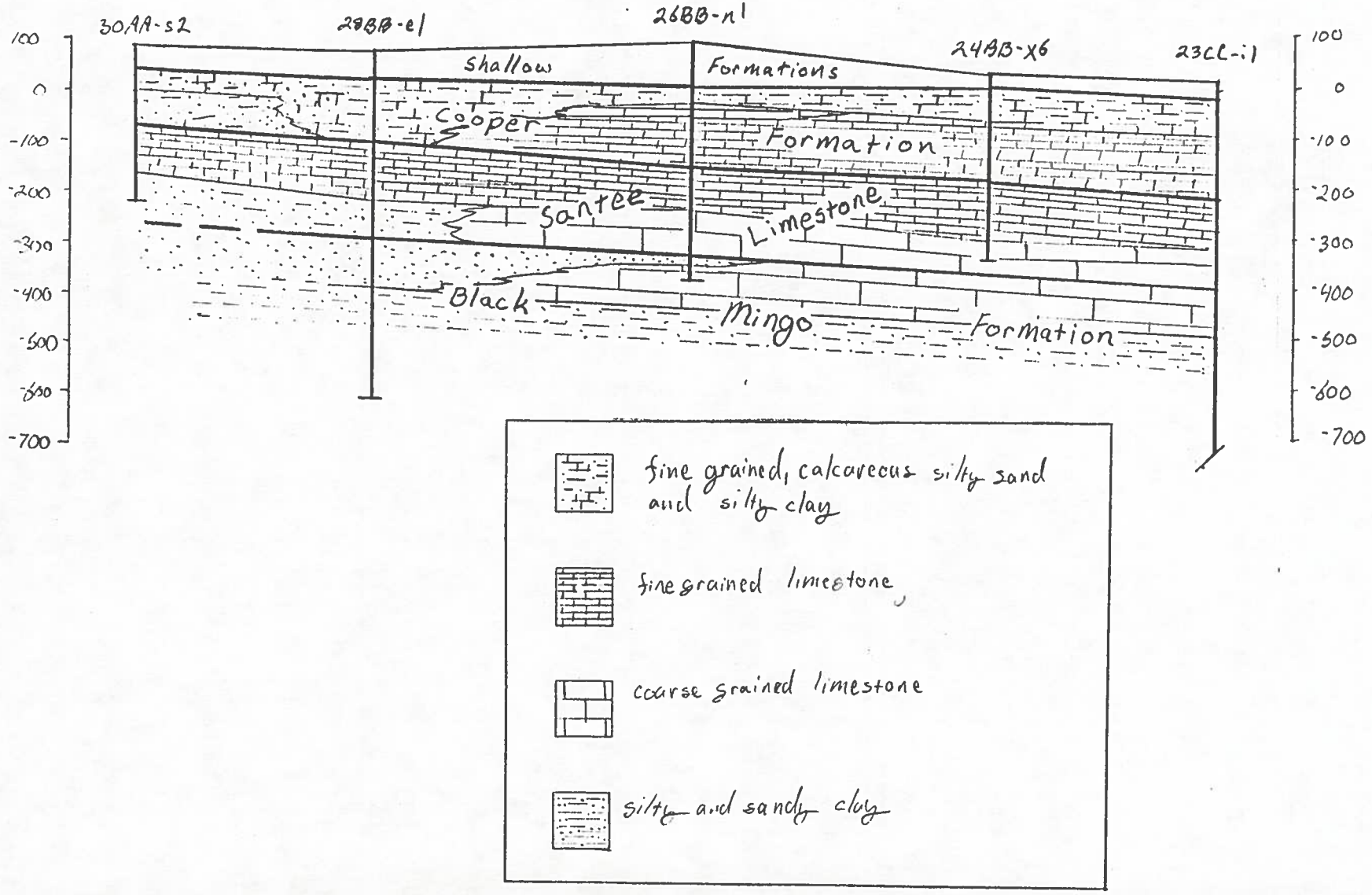
Considerably more work needs to be done to develop an accurate geohydrologic framework for Colleton County. An abundance of file data already exists which can be used to full in data gaps. The Cretaceous formations need to be studied and added to the hydrologic framework. The hydraulic parameters of the aquifers are not well defined.

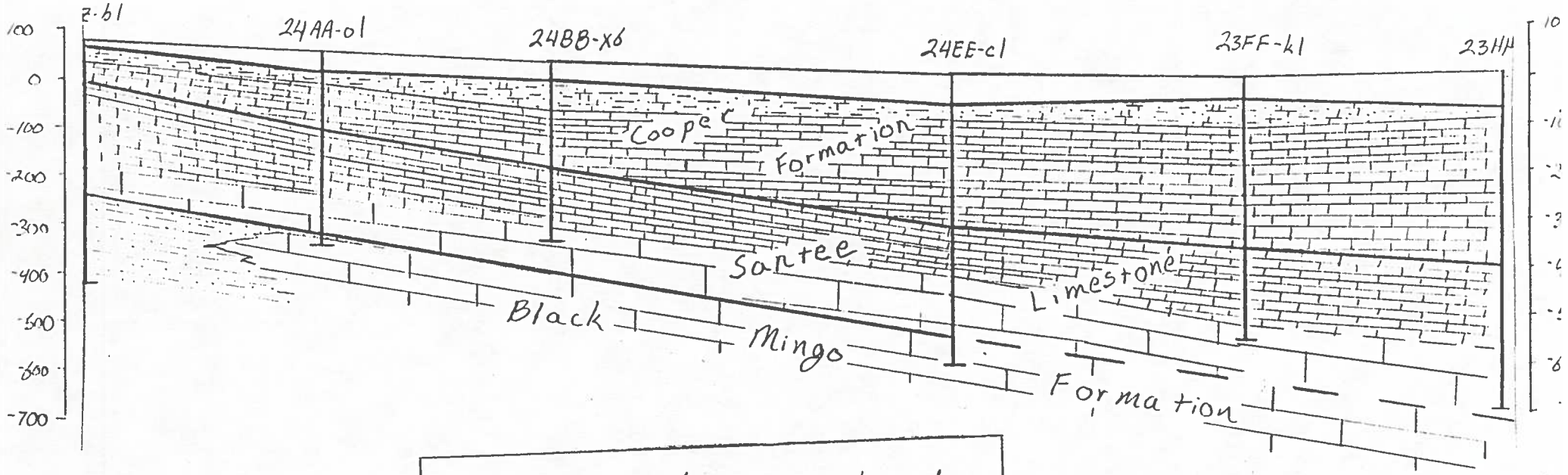


Location of geologic sections in Colleton County



- fine grained, calcareous silty sand and silty clay
- fine grained limestone
- coarse grained limestone
- silty and sandy clay


30AA-s2
29BB-e1
26BB-n1
24BB-x6
23CC-i1
100
0
-100
-200
-300
-400
-500
-600
-700
Shallow
Formations
Cooper
Formation
Santee
Limestone
Black
Mingo
Formation
fine grained, calcareous silty sand and silty clay
fine grained limestone
coarse grained limestone
silty and sandy clay


z-61
24AA-01
24BB-X6
24EE-c1
23FF-k1
23HH
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Santee
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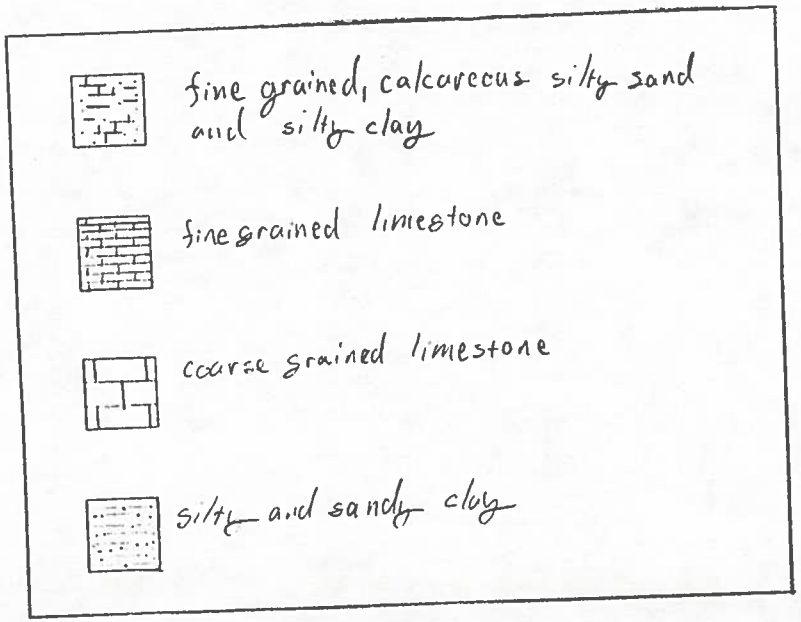
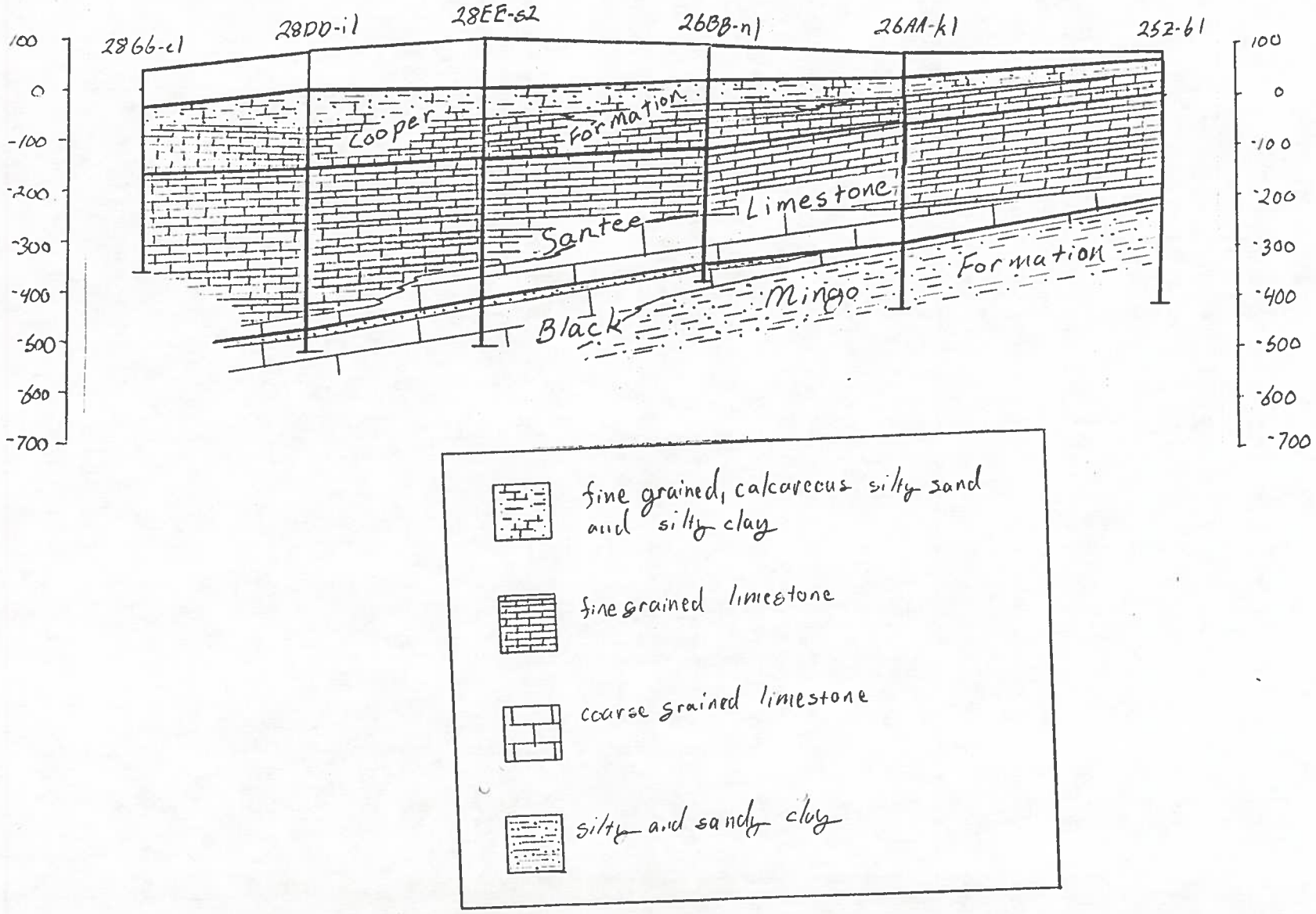
Mingo
Formation


fine grained, calcareous silty sand and silty clay
fine grained limestone
coarse grained limestone
silty and sandy clay


100
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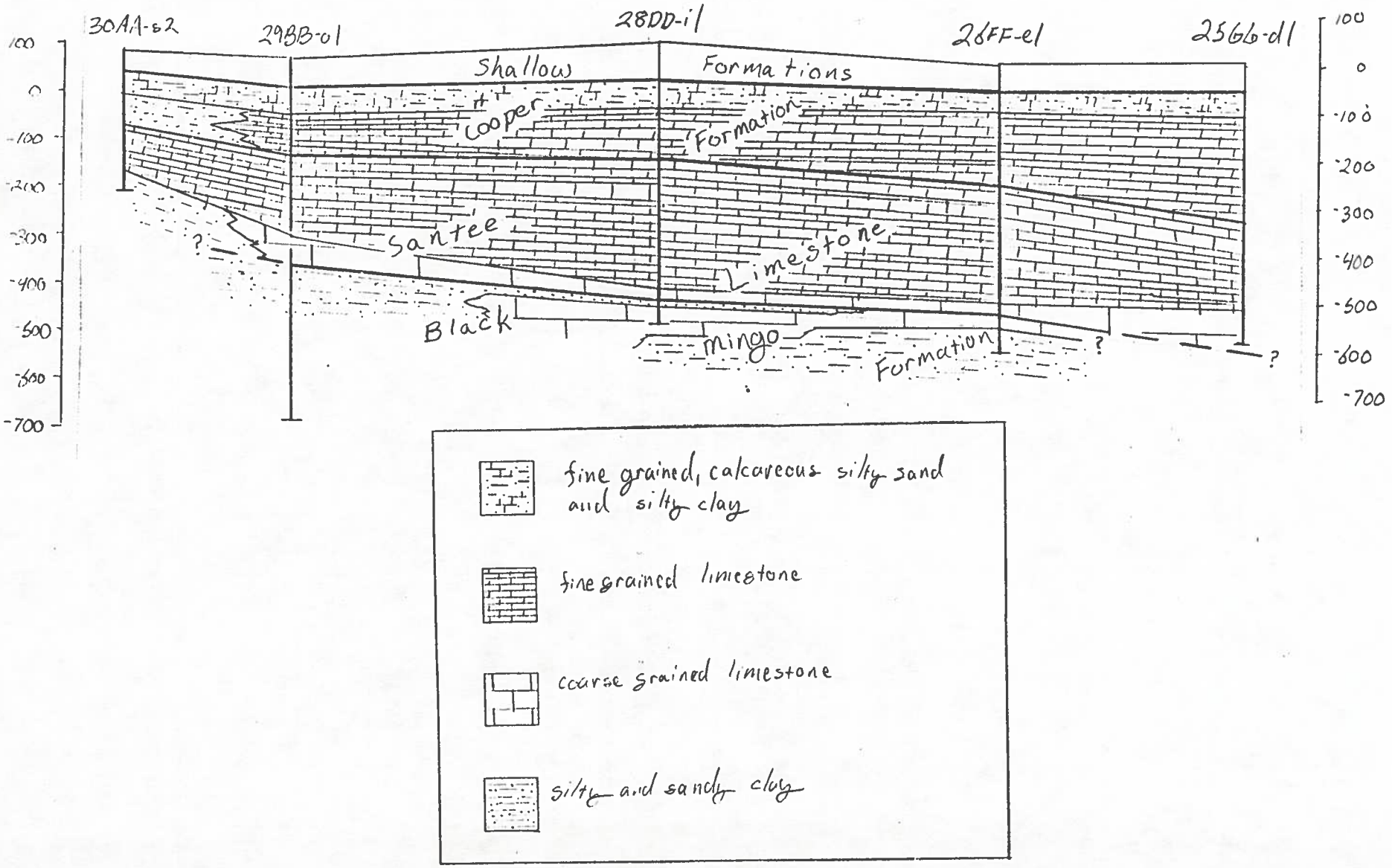
2866-c1
28DD-i1
28EE-s2
26BB-n1
26AA-k1
252-b1
Cooper
Formation
Santee
Limestone
Black
Mingo
Formation
fine grained, calcareous silty sand and silty clay
fine grained limestone
coarse grained limestone
silty and sandy clay


30AA-s2
29BB-o1
28DD-i1
26FF-e1
25Gb-d1
Shallow
Formations
Cooper
Formation
Santee
Limestone
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Mingo
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-500
-600
-700
fine grained, calcareous silty sand and silty clay
fine grained limestone
coarse grained limestone
silty and sandy clay

References

Aucott, W. R., and Speiran, G. K., 1985, Ground water flow in the coastal plain aquifers of South Carolina: Ground Water, v. 23, no. 6.

Gohn, G. S., Higgins, B. B., Smith, C. C., and Owens, J. P., 1977, Lithostratigraphy of the deep corehole (Clubhouse Crossroads Corehole I) near Charleston, South Carolina in Rankin, D. W., ed., Studies related to the Charleston, South Carolina Earthquake of 1886- A preliminary report: U. S. Geological Survey Professional Paper 1028, p. 59-70.

Hayes, L. R., 1979, The ground-water resources of Beaufort, Colleton, Hampton, and Jasper Counties, South Carolina: South Carolina Water Resources Commission Report No. 9, 91 p.

Park, A. D., 1985, The ground water resources of Charleston, Berkeley, and Dorchester Counties, South Carolina: South Carolina Water Resources Commission Report No. 139, 145 p.

Reid, M. S., Aucott, W. R., Lee, R. W., and Renken, R. A., 1986, Hydrologic and geologic analysis of a well in Dorchester County, South Carolina: U. S. Geological Survey Water Resources Investigations Report 86-4161, 23 p.

23HH-a5 COL-148

0–100	dark grayish green, fine to medium-grained quartz sand with abundant shell fragments.
100–130	yellowish gray, very fine-grained limestone.
130–160	limestone as above, with very fine-grained abundantly shelly quartz sand.
160–530	yellowish gray, fine-grained limestone.
530–580	yellowish gray and reddish, hard, coarse-grained limestone with abundant phosphate.
580–700	medium gray, coarse-grained limestone, with abundant calcareous silt and clay.

24AA-o1 COL-248

0–10	white, very clean, very coarse-grained quartz sand.
10–35	dark green, fine-grained quartz sand and clay.
35–55	light green, calcareous, fine-grained sand with clay.
55–155	olive, fine, silty limestone with fine-grained quartz sand.
155–235	light gray, clayey, slightly fossiliferous medium-grained limestone.
235–295	light gray, abundantly fossiliferous limestone.
295–305	light gray, hard, moderately phosphatic, fossiliferous, coarse-grained limestone with abundant brown shell fragments or phosphate (?).
305–369	dark gray, coarse-grained, fossiliferous (shelly) limestone.
369–372	dark gray, coarse-grained quartz sand with minor limestone (shell).
372–395	dark gray, coarse-grained, fossiliferous, sandy limestone.

24BB-x6 COL-279

0–10	reddish, medium-grained quartz sand with trace clay.
20–30	dark gray, coarse-grained quartz sand with clay layers.
30–90	brownish gray, very fine-grained quartz sand (minor) with silty clay, calcareous.
90–150	light gray, very fine-grained limestone.
150–270	as above, not quite as fine-grained.
270–330	yellowish gray, medium-grained, slightly fossiliferous limestone.
330–370	yellowish gray, coarse-grained, slightly fossiliferous (shelly) limestone.

24EE-c1 COL-96

0-25	light gray, fine, sandy, silty clay.
25-60	greenish, silty, medium-grained quartz sand with minor fossil fragments.
60-90	as above, but clay increases and sand decreases.
90-420	light gray, very fine-grained, clayey limestone.
420-550	yellowish gray, coarse-grained, slightly fossiliferous limestone.
550-600	dark gray, coarse-grained limestone.

25GG-d1 COL-94

0-60	brown and orange, fine and medium-grained quartz sand with minor clay.
60-110	dark gray, calcareous clay with common fine-grained sand.
110-150	medium gray, calcareous clay with trace fine-grained sand.
150-330	medium gray, fine-grained limestone.
330-500	light gray, very fine-grained limestone.
500-590	dark gray, coarse-grained, fossiliferous (shelly) limestone.

26AA-k1 COL-97

0-20	brown and red coarse-grained sand with clay.
20-50	brown medium-grained sand with abundant shells.
50-90	gray fossiliferous, calcareous silty and sandy clay.
90-140	green, very fine-grained, silty limestone.
140-310	yellowish gray, slightly fossiliferous medium-grained limestone.
310-390	dark gray, hard, fossiliferous (shelly) limestone.
390-450	dark gray, calcareous silty clay.
450-500	dark gray, sandy (coarse) micaceous clay.

26BB-n1 COL-278

0-30	brown and orange, medium-grained silty sand.
30-70	dark green, coarse-grained quartz sand with common clay.
70-90	dark green, very fine-grained quartz sand with common clay.
90-110	light brown, fine-grained, silty calcareous clay.
110-140	dark gray, coarse-grained, fossiliferous (shelly), hard limestone.
140-240	light gray, very fine-grained limestone.
240-320	yellowish gray, medium-grained, slightly fossiliferous, clayey limestone.
320-420	very light gray, coarse-grained, fossiliferous limestone with abundant calcareous clay.
420-440	dark gray, coarse-grained quartz sand with minor shell limestone fragments.
440-460	dark gray, coarse-grained, fossiliferous (shelly), hard limestone with abundant medium-grained quartz sand.

26CC-12 COL-236

0-10	dark green, very fine-grained quartz sand with minor clay.
10-30	yellow gray, silty clay.
30-60	medium gray, calcareous, silty clay, with minor fine-grained quartz sand.
60-110	no samples
110-240	light gray, very fine-grained limestone.
240-250	medium gray, shelly and fine-grained limestone with common fine-grained quartz sand.
250-300	light gray, fine-grained limestone.
300-350	dark gray, coarse-grained, fossiliferous (shelly) limestone with abundant medium-grained quartz sand.
350-410	very dark gray, silty clay, with minor fine-grained quartz sand.
410-800	very dark gray, fine-grained quartz sand, with minor clay.

26FF-e1 COL-92

0-20	brown and orange silty sand with phosphate (?).
20-50	medium gray, medium-grained quartz sand.
50-60	coarse-grained, clayey sand.
60-100	moderately fossiliferous, very fine-grained silty sand with phosphate.
100-510	light gray, very fine-grained limestone.
510-520	as above, extremely phosphatic.
520-550	light gray, hard, coarse-grained, fossiliferous (shelly) and glauconitic, coarsely sandy limestone.
550-600	dark gray, fine-grained, calcareous silty clay.

28DD-i1 COL-161

0-10	reddish, silty clay.
10-20	brown, coarse-grained quartz sand with clay.
20-40	dark brown, fine-grained quartz sand with clay.
40-50	dark brown, very coarse-grained quartz sand with minor fine-grained silty clay.
50-110	dark brownish gray, silty clay, with minor shell fragments.
110-150	yellowish green, very fine-grained silty sand.
150-220	light gray, fine-grained, silty limestone.
220-240	light gray, very-fine grained quartz sand with common calcareous silt.
240-500	yellowish gray, very fine to fine-grained limestone.

28DD-i2 COL-162

0-10	light gray, fine silty clay.
10-20	brown and red sandy clay.
20-70	brown medium sandy clay.
70-130?	greenish clayey fine-grained quartz sand.
130-520	white to light gray, very fine-grained, clayey limestone.
520-540	medium gray, coarse-grained, fossiliferous limestone.
540-560	gray, medium-grained quartz sand with shell and limestone fragments, abundant phosphate.
560-600	dark gray, coarse grained, abundantly fossiliferous limestone, minor phosphate.

28EE-g1 COL-93

0-70	red, white to gray, very fine-grained silty clay, noncalcareous.
70-92	dark green, very sandy (coarse and fine) clay, increasing fossils with depth.
92-110	light gray, coarse-grained, fossiliferous quartz sand.
110-200	light gray and white, extremely fine-grained, clayey limestone.
200-220	as above, containing abundant medium-grained quartz sand.
220-380	light gray, fine-grained, clayey limestone.

28EE-s2 COL-147

0-10	tan, hard, fine-grained, clayey limestone.
10-25	coquina, oyster shells, some cementation, minor quartz sand.
25-35	dark green, medium-grained, shelly quartz sand.
35-65	light gray, medium-grained quartz sand with minor shell.
65-175	light gray, very fine-grained quartz sand with calcareous silt and shell.
175-255	light gray, very fine-grained limestone.

29DD-f2 HAM-76

0-30	orange, gray and red clay with medium-grained quartz sand.
30-40	yellow, fine-grained, micaceous quartz sand.
40-70	light green, fine-grained quartz sand with minor clay.
70-80	light gray and dark gray clay.
80-100	light gray, hard limestone, with sand and clay as above.
100-110	light gray, hard, slightly fossiliferous, phosphatic, medium-grained limestone.
110-160	light gray, fine-grained limestone.
160-190	light gray, fossiliferous (shelly), coarse limestone, with common coarse-grained quartz sand.
190-220	light gray, very fine-grained limestone.

30AA-s2 COL-98

0-50	reddish brown, very clean, medium-grained quartz sand.
50-70	dark brown, coarse-grained, phosphatic quartz sand.
70-90	as above, but no phosphate.
90-150	tan, medium-grained quartz sand.
150-250	light gray, fine-grained, slightly sandy limestone.
250-300	light gray, medium-grained quartz sand with common coarse-grained limestone fragments.

31CC-p6 HAM-153

0-40	brown, fine and coarse-grained quartz sand with minor shell.
50-60	dark brown, fossiliferous, silty quartz sand.
60-140	light gray, extremely coarse-grained, slightly sandy fossiliferous limestone (bivalve crusts and molds).
140-180	light gray, calcite-cemented quartz sandstone.
180-220	light gray, shelly, coarse-grained quartz sand.
220-340	light gray, fine-grained quartz sand with shell and calcite, minor silt.
340-370	white, medium-grained quartz sand, with abundant coarse limestone.
370-450	white, coarse-grained, fossiliferous limestone.
450-520	light gray, very fine-grained quartz sand with abundant fine to medium-grained calcite sand.
520-580	white, very coarse-grained quartz sand, with minor limestone/ clay.
580-720	gray, medium-grained quartz sand, with abundant phosphate and minor glauconite.
720-940	dark gray with brown, coarse-grained quartz sand.

32BB-il HAM-72

0-50	orange red and tan, fine to medium-grained quartz sand.
50-100	orange and brown, fine-grained quartz sand with abundant shell, fossil and limestone.
100-130	tan, medium-grained quartz sand with common shell fragments.
130-150	dark gray, clayey, fossiliferous limestone.
150-230	gray, very fine-grained limestone.
230-340	light gray, coarse-grained limestone.
340-400	gray, very fine-grained limestone.
400-410	olive, very clayey, very phosphatic limestone.
410-450	olive, very fine-grained, silty, clayey sand.
450-460	olive, very shelly clay.
460-490	olive, very coarse-grained quartz sand with abundant very coarse phosphate.
490-510	reddish brown clay with minor coarse phosphate and quartz sand.
510-600	gray clay with mica and quartz sand.
600-880	dark gray clay.