UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

LOOSE-LEAF FIELD NOTEBOOK

S-137

Field Book
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Form C

E-1 Envirotech, Ste Flora

May '12 ~ Mon.

- No sample 0-10' as all measurements are from rotary table. No sample 10-20'. Only one sample sack taken for intervals 20'-45', 45-55', & 55-60'. Two sample sacks filled thereafter.

Drilling plan is to drill with 8 3/4" bit to 150± ft., then ream hole, then insert 13 3/8" casing. Due to caving the samples to 150' are expected to be contaminated.

Drilling was very easy in very soft (unconsolidated) material to 57'; drilling slightly harder thereafter, but still easy. Hole caved slightly until mud was to be connected at 103'. Here caving was so bad that "Red mud" (650 lbs.) had to be added to drilling mud already consisting of Zeogel, Impermex, & Fibertex, Soltex, (loss circulation material), & "Caustic". Caustic is Impaper Preservative.

Drilling ceased at 103' and about 2 p.m. Next mud was put on at beginning of mid shift.

Samples taken from head of outlet trough and in front of a baffle in the trough.

R.C. Townsend sampling on swing shift.

May 13 - Tues - Ken Russell

Start - 10 3'

- Hard layer at 106' - 107'

Sample at 110'

(1)

111' - Drilled hard again.
113- " 2 ft

120- Sample - - Samples recovered are coarse fragments with sharp edges apparently from cemented layers. (120-130)

130' - Drilling stopped and bit lifted 2 ft off bottom + mud allowed to circulate. Sample taken after 5 minutes circulation (130-140)

140- Sample (marked 140-150)

150' Sample. (Marked 150-160).

Note. Method of marking sample bags for above zone may shift started at 110, 120, 130, 140, 150 seem incorrect it seems to me that a bag of material taken when bit was at 150 should not be marked 150-160 but rather 140-150 Please check. I will continue this system however to the end of this shift.

160' Sample - (Marked 160-170).

164- Added another stem

164 Pulled string to ream.

A 17½ inch bit was used To ream hole. This bit is too large to fit through the Table hole & had to be broken

O – Core 7

16.5
2
1.8

129.25 – Kelly
29.28 – and
156.53
to 9 to 165.

from Kelly underneath the platform. Thru Tools from 3:30 PM to 5:30 PM.

May 13 ~Tuesday ~ 8AM - 4 PM Local

7:15 reaming at 115 at change of shift; mud thick, purple.
7:45 Kelly down - T.D 129.25; bit wandering around considerably near end of run.

129.25
29.28 - rod added - about 8:30 AM
2.19 - cross-over sub
5.00 - on rod added at 9:10 AM
165.72 - to set casing

- balance of morning circulating while preparing to cement.
- at 10:00 PM ran TOTCO Drift record, finding hole off only 1/4° at 160'
- pull out of hole to set 13 3/8" casing
- remove rotary table (openings too small for casing; build platform below derrick floor).
- 2:45 PM - start run casing
- 7:00 end of shift - trying to run 2nd. section

(see p 6)

Notes on cuttings ~ F1

20-45 A foraminiferal sand made up mainly of beach types such as Calcarina and Marginopora; most of former without spines but few with long spines of reef-flat type; broken Halimeda segments few also ech. spines; microgast. in some abundance, few Homotrema along with numerous frags. of orange tubes prob. Tubipora. Frag. of pelecypods common + some fine frag. of undet. origin, possibly coral.

45-55 Coarse, coral fragment - Halimeda sand. Many complete Halimeda ~~[illegible]~~ segments, [illegible] [illegible] some coral fragments and a few [illegible] fragments. [illegible] fragments, some [illegible] [illegible] [illegible]. Several forams - Calcarina, [illegible], [illegible] [illegible] [illegible] state of preservation. Few echinoid spines fragments of [illegible]. Rare Halimeda [illegible] and Marginopora and cream-colored [illegible] [illegible] [illegible] Calcarina, [illegible], M.R. Probably a [illegible] deposit, [illegible] [illegible] [illegible] [illegible] coral [illegible] [illegible] [illegible]

55-60 Similar to last but with % Halimeda much higher + many segments unbroken, more coral, thin-shelled bivalves - looks like lagoon fauna of intermediate depth - Marginopora and Calcarina rare

60-70 Similar to 45-55; mostly Halimeda, bivalves numerous, corals rare; gast. with orig. color, few ech. spines

70-80 Coarse Halimeda sd; similar to 45-55

80-90	*Halimeda* debris finer than last
90-100	Coral and *Halimeda* debris; few mollusks (5) as molds; *Tubipora* and *Homotrema* rare, *Pyrgina* weathered free. (in separate vial).
100-110	Fine to medium coral and *Halimeda* debris; moll. fragments; rare beach-type forams + others / moll. mold; rare *Tubipora*, *Homotrema*, ech. spines
110-120	Coarse coral fragments with rare *Halimeda* (contamination?), few fragments of large mollusks; some of small, branching coral very fresh; beach forams in fair numbers but only a few of the *Calcarinas* have spines + most of these are broken
120-130	Coarse coral similar to last with large pieces yellow calcite; most of coral pieces appear worn; very little fine material (forams etc) in part of sample sieved; mud greatly thickened – this probably in large part explains absence of fines
130-140 } 140-150 } 150-160 }	Essentially same as last
160-170	Similar to 120-130; some pieces of fine material well cemented (see sample). The interval 120-170 is mainly well cemented coral rock; moll. molds + much yellow calcite – zone leached, re-xl + cemented – – –
170-180 } 180-190 }	Similar to 120-130 (see Note on Core #1)

May 13 cont. 4 P.M. - 11:30 P.M. - TOWNSEND

4 P.M. Casing being set. At about 75' casing stopped dropping and went further only by repeated pulling and dropping. At about 103' casing refused to penetrate further. Hole apparently caved.

- Casing pulled and rods put on to drill out hole.
- Hole drilled out starting at about 9 P.M.
- Reaming to about 10 P.M.
- Circulated to end of shift trying to "build up mud" according to Springer.

MAY 14 - Wed. 12 Midnight. - RUSSELL.

- Circulating mud to 1.35 AM. Crew building up mud in pit by addition of new sacks of mix.

AM - 1.40 Started pulling string. Mud in good condition.

AM - 1.55 - Set string so that reaming bit is at about 100 feet. Attempted to clean off "ledge" (spiller) which held up casing by whipping bit around at terrific speed.

-3.15 AM. Circulating, bit on bottom.

-4.30 AM - Stopped circulating and reamed hole out [illegible] 92 - 110 (?)

4.15 AM - Stopped reaming - started circulating mud.

6.15 AM - Rolled string from hole - prepared to set casing again

Core 7

158

7:00 AM – Casing [illegible] rig [illegible] [illegible].
[illegible] – [illegible] [illegible] as before.

May 14 ~ [illegible] – 7:30 AM – 4 PM ~ Ladd

7:40 – ran 4th length casing; 5th (last) section washed to bottom 158' below rotary table; clean sludge pit;
8:45 start to mix cement; pumped about 70 bags thru casing before blow out; pumped mud on top cement to force it down but only recovered streaks from outside casing; pumped out sludge pit again and cleaned out around top casing preparatory to cementing outside with concrete.

4 PM – 11:30 A.M.

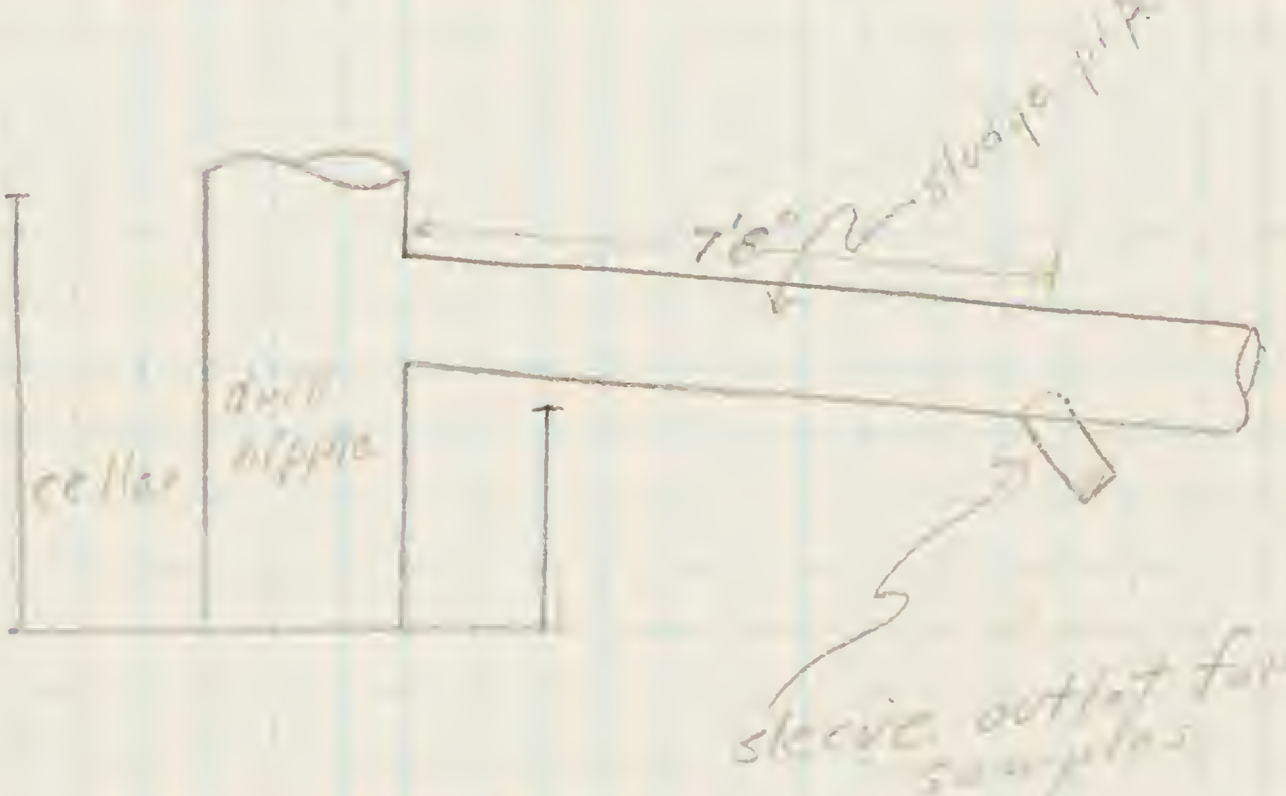
4 PM – 3 yds concrete set around casing in cellar.
4:30 PM. – Rig shut down until cement & concrete sets. Crew cleaning and preparing rig for drilling when cement sets.

May 15 ~ Thurs. – 8 AM – 4 PM ~ Ladd

Waiting on cement, building up mud, pvc and accessories for catching cuttings

4 PM – 11:30 PM. [illegible]
Waiting on cement and preparing rig for drilling tomorrow [illegible]. [illegible] set up [illegible] system consisting of 8⅝" pipe welded to the drill nipple below rotary table. This pipe is inclined downward slightly to carry sludge to pit. 7'5" from drill nipple [illegible]" sleeve is welded into the bottom of the sludge pipe and is inclined upward toward the cavity.

This sleeve is the outlet for sample collection.



2 AM – 5.30 NOONE 5.30 – RUSSELL

1.45 AM. Casing cement drilled through – reached 170'. Held drilling and circulated until 5.15. Prepared mud,

5.30 – Pulled string preparatory to making first core. (core barrel is 15' – diamond bit).

6.00 AM – Lights went out – 3 – minutes!
Ted starts his first dye test. Got my jitters when quantities of dark black grease poured from core barrel – but we hope it doesn't dissolve much enough to affect dye test. Cover on turntable may have prevented contamination!

O - Core 71

7:45 AM - Samples of cuttings during coring taken with medium and fine sieves. Only saw bag kept of 170-180 and 180-190 intervals.
Townsend's ~~super~~ dye experiment showed return with 2 3/8" 25 minutes of drifting time after drill bit bottomed (requiring) it should have shown from 3-5 minutes.
Driller said last 3 feet of 25 feet good drilling quickly then [illegible] - [illegible] stuck

7:55 AM - B.H. Springs says they plan to go to 180 ft. with 8 3/4" rock bit then ream with larger bit.

May 16 - 8AM - 4PM Ladd
8:30 - pulled core bbl with 1½' of coral shell is fairly well cemented; driller noted harder drilling in last 3' + core probably from this interval - core less well cemented at bottom
#1 190'- 191 - see over

9:45 Going back into hole with 8 3/4" rock bit to ream to 192.4 = bottom of core (not 191)

11:15 - 12:20

192.4 - 200	coarse cuttings
210 - 220	of coral but all
220 - 230	soft drilling acc. to driller

5⅝ + 3½

D – Core 71

"Coral ~~lst~~ ls.
Coralliferous Halimeda ls.

Notes on Core #1 -170 -191"

Recovery in 2 pieces - smaller one (top) 5" in length, larger one (bottom) 6½" but base crumbled. Half of top of upper piece is a colony of coral that is not in position of growth; this colony and other smaller pieces of coral sand embedded in a matrix of Halimeda segments, well preserved micro-mollusks, smaller foraminifera and undet. finer debris. All foss. with orig. shell – no molds nor cavities of any sort suggesting solution. The material is moderately well cemented. On Engebi it would be placed in the "coral head ls." group. The material probably is lagoonal, probably close to (or part of) a coral knoll

Lower, larger piece actually in 2 parts, the upper one 3½" the other slightly smaller. This material is similar to that above but contains fewer and smaller corals and is more friable. It is composed primarily of Halimeda debris such as is found at intermediate depths in the existing lagoon.

Bottom piece with an abundance of coral (like the top piece) but friable; some of coral may be in position of growth; sides of core show cavities; these do not appear to be solution cavities but places where fines were washed out during coring.

All this core suggests intermediate lagoon depth near (or on) a coral knoll

(92)

of coral may be in posi[illegible]
sides of core show cavities; these do not
appear to be solution cavities but places
where fines were washed out during
coring.
All this core suggests intermediate
lagoon depth near (or on) a coral knoll

(9a)

230 - 240 } — still soft but very
240 - 250 } heavy cuttings — coral
& shells

250 - 260 }
260 - 270 }
270 - 280 } to 1 PM — note changing
280 - 290 } texture
290 - 300 }

300 - 570 to 4 PM — cuttings plentiful
— no plentiful about 5 ?0
in 5 [illegible] [illegible]
coring. All soft
[illegible] to driller.

Collection of cuttings in each
10' interval begun after 9' drilled
down — at end each 10' interval
string circulated until 2 sacks
cuttings collected.

4 P.M. to 11:30 P.M. Townsend

4 P.M. Drilled 570' to 600' — easy drilling &
cuttings have higher proportion of fine
fragments (1/8" & smaller). Some loss of
drilling [illegible] & [illegible] being [illegible] at end of
day shift. Drill stopped at 600' to build
up mud and pressure to take core.

[illegible] - 5:15 P.M. — Took core with 6 1/2" (O.D.) x
3 1/2" (I.D.) diamond bit & [illegible] [illegible].
[illegible] ([illegible] [illegible]) [illegible] [illegible] [illegible]
[illegible] [illegible] [illegible] [illegible] [illegible]
[illegible]. (See Driller's coring report.) (10).

No cuttings showed during coring. No sample bags for the 600'-610' & 610'-620' intervals.

Core #2 600-625 - see over

2 feet of core recovered. Material fairly hard but porous "cemented" sandy, [illegible] and [illegible] (?) $CaCO_3$. Most of the material in this and the 1st core taken fluoresces yellow. This core consists of 15 pieces, 2 of which are very small. At top of core is one large piece about [illegible].

Driller said drilling was hard for only a short distance & the core probably represents this hard zone.

9 P.M. - 9:45 P.M. Removing core. Rest of shift spent cleaning rig & preparing to drill.

no cuttings 620'-630'

May 14 - 195[illegible].

12:30. Started collecting samples at 640 (630-640) [cored & met no larger [illegible] noted H_2S] [illegible] [illegible] [illegible]] can't [illegible]

[illegible]

1:30 [illegible] [illegible]

[illegible] [illegible] [illegible]

& drilling stopped. Check [illegible] [illegible] results in [illegible] 1720 ft [illegible] [illegible]. Change in texture from coarse in 890-900 sample to fine in 900-910 [illegible] due to hole being cleaned out while bit was held at 900 [illegible] only fine [illegible] left in suspension when [illegible].

O — Core 71

Coral limestone

Notes on Core # 2 - 600 - 625' (see over)

Core consists of 3 oriented sections and 12 smaller unoriented pieces (one of these sent to Cole 5/19/52 as Sample A)

Largest oriented piece is at top - length 5". It is a hard, cavernous, recrystallized coralliferous ls in which the corals without exception appear as molds. Sum of cavities or fractures are rimmed with yellow calcite, others are filled with larger bits of same material. Most of determinable structure is that of coral; shell molds poor. Many (if not all) of corals are obviously not in position of growth.

Small unoriented pieces are similar to above, middle oriented piece has many mollusk molds as has bottom piece - some of these may make id. squeezes.

→ Cole 5/26/52 gave coral molds to Wells
Cole will break for forams later

(110)

resumed,

4:45 AM – Samples collected to 970 ft –
Lost circulation at 975'
Driller (Aldrich) claims he hit hard stuff at 975.

(margin note, linked to the lines above:) Doll, cores small from 970 ... [illegible]

5:00 AM. Pumped mud for few minutes with no return of circulation. Decided to pull string & ream hoping [illegible] reaming will help plug hole – Asked driller to check depth by strapping as he comes out
– This done; depth OK.
– Built up mud into hole at close shift (~940±

[Note: Yesterday, acc. to Springer, circulation failed momentarily on several occasions & he was tempted to shut down but each time flow returned HEL]

May 17 – Sat. 8 AM – 4 PM – [illegible]
– out of hole on root plugged bit
9:45 start back in hole with 12" rock bit to ream
10:25 regained circulation – reaming
12:35 down to 372
1:45 " " 520
3:15 " " 750' – not losing much mud – only what would be expected in reaming hole
4:15 down to 800

[illegible] 905 ft. [illegible]

O — Core 7

Core at 1205' in before / hard rock encountered.

[illegible]

4 P.M. - 11:30 P.M.

At start of shift tools being removed because bit plugged. Tools down hole at 8:20 P.M. 8¾" bit with 12" Security reamer being used to clean out hole. Reaming started at 905'. When a new pipe joint was added at 934', mud flowed freely from top of pipe in hole after the kelly was removed and until next pipe was attached. Bill Springer says this is due to weight of cuttings outside of drill pipe forcing mud up the inside of the pipe.

9 P.M. - Bit down to 963'. Then circulated.

9:21 P.M. Circulation lost completely at 989' ± 2'. Driller continued to drill without return of mud. Driller says it drilled harder here just before losing water, then bit dropped rapidly for 3-4' and drilled harder again. Another "soft" spot 3-4' hit in the 990-1000' interval.

9:48 P.M. Drilled 1000-1010' interval in 5 min. Drilled "dry" (no mud return) to 1021'. No samples available from 980' to 1021'. At 1021' pipe pulled. Pipe out & pits being cleaned preparatory to mixing new mud at end of shift.

May 18, 1952 - 12 Mid → 8 AM - Crowell

12:00 Mid - Cleaning slush pits. Preparing new batch of mud. (Til 6:00 AM when I left for breakfast)

May 18 - 8 AM - 4 PM - Ladd
Sunday

Into hole with 8¾" rock bit; down to 1035' ± by 10:30, drilling dry; called Coray for emergency shipment of Zeogel (400 sacks), Gel flake (25), Fibertex (25) and Tannex (2 drums)

D - Core 7

this prob. silt zone cored at Engebi

- Circulation back at 9:40 from 1045± return almost clear water; some very

This prob. silt zone - cored at Engebi

- Circulation back at 9:40 from 1045±, return almost clear water; some very chalky lime but no chips
- crude material again 1045±
- 10:0c - down to 1075 (100' borow cavity
- hardened up about 1083'
- 11:00AM - at 1130' - only very fine cuttings - most going into cavity still? Circulation strong
- 11:15AM - 1130-40' - circulating to mix more mud; cuttings still very fine; may be mostly from top layers
- 11:40 AM - at 1160' - no change
- 12:30 PM - at 1210' - cuttings very light
- circulate to mix more mud
- 1 PM pulling out about 200 feet to await more Jel flake, etc. ordered from Parry early this morning.
- 2:45 PM Mixing mud.

4 P.M. — 11:30 P.M.

Mixing mud to 4:40. About 200' pipe out of hole w/ 4 7/8 bit on bottom.

1210?

4:40 - started drilling at 1220

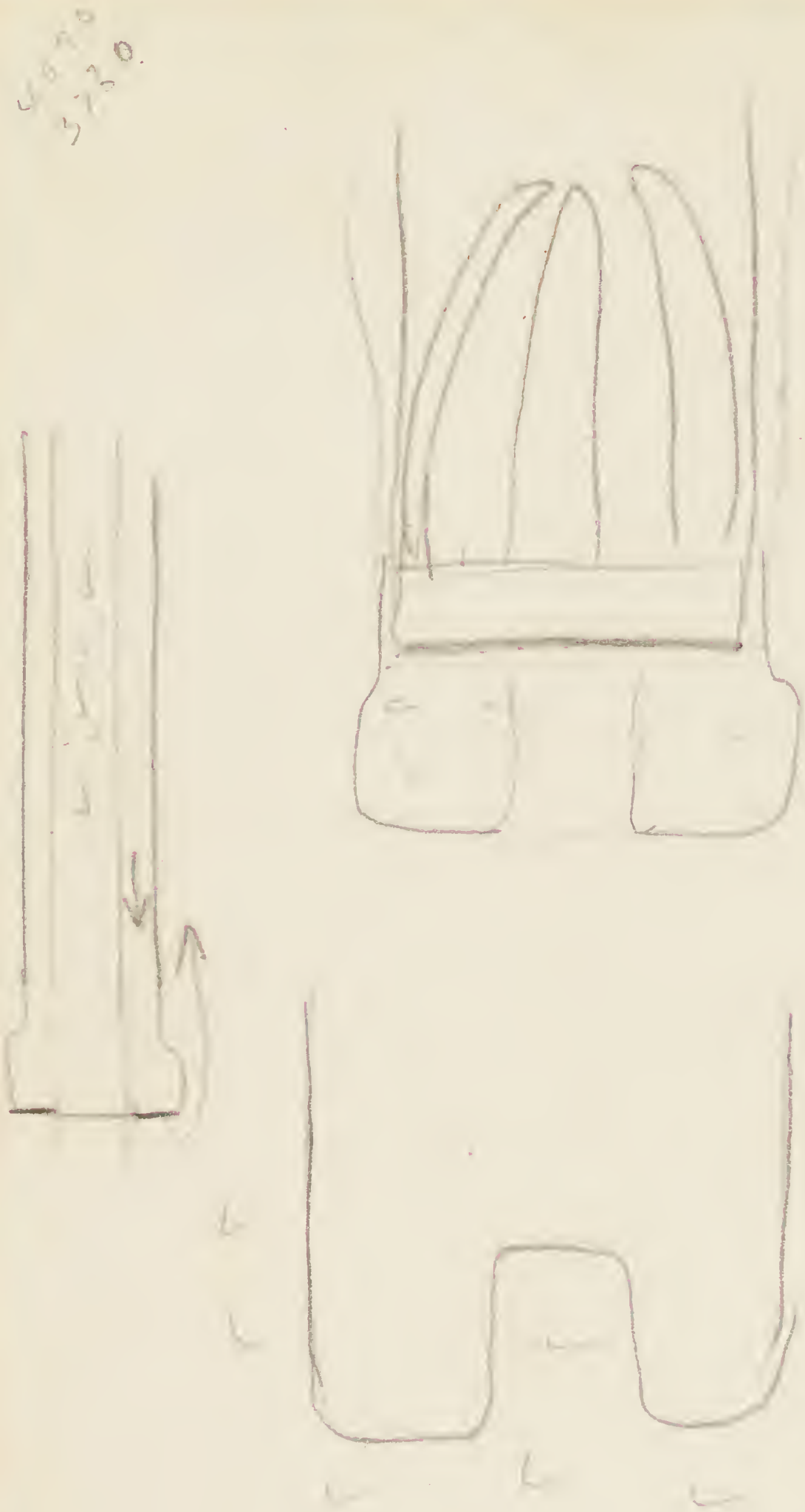
4:50 - lost "head" gone at 1232' & decided to take a core.

Sample 1220 to 1230 taken at 1048.

Sample 1230 - to 1240 taken at 1252.

(14)

C = Core 71



5:03 - Started to pull pipe out to put core barrel on.

[illegible]

5:17 Started to core with 55' core barrel and 6 5/8" (O.D.) x 3 1/2" (I.D.) at [illegible] wt. Driller says it drilled hard at first. Drilling very slow throughout & driller says material is hard with only occasional soft streaks.

Losing some drilling fluid throughout the coring.

Coring complete at 10:30 P.M. Pipe pulled.

11:25 Core out. 11 ft. core recovered from 16 feet of drilling — 69% recovery.

Circulation apparently lost at end of coring.

[illegible] 19 - 1952 - 12 Midnight - [illegible] Russell ✓

Description of core #3 (1232-1248) ✓

core #3 1732-48 see pp. 15a 15b 16

Length - Total 11 feet.
Recovery 69% of 16 ft drilled.
Consists of 25 pieces of oriented core, ranging in length from 2 1/2 inches to 9 inches, 18 pieces of unoriented core ranging in size from 3 inches to 3/4 inch and one bag of gravel size core recovered immediately above lowermost oriented piece of core. Each piece of oriented core is marked with a T on uppermost surface and placed in core box with top surfaces to left. Individual pieces were not numbered in sequence so that care should be taken to keep them in proper order when removing from core box.

1:25 AM - Have been mixing mud since midnight.

4.00 AM - Mud ready. Preparing to go back in hole with 8 1/4 bit. Removed cut [illegible] to [illegible] with 8 1/4 [illegible]

4.45. Reamed to 1244' & lost 6 inches of mud with no return of circulation.

5:00 AM. Practically nothing [illegible] lost from 1248 - 1260. [illegible] struck at 1266 - still no circulation. Lost 16 inches of mud [illegible] [illegible] [illegible], [illegible] [illegible] until at 1306. [illegible] [illegible] [illegible] [illegible] [illegible]. From 1264 to 1272 is hard drilling.

5.15 AM. A total of 25 inches of mud lost since [illegible] was returned to [illegible] [illegible] coring [illegible] drilling to 1272 - no return of circulation. Ceased pumping & drilling at 1272 (5:14 AM) & [illegible] [illegible] [illegible] [illegible]. Rotating kelly without pumping [illegible] [illegible] [illegible] off bottom.

→ See back of this page for detail section from 1232' to 1272'.

- see p 16 for notes on core.

(15a)

[illegible] and megacrysts are preserved in [illegible] of [illegible] sections of core [illegible] what appear to be larger but most are recrystallized and [illegible] may not be possible. Sent to Cole [illegible] oriented piece from (over)

Core 7

1232-1246 Sand porous ls. (See core 3)

1246-1248 Soft ls., apparently where circulation lost. (last two feet of core seen)

1248-1261 Extremely cavernous, drill drops 1 to 3 feet at a time with intervals of only 6 inches to 1 foot of sufficient formation to retard drill.

1256-1264 - firm ls. but easy to drill

1264-1272 - hard ls., chatters drill. (probably porous)

150

1237-1272 - Hard to [illegible] drilling
(probably porous)

1272

150

5:30 AM - [illegible] gas [illegible] around -
[illegible]
[illegible] without circulation,
but keep pump [illegible] up.

5:45 - [illegible]
[illegible] Back in
operation [illegible] AM.

7:05 - [illegible]
[illegible] drawing up.

NOTE: No samples taken from
1240 to 1248 (core) and from
1255 to 1270 (lost circulation)

May 19 ~ Mon 8 AM - 4 PM ~ Ladd

Delayed by failure of gas engine that starts big diesels. Start back to bottom at 9:20 AM; some caving - back on bottom (1272') at 10 AM. Moved cement pump to shore, to increase volume water. - and no (ugh!) circulation!
- 10:10 - drilling hard at 1285' (5' beyond Engebi)
- shut down to complete pump installation, etc.
1290±

Core #3
1232-48

Note: - Limestone of core 1232-1248 is dense and recrystallized with irregular cavities left by the removal of corals and other material. All of corals and mollusks are preserved as molds; some of denser sections of core contain ~~contain~~ what appear to be larger forams but most are recrystallized and identifications may not be possible. Sent chips to Cole [illegible] oriented piece from

Cole
B

(over)

O — Core 7

Core # 3 (spec. B) - Calc reports (5/26/52) - has Cyclocylpeus - may be Ceidae - if so in Tert. ?
also Amphistegina

bottom). This layer was predicted on basis of Engebi drilling and may be the same as the "Lill layer" of Bikini that is Miocene f and records a time (late f or early g) when this part of section stood above sea level & corals, etc were dissolved (Miocene g shells above Lill layer were not so altered.) This emergence definitely not assoc with Pleistocene changes of level.

4 P.M. - 11:30 P.M.

Rig shut down at beginning of [illegible].

5:02 Started drilling at 1294'.
6:00 Stopped drilling at 1312' because all water used up. Drilling this 18' was only "fairly hard" with two soft breaks. No circulation on drilling. Filled pits with water.
7:41 Drilled 1312' to 1341' before [illegible] of water again. Stopped drilling [illegible], filled pits with water.
10:42 Started drilling again at 1341'.
11:22 Stopped drilling at 1358.72'.
All drilling on this shift done with salt water at no pressure (complete water loss).
Drilling only "fairly hard" from 1357' to 1358'. All the rest moderately easy or [illegible].

May 20 - 12 M To 8 AM. [illegible], Emmett

1358 -
1235 P.M. Drilled To 1446 with salt water. No circulation. Rock firm but easy To drill.
(1424 - 1426 - Very hard
1426 - 1434 - Fairly hard
1434 - 1446 - Easy with no resistance)
1446 - 1450 - Fairly hard
12:40 - Filling pits with water.

1:00 AM Resumed drilling with [illegible] [illegible] 3/4 bit [illegible] [illegible] to [illegible] [illegible] [illegible] [illegible] to [illegible] bottom.
Drilling hard rock at 1450.

1450 - 1455 - Hard rock - 12 minutes to drill with 15,000 lbs on bit.
1455 - 1477 - Dropped thru 22 feet in one minute - no resistance.
Added new stem.

2.15 AM.
1477 - 1506 - Dropped entire 29 feet in 3 minutes - Not more than 2 feet total resistance all way down, each spot being a matter of inches.

1506 - 151[illegible] - Free drop.
1510 - 1515 - Soft
1515 - 1520 fairly hard
1520 - 1525 - [illegible] [illegible] chatter caused by bit hitting something solid on [illegible] one side of hole [illegible] very soft or cavity on other side - chatter every 3 or 4 feet - Rock fairly hard.
1525 - 1530 - Took 10 minutes with 15,000 lbs on bit - Fairly hard
1530 - 1533 - Fairly hard
1533 - 1535 - Free drop.

3.00 AM - Stopped to fill pits.

5.10 P.M. Resumed drilling. Soil not [illegible]
[illegible]

5.10 AM - Resumed drilling; bit went [illegible] 25 feet; slumped material had to be redrilled [illegible] bottom; hole badly caved to [illegible] after redrilling 25 ft.

5.20 - Drilling in 1535-1540 zone. Bit chattering & grabbing frequently. Rotary speed of [illegible] [illegible] 16,000 lbs on bit.

1540-1565 Drilling fairly hard [illegible]. Some [illegible] fast below [illegible] at 1550.

(Note: From 1535 to 1565, except for one [illegible] at 1554 the rock [illegible] [illegible] fairly hard but chattering of drill indicated [illegible] [illegible] (probably [illegible] texture)

5.59 AM - Bit froze at 1567 ft. Took 45 seconds of drilling manipulation to free. Drill chattering and bucking very strongly.

6.02 AM - Stopped drilling at 1570' to refill pits.

6.10 - to end of shift - refilling pits

Summary of the shift.
Of 182 feet drilled (1388 - 1570) most is fairly hard, gritty material which caused kelly to chatter & buck. Driller reported 4 zones of open

[illegible] extremely [illegible] [illegible].
12 ft, 55 ft, 7 ft and 1 ft thick respectively. It is quite possible that these are not beds with water only but zones of very loose sand which the pump slurries readily ahead of the bit. One possible argument for this is that there is always caved material to clean out when drilling is resumed after filling pits - even when drilling has been stopped in the midst of a free drop. (Note first drop 1533-1535 - refill pits - 25 ft of caved material when drilling resumed.)
No circulation this shift. All drilling above with clear water. No samples collected.

May 20 - Tues. 8AM - 4PM Ladd

Rept. #5 → to ONR

Shut down at start of shift to complete filling of pits and to continue work on one of pumps that is still not operating satisfactorily.

- Back into hole at 8:30, drilling through 55' caving
- 8:37 on bottom at 1570

- 8:50 down to 1593; drilled mostly with low pressure, but harder near top of interval; last 10 feet soft; pulled out to add another length but hole had caved and pipe would not run; put Kelley back and drilled out.

9:15 added another length; drilled to 1623'; interval almost uniformly hard; drilled smoothly except for 2 spots of broken material where pressure was raised. Driller figures this interval hard enough to core - would also make good casing seat; circulated for 10 min at end of run to clean out hole Pits over half emty after 2 runs.

T.D. 1653'

9:55 added another length - will make 1653' start firm with 10,000 lbs. on bit.

10:03 pulled off bottom to refill pits; last of water went out quickly; - string sluggish due to fill; driller pulls out 4 stands while pits are filled.

Fitzpatrick

1020 COMPLETE PULLING 4 STANDS, FILLING PIT

1145 PIT FULL OF SALT WATER BEGIN REPLACING PIPE TO BEGIN DRILLING AT 1623'

1155 AT 1587' RAN INTO CUTTINGS HAD TO REDRILL AT 26000 LBS TO START THRU TOOK 3 MINUTES TO DRILL BACK TO 1623' AT THAT DEPTH (1623') CIRCULATED SALT WATER 5 MINUTES

1202 ADDING NEW PIPE SECTION - DRILL TO 1653'

*

encountered fairly hard rock at 1712

HOLE SEVERAL TIMES BEFORE CONNECTION COULD BE MADE

encountered fairly hard rock at 1712; drilled to 1718'; circulating prior to coming out for core bbl.

2:40 starting out of hole

1825 OUT OF HOLE. [illegible] PUT ON CORE [illegible] TOTCO INSTRUMENT INDICATES [illegible] AT 1728'
(ANY [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible])

1900 [illegible] CORE BARREL

1925 CORE BARREL [illegible] TO 1718' [illegible] TO [illegible] FINAL 22' [illegible] THE [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] INTO THE HOLE DURING [illegible] OPERATIONS

1700 – 1900 DURING CORING + DRILLING THE ROCK HAS BEEN GENERALLY FAIRLY HARD, WITH SEVERAL INTERSPERSED SOFT STREAKS. THE GENERAL RATE OF CORING APPARENTLY FOLLOWS FAIRLY CLOSELY THE SECTION FROM 1682' TO 1693'. CORE IS TAKEN FROM 1718' TO 1740'

1925 COMPLETED CORING AT 1740' BEGIN PULLING DRILL PIPE AND CORE BARREL

2005 CORE BARREL AT SURFACE

2035 LAST PIECE OF CORE REMOVED — TOTAL LENGTH 10 1/2' OR 47.7% OF TOTAL CORE BARREL CUTTING

8:00 WORKING WITH CORE BARREL PREPARING TO LAY IT BACK ON RACK — THEN [illegible] TO MIX MUD WITHOUT [illegible] OF [illegible] TO TRY TO [illegible]
[illegible] [illegible] EXPECTED TO TAKE 5 HOURS — [illegible] TIME [illegible] DRILLING ABOUT 0800 6/21/72
[illegible]

9:00 to end of shift at 1130
Mixing mud. No drilling.
Core taken this shift, 1718'–1740' (core #4) consists of 18 oriented pieces $2\frac{1}{2}$"–9" in length. 4'–$4\frac{1}{2}$' of the top of the core appears to be a nearly continuous section. Below this, gravel up to $2\frac{1}{2}$" & unoriented was recovered between the larger oriented pieces. This probably represents discontinuous recovery.

Core #4 (see p 26) 1718–40

The largest part of the core consists of dense to fairly porous, white, fossiliferous limestone some of which has a rust-colored stain apparently due to the drilling operation.
Top of oriented pieces marked with a black ink T.

May 31 Wed. Midnight – 8 AM. Russell

12.50 AM. Mixing mud.
170 sacks [illegible]
80 " [illegible]
1/4 sack cement
20 gal Tannex
[illegible] to [illegible]

3.45 AM. Started back in hole.
Hole bridged at 1083. Driller explained that 11 inch hole goes to 1021 ($8\frac{3}{4}$ below that) and that cavings had plugged at this narrowing point.
Tried locking stem on rotary

table and rotating to free.
Didn't work - put kelly on [illegible] drill through. Tried drilling a few minutes before getting pump pressure on.
("must be a boulder; its harder being held" Oiler).
Lost 2 hours [illegible] in drilling through bridge (6 feet)

4:15 pm Bridge again at 1683.
Drilled through [illegible]
[illegible]
Had to drill it out (5 feet)

4:30 pm Bridged again at 1703
Had to drill it through

5:15 Stem runs into cavity at 1700 - probably filling remaining 40 ft to bottom.

5:45. Reached bottom of hole after redrilling through cored section.
Drill shaft to rotary table broke. Cement pump failed ([illegible])
Started pulling out of hole to make repairs

May 11 ~ Wed ~ 7 AM - 4 PM ~~Lott~~ - FITZPATRICK

0645 REPAIRS ON EQUIPMENT COMPLETE
BEGIN PULLING CORE PIPE - BEGIN DRILLING AT 1740'

(TO PAGE 27)

Sample H - one of number of unoriented pieces 7'8" from top of core - K Calc - 5/21/56

Sample I - Big chip from bottom of oriented piece 8' from top of core (piece at left of 3rd channel in core box) K Calc 5/21/56

25W

Notes on Core No 4 - 1718-1740'

25

Notes on Core No. 4 — 1218-1740'

First 2 pieces, each 6' in length have a sandy texture with traces of horizontal bedding. The material is porous and only moderately well cemented. It is composed almost entirely of Foraminifera - both the smaller discoid "beach types" and the larger lepidocyclines. They appear to be beautifully preserved. External appearances suggest Miocene forms from Lau and I think we are still in the Tertiary e unit. The large numbers of smaller forams suggest very shallow water (possibly even a beach). Chips from the base of upper piece ("C") and from base of lower piece ("D") sent to Cole 5/21/52.

First 4' of core (possibly 4½') form an unbroken section and starting with piece 3 (1' from top of core) is becomes dense. a few small cavities and cracks are veneered with minute calcite xls but rock is not recryst. Same large forams are present and are as well preserved as those above; sections of large calcite xls probably represent echinoid spines (Specimen E from base of 4th piece sent to Cole 5/21/52)

Each piece has numerous molds of branching coral (1" or slightly more) and other molds that probably represent mollusks; rock in 6th & 7th pc. still dense & white & well preserved forams persist; balance of first 4½' similar.

Piece 1' from top of core has good forams in dense matrix (Sample F to Cole 5/21/52)

Sample 6' from top core has well preserved coral molds (Sample G to Cole for Wells 5/21/52)

(2C)

0905 BEGIN DRILLING AT 1740'

1740-41 HARD WITH VOIDS

0920 41-50 HARD SMOOTH DRILLING

50-53 BEGIN CUTTING SOFTER STILL DRILLING SMOOTH

53-54 SOFT WITH VOIDS

54-55 " AND SMOOTH

55-60 SOFT SMOOTH WITH FEW VOID

60-62 HARD SMOOTH VERY FEW VOID

62-63 SOFT AND SMOOTH

63 VERY ROUGH

63-64½ SOFT AND SMOOTH

64½-65 SOFT WITH VOID

0934 65-69 VERY SOFT WITH THIN HARD STRATA AT 67

CIRCULATE FOR 7.5 MINUTES

0942 BEGIN DRILLING AT 1769' HARD, SMOOTH

0950 1770-71 SOFT WITH VOIDS

71-85 VERY SOFT, SMOOTH WITH OCCASIONAL VOIDS

85-89 GETTING HARD

89-90 VERY SOFT, SMOOTH

1009 AT 90 VERY HARD ROUGH THIN STRATA

90-97 FAIRLY SOFT AND SMOOTH WITH OCCASIONAL VOID

BEGIN CIRCULATING & CONNECTING

1010 BEGIN DRILLING AT 1797

1797-1805 SOFT WITH MANY VOIDS

1805-07 HARD THEN VERY SOFT

07-12 VERY SOFT WITH VOIDS

12-16 SMOOTH, HARD

16-25 SOFT WITH MANY VOIDS

25-27 VERY ROUGH UNEVEN DRILLING

NOTE: WATER IS NOT BEING USED AS FAST AS IN PREVIOUS DRILLING

1529 BEGIN DRILLING AT 1827'

1827- 31 SOFT WITH VOIDS

31- 34 HARD, SMOOTH

34 VERY ROUGH DRILL

34- 46 VERY SOFT OCCASIONAL VOIDS CAUSING CHATTER FROM 38-43 DRILL FREE-FELL THRU.

46-47 VERY HARD, SMOOTH

47-48½ HARD WITH VOIDS

48½-51 SOFT MANY VOIDS

51 VERY HARD, SMOOTH

52-53 " " WITH VOIDS

1057 53-57 VERY SOFT WITH ALOT ROUGH DRILLING

REPLACING BITS, CONNECTIONS CIRCULATING

BEGIN DRILLING 1857'

1857-62 HARD WITH VERY FEW VOIDS

1130 1860

62-64 SOFT, SMOOTH

64-76 SOFT WITH MANY ZONES OF VOIDS / CHATTER EVENLY SPACED THROUGHOUT. DRILL PRACTICALLY FELL FREE FROM ABOUT 1866-1868

1:40 AT 1876'

BEGIN DRILLING AT 1876

1876'-90 SOFT SMOOTH

1147 1890'

1890-94 SOFT, SMOOTH

94 VERY ROUGH

1894-1914 VERY SOFT - BIT DROPPED FROM 1908-1914

14-15 SOFT WITH VOIDS

1915-1916 VERY HARD FAIRLY SMOOTH

1201 F[illegible] [illegible] [illegible]
[illegible] – [illegible]
[illegible]
[illegible]

[illegible]

1217 BEGIN DRILLING AT 1916
1916-24 SOFT [illegible]
WITH [illegible] VOIDS AND SMALL
HARD SPOTS
24 VERY HARD [illegible] ZONE
25-6 GENERALLY SOFT WITH SCATTERED
VOIDS
4 VERY HARD ZONE 4-5"
[illegible] SOFT WITH VOIDS
[illegible] BIT [illegible] LAST FOOT
1225 AT 1940'

BEGIN DRILLING AT 1940'
40-54 [illegible] SMOOTH DRILLING
54-55 VOIDS & HARD DRILLING
55-58 VERY SOFT AND SMOOTH
58-65 FAIRLY HARD
65-66 SOFT WITH VOIDS
66-68 HARD SMOOTH DRILLING
68-70 SOFT WITH MUCH CHATTER
70-75 FAIRLY HARD
1342 AT 1975'

IT HAS BEEN DECIDED TO USE THIS LAST HARD ZONE AS A CASING SEAT. HOLE IS TO BE REAMED (ABOUT 1 DAY REQUIRED) CASING PUT DOWN (ABOUT 9 HRS), AND THEN CEMENTED (ABOUT 1½ DAYS) — ESTIMATED TIME TO BEGIN OPERATIONS ABOUT 24 MAY.

BIT USED FOR LAST 25' [illegible] [illegible] [illegible] [illegible] [illegible] DRILLER (JOHNSON) CLAIMS ROCK MUST BE VERY HARD.

[redacted]

2 PM - 11:30 P.M.

Hole to be reamed from approx. 1110' to bottom, 1925'. Reaming started at 2 P.M.

7:20 Reamed to 1176'.

Mole started caving from 1150 feet ±; pulled out 1210' ±, started to mix mud; used all available supplies.

May 22 - Thurs. - Ladd

6:20 AM - Reaming at 1210 - no return of mud.

6:40 AM - reamed to 1236' - very hard going near end of run (this the unit cored earlier); new joint added without any fill but still no return of mud.

6:55 - to 1270

7:20 - " 1292 going easier; shut down to attach new pressure gauge; ordered all remaining supplies mud up from Perry

9:00 AM - reamed to 1320' - very rough last 5' ; replaced bolts on rotary bushing.

10:20 - to 1409

11:00 - " 1458

1:20 - " 1515 ½ but have drilled to make connection 4 times due to caving; mud 5½ lbs

2:35 - to 1526'

(30)

5PM – reamed to 1549 (due to error in pipe talley depths during shift up to this point are off by about 30')

4–11:30 PM. Drill sticking at 1525–1549. Ran out of mud mixes.
8:15 Started drilling with new mud.
9:05 New mud all gone, Drill still sticking. I think the hole is caving or about 20' of cuttings are remaining in the hole above about 1550'. Bill Springle decided to run a 8⅝ bit run in to free hole, then ream again. I think we have to find a place to get rid of the cuttings.
At end of shift the pipe was being pulled to replace bit.

May 23 ~ Fri. ~ Ladd 8AM – 4PM
Heavy caving continues, even with reamer removed, down to 1710 at 8:15 AM hole tight, unable to make connection; to add third pump so as to avoid caving while pits are being refilled; will probably have to mix more mud to get Kelley down to 1740.

8:40 – Trying to pull out 3–4 stands to pain mud – done by 9AM

Added saw dust (100 lbs ±) to mud; start back in hole 2:00 PM – down to 1500' ± in clean; on to 2000' by 3:15 with no return of circulation; mud more than ⅓ gone; to pump remainder in hole and then pull out before putting on reamer (hole now reamed to 1526')

3:30 start out of hole - mud pits almost empty

4 PM - 11:30 PM. Started mixing mud at beginning of shift. Mixed mud until 9 P.M. Mud the Follows:
95 sacks Zeogel
32 " Impermex
25 gallons Tannex
1000 lbs. sawdust

9:15 Started reaming again at 1549'. Pipe went into hole free and easy to 1591. No return of drilling mud.

11:30 Hole reamed to 1635' - mud & water gone.

May 1st Sat. 1:30 - 8 AM. - Russell

1:30 AM. Stopping reaming at 1656 to refill pits.

2:00 AM - Pits full. Started back in hole to continue reaming.

2:15. Water flowed from pipe because of settling cuttings when made joint put on at 1666.

3:25. Reamed to 1705. after putting on new joint, cuttings filling hole and first cut off flow of water for several minutes. Manipulation of pumps & valves broke through.

4:00 A.M. Reamed to 1730. Pulled 3 strings to fill pits. cuttings settled to about 40 ft of bottom of reamed hole.

32

6:00 AM Shut down 12 hours check pressure.

May 24 ~ Sat. 73° - 4PM ~ Ladd

7:30 AM Reaming at 1754' (getion where we had trouble yesterday) with salt water; pulling up to mix mud; 10:15 start back in hole; 10:25 down to 1820± - drilling mostly easy but with few hard streaks that cause much chatter.

~ 11:30 - reamed to 1857 but unable to make connection on wet cuttings - mud pit now about ½ empty and still no circulation. - shut down to mix mud.

Rept. to O&R → - 2:20 resume drilling
- 2:50 at 1906
- 4:00 reamed to bottom at 1975; pull up to mix more mud (pit is nearly empty)

4 P.M. - 10:30 P.M. Mixed mud until 7:30. Then pumped mud into hole. Bit went to bottom of hole very easily on this operation.

8:00 All of mud pumped into hole - pipe pulled. Cementing pump moved from shore facility. Preparations made to run casing and cement casing. All three crews on duty.

10:45 Started to run casing. Four joints of

casing to 1130. Rest five joints of 9 5/8" casing. Casing is 36 lb.; 9 5/8" O.D.

May 25 ~ Sun 1973

Casing running to ~~1134~~ and hole cemented by 7AM. Shut down to allow cement to set; to resume drilling 6AM 5/27.

May 27 ~ Tues 5:30 AM - 4PM Field

Bit at 1936' (1978.7 with K.B.) - start drilling slowly to clean out cement; use water (when mud is used with cement drilling it "clobbers up") - good return water. (first touched cement 1963')

- 1975-78 drills hard, cuttings medium to fine, include cement and bits of black material from shoe; circulate for 45 min. to clean hole before running core bbl. Ran Totco 1963 (1° off)

  Cutting dense, hard, white to tan or slightly pink recr. ls., some banded structure (algal?), very few chips are cavernous; some show coral structure; well preserved larger forams present.
- 6:40 - 7:30 - out of hole
- 8:00 start down with core bbl.

[Note: Yesterday men on lagoon acc. Johnson close to drill site reported muddy water in 3 spots]

- 8:43 circ return
- 8:50 - start coring - "moderately hard"

- 10:15 few fine cuttings - thin plates hard white ls. - sample in vial
- 10:45 averaging 7-8 min/ft; one

(see p. 37)

190 - 210 Coal hard ½
210 - 230 Shell ½
230 - 280 Coal hard ½
280 - 300 Coal + shell - fine
300 - 330 " " " - coarse

Notes on cuttings ~E/ (see above)

190-200 Sample consists mostly of large pieces of

Notes on cuttings ~F 1 (see above)

190-200 Sample consists mostly of large pieces of coral (Porites) - up to 1¼" in diameter; drill apparently struck very large colony. Other corals are represented in the coarse material as are pieces of buff to tan ls. containing Halimeda fragments and mollusk shells.
Finer fraction (less than ¼") consists of broken coral + frag. ls with few frag. Halimeda and forams (Marginopora, chiefly).

200-210 Same as last

210-220 Similar to last two but with fewer Porites fragments. There are a few pieces of the buff to tan, dense foss. ls and in one piece this material grades into a porous, highly foss. (small forams + micro-moll) cemented ls. Think the dense mat. is derived from porous mat. by dep. of calcite. In this connection see large gast. shell lined with yellow calcite ½ls.
Many well preserved micro-moll. in porous layer + free in finer fraction - mostly gast. with thin-shelled pelecy, such as fellinids + frags. of coarse ribbed forms. Halimeda frags rare

220-230 Larger pieces composed almost entirely of micro foss - some porous, some dense (like last); cementation is by yellow calcite and all stages may be found; rich in micro-moll.

230-240 Coarse coral; microfoss + yellow

rock frags

calcite, rare; some large moll. shells + well preserved coral; many small moll incl. arch

210-250 Coarse, mostly Porites and foram-moll. ls similar to that above (210-220) but without much yellow calcite; smaller forams abundant in fine fraction.

250-260 Similar to last but higher percentage finger coral; Pyrgoma molds

260-270 Similar; rare moll molds; 3 Lithodomus, 2 small oysters

270-280 Coarse coral with frag. ls matrix rich in micro-gast., some yellow calcite - some of gast. with traces of original color

280-290 Fine coral and shells with few large pieces coral and several pieces cemented ls. with Halimeda, etc.; worn moll., mostly small

290-300 Mostly fines with small amt. coarse coral including cemented shell ls., yellow calcite, worn moll,

300-310 Coarse coral with cemented shell debris; worn cardiums, small rounded pebbles

310-320 few large pieces, 2/3 of them fragments of coral (both massive Porites and pts of branches); other coarse pieces of tan, fossiliferous ls. with sol. centers. Fines mostly coral frag. with few micro. moll, frag. larger shells + coch. spines, smaller forams

(see p. 43)

5' 9"
6'
6'
2' 9"
19' 18"

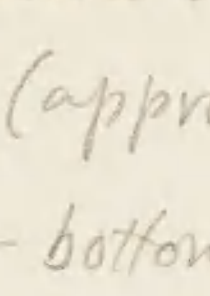
20.5'

.82
25 | 20.50
200
50

Core #5

Sent 3 samples - J-K-L
to cole 5/28

J - from 7-8" from top -
K - " 2002' (approx) - not oriented piece
L - " 2003 - bottom piece



mcd, soft and one soft spot - 3-4" each.

med, soft and one soft spot - 3-4" each.

4:25 one foot in 12 min. after soft spots
12:00 noon Embedded coring; last 2" went softer (1½ + 3½) but hardened at end; no loss of circulation.
1:50 PM - out of hole.

Core #5
1978-
2003

Recovered 20'6" hard whit rexl. ls. (= 82 %)
Core in 34 oriented pieces + ½ doz short sections of small unoriented pieces
Top 5'6" of core placed in Box #2,
balance in box #3 (filling it up)

(see above)

Rock contains many reef corals, all preserved as molds as are mollusks; some cavities measure 2-3" across & not all lined with calcite xls.; some corals may be in position of growth, others obviously are not in position.

ONR Rept. #6

Reamed to 2003 by 4:45 PM.; drilled to 2005 - no cuttings; shut down to mud up

- 6 hrs lost circulation at 2007', adding sawdust; loss due to 6" drop; circulation returned in 15 min. ±

- drilled on to 2020 - very poor cuttings, mostly wood & Imperforate

DYE TESTS

After core No. 5 (1978-2003') was taken, two dye tests were made to check speed of drilling fluid.

TEST NO. 1 -

Drilling fluid - sea water
Dye - Sodium fluorescein - eighteen pounds

Amount dye - 2 oz. by volume
Hole depth - 2023'
Hole condition - $9\frac{5}{8}$" casing ([illegible]) & $6\frac{1}{4}$" open hole to bottom.

Circulation - good.

Dye placement - in top of float valve, a spring-closed, seated cone which is placed directly above the bit to keep water and/or drilling fluid from backing up pipe as it is being run into hole, & released when fluid under pump pressure comes down the pipe.

Pump strokes - 52/min.
Drill pipe rotatation - approx. 20 RPM.
Total distance dye traveled - 2027'.
Time - <u>11 min. 31.7 seconds</u>

Test results:

A vivid green color showed at end of flowpipe. The fluid traveled approximately 175'/min or 3'/sec. or 34 sec./100'.

<u>Test No. 2</u>

Approx. 3 oz. of a red textile dye put in suction hose in pit to check complete circuit of drilling fluid. A small amount of Impermex had been added to the fluid, but the dye showed up well.

Total time - 15 min. 4 sec.
Pumps - 48 strokes
Pipe RPM - 20
Depth of hole 2015'
Total length of circuit - 4232'.

In test No. 1, fluid traveled 2027' in 11 min. 31.7 sec., & in No. 2 fluid traveled 4232' in 15 min. 4 sec. Apparently fluid travels in the magnitude of three times as fast from pit to bottom of hole as from bottom of hole to pit.

May 27 - 12 M - 8 AM - [illegible]
Depth 2066 by 8 AM.
Took about 15 minutes to collect sample - but [illegible] [illegible] 2064 [illegible] that time.

1.30. Driller noted about 3 ft interval 2077 - 2080 when drilling was faster - Rock softer though still firm.

5.30 AM - Depth 2105.
Circulation constant though still losing steadily; Mixing to try & keep sand[illegible] so that mud is very thin. (Might explain almost complete lack of cuttings larger than sand size.)

5.27 AM - Circulation lost abruptly at 2124. (End of old day).
Driller says bit hit "very rough zone" for last 2 inches of hole run just before circulation stopped.

3.30 - 4.25. Mixing mud, put in last 3 barrels of conditioner.

4.30. Added new rod to string & prepare to continue drilling hoping that thicker mud & conditioner will restore circulation.

4.37 AM. Circulation returns at 2122 - Mud Cave about 1 foot. Drilled rough zone 2124-2127 was very soft - probably open cavity

4.45 Circulation, little mud flow trickle at 2130, Stopped completely at 2131

4.50 + Circ returned only intermittently at 2135 —

4.51 Zone 2136 - 2143 apparently [illegible] all tight no resistance. At 2135 notified Bill Springer. Driller says it seemed [illegible] waste of drilling mud to [illegible] very near total without more lost circulation material.

Driller says zone from 2125 down to cavity at 2136 was very rough - drill chattered & kicked badly.

5.30 AM. Harry Ladd on scene. Springer & Ladd decide to go ahead with salt water only (dry drilling)

May 28 ~ Wed 6AM - 4PM - Ladd

6:15 rough drilling @ 2155 - soft

(41)

2130 - 2155 ; harder 2155 - 2160

6:50 - shut down to fill pits

8:45 - unable to get back to bottom - 10' ± of cuttings, washed down to seat-table.

9:10 - 2160 - 2165 - 1 ft. soft, rest firm

9:30 - 2165 - 2175 - firm, fairly uniform

9:50 out of hole to await installation of 4" water line and, incidently to examine pit; bit badly coarn with many of small teeth broken off. (after 12 hrs?)

2:30 PM Back in hole with new bit

3 PM - on to 2195 - all firm; cavity 2188-89.

3:45 PM pulled up To work on pumpline

4 PM - 11:30 PM.

Working on pump until 4:55.

4:55 Ran pipe into hole. Bit refused a few feet above bottom, presumably due to settlement of cuttings. Hole washed clean.

5:05 Started drilling at 2193'. Hole to 2225' at 6 PM. Zone at 2197' to 2212' gave virtually no resistance to the bit.

FIN

6:40 2250' EXCEPT FOR DEPTHS INDICATED ABOVE DRILLING HAS PROCEEDED AT ABOUT 6 MINUTES PER FT

7:05 2260' DRILLING SMOOTHLY AT LESS THAN 2 MINUTES/FT.

To P9 44

Notes on cuttings (cont. from p.36)

320-330 Very similar to 310-320

330-340 Course + fine pieces dense, buff ls, much of it rexl to yellow calcite; some dark elongate areas may represent larger (recryst) NO → forams; coral structure obscure. Moll. shells rare (note *Turbo* operculum); forams also rare; this mat. quite diff from samples immediately above.

340-350 Similar to last but coral and mollusk molds much more abundant; int. mold *Pyrgoma*

350-360 Similar to last 2, molds large moll, both pelecy. + gast; also small moll + forams with shell (contam. from above?) - (3 free *pyrgomas* with orig. shell)

360-370 Little change; gray, cavernous ls. with much rexl. yellow calcite; corals and larger moll. as molds; few micro moll. + many smaller forams with shell.

370-380 } Same as last - forams + small moll. shells become fewer with depth
380-390
390-400
400-410
410-420
420-430

430-440 Similar but with well preserved corals and large (frag.) moll.

440-450 Like 370-420 - unalt. corals and moll. Rare. (over)

450-460' – gray ls + yellow calcite – higher proportion of dense pieces than above; foss. as molds

460-470 – same as last; unaltered coral + shell rare + may represent contamination from above; only forams are recryst. in yellow calcite

470-480 – Essentially same as last but note well preserved micro-moll. in finest fraction (bottled) – gast. (Caecum), also forams. In coarser fraction calcite molds of Vermetus, pelecy with both valves. Micro-moll. do not appear to have come from near surface, some have frag of gray ls. attached.

480-490 – Same as last with same moll. in finest fraction

490-500 – no essential change

500-510 – " " " ; few well pres. corals and Halimeda

510-520 } no essential change
520-530 } – micro-moll less abundant at lower levels
530-540 }
540-550 }
550-560 }
560-570 }
570-580 }
590-600 }

(600-625 = Core No. 2)

630-640 – Coarse cuttings of richly fossiliferous ls – foss. recryst. calcite and chalky lime in chalky matrix; moll, corals, forams
medium + fine fractions similar to section 500-600 – plus very large moll shells
Small forams + micro-moll abundant in fine fraction (both int. molds and others with shell – Caecum, etc.)

640-650 – same as above.

(see Book 2, P 29)

43a

7:24	2270'	Start fast drilling [illegible]
7:40	2270	Connection [illegible]
7:56	2286	Drilling 1 ft/min
10:58	2306	Drilling same as [illegible]
		Averages 2 min [illegible] – drilling time between 2280 & 2296 averages about 1½ minutes/ft

Small forams & micro-mostly abundant in fine fraction (both int. molds and others with shell & secum, etc.)
840-850 - same as above.

(See Book I, P 29)

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7:25	2270' [illegible]
7:40	2272 Connecting [illegible]
7:55	2290' Drilling [illegible]
10:55	2300' Drilling [illegible]

[illegible] between 2290 & 2300 averages about 12 minutes / ft

May 29, 12 Mid — 8 AM Russell

12.35 AM - Depth 2445.
Fairly hard smooth drilling from 2392 - 2445 reports driller.

1.00 AM. 2455 ft. with kelly down. Water in pits running low. Pull kelly up & rotate string until pits fill.

1.40 AM. Pits full - resume drilling.

2.00 AM. D. 2460
Driller says that so far ft drilled so far on this shift (2445-2460) has been quite uniform fairly hard rock which drills like "chalky lime", drilling rate - fairly constant.

"Rough streak" at 2460 which died out within 2 or 3 feet to same type as lighter [illegible] ft.

2.30. Depth 2485 - No change although drilling time per 10 feet is lengthening.

Driller says he has had no difficulty [illegible] with

(44)

accumulating cuttings. Since bit goes right back in bottom after each rod addition. (Where do they going drilling has had one progress deeper casing since 2212, the it proves that rock produce cuttings but only a silt capable of being washed away by the mud water being pumped through)

2490-2495 - Very soft.

5.25 AM Depth 2510'
Accumulation of cuttings, beginning to effect change in bit position (binding)

6.00 AM Unable to add new pipe because of accumulation of cuttings.

6.25 AM Pulled two stands of pipe and shut down to repair mud pump. (Pump with very uneven pressure causes hose to whip back & forth)
- Piece of wood from sawdust pile caused trouble.

6.55 AM Still trying to add a new joint of pipe.

7.00 AM Made it

7.25 - Depth at end of shift 2522'

May 29 - Thurs. 8AM - 4PM Ladd

Drilled to 2527 - fairly hard, no streaks
shut down to service rig and fill pits

- to 2530 with no change; drilled slowly, losing some water (arranging to add 3rd pump - 2" line - that should enable us to drill continuously unless large cavities are encountered)

- 10:45 - to 2550 - continues fairly hard with few rough streaks 2552 - 2556; shut down to fill pits and install pump 2 - this ties bit depth

- 12:45 PM - 2550 - 2575 - fairly hard, smooth except for cavity 2565 - 2568; put some cuttings on this "shelf"

- 1:30 PM - 2575 - 2600' - firm except for rough spot 2582-83, soft 2582-95.

- 2:45 - 2600 - 2620' - firm except rough 2618 shut down to refill pits - pulling up

- 3:45 - hole filled 50' ± with cuttings

29 May (cont'd) 4:00 PM → 12:00 P.M

4:50 2633'
6:00 2663' Decided to take core here. Mixed mud for 2 hrs. The pumped mud into hole, pulled pipe & put on core barrel & bit. Ran pipe by end of shift.

May 30 - Fri. - midnight to 8AM Fair

- 3:30 AM start out of hole after 25' core run averaging 10 min. per ft. No soft spots but pt. (15-20') very rough.

6:00 AM out of hole; trip showed by tight joints.

core #6

Recovered 16'5" core = 65%
coralliferous, foraminifera

Core projecting from end of bbl - probably last part of bottom.

Core consists of 27 large oriented pieces (with 4 small oriented slightly altered fragments) and another unoriented piece in ½ dr 2 or pieces.

core 2662 - 2687

Cole M+N

Samples to Cole -

M - 2' 1" from top of core } unoriented chips

N - 7' 10" " " " " } chips

ONR Rpt #5

M. Rowell →

12.25. Replaced several joints, having bad collars. On way back to drilling. Few doubles T & C.

1.55) Drilling resumed on pipe. Says we were 1 foot short previously. Thus core is really 2662 - 2687.

2.05 PM. Finished reaming - Starting to drill.

3:41 - Drilled to ~~2715~~ 2721'

May 30
4 P.M.-11:30 P.M. (RCT)

4:00 Drilling at 2721' at beginning of shift. Very soft spot at 2722' (about ½ foot).

5.5? From 2715 to 2780 (Prob ...) drilling has progressed 1 ft per min or faster; at 2760 and 2775 drilled into open cavities of about 1 ft. Rest is probably very porous or very weakly cemented rock.

6.30 - 2760 - 2800 - Fairly hard.

Drilling fairly hard to 2890' except two feet of no resistance at 2828'-2830'. Drilling soft to 2890'. Then from 2890' to 3045' drilling with virtually no resistance; formation held 14,000 lbs. bit pressure when pipe was not turned, but when drilling started, resistance stopped.

9:40 At 2985' drilling was stopped until Ladd & Springer were notified of the extremely soft zone from 2885' to 2985'. Drilled to 3045' while decision was made to try to obtain a sample of the soft zone by using the junk basket. Pipe was being pulled at end of shift.

Although drilling was easy in soft zone, "cuttings" did not seem to pack around bit & pipe; as each succeeding joint was added, bit went directly to bottom of hole. No indication of caving. No circulation, of course.

Lack of caving seemed to indicate[1] that the material is not an uncemented or otherwise unconsolidated sand. Lack of accumulation of cuttings would seem to indicate[2] large interstices & high permeability. (Perhaps this is Karig's Jell-O zone.)

1) - correct
2) incorrect } see detailed notes page 50

[Left margin: See driller's report for time per 5' drilling; reached 3045' at 10:15 PM]

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May 31 - Sat. Noon - Sam Russell

12.15 AM Lowering basket & float valve - attached & ready to get sample of "Jello Zone"

12.50. From 12.15 - 12.50 AM shut down because driller noted that pit hung up one joint down. We feared this meant that the inner casing had broken & he called Bill Springer. When tool pusher arrived he tested & noted that bit was hung at this point whether it was going up or down & concluded (or rather hoped) that the only difficulty was that a "burr" or something was preventing and that the casing had not parted. With this the crew resumed fishing expedition with junk basket to our "jello zone"!

1.10 - PM. Bill Springer tells me he is convinced the casing has parted. We plan to try to screw on top after this junk basket run.

5.40 Junk basket produced recognizable sample of bottom material. Appears to be finely divided lime - dead white - granular, poorly cemented, not distinguishable organic structure - grains vary in size and shape

Material was mostly recoverable
chalk than anything else readily
enough to mould. On first examination
it appears to be composed of [illegible]
white grains of all size and shape. up to 1 mm
None of these, however, platy fragments
[illegible] easily grown [illegible]
crushed between the fingers breaks
to a powder of fine [illegible]
[illegible]
grains [illegible] clear crystalline
(probably secondary) → calcite which does not powder. No
organic forms have been recognized.
When dissolved in acid there
is practically no insoluble residue.
When placed in fresh water it readily
breaks down into the finest of
grain sizes and makes the water
milky.

—same— possible lit. [illegible] forms

The nature of the material is
such that the action of the bit
is clearly understandable

1) There is practically no resistance
because it is friable, breaking
up on the slightest pressure to
fine grains.

2) There are no cuttings to come
in the hole because the
drilled material is readily
flushed away to higher cavities
by the sea water from the
slush pump.

N.B. Sample recovered has probably the
highest percentage of contamination
yet recorded. Concluding that chalk is
sole constituent of zone is based on
fact that chalk is only **new** material
noted and previously recorded [illegible] (5?)
[illegible] indicates presence of other materials

samples in 3 jars; one of these contains vial of fairly pure material; sample in second jar is contaminated by grease; third jar contains hand ls. chips from above

May 31 ~ Sat. - 8AM - 4PM. Lopez

Spent morning adding new length 9 5/8 casing and testing; unable to raise or turn string; how top section became loosened is something of a mystery. Repacked swivel.
Into hole at 11 AM with diamond core bbl
12:15 PM drilled 5' (3052 - 3055') without water, burning bit at end of run

split core
Core #7
3052'
3055'

- Recovered 3' (=100%) of fine-grained limestone with hard masses; drilling time per foot 2+1+1 (approx)

Back in hole with 8 3/4 rock bit
5/31/52 4PM - midnight - Townsend & Fitzpatrick
8:00 PM CHALK = SOFT TO DRAX [illegible] WHERE FIRST RESISTANT LAYER IS CONTACTED - AND BECAME [illegible]

9:00 3055' SAME VERY SOFT, FAST DRILLING MATERIAL AS BEFORE — STOPPED TO PREPARE FOR TAKING CORE #8
— TOTCO INSTRUMENT INDICATES 3½° ANGLE AT BOTTOM. [i.e. straightening up]

10.00 PM [illegible]

10.50 PM - 28 ft of cuttings had to be drilled through to reach bottom [illegible]

Notes on Core #8 -3350-3353'

Material is coarser than chalky material that makes up most of Core #7 and contains a much higher proportion of material that clearly is organic. Mollusks occur as poorly preserved and fragmentary molds; some of corals are coarsely XT casts; small forams (discoid type) appear neotized; questionable larger forams; almost perfect XT spheres that may be forams; + rods, tubes and small horn-shaped structures of uncertain affinities.

(Sample P to Cole 6/1/82

5/a

6/1/82

#8 core 3350-53

6/1/52 Sunday 1 - Midnight - 8 AM Bissell

1.45 AM - Out of hole with core No 8 - 3350 - 3353.
RATS! We pulled our bit too soon, & missed our [illegible] core, got core 3 inches long, or 8 1/3 % recovery.
Core represents last of core nearly, probably. Driller says last foot drilled in 5 minutes, whereas first 2 feet only took 1 minute each. At end of run the bit was fast stuck & could be lifted from bottom only by pulling with 80,000 lbs. Core is fairly hard with some of the chalky characteristics of the previous core but with more distinct organic structures such as coral and a few forams. Color is brownish yellow.

core #8 3350-53 (see above) cclr. P

3.45 AM - There was no flow of cuttings in hole on return with fresh bit.

4.10 Drilled 3353 - 3368 (59?) and seems [illegible] in the soft chalk. That hard spot at the end of the core run was a fluke.

Note: The drilling time record in much of the hole has been our only continuous guide to the formation drilled & check of this

record and as stated [illegible]
cuttings and core have usually
used to locate the relative hardness
of sediments by the drilling time
record. It must be recognized
that this is only relative and
that rock of typical hardness
in different places in the column
will take different length of time
to drill depending on several
varying factors a) the driller's
individual drilling rate preference
b) type of rock bit in use c) holding
back while geologist collect
samples d) type of drilling mud
used (or sea-water) e
It is highlighted here because
for the last 500 ± feet the
drilling has been in a friable
chalk or near chalk and
for most of the time the driller
has been able to drill 1 ft per
minute, however the
drilling time record for the
present run (3350 – 3420 + ?)
will show drilling times of from
per ft 2 to 5 minutes and yet the
driller points out that the rock is
still as soft as previously. He
says he is deliberately holding back
on speed to increase the chances
for cuttings to be washed up &
into carrier higher in the hole.

END OF BOOK 1