JTP

SULTANATE OF OMAN

Water resources survey of Northern Oman

SUPPLEMENTARY REPORT

OF

INSTITUTE OF HYDROLOGY

'APPENDICES'

January 1975

SULTANATE OF OMAN

WATER RESOURCES SURVEY OF NORTHERN OMAN

APPENDICES

TO

SUPPLEMENTARY REPORT

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APPENDIX A

ESTIMATION OF TRANSMISSIVITY

A.1 Determination of transmissivity from step-drawdown tests

The first stage water level data from the 20 three-stage step drawdown tests have been analysed using Jacob's modification of the Theis method. Solutions were obtained using the following form of the Jacob equation:

$$T = 0.183\ Q/\Delta s$$

where T is the transmissivity in m^2/day

Q is the well yield in m^3/day

and Δs is the drawdown in metres.

The results, shown in Table A.1, give values from 4 m^2/day to 570 m^2/day. Large variations were found in the results from any particular area and we demonstrate later in this chapter that much of this variation is due to the location of the screens. The highest values were generally from the boreholes with screens in the *Upper Gravels*. The deeper boreholes with screens below these beds generally show low estimates of transmissivity. All of the results are below 600 m^2/day. These are low values and indicate a poor aquifer transmissivity even in the *Upper Gravels*.

A.2 Estimation of transmissivity from specific capacity

For the remaining wells we must use an alternative method of estimating transmissivity. Various methods are available for calculating aquifer transmissivity from specific capacity data. Also transmissivity can be estimated from very small amounts of data using the simplest of the drawdown equations, that derived by Theis. The assumptions involved in this and other methods require that the yield and the drawdown data

Table A.1

TRANSMISSIVITY VALUES DERIVED FROM JT BOREHOLES

Well No.	Transmissivity (m^2/day)	Location
JT 11	14	Wadi Nakhl
JT 12	4	Wadi Nakhl
JT 20	14	Wadi Bani Ghafir
JT 28	300	Wadi Semail
JT 29	370	Wadi Semail
JT 30	390	Wadi Semail
JT 31	110	Wadi Semail
JT 36	190	Al Khabura
JT 41	86	Rumais
JT 48	570	Rumais
JT 49	160	Rumais
JT 50	110	Rumais
JT 57	170	Wadi Bani Kharus
JT 58	86	Wadi Bani Kharus
JT 62	390	Wadi Aday
JT 63	160	Wadi Nakhl
JT 64	85	Sohar
JT 65	110	Sohar
JT 67	220	Wadi Bani Kharus
JT 74	95	Rumais

are from 100 per cent efficient wells* in non-leaky artesian aquifers. However, our analysis of the step-drawdown test data indicates that in the Batinah only 5 boreholes have a well efficiency of better than 90 per cent and it is most unlikely that true artesian conditions exist in the relatively shallow sediments explored to date.

We have therefore used an empirical method based on the correlation between transmissivity and specific capacity for the 20 boreholes shown in Table A.1. This correlation is shown graphically in Figure A.1. Excluding the result from well JT62, the relationship is of the form;

$$T = \alpha C$$

where C is specific capacity in m^2/day.

α is found to be 0.298. The 95 per cent confidence limits indicate that the real transmissivity lies between 0.136C and 0.655C.

Specific capacity data computed from the pumping test information from the JT series boreholes and from selected boreholes from previous drilling programmes are shown in Table A.2. Where multi-stage testing has taken place the specific capacity has been calculated from the first stage of testing.

The specific capacities range from about 10 m^2/day to over 3,000 m^2/day giving transmissivities from 3 m^2/day to about 1,000 m^2/day based upon α = 0.298. The upper and lower limits at 95 per cent confidence can be determined from Figure A.1.

An alternative assessment of the aquifer properties could be obtained by using lithological data and yield/drawdown relationships. However the difficulty of assessing the consequences of secondary carbonate cement on the aquifer properties of a variable gravel and gravel clay

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*well efficiency is the ratio of drawdown as a result of the resistance of the aquifer to the total drawdown, which is the result of aquifer resistance and screen resistance.

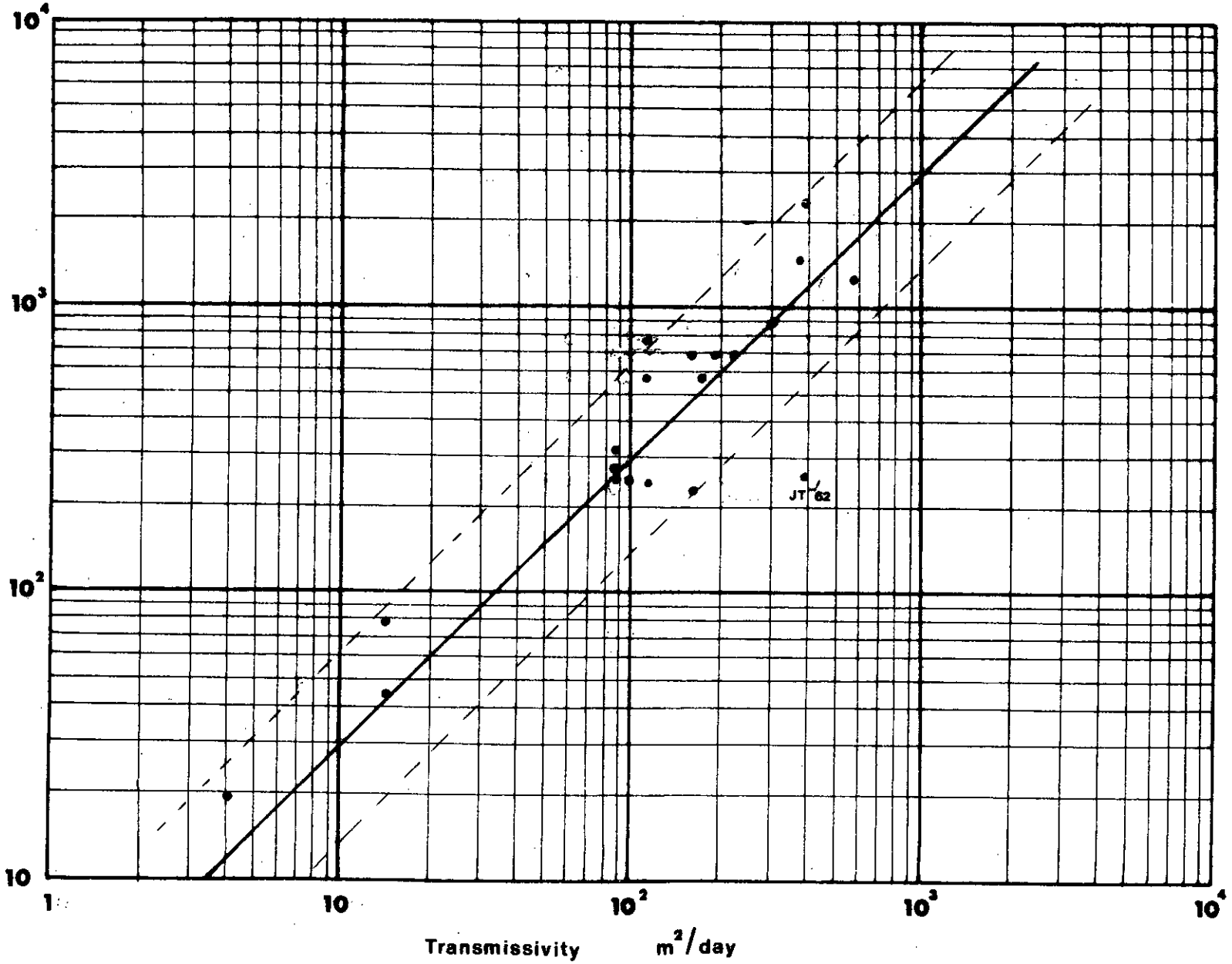

10⁴
10³
10²
10
1
10
10²
10³
10⁴
JT 62
Specific Capacity
m²/day
Transmissivity m²/day

FIGURE A.1

Table A.2

ESTIMATION OF TRANSMISSIVITY FROM SPECIFIC CAPACITY

Well No	Specific Capacity (m^2/day)	Estimated Transmissivity (m^2/day)	Well No	Specific Capacity (m^2/day)	Estimated Transmissivity (m^2/day)
JT 1	3283	980	JT 54	561	170
2	154	47	55	83	25
3	2894	870	57	562	170
4	2039	620	58	214	65
5	12	4	61	216	65
10	158	47	62	253	77
11	45	19	63	226	69
12	19	6	64	241	73
13	1031	310	65	236	72
15	1019	305	66	1158	340
18	79	24	67	672	200
20	78	24	69	483	145
22	2552	760	70	251	76
23	1192	350	71	130	39
24	153	46	72	603	182
25	80	24	73	3217	970
26	160	48	74	248	76
27	30	9	75	1541	460
28	784	235	76	235	71
29	1430	430			
30	2298	690	WRP 1	29	9
31	747	225	2	43	13
33	284	86			
35	2249	680	GP 8	13	4
36	681	205	10	11	3
37	221	68	12	15	5
38	1730	520			
41	254	77	ADG 1	1224	360
43	1010	305	13	355	108
44	1268	380	14	3594	1080
45	1324	390	15	612	185
46	417	130	16	399	122
47	1028	310	17	318	97
48	1255	375	19	111	33
49	676	205	20	183	55
50	562	170	22	73	22
51	1035	310	23	333	100
53	75	23	24	104	31.
			25	79	24
			26	366	110
			27	141	42

sequence make this method too uncertain.

A.3 Hydraulic Conductivity of the Alluvium

Estimates of the hydraulic conductivity (permeability) of the alluvium have been obtained by dividing the transmissivity by screen length for each borehole. Table A.3 gives the results for boreholes with screens located in the *Upper Gravels*, Table A.4 for those in the *Clayey Gravels* and Table A.5 for those in the *Cemented Gravels* and limestones.

In compiling these results we have used the total length of screen below the water table. Where several screens occur, or when a single screen has been positioned across the boundary between two classes of gravels the total screen length has been used but the borehole has been classified according to the location of the major portion of the screen. Those boreholes where there was insufficient water to carry out a yield test are shown as having zero conductivity. Several of these boreholes have slowly made water over periods of several months indicating hydraulic conductivities of less than 10^{-1} m/day. They are included to illustrate the distribution of semi-pervious, poor, or even non-existent aquifer potential.

Upper Gravels Table A.3

The highest values of hydraulic conductivity have been obtained from the boreholes in the Wadi Semail and there is a marked reduction in the values derived from the western boreholes. This could reflect the different sedimentary environment of the *Upper Gravels* in various wadis. However the western area has been poorly sampled; many boreholes have been cased through the shallow *Upper Gravels* and the sample of seven wells may not be representative. Only one borehole in the *Upper Gravels*, JT14, failed to give sufficient water for test pumping purposes. This well sunk to a depth of 70 m is in the zone of deepest water with a

Table A.3

HYDRAULIC CONDUCTIVITY OF THE UPPER GRAVELS

Borehole number	Hydraulic Conductivity (m/day)	Comments
WADI FAR		
JT13	4	-
JT14	0	Insufficient water to test
WADI BANI KHARUS		
JT57	7	Screens also in Clayey and Cemented Gravels
ADG23	7	-
WADI NAKHL		
ADG22	1	-
ADG17	6	-
WADI TAWW		
ADG16	9	-
WADI HALBAN		
JT25	2	Screen also in Clayey Gravels
JT66	28	-
JT76	6	
JT43	28	
JT44	32	
JT45	30	
JT46	11	
JT47	26	
JT48	31	
JT49	16	
JT50	12	
WADI SEMAIL		
ADG15	11	Some sand
JT51	6	-
JT73	19	Some sand and clay
JT30	33	-
JT31	9	Some sand and clay
JT29	18	-
JT28	11	-
JT38	37	-
ADG1	47	-
JT3	55	-
JT4	42	-
WADI RUSAYL		
JT75	46	-
ADG14	49	-
ADG13	5	-

Table A.4

HYDRAULIC CONDUCTIVITY OF CLAYEY GRAVELS

Borehole number	Hydraulic Conductivity (m/day)	Comments
WADI BANI GHAFIR		
ADG25	2	-
ADG26	7	-
JT20	0.5	-
JT21	0	Reported dry, subsequently made water
JT22	33	Screen set in gravel lens
WADI FAR		
ADG19	3	-
ADG20	4	-
JT16	-	Not tested, water too deep
JT18	1	-
ADG27	4	-
JT15	13	Screen set in gravel lens
WADI BANI KHARUS		
JT58	1	-
JT69	3	-
ADG24	2	-
JT23	10	-
JT24	2	-
JT67	15	Screen set in gravel lens
WADI NAKHL		
JT63	6	-
JT 5	0.4	-
JT10	4	-
WADI AL AJAL		
JT52	0	Reported dry, subsequently made water
JT56	0	-
JT 7	-	Not tested, water too deep
WADI HALBAN		
JT41	3	-
JT74	3	-
JT37	3	-
JT42	0	Made water after completion
WADI SEMAIL		
JT32	0	Made water after completion
WW9	0.2	) PD(O) production wells
WW10	0.1	)
WD1		) Government production wells in
WD2		) Al Khawd wellfield

Table A.4 continued

Borehole number	Hydraulic Conductivity (m/day)	Comments
WADI SEMAIL		
WD3		) Government production wells in
WD4		) Al Khawd wellfield
WADI RUSAYL		
JT53	0.5	) Government wells in
WRP 1	0.4	) Rusayl Wellfield
WRP 2	0.5	)
GP 8	0.3	)
GP 10	0.2	)
GP 12	0.3	)

Table A.5

HYDRAULIC CONDUCTIVITY OF CEMENTED GRAVELS AND LIMESTONES

Borehole number	Hydraulic Conductivity (m/day)	Comments
WADI BANI GHAFIR		
JT19	0	Made water after completion
WADI FAR		
JT17	0	Made water after completion
WADI BANI KHARUS		
JT57	7	Screen also in Clayey Gravels
JT68	-	Not tested, water too deep
JT70	1	-
JT71	1	-
WADI NAKHL		
JT11	1	Screen also in Clayey Gravels
JT12	0.2	Screen also in Clayey Gravels
JT33	4	-
JT72	4	-

standing water level 63 m below the surface. Although shown in Table A.3 as having zero permeability, this is not a true measure of the aquifer potential but reflects the problems encountered in providing proper well design during the early exploration stages of our study.

Clayey Gravels Table A.4

The western area of the Batinah provides values slightly higher than those obtained for the east which is a reversal of the trend seen in the *Upper Gravels*. The three boreholes, JT15, JT67 and and JT22 give conductivities of 13, 15 and 33 m/day respectively. These results, similar to those obtained for the *Upper Gravels*, are for boreholes with screens set in the gravel lens at the base of the *Clayey Gravels* (see Figure 2.10). They suggested that a limited but significant aquifer may be present within the otherwise unattractive prospect of the *Clayey Gravels*.

Cemented Gravels and Limestones Table A.5

There are ten boreholes with screens set below the base of the *Clayey Gravels*; all are located in the western part of the Batinah. Most of these wells have some part of the screen set in higher beds and it is particularly difficult to determine the origin of the groundwater in these cases.

The hydraulic conductivities are similar to those for the *Clayey Gravels*. Of particular significance are the values for the coastal wells JT70, JT71 and JT72. They demonstrate very low conductivities in the relatively shallow sediments at the coast in the Wadi Bani Kharus basin. This corresponds with the appearance of silts and sands in the shallow deposits of this area where the coastal plain is widest. However, the occurrence of Tertiary Limestones immediately off-shore from these boreholes, and the possibility of extensive carbonate cement or even of limestone at shallow

depths beneath the Wadi Bani Kharus basin would explain the results.

The range of values obtained are shown in Figure A.2 where they are compared with hydraulic conductivity values for a wide range of rock types (after Bear). The descriptions show that the *Upper Gravels* exhibit hydraulic conductivities which would enable them to be classified as good aquifers but nevertheless they tend to fall within Bear's semi-pervious category. The *Clayey Gravels* and the *Cemented Gravels* and Limestones exhibit aquifer characteristics similar to those expected in find sands and silts. Generally they must be regarded as poor semi-pervious aquifers of limited groundwater potential.

A.4 Credibility of the Hydraulic Conductivity Data

It is useful to make some detailed comment concerning the validity of the data and of the methods employed to derive the estimates of conductivity. Our approach has been conservative. For example, it has been assumed that the entire screen length in each borehole has tapped productive formations. This is unlikely and the hydraulic conductivities, derived by dividing transmissivity by screen length, will tend to be underestimated resulting in a low resources estimate in the flow net analysis.

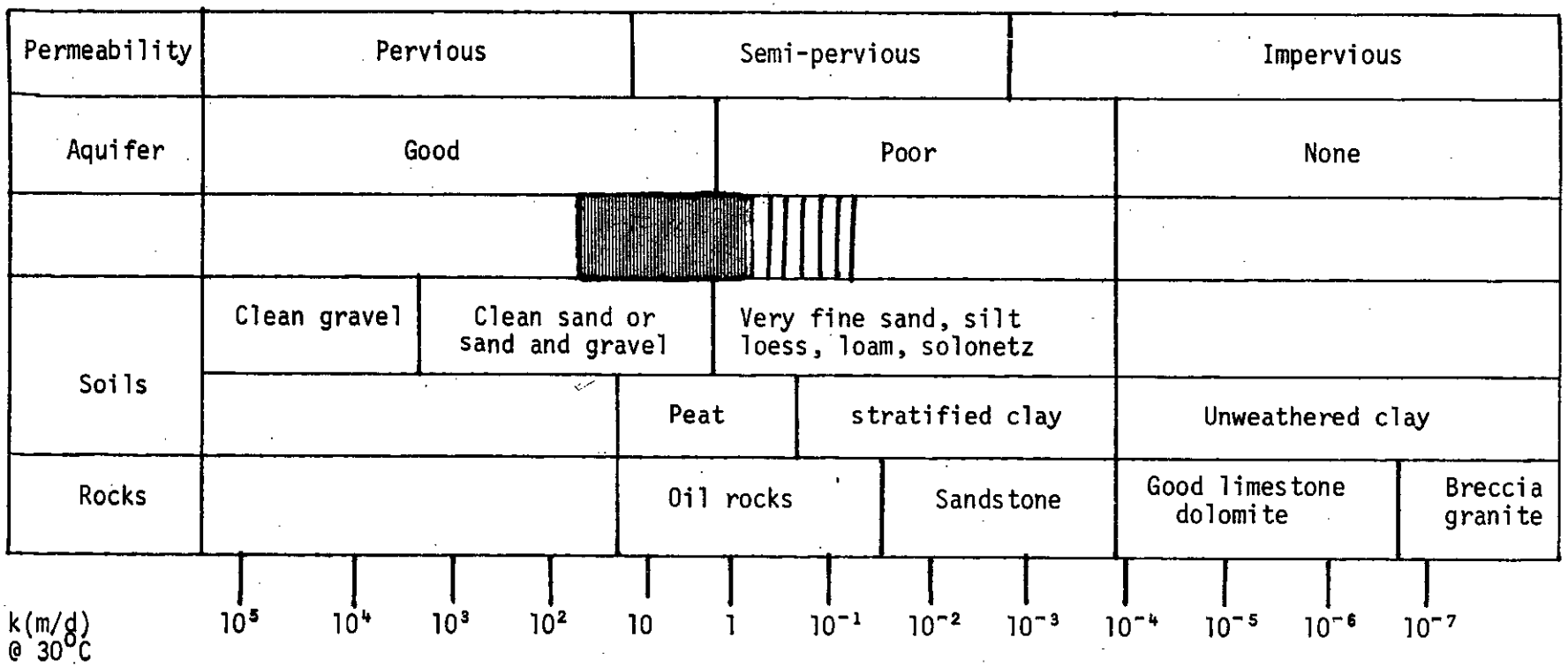
However the major uncertainty lies in the estimation of transmissivity from the specific capacity data. The empirical method used above gives values which do not agree with an independent assessment made by Barber (Report of a Consultancy Mission, 1974). Barber estimated transmissivity using a semi-empirical formula based on the Thiem equilibrium equation;

$$T = \frac{2.3}{2\pi} \log \frac{r_e}{r_w} \cdot \frac{Q}{S_w}$$

where: Q = discharge rate of borehole in m^3/day
T = aquifer transmissivity in m^2/day
r_e = radius of influence of well in m

Figure A.2

TYPICAL VALUES OF HYDRAULIC CONDUCTIVITY



Range of values obtained for upper gravels

Range of values obtained for Clayey Gravels

Mr J. Bear in Dynamics of Fluids in Porous Media

r_w = effective radius of well in m
S_w = equilibrium drawdown at the well in m

This equilibrium method produces similar estimates of hydraulic conductivity to those obtained by our empirical method for boreholes in the *Clayey* and *Cemented Gravels* but considerably higher values for the *Upper Gravels* (10-200 m/day as compared with 1-50 m/day). Some differences are undoubtedly due to the large well losses in many of the boreholes. However, comparison of results from boreholes with small well losses show that the differences are signficant even when well efficiency is greater than 90 per cent. In Table A.6, which shows examples of the hydraulic conductivities derived by both methods, it is apparent that well efficiency is only part of the problem.

The major cause of uncertainty is in the interpretation of the response of the aquifer to pumping. The Thiem method requires that test data used to derive the specific capacity should exhibit non-leaky artesian characteristics. This requires a groundwater condition where the aquifer unit is overlain by a totally impermeable bed which does not itself yield any groundwater or allow passage of water from any overlying water bearing horizons. By contrast a leaky artesian system allows groundwater to pass through the impermeable bed until eventually the well yield is obtained from the leakage and not from the artesian aquifer.

The specific capacity of a well is calculated from the value of drawdown at the end of the first stage of a step drawdown test. Fig A.3 illustrates the differing behaviour of non-leaky and leaky artesian aquifers during this first stage of pumping. A well in a leaky artesian aquifer with a low transmissivity can show the same drawdown at the end of the first stage as a well in a non-leaky artesian aquifer of high transmissivity. A specific capacity method based on the non-leaky assumption will therefore over-estimate transmissivity when conditions are actually leaky. True non-leaky aquifer conditions are unlikely in the Batinah where there do not appear to be any large scale, totally impermeable formations. The discrepancy between the two sets of data is thus attributed to differences in the value $\frac{2.3}{2\pi} \log ({}^{r}e/r_w)$. This

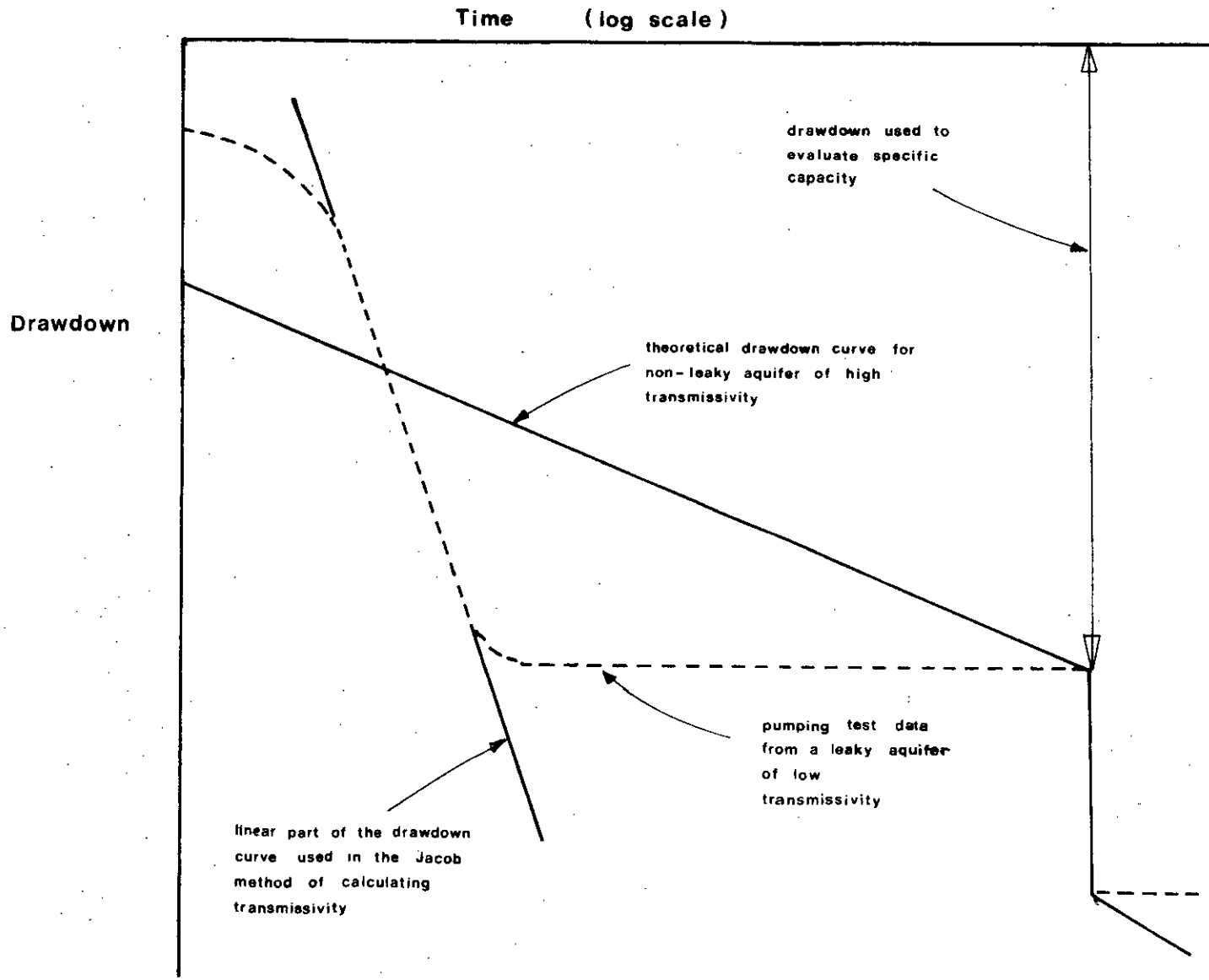
Table A.6

HYDRAULIC CONDUCTIVITY

(m/day)

	Semi-empirical method	Empirical method	Well Efficiency [1] %
JT 30	143	9	62
JT 35	267	62	47
JT 37	126	12	9
JT 36	80	19	91
JT 55	10	0.5	95
JT 67	34	15	99

Note: 1 Well efficiency has been taken as the ratio of the drawdown resulting from the properties of the aquifer to the total drawdown, expressed as a percentage. Inefficient boreholes have a significant drawdown component resulting from the construction of the well. The formation losses, BQ in Appendix A, and the well losses, CQ^2, have been derived by analysis of the step-drawdown data using a method proposed by Rorabaugh. The well efficiencies given above were computed from BQ/SW.



ALTERNATIVE INTERPRETATIONS OF A DRAWDOWN CURVE IN LEAKY ARTESIAN CONDITIONS

FIGURE A.3

empirical value of α normally lies between 1.3 and 1.4 for non-leaky aquifers. We have shown that a value of $\alpha = 0.298$ could be derived from the data available and we consider that this is a more appropriate value in view of the aquifer conditions.

APPENDIX B

BOREHOLE DETAILS FOR THE BATINAH

This catalogue of borehole construction details and pumping test information relating to 137 boreholes provides a summary of the results of the groundwater drilling exploration programme. The tables contain details of most of the exploration wells constructed for the water resources survey together with some information for earlier wells and others drilled for water supply purposes. In our analysis in chapters 2 and 3 we have not used the information from all of these sites; some are outside the boundaries of the area covered by this report, others are excluded due to their close proximity to the key boreholes shown in Figure 2.1.

The well numbering system relates either to the construction sequence of the various drilling contracts or to the most commonly used reference by which the boreholes are known. A national well numbering system is needed to replace the existing well references which tend to be confusing particularly when several wells of different sizes occur in the same area. As a guide to the tables an explanation of the various series is given.

ADG 1 - 35

Boreholes constructed by Geoprosco Ltd prior to the start of the water resources survey. These wells tend to have been sited along the coast road between Sib and As Suwayq.

JT 1 - 76

Boreholes constructed by Geoprosco Ltd during the period of the water resources survey. The wells were constructed either for exploration purposes between the coast road and the mountains or at the request of the Government for water supply purposes normally in the coastal zone.

GP 1 - 15 and WRP 1 - 2

These exploration and production wells are located in the Wadi Rusayl. GP boreholes were constructed prior to the water resources survey; production wells WRP1 and WRP2 were constructed during the survey.

Lansab 1 - 2

Test boreholes in the Wadi Lansab constructed as part of the exploration programme for SAF(TR).

PD(O)9 and 10

Production wells in the Wadi Semail supplying PD(O).

DW 1-4

Small diameter exploration boreholes constructed to monitor the saline intrusion at the coast.

WELL DETAILS					PUMPING TEST DETAILS						STEP DRAWDOWN ANALYSIS						
WELL NO	BORE-HOLE DEPTH (m)	DEPTH TO WATER LEVEL (m)	LENGTH OF SCREEN (m)	DEPTH TO TOP OF SCREEN (m)	TEST YIELD (l/s)	FLOW MEASU-RING DEVICE	TEST YIELD Q (m^3/day	INCREMENT OF DRAWDOWN Δ_S (m)	DRAWDOWN SW (m)	SPECIFIC CAPACITY Q/SW m^2/day		SW/Q	FORMATION CONSTANT B	WELL CONSTANT C	FORMATION LOSS BQ (m)	WELL LOSS CQ^2 (m)	WELL EFFICIENCY BQ/SW %
J.T 1	38.7	26.2	5.5	28.6	11.4		985		0.30	3283		0.000305		CONSTANT RATE			
J.T 2	30.4	9.1	9.8	19.5	12.9 - 13.3		1113 - 1146		7.32	154		0.00648		CONSTANT RATE			
J.T 3	36.6	8.5	15.9	17.7	13.1 - 14.0		1134 - 1211		0.40	2895		0.000345		CONSTANT RATE			
J.T 4	34.1	7.3	14.6	16.8	14.4		1244		0.61	2039		0.000490		CONSTANT RATE			
J.T 5	70.1	51.8	11.6 10.2	22.9 58.8	1.3 - 2.2		109 - 192		12.2	12.3		0.0813		CONSTANT RATE			
J.T 6	70.1	-	10.6 9.7	23.2 60.4	No groundwater within 70 m of surface									NO TEST PUMP			
J.T 7	140	61	22.5	117.1	Standing water level at 61 m at completion Air lifted at 1.3 l/s from 97 m standing water level now at 18 m.									NO TEST PUMP			
J.T 8	12.5		6.1	6.1	Reached bedrock at 12.5 m. No water									NO TEST PUMP			
J.T 9	42				Reached bedrock at 42 m, reported dry. Subsequently made water. Standing water level now 22 m below surface									NO TEST PUMP			
J.T 10	70.97	42.3	10.4 10.5	22.5 59.5	6.2 7.7 8.5	3" ori- fice	536 665 734	3.40 1.10 1.00	3.40 4.50 5.50	158 148 133		0.00633 0.00676 0.00752	5.5	9.6	2.05 2.54 2.81	1.32 2.04 2.50	61 56 53
J.T 11	140	50.7	9 12	71 128	3.0 3.2 3.5	Weir	259 276 302	5.82 1.80 3.83	5.82 7.62 11.45	44.5 36.2 26.4		0.0225 0.0276 0.0379		Negative B value			

WELL DETAILS					PUMPING TEST DETAILS						STEP DRAWDOWN ANALYSIS						
WELL NO	BORE-HOLE DEPTH (m)	DEPTH TO WATER LEVEL (m)	LENGTH OF SCREEN (m)	DEPTH TO TOP OF SCREEN (m)	TEST YIELD (l/s)	FLOW MEASU-RING DEVICE	TEST YIELD Q (m^3/day)	INCREMENT OF DRAWDOWN Δ_S (m)	DRAWDOWN SW (m)	SPECIFIC CAPACITY Q/SW m^2/day		SW/Q	FORMATION CONSTANT B	WELL CONSTANT C	FORMATION LOSS BQ (m)	WELL LOSS CQ^2 (m)	WELL EFFICIENCY BQ/SW %
J.T. 12	140	25.1	11.6 12.3	43.5 91.3	3.7 4.1 4.4	WEIR	320 354 380	17.20 7.80 7.60	17.20 25.00 32.60	18.6 19.2 11.7		0.0538 0.0521 0.0855	Negative B value				
J.T. 13	70	35.2	11 11	35 59	7.4 9.1 10.4	3" ori-fice	639 786 899	0.62 0.23 0.18	0.62 0.85 1.03	1031 925 873		0.00097 0.00108 0.00114	0.72	1.52	0.32 0.39 0.45	0.30 0.45 0.59	52 46 43
J.T. 14	70		22.8	47.2	Reported dry at time of drilling. Standing water level now at 63 m.								NO TEST PUMP				
J.T. 15	101	34.8	11 12	43 66	7.9 9.7 11.1	3" ori-fice	683 838 959	0.67 0.27 0.07	0.67 0.94 1.01	1019 891 950		0.000981 0.001122 0.00105	Unable to plot SW/Q v Q data				
J.T. 16	140	62.5	12 12	69 92	Insufficient water to pump from 70 m, the maximum setting for test pump.								NO TEST PUMP				
J.T. 17	144		11.6 12.9	70.3 94.2	Reported dry at time of drilling. Standing water level now 18 m.								NO TEST PUMP				
J.T. 18	70	9.6	26	44	8.9 11.0 12.7	3" ori-fice	769 950 1097	9.80 3.70 3.60	9.80 13.50 17.10	78.5 70.4 64.2		0.0127 0.0142 0.0156	8.15	19	4.35 5.38 6.21	5.42 8.28 11.03	44 39 36
J.T. 19	140	23.2	7 22	44 118	Insufficient water to test pump. Standing water level now at 12 m.								NO TEST PUMP				
J.T. 20	141	15.2	22.8	22.7	6.9 9.2 9.9	3" ori-fice	596 795 855	7.60 5.20 5.90	7.60 12.80 18.70	78.4 62.1 45.7		0.0128 0.0161 0.0219	Unable to plot SW/Q v Q data				
J.T. 21	144		24.4	24.5	Reported dry at time of drilling. Made water during 7 days following completion. Now 37 m to water.								NO TEST PUMP				

WELL DETAILS					PUMPING TEST DETAILS						STEP DRAWDOWN ANALYSIS						
WELL NO	BORE-HOLE DEPTH (m)	DEPTH TO WATER LEVEL (m)	LENGTH OF SCREEN (m)	DEPTH TO TOP OF SCREEN (m)	TEST YIELD (l/s)	FLOW MEASU-RING DEVICE	TEST YIELD Q (m^3/day)	INCREMENT OF DRAWDOWN Δ_S (m)	DRAWDOWN SW (m)	SPECIFIC CAPACITY Q/SW m^2/day		SW/Q	FORMATION CONSTANT B	WELL CONSTANT C	FORMATION LOSS BQ (m)	WELL LOSS CQ^2 (m)	WELL EFFICIENCY BQ/SW %
J.T. 22	142	52.4	11 12	67 128	6.2 7.7 8.8	3" ori-fice	536 665 760	0.21 1.06 0.35	0.21 1.27 1.62	2552 524 469		0.000392 0.00191 0.00213	UNABLE TO PLOT SW/Q v Q DATA				
J.T. 23	222.5	22.4	11 12 11	47 163 210	6.9 8.8 9.8	3" ori-fice	596 760 847	0.50 0.22 0.20	0.50 0.72 0.92	1192 1056 921		0.000839 0.000947 0.001086	0.47	1.76	0.20 0.25 0.28	0.30 0.49 0.61	39 34 31
J.T. 24	143	48.0	11 11	86 130	6.2 7.7 8.8	3" ori-fice	536 665 760	3.50 0.87 1.03	3.50 4.37 5.4	153 152 141		0.00654 0.00658 0.00709	7.4	6.19	2.75 3.42 3.91	0.85 0.32 1.73	78 78 72
J.T. 25	56	13.4	15	38	7.2 8.8 10.2	3" ori-fice	622 760 881	7.80 4.45 2.10	7.80 12.25 14.35	79.7 62.0 61.4		0.0125 0.0161 0.0163	8.4	25.4	3.63 4.44 5.14	4.75 7.09 9.52	43 38 35
J.T. 26	29	6.2	15	14	7.4 9.0 10.4	3" ori-fice	639 778 899	4.00 0.50 4.40	4.0 4.5 8.9	160 173 101		0.00625 0.00578 0.00990		UNABLE TO PLOT SW/Q v Q DATA			
J.T. 27	71	34.3	10	61	1.6 - 1.4	V tank	138 - 121		4.66 - 4.95	29.6 - 24.4		0.0338 - 0.041		CONSTANT RATE			
J.T. 28	70	23.6	22	35	6.9 8.4 9.8	3" ori-fice	596 726 847	0.76 0.08 0.12	0.76 0.84 0.96	784 864 882		0.00128 0.00116 0.00113	SPECIFIC CAPACITY INCREASING DURING TEST INDICATING WELL DEVELOPMENT NEGATIVE SLOPE FOR SW/Q v Q GRAPH				
J.T. 29	70.6	12.0	11.5 11.97	34.5 58.03	7.2 8.8 10.2	3" ori-fice	622 760 881	0.44 0.10 0.06	0.44 0.54 0.60	1430 1421 1481		0.000699 0.000704 0.000675	SPECIFIC CAPACITY INCREASING DURING TEST INDICATING WELL DEVELOPMENT NEGATIVE SLOPE FOR SW/Q v Q GRAPH				
J.T. 30	70.6	19.4	21.0	45.3	6.7 8.3 9.5	3" ori-fice	579 717 821	0.25 0.06 0.10	0.25 0.31 0.41	2298 2298 1993		0.000435 0.000435 0.000502	0.44	0.47	0.18 0.22 0.25	0.08 0.12 0.15	70 65 62
J.T. 31	70.6	37.6	24.1	46.26	6.7 8.4 9.1	3" ori-fice	579 726 786	0.78 0.32 0.01	0.78 1.09 1.10	747 665 714		0.001340 0.00150 0.00140	1.36	1.42	0.55 0.68 0.74	0.02 0.04 0.04	71 63 68

WELL DETAILS					PUMPING TEST DETAILS						STEP DRAWDOWN ANALYSIS					
WELL NO	BORE-HOLE DEPTH (m)	DEPTH TO WATER LEVEL (m)	LENGTH OF SCREEN	DEPTH TO TOP OF SCREEN (m)	TEST YIELD (l/s)	FLOW MEASU-RING DEVICE	TEST YIELD Q (m^3/day)	INCREMENT OF DRAWDOWN Δs (m)	DRAWDOWN sw (m)	SPECIFIC CAPACITY Q/sw (m^2/day)	SW/Q	FORMATION CONSTANT B	WELL CONSTANT C	FORMATION LOSS BQ (m)	WELL LOSS CQ^2 (m)	WELL EFFICIENCY BQ/sw %
J.T 32	71.5	56.4	24.1	46.4	INSUFFICIENT WATER TO TEST							NO TEST PUMP				
J,T 33	31.55	8.4	20	11	2.2	V TANK	190		0.67	284	0.00352	CONSTANT RATE				
J.T 34	87.00		13	74	REPORTED DRY ON COMPLETION							NO TEST PUMP				
J.T 35	35.00	10.0	11	24	6.9 8.5 9.9	3" ORI-FICE	596 734 855	0.26 0.12 0.04	0.26 0.39 0.43	2249 1892 2012	0.000445 0.000529 0.000497	0.36	0.69	0.15 0.18 0.21	0.12 0.18 0.24	56 47 50
J.T 36	35.00	12.2	11	24	6.7 8.3 9.5	3" ORI-FICE	579 717 821	0.85 0.25 0.13	0.85 1.10 1.23	681 652 667	0.00147 0.00153 0.00150	2.02	0.34	0.81 1.01 1.15	0.06 0.08 0.11	96 91 94
J.T 37	70.00	28.2	11 12	36 58	6.6 8.1 9.4	2½" ORI-FICE	575 701 809	2.60 1.00 1.44	2.60 3.60 5.04	221 195 161	0.00452 0.00513 0.00621	0.60	14.8	0.24 0.29 0.34	2.36 3.51 4.68	9 8 7
J.T 38	20.00	3.2	14.2	4	2.2	V TANK	190		0.11	1730	0.000578	CONSTANT RATE				
J,T 39	5.5	1.2	3.5	2	REPORTED INTO BED-ROCK AT 5.5 M							NO TEST PUMP				
J.T 40	5.0		3.5	0.5	REPORTED INTO BED-ROCK AT 5.0 M HOLE DRY							NO TEST PUMP				
J.T. 41	71.3	6.3	24	46	6.7 8.4 9.5	3" ORI-FICE	579 726 821	2.28 0.02 0.43	2.28 2.30 2.73	254 316 301	0.00394 0.00316 0.00332	UNABLE TO PLOT sw/Q v. Q DATA				

WELL DETAILS					PUMPING TEST DETAILS							STEP DRAWDOWN ANALYSIS						
WELL NO	BORE-HOLE DEPTH (m)	DEPTH TO WATER LEVEL (m)	LENGTH OF SCREEN (m)	DEPTH TO TOP OF SCREEN (m)	TEST YIELD (l/s)	FLOW MEASU-RING DEVICE	TEST YIELD Q (m^3/day)	INCREMENT OF DRAWDOWN Δ_S (m)	DRAWDOWN SW (m)	SPECIFIC CAPACITY Q/SW m^2/day		SW/Q	FORMATION CONSTANT B	WELL CONSTANT C	FORMATION LOSS BQ (m)	WELL LOSS CQ^2 (m)	WELL EFFICIENCY BQ/SW %
J.T. 42	71		23	46	Insufficient water to test when completed. Water level now 31.5 m								NO TEST PUMP .				
J.T. 43	38	9.4	11	27	6.9 8.4 9.9	3" ori-fice	596 726 855	0.59 0.11 0.10	0.59 0.70 0.80	1010 1037 1069		0.00099 0.000964 0.000935	Specific capacity increasing during test indicating well development				
J.T. 44	36	7.7	12	24	6.9 8.4 9.8	3" ori-fice	596 726 847	0.47 0.24 0.13	0.47 0.71 0.84	1268 1023 1008		0.000789 0.000978 0.000992	0.53	1.62	0.22 0.27 0.31	0.28 0.41 0.56	44 39 36
J.T. 45	38	8.6	13	25	6.9 8.4 9.9	3" ori-fice	596 726 855	0.45 0.20 0.21	0.45 0.65 0.86	1324 1117 994		0.000755 0.000895 0.00101	0.45	1.53	0.19 0.23 0.27	0.26 0.39 0.54	41 38 33
J.T. 46	38	8.3	12	26	6.9 8.4 9.9	3" ori-fice	596 726 855	1.43 0.21 0.12	1.43 1.64 1.76	417 443 486		0.00240 0.00226 0.00206	Specific capacity increasing during test indicating well development.				
J.T. 47	37	9.0	12	25	6.9 8.4 9.9	3" ori-fice	596 726 855	0.58 0.11 0.07	0.58 0.69 0.76	1028 1052 1125		0.000973 0.000951 0.000889	Specific capacity increasing during test indicating well development				
J.T. 48	38	7.8	12	26	6.9 8.4 9.9	3" ori-fice	596 726 855	0.48 0.13 0.13	0.48 0.61 0.74	1255 1200 1163		0.000797 0.000833 0.000860	0.94	0.51	0.39 0.47 0.56	0.09 0.13 0.18	82 79 76
J.T. 49	38	7.7	13	25	6.8 8.3 9.5	3" ori-fice	588 717 821	0.87 0.18 0.18	0.87 1.05 1.23	676 683 667		0.00148 0.00146 0.00150	2.04	0.22	0.83 1.02 1.16	0.04 0.05 0.07	96 97 95
J.T. 50	38	7.7	14	24	6.7 8.3 9.5	3" ori-fice	579 717 821	1.03 0.26 0.31	1.03 1.29 1.60	562 558 515		0.00178 0.00179 0.00194	1.94	1.29	0.80 1.00 1.14	0.21 0.32 0.42	78 78 72
J.T. 51	70.5	9.8	50	20	6.9 8.4 9.7	2½" ori-fice	595 728 842	0.58 0.13 0.16	0.58 0.70 0.86	1035 1040 979		0.000966 0.000962 0.001021	1.2	0.44	0.50 0.61 0.70	0.08 0.11 0.15	86 87 82

WELL DETAILS					PUMPING TEST DETAILS							STEP DRAWDOWN ANALYSIS					
WELL NO	BORE-HOLE DEPTH	DEPTH TO WATER LEVEL (m)	LENGTH OF SCREEN (m)	DEPTH TO TOP OF SCREEN (m)	TEST YIELD (l/s)	FLOW MEASU-RING DEVICE	TEST YIELD Q (m^3/day)	INCREMENT OF DRAWDOWN Δ_S (m)	DRAWDOWN SW (m)	SPECIFIC CAPACITY Q/SW m^2/day		SW/Q	FORMATION CONSTANT B	WELL CONSTANT C	FORMATION LOSS BQ (m)	WELL LOSS CQ^2 (m)	WELL EFFICIENCY BQ/SW %
J.T. 52	144	58	11 11	63 119	DRILLED TO 70 m. NO WATER. CASING PULLED AND BOREHOLE DEEPENED TO 114 m. TESTED AT 25 gph BY AIR LIFT. WATER LEVEL NOW 50.8 m BELOW SURFACE								NO TEST PUMP				
J.T. 53	72	4.4	50	22	6.3	2½" ori-fice	544		7.27	74.8		0.0134	CONSTANT RATE				
J.T. 54	71	1.4	50	21	6.9 8.4 9.7	2½" ori-fice	595 728 842	1.06	1.06	561		0.00178 TIDAL	FLUCTUATIONS AFFECTING WATER LEVELS				
J.T. 55	71	2.2	50	21	6.2 8.4 8.8	2½" ori-fice	537 722 759	6.50 1.30 0	6.50 7.80 7.80	82.6 92.6 97.3		0.0121 0.0108 0.0103	16.9	1.33	6.34 8.48 8.91	0.18 0.34 0.37	97 98 95
J.T. 56	71	53	24	47	INSUFFICIENT WATER TO TEST. WATER LEVEL RISEN TO 15 m OVER 8 MONTHS									NO TEST PUMP			
J.T. 57	72	19.3	11.4 11.53	23.6 60.5	6.7 8.3 9.5	3" ori-fice	579 717 821	1.03 0.26 0.31	1.03 1.28 1.60	562 558 515		0.00178 0.00179 0.00194	2	1.3	0.80 1.00 1.14	0,21 0.32 0.42	78 78 72
J.T. 58	70	2.9	50	13	6.7 8.3 9.5	3" ori-fice	579 717 821	2.70 0.20 2.25	2.70 2.90 5.15	214 247 159		0.00467 0.00405 0.00629	UNABLE TO PLOT SW/Q V Q DATA				
J.T. 59	71	16.4	22	24	DRILLED TO 46 m. INSUFFICIENT WATER TO TEST. DEEPENED TO 71 m. INSUFFICIENT WATER TO TEST.								NO TEST PUMP				
J.T. 60	11	1.7	8	3	INSUFFICIENT WATER TO TEST								NO TEST PUMP				
J.T. 61	36	2.1	11	25	6.9 8.4 9.7	2½" ori-fice	595 728 842	2.75 1.90 0.80	2.75 4.65 5.45	216 157 154		0.00463 0.00637 0.00649	0.6	1.57	0.25 0.30 0.35	0.27 0.40 0.54	48 43 40

WELL DETAILS					PUMPING TEST DETAILS						STEP DRAWDOWN ANALYSIS						
WELL NO	BORE-HOLE DEPTH (m)	DEPTH TO WATER LEVEL (m)	LENGTH OF SCREEN (m)	DEPTH TO TOP OF SCREEN (m)	TEST YIELD (l/s)	FLOW MEASU-RING DEVICE	TEST YIELD Q (m^3/day)	INCREMENT OF DRAWDOWN Δ_S (m)	DRAWDOWN SW (m)	SPECIFIC CAPACITY Q/SW m^2/day		SW/Q	FORMATION CONSTANT B	WELL CONSTANT C	FORMATION LOSS BQ (m)	WELL LOSS CQ^2 (m)	WELL EFFICIENCY BQ/SW %
J.T. 62	30	2.9	8	22	6.9 8.4 9.7	2½" ori-fice	595 728 842	2.35 0.87 0.22	2.35 3.22 3.44	253 226 245		0.00395 0.00443 0.00408	5.55	0.90	2.29 2.81 3.24	0.15 0.23 0.31	97 87 94
J.T. 63	24	6.4	12	12	6.4 8.0 9.1	3" ori-fice	553 691 786	2.45 1.60 1.10	2.45 4.05 5.15	226 171 153		0.00443 0.00585 0.00654	0.6	16	0.23 0.29 0.33	2.35 3.68 4.77	9 7 6
J.T. 64	35	11.8	11	23	6.7 8.3 9.5	3" ori-fice	579 717 821	2.40 0.30 0.30	2.40 2.70 3.00	241 266 274		0.00415 0.00376 0.00365	Specific capacity increasing during test indicating well development				
J.T. 65	35	13.1	11.54	23.4	6.7 8.3 9.5	3" ori-fice	579 717 821	2.45 1.00 0.60	2.45 3.45 4.05	236 208 203		0.00424 0.00481 0.00493	4.15	5.26	1.67 2.07 2.37	0.85 1.30 1.71	68 60 58
J.T. 66	30	13.6	12	18	6.7 8.3 9.5	3" ori-fice	579 717 821	0.5 0.155 0.105	0.5 0.655 0.76	1158 1095 1080		0.000864 0.000913 0.000926	1.035	0.55	0.42 0.52 0.59	0.09 0.14 0.18	83 79 78
J.T. 67	70.41	47.2	12.2 13.2	34.6 57.2	5.75 7.15 8.25	3" ori-fice	497 618 713	0.74 0.15 0.17	0.74 0.89 1.06	672 694 673		0.00149 0.00144 0.00149	2.12	1.00	0.73 0.91 1.05	0.12 0.18 0.24	99 102 99
J.T. 68	140	63.3	23.4	116.6	Drilled to 71 m. Insufficient water to test Deepened to 140 m - Water too deep to test. Air lift yield about 4000 gph								NO TEST PUMP				
J.T. 69	72	5.9	50	20	6.7 8.3 9.5	3" ori-fice	579 717 821	1.20 0.17 0.17	1.20 1.37 1.54	483 523 533		0.00207 0.00191 0.00188	Specific capacity increasing during test indicating well development				
J.T. 70	71	2.9	51	20	6.4 7.3 9.1	3" ori-fice	553 631 786	0.20 0.28 0.56	2.20 2.48 3.04	251 254 259		0.00398 0.00394 0.00386	Specific capacity increasing during test indicating well development				
J.T. 71	72	2.2	52	20	6.4 8.0 9.1	3" ori-fice	553 691 786	4.25 1.15 0.90	4.25 5.4 6.3	130 128 125		0.00769 0.00781 0.0080	10	0.27	3.84 4.80 5.46	0.04 0.06 0.08	82 89 87

WELL DETAILS					PUMPING TEST DETAILS							STEP DRAWDOWN ANALYSIS					
WELL NO	BORE-HOLE DEPTH (m)	DEPTH TO WATER LEVEL (m)	LENGTH OF SCREEN (m)	DEPTH TO TOP OF SCREEN (m)	TEST YIELD (l/s)	FLOW MEASU-RING DEVICE	TEST YIELD Q (m^3/day)	INCREMENT OF DRAWDOWN Δs (m)	DRAWDOWN SW (m)	SPECIFIC CAPACITY Q/SW m^2/day		SW/Q	FORMATION CONSTANT B	WELL CONSTANT C	FORMATION LOSS BQ (m)	WELL LOSS CQ^2 (m)	WELL EFFICIENCY BQ/SW %
J.T. 72	72	2.0	52	20	6.7 8.2 9.5	3" ori-fice	579 708 821	0.96 0.17 0.13	0.96 1.13 1.26	603 627 652		0.00166 0.00160 0.00153	Specific capacity increasing during test indicating well development				
J.T. 73	71	2.5	50	20	6.7 8.3 9.5	3" ori-fice	579 717 821	0.18 0.83 0.10	0.18 1.01 1.11	3217 710 740		0.000311 0.00141 0.00135	Unable to plot SW/Q v Q Data				
J.T. 74	70	10.7	26	44	5.9 7.3 8.5	3" ori-fice	510 631 734	2.06 0.67 0.72	2.06 2.73 3.45	248 231 213		0.00403 0.00433 0.00470	3.65	6.00	1.29 1.60 1.86	0.75 1.15 1.56	63 59 54
J.T. 75	31	5.2	10	13	6.6 8.2 9.3	3" ori-fice	570 708 804	0.37 0.10 0.10	0.37 0.48 0.58	1541 1491 1386		0.000649 0.000671 0.000722	0.71	0.567	0.28 0.35 0.40	0.09 0.14 0.18	76 24 69
J.T. 76	27	12.3	11.5	14.5	2.8		247		1.05	235		0.00426	CONSTANT RATE				
W.R. P.1	75	9.2	24	50	3.1 4.3 6.2		268 375 536	9.10 10.20 14.30	9.10 19.30 33.60	29.4 19.4 16.0		0.0340 0.0515 0.0625	12	272	2.23 3.12 4.46	9.41 18.39 37.64	24 31 31
W.R. P.2	76	10.1	24	50	2.3 4.7 7.1 8.0	2½" ori-fice	199 406 613 691	4.60 8.50 13.4 5.7	4.60 13.10 26.50 32.2	43.3 31.0 23.1 21.5		0.0231 0.0323 0.0433 0.0465	19	101.5	2.62 5.36 8.09 9.12	1.93 8.12 18.39 23.34	58 40 31 28
LANSAB 1	36	8.4	6.3	28.7	0.7		60.5		18.41	3.29		0.304	CONSTANT RATE				
LANSAB 2	27	13.00	3.1 3.1	15.7 21.4	0.7		60.5		5.22	11.6		0.086	CONSTANT RATE				
LANSAB 3	36	13.8	4 4	22 28	1.3		112		4.13	27.1		0.0369	CONSTANT RATE				

WELL DETAILS					PUMPING TEST DETAILS							STEP DRAWDOWN ANALYSIS					
WELL NO.	BORE-HOLE DEPTH (m)	DEPTH TO WATER LEVEL (m)	LENGTH OF SCREEN (m)	DEPTH TO TOP OF SCREEN (m)	TEST YIELD (l/s)	FLOW MEASU-RING DEVICE	TEST YIELD Q (m^3/day)	INCREMENT OF DRAWDOWN Δ_S (m)	DRAWDOWN SW (m)	SPECIFIC CAPACITY Q/SW m^2/day		SW/Q	FORMATION CONSTANT B	WELL CONSTANT C	FORMATION LOSS BQ (m)	WELL LOSS CQ^2 (m)	WELL EFFI-CIENCY BQ/SW %
PDO 9	602	25.7	7.0 7.9	166 183	7.1	gauged tank	610		50.50	12.1		0.0826	CONSTANT RATE				
PDO 10	305.7	25.6	7.9 7.6 7.0 7.9	147 166 184 193	8.1	gauged tank	697		55.60	12.5		0.0800	CONSTANT RATE				
ADG 1	23.5	5.8	9.1	4.3	12.9		1114		0.91	1224		0.000817	CONSTANT RATE				
ADG 2	59.5	16.5	22.3 3.1	9.4 53.3	12.9		1114		2.74	406		0.00246	CONSTANT RATE				
ADG 3	59.7	16.5	17.4 11.9	18.3 42.1	12.9		1114		2.74	406		0.00246	CONSTANT RATE				
ADG 4	59.5	10.7	5.5 6.2 5.8	17.4 33.8 45.1	12.9		1114		2.43	458		0.00218	CONSTANT RATE				
ADG 5	56.4	15.2	17.4 6.1	18.3 42.7	12.9		1114		2.21	504		0.00198	CONSTANT RATE				
ADG 6	39	14.6	17.2	18.3	12.9		1114		1.67	667		0.00150	CONSTANT RATE				
ADG 7	36	16.2	17.1	17.4	12.9		1114		2.13	523		0.00191	CONSTANT RATE				
ADG 8	37.5	20.4	19.7	15.7	12.9		1114		3.05	365		0.00274	CONSTANT RATE				
ADG 9	47.9	22.2	22.9	23.5	6.3		545		15.24	35.8		0.0279	CONSTANT RATE				
ADG 10	50	22.1	26.2	22.3	10.2		883		12.34	72		0.0140	CONSTANT RATE				
ADG 11	47	20.7	22.9	22.8	12.9		1114		5.48	203		0.00493	CONSTANT RATE				

WELL DETAILS					PUMPING TEST DETAILS						STEP DRAWDOWN ANALYSIS						
WELL NO.	BORE-HOLE DEPTH (m)	DEPTH TO WATER LEVEL (m)	LENGTH OF SCREEN (m)	DEPTH TO TOP OF SCREEN (m)	TEST YIELD (l/s)	FLOW MEASU-RING DEVICE	TEST YIELD Q (m^3/day)	INCREMENT OF DRAWDOWN Δ_S (m)	DRAWDOWN SW (m)	SPECIFIC CAPACITY Q/SW m^2/day		SW/Q	FORMATION CONSTANT B	WELL CONSTANT C	FORMATION LOSS BQ (m)	WELL LOSS CQ^2 (m)	WELL EFFIC-IENCY BQ/SW %
ADG 12	46.7	20.7	23.4	22.6	12.9		1114		3.65	305		0.00328		CONSTANT RATE ONLY			
ADG 13	34.2	7.6	21.0	11.3	12.9		1114		3.14	355		0.00282		CONSTANT RATE ONLY			
ADG 14	36	5.9	21.9	10.4	12.9		1114		0.31	3594		0.000278		CONSTANT RATE ONLY			
ADG 15	34.2	9.0	16.5	13.7	12.9		1114		1.82	612		0.00163		CONSTANT RATE ONLY			
ADG 16	35.7	18.1	19.8	11.9	12.6		1092		2.74	399		0.00251		CONSTANT RATE ONLY			
ADG 17	34.8	15.4	19.5	11.6	12.9		1114		3.50	318		0.00314		CONSTANT RATE ONLY			
ADG 18	47.6	18.3	26.5	16.8	12.9		1114		3.96	281		0.00356		CONSTANT RATE ONLY			
ADG 19	47	7.0	12	31	12.9		1114		10.06	111		0.00901		CONSTANT RATE ONLY			
ADG 20	47.3	8.5	15.5	27.5	12.9		1114		6.09	183		0.00546		CONSTANT RATE ONLY			
ADG 21	45.1	8.5	14	27.5	12.9		1114		2.44	457		0.00219		CONSTANT RATE ONLY			
ADG 22	39	13.4	15.3	19.2	12.9		1114		15.20	73		0.0137		CONSTANT RATE ONLY			
ADG 23	39	12.8	14.7	21	12.9		1114		3.35	333		0.00300		CONSTANT RATE ONLY			
ADG 24	49	9.8	17.5	14	12.9		1114		10.67	104		0.00962		CONSTANT RATE ONLY			
ADG 25	35.7	10.7	4.9 7.7	18.9 26.8	9.4		818		10.36	79		0.0127		CONSTANT RATE ONLY			
ADG 26	46	8.8	9 6	21 39	12.9		1114		3.04	366		0.00273		CONSTANT RATE ONLY			
ADG 27	34.5	6.1	3.4 6.1	18.6 25.9	12.9		1114		7.92	141		0.00709		CONSTANT RATE ONLY			
ADG 28	36	8.5	16.7	16.5	12.9		1114		1.52	733		0.00136		CONSTANT RATE ONLY			

WELL NO	BORE-HOLE DEPTH (m)	DEPTH TO WATER LEVEL (m)	LENGTH OF SCREEN (m)	DEPTH TO TOP OF SCREEN (m)	TEST YIELD (l/s)	FLOW MEASU-RING DEVICE	TEST YIELD Q (m^3/day)	INCREMENT OF DRAWDOWN Δ_S (m)	DRAWDOWN SW (m)	SPECIFIC CAPACITY Q/SW m^2/day		SW/Q	FORMATION CONSTANT B	WELL CONSTANT	FORMATION LOSS BQ (m)	WELL LOSS CQ^2 (m)	WELL EFFICI-ENCY BQ/SW %
ADG 29	36.5	10.1	15	17	12.9		1114		3.05	365		0.00274		CONSTANT RATE ONLY			
ADG 30	48.4	7.6	16	32	13.6		1178		3.05	386		0.00259		CONSTANT RATE ONLY			
ADG 31	48	6.4	17	29.5	13.6		1178		4.27	276		0.00362		CONSTANT RATE ONLY			
ADG 32	33.5	6.7	12.5	21	13.9		1200		0.91	1319		0.000758		CONSTANT RATE ONLY			
ADG 33	36.5	8.5	6 9.5	16.5 22.5	14.4		1243		1.52	818		0.00122		CONSTANT RATE ONLY			
ADG 34	35	8.5	5	17	14.4		1243		1.52	818		0.00122		CONSTANT RATE ONLY			
ADG 35	36	14.6	5.5	18	13.2		1145		4.27	268		0.00373		CONSTANT RATE ONLY			

WELL DETAILS						PUMPING TEST DETAILS						STEP DRAWDOWN ANALYSIS					
WELL	NO	BORE-HOLE DEPTH (m)	DEPTH TO WATER LEVEL (m)	LENGTH OF SCREEN (m)	DEPTH TO TOP OF SCREEN (m)	TEST YIELD (l/s)	FLOW MEASU-RING DEVICE	TEST YIELD Q (m^3/day)	INCREMENT OF DRAWDOWN Δ_S (m)	DRAWDOWN SW (m)	SPECIFIC CAPACITY Q/SW m^2/day	SW/Q	FORMATION CONSTANT B	WELL CONSTANT C	FORMATION LOSS BQ (m)	WELL LOSS CQ^2 (m)	WELL EFFICIENCY BQ/SW %
DW	1	300	11	290.9	9.1								NO TEST BOREHOLES SMALL DIAMETER OBSERVATION WELLS				
DW	2	300	9.1	290.9	9.1												
DW	3	300															
DW	4	300															
GP	1	86	HOLE ABANDONED DRY														
GP	2	58	8.5	4.6 13.4	22.8 58.2	4.2		360		35.66	10.1	0.0991		CONSTANT RATE ONLY			
GP	3	59.5	10.8	10.3	49.1	3.1		265						CONSTANT RATE ONLY			
GP	4	55.4	9.1	4.1 11.3	29.8 43.9	2.8		247						CONSTANT RATE ONLY			
GP	5	61.4	8.4	4.3 11.7	25.9 46.5	5.2		448						CONSTANT RATE ONLY			
GP	6	60.3	7.5	13 11.8	25.3 45.1	2.6		228		36.73	6.2	0.161		CONSTANT RATE ONLY			
GP	7	60.3	8.5	4.5 12.0	25.2 45.3	4.9		422						CONSTANT RATE ONLY			
GP	8	60.3	9.1	4.7 10.4	24.9 47.3	5.3		458		35.05	13.1	0.0765		CONSTANT RATE ONLY			
GP	9	60.3	10.3	3 10.1	48 47.2	3.8		327		33.89	9.6	0.104		CONSTANT RATE ONLY			
GP	10	60.3	10.3	3.1 10.4	25.6 46.9	4.2		360		33.89	10.6	0.0941		CONSTANT RATE ONLY			
GP	11	60.3	9.1	3.7 11.6	27.4 45.1	2.6		229		35.05	6.5	0.153		CONSTANT RATE ONLY			

WELL DETAILS					PUMPING TEST DETAILS						STEP DRAWDOWN ANALYSIS					
WELL NO	BORE-HOLE DEPTH (m)	DEPTH TO WATER LEVEL (m)	LENGTH OF SCREEN (m)	DEPTH TO TOP OF SCREEN (m)	TEST YIELD (l/s)	FLOW MEASU-RING DEVICE	TEST YIELD Q (m^3/day)	INCREMENT OF DRAWDOWN Δ_S (m)	DRAWDOWN SW (m)	SPECIFIC CAPACITY Q/SW m^2/day	SW/Q	FORMATION CONSTANT B	WELL CONSTANT C	FORMATION LOSS BQ (m)	WELL LOSS CQ^2 (m)	WELL EFFI-CIENCY BQ/SW %
GP 12	60.3	9.1	4.6 13.1	25.9 44.2	6.1		523		35.05	14.9	0.0671	CONSTANT RATE ONLY				
GP 13	60.3	9.6	3.1 12.2	28 48.2	8.3		720		34.59	20.8	0.048	CONSTANT RATE ONLY				
GP 14	60.3	9.1	10.6	49.4	5.7		491		35.05	14.0	0.0714	CONSTANT RATE ONLY				
GP 15	60.3	9.1	16.5 9.7	19.2 50.6	9.8		845		35.05	24.1	0.0415	CONSTANT RATE ONLY				

APPENDIX C

STRATA RECORDS

The following information has been collected during the construction of the principal boreholes sunk during the period of the water resources survey:

1. Time to penetrate 1 metre
2. Drillers record of strata every metre
3. Geologists description of lithological samples collected every metre.

This information has been put onto punched cards and a computer program written to enable the data to be presented in simple graphical form. The results, the Strata Records, have been prepared using the Univac 1108 computer at the Institute of Hydrology.

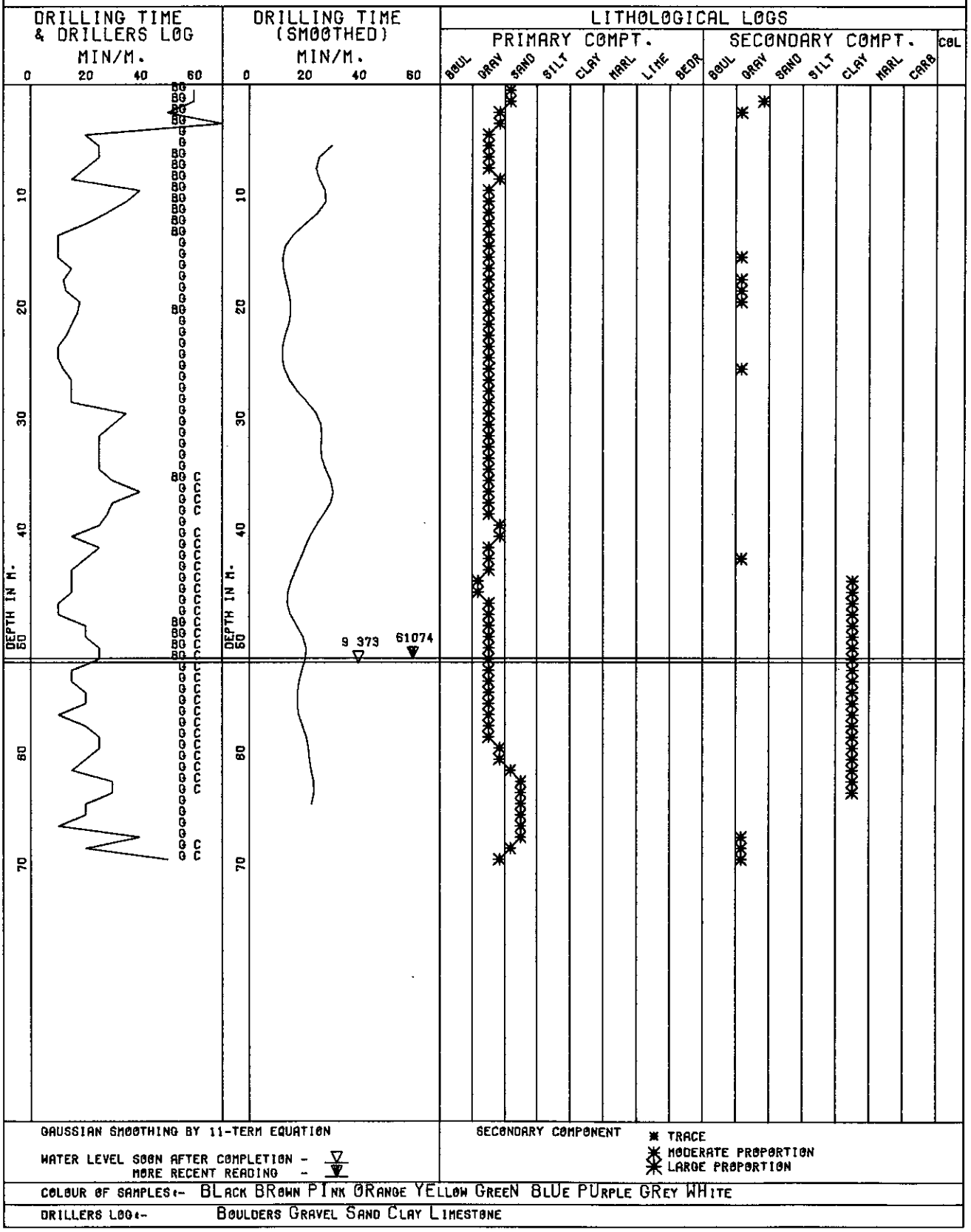
A smoothed drilling time log has been generated to simplify the very variable penetration rate information. The lithological logs show the nature of the primary rock constituents and also indicate mixed lithologies by identifying any other constituents. An indication of their abundance is given by means of the symbol size. Coarse, medium and fine grained gravel and sand is also shown, the position of the symbol being to the left hand side of the column for coarse grained material.

Water levels are given in the tables. The completion water level is shown together with a more recent reading. Eventually maximum and minimum water level positions will be given for the period of the study.

For identification purposes the current well references are used and the location of the boreholes given in the form of a grid reference.

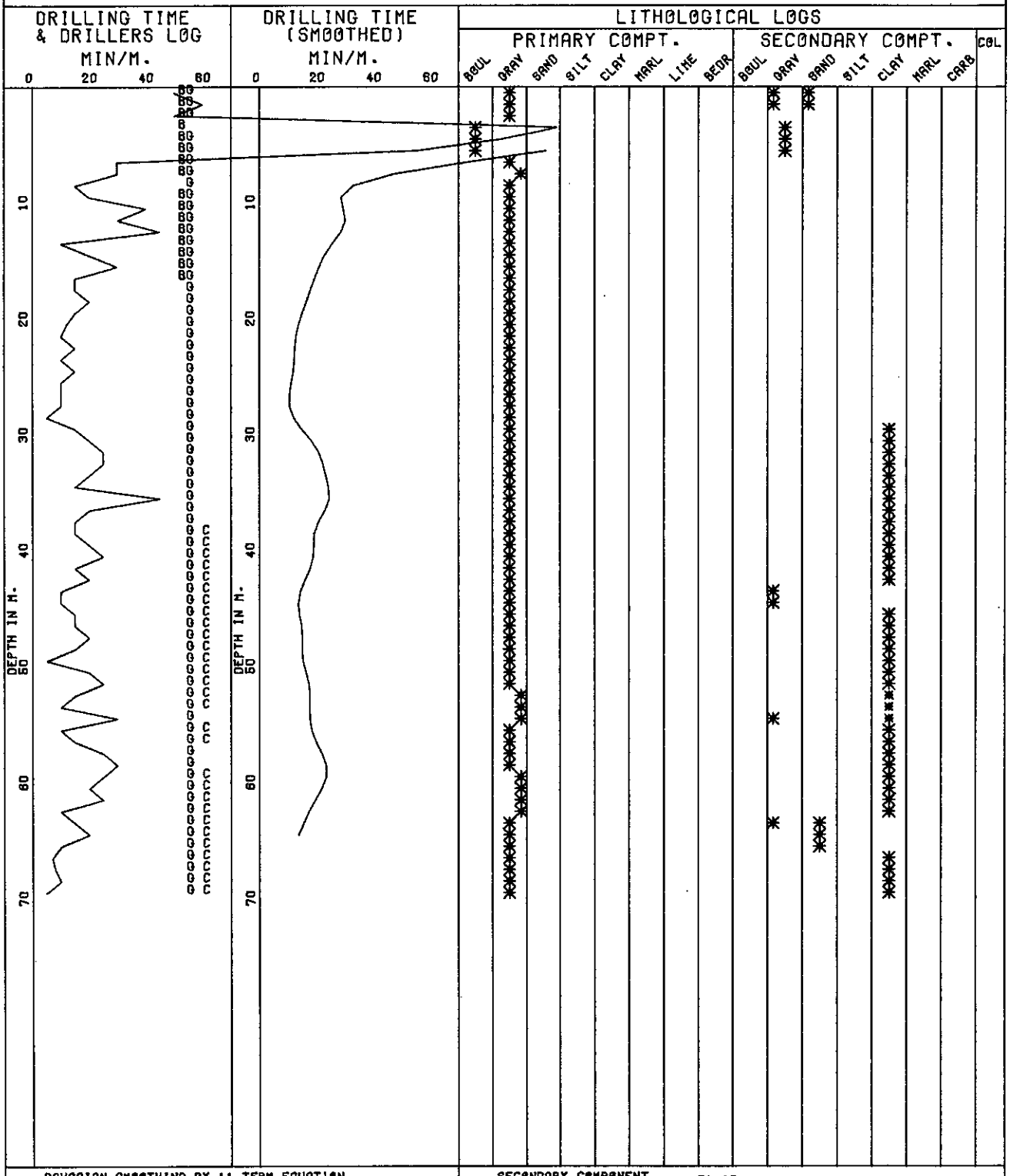
WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT 5 GRID REF. 58946114



WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT 6 GRID REF. 58836049

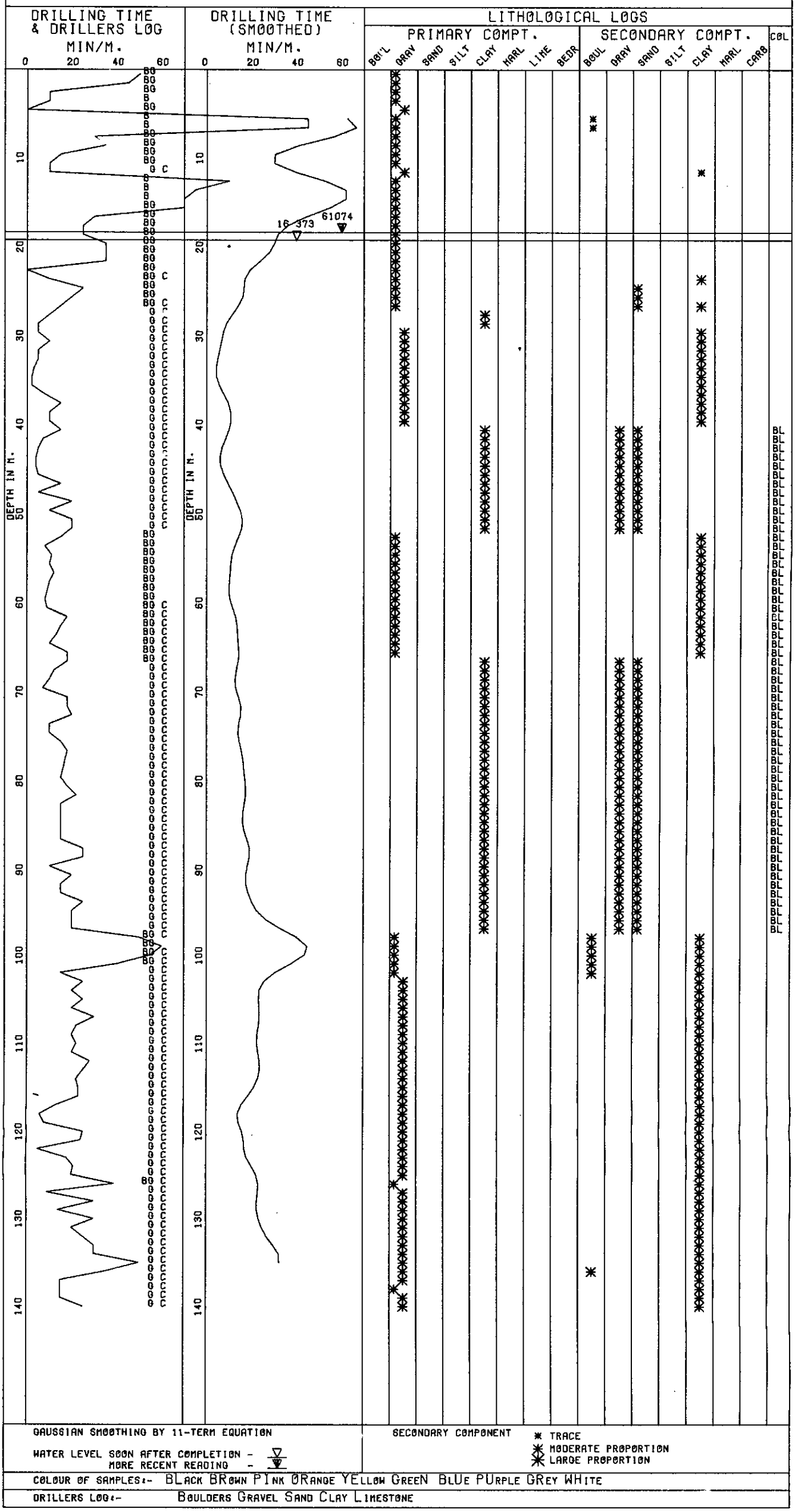


COLOUR OF SAMPLES:- BLACK BROWN PINK ORANGE YELLOW GREEN BLUE PURPLE GREY WHITE

DRILLERS LOG:- BOULDERS GRAVEL SAND CLAY LIMESTONE

WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT 7 GRID REF. 58605988



GAUSSIAN SMOOTHING BY 11-TERM EQUATION

WATER LEVEL SOON AFTER COMPLETION -
MORE RECENT READING -

SECONDARY COMPONENT

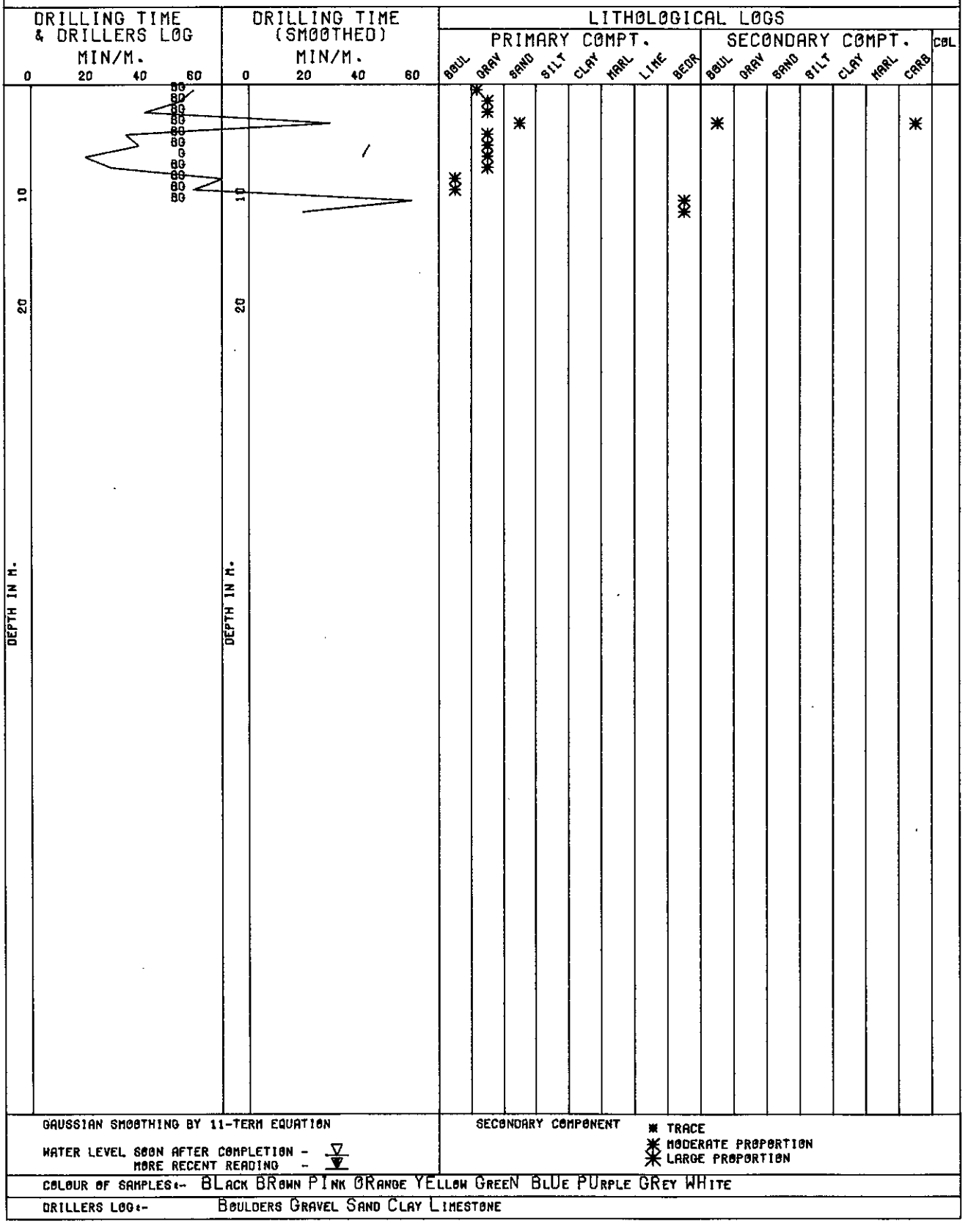
* TRACE
* MODERATE PROPORTION
* LARGE PROPORTION

COLOUR OF SAMPLES:- BLACK BROWN PINK ORANGE YELLOW GREEN BLUE PURPLE GREY WHITE

DRILLERS LOG:- BOULDERS GRAVEL SAND CLAY LIMESTONE

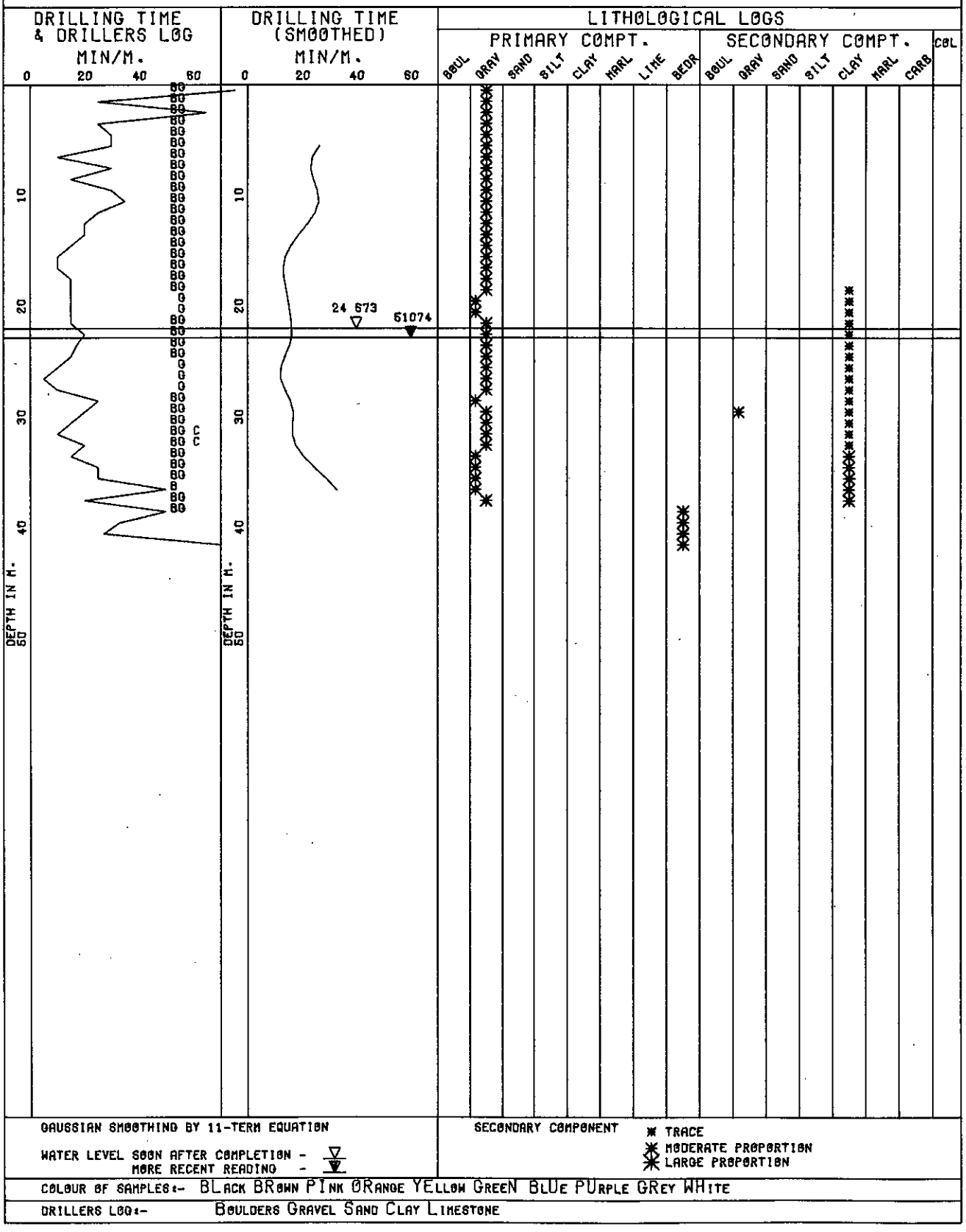
WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT 8 GRID REF. 58445888



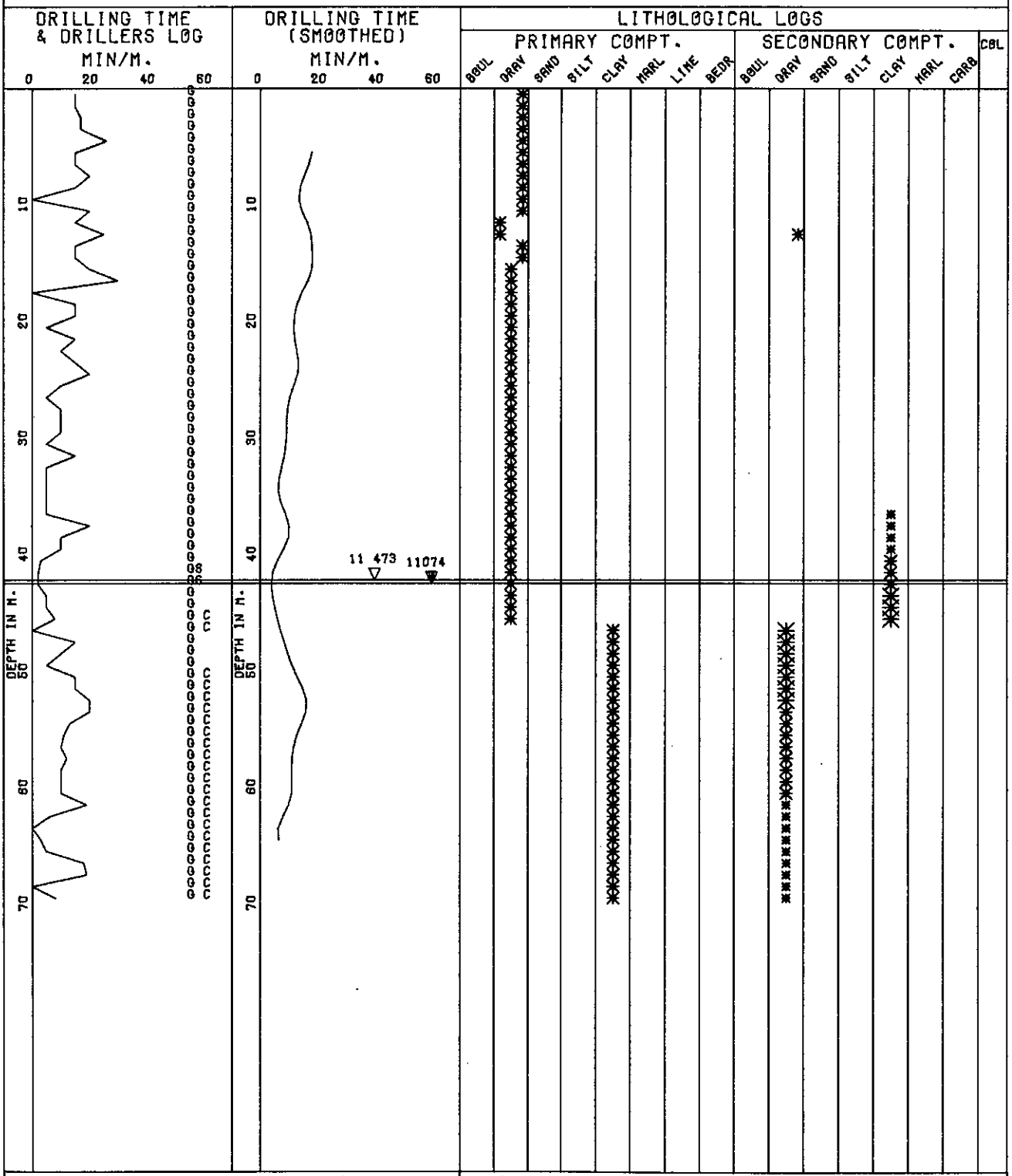
WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT 9 GRID REF. 57795853



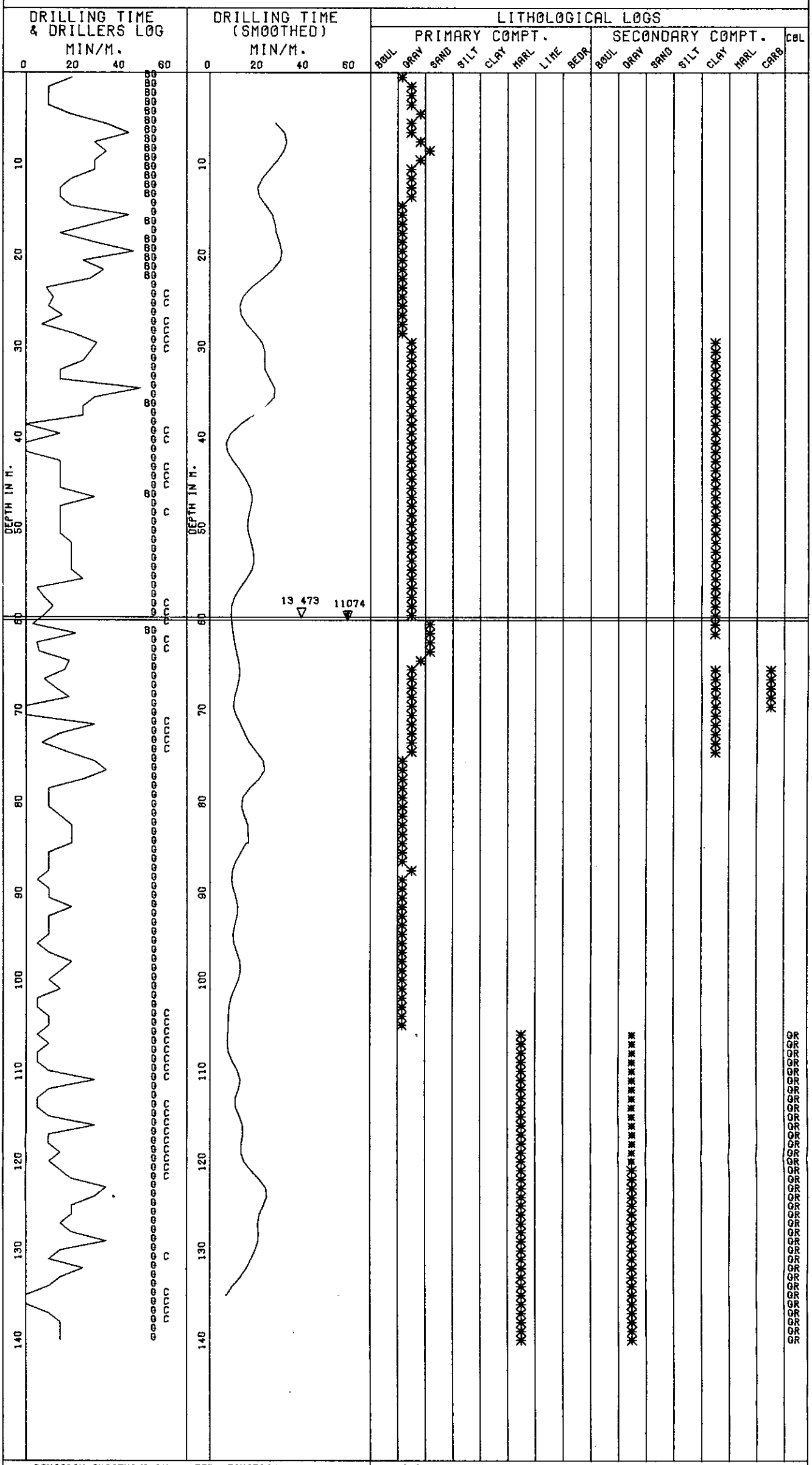
WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT10 GRID REF. 57816141



WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT11 GRID REF. 57576080



GAUSSIAN SMOOTHING BY 11-TERM EQUATION

WATER LEVEL SOON AFTER COMPLETION -
MORE RECENT READING -

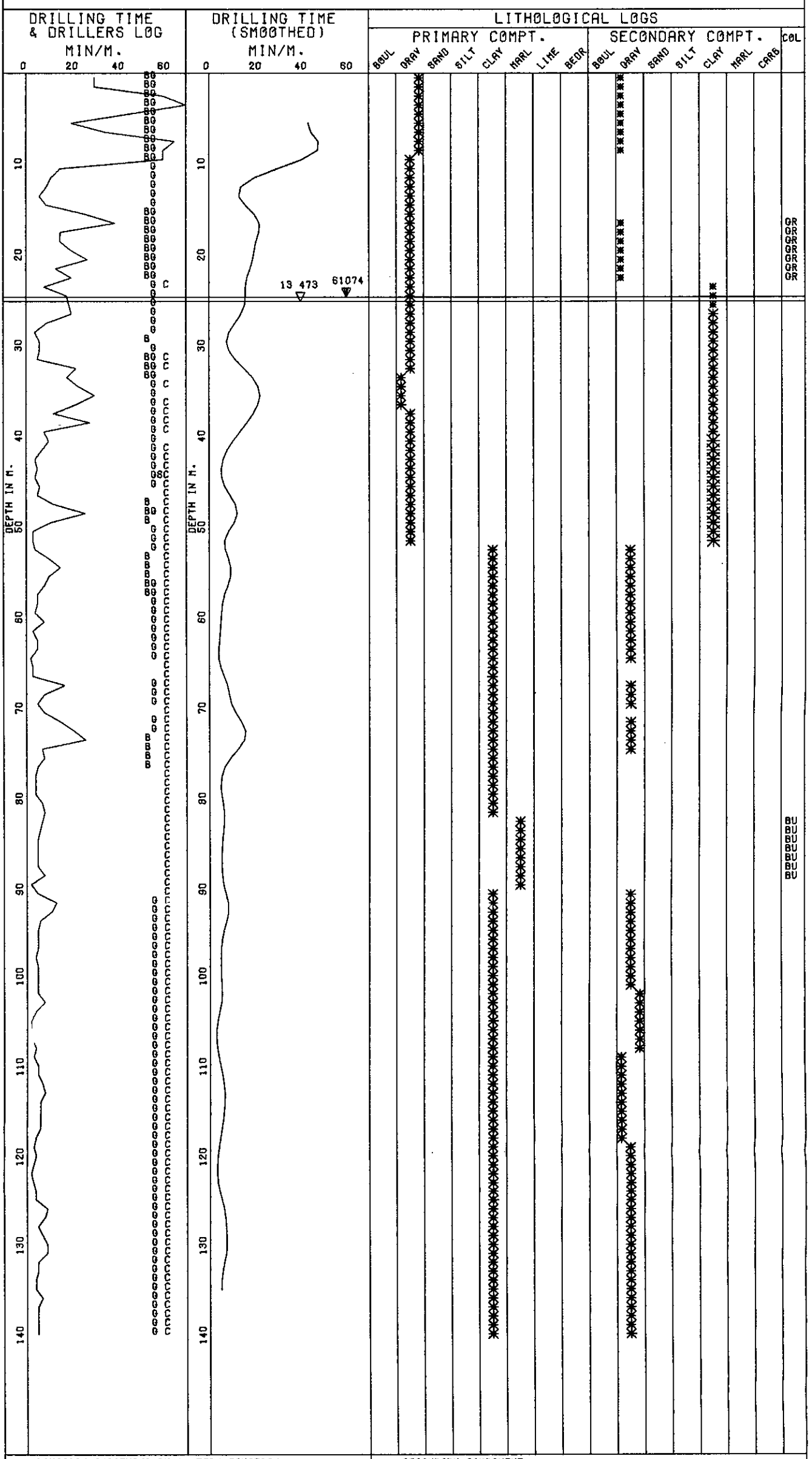
SECONDARY COMPONENT
* TRACE
* MODERATE PROPORTION
* LARGE PROPORTION

COLOUR OF SAMPLES:- BLACK BROWN PINK ORANGE YELLOW GREEN BLUE PURPLE GREY WHITE

DRILLERS LOG:- BOULDERS GRAVEL SAND CLAY LIMESTONE

WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT12 GRID REF. 57306023



WATER RESOURCES SURVEY OF NORTHERN OMAN

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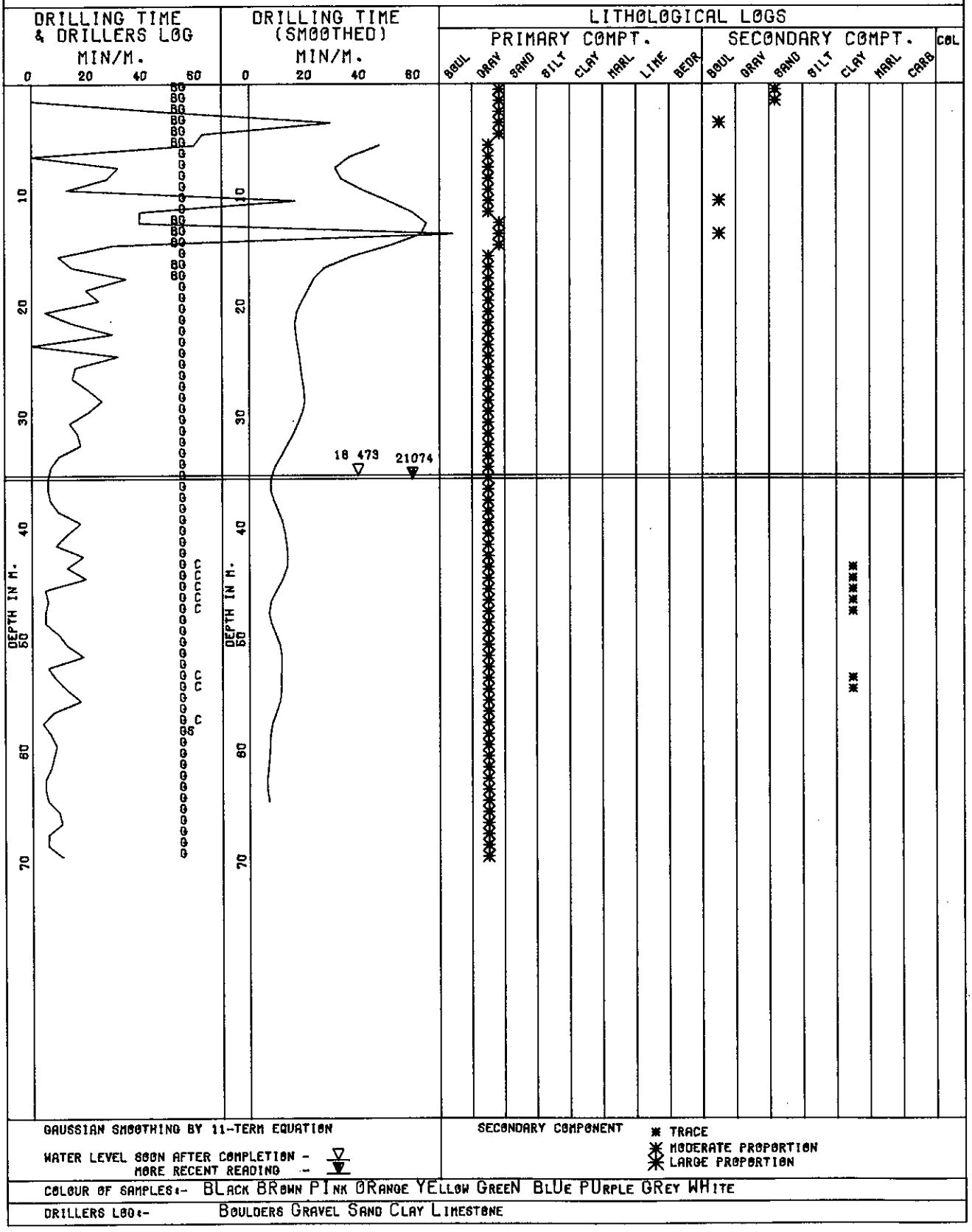
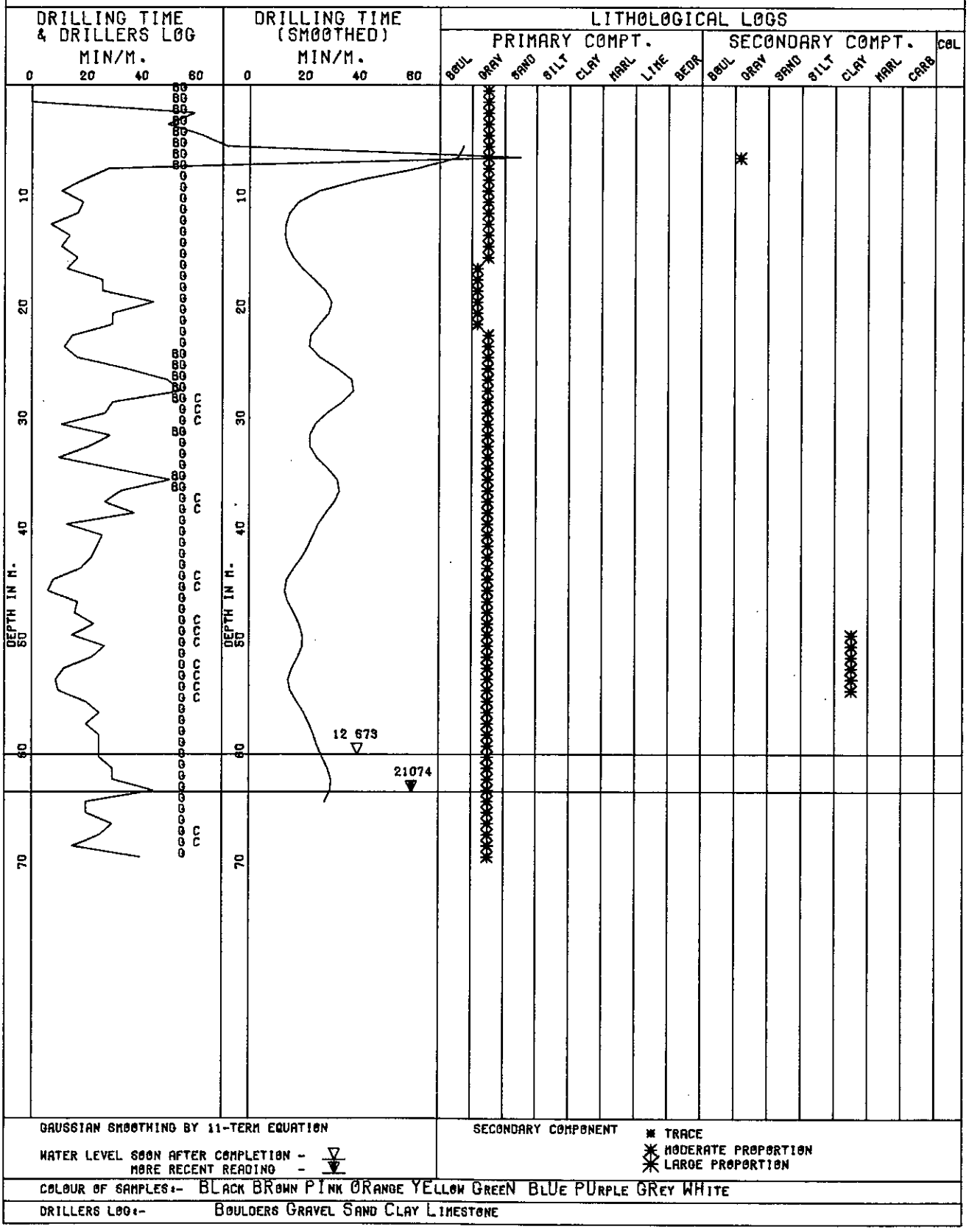


WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT14 GRID REF. 56056133



WATER RESOURCES SURVEY OF NORTHERN OMAN

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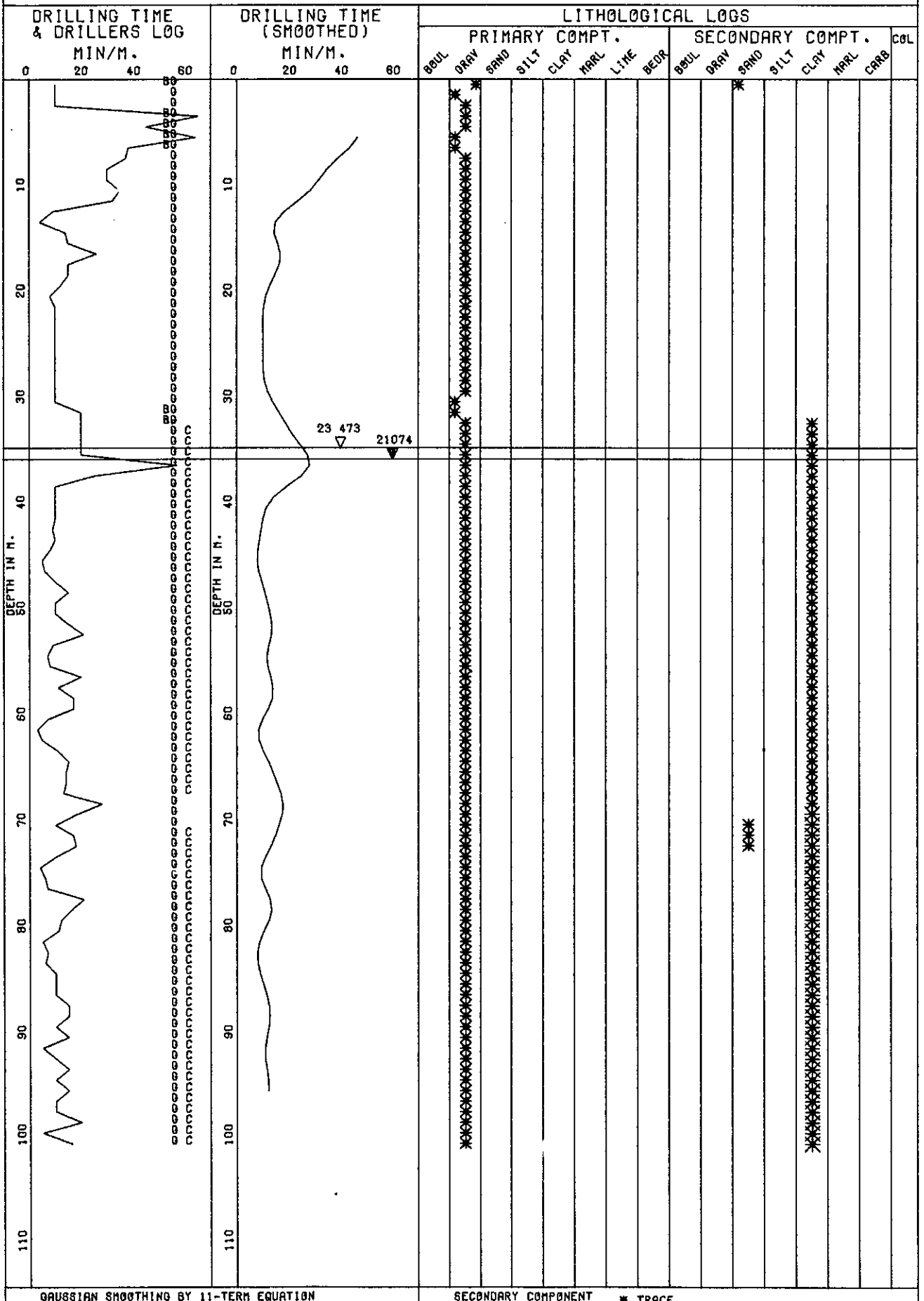
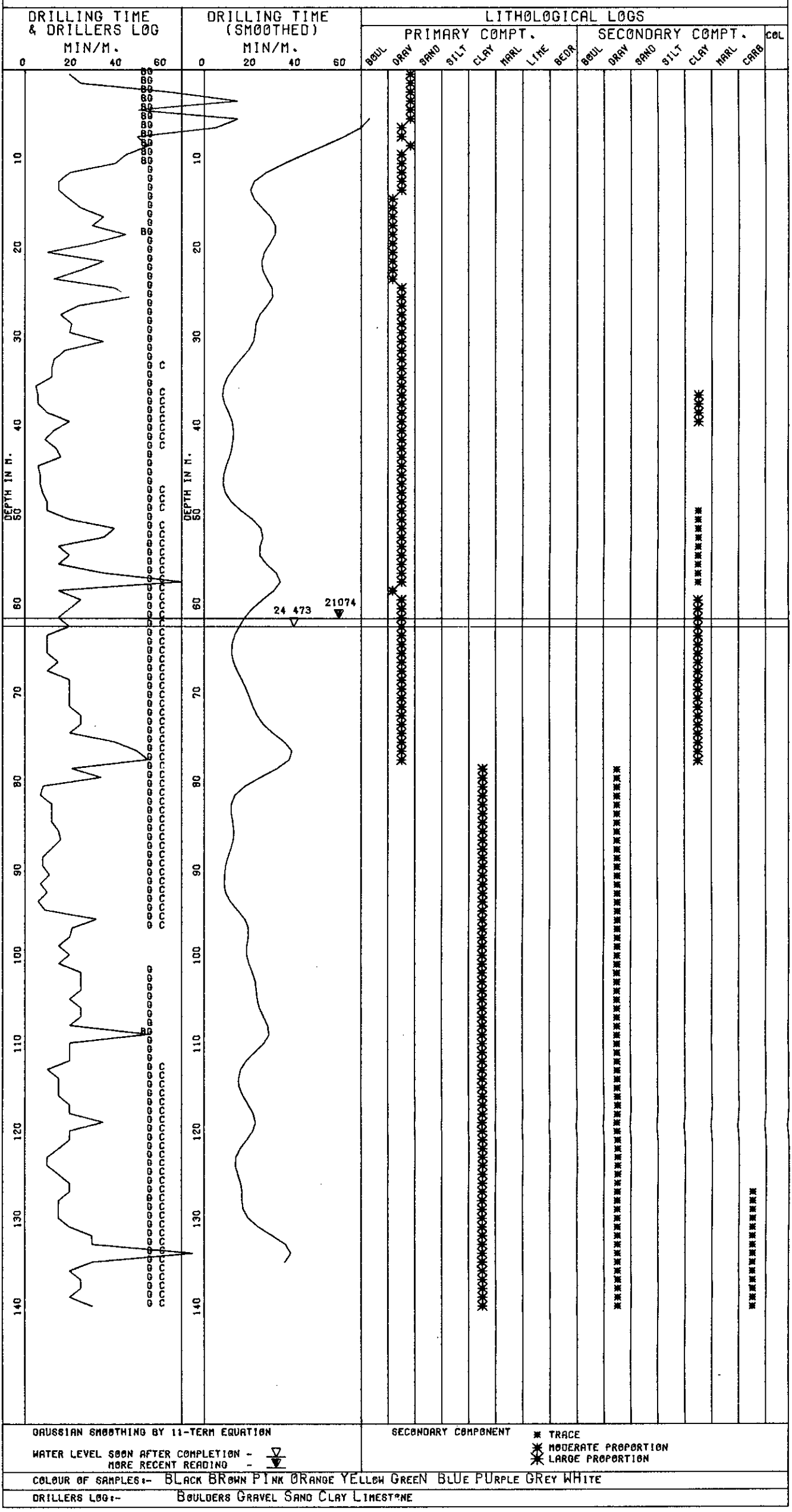


WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT16 GRID REF. 55496149



GAUSSIAN SMOOTHING BY 11-TERM EQUATION

WATER LEVEL SOON AFTER COMPLETION - ▽

MORE RECENT READING - ▼

SECONDARY COMPONENT

* TRACE

✱ MODERATE PROPORTION

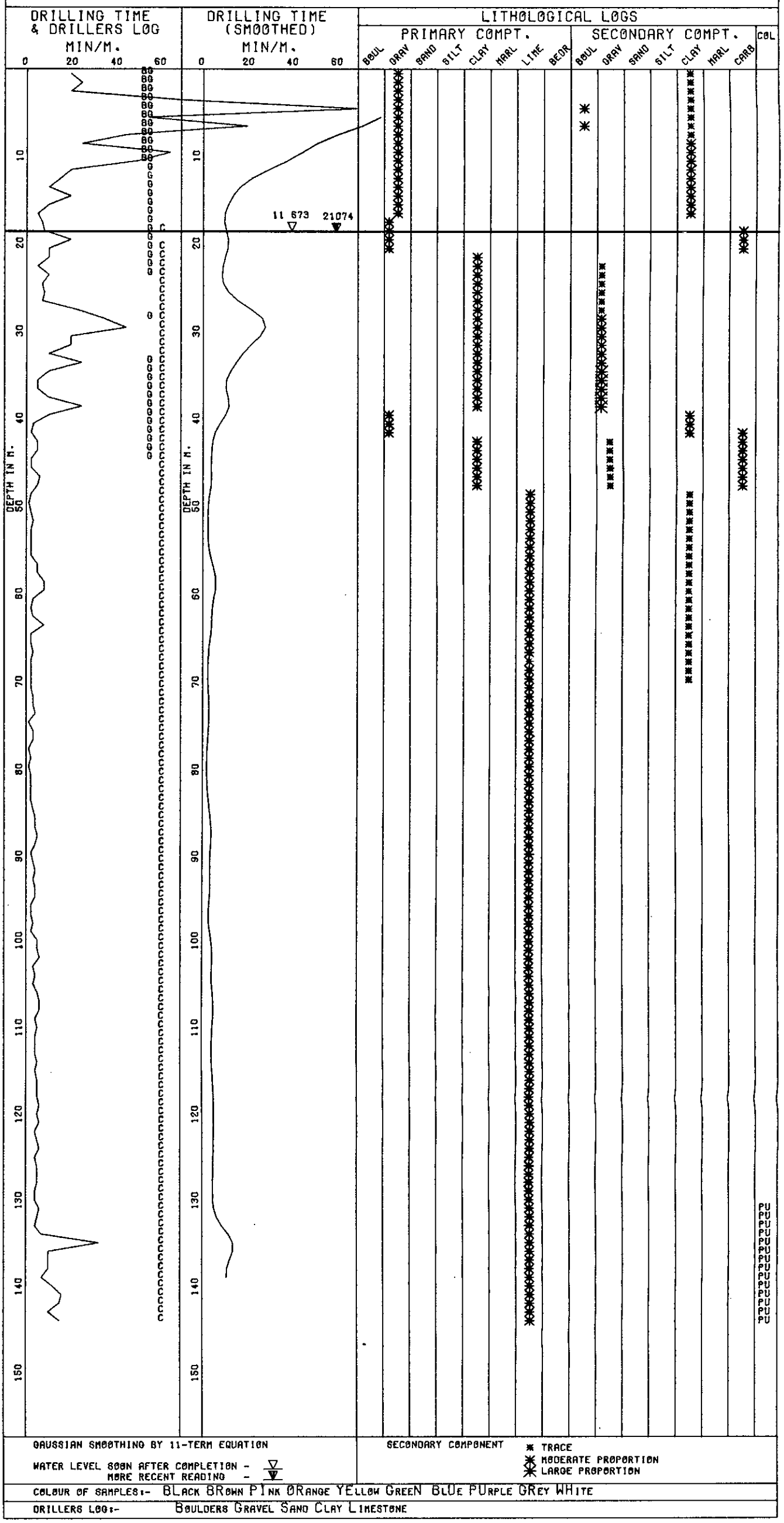
✱ LARGE PROPORTION

COLOUR OF SAMPLES:- BLACK BROWN PINK ORANGE YELLOW GREEN BLUE PURPLE GREY WHITE

DRILLERS LOG:- BOULDERS GRAVEL SAND CLAY LIMESTONE

WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT17 GRID REF. 55176093



GAUSSIAN SMOOTHING BY 11-TERM EQUATION

WATER LEVEL SOON AFTER COMPLETION - ▽

MORE RECENT READING - ▼

SECONDARY COMPONENT

* TRACE

✳ MODERATE PROPORTION

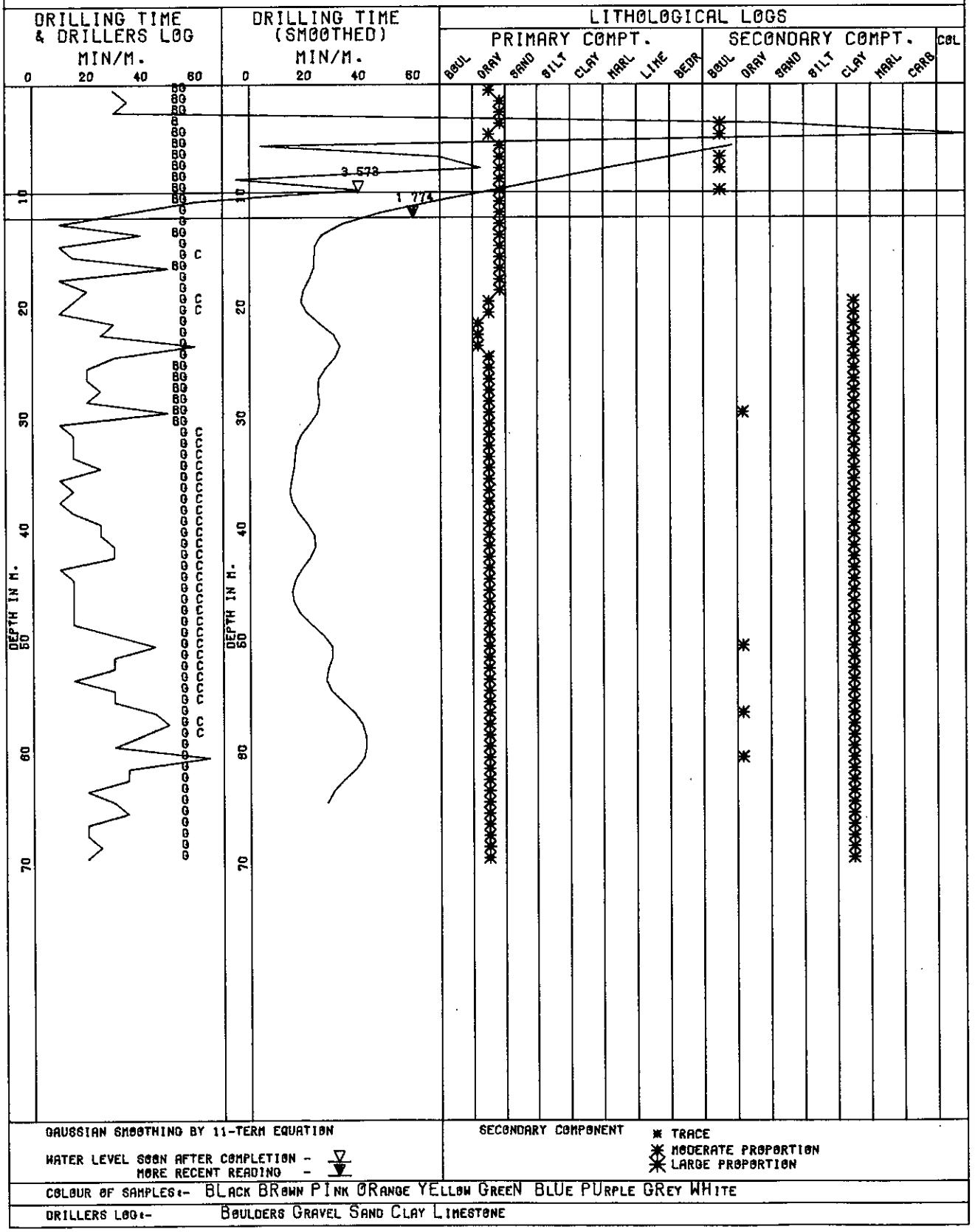
✳ LARGE PROPORTION

COLOUR OF SAMPLES:- BLACK BROWN PINK ORANGE YELLOW GREEN BLUE PURPLE GREY WHITE

DRILLERS LOG:- BOULDERS GRAVEL SAND CLAY LIMESTONE

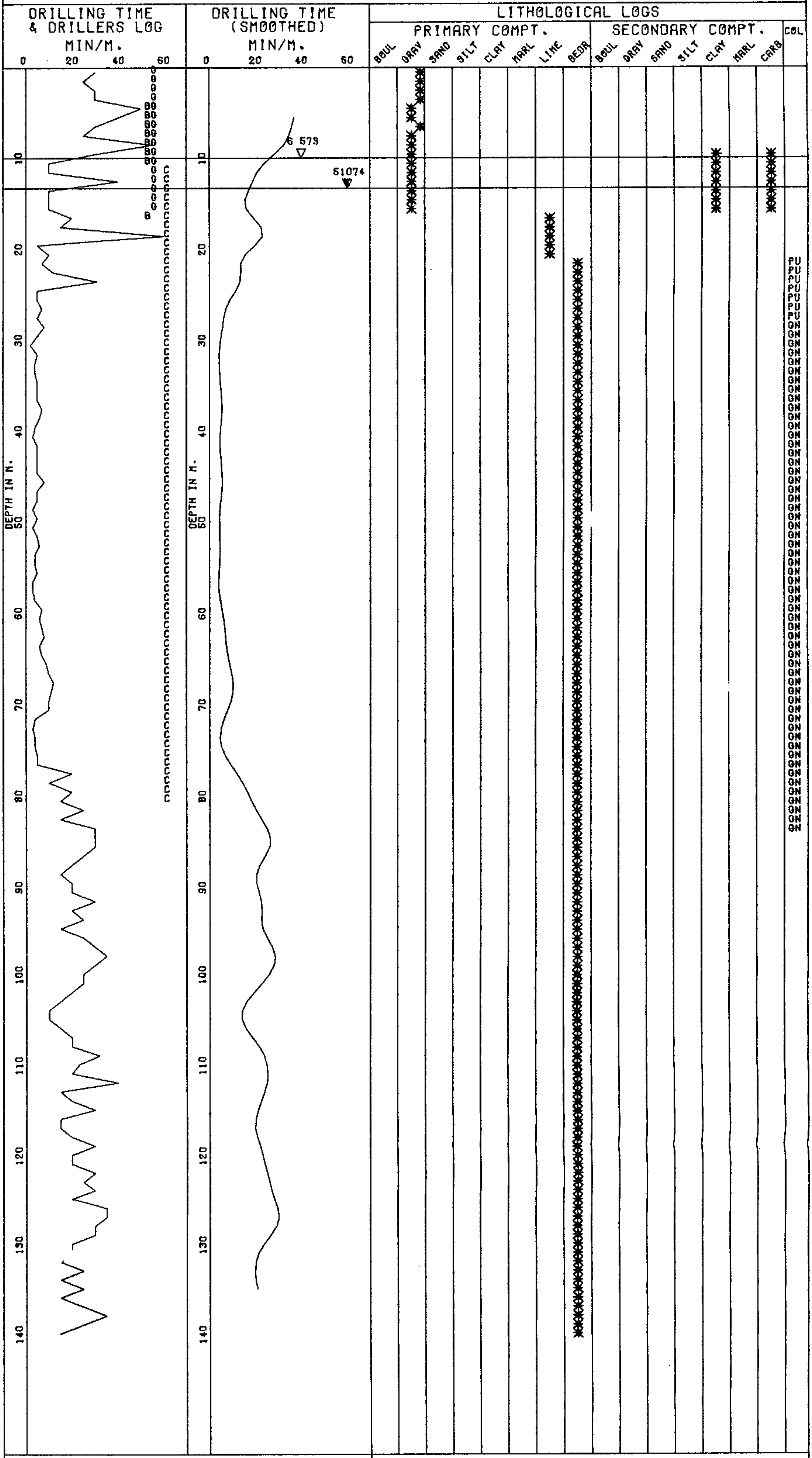
WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT18 GRID REF. 54545940



WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT19 GRID REF. 53656113



GAUSSIAN SMOOTHING BY 11-TERM EQUATION

WATER LEVEL SOON AFTER COMPLETION - ▽
MORE RECENT READING - ▼

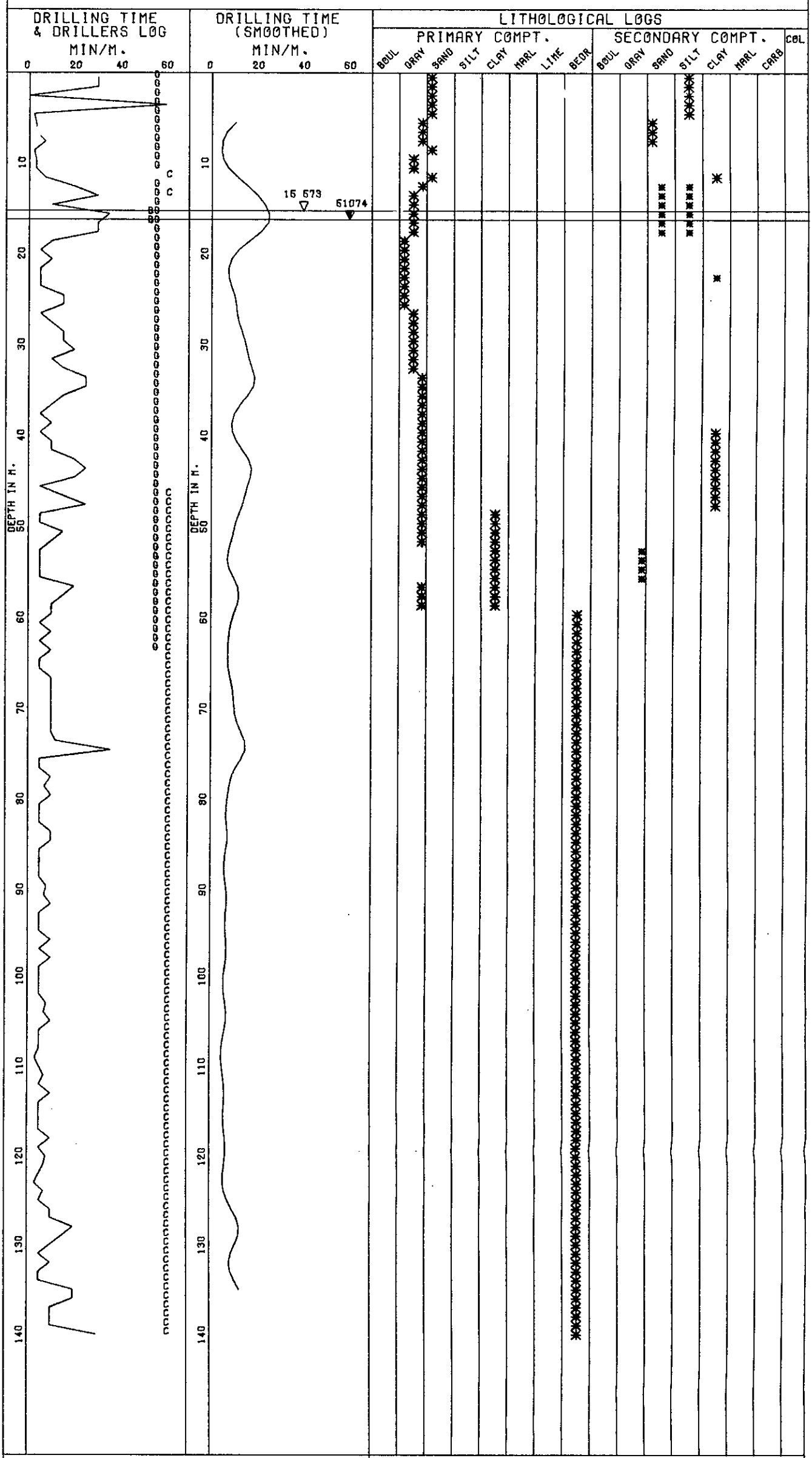
SECONDARY COMPONENT ✱ TRACE
✱ MODERATE PROPORTION
✱ LARGE PROPORTION

COLOUR OF SAMPLES:- BLack BRown PInk ORange YEllow GreeN BLUe PUrple GRey WHite

DRILLERS LOG:- Boulders Gravel Sand Clay Limestone

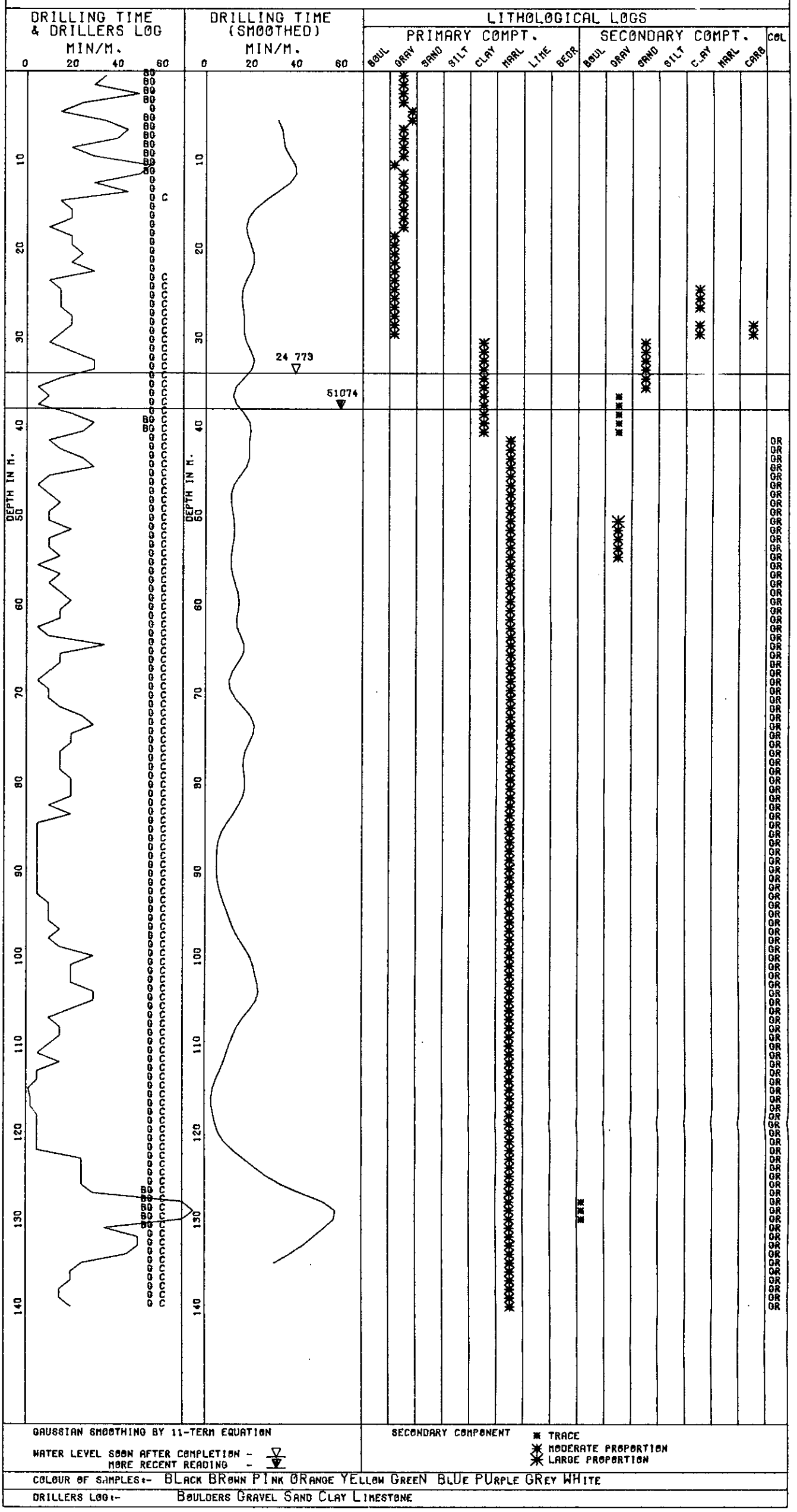
WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT20 GRID REF. 53616128



WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT21 GRID REF. 53726157



GAUSSIAN SMOOTHING BY 11-TERM EQUATION

WATER LEVEL SOON AFTER COMPLETION -
MORE RECENT READING -

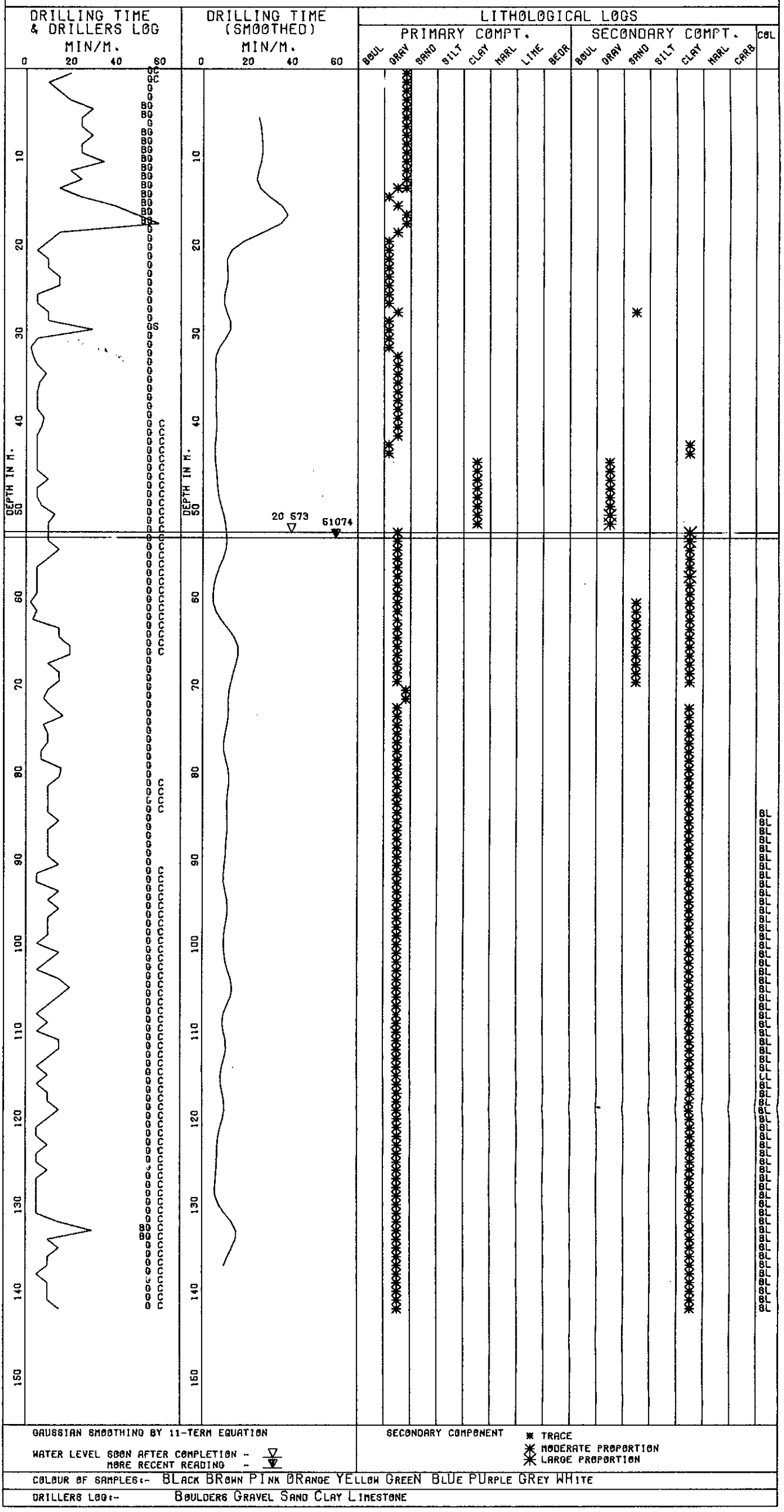
SECONDARY COMPONENT
* TRACE
** MODERATE PROPORTION
*** LARGE PROPORTION

COLOUR OF SAMPLES:- BLACK BROWN PINK ORANGE YELLOW GREEN BLUE PURPLE GREY WHITE

DRILLERS LOG:- BOULDERS GRAVEL SAND CLAY LIMESTONE

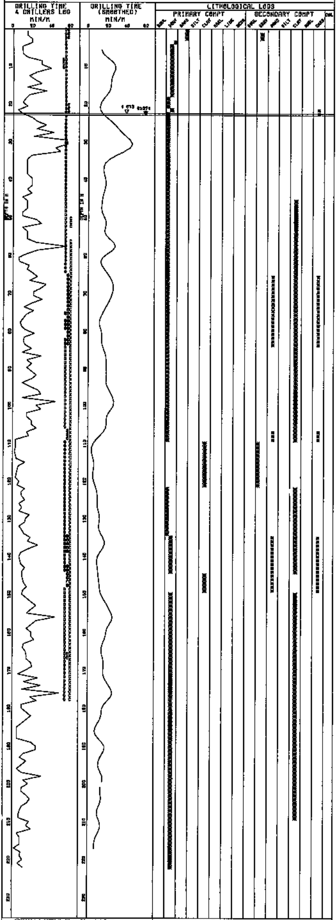
WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT22 GRID REF. 53736221



WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO JT23 GRID REF 57516185



GAUSSIAN SMOOTHING BY 11-TERM EQUATION

WATER LEVEL SHOWN AFTER COMPLETION -
MORE RECENT READING -

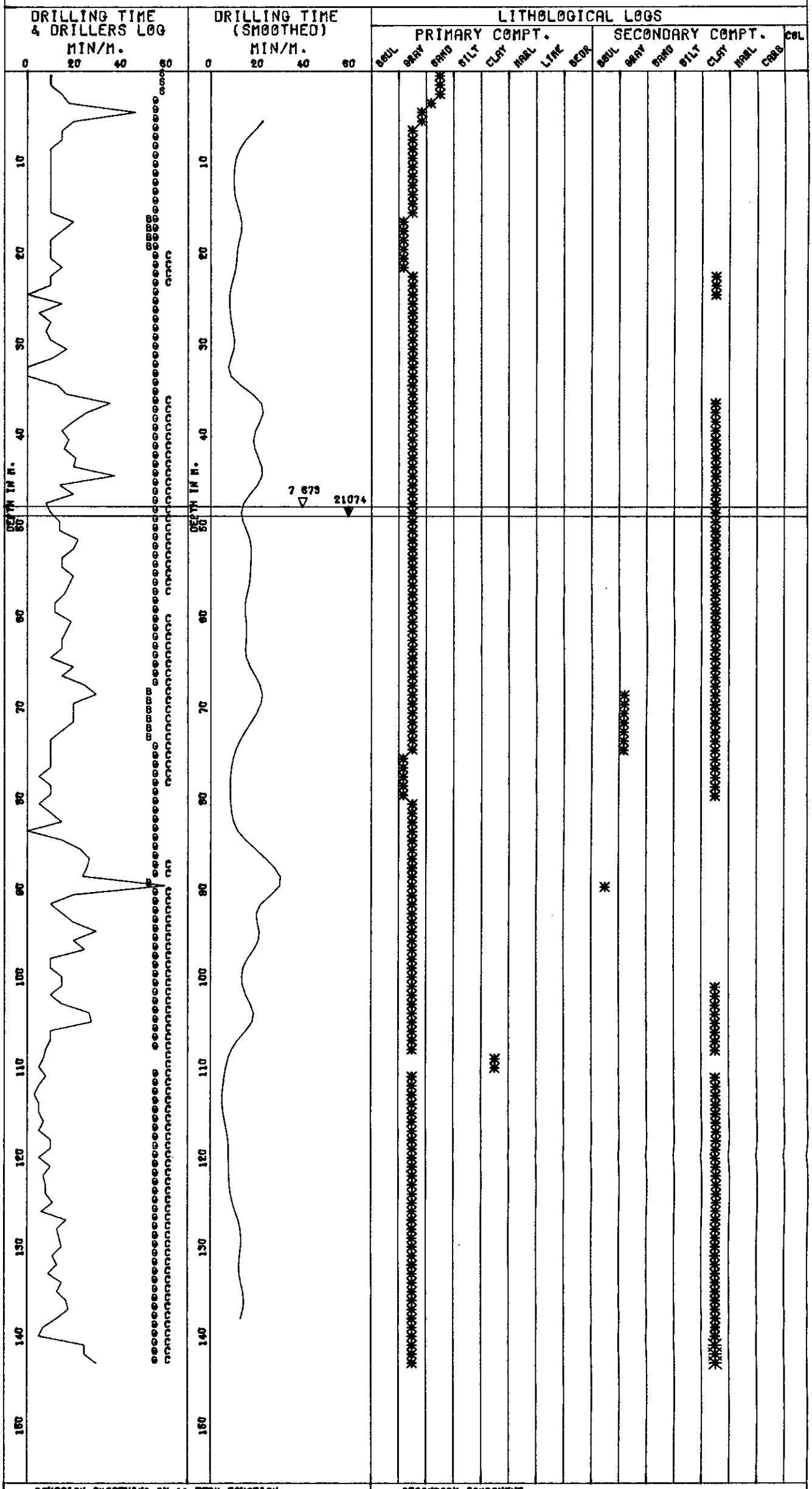
SECONDARY COMPONENT: TRACE; MODERATE PROPORTION; LARGE PROPORTION

COLOUR OF SAMPLES:- BLack BRown PInk ORange YEllow GReeN BLUe PUrple GRey WHite

DRILLERS LOG:- Boulders Gravel Sand Clay Limestone

WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT24 GRID REF. 57426122



GAUSSIAN SMOOTHING BY 11-TERM EQUATION

WATER LEVEL SEEN AFTER COMPLETION -
MORE RECENT READING -

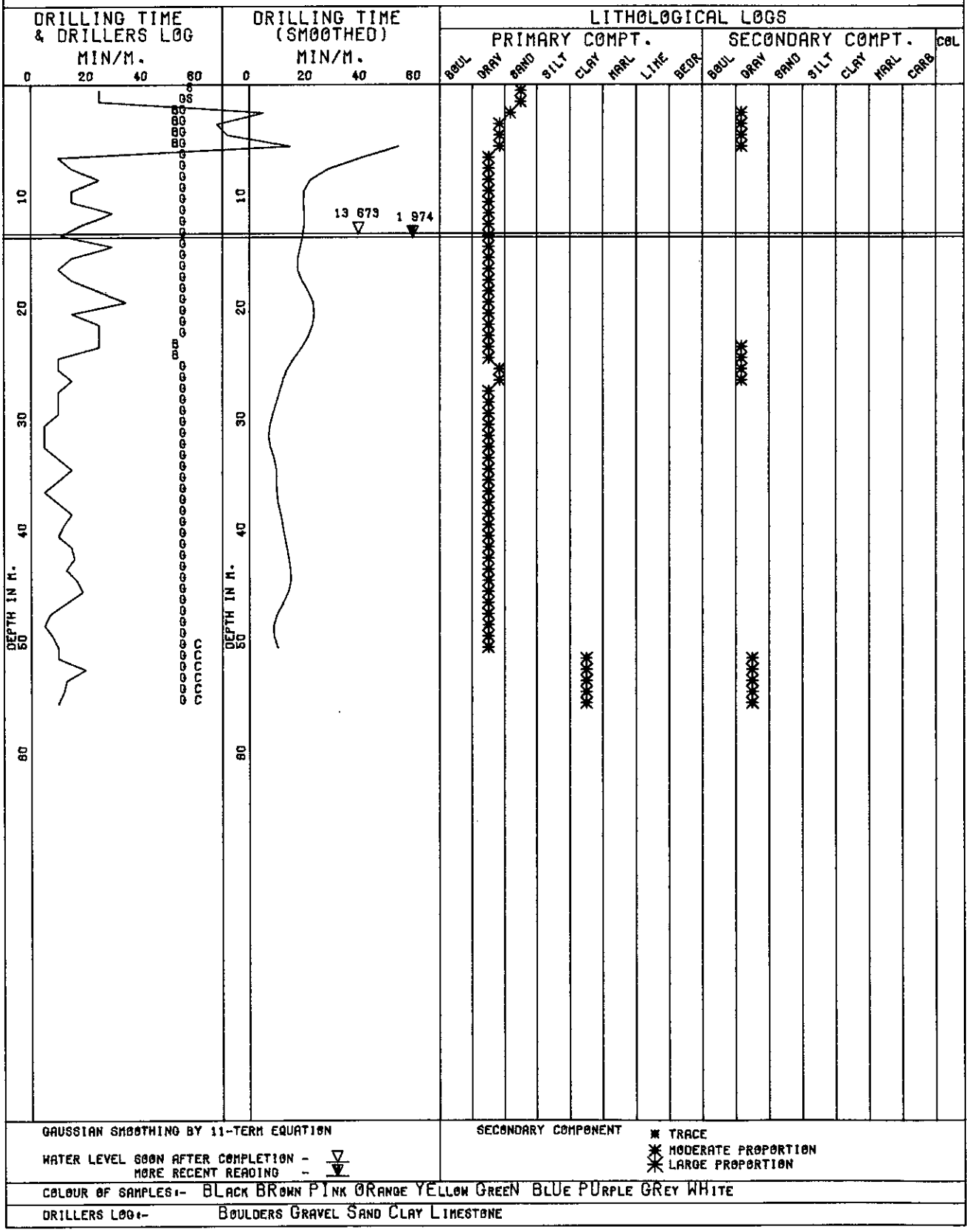
SECONDARY COMPONENT
* TRACE
** MODERATE PROPORTION
*** LARGE PROPORTION

COLOUR OF SAMPLES:- BLACK BROWN PINK ORANGE YELLOW GREEN BLUE PURPLE GREY WHITE

DRILLERS LOG:- BOULDERS GRAVEL SAND CLAY LIMESTONE

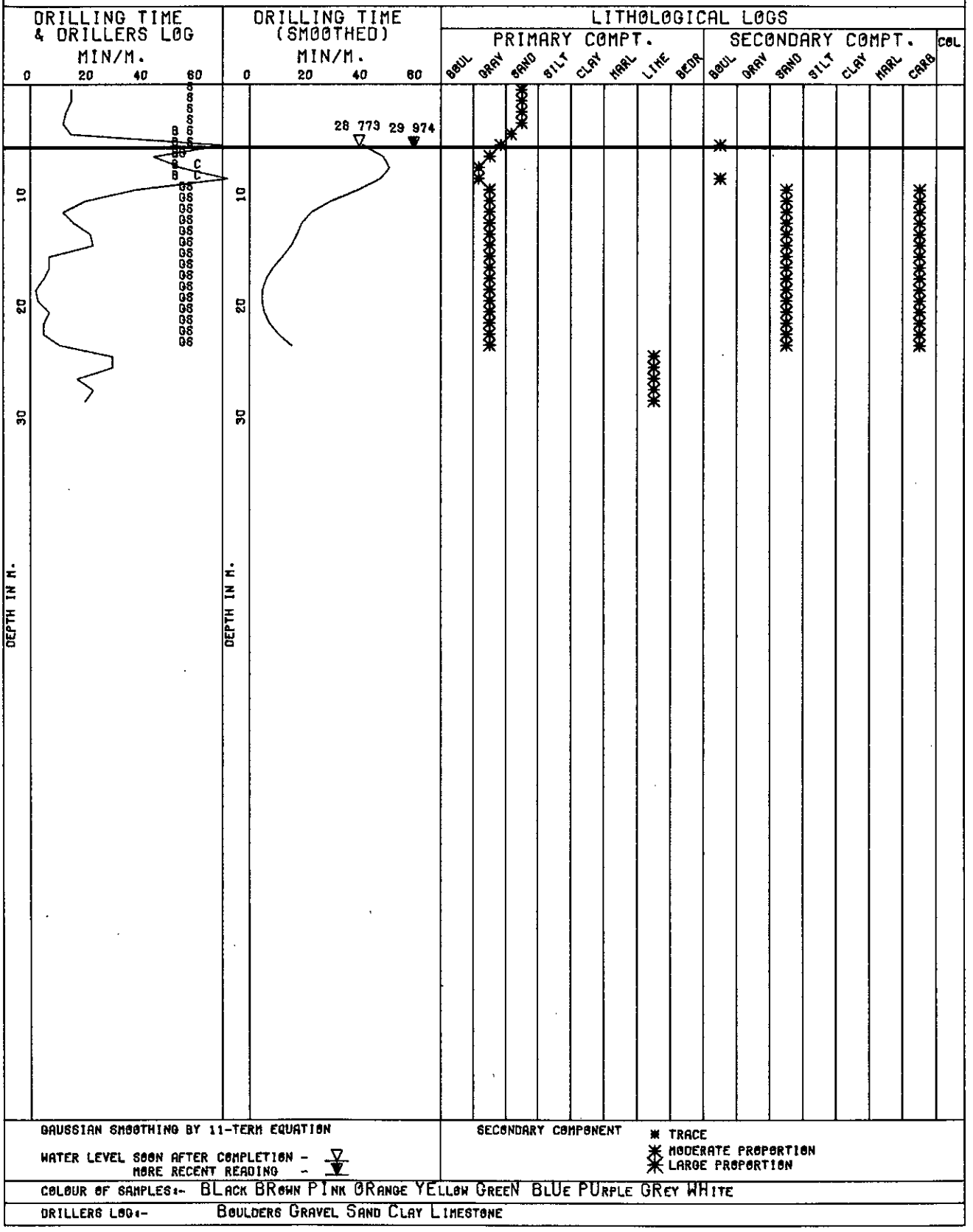
WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT25 GRID REF. 59986190



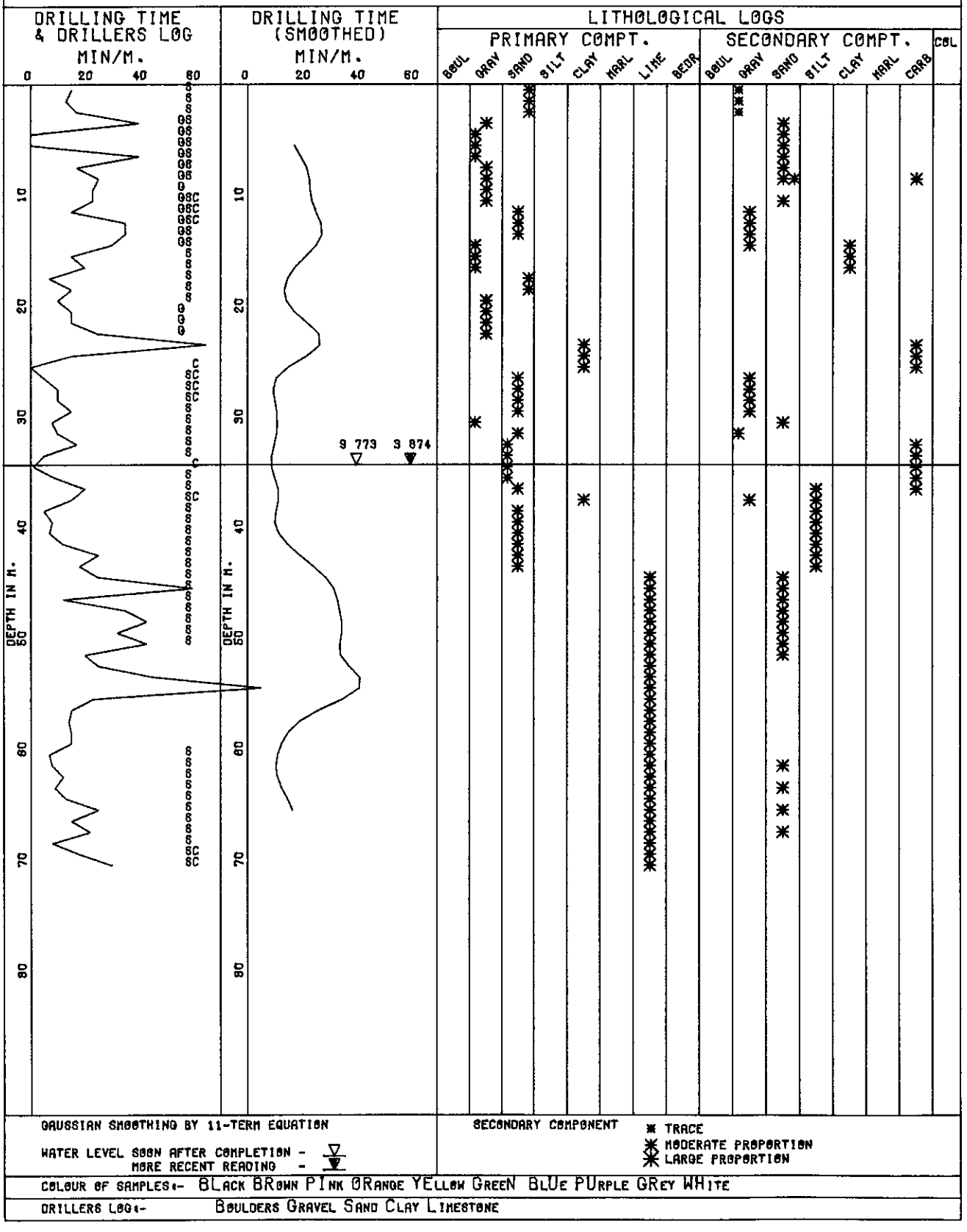
WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT26 GRID REF. 64656100



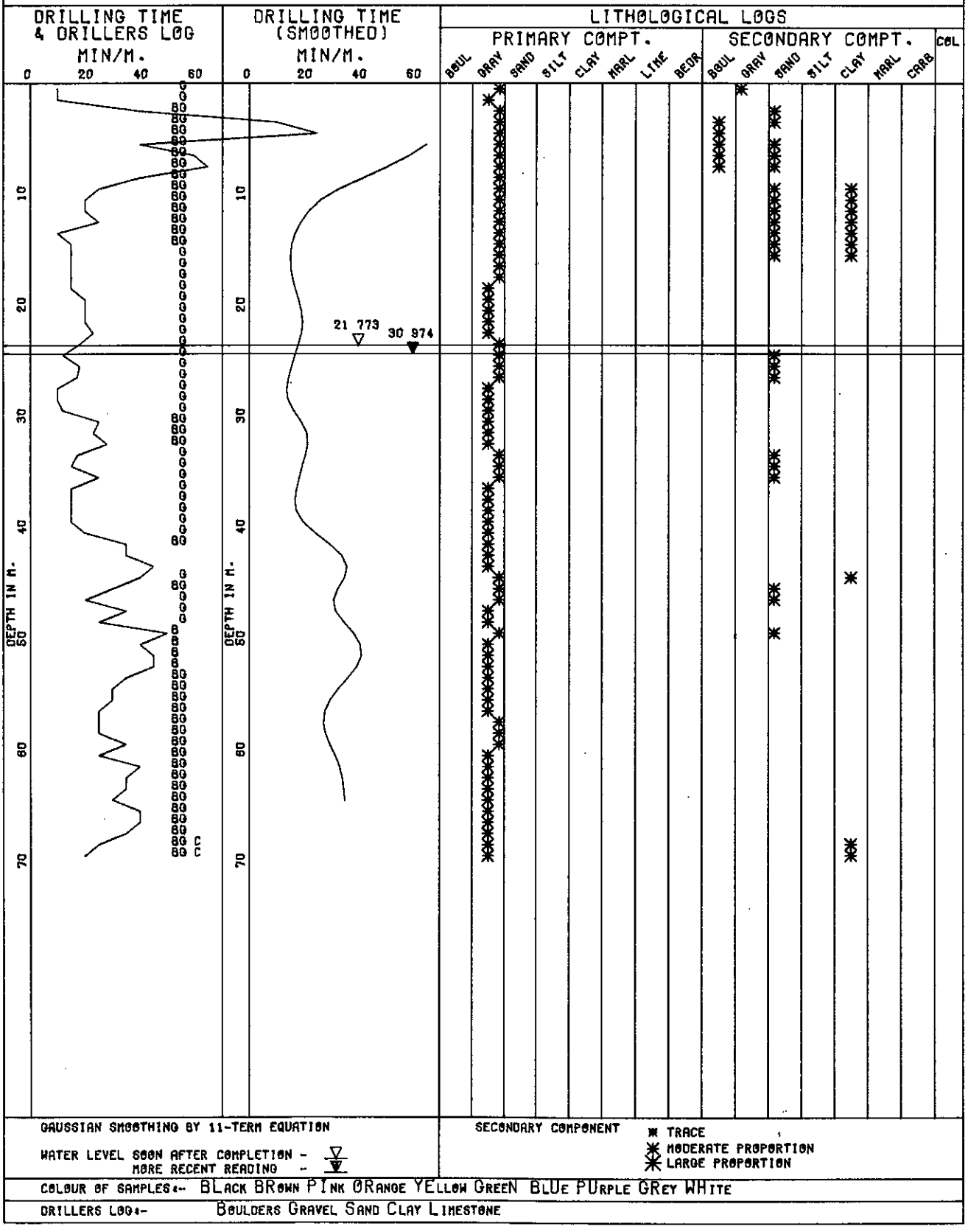
WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT27 GRID REF. 64886095



WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT28 GRID REF. 61726144



GAUSSIAN SMOOTHING BY 11-TERM EQUATION

WATER LEVEL SOON AFTER COMPLETION - ▽

MORE RECENT READING - ▼

SECONDARY COMPONENT

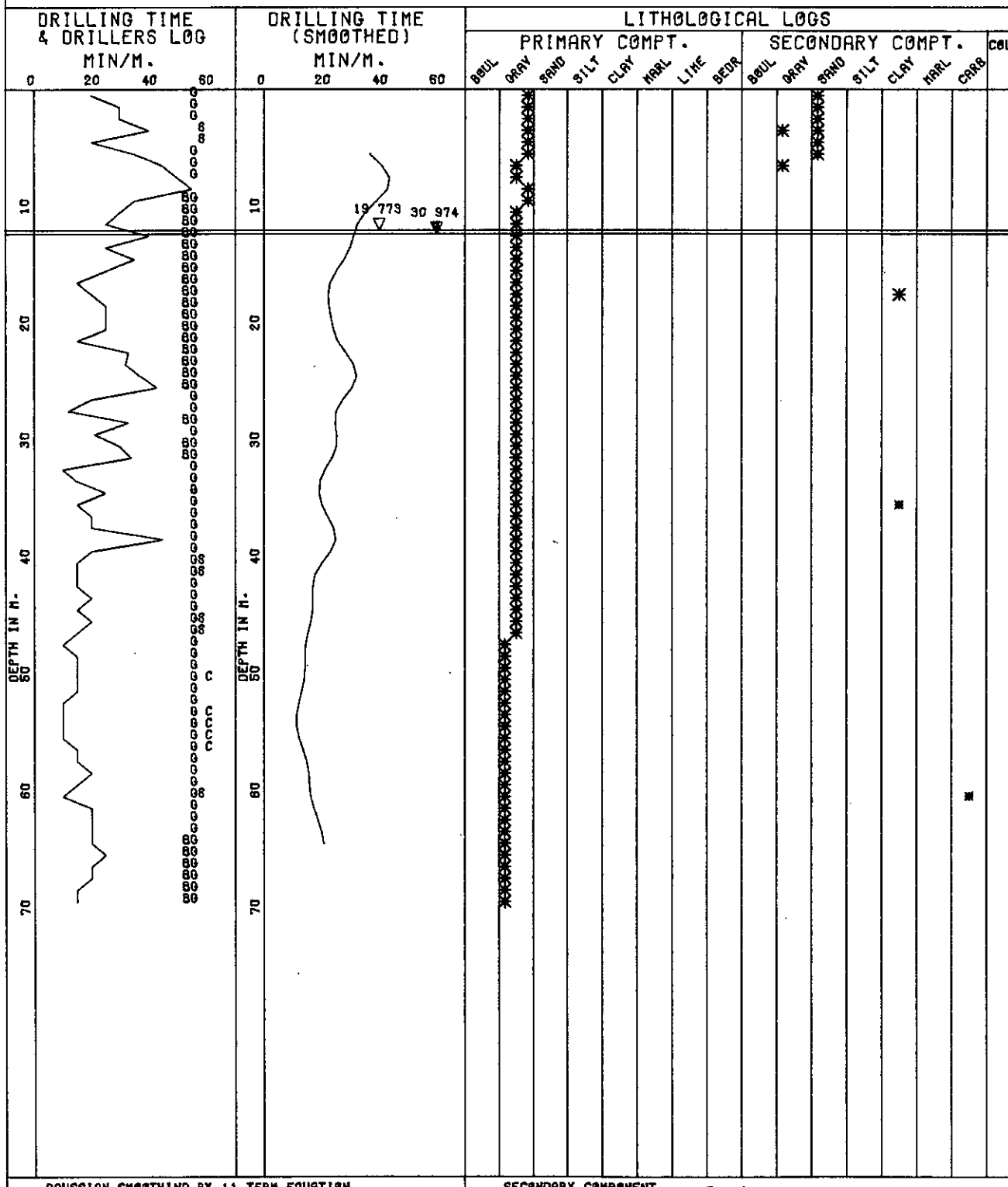
* TRACE
* MODERATE PROPORTION
* LARGE PROPORTION

COLOUR OF SAMPLES:- BLACK BROWN PINK ORANGE YELLOW GREEN BLUE PURPLE GREY WHITE

DRILLERS LOG:- BOULDERS GRAVEL SAND CLAY LIMESTONE

WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT29 GRID REF. 61726163



WATER RESOURCES SURVEY OF NORTHERN OMAN

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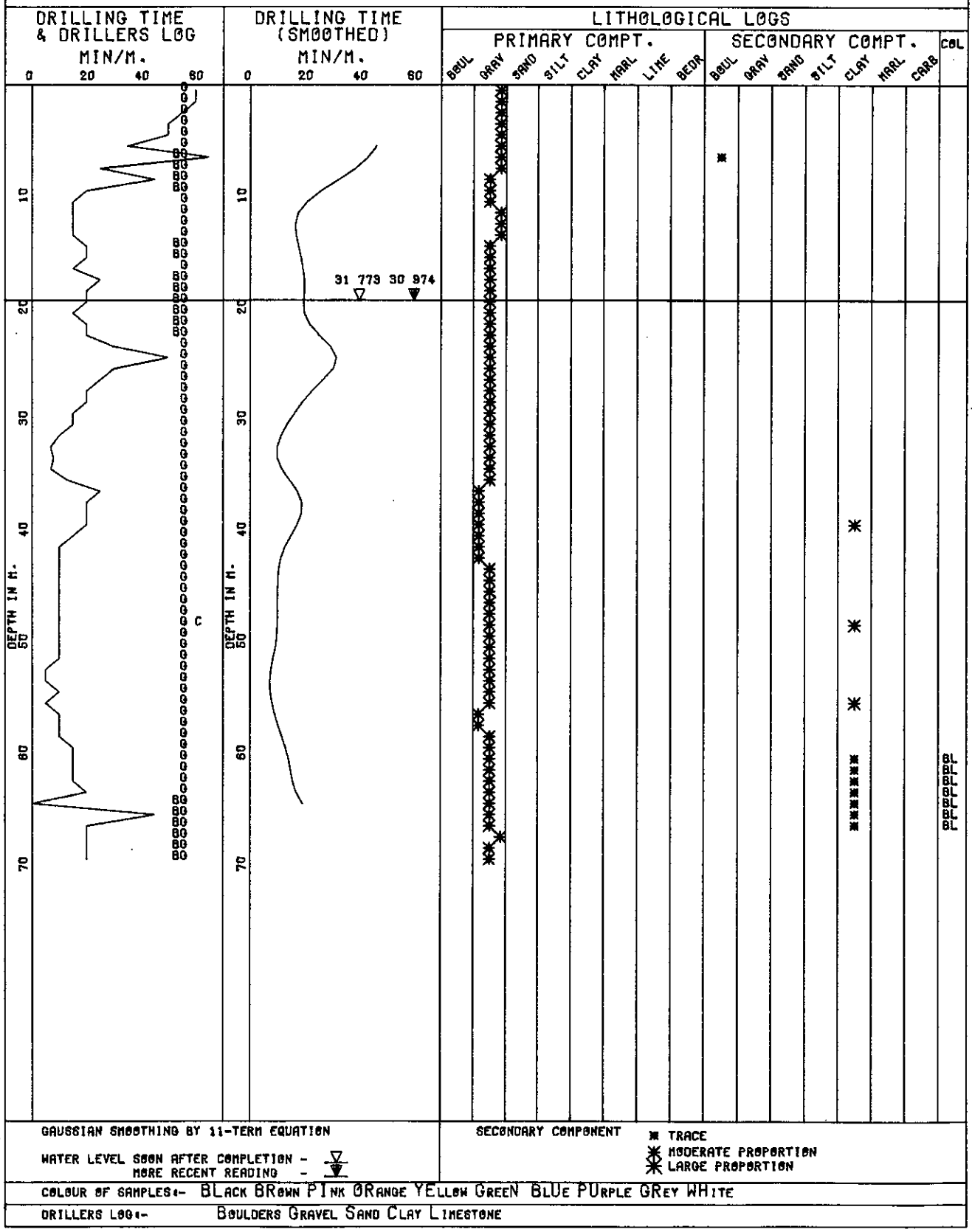
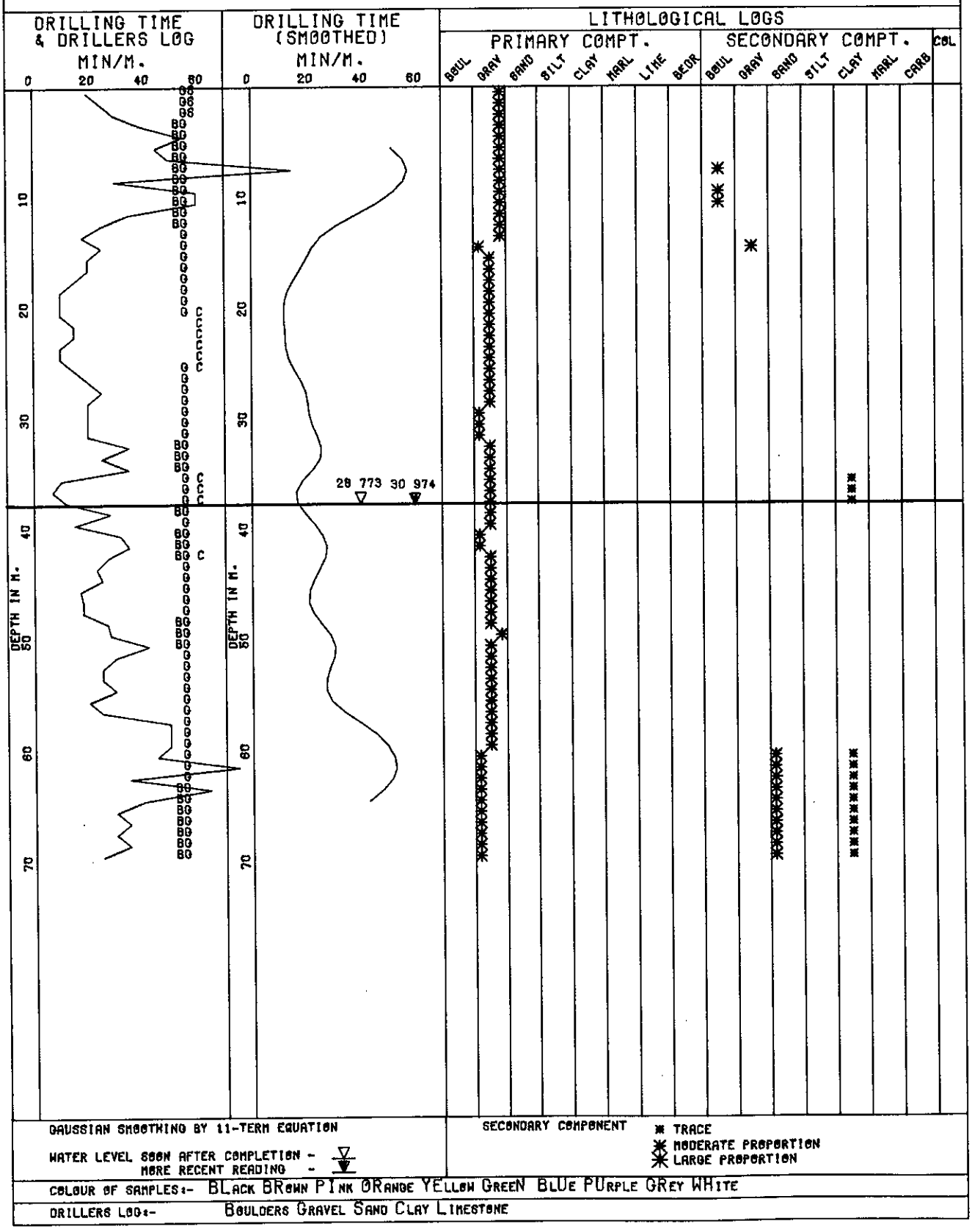


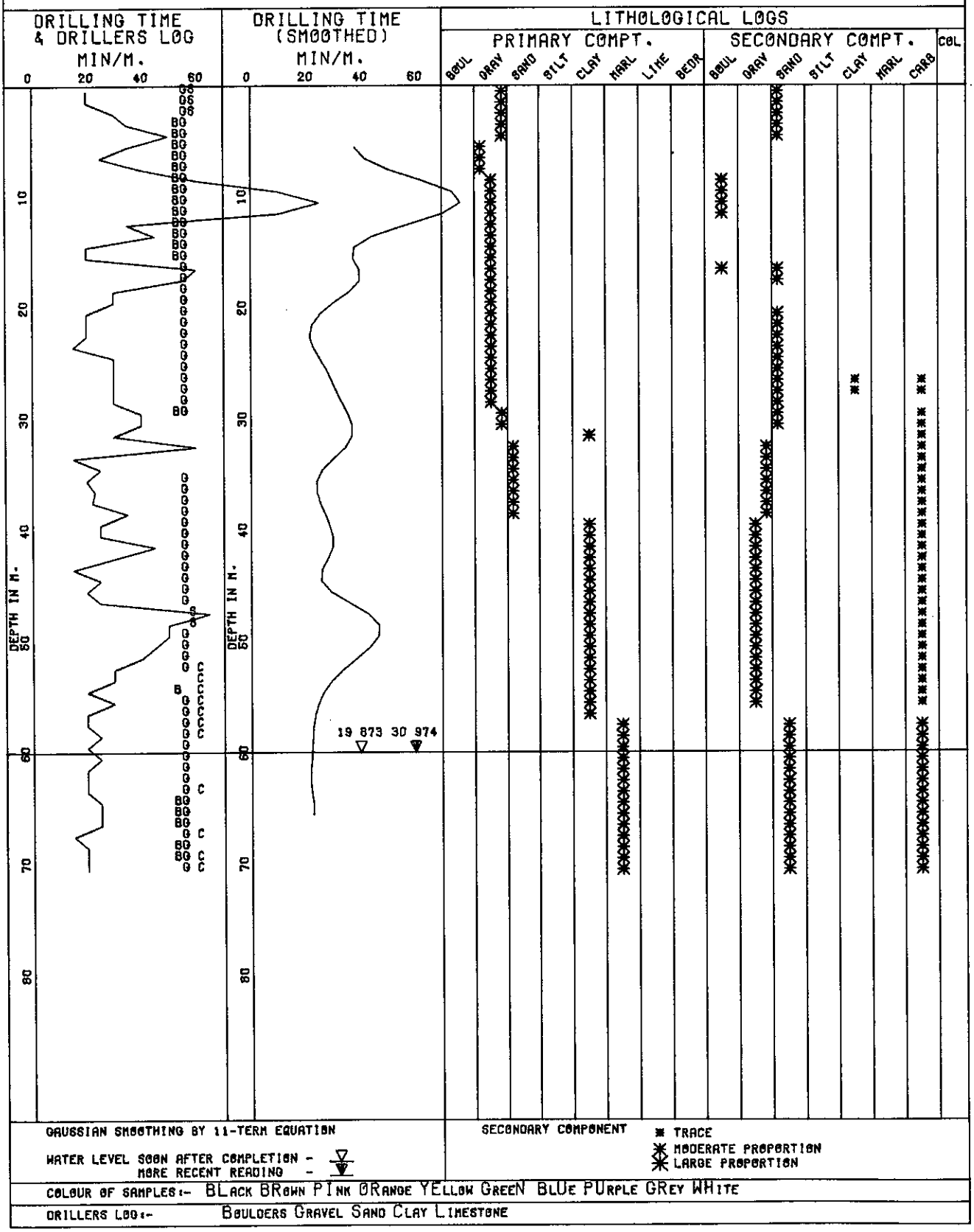
WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT31 GRID REF. 61386133



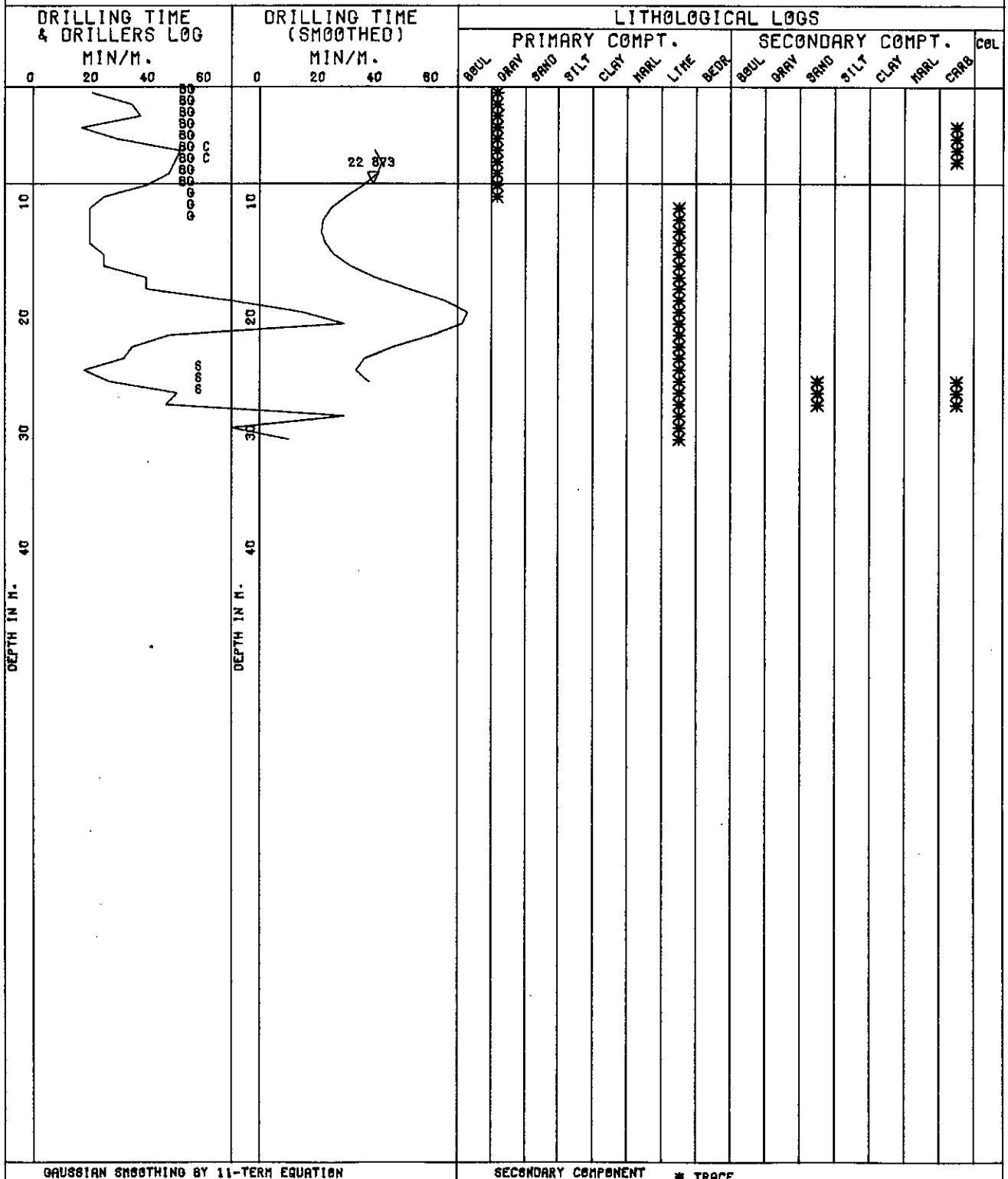
WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT32 GRID REF. 61386106



WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT33 GRID REF. 58305974

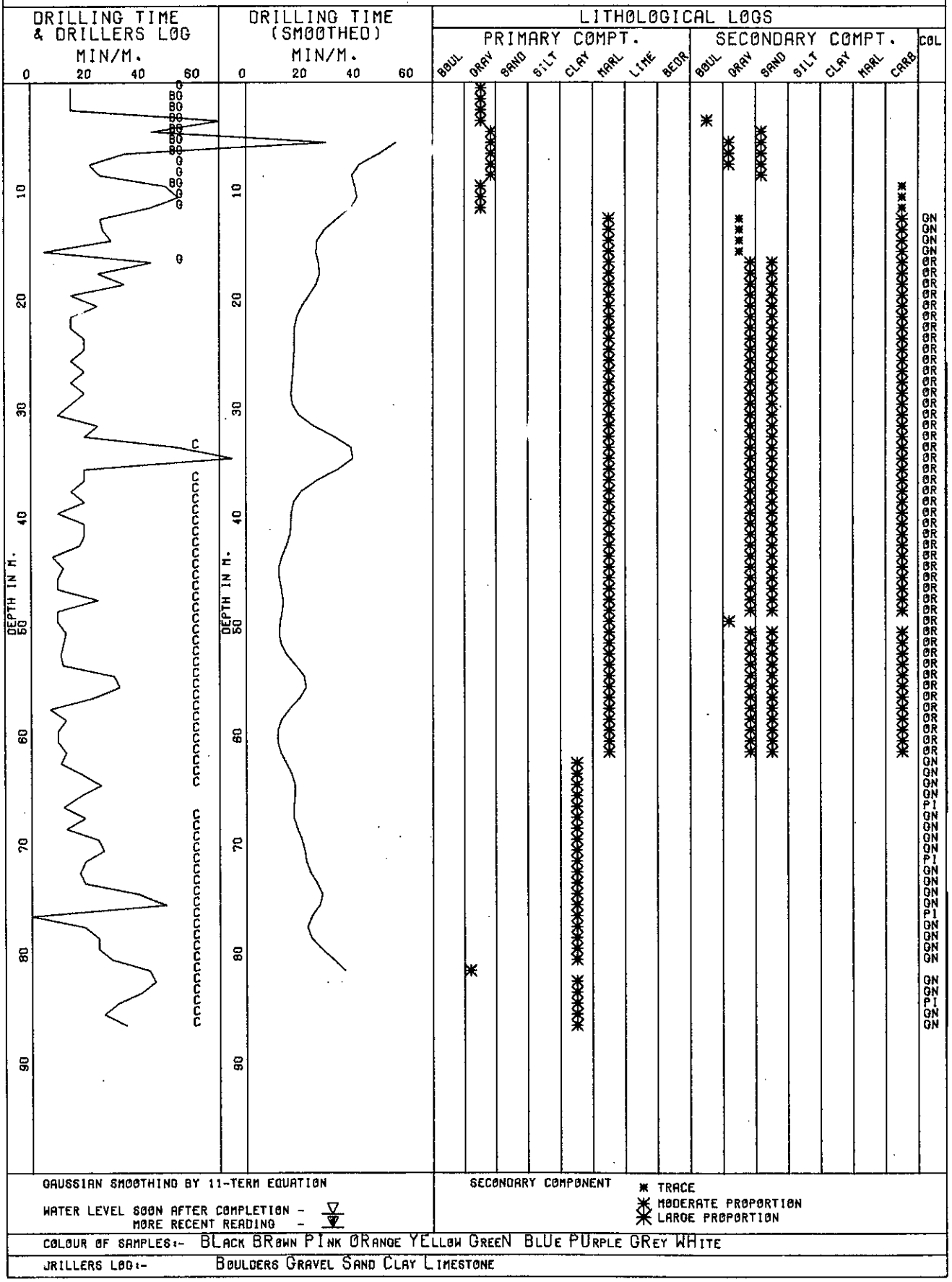


COLOUR OF SAMPLES:- BLACK BROWN PINK ORANGE YELLOW GREEN BLUE PURPLE GREY WHITE

DRILLERS LOG:- BOULDERS GRAVEL SAND CLAY LIMESTONE

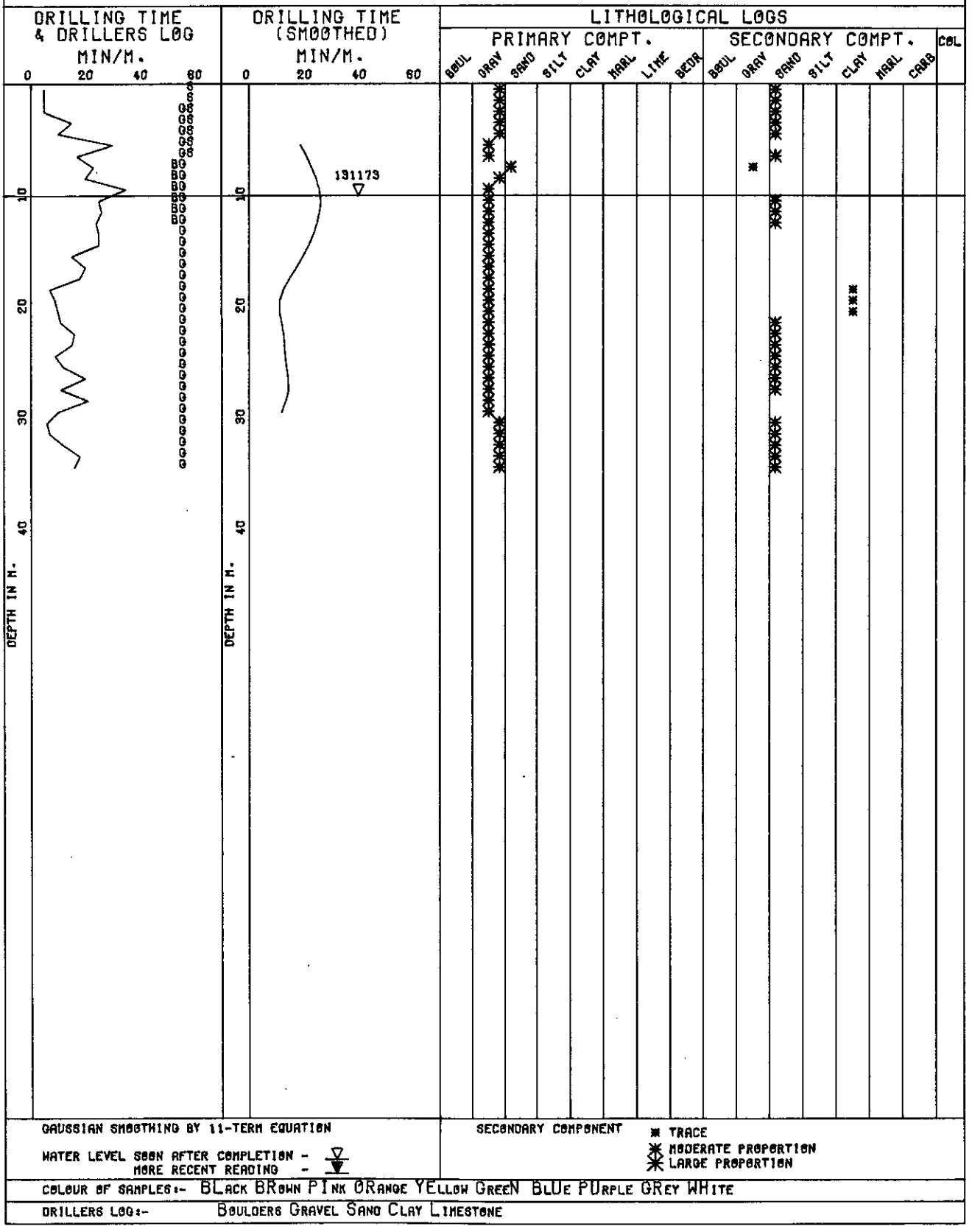
WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT34 GRID REF. O



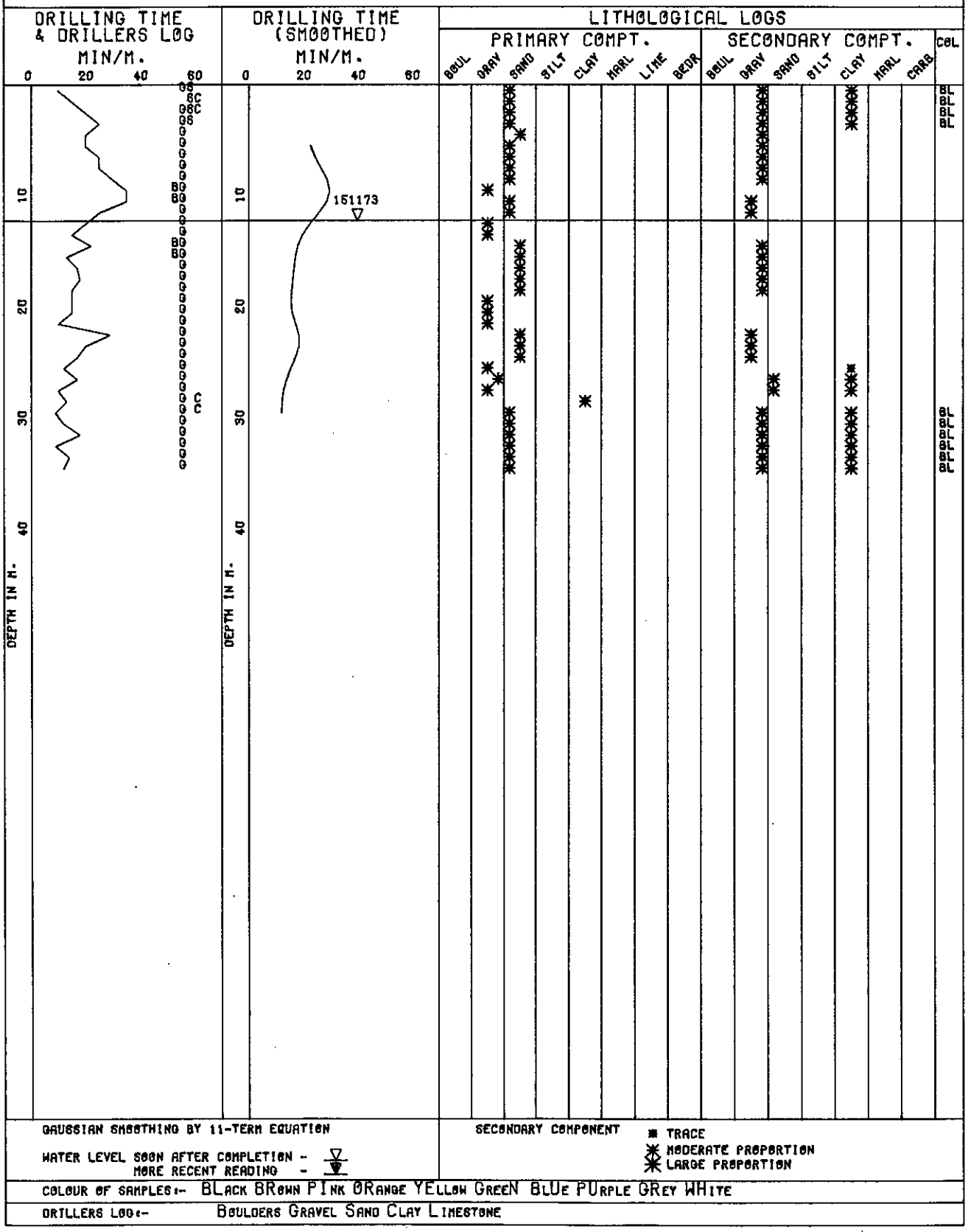
WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT35 GRID REF. O



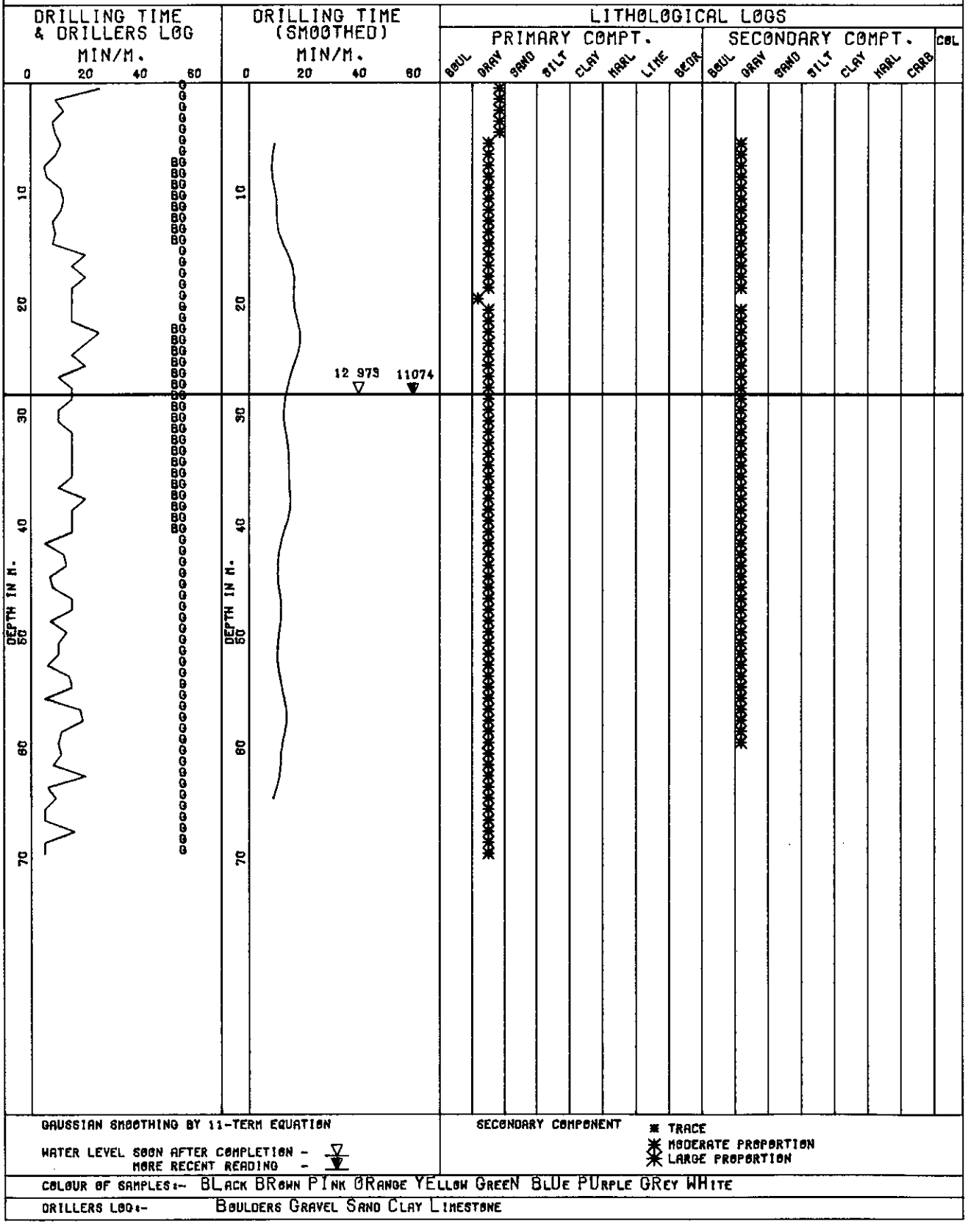
WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT36 GRID REF. O



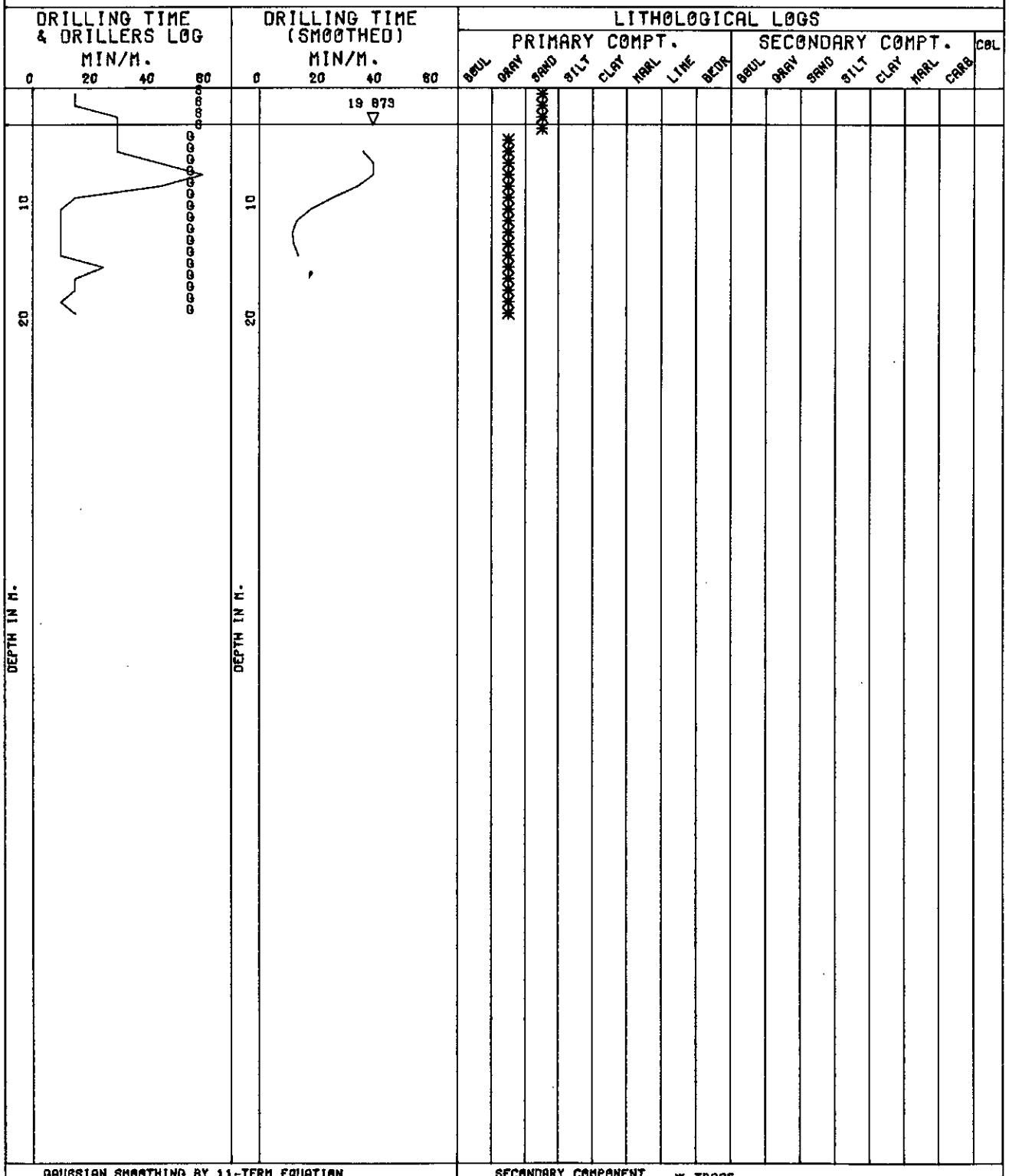
WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT37 GRID REF. 60606168



WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT38 GRID REF. 62046194



GAUSSIAN SMOOTHING BY 11-TERM EQUATION

WATER LEVEL SOON AFTER COMPLETION - ▽

MORE RECENT READING - ▼

SECONDARY COMPONENT

* TRACE

** MODERATE PROPORTION

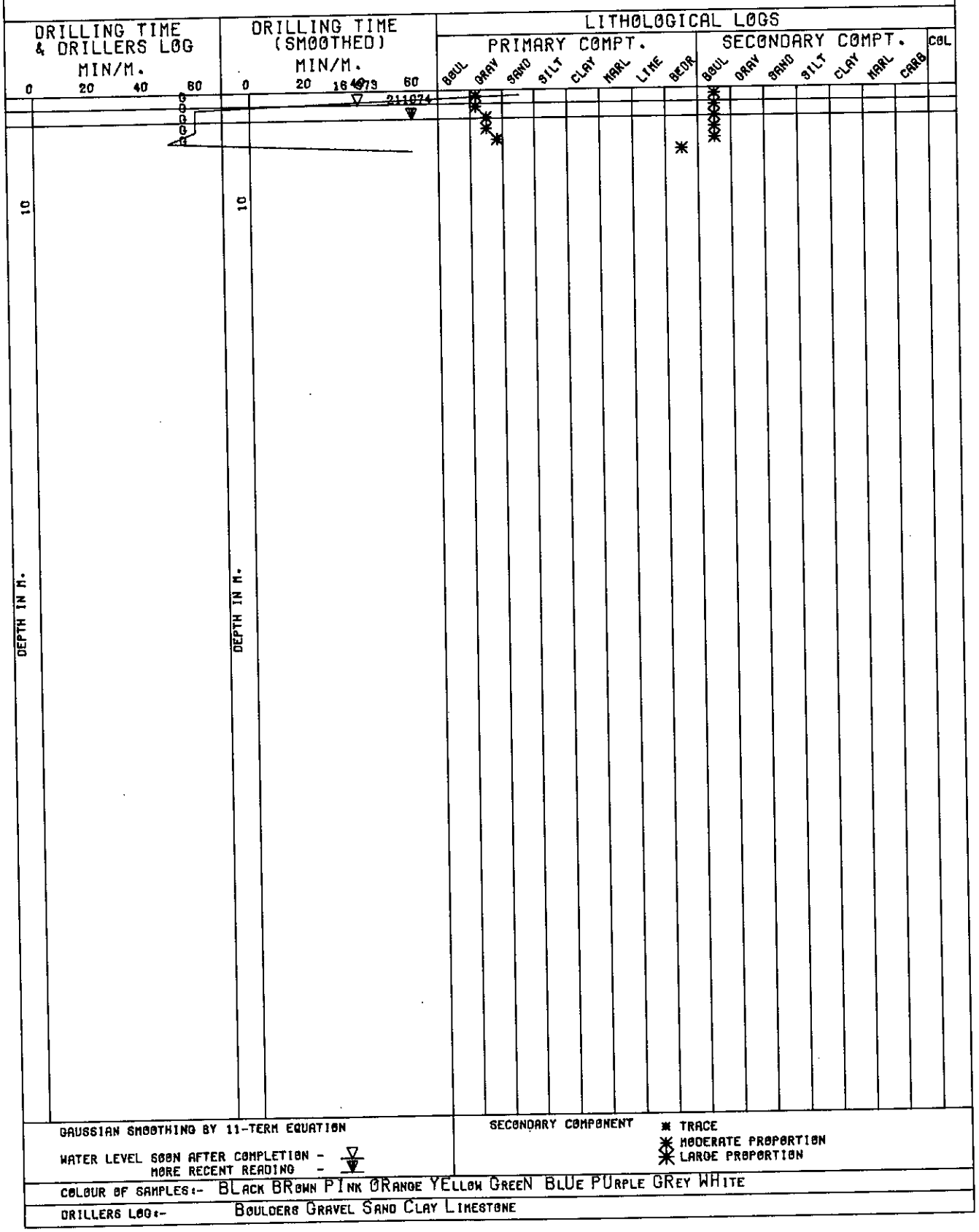
*** LARGE PROPORTION

COLOUR OF SAMPLES:- BLACK BROWN PINK ORANGE YELLOW GREEN BLUE PURPLE GREY WHITE

DRILLERS LOG:- BOULDERS GRAVEL SAND CLAY LIMESTONE

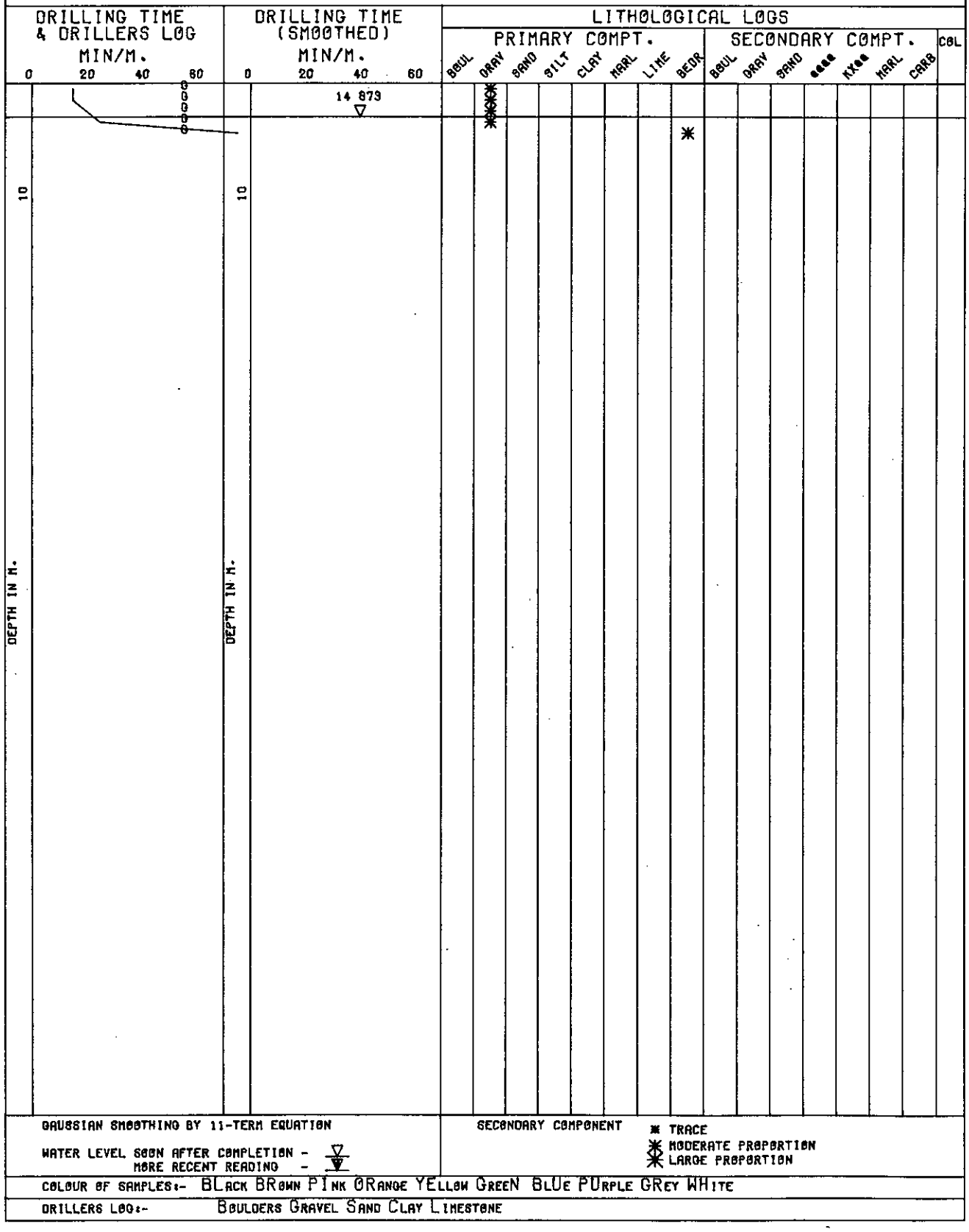
WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT39 GRID REF. 61426076



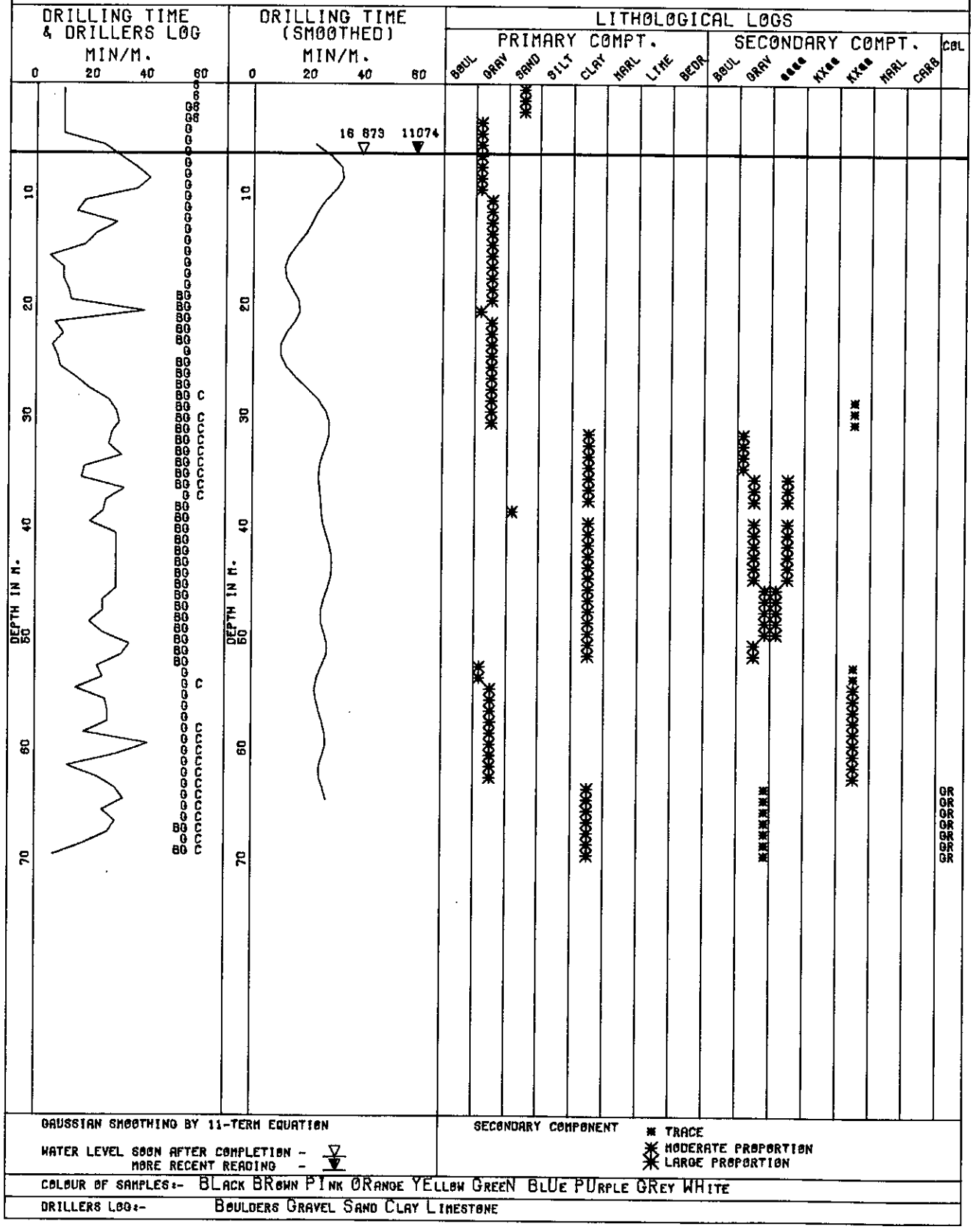
WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT40 GRID REF. 56905953



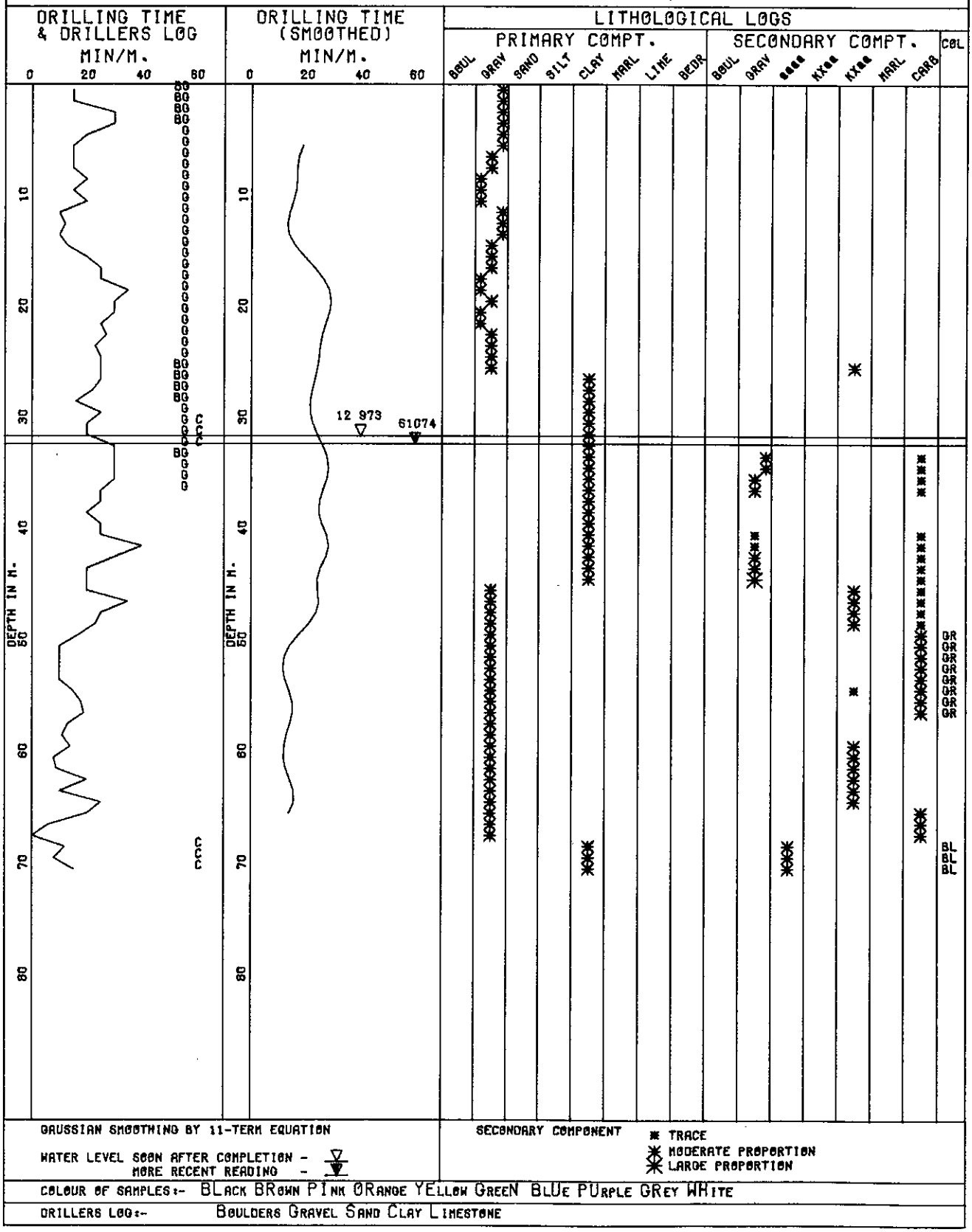
WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT41 GRID REF. 60276206



WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT42 GRID REF. 60646137



GAUSSIAN SMOOTHING BY 11-TERM EQUATION

WATER LEVEL SOON AFTER COMPLETION - ▽

MORE RECENT READING - ▼

SECONDARY COMPONENT

* TRACE

** MODERATE PROPORTION

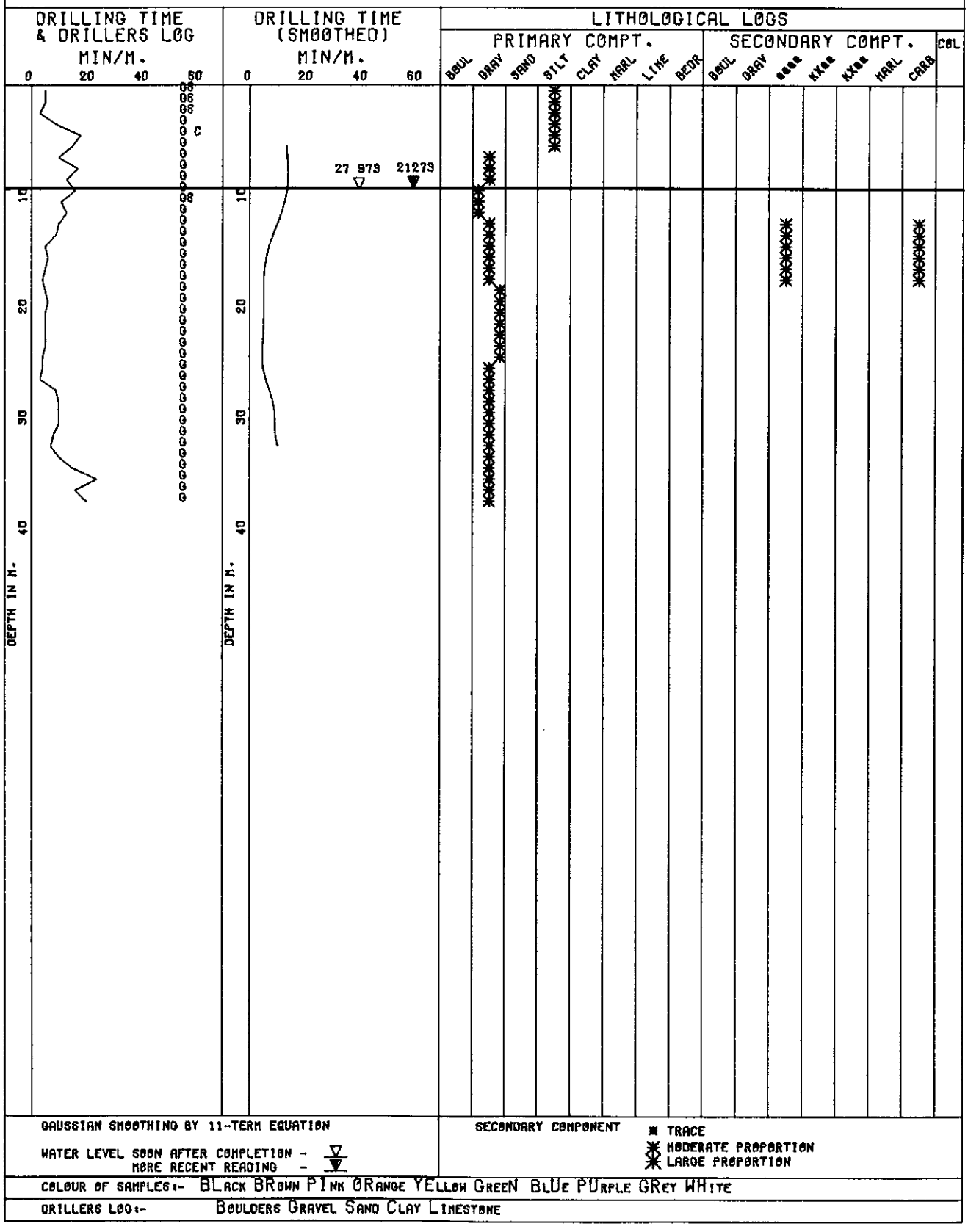
** LARGE PROPORTION

COLOUR OF SAMPLES:- BLACK BROWN PINK ORANGE YELLOW GREEN BLUE PURPLE GREY WHITE

DRILLERS LOG:- BOULDERS GRAVEL SAND CLAY LIMESTONE

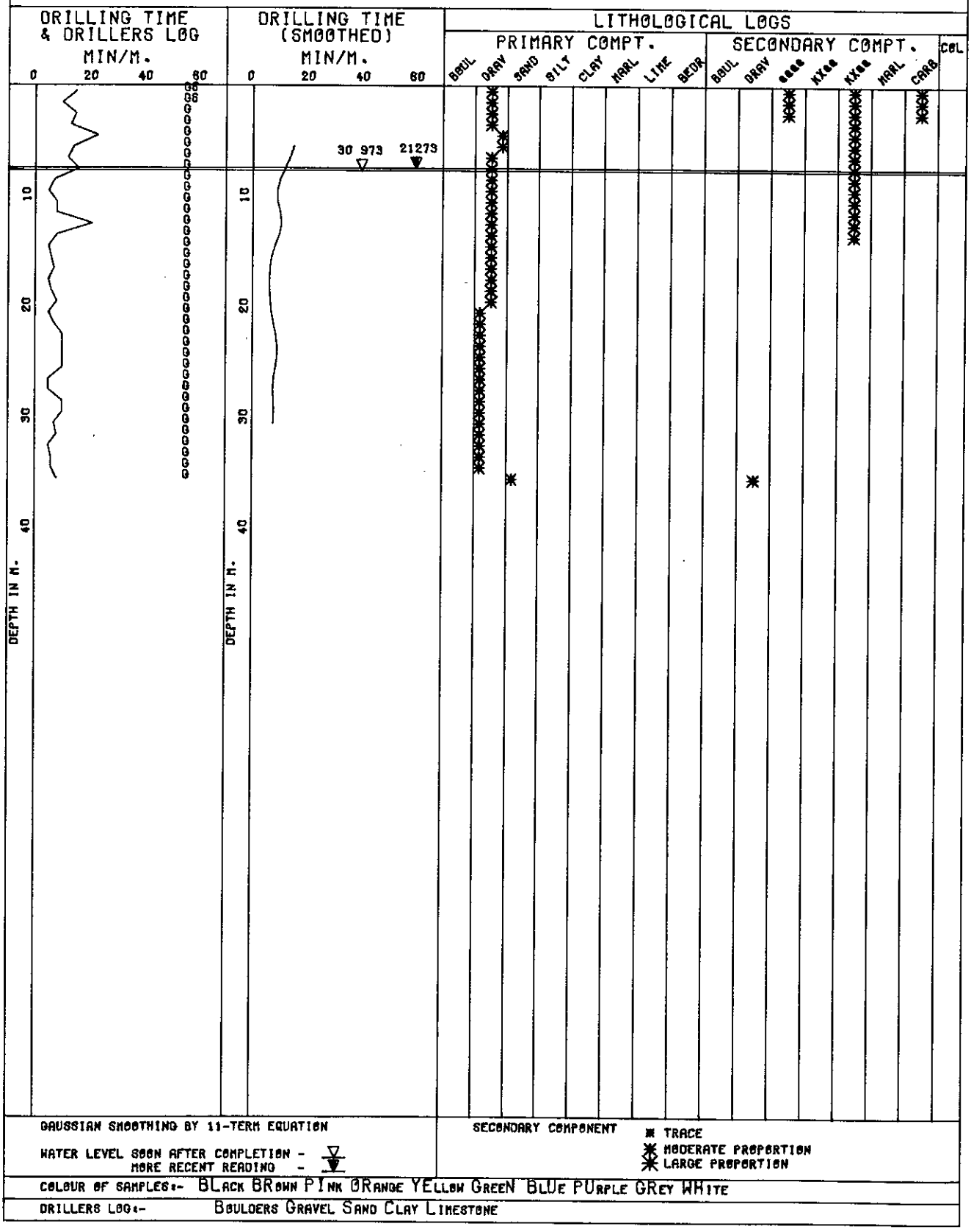
WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT43 GRID REF. 60616202



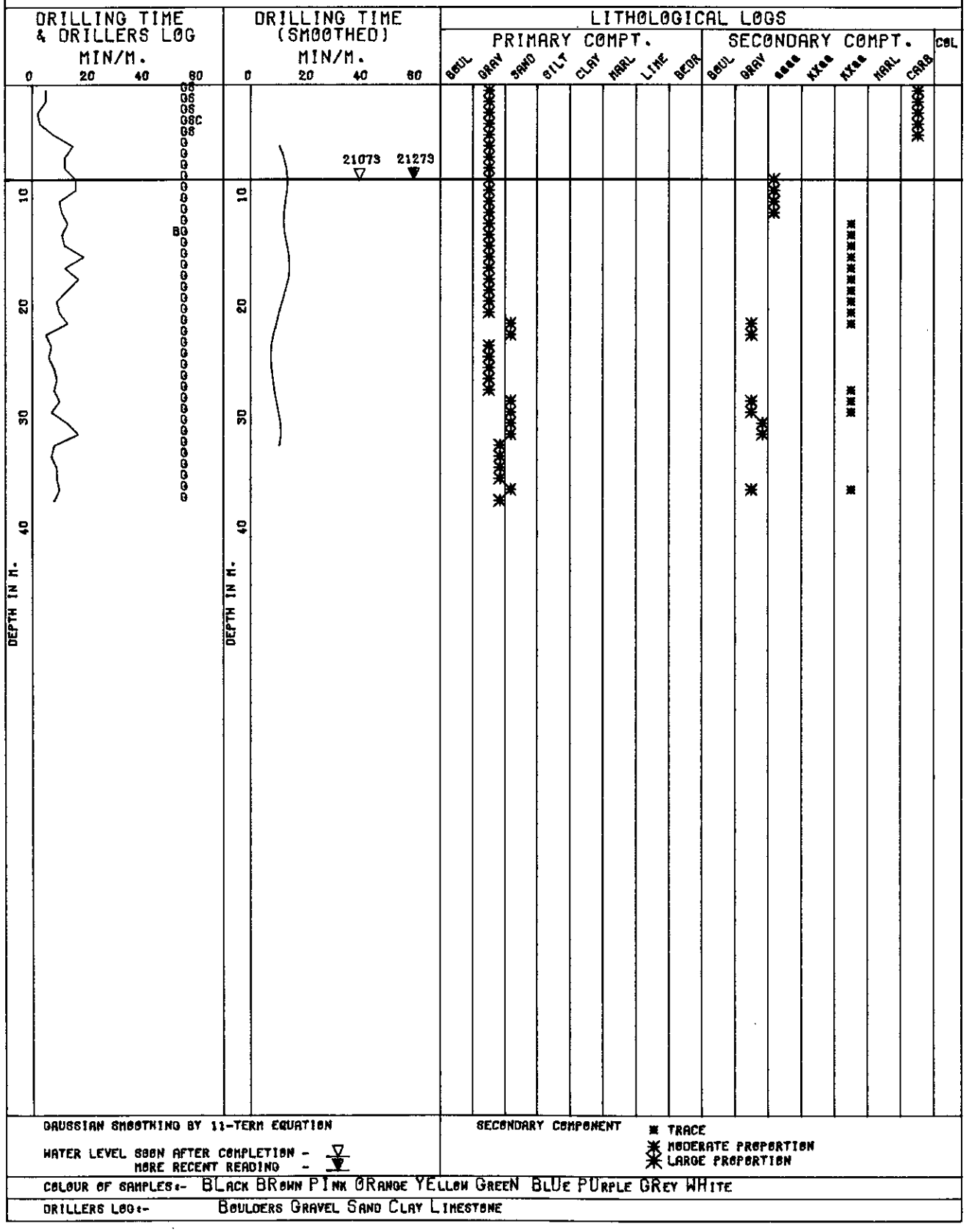
WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT44 GRID REF. 60616204



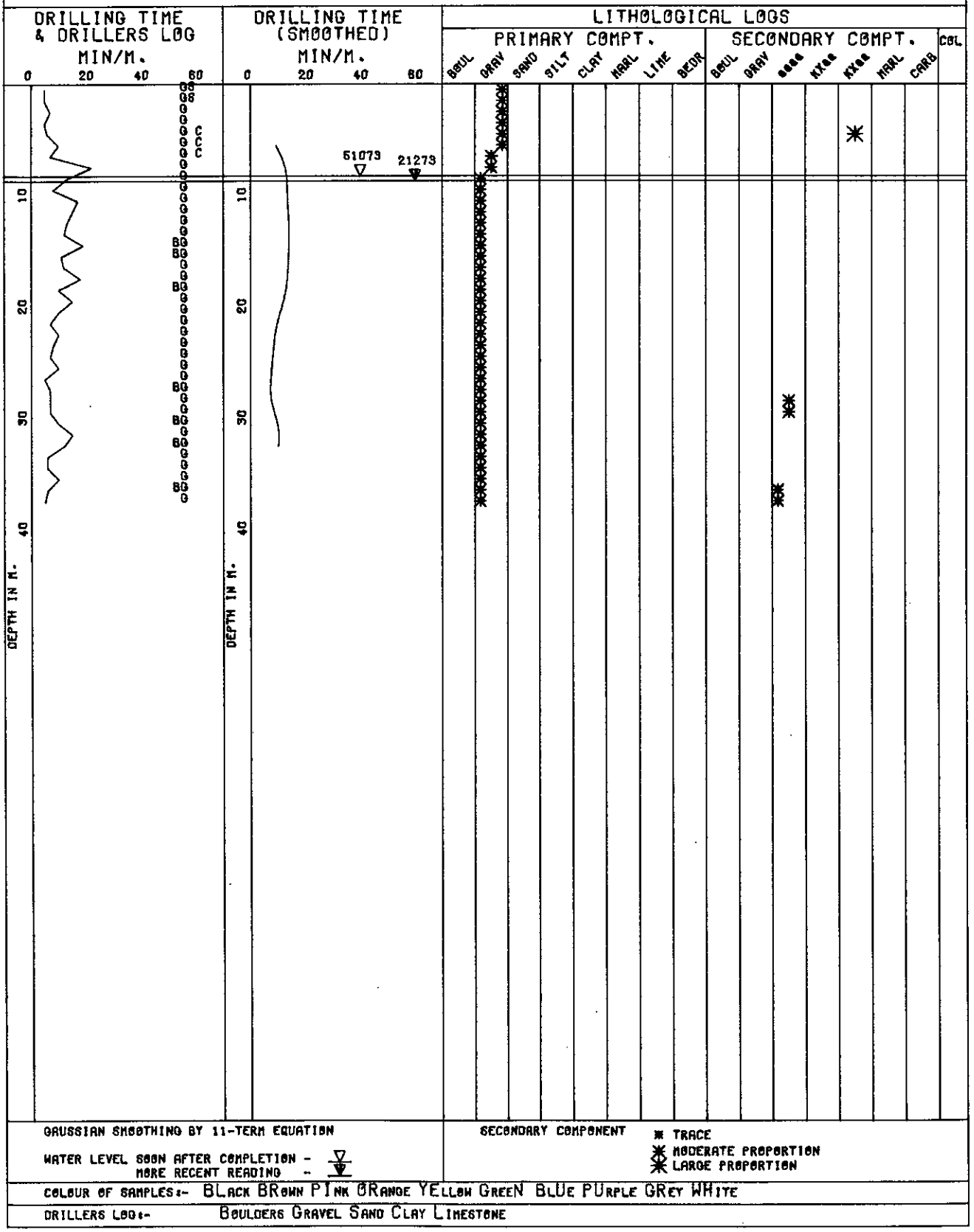
WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT45 GRID REF. 60676203



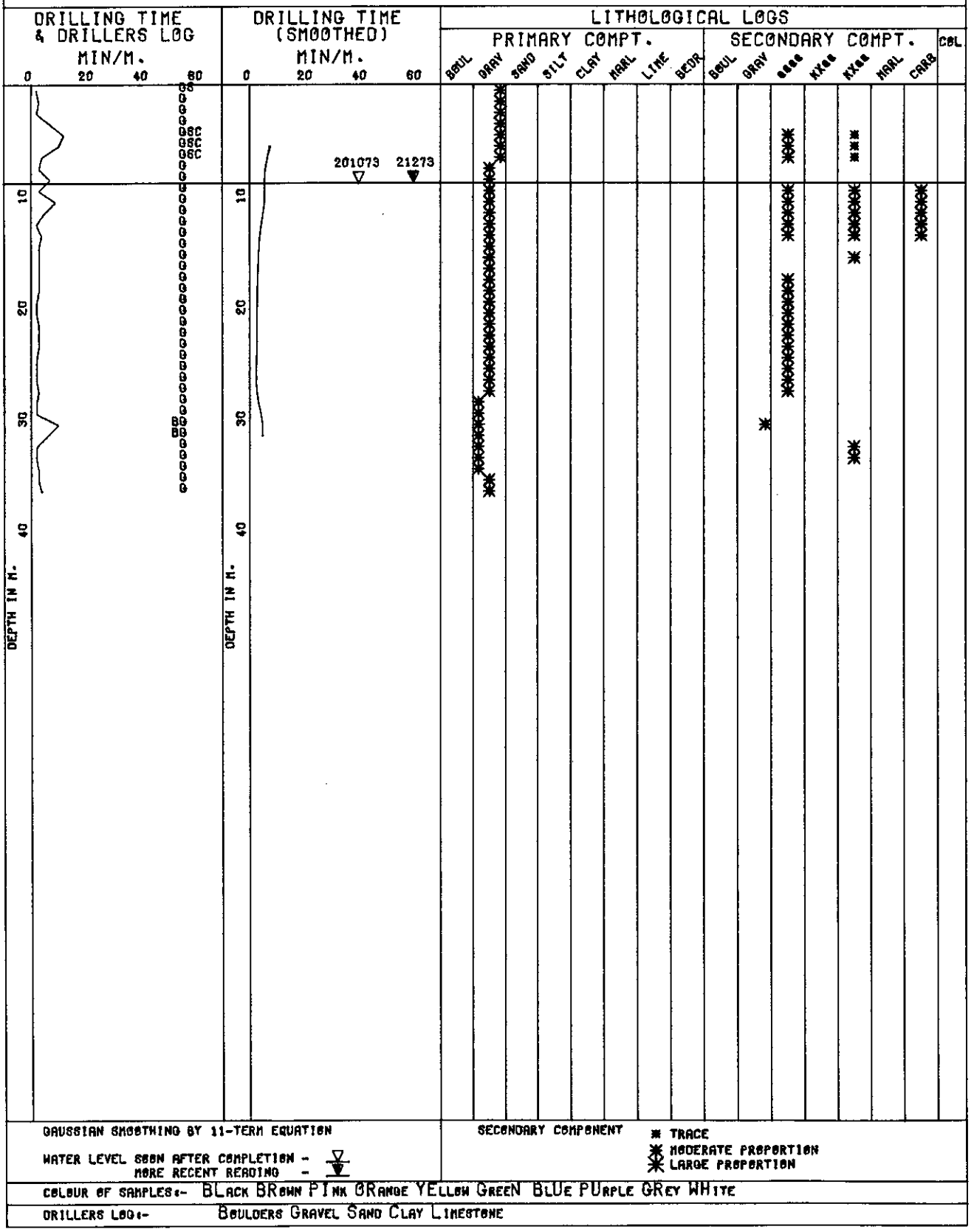
WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT46 GRID REF. 60656203



WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT47 GRID REF. 60636202



GAUSSIAN SMOOTHING BY 11-TERM EQUATION

WATER LEVEL SEEN AFTER COMPLETION –
MORE RECENT READING –

SECONDARY COMPONENT

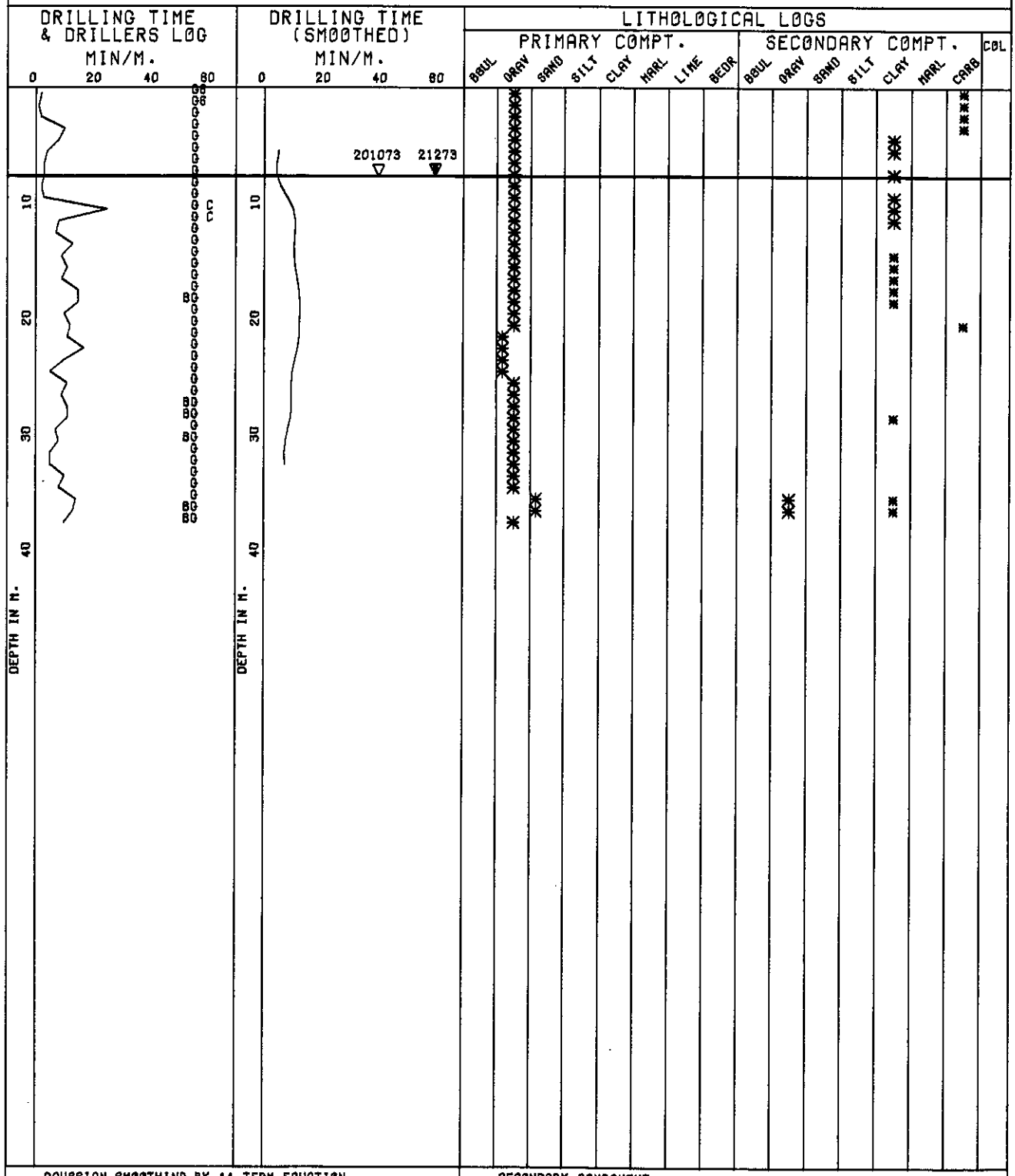
* TRACE
** MODERATE PROPORTION
** LARGE PROPORTION

COLOUR OF SAMPLES:- BLACK BROWN PINK ORANGE YELLOW GREEN BLUE PURPLE GREY WHITE

DRILLERS LOG:- BOULDERS GRAVEL SAND CLAY LIMESTONE

WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT48 GRID REF. 60636204



GAUSSIAN SMOOTHING BY 11-TERM EQUATION

WATER LEVEL SOON AFTER COMPLETION - ▽
MORE RECENT READING - ▼

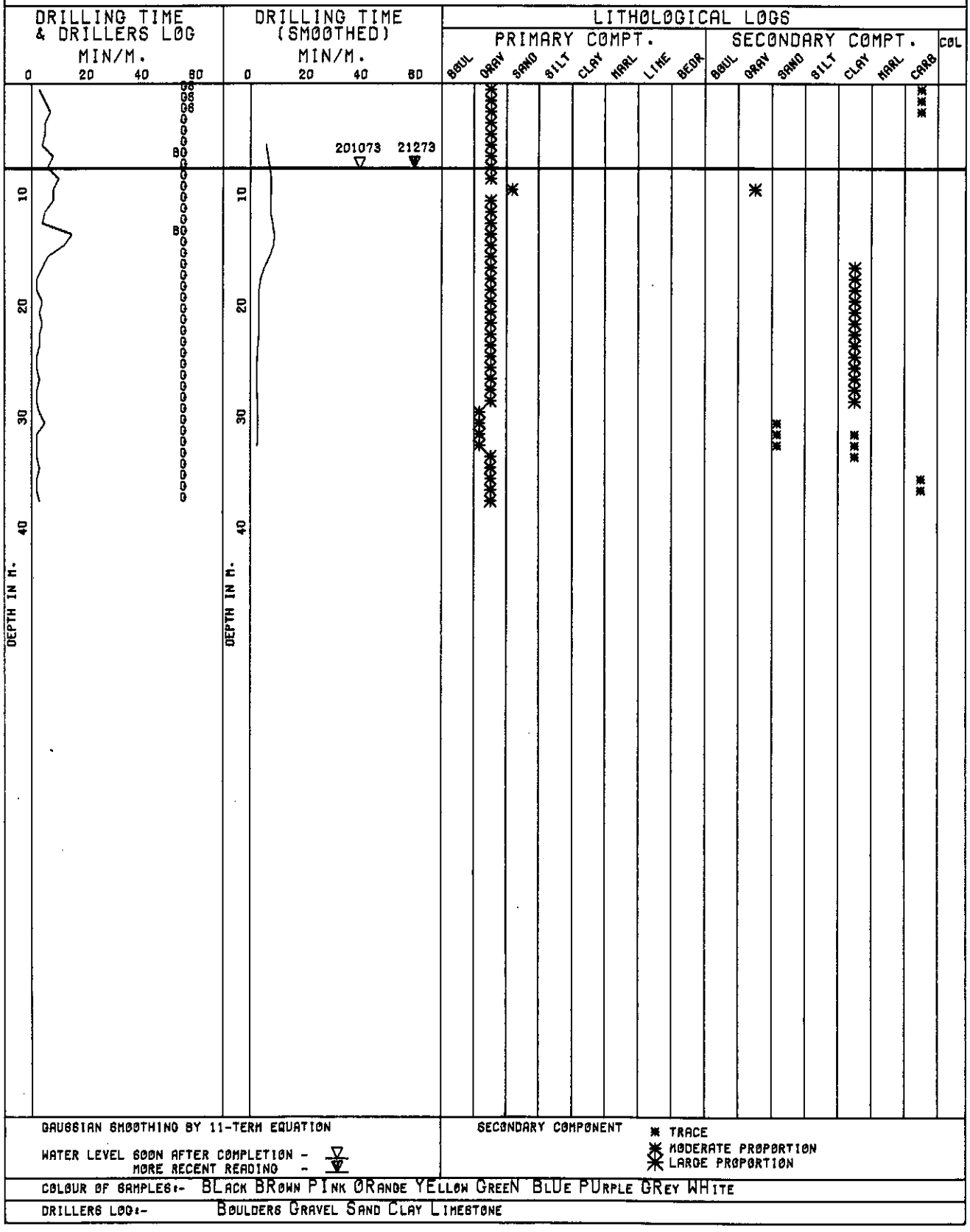
SECONDARY COMPONENT
* TRACE
** MODERATE PROPORTION
*** LARGE PROPORTION

COLOUR OF SAMPLES:- BLACK BROWN PINK ORANGE YELLOW GREEN BLUE PURPLE GREY WHITE

DRILLERS LOG:- BOULDERS GRAVEL SAND CLAY LIMESTONE

WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT49 GRID REF. 60656205



GAUSSIAN SMOOTHING BY 11-TERM EQUATION

WATER LEVEL SOON AFTER COMPLETION - ▽
MORE RECENT READING - ▼

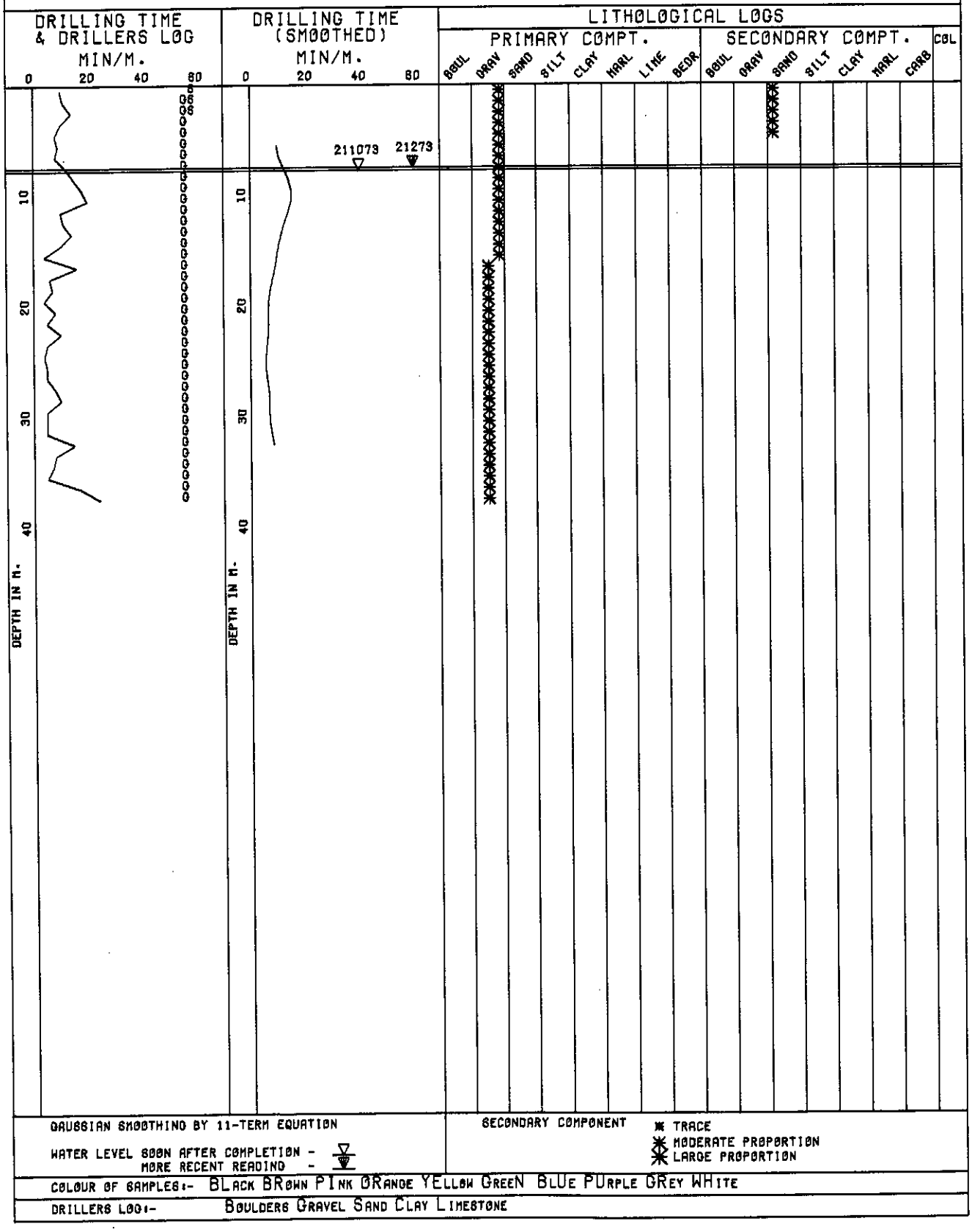
SECONDARY COMPONENT
* TRACE
** MODERATE PROPORTION
*** LARGE PROPORTION

COLOUR OF SAMPLES:- BLACK BROWN PINK ORANGE YELLOW GREEN BLUE PURPLE GREY WHITE

DRILLERS LOG:- BOULDERS GRAVEL SAND CLAY LIMESTONE

WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT50 GRID REF. 60676205



GAUSSIAN SMOOTHING BY 11-TERM EQUATION

WATER LEVEL SOON AFTER COMPLETION - ▽

MORE RECENT READING - ▼

SECONDARY COMPONENT

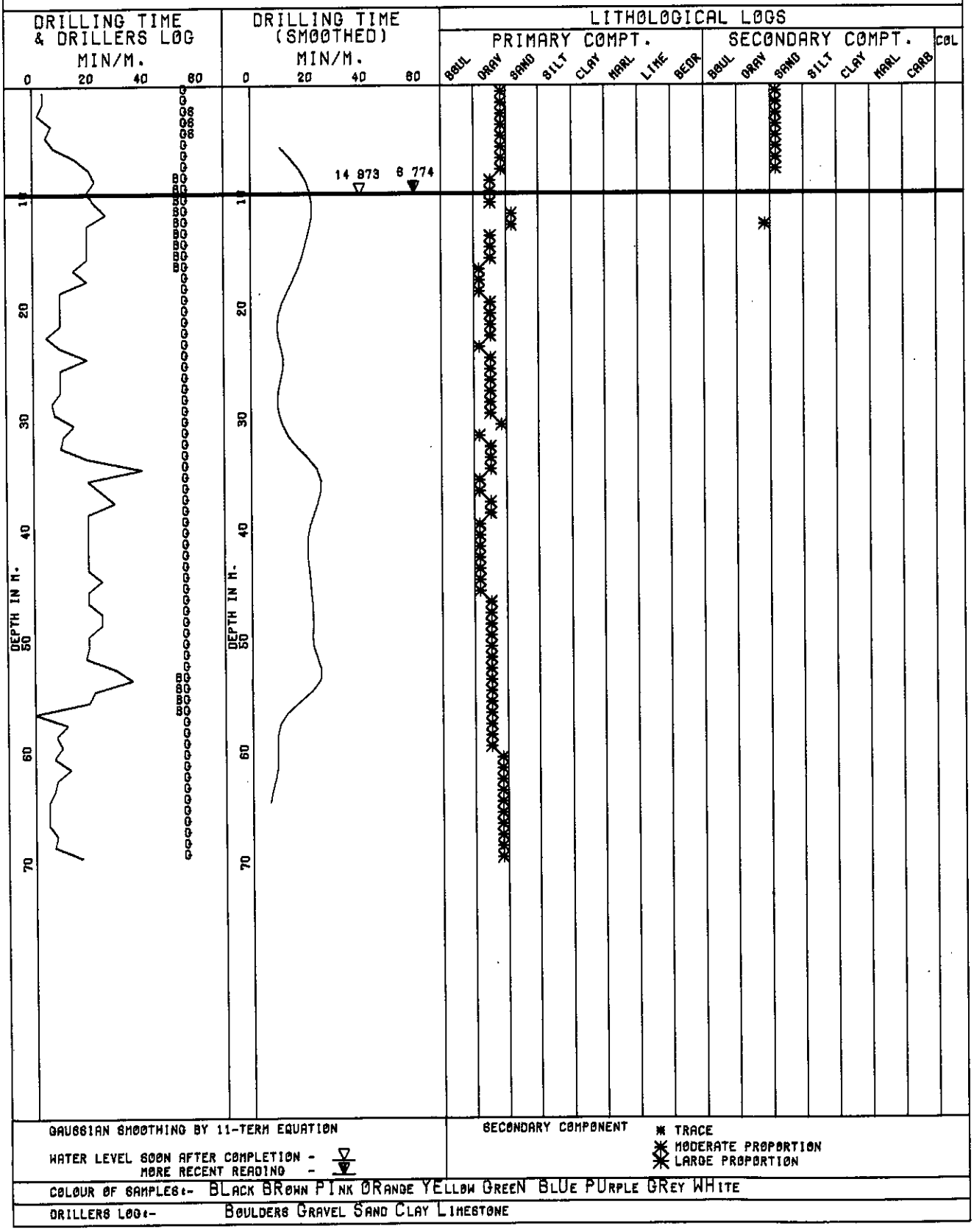
* TRACE
* MODERATE PROPORTION
* LARGE PROPORTION

COLOUR OF SAMPLES:- BLACK BROWN PINK ORANGE YELLOW GREEN BLUE PURPLE GREY WHITE

DRILLERS LOG:- BOULDERS GRAVEL SAND CLAY LIMESTONE

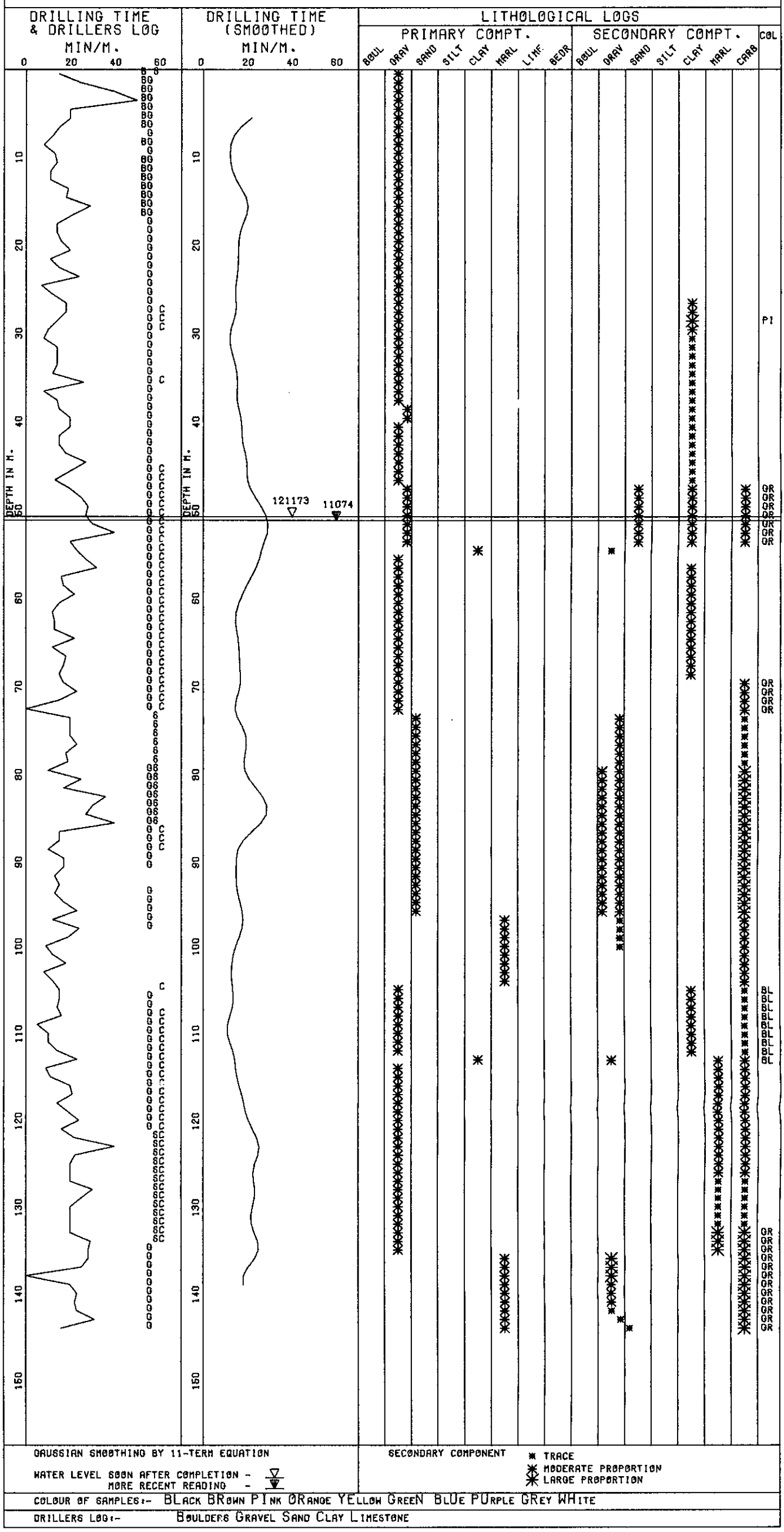
WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT51 GRID REF. 61106203



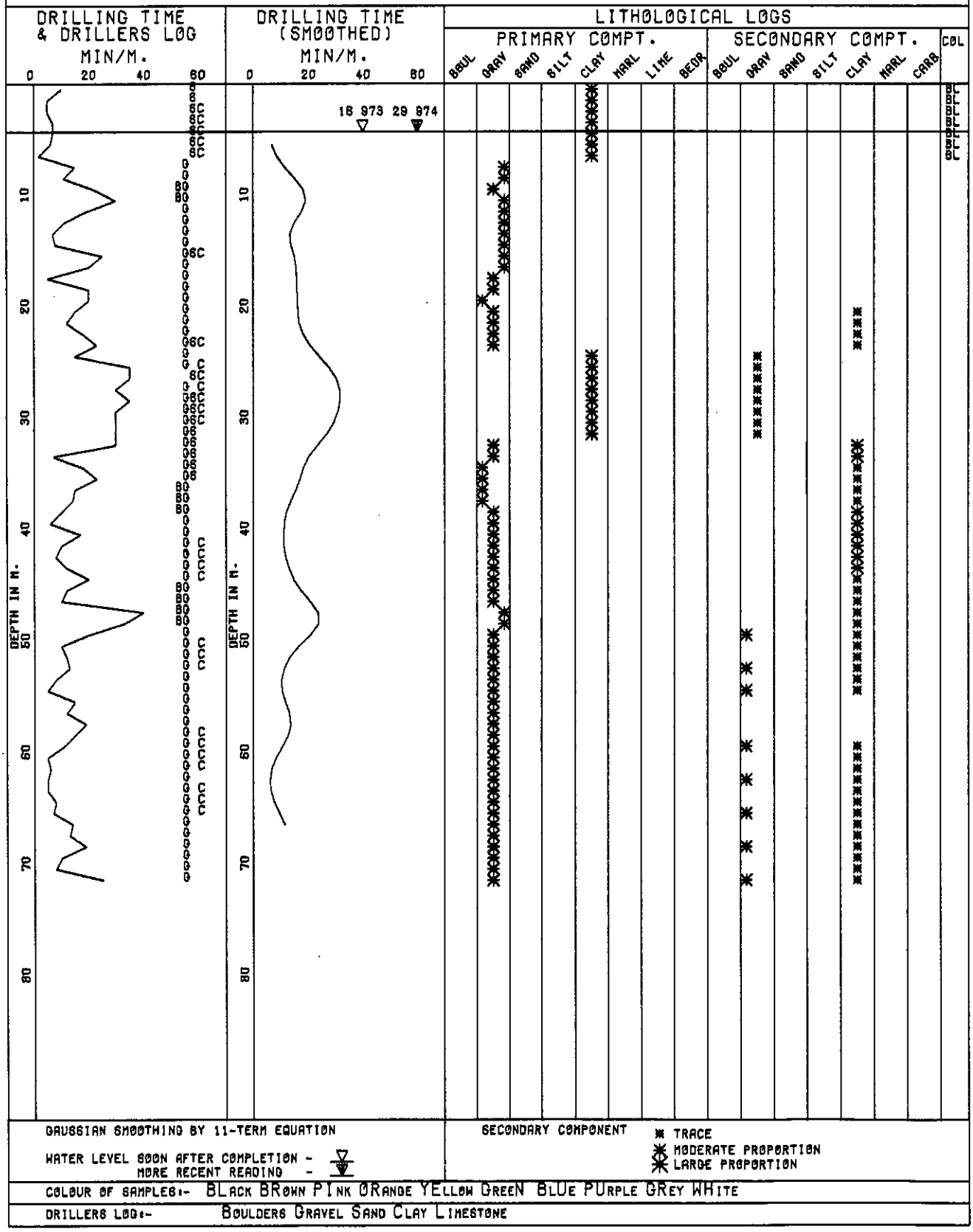
WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT52 GRID REF. 59356102



WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT53 GRID REF. 62846127



GAUSSIAN SMOOTHING BY 11-TERM EQUATION

WATER LEVEL SOON AFTER COMPLETION - ▽
MORE RECENT READING - ▼

SECONDARY COMPONENT

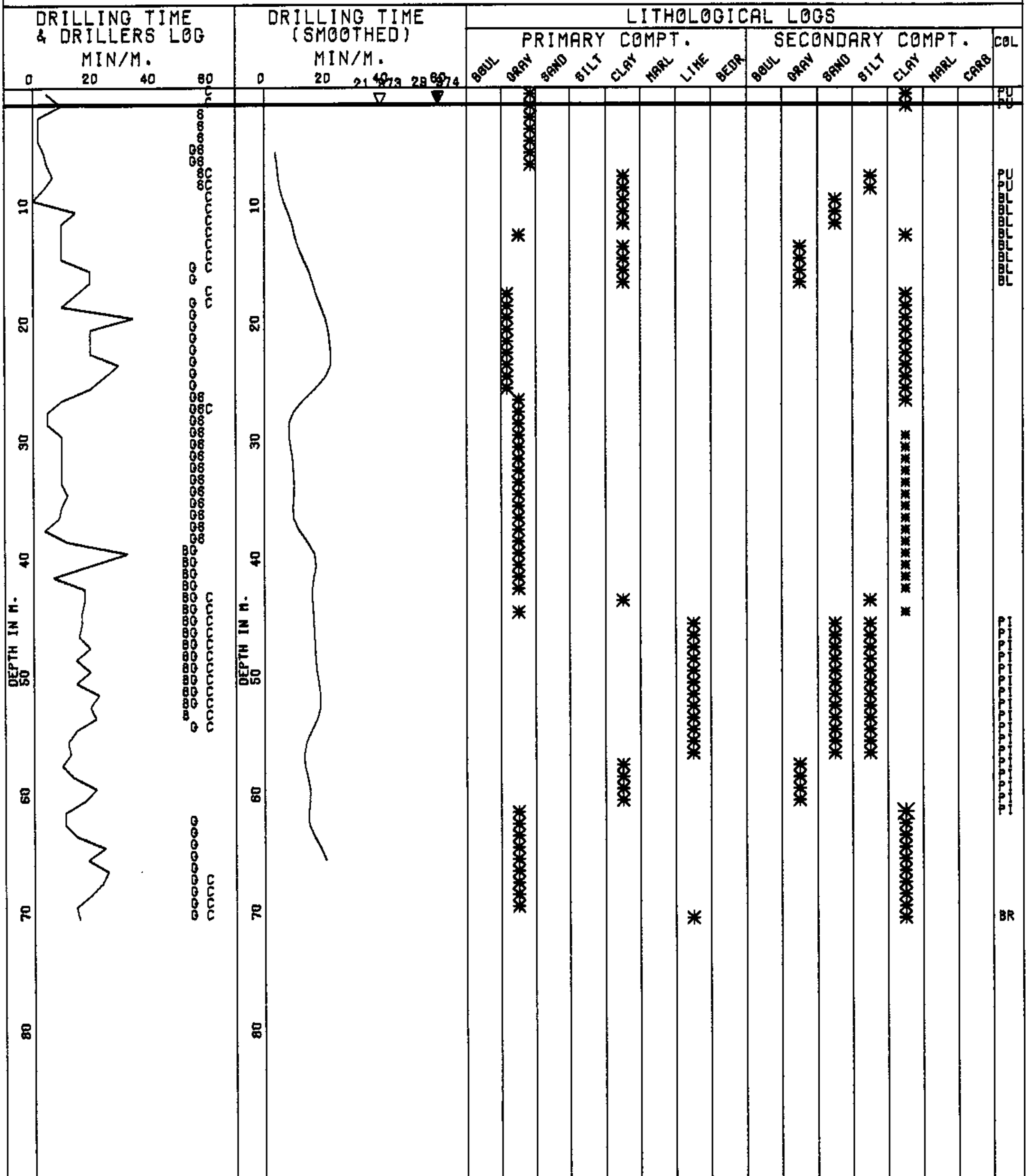
* TRACE
* MODERATE PROPORTION
* LARGE PROPORTION

COLOUR OF SAMPLES:- BLACK BROWN PINK ORANGE YELLOW GREEN BLUE PURPLE GREY WHITE

DRILLERS LOG:- BOULDERS GRAVEL SAND CLAY LIMESTONE

WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT54 GRID REF. 64306107



GAUSSIAN SMOOTHING BY 11-TERM EQUATION

WATER LEVEL SOON AFTER COMPLETION - ▽
MORE RECENT READING - ▼

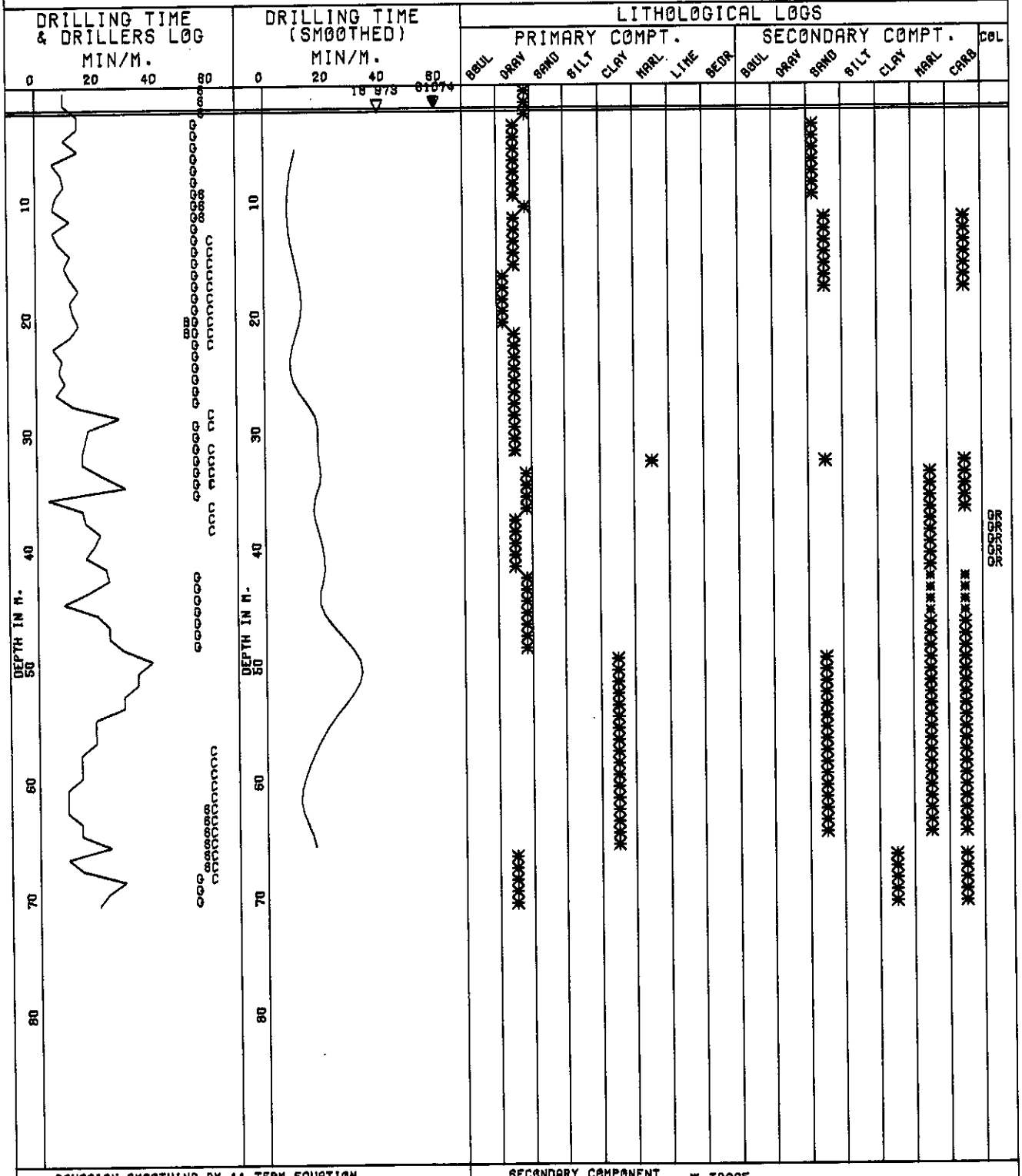
SECONDARY COMPONENT
* TRACE
MODERATE PROPORTION
LARGE PROPORTION

COLOUR OF SAMPLES:- BLack BRown PInk ORange YEllow GreeN BLUe PUrple GRey WHite

DRILLERS LOG:- Boulders Gravel Sand Clay Limestone

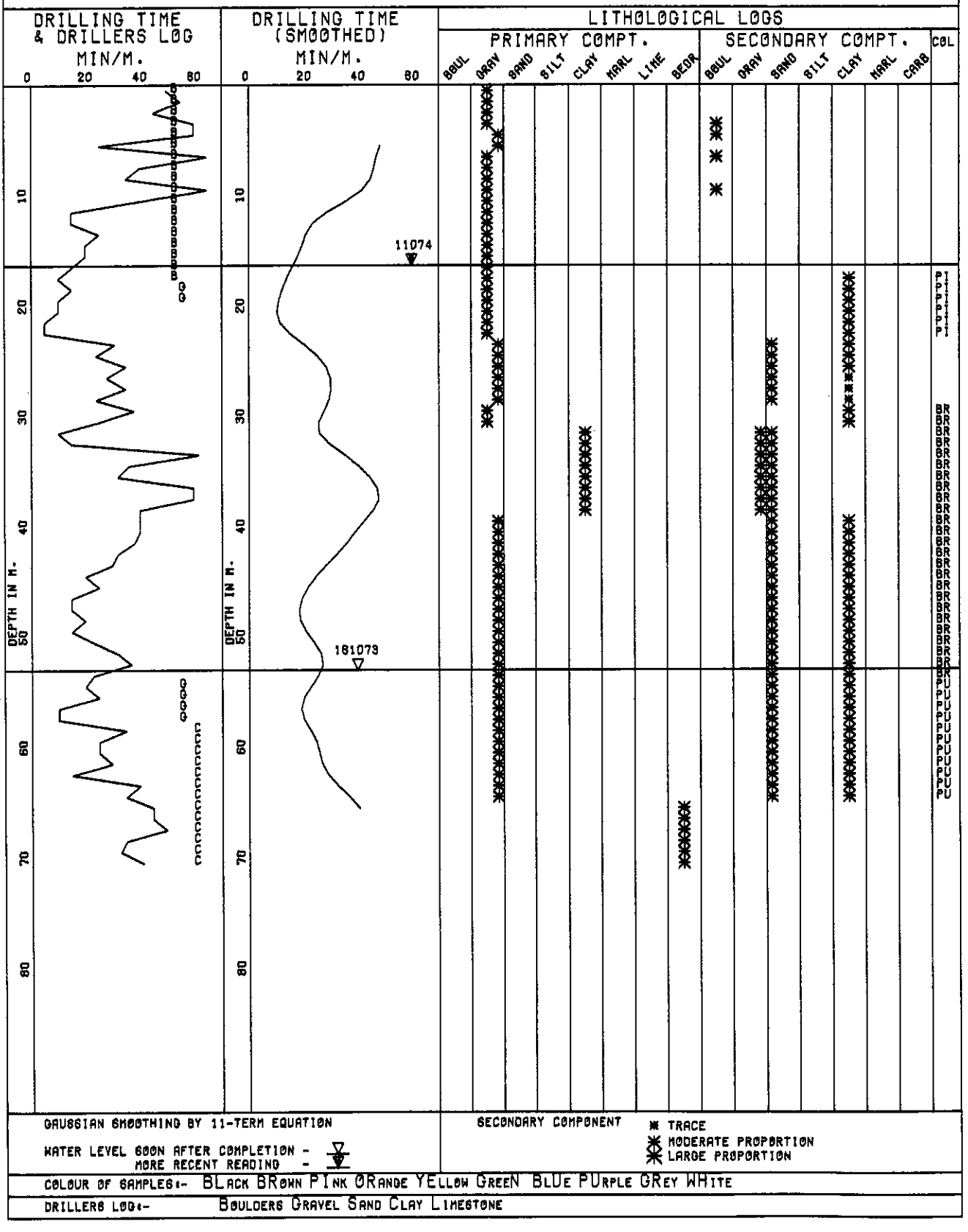
WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT55 GRID REF. 63116121



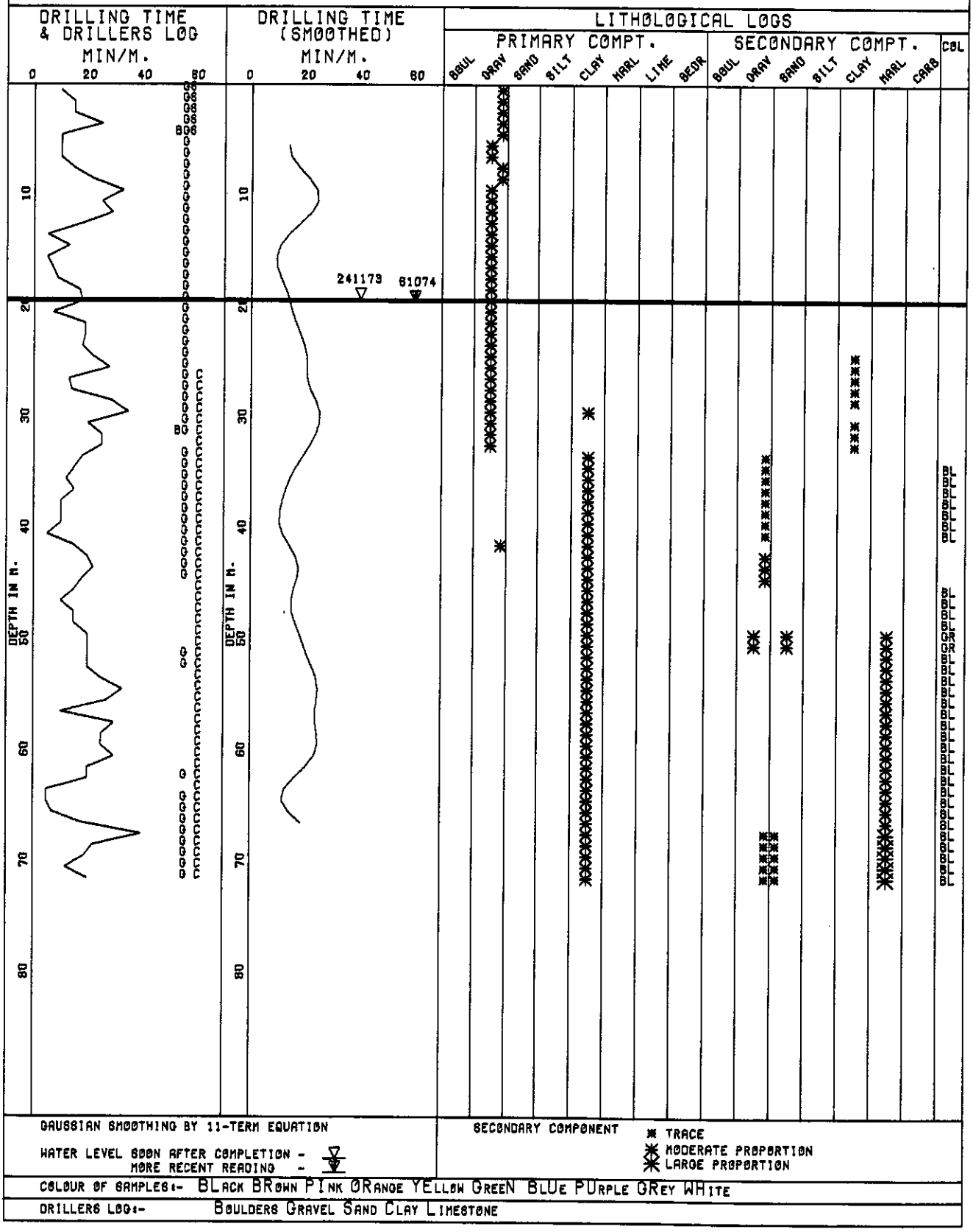
WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT56 GRID REF. 59336021



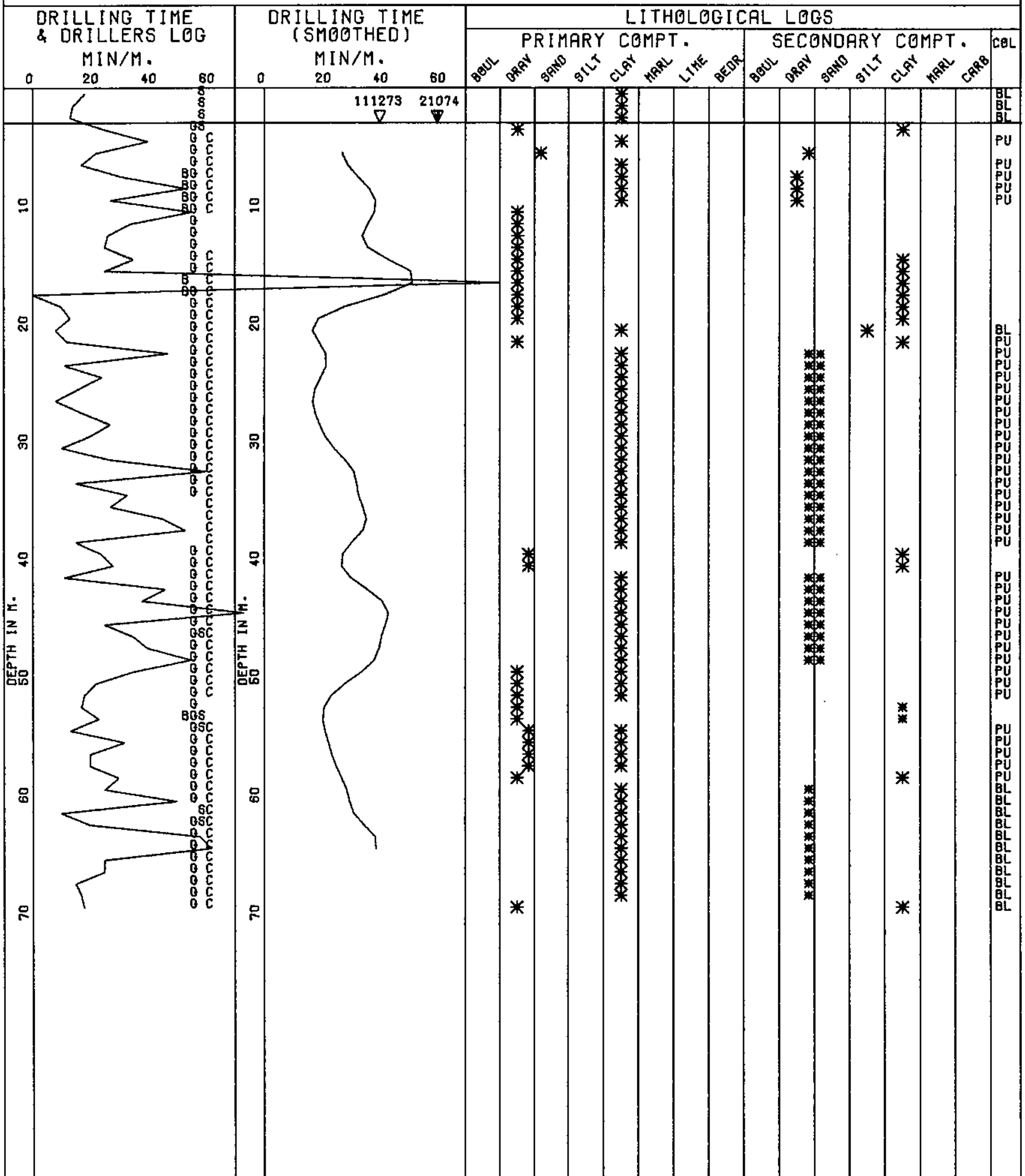
WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT57 GRID REF. 57196202



WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT58 GRID REF. 57306278



GAUSSIAN SMOOTHING BY 11-TERM EQUATION

WATER LEVEL SOON AFTER COMPLETION - ▽
MORE RECENT READING - ▼

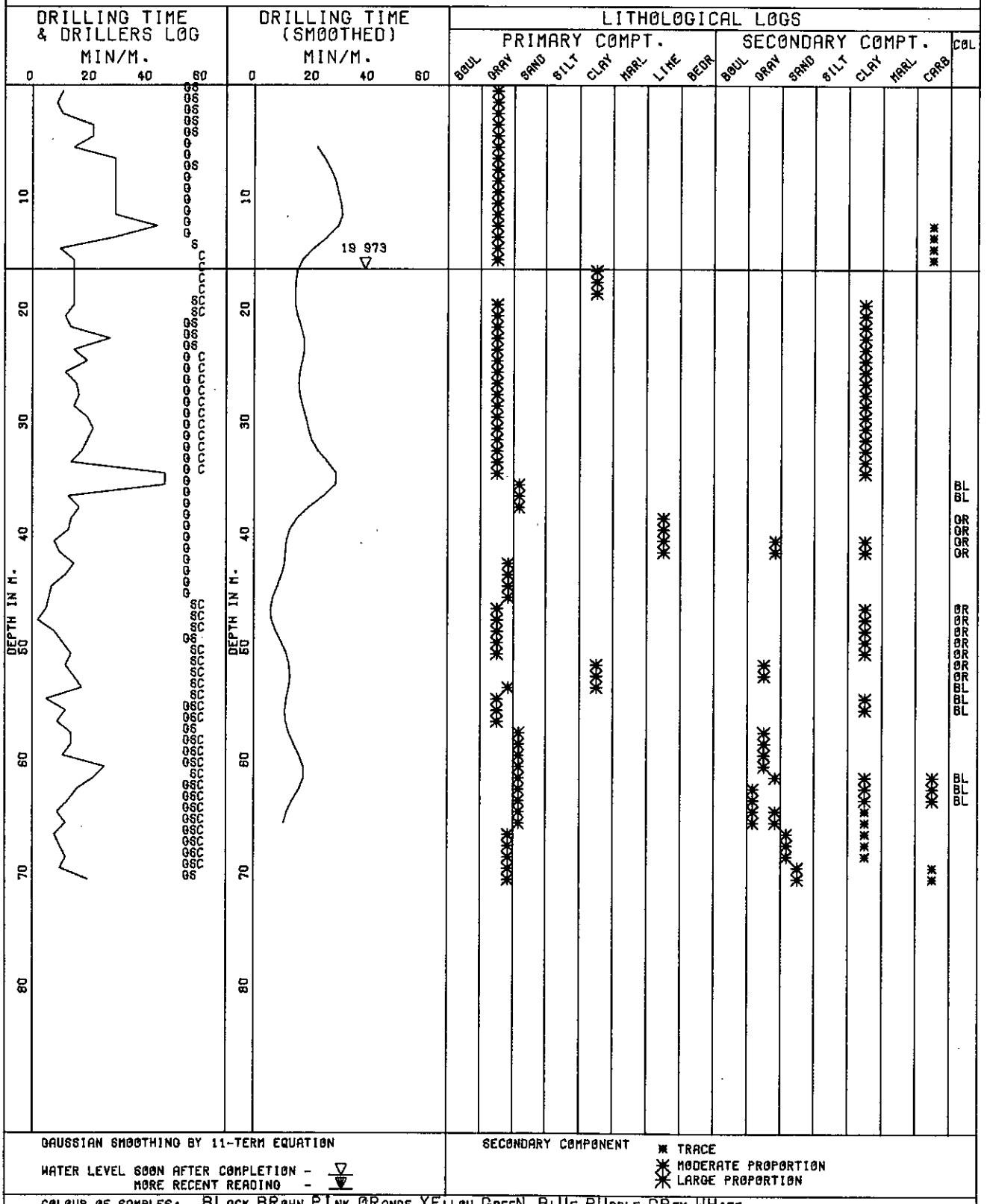
SECONDARY COMPONENT
* TRACE
MODERATE PROPORTION
LARGE PROPORTION

COLOUR OF SAMPLES:- BLack BRown PInk ORange YEllow GreeN BLUe PUrple GRey WHite

DRILLERS LOG:- Boulders Gravel Sand Clay Limestone

WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT59 GRID REF. 63106083



GAUSSIAN SMOOTHING BY 11-TERM EQUATION

WATER LEVEL SOON AFTER COMPLETION - ▽

MORE RECENT READING - ▼

SECONDARY COMPONENT

✱ TRACE

✱ MODERATE PROPORTION

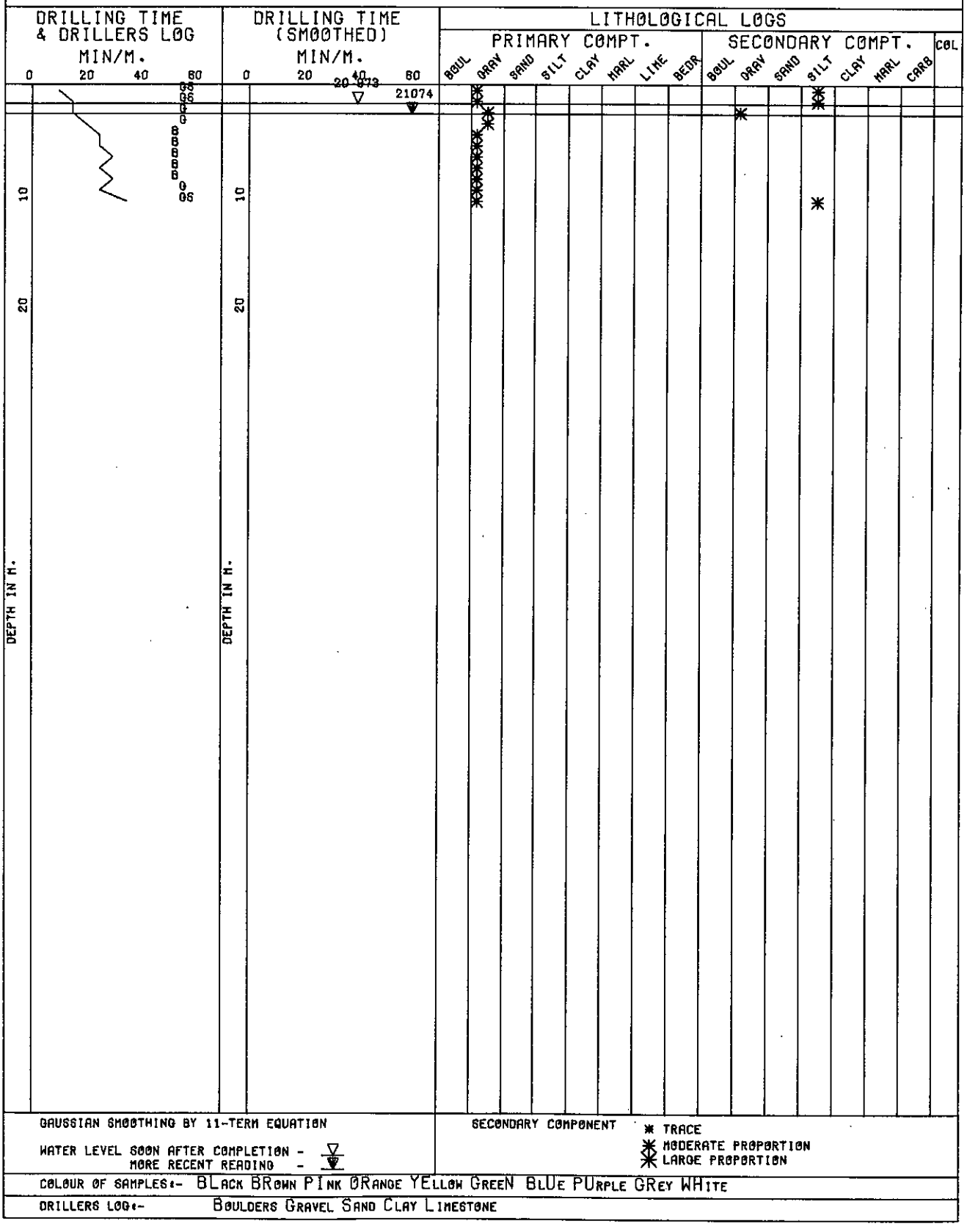
✱ LARGE PROPORTION

COLOUR OF SAMPLES:- BLack BRown PInk ORange YELlow GreeN BLUe PURple GREy WHite

DRILLERS LOG:- Boulders Gravel Sand Clay Limestone

WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT60 GRID REF. 65616114



GAUSSIAN SMOOTHING BY 11-TERM EQUATION

WATER LEVEL SOON AFTER COMPLETION - ▽

MORE RECENT READING - ▼

SECONDARY COMPONENT

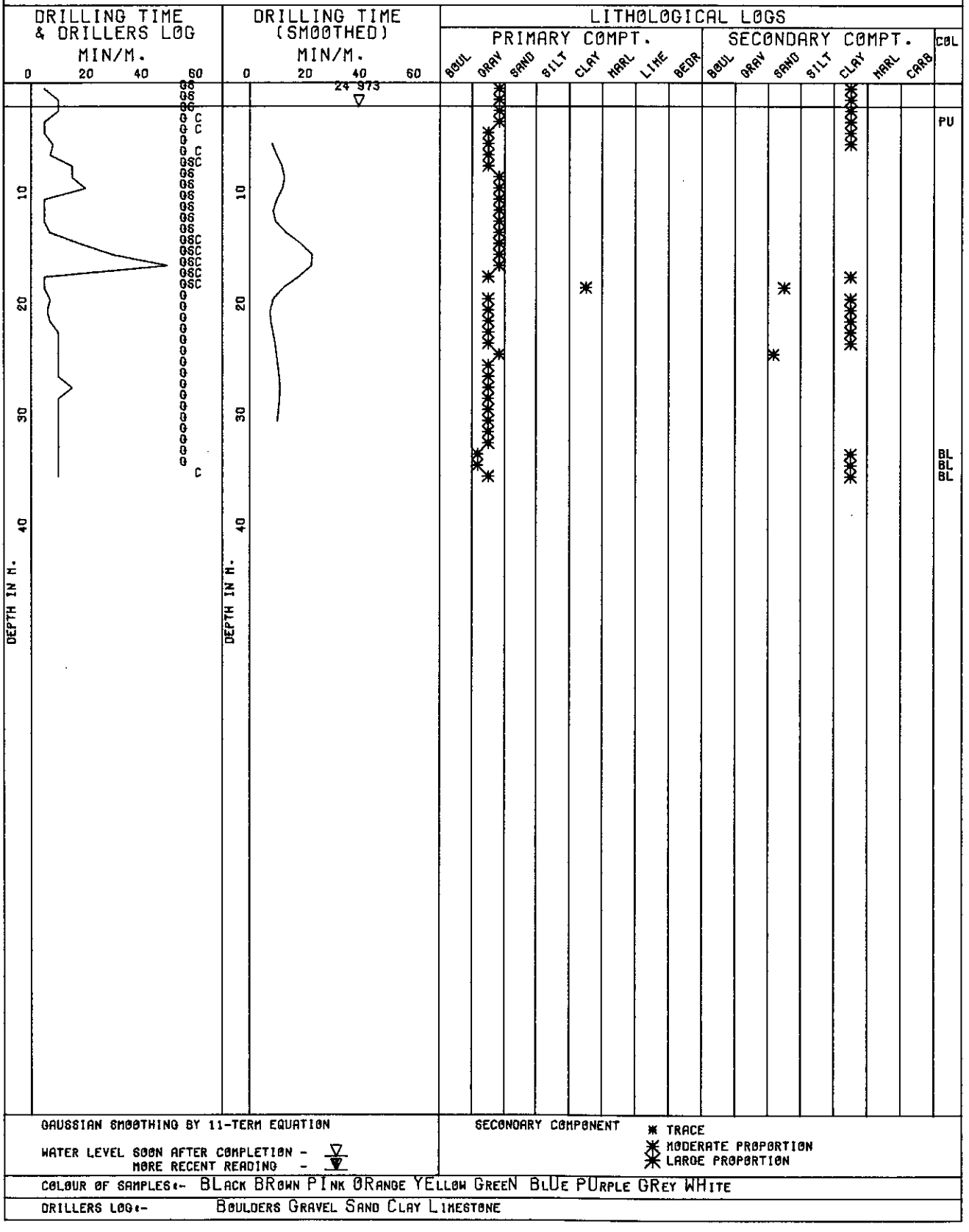
* TRACE
* MODERATE PROPORTION
* LARGE PROPORTION

COLOUR OF SAMPLES:- BLACK BROWN PINK ORANGE YELLOW GREEN BLUE PURPLE GREY WHITE

DRILLERS LOG:- BOULDERS GRAVEL SAND CLAY LIMESTONE

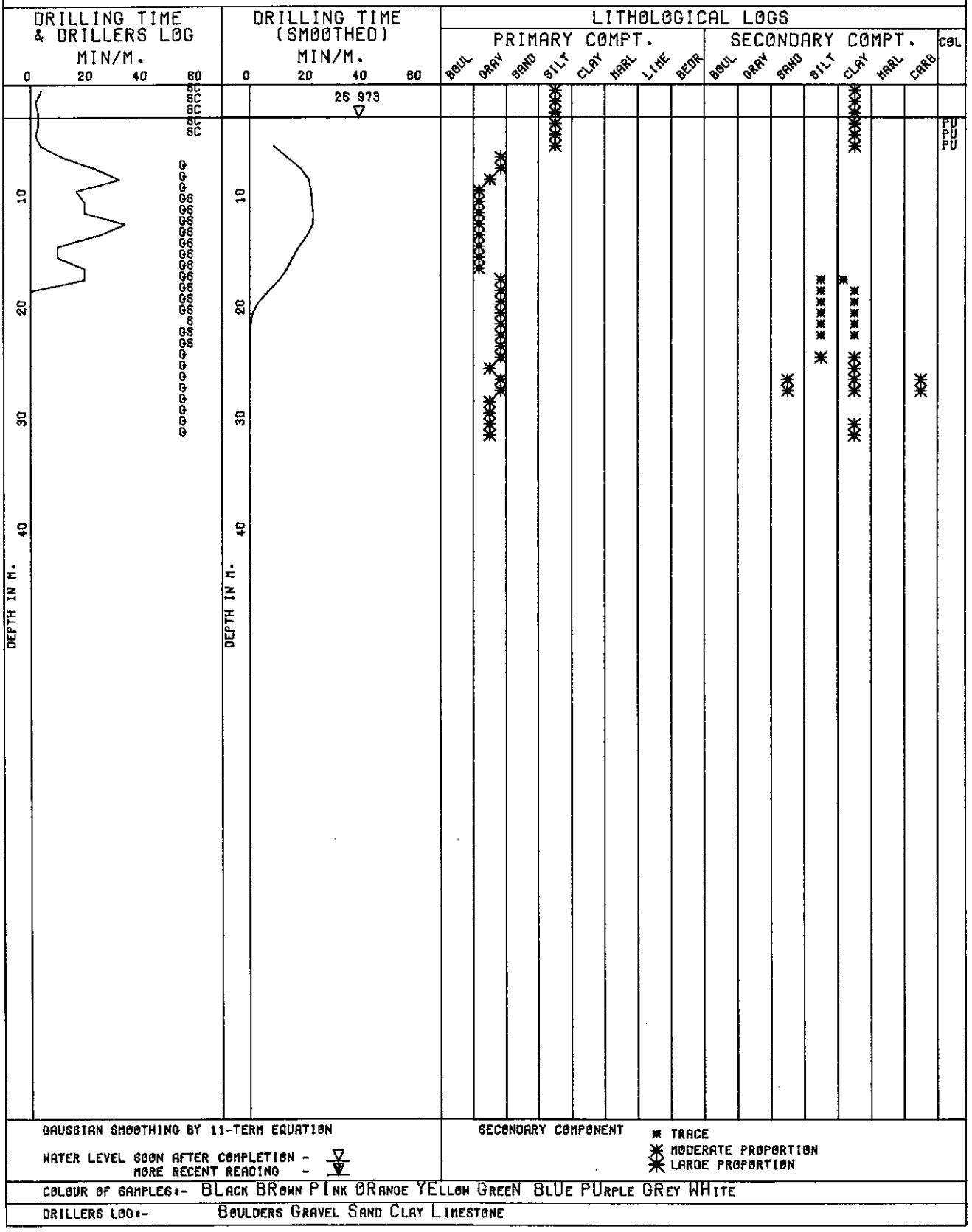
WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT61 GRID REF. 65616113



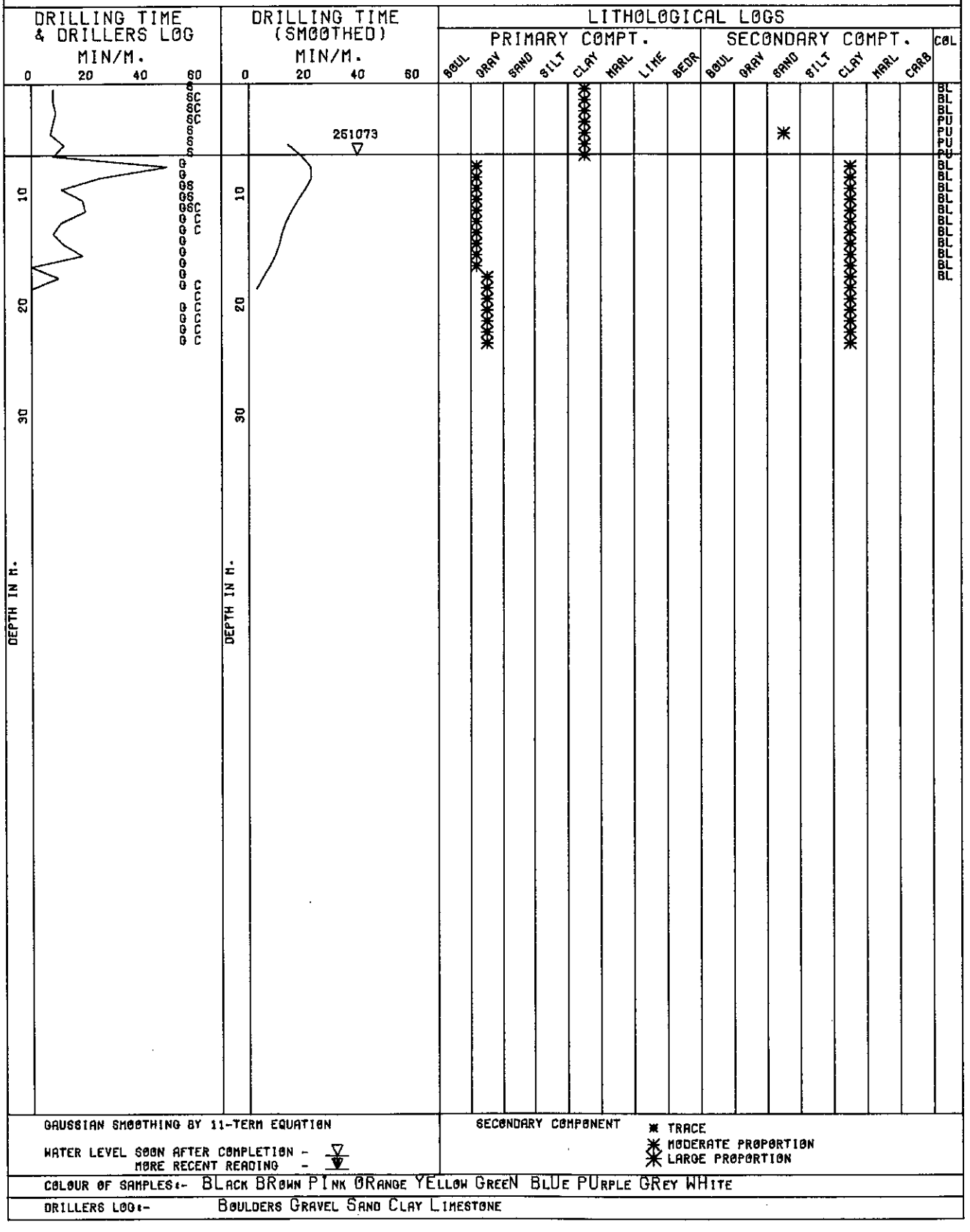
WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT62 GRID REF. 65616115



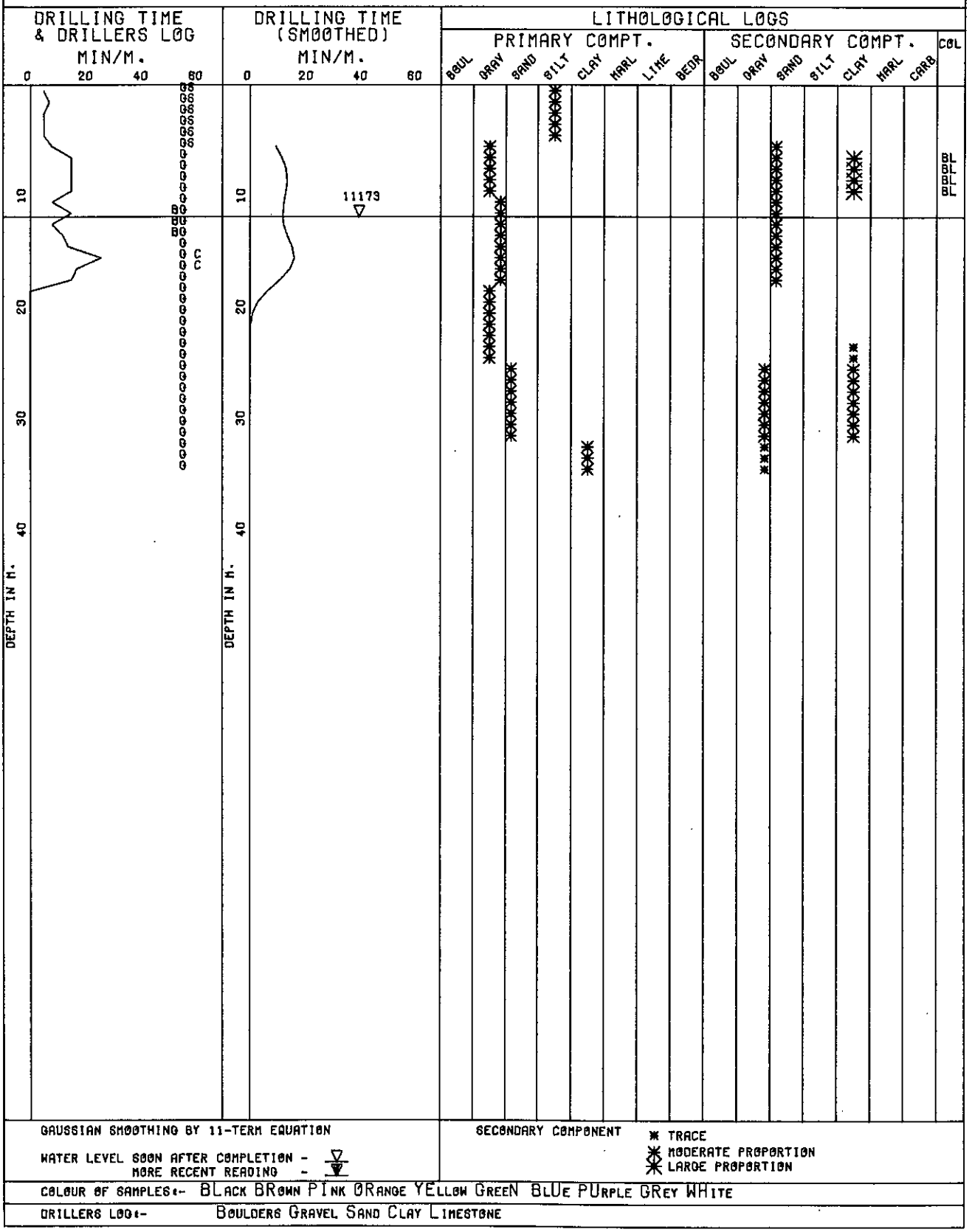
WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT63 GRID REF. 58706200



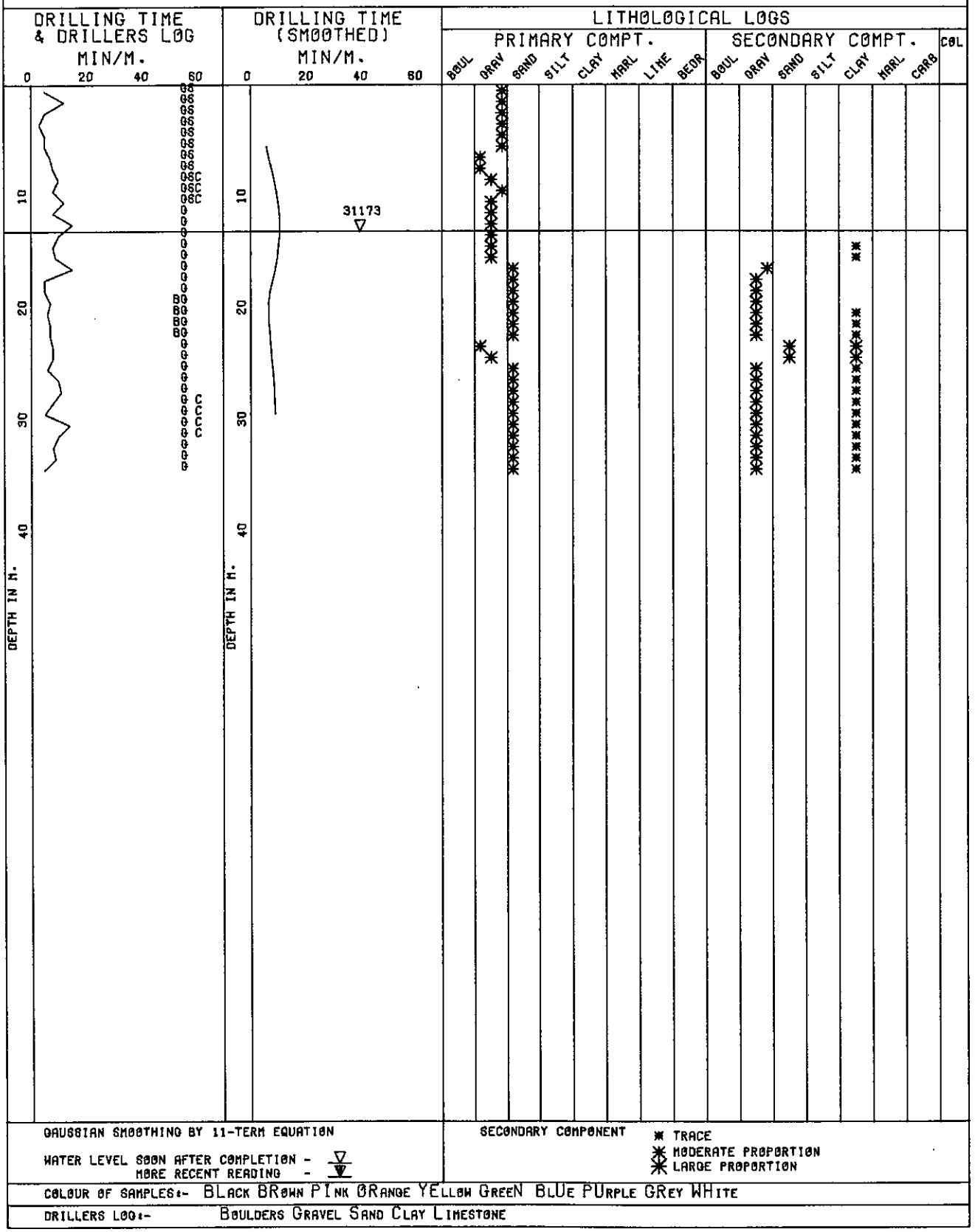
WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT64 GRID REF. O



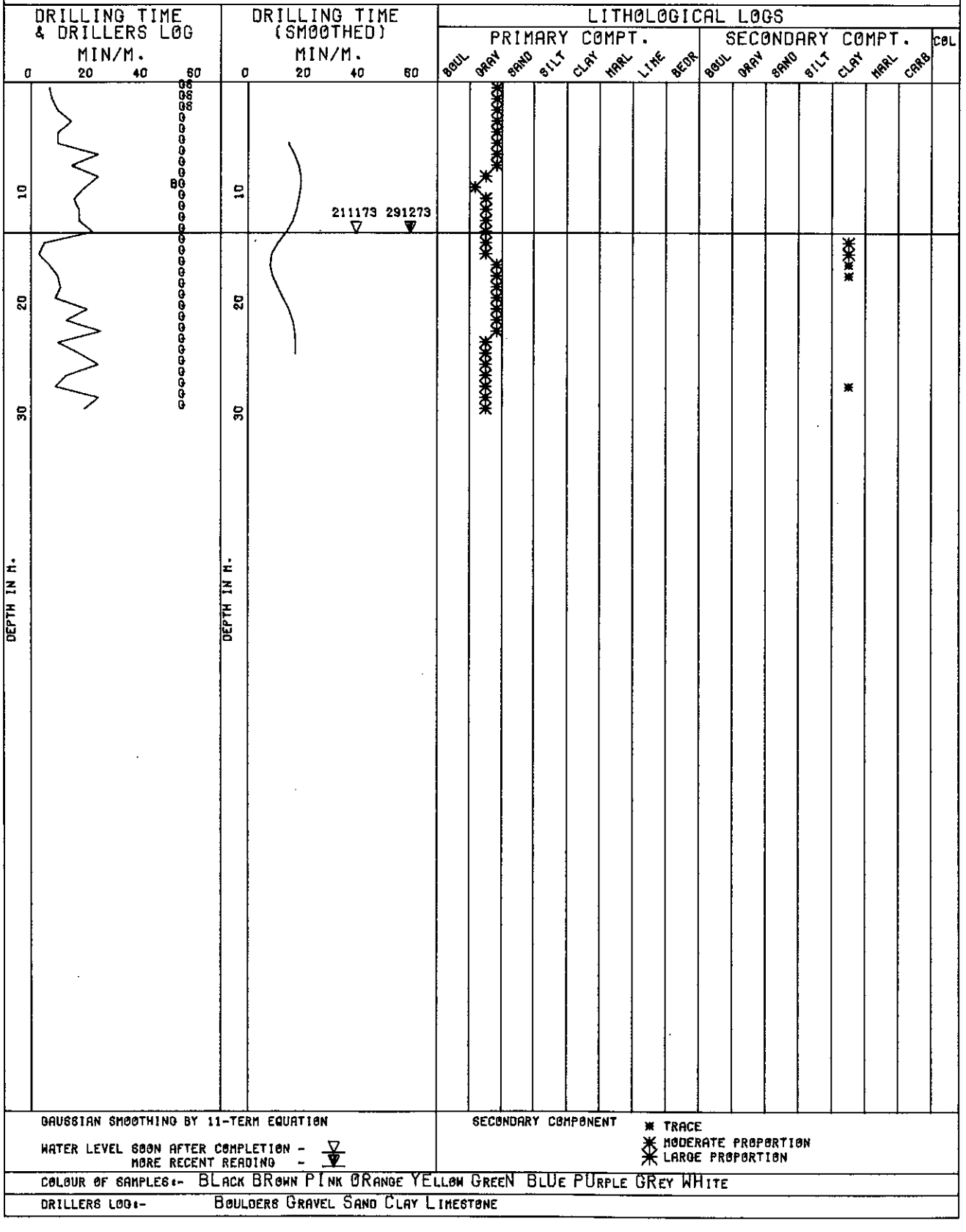
WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT65 GRID REF. O



WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT66 GRID REF. 60036190



GAUSSIAN SMOOTHING BY 11-TERM EQUATION

WATER LEVEL SOON AFTER COMPLETION - ▽
MORE RECENT READING - ▼

SECONDARY COMPONENT

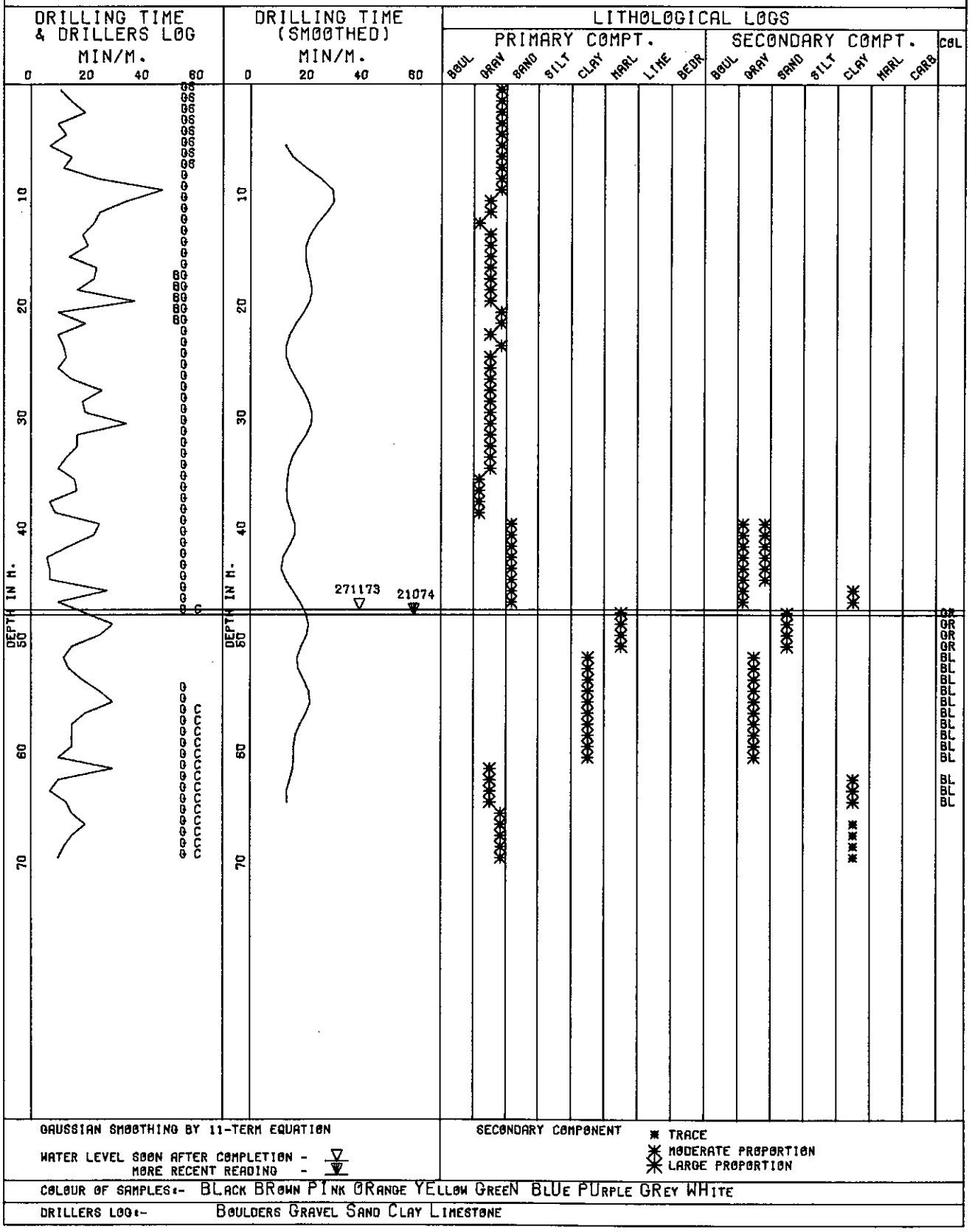
* TRACE
** MODERATE PROPORTION
*** LARGE PROPORTION

COLOUR OF SAMPLES:- BLACK BROWN PINK ORANGE YELLOW GREEN BLUE PURPLE GREY WHITE

DRILLERS LOG:- BOULDERS GRAVEL SAND CLAY LIMESTONE

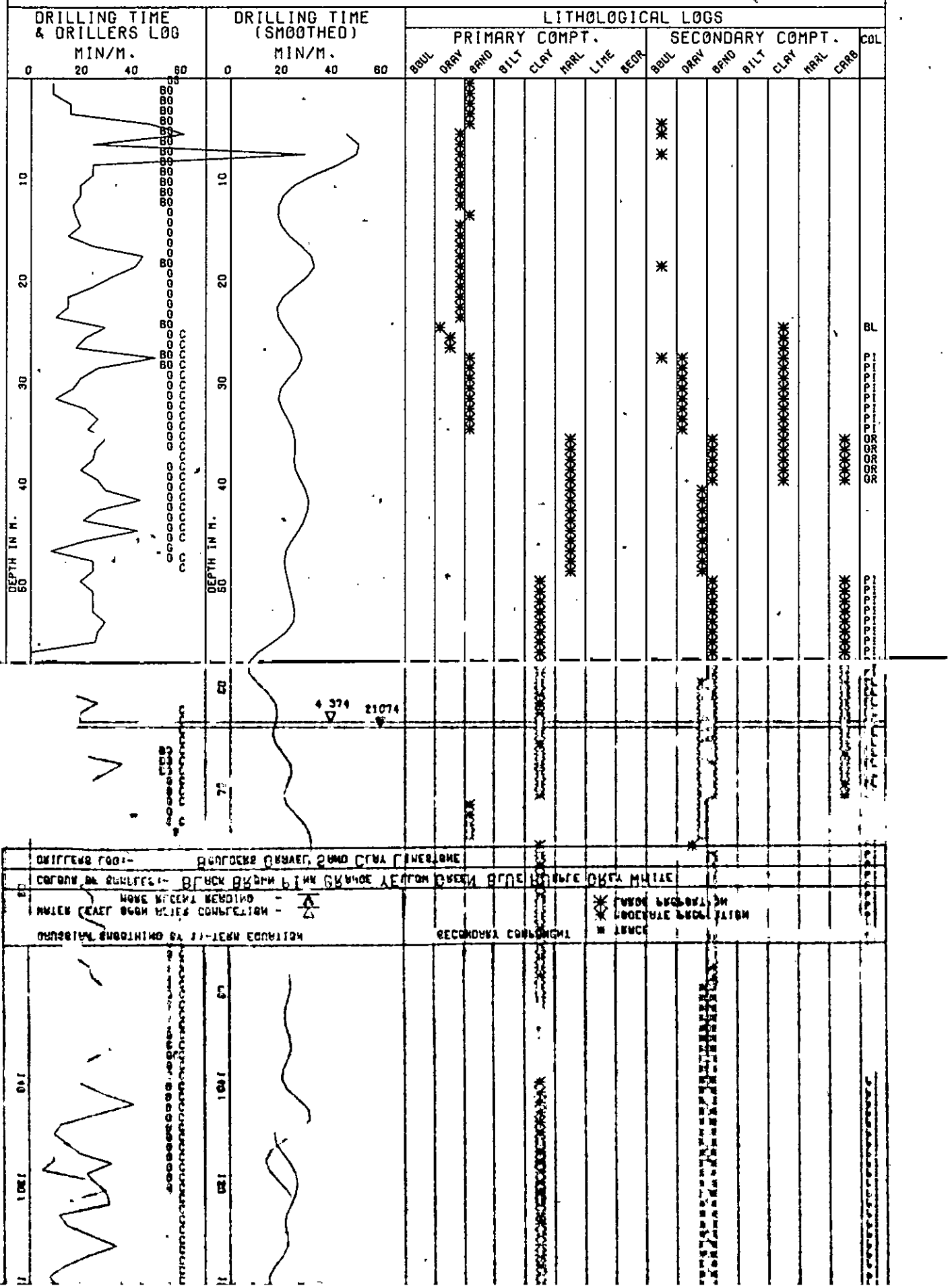
WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT67 GRID REF. 56886131



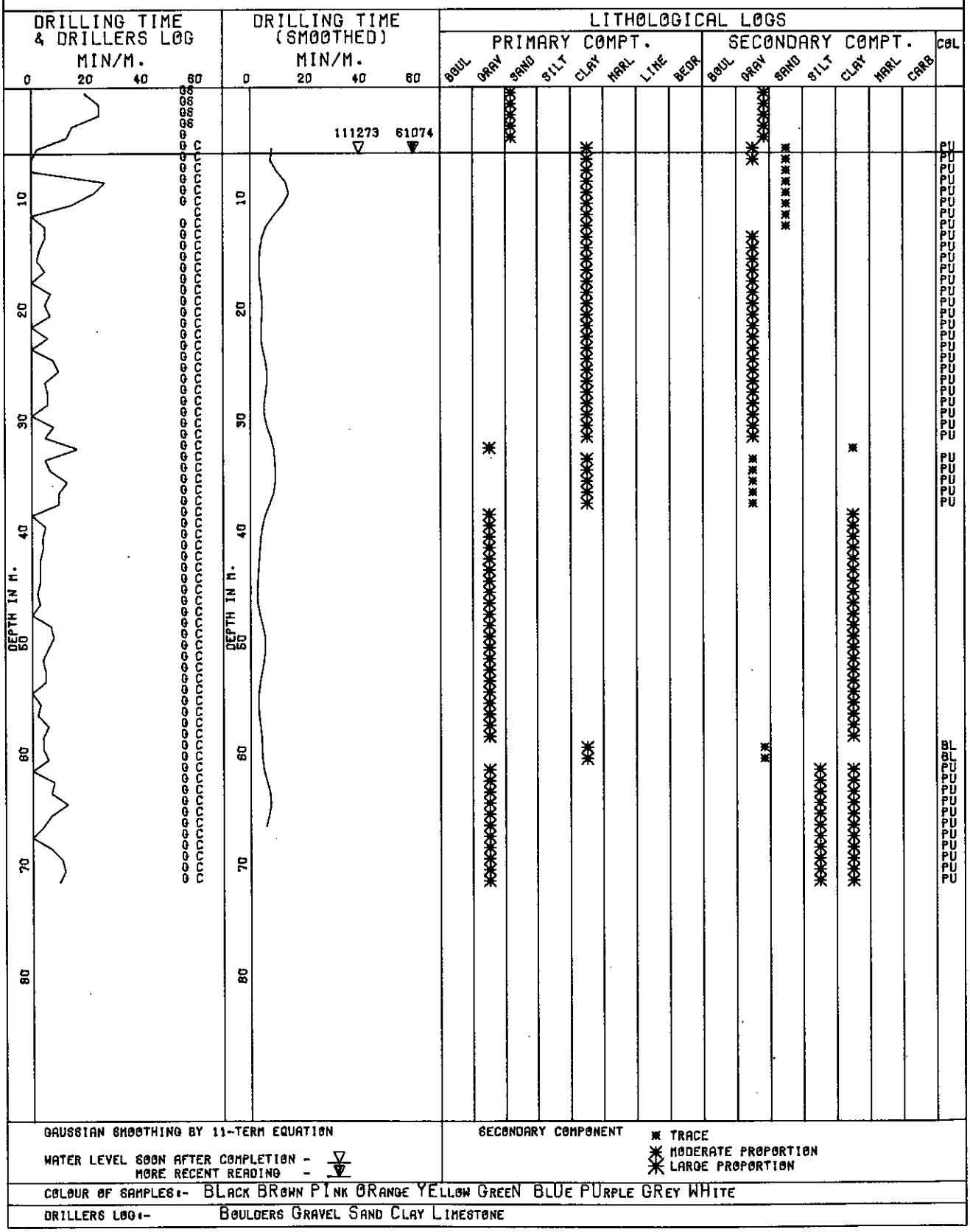
WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT68 GRID REF. 56956078



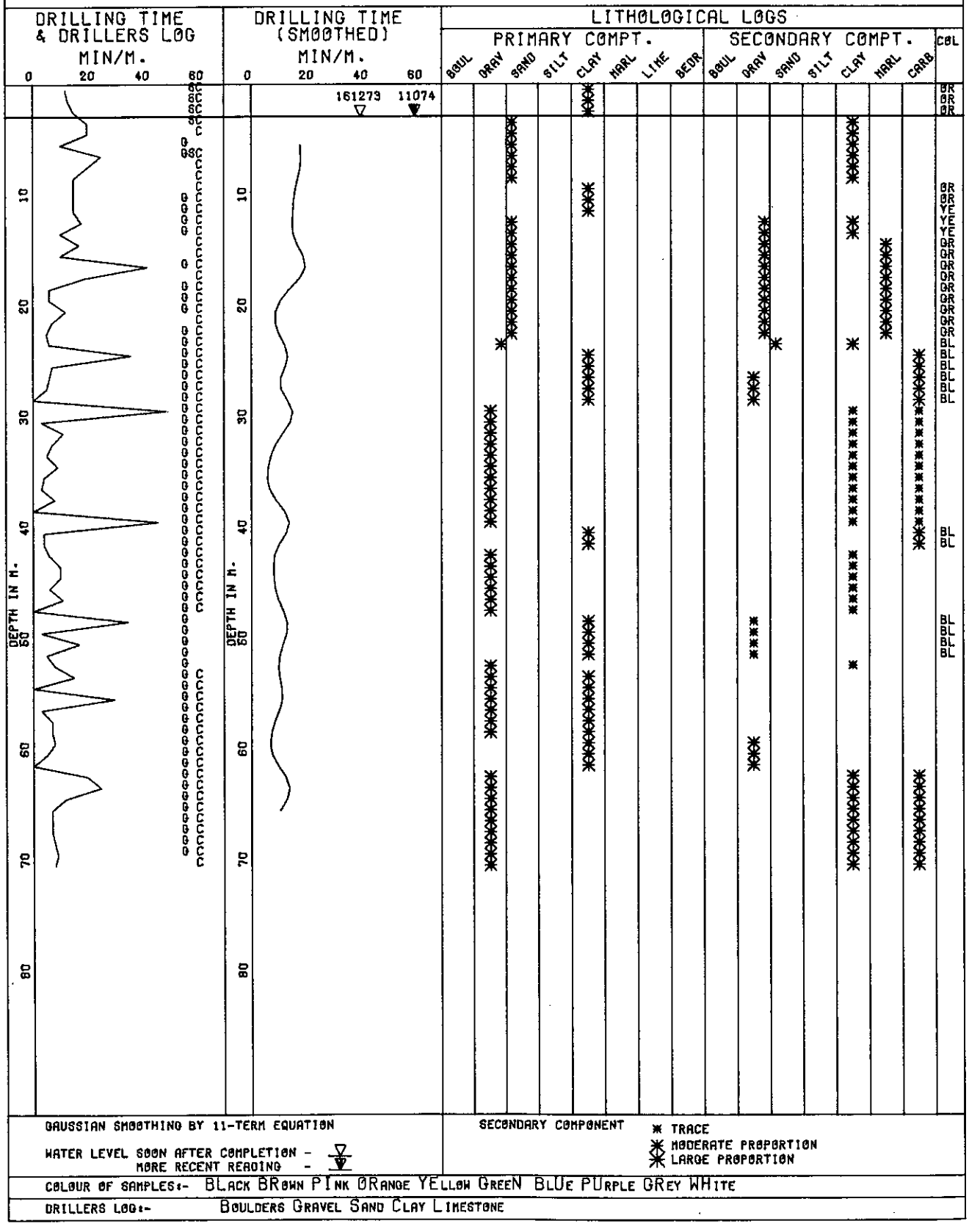
WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT69 GRID REF. 57266258



WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT70 GRID REF. 57986246



GAUSSIAN SMOOTHING BY 11-TERM EQUATION

WATER LEVEL SOON AFTER COMPLETION - ▽

MORE RECENT READING - ▼

SECONDARY COMPONENT

* TRACE

✳ MODERATE PROPORTION

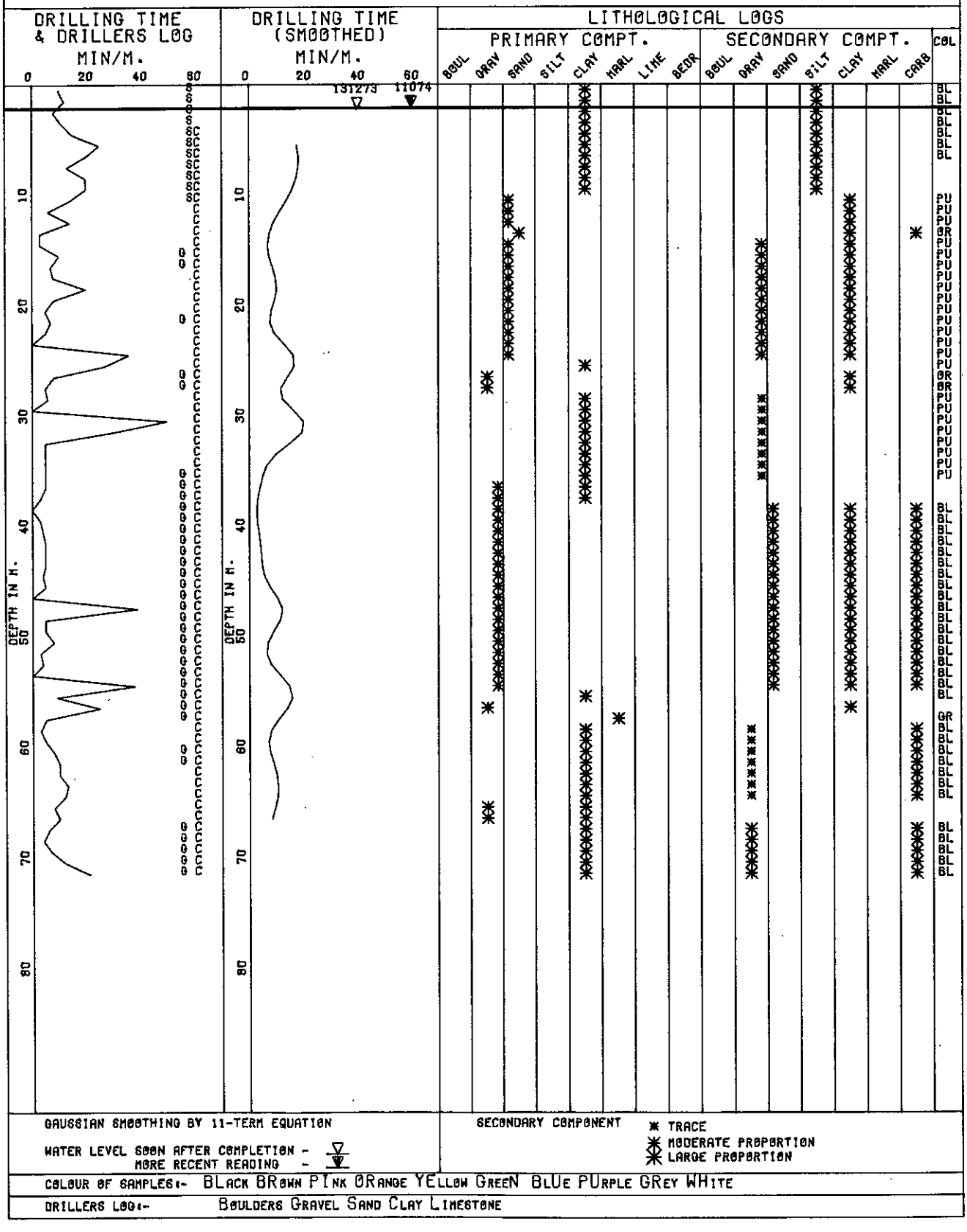
✳ LARGE PROPORTION

COLOUR OF SAMPLES:- BLACK BROWN PINK ORANGE YELLOW GREEN BLUE PURPLE GREY WHITE

DRILLERS LOG:- BOULDERS GRAVEL SAND CLAY LIMESTONE

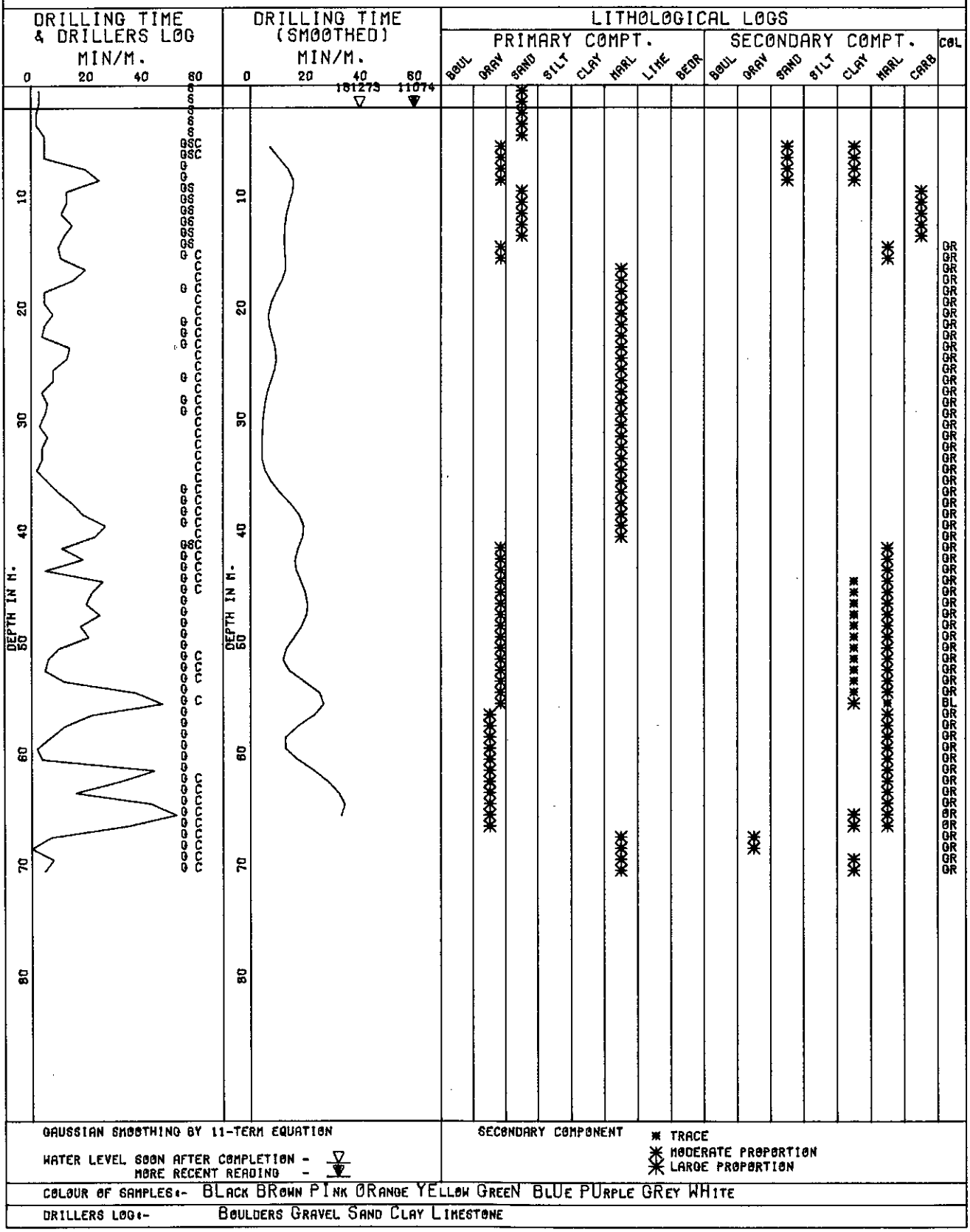
WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT71 GRID REF. 57856280



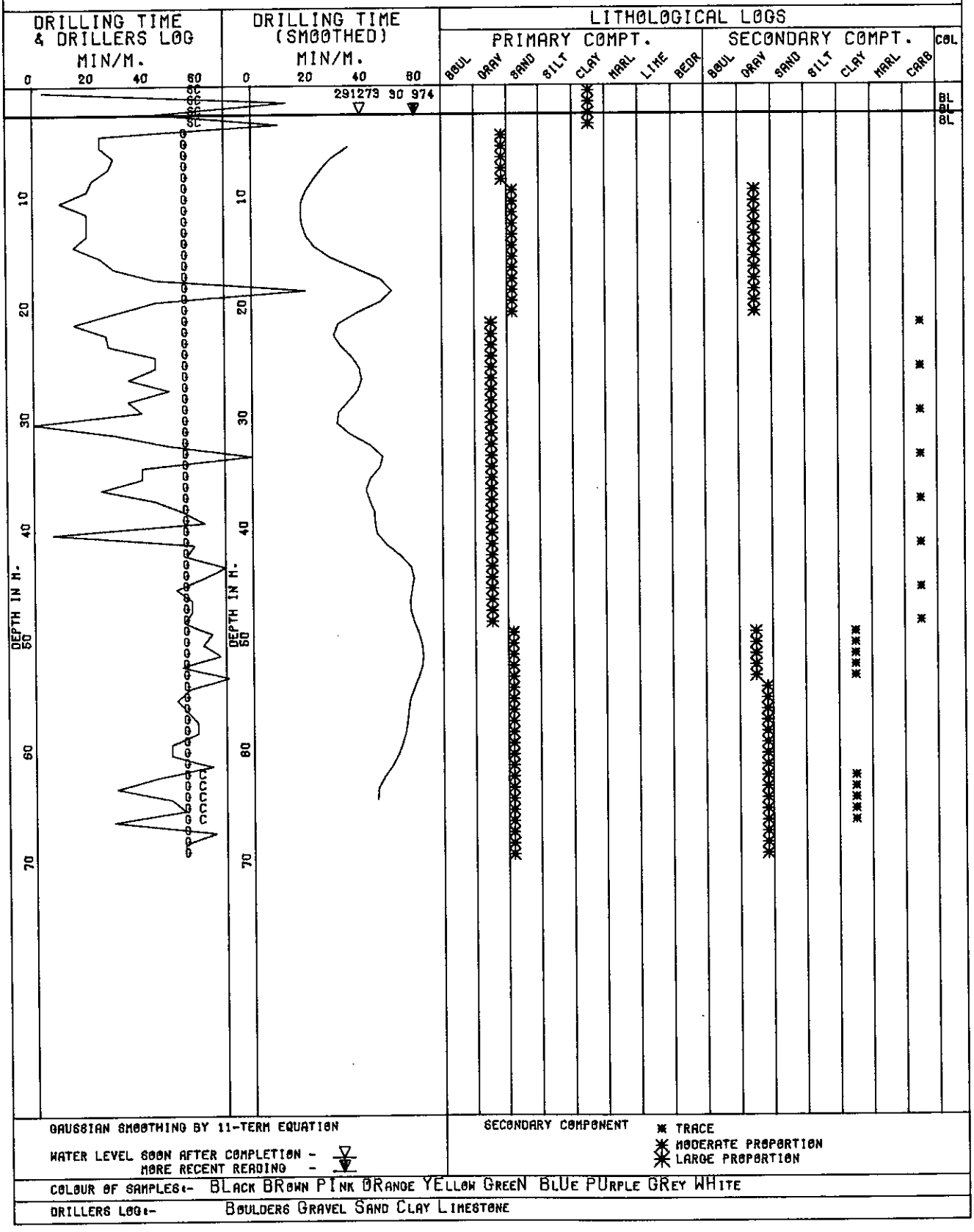
WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT72 GRID REF. 58736231



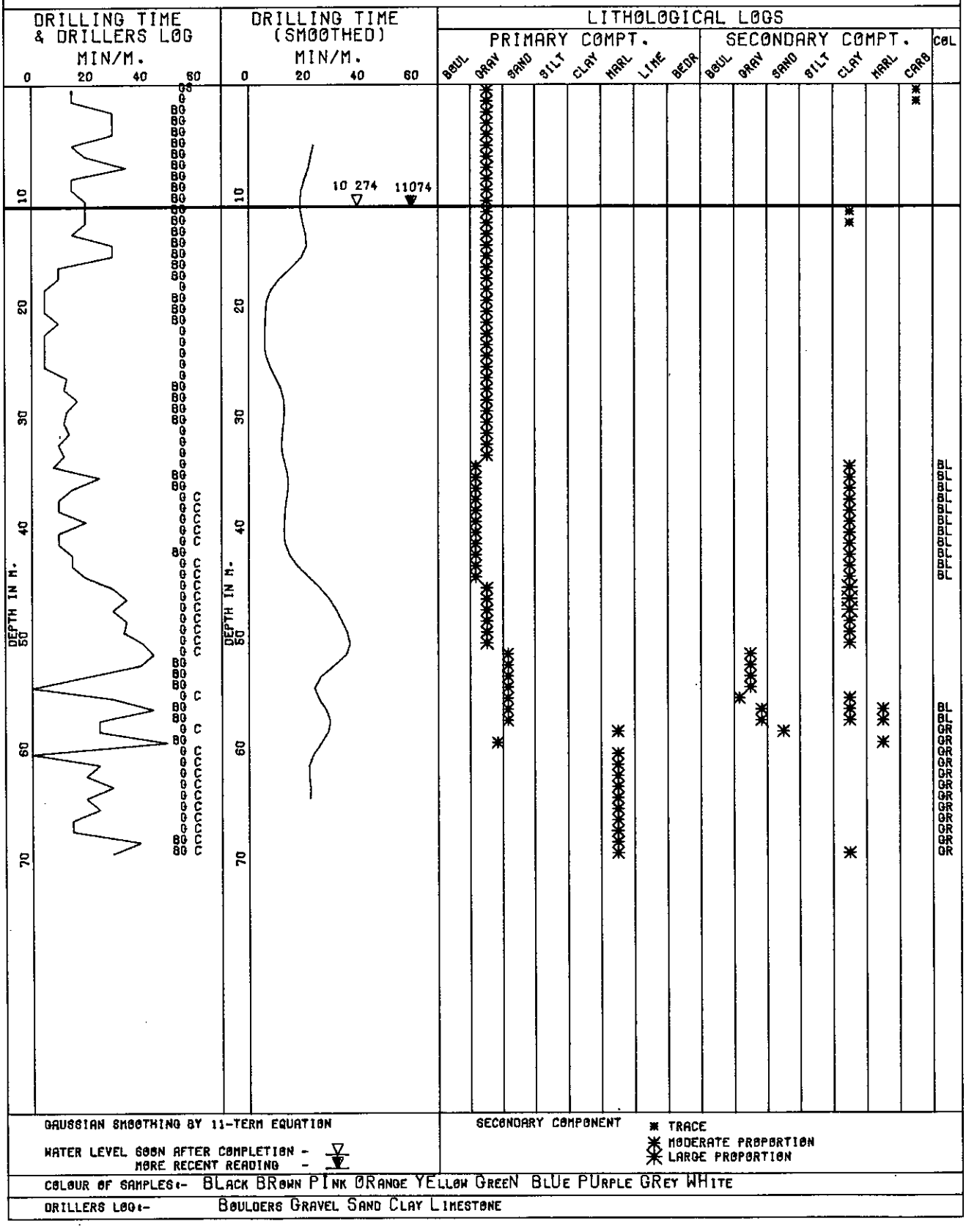
WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT73 GRID REF. 61406210



WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. JT74 GRID REF. 60286201

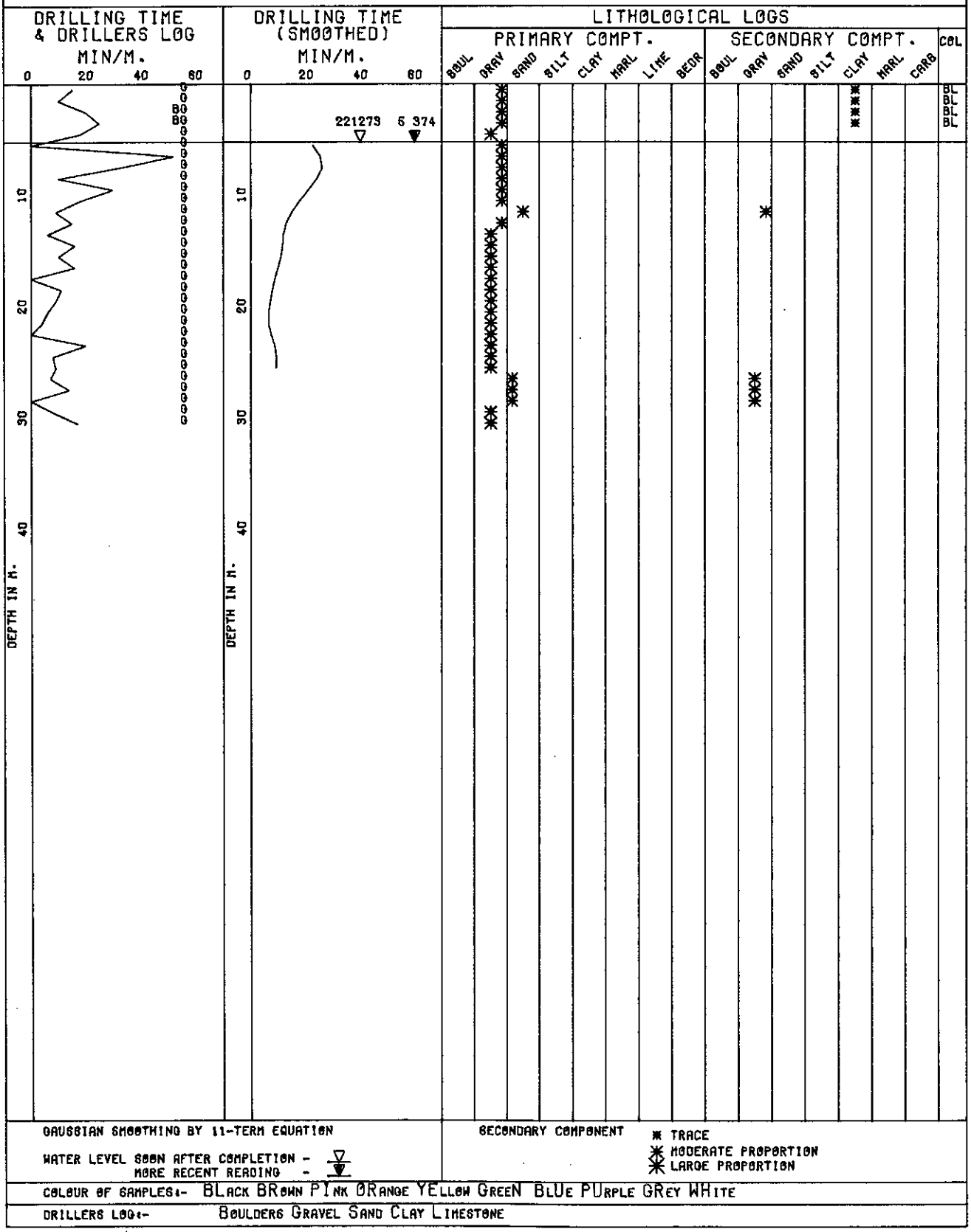


COLOUR OF SAMPLES:- BLACK BROWN PINK ORANGE YELLOW GREEN BLUE PURPLE GREY WHITE

DRILLERS LOG:- BOULDERS GRAVEL SAND CLAY LIMESTONE

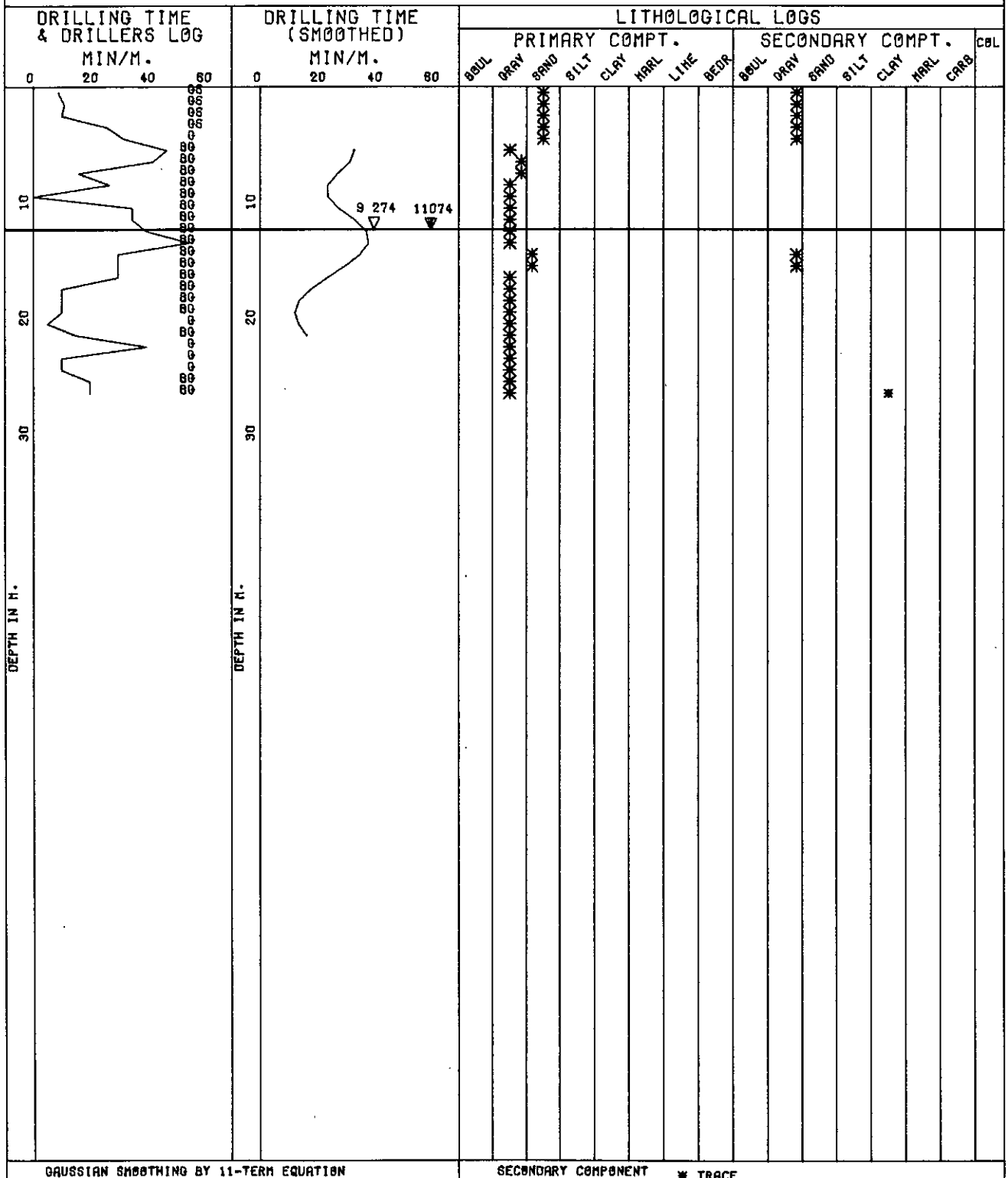
WATER RESOURCES SURVEY OF NORTHERN OMAN

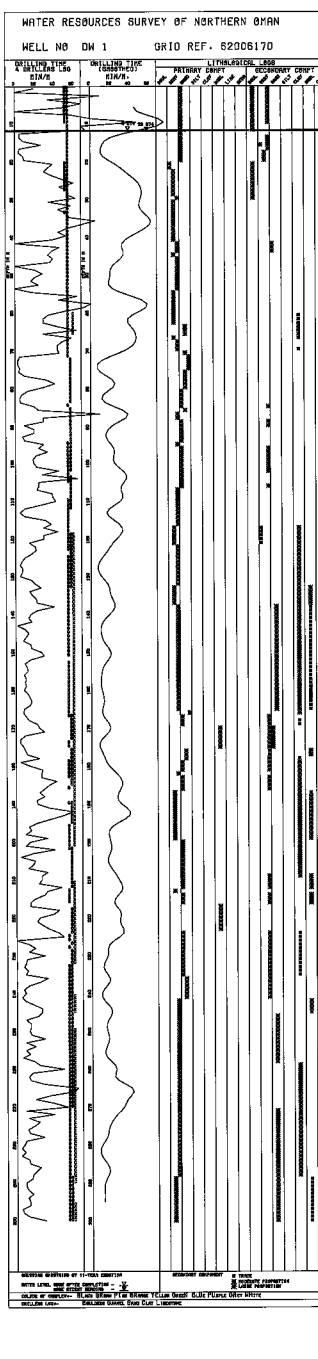
WELL NO. JT75 GRID REF. 62446150



WATER RESOURCES SURVEY OF NORTHERN OMAN

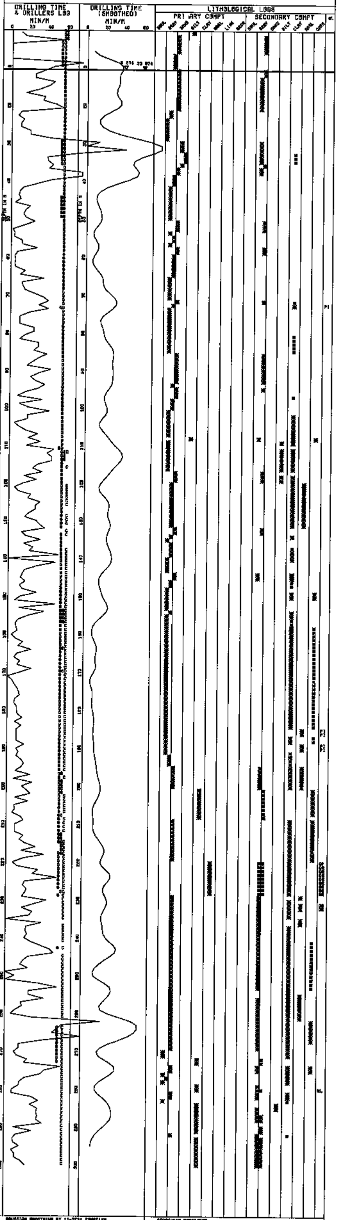
WELL NO. JT76 GRID REF. 60536196




WATER RESOURCES SURVEY OF NORTHERN OMAN
WELL NO DW 1
GRID REF. 62006170
DRILLING TIME & DRILLING LOG
MIN/6
DRILLING TIME (SMOOTHED)
MIN/6
LITHOLOGICAL LOGS
PRIMARY CARBT
SECONDARY CARBT
WATER LEVEL MEAS STATIC
WATER LEVEL MEAS PUMPING
COLOUR OF CUTTINGS
DRILLING LOG

WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO DW 2 GRID REF 61406180



GAUSSIAN SMOOTHING BY 11-TERM EQUATION

WATER LEVEL SOON AFTER COMPLETION –
MORE RECENT READING –

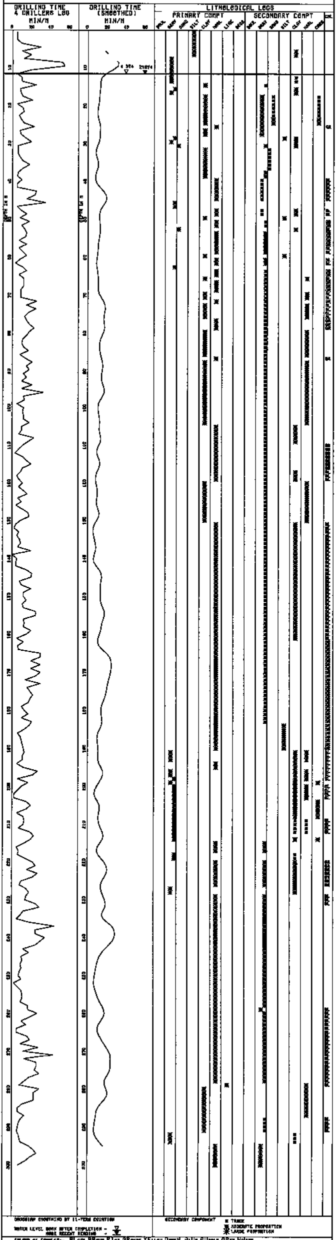
SECONDARY COMPONENT
TRACE
MODERATE PROPORTION
LARGE PROPORTION

COLOUR OF SAMPLES:– BLack BRown PInk ORange YEllow GReeN BLUe PUrple GRey WHite

DRILLERS LOG:– Boulders Gravel Sand Clay Limestone

WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO. DW 3 GRID REF 57306240



GAUSSIAN SMOOTHING BY 11-TERM EQUATION

WATER LEVEL SOON AFTER COMPLETION -
MORE RECENT READING -

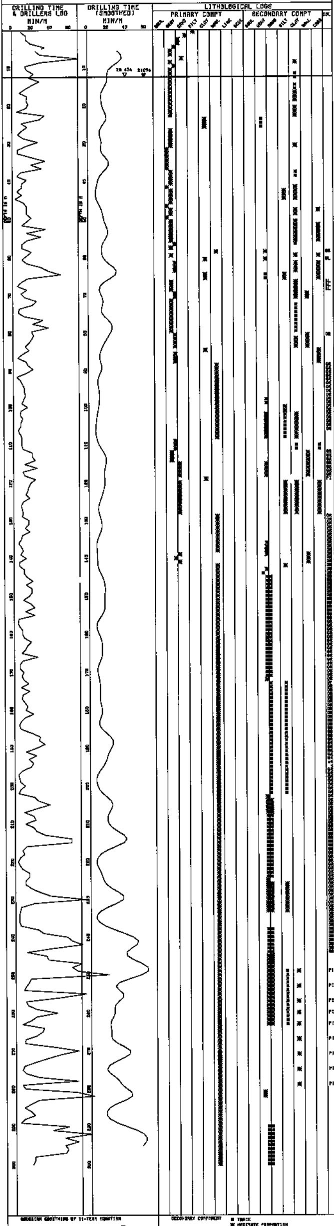
SECONDARY COMPONENT
TRACE
MODERATE PROPORTION
LARGE PROPORTION

COLOUR OF SAMPLES:- BLack BRown PInk ORange YEllow GreeN BlUe PUrple GRey WHite

DRILLERS LOG:- Boulders Gravel Sand Clay Limestone

WATER RESOURCES SURVEY OF NORTHERN OMAN

WELL NO OW 4 GRID REF 57826210



GAUSSIAN SMOOTHING BY 11-TERM EQUATION

WATER LEVEL SOON AFTER COMPLETION -
MORE RECENT READING -

SECONDARY COMPONENT ■ TRACE
✳ MODERATE PROPORTION
✳ LARGE PROPORTION

COLOUR OF SAMPLES: BLack BRown PInk BRonze YEllow GreeN BLUe PUrple GRey WHite

DRILLERS LOG:- Boulders Gravel Sand Clay Limestone