

WATER RESOURCES OF AUSTIN, TEXAS

By

W. N. White and Penn Livingston

October 1941

FILE COPY
STATE BOARD OF WATER ENGINEERS
AUSTIN, TEXAS
DO NOT REMOVE FROM OFFICE

Texas State Board of Water Engineers

File Travis

UNITED STATES DEPARTMENT OF THE INTERIOR, GEOLOGICAL SURVEY

WATER RESOURCES OF AUSTIN, TEXAS

By

W. N. White and Penn Livingston

October
~~September~~ 1941

Prepared in cooperation with the Texas State Board of Water Engineers

C. S. Clark, Chairman
A. H. Dunlap, Member
J. W. Pritchett, Member

Water resources of Austin, Texas
Ground Water

By

W. N. White and Penn Livingston
September 1941

Austin which had a population of 87,930 in 1940 is situated on the banks of the Colorado River. It obtains most of its water supply from the river but the public supply of two small suburban communities and water for several public swimming pools is obtained from wells or springs.

Travis County is divided into two major geographical districts by a fault zone that runs nearly north and south through the center of the county. In the fault zone and to the west of it the topography is rough and characteristic of highly dissected limestone. East of the fault zone the topography is comparatively level or rolling.

Austin is just east of the fault zone and on this side the formations have dropped down about 500 feet. Here the Austin chalk is at the surface below which are in descending order as they are penetrated by the well drill the Eagle Ford shale, Buda limestone, Del Rio clay, Georgetown limestone, Edwards limestone, Glen Rose limestone, and the Travis Peak formation, all of Cretaceous age. Of these formations the Travis Peak formation and Edwards limestone are the only ones that yield water in considerable quantities. The Austin chalk supplies small quantities of water to farm wells adjacent to Austin. The Eagle Ford shale, Buda limestone, Del Rio clay, and Glen Rose limestone are not known to yield good water to wells in this part of Texas in areas where they are under cover, as they are at Austin. Wells and springs in Austin that derive water from the Travis Peak formation, Edwards limestone, and Quaternary gravels are briefly discussed below. The wells and springs are shown on the accompanying map of Travis County. Logs and analyses of water from most of the wells are given in the accompanying tables.

Travis Peak formation:- The principal water-bearing sands of the Travis Peak formation were encountered at depths of 1,455 to 1,800 feet in the well at the State Insane Asylum (no. 333); at 1,674 to 1,944 feet in the city well in Blum Park (no. 697); at 1,595 feet in the O. O. Norwood well near the southeast boundary of the city (no. 698); and at 1,675 to 1,875 feet in the Perry well (no. 700). According to Hill,¹ well 333 about 40 years ago had a natural flow of 150,000 gallons a day and would throw water to a height of 40 feet. The static water level in this well is now 15 feet below the ground surface. It is pumped at the rate of 125 gallons a minute and supplies water to the asylum laundry and boilers. The water is somewhat high in bicarbonate and sulphate, but is mixed with city water and used for drinking. The city well in Blum Park is reported to have had a flow of 112 gallons a minute in 1932. It was pumped at the estimated rate of 200 gallons a minute when it was visited in 1937. The water is somewhat high in sulphate and chloride and is used to supply a swimming pool. The Norwood well is said to have had a flow of 83 gallons a minute in 1937. The water from this well is also used for a swimming pool. The Perry well is said to have had a flow of 250,000 gallons a day when it was drilled in 1899. The water is highly mineralized and the well is not used.

West of the fault zone and $4\frac{1}{2}$ miles west of the Capitol, water-bearing beds were encountered in the Travis Peak at depths of 936 to 977 feet in the Adkins well (no. 443). The beds consisted of white water sand, alternating streaks of light-brown sand, and packed sand. The water is only moderately mineralized but the static level is about 370 feet below the surface of the ground and the well is reported to yield only 14 gallons a minute. Six miles northwest of the Capitol sands in the Travis Peak were

¹Hill, R. T., Geography and geology of the Black and Grand Prairies, Texas, with detailed descriptions of the Cretaceous formations and special reference to artesian waters: U. S. Geol. Survey, 21st Ann. Rept., pt. VII, pp. 499 to 514, 1940.

penetrated at depths of 490 to 842 feet in the Boy Scouts well (no. 430). This well has a measured flow of 40 gallons a minute and supplies water to a swimming pool. The water is highly mineralized.

At Manor, 15 miles to the northeast of Austin, the Travis Peak sands were encountered at 2,763 to 3,001 feet in the city well (no. 853). This well is said to have had a natural flow of 150 gallons a minute in 1936 and 110 gallons a minute in 1941. The water is rather highly mineralized.

Edwards limestone:- Barton Springs, which have their source in Edwards limestone, rise in the beds of Barton Creek in Zilker Park south of the Colorado River at the western limits of the city. Over 300 measurements of the flow from these springs were made between 1894 and 1937 by the Federal Geological Survey in cooperation with the Texas Board of Water Engineers. The minimum observed flow was 12.1 second-feet on February 26, 1918. The springs supply a large municipal swimming pool. The water is relatively low in dissolved minerals (see table of analyses, p. 7).

As far as can be learned no important supplies of good water were found in the Edwards limestone during the drilling of the deep wells mentioned in the preceding section. A well at the State Capitol (no. 701) taps water in the Edwards at about 460 feet. The water is very highly mineralized and used only for medicinal purposes. Other Edwards wells in or near Austin include the following: Three and one-fourth miles northeast of the Capitol well 337, 405 feet in depth, belonging to the State Highway Department supplies water to Camp Hubbard. It is pumped at the rate of 25 gallons a minute and the water is comparatively low in dissolved minerals. Four and three-fourth miles northeast of the Capitol wells 343 and 344, respectively 450 and 458 feet in depth supply water to a suburban population of about

250 families. It is reported that under test well 343 had a specific yield (yield in gallons a minute per foot of drawdown) of only about $3\frac{1}{2}$ and well 344 a specific yield of only about .16. The water is moderately low in dissolved minerals. Four miles southwest of the Capitol, well 482, depth 280 feet, supplies water to a small subdivision. Numerous farm wells both to the north and to the south of Austin derive water from the Edwards but none of them are equipped with large power pumps nor yield much water. At Pflugerville, 8 miles northeast of Austin, the well of the Pflugerville Gin Company, 696 feet in depth, has a reported yield of 60 gallons a minute. The water contains 732 parts per million in total dissolved solids and 347 parts per million of hardness and is used to supply the domestic needs of a part of the town.

Quaternary gravels:-- The gravels and sands of the Colorado River flood plain and adjacent terraces yield water in considerable quantities to several shallow wells at or near Austin. The wells include nos. 457 to 459 which are used to supply water to the Deep Eddy Swimming pool, and well 439, used to supply the swimming pool at the Institute for the Feeble minded. A few miles to the east of Austin wells 713, 730, and 731 are used for irrigation, the first supplying 12 acres, the second 15 acres, and the third 20 acres. Well 740, also in that area, is used for irrigation and wells 739 and 742 are used to supply the State Farm Colony with water for domestic purposes and for watering lawns and shrubbery. All of these wells are less than 50 feet in depth. The water they yield is relatively low in dissolved minerals.

Colorado River Water

Colorado River is the second largest river within the boundaries of Texas and as a result of the recent construction and operation of the Buchanan and Lake Travis reservoirs both above Austin, it is one of the best controlled streams in this country.

The difficulties involved in the chemical control of Colorado River water, formerly a major problem at the Austin Water Works, have become almost negligible since the Buchanan and Lake Travis reservoirs were brought into operation. Under present conditions of stream control, the hardness of the water which used to vary widely within periods of even a few hours remains practically constant for weeks at a time. The average hardness is about 160 parts per million, pH about 8, and the total dissolved solids slightly less than 300 parts per million. The departures from the average are comparatively small. According to the Report of Mr. Haygood, Chemist at the Plant, detailed chemical analyses of the water now are made only twice a year, more frequent analyses being unnecessary under present conditions. In regulating the treatment at the Austin plant determinations are made only of the phenolphthalein and methylorange alkalinity. Analyses of untreated river water made in 1938, 1939, and 1941 are given in the table on page 8.

Conclusions

According to the available data, conditions in the Austin are not favorable for developing large quantities of water of good quality from wells. The Travis Peak sands lie deep and the water in them is of variable quality. some of it distinctly poor. No wells of large yield thus far have

been developed in the Edwards limestone and conditions in general do not seem promising for such development. Some water of low mineral content occurs in the river flood plain and terrace gravels but the amount is believed to be comparatively small. A fairly large supply is available from Barton Springs. If diversion could be made from Barton Creek between the springs and the Colorado River the scenic beauty of the springs would not be materially damaged. An almost unlimited supply of water is available from the Colorado River for public water supply or defense industries in any except the driest years.

Well No.	Owner	Depth of well (ft.)	Date of collection	Total dissolved solids (calc.)	Calcium (Ca)	Magnesium (MG)	Sodium and Potassium (Na + K) (calc.)	Sulfate (SO ₄)	Chloride (Cl)	Nitrate (NO ₃)	Fluoride (F)	Total hardness as CaCO ₃ (calc.)	
333	State of Texas	1,975	May 25, 1938	1,517	32	14	514	512	445	253	a/	5.6	139
337	State Highway Dept.	405	Mar. 7, 1940	402	144	6	15	382	33	34	35	0.4	393
343	Travis County	458	Mar. 20, 1941	766	95	29	154	378	121	180	a/	0.9	358
443	W. S. Adkins, et al.	977	Mar. 20, 1939	914	-	-	258	255	450	45	-	-	180
482	Theodor Low	280	Aug. 25, 1937	-	-	-	-	308	40	36	a/	-	339
697	City of Austin	2,246	Aug. 18, 1937	-	-	-	-	122	500	345	a/	3.8	50
430	Boy Scouts of America	852	Nov. 19, 1940	3,797	71	41	1,297	516	732	1,400	a/	1.9	346
698	O. O. Norwood	1,595	Aug. 18, 1937	-	-	-	-	430	350	82	a/	-	271
700	F. B. Perry	2,025	Oct. 4, 1937	1,749	48	37	534	504	627	245	a/	6.9	272
711	R. & G. Water Co.	1,147	July 4, 1938	7,206	368	204	1,902	236	2,207	2,406	a/	3.2	1,761
711	do.	1,147	Sept. 18, 1938	7,186	376	213	1,881	325	2,161	2,370	-	3.6	1,813
853	City of Manor	3,001	Mar. 20, 1941	1,828	94	24	517	366	746	264	a/	3.2	335

Analyses of water from Barton Springs, near Austin, Texas
(Results are in parts per million.)

City of Austin	Aug. 23, 1937	405	87	22	36	329	56	42	a/	-	309
do.	Sept. 7, 1937	471	85	30	50	306	60	89	a/	0.7	336
do.	Sept. 9, 1937	342	83	27	10	318	28	31	a/	0.6	318
do.	Oct. 27, 1939	407	79	28	37	305	38	71	a/	0.2	312
do.	Nov. 9, 1939	399	73	38	26	311	41	68	a/	-	338

a/ Nitrate less than 20 parts per million.

Analyses of untreated water from Colorado River

(Results are in parts per million.)

Date of Collection	Total dissolved solids (calc.)	Calcium (Ca)	Magnesium (Mg)	Potassium (Na + K) (calc.)	Sulfate (SO ₄)	Chloride (Cl)	Nitrate (NO ₃)	Fluoride (F)	Total hardness as CaCO ₃ (calc.)	pH
July 1938	291	49	12	33	161	37	50	2.6	172	7.8
Oct. 1938	250	46	13	23	205	13	27	a/	168	8.0
May 25, 1939	280	48	15	24	170	35	39	2.4	182	-
Aug. 5, 1939	220	37	11	21	120	30	38	1.0	138	-
June 6, 1941	251	44	13	22	169	23	32	4.4	163	8.0
Aug. 29, 1941	247	40	-	28	184	24	31	1.5	159	-

a/ Nitrate less than 20 parts per million.

b/ Fluoride less than .5 parts per million.

Drillers' logs at Austin, Travis County, Texas

	Thickness (feet)	Depth (feet)
--	---------------------	-----------------

Log of well 333 5843401

Interpretation of log by C. C. Babb,
U. S. Geol. Survey. State of Texas
tract, in Austin at the Insane Asylum,
2½ miles north of the State Capitol.
Altitude of land surface, 635 feet.

Dark shale	80	80
Very hard limestone (Buda)	25	105
Blue marl (Del Rio)	90	195
Limestone and alterna- tions of limestone, marl and sand	1105	1300
Water-bearing sand	15	1315
Limestone	60	1375
Rotten shale	50	1425
Limestone	60	1485
Sand, water-bearing	315	1800
Blue shale or marl; no limestone	175	1975
TOTAL DEPTH		1975

Information from, Hill, R. T.,
Geography and Geology of the Black
and Grand Prairies, Texas, U. S. Geol.
Survey 21st Ann.Rept.Part 7,p.508,
1899-1900.

Driller's log of well 343 7

Travis County Water District No. 2
pumping plant, 4¼ miles northeast of
the State Capitol.

Soil	3	3
Soft chalk	8	11
Chalk	67	78
Soft broken chalk	15	93
Chalk	8	101
Hard shale	49	150
Harder shale	16	166
Limestone	41	207
Hard clay	28	235
Blue clay	31	266
Limestone	11	277
Hard limestone	23	300

	Thickness (feet)	Depth (feet)
--	---------------------	-----------------

Driller's log of well 343--Continued

Limestone and few layers of shale	47	347
Hard sticky shale	4	351
Lime and shale	4	355
Lime	35	390
Hard layers lime	5	395
Medium hard layers lime	8	403
Core lime	4	407
Hard lime	4	411
Soft lime	5	416
Hard lime and rock	4	420
Soft lime	3	423
Rock	2	425
Hard lime	12	437
Soft and rough lime	2	439
Hard lime	2	441
Soft lime	1	442
Soft and rough lime	2	444
Hard lime	4	448
Soft and rough lime	2	450
Soft lime (water 402 to 458 feet)	8	458
TOTAL DEPTH		458✓

CASING RECORD: Blank 10-3/4 and 6-inch
to 406 feet, 6-inch screen 406 to bottom.

Driller's log of well 697 5851102

City of Austin, Blum Creek Park, 2½ miles
south of the State Capitol. Altitude of
discharge pipe, 524 feet.

Soil	6	6
Lime rock	189	195
Sand and shale	15	210
Lime rock	30	240
Black shale	35	275
Blue lime rock	35	310
Blue mud	35	345
Black shale	39	384

(Continued on next page)

Drillers' logs at Austin, Travis County, Texas--Continued

	Thickness (feet)	Depth (feet)
<u>Driller's log of well 697--Continued</u>		
Rock	399	783
Flint rock	16	799
Hard rock	29	828
Rock	142	970
Hard rock	47	1017
Rock	104	1121
Soft lime	34	1155
Rock and black shale	22	1177
Rock	62	1239
Hard rock	21	1260
Rock	374	1634
Limestone and conglom- erate	40	1674
Sand rock	17	1691
Sand	18	1709
Sand rock	15	1724
Sand	121	1845
Shale	5	1850
Sand	43	1893
Shale	14	1907
Sharp sand	18	1925
Fine sand	12	1937
Hard sand	7	1944
Shale	23	1967
Sand rock and lime	33	2000
Shale	28	2028
Sticky shale	7	2035
Hard rock	8	2043
Shale and lime	28	2071
Lime rock	13	2084
Rock	12	2096
Shale	18	2114
Rock	12	2126
Fine sand rock, lime and cement	25	2151
Hard rock	9	2160
Sand and rock	11	2171
Rock	7	2178
Sand	3	2181
Porous rock	8	2189
Sand and rock	24	2213
Shale	20	2233
Rock and shale	13	2246
TOTAL DEPTH		2246

	Thickness (feet)	Depth (feet)
<u>Driller's log of well 697--Continued</u>		
CASING RECORD: 1,634 feet of 6-5/8-inch, 572 feet of 5-3/16 and 4-1/2-inch.		
<u>Log of well 698</u> 58-51-103		
From interpretations from log and samples by E. H. Sellards. O. O. Norwood, in Travis Heights in Austin, 2 miles south of the State Capitol. Altitude of land surface, 475+ feet.		
Austin chalk	208	208
Eagle Ford clay and limestone, Buda limestone and Del Rio clay	140	348
Georgetown limestone to Travis Peak formation, inclusive	1247	1595
TOTAL DEPTH		1595
CASING RECORD: 8-inch to bottom, Informa- tion from Sellards, E. H., Mineral Resources of Texas, Travis County: Bureau of Econ. Geology, University of Texas, p. 62, 1930.		

	Thickness (feet)	Depth (feet)
<u>Log of well 700</u> 58-43-704		
F. B. Perry, in Austin, 1/2 mile southeast of the State Capitol.		
Surface dirt	20	20
Gravel bed (water)	5	25
Limestone	100	125
Shale	70	195
Limestone	25	220
Blue marl	40	260
Limestone	100	360
Sand rock	10	370
Limestone	70	440
Sand rock and limestone (sulphur water)	150	590
Limestone	600	1190
(continued on next page)		

Drillers' logs at Austin, Travis County, Texas--Continued

<u>Log of well 700--Continued</u>			<u>Log of well 700--Continued</u>		
	Thickness (feet)	Depth (feet)	Thickness (feet)	Depth (feet)	
Sand rock (water)	25	1215	Blue shale	60	2025
Limestone	300	1515	Shale	--	--
Blue shale	60	1575	TOTAL DEPTH		2025
Limestone	100	1675	CASING RECORD: 300 feet of 10-inch; 600		
Sand rock, main			feet of 8-inch; 300 feet of 7-inch and		
flow	200	1875	200 feet of 6-inch. Information from		
Blue shale	40	1915	<u>Hill, R. T., op. cit. pp. 509-510.</u>		
Sand rock	50	1965			

MAP OF TRAVIS COUNTY, TEXAS SHOWING WATER WELLS AND SPRINGS

- EXPLANATION —
- WELL WITH HAND PUMP, BUCKET, OR BAILER
 - ◌ WELL WITH WINDMILL OR SMALL POWER PUMP
 - ◊ UNUSED WELL
 - ⊙ WELL WITH PUMPING PLANT— 5 HORSE POWER OR LARGER
 - ⋄ WELL DRILLED TO TEST FOR OIL OR GAS
 - ▣ TEST WELL DRILLED BY W.P.A. LABOR
 - FLOWING WELL
 - ⊕ SPRING
 - ⊖ CORE TEST BY BUREAU OF RECLAMATION



BASE COMPILED FROM
STATE HIGHWAY PLANNING SURVEY COUNTY ROAD MAP
AND FIELD NOTES

TEXAS BOARD OF
WATER ENGINEERS
ASSISTED BY
U.S. GEOLOGICAL SURVEY

