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Potential Holocene Mineral Resources under the Mississippi Sound-Sediment Analysis in the Framework of a New Stratigraphic System

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BRIEF SUMMARY OF 1983-84 RESEARCH ACTIVITIES AND RESULTS

(1) Purpose of Study

We proposed to analyze core samples from a large number of coreholes, drilled in the Mississippi Sound over a period of about ten years by various agencies and private companies (oil, foundation engineering, etc.). The first work stage would be the setting up of a stratigraphic framework for sedimentary units in the coreholes that would allow correlation of such units between cores over the entire study area. This also involves the tying of such units into units of known ages outside the study area, age determination without such correlation is unavailable within the area. In the second stage of work the economically potentially useful sand and clay intervals and their geological positions would have been identified on the basis of granulometric and microfossil sample studies and stratigraphic correlation of the drillhole.

(2) Stratigraphic Subdivisions in Mississippi-Sound and Adjacent Areas (table and cross-sections)

Upper Miocene. Clayey beds with intercalated sandy horizons and lenses, deposited mostly in paralic and continental facies from the Pascagoula Formation in the subsurface. The Rangia johnsoni (a brackish clam) range zone top had in the past been thought to represent the top of the Miocene in Louisiana-Alabama (c. 680')- Our recent work shows that planktonic foraminifer-dated Miocene units occur at shallower depths off the Alabama shore than the presently known shallowest R. johnsoni occurrences do.

Pliocene. Because of the lithologic uniformity of the late Neogene (U. Miocene - Pliocene?) paralic-continental sequence in the Mississippi coastal and nearshore areas, part of , our effort went toward detailed analysis of sediments of the top two hundred feet of the sequence that is accessible my usual rotary drilling methods. The aim is to locate age-diagnostic (inner-midshelf) planktonic fossils from open-marine tongues that might have inter-layered with inshore-nearshore brackish and continental units without any value in relative age-dating. Two coreholes, 200+ ft deep, were planned for the Mississippi Coast (Gulfport and Bayou Casotte, near Pascagoula) at strategic locations to establish a detailed, full stratigraphic sequence of shallow subsurface units and long-range correlation is also attempted with coreholes in coastal Alabama and northwest Florida. A Pliocene interval has been positively been identified, as the result at Gulf Beach in that area. It may be correlat-able with the uppermost Neogene coastal units of Alabama and Mississippi (Fig. 1). Further work is needed.

The Citronelle (Late Pliocene) and earlier Pliocene alluvial units have not been encountered in the Mississippi coastal subsurface.

Late Pleistocene. Three formations are known from this time, related to a transgressive regressive interglacial sediment cycle. The Prairie Fm. consists of silty sands and sands (fluvial-alluvial units), deposited at the same time when clayey-silty beds of the transgressive marine-paralic Biloxi Fm formed seaward. A barrier complex, composed of the Gulfport Fm. contains usually clean sand of beach dune-shoreface origin. These units are widespread in coastal and nearshore Mississippi.

Holocene. Muddy offshore and estuarine and clean sandy nearshore-beach sediments formed during the early stages of the transgression. Formation of the barrier island chain thereafter cut off open marine circulation and formed the present Mississippi Sound; covering more saline sediment with less saline-to-highly brackish lagoonal deposits during this regressive substage. The western part of the Sound was blocked by the even more recent formation of Mississippi River subdeltas; resulting in the same changes in the Holocene sediment sequence. The lagoonal deposits tend to be silty-muddy, muddy in granulometric composition.

The accompanying illustrations show these changes in the granulometric features and biotope, composition of the sediment sequences under various parts of the Mississippi Sound.

Source of Cores (1983-84 Study Segment)

(1) Gulf Coast Research Laboratory rotary drilling in Mississippi Sound, 1973-79.
(2) Capezzoli Engineering, beach reclamation drill logs, Harrison County Beach.
(3) Sea Grant (”Lytle”) vibracores, 1979-82 chemical pollution study, Sound.
(4) Exxon, Shell, Mobil Oil, foundation core drilling, Mississippi Sound and Gulf.
(5) Gulfport Harbor sand-supply research for harbor extension, coreholes.
(6) Mississippi Highway Department drillholes, Buena Vista.
(7) U.S. Corps of Engineers rotary coreholes (Ship Island line "Spoils,” off Petit Bois Island.)
(8) Foundation engineering coreholes, V. Thompson (Mobile), Larry Jacobs (Pensacola, FL), Pensacola Testing Lab.-long range correlation between MS-AL, NW Florida.

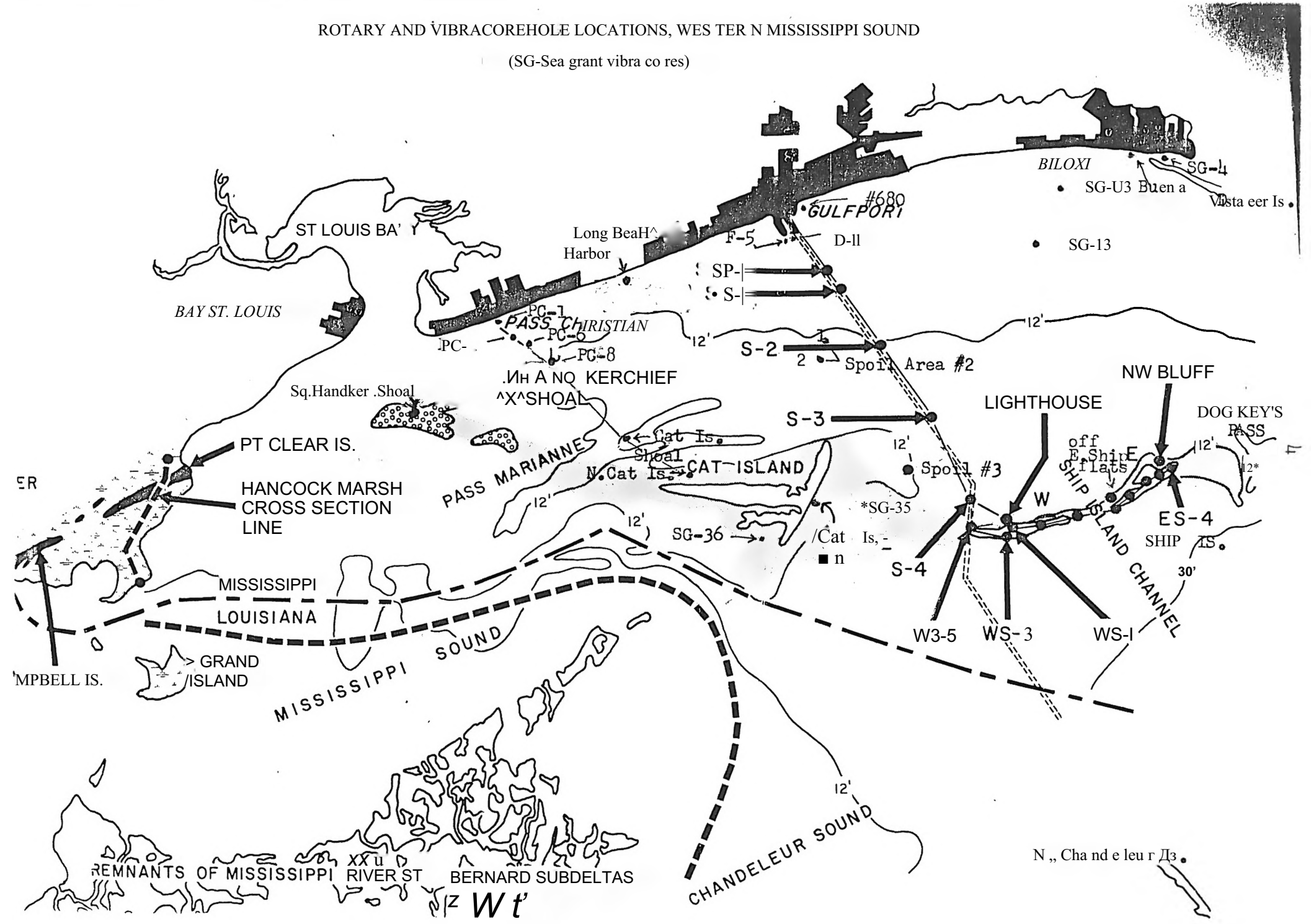
GENERAL STRATIGRAPHIC CHART, MIOCENE-HOLOCENE

MISSISSIPPI-ALABAMA-FLORIDA PANHANDLE COAST

		MISSISSIPPI	ALABAMA - W. FLORIDA PANHANDLE	CENTRAL FLORIDA PANHANDLE
HOLOCENE		Alluvial, estuarine, lagoonal-bay and inner shelf deposits; transgressive-regressive sequence in Mississippi Sound and Mobile Bay		
		- - - unconformity - - -		
		Late Pleistocene (Mid-Wisconsian?) beach ridge plains		
		- - - unconformity - - -		
PLEISTOCENE		Late Pleistocene (Sangamonian and early Wisconsian) transgressive-regressive sequence correlative units Prairie Fm (alluvial) - Biloxi Fm (inner shelf-to-estuarine) - Gulfport Fm (barrier complex)		
		- - - unconformity - - -		
		Earlier Pleistocene alluvial deposits (higher "terrace")		
		- - - unconformity - - -		
			Citronelle Fm - alluvial (in upland areas)	
			- - - unconformity - - -	
PLIOCENE		Estuarine/alluvial Pliocene deposits; correlative with central Florida Panhandle Pliocene units		Intracoastal Limestone-Jackson Bluff Fm Phosphoritic Sand (Four-Mile Village Member)
			- - - unconformity - - -	
MIOCENE Upper		Pascagoula Fm	Miocene Coarse Clastics Upper Pensacola Clay	Choctawhatchee Fm (=Lower Intracoastal Fm of Clark and Schmidt, 1982)
			- - - unconformity (?) - - -	
	Middle	Hattiesburg Fm	Escambia Sequence Lower Pensacola Clay-Bruce Creek Limestone	Shoal River Fm Oak Grove-Bruce Creek Fms
			- - - unconformity - - -	
	Lower	Catahoula Fm	Tampa-Chickasawhay undifferentiated	Tampa stage limestones (Chipóla, etc.)

ROTARY AND VIBRACOREHOLE LOCATIONS, WES TER N MISSISSIPPI SOUND

(SG-Sea grant vibra co res)



ROTARY AND VIBRA-COREHOLE LOCATIONS, EAS TERN MISSISSIPPI SOUND
(SG- Seagrant("lytie")vibracores)

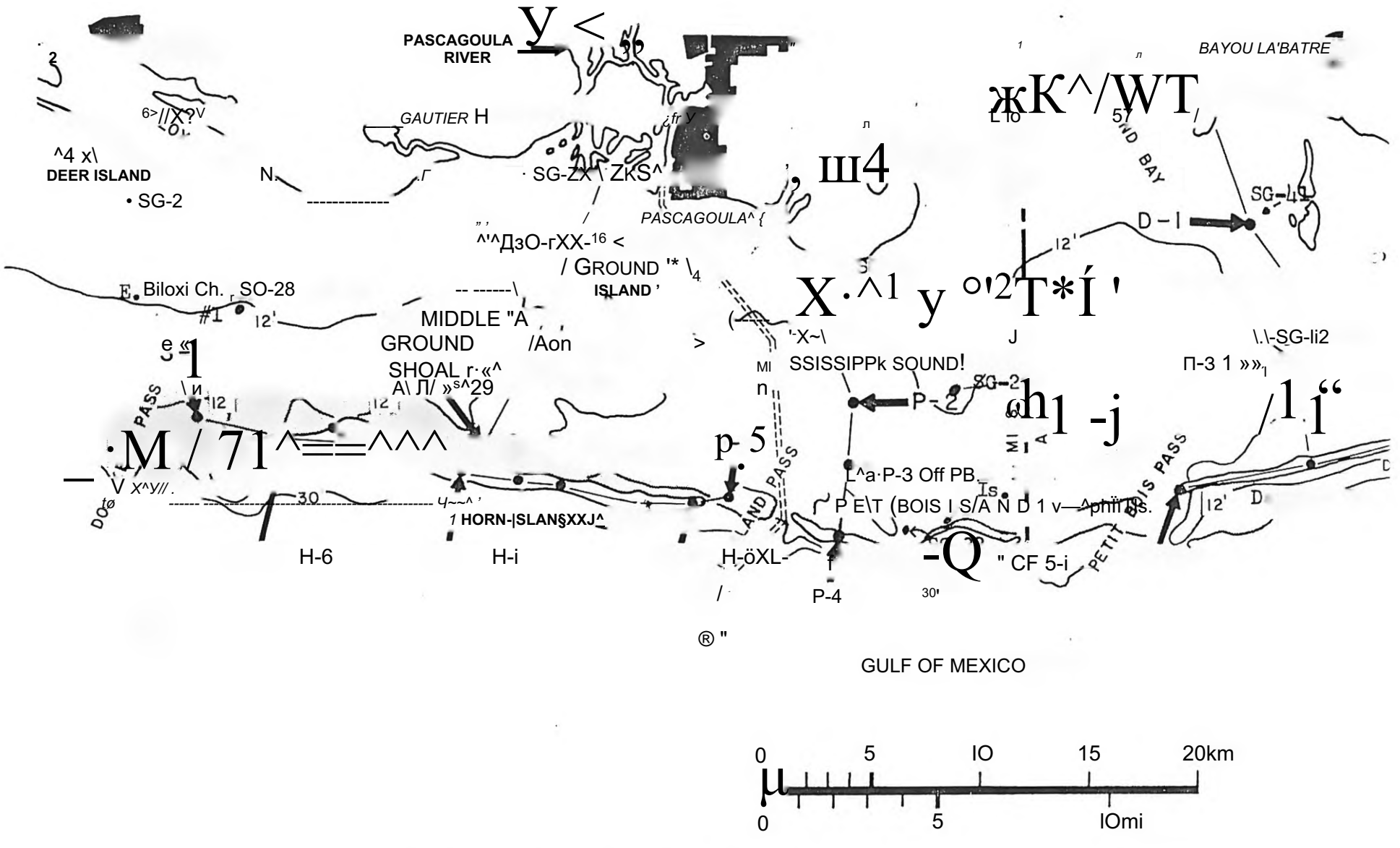
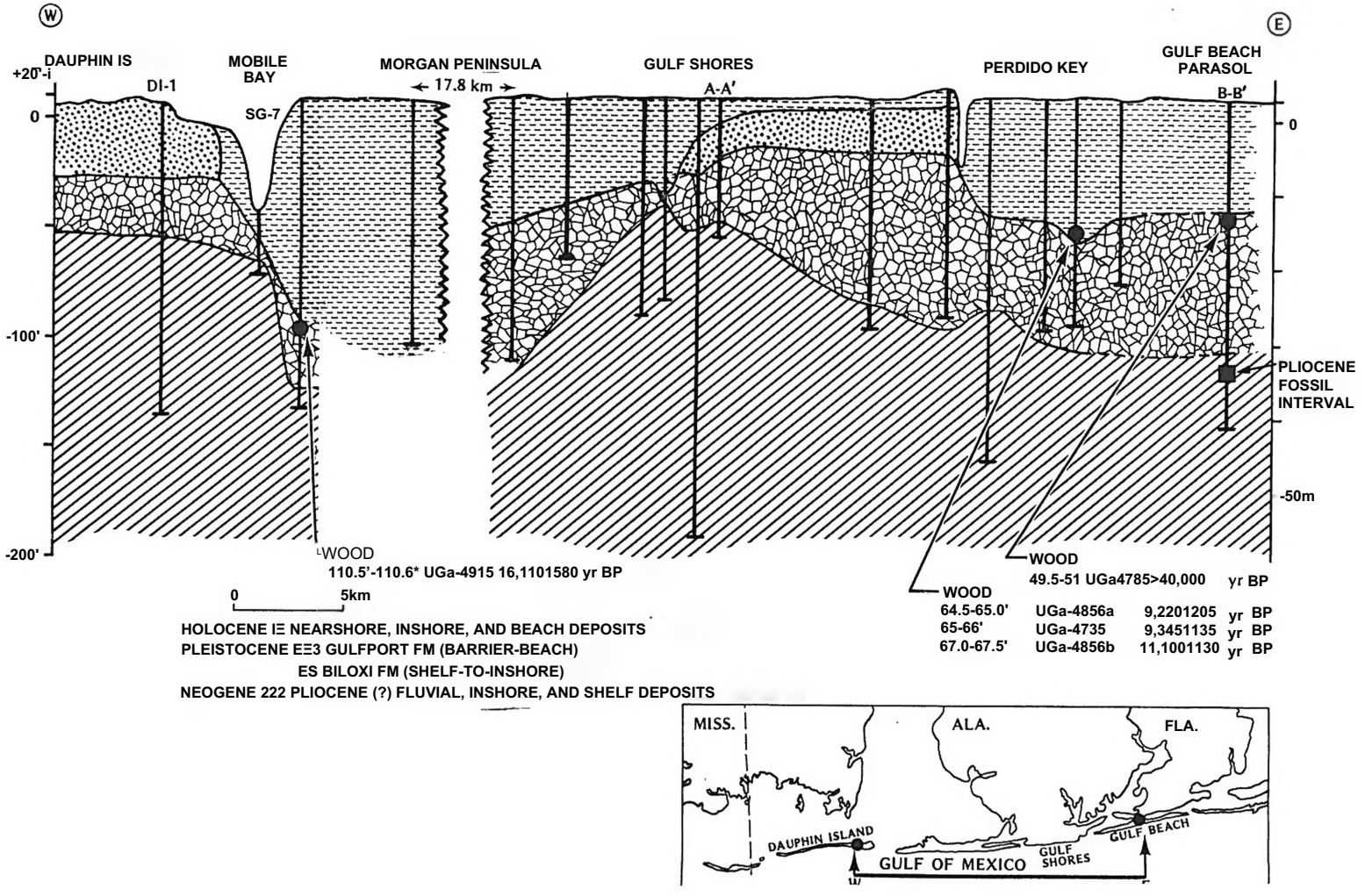
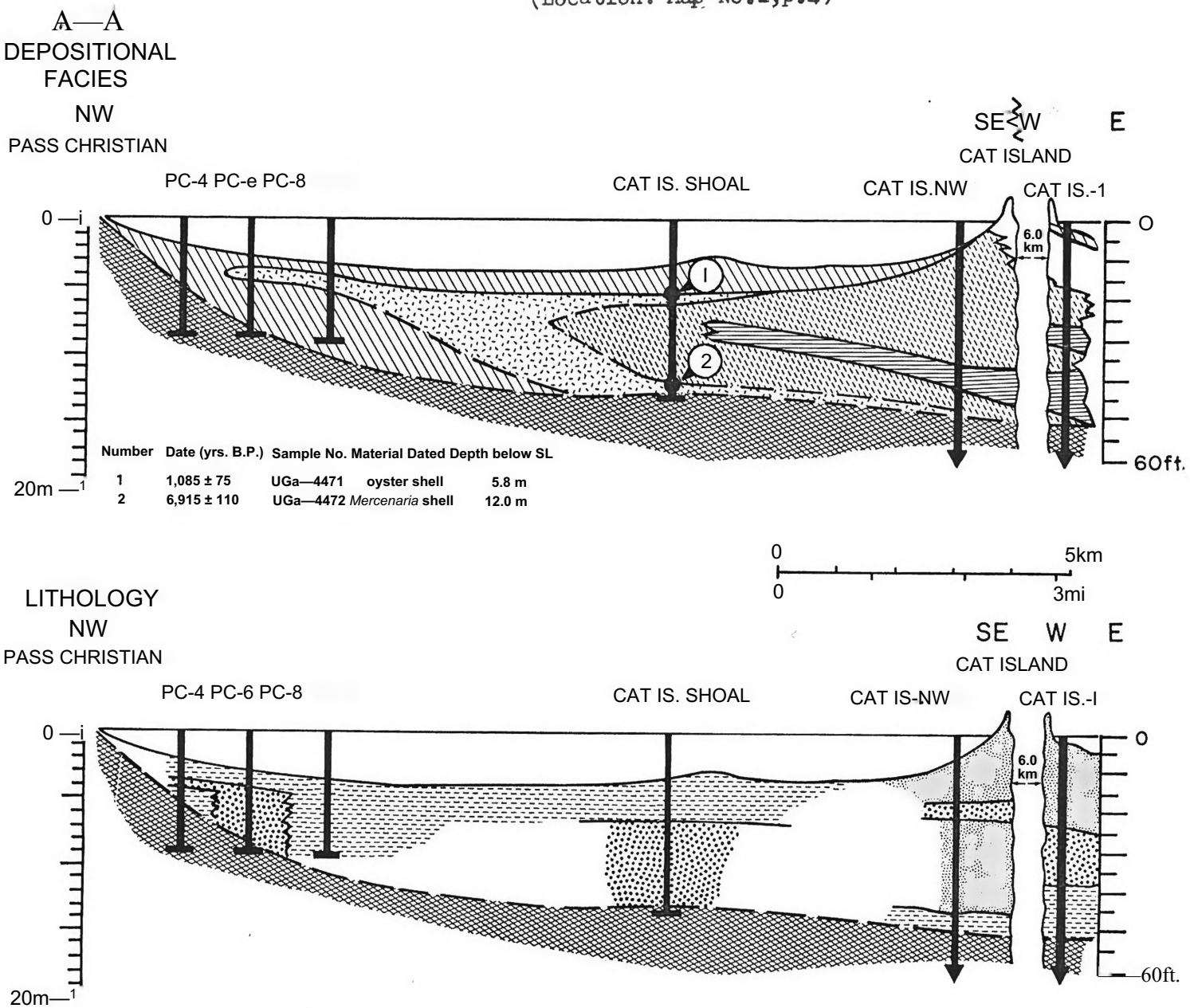
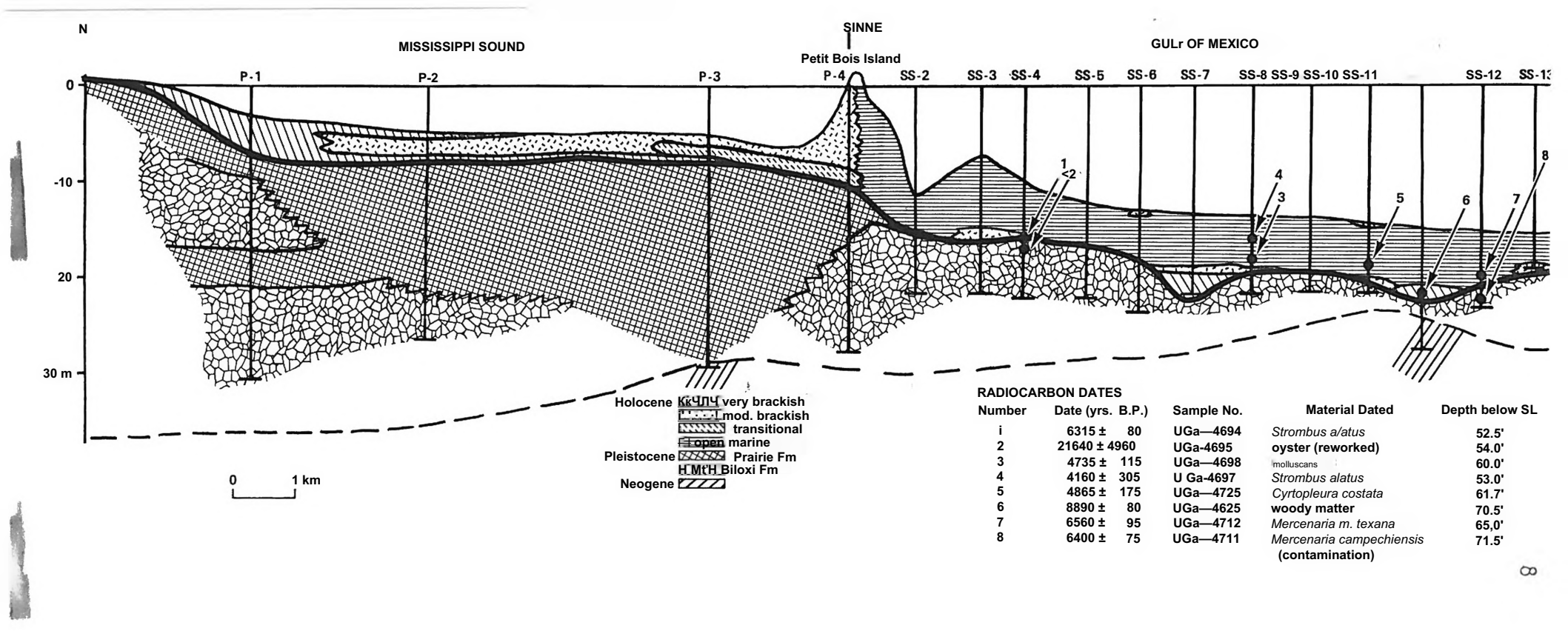


Fig.l. Long-distance correlation of Neogene and Quaternary units .Mississippi-Alabama-W Florida



Fig· 2· Biotope and lithology of Holocene deposits,Cat Island line
(Location: Map No.1;p.4)



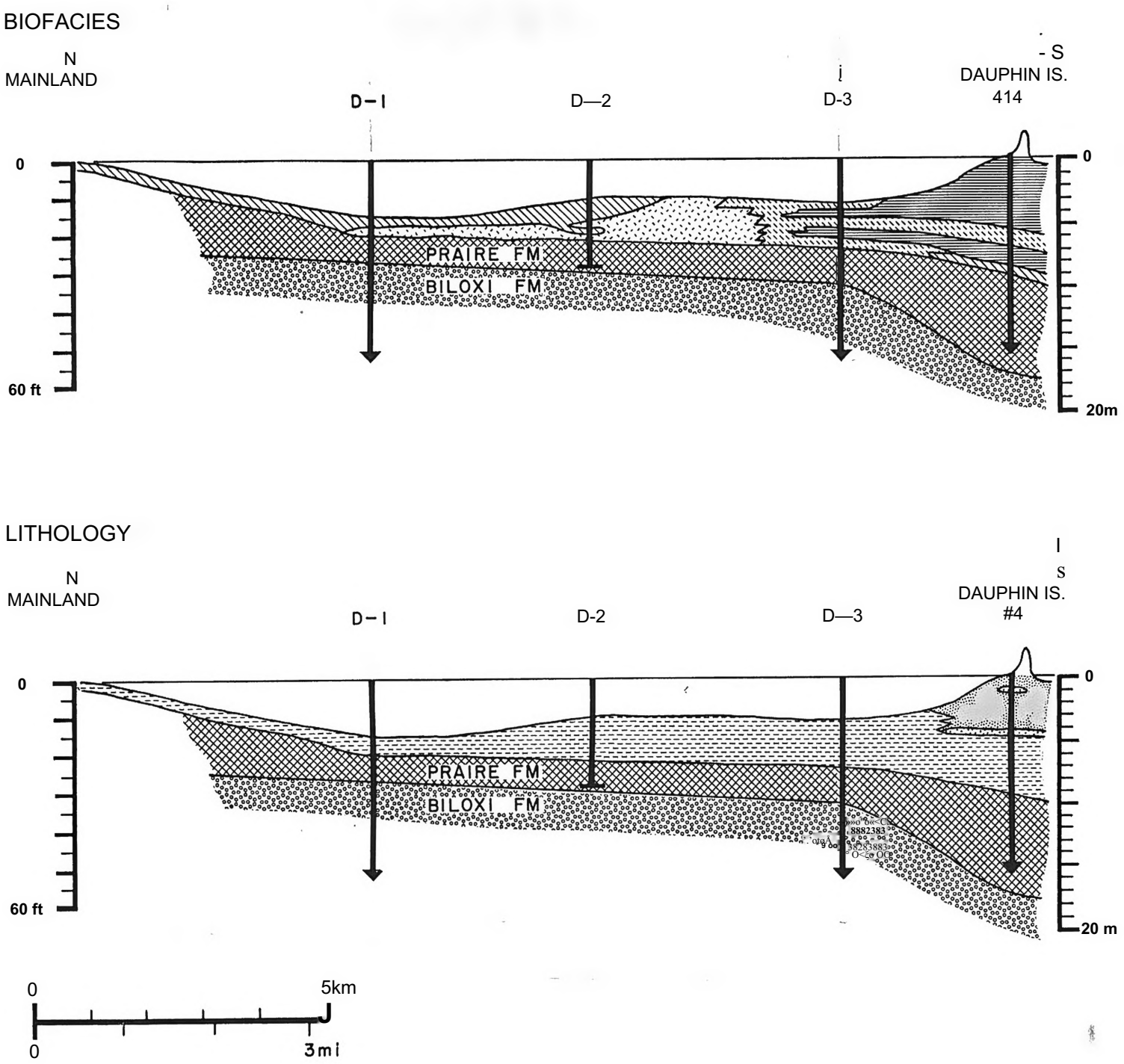


RADIOCARBON DATES

Number	Date (yrs. B.P.)	Sample No.	Material Dated	Depth below SL
i	6315 ± 80	UGa—4694	*Strombus a/atus*	52.5'
2	21640 ± 4960	UGa-4695	oyster (reworked)	54.0'
3	4735 ± 115	UGa—4698	molluscans	60.0'
4	4160 ± 305	U Ga-4697	*Strombus alatus*	53.0'
5	4865 ± 175	UGa—4725	*Cyrtopleura costata*	61.7'
6	8890 ± 80	UGa—4625	woody matter	70.5'
7	6560 ± 95	UGa—4712	*Mercenaria m. texana*	65,0'
8	6400 ± 75	UGa—4711	*Mercenaria campechiensis* (contamination)	71.5'

Fig. 3. Ship Island line . Biotopes and lithology of Holocene deposits.(Location:Map No.l,p.U)

Fig. h. Dauphin Island N-line« Biotopes and lithology of Holocene deposits.(Location:Map No.2, p.5)



SAND AND CLAY CONCENTRATE INTERVALS IN MISSISSIPPI SOUND COREHOLES
("Sand": >70% Sand Content; "Clay": >50% Clay Content)
Depth: Below Sealevel, TD = Total Subsea Depth

	Sand	Clay
(1) Pass Christian-Cat Island Line		
Pass Christian #1 (21'TD)	2-10 ft; 14.5-15 ft	none
#2 (24'TD)	none	12-13; 15-17 ft
#4 (25.5'TD)	11-13 ft	0-1; 13-14 ft
#6 (26'TD)	3-13; 15-17 ft	none
#8 (27'TD)	none	11-25 ft
Cat Island Shoal (45'TD)	9-17; 19-29 ft (depths below mudline)	3-4 ft (depth below mudline)
N. Cat Island (90'TD)	4.5-45; 58-77, 88-90 ft	79-80 ft
Cat Island (E) No. 1 (51'TD)	4.5-49 ft	none
(2) Square Handkerchief Shoal (51.5'TD)	6.5-24; 38-52 ft	none
(3) Gulfport-Ship Island Line		
Gulfport Harbor #680; 2100 ft off seawall (15'TD)	4-15 ft	none
F-5, Gulfport Harbor (100'TD)	39-40; 43-44; 58-80 ft	19-25; 34-35; 88-100 ft
D-l, Gulfport Harbor (50'TD)	34-50 ft	14-30 ft
Spoil Area #1, Hole #1 (25'TD)	17-19; 24-26 ft	8-15.5 ft
#2 (28'TD)	43-45; 59-75 ft	10-18 ft
S-l (75'TD)	43-45 ft	11.5-30 ft
S-2 (90'TD)	31-32; 34-40; 74-82 ft	18-24; 57-64; 68-70; 85-90 ft
Spoil Area #2; Hole #1 (30'TD)	23-30 ft	12-20 ft
Hole #2 (33'TD)	26-33 ft	14-21 ft
S-3 (123.5'TD)	39-40; 54-55; 123-124 ft	18-26;
Spoil Area #3; Hole #1 (24'TD)	8-11; 16-24 ft	none
Hole #2 (31'TD)	12-14; 17-30; 30-31 ft	17-18 ft
S-4 (90'TD)	23-40; 45-48; 63-65 ft	none
S-5 (85'TD) (also listed as WS-5)	4-41.5; 53-55; 76-77 ft	42-44; 64-65 ft
Off E. Ship Flats (53.5'TD)	9-20; 30-40; 43-44 ft	22-24 ft

	Sand	Clay
S-6 (Dog Keys) (95'TD)	6-24, 37-38; 67-95 ft	none
Off W. Ship Is. Lighthouse (59'TD)	6-30; 43-47; 58-49 ft	53-54 ft
Off E. Ship Is., NW Bluff (44.5'TD)	9-41 ft	none
(4) Long Beach Harbor (46'TD)	9-18 ft	44-46 ft
(5) Buena Vista, Off E. Biloxi (50'TD)	9.5-22; 30-44.5 ft	none
E. Biloxi Channel (60.5'TD)	20-24, 49-56 ft	13-15 ft
(6) Horn Island-Middle Ground Line		
R-l (44'TD)	32-38 ft	none
R-2 (54'TD)	16-29; 38-41 ft	none
R-3 (54'TD)	14-21,5; 27-28 ft	23-25; 34-38; 39-48; 49-52 ft
Middle Ground (58.5'TD)	5-34.5; 42-43; 58-59 ft	none
(7) Petit Bois Island Line		
P-1 (95'TD)	38-40; 61-67 ft	13-14; 16-20; 25-35; 46-48; 71-82; 90-95 ft
P-2 (84'TD)	34-65 ft	17-19; 74-85 ft
P-3 (94.5'TD)	39-68; 92-93 ft	18-25; 73-84; 94-95 ft
P-4 (90' TD)	4-28; 35-36; 38-40, 48-50, 54-55, 58-61 ft	74-75; 77-87 ft
Off Petit Bois Island (65'TD)	3-44; 51-52 ft	44-49 ft
(8) Dauphin Island Line		
D-1 (66.5'TD)	50-66 ft	none
D-2 (29' TD)	9-14; 28-29 ft	23-28 ft
D-3 (58'TD)	none	12-13; 20-21;28-57 ft
(9) Sea Grant ("Lytle") Vibracores, Mississippi Sound		
Depths (including TD) in cm, below bottom (mudline)		
SG-2 Deer Island area (308 cm TD)	none	none
SG-4 same area (293 cm TD)	0-20; 110-140, 210-293	none
SG-13 Edgewater off Biloxi (308 cm TD)	none	50-110
SG-14 Pt. aux Chenes (220 cm TD)	0-165	200-220

	Sand	Clay
SG-16B Mouth, E. Pascagoula River (250 cm TD)	none	none
SG-26A "Grande Batture Island" area (251 cm TD)	0-80; 120-150	50-70
SG-27 Off Horn Island (301 cm TD)	0-45	115-125; 170-190; 250-301
SG-28B Off Bellefontaine Beach (229 cm TD)	0-70; 90-230	none
SG-29B NW Round Island (297 cm TD)	220-270	0-60; 140-160
SG-32 Off Petit Bois Island (320 cm TD)	130-320	0-100
SG-33 Off W. Ship Island (170 cm TD)	150-170	39-70
SG-35 Ship Island Pass (231 cm TD)	none	20-231
SG-36 South of Cat Island (Spit Cove) (281 cm TD)	none	150-281
SG-41 North of Dauphin Island (303 cm TD)	100-170	220-303
SG-42 Same area (320 cm TD)	none	0-80; 120-200
SG-43 Off d'Iberville H. , Biloxi (281 cm TD)	none	60-270