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APPENDIX A

EXAMPLES OF INTERESTING P/Z PLOTS FROM THE STUDY

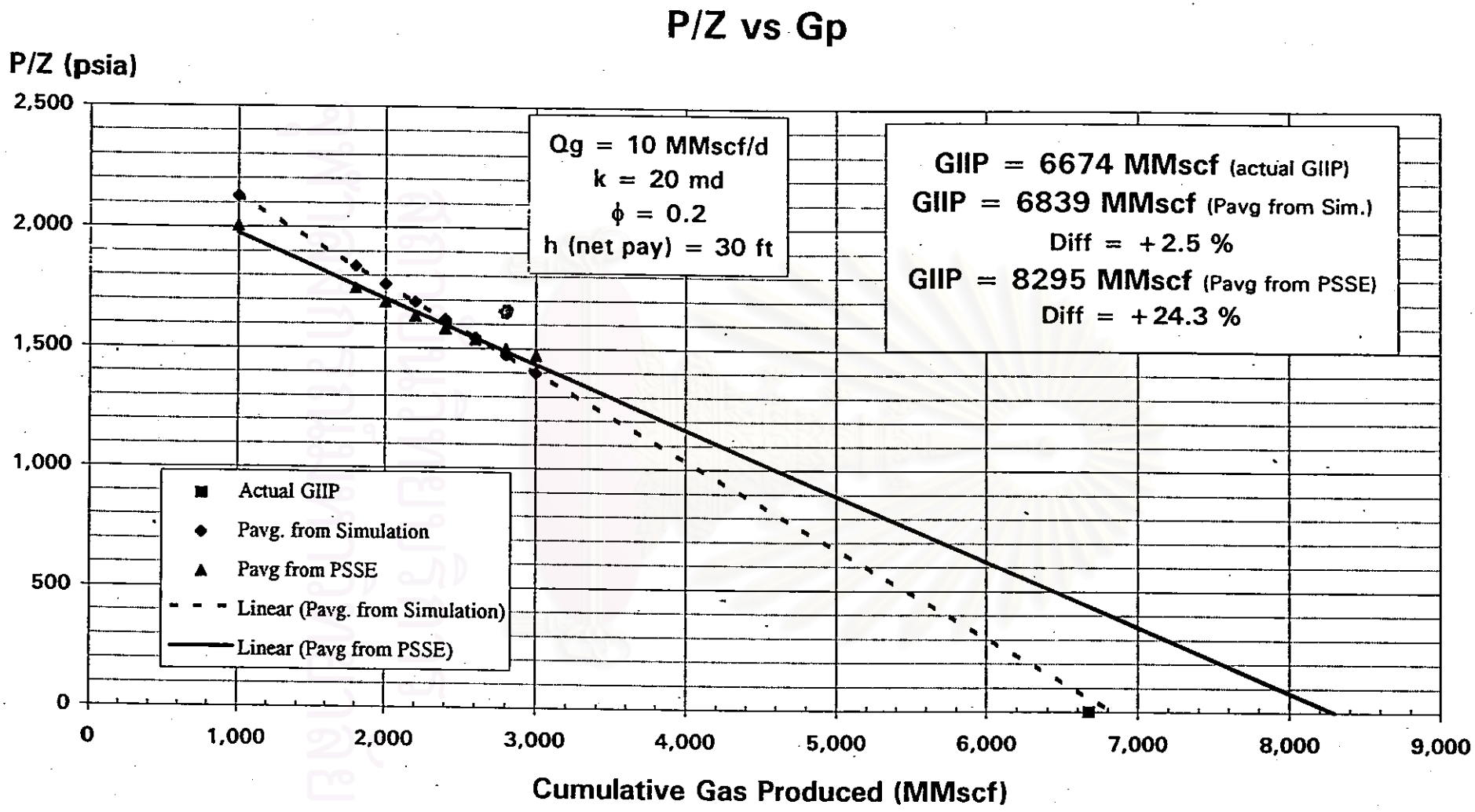

Figure A-1 The p/z plot of a single-layered reservoir where q_g = 10 MMscf/d, k = 20 md

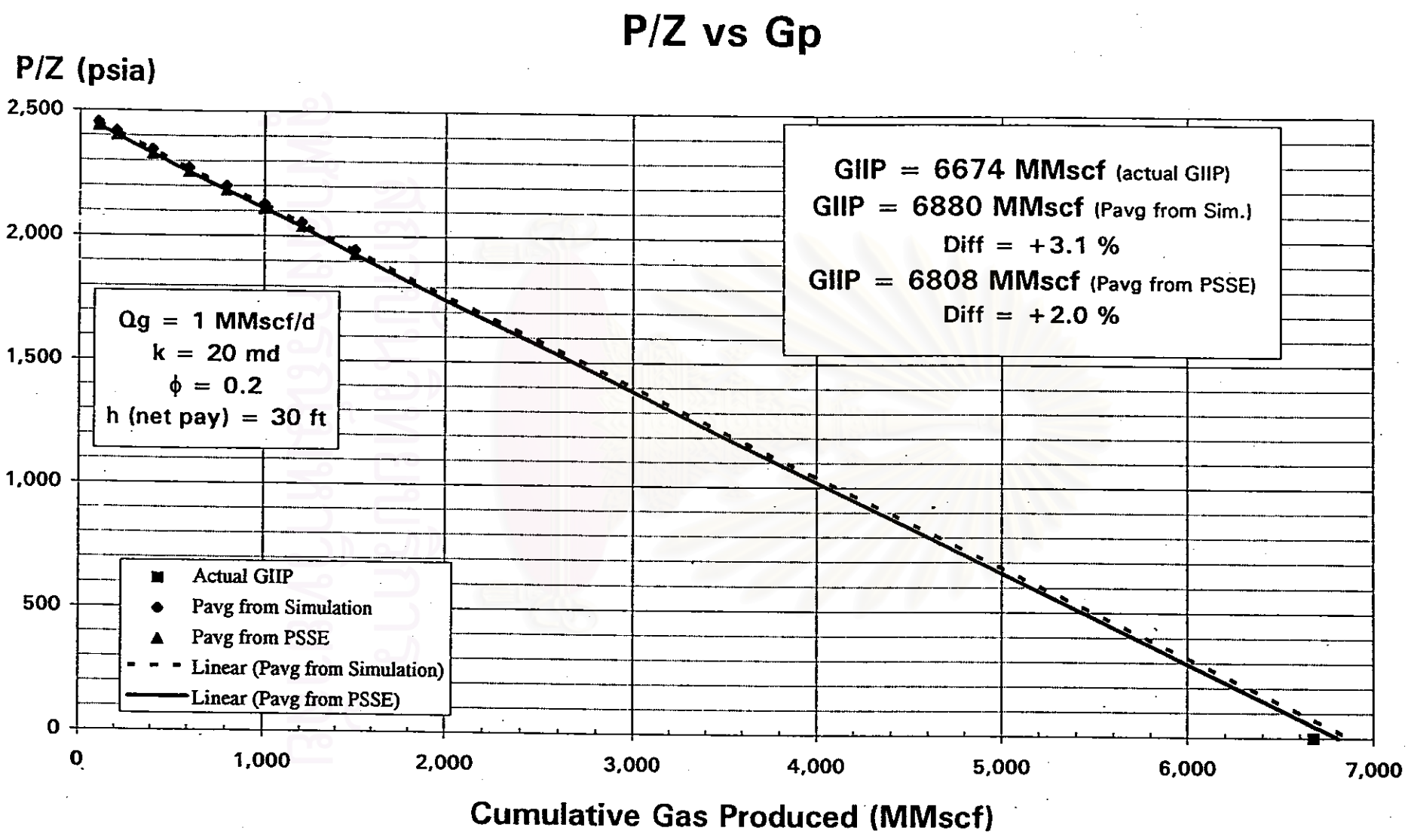

Figure A-2 The p/z plot for a single-layered reservoir where q_g = 1 MMscf/d, k = 20 md

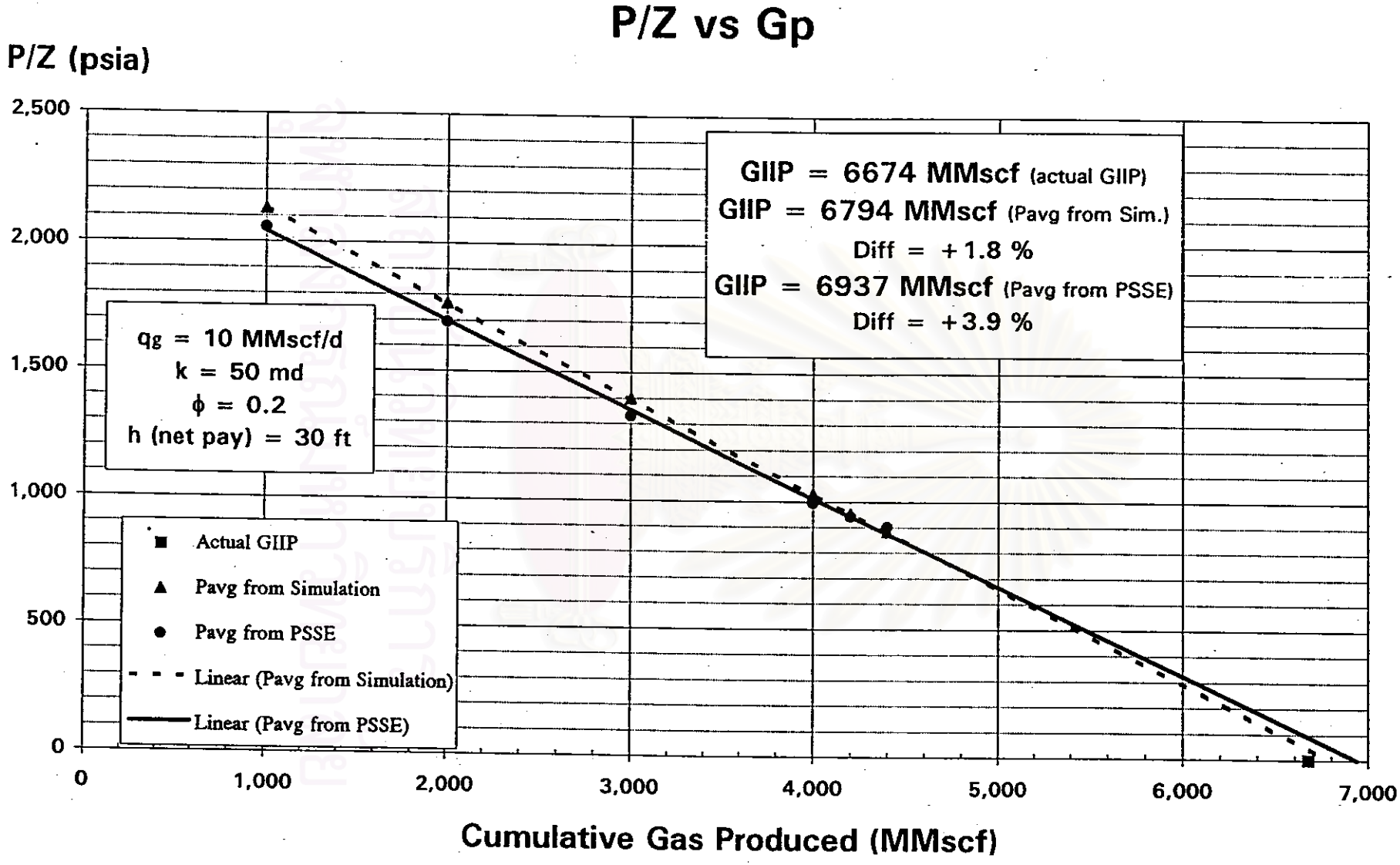

Figure A-3 The p/z plot for a single-layered reservoir where q_g = 10 MMscf/d, k = 50 md

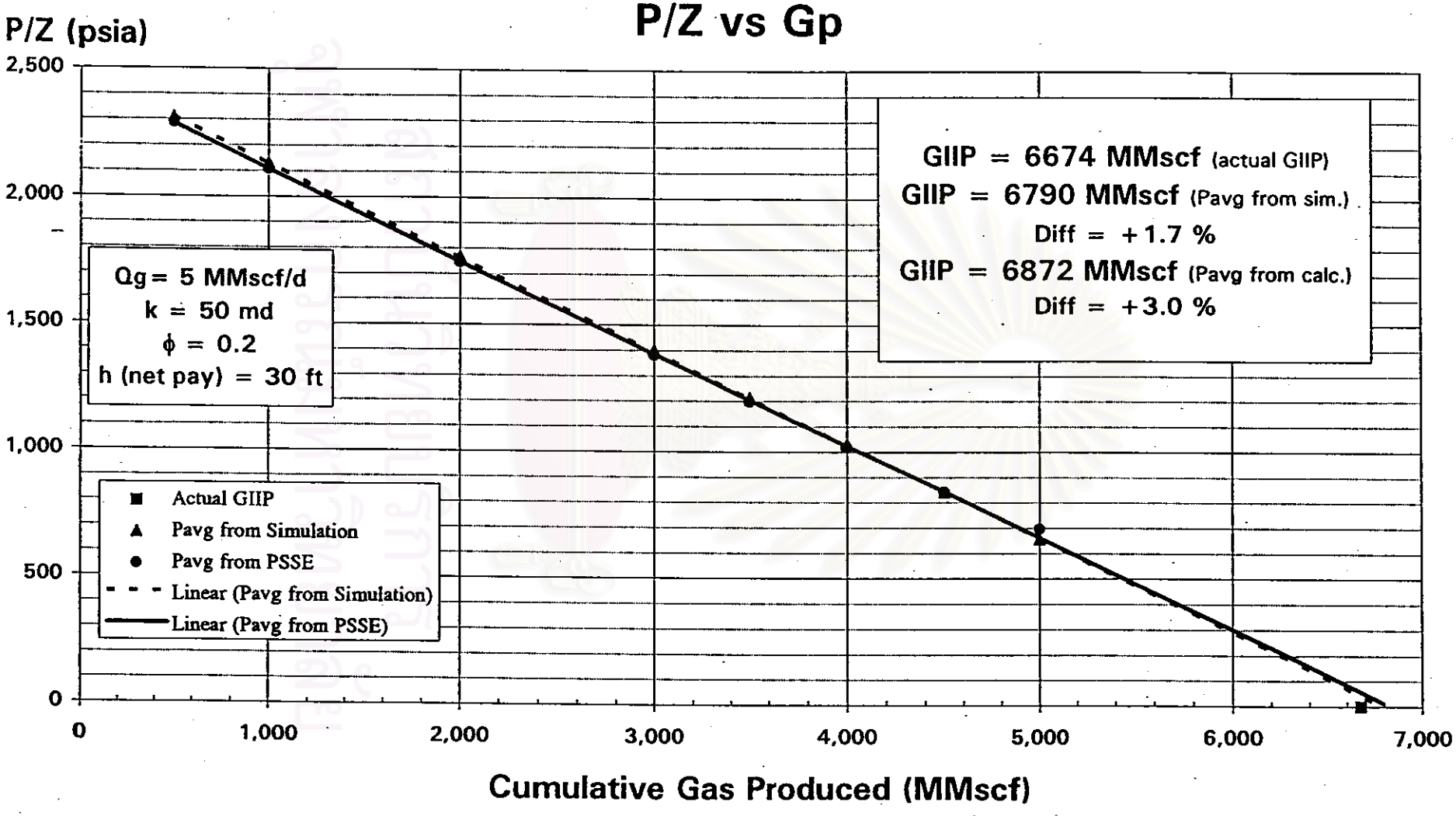

Figure A-4 The p/z plot of a single-layered reservoir where q_g = 5 MMscf/d, k = 50 md

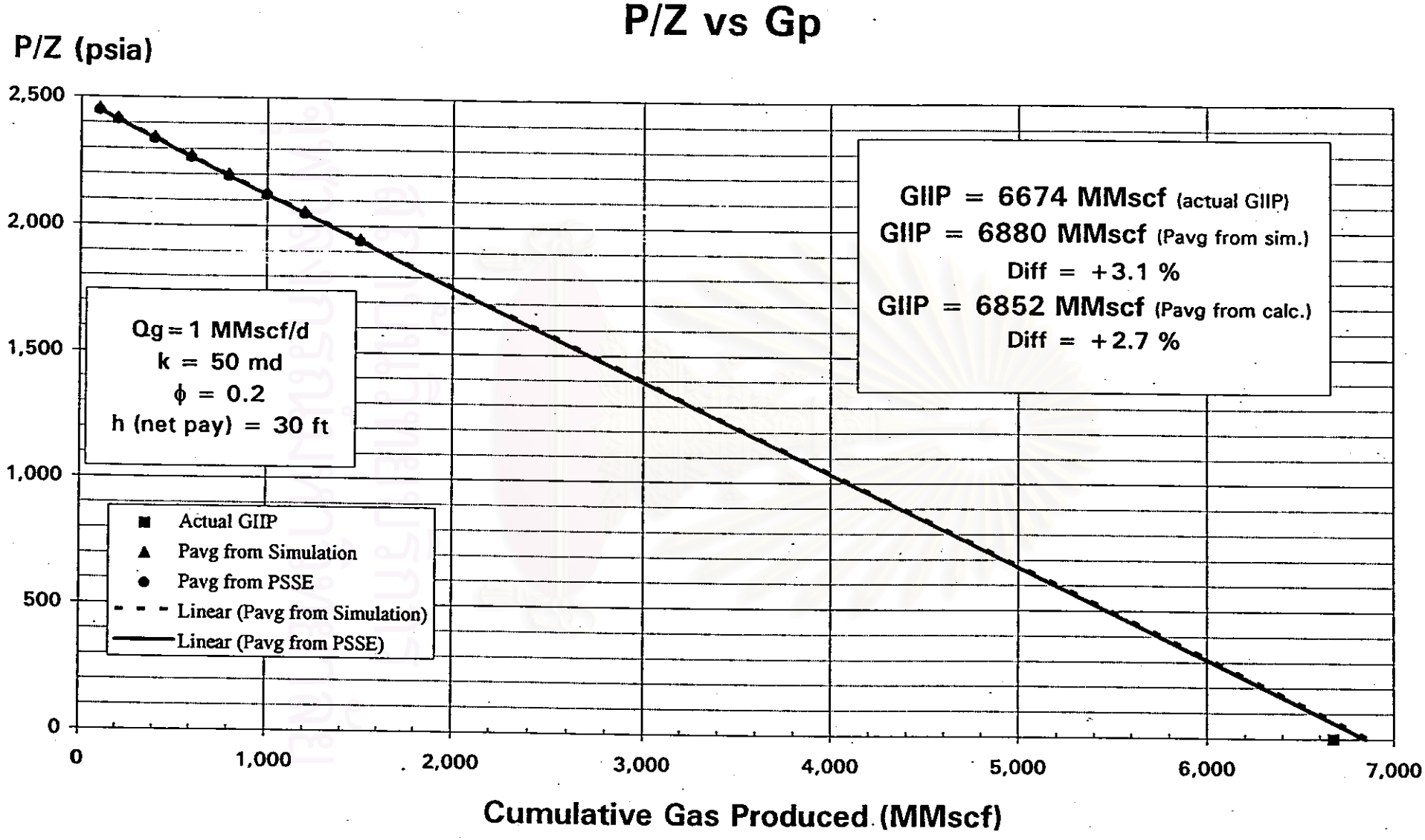

Figure A-5 The p/z plot of a single-layered reservoir where q_g = 1 MMscf/d, k = 50 md

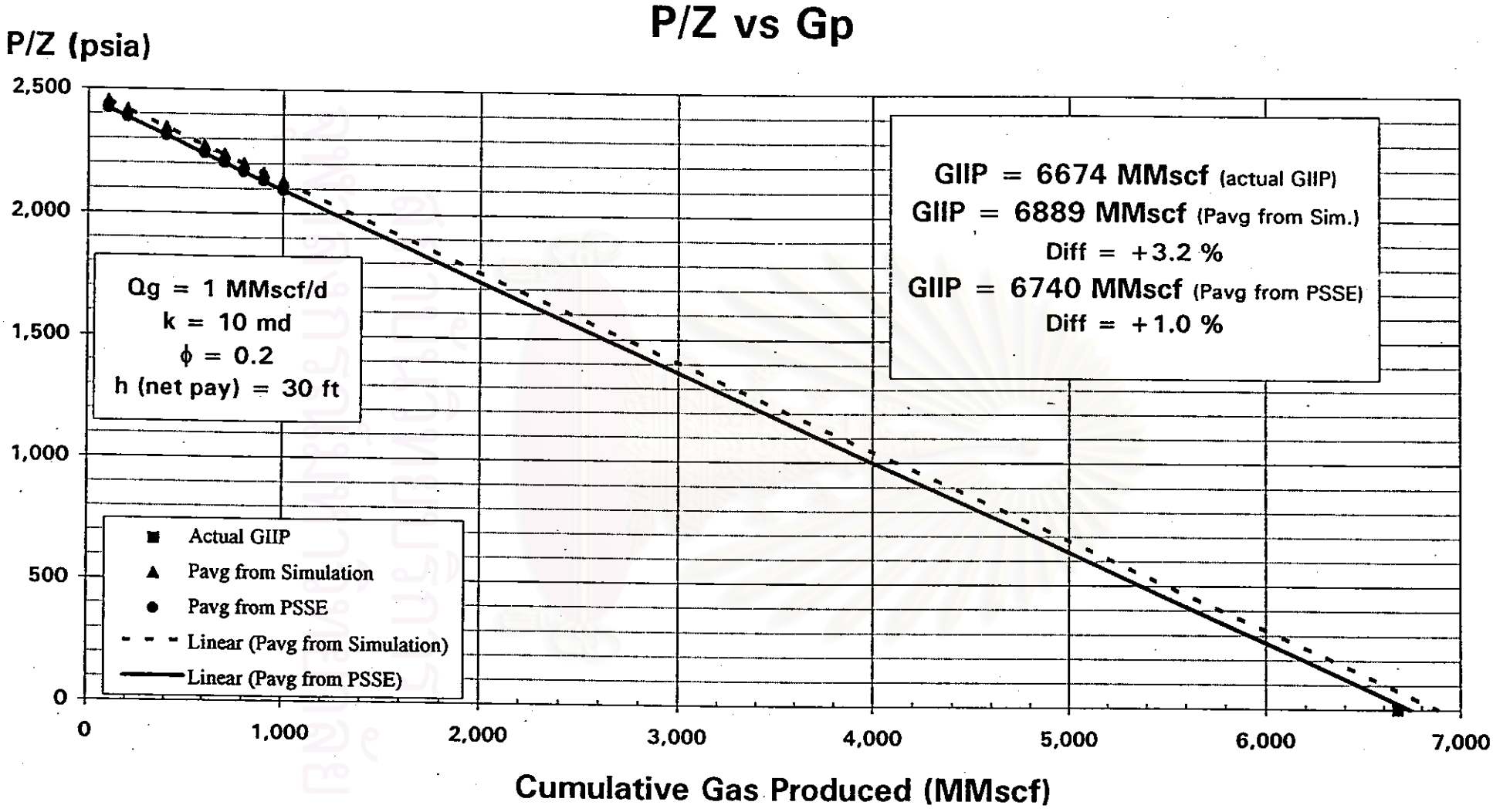

Figure A-6 The p/z plot of a single-layered reservoir where q_g = 1 MMscf/d, k= 10 md

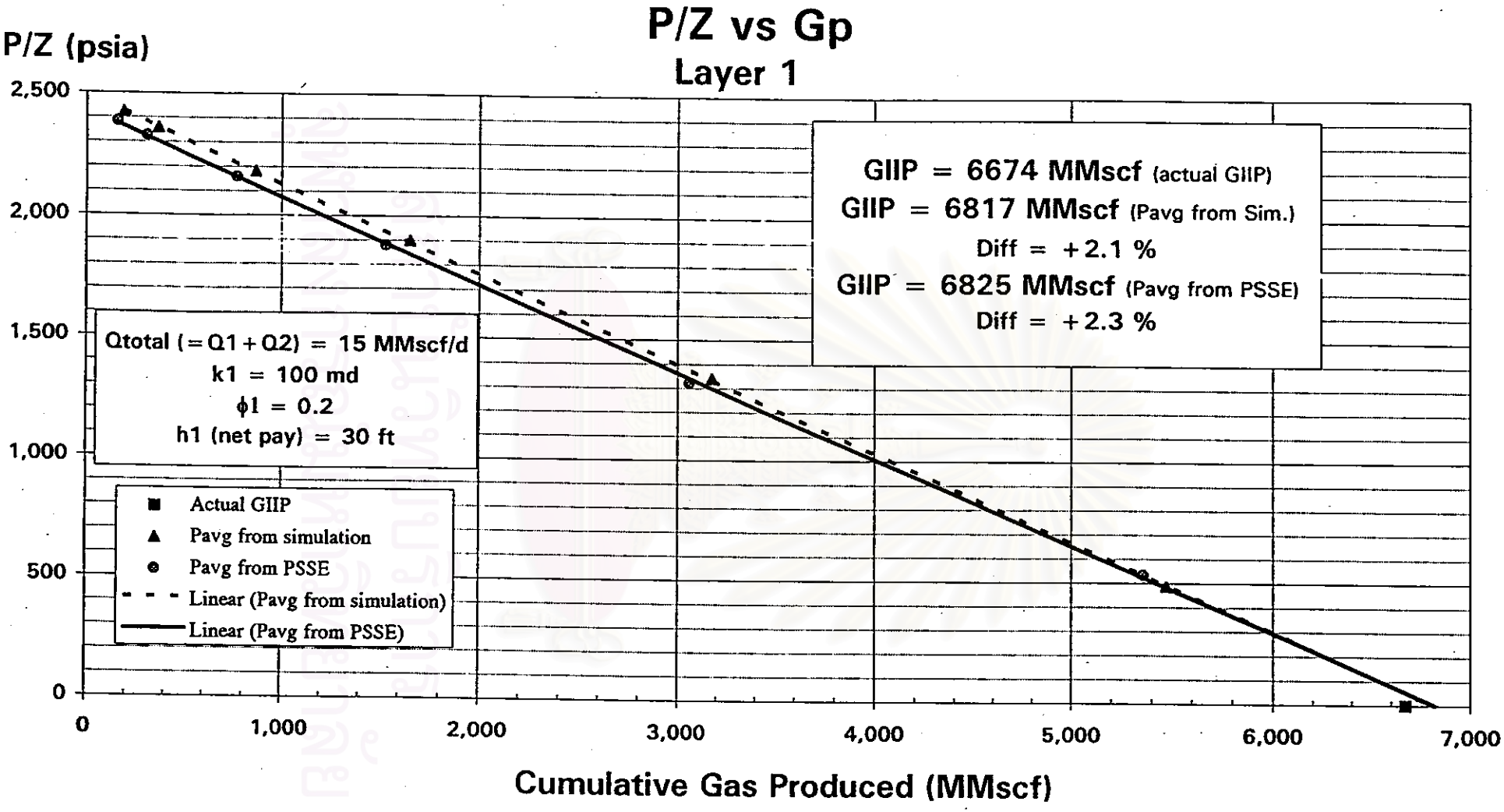

Figure A-7 The p/z plot of layer 1 of case 2 in Table 7-2

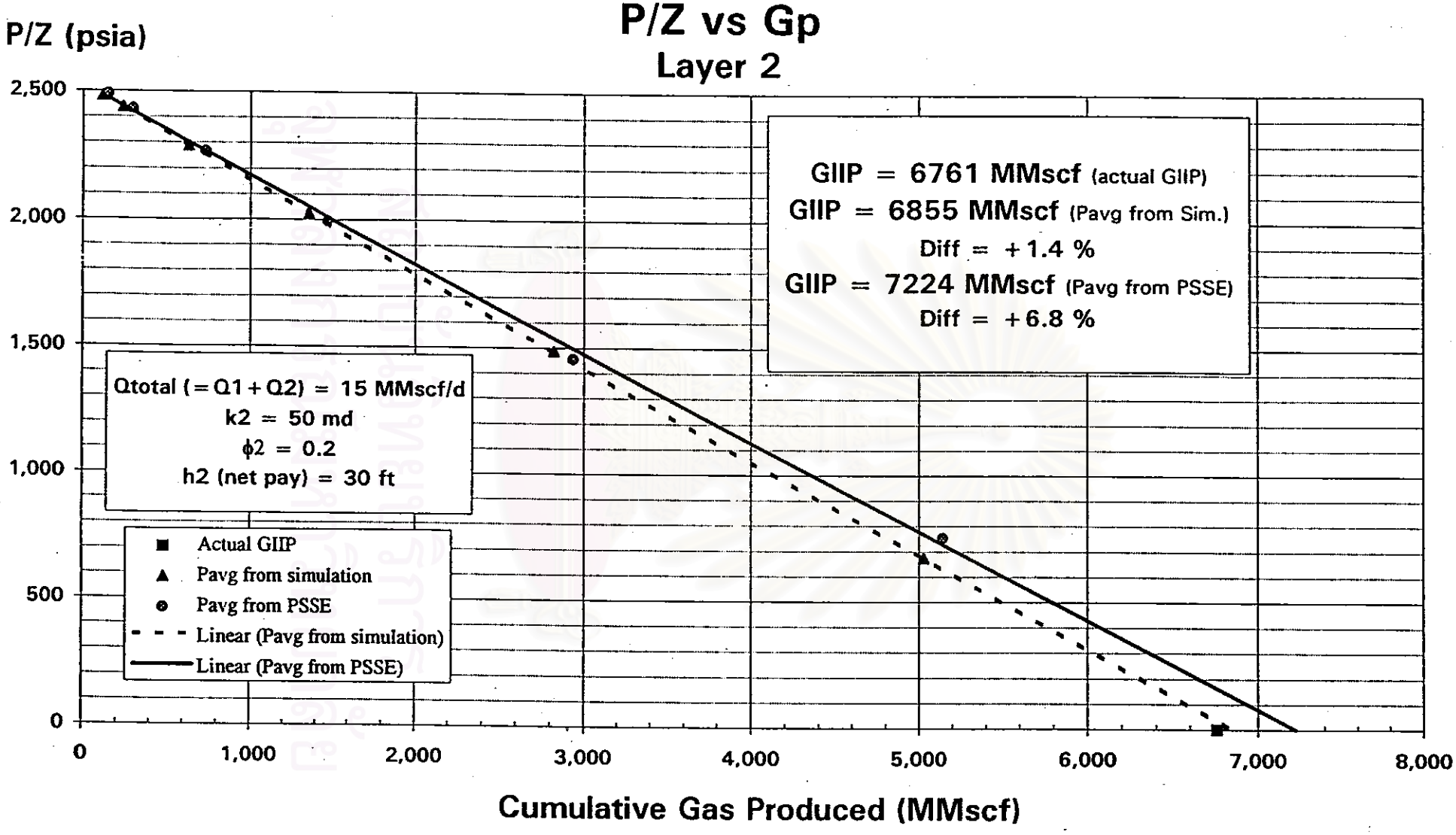

Figure A-8 The p/z plot of layer 2 of case 2 in Table 7-2

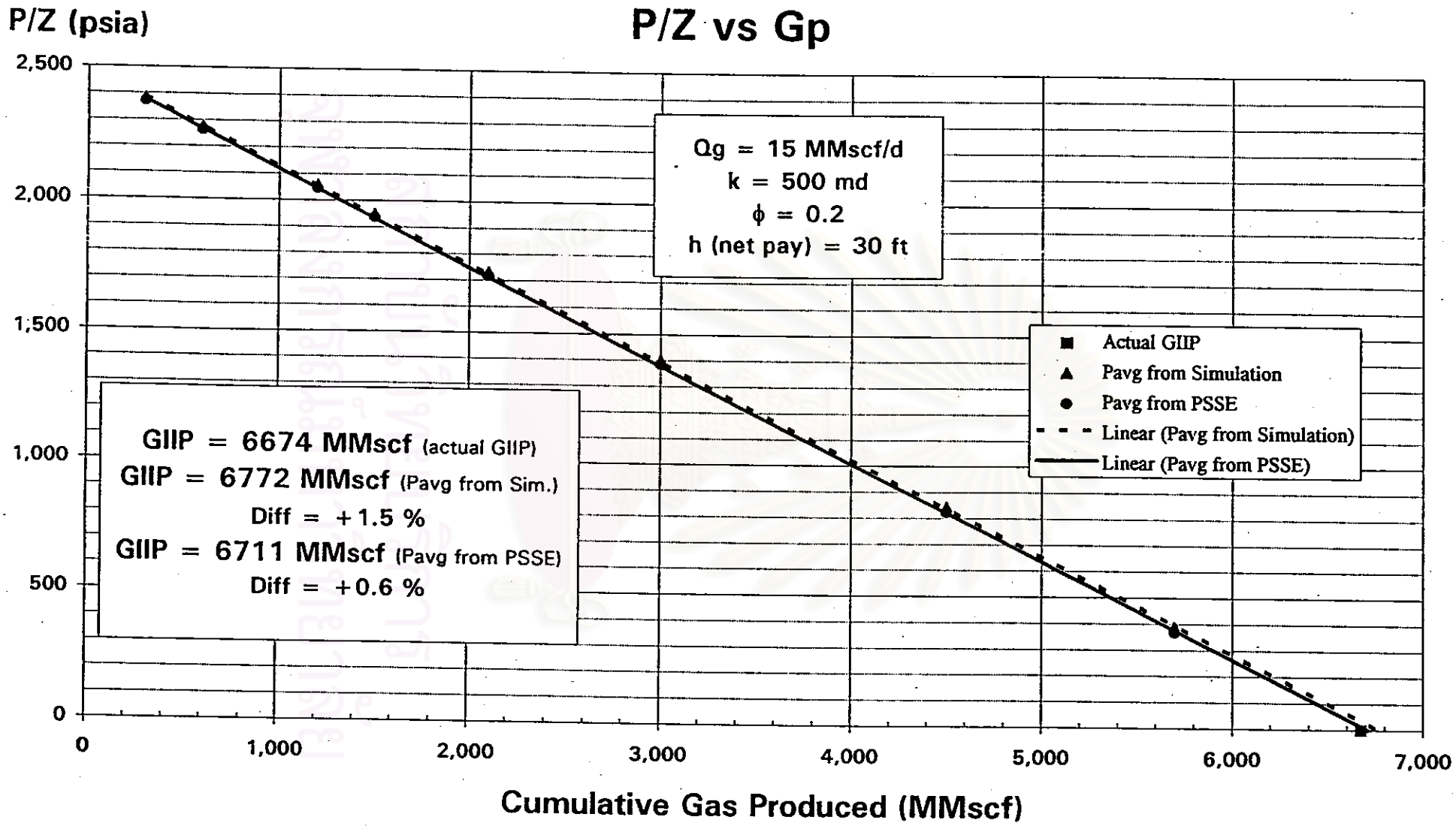

Figure A-9 The p/z plot for a single-layered reservoir where q_g = 15 MMscf/d, k = 500 md

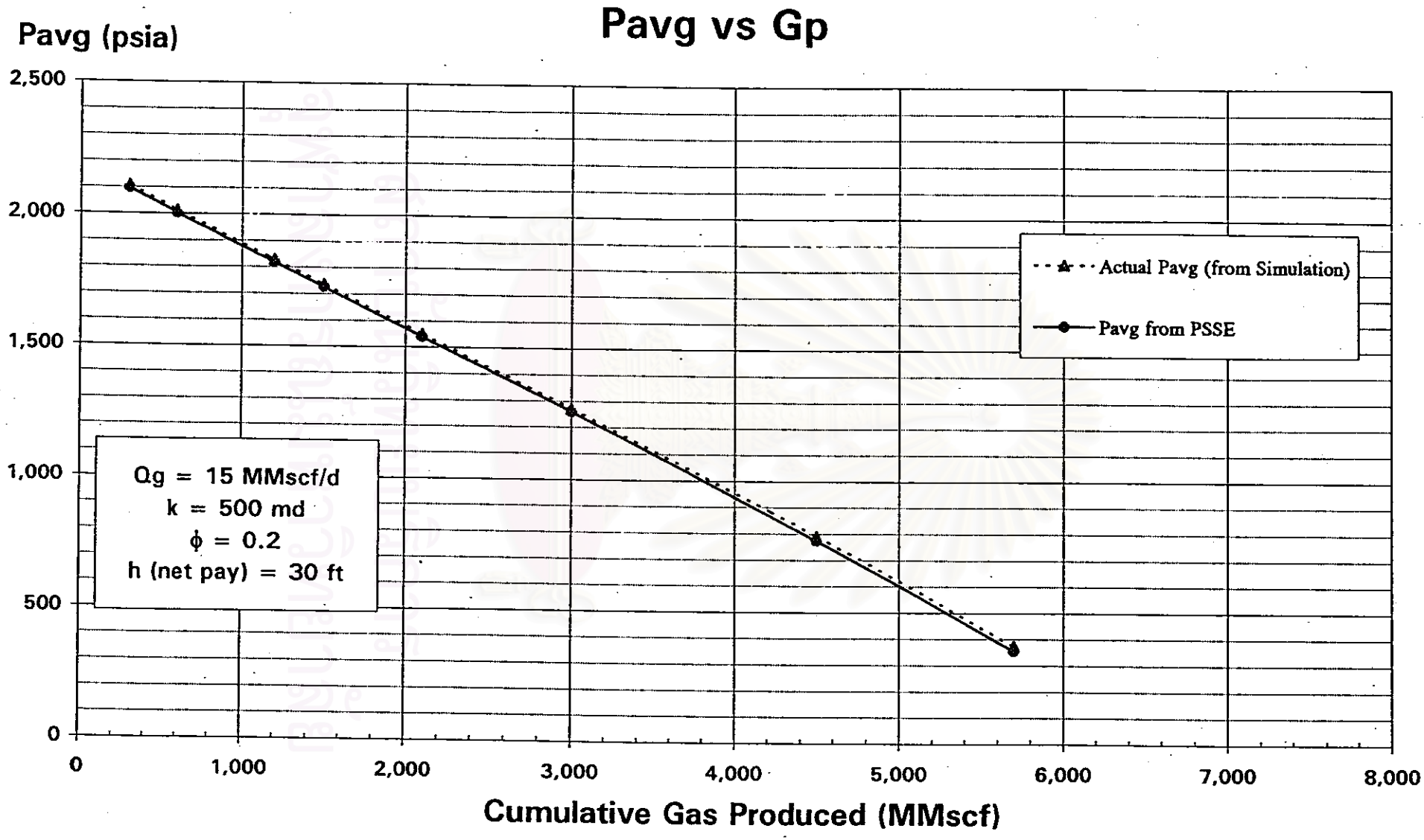

Figure A-10 Relationship between Pavg and Gp for a single-layered reservoir where q_g = 15 MMscf/d, k = 500 md

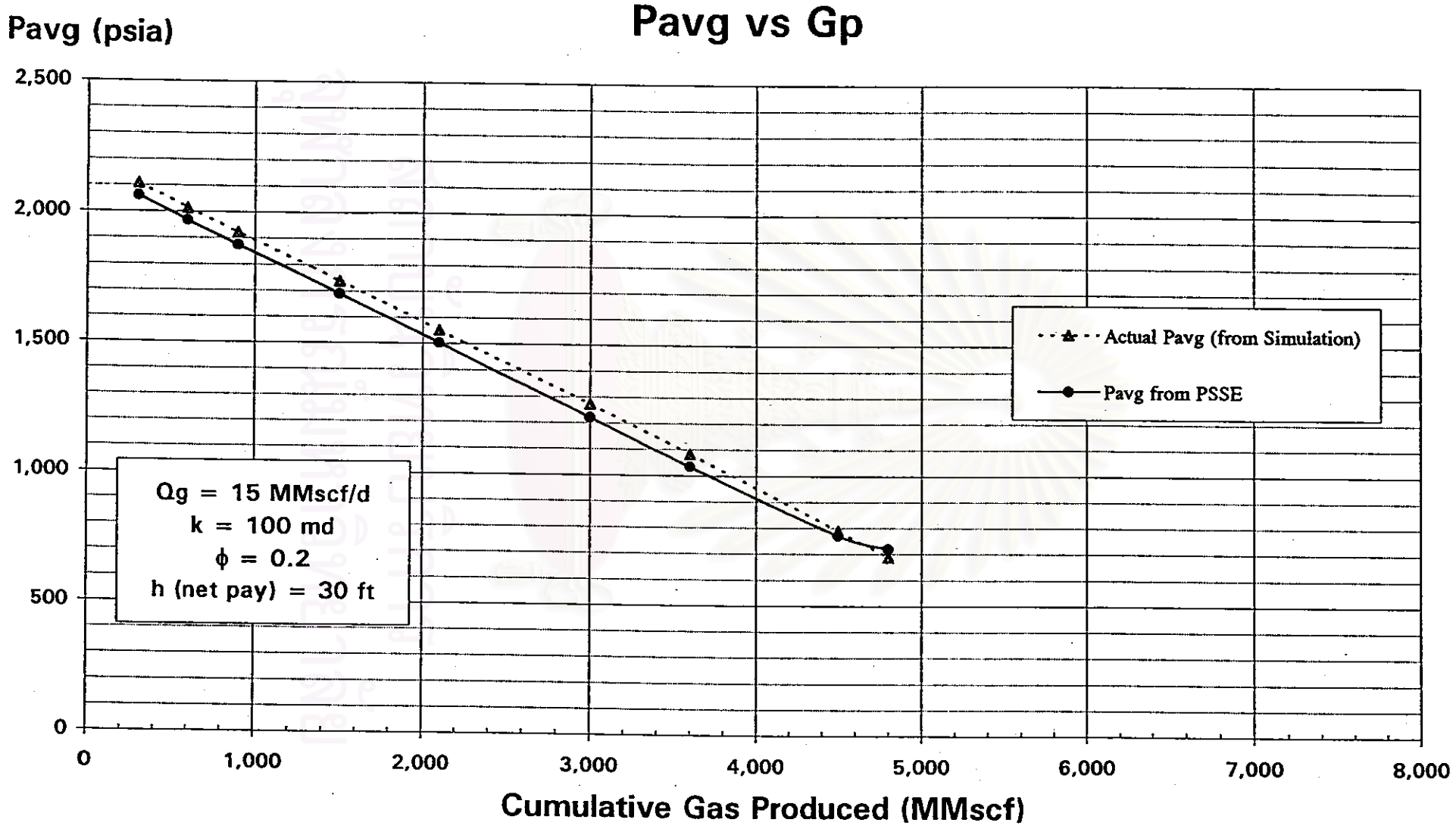

Figure A-11 Relationship between Pavg and Gp for a single-layered reservoir where q_g = 15 MMscf/d, k = 100 md

APPENDIX B

CASES USED FOR RATE ALLOCATION STUDY FOR A TWO-LAYERED RESERVOIR WITH ONE WELL AT VARIOUS Q_T

Table B-1 Cases used for rate-allocation study for a two-layered reservoir with one well at q_T = 1 MMscf/d.

Case	A1 (ft x ft)	A2 (ft x ft)	h1 (ft)	h2 (ft)	ϕ1	ϕ2	k1 (mD)	k2 (mD)	Q2 /Q1		Error (%)	Remark
									Actual	Equation		
1	3300 x 3300	3300 x 3300	30	30	0.2	0.2	10	100	1.04	1.02	-1.9	
2	3300 x 3300	3300 x 3300	30	30	0.2	0.2	20	100	1.02	1.01	-0.4	
3	3300 x 3300	3300 x 3300	30	30	0.2	0.2	50	100	1.00	1.01	0.6	
4	3300 x 3300	3300 x 3300	30	30	0.2	0.2	100	100	1.01	1.00	-1.0	
5	3300 x 3300	3300 x 3300	30	30	0.2	0.2	100	50	1.01	0.99	-1.3	
6	3300 x 3300	3300 x 3300	30	30	0.2	0.2	100	20	1.00	0.99	-1.4	
7	3300 x 3300	3300 x 3300	30	30	0.2	0.2	100	10	0.97	0.98	1.5	
8	3300 x 3300	3300 x 3300	30	30	0.1	0.2	100	100	2.02	1.99	-1.6	
9	3300 x 3300	3300 x 3300	30	30	0.1	0.3	100	100	3.03	2.98	-1.7	
10	3300 x 3300	3300 x 3300	30	30	0.3	0.1	100	100	0.34	0.34	-0.8	
11	3300 x 3300	3300 x 3300	30	30	0.1	0.2	20	100	2.03	2.02	-0.5	
12	3300 x 3300	3300 x 3300	30	30	0.1	0.2	100	20	1.98	1.96	-1.0	
13	3300 x 3300	3300 x 3300	30	30	0.1	0.2	10	100	2.05	2.03	-0.8	
14	3300 x 3300	3300 x 3300	30	30	0.1	0.2	100	50	2.00	1.98	-0.9	
15	3300 x 3300	3300 x 3300	30	30	0.3	0.1	20	100	0.34	0.34	-0.5	
16	3300 x 3300	3300 x 3300	30	30	0.3	0.1	100	20	0.34	0.33	-1.7	
17	3300 x 3300	3300 x 3300	30	30	0.3	0.1	10	100	0.34	0.34	0.7	
18	3300 x 3300	3300 x 3300	30	30	0.3	0.1	100	50	0.34	0.33	-1.4	
19	3300 x 3300	3300 x 3300	30	30	0.2	0.1	20	100	0.51	0.51	-0.6	
20	3300 x 3300	3300 x 3300	30	30	0.1	0.3	100	20	2.97	2.94	-0.9	
21	3300 x 3300	3300 x 3300	15	30	0.1	0.2	100	100	4.05	4.00	-1.2	
22	3300 x 3300	3300 x 3300	15	30	0.3	0.1	100	100	0.68	0.67	-0.6	
23	3300 x 3300	3300 x 3300	15	30	0.1	0.2	20	100	4.06	4.06	-0.1	
24	3300 x 3300	3300 x 3300	15	30	0.1	0.2	100	20	3.98	3.94	-0.8	
25	3300 x 3300	3300 x 3300	15	30	0.1	0.2	10	100	4.10	4.08	-0.5	
26	3300 x 3300	3300 x 3300	15	30	0.1	0.2	100	50	4.04	3.97	-1.5	
27	3300 x 3300	3300 x 3300	15	30	0.3	0.1	20	100	0.69	0.68	-0.7	
28	3300 x 3300	3300 x 3300	15	30	0.3	0.1	100	20	0.67	0.66	-0.5	
29	3300 x 3300	3300 x 3300	15	30	0.3	0.1	10	100	0.72	0.69	-4.3	not used
30	3300 x 3300	3300 x 3300	15	30	0.3	0.1	100	50	0.68	0.67	-1.1	

Table B-1 (cont'd)

Case	A1, (ft x ft)	A2 (ft x ft)	h1 (ft)	h2 (ft)	ϕ1	ϕ2	k1 (mD)	k2 (mD)	Q2 /Q1		Error (%)	Remark
									Actual	Equation		
31	3300 x 3300	3300 x 3300	15	30	0.2	0.1	20	100	1.03	1.02	-0.8	
32	3300 x 3300	3300 x 3300	15	30	0.1	0.3	100	20	5.92	5.90	-0.3	
33	3300 x 3300	3300 x 3300	30	15	0.1	0.2	20	100	1.02	1.01	-1.2	
34	3300 x 3300	3300 x 3300	30	15	0.1	0.2	100	20	1.00	0.98	-1.7	
35	3300 x 3300	3300 x 3300	30	15	0.3	0.1	20	100	0.17	0.17	-0.8	
36	3300 x 3300	3300 x 3300	30	15	0.3	0.1	100	20	0.17	0.16	-2.9	
37	3300 x 3300	3300 x 3300	30	15	0.3	0.1	10	100	0.17	0.17	-0.9	
38	3300 x 3300	3300 x 3300	30	15	0.1	0.3	100	20	1.48	1.46	-1.1	
39	2100 x 2100	3300 x 3300	30	30	0.1	0.2	100	100	4.99	4.91	-1.6	
40	2100 x 2100	3300 x 3300	30	30	0.1	0.2	20	100	5.00	4.98	-0.4	
41	2100 x 2100	3300 x 3300	30	30	0.3	0.1	20	100	0.84	0.84	-0.2	
42	2100 x 2100	3300 x 3300	30	30	0.1	0.3	100	20	7.40	7.25	-2.1	
43	2100 x 2100	3300 x 3300	15	30	0.1	0.2	100	100	9.99	9.86	-1.3	
44	2100 x 2100	3300 x 3300	15	30	0.1	0.2	20	100	10.01	10.00	-0.2	
45	2100 x 2100	3300 x 3300	15	30	0.1	0.2	100	20	9.79	9.72	-0.7	
46	2100 x 2100	3300 x 3300	15	30	0.3	0.1	20	100	1.69	1.68	-0.6	
47	2100 x 2100	3300 x 3300	15	30	0.3	0.1	100	20	1.64	1.64	-0.5	
48	2100 x 2100	3300 x 3300	30	15	0.1	0.2	20	100	2.50	2.48	-0.6	
49	2100 x 2100	3300 x 3300	30	15	0.1	0.2	100	20	2.42	2.41	-0.4	
50	2100 x 2100	3300 x 3300	30	15	0.3	0.1	20	100	0.42	0.42	-0.9	
51	2100 x 2100	3300 x 3300	30	15	0.3	0.1	100	20	0.41	0.41	-1.5	
52	3300 x 3300	2100 x 2100	30	30	0.1	0.2	100	100	0.82	0.81	-1.4	
53	3300 x 3300	2100 x 2100	30	30	0.1	0.2	20	100	0.83	0.82	-1.0	
54	3300 x 3300	2100 x 2100	15	30	0.1	0.2	20	100	1.67	1.65	-1.3	
55	3300 x 3300	2100 x 2100	15	30	0.1	0.2	100	20	1.62	1.60	-1.2	
56	3300 x 3300	2100 x 2100	30	15	0.1	0.2	20	100	0.42	0.41	-1.8	
57	3300 x 3300	2100 x 2100	30	15	0.1	0.2	100	20	0.41	0.40	-2.3	
58	3300 x 3300	2100 x 2100	30	15	0.3	0.1	100	20	0.07	0.07	-2.2	

Table B-2 Cases used for rate-allocation study for a two-layered reservoir with one well at q_T = 5 MMscf/d.

Case	A1 (ft x ft)	A2 (ft x ft)	h1 (ft)	h2 (ft)	ϕ1	ϕ2	k1 (mD)	k2 (mD)	Q2 /Q1		Error (%)	Remark
									Actual	Equation		
1	3300 x 3300	3300 x 3300	15	30	0.1	0.3	100	20	5.49	5.35	-2.5	
2	3300 x 3300	3300 x 3300	15	30	0.1	0.2	100	100	4.01	3.94	-1.9	
3	3300 x 3300	3300 x 3300	15	30	0.1	0.2	20	100	4.19	4.26	1.8	
4	3300 x 3300	3300 x 3300	15	30	0.1	0.2	100	20	3.66	3.63	-0.8	
5	3300 x 3300	3300 x 3300	15	30	0.1	0.2	10	100	4.45	4.41	-0.8	
6	3300 x 3300	3300 x 3300	15	30	0.1	0.2	100	50	3.91	3.80	-2.8	
7	3300 x 3300	3300 x 3300	15	30	0.2	0.1	20	100	1.15	1.13	-1.6	
8	3300 x 3300	3300 x 3300	15	30	0.3	0.1	100	100	0.69	0.71	2.7	
9	3300 x 3300	3300 x 3300	15	30	0.3	0.1	20	100	0.79	0.77	-2.8	
10	3300 x 3300	3300 x 3300	15	30	0.3	0.1	100	20	0.66	0.65	-0.9	
11	3300 x 3300	3300 x 3300	15	30	0.3	0.1	10	100	0.98	0.80	-18.9	not used
12	3300 x 3300	3300 x 3300	15	30	0.3	0.1	100	50	0.68	0.68	0.7	
13	3300 x 3300	3300 x 3300	30	15	0.1	0.3	100	20	1.30	1.30	0.1	
14	3300 x 3300	3300 x 3300	30	15	0.1	0.2	20	100	1.06	1.04	-2.2	
15	3300 x 3300	3300 x 3300	30	15	0.1	0.2	100	20	0.89	0.88	-0.8	
16	3300 x 3300	3300 x 3300	30	15	0.3	0.1	10	100	0.21	0.19	-7.9	not used
17	3300 x 3300	3300 x 3300	30	15	0.3	0.1	20	100	0.19	0.19	-1.7	
18	3300 x 3300	3300 x 3300	30	15	0.3	0.1	100	20	0.17	0.16	-6.4	
19	3300 x 3300	3300 x 3300	30	30	0.1	0.2	100	100	2.02	1.94	-3.9	
20	3300 x 3300	3300 x 3300	30	30	0.1	0.2	20	100	2.08	2.10	1.1	
21	3300 x 3300	3300 x 3300	30	30	0.1	0.2	100	20	1.88	1.79	-4.7	
22	3300 x 3300	3300 x 3300	30	30	0.1	0.2	10	100	2.19	2.18	-0.6	
23	3300 x 3300	3300 x 3300	30	30	0.1	0.2	100	50	1.99	1.87	-5.8	
24	3300 x 3300	3300 x 3300	30	30	0.1	0.3	100	100	2.97	2.86	-3.7	
25	3300 x 3300	3300 x 3300	30	30	0.1	0.3	100	20	2.78	2.64	-5.1	
26	3300 x 3300	3300 x 3300	30	30	0.2	0.1	20	100	0.55	0.56	1.5	
27	3300 x 3300	3300 x 3300	30	30	0.3	0.1	100	100	0.34	0.35	2.8	
28	3300 x 3300	3300 x 3300	30	30	0.3	0.1	20	100	0.37	0.38	2.4	
29	3300 x 3300	3300 x 3300	30	30	0.3	0.1	100	20	0.33	0.32	-2.2	
30	3300 x 3300	3300 x 3300	30	30	0.3	0.1	10	100	0.41	0.39	-4.3	

Table B-2 (cont'd)

Case	A1 (ft x ft)	A2 (ft x ft)	h1 (ft)	h2 (ft)	ϕ1	ϕ2	k1 (mD)	k2 (mD)	Q2 /Q1		Error (%)	Remark
									Actual	Equation		
31	3300 x 3300	3300 x 3300	30	30	0.3	0.1	100	50	0.34	0.34	-0.7	
32	3300 x 3300	3300 x 3300	30	30	0.2	0.2	10	100	1.15	1.12	-2.5	
33	3300 x 3300	3300 x 3300	30	30	0.2	0.2	20	100	1.07	1.08	1.3	
34	3300 x 3300	3300 x 3300	30	30	0.2	0.2	50	100	1.02	1.04	1.5	
35	3300 x 3300	3300 x 3300	30	30	0.2	0.2	100	100	1.01	1.00	-1.0	
36	3300 x 3300	3300 x 3300	30	30	0.2	0.2	100	50	1.00	0.97	-3.4	
37	3300 x 3300	3300 x 3300	30	30	0.2	0.2	100	20	0.96	0.92	-3.9	
38	3300 x 3300	3300 x 3300	30	30	0.2	0.2	100	10	0.89	0.89	0.2	
39	2100 x 2100	3300 x 3300	30	30	0.1	0.3	100	20	6.78	6.30	-7.1	not used
40	2100 x 2100	3300 x 3300	30	30	0.1	0.2	100	100	4.88	4.63	-5.1	
41	2100 x 2100	3300 x 3300	30	30	0.1	0.2	20	100	5.00	5.02	0.3	
42	2100 x 2100	3300 x 3300	30	30	0.3	0.1	20	100	0.88	0.90	2.7	
43	2100 x 2100	3300 x 3300	15	30	0.1	0.2	100	100	9.78	9.39	-4.0	
44	2100 x 2100	3300 x 3300	15	30	0.1	0.2	20	100	9.99	10.17	1.8	
45	2100 x 2100	3300 x 3300	15	30	0.1	0.2	100	20	8.83	8.66	-1.9	
46	2100 x 2100	3300 x 3300	15	30	0.3	0.1	100	20	1.56	1.56	0.0	
47	2100 x 2100	3300 x 3300	15	30	0.3	0.1	20	100	1.82	1.83	0.7	
48	2100 x 2100	3300 x 3300	30	15	0.1	0.2	100	20	2.07	2.11	1.8	
49	2100 x 2100	3300 x 3300	30	15	0.1	0.2	20	100	2.50	2.47	-1.0	
50	2100 x 2100	3300 x 3300	30	15	0.3	0.1	100	20	0.39	0.38	-2.7	
51	2100 x 2100	3300 x 3300	30	15	0.3	0.1	20	100	0.45	0.45	-1.0	
52	3300 x 3300	2100 x 2100	30	30	0.1	0.2	100	100	0.82	0.81	-0.8	
53	3300 x 3300	2100 x 2100	30	30	0.1	0.2	20	100	0.88	0.88	0.2	
54	3300 x 3300	2100 x 2100	15	30	0.1	0.2	20	100	1.81	1.79	-1.2	
55	3300 x 3300	2100 x 2100	15	30	0.1	0.2	100	20	1.54	1.52	-1.2	
56	3300 x 3300	2100 x 2100	30	15	0.1	0.2	100	20	0.39	0.37	-5.1	
57	3300 x 3300	2100 x 2100	30	15	0.1	0.2	20	100	0.45	0.43	-3.4	
58	3300 x 3300	2100 x 2100	30	15	0.3	0.1	100	20	0.07	0.07	-4.7	

Table B-3 Cases used for rate-allocation study for a two-layered reservoir with one well at q_T = 10 MMscf/d.

Case	A1 (ft x ft)	A2 (ft x ft)	h1 (ft)	h2 (ft)	ϕ1	ϕ2	k1 (mD)	k2 (mD)	Q2 /Q1		Error (%)	Remark
									Actual	Equation		
1	3300 x 3300	3300 x 3300	30	30	0.2	0.2	10	100	n/a	1.29		not used
2	3300 x 3300	3300 x 3300	30	30	0.2	0.2	20	100	n/a	1.20		not used
3	3300 x 3300	3300 x 3300	30	30	0.2	0.2	50	100	n/a	1.08		not used
4	3300 x 3300	3300 x 3300	30	30	0.2	0.2	100	100	n/a	1.00		not used
5	3300 x 3300	3300 x 3300	30	30	0.2	0.2	100	50	n/a	0.93		not used
6	3300 x 3300	3300 x 3300	30	30	0.2	0.2	100	20	n/a	0.84		not used
7	3300 x 3300	3300 x 3300	30	30	0.2	0.2	100	10	0.80	0.77	-3.1	
8	3300 x 3300	3300 x 3300	30	30	0.1	0.2	100	100	1.94	1.85	-4.9	
9	3300 x 3300	3300 x 3300	30	30	0.1	0.3	100	100	2.95	2.65	-10.4	
10	3300 x 3300	3300 x 3300	30	30	0.3	0.1	100	100	0.35	0.38	8.6	
11	3300 x 3300	3300 x 3300	30	30	0.1	0.2	20	100	2.16	2.21	2.2	
12	3300 x 3300	3300 x 3300	30	30	0.1	0.2	100	20	1.68	1.54	-8.0	
13	3300 x 3300	3300 x 3300	30	30	0.1	0.2	10	100	2.36	2.39	1.1	
14	3300 x 3300	3300 x 3300	30	30	0.1	0.2	100	50	1.89	1.71	-9.4	
15	3300 x 3300	3300 x 3300	30	30	0.3	0.1	20	100	0.42	0.45	7.8	
16	3300 x 3300	3300 x 3300	30	30	0.3	0.1	100	20	0.33	0.32	-3.1	
17	3300 x 3300	3300 x 3300	30	30	0.3	0.1	10	100	0.45	0.49	8.6	
18	3300 x 3300	3300 x 3300	30	30	0.3	0.1	100	50	0.35	0.35	1.2	
19	3300 x 3300	3300 x 3300	30	30	0.2	0.1	20	100	0.61	0.65	5.9	
20	3300 x 3300	3300 x 3300	30	30	0.1	0.3	100	20	2.44	2.21	-9.6	
21	3300 x 3300	3300 x 3300	15	30	0.1	0.2	100	100	3.92	3.62	-7.7	
22	3300 x 3300	3300 x 3300	15	30	0.3	0.1	100	100	0.71	0.74	3.7	
23	3300 x 3300	3300 x 3300	15	30	0.1	0.2	20	100	4.39	4.33	-1.4	
24	3300 x 3300	3300 x 3300	15	30	0.1	0.2	100	20	3.31	3.02	-8.6	
25	3300 x 3300	3300 x 3300	15	30	0.1	0.2	10	100	4.83	4.67	-3.2	
26	3300 x 3300	3300 x 3300	15	30	0.1	0.2	100	50	3.73	3.35	-10.4	
27	3300 x 3300	3300 x 3300	15	30	0.3	0.1	20	100	n/a	0.89		not used
28	3300 x 3300	3300 x 3300	15	30	0.3	0.1	100	20	0.65	0.62	-4.2	
29	3300 x 3300	3300 x 3300	15	30	0.3	0.1	10	100	n/a	0.96		not used
30	3300 x 3300	3300 x 3300	15	30	0.3	0.1	100	50	0.70	0.68	-2.1	

Table B-3 (cont'd)

Case	A1 (ft x ft)	A2 (ft x ft)	h1 (ft)	h2 (ft)	ϕ1	ϕ2	k1 (mD)	k2 (mD)	Q2 /Q1		Error (%)	Remark
									Actual	Equation		
31	3300 x 3300	3300 x 3300	15	30	0.2	0.1	20	100	1.30	1.27	-2.8	
32	3300 x 3300	3300 x 3300	15	30	0.1	0.3	100	20	4.89	4.33	-11.4	not used
33	3300 x 3300	3300 x 3300	30	15	0.1	0.2	20	100	1.11	1.13	2.0	
34	3300 x 3300	3300 x 3300	30	15	0.1	0.2	100	20	0.78	0.79	0.9	
35	3300 x 3300	3300 x 3300	30	15	0.3	0.1	20	100	0.21	0.23	8.6	
36	3300 x 3300	3300 x 3300	30	15	0.3	0.1	100	20	0.16	0.16	-0.7	
37	3300 x 3300	3300 x 3300	30	15	0.3	0.1	10	100	n/a	0.25		not used
38	3300 x 3300	3300 x 3300	30	15	0.1	0.3	100	20	n/a	1.13		not used
39	2100 x 2100	3300 x 3300	30	30	0.1	0.2	100	100	4.74	3.98	-16.0	not used
40	2100 x 2100	3300 x 3300	30	30	0.1	0.2	20	100	4.99	4.76	-4.6	
41	2100 x 2100	3300 x 3300	30	30	0.3	0.1	20	100	0.98	0.97	-0.3	
42	2100 x 2100	3300 x 3300	30	30	0.1	0.3	100	20	5.74	4.76	-17.0	not used
43	2100 x 2100	3300 x 3300	15	30	0.1	0.2	100	100	9.22	7.78	-15.6	not used
44	2100 x 2100	3300 x 3300	15	30	0.1	0.2	20	100	9.99	9.31	-6.8	
45	2100 x 2100	3300 x 3300	15	30	0.1	0.2	100	20	7.64	6.50	-14.9	not used
46	2100 x 2100	3300 x 3300	15	30	0.3	0.1	20	100	n/a	1.91		not used
47	2100 x 2100	3300 x 3300	15	30	0.3	0.1	100	20	1.45	1.33	-8.3	
48	2100 x 2100	3300 x 3300	30	15	0.1	0.2	20	100	2.48	2.43	-2.1	
49	2100 x 2100	3300 x 3300	30	15	0.1	0.2	100	20	n/a	1.70		not used
50	2100 x 2100	3300 x 3300	30	15	0.3	0.1	20	100	0.49	0.50	1.7	
51	2100 x 2100	3300 x 3300	30	15	0.3	0.1	100	20	0.36	0.35	-4.2	
52	3300 x 3300	2100 x 2100	30	30	0.1	0.2	100	100	0.83	0.86	3.4	
53	3300 x 3300	2100 x 2100	30	30	0.1	0.2	20	100	0.95	1.03	7.7	
54	3300 x 3300	2100 x 2100	15	30	0.1	0.2	20	100	1.99	2.01	1.2	
55	3300 x 3300	2100 x 2100	15	30	0.1	0.2	100	20	1.45	1.40	-3.4	
56	3300 x 3300	2100 x 2100	30	15	0.1	0.2	20	100	0.49	0.52	7.6	
57	3300 x 3300	2100 x 2100	30	15	0.1	0.2	100	20	0.36	0.37	0.7	
58	3300 x 3300	2100 x 2100	30	15	0.3	0.1	100	20	0.07	0.07	0.0	

Table B-4 Cases used for rate-allocation study for a two-layered reservoir with one well at q_T = 15 MMscf/d.

Case	A1 (ft x ft)	A2 (ft x ft)	h1 (ft)	h2 (ft)	ϕ1	ϕ2	k1 (mD)	k2 (mD)	Q2 /Q1		Error (%)	Remark
									Actual	Equation		
1	3300 x 3300	3300 x 3300	30	30	0.2	0.2	10	100		1.43		
2	3300 x 3300	3300 x 3300	30	30	0.2	0.2	20	100	1.20	1.28	7.2	
3	3300 x 3300	3300 x 3300	30	30	0.2	0.2	50	100	1.07	1.11	4.1	
4	3300 x 3300	3300 x 3300	30	30	0.2	0.2	100	100	1.01	1.00	-1.3	
5	3300 x 3300	3300 x 3300	30	30	0.2	0.2	100	50	0.96	0.90	-6.5	
6	3300 x 3300	3300 x 3300	30	30	0.2	0.2	100	20	0.86	0.78	-9.7	
7	3300 x 3300	3300 x 3300	30	30	0.2	0.2	100	10		0.70		
8	3300 x 3300	3300 x 3300	30	30	0.1	0.2	100	100	1.94	1.56	-19.8	
9	3300 x 3300	3300 x 3300	30	30	0.1	0.3	100	100	2.88	2.01	-30.1	
10	3300 x 3300	3300 x 3300	30	30	0.3	0.1	100	100	0.36	0.50	38.7	
11	3300 x 3300	3300 x 3300	30	30	0.1	0.2	20	100	2.21	2.00	-9.8	
12	3300 x 3300	3300 x 3300	30	30	0.1	0.2	100	20	1.59	1.21	-23.7	
13	3300 x 3300	3300 x 3300	30	30	0.1	0.2	10	100		2.22		
14	3300 x 3300	3300 x 3300	30	30	0.1	0.2	100	50	1.83	1.40	-23.7	
15	3300 x 3300	3300 x 3300	30	30	0.3	0.1	20	100	0.45	0.64	42.3	
16	3300 x 3300	3300 x 3300	30	30	0.3	0.1	100	20	0.32	0.39	19.7	
17	3300 x 3300	3300 x 3300	30	30	0.3	0.1	10	100		0.71		
18	3300 x 3300	3300 x 3300	30	30	0.3	0.1	100	50	0.35	0.45	28.7	
19	3300 x 3300	3300 x 3300	30	30	0.2	0.1	20	100		0.83		
20	3300 x 3300	3300 x 3300	30	30	0.1	0.3	100	20		1.57		
21	3300 x 3300	3300 x 3300	15	30	0.1	0.2	100	100	3.87	2.05	-47.0	
22	3300 x 3300	3300 x 3300	15	30	0.3	0.1	100	100	0.73	0.66	-10.7	
23	3300 x 3300	3300 x 3300	15	30	0.1	0.2	20	100		2.64		
24	3300 x 3300	3300 x 3300	15	30	0.1	0.2	100	20		1.60		
25	3300 x 3300	3300 x 3300	15	30	0.1	0.2	10	100		2.93		
26	3300 x 3300	3300 x 3300	15	30	0.1	0.2	100	50	3.60	1.84	-48.7	
27	3300 x 3300	3300 x 3300	15	30	0.3	0.1	20	100		0.84		
28	3300 x 3300	3300 x 3300	15	30	0.3	0.1	100	20		0.51		
29	3300 x 3300	3300 x 3300	15	30	0.3	0.1	10	100		0.94		
30	3300 x 3300	3300 x 3300	15	30	0.3	0.1	100	50	0.70	0.59	-16.5	

Table B-4 (cont'd)

Case	A1 (ft x ft)	A2 (ft x ft)	h1 (ft)	h2 (ft)	ϕ1	ϕ2	k1 (mD)	k2 (mD)	Q2 /Q1		Error (%)	Remark
									Actual	Equation		
31	3300 x 3300	3300 x 3300	15	30	0.2	0.1	20	100		1.09		
32	3300 x 3300	3300 x 3300	15	30	0.1	0.3	100	20		2.07		
33	3300 x 3300	3300 x 3300	30	15	0.1	0.2	20	100		1.51		
34	3300 x 3300	3300 x 3300	30	15	0.1	0.2	100	20		0.92		
35	3300 x 3300	3300 x 3300	30	15	0.3	0.1	20	100		0.48		
36	3300 x 3300	3300 x 3300	30	15	0.3	0.1	100	20	0.16	0.29	82.2	
37	3300 x 3300	3300 x 3300	30	15	0.3	0.1	10	100		0.54		
38	3300 x 3300	3300 x 3300	30	15	0.1	0.3	100	20		1.19		
39	2100 x 2100	3300 x 3300	30	30	0.1	0.2	100	100	4.67	3.12	-33.1	
40	2100 x 2100	3300 x 3300	30	30	0.1	0.2	20	100	4.99	4.01	-19.7	
41	2100 x 2100	3300 x 3300	30	30	0.3	0.1	20	100		1.28		
42	2100 x 2100	3300 x 3300	30	30	0.1	0.3	100	20	5.38	3.15	-41.4	
43	2100 x 2100	3300 x 3300	15	30	0.1	0.2	100	100		4.12		
44	2100 x 2100	3300 x 3300	15	30	0.1	0.2	20	100	9.99	5.29	-47.0	
45	2100 x 2100	3300 x 3300	15	30	0.1	0.2	100	20		3.21		
46	2100 x 2100	3300 x 3300	15	30	0.3	0.1	20	100		1.69		
47	2100 x 2100	3300 x 3300	15	30	0.3	0.1	100	20		1.02		
48	2100 x 2100	3300 x 3300	30	15	0.1	0.2	20	100	2.49	3.04	22.3	
49	2100 x 2100	3300 x 3300	30	15	0.1	0.2	100	20		1.84		
50	2100 x 2100	3300 x 3300	30	15	0.3	0.1	20	100		0.97		
51	2100 x 2100	3300 x 3300	30	15	0.3	0.1	100	20		0.59		
52	3300 x 3300	2100 x 2100	30	30	0.1	0.2	100	100	0.83	0.77	-7.0	
53	3300 x 3300	2100 x 2100	30	30	0.1	0.2	20	100		0.99		
54	3300 x 3300	2100 x 2100	15	30	0.1	0.2	20	100		1.31		
55	3300 x 3300	2100 x 2100	15	30	0.1	0.2	100	20		0.80		
56	3300 x 3300	2100 x 2100	30	15	0.1	0.2	20	100		0.75		
57	3300 x 3300	2100 x 2100	30	15	0.1	0.2	100	20		0.46		
58	3300 x 3300	2100 x 2100	30	15	0.3	0.1	100	20	0.07	0.15	106.2	

Table B-5 Cases used for rate-allocation study for a two-layered reservoir with one well at q_T = 20 MMscf/d.

Case	A1 (ft x ft)	A2 (ft x ft)	h1 (ft)	h2 (ft)	ϕ1	ϕ2	k1 (mD)	k2 (mD)	Q2 /Q1		Error (%)	Remark
									Actual	Equation		
1	3300 x 3300	3300 x 3300	30	30	0.2	0.2	10	100		1.42		
2	3300 x 3300	3300 x 3300	30	30	0.2	0.2	20	100		1.28		
3	3300 x 3300	3300 x 3300	30	30	0.2	0.2	50	100	1.08	1.11	3.0	
4	3300 x 3300	3300 x 3300	30	30	0.2	0.2	100	100	1.01	1.00	-1.5	
5	3300 x 3300	3300 x 3300	30	30	0.2	0.2	100	50	0.95	0.90	-5.6	
6	3300 x 3300	3300 x 3300	30	30	0.2	0.2	100	20		0.78		
7	3300 x 3300	3300 x 3300	30	30	0.2	0.2	100	10		0.71		
8	3300 x 3300	3300 x 3300	30	30	0.1	0.2	100	100	1.93	1.43	-25.7	
9	3300 x 3300	3300 x 3300	30	30	0.1	0.3	100	100	2.81	1.76	-37.3	
10	3300 x 3300	3300 x 3300	30	30	0.3	0.1	100	100	0.36	0.57	55.9	
11	3300 x 3300	3300 x 3300	30	30	0.1	0.2	20	100		1.82		
12	3300 x 3300	3300 x 3300	30	30	0.1	0.2	100	20		1.12		
13	3300 x 3300	3300 x 3300	30	30	0.1	0.2	10	100		2.03		
14	3300 x 3300	3300 x 3300	30	30	0.1	0.2	100	50	1.79	1.29	-28.0	
15	3300 x 3300	3300 x 3300	30	30	0.3	0.1	20	100		0.72		
16	3300 x 3300	3300 x 3300	30	30	0.3	0.1	100	20	0.32	0.44	38.7	
17	3300 x 3300	3300 x 3300	30	30	0.3	0.1	10	100		0.80		
18	3300 x 3300	3300 x 3300	30	30	0.3	0.1	100	50	0.35	0.51	45.6	
19	3300 x 3300	3300 x 3300	30	30	0.2	0.1	20	100		0.89		
20	3300 x 3300	3300 x 3300	30	30	0.1	0.3	100	20		1.38		
21	3300 x 3300	3300 x 3300	15	30	0.1	0.2	100	100	3.82	1.82	-52.4	
22	3300 x 3300	3300 x 3300	15	30	0.3	0.1	100	100	0.74	0.72	-3.1	
23	3300 x 3300	3300 x 3300	15	30	0.1	0.2	20	100		2.32		
24	3300 x 3300	3300 x 3300	15	30	0.1	0.2	100	20		1.43		
25	3300 x 3300	3300 x 3300	15	30	0.1	0.2	10	100		2.58		
26	3300 x 3300	3300 x 3300	15	30	0.1	0.2	100	50	3.55	1.64	-53.8	
27	3300 x 3300	3300 x 3300	15	30	0.3	0.1	20	100		0.92		
28	3300 x 3300	3300 x 3300	15	30	0.3	0.1	100	20		0.57		
29	3300 x 3300	3300 x 3300	15	30	0.3	0.1	10	100		1.02		
30	3300 x 3300	3300 x 3300	15	30	0.3	0.1	100	50	0.71	0.65	-8.2	

Table B-5 (cont'd)

Case	A1 (ft x ft)	A2 (ft x ft)	h1 (ft)	h2 (ft)	ϕ1	ϕ2	k1 (mD)	k2 (mD)	Q2 /Q1		Error (%)	Remark
									Actual	Equation		
31	3300 x 3300	3300 x 3300	15	30	0.2	0.1	20	100		1.13		
32	3300 x 3300	3300 x 3300	15	30	0.1	0.3	100	20		1.76		
33	3300 x 3300	3300 x 3300	30	15	0.1	0.2	20	100		1.43		
34	3300 x 3300	3300 x 3300	30	15	0.1	0.2	100	20		0.88		
35	3300 x 3300	3300 x 3300	30	15	0.3	0.1	20	100		0.57		
36	3300 x 3300	3300 x 3300	30	15	0.3	0.1	100	20	0.16	0.35	119.9	
37	3300 x 3300	3300 x 3300	30	15	0.3	0.1	10	100		0.63		
38	3300 x 3300	3300 x 3300	30	15	0.1	0.3	100	20		1.09		
39	2100 x 2100	3300 x 3300	30	30	0.1	0.2	100	100	4.44	2.60	-41.4	
40	2100 x 2100	3300 x 3300	30	30	0.1	0.2	20	100	4.97	3.32	-33.3	
41	2100 x 2100	3300 x 3300	30	30	0.3	0.1	20	100		1.31		
42	2100 x 2100	3300 x 3300	30	30	0.1	0.3	100	20		2.51		
43	2100 x 2100	3300 x 3300	15	30	0.1	0.2	100	100	9.16	3.31	-63.9	
44	2100 x 2100	3300 x 3300	15	30	0.1	0.2	20	100	9.94	4.22	-57.5	
45	2100 x 2100	3300 x 3300	15	30	0.1	0.2	100	20		2.60		
46	2100 x 2100	3300 x 3300	15	30	0.3	0.1	20	100		1.67		
47	2100 x 2100	3300 x 3300	15	30	0.3	0.1	100	20		1.03		
48	2100 x 2100	3300 x 3300	30	15	0.1	0.2	20	100	2.48	2.61	5.0	
49	2100 x 2100	3300 x 3300	30	15	0.1	0.2	100	20		1.60		
50	2100 x 2100	3300 x 3300	30	15	0.3	0.1	20	100		1.03		
51	2100 x 2100	3300 x 3300	30	15	0.3	0.1	100	20		0.63		
52	3300 x 3300	2100 x 2100	30	30	0.1	0.2	100	100	0.84	0.79	-5.8	
53	3300 x 3300	2100 x 2100	30	30	0.1	0.2	20	100		1.00		
54	3300 x 3300	2100 x 2100	15	30	0.1	0.2	20	100		1.28		
55	3300 x 3300	2100 x 2100	15	30	0.1	0.2	100	20		0.79		
56	3300 x 3300	2100 x 2100	30	15	0.1	0.2	20	100		0.79		
57	3300 x 3300	2100 x 2100	30	15	0.1	0.2	100	20		0.49		
58	3300 x 3300	2100 x 2100	30	15	0.3	0.1	100	20	0.07	0.19	167.8	

APPENDIX C

PLOTS OF FLOW RATE OF EACH LAYER VS. TIME OF INTERESTING CASES

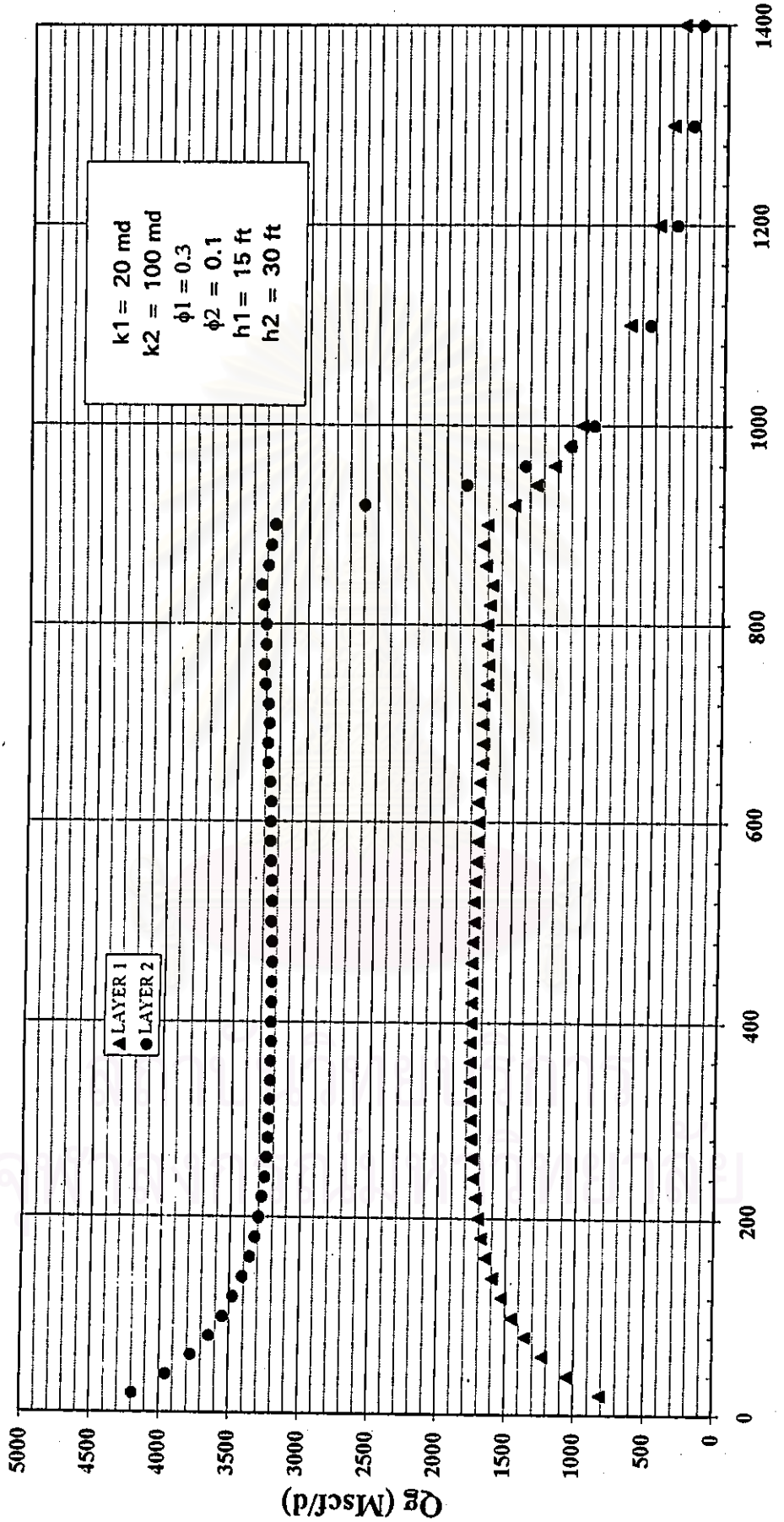

Figure C-1 Flow rate of each layer for a typical two-layered reservoir

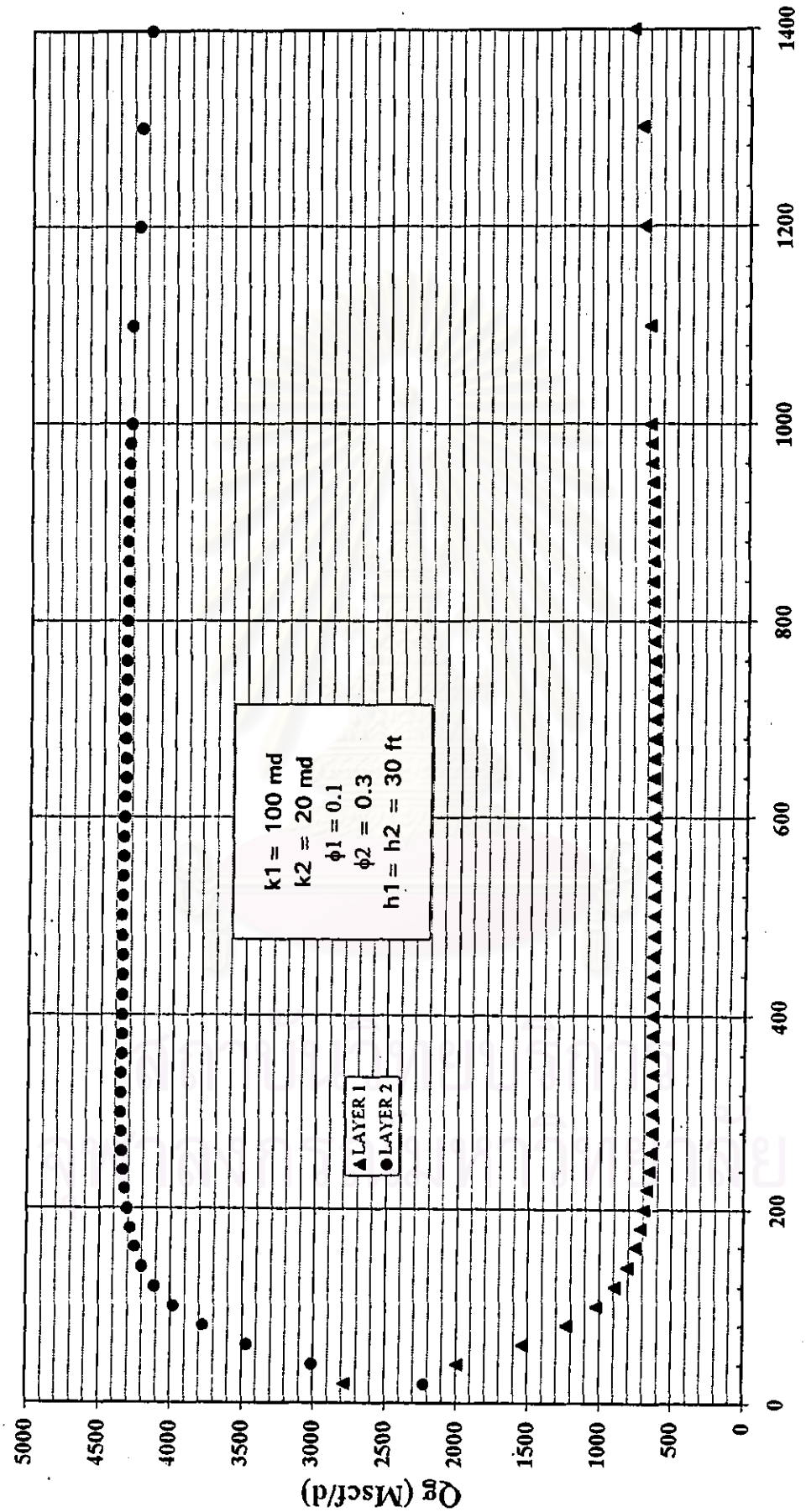

Figure C-2 Flow rate of each layer for a typical two-layered reservoir

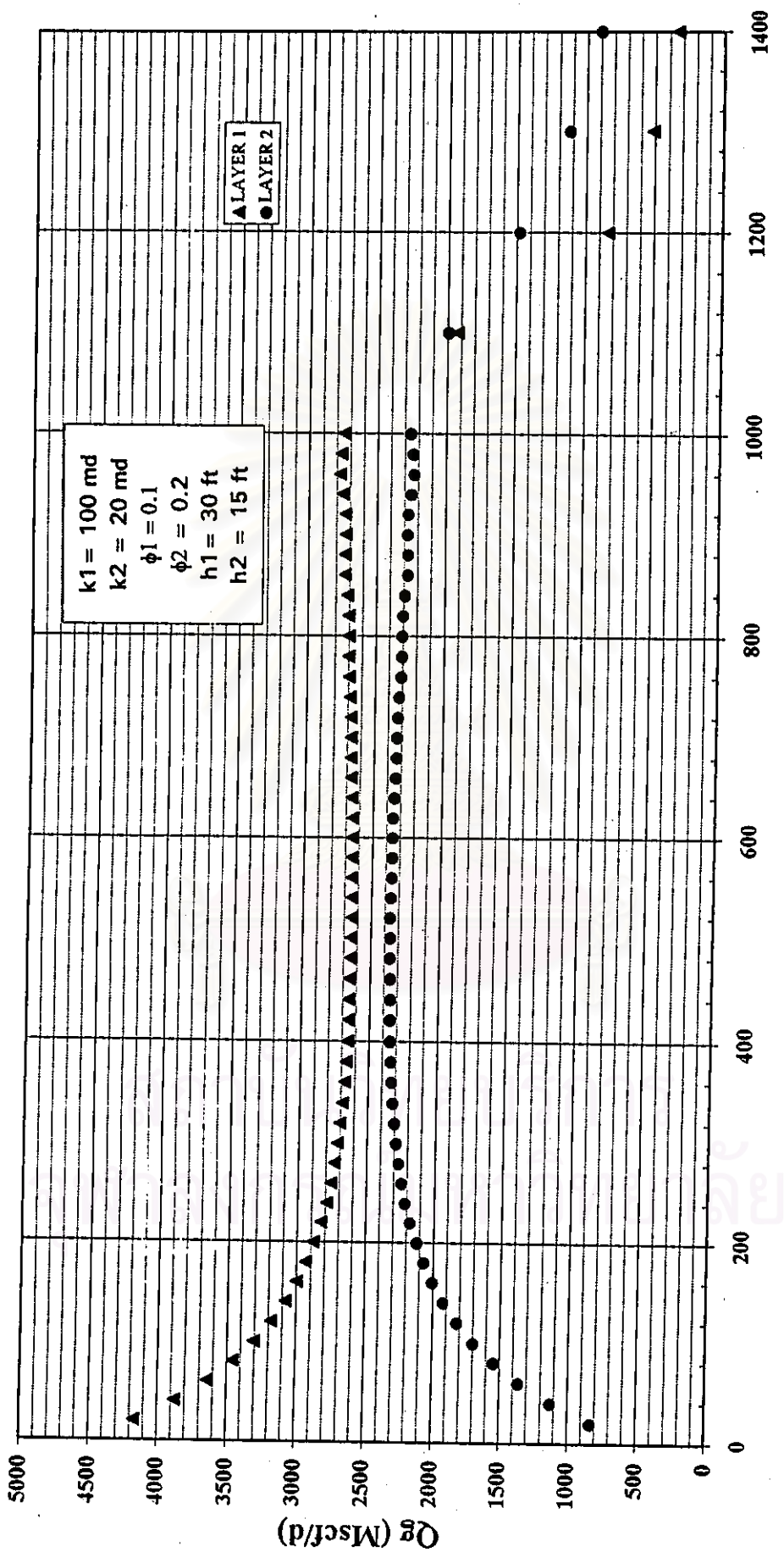

Figure C-3 Flow rate of each layer for a typical two-layered reservoir

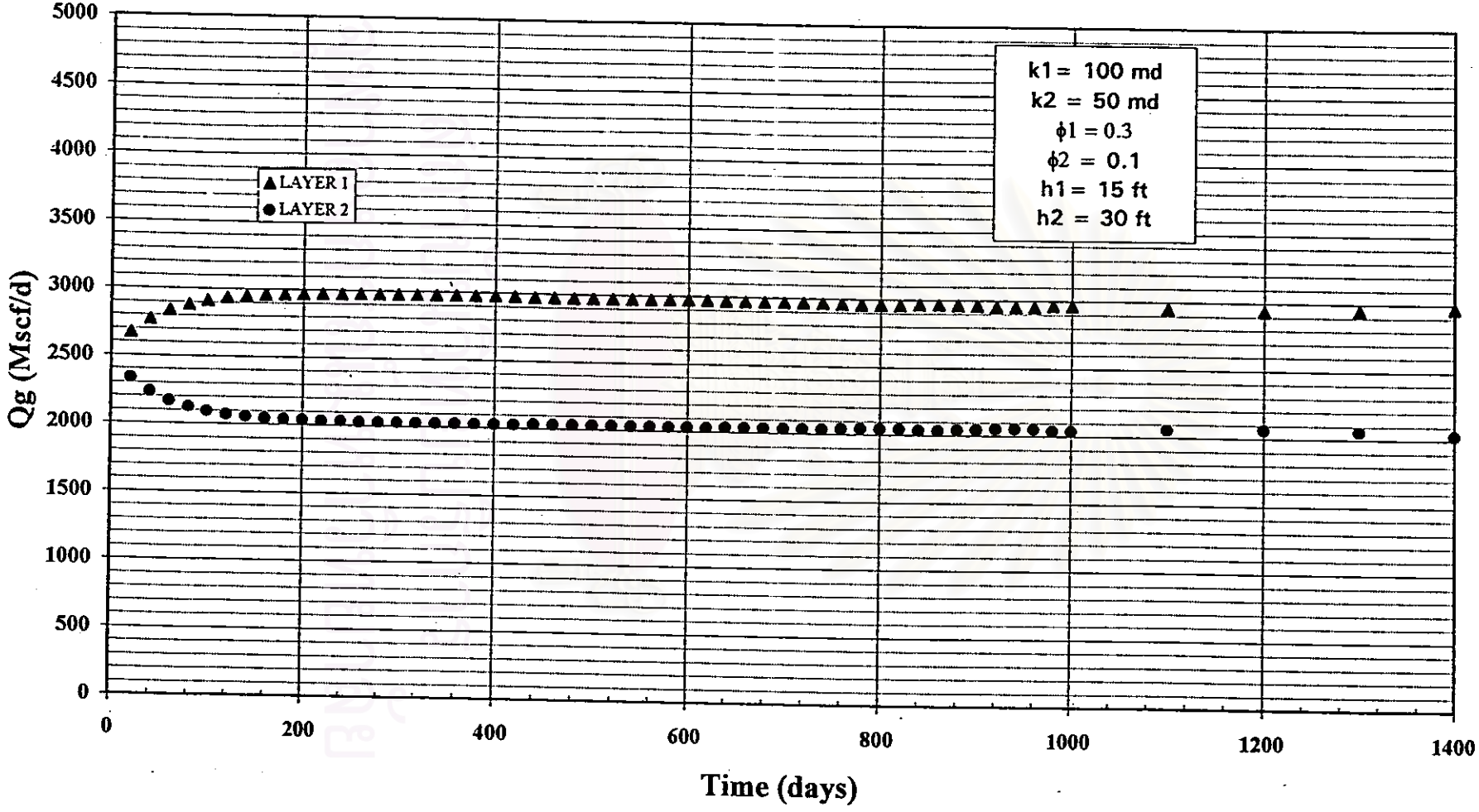

Figure C-4 Flow rate of each layer for a typical two-layered reservoir

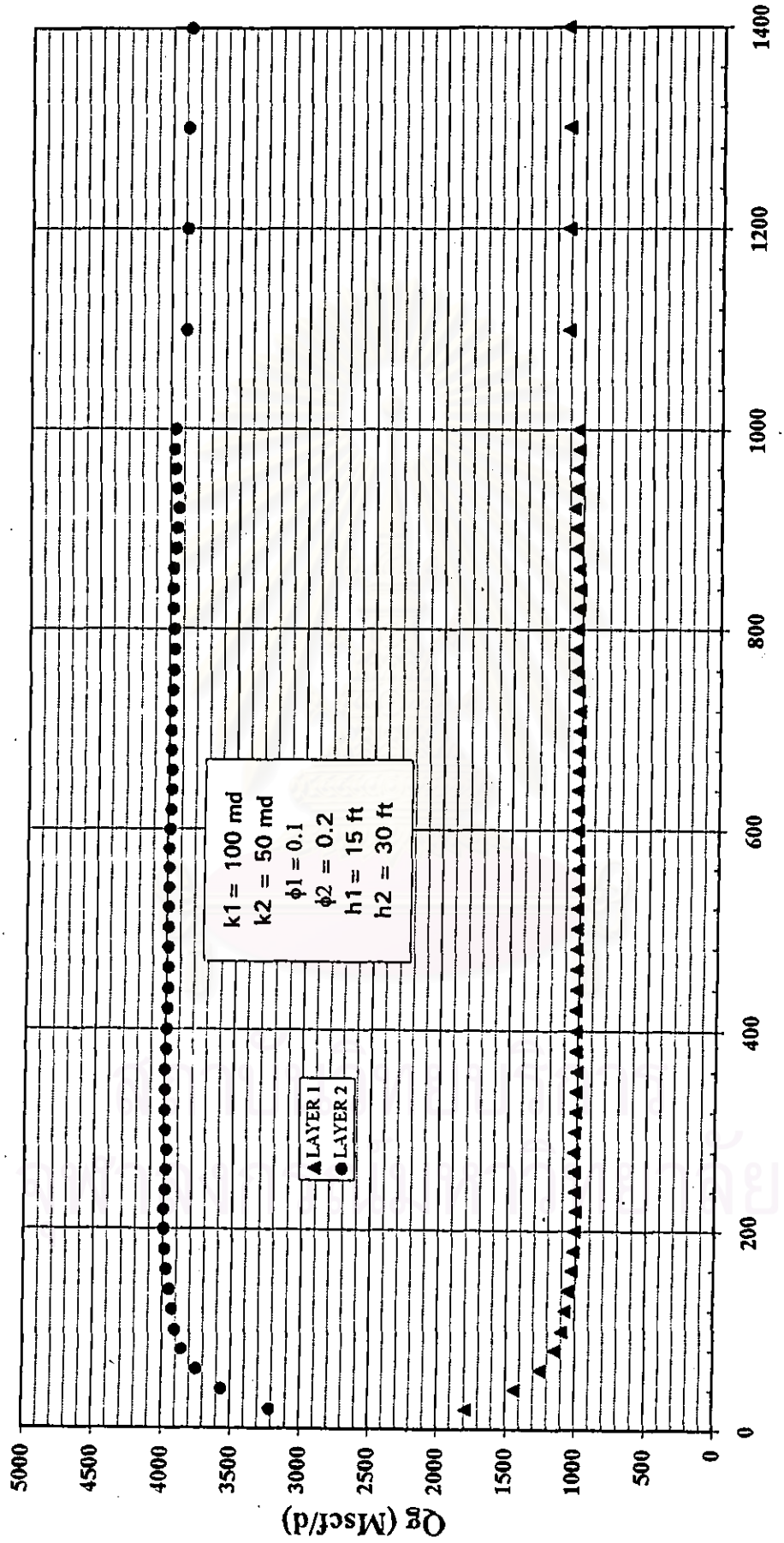

Figure C-5 Flow rate of each layer for a typical two-layered reservoir

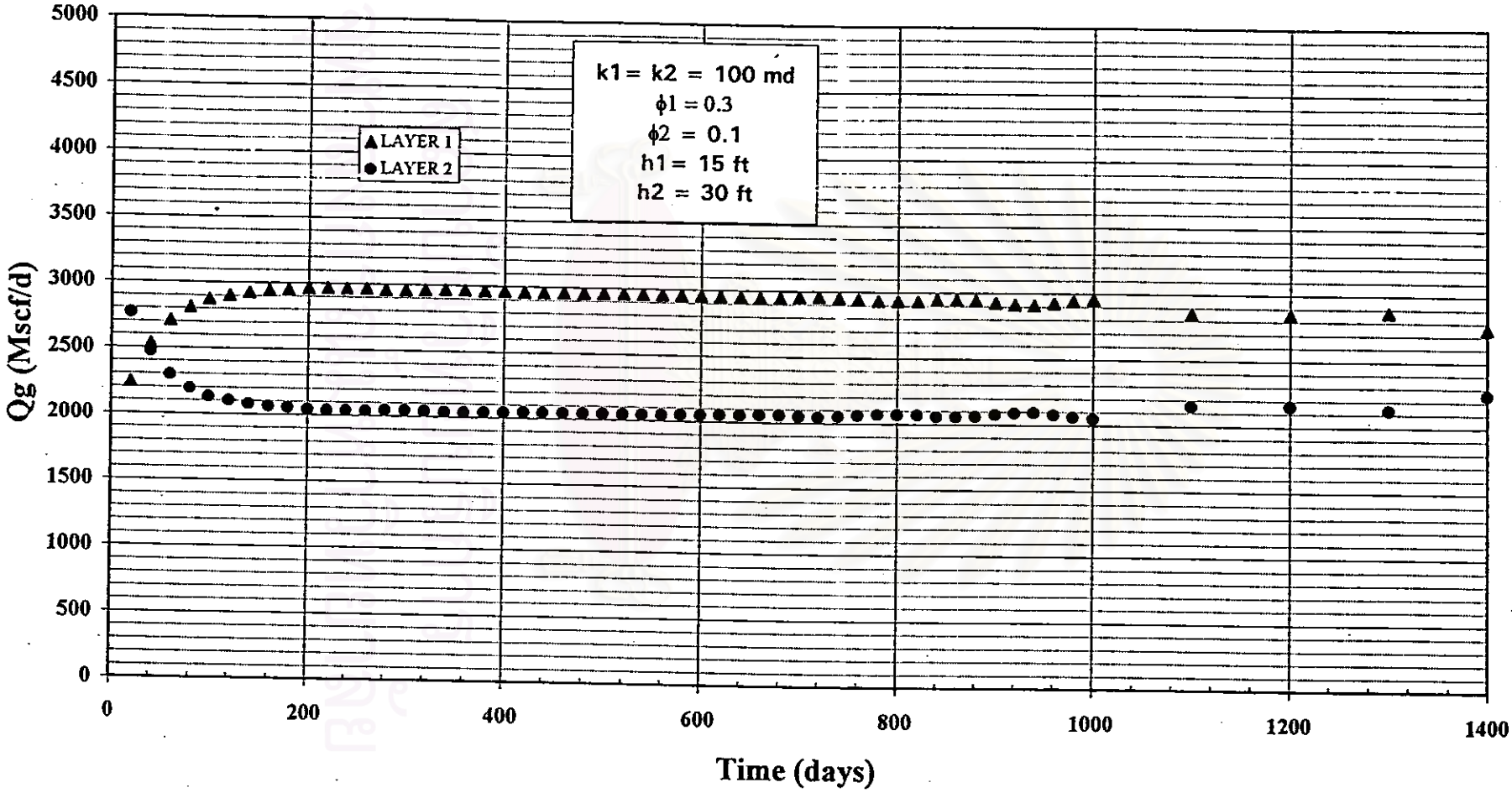

Figure C-6 Flow rate of each layer for a typical two-layered reservoir

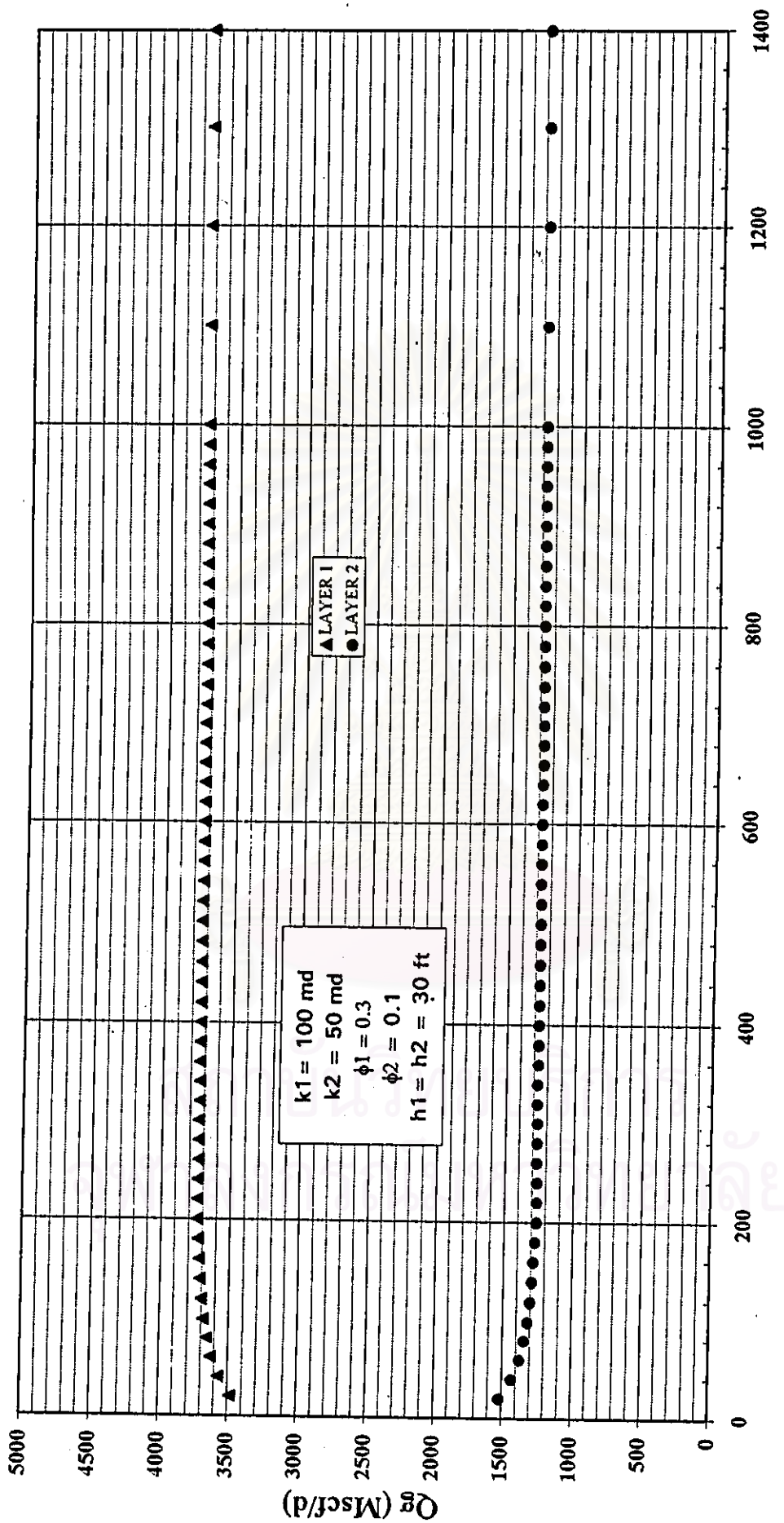

Figure C-7 Flow rate of each layer for a typical two-layered reservoir

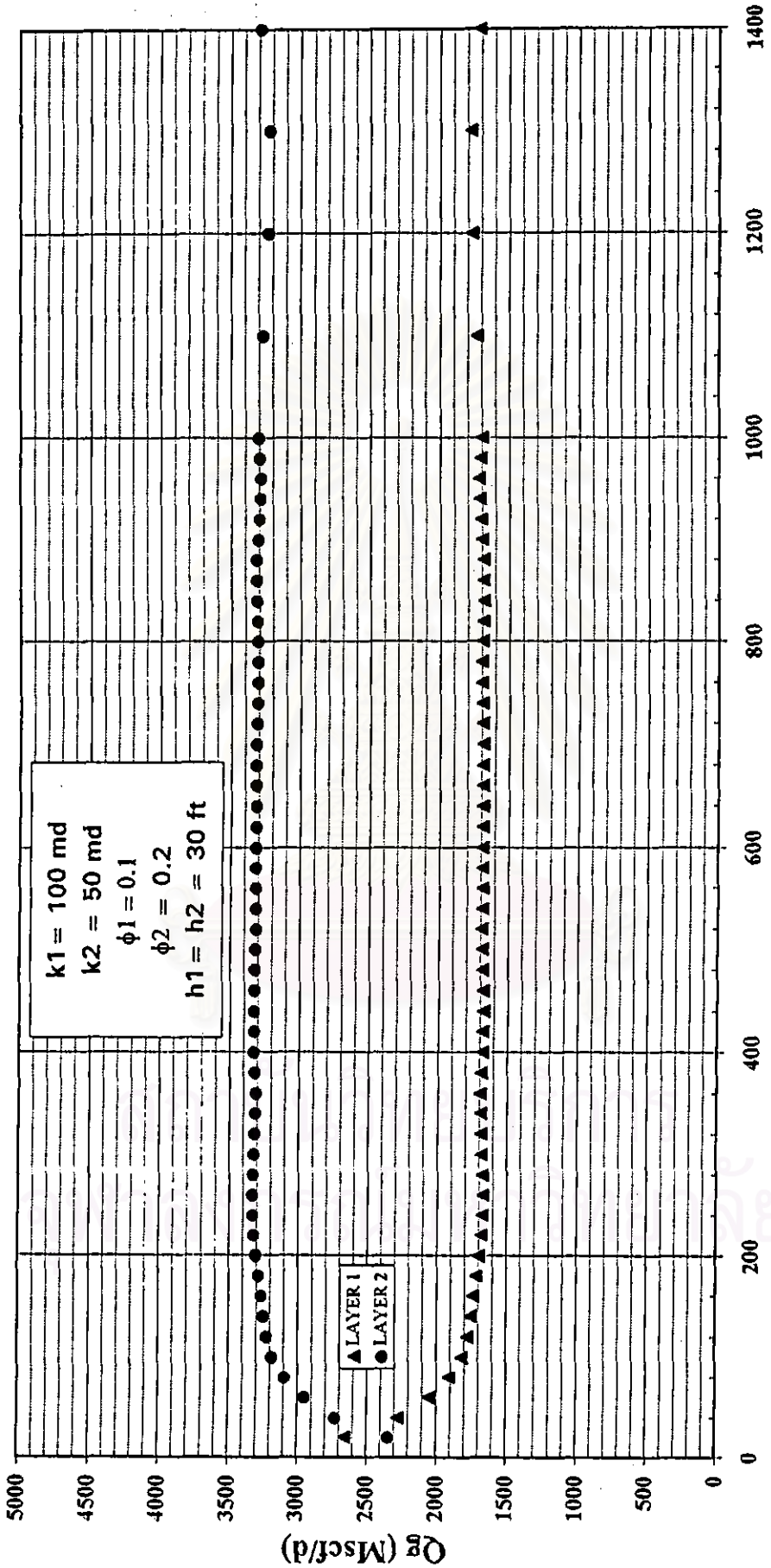

Figure C-8 Flow rate of each layer for a typical two-layered reservoir

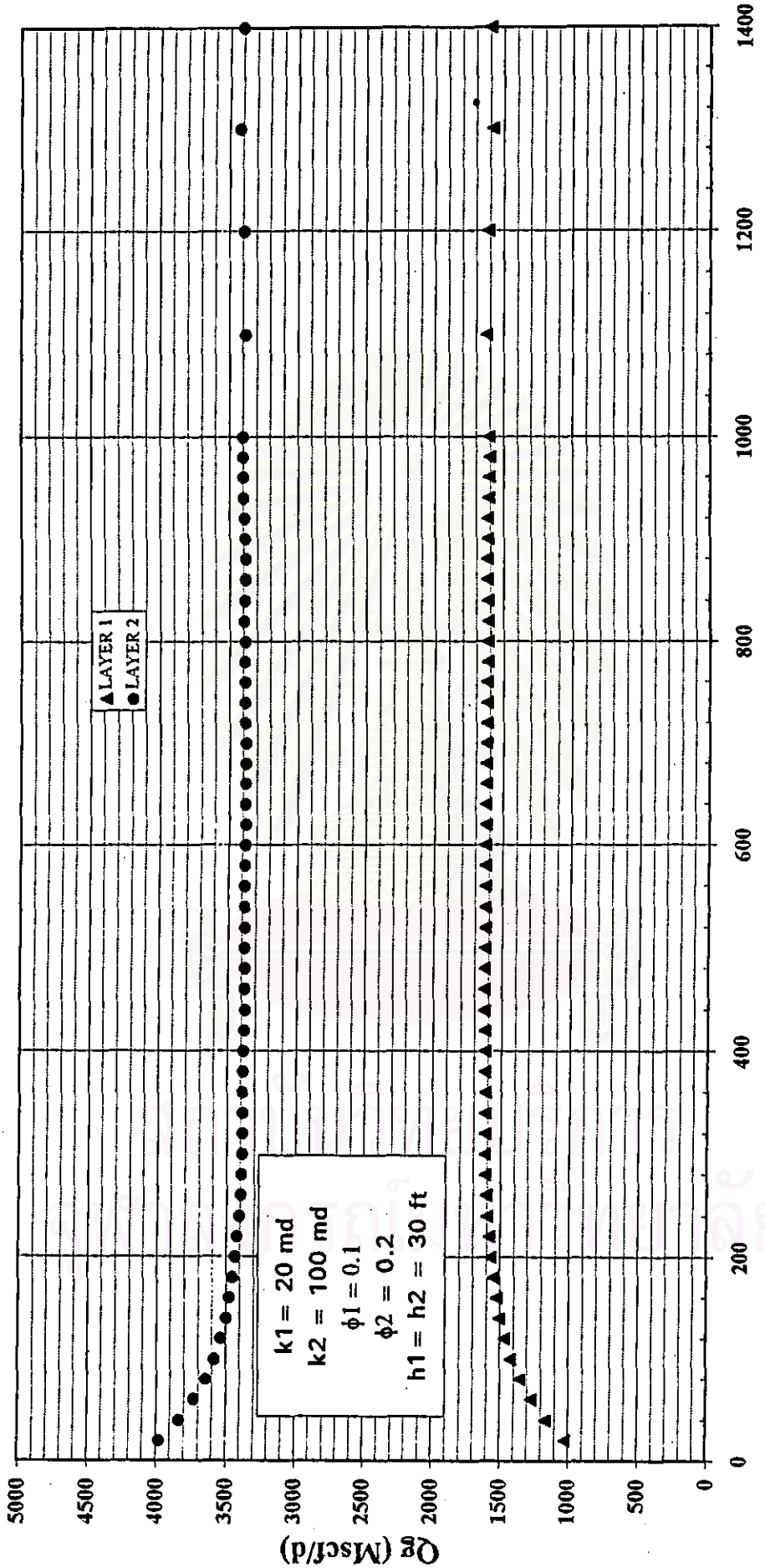

Figure C-9 Flow rate of each layer for a typical two-layered reservoir

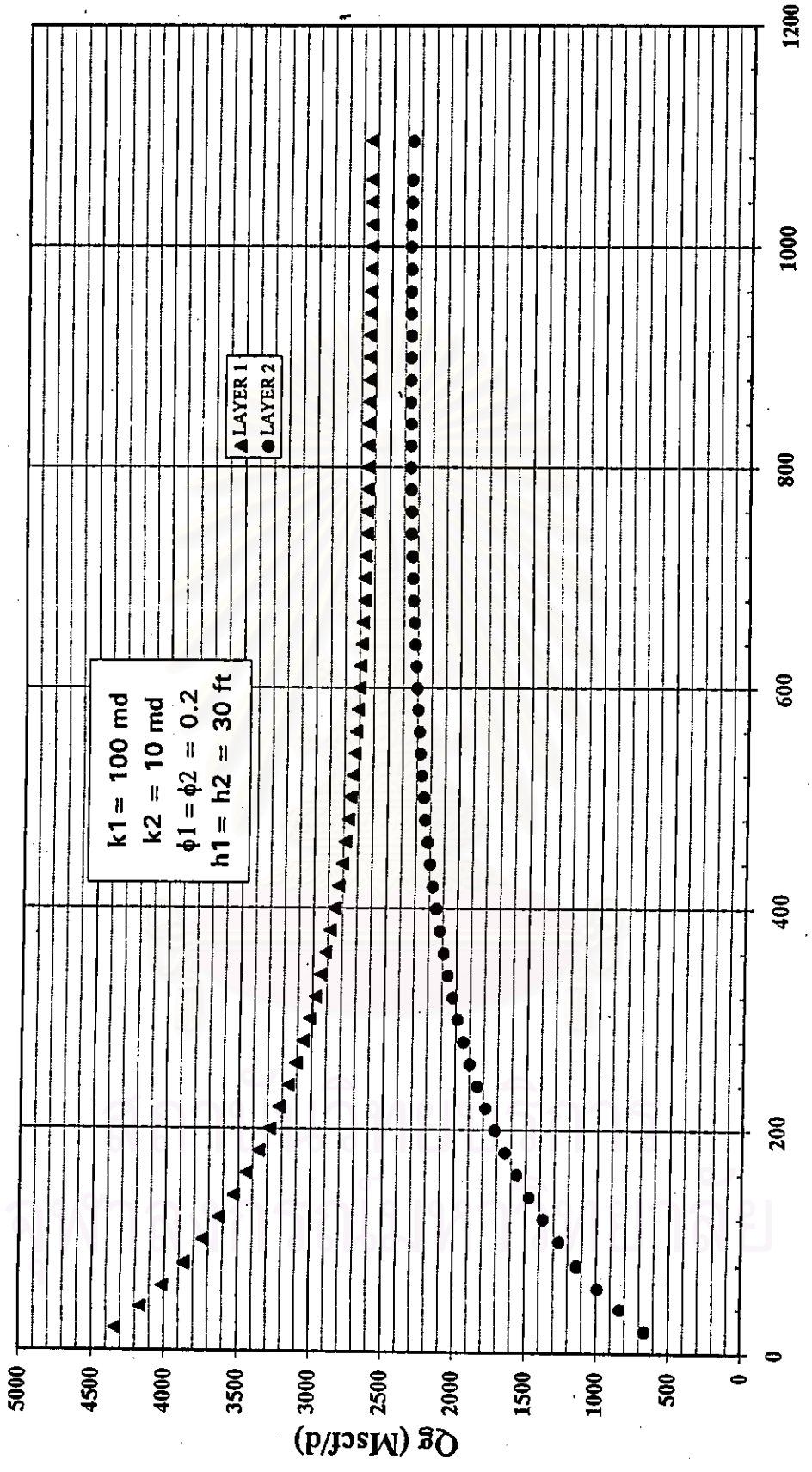

Figure C-10 Flow rate of each layer for a typical two-layered reservoir

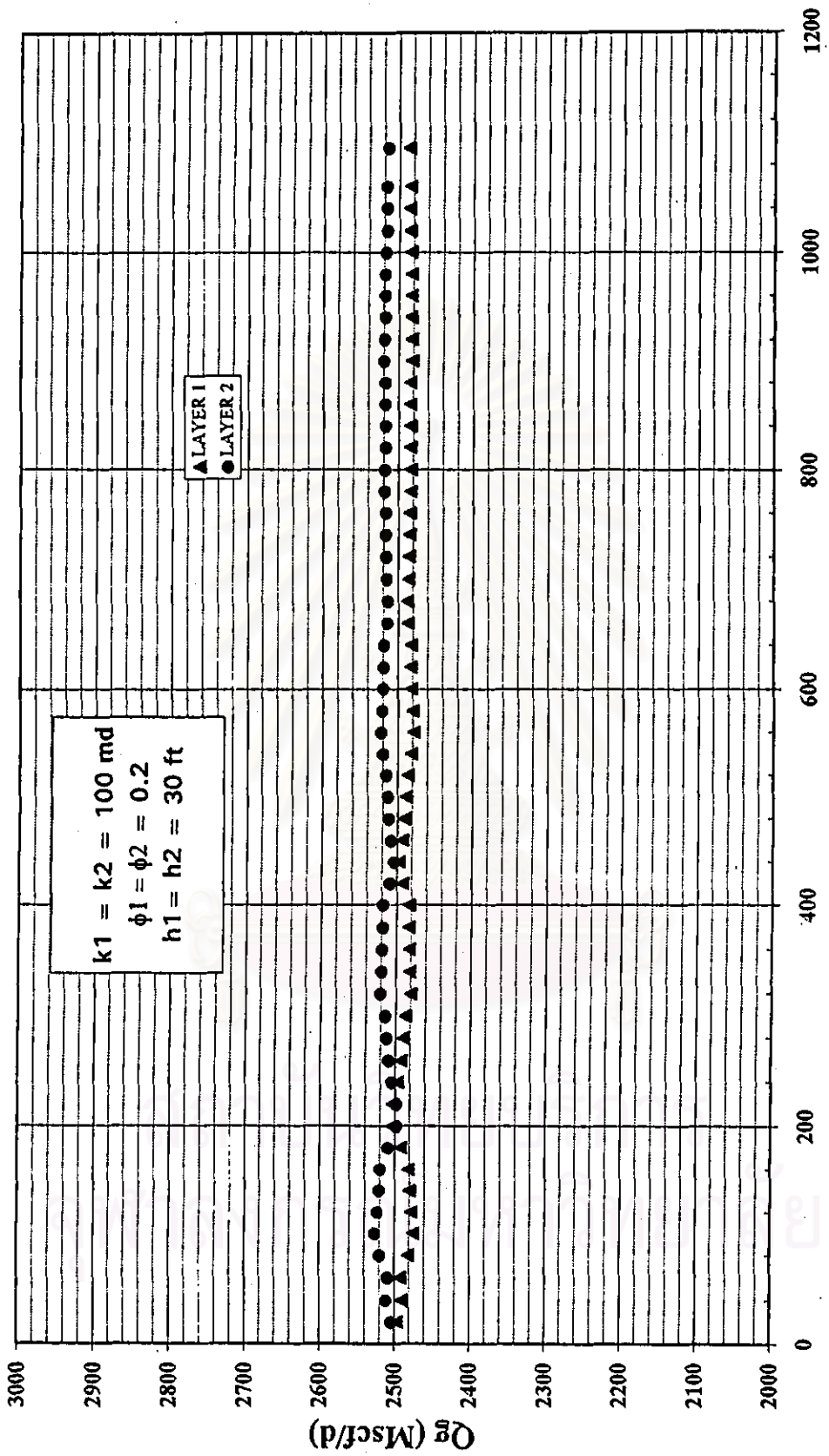

Figure C-11 Flow rate of each layer for a typical two-layered reservoir, q_t = 5 MMscf/d

VITAE

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