

5.3. Mud Report

Phases:

- 36" hole 30" csg. Drilled with sea water with return to sea bed. Filled the hole with spud mud (gel & lime) before setting of 30" csg. Drilled out cement with sea water and displaced with high viscosity mud.
- 26" hole 20" csg. Drilled 17½" pilot hole with mud (gel & lime) and reamed the 26" hole using sea water. Displaced hole with 1200 bbl high viscosity mud (150 sec/qt) before running 20" csg. Drilled out cement with sea water.
- 17½" hole 13-3/8" csg. Displaced sea water with 1000 bbl prehydrated gel. Drilled to 1915 m MW = 1.10 sp.gr./Visc = 35 sec/qt. Lost 250 bbls of mud over the shaker and the desilter while drilling the first part of the 17½" hole. Started to increase the mud weight at 1915 m and at 2200 m the mud properties was MW = 1.16 sp.gr./Visc = 40 sec/qt. Drilled with this mud down to 2540 m and with MW = 1.20 sp.gr./Visc = 45 sec/qt down to 2652 m. Circulated and conditioned the mud before the running of the 13-3/8" casing. Displaced cement with mud.

12" hole 9-5/8" csg.

Drilled cement from 2642 m to 2652 m with mud treated with Sodium Bicarbonate. Due to the expected formation pressure build up the mud properties was gradually built up from 1.25 sp.gr./visc. 40 sec/qt at 2700 m to 1.60 sp.gr./visc. 45 sec/qt. at 3150 m. This mud was used for drilling down to 2350 m, where a pore pressure build up was observed through the "d" exponent, and by fill-in at the bottom after a trip.

At 3500 m the mud properties was built up to 1.75 sp.gr. and visc. 60 sec/qt. which properties was maintained for drilling down to 3790 m.

8 - 3/8" hole

Drilled out cement with mud treated with Sodium Bicarbonate and 2 ppb H<sub>2</sub>S Scavanger. Increased mud weight at 3870 m to 1.82 sp.gr. and visc. to 65 sec./qt. Started to increase the mud weight at 3990 m due to pressure build up. While drilling from 4040 m to 4042 m the mud became gas cut. Circulated and raised mud weight to 2.04 sp.gr. Lost 40 bbls of mud at 4044 m. Reduced mud weight to 2.00 sp.gr. Circulated with 15 spm with 60% mud loss. Lost 200 bbls. Mixed lost circulation material which was spotted in the assumed loss zone. The circulation was reestablished but the well was still flowing. Reduced the yield point from 20 to 15 and increased the mud weight stepwise to 2.11 sp.gr. Lost mud while increasing mud weight and mixed and spotted lost circulation material which stopped the well from flowing.

After spotting the baryte plug and pulling up into the casing at 3940 m the mud was

# DRILLING FLUID PROPERTIES

| DATA    | DEPTH | WEIGHT | VISCOSITY | FILTRATION |               | SAND | METH. BLUE | PH  | VISCOSITY |          | GELS |    | FILTRATE ANALYSIS |           |           |        | RETORT ANALYSIS |          |            | REMARKS AND TREATMENT  |
|---------|-------|--------|-----------|------------|---------------|------|------------|-----|-----------|----------|------|----|-------------------|-----------|-----------|--------|-----------------|----------|------------|--|
|         |       |        |           | CC         | Cake<br>32 nd |      |            |     | %         | PV<br>cp | YP   | In | 10<br>min         | cl<br>ppm | Ca<br>ppm | Pm     | Pf/<br>Mf       | Oil<br>% | Water<br>% |  |
| 9-8-76  | 161   | 1.14   | 125       |            |               |      |            |     |           |          |      |    |                   |           |           |        |                 |          |            | Spud mud   |
| 10-8-76 | 700   | 1.08   | 150       | NC         | 2             | 15   | 25         | 8.0 | 8         | 11       | 3    | 7  | 14000             | 300       | —         | —      |                 |          | 5          | Loosing mud over shaker  |
| 11-8-76 | 700   | 1.08   | 150       | NC         | 2             | —    | 35         | 105 | 28        | 57       | 12   | 55 | 2000              | 1000      |           | 0.4/-  |                 |          | 4          | Opening 26" hole w/sea water                                   |
| 12-8-76 | 700   |        |           |            |               |      |            |     |           |          |      |    |                   |           |           |        |                 |          |            | Run 20" casing   |
| 13-8-76 | 700   |        |           |            |               |      |            |     |           |          |      |    |                   |           |           |        |                 |          |            | Run BOP-stack  |
| 14-8-76 | 1050  | 1.09   | 35        | NC         | 2             | 4    | 25         | 9.0 | 6         | 10       | 3    | 6  | 12000             | 2000      | 12        | 08/12  |                 |          | 8          | Drlg. 17-1/2" hole   |
| 15-8-76 | 1430  | 1.08   | 36        | NC         | 2             | TR   | 30         | 9.0 | 5         | 14       | 8    | 12 | 13000             | 1000      | —         | —      |                 |          | 6          | Lost 250 bbl white drilling                                    |
| 16-8-76 | 1673  | 1.09   | 33        | 9.7        | 2             | 0.5  | 21         | 8.5 | 6         | 16       | 11   | 14 | 13500             | 750       | —         | —      |                 |          | 5          | Drlg.  |
| 17-8-76 | 1914  | 1.12   | 35        | 9.7        | 2             | 1.5  | 20         | 8.0 | 7         | 15       | 6    | 14 | 14000             | 800       | —         | —      |                 |          | 6          | Drlg.  |
| 18-8-76 | 2176  | 1.14   | 38        | 9.7        | 2             | 0.25 | 25         | 8.0 | 7         | 21       | 6    | 9  | 16500             | 800       | —         | —      |                 |          | 7          | Built 500 bbl. of mud with<br>8.5 lbs/bbl LCM to achive p.test |
| 19-8-76 | 2259  | 1.16   | 37        | 5.2        | 2             | 0.25 | 23         | 85  | 7         | 6        | 0    | 11 | 10000             | 320       | —         | —      |                 |          | 9          | Drlg.  |
| 20-8-76 | 2438  | 1.16   | 37        | 5.8        | 2             | 0.25 | —          | 85  | 13        | 9        | 3    | 17 | 11500             | 300       | —         | 0.1/-  |                 |          | 9          | Drlg.  |
| 21-8-76 | 2541  | 1.16   | 40        | 5.1        | 2             | TR   | 29         | 85  | 14        | 10       | 2    | 16 | 12500             | 120       | —         | 0.1/-  |                 |          | 10         | Drlg.  |
| 22-8-76 | 2562  | 1.19   | 47        | 5.0        | 2             | 0.25 | 29         | 85  | 16        | 12       | 3    | 21 | 12500             | 160       | —         | 0.1/-  |                 |          | 10         | Tight hole. Circ ang PQH.                                      |
| 23-8-76 | 2652  | 1.20   | 61        | 4.2        | 2             | TR   | 31         | 85  | 18        | 16       | 2    | 23 | 11500             | 120       | —         | 0.1/-  |                 |          | 11         |  |
| 24-8-76 | 2652  | 1.20   | 73        | 4.3        | 2             | TR   | 32         | 85  | 24        | 15       | 2    | 21 | 11000             | 160       | —         | —      |                 |          | 11         | Working on wear-bushing  |
| 25-8-76 | 2652  | 1.20   | 39        | 8.5        | 2             | TR   | 32         | 105 | 9         | 5        | 0    | 4  | 10500             | 60        | —         | 0.6/-  |                 |          | 11         | logging  |
| 26-8-76 | 2652  | 1.20   | 73        | 4.3        | 2             | TR   | 32         | 85  | 24        | 15       | 2    | 21 | 11000             | 160       | —         | TR/-   |                 |          | 11         | Circ. and run 13-3/8" casing                                   |
| 27-8-76 | 2652  |        |           |            |               |      |            |     |           |          |      |    |                   |           |           |        |                 |          |            | Cemented and tested BOP.                                       |
| 28-8-76 | 2652  | 1.20   | 39        | 8.5        | 2             | TR   | 32         | 105 | 9         | 5        | 0    | 4  | 10500             | 60        | —         | 0.6/-  |                 |          | 11         | Drlg. shoe.  |
| 29-8-76 | 2698  | 1.26   | 38        | 8.5        | 2             | TR   | 35         | 105 | 12        | 9        | 2    | 11 | 8500              | 40        | —         | 0.6/-  |                 |          | 12         | Drlg.  |
| 30-8-76 | 2863  | 1.37   | 54        | 6.0        | 2             | TR   | 27         | 9.0 | 30        | 20       | 3    | 12 | 6000              | 100       | —         | —      |                 |          | 13         | Drlg.  |
| 31-8-76 | 2920  | 1.39   | 42        | 6.0        | 1             | TR   | —          | 9.5 | 19        | 15       | 2    | 10 | 6000              | 120       | —         | 10/1.6 |                 |          | 15         | Stop drlg. Circ. to raise weight                               |
| 1-9-76  | 3000  | 1.50   | 85        | 4.0        | 1             | TR   | 30         | 85  | 48        | 35       | 5    | 25 | 6500              | 140       | —         | 0.1/-  |                 |          | 23         | Drlg.  |
| 2-9-76  |       |        |           |            |               |      |            |     |           |          |      |    |                   |           |           |        |                 |          |            |  |
| 3-9-76  |       |        |           |            |               |      |            |     |           |          |      |    |                   |           |           |        |                 |          |            |  |
| 4-9-76  |       |        |           |            |               |      |            |     |           |          |      |    |                   |           |           |        |                 |          |            | Worked on BOP,   |
| 5-9-76  |       |        |           |            |               |      |            |     |           |          |      |    |                   |           |           |        |                 |          |            | Installed well-head  |
| 6-9-76  |       |        |           |            |               |      |            |     |           |          |      |    |                   |           |           |        |                 |          |            | adapter  |
| 7-9-76  |       |        |           |            |               |      |            |     |           |          |      |    |                   |           |           |        |                 |          |            |  |
| 8-9-76  |       |        |           |            |               |      |            |     |           |          |      |    |                   |           |           |        |                 |          |            |  |
| 9-9-76  | .618  | 1.48   | 52        | 6.0        | 2             | —    | 28         | 105 | 30        | 21       | 5    | 45 | 7000              | 2800      | —         | 13/23  |                 |          | 17         | Drlg cement.plug.  |
| 10-9-76 | 2810  | 1.52   | 85        | 4.0        | 1             | TR   | 40         | 85  | 66        | 31       | 5    | 30 | 8000              | 350       | —         | —      |                 |          | 21         | Reamed and washed  |
| 11-9-76 | 3010  | 1.52   | 95        | 4.0        | 1             | TR   | 40         | 80  | 68        | 38       | 8    | 33 | 7000              | 350       | —         | —      |                 |          | 19         | Reamed and drlg.   |
| 12-9-76 | 3107  | 1.55   | 75        | 4.4        | 1             | —    | 45         | 80  | 62        | 42       | 8    | 38 | 6500              | 400       | —         | —      |                 |          | 22         | Drlg.  |
| 13-9-76 | 3157  | 1.59   | 55        | 4.9        | 2             | TR   | 40         | 85  | 37        | 13       | 1    | 13 | 6000              | 240       | —         | 0.1/-  |                 |          | 21         | Drlg.  |
| 14-9-76 | 3249  | 1.60   | 40        | 4.0        | 2             | TR   | 35         | 90  | 41        | 11       | 2    | 4  | 5600              | 160       | —         | 0.15/- |                 |          | 22         | Drlg.  |
| 15-9-76 | 3298  | 1.60   | 62        | 3.9        | 2             | TR   | —          | 100 | 46        | 18       | 2    | 13 | 5900              | 80        | —         | 0.6/-  |                 |          | 22         | Drlg.  |
| 16-9-76 | 3327  | 1.60   | 60        | 3.8        | 2             | TR   | 35         | 100 | 50        | 21       | 3    | 12 | 5700              | 80        | —         | 0.6/-  |                 |          | 23         | Drlg.  |
| 17-9-76 | 3378  | 1.65   | 59        | 3.9        | 2             | TR   | 30         | 95  | 51        | 23       | 3    | 15 | 5800              | 80        | —         | 0.6/-  |                 |          | 25         | Drlg. - some bit-balling                                       |
| 18-9-76 | 3422  | 1.69   | 60        | 4.3        | 2             | TR   | —          | 95  | 49        | 19       | 2    | 15 | 5700              | 80        | —         | 0.6/-  |                 |          | 26         | Drlg.  |
| 19-9-76 | 3475  | 1.73   | 58        | 4.1        | 2             | TR   | 30         | 95  | 55        | 16       | 1    | 10 | 6000              | 80        | —         | 0.8/-  |                 |          | 26         | Drlg.  |
| 20-9-76 | 3512  | 1.75   | 64        | 3.9        | 2             | TR   | 30         | 95  | 59        | 22       | 2    | 13 | 6100              | TR        | —         | 0.5/-  |                 |          | 26         | Drlg.  |
| 21-9-76 | 3538  | 1.75   | 60        | 3.9        | 2             | TR   | 31         | 9.0 | 54        | 19       | 2    | 10 | 6100              | 20        | —         | 0.5/-  |                 |          | 26         | Drlg.  |

TABLE A.4

**DRAWING FOUND PROPERTIES**

| DATA     | DEPTH<br>m | WEIGHT<br>Sp. gr. | VISCOSITY<br>Sec | FILTRATION |               | SAND<br>% | METH. BLUE | PH   | VISCOSITY |    | GELS |           | FILTRATE ANALYSIS |           |     |           | RETORT ANALYSIS |            |        | REMARKS AND TREATMENT         |
|----------|------------|-------------------|------------------|------------|---------------|-----------|------------|------|-----------|----|------|-----------|-------------------|-----------|-----|-----------|-----------------|------------|--------|-------------------------------|
|          |            |                   |                  | CC         | Cake<br>32 nd |           |            |      | PV<br>cp  | YP | In   | 10<br>min | cl<br>ppm         | Ca<br>ppm | Pm  | Pf/<br>Mf | Oil<br>%        | Water<br>% | Solids |                               |
| 22-9-76  | 3572       | 1.75              | 58               | 38         | 2             | TR        | —          | 10.0 | 52        | 19 | 2    | 9         | 5900              | 0         |     | 08/-      |                 |            | 27     | Drlg.                         |
| 23-9-76  | 3583       | 1.75              | 62               | 39         | 2             | —         | —          | 9.5  | 56        | 24 | 2    | 12        | 6100              | 0         |     | 07/-      |                 |            | 27     | Drlg.-logged hole             |
| 24-9-76  | 3610       | 1.75              | 67               | 38         | 2             | —         | 31         | 9.5  | 56        | 20 | 2    | 14        | 6300              | 0         |     | 05/-      |                 |            | 28     | Drlg.                         |
| 25-9-76  | 3644       | 1.75              | 62               | 39         | 2             | —         | —          | 9.5  | 56        | 21 | 1    | 10        | 6300              | 0         |     | 05/-      |                 |            | 27     | Drlg.                         |
| 26-9-76  | 3681       | 1.75              | 62               | 37         | 2             | —         | —          | 9.5  | 54        | 21 | 1    | 10        | 6200              | 0         |     | 04/-      |                 |            | 27     | Drlg.                         |
| 27-9-76  | 3700       | 1.75              | 62               | 33         | 2             | —         | 40         | 9.5  | 63        | 29 | 4    | 15        | 6000              | 20        |     | 04/-      |                 |            | 27     | Drlg.                         |
| 28-9-76  | 3743       | 1.75              | 63               | 35         | 1             | —         | 37         | 9.5  | 58        | 23 | 5    | 20        | 5600              | 50        |     |           |                 |            | 26     | Drlg.                         |
| 29-9-76  | 3772       | 1.75              | 65               | 36         | 1             | —         | 38         | 9.5  | 58        | 23 | 4    | 18        | 6000              | 100       |     |           |                 |            | 25     | Drlg.                         |
| 30-9-76  | 3789       | 1.75              | 60               | 34         | 2             | —         | 38         | 9.0  | 55        | 23 | 4    | 18        | 6000              | 100       |     |           |                 |            | 26     | Drlg. logged 12" hole         |
| 1-10-76  | 3789       | 1.75              | 55               | 35         | 1             | —         | 38         | 9.0  | 49        | 21 | 5    | 19        | 6000              | 100       |     |           |                 |            | 26     | Circ. to run 9 5/8" casing.   |
| 2-10-76  | 3789       |                   |                  |            |               |           |            |      |           |    |      |           |                   |           |     |           |                 |            |        | Run 9 5/8" casing             |
| 3-10-76  | 3789       |                   |                  |            |               |           |            |      |           |    |      |           |                   |           |     |           |                 |            |        | Cemented. Testedd BOP         |
| 4-10-76  | 3792       | 1.74              | 65               | 4.0        | 2             | —         | 4.0        | 12.0 | 47        | 25 | 5    | 20        | 8000              | 160       | 6.0 | 3.0/5.5   |                 |            | 28     | Run in with 8 3/8" bit. Drlg. |
| 5-10-76  | 3819       | 1.73              | 55               | 4.0        | 2             | —         | 4.0        | 10.5 | 39        | 18 | 4    | 13        | 6000              | 150       | 2.5 | 1.8/2.2   |                 |            | 27     | Drlg. Mixing Milgard. 2 ppg   |
| 6-10-76  | 3867       | 1.75              | 60               | 4.0        | 1             | —         | 35         | 10.5 | 48        | 16 | 3    | 16        | 4000              | 80        | 1.8 | 1.1/2.3   |                 |            | 30     | Drlg. Gradual increased MW    |
| 7-10-76  | 3880       | 1.82              | 70               | 4.0        | 1             | —         | 35         | 10.0 | 59        | 22 | 3    | 15        | 4200              | 60        | 1.6 | 0.7/2.0   |                 |            | 30     | Drlg.                         |
| 8-10-76  |            |                   |                  |            |               |           |            |      |           |    |      |           |                   |           |     |           |                 |            |        | Repaired heave compensator    |
| 9-10-76  | 3900       | 1.81              | 55               | 4.0        | 1             | —         | 30         | 9.5  | 50        | 16 | 3    | 14        | 4500              | TR        | 0.8 | 0.4/1.8   |                 |            | 30     | Drlg.                         |
| 10-10-76 | 3929       | 1.81              | 60               | 4.0        | 1             | —         | 38         | 8.5  | 56        | 18 | 3    | 14        | 5800              | 100       | 0.3 | 0.1/0.6   |                 |            | 31     | Drlg.                         |
| 11-10-76 | 3937       | 1.81              | 63               | 4.0        | 1             | —         | 38         | 8.5  | 55        | 21 | 3    | 19        | 5500              | 120       | 0.4 | 0.1/1.0   |                 |            | 30     | Circ. and coring              |
| 12-10-76 | 4019       | 1.88              | 76               | 4.0        | 2             | —         | 38         | 8.5  | 65        | 28 | 5    | 37        | 5500              | 100       | —   | —         |                 |            | 33     | Coring. Drlg.                 |
| 13-10-76 | 4044       | 2.00              | 70               | 4.0        | 1             | —         | 38         | 9.0  | 59        | 23 | 3    | 20        | 5500              | 120       |     |           |                 |            | 35     | Drlg. Lost circulating        |
| 14-10-76 | 4044       | 2.03              | 58               | 4.0        | 2             | —         | 38         | 8.5  | 50        | 20 | 3    | 15        | 5500              | 100       |     |           |                 |            | 35     | The well was loosing          |
| 15-10-76 | 4044       | 2.10              | 52               | 4.0        | 1             | —         | 35         | 9.0  | 45        | 10 | 3    | 10        | 5800              | 120       |     |           |                 |            | 35     | and flowing. Mixed            |
| 16-10-76 | 4044       | 2.05              | 50               | 4.0        | 1             | —         | 35         | 8.5  | 49        | 8  | 3    | 8         | 6000              | 120       |     |           |                 |            | 35     | LCM and increased             |
| 17-10-76 | 4044       | 2.08              | 58               | 4.0        | 1             | —         | 35         | 8.5  | 55        | 12 | 3    | 14        | 5700              | 140       |     |           |                 |            | 36     | the mud weight.               |
| 18-10-76 | 4044       | 2.11              | 52               | 4.3        | 2             | —         | 33         | 9.0  | 50        | 17 | 1    | 9         | 5600              | 120       |     | 0.2/-     |                 |            | 36     | Logged and plugged            |
| 19-10-76 |            |                   |                  |            |               |           |            |      |           |    |      |           |                   |           |     |           |                 |            |        | the well.                     |

TABLE A.4