

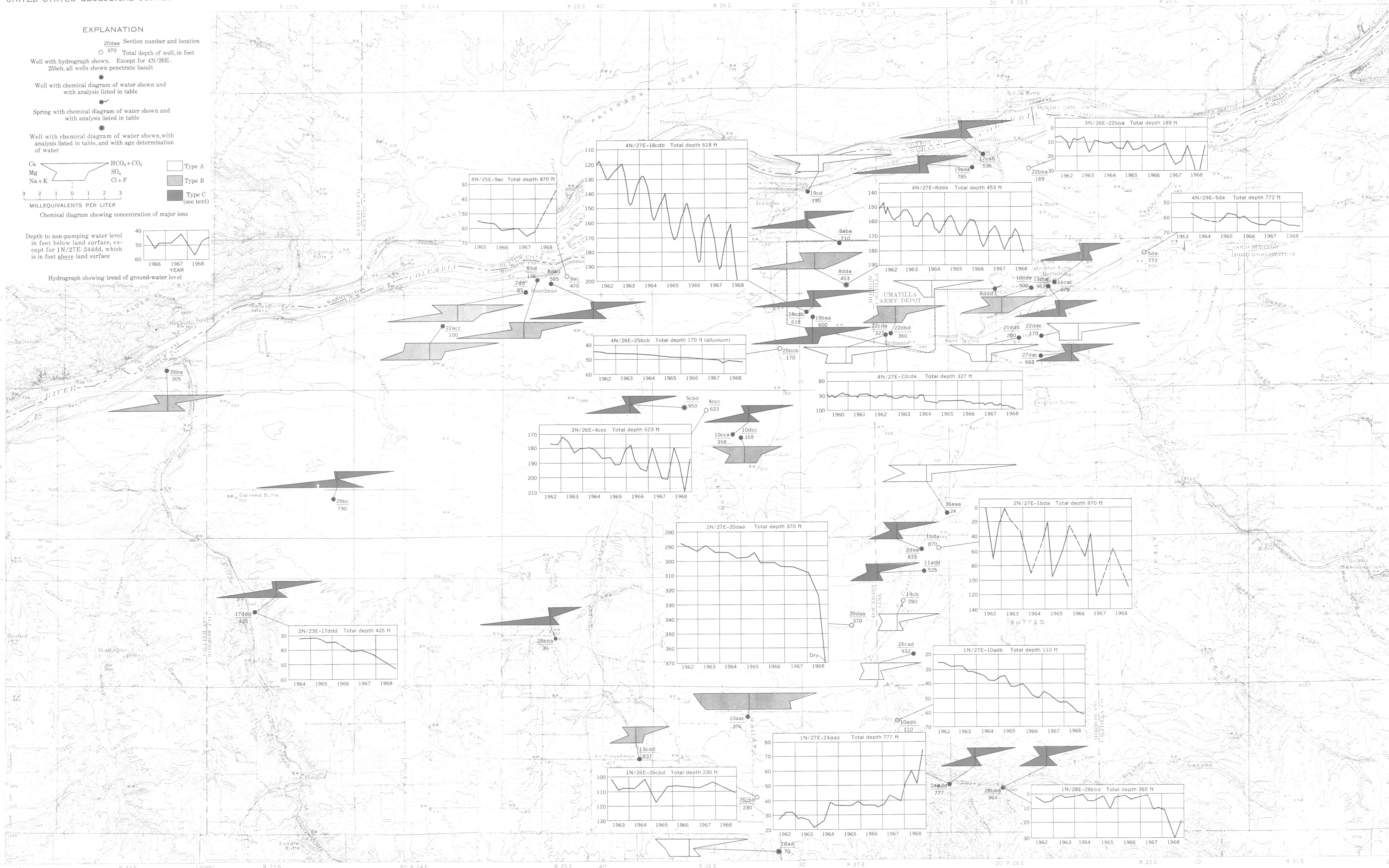
EXPLANATION

20daa Section number and location
○ 370 Total depth of well, in feet
Well with hydrograph shown. Except for 4N/26E-25bc, all wells shown penetrate basalt
Well with chemical diagram of water shown and with analysis listed in table
Spring with chemical diagram of water shown and with analysis listed in table
Well with chemical diagram of water shown, with analysis listed in table, and with age determination of water

Ca HCO₃+CO₂
Mg SO₄
Na+K Cl+F
3 2 1 0 1 2 3
MILLEQUIVALENTS PER LITER
Chemical diagram showing concentration of major ions

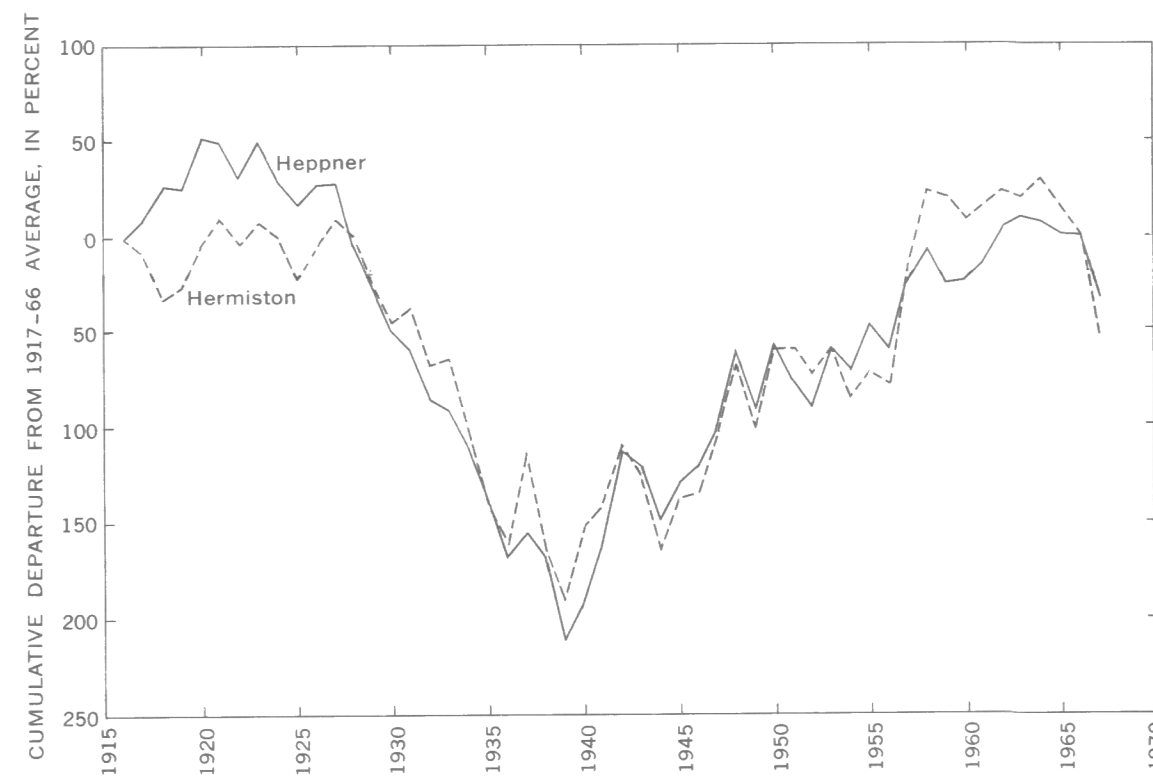
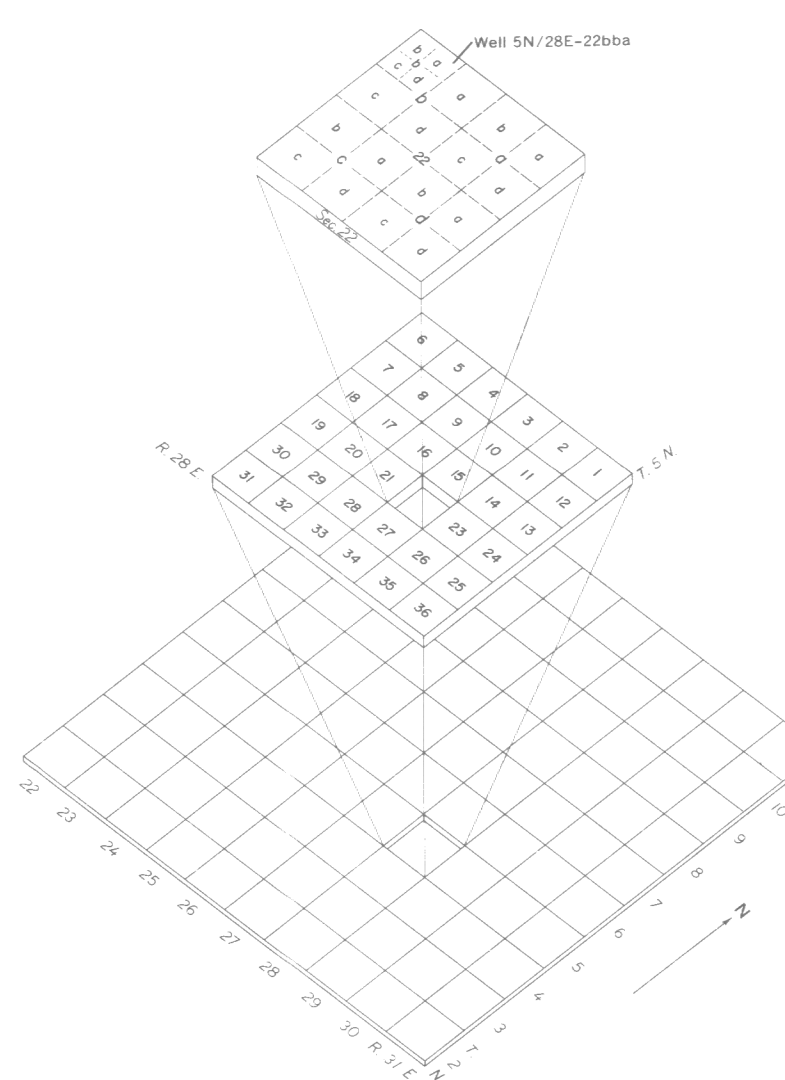
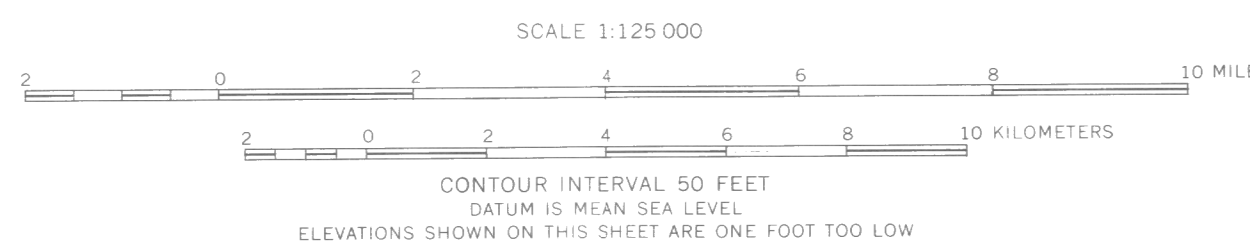
Depth to non-pumping water level in feet below land surface, except for 1N/27E-24ddd, which is in feet above land surface

Hydrograph showing trend of ground-water level



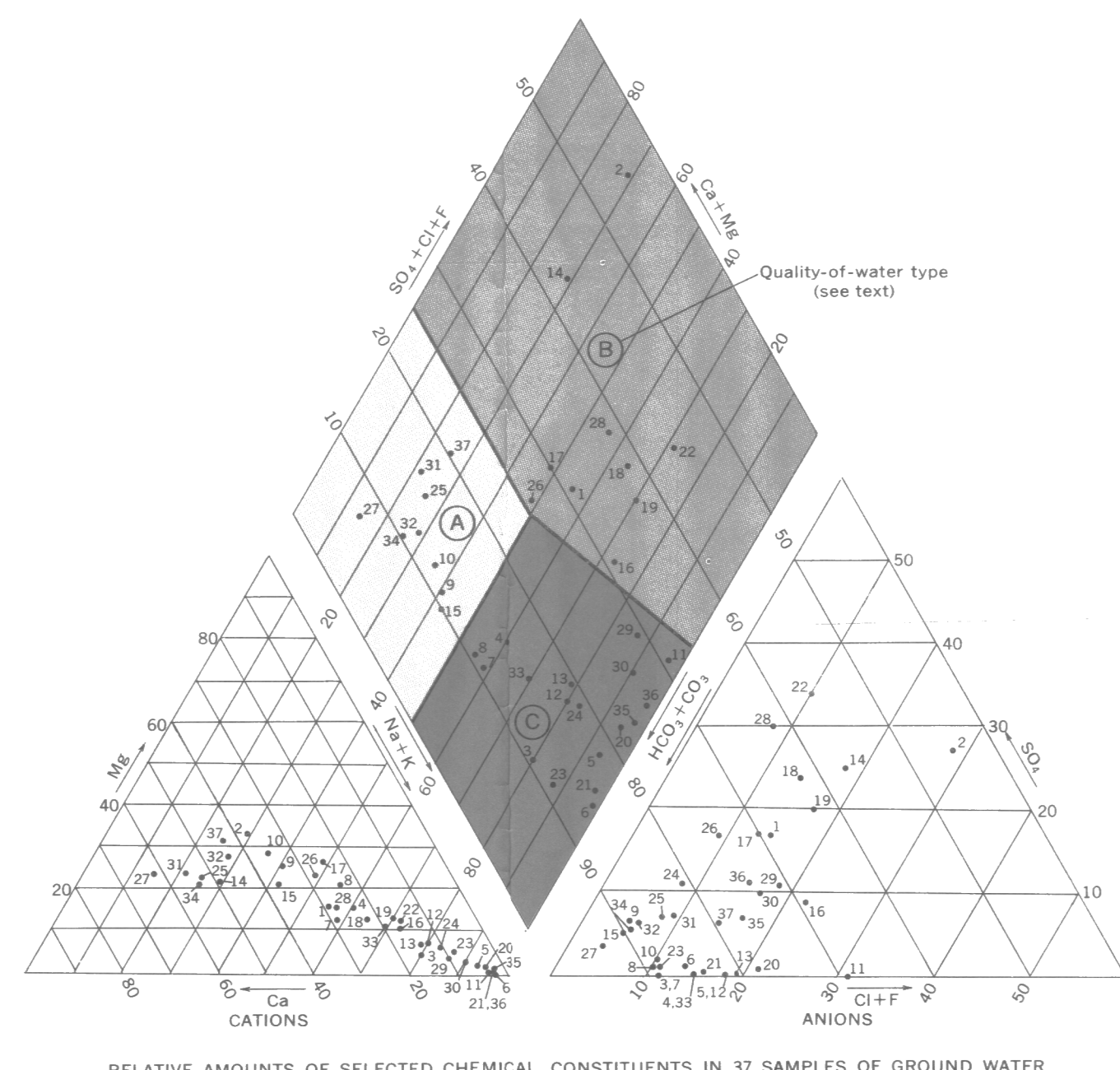
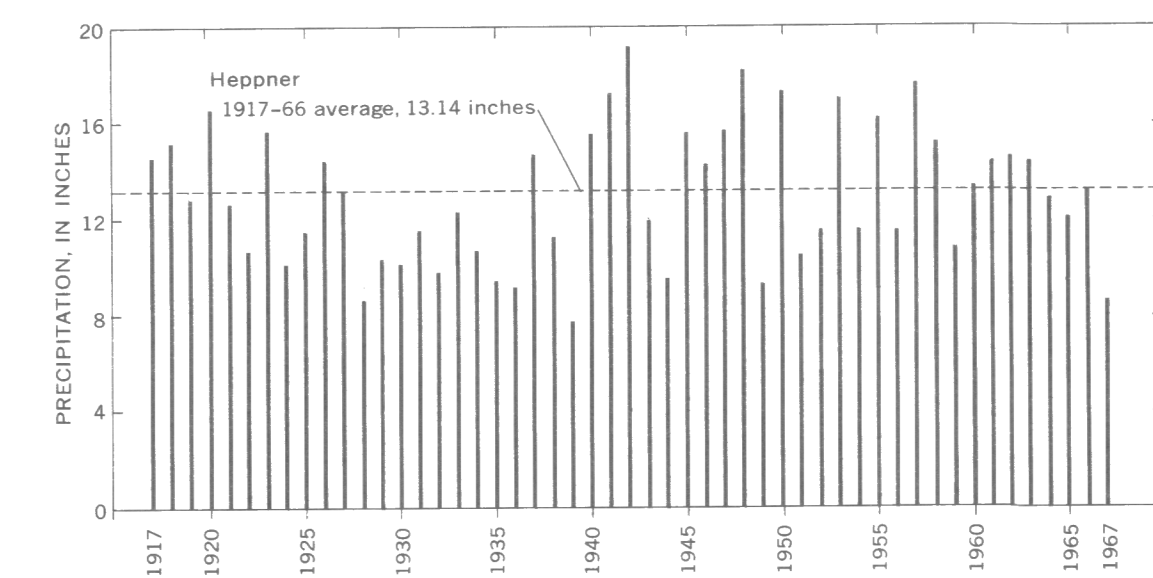
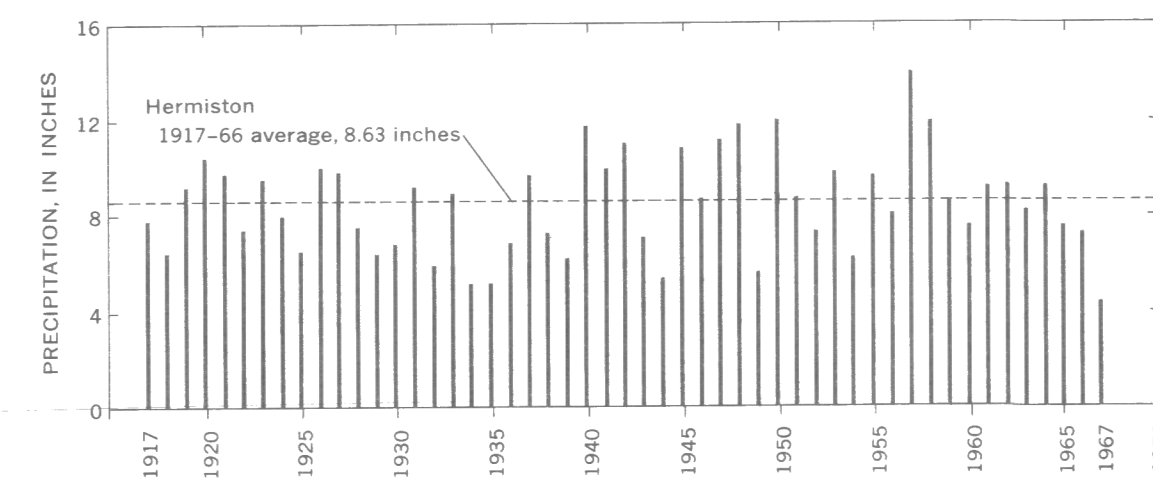
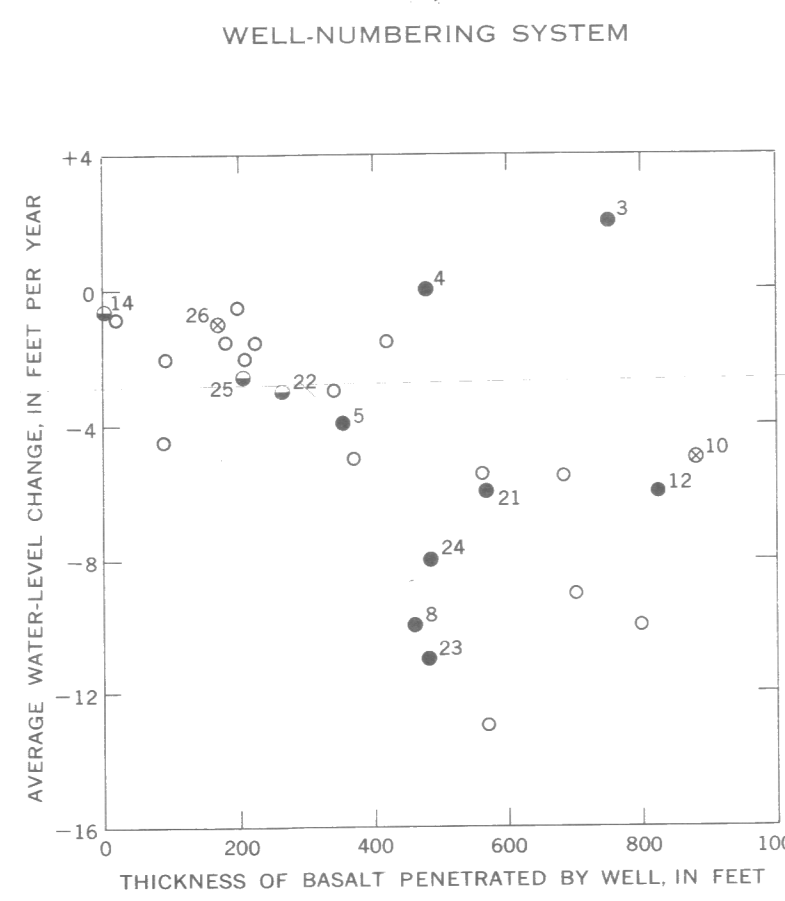
Base from U.S. Geological Survey 30' topographic quadrangles, 1905-16

HYDROLOGIC MAP



RADIOCARBON AGES OF GROUND WATER

Aquifer represented	Interval open to well (depth in feet)	Type of water	Well number	U.S. Geol. Survey Lab. No.	Apparent age (years)
Shallow	30-70	A	1S/26E-1dad	W-2112	Modern
Intermediate	256-431	B	4N/27E-8ada	W-3090	6,700
Deep	300-560	C	3N/26E-5cld	W-2092	27,200



CHEMICAL ANALYSES OF GROUND WATER

Location	Thickness of basalt penetrated by well (feet)	Date sampled	Milligrams per liter														pH	Type of water (see text)	
			Temperature (°C) (°F)	Silica (SiO ₂)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO ₃) + Carbonate (CO ₃)	Sulfate (SO ₄)	Chloride (Cl)	Fluoride (F)	Dissolved solids	Hardness as CaCO ₃	Sodium-adsorption-ratio (SAR)	Specific conductance (microhm/cm at 25°C)			
1N/25E-13cdd	203	5-10-67	16	41	38	17	5.6	34	5.9	126	24	14	0.8	201	66	1.8	292	7.9	B
1N/26E-10aac	368	5-10-67	18	54	58	71	38	64	12	252	120	91	4	668	384	1.3	891	7.9	B
1N/27E-24ddd	746	5-10-67	21	69	63	8	1.6	4.8	4.5	140	2	9.0	9	210	26	4.1	258	8.6	C
1N/28E-28bbd	355	4-28-63	18	54	70	15	5.7	40	5.2	163	6	15	5	823	61	2.2	285	8.1	C
2N/25E-17ddd	353	5-11-67	21	70	68	3.9	.7	73	8.8	173	2	20	1.9	266	12	9	351	8.6	C
2N/25E-28bbb	-	6-16-58	27	80	115	1.6	.0	90	5.6	162	29	16	2.0	337	4	20	388	9.1	C
2N/27E-24aaa	651	5-10-67	24	75	71	17	4.5	33	9.7	160	2	10	8	225	60	1.8	275	8.1	C
11add	462	4-28-53	17	62	66	14	7.5	32	9	161	8	9.5	6	219	66	1.7	373	8.1	C
14cb	192	6-17-58	14	38	72	25	12	30	7.2	198	11	6.0	4	261	112	1.2	343	7.6	A
26cad	880	5-10-67	23	73	69	22	11	22	5.4	163	6.6	9.5	6	226	110	1.0	287	8.1	A
3N/23E-25bc	756	5-9-67	-	61	3.0	.6	106	15	213	4	53	2.0	347	10	14	501	8.4	C	
3N/26E-5cld	830	5-11-67	23	74	78	9.0	2.9	57	12	176	2	20	1.5	268	34	4.2	344	8.1	C
10ca	494	5-11-67	23	74	79	9.4	3.1	56	10	168	2.0	20	1.6	264	36	4.0	329	8.0	C
10dec	4	5-11-67	18	64	55	40	11	25	4.6	143	48	26	4	280	145	9	416	7.5	B
3N/27E-36aaa	0	4-28-53	11	52	47	47	16	38	5.4	333	14	9.5	5	372	184	1.9	571	7.4	A
4N/22E-35ba	57	5-11-67	16	60	53	17	6.5	77	10	212	21	37	1.0	328	69	4.0	499	8.3	B
4N/24E-22aac	86	5-9-67	17	62	50	20	64	4.5	258	50	26	8	372	158	2.2	588	8.0	B	
4N/25E-73dd	50	6-17-58	18	65	55	32	11	97	6.0	256	79	32	8	439	125	3.8	656	7.7	B
8bd	138	2-1-65	-	49	19	8.9	8.8	9.6	225	55	34	1.2	376	84	4.2	567	8.2	B	
8dad	510	1-9-65	20	68	56	3.5	.7	83	10	198	1.8	28	1.8	284	12	11	405	8.4	C
4N/27E-3aba	569	5-26-64	21	70	71	2.0	.3	72	11	179	.0	17	1.4	265	6	13	339	8.4	C
8dda	263	5-26-64	20	68	62	18	8.5	84	9.4	186	90	18	1.4	384	80	4.1	542	8.0	B
18cbl	478	4-22-63	-	67	7.5	2.7	10	233	2.4	14	1.1	300	30	6.4	401	7.9	C		
19baa	485	5-26-64	20	68	55	10	3.2	81	10	222	25	10	1.4	305	38	5.7	429	8.1	C
22cda	170	5-26-64	19	67	50	52	14	26	4.6	252	17	13	4	307	188	8	489	7.8	A
22bdb	205	4-22-63	18	65	60	24	13	41	9.2	193	34	13	5	290	112	1.7	405	8.0	B
4N/28E-84dd	Spring	7-11-67	16	60	42	47	11	22	2.06	6.4	4.0	4	222	162	3	369	7.6	A	
10cda	480	7-21-61	-	58	23	9.5	50	16	155	62	11	5	312	95	2.2	-	8.2	B	
11cac	874	7-21-61	-	64	5.8	1.4	54	10.5	125	18	20	7	244	30	5.3	-	8.4	C	
11cca	907	7-21-61	-	68	4.2	1.0	55	10.5	122	16	18	7	245	15	6.2	-	8.6	C	
21ddd	0	5-9-67	13	56	46	45	12	18	4.1	202	14	12	4	250	162	6	395	7.7	A
23dad	37	5-9-67	14	58	47	38	15	25	4.1	233	12	8.0	4	264	156	9	416	7.9	A
27fac	398	5-11-67	20	68	69	12	4.1	43	8.4	160	0	14	1.3	231	47	2.7	289	8.2	C
5N/27E-18ed	-	7-16-54	-	48	56	14	27	6.9	269	13	9.0	5	311	197	8	468	7.2	A	
5N/28E-17cab	-	5-9-67	-	65	2.6	.8	82	9.4	180	13	18	1.7	289	10	11	390	8.6	C	
19aaa	615	5-9-67	24	76	67	1.5	.4	86	12	174	23	18	1.7	301	5	15	399	8.7	C
1S/26E-1dad	43	5-10-67	16	61	65	40	18	24	5.6	229	15	22	.5	303	174	.8	437	7.9	A

¹Analyzed by Charlton Laboratories, Portland, Ore.; all others by U.S. Geol. Survey.

HYDROLOGY OF BASALT AQUIFERS IN THE HERMISTON-ORDNANCE AREA, UMATILLA AND MORROW COUNTIES, OREGON

By
James H. Robison
1971