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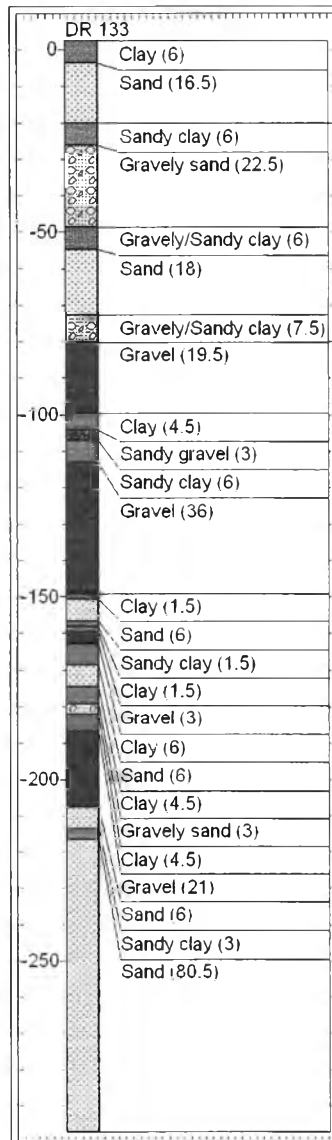
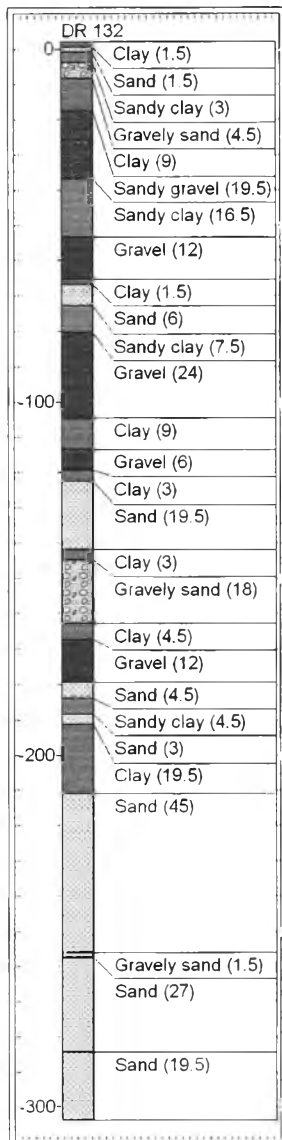
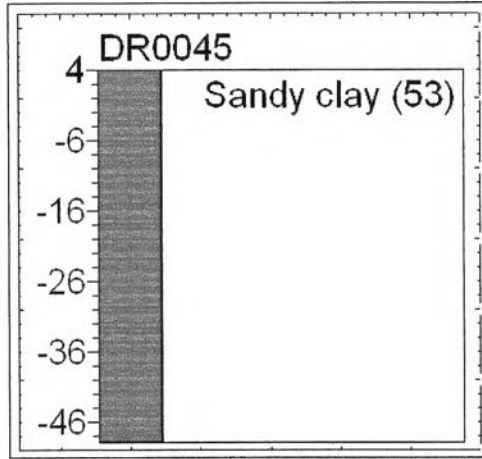
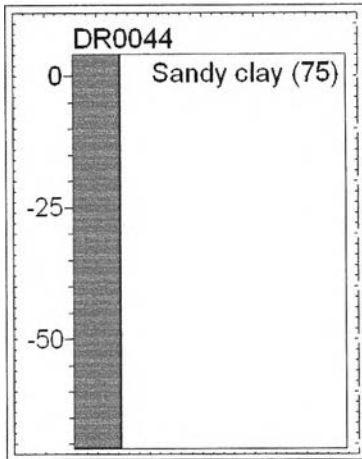
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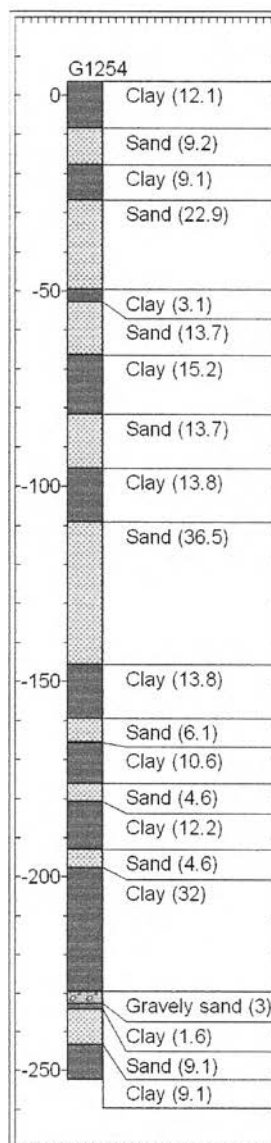
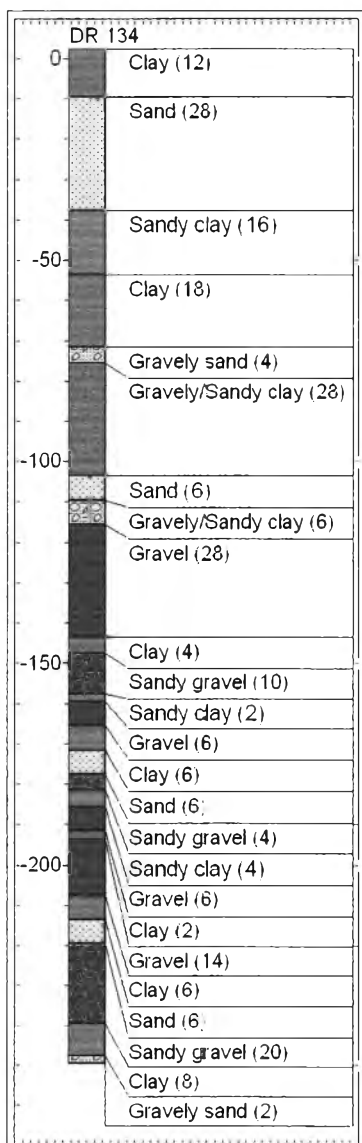
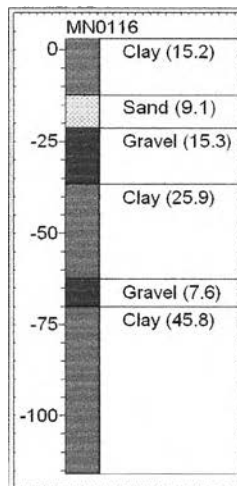
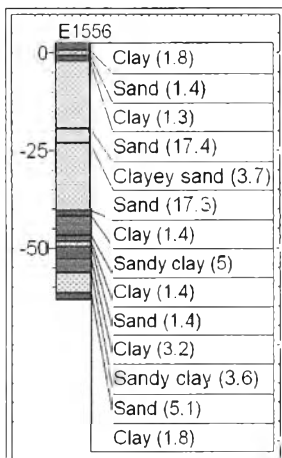
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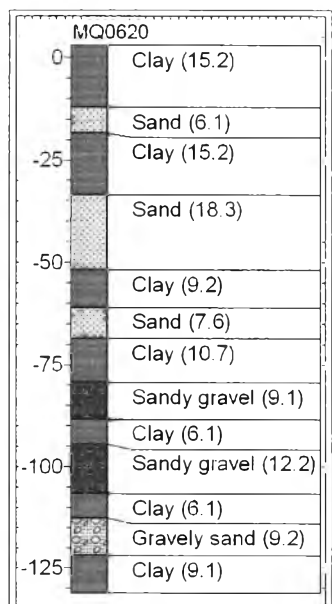
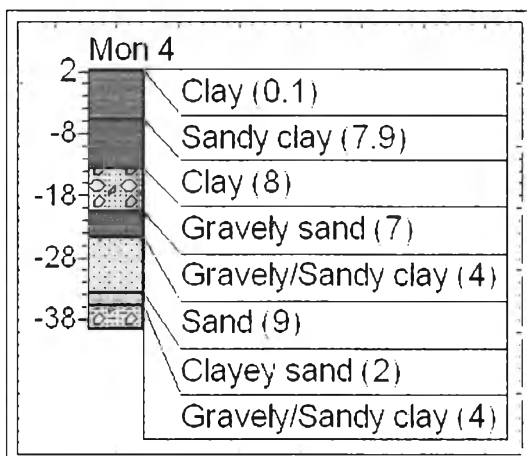
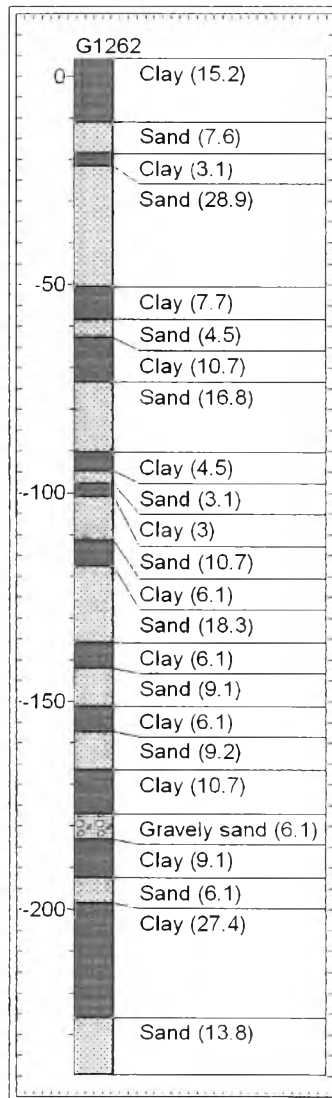
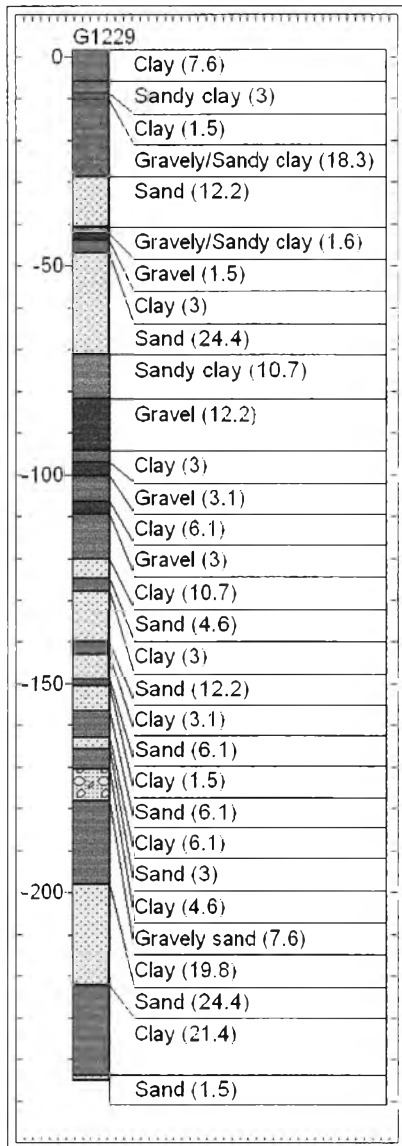
# APPENDICES

# APPENDIX 1

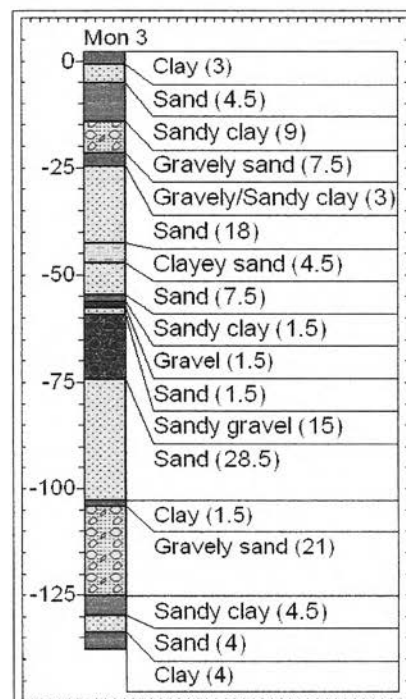
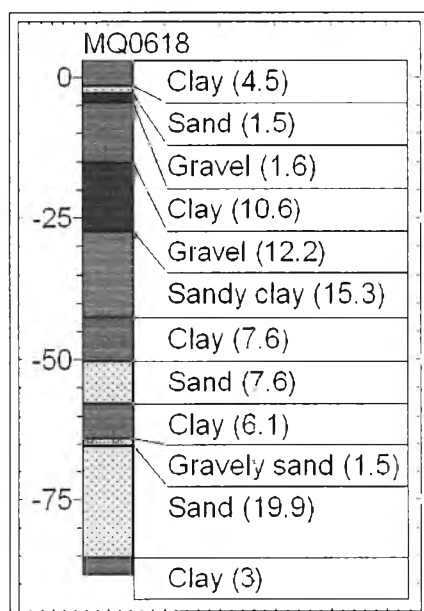
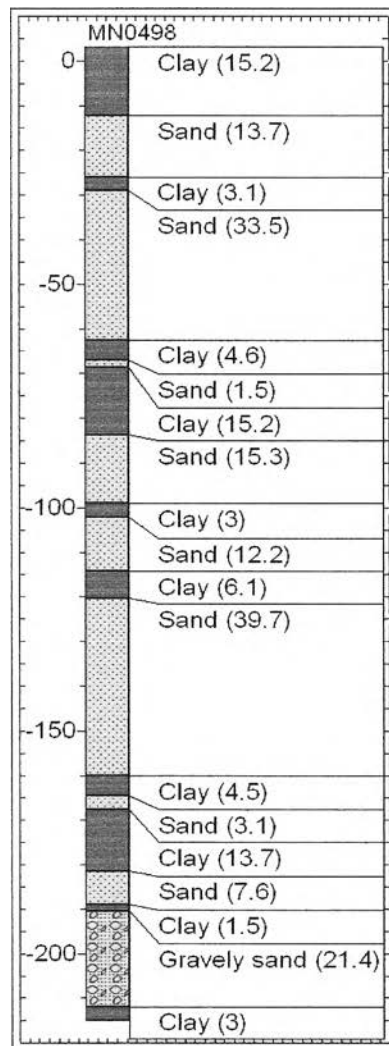
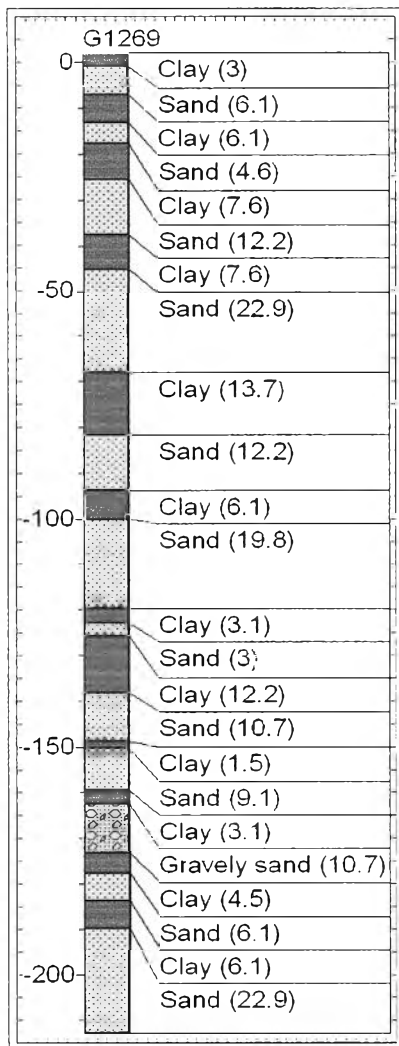
WELLS LOG DATA AND SURFACE ELEVATION MAPS  
EACH LAYER

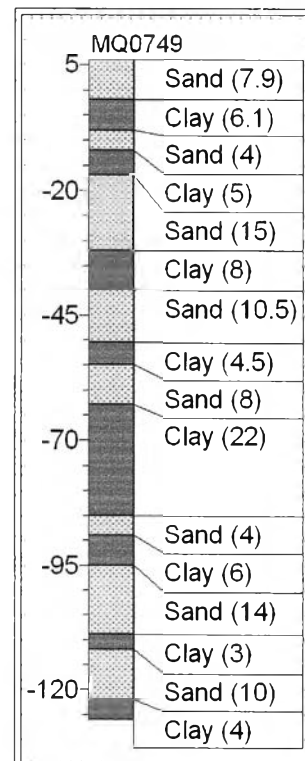
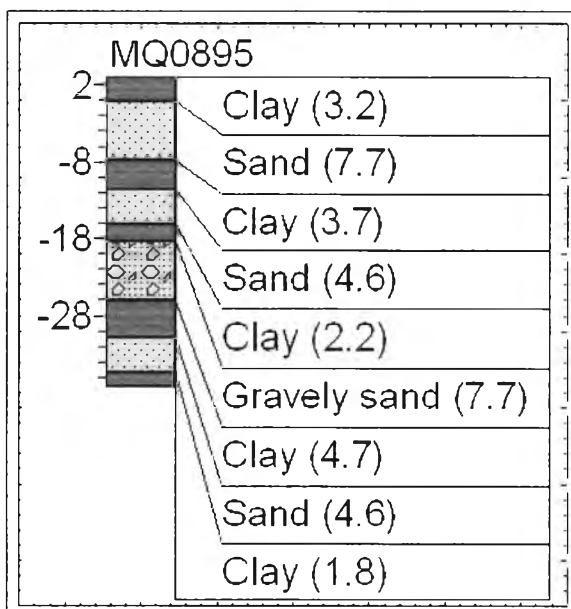
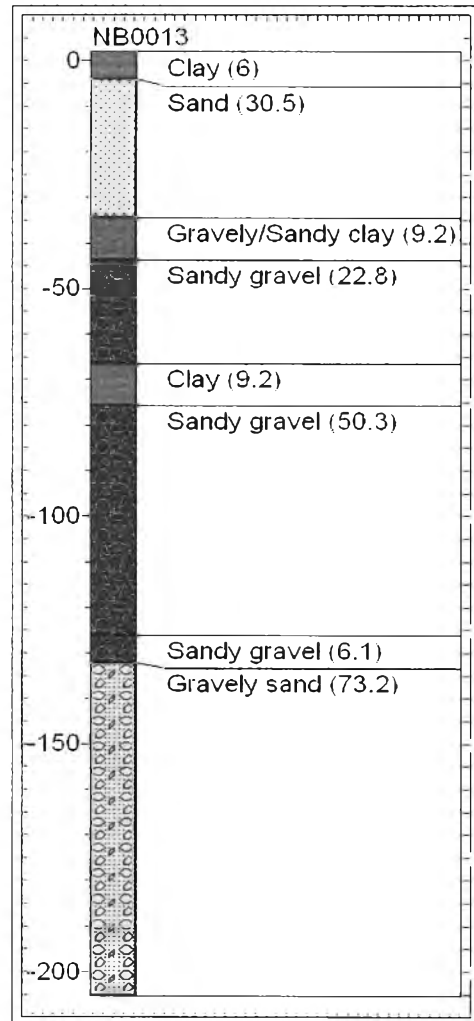
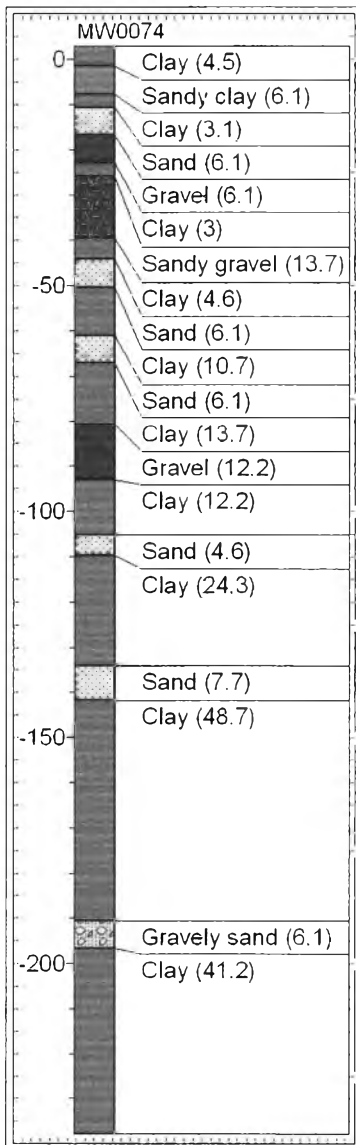


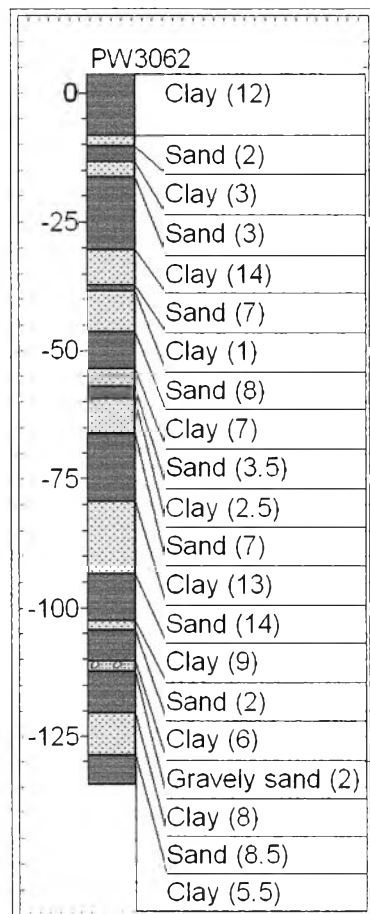
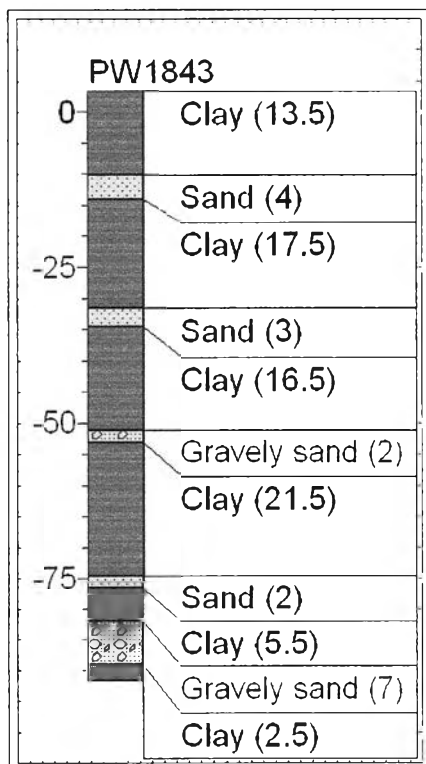
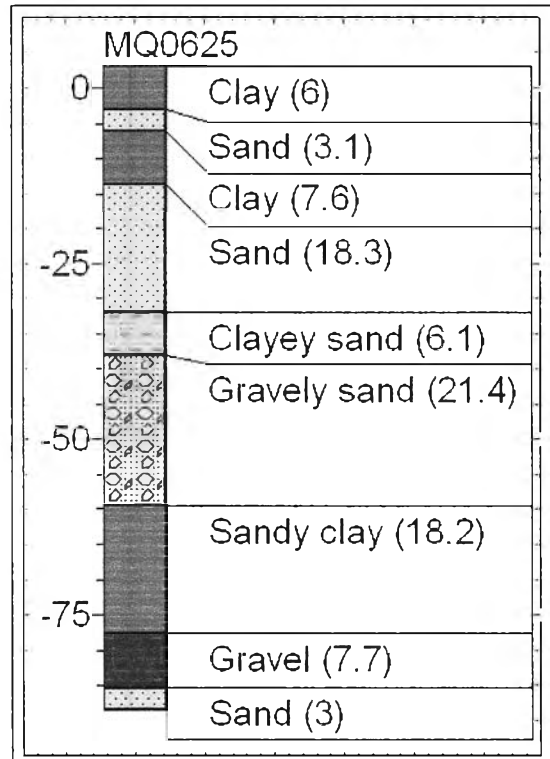
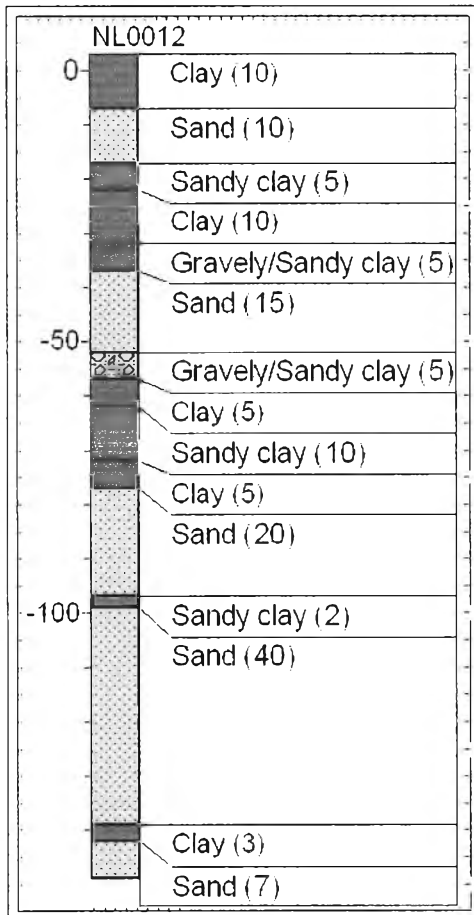


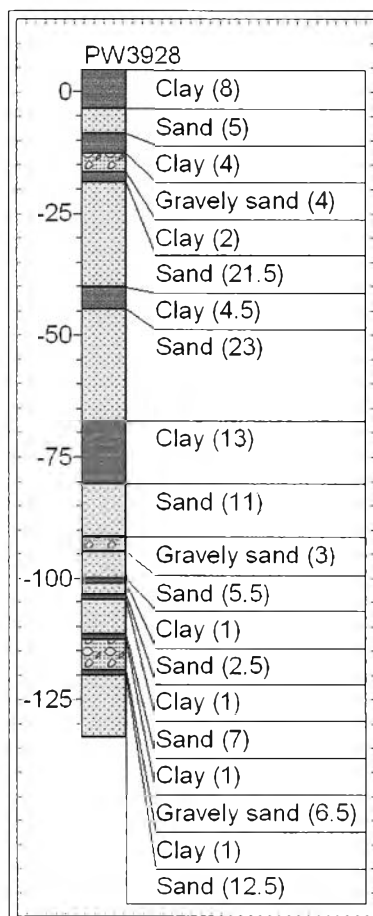
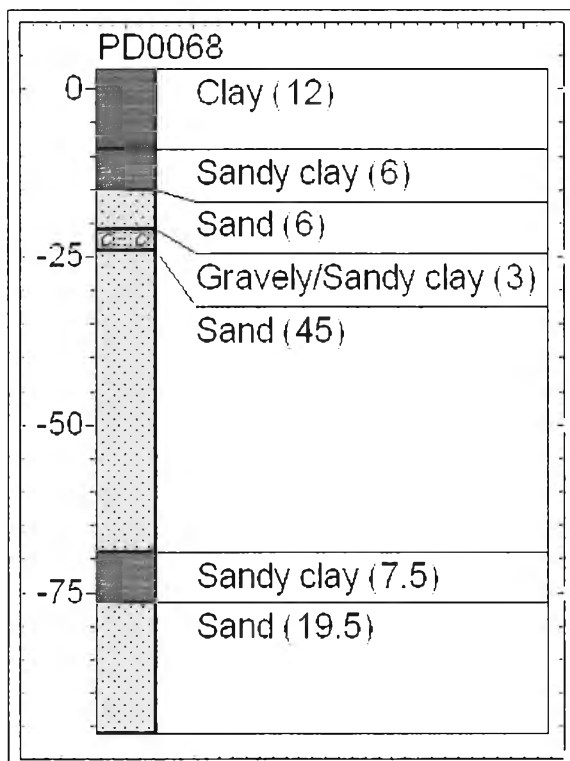
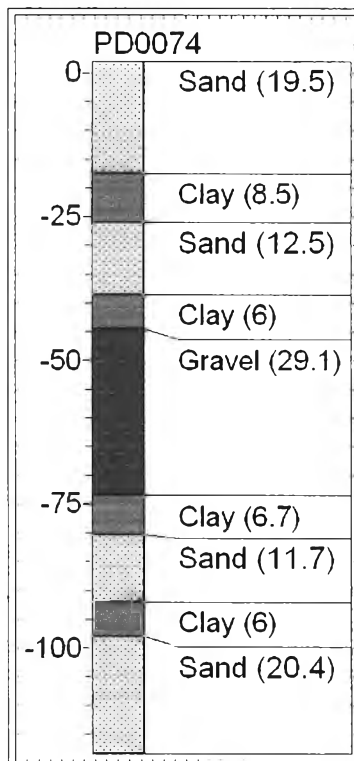
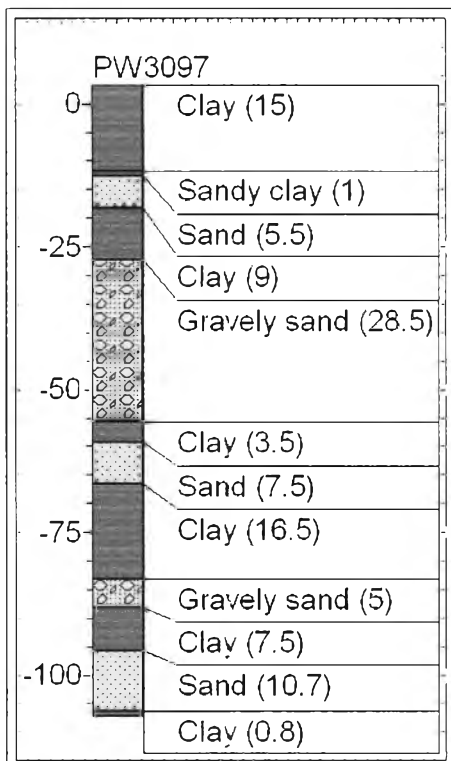


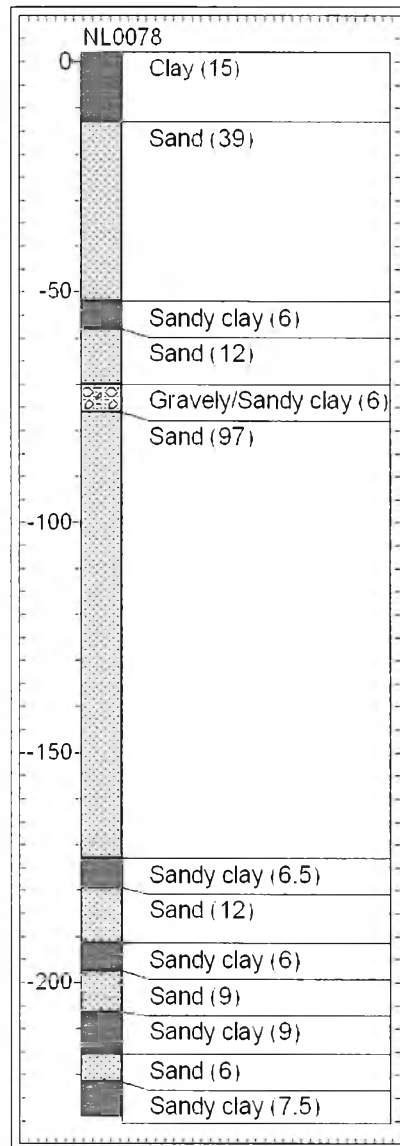
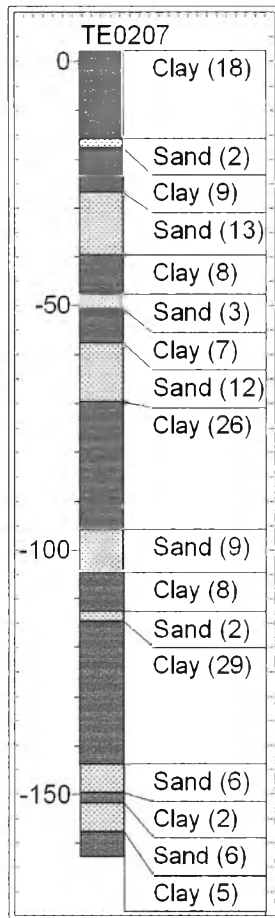


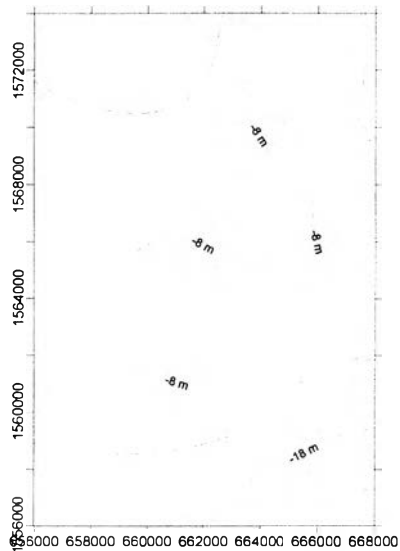




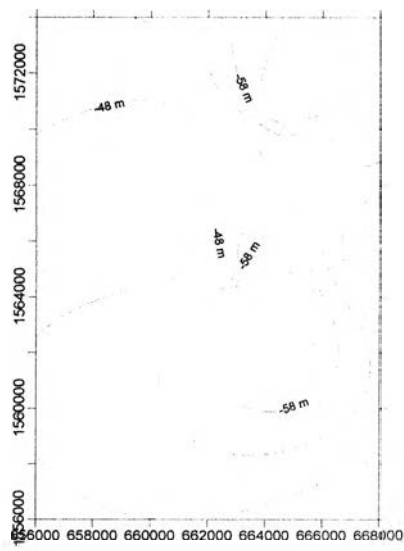




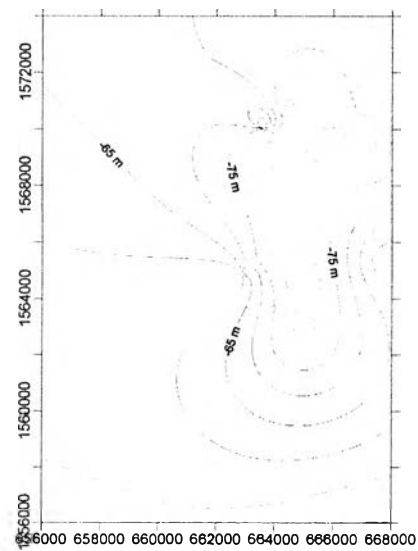




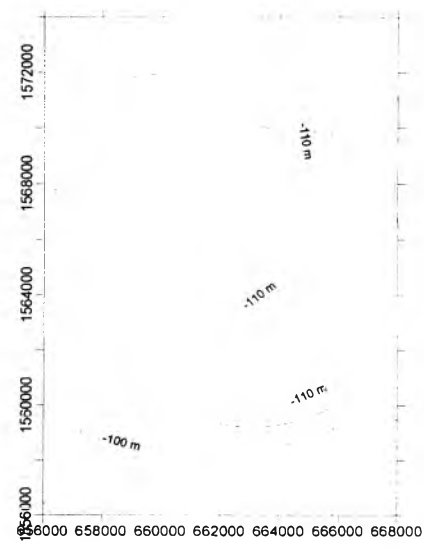
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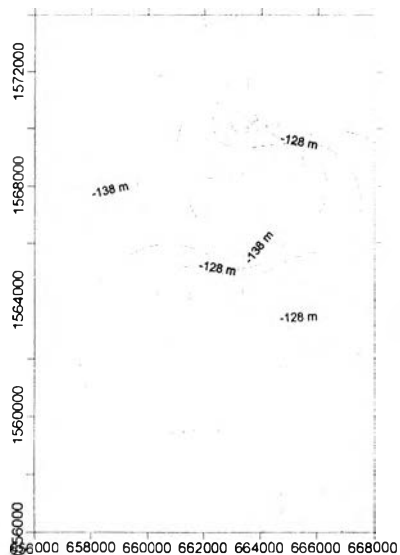
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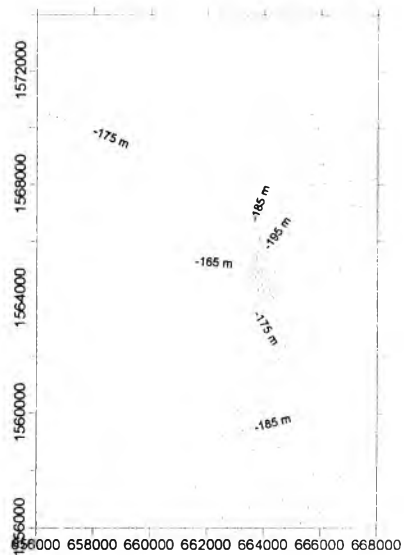
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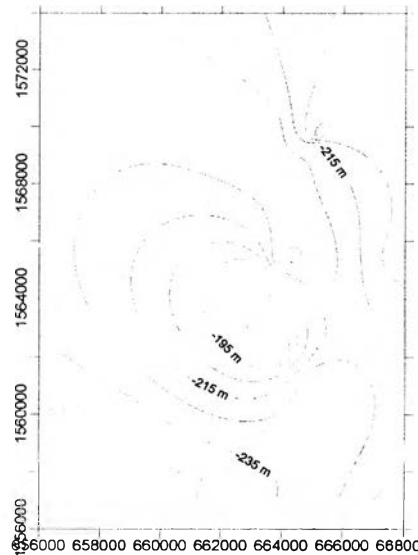
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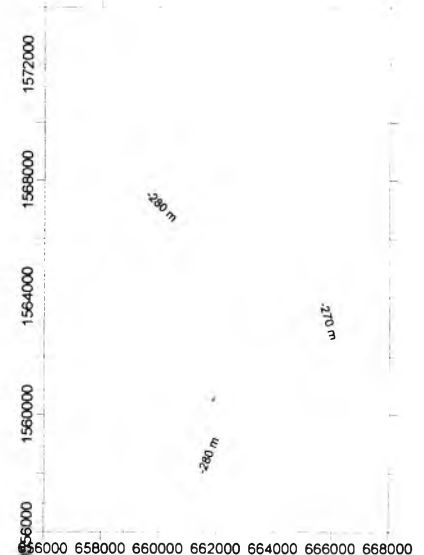
E. Layer 6



F. Layer 7



G. Layer 8



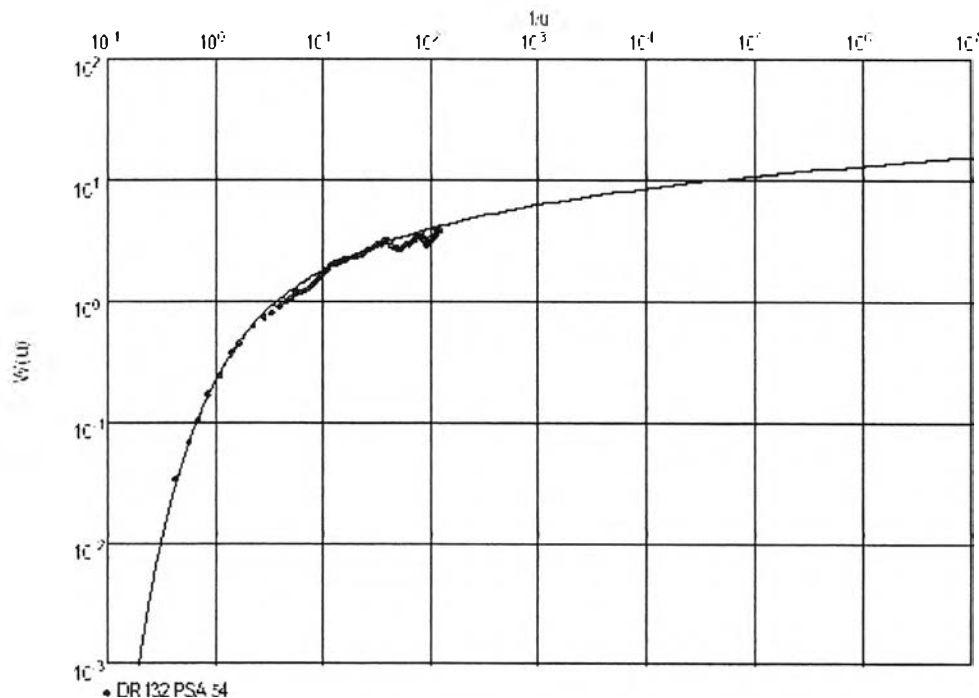
H. Layer 9

Figure 1. Surface elevation maps each layer.

# APPENDIX 2

PUMPING TEST DATA AND ANALYSIS

MINING & PETROLEUM DEPT. CHULALONGKORN UNIVERSITY 1155 Phra Athit Road, Bangkok 10330 Thailand Tel: 00221820191 Fax: 0022181000	Pumping test analysis Theis analysis method Confined aquifer	Date: 11.13.2003	Page 1
		Project KHLONG PHRAYA BALE	
		Evaluated by: WAHYU WILOPO	
Pumping Test No. 2		Test conducted on: 17.10.2003	
DR 132 PSA 54			
Discharge 39,000 m <sup>3</sup> /h			



Transmissivity (m<sup>2</sup>/min):  $1.77 \times 10^{-1}$

Hydraulic conductivity (m/min):  $1.48 \times 10^{-2}$

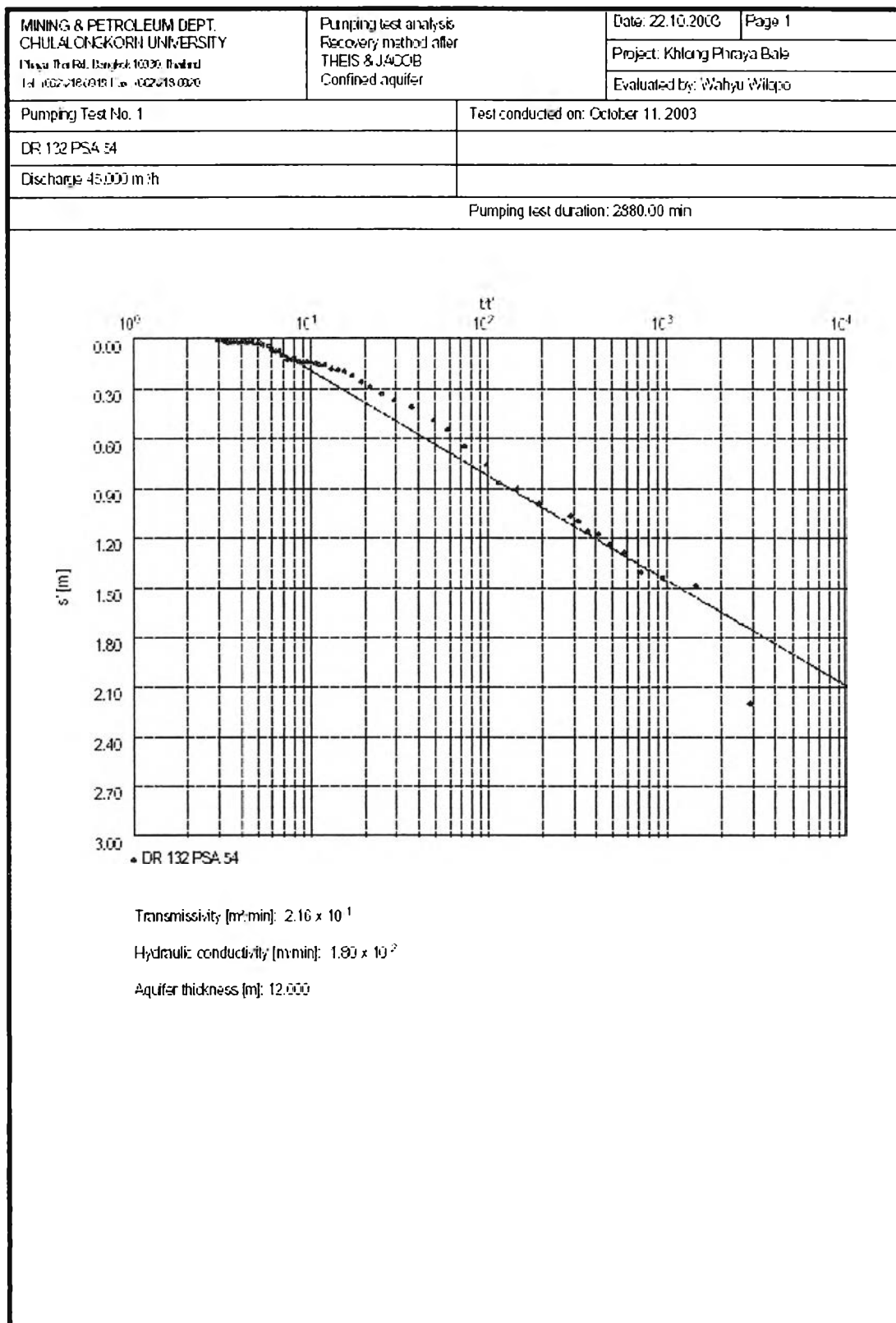
Aquifer thickness (m): 12,000

Storativity:  $1.26 \times 10^{-1}$



MINING & PETROLEUM DEPT. CHULALONGKORN UNIVERSITY 11331 Thailand, Bangkok 10300 Thailand Tel: 662-142-1019 Fax: 662-213-0000		Pumping test analysis This analysis method Confined aquifer		Date: 11.13.2008	Page 2
Pumping Test No. 2		Test conducted on: 17.10.2003			
DR 132 PSA 54		DR 132 PSA 54			
Discharge 39.000 m <sup>3</sup> /h		Distance from the pumping well 446.000 m			
Static water level: 39.300 m below datum					
	Pumping test duration [min]	Water level [m]	Drawdown [m]		
2	1.00	39.350	0.000		
3	2.00	39.350	0.000		
4	3.00	39.350	0.000		
5	4.00	39.350	0.000		
6	5.00	39.350	0.000		
7	6.00	39.350	0.000		
8	7.00	39.350	0.000		
9	8.00	39.350	0.000		
10	9.00	39.350	0.000		
11	10.00	39.350	0.000		
12	15.00	39.370	0.010		
13	20.00	39.380	0.020		
14	25.00	39.390	0.030		
15	30.00	39.410	0.050		
16	40.00	39.430	0.070		
17	50.00	39.470	0.110		
18	60.00	39.490	0.130		
19	80.00	39.540	0.180		
20	100.00	39.570	0.210		
21	120.00	39.590	0.230		
22	140.00	39.620	0.290		
23	160.00	39.650	0.290		
24	180.00	39.670	0.310		
25	200.00	39.690	0.330		
26	220.00	39.700	0.340		
27	240.00	39.720	0.360		
28	260.00	39.730	0.370		
29	280.00	39.750	0.390		
30	300.00	39.770	0.410		
31	320.00	39.800	0.440		
32	340.00	39.830	0.470		
33	360.00	39.850	0.490		
34	380.00	39.880	0.520		
35	400.00	39.900	0.540		
36	420.00	39.930	0.570		
37	450.00	39.950	0.590		
38	480.00	39.990	0.600		
39	510.00	39.970	0.610		
40	540.00	39.990	0.630		
41	570.00	40.000	0.640		
42	600.00	40.010	0.650		
43	660.00	40.030	0.670		
44	720.00	40.040	0.680		
45	780.00	40.060	0.700		
46	840.00	40.080	0.720		
47	900.00	40.110	0.750		
48	960.00	40.140	0.790		
49	1020.00	40.160	0.800		
50	1080.00	40.190	0.830		

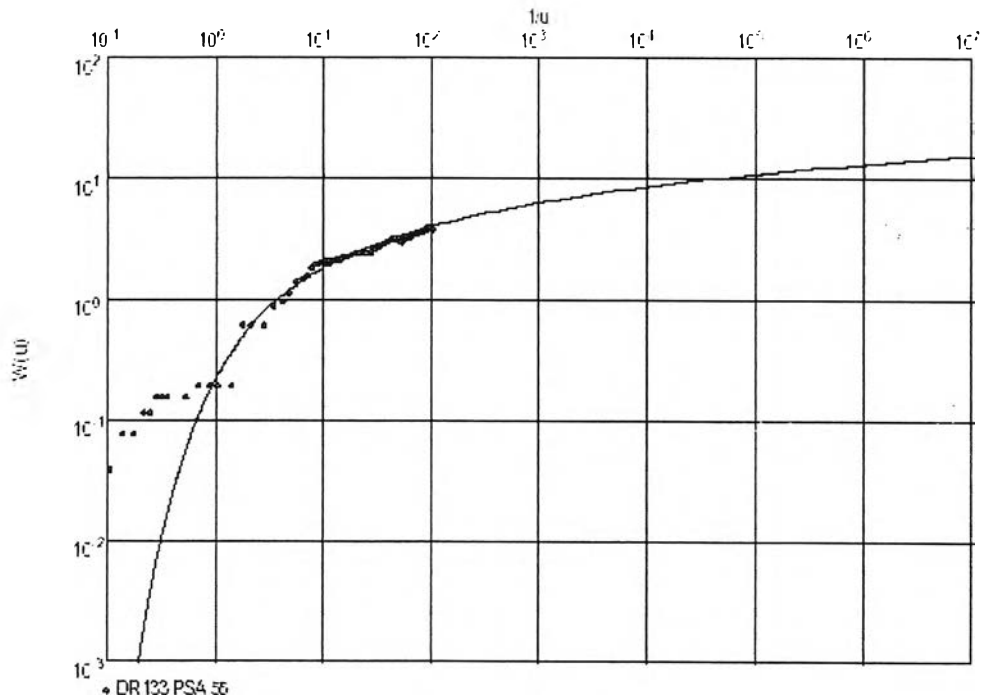
MINING & PETROLEUM DEPT. CHULALONGKORN UNIVERSITY 11321 Thail Rd., Bangkok 10330, Thailand Tel: +6622754913 Fax: +6622754909		Pumping test analysis Theis analysis method Confined aquifer		Date: 11.13.2003	Page 3
Pumping Test No. 2		Test conducted on: 17.10.2003			
DR 132 PSA 54		DR 132 PSA 54			
Discharge 39.000 m <sup>3</sup> /h		Distance from the pumping well 446.000 m			
Static water level: 39.300 m below datum					
	Pumping test duration [min]	Water level [m]	Drawdown [m]		
51	1140.00	40.210	0.850		
52	1200.00	40.230	0.870		
53	1250.00	40.250	0.890		
54	1320.00	40.290	0.900		
55	1380.00	40.270	0.910		
56	1440.00	40.290	0.900		
57	1500.00	40.240	0.890		
58	1560.00	40.200	0.840		
59	1620.00	40.190	0.800		
60	1680.00	40.190	0.800		
61	1740.00	40.130	0.790		
62	1800.00	40.140	0.780		
63	1860.00	40.150	0.790		
64	1920.00	40.180	0.820		
65	2040.00	40.190	0.830		
66	2100.00	40.210	0.850		
67	2220.00	40.220	0.890		
68	2280.00	40.240	0.880		
69	2340.00	40.250	0.890		
70	2400.00	40.290	0.920		
71	2460.00	40.290	0.930		
72	2520.00	40.310	0.950		
73	2580.00	40.340	0.980		
74	2640.00	40.350	0.990		
75	2700.00	40.380	1.020		
76	2760.00	40.400	1.040		
77	2820.00	40.410	1.060		
78	2880.00	40.410	1.060		
79	2940.00	40.420	1.090		
80	3000.00	40.390	1.000		
81	3060.00	40.310	0.960		
82	3120.00	40.270	0.910		
83	3180.00	40.230	0.870		
84	3240.00	40.210	0.830		
85	3300.00	40.230	0.870		
86	3360.00	40.270	0.910		
87	3420.00	40.290	0.900		
88	3480.00	40.300	0.940		
89	3540.00	40.270	0.910		
90	3600.00	40.280	0.920		
91	3660.00	40.300	0.940		
92	3720.00	40.310	0.960		
93	3780.00	40.320	0.960		
94	3840.00	40.350	0.990		
95	3900.00	40.380	1.020		
96	3960.00	40.390	1.030		
97	4020.00	40.410	1.050		
98	4080.00	40.490	1.120		
99	4260.00	40.500	1.140		
100	4320.00	40.500	1.140		



MINING & PETROLEUM DEPT CHULALONGKORN UNIVERSITY 1059 Jittrajit Rd., Bangkok, 10395 Thailand Tel: 002-218-0919 Fax: 002-218-0909		Pumping test analysis Recovery method after THEIS & JACOB Confined aquifer		Date: 22.10.2003	Page 2
Pumping Test No. 1		Test conducted on: October 11, 2003			
DR 132 PSA 54		DR 132 PSA 54			
Discharge 45,000 m <sup>3</sup> /h					
Static water level: 39,510 m below datum		Pumping test duration: 2580.00 min			
	Time from end of pumping [min]	Water level [m]	Residual drawdown [m]		
1	1.00	41.710	2.200		
2	2.00	41.000	1.490		
3	3.00	40.900	1.450		
4	4.00	40.920	1.410		
5	5.00	40.800	1.290		
6	6.00	40.750	1.240		
7	7.00	40.660	1.180		
8	8.00	40.670	1.160		
9	9.00	40.610	1.100		
10	10.00	40.590	1.070		
11	15.00	40.510	1.000		
12	20.00	40.410	0.900		
13	25.00	40.390	0.870		
14	30.00	40.270	0.760		
15	40.00	40.190	0.680		
16	50.00	40.090	0.580		
17	60.00	40.000	0.490		
18	80.00	39.920	0.410		
19	100.00	39.890	0.370		
20	120.00	39.840	0.330		
21	140.00	39.800	0.290		
22	160.00	39.770	0.260		
23	180.00	39.730	0.220		
24	200.00	39.710	0.200		
25	220.00	39.700	0.190		
26	240.00	39.690	0.180		
27	260.00	39.670	0.160		
28	280.00	39.670	0.160		
29	300.00	39.660	0.150		
30	320.00	39.650	0.140		
31	340.00	39.650	0.140		
32	360.00	39.650	0.140		
33	380.00	39.650	0.140		
34	400.00	39.640	0.130		
35	420.00	39.640	0.130		
36	450.00	39.640	0.130		
37	480.00	39.610	0.100		
38	510.00	39.590	0.080		
39	540.00	39.590	0.080		
40	570.00	39.570	0.060		
41	600.00	39.560	0.050		
42	660.00	39.550	0.040		
43	720.00	39.540	0.030		
44	780.00	39.530	0.020		
45	840.00	39.530	0.020		
46	900.00	39.530	0.020		
47	960.00	39.530	0.020		
48	1020.00	39.530	0.020		
49	1080.00	39.530	0.020		
50	1140.00	39.530	0.020		



MINING & PETROLEUM DEPT. CHULALONGKORN UNIVERSITY 113, Patana 1 Road, Bangkok 10330 Thailand Tel: 662-218-2181 Fax: 662-218-0026	Pumping test analysis Theis analysis method Confined aquifer	Date: 11.13.2003	Page 1
		Project: KHLONG PHRAYA BALE	
		Evaluated by: WAHYU WILOPO	
Pumping Test No. 1		Test conducted on: 11.10.2003	
DR 133 PSA 56			
Discharge 45,000 m <sup>3</sup> /h			



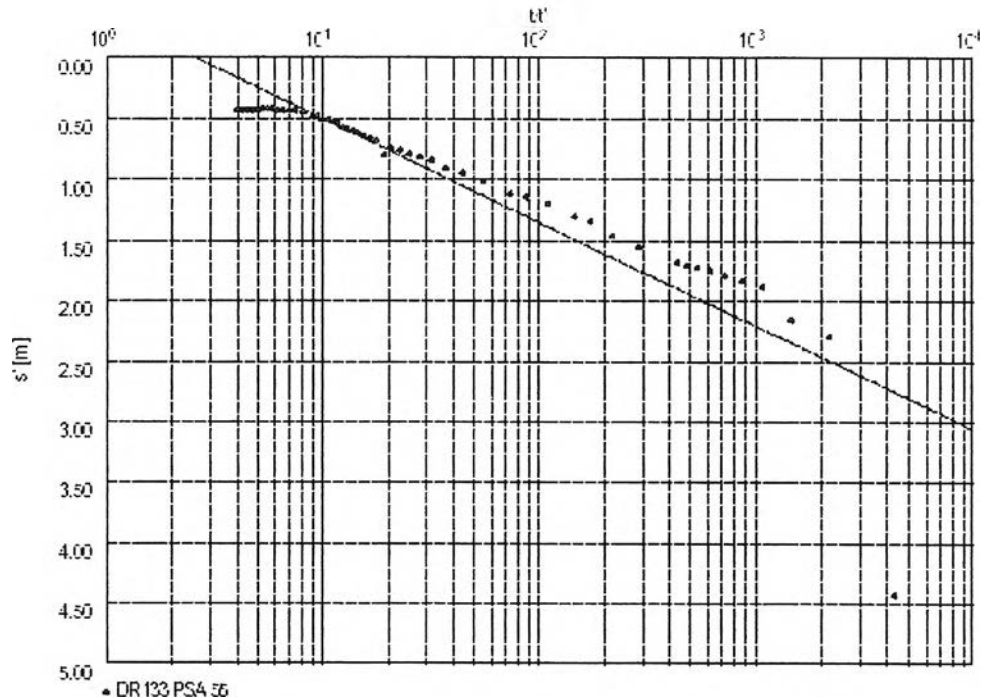
Transmissivity [m<sup>2</sup>/min]:  $2.27 \times 10^{-1}$   
 Hydraulic conductivity [m/min]:  $1.93 \times 10^{-2}$   
 Aquifer thickness [m]: 12,000  
 Storativity:  $1.29 \times 10^{-4}$

MINING & PETROLEUM DEPT. CHULALONGKORN UNIVERSITY 1 Phasi Charoen Rd., Bangkok 10330 Thailand Tel: (0)22160911 to (0)22160922		Pumping test analysis Theis analysis method Confined aquifer		Date: 11.13.2003	Page 2
Pumping Test No. 1		Test conducted on: 11.10.2003			
DR 133 PSA 55		DR133 PSA 55			
Discharge 45,000 m <sup>3</sup> /h		Distance from the pumping well 445,000 m			
Static water level: 38.400 m below datum					
	Pumping test duration [min]	Water level [m]	Drawdown [m]		
1	1.00	38.490	0.090		
2	2.00	38.470	0.010		
3	3.00	38.470	0.010		
4	4.00	38.490	0.020		
5	5.00	38.490	0.020		
6	6.00	38.490	0.030		
7	7.00	38.490	0.030		
8	8.00	38.500	0.040		
9	9.00	38.500	0.040		
10	10.00	38.500	0.040		
11	15.00	38.500	0.040		
12	20.00	38.510	0.050		
13	25.00	38.510	0.050		
14	30.00	38.510	0.050		
15	40.00	38.510	0.050		
16	50.00	38.620	0.160		
17	60.00	38.620	0.160		
18	80.00	38.620	0.160		
19	100.00	38.650	0.230		
20	120.00	38.710	0.290		
21	140.00	38.750	0.290		
22	160.00	38.820	0.360		
23	180.00	38.840	0.380		
24	200.00	38.870	0.410		
25	220.00	38.930	0.470		
26	240.00	38.970	0.510		
27	260.00	38.950	0.520		
28	280.00	38.990	0.530		
29	300.00	38.990	0.530		
30	320.00	38.990	0.530		
31	340.00	39.000	0.540		
32	360.00	39.010	0.550		
33	380.00	39.010	0.550		
34	400.00	39.020	0.560		
35	420.00	39.030	0.570		
36	450.00	39.040	0.580		
37	480.00	39.050	0.590		
38	510.00	39.050	0.600		
39	540.00	39.050	0.620		
40	570.00	39.050	0.620		
41	600.00	39.050	0.620		
42	650.00	39.050	0.620		
43	720.00	39.050	0.630		
44	780.00	39.110	0.650		
45	840.00	39.140	0.680		
46	900.00	39.170	0.710		
47	960.00	39.190	0.730		
48	1020.00	39.210	0.750		
49	1080.00	39.230	0.770		
50	1140.00	39.250	0.800		





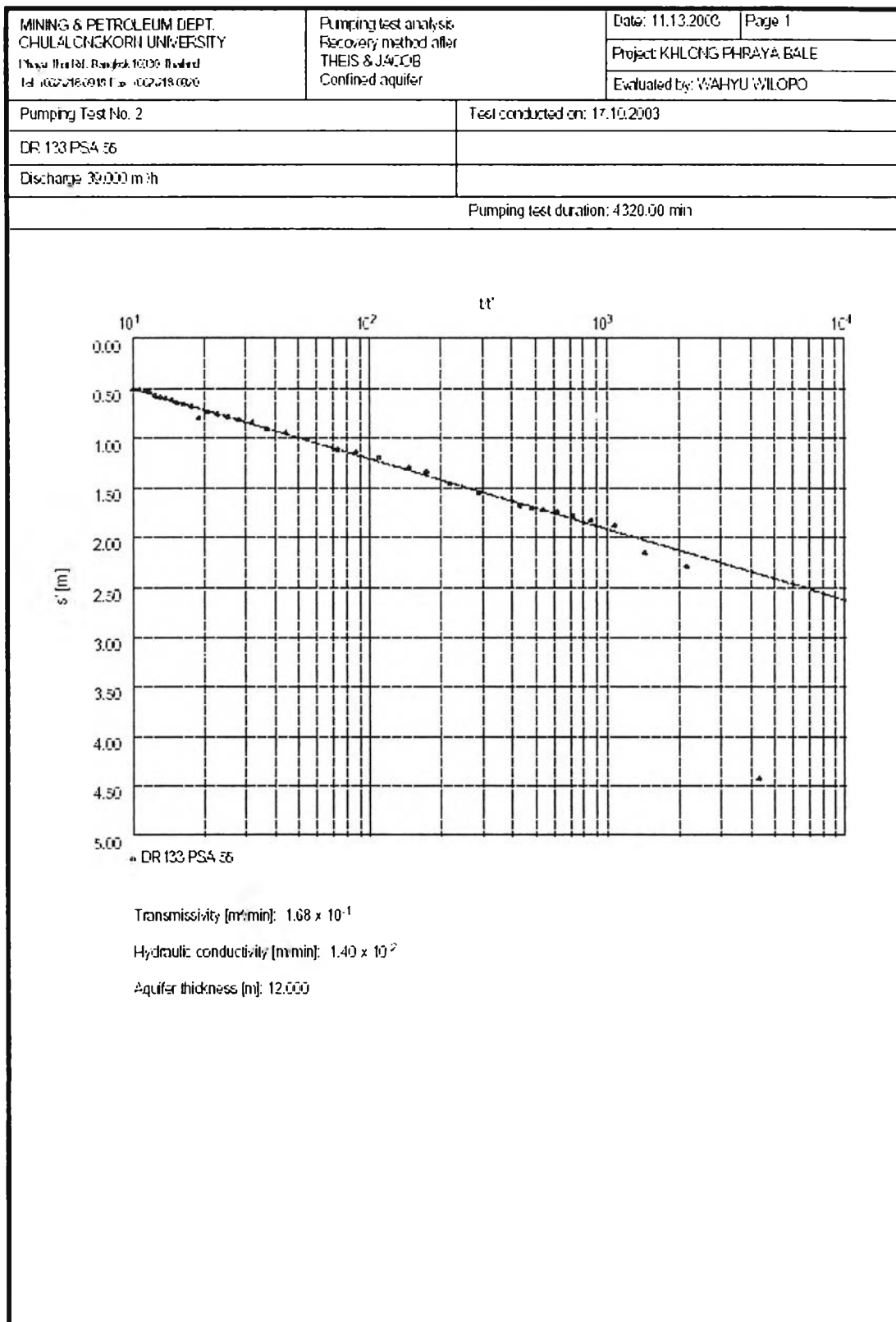
MINING & PETROLEUM DEPT. CHULALONGKORN UNIVERSITY 119, Phra Athit Rd., Bangkok 10200, Thailand Tel. +662 218 0919 Fax. +662 218 0920	Pumping test analysis Recovery method after THEIS & JACOB Confined aquifer	Date: 11.13.2003	Page 1
		Project: KHLONG PHRAYA BALE	
		Evaluated by: WAHYU WILOPO	
Pumping Test No. 2		Test conducted on: 17.10.2003	
DR 133 PSA 56			
Discharge: 39,000 m <sup>3</sup> /h			
Pumping test duration: 4320.00 min			



Transmissivity [m<sup>2</sup>/min]:  $1.39 \times 10^{-1}$   
 Hydraulic conductivity [m/min]:  $1.15 \times 10^{-2}$   
 Aquifer thickness [m]: 12,000

MINING & PETROLEUM DEPT. CHULALONGKORN UNIVERSITY 1055 Phra Athit Rd., Bangkok 10300 Thailand Tel: +66225120018 Fax: +66225120020		Pumping test analysis Recovery method after THEIS & JACOB Confined aquifer		Date: 11.13.2008 Page 2
				Project: KHLONG PHRAYA BALE
				Evaluated by: WAHYU WILOPO
Pumping Test No. 2			Test conducted on: 17.10.2003	
DR 133 PSA 56			DR 133 PSA 56	
Discharge 39,000 m <sup>3</sup> /h				
Static water level: 39.460 m below datum			Pumping test duration: 4320.00 min	
	Time from end of pumping [min]	Water level [m]	Residual drawdown [m]	
1	1.00	42.860	4.400	
2	2.00	40.790	2.300	
3	3.00	40.630	2.170	
4	4.00	40.350	1.890	
5	5.00	40.300	1.840	
6	6.00	40.250	1.790	
7	7.00	40.220	1.760	
8	8.00	40.190	1.730	
9	9.00	40.170	1.710	
10	10.00	40.150	1.690	
11	15.00	40.020	1.560	
12	20.00	39.920	1.460	
13	25.00	39.810	1.350	
14	30.00	39.760	1.300	
15	40.00	39.690	1.230	
16	50.00	39.610	1.150	
17	60.00	39.580	1.120	
18	80.00	39.470	1.010	
19	100.00	39.410	0.950	
20	120.00	39.370	0.910	
21	140.00	39.300	0.840	
22	160.00	39.280	0.820	
23	180.00	39.250	0.790	
24	200.00	39.220	0.760	
25	220.00	39.200	0.740	
26	240.00	39.200	0.800	
27	260.00	39.190	0.890	
28	280.00	39.120	0.860	
29	300.00	39.100	0.840	
30	320.00	39.080	0.820	
31	340.00	39.070	0.810	
32	360.00	39.050	0.800	
33	380.00	39.040	0.800	
34	400.00	39.000	0.840	
35	420.00	38.960	0.830	
36	450.00	38.980	0.820	
37	480.00	38.970	0.810	
38	510.00	38.950	0.790	
39	540.00	38.950	0.790	
40	600.00	38.910	0.750	
41	660.00	38.890	0.730	
42	720.00	38.860	0.700	
43	780.00	38.890	0.730	
44	840.00	38.820	0.660	
45	900.00	38.890	0.720	
46	960.00	38.880	0.710	
47	1020.00	38.890	0.720	
48	1080.00	38.890	0.720	
49	1140.00	38.890	0.720	
50	1200.00	38.890	0.720	







# APPENDIX 3

MONITORING WELLS DATA

Observation Well PD0068

Northing: 665126  
 Easting : 1569478

No.	Date Measured	GWL (m.SWL)
1	1/13/1993 12:00	15.85
2	2/19/1993 12:00	16.08
3	3/22/1993 12:00	16.08
4	4/26/1993 12:00	16.37
5	5/21/1993 12:00	16.54
6	6/1/1993 12:00	16.91
7	7/22/1993 12:00	16.92
8	8/23/1993 12:00	16.84
9	9/15/1993 12:00	16.88
10	10/12/1993 12:00	16.83
11	11/23/1993 12:00	16.89
12	12/15/1993 12:00	16.94
13	1/24/1994 12:00	17.12
14	2/17/1994 12:00	17.16
15	3/28/1994 12:00	17.21
16	4/29/1994 12:00	17.32
17	5/20/1994 12:00	17.44
18	6/27/1994 12:00	17.49
19	7/6/1994 12:00	17.55
20	8/15/1994 12:00	17.61
21	9/26/1994 12:00	17.73
22	10/17/1994 12:00	17.83
23	11/1/1994 12:00	17.48
24	12/20/1994 12:00	17.5
25	1/26/1995 12:00	17.71
26	2/20/1995 12:00	17.82
27	3/15/1995 12:00	17.94
28	4/24/1995 12:00	18.13
29	5/12/1995 12:00	18
30	6/6/1995 12:00	17.85
31	7/10/1995 12:00	17.9
32	9/26/1995 12:00	18.33
33	12/21/1995 12:00	17.98
34	1/24/1996 12:00	18.28
35	2/27/1996 12:00	18.72
36	3/20/1996 12:00	18.98
37	4/23/1996 12:00	19.25
38	5/20/1996 12:00	19.43
39	6/14/1996 12:00	19.6
40	7/13/1996 12:00	19.82
41	8/14/1996 12:00	19.98
42	9/9/1996 12:00	19.89
43	10/20/1996 12:00	19.42
44	11/19/1996 12:00	18.95
45	12/20/1996 12:00	18.97
46	1/21/1997 12:00	19.71
47	2/20/1997 12:00	19.81
48	3/20/1997 12:00	19.99
49	4/7/1997 12:00	20.77
50	5/28/1997 12:00	21.05
51	6/2/1997 12:00	20.77
52	7/8/1997 12:00	21.4
53	8/11/1997 12:00	21.39
54	10/21/1997 12:00	21.32
55	11/19/1997 12:00	21.36

No.	Date Measured	GWL (m.SWL)
56	12/22/1997 12:00	21.49
57	1/22/1998 12:00	21.21
58	2/22/1998 12:00	21.14
59	4/22/1998 12:00	21.68
60	5/19/1998 12:00	21.79
61	6/12/1998 12:00	21.84
62	6/14/1999 10:40	23.42
63	7/14/1999 13:55	23.42
64	8/18/1999 12:40	23.48
65	9/17/1999 12:40	21.6
66	10/25/1999 14:20	21.66
67	11/7/1999 12:30	21.63
68	12/6/1999 12:00	21.64
69	1/18/2000 12:00	19.96
70	2/14/2000 12:00	20.11
71	3/7/2000 12:00	20.13
72	4/5/2000 12:00	20.19
73	5/16/2000 14:20	20.1
74	6/12/2000 11:10	20.98
75	7/13/2000 13:45	20.91
76	8/11/2000 14:10	20.9
77	9/11/2000 13:45	20.9
78	10/16/2000 14:00	20.85
79	11/16/2000 13:00	20.22
80	12/14/2000 14:10	20.15
81	1/10/2001 13:55	20
82	2/13/2001 13:45	19.08
83	3/14/2001 12:55	20.38
84	4/19/2001 13:00	20.42
85	5/17/2001 13:30	20.53
86	6/14/2001 14:10	20.34
87	7/16/2001 9:40	20.82
88	8/17/2001 11:48	20.8
89	9/27/2001 11:00	20.78
90	10/17/2001 12:00	20.41
91	11/27/2001 11:00	20.66
92	12/21/2001 14:20	19.96
93	1/18/2002 14:30	19.72
94	2/12/2002 14:20	20.15
95	3/19/2002 13:30	20.21
96	4/12/2002 10:10	20.68
97	5/15/2002 10:20	20.56
98	6/17/2002 12:10	20.51
99	8/6/2002 12:00	20.74
100	9/5/2002 12:00	20.74
101	10/7/2002 12:00	20.71
102	11/6/2002 12:00	20.22
103	12/6/2002 12:00	20.65
104	1/9/2003 12:00	19.37
105	2/14/2003 12:00	19.46
106	5/14/2003 11:30	20.1
107	6/18/2003 11:30	20.2
108	7/11/2003 13:10	20.02
109	8/13/2003 13:20	20
110	9/10/2003 11:35	20.15

Observation Well PD0074

Northing: 663979  
 Easting : 1562311

No.	Date Measured	GWL (m.SWL)
1	11/20/1992 12:00	18.14
2	12/15/1992 12:00	18.03
3	1/20/1993 12:00	18.04
4	2/17/1993 12:00	18.06
5	3/10/1993 12:00	18.42
6	5/11/1993 12:00	18.43
7	5/16/1993 12:00	18.4
8	6/10/1993 12:00	18.52
9	7/23/1993 12:00	18.55
10	8/19/1993 12:00	18.4
11	9/22/1993 12:00	18.4
12	10/11/1993 12:00	18.54
13	12/27/1993 12:00	18.51
14	1/26/1994 12:00	18.38
15	2/18/1994 12:00	18.37
16	3/30/1994 12:00	18.17
17	5/6/1994 12:00	18.14
18	6/28/1994 12:00	18.19
19	7/26/1994 12:00	18.1
20	8/17/1994 12:00	18
21	9/7/1994 12:00	17.56
22	11/4/1994 12:00	18.16
23	12/5/1994 12:00	22.16
24	1/4/1995 12:00	22.14
25	2/23/1995 12:00	20.93
26	3/23/1995 12:00	21.14
27	4/18/1995 12:00	21.39
28	5/19/1995 12:00	21.84
29	6/28/1995 12:00	22.2
30	7/20/1995 12:00	22.17
31	8/15/1995 12:00	22.03
32	12/22/1995 12:00	20.88
33	1/22/1996 12:00	20.74
34	2/22/1996 12:00	20.66
35	3/1/1996 12:00	22.57
36	4/23/1996 12:00	22.64
37	5/13/1996 12:00	22.47
38	6/13/1996 12:00	22.59
39	7/13/1996 12:00	22.49
40	8/16/1996 12:00	23.1
41	9/18/1996 12:00	23.12
42	11/13/1996 12:00	21.35
43	12/16/1996 12:00	21.35
44	1/10/1997 12:00	21.48
45	2/13/1997 12:00	23.57
46	3/13/1997 12:00	23.63
47	4/7/1997 12:00	24.14
48	5/22/1997 12:00	24.46
49	6/16/1997 12:00	24.54
50	7/11/1997 12:00	24.92
51	8/15/1997 12:00	24.84
52	10/24/1997 12:00	24.53
53	11/13/1997 12:00	24.53
54	12/12/1997 12:00	24.62
55	1/13/1998 12:00	24.44

No.	Date Measured	GWL (m.SWL)
56	2/12/1998 12:00	24.32
57	3/11/1998 12:00	24.5
58	4/9/1998 12:00	24.67
59	5/6/1998 12:00	24.52
60	6/14/1999 14:10	22.96
61	7/14/1999 12:30	22.9
62	9/17/1999 13:30	22.7
63	10/25/1999 12:40	22.79
64	1/17/2000 13:10	22.44
65	2/9/2000 12:00	22.46
66	3/10/2000 12:00	22.43
67	4/5/2000 12:00	22.49
68	5/16/2000 13:50	22.4
69	6/12/2000 12:00	23.27
70	7/13/2000 12:30	23.41
71	8/11/2000 12:20	23.51
72	9/11/2000 14:30	23.22
73	10/13/2000 12:30	22.85
74	11/14/2000 11:50	22.88
75	12/13/2000 11:50	22.84
76	1/12/2001 11:45	22.71
77	2/9/2001 11:30	22.24
78	3/13/2001 13:45	22.12
79	4/11/2001 13:55	22.11
80	5/15/2001 12:15	22.01
81	6/14/2001 12:36	22.88
82	7/12/2001 14:15	22.95
83	8/17/2001 10:05	22.89
84	9/4/2001 13:00	22.85
85	10/8/2001 10:00	22.72
86	11/2/2001 14:00	22.69
87	12/18/2001 12:00	22.89
88	1/24/2002 10:00	21.69
89	2/18/2002 12:30	22.13
90	3/15/2002 12:20	22.18
91	4/12/2002 10:50	22.23
92	5/15/2002 10:55	22.16
93	6/12/2002 10:40	22.13
94	8/6/2002 12:00	20.04
95	9/5/2002 12:00	20.12
96	10/7/2002 12:00	22.49
97	11/6/2002 12:00	23.37
98	12/6/2002 12:00	23.47
99	1/9/2003 12:00	24.85
100	2/14/2003 12:00	21.46
101	5/14/2003 12:10	22.03
102	6/18/2003 13:05	22.08
103	7/11/2003 14:05	21.84
104	8/13/2003 14:10	22.17
105	9/10/2003 13:00	22.01



Observation Well NL0012

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Northing: 665126  
 Easting : 1569478

No.	Date Measured	GWL (m.SWL)
1	1/13/1993 12:00	18.57
2	2/19/1993 12:00	18.8
3	3/22/1993 12:00	19.1
4	4/26/1993 12:00	19.13
5	5/21/1993 12:00	19.35
6	6/1/1993 12:00	19.45
7	7/22/1993 12:00	19.55
8	8/23/1993 12:00	19.53
9	9/15/1993 12:00	19.6
10	10/12/1993 12:00	19.92
11	11/23/1993 12:00	19.98
12	12/15/1993 12:00	20.01
13	1/24/1994 12:00	20.11
14	2/17/1994 12:00	20.23
15	3/28/1994 12:00	20.12
16	4/29/1994 12:00	20.23
17	5/20/1994 12:00	20.33
18	6/27/1994 12:00	20.41
19	7/6/1994 12:00	20.56
20	8/15/1994 12:00	20.62
21	9/26/1994 12:00	20.65
22	10/17/1994 12:00	20.75
23	11/1/1994 12:00	20.41
24	12/20/1994 12:00	20.22
25	1/26/1995 12:00	20.81
26	2/20/1995 12:00	20.81
27	3/15/1995 12:00	20.99
28	4/24/1995 12:00	21.12
29	5/21/1995 12:00	21.94
30	6/6/1995 12:00	22.23
31	2/27/1996 12:00	21.78
32	3/20/1996 12:00	22.1
33	4/23/1996 12:00	22.36
34	5/20/1996 12:00	22.57
35	6/14/1996 12:00	22.74
36	7/13/1996 12:00	22.98
37	8/14/1996 12:00	23.15
38	9/9/1996 12:00	23.09
39	10/20/1996 12:00	22.4
40	11/19/1996 12:00	22.27
41	12/20/1996 12:00	22.35
42	1/21/1997 12:00	22.9
43	2/20/1997 12:00	22.97
44	3/20/1997 12:00	23.12
45	4/7/1997 12:00	23.97
46	5/28/1997 12:00	24.32
47	6/2/1997 12:00	23.97
48	7/8/1997 12:00	24.7
49	8/11/1997 12:00	24.81
50	10/21/1997 12:00	24.65
51	11/19/1997 12:00	24.56
52	12/22/1997 12:00	24.59
53	1/22/1998 12:00	24.54
54	2/22/1998 12:00	24.63
55	3/19/1998 12:00	24.85

No.	Date Measured	GWL (m.SWL)
56	4/22/1998 12:00	24.9
57	5/19/1998 12:00	25.02
58	6/12/1998 12:00	25.13
59	6/14/1999 10:40	24.45
60	7/14/1999 13:55	24.45
61	8/18/1999 12:40	24.2
62	9/17/1999 12:40	23.66
63	10/25/1999 14:20	23.7
64	11/7/1999 12:30	23.6
65	12/6/1999 12:00	23.67
66	1/18/2000 12:00	23.26
67	2/14/2000 12:00	23.33
68	3/7/2000 12:00	23.42
69	4/5/2000 12:00	23.43
70	5/16/2000 14:20	23.33
71	6/12/2000 11:10	23.71
72	7/13/2000 13:45	23.65
73	8/11/2000 14:10	23.42
74	9/11/2000 13:45	23.77
75	10/16/2000 14:00	23.82
76	11/16/2000 13:00	23.36
77	12/14/2000 14:10	23.35
78	1/10/2001 13:55	23.02
79	2/13/2001 13:45	23.01
80	3/14/2001 12:55	23.34
81	4/19/2001 13:00	23.5
82	5/17/2001 13:30	23.61
83	6/14/2001 14:10	23.88
84	7/16/2001 9:40	23.91
85	8/17/2001 11:48	24
86	9/27/2001 11:00	23.99
87	10/17/2001 12:00	23.57
88	11/27/2001 11:00	23.83
89	12/21/2001 14:20	23.08
90	1/18/2002 14:30	22.87
91	2/12/2002 14:20	23.2
92	3/19/2002 13:30	23.28
93	4/12/2002 10:10	23.66
94	5/15/2002 10:20	23.55
95	6/17/2002 12:10	23.48
96	8/6/2002 12:00	23.59
97	9/5/2002 12:00	23.54
98	10/7/2002 12:00	22.98
99	11/6/2002 12:00	23.27
100	12/6/2002 12:00	23.66
101	1/9/2003 12:00	22.58
102	2/14/2003 12:00	22.4
103	5/14/2003 11:30	22.86
104	6/18/2003 11:30	22.9
105	7/11/2003 13:10	22.83
106	8/13/2003 13:20	22.78
107	9/10/2003 11:35	22.88

Observation Well NL0078

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Northing: 663979  
 Easting : 1562311

No.	Date Measured	GWL (m.SWL)
1	1/20/1993 12:00	19
2	2/17/1993 12:00	19.01
3	3/10/1993 12:00	18.99
4	4/16/1993 12:00	18.91
5	5/11/1993 12:00	18.93
6	6/10/1993 12:00	19.11
7	7/23/1993 12:00	19.19
8	8/19/1993 12:00	19.29
9	10/11/1993 12:00	19.19
10	12/27/1993 12:00	19.32
11	1/26/1994 12:00	19.27
12	2/18/1994 12:00	19.14
13	3/30/1994 12:00	19.2
14	4/15/1994 12:00	19.18
15	5/6/1994 12:00	19.03
16	6/27/1994 12:00	19.14
17	7/26/1994 12:00	19.12
18	8/17/1994 12:00	19.08
19	10/7/1994 12:00	19.41
20	11/9/1994 12:00	19.1
21	12/5/1994 12:00	19.1
22	1/4/1995 12:00	21.03
23	2/23/1995 12:00	21.35
24	3/23/1995 12:00	21.49
25	4/18/1995 12:00	21.95
26	5/19/1995 12:00	22.36
27	6/28/1995 12:00	22.55
28	7/20/1995 12:00	22.59
29	8/15/1995 12:00	22.58
30	12/22/1995 12:00	21.42
31	1/22/1996 12:00	21.54
32	2/22/1996 12:00	21.56
33	3/22/1996 12:00	23.24
34	4/23/1996 12:00	23.48
35	5/13/1996 12:00	23.58
36	6/19/1996 12:00	23.7
37	7/13/1996 12:00	23.74
38	9/18/1996 12:00	21.07
39	11/13/1996 12:00	12.1
40	12/16/1996 12:00	12.13
41	1/10/1997 12:00	12.19
42	2/13/1997 12:00	12.27
43	3/13/1997 12:00	10.9
44	4/7/1997 12:00	11.07
45	5/22/1997 12:00	11.2
46	6/16/1997 12:00	11.33
47	7/11/1997 12:00	11.49
48	8/15/1997 12:00	11.47
49	10/24/1997 12:00	10.77
50	11/13/1997 12:00	10.87
51	12/12/1997 12:00	10.79
52	1/13/1998 12:00	10.62
53	2/12/1998 12:00	10.68
54	3/11/1998 12:00	10.84
55	4/9/1998 12:00	10.94

No.	Date Measured	GWL (m.SWL)
56	5/6/1998 12:00	10.83
57	6/14/1999 14:10	10.1
58	7/14/1999 12:30	10.15
59	8/20/1999 15:00	10.13
60	1/17/2000 13:10	9.61
61	2/9/2000 12:00	9.7
62	3/10/2000 12:00	9.7
63	4/5/2000 12:00	9.93
64	5/16/2000 13:50	9.63
65	6/12/2000 12:00	9.91
66	7/13/2000 12:30	9.73
67	8/11/2000 12:20	9.77
68	9/11/2000 14:30	9.51
69	10/13/2000 12:30	10.87
70	11/14/2000 11:50	10.89
71	12/13/2000 11:50	10.72
72	1/12/2001 11:45	10.62
73	2/9/2001 11:30	9.22
74	3/13/2001 13:45	9.34
75	4/11/2001 13:55	9.4
76	5/15/2001 12:15	9.41
77	6/14/2001 12:36	9.42
78	7/12/2001 14:15	9.55
79	8/17/2001 10:05	9.43
80	9/4/2001 13:00	9.5
81	10/8/2001 10:00	9.44
82	11/2/2001 14:00	9.38
83	12/18/2001 12:00	8.96
84	1/24/2002 10:00	9.08
85	2/18/2002 12:30	8.65
86	3/15/2002 12:20	8.69
87	4/12/2002 10:50	9.56
88	5/15/2002 10:55	9.48
89	6/12/2002 10:40	96.47
90	8/6/2002 12:00	8.97
91	9/5/2002 12:00	8.99
92	10/7/2002 12:00	9.51
93	11/6/2002 12:00	9.25
94	12/6/2002 12:00	9.45
95	1/9/2003 12:00	8.72
96	2/14/2003 12:00	8.91
97	5/14/2003 12:10	9.43
98	6/18/2003 13:05	9.49
99	7/11/2003 14:05	9.4
100	8/13/2003 14:10	9.2
101	9/10/2003 13:00	9.23

Observation Well NB0013

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Northing: 663979  
 Easting : 1562311

No.	Date Measured	GWL (m.SWL)
1	1/20/1993 12:00	20.35
2	2/17/1993 12:00	20.26
3	3/10/1993 12:00	20.67
4	4/16/1993 12:00	20.64
5	5/11/1993 12:00	20.67
6	6/10/1993 12:00	21.17
7	7/23/1993 12:00	21.37
8	8/19/1993 12:00	21.39
9	9/22/1993 12:00	21.09
10	10/7/1994 12:00	22.32
11	12/5/1994 12:00	23.05
12	1/4/1995 12:00	23.03
13	2/23/1995 12:00	23
14	3/23/1995 12:00	23.45
15	4/18/1995 12:00	23.59
16	5/19/1995 12:00	23.78
17	6/28/1995 12:00	23.66
18	7/20/1995 12:00	23.7
19	12/22/1995 12:00	23.42
20	1/22/1996 12:00	23.57
21	2/22/1996 12:00	23.62
22	3/22/1996 12:00	24.35
23	4/23/1996 12:00	24.55
24	5/13/1996 12:00	24.67
25	6/13/1996 12:00	24.8
26	7/13/1996 12:00	24.96
27	8/16/1996 12:00	25.04
28	9/14/1996 12:00	25.1
29	12/16/1996 12:00	25.26
30	1/20/1997 12:00	25.32
31	2/13/1997 12:00	25.1
32	3/13/1997 12:00	25.71
33	4/7/1997 12:00	25.74
34	5/22/1997 12:00	26.08
35	6/16/1997 12:00	26.26
36	7/11/1997 12:00	26.45
37	8/15/1997 12:00	26.49
38	10/24/1997 12:00	26.5
39	11/13/1997 12:00	26.33
40	12/12/1997 12:00	26.29
41	1/13/1998 12:00	26.25
42	2/12/1998 12:00	26.43
43	3/11/1998 12:00	26.37
44	4/9/1998 12:00	26.57
45	5/6/1998 12:00	26.48
46	6/14/1999 14:10	24.68
47	7/14/1999 12:30	24.42
48	8/20/1999 15:00	24.48
49	9/17/1999 13:30	24.54
50	10/25/1999 12:40	24.5
51	11/5/1999 12:30	26.52
52	12/14/1999 11:30	26.56
53	1/17/2000 13:10	24
54	2/9/2000 12:00	24.11
55	3/10/2000 12:00	24.19

No.	Date Measured	GWL (m.SWL)
56	4/5/2000 12:00	24.14
57	5/16/2000 13:50	24.1
58	6/12/2000 12:00	24.89
59	7/13/2000 12:30	24.75
60	8/11/2000 12:20	24.7
61	9/11/2000 14:30	24.52
62	10/13/2000 12:30	24.32
63	11/14/2000 11:50	24.22
64	12/13/2000 11:50	24.19
65	1/12/2001 11:45	24.11
66	2/9/2001 11:30	24.07
67	3/13/2001 13:45	24.01
68	4/11/2001 13:55	24
69	5/15/2001 12:05	24.02
70	6/14/2001 12:36	24.85
71	7/12/2001 14:15	24.74
72	8/17/2001 10:05	24.77
73	9/4/2001 13:00	27.76
74	10/8/2001 10:00	27.7
75	11/2/2001 14:00	27.61

Observation Well NB0069

149

Northing: 665126  
 Easting : 1569478

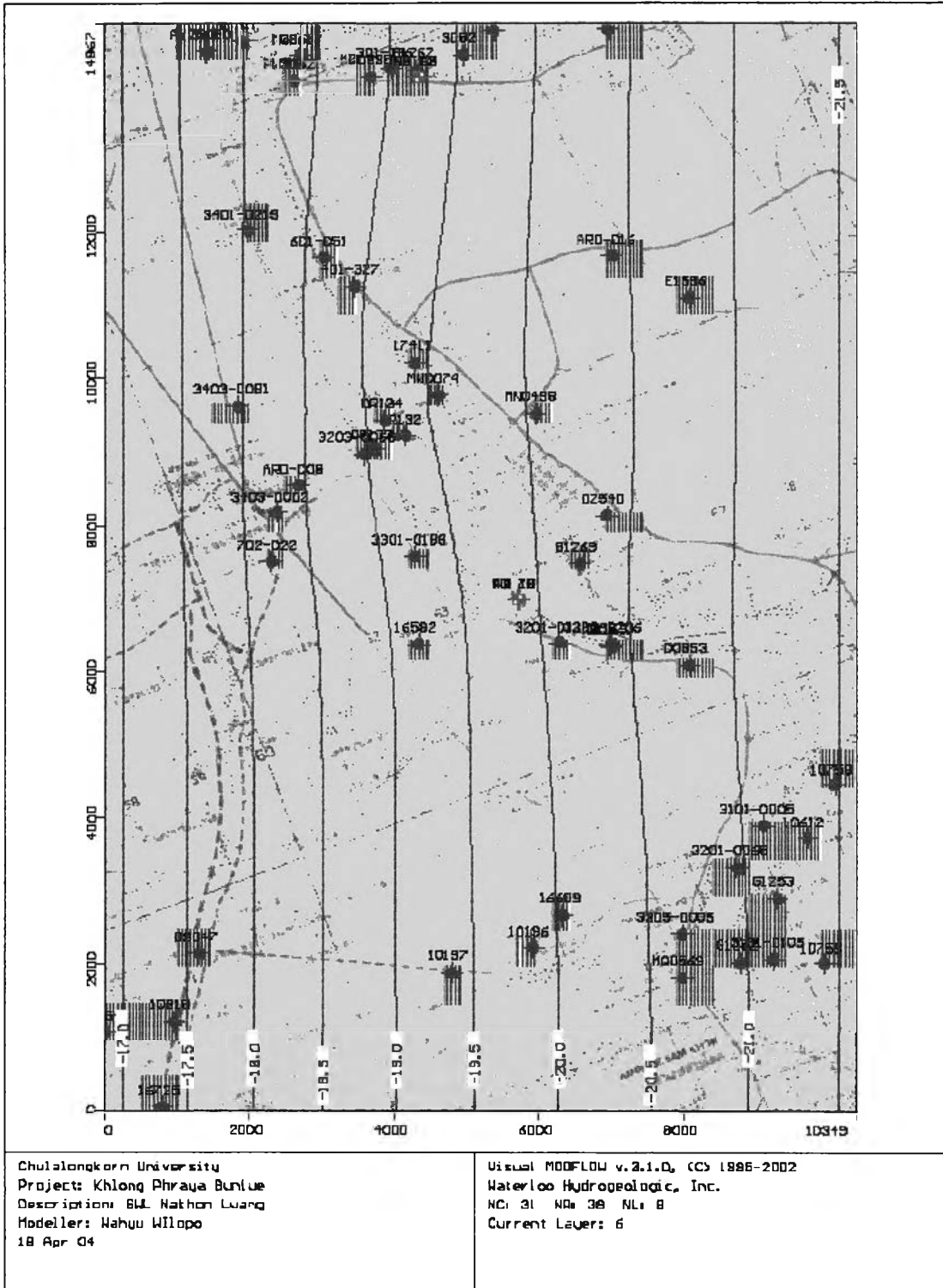
No.	Date Measured	GWL (m.SWL)
1	1/13/1993 12:00	18.88
2	2/19/1993 12:00	18.99
3	3/22/1993 12:00	19.05
4	4/26/1993 12:00	19.01
5	5/21/1993 12:00	19.26
6	6/1/1993 12:00	19.35
7	7/22/1993 12:00	19.42
8	8/23/1993 12:00	19.45
9	9/15/1993 12:00	19.51
10	10/12/1993 12:00	19.7
11	2/17/1994 12:00	20.01
12	3/28/1994 12:00	21.4
13	4/29/1994 12:00	21.62
14	5/20/1994 12:00	21.88
15	6/27/1994 12:00	21.97
16	7/6/1994 12:00	21.2
17	8/15/1994 12:00	21.32
18	9/26/1994 12:00	21.39
19	10/17/1994 12:00	21.5
20	11/1/1994 12:00	21.32
21	12/20/1994 12:00	21.3
22	1/26/1995 12:00	22.31
23	2/20/1995 12:00	22.52
24	3/15/1995 12:00	22.75
25	4/24/1995 12:00	22.94
26	5/12/1995 12:00	23.35
27	6/6/1995 12:00	22.81
28	7/10/1995 12:00	22.7
29	8/24/1995 12:00	23.44
30	9/26/1995 12:00	23.33
31	11/27/1995 12:00	23.87
32	12/21/1995 12:00	24.48
33	1/24/1996 12:00	24.68
34	2/27/1996 12:00	24.75
35	3/20/1996 12:00	24.96
36	4/23/1996 12:00	25.18
37	5/20/1996 12:00	25.28
38	6/14/1996 12:00	25.42
39	7/13/1996 12:00	25.65
40	8/14/1996 12:00	25.7
41	9/9/1996 12:00	25.55
42	10/20/1996 12:00	25.04
43	11/19/1996 12:00	25.04
44	12/20/1996 12:00	25.12
45	1/21/1997 12:00	26
46	2/20/1997 12:00	26.43
47	3/20/1997 12:00	26.72
48	4/7/1997 12:00	28.23
49	6/2/1997 12:00	28.23
50	7/8/1997 12:00	28.82
51	8/11/1997 12:00	28.85
52	10/21/1997 12:00	27.49
53	11/19/1997 12:00	27.42
54	12/22/1997 12:00	27.42
55	1/22/1998 12:00	27.54

No.	Date Measured	GWL (m.SWL)
56	2/22/1998 12:00	27.67
57	3/19/1998 12:00	27.75
58	4/22/1998 12:00	28.04
59	5/19/1998 12:00	28.1
60	6/12/1998 12:00	28.3
61	6/14/1999 10:40	27.39
62	7/14/1999 13:55	27.3
63	8/18/1999 12:40	27.2
64	9/17/1999 12:40	26.87
65	10/25/1999 14:20	26.82
66	11/7/1999 12:30	26.97
67	12/6/1999 12:00	26.99
68	1/18/2000 12:00	27.32
69	2/14/2000 12:00	27.4
70	3/7/2000 12:00	27.42
71	4/5/2000 12:00	27.33
72	5/16/2000 14:20	27.35
73	6/12/2000 11:10	27.82
74	7/13/2000 13:45	27.71
75	8/11/2000 14:10	27.63
76	9/11/2000 13:45	27.82
77	10/16/2000 14:00	27.9
78	11/16/2000 13:00	27.72
79	12/14/2000 14:10	27.88
80	1/10/2001 13:55	27.78
81	2/13/2001 13:45	27.62
82	3/14/2001 12:55	27.64
83	4/19/2001 13:00	27.99
84	5/17/2001 13:30	28.21
85	6/14/2001 14:10	28
86	7/16/2001 9:40	27.89
87	8/17/2001 11:48	27.82
88	9/27/2001 11:00	27.8
89	10/17/2001 12:00	27.69
90	11/27/2001 11:00	27.69
91	12/21/2001 14:20	27.55
92	1/18/2002 14:30	27.6
93	2/12/2002 14:20	23.98
94	3/19/2002 13:30	24.06
95	4/12/2002 10:10	27.98
96	5/15/2002 10:20	27.97
97	6/17/2002 12:10	27.92
98	8/6/2002 12:00	27.92
99	9/5/2002 12:00	27.9
100	10/7/2002 12:00	27.84
101	11/6/2002 12:00	27.25
102	12/6/2002 12:00	27.93
103	1/9/2003 12:00	27.8
104	2/14/2003 12:00	27.69
105	5/14/2003 11:30	27.85
106	6/18/2003 11:30	27.79
107	7/11/2003 13:10	27.74
108	8/13/2003 13:20	27.65
109	9/10/2003 11:35	27.67

# APPENDIX 4

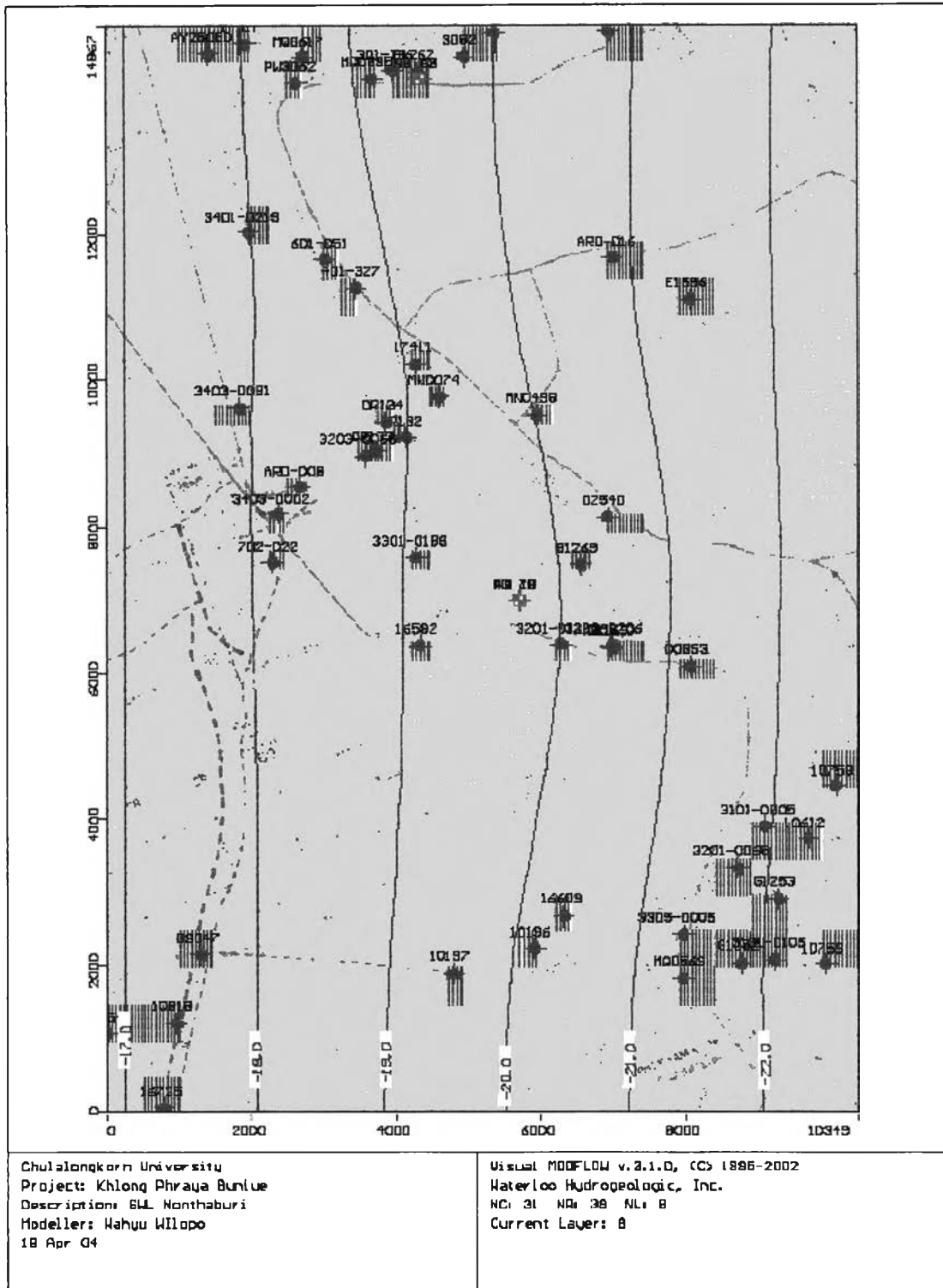
## GROUNDWATER FLOW MODELING





Chulalongkorn University  
Project: Khlong Phraya Bunlue  
Description: BIL Nathon Luang  
Modeller: Wahyu Wilopo  
18 Apr 04

Visual MODFLOW v.2.1.0, (C) 1986-2002  
Waterloo Hydrogeologic, Inc.  
NC: 31 NR: 38 NL: 8  
Current Layer: 6





## CURICULLUM VITAE

Wahyu Wilopo was born on November 19, 1975 in Yogyakarta Indonesia. He got B.Sc. in the Geological Engineering Department from Gadjah Mada University Indonesia in 1999. After graduated, he joined with Geological Engineering Department as a teaching assistant until 2002. He becomes permanent lecturer in Geological Engineering Department since 2002 until present. In the 2002, he received scholarship from AUN-Seed/Net program to continue study for master degree program in Mining and Petroleum Department Chulalongkorn University Thailand and finished in 2004.