**CBM 93-003, 1-2-2010; Notes on the gas detection system and the results obtained during the drilling of CBM 93-003 and CBM 93-004**

**1) RELATIVE GAS READINGS**

**a/** Total Gas readings were not correlating well with chromatograph readings

**b/** Total Gas is reading relatively high, in the 6 1/8" hole on both CBM 93-004 and CBM 93-003 standard carbide package was circulated and gave 160 units and 150 units of gas in these wells.

**c/** Both Systems have been extensively tested and record well with test gas and calibration gas. A modest amount of calibration gas was put in the gas trap and recorded the following relative values:

25 units Total Gas (above background)
C1 992 ppm
C2 197 ppm
C3 142 ppm
iC4 122 ppm
nC4 112 ppm
iC5 102 ppm
nC5 95 ppm
CO2 489 ppm

A rough estimation of equivalent "Chromatograph Total Gas" excluding CO2 would be about 13 units.

**d/** The highest readings recorded in CBM 93-003 came from the interval 850m to 860m with the highest reading for total gas being 30 units, being about 25 units above background. The highest reading from the chromatograph was only was a maximum C1 20ppm; C2 3ppm, roughly equivalent to 0.1 unit total gas.

**e/** This has been an ongoing problem with the gas readings, that I was concerned with from the onset of drilling CBM 93-004. The problem was addressed diligently by Weatherford mudloggers and technicians in Singapore. I was not on the latter part of CBM 93-004; however the recorded results demonstrate inconsistency between total gas and chromatograph readings. At the onset of CBM 93-003 drilling I was on the verge of calling for a new chromatograph to be sent out to the rig, however again in test and instrument calibration the equipment performed, albeit that the total gas demonstrated higher sensitivity as indicated by carbide and tests as detailed in points a/ and b/ above. During normal operating conditions, long periods of circulation while drilling, more erratic gas responses were observed.

**f/** Reexamination of the unedited data for the interval 850m to 860m in CBM 93-003 revealed the following:

**i/** The peak reading of 30 units of gas at 851m had no corresponding chromatograph readings; the mudlog shows some values however these were delayed significantly, by 10 minutes.

**ii/** Perhaps the same problem was effecting the gas measurements as was also effecting this geologist in certain ways, specifically the very high temperatures during the day, with maximum temperatures of 48 -49 $^{o}$ C in the shade recorded on several days.

**iii/** The symptoms of the gas recording and lack of correlation between total gas and chromatograph values and abnormally high total gas, suggest that there is a condensation problem. The gas system is fitted with a Calcium Carbide scrubber to remove water vapour before it reaches the total gas and chromatograph however it is probable that the scrubber is easily overloaded. The gas collection system, the gas trap and lines to the mudlogging unit are exposed to the sun, and with the intense radiant heat these are likely to be heated, likely 100$^{o}$ C or greater, even the plastic lines. There was a condensation bottle near the gas trap however this probably aided in supercharging the gas system with water vapour.

**2/ RECOMMENDATIONS**

**a/ Input gas sample line should enter the mudlogging shack via the opening that houses the air conditioner. The line should enter a condensation bottle mounted directly adjacent to the air conditioner within the mudlogging shack.**

**b/ A condensation bottle should not be placed near the gas trap exposed to radiant heat. Shading of the gas trap and lines could be considered.**

**c/ Calcium Carbide scrubber, more regular maintenance?**

**If these measures do not improve gas reading consistency, Weatherford should have a backup chromatograph to send to rig site on short notice.**

**3/ GENERAL COMMENT ON GAS READINGS**

**a**/ In the 3.8" hole with core bit the volume rock cut is relatively small, even with a 5 m/hr, a general average drill rate as a consequence the amount of gas liberated during drilling could be small. On the other hand hole annular volume is also small, as is volume of mud pumped**.**

**b/** Following drilling of CBM 93-004 it was recommended that positioning of the gas trap be improved and that air gaps in the flowline be eliminated. In CBM 93-004 the gas trap was positioned within the flowline, towards the end of it where the mud is discharged to the mud pit, about 4.5m from the well head within a gap cut into the top of the flowline. A small dam was created downstream from the trap to allow sufficient depth of mud for the gas trap to operate. The flowline consisted of 18cm plastic tube. It was reported that there were problems with this setup particularly when sand stated caving from uphole, in particular unconsolidated Jurassic sands, with the effect that the dam in the flowline became a problem.

**c/** In setting up the flowline following the running of 4 ½" casing in CMB 93-003 all observation ports were eliminated by installing a new flowline. Mud flowed down the flowline 5m, pouring into a vessel with sufficient depth for the gas trap to operate and with the gas trap placed close to where the mud poured into this vessel.

**d/** Some consideration was given to Installing  a possum belly closer to the wellhead however a practical design did not emerge at the time of setup. Given the nature of the drilling fluid it could well be that any gas within the fluid could well be substantially reduced as it flowed done the flowline?

M.R. Harrison 1/2/10