WELL CONSTRUCTION REPORT

ROYAL IRRIGATION DEPARTMENT

WELL NO. D13 (NEW)

SUKHOTHAI GROUNDWATER

A. SAWANKHALOK C. SUKHOTHAI

เรียน กรมชลประทาน
เพื่อทราบและพิจารณา
(ลงชื่อ) อนิรุธ สงวนสัตย์
นายอนิรุธ สงวนสัตย์
(นายอนิรุธ สงวนสัตย์)
ชคบ.น้ำใต้ดินสุโขทัย

ทราบ

ลงชื่อ.....ประธานกรรมการ
ลงชื่อ.....กรรมการ
ลงชื่อ.....กรรมการ

CONTRACTOR : WELL FLOW CO., LTD.

Tel. 0-2519-0637

MARCH , 2002

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IN POCKET

DRILLED LOG , GEOPHYSIC LOG AND WELL CONSTRUCTION DESIGN

RECORDS OF WELL

WELL NO. D13 (NEW)

LOCATION : SUKHOTHAI GROUNDWATER A. SAWANKHALOK C. SUKHOTHAI

OWNER : ROYAL IRRIGATION DEPARTMENT

CONTRACTOR : WELL FLOW CO., LTD.

DRILLING AND CONSTRUCTION : WELL FLOW CO., LTD.

DETAILS ON DRILLING AND CONSTRUCTION

[1] Date drilling started : 23/02/2002 Drilling ended : 12/03/2002

Completed : 25/03/2002

[2] Drilling rig : Reverse circulation rotary

[3] Hole diameter : 22 inch. from 0 m. to 132 m. depth

[4] Depth drilling : 132 m. Depth cased and screened : 111.50 m.

[5] Geophysical well logging : 13/03/2002

- Resistivity Log (8"/16"/32"/64" normal resistivity log)
- Resistivity Log (single point resistivity log)
- Self Potential Log
- Gamma Ray Log

[6] Date cased and screen : 16/03/2002

[7] Casing type and diameter : ASTM-A53

14 inch. from 0 m. to 44 m. depth

10 inch. from 59 m. to 77 m. depth

10 inch. from 83 m. to 89 m. depth

10 inch. from 110 m. to 111.50 m. depth (Tail pipe)

[8] Screen type and diameter : STAINLESS STEEL

10 inch. (NO.80) from 44 m. to 59 m. depth

10 inch. (NO.80) from 77 m. to 80 m. depth

10 inch. (NO.60) from 80 m. to 83 m. depth

10 inch. (NO.60) from 89 m. to 110 m. depth

[9] Gravel packed : from 12 m. to 132 m. Depth : 16/03/2002

[10] Well verticality test : 16/03/2002

[11] Well development

- Developed by airlift pumping and surging

Date started : 17/03/2002 Date completed : 18/03/2001

- Developed by vertical turbine pump

Date started : 19/03/2002 Date completed : 19/03/2002

[12] Pumping test data

- Step drawdown test and recovery test (4 steps)

Date started : 20/03/2002 hr. 14.00 Date completed : 23/03/2002 hr. 14.00

Static water level (SWL) : 12.68 m.

Step 1. Q = 115 m^3/hrs. drawdown = 10.17 m. (9 hrs.)

Step 2. Q = 160 m^3/hrs. drawdown = 13.08 m. (9 hrs.)

Step 3. Q = 195 m^3/hrs. drawdown = 25.32 m. (9 hrs.)

Step 4. Q = 222 m^3/hrs. drawdown = 28.10 m. (9 hrs.)

- Constant rate test and recovery test

Date started : 23/03/2002 hr. 14.00 Date completed : 25/03/2002 hr. 14.00

Static water level (SWL) : 12.68 m. Flow rate : 206 m^3/hr.

Drawdown : 30.96 m. (24 hrs.)

[13] Cement grouting : from 0 m. to 12 m. Depth : 25/03/2002

[14] Transmissivity (T) = 258.67 m^2/day

Hydraulic conductivity (K) = 6.16 m/day

Well efficiency : page 43

DRILLING AND LITHOLOGIC LOG

WELL NO. D13 (NEW) : ROYAL IRRIGATION DEPARTMENT

LOCATION : SUKHOTHAI GROUNDWATER A. SAWANKHALOK C. SUKHOTHAI

DRILLING METHOD : REVERSE CIRCULATION ROTARY ; DRILLING MUD : WATER AND BENTONITE

TOTAL DEPTH : 132 m. CONSTRUCTION DEPTH : 111.50 m.

STATIC WATER LEVEL : 12.68 m. SWL MEASURE : 21/03/2002

DRILLING STARTED : 23/02/2002 COMPLETED : 25/03/2002

CASING TYPE AND DIAMETER : ASTM-A53

14 inch. from 0 m. to 44 m.

10 inch. from 59 m. to 77 m.

10 inch. from 83 m. to 89 m.

10 inch. from 110 m. to 111.50 m. (Tail pipe)

SCREEN TYPE AND DIAMETER : STAINLESS STEEL

10 inch. (NO.80) from 44-50 , 50-56 , 56-59 , 77-80 m.

10 inch. (NO.60) from 80-83 , 89-95 , 95-101 , 101-104 , 104-107 , 107-110 m.

DRILLING BY : WELL FLOW CO., LTD.

PENETRATION RATE AND DRILLING DETAILS (0 50 100 150 [min.])	DEPTH (m.)	DRILLED LOG	LITHOLOGY DESCRIPTION COMMENTS
	5		CLAY : yellowish brown
	10		
	15		
	20		SAND/GRAVEL : brown, very coarse sand to gravel, subangular to subrounded
	25		
			CLAY : dark brown
	30		SAND : brown, coarse to very coarse grained, subangular to subrounded

PENETRATION RATE AND DRILLING DETAILS 0 50 100 150 [min.]	DEPTH (m.)	DRILLED LOG	LITHOLOGY DESCRIPTION COMMENTS
	35		SAND : brown, coarse to very coarse grained, subangular to subrounded
	40		
			GRAVEL/SANDY CLAY : brown, subangular to subrounded
			SAND : brown, very coarse grained, subangular to subrounded
	45		
	50		SANDY CLAY/COBBLE : yellowish brown, subangular to subrounded
	55		PEBBLE : yellowish brown, subangular to subrounded
	60		CLAY : yellowish brown
	65		CLAY : dark greynish brown
	70		
	75		

PENETRATION RATE AND DRILLING DETAILS 0 50 100 150 [min.]	DEPTH (m.)	DRILLED LOG	LITHOLOGY DESCRIPTION COMMENTS
			CLAY : dark greynish brown
	80		GRAVEL : brown, subangular to subrounded
	85		SAND/GRAVEL : light greynish brown, very coarse sand to gravel, subangular to subrounded
	90		CLAY : greynish brown
	95		GRAVEL : greynish brown, subangular to subrounded
	100		SAND/GRAVEL : greynish brown, very coarse sand to gravel, subangular to subrounded
	105		PEBBLE : greynish brown, subangular to subrounded
	110		SANDY CLAY/GRAVEL : yellowish brown, subangular to subrounded
	115		PEBBLE : medium to dark grey
	120		SAND/GRAVEL : greynish brown, very coarse sand to gravel, subangular to subrounded
			CLAY : greynish brown

PENETRATION RATE AND DRILLING DETAILS 0 50 100 150 [min.]	DEPTH (m.)	DRILLED LOG	LITHOLOGY DESCRIPTION COMMENTS
			CLAY : greynish brown
	125		SAND/GRAVEL : greynish brown, coarse sand to gravel, subangular to subrounded
	130		SANDY CLAY/GRAVEL : greynish brown, subangular to subrounded
	132		

DRILLED LOG OF WELL

ROYAL IRRIGATION DEPARTMENT : WELL NO. D13 (NEW)

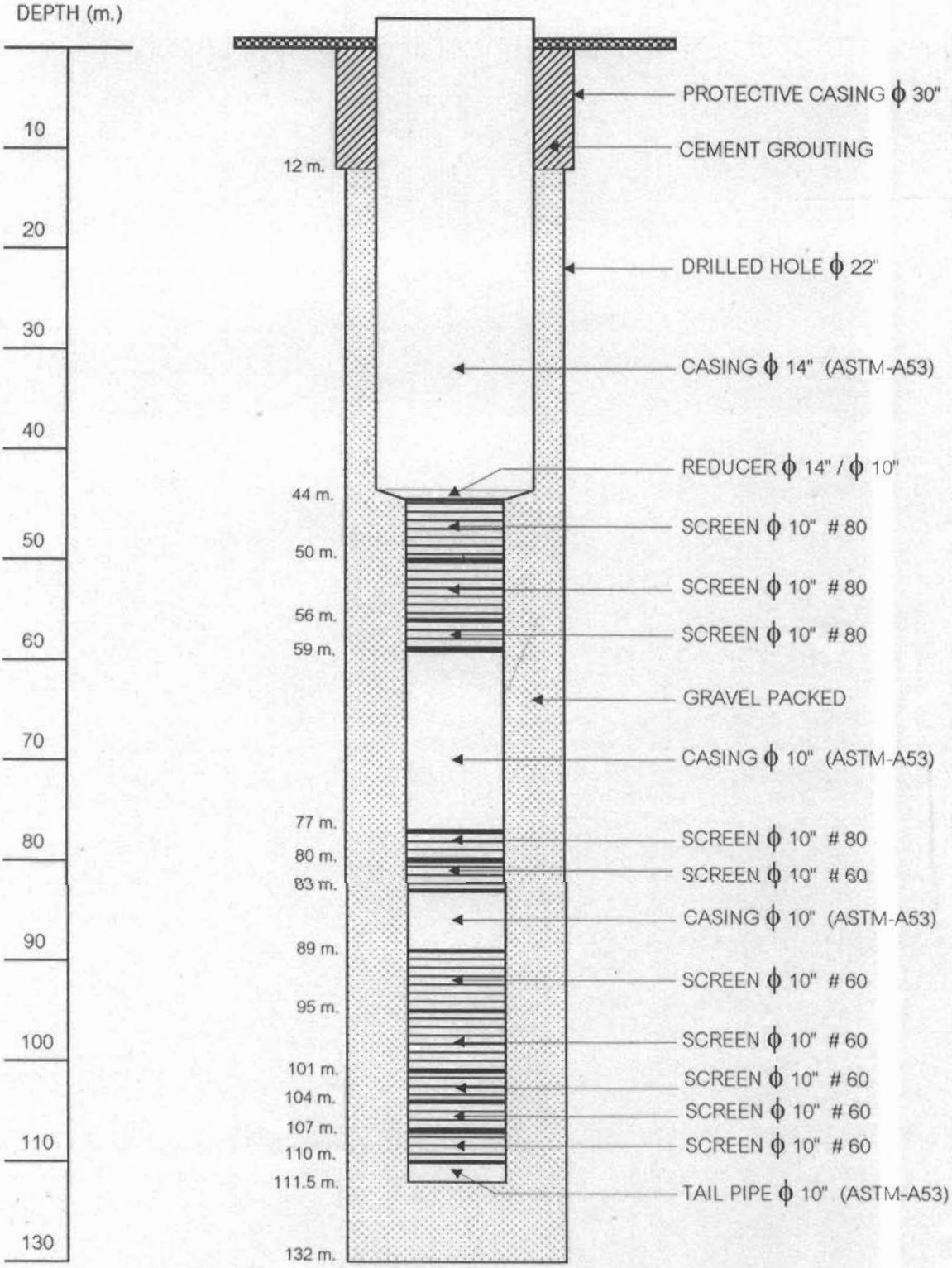
SUKHOTHAI GROUNDWATER A.SAWANKHALOK C.SUKHOTHAI

DEPTH (m.)		THICKNESS	LITHOLOGY
FROM	TO	(m.)	
0	15	15	CLAY : yellowish brown
15	25	10	SAND/GRAVEL : brown, very coarse sand to gravel, subangular to subrounded
25	27	2	CLAY : dark brown
27	40	13	SAND : brown, coarse to very coarse grained, subangular to subrounded
40	42	2	GRAVEL/SANDY CLAY : brown, subangular to subrounded
42	44	2	SAND : brown, very coarse grained, subangular to subrounded
44	53	9	SANDY CLAY/COBBLE : yellowish brown, subangular to subrounded
53	58	5	PEBBLE : yellowish brown, subangular to subrounded
58	61	3	CLAY : yellowish brown
61	77	16	CLAY : dark greynish brown
77	83	6	GRAVEL : brown, subangular to subrounded
83	85	2	SAND/GRAVEL : light greynish brown, very coarse sand to gravel, subangular to subrounded
85	89	4	CLAY : greynish brown
89	93	4	GRAVEL : greynish brown, subangular to subrounded
93	96	3	SAND/GRAVEL : greynish brown, very coarse sand to gravel, subangular to subrounded
96	100	4	PEBBLE : greynish brown, subangular to subrounded
100	105	5	SANDY CLAY/GRAVEL : yellowish brown, subangular to subrounded
105	111	6	PEBBLE : medium to dark grey
111	113	2	SAND/GRAVEL : greynish brown, very coarse sand to gravel, subangular to subrounded
113	121	8	CLAY : greynish brown
121	125	4	SAND/GRAVEL : greynish brown, coarse sand to gravel, subangular to subrounded
125	132	7	SANDY CLAY/GRAVEL : greynish brown, subangular to subrounded

WELL CONSTRUCTION DIAGRAM

ROYAL IRRIGATION DEPARTMENT : WELL NO. D13 (NEW)

SUKHOTHAI GROUNGWATER A.SAWANKHALOK C.SUKHOTHAI



VERTICALITY TEST DATA

ROYAL IRRIGATION DEPARTMENTS : WELL NO. D13 (NEW)

SUKHOTHAI GROUNDWATER A. SAWANKHALOK C. SUKHOTHAI

DEPTH (X) (m.)	x (mm.)	y (mm.)	d (mm.)	DEFLECTION (D) (mm.)
0	0	0	0.00	0.00
2	0	1	1.00	1.67
4	1	1	1.41	3.30
6	2	1	2.24	6.71
8	2	2	2.83	10.37
10	2	4	4.47	19.38
12	3	4	5.00	25.00
14	4	3	5.00	28.33
16	4	4	5.66	35.83
18	2	4	4.47	31.30
20	3	3	4.24	32.53
22	4	3	5.00	41.67
24	4	4	5.66	50.91
26	5	3	5.83	56.37
28	5	4	6.40	66.17
30	4	3	5.00	55.00
32	5	4	6.40	74.70
34	4	5	6.40	78.97
36	5	5	7.07	91.92
38	4	4	5.66	77.31
40	5	4	6.40	91.78
42	4	6	7.21	108.17
44	4	4	5.66	88.62

REMARKS

SUSPENSION HEIGHT (K) = 3.00 m.

$d = \sqrt{x^2 = y^2}$

DEFLECTION (D) = $\frac{(K + X)\ d}{K}$

DUMMY PIPE = 300 mm. IN DIAMETER

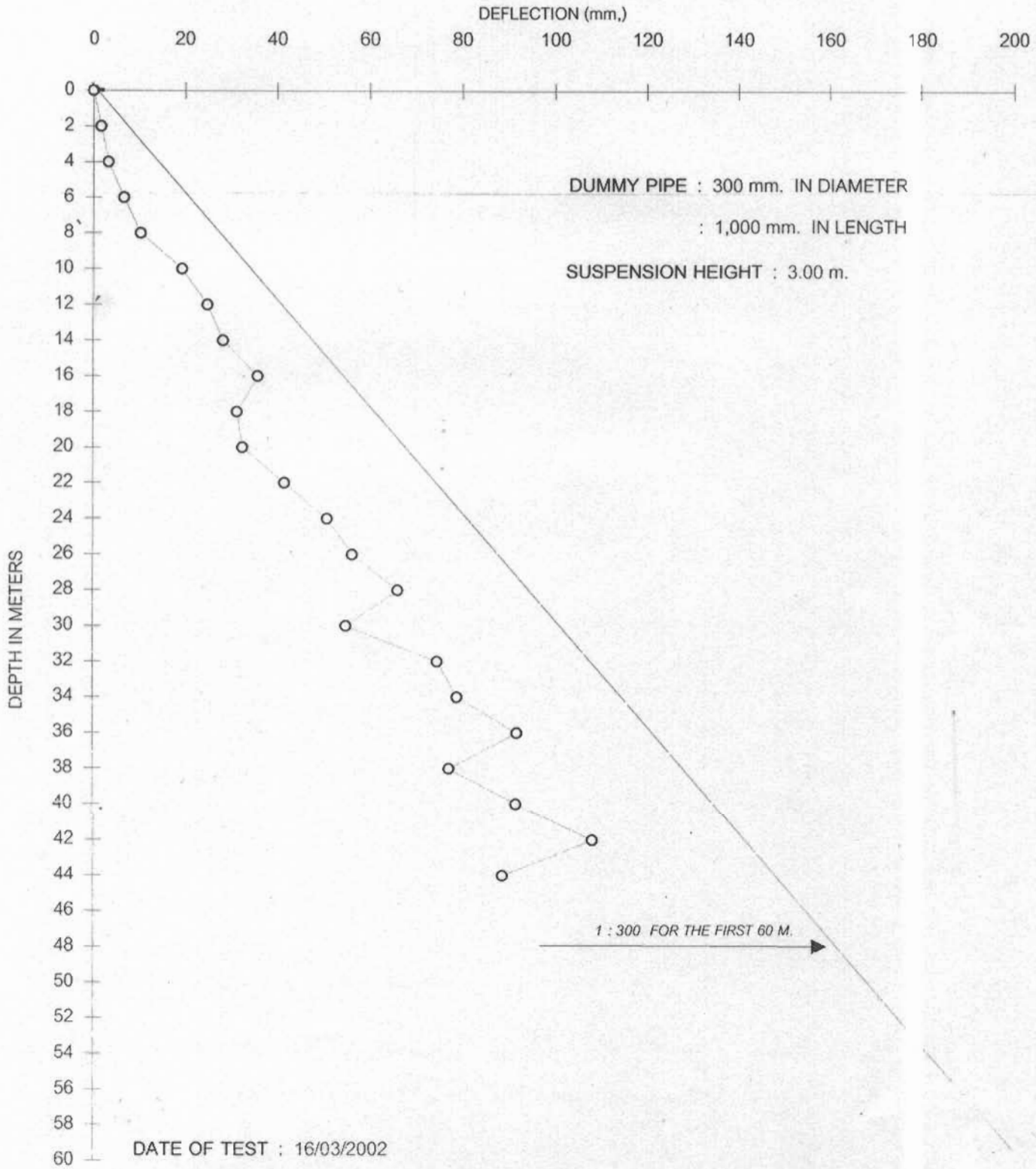
= 1,000 mm. IN LENGTH

DATE OF TEST : 16/03/2002

DATA PLOT : VERTICALITY TEST

ROYAL IRRIGATION DEPARTMENT : WELL NO. D13 (NEW)

SUKHOTHAI GROUNDWATER A. SAWANKHALOK C. SUKHOTHAI



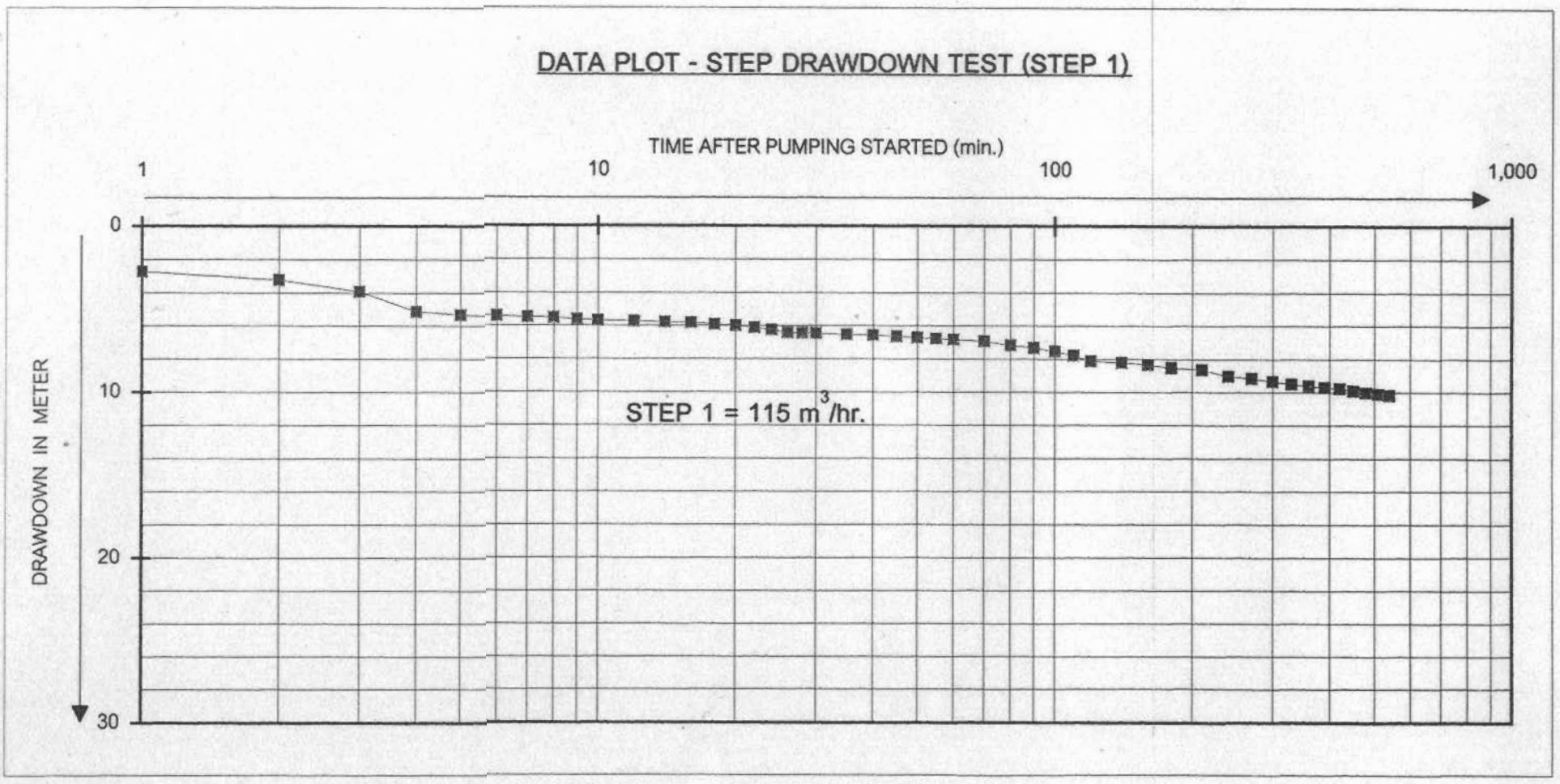
DATE OF TEST : 16/03/2002

PUMPING TEST DATA (STEP 1)

TEST WELL : **WELL NO. D13 (NEW)** : ROYAL IRRIGATION DEPARTMENT
LOCATION : SUKHOTHAI GROUNDWATER A. SAWANKHALOK C. SUKHOTHAI
DEPTH OF CONSTRUCTION : 111.50 m. ; AQUIFERS : SAND AND GRAVEL
TYPE OF TEST : STEP DRAWDOWN TEST (STEP 1)
PUMP EMPLOYED : VERTICAL TURBINE PUMP ; PUMP SETTED : 44 m.
PUMPING STARTED : DATE 20/03/2002 hr. 14.00 ; PUMPING STOPPED : DATE 20/03/2002 hr. 23.00
DURATION OF PUMPING TEST (t) : 540 min.
REMARKS : ϕ 6" Orifice / ϕ 8" Pipe

DATE	TIME (hr&min)	ELAPSED TIME (min)	DEPTH TO WATER (m.)	MEASURED DRAWDOWN (m.)	PUMPING RATE (m^3/hr)	ORIFICE HEAD (inch.)	REMARKS
20/03/2002	14.00	0	12.68	0.00	115	10"	STEP 1 = 115 m^3/hr.
	14.01	1	15.40	2.72	"	"	
	14.02	2	15.90	3.22	"	"	
	14.03	3	16.60	3.92	"	"	
	14.04	4	17.80	5.12	"	"	
	14.05	5	18.00	5.32	"	"	
	14.06	6	18.09	5.41	"	"	
	14.07	7	18.15	5.47	"	"	
	14.08	8	18.20	5.52	"	"	
	14.09	9	18.30	5.62	"	"	
	14.10	10	18.38	5.70	"	"	
	14.12	12	18.40	5.72	"	"	
	14.14	14	18.47	5.79	"	"	
	14.16	16	18.50	5.82	"	"	
	14.18	18	18.59	5.91	"	"	
	14.20	20	18.67	5.99	"	"	
	14.22	22	18.80	6.12	"	"	
	14.24	24	18.92	6.24	"	"	
	14.26	26	19.10	6.42	"	"	
	14.28	28	19.12	6.44	"	"	
	14.30	30	19.15	6.47	"	"	
	14.35	35	19.20	6.52	"	"	
	14.40	40	19.25	6.57	"	"	
	14.45	45	19.31	6.63	"	"	
	14.50	50	19.39	6.71	"	"	
	14.55	55	19.45	6.77	"	"	
	15.00	60	19.51	6.83	"	"	
	15.10	70	19.62	6.94	"	"	
	15.20	80	19.85	7.17	"	"	
	15.30	90	20.00	7.32	"	"	
	15.40	100	20.21	7.53	"	"	
	15.50	110	20.46	7.78	"	"	
	16.00	120	20.79	8.11	"	"	
	16.20	140	20.88	8.20	"	"	
	16.40	160	21.00	8.32	"	"	
	17.00	180	21.19	8.51	"	"	

DATE	TIME (hr&min)	ELAPSED TIME (min)	DEPTH TO WATER (m.)	MEASURED DRAWDOWN (m.)	PUMPING RATE (m^3/hr)	ORIFICE HEAD (Inch.)	REMARKS
20/03/2002	17.30	210	21.31	8.63	115	10"	
	18.00	240	21.70	9.02	"	"	
	18.30	270	21.82	9.14	"	"	
	19.00	300	22.00	9.32	"	"	
	19.30	330	22.18	9.50	"	"	
	20.00	360	22.27	9.59	"	"	
	20.30	390	22.36	9.68	"	"	
	21.00	420	22.45	9.77	"	"	
	21.30	450	22.59	9.91	"	"	
	22.00	480	22.70	10.02	"	"	
	22.30	510	22.78	10.10	"	"	
	23.00	540	22.85	10.17	"	"	


DATA PLOT - STEP DRAWDOWN TEST (STEP 1)
TIME AFTER PUMPING STARTED (min.)
1
10
100
1,000
0
10
20
30
DRAWDOWN IN METER
STEP 1 = 115 m3/hr.

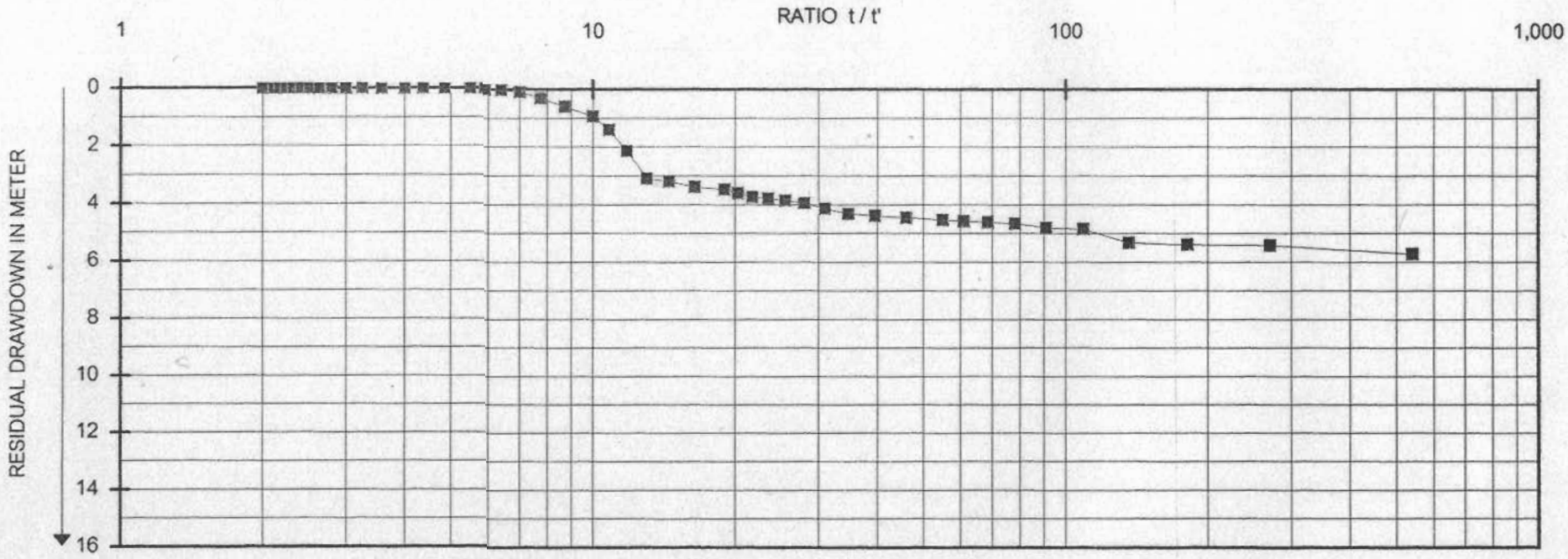
RECOVERY TEST DATA (STEP 1)

TEST WELL : **WELL NO. D13 (NEW)** : ROYAL IRRIGATION DEPARTMENT
LOCATION : SUKHOTHAI GROUNDWATER A. SAWANKHALOK C. SUKHOTHAI
DEPTH OF CONSTRUCTION : 111.50 m. ; AQUIFERS : SAND AND GRAVEL
STATIC WATER LEVEL (SWL.) : 12.68 m.
PUMPING STARTED : DATE 20/03/2002 hr. 14.00 ; PUMPING STOPPED : DATE 20/03/2002 hr. 23.00
DURATION OF PUMPING TEST (t) : 540 min. ; AVERAGE DISCHARGE RATE : 115 m^3/hr
DURATION OF RECOVERY TEST : 540 min.

DATE	TIME (hr&min)	TIME SINCE PUMPING		RATIO t / t'	DEPTH TO WATER (m.)	RESIDUAL DRAWDOWN (m.)	CALCULATED RECOVERY (m.)	REMARKS
		STOPPED t' (min)	STARTED t = t + t' (min)					
20/03/2002	23.00	0	540	-	22.85	10.17	0.00	
	23.01	1	541	541.00	18.40	5.72	4.45	
	23.02	2	542	271.00	18.10	5.42	4.75	
	23.03	3	543	181.00	18.07	5.39	4.78	
	23.04	4	544	136.00	18.00	5.32	4.85	
	23.05	5	545	109.00	17.53	4.85	5.32	
	23.06	6	546	91.00	17.49	4.81	5.36	
	23.07	7	547	78.14	17.34	4.66	5.51	
	23.08	8	548	68.50	17.29	4.61	5.56	
	23.09	9	549	61.00	17.25	4.57	5.60	
	23.10	10	550	55.00	17.21	4.53	5.64	
	23.12	12	552	46.00	17.13	4.45	5.72	
	23.14	14	554	39.57	17.07	4.39	5.78	
	23.16	16	556	34.75	17.00	4.32	5.85	
	23.18	18	558	31.00	16.81	4.13	6.04	
	23.20	20	560	28.00	16.63	3.95	6.22	
	23.22	22	562	25.55	16.53	3.85	6.32	
	23.24	24	564	23.50	16.46	3.78	6.39	
	23.26	26	566	21.77	16.41	3.73	6.44	
	23.28	28	568	20.29	16.28	3.60	6.57	
	23.30	30	570	19.00	16.15	3.47	6.70	
	23.35	35	575	16.43	16.06	3.38	6.79	
	23.40	40	580	14.50	15.87	3.19	6.98	
	23.45	45	585	13.00	15.77	3.09	7.08	
	23.50	50	590	11.80	14.82	2.14	8.03	
	23.55	55	595	10.82	14.09	1.41	8.76	
21/03/2002	24.00	60	600	10.00	13.62	0.94	9.23	
	0.10	70	610	8.71	13.28	0.60	9.57	
	0.20	80	620	7.75	12.99	0.31	9.86	
	0.30	90	630	7.00	12.77	0.09	10.08	
	0.40	100	640	6.40	12.70	0.02	10.15	
	0.50	110	650	5.91	12.68	0.00	10.17	
	1.00	120	660	5.50	12.68	0.00	10.17	
	1.20	140	680	4.86	12.68	0.00	10.17	
	1.40	160	700	4.38	12.68	0.00	10.17	
	2.00	180	720	4.00	12.68	0.00	10.17	

DATE	TIME (hr&min)	TIME SINCE PUMPING		RATIO t / t'	DEPTH TO WATER (m.)	RESIDUAL DRAWDOWN (m.)	CALCULATED RECOVERY (m.)	REMARKS
		STOPPED t' (min)	STARTED t = t + t' (min)					
21/03/2002	2.30	210	750	3.57	12.68	0.00	10.17	
	3.00	240	780	3.25	12.68	0.00	10.17	
	3.30	270	810	3.00	12.68	0.00	10.17	
	4.00	300	840	2.80	12.68	0.00	10.17	
	4.30	330	870	2.64	12.68	0.00	10.17	
	5.00	360	900	2.50	12.68	0.00	10.17	
	5.30	390	930	2.38	12.68	0.00	10.17	
	6.00	420	960	2.29	12.68	0.00	10.17	
	6.30	450	990	2.20	12.68	0.00	10.17	
	7.00	480	1,020	2.13	12.68	0.00	10.17	
	7.30	510	1,050	2.06	12.68	0.00	10.17	
	8.00	540	1,080	2.00	12.68	0.00	10.17	

DATA PLOT - RECOVERY TEST (STEP 1)

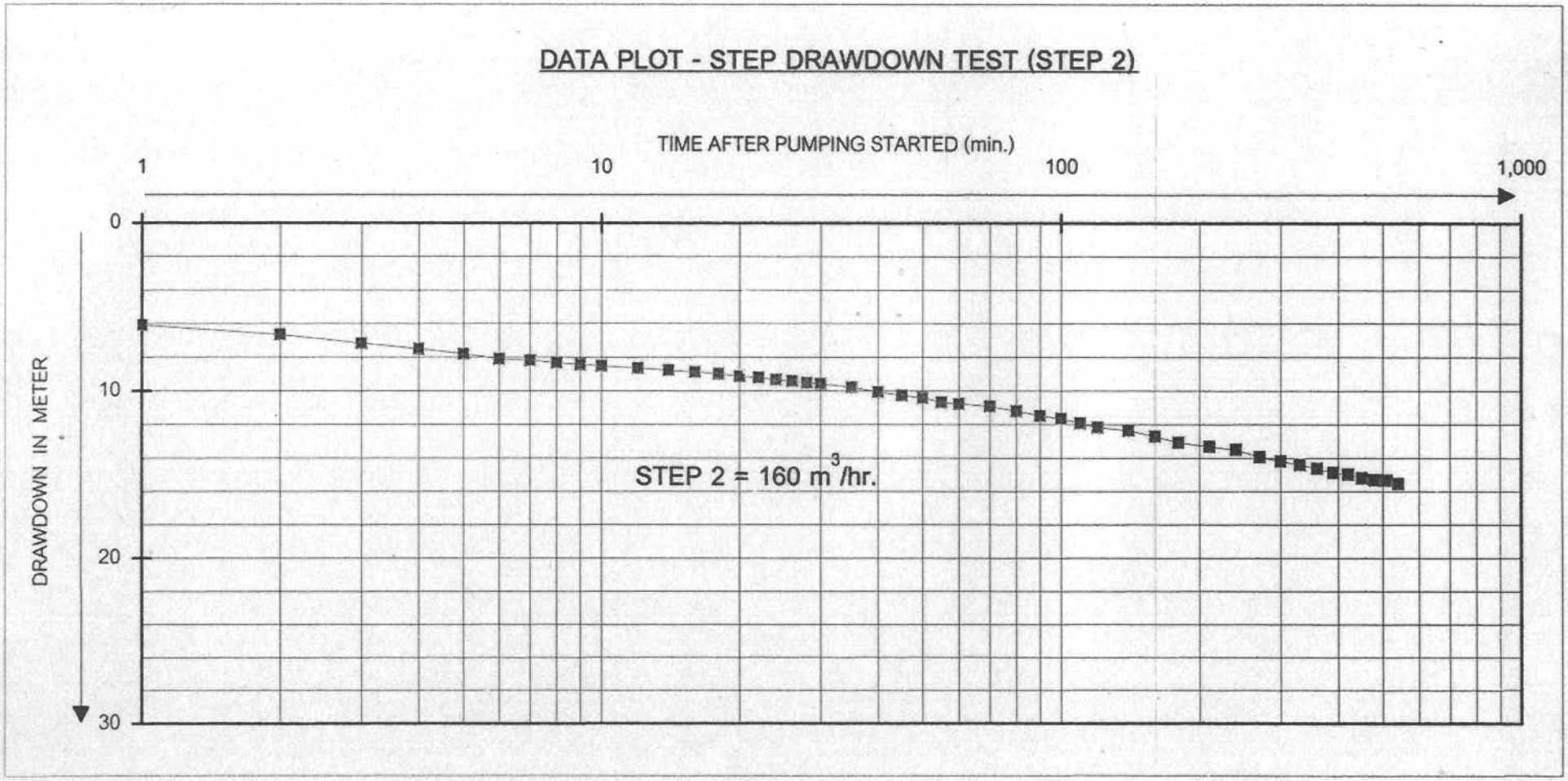


PUMPING TEST DATA (STEP 2)

TEST WELL : **WELL NO. D13 (NEW)** : ROYAL IRRIGATION DEPARTMENT
LOCATION : SUKHOTHAI GROUNDWATER A. SAWANKHALOK C. SUKHOTHAI
DEPTH OF CONSTRUCTION : 111.50 m. ; AQUIFERS : SAND AND GRAVEL
TYPE OF TEST : STEP DRAWDOWN TEST (STEP 2)
PUMP EMPLOYED : VERTICAL TURBINE PUMP ; PUMP SETTED : 44 m.
PUMPING STARTED : DATE 21/03/2002 hr. 08.00 ; PUMPING STOPPED : DATE 21/03/2002 hr. 17.00
DURATION OF PUMPING TEST (t) : 540 min.
REMARKS : ϕ 6" Orifice / ϕ 8" Pipe

DATE	TIME (hr&min)	ELAPSED TIME (min)	DEPTH TO WATER (m.)	MEASURED DRAWDOWN (m.)	PUMPING RATE (m^3/hr)	ORIFICE HEAD (inch.)	REMARKS
21/03/2002	8.00	0	12.68	0.00	160	20"	**STEP 2 = 160 m^3/hr.**
	8.01	1	18.76	6.08	"	"	
	8.02	2	19.33	6.65	"	"	
	8.03	3	19.84	7.16	"	"	
	8.04	4	20.17	7.49	"	"	
	8.05	5	20.47	7.79	"	"	
	8.06	6	20.78	8.10	"	"	
	8.07	7	20.87	8.19	"	"	
	8.08	8	21.00	8.32	"	"	
	8.09	9	21.11	8.43	"	"	
	8.10	10	21.19	8.51	"	"	
	8.12	12	21.32	8.64	"	"	
	8.14	14	21.45	8.77	"	"	
	8.16	16	21.56	8.88	"	"	
	8.18	18	21.67	8.99	"	"	
	8.20	20	21.80	9.12	"	"	
	8.22	22	21.88	9.20	"	"	
	8.24	24	22.00	9.32	"	"	
	8.26	26	22.09	9.41	"	"	
	8.28	28	22.20	9.52	"	"	
	8.30	30	22.25	9.57	"	"	
	8.35	35	22.45	9.77	"	"	
	8.40	40	22.74	10.06	"	"	
	8.45	45	22.94	10.26	"	"	
	8.50	50	23.10	10.42	"	"	
	8.55	55	23.35	10.67	"	"	
	9.00	60	23.45	10.77	"	"	
	9.10	70	23.60	10.92	"	"	
	9.20	80	23.88	11.20	"	"	
	9.30	90	24.16	11.48	"	"	
	9.40	100	24.34	11.66	"	"	
	9.50	110	24.60	11.92	"	"	
	10.00	120	24.85	12.17	"	"	
	10.20	140	25.04	12.36	"	"	
	10.40	160	25.41	12.73	"	"	
	11.00	180	25.76	13.08	"	"	

DATE	TIME (hr&min)	ELAPSED TIME (min)	DEPTH TO WATER (m.)	MEASURED DRAWDOWN (m.)	PUMPING RATE (m^3/hr)	ORIFICE HEAD (inch.)	REMARKS
21/03/2002	11.30	210	26.00	13.32	160	20"	
	12.00	240	26.19	13.51	"	"	
	12.30	270	26.62	13.94	"	"	
	13.00	300	26.87	14.19	"	"	
	13.30	330	27.08	14.40	"	"	
	14.00	360	27.29	14.61	"	"	
	14.30	390	27.54	14.86	"	"	
	15.00	420	27.64	14.96	"	"	
	15.30	450	27.88	15.20	"	"	
	16.00	480	27.98	15.30	"	"	
	16.30	510	28.00	15.32	"	"	
	17.00	540	28.20	15.52	"	"	

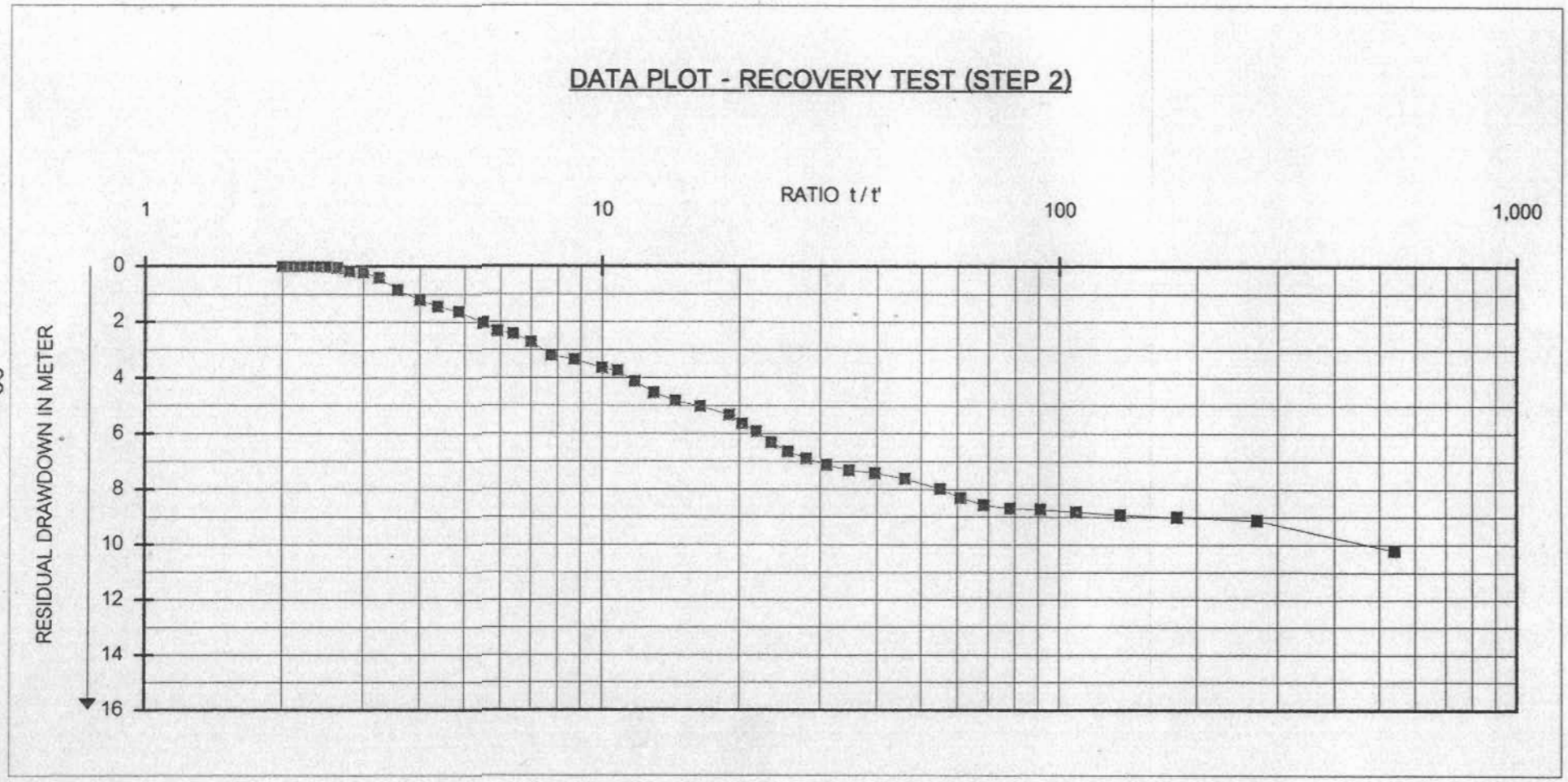

DATA PLOT - STEP DRAWDOWN TEST (STEP 2)
TIME AFTER PUMPING STARTED (min.)
1
10
100
1,000
DRAWDOWN IN METER
0
10
20
30
STEP 2 = 160 m3/hr.

RECOVERY TEST DATA (STEP 2)

TEST WELL : WELL NO. D13 (NEW) : ROYAL IRRIGATION DEPARTMENT
LOCATION : SUKHOTHAI GROUNDWATER A. SAWANKHALOK C. SUKHOTHAI
DEPTH OF CONSTRUCTION : 111.50 m. ; AQUIFERS : SAND AND GRAVEL
STATIC WATER LEVEL (SWL.) : 12.68 m.
PUMPING STARTED : DATE 21/03/2002 hr. 08.00 ; PUMPING STOPPED : DATE 21/03/2002 hr. 17.00
DURATION OF PUMPING TEST (t) : 540 min. ; AVERAGE DISCHARGE RATE : 160 m^3/hr
DURATION OF RECOVERY TEST : 540 min.

DATE	TIME (hr&min)	TIME SINCE PUMPING		RATIO t / t'	DEPTH TO WATER (m.)	RESIDUAL DRAWDOWN (m.)	CALCULATED RECOVERY (m.)	REMARKS
		STOPPED t' (min)	STARTED t = t + t' (min)					
21/03/2002	17.00	0	540	-	28.20	15.52	0.00	
	17.01	1	541	541.00	22.90	10.22	5.30	
	17.02	2	542	271.00	21.80	9.12	6.40	
	17.03	3	543	181.00	21.69	9.01	6.51	
	17.04	4	544	136.00	21.60	8.92	6.60	
	17.05	5	545	109.00	21.50	8.82	6.70	
	17.06	6	546	91.00	21.41	8.73	6.79	
	17.07	7	547	78.14	21.38	8.70	6.82	
	17.08	8	548	68.50	21.26	8.58	6.94	
	17.09	9	549	61.00	20.99	8.31	7.21	
	17.10	10	550	55.00	20.67	7.99	7.53	
	17.12	12	552	46.00	20.30	7.62	7.90	
	17.14	14	554	39.57	20.10	7.42	8.10	
	17.16	16	556	34.75	20.00	7.32	8.20	
	17.18	18	558	31.00	19.80	7.12	8.40	
	17.20	20	560	28.00	19.58	6.90	8.62	
	17.22	22	562	25.55	19.33	6.65	8.87	
	17.24	24	564	23.50	19.00	6.32	9.20	
	17.26	26	566	21.77	18.60	5.92	9.60	
	17.28	28	568	20.29	18.32	5.64	9.88	
	17.30	30	570	19.00	18.00	5.32	10.20	
	17.35	35	575	16.43	17.70	5.02	10.50	
	17.40	40	580	14.50	17.50	4.82	10.70	
	17.45	45	585	13.00	17.22	4.54	10.98	
	17.50	50	590	11.80	16.80	4.12	11.40	
	17.55	55	595	10.82	16.42	3.74	11.78	
	18.00	60	600	10.00	16.33	3.65	11.87	
	18.10	70	610	8.71	16.02	3.34	12.18	
	18.20	80	620	7.75	15.88	3.20	12.32	
	18.30	90	630	7.00	15.40	2.72	12.80	
	18.40	100	640	6.40	15.10	2.42	13.10	
	18.50	110	650	5.91	15.00	2.32	13.20	
	19.00	120	660	5.50	14.70	2.02	13.50	
	19.20	140	680	4.86	14.30	1.62	13.90	
	19.40	160	700	4.38	14.11	1.43	14.09	
	20.00	180	720	4.00	13.88	1.20	14.32	

DATE	TIME (hr&min)	TIME SINCE PUMPING		RATIO t / t'	DEPTH TO WATER (m.)	RESIDUAL DRAWDOWN (m.)	CALCULATED RECOVERY (m.)	REMARKS
		STOPPED t' (min)	STARTED t = t + t' (min)					
21/03/2002	20.30	210	750	3.57	13.52	0.84	14.68	
	21.00	240	780	3.25	13.09	0.41	15.11	
	21.30	270	810	3.00	12.90	0.22	15.30	
	22.00	300	840	2.80	12.86	0.18	15.34	
	22.30	330	870	2.64	12.74	0.06	15.46	
	23.00	360	900	2.50	12.69	0.01	15.51	
	23.30	390	930	2.38	12.68	0.00	15.52	
22/03/2002	24.00	420	960	2.29	12.68	0.00	15.52	
	0.30	450	990	2.20	12.68	0.00	15.52	
	1.00	480	1,020	2.13	12.68	0.00	15.52	
	1.30	510	1,050	2.06	12.68	0.00	15.52	
	2.00	540	1,080	2.00	12.68	0.00	15.52	

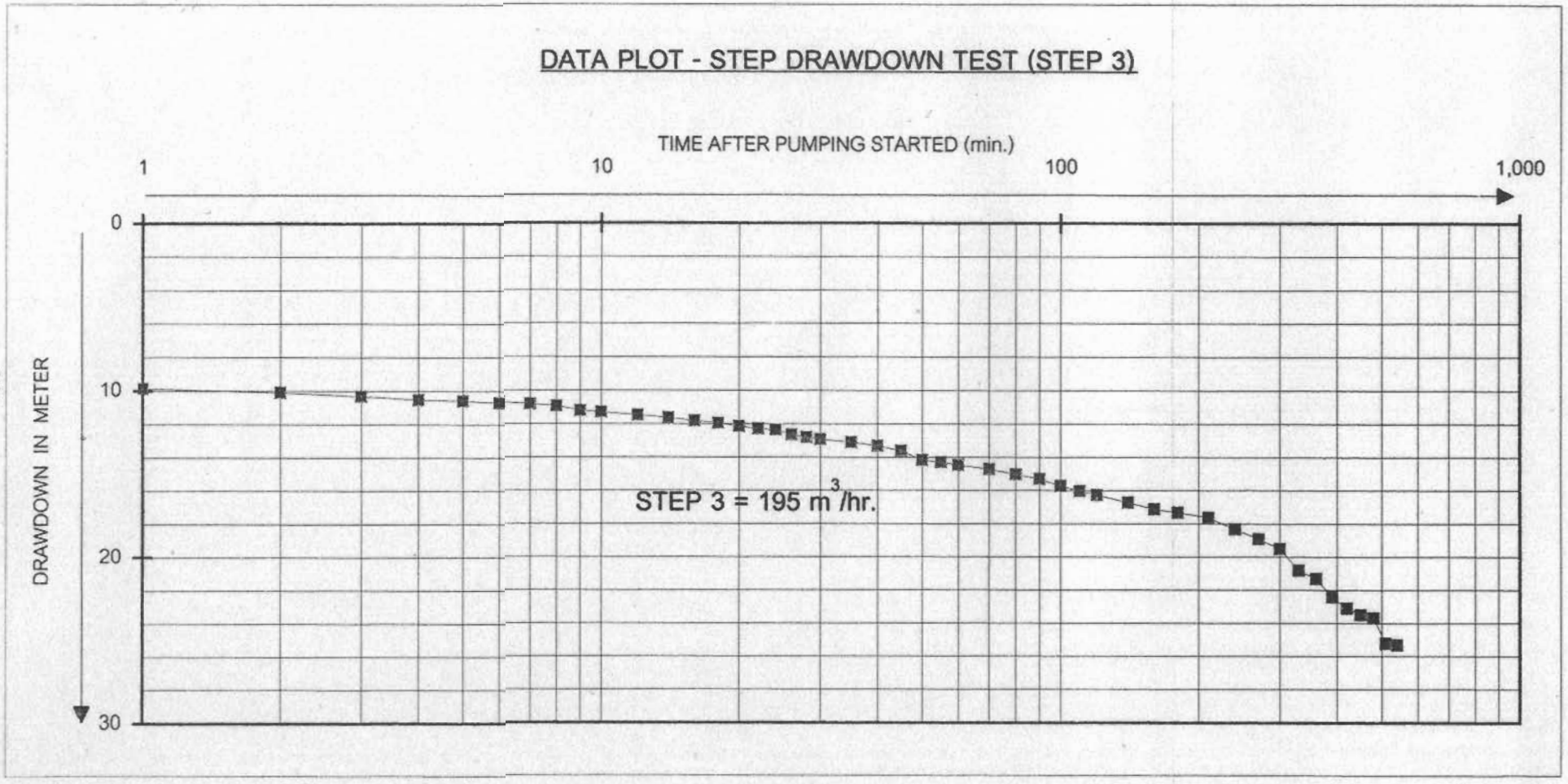

DATA PLOT - RECOVERY TEST (STEP 2)
RATIO t / t'
1
10
100
1,000
RESIDUAL DRAWDOWN IN METER
0
2
4
6
8
10
12
14
16

PUMPING TEST DATA (STEP 3)

TEST WELL : WELL NO. D13 (NEW) : ROYAL IRRIGATION DEPARTMENT
LOCATION : SUKHOTHAI GROUNDWATER A. SAWANKHALOK C. SUKHOTHAI
DEPTH OF CONSTRUCTION : 111.50 m. ; AQUIFERS : SAND AND GRAVEL
TYPE OF TEST : STEP DRAWDOWN TEST (STEP 3)
PUMP EMPLOYED : VERTICAL TURBINE PUMP ; PUMP SETTED : 44 m.
PUMPING STARTED : DATE 22/03/2002 hr. 02.00 ; PUMPING STOPPED : DATE 22/03/2002 hr. 11.00
DURATION OF PUMPING TEST (t) : 540 min.
REMARKS : ϕ 6" Orifice / ϕ 8" Pipe

DATE	TIME (hr&min)	ELAPSED TIME (min)	DEPTH TO WATER (m.)	MEASURED DRAWDOWN (m.)	PUMPING RATE (m^3/hr)	ORIFICE HEAD (inch.)	REMARKS
22/03/2002	2.00	0	12.68	0.00	195	30"	STEP 3 = 195 m^3/hr.
	2.01	1	22.54	9.86	"	"	
	2.02	2	22.78	10.10	"	"	
	2.03	3	22.99	10.31	"	"	
	2.04	4	23.20	10.52	"	"	
	2.05	5	23.26	10.58	"	"	
	2.06	6	23.38	10.70	"	"	
	2.07	7	23.49	10.81	"	"	
	2.08	8	23.60	10.92	"	"	
	2.09	9	23.89	11.21	"	"	
	2.10	10	23.98	11.30	"	"	
	2.12	12	24.15	11.47	"	"	
	2.14	14	24.30	11.62	"	"	
	2.16	16	24.50	11.82	"	"	
	2.18	18	24.64	11.96	"	"	
	2.20	20	24.82	12.14	"	"	
	2.22	22	24.97	12.29	"	"	
	2.24	24	25.04	12.36	"	"	
	2.26	26	25.32	12.64	"	"	
	2.28	28	25.48	12.80	"	"	
	2.30	30	25.60	12.92	"	"	
	2.35	35	25.78	13.10	"	"	
	2.40	40	25.99	13.31	"	"	
	2.45	45	26.30	13.62	"	"	
	2.50	50	26.86	14.18	"	"	
	2.55	55	26.99	14.31	"	"	
	3.00	60	27.15	14.47	"	"	
	3.10	70	27.40	14.72	"	"	
	3.20	80	27.72	15.04	"	"	
	3.30	90	27.99	15.31	"	"	
	3.40	100	28.40	15.72	"	"	
	3.50	110	28.70	16.02	"	"	
	4.00	120	28.94	16.26	"	"	
	4.20	140	29.40	16.72	"	"	
	4.40	160	29.80	17.12	"	"	
	5.00	180	30.00	17.32	"	"	

DATE	TIME (hr&min)	ELAPSED TIME (min)	DEPTH TO WATER (m.)	MEASURED DRAWDOWN (m.)	PUMPING RATE (m^3/hr)	ORIFICE HEAD (Inch.)	REMARKS
22/03/2002	5.30	210	30.30	17.62	195	30"	
	6.00	240	31.00	18.32	"	"	
	6.30	270	31.60	18.92	"	"	
	7.00	300	32.20	19.52	"	"	
	7.30	330	33.50	20.82	"	"	
	8.00	360	34.00	21.32	"	"	
	8.30	390	35.10	22.42	"	"	
	9.00	420	35.80	23.12	"	"	
	9.30	450	36.19	23.51	"	"	
	10.00	480	36.37	23.69	"	"	
	10.30	510	37.90	25.22	"	"	
	11.00	540	38.00	25.32	"	"	

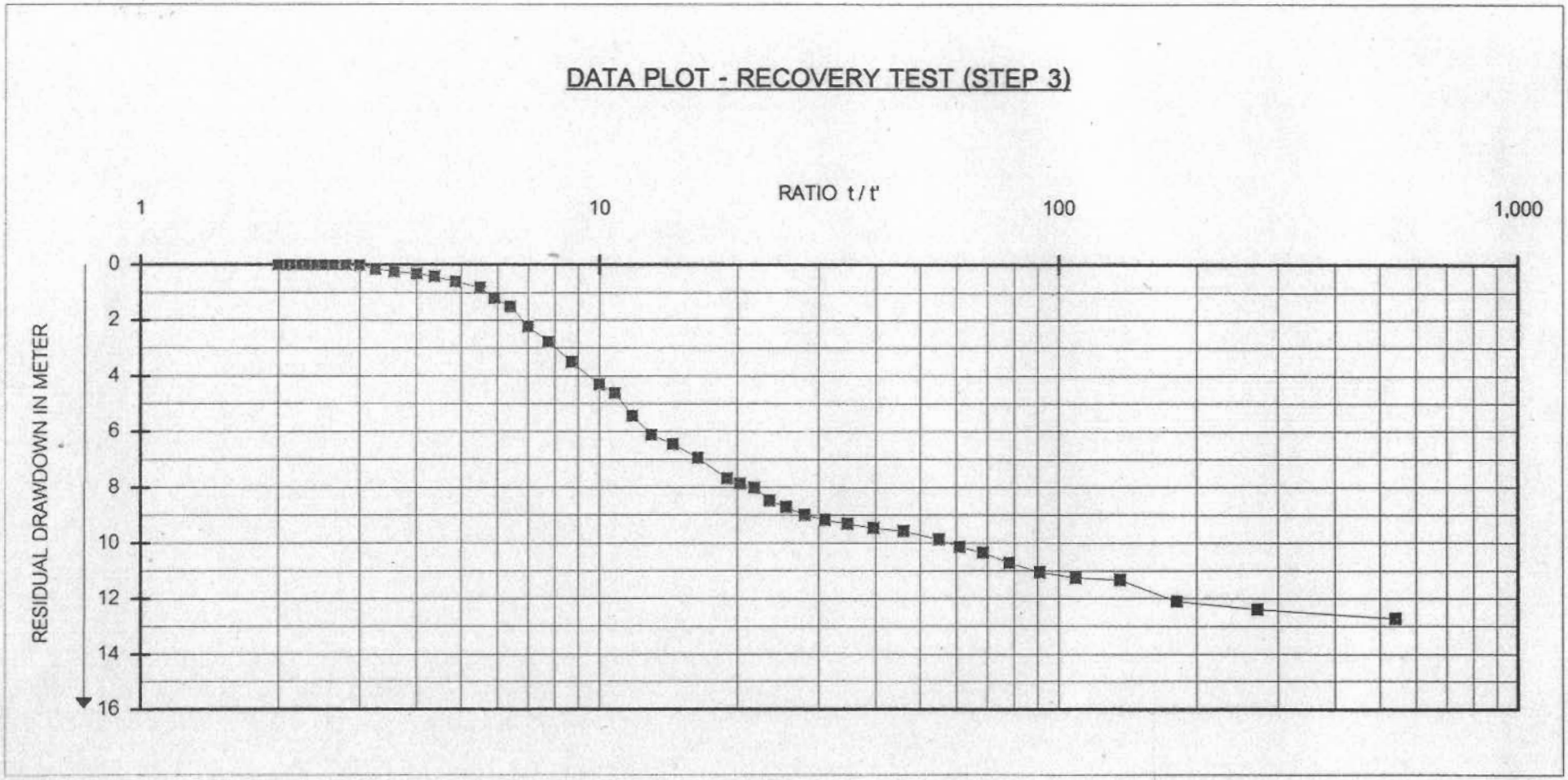

DATA PLOT - STEP DRAWDOWN TEST (STEP 3)
TIME AFTER PUMPING STARTED (min.)
1
10
100
1,000
DRAWDOWN IN METER
0
10
20
30
STEP 3 = 195 m3/hr.

RECOVERY TEST DATA (STEP 3)

TEST WELL : **WELL NO. D13 (NEW)** : ROYAL IRRIGATION DEPARTMENT
LOCATION : SUKHOTHAI GROUNDWATER A. SAWANKHALOK C. SUKHOTHAI
DEPTH OF CONSTRUCTION : 111.50 m. ; AQUIFERS : SAND AND GRAVEL
STATIC WATER LEVEL (SWL.) : 12.68 m.
PUMPING STARTED : DATE 22/03/2002 hr. 08.00 ; PUMPING STOPPED : DATE 22/03/2002 hr. 11.00
DURATION OF PUMPING TEST (t) : 540 min. ; AVERAGE DISCHARGE RATE : 195 m^3/hr
DURATION OF RECOVERY TEST : 540 min.

DATE	TIME (hr&min)	TIME SINCE PUMPING		RATIO t / t'	DEPTH TO WATER (m.)	RESIDUAL DRAWDOWN (m.)	CALCULATED RECOVERY (m.)	REMARKS
		STOPPED t' (min)	STARTED t = t + t' (min)					
22/03/2002	11.00	0	540	-	38.00	25.32	0.00	
	11.01	1	541	541.00	25.41	12.73	12.59	
	11.02	2	542	271.00	25.08	12.40	12.92	
	11.03	3	543	181.00	24.79	12.11	13.21	
	11.04	4	544	136.00	24.00	11.32	14.00	
	11.05	5	545	109.00	23.93	11.25	14.07	
	11.06	6	546	91.00	23.73	11.05	14.27	
	11.07	7	547	78.14	23.40	10.72	14.60	
	11.08	8	548	68.50	23.03	10.35	14.97	
	11.09	9	549	61.00	22.82	10.14	15.18	
	11.10	10	550	55.00	22.55	9.87	15.45	
	11.12	12	552	46.00	22.25	9.57	15.75	
	11.14	14	554	39.57	22.15	9.47	15.85	
	11.16	16	556	34.75	22.00	9.32	16.00	
	11.18	18	558	31.00	21.86	9.18	16.14	
	11.20	20	560	28.00	21.68	9.00	16.32	
	11.22	22	562	25.55	21.40	8.72	16.60	
	11.24	24	564	23.50	21.16	8.48	16.84	
	11.26	26	566	21.77	20.69	8.01	17.31	
	11.28	28	568	20.29	20.54	7.86	17.46	
	11.30	30	570	19.00	20.36	7.68	17.64	
	11.35	35	575	16.43	19.63	6.95	18.37	
	11.40	40	580	14.50	19.14	6.46	18.86	
	11.45	45	585	13.00	18.80	6.12	19.20	
	11.50	50	590	11.80	18.12	5.44	19.88	
	11.55	55	595	10.82	17.29	4.61	20.71	
	12.00	60	600	10.00	16.98	4.30	21.02	
	12.10	70	610	8.71	16.19	3.51	21.81	
	12.20	80	620	7.75	15.46	2.78	22.54	
	12.30	90	630	7.00	14.90	2.22	23.10	
	12.40	100	640	6.40	14.18	1.50	23.82	
	12.50	110	650	5.91	13.88	1.20	24.12	
	13.00	120	660	5.50	13.50	0.82	24.50	
	13.20	140	680	4.86	13.29	0.61	24.71	
	13.40	160	700	4.38	13.10	0.42	24.90	
	14.00	180	720	4.00	13.00	0.32	25.00	

DATE	TIME (hr&min)	TIME SINCE PUMPING		RATIO t/t'	DEPTH TO WATER (m.)	RESIDUAL DRAWDOWN (m.)	CALCULATED RECOVERY (m.)	REMARKS
		STOPPED t' (min)	STARTED t = t + t' (min)					
22/03/2002	14.30	210	750	3.57	12.92	0.24	25.08	
	15.00	240	780	3.25	12.84	0.16	25.16	
	15.30	270	810	3.00	12.70	0.02	25.30	
	16.00	300	840	2.80	12.68	0.00	25.32	
	16.30	330	870	2.64	12.68	0.00	25.32	
	17.00	360	900	2.50	12.68	0.00	25.32	
	17.30	390	930	2.38	12.68	0.00	25.32	
	18.00	420	960	2.29	12.68	0.00	25.32	
	18.30	450	990	2.20	12.68	0.00	25.32	
	19.00	480	1,020	2.13	12.68	0.00	25.32	
	19.30	510	1,050	2.06	12.68	0.00	25.32	
	20.00	540	1,080	2.00	12.68	0.00	25.32	

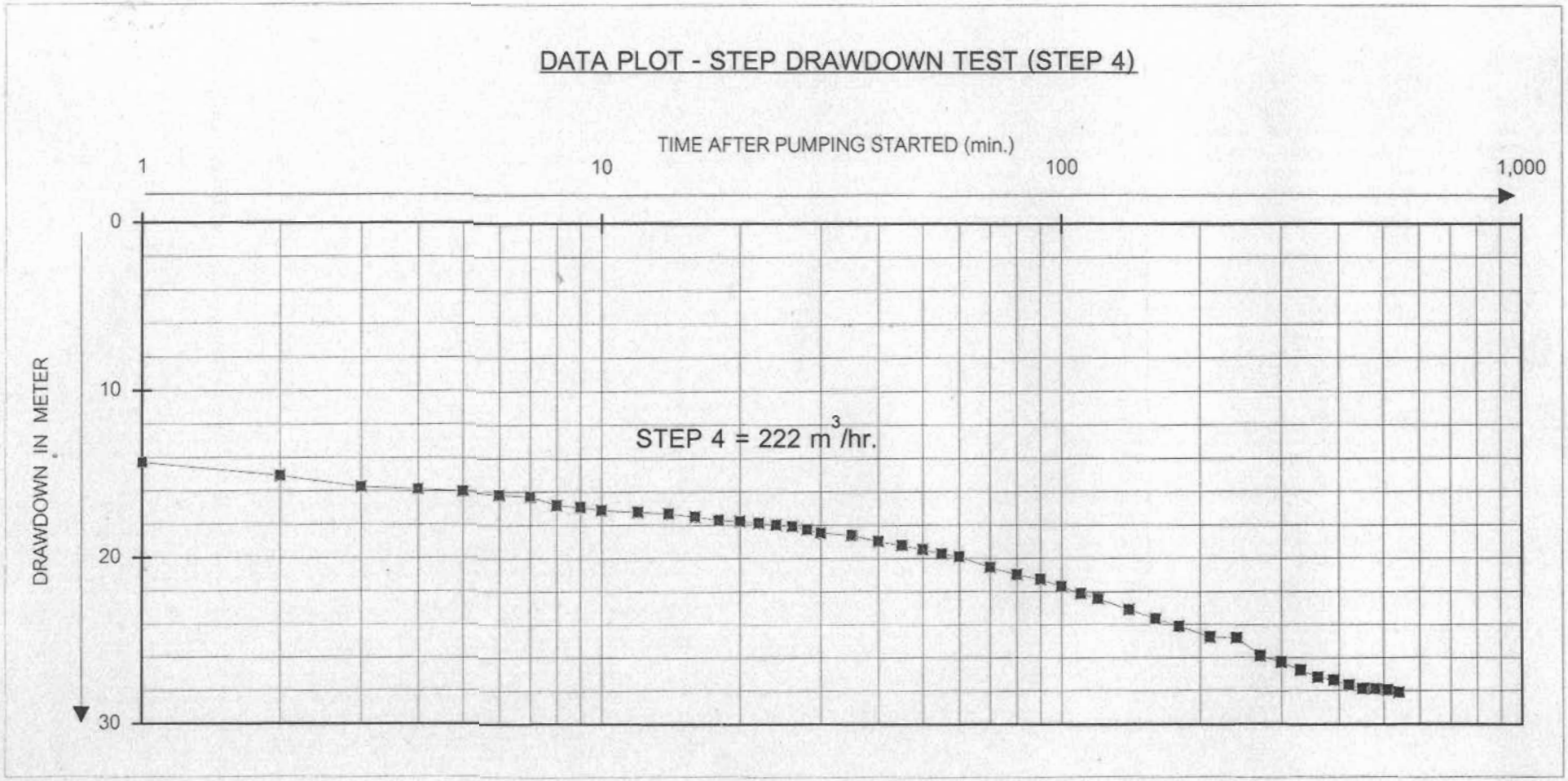

DATA PLOT - RECOVERY TEST (STEP 3)
RATIO t / t'
1
10
100
1,000
RESIDUAL DRAWDOWN IN METER
0
2
4
6
8
10
12
14
16

PUMPING TEST DATA (STEP 4)

TEST WELL : **WELL NO. D13 (NEW)** : ROYAL IRRIGATION DEPARTMENT
LOCATION : SUKHOTHAI GROUNDWATER A. SAWANKHALOK C. SUKHOTHAI
DEPTH OF CONSTRUCTION : 111.50 m. ; AQUIFERS : SAND AND GRAVEL
TYPE OF TEST : **STEP DRAWDOWN TEST (STEP 4)**
PUMP EMPLOYED : VERTICAL TURBINE PUMP ; PUMP SETTED : 44 m.
PUMPING STARTED : DATE 22/03/2002 hr. 20.00 ; PUMPING STOPPED : DATE 23/03/2002 hr. 05.00
DURATION OF PUMPING TEST (t) : 540 min.
REMARKS : ϕ 6" Orifice / ϕ 8" Pipe

DATE	TIME (hr&min)	ELAPSED TIME (min)	DEPTH TO WATER (m.)	MEASURED DRAWDOWN (m.)	PUMPING RATE (m^3/hr)	ORIFICE HEAD (inch.)	REMARKS
22/03/2002	20.00	0	12.68	0.00	222	40"	STEP 4 = 222 m^3/hr.
	20.01	1	26.97	14.29	"	"	
	20.02	2	27.75	15.07	"	"	
	20.03	3	28.43	15.75	"	"	
	20.04	4	28.55	15.87	"	"	
	20.05	5	28.69	16.01	"	"	
	20.06	6	28.87	16.19	"	"	
	20.07	7	28.97	16.29	"	"	
	20.08	8	29.48	16.80	"	"	
	20.09	9	29.59	16.91	"	"	
	20.10	10	29.80	17.12	"	"	
	20.12	12	29.89	17.21	"	"	
	20.14	14	30.00	17.32	"	"	
	20.16	16	30.17	17.49	"	"	
	20.18	18	30.38	17.70	"	"	
	20.20	20	30.44	17.76	"	"	
	20.22	22	30.57	17.89	"	"	
	20.24	24	30.67	17.99	"	"	
	20.26	26	30.75	18.07	"	"	
	20.28	28	30.94	18.26	"	"	
	20.30	30	31.14	18.46	"	"	
	20.35	35	31.28	18.60	"	"	
	20.40	40	31.67	18.99	"	"	
	20.45	45	31.89	19.21	"	"	
	20.50	50	32.15	19.47	"	"	
	20.55	55	32.42	19.74	"	"	
	21.00	60	32.58	19.90	"	"	
	21.10	70	33.23	20.55	"	"	
	21.20	80	33.67	20.99	"	"	
	21.30	90	33.95	21.27	"	"	
	21.40	100	34.37	21.69	"	"	
	21.50	110	34.80	22.12	"	"	
	22.00	120	35.11	22.43	"	"	
	22.20	140	35.78	23.10	"	"	
	22.40	160	36.33	23.65	"	"	
	23.00	180	36.79	24.11	"	"	

DATE	TIME (hr&min)	ELAPSED TIME (min)	DEPTH TO WATER (m.)	MEASURED DRAWDOWN (m.)	PUMPING RATE (m^3/hr)	ORIFICE HEAD (inch.)	REMARKS
22/03/2002	23.30	210	37.44	24.76	222	40"	
23/03/2002	24.00	240	37.49	24.81	"	"	
	0.30	270	38.56	25.88	"	"	
	1.00	300	38.95	26.27	"	"	
	1.30	330	39.43	26.75	"	"	
	2.00	360	39.87	27.19	"	"	
	2.30	390	40.04	27.36	"	"	
	3.00	420	40.35	27.67	"	"	
	3.30	450	40.56	27.88	"	"	
	4.00	480	40.59	27.91	"	"	
	4.30	510	40.64	27.96	"	"	
	5.00	540	40.78	28.10	"	"	

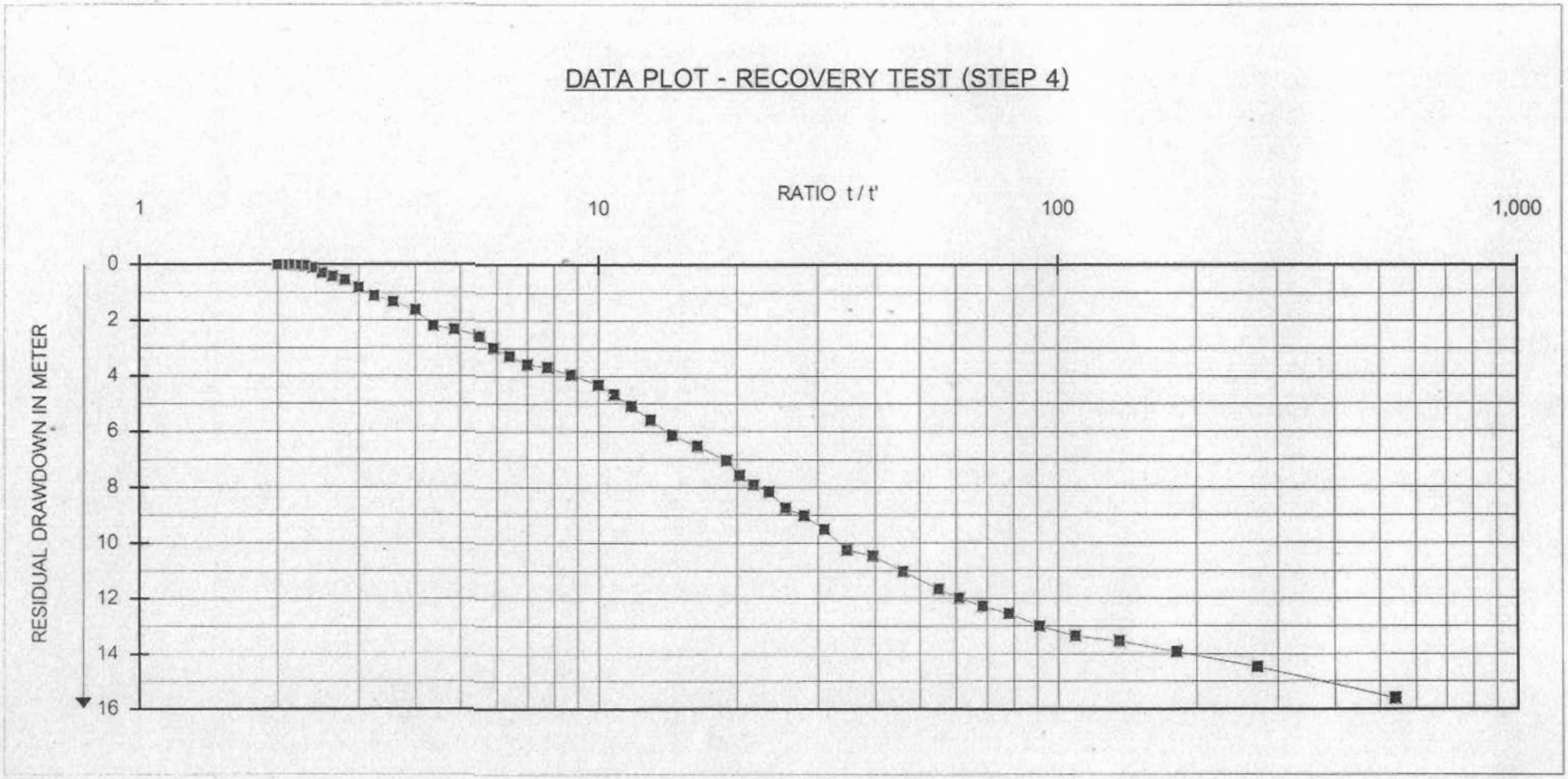

DATA PLOT - STEP DRAWDOWN TEST (STEP 4)
TIME AFTER PUMPING STARTED (min.)
1
10
100
1,000
0
10
20
30
DRAWDOWN IN METER
STEP 4 = 222 m3/hr.

RECOVERY TEST DATA (STEP 4)

TEST WELL : WELL NO. D13 (NEW) : ROYAL IRRIGATION DEPARTMENT
LOCATION : SUKHOTHAI GROUNDWATER A. SAWANKHALOK C. SUKHOTHAI
DEPTH OF CONSTRUCTION : 111.50 m. ; AQUIFERS : SAND AND GRAVEL
STATIC WATER LEVEL (SWL.) : 12.68 m.
PUMPING STARTED : DATE 22/03/2002 hr. 20.00 ; PUMPING STOPPED : DATE 23/03/2002 hr. 05.00
DURATION OF PUMPING TEST (t) : 540 min. ; AVERAGE DISCHARGE RATE : 222 m^3/hr
DURATION OF RECOVERY TEST : 540 min.

DATE	TIME (hr&min)	TIME SINCE PUMPING		RATIO t / t'	DEPTH TO WATER (m.)	RESIDUAL DRAWDOWN (m.)	CALCULATED RECOVERY (m.)	REMARKS
		STOPPED t' (min)	STARTED t = t + t' (min)					
23/03/2002	5.00	0	540	-	40.78	28.10	0.00	
	5.01	1	541	541.00	28.30	15.62	12.48	
	5.02	2	542	271.00	27.15	14.47	13.63	
	5.03	3	543	181.00	26.61	13.93	14.17	
	5.04	4	544	136.00	26.22	13.54	14.56	
	5.05	5	545	109.00	26.05	13.37	14.73	
	5.06	6	546	91.00	25.69	13.01	15.09	
	5.07	7	547	78.14	25.23	12.55	15.55	
	5.08	8	548	68.50	24.97	12.29	15.81	
	5.09	9	549	61.00	24.67	11.99	16.11	
	5.10	10	550	55.00	24.34	11.66	16.44	
	5.12	12	552	46.00	23.71	11.03	17.07	
	5.14	14	554	39.57	23.15	10.47	17.63	
	5.16	16	556	34.75	22.93	10.25	17.85	
	5.18	18	558	31.00	22.19	9.51	18.59	
	5.20	20	560	28.00	21.71	9.03	19.07	
	5.22	22	562	25.55	21.43	8.75	19.35	
	5.24	24	564	23.50	20.84	8.16	19.94	
	5.26	26	566	21.77	20.59	7.91	20.19	
	5.28	28	568	20.29	20.25	7.57	20.53	
	5.30	30	570	19.00	19.72	7.04	21.06	
	5.35	35	575	16.43	19.20	6.52	21.58	
	5.40	40	580	14.50	18.82	6.14	21.96	
	5.45	45	585	13.00	18.27	5.59	22.51	
	5.50	50	590	11.80	17.78	5.10	23.00	
	5.55	55	595	10.82	17.35	4.67	23.43	
	6.00	60	600	10.00	17.00	4.32	23.78	
	6.10	70	610	8.71	16.64	3.96	24.14	
	6.20	80	620	7.75	16.36	3.68	24.42	
	6.30	90	630	7.00	16.26	3.58	24.52	
	6.40	100	640	6.40	15.96	3.28	24.82	
	6.50	110	650	5.91	15.67	2.99	25.11	
	7.00	120	660	5.50	15.25	2.57	25.53	
	7.20	140	680	4.86	15.00	2.32	25.78	
	7.40	160	700	4.38	14.87	2.19	25.91	
	8.00	180	720	4.00	14.30	1.62	26.48	

DATE	TIME (hr&min)	TIME SINCE PUMPING		RATIO t / t'	DEPTH TO WATER (m.)	RESIDUAL DRAWDOWN (m.)	CALCULATED RECOVERY (m.)	REMARKS
		STOPPED t' (min)	STARTED t = t + t' (min)					
23/03/2002	8.30	210	750	3.57	14.00	1.32	26.78	
	9.00	240	780	3.25	13.80	1.12	26.98	
	9.30	270	810	3.00	13.50	0.82	27.28	
	10.00	300	840	2.80	13.22	0.54	27.56	
	10.30	330	870	2.64	13.10	0.42	27.68	
	11.00	360	900	2.50	12.98	0.30	27.80	
	11.30	390	930	2.38	12.80	0.12	27.98	
	12.00	420	960	2.29	12.72	0.04	28.06	
	12.30	450	990	2.20	12.70	0.02	28.08	
	13.00	480	1,020	2.13	12.68	0.00	28.10	
	13.30	510	1,050	2.06	12.68	0.00	28.10	
	14.00	540	1,080	2.00	12.68	0.00	28.10	

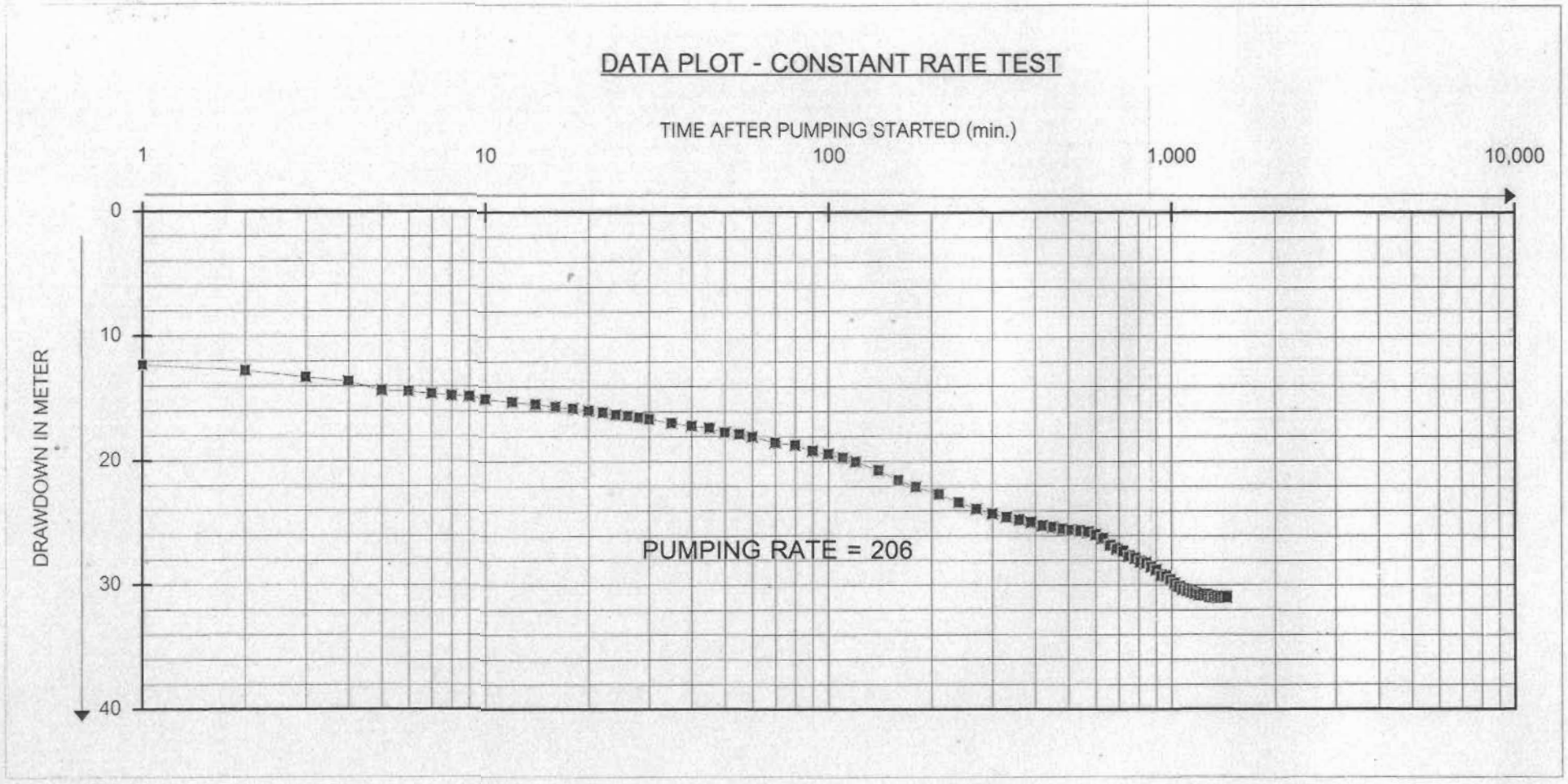

DATA PLOT - RECOVERY TEST (STEP 4)
RATIO t / t'
1
10
100
1,000
RESIDUAL DRAWDOWN IN METER
0
2
4
6
8
10
12
14
16

PUMPING TEST DATA (CONSTANT)

TEST WELL : **WELL NO. D13 (NEW)** : ROYAL IRRIGATION DEPARTMENT
LOCATION : SUKHOTHAI GROUNDWATER A. SAWANKHALOK C. SUKHOTHAI
DEPTH OF CONSTRUCTION : 111.50 m. ; AQUIFERS : SAND AND GRAVEL
TYPE OF TEST : **CONSTANT RATE TEST**
PUMP EMPLOYED : VERTICAL TURBINE PUMP ; PUMP SETTED : 44 m.
PUMPING STARTED : DATE 23/03/2002 hr. 14.00 ; PUMPING STOPPED : DATE 24/03/2002 hr. 14.00
DURATION OF PUMPING TEST (t) : 1,440 min. ; STATIC WATER LEVEL : 12.68 m.
REMARKS : ϕ 6" Orifice / ϕ 8" Pipe

DATE	TIME (hr&min)	ELAPSED TIME (min)	DEPTH TO WATER (m.)	MEASURED DRAWDOWN (m.)	PUMPING RATE (m^3/hr)	ORIFICE HEAD (inch.)	REMARKS
23/03/2002	14.00	0	12.68	0.00	206	34"	
	14.01	1	25.00	12.32	"	"	
	14.02	2	25.43	12.75	"	"	
	14.03	3	25.95	13.27	"	"	
	14.04	4	26.32	13.64	"	"	
	14.05	5	27.03	14.35	"	"	
	14.06	6	27.09	14.41	"	"	
	14.07	7	27.30	14.62	"	"	
	14.08	8	27.42	14.74	"	"	
	14.09	9	27.52	14.84	"	"	
	14.10	10	27.69	15.01	"	"	
	14.12	12	27.93	15.25	"	"	
	14.14	14	28.11	15.43	"	"	
	14.16	16	28.30	15.62	"	"	
	14.18	18	28.45	15.77	"	"	
	14.20	20	28.63	15.95	"	"	
	14.22	22	28.76	16.08	"	"	
	14.24	24	28.95	16.27	"	"	
	14.26	26	29.05	16.37	"	"	
	14.28	28	29.17	16.49	"	"	
	14.30	30	29.29	16.61	"	"	
	14.35	35	29.60	16.92	"	"	
	14.40	40	29.83	17.15	"	"	
	14.45	45	30.00	17.32	"	"	
	14.50	50	30.37	17.69	"	"	
	14.55	55	30.50	17.82	"	"	
	15.00	60	30.72	18.04	"	"	
	15.10	70	31.19	18.51	"	"	
	15.20	80	31.37	18.69	"	"	
	15.30	90	31.86	19.18	"	"	
	15.40	100	32.10	19.42	"	"	
	15.50	110	32.39	19.71	"	"	
	16.00	120	32.73	20.05	"	"	
	16.20	140	33.42	20.74	"	"	
	16.40	160	34.20	21.52	"	"	
	17.00	180	34.74	22.06	"	"	

DATE	TIME (hr&min)	ELAPSED TIME (min)	DEPTH TO WATER (m.)	MEASURED DRAWDOWN (m.)	PUMPING RATE (m^3/hr)	ORIFICE HEAD (inch.)	REMARKS
23/03/2002	17.30	210	35.34	22.66	206	34"	
	18.00	240	36.00	23.32	"	"	
	18.30	270	36.54	23.86	"	"	
	19.00	300	36.92	24.24	"	"	
	19.30	330	37.20	24.52	"	"	
	20.00	360	37.40	24.72	"	"	
	20.30	390	37.62	24.94	"	"	
	21.00	420	37.89	25.21	"	"	
	21.30	450	38.00	25.32	"	"	
	22.00	480	38.16	25.48	"	"	
	22.30	510	38.24	25.56	"	"	
	23.00	540	38.32	25.64	"	"	
	23.30	570	38.40	25.72	"	"	
24/03/2002	24.00	600	38.60	25.92	"	"	
	0.30	630	38.90	26.22	"	"	
	1.00	660	39.44	26.76	"	"	
	1.30	690	39.75	27.07	"	"	
	2.00	720	39.94	27.26	"	"	
	2.30	750	40.37	27.69	"	"	
	3.00	780	40.54	27.86	"	"	
	3.30	810	40.78	28.10	"	"	
	4.00	840	40.91	28.23	"	"	
	4.30	870	41.20	28.52	"	"	
	5.00	900	41.46	28.78	"	"	
	5.30	930	41.89	29.21	"	"	
	6.00	960	41.99	29.31	"	"	
	6.30	990	42.26	29.58	"	"	
	7.00	1,020	42.54	29.86	"	"	
	7.30	1,050	42.80	30.12	"	"	
	8.00	1,080	43.04	30.36	"	"	
	8.30	1,110	43.12	30.44	"	"	
	9.00	1,140	43.22	30.54	"	"	
	9.30	1,170	43.33	30.65	"	"	
	10.00	1,200	43.45	30.77	"	"	
	10.30	1,230	43.46	30.78	"	"	
	11.00	1,260	43.47	30.79	"	"	
	11.30	1,290	43.60	30.92	"	"	
	12.00	1,320	43.62	30.94	"	"	
	12.30	1,350	43.63	30.95	"	"	
	13.00	1,380	43.64	30.96	"	"	
	13.30	1,410	43.62	30.94	"	"	
	14.00	1,440	43.64	30.96	"	"	


DATA PLOT - CONSTANT RATE TEST
TIME AFTER PUMPING STARTED (min.)
1
10
100
1,000
10,000
DRAWDOWN IN METER
0
10
20
30
40
PUMPING RATE = 206

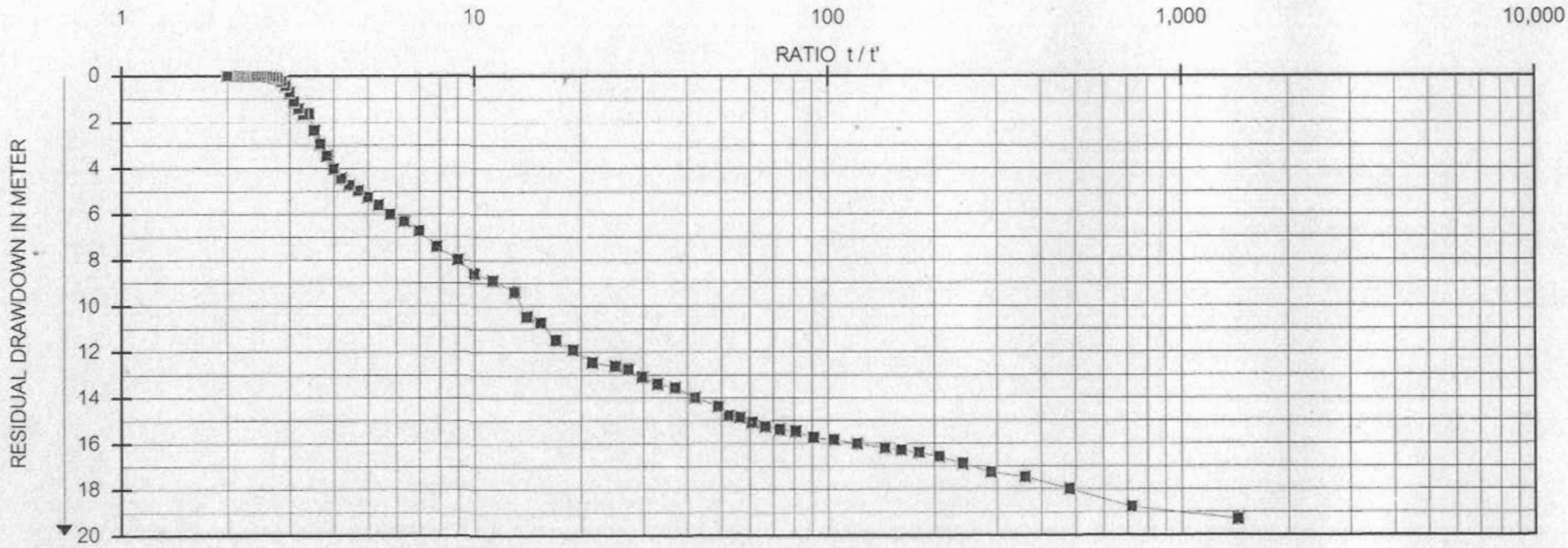
RECOVERY TEST DATA (CONSTANT)

TEST WELL : **WELL NO. D13 (NEW)** : ROYAL IRRIGATION DEPARTMENT
LOCATION : SUKHOTHAI GROUNDWATER A. SAWANKHALOK C. SUKHOTHAI
DEPTH OF CONSTRUCTION : 111.50 m. ; AQUIFERS : SAND AND GRAVEL
STATIC WATER LEVEL (SWL) : 12.68 m.
PUMPING STARTED : DATE 23/03/2002 hr. 14.00 ; PUMPING STOPPED : DATE 24/03/2002 hr. 14.00
DURATION OF PUMPING TEST (t) : 1,440 min. ; AVERAGE DISCHARGE RATE : 206 m^3/hr
DURATION OF RECOVERY TEST : 1,440 min.

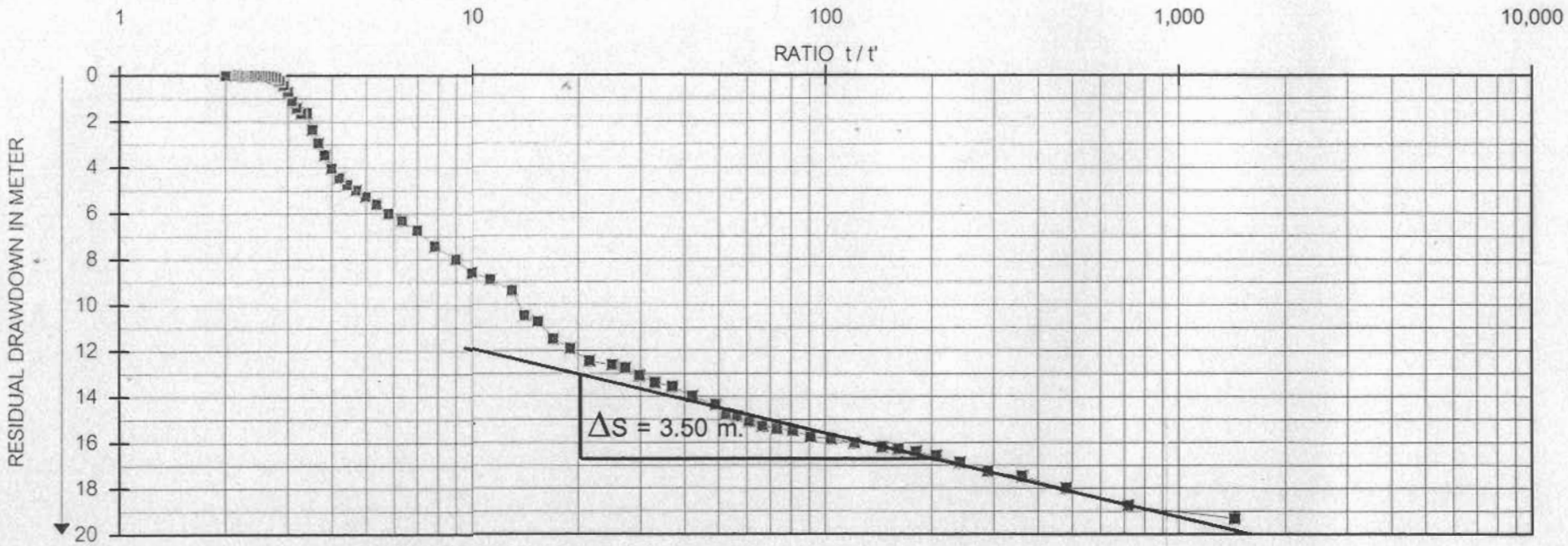
DATE	TIME (hr&min)	TIME SINCE PUMPING		RATIO t / t'	DEPTH TO WATER (m.)	RESIDUAL DRAWDOWN (m.)	CALCULATED RECOVERY (m.)	REMARKS
		STOPPED t' (min)	STARTED t = t + t' (min)					
24/03/2002	14.00	0	1,440	-	43.64	30.96	0.00	
	14.01	1	1,441	1,441.00	32.00	19.32	11.64	
	14.02	2	1,442	721.00	31.45	18.77	12.19	
	14.03	3	1,443	481.00	30.68	18.00	12.96	
	14.04	4	1,444	361.00	30.16	17.48	13.48	
	14.05	5	1,445	289.00	29.95	17.27	13.69	
	14.06	6	1,446	241.00	29.57	16.89	14.07	
	14.07	7	1,447	206.71	29.27	16.59	14.37	
	14.08	8	1,448	181.00	29.09	16.41	14.55	
	14.09	9	1,449	161.00	28.98	16.30	14.66	
	14.10	10	1,450	145.00	28.88	16.20	14.76	
	14.12	12	1,452	121.00	28.70	16.02	14.94	
	14.14	14	1,454	103.86	28.52	15.84	15.12	
	14.16	16	1,456	91.00	28.43	15.75	15.21	
	14.18	18	1,458	81.00	28.16	15.48	15.48	
	14.20	20	1,460	73.00	28.08	15.40	15.56	
	14.22	22	1,462	66.45	27.96	15.28	15.68	
	14.24	24	1,464	61.00	27.77	15.09	15.87	
	14.26	26	1,466	56.38	27.53	14.85	16.11	
	14.28	28	1,468	52.43	27.45	14.77	16.19	
	14.30	30	1,470	49.00	27.05	14.37	16.59	
	14.35	35	1,475	42.14	26.68	14.00	16.96	
	14.40	*40*	*1,480*	*37.00*	*26.25*	*13.57*	*17.39*	
	14.45	45	1,485	33.00	26.08	13.40	17.56	
	14.50	50	1,490	29.80	25.78	13.10	17.86	
	14.55	55	1,495	27.18	25.44	12.76	18.20	
	15.00	60	1,500	25.00	25.30	12.62	18.34	
	15.10	70	1,510	21.57	25.15	12.47	18.49	
	15.20	80	1,520	19.00	24.60	11.92	19.04	
	15.30	90	1,530	17.00	24.17	11.49	19.47	
	15.40	100	1,540	15.40	23.42	10.74	20.22	
	15.50	110	1,550	14.09	23.15	10.47	20.49	
	16.00	120	1,560	13.00	22.08	9.40	21.56	
	16.20	140	1,580	11.29	21.59	8.91	22.05	
	16.40	160	1,600	10.00	21.28	8.60	22.36	
	17.00	180	1,620	9.00	20.67	7.99	22.97	

DATE	TIME (hr&min)	TIME SINCE PUMPING STOPPED t' (min)	TIME SINCE PUMPING STARTED t = t + t' (min)	RATIO t / t'	DEPTH TO WATER (m.)	RESIDUAL DRAWDOWN (m.)	CALCULATED RECOVERY (m.)	REMARKS
24/03/2002	17.30	210	1,650	7.86	20.10	7.42	23.54	
	18.00	240	1,680	7.00	19.42	6.74	24.22	
	18.30	270	1,710	6.33	19.00	6.32	24.64	
	19.00	300	1,740	5.80	18.68	6.00	24.96	
	19.30	330	1,770	5.36	18.27	5.59	25.37	
	20.00	360	1,800	5.00	17.94	5.26	25.70	
	20.30	390	1,830	4.69	17.65	4.97	25.99	
	21.00	420	1,860	4.43	17.41	4.73	26.23	
	21.30	450	1,890	4.20	17.12	4.44	26.52	
	22.00	480	1,920	4.00	16.71	4.03	26.93	
	22.30	510	1,950	3.82	16.14	3.46	27.50	
	23.00	540	1,980	3.67	15.62	2.94	28.02	
	23.30	570	2,010	3.53	15.03	2.35	28.61	
25/03/2002	24.00	600	2,040	3.40	14.31	1.63	29.33	
	0.30	630	2,070	3.29	14.33	1.65	29.31	
	1.00	660	2,100	3.18	14.10	1.42	29.54	
	1.30	690	2,130	3.09	13.80	1.12	29.84	
	2.00	720	2,160	3.00	13.40	0.72	30.24	
	2.30	750	2,190	2.92	13.12	0.44	30.52	
	3.00	780	2,220	2.85	12.92	0.24	30.72	
	3.30	810	2,250	2.78	12.80	0.12	30.84	
	4.00	840	2,280	2.71	12.75	0.07	30.89	
	4.30	870	2,310	2.66	12.72	0.04	30.92	
	5.00	900	2,340	2.60	12.70	0.02	30.94	
	5.30	930	2,370	2.55	12.68	0.00	30.96	
	6.00	960	2,400	2.50	12.68	0.00	30.96	
	6.30	990	2,430	2.45	12.68	0.00	30.96	
	7.00	1,020	2,460	2.41	12.68	0.00	30.96	
	7.30	1,050	2,490	2.37	12.68	0.00	30.96	
	8.00	1,080	2,520	2.33	12.68	0.00	30.96	
	8.30	1,110	2,550	2.30	12.68	0.00	30.96	
	9.00	1,140	2,580	2.26	12.68	0.00	30.96	
	9.30	1,170	2,610	2.23	12.68	0.00	30.96	
	10.00	1,200	2,640	2.20	12.68	0.00	30.96	
	10.30	1,230	2,670	2.17	12.68	0.00	30.96	
	11.00	1,260	2,700	2.14	12.68	0.00	30.96	
	11.30	1,290	2,730	2.12	12.68	0.00	30.96	
	12.00	1,320	2,760	2.09	12.68	0.00	30.96	
	12.30	1,350	2,790	2.07	12.68	0.00	30.96	
	13.00	1,380	2,820	2.04	12.68	0.00	30.96	
	13.30	1,410	2,850	2.02	12.68	0.00	30.96	
	14.00	1,440	2,880	2.00	12.68	0.00	30.96	

DATA PLOT - RECOVERY TEST (CONSTANT)



DATA PLOT - RECOVERY TEST (CONSTANT)



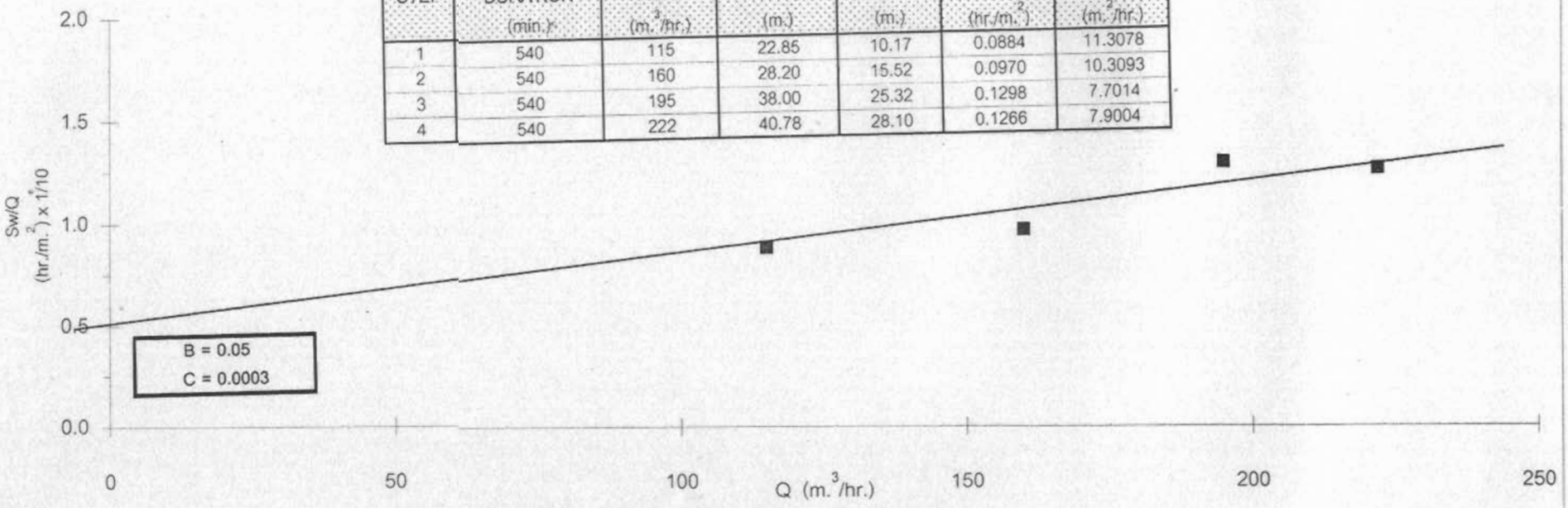
Transmissivity (T)	Hydraulic conductivity (K)
T = 2.30 Q / 4π ΔS _____ Cooper & Jacob equation	K = T / b _____ Freeze and Cherry , 1979
Q = 206 $m.^3$/hr. = 4,944 m^3/day	T = 258.67 $m.^2$/day
ΔS = 3.50 m..	b = length of screen = 42 m..
T = (2.30 x 4,944) / (4 x 3.14 x 3.50)	K = 258.67 / 42
= 258.67 $m.^2$/day	= 6.16 m./day

SPECIFIC DRAWDOWN PLOT

ROYAL IRRIGATION DEPARTMENT : WELL NO. D13 (NEW)

SUKHOTHAI GROUNDWATER A. SAWANKHALOK C. SUKHOTHAI

STEP	DURATION (min.)	RATE ($m.^3/hr.$)	PWL (m.)	Sw (m.)	Sw/Q ($hr./m.^2$)	Q/Sw ($m.^2/hr.$)
1	540	115	22.85	10.17	0.0884	11.3078
2	540	160	28.20	15.52	0.0970	10.3093
3	540	195	38.00	25.32	0.1298	7.7014
4	540	222	40.78	28.10	0.1266	7.9004



STEP	RATE ($m.^3/hr.$)	BQ	CQ^2	Well Efficiency Lp (%)
1	115	5.75	3.97	59.17
2	160	8.00	7.68	51.02
3	195	9.75	11.41	46.08
4	222	11.10	14.79	42.88
Well Effiency (Lp) = $(BQ)/(BQ+CQ^2)X100\%$				

WELL EFFICIENCY

ROYAL IRRIGATION DEPARTMENT : WELL NO. D13 (NEW)

SUKHOTHAI GROUNGWATER A.SAWANKHALOK C.SUKHOTHAI

Drawdown (Sw) = $BQ + CQ^2$

Well efficiency (Lp) = BQ/Sw x 100 %

Table of lamina flow

Q (m^3/hr)	BQ	CQ^2	Sw (m.)	PWL (m.)	Q/Sw (m^2/hr)	Well efficiency Lp (%)
10	0.50	0.03	0.53	13.21	18.87	94.34
20	1.00	0.12	1.12	13.80	17.86	89.29
30	1.50	0.27	1.77	14.45	16.95	84.75
40	2.00	0.48	2.48	15.16	16.13	80.65
50	2.50	0.75	3.25	15.93	15.38	76.92
60	3.00	1.08	4.08	16.76	14.71	73.53
70	3.50	1.47	4.97	17.65	14.08	70.42
80	4.00	1.92	5.92	18.60	13.51	67.57
90	4.50	2.43	6.93	19.61	12.99	64.94
100	5.00	3.00	8.00	20.68	12.50	62.50
110	5.50	3.63	9.13	21.81	12.05	60.24
120	6.00	4.32	10.32	23.00	11.63	58.14
130	6.50	5.07	11.57	24.25	11.24	56.18
140	7.00	5.88	12.88	25.56	10.87	54.35
150	7.50	6.75	14.25	26.93	10.53	52.63
160	8.00	7.68	15.68	28.36	10.20	51.02
170	8.50	8.67	17.17	29.85	9.90	49.50
180	9.00	9.72	18.72	31.40	9.62	48.08
190	9.50	10.83	20.33	33.01	9.35	46.73
200	10.00	12.00	22.00	34.68	9.09	45.45
210	10.50	13.23	23.73	36.41	8.85	44.25
220	11.00	14.52	25.52	38.20	8.62	43.10
230	11.50	15.87	27.37	40.05	8.40	42.02
240	12.00	17.28	29.28	41.96	8.20	40.98
250	12.50	18.75	31.25	43.93	8.00	40.00
260	13.00	20.28	33.28	45.96	7.81	39.06
270	13.50	21.87	35.37	48.05	7.63	38.17
280	14.00	23.52	37.52	50.20	7.46	37.31
290	14.50	25.23	39.73	52.41	7.30	36.50
300	15.00	27.00	42.00	54.68	7.14	35.71