DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

PREPARED IN COOPERATION WITH THE
STATE GEOLOGICAL SURVEY OF KANSAS
KANSAS STATE DEPARTMENT OF HEALTH
KANSAS STATE BOARD OF AGRICULTURE

HYDROLOGIC INVESTIGATIONS
ATLAS HA-279

GENERALIZED COLUMNAR SECTION AND WATER-BEARING CHARACTERISTICS

SYSTEM	SERIES	GROUP		THICKNESS	LITHOLOGY	HYDROLOGY
QUATERNARY	Recent		Alluvium	0-35	Unconsolidated clay, silt, sand, and chert gravel, coarse sand and gravel at base 0-10' thick, beneath flood plains and terraces adjacent to the present stream channels.	Wells in Neosho River and tributary valleys yield as much as 100 gpm of good to fair quality water. Aquifer offers considerable potential for development.
	Pleistocene		Terrace deposits	0-20		Wells in undrained terrace deposits yield 10 to 20 gpm of good to fair quality water.
PENNSYLVANIAN	Missouri	Kansas City Group	Chanute Shale	0-300±	Sandy shale containing sand lenses.	Yields small quantities of water to wells in weathered and sandy zones.
			Drum Limestone		Hard, crystalline limestone.	Yields small quantities of water to wells in soil zone and solution zone from downdip from outcrop area.
			Cherryvale Shale		Sandy to silty shale; sandy zone near base of formation.	Yields some water to wells from the sandy zone.
			Dennis Limestone		Cherty limestone containing zone of black concretionary shale.	Yields small quantities of water to large-diameter wells.
			Galesburg Shale		Sandy shale and sandstone containing large amounts of silt.	Yields 5 to 10 gpm of fair to poor quality water to wells downdip from outcrop area.
			Swope Limestone		Bedded limestone, about 8 feet thick.	Yields some water to wells from joints, crevices, and bedding planes.
			Ladore Shale		Bluish-gray shale, sandy near top of the formation.	May contain some water in sandy zone.
			Hertha Limestone		Gray, crystalline, silty limestone, not continuous throughout.	Yields water to wells from soil in the outcrop area.
		Pleasanton Group	Tacket Formation[1]	0-70	Shale containing zone of nodular limestone near top of formation.	Yields small quantities of highly mineralized water to wells. Black shale yields some oil.
			Checkerboard Limestone		Fine, crystalline limestone separated by thin bed of gray shale.	Probably yields no water to wells.
			Seminole Formation		Consists of South Mound Shale Member[1] (about 12 feet) and Hepler Sandstone Member[2] (2 to 12 feet).	Yields as much as 5 gpm to wells in Hepler Member. Water is hard and may contain excessive nitrate.
	Des Moines	Marmaton Group	Holdenville Shale	0-250±	Gray, silty, platy to blocky fossiliferous shale. Discontinuous, ranges from 0 to 45 feet thick.	Yields 1 to 5 gpm to large-diameter wells. High chloride content reported locally.
			Lenapah Limestone		Consists of Idenbro Limestone, Perry Farm Shale, and Norfleet Limestone Members. Ranges from 5 to 15 feet thick.	Idenbro Member yields very small quantities of hard water to wells.
			Nowata Shale		Gray to black platy shale. Ranges from 6 to 15 feet thick.	Yields 1 to 5 gpm of fair quality water locally to large-diameter wells.
			Altamont Limestone		Consists of Worland Limestone, Lake Neosho Shale, and Amoret Limestone Members. Thickness about 15 feet.	Yields very small quantities of fair quality water to wells from the Amoret Member.
			Bandera Shale		Sequence of interbedded sandstone, siltstone, and sandy shale ranging in thickness from 70 to 100 feet.	May yield as much as 40 gpm to wells locally. Most wells yield up to 10 gpm of fair to poor quality water.
			Pawnee Limestone		Consists of Laberdie Limestone, Mine Creek Shale, Myrick Station Limestone, and Anna Shale. Thickness about 25 feet.	Laberdie Limestone yields very small quantities of water to wells.
			Labette Shale		Greenish-brown shale containing sandstone lentils in the upper 20 feet in northern part of the area and fine-grained sandstone and sandy shale near the middle in central and southern part of the area. Total thickness is about 75 feet.	Yields 5 gpm to wells in most of the outcrop area. Best sites obtained from sandy zones. Quality of water is satisfactory for most uses.
			Fort Scott Limestone		Gray, crystalline, thin-bedded limestone and thin, black, platy shale. Consists of Higginsville Limestone[3], Little Osage Shale[4], and Blackjack Creek Limestone[3] Members. Thickness about 28 feet.	Yields small quantities of fair quality water to wells, especially downdip from outcrop area.
		Cherokee Group	Cabaniss Formation	0-140±	Upper 140 feet of formation crops out in the area. Consists of an upper black, platy shale; the nodular, silty Breezy Hill Limestone Member; a thick gray and tan, blocky shale and sandstone; the Verdigris Limestone Member; a black shale and silty shale, containing a thin coal bed; and the tan, fine-grained Chelsea(?) Sandstone Member.	Upper shale yields very small quantities of poor quality water. Sandy zones in upper shale yield some water that locally contains hydrogen sulphide. Oil, gas, and water of high chloride content occur in some sandstones in the eastern part of the area.
					Lower part, which is not exposed, consists principally of dark shale, sandy shale, and sandstone.	Lower part of the formation not yet known to yield usable quality water in this area.

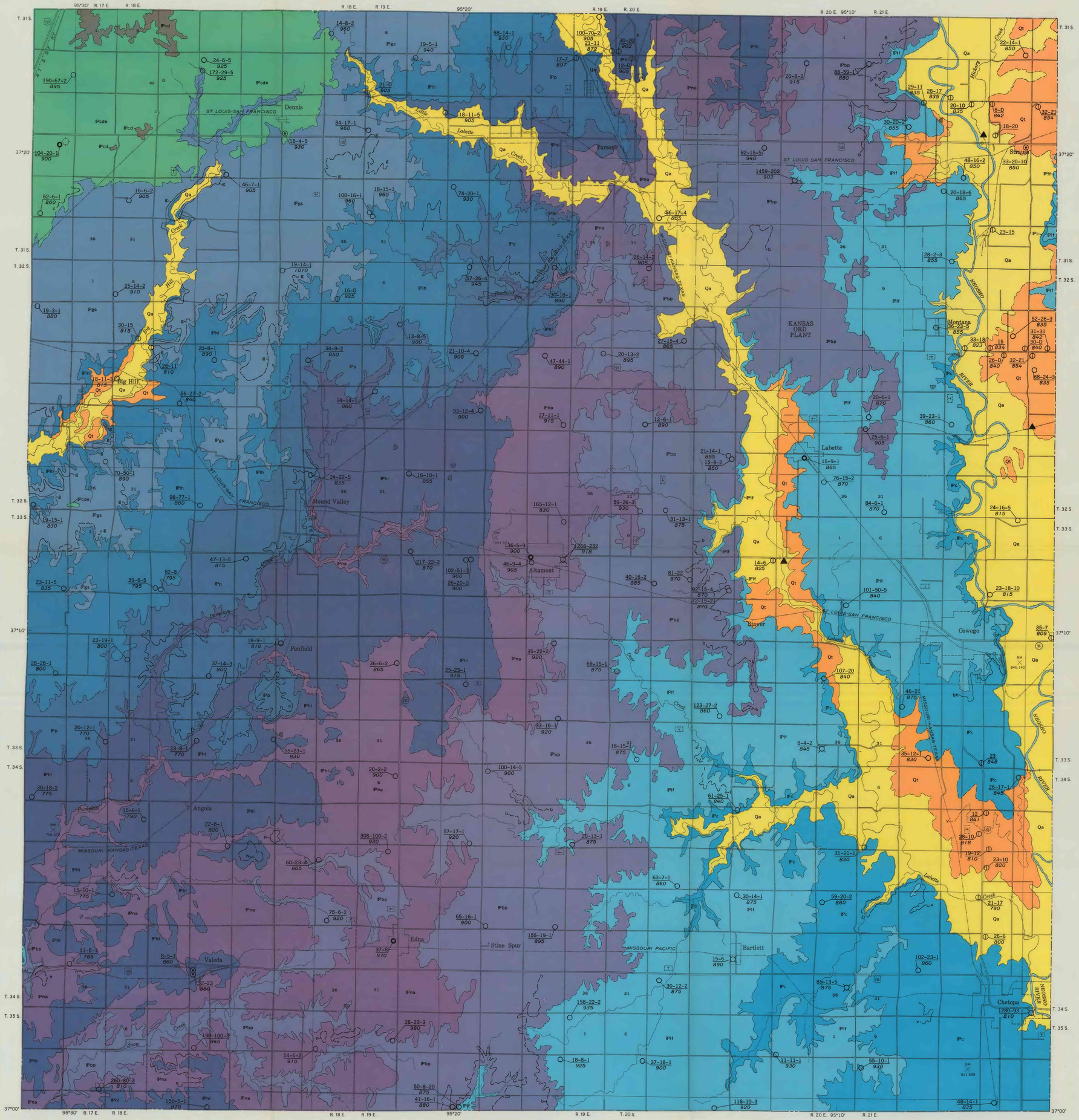
[1] Of Jewett and others, 1965
[2] Of Jewett, 1940
[3] Of Cline, 1941
[4] Of Jewett, 1941

ANALYSES OF WATER FROM REPRESENTATIVE WELLS

DISSOLVED CONSTITUENTS AND HARDNESS GIVEN IN PARTS PER MILLION[1]

WELL NUMBER	DEPTH, FEET	GEOLOGIC SOURCE	DATE OF COLLECTION	TEMPERATURE (°F)	DISSOLVED SOLIDS (CALCULATED AT 180°C)	SILICA (SiO_2)	IRON (Fe)	MANGANESE (Mn)	CALCIUM (Ca)	MAGNESIUM (Mg)	SODIUM AND POTASSIUM (Na + K)	BICARBONATE (HCO_3)	SULFATE (SO_4)	CHLORIDE (Cl)	FLUORIDE (F)	NITRATE[2] (NO_3)	HARDNESS AS $CaCO_3$ TOTAL	HARDNESS AS $CaCO_3$ CARBONATE	HARDNESS AS $CaCO_3$ NONCARBONATE	SPECIFIC CONDUCTANCE (MICROMHOS AT 25° C)	pH
31 17E 11da	190	Dodds Creek Sh. Mbr.[3]	2 18 65	...	617	4.0	.03	.00	61	17	149	351	118	67	1.4	27	222	222	0	1010	...
31 17E 26cc	62	Winterset Ls. Mbr.	2 18 65	65	136	1.1	2.7	.15	34	2.7	14	100	23	10	.2	.8	96	82	14	240	...
31 18E 9bb	24	Winterset Ls. Mbr.	6 17 64	63	512	14	.14	.07	76	49	45	450	103	28	.3	1.3	386	328	58	820	...
31 18E 14cc	25	Stark Sh. Mbr.	6 17 64	...	686	9.0	.11	.05	193	3.5	25	309	113	34	.1	.9	504	294	210	1020	...
31 18E 24dc	46	Galesburg Sh.	2 26 64	...	468	7.0	.187	.38	114	11	41	339	100	23	.4	4.4	330	278	52	730	...
31 18E 30ca	36	Galesburg Sh.	7 8 64	...	...	...	...	...	...	...	...	...	195	46	.4	46	...	...	...	...	...
31 19E 1ab	100	Tacket Fm.	10 20 64	...	...	...	...	...	...	...	...	...	560	...	...	0	...	...	...	...	...
31 19E 3cd	50	Hertha Ls. Tacket Fm.	2 18 65	...	2819	15	.00	.08	372	156	257	337	118	306	...	828	1569	276	1293	3780	...
31 19E 8bb	19	Hertha Ls.	7 8 64	...	...	...	...	...	...	...	...	...	90	...	...	46	...	...	...	...	...
31 19E 28bb	74	Tacket Fm.	6 18 64	...	1297	11	.00	.00	64	27	328	454	215	83	.6	345	270	270	0	1840	...
31 20E 22ab	82	Bandera Sh.	6 17 64	...	519	15	.29	.02	109	16	52	346	126	26	.4	5.6	334	284	54	800	...
31 20E 25ba	145±	Bandera Fm.	2 26 64	...	1605	9.2	.02	.02	64	12	460	1220	0	115	3.7	.0	204	204	0	2400	...
31 20E 29cc	86	Bandera Sh.	7 8 65	66	1170	14	3.2	.16	123	49	223	392	349	217	.5	1.9	508	322	186	1810	7.4
31 21E 7bb	88	Labette Sh.	6 19 64	73	2870	8.0	.43	.00	112	75	890	644	249	1215	1.0	2.7	588	528	60	5010	...
31 21E 9cd	28	Wisconsin deposits	6 22 64	...	439	16	9.2	1.0	126	21	14	478	20	7.0	.1	.0	401	392	9	680	...
31 21E 15cc	18	Wisconsin deposits	6 22 63	...	406	15	7.2	.22	54	12	60	256	110	7.0	.2	5.8	200	200	0	620	...
31 21E 17db	30	Illinoian deposits	7 8 65	...	650	16	.07	.0	66	12	134	226	118	59	.5	133	214	186	28	970	7.4
31 21E 22aa	33	Illinoian deposits	7 8 65	...	1720	10	.03	.00	262	77	178	300	1020	24	.7	32	2888	476	2412	5010	...
31 21E 29aa	20	Little Osage Sh. Mbr.	6 18 64	65	453	18	.03	.00	102	25	31	444	27	14	.2	17	358	358	0	730	...
31 21E 33cc	26	Little Osage Sh. Mbr.	6 18 64	67	530	18	.07	.00	90	29	62	416	38	8.4	.1	.0	344	336	8	870	...
31 21E 34bb	23	Wisconsin deposits	6 22 64	...	408	21	6.5	.8	118	11	8.7	312	89	7.0	.1	.0	340	256	84	620	...
31 21E 6cc	25	Galesburg Sh.	6 18 64	60	1743	13	.03	.00	286	69	238	322	583	169	.3	297	822	264	558	2860	...
32 18E 7dc	30	Wisconsin deposits	6 24 63	...	253	14	.00	.00	34	12	41	173	42	23	.4	1.5	134	134	0	450	...
32 18E 14ac	34	South Mound Sh. Mbr.	10 12 64	...	...	...	...	...	...	...	...	...	690	...	.0	.0	...	...	...	...	...
32 18E 18cc	18	Illinoian deposits	2 18 65	...	707	18	.01	.00	101	31	60	76	61	107	.2	292	380	62	318	1100	...
32 18E 33cc	99	Tacket Fm.	10 14 64	...	...	...	...	...	...	...	...	...	750	250	...	1.0	...	...	...	...	...
32 19E 4ab	57	Tacket Fm.	6 18 64	68	825	12	.00	.00	211	19	33	329	316	33	.2	39	604	270	334	1150	...
32 19E 7ad	13	Tacket Fm.	10 12 64	...	...	...	...	...	...	...	...	...	690	...	.0	0	...	...	...	...	...
32 19E 16aa	21	Hepler Ss. Mbr.	6 18 64	...	4852	13	.08	.05	512	392	436	581	3156[4]	24	.7	32	2888	476	2412	5010	...
32 19E 21da	93	Bandera Sh.	2 18 65	...	3665	14	.17	.00	456	297	465	427	324	1890	.1	9.3	2358	350	2008	6640	...
32 19E 32bb	36	Idenbro Ls. Mbr.	10 15 64	...	...	...	...	...	...	...	...	...	195	46	.4	46	...	...	...	...	...
32 20E 8dd	27	Anna Sh. Mbr.	6 18 64	63	806	15	1.4	.00	147	34	77	410	255	33	.3	42	506	336	170	1170	...
32 20E 36bb	76	Labette Sh.	7 8 65	...	2636	7.5	.30	.0	439	129	136	377	1360	58	.5	115	1626	309	1317	3800	7.1
32 21E 10db	52	Cabaniss Fm.	7 9 65	61	504	18	.49	.0	42	10	146	422	0	78	.7	1.1	146	146	0	850	7.7
32 21E 35dc	85	Little Osage Sh. Mbr.	2 26 64	...	455	10	1.6	.05	27	25	117	415	54	16	.4	9	170	170	0	740	...
33 17E 11dd	23	Ladore Sh.	10 13 64	...	...	...	...	...	...	...	...	...	...	405	...	46	...	...	...	...	...
33 17E 36da	20	Holdenville Sh.	10 14 64	...	...	...	...	...	...	...	...	...	...	...	...	46	...	...	...	...	...
33 18E 8cd	39	Tacket Fm.	2 18 65	...	1903	11	4.4	.22	180	63	357	456	1012	45	.6	9.3	708	374	334	2590	...
33 18E 10ba	47	Hepler Ss. Mbr.	6 18 64	...	2786	10	.03	.00	582	86	149	295	1780	14	.7	19	1806	242	1564	2950	...
33 18E 23bb	18	Hepler Ss. Mbr.	2 18 65	...	1237	12	.80	.05	158	40	193	324	207	153	.2	314	558	266	292	1890	...
33 18E 33cb	23	Nowata Sh.	2 18 65	...	1119	3.0	.05	.00	221	25	64	176	80	76	.1	564	654	144	510	1620	...
33 18E 34dd	55	Bandera Sh.	10 28 64	...	...	...	...	...	...	...	...	...	...	710	...	46	...	...	...	...	...
33 19E 9abd	102	Worland Ls. Mbr. Bandera Sh.	10 15 64	...	...	...	...	...	...	...	...	...	...	187	...	45	...	...	...	...	...
33 19E 11aa	1298	Mississippian rocks Cotter and Jefferson City Dolomites	11 4 42		2623		2.2		29	15	993	520	12	1300	6.0	6.2	134	134	0		
33 19E 11bbd	136	Bandera Sh.	5 27 65	60	640	18	.01	.0	90	30	86	273	247	29	.2	5.3	348	224	124	960	7.9
33 19E 19da	36	Nowata Sh. Worland Ls. Mbr.	7 9 65	...	675	18	.17	.0	51	19	191	505	53	140	1.1	1.0	205	205	0	1150	7.7
33 19E 28ab	25	Nowata Sh.	10 28 64	66	...	...	...	...	...	...	...	...	...	403	...	46	...	...	...	...	...
33 20E 8ad	81	Labette Sh.	6 15 65	61	1977	8.2	.03	.0	35	33	707	825	90	660	3.4	9	223	223	0	3490	...
33 20E 8cb	40	Laberdie Ls. Mbr.	6 18 64	...	2863	8.0	.03	.00	320	195	303	405	1384	159	.5	114	1600	332	1268	3520	...
33 20E 9abd	92	Englewood Channel Ss.	2 26 65	...	355	12	.01	.00	64	32	26	320	44	13	.2	2.0	291	270	21	610	...
33 20E 13ab	101	Little Osage Sh. Mbr.	7 8 65	...	1200	8.2	.01	.0	146	2.4	189	601	2.5	340	.5	9	24	24	0	2110	8.3
33 20E 26dc	123	Labette Sh.	6 19 64	...	4100	9.8	.08	.0	180	129	1141	530	636	1475	4.8	239	986	472	514	6640	7.7
33 21E 3ab	24	Wisconsin deposits	10 21 64	...	...	...	...	...	...	...	...	...	...	60	...	46	...	...	...	...	...
33 21E 10cc	23	Wisconsin deposits	7 8 65	...	905	18	.03	1.1	158	39	113	528	201	93	.2	23	564	433	121	1420	7.0
33 21E 32dc	35	Cabaniss Fm.	6 18 64	63	835	10	2.0	.00	172	18	59	105	458	20	1.6	44	503	86	417	1090	...
34 17E 2cc	30	Nowata Sh.	10 16 64	...	...	...	...	...	...	...	...	...	...	210	...	0	...	...	...	...	...
34 18E 14aa	22	Idenbro Ls. Mbr.	2 18 65	...	292	5.0	5.3	.19	72	7.9	14	132	121	5.0	.2	9	212	108	104	460	...
34 18E 24cd	75	Bandera Sh.	10 28 64	...	...	...	...	...	...	...	...	...	...	166	...	46	...	...	...	...	...
34 19E 3bb	100	Bandera Sh.	2 26 64	...	429	16	.36	.08	55	28	75	473	.0	21	.1	1.1	252	252	0	730	...
34 19E 6ad	20	Recent deposits Nowata Sh.	10 27 64	...	...	...	...	...	...	...	...	...	...	15	...	.0	...	...	...	...	...
34 19E 9dc	57	Bandera Sh.	10 26 64	65	...	...	...	...	...	...	...	...	...	382	...	46	...	...	...	...	...
34 19E 18ab	308	Bandera Sh.	10 27 64	62	...	...	...	...	...	...	...	...	...	375	...	1.0	...	...	...	...	...
34 19E 23dd	155	Labette Sh.	2 18 65	63	1062	6.0	.87	.05	30	39	319	610	72	135	1.3	124	236	236	0	1770	...
34 20E 17dc	63	Labette Sh.	10 27 64	65	...	...	...	...	...	...	...	...	...	120	...	46	...	...	...	...	...
34 20E 32ba	30	Labette Sh.	10 27 64	64	...	...	...	...	...	...	...	...	...	30	...	44	...	...	...	...	...
34 20E 36ac	85	Cabaniss Fm.	10 22 64	63	...	...	...	...	...	...	...	...	...	308	...	.0	...	...	...	...	...
34 21E 7cc	31	Excello Fm.[4]	10 28 64	60	...	...	...	...	...	...	...	...	...	30	...	46	...	...	...	...	...
34 21E 29cd	102	Cabaniss Fm.	7 9 65	70	1674	5.4	3.4	.15	32	24	543	608	665	102	1.2	1.7	178	178	0	2490	7.9
34 21E 35cc	1280	Cotter and Jefferson City Dolomites Roubidoux Fm.	5 22 35		921	11	.3	---	3.3	8.3	347	200	26	289	7.6	---	---	---	---	---	---
35 17E 12dd	260	Bandera Sh.	10 14 64	...	...	...	...	...	...	...	...	...	...	750	...	1.0	...	...	...	...	...
35 18E 4cc	190	Bandera Sh.	7 9 65		5113	8.2	.89	.0	36	27	1964	1041	4.1	2555[4]	4.0	1.2	201	201	0	9040	7.6
35 20E 2cc	11	Higginsville Ls. Mbr.	7 9 65	66	1414	11	.02	.0	319	23	100	272	465	162	.4	199	890	223	667	1950	7.3
35 20E 7aa	37	Labette Sh.	7 9 65		384	5.4	.01	.0	114	12	9.3	330	28	9.0	.3	43	334	270	64	650	7.4
35 20E 16ab	118	Englewood Channel Ss.	10 22 64	69	...	...	...	...	...	...	...	...	...	210	...	8	...	...	...	...	...
35 21E 7bb	55	Cabaniss Fm.	7 7 64	...	...	...	...	...	...	...	...	...	...	225	...	44	...	...	...	...	...
35 21E 15ba	40	Chelsea(?) Ss. Mbr.	10 26 64	...	...	...	...	...	...	...	...	...	...	255	...	8	...	...	...	...	...
OBSERVED RANGE OF CONSTITUENTS IN LABETTE COUNTY					136-5113	1.1-21	.00-18	0-1.1	3.3-582	2.4-392	8.7-1141	76-825	0-3156	5-2555	0-7.6	0-828	24-2888	24-528	0-2412	240-9040	7.0-8.3
U.S. PUBLIC HEALTH STANDARDS (1962) RECOMMENDED MAXIMUM					500-1000	---	0.3	0.05					250	250	1.5	45					

Footnotes:
1. One part per million is equivalent to one pound of substance per million pounds of water or 8.33 pounds per million gallons of water.
2. In areas in which the nitrate content of water is known to exceed 45 ppm, the public should be warned of the potential dangers of using the water for infant feeding (U.S. Public Health Service, 1962, p. 7).
3. Of Jewett, 1952
4. Of Searight, 1953



Base from County Highway Map

Geology mapped by W. L. Jungmann, 1962-63

SCALE 1:63 360

EXPLANATION

QUATERNARY

Recent

Qa — Alluvium

Qt — Terrace deposits

Pleistocene

Missouri — Kansas City Group

IPcd — Chanute Shale and Drum Limestone

IPcde — Cherryvale Shale and Dennis Limestone
c, base of Cherryvale Shale

IPgs — Galesburg Shale and Swope Limestone
g, base of Galesburg Shale

IPl — Ladore Shale and Hertha Limestone
l, base of Ladore Shale

IPp — Pleasanton Group
c, base of Checkerboard Limestone

Des Moines — Marmaton Group

IPhv — Holdenville Shale and Lenapah Limestone
h, base of Holdenville Shale

IPna — Nowata Shale and Altamont Limestone
n, base of Nowata Shale

IPbp — Bandera Shale and Pawnee Limestone
b, base of Bandera Shale

IPlf — Labette Shale and Fort Scott Limestone
l, base of Labette Shale

IPc — Cherokee Group
bh, base of Breezy Hill Limestone Member of Cabaniss Formation
v, base of Verdigris Limestone Member of Cabaniss Formation

PENNSYLVANIAN — CARBONIFEROUS

Contact
Dashed where approximate or inferred, dotted where concealed

Domestic or stock well

Public supply well

Industrial well

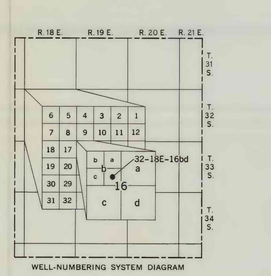
Observation well

Test hole

Stream gaging station

15-6-1 / 790 — Upper left number is depth of well or test hole below land surface, in feet; second number is depth to water level below land surface, in feet; third number (when shown) is the yield, in gallons per minute. Lower number is the altitude of the land surface, in feet above mean sea level

D=dry hole



WELL-NUMBERING SYSTEM DIAGRAM

UNCONSOLIDATED DEPOSITS

The unconsolidated aquifers are the best potential sources of ground water in Labette County. Wisconsin and Recent deposits, which underlie the flood plain of the Neosho River and other streams, are the most likely to yield water in sufficient quantity and quality for small industry and housing development. In some areas, groups of wells or collection galleries may obtain as much as 100 gpm. The Illinoian deposits, which occur as discontinuous terraces, yield about 10 to 20 gpm of good to fair quality water to wells.

Ground water in the unconsolidated aquifers is recharged by direct penetration of rainfall, 40 inches annually which is nearly the greatest in the State, by infiltration of spring runoff that emanates from the consolidated rocks bounding the valleys, and by infiltration from floodwaters that occasionally cover the flood plain. Ground water is discharged by inflow to streams, by evaporation and transpiration in areas where the water table is shallow, and by pumping from wells. The quantity of water available in the unconsolidated aquifer varies perennially with the quantity added and removed from storage. The movement of ground water in the Neosho River valley is principally toward the river, but some water moves down the valley under an average gradient of about 2 feet per mile.

An aquifer test made at well 32-21E-4cd showed a water-level drawdown of 20.3 feet after pumping 90 gpm continuously for 98 hours. The specific capacity for the test was 3.9 gpm/ft (gallons per minute per foot drawdown). The coefficient of permeability determined was about 420 gpd/ft^2 (gallons per day per square foot) and the coefficient of storage at the end of the test was 0.20.

If it is assumed that these values are representative of the unconsolidated aquifer, the quantity of water in storage is about 40 million gallons per foot of saturated material for each square mile. In the area of the test, storage is about 2,000 acre-feet per square mile.

Increased pumping in the Neosho River valley probably would salvage some water presently discharged to the river and to evapotranspiration. The resultant lowering of water levels by pumping also would increase space available for storing recharge.

AVAILABILITY OF SURFACE WATER

Because ground water is in limited supply in most of Labette County, additional conservation of surface water should be considered. Streamflow records indicate that about one-fourth (10 inches) of the average annual rainfall (40 inches) leaves the county as surface runoff. The streamflow, which is composed of both ground-water inflow and storm runoff, is somewhat erratic.

The Neosho River carries most of the surface runoff. The average annual discharge near Parsons (1921-65) is about 2,400 cfs (cubic feet per second) or 1.7 million acre-feet. The maximum observed discharge was 410,000 cfs on July 14, 1951, and periods of no flow were observed during five of the years of record. A period of no flow existed from October 1, 1957 to March 3, 1958.

Labette Creek, principal tributary of the Neosho River, has an average annual discharge near Oswego (1921-56) of about 150 cfs. The maximum observed discharge was 10,000 cfs on June 2, 1965, and periods of no flow were recorded during four of the years of record.

The quality of surface water in the county is generally good. The total dissolved solids in water from the Neosho River in 1963-64 ranged from 190 to 600 parts per million.

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INTRODUCTION

This study is a part of an investigation of the geology and availability of water in southeast Kansas. The report was prepared in cooperation with the State Geological Survey of Kansas, the Environmental Health Services of the Kansas State Department of Health, and the Division of Water Resources of the Kansas State Board of Agriculture. The classification and nomenclature of the stratigraphic units used in this report are those of the U.S. Geological Survey and differ somewhat from those of the State Geological Survey of Kansas.

AVAILABILITY OF GROUND WATER

Ground water of suitable quality and quantity for domestic and stock purposes is available in most parts of Labette County. However, some of the ground-water sources may be inadequate during years of extreme drought.

CONSOLIDATED DEPOSITS

The consolidated aquifers generally contain water in the soil and weathered rock zones at shallow depths. The quantity and chemical quality of water in each formation depend on the character of the rocks, the degree of rock weathering, and the thickness of the soil zone. Yields from wells range from less than 1 gpm (gallon per minute) to about 40 gpm. Both yield and chemical quality range within wide limits in the same formation.

Most consolidated rock formations yield some water to wells in and near the area where they crop out. If insufficient amounts of water are obtained from a well that fully penetrates the weathered zone, a greater quantity may be available downdip (northwestward) from the outcrop area. Large-diameter cistern-type wells with lateral collection galleries result in greater yields from these formations. Proper protection from bacterial contamination should be provided for shallow wells.

Wells in the Bandera Shale may yield as much as 40 gpm of