Libyan Arab Republic

Kufra and Sarir Authority

Jalu - Tazerbo Project: Phase 2

APPENDIX 3

T(T2-65)

SITE REPORT

Hydrogeological Department
Institute of Geological Sciences
Exhibition Road, London SW7 2DE
1974

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CONTENTS

TABLES

FIGURES

FILE DATA NOT REPRODUCED IN THIS APPENDIX

A. General

1. Rest water levels in all wells taken simultaneously
2. Specific electrical conductance logs of T(T2-65)01, T(T2-65)02 long and short strings, existing water well central
3. Final lithological/gamma-ray/neutron log by Schlumberger of BP well T2-65 to 2950 ft
4. Sonic log by Schlumberger of BP well T2-65 to 3500 ft
5. Geophysical logs listed in Section 5 of contents
6. Verticality survey for T(T2-65)P
7. Size analysis data
8. Size analysis plots
9. Slug tests on existing Water Wells North, East and Central, with storage effect correction plots
10. Contractor's air lift test record on existing water wells
11. Original BP records of existing water wells

B. Pumping test

1. All recorder charts
2. Data from development pumping including meter readings, tabulated drawdowns, discharge readings etc
3. Main test: tabulated data
4. Recorder charts, drawdown and recovery plots from all observation wells
5. Data obtained by running flowmeter in screened sections of pumped well

Jalu–Tazerbo Project: Phase 2

Appendix 3: T(T2-65) Site Report

1. Location: 27° 10' 19" North, 22° 05' 05" East

2. Ground elevation: 414 feet above mean sea level approximately at T2-65

3. Site plan and elevations: Figure 1 and Table 1

TABLE I

Ground and casing top elevations in feet above mean sea level

	ground	casing top
T2-65	414	-
WW North East	414.1	414.4
WW Central	413.6	414.9
WW South West	414.2	415.6
T[T2-65]01	-	418.3
T[T2-65]02		
1. short string	415.4	418.5
2. long string	415.4	415.9
T[T2-65]P	414.5	415.5
T1-65		
WW North East	425.2	-

4. Existing water wells: There are three existing water wells at this site and a fourth at T1-65 was monitored during the pumping tests. Completion and current status details are shown on Tables II and III.

TABLE II

Data from B.P. Exploration Co. (Libya) Limited water well records

1	2	3	4
528	453	416-453	T2
529	453	411-453	T2
530	454	411-454	T2
262	504	458-504	T1

1. Company well file number
2. Total depth on completion in feet
3. Perforated interval below ground level
4. Site

TABLE III

Current data on existing water wells

1	2	3	4
WW North East	T2	453	1320
WW Central	T2	454	1360
WW South West	T2	412	2350
WW North East	T1	-	-

1. Well location
2. Site
3. Depth after cleaning
4. Specific electrical conductance in micromhos/cm determined from air-lifted discharge

5. Geophysical logs: The following logs are available on file but are not enclosed with this report.

(i) T2-65: final lithological gamma-ray/neutron log to 2950 feet
(ii) T2-65: sonic log to 3500 feet
(iii) T2-65: resistivity and self-potential log to 3500 feet. Mud log to 3000 feet by B. P.
(iv) T(T2-65)01. Gamma-ray log (IGS) to 863 feet
(v) T(T2-65)02 - long string. Gamma-ray log (IGS) to 384 feet
(vi) T(T2-65)P. Gamma-ray log (IGS) 289 to 551 feet
(vii) T2-65 WW North-East. Gamma-ray log (IGS) to 440 feet
(viii) T2-65 WW Central. Gamma-ray log (IGS) to 216.5 feet
(ix) T2-65 WW South-West. Gamma-ray log (IGS) to 381 feet

6. Drilling and completion:

(a) T(T2-65)01 (Figure 2) was drilled by rotary rig using Quiktrol mud to a total depth of 870 feet with a 9.7/8 inch hole. Continuous lithological sampling was carried out at 10 foot intervals from 110 feet to 870 feet. The well was completed with a combination string of 3½ inch blank casing and four separate 8.2 feet joints of 80 mm Hagusta, each Hagusta joint being set at a level according to aquifer lithology. External cement plugs were set between 382 and 412 feet and between 560 and 590 feet to seal off the principal aquifer.

(b) T(T2-65)02 (Figure 3) was drilled

by rotary rig using Revert mud. This is a dual completion well, and the two strings were emplaced in a 15 inch hole drilled to 385 feet. The long string wellscreen is a combination of 3½ inch blank casing and two double joints of 80 mm Hagusta set between 295-311.4 and 355-371.4 feet. The short string consists of 3½ inch blank to 265.57 feet with a single joint of Johnson 5 inch 8 slot wire-wrapped screen set between 243.4 feet and 257.4 feet. Cement plugs were set at 205-225 feet and 265-285 feet around both of the strings, the spaces between the cement plugs being filled with formation stabliser.

(c) T(T2-65)P (Figure 4) has a 16 inch cased section to 299 feet cemented in a 20 inch hole. The continuation to TD of 556.5 feet is a 15 inch hole drilled with Revert mud and completed with 200 mm Hagusta screen (0.7 - 1.2 mm) and blank casing set as shown. The well was then developed by swabbing and airlifting.

7. Aquifer lithology and stratigraphy: A summary of stratigraphical and lithological data at T2-65 site is shown in Table IV. Further details are apparent in Figure 5 which shows the lithology in diagrammatic form to 870 feet and in the cross-section B-B' of the main report. The sequence is a sand-sandstone clay/shale sequence with occasional thin carbonate horizons. The sandstone has a carbonate cement. Significant clay or shale horizons are numbered in Figure 5.

8. Test Pumping:
(a) Development Pumping. Autographic recorders were installed on all three existing wells at T2-65, on the long string of T(T2-65)02 and on one of the existing wells at T1-65 which is located some 2 km to the north. Drawdown measurements were made manually by electric probe on T(T2-65)01 and on the short string of T(T2-65)02.

Development pumping began at 09.30 hours on 20 November 1973, and three stages with progressive increase in discharge rates were completed by 1650 hours on the same day. Discharge rates were measured in a rectangular tank and by weir and manometer levels. The discharge was clear and virtually sand free by the end of the first stage. Basic data are shown in Table VI.

A flow meter log was run during the lowest pumping rate. Measurements were taken at two metre intervals from 92 to 170 metres below ground level (302 to 558 feet). Due to mechanical failure, no further runs were possible. The results of the run are shown in Figure 6 which also shows the general lithology. A general correlation of production rates and lithology is apparent.

(b) Main Aquifer Test The main aquifer test commenced at 0900 hours on 22 November 1973 and continued until 0900 hours on 27 November. The pumping rate averaged 1609 US gallons/minute - (101.5 litres/sec) and was maintained at a fairly constant level with less than 1% variation on either side. The specific capacity after 120 hours was 15.93 U.S. gallons/minute/foot (3.3 litres/sec/metre) which indicates no further development from stage I in the development pumping.

Manual measurements of drawdown and recovery for the first 100 minutes were made on all three existing wells at T2, on T(T2-65)01 and on both strings of T(T2-65)02; thereafter data were taken from recorder charts. In the case of the North-East Water Well at T1-65, all measurements were made from recorder charts.

(c) Aquifer analysis: The basic principles of the methods of analysis used and the significant terminology have been explained in the main report. A summary of the results is shown in Table VII. The lower screens in T(T2-65)01 were required only for water quality determinations and were backfilled before the main aquifer test. The in-hole cement plugs were set at their particular levels with this intention in mind. The remaining screens therefore straddled the lower responding section (2) between 413 and 558 feet below ground level. The screens in the existing wells at T2-65 were considered as occurring within the same responding interval although it is apparent in the lithological cross-section, Figure 5, that there is a thin clay layer (5) existing within the section and below the screens on the existing wells. The upper responding section is screened in the long string of T(T2-65)02; the short string of this well was assumed to be in the lowest non-responding section, although the clay layer below is not a very marked feature. In the event, drawdowns did occur in this well showing that vertical flow down into the upper responding section 1 was occurring. The drawdowns were considerably less than in the upper responding section showing a marked vertical head difference. Both plots (for the upper responding layer and for the lowest responding layer) gave normal artesian response curves showing that both layers form subsidiary inter-related parts of an artesian system.

Drawdown and recovery plots of all wells indicate fully artesian conditions operating throughout the test. In making calculations to determine the aquifer characteristics, the appropriate abstraction rate from each responding section required determination. Unfortunately, the flow meter was inoperative during the main test and therefore an indirect method of calculation was used as shown in the procedure below:

Drawdown in responding section 1 during development pumping: $= s_1$

Discharge from responding section 1 during development pumping: $= Q_1$

Comparative figures during main test: $= s_1'$ & Q_1'

Therefore:

$$\frac{s_2 / s_1}{s_2' / s_1'} = \frac{Q_2 / Q_1}{Q_2' / Q_1'}$$

Using drawdowns in T(T2-65)01 for responding section 2 and in T(T2-65)02 (long string) for responding section 1:

$Q_2 = 41.4$ and $Q_1 = 31.9$ litres/sec (from flow velocity log)

$$Q_2/Q_1 = \frac{41.4}{31.9} = 1.30$$

Observed drawdown data:

(a) Development pumping

Time (mins)	s_1(metres)	s_2	s_2/s_1
30	.73	1.4	1.91
40	.79	1.45	1.83
50	.84	1.55	1.84
60	.90	1.57	1.74
100	1.0	1.77	1.77
			1.83 Average

(b) Main aquifer test

Time (mins)	s_1' (metres)	s_2'	s_2'/s_1'
30	.98	1.35	1.38
40	1.05	1.45	1.38
50	1.10	1.60	1.45
60	1.15	1.65	1.43
100	1.30	1.75	1.35
			1.40 Average

Therefore:

$$\frac{s_2 / s_1}{s_2' / s_1'} = \frac{1.83}{1.40} = \frac{1.30}{Q_2' / Q_1'}$$

and

$Q_2'/Q_1' = 0.99$ and $Q_2' + Q_1' = 101.5$ litres/sec (from surface measurements)

Hence

$Q_2' = 50.24$ litres/sec and $Q_1' = 51.26$ litres/sec

These results are anomalous since they show a reversal of the situation in the original flow velocity log and the calculated transmissivity values derived from the two tests are not comparable. The cause may lie in errors in observation of the 01 drawdown data which are known to be suspect. The same procedure was followed using data from 02 (long string) and water well central (for responding section 2).

Here $s_2/s_1 = 0.63$ and $s_2'/s_1' = 0.67$

$$\frac{0.63}{0.67} = \frac{1.30}{Q_2'/Q_1'}$$

$Q_2' = 58.5$ litres/sec and $Q_1' = 43$ litres/sec

These results accord with the flow velocity log and also give consistent results for the transmissivity values calculated for the central well in both tests. These discharge rates have therefore been used in the analysis of the main aquifer test data.

The drawdown and recovery data have been analysed using the log-log and semi log plots for the former and log-log for the latter. The log-log plots showed consistent Theis type curve trends except for the very early times for which the data plots consistently deviate by amounts consistent with well storage and minor skin effects.

The slug tests on all wells gave results indicative of good hydraulic continuity with the aquifer but minor effects due partly to storage and partly to the narrow screen interval within a heterogerous sequence are to be expected. The technique adopted was to fit the main part of the curve to the type curve plot. It was usually found that all readings after 10 minutes fell consistently on the type curve and the earlier readings, whilst not very distant, showed an asymptotic plot with less than required drawdown and recovery values.

All wells other than 02 long string are screened in the lower responding section (2) and calculated aquifer constants using both time and distance drawdown plots showed a close consistency, with artesian response throughout.

The long string of 02 is the only well screened in the upper responding layer (1). The data also gave standard artesian plots but the occurrence of drawdowns in the overlying, assumed non-responding, layer shows that the intermediate clay layer cannot have proved an effective seal. It follows that the drawdowns in 02-long string are less than would have occurred with vertical flow and therefore the apparent transmissivity values are too high.

The total transmissivity based on the results of the analysis of both sections was used to compute the well efficiency which showed an extremely low value, around 21% (see table VII), which contrasts with the general efficiency of wells with this type of completion elsewhere in Libya of 60-75%. It could only be assumed that well losses are extremely high due to poor completion, but this would be surprising since a biodegradable mud was used. Alternatively, either the values of discharge in relation to the assumed responding layers are in error, or the drawdowns have been affected by inflow from outside the responding layers. This latter effect has certainly operated in the case of the upper responding layer but it seems unlikely to have occurred in the case of the lower, since there is a very thick clay horizon below this level. The former explanation may be invoked in the case of data from the existing wells since it is known that a thin clay layer does occur at an intermediate position with the lower responding layer and below the screened intervals. A reduced discharge consistent with this subsection of the responding section (2) could be applicable with correspondingly reduced transmissivity results. The explanation is more difficult for the drawdown data for T(T2-65)01 since the screens straddle the entire responding section (2) and the screens were set with this consideration in mind. For this explanation to hold for this well, it would be necessary to assume that the lower screen was inoperative during the test.

Further significant information is available from the sieve analysis results on the lithological samples. Permeability calculations based on grain size distributions are normally too high due to the presence of interstititial clay or cement. In constrast, the calculated permeabilities from the grain size date are all consistently lower than the aquifer test values which do strongly indicate that the latter are in error. Details of the relevant calculations are shown in Table IX. These calculations show without any doubt the transmissivities calculated from the aquifer analysis are excessively high. Some confirmation of the validity of the calculations is afforded by the close comparison between the transmissibility ratios for the two sections and the actual ratios of discharge from these sections; and also by the computed well efficiency which compares with the general efficiency values for wells completed in this manner, but is perhaps on the high side.

In considering these results, certain other factors should be taken into account. The static water levels in all observation wells are at an identical level showing that for their corresponding screen depths there are no vertical head differences under natural flow conditions. Barometric efficiences are comparable. The other significant feature is that the drawdown measurement at T1-65 shows an artesian response and the value of transmissivity computed is of the same order as those at the existing wells at T2-65. It would appear, therefore, that the significant clay boundary layers must extend at least 2 km away from T2-65.

9. Hydrochemistry: Details of analyses shown in Table X.

TABLE IV

T2-65: Stratigraphical and lithological data

	feet ± mean sl	feet bgl
T2-65 ground elevation	414	0
Static water level	297	117
Base Calanscio	29	385
Base Upper Aquifer	-121	535
Top Middle Aquifer	-274	688
Base Middle Aquifer	-420	834
Top ?Oligocene	-1221	1635
Base Oligocene	-2135	2549

TABLE V

Tabulated summary of selected size analysis data

Interval feet bgl		D50 (microns)	D90 (microns)	1 Cu	2 σ	3 K
180	190	430	178	2.95	1.488	160
190	200	430	194	2.63	1.315	220
200	210	430	187	2.78	1.217	240
210	220	370	152	2.80	0.980	290
220	230	350	150	2.73	0.967	275
230	240	400	175	2.63	1.010	310
240	250	390	143	3.11	1.101	270
250	260	540	233	2.88	-	-
260	270	390	165	2.94	1.748	110
270	280	430	210	2.57	1.506	150
280	290	375	138	3.26	1.632	125
290	300	370	172	2.59	1.331	200
300	310	415	189	2.86	-	-
340	350	480	170	3.65	1.612	140
350	360	490	240	2.50	1.060	360
360	370	360	203	2.12	0.962	290
370	380	325	163	2.27	1.301	185
380	390	280	127	2.76	1.681	115
390	400	193	83	2.81	-	-
400	410	375	148	2.97	1.018	280
410	420	277	153	2.03	0.768	250
440	450	1680	105	9.81	2.161	less than 100
450	460	525	225	2.78	1.128	350
460	470	300	125	2.84	1.012	225
470	480	400	180	2.61	0.924	340
480	490	540	225	2.84	0.986	430
490	500	415	205	2.29	0.808	410
500	510	550	230	2.83	1.032	410
510	520	340	145	2.72	0.998	260
520	530	320	165	2.15	0.793	290
530	540	270	115	2.65	0.893	220
540	550	330	145	2.55	0.965	260
550	560	268	80	3.88	-	-
690	700	395	110	4.41	1.301	210
700	710	410	152	3.29	1.061	300
720	730	450	208	2.50	0.926	400
730	740	425	185	2.65	0.997	330
750	760	265	108	2.87	1.166	180
760	770	205	95	2.47	1.115	150
770	780	215	100	2.65	1.131	155
790	800	278	98	3.16	0.995	210
800	810	356	169	2.63	0.982	280
810	820	240	108	2.78	1.143	170
820	830	343	117	3.62	1.272	200
830	840	515	155	3.71	1.031	380
850	860	290	80	4.93	-	-
860	870	280	80	5.13	-	-

1 Cu: uniformity coefficient (D40/D90)

2 σ : standard deviation (ϕ 84- ϕ16)/4 + (ϕ 95- ϕ5)/66 where grain size in ϕ units

3 K: permeability in US galls/day/ft^2 based on σ and ϕ 50

TABLE VI

T(T2-65)P: Development pumping

	Stage I	Stage II	Stage III
Time started	0930 hrs	1400 hrs	1500 hrs
Time completed	1400 hrs	1500 hrs	1650 hrs
SWL in meters below gl	36.045	36.045	36.045
SWL in feet	118.26	118.26	118.26
Pumping level in meters below gl	58.81	62.49	65.25
Pumping level in feet	192.95	205.03	214.08
Drawdown in meters	22.765	26.445	29.205
Drawdown in feet	74.69	86.77	95.82
Discharge in litre/sec	71.97	83.95	95.63
Discharge in USG/min	1140	1330	1515
Sp. Cap. litres/sec/m (time in minutes)	3.16 (270)	3.17 (60)	3.27 (30)
Sp. Cap. USG/min/ft	15.26	15.33	15.81

TABLE VII

Summary of aquifer analysis results at T2-65

i Boundary conditions

	feet bgl
Non-responding section 1. [upper level is water table]	117 - 217
Non-responding section 2.	217 - 289
Responding section 1.	289 - 413
Responding section 2.	413 - 558
Production well screen	299 - 556

ii Development pumping

Discharge from responding section 1. = 31.91 litres/sec

Discharge from responding section 2. = 41.4 litres/sec

Well	Transmissivity m²/day	Storage coefficient x 10⁻⁴	Analysis(1)
T[T2-65]01 r = 98 m (2) responding section 2.	850	0.88	LL/DD
T[T2-65]02 long string r = 91 m responding section 1.	895	2.10	LL/DD
T[T2-65]02 (3) short string r = 91 m responding section 1.	731	26.00	LL/DD
WW Central r = 225 m responding section 2.	1294	1.7	LL/DD

iii Main aquifer test

T[T2-65]01 r = 98 m responding section 2.	1183	1.3	LL/DD tsl = 19 minutes
	1113	1.3	SL/DD; straight line plot: 10-6000 min.
	1463	0.6	R/LL
	1253	1.1	Average values
T[T2-65]02 r = 91 m long string responding section 1.	1075	2.3	LL/DD tsl = 28 minutes
	1014	1.9	SL/DD; straight line plot: 6-2400
	1045	2.1	Average values

T2-65 WW South-west r = 200 m responding section 2.	1320	2.2	LL/DD; tsl = 120
	1379	2.0	SL/DD; straight line plot; 80-8000
	1490	1.8	LL/R
	1396	2.0	Average values
WW Central r = 225 m responding section 2.	1298	2.3	LL/DD; tsl = 86
	1155	2.9	SL/DD; straight line plot: 200-8000
	1368	1.3	LL/R
	1273	2.2	Average values
WW North-east r = 250 m responding section 2.	1422	1.9	LL/DD; tsl = 100
	1621	2.3	SL/DD; straight line plot: 200-4000
	1518	1.4	LL/R
	1520	1.9	Average values
	1396	2.0	Average values for three existing wells
WW North-east T1-65 r = 1950 m responding section 2.	1437	3.3	LL/DD; tsl = 15,000 min
	1442	2.5	SL/DD; slp from 1000-10,000 min
	1456	3.0	Average values
01, all existing wells at T2 and WWNE at T1	1580	1.4	SL/DD; distance drawdown
	1421	1.9	Average for 01, existing wells and distance drawdown

(1.) LL : log-log
DD : drawdown
SL : semi-log
R : recovery

(2.) r : distance from pumping well

(3.) 02 (short string) is screened in what was assumed to be a non-responding section but in the event drawdowns occurred. For comparative purposes an analysis was made assuming a discharge of 31.9 litres/sec

TABLE VIII

Well efficiency based on pump test aquifer constants

Transmissivity responding section 1.	= 1075 m^2/day
Transmissivity responding section 2.	= 1421 m^2/day
Total transmissivity	= 2496 m^2/day
	= 200,978 US galls/day/ft
Average storage coefficient	= 2.0×10^{-4}
Theoretical specific capacity[1]	= 76.42 US galls/min/ft
Observed specific capacity	= 15.93 US galls/min/ft
Efficiency	= 21%

[1] Specific capacity = $T/[264 \log \frac{T\ t}{2693\ r_w^2\ S} - 65.5]$

t = time in minutes

r_w = well radius in feet

T = transmissivity in US galls/day/ft

TABLE IX

Calculation procedures relating permeability to grain size variations

1.	Upper responding section in feet (289-413)	124
	Total thickness clay layers in feet	18
	Remainder (7' sand; 99' clayey sand)	106
	Average permeability of responding section calculated from grain size analysis: in US gpd/ft^2	228
	Estimated permeability (90%)	205
	Calculated transmissivity (106 x 205) in US gpd/ft in m^2/day	21,730 270
2.	Lower responding section (413-558')	145
	Total thickness clay layers	3
	Remainder (35' sands, 26' clay sands, 81' of sandy clays, carbonates and sandstones)	142
	Average grain-size permeability of sands/clay sands in US gpd/ft^2	333
	Estimated true permeability (90% of average)	300
	From flow log, percentage flow in sands/clay	37
	From flow log, percentage flow in sandstones etc	18.5
	Productivity of sands and clay sands [percentage flow per foot]	0.606
	Productivity of sandstones, sandy clays etc	0.228
	Estimated permeability of sandstones etc (1/3 x permeability of sands)	100
	Transmissivity of lower responding section [61 x 300 + 81 x 100] in US gpd/ft in m^2/day	 26,400 328
3.	Total transmissivity of both responding sections - in US gpd/ft - in m^2/day	48,130 598
4.	Ratio of calculated transmissivities (lower responding section to upper)	1.255
5.	Ratio of calculated discharge rates from corresponding sections	1.36
6.	Theoretical specific capacity in US galls/min/ft after 5000 min	20.24
7.	Observed specific capacity	15.93
8.	Well efficiency %	79

TABLE X

T(T2-65)P: Chemical analyses

IGS Reference	74/145
Ca^{2+}	107
Mg^{2+}	55
Na^{+}	174
K^{+}	44
HCO_3^- (Lab)	127
SO_4^{2-}	55.9
Cl^-	479
NO_3^-	81
Total determined major constituents	1123
Sr^{2+}	1.6
F^-	0.68
B	0.08
Total Fe	0.013
Total Mn	< 0.007
Cd	< 0.0005
Co	< 0.001
Cu	0.008
Ni	< 0.001
Pb	< 0.001
Zn	0.005
SO_4/Cl	0.067
Mg/Ca	0.85
K/Na	0.15
Σ cations	18.55
Σ anions	17.80
Ionic balance	2.1

TABLE XI

Corrator readings

(T2-65) 26 November 1973 [fourth day of pumping test]

Metal/Alloy	A	B	R
Copper	1.70	1.20	1.45
Stainless steel 316	1.00	1.00	1.00
Stainless steel 308 L	1.00	1.00	1.00
Aluminium 6063	1.20	1.20	1.20
Aluminium 5052	1.10	1.05	1.08
Zinc	1.50	0.50	1.00
Mild steel 1010*	1.20	1.00	1.10
Mild steel 1020*	2.50	1.50	2.00
Bronze 660	1.00	1.20	1.10
AP1 H40	13.00	-0.20	6.40

Note: Columns A and B refer to readings at different polarity, R is the average

* These probes are corroded and therefore readings are suspect

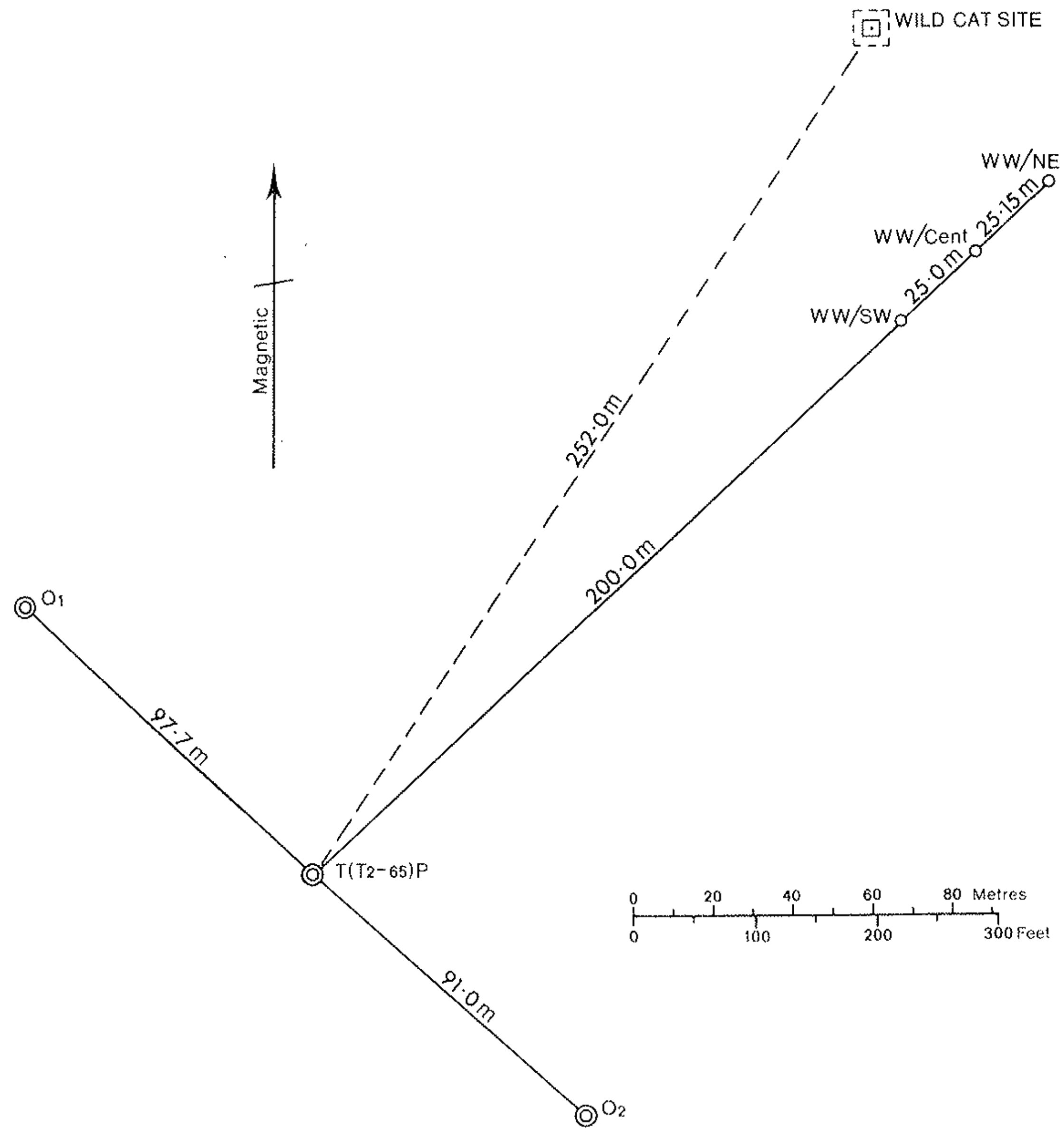


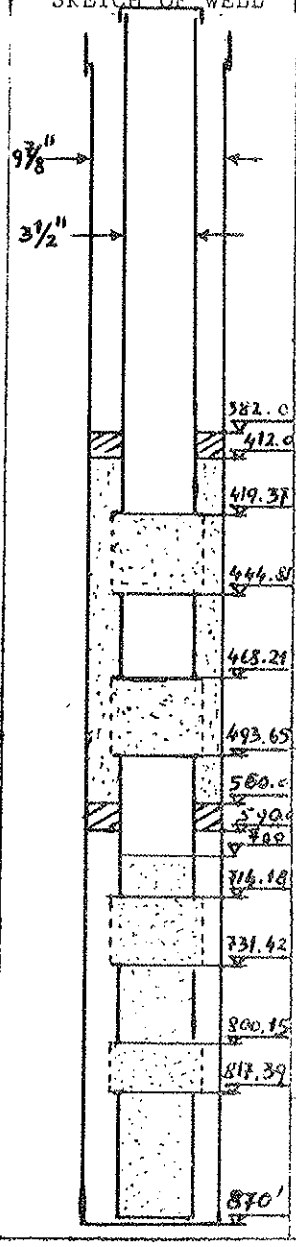
Figure 1. Site plan

WATER WELL

CUSTOMER : KAC LOCATION : T(T2-65)0-1	RIGGING UP ON: 1.10.73 AT RELEASE LOCATION: AT 14.10.73	TOOL PUSHER: DRILLERS: KIRICH : KARADICH :	RIG NO 4

FORMATION

SKETCH OF WELL



DRILLING
Dit Ø 9⅞" ...... from 0.00 ...... to 870' ....

LOST CIRCULATION from .... to ....

MUD MATERIALS USED
Bentonite 12 SX kg Spersen .... kg
Caustic Soda .... kg CMC .... kg
QUIKTROL 105 SX

*CASING Ø ID from .... to ....
from .... to ....

SCREENS Ø ID from .... to ....
or SLOTTED CG

PLUG FROM 382 TO 412 AND FROM 560 TO 590 FT.
CEMENT BASKET SET AT 590 FT.

JETTING PIPE Ø to ....
Range :
WELL DELIVERY
.... Dynamic W.L.1 ....
.... Dynamic W.L. ....
STATIC WATER LEVEL after jetting ....
WELL HEAD

FUEL ....
GAZOLINE ....

Toolpusher signature

* INSTALLATION
3½" TBG. FROM +3' TO 419.37'
HAGUSTA FROM 419.37 TO 444.81'
3½" TBG FROM 444.81 TO 468.21'
HAGUSTA FROM 468.21 TO 493.65'
3½" TBG FROM 493.65 TO 714.18'
HAGUSTA FROM 714.18 TO 731.42'
3½" TBG FROM 731.42 TO 800.15'
HAGUSTA FROM 800.15 TO 817.39'
3½" TBG FROM 817.39 TO 870.0'

TOTAL LENGHT 3½" TBG = 787.64'
TOTAL LENGHT HAGUSTA = 85.36'

LITHOLOGICAL SAMPLES TAKEN FROM 110' TO 870'
WELL HAS BEEN GAMMA LOGGED AND CONDUCTIVITY LOGGED
ANNULUS FROM 560 TO 412 HA BEEN BACK FILLED.
TUBING 3½" HAS BEEN BACKFILLED FROM 870 TO 700 ft
DRILLING RIG CLEANED AND TESTED 3 EXISTING WELL ON THE SI.
DISTANCE FROM T(FF1-65) TO T(T2-65) IS 79 kms

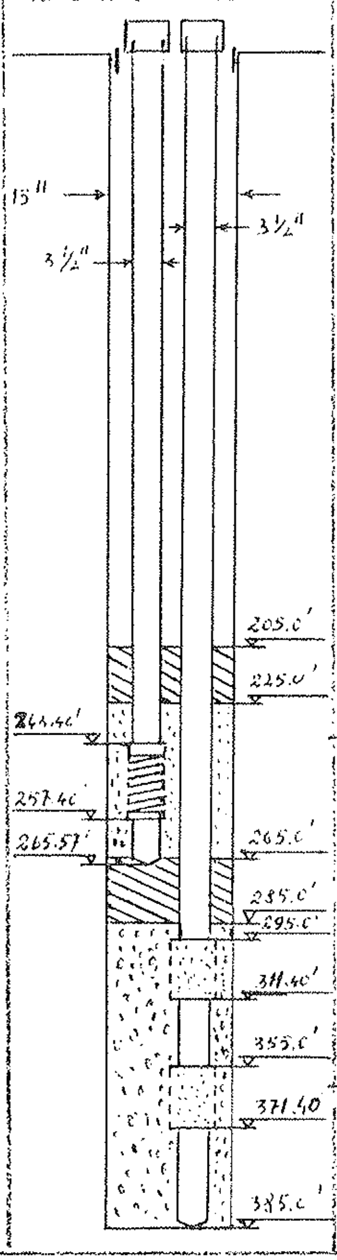
Figure 2. T(T2-65)01: Contractor's completion report

WATER WELL

CUSTOMER : KAC LOCATION : T(T2-65)0-2	RIGGING UP ON: 10.11.1973 AT RELEASE LOCATION: AT 19.11.1973	TOOLPUSHER RICHARDSON DRILLERS KIRICH KARACHICH	RIG NO. 4

FORMATION

SKETCH OF WELL



DRILLING

Bit ∅ 15" from 0.00' to 385.0'

LOST CIRCULATION from.......... to..........

MUD MATERIALS USED

Bentonite.....kg Spersen...........kg

Caustic Soda..kg CMC...............kg

REVERT 63 KG ....

CASING ∅ ID * 3½" TBG from.......... to..........

CONDUCTOR PIPE from +2 to 3'

** SCREENS ∅ ID HAGUSTA AND JOHNSON from.......... to..........

or SLOTTED CG ....

PLUG FROM 205.0' TO 225' AND 265.0' TO 285.0'

CEMENT BASKET..........

JETTING PIPE ∅ to..........

Range :

WELL DELIVERY

.... Dynamic W.L..........

.... Dynamic W.L..........

STATIC WATER LEVEL after jetting..........

WELL HEAD

FUEL..........

GASOLINE ....

Toolpusher signature

* TUBING INSTALLATION:

A. LONG STRING

FROM +2' TO 295.0 → 3½" TBG

FROM 311.40' TO 355.0 → 3½" TBG

FROM 371.40' TO 385.0 → 3½" TBG

TOTAL 3½" TBG LONG STRING = 354.2'

B. SHORT STRING.

FROM +2' TO 243.40' → 3½" TBG

FROM 257.40' TO 265.57' → 3½" TBG

TOTAL SHORT STRING = 253.57'

GRAND TOTAL 3½" TBG = 607.77'

** SCREEN INSTALLATION!

A. LONG STRING.

HAGUSTA ∅ 3½ FROM 295.0' TO 311.40',

-"- FROM 355.0' TO 371.40'

TOTAL HAGUSTA ∅ 3½ = 32.80'

B. SHORT STRING

JOHNSON TELESCOPIC ∅ 5" FROM 243.40' TO 257.40'

TOTAL JOHNSON = 14.0'

FORMATION STABILIZER FROM 285.0' TO 265.0' AND FROM 285 TO 385 ...

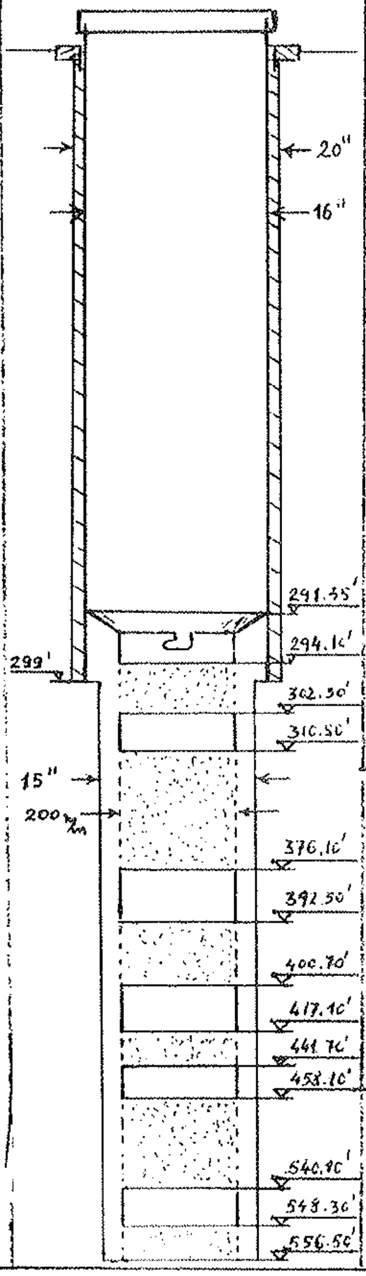
Figure 3. T(T2-65)02: Contractor's completion report

WATER WELL

CUSTOMER : KAC LOCATION : T(T2-65) P	RIGGING UP ON: 20.10.73 AT RELEASE LOCATION: AT 3.11.1973.	TOOLPUSHER DRILLERS KIRICH KARAČICH	RIG NO. 4

FORMATION

SKETCH OF WELL



DRILLING

Dit Ø 20" from 0.00 to 299.0'

15" 290.0' 556.5'

LOST CIRCULATION from .... to ....

MUD MATERIALS USED

Bentonite 60 AX kg Spersen .... kg

Caustic Soda .. kg CMC .... kg

REVERT 27 AX

CASING Ø OD 16" from +4' to 299.0'

CONDUCTOR PIPE from +4' to 3.0'

SCREENS Ø ID ** from .... to ....

or SLOTTED CG

PLUG ....

CEMENT ~~BASKET~~ CEMENTED ANNULUS 20"/16" FROM 0.0' TO 299'

CONCRETE BASE ON SURFACE 4'x4'x3'

JETTING PIPE Ø to ....

Range :

WELL DELIVERY

.... Dynamic W.L. ....

.... Dynamic W.L. ....

STATIC WATER LEVER after jetting ....

WELL HEAD

FUEL ....

GAZOLINE ....

Toolpusher signature

** SCREEN INSTALLATION

LEAD SEAL AND BAYONET FROM 291.35' TO 294.10'

BLANK HAGUSTA Ø 200 m/m 302.30' TO 310.50'

-"- -"- 376.10' TO 392.50'

-"- -"- 400.70' TO 417.10'

-"- -"- 441.70' TO 458.10'

-"- -"- 540.10' TO 548.30'

TOTAL BLANK 68.35'

HAGUSTA PREPACKED SCREEN 0.7 - 1.2 m/m

SCREEN HAGUSTA Ø 200 m/m FROM 294.10' TO 302.30'

-"- -"- 310.50' TO 376.10'

-"- -"- 392.50' TO 400.70'

-"- -"- 417.10' TO 441.70'

-"- -"- 458.10' TO 540.10'

-"- -"- 548.30 TO 556.50'

TOTAL SCREEN 196.80' GRAND TOTAL 265.15'

RIG MOVED TO T(T2-65) O-2 DISTANCE 100 m.

Figure 4. T(T2-65)P: Contractor's completion report

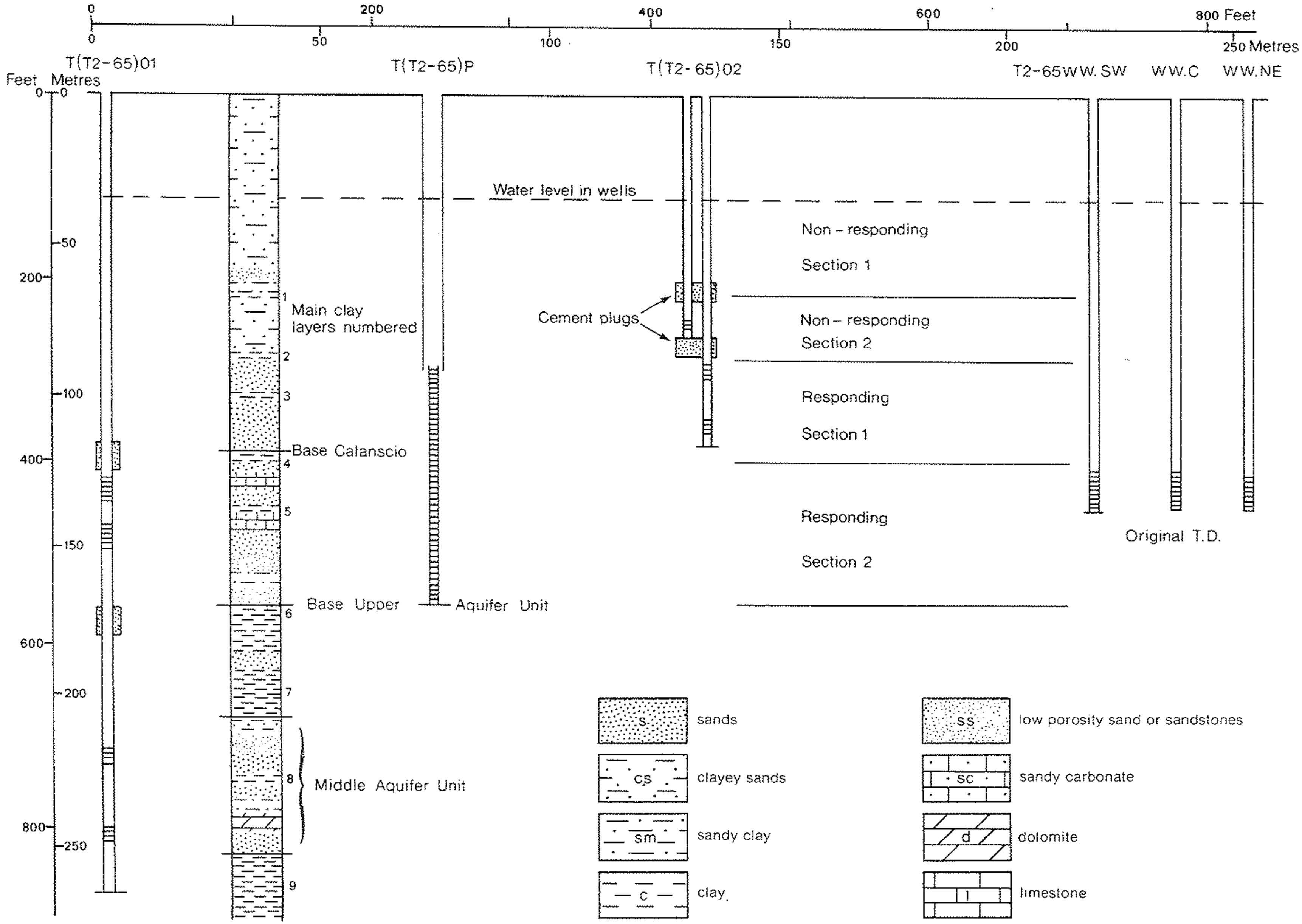
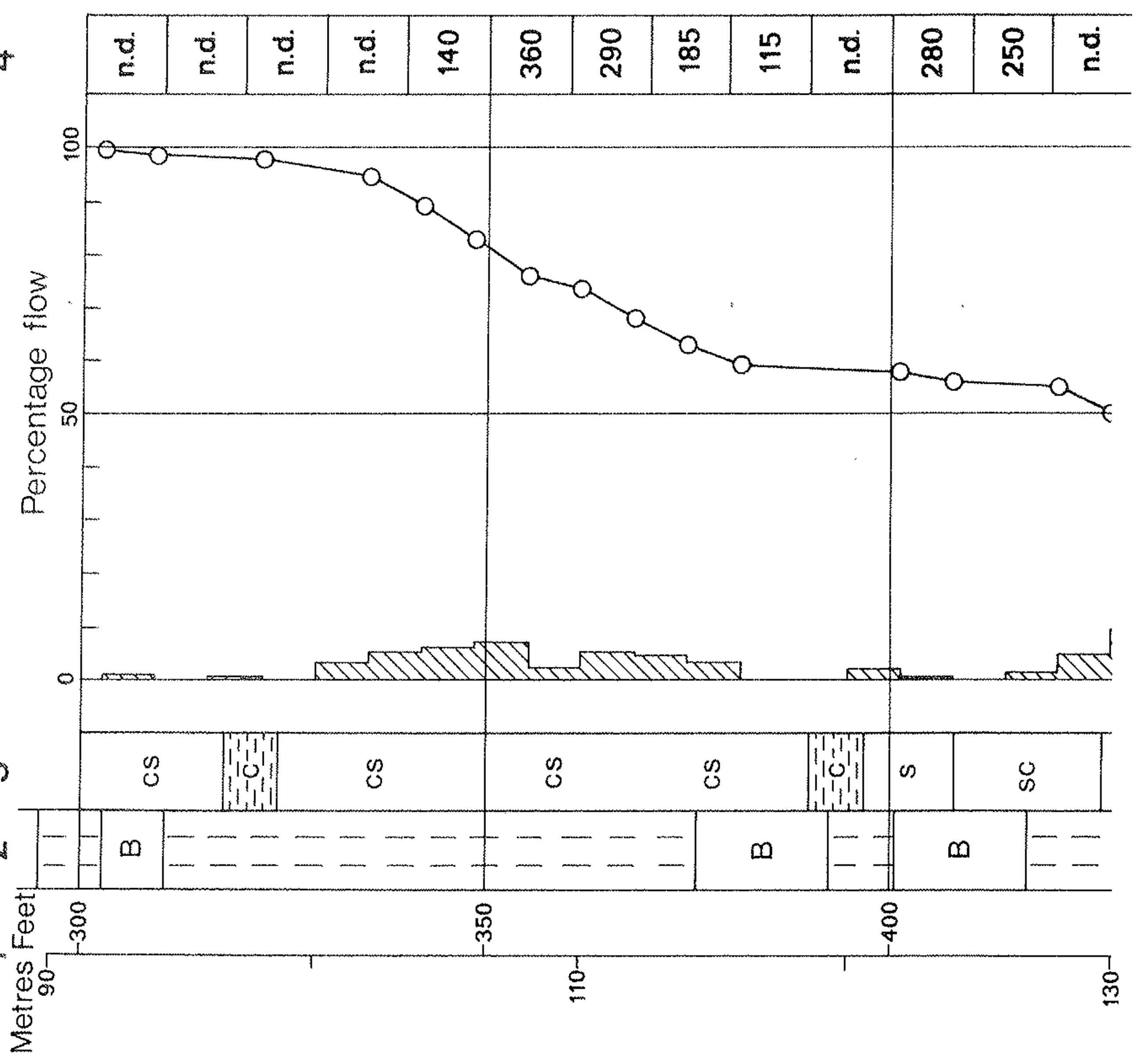


Figure 5. Lithological log and cross-section


1
2
3
4
Metres Feet
90
110
130
300
350
400
B
B
B
CS
C
CS
CS
CS
C
S
SC
Percentage flow
0
50
100
n.d.
n.d.
n.d.
n.d.
140
360
290
185
115
n.d.
280
250
n.d.

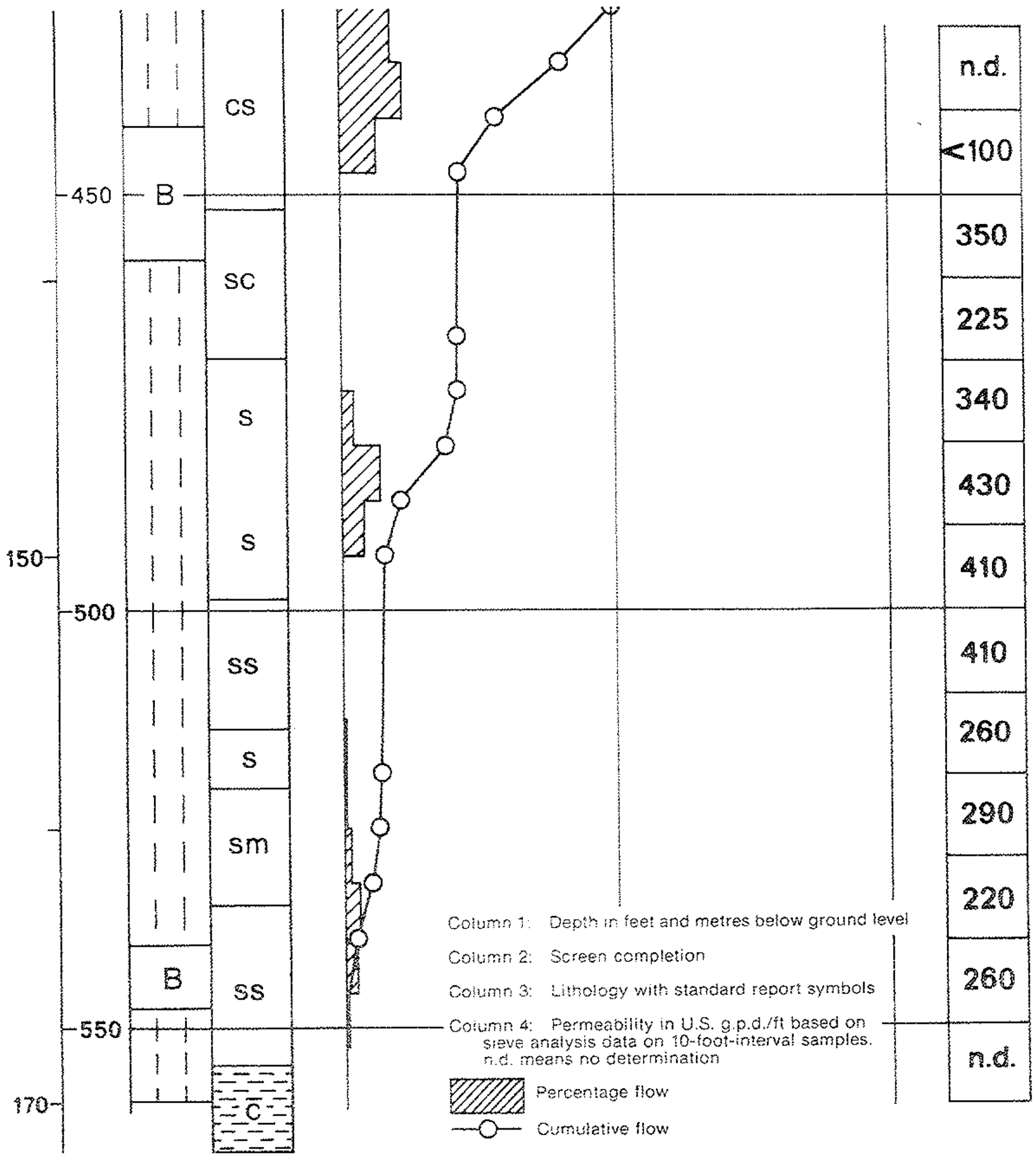


Figure 6. Flow meter log