TEXAS BOARD OF WATER ENGINEERS

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Contamination Report No. 7

Investigation of Contamination Complaint in South-central Knox County, Texas

By

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INVESTIGATION OF CONTAMINATION COMPLAINT IN SOUTH-CENTRAL KNOX COUNTY, TEXAS

On November 28, 1959 Mr. J. C. Baty wrote to the Board of Water Engineers stating that the water well on his farm, about two miles north of Munday, was producing water of such poor quality that it was not usable for any purpose. The water was reported to be potable when the well was dug in 1955, but since that time the quality has become progressively worse.

The writer made an investigation of the problem on December 15 through December 17, 1959. The results of this investigation and the interpretations of the data are contained herein. Tabulations of the water wells and chemical analyses are included at the end of this report.

Shown on Plate I is the area of investigation, indicating the locations of water wells, salt water disposal wells, oil tests and chemical analyses. There are no surface oilfield brine disposal pits in this area.

The Seymour formation of Quaternary age crops out at the surface in the area of investigation underlain at depth of less than 60 feet by rocks of the Clear Fork group of Permian age. The Seymour is the principal source of ground water in this area of Knox County. It is an alluvial deposit, consisting of coarse-grained sand and gravel, fine-grained sand and silt, red and gray clay, caliche, and some volcanic ash. The underlying Permian rocks consist largely of red and gray shale, containing relatively thin layers of limestone, gypsum, dolomite, and marl. Ground water in the Clear Fork group is slightly to moderately saline, and is generally unsuitable for domestic consumption in this area.

Plate II is a water surface contour map showing the slope and direction of the ground water in the Seymour formation. The configuration and direction of slope of the water surface is very similar to the topography. The slope is generally north toward the Salt Fork of the Brazos River.

The direction of movement of the ground water indicates that the source of any artificial contamination would be south of the contaminated well and that the contaminant would move northward with the movement of the ground water until it reached the well. Since there are no sources of artificial contamination immediately south of the well the nearest possible source of contamination would be the two salt water disposal wells two and one-half miles south. The wells are reported to be disposing of salt water below 350 feet. If either or both of these wells are the source of the contamination then one or more of the several heavily pumped irrigation wells located immediately north of the disposal wells would be the first to become polluted. Analyses of water from these wells indicate that the water is of good quality.

Plates III and IV indicate that the probable cause of the contamination noted in the Baty well is related to the presence of a local high in the underlying red beds with subsequent thinning of the Seymour formation. Plate III outlines the contaminated area by contours along lines of equal concentration of total dissolved solids in the area of investigation. The fringe wells are producing water of good quality while the concentration of total dissolved solids increased toward the contaminated well in the center. It appears that the contamination is confined to that central area.

Plate IV is a contour map on the depth to the top of the red beds of the Clear Fork group. These contours follow the same pattern as those on Plate III and the wells showing the highest concentrations of dissolved solids are located where the red beds are close to the surface. The contaminated area, therefore, is intimately related to the local red bed high.

The red beds may be contaminating the wells in this area by one or more of the following processes:

(1) Ground water in the Seymour formation may be dissolving gypsum and other salts from the red beds. The local red bed high may contain considerable amounts of gypsum and other salts which may be dissolved in large quantities due to the increased circulation of the ground water.

(2) The ground water may be coming mostly from the red beds. In some areas of Knox and Haskell Counties the red beds are known to be fractured sufficiently to allow ground water under sufficient pressure to move upward.

(3) The contaminated wells may be drilled too deep into the red beds. The lower saturated portion which was penetrated may actually be a sandy facies of the Clear Fork group containing saline water. This saline water may enter the well and contaminate the fresh water as the hydrostatic head is lowered by pumping.

Table 1--Partial Records of Wells in Knox County

Method of lift and type of power: B, bucket; C, clylinder; E, electric; G, gasoline; N, none; Ng, natural gas; T, turbine; W, Windmill.
Elevation measurements by altimeter
Use of water: D, domestic; Irr, irrigation; N, none; S, stock.

Well No.	Owner	Driller	Altitude of land surface (ft)	Date completed	Depth of well (ft)	Diameter of well (in)	Depth (ft)	Water-Bearing unit	Water Level		Method of lift	Use of Water	Remarks
									Below land-surface datum (ft)	Date of measurement			
1	A. O. Tomlinson	John Kale	1437	1-55	37	14	37	Seymour	20.7	5-15-56	T-G	Irr.	Sampled 1956
2	V. S. Moore	--	-	-	40	30	30	do	-	-	HB	D	Sampled 12-15-59
3	F. Cervany	--	1450	-	19	30	19	do	UTM	-	CW	S	Sampled 12-15-59
4	J. C. Baty	--	1450	-	23	30	23	do	16.2	12-15-59	JE	D	do
5	John Klug	Richardson	1447	1957	22	8	22	do	16.8	do	CE	DS	do
6	do	Arnold Bruner	-	1955?	1800 ±	-	-	do	-	-	-	N	Abandoned oil test
7	A. L. Roden	Don Combs	1452	3-55	41	12	41	do	26.9	5-16-56	TE	Irr	Control point
8	Claude Reed	John Kale	1443	3-55	52	14	52	do	24.3	3-9-56	TE	Irr	do
9	Minnie Cervany	Don Combs	1458	2-55	58	14	58	do	18.2	3-15-56	TG	Irr	do
10	C. E. Reed	John Kale	1468	12-54	54	14	54	do	28.8	3-9-56	TE	Irr	do
11	Albert Fetsch	Albert Fetsch	-	1957	40	-	-	do	-	-	JE	Irr	Sampled 12-15-59
12	do	--	-	-	45	30	45	do	10.8	12-16-59	CE	DS	
13	B. F. Cornett	J. M. Rea	1479	8-55	46	14	46	do	26.5	12-16-59	TE	Irr	Sampled 12-16-59
14	do	Dickerson	-	1955	40	13	40	do	19.8	3-1-56	TE	Irr	Control point
15	A. A. Smith, Jr.	--	1484	-	60	6	60	do	27.8	12-16-59	CW	D	Sampled 12-16-59
16	Frank Russell	Don Combs	1469	8-52	41	14	41	do	16.9	3-8-56	TE	Irr	
17	C. E. Holbert #7	Williams	-	-	1800 ±	-	-	do	-	-	N	N	Oil test-Disposing of brine below 350'
18	C. E. Holbert	John Kale	1474	2-52	59	14	59	do	19.4	3-8-56	TG	Irr	Control point
19	Zeissel #1	GFG Oil Co.	-	-	1800 ±	-	-	-	-	-	-	N	Oil test-Disposing of brine below 350'

Table 2. ANALYSES OF WATER FROM WELLS IN SEYMOUR FORMATION, KNOX COUNTY, TEXAS

Well	Owner	Depth Ft.	Date of Collection	Silica SiO_2	Calcium Ca	Magnesium Mg	Sodium + Potassium Na+K	Bicarbonate HCO_3	Sulfate SO_4	Chloride Cl	Fluoride F	Nitrate NO_3	Dissolved Solids	Hardness as $CaCo_3$	Specific Conductance micromhos-25°C
1	A. L. Tomlinson	37	8-29-56	24	46	25	138	364	80	62	2.0	41	585	218	971
2	V. S. Moore	35	12-15-59	24	54	25	108	316	72	46	1.3	86	571	238	897
3	F. Cervany	19	12-15-59	26	102	149	702	522	948	605	-	155	2940	867	4210
4	J. C. Baty	23	12-15-59	28	225	322	1000	481	1620	1300	3.5	180	4920	1890	6730
5	John Klug	22	12-15-59	26	132	98	369	366	540	460	1.6	25	1830	732	2740
11	Albert Fetsch	40	12-16-59	24	76	89	323	429	408	320	-	43	1500	556	2300
13	B. F. Cornett	46	12-16-59	28	42	16	165	363	80	64	1.5	62	639	171	986
15	A. A. Smith, Jr.	60	12-16-59	26	41	14	93	266	51	32	0.8	54	443	160	688

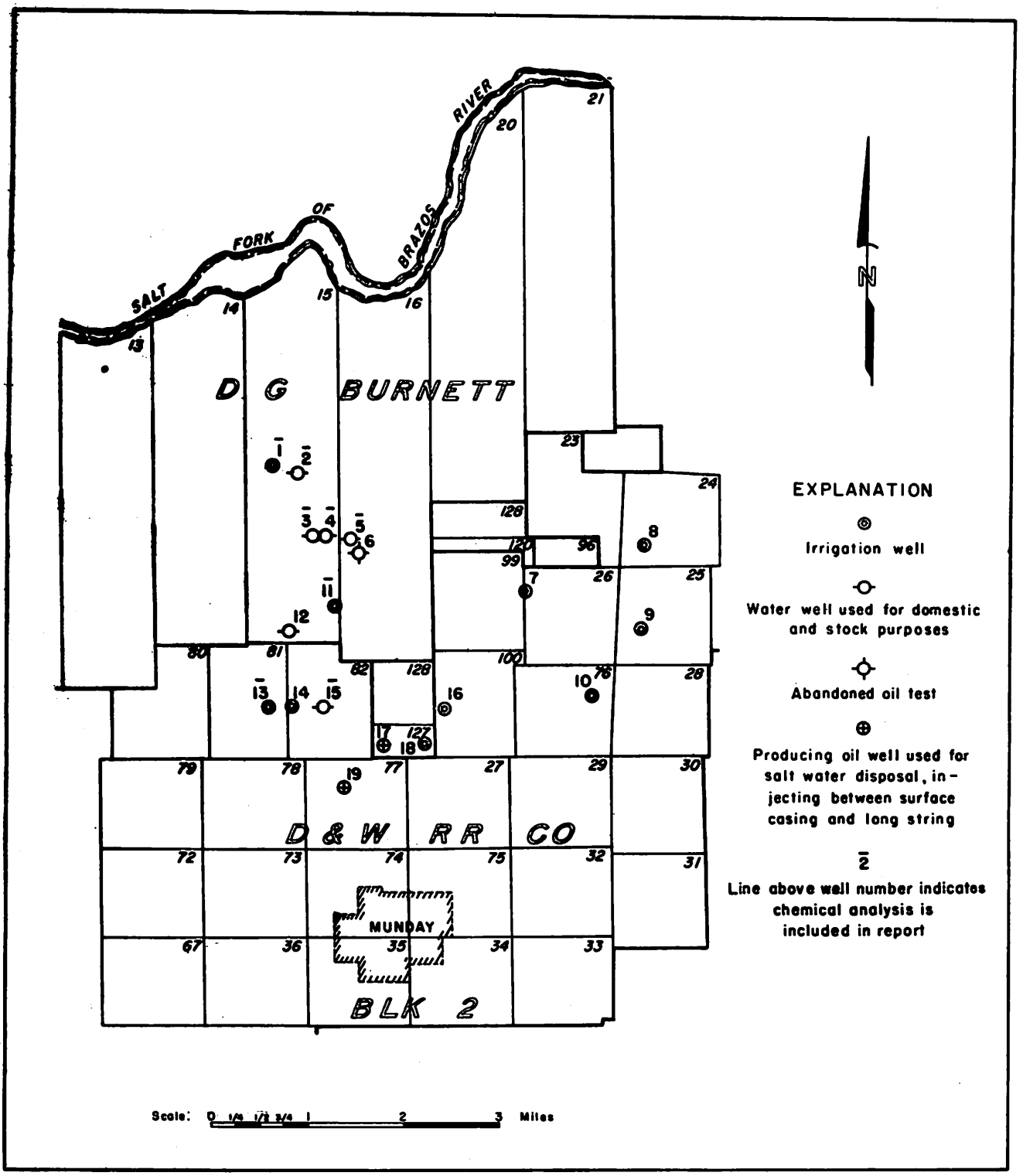

PLATE I – LOCATION OF WATER WELLS AND OIL TESTS IN AREA OF INVESTIGATION, KNOX COUNTY, TEXAS.

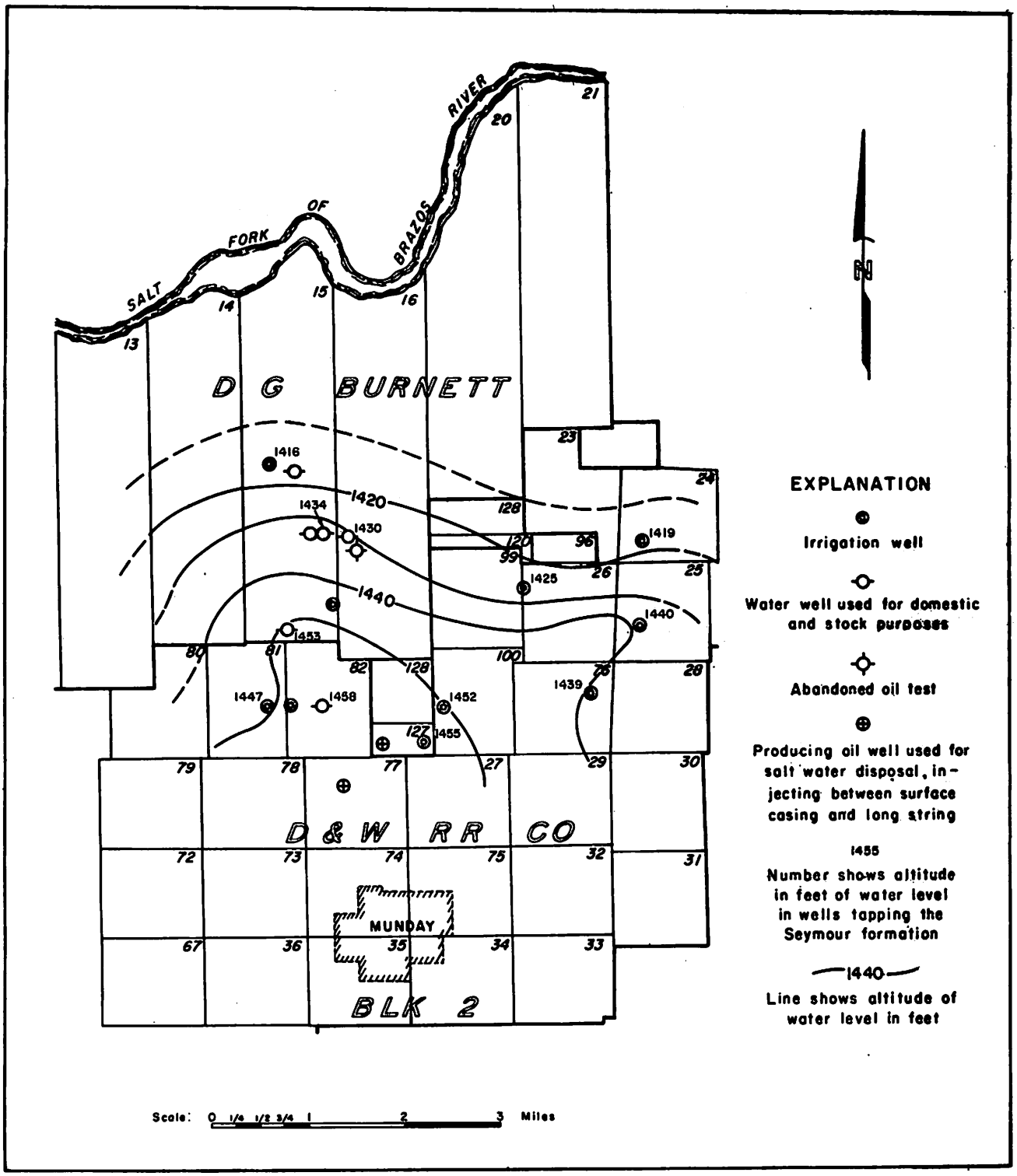

PLATE 2 - WATER SURFACE CONTOUR MAP OF AREA OF INVESTIGATION, KNOX COUNTY, TEXAS

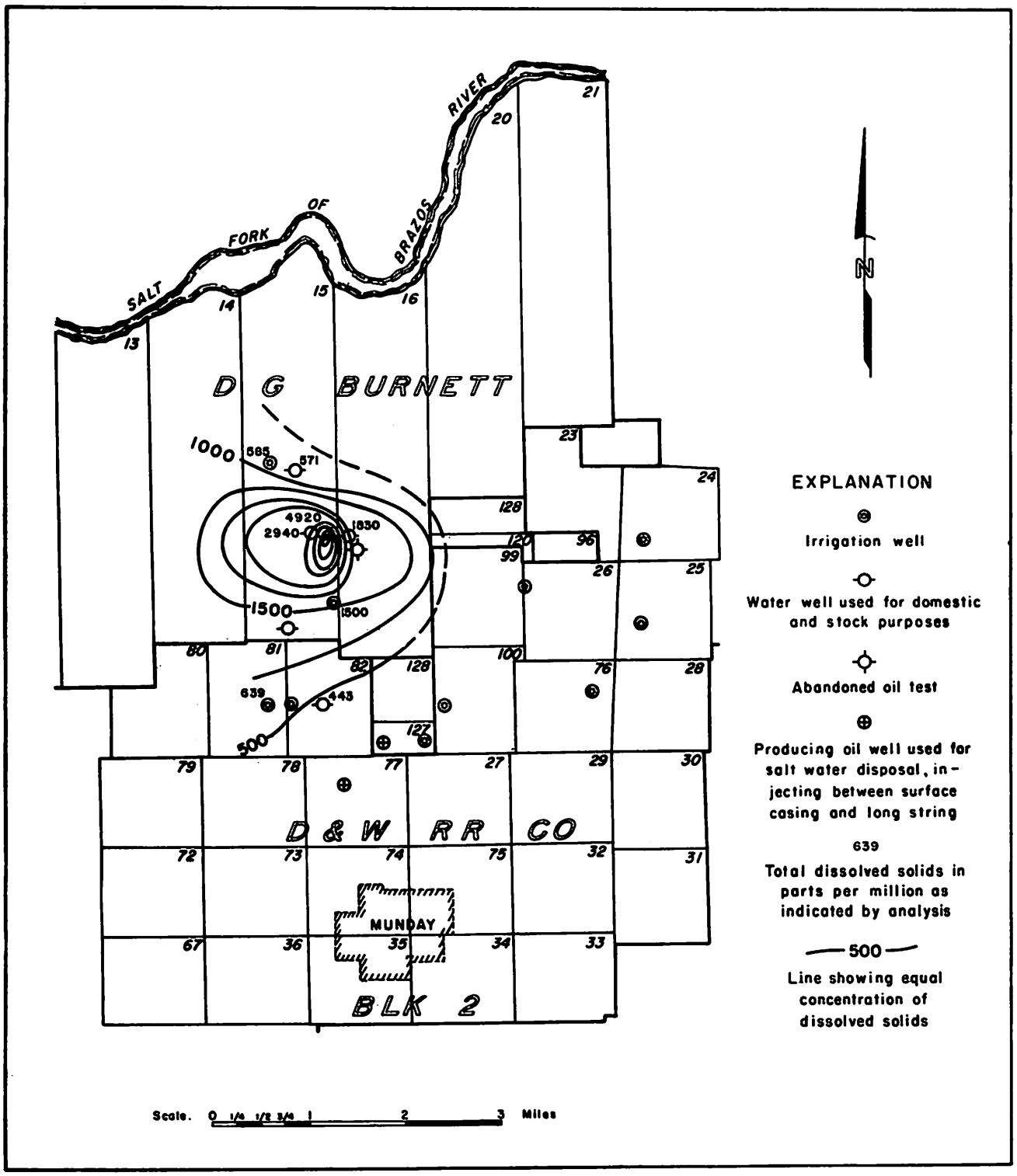

PLATE 3 – CONCENTRATIONS OF TOTAL DISSOLVED SOLIDS IN AREA OF INVESTIGATION, KNOX COUNTY, TEXAS.

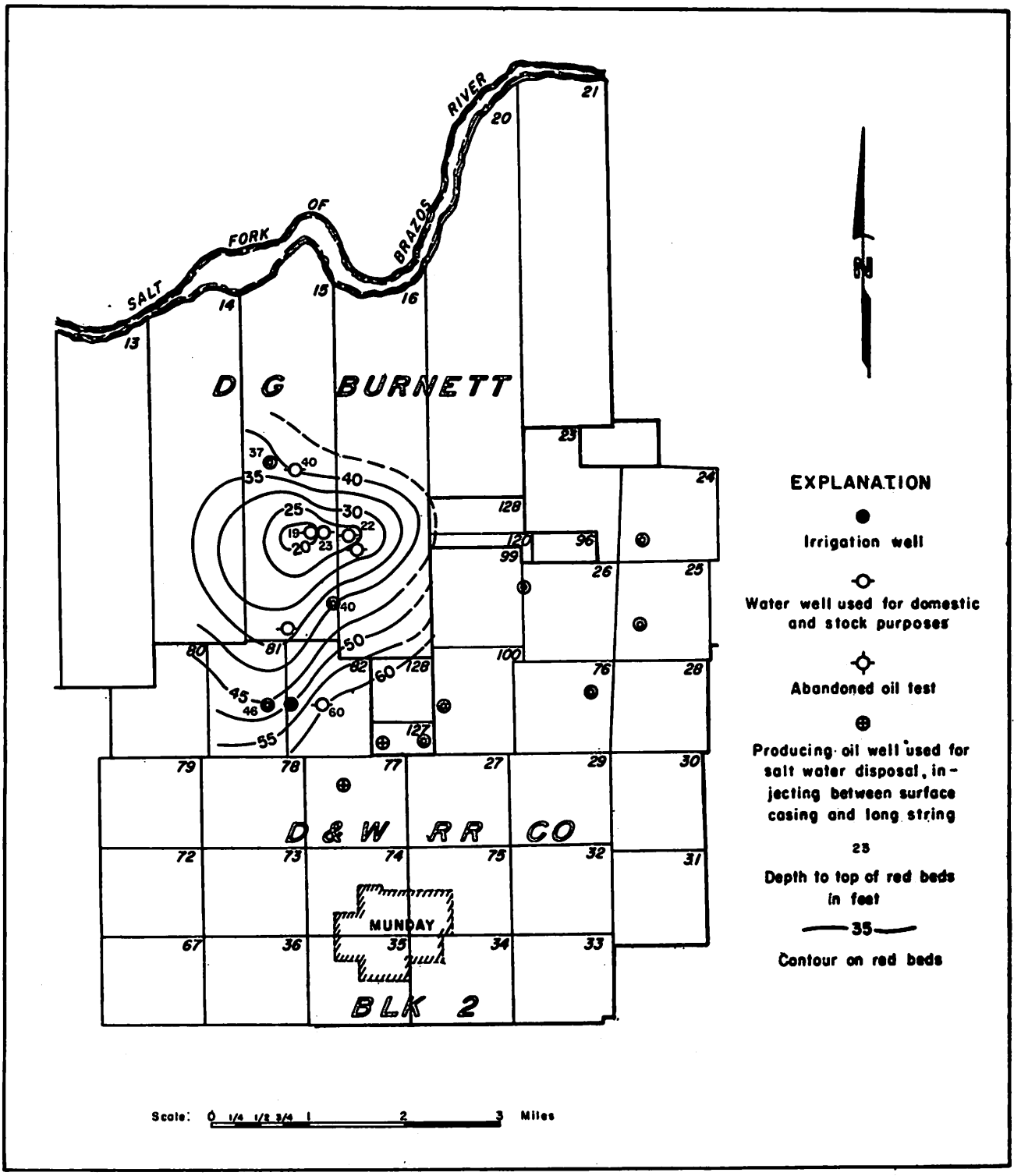

PLATE 4 - CONFIGURATION OF THE RED BED SURFACE IN AREA OF INVESTIGATION, KNOX COUNTY, TEXAS