TEXAS STATE BOARD OF WATER ENGINEERS
C. S. Clark, Chairman
A. H. Dunlap, Member
J. W. Pritchett, Member

MEMORANDUM: GROUND-WATER RESURCES IN THE AREA BETWEEN BUDA AND SAN MARCOS, HAYS COUNTY, TEXAS

By

W. O. George and R. R. Bennett

Prepared in cooperation with the United States
Department of the Interior, Geological Survey

May 5, 1942

MEMORANDUM: GROUND-WATER RESOURCES IN THE AREA BETWEEN BUDA AND SAN MARCOS, HAYS COUNTY, TEXAS

By

W. O. George and R. R. Bennett
May 5, 1942

Introduction

The area between San Marcos and Buda, Texas, was visited by the writers on May 4, 1942, at the request of First Lt. Seth H. Steele, U. S. Army, Corps of Engineers. The object of the field investigation was to select the best locations for test wells to determine if it is possible to obtain four million gallons of water a day from wells in that area.

Geology

Most of the area investigated is on the outcrop of the Austin chalk, of Cretaceous age. The Cretaceous formations that underlie the Austin chalk are, in descending order, the Eagle Ford shale, Buda limestone, Del Rio clay, Georgetown limestone, Edwards limestone, Comanche Peak limestone, Walnut clay, Glen Rose limestone and the Travis Peak formation. These formations constitute several hundred feet of sediments.

In general, the formations dip to the east but numerous faults change the dip and the outcrops into an irregular pattern.

The principal water-bearing formation is the Edwards limestone which is about 400 feet thick and is largely composed of massive beds of crystalline limestone. The water occurs in the fault and fracture planes that have been enlarged by solution. The size, number and course of these openings cannot be determined by surface examinations, hence it is difficult, if not impossible, to predict accurately the quantity of water a well will yield.

The Travis Peak formation yields fairly large supplies of water in some parts of Texas but in this area, it lies at a great depth, probably from 1,200 to 1,500 feet, and it is not probable that this formation would yield water of the required quantity or quality.

Hydrology

There has been no large development of water from wells in the area investigated except for the wells drilled by the City of San Marcos and the Bureau of Fisheries. These wells are within the city limits of San Marcos. The city's water supply is obtained from two wells that are connected by a 12-inch horizontal pipe about 15 feet below the land surface. The wells, distinguished as No. 1 and 2 on the accompanying map, are 115 feet deep and draw water from the Edwards limestone. It was reported that the water level in the wells is about 7 feet below the land surface most of the time. The city's old well (No. 2) has been pumped at the rate of 1,000 gallons a minute with a drawdown of three feet. The City of San Marcos consumes an average of about 600,000 gallons a day. The Bureau of Fisheries well (No. 3) was drilled to a depth of 1,495 feet into the Travis Peak formation but the water was found to contain hydrogen sulphide. The well was plugged at some place between 300 and 400 feet in the Edwards limestone. The well has a flow of several hundred gallons a minute.

San Marcos Springs flow from the Edwards limestone. The discharge of these springs has been measured at frequent intervals by the U. S. Geological Survey, Surface Water Division. Based on 132 measurements taken from 1894 to May 1941, the maximum discharge was 286 cubic feet a second, the average discharge was 144 cubic feet a second, and the minimum discharge was 51 cubic feet a second or about 33 million gallons a day.

The City of Kyle (No. 4) has a water well 595 feet deep which was completed in 1939. The water level in this well was reported as 130 feet below the surface. The reported yield of this well is 115 gallons a minute. The chemical analysis of this water is given on page 8. A log of the well is given on page 6.

Conclusions

Owing to the scarcity of data on yield of Edwards wells in the area investigated, one or more test holes should be drilled through the Edwards limestone. The location of three proposed test wells (nos. 1, 2 and 3) are shown on the accompanying map. The selection of these sites is based on the results of the brief geological investigation, coupled with information previously obtained in this and other similar areas. These data indicate that the opportunities for circulation of water in the underground reservoir and recovery of the water through wells may be somewhat more favorable at these sites than in other parts of the area. However, inasmuch as the yield of the wells depends largely on the number and size of the fractures and solutional openings, it is impossible to predict how much each well will yield. No. 1 should be drilled first.

All of the test wells should be cased through the Del Rio clay, preferably with 10-inch casing. It is believed that for well no. 1, this will require not more than 150 feet of casing. Well cuttings and water samples should be collected at frequent intervals. Pumping tests should be run on each of the test wells. This should include a measure of the quantity of water discharged, the drawdown and the recovery of the water level after the pump is shut off. The pump should be operated at different rates so that the quantity discharged may be plotted against the drawdown, thus determining the specific capacity of the well at various rates of pumping.

If the test wells indicate that four million gallons a day cannot be obtained at the sites indicated, it is probable that wells may be drilled in a selected area near San Marcos that will yield the required amount.

Driller's log of well owned by U. S. Bureau of Fisheries at San Marcos, Texas

	Thickness (feet)	Depth (feet)
Blue clay and limestone	30	30
Hard gray limestone	20	50
No record	78	128
Cave, anundant water	2	130
Brittle white limestone	61	191
Cave, inexhaustible supply of good water	4	195
Black flint	7	202
Blue shale	12	214
Black flint	6	220
Soft limestone	106	326
Hard white limestone	57	383
Hard gray limestone	27	410
Rotten limestone	41	451
Hard gray limestone	34	485
Blue clay	1	486
Soft white limestone	47	533
Hard white limestone	82	625
Hard blue clay	27	652
Hard white limestone, sulphur	78	730
White clay	5	735
White limestone	25	760
Limestone	34	799
Hard blue limestone	11	810
Brittle white limestone	225	1035
Gray limestone	77	1112
Blue clay	7	1119
Hard gray limestone, small quantity of good water	59	1178
Hard white limestone	27	1225
Limestone	24	1249
Hard yellow limestone. Water rose 100 feet in 2 hours, 6-inch casing driven tight did not shut off water	42	1291
Sandstone, good water, rose 400 feet in 20 minutes. Temperature 80° F., flow increased to 4 gallons per minute	54	1345
Hard gray limestone	29	1374
Soft limestone	31	1405
Black sandstone	5	1410
Soft gray sandy limestone, sulphur, flow increased to 6 gallons per minute	65	1475
Blue clay, caves	20	1495

Well H-21 of
Bull. 6004

Driller's log of water well (No. 4) at City of Kyle. City water supply owned by City.

	Thickness (feet)	Depth (feet)
Surface soil	5	5
Hard Taylor marl	13	18
Hard Cap rock	4	22
Austin chalk	160	182
Eagle Ford shale	32	214
Buda lime	44	258
Dry crevice at 227 feet		
Del Rio clay - cased temporarily	52	310
Georgetown lime	30	340
Edwards lime	120	460
Water - 365-377'		
Water, sulphur - 385-395'		
Water - 405-410'		
Water in porous formation and honeycomb - 426-460'		
Edwards limestone continued. Alternate stratas flint cobbles and porous limestone, water bearing	66	526
Edwards limestone	69	595

67-01-303

Partial chemical analysis of water from U. S. Bureau of Fisheries well at San Marcos, Texas. Analysis by E. W. Lohr, U. S. Geological Survey. Samples collected by B. A. Barnes, October 4, 1937.

Total dissolved solids (calc.)	221
Calcium (Ca)	41
Magnesium (Mg)	13
Sodium and Potassium (Na + K) (calc.)	21
Bicarbonate (HCO_3)	134
Sulphate (SO_4)	47
Chloride (Cl)	30
Nitrate (NO_3)	b/
Total hardness as $CaCO_3$	158

b/ Nitrate less than 20 parts per million.

Chemical analysis of water from well at Kyle, Texas (No. 4). Sample collected January, 1939. Analyzed by the State Board of Health, Carl A. Nau, M. D., Ditector of Laboratory.

Total dissolved solids (calc.)	632
pH	6.9
P. Alkalinity	0.
Total Alkalinity	235.
Calcium (Ca)	84
Magnesium (Mg)	65
Total hardness as $CaCO_3$	453.
Sodium (calc.)	25.
Carbonate (CO_3)	0.
Bicarbonate (HCO_3)	287.
Sulfate (SO_4)	222.
Chloride (Cl)	46.
Fluoride (F)	1.2

67-01-303