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U. S. ENVIRONMENTAL PROTECTION AGENCY

Effects of Drilling Fluids on the Behavior of the Juvenile Red Hake, *Urophycis chuss* (Walbaum)

II. Effects on Established Behavioral Baselines

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Chemical analyses of drilling fluids

PREFACE

The following is a final report on our 21-month project studying the effects of drilling fluids (muds) on the behavior of juvenile red hake, Urophycis chuss (Walbaum). The project was essentially two-phased, with the first phase dedicated to establishing baseline ecological and behavioral data, and the second phase dedicated to actual toxicological testing.

The goal of the first phase of the project was to establish baseline information on the behavior, life history, and ecology of the red hake. To that end we studied in the laboratory: activity rhythms, feeding cycles, shelter preference and usage, and growth rates. Concomitantly, we endeavored to verify our laboratory observations as fully as possible with field data on rhythms of shelter usage, shelter preferences, growth rates, and recruitment patterns. The results of the laboratory studies were previously reported in last year's Progress Report (Olla et al., 1980a).

The second phase of the project consisted of the determination of the toxicological effects of drilling fluid on the behavioral baselines of juvenile red hake as determined in the first phase of the project. The body of this second, and final, report contains: 1) a description of the apparatus and experimental protocol developed to simulate the dilution and winnowing of drilling fluid falling through the oceanic water column; 2) the results of experiments directly testing the effects of drilling fluid on red hake; 3) the results of experiments

testing the response of planktonic red hake to thermoclines and the feasibility of such experiments for toxicological testing of drilling fluid; and 4) our conclusions and recommendations.

SECTION 1.

Design and protocol for pre-test treatment of drilling fluid

INTRODUCTION

In any controlled experiment designed to test the effects of a potentially harmful pollutant on any marine organism or community, it is essential that the test organism/community be exposed to the test agent in a realistic manner. The conditions of exposure should simulate, as closely as possible, conditions under which the test organism/community might encounter the pollutant in the natural environment, given the constraints imposed by the laboratory. If such criteria are not met, the entire procedure may be of academic interest, but the results are of limited practical value, especially if regulatory criteria or guidelines are to be based on laboratory results.

Our testing concerned benthic organisms and communities. To be ecologically pertinent, this required that drilling fluids had to be introduced into experimental aquaria in a procedure that simulated the process whereby drilling fluids from active oil rigs eventually reach benthic communities. On the majority of drilling platforms currently, or previously, in use, that means the drilling fluids are released periodically into the water column underneath the rig, at various depths, and subsequently drift through the water column to the benthos. It is obvious that such a path will effect both the physical and chemical characteristics of the drilling fluids, a mixture of liquid, various sized clay particles, salts, organic compounds and

other chemical additives, many of which are water-soluble. The layering of whole drilling muds on the test benthic community substrate is, quite simply, unrealistic. Likewise, exposing benthic organisms to only water soluble fractions, particularly those components that would be quickly absorbed into the water column during the descent to the bottom, is also unrealistic. Static systems of any sort are also unrealistic for determining the responses of natural dynamic communities to pollutants.

Therefore, we endeavored to develop a procedure for introducing drilling fluid into our test facilities that met the following three objectives:

1) The drilling fluid components introduced were representative of components that would reach the benthos following a discharge 18 m above the sea floor bottom. Several studies have shown that various particulate components of drilling fluid discharges are dissipated via a near-surface plume and do not accumulate on the benthos in measurable concentrations (Ayers et al., 1980a, b; Houghton et al., 1980; Meek and Ray, 1980). Similarly, we would expect that certain water soluble components would be diluted considerably, and transported by currents before reaching benthic communities near oil rigs. Alternatively, the water-soluble organics may be concentrated at the thermocline (J. Trefry, pers. comm.), which also would prevent the water solubles from reaching the benthos. Thus, it is obvious that only certain

components of discharged drilling fluids would actually encroach on benthic communities near oil rigs.

2) The amount of drilling fluid added was representative of discharge volumes from active oil rigs.

3) The drilling fluid, once in the test facilities, was subjected to water currents and dilution factors representative of possible natural conditions. Static systems were not employed.

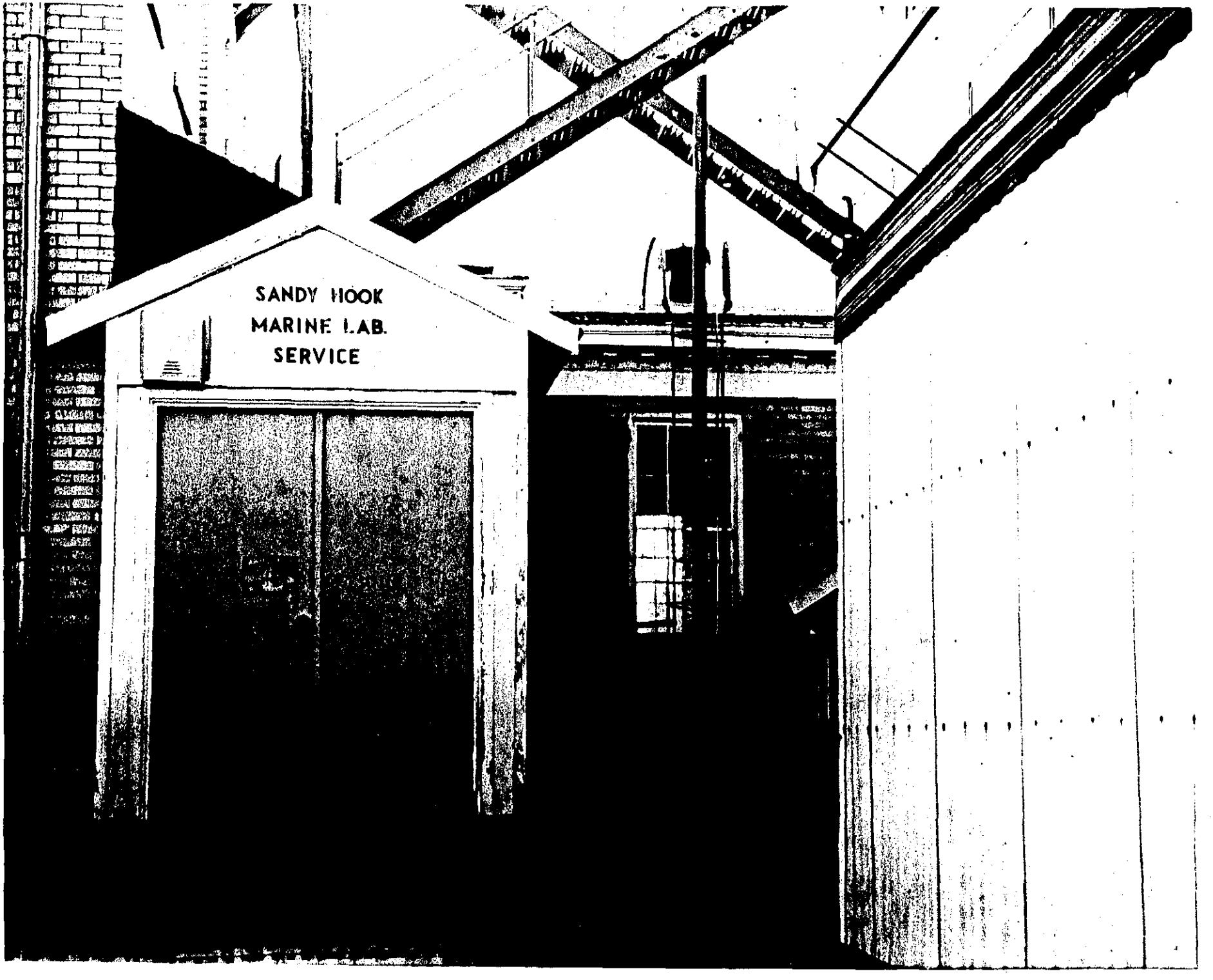
MATERIALS AND METHODS

Treatment of Drilling Fluids

The drilling fluids used throughout these experiments were from a single sample, 12.6 lbs gal^{-1}, taken from well S.T. 122-A #1, Galveston, Texas, at a depth of 9556 ft. The fluids were provided by the Drilling Fluids Sample Program of Petroleum Equipment Suppliers Association (PESA).

In order to simulate the changes in drilling fluid composition that would be incurred during the passive descent through the ocean water column, we passed the test drilling fluid through a 6.1 m PVC pipe column (9.5 cm inside diameter) filled with sea water (Fig. 1). The volume of the column was 43 l. The column was fitted with two petcocks 1.5 m and 3.0 m from the top to drain off any supernatant. The bottom of the column was fitted with a 2.5 cm ball-valve to drain

Fig. 1. 6.1 m PVC seawater column (43 l) used to treat drilling fluids.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off drilling fluids which collected at the bottom. The entire apparatus was mounted vertically and retained by restraining wires and guys.

A complete treatment was as follows. The column was filled with ambient sea water from the laboratory's standard seawater supply system. A volume of sea water equivalent to the volume of drilling fluid to be treated (12 l) was then drained from the column. This prevented any overflow or spillage of drilling fluid when the fluids were poured into the column. The fluids were then immediately poured into the top of the column. The drilling fluids were allowed to settle to the bottom of the column for a period of 1 h. (Preliminary tests showed that settlement of 5 h or longer did not appreciably increase the amount of fluid re-collected from the column). After 1 h, the top 3 m of supernatant were drained from the column via the first and second petcocks. The drilling fluids that had settled to the bottom and any remaining supernatant were then drained from the bottom of the column. Since the desired treatment was to simulate an 18 m water column, this procedure was repeated three times for each portion of drilling fluid used in a particular experiment.

Samples of the supernatant and settled drilling fluids were collected after each passage through the column. The density of each fraction, and the amount of solids, expressed as percent weight, were determined.

RESULTS

A crude fractionation occurred when the drilling fluids were passed through the seawater column. Each 12 l sample of drilling fluid used in a particular experiment was passed through the column three times to simulate an 18 m ocean water column. Each time the drilling fluid was passed through the experimental column, a partial fractionation occurred.

After the first passage through the column, the supernatant which was drained from the top 3 m of the column was discolored to a deep brown, a consequence of suspended lighter solids and water solubles incorporated into the sea water. The heavier solids in the drilling fluids settled quickly to the bottom. When the bottom valve was opened, a heavy viscous fluid, similar to the original drilling fluid in consistency, was collected. The volume of the heavy, drilling fluid fraction was 12 l, equivalent to the volume of whole drilling fluid originally introduced.

This heavy, fluid fraction was then re-settled through the water column (with clean sea water). Again the supernatant was a deep brown. The heavy, viscous layer was again collected at the bottom, but the volume of this heavy fraction decreased to approximately 5 l, or 42%, of the original whole mud volume. Consequently, we also collected enough of the fraction directly above the heaviest fraction to bring the total volume back to 12 l, which was once again passed

through a column of clean sea water.

The third passage through the column again produced a brown supernatant. The heavy viscous layer of solids from the drilling fluids again collected at the bottom of the column, but the volume had decreased to 1 to 2 l. Therefore, the fraction directly above the heavy layer was added to bring the total volume back to 12 l. This final 12 l of "washed" drilling fluids was then introduced to the test aquaria.

The exact determination of the chemical composition of the initial drilling fluid, the intermediate products of the seawater column treatment, and the final fluids introduced into the test aquaria was performed by the laboratory of Dr. Thomas Gilbert at the New England Aquarium (Table 1). In addition to the above analyses, we determined the relative amount of solids in the drilling fluids after each treatment in the water column by measuring the proportion, by weight, of the solids to the drilling fluid (Table 2).

Looking at each of the three stages of the water column treatment, the amount of solids (expressed as % total weight of fluid) varied little from trial to trial, indicating that the final composition of the drilling fluids in each of the experiments was consistent and equivalent.

Table 1. Bulk analysis of whole drilling fluid prior to treatment in seawater column.

	Concentration (mg ml^{-1} of whole fluid)
Major Elements	
1. Barium	115.0
2. Iron	3.2
3. Chromium	0.38
4. Manganese	0.25
5. Copper	0.04
Water Soluble Organics	
1. Vanillin	All within 1-5 μg l^{-1} of filtrate[1]
2. Methyl-ethyl phenol	
3. C_{17}-C_{20} hydrocarbons	
4. Tributyl phosphate	

[1]10 ml of drilling fluid suspended in one liter seawater for 0.5 h, allowed to settle and filtered with 0.4 μm pore filter.

Table 2. Amount of solids (percent total weight of fluid) in whole drilling fluids and in experimental fluids after 1, 2 and 3 treatments in artificial water column.

	Whole Drilling Fluid (%)	1st Treatment (%)	2nd Treatment (%)	3rd Treatment (%)
Experiment 1				
Sample 1	45.6	31.8	25.0	15.4
Experiment 2				
Sample 1	48.7	34.0	25.0	10.0
Sample 2	48.3	33.3	25.5	16.1
Experiment 3				
1st Introduction				
Sample 1	50.3	30.5	22.1	9.4
Sample 2	49.5	32.0	24.4	11.3
2nd Introduction				
Sample 1	50.2	34.8	23.8	14.2
Sample 2	49.1	33.4	21.7	10.1
3rd Introduction				
Sample 1	49.6	32.5	22.2	13.7
Sample 2	48.3	33.4	23.8	14.3
4th Introduction				
Sample 1	49.6	31.6	22.2	12.9
Sample 2	49.4	32.7	21.1	12.5
$\bar{x}$	49.0±1.3	32.7±1.2	23.3±1.5	12.7±2.3

DISCUSSION

The results clearly show that the amounts of solids in the final drilling fluid preparation, after three "washes" in the seawater column, were reduced significantly from that of the whole drilling fluid. This is to be expected in the field when a drilling fluid is discharged from a rig and passed down through the water column. Even in the case of "shunts", i.e., when the drilling fluids are discharged from pipes at depths close to the bottom, the fluids will pass through as much as 12 m of water (Ayers et al., 1980a; Gettleson and Laird, 1980). We believe that the final drilling fluids, including the reduced percentage of solids, collected after our treatment of drilling fluids with the seawater column, are a better representation of the composition of the materials which accumulated on the bottom in the field, than a preparation consisting of whole drilling fluids. (We add that water soluble fractions, commonly referred to as "mud aqueous fractions MAF" in various laboratory studies, are not pertinent to our study of benthic species in a dynamic environment).

We were next faced with the criteria of introducing the drilling fluid solutions in quantities that are realistic for the field. We used the report by Ayers et al. (1980a) of a test well in the Mid-Atlantic region as our guideline. They reported that 1287 metric tons of drilling fluid solids were discharged over the life of the well (193 days). This is equivalent to an average daily discharge of 6.7×10^3 kg of solids day^{-1}.

Studies in the dispersal of drilling fluids in the field indicate that the vast majority of solids initially fall within the perimeter of the drilling rig (Ayers et al., 1980b; Meek and Ray, 1980). We assumed a rig of 50 m radius (7853 m^2); thus, we estimated a daily discharge of 0.84 kg of drilling fluid solids m^{-2} d^{-1} underneath the rig for our experimental guidelines. Thus, the amount of drilling fluids and associated solids to be introduced into our experimental communities were determined using the amount of 0.84 kg m^{-2} d^{-1} as a realistic guide for field conditions.

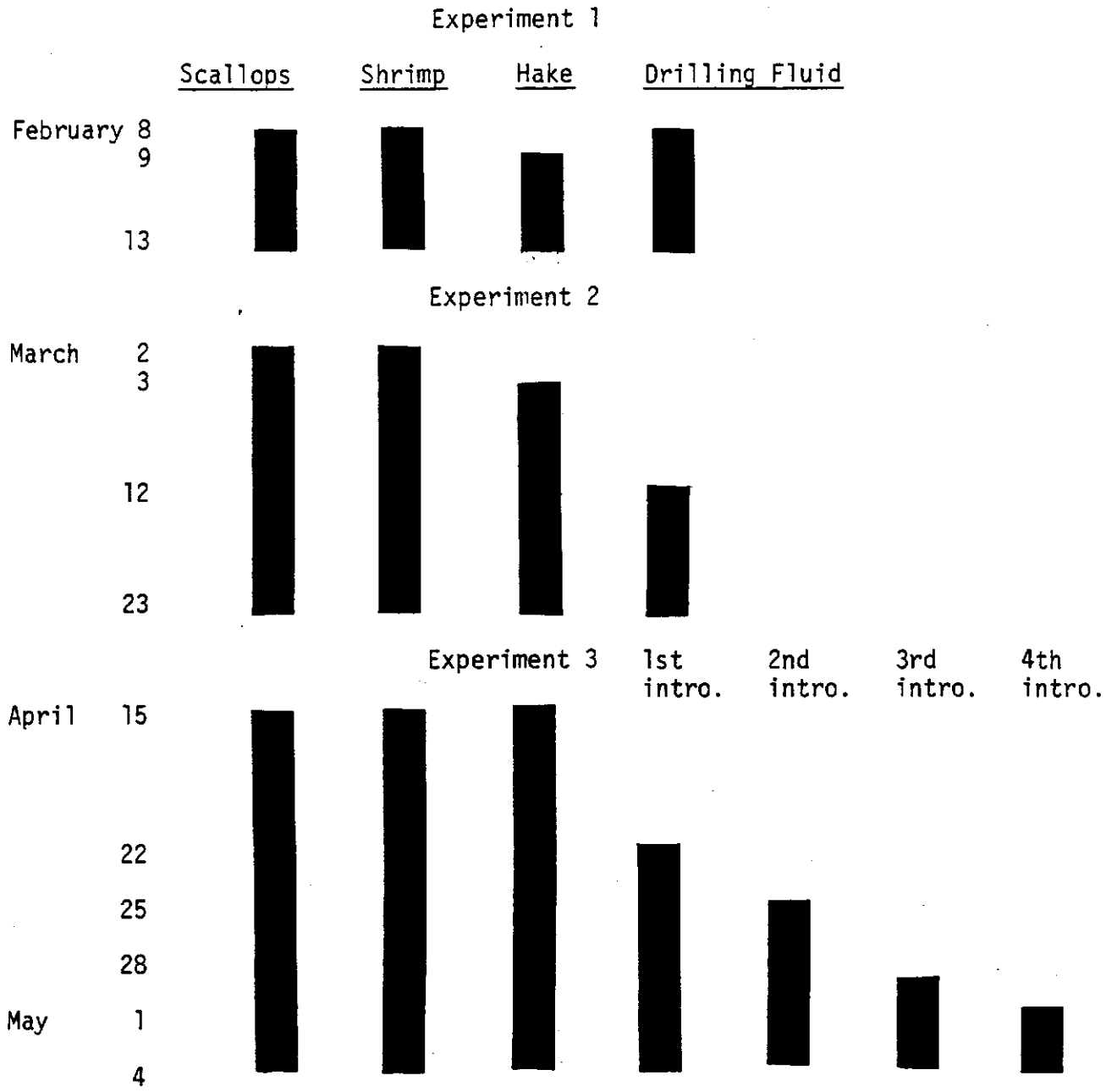
Given an average solids content of 12.7% by weight of the "washed" drilling fluids after treatment in the seawater column (Table 2), an introduction of 3 l of the "washed" drilling fluid (1.1 g ml^{-1}) was equivalent to an introduction of approximately 0.58 kg m^{-2} d^{-1}. (The area of each test aquarium was 0.72 m^2.)

SECTION 2.

Toxicological testing of drilling fluid on experimental benthic communities

The toxicological testing phase of our program consisted of three major experiments. In general, each tested the behavioral response of a laboratory benthic community, consisting of juvenile red hake, *Urophycis chuss*, sea scallops, *Placopecten magellanicus*, and sand shrimp, *Crangon septemspinosa*, to the presence of drilling fluids introduced in various concentrations and intervals. In Experiment 1, we tested the short term (4 day) response of benthic communities consisting of hake, scallops, and shrimp to drilling fluids which had been introduced to the experimental substrate prior to the introduction of test organisms. Such a test simulated the response of the benthic organisms to a previously contaminated substrate. In Experiment 2, drilling fluids were introduced to previously established communities of hake, scallops, and shrimp. We observed the immediate responses of the test organisms to the initial presence of the fluids, and any reactions to the fluids over the following 12 days. In Experiment 3, drilling fluids were repeatedly introduced to established comminities of hake, scallops, and shrimp every 3 days. We again observed immediate reactions to the initial presence of the drilling fluids and any later behavioral changes attributable to the continued presence and increase in concentration of drilling fluids in the communities over the following 12 days. A comparison of the protocol in Experiments 1-3 is listed in Table 3.

Table 3. Basic experimental timetable for Experiments 1,2, and 3.



We monitored all three species in the experimental communities for indications of stress or change due to the presence of the drilling fluids. The relative health of the scallops was determined by the degree of gaping between the shell valves and the appearance of the velar mantle fold. The activity of the sand shrimp was observed and relative mortality rates were estimated. The activity of the juvenile hake was quantified, the degree of nocturnal rhythmicity determined and rates of growth, in both length and weight, were calculated and compared.

Experiment 1

INTRODUCTION

The purpose of Experiment 1 was to test whether there were any responses of benthic organisms to sand substrates which had been recently contaminated by drilling fluids. Drilling fluids were introduced to aquaria containing a clean sand substrate. The test organisms were then introduced to the aquaria after the introduction of drilling fluids, thereby simulating circumstances in the field when animals might immigrate to an area upon which drilling fluids had already been deposited.

Such a procedure would allow us to separate effects on the test organisms due to contact with contaminated sediment from effects

due to the physical introduction of the drilling fluids down upon the test organisms. Any changes in the behavior of the organisms exposed to contaminated sediments versus those in uncontaminated sediments would presumably be due to either pollutants released into the water column by the drilling fluids, some action of the fine particulate matter in the substrate, or a secondary effect transmitted via the food chain.

MATERIALS AND METHODS

The juvenile hake and sea scallops were collected from 40° 15'N, 73°50'W, at a depth of 30 m. Scallops were collected with a commercial-type bottom dredge, brought onboard ship, and then placed into insulated coolers holding ambient sea water. As the scallops gradually reopened their shells following closure elicited during capture, juvenile hake which had been inside the scallops emerged and were collected. The hake and scallops were returned to the laboratory and placed in holding aquaria. Sand shrimp were collected from Sandy Hook Bay with a 6 m otter trawl and returned to the laboratory and placed in holding aquaria.

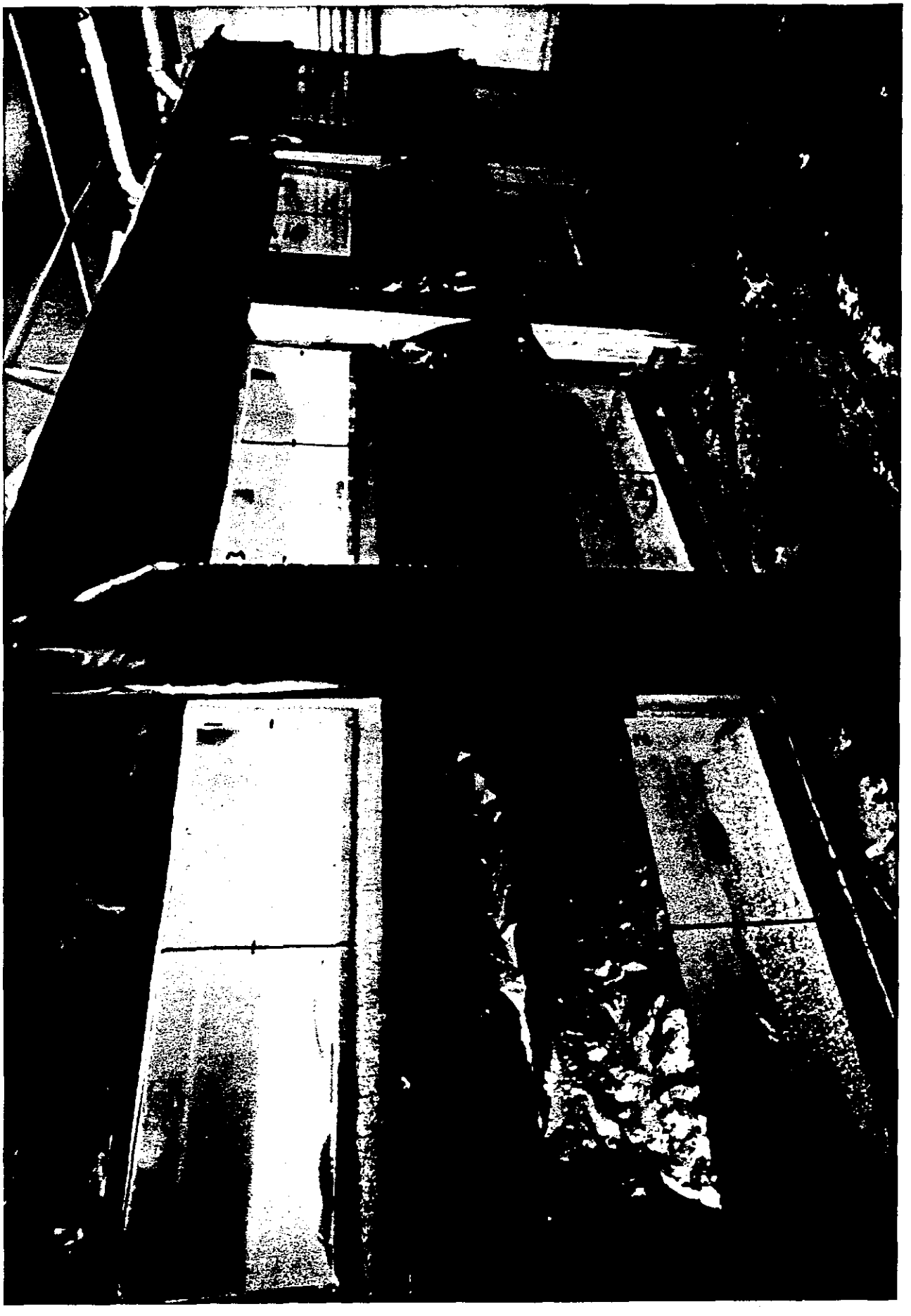
All scallops and hake were held in the laboratory at ambient natural temperatures and photoperiods which matched natural conditions. Fish were fed sand shrimp, ad libitum, and scallops were placed in holding aquaria to provide shelter.

Eight 360 l aquaria, 1.2 m x 0.6 m x 0.5 m, each with a viewing window, 1.0 m x 0.3 m, were used for the experiment: four control

(Nos.1, 2, 7, 8) and four treatment (Nos. 3, 4, 5, 6) (Fig. 2). The bottom of each aquarium (0.72 m^2) was covered with 9 cm thick layer of coarse grained sand (0.6 - 4 mm grain size). A flow-through seawater system continuously supplied fresh sea water via a head tank and multiple PVC pipe delivery apparatus. The delivery tube to each aquarium was 1/2" PVC, each with four slots spaced 8 cm apart, with the bottom slot 2.5 cm above the sand substrate. This configuration induced a laminar-like flow the length of the aquarium to an overflow valve at the opposite end. Flow rates were controlled by check valves and maintained at 3.0 l min^{-1}. Temperature was maintained at 10.0 $\pm$ 0.6°C. Illumination was provided by a 40 W fluorescent bulb over each tank during the daytime, and a 7 W bulb at night. Light intensity, as measured at the surface of the water was 1000 lux during the day and 2.5 lux at night. The photoperiod was 10:14, L:D, which matched the appropriate natural conditions for the time of year. Each tank was surrounded by black plastic and the entire experimental area was cordoned off with black plastic to prevent visual interference with any of the aquaria.

The test organisms were monitored with a closed-circuit TV and associated video tape recording system with recordings used for subsequent analysis. Two cameras, covering four aquaria each, simultaneously recorded the activity in the aquaria for 20 min each hour, on a 24-h cycle. An activity score for the juvenile red hake was obtained by counting the number of times any fish passed the midline of the aquarium, as marked by a strip of black tape on the viewing

Fig. 2. Eight aquaria used in drilling fluids experiments.



window, in any 20 min observation period. Activity scores were averaged over daytime and nighttime (Olla et al., 1980a).

Each fish was measured for total length (TL) before introduction to the aquaria, and immediately after removal from the aquaria at the experiment's end. Growth rates for length were calculated using the formula: $G_L = 100 (\ln L_2 - \ln L_1) / (t_2 - t_1)$ where L_2 and L_1 equal total length at times t_2 and t_1, respectively (Ricker, 1975).

The food consumption rates of the juvenile hake were estimated from the number of shrimp remaining in the aquaria at the end of the experiment. We assumed that natural mortality over the four days was negligible compared to the mortality caused by predation by the hake. Since few shrimp carcasses were seen during the experiment, this appeared to be a reasonable assumption. Two observations support this contention: 1) sand shrimp are easily kept in the laboratory given proper food and temperatures; they will easily live for weeks or longer; 2) hake rarely feed on dead shrimp if live shrimp are available, and hence would not have been expected to ingest shrimp carcasses in the tank. Live shrimp will feed on dead shrimp but they require several hours to do so, and hence would have been observed doing so by the experimenters. Also, the shrimp do not ingest the exoskeletons.

The number of shrimp consumed were multiplied by the mean weight of the individual shrimp introduced into the tank. This total

was divided by the total wet weight of the three fish at the conclusion of the experiment, pro-rated for a 24-h period, and expressed as % body weight day^{-1}.

On 8 February, 1981, at 1400 h, 2.5 l of "washed" drilling fluids which had been treated in the artificial water column (see Section 1) were introduced to Treatment Aquaria Nos. 3, 4, 5, and 6. The fluids were poured evenly across the surface and allowed to settle to the substrate. This amount of fluids, $\bar{x}$ = 15.4% solids by weight with a density of 1.11 g ml^{-1}, was equivalent to an introduction of 0.59 kg solids m^{-2}. By 1900 h, the water in each aquarium had cleared, and the solids had settled to the substrate. At 2000 h, 40 shrimp, $\bar{x}$ TL = 40.9 mm, $\bar{x}$ wet weight = 0.44 g, and three scallops, 100-130 mm, were introduced into each of the eight aquaria. The animals were allowed to adjust to the new environment overnight. At 1100 h, 9 February, three juvenile red hake were introduced into each of the eight aquaria. There was no significant difference in size between control and treatment fish. Video taping began at 1300 h and continued for 96 h until 1200 h, 13 February.

At 1300 h, 13 February, all test organisms were removed. Fish were measured, weighed, and then frozen. The number of shrimp remaining were counted, weighed, and frozen. The scallops were frozen.

Water column and sediment samples were taken from all eight aquaria 20 h after initial introduction of the drilling fluids and 96 h later, at the conclusion of the experiment. Separate HCl acid-washed pipettes were used to sample 150 ml of water 20 cm above the

substrate and 1 cm above the substrate. These samples were referred to as top and bottom water samples, respectively. A sediment sample of the top 2 cm of the sand substrate, of approximately 130 g dry weight, was taken using an HCl acid-washed polyethylene 100 ml cup attached to a PVC pipe. All samples were stored in HCl acid-washed polyethylene sample bottles, 0.5 ml of redistilled HNO_3 added, and then stored at 4°C.

RESULTS

Introduction of Drilling Fluids

The solids from the drilling fluids settled in a patchy manner onto the sand substrate of the treatment aquaria. Light covering of fluid solids were visible over most of the sediment with heavier patches, up to 0.25 mm thick, visible in spots. These heavier patches covered less than 10% of the total substrate area. The viscosity of the drilling fluids was greatly reduced by the treatment in the water column; thus, the solids settled very quickly to the substrate. Much of the solids appeared almost crystalline in form, due, in part, to the large amounts of barite in the original drilling fluids. A summary of the chemical analyses of all aquaria, water column and sediment samples, taken 20 h after initial introduction of drilling fluids and 96 h later, are listed in Appendix A.

General Behavior of Test Organisms

Neither the scallops nor the shrimp showed any overt reaction to the presence of the drilling fluid solids or any water soluble

components. All scallops showed typical, healthy gapes (15-30 mm) and the velar mantle fold appeared normal and healthy. There were no prolonged signs of stress such as extreme gapes between the valves, or heavy mucous production (Dickie, 1958). A scallop occasionally "clapped" its valves, rapidly opening and shutting the valves, which then stirred up the light particulate fraction of the drilling fluid solids, often causing a muddy or silty appearance to the water. However, such clapping often occurred in control tanks as well, except there was no subsequent turbidity to the water. The presence of turbidity in treatment aquaria, the result of scallop clapping, did not appear to induce any further clapping on the part of the scallops, nor any uncharacteristic behavior on the part of either of the shrimp or the hake.

Shrimp did not appear to behave any differently in treatment aquaria, as opposed to control aquaria. They buried in the substrate, both in clean sand spots and directly into sand that had visually obvious concentrations of drilling fluid solids. Since all shrimp were not visible in the sand, and because we did not want to unnecessarily disturb the hake, we could not make the detailed observations necessary to quantify the relative numbers of shrimp in heavy concentrations of drilling fluid solids versus the cleaner sections of the treatment aquaria. Shrimp fed on other dead shrimp in both the control and treatment aquaria.

The shrimp were too small to be reliably seen by the TV camera, and thus, we could not precisely quantify their activity.

However, qualitative observations strongly indicated that the shrimp were nocturnal in activity. Shrimp were rarely seen swimming in the water during the daytime, but substantial numbers of shrimp were seen actively swimming and foraging by night. These observations were in agreement with previous studies on sand shrimp (Wilcox and Jeffries, 1974).

The general behavior of the fish was similar, in both control and treatment aquaria, to that reported in Olla et al. (1980a). Hake foraged over the sand bottom, lightly touching objects with their chemically sensitive filament-like pelvic fins. The hake's food source consisted solely of sand shrimp, which they readily consumed, chasing and catching the shrimp as previously described in Olla et al. (1980a). Agonistic encounters between the hake were again similar, in both form and circumstances, to those described in Olla et al. (1980a) for fish in an undisturbed laboratory community.

There were no overt behavioral reactions by the fish to the presence of the drilling fluid solids, or to occasional fluid-associated turbidity caused by the clapping of scallops. Fish foraged over the drilling fluid solids, maintained shelter over the solids, chased and fed on shrimp over the solids, and showed no overt signs of avoidance or stress.

Hake Activity Rhythms

The hake did not display a clear nocturnal rhythm, as has been shown previously for fish both in the laboratory (Olla et al., 1980a)

and in the field (Steiner et al., 1982). This lack of nocturnal rhythm was true for three of four control and all four treatment aquaria (Fig. 3). Only in control aquarium No. 8 was there a consistent and strong nocturnal activity pattern.

The absence of a definite nocturnal rhythm in the controls was contrary to previous laboratory and field studies (Steiner et al., 1982), and indicated that the test animals were in some way disturbed. Thus, no conclusions about the effects of drilling fluids on hake activity patterns could be derived from Experiment 1.

Growth and Feeding of Hake

The initial and final sizes and growth rates of juvenile hake in Experiment 1 are listed in Table 4. There was no significant difference between the growth rates of control versus treatment fish (Student t-test; $P>0.05$). All growth rates were in the range determined for fish of similar size and similar temperature in previous laboratory and field studies (Steiner et al., 1982).

Rates of food consumption by the hake averaged from 4.14-6.84% body weight day^{-1} for the eight aquaria (Table 5). The mean values for the four control aquaria (5.61% body weight day^{-1}) did not differ significantly from the mean of the four treatment aquaria (5.69% body weight day^{-1}) (Student t-test; $P>0.05$).

The number of shrimp remaining from the original 40 at the conclusion of the experiment did not differ significantly between control and treatment aquaria. Except for Control No. 1 and Treatment No. 3,

Fig. 3. Mean activity score h^{-1} averaged for night and day, respectively, for each aquarium; controls and treatments combined in Experiment 1.

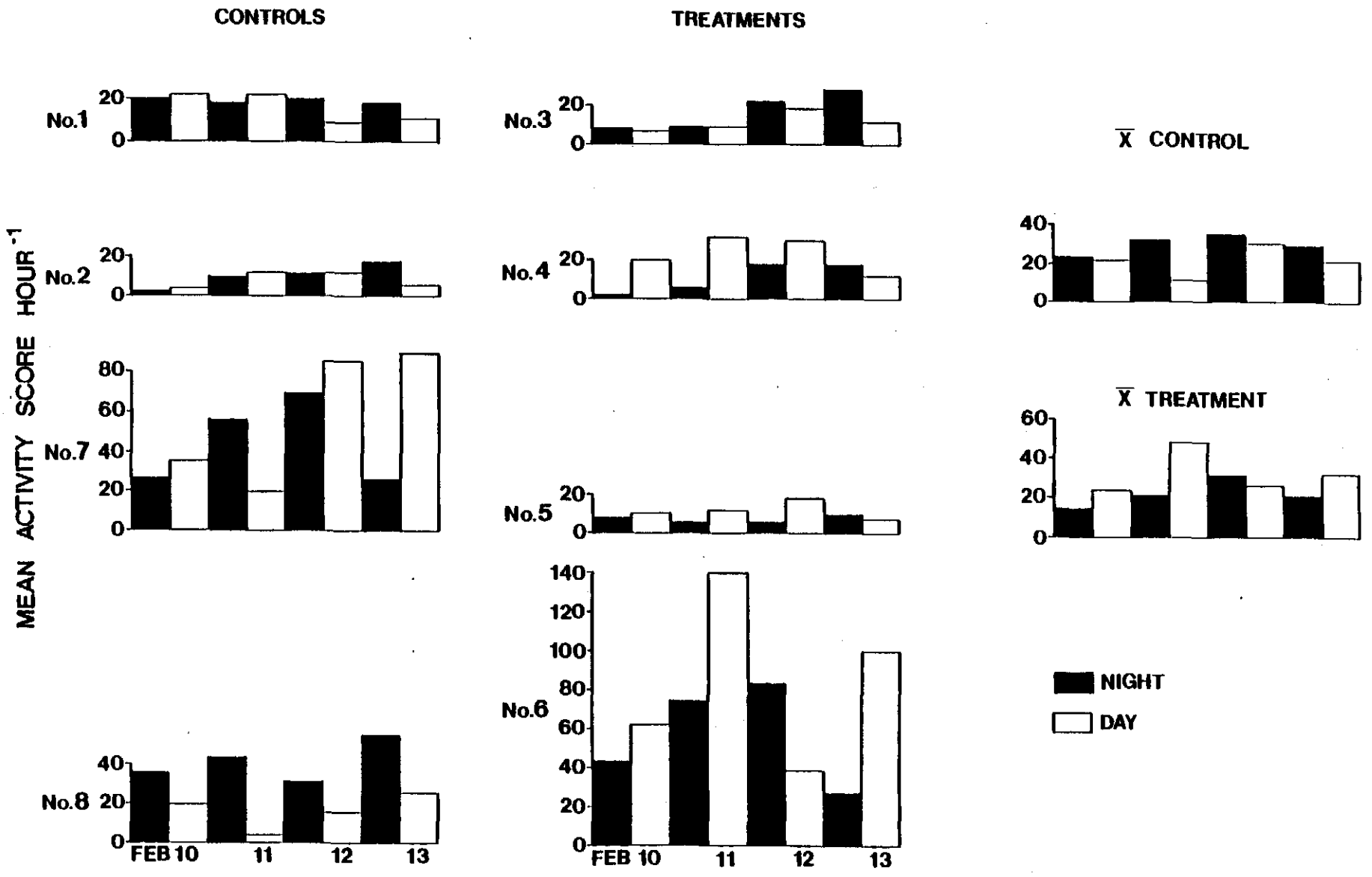

CONTROLS
TREATMENTS
MEAN ACTIVITY SCORE HOUR^{-1}
No.1
No.2
No.7
No.8
No.3
No.4
No.5
No.6
X̄ CONTROL
X̄ TREATMENT
NIGHT
DAY
FEB 10
11
12
13

Table 4. Growth rates of juvenile red hake in Experiment 1.

	Initial TL (mm)	Final TL (mm)	G_L (% day^{-1})
Control Aquaria			
No. 1	96	97	0.26
	100	102	0.50
	119	121	0.42
No. 2	100	104	0.98
	115	118	0.64
	134	138	0.74
No. 7	103	108	1.19
	108	111	0.68
	120	125	1.00
No. 8	92	92	0
	107	112	1.14
	130	135	0.94
	$\bar{x}$ = 110±13	114±14	0.71±0.37
Treatment Aquaria			
No. 3	103	103	0
	109	110	0.23
	127	132	0.97
No. 4	97	101	1.01
	105	110	1.16
	121	126	1.01
No. 5	106	112	1.38
	110	113	0.67
	129	133	0.76
No. 6	106	111	1.15
	110	114	0.89
	128	133	0.96
	$\bar{x}$ = 113±11	117±11	0.85±0.39

Table 5. Estimates of food consumption rates of juvenile red hake in Experiment 1.

	No. of Shrimp Remaining[1]	Wet Weight of Shrimp Consumed[2] (g)	Total Wet Weight of Fish (g)	Consumption Rate % Body Weight d^{-1}
Control Aquaria				
No. 1	30	4.45	26.88	4.14
No. 2	23	7.56	37.50	5.04
No. 7	21	8.45	30.88	6.84
No. 8	23	7.56	29.50	6.41
	$\bar{x}$ = 24±4	7.00±1.75	31.19±4.52	5.61±1.24
Treatment Aquaria				
No. 3	25	6.67	30.72	5.43
No. 4	23	7.56	32.62	5.79
No. 5	23	7.56	36.29	5.21
No. 6	20	8.90	35.21	6.32
	$\bar{x}$ = 23±2	7.67±0.92	33.71±2.52	5.69±0.48

[1]40 shrimp in each aquarium at beginning of experiment. Difference between initial level and remaining shrimp assumed to be eaten by hake.

[2]Estimated by multiplying number of shrimp consumed times mean weight of shrimp. Mean weight obtained from linear regression of shrimp length:weight. Weight (mg) = $0.00159\ L^{3.38}$ (Luczkovich, 1982). Mean length of shrimp in Experiment 1 = 40.37 mm.

the number of shrimp remaining ranged from 20-23 (Table 5). The two aquaria with the largest numbers of remaining shrimp (No. 3 = 25 shrimp; No. 1 = 30 shrimp) also contained fish with the lowest average growth rates. Thus, the decrease in shrimp is most directly attributable to predation by the fish. There was no evidence of any difference in natural shrimp mortality, other than predation, in treatment versus control aquaria. There were no signs of an increase in the number of shrimp carcasses in treatment aquaria. (Hake do not usually eat dead shrimp if live shrimp are available).

Experiment 2

INTRODUCTION

The lack of normal nocturnal rhythm patterns in Experiment 1 in both the controls and treatments caused us to modify our experimental procedure to ensure that fish were behaving within previously established behavioral baselines (Olla *et al.*, 1980a). Therefore, in Experiment 2 we instituted an initial pre-test observation period, allowing us to establish that all fish were suitably acclimated to the experimental aquaria and were exhibiting normal behavioral patterns of activity and feeding prior to the introduction of the drilling fluid. This meant that the drilling fluid was now introduced into aquaria already holding the test animals. Thus, any effects seen in

the treatment aquaria could be attributed to, 1) a reaction to the initial, physical introduction of the drilling fluid; 2) a subsequent reaction to gradual release of chemical components in the drilling fluids; or 3) some interaction of the first two. Such a situation could potentially confront benthic organisms within the discharge region beneath or near a drilling platform.

The drilling fluids in Experiment 2 were treated in the same manner described previously; i.e., they were passed through the 6.1 m column three successive times. Since no obvious changes were seen in Experiment 1, we increased the contaminant loading to double that used in Experiment 1.

MATERIALS AND METHODS

The same eight aquaria used in Experiment 1 were used in Experiment 2 after having been emptied, acid-washed, and then refilled with clean sand substrate and sea water. Control aquaria were again Nos. 1, 2, 7, 8, and treatment aquaria were Nos. 3, 4, 5, and 6. Photoperiod was changed to 11:13, L:D, to simulate natural light cycles. Temperature was maintained at 8.3 $\pm$ 0.6°C.

At 1700 h, 2 March, 1981, four scallops (100-135 mm) and 175 sand shrimp, $\bar{x}$ TL = 40.8 mm, $\bar{x}$ wet weight = 0.46 g, were placed into each of the eight aquaria (Table 3). We substantially increased the number of sand shrimp to ensure that there would be adequate food resources for

the hake, and reduce the probability that behavioral changes caused by food deprivation would occur.

At 1200 h, 3 March, three juvenile red hake were placed into each of the eight aquaria; sizes of control and treatment fish both averaged 102 mm. At 0900 h, 4 March, we began 20 min video tape observations each hour on a 24-h basis and continued these throughout the duration of the experiment. Activity scores were determined as described for Experiment 1.

At 1200 h, 12 March, 6 l of "washed" drilling fluid were hand poured over the surface of the four treatment aquaria. Simultaneously, 6 l of sea water were similarly poured into the four control aquaria. The 6 l of drilling fluid, 13% solids by weight, density of 1.1 g ml^{-1}, corresponded to introduction of 1.19 kg m^{-2} of drilling fluid solids over the experimental substrate.

At 1100 h, 23 March, all hake were removed, measured, weighed and frozen. The remaining shrimp were counted and frozen; all scallops were frozen.

The growth of each fish, in length, was expressed as growth rates:

$$G_L = 100\ (\ln L_2 - \ln L_1\ /\ t_2 - t_1),$$

where L_2 and L_1, equal total length at times t_2 and t_1, respectively (Ricker, 1975).

Consumption rates of shrimp by the juvenile hake were calculated as in Experiment 1, except that an adjustment was made for

natural mortality of the shrimp. A preliminary experiment demonstrated natural mortality of approximately one shrimp per day under experimental conditions without predatory hake. Therefore, after final shrimp counts were made at the end of Experiment 2, 20 shrimp were added to the total remaining before calculating the shrimp consumed by hake. For example, if 55 shrimp remained on Day 20, we calculated: 175 - (55 + 20) = 100 shrimp consumed.

Top and bottom water column and sediment samples were taken at 1100 h, 13 March (24 h after initial introduction of drilling fluids) and at 1000 h, 23 March, the end of the experiment (Appendix B). Sampling procedure was as described for Experiment 1.

RESULTS

General Behavior

There were no overt differences in behavior between control and treatment aquaria for any of the three benthic species, beyond that of initial reaction to the introduction of the drilling fluid (see below). In general, scallops displayed normal, healthy gapes (15-30 mm) and healthy looking velar mantle folds. Scallops in both control and treatment occasionally clapped and shifted position. Again, clapping by scallops stirred up particulate drilling fluid solids in the treatment aquaria, causing turbidity in the water columm,

but this did not elicit any subsequent clapping or reaction from other scallops.

Shrimp were again seen more frequently at night in both control and treatment aquaria. They rested on the sand substrate or buried in the sand in both control and treatment aquaria. Shrimp buried into sand contaminated with drilling fluids, and did not show any avoidance of such sediments, even if cleaner areas of sand were available within the aquarium. Shrimp in both controls and treatment aquaria fed on carcasses of other shrimp which had died.

Juvenile hake behaved similarly in both control and treatment aquaria. Fish maintained shelters underneath scallops and in the corners of the aquaria since they were too large to take shelter within the internal mantle cavities of the scallops. The hake showed agonistic behavior (Steiner et al., 1982), defending shelters and competing over food. Hake fed normally on the sand shrimp, catching and ingesting the prey in the manner previously described by Luczkovich and Olla (in prep.).

In the treatment aquaria, prey capture often involved detecting and capturing shrimp that had been buried in contaminated sediments. There was no indication that prey captures differed in any obvious way from prey capture in control aquaria. All of these general behavior observations were in accordance with the behavior described in detail in Olla et al. (1980a). In essence, all of the test organisms behaved generally as test animals had behaved in the extensive baseline experiments described in Olla et al. (1980a).

Introduction of Drilling Fluids

The drilling fluid in Experiment 2 was introduced by pouring the fluid evenly over the surface of the treatment aquaria. The heavier fractions immediately settled to the bottom, and the entire water column became an opaque brown color. It was not possible to see more than 7-10 cm into each aquarium through the viewing window. The water gradually began to clear as the continuous-flow seawater system slowly washed away suspended fluid matter and other slightly heavier particulate fractions settled to the bottom. Within 2-3 h it was possible to see approximately half way across the width of the tank. Within 5 h it was possible to see the back walls of the test aquaria and the TV video cameras could reliably monitor the activity of the hake.

The introduction of the drilling fluid into the treatment aquaria provoked immediate and strong, but short-lived, reactions from all three benthic species. From among the four treatment aquaria, several scallops responded with vigorous clapping and shifting of positions within the tank, but no sustained swimming. Prior to the introduction of the drilling fluid (which was initiated at 1200 h) shrimp were rarely observed swimming in the water column during daytime hours. After the introduction of the drilling fluid, substantial numbers of shrimp (ranging from 5-20 at any one time) swam to the surface of the water where they continued to swim back and forth rapidly. Additionally, we observed shrimp swimming in the mid-water

column, although our vision was limited only to that area immediately next to the viewing window.

The juvenile hake showed the clearest raction to the initial introduction of the drilling fluid. All fish, within seconds of the introduction of the drilling fluid, increased swimming and moved laterally to the edges of the developing brown cloud. After the cloud enveloped the entire aquarium, several fish swam to the surface and swam rapidly back and forth. This behavior lasted for 2-3 h, even as the brown cloud began to clear. During this time the activity levels appeared to be generally much higher, but we were unable to quantify this since the initial opaque cloud caused by the drilling fluid prevented us from seeing all the fish within any of the aquaria. After this 2-3 h period, the fish settled down, returned to the bottom and resumed apparently normal foraging, feeding and agonistic encounters. We observed fish feeding on shrimp within 2 h of the introduction of the drilling fluid.

Hake Activity Rhythms

Pretest Period

Juvenile hake in control and treatment aquaria displayed a rhythmic pattern of greater activity at night during the eight-day pretest period (4-11 March) despite considerable variability between tanks in overall levels of activity (Figs. 4, 5). When all four control aquaria were averaged together, average nighttime activity was always greater than daytime activity (Fig. 6). Likewise, in

Fig. 4. Mean activity score h^{-1} averaged for night and day, respectively, for the four control aquaria in Experiment 2 during pre-test and post-introduction (test) periods.

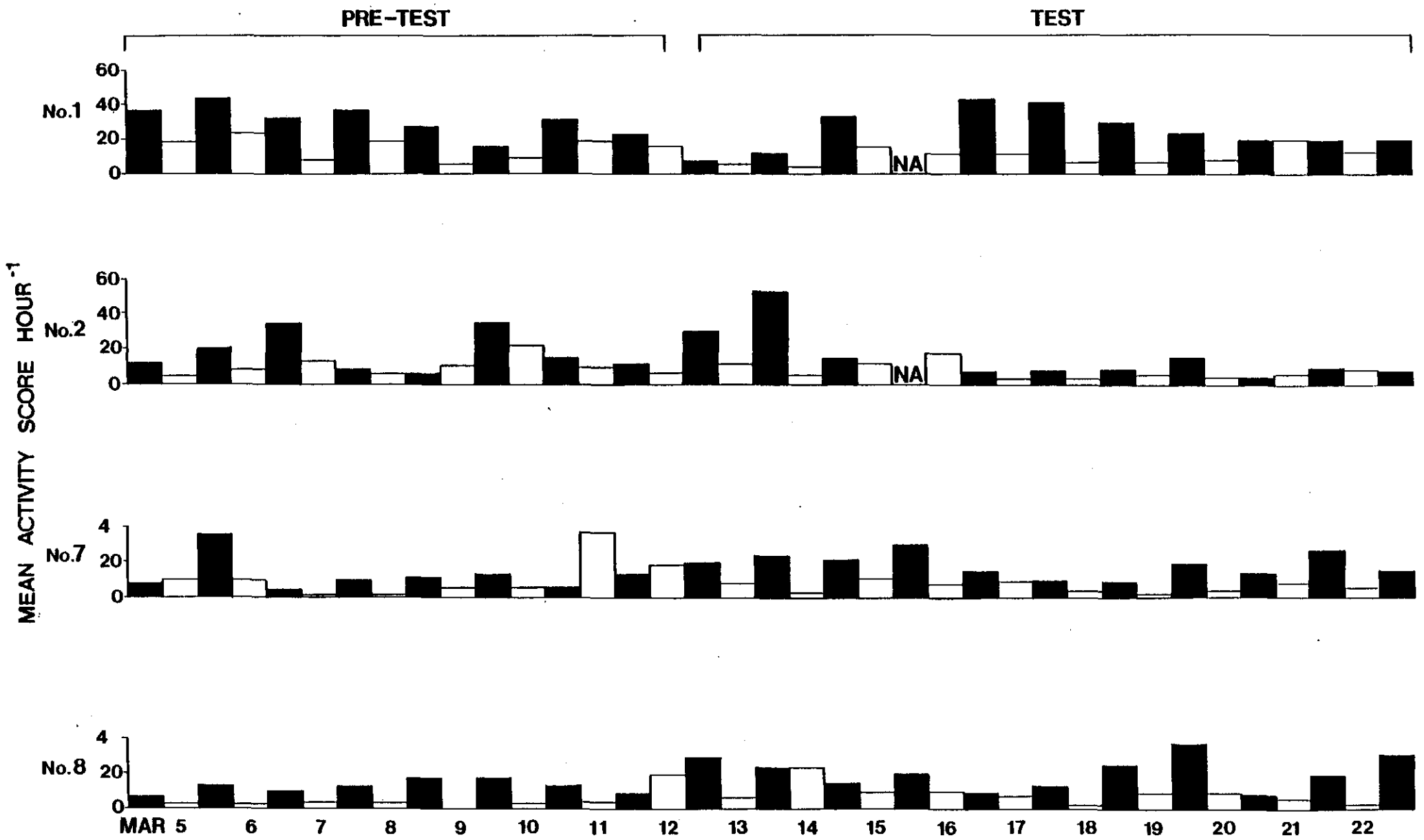

PRE-TEST
TEST
MEAN ACTIVITY SCORE HOUR^{-1}
No.1
No.2
No.7
No.8
60
40
20
0
4
NA
MAR 5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22

Fig. 5. Mean activity score h^{-1} averaged for night and day, respectively, for the four treatment aquaria in Experiment 2 during pre-test and post-introduction (test) periods.

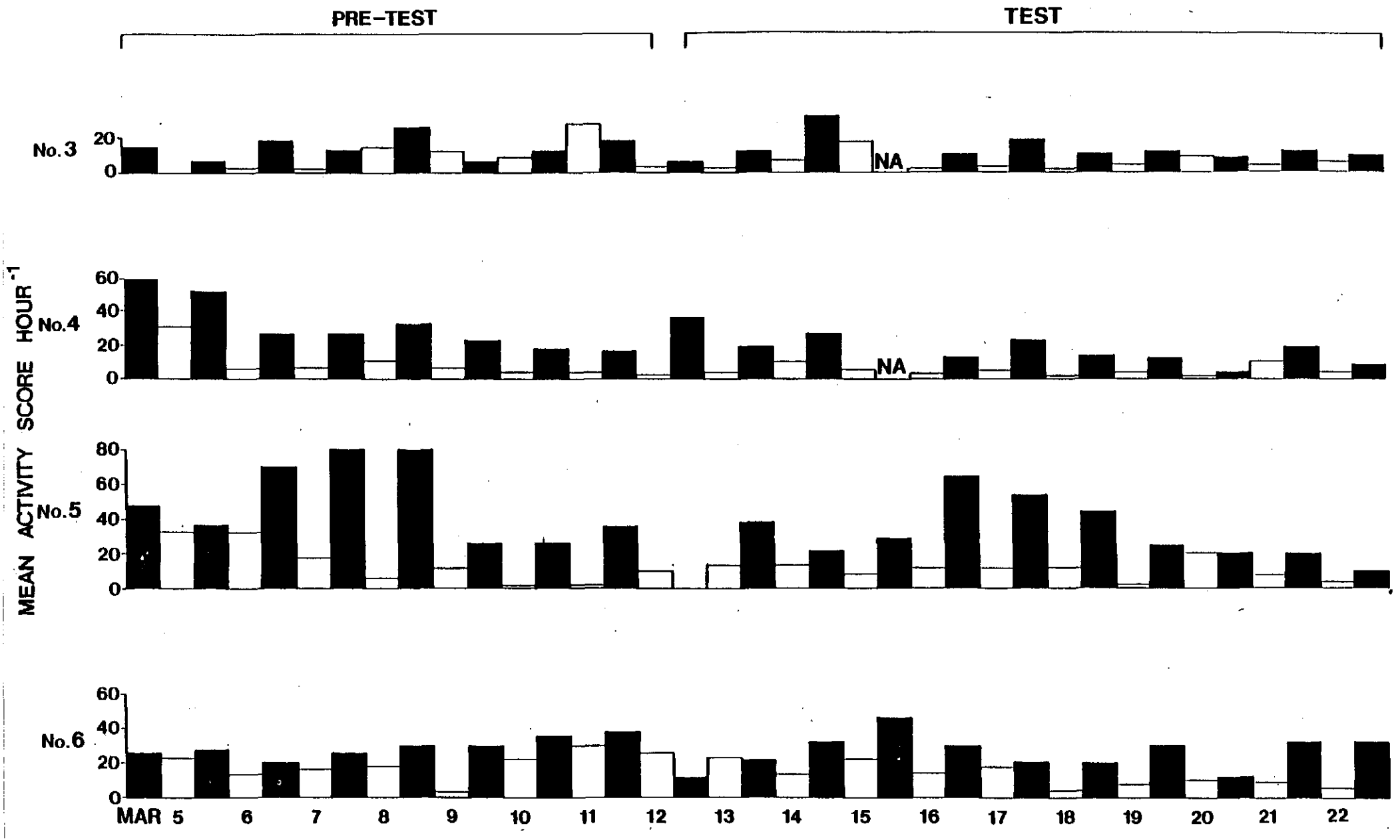

PRE-TEST
TEST
MEAN ACTIVITY SCORE HOUR^{-1}
No.3
No.4
No.5
No.6
NA
NA
MAR 5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22

Fig. 6. Mean activity score h^{-1} averaged for night and day for all control and treatment aquaria, respectively, in Experiment 2 during pre-test and post-introduction (test) periods.

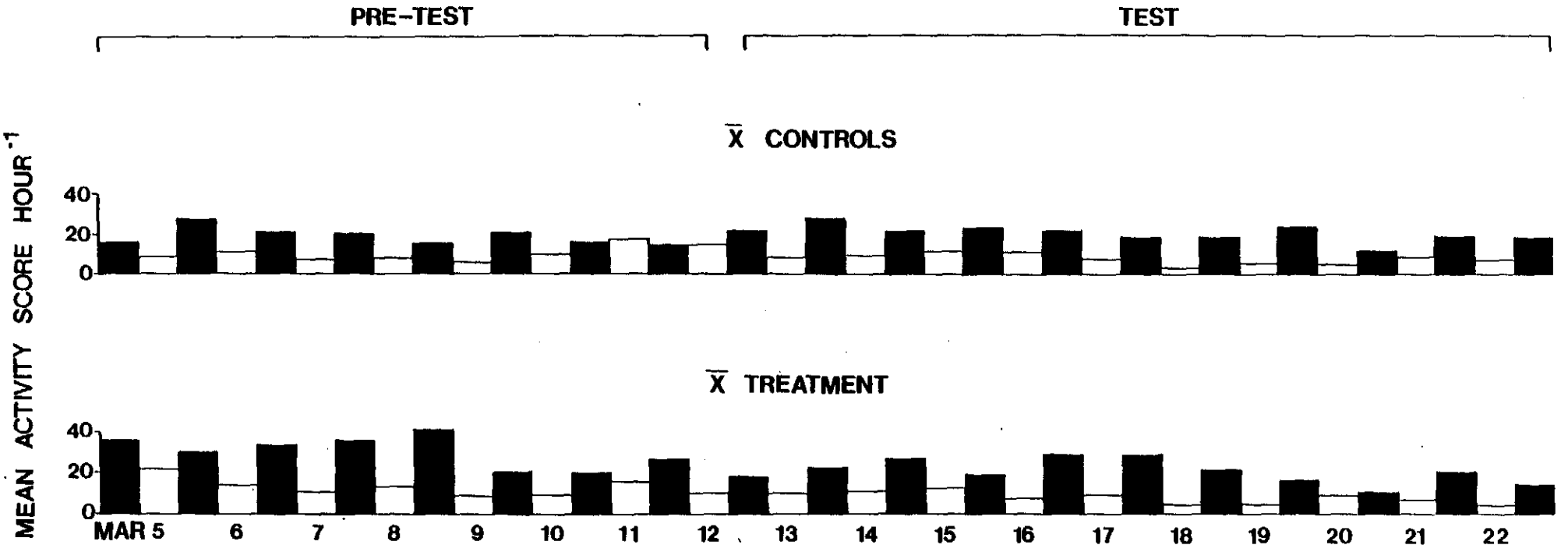

PRE-TEST
TEST
X̄ CONTROLS
X̄ TREATMENT
MEAN ACTIVITY SCORE HOUR-1
40
20
0
MAR 5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22

Table 6. Mean nighttime and daytime activity scores in Experiment 2 for all aquaria: controls and treatments averaged, respectively, for pre-test and post-introduction (test) periods.

		Nighttime Activity	Daytime Activity
Control Aquaria		$\bar{x}$	$\bar{x}$
No. 1	Pre-test	31	15
	Test	25	11
No. 2	Pre-test	28	10
	Test	17	8
No. 7	Pre-test	13	11
	Test	18	6
No. 8	Pre-test	13	6
	Test	22	9
	Pre-test	$\bar{\bar{x}}$ = 21	11
	Test	$\bar{\bar{x}}$ = 21	9
Treatment Aquaria			
No. 3	Pre-test	13	8
	Test	18	5
No. 4	Pre-test	31	9
	Test	17	5
No. 5	Pre-test	50	14
	Test	32	11
No. 6	Pre-test	29	19
	Test	26	13
	Pre-test	$\bar{\bar{x}}$ = 31(24)[1]	13
	Test	$\bar{\bar{x}}$ = 23	9

[1]Average without Treatment No. 5 included.

treatment tanks, average nighttime activity was always greater than average daytime levels (Fig. 6). However, the average night score for treatment aquaria was, on the average, 48% greater than the average nighttime score for control aquaria during the eight-day pretest period (Table 6). This was due to the particularly high scores of Treatment No. 5 (Fig. 5) during the pretest period. If Treatment No. 5 is not included, the difference between mean nighttime scores for control versus treatment aquaria during the pretest period decreases, (Control = 21; Treatment = 24; Table 6).

Post Introduction of Drilling Fluid

All tanks, both controls and treatments, maintained a clear nocturnal rhythm after the introduction of drilling fluids on 12 March (Figs. 4, 5). When the four control aquaria were averaged together they showed the same consistent nocturnal rhythm they had shown during the pretest period (Fig. 6). The levels were not significantly different than pretest levels of activity (Table 6). When the four treatment tanks were averaged together, they also showed a consistent nocturnal rhythm (Fig. 6), but the levels of activity were significantly lower at night than they had been during the pretest period (Table 6). This was due to significant drops in activity in Treatment Nos. 4 and 5. Due to the decrease in post-introduction levels of activity in treatment aquaria, the levels of activity for control and treatment aquaria were equivalent following the introduction of drilling fluid.

In summary, all aquaria, both control and treatment, displayed consistent nocturnal rhythms during the pretest and post-introduction periods. There was variability between tanks and fluctuations in levels of activity among the tanks, but no consistent difference between controls and treatments. An average nighttime level of activity for treatment aquaria was greater than the average of control aquaria during the pretest period; this was due to high activity levels in Treatment No. 5. The average nighttime level of activity for treatment aquaria decreased during the post-introduction period and become equivalent to the levels of activity for the control aquaria. The average level of activity for the control aquaria remained unchanged throughout the entire experiment.

Growth and Feeding of Hake

The initial and final sizes of hake in Experiment 2 are listed in Table 7. There was no significant difference between the average growth rates of fish in control versus treatment aquaria (Student t-test; $P > 0.05$). The average growth rate for control fish (G_L = 0.72% d^{-1}) and the treatment fish (G_L = 0.78% d^{-1}) were not significantly different as compared with growth rates from Experiment 1, and were comparable to growth rates found in previous studies (Steiner *et al.*, 1982).

Food consumption rates for the hake are listed in Table 8. Averages for the eight aquaria ranged from 5.19 to 7.16% body weight d^{-1}. Average consumption rate for the treatment aquaria (5.71% body weight d^{-1})

Table 7. Growth rates of juvenile red hake in Experiment 2.

	Initial TL (mm)	Final TL (mm)	G_L (% day^{-1})
Control Aquaria			
No. 1	94	107	0.65
	101	122	0.94
	116	136	0.80
No. 2	90	102	0.63
	99	119	0.92
	117	124	0.29
No. 7	92	103	0.56
	96	113	0.82
	113	128	0.62
No. 8	96	111	0.73
	96	115	0.90
	120	139	0.73
	$\bar{x}$ = 102±11	118±12	0.72±0.18
Treatment Aquaria			
No. 3	92	105	0.66
	99	108	0.44
	114	134	0.81
No. 4	90	103	0.67
	98	115	0.80
	114	139	0.82
No. 5	94	113	0.92
	103	125	0.97
	110	130	0.84
No. 6	90	102	0.63
	98	119	0.97
	113	134	0.85
	$\bar{x}$ = 101±9	119±13	0.78±0.16

Table 8. Estimates of food consumption rates of juvenile red hake in Experiment 2.

	No. of Shrimp Remaining[1]	Wet Weight of Shrimp Consumed[2] (g)	Total Wet Weight of Fish (g)	Consumption Rate % Body Weight d^{-1}
Control Aquaria				
No. 1	35	53.9	37.66	7.16
No. 2	55	44.9	32.63	6.88
No. 7	59	43.1	32.21	6.69
No. 8	50	47.1	39.07	6.03
$\bar{x}$ =	50±11	47.3±4.7	35.39±3.5	6.69±0.48[3]
Treatment Aquaria				
No. 3	63	41.3	35.67	5.79
No. 4	68	39.1	37.64	5.19
No. 5	63	41.3	38.48	5.37
No. 6	48	48.1	36.98	6.50
$\bar{x}$ =	61±9	42.5±3.9	37.19±1.19	5.71±0.58

[1]175 shrimp in each aquarium at beginning of experiment. Number of shrimp consumed = (175 - No. remaining - 20), where 20 is the adjustment for natural mortality.

[2]Estimated by multiplying number of shrimp consumed times mean weight of shrimp. Mean weight obtained from linear regression of shrimp length:weight. Weight (mg) = $0.00159\ L^{3.38}$ (Luczkovich, 1982). Mean length of shrimp = 41.0 mm.

[3]Significantly different from mean value of treatment fish ($P<0.05$, Student t-test).

was significantly lower than the average consumption for the control aquaria (6.69% body weight d^{-1}; Student *t*-test;$P<0.05$).

Experiment 3

INTRODUCTION

The results of Experiments 1 and 2 suggested the following: 1) A pretest control period was necessary to ensure that baseline rhythmicity of activity was present in all eight aquaria prior to testing and would be indicative of behavioral acclimation to aquarium conditions; 2) All three species of test organisms showed an immediate, but apparently short-lived response to the introduction of the drilling fluids.

Therefore, Experiment 3 was designed to incorporate the above points. Again, a seven day pretest control period was monitored before introducing the drilling fluids. The drilling fluid was then introduced from a new delivery system that eliminated any possibility of observer influence, thus allowing us to quantify more carefully the avoidance responses of the hake. Additionally, new fluid was introduced every three days over a 12-day period. This was to provide a replicate series to test the avoidance responses of the hake and also allow us to test the behavioral and growth responses of the fish to increasing amounts of drilling fluid. We concluded that a staggered increase in drilling fluid contamination was an important consideration

in simulating real-world situations where drilling fluids are released to the benthos throughout the life of an oil rig. Testing this way permitted us to address the question whether there was a cumulative effect caused by the drilling fluid that was not immediately induced by a single dosage.

MATERIALS AND METHODS

The eight aquaria used previously were emptied, acid-washed, and refilled with clean sand substrates and sea water. Nos. 1, 2, 7 and 8 were designated control aquaria; Nos. 3, 4, 5 and 6 were designated treatment aquaria. Photoperiod was maintained at 12:12, L:D, matching natural conditions for the time of year. Temperature was maintained at 8.9 $\pm$ 0.35°C.

At 1200 h, 15 April 1981, four scallops (100-135 mm) and 175 shrimp ($\bar{x}$ TL = 47.9 mm; $\bar{x}$ wet weight = 0.76 g) were introduced into each aquaria, along with three juvenile red hake. At 1500 h, 16 April, we began 20 min video tape observations each hour on a 24-h basis which continued throughout the experiment.

At 1300 h, 22 April, 6 l of "washed" drilling fluid were introduced to the four treatment aquaria via a 2" PVC pipe placed centrally over each aquarium so that its opening was 2 cm below the water's surface. The introduction of drilling fluid was repeated at 1300 h on 25 April, 28 April, and 1 May. The quantity of drilling fluid, an average of 12.7% solids by weight, 1.11 g ml^{-1} density, corresponded

to an introduction of 1.17 kg m^{-2} of drilling fluid solids for each of the four introductions of drilling fluid. The total contamination was equivalent to 4.7 kg m^{-2} of solids over 12 days.

At 1200 h, 4 May, all shrimp, scallops, and hake were removed from the tank. Shrimp were counted and frozen, scallops were frozen, and the hake were weighed, measured, and then returned to the aquaria for further long-term growth experiments. The three fish from Treatment No. 6 were not returned, but frozen for future tissue analysis.

Water columns and sediment samples were taken for chemical analysis on a regular, sequential schedule (see Appendix C). Top and bottom water samples were taken at 0900 h, 22 April, 4 h before the first introduction of drilling fluid. Top and bottom water samples were then taken at 1400 h, 22 April, 1 h after the introduction of drilling fluid. Top and bottom water samples were then taken at 0600 h, 23 April, 17 h after the drilling fluid introduction. This sequence was then repeated for each of the remaining three introductions of drilling fluid. Final samples were taken on 4 May.

A sediment sample was first taken at 0900 h, 22 April, 4 h before the first introduction of drilling fluid. Subsequent samples were taken at 0600 h, the day following each introduction of drilling fluid. An array of four plexiglass Petri dishes 9 cm diameter and 1.3 cm deep were placed in a square arrangement directly below the PVC drilling fluid introduction pipe. Each Petri dish was buried into the sediment so that its lip was just below the surface of the sand.

A 1.5 cm cork was fitted into the center of each dish. A sharpened wooden dowel was then stuck into the cork at the time of sampling and the entire dish, with sand and accumulated drilling fluid solids, lifted and removed from the tank. The use of the Petri dishes ensured equivalent sediment samples from the same position and depth in each aquarium.

Growth rates, consumption rates, and relative shrimp mortality were calculated as described for Experiments 1 and 2.

To quantify the escape/avoidance responses of hake to the introduction of drilling fluids, we measured the time elapsed until each fish was enveloped by the cloud created by the drilling fluid. The position of each fish in the aquaria was noted at time zero, the time at which drilling fluid introduction began, and designated as the control point for each fish, respectively. We then measured the time, in seconds, until each fish and its control point were enveloped by the expanding cloud of drilling fluid. Assuming the control points to be randomly distributed over the experimental substrate (fish were almost always near the bottom at the time of introduction), any deviation in total time elapsed for the fish to be enveloped by the drilling fluid versus time elapsed for the control points to be enveloped would indicate a response of the fish to the encroaching drilling fluid. If the hake avoided the drilling fluid, then the time elapsed should be greater than the time elapsed for the control points.

RESULTS

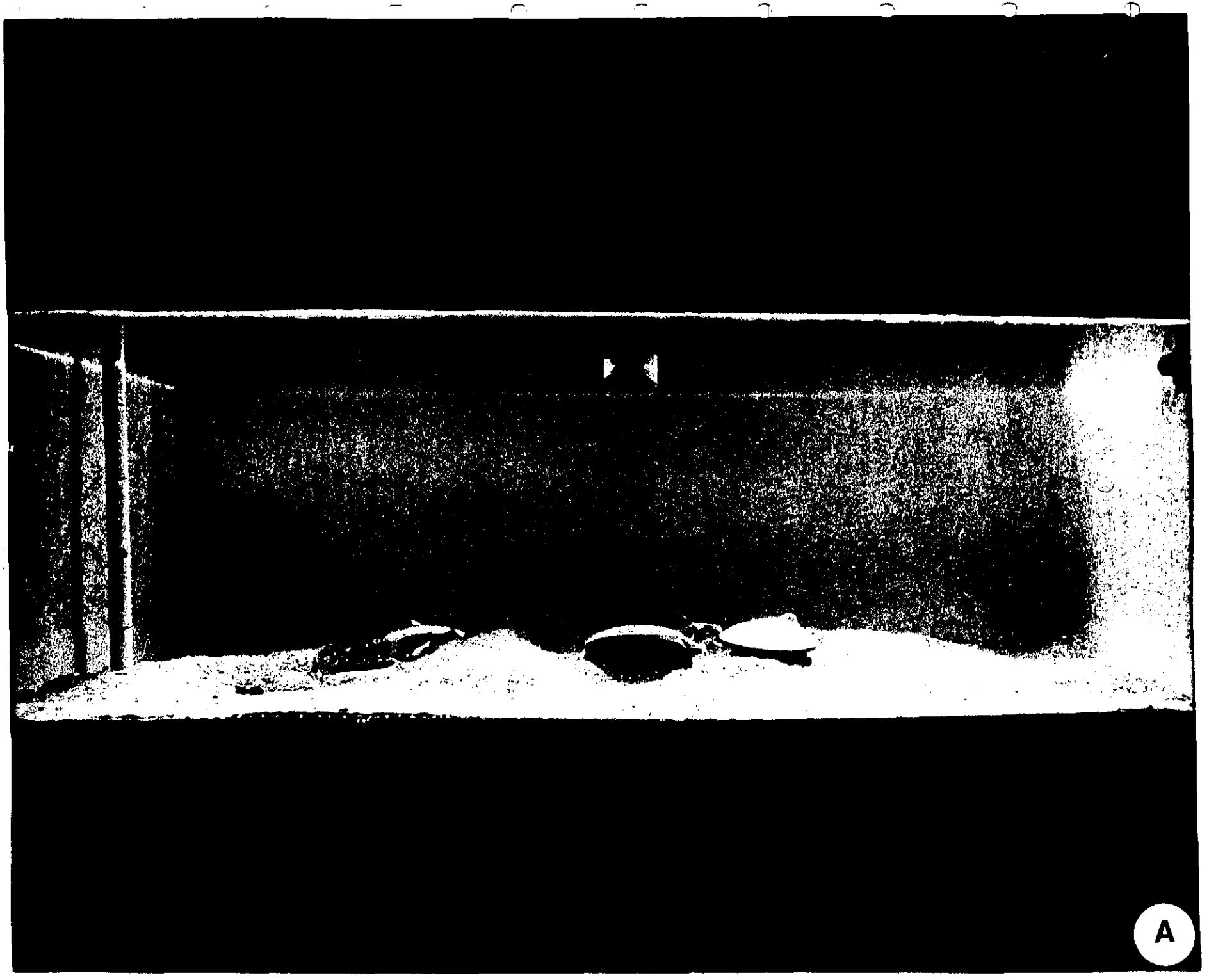
General Behavior

Again, there were no overt differences in behavioral patterns between any of the three test species in control versus treatment aquaria. Scallops appeared healthy, with normal gapes between valves (15-30 mm). Shrimp buried in the sediments, during the day, and foraged over the sediments and swam in the water column during the night Fish took shelter beneath scallops and in corners of the aquaria by day, and foraged for shrimp and swam openly at night. Fish engaged in agonistic and competitive interactions as described previously (Olla et al. 1980a; Steiner et al. 1982). In general, all behavior patterns of the three species were equivalent to the behavior detailed previously for laboratory communities (Olla et al. 1980a), and equivalent to the behavior patterns seen in Experiments 1 and 2.

Introduction of Drilling Fluids

The drilling fluids were poured into each aquarium via a 2" PVC pipe which had its opening centered over the aquarium, just below the surface of the water (Fig. 7A). The heavier density of the drilling fluid with respect to the sea water, caused the drilling fluid to drop straight down to the sediment, and then spread along the bottom of the aquarium, in a distinct, heavy cloud. The effect was that of an expanding, upside-down mushroom (Fig. 7B). As the cloud expanded to

Fig. 7. Photographic sequence of introduction of drilling fluid into treatment aquarium: A) Aquarium just prior to introduction of drilling fluids; B) Seconds after introduction of fluids, upside-down mushroom cloud begins to form; C) Cloud of fluid expands along substrate outward to aquarium walls, (Note that hake are staying away from cloud); D) Cloud has nearly enveloped the entire aquarium, (Note that one hake is still avoiding the cloud).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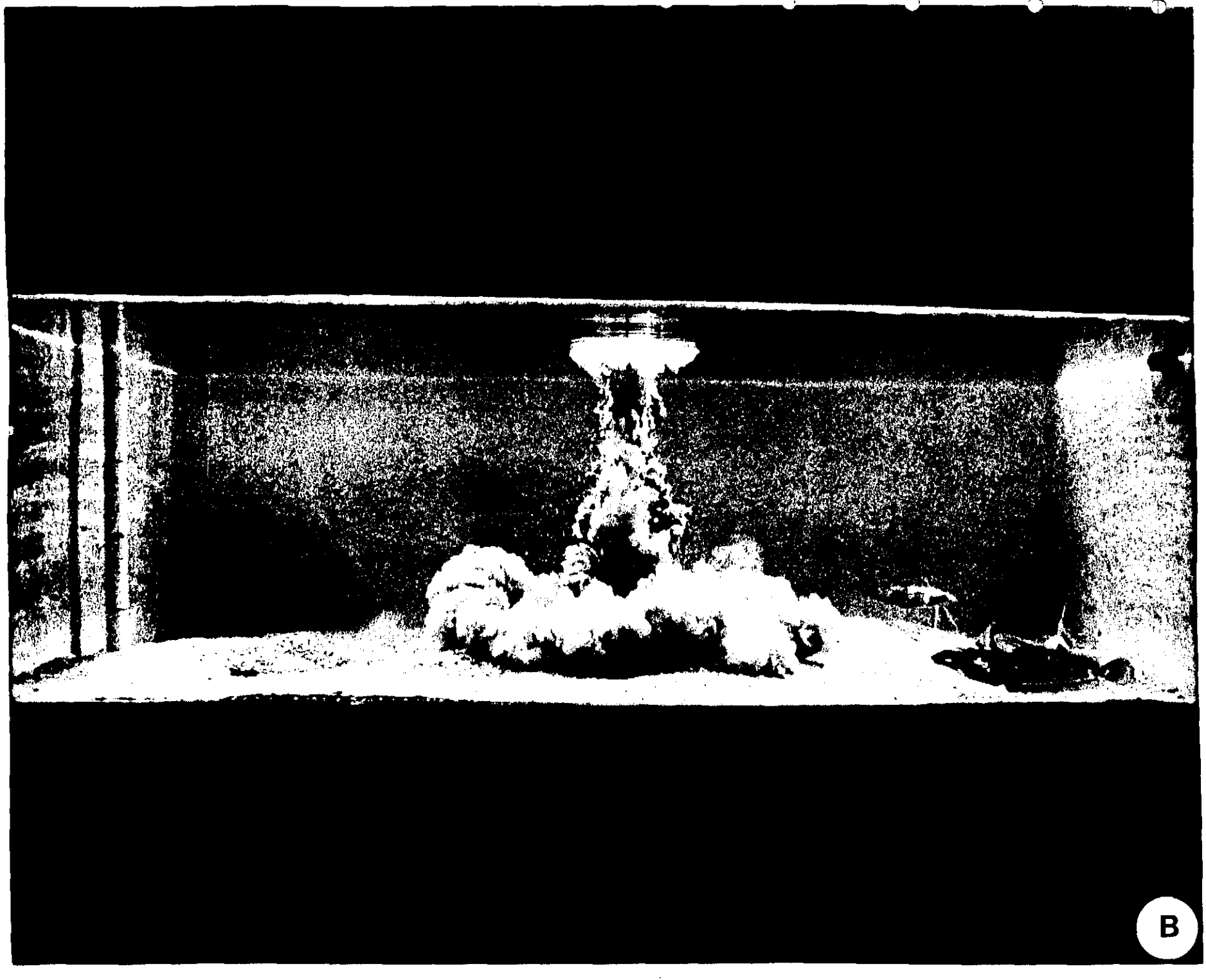
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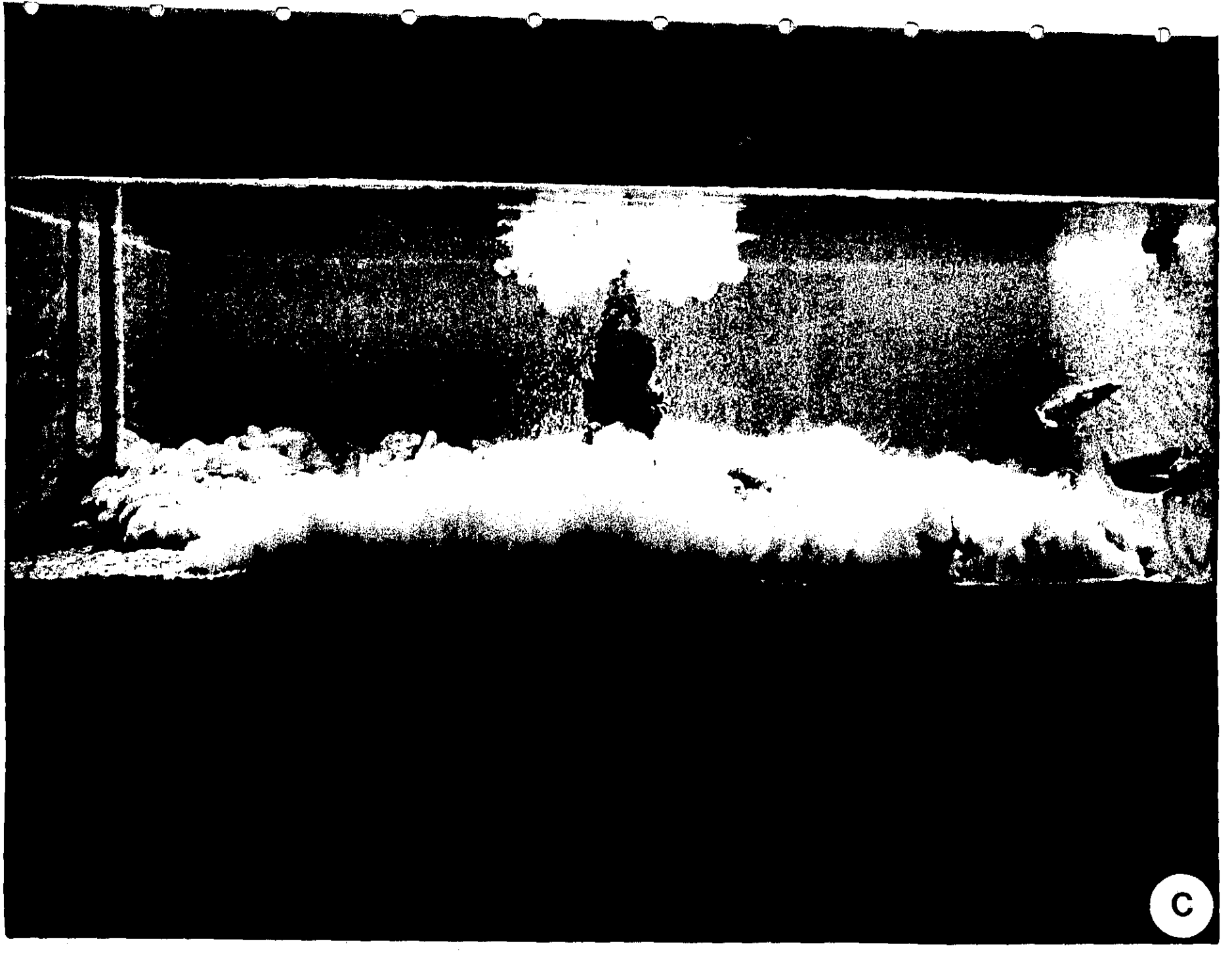
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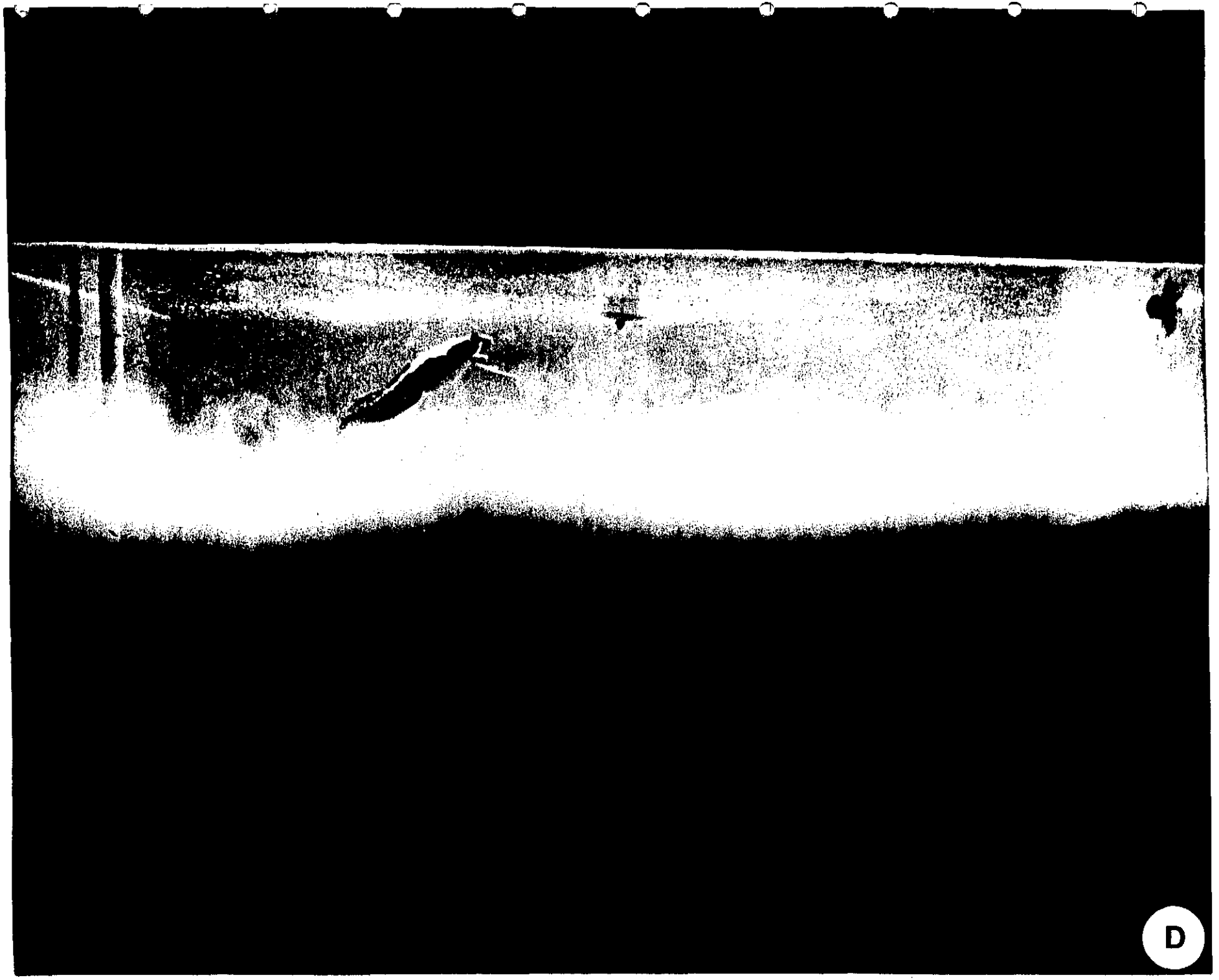

D

the walls of the aquarium (Fig. 7C), it gradually rose upwards and enveloped the entire aquarium (Fig. 7D). The clouds enveloped the tanks within 2 min. Gradually, the heavier solids settled to the bottom and the remaining silty water cleared in approximately 5 h.

There were obvious and different behavioral reactions in response to the actual introduction of the drilling fluids. These reactions were similar to those displayed during the introduction of fluids in Experiment 2. Several scallops, as noted in Experiment 2, reacted with vigorous clapping, and occasional shifting of position. Although an observer could not see the scallops directly, one could see a sudden swirling or excess of sediment in the water as a result of the scallops' clapping. We did not quantify this behavior, but note that it did occur immediately after the introduction of the fluid.

Shrimp reacted by rising in the water column and swimming to the surface. Within minutes after the drilling fluids had enveloped the aquaria, numerous shrimp, from 5-20 individually, were seen swimming rapidly back and forth at the water's surface. This was in contrast to minutes before the introduction of drilling fluid, when there were no shrimp at the water's surface. We could not accurately quantify further reactions on the part of the shrimp because of obscured visibility due to the murky, silty water.

These initial reactions on the part of both the scallops and shrimp subsided within 2-3 h, and did not reappear until the next

introduction of drilling fluid. The reactions appeared at each of the four introductions of fluids, and there was no indication that the reaction waned at all with successive introductions.

As first noted in Experiment 2, the juvenile hake reacted to the introduction of drilling fluids with rapid swimming, a tendency to rise towards the surface, and an apparent avoidance of the murky cloud. To test this qualitative impression, we measured the time until each fish was enveloped by the cloud of drilling fluid versus control points, as determined by the fishes' position just prior to the drilling fluid introduction. Results are shown in Table 9.

In all four treatment aquaria, at all four introductions of drilling fluid, the time elapsed until envelopment by the drilling fluid could was significantly greater for the fish as compared to the control points ($\underline{P}<0.05$;Student t-test; Table 9). This indicated that the fish avoided the cloud of drilling fluid, keeping to the edge of the encroaching fluid until it was no longer possible for the fish to remain in clear water. The time elapsed at Introduction 4 was not significantly different than the time elapsed for Introduction 1 (Table 9), indicating that there was no waning of the fishes' avoidance response with successive exposures to the drilling fluid.

Table 9. Mean time elapsed (s) until treatment fish and control points were enveloped by drilling fluid at each of four introductions.

Aquarium	Fish ($\bar{x}_3$±SD)	Control Points ($\bar{x}_3$±SD)
	Introduction 1	
No. 3	46.6±17.6	7.0±4.0[1]
No. 4	42.1±8.6	12.6±7.6
No. 5	42.9±14.7	14.0±2.6
No. 6	38.2±7.9	12.8±4.3
$\bar{\bar{x}}$	42.4±11.4	11.6±5.1
	Introduction 2	
No. 3	50.4±19.8	15.9±3.8
No. 4	46.4±12.7	11.2±10.8
No. 5	40.4±30.4	12.5±4.1
No. 6	68.4±24.9	36.7±48.1
$\bar{\bar{x}}$	51.4±22.2	22.6±27.3
	Introduction 3	
No. 3	43.1±17.3	17.2±2.0
No. 4	41.1±13.1	12.4±5.1
No. 5	35.0±11.0	19.1±16.2
No. 6	32.2±12.8	13.1±3.7
$\bar{\bar{x}}$	37.9±12.6	15.5±8.0
	Introduction 4	
No. 3	42.5±6.4	19.7±6.9
No. 4	36.1±6.8	16.0±3.6
No. 5	43.2±16.0	18.7±2.0
No. 6	33.8±2.3	15.6±3.5
$\bar{\bar{x}}$	38.9±9.0	17.5±4.1

[1]All differences between fish and control points were statistically significant ($P<0.05$; Student t-test).

Hake Activity Rhythms

Pretest Period

Examining average activity over the six-day pretest period, fish were more active by night than by day (Figs. 8, 9, 10). However, there was considerable variation in the relative values between aquaria.

Post-Introduction (Test) Period

In the controls, fish continued to be more active by night than by day; however, some relative changes were observed during the 12-day post-introduction period. Control Nos. 2 and 8 displayed large increases in nighttime activity levels (Fig. 8; Table 10). Thus the average nighttime activity levels for control aquaria increased when compared to pretest levels.

In treatment aquaria, average nighttime activity decreased in the post-introduction period, as compared to pretest levels (Fig. 9; Table 10). However, as in controls, nighttime activity was still greater than daytime activity (Table 10). There were no regular changes in activity that could be correlated with the linear increases in drilling fluid contaminant, i.e. average activity did not decrease (or increase) with each succeeding introduction of drilling fluid.

Fig. 8. Mean activity score h^{-1} averaged for night and day, respectively for the four control aquaria in Experiment 3 during pre-test and post-introduction (test) periods.

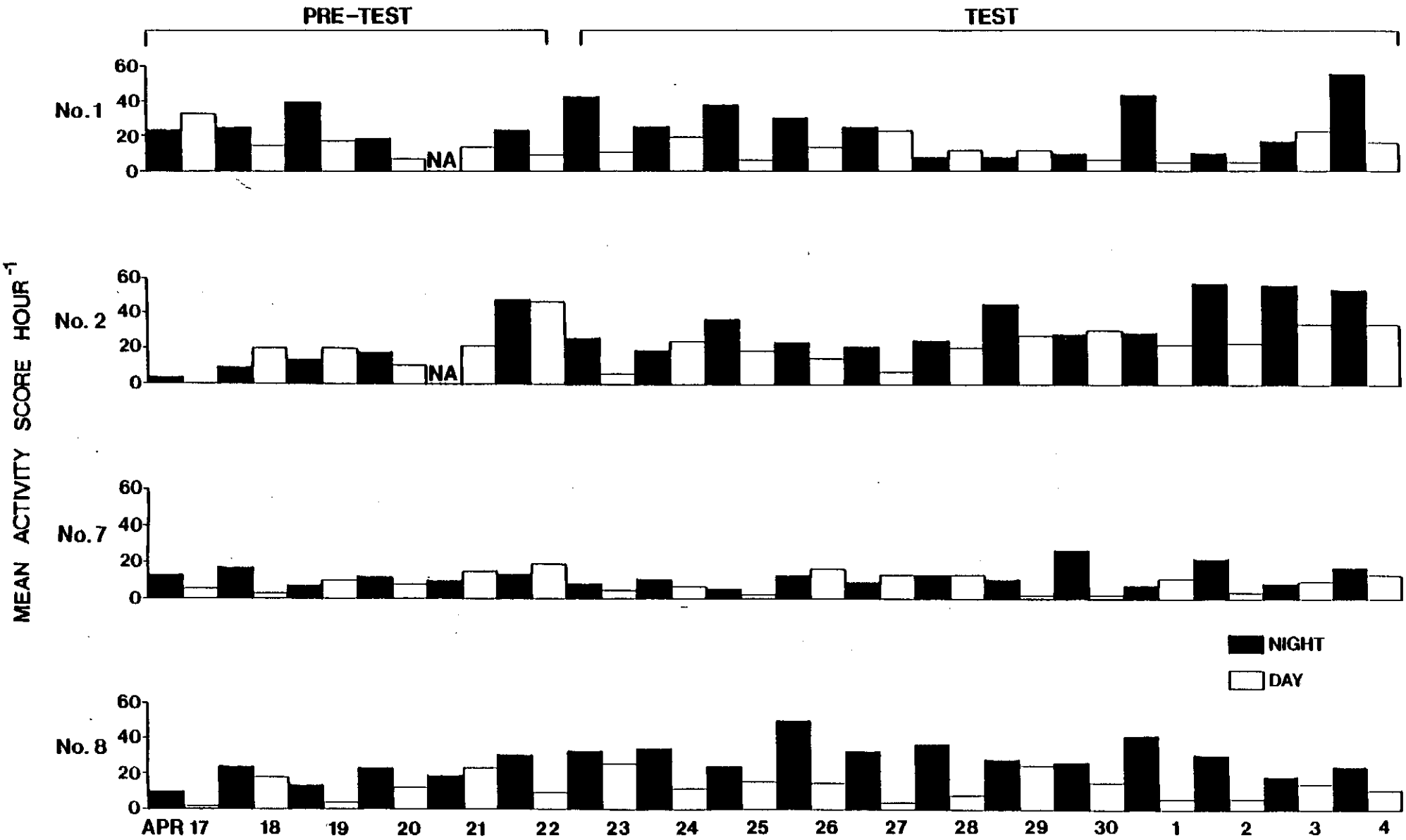

PRE-TEST
TEST
MEAN ACTIVITY SCORE HOUR^{-1}
No. 1
No. 2
No. 7
No. 8
60
40
20
0
NA
NIGHT
DAY
APR 17
18
19
20
21
22
23
24
25
26
27
28
29
30
1
2
3
4

Fig. 9. Mean activity score h^{-1} averaged for night and day, respectively, for the four treatment aquaria in Experiment 3 during pretest and post-introduction (test) periods.

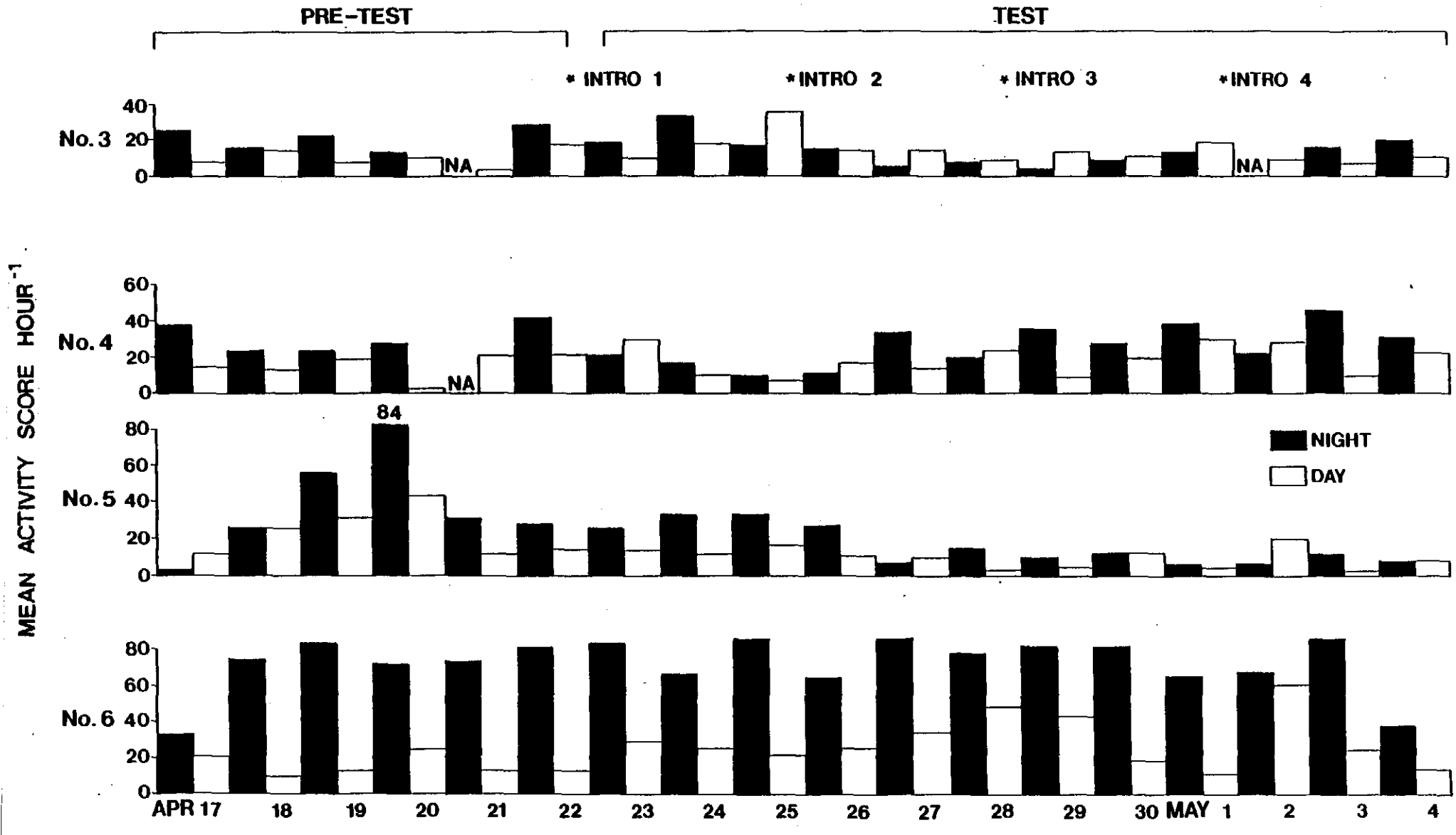

PRE-TEST
TEST
* INTRO 1
* INTRO 2
* INTRO 3
* INTRO 4
MEAN ACTIVITY SCORE HOUR^{-1}
No. 3
No. 4
No. 5
No. 6
NA
84
NIGHT
DAY
APR 17
18
19
20
21
22
23
24
25
26
27
28
29
30
MAY 1
2
3
4

Fig. 10. Mean activity score h^{-1} averaged for night and day for all control and treatment aquaria, respectively, in Experiment 3 during pre-test and post-introduction (test) periods.

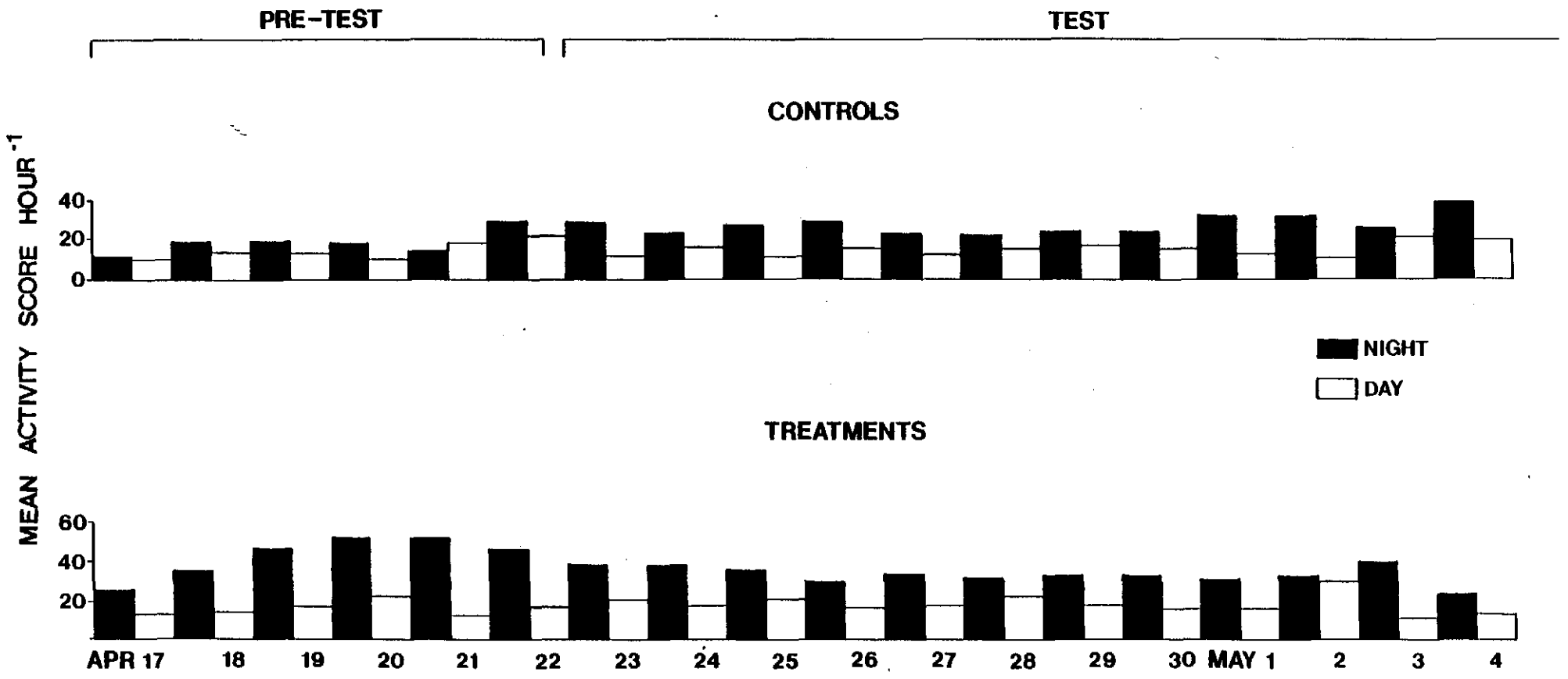

PRE-TEST
TEST
CONTROLS
MEAN ACTIVITY SCORE HOUR^{-1}
40
20
0
NIGHT
DAY
TREATMENTS
60
40
20
APR 17
18
19
20
21
22
23
24
25
26
27
28
29
30
MAY 1
2
3
4

Table 10. Mean nighttime and daytime activity scores in Experiment 3 for all aquaria and controls and treatments, respectively, averaged for pre-test and post-introduction (test) periods.

		Nighttime Activity	Daytime Activity
Control Aquaria		$\bar{x}$	$\bar{x}$
No. 1	Pre-test	26.3	16.2
	Test	26.4	13.8
No. 2	Pre-test	18.1	19.9
	Test	35.7	22.3
No. 7	Pre-test	12.2	10.2
	Test	13.4	8.7
No. 8	Pre-test	20.3	11.6
	Test	33.0	14.2
	Pre-test $\bar{\bar{x}}$ =	19.2	14.5
	Test $\bar{\bar{x}}$ =	27.1	14.8
Treatment Aquaria			
No. 3	Pre-test	26.4	10.3
	Test	14.7	14.2
No. 4	Pre-test	31.0	15.5
	Test	26.4	18.3
No. 5	Pre-test	38.3	24.7
	Test	16.6	9.9
No. 6	Pre-Test	70.0	16.3
	Test	71.4	30.7
	Pre-test $\bar{\bar{x}}$ =	41.4	16.7
	Test $\bar{\bar{x}}$ =	32.3	18.3

Growth and Feeding of Hake

The initial and final sizes of juvenile hake in Experiment 3 are listed in Table 11. The mean growth rate in length for treatment hake (G_L = 0.86% d^{-1}) was less than the mean average growth in length for control fish (G_L = 0.96% d^{-1}). This was not statistically significant (P=0.10, Student t-test). The mean average growth in weight for treatments (G_W = 2.98% d^{-1}) was not significantly different than growth in weight for control fish (G_W = 3.04% d^{-1}) (Table 12).

The estimated consumption rates for Experiment 3 ranged from 5.67 to 7.20% body weight d^{-1} for all eight aquaria (Table 13). The mean for treatment aquaria (5.92% body weight d^{-1}) was less than the mean for control aquaria (6.62% body weight d^{-1}). This difference was statistically significant (P<0.05, Student t-test).

Table 11. Growth rates (length) of juvenile red hake in Experiment 3.

	Initial TL (mm)	Final TL (mm)	G_L (% day^{-1})
Control Aquaria			
No. 1	100	123	1.09
	107	129	0.98
	130	158	1.03
No. 2	85	103	1.01
	104	120	0.75
	120	142	0.89
No. 7	104	129	1.13
	118	144	1.05
	133	157	0.87
No. 8	93	113	1.03
	94	115	1.06
	139	155	0.57
$\bar{x}$ =	111±17	132±19	0.96±0.16
Treatment Aquaria			
No. 3	100	124	1.13
	108	130	0.98
	130	151	0.79
No. 4	83	98	0.87
	102	123	0.99
	125	146	0.82
No. 5	106	128	0.99
	115	134	0.80
	133	150	0.75
No. 6	99	109	0.51
	103	127	1.10
	140	156	0.57
$\bar{x}$ =	112±17	131±17	0.86±0.19

Table 12. Growth rates (weight) of juvenile red hake in Experiment 3.

	Initial Weight (g)	Final Weight (g)	G_W (% day^{-1})
Control Aquaria			
No. 1	6.20	11.00	3.02
	8.13	14.97	3.21
	17.09	29.08	2.80
No. 2	3.54	7.10	3.67
	7.78	13.06	2.73
	11.32	18.70	2.64
No. 7	8.33	15.27	3.37
	11.30	19.39	2.84
	16.22	29.85	3.21
No. 8	5.72	9.25	2.53
	5.77	10.70	3.25
	15.11	28.04	3.26
	$\bar{x}$ = 9.71±4.48	17.20±7.96	3.04±0.34
Treatment Aquaria			
No. 3	7.57	15.46	3.76
	7.89	15.71	3.62
	15.20	26.69	2.96
No. 4	3.49	7.22	3.83
	8.50	15.61	3.20
	13.59	21.92	2.52
No. 5	6.62	12.95	3.53
	8.79	15.47	2.98
	16.77	23.63	2.14
No. 6	5.34	8.66	2.54
	7.69	14.34	3.28
	19.56	25.39	1.37
	$\bar{x}$ = 10.08±4.97	16.92±6.25	2.98±0.73

Table 13. Estimates of food consumption rates of juvenile red hake in Experiment 3.

	No. of Shrimp Remaining[1]	Wet Weight of Shrimp Consumed[2] (g)	Total Wet Weight of Fish (g)	Consumption Rate % Body Weight d^{-1}
Control Aquaria				
No. 1	66	68.4	55.1	6.53
No. 2	86	53.2	38.9	7.20
No. 7	53	78.3	64.5	6.39
No. 8	80	57.8	48.0	6.34
	$\bar{x}$ = 71±15	64.4±11.2	51.6±10.8	6.62±0.40[3]
Treatment Aquaria				
No. 3	74	62.3	57.9	5.67
No. 4	87	52.5	44.8	6.17
No. 5	77	60.1	52.1	6.07
No. 6	86	53.2	48.4	5.79
	$\bar{x}$ = 81±6	57.0±4.9	50.8±5.6	5.92±0.23

[1]175 in each aquarium at beginning of experiment. Number of shrimp consumed = (175 - No. remaining - 19 [adjustment for natural mortality]).

[2]Estimated by multiplying number of shrimp consumed times mean weight of shrimp. Mean weight obtained from linear regression of shrimp length:weight. Weight (mg) = $0.00159\ L^{3.38}$ (Luczkovich, 1982). Mean length of shrimp = 47.9 mm.

[3]Significantly different from mean value of treatment fish ($P<0.05$; Student t-test).

DISCUSSION OF EXPERIMENTS 1 - 3

General Behavior

The juvenile red hake displayed normal patterns of feeding and aggression despite the presence of drilling fluid. The hake foraged over the substrate in typical fashion, extending their filament-like pelvic fins. The hake sought shelter underneath scallops and in the corners of the aquaria. (The fish were generally too large to take shelter within the scallop mantle cavities). The fish were aggressive toward one another, with the larger fish within each aquarium establishing dominance over the smaller individuals. All of these observations were consistent with extensive observations and behavior reported previously for these species in uncontaminated laboratory communities (Olla et al. 1980a; Steiner et al., 1982).

We could find no previous literature reports concerning sublethal effects of drilling fluids on fish behavior. Several reports have been concerned with classic LC_{50} measurements (Falk and Lawrence, 1973; Land, 1974; Sprague and Logan, 1979; Tornberg et al., 1980), but these studies are not directly applicable to the species (red hake) or nature of experiments discussed herein.

Scallops appeared to filter normally, with normal gapes and velar mantle folds which also appeared normal. Our qualitative observations suggested that the sand shrimp were nocturnally active, burying in the sand substrate by day, often in sand obviously contaminated with

drilling fluid solids. Thus, the presence of drilling fluids in the aquaria communities did not appear to cause any stressful or aberrant behaviors in the shrimp and scallops.

Previous studies in the literature are in general agreement with our study, although test procedures were different from ours. Gerber et al. (1980) showed that sand shrimp, Crangon septemspinosa, were not acutely affected by four different lignosulfonate drilling fluids. They tested the mud aqueous fraction (MAF), filtered mud aqueous fraction (FMAF), suspended whole mud (SM) and whole mud (WM) layered on the test vessel substrates. None of the various fractions was acutely toxic to the sand shrimp. They did find lower enzyme activity in the sand shrimp in 100% MAF (derived from 1:10 dilution of WM), but could not ascribe any biological meaning to the observed decrease. Gerber et al. (1980) also tested the toxicity of the same drilling fluids to sea scallops, and found 96-h LC_{50} values of 3.2% WM and 49% WM for a medium-density and light-density lignosulfonate drilling fluid, respectively. Neff et al. (1981) found 40% survival of bay scallops, Aequipecten amplicostatus, to a layered solid phase of a chrome lignosulfonate drilling fluid prepared in 20 ml l^{-1} dilution. (The latter experiment was a static system.)

Hake Activity Rhtyhms

Hake activity patterns varied among the three experiments, for both controls and treatments. In Experiment 1, neither controls nor treatments showed clear nocturnal rhythms, in contrast to results

demonstrated previously for uncontaminated laboratory communities (Olla et al. 1980a). However, we attribute this anomaly to a lack of acclimation to experimental conditions on the part of both controls and treatment fish, and not any effect due to drilling fluid.

In Experiment 2, both control and treatment fish showed strong nocturnal rhythms. Treatment fish decreased in average nighttime activity after the introduction of drilling fluid, but not below the levels of activity in control fish. Control fish showed consistent activity levels for both nighttime and daytime throughout the experiment.

In Experiment 3, both controls and treatment fish showed dominant nocturnal rhythms. Treatment fish again decreased in average nighttime activity after the introduction of drilling fluid. This was in contrast to the control fish which increased in activity during the same time period. Thus, in both Experiments 2 and 3 we saw a decrease in nighttime activity for treatment fish after the initial introduction of drilling fluid. Control fish in Experiments 2 and 3 did not show similar patterns; rather they either maintained equivalent levels of activity or increased their activity levels.

Thus, activity levels may have been affected by the presence of drilling fluid. Treatment fish tended to decrease their activity during nighttime, normally their time of greatest activity. However, nighttime activity was still greater than daytime activity.

Reaction to Introduction of Drilling Fluids

In Experiments 2 and 3 there were immediate and obvious reactions on the part of all three species to the introduction of drilling fluid. (In Experiment 1, all test species were introduced to the aquaria after the introduction of the drilling fluid). Several scallops reacted by vigorous clapping of their valves and movement within the tank. Shrimp reacted by swimming up from the sand substrate and swimming rapidly in the water column. The hake clearly avoided the encroaching cloud of drilling fluid, staying at the borders of the cloud until the fluid enveloped the entire aquarium.

Growth and Feeding of Hake

In all three experiments, there were no significant differences in growth rates (length) for the hake between control and treatment fish. The rates observed were consistent between experiments ranging from 0.71-0.96% d^{-1}, and were consistent with rates observed in previous experiments (Steiner *et al.*, 1982). In Experiment 3, there was no significant difference in growth (weight) between control and treatment fish.

The consumption rate of the hake differed significantly between control and treatment fish in two of the three experiments. In Experiment 1, there was no difference between controls and treatments. However, in both Experiments 2 and 3 (which were of greater duration

than Experiment 1) consumption rates of treatment fish were significantly less than the consumption rates of control fish. Thus, treatment fish consumed less prey than control fish, but grew at equivalent rates.

Previous studies have suggested that growth may be inhibited by drilling fluid in archiannelids (Neff et al., 1981), oysters (Rubinstein et al., 1980), mussels (Gerber et al., 1980), and juvenile mysid shrimp (Carr et al., 1980). Inhibition of feeding in the presence of drilling fluid has been suggested for mysids (Carr et al., 1980) and lobsters (Derby and Atema, 1981). However, Neff et al. (1981) have suggested that, at least in their study, MAF (water solubles) were responsible for deleterious effects. Because of our "washing" procedure, we did not have high concentrations of MAF in our experimental systems.

Ecological Implications

The first point of interest to consider is the avoidance of encroaching clouds of drilling fluid by the shrimp and red hake. In particular, the juvenile hake avoided the clouds as long as possible. This suggests that hake in the field will show avoidance responses to drilling fluid being discharged from above. Though such a reaction may seem intuitively adaptive on first examination, there could be deleterious subsequent effects from such a response. Juvenile red hake live in a specialized habitat, i.e., sea scallop beds where they

obtain shelter within the internal mantle cavities of the scallops (Steiner et al., 1982). If the hake are forced to leave their specialized habitats, they may be subjected to greater predation rates by their numerous predators (Langton and Bowman, 1980), or be forced into areas where they cannot find enough food to grow efficiently and quickly. Such avoidance reactions would be intensified at night when many more hake are feeding outside of their scallop shelters than during the daytime (Steiner et al., 1982). We also note that in Experiment 3, the avoidance response of the fish did not wane with repetitive introductions of drilling fluid. Thus, during the life of wells in which discharges of fluid are often and repetitive (Ayers et al., 1980a), the fish may be forced away from their specialized habitats for long periods of time, possibly amplifying the deleterious effects of increased predation and decreased feeding efficiency.

The subsequent behaviors of the hake after the initial avoidance response suggests that the hake do not interpret the continued presence of drilling fluid per se, particularly the deposited solids, as a danger. Either they do not detect the pollutants, or they may detect the material but do not interpret it as dangerous (Olla et al., 1980b). The lack of obvious reaction to the deposited drilling fluid solids suggests that the avoidance reaction of the hake to the encroaching cloud of descending fluid is a reaction to the physical cloud itself, and not particular constituents composing the cloud.

The fact that fish were able to feed on shrimp, and displayed

normal agonistic patterns, suggests that it is possible that juvenile hake could repopulate an area contaminated with drilling fluid, for example, if the hake were initially driven off by the descending fluid.

Similarly, if hake were inside scallops during the initial deposition and did not detect the encroaching fluid, there may be no detection and subsequent avoidance once the fish subsequently leave the scallops. At this point, it is interesting to note the observation made by Menzie et al. (1980) of increased numbers of red hake in the immediate vicinity of a completed oil well, particularly in the regions of significant residues of drilling discharges. Thus, it seems likely that red hake will not avoid areas of sediment previously contaminated by drilling fluid, but may avoid the actual cloud-like discharges.

Given that the juvenile red hake may re-inhabit areas previously contamined by drilling fluid, we must consider the portions of our experiments concerning activity, growth and feeding. Activity decreased in treatment fish after the introduction of drilling fluid in comparison with their activity prior to the introduction of drilling fluid. Consumption rates of the treatment fish were significantly less than controls, but growth rates were equivalent. Different explanations are possible. The drilling fluid may have affected the fish's metabolism in some way, causing the decrease in activity. However, such an alteration in metabolism might be expected to affect

growth, which was not the case.

A second possibility is that the fish did, in fact, detect the contaminants and responded by lowering their activity as low as possible without affecting their feeding and growth. Since growth rates affect the time needed to outgrow the scallop habitat (Steiner et al., 1982), maintaining optimum growth rates may be the fish's most important concern.

A third possibility is an interaction of the fish with the shrimp prey. The shrimp may have been slightly more difficult to detect and capture in the treatment aquaria. This could have been due to the impairment of the hake's chemically sensitive pelvic fins (Pearson et al.,1980), visual impairment caused by periodic turbidity, or more inaccessible refuges by the shrimp in the substrate (under drilling fluid solids or deeper in the sediments). In any event, the fish in control aquaria may have been confronted with an overabundance of prey shrimp, all easier to capture, than the treatment fish. The control fish may have captured more shrimp but utilized their energy sources less efficiently than the treatment fish. Such responses have been previously noted for fish in an abundant food situation (Brett and Groves, 1979). The need for more efficient utilization of food resources in the treatment fish would have had a concomitant effect on activity, causing the elimination of any activity not essential for feeding.

All of the experiments were conducted with drilling fluid

contaminant levels comparable to what might be found in the field. Experiment 1 = 0.73 kg m^{-2}; Experiment 2 = 1.19 kg m^{-2} Experiment 3 = 4.70 kg m^{-2} (all expressed as dry weight solids). If higher levels were introduced, more pronounced effects might be possible. For example, greater reduction in the consumption rates of hake could outweigh any ability to increase utilization efficiency, and thus growth could be decreased with resulting decreased survival and reproductive success.

As a last, but very important consideration, we emphasize that these results are all based on only <u>one</u> drilling fluid. Numerous studies have shown the tremendous variability in the toxicity of drilling fluid. It is simply not possible, nor realistic, to extrapolate from this one drilling fluid to all drilling fluids. If tests such as these are to be useful in regulation and environmental procedures, researchers must have access to drilling fluids used throughout the life of a well, and to drilling fluids from different wells in different regions. One test is simply not enough for adequate judgment.

SECTION 3.

Experimental tests of the response of planktonic red hake larvae to thermoclines

INTRODUCTION

The previous three experiments all concerned the possible effects of drilling fluid on the experimental benthic communities consisting of sea scallops, shrimp, and juvenile red hake, with a strong emphasis on the activity, feeding and growth of the juvenile hake. However, the juvenile phase is not the only segment of the red hake's life that may be vulnerable to the intrusion of drilling fluid into the marine environment. Our field work has shown that there is a prolonged period of recruitment during which the planktonic post-larvae of red hake descend to the benthic scallop communities. This recruitment period lasts from August to at least December (Steiner et al., 1982). A significant portion of this recruitment occurs while the strong summer thermocline is still present; thus, the descending post-larvae must have a behavioral/physiological adaptation that facilitates the transition from a warm planktonic environment to a benthic environment that may be as much as 16°C colder (Steiner et al., 1982).

Therefore, we developed an experimental program that would test the reaction of planktonic red hake post-larvae to various thermoclines and to observe any behaviors that are used to penetrate the thermoclines. This initially involved an extensive field sampling effort, as there was no previous information on the seasonal availability of

planktonic hake in our study area, nor any previous experience on the ability or procedures necessary to successfully capture planktonic hake alive and return them to the laboratory. The subsequent laboratory work was, first, an inquiry into the feasibility of thermocline experiments, and second, an inquiry into the behavioral stragegies of planktonic red hake in response to thermoclines.

MATERIALS AND METHODS

Field Collections

Collection of planktonic post-larval red hake were made at considerable distances offshore from New Jersey. We collected the hake from aboard the RV Kyma on a transect ranging from 40° 15N, 73°50W, to 40°08N, 73°24W; the latter point approximately 30 nautical miles offshore in 125 m depth. We used a 2000 μ mesh Haedrich net, 1 m across the mouth, which sampled only the top 10-20 cm of the water column, and 0.5 m x 1.0 m, 1800 μ mesh, pipe net which sampled the top 0.5 m of the water column. Eight collecting trips were made from 7 August to 8 October 1980 (Table 14).

Neuston tows were made for 10 min at a time, the nets retrieved, and the catch immediately sorted. Dead planktonic hake were preserved in 5% formalin. Live hake were immediately placed in self-sealing plastic bags, half-filled with sea water and super-saturated with oxygen, and then placed in a water bath at an ambient temperature of

Table 14. Results of field sampling program for planktonic post-larval red hake.

Date	Location	Total Sampling Time(min)	No. of Planktonic Red Hake Collected	
			Live	Dead
7 August 1980	40°08'N, 73°24'W	100	0	2
8 August 1980	40°15'N, 73°50'W	90	0	0
8 September 1980	40°15'N, 73°50'W	90	0	0
11 September 1980	40°08'N, 73°21'W	80	137	97
23 September 1980	40°15'N, 73°50'W	90	15	43
6 October 1980	40°15'N, 73°50'W	50	8	19
7 October 1980	40°15'N, 73°50'W	65	8	21
8 October 1980	40°15'N, 73°50'W	90	0	6

25°C. Upon return to the laboratory, the planktonic red hake were kept in the flow-through seawater aquaria, at temperatures of 20-22°C, and fed Artemia spp nauplii.

Thermocline Experiments

The laboratory thermocline experiments were conducted in a 2.48 x 0.88 x 0.96 m rectangular aquaria (1500-l volume) with a single viewing window (2.29 x 0.81 m). The bottom was covered with a 5-cm thick layer of sand (0.6-4.0 mm grain size). Filtered sea water was delivered via a network of pipes underneath the sand bottom; overflow valves were located at the top of the aquaria on either side. Light levels, as measured at the surface were 2000 lux, provided by a bank of fluorescent bulbs. An array of nine temperature probes, each connected to a multi-channel recorder, were placed in the left rear corner of the aquaria to provide continuous temperature readings. The bottom temperature probe was placed 9 cm above the sand substrate; the next four probes were placed 7 cm apart; the remaining four probes were 9 cm apart. The top probe was within 5 cm of the water's surface. The aquarium was surrounded by blinds and recessed into a small room to prevent visual and acoustical interference.

At the beginning of each thermocline trial, the aquarium was filled with clean sea water of ambient temperature (20-22°C). Then 10°C water was injected through a bottom delivery pipe system, forcing warm water out the overflow valves at the top, creating a stable

thermocline with 20°C water at the top and 10°C at the bottom. After the required amount of cold water was injected (approximately 600 l) the delivery system was turned off, and a static thermocline maintained for the duration of the experiment.

Three planktonic post-larval hake were taken from holding aquarium where they had been acclimated to 20°C. These fish, ranging in size from 29-43 mm (Table 15), had shown signs of beginning their transformation from planktonic post-larvae to benthic juveniles. Their coloration was beginning to darken, in particular, the silvery coloration of ventral and lateral sides was fading. The fish were extending their filament-like pelvic fins in a manner similar to juveniles, and they were frequently foraging over the sediment of their holding aquaria. All of these are behavior patterns common to benthic juveniles (Olla et al.,1980a). The three fish were placed in an opaque 10 l plexiglass container filled with 20°C sea water, and allowed to sit undisturbed for 1 h.

The plexiglass container was then gently lifted over the lip of the test aquaria, and lowered into the water column until totally submerged. (The upper lip of the plexiglass container was 1-2 cm below the surface of the water). The plexiglass container was then rotated forward, allowing the three fish to swim out of the container into the water column of the test aquaria.

Observations began immediately after the fish entered the experimental water column. Each fish was monitored for the first 10 minutes after entering the experimental aquarium, their behaviors and

Table 15. Experiment conditions for laboratory thermocline trials. All fish acclimated to 20°C prior to trial.

	Surface Temperature (°C)	Bottom Temperature[1] (°C)	Size of Hake (TL mm)
		Treatment	
Trial 1	20.5	10.2	39,34,29
Trial 2	19.7	10.1	37,36,30
Trial 3	18.7	10.4	43,36,31
Trial 4	18.7	15.0	42,39,31
		Control	
Trial 1	19.5	19.5	38,34,34
Trial 2	19.5	19.5	36,34,31

[1]Temperature recorded at start of experiment. Final temperatures, 6-10 h later, were 1-2°C higher.

positions noted with a multi-channel recorder. Thereafter, each fish was monitored for 5 minutes every hour for 6-10 hours. The percent time that each fish spent in each of nine horizontal zones, as demarcated by the nine temperature probes, was calculated and then averaged for all three fish. For example, fish 1 may have spent 60 sec (20% of 5 minutes) below probe 1, 60 sec (20%) between probes 2 and 3, and 180 sec (60%) between probes 3 and 4. Three trials were run with surface temperature of 20°C and bottom temperature of 10°C (Table 15). One trial was run with surface temperature of 20°C and bottom temperature of 15°C.

In two control trials fish were placed into an isothermal water column, 20°C throughout (Table 15).

RESULTS

The initial reaction of all fish, both treatment and control, was to swim immediately to the bottom of the aquaria after leaving the introduction container. However, these were not fright or startle reactions on the part of the fish. In fact, they often took as long as 3-4 minutes to leave the introduction container, idly swimming inside the container and only exiting by random movement. Once outside the confines of the container and able to see the sediment 80 cm below, the fish immediately swam rapidly towards the bottom.

Control fish were able to swim to the bottom unimpeded, and begin to exhibit normal benthic behavior: foraging with pelvic fins

extended and engaging in agonistic encounters. However, treatment fish showed obvious reactions to the presence of the thermoclines. Within seconds of penetrating the cold water, the fish began to shake violently with obvious muscle spasms. Of the nine fish tested in treatment trials with 10°C bottom water, six fish were able to return immediately to the upper layers of warm water within seconds after the initial signs of thermal shock. However, three of the nine fish became moribund after the initial spasms of thermal shock and slowly drifted to the bottom of the aquarium, where they lay motionless on the substrate. Our initial impression was that these latter three fish were dead. However, all three fish, within 2 hours, began to show slight opercular movement, then slight muscle twitches, and eventually righted themselves and swam upwards in the water column into the warmer waters.

In the continued presence of a strong thermocline, i.e., with 10°C water on the bottom, the fish maintained position in the warmer water, with occasional excursions into the colder water. A fish would swim back and forth in warm water, and then swim downwards into the cold water, as if once again attempting to reach the sediment. Upon entering the colder layers, the fish would again begin to twitch violently, and immediately rush back to the surface and warmer water.

Control fish swam straight to the bottom and generally remained there. After several hours in the aquarium, control fish would occasionally swim up and down in the water column, and spend time both at

the substrate and at the water's surface.

Graphic depictions of the percent time spent in the different thermal zones clearly show the difference between control and treatment fish. In both control trials, fish spent approximately equal times at the bottom, and at the surface for the first 1 hour after introduction (Figs. 11, 12). However, in later observations, the fish spent well over 60-70% of their time on the bottom, with small amounts of time spent in upper zones.

The treatment trials with strong thermoclines (20°C at the surface, 10°C at the bottom) were vastly different. In Trial 1, the fish rarely descended below the 15°C isotherm (Fig. 13A, B). At each observation the fish spent the majority of their time in the upper thermal zone (20°C), with decreasing time spent in the next three lower zones. By 1800 h (the last observation), the fish still did not spend any time in water colder than 14.5°C.

In Trial 2, again the fish spent the clear majority of their time in warm surface waters (Fig. 14). During the first observation at 0900, one fish was in initial thermal shock and lying on the bottom. This accounted for the time spent below 11°C. After that initial observation, that fish recovered and all three fish spent most of their time above 15°C, with occasional forays to colder water at the 1345 h and 1545 h observations (Fig. 14).

In Trial 3, two of the three fish went into thermal shock and immediately drifted to the bottom (Fig. 15). This accounted for the high

Fig. 11. Distribution of fish in temperature zones in Control Trial 1. Each diagram is the average of 5 min readings on each of three fish.

PERCENT TIME SPENT IN TEMPERATURE ZONES

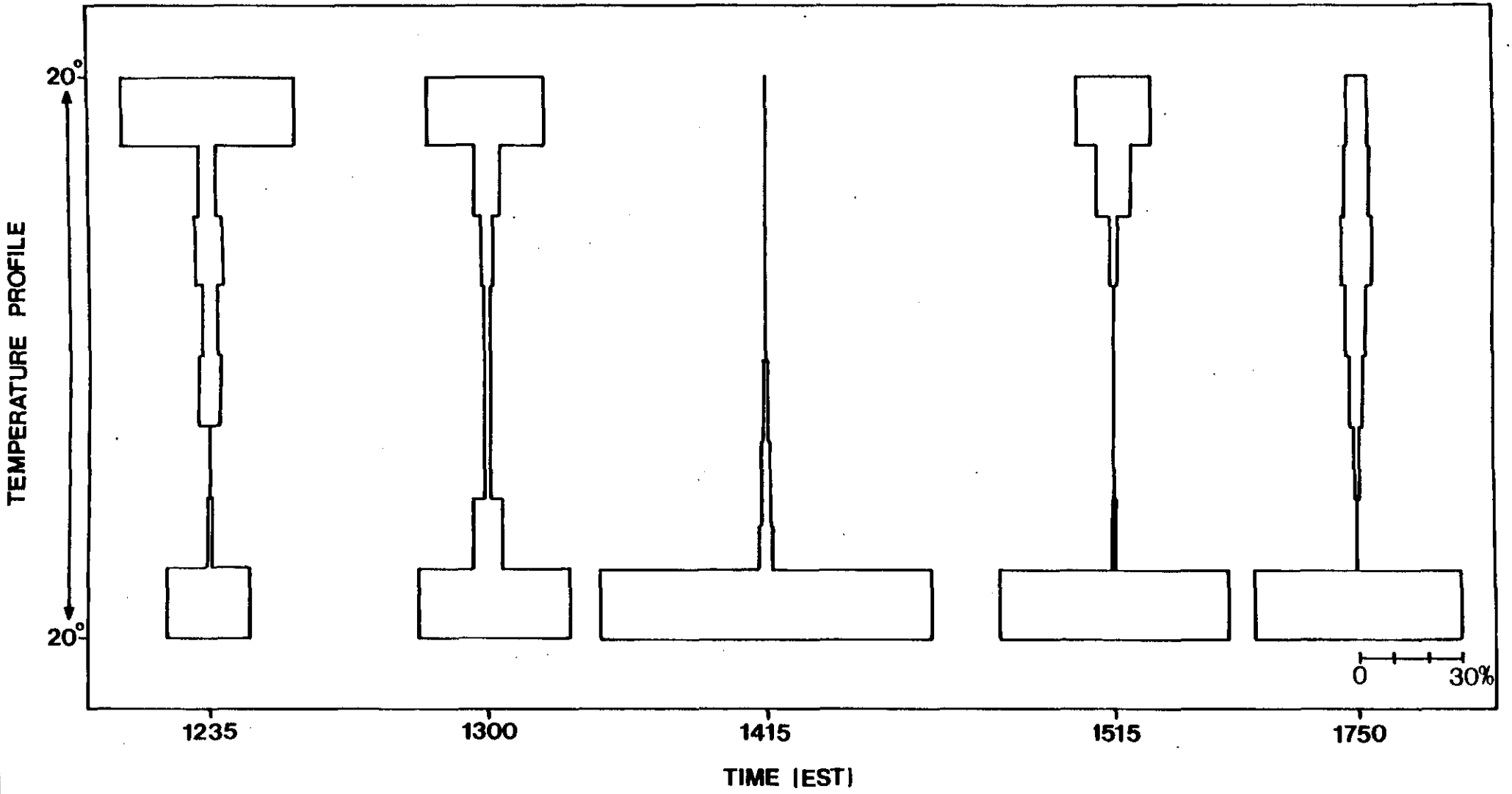


Fig. 12. Distribution of fish in temperature zones in Control Trial 2. Each diagram is the average of 5 min readings on each of three fish.

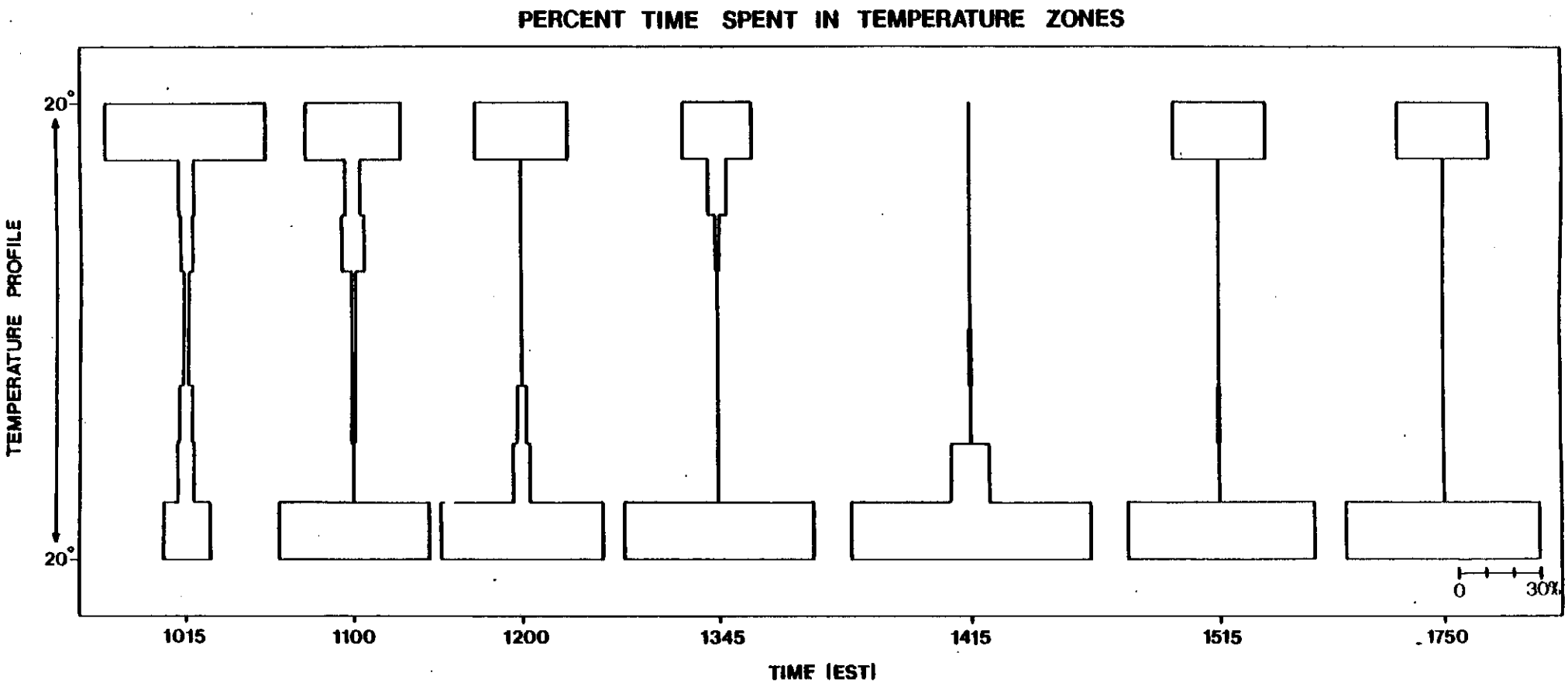
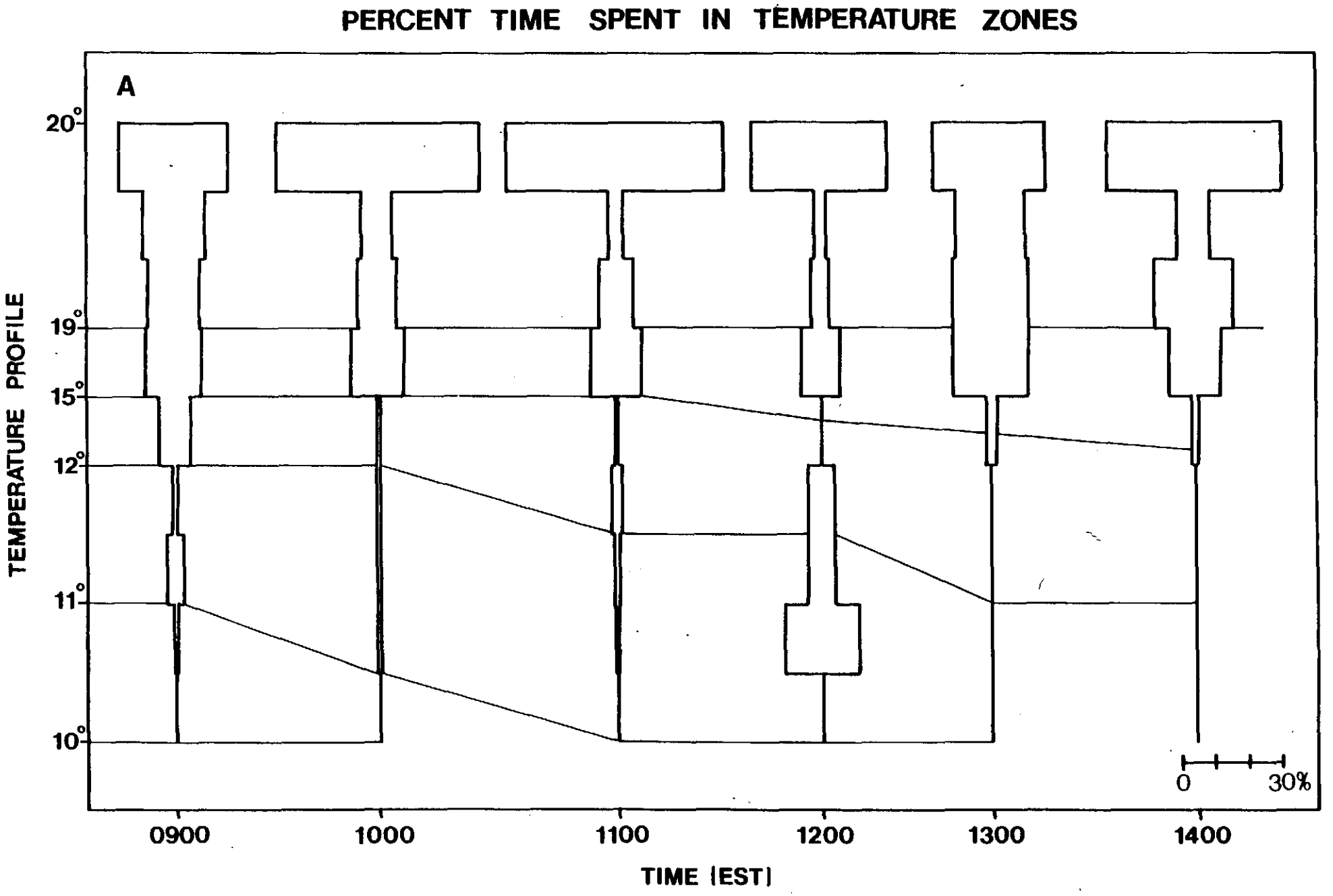

PERCENT TIME SPENT IN TEMPERATURE ZONES
TEMPERATURE PROFILE
20°
20°
0
30%
1015
1100
1200
1345
1415
1515
1750
TIME (EST)

Fig. 13. Distribution of fish in temperature zones in Thermocline Trial 1. Each diagram is the average of 5 min readings on each of three fish: A) 0900-1400 h; B) 1500-1800 h.


PERCENT TIME SPENT IN TEMPERATURE ZONES
A
TEMPERATURE PROFILE
20°
19°
15°
12°
11°
10°
0
30%
0900
1000
1100
1200
1300
1400
TIME (EST)

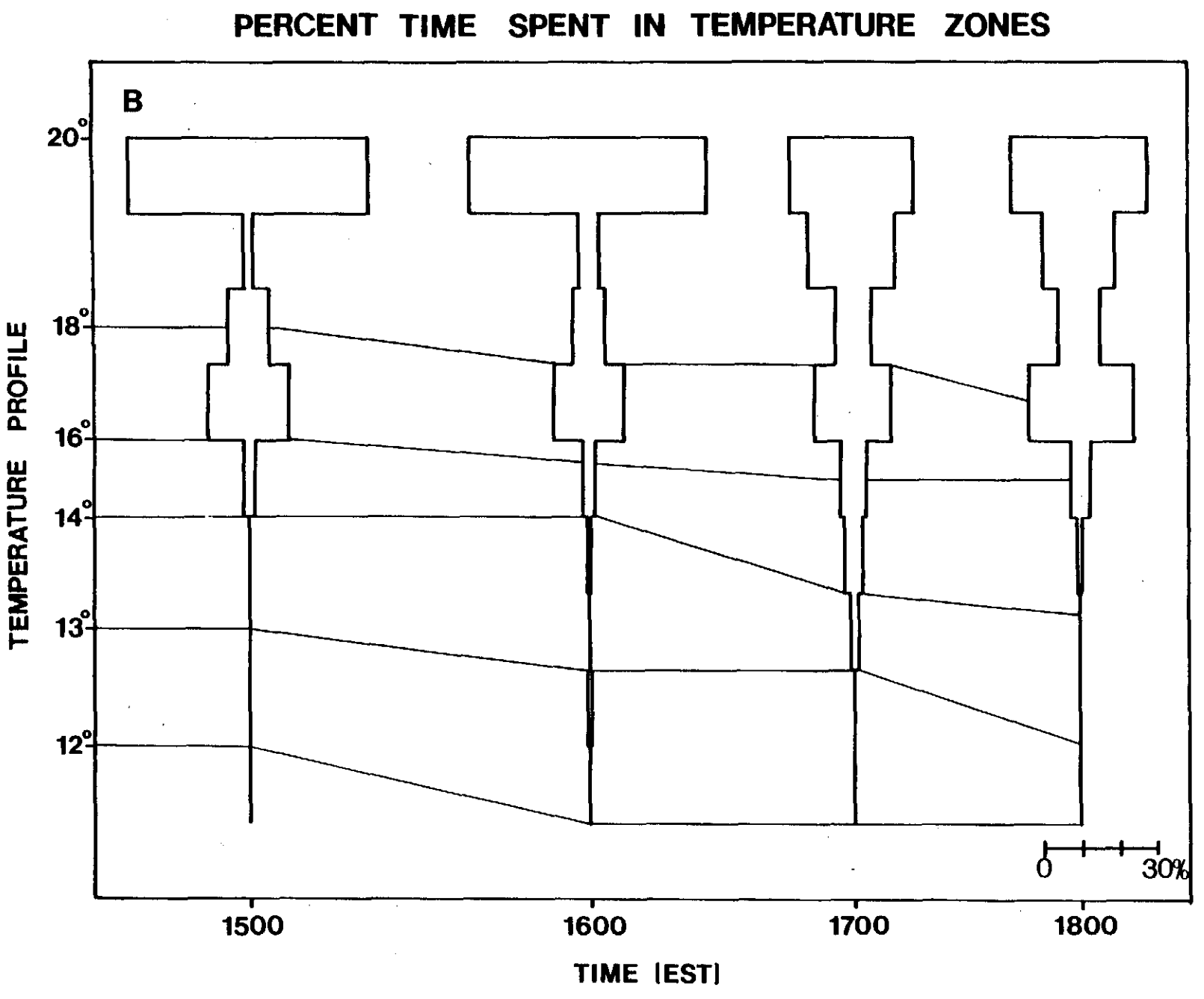

PERCENT TIME SPENT IN TEMPERATURE ZONES
B
20°
18°
16°
14°
13°
12°
TEMPERATURE PROFILE
0
30%
1500
1600
1700
1800
TIME (EST)

Fig. 14. Distribution of fish in temperature zones in Thermocline Trial 2. Each diagram is the average of 5 min readings on each of three fish; * indicates one fish in thermal shock.

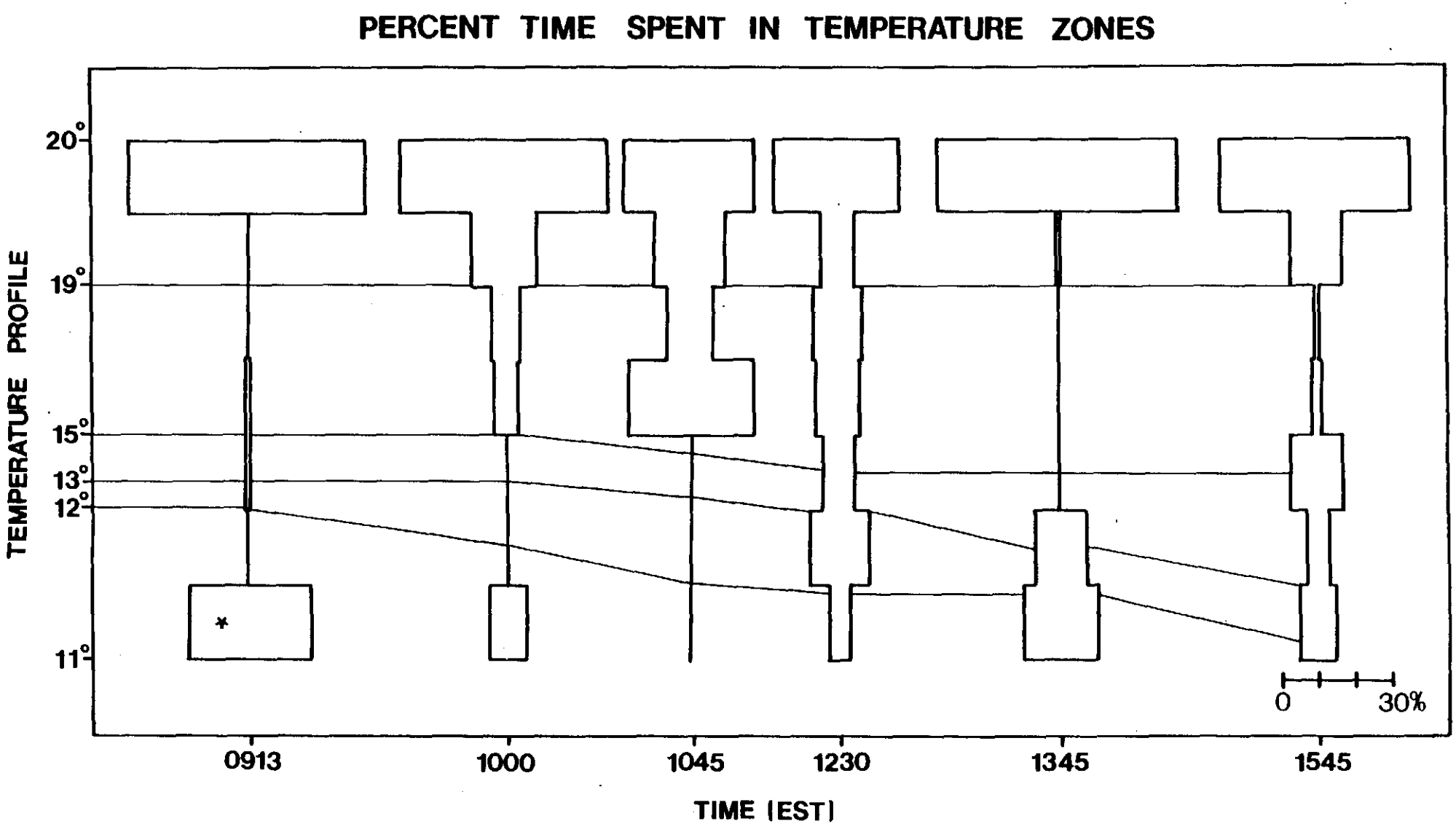
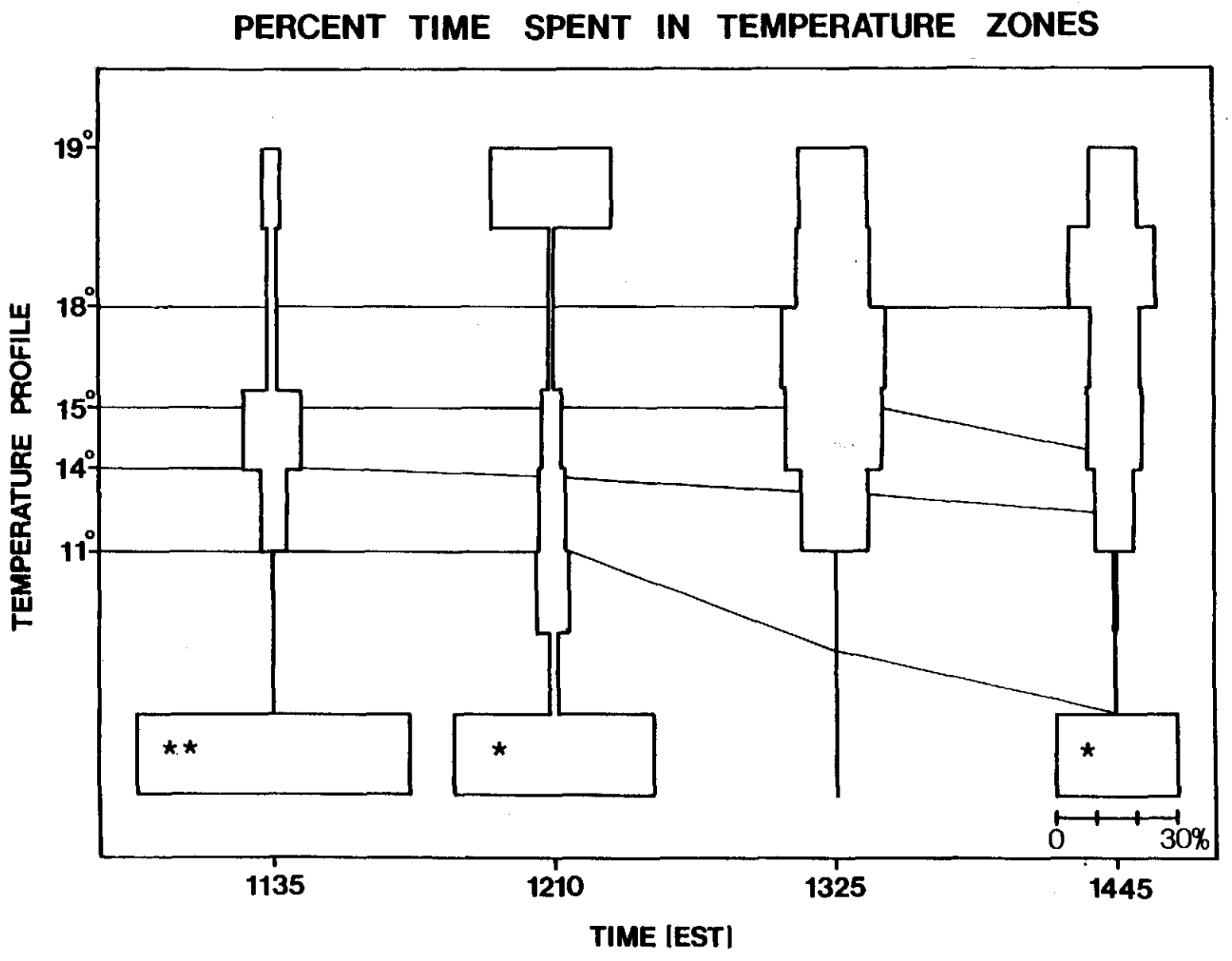

PERCENT TIME SPENT IN TEMPERATURE ZONES
TEMPERATURE PROFILE
20°
19°
15°
13°
12°
11°
*
0
30%
0913
1000
1045
1230
1345
1545
TIME (EST)

Fig. 15. Distribution of fish in temperature zones in Thermocline Trial 3. Each diagram is the average of 5 min readings on each of three fish;
* indicates one fish in thermal shock;
** indicates two fish in thermal shock.

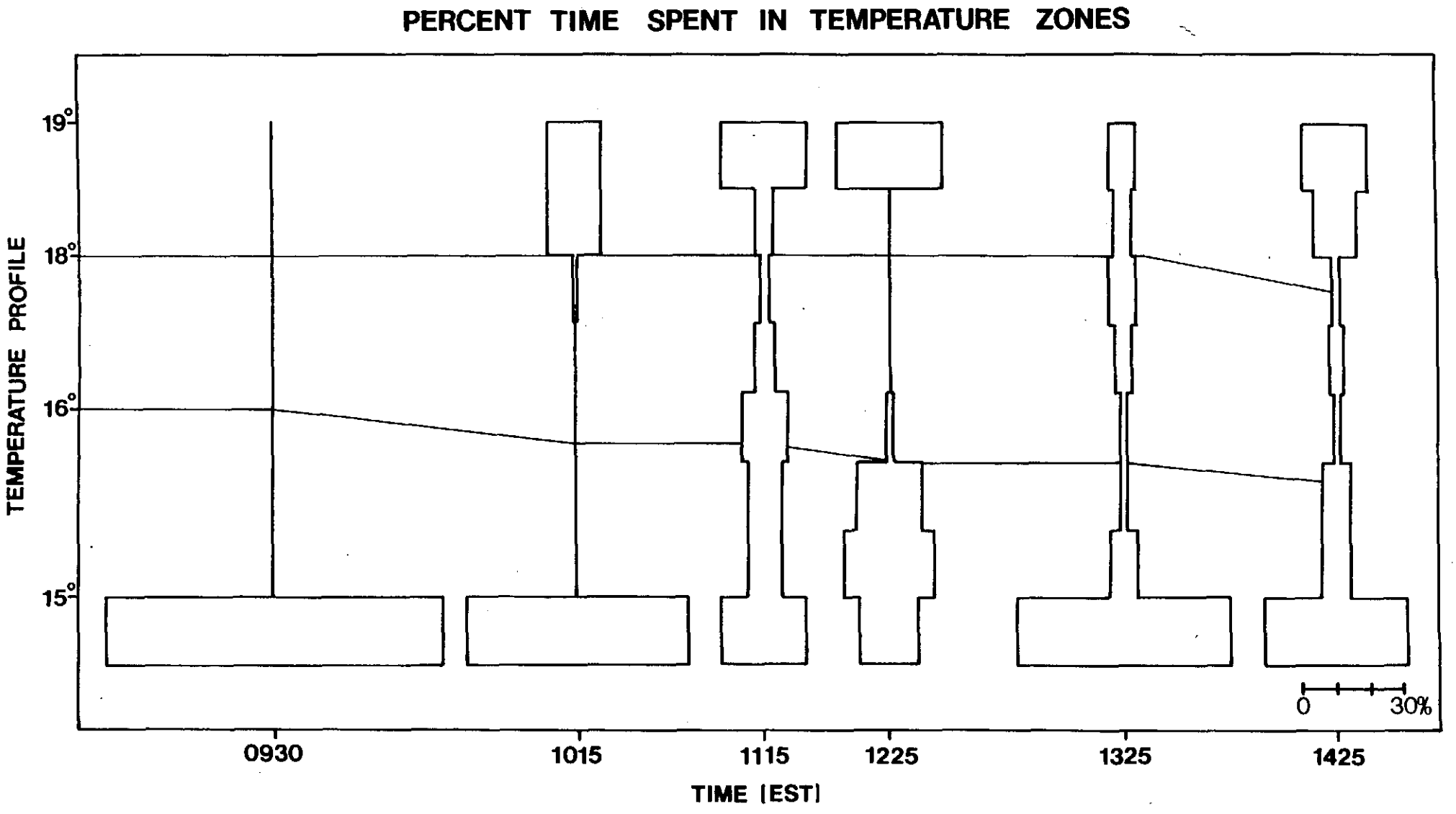

PERCENT TIME SPENT IN TEMPERATURE ZONES
TEMPERATURE PROFILE
19°
18°
15°
14°
11°
**
*
*
0
30%
1135
1210
1325
1445
TIME (EST)

percentage of time below 11°C at the 1135 h observation. At the 1210 h observation, one fish was still in shock, while the second had recovered enough to make feeble attempts to rise to warmer waters. By the 1325 h observation, all fish were spending 80% of their time above 14.5°C. By the 1445 h observation, one fish had succumbed to the initial stress of thermal shock and was again lying on the bottom (though still alive), but the other two fish were still remaining above 14.5°C. (It is interesting that the thermally shocked fish did not die, but was recovered alive from the aquarium two days later).

It is clear that fish responded to the strong thermoclines. They remained in warmer waters, i.e., above 14°C, a majority of the time, and made only excursions into colder waters, except for cases of thermally shocked individuals.

In Trial 4, the last of the the thermocline tests, a weaker thermocline was formed in the aquarium, 20°C at the surface, but only 15°C at the bottom. The results were more similar to the controls than the other three thermocline trials. During the first two observations, all three fish were primarily on the bottom, but not as a result of thermal shock (Fig. 16). They displayed none of the characteristic muscle spasms or violent twitches displayed in previous instances of thermal shock. In subsequent observations the fish concentrated their swimming on or near the bottom, with brief periods of swimming in mid-water zones or near the surface (Fig. 16).

Fig. 16. Distribution of fish in temperature zones in Thermocline Trial 4. Each diagram is the average of 5 min readings on each of three fish.


PERCENT TIME SPENT IN TEMPERATURE ZONES
TEMPERATURE PROFILE
19°
18°
16°
15°
0
30%
0930
1015
1115
1225
1325
1425
TIME (EST)

DISCUSSION

The planktonic post-larvae showed a clear avoidance response to waters colder than 15°C. In addition, some individuals were stressed enough to go into thermal shock; they became moribund initially, unable to swim, and sank to the bottom of the test aquarium. These thermally shocked fish were able to overcome this thermal shock within 1-2 hours, and swim upward into warmer waters. None of the fish showed an acclimation to the 10°C water within the time-span of the experiments (6-10 h).

The fish used in these experiments were large enough (29-43 mm) to descend to the benthos in the field (Steiner et al., 1982); they demonstrated behavioral patterns characteristics of benthic juveniles prior to their being tested with the thermocline. The results indicate that the process of recruitment to the benthos from the plankton may take considerable time for a given individual in the presence of a strong thermocline. In particular, the tendency of several fish to spend significant periods of time swimming back and forth at the 15°C isotherm, with occasional quick excursions into colder water and back up again, suggests that descending red hake post-larvae may become suspended at the thermocline for significant time intervals, possibly several days, before completing their descent.

This behavior has significant implications for pollutant research and guidelines. The light particulate fractions and water

soluble compounds of drilling fluids can be expected to become concentrated at the thermocline because of temperature and density gradients (J. Trefry, pers. comm.) as a result of drilling fluid passing through the water column after discharge from an oil rig. Therefor, although these fractions and compounds might not ever be imposed upon a benthic community (Current Report), these fractions may still be inflicted upon juvenile red hake before they reach the benthos. In addition, if juvenile red hake become exposed to drilling fluid water soluble fractions, which have been demonstrated to be toxic to a variety of marine organisms (Neff et al., 1981; T. Gilbert, pers. comm.), the hake may be particularly vulnerable due to the already imposed stress of the lowered temperatures.

The potential for harm to juvenile red hake in such a scenario is very plausible. We know that red hake do descend to the benthos while a strong thermocline is still present (Steiner et al., 1982). We now have laboratory experimental evidence that the actual descent and acclimation may take a significant period of time, including some period during which the hake become suspended at the steepest part of the thermocline gradient. We know that certain fractions of the drilling fluids will become suspended at the same portions of the thermocline as well (J. Trefry, pers. comm.). Therefore, we have a situation in which juvenile red hake may be exposed to toxic constituents of drilling fluids, possibly for several days.

It is important to further test this possibility of juvenile hake being exposed to drilling fluid pollutants. We have demonstrated

the feasibility of such experiments. These experiments need to be expanded to test the reactions of the hake to thermoclines tainted with drilling fluid contaminants. Furthermore, this scenario extends to other fish besides red hake. Many benthic marine fishes have planktonic larvae and post-larvae that must pass through the thermocline to reach the benthos. It is likely that they will show the same sort of acclimation and behavioral responses that the red hake exhibit. Larger pelagic fishes may also become concentrated at thermoclines, for example, in the midst of feeding bouts. Olla and coworkers have shown that young bluefish, Pomatomus saltatrix, will concentrate at isotherms and make excursions into colder water for feeding (Olla et al., in prep.). The actual behavioral sequences of the bluefish, including the violent shakes in response to the colder waters, are so similar to that of the phylogenetically dissimilar red hake, to suggest that such behaviors in response to thermoclines are ubiquitous for many marine fishes. If so, this necessitates the need for further resting of the possible concentrating of pollutants at thermoclines, and the subsequent responses of many fishes to these pollutant concentrations.

SECTION 4.

Conclusions and recommendations

During our two-year study, we have developed a realistic experimental protocol appropriate for simulating conditions under which benthic organisms would be exposed to drilling fluids discharged from offshore drilling rigs. This is an important consideration, given the diverse and sometimes conflicting methodologies used in previous drilling fluid experimental work. The appropriate value of any toxicological testing procedure, especially that concerning the possible exposure to pollutants of marine organisms in their natural habitat, is directly related to the degree to which the testing approximates a natural situation. We believe that our newly devised methodology of drifting drilling fluids down through an artificial seawater column, and subsequently introducing the drilling fluids into experimental aquaria via a natural plume is the closest procedure yet to simulating the real world. We recommend that any further determination of ecological and behavioral responses of marine organisms to drilling fluids utilize a similar methodology.

Our experiments testing the responses of a community of juvenile red hake, *Urophycis chuss*, sand shrimp, *Crangon septemspinosa*, and sea scallops, *Placopecten magellanicus*, to the presence of used drilling fluids had mixed results. There were no immediately visible acute effects on the survival or behavior of any of the test organisms, beyond that of the initial reactions to the physical introduction of the drilling fluids into the aquaria. Activity patterns were apparently not severely disrupted, nor were any particularly abnormal behaviors prominent in any of the test aquaria. There were indications of a reduction in activity levels of treatment fish after the introduction

of drilling fluids. In addition to the above, the consumption rates of the treatment fish upon their prey source, the sand shrimp, were lower in the treatment aquaria, as opposed to the control aquaria. There was a concomitant trend for less growth in treatment aquaria as well, though not statistically significant. We hypothesized that the hake in the test aquaria had greater difficulty in finding and capturing prey, for a variety of possible reasons, and adjusted to their lesser food intake with lesser activity expenditures. In cases of longer exposure under field conditions, or with greater exposure levels, such a trend for lesser food consumption could eventually lead to disruptive and deleterious growth rates.

As mentioned above, there were definite behavioral reactions on the part of all three marine species to the presence of a plume of drilling fluids. The behavior indicated agitation, irritation, and subsequent escape responses. The hake showed a quantifiably demonstrable escape reaction. Such responses in the field could have adverse ecological impact on a red hake population. Forcing the juvenile red hake from their preferred habitat could lead to increased predation risk, force them into unnatural or sub-optimal areas of food, and deprive them of their natural shelter sites. We recommend that further work study this aspect.

Our experiments involving the laboratory marine communities addressed only the problem of immediate and intermediate length (21 day) behavioral and ecological responses. We did not perform any concomitant physiological or histological examinations to test for pollutant uptake

or contamination of vital body organs and tissues. However, we did save and preserve all treatment and control animals in proper recommended storage in hopes of future histological examination. We recommend that these specimens be properly examined for evidence of tissue bioaccumulation of pollutants or tissue degradation. This is particularly important in the case of the hake which were feeding throughout the experiment on potentially contaminated sand shrimp.

The thermocline experiments highlighted an important potential scenario in which larval fishes of many species could be exposed to highly toxic constituents of drilling fluids. The results of our seawater column analyses indicated clearly that water soluble fractions of drilling fluids are absorbed into the water column before reaching the benthos. Field studies (J. Trefry, pers. comm.) have shown that these potentially toxic constituents tend to concentrate at the thermocline. Our thermocline studies clearly demonstrated that larval red hake also congregate at the thermocline during a prolonged period of adjustment which is necessary to complete their descent from the plankton to the benthos. Thus, a situation exists where an even greater danger than the presence of drilling fluids on the benthos may be manifested in the presence and concentration of water soluble toxic components of drilling fluids at the thermocline. Is is likely that many other benthic fish species which have planktonic larval forms, e.g., cod, haddock, also incorporate a period of thermoregulatory adjustment at the thermocline and could also be affected by concentrations of toxic water soluble constituents. We strongly recommend that further work examine this question.

Our final comments consider the practicality of testing only one drilling fluid, as was done in our experiments. It is becoming increasingly apparent that drilling fluids vary widely in their relative toxicities to marine organisms. Thus, the results of our experiments could have relatively little or no predictive value if applied to a well drilled under different conditions which would require differently composed drilling fluids. We recommend that further studies address a large variety of drilling fluids, not selected samples. Furthermore, we recommend that further work study the variety of drilling fluids used throughout the life of wells, and not just one selected sample.

SECTION 5

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SECTION 6

Appendices

Chemical analyses of drilling fluids

APPENDIX A.

Chemical analysis of drilling fluids, water column, and sediment samples in Experiment 1

DETERMINATION OF TRACE ELEMENTS IN DRILLING FLUID-RELATED SAMPLES IN EXPERIMENT 1

I. Samples

A total of 48 samples from eight test tanks were supplied by investigators at the NMFS, Sandy Hook Laboratory. Half were taken on the first day of the test, half on the fourth (and last) day. The samples were of two types: two seawater samples from each tank, one designated top (T) of tank, and one from 1 cm above the sediment, labeled bottom (B); and a sediment sample (S). The sediment samples consisted of coarse sand and a variable amount of water. There were fine sediments in samples from tanks #3-6, presumably settled portions of drilling fluids.

In addition, two containers of the PESA drilling fluids used in the test were provided: one had been washed once through a seawater column; one had been washed three times (PESA-C3).

II. Seawater Test Media

A. Sample treatment and analysis

The water samples were acidified in their original containers with redistilled HNO_3 and held for several days to permit desorption of metals lost to the plastic walls during storage. They were then aspirated directly into a dc plasma echelle emission spectrometer which is capable of measuring 16 elements simultaneously. In this case, 11 elements were measured: Al, Ba, Cd, Cr, Cu, Fe, Hg, Mn, Ni, Pb, and Zn.

B. Results

With the exception of sample 1-B-Day 1, only three of the measured elements, Ba, Fe, and Mn, were present at detectable levels in the seawater

test media. The detection limits for the other elements are given in Table 1.

Sample 1-B-Day 1 contained elevated levels of Cr, Cu, Fe, Ni, and Zn (Table 2), which were not approached in other samples from this tank. Presumably this sample was contaminated.

Concentrations of barium, iron, and manganese in the seawater samples are given in Table 3. Barium concentrations in the control tanks (#1, 2, 7, 8) were a constant 12 ppb (±1). Ba concentrations in the test tanks were much higher than in controls and significantly higher on Day 1 of the test than on Day 4. Generally higher barium levels occur in bottom water samples than in those from the top. Many values exceeded the theoretical limit of barium solubility in seawater (∿50 ppb). The measurement of such values suffered from unusually high variabilities in emission intensity during Ba quantitation, indicating that some Ba was present as suspended particles.

The leaching of Ba from fluids suspended in seawater was examined in a separate set of experiments (Table 4). Whole PESA fluids and a column-washed fluid (PESA-C3) provided by the Sandy Hook Laboratory were suspended at loadings of 1.0 ml/l in seawater, and sampled at various intervals after mixing. Each sample was immediately separated by centrifugation at 32,000 X gravity for 10 min. The concentration of Ba in the supernatants again exceeded the theoretical solubility of Ba in seawater, suggesting that particulate $BaSO_4$ was not solely responsible for elevated Ba levels. We hypothesize that Ba may be stabilized in solution by interaction with the dissolved organic compounds that give the liquid phase of PESA fluid its dark brown color.

Manganese behaved in a simpler manner. There was no significant difference between test and control levels or between top and bottom samples of tanks on Day 1. The Day 4 control-tank values were uniform and slightly higher than on Day 1. In Day 4 test tanks, Mn concentrations were slightly greater in bottom than in top samples.

Iron concentrations showed a similar enrichment in bottom samples on Day 4 in all four test tanks. However, no systematic change was observed between Day 1 and Day 4 levels in control or test tanks.

III. Sedimentary Test Media

A. Sample treatment and analysis

The sediment samples were of a distinctly bimodal character, so it was decided to separate the coarse sand substrate from fine solids and water present in each sample. The whole sample was weighed and the dry weight of the coarse fraction (retained by 500-μm Nitex screen) was determined. The fines and water passing the screen were combined with the seawater used to rinse the container and the sand.

The fine sediment/water fractions were taken to 125 ml with seawater. A well-mixed aliquot of each sample was filtered to 0.45 μm to determine the loading of fine solids. Dissolved metal concentrations in these suspensions were determined following high speed centrifugation - 32,000 X g for 10 min. A 10-ml aliquot of each supernatant was mixed with 1.0 ml of 0.1M Na_4EDTA to stabilize trace elements in solution.

A second extraction of the remaining seawater/fine sediment suspensions was performed using acetic acid. The technique was similar to that used by Mariani *et al*. (1980) to obtain "bioavailable" metals in a solid phase.

The suspensions were leached for two hours on a rotary shaker in 25% v/v acetic acid. The solids were then removed by high -speed centrifugation, and the supernatants quantified using an appropriate standard and blank.

B. Results

The physical characteristics of the 16 sediment samples are listed in Table 5. Heterogeneity in sample size and composition among the samples made it difficult to choose a meaningful normalizing factor for the chemical concentrations measured. Table 6 contains the mass of each of the measured elements in the total 125-ml volume of suspension prepared from the whole sample. Data in Table 7 are expressed in μg/g of the fine sediment/seawater fractions. The latter weights were obtained by subtracting the dry weights of coarse sand from total sample weights and are listed in Table 5. Data in Tables 6 and 7 indicate that the sediments from test tanks contained higher concentrations of most seawater-leachable and acetic acid-leachable trace metals than did control sediments. As expected, much greater quantities of most metals were released from test sediments by 25% acetic acid than by seawater.

Barium concentrations, however, were lower in the acetic acid treated samples. These results may be due to protonation of the organic functional groups which could stabilize Ba in solution in alkaline drilling fluids suspensions.

IV. Summary

Although the concentrations of most of the trace metals of interest were very low in the seawater test media, the settled drilling fluids did continue to release metals when mixed with seawater. Leaching with weak

acid released even more of these metals, indicating that they might be available to benthic organisms.

Barium exhibited atypical behavior. It was significantly elevated in the water column in test tanks, but decreased sharply during the test interval. Barium concentrations significantly exceeded the theoretical solubility limit of 50 ppb, both in the Sandy Hook test media and in the seawater suspension test conducted at the Aquarium. The process of washing the PESA fluids did not entirely remove the fluids components which appear to promote the solubility of Ba, or did not remove all the very fine, perhaps colloidal, particles of $BaSO_4$.

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Table 1. Limits of detection for elements not observed in seawater test media.

Al	Cd	Cr	Cu	Hg	Ni	Pb	Zn
				ppb			
50	12	10	2	6	5	0.25×10^3	20

Table 2. Concentrations of elements in anomalous sample 1-B-Day 1.

	Ba	Cr	Cu	Fe	Mn	Ni	Zn
			ppb				
mean ($\bar{x}$)	16	190	45	1405	82	170	2598
sd	2	5	2	432	5	10	148

Table 3. Concentrations of three elements in seawater test media (ppb)[1]

Tank #	Ba[2]				Fe				Mn			
	Day 1		Day 4		Day 1		Day 4		Day 1		Day 4	
	top	bottom	top	bottom	top	bottom	top	bottom	top	bottom	top	bottom
1	12 1	-[3]	14 1	13 1	109 27	-[3]	142 45	106 37	59 4	-[3]	81 4	83 4
2	11 1	12 1	13 1	13 1	55 20	113 27	<50	<50	58 3	62 4	84 3	81 4
3	516 56	1406 86	32 1	150 28	102 38	341 30	171 51	416 115	64 4	65 5	84 4	100 4
4	62 4	111 15	22	54	75 22	95 21	93 36	206 60	60 3	59 3	80 3	84 3
5	58 6	394 35	26 1	50 1	118 34	246 18	126 43	278 79	58 3	67 4	85 8	91 9
6	216 50	121 26	18 1	21 1	138 37	130 35	<50	77 32	63 4	59 4	82 8	80 8
7	10 1	10 1	13 1	13 1	62 25	81 26	<50	<50	57 3	61 4	80 8	80 8
8	11 1	11 1	13 1	12 1	52 24	53 25	<50	57 27	56 4	56 3	78 8	81 8

(1) Entries consist of mean and standard deviation for triplicate measurements.
(2) Ba concentrations corrected for 4 ppb Ba in the seawater blank.
(3) see Table 2.

Table 4. Dissolved concentrations of two elements in seawater suspensions (1 ml/l) of whole and washed (C3) PESA drilling fluids with time after mixing.

		Ba		Cr	
		0.5 h	96 h	0.5 h	96 h
PESA	mean ($\bar{x}$)	71	139	89	87
	sd	1	2	1	2
PESA-C3	mean ($\bar{x}$)	43	95	5	5
	sd	1	1	1	1

Table 5. Physical characteristics of the sediment test medium samples.

Tank # and day sampled	Wet weight of total sample (g)	Dry weight of coarse sand (g)	% coarse in total	Weight of water and fine particles in sample (g)	Dry weight of fine particles (g)	
1-D1(F)	195.0	148.4	76.1	46.6		Control Tanks
1-D4(F)	198.2	154.1	77.8	44.0		
2-D1(F)	198.0	141.2	71.3	56.8		
2-D4(F)	212.6	162.6	76.5	50.0		
3-D1(F)	201.8	147.1	72.9	54.7		Test Tanks
3-D4(F)	210.8	159.1	75.5	51.7		
4-D1(F)	183.2	134.9	73.6	48.3		
4-D4	194.0	144.1	74.3	49.9	2.96	
5-D1	174.2	115.5	66.3	58.7	2.20	
5-D4	211.3	161.1	76.2	49.3	2.78	
6-D1	195.1	147.6	75.6	47.5	2.59	
6-D4	218.3	168.4	77.2	49.9	2.84	
7-D1	174.9	132.7	75.0	42.2	0.09	Control Tanks
7-D4	220.2	144.8	65.8	75.4	0.02	
8-D1	194.0	142.3	73.4	51.8	0.05	
8-D4	192.2	146.9	76.4	45.3	0.03	

(F) - Seawater suspensions of the water/fine particle fractions of these samples were filtered prior to analyses. Results of analysis of these filtrates are not included in Tables 6 and 7.

Table 6. Total amount of some trace elements leached from sediment samples by I. seawater, II. 25% acetic acid (weight in μg)(1)

	Tank #	Al Day 1	Al Day 4	Ba Day 1	Ba Day 4	Cr Day 1	Cr Day 4	Cu Day 1	Cu Day 4	Fe Day 1	Fe Day 4	Mn Day 1	Mn Day 4	Ni Day 1	Ni Day 4	Zn Day 1	Zn Day 4
I.																	
Test	4		20 2		59 5		0.9 0.1		0.9 0.1		11 2		13.3 0.7		0.5 0.4		8.8 0.4
Test	5	<2	19 2	40 3	91 10	0.59 0.10	0.90 0.06	0.54 0.06	0.76 0.06	4 2	17 4	38.0 0.6	29.7 0.6	0.3	0.6 0.4	8.9 0.3	6.4 0.4
Test	6	<1	26 2	26 1	128 7	0.77 0.09	1.07 0.09	1.02 0.10	0.73 0.07	6 2	21 4	25.4 0.4	15.1 0.8	1.7 0.4	0.8 0.3	11.4 0.4	6.6 0.5
Control	7	<1	36 3	3.5 0.1	3.01 0.09	<0.1	<0.1	0.16 0.06	0.81 0.07	2 2	446 29	<0.4	21.3 0.4	<0.3	<0.3	0.8 0.3	3.6 0.4
Control	8	53 3		3.39 0.09		0.18 0.07		0.8 0.1		267 18		17.2 0.5		1.1 0.4		6.6 0.4	
II.																	
	4		602 11		12 2		214 1		31.9 0.3		1599 24		405 4		3 1		106.4 0.7
	5	590 11	783 13	11 2	12 2	183 1	263 1	20.5 0.3	33.5 0.3	1190 16	1828 24	328 4	457 4	2.0 0.8	4.7 0.8	98.4 0.8	124 2
	6	742 12	583 10	15 2	13 2	235 1	186 1	23.5 0.3	25.0 0.3	1528 22	1346 18	429 4	372 3	3.5 0.8	3.0 0.8	130.2 0.8	93.9 0.7
	7	13 3	17 3	11 2	12 2	<1	<1	<0.3	<0.3	125 3	322 5	<1	5 1	<1	<1	<0.7	4.7 0.7
	8	18 3		11 2		<1		<0.3		154 3		9 1		<1		2.0 0.3	

(1) Entries consist of mean and standard deviation for triplicate measurements.

Table 7. Concentration of some trace elements leached from the fine and water fraction of sediment samples by I. seawater, and II. 25% acetic acid (μg/g of fraction)[1].

	Tank #	Al Day 1	Al Day 4	Ba Day 1	Ba Day 4	Cr Day 1	Cr Day 4	Cu Day 1	Cu Day 4	Fe Day 1	Fe Day 4	Mn Day 1	Mn Day 4	Ni Day 1	Ni Day 4	Zn Day 1	Zn Day 4
I.	4		0.40		1.2		0.018		0.018		0.22		0.27		0.010		0.176
			0.04		0.1		0.002		0.002		0.04		0.01		0.008		0.008
	5	<0.03	0.38	0.68	1.8	0.010	0.018	0.009	0.015	0.07	0.34	0.65	0.59	<0.005	0.012	0.152	0.128
			0.04	0.05	0.2	0.002	0.001	0.001	0.001	0.03	0.08	0.01	0.01		0.008	0.005	0.008
	6	<0.02	0.52	0.55	2.6	0.016	0.021	0.021	0.015	0.13	0.42	0.535	0.30	0.036	0.016	0.240	0.13
			0.04	0.02	0.1	0.002	0.002	0.002	0.001	0.04	0.08	0.008	0.02	0.008	0.006	0.008	0.01
	7	<0.02	0.48	0.083	0.040	<0.002	<0.001	0.004	0.011	<0.05	5.9	<0.009	0.028	<0.007	<0.004	0.019	0.048
			0.04	0.002	0.001			0.001	0.001		0.4		0.005			0.007	0.005
	8	1.02		0.065		0.003		0.015		5.2		0.332		0.021		0.127	
		0.06		0.002		0.001		0.002		0.3		0.009		0.008		0.008	
II.	4		12.1		0.24		4.29		0.639		32.0		8.12		0.06		2.13
			0.2		0.04		0.02		0.006		0.5		0.08		0.02		0.01
	5	10.1	15.6	0.19	0.24	3.12	5.25	0.349	0.669	20.3	36.5	5.59	9.12	0.03	0.09	1.68	2.48
		0.2	0.3	0.03	0.04	0.02	0.02	0.005	0.006	0.3	0.5	0.07	0.08	0.01	0.02	0.01	0.04
	6	15.6	11.7	0.32	0.26	4.95	3.73	0.495	0.501	32.2	27.0	9.03	7.45	0.07	0.06	2.74	1.88
		0.3	0.2	0.04	0.04	0.02	0.02	0.006	0.006	0.5	0.4	0.08	0.06	0.02	0.02	0.02	0.01
	7	0.31	0.23	0.26	0.16	<0.02	<0.01	<0.007	<0.004	2.96	4.27	<0.02	0.07	<0.02	<0.01	<0.02	0.062
		0.07	0.04	0.05	0.03					0.07	0.07		0.01				0.009
	8	0.35		0.21		<0.02		0.006		2.97		0.17		0.02		0.039	
		0.06		0.04						0.06		0.02				0.006	

(1) Entries consist of mean and standard deviation for triplicate measurements.

APPENDIX B.

Chemical analysis of drilling fluids, water column and sediment samples in Experiment 2

DETERMINATION OF TRACE ELEMENTS IN DRILLING FLUIDS SAMPLES FROM EXPERIMENT 2

I. Samples

A total of 48 samples from the second drilling fluids experiment (DF2) were supplied by investigators at the NMFS, Sandy Hook Laboratory. Half were taken 24 h (Day 2) after the introduction of washed drilling fluids to the test tanks. The remaining samples were taken after 262 h - Day 11 of the test. As in the first experiment, samples were taken from each of eight tanks: two seawater samples from the top of a tank (T), and 1 cm above the tank bottom (B), and a sediment sample (S). The seawater samples were acidified to pH 2 at the time of collection with redistilled HNO_3.

II. Seawater Test Media

A. Sample treatment and analysis

As described in the previous report (Appendix A), seawater samples were aspirated directly into a dc plasma emission spectrometer (dcPES) for simultaneous measurement of 11 elements. Blank and standard solutions were prepared from 0.45-μm filtered seawater from Massachusetts Bay. The salinity of this water was higher than that of the samples, necessitating a small correction for Ca-induced background shifts at some analytical wavelengths. In addition, Ba concentrations were corrected for the presence of 5 ppb Ba in the seawater blank.

B. Results

Of the 11 elements measured, seven could not be reliably detected in the seawater samples. The detection limits for these elements are given in Table 1.

Chromium concentrations were very close to the limit of detection (∿2 ppb), but several test samples from Day 2 contained significantly higher Cr than the control samples. By Day 11 these differences were not detectable (Table 2).

As in the first experiment, Ba, Fe, and Mn were present in the seawater media at measurable concentrations. In DF1, the control tanks had 12±1 ppb of Ba; in DF2 they contained 14±1 ppb of Ba - not a significant difference. The concentrations of Ba in the test tanks were higher than the controls; in most of the test samples from Day 2, the theoretical solubility of Ba in seawater (50 ppb) was exceeded. Ba concentrations were greater in bottom versus top water samples. By Day 11 these Ba levels had decreased to nearly those of the control tanks.

Fe concentrations were slightly higher in test than in control tanks. However, there was no difference between top and bottom samples. The largest differences in average Fe levels occurred between Day 2 (60 ppb) and Day 11 (275 ppb). Since the increase occurred in both test and control tanks, some common source for the additional Fe is indicated. One possibility is in-flowing seawater, but it is more likely that the iron leached from the sand substrate used in all tanks (see below). Mn concentrations in the seawater test media did not vary with time or between test and control tanks.

III. Sediment Samples

A. Analytical technique

The sediment samples were analyzed using the methods described in detail in our previous report (Appendix A). The coarse sand fraction was separated from the fine particle/seawater fraction, and the latter was

leached by seawater and by 25% acetic acid in seawater. The trace element concentrations in the leachates were determined by dcPES.

B. Results

The physical properties of the sediment samples are listed in Table 3. The dry weight of fine particles in the test tanks is approximately twice that obtained for the DF1 test samples, reflecting the higher loading of drilling fluid used in DF2.

Table 4 includes the concentrations of eight elements released into seawater by the fraction consisting of fine particles and water from each sample. The weight of these fractions is included in Table 3. Differences between Day 2 and Day 11 samples from the control tanks are not pronounced, except for decreased Fe concentration in each tank. The test tanks show systematic decreases in Fe and also in Cr, Cu, Mn, Ni, and Zn. In each case, the element was probably leached from the sedimentary layer, with less of the leachable fractions present at the end of the experiment.

Table 5 lists the concentrations of trace elements released by leaching with 25% acetic acid. No systematic variation from Day 2 to Day 11 is evident in the data. Average trace element levels in the sediment from DF1 and DF2 are presented in Table 6. The concentrations of all elements, with the exception of Ba, were higher in the DF2 controls than in DF1 controls. Within DF2, the seawater leachates of the controls contained higher metal concentrations than the tests. Acetic acid released comparable levels of Cu, Fe, and Ni, but much higher concentrations of Ba, Cr, Mn, and Zn in test versus control sediments.

Perhaps the coarse sand substrate in all tanks in the DF2 experiment was the source of acid-leachable metals, notably Al, Fe, and Mn, which

were higher in DF2 versus DF1 samples. In DF2 the seawater leachates of test sediments contained less of these metals than did those of the controls, perhaps due to scavenging of the metals by the fine particles of drilling fluids. These were then released by weak acid leaching with additional contributions of Ba, Cr, Mn, Ni, and Zn from the drilling fluid itself.

The concentrations of drilling fluid-derived metals in DF2 versus DF1 test samples should be approximately twice as high, because of the greater fluid loading. That elements like Ba and Cr were not proportionately higher in DF2 samples may reflect the loss of Cr during the initial settling of the PESA fluid samples and for Ba is the result of the limited solubility of $BaSO_4$ in pH 2 seawater.

Table 1. Limits of detection for elements not observed in seawater test media.

Al	Cd	Cu	Hg	Ni	Pb	Zn
			ppb			
100	15	3	50	5	75	15

Table 2. Concentrations (ppb) of four elements in seawater test media.

	Ba				Cr[1]		Fe				Mn			
	Day 2		Day 11		Day 2		Day 2		Day 11		Day 2		Day 11	
Tank #	Top	Bottom	Top	Bottom	Top	Bottom	Top	Bottom	Top	Bottom	Top	Bottom	Top	Bottom
1 $\bar{x}$	13	14	15	17	<2	<2	53	73	374	444	113	116	113	124
sd	1	1	1	1			7	9	22	26	3	3	3	3
2 $\bar{x}$	14	14	15	16	<2	<2	27	57	163	177	115	125	114	122
sd	1	1	1	1			8	13	14	14	4	3	3	4
3 $\bar{x}$	33	83	17	18	3	7	49	75	205	368	114	122	115	123
sd	7	26	2	1	1	1	8	8	13	28	3	5	4	5
4 $\bar{x}$	24	129	18	20	3	3	91	119	494	379	121	122	119	120
sd	3	50	2	2	1	1	11	10	28	21	6	5	4	4
5 $\bar{x}$	111	192	25	23	<2	3	78	71	267	251	119	120	117	107
sd	17	55	7	2		1	20	9	19	18	3	4	4	5
6 $\bar{x}$	146	165	16	16	3	3	72	83	262	361	119	123	117	110
sd	19	65	1	1	1	1	12	44	16	13	5	4	3	4
7 $\bar{x}$	15	14	15	13	7	<2	46	28	213	156	114	123	117	111
sd	1	1	1	1	1		13	12	18	11	3	4	4	5
8 $\bar{x}$	14	13	15	14	<2	<2	26	31	153	126	112	119	115	118
sd	1	1	1	1			6	8	13	9	4	3	3	6

[1] Cr values of Day 11 were all <2 ppb

Table 3. Physical characteristics of the sediment test medium samples from drilling fluid Experiment 2.

Tank	Day Sampled	Wet Weight of Total Sample (g)	Dry Weight of Coarse Sand (g)	% Coarse in Total	Weight of Water and Fine Particles in Sample (g)	Dry Weight of Fine Particles (g)
1	2	185.0	135.1	73.0	49.87	0.06
Control	11	169.3	127.0	75.0	42.27	0.07
2	2	138.1	97.7	70.7	40.39	0.03
Control	11	191.2	144.0	75.3	47.15	0.04
3	2	198.8	141.6	71.2	57.20	4.49
Test	11	210.7	156.7	74.4	54.00	5.34
4	2	172.4	118.2	68.9	54.19	6.59
Test	11	168.6	117.4	69.6	51.21	5.34
5	2	193.3	137.5	71.1	55.77	6.11
Test	11	205.8	153.0	74.3	52.84	5.48
6	2	190.9	139.3	73.0	51.64	5.14
Test	11	205.8	150.7	73.2	55.10	8.36
7	2	159.8	115.1	72.2	44.68	0.03
Control	11	180.0	132.3	73.5	47.76	0.004
8	2	190.8	123.5	64.7	67.34	0.04
Control	11	179.0	128.4	71.8	50.55	0.007

Table 4. Concentration of some trace elements leached from the fine and water fraction of Experiment 2 sediment samples by seawater (μg/g of fraction).

	Al		Ba		Cr		Cu		Fe		Mn		Ni		Zn	
Tank #	Day 2	Day 11	Day 2	Day 11	Day 2	Day 11	Day 2	Day 11	Day 2	Day 11	Day 2	Day 11	Day 2	Day 11	Day 2	Day 11
Control 1 $\bar{x}$	25.6	30.3	0.048	0.07	0.042	0.031	0.082	0.106	36.9	18.2	3.1	5.80	0.046	0.026	0.70	0.69
sd	0.5	0.2	0.002	0.02	0.004	0.009	0.004	0.007	0.6	0.4	0.2	0.09	0.008	0.007	0.01	0.02
Control 2 $\bar{x}$	30.2	28.8	0.057	0.06	0.104	0.042	0.139	0.066	75	43	3.0	4.90	0.072	0.025	0.60	0.62
sd	0.6	0.2	0.002	0.02	0.005	0.008	0.005	0.006	1	1	0.1	0.08	0.007	0.006	0.02	0.02
Test 3 $\bar{x}$	0.31	0.41	0.36	0.72	0.031	0.017	0.013	<0.006	0.09	<0.1	1.9	0.98	0.031	<0.007	0.79	0.56
sd	0.03	0.04	0.01	0.09	0.002	0.007	0.001		0.03		0.1	0.04	0.005		0.02	0.02
Test 4 $\bar{x}$	0.37	0.31	0.36	0.31	0.037	<0.01	0.009	<0.006	<0.1	<0.1	3.0	0.45	0.031	<0.008	1.08	0.33
sd	0.04	0.04	0.01	0.02	0.002		0.001				0.1	0.04	0.006		0.001	0.02
Test 5 $\bar{x}$	0.41	0.34	0.86	0.32	0.030	<0.01	0.009	<0.006	0.14	<0.1	2.2	1.02	0.013	<0.008	0.922	0.44
sd	0.02	0.04	0.04	0.02	0.002		0.002		0.09		0.1	0.06	0.007		0.007	0.04
Test 6 $\bar{x}$	0.31	0.42	0.36	0.49	0.029	0.022	0.011	<0.005	0.10	<0.1	2.1	1.09	0.031	<0.009	1.08	0.74
sd	0.02	0.04	0.01	0.04	0.002	0.007	0.001		0.04		0.1	0.04	0.004		0.02	0.02
Control 7 $\bar{x}$	35.4	22.4	0.056	0.04	0.110	0.034	0.152	0.057	56.7	36.0	2.1	1.24	0.051	<0.01	0.74	0.34
sd	0.6	0.3	0.002	0.02	0.004	0.008	0.004	0.006	0.9	0.8	0.1	0.04	0.004		0.01	0.02
Control 8 $\bar{x}$	23.7	20.8	0.056	0.06	0.059	0.036	0.062	0.069	37.2	30.4	2.0	1.98	0.025	<0.01	0.42	0.42
sd	0.5	0.2	0.001	0.02	0.003	0.008	0.003	0.006	0.7	0.7	0.1	0.06	0.006		0.01	0.02

Table 5. Concentration of some trace elements leached by 25% acetic acid from the fine and water fraction of Experiment 2 sediment samples (µg/g of fraction).

	Al		Ba		Cr		Cu		Fe		Mn		Ni		Zn	
Tank #	Day 2	Day 11	Day 2	Day 11	Day 2	Day 11	Day 2	Day 11	Day 2	Day 11	Day 2	Day 11	Day 2	Day 11	Day 2	Day 11
Control 1 $\bar{x}$	31	30	0.064	0.073	0.060	0.080	0.072	0.111	45	61	2.97	5.7	0.04	0.06	0.68	0.59
sd	3	3	0.004	0.002	0.004	0.005	0.002	0.002	1	1	0.08	0.2	0.01	0.01	0.04	0.05
Control 2 $\bar{x}$	30	28	0.074	0.062	0.106	0.078	0.101	0.076	73	55	2.70	5.0	0.10	0.08	0.52	0.53
sd	3	3	0.005	0.002	0.005	0.004	0.002	0.002	2	1	0.07	0.1	0.01	0.02	0.02	0.04
Test 3 $\bar{x}$	13	14	0.11	0.39	2.67	2.89	0.369	0.533	39.9	57	7.3	6.9	0.07	0.11	2.73	2.56
sd	1	1	0.01	0.02	0.05	0.06	0.005	0.006	0.8	1	0.2	0.2	0.01	0.02	0.07	0.07
Test 4 $\bar{x}$	19	12	0.29	0.20	3.88	2.36	0.779	0.836	57	61	12.5	5.9	0.13	0.10	6.7	1.70
sd	2	2	0.01	0.06	0.09	0.04	0.007	0.008	1	1	0.3	0.2	0.01	0.02	0.2	0.04
Test 5 $\bar{x}$	17	11	0.16	0.23	4.1	2.67	0.608	0.479	49	58	9.0	7.2	0.11	0.11	4.3	2.02
sd	2	1	0.02	0.06	0.1	0.06	0.007	0.006	1	1	0.3	0.2	0.01	0.01	0.1	0.06
Test 6 $\bar{x}$	16	16	0.19	0.22	3.83	4.43	0.548	0.693	49	66	9.3	10.2	0.12	0.15	3.81	4.5
sd	2	2	0.06	0.02	0.08	0.09	0.008	0.005	1	1	0.3	0.3	0.01	0.01	0.08	0.1
Control 7 $\bar{x}$	32	22	0.058	0.054	0.110	0.057	0.121	0.080	56	41.2	1.86	1.55	0.06	0.05	0.58	0.27
sd	3	2	0.002	0.004	0.004	0.004	0.002	0.002	1	0.9	0.04	0.04	0.01	0.01	0.02	0.02
Control 8 $\bar{x}$	23	19	0.049	0.081	0.061	0.036	0.079	0.078	36.9	34.7	1.83	2.31	0.03	0.04	0.37	0.32
sd	2	2	0.003	0.004	0.003	0.004	0.003	0.002	0.8	0.7	0.04	0.06	0.01	0.01	0.03	0.02

Table 6. Mean concentration of trace elements leached from DF Experiment 1 and Experiment 2 sediment samples by I. seawater, and II. 25% acetic acid (μg/g of fraction).

		Al	Ba	Cr	Cu	Fe	Mn	Ni	Zn
I.									
DF1 Control	$\bar{x}$	0.5	0.06	<0.004	0.010	4			0.06
(n=3)	sd	0.5	0.02		0.006	3	<0.2	<0.01	
DF1 Test	$\bar{x}$	<0.5	1.4	0.017	0.016	24	0.5	0.02	0.17
(n=5)	sd		0.8	0.004	0.004	14	0.2	0.01	0.05
DF2 Control	$\bar{x}$	27	0.056	0.06	0.09	42	3	0.03	0.6
(n=8)	sd	5	0.009	0.03	0.04	17	2	0.02	0.2
DF2 Test	$\bar{x}$	0.36	0.5	0.02	0.007	<0.1	1.6	0.02	0.7
(n=8)	sd	0.05	0.2	0.01	0.004		0.8	0.01	0.3
II.									
DF1 Control	$\bar{x}$	0.30	0.21	<0.02	< 0.004	3.4	<0.08	<0.02	0.04
(n=3)	sd	0.06	0.05			0.8			0.03
DF1 Test	$\bar{x}$	13	0.25	4.3	0.5	30	8	0.06	2.2
(n=5)	sd	11	0.05	0.9	0.1	6	1	0.02	0.4
DF2 Control	$\bar{x}$	27	0.06	0.07	0.90	50	3	0.06	0.5
(n=8)	sd	5	0.01	0.03	0.09	13	2	0.02	0.1
DF2 Test	$\bar{x}$	15	0.22	3.4	0.6	55	9	0.11	4
(n=8)	sd	3	0.09	0.8	0.2	8	2	0.02	2

APPENDIX C.

Chemical analysis of drilling fluids, water column, and sediment samples in Experiment 3

DETERMINATION OF TRACE ELEMENTS IN SAMPLES FROM DRILLING FLUIDS EXPERIMENT 3

I. Samples

A total of 142 samples from the third drilling fluid experiment (DF3) were supplied by investigators at NMFS, Sandy Hook Laboratory. As in prior experiments, three kinds of samples were supplied: seawater samples labelled "T" from the top of the tank and "B" from 1 cm above the tank bottom, and sediment samples labelled "S". Samples had been taken to bracket four introductions of drilling fluid during the course of the experiment. In addition, two samples of the washed drilling fluid used in the experiment were provided.

Given such a large collection of samples, analyses of all of them were not practical. Therefore, control samples from Tank 1 and test samples from Tanks 4 and 5 were selected for analysis. In addition, the concentrations of barium, chromium, and iron in the washed drilling fluid used in the test tanks were analyzed.

II. Seawater Test Media

A. Sample treatment and analysis

As described in previous reports (Appendices A, B), seawater samples were acidified in their original containers with redistilled HNO_3, and directly analyzed by dcPES. The concentrations of 10 elements were measured simultaneously: Al, Ba, Cd, Cr, Cu, Fe, Hg, Mn, Ni, and Zn.

B. Results

Five elements were not present at detectable levels in the seawater test media. Detection limits for these elements are given in Table 1. The

concentrations of the five elements present in detectable amounts are reported in Table 2.

The concentrations of metals were much higher in the first samples taken (one hour) after each introduction of drilling fluid. Detectable amounts of Cr appeared only in this subgroup of samples. Detectable levels of Al were found predominately in this subgroup. Elevated concentrations of Ba, Fe, and Mn were detected in the one hour samples, and declined with increased settling time. Ba concentrations showed the greatest decline in the interval, indicating that most of the Ba in the water samples was present as settling solids - probably fine barite particles.

Samples of surface water taken one hour after the introduction of drilling fluid contained greater metal concentrations than those from near the bottoms of the same tanks. This relationship does not hold for samples taken after longer settling intervals, suggesting relatively rapid settling of particulate metals from the upper water column. Ba levels in nearly all samples exceeded the theoretical solubility limit of ∿50 ppb in seawater, indicating that some Ba was present in suspended particles or was stabilized in solution by other fluid components.

III. Sedimentary Test Media

A. Sample treatment and analysis

The sediment samples were analyzed using the methods described in our previous reports (Appendices A, B). The coarse sand was separated from the fine particle/seawater fraction by sieving. Aliquots of the latter fraction were leached by seawater and by 25% acetic acid in seawater, and the dissolved concentrations of 10 metals in the leachates were measured

by dePES. The dry weight of fine particles (<500 μm) in this fraction was determined by filtering a representative subsample, then drying the retained solids at 100°C and weighing.

B. Results

Physical characteristics of the sediment samples are listed in Table 3. The dry weight of fine particles increases with successive additions of drilling fluid to the test tank. The fourth addition, sampled on Day 11, increased the loading of fine particles by twice that of each prior introduction of fluid. By the final day of the experiment, the concentration of fine particles in the sediment samples had decreased dramatically.

The results of trace metal determinations are presented in Tables 4 and 5. The concentrations are normalized to the weight of the sample fraction consisting of fine particles and seawater - that is, the total sample minus the coarse sediment.

In both leachates the control samples have significantly more of the majority of the elements on Day 1 than they do by Day 11. If levels in all tanks are higher at first, the sediments are gradually losing leachable material. Perhaps the elements are being carried out of the system in seawater. Mechanisms of adsorption to and settling with particles would give an increase in acid-leachable metal concentrations with time. This is not observed in the control. Another possible sink of metals is adsorption to the tank walls.

In the sediments from the test tanks, the seawater-leachable metal concentrations generally decrease from a starting level much higher than that in the control through each of the successive drilling fluid introductions, then rise again on the last day of the experiment, about 66 h

after the last addition of fluids to the tank. Only Al and Fe do not start on Day 2 at higher concentrations than the Day 1 control.

Conversely, the concentrations of acid-leachable metals in the test sediments increase with successive additions of drilling fluid. The relatively high concentrations in Day 5 versus Day 8 may be an artifact of the normalization method. There is an unusually small weight of seawater in the former and a large weight in the latter (Table 3).

It is possible that metals which are available to the seawater leaching process at the beginning of the experiment are bound to the sediment with time and with successive additions of organic and clay adsorbents, so that more rigorous leaching conditions are necessary to release them.

IV. Test Drilling Fluid

A. Sample treatment and analyis

The drilling fluid used in the experiments at NMFS, Sandy Hook Laboratory, is a used fluid from Galveston Island, Texas, supplied by the Petroleum Equipment Suppliers Association (PESA). Other laboratories have also performed some work on this fluid. An analysis protocol for total Ba in drilling fluids that includes a simple dissolution procedure has been developed. This was performed on samples of the seawater-washed PESA fluids supplied by Sandy Hook researchers. Subsequent work has shown that the Ba concentrations obtained by this method are occasionally low, and other methods are being examined. The concentrations of Fe and Cr released by the procedure outlined below appear to be reproducible, although the fraction of these elements in the lithogenous phase of the fluid is not released.

Triplicate subsamples of drilling fluid (~0.5 ml) were treated with 10 ml of 30% hydrogen peroxide, H_2O_2, to oxidize organic material. After 2 h, each sample was diluted to 1-liter with 3% HCl in deionized water, and then shaken for three days. Monitoring of metal concentrations over a period of a week has shown that values rise rapidly in the first two days, then stabilize at a maximum. The large ratio of extractant to sample was designed to prevent limitation of dissolved Ba concentrations by the insolubility of $BaSO_4$. However, low Ba results do occur occasionally.

B. Results

The Ba measurements obtained by our best measurements to date are not reliable. However, neutron activation analysis of the PESA fluids gives a Ba concentration of 27-28% in the dry whole fluid (Robert Shokes, personal communication). The concentrations of Cr and Fe obtained from the whole and washed samples of PESA drilling fluid by dcPES measurement of the 3% HCl leachates are summarized in Table 6. Roughly two-thirds of the Cr and Fe found in the whole drilling fluids has been removed by the process of washing the fluids through 20 m of seawater.

Table 1. Detection limits for four trace metals in seawater samples.

Cd	Cu	Hg	Ni	Zn
		ppm		
0.03	0.01	0.05	0.01	0.02

Table 2. Concentrations of five elements in seawater samples from the top and bottom of two tanks (ppm).

Sample				Al	Ba	Cr	Fe	Mn
Control	Day 1	T	$\bar{x}$	<0.02	<0.02	<0.008	0.08	0.09
			sd				0.02	0.01
(Tank #1)		B	$\bar{x}$	<0.02	<0.02	<0.008	0.04	0.083
			sd				0.02	0.009
	Day 11	T	$\bar{x}$	<0.02	<0.02	<0.008	0.11	0.081
			sd				0.02	0.008
		B	$\bar{x}$	<0.01	<0.02	<0.008	0.13	0.08
			sd				0.02	0.01
Test: 1 hr after mud introduction								
(Tank #4)	Day 1	T	$\bar{x}$	2.71	7.9	0.095	2.3	0.15
			sd	0.04	0.3	0.009	0.1	0.01
		B	$\bar{x}$	2.56	7.4	0.092	2.15	0.15
			sd	0.03	0.2	0.010	0.05	0.01
	Day 4	T	$\bar{x}$	1.78	5.8	0.080	1.69	0.12
			sd	0.02	0.2	0.009	0.08	0.01
		B	$\bar{x}$	1.70	5.6	0.074	1.56	0.12
			sd	0.03	0.3	0.009	0.03	0.01
	Day 7	T	$\bar{x}$	2.01	5.3	0.075	1.74	0.11
			sd	0.04	0.2	0.009	0.05	0.01
		B	$\bar{x}$	1.43	3.3	0.071	1.47	0.11
			sd	0.05	0.1	0.009	0.05	0.11

Table 2. (continued)

Sample			Al	Ba	Cr	Fe	Mn
Day 10	T	$\bar{x}$	2.5	7.0	0.079	2.0	0.12
		sd	0.1	0.3	0.009	0.2	0.01
	B	$\bar{x}$	1.60	3.3	0.078	1.51	0.12
		sd	0.09	0.3	0.009	0.07	0.01
18 hr after mud introduction							
Day 2	T	$\bar{x}$	<0.02	0.06	<0.009	0.08	0.102
		sd		0.02		0.02	0.009
	B	$\bar{x}$	<0.08	0.09	<0.008	0.09	0.10
		sd		0.02		0.02	0.01
Day 5	T	$\bar{x}$	<0.02	0.24	<0.008	0.12	0.08
		sd		0.02		0.02	0.01
	B	$\bar{x}$	<0.05	0.18	<0.008	0.17	0.082
		sd		0.02		0.02	0.009
Day 8	T	$\bar{x}$	<0.05	0.10	<0.008	0.08	0.09
		sd		0.02		0.02	0.02
	B	$\bar{x}$	<0.02	0.11	<0.008	0.13	0.08
		sd		0.02		0.02	0.01
Day 11	T	$\bar{x}$	<0.02	0.12	<0.009	0.16	0.073
		sd		0.02		0.02	0.009
	B	$\bar{x}$	<0.04	0.12	<0.008	0.13	0.07
		sd		0.02		0.02	0.01

Table 2. (continued)

Sample				Al	Ba	Cr	Fe	Mn
1 hr prior to mud introduction								
	Day 4	T	$\bar{x}$	<0.03	0.04	<0.008	0.14	0.064
			sd		0.02		0.02	0.009
		B	$\bar{x}$	<0.04	0.04	<0.009	0.10	0.079
			sd		0.02		0.02	0.008
	Day 7	T	$\bar{x}$	0.51	0.09	<0.008	0.10	0.079
			sd	0.09	0.02		0.02	0.008
		B	$\bar{x}$	<0.02	0.06	<0.008	0.08	0.08
			sd		0.02		0.02	0.01
	Day 10	T	$\bar{x}$	<0.02	0.05	<0.008	0.11	0.078
			sd		0.02		0.02	0.008
		B	$\bar{x}$	<0.02	0.08	<0.008	0.11	0.07
			sd		0.02		0.02	0.01
Final sample	Day 13	T	$\bar{x}$	<0.02	0.06	<0.008	0.16	0.081
			sd		0.02		0.02	0.008
		B	$\bar{x}$	<0.02	0.05	<0.008	0.22	0.08
			sd		0.02		0.02	0.01

Table 3. Physical characteristics of the sediment test medium samples from Tanks 1 and 5, drilling fluid Experiment 3.

Sample	Day Sampled	Wet Weight of Total Sample (g)	Dry Weight of Coarse Sand (g)	% Coarse in Total	Weight of Water and Fine Particles in Sample (g)	Dry Weight of Fine Particles (g)	% Fine Particles in Total
Control Tank 1	1	170.9	124.3	72.7	46.6	0.03	
	11	180.1	128.4	71.3	51.7	0.05	
Test Tank 5	2	252.8	174.9	69.2	77.9	7.77	3.1
	5	250.1	188.0	75.2	62.1	15.17	6.1
	8	229.6	110.8	48.3	118.8	23.84	10.0
	11	249.1	181.2	72.7	67.9	42.77	17.2
	13	127.3	82.3	64.7	45.0	6.35	5.0

Table 4. Concentration of trace elements leached from the fine particle/seawater fraction of sediment samples by seawater (μg/g of fraction).

Sample	Day Sampled		Al	Ba	Cr	Cu	Fe	Mn	Ni	Zn
Control Tank 1:										
	1	$\bar{x}$	81	0.17	0.36	0.07	231	1.98	0.09	0.28
		sd	4	0.05	0.06		8	0.09		0.09
	11	$\bar{x}$	0.2	0.06	0.06	0.07	0.10	0.07	0.09	0.08
		sd		0.04						
Test Tank 5:										
	2	$\bar{x}$	47	0.72	2.16	4.15	73	59.8	0.34	6.0
		sd	1	0.04	0.04	0.07	2	1.0	0.01	0.1
	5	$\bar{x}$	4.6	0.158	0.26	0.06	0.22	56.1	0.39	4.8
		sd	0.1	0.009	0.01	0.01	0.06	0.7	0.02	0.1
	8	$\bar{x}$	2.66	0.48	0.183	0.031	0.41	32.2	0.18	1.09
		sd	0.07	0.05	0.007	0.006	0.10	0.5	0.01	0.03
	11	$\bar{x}$	0.5	0.56	0.03	0.03	0.3	3.35	0.10	0.70
		sd	0.1	0.04	0.01	0.01	0.1	0.05	0.03	0.02
	13	$\bar{x}$	3.2	0.300	0.15	0.28	0.1	3.29	0.08	1.90
		sd	0.2	0.010	0.02	0.02		0.05	0.04	0.04

Table 5. Concentration of trace elements leached from the fine particle/seawater fraction of sediment samples by 25% acetic acid in seawater (μg/g of fraction).

Sample	Day Sampled		Al	Ba	Cr	Cu	Fe	Mn	Ni	Zn
Control Tank 1:										
	1	$\bar{x}$	67.3	0.15	0.34	0.20	201	1.71	0.14	0.46
		sd	0.5	0.05	0.01	0.02	1	0.07	0.04	0.03
	11	$\bar{x}$	1.40	0.10	0.03	0.08	93.3	1.11	0.03	0.31
		sd	0.06	0.05		0.02	1.0	0.09		0.04
Test Tank 5:										
	2	$\bar{x}$	45	0.03	3.34	4.11	122	53.8	0.33	5.06
		sd	3	0.01	0.05	0.04	2	0.5	0.01	0.08
	5	$\bar{x}$	56	0.12	8.4	6.24	219	86.7	0.53	9.9
		sd	4	0.02	0.1	0.03	4	0.4	0.02	0.1
	8	$\bar{x}$	38	0.22	7.50	4.87	177	62.0	0.421	7.17
		sd	3	0.02	0.07	0.03	3	0.4	0.010	0.07
	11	$\bar{x}$	54	0.57	13.8	13.13	375	111.3	0.80	15.4
		sd	4	0.04	0.1	0.07	7	0.8	0.02	0.2
	13	$\bar{x}$	24	0.09	5.2	4.53	140	34.4	0.32	4.3
		sd	2	0.03	0.1	0.08	4	0.7	0.03	0.1

Table 6. Comparison of seawater washed and whole used drilling fluids from Galveston Island.

Sample	Solids Content in Whole Drilling Fluids (g/ml)		Concentrations released by H_2O_2/HCl dissolution (mg/g dry solids)	
			Cr	Fe
Unwashed	0.76	$\bar{x}$	0.60	1.2
		sd	0.03	1
Washed	0.14	$\bar{x}$	0.17	4.1
		sd	0.03	0.4

APPENDIX D

Drilling fluids source information

CO 427

8 October 1981

Dr. Bori Olla, Chief
Behavior Investigations
NOAA/NMFS
Northeast Fisheries Center
Sandy Hook Laboratory
Highlands, NJ 07732

Dear Bori:

As requested, I have compiled information on the Galveston County well which was the source of one of the drilling fluids tested in your program. This information is in addition to previously supplied information on the well location (State Tract 122 A-1, Townsite #3, Galveston County, TX.), the daily mud report for the day sampled, and the sample documentation sheets. I must apologize for the delay in obtaining this data; however, I am greatly understaffed for our current activities.

As I indicated earlier, the mud used in this well was a very typical lignosulfonate mud. The well was located in the wetlands of Galveston Island within a few meters of Galveston Bay (see photograph); however, it could have just as easily been in the water. Other wells for the development of that field have been over the water. In reviewing the program, I do not note any products which would be banned nor changed had the job been of a marine nature. A small amount of sodium chromate was used (1 sack) and this might would be deleted if the operation had been in a more closely regulated area (e.g., Flower Gardens or Georges Bank). Otherwise, the products are the same and in the same relative proportions as one might find on any offshore coast. The drilling operation proceeded as normal and all equipment used was standard.

I have compiled the total amount of products used up to the day of sampling, 20 January 1981 (note: drilling continued until 8 March 1981) in Table 1. Our trade name as well as a brief generic description is listed for each product added. The source of this data is the daily mud report completed each day by the mud engineer. I have attached these also for your reference (Appendix A) and have compiled daily product usage by day in Table 2. For each product, I have calculated total weight (pounds) and relative percentage (%) of the total fluid additive weight. Because several engineers worked this job, errors were made on the daily mud sheets in calculating total products added. I have corrected these in my compilations in order to give an accurate

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accounting of product usage. Whenever a decision was necessary as to which numbers was correct, I tried to estimate on the conservative side. Corrections are in brackets on Table 2.

For the purposes of any publication which may result from your work, I request that trade names not be used but rather the generic descriptions. I have purposefully deleted all references on the mud reports and associated data with regards to the operator's identity and would likewise request the same with regards to our corporate name. Insomuch as this investigation is directed towards an understanding of drilling fluids in general, I do not see any reason for identifying any particular company. You may, of course, cite my name and affiliation in personal communication as a data source.

The depth of the well at the time of sampling (9,556 ft) represents approximately 75% of the total depth (12,702 depth) even though only 42% of the total operations time had passed (35 days of total 83 days). The depth represents an approximate average depth of wells for the domestic United States (10,000 ft) and is quite close to the mean depth (10,591 ft.) of wells reviewed by Gary Petrazzuolo[1] for the EPA. For the sake of comparisons, I have contrasted the Galveston County well to his findings on the composition of the mud.

TOTAL MUD ADDITIVES

From a review of five wells in the average depth range (9,800-11,085 ft), Petrazzuolo found that the total amount of mud additives ranged from 300-850 tons per well with a mean of 662 tons. The Galveston County well, at the time of sampling, had used 324 tons. While this is within the range of 300-850, it is below the mean; however, the depth is also slightly below the depth range from which he drew his data. Galveston County well was plotted over Figure 3-1 and it is in line with the other data points.

TOTAL BARITE

For the same five wells, Petrazzuolo noted a range of 240-730 tons per well with a mean of 539 tons. The Galveston County well used 289 tons and is within the range. Again, the amount falls below the mean because the depth is just slightly below the depth range. Barite usage, while directly correlated

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1 Petrazzuolo, G., 1981. An environmental assessment of drilling fluids and cuttings released onto the Outer Continental Shelf. Report to Industrial Permits Branch and Ocean Programs Branch, U.S. Environmental Protection Agency. 2 volumes. Various pagination. DRAFT.

with depth, is more importantly a function of downhole pressures. One could have identical depths with different barite percentages due to differential formation pressures. Figure 3-2 is attached.

TOTAL LIGNOSULFONATE

Petrazzuolo (1981:3-8) noted that the relative percentage of lignosulfonate exhibited greater variability than either total fluid additives or barite usages. Nevertheless, the Galveston County well lignosulfonate usage of 8.15 tons is within the range of 6.3-29 tons per well with a mean of 17.2 tons. The lignosulfonate used on this well, IMCO RD-111, is our most widely used lignosulfonate. Figure 3-3 has been attached with the Galveston County data plotted on the graph.

TOTAL BENTONITE

Total bentonite clay used in the Galveston County well (9.0 tons) is below the range given for the 5 wells Petrazzuolo included in the medium depth range (31-117 tons per well with a mean value of 55 tons). However, he noted that his mean is skewed by one data point and that clay usage is the most different product to characterize. He explains, and rightly so, that the variability is a result of downhole conditions, namely the viscosifying action of formation clays. Along the Texas Gulf Coast, we have an abundance of fine colloidal clays called "gumbo" in our substrate due to the depositional nature of the Gulf Coast.

Perry and Hower[2] extensively studied the composition of shales obtained from wells drilled in the Galveston area at depths from 3,364 to 17,000 feet. They found smectite-illite mixed layers clays predominant at shallow depths with kaolinite clay predominant as depth increases.

OTHER BASIC DRILLING FLUID COMPONENTS

Other basic drilling fluid components discussed by Petrazzuolo (1981:3-11) include lignite, cellulosic polymers, caustic soda, and carbonate/bicarbonate. The Galveston County well had three of these four components. Lignite (IMCO LIG) usage at 9.5 tons fell within his range (2.5-23.7) and was very close to his means of 11.5 tons per well. Caustic usage at Galveston (3.9 tons) is below his range (6.4-39.3 tons) but was adequate to maintain the desired 10-11 pH. Soda ash (carbonate) usage is within the range of 0.-1.5 tons.

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2 Perry, E. and J. Hower, 1970. Burial diagenesis in Gulf Coast sediments. Clays and Clay Minerals 18:165-177.

SPECIAL ADDITIVES

Petrazzuolo noted that the number and amounts of special additives used are highly well specific due to variable downhole conditions. He noted that sodium acid pyrophosphate, alumminum stearate, and gound nut shells are used frequently. All three were in the Galveston County mud program. Overall, the total special additives category constituted 1.81% of the total mud additive weight. This agrees with Petrazzuolo's finding that "...generally, special additives represent only a small fraction of total additives usage (less than 16% but generally less than 4%)...". The special additives are composed of the following: IMCO MD (0.19%), IMCO SAPP (0.45%), IMCO PLUG (0.31%), Soltex (0.81%), Aluminum stearate (0.03%), and sodium chromate (0.02%). Table 3-10 is attached for reference.

Bori, I believe this information should be adequate to characterize the mud which you tested and to demonstrate that it was a typical mud such as is being discharged on the OCS around the country. If I can supply any additional information, please do not hesitate to call (713/671-3684). I would appreciate a copy of any reports or papers. By the way, thanks for your report on Callinectes. Best regards.

Sincerely yours,
IMCO Services

Mo Jones

Maurice (Mo) Jones, Supervisor
Environmental Affairs and Regualtions

MJ/jye

Attachments

cc: Doyle Waller, IMCO
Roger Bleier, IMCO
James H. Baker, IMCO
Mike Hulse, IMCO

Table 1. Product composition of mud at time of sampling (20 January 1981) for ST 122 A-1, Townsite #3, Galveston County, TX.

Product Name	Generic Description	Unit	Units Used	Total Weight	% Total
IMCO BAR	barite	100	5780	578,000	89.08
IMCO GEL	bentonite clay	100	180	18,000	2.77
IMCO RD-111	chrome lignosulfonate	50	326	16,300	2.51
IMCO LIG	lignite	50	340	17,000	2.62
IMCO MD	detergent	5 gal/42 lbs	30	1,260	0.19
IMCO SAPP	sodium acid pyrophosphate	100	29	2,900	0.45
IMCO PLUG	pecan shells	50	40	2,000	0.31
Soltex	asphaltic compound	50	105	5,250	0.81
Aluminum stearate	aluminum stearate	25	9	225	0.03
Soda ash	sodium carbonate	100	1	100	0.02
Sodium chromate	sodium chromate	100	1	100	0.02
Caustic soda	sodium hydroxide	50	155	7,750	1.19
				Σ = 648,885	100.00

Table 2. Daily product usage for ST 122 A-1, Townsite #3, Galveston, TX.

REPORT NO.	DATE	IMCO BAR*	IMCO GEL	RD-111	IMCO LIG	CAUSTIC	MD	SAPP	SOLTEX	MISC.
1	12/16/80	NO DATA RECORDED								
2	12/19/80	840B/2S	54			5		7		
3	12/20/80				[7]	2	1	7		
4	12/21/80		21		7	11	4			
5	12/22/80	16S	24		8		3			
6	12/23/80				6	3				Plug 20
7	12/24/80	NO REPORT		[8]	[18]	[7]	[4]			
8	12/25/80	[20S]	[9]	12	24	10	4			Al Stearate 1
9	12/26/80	32S	14	[4]	[12]	[2]		8		Soda Ash 1
10	12/27/80		15	12	24	4				
11	12/28/80		20	10	20	5				
12	12/29/80	20S	5			11				Plug 20
13	12/30/80	499B/40S		6	12	5				
14	12/31/80			13	20	5	5			
15	1/ 1/81	10S		27	10	5	6		69	
16	1/ 2/81			10	10	3				
17	1/ 3/81			18	6	8				
18	1/ 4/81	408B/10S	8	17	10	4	1		2	Al Stearate 2
19	1/ 5/81	449B		10	10	5				
20	1/ 6/81	10S		10	13	9			5	
21	1/ 7/81	20S		10	10	5			5	
22	1/ 8/81	20S		15	29	11	1		9	
23	1/ 9/81			21	11	9	1			
24	1/10/81	421B/30S		56		6				
25	1/11/81			8	11	2				
26	1/12/81	495B	5	12	[20]	3				Al Stearate 1
27	1/13/81	NO TREATMENT								
28	1/14/81	500B/30S		17	2				10	NaCr 1 Al Stearate 2
29	1/15/81	NO TREATMENT NEEDED								
30	1/17/81	NO TREATMENT NEEDED								
31	1/18/81	20S		10	5	5		7		Al Stearate [3]
32	1/19/81	935B		10	10	5				
33	1/20/81	938B/15S	5	10	25	5			5	
TOTALS		5485B 295S T ~5780	180	326	340	155	30	29	105	40 Plug 9 Al Stearate 1 Soda Ash 1 NaCr

* IMCO BAR is listed as both bulk (B) and sack (S) material.

WEIGHT OF TOTAL MUD ADDITIVES UTILIZED
VERSUS DEPTH OF WELL

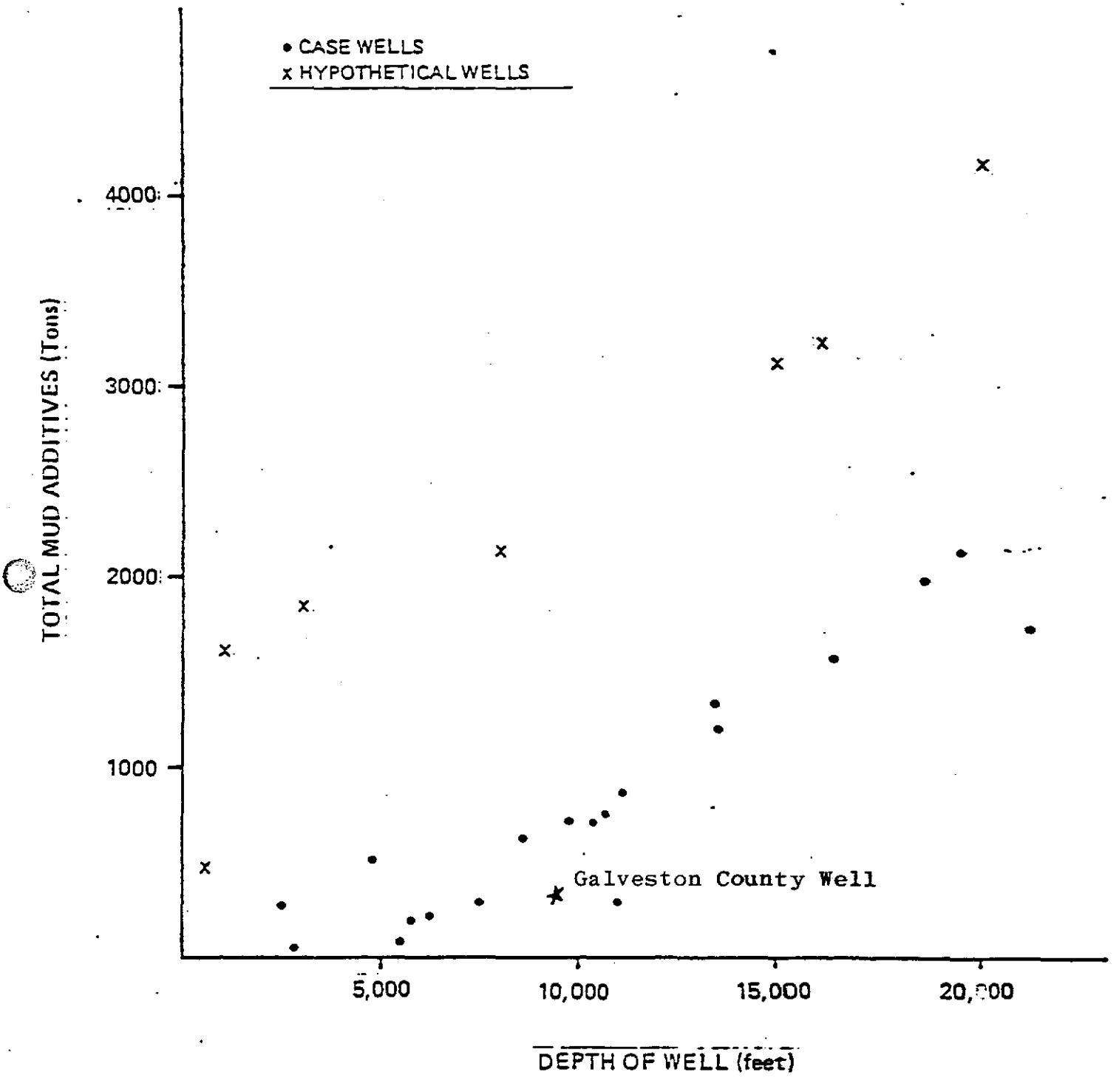


Figure 3—1

from Petrazzuolo, 1981.

BARITE UTILIZED VERSUS DEPTH OF WELL

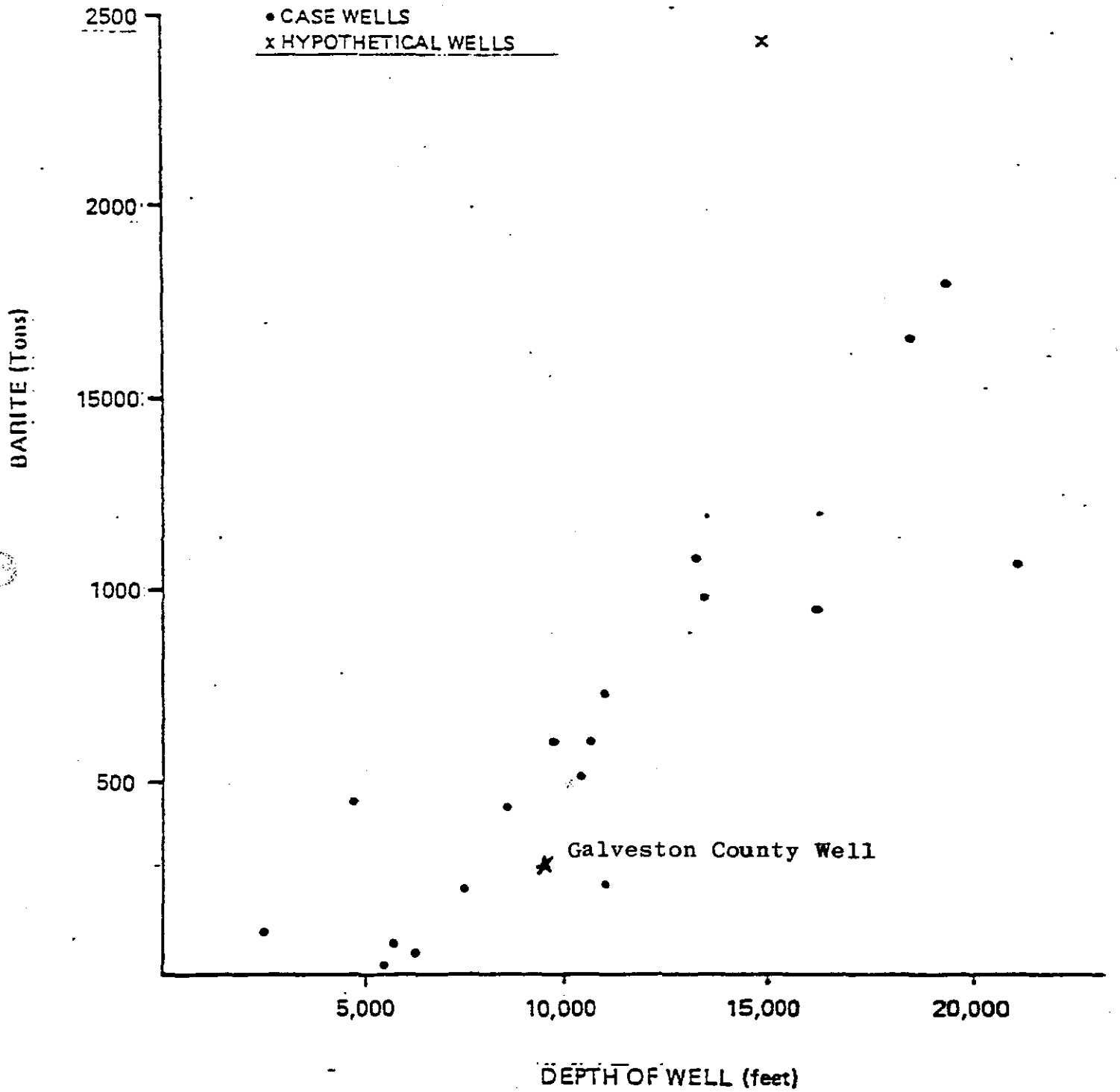


Figure 3–2

from Petrazzuolo, 1981

CHROME – PLUS FERROCHROME LIGNOSULFONATE
UTILIZED VERSUS DEPTH OF WELL

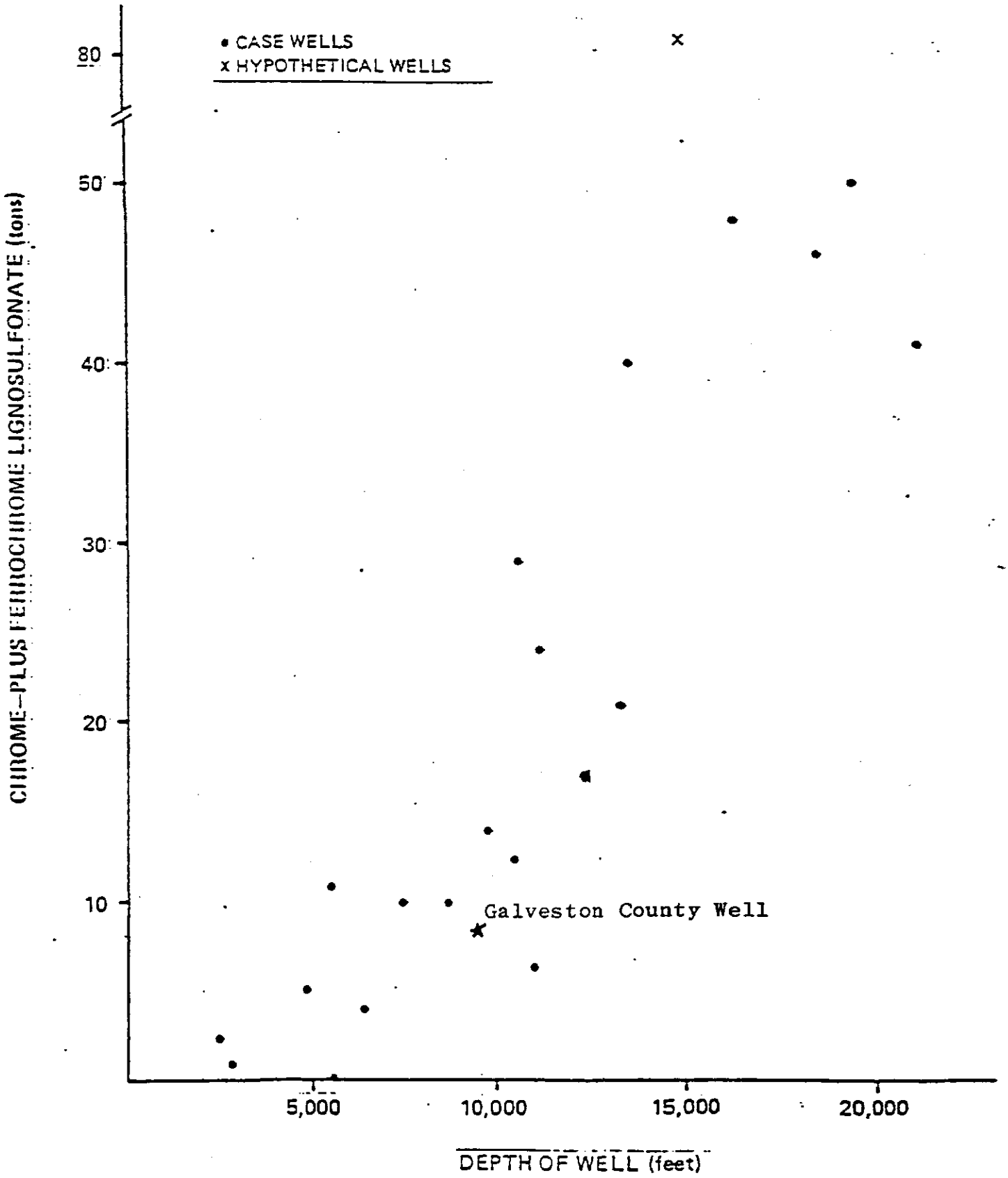
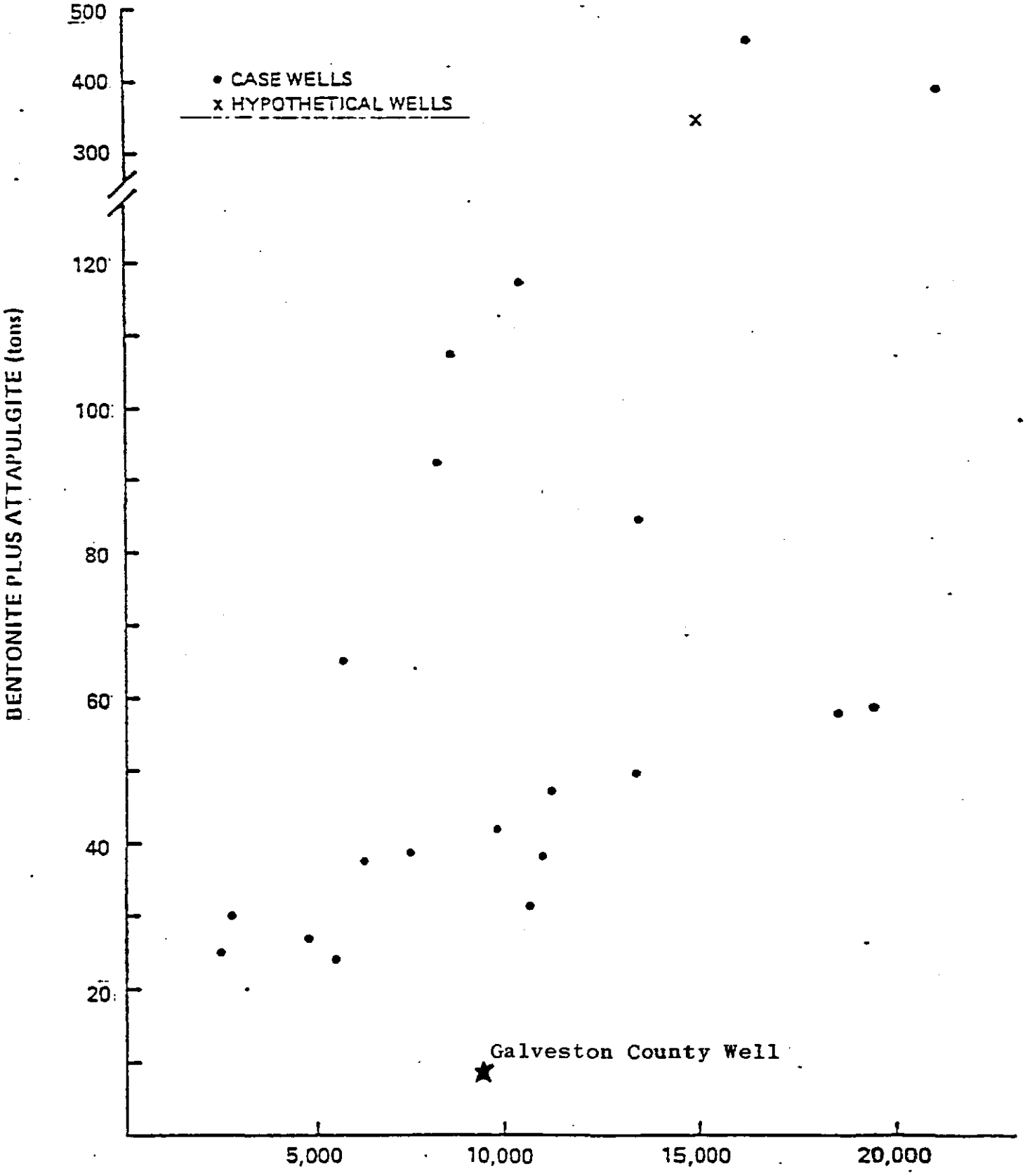


Figure 3–3

from Petrazzuolo, 1981

BENTONITE PLUS ATTAPULGITE CLAYS UTILIZED
VERSUS DEPTH OF WELL



from Petrazzuolo, 1981

Table 3-10. SPECIALTY ADDITIVE USAGE (PERCENTAGE OF TOTAL USAGE) VERSUS DEPTH OF WELL

Well Designation	Depth of Well (feet)	Specialty Addit Usage (% Total)
C	4851	0.97
I	5410	0.16
A	9800	0.07
B	10,418	0.69
G	10,641	2.88
H	11,085	1.08
J	13,525	3.37
L	15,000	1.94
K	16,320	0.10
D	19,472	15.7
F	21,113	10.3

*For references to this table, refer to the appropriate well designation and citation in Table 3-6.

from Petrazzuolo, 1981

RT REPORT NO. 2

DEPTH 1800

WELL | S/T

NO. #1

DATE 2-15-90

REPORT FOR MR. Mike Hodge

REPORT FOR MR. Buster Pate

SECTION, TOWNSHIP, RANGE

WELL NAME AND NO. A-1

FIELD OR BLOCK NO. 122A-593

COUNTY, PARISH OR OFFSHORE AREA GALVESTON

STATE/PROVINCE TX

OPERATION		CASING	MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: Drilling		SURFACE: 10 3/4 IN. AT 1500 FT.	HOLE: 150	PITS: 468	PUMP SIZE: 4 1/2 X 9 IN.	ANNULAR VEL. (FT./MIN.): — OPPOSITE DP: —
BIT SIZE (IN.): 9 7/8	NO.: 2	INTERMEDIATE: — IN. AT — FT.	TOTAL CIRCULATING VOLUME: 618		PUMP MAKE / MODEL: P-9	OPPOSITE COLLAR: 99
DRILL PIPE SIZE: 4 1/2	TYPE: 16.6	PRODUCTION OR LINER: — IN. AT — FT.	IN STORAGE: —	WEIGHT: —	BBL./STROKE: .0396 STROKE/MIN.: 118	CIRCULATING PRESSURE PSI:
DRILL COLLAR SIZE: 7	LENGTH: 329	MUD TYPE: Spud			BBL./MIN.: 4.673	BOTTOMS UP (MIN.): 26 SYSTEM TOTAL (MIN.): 132

Sample from ☐ Flowline ☑ Pit
Flowline Temperature 84 °F

MUD PROPERTIES	TN		
Time Sample Taken	0500		
Depth (ft)	1800		
Weight ☑ (ppg) ☐ (lb/cu ft)	9.1		
Mud Gradient (psi/ft)	.4727		
Funnel Viscosity (sec/qt) API at 78 °F	37		
Plastic Viscosity cp at 78 °F	6		
Yield Point (lb/100 sq ft)	22		
Gel Strength (lb/100 sq ft) 10 sec/10 min	10/24	/	/
pH ☑ Strip ☐ Meter	10.5		
Filtrate API (ml/30 min)	45		
API HP HT Filtrate (ml/30 min) at ___ °F	—		
Cake Thickness 32nd in API ☐ HTHP ☐	4		
Alkalinity, Mud (Pm)	2.1		
Alkalinity, Filtrate (P_f/M_f)	7.1	/	/
Salt ☐ppm ☐ppg Chloride ☐ppm ☐ppg	2400		
Calcium ☑ ppm ☐ Gyp ppb	40		
Sand Content (% by Vol)	2		
Solids Content (% by Vol)	8		
Oil Content (% by Vol)	—		
Water Content (% by Vol)	92		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT

	SIZE	HRS/TOUR			SIZE	HRS/TOUR
Centrifuge	NONE			Desilter		
Degasser				Shaker	While Drilling	
Desander				Mud Cleaner	While Drilling	

DAILY COST 9,025.00 INCL ALL BULK CUMULATIVE COST 9025.00

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
9.2	34-38	20-10

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☐ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT		DAILY USE
☐ IMCO BAR	As Needed to Slug	2 2
☐ IMCO GEL	1 SX/Connection	59
☐ IMCO BRINEGEL	BAR Bulk/100 lbs	84
☐ IMCO RD-111	6 SX/Tour	
☐ IMCO PAC	As Needed to Control Use	
☐ IMCO THIN		
☐ IMCO CAUSTIC SODA	3 SX/Tour	5 5
☑ IMCO M D	4 CNS/Tour	
☐ IMCO POLY RX		
☑ SAAP	As Needed to Cont Use	7 7
☐		

REMARKS Run Plenty of Water - Run Mud Cleaner While Drilling.
Mud Cleaner Pump Motor Burnt out - Drilled out Cement Plug - No Problems.

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
Pat Sparks	Liberty, TX	336-2255
	WAREHOUSE LOCATION	TELEPHONE

RT REPORT NO. 5

DEPTH 2334

WELL | S/T

JOB NO. 1

JOB DATE 2-15-80

SECTION, TOWNSHIP, RANGE —

PROVINCE X

A-1 | TECH-TIS | [illegible]

OPERATION		CASING	MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: Survey / OOH		SURFACE: 10 3/4 IN. AT 1500 FT.	HOLE: 200	PITS: 309	PUMP SIZE: 4 1/2 X 9 IN.	ANNULAR VEL. (FT./MIN.) OPPOSITE DP: 62
BIT SIZE (IN.): 9 7/8	NO.	INTERMEDIATE: — IN. AT — FT.	TOTAL CIRCULATING VOLUME: 509		PUMP MAKE / MODEL: D-9	OPPOSITE COLLAR: 99
DRILL PIPE SIZE: 4 1/2	TYPE: 16.6	PRODUCTION OR LINER: — IN. AT — FT.	IN STORAGE	WEIGHT	BBL./STROKE: 0.0396 STROKE/MIN.: 118	CIRCULATING PRESSURE PSI: 1800
DRILL COLLAR SIZE: 7	LENGTH: 330	MUD TYPE: Solid			BBL./MIN.: 4.73	BOTTOMS UP (MIN.): 36
						SYSTEM TOTAL (MIN.): 109

Sample from ☐ Flowline ☑ Pit

Flowline Temperature °F

MUD PROPERTIES			
Time Sample Taken	0630		
Depth (ft)	2334		
Weight ☑ (ppg) ☐ (lb/cu ft)	9.3		
Mud Gradient (psi/ft)	.4436		
Funnel Viscosity (sec/qt) API at 62 °F	36		
Plastic Viscosity cp at 62 °F	7		
Yield Point (lb/100 sq ft)	9		
Gel Strength (lb/100 sq ft) 10 sec/10 min	3/6	/	/
pH ☐ Strip ☐ Meter	9.5		
Filtrate API (ml/30 min)	4.0		
API HP HT Filtrate (ml/30 min) at °F	H		
Cake Thickness 32nd in API ☐ HTHP ☐	4		
Alkalinity, Mud (Pm)	1.0		
Alkalinity, Filtrate (P_f/M_f)	3/6	/	/
Salt ☐ppm ☐ppg Chloride ☐ppm ☐ppg	3400		
Calcium ☑ ppm ☐ Gyp ppb	TR		
Sand Content (% by Vol)	3.5		
Solids Content (% by Vol)	7		
Oil Content (% by Vol)	H		
Water Content (% by Vol)	93		
Methylene Blue Capacity (ml/ml Mud)	14		
Methylene Blue (lb/bbl Bentonite Eq)	14		

EQUIPMENT

	SIZE	HRS/TOUR			SIZE	HRS/TOUR	
Centrifuge				Desilter			
Degasser				Shaker		While Drill	
Desander				Other Mud Cleaner		While Drill	

DAILY COST 175.00 | CUMULATIVE COST $9200

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
9.2	34-35	10-20

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☐ OPERATOR'S REPRESENTATIVE ☑ OTHER Mud Engr

RECOMMENDED TOUR TREATMENT	DAILY	CUM
☐ IMCO BAR To Std Dr2 Only		2
☐ IMCO GEL As Needed for Gel Use		59
☐ IMCO ~~BRINEGEL~~ Bar Bulk/Mult		040
☐ IMCO RD-111 5 SX/Tour		
☐ IMCO ~~VG-10~~ Lig 20 SX/Tour		
☐ IMCO THIN		
☐ IMCO CAUSTIC SODA 4 SX/Tour	2	7
☐ IMCO M D 4 Pails/Tour		
☐ IMCO POLY RX		
☐ SAAP	7	7
☐ MD	1	1

REMARKS Mud Cleaner & Bean Work — Add Steady Stream of H2O While Drilling

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
PAT SERCKS	LIBERTY TX	336-7238
UTILITY	WAREHOUSE LOCATION: GALVESTON TX	TELEPHONE: 974-5373

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DRT REPORT NO. 4

DEPTH 2560

WELL | S/T

NO. 4

MUD DATE 2-15-90

SECTION, TOWNSHIP, RANGE —

PROVINCE

OPERATION		CASING		MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: Drilling - Survey		SURFACE: 10¾ IN. AT 1500 FT.		HOLE: 715	PITS: 460	PUMP SIZE: 6½ X 9 IN.	ANNULAR VEL. (FT./MIN.)
BIT SIZE (IN.): 9⅞	NO. 1	INTERMEDIATE: — IN. AT — FT.		TOTAL CIRCULATING VOLUME: 675		PUMP MAKE: GARDNER DENVER	OPPOSITE DP: 125
DRILL PIPE SIZE: 4½	TYPE: 16.6	PRODUCTION OR LINER: — IN. AT — FT.		IN STORAGE: —	WEIGHT: —	MODEL: P2-9	OPPOSITE COLLAR: 198
						BBL./STROKE: .095	STROKE/MIN.: 110
DRILL COLLAR SIZE: 7	LENGTH: 330	MUD TYPE: Lignosulfate				BBL./MIN.: 9.35	CIRCULATING PRESSURE PSI: 130
							BOTTOMS UP (MIN.): 20
							SYSTEM TOTAL (MIN.): 72

Sample from ☐ Flowline ☑ Pit

Flowline Temperature 72 °F

MUD PROPERTIES	IN		
Time Sample Taken	0545		
Depth (ft)	2500		
Weight ☑ (ppg) ☐ (lb/cu ft)	8.9		
Mud Gradient (psi/ft)	.463		
Funnel Viscosity (sec/qt) API at 70 °F	32		
Plastic Viscosity cp at 70 °F	8		
Yield Point (lb/100 sq ft)	5		
Gel Strength (lb/100 sq ft) 10 sec/10 min	3/8	/	/
pH ☑ Strip ☐ Meter	11.5		
Filtrate API (ml/30 min)	36		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☐ HTHP ☐	4		
Alkalinity, Mud (Pm)	3.4		
Alkalinity, Filtrate (P_f/M_f)	.18/2.7	/	/
Salt ☐ppm ☐ppg Chloride ☑ppm ☐ppg	3200		
Calcium ☑ ppm ☐ Gyp ppb	TR		
Sand Content (% by Vol)	.3		
Solids Content (% by Vol)	4		
Oil Content (% by Vol)	—		
Water Content (% by Vol)	96		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT

	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge		None	Desilter		None
Degasser		—	Shaker		[illegible]
Desander		None	Other		[illegible]

DAILY COST $580.00

CUMULATIVE COST $9,780

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
9.2	34 - 38	10 - 20

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☐ OPERATOR'S REPRESENTATIVE ☑ OTHER [illegible]

RECOMMENDED TOUR TREATMENT	DAY	
☐ IMCO BAR USE To Slug Pos Only		2
☐ IMCO GEL As Needed / Initial Use	21	75
☐ IMCO ~~SPANGEL~~ CMC/HMO		240
☐ IMCO RD-111		
☐ IMCO ~~VG-10~~ Liq 5 SX / TOUR	7	14
☐ IMCO THIN		
☐ IMCO CAUSTIC SODA	11	18
☐ IMCO M D	4	5
☐ IMCO POLY RX		
☐ SAP		7
☐		

REMARKS Drilling Operations - Add Steady Stream H2O While Drilling

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
Val Sparks	Liberty, TX	336-9255
UTILITY	WAREHOUSE LOCATION: Galveston, TX	TELEPHONE 724-5373

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RT REPORT NO. 5

DEPTH 3010

WELL | S/T

NO. 0126 X 4

SPD DATE 2-15-90

SECTION, TOWNSHIP, RANGE —

PROVINCE

E A 2 | 122A-373 | GALVESTON

OPERATION		CASING	MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: Rotary Drilling		SURFACE: 1500 IN. AT 10 3/4 FT.	HOLE: 254	PITS: 468	PUMP SIZE: 6 1/4 X 9 IN.	ANNULAR VEL. (FT./MIN.): —
BIT SIZE (IN.): 9 7/8	NO.	INTERMEDIATE: — IN. AT — FT.	TOTAL CIRCULATING VOLUME: 722		PUMP MAKE: GARDNER DENVER	OPPOSITE OF: —
					MODEL: P-2 9	OPPOSITE COLLAR: —
DRILL PIPE SIZE: 4 1/2	TYPE: 16.6	PRODUCTION OR LINER: — IN. AT — FT.	IN STORAGE: —	WEIGHT: —	BBL./STROKE: 0.085	STROKE/MIN.: —
						CIRCULATING PRESSURE PSI: —
DRILL COLLAR SIZE: 7"	LENGTH: 330	MUD TYPE: Spud Lig			BBL./MIN.: —	BOTTOMS UP (MIN.): —
						SYSTEM TOTAL (MIN.): —

Sample from ☐ Flowline ☑ Pit

Flowline Temperature °F

MUD PROPERTIES	IN		
Time Sample Taken	0500		
Depth (ft)	3010		
Weight ☑ (ppg) ☐ (lb/cu ft)	9.6		
Mud Gradient (psi/ft)	0.4992		
Funnel Viscosity (sec/qt) API at 53° °F	36		
Plastic Viscosity cp at 53° °F	7		
Yield Point (lb/100 sq ft)	8		
Gel Strength (lb/100 sq ft) 10 sec/10 min	9 24	/	/
pH ☑ Strip ☐ Meter	9.0		
Filtrate API (ml/30 min)	16		
API HP HT Filtrate (ml/30 min) at ____ °F	1-1		
Cake Thickness 32nd in. API ☐ HTHP ☐	2		
Alkalinity, Mud (Pm)	.8		
Alkalinity, Filtrate (P_f/M_f)	2/.6	/	/
Salt ☐ppm ☐ppg Chloride ☐ppm ☐ppg	3000		
Calcium ☑ ppm ☐ Gyp ppb	80		
Sand Content (% by Vol)	0.3		
Solids Content (% by Vol)	6		
Oil Content (% by Vol)	1-1		
Water Content (% by Vol)	94		
Methylene Blue Capacity (ml/ml Mud)	1-1		
Methylene Blue (lb/bbl Bentonite Eq)	1-1		

EQUIPMENT

	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge	NONE		Desilter	NONE	
Degasser	—		Shaker	Wet	
Desander	NONE		Other	MUD Cleaner	11 Drilling

DAILY COST	CUMULATIVE COST
657 00	10,437

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
9.1-9.6	34-38	10-20

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☐ OPERATOR'S REPRESENTATIVE ☑ OTHER Mud Engr

RECOMMENDED TOUR TREATMENT Daily Cost

☐ IMCO BAR	16	18
☐ IMCO GEL 1/connection	24	99
☐ IMCO ~~BRINEGEL~~ Silk Bag/100 lb		840
☐ IMCO RD-111		
☐ IMCO ~~VG-10~~ Lig 5 sx/Tour	8	22
☐ IMCO THIN		
☐ IMCO CAUSTIC SODA 3/Tour		18
☐ IMCO M D 2/Tour	3	8
☐ IMCO POLY RX		
☒ SAAP		>
☒ Plug 1 sx every 2 hrs		

REMARKS Waiting on bearing for Rotary Table since 1900 hrs 12-21

THANKS

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
PAT STACKS	LUBBOCK, TX	536-9755
UTILITY	WAREHOUSE LOCATION: GALVESTON, TX	TELEPHONE 744-5323

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REPORT NO. 6

DEPTH 3500

WELL

MO. #4

MUD DATE 12-15-80

SECTION, TOWNSHIP, RANGE

PROVINCE

#A-1 | 122 A-ST | Galveston | Tex.

OPERATION		CASING	MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: Drlg		SURFACE: 1500 IN. AT 10 3/4 FT.	HOLE: 294	PITS: 450±	PUMP SIZE: 6 1/4 X 9 IN.	ANNULAR VEL. (FT./MIN.): .0776 OPPOSITE DP 125
BIT SIZE (IN.): 9 7/8	NO.	INTERMEDIATE: — IN. AT FT.	TOTAL CIRCULATING VOLUME: 744±		PUMP MAKE: G.D. MODEL: P-2 9	OPPOSITE COLLAR 175
DRILL PIPE SIZE: 4 1/2	TYPE XO 16.6	PRODUCTION OR LINER: — IN. AT FT.	IN STORAGE	WEIGHT	BBL./STROKE: .085 STROKE MIN.: 110	CIRCULATING PRESSURE PSI: 1800
DRILL COLLAR SIZE: 7"	LENGTH: 330	MUD TYPE: Gel, Caustic, H_2O, SAPP			BBL./MIN.: 9.35	BOTTOMS UP (MIN.): 29± SYSTEM TOTAL (MIN.): 79±

Sample from ☐ Flowline ☐ Pit
Flowline Temperature °F

MUD PROPERTIES			
Time Sample Taken	5 AM		
Depth (ft)	3500		
Weight ☑ (ppg) ☐ (lb/cu ft)	9.6		
Mud Gradient (psi/ft)	.4992		
Funnel Viscosity (sec/qt) API at ____ °F	65		
Plastic Viscosity cp at ____ °F	18		
Yield Point (lb/100 sq ft)	23		
Gel Strength (lb/100 sq ft) 10 sec/10 min	18/76	/	/
pH ☐ Strip ☐ Meter	9.0		
Filtrate API (ml/30 min)	13.4		
API HP/HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☐ HTHP ☐	3		
Alkalinity, Mud (Pm)	.7		
Alkalinity, Filtrate (Pf/Mf)	.3/.6	/	/
Salt ☐ ppm ppg Chloride ☑ ppm ppg	3000		
Calcium ☑ ppm ☐ Gyp ppb	20		
Sand Content (% by Vol)	0.4		
Solids Content (% by Vol)	6		
Oil Content (% by Vol)	—		
Water Content (% by Vol)	94		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT

	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge	—		Desilter		
Degasser	24	hours	Shaker	24	hrs
Desander	24	hours	Other Mud Cleaner	24 h.	

DAILY COST: 540 — CUMULATIVE COST: 10,977

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
9.4-9.6	34-38	10-2

BY AUTHORITY: ☐ OPERATOR'S WRITTEN ☑ OPERATOR'S REPRESENTATIVE ☐ DRILLING CONTRACTOR ☐ OTHER

RECOMMENDED TOUR TREATMENT

☑ IMCO BAR			
☑ IMCO GEL	1 sk every 100 ft.		
☐ IMCO BRINEGEL			
☐ IMCO RD-111	3 sks tour		
☑ IMCO Vis-Lig	103 — 9 sk tour	6	28
☐ IMCO THIN			
☑ IMCO CAUSTIC SODA	71 — 3 sk tour	3	21
☑ IMCO M O	2 cans tour.		
☐ IMCO POLY RX			
☑ Plug for Bit Balling		20	20
☐			

REMARKS: Use water & gel to maintain Vis. Use Barite to maintain wt
Per tour
3 RD111 3 caustic
1 Lig 2 MO

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
P.E. McAliley	Dayton, Tx	258 2765
	WAREHOUSE LOCATION: Galveston, Tx	TELEPHONE: 774 537[illegible]

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RT REPORT NO. 8

DEPTH

WELL | S/T

NO. 4

DATE 2.15.81

SECTION, TOWNSHIP, RANGE

PROVINCE

OPERATION		CASING		MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: D-1		SURFACE: 10 3/4 IN. AT 1500 FT.		HOLE	PITS: 450	PUMP SIZE: 6 1/4 X 9 IN.	ANNULAR VEL. (FT./MIN.) OPPOSITE DP: 125
BIT SIZE (IN.): 9 7/8	NO.: 2	INTERMEDIATE: — IN. AT FT.		TOTAL CIRCULATING VOLUME		PUMP MAKE: G.D. MODEL: P-2-6	OPPOSITE COLLAR: 190
DRILL PIPE SIZE: 4 1/2	TYPE: 16.60	PRODUCTION OR LINER: — IN. AT FT.		IN STORAGE	WEIGHT	BBL./STROKE: .085 STROKE/MIN.: 110	CIRCULATING PRESSURE PSI: 1800
DRILL COLLAR SIZE: 7"	LENGTH: 1270	MUD TYPE: Lignosulfate				BBL./MIN.: 9.35	BOTTOMS UP (MIN.): 95
							SYSTEM TOTAL (MIN.): 815

Sample from ☐ Flowline ☐ Pit
Flowline Temperature °F

MUD PROPERTIES			
Time Sample Taken	5 p.m.		
Depth (ft)	—		
Weight ☐ (ppg) ☐ (lb/cu ft)	9.6		
Mud Gradient (psi/ft)	.4992		
Funnel Viscosity (sec/qt) API at ____ °F	38		
Plastic Viscosity cp at ____ °F	20		
Yield Point (lb/100 sq ft)	10		
Gel Strength (lb/100 sq ft) 10 sec/10 min	2/5	/	/
pH ☐ Strip ☐ Meter	10.8		
Filtrate API (ml/30 min)	6		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☐ HTHP ☐	2		
Alkalinity, Mud (Pm)	2.4		
Alkalinity, Filtrate (P_f/M_f)	.8/1.2	/	/
Salt ☐ ppm ☐ gpg Chloride ☐ ppm ☐ gpg	3300		
Calcium ☒ ppm ☐ Gyp ppb	20		
Sand Content (% by Vol)	0.3		
Solids Content (% by Vol)	6		
Oil Content (% by Vol)	—		
Water Content (% by Vol)	94		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT	SIZE	HRS/TOUR	EQUIPMENT	SIZE	HRS/TOUR
Centrifuge	—		Desilter	—	
Degasser	24	6	Shaker	3 4	6
Desander	—		Other	Mud Cleaner	24

DAILY COST	CUMULATIVE COST
1355	13,634

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
9.6	34-38	10 cc

BY AUTHORITY: ☐ OPERATOR'S WRITTEN ☒ OPERATOR'S REPRESENTATIVE ☐ DRILLING CONTRACTOR ☐ OTHER

RECOMMENDED TOUR TREATMENT

	Daily	Total
☐ IMCO BAR		
☐ IMCO GEL		
☐ IMCO BRINEGEL		
☒ IMCO RD-111	12	20
☒ IMCO ~~VC-10~~ Lig	24	70
☐ IMCO THIN		
☒ IMCO CAUSTIC SODA	10	20
☒ IMCO M D	4	16
☐ IMCO POLY RX		
☐		
☒ Engineer on Location	1	2

REMARKS D-1 pipe was pulled, [illegible]
Pressure Chart [illegible]

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
F. J. M.	Dafi Stu	259 2765
UTILITY	WAREHOUSE LOCATION	TELEPHONE
	Gulf [illegible]	745 373

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RT REPORT NO. 9

DEPTH 5022

WELL | S/T

NO. #4

DATE 12-15-80

SECTION TOWNSHIP, RANGE —

COUNTY

State 1 Pet 122 #A-1 | 122 A 595 | Galveston | Texas

OPERATION		CASING		MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: Drlg		SURFACE: 10 3/4 IN. AT 1500 FT.		HOLE: 420±	PITS: 550±	PUMP SIZE: 6 1/4 X 9 IN.	ANNULAR VEL. (FT./MIN.) .0741 OPPOSITE UP: 126±
BIT SIZE (IN.): 9 7/8"	NO.: 5	INTERMEDIATE: — IN. AT FT.		TOTAL CIRCULATING VOLUME: 970±		PUMP MAKE: G.D MODEL: 7.7.9	.0471 OPPOSITE COLLAR: 199±
DRILL PIPE SIZE: 4 1/2"	TYPE: X.H. 11.60	PRODUCTION OR LINER: — IN. AT FT.		IN STORAGE: —	WEIGHT: —	BBL./STROKE: .085	STROKE/MIN.: 110
DRILL COLLAR SIZE: 7"	LENGTH: 1320	MUD TYPE: Lignosulfonate				BBL./MIN.: 9.35	CIRCULATING PRESSURE PSI: 2000; BOTTOMS UP (MIN.): 42±; SYSTEM TOTAL (MIN.): 105±

Sample from ☐ Flowline ☐ Pit
Flowline Temperature °F

MUD PROPERTIES			
Time Sample Taken	2130		
Depth (ft)	5022		
Weight ☑ (ppg) ☐ (lb/cu ft)	9.6		
Mud Gradient (psi/ft)	.4992		
Funnel Viscosity (sec/qt) API at ____ °F	39		
Plastic Viscosity cp at ____ °F	14		
Yield Point (lb/100 sq ft)	9		
Gel Strength (lb/100 sq ft) 10 sec/10 min	3/19	/	/
pH ☑ Strip ☐ Meter	10.3		
Filtrate API (ml/30 min)	6.6		
API HPHT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☐ HTHP ☐	2		
Alkalinity, Mud (Pm)	2.0		
Alkalinity, Filtrate (P_f/M_f)	.0/1.6	/	/
Salt ☐ ppm ☐ gpg Chloride ☑ ppm ☐ gpg	3100		
Calcium ☑ ppm ☐ Gyp ppb	-0-		
Sand Content (% by Vol)	0.3		
Solids Content (% by Vol)	6		
Oil Content (% by Vol)	—		
Water Content (% by Vol)	94		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT

	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge	—		Desilter	—	
Degasser	24 Hours		Shaker	24 hours	
Desander	Mud Cleaners		Other	Jet Cleaner	24

DAILY COST: 1,968 * CUMULATIVE COST: 15,602

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
9.5-10.0	35-38	10-8

BY AUTHORITY: ☑ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☐ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT

		Daily Total
☑ IMCO BAR	32	70
☑ IMCO GEL	14	122
☑ IMCO ~~BRINEGEL~~ Poly Wraps	8 *	19
☑ IMCO RD-111		24
☑ IMCO ~~VG-10~~ Lig		82
☑ IMCO ~~THIN~~ Sapp	8 *	15
☑ IMCO CAUSTIC SODA		40
☑ IMCO M.D.		12
☑ IMCO ~~POLY-BX~~ Al Sulfate		1
☑ Soda Ash		1
☑ Engineer on Location	2 *	3

REMARKS * Cost Includes 2 days of Engineering Fee, and adj. on Wraps & Sapp
Drlg Ahead No prob. Need to remove solids (Fine) 180-200 screen
Thanks P.S.M.

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
Phillip McAliley	Dayton, Tex.	258-2765
UTILITY	WAREHOUSE LOCATION: Galveston, Tex.	TELEPHONE: 744-5373

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RT | REPORT NO. 10

DEPTH 5614

WELL | S/T

MO 24

D DATE 15 Feb

TION, TOWNSHIP, RANGE

OPERATION		CASING 11#	MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: Drlg		SURFACE: 10 3/4 IN. AT 1500 FT.	HOLE: 505	PITS: 550	PUMP SIZE: 6 1/4 X 9 IN.	ANNULAR VEL. (FT./MIN.): .017 OPPOSITE DP 134; .041 OPPOSITE COLLAR 213
BIT SIZE (IN.): 9 1/2	NO.: 12,12,12 X 7	INTERMEDIATE: IN. AT FT.	TOTAL CIRCULATING VOLUME: 1055		PUMP MAKE: GD. MODEL: D-7 9	
DRILL PIPE SIZE: 4 1/2	TYPE: 16.60	PRODUCTION OR LINER: IN. AT FT.	IN STORAGE: AV =	WEIGHT: 426	BBL./STROKE: .095 STROKE/MIN.: 112	CIRCULATING PRESSURE PSI: 1900
DRILL COLLAR SIZE: 7	LENGTH: 330	MUD TYPE: Lignosulfonate			GPM-421 BBL./MIN.: 10.03	BOTTOMS UP (MIN.): 42; SYSTEM TOTAL (MIN.): 105

Sample from ☐ Flowline ☑ Pit
Flowline Temperature °F

MUD PROPERTIES			
Time Sample Taken	5:00		
Depth (ft)	5614		
Weight ☑ (ppg) ☐ (lb/cu ft)	9.4		
Mud Gradient (psi/ft)	.5016		
Funnel Viscosity (sec/qt) API at ____ °F	37		
Plastic Viscosity cp at ____ °F	10		
Yield Point (lb/100 sq ft)	10		
Gel Strength (lb/100 sq ft) 10 sec/10 min	2/14	/	/
pH ☑ Strip ☐ Meter	10.0		
Filtrate API (ml/30 min)	3.0		
API HPHT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☐ HTHP ☐	2		
Alkalinity, Mud (Pm)	1.1		
Alkalinity, Filtrate (P_f/M_f)	.5/1.0	/	/
Salt ☐ ppm ☐ gpg Chloride ☑ ppm ☐ gpg	3100		
Calcium ☑ ppm ☐ Gyp ppb	60		
Sand Content (% by Vol)	.5		
Solids Content (% by Vol)	7		
Oil Content (% by Vol)	—		
Water Content (% by Vol)	93		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT

	SIZE	HRS/TOUR				SIZE	HRS/TOUR		
Centrifuge					Desilter				
Degasser	R.G				Shaker				
Desander					Other S				

DAILY COST: 1,427 —
CUMULATIVE COST: 17,039 —

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
9.5-10.0	35-38	10-8

BY AUTHORITY: ☐ OPERATOR'S WRITTEN ☐ OPERATOR'S REPRESENTATIVE ☐ DRILLING CONTRACTOR ☑ OTHER

RECOMMENDED TOUR TREATMENT	Daily	Total
☑ IMCO BAR	—	70
☑ IMCO GEL	15	137
☑ IMCO ~~BRINEGEL~~ POLY WRAP	5	24
☑ IMCO RD-111	12	36
☑ IMCO ~~VC-10~~ LIG	24	106
☐ IMCO THIN		
☑ IMCO CAUSTIC SODA	4	44
☐ IMCO M D		
☐ IMCO POLY RX		
☑ ENG	1	4
☐		

REMARKS: [illegible] Mud cleaner needs new screen. Screens to be removed.

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
Tommy Mitchell	Hobbs	393-7383
UTILITY	WAREHOUSE LOCATION: Gainesville	TELEPHONE: 734-5772

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RT	REPORT NO. 11
DEPTH	5114
WELL	S/T
NO.	4
DATE	
TOWN, TOWNSHIP, RANGE	
COUNTY	

S.L. A-122-A | S.L. A-122 | [illegible]

OPERATION		CASING		MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: GIH		SURFACE: 10 3/4 IN. AT 1510 FT.		HOLE: 320	PITS: 350	PUMP SIZE: 6 1/4 X 9 IN.	ANNULAR VEL. (FT./MIN.) OPPOSITE DP: 134
BIT SIZE (IN.): 9 7/8	NO.: 1	INTERMEDIATE: IN. AT FT.		TOTAL CIRCULATING VOLUME: 870		PUMP MAKE: [illegible] MODEL: [illegible]	OPPOSITE COLLAR: 213
DRILL PIPE SIZE: 4 1/2	TYPE: [illegible]	PRODUCTION OR LINER: IN. AT FT.		IN STORAGE: AV:	WEIGHT: 439	BBL./STROKE: [illegible] STROKE/MIN.: 112	CIRCULATING PRESSURE PSI: 1900
DRILL COLLAR SIZE: 7"	LENGTH: 3[illegible]	MUD TYPE: Lignosulfonate				GPM: 421 BBL./MIN.: 10.03	BOTTOMS UP (MIN.): 44 SYSTEM TOTAL (MIN.): 87

Sample from ☐ Flowline ☒ Pit
Flowline Temperature °F

MUD PROPERTIES			
Time Sample Taken	4:30		
Depth (ft)	5114		
Weight ☒ (ppg) ☐ (lb/cu ft)	9.6		
Mud Gradient (psi/ft)	.4992		
Funnel Viscosity (sec/qt) API at ____ °F	38		
Plastic Viscosity cp at ____ °F	13		
Yield Point (lb/100 sq ft)	6		
Gel Strength (lb/100 sq ft) 10 sec/10 min	4/6	/	/
pH ☒ Strip ☐ Meter	10.0		
Filtrate API (ml/30 min)	7.0		
API HPHT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☐ HTHP ☐	2		
Alkalinity, Mud (Pm)	1.2		
Alkalinity, Filtrate (P_f/M_f)	.5/1.1	/	/
Salt ☐ ppm ☐ gpg Chloride ☒ ppm ☐ gpg	3500		
Calcium ☒ ppm ☐ Gyp ppb	20		
Sand Content (% by Vol)	.15		
Solids Content (% by Vol)	6		
Oil Content (% by Vol)	—		
Water Content (% by Vol)	94		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT

	SIZE	HRS/TOUR			SIZE	HRS/TOUR	
Centrifuge				Desilter			
Degasser	[illegible]			Shaker	40	40	[illegible]
Desander				Other	NO	[illegible]	[illegible]

DAILY COST: 1200 — CUMULATIVE COST: 18 229 —

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
9.5 [illegible]	32-38	[illegible]

BY AUTHORITY: ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☐ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT

☐ IMCO BAR		70
☒ IMCO GEL	20	151
☐ IMCO BRINEGEL		
☒ IMCO RD-111	10	34
☒ IMCO ~~VG-10~~ [illegible]	20	126
☐ IMCO THIN		
☒ IMCO CAUSTIC SODA	5	49
☐ IMCO M D		
☐ IMCO POLY RX		
☒ [illegible]	1	5
☐		

REMARKS: [illegible]

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
[illegible]	Houston	415-4124
UTILITY	WAREHOUSE LOCATION	TELEPHONE
	Houston	376-1238

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RT REPORT NO. 12

DEPTH 5997

WELL | S/T

NO. 4

DATE 12-15-90

SECTION, TOWNSHIP, RANGE

M-A 638

CHANGE

OPERATION		CASING	MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: Drilling		SURFACE: 10 3/4 IN. AT 1500 FT.	HOLE: 526	PITS: 450	PUMP SIZE: 6 x 9 INC.	ANNULAR VEL. (FT./MIN.): OPPOSITE DP 132
BIT SIZE (IN.): 9 7/8	NO.: 8	INTERMEDIATE: IN. AT FT.	TOTAL CIRCULATING VOLUME: 926		PUMP MAKE: G.D. MODEL: P-9	OPPOSITE COLLAR 220
DRILL PIPE SIZE: 4 1/2	TYPE: 16.60	PRODUCTION OR LINER: IN. AT FT.	IN STORAGE: AV=	WEIGHT: 443	BBL./STROKE: .095 STROKE/MIN.: 122	CIRCULATING PRESSURE PSI: 1500
DRILL COLLAR SIZE: 7"	LENGTH: 1305	MUD TYPE: Lignosulfonate			BBL./MIN.: 11.37 GPM: 435	BOTTOMS UP (MIN.): 43 SYSTEM TOTAL (MIN.): 891

Sample from ☒ Flowline ☐ Pit
Flowline Temperature °F

MUD PROPERTIES			
Time Sample Taken	9:00 a.m.		
Depth (ft)	5997		
Weight ☒ (ppg) ☐ (lb/cu ft)	9.6		
Mud Gradient (psi/ft)	.499		
Funnel Viscosity (sec/qt) API at ____ °F	38		
Plastic Viscosity cp at ____ °F	9		
Yield Point (lb/100 sq ft)	6		
Gel Strength (lb/100 sq ft) 10 sec/10 min	1/6	/	/
pH ☒ Strip ☐ Meter	10.4		
Filtrate API (ml/30 min)	12		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☐ HTHP ☐	2		
Alkalinity, Mud (Pm)	1.6		
Alkalinity, Filtrate (P_f/M_f)	.1/.65	/	/
Salt ☐ ppm ☐ gpg Chloride ☐ ppm ☐ gpg	4100		
Calcium ☒ ppm ☐ Gyp ppb	20		
Sand Content (% by Vol)	.50		
Solids Content (% by Vol)	7		
Oil Content (% by Vol)	—		
Water Content (% by Vol)	93		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT

	SIZE	HRS/TOUR			SIZE	HRS/TOUR		
Centrifuge					Desilter			
Degasser	[illegible]				Shaker	30	[illegible]	
Desander					Other			

DAILY COST

CUMULATIVE COST

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
9.5 [illegible]	36-38	10-9

BY AUTHORITY: ☐ OPERATOR'S WRITTEN ☐ OPERATOR'S REPRESENTATIVE ☐ DRILLING CONTRACTOR ☒ OTHER

RECOMMENDED TOUR TREATMENT

☐ IMCO BAR		800
☒ IMCO GEL	5	162
☐ IMCO ~~BRINEGEL~~ Soda Ash	20	90
☐ IMCO RD-111		34
☒ IMCO ~~VC-10~~ Lig		126
☒ IMCO ~~THIN~~ Plus	20	20
☒ IMCO CAUSTIC SODA	11	60
☐ IMCO M D		
☐ IMCO POLY RX		
☐		
☒ Engr	1	6

REMARKS Change out shale shakers - Mud Cleaner - Degasser at Mud Service [illegible] Built some volume [illegible]

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
Jimmy Nichol	Houston	455-4834
UTILITY	WAREHOUSE LOCATION	TELEPHONE
	Galveston	744-5377

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RT REPORT NO. 13

DEPTH 5967

WELL | S/T

NO. #4

RPT DATE 12-15-80

SECTION, TOWNSHIP, RANGE

COUNTY

S.T. A 122 #A-1 | ST A 122 | GALVESTON TEXAS

OPERATION		CASING	MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY		SURFACE 10 3/4 IN. AT 1500 FT.	HOLE 528±	PITS 400±	PUMP SIZE 6 1/4 X 9 IN.	ANNULAR VEL. (FT./MIN.) .075 OPPOSITE TOP 138
BIT SIZE (IN.) 9 7/8	NO.	INTERMEDIATE — IN. AT FT.	TOTAL CIRCULATING VOLUME 528±		PUMP MAKE G.D. MODEL P.7.9	.047 OPPOSITE COLLAR 230
DRILL PIPE SIZE 4 1/2	TYPE XO Hughes	PRODUCTION OR LINER — IN. AT FT.	IN STORAGE	WEIGHT	BBL./STROKE .085 STROKE/MIN. 122	CIRCULATING PRESSURE PSI —
DRILL COLLAR SIZE 7	LENGTH	MUD TYPE Lignosulfonate			10.37 BBL./MIN. 435 gpm	BOTTOMS UP (MIN.) 43 SYSTEM TOTAL (MIN.) 89

Sample from ☐ Flowline ☐ Pit
Flowline Temperature °F

MUD PROPERTIES			
Time Sample Taken	5:00		
Depth (ft)	5967		
Weight ☑ (ppg) ☐ (lb/cu ft)	9.9		
Mud Gradient (psi/ft)	.515		
Funnel Viscosity (sec/qt) API at ____ °F	40		
Plastic Viscosity cp at ____ °F	18		
Yield Point (lb/100 sq ft)	11		
Gel Strength (lb/100 sq ft) 10 sec/10 min	1/10	/	/
pH ☐ Strip ☐ Meter	10.6		
Filtrate API (ml/30 min)	7.8		
API HPHT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☐ HTHP ☐	2		
Alkalinity, Mud (Pm)	1.8		
Alkalinity, Filtrate (Pf/Mf)	.6/1.2	/	/
Salt ☐ ppm ☐ gpg Chloride ☑ ppm ☐ gpg	4000		
Calcium ☑ ppm ☐ Gyp pob	20		
Sand Content (% by Vol)	0.2		
Solids Content (% by Vol)	6		
Oil Content (% by Vol)	—		
Water Content (% by Vol)	94		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge			Desilter	Mud Kleaner Pennant	24
Degasser	Rig	24 hr	Shaker	Tandem 30x40	24
Desander			Other	Mud Logger	

DAILY COST $ 5742 — Tan Inc | CUMULATIVE COST $ 25,067 — Tan Inc

MUD PROPERTIES SPECIFICATIONS		
WEIGHT 9.5-10.	VISCOSITY 35-38	FILTRATE 10-8

BY AUTHORITY ☑ OPERATOR'S WRITTEN ☐ OPERATOR'S REPRESENTATIVE ☐ DRILLING CONTRACTOR ☐ OTHER

RECOMMENDED TOUR TREATMENT	Materials used Daily	Total
☑ IMCO BAR	40	
☐ IMCO GEL		
☑ IMCO ~~DRIL~~GEL Bulk	499	339
☑ IMCO RD 111	6	40
☑ IMCO ~~VG-10~~ Lig	12	139
☐ IMCO THIN		
☑ IMCO CAUSTIC SODA	5	65
☐ IMCO M D		
☐ IMCO POLY RX		
☐		
☑ Engineer on Location	1	7

REMARKS ☑ Reflects bulk - ~~[illegible]~~ G.I.H., P.O.O.H removed steering tool, L/B IH + cleaned - P.O.O.H. Put on new bit #5 G.I.H. at [illegible] check w/ Packed B.H.A. Tanks Mud needs good dilution water.
P.E. McAliley

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
P.E. McAliley	Dayton, Tx.	258 2765
AREA OFFICE	WAREHOUSE LOCATION	TELEPHONE
	Galveston, Tx.	744 5373

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RT REPORT NO. 14

DEPTH

WELL | S/T

NO. #4

DATE 2-15-00

SECTION TOWNSHIP, RANGE

County A-628

S.T. A 122 -A-1 | S.T. A-125 Galveston Texas

OPERATION		CASING	MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY		SURFACE 10 3/4 IN. AT 1500 FT.	HOLE	PITS 400 ±	PUMP SIZE 6 1/4 X 9 IN.	ANNULAR VEL. (FT./MIN.) OPPOSITE BIT 141 ±
BIT SIZE (IN.) 9 7/8	NO. 9	INTERMEDIATE IN. AT FT.	TOTAL CIRCULATING VOLUME		PUMP MAKE G.D. MODEL P-7.9	OPPOSITE COLLAR 224 ±
DRILL PIPE SIZE 4 1/2	TYPE X-H 16.60	PRODUCTION OR LINER IN. AT FT.	IN STORAGE	WEIGHT	BBL./STROKE .095 STROKE/MIN. 124	CIRCULATING PRESSURE PSI 2300
DRILL COLLAR SIZE 7	LENGTH 1320	MUD TYPE Lignosul/Lignite			10.54 BBL./MIN. 443 GPM	BOTTOMS UP (MIN.) SYSTEM TOTAL (MIN.)

Sample from ☐ Flowline ☐ Pit
Flowline Temperature °F

MUD PROPERTIES	In		
Time Sample Taken	7am		
Depth (ft)			
Weight ☒ (ppg) ☐ (lb/cu ft)	10.2		
Mud Gradient (psi/ft)	.5304		
Funnel Viscosity (sec/qt) API at °F	41		
Plastic Viscosity cp at °F	15		
Yield Point (lb/100 sq ft)	8		
Gel Strength (lb/100 sq ft) 10 sec/10 min	2/8	/	/
pH ☒ Strip ☐ Meter	11.0		
Filtrate API (ml/30 min)	7.6		
API HPHT Filtrate (ml/30 min) at °F	—		
Cake Thickness 32nd in API ☒ HTHP ☐	2		
Alkalinity, Mud (Pm)	2.0		
Alkalinity, Filtrate (P_f/M_f)	.9/1.6	/	/
Salt ☐ ppm ☐ gpg Chloride ☒ ppm ☐ gpg	3600		
Calcium ☒ ppm ☐ Gyp ppb	20		
Sand Content (% by Vol)	0.2		
Solids Content (% by Vol)	6		
Oil Content (% by Vol)	—		
Water Content (% by Vol)	94		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT

	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge			Desilter		
Degasser	Wheel Needle		Shaker	24 Hrs.	
Desander			Other	mud cleaner	24 hr

DAILY COST $1424 Tex Inc. | CUMULATIVE COST $26,491 Tex Inc.

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
8.5 - 10.0	35-40	6-4

BY AUTHORITY: ☒ OPERATOR'S WRITTEN ☐ OPERATOR'S REPRESENTATIVE ☐ DRILLING CONTRACTOR ☐ OTHER

RECOMMENDED TOUR TREATMENT

	Materials Used Daily	Total
☐ IMCO BAR		130
☐ IMCO GEL		
☐ IMCO BRINEGEL		1339
☒ IMCO RD-111	13	53
☒ IMCO ~~VG-10~~ L-3	20	158
☐ IMCO THIN		
☒ IMCO CAUSTIC SODA	5	70
☒ IMCO-M D	5	17
☐ IMCO POLY RX		
☐		
☒ Engineer on Location	1	8

REMARKS: Drlg. Ahead no probs. Except for some torque. Raised mud weight to 10.2 ppg.

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
Phillip McAliley	Pasadena, Texas	358 3765
UTILITY	WAREHOUSE LOCATION	TELEPHONE
	Galveston, Texas	744 5373

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RT REPORT NO. 15

DEPTH 1805

WELL | S/T

NO.

DATE

SECTION TOWNSHIP, RANGE

PROVINCE

OPERATION		CASING	MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: Drlg		SURFACE: 10 3/4 IN. AT 1500 FT.	HOLE: 600	PITS: 450	PUMP SIZE: 6 1/4 X 9 IN.	ANNULAR VEL. (FT./MIN.): OPPOSITE DP 142
BIT SIZE (IN.): 9 7/8	NO.: 10	INTERMEDIATE: IN. AT FT.	TOTAL CIRCULATING VOLUME: 1050		PUMP MAKE: G.D. MODEL: D-7-9	OPPOSITE COLLAR 226
DRILL PIPE SIZE: 4 1/2	TYPE: 16.60	PRODUCTION OR LINER: IN. AT FT.	IN STORAGE: AV =	WEIGHT: 515	BBL./STROKE: .095 STROKE/MIN.: 125	CIRCULATING PRESSURE PSI: 2100
DRILL COLLAR SIZE: 6	LENGTH: 1320	MUD TYPE: LIGNOSULFONATE			BBL./MIN.: 10.63 GPM: 446	BOTTOMS UP (MIN.): 48 SYSTEM TOTAL (MIN.): 391

Sample from ☐ Flowline ☑ Pit
Flowline Temperature °F

MUD PROPERTIES	IN	OUT		
Time Sample Taken	4:30a			
Depth (ft)	1805			
Weight ☑ (ppg) ☐ (lb/cu ft)	10.2	10.2		
Mud Gradient (psi/ft)	.546			
Funnel Viscosity (sec/qt) API at ____ °F	45	55		
Plastic Viscosity cp at ____ °F	18			
Yield Point (lb/100 sq ft)	12			
Gel Strength (lb/100 sq ft) 10 sec/10 min	2/4	/	/	
pH ☑ Strip ☐ Meter	10.5			
Filtrate API (ml/30 min)	3.0			
API HPHT Filtrate (ml/30 min) at ____ °F	—			
Cake Thickness 32nd in API ☐ HTHP ☐	2			
Alkalinity, Mud (Pm)	1.6			
Alkalinity, Filtrate (P_f/M_f)	.6/.9	/	/	
Salt ☐ ppm ☐ gpg Chloride ☐ ppm ☐ gpg	3900			
Calcium ☑ ppm ☐ Gyp ppb	20			
Sand Content (% by Vol)	.1			
Solids Content (% by Vol)	7			
Oil Content (% by Vol)	—			
Water Content (% by Vol)	93			
Methylene Blue Capacity (ml/ml Mud)	—			
Methylene Blue (lb/bbl Bentonite Eq)	—			

EQUIPMENT

	SIZE	HRS/TOUR			SIZE	HRS/TOUR		
Centrifuge					Desilter			
Degasser	Rig				Shaker	2 screen		
Desander					Other	Rig		

DAILY COST: Thru Lns. $ 8962.00

CUMULATIVE COST: Thru Lns. $ 35459.02

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
10.0-10.2	38-40	10-9

BY AUTHORITY: ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☑ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT

	Day	Total
☐ IMCO BAR		1350
☐ IMCO GEL		
☑ IMCO ~~BRINEGEL~~	10	140
☑ IMCO RD-111	27	90
☑ IMCO VC-10	10	108
☑ IMCO ~~THIN~~		
☑ IMCO CAUSTIC SODA	5	15
☑ IMCO M-D	6	75
☐ IMCO ~~POLY-RX~~ Soltex (1 Lsm)	49	49
☐		
☐ Eng	1	9

REMARKS: Add 30 lb/bbl Soltex to mud system

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
Henry Nichol	Houston	495-4174
UTILITY	WAREHOUSE LOCATION	TELEPHONE
	Cameron	749-5377

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RT REPORT NO. 16

DEPTH 1,662

WELL | S/T

NO. 4

DATE

SECTION, TOWNSHIP, RANGE

COUNTY

OPERATION		CASING	MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: T.I.H.		SURFACE: 10¾ IN. AT 1500 FT.	HOLE: 630	PITS: 475	PUMP SIZE: 6½ X 12 IN.	ANNULAR VEL. (FT./MIN.) OPPOSITE DP: 143
BIT SIZE (IN.): 9⅞	NO.: 11	INTERMEDIATE: IN. AT FT.	TOTAL CIRCULATING VOLUME: 1105		PUMP MAKE: G.D. MODEL: 7-9	OPPOSITE COLLAR: 228
DRILL PIPE SIZE: 4½	TYPE: Hole	PRODUCTION OR LINER: IN. AT FT.	IN STORAGE: AV =	WEIGHT: 530	BBL./STROKE: .105 STROKE/MIN.: 126	CIRCULATING PRESSURE PSI: 2100
DRILL COLLAR SIZE: 7"	LENGTH: 1316	MUD TYPE: Lignosulfonate			GPM: 441 BBL./MIN.: 10.71	BOTTOMS UP (MIN.): 50 SYSTEM TOTAL (MIN.): 103

Sample from ☐ Flowline ☐ Pit
Flowline Temperature °F

MUD PROPERTIES			
Time Sample Taken	4:30p		
Depth (ft)	1662		
Weight ☑ (ppg) ☐ (lb/cu ft)	10.2		
Mud Gradient (psi/ft)	.5304		
Funnel Viscosity (sec/qt) API at °F	45		
Plastic Viscosity cp at °F	19		
Yield Point (lb/100 sq ft)	2		
Gel Strength (lb/100 sq ft) 10 sec/10 min	1/6	/	/
pH ☑ Strip ☐ Meter	10.0		
Filtrate API (ml/30 min)	6.4		
API HP.HT Filtrate (ml/30 min) at °F	—		
Cake Thickness 32nd in API ☐ HTHP ☐	2		
Alkalinity, Mud (Pm)	1.2		
Alkalinity, Filtrate (P_f/M_f)	.5/1.4	/	/
Salt ☐ ppm ☐ gpg Chloride ☐ ppm ☐ gpg	4000		
Calcium ☑ ppm ☐ Gyp ppb	20		
Sand Content (% by Vol)	.10		
Solids Content (% by Vol)	7		
Oil Content (% by Vol)	—		
Water Content (% by Vol)	93		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT	SIZE	HRS/TOUR			SIZE	HRS/TOUR		
Centrifuge					Desilter			
Degasser	12"				Shaker	3	1	1/2
Desander					Other MC	1	1	1/2

DAILY COST: Thru INV. 842—

CUMULATIVE COST: To Incl 36301—

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
10.2	32-40	10-8

BY AUTHORITY: ☐ OPERATOR'S WRITTEN ☐ OPERATOR'S REPRESENTATIVE ☐ DRILLING CONTRACTOR ☐ OTHER

RECOMMENDED TOUR TREATMENT

☐ IMCO BAR		1339
☐ IMCO GEL		
☑ IMCO BRINEGEL		140
☑ IMCO RD-111	10	90
☑ IMCO VC-10	10	172
☐ IMCO THIN		
☑ IMCO CAUSTIC SODA	3	78
☐ IMCO M D		
☐ IMCO POLY-RX Sifter		64
☐		
☑ Eng	1	10

REMARKS: Have to add large amounts of water to control mud.

Clean mud sheen - [illegible] to 100 [illegible]

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
Lonny Nix	Houston	495-4124
UTILITY	WAREHOUSE LOCATION	TELEPHONE
	Galveston	744-5372

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RT REPORT NO. 17

DEPTH 7176

WELL | S/T

NO. 4

DATE 2-15-80

SECTION, TOWNSHIP, RANGE HGM - A622

COUNTY

STATE TEXAS

S.I. A-122 A-7 | STATE | DIRECTION

OPERATION		CASING	MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: Drlg		SURFACE: 10 3/4 IN. AT 1510 FT.	HOLE: 650 ±	PITS: 450 ±	PUMP SIZE: 6 1/4 X 9 IN	ANNULAR VEL. (FT./MIN.): .0975 OPPOSITE DP 142
BIT SIZE (IN.): 7 7/8	NO.: 11	INTERMEDIATE: IN. AT FT.	TOTAL CIRCULATING VOLUME: 1100 ±		PUMP MAKE: G.D. MODEL: P-2-9	.0976 OPPOSITE COLLAR 226
DRILL PIPE SIZE: 4 1/2	TYPE: X O 16.60	PRODUCTION OR LINER: IN. AT FT.	IN STORAGE: NU	WEIGHT: 545 ±	BBL./STROKE: .085 STROKE/MIN.: 125	CIRCULATING PRESSURE PSI: 2000
DRILL COLLAR SIZE: 7	LENGTH	MUD TYPE: Lignosulfonate			10.625 BBL./MIN. 446 GPM	BOTTOMS UP (MIN.): 52 ± SYSTEM TOTAL (MIN.): 102 ±

Sample from ☐ Flowline ☐ Pit
Flowline Temperature °F

MUD PROPERTIES	T.		
Time Sample Taken	5 AM		
Depth (ft)	7176		
Weight ☒ (ppg) ☐ (lb/cu ft)	10.1		
Mud Gradient (psi/ft)	.5252		
Funnel Viscosity (sec/qt) API at °F	39		
Plastic Viscosity cp at °F	16		
Yield Point (lb/100 sq ft)	10		
Gel Strength (lb/100 sq ft) 10 sec/10 min	2/22	/	/
pH ☐ Strip ☒ Meter	10.0		
Filtrate API (ml/30 min)	4.0		
API HPHT Filtrate (ml/30 min) at °F	—		
Cake Thickness 32nd in API ☒ HTHP ☐	2		
Alkalinity, Mud (Pm)	2.2		
Alkalinity, Filtrate (P_f/M_f)	.7/1.9	/	/
Salt ☐ ppm ☐ gpg Chloride ☒ ppm ☐ gpg	4000		
Calcium ☐ ppm ☐ Gyp ppb	20		
Sand Content (% by Vol)	0.2		
Solids Content (% by Vol)	7		
Oil Content (% by Vol)	—		
Water Content (% by Vol)	93		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT

	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge			Desilter		
Degasser	R.	[illegible]	Shaker	Brandt	24 hrs
Desander			Other	M. Clean	24 hrs

DAILY COST $ 1124 — Tax Inc. | CUMULATIVE COST $ 37425 — Tax Inc.

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
10.2	38-40	10-8

BY AUTHORITY: ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☐ OPERATOR'S REPRESENTATIVE ☒ OTHER

RECOMMENDED TOUR TREATMENT

	Materials Used	Daily Tot.
☐ IMCO BAR		133
☐ IMCO GEL		
☐ IMCO BRINEGEL		145
☒ IMCO RD-111	18	102
☒ IMCO ~~VC-10~~ Cig	6	13
☐ IMCO THIN		
☒ IMCO CAUSTIC SODA	8	86
☐ IMCO M.D		
☐ IMCO POLY RX		64
☐		
☒ Engineer on Location	1	11

REMARKS: Drlg Ahead no prob.

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
Phillip McAtee	Dayton Tx	258 2765
UTILITY	WAREHOUSE LOCATION	TELEPHONE
	Galveston Tx	744 6373

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REPORT NO. 20

DEPTH

WELL | S/T

NO.

DATE 10-20

SECTION, TOWNSHIP, RANGE

SURFACE

OPERATION		CASING	MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: Lay down		SURFACE: 10 3/4 IN. AT 1500 FT.	HOLE: 705	PITS: 475	PUMP SIZE: 6 X 9 IN.	ANNULAR VEL. (FT./MIN.):
BIT SIZE (IN.): 9 7/8	NO.: 12	INTERMEDIATE: IN. AT FT.	TOTAL CIRCULATING VOLUME: 1112		PUMP MAKE: G-M MODEL: 7-2-1	OPPOSITE DC: OPPOSITE COLLAR: 200
DRILL PIPE SIZE: 4 1/2	TYPE: 16.60	PRODUCTION OR LINER: IN. AT FT.	IN STORAGE: AV	WEIGHT: 592	BBL./STROKE: .105	STROKE/MIN.: 127
DRILL COLLAR SIZE: 7	LENGTH: 1315	MUD TYPE: LIGNOSULFONATE			BBL./MIN.: 10.7	CIRCULATING PRESSURE PSI: 2100
						BOTTOMS UP (MIN.): 55
						SYSTEM TOTAL (MIN.): 190

Sample from ☐ Flowline ☐ Pit
Flowline Temperature °F

MUD PROPERTIES			
Time Sample Taken	4:30		
Depth (ft)	1232		
Weight ☐ (ppg) ☐ (lb/cu ft)	10.3		
Mud Gradient (psi/ft)	.536		
Funnel Viscosity (sec/qt) API at °F	40		
Plastic Viscosity cp at °F	15		
Yield Point (lb/100 sq ft)	9		
Gel Strength (lb/100 sq ft) 10 sec/10 min	12 /	/	/
pH ☐ Strip ☐ Meter	11.8		
Filtrate API (ml/30 min)	5.5		
API HP HT Filtrate (ml/30 min) at °F	—		
Cake Thickness 32nd in API ☐ HTHP ☐	2		
Alkalinity, Mud (Pm)	2.1		
Alkalinity, Filtrate (P_f/M_f)	.4/.6	/	/
Salt ☐ ppm ☐ gpg Chloride ☐ ppm ☐ gpg	3300		
Calcium ☐ ppm ☐ Gyp ppb	20		
Sand Content (% by Vol)	.25		
Solids Content (% by Vol)	8		
Oil Content (% by Vol)	—		
Water Content (% by Vol)	93		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT	SIZE	HRS/TOUR				SIZE	HRS/TOUR		
Centrifuge					Desilter				
Degasser	10				Shaker	4	23		
Desander					Other				

DAILY COST	CUMULATIVE COST
1,625	9,157.12

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
10.3	35-40	6-4

BY AUTHORITY: ☑ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☐ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT		
☑ IMCO BAR Barite		2,000
☐ IMCO GEL		170
☐ IMCO BRINEGEL	10	100
☑ IMCO RD-111	10	175
☑ IMCO VC-10 Lig	13	247
☐ IMCO THIN		
☑ IMCO CAUSTIC SODA	9	104
☐ IMCO M-I Salter	5	76
☐ IMCO POLY RX		
☐		
☐		

REMARKS: Experiment [illegible] pressure [illegible] to [illegible] Drill [illegible]

Mud [illegible] Shape

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
Tommy Nichol	Houston	915 3134
UTILITY	WAREHOUSE LOCATION	TELEPHONE
	Galveston	744-5373

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REPORT NO. 8

DEPTH 7314

WELL | S/T

RIG NO. 4

SPUD DATE 12·15·80

SECTION, TOWNSHIP, RANGE MBM A628

PROVINCE TEXAS

S.T. A-122 A#1 | S.T. 126 | GALVESTON

OPERATION		CASING	MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: G.I.H.		SURFACE: 10 3/4 IN. AT 1500 FT.	HOLE: 662±	PITS: 550±	PUMP SIZE X IN.: 6 1/4 X 9	ANNULAR VEL. (FT./MIN.) .075: 142± OPPOSITE DP
BIT SIZE (IN.): 9 7/8	NO.: 12	INTERMEDIATE: — IN. AT FT.	TOTAL CIRCULATING VOLUME: 1212±		PUMP MAKE: G.D MODEL: P.2.9	.047 OPPOSITE COLLAR: 226±
DRILL PIPE SIZE: 4 1/2	TYPE X-H: 16.60	PRODUCTION OR LINER: — IN. AT FT.	IN STORAGE: AU	WEIGHT: 555±	BBL./STROKE: .085 STROKE/MIN.: 125	CIRCULATING PRESSURE PSI: 2000
DRILL COLLAR SIZE: 7	LENGTH: 1315	MUD TYPE: Lignosulfonate			BBL./MIN.: 10.625 446	BOTTOMS UP (MIN.): 52±
						SYSTEM TOTAL (MIN.): 114±

Sample from ☐ Flowline ☐ Pit

Flowline Temperature °F

MUD PROPERTIES	
	In
Time Sample Taken	330 Am
Depth (ft)	7314
Weight ☒ (ppg) ☐ (lb/cu ft)	10.3
Mud Gradient (psi/ft)	.5356
Funnel Viscosity (sec/qt) API at ____ °F	38
Plastic Viscosity cp at ____ °F	15
Yield Point (lb/100 sq ft)	8
Gel Strength (lb/100 sq ft) 10 sec. 10 min	1/4 / /
pH ☐ Strip ☒ Meter	10.3
Filtrate API (ml/30 min)	5
API HP HT Filtrate (ml/30 min) at ____ °F	—
Cake Thickness 32nd in API ☒ HTHP ☐	2
Alkalinity, Mud (Pm)	2.2
Alkalinity, Filtrate (Pf/Mf)	.4/1.8 / /
Salt ppm ppb Chloride ppm	3500
Calcium ☒ ppm ☐ gyp ppb	22
Sand Content (% by Vol)	0.2
Solids Content (% by Vol)	6
Oil Content (% by Vol)	—
Water Content (% by Vol)	94
Methylene Blue Capacity (ml/ml Mud)	—
Methylene Blue (lb/bbl Bentonite Eq)	—

EQUIPMENT

	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge	—		Desilter	—	
Degasser	R.S.	16 Needle	Shaker	Brandt	24 hrs
~~Desander~~	Mud Logger		Other	Mud Cleaner	24 hr

DAILY COST $ 5398 Tax Exc. | CUMULATIVE COST $ 42,823 Tax Incl.

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
10.3	38-40	8-6

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☒ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT

	Daily	Tour
☒ IMCO BAR	10	15
☒ IMCO GEL	8	
☒ IMCO ~~BRINE GEL~~ Bulk Bar 3805	408	17
☒ IMCO RD-111	17	12
☒ IMCO ~~Vero~~ Lig	10	19
☒ IMCO ~~Thin~~ Sulfex	2	
☒ IMCO CAUSTIC SODA	4	9
☒ IMCO M D	1	
☒ IMCO ~~POLY PAC~~ Al. Stearate	2	
☐		
☒ Engineer or Location	1	12

REMARKS Daily Mud [illegible] - P.O.O.H for bit change #12. - Wt. Mud up to 10.2 lb/gal. Tour Treatment RD111 3 Sulfex 3 Lig 3 Caustic 4 Tour P.M.

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
P.E. McAlley	Dayton Texas	2582765
	WAREHOUSE LOCATION	TELEPHONE
	Galveston Texas	744 5373

Form 515 Rev. 5/1/80

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REPORT NO. 5
DEPTH 9475
WELL
MUD NO. 4
SPUD DATE 12.15.80
SECTION, TOWNSHIP, RANGE MSA 628
PROVINCE

S.T. 122-A #1 | S.T. 122 A-1 | Galveston | Texas

OPERATION		CASING	MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: Drlg.		SURFACE: 10 3/4 IN. AT 1500 FT.	HOLE: 405±	PITS: 560±	PUMP SIZE: 4 1/2 X 9 IN.	ANNULAR VEL. (FT./MIN.): .072 OPPOSITE DP 131±
BIT SIZE (IN.): 6 3/4	NO.	INTERMEDIATE: 7 5/8 IN. AT 9268 FT.	TOTAL CIRCULATING VOLUME: 965±		PUMP MAKE: G.D MODEL: P-2-9	.022 OPPOSITE COLLAR 109±
DRILL PIPE SIZE: 3 1/2	TYPE: 13.3	PRODUCTION OR LINER: — IN. AT FT.	IN STORAGE: All =	WEIGHT: 343±	BBL./STROKE: .0396 STROKE/MIN.: 99	CIRCULATING PRESSURE PSI: 2350
DRILL COLLAR SIZE: 4 3/4	LENGTH	MUD TYPE: Lignosulfonate			GPM 183 BBL./MIN. 3.92	BOTTOMS UP (MIN.): 88± SYSTEM TOTAL (MIN.): 246±

Sample from ☐ Flowline ☐ Pit
Flowline Temperature °F

MUD PROPERTIES	In	Out	
Time Sample Taken	11:30		
Depth (ft)	9475		
Weight ☒ (ppg) ☐ (lb/cu ft)	16.0	(16)	
Mud Gradient (psi/ft)	.832		
Funnel Viscosity (sec/qt) API at ____ °F	58	63	
Plastic Viscosity cp at ____ °F	46		
Yield Point (lb/100 sq ft)	22		
Gel Strength (lb/100 sq ft) 10 sec/10 min	3/17	/	/
pH ☐ Strip ☒ Meter	11.0		
Filtrate API (ml/30 min)	3.8		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☒ HTHP ☐	2		
Alkalinity, Mud (Pm)	4.6		
Alkalinity, Filtrate (Pf/Mf)	1.7/2.8	/	/
Salt ☐ ppm ☐ ppg Chloride ☒ ppm ☐ gpg	3500		
Calcium ☒ ppm ☐ Gyp ppb	120		
Sand Content (% by Vol)	0.2		
Solids Content (% by Vol)	31		
Oil Content (% by Vol)	3		
Water Content (% by Vol)	66		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT

	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge			Desilter		
Degasser R.S			Shaker Brandt	80x60	
Desander M. Clemmer	150		Other M. Lucas		

DAILY COST 253 (22 Tbgs Sub.) CUMULATIVE COST 160,579 (Tank Inc.)

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
16.0	55	4 or less

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☒ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT

☐ IMCO BAR		
☐ IMCO GEL		3
☐ IMCO ~~BRINEGEL~~ Bulk		9
☐ IMCO RD-111		9
☐ IMCO ~~VG-69~~ Liq		5
☐ IMCO ~~THIN~~ Sulfex		1
☐ IMCO CAUSTIC SODA		1
☐ IMCO ~~MUD~~ Soda		1
☐ IMCO ~~BOLAPAX~~ Lubrikleen		2
☒ Bench		1
☒ Engineer on Location	1	5

REMARKS Have Dyna Drill in hole. After desired angle is cut, will go in hole w/ new bit. Thanks
P.E.M.

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
P.E. McAliley	Dayton, Tx.	258-2765
TA OFFICE	WAREHOUSE LOCATION: Galveston, Tx	TELEPHONE: 744-5373

Form 515 Rev. 5M 2-80

NOTICE: ANY OPINION AND/OR RECOMMENDATION, EXPRESSED ORALLY OR WRITTEN HEREIN, HAS BEEN PREPARED CAREFULLY AND MAY BE USED IF THE USER SO ELECTS. HOWEVER, NO REPRESENTATION OR WARRANTY IS MADE BY

REPORT NO. 5-7

DATE

WELL

NO. 4

DATE 12-15-80

COUNTY, TOWNSHIP, RANGE Blk 628

PROVINCE

S.T. 122 A-1 | ST122 | Galveston | Texas

OPERATION		CASING		MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: G.I.H.		SURFACE: 10 3/4 IN. AT 1500 FT.		HOLE: 410	PITS: 580±	PUMP SIZE: 4 1/2 X 9 IN.	ANNULAR VEL. (FT./MIN.): .022 OPPOSITE DP 123
BIT SIZE (IN.): 6 3/4	NO.	INTERMEDIATE: 7 5/8 IN. AT 9268 FT.		TOTAL CIRCULATING VOLUME: 990±		PUMP MAKE: G.D. MODEL: 7-2-9	.023 OPPOSITE COLLAR 178
DRILL PIPE SIZE: 3 1/2	TYPE: E 19.30	PRODUCTION OR LINER: IN. AT FT.		IN STORAGE: A.U. =	WEIGHT: 345±	BBL./STROKE: .0396 @ STROKE/MIN.: 99 SPM 187	CIRCULATING PRESSURE PSI: 88±
DRILL COLLAR SIZE: 4 3/4	LENGTH	MUD TYPE: Lignosu/Gumite				BBL./MIN.: 3.92	BOTTOMS UP (MIN.): SYSTEM TOTAL (MIN.): 253±

Sample from ☐ Flowline ☒ Pit

Flowline Temperature °F

MUD PROPERTIES	In		
Time Sample Taken	4:30		
Depth (ft)			
Weight ☒ (ppg) ☐ (lb/cu ft)	16.0		
Mud Gradient (psi/ft)	.832		
Funnel Viscosity (sec/qt) API at °F	65		
Plastic Viscosity cp at °F	50		
Yield Point (lb/100 sq ft)	25		
Gel Strength (lb/100 sq ft) 10 sec/10 min	3/22	/	/
pH ☒ Strip ☐ Meter	11.0		
Filtrate API (ml/30 min)	4.0		
API HP HT Filtrate (ml/30 min) at °F	—		
Cake Thickness 32nd in API ☒ HTHP ☐	2		
Alkalinity, Mud (Pm)	4.6		
Alkalinity, Filtrate (P_f/M_f)	1.2/2.0	/	/
Salt ☐ppm ☐ppg Chloride ☒ppm ☐ppg	3400		
Calcium ☒ ppm ☐ Gyp ppb	80		
Sand Content (% by Vol)	0.2		
Solids Content (% by Vol)	31		
Oil Content (% by Vol)	3		
Water Content (% by Vol)	66		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT

	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge			Desilter		
Degasser	R.S.		Shaker	Brandt	80 x 60
Desander	M. Cleaner	150	Other	M. Layer	

DAILY COST $ 4841 Thru End, CUMULATIVE COST $ 165,420 Tax Inc.

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
16.0	55	4 or less

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☒ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT	Material used	
☒ IMCO BAR	80	77
☐ IMCO GEL		22
☐ IMCO ~~BRINEGEL~~ Bulk	425	96
☐ IMCO RD-111		34
☐ IMCO ~~VC-10~~ L.J.		51
☐ IMCO ~~THIN~~ Solar		15
☐ IMCO CAUSTIC SODA		18
☐ IMCO ~~MUD~~ Soap		13
☐ IMCO ~~POLYPAC~~ Lubrikleen		27
☒ Bleach		10
☒ Engineer on location	1	51

REMARKS P.O.O.H @ approx 6pm to change bit. Mud is cold needs to be circulated. Thks P.E.M.

What

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
P.E. McAlile	Dayton Tx	258 2765
MAIN OFFICE	WAREHOUSE LOCATION: Galveston Tx.	TELEPHONE 744 5373

Form 515 Rev. 50M 2-80

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RT REPORT NO. 58

DEPTH 9479

WELL | S/T

NO. 4

SPD DATE 2-15-80

SECTION, TOWNSHIP, RANGE BM-A-628

PROVINCE

ST 122-A#1 | ST 122 | GALVESTON | TEXAS

OPERATION	CASING	MUD VOLUME (BBL)	CIRCULATION DATA
PRESENT ACTIVITY: Dynadrill	SURFACE: 10 3/4 IN. AT 1500 FT.	HOLE: 402 / PITS: 500	PUMP SIZE X IN.: 4 1/2 X 9
BIT SIZE (IN.): 6 3/4 / NO.	INTERMEDIATE: 7 5/8 IN. AT 9268 FT.	TOTAL CIRCULATING VOLUME: 902	PUMP MAKE: G-D / MODEL: P-7-G
DRILL PIPE SIZE: 3 1/2 / TYPE: E / 13.30	PRODUCTION OR LINER: IN. AT FT.	IN STORAGE: AY = 332 / WEIGHT	BBL./STROKE: .0396 / STROKE, MIN.: 96
DRILL COLLAR SIZE: 4 3/4 / LENGTH	MUD TYPE: LIGNOSULFONATE		GPM = 159 / BBL./MIN.: 3.8

ANNULAR VEL. (FT./MIN.): .033 OPPOSITE DP 119; .022 OPPOSITE COLLAR 173

CIRCULATING PRESSURE PSI: 2900

X-8323 BOTTOMS UP (MIN.): 87

SYSTEM TOTAL (MIN.): 237

Sample from ☐ Flowline ☐ Pit

Flowline Temperature °F

MUD PROPERTIES			
Time Sample Taken	5:00 AM		
Depth (ft)	9479		
Weight ☑ (ppg) ☐ (lb/cu ft)	16.0		
Mud Gradient (psi/ft)	.832		
Funnel Viscosity (sec/qt) API at 110 °F	60		
Plastic Viscosity cp at °F	44		
Yield Point (lb/100 sq ft)	23		
Gel Strength (lb/100 sq ft) 10 sec/10 min	3 / 21	/	/
pH ☐ Strip ☐ Meter	11.0		
Filtrate API (ml/30 min)	3.8		
API HP HT Filtrate (ml/30 min) at °F	—		
Cake Thickness 32nd in API ☐ HTHP ☐	2		
Alkalinity, Mud (Pm)	4.5		
Alkalinity, Filtrate (P_f/M_f)	.2 / 2.8	/	/
Salt ☐ ppm ☐ gpg Chloride ☐ ppm ☐ gpg	3500		
Calcium ☑ ppm ☐ Gyp ppb	80		
Sand Content (% by Vol)	.20		
Solids Content (% by Vol)	31		
Oil Content (% by Vol)	3		
Water Content (% by Vol)	66		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT

	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge			Desilter		
Degasser	Rig		Shaker	60x80	
Desander			Other	Rental - 100	

DAILY COST: Rig Inv 438.00

CUMULATIVE COST: Rig Inv Del. Chg 165,858

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
16.0	55-60	4 cc Loss

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☐ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT	Daily USE	Total USE
☐ IMCO BAR	10	740
☐ IMCO GEL		328
☐ IMCO ~~BRINEGEL~~ Bulk		9600
☐ IMCO RD-111	3	468
☐ IMCO ~~VG-69~~ Lig		513
☐ IMCO ~~THIN~~ Spice		159
☐ IMCO CAUSTIC SODA		181
☐ IMCO ~~MD~~ Sapp		13
☐ IMCO ~~POLY RX~~ Lignite		24
☑ Bicarb		10
☑ Eng	1	52

REMARKS T.T.H w/Dynadrill - will not work - P.U. new Dynadrill. G.T.H. Shows 10° Inc in Temp

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
Tommy Nichol	Houston	495-4134
UTILITY	WAREHOUSE LOCATION: Galveston	TELEPHONE

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RT REPORT NO. 59

DEPTH 9548

WELL | S/T

NO. 4

MUD DATE 2-15-81

SECTION, TOWNSHIP, RANGE 12-11-12-628

PROVINCE

Glen White | ST 122 | Galveston | Texas

OPERATION		CASING	MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: Drilling		SURFACE: 10 3/4 IN. AT 1500 FT.	HOLE: 404	PITS: 540	PUMP SIZE: 4 1/2 X 9 IN.	ANNULAR VEL. (FT./MIN.): .032 OPPOSITE DP 126
BIT SIZE (IN.): 6 3/4	NO.: Dimond	INTERMEDIATE: 7 5/8 IN. AT 9268 FT.	TOTAL CIRCULATING VOLUME: 944		PUMP MAKE: GD MODEL: P-2-9	.022 OPPOSITE COLLAR 183
DRILL PIPE SIZE: 3 1/2	TYPE: 13.30	PRODUCTION OR LINER: IN. AT FT.	IN STORAGE: AV= 333	WEIGHT	BBL./STROKE: .0396 STROKE: 102	CIRCULATING PRESSURE PSI: 2700-2800
DRILL COLLAR SIZE: 4 3/4	LENGTH	MUD TYPE: LIGNOSULFONATE			GPM 169 BBL./MIN. 4.029	BOTTOMS UP (MIN.): 83 ± SYSTEM TOTAL (MIN.): 233

Sample from ☐ Flowline ☒ Pit

Flowline Temperature °F

MUD PROPERTIES	In	Out
Time Sample Taken	4.30	
Depth (ft)	9548	TVD 8800
Weight ☒ (ppg) ☐ (lb/cu ft)	16.0+	16.0+
Mud Gradient (psi/ft)	.832	
Funnel Viscosity (sec/qt) API at 110° °F	48	55
Plastic Viscosity cp at °F	38	
Yield Point (lb/100 sq ft)	15	
Gel Strength (lb/100 sq ft) 10 sec/10 min	2/14	/ /
pH ☒ Strip ☐ Meter	10.8	
Filtrate API (ml/30 min)	4.0	
API HP HT Filtrate (ml/30 min) at °F	—	
Cake Thickness 32nd in API ☐ HTHP ☐	2	
Alkalinity, Mud (Pm)	2.6	
Alkalinity, Filtrate (P_f/M_f)	1.2/26	/ /
Salt ppm/ppg Chloride ppm/ppg	3500	
Calcium ☒ ppm ☐ Gyp ppb	120	
Sand Content (% by Vol)	.10	
Solids Content (% by Vol)	30	
Oil Content (% by Vol)	2	
Water Content (% by Vol)	68	
Methylene Blue Capacity (ml/ml Mud)	17 PPB LGS	
Methylene Blue (lb/bbl Bentonite Eq)	27 LGS	
	407 PPB Barite	

EQUIPMENT

	SIZE	HRS/TOUR			SIZE	HRS/TOUR		
Centrifuge					Desilter			
Degasser	Rig				Shaker	60 x 60		
Desander					Other	Bulk	MC - 100	

DAILY COST: Thru Tour 5,334.80

CUMULATIVE COST: Thru Tour 171,246 —

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
16.0	50-65	4cc Less

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☐ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT	Daily USE	Total USE
☐ IMCO BAR		740
☐ IMCO GEL		328
☐ IMCO ~~BRINEGEL~~ Bulk	455	10655
☐ IMCO RD-111	12	480
☐ IMCO ~~VG-10~~ Lig	8	521
☐ IMCO ~~THIN~~ Sulfe		159
☐ IMCO CAUSTIC SODA		181
☐ IMCO ~~M-D~~ Soda		13
☐ IMCO ~~POLY RX~~ Lubricant	4	28
☐		
☒ ENG	1	53

REMARKS: Rig Dynadrill Sticking Tool - Drilling for 24 hrs. Have Given Mud A Bath Needed Dilute of water. - Mud in VERY Good Condition

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
Tommy Nichol	Houston	495-4134
UTILITY	WAREHOUSE LOCATION: Galveston	TELEPHONE: 744-5373

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RT REPORT NO. 60

DEPTH 9601

WELL | S/T

NO. 4

DATE 2-15-90

SECTION, TOWNSHIP, RGE 3M-A-628

PROVINCE

ST 122 A #1 | ST 122 | GALVESTON | TEXAS

OPERATION		CASING	MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: Drlg/Dynadrill		SURFACE: 10 3/4 IN. AT 1500 FT.	HOLE: 405	PITS: 530	PUMP SIZE X IN.: 4 1/2 X 9	ANNULAR VEL. (FT./MIN.): .032 OPPOSITE DP 128
BIT SIZE (IN.): 6 3/4	NO.: KR Diamond	INTERMEDIATE: 7 5/8 IN. AT 9268 FT.	TOTAL CIRCULATING VOLUME: 935		PUMP MAKE: BD MODEL: D-2-9	.022 OPPOSITE COLLAR 186
DRILL PIPE SIZE: 3 1/2	TYPE: E 13.30	PRODUCTION OR LINER: IN. AT FT.	IN STORAGE: AV =	WEIGHT: 334	BBL./STROKE: .0396 STROKE/MIN.: 104	CIRCULATING PRESSURE PSI: 2600-2700
DRILL COLLAR SIZE: 4 3/4	LENGTH	MUD TYPE: Lignosulfonate			GPM: 172 BBL./MIN.: 4.1	BOTTOMS UP (MIN.): 81 SYSTEM TOTAL (MIN.): 228

Sample from ☐ Flowline ☑ Pit
Flowline Temperature °F

MUD PROPERTIES	In	Out	
Time Sample Taken	4:30		
Depth (ft)	9601		
Weight ☑ (ppg) ☐ (lb/cu ft)	16.0	16.0	
Mud Gradient (psi/ft)	.832		
Funnel Viscosity (sec/qt) API at 120 °F	51	62	
Plastic Viscosity cp at 100 °F	38		
Yield Point (lb/100 sq ft)	20		
Gel Strength (lb/100 sq ft) 10 sec/10 min	2/16	/	/
pH ☑ Strip ☐ Meter	10.8		
Filtrate API (ml/30 min)	3.8		
API HP HT Filtrate (ml/30 min) at °F	—		
Cake Thickness 32nd in API ☐ HTHP ☐	2		
Alkalinity, Mud (Pm)	2.5		
Alkalinity, Filtrate (P_f/M_f)	1.1/2.6	/	/
Salt ☐ppm ☐ppg Chloride ☐ppm ☐ppg	3600		
Calcium ☑ ppm ☐ Gyp ppb	140		
Sand Content (% by Vol)	.1		
Solids Content (% by Vol)	31		
Oil Content (% by Vol)	2		
Water Content (% by Vol)	69		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT	SIZE	HRS/TOUR				SIZE	HRS/TOUR		
Centrifuge					Desilter				
Degasser	Rig				Shaker	6 HRP			
Desander					Other	Rahmat 16 mic			

DAILY COST Thru Eng 810.00 | CUMULATIVE COST Tar: Detch Inc 172,056

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
16.0	50-55	4cc Loss

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☐ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT	Daily Use	Total Use
☐ IMCO BAR		740
☐ IMCO GEL		328
☐ IMCO ~~BRINEGEL~~ Bulk Bar		10055
☐ IMCO RD-111	5	485
☐ IMCO ~~VC-10~~ Lig		521
☐ IMCO ~~THIN~~ Sollex	3	28
☐ IMCO CAUSTIC SODA		181
☐ IMCO M D		13
☐ IMCO ~~POLY PX~~ Lubekleen	1	3
☐		
☑ Eng	1	54

REMARKS Running Dynadrill w/ Steering tool - No problems

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
Tommy Nichol	Houston	495-4134
UTILITY	WAREHOUSE LOCATION	TELEPHONE
	Galveston	744-5373

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REPORT NO. 24

DEPTH 9670

WELL | S/T

DAY 8

DATE 12.15.80

SECTION, TOWNSHIP, RANGE 62E

PROVINCE

S.T. 122 A#1 | ST 122 | Galveston | Texas

OPERATION		CASING	MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: Dcl / Dyna Drill		SURFACE: 10 3/4 IN. AT 1500 FT.	HOLE: 407±	PITS: 500±	PUMP SIZE X IN.: 4 1/2 X 9	ANNULAR VEL. (FT./MIN.): 8 3/4" OPPOSITE DP 121±
BIT SIZE (IN.): 6 3/4	NO.: Diamond	INTERMEDIATE: 7 5/8 IN. AT 9268 FT.	TOTAL CIRCULATING VOLUME: 907±		PUMP MAKE: G.D MODEL: P. 2.9	8 3/4" OPPOSITE COLLAR 176±
DRILL PIPE SIZE: 3 1/2	TYPE: E	PRODUCTION OR LINER: — IN. AT FT.	IN STORAGE: AV =	WEIGHT: 335	BBL./STROKE: .0396 STROKE/MIN.: 98	CIRCULATING PRESSURE (PSI): 2000
DRILL COLLAR SIZE: 4 3/4	LENGTH: 1130	MUD TYPE: Lignosulfonate			GPM: 163 BBL./MIN.: 3.88	BOTTOMS UP (MIN.): 86 SYSTEM TOTAL (MIN.): 234±

Sample from ☐ Flowline ☑ Pit

Flowline Temperature 122 °F

MUD PROPERTIES	In		Out
Time Sample Taken	5 pm		
Depth (ft)	9670		
Weight ☐ (ppg) ☐ (lb/cu ft)	16.+		16.+
Mud Gradient (psi/ft)	.832		
Funnel Viscosity (sec/qt) API at 121 °F	53		60
Plastic Viscosity cp at 102 °F	38		
Yield Point (lb/100 sq ft)	32		
Gel Strength (lb/100 sq ft) 10 sec/10 min	3/21	/	/
pH ☑ Strip ☐ Meter	11.0		
Filtrate API (ml/30 min)	3.6		
API HP HT Filtrate (ml/30 min) at °F	—		
Cake Thickness 32nd in API ☑ HTHP ☐	2		
Alkalinity, Mud (Pm)	2.8		
Alkalinity, Filtrate (P_f/M_f)	1.0/2.0	/	/
Salt ☐ ppm ☐ ppg Chloride ☑ ppm ☐ ppg	3600		
Calcium ☑ ppm ☐ Gyp ppb	80		
Sand Content (% by Vol)	0.1		
Solids Content (% by Vol)	31		
Oil Content (% by Vol)	2		
Water Content (% by Vol)	67		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT

	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge	—		Desilter	—	
Degasser	Rig	—	Shaker	Brandt	60 hrs
Desander	M. Logger		Other	M. Clerk	150

DAILY COST $455 on Thru Tour | CUMULATIVE COST $172,511 on Tour Ent.

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
16.0	50-55	4 or less

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR'S ☑ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT

☐ IMCO BAR		
☐ IMCO GEL		
☐ IMCO ~~BRINECOL~~ Bill		
☐ IMCO RD-111		
☐ IMCO ~~VC-10~~ L.J		
☐ IMCO ~~THIN~~ Soltex		
☐ IMCO CAUSTIC SODA		
☐ IMCO M D		
☐ IMCO ~~PERMATEX~~ Lubriklean		
☐		
☑ Eng.	1	

REMARKS Running Dyna Drill w/ steering tool - No prob. Thks P.S.H.

IMCO REPRESENTATIVE: P.E. McAliley

HOME ADDRESS: Dayton, Tx.

WAREHOUSE LOCATION: Galveston, Tx.

Form 515 Rev. 5084 2-80

NOTICE: ANY OPINION AND/OR RECOMMENDATION ... CAREFULLY AND MAY BE USED IF THE USER SO ... OURSELVES OR OUR AGENTS AS TO ITS COR...

REPORT NO. 2
DEPTH 9712
WELL
RIG NO. 4
PUB DATE 12-15-80
SECTION, TOWNSHIP, AREA ABM-628
PROVINCE

S.T. 122-A#1 Townsite #3 | ST 122 | Galveston | Texas

OPERATION		CASING	MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: Drlg / Dynadrill		SURFACE: 10 3/4 IN. AT 1500 FT.	HOLE: 427±	PITS: 450±	PUMP SIZE: 4 1/2 X 9 IN.	ANNULAR VEL. (FT./MIN.): .022 OPPOSITE DP 124±
BIT SIZE (IN.): 6 3/4	NO.: Diamond	INTERMEDIATE: 7 5/8 IN. AT 9268 FT.	TOTAL CIRCULATING VOLUME: 877±		PUMP MAKE: G.D. MODEL: P-2-9	.022 OPPOSITE COLLAR 180±
DRILL PIPE SIZE: 3 1/2	TYPE: E 13.30	PRODUCTION OR LINER: IN. AT FT.	IN STORAGE: A.U. =	WEIGHT: 355±	BBL./STROKE: .0396 STROKE/MIN.: 100	CIRCULATING PRESSURE PSI: 2800
DRILL COLLAR SIZE: 4 3/4	LENGTH:	MUD TYPE: Lignosol/Polymer			GPM 166 BBL./MIN. 3.96	BOTTOMS UP (MIN.): 90± SYSTEM TOTAL (MIN.): 221±

Sample from ☐ Flowline ☒ Pit
Flowline Temperature °F

MUD PROPERTIES			
Time Sample Taken	4:30		
Depth (ft)	9712		
Weight ☒ (ppg) ☐ (lb/cu ft)	15.9		
Mud Gradient (psi/ft)	.8268		
Funnel Viscosity (sec/qt) API at ____ °F	52		
Plastic Viscosity cp at ____ °F	36		
Yield Point (lb/100 sq ft)	19		
Gel Strength (lb/100 sq ft) 10 sec/10 min	3/21	/	/
pH ☒ Strip ☐ Meter	11.0		
Filtrate API (ml/30 min)	3.6		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☒ HTHP ☐	2		
Alkalinity, Mud (Pm)	2.8		
Alkalinity, Filtrate (P_f/M_f)	1.0/2.2	/	/
Salt ☐ppm ☐gpg Chloride ☐ppm ☐gpg	3600		
Calcium ☒ ppm ☐ Gyp ppb	80		
Sand Content (% by Vol)	0.2		
Solids Content (% by Vol)	30		
Oil Content (% by Vol)	4		
Water Content (% by Vol)	66		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge			Desilter		
Degasser Rig	When Need		Shaker Brandt	80	160
Desander M. Glenner	150		Other M. Lenger		

DAILY COST 2233 ea Thru Inv. | CUMULATIVE COST 174,744 Thru Inv.

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
15.9	50-55	4 or Less

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☒ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT		
☐ IMCO BAR		
☐ IMCO GEL		
☐ IMCO BRINEGEL		
☒ IMCO ~~RO-THI~~ Rom	15	60
☒ IMCO ~~VG-69~~ Li	10	53
☒ IMCO ~~THIN~~ Sol-ex	10	28
☒ IMCO CAUSTIC SODA	6	18
☐ IMCO M D		
☒ IMCO ~~POLY-PAC~~ Lubri-klean	2	7
☐		
☒ Engineer on Loc.		5

REMARKS Running Dyna Drill w/ steering tool, Letting Mud wt. ease back via Co. mans orders. Had Rig prob 2-17-81 @ 6:30 am Approx 10 approx 6 pm. unable to mix chemicals — Diesel will be up to 5% by tomorrow morn. Thanks P.E.M.

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
P. E. McAliley	Dayton, Tx	258-2765
	WAREHOUSE LOCATION	TELEPHONE
	Galveston, Tx	744-5373

Form 515 Rev. 50M 2-80

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RT REPORT NO. 63

EPTH 9738

WELL | S/T

MO. 4

ED DATE 12-15-80

CTION, TOWNSHIP, NGE: BM-A 628

ROVINCE

ST 122-A #1 | ST 122-A | GALVESTON TEXAS

OPERATION		CASING	MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: Survey		SURFACE: 10 3/4 IN. AT 1500 FT.	HOLE: 414	PITS: 450	PUMP SIZE: 4 1/2 X 9 IN.	ANNULAR VEL. (FT./MIN.): .032 OPPOSITE DP
BIT SIZE (IN.): 6 3/4	NO.: Hughes	INTERMEDIATE: 7 5/8 IN. AT 9264 FT.	TOTAL CIRCULATING VOLUME: 864		PUMP MAKE: GD MODEL: P-2-9	.022 OPPOSITE COLLAR
DRILL PIPE SIZE: 3 1/2	TYPE: E 13.30	PRODUCTION OR LINER: IN. AT FT.	IN STORAGE: AV = 342	WEIGHT	BBL./STROKE: .0396	STROKE MIN.	CIRCULATING PRESSURE PSI: 5K5
DRILL COLLAR SIZE: 4 3/4	LENGTH: 330	MUD TYPE: LIGNOSULFONATE			BBL./MIN.	BOTTOMS UP (MIN.): 8636 SYSTEM TOTAL (MIN.):

Sample from ☐ Flowline ☒ Pit
Flowline Temperature °F

MUD PROPERTIES			
Time Sample Taken	4:30 AM		
Depth (ft)	9738		
Weight ☒ (ppg) ☐ (lb/cu ft)	15.9		
Mud Gradient (psi/ft)	.826		
Funnel Viscosity (sec/qt) API at ____ °F	56		
Plastic Viscosity cp at ____ °F	37		
Yield Point (lb/100 sq ft)	20		
Gel Strength (lb/100 sq ft) 10 sec/10 min	3/22	/	/
pH ☒ Strip ☐ Meter	10.8		
Filtrate API (ml/30 min)	3.6		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☐ HTHP ☐	2		
Alkalinity, Mud (Pm)	3.2		
Alkalinity, Filtrate (P_f/M_f)	.9/.25	/	/
Salt ☐ppm ☐gpg Chloride ☐ppm ☐gpg	3600		
Calcium ☒ ppm ☐ Gyp ppb	80		
Sand Content (% by Vol)	.2		
Solids Content (% by Vol)	30		
Oil Content (% by Vol)	5		
Water Content (% by Vol)	65		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT

	SIZE	HRS/TOUR			SIZE	HRS/TOUR		
Centrifuge					Desilter			
Degasser	Rig				Shaker	Rig		
Desander					Other	Elmco MC-150		

DAILY COST: 505 — CUMULATIVE COST: 175,249 —

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
15.9	50-55	4 or less

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☐ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT	DAILY USE	TOTAL USE
☐ IMCO BAR	30	770
☐ IMCO GEL		325
☐ IMCO ~~BRINEGEL~~ Bulk		10055
☐ IMCO RD-111		500
☐ IMCO ~~VC-10~~ LIG		531
☐ IMCO ~~THIN~~ Sollex		171
☐ IMCO CAUSTIC SODA		187
☐ IMCO ~~M-O~~ Lubritend		32
☐ IMCO POLY RX		
☐		
☒ ENG	1	57

REMARKS: Tagged Hole 35' P.C.H. - Go in w/Hole Opener - No Problems - Survey P.C.H. - Drop Pipe to CTN w/Bit.

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
Tommy Nichol	Houston	495-4134
UTILITY	WAREHOUSE LOCATION: Galveston	TELEPHONE: 744-5373

Form 515 Rev. 50M 2-80 Printed in USA

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RT REPORT NO. 64

DEPTH 9844

WELL | S/T

NO. 4

RD DATE 12-15-80

SECTION, TOWNSHIP, RANGE BM-A-628

PROVINCE

ST 122 A #1 | ST 122 A | GALVESTON TEXAS

OPERATION		CASING	MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: Drlg		SURFACE: 10 3/4 IN. AT 1500 FT.	HOLE: 418	PITS: 520	PUMP SIZE: 4 1/2 X 9 IN.	ANNULAR VEL. (FT./MIN.): .032 OPPOSITE DP 141
BIT SIZE (IN.): 6 3/4	NO.	INTERMEDIATE: 7 5/8 IN. AT 9268 FT.	TOTAL CIRCULATING VOLUME: 938		PUMP MAKE: G-D MODEL: D-2-9	.022 OPPOSITE COLLAR 205
DRILL PIPE SIZE: 3 1/2	TYPE: E 13.30	PRODUCTION OR LINER: IN. AT FT.	IN STORAGE: AV	WEIGHT: 345	BBL./STROKE: .0396	STROKE/MIN.: 114
DRILL COLLAR SIZE: 4 3/4	LENGTH: 330	MUD TYPE: LIGNOSULFONATE			GPM 189 BBL./MIN. 4.5	CIRCULATING PRESSURE PSI 2500-2600 BOTTOMS UP (MIN.) 76 SYSTEM TOTAL (MIN.) 208

Sample from ☐ Flowline ☒ Pit

Flowline Temperature °F

MUD PROPERTIES	IN	OUT	
Time Sample Taken	4:30		
Depth (ft)	9844		
Weight ☒ (ppg) ☐ (lb/cu ft)	15.9	15.9	
Mud Gradient (psi/ft)	.826		
Funnel Viscosity (sec/qt) API at 110° °F	49	58	
Plastic Viscosity cp at 48 °F	36		
Yield Point (lb/100 sq ft)	17		
Gel Strength (lb/100 sq ft) 10 sec/10 min	2/12	/	/
pH ☒ Strip ☐ Meter	105		
Filtrate API (ml/30 min)	3.8		
API HP HT Filtrate (ml/30 min) at °F	—		
Cake Thickness 32nd in API ☐ HTHP ☐	2		
Alkalinity, Mud (Pm)	3.1		
Alkalinity, Filtrate (P_f/M_f)	.8/2.3	/	/
Salt ☐ppm ☐ppg Chloride ☒ppm ☐ppg	3700		
Calcium ☒ ppm ☐ Gyp ppb	120		
Sand Content (% by Vol)	.1		
Solids Content (% by Vol)	30		
Oil Content (% by Vol)	5		
Water Content (% by Vol)	65		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT

	SIZE	HRS/TOUR				SIZE	HRS/TOUR		
Centrifuge					Desilter				
Degasser	Rig				Shaker	60 x 80			
Desander					Other	MC + Brandt - 150			

DAILY COST	CUMULATIVE COST
997 00	176,246 —

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
15.9	50-55	4 cc 10-35

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☐ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT	Daily	Total
☐ IMCO BAR	20	790
☐ IMCO GEL		328
☐ IMCO ~~BRINECO~~ Bulk		1050
☐ IMCO RD-111	15	515
☐ IMCO ~~VG-69~~ Lig		531
☐ IMCO ~~THIN~~ Setter		171
☐ IMCO CAUSTIC SODA		187
☐ IMCO ~~BD~~ Lubrikleen	—	32
☐ IMCO POLY RX		
☐		
☐ Eng + Trailer	1	58

REMARKS G.I.H. - / Bit + D.H. - Mud Gas Very Gas Cut Peaked at 52 units Trip Gas

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
Tommy Nichols	Houston	495-4134
UTILITY	WAREHOUSE LOCATION	TELEPHONE
	Galveston	744-5373

Form 515 Rev. 50M 2-80 Printed in USA

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RT REPORT NO. 25

DEPTH 9937

WELL | SEC

MUD NO. 4

MUD DATE 12-15-86

SECTION, TOWNSHIP, RANGE ADM-A-628

PROVINCE

ST 122 A #1 | ST 122 A | Galveston | Texas

OPERATION		CASING	MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: Drlg/Dyna Drill		SURFACE: 10 3/4 IN. AT 1500 FT.	HOLE: 921±	PITS: 530±	PUMP SIZE X IN.: 4 1/2 x 9	ANNULAR VEL. (FT./MIN.): .036 OPPOSITE DP 133±
BIT SIZE (IN.): 6 3/4	NO.	INTERMEDIATE: 7 5/8 IN. AT 9268 FT.	TOTAL CIRCULATING VOLUME: 951±		PUMP MAKE: G.D. MODEL: T.2.9	.032 OPPOSITE COLLAR 184±
DRILL PIPE SIZE: 3 1/2	TYPE: 13.30	PRODUCTION OR LINER: — IN. AT FT.	IN STORAGE: AV =	WEIGHT: 348	BBL./STROKE: .0427 @ 98% Eff.	STROKE/MIN.: CIRCULATING PRESSURE PSI: 2700
DRILL COLLAR SIZE: 4 3/4	LENGTH: 330	MUD TYPE: Lignosulfonate			SPM 179 BBL./MIN. 4.27	BOTTOMS UP (MIN.): 152± SYSTEM TOTAL (MIN.): 223±

Sample from ☐ Flowline ☐ Pit
Flowline Temperature °F

MUD PROPERTIES	In	Out
Time Sample Taken	4:30 pm	
Depth (ft)	9937	
Weight ☒ (ppg) ☐ (lb/cu ft)	15.8	15.6
Mud Gradient (psi/ft)	.8216	
Funnel Viscosity (sec/qt) API at ____ °F	50	50
Plastic Viscosity cp at ____ °F	36	
Yield Point (lb/100 sq ft)	17	
Gel Strength (lb/100 sq ft) 10 sec/10 min	2/10	/ /
pH ☐ Strip ☐ Meter	10.5	
Filtrate API (ml/30 min)	3.6	
API HP HT Filtrate (ml/30 min) at ____ °F	—	
Cake Thickness 32nd in API ☒ HTHP ☐	2	
Alkalinity, Mud (Pm)	3.0	
Alkalinity, Filtrate (P_f/M_f)	.8/22	/ /
Salt ☐ppm ☐gpg Chloride ☒ppm ☐gpg	3700	
Calcium ☒ ppm ☐ Gyp ppb	100	
Sand Content (% by Vol)	0.1	
Solids Content (% by Vol)	30	
Oil Content (% by Vol)	5	
Water Content (% by Vol)	65	
Methylene Blue Capacity (ml/ml Mud)	—	
Methylene Blue (lb/bbl Bentonite Eq)	—	

EQUIPMENT	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge			Desilter		
Degasser Rig When Needed			Shaker Bennett Boxes		
Desander M. Logger			Other M. Cleaner 150		

DAILY COST $ 493 @ Thru Inv. | CUMULATIVE COST $ 176,739 @ Tot. Inv.

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
15.9	50-55	4 or less

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☒ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT

☐ IMCO BAR	
☐ IMCO GEL	
☐ IMCO BRINE Bulk	
☐ IMCO RD-111	
☐ IMCO LIG	
☐ IMCO Salten	
☐ IMCO CAUSTIC SODA	
☐ IMCO Lubrikleen	
☐ IMCO POLY RX	
☐	
☒ Engineer on Location	1.5

REMARKS P.D.O.H. + put on Dyna Drill. R.I.H. @ appx 8pm
Recieved 100 u GAS from trip - made it around before bryan
Caught it. cut wt P.E.M
Back to 15.5 #/gal

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
P.E. McAliley	Dayton, Tex.	258-2765
CONTRACTOR	WAREHOUSE LOCATION	TELEPHONE
	Galveston, Tex.	744-5373

Form 515 Rev. 6/84

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REPORT NO. 6C
DEPTH 10007
WELL
PTE NO. 4
SPUD DATE 12-15-80
SECTION, TOWNSHIP, RANGE BBM-A-62
PROVINCE

S.T 122 - A #1 Townsite #3 | ST122 | Galveston | Texas

OPERATION		CASING	MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: P.O.O.H.		SURFACE: 10 3/4 IN. AT 1500 FT.	HOLE: 424 ±	PITS: 600 ±	PUMP SIZE: 4 1/2 X 9 IN.	ANNULAR VEL. (FT./MIN.): .072 OPPOSITE DP 133 ; .022 OPPOSITE COLLAR 194 ±
BIT SIZE (IN.): 6 3/4	NO.	INTERMEDIATE: 7 5/8 IN. AT 9268 FT.	TOTAL CIRCULATING VOLUME: 1024 ±		PUMP MAKE: G.D. MODEL: P.2-9.	
DRILL PIPE SIZE: 3 1/2	TYPE: E 13.30	PRODUCTION OR LINER: — IN. AT FT.	IN STORAGE: AV =	WEIGHT: 351 ±	BBL./STROKE: .0427 STROKE/MIN.: 100	CIRCULATING PRESSURE PSI: —
DRILL COLLAR SIZE: 4 3/4	LENGTH	MUD TYPE: Lignosulphonate			98m 179 BBL./MIN. 4.27	BOTTOMS UP (MIN.): 82 ± ; SYSTEM TOTAL (MIN.): 3903 ±

Sample from ☐ Flowline ☒ Pit
Flowline Temperature 115 °F

MUD PROPERTIES	Inc		
Time Sample Taken	4:00pm		
Depth (ft)	10007		
Weight ☒ (ppg) ☐ (lb/cu ft)	16.0		
Mud Gradient (psi/ft)	.832		
Funnel Viscosity (sec/qt) API at ____ °F	53		
PV Viscosity cp at ____ °F	40		
Yield Point (lb/100 sq ft)	24		
Gel Strength (lb/100 sq ft) 10 sec/10 min	3/14	/	/
pH ☒ Strip ☐ Meter	11.0		
Filtrate API (ml/30 min)	3.4		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☒ HTHP ☐	2		
Alkalinity, Mud (Pm)	3.8		
Alkalinity, Filtrate (P_f/M_f)	1.1/2.4	/	/
Salt ☐ppm ☐gpg Chloride ☒ppm ☐gpg	7800		
Calcium ☒ ppm ☐ Gyp ppb	120		
Sand Content (% by Vol)	0.1		
Solids Content (% by Vol)	29		
Oil Content (% by Vol)	4		
Water Content (% by Vol)	67		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT

	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge			Desilter		
Degasser Rig			Shaker Brandt	80 x 6	
Desander M. Logger			Other M. Chemical		

DAILY COST $6422 = Thru Inv. CUMULATIVE COST $183,181 Tax Inc

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
15.9	50-55	4 or less

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☒ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT

☐ IMCO BAR	
☐ IMCO GEL	
☐ IMCO ~~DRIMGEL~~ Bulk *	
☐ IMCO RD-111	
☐ IMCO ~~VIS-PO~~ Lig	10
☐ IMCO ~~THIN~~ Soltex	40
☐ IMCO CAUSTIC SODA	4
☐ IMCO ~~MUD~~ Lubriklean	
☐ IMCO POLY RX	
☐	
☒ Engineer on Location	1

REMARKS P.O.O.H. for new bit, have achieved angle w/ Dynadrill.

Cost Inc 4500.00 cost of Bulk.

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
P.E. McAliley	Dayton, Tx	258 3765
AREA OFFICE	WAREHOUSE LOCATION: Galveston, Tx	TELEPHONE 744 5373

Form 515 Rev. 50M 2-80

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REPORT NO. 67

Depth 10,063

WELL | T | S/T

No. 4

Date 12-15-84

Section, Township, Range MBM-6-8

Province

S.T. 122-A #1 | Townsite #3 | ST 122 | Galveston | Texas

OPERATION		CASING	MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: Drlg		SURFACE: 10 3/4 IN. AT 1500 FT.	HOLE: 430±	PITS: 600±	PUMP SIZE: 4 1/2 X 9 IN.	ANNULAR VEL. (FT./MIN.): .0222 OPPOSITE DP 199±
BIT SIZE (IN.): 6 3/4	NO.: 24	INTERMEDIATE: 7 5/8 IN. AT 9268 FT.	TOTAL CIRCULATING VOLUME: 1030±		PUMP MAKE: G.D. MODEL: P.Z. 9	.0222 OPPOSITE COLLAR 217±
DRILL PIPE SIZE: 3 1/2	TYPE: E 13.30	PRODUCTION OR LINER: — IN. AT FT.	IN STORAGE: AV =	WEIGHT: 354±	BBL./STROKE: .0427 @ 97% STROKE/MIN.: 112	CIRCULATING PRESSURE (PSI): 2500±
DRILL COLLAR SIZE: 4 3/4	LENGTH: 210	MUD TYPE: Lignosulfonate			8 1/2 201 BBL./MIN. 4.78	BOTTOMS UP (MIN.): 79± SYSTEM TOTAL (MIN.): 215±

Sample from ☐ Flowline ☒ Pit

Flowline Temperature 116 °F

	MUD PROPERTIES In		Out
Time Sample Taken	4 am		
Depth (ft)	10,065		
Weight ☒ (ppg) ☐ (lb/cu ft)	16.8		15.5+
Mud Gradient (psi/ft)	.872		
Funnel Viscosity (sec/qt) API at ____ °F	54		63
Plastic Viscosity cp at ____ °F	44		
Yield Point (lb/100 sq ft)	24		
Gel Strength (lb/100 sq ft) 10 sec/10 min	3 / 14	/	/
pH ☒ Strip ☐ Meter	11.0		
Filtrate API (ml/30 min)	3.2		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☒ HTHP ☐	2		
Alkalinity, Mud (Pm)	3.6		
Alkalinity, Filtrate (P_f/M_f)	1.1/2.2	/	/
Salt ☐ppm ☐gpg Chloride ☒ppm ☐gpg	3000		
Calcium ☒ ppm ☐ Gyp ppb	120		
Sand Content (% by Vol)	0.1		
Solids Content (% by Vol)	29		
Oil Content (% by Vol)	5		
Water Content (% by Vol)	66		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT

	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge	—		Desilter	—	
Degasser Rig	Wlm Needed		Shaker Brandt	60 x 60	
~~Desander~~ Mt. Logged			Other Mt. Cleaner	120	

DAILY COST 1,259 Thru Inv. | CUMULATIVE COST 189,420 Thru Inv.

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
15.9	50-55	4 or Less

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☒ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT

☐ IMCO BAR	
☐ IMCO GEL	
☐ IMCO ~~BRINEGEL~~ Bulk	
☐ IMCO RD-111	
☐ IMCO ~~VG-69~~ Liq	
☐ IMCO ~~THIN~~ Soltex	
☐ IMCO CAUSTIC SODA	
☐ IMCO ~~MO~~ Lubi-Klean	
☐ IMCO POLY RX	
☒ Plug-(Med)	
☒ Engineer on Location	

REMARKS Drlg Ahead no prob. B.G. Gas 20-100u

Thanks P.E.M.

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
P.E. McAliley	Dayton, Tex	258-37[illegible]
AREA OFFICE	WAREHOUSE LOCATION	TELEPHONE
	Galveston, Tex	744-[illegible]

Form 515 Rev. 50M-2-80

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REPORT NO. 68
DEPTH 10292
WELL
DATE 12-15-80
SECTION, TOWNSHIP, RANGE BBM-A-628
PROVINCE

ST 122-A #1 | ST-122-A | GALVESTON | TEXAS

OPERATION		CASING	MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: Survey / Drlg		SURFACE: 10 3/4 IN. AT 1500 FT.	HOLE: 436	PITS: 550	PUMP SIZE: 4 1/2 X 9 IN.	ANNULAR VEL. (FT./MIN.): .032 OPPOSITE DP 151
BIT SIZE (IN.): 6 3/4	NO.: 25	INTERMEDIATE: 7 5/8 IN. AT 9268 FT.	TOTAL CIRCULATING VOLUME: 986		PUMP MAKE: G-D MODEL: P-2-9	.022 OPPOSITE COLLAR 220
DRILL PIPE SIZE: 3 1/2	TYPE: 13.30	PRODUCTION OR LINER: IN. AT FT.	IN STORAGE: AY = 360	WEIGHT:	BBL./STROKE: .044	STROKES/MIN.: 110
DRILL COLLAR SIZE: 4 3/4	LENGTH: 310	MUD TYPE: LIGNOSULFONATE			GPM: 203 BBL./MIN.: 4.84	CIRCULATING PRESSURE PSI: 3000 BOTTOMS UP (MIN.): 74 SYSTEM TOTAL (BBL.): 203

Sample from ☐ Flowline ☐ Pit
Flowline Temperature °F

MUD PROPERTIES	IN	OUT	
Time Sample Taken	4:30 AM		
Depth (ft)	10292		
Weight ☑ (ppg) ☐ (lb/cu ft)	15.9		
Mud Gradient (psi/ft)	826		
Funnel Viscosity (sec/qt) API at ____ °F	53		
Plastic Viscosity cp at ____ °F	43		
Yield Point (lb/100 sq ft)	20		
Gel Strength (lb/100 sq ft) 10 sec/10 min	2 / 18	/	/
pH ☑ Strip ☐ Meter	10.5		
Filtrate API (ml/30 min)	3.2		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☐ HTHP ☐	2		
Alkalinity, Mud (Pm)	3.0		
Alkalinity, Filtrate (P_f/M_f)	.6 / 20	/	/
Salt ☐ppm ☐gpg Chloride ☑ppm ☐gpg	3800		
Calcium ☑ ppm ☐ Gyp ppb	80		
Sand Content (% by Vol)	.10		
Solids Content (% by Vol)	30		
Oil Content (% by Vol)	5		
Water Content (% by Vol)	65		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT	SIZE	HRS/TOUR	SIZE	HRS/TOUR
Centrifuge			Desilter	
Degasser	RIG		Shaker	60 x 80
Desander			Other	Mc-Bean 150

DAILY COST THRU INV: 1,299.00
CUMULATIVE COST (INCL. DELIVERY): 185,714

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
15.9	50-55	4 or less

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☐ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT	DAILY	TO DATE
☐ IMCO BAR	15	865
☐ IMCO GEL		328
☐ IMCO ~~BRINE~~ GEL Bulk		1033
☐ IMCO RD-111	18	542
☐ IMCO ~~VG-69~~ Rig	12	553
☐ IMCO ~~THIN~~ Sollex		184
☐ IMCO CAUSTIC SODA		191
☐ IMCO ~~M-D~~ Lignikleen		32
☐ IMCO POLY RX		
☐		
☐ ENG	1	12

REMARKS: Mud Looks Good. Working to Lower Viscosity + Yield Point + Drilling Mud Making Formation - Having to Add Water + Barite to maintain Wt + Viscosity -

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
Tommy Nichol	Houston	495-4134
AREA OFFICE	WAREHOUSE LOCATION: Galveston	TELEPHONE: 744-5373

Form 515 Rev. 50M 2-80

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REPORT NO. 69

DATE 10,771

WELL

JOB NO. 4

MUD DATE 12-15-80

DEPTH, TOWNSHIP, RANGE MBM-A-628

PROVINCE TX

ST 122 A #1 | ST 122 | GALVESTON

OPERATION		CASING	MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY		SURFACE 10 3/4 IN. AT 1500 FT.	HOLE 455	PITS 500	PUMP SIZE 4 1/2 X 9	ANNULAR VEL. (FT./MIN.) .032 15 .028 220
BIT SIZE (IN.) 6 3/4	NO. 25	INTERMEDIATE 7 5/8 IN. AT 9268 FT.	TOTAL CIRCULATING VOLUME 955		PUMP MAKE G.D MODEL P-2-9	OPPOSITE COLLAR
DRILL PIPE SIZE 3 1/2	TYPE 13.30	PRODUCTION OR LINER IN. AT FT.	IN STORAGE AV	WEIGHT 375	BBL./STROKE .044 STROKE/MIN. 110	CIRCULATING PRESSURE PSI 3000
DRILL COLLAR SIZE 4 3/4	LENGTH 310	MUD TYPE LIGNOSULFONATE			BBL./MIN. 4.84 GPM 203	BOTTOMS UP (MIN.) 38 SYSTEM TOTAL (MIN.) 197

Sample from ☐ Flowline ☒ Pit

Flowline Temperature °F

MUD PROPERTIES			
Time Sample Taken	4:30		
Depth (ft)	10,771		
Weight ☒ (ppg) ☐ (lb/cu ft)	16.0		
Mud Gradient (psi/ft)	.832		
Funnel Viscosity (sec/qt) API at ____ °F	54		
Plastic Viscosity cp at ____ °F	43		
Yield Point (lb/100 sq ft)	20		
Gel Strength (lb/100 sq ft) 10 sec/10 min	2 /13	/	/
pH ☐ Strip ☒ Meter	10.8		
Filtrate API (ml/30 min) 3.3	[illegible]		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☐ HTHP ☐	2		
Alkalinity, Mud (Pm)	3.4		
Alkalinity, Filtrate (P_f/M_f)	1.0 /25	/	/
Salt ☐ppm ☐gps Chloride ☒ppm ☐gps	3800		
Calcium ☒ ppm ☐ Gyp ppb	80		
Sand Content (% by Vol)	.1		
Solids Content (% by Vol)	30		
Oil Content (% by Vol)	5		
Water Content (% by Vol)	65		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge			Desilter		
Degasser	RIG		Shaker	60 & 80	
Desander			Other	BARNET MC-180	

DAILY COST THRU INV 5,926.00

CUMULATIVE COST THRU OCT INV 191,645.00

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
16.0	50-55	4 or Less

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☐ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT	Daily Usage	Cum
☐ IMCO BAR	44	904
☐ IMCO GEL		326
☐ IMCO ~~BRINEGEL~~ Bulk	410	11,0[illegible]
☐ IMCO RD-111	22	570
☐ IMCO ~~VG-69~~ LIG	4	557
☐ IMCO ~~THIN~~ Solter		189
☐ IMCO CAUSTIC SODA	5	146
☐ IMCO ~~MD~~ Lubrikleen		32
☐ IMCO POLY RX		
☐		
☒ ENG	1	63

REMARKS: Drlg Mud Making Formation. Requiring Water Dilution and Barite. Installed 180 Mesh Screen on Mud Cleaner. Running 3-11's in Bit. Improved Hydraulics. Increased Drilling Rate. Add Water!

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
Tommy Nichol	Houston	495-4134
	WAREHOUSE LOCATION	TELEPHONE
	Galveston	744-5375

Form 515 Rev. 50M 2-80

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DRILLING REPORT NO. 70

DEPTH 10,987

WELL | BY

MUD NO. 4

AUG DATE 12-15-80

SECTION, TOWNSHIP, AREA SBM-628

PROVINCE

S.T. 122-A&1, Townsite 3 | ST 122 | Galveston | Texas

OPERATION		CASING	MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: Drlg		SURFACE: 10 3/4 IN. AT 1500 FT.	HOLE: 463	PITS: 500 ±	PUMP SIZE: 4 1/2 X 9 IN.	ANNULAR VEL. (FT./MIN.): .072 OPPOSITE DP 151; .072 OPPOSITE COLLAR 220
BIT SIZE (IN.): 6 3/4	NO.: 2	INTERMEDIATE: 7 5/8 IN. AT 9268 FT.	TOTAL CIRCULATING VOLUME: 963 ±		PUMP MAKE: G.D. MODEL: P-2-9	
DRILL PIPE SIZE: 3 1/2	TYPE: E 13.30	PRODUCTION OR LINER: — IN. AT FT.	IN STORAGE: A V =	WEIGHT: 381	BBL./STROKE: .044 STROKE/MIN.: 110	CIRCULATING PRESSURE PSI: 3000
DRILL COLLAR SIZE: 4 3/4	LENGTH: 330	MUD TYPE: Lignosulfonate			GPM 203 BBL./MIN. 4.84	BOTTOMS UP (MIN.): 79 ± SYSTEM TOTAL (MIN.): 199 ±

Sample from ☐ Flowline ☑ Pit
Flowline Temperature 115 °F

MUD PROPERTIES	In		Out
Time Sample Taken	11:30 am		
Depth (ft)	10,987 @ 5:30 am.		
Weight ☑ (ppg) ☐ (lb/cu ft)	16.0		15.8
Mud Gradient (psi/ft)	.832		
Funnel Viscosity (sec/qt) API at ____ °F	49		59
Plastic Viscosity cp at ____ °F	39		
Yield Point (lb/100 sq ft)	17		
Gel Strength (lb/100 sq ft) 10 sec/10 min	2/7	/	/
pH ☑ Strip ☐ Meter	11.4		
Filtrate API (ml/30 min)	3.4		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☑ HTHP ☐	2		
Alkalinity, Mud (Pm)	4.2		
Alkalinity, Filtrate (P_f/M_f)	1.3/2.7	/	/
Salt ☐ppm ☐gpg Chloride ☑ppm ☐gpg	3700		
Calcium ☑ ppm ☐ Gyp ppb	80		
Sand Content (% by Vol)	0.1		
Solids Content (% by Vol)	30		
Oil Content (% by Vol)	5		
Water Content (% by Vol)	65		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT

	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge	—		Desilter	—	
Degasser	Rig When Need		Shaker	Brandt	80 x 60
Desander	M. Loggers 24 hr		Other	M. Cleaner	180

DAILY COST 5890 Thru Ind. CUMULATIVE COST 197,535 Thru Ind.

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
16.0	49	4 or Less

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☑ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT

☐ IMCO BAR		90
☐ IMCO GEL		3
☑ IMCO ~~BRINEGEL~~ Bulk	484	11
☑ IMCO RD-111	12	5
☑ IMCO ~~VG-69~~ Lig	25	5
☑ IMCO ~~THIN~~ Soltex		13
☑ IMCO CAUSTIC SODA	11	20
☐ IMCO ~~MO~~ Lubrikleen		3
☐ IMCO POLY RX		
☑ Plug	12	3
☑ Engineer on location	1	1

REMARKS Drlg ahead No prob – G.T.H. @ Approx 5:30 pm – B.G. Gas 3500 Connection Gas – 80 u Trip Gas 400 u

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
P.E. McAliley	Dayton, Texas	258 3765
	WAREHOUSE LOCATION: Galveston, Texas	TELEPHONE: 744 5373

Form 515 Rev. 50M 2-80

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DRT. REPORT NO. 4
DEPTH 11,241
WELL
MUD DATE 12-15-80
SECTION, TOWNSHIP, AREA PGM-628
PROVINCE TEXAS

Shorty Salzman ST122 | Galveston | Texas

OPERATION		CASING		MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: P.O.O.H		SURFACE: 10 3/4 IN. AT 1500 FT.		HOLE: 460 t	PITS: 522 t	PUMP SIZE: 4 1/2 X 9 IN.	ANNULAR VEL. (FT./MIN.): .032 OPPOSITE DC 151 t
BIT SIZE (IN.): 6 3/4	NO.: 26	INTERMEDIATE: 7 5/8 IN. AT 9268 FT.		TOTAL CIRCULATING VOLUME: 982 t		PUMP MAKE: G.D. MODEL: P-2-9	.022 OPPOSITE COLLAR 220 t
DRILL PIPE SIZE: 3 1/2	TYPE: 13.30	PRODUCTION OR LINER: — IN. AT FT.		IN STORAGE: AV =	WEIGHT: 379 t	BBL./STROKE: .044 STROKE/MIN.: 110	ON GRADING PRESSURE PSI: 3000
DRILL COLLAR SIZE: 4 3/4	LENGTH: 320	MUD TYPE: Lignosulfonate				SPM 203 BBL./MIN. 4.84	BOTTOMS UP (MIN.): 39 t SYSTEM TOTAL (MIN.): 203 t

Sample from ☐ Flowline ☑ Pit
Flowline Temperature 72 °F

MUD PROPERTIES	IN		OUT
Time Sample Taken	8:30 pm	to	4:30 pm
Depth (ft)	11,241		
Weight ☑ (ppg) ☐ (lb/cu ft)	16.0		15.8
Mud Gradient (psi/ft)	.832		
Funnel Viscosity (sec/qt) API at ____ °F	53		80
Plastic Viscosity cp at ____ °F	36		
Yield Point (lb/100 sq ft)	18		
Gel Strength (lb/100 sq ft) 10 sec/10 min	2/10	/	/
pH ☑ Strip ☐ Meter	11.4		
Filtrate API (ml/30 min)	3.2		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☑ HTHP ☐	2		
Alkalinity, Mud (Pm)	3.2		
Alkalinity, Filtrate (P_f/M_f)	1.3/2.5	/	/
Salt ☐ppm ☐ppg Chloride ☑ppm ☐ppg	4300		
Calcium ☑ ppm ☐ Gyp ppb	80		
Sand Content (% by Vol)	0.1		
Solids Content (% by Vol)	27		
Oil Content (% by Vol)	5		
Water Content (% by Vol)	68		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT

	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge			Desilter		
Degasser Rig Uses Mud			Shaker Brandt Box 60		
Desander M. Logger 24 hrs			Other M. Cleaner 180		

DAILY COST 2174 Thru Tour. CUMULATIVE COST 149,709 Tot. Sal

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
16.0	48	4 or Less

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☑ OPERATOR'S REPRESENTATIVE ☐ OTHER

Materials Used

RECOMMENDED TOUR TREATMENT

☑ IMCO BAR	20 sx
☐ IMCO GEL	
☑ IMCO ~~BRINEGEL~~ Bulk	20 sx
☑ IMCO RD-111	5
☑ IMCO ~~VG-69~~ L.T.	15 sx
☐ IMCO ~~THIN~~ Salinex	
☐ IMCO CAUSTIC SODA	
☐ IMCO ~~MOD~~ Lubrikleen	3
☑ IMCO ~~POLYPAK~~ Plug	5
☑ Sodium Chromate	2
☑ Engineer on Location	1

REMARKS Had been Drlg no prob - penetration rate slowed - RD 0.11 to change bit. Vis coming out Increasing due to Cl's. Jetted 700 bbls of 10 #/gal mud in storage tank. Anadarko shale is making mud - must maintain good stream of water to control vis

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
P.E. McAliley	Dayton, Texas	258 2225
OFFICE	WAREHOUSE LOCATION	TELEPHONE
	Galveston, Texas	744 5373

Form 515 Rev. 50M 2-80

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REPORT NO. 72
DATE 11-6-81
WELL
NO. 4
DATE 12-15-81
SECTION, TOWNSHIP, RANGE
BLOCK A-628
PROVINCE

ST 122 A #1 | ST 122 | GALVESTON | TEXAS

OPERATION		CASING	MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: Drlg		SURFACE: 10 3/4 IN. AT 1500 FT.	HOLE: 488	PITS: 500	PUMP SIZE: 4 1/2 X 9 IN.	ANNULAR VEL. (FT./MIN.): .032 OPPOSITE DP 145
BIT SIZE (IN.): 6 3/4	NO.: 3-11 27	INTERMEDIATE: 7 5/8 IN. AT 9268 FT.	TOTAL CIRCULATING VOLUME: 988		PUMP MAKE: G.D MODEL: P-2-9	.022 OPPOSITE COLLAR 212
DRILL PIPE SIZE: 3 1/2	TYPE: E 13.30	PRODUCTION OR LINER: IN. AT FT.	IN STORAGE: AY	WEIGHT: 402	BBL./STROKE: .044	STROKE/MIN.: 106
DRILL COLLAR SIZE: 4 3/4	LENGTH:	MUD TYPE: LIGNOSULFONATE			BBL./MIN.: 4.664	CIRCULATING PRESSURE PSI: 3000
						BOTTOMS UP (MIN.): 86
						SYSTEM TOTAL (MIN.): 212

Sample from ☐ Flowline ☑ Pit
Flowline Temperature °F

MUD PROPERTIES			
Time Sample Taken	4:30		
Depth (ft)	4628		
Weight ☑ (ppg) ☐ (lb/cu ft)	16.0		
Mud Gradient (psi/ft)	.832		
Funnel Viscosity (sec/qt) API at ____ °F	50		
Plastic Viscosity cp at ____ °F	38		
Yield Point (lb/100 sq ft)	18		
Gel Strength (lb/100 sq ft) 10 sec/10 min	2 / 12	/	/
pH ☑ Strip ☐ Meter	10.5		
Filtrate API (ml/30 min)	3.2		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☐ HTHP ☐	2		
Alkalinity, Mud (Pm)	2.0		
Alkalinity, Filtrate (P_f/M_f)	.8 / 2.4	/	/
Salt ☐ppm ☐ppg Chloride ☐ppm ☐ppg	4100		
Calcium ☑ ppm ☐ Gyp ppb	120		
Sand Content (% by Vol)	.1		
Solids Content (% by Vol)	29		
Oil Content (% by Vol)	5		
Water Content (% by Vol)	66		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge			Desilter		
Degasser	Rig		Shaker	60 180	
Desander			Other	Baroid-180	

DAILY COST: 7,975.00
CUMULATIVE COST: 207,684.00

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
16.0	47	4 or Less

BY AUTHORITY: ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☐ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT	Daily Use	Cum. Use
☐ IMCO BAR Slugs	—	1435
☐ IMCO GEL	—	1528
☐ IMCO ~~BRINEGEL~~ Bulk	300	4,27
☐ IMCO RD-111	21	60
☐ IMCO ~~VG-10~~ Liq	12	64
☐ IMCO ~~THIN~~ Solter		184
☐ IMCO CAUSTIC SODA	8	215
☐ IMCO M D		
☐ IMCO ~~POLY-RX~~ Plug	9	56
☐		
☑ ENG	1	66

REMARKS: Requiring Large water Dilution to control viscosity. Water requires Barite usage.

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
Tommy Nichol	Houston	495-4134
OFFICE	WAREHOUSE LOCATION: Galveston	TELEPHONE: 744-5373

Form 515 Rev. 50M 2-80

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DAILY REPORT NO. 5
DEPTH 11693
BIT NO. 4
SPUD DATE 12-15-81
SECTION, TOWNSHIP, BLOCK MBM-A-628

ST 122 A #

ST-122 Galveston Texas

OPERATION		CASING	MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: Drlg. Ahead		SURFACE: 10 3/4 IN. AT 1500 FT.	HOLE: 488	PITS: 500	PUMP SIZE: 4 1/2 X 9 IN.	ANNULAR VEL. (FT/MIN.): .132 OPPOSITE DP 155
BIT SIZE (IN.): 6 3/4	NO.: 5-12S 28	INTERMEDIATE: 7 5/8 IN. AT 9268 FT.	TOTAL CIRCULATING VOLUME: 988		PUMP MAKE: G-Denver MODEL: P-2-9	.022 OPPOSITE COLLAR 225
DRILL PIPE SIZE: 3 1/2	TYPE: E 13.30#	PRODUCTION OR LINER: IN. AT FT.	IN STORAGE: AM = 402	WEIGHT	BBL./STROKE: .044	STROKES/MIN.: 114 CIRCULATING PRESSURE PSI: 3000
DRILL COLLAR SIZE: 4 3/4	LENGTH	MUD TYPE: Lignosulfonate			(5.016) BBL./MIN.: 5.02	BOTTOMS UP (MIN.): 80 SYSTEM TOTAL (BBL.): 197

Sample from ☐ Flowline ☑ Pit
Flowline Temperature °F

MUD PROPERTIES			
Time Sample Taken	14:00		
Depth (ft)	11693		
Weight ☑ (ppg) ☐ (lb/cu ft)	16.0		
Mud Gradient (psi/ft)	.832		
Funnel Viscosity (sec/qt) API at ____ °F	50		
Plastic Viscosity cp at ____ °F	39		
Yield Point (lb/100 sq ft)	20		
Gel Strength (lb/100 sq ft) 10 sec/10 min	1/8	/	/
pH ☑ Strip ☐ Meter	10.5		
Filtrate API (ml/30 min)	3.0		
API HP+HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☑ HTHP ☐	2		
Alkalinity, Mud (Pm)	1.8		
Alkalinity, Filtrate (P_f/M_f)	.8/1.8	/	/
Salt ☐ ppm ☐ gps Chloride ☑ ppm ☐ gps	4400		
Calcium ☑ ppm ☐ Gyp ppb	80		
Sand Content (% by Vol)	TR		
Solids Content (% by Vol)	30		
Oil Content (% by Vol)	5		
Water Content (% by Vol)	65		
Methylene Blue Capacity (ml/ml Mud)			
Methylene Blue (lb/bbl Bentonite Eq)			

EQUIPMENT	SIZE	HRS/TOUR				SIZE	HRS/TOUR		
Centrifuge					Desilter				
Degasser					Shaker				
Desander					Other				

DAILY COST: 3945
CUMULATIVE COST: 21629

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
16.0		

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☑ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT	AM	PM
☑ IMCO BAR Slug	300	969
☐ IMCO GEL	-	32
☐ IMCO ~~BRINEGEL~~ Bulk Wt.	300	1215
☑ IMCO RD-111	16	619
☑ IMCO ~~SC-111~~ Lig	16	636
☐ IMCO ~~THIN~~ Soltex	-	134
☑ IMCO CAUSTIC SODA	16	22
☐ IMCO M D		
☑ IMCO ~~POLY-PAC~~ Plug	9	65
☐		
☑ Engineer	1	67

REMARKS POOH for Bit change - L/D 14 stds. prior to trip - Trip Gas 460 units
Backgroundgas 60-62u - Conn. gas 12-15 units

IMCO REPRESENTATIVE: Bruce P. Hammond
HOME ADDRESS: Liberty, Texas
TELEPHONE: 495-4134
AREA OFFICE: Thank You!
WAREHOUSE LOCATION: Galveston
TELEPHONE: 744-5373

Form 515 Rev. 50M 2-80

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REPORT NO. 4
DEPTH 11743
WELL
9
TO DATE 2-15-81
SECTION, TOWNSHIP, RANGE B-A-62

ST. 122-A #		ST.-122	Galveston TX

OPERATION	CASING	MUD VOLUME (BBL)	CIRCULATION DATA
PRESENT ACTIVITY: Drilling	SURFACE: 10 3/4 IN. AT 1500 FT.	HOLE: 500 / PITS: 500	PUMP SIZE: 4 1/2 X 9 IN. / ANNULAR VEL. FT./MIN.: 150
BIT SIZE (IN.): 6 3/4 / NO. 3-123 / 2812	INTERMEDIATE: 7 5/8 IN. AT 9268 FT.	TOTAL CIRCULATING VOLUME: 1000	PUMP MAKE: Gardner Denver / MODEL: PZ-9 / OPPOSITE DP: 211
DRILL PIPE SIZE: 3 1/2 / TYPE: 13.30#	PRODUCTION OR LINER: IN. AT FT.	IN STORAGE: AY = / WEIGHT: 402	BBL./STROKE: .044 / STROKE/MIN.: 110 / OPPOSITE COLLAR: 211 / CIRCULATING PRESSURE PSI: 3000
DRILL COLLAR SIZE: 4 3/4 / LENGTH:	MUD TYPE: Lignosulfonate	BBL./MIN.: 4.84	BOTTOMS UP (MIN.): 83 / SYSTEM TOTAL (MIN.): 247

Sample from ☐ Flowline ☑ Pit
Flowline Temperature 118 °F

MUD PROPERTIES			
Time Sample Taken	04:30		
Depth (ft)	11743		
Weight ☑ (ppg) ☐ (lb/cu ft)	16.0		
Mud Gradient (psi/ft)	.832		
Funnel Viscosity (sec/qt) API at 105 °F	60		
Plastic Viscosity cp at 105 °F	56		
Yield Point (lb/100 sq ft)	23		
Gel Strength (lb/100 sq ft) 10 sec/10 min	2/12	/	/
pH ☑ Strip ☐ Meter	10.5		
Filtrate API (ml/30 min)	2.9		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☑ HTHP ☐	2		
Alkalinity, Mud (Pm)	2.2		
Alkalinity, Filtrate (P_f/M_f)	.6/.7	/	/
Salt ☐ppm ☐ppg / Chloride ☑ppm ☐ppg	4100		
Calcium ☑ ppm ☐ Gyp ppb	80		
Sand Content (% by Vol)	1/2		
Solids Content (% by Vol)	32		
Oil Content (% by Vol)	35		
Water Content (% by Vol)	65 (64.5)		
Methylene Blue Capacity (ml/ml Mud)			
Methylene Blue (lb/bbl Bentonite Eq)			

EQUIPMENT	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge				Desilter	
Degasser				Shaker	
Desander				Other	

DAILY COST 1914 | CUMULATIVE COST 213,543

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
16.0		

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☑ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT	Daily	Cum
☐ IMCO BAR	—	900
☐ IMCO GEL	—	32
☐ IMCO ~~BRINEGEL~~ Bulk	40	1261
☑ IMCO RD-111	23	69
☑ IMCO ~~WBL~~ Lig	23	453
☑ IMCO ~~MIN~~ Soltex	—	184
☑ IMCO CAUSTIC SODA	6	22
☐ IMCO M D		
☑ IMCO ~~POLYPAC~~ Plug	6	11
☐		
☐ Engineer	1	68

REMARKS Take Survey - Could not retrieve - POOH - wait on special reamer - install in BHA & GIH to ream, drilling ahead
Have been running degasser and bot mud cleaner - Solids account for rise in viscosity - Are now running mud cleaner - Had No Vis Bottoms Up

IMCO REPRESENTATIVE Bruce P. Hammond | HOME ADDRESS Liberty, TX | total cost 213,543 | TELEPHONE 495-4134
USER OFFICE Thank You! | WAREHOUSE LOCATION Galveston, TX | TELEPHONE 744-5573

Form 515 Rev. 50M 2-80

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REPORT NO. 7
DEPTH 11,833
WELL
NO. 4
DATE 2-15-80
SECTION, TOWNSHIP, RANGE 18m-638
PROVINCE

S.T. 122-A#1, Townsite #3 | S.T. 122 | Galveston | Texas

OPERATION		CASING		MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: P.O.O.H		SURFACE: 10 3/4 IN. AT 1500 FT.		HOLE: 502 t	PITS: 500 t	PUMP SIZE: 4 1/2 X 9 IN.	ANNULAR VEL. (FT./MIN.): .032 150 t OPPOSITE PIPE
BIT SIZE (IN.): 6 3/4	NO. (28)	INTERMEDIATE: 7 5/8 IN. AT 9268 FT.		TOTAL CIRCULATING VOLUME: 1002 t		PUMP MAKE: G.D. MODEL: P-2-G	.032 217 OPPOSITE COLLAR
DRILL PIPE SIZE: 3 1/2	TYPE: E 13.30	PRODUCTION OR LINER: — IN. AT FT.		IN STORAGE: A V -	WEIGHT: 404 t	BBL./STROKE: .044 STROKE/MIN.: 110	CIRCULATING PRESSURE PSI: 2350
DRILL COLLAR SIZE: 4 3/4	LENGTH: —	MUD TYPE: Lignosulfonate				GPM: 203 BBL./MIN.: 4.84	BOTTOMS UP (MIN.): 84 SYSTEM TOTAL (MIN.): 208

Sample from ☐ Flowline ☑ Pit
Flowline Temperature °F

	MUD PROPERTIES		
Time Sample Taken	4:30 pm		
Depth (ft)	11,833		
Weight ☑ (ppg) ☐ (lb/cu ft)	16.0		
Mud Gradient (psi/ft)	.832		
Funnel Viscosity (sec/qt) API at ____ °F	47		
Plastic Viscosity cp at ____ °F	34		
Yield Point (lb/100 sq ft)	14		
Gel Strength (lb/100 sq ft) 10 sec/10 min	2/8	/	/
pH ☑ Strip ☐ Meter	10.8		
Filtrate API (ml/30 min)	3.0		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☑ HTHP ☐	2		
Alkalinity, Mud (Pm)	2.6		
Alkalinity, Filtrate (P_f/M_f)	.9/1.8	/	/
Salt ☐ppm ☐ppg Chloride ☑ppm ☐ppg	3600		
Calcium ☑ ppm ☐ Gyp ppb	80		
Sand Content (% by Vol)	0.1		
Solids Content (% by Vol)	30		
Oil Content (% by Vol)	4		
Water Content (% by Vol)	66		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT

	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge	—			Desilter	—
Degasser Rig	Ac Nedal			Shaker Brandt	80 K.bo
Desander M. Logger				Other M-Clone	150

DAILY COST $3342 Jd Thru Sev. | CUMULATIVE COST $210,885 Tot Est

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
16.0	47	4 or Less

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☑ OPERATOR'S REPRESENTATIVE ☐ OTHER

Materials used

RECOMMENDED TOUR TREATMENT

☑ IMCO BAR	30	
☐ IMCO GEL		
☑ IMCO ~~DRIMEDIE~~ Bulk	45	
☐ IMCO RD-111		
☐ IMCO ~~HS-40L~~		
☑ IMCO ~~THIN~~ Salter	60	
☑ IMCO CAUSTIC SODA	4	
☑ IMCO ~~TRO~~ Lubriklean	3	
☑ IMCO ~~POLY-PAK~~ Plug	16	
☐		
☑ Engineer on Location	1	

REMARKS Drlg Ahead no prob. - To keep Vis down must ~~t~~ continue good stream of water, which keeps increasing mud vol by approx 80 bbls a day. P.O.O.H for bit change. Thanks P.E.M.

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
P.E. McAliley	Dayton, Texas	258-2765
AREA OFFICE	WAREHOUSE LOCATION	TELEPHONE
	Galveston, Texas	744-5373

Form 515 Rev. 50M 2-80

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REPORT NO. 4
DEPTH 7680
WELL
NO. 4
DATE 12.15.80
SECTION, TOWNSHIP, RANGE
BLOCK A 628

S.T. A-122 A#1 | S.T. 122 A-1 | Galveston | Texas

OPERATION		CASING	MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: Drlg.		SURFACE: 10 3/4 IN. AT 1500 FT.	HOLE: 639±	PITS: 480±	PUMP SIZE: 6 1/4 X 9 IN.	ANNULAR VEL. (FT./MIN.): .075 OPPOSITE DP 142±
BIT SIZE (IN.): 9 7/8	NO.: 12	INTERMEDIATE: — IN. AT FT.	TOTAL CIRCULATING VOLUME: 1119±		PUMP MAKE: G.D. MODEL: P.2.9	OPPOSITE COLLAR 236±
DRILL PIPE SIZE: 4 1/2	TYPE: X O 16.60	PRODUCTION OR LINER: — IN. AT FT.	IN STORAGE: AV	WEIGHT: 539±	BBL./STROKE: .085 STROKE/MIN.: 125	CIRCULATING PRESSURE PSI: 2100
DRILL COLLAR SIZE: 7	LENGTH: 1315	MUD TYPE: Lignosulfonate			BBL./MIN.: 10.625 GPM: 446	BOTTOMS UP (MIN.): 51± SYSTEM TOTAL (MIN.): 105±

Sample from ☒ Flowline ☐ Pit
Flowline Temperature 120 °F

MUD PROPERTIES			
	IN		
Time Sample Taken	5 am		
Depth (ft)	7680		
Weight ☒ (ppg) ☐ (lb/cu ft)	10.3		
Mud Gradient (psi/ft)	.5356		
Funnel Viscosity (sec/qt) API at 120 °F	38		
Plastic Viscosity cp at 115 °F	16		
Yield Point (lb/100 sq ft)	18		
Gel Strength (lb/100 sq ft) 10 sec/10 min	1/12	/	/
pH ☐ Strip ☒ Meter	11.2		
Filtrate API (ml/30 min)	5.2		
API HPHT Filtrate (ml/30 min) at °F	—		
Cake Thickness 32nd in API ☒ HTHP ☐	2		
Alkalinity, Mud (Pm)	2.4		
Alkalinity, Filtrate (Pf/Mf)	1.0/2.0	/	/
Salt ☐ ppm ☐ ppg Chloride ☒ ppm ☐ ppg	3700		
Calcium ☒ ppm ☐ Gyp ppb	20		
Sand Content (% by Vol)	0.4		
Solids Content (% by Vol)	7		
Oil Content (% by Vol)	—		
Water Content (% by Vol)	93		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT

	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge	—		Desilter	—	
Degasser	Rig	When Needed	Shaker	Brandt	24 hrs
Desander	Mud Logger	24 hrs	Other	Mud Cleaner	24

DAILY COST 5,138 — Tax 4.4 Inv. CUMULATIVE COST $47,961 Tax Incl.

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
10.3	38-40	6-4

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☒ OPERATOR'S REPRESENTATIVE ☐ DRILLING CONTRACTOR ☐ OTHER

RECOMMENDED TOUR TREATMENT

	Daily	Total
☐ IMCO BAR		
☐ IMCO GEL		
☒ IMCO ~~BENTGEL~~ Bulk Bar $4100	449	21
☒ IMCO RD-111	10	13
☒ IMCO ~~VG-10~~ Lig	10	20
☐ IMCO THIN		
☒ IMCO CAUSTIC SODA	5	9
☐ IMCO M D		
☐ IMCO POLY RX		
☐		
* Engineer on location	1	13

REMARKS Drlg. Ahead No prob. Mud Needs good drink of water

Thks P.S.M.

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
R.E. McAliley	Dayton, Texas 713	258 2765
	WAREHOUSE LOCATION	TELEPHONE
	Galveston, Texas	744 5273

Form 515 Rev 10/84 ST 78 Printed in USA

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RT REPORT NO. 21

DEPTH 8189

WELL | S/T

NO. 4

D DATE 2-15-90

TION, TOWNSHIP, RGE

PROVINCE

ST. ISLAND | ST. ISLAND | GALVESTON

OPERATION		CASING	MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: Drlg		SURFACE: 10 3/4 IN. AT 1520 FT.	HOLE: 736	PITS: 500	PUMP SIZE: 6 1/4 X 9 IN.	ANNULAR VEL. (FT./MIN.): .075 OPPOSITE DP 143
BIT SIZE (IN.): 9 1/8	NO.: 12	INTERMEDIATE: IN. AT FT.	TOTAL CIRCULATING VOLUME: 1236		PUMP MAKE: IDECO MODEL: 7 29	.047 OPPOSITE COLLAR 228
DRILL PIPE SIZE: 4 1/2	TYPE: 16.60	PRODUCTION OR LINER: IN. AT FT.	IN STORAGE: AV	WEIGHT: 620	BBL./STROKE: .055 STROKE, MIN.: 126	CIRCULATING PRESSURE PSI 2200
DRILL COLLAR SIZE: 7	LENGTH: 615	MUD TYPE: LIGNOSULFONATE			GPM 450 BBL./MIN. 10.71	BOTTOMS UP (MIN.) 58 SYSTEM TOTAL (MIN.) 115

Sample from ☐ Flowline ☒ Pit
Flowline Temperature °F

MUD PROPERTIES			
Time Sample Taken	4:30		
Depth (ft)	8189		
Weight ☒ (ppg) ☐ (lb/cu ft)	10.3		
Mud Gradient (psi/ft)	5356		
Funnel Viscosity (sec/qt) API at ____ °F	41		
Plastic Viscosity cp at ____ °F	14		
Yield Point (lb/100 sq ft)	10		
Gel Strength (lb/100 sq ft) 10 sec/10 min	1/14	/	/
pH ☐ Strip ☒ Meter	11.0		
Filtrate API (ml/30 min)	5.8		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☐ HTHP ☐	2		
Alkalinity, Mud (Pm)	2.6		
Alkalinity, Filtrate (P_f/M_f)	1.2/2.4	/	/
Salt ☐ ppm ☐ gpg Chloride ☒ ppm ☐ gpg	4,000		
Calcium ☒ ppm ☐ Gyp ppb	20		
Sand Content (% by Vol)	.10		
Solids Content (% by Vol)	9		
Oil Content (% by Vol)	—		
Water Content (% by Vol)	92		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT

	SIZE	HRS/TOUR				SIZE	HRS/TOUR		
Centrifuge					Desilter				
Degasser	12.0				Shaker	60	60		
Desander					Other	Balance	MK-120		

DAILY COST 1,697.00 | CUMULATIVE COST 51,296.00

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
10.3	38-40	6-4

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☐ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT

☒ IMCO BAR		296
☐ IMCO GEL		170
☐ IMCO ~~BRINEGEL~~ SALT	20	170
☐ IMCO RD-111	10	155
☐ IMCO ~~VC-10~~ LIG	10	221
☐ IMCO THIN		
☐ IMCO CAUSTIC SODA	5	129
☐ IMCO ~~MD~~ SOLTEX	5	91
☐ IMCO POLY RX		
☐ E-G	1	15
☐		

REMARKS: Drlg ahead at [illegible]

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
Tommy Nichols	Houston	455-4134
UTILITY	WAREHOUSE LOCATION	TELEPHONE
	Galveston	744-5373

Form 515 Rev. 50M 2-80 Printed in USA

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REPORT NO. 2

DEPTH 8588

WELL | ST

MUD NO. 4

MUD DATE 12·15·90

SECTION, TOWNSHIP, RANGE

COUNTY 628

S.T. 122 A #1 | ST 122A | GALVESTON | TEXAS

OPERATION	CASING	MUD VOLUME (BBL)	CIRCULATION DATA
PRESENT ACTIVITY: Drlg	SURFACE: 10 3/4 IN. AT 1500 FT.	HOLE: 770± PITS: 580±	PUMP SIZE: 6 1/4 X 9 IN.
BIT SIZE (IN.): 9 7/8 NO.: 13	INTERMEDIATE: — IN. AT FT.	TOTAL CIRCULATING VOLUME: 1350±	PUMP MAKE: G.D. MODEL: P-Z-9
DRILL PIPE SIZE: 4 1/2 TYPE: X H 16.60	PRODUCTION OR LINER: — IN. AT FT.	IN STORAGE: AV WEIGHT: 650±	DBL./STROKE: .085 STROKE/MIN.: 126
DRILL COLLAR SIZE: 7 LENGTH: 1315	MUD TYPE: Lignosulfonate		10.71 BBL./MIN. 450 gpm

ANNULAR VEL. (FT./MIN.): .075 OPPOSITE DP 143± ; .047 OPPOSITE COLLAR 228±

CIRCULATING PRESSURE PSI 2200

BOTTOMS UP (MIN.) 61±

SYSTEM TOTAL (MIN.) 126±

Sample from ☐ Flowline ☐ Pit

Flowline Temperature °F

MUD PROPERTIES	In	Out		
Time Sample Taken	5 AM			
Depth (ft)	8588			
Weight ☑ (ppg) ☐ (lb/cu ft)	10.3			
Mud Gradient (psi/ft)	.5356			
Funnel Viscosity (sec/qt) API at ____ °F	47			
Plastic Viscosity cp at ____ °F	16			
Yield Point (lb/100 sq ft)	12			
Gel Strength (lb/100 sq ft) 10 sec/10 min	2/34	/	/	
pH ☐ Strip ☐ Meter	10.6			
Filtrate API (ml/30 min)	5.0			
API HP HT Filtrate (ml/30 min) at ____ °F	—			
Cake Thickness 32nd in API ☑ HTHP ☐	2			
Alkalinity, Mud (Pm)	2.6			
Alkalinity, Filtrate (P_f/M_f)	.8/2.2	/	/	
Salt (NaCl) Chloride	3800			
Calcium ☑ ppm ☐ Gyp ppb	20			
Sand Content (% by Vol)	0.1			
Solids Content (% by Vol)	8			
Oil Content (% by Vol)	—			
Water Content (% by Vol)	92			
Methylene Blue Capacity (ml/ml Mud)	—			
Methylene Blue (lb/bbl Bentonite Eq)	—			

EQUIPMENT

	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge			Desilter		
Degasser	Rig when needed		Shaker	Brandt	60 x 60
Desander	M.C. 12 hrs		Other	Mud Logger	

DAILY COST $ 2675 Tax Incl.

CUMULATIVE COST $ 53961 Tax Incl.

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
10.3	38-40	6-4

BY AUTHORITY ☑ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☑ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT

Materials used	Daily	To
☑ IMCO BAR	20	20
☐ IMCO GEL		17
☑ IMCO ~~GEL~~ Bar		21
☑ IMCO RD-111	15	17
☑ IMCO ~~Lig~~ Lig	29	25
☑ IMCO ~~THIN~~ Sol-ex	9	9
☑ IMCO CAUSTIC SODA	11	20
☑ IMCO M D	1	29
☐ IMCO POLY RX		
☐		
☑ Engineer on Location	1	16

REMARKS Drlg Ahead no prob - Cuttings small - very little, is O-Tex, it may gas Thanks P.E. M

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
P.E. McAliley	Dayton, Tex.	258 2765
	WAREHOUSE LOCATION	TELEPHONE
	Galveston, Tex.	744 5373

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RT REPORT NO. 23

DEPTH 8925

WELL | S/T

JOB NO. 4

SPUD DATE 12-15-80

SECTION, TOWNSHIP, RANGE 6 28

PROVINCE

S.T. 122 AH1

OPERATION		CASING		MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: Drlg		SURFACE: 10 3/4 IN. AT 1500 FT.		HOLE: 900±	PITS: 550±	PUMP SIZE: 6 1/2 X 9 IN.	ANNULAR VEL. (FT./MIN.): .0751 OPPOSITE DP 143±
BIT SIZE (IN.): 9 7/8	NO.: 14	INTERMEDIATE: IN. AT FT.		TOTAL CIRCULATING VOLUME: 1350±		PUMP MAKE: G.D MODEL: P.2.9	.047 OPPOSITE COLLAR 223±
DRILL PIPE SIZE: 4 1/2	TYPE: 16.60	PRODUCTION OR LINER: IN AT FT.		IN STORAGE: NU	WEIGHT: 675	BBL./STROKE: .0785	STROKE/MIN: 126
DRILL COLLAR SIZE: 7	LENGTH: 1315	MUD TYPE: Lignosulfonate				10.71 BBL./MIN.	490 GPM

CIRCULATING PRESSURE PSI: 2200

BOTTOMS UP (MIN.): 63±

SYSTEM TOTAL (MIN.): 126±

Sample from ☐ Flowline ☐ Pit

Flowline Temperature 130 °F

MUD PROPERTIES			
Time Sample Taken	5:30 p.m.		
Depth (ft)	8925		
Weight ☒ (ppg) ☐ (lb/cu ft)	10.3		
Mud Gradient (psi/ft)	.535		
Funnel Viscosity (sec/qt) API at ____ °F	46		
Plastic Viscosity cp at ____ °F	20		
Yield Point (lb/100 sq ft)	8.2		
Gel Strength (lb/100 sq ft) 10 sec/10 min	3/14	/	/
pH ☒ Strip ☐ Meter	10.6		
Filtrate API (ml/30 min)	5.4		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake thickness 32nd in API ☐ HTHP ☐	2		
Alkalinity, Mud (Pm)	2.4		
Alkalinity, Filtrate (Pf/Mf)	.7/1.6	/	/
Cait ☐ ppm ☐ ppg Chloride ☒ ppm ☐ ppg	7300		
Calcium ☐ ppm ☐ Gyp ppb	40		
Sand Content (% by Vol)	0.2		
Solids Content (% by Vol)	9		
Oil Content (% by Vol)	—		
Water Content (% by Vol)	91		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT

	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge			Desilter		
Degasser	Wh.	Needed	Shaker	12	24
Desander	Mi.	12	Other	Mi.	12

DAILY COST 1739 Tax Incl

CUMULATIVE COST 55700 Tax Incl

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
10.3	35-45	6-4

BY AUTHORITY ☒ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☐ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT

	Prior	Total
☐ IMCO BAR		21
☐ IMCO GEL		17
☐ IMCO BRINEGEL Bulk Bar		20
☒ IMCO RD-111	21	19
☒ IMCO ~~XC-10~~	11	26
☒ IMCO THIN Sellof		90
☒ IMCO CAUSTIC SODA	9	12
☐ IMCO M D	1	2
☐ IMCO POLY RX		
☐		
☒ Lignosulfonate	1	17

REMARKS Drlg Ahead No prob. Changed Nozz bit. Flaked P.T.M.

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
J.E. McAliley	Dayton Tex.	258-2765
	WAREHOUSE LOCATION: Galveston Tex	TELEPHONE: 744 5373

Form 515 Rev 1300 11-79 Printed in USA

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REPORT NO. 24

DEPTH 9240

WELL | S/T

NO. 4

DATE 12-15-80

SECTION, TOWNSHIP, RANGE N-D-A 6-72

PROVINCE

S.I. 122 A #1 | ST 122 A-1 | GALVESTON

OPERATION		CASING 118	MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: Drlg		SURFACE: 10 3/4 IN. AT 1500 FT.	HOLE: 829	PITS: 575	PUMP SIZE: 6 X 9 1/2 IN.	ANNULAR VEL. (FT./MIN.): DP 141
BIT SIZE (IN.): 9 7/8	NO. 13, 13, 9 14	INTERMEDIATE: IN. AT FT.	TOTAL CIRCULATING VOLUME: 1404		PUMP MAKE: G-D MODEL: P-Z-9	OPPOSITE COLLAR 226
DRILL PIPE SIZE: 4 1/2	TYPE: 16.60-G	PRODUCTION OR LINER: IN. AT FT.	IN STORAGE: Ay =	WEIGHT: 698	BBL./STROKE: .085	STROKE/MIN.: 125
DRILL COLLAR SIZE: 7"	LENGTH: 1315	MUD TYPE: LIGNOSULFONATE			GPM - 446 BBL./MIN.: 10.625	CIRCULATING PRESSURE PSI: 2200 BOTTOMS UP (MIN.): 66 SYSTEM TOTAL (MIN.): 132

Sample from ☐ Flowline ☒ Pit
Flowline Temperature °F

	MUD PROPERTIES In	Out	
Time Sample Taken	4:15 AM		
Depth (ft)	9240		
Weight ☒ (ppg) ☐ (lb/cu ft)	10.6+	10.6+	
Mud Gradient (psi/ft)	.5512		
Funnel Viscosity (sec/qt) API at ____ °F	42	50	
Plastic Viscosity cp at ____ °F	18	19	
Yield Point (lb/100 sq ft)	15		
Gel Strength (lb/100 sq ft) 10 sec/10 min	3/20	/	/
pH ☒ Strip ☐ Meter	10.8		
Filtrate API (ml/30 min)	5.0		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☐ HTHP ☐	2		
Alkalinity, Mud (Pm)	2.0		
Alkalinity, Filtrate (P_f/M_f)	.9/20	/	/
Salt ☐ppm ☐gps Chloride ☒ppm ☐gps	4100		
Calcium ☒ppm ☐ Gyp ppb	20		
Sand Content (% by Vol)	.25		
Solids Content (% by Vol)	10		
Oil Content (% by Vol)	—		
Water Content (% by Vol)	90		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT

	SIZE	HRS/TOUR			SIZE	HRS/TOUR	
Centrifuge				Desilter			
Degasser	12	6		Shaker	6	6	
Desander				Other MK-Bailer			120

DAILY COST: Thru Inv. 6,581.00 | CUMULATIVE COST: 62,281.00

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
10.6	40-44	6-4

BY AUTHORITY ☒ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☐ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT	DAILY USE	TOTAL USE
☒ IMCO BAR	421	2617
☐ IMCO GEL		170
☒ IMCO ~~BRINEGEL~~ Bar	30	230
☒ IMCO RD-111	56	247
☐ IMCO ~~VC-10~~ Solter		90
☒ IMCO ~~THIN~~ Lig		267
☒ IMCO CAUSTIC SODA	6	135
☒ IMCO M D		29
☐ IMCO POLY RX		
☒ Eng	1	18
☐		

REMARKS Wt. up from 10.3 to 10.6. Mud requires heavy water dilution to control viscosity. - Max. Gas 40 units

RMARC: 800 sx

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
Tommy Nichol	Houston	495-4134
UTILITY	WAREHOUSE LOCATION	TELEPHONE
	Galveston	744-5373

Form 515 Rev. 50M 2-80 Printed in USA

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RT REPORT NO. 25

DEPTH 9261

WELL | S/T

S NO. 4

MUD DATE 2-15-80

CTION, TOWNSHIP, NGE 2M-A628

PROVINCE

S.L. 127-A #1 | S.L. 127-A | GALVE TEXAS

OPERATION		CASING 11"8	MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: Logging		SURFACE 10 3/4 IN. AT 500 FT.	HOLE 832	PITS 500	PUMP SIZE 6 1/4 X 9 IN.	ANNULAR VEL. (FT./MIN.) OPPOSITE DP 142
BIT SIZE (IN.) 9 1/8	NO. 14	INTERMEDIATE IN. AT FT.	TOTAL CIRCULATING VOLUME 1332		PUMP MAKE G.D. MODEL P-7-9	OPPOSITE COLLAR 226
DRILL PIPE SIZE 4 1/2	TYPE 16.60	PRODUCTION OR LINER IN. AT FT.	IN STORAGE AY	WEIGHT 700	BBL./STROKE .085 STROKE/MIN. 125	CIRCULATING PRESSURE PSI 2200
DRILL COLLAR SIZE 7"	LENGTH 1315	MUD TYPE Lignosulfonate			BBL./MIN. 10.625	BOTTOMS UP (MIN.) 166 SYSTEM TOTAL (MIN.) 125

Sample from ☐ Flowline ☐ Pit
Flowline Temperature °F

MUD PROPERTIES			
Time Sample Taken	4:45 A		
Depth (ft)	9267		
Weight ☑ (ppg) ☐ (lb/cu ft)	10.6+		
Mud Gradient (psi/ft)	.5512		
Funnel Viscosity (sec/qt) API at ____ °F	36		
Plastic Viscosity cp at ____ °F	14		
Yield Point (lb/100 sq ft)	4		
Gel Strength (lb/100 sq ft) 10 sec/10 min	1/6	/	/
pH ☑ Strip ☐ Meter	10.2		
Filtrate API (ml/30 min)	4.4		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☐ HTHP ☐	2		
Alkalinity, Mud (Pm)	1.6		
Alkalinity, Filtrate (P_f/M_f)	.7/15	/	/
Salt ☐ ppm ☐ ppg Chloride ☐ ppm ☐ ppg	3800		
Calcium ☐ ppm ☐ Gyp ppb	20		
Sand Content (% by Vol)	.10		
Solids Content (% by Vol)	10		
Oil Content (% by Vol)	—		
Water Content (% by Vol)	90		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT

	SIZE	HRS/TOUR			SIZE	HRS/TOUR	
Centrifuge				Desilter			
Degasser	Rig			Shaker	60 x 40		
Desander				Other Bulk Tank	1.10		

DAILY COST Last 773.00 | CUMULATIVE COST Last 63,054.00

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
10.6	42 45	6.4

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☑ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT	Daily	Total
☒ IMCO BAR		2617
☐ IMCO GEL		170
☐ IMCO ~~BRINEGEL~~ SeaBac		230
☒ IMCO RD-111	8	255
☒ IMCO ~~VG-10~~ Lig	11	278
☐ IMCO ~~THIN~~ Sollex		90
☒ IMCO CAUSTIC SODA	2	137
☐ IMCO M D		29
☐ IMCO POLY RX		
☐		
☒ ENG	1	19

REMARKS Logging - Max Gas AFTER 10 STANDS. START TRIP 25 units

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
Tommy Nichol	Houston	495-4134
UTILITY	WAREHOUSE LOCATION Galveston	TELEPHONE 744-5373

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RT REPORT NO. 26

DEPTH 12667

WELL | S/T

NO. 41

DATE 2-15-80

SECTION, TOWNSHIP, RANGE

PROVINCE

S.I. 122 - A #1 | S.I. 122 | STATE

OPERATION		CASING		MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: Reaming		SURFACE: 10 3/4 IN. AT 1500 FT.		HOLE: 832	PITS: 350	PUMP SIZE: 6 1/4 X 9 IN.	ANNULAR VEL. (FT./MIN.): 142 OPPOSITE DP
BIT SIZE (IN.): 9 7/8	NO.: 16	INTERMEDIATE: IN. AT FT.		TOTAL CIRCULATING VOLUME: 1182		PUMP MAKE: GD MODEL: PZ9	OPPOSITE COLLAR: 246
DRILL PIPE SIZE: 4 1/2	TYPE: H.W.D.P.	PRODUCTION OR LINER: IN. AT FT.		IN STORAGE: AV	WEIGHT: 200	BBL./STROKE: .095 STROKE/MIN.: 125	CIRCULATING PRESSURE PSI: 1400
DRILL COLLAR SIZE: 7"	LENGTH: BHA 1215	MUD TYPE: LIGNOSULFONATE				BBL./MIN.: 10.625	BOTTOMS UP (MIN.): 66 SYSTEM TOTAL (MIN.): 125

Sample from ☐ Flowline ☒ Pit
Flowline Temperature °F

MUD PROPERTIES			
Time Sample Taken	4:00		
Depth (ft)	12667		
Weight ☒ (ppg) ☐ (lb/cu ft)	11.1		
Mud Gradient (psi/ft)	.5772		
Funnel Viscosity (sec/qt) API at ____ °F	40		
Plastic Viscosity cp at ____ °F	19		
Yield Point (lb/100 sq ft)	9		
Gel Strength (lb/100 sq ft) 10 sec/10 min	1/7	/	/
pH ☒ Strip ☐ Meter	10.2		
Filtrate API (ml/30 min)	4.4		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☐ HTHP ☐	2		
Alkalinity, Mud (Pm)	1.6		
Alkalinity, Filtrate (P_f/M_f)	.6/1.6	/	/
Salt ☐ppm ☐gpg Chloride ☒ppm ☐gpg	4,000		
Calcium ☒ ppm ☐ Gyp ppb	20		
Sand Content (% by Vol)	.10		
Solids Content (% by Vol)	10		
Oil Content (% by Vol)	—		
Water Content (% by Vol)	90		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT	SIZE	HRS/TOUR				SIZE	HRS/TOUR		
Centrifuge					Desilter				
Degasser	Rig				Shaker	4 x 60			
Desander					Other Rig		120	DC	

DAILY COST	CUMULATIVE COST
5533	68537

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
10.6	42-45	6-9

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☐ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT	DAILY USE	TOTAL USE
☒ IMCO BAR	495	~~512~~ 1
☒ IMCO GEL	5	175
☐ IMCO ~~BRINEGEL~~ SALT GEL		230
☒ IMCO RD-111	12	267
☐ IMCO ~~VC-10~~ LIG		278
☐ IMCO ~~THIN~~ SPOTS		90
☒ IMCO CAUSTIC SODA	3	140
☐ IMCO M D		29
☐ IMCO POLY RX		
☒ AL SULFATE	1	
☒ ENG	1	20

REMARKS: Could not get to bott. - after logging. Reaming to bottom. Mud Gas 54 units. Brought mw to 11.1 from 10.6

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
Tommy Nichol	Houston	495-4134
UTILITY	WAREHOUSE LOCATION: Galveston	TELEPHONE: 744-5373

Form 515 Rev. 50M 2-80 Printed in USA

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DRT REPORT NO. 27

DEPTH 9267

WELL | S/T

MUD NO. 4

MUD DATE 12-15-80

SECTION, TOWNSHIP, RANGE MPM 4-628

PROVINCE

S.T 122 - A#1 | ST 122 | Galveston Texas

OPERATION		CASING	MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: O.O.H.		SURFACE: 10 3/4 IN. AT 1500 FT.	HOLE: 832	PITS: 300 ±	PUMP SIZE: 6 1/4 X 9 IN.	ANNULAR VEL. (FT./MIN.)
BIT SIZE (IN.): 9 7/8	NO. R.R. 14	INTERMEDIATE: IN. AT FT.	TOTAL CIRCULATING VOLUME: 1132 ±		PUMP MAKE: G.D. MODEL: P.Z. 9	OPPOSITE DP
DRILL PIPE SIZE: 4 1/4	TYPE: XS	PRODUCTION OR LINER: IN. AT FT.	IN STORAGE:	WEIGHT: AV. 700 ±	BBL./STROKE: .035 STROKE/MIN.: 125	OPPOSITE COLLAR
DRILL COLLAR SIZE: 7	LENGTH: B.H.A 1315	MUD TYPE: Lignosulfonate			BBL./MIN.: 10.625	CIRCULATING PRESSURE PSI
						BOTTOMS UP (MIN.)
						SYSTEM TOTAL (MIN.)

Sample from ☐ Flowline ☐ Pit

Flowline Temperature °F

MUD PROPERTIES			
Time Sample Taken	5.00 AM		
Depth (ft)	9267		
Weight ☒ (ppg) ☐ (lb/cu ft)	11.1		
Mud Gradient (psi/ft)	.5772		
Funnel Viscosity (sec/qt) API at ____ °F	41		
Plastic Viscosity cp at ____ °F	20		
Yield Point (lb/100 sq ft)	10		
Gel Strength (lb/100 sq ft) 10 sec/10 min	1/7	/	/
pH ☒ Strip ☐ Meter	10.2		
Filtrate API (ml/30 min)	4.2		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☒ HTHP ☐	2		
Alkalinity, Mud (Pm)	1.3		
Alkalinity, Filtrate (P_f/M_f)	.7/66	/	/
Salt ☐ ppm ☐ ppg Chloride ☐ ppm ☐ ppg	3300		
Calcium ☒ ppm ☐ Gyp ppb	20		
Sand Content (% by Vol)	0.1		
Solids Content (% by Vol)	10		
Oil Content (% by Vol)	—		
Water Content (% by Vol)	90		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT

	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge			Desilter		
Degasser	Wren Needle		Shaker	Brandt	24 hrs
Desander			Other	M.C. 24 hrs	

DAILY COST: ~~[illegible]~~ 253 (Tax Jan)

CUMULATIVE COST: ~~[illegible]~~ 76,840 (Tax)

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
11.1	42-45	6-4

BY AUTHORITY: ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☒ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT

☐ IMCO BAR	
☐ IMCO GEL	2
☐ IMCO BRINEGEL	0
☐ IMCO RD-111	
☐ IMCO VC-10	1
☐ IMCO THIN	1
☐ IMCO CAUSTIC SODA	1
☐ IMCO M D	1
☐ IMCO POLY RX	3
☐	3
☐	4

REMARKS: Replaced shaker screens on crown - restring Drill string P.U.H. Put on Reran + Reamed. Will run csg. Thank P.S.M.

IMCO REPRESENTATIVE: J. E. McAliley

HOME ADDRESS: Dayton Tx.

WAREHOUSE LOCATION: Galveston, Tx.

TELEPHONE: 2587215

TELEPHONE: 7445373

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DRT REPORT NO. 30
DEPTH 9267
WELL S/T
DS NO. 4
MUD DATE 12.15.80
SECTION, TOWNSHIP, RANGE MBA 628
PROVINCE

S.T. 122, A #1 | ST 122 A1 | Galveston Texas

OPERATION	CASING	MUD VOLUME (BBL)	CIRCULATION DATA
PRESENT ACTIVITY: G.I.H.	SURFACE: 10 3/4 IN. AT 1500 FT.	HOLE: 371 / PITS: 500	PUMP SIZE: 4 1/2 X 9 IN.
BIT SIZE (IN.): 6 3/4 / NO.: 15	INTERMEDIATE: 7 5/8 IN. AT FT.	TOTAL CIRCULATING VOLUME: 935	PUMP MAKE: G.D / MODEL: P.2.S
DRILL PIPE SIZE: 3 1/2 / TYPE: E 1230	PRODUCTION OR LINER: — IN. AT FT.	IN STORAGE: — / WEIGHT: —	BBL./STROKE: .0396 @ 90% / STROKE/MIN.: 110
DRILL COLLAR SIZE: 4 3/4 / LENGTH: BHA 1623	MUD TYPE: Lignosulfonate		BBL./MIN.: 4.36 — 183 gpm

ANNULAR VEL. (FT./MIN.): .00742 OPPOSITE DP —; .0049 OPPOSITE COLLAR —
CIRCULATING PRESSURE PSI —
BOTTOMS UP (MIN.) —
SYSTEM TOTAL (MIN.) —

Sample from ☐ Flowline ☐ Pit
Flowline Temperature °F

MUD PROPERTIES			
Time Sample Taken	15am		
Depth (ft)	9267		
Weight ☐ (ppg) ☐ (lb/cu ft)	11.2		
Mud Gradient (psi/ft)	.5824		
Funnel Viscosity (sec/qt) API at ____ °F	42		
Plastic Viscosity (cp) at ____ °F	22		
Yield Point (lb/100 sq ft)	12		
Gel Strength (lb/100 sq ft) 10 sec/10 min	1/5	/	/
pH ☑ Strip ☐ Meter	10.2		
Filtrate API (ml/30 min)	4.4		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☑ HTHP ☐	2		
Alkalinity, Mud (Pm)	1.8		
Alkalinity, Filtrate (Pf/Mf)	.6/1.8	/	/
Salt ppm/ppg Chloride ppm/ppg	3700		
Calcium ☑ ppm ☐ Gyp ppb	20		
Sand Content (% by Vol)	0.2		
Solids Content (% by Vol)	11		
Oil Content (% by Vol)	—		
Water Content (% by Vol)	89		
Methylene Blue Capacity (ml/m³ Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT

	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge	—		Desilter	—	
Degasser	Wm Weld		Shaker	Brandt Cobra	
Desander	Pulsizer		Other	McClean 24hr	

DAILY COST: 253 — No Tax Inv.
CUMULATIVE COST: 76 183 Tax Inc.

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
11.2	42-45	6-4

BY AUTHORITY: ☑ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☐ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT

- ☐ IMCO BAR
- ☐ IMCO GEL
- ☐ IMCO BRINEGEL
- ☐ IMCO RD-111
- ☐ IMCO VC-10
- ☐ IMCO THIN
- ☐ IMCO CAUSTIC SODA
- ☐ IMCO M D
- ☐ IMCO POLY RX
- ☐
- ☑ Engineer on Loc.

NO TREATMENT.

REMARKS: G.I.H. w/ 3 1/2" D.P will Drill out w/ 6 3/4 Bit.
P.T.M.

IMCO REPRESENTATIVE: P.E. McAliley
HOME ADDRESS: Dayton Texas
WAREHOUSE LOCATION: Galveston Tex
TELEPHONE: 2582765
TELEPHONE: 7445373

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REPORT NO. 31
DEPTH 9337
WELL
S/T
NO. 4
PUB DATE 12/15/80
SECTION, TOWNSHIP, RANGE mBm 628
PROVINCE

WELL NAME: S.T. 122, A #1 | ST 122 A1 | Galveston | Texas

OPERATION		CASING	MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: Drlg		SURFACE: 10 3/4 IN. AT 1500 FT.	HOLE: 400±	PITS: 530±	PUMP SIZE: 4 1/2 X 9 IN.	ANNULAR VEL. (FT./MIN.): DP 102 / 640± DC 233 / 213
BIT SIZE (IN.): 6 3/4	NO.: 15	INTERMEDIATE: 7 5/8 IN. AT 9768 FT.	TOTAL CIRCULATING VOLUME: 930±		PUMP MAKE: G.D. MODEL: P.2.9	DP/DC COLLAR 90±
DRILL PIPE SIZE: 3 1/2	TYPE: E 13.30	PRODUCTION OR LINER: — IN. AT FT.	IN STORAGE: NV	WEIGHT: 330±	BBL./STROKE: .0366 @ 90% STROKE/MIN.: 120	CIRCULATING PRESSURE PSI: 2000
DRILL COLLAR SIZE: 4 3/4	LENGTH: 1623	MUD TYPE: Lignosulfonate			4.75 BBL./MIN. 200	BOTTOMS UP (MIN.): 69± SYSTEM TOTAL (MIN.): 198±

Sample from ☐ Flowline ☐ Pit
Flowline Temperature °F

MUD PROPERTIES			
Time Sample Taken	5 am		
Depth (ft)	9337		
Weight ☑ (ppg) ☐ (lb/cu ft)	11.8		
Mud Gradient (psi/ft)	.6136		
Funnel Viscosity (sec/qt) API at ____ °F	42		
Plastic Viscosity cp at ____ °F	19		
Yield Point (lb/100 sq ft)	10		
Gel Strength (lb/100 sq ft) 10 sec/10 min	4/25	/	/
pH ☑ Strip ☐ Meter	11.0		
Filtrate API (ml/30 min)	6		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☑ HTHP ☐	2		
Alkalinity, Mud (Pm)	2.6		
Alkalinity, Filtrate (P_f/M_f)	1.2/2.6	/	/
Salt ppm Chloride ppm	3500		
Calcium ☑ ppm ☐ Gyp ppb	40		
Sand Content (% by Vol)	0.25		
Solids Content (% by Vol)	12		
Oil Content (% by Vol)	—		
Water Content (% by Vol)	84		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT

	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge			Desilter		
Degasser Rig	As Needed		Shaker Brandt	60x80	
Desander M. Logg	24 hrs		Other M. Cleaner	24 hrs	
DAILY COST $ 1,681	Tour Inv.		CUMULATIVE COST $ 77,864	Tour Inv.	

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
12.	42-46	6-4

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☑ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT

Materials used	Daily	Total
☑ IMCO BAR sk.	20	28
☐ IMCO GEL		17
☐ IMCO BRINEGEL		45
☑ IMCO RD-111	10	29
☑ IMCO ~~VC-10~~ Lig	5	20
☐ IMCO ~~THIN~~ Saltex		16
☑ IMCO CAUSTIC SODA	5	14
☐ IMCO M D		2
☑ IMCO ~~POLY-RX~~ Sapp	7	27
☑ NA Cr		1
☑ Engineer on location		

REMARKS: Drilled out csg float tested to 1500 psi. - Drilled out shoe, tested 10' of formation, tested to equivalent 16.5 #/gal. Drilled ahead another 80', then pull out and change BHA. Test P.P.M.

MUD REPRESENTATIVE	HOME ADDRESS	TELEPHONE
P. E. McAliley	Dayton, Tex.	258 2765
	WAREHOUSE LOCATION: Galveston, Tex.	TELEPHONE: 744 5373

NOTICE: ANY OPINION AND/OR RECOMMENDATION, EXPRESSED ORALLY OR WRITTEN HEREIN, HAS BEEN PREPARED ... AND MAY BE USED IF THE USER ... REPRESENTATION OR WARRANTY IS MADE BY ... FOR ANY

REPORT NO. 32

DEPTH 9432

WELL | S/T

MUD NO. 4

MUD DATE 12.15.80

SECTION, TOWNSHIP, RANGE

PROVINCE 628

S.T. 122 A #1 | ST 122 A1 | Galveston Texas

OPERATION	CASING	MUD VOLUME (BBL)	CIRCULATION DATA
PRESENT ACTIVITY	SURFACE 10 3/4 IN. AT 1504 FT.	HOLE 401 / PITS 512 ±	PUMP SIZE 4 1/2 X 9 IN. / VEL. (FT/MIN.) 149 ± in. H. / 0.0347 / 0.0347 67 ±
BIT SIZE (IN.) 6 3/4 / NO. 16	INTERMEDIATE 7 5/8 IN. AT 9269 FT.	TOTAL CIRCULATING VOLUME 913 ±	PUMP MAKE / MODEL 6.0 / 2.9 / 0.0232 / 0.0232 DRILL COLLAR 222 ±
DRILL PIPE SIZE 3 1/2 / TYPE E	PRODUCTION OR LINER — IN. AT FT.	IN STORAGE AV ≈ / WEIGHT 330	BBL./STROKE .0396 @ 90% / STROKE/MIN. 125 / CIRCULATING PRESSURE PSI 2100
DRILL COLLAR SIZE 4 3/4 / LENGTH BHA 1600	MUD TYPE Lignosulfonate		BBL./MIN. 4.95 / 208 / SYSTEM TOTAL (MIN.) 184 ± / BOTTOMS UP (MIN.) 64 ±

Sample from ☐ Flowline ☑ Pit

Flowline Temperature °F

MUD PROPERTIES	Tw		O.t
Time Sample Taken	4:30		
Depth (ft)	9432		
Weight ☑ (ppg) ☐ (lb/cu ft)	12.1		12.1+
Mud Gradient (psi/ft)	.6292		
Funnel Viscosity (sec/qt) API at ____ °F	41		47
Plastic Viscosity cp at ____ °F	19		
Yield Point (lb/100 sq ft)	10		
Gel Strength (lb/100 sq ft) 10 sec/10 min	2/12	/	/
pH ☑ Strip ☐ Meter	11.0		
Filtrate API (ml/30 min)	6		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☑ HTHP ☐	2		
Alkalinity, Mud (Pm)	2.2		
Alkalinity, Filtrate (Pf/Mf)	1.1/2.1	/	/
Salt ppm Chloride ppm	3300		
Calcium ☑ ppm ☐ Gyp ppb	20		
Sand Content (% by Vol)	0.2		
Solids Content (% by Vol)	12		
Oil Content (% by Vol)	—		
Water Content (% by Vol)	88		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge			Desilter		
Degasser Rig when needed			Shaker Brandt 4 x 80		
Desander M. Logger 24 hrs			Other M. Logger 24 hrs		

DAILY COST $ 9586* Tax Tax | CUMULATIVE COST $ 87450 Tax Inc.

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
12.	42-46	6-4

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☑ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT

	Material Used Daily	Total
☑ IMCO BAR		280
☑ IMCO GEL		175
☑ IMCO ~~BRINEGEL~~ Bar Bulk *	935	455
☑ IMCO RD 111	10	304
☑ IMCO ~~VS-10~~ Lig	10	315
☑ IMCO ~~THIN~~ Soltex		100
☑ IMCO CAUSTIC SODA	5	150
☑ IMCO M D		29
☑ IMCO ~~POLY RX~~ Sapp		27
☑ Na C		1
☑ Engineer on Location	1	26

REMARKS: Drlg ahead no prob.

Thank P.E.M.

IMCO REPRESENTATIVE: P.E. McAliley

HOME ADDRESS: Dayton, Texas | TELEPHONE 717-258 2765

WAREHOUSE LOCATION: Galveston, Texas | TELEPHONE 744 5773

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REPORT NO. 33

DEPTH 9556

WELL | S/T

JOB NO. 4

PUB DATE 12-15-80

SECTION, TOWNSHIP, RANGE

PROVINCE NBM-A 628

S.I. 122-A #1 | S.I. 122-A | GALVESTON TEXAS

OPERATION	CASING	MUD VOLUME (BBL)	CIRCULATION DATA
PRESENT ACTIVITY: T.T.H	SURFACE: 10 3/4 IN. AT 1500 FT.	HOLE: 404 / PITS: 450	PUMP SIZE: 4 1/2 X 9 IN.
BIT SIZE (IN.): 6 3/4 / NO.: 17	INTERMEDIATE: 7 5/8 IN. AT 9267 FT. (327)	TOTAL CIRCULATING VOLUME: 854	PUMP MAKE: Gardner-Denver / MODEL: P-7-9
DRILL PIPE SIZE: 3 1/2 / TYPE: E / 1330	PRODUCTION OR LINER: IN. AT FT.	IN STORAGE: AV = / WEIGHT: 333	BBL./STROKE: .0396-90% / STROKE/MIN.: 120
DRILL COLLAR SIZE: 4 3/4 / LENGTH: 3HA	MUD TYPE: LIGNOSULFONATE		BBL./MIN.: 4.75

ANNULAR VEL. (FT./MIN.): OPPOSITE DP .032 149; OPPOSITE COLLAR .022 216

CIRCULATING PRESSURE PSI: 2100

BOTTOMS UP (MIN.): 70

SYSTEM TOTAL (MIN.): 180

Sample from ☐ Flowline ☑ Pit

Flowline Temperature °F

MUD PROPERTIES	In	Out
Time Sample Taken	12:00	
Depth (ft)	9556	
Weight ☑ (ppg) ☐ (lb/cu ft)	12.6	12.6
Mud Gradient (psi/ft)	.6552	
Funnel Viscosity (secqt) API at °F	42	52
Plastic Viscosity cp at °F	20	
Yield Point (lb/100 sq ft)	14	
Gel Strength (lb/100 sq ft) 10 sec/10 min	2/15	/ /
pH ☑ Strip ☐ Meter	10.7	
Filtrate API (ml/30 min)	6.0	
API HP HT Filtrate (ml/30 min) at °F	—	
Cake Thickness 32nd in API ☐ HTHP ☐	2	
Alkalinity, Mud (Pm)	2.0	
Alkalinity, Filtrate (Pf/Mf)	.6/20	/ /
Salt ppm Chloride ppm	3400	
Calcium ppm ☐ Gyp ppb	20	
Sand Content (% by Vol)	.10	
Solids Content (% by Vol)	14	
Oil Content (% by Vol)	—	
Water Content (% by Vol)	86	
Methylene Blue Capacity (ml/ml Mud)	—	
Methylene Blue (lb/bbl Bentonite Eq)	—	

EQUIPMENT

	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge			Desilter		
Degasser	RIG - ASINEEDED		Shaker	60-80	
Desander			Other	BARITE MC - 120	

DAILY COST: Thru Inv 10,299 —

CUMULATIVE COST: Tax + Del. Chg 97,749 —

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
12.6	42-45	6-4

BY AUTHORITY: ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☐ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT	Daily USE	Total USED
☒ IMCO BAR	15	295
☒ IMCO GEL	5	180
☒ IMCO ~~BRINEGEL~~ Bulk Barite	938	548
☒ IMCO RD-111	10	314
☒ IMCO ~~VCAD~~ LIG	25	340
☒ IMCO ~~THIN~~ Soltex	5	105
☒ IMCO CAUSTIC SODA	5	155
☐ IMCO M D		29
☐ IMCO POLY PX		
☐		
☒ ENG	1	27

REMARKS: Drilled to 9556 @ 5:30 pm. Mud Locks Good. Will work on water line when we get in hole.

NOTE: SSC [illegible] Location - Running 20-25 units Background Gas

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
Tommy Nixon	Houston	495-4134
	WAREHOUSE LOCATION	TELEPHONE
	Galveston	744-5373

NOTICE: [illegible] RECOMMENDATION EXPRESSED OR IMPLIED OR WRITTEN HEREIN, HAS BEEN PREPARED [illegible] NO EXPRESS OR IMPLIED WARRANTY IS MADE BY [illegible]

REPORT NO. 34

DEPTH 9599

WELL | S/T

RIG NO. 4

SPUD DATE 12-15-81

SECTION, TOWNSHIP, RANGE M&M-A-628

PROVINCE

ST 122-A #1 | ST 122 | GALVESTON | TEXAS

OPERATION	CASING	MUD VOLUME (BBL)	CIRCULATION DATA
PRESENT ACTIVITY: Drlg	SURFACE: 10 3/4 IN. AT 1500 FT.	HOLE: 405 / PITS: 500	PUMP SIZE: 4 1/2 X 9 IN.
BIT SIZE (IN.): 6 3/4 / NO.: 17	INTERMEDIATE: 7 5/8 IN. AT 9268 FT. (327)	TOTAL CIRCULATING VOLUME: 905	PUMP MAKE: G-D / MODEL: P-7-9
DRILL PIPE SIZE: 3 1/2 / TYPE: E	PRODUCTION OR LINER: IN. AT FT.	IN STORAGE: AV = 334 / WEIGHT	BBL./STROKE: .0396-90% / STROKE/MIN: 125
DRILL COLLAR SIZE: 4 3/4 / LENGTH: 695	MUD TYPE: LIGNOSULFONATE		BBL./MIN: 4.95

ANNULAR VEL. (FT./MIN.): DP 232 — 155; DC 222 — 225

CIRCULATING PRESSURE PSI: 2000-2100

BOTTOMS UP (MIN.): 67

SYSTEM TOTAL (MIN.): 183±

Sample from ☐ Flowline ☒ Pit

Flowline Temperature °F

MUD PROPERTIES	In	Out		
Time Sample Taken	4:30			
Depth (ft)	9599			
Weight ☒ (ppg) ☐ (lb/cu ft)	12.7	12.7		
Mud Gradient (psi/ft)	.664			
Funnel Viscosity (sec/qt) API at ____ °F	43	55		
Plastic Viscosity cp at ____ °F	25			
Yield Point (lb/100 sq ft)	19			
Gel Strength (lb/100 sq ft) 10 sec/10 min	2/21	/	/	
pH ☒ Strip ☐ Meter	10.5			
Filtrate API (ml/30 min)	4.2			
API HP HT Filtrate (ml/30 min) at ____ °F	—			
Cake Thickness 32nd in API ☐ HTHP ☐	2			
Alkalinity, Mud (Pm)	1.2			
Alkalinity, Filtrate (P_f/M_f)	.6/1.0	/	/	
Salt ☐ ppm ☐ ppg Chloride ☐ ppm ☐ ppg	3500			
Calcium ☒ ppm ☐ Gyp ppb	20			
Sand Content (% by Vol)	.10			
Solids Content (% by Vol)	14			
Oil Content (% by Vol)	—			
Water Content (% by Vol)	86			
Methylene Blue Capacity (ml/ml Mud)	—			
Methylene Blue (lb/bbl Bentonite Eq)	—			

EQUIPMENT

	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge			Desilter		
Degasser Rig			Shaker	60 X 80	
Desander			Other BRANDT-MK-150		

DAILY COST Thru Inv. 2,898 =

CUMULATIVE COST Tax & Del Chg 100,647.00

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
12.6	42-45	4 or less

BY AUTHORITY: ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☒ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT

	Daily Use	Tot Use
☐ IMCO BAR	—	295
☒ IMCO GEL	25	205
☐ IMCO BRINEGEL Bulk	—	548
☐ IMCO RD-111		
☒ IMCO VC-10 Liq	20	35
☒ IMCO THIN Sulfex Liq	20	125
☒ IMCO CAUSTIC SODA	3	158
☒ IMCO M D		29
☐ IMCO POLY RX		
☒ ENG	1	28
☐		

REMARKS: Brandt water loss down as instructed. Mud in excellent condition

Bulk - 750 sx Barkgrind - 10-20 sacks Cellras - Angelina Small

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
Tommy Nichol	Houston	495-4134
	WAREHOUSE LOCATION	TELEPHONE
	Galveston	744-5373

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DRT REPORT NO. 35

DEPTH 9740

WELL | ST

MUD NO. 4

PUB DATE 12-15-80

SECTION, TOWNSHIP, RANGE

PROVINCE BRM A-62

ST 122 - A#1 | ST 122 | Galveston, Texas

OPERATION		CASING	MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: D/G		SURFACE: 10 3/4 IN. AT 1500 FT.	HOLE: 410 ±	PITS: 430 ±	PUMP SIZE: 4 1/2 X 9 IN.	ANNULAR VEL. (FT./MIN.): .0372 DP 155 ±
BIT SIZE (IN.): 6 3/4	NO.: 17	INTERMEDIATE: 7 5/8 IN. AT 9268 FT.	TOTAL CIRCULATING VOLUME: 840 ±		PUMP MAKE: 6-D MODEL: P-29	.0232 OPPOSITE COLLAR 225 ±
DRILL PIPE SIZE: 3 1/2	TYPE: E 13.30	PRODUCTION OR LINER: — IN. AT FT.	IN STORAGE: AV =	WEIGHT: 340	BBL./STROKE: .0396 0.0496 STROKE/MIN.: 125	CIRCULATING PRESSURE PSI: 2100
DRILL COLLAR SIZE: 4 3/4	LENGTH: 655	MUD TYPE: Lignosulfonate			BBL./MIN.: 4.95	BOTTOMS UP (MIN.): 69 ± SYSTEM TOTAL (MIN.): 170 ±

Sample from ☐ Flowline ☒ Pit
Flowline Temperature °F

MUD PROPERTIES	In		
Time Sample Taken	6 am		
Depth (ft)	9740		
Weight ☒ (ppg) ☐ (lb/cu ft)	12.7	12.7	
Mud Gradient (psi/ft)	.6604		
Funnel Viscosity (sec/qt) API at ____ °F	44	53	
Plastic Viscosity cp at ____ °F	23		
Yield Point (lb/100 sq ft)	12		
Gel Strength (lb/100 sq ft) 10 sec/10 min	2/20	/	/
pH ☒ Strip ☐ Meter	11.2		
Filtrate API (ml/30 min)	4.0		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☒ HTHP ☐	2		
Alkalinity, Mud (Pm)	2.2		
Alkalinity, Filtrate (P_f/M_f)	1.1/2.0	/	/
Salt ☐ppm ☐ppg Chloride ☒ppm ☐gpg	3500		
Calcium ☒ ppm ☐ Gyp ppb	320		
Sand Content (% by Vol)	0.1		
Solids Content (% by Vol)	14		
Oil Content (% by Vol)	—		
Water Content (% by Vol)	86		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT

	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge	—		Desilter		
Degasser	Rig Wea Hand		Shaker	Rig 60 x 30	24 h
Desander	Unlogged 24 hrs		Other	McClerkin MK-15	

DAILY COST $ 863 Tax Inc. | CUMULATIVE COST $ 101,510 Tax Inc.

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
12.6	42-45	4 or less

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☒ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT

	Used	Inventory
☐ IMCO BAR		29
☐ IMCO GEL		20
☐ IMCO BRINEGEL Blk		341
☒ IMCO RD-111	5	319
☒ IMCO ~~VC-10~~ Li	15	36
☐ IMCO THIN Sol tex		12
☒ IMCO CAUSTIC SODA	7	16
☐ IMCO M D		29
☐ IMCO POLY RX		
☐		
☒ Engineer on Location	1	29

REMARKS Drlg Ahead no prob.
Thanks
P.S.M.

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
P.E. McAliley	Dayton Texas	258 2765
	WAREHOUSE LOCATION	TELEPHONE
	Galveston, Texas	744 5773

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REPORT NO. 3

DEPTH 9785

WELL

SUB DATE 12-13-80

SECTION, TOWNSHIP, RANGE

PROVINCE

ST 122 #A#1 | ST 122 | GALVESTON

OPERATION		CASING	MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: Drlg		SURFACE: 10 3/4 IN. AT 1503 FT.	HOLE: 411 ±	PITS: 430 ±	PUMP SIZE: 4 1/2 X 9 IN.	ANNULAR VEL. (FT./MIN.): DP 223 / DC 155.5
BIT SIZE (IN.): 6 3/4	NO.: 13	INTERMEDIATE: 7 5/8 IN. AT 9268 FT.	TOTAL CIRCULATING VOLUME: 844 ±		PUMP MAKE: G.D / MODEL: 7.2.9	COLLAR: 235 ±
DRILL PIPE SIZE: 3 1/2	TYPE: E	PRODUCTION OR LINER: — IN. AT — FT.	IN STORAGE: NV	WEIGHT: 340	BBL./STROKE: .0396 @ 90%	STROKE/MIN.: 125
DRILL COLLAR SIZE: 4 3/4	LENGTH: 695	MUD TYPE: Lignosul/Caustic			BBL./MIN.: 4.95	CIRCULATING PRESSURE PSI: 2403
						BOTTOMS UP (MIN.): 63
						SYSTEM TOTAL (MIN.): 171 ±

Sample from ☐ Flowline ☒ Pit

Flowline Temperature °F

MUD PROPERTIES			
Time Sample Taken	8 am		
Depth (ft)	9785		
Weight ☒ (ppg) ☐ (lb/cu ft)	12.7		
Mud Gradient (psi/ft)	.6604		
Funnel Viscosity (sec/qt) API at ____ °F	43		
Plastic Viscosity cp at ____ °F	23		
Yield Point (lb/100 sq ft)	17		
Gel Strength (lb/100 sq ft) 10 sec/10 min	2/21	/	/
pH ☒ Strip ☐ Meter	11.0		
Filtrate API (ml/30 min)	4		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☒ HTHP ☐	2		
Alkalinity, Mud (Pm)	2.2		
Alkalinity, Filtrate (P_f/M_f)	1.0/2.0	/	/
Salt ☐ppm ☐gps Chloride ☒ppm ☐gps	3500		
Calcium ☒ ppm ☐ Gyp ppb	20		
Sand Content (% by Vol)	a10		
Solids Content (% by Vol)	14		
Oil Content (% by Vol)	—		
Water Content (% by Vol)	86		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge			Desilter		
Degasser	R		Shaker	Brandt Boxes	
Desander			Other		

DAILY COST: 863 — Thru End.

CUMULATIVE COST: 142,373 — Thru End

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
12.6	42-45	4 or less

BY AUTHORITY: ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☒ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT

	Daily	Total
☐ IMCO BAR		29
☐ IMCO GEL		20
☐ IMCO BRINEGEL Bulk		14
☒ IMCO RD-111	5	32
☒ IMCO VC10 Liq	16	37
☐ IMCO THIN Solex		12
☒ IMCO CAUSTIC SODA	7	17
☐ IMCO M D		2
☐ IMCO POLY RX		
☐		
☒ Engineering & Location	1	37

REMARKS: Drlg Blank no prob

Thks

P.E.M

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
P. E. McAliley	Dayton Tx	258 2268
AREA OFFICE	WAREHOUSE LOCATION	TELEPHONE
	Galveston Tx	744 5373

Form 515 Rev. 50M 2-80

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RT REPORT NO. 37

DEPTH 9469

WELL | S/T

NO. 4

DATE 12-15-80

SECTION, TOWNSHIP, RANGE PM-A-628

PROVINCE

ST 122-A #1 | ST 122-A | GALVESTON

OPERATION		CASING	MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: Circ - P.O.H.		SURFACE: 10 3/4 IN. AT 1500 FT.	HOLE: 413	PITS: 475	PUMP SIZE: 4 1/2 X 9 IN.	ANNULAR VEL. (FT./MIN.): .032 OPPOSITE DP 155
BIT SIZE (IN.): 6 3/4	NO.: 18	INTERMEDIATE: 7 5/8 IN. AT 7268 FT.	TOTAL CIRCULATING VOLUME: 888		PUMP MAKE: GD	.022 OPPOSITE COLLAR 225
DRILL PIPE SIZE: 3 1/2	TYPE: E 13.30	PRODUCTION OR LINER: IN. AT FT.	IN STORAGE: AV = 340	WEIGHT	MODEL: P-7-9 BBL./STROKE: .0396 STROKE/MIN.: 125	CIRCULATING PRESSURE PSI: 2000 2100
DRILL COLLAR SIZE: 4 3/4	LENGTH: 695	MUD TYPE: Lignosulfonate			GPM-208 BBL./MIN.: 4.95	BOTTOMS UP (MIN.): 69 SYSTEM TOTAL (MIN.): 179

Sample from ☐ Flowline ☒ Pit
Flowline Temperature °F

	MUD PROPERTIES		
Time Sample Taken	4:30		
Depth (ft)	9469		
Weight ☒ (ppg) ☐ (lb/cu ft)	12.5+		
Mud Gradient (psi/ft)	.65		
Funnel Viscosity (sec/qt) API at ____ °F	46		
Plastic Viscosity cp at ____ °F	25		
Yield Point (lb/100 sq ft)	12		
Gel Strength (lb/100 sq ft) 10 sec/10 min	2/22	/	/
pH ☒ Strip ☐ Meter	10.3		
Filtrate API (ml/30 min)	4.0		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☐ HTHP ☐	2		
Alkalinity, Mud (Pm)	1.6		
Alkalinity, Filtrate (P_f/M_f)	.8/20	/	/
Salt ☐ppm ☐ppb Chloride ☐ppm ☐ppb	3600		
Calcium ☒ppm ☐ Gyp ppb	20		
Sand Content (% by Vol)	.20		
Solids Content (% by Vol)	14		
Oil Content (% by Vol)	—		
Water Content (% by Vol)	86		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT

	SIZE	HRS/TOUR			SIZE	HRS/TOUR	
Centrifuge				Desilter			
Degasser	Rig			Shaker	60	x 20	
Desander				Other	Blanket MC-150		

DAILY COST Thru Eng 663.00 | CUMULATIVE COST Thru Report 103,035.00

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
12.5-12.7	42-45	4 or less

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☐ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT	Daily Use	Total Used
☐ IMCO BAR	25	320
☐ IMCO GEL	15	220
☐ IMCO ~~BRINEGEL~~ Rig Dock		5415
☒ IMCO RD-111		
☐ IMCO ~~VC-10~~ Lig		
☒ IMCO ~~THIN~~ Sulfex		125
☐ IMCO CAUSTIC SODA	3	
☐ IMCO M D		29
☐ IMCO POLY RX		
☐		
☒ Eng	1	31

REMARKS: Pipe stuck P.O.H. - Worker Fire

10 Hours Gas

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
Tommy Nichol	Houston	495-4134
UTILITY	WAREHOUSE LOCATION: Galveston	TELEPHONE: 744-5373

Form 515 Rev. 50M 2-80 Printed in USA

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RT REPORT NO. 38

DEPTH 9969

WELL | S/T

NO. 4

DATE 12-15-80

SECTION, TOWNSHIP, RANGE 629

ELEVATION

S.I. 122-A #1 | S.I. 122-A | GALVESTON

OPERATION		CASING	MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY		SURFACE 10 3/4 IN. AT 1500 FT.	HOLE 465	PITS 400	PUMP SIZE 4 1/2 X 9 IN.	ANNULAR VEL. (FT./MIN.) OPPOSITE DP
BIT SIZE (IN.) 6 3/4 6 3/4	NO. 1 1 1	INTERMEDIATE 7 5/8 IN. AT 9268 FT.	TOTAL CIRCULATING VOLUME		PUMP MAKE G-D MODEL P-2-9	OPPOSITE COLLAR
DRILL PIPE SIZE 3 1/2	TYPE E 13.30	PRODUCTION OR LINER IN. AT FT.	IN STORAGE	WEIGHT AV E 340	BBL./STROKE .0396 STROKE/MIN.	CIRCULATING PRESSURE PSI
DRILL COLLAR SIZE 4 3/4	LENGTH 615	MUD TYPE LIGNOSULFONATE			BBL./MIN.	BOTTOMS UP (MIN.) / SYSTEM TOTAL (MIN.)

Sample from ☐ Flowline ☐ Pit
Flowline Temperature °F

MUD PROPERTIES			
Time Sample Taken	12:00		
Depth (ft)	9969		
Weight ☒ (ppg) ☐ (lb/cu ft)	12.8+		
Mud Gradient (psi/ft)	.666		
Funnel Viscosity (sec/qt) API at °F	47		
Plastic Viscosity cp at °F	25		
Yield Point (lb/100 sq ft)	14		
Gel Strength (lb/100 sq ft) 10 sec/10 min	2/24	/	/
pH ☒ Strip ☐ Meter	10.2		
Filtrate API (ml/30 min)	4.0		
API HP HT Filtrate (ml/30 min) at °F	—		
Cake Thickness 32nd in API ☐ HTHP ☐	2		
Alkalinity, Mud (Pm)	1.5		
Alkalinity, Filtrate (P_f/M_f)	.6/1.8	/	/
Salt ☐ppm ☐ppg Chloride ☒ppm ☐ppg	3600		
Calcium ☒ppm ☐ Gyp ppb	20		
Sand Content (% by Vol)	.10		
Solids Content (% by Vol)	14		
Oil Content (% by Vol)	—		
Water Content (% by Vol)	86		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT

	SIZE	HRS/TOUR				SIZE	HRS/TOUR		
Centrifuge					Desilter				
Degasser	Rig				Shaker	4 screens			
Desander					Other	[illegible]			

DAILY COST 5091 — CUMULATIVE COST 108132 —

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
12.9	45 50	4 6 6.035

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☐ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT	DAILY USE	TOTAL USE
☒ IMCO BAR	38	358
☐ IMCO GEL		220
☒ IMCO ~~BRINEGEL~~ Brine Gel	49	593
☒ IMCO RD-111		324
☐ IMCO ~~VG-10~~ Lig		375
☐ IMCO ~~THIN~~ Soltex		125
☐ IMCO CAUSTIC SODA		175
☒ IMCO M D	1	30
☐ IMCO POLY RX		
☒ Eng	1	32
☐		

REMARKS Wt up to 12.5 ppg. Pipe hung to stuck - Will Plug Back to Csg

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
Tommy Nichol	Houston	495-4134
UTILITY	WAREHOUSE LOCATION	TELEPHONE
	Liberty	744-5373

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RT REPORT NO. 39

DEPTH 9138

WELL | S/T

NO. 4

DATE 12-15-80

SECTION, TOWNSHIP, RANGE 211-628

PROVINCE

ST 122-A#1 | ST 122-A | CONNESTEO

OPERATION		CASING		MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: Drlg Cement		SURFACE: 10 3/4 IN. AT 1500 FT.		HOLE: 390	PITS: 475	PUMP SIZE X IN.: 4 1/2 X 9	ANNULAR VEL. (FT./MIN.) OPPOSITE DP: 155
BIT SIZE (IN.): 6 3/4	NO.: 18	INTERMEDIATE: 7 5/8 IN. AT 9268 FT.		TOTAL CIRCULATING VOLUME: 865		PUMP MAKE: G.D. MODEL: P-7-9	OPPOSITE COLLAR: 225
DRILL PIPE SIZE: 3 1/2	TYPE: E 13.30	PRODUCTION OR LINER: IN. AT FT.		IN STORAGE: AVE 322	WEIGHT	BBL./STROKE: 0.396 STROKE/MIN.: 125	CIRCULATING PRESSURE PSI:
DRILL COLLAR SIZE: 4 3/4	LENGTH: 1615	MUD TYPE: LIGNOSULFONATE				BBL./MIN.: 4.95	BOTTOMS UP (MIN.): 65 SYSTEM TOTAL (MIN.): 175

Sample from ☐ Flowline ☒ Pit
Flowline Temperature °F

MUD PROPERTIES			
Time Sample Taken	4:30		
Depth (ft)	9138		
Weight ☒ (ppg) ☐ (lb/cu ft)	12.5		
Mud Gradient (psi/ft)	.65		
Funnel Viscosity (sec/qt) API at ____ °F	54		
Plastic Viscosity cp at ____ °F	28		
Yield Point (lb/100 sq ft)	18		
Gel Strength (lb/100 sq ft) 10 sec/10 min	3/30	/	/
pH ☒ Strip ☐ Meter	12.0		
Filtrate API (ml/30 min)	4.0		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☐ HTHP ☐	2		
Alkalinity, Mud (Pm)	5.4		
Alkalinity, Filtrate (P_f/M_f)	.8/2.4	/	/
Salt ☐ppm ☐gpg Chloride ☐ppm ☐gpg	3700		
Calcium ☒ ppm ☐ Gyp ppb	160		
Sand Content (% by Vol)	.25		
Solids Content (% by Vol)	13		
Oil Content (% by Vol)	—		
Water Content (% by Vol)	87		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT

	SIZE	HRS/TOUR				SIZE	HRS/TOUR		
Centrifuge					Desilter				
Degasser	Rig				Shaker	Rig			
Desander					Other	Rig			

DAILY COST: Thru Tour 1,678 —
CUMULATIVE COST: Thru Tour 109,910 —

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
12.5	45-50	4 cc Less

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☐ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT	Day	Total
☒ IMCO BAR	23	346
☐ IMCO GEL		220
☐ IMCO ~~BRINE~~GEL Bulk Bar		5973
☒ IMCO RD-111	25	349
☒ IMCO ~~VC-10~~ Lig	5	380
☐ IMCO ~~THIN~~ Sil-Ver		125
☐ IMCO CAUSTIC SODA		175
☒ IMCO M D	1	31
☒ IMCO ~~POLY-RX~~ Sapp	2	
☒ Eng	1	33
☐		

REMARKS: Cement CDEN 11.2 - 3000 - Csg. — Drlg Green Cement - Hard Cement Contaminated Treated w/ Sapp & RD-111

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
Tommy Nichols	Houston	495-4134
UTILITY	WAREHOUSE LOCATION	TELEPHONE
	Liberty - Galveston	744-5373

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RT REPORT NO. 4

DEPTH 9318

WELL | S/T

NO. 4

DATE 2.15.80

SECTION, TOWNSHIP, RANGE MBM 628

PROVINCE

S.T. 122 - A#1 | ST 122 | Galveston | TXS

OPERATION		CASING		MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: P.O.O.H		SURFACE: 10 3/4 IN. AT 1500 FT.		HOLE: 400	PITS: 500 ±	PUMP SIZE: 4 1/2 X 9 IN.	ANNULAR VEL. (FT./MIN.): —
BIT SIZE (IN.): 6 3/4	NO.	INTERMEDIATE: 7 5/8 IN. AT 4718 FT.		TOTAL CIRCULATING VOLUME: 900 ±		PUMP MAKE: G.D	OPPOSITE DP: —
DRILL PIPE SIZE: 3 1/2	TYPE: E	PRODUCTION OR LINER: — IN. AT — FT.		IN STORAGE: AV =	WEIGHT: 325 ±	MODEL: P.2.9	OPPOSITE COLLAR: —
DRILL COLLAR SIZE: 4 3/4	LENGTH	MUD TYPE: Lignosulfonate				BBL./STROKE: .0396 @ 90%	STROKE/MIN.: CIRCULATING PRESSURE PSI: —
						BBL./MIN.: —	BOTTOMS UP (MIN.): —
							SYSTEM TOTAL (MIN.): —

Sample from ☐ Flowline ☐ Pit

Flowline Temperature °F

MUD PROPERTIES	Tour		
Time Sample Taken	5 am		
Depth (ft)	9318		
Weight ☐ (ppg) ☐ (lb/cu ft)	12.5		
Mud Gradient (psi/ft)	.6396		
Funnel Viscosity (sec/qt) API at ____ °F	38		
Plastic Viscosity cp at ____ °F	16		
Yield Point (lb/100 sq ft)	6		
Gel Strength (lb/100 sq ft) 10 sec/10 min	1/4	/	/
pH ☐ Strip ☐ Meter	10.5		
Filtrate API (ml/30 min)	4.0		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☐ HTHP ☐	2		
Alkalinity, Mud (Pm)	4.6		
Alkalinity, Filtrate (P_f/M_f)	1.4/3.4	/	/
Salt ☐ppm ☐ppg Chloride ☐ppm ☐ppg	3200		
Calcium ☐ ppm ☐ Gyp ppb	100	Ca^{++} 1000	
Sand Content (% by Vol)	0.1		
Solids Content (% by Vol)	12		
Oil Content (% by Vol)	—		
Water Content (% by Vol)	88		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT

	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge	—		Desilter	—	
Degasser Rig			Shaker Black Box		
Desander M. Lopez			Other M. Clean 150		

DAILY COST $ 2325 JV Thru Inv. | CUMULATIVE COST $ 112,972 Tot Inc.

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
12.3-12.5	40-44	4 or less

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☑ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT

Materials Used	Daily	Total
☑ IMCO BAR	20	426
☑ IMCO GEL		220
☑ IMCO ~~BRINGGEL~~ Bulk		598
☑ IMCO RD-111		354
☑ IMCO ~~VC-10~~ Liq	30	418
☑ IMCO ~~THIN~~ Solus	10	135
☑ IMCO CAUSTIC SODA	2	177
☑ IMCO M D		31
☑ IMCO ~~POLY-RX~~ Supp	3	6
☐		
☑ Engineer on loc	1	35

REMARKS P.O.O.H. To put on Dyna Drill, Tests P.S.M.

R Ca++ test 1st Day (Mon) got 6300 ppm

Yesterday Alice Hom Sol 1000 ppm

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
P.E. McAlister	Pasadena, Tx.	358 2765
UTILITY	WAREHOUSE LOCATION	TELEPHONE
	Galveston, Tx.	744 5373

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RT REPORT NO. 42

DEPTH 9321

WELL | S/T

NO. 4

DATE 2-15-80

SECTION, TOWNSHIP, RANGE RM-A-620

PROVINCE

ST. 122 - A#1 | ST 122 | GALVESTON

OPERATION		CASING		MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: Dyna Drill		SURFACE: 10 3/4 IN. AT 1500 FT.		HOLE: 400	PITS: 300	PUMP SIZE: 4 1/2 X 9 IN.	ANNULAR VEL. (FT./MIN.) OPPOSITE DP: 155
BIT SIZE (IN.): 6 3/4	NO.: 18	INTERMEDIATE: 7 5/8 IN. AT 9268 FT.		TOTAL CIRCULATING VOLUME: 700		PUMP MAKE: G-D MODEL: P-2-9	OPPOSITE COLLAR: 225
DRILL PIPE SIZE: 3 1/2	TYPE: E 1330	PRODUCTION OR LINER: IN. AT FT.		IN STORAGE: AV	WEIGHT: 328	BBL./STROKE: .0396 STROKE/MIN.: 125	CIRCULATING PRESSURE PSI: 2300
DRILL COLLAR SIZE: 4 3/4	LENGTH:	MUD TYPE: LIGNOSULFONATE				GPM = 208 BBL./MIN.: 4.95	BOTTOMS UP (MIN.): 66 SYSTEM TOTAL (MIN.): 141

Sample from ☐ Flowline ☐ Pit
Flowline Temperature °F

MUD PROPERTIES			
Time Sample Taken	4:30		
Depth (ft)	9321		
Weight ☒ (ppg) ☐ (lb/cu ft)	12.4		
Mud Gradient (psi/ft)	.644		
Funnel Viscosity (sec/qt) API at ____ °F	41		
Plastic Viscosity cp at ____ °F	24		
Yield Point (lb/100 sq ft)	6		
Gel Strength (lb/100 sq ft) 10 sec/10 min	1/5	/	/
pH ☐ Strip ☐ Meter	11.0		
Filtrate API (ml/30 min)	4.0		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☐ HTHP ☐	2		
Alkalinity, Mud (Pm)	4.4		
Alkalinity, Filtrate (P_f/M_f)	1.7/2.4	/	/
Salt ☐ppm ☐ppg Chloride ☐ppm ☐ppg	3200		
Calcium ☒ ppm ☐ Gyp ppb	80		
Sand Content (% by Vol)	.10		
Solids Content (% by Vol)	13		
Oil Content (% by Vol)	—		
Water Content (% by Vol)	87		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT

	SIZE	HRS/TOUR				SIZE	HRS/TOUR		
Centrifuge					Desilter				
Degasser	Rig				Shaker	Bottom			
Desander					Other	Blanket 150			

DAILY COST: Three Fifty 5594.00
CUMULATIVE COST: 118,566.52

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
12.3-12.5	41-45	4 cc 20

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☐ OPERATOR'S REPRESENTATIVE ☒ OTHER

RECOMMENDED TOUR TREATMENT

☒ IMCO BAR	14	448
☒ IMCO GEL	10	230
☒ IMCO ~~BRINEGEL~~ Barite Bulk	467	450
☒ IMCO RD-111	10	364
☐ IMCO ~~VC-10~~ Lig	-	418
☐ IMCO ~~THIN~~ Spotter	—	135
☐ IMCO CAUSTIC SODA	—	171
☒ IMCO M D	1	32
☒ IMCO ~~POLY-RX~~ Sand	2	8
☒ Al Sulfate	1	8
☒ Eng	1	36

REMARKS: Dyna Drill - Circ. [illegible] Pump Volume [illegible] Time [illegible] Drill Pipe to Fill Hole - Began Reaming 9230

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
Tommy Nelson	Houston	495-4134
UTILITY	WAREHOUSE LOCATION: Galveston	TELEPHONE: 744-5373

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DRT | REPORT NO. 43

DEPTH

WELL	S/T

MUD DATE

SECTION, TOWNSHIP, RANGE

PROVINCE

OPERATION		CASING		MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY		SURFACE IN. AT FT.		HOLE	PITS	PUMP SIZE X IN.	ANNULAR VEL. (FT./MIN.) OPPOSITE DP
BIT SIZE (IN.)	NO.	INTERMEDIATE IN. AT FT.		TOTAL CIRCULATING VOLUME		PUMP MAKE MODEL	OPPOSITE COLLAR
DRILL PIPE SIZE	TYPE	PRODUCTION OR LINER IN. AT FT.		IN STORAGE	WEIGHT	BBL./STROKE STROKE/MIN.	CIRCULATING PRESSURE PSI
DRILL COLLAR SIZE	LENGTH	MUD TYPE				BBL./MIN.	BOTTOMS UP (MIN.) SYSTEM TOTAL (MIN.)

Sample from ☐ Flowline ☒ Pit

Flowline Temperature °F

MUD PROPERTIES			
Time Sample Taken			
Depth (ft)			
Weight ☐ (ppg) ☐ (lb/cu ft)			
Mud Gradient (psi/ft)			
Funnel Viscosity (sec/qt) API at °F			
Plastic Viscosity cp at °F			
Yield Point (lb/100 sq ft)			
Gel Strength (lb/100 sq ft) 10 sec/10 min	/	/	/
pH ☐ Strip ☐ Meter			
Filtrate API (ml/30 min)			
API HP HT Filtrate (ml/30 min) at °F			
Cake Thickness 32nd in API ☐ HTHP ☐			
Alkalinity, Mud (Pm)			
Alkalinity, Filtrate (P_f/M_f)	/	/	/
Salt ☐ppm ☐gpg Chloride ☐ppm ☐gpg			
Calcium ☐ ppm ☐ Gyp ppb			
Sand Content (% by Vol)			
Solids Content (% by Vol)			
Oil Content (% by Vol)			
Water Content (% by Vol)			
Methylene Blue Capacity (ml/ml Mud)			
Methylene Blue (lb/bbl Bentonite Eq)			

EQUIPMENT	SIZE	HRS/TOUR			SIZE	HRS/TOUR		
Centrifuge					Desilter			
Degasser					Shaker			
Desander					Other			

DAILY COST	CUMULATIVE COST

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☐ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT

☐ IMCO BAR		
☐ IMCO GEL	6	
☐ IMCO BRINEGEL		
☐ IMCO RD-111		
☐ IMCO VC-10		
☐ IMCO THIN		
☐ IMCO CAUSTIC SODA		
☐ IMCO M D		
☐ IMCO POLY RX		
☒ Eng	1	
☐		

REMARKS

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
UTILITY	WAREHOUSE LOCATION	TELEPHONE

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DRI NO. 77
DEPTH
WELL
MUD NO. 4
MUD DATE 12-15-80
SECTION, TOWNSHIP, RANGE
PROVINCE

S.L. 122-A

OPERATION		CASING	MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: Drlg		SURFACE: 10 3/4 IN. AT 1500 FT.	HOLE: 408±	PITS: 350±	PUMP SIZE: 4 1/2 X 9 IN.	ANNULAR VEL. (FT./MIN.): .032 DRILL PIPE 136±
BIT SIZE (IN.): 6 3/4	NO.: 19	INTERMEDIATE: 7 5/8 IN. AT 9268 FT.	TOTAL CIRCULATING VOLUME: 758±		PUMP MAKE: G.D. MODEL: P.2.9	.0232 COLLAR 198±
DRILL PIPE SIZE: 3 1/2	TYPE: 13.30	PRODUCTION OR LINER: — IN. AT FT.	IN STORAGE: Av =	WEIGHT: 330	BBL./STROKE: .0396 STROKE/MIN.: 110	CIRCULATING PRESSURE PSI: 2100±
DRILL COLLAR SIZE: 4 3/4	LENGTH:	MUD TYPE: Lignosulfonate			SPM = 183 BBL./MIN.: 4.356	BOTTOMS UP (MIN.): 76
						SYSTEM TOTAL (MIN.): [illegible]

Sample from ☐ Flowline ☒ Pit
Flowline Temperature °F

MUD PROPERTIES	In	Out	
Time Sample Taken	5 am		
Depth (ft)	9511		
Weight ☒ (ppg) ☐ (lb/cu ft)	12.5	12.5	
Mud Gradient (psi/ft)	.65		
Funnel Viscosity (sec/qt) API at ____ °F	40	44	
Plastic Viscosity cp at ____ °F	25		
Yield Point (lb/100 sq ft)	8		
Gel Strength (lb/100 sq ft) 10 sec/10 min	2/4	/	/
pH ☐ Strip ☐ Meter	10.3		
Filtrate API (ml/30 min)	3.8		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☒ HTHP ☐	2		
Alkalinity, Mud (Pm)	3.6		
Alkalinity, Filtrate (P_f/M_f)	1.1/2.0	/	/
Salt ☐ ppm ☐ gpg Chloride ☐ ppm ☐ gpg	3200		
Calcium ☒ ppm ☐ Gyp ppb	80		
Sand Content (% by Vol)	0.20		
Solids Content (% by Vol)	14		
Oil Content (% by Vol)	—		
Water Content (% by Vol)	86		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge	—		Desilter	—	
Degasser	R-2		Shaker	Brandt	160
Desander	M. Hogger		Other	M. Gasser	150
DAILY COST $ 795 - Thru Inc			CUMULATIVE COST $ 120,000 - Tot.		

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
12.5	42-45	4 or less

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☒ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT

☐ IMCO BAR		
☐ IMCO GEL		
☐ IMCO ~~BRINEGEL~~ Bulk		
☐ IMCO RD-111		
☐ IMCO ~~VG-69~~ Lig		
☐ IMCO ~~THIN~~ Collex		
☐ IMCO CAUSTIC SODA		
☐ IMCO M D		
☐ IMCO POLY RX		
☒ Trea Lubrikleen	6	6
☒ Engineer on Loc	1	3

REMARKS Drlg. Ahead - Added Lubrikleen to reduce Drag for Directional Drilling. Thanks G.C.M.

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
P.E. McAliley	Dayton, Tex	258 2265
	WAREHOUSE LOCATION	TELEPHONE
	Conroe, Tex	744 5373

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REPORT NO. 15
DEPTH 9464
WELL
BOX 4
DATE 12-15-80
SECTION, TOWNSHIP, RANGE
PROVINCE

S.T. 122 - A#1 | ST 122 | Galveston | Texas

OPERATION		CASING		MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: D.D.H.		SURFACE: 10 3/4 IN. AT 1500 FT.		HOLE: 406±	PITS: 350±	PUMP SIZE: 4 1/2 X 9 IN.	ANNULAR VEL. (FT./MIN.): .082 OPPOSITE DP: —
BIT SIZE (IN.): 6 3/4	NO.	INTERMEDIATE: 7 5/8 IN. AT 9268 FT.		TOTAL CIRCULATING VOLUME: 756±		PUMP MAKE: G.D. MODEL: P.2.9	OPPOSITE COLLAR: .032 —
DRILL PIPE SIZE: 3 1/2	TYPE: E 13.30	PRODUCTION OR LINER: — IN. AT FT.		IN STORAGE: AV = 328±	WEIGHT	BBL./STROKE: .0396 STROKE/MIN.	CIRCULATING PRESSURE PSI: —
DRILL COLLAR SIZE: 4 3/4	LENGTH	MUD TYPE: Lignosulfonate				BBL./MIN.	BOTTOMS UP (MIN.): — SYSTEM TOTAL (MIN.): —

Sample from ☐ Flowline ☒ Pit
Flowline Temperature °F

MUD PROPERTIES	In		
Time Sample Taken	5 am		
Depth (ft)			
Weight ☒ (ppg) ☐ (lb/cu ft)	12.4		
Mud Gradient (psi/ft)			
Funnel Viscosity (sec/qt) API at ____ °F	40		
Plastic Viscosity cp at ____ °F	20		
Yield Point (lb/100 sq ft)	19		
Gel Strength (lb/100 sq ft) 10 sec/10 min	2/4	/	/
pH ☒ Strip ☐ Meter	10.8		
Filtrate API (ml/30 min)	4.0		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☒ HTHP ☐	2		
Alkalinity, Mud (Pm)	3.4		
Alkalinity, Filtrate (P_f/M_f)	1.1/2.0	/	/
Salt ☐ppm ☐ppg Chloride ☒ppm ☐ppg	3200		
Calcium ☒ ppm ☐ Gyp ppb	60		
Sand Content (% by Vol)	0.1		
Solids Content (% by Vol)	13		
Oil Content (% by Vol)	—		
Water Content (% by Vol)	87		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT

	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge	—		Desilter	—	
Degasser	Rig		Shaker	Brandt	30x60
Desander	Mayco		Other	m/cleaner	150 m

DAILY COST: 795 Thru Inv
CUMULATIVE COST: 120,795 Tax Incl

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
12.5	42-45	4 or Less

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☒ OPERATOR'S REPRESENTATIVE ☐ OTHER Mcaliley

RECOMMENDED TOUR TREATMENT

☐ IMCO BAR		46
☐ IMCO GEL		25
☐ IMCO ~~BRINEGEL~~ Bulk		[illegible]
☐ IMCO RD-111		[illegible]
☐ IMCO ~~MC-10~~ Lig		41
☐ IMCO ~~THIN~~ Soltex		15
☐ IMCO CAUSTIC SODA		17
☐ IMCO M D		22
☐ IMCO POLY RX		
☒ Imco Lubrikleen	6	12
☒ Engineer on Loc.	1	39

REMARKS: Unable to circulate. P.O.O.H. check Bit etc. Thanks
P.E. McAliley

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
P.E. McAliley	Dayton, Tx.	258 2765
	WAREHOUSE LOCATION: Galveston, Tx	TELEPHONE: 744 5393

Form 515 Rev. 50M 2-80

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REPORT NO. 46
DEPTH 9426
WELL
NO. 4
DATE 12-15-80
SECTION, TOWNSHIP, RANGE M Bm 6x8
PROVINCE

S.T. 122 - A #1 | S.T. 122 | Galveston Texas

OPERATION		CASING	MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY		SURFACE 10 3/4 IN. AT 1500 FT.	HOLE 406 ±	PITS 400 ±	PUMP SIZE 4 1/2 X 9 IN.	ANNULAR VEL. (FT./MIN.) .032 ± OPPOSITE DP 136
BIT SIZE (IN.) 6 3/4	NO.	INTERMEDIATE 7 5/8 IN. AT 9268 FT.	TOTAL CIRCULATING VOLUME 806 ±		PUMP MAKE G.D MODEL P.Z.9	.0222 OPPOSITE COLLAR 195
DRILL PIPE SIZE 3 1/2	TYPE E 13.30	PRODUCTION OR LINER — IN. AT FT.	IN STORAGE A.U. =	WEIGHT	BBL./STROKE .0396 @ 90% HD STROKE/MIN.	CIRCULATING PRESSURE PSI 2100-2150
DRILL COLLAR SIZE 4 2/4	LENGTH	MUD TYPE Lignosulfonate			SPM - 183 BBL./MIN. 4.356	BOTTOMS UP (MIN.) 75 ± SYSTEM TOTAL (MIN.) [illegible]

Sample from ☐ Flowline ☑ Pit
Flowline Temperature °F

MUD PROPERTIES	In		Out
Time Sample Taken	8 am	vertical	
Depth (ft)	9426		
Weight ☑ (ppg) ☐ (lb/cu ft)	12.8		12.8
Mud Gradient (psi/ft)	.656		
Funnel Viscosity (sec/qt) API at ____ °F	55		55
Plastic Viscosity cp at: ____ °F	31		
Yield Point (lb/100 sq ft)	17		
Gel Strength (lb/100 sq ft) 10 sec/10 min	3/23	/	/
pH ☑ Strip ☐ Meter	11.0		
Filtrate API (ml/30 min)	3.8		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☑ HTHP ☐	2		
Alkalinity, Mud (Pm)	3.0		
Alkalinity, Filtrate (P_f/M_f)	1.2/2.7	/	/
Salt ☐ ppm ☐ gpg Chloride ☑ ppm ☐ gpg	3200		
Calcium ☑ ppm ☐ Gyp ppb	20		
Sand Content (% by Vol)	0.2		
Solids Content (% by Vol)	14		
Oil Content (% by Vol)	—		
Water Content (% by Vol)	86		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge			Desilter		
Degasser Rig			Shaker Brandt	80	60
Desander M.Logger			Other M.C. Reamer	150	

DAILY COST $ 5774 - Tex Inc. CUMULATIVE COST $ 126,569 - Tex Inc.

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
12.8	42-45	4 or less

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☑ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT	Materials Used	Cost
☑ IMCO BAR	10	[illegible]
☑ IMCO GEL	9	26
☑ IMCO ~~BRINEGEL~~ Bulk *	470	65
☑ IMCO RD-111	5	[illegible]
☑ IMCO ~~VG-69~~ Liq	14	42
☑ IMCO ~~THIN~~ Soltex	5	14
☐ IMCO CAUSTIC SODA		17
☐ IMCO M D		32
☑ IMCO ~~POLYPAK~~ Na Chromate	2	
☑ Inco Lubriklean	2	19
☑ Engineer on location	1	75

REMARKS Hole started coming in when lifting pipe to move - raised mud wt to 12.8#/gal. + vis to 55 per co. man's orders.

Thanks P.E.M.

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
P.E. McAliley	Dayton, Texas	258 2765
	WAREHOUSE LOCATION	TELEPHONE
	Galveston, Texas	744 5373

Form 515 Rev. 50M 2-80

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RT REPORT NO. 47

DEPTH 9464

WELL | S/T

MUD NO. 4

MUD DATE 12-15-81

SECTION, TOWNSHIP, RANGE 78m-A-628

PROVINCE

ST 122-A H | ST 122 | GALVESTON TEXAS

OPERATION		CASING		MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: Reaming		SURFACE: 10 3/4 IN. AT 1500 FT.		HOLE: 400	PITS: 350	PUMP SIZE: 4 1/2 X 9 IN.	ANNULAR VEL. (FT./MIN.): .022 OPPOSITE DP 148
BIT SIZE (IN.): 6 3/4	NO.: Hc Oth	INTERMEDIATE: 7 5/8 IN. AT 9268 FT.		TOTAL CIRCULATING VOLUME: 750		PUMP MAKE: G-D MODEL: P-7-9	.022 OPPOSITE COLLAR 216
DRILL PIPE SIZE: 3 1/2	TYPE: E 13.30	PRODUCTION OR LINER: IN. AT FT.		IN STORAGE: AV 330	WEIGHT	BBL./STROKE: .0396 .07	STROKE MIN.: 120
DRILL COLLAR SIZE: 4 3/4	LENGTH	MUD TYPE: LIGNOSULFONATE				GPM = 200 BBL./MIN.: 4.752	CIRCULATING PRESSURE PSI: 2000
							BOTTOMS UP (MIN.): 69 ±
							SYSTEM TOTAL (MIN.): 158 ±

Sample from ☐ Flowline ☐ Pit
Flowline Temperature °F

MUD PROPERTIES	In	Out	
Time Sample Taken	330 am		
Depth (ft)	9464		
Weight ☒ (ppg) ☐ (lb/cu ft)	12.8	12.8	
Mud Gradient (psi/ft)	.656		
Funnel Viscosity (sec/qt) API at ____ °F	54	70	
Plastic Viscosity cp at ____ °F	35		
Yield Point (lb/100 sq ft)	15		
Gel Strength (lb/100 sq ft) 10 sec/10 min	3/24	/	/
pH ☑ Strip ☐ Meter	10.5		
Filtrate API (ml/30 min)	3.8		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☐ HTHP ☐	2		
Alkalinity, Mud (Pm)	3.4		
Alkalinity, Filtrate (P_f/M_f)	.9/4	/	/
Salt ☐ppm ☐ppg Chloride ☑ppm ☐ppg	3300		
Calcium ☒ ppm ☐ Gyp ppb	40		
Sand Content (% by Vol)	.2		
Solids Content (% by Vol)	14		
Oil Content (% by Vol)	3		
Water Content (% by Vol)	83		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT

	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge			Desilter		
Degasser	Rig		Shaker	Rig/90	
Desander			Other	Bulk	150-MC

DAILY COST: Thru Inv 1,130 —

CUMULATIVE COST: Thru Inv 127,699 —

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
12.8	55	4 cc less

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☐ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT	Daily Use	Tot. Use
☐ IMCO BAR		470
☐ IMCO GEL	63	328
☐ IMCO ~~BRINEGEL~~ Bulk	—	4220
☐ IMCO RD-111	4	373
☐ IMCO ~~VG10~~ L.G	8	436
☐ IMCO ~~THIN~~ Solter	—	140
☐ IMCO CAUSTIC SODA		177
☐ IMCO M.D		32
☐ IMCO ~~POLYBXS~~ Sodium Chromate	—	2
☒ ENG	1	41
☐		

REMARKS Reamed to bottom. Short Trip - Survey weight not go to bottom. After 4 hrs trying to circ - Pipe stuck. Came free - Hole collapsing in Approach. Reaming to bottom again

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
Tommy Nichol	Houston	495-4134
UTILITY	WAREHOUSE LOCATION	TELEPHONE
	Galveston	744-5373

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RT REPORT NO. 48

DEPTH 9404

WELL | S/T

MUD NO. 4

MUD DATE 2-15-81

SECTION, TOWNSHIP, RANGE 1(E)N-A-625

PROVINCE

ST 122 A #1 | ST 122 | GALVESTON | OFFSHORE BASE

OPERATION		CASING		MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: Fishing		SURFACE: 10 3/4 IN. AT 1500 FT.		HOLE: 400	PITS: 350	PUMP SIZE: 4 1/2 X 9 IN.	ANNULAR VEL. (FT./MIN.): .0321 OPPOSITE DP 148
BIT SIZE (IN.): 6 3/4	NO.: 2, 1 3	INTERMEDIATE: 7 5/8 IN. AT 9268 FT.		TOTAL CIRCULATING VOLUME: 750		PUMP MAKE: G.O. MODEL: F-7-9	.0221 OPPOSITE COLLAR 216
DRILL PIPE SIZE: 3 1/2	TYPE: E 13.30	PRODUCTION OR LINER: IN. AT FT.		IN STORAGE: AV =	WEIGHT: 330	BBL./STROKE: .0306	STROKE, MIN.: 120
DRILL COLLAR SIZE: 4 3/4	LENGTH	MUD TYPE: Lignosulphonate				BBL./MIN.: Dm = 200 4.252	CIRCULATING PRESSURE PSI: 2,000 BOTTOMS UP (MIN.): 65 1 SYSTEM TOTAL (MIN.): 105 1

Sample from ☐ Flowline ☐ Pit

Flowline Temperature °F

MUD PROPERTIES			
Time Sample Taken	4:00 am		
Depth (ft)	9404		
Weight ☒ (ppg) ☐ (lb/cu ft)	12.8+		
Mud Gradient (psi/ft)	.656		
Funnel Viscosity (sec/qt) API at °F	58		
Plastic Viscosity cp at °F	36		
Yield Point (lb/100 sq ft)	16		
Gel Strength (lb/100 sq ft) 10 sec/10 min	3/24	/	/
pH ☐ Strip ☐ Meter	10.5		
Filtrate API (ml/30 min)	3.8		
API HP HT Filtrate (ml/30 min) at °F	—		
Cake Thickness 32nd in API ☐ HTHP ☐	2		
Alkalinity, Mud (Pm)	3.3		
Alkalinity, Filtrate (P_f/M_f)	.9/23	/	/
Salt ☐ppm ☐ppg Chloride ☐ppm ☐ppg	3300		
Calcium ☒ ppm ☐ Gyp ppb	40		
Sand Content (% by Vol)	.20		
Solids Content (% by Vol)	14		
Oil Content (% by Vol)	3		
Water Content (% by Vol)	83		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT

	SIZE	HRS/TOUR			SIZE	HRS/TOUR		
Centrifuge					Desilter			
Degasser	Rig				Shaker	60 x 80		
Desander					Other	Pad-T	MC-150	

DAILY COST: Inv. 10,095 — CUMULATIVE COST: Inv. 128,788 —

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
12.8	55	4 cc less

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☐ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT	DAILY USE	TOTAL USE
☐ IMCO BAR	40	510
☐ IMCO GEL		328
☐ IMCO ~~BRINEGEL~~ Barite		6920
☐ IMCO RD-111		373
☐ IMCO ~~VG-10~~ L-G		436
☐ IMCO ~~THIN~~ Seller	5	146
☐ IMCO CAUSTIC SODA		177
☐ IMCO M D		32
☐ IMCO ~~POLY BX~~ Lubricline		14
☐ ENG	1	42
☐		

REMARKS Could not ream to bottom. P.C.H. - One cone and 2 ft from end of pull hole reamer left in hole - TIH w/magnet.

Mud needs water.

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
Tommy Nichol	Houston	495-4134
UTILITY	WAREHOUSE LOCATION	TELEPHONE
	Galveston	744-5373

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REPORT NO. 4
DEPTH 9298
WELL / S/T
MUD NO. 4
MUD DATE 12.15.80
SECTION, TOWNSHIP, RANGE ABM 628
PROVINCE

S.T. 122 - A #1 | S.T. 122 | Galveston | Texas

OPERATION		CASING	MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: D/L		SURFACE: 10 3/4 IN. AT 1500 FT.	HOLE: 400 ±	PITS: 500 ±	PUMP SIZE: 4 1/2 X 9 IN.	ANNULAR VEL. (FT./MIN.): 1022 OPPOSITE DP 148
BIT SIZE (IN.): 6 3/4	NO.	INTERMEDIATE: 7 5/8 IN. AT 9268 FT.	TOTAL CIRCULATING VOLUME: 900 ±		PUMP MAKE: G.D. MODEL: P.2.9	1022 OPPOSITE COLLAR 216
DRILL PIPE SIZE: 3 1/2	TYPE: E / LENGTH: 13,730	PRODUCTION OR LINER: — IN. AT FT.	IN STORAGE: AV.	WEIGHT: 330	BBL./STROKE: .0396 STROKE/MIN.: 120	CIRCULATING PRESSURE PSI: 2000
DRILL COLLAR SIZE: 4 3/4	LENGTH	MUD TYPE: Lignosulphonate			G.P.M. = 200 BBL./MIN. 4.752	BOTTOMS UP (MIN.): 69 ± SYSTEM TOTAL (MIN.): 189 ±

Sample from ☐ Flowline ☐ Pit
Flowline Temperature °F

MUD PROPERTIES	In		Out
Time Sample Taken	9AM		
Depth (ft)	9290		
Weight ☒ (ppg) ☐ (lb/cu ft)	15.5		15.5
Mud Gradient (psi/ft)	.806		
Funnel Viscosity (sec/qt) API at ____ °F	70		93
Plastic Viscosity cp at ____ °F	50		
Yield Point (lb/100 sq ft)	35		
Gel Strength (lb/100 sq ft) 10 sec/10 min	8/64	/	/
pH ☐ Strip ☐ Meter	11.0		
Filtrate API (ml/30 min)	4.0		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☒ HTHP ☐	2		
Alkalinity, Mud (Pm)			
Alkalinity, Filtrate (P_f/M_f)	.1/2.2	/	/
Salt ☐ppm ☐ppg Chloride ☐ppm ☐ppg	3300		
Calcium ☒ ppm ☐ Gyp ppb	20		
Sand Content (% by Vol)	0.1		
Solids Content (% by Vol)	30		
Oil Content (% by Vol)	5		
Water Content (% by Vol)	65		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT

	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge	—		Desilter	—	
Degasser	Rig		Shaker	Brandt	30 x 30
Desander	M. Cleaner	150	Other		

DAILY COST $ 17,767 - Thru Inv
CUMULATIVE COST $ 146,555 Tax Incl

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
15.5	50	4 or less

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☒ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT

	Material Used	$
☐ IMCO BAR		
☐ IMCO GEL		
☒ IMCO ~~BARNECLE~~ Bulk *	1700	[illegible]
☒ IMCO RD-111	5	[illegible]
☒ IMCO VC-10	5	[illegible]
☐ IMCO ~~THIN~~ Sol-tex		[illegible]
☒ IMCO CAUSTIC SODA	[illegible]	[illegible]
☐ IMCO M D		[illegible]
☐ IMCO POLY RX		
☒ Imco lubrikleen	6	20
☒ Engineer on location	1	[illegible]

REMARKS * majority of cost due to weighting up mud from 12.5 to 15.5

Only [illegible] P.E.M. Now starting chemical treatments to reduce P.V. - Y.P. & Vis. Wanted Weight Turn at 15.5 before chemicals

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
P.E. McAliley	Dayton, Tx	258 2765
	WAREHOUSE LOCATION	TELEPHONE
	Galveston, Tx	744 5373

Form 515 Rev. 50M 2-80

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DRT REPORT NO. 20
DEPTH 9368
WELL
MUD NO. 4
MUD DATE 12-15-80
SECTION, TOWNSHIP, RANGE Galveston - 628
PROVINCE

S.T. 122 - A #1 | S.T. 122 | Galveston | Texas

OPERATION	CASING	MUD VOLUME (BBL)	CIRCULATION DATA
PRESENT ACTIVITY: Fishing	SURFACE: 10 3/4 IN. AT 1500 FT.	HOLE: 400± PITS: 500±	PUMP SIZE: 4 1/2 X 9 IN.
BIT SIZE (IN.) / NO.	INTERMEDIATE: 7 5/8 IN. AT 9268 FT.	TOTAL CIRCULATING VOLUME: 900±	PUMP MAKE: G.D. MODEL: P.2.9
DRILL PIPE SIZE: 3 1/2 TYPE: E 13.30	PRODUCTION OR LINER: — IN. AT — FT.	IN STORAGE: AV = 330± WEIGHT	BBL./STROKE: .0396 @ 90% STROKE/MIN.: 170
DRILL COLLAR SIZE: 4 3/4 LENGTH	MUD TYPE: Lignosulfonate		GPM: 200 BBL./MIN.: 4.752

ANNULAR VEL. (FT./MIN.): .022 OPPOSITE DP 148± ; .022 OPPOSITE COLLAR 216± ; CIRCULATING PRESSURE PSI 2000 ; BOTTOMS UP (MIN.) 65± ; SYSTEM TOTAL (MIN.) 185±

Sample from ☐ Flowline ☐ Pit
Flowline Temperature °F

MUD PROPERTIES	In	Out
Time Sample Taken	4:30 am	
Depth (ft)	9368	
Weight ☒ (ppg) ☐ (lb/cu ft)	15.5	15.5
Mud Gradient (psi/ft)	.806	
Funnel Viscosity (sec/qt) API at ____ °F	63	68
Plastic Viscosity cp at ____ °F	52	
Yield Point (lb/100 sq ft)	21	
Gel Strength (lb/100 sq ft) 10 sec/10 min	3/27	/ /
pH ☒ Strip ☐ Meter	11.3	
Filtrate API (ml/30 min)	3.8	
API HP HT Filtrate (ml/30 min) at ____ °F	—	
Cake Thickness 32nd in API ☒ HTHP ☐	2	
Alkalinity, Mud (Pm)	5.0	
Alkalinity, Filtrate (P_f/M_f)	1.2/2.9	/ /
Salt ☐ppm ☐ppg Chloride ☒ppm ☐ppg	3500	
Calcium ☒ ppm ☐ Gyp ppb	60	
Sand Content (% by Vol)	0.1	
Solids Content (% by Vol)	30	
Oil Content (% by Vol)	4	
Water Content (% by Vol)	66	
Methylene Blue Capacity (ml/ml Mud)	—	
Methylene Blue (lb/bbl Bentonite Eq)	—	

EQUIPMENT

	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge			Desilter		
Degasser	R.S		Shaker	Brandt	80 hrs
Desander	M. Cleaner	150	Other		

DAILY COST: 1092 Thru Sep. | CUMULATIVE COST: 147,647 Tot Eng.

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
15.5	55	4 or less

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☒ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT — Materials Used

	Used	Total
☒ IMCO BAR	26	52
☐ IMCO GEL		32
☐ IMCO ~~BRINEGEL~~ Salt		670
☒ IMCO RD-111	10	38
☒ IMCO ~~UC-10~~ L.S	10	45
☐ IMCO ~~THIN~~ Soltex		195
☒ IMCO CAUSTIC SODA	4	18
☐ IMCO M D		32
☐ IMCO POLY RX		
☒ Saco Lubrikleen		30
☒ Engineer on Loc		30

REMARKS P.O.O.H. @ approx 11 am 12-5 - Both Junk baskets down in hole - Went D.E.H. fishing for baskets - got D.I.H. @ approx 7:30 am 12-6 Mud needs water and additional chemicals & circulating time. Thanks P.E.M.

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
P. E. McAliley	Dayton, Tx.	258-2765
	WAREHOUSE LOCATION	TELEPHONE
	Galveston, Tx.	744 5373

Form 515 Rev. 50M 2-80

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DRT REPORT NO. 5
DEPTH 9470
WELL
MUD NO. 4
MUD DATE 12-15-80
SECTION, TOWNSHIP, RANGE MBM-628
PROVINCE

S.T.-122-A#1 | S.T. 122 | Galveston | Texas

OPERATION	CASING	MUD VOLUME (BBL)	CIRCULATION DATA
PRESENT ACTIVITY: Cementing	SURFACE: 10 3/4 IN. AT 1500 FT.	HOLE: 400± PITS: 500±	PUMP SIZE: 4 1/2 X 9 IN.
BIT SIZE (IN.): 6 NO.: T	INTERMEDIATE: 7 5/8 IN. AT 9268 FT.	TOTAL CIRCULATING VOLUME: 900±	PUMP MAKE: G.D. MODEL: P-2-9
DRILL PIPE SIZE: 3 1/2 TYPE: E 13.30	PRODUCTION OR LINER: — IN. AT FT.	IN STORAGE: AV - 330± WEIGHT	BBL./STROKE: .03966 STROKE/MIN.: 130
DRILL COLLAR SIZE: 6 LENGTH: —	MUD TYPE:		SPM 216 BBL./MIN.: 5.148

ANNULAR VEL. (FT./MIN.): .072 OPPOSITE DP: 161± OPPOSITE COLLAR: —
CIRCULATING PRESSURE PSI: 2000± BOTTOMS UP (MIN.): 64± SYSTEM TOTAL (MIN.): 175±

Sample from ☐ Flowline ☐ Pit
Flowline Temperature °F

MUD PROPERTIES	I.		O-T
Time Sample Taken	5am		
Depth (ft)	9470		
Weight ☑ (ppg) ☐ (lb/cu ft)	16.0+		16.0+
Mud Gradient (psi/ft)	.832		
Funnel Viscosity (sec/qt) API at ____ °F	55		60
Plastic Viscosity cp at ____ °F	50		
Yield Point (lb/100 sq ft)	15		
Gel Strength (lb/100 sq ft) 10 sec/10 min	4/17	/	/
pH ☐ Strip ☐ Meter	11.0		
Filtrate API (ml/30 min)	3.6		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☑ HTHP ☐	2		
Alkalinity, Mud (Pm)	4.9		
Alkalinity, Filtrate (P_f/M_f)	1.2/2.3	/	/
Salt ☐ppm ☐ppg Chloride ☑ppm ☐gpg	3500		
Calcium ☑ ppm ☐ Gyp ppb	60		
Sand Content (% by Vol)	0.1		
Solids Content (% by Vol)	31		
Oil Content (% by Vol)	4		
Water Content (% by Vol)	65		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT

	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge	—		Desilter	—	
Degasser	Rig		Shaker	Brandt	Balance
Desander	m-Cleaner	150	Other	—	

DAILY COST $6851 Thru Tour | CUMULATIVE COST $154,498 Tot. Int.

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
16.0+	55	4 or less

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☑ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT (MAGGIE'S MUD)

☑ IMCO BAR	20	55
☐ IMCO GEL		3
☑ IMCO ~~BRINEGEL~~ Bulk *	469	1
☑ IMCO RD-111	20	40
☑ IMCO ~~VG-69~~ Lig	10	46
☑ IMCO ~~THIN~~ Soltex	15	15
☐ IMCO CAUSTIC SODA		1
☐ IMCO M D		3
☑ IMCO ~~POLY-PAC~~ Lubrikleen	4	27
☐		
☑ Engineer on location	1	45

REMARKS Co. man Requested mud wt raised from 15.5 #/gal to 16.0+ #/gal Decided to cement hole, after not being able to tag fish. G.I.H. circulated @ approx 3:30 Am 2-7. Flushed P.E.M.

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
P.E. McAliley	Dayton, Texas	252 2765
	WAREHOUSE LOCATION	TELEPHONE
	Galveston, Texas	744-5373

Form 515 Rev. 50M 2-80

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RT REPORT NO. 52

WELL

NO. 4

DATE 2-15-84

TION, TOWNSHIP, RANGE ABM 628

PROVINCE

S.T. 122 - A#1 | ST122 | Galveston | Texas

OPERATION		CASING		MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: G.I.H		SURFACE: 10 3/4 IN. AT 1500 FT.		HOLE: 400±	PITS: 500±	PUMP SIZE: 4 1/2 X 9 IN.	ANNULAR VEL. (FT./MIN.): .032 OPPOSITE DC 144±
BIT SIZE (IN.): 6 3/4	NO.: R.R.	INTERMEDIATE: 7 5/8 IN. AT 9268 FT.		TOTAL CIRCULATING VOLUME: 900±		PUMP MAKE: G.D. MODEL: P.Z.9	.022 OPPOSITE COLLAR 234±
DRILL PIPE SIZE: 3 1/2	TYPE: E	PRODUCTION OR LINER: IN. AT FT.		IN STORAGE: AV = 332	WEIGHT	BBL./STROKE: .0396	STROKE/MIN.: 130
DRILL COLLAR SIZE: 4 3/4	LENGTH	MUD TYPE: Lignosulfonate				SPM 216 BBL./MIN. 5.148	CIRCULATING PRESSURE (PSI): 2090 BOTTOMS UP (MIN.): 64± SYSTEM TOTAL (MIN.): 176±

Sample from ☐ Flowline ☐ Pit

Flowline Temperature °F

MUD PROPERTIES			
Time Sample Taken	9 am		
Depth (ft)			
Weight ☒ (ppg) ☐ (lb/cu ft)	16.0+		
Mud Gradient (psi/ft)	.832		
Funnel Viscosity (sec/qt) API at ____ °F	55		
Plastic Viscosity cp at ____ °F	50		
Yield Point (lb/100 sq ft)	15		
Gel Strength (lb/100 sq ft) 10 sec/10 min	3/15	/	/
pH ☒ Strip ☐ Meter	12		
Filtrate API (ml/30 min)	3.6		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☒ HTHP ☐	2		
Alkalinity, Mud (Pm)			
Alkalinity, Filtrate (P_f/M_f)	1.2/2.4	/	/
Salt ☐ppm ☐ppg Chloride ☒ppm ☐ppg	3500		
Calcium ☒ ppm ☐ Gyp ppb	60		
Sand Content (% by Vol)	0.1		
Solids Content (% by Vol)	31		
Oil Content (% by Vol)	4		
Water Content (% by Vol)	65		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT

	SIZE	HRS/TOUR			SIZE	HRS/TOUR	
Centrifuge	—			Desilter	—		
Degasser	Rig			Shaker	Brandt	2	80
Desander	M. Cleaner			Other			

DAILY COST $ 253 Thru Incl. | CUMULATIVE COST 154,751 Thru Incl.

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
16.0	55	4 or less

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☒ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT	Daily	Cum
☐ IMCO BAR		55
☐ IMCO GEL		32
☐ IMCO BRINEGEL		9
☐ IMCO RD-111		10
☐ IMCO VC-10		41
☐ IMCO THIN		15
☐ IMCO CAUSTIC SODA		18
☐ IMCO M D		37
☐ IMCO ~~POLYMER~~ Lubrikleen		2
☐		
☒ Engineer on Location	1	46

REMARKS Waiting on Cement to set up.

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
R.E. McAliley	Dayton, Tex	258 2765
AREA OFFICE	WAREHOUSE LOCATION: Galveston, Tex.	TELEPHONE 744 5373

Form 515 Rev. 50M 2-80

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REPORT NO. 53
DEPTH 9339
WELL
SUB DATE 12·15·80
SECTION, TOWNSHIP, RANGE 68m 62b
PROVINCE

S.T. 122 - A #1 | ST 122 | Galveston | Texas

OPERATION		CASING	MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: D/G.		SURFACE: 10 3/4 IN. AT 1500 FT.	HOLE: 400±	PITS: 500±	PUMP SIZE X IN.: 4 1/2 9	ANNULAR VEL. (FT./MIN.): .032 OPPOSITE DP 124±
BIT SIZE (IN.): 6 7/4	NO.: R.R.	INTERMEDIATE: 7 5/8 IN. AT 9268 FT.	TOTAL CIRCULATING VOLUME: 900±		PUMP MAKE: G.D. MODEL: P.2.9	.037 OPPOSITE COLLAR 180±
DRILL PIPE SIZE: 3 1/2	TYPE: E	PRODUCTION OR LINER: — IN. AT FT.	IN STORAGE: AV =	WEIGHT: 330±	BBL./STROKE: .0396 STROKE/MIN.: 100	CIRCULATING PRESSURE PSI: 2200
DRILL COLLAR SIZE: 4 3/4	LENGTH:	MUD TYPE: Lignosulfonate			GPM: 166 BBL./MIN.: 3.96	BOTTOMS UP (MIN.): 83± SYSTEM TOTAL (MIN.): 237±

Sample from ☐ Flowline ☐ Pit
Flowline Temperature °F

MUD PROPERTIES			
Time Sample Taken	9 am		
Depth (ft)	9337		
Weight ☒ (ppg) ☐ (lb/cu ft)	16.0		
Mud Gradient (psi/ft)	.832		
Funnel Viscosity (sec/qt) API at ____ °F	62		
Plastic Viscosity cp at ____ °F	45		
Yield Point (lb/100 sq ft)	25		
Gel Strength (lb/100 sq ft) 10 sec/10 min	5/52	/	/
pH ☐ Strip ☐ Meter	11.0		
Filtrate API (ml/30 min)	4.2		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☒ HTHP ☐	2		
Alkalinity, Mud (Pm)	4.8		
Alkalinity, Filtrate (P_f/M_f)	44/30	/	/
Salt ☐ ppm ☐ gpg Chloride ☒ ppm ☐ gpg	3100		
Calcium ☒ ppm ☐ Gyp ppb	160		
Sand Content (% by Vol)	0.1		
Solids Content (% by Vol)	31		
Oil Content (% by Vol)	4		
Water Content (% by Vol)	65		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge	—		Desilter	—	
Degasser	Rig		Shaker	Brandt	48x60
Desander	M. Cleaner	154	Other	—	

DAILY COST: 1807 Thru Sun
CUMULATIVE COST: 156,558 Thru Sun.

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
16.0	55	4 or less

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☒ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT (Materials Used)	Qty	Cost
☐ IMCO BAR		55
☐ IMCO GEL		3
☐ IMCO BRINEGEL		91
☐ IMCO RD-111	20	4
☐ IMCO ~~VC-10~~ Lig	12	4
☐ IMCO ~~THIN~~ Salter		15
☐ IMCO CAUSTIC SODA		18
☒ IMCO ~~IMCO~~ Sapp	9	17
☒ IMCO ~~POLY-PX~~ Lubriklean		2
☒ Sodium Bicarbonate	10	1
☒ Engineer on location	1	4

REMARKS: Drilled out cement plug. Are reaming down to bottom. We probably set another plug. Thus P.E.M.

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
P.E. McAliley	Dayton Tex	258 2765
	WAREHOUSE LOCATION: Galveston Tex	TELEPHONE: 744 5373

Form 515 Rev. 50M 2-80

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RT REPORT NO. 54

DEPTH 9434

WELL | S/T

MUD NO. 4

MUD DATE 12-15-90

SECTION, TOWNSHIP, RANGE 12 M-A-628

PROVINCE

ST 122 A #1 | ST 122-A | GALVESTON TEXAS

OPERATION		CASING		MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: Drlg		SURFACE: 10 3/4 IN. AT 1500 FT.		HOLE: 402	PITS: 500	PUMP SIZE: 4 1/2 X 9 IN.	ANNULAR VEL. (FT./MIN.): .032 OPPOSITE DP 126
BIT SIZE (IN.): 6 3/4	NO.	INTERMEDIATE: 9 5/8 IN. AT 9268 FT.		TOTAL CIRCULATING VOLUME: 902		PUMP MAKE: G-D MODEL: P-7-9	.022 OPPOSITE COLLAR 184
DRILL PIPE SIZE: 3 1/2	TYPE: E 13.30	PRODUCTION OR LINER: IN. AT FT.		IN STORAGE: AV =	WEIGHT: 332	BBL./STROKE: 0396	STROKE/MIN.: 102
DRILL COLLAR SIZE: 4 3/4	LENGTH	MUD TYPE: LIGNOSULFONATE				GPM - 169 BBL./MIN.: 4.04	CIRCULATING PRESSURE, PSI: 2100 BOTTOMS UP (MIN.): 82 ± SYSTEM TOTAL (MIN.): 223

Sample from ☐ Flowline ☒ Pit
Flowline Temperature °F

MUD PROPERTIES			
Time Sample Taken	4:30 Am		
Depth (ft)	9434		
Weight ☒ (ppg) ☐ (lb/cu ft)	16.0		
Mud Gradient (psi/ft)	.832		
Funnel Viscosity (sec/qt) API at ____ °F	60		
Plastic Viscosity cp at ____ °F	45		
Yield Point (lb/100 sq ft)	20		
Gel Strength (lb/100 sq ft) 10 sec/10 min	5/35	/	/
pH ☒ Strip ☐ Meter	11.0		
Filtrate API (ml/30 min)	4.2		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☐ HTHP ☐	2		
Alkalinity, Mud (Pm)	5.0		
Alkalinity, Filtrate (P_f/M_f)	1.4/3.0	/	/
Salt ☐ppm ☐gpg Chloride ☒ppm ☐gpg	3400		
Calcium ☒ ppm ☐ Gyp ppb	140		
Sand Content (% by Vol)	.2		
Solids Content (% by Vol)	31		
Oil Content (% by Vol)	3		
Water Content (% by Vol)	66		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT

	SIZE	HRS/TOUR			SIZE	HRS/TOUR	
Centrifuge				Desilter			
Degasser Ric				Shaker 60x 80			
Desander				Other Rubber MC-150			

DAILY COST Thru Inv 1,442.00 | CUMULATIVE COST Tangible 158000

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
16.0	55	4 or Less

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☒ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT	Daily Use	Total Use
☒ IMCO BAR	34	590
☐ IMCO GEL	-	328
☐ IMCO ~~BRINEGEL~~ Bulk Bar		9175
☐ IMCO RD-111	10	438
☒ IMCO ~~VG-10~~ Lig	3	476
☒ IMCO ~~THIN~~ Lig Sulfex	4	159
☐ IMCO CAUSTIC SODA		181
☐ IMCO ~~MD~~ Sand	1	13 ~~32~~
☐ IMCO ~~POLY-PAC~~ Lubriklean		~~29~~
☐ Bicarb	-	10
☒ Eng	1	48

REMARKS Drilled Past Blue Attempting to MAKE New hole

Mud Looks better. Still working on Gelsr Yield

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
Tommy Nichol	Houston	495 4134
UTILITY	WAREHOUSE LOCATION: Galveston	TELEPHONE 744-5373

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DRT REPORT NO. 55

DEPTH 9439

WELL | S/T

MUD NO. 4

MUD DATE 12-15-80

SECTION, TOWNSHIP, RANGE ABM-A 628

PROVINCE

ST 122 A #1 | ST 122 | GALVESTON TEXAS

OPERATION		CASING	MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: T.I.H/Dynadrill		SURFACE: 10 3/4 IN. AT 1500 FT.	HOLE: 402	PITS: 500	PUMP SIZE: 4 1/2 X 9 IN.	ANNULAR VEL. (FT./MIN.): .022 OPPOSITE DP 126
BIT SIZE (IN.): 6 3/4	NO.: 3123	INTERMEDIATE: 7 5/8 IN. AT 9268 FT.	TOTAL CIRCULATING VOLUME: 902		PUMP MAKE: G.D. MODEL: P-Z-9	.022 OPPOSITE COLLAR 184
DRILL PIPE SIZE: 3 1/2	TYPE: E 13.30	PRODUCTION OR LINER: IN. AT FT.	IN STORAGE: AVE	WEIGHT	BBL./STROKE: .0396	STROKE/MIN.: 102
DRILL COLLAR SIZE: 4 3/4	LENGTH: Chg BHA	MUD TYPE: LIGNOSULFONATE			BBL./MIN.: 4.04	CIRCULATING PRESSURE PSI 2100; BOTTOMS UP (MIN.) 82 ±; SYSTEM TOTAL (MIN.) 223

Sample from ☐ Flowline ☒ Pit

Flowline Temperature °F

MUD PROPERTIES			
Time Sample Taken	5:00 AM		
Depth (ft)	9439		
Weight ☒ (ppg) ☐ (lb/cu ft)	16.0		
Mud Gradient (psi/ft)	.832		
Funnel Viscosity (sec/qt) API at ____ °F	59		
Plastic Viscosity cp at ____ °F	45		
Yield Point (lb/100 sq ft)	20		
Gel Strength (lb/100 sq ft) 10 sec/10 min	3/19	/	/
pH ☒ Strip ☐ Meter	11.0	11.0	
Filtrate API (ml/30 min)	4.0		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☐ HTHP ☐	2		
Alkalinity, Mud (Pm)	4.8		
Alkalinity, Filtrate (P_f/M_f)	1.9/3.0	/	/
Salt ☐ppm ☐gpg Chloride ☐ppm ☐gpg	3400		
Calcium ☐ ppm ☐ Gyp ppb	120		
Sand Content (% by Vol)	.25		
Solids Content (% by Vol)	31		
Oil Content (% by Vol)	3		
Water Content (% by Vol)	66		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT

	SIZE	HRS/TOUR			SIZE	HRS/TOUR		
Centrifuge					Desilter			
Degasser	Rig				Shaker	60 x 80		
Desander					Other	Rig out MX-1500		

DAILY COST: Thru End 2,326—

CUMULATIVE COST: Thru End 160,326—

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
16.0	55-60	4 or LESS

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☐ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT	Daily Use	Total Use
☒ IMCO BAR Slugs	60	650
☐ IMCO GEL		328
☒ IMCO ~~BRINEGEL~~ Bulk Bar		9175
☒ IMCO RD-111	27	465
☒ IMCO ~~VC-10~~ Lig	37	513
☐ IMCO ~~THIN~~ Soltex		159
☐ IMCO CAUSTIC SODA		181
☐ IMCO ~~SO~~ Soda		13
☐ IMCO ~~POLY-RX~~ Lubricleen		24
☐ Biocide		10
☒ ENG	1	49

REMARKS: Ran In Hole w/ Stabilizers No Packer. Drilled 5 ft. POH & P.U. Dynadrill

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
Tommy Nichol	Houston	495-4134
UTILITY	WAREHOUSE LOCATION	TELEPHONE
	Galveston	744-5373

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RT REPORT NO. 20

DEPTH 9267

WELL | S/T

NO. 4

JOB DATE 12.15.80

SECTION, TOWNSHIP, RANGE MBM 628

PROVINCE

S.T. 122, A#1 | ST 122 A1 | Galveston | Texas

OPERATION		CASING		MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: P.O.O.H		SURFACE: 10 3/4 IN. AT 1500 FT.		HOLE: 832t	PITS: 350t	PUMP SIZE: 6 1/4 X 9 IN.	ANNULAR VEL. (FT./MIN.)
BIT SIZE (IN.): 9	NO.	INTERMEDIATE: — IN. AT — FT.		TOTAL CIRCULATING VOLUME: 1182t		PUMP MAKE: G.D.	OPPOSITE DP: —
						MODEL: P.2.9	OPPOSITE COLLAR: —
DRILL PIPE SIZE: 4 1/2	TYPE: XH	PRODUCTION OR LINER: — IN. AT — FT.		IN STORAGE: AV 700	WEIGHT	BBL./STROKE: .085	STROKE (IN.): —
DRILL COLLAR SIZE:	LENGTH:	MUD TYPE: Lignosulfonate				BBL./MIN.: —	CIRCULATING PRESSURE PSI: —
							BOTTOMS UP (MIN.): —
							SYSTEM TOTAL (MIN.): —

Sample from ☐ Flowline ☒ Pit

Flowline Temperature 110 °F

MUD PROPERTIES	Inv		
Time Sample Taken	8 pm		
Depth (ft)	9267		
Weight ☒ (ppg) ☐ (lb/cu ft)	11.1		
Mud Gradient (psi/ft)	.5772		
Funnel Viscosity (sec qt) API at 110 °F	44		
Plastic Viscosity cp at ____ °F	18		
Yield Point (lb/100 sq ft)	11		
Gel Strength (lb/100 sq ft) 10 sec/10 min	2/13	/	/
pH ☒ Strip ☐ Meter	11.0		
Filtrate API (ml/30 min)	4.4		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☒ HTHP ☐	2		
Alkalinity, Mud (Pm)	2.6		
Alkalinity, Filtrate (P_f/M_f)	1.9/2.7	/	/
Salt ☐ Cl+ Chloride ☐	3800		
Calcium ☒ ppm ☐ Gyp ppb	20		
Sand Content (% by Vol)	0.1		
Solids Content (% by Vol)	10		
Oil Content (% by Vol)	—		
Water Content (% by Vol)	90		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT

	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge			Desilter		
Degasser	When Needed		Shaker	B. mud + 24 hrs	
Desander	M.C. 120 mesh		Other	M.C. on Loc.	

DAILY COST $ 6,837 Thru Inv. | CUMULATIVE COST $ 75,677 Thru Inv.

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
11.1	42-45	6-4

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☒ OPERATOR'S REPRESENTATIVE ☐ DRILLING CONTRACTOR ☐ OTHER

RECOMMENDED TOUR TREATMENT

	Materials Used Daily	Total
☒ IMCO BAR	30	26
☐ IMCO GEL		17
☒ IMCO BRINEGEL Blk	500	34
☒ IMCO RD-111	17	28
☒ IMCO VC-10 Liq	2	30
☒ IMCO THIN Soltex	10	10
☒ IMCO CAUSTIC SODA		14
☐ IMCO M D		20
☒ IMCO POLY RX Na chromate	1	1
☒ Al. Stearate	2	9
☒ Engineer On Location	1	22

REMARKS P.O.O.H 10 run csg.

Thanks P.S.M.

IMCO REPRESENTATIVE: Phillip McAliley

HOME ADDRESS: Dayton, Tex. 713

WAREHOUSE LOCATION: Galveston, Tex.

TELEPHONE: 258 2765

TELEPHONE: 744 5373

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UNT | REPORT NO. 29
DEPTH 9268
WELL | S/T
RIG NO. 4
MUD DATE 12-15-80
SECTION, TOWNSHIP, RANGE MBM-628
PROVINCE

S.T. 122 - A#1 | S.T. 122 | GALVESTON | TEXAS

OPERATION	CASING	MUD VOLUME (BBL)	CIRCULATION DATA
PRESENT ACTIVITY: Nipple Down	SURFACE: 10 3/4 IN. AT 1500 FT.	HOLE: 435 / PITS: 500	PUMP SIZE: 6 1/4 X 9 IN. / ANNULAR VEL. (FT./MIN.): —
BIT SIZE (IN.): — / NO.: —	INTERMEDIATE: 7 5/8 IN. AT FT.	TOTAL CIRCULATING VOLUME: 935	PUMP MAKE: G-D / MODEL: P-2-9 / OPPOSITE DP: — / OPPOSITE COLLAR: —
DRILL PIPE SIZE: — / TYPE: —	PRODUCTION OR LINER: IN. AT FT.	IN STORAGE / WEIGHT	BBL./STROKE: .085 / STROKE/MIN.: — / CIRCULATING PRESSURE PSI: —
DRILL COLLAR SIZE: — / LENGTH: —	MUD TYPE: LIGNOSULFONATE		BBL./MIN.: — / BOTTOMS UP (MIN.): — / SYSTEM TOTAL (MIN.): —

Sample from ☐ Flowline ☐ Pit
Flowline Temperature °F

MUD PROPERTIES			
Time Sample Taken	4:30		
Depth (ft)	9268		
Weight ☐ (ppg) ☐ (lb/cu ft)	11.2+		
Mud Gradient (psi/ft)	.5824		
Funnel Viscosity (sec/qt) API at ____ °F	42		
Plastic Viscosity cp at ____ °F	22		
Yield Point (lb/100 sq ft)	12		
Gel Strength (lb/100 sq ft) 10 sec/10 min	1/5	/	/
pH ☑ Strip ☐ Meter	10.2		
Filtrate API (ml/30 min)	4.4		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☐ HTHP ☐	2		
Alkalinity, Mud (Pm)	1.8		
Alkalinity, Filtrate (P_f, M_f)	.6/1.8	/	/
Salt ☐ppm ☐ppg / Chloride ☐ppm ☐gpg	3700		
Calcium ☑ ppm ☐ Gyp ppb	20		
Sand Content (% by Vol)	.25		
Solids Content (% by Vol)	11		
Oil Content (% by Vol)	—		
Water Content (% by Vol)	89		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT	SIZE	HRS/TOUR		SIZE	HRS/TOUR	
Centrifuge				Desilter		
Degasser Rig				Shaker Brandt-6 Unit		
Desander				Other Brandt-MC-120		

DAILY COST: 253.00
CUMULATIVE COST: 75930.00

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
11.1	40-42	6-4

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☐ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT

- ☐ IMCO BAR
- ☐ IMCO GEL — No Chemical used
- ☐ IMCO BRINEGEL
- ☐ IMCO RD-111
- ☐ IMCO VC-10
- ☐ IMCO THIN
- ☐ IMCO CAUSTIC SODA
- ☐ IMCO M D
- ☐ IMCO POLY RX
- ☑ Eng Trailer 253
- ☐

REMARKS Ran 7 5/8 Csg + Cemented

IMCO REPRESENTATIVE: Tommy Nichol
HOME ADDRESS: Houston
WAREHOUSE LOCATION: Galveston
TELEPHONE: 495-4134
TELEPHONE: 744-5373

NO ICF ANY OPINION AND/OR RECOMMENDATION, EXPRESSED ORALLY OR WRITTEN HEREIN, HAS BEEN PREPARED CAREFULLY AND MAY BE USED IF THE USER SO ELECTS. HOWEVER, NO REPRESENTATION OR WARRANTY IS MADE BY ... AND NO LIABILITY IS ASSUMED FOR ANY

REPORT NO. 76
DEPTH 16,835
WELL
DATE 12-15-80
SECTION, TOWNSHIP, RANGE Block 628
PROVINCE

S.T. 122-A #1, Townsite #3 | ST 122 | Galveston | Texas

OPERATION		CASING	MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: 0.0.H		SURFACE: 10 3/4 IN. AT 1500 FT.	HOLE: 502±	PITS: 500±	PUMP SIZE: 4 1/2 X 9 IN.	ANNULAR VEL. (FT./MIN.): .032 OPPOSITE DP 150
BIT SIZE (IN.): 6 3/4	NO. 38 RR	INTERMEDIATE: 7 5/8 IN. AT 9268 FT.	TOTAL CIRCULATING VOLUME: 1002±		PUMP MAKE: G.D. MODEL: P-2-9	.028 OPPOSITE COLLAR 217
DRILL PIPE SIZE: 3 1/2	TYPE: 13.30	PRODUCTION OR LINER: — IN. AT FT.	IN STORAGE: AV = 404±	WEIGHT	BBL./STROKE: .044 STROKE/MIN.: 110	CIRCULATING PRESSURE PSI: 3000
DRILL COLLAR SIZE: 4 3/4	LENGTH: —	MUD TYPE: Lignosul/Caustic			GPM 203 BBL./MIN. 4.84	BOTTOMS UP (MIN.): 84 SYSTEM TOTAL (MIN.): 200±

Sample from ☐ Flowline ☒ Pit
Flowline Temperature 110 °F

MUD PROPERTIES	IN		
Time Sample Taken	4:30 AM		
Depth (ft)	16,835		
Weight ☒ (ppg) ☐ (lb/cu ft)	16.0		
Mud Gradient (psi/ft)	.832		
Funnel Viscosity (sec/qt) API at ____ °F	47		
Pl Viscosity cp at ____ °F	37		
Yield Point (lb/100 sq ft)	12		
Gel Strength (lb/100 sq ft) 10 sec/10 min	2/7	/	/
pH ☒ Strip ☐ Meter	10.8		
Filtrate API (ml/30 min)	3.0		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☒ HTHP ☐	2		
Alkalinity, Mud (Pm)	2.6		
Alkalinity, Filtrate (P_f/M_f)	.9/1.8	/	/
Salt ☐ppm ☐ppg Chloride ☒ppm ☐ppg	3600		
Calcium ☒ ppm ☐ Gyp ppb	80		
Sand Content (% by Vol)	0.1		
Solids Content (% by Vol)	30		
Oil Content (% by Vol)	4		
Water Content (% by Vol)	66		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT	SIZE	HRS/TOUR				
Centrifuge					Desilter	
Degasser Rig					Shaker Rig	
Desander Rig					Other McKenzie	
DAILY COST $589 Thru Inv.					CUMULATIVE COST $219,474 Thru Inv.	

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
16.0	47	4 to Less

BY AUTHORITY: ☐ OPERATOR'S WRITTEN ☐ FOREMAN/CONTRACTOR ☒ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT

☒ IMCO BAR	
☐ IMCO GEL	
☐ IMCO BRINEGEL	
☐ IMCO RD-111	
☐ IMCO VC-10	
☐ IMCO THIN	
☐ IMCO CAUSTIC SODA	
☐ IMCO M D	
☐ IMCO POLY RX	
☐	
☒ Engineer on Location	

REMARKS: Mud Needs more diesel to raise level to 5%. However last 36 hrs have been tripping or fishing for bit & stabilizers, have not had chance to mix mud. Picked up fish & retrieved, Starting B.I.H. Thanks P.E.M.

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
P.E. McAliley	Dayton, Texas	258-2745
	WAREHOUSE LOCATION: Galveston, Texas	TELEPHONE: 744-5373

Form 515 Rev. 50M 2-80

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REPORT NO. 77
TVD: 11909
DAY 4
MUD DATE 12-15-80
BLOCK IBM-A 628

ST 122 A #1 | ST 122-A | GALVESTON, TEXAS

OPERATION		CASING	MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: Drilling		SURFACE: 10 3/4 IN. AT 1500 FT.	HOLE: 498	PITS: 540	PUMP SIZE: 4 1/2 X 9 IN.	ANNULAR VEL. (FT./MIN.): .032 OPPOSITE DP 158
BIT SIZE (IN.): 6 3/4	NO.	INTERMEDIATE: 7 5/8 IN. AT 9268 FT.	TOTAL CIRCULATING VOLUME: 1038		PUMP MAKE: G-D MODEL: P-2-9	.022 OPPOSITE COLLAR 230
DRILL PIPE SIZE: 3 1/2	TYPE: 3.30 E	PRODUCTION OR LINER: IN. AT FT.	IN STORAGE: AY =	WEIGHT: 410	BBL./STROKE: .044 STROKE/MIN.: 115	CIRCULATING PRESSURE PSI: 3,000
DRILL COLLAR SIZE: 4 3/4	LENGTH:	MUD TYPE: LIGNOSULFONATE			GPM: 212 BBL./MIN.: 5.06	9 3/8 SKS BOTTOMS UP (MIN.): 81 SYSTEM TOTAL (MIN.): 205

Sample from ☐ Flowline ☒ Pit
Flowline Temperature °F

MUD PROPERTIES			
Time Sample Taken	4:30		
Depth (ft) 11,907	11909		
Weight ☒ (ppg) ☐ (lb/cu ft)	16.0		
Mud Gradient (psi/ft)	.832		
Funnel Viscosity (sec/qt) API at ____ °F	48		
Plastic Viscosity cp at ____ °F	38		
Yield Point (lb/100 sq ft)	14		
Gel Strength (lb/100 sq ft) 10 sec/10 min	2/10	/	/
pH ☒ Strip ☐ Meter	10.5		
Filtrate API (ml/30 min)	3.0		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☐ HTHP ☐	2		
Alkalinity, Mud (Pm)	2.5		
Alkalinity, Filtrate (P_f/M_f)	.8/1.7	/	/
Salt ☐ppm ☐ppg Chloride ☒ppm ☐ppg	3800		
Calcium ☒ppm ☐ Gyp ppb	80		
Sand Content (% by Vol)	.10		
Solids Content (% by Vol)	31		
Oil Content (% by Vol)	4		
Water Content (% by Vol)	65		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT	SIZE	HRS/TOUR			SIZE	HRS/TOUR		
Centrifuge					Desilter			
Degasser	RIG				Shaker	60x80		
Desander					Other	BRANDT	180	

DAILY COST THRU INV: 7,570.00
CUMULATIVE COST THRU INV: 225,044

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
16.0	47	4 OR LESS

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☒ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT	Daily	Inv
☐ IMCO BAR		1025
☐ IMCO GEL		328
☒ IMCO ~~BRINEGEL~~ BAR	100	1300
☐ IMCO RD-111	20	660
☒ IMCO ~~VG-10~~ LIG	15	668
☒ IMCO ~~THIN~~ Solter	5	198
☒ IMCO CAUSTIC SODA	4	25
☒ IMCO ~~MO~~ Lubriklean		35
☐ IMCO POLY RX		
☒ Plug	4	85
☐		

REMARKS Reamed to bottom & Began to Drill @ 7:00 P.m - Drilling very slow.

MUD CUT TO 15.5 by GAS on TRIP GAS - TVD: 10,820.

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
Tommy Nichol	Houston	495-4134
DISTRICT OFFICE	WAREHOUSE LOCATION	TELEPHONE
	Galveston	744-5873

Form 515 Rev. 50M 2-80

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REPORT NO. 7
DEPTH 12,206
WELL
MUD DATE 12-15-80
SECTION, TOWNSHIP, RANGE MBM-A 628
PROVINCE

Shorty Salsman | ST 122-A | Galveston | Texas

OPERATION		CASING	MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: Survey		SURFACE: 10 3/4 IN. AT 1500 FT.	HOLE: 511	PITS: 550	PUMP SIZE: 4 1/2 X 9 IN.	ANNULAR VEL. (FT./MIN.): .032 OPPOSITE DP 141
BIT SIZE (IN.): 6 3/4	NO. 12,12,12	INTERMEDIATE: 7 5/8 IN. AT 9268 FT.	TOTAL CIRCULATING VOLUME: 1061		PUMP MAKE: G-D MODEL: P-2-9	.022 OPPOSITE COLLAR 206
DRILL PIPE SIZE: 3 1/2	TYPE: E 13.30	PRODUCTION OR LINER: IN. AT FT.	IN STORAGE: AV = 421	WEIGHT	BBL./STROKE: .044 STROKE/MIN.: 4.532	CIRCULATING PRESSURE PSI: 3000 SKS 9568 BOTTOMS-UP (MIN.): 93
DRILL COLLAR SIZE: 4 3/4	LENGTH	MUD TYPE: LIGNOSULFONATE			GPM BBL./MIN.: 103	SYSTEM TOTAL (MIN.): 234

Sample from ☐ Flowline ☒ Pit
Flowline Temperature °F

MUD PROPERTIES			
Time Sample Taken	4:00 AM		
Depth (ft)	12,206		
Weight ☒ (ppg) ☐ (lb/cu ft)	16.0		
Mud Gradient (psi/ft)	.832		
Funnel Viscosity (sec/qt) API at ____ °F	49		
Plastic Viscosity cp at ____ °F	36		
Yield Point (lb/100 sq ft)	15		
Gel Strength (lb/100 sq ft) 10 sec/10 min	2 / 12	/	/
pH ☒ Strip ☐ Meter	10.5		
Filtrate API (ml/30 min)	3.0		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☐ HTHP ☐	2		
Alkalinity, Mud (Pm)	2.2		
Alkalinity, Filtrate (P_f/M_f)	.9 / 2.0	/	/
Salt ☐ppm ☐ppb Chloride ☒ppm ☐ppb	4200		
Calcium ☒ ppm ☐ Gyp ppb	80		
Sand Content (% by Vol)	.2		
Solids Content (% by Vol)	31		
Oil Content (% by Vol)	4		
Water Content (% by Vol)	65		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge			Desilter		
Degasser	Rig		Shaker	60-80	
Desander			Other	Brandt MC-180	

DAILY COST	CUMULATIVE COST
Thru Inv 6,125.00	(A) (B) Inc 231,169

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
16.0	47	40 or less

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☐ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT	Daily Use	Cum. Use
☐ IMCO BAR		1029
☐ IMCO GEL		320
☐ IMCO ~~BRINEGEL~~ Bulk	500	13,[illegible]
☐ IMCO RD-111	23	[illegible]
☐ IMCO ~~VG-10~~ Lig	22	650
☐ IMCO ~~THIN~~ Bolter	7	18
☐ IMCO CAUSTIC SODA	2	[illegible]
☐ IMCO ~~MD~~ Lubriklean	—	35
☐ IMCO ~~POLYBX~~ Plug	4	[illegible]
☐		
☒ Eng	1	[illegible]

REMARKS Mud Cleaner Down for 8 hrs. Shale Shakers Down For 2 hours. Viscosity Came up to 68 while drlg. Added water to bring viscosity Down. Use Bulk. - Formation continues to make 80-100 BBLS mud per day. Bulk on Location: 400sx @ 4:00Am

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
Tommy Nichol	Houston	495-4134
AREA OFFICE	WAREHOUSE LOCATION: Galveston	TELEPHONE: 744-5323

Form 515 Rev. 50M 2-80

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REPORT NO. 7
DEPTH 12,542
WELL NO.
DATE 12-15-80
SECTION, TOWNSHIP, RANGE 18M 628
PROVINCE

S.T. 122-A#1, Townsite 3 | ST 122 | Galveston | Texas

OPERATION		CASING	MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: Drlg		SURFACE: 10 3/4 IN. AT 1500 FT.	HOLE: 513 ±	PITS: 455 ±	PUMP SIZE: 4 1/2 X 9 IN.	ANNULAR VEL. (FT./MIN.): .072 OPPOSITE DP 140±
BIT SIZE (IN.): 6 3/4	NO.: 22,22,22	INTERMEDIATE: 7 5/8 IN. AT 9268 FT.	TOTAL CIRCULATING VOLUME: 968 ±		PUMP MAKE: G.D. MODEL: P.2.9	.072 OPPOSITE COLLAR 204 ±
DRILL PIPE SIZE: 3 1/2	TYPE: E 13.3	PRODUCTION OR LINER: — IN. AT — FT.	IN STORAGE: AV =	WEIGHT: 422	BBL./STROKE: .044 STROKE/MIN.: 102	CIRCULATING PRESSURE PSI: 3000 ±
DRILL COLLAR SIZE: 4 3/4	LENGTH: 330	MUD TYPE: Lignosulfonate			GPM: 188 BBL./MIN.: 4.49	BOTTOMS UP (MIN.): 84 ± SYSTEM TOTAL (MIN.): 246 ±

Sample from ☐ Flowline ☒ Pit
Flowline Temperature 117 °F

MUD PROPERTIES	TM		
Time Sample Taken	4:30 am		
Depth (ft)	12,542		
Weight ☒ (ppg) ☐ (lb/cu ft)	15.9		
Mud Gradient (psi/ft)	.8268		
Funnel Viscosity (sec/qt) API at ____ °F	57		
Plastic Viscosity cp at ____ °F	42		
Yield Point (lb/100 sq ft)	22		
Gel Strength (lb/100 sq ft) 10 sec/10 min	2/17	/	/
pH ☒ Strip ☐ Meter	11.2		
Filtrate API (ml/30 min)	3.0		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☐ HTHP ☐	2		
Alkalinity, Mud (Pm)	3.2		
Alkalinity, Filtrate (P_f/M_f)	1.1/2.3	/	/
Salt ☐ppm ☐gpg Chloride ☐ppm ☐gpg	3600		
Calcium ☒ ppm ☐ Gyp ppb	[redacted] 40		
Sand Content (% by Vol)	0.1		
Solids Content (% by Vol)	30		
Oil Content (% by Vol)	5		
Water Content (% by Vol)	65		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge	—			Desilter	—
Degasser	Rig Wide Needed			Shaker	Brandt 800 Lo
Desander	Mud Cleaner Needed			Other	M. Logged

DAILY COST $5600 Thru Inc. | CUMULATIVE COST $236,769 Thru Inc.

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
16.0	47	4 or Less

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☒ OPERATOR'S REPRESENTATIVE ☐ DRILLING CONTRACTOR ☐ OTHER

RECOMMENDED TOUR TREATMENT		
☐ IMCO BAR		
☐ IMCO GEL		
☒ IMCO ~~DRIMCELL~~ Bulk		
☒ IMCO RD-111	10	70
☐ IMCO ~~VG-10~~ Lig		
☒ IMCO ~~THIN~~ Soltex	5	
☒ IMCO CAUSTIC SODA		
☒ IMCO ~~MD~~ Lubrikleen	3	
☒ IMCO ~~ROCK PIK~~ Plug	15	
☒ Sodium Chromate		
☐ Engineer on Location		

REMARKS Shakers down from 3-4:30 am circuit breaker kept flipping - replaced at 4:30. Wtg had been 47 most of day - Just rose & is now coming back down. Mud needs daily treatments of Vicial - Mud Cleaner needed 24 hrs a day. Thank P.S.M.

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
P.E. McAliley	Dayton, Texas	258 2767
MUD REPRESENTATIVE	WAREHOUSE LOCATION	TELEPHONE
	Galveston, Texas	744 5573

Form 515 Rev. 50M 2-80

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REPORT NO. 10
DATE 12-7-79
WELL
NO. 4
DATE 2-15-80
BLOCK, TOWNSHIP, RANGE 1BM-A-628
PROVINCE

ST 122 A #1 | ST 122-A | GALVESTON | TEXAS

OPERATION		CASING	MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY		SURFACE 10 3/4 IN. AT 1500 FT.	HOLE 535	PITS 400	PUMP SIZE 4 1/2 X 9 IN.	ANNULAR VEL. FT./MIN. .032 OPPOSITE HW
BIT SIZE (IN.) 6 3/4	NO. 2,3 31	INTERMEDIATE 7 5/8 IN. AT 9268 FT.	TOTAL CIRCULATING VOLUME 935		PUMP MAKE G-D MODEL D-2-9	.022 OPPOSITE COLLAR
DRILL PIPE SIZE 3 1/2	TYPE E 13.30	PRODUCTION OR LINER IN. AT FT.	IN STORAGE AVE 438	WEIGHT	BBL./STROKE .044 STROKE/MIN.	CIRCULATING PRESSURE PSI
DRILL COLLAR SIZE 4 3/4	LENGTH	MUD TYPE LIGNOSULFONATE			BBL./MIN.	BOTTOMS UP (MIN.) SYSTEM TOTAL (MIN.)

Sample from ☐ Flowline ☐ Pit
Flowline Temperature °F

MUD PROPERTIES			
Time Sample Taken	4:00 P.M.		
Depth (ft)	12,737		
Weight ☐ (ppg) ☐ (lb/cu ft)	16.0		
Mud Gradient (psi/ft)	.832		
Funnel Viscosity (sec/qt) API at ____ °F	50		
Plastic Viscosity cp at ____ °F	41		
Yield Point (lb/100 sq ft)	18		
Gel Strength (lb/100 sq ft) 10 sec/10 min	2/13	/	/
pH ☒ Strip ☐ Meter	10.2		
Filtrate API (ml/30 min)	3.0		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☐ HTHP ☐	2		
Alkalinity, Mud (Pm)	2.8		
Alkalinity, Filtrate (P_f/M_f)	.8/1.9	/	/
Salt ☐ ppm ☐ ppg Chloride ☒ ppm ☐ ppg	3700		
Calcium ☒ ppm ☐ Gyp ppb	40		
Sand Content (% by Vol)	.10		
Solids Content (% by Vol)	30		
Oil Content (% by Vol)	5.5		
Water Content (% by Vol)	64.5		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT	SIZE	HRS/TOUR			SIZE	HRS/TOUR		
Centrifuge					Desilter			
Degasser	Rig				Shaker	60 + 80		
Desander					Other	Brandt - 180 Mesh		

DAILY COST Thru Inv
CUMULATIVE COST Tatbell Inc

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
16.0	47	4 or Less

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☐ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT	DAILY USE	TO DATE USE
☐ IMCO BAR	19	1048
☐ IMCO GEL		328
☐ IMCO ~~BRINEGEL~~ Bar	230	4491
☐ IMCO RD-111	2	708
☐ IMCO ~~VC-10~~ Lig	8	648
☐ IMCO ~~THIN~~ Soltex	5	211
☐ IMCO CAUSTIC SODA		291
☐ IMCO ~~MB~~ Lubriklean		70
☐ IMCO ~~POLY-RX~~ Plug	10	48
☒ Sodium Chromate	1	4
☐ Eng	1	72

REMARKS P.O.H. To Log. Stand of D.P shows 12,702

Bulk on Location - 1100 SX

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
Tommy Nichol	Houston	495-4134
MCA OFFICE	WAREHOUSE LOCATION	TELEPHONE
	Galveston	744-5373

Form 515 Rev. 50M 2-80

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REPORT NO. 31
DEPTH 12,737
WELL
4
DATE 2-15-80
SECTION, TOWNSHIP, RANGE 13M-A-678
PROVINCE

ST 122 A #1 | ST 122 | GALVESTON TEXAS

OPERATION		CASING	MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: Circulating		SURFACE: 10 3/4 IN. AT 1500 FT.	HOLE: 535	PITS: 550	PUMP SIZE: 4 1/2 X 9 IN.	ANNULAR VEL. (FT./MIN.): .022 OPPOSITE DP 154
BIT SIZE (IN.): 6 3/4	NO. 3-12's 31	INTERMEDIATE: 7 5/8 IN. AT 9268 FT.	TOTAL CIRCULATING VOLUME: 1085		PUMP MAKE: G.D MODEL: P-7-9	.022 OPPOSITE COLLAR 222
DRILL PIPE SIZE: 3 1/2	TYPE: E 13.30	PRODUCTION OR LINER: IN. AT FT.	IN STORAGE: AV. 438	WEIGHT	BBL./STROKE: .044 STROKE/MIN. 112	CIRCULATING PRESSURE PSI 3000 9954.34
DRILL COLLAR SIZE: 4 3/4	LENGTH	MUD TYPE: LIGNOSULFONATE			GPM 206 BBL./MIN. 4.9	BOTTOMS UP (MIN.) 35 SYSTEM TOTAL (MIN.) 221

Sample from ☐ Flowline ☐ Pit
Flowline Temperature °F

MUD PROPERTIES			
Time Sample Taken	4:30		
Depth (ft)	12,737		
Weight ☑ (ppg) ☐ (lb/cu ft)	16.2+		
Mud Gradient (psi/ft)	8424		
Funnel Viscosity (sec/qt) API at ____ °F	51		
Plastic Viscosity cp at ____ °F	41		
Yield Point (lb/100 sq ft)	19		
Gel Strength (lb/100 sq ft) 10 sec/10 min	2/10	/	/
pH ☑ Strip ☐ Meter	10.0		
Filtrate API (ml/30 min)	2.6		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☐ HTHP ☐	2		
Alkalinity, Mud (Pm)	1.9		
Alkalinity, Filtrate (P_f/M_f)	.6/1.4	/	/
Salt ☐ppm ☐gpg Chloride ☑ppm ☐gpg	4100		
Calcium ☑ ppm ☐ Gyp ppb	40		
Sand Content (% by Vol)	.25		
Solids Content (% by Vol)	31		
Oil Content (% by Vol)	5		
Water Content (% by Vol)	64		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT	SIZE	HRS/TOUR			SIZE	HRS/TOUR		
Centrifuge					Desilter			
Degasser	R.G				Shaker	60 x 60		
Desander					Other	Bar-Vac 180		

DAILY COST: Than Inv 9,534—
CUMULATIVE COST: Tal. Del. Inv 249,740—

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
16.1	49	4 or less

BY AUTHORITY: ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☒ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT	USE	DAILY USE
☐ IMCO BAR	11	165
☐ IMCO GEL	—	325
☐ IMCO ~~BRINEGEL~~ Bulk	900	5940
☐ IMCO RD-111	20	722
☐ IMCO ~~VG-69~~ Lig	5	70
☐ IMCO ~~THIN~~ Soller	2	20
☐ IMCO CAUSTIC SODA	3	24
☐ IMCO ~~MLD~~ Lubrikleen	—	75
☐ IMCO ~~POLY-RX~~ Plug	5	50
☑ ENG Na Cr	1	5
☐		73

REMARKS: Went Back to Bottom & Circ. Mud cut to 12.2/2200 units Gas. wt. up 16.1+ Pull up & ream thru tight turn. Go Back to Bottom Circ - 1600 units Gas wt up to 16.2+
Barite on location: 650

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
Tommy Nelson	Houston	495-4134
	WAREHOUSE LOCATION: Galveston	TELEPHONE: 744-5373

Form 515 Rev. 50M 2-80

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RI REPORT NO. 97

DEPTH 13,702

WELL | SITE

NO. 4

DATE 2·15·80

SECTION, TOWNSHIP, RANGE 6M-N-62B

PROVINCE

S.T. 122-A #1, Townsite #3 | 122-A | Galveston | Texas

OPERATION		CASING	MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: O.O.H		SURFACE: 10 3/4 IN. AT 1500 FT.	HOLE: 535±	PITS: 550±	PUMP SIZE: 4½ X 9 IN.	ANNULAR VEL. (FT./MIN.): .032 OPPOSITE DP; .028 OPPOSITE COLLAR
BIT SIZE (IN.): —	NO.: —	INTERMEDIATE: 7 5/8 IN. AT 9268 FT.	TOTAL CIRCULATING VOLUME: 1085±		PUMP MAKE: G.D. MODEL: P.Z.9	
DRILL PIPE SIZE: —	TYPE: —	PRODUCTION OR LINER: — IN. AT FT.	IN STORAGE: AV=	WEIGHT: 438	BBL./STROKE: .044	STROKE/MIN.: —
DRILL COLLAR SIZE: —	LENGTH: —	MUD TYPE: Lignosulfonate			BBL./MIN.: —	CIRCULATING PRESSURE PSI: — BOTTOMS UP (MIN.): — SYSTEM TOTAL (MIN.): —

Sample from ☐ Flowline ☒ Pit

Flowline Temperature °F

MUD PROPERTIES			
Time Sample Taken	4:30 Am		
Depth (ft)	13,702		
Weight ☒ (ppg) ☐ (lb/cu ft)	16.1+		
Mud Gradient (psi/ft)	.8424		
Funnel Viscosity (sec/qt) API at ____ °F	50		
Plastic Viscosity cp at ____ °F	39		
Yield Point (lb/100 sq ft)	21		
Gel Strength (lb/100 sq ft) 10 sec/10 min	2/8	/	/
pH ☐ Strip ☐ Meter	10.0		
Filtrate API (ml/30 min)	2.6		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☒ HTHP ☐	2		
Alkalinity, Mud (Pm)	1.9		
Alkalinity, Filtrate (P_f/M_f)	.6/1.4	/	/
Salt ☐ ppm ☐ ppg Chloride ☒ ppm ☐ ppg	4100		
Calcium ☒ ppm ☐ Gyp ppb	40		
Sand Content (% by Vol)	0.1		
Solids Content (% by Vol)	31		
Oil Content (% by Vol)	5		
Water Content (% by Vol)	64		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT	SIZE	HRS/TOUR			SIZE	HRS/TOUR		
Centrifuge	—				Desilter	—		
Degasser	R/S				Shaker	Brandt	80	60
Desander	Ma. Clinker	150			Other	Ma. Lasco		

DAILY COST $ 253 00 Thru End.

CUMULATIVE COST $ 249,993 Tax Exp.

MUD PROPERTIES SPECIFICATIONS		
WEIGHT: 16.1	VISCOSITY: 47	FILTRATE: 4 or Less

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☐ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT	
☐ IMCO BAR	NO
☐ IMCO GEL	TREATMENT
☐ IMCO BRINEGEL	
☐ IMCO RD-111	
☐ IMCO VC-10	
☐ IMCO THIN	
☐ IMCO CAUSTIC SODA	
☐ IMCO M D	
☐ IMCO POLY RX	
☐	
☐	

REMARKS O.O.H. Running logs.

Thank P.E.M.

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
P.E. McAliley	Dayton, Texas	258 2765
AREA OFFICE	WAREHOUSE LOCATION: Galveston Texas	TELEPHONE: 744 5373

Form 515 Rev. 50M 2-80

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REPORT NO. 3
DEPTH 12,737
WELL
RIG
SPUD DATE 12-15-80
SECTION, TOWNSHIP, RANGE Gm A-628
PROVINCE

S.T. 122-A #1, Townsite 3 | S.T. 122 | Galveston | Texas

OPERATION		CASING	MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: O.O.H		SURFACE: 10 3/4 IN. AT 1500 FT.	HOLE: 535 ±	PITS: 550 ±	PUMP SIZE: 4 1/2 X 9 IN.	ANNULAR VEL. (FT./MIN.): .072 OPPOSITE OF —
BIT SIZE (IN.): —	NO.: —	INTERMEDIATE: 7 5/8 IN. AT 9768 FT.	TOTAL CIRCULATING VOLUME: 1085 ±		PUMP MAKE: G.B. MODEL: 7-Z-9	.023 OPPOSITE COLLAR —
DRILL PIPE SIZE: —	TYPE: —	PRODUCTION OR LINER: — IN. AT FT.	IN STORAGE: AV = 438	WEIGHT	BBL./STROKE: .044	STROKE/MIN. CIRCULATING PRESSURE/PSI —
DRILL COLLAR SIZE: —	LENGTH: —	MUD TYPE: Lignosul/Bentonite			BBL./MIN.	BOTTOMS UP (MIN.) — SYSTEM TOTAL (MIN.) —

Sample from ☐ Flowline ☑ Pit
Flowline Temperature °F

MUD PROPERTIES	IN		
Time Sample Taken	4:30 AM		
Depth (ft)	12,737		
Weight ☑ (ppg) ☐ (lb/cu ft)	16.1		
Mud Gradient (psi/ft)	.8424		
Funnel Viscosity (sec/qt) API at ____ °F	53		
Plastic Viscosity cp at ____ °F	41		
Yield Point (lb/100 sq ft)	22		
Gel Strength (lb/100 sq ft) 10 sec/10 min	2/10	/	/
pH ☑ Strip ☐ Meter	10.3		
Filtrate API (ml/30 min)	2.8		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☑ HTHP ☐	2		
Alkalinity, Mud (Pm)	2.1		
Alkalinity, Filtrate (P_f/M_f)	.7/.66	/	/
Salt ☐ppm ☐ppg Chloride ☑ppm ☐ppg	4100		
Calcium ☑ ppm ☐ Gyp ppb	40		
Sand Content (% by Vol)	0.1		
Solids Content (% by Vol)	31		
Oil Content (% by Vol)	5		
Water Content (% by Vol)	64		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT

	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge	—		Desilter	—	
Degasser Rig			Shaker Brandt	80x40	
Desander M. Cleaner	150		Other M. Lager		

DAILY COST $253 Thru Eq. | CUMULATIVE COST $250,246 Tot Eq.

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
16.1	47	4 or less

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☑ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT

- ☐ IMCO BAR
- ☐ IMCO GEL
- ☐ IMCO BRINEGEL
- ☐ IMCO RD-111
- ☐ IMCO VC-10
- ☐ IMCO THIN
- ☐ IMCO CAUSTIC SODA
- ☐ IMCO M D
- ☐ IMCO POLY RX
- ☐
- ☑ Eq.

NO TREATMENT

REMARKS O.O.H. to log. Went in hole @ 12:30 pm to circulate — circulated till 3:30 mud cut to 14.7 lb/gal max. Thank P.S.M.

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
P.E. McAliley	Dayton, Tex.	258 2765
	WAREHOUSE LOCATION: Galveston, Tex.	TELEPHONE: 744-5323

Form 515 Rev. 50M 2-80

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REPORT NO. 27

DATE 12-7-7

WELL | SITE

DATE 12-15-90

COUNTY, TOWNSHIP, RANGE Hem. A 6 B

PROVINCE

S.T. 122 - A#1, Township 4 | S.T. 122 | Galveston | Texas

OPERATION		CASING	MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: O.D.H.		SURFACE: 10 3/4 IN. AT 1503 FT.	HOLE: 535	PITS: 550'	PUMP SIZE x DIA.: 4 1/2 9	ANNULAR VEL. (FT/MIN.): .032 OPPOSITE DP —
BIT SIZE (IN.): —	NO.: —	INTERMEDIATE: 7 5/8 IN. AT 9268 FT.	TOTAL CIRCULATING VOLUME: 1085		PUMP MAKE: G.D. MODEL: P-7-9	.022 OPPOSITE COLLAR —
DRILL PIPE SIZE: —	TYPE: —	PRODUCTION OR LINER: — IN. AT — FT.	IN STORAGE: AV-438	WEIGHT	BBL./STROKE: .044	STROKE/BBL.: — CIRCULATING PRESSURE PSI: —
DRILL COLLAR SIZE: —	LENGTH: —	MUD TYPE: Lignosulfonate			BBL./MIN.: —	BOTTOMS UP (MIN.): — SYSTEM TOTAL (MIN.): —

Sample from ☐ Flowline ☑ Pit

Flowline Temperature °F

MUD PROPERTIES	Pit		
Time Sample Taken	4:30 am		
Depth (ft)	12737		
Weight ☑ (ppg) ☐ (lb/cu ft)	16.1		
Mud Gradient (psi/ft)	.8424		
Funnel Viscosity (sec/qt) API at ____ °F	53		
Plastic Viscosity cp at ____ °F	41		
Yield Point (lb/100 sq ft)	22		
Gel Strength (lb/100 sq ft) 10 sec/10 min	2/11	/	/
pH ☑ Strip ☐ Meter	10.2		
Filtrate API (ml/30 min)	2.8		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☑ HTHP ☐	2		
Alkalinity, Mud (Pm)	2.1		
Alkalinity, Filtrate (P_f/M_f)	.7/1.6	/	/
Salt ☐ppm ☐ppg Chloride ☑ppm ☐ppg	4100		
Calcium ☑ ppm ☐ Gyp ppb	40		
Sand Content (% by Vol)	0.1		
Solids Content (% by Vol)	31		
Oil Content (% by Vol)	5		
Water Content (% by Vol)	64		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge	—			Desilter	—
Degasser	R.S.			Shaker	Brandt 80 x 60
Desander	M. Brandt	150		Other	M. Logger

DAILY COST $253 on Thru Eng

CUMULATIVE COST $250,477 to date

MUD PROPERTIES SPECIFICATIONS

WEIGHT: 16.1 | VISCOSITY: 47 | FILTRATE: 4 to 6 cc

BY AUTHORITY: ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☐ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT

- ☐ IMCO BAR
- ☐ IMCO GEL
- ☐ IMCO BRINEGEL
- ☐ IMCO RD-111
- ☐ IMCO VC-10
- ☐ IMCO THIN
- ☐ IMCO CAUSTIC SODA
- ☐ IMCO M D
- ☐ IMCO POLY RX
- ☐
- ☑ Eng.

NO TREATMENT 76

REMARKS G.I.H. to fish for Dip meter. Thank P. Gen

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
P.E. McAliley	Dayton Tex	258-2765
	WAREHOUSE LOCATION: Lanscaster Tex	TELEPHONE: 745-3[illegible]

ORALLY OR WRITTEN HEREIN, HAS BEEN PREPARED
NO REPRESENTATION OR WARRANTY IS MADE BY
AND NO LIABILITY IS ASSUMED BY US

REPORT NO. 1
DEPTH 12,737
WELL
DATE 3/15/86
FROM TOWNSHIP Wm-A-62

OPERATION		CASING		MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: O.O.H.		SURFACE: 10 3/4 IN. AT 1500 FT.		HOLE: 535	PITS: 550	PUMP SIZE: 4 1/2 X 9 IN.	ANNULAR VEL. (FT/MIN.): .033 OPPOSITE DP
BIT SIZE (IN.): —	NO.: —	INTERMEDIATE: 7 5/8 IN. AT 9260 FT.		TOTAL CIRCULATING VOLUME: 1085		PUMP MAKE: G.D. MODEL: 7-2-9	.037 OPPOSITE COLLAR
DRILL PIPE SIZE:	TYPE:	PRODUCTION OR LINER: IN. AT FT.		IN STORAGE: AV = 438	WEIGHT:	BBL./STROKE: .044	STROKE/MIN.: —
DRILL COLLAR SIZE:	LENGTH:	MUD TYPE: Lignosulfonate				BBL./MIN.: —	BOTTOMS UP (MIN.): SYSTEM TOTAL (MIN.):

* Sample from ☐ Flowline ☒ Pit
Flowline Temperature 72 °F

MUD PROPERTIES	JN	
Time Sample Taken	4:30 pm	
Depth (ft)	12737	
Weight ☐ (ppg) ☐ (lb/cu ft)	16.1	
Mud Gradient (psi/ft)	.8424	
Funnel Viscosity (sec/qt) API at ____ °F	92	
Plastic Viscosity cp at ____ °F	88	
Yield Point (lb/100 sq ft)	46	
Gel Strength (lb/100 sq ft) 10 sec/10 min	5/20	
pH ☒ Strip ☐ Meter	10.5	
Filtrate API (ml/30 min)	2.8	
API HP HT Filtrate (ml/30 min) at ____ °F	—	
Cake Thickness 32nd in API ☒ HTHP ☐	3	
Alkalinity, Mud (Pm)	2.2	
Alkalinity, Filtrate (P_f/M_f)	7/1.6	
Salt ☐ppm ☐ppg Chloride ☐ppm ☐ppg	4100	
Calcium ☒ ppm ☐ Gyp ppb	40	
Sand Content (% by Vol)	0.1	
Solids Content (% by Vol)	31	
Oil Content (% by Vol)	5	
Water Content (% by Vol)	64	
Methylene Blue Capacity (ml/ml Mud)	—	
Methylene Blue (lb/bbl Bentonite Eq)	—	

EQUIPMENT	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge	—		Desilter	—	
Degasser	R.j		Shaker	Brandt	Board
Desander	M. Chrome 150		Other	Mud Gas	

DAILY COST $253 Thrifty
CUMULATIVE COST $250,752

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
16.1	47	4 cc Low

BY AUTHORITY: ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☒ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT

- ☐ IMCO BAR
- ☐ IMCO GEL
- ☐ IMCO BRINEGEL
- ☐ IMCO RD-111
- ☐ IMCO VC-10
- ☐ IMCO THIN
- ☒ IMCO CAUSTIC SODA
- ☐ IMCO M D
- ☐ IMCO POLY RX
- ☐
- ☒ Eng.

NO TREATMENT

REMARKS O.O.H. to fish Dip meter. * Mud has gotten cold in pits & hasn't been circulated since 3:30 pm 3-11-86.
T. Pat P.E.

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
J.E. McAliley	Dayton, Texas	258-2765
AREA OFFICE	WAREHOUSE LOCATION: Galveston, Texas	TELEPHONE: 744-5322

Form 515 Rev. 50M 2-80

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PROPOSAL NO.	
MUD NO.	12,737
WELL NO.	
DATE	1-15-80
FIELD, TOWNSHIP	Gal-A 628
COUNTY	

J.I. 122 A#1, Townsite #3 | J.I. 122 | Galveston | Texas

OPERATION		CASING		MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: G.I.H		SURFACE: 10 3/4 IN. AT 1500 FT.		HOLE: 535	PITS: 550	PUMP SIZE: 4 1/2 X 9 IN.	ANNULAR VEL. (FT./MIN.): .032 OPPOSITE BIT
BIT SIZE (IN.): 6 3/4	NO.: RR	INTERMEDIATE: 7 5/8 IN. AT 9268 FT.		TOTAL CIRCULATING VOLUME: 1085		PUMP MAKE: G.D. MODEL: P.2.9	.022 OPPOSITE COLLAR
DRILL PIPE SIZE: 3 1/2	TYPE: E 1370	PRODUCTION OR LINER: — IN. AT FT.		IN STORAGE: AV =	WEIGHT: 438	BBL./STROKE: .044	STROKES/MIN. —
DRILL COLLAR SIZE: 4 3/4	LENGTH: —	MUD TYPE: Lignosulfonate				BBL./MIN. —	BOTTOMS UP (MIN.) — SYSTEM TOTAL (MIN.) —

Sample from ☐ Flowline ☑ Pit
Flowline Temperature °F

MUD PROPERTIES			
	Jw		
Time Sample Taken	4:30 am		
Depth (ft)	12,737		
Weight ☑ (ppg) ☐ (lb/cu ft)	16.2		
Mud Gradient (psi/ft)	.8424		
Funnel Viscosity (sec/qt) API at ____ °F	48		
Plastic Viscosity cp at ____ °F	36		
Yield Point (lb/100 sq ft)	13		
Gel Strength (lb/100 sq ft) 10 sec/10 min	2/6	/	/
pH ☑ Strip ☐ Meter	10.5		
Filtrate API (ml/30 min)	2.8		
API HP,HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☑ HTHP ☐	2		
Alkalinity, Mud (Pm)	2.6		
Alkalinity, Filtrate (P_f/M_f)	0.7/1.8	/	/
Salt ☐ppm ☐gpg Chloride ☑ppm ☐gpg	4100		
Calcium ☑ ppm ☐ Gyp ppb	40		
Sand Content (% by Vol)	0.1		
Solids Content (% by Vol)	31		
Oil Content (% by Vol)	5		
Water Content (% by Vol)	62		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge	—		Desilter	—	
Degasser Rig			Shaker Brandt 80x60		
Desander M. Logger			Other M. Chem. DSU		
DAILY COST $ 253 00 Tax Ins.			CUMULATIVE COST $ 251,005 + Tax Ins.		

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
16.1	47	4 cc. Lec

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☑ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT

- ☐ IMCO BAR
- ☐ IMCO GEL
- ☐ IMCO BRINEGEL
- ☐ IMCO RD-111
- ☐ IMCO VC-10
- ☐ IMCO THIN
- ☐ IMCO CAUSTIC SODA
- ☐ IMCO M.D.
- ☐ IMCO POLY RX
- ☐
- ☑ Eng.

NO TREATMENT

REMARKS: G.I.H. w/ R.R bit to csg. shoe to circulate. Any possible debris. Thank P.S.M.

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
P.E. McAliley	Dayton, Texas	258 2765
AREA OFFICE	WAREHOUSE LOCATION	TELEPHONE
	Galveston, Texas	744 5323

Form 515 Rev. 50M 2-80

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REPORT NO.
DEPTH 12,737
WELL
DATE 12-15-80
FOR, TOWNSHIP, RANGE BK-A-628
PRESENCE

S.T. 122-A#1, Tower Site #3 | S.T. 122 | Galveston | Texas

OPERATION		CASING	MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: P.O.O.H.		SURFACE: 10 3/4 IN. AT 1500 FT.	HOLE: 535	PITS: 550	PUMP SIZE X IN.: 4 1/2 X 9	ANNULAR VEL. (FT./MIN.): .032
BIT SIZE (IN.): —	NO.: —	INTERMEDIATE: 7 5/8 IN. AT 9268 FT.	TOTAL CIRCULATING VOLUME: 1085		PUMP MAKE: G.D. MODEL: P-2-9	OPPOSITE DP: — OPPOSITE COLLAR: —
DRILL PIPE SIZE: 3 1/2	TYPE: G 1230	PRODUCTION OR LINER: — IN. AT — FT.	IN STORAGE: AU = 438	WEIGHT:	BBL./STROKE: .044	STROKE/MIN.: —
DRILL COLLAR SIZE: 4 3/4	LENGTH: —	MUD TYPE: Lignosulfonate			BBL./MIN.: —	CIRCULATING PRESSURE PSI: — BOTTOMS UP (MIN.): — SYSTEM TOTAL (MIN.): —

Sample from ☐ Flowline ☒ Pit
Flowline Temperature 76 °F

MUD PROPERTIES			
Time Sample Taken	11:30 AM		
Depth (ft)	12,737		
Weight ☒ (ppg) ☐ (lb/cu ft)	16.2		
Mud Gradient (psi/ft)	.8421		
Funnel Viscosity (sec/qt) API at ____ °F	52		
Plastic Viscosity cp at ____ °F	37		
Yield Point (lb/100 sq ft)	23		
Gel Strength (lb/100 sq ft) 10 sec/10 min	2/6	/	/
pH ☒ Strip ☐ Meter	10.5		
Filtrate API (ml/30 min)	2.6		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☒ HTHP ☐	2		
Alkalinity, Mud (Pm)	2.6		
Alkalinity, Filtrate (P_f/M_f)	.7/1.8	/	/
Salt ☐ ppm ☐ ppg Chloride ☒ ppm ☐ ppg	4100		
Calcium ☒ ppm ☐ Gyp ppb	40		
Sand Content (% by Vol)	0.1		
Solids Content (% by Vol)	31		
Oil Content (% by Vol)	5		
Water Content (% by Vol)	64		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge			Desilter		
Degasser	Rig		Shaker	Brandt	8 @ 60
Desander	M. Logan		Other	M. Cleaner	1 @ 50
DAILY COST $253			CUMULATIVE COST $251,258		

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
16.1	47	4 or less

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☒ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT

- ☐ IMCO BAR
- ☐ IMCO GEL
- ☐ IMCO BRINEGEL
- ☐ IMCO RD-111
- ☐ IMCO VC-10
- ☐ IMCO THIN
- ☐ IMCO CAUSTIC SODA
- ☐ IMCO M D
- ☐ IMCO POLY RX
- ☐
- ☐ Eng

NO TREATMENT

REMARKS Went T.H. w/ spear got some, cable ripped out - W.O.B.H. Again w/ spear - Now P.O.O.H. That P.S.M.

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
P.E. McAliley	Dayton Texas	258-2145
	WAREHOUSE LOCATION: Galveston Texas	TELEPHONE: 744-5873

Form 515 Rev. 50M 2-80

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REPORT NO. 22
DEPTH 12,737
WELL
DATE 2-15-80
TOWNSHIP
PROVINCE

S.I. 122 A#1, Townsite #2 | ST 122 | Galveston | Texas

OPERATION		CASING		MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: O.O.H		SURFACE: 10 3/4 IN. AT 1500 FT.		HOLE: 535±	PITS: 500	PUMP SIZE: 4½ X 9 IN.	ANNULAR VEL. (FT./MIN.): .038 —
BIT SIZE (IN.): —	NO.: —	INTERMEDIATE: 7 5/8 IN. AT 9218 FT.		TOTAL CIRCULATING VOLUME: 1035±		PUMP MAKE: G.D. / MODEL: P-2-9	.037
DRILL PIPE SIZE: 3½	TYPE: E 13.30	PRODUCTION OR LINER: — IN. AT — FT.		IN STORAGE: AV = 433	WEIGHT	BBL./STROKE: .044	STROKE/MIN.: —
DRILL COLLAR SIZE: 4 3/4	LENGTH: —	MUD TYPE: Lignosulfonate				BBL./MIN.: —	SYSTEM TOTAL (MIN.): —

Sample from ☐ Flowline ☑ Pit
Flowline Temperature 76 °F

MUD PROPERTIES			
	Ew		
Time Sample Taken	4:30	Am	
Depth (ft)	12,737		
Weight ☑ (ppg) ☐ (lb/cu ft)	16.2		
Mud Gradient (psi/ft)	.8427		
Funnel Viscosity (sec/qt) API at ____ °F	49		
Pl Viscosity cp at ____ °F	36		
Yield Point (lb/100 sq ft)	18		
Gel Strength (lb/100 sq ft) 10 sec/10 min	6/6	/	/
pH ☑ Strip ☐ Meter	10.5		
Filtrate API (ml/30 min)	2.6		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☑ HTHP ☐	2		
Alkalinity, Mud (Pm)	2.8		
Alkalinity, Filtrate (P_f/M_f)	.7/1.8	/	/
Salt ☐ppm ☐ppg Chloride ☑ppm ☐ppl	4100		
Calcium ☑ ppm ☐ Gyp ppb	40		
Sand Content (% by Vol)	0.1		
Solids Content (% by Vol)	31		
Oil Content (% by Vol)	5		
Water Content (% by Vol)	64		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge	—			Desilter	—
Degasser	Rig			Shaker	Brandt 4 50 screen
Desander	M. Degasser			Other	Mud Cleaner 1.5

DAILY COST $253 as of this rep.
CUMULATIVE COST $251,511 Tot. Tot.

MUD PROPERTIES SPECIFICATIONS		
WEIGHT 16.1	VISCOSITY 47	FILTRATE 4 or less

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☑ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT	
☐ IMCO BAR	N
☐ IMCO GEL	O
☐ IMCO BRINEGEL	T
☐ IMCO RD-111	R
☐ IMCO VC-10	E
☐ IMCO THIN	A
☐ IMCO CAUSTIC SODA	T
☐ IMCO M D	M
☐ IMCO POLY-RX	E
☐	N
☑ Eng.	T: 80

REMARKS G.F.H. w/ spear. Fishing for Dipmeter. Thank P.E.M.

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
P. E. McAliley	Dayton Texas	259-2765
	WAREHOUSE LOCATION	TELEPHONE
	Galveston Texas	744-5573

Form 515 Rev. 50M 2-80

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REPORT NO. 17
PTN 12,737
WELL
DATE 5-15-80
TOWNSHIP
Bm-A-628
PROVINCE

S.I. 122 A#1, Townsite #3 | S.I. 122 | Galveston | Texas

OPERATION		CASING		MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: G.I.H.		SURFACE: 10 3/4 IN. AT 1500 FT.		HOLE: 535	PITS: 480	PUMP SIZE: 4 1/2 X 9 IN.	ANNULAR VEL. (FT./MIN.): .077 OPPOSITE DP 162
BIT SIZE (IN.): 6 3/4	NO.	INTERMEDIATE: 7 5/8 IN. AT 9268 FT.		TOTAL CIRCULATING VOLUME: 1015		PUMP MAKE: G.D. MODEL: P-2.9	.077 OPPOSITE COLLAR 3.36
DRILL PIPE SIZE: 3 1/2	TYPE: E 13.30	PRODUCTION OR LINER: — IN. AT FT.		IN STORAGE: AV = 478	WEIGHT	BBL./STROKE: .044 STROKE/MIN.: 118	CIRCULATING PRESSURE PSI: 2000
DRILL COLLAR SIZE: 4 3/4	LENGTH	MUD TYPE: Lignosulfonate				BBL./MIN.: 5.192 218	BOTTOMS UP (MIN.): 84 SYSTEM TOTAL (MIN.): 195

Sample from ☐ Flowline ☒ Pit
Flowline Temperature °F

MUD PROPERTIES	In		
Time Sample Taken	4:30 Am		
Depth (ft)	12,737		
Weight ☒ (ppg) ☐ (lb/cu ft)	16.2		
Mud Gradient (psi/ft)	.8424		
Funnel Viscosity (sec/qt) API at ____ °F	47		
Plastic Viscosity cp at ____ °F	26		
Yield Point (lb/100 sq ft)	25		
Gel Strength (lb/100 sq ft) 10 sec/10 min	2/6	/	/
pH ☒ Strip ☐ Meter	10.6		
Filtrate API (ml/30 min)	2.6		
API or HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nds in API ☒ HTHP ☐	2		
Alkalinity, Mud (Pm)	3.0		
Alkalinity, Filtrate (Pf/Mf)	.9/1.8	/	/
Salt ppm Chloride ppm	4100		
Calcium ☒ ppm ☐ Gyp ppb	40		
Sand Content (% by Vol)	0.1		
Solids Content (% by Vol)	30		
Oil Content (% by Vol)	4		
Water Content (% by Vol)	66		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT

	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge			Desilter		
Degasser R.J.			Shaker Brandt	80	60
Desander M. Cleaner	150		Other Mud Logger		

DAILY COST $2018.00 Tax Inc. | CUMULATIVE COST $252,829.00 Tax Incl.

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
16.1	47	4 or less

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☒ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT — Materials Used

	Drill	R
☐ IMCO BAR		
☐ IMCO GEL		
☒ IMCO ~~BRINEGEL~~ Bulk		
☐ IMCO RD-111		
☐ IMCO VC-10		
☐ IMCO THIN		
☒ IMCO CAUSTIC SODA	1	
☐ IMCO M D		
☐ IMCO ~~POLY-PAK~~ Plug	838	91
☒ Soltex	* 870	22
☒ Engineer on loc.	1	8

REMARKS: G.I.H. w/ fishing tool.
Thank You
P.S.M.
* 20 sks of Plug were used Drain back on the floor.

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
P.E. McAliley	Dayton, Texas	258 2765
	WAREHOUSE LOCATION	TELEPHONE
	Galveston, Texas	744 5373

Form 515 Rev. 1/81

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REPORT NO. 7
TH 12,737
WELL
DATE 2-15-80
FOR, TOWNSHIP, RE Bm-A-62
COUNTY

J.I. TEXAS, Towasite #3	J.I. 122	Galveston	Texas

OPERATION		CASING	MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: G.I.H.		SURFACE: 10 3/4 IN. AT 1500 FT.	HOLE: 535 ±	PITS: 480 ±	PUMP SIZE: 4 1/2 X 9 IN.	ANNULAR VEL. (FT./MIN.): .032 OPPOSITE DP 162 ±
BIT SIZE (IN.): 6 3/4	NO.: 30	INTERMEDIATE: 7 5/8 IN. AT 9269 FT.	TOTAL CIRCULATING VOLUME: 1015 ±		PUMP MAKE: G.D. MODEL: P-2-9	.022 OPPOSITE COLLAR 236 ±
DRILL PIPE SIZE: 3 1/2	TYPE: E 13.30	PRODUCTION OR LINER: — IN. AT FT.	IN STORAGE: 40 - 438	WEIGHT	BBL./STROKE: .044	STROKE/MIN.: 118
DRILL COLLAR SIZE: 4 3/4	LENGTH: —	MUD TYPE: Lignosol Formate			gpm 218 BBL./MIN. 5.192	CIRCULATING PRESSURE PSI: 3000 BOTTOMS UP (MIN.): 84 SYSTEM TOTAL (MIN.): 195

Sample from ☐ Flowline ☑ Pit
Flowline Temperature 90 °F

MUD PROPERTIES	In	Out
Time Sample Taken	14:30	
Depth (ft)	12,737	
Weight ☑ (ppg) ☐ (lb/cu ft)	16.2	14.7
Mud Gradient (psi/ft)	.8424	
Funnel Viscosity (sec/qt) API at ____ °F	52	90
Plastic Viscosity cp at ____ °F	44	
Yield Point (lb/100 sq ft)	20	
Gel Strength (lb/100 sq ft) 10 sec/10 min	2/7	/ /
pH ☐ Strip ☐ Meter	10.7	
Filtrate API (ml/30 min)	2.8	
API HP HT Filtrate (ml/30 min) at ____ °F	—	
Cake Thickness 32nd in API ☑ HTHP ☐	2	
Alkalinity, Mud (Pm)	3.0	
Alkalinity, Filtrate (Pf/Mf)	.9/1.8	/ /
Salt ☐ppm ☐ppg Chloride ☑ppm ☐ppg	4100	
Calcium ☐ ppm ☐ Gyp ppb	40	
Sand Content (% by Vol)	0.1	
Solids Content (% by Vol)	31	
Oil Content (% by Vol)	4	
Water Content (% by Vol)	65	
Methylene Blue Capacity (ml/ml Mud)	—	
Methylene Blue (lb/bbl Bentonite Eq)	—	

EQUIPMENT	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge			Desilter		
Degasser Rig			Shaker Brandt 30x60		
Desander M. Lagster			Other M Clearwater 150		

DAILY COST $ 2531.82 Two Tau. CUMULATIVE COST $ 356,060 Tax Inc

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
16.1	47	4 or less

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☑ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT — Materials Used

	Daily	Inv.
☑ IMCO BAR	60	111
☑ IMCO GEL	5	3
☑ IMCO ~~BRINEGEL~~ Blk	200	55
☐ IMCO RD-111		7
☐ IMCO ~~VG-10~~ Lig		7
☐ IMCO ~~THIN~~ Soltex		2
☐ IMCO CAUSTIC SODA		2
☐ IMCO ~~MO~~ Lubkleen		7
☐ IMCO ~~POLYPAC~~ Poly		5
☑ Sodium Chromate		5
☑ Engineer on Location	1	8

REMARKS: Retrieved Dipmeter - G.I.H. Reaming & too condition mud. Running Diesel in mud since started reaming to raise to 5 oil content. Thks P.E.M.

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
P.E. McAliley	Dayton, Texas	258 2765
	WAREHOUSE LOCATION	TELEPHONE
	Galveston Texas	744 5373

Form 515 Rev. 50M 2-80

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RT REPORT NO. 7

PM 12702

WELL | SEC

NO. 4

DATE 2-4-80

TION, TOWNSHIP, RGE 3A-A 629

SERVICE

O.T. 122 - AMI - Town site - 3 | O.T. 122 | Galveston | Texas

OPERATION		CASING		MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: O.O.H.		SURFACE: 10 3/4 IN. AT 1500 FT.		HOLE: 535	PITS: 500	PUMP SIZE: 4 1/2 X 9 IN.	ANNULAR VEL. (FT./MIN.): .022 OPPOSITE DP 162
BIT SIZE (IN.): 6 3/4	NO.	INTERMEDIATE: 7 5/8 IN. AT 9268 FT.		TOTAL CIRCULATING VOLUME: 1035		PUMP MAKE: G.D MODEL: P-2.9	.022 OPPOSITE COLLAR 236
DRILL PIPE SIZE: 3 1/2	TYPE: E 13.70	PRODUCTION OR LINER: — IN. AT FT.		IN STORAGE: AV = 438	WEIGHT	BBL./STROKE: .044 STROKE/MIN.: 118	CIRCULATING PRESSURE PSI: 3300
DRILL COLLAR SIZE: 4 3/4	LENGTH: —	MUD TYPE: Lignosulfonate				SPM 218 BBL./MIN. 5.192	BOTTOMS UP (MIN.): 84 SYSTEM TOTAL (MIN.): 195

Sample from ☐ Flowline ☑ Pit

Flowline Temperature °F

MUD PROPERTIES	IN		
Time Sample Taken	830 Am		
Depth (ft)	12702		
Weight ☑ (ppg) ☐ (lb/cu ft)	16.2		
Mud Gradient (psi/ft)	.8424		
Funnel Viscosity (sec/qt) API at ____ °F	47		
Plastic Viscosity cp at ____ °F	39		
Yield Point (lb/100 sq ft)	17		
Gel Strength (lb/100 sq ft) 10 sec/10 min	2/6	/	/
pH ☑ Strip ☐ Meter	10.8		
Filtrate API (ml/30 min)	2.6		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☑ HTHP ☐	2		
Alkalinity, Mud (Pm)	3.0		
Alkalinity, Filtrate (P_f/M_f)	.8/1.9	/	/
Salt ☐ppm ☐ppb Chloride ☐ppm ☐ppb	4100		
Calcium ☑ ppm ☐ Gyp ppb	40		
Sand Content (% by Vol)	0.1		
Solids Content (% by Vol)	30		
Oil Content (% by Vol)	5		
Water Content (% by Vol)	65		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT

	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge	—		Desilter	—	
Degasser Rig			Shaker Brandt	80x60	
Desander Mo. Hogler			Other M. cleaner	150	

DAILY COST $ 1564 Thru IN

CUMULATIVE COST $ 258,024 Tho Inc.

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
16.4	47	4 or less

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☑ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT (Material Used)

	Daily	Cum
☑ IMCO BAR	30	114
☐ IMCO GEL		37
☑ IMCO ~~BRINEGEL~~ Bulk	50	80.4
☑ IMCO RD-111	5	73
☑ IMCO ~~VG-10~~ Lig		70
☑ IMCO ~~THIN~~ Colex	5	23
☑ IMCO CAUSTIC SODA	3	29
☐ IMCO ~~M-I~~ Lubr. Mica		70
☐ IMCO ~~POLY PIN~~ Plug	15	65
☑ NA Cr		5
☑ Engineer on location	1	8

REMARKS O.O.H. Logging. Tho P.S.M.

IMCO REPRESENTATIVE: P.E. McAlilay

HOME ADDRESS: Dayton Texas

TELEPHONE: 258 2765

WAREHOUSE LOCATION: Galveston, Texas

TELEPHONE: 744 5373

Form 515 Rev. 50M 2-80

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RT REPORT NO. 4 0

DEPTH 12702

WELL

NO. 44

DATE 2-15-86

TION, TOWNSHIP, GE an-A-62

DISTRICT

S.T. ICC A#1 TOWNSITE #2 | S.T. ICC | Galveston | TEXAS

OPERATION		CASING	MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: G IH		SURFACE: 10 3/4 IN. AT 1500 FT.	HOLE: 535±	PITS: 350±	PUMP SIZE: 4 1/2 X 9 X IN.	ANNULAR VEL. (FT./MIN.) OPPOSITE DP: 162
BIT SIZE (IN.): 6 3/4	NO.: RR29	INTERMEDIATE: 7 5/8 IN. AT 9268 FT.	TOTAL CIRCULATING VOLUME: 885		PUMP MAKE: GD MODEL: PZ9	OPPOSITE COLLAR: 236
DRILL PIPE SIZE: 3 1/2	TYPE: E 13.30	PRODUCTION OR LINER: ——— IN. AT ——— FT.	TRIP STORAGE: RON VOL.	WEIGHT: 428#	BBL./STROKE: .044 STROKE/MIN.: 118	CIRCULATING PRESSURE PSI: 2000
DRILL COLLAR SIZE: 4 3/4	LENGTH: 263	MUD TYPE: Lignosulfonate / Emulsion			SPM - 218 BBL./MIN.: 5.192	BOTTOMS UP (MIN.): 84 SYSTEM TOTAL (MIN.): 145

Sample from ☐ Flowline ☑ Pit
Flowline Temperature ——— °F

MUD PROPERTIES	
Time Sample Taken	4:30 AM
Depth (ft)	12702
Weight ☑ (ppg) ☐ (lb/cu ft)	16.2
Mud Gradient (psi/ft) 10700# @ 12702	.8424
Funnel Viscosity (sec/qt) API at 89 °F	45
Plastic Viscosity cp at 80 °F	34
Yield Point (lb/100 sq ft)	13
Gel Strength (lb/100 sq ft) 10 sec/10 min	1/3
pH ☑ Strip ☐ Meter	10.2
Filtrate API (ml/30 min)	3.0
API HP HT Filtrate (ml/30 min) at ——— °F	—
Cake Thickness 32nd in API ☑ HTHP ☐	2/32
Alkalinity, Mud (Pm)	2.0
Alkalinity, Filtrate (P_f/M_f)	.5/1.5
Salt ☐ppm ☐gpg Chloride ☑ppm ☐gpg	4000
Calcium ☑ ppm ☐ Gyp ppb	40
Sand Content (% by Vol)	TR
Solids Content (% by Vol)	29.0
Oil Content (% by Vol)	5.0
Water Content (% by Vol)	66.0
Methylene Blue Capacity (ml/ml Mud)	—
Methylene Blue (lb/bbl Bentonite Eq)	—

EQUIPMENT HOLE — 103

	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge	———		Desilter	Brandt	(150 net
Degasser	RLG		Shaker	Brandt	80 X 4
Desander	RLG		Other	Mud Logger	

DAILY COST TRY INV $ 337.00 | CUMULATIVE COST TAX INV $ 258,361.0

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
16.2	47	4 or less

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☑ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT	material used
☑ IMCO BAR	10
☑ IMCO GEL	
☑ IMCO ~~BRINEGEL~~ Bulk	
☑ IMCO RD-111	
☑ IMCO ~~VG-10~~ LG	
☑ IMCO ~~THIN~~ Soltex	
☑ IMCO CAUSTIC SODA	
☑ IMCO ~~MD~~ Lubrikleen	
☑ IMCO ~~POLY RX~~ Plug	
☑ NaCR	
☑ Eng. on Location	1

REMARKS Finished logging. Circ. at 9260. Pooh & pick up BHA & go back to bottom to circ. out before running liner.

IMCO REPRESENTATIVE: Vicki Snider / Parker

HOME ADDRESS: Wharton, Tx 713 | TELEPHONE: 532-1824

WAREHOUSE LOCATION: Galveston, Tx | TELEPHONE: 744-5378

Form 515 Rev. 2-80

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NO. 79
PTH 12702
WELL | S/T
NO. 4
DATE 7-15-80
TION, TOWNSHIP, RANGE
Sn-A-628

Galveston Texas

OPERATION		CASING		MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: TIH w/ Liner		SURFACE: 10 3/4 IN. AT 1500 FT.		HOLE: 437	PITS: 350±	PUMP SIZE: 4 1/2 X 9 IN.	ANNULAR VEL. (FT./MIN.) OPPOSITE DP: 104
BIT SIZE (IN.): —	NO.: —	INTERMEDIATE: 7 5/8 IN. AT 9268 FT.		TOTAL CIRCULATING VOLUME: 787±		PUMP MAKE: GD MODEL: PZ9	OPPOSITE COLLAR: 182
DRILL PIPE SIZE: 3 1/2	TYPE: E 13.30	PRODUCTION OR LINER: IN. AT FT.		ANNULAR VOL: 296±	WEIGHT	BBL./STROKE: .044 STROKE/MIN.: 83	CIRCULATING PRESSURE PSI: 2000
DRILL COLLAR SIZE: —	LENGTH: —	MUD TYPE: Lignosulfonate / Emulsion				gpm — 153 BBL./MIN.: 3.652	BOTTOMS UP (MIN.): 81 SYSTEM TOTAL (MIN.): 215

Sample from ☐ Flowline ☑ Pit
Flowline Temperature — °F

MUD PROPERTIES			
Time Sample Taken	4:20 pm		
Depth (ft) @9220	12702		
Weight ☑ (ppg) ☐ (lb/cu ft)	16.2+		
Mud Gradient (psi/ft) 10700# @ 12702	.8424		
Funnel Viscosity (sec/qt) API at 88 °F	48		
Plastic Viscosity cp at 80 °F	38		
Yield Point (lb/100 sq ft)	18		
Gel Strength (lb/100 sq ft) 10 sec/10 min	2/4	/	/
pH ☑ Strip ☐ Meter	10.5		
Filtrate API (ml/30 min)	3.1		
API HP HT Filtrate (ml/30 min) at °F	—		
Cake Thickness 32nd in API ☑ HTHP ☐	2/32		
Alkalinity, Mud (Pm)	1.5		
Alkalinity, Filtrate (P_f/M_f)	.5/2.0	/	/
Salt ☐ ppm ☐ gpg Chloride ☑ ppm ☐ gpg	4000		
Calcium ☐ ppm ☐ Gyp ppb	40		
Sand Content (% by Vol)	TR		
Solids Content (% by Vol)	30.0		
Oil Content (% by Vol)	5.0		
Water Content (% by Vol)	65.0		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT HOLE — 12 1/4"

	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge	—		Desilter	Brandt (15 HP)	
Degasser	Rig		Shaker	Brandt 80 X 6	
Desander	Rig		Other	Mud Logger	

DAILY COST TODAY $1278.00 CUMULATIVE COST TO DATE $25,639.0

MUD PROPERTIES SPECIFICATIONS

WEIGHT 16.2 VISCOSITY 47 FILTRATE 4 or less

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☑ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT

	Material used	
☑ IMCO BAR		11
☑ IMCO GEL		3
☑ IMCO ~~BRINEGEL~~ BULK	20	15
☑ IMCO RD-111	10	7
☑ IMCO ~~VC-10~~ LG	10	7
☑ IMCO ~~THIN~~ Soltex		2
☑ IMCO CAUSTIC SODA	2	2
☑ IMCO ~~M-D~~ Lubrikleen		7
☑ IMCO ~~POLY PIK~~ Plug	15	8
☑ NaCr		
☐ Eng. on Location	1	8
	Daily Total	

REMARKS Pumped pill (plug) into open hole. POOH + pick up 5" liner (3800')

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
Vicki Snider	Wharton, Tx 713	532-1824
Thanks	WAREHOUSE LOCATION: Galveston, Tx	TELEPHONE 744-5372

Form 515 Rev. 50M 2-80

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REPORT NO. 4
DEPTH 12702
WELL
DATE 2-15-80
SECTION, TOWNSHIP, RANGE M-A-628

RIGG A#1 - Townsite #3 | J.I. TCC | Galveston | Texas

OPERATION		CASING		MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: 1H w/ Bit		SURFACE: 10 3/4 IN. AT 1500 FT.		HOLE: 378±	PITS: 500±	PUMP SIZE: 4 1/2 X 9 IN.	ANNULAR VEL. (FT./MIN.): OPPOSITE DP 96
BIT SIZE (IN.): 6 3/4	NO.: AR	INTERMEDIATE: 7 5/8 IN. AT 4268 FT.		TOTAL CIRCULATING VOLUME: 878±		PUMP MAKE: GD MODEL: D29	OPPOSITE COLLAR 134
DRILL PIPE SIZE: 3 1/2	TYPE: E 13.30	PRODUCTION OR LINER: 5 IN. AT 8961-12702 FT.		TOTAL MUD VOLUME: 878	WEIGHT: 312	BBL./STROKE: .044 STROKE/MIN.: 77	CIRCULATING PRESSURE PSI 2000
DRILL COLLAR SIZE: 4 3/4	LENGTH: 3603	MUD TYPE: Lignosulfonate / Emulsion				gpm = 142 BBL./MIN. 3.39	BOTTOMS UP (MIN.) 92 SYSTEM TOTAL (MIN.) 259

Sample from ☐ Flowline ☑ Pit
Flowline Temperature ____ °F

MUD PROPERTIES		
Time Sample Taken	4:30 pm	
Depth (ft) @ 8961	12702 TD	
Weight ☑ (ppg) ☐ (lb/cu ft)	16.2	
Mud Gradient (psi/ft) 9544# @ 8961	.8424	
Funnel Viscosity (sec/qt) API at 85 °F	50	
Plastic Viscosity cp at 76 °F	39	
Yield Point (lb/100 sq ft)	20	
Gel Strength (lb/100 sq ft) 10 sec/10 min	2/5	/ /
pH ☑ Strip ☐ Meter	10.3	
Filtrate API (ml/30 min)	3.2	
API HP HT Filtrate (ml/30 min) at ____ °F	—	
Cake Thickness 32nd in API ☑ HTHP ☐	2/32	
Alkalinity, Mud (Pm)	1.4	
Alkalinity, Filtrate (Pf/Mf)	4/1.6	/ /
Salt ☐ ppm ☐ gpg Chloride ☑ ppm ☐ gpg	4000	
Calcium ☑ ppm ☐ Gyp ppb	40	
Sand Content (% by Vol)	TR	
Solids Content (% by Vol)	31.0	
Oil Content (% by Vol)	5.0	
Water Content (% by Vol)	64.0	
Methylene Blue Capacity (ml/ml Mud)	—	
Methylene Blue (lb/bbl Bentonite Eq)	—	

EQUIPMENT	SIZE	HRS/TOUR		SIZE	HRS/TOUR
HOLE		112			
Centrifuge	—		Desilter	Brandt	1 (150 mesh)
Degasser	RIG		Shaker	2 Brandt	80X6
Desander	—		Other	Mud Logger	

DAILY COST: TBY $1669.00
CUMULATIVE COST: TBY $2623.06

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
16.2	47	4 or less

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☑ OPERATOR'S REPRESENTATIVE ☐ DRILLING CONTRACTOR ☐ OTHER

RECOMMENDED TOUR TREATMENT	Material used
☑ IMCO BAR	11
☑ IMCO GEL	2
☑ IMCO ~~BRINEGEL~~ Bulk	40
☑ IMCO RD-111	7
☑ IMCO ~~VCHO~~ LIG	7
☑ IMCO ~~THIN~~ Soltex	22
☑ IMCO CAUSTIC SODA	2
☑ IMCO ~~M-D~~ Lubrikleen	7
☑ IMCO ~~POLY RX~~ Plug	8
☑ NaCr	
☑ Eng. on Location	1 8

REMARKS Top of liner @ 8961. Cemented. POOH + p.u. bit to dress off top of liner.
720 units max bottoms up gas

IMCO REPRESENTATIVE: Vicki Snider / Sparks
HOME ADDRESS: Wharton, Tx 713
TELEPHONE: 532-1824
WAREHOUSE LOCATION: Galveston, Tx
TELEPHONE: 744-5373

Form 515 Rev. 5-80M 2-80

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REPORT NO. 9
DEPTH 12702
WELL
44
DATE 2-15-80
SECTION, TOWNSHIP, RANGE 30-A-628

OPERATOR: Tex Tex Exploration | CONTRACTOR: Tex Tex | LOCATION: Galveston | STATE: Texas

OPERATION		CASING	MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: G/H		SURFACE: 10 3/4 IN. AT 1500 FT.	HOLE: 378±	PITS: 500±	PUMP SIZE: 4½ X 9 IN.	ANNULAR VEL. (FT./MIN.) OPPOSITE BIT: 137
BIT SIZE (IN.): RTS Tool	NO.	INTERMEDIATE: 7 5/8 IN. AT 9268 FT.	TOTAL CIRCULATING VOLUME: 878±		PUMP MAKE: GD MODEL: D29	OPPOSITE COLLAR: 192
DRILL PIPE SIZE: 3½	TYPE: E 13.30	PRODUCTION OR LINER: 5 IN. AT 8461 FT.	MUD ON HOLE AND VOL	WEIGHT: 312±	BBL./STROKE: .044 STROKE/MIN.: 110	CIRCULATING PRESSURE PSI: 2000
DRILL COLLAR SIZE: 4 3/4	LENGTH: 232	MUD TYPE: Lignosulfonate/Emulsion			gpm - 203 BBL./MIN.: 4.84	BOTTOMS UP (MIN.): 65 SYSTEM TOTAL (MIN.): 181

Sample from ☐ Flowline ☑ Pit
Flowline Temperature — °F

MUD PROPERTIES			
Time Sample Taken	4:30 pm		
Depth (ft) 8461	12702		
Weight ☐ (ppg) ☐ (lb/cu ft)	16.0		
Mud Gradient (psi/ft) 7455# @ 8461	.832		
Funnel Viscosity (sec/qt) API at ____ °F	76		
Plastic Viscosity cp at ____ °F	48		
Yield Point (lb/100 sq ft)	20		
Gel Strength (lb/100 sq ft) 10 sec/10 min	3/8	/	/
pH ☑ Strip ☐ Meter	12.0	— due to cement	
Filtrate API (ml/30 min)	3.9		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☑ HTHP ☐	2/32		
Alkalinity, Mud (Pm)	4.5		
Alkalinity, Filtrate (Pf/Mf)	1.0/2.6	/	/
Salt ☐ ppm ☐ ppg Chloride ☑ ppm ☐ ppg	4000		
Calcium ☑ ppm ☐ Gyp ppb	200		
Sand Content (% by Vol)	TR		
Solids Content (% by Vol)	30.0		
Oil Content (% by Vol)	5.0		
Water Content (% by Vol)	65.0		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge	—		Desilter	Brandt (150)	
Degasser	RLG		Shaker	2 Brandt 80X6	
Desander	—		Other	Mud Logger	

HOLE - 78±

DAILY COST: This Int $ 3483.00
CUMULATIVE COST: This Well $ 263789.00

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
16.2	47	4 or less

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☑ OPERATOR'S REPRESENTATIVE ☐ DRILLING CONTRACTOR ☐ OTHER

RECOMMENDED TOUR TREATMENT		
☑ IMCO BAR		11
☑ IMCO GEL		32
☑ IMCO ~~BRINEGEL~~ Bulk	200	15
☑ IMCO RD-111	10	2
☑ IMCO ~~VC-10~~ 46	10	2
☑ IMCO ~~THIN~~ Soltex		2
☑ IMCO CAUSTIC SODA		4
☑ IMCO ~~MD~~ Lubrikleen		7
☑ IMCO ~~POLY RX~~ Plug		8
☑ NaCl		5
☑ Eng. on Location	1	8

REMARKS: Drilled cement 8900 to 8961. POOH & pick up RTS tool. Circ at 9661. Could not set RTS tool. POOH. Mud wt. cut back to 11.3.

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
Vicki Snider	Houston Tx 713	532-1824
Thanks	WAREHOUSE LOCATION: Galveston Tx	TELEPHONE: 744-5373

Form 515 Rev. 50M 2-80

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REPORT NO. 9

DEPTH 12,702

WELL | BIT

DATE 1-15-80

SEC. TOWNSHIP, RANGE Bm A-6-8

S.I. 122-A#1 Transite - 3 | S.I. 122 | Galveston | Texas

OPERATION		CASING		MUD VOLUME (BBL)		CIRCULATION DATA	
PRESENT ACTIVITY: G.I.H.		SURFACE: 10 3/4 IN. AT 1500 FT.		HOLE: 378±	PITS: 500±	PUMP SIZE: 4 1/2 X 9 IN.	ANNULAR VEL. (FT./MIN.) OPPOSITE DP: 177±
BIT SIZE (IN.): Scraper	NO.	INTERMEDIATE: 7 5/8 IN. AT 9268 FT.		TOTAL CIRCULATING VOLUME: 878±		PUMP MAKE: G.D. MODEL: P-2.9	OPPOSITE COLLAR: 192±
DRILL PIPE SIZE	TYPE	PRODUCTION OR LINER: 5 IN. AT 8961-7117 FT.		IN STORAGE: AV - 312±	WEIGHT	BBL./STROKE: .044 STROKE/MIN.: 110	CIRCULATING PRESSURE PSI: 2000
DRILL COLLAR SIZE	LENGTH	MUD TYPE: Lignosulfonate				GPM: 203 BBL./MIN.: 4.84	BOTTOMS UP (MIN.): 65± SYSTEM TOTAL (MIN.): 131±

Sample from ☐ Flowline ☒ Pit
Flowline Temperature 102 °F

MUD PROPERTIES	IW		
Time Sample Taken	4:30pm		
Depth (ft)	12702		
Weight ☒ (ppg) ☐ (lb/cu ft)	16.1		
Mud Gradient (psi/ft)	.8372		
Funnel Viscosity (sec/qt) API at ____ °F	64		
Plastic Viscosity cp at ____ °F	40		
Yield Point (lb/100 sq ft)	22		
Gel Strength (lb/100 sq ft) 10 sec/10 min	4/21	/	/
pH ☒ Strip ☐ Meter	11.0		
Filtrate API (ml/30 min)	5.0		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☒ HTHP ☐	2		
Alkalinity, Mud (Pm)	4.6		
Alkalinity, Filtrate (P_f/M_f)	1.0/2.4	/	/
Salt ☐ppm ☐ppg Chloride ☐ppm ☐ppg	3400		
Calcium ☒ ppm ☐ Gyp ppb	160		
Sand Content (% by Vol)	0.1		
Solids Content (% by Vol)	31		
Oil Content (% by Vol)	4		
Water Content (% by Vol)	65		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT

	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge			Desilter		
Degasser	R.G.		Shaker	Brandt	80+60
Desander	M. Logger		Other	M. Cleaner	150

DAILY COST $2058 Thru Jan.
CUMULATIVE COST $265,847 Tot. Exp.

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
16.2	47	4 or Less

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☒ OPERATOR'S REPRESENTATIVE ☐ DRILLING CONTRACTOR ☐ OTHER

RECOMMENDED TOUR TREATMENT		
☐ IMCO BAR		
☐ IMCO GEL		
☒ IMCO ~~BRINEGEL~~ Bulk	190	1600
☒ IMCO RD-111	4	75
☒ IMCO ~~VG-69~~	13	736
☒ IMCO ~~THIN~~ Soda Ash	2	2
☐ IMCO CAUSTIC SODA		
☒ IMCO ~~MB~~ Bicarb	4	24
☐ IMCO POLY RX		
☒ Sage	1	11
☒ Engineer on Loc.	1	88

REMARKS G.I.H. w/ Scraper to clean up Production Liner.
Flush P.S.M.

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
P.E. McAliley	Dayton, Tx	2582765
	WAREHOUSE LOCATION: Galveston, Tx	TELEPHONE: 74[illegible]

Form 515 Rev. 50M 2-80

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IMCO Services

A Division of HALLIBURTON Company
2400 West Loop South, P.O. Box 22605
Houston, Texas 77027 A/C 713 671-4800

DRILLING MUD REPORT

REPORT NO. 2

DATE 3-25 19 81 DEPTH 12702 TD

API WELL NO.	STATE	COUNTY	WELL	S/T

NO.

DATE 7-15-80

FIELD, TOWNSHIP, RANGE BM-A-628

DIVISION GS

PRESENT ACTIVITY	SURFACE	HOLE	PITS	PUMP SIZE X IN:	ANNULAR VEL. (FT./MIN.)
O.O.H.	10 3/4 IN. AT 1500 FT.	378±	450±	4 1/2 9	OPPOSITE DP 137±
BIT SIZE (IN.) / NO.	INTERMEDIATE	TOTAL CIRCULATING VOLUME		PUMP MAKE G.D	OPPOSITE COLLAR 142±
— / —	7 5/8 IN. AT 9268 FT.	828±		MODEL P-2-9	
DRILL PIPE SIZE / TYPE	PRODUCTION OR LINER	IN STORAGE / WEIGHT		BBL./STROKE / STROKE/MIN.	CIRCULATING PRESSURE PSI 2000
— / —	5 1/2 8961-TD IN. AT FT.	AV = 312±		.044 / 100	BOTTOMS UP (MIN.) 65
DRILL COLLAR SIZE / LENGTH	MUD TYPE			gpm 203 BBL./MIN. 4.84	SYSTEM TOTAL (MIN.) 181
— / —					

Sample from ☐ Flowline ☑ Pit
Flowline Temperature 115 °F

MUD PROPERTIES			
	Jd		
Time Sample Taken	4:30 am		
Depth (ft)	12702		
Weight ☑ (ppg) ☐ (lb/cu ft)	16.0		
Mud Gradient (psi/ft)	.832		
Funnel Viscosity (sec/qt) API at ____ °F	45		
Plastic Viscosity cp at ____ °F	29		
Yield Point (lb/100 sq ft)	17		
Gel Strength (lb/100 sq ft) 10 sec/10 min	3/12	/	/
pH ☑ Strip ☐ Meter	11.0		
Filtrate API (ml/30 min)	5.0		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☑ HTHP ☐	2	Ca++	9300
Alkalinity, Mud (Pm)	5.6		
Alkalinity, Filtrate (P_f/M_f)	1.4/3.2	/	/
Salt ☐ ppm ☐ ppb Chloride ☑ ppm ☐ ppb	3400		
Calcium ☑ ppm ☐ Gyp ppb	40		
Sand Content (% by Vol)	0.1		
Solids Content (% by Vol)	31		
Oil Content (% by Vol)	4		
Water Content (% by Vol)	65		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT

	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge	—		Desilter	—	
Degasser	R.S		Shaker	Brandt	80 + 60
Desander	Mi Logs or		Other	—	

DAILY COST $2790.00 Thru I.O.

CUMULATIVE COST $268,637.00 Thru I.O.

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
16.1	47	4 or less

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☑ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT

Materials used

	DAILY	TOTAL
☑ IMCO BAR	40	1M
☐ IMCO GEL		
☑ IMCO ~~BRINEGEL~~ Bulk	25	[illegible]
☑ IMCO RD-111	[illegible]	76
☑ IMCO ~~KC 10~~ L.S	25	[illegible]
☐ IMCO THIN		
☐ IMCO CAUSTIC SODA		
☐ IMCO M D		
☑ IMCO ~~POLY RX~~ Snap	2	
☑ Bicarb	24	48
☑ Engineer on Loc.	1	86

REMARKS O.O.H. To run Bond Log. Also Initial treatment of Bicarb. Dropped Ca++ from 9300 to 5200. Took 13 hours of circulating time to remove Ca from mud. This due in part from extensive Ca++ contamination which also cause high vis & slow circulating time. Thanks PLM

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
P.E. McAliley	Dayton Tx	253 2765
	WAREHOUSE LOCATION	TELEPHONE
	Galveston, Tx	744 5373

Form 515 Rev. 10M 2-80

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Houston, Texas 77027 A/C 713 671 4800

DRILLING MUD REPORT

REPORT NO. 18

DATE 3-26 19 84 DEPTH 12703 TD

API WELL NO.	STATE	COUNTY	WELL	S/T

DATE 2-15-80
SEC. TOWNSHIP, RANGE BM-A-628
SERVICE AC

ENT ACTIVITY		SURFACE	HOLE	PITS	PUMP SIZE X IN.	ANNULAR VEL. (FT./MIN.)
O.O.H		10 3/4 IN. AT 1500 FT.	378	450	4 1/2 9	OPPOSITE BIT 177
SIZE (IN.)	NO.	INTERMEDIATE	TOTAL CIRCULATING VOLUME		PUMP MAKE G.D. MODEL P-2-9	OPPOSITE COLLAR 192
—	—	7 5/8 IN. AT 9268 FT.	828			
DRILL PIPE SIZE	TYPE	PRODUCTION OR LINER	IN STORAGE	WEIGHT	BBL./STROKE STROKE/MIN.	CIRCULATING PRESSURE PSI 2000
—	—	5 1/2 8961 - TD IN. AT FT.	AV = 312		.044 110	BOTTOMS UP (MIN.) 65
DRILL COLLAR SIZE	LENGTH	MUD TYPE			GPM 203 BBL./MIN. 4.84	SYSTEM TOTAL (MIN.) 181
—	—					

Sample from ☐ Flowline ☑ Pit
Flowline Temperature 108 °F

MUD PROPERTIES	IN
Time Sample Taken	4:30 AM
Depth (ft)	12702
Weight ☐ (ppg) ☐ (lb/cu ft)	16.0
Mud Gradient (psi/ft)	.832
Funnel Viscosity (sec/qt) API at ____ °F	45
Plastic Viscosity cp at ____ °F	31
Yield Point (lb/100 sq ft)	17
Gel Strength (lb/100 sq ft) 10 sec/10 min	2/16
pH ☐ Strip ☐ Meter	11.0
Filtrate API (ml/30 min)	5.0
API HP HT Filtrate (ml/30 min) at ____ °F	—
Cake Thickness 32nd in API ☑ HTHP ☐	2
Alkalinity, Mud (Pm)	5.8
Alkalinity, Filtrate (Pf/Mf)	1.6/34
Salt ☐ ppm ☐ ppg Chloride ☑ ppm ☐ ppg	3400
Calcium ☑ ppm ☐ Gyp ppb	40
Sand Content (% by Vol)	0.1
Solids Content (% by Vol)	31
Oil Content (% by Vol)	4
Water Content (% by Vol)	65
Methylene Blue Capacity (ml/ml Mud)	—
Methylene Blue (lb/bbl Bentonite Eq)	—

EQUIPMENT

	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge			Desilter		
Degasser			Shaker	Brandt	80 60
Desander	M. Hogger		Other		

DAILY COST $ 2406.00 Incl Tax * CUMULATIVE COST 271,043 Tax Inc

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
16.1	47	4 or Less

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☑ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT

☐ IMCO BAR		1155
☐ IMCO GEL		
☑ IMCO ~~BRINEGEL~~ Bulk *	250	1650
☐ IMCO RD-111		760
☐ IMCO VC-10		75
☐ IMCO THIN		
☐ IMCO CAUSTIC SODA		
☐ IMCO M D		
☐ IMCO POLY RX		
☐		
☑ Engineer on location	1	90

REMARKS O.O.H. to log (Bond log) Pf is high due to chemical interaction b/t previous cement contamination & Bicarb treatment. which costs caustic. Thanks P.S.M. * Adj Bulk cost.

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
P.E. McAliley	Dayton, Tx	2582765
	WAREHOUSE LOCATION	TELEPHONE
	Galveston, Tx	7445377

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2400 West Loop South, P.O. Box 22605
Houston, Texas 77027 A/C 713 671 4800

DRILLING MUD REPORT

REPORT NO. 99
DATE March 28, 1981 DEPTH 12,702

API WELL NO.	STATE	COUNTY	WELL	S/T

74
DATE 5-80
RANGE, TOWNSHIP, SEC M-A-628
PROVINCE 85

PRESENT ACTIVITY	SURFACE	HOLE	PITS	PUMP SIZE X IN.	ANNULAR VEL. (FT./MIN.)
P.O.O.H.	10 3/4 IN. AT 1500 FT.	378	450	4 1/2 X 9	.0175 DP 196 ±
BIT SIZE (IN.) / NO.	INTERMEDIATE	TOTAL CIRCULATING VOLUME		PUMP MAKE 6.D.	.0239 DC 144 ±
4 1/2	7 5/8 IN. AT 9268 FT.	828		MODEL P-Z-9	
DRILL PIPE SIZE / TYPE	PRODUCTION OR LINER	IN STORAGE	WEIGHT	BBL./STROKE / STROKE/MIN.	CIRCULATING PRESSURE PSI 3000
3 1/2 E 13.30	5 1/2 8961 IN. AT TOT.D. FT.	AV= 312		.044 78	BOTTOMS UP (MIN.) 103 ±
DRILL COLLAR SIZE / LENGTH	MUD TYPE Lignosulfonate			GPM 144 BBL./MIN. 3.43	SYSTEM TOTAL (MIN.) 291 ±

Sample from ☑ Flowline ☐ Pit
Flowline Temperature 100 °F

MUD PROPERTIES	IN	OUT
Time Sample Taken	4:30 p.m.	
Depth (ft)	12,702	
Weight ☑ (ppg) ☐ (lb/cu ft)	16.0+	16.0
Mud Gradient (psi/ft)	.832	
Funnel Viscosity (sec/qt) API at 100 °F	45	56
Plastic Viscosity cp at 96 °F	36	
Yield Point (lb/100 sq ft)	15	
Gel Strength (lb/100 sq ft) 10 sec/10 min	2/8	/ /
pH ☑ Strip ☐ Meter	11.0	
Filtrate API (ml/30 min)	4.4	
API HP HT Filtrate (ml/30 min) at ____ °F	—	
Cake Thickness 32nd in API ☑ HTHP ☐	2	
Alkalinity, Mud (Pm)	5.8	
Alkalinity, Filtrate (P_f/M_f)	1.5/3.1	/ /
Salt ☐ ppm ☐ gpg Chloride ☑ ppm ☐ gpg	3500	
Calcium ☑ ppm ☐ Gyp ppb	40	
Sand Content (% by Vol)	0.1	
Solids Content (% by Vol)	31	
Oil Content (% by Vol)	4	
Water Content (% by Vol)	65.0	
Methylene Blue Capacity (ml/ml Mud)	—	
Methylene Blue (lb/bbl Bentonite Eq)	—	

EQUIPMENT	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge	—		Desilter	—	
Degasser	—		Shaker	Brandt	80 x 60
Desander	M. Logger		Other	—	

DAILY COST $ 1650 Thru Inv. CUMULATIVE COST $ 272,693 Thru Inv.

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
16.1	47	4 or Less

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☑ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT		DAILY TOTAL
☑ IMCO BAR	6	120
☐ IMCO GEL		
☑ IMCO ~~DRILL GEL~~ Bulk	50	125
☑ IMCO RD-111	16	76
☑ IMCO ~~VG-10~~ Lig	25	77
☐ IMCO THIN		
☐ IMCO CAUSTIC SODA		
☐ IMCO M D		
☐ IMCO POLY RX		
☐		
☑ Engineer on Location	1	91

REMARKS O.D.H. too Log. Thank P.E.M

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
P.E. McAliley	Dayton, Tx.	258 2765
	WAREHOUSE LOCATION	TELEPHONE
	Galveston, Tx.	744 5373

Form 515 Rev. 50M 2-80

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IMCO Services

A Division of HALLIBURTON Company
2400 West Loop South, P.O. Box 22605

DRILLING MUD REPORT

REPORT NO. 78

DATE 3-28-81

API WELL NO.	STATE	COUNTY	WELL	S/T

NO. 9

DATE 2-15-80

TWSH. TOWNSHIP. BLK. A-628

SURVEY

PRESENT ACTIVITY	SURFACE	HOLE	PITS	PUMP SIZE X IN.	ANNULAR VEL. (FT./MIN.)
O.O.H	10 3/4 IN. AT 1500 FT.	373	450	4 1/2 X 9	.0175 OPEN HOLE 96 ±
SIZE (IN.) / **NO.**	**INTERMEDIATE**	**TOTAL CIRCULATING VOLUME**		**PUMP MAKE** 6.0 / **MODEL** 2.2.9	.0277 OPPOSITE COLLAR 144 ±
— / —	7 5/8 IN. AT 9268 FT.	828			
DRILL PIPE SIZE / **TYPE**	**PRODUCTION OR LINER**	**IN STORAGE** / **WEIGHT**		**BBL./STROKE** / **STROKE/MIN.**	**CIRCULATING PRESSURE PSI** 2000
— / —	5 1/2 IN. AT 1207 FT.	NV = 312		.044 / 78	
DRILL COLLAR SIZE / **LENGTH**	**MUD TYPE** Lignosul Caustic			GPM 144 / BBL./MIN. 3.43	**BOTTOMS UP (MIN.)** 107 ± / **SYSTEM TOTAL (MIN.)** 241 ±
— / —					

Sample from ☐ Flowline ☒ Pit
Flowline Temperature 100 °F

MUD PROPERTIES			
Time Sample Taken	4:30 AM		
Depth (ft)	12702		
Weight ☒ (ppg) ☐ (lb/cu ft)	15.8		
Mud Gradient (psi/ft)	.8216		
Funnel Viscosity (sec/qt) API at ____ °F	45		
Plastic Viscosity cp at ____ °F	38		
Yield Point (lb/100 sq ft)	16		
Gel Strength (lb/100 sq ft) 10 sec/10 min	2/8	/	/
pH ☐ Strip ☐ Meter	11.0		
Filtrate API (ml/30 min)	4.6		
API HP HT Filtrate (ml/30 min) at ____ °F	—		
Cake Thickness 32nd in API ☐ HTHP ☐	2		
Alkalinity, Mud (Pm)	5.6		
Alkalinity, Filtrate (P_f/M_f)	1.5/3.1	/	/
Salt ☐ppm ☐ppg Chloride ☒ppm ☐ppg	3500		
Calcium ☒ ppm ☐ Gyp ppb	40		
Sand Content (% by Vol)	0.1		
Solids Content (% by Vol)	31		
Oil Content (% by Vol)	4		
Water Content (% by Vol)	65		
Methylene Blue Capacity (ml/ml Mud)	—		
Methylene Blue (lb/bbl Bentonite Eq)	—		

EQUIPMENT

	SIZE	HRS/TOUR		SIZE	HRS/TOUR
Centrifuge	—		Desilter	—	
Degasser	—		Shaker	Blanch	80 ea
Desander	M. Loyd		Other	—	

DAILY COST $253.00 Thru Tour. CUMULATIVE COST 272,946 Thru 3m

MUD PROPERTIES SPECIFICATIONS

WEIGHT	VISCOSITY	FILTRATE
16.0	47	4 or Low

BY AUTHORITY ☐ OPERATOR'S WRITTEN ☐ DRILLING CONTRACTOR ☒ OPERATOR'S REPRESENTATIVE ☐ OTHER

RECOMMENDED TOUR TREATMENT

- ☐ IMCO BAR
- ☐ IMCO GEL
- ☐ IMCO BRINEGEL
- ☐ IMCO RD-111
- ☐ IMCO VC-10
- ☐ IMCO THIN
- ☐ IMCO CAUSTIC SODA
- ☐ IMCO M D
- ☐ IMCO POLY RX
- ☐
- ☒ Eng. on Loc

NO TREATMENT

REMARKS O.O.H. after testing liner.
Thank P.S.M.

IMCO REPRESENTATIVE	HOME ADDRESS	TELEPHONE
P.E. McAliley	Dayton Tx	258 2765
	WAREHOUSE LOCATION	**TELEPHONE**
	Galveston Tx	744 5373

Form 515 Rev 10M 2-80

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