

Log Analysis 82 -33

Problems of injection into well 82 -33 have caused us to examine possible alternative actions. The main idea is to take remedial action without shutting in well 54.3. To accomplish this, work must be completed in no more than 4 or 5 days, which is the estimated time it would take to fill the reserve pit at 54 - 3.

One of the proposals, discussed in this report, is the disposal of fluids into a higher zone presently located behind the casing. This zone was intersected in drilling at 1655' and resulted in complete loss of returns (see attached drilling report). Circulation was never regained using LCM. It was necessary to bypass the zone by drilling ahead, running casing, and cementing the casing in two stages.

Based on our difficulty in sealing the zone, it appears to be a likely candidate for the disposal of test fluids. One concern in using it is the possibility that it is connected in some way with the shallow ground-water system. We have no means of determining if this possibility is real short of injection into the zone.

What are some of the possible consequences of injecting into the zone at 1655'? For convenience some of the possibilities are listed in outline form.

Case I : The injected fluids are confined beneath an impermeable cap and do not enter the shallow ground water system.

A. Confinement, but there is leakage back into that portion of the reservoir being produced. Effect: Possible effect, which is difficult to access, on the reservoir and/or on the test results.

Log Analysis 82 - 33

Problems of injection into well 82 - 33 have caused us to examine possible alternative actions. The main idea is to take remedial action without shutting in well 54.3. To accomplish this, estimated work must be completed in no more than 4 or 5 days, which is the

- B. Confinement, with no leakage back into the producing part of the reservoir. Effect: None. This is "Fat City".

Case II: The injected fluids leak or migrate into the shallow ground-water system.

- A. Migration of the fluids southward into the Milford irrigation district. Effect: Possible significant degradation of irrigation water by addition of boron and sodium chloride resulting in crop failures. If this were to happen we would literally buy the farm or farms as the case may be. Fortunately ground-water flow in the basin is from south to north.
- B. Migration of fluids northward into the irrigation area situated along the western slopes of the Mineral Range. Effect: Same as A above. The irrigated area is much smaller, only about 1200 acres, so that the potential loss is much less than in A.
- C. Migration of fluids west down hydraulic gradient and then north. Effect: Quality degradation of stock water. Existing water source in the potential impact area are already mixtures of reservoir water and other water types. The water is generally of poor quality, but an additional influx of reservoir water will certainly lower its quality even more.
- D. Leakage to the surface, with flow probably west and north. Effect: Possible severe erosion along the channel with possible flooding of the poorly drained low lands. The potentially impacted lands are used only for seasonable grazing and they are not much good for that.

We do know that geothermal reservoir waters are naturally leaking into the shallow ground water system, but we don't know precisely where. If there was communication between the injection zone and the shallow ground water reservoir, the most likely effect would be II C. The greatest disaster would result from II A. II D would be bad because it would be highly visible, but the ground water table is quite deep in this area so there is not much likelihood of surface flow.

If it becomes necessary, we can inject into the upper zone in 82 - 33 and rely upon our water observation well system to give us warning. The following is a log fracture analysis for the depth interval between 1550' and 1750'. Depth from K B, 21 ft. above G L.

The FDC log indicates two fractured intervals at between 1589 and 1635' and 1642' and 1673'. The most significant fracture/s is/are found in the interval 1658' to 1662' (Fig. 1). The caliper indicates fractures between 1610' and 1636' and between 1658' and 1672' (Fig. 1).

BHC log indicates fracturing between 1584 and 1669'. The most significant fracture/s is/are found in the interval 1656' to 1661' (Fig. 2).

The Induction log indicates fractures in the intervals 1611 - 1633' and 1655' - 1663' with the second being the most significant (Fig. 3).

DAILY REPORT DETAILED

LEASE ROOSEVELT KGRAWELL NO. 82-33SHEET NO. 2

DATE	TOTAL DEPTH	NATURE OF WORK PERFORMED
------	----------------	--------------------------

11-12-75	616	<p>WOC.</p> <p>Recovered all of fish. Circ & cond hole. Ran 14 jts, 575', 13 3/8" OD, 54.5#, K-55 R3, BT&C casing, set at 575'. (Unable to get casing below 575') Cemented w/500 sx class B cement, 1:1 perlite, 40% silica flour, 2% gel, 2/10% CFR, 4/10% HR-4, 13.8#/gal. Pumped plug to 537' at 10:00 a.m., 11-12-75, good returns. Circ est 100 sx good cement.</p>
11-13-75	616	<p>Nippling up.</p> <p>WOC 21 hrs, 3 hrs cut-off 20" & 13 3/8" casing. Cement around 13 3/8" casing settled to 21' below bottom of cellar. Will fill to surface w/pea gravel.</p>
11-14-75	616	<p>Testing BOP's.</p> <p>Cut off casing, installed BOP stack. Tested casing to 1000#, blind rams to 1200#, pipe rams to 1100# and hydril to 600#, 30 mins each, held OK.</p>
11-15-75	745	<p>Drilling quartz diorite.</p> <p>Finished nippling up. Drilled cement and reamed 25 feet to bottom. Started 12 1/4" hole at 616'.</p>
11-16-75	1094	<p>Drilling diorite.</p> <p>Flow line temperature at 1085', 110°F in, 118°F out.</p>
11-17-75	1410	<p>Drilling quartz diorite.</p> <p>Totco 1 1/4 Deg at 1101'. Flow line temperature at 1390', 120°F in, 128°F out.</p>
11-18-75	1623	<p>Drilling granodiorite.</p> <p>Trip for bit at 1562'. Totco 2 deg at 1562'. Flow line temp at 1595', 114°F in, 124°F out.</p>
11-19-75	1678	<p>Mixing mud.</p> <p>Drilled to 1655', lost complete returns. Mixed and pumped in 3 LCM pills, no returns. Mixed pit of mud, 20% LCM. Pumped in and drilled to 1662', no returns (Appears to be 2' fracture 1655'-57'.) Drilled to 1669', no returns. Mixed pit of mud w/30% LCM, pumped in and drilled to 1678', no returns, apparently through fractures. Lost approximately 1,400 bbls mud.</p>

DAILY REPORT DETAILED

LEASE ROOSEVELT KGRAWELL NO. 82-33SHEET NO. 3

DATE	TOTAL DEPTH	NATURE OF WORK PERFORMED
------	----------------	--------------------------

11-20-75	1678	Mixing mud. Mixed 300 bbls mud, 35% LCM, 8.6 #/gal., Vis 70, FC 2/32, filled hole to 50' from top. Mixed pit of mud, 35% LCM, pumped in hole, filled to 110' from top. Mixed pit of mud, pumped in with no returns. Pumped 100 Bbls in DP and 25 Bbls in annulus, no returns. Mix High Wtr Loss pill, flushed to btm, no returns. COOH, WIH w/open ended DP to Td. Mixing mud.
11-21-75	PTD 1647 OTD 1678	Lost circulation. Mixed pit of mud and LCM. Spotted 50 sx Class B cement, 4% CaCl ₂ , WOC 4 hrs. Tag top of cement at 1656'. Sptd 50 sx Class B cement, 4% CaCl ₂ and COOH w/DP. Ran wooden float on WL, left float and 300' WL in hole, no fluid in hole. Rec Fish. WIH open ended, tagged top of cement at 1647'. Spotted 50 sx Class B cement, 4% CaCl ₂ . WOC 4 3/4 hrs. Tagged top of cement at 1647', no fill.
11-22-75	OTD 1678 PTD 1647	Lost circulation. Dropped 2 tons alfalfa cubes and 300 BW in hole. Went in hole w/bit, no fill up. Dropped 1 1/2 tons alfalfa cubes in hole. Went in hole w/bit, no fill up. Dropped 200 gel-soaked burlap sacks in hole, followed w/1 1/2 tons alfalfa cubes, followed w/200 bbls. mud, 30-35% LCM. Mixed pit of mud and LCM. Went in hole w/bit, no fill up.
11-23-75	OTD 1678 PTD 1650	Lost circulation. Came out of hole. Dumped 200 gelled Burlap sacks, 3 tons 6" to 9" lump coal and 2 tons alfalfa cubes in hole, hole filled up. Went in hole, drilled intermittent bridges and LCM to 1650' and lost complete returns. Came out of hole, Shut in 2 1/2 hours for gas sample. Analysis showed 10,000 ppm CO ₂ and trace of H ₂ S. Started dropping burlap sacks in hole.
11-24-75	1678	Lost circulation. Dropped 180 gelled burlap sacks, 1 ton 6" to 9" lump coal, 2 1/2 tons alfalfa cubes and 2 tons coal in hole. Went in w/bit, drld bridges 300 to 700'. Down 2 hrs. mixing mud and raising viscosity. Came out of hole, picked up 10 DC's and went in hole. Drilled bridges to 750', lost complete returns, went to 1670', hole clear. Came out of hole. Dropped 7 (10" OD x 15' long) plastic rolls filled w/mud, followed w/gel mud. Went in hole w/bit, hole clear to 1678'. Started loading hole with coal.

DAILY REPORT DETAILED

LEASE ROOSEVELT KGRA

WELL NO. 82-33

SHEET NO. 4

DATE	TOTAL DEPTH	NATURE OF WORK PERFORMED
------	----------------	--------------------------

11-25-75	1678	<p>Lost circulation.</p> <p>Dropped 2 tons lump coal in hole. Mixed pit of mud and LCM. WIH w/bit, drld small bridges 750' to 1575' and plugged bit. WIH, drld bridges to 1650' and lost complete returns, COOH. WIH w/open-ended DP to 1509'. Mixed and sptd. 150 sx Barite plug on btm, Waited $\frac{1}{2}$ hr., tagged btm., no fill. Mixed and sptd 150 sx Barite plug on btm., no fill. COOH, mixed pit of mud and LCM.</p>
11-26-75	1728	<p>Drilling granodiorite.</p> <p>Dropped in 400 plastic bags filled w/wood chips and Barite, flushed w/400 bbls mud, no fill. Cleaned and filled pit, mixed mud. WIH w/open ended DP to 1256'. Flushed w/420 gals Diesel oil, followed w/840 gals diesel oil mixed w/6 gals DOC No. 12 and 200 sx Class B cement, 4% CaCl_2, flushed w/210 gals diesel oil and 14 Bbls wtr. COOH, WIH w/drlg assy, no fill. Drilled 1678-1728 in $4\frac{1}{2}$ hrs, no returns.</p>
11-27-75	1853	<p>Drilling granodiorite.</p> <p>Drilling 12 hrs. without returns, WO water 12 hrs.</p>
11-28-75	1960	<p>Drilling granodiorite.</p> <p>9 hrs., drilling without returns, 15 hrs., WO water.</p>
11-29-75	2004	<p>Logging.</p> <p>Drilled to 2004' without returns. 2 hrs WO water. Ran Schl sonic log, mis-run. Ran Density-Caliper log. Reran Sonic log, mis-run. Max BHT 210°. Ran direction and deviation survey. 2 deg 30 min, North 78° 28'W at 1992'. Horiz displacement 29.7.</p>
11-30-75	2004	<p>Logging.</p> <p>Ran Schlumberger Sonic log, Induction log failed. WIH w/DP, COOH, LDDC & $4\frac{1}{2}$" DP. PU 7" DC's. Ran Agnew and Sweet temperature survey. Max BHT 254° at 1500', 229.2° at 1990'.</p>
12-01-75	2004	<p>Coming out of hole with magnet.</p> <p>Completed Schlumberger Induction log. PU 7" DC's, $4\frac{1}{2}$" DP and bit, washed and conditioned hole to btm, no returns. Made short trip, no fill, COOH. Ran $11\frac{1}{2}$" magnet to btm, no recovery, reran magnet to bottom, started out of hole.</p>

DAILY REPORT DETAILED

LEASE ROOSEVELT KGRA

WELL NO. 82-33

SHEET NO. 5

DATE
NATURE OF WORK

TOTAL
DEPTH
PERFORMED

12-02-75

2004

WOC.

COOH W/magnet, no recovery. Ran 46 jts, 2010', 9 5/8" OD, 40#, K-55, R-3, BT&C casing w/float shoe, 2', float collar 1.58', DV Tool 4', 2 9 5/8 x-over nipples 2.45'. Set casing at 2001' RKB, float collar at 1955.52', metal petal baskets at 1695' amd 1600', DV tool at 1556'. Pumped in 260 BW, no returns. Cemented bottom stage w/200 sacks Class B cement, 1:1 Perlite, 40% Silica Flour 2% gel, 4/10% HR4, 5/10% CFR-2, 13.8#/gal. Dropped "latch-in plug," displaced with 148 BW, latched into float collar at 1955', no returns. Dropped DV tool bomb, opened ports and set packer. Filled hole w/105 BW, circulated w/full returns. (Cement contaminated water). Circ 4 hrs to allow first stage to take initial set. Cemented second stage w/600 sx Class B cement, 1:1 Perlite, 40% Silica Flour, 2% gel, 4/10% HR4, 5/10% DFR-2. Had intermittent returns while mixing first 50 sx, then full returns. Dropped DV closing tool and wiper plug. After displacing 60 Bbls had 900# pump pressure, lost complete returns. Slowed pump rate and completed displacing. Closed DV packer ports at 12:00 midnite, 12-1-75. WOC. No cement returns.

12-03-75

2004

Nippling up BOP's.

WOC 18 1/2 hrs. Cut off casing and started nipping up BOP's.

12-04-75

2004

Preparing to run cement bond log.

Finished nipping up BOP's. Tested blind rams and casing to 1050#, 30 mins, OK. Tstd Btm, middle and top pipe rams to 1275#, 30 mins each, OK. Tested Hydril to 550#, 30 mins, OK. WIH w/bit, to DV tool to 1556', drld DV tool and went to float collar at 1954'. Circ btms up, tested DV tool w/800#, 30 mins, OK. Drld float collar and firm cement to top of shoe. Circ btms up. Tested casing and float collar w/800#, 30 mins, OK, press incr to 950# due to heat. Came out of hole to run Schlumberger. Bond log.

FDC

Fig. 1

Gamma

1589

1600

Caliper

1635

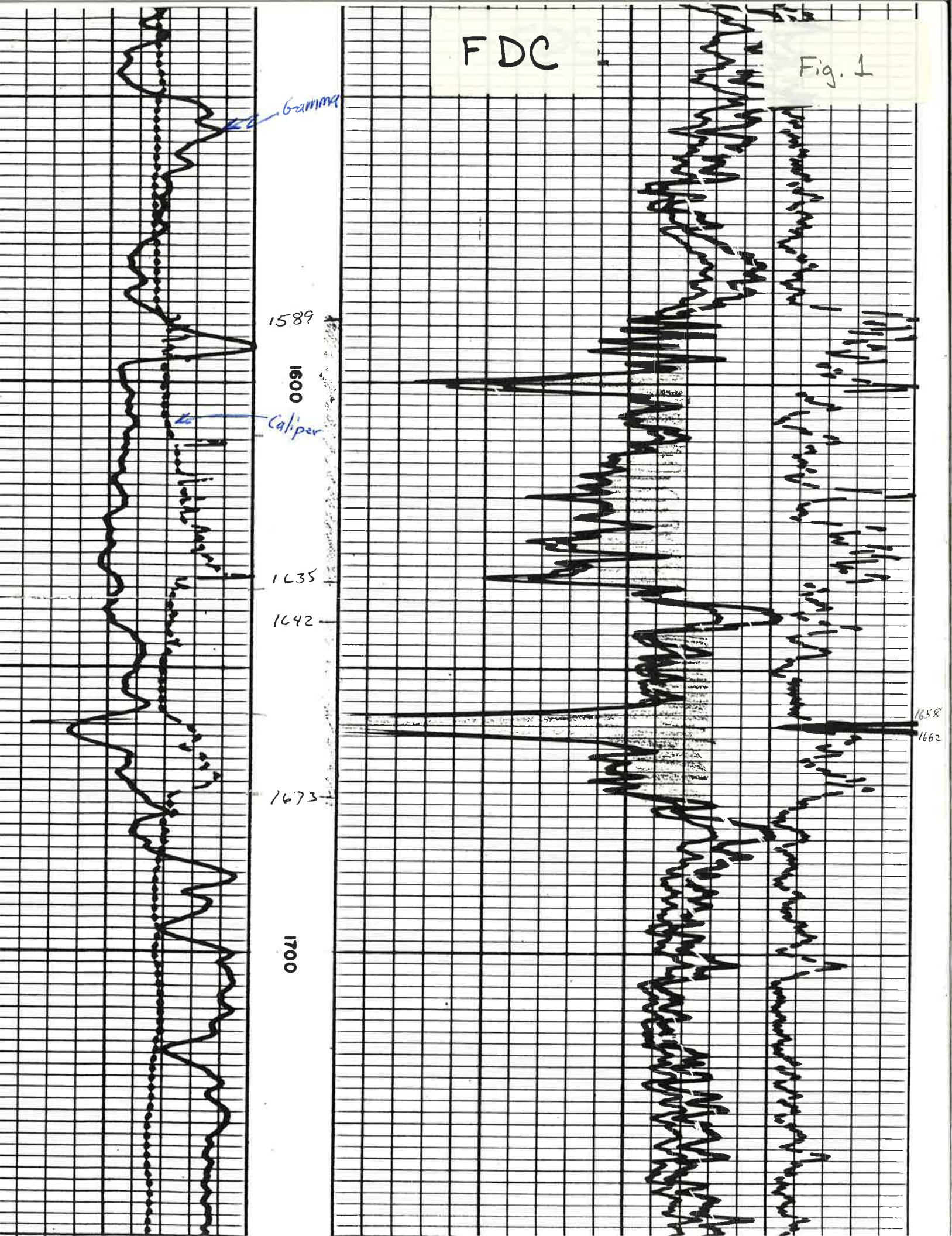
1642

1673

1700

1658

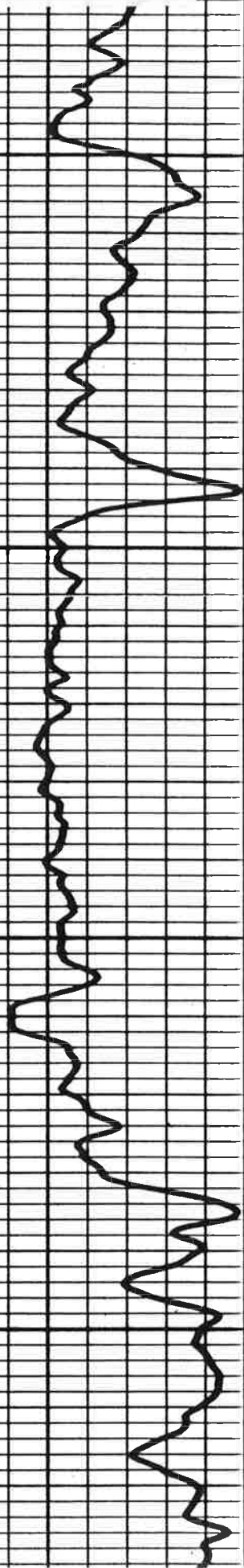
1662



GR

BHC

Fig. 2

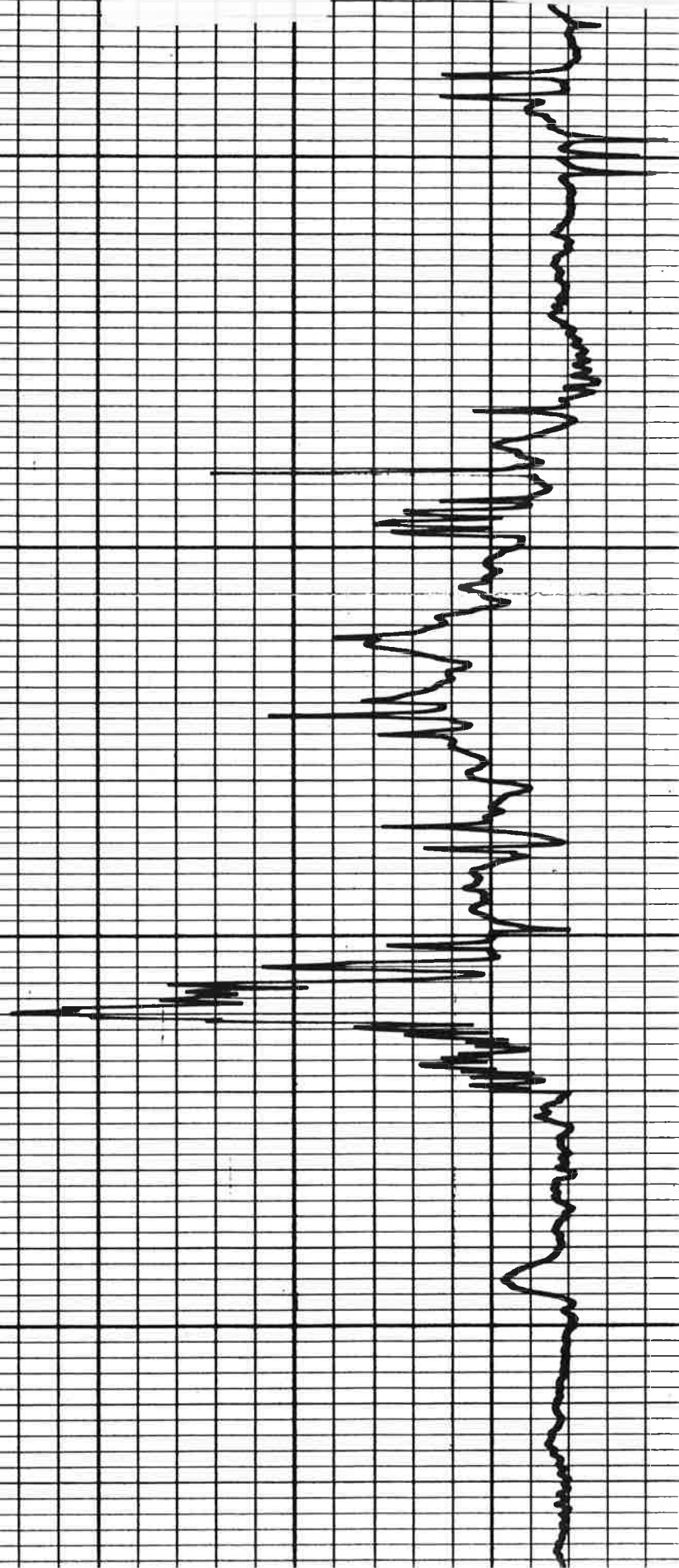


1584

1600

1669

1700



1656

1661

Fig. 3

IND

GR

1600

1611

1633

1655 1663
1000 15

1700

