UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
Water Resources Division

BASIC DATA FOR THREE LACUSTRINE CLAY DEPOSITS IN THE SOUTHERN PART OF THE SAN JOAQUIN VALLEY, CALIFORNIA

Prepared in cooperation with the
California Department of Water Resources

OPEN-FILE REPORT

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INTRODUCTION

Purpose and Scope

The purpose of this report is to supplement other studies in the San Joaquin Valley by presenting data on the extent and thickness of the A clay, the C clay, and the E clay (including the Corcoran Clay Member of the Tulare Formation). The scope of the report included (1) examination and evaluation of all available well-log data in the area, (2) construction of a base map showing well locations, and (3) tabulation of data on the altitude of the base and the thickness of each of the three clays.

This study was made during the 1964 and 1965 fiscal years by the U.S. Geological Survey, Water Resources Division, in cooperation with the California Department of Water Resources, under the supervision of Fred Kunkel, district geologist for ground-water studies in California.

Well-Numbering System

The sites in the San Joaquin Valley, shown on figure 1, and the corresponding lithologic and well-log data in the files of the Geological Survey are assigned numbers according to the location of the site in the rectangular system for the subdivision of public land. For example, in the number 19S/22E-19A1 M for a site south of Hanford, the number and letter before the slash indicate the township (T. 19 S.) and those following the slash indicate the range (R. 22 E.); the number between the hyphen and the letter indicates the section (sec. 19); the letter following the section number indicates the 40-acre subdivision of the section, as shown in the accompanying diagram.

A Z following the section number indicates the location of the site within a section has not been verified in the field, and the location description is not adequate for assignment of a 40-acre tract letter.

Within each 40-acre tract, those sites numbered serially, as indicated by the final digit, were field located, and a well-schedule sheet was made. Where the final digit is missing, the site was plotted in the office from an adequate location description without field verification or completion of a well schedule.

The final letter (M or S) indicates the base line and meridian. That part of the valley north of Kern Lake Bed is in the Mount Diablo base line and meridian, and that part south of Kern Lake Bed is in the San Bernardino base line and meridian.

The well symbol on the map shows only the section number, the 40-acre tract letter, and the serial number, if assigned.

D	C	B	A
E	F	G	H
M	L	K	J
N	P	Q	R

Nature of the Available Data

Figure 1 shows sites in the southern part of the San Joaquin Valley for which selected electric and (or) lithologic logs for the ground-water reservoir are available in the files of the U.S. Geological Survey at Sacramento, Calif. These data consist of about 4,000 electric logs and about 300 lithologic logs of core and auger holes and reverse-rotary wells. Most of the logs may be inspected by the public; however, those logs classified confidential by the well owners may be inspected only with special authorization.

About 80 percent of the available electric logs are of water wells and were obtained from well owners and drillers during the water-well canvass of the area. About 20 percent are of oil and gas wells and most are ozalid prints. About 50 electric logs are of core holes.

The U.S. Geological Survey, the U.S. Bureau of Reclamation, and the California Department of Water Resources have cored and made detailed lithologic logs of about 100 holes in the fresh-water-bearing deposits in the southern part of the San Joaquin Valley. About half the core holes (fig. 1) also were electric logged.

The Geological Survey has collected lithologic logs of several hundred auger and reverse-rotary holes from the California Department of Water Resources and ground-water consultants. Because of space limitations, the sites of only those holes for which the most complete data are available are shown on figure 1.

Table 1 lists the altitude of the base and the thickness of the A clay, the C clay, and the E clay, as determined from electric or lithologic logs in the files of the Geological Survey.

Table 1.--Altitude and thickness of the A clay, the C clay, and the E clay

Altitude, in feet above(+) or below(-) sea level, is that of the base of the clay, except beneath Kern and Buena Vista Lake Beds where the altitude of the A clay is the base of the upper clay stratum.

Thickness of the clay is given in feet. Where two numbers are shown separated by a colon(:), the clay is bifurcated into an upper and lower stratum. The number to the left of the colon is the thickness of the upper bifurcation; the number to the right is the thickness of the lower bifurcation. Further subdivision of the upper or lower stratum is indicated by a slash(/) or slashes; the number to the left of the slash indicates the thickness of the upper additional subdivision, the number to the right of the slash indicates the thickness of the lower subdivision. A question mark(?) indicates the stratum is absent or that the top or bottom is poorly defined, and the thickness is unknown or uncertain.

Well number	A clay		C clay		E clay	
	Altitude	Thickness	Altitude	Thickness	Altitude	Thickness
T. 14 S., R. 12 E., Mount Diablo base line and meridian (MDB&M)						
2N2					-206	100
3P1					-80	90
8H1					+140	60
11E1					-165	100
12H					-364	90
14F1					-195	90
23P1					-85	70
23P2					-147	110
35H1					-171	130
36J					-228	95

Well number	A clay		C clay		E clay	
	Altitude	Thickness	Altitude	Thickness	Altitude	Thickness
T. 14 S., R. 13 E., MDB&M						
1N1					-395	80
6P1					-388	95
11D2					-416	75
13E1					-438	75
17E1					-417	95
19R1					-386	95
21N1					-444	95
24N1					-477	90
26N1					-501	90
29N					-401	100
36N1					-508	100
T. 14 S., R. 14 E., MDB&M						
3R					-335	60
6N2					-380	75
10N2					-363	60
10N4					-363	60
12N2			-45	13	-325	50
12R			-42	4		
13E			-37	6		
14G1					-346	70
17Q1					-418	65
18N2					-438	70
20N1					-453	75
21A					-398	61
21K1					-406	50

Well number	A clay		C clay		E clay	
	Altitude	Thickness	Altitude	Thickness	Altitude	Thickness
T. 14 S., R. 14 E., MDB&M--Continued						
24E1					-355	62
27A					-404	62
28R					-454	88
29R1					-466	65
33E1					-485	85
36N1					-424	85
T. 14 S., R. 15 E., MDB&M						
3B1	+75	20				
3K1	+72	20				
5A			-89		-317	60
8C	+122	2:5				
10A	+86	8:4	-98	18	-326	50
11R			-77	6	-337	50
16A			-84	20		
16D1			-90	4:9	-342	55
18E1			-45	5	-345	70
19N1					-367	50
22N	+101	4	-109	4:3	-376	54
25H1					-369	50
25K1			-90	5		
26N	+91	4			-390	49
30M1					-376	60
32A					-406	82
			-77	10		
32N2			-68	5		
T. 14 S., R. 16 E., MDB&M						
8N	+103	2:4	-79	6:4	-320	20:?
15R	+114	2:5			-316	24:?
16A	+110	2:3	-62	18	-366	24:?
16R	+104		-79	3:5	-356	18:4
24N	+125	4			-327	44

Well number	A clay		C clay		E clay	
	Altitude	Thickness	Altitude	Thickness	Altitude	Thickness
T. 14 S., R. 16 E., MDB&M--Continued						
27D					-319	52
33D	+100	11	-97	2	-393	48
34A	+101		-70		-391	40:8
T. 15 S., R. 12 E., MDB&M						
1C					-173	100
1R					-168	100
2P1					- 27	90
23Q1					+459	10
T. 15 S., R. 13 E., MDB&M						
4E					-425	100
5M1					-348	100
7M1					-200	105
8E					-314	85
9E2					-425	100
11D1					-495	80
16K1					-436	80
18N1					- 62	85
18R1					-258	90
20E1					-207	90
22F					-437	70
22N1					-407	60
26B1					-510	65
T. 15 S., R. 14 E., MDB&M						
1K2					-423	80
4L1					-500	82
6D2					-505	80
6N1					-500	85

Well number	A clay		C clay		E clay	
	Altitude	Thickness	Altitude	Thickness	Altitude	Thickness
T. 15 S., R. 14 E., MDB&M--Continued						
12M1					-452	75
15C					-495	85
15E1					-494	85
18B1					-490	85
18D1					-500	80
18Q1					-513	85
21Q					-475	90
23D3					-477	80
24F					-459	85
28Q					-463	80
34E1					-441	75
T. 15 S., R. 15 E., MDB&M						
2A			-122	6	-453	62:10
3R	+107	6			-443	94
4A					-425	80
4N1					-418	92
5D					-416	90
8N					-400	95
8R					-408	88
10N1					-434	96
11K1					-466	85
12A	+98	5			-473	48:10
14N					-447	87
17N					-400	90
19M1					-468	85
20A					-387	87

Well number	A clay		C clay		E clay	
	Altitude	Thickness	Altitude	Thickness	Altitude	Thickness
T. 15 S., R. 15 E., MDB&M--Continued						
20N					-396	85
22N1					-398	90
22Q1					-408	85
24N					-458	85
27N1					-422	84
30N2					-461	80
33E1					-410	90
T. 15 S., R. 16 E., MDB&M						
7D1			-117	10		
12C1					-423	30:30
17L1					-482	40:15
23J1	+113					
28A1					-478	80
34N					-490	91
35R					-468	93
T. 15 S., R. 17 E., MDB&M						
5F					-380	25:10
10M					-385	?:10
11M					-350	?:20
16H1					-370	10:25
24A					-333	?:10
T. 15 S., R. 18 E., MDB&M						
29P					-351	(?)
34H	163				-332	20
34N	143				-331	26
T. 16 S., R. 14 E., MDB&M						
1G					-455	75
3H					-440	75
10Q1					-528	80
11K					-461	80
12K1					-461	75
16N1					-442	15
24G					-475	30:?
26F					-412	20:?
36D					-383	20:?

Well number	A clay		C clay		E clay	
	Altitude	Thickness	Altitude	Thickness	Altitude	Thickness
T. 16 S., R. 15 E., MDB&M						
3R					-421	83
4D					-409	81
4R					-401	81
6G1					-449	65
7A					-427	78
8R					-401	82
9D					-406	83
9R					-406	80
10R					-416	63
11R					-432	89
16N					-374	70
21R					-382	67
23L					-457	75
24N1					-458	45
26N3					-425	70
27N2					-352	55
34N1					-234	10
36R1					-480	65
. 16 S., R. 16 E., MDB&M						
1N1					-470	90
8B					-485	(?)
0A					-470	95
6A					-467	85
7D					-431	82
7R					-451	78
8P1					-437	75
9D					-433	86
9N					-446	74
0R1					-432	75
2A					-472	93
2N					-477	76
3A					-460	86
3Q					-474	94

Well number	A clay		C clay		E clay	
	Altitude	Thickness	Altitude	Thickness	Altitude	Thickness
T. 16 S., R. 16 E., MDB&M--Continued						
24A					-453	88
30N1					-463	65
32D					-432	76
32J					-433	70
34D					-427	69
35D					-436	68
T. 16 S., R. 17 E., MDB&M						
3N					-426	?:20
6N					-462	94
7Q1					-465	85
15R1					-445	30:20
17D					-453	88
17P1					-457	95
17R					-446	85
22J					-446	85
26A					-438	42:18
31D					-455	88
31Q					-445	75
32N1					-438	75
35D					-443	87
36P					-429	84
T. 16 S., R 18 E., MDB&M						
2N	166				-332	18:14
16A	163				-354	20:28
16N					-380	24:20
23D	162				-359	36:30
26A	157				-355	34:30

Well number	A clay		C clay		E clay	
	Altitude	Thickness	Altitude	Thickness	Altitude	Thickness
T. 16 S., R. 18 E., MDB&M--Continued						
26E					-369	30
36A			-27		-341	24:22
T. 16 S., R. 19 E., MDB&M						
7D					-263	28:9
18A					-268	25:13
18N					-297	22:18
T. 17 S., R. 15 E., MDB&M						
1N1					-307	15:?
2N1					-243	10:?
3P					-227	10:?
4H					-225	30:?
10D					-202	27:?
11K					-295	50
14K					-233	20:?
22A					-254	15:?
22E1					-148	15:?
23A					-247	14:?
25D					-258	21:?
26C1					-293	20:?
27Q1					-344	10:?
35N1					-400	40:?
36K1					-331	35:?
T. 17 S., R. 16 E., MDB&M						
1N					-401	50
2A					-412	56
3R					-400	63
4R					-412	65

Well number	A clay		C clay		E clay	
	Altitude	Thickness	Altitude	Thickness	Altitude	Thickness
T. 17 S., R. 16 E., MDB&M--Continued						
5E1					-448	20/15:40
7A					-481	14:78
7Q					-453	65
9A					-421	70
15R					-448	47
16A					-446	38
22E1					-419	30:?
24D					-410	59
27Q1					-531	36
30A2					-297	50:?
32A					-399	35:22
35N					-502	12:29
T. 17 S., R. 17 E., MDB&M						
2R					-409	81
3C					-419	78
4P1					-428	70
7D					-389	63
7R					-378	56
8A					-441	79
8D					-411	64
10H					-415	79
14N					-436	77
15D					-430	78
17N					-365	51
18C					-369	56
18P					-379	65

Well number	A clay		C clay		E clay	
	Altitude	Thickness	Altitude	Thickness	Altitude	Thickness
T. 17 S., R. 17 E., MDB&M--Continued						
19P					-405	59
21A					-393	8:38
23A					-424	58
23N					-439	81
26A					-440	84
26N					-445	54:14
28A					-388	54:14
29D					-383	74
30N					-457	10:31
35A					-435	67
35R					-436	60
T. 17 S., R. 18 E., MDB&M						
1D1	+130	10	-67	12	-317	40:15
5D					-404	72
5M					-402	70
6E					-409	(?)
7C					-403	65
9C1					-428	60
3L					-375	60
3N	+126	6:4	-48	14		
5A	+124	6:8	-76	16	-380	69
6R	+128	20	-46	14	-372	57
3R	+144				-355	51
4H	+116	10	-39	10	-364	60

Well number	A clay		C clay		E clay	
	Altitude:	Thickness	Altitude:	Thickness	Altitude:	Thickness
T. 17 S., R. 18 E., MDB&M--Continued						
26N	+131	32	-48	6:6	-364	53
35A	+146	10:7	-46	8:4	-352	51
35R	+136	69	-45	5	-316	54
T. 17 S., R. 19 E., MDB&M						
6N	+157	6	-34	8	-355	30:19
8D					-345	?:6
19D	+135					
20D	+149	(?)	-18	6	-354	15:22
20R	+150	2:?			-334	14:14
30N	+150	12	-77	6	-350	49
31R	+148	11	-26	4		
34N	+157	20			-326	6:14
35N	+163	8:7	-19	8	-309	12:11
T. 17 S., R. 20 E., MDB&M						
7Z1					-252	?:5
T. 17 S., R. 21 E., MDB&M						
2D					+4	14:?
3N					-18	7:?
9N					-70	12:?
8R					-109	10/10:?
T. 18 S., R. 15 E., MDB&M						
1N2					-443	25:?
2N1					-375	40:?
3N1					-223	10:?
1N1					-285	35:?

Well number	A clay		C clay		E clay	
	Altitude	Thickness	Altitude	Thickness	Altitude	Thickness
T. 18 S., R. 16 E., MDB&M						
1N1					-496	40:25
3D					-427	36:13/22
4E					-355	(?)
4N					-338	18:18
5A					-351	22:22
5D					-315	26:10
6D					-372	49:27
7P1					-458	25:?
8P1					-314	20:?
9A					-376	35:12/23
9R					-345	23:6/10
10R					-392	28:19/19
15R					-379	22:10/14
17M1					-444	11:?
19M1					-435	10:?
20E1					-483	15:?
20N2					-480	15:?
21A					-378	30:14/17
25K					-404	10:20
26F2					-417	15:20
30R1					-480	8:?
33A					-506	58
33Q1					-427	15:?
34D					-580	55:20
36P1					-394	40:20
T. 18 S., R. 17 E., MDB&M						
1R					-452	70
2N					-449	75
2R					-462	75
3D					-431	87
5K1					-481	70

Well number	A clay		C clay		E clay	
	Altitude	Thickness	Altitude	Thickness	Altitude	Thickness
T. 18 S., R. 17 E., MDB&M--Continued						
7L1					-533	5/10:30
7N3					-485	10:15
8P1					-545	5:30
12N1					-505	10:60
14Q1					-553	75
15E1					-566	15:30
15N1					-561	10/12:25
17E1					-527	10:15
18Q1					-489	15/10:30
23N2					-554	50
24N2					-548	60
27E1					-539	15:35
29N1					-460	?:30
30P1					-419	30:15
31N1					-371	?:20
33N1					-451	?:30
35N1					-528	?:40
36Q1					-532	?:30
T. 18 S., R. 18 E., MDB&M						
1A					-376	51
1G2	+144	28				
2N	+125	30			-389	56
6A	+151	(?)			-423	48
8N					-466	54
11A					-376	51
12R	+149	51?			-378	55
15N	+141	59?	-47	10	-484	78
16D					-443	53
18N1					-535	70

Well number	A clay		C clay		E clay	
	Altitude	Thickness	Altitude	Thickness	Altitude	Thickness
T. 18 S., R. 18 E., MDB&M--Continued						
19N1					-547	59
20A					-499	71
21N1					-525	65
21R					-495	66
29N1					-543	64
36N1					-495	60
T. 18 S., R. 19 E., MDB&M						
1A	+164	6?	-13	8	-266	22:8
2R1	+149	20	-14	6	-278	10:8
3M	+149	4:19	-20	4	-341	10:20
5A	+155	16	-33	4:2/2	-340	6:26
6B	+148	50				
6N	+130	32			-371	69
6R	+142	26	-40	18	-340	53
8A	+144	20	-28	11		
8C	+136	34	-36	14		
10A	+154	12				
10N	+148	16	-30	12		
12N1	+149	16	-24	2:4	-287	4:12
13A1	+149	22	-27	10	-275	13:11
15A	+147	18				
17A	+133	36	-35	18	-357	55
17R	+139	40	-45	14	-366	66
18A	+133	54	-55	8	-369	54
19N			-37	15	-447	70
20D	+134	(?)	-49	17		
20R	+139	26?	-55	28	-396	70
21A	+132	32	-46	19	-356	58
21R			-49	13	-384	72
22M2	+129	25				
22R	+143	24	-43	29	-373	74
23A1	+135	21	-30	13	-330	38:6
23D	+130	26:6	-37	14		
25A	+143	34	-37	18	-357	24:30

Well number	A clay		C clay		E clay	
	Altitude	Thickness	Altitude	Thickness	Altitude	Thickness
T. 18 S., R. 19 E., MDB&M--Continued						
25D	+138	30	-43	20		
31C					-462	67
31H					-463	60
32D	+146	(?)	-23	15		
32N			-22			
33A	+136	40	-46	28		
33R	+144	34	-60	8	-414	78
36D	+134	36	-46	22	-375	18:30
T. 18 S., R. 20 E., MDB&M						
18R	+155	8	-20	8	-268	14:8
30R	+139	14:12	-39	22	-361	20:28
T. 18 S., R. 22 E., MDB&M						
30E2					-155	10:10
36P1					-111	55
T. 18 S., R. 23 E., MDB&M						
12H1					+ 44	15:10
T. 19 S., R. 17 E., MDB&M						
2E1					-516	?:55
3N1					-449	?:10
4N2					-424	?:25
5E1					-385	?:20
6A1					-404	?:30
9N1					-412	?:15
9Q1					-425	?:15
10N1					-438	?:5/25
22J1					-403	?:28
22M					-322	?:10
26N					-373	?:10
28E1					-327?	?:10
28P					-305?	?:10/10
36E1					-523	?:10

Well number	A clay		C clay		E clay	
	Altitude	Thickness	Altitude	Thickness	Altitude	Thickness
T. 19 S., R. 18 E., MDB&M						
2N					-490	54
10R					-488	51
11R					-488	12:54
13N					-484	12:58
13R					-479	12:52
16N					-510	3:70
17A					-515	?:80
26N					-452	?:38
28D					-475	?:39
33A					-467	?:29
33E2					-495	?:30
33N2					-500	?:25
36A					-487	6:67
T. 19 S., R. 19 E., MDB&M						
1D1	+113	58	-57	22	-385	80
1R1	+110	49			-387	78
2N			-61	12	-413	81
2R	+133	62	-54	36		
4G1					-434	77
9N			-13	6?	-470	76
13R1					-402	76
14A			-74	16?		
15A			-65	(?)	-423	80
16N			-7	9		

Well number	A clay		C clay		E clay	
	Altitude	Thickness	Altitude	Thickness	Altitude	Thickness
T. 19 S., R. 19 E., MDB&M--Continued						
19R					-479	54
21K2					-479	70
23N					-445	68
24D1					-413	73
24R1			-66	70		
25L						
26Q1			-61	21		
31A					-492	64
33R					-473	?:57
35R1			-86		-456	72
36A1					-429	69
T. 19 S., R. 20 E., MDB&M						
3K2	+143	32	-45	20	-367	23:10
4N1			-50	20		
4R1	+142	34	-44	16		
6A1	+137	34	-47	26	-374	81
6D2	+119	20:14	-50	36		
6J1	+133	40				
7A1			-52	27	-381	78
7F1	+130	40	-60	30		
7N1	+122	52	-63	25	-391	78
8A1	+136	44				
8R1	+134	52	-54	22	-388	78
9R1			-50	20		
10N1						
11N1	+147	24	-50	15	-374	32:34
13A2	+146	22	-34	12	-352	36.30

Well number	A clay		C clay		E clay	
	Altitude	Thickness	Altitude	Thickness	Altitude	Thickness
T. 19 S., R. 20 E., MDB&M--Continued						
13N1	+140	19	-50	16	-374	76
14N1	+136	36	-54	18	-387	34:26
16A1	+129	40				
16N1	+134	46	-58	26	-392	76
18R1	+124	59				
20F1	+128		-65	25		
22D1	+134	40				
26N2	+131	44	-59	20	-400	75
27A1	+134	38	-56	16		
27D1	+133	46	-61	18		
27N1	+124	56	-67	28		
28D1			-65	12		
29L1			-71	28		
29R					-407	78
30A1					-405	73
30D1	+124	30				
30R1						
34N1			-72	18		
34M	+124	48	-72	24		
35H1	+131	40	-62	15		
T. 19 S., R. 22 E., MDB&M						
2D					-127	55
19A1					-227	67
T. 19 S., R. 23 E., MDB&M						
10Z1					73	40
T. 20 S., R. 18 E., MDB&M						
1D					-447	?:31
1N					-461	?:36
2N2					-473	?:28
3M1					-489	?:20
9M1					-568	?:30
11N1					-477	?:25

Well number	A clay		C clay		E clay	
	Altitude	Thickness	Altitude	Thickness	Altitude	Thickness
T. 20 S., R. 18 E., MDB&M--Continued						
13A					-447	?:35
14N					-466	?:25
18E2					-483	?:25
23A					-466	?:25
23N1					-485	?:15
25A					-453	?:13
28B1					-525?	?:15
33E1					-560	?:10
36D1					-478	?:25
T. 20 S., R. 19 E., MDB&M						
2D			-62	3:5?	-474	72
2N			-59	7	-483	74
4D					-468	6:42
5D1					-470	?:45
5R					-437	?:24
6D1					-455	?:33
6R					-442	?:32
10J1					-417	?:20
10N			-56	7	-423	?:16
11A1					-462	71
12R3			-100	28?	-457	72

Well number	A clay		C clay		E clay	
	Altitude	Thickness	Altitude	Thickness	Altitude	Thickness
T. 20 S., R. 19 E., MDB&M--Continued						
14N					-403	?:21
17N					-431	?:28
21N			-70?	(?)	-438	?:22
24D1			-130	(?)	-513	52
24R1			-110	24		
25D1						
26Q1					-498	10:15
28R			-70		-436	?:30
31K					-450	?:10
31P	+180	5	-28	10		
31Z1					-450	23
32D			-46	10?		
36C1			-147	(?)	-537	47
T. 20 S., R. 20 E., MDB&M						
1A1	+133	28	-63	20	-404	80
1N1	+126	46	-72	24	-421	76
2N2	+122	38	-80	29	-422	74
3A1			-71	23	-410	74
3N1			-83	33	-426	74
4N1	+120	(?)	-89	36	-423	73
6A2			-93	20?	-430	74
8D1			-93	32	-440	71
9N1			-90	23	-436	72

Well number	A clay		C clay		E clay	
	Altitude	Thickness	Altitude	Thickness	Altitude	Thickness
T. 20 S., R. 20 E., MDB&M--Continued						
11N1	+113	50?	-85	29	-431	76
12N1	+115	55	-83	29	-429	78
14N1			-93	35	-432	75
16R1					-435	75
17H1			-95	20		
19K1					-517	65
20D1			-114	34		
21J2			-100	20		
23A2	+108	60	-91	31		
24N2	+105	67	-92	30	-428	77
24R1	+106	?:24	-88		-427	78
25N1			-91	24	-436	93
26D1	+103	?:15				
27D2	+100	42			-435	76
28R1			-100	26		
29G1			-115	20	-465	80
31A1			-118	30		
34R1			-99	20	-450	99
35D2						
36A1			-88	16		
36R1			-91	16		
T. 20 S., R. 21 E., MDB&M						
4C1	+131	?:10	-57	15		
5C1	+131	?:20	-65	15		
5F1	+130	?:10	-65	12	-415	75
7N1	+122	(?)	-78	24	-435	88
8D1	+125	60	-70	20		

Well number	A clay		C clay		E clay	
	Altitude	Thickness	Altitude	Thickness	Altitude	Thickness
T. 20 S., R. 21 E., MDB&M--Continued						
8R1	+124	?:8	-63	16	-418	83
13Z1						
14A1	+133	35	-50	15	-365	70
16L1	+130	45	-68	10	-408	80
19F1	+109	(?)				
20C1			-75	20	-420	85
24N1	+120	15:25	-62	10	-404	80
26B1			-75	10		
26J1			-85	10	-450	80
29A1	+123	26	-74	22	-425	87
29R1	+113	?:18	-86	20	-446	95
T. 20 S., R. 22 E., MDB&M						
3G1					-238	70
10H2					-250	70
13C1					-233	55
14G1					-257	65
20D2					-335	65
21Z1					-330	65
24Z2					-283	65
29Q1					-395	70
T. 20 S., R. 23 E., MDB&M						
8C1					-167	40
14C1					-109	35:10
26L1					-118	35
T. 21 S., R. 18 E., MDB&M						
1D1					-483	?:10
2D1					-495	?:10
3B1					-524	?:20
4D2					-578	?:10
5D1					-523	?:10
7N1					-378	?:10
11B1					-479	?:10/10
13Z1					-584	?:30
14D1					-517	?:30

Well number	A clay		C clay		E clay	
	Altitude	Thickness	Altitude	Thickness	Altitude	Thickness
T. 21 S., R. 18 E., MDB&M--Continued						
15D1					-544	?:10
16D1					-465	?:10
17M2					-408	?:20
20N1					-310	?:10
23D1					-505	?:15
29N1					-253	?:10
33B1					-323	?:10
33E1					-265	?:10
33N1					-195	?:10
35N1					-360	?:10
T. 21 S., R. 19 E., MDB&M						
1A1			-150	30	-545	65
4M1					-443	5:25
8C1					-449	5:20
12N1					-618	15:15
18D2					-485	?:20
19D1					-688	136
23M1					-627	30:25
T. 21 S., R. 20 E., MDB&M						
1C1			-93	20	-445	97
3P1			-122	24	-481	115
5B1			-133	25	-530	85
8B1			-153	30	-530	65
9M1			-168	25	-538	85
18A2			-186	40	-621	95
18D2					-621	100
19D1					-688	110
19D2			-196	40		
26B1					-531	80

Well number	A clay		C clay		E clay	
	Altitude	Thickness	Altitude	Thickness	Altitude	Thickness
T. 21 S., R. 21 E., MDB&M						
2N1	+108	4:18	-120	18	-501	99
3A1	+111	?:18	-106	15	-479	97
4A2	+104	(?)	-102	(?)	-470	100
4D1	+105	49	-96	(?)	-456	102
6J1			-95	(?)	-460	106
7A1			-100	19	-463	111
7D1					-447	102
7J1					-469	112
7M1			-108	(?)	-471	110
13A3	+97		-98	20	-535	115
15R1	+93	?:20			-509	116
16D1	+93				-489	114
18R1					-483	116
21D1					-503	125
23D1					-515	115
25A2	+83	36	-121	38	-555	115
25N1	+75	38	-133	(?)	-533	109
25R1	+78	40	-125	(?)	-554	120
34D1					-518	120
T. 21 S., R. 22 E., MDB&M						
7K1			-80	35	-530	112
12N1					-377	68
14A1	+122	20:10			-393	80
18C1	+106	25	-94	55	-534	115
20A4	+104	4:6	-86	29	-540	104
20N1			-116	32	-554	120
21C1					-531	95
21P1	+99	60	-98	25	-547	110
26J1					-452	90
26N1	+102	8:8	-94	24	-504	124
28R1	+95	6:4/4			-550	117
35C1			-86	25		
36A1					-413	80

Well number	A clay		C clay		E clay	
	Altitude	Thickness	Altitude	Thickness	Altitude	Thickness
T. 21 S., R. 23 E., MDB&M						
21C1					-290	15:55
23Q1					-195	12:45
26A1					-184	10:50
26D1					-228	15:45
29A1					-317	32:51
31R1	+146	12:22			-374	44:68
T. 21 S., R. 24 E., MDB&M						
31D1					-178	10:50
35M1					-22	?:17
T. 22 S., R. 18 E., MDB&M						
1M					-565	40:30
11L1					-455	35
12M1					-520	20:20
T. 22 S., R. 19 E., MDB&M						
2Z1					-802	95
3Z1					-806	95
13L					-610	100
22K					-472	90
T. 22 S., R. 20 E., MDB&M						
9Z1					-816	95
17K					-776	158
32E					-508	140
35C					-755	130

Well number	A clay		C clay		E clay	
	Altitude	Thickness	Altitude	Thickness	Altitude	Thickness
T. 22 S., R. 21 E., MDB&M						
12H1					-575	110
15Z1					-646	120
33E					-721	105
T. 22 S., R. 22 E., MDB&M						
3L1			-114	32	-542	124
5J			-132	20	-548	106
5M1			-126	20	-545	90
6M1			-135	26	-544	97
8N1			-145			
10A1			-88	25	-528	125
11R1			-76	12	-532	130
12Z1			-31	12		
15D1			-138	22	-570	110
22R			-140	23		
30R					-606	110
T. 22 S., R. 23 E., MDB&M						
2A1					-234	20:39
2R1					-280	21:59
3A1					-271	20:58
3D1					-294	28:56
5A1					-335	112:62
5N1					-380	140:65
8A					-343	38:62
9K2					-343	34:64
10N1					-344	26:64
11N1					-339	110
13A1					-283	20:58
13D1					-324	76
16N1					-395	156
18A3					-401	148
19N			-101	38		
22A1					-386	39:64

Well number	A clay		C clay		E clay	
	Altitude	Thickness	Altitude	Thickness	Altitude	Thickness
T. 22 S., R. 23 E., MDB&M--Continued						
22D					-384	126
23N2					-423	130
23Q1					-410	130
25E1					-415	130
25H2					-352	40:70
26N					-471	72:78
27D1					-440	162
28D			-12	44	-432	180
28N			-49		-485	186
33A2					-485	185
31A1			-89			
T. 22 S., R. 24 E., MDB&M						
19N					-341	44:62
31N					-386	76:72
T. 23 S., R. 19 E., MDB&M						
12M					-499	90
T. 23 S., R. 20 E., MDB&M						
7C					-587	140
7P					-586	140
24P					-777	130
28B					-777	135
31N					-618	127
T. 23 S., R. 21 E., MDB&M						
2F					-648	105
8E					-684	119
10H					-648	107
11Q					-640	85
12N					-631	100
13E					-625	80
25B					-613	100
T. 23 S., R. 22 E., MDB&M						
4E					-628	80
9A			-143	35	-623	75
13R					-569	70
17L					-605	95
29D					-603	95

Well number	A clay		C clay		E clay	
	Altitude	Thickness	Altitude	Thickness	Altitude	Thickness
T. 23 S., R. 22 E., MDB&M--Continued						
29K					-595	92
29N					-598	95
30A					-612	93
34K					-489	88
36C					-340	90
36R					-295	(?)
T. 23 S., R. 23 E., MDB&M						
14M1					-533	90
20D					-555	105
27A					-510	100
32N1					-315	90
32P1					-312	90
33A1			-68?	5?	-413	100
T. 23 S., R. 24 E., MDB&M						
16R1					-325	50
20D					-374	59
20R					-369	54
21A					-325	50
32A					-360	52
32P1					-373	50
32R					-366	48
33J1					-349	55
T. 23 S., R. 25 E., MDB&M						
9Q2					+30	15:?
16N1					-81	16:30
33J					+21	20
T. 24 S., R. 20 E. MDB&M						
12R					-748	150

Well number	A clay		C clay		E clay	
	Altitude	Thickness	Altitude	Thickness	Altitude	Thickness
T. 24 S., R. 21 E., MDB&M						
7A					-778	100
7J	+153	?:21				
17D					-720	100
17Q					-646	90
30P					-743	140
T. 24 S., R. 22 E., MDB&M						
1A					-275	80
2J					-312	90
4J					-483	85
11K					-306	70
15P	+162	(?)			-338	82
27C	+165	5:22				
29D	+166	4:21				
T. 24 S., R. 23 E., MDB&M						
5R1			-62	15	-242	70
15N	+164	4:4/11/5				
23N					-171	(?)
29E	+157	2:4/3/3/5/6				
34R1			-55	30	-160	40
35E					-174	(?)
T. 24 S., R. 24 E., MDB&M						
2A					-238	6:36
6A					-388	67
8A					-346	69
8D					-350	75
10A					-294	10:55
11N					-246	8:52
11R					-210	12:52
12R					-159	?:40
15D					-273	5:45
15N					-231	5:45
17N					-214	3:40

Well number	A clay		C clay		E clay	
	Altitude	Thickness	Altitude	Thickness	Altitude	Thickness
T. 24 S., R. 24 E., MDB&M--Continued						
18D					-289	93
19N					-163	4:50
20A2					-239	?:35
22N					-184	6:40
22R					-162	?:42
23D					-208	?:35
T. 25 S., R. 19 E., MDB&M						
13C					-293?	15
T. 25 S., R. 20 E., MDB&M						
8D					-635?	45
T. 25 S., R. 21 E., MDB&M						
1N	+180	?:13				
1R1					-409	85
7A					-786	100
8A					-689	120
17K					-643	100
21D	+189	5:2/5				
T. 25 S., R. 22 E., MDB&M						
8A	+180	?:6/4/3				
10B					-196	(?)
15A	+185	3:2				
27R			+10	10:10	-180	50
28N			-31	30	-229	55
30N			-48?	?:10	-243	60
			-35	50		
32C2			-30	35:10	-225	60
32D1			-45	40	-245	60
32R1			-47	50	-176	55
35R	+194	3:9				

Well number	A clay		C clay		E clay	
	Altitude	Thickness	Altitude	Thickness	Altitude	Thickness
T. 25 S., R. 23 E., MDB&M						
8E	+186	5/2/4				
29A1					-88	70
T. 25 S., R. 24 E., MDB&M						
15H1					-75	10:5
T. 25 S., R. 25 E., MDB&M						
22D1					-64	20/5:?
T. 26 S., R. 22 E., MDB&M						
4P	+196	1:7				
5P1			+65	55	-105	45
27Q2			+150	40	+10	45
T. 26 S., R. 23 E., MDB&M						
27P1			-8	10	-205	40
29J1			-13	10	-191	
T. 27 S., R. 22 E., MDB&M						
7H	+186	?:1/11				
11K1			+105	40	-145	
20L	+193	4:2/2				
23D3			+58	15	-197	45
23E3			+73	(?)	-187	45
33J2			+96	40	-54	20
T. 27 S., R. 23 E., MDB&M						
1R1			+21	10		
8P1					-119	22
17F1					-123	25
17H1					-97	20
17J1					-77	20

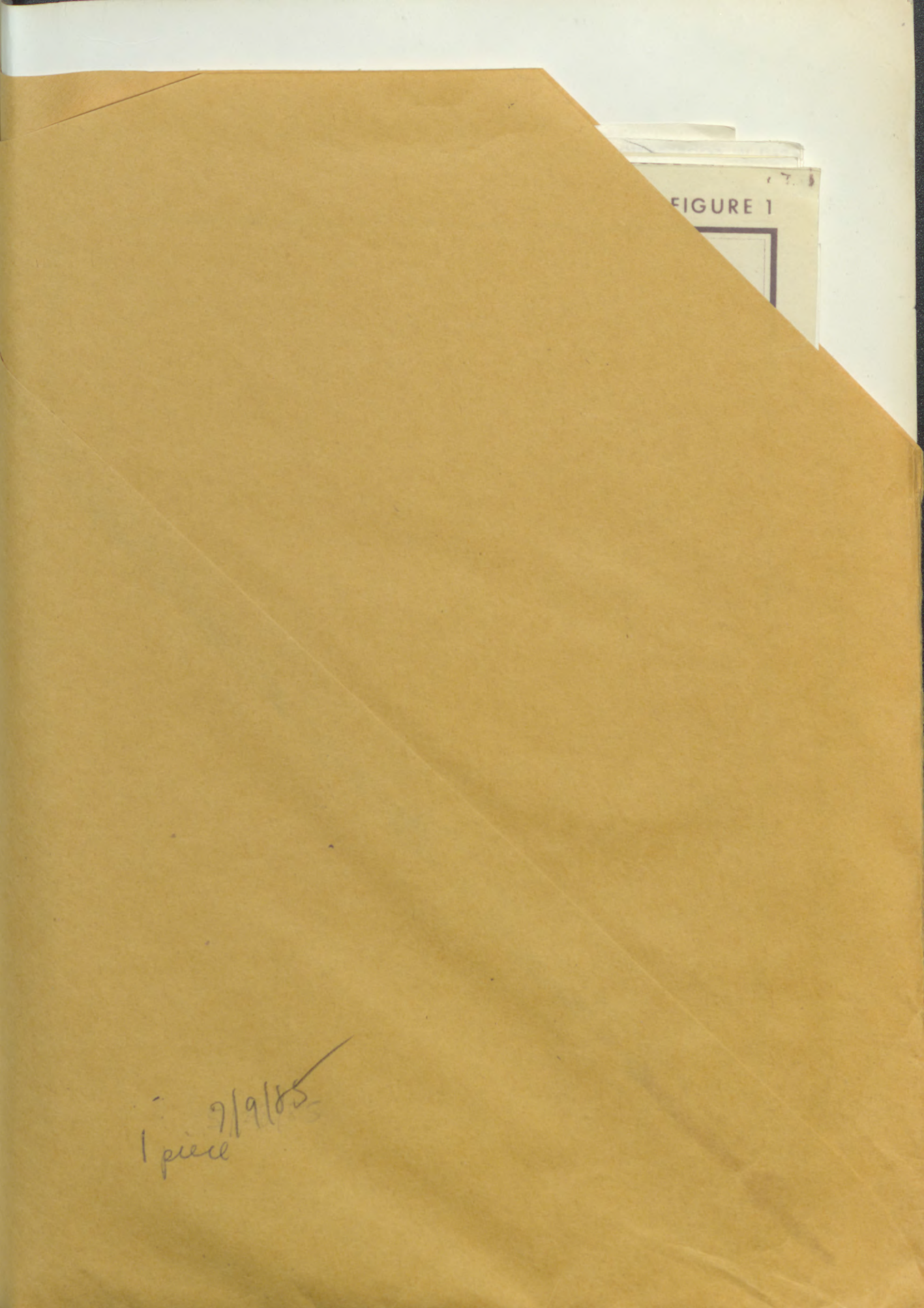
Well number	A clay		C clay		E clay	
	Altitude	Thickness	Altitude	Thickness	Altitude	Thickness
T. 27 S., R. 23 E., MDB&M--Continued						
18H2					-126	33
18L3					-132	30
26F1					-22?	10
27C1					-34	15
27J1					-119	15
28A1					-10	(?)
34A1					-87	20
T. 28 S., R. 22 E., MDB&M						
9D1					-216	30
9R1					-162	10
10P4					-165?	10
13K					-50	10
22D1					-177	20
22E1					-165	20
30M					-20	10
35G1					-154	30
T. 28 S., R. 23 E., MDB&M						
7C2					+65	
7H1					+65	
T. 28 S., R. 24 E., MDB&M						
7P1					+135	20
T. 29 S., R. 22 E., MDB&M						
10L					-6	20
24R					-165	18
T. 29 S., R. 23 E., MDB&M						
21J					-216	15
T. 29 S., R. 24 E., MDB&M						
21B1					-71?	25

Well number	A clay		C clay		E clay	
	Altitude	Thickness	Altitude	Thickness	Altitude	Thickness
T. 30 S., R. 24 E., MDB&M						
4C1					-247	15
22A					-15	25
22H					+87	40
T. 30 S., R. 25 E., MDB&M						
28C3					-143	10:10/20
28E					-175	70
30R					-255	20
32C					-335	20
33A					-164	30:40
T. 30 S., R. 28 E , MDB&M						
10N1					+203	10
16K					+188	20
T. 31 S., R. 24 E., MDB&M						
13J	+267	6:?				
22G					-149	20
24K	+264	9:?				
24R	+267	(?)				
32B					-75	10?
T. 31 S., R. 25 E., MDB&M						
3D					-330	40
3E					-294	40
4Q					-209	20
9D					-275?	40
9M	+264	3:?				
14G	+271	6:?				
15C	+268	2:?				
15R1					-544	60
16A1					-332	10
16D1					-412	30

Well number	A clay		C clay		E clay	
	Altitude	Thickness	Altitude	Thickness	Altitude	Thickness
T. 31 S., R. 25 E., MDB&M--Continued						
16H1					-433?	25
16J1					-409?	20
18J	+261	7:?				
26A1					-531	40
27D					-365	50
27F1					-375	45
36A1					-516	35
T. 31 S., R. 26 E., MDB&M						
2A1					+84	30
2J1					+62	35
3A1					-13	45
6M					-132?	10
21N	+270	4:?				
27L1					-195	20
28G	+265	5:?				
T. 31 S., R. 27 E., MDB&M						
19D1					+25?	20
T. 31 S., R. 28 E., MDB&M						
23H1					+67	25?
26A1					+18	30
31E	+270	(?)			-45	20
T. 31 S., R. 29 E., MDB&M						
1A1					+210	
2M1					+151	
3A2					+199?	18
3C1					+185?	25
3P					+101?	20
6F1					+91?	10
9F					+70?	15
23E1					+119	45
23L2					+108	15
36B2					+160	25

Well number	A clay		C clay		E clay	
	Altitude	Thickness	Altitude	Thickness	Altitude	Thickness
T. 32 S., R. 25 E., MDB&M						
1H1					-625	40?
25Q1					-315	
T. 32 S., R. 26 E., MDB&M						
4Q					-321	15
9D	+252	3/10:?				
9G					-370	20
10N	+253	3/2/2:10?				
11N					-369	20
16F	+247	5/10:?				
25P1					-370	
27B					-438	40
36P2					-360	
T. 32 S., R. 27 E., MDB&M						
4J					-165?	40
4L					-156?	30
17H					-105	45
18J	+260	4:?				
21A					-127	45
35R1					-191	40
T. 32 S., R. 28 E., MDB&M						
4H	+274	18:2/5				
5Q	+273	11:24				
10R1					-129	25
17B	+275	2/1/1:7				
30D1					-202	90
30H2					-212	75
T. 32 S., R. 29 E., MDB&M						
7R1					-51?	15
19H2					+130	20

Well number	A clay		C clay		E clay	
	Altitude	Thickness	Altitude	Thickness	Altitude	Thickness
T. 11 N., R. 21 W., SBB&M						
3B1					-211	32
T. 12 N., R. 20 W., SBB&M						
25Q					-53	25
29R1					-130	85



1 piece 7/9/85