TELEX. 45-556

AMAX EXPLORATION, INC.
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MEMORANDUM

TO: LL&E (Bob Sellers) and Anadarko (Bob Edmiston)

SUBJECT: Comments on the Temperature Logs from the AMAX #1 Livermore Well

FROM: William M. Dolan

DATE: March 28, 1979

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Data Acquisition

Obtaining accurate temperature data from the AMAX #1 Livermore Well continues to be a challenge, to wit:

(1) AMAX forgot to bring the maximum reading thermometers.

(2) GO's temperature tool failed at 8250 feet. They replaced it with a tool that read 26 degrees higher (the evidence indicates that the first tool was more correct).

(3) The GO differential trace behaved poorly and infrequently.

(4) The Agnew & Sweet tool reads significantly lower than GO's and the departure also systematically increases with depth (approximately 2 degrees F/1000 feet). We suspect the Agnew and Sweet tool is slightly pressure sensitive.

Observation

(1) A comparative examination reveals the recent logs to have the same general form. They depart from the November 30 log in both the top and bottom regions. The top part is understandable in that equilibration would have still been proceeding in that portion of the hole on November 30. The bottom part is less comprehensible and requires discussion.

(2) From 100 to 2500 feet, the gradient established by both logs is approximately 3.3 degrees F/100 feet (60 degrees C /km).

(3) From 2500 to 5000 feet, the gradients are about 3.8 degrees F /100 feet (69.3 degrees C/km) which was the gradient forecast for the well from the shallow temperature data.

(4) From 5000 to the fault zone at 5770 feet, a smooth positive excursion is witnessed on all three logs in a nearly identical fashion.

(5) At 5770 feet on the two later logs, an abrupt negative excursion asymptotically approaches a new gradient of 2.2 degrees F /100 feet (40 degrees C/km) whereas the November 30 log was essentially a smooth function with a clear suggestion that it was endeavoring to return to the 3.8 degrees F/100 feet trend.

(6) The disparate behavior of the logs from 7000 feet downward contradicts normal expectations, i.e. that portion of the hole, having been least effected by drill fluid cooling, was to be essentially equilibrated by November 30, 1978 and accordingly was not expected to be significantly different in March.

(7) There are two notable excursions (negative) from the pattern witnessed on both GO logs. One is at 4700 feet and the other at 8500 feet. The first corresponded with the known water entry that terminated the aerated mud effort. The second resulted in a loss of 1000 barrels of mud in the course of drilling. There are also several other very minor negative excursions seen on the March 5 log.

The curious aspect of the 3700 and 8500 feet events is that they have exhibited a negligible tendency to equilibrate during a 3 month period.

(8) March 5 GO and March 8 A&S logs project back to a surface temperature of about 56 degrees F which correspond with the estimated mean annual temperature.

Conclusions

(1) The GO and A&S logs provide reasonably consistent relative portrayals.

(2) The GO logs are favored for absolute temperatures (November 30 - 342 degrees F, bottom hole; March 5 - 338 degrees F, bottom hole) for the following reasons:

(a) Both GO and A&S start from approximately the same origin (56 degrees F).

(b) The departure is a fairly consistent 2 degrees F/1000 feet.

(c) The A&S instrument is the most likely to be affected by pressure.

(3) The lack of equilbration at 4700 feet and 8500 feet implies fluid movement in the well.

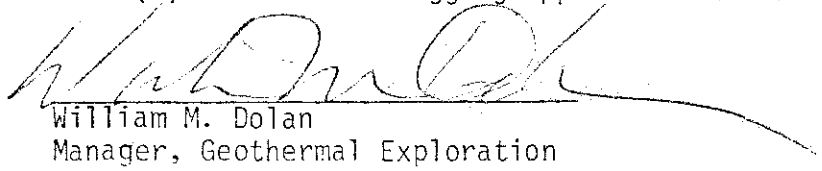
(4) The temperature patterns from 5000 feet to 7000 feet are consistent with the well having penetrated a high angle thermal conduit (fault zone?).

(5) The inconsistent behavior of the negative excursions below 5770 feet is tentatively attributable to a little understood fluid movement with the well.

(6) One cannot safely predict the depth to dry steam temperatures by any gradient projection from these logs.

(7) We should retain Dave Blackwell for purposes of attempting to quantitatively fit a model to the data.

(8) No further logging appears to be warranted.



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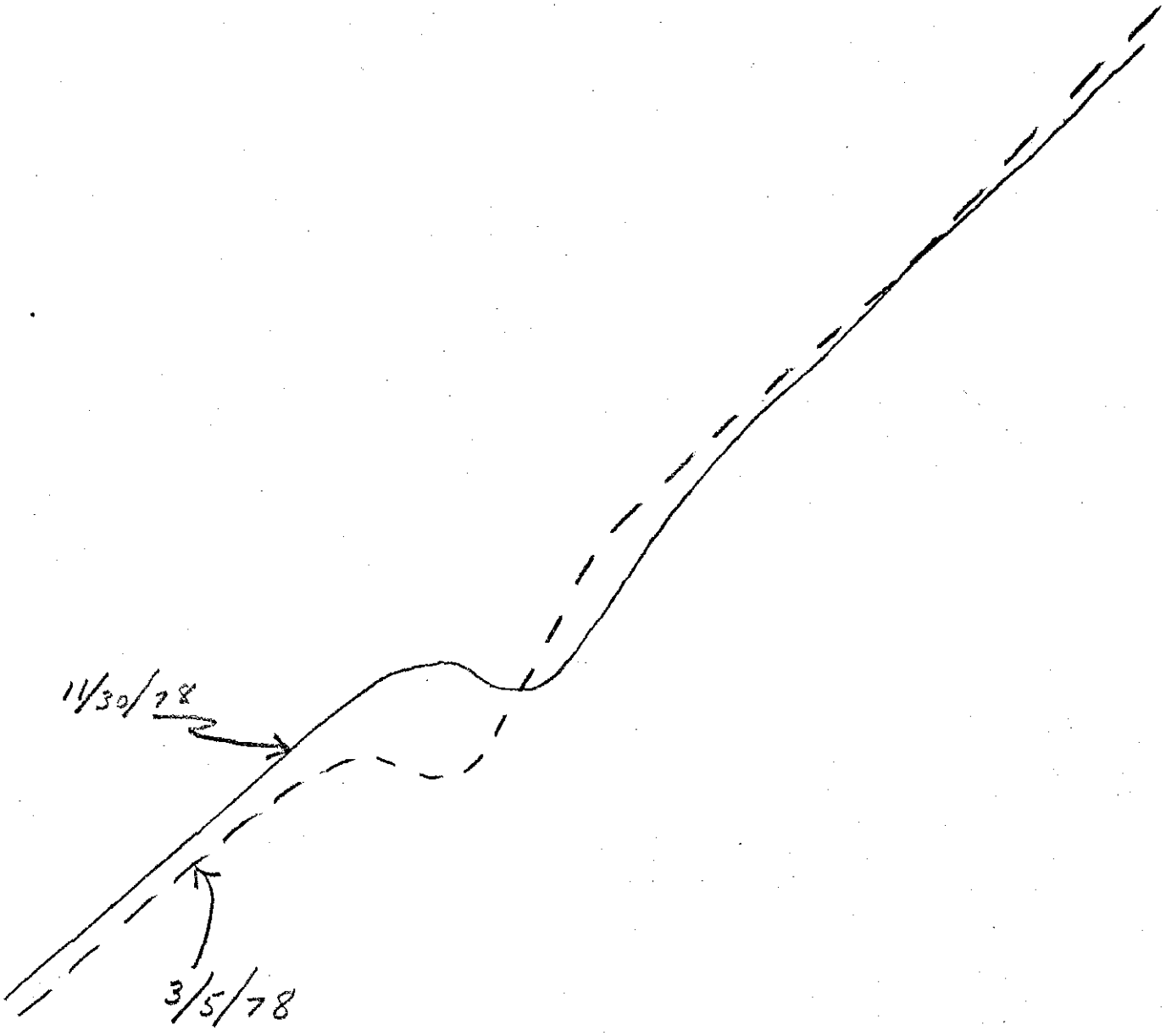
WMD:mp

AMAX No. 1 Livermore
GO Log Comparison



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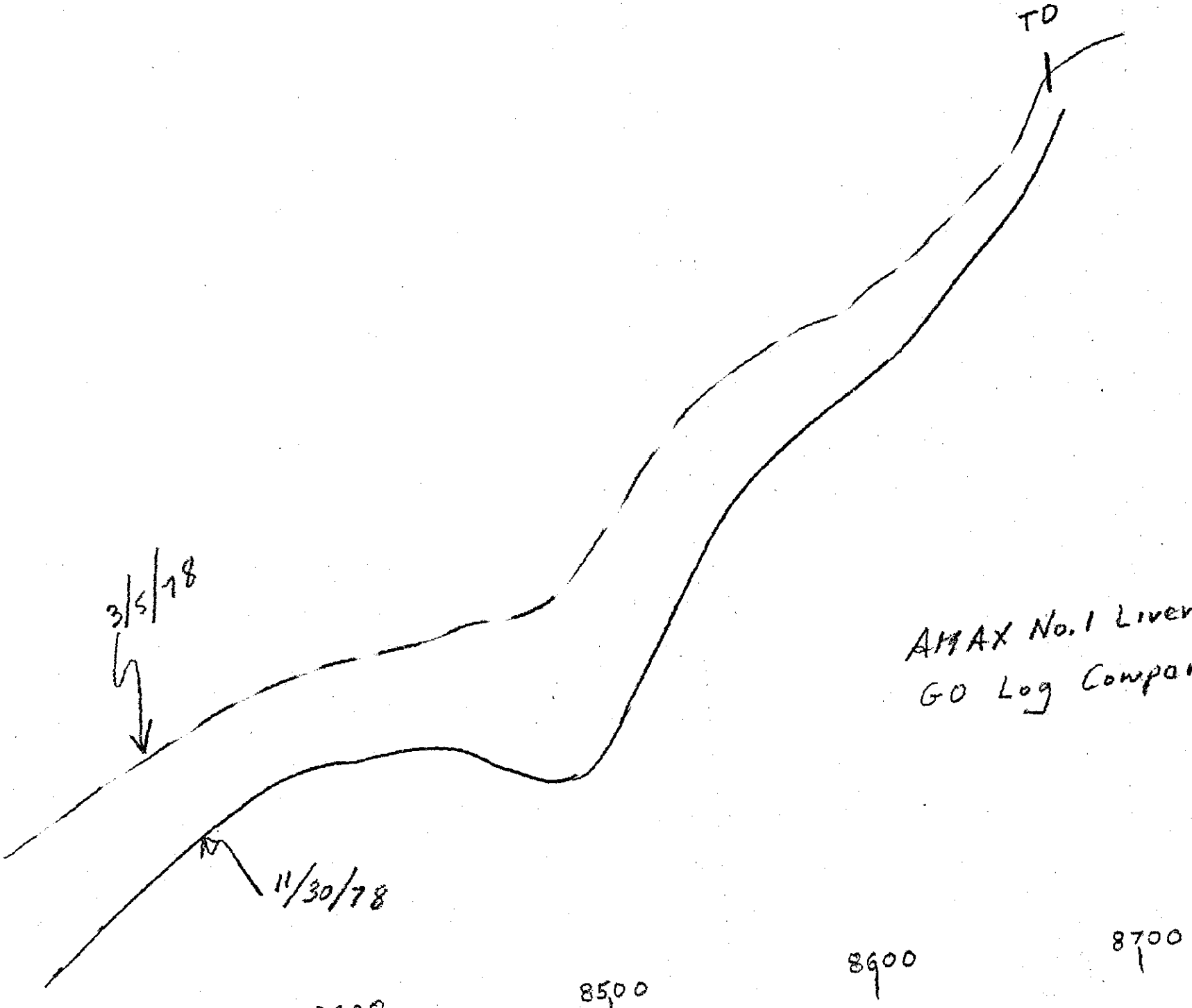

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