THE Cross SECTION

A Monthly Publication of the High Plains Underground Water Conservation District No. 1

Volume 7—No. 8 "THERE IS NO SUBSTITUTE FOR WATER" *January 1961*

Annual Measurement Of Water Levels In Southern High Plains Nears Completion

Water levels in observation wells throughout the southern High Plains in Texas are presently being measured. These measurements are part of the regular ground-water investigative work of the State Board of Water Engineers, the U. S. Geological Survey and the High Plains Underground Water Conservation District. Water level measurements are made annually.

The Water District is measuring water levels in wells located in Cochran, Lubbock, Lynn, Castro and Deaf Smith Counties and in a portion of Armstrong County. The Board of Water Engineers and the U.S.G.S. have divided the remainder of the counties between themselves.

With preliminary reports in, it appears that measurements in the sandy-land areas indicate that water levels are near the same level as a year ago. Only slight declines in the water levels are reported from the northern counties where soils are heavier and the wells are of larger capacity. These preliminary reports seem to indicate more natural recharge to the underground reservoir during 1960 than is normally experienced. The big rains during the summer filled the lakes over the plains. The lakes are the primary points of natural recharge to the reservoir.

"The Cross Section" will publish the water level measurements as soon as they can be released by the State Board of Water Engineers.

Don Reddell prepares to record the depth to the water level below land surface in this observation well. Y. F. Snodgrass unreels a steel tape into the well to make the measurement. Both men are High Plains Water District staff members. Water levels in hundreds of southern High Plains observation wells are measured annually.

JOHN GAMMON ELECTED TO DISTRICT BOARD PRESIDENCY FOR 1961

During a recent meeting of the Board of Directors of the High Plains Underground Water Conservation District, the five-man board elected John Gammon of Lazbuddie to serve as President for the year 1961. He replaces Elmer Blankenship of Wilson.

T. L. Sparkman, Jr. of Hereford was elected Vice President, replacing J. R. Belt, Jr. of Lockney who was elected Secretary-Treasurer of the new board.

Mr. Blankenship and Roy Hickman of Morton round out the membership of the board.

Picture Booklet Published By North Plains District

The North Plains Ground Water Conservation District has published a full-color picture booklet entitled, "Ogallala Slim Sez, You Never Miss the Water 'Till the Well Goes Dry'." The booklet is designed to tell the story of underground water in the North Plains of Texas.

The central character, "Ogallala Slim," is a bow-legged cowboy who tells the story of water to his buddy, "Frisco."

According to the North Plains Water District office in Dumas, the booklet was prepared by artist Don Ray of West Texas State College in Canyon, under the supervision of Wilson Buchanan and Delbert Timmons, district staff member. Gene Saunders Printing Company of Dumas printed the booklet.

Copies of the picture book may be obtained by writing to the North Plains Water District, Box 935, Dumas, Texas.

Water Board Releases Hale County Report

The State Board of Water Engineers has recently published a bulletin on the geology and ground-water resources of Hale County, Texas. The bulletin is number 6010. It was prepared by the U. S. Geological Survey. James G. Cronin, Engineer, and Lloyd C. Wells, Geologist, both with the U.S.G.S., supervised the field work and made the computations. They also wrote the text which was edited by the staff of the Board of Water Engineers. Funds for this study were supplied by the U.S.G.S., State Board of Water Engineers and Hale County.

Copies of the bulletin may be obtained by writing to the State Board of Water Engineers, Capitol Station, Austin.

WELL DRILLING ACTIVITY SLOWS IN 1960

In 1960, commercial water-well drilling in the High Plains Underground Water Conservation District decreased by about 25 percent from 1959. There were 1133 wells drilled in the District as compared with 1518 wells drilled during 1959.

The decline in drilling can probably be explained by thinking back to the moisture conditions of the soil last winter and spring. We experienced a damp, cold winter with above average precipitation recorded. Even though most farmers irrigate their land before planting time last spring only a limited amount of water was required. Some did not irrigate at all before planting. During the months of June and July, most of the southern High Plains received tremendous rains. The rains delayed the need for summer irrigations until the latter part of July or the early part of August.

You will note in the table below, that the 1959 figures representing the number of replacement wells drilled are about equal to the 1960 figures. This may or may not be significant in pointing out that the number of replacement wells drilled each year is progressively increasing in comparison to the total number of wells drilled.

The table below shows the drilling statistics for the years 1959 and 1960 for each county within the High Plains Water District.

County	*Permits Issued*		*New Wells Drilled*		*Replacement Wells Drilled*		*Dry Holes Drilled*		*Total Wells Drilled*	
	1959	1960	1959	1960	1959	1960	1959	1960	1959	1960
Armstrong	6	5	5	3	0	0	1	0	6	3
Bailey	136	75	72	48	7	15	12	5	91	68
Castro	107	88	84	44	21	23	1	5	106	72
Cochran	82	30	50	35	5	1	9	2	64	38
Deaf Smith	155	84	87	61	34	36	7	0	128	97
Floyd	190	81	115	81	23	12	6	1	144	94
Hockley	299	184	225	154	12	8	26	20	263	182
Lamb	204	110	152	97	16	18	8	8	176	123
Lubbock	318	255	210	197	20	25	22	27	252	249
Lynn	129	92	86	73	3	2	12	12	101	87
Parmer	154	92	105	53	35	31	3	4	143	88
Potter	2	1	0	0	2	0	0	0	2	0
Randall	67	21	34	26	5	3	3	3	42	32
Total	1849	1118	1225	872	183	174	110	87	1518	1133

THE Cross SECTION

A MONTHLY PUBLICATION OF THE HIGH PLAINS UNDERGROUND WATER CONSERVATION DISTRICT NO. 1

Published monthly by the High Plains Underground Water Conservation District No. 1
1628 15th Street, Lubbock, Texas.

Telephone PO2-8088

Second-Class postage paid at Lubbock, Texas

ALLAN WHITE
Editor

Far Western Irrigation More Easily Predicted Than In Texas High Plains

By W. L. BROADHURST, Chief Hydrologist,
High Plains Underground Water Conservation District

In order to learn more about irrigation practices outside the High Plains region that might be of value to us here in connection with our work in water conservation, we recently made an inspection of irrigation practices in New Mexico, Arizona, and California. The trip was in connection with attendance at the 28th annual meeting of the National Reclamation Association, which was held in November 1960, at Bakersfield, California.

One of the most significant differences in the problems associated with irrigation in the two regions is related to the amount of annual precipitation.

In most of the important irrigated

W. L. BROADHURST

areas of New Mexico, Arizona, and California, annual rainfall in general ranges from about five inches to ten inches. Consequently, extensive farming operations in those states are seldom ever attempted without irrigation. On the other hand, annual precipitation on the High Plains is about twenty inches, most of which falls during the principal crop-growing season.

The Plains region is generally referred to as semi-arid, but extensive dry-land farming operations have been carried on successfully for many years. As a matter of fact, during years of above average rainfall, or even average rainfall properly distributed, some dry-land farms have produced more net profit per acre than adjoining irrigated farms.

Throughout the arid regions, irrigation water can be applied scientifically to promote the growth and maturity of plants at the correct time of the year. But on the Plains, timeliness of irrigation is a much more complicated problem. For example, the cotton plant needs a given amount of moisture during the fruiting period several weeks before it reaches maturity. In the arid region the moisture available to the plant can be controlled fairly well by starting and stopping irrigation on certain dates. Here on the Plains we may irrigate on the same dates, but if it then rains for several weeks, as it does quite often during the late summer, it is impossible to control the moisture available to the plant. As a result, instead of getting plant maturity at the proper time before frost, we may get increased foliage growth, delayed maturity, and reduced quality of the crop. Consequently the Plains irrigator is faced with the proposition of deciding whether he should apply one more irrigation near the end of the growing season or depend on rainfall to finish the crop. If he doesn't irrigate and it doesn't rain, his crops may suffer for lack of moisture. However, if he irrigates and then receives heavy rain his crops may also suffer from too much moisture.

The question of whether the irrigators in the High Plains practice full irrigation throughout the year, disregarding rainfall, and plan for maximum yields per acre for a limited time, or practice only supplemental irrigation at the apparent strategic times and plan for maximum yields per inch of water, both rainfall and irrigation, for a longer period of time, is related not only to a limited supply of ground water but also to economic and weather factors that can not be completely foretold. Consequently, such a question obviously can not be answered by a governing body, but is a decision for each operator.

The question has been raised why should one operator practice supplemented irrigation and conserve water when the neighbor pumps full tilt throughout the year. Based not only on my opinion, but on the studies by many competent and recognized ground-water hydrologists, geologists, and engineers, if the wells are adequately spaced here in the Ogallala formation, a water-table aquifer, the neighbor who pumps full tilt throughout the year will deplete his supply of ground water long before the operator who practices conservation. The exceedingly slow rate of movement of the ground water prevents the rapid depletion of the supply around one well by excessive pumping from other wells. Futhermore, the excessive pumper may in time observe that the conservative operator is making more net profit per inch of water and then he too will become a supplemental irrigator and thereafter attempt to reap greater economic returns from the use and sale of his underground water.

WHEN YOU MOVE . . .

Please notify High Plains Water District, 1628 - 15th Street, Lubbock, Texas, on Post Office Form 22S obtainable from your local postmaster, giving old as well as new address, to insure no interruption in the delivery of "The Cross Section."

THE CROSS SECTION
1628 15th Street
Lubbock, Texas
Dear Sir:
I do not now receive THE CROSS SECTION but would like to have it sent to me each month, free of charge, at the address given below.
(Please cut out and mail to our address)
Name_____
Street Address_____
City and State_____

THREE DIRECTORS AND TWENTY-SIX COMMITTEEMEN ELECTED

The annual election of Directors and County Committeemen for the High Plains Underground Water Conservation District was held on January 10. Three Directors were elected, and two Committeemen in each county were elected.

Five directors serve on the Board of the Water District. They each serve two-year terms of office. Two are elected on even years and three on the odd years. The thirteen-county Water District is divided into five Director's Precincts, with one Director being elected from each precinct. To qualify, the Directors must be resident qualified taxpayers.

This year, Elmer Blankenship of Wilson was re-elected to continue serving on the Board representing Director's Precinct No. 1, made up of Lubbock and Lynn counties.

John Gammon of Lazbuddie was re-elected to the Board in Director's Precinct No. 3, consisting of Bailey, Castro and Parmer counties. He ran unopposed.

The voters re-elected T. L. Sparkman, Jr. of Hereford to the Board in Director's Precinct No. 4, which consists of Armstrong, Deaf Smith, Potter and Randall counties. He was also running unopposed.

In each of the thirteen Water District counties, two committeemen were elected to serve for three-year terms of office on a five-man County Committee. The County Committeemen approve well-drilling applications and attend to the general Water District business in their particular county. The Committeemen also serve as advisory groups to the Board of Directors, expressing the desires of the people in their counties. The terms of office of the Committeemen are staggered so that two are elected the first year, then two others the next year, and finally on the third year, only one man is elected.

All Commissioner's Court precincts in each county have at least one representative on the County Committee.

Committeemen who were elected on January 10 to serve three-year terms of office were:

ARMSTRONG COUNTY
Commissioner's Precinct No. 3
(Elected Two)
James Bible, Wayside
George A. Denny, Happy, and Carrol D. Rogers, Wayside, tied for the second place.

BAILEY COUNTY
Commissioner's Precinct No. 2
Ralph E. Ethridge, Route 5, Muleshoe, and Leldon Phillips, Route 2, Muleshoe, tied for this place.
Commissioner's Precinct No. 4
Lester Howard, Route 5, Muleshoe.

CASTRO COUNTY
Committeeman-at-Large
George Bradford, Box 732, Dimmitt.
Commissioner's Precinct No. 2
C. W. Anthony, Route 4, Dimmitt.

COCHRAN COUNTY
Committeeman-at-Large
Weldon Newsom, Route 2, Morton.
Commissioner's Precinct No. 1
H. B. Barker, Morton.

DEAF SMITH COUNTY
Committeeman-at-Large
J. B. McCathern, Jr., Route 5, Hereford.
Commissioner's Precinct No. 1
Charles Packard, Route 3, Hereford.



The three men shown above are newly-elected members of the board of directors of the High Plains Water District. They are, left to right, Elmer Blankenship, Wilson; John Gammon, Lazbuddie; and T. L. Sparkman, Jr., Hereford. They were elected January 10 by voters of the Water District to serve two-year terms on the board.

FLOYD COUNTY
Commissioner's Precinct No. 2
V. H. Kellison, Box 846, Lockney.
Commissioner's Precinct No. 4
G. L. Fawver, Route 5, Floydada.

HOCKLEY COUNTY
Committeeman-at-Large
Bryan Daniel, Route 2, Levelland.
Commissioner's Precinct No. 3
Robert Hill, Jr., Route 3, Levelland, and Hugh Savage, Route 3, Levelland tied for this place.

LAMB COUNTY
Commissioner's Precinct No. 1
Willie Gene Green, Olton.
Commissioner's Precinct No. 4
Henry Gilbert, Sudan.

LUBBOCK COUNTY
Committeeman-at-Large
W. J. Bryant, 1902 Avenue C., Lubbock.
Commissioner's Precinct No. 3
Virgil Isom, Idalou.

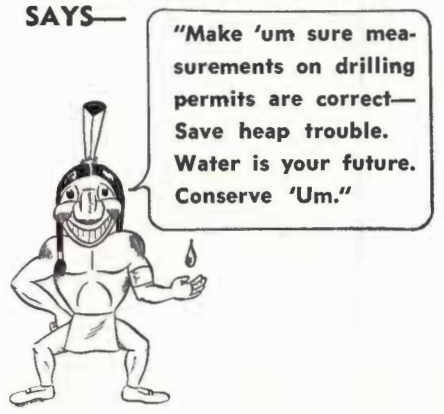
LYNN COUNTY
Commissioner's Precinct No. 1
Earl Cummings, Wilson.
Commissioner's Precinct No. 4
Frank P. Lisemby, Jr., Route 1, Wilson.

PARMER COUNTY
Committeeman-at-Large
Walter Kaltwasser, RFD, Farwell.
Commissioner's Precinct No. 4
Joe B. Jennings, RFD, Muleshoe.

POTTER COUNTY
Commissioner's Precinct No. 4 (elected two)
T. G. Baldwin, Bushland.
R. C. Sampson, Jr., Bushland.

RANDALL COUNTY
Commissioner's Precinct No. 2
Ed Wieck, Route 1, Canyon.
Commissioner's Precinct No. 4
Lewis A. Tucek, Route 1, Canyon.

"CHIEF RUNNING WATER," SAYS—



LEGISLATIVE BRIEFS

It appears at this early hour in the recently-convened Texas legislative session that several state-wide water bills will be considered.

There have been two pieces of legislation drafted by the State Water Development Board. Both of these bills would liberalize the law under which loans from the $200 million state water development fund may be made. Presently, the board can only loan on water projects an amount equal to one-third of the total cost, or $5 million, which ever is the smaller. If passed into law, the bill would give the board authority to make loans up to $15 million to state political subdivisions for the construction of approved projects.

There are other provisions in the bill that would make the water development fund more flexible.

These bills have been endorsed by practically every organization in the state that is interested in water development in Texas.

Another proposal that has been kicked around a lot but to our knowledge has never been put into bill-form is the state acquisition of conservation storage in federal-built dams.

The thinking here is that the dams built in Texas should be constructed to develop the optimum potential of the dam site. In other words, in cases where local groups can not afford to build more storage space into a dam reservoir than that presently needed, but yet more storage space can be made available, then the state should step in and finance the additional construction. The state would sell the storage space to political subdivisions as future water needs arise.

The Governor's Statewide Water Committee in Austin on January 5 made some recommendations concerning certain changes in the organization of the Board of Water Engineers, but to our knowledge these changes have not been drafted into law. The recommendations reads in part as follows:

"Be it resolved,

"1. That we favor the vesting by statute in the Chief Engineer of all engineering and geologic functions and related administrative services, and who shall be responsible therefor and in charge thereof and further shall be appointed by the Board of Water Engineers;

"2. That we favor the principle of having a full-time, three-member agency to exercise the quasi-judicial duties now vested by statute in the Board;

"3. That we favor changing the name of the Board of Water Engineers to the Texas Water Commission."

Governor Daniel has asked that a special legislative committee be established to study the need for pollution abatement legislation. He has asked that this investigation be made in time to facilitate a report to this session of the Legislature.

Last but not least, the Governor has also asked that a study of the feasibility of a water-use fee to finance state water planning and administration be made by the Legislature. To date no study committee has been appointed in either the House or in the Senate.

Please Close Those Abandoned Wells!

CHIEF RUNNING WATER
HIGH PLAINS WATER DISTRICT
1628 FIFTEENTH STREET LUBBOCK, TEXAS
Dear Chief Running Water:
I am interested in helping to sell "Water Conservation" in the High Plains.
Please send me _____ window stickers. My name and address is:
Name _____
Address _____
City and State _____

IRRIGATION DATA RECORDED ON SOUTHERN HIGH PLAINS FARMS

By Y. F. SNODGRASS, Field Representative,
High Plains Underground Water Conservation District

Horace Durham operates a farm in the southwestern part of Lubbock County. The legal description of the farm is Tract 1, Section 28, Block C-B. The soil of the farm is classified as "mixed sandy loam".

Mr. Durham agreed to cooperate with the High Plains Water District by keeping records of the amount of water pumped from one well, dates of irrigation applications, crop yields per acre, amount of precipitation received, fertilizer applied and any other information that he might deem important to the production of irrigated crops.

A 4-inch deep-well turbine pump powered by a 10 H. P. electric motor was used to produce ground water for irrigation. A Sparling flow-meter was installed on the discharge pipe of the pump, and 2,000 feet of 4-inch surface pipe was used to convey irrigation water to the crops. The pump produces approximately 175 gallons per minute.

In 1959, the maximum capacity of the well was not utilized and only 30 acres of cotton was irrigated. However, in 1960, by receiving above average rainfall in June and July and by using closed surface pipe, 30.3 acres of cotton and 32 acres of grain sorghum were irrigated with water from the well.

In 1959, cotton land on the Durham farm was irrigated three times. During the period, March 9 to April 2, a pre-plant irrigation of 6.42 acre-inches of water per acre was applied. Because the cotton received 9.8 inches of rain in June and July, the first summer irrigation was not required until July 31. From July 31 to August 10, 2.43 acre-inches of water per acre were utilized. The last irrigation was commenced August 15 and completed August 24. The cotton received 2.67 acre-inches of water per acre during this irrigation.

In March 1959, before the pre-plant irrigation, 74 pounds of nitrogen and 50 pounds of phosphrus were applied. Cotton was planted the 13th day of May. Three light hails and two dust storms were encountered in June. The pre-plant irrigation was applied to every row; however, the two summer irrigations were applied to alternate furrows. The length of the rows ranged from 1,000 feet to approximately 1,600 feet.

Mr. Durham harvested 766 pounds of lint per acre. The lint yield per acre-inch of irrigation water was 66.6 pounds. During the crop year, 18.30 inches of rainfall were recorded on the Durham farm. The lint yield per acre-inch of total water received (18.30 inches of rainfall plus 11.52 inches of irrigation water equals 29.82 inches) was 25.69 pounds.

As stated above, in 1960, there were 30.3 acres of cotton planted. A total of 10.27 acre-inches of irrigation water was pumped on the cotton during the crop year. In 1960, 22.65 inches of rainfall were recorded on the farm. From March 28 to April 20, 6.23 acre-inches of water per acre were applied as a pre-plant irrigation. In June and July, 11.90 inches of rainfall were received. During the period August 2-10, the first summer irrigation, 2.15 inches were pumped; and during the period August 19-25, the last irrigation, 1.89 inches were pumped.

The 1960 cotton crop was harvested. Lint yield of 779.5 pounds per acre was produced. Lint yield per acre-inch of irrigation water was 75.8 pounds. Lint yield per acre-inch of total water applied (irrigation and rainfall) was 23.68 pounds.

Every row of the cotton land was pre-plant irrigated. The two summer irrigations were applied to alternate furrows. The cotton was planted on May 9. Hail damaged the cotton on June 18. The damage constituted a 22 percent loss. The cotton land was fertilized with 82 pounds of nitrogen, 60 pounds of phosphrus and 25 pounds of potash per acre.

Mr. Durham also watered 32 acres of grain sorghum. The grain land was pre-plant irrigated with an application of 3.88 acre-inches of water per acre. The grain land was also watered twice in the summer. All irrigations were applied in alternate furrows. The summer irrigation of 2.17 acre-inches per acre was applied August 11 to August 19. The last summer irrigation of 3.60 acre-inches per acre was applied August 25 to August 27. No fertilizer was applied. The grain yield averaged 2,844 pounds per acre. Yield per acre-inch of irrigation water was 295 pounds. The yield per acre-inch of total water applied (irrigation plus rainfall) was 88.1 pounds.

Joe D. Unfred owns and operates a farm designated as the NE1/4, Section 149, Block 9, H.E. & W.T. Survey, in Lynn County. The soil of this farm is classified as "mixed sandy loam."

During the spring of 1959, a Sparling flow-meter was installed on the discharge pipe of one of the farm's 4-inch deep-well turbine pumps in order to gather information concerning amount of water pumped.

In 1959, with water from the well, Mr. Unfred irrigated 55 acres of cotton. He uses underground pipe to convey water to the field. Row lengths ranged from 1,300 to 1,700 feet. On March 11, the pre-plant irrigation was started. By May 1, there had been 6.01 acre-inches of water per acre applied to the land. This irrigation was applied to every furrow. From August 9 to August 15, 1.44 acre-inches of water per acre were applied to the cotton. On August 19, Mr. Unfred started irrigating the cotton land again. He had applied 2.39 acre-inches of water per acre by the time he finished on September 5. The summer irrigations were applied to alternate furrows. Rainfall received on the farm during the crop year totaled 23.95 inches.

From the 55 acres of cotton, Mr. Unfred harvested 565 pounds of lint per acre. The lint yield per acre-inch of irrigation water was 57.4 pounds. The lint yield per acre-inch of total water applied (irrigation plus rainfall)) was 16.7 pounds.

In 1960, Mr. Unfred increased to 70 acres the amount of crop land irrigated from the 4-inch well. A pre-plant irrigation was commenced March 25 and was completed April 21. Alternate furrows were watered and 3.00 acre-inches per acre were applied. Cotton was planted May 10, 11, and 12, and before emergence the seedbed became extremely dry. Irrigation was commenced on May 20 in an effort to get the cotton up. By June 4, 1.51 acre-inches of water per acre had been applied. Rainfall amounting to 14.75 inches was recorded during the last part of June and July. The next irrigation was begun on August 1 and completed August 16 after 1.46 acre-inches of water per acre were pumped to the cotton. Then, on August 18 to August 28, Mr. Unfred applied 0.97 acre-inch of irrigation water per acre, making a total of 6.94 acre-inches per acre, including the pre-plant irrigation. The total rainfall for the year was 26.35 inches.

The 1960 cotton crop yielded 800 pounds of lint per acre. The yield per acre-inch of irrigation water was 115.3 pounds. Lint yield per acre-inch of total water applied (irrigation and rainfall) was 24.0 inches. No fertilizer was applied to the cotton land in either 1959 or 1960.

Mr. Unfred's well produces approximately 150 gallons of water per minute. Several years ago, he installed underground pipe on his farm as a result of tests which showed that he lost by evaporation and seepage more than 15 percent of his irrigation water through use of open ditches.

1959 AND 1960 IRRIGATION AND RAINFALL DATA
HORACE DURHAM — LUBBOCK COUNTY

Crop	Date of Irrigation	Acres Irrigated	WATER (Inches) Irrig. Water	Rain-fall	Total Water	YIELD (Pounds) Per Acre	Per Acre-In. Irrig.	Per Ac.-In. Total Water
1959	Mar. 9-Apr.2	30.0	6.42					
Cotton	July 31-Aug. 10	30.0	2.43					
	Aug.15-Aug. 24	30.0	2.67					
Total		30.0	11.52	18.30	29.82	766	66.6	25.7
1960	Mar. 28-Apr. 20	30.3	6.23					
Cotton	Aug. 2-Aug. 10	30.3	2.15					
	Aug. 19-Aug. 25	30.3	1.89					
Total		30.3	10.27	22.65	32.92	779.5	75.8	23.7
Grain	Apr. 20-May 2	32.0	3.88					
Sorghum	Aug. 11-Aug. 19	32.0	2.17					
	Aug. 25-Sept. 7	32.0	3.60					
Total		32.0	9.65	22.65	32.30	2,844	295	88.1

1959 AND 1960 IRRIGATION AND RAINFALL DATA
JOE UNFRED — LYNN COUNTY

Crop	Date of Irrigation	Acres Irrigated	WATER (Inches) Irrig. Water	Rain-fall	Total Water	YIELD (Pounds) Per Acre	Per Acre-In. Irrig.	Per Ac.-In. Total Water
1959	Mar. 11-May 1	55.0	6.01					
Cotton	Aug. 9-Aug. 15	55.0	1.44					
	Aug. 16-Sept. 5	55.0	2.39					
Total		55.0	9.84	23.95	33.79	565	57.4	16.7
1960	Mar. 25-Apr. 21	70.0	3.00					
Cotton	May 20-June 4	70.0	1.51					
	Aug. 1-Aug. 16	70.0	1.46					
	Aug. 18-Aug. 28	70.0	0.97					
Total		70.0	6.94	26.35	33.29	800	115.3	24.0

High Plains Underground Water
Conservation District No. 1
1628 Fifteenth Street
Lubbock, Texas

Second Class Permit

THE Cross SECTION

A Monthly Publication of the High Plains Underground Water Conservation District No. 1

Volume 7—No. 9 "THERE IS NO SUBSTITUTE FOR WATER" *February 1961*

UNDERGROUND WATER DEPLETION SUIT FILED

Marvin and Mildred Shurbet, a Floyd County farm couple, have filed a law suit against the Federal Government.

If they win, the way would be paved for millions of dollars in tax savings for High Plains irrigators.

The suit seeks a cost-depletion income-tax allowance on underground water used for irrigation farming.

It would establish their right to an income-tax deduction based on the fact that irrigation results in a using up of the underground water. Tax people refer to this as a cost-depletion income-tax allowance.

George W. McCleskey, Lubbock attorney, is shown above as he filed the Shurbet's underground water depletion suit in U. S. District Court at Lubbock. Mr. McCleskey points to the date when the suit was filed.

Since 1954, the High Plains Underground Water Conservation District has sought a cost-depletion allowance for area landowners. The Shurbet case is a test case resulting from the Internal Revenue Service's failure to consider underground water in the High Plains of Texas as a depletable natural resource under the present tax code. If the Shurbet's win, the precedent growing out of the suit should benefit everyone with a similar set of circumstances.

The suit was filed in U. S. District Court in Lubbock on February 21st by George W. McCleskey, Lubbock, J. Chrys Dougherty, Austin, and Edwin L. Kahn, Washington, D. C.

As explained by attorneys, the suit will prove that ground water under the High Plains of Texas is a natural deposit and is being depleted just as oil, gas, gold or any other natural deposit; and therefore underground water should come under the Federal law allowing an income-tax deduction for depletion of other resources.

Plaintiffs contend that property owners who can establish an actual cost of underground water beneath their land and who are using the water from storage to produce income should be entitled to deduct the cost of such water as it is exhausted.

In 47 counties of the Panhandle and southern High Plains there are approximately 20,000 irrigation farmers using 50,000 wells to irrigate 5,000,000 acres of land.

The deduction allowance being sought by the Shurbets will be for the tax year 1959 and will amount to only about $300. The size of the farm, the amount paid for water, the amount of the underground water in storage —all these and many other factors are involved; consequently, the $300. figure certainly would not hold true in all cases. However, using the $300. only as an average, solely for the sake of figuring, that would amount to $6,000,000 annually which would remain in the area economy.

Aside from the tax benefits to area underground water users, the High Plains Water District is convinced that success in this law suit will result in much better use of water. Tax calculations will undoubtedly make taxpayers more conscious of the real value of their water and therefore anxious to use it to the best advantage.

The depletion allowance which is being claimed in this suit is based upon cost of the underground water and not upon any percentage calculation such as is true in the oil industry.

The suit will contend that when a landowner depletes his water supply he has exhausted a portion of his capital investment, and to the extent that such a capital asset has been depleted in the production of income he should clearly come within the principles of law applicable to allowance of deduction for depletion of natural deposits.

Section 611 of the Internal Revenue Code, as amended in 1954, states, "in the case of mines, oil and gas wells, other natural deposits, and timber, there shall be allowed as a deduction in computing taxable income a reasonable allowance for depletion and for depreciation of improvements according to the peculiar conditions in each case; such reasonable allowance in all cases to be made under regulations prescribed by the Secretary or his delegate."

Mr. Shurbet is a former member of the Board of Directors of the High Plains Water District. He presently serves on the State Water Development Board.

Various aspects of the underground water depletion case have been studied for months by attorneys and hydrologists. Bill Broadhurst, kneeling, High Plains Water District hydrologist, explains the operation of a typical southern High Plains irrigation well installation to, standing, Tom McFarland, Water District manager; George McCleskey, Lubbock attorney; Bill Guyton, Austin hydrologist; Edwin L. Kahn, Washington, D. C. attorney; Jack Sexton, Washington, D. C. attorney; and Chrys Dougherty, Austin attorney.

One of four irrigation wells on the Shurbet farm is shown above at left. Only a short distance from this production well is an observation well, right, in which the water level is measured. An automatic recorder is installed in the well. It continually records fluctuations in the underground water level. This record will be important in substantiating depletion.

THE Cross SECTION

A MONTHLY PUBLICATION OF THE HIGH PLAINS UNDERGROUND WATER CONSERVATION DISTRICT NO. 1

Published monthly by the High Plains Underground Water Conservation District No. 1
1628 15th Street, Lubbock, Texas

Telephone PO2-8088

ALLAN WHITE
Editor

BILL TO CLOSE ABANDONED WELLS INTRODUCED IN LEGISLATURE

No doubt most of our readers noted the Associated Press story that appeared in our area newspapers this month concerning a 7-year old boy who fell into a well in Arizona.

The youngster plunged 275 feet down a cased well into 250 feet of water. The fall which broke the boy's pelvis bone and both thighs almost cost him his life.

Only through a series of miraculous events was the boy ultimately hauled from the well alive. First, the boy was conscious and could hear his father as instructions were yelled down to him. Second, the youth did not panic which could probably not be said of most adults who found themselves in such a predicament. Third, the rescuers were able to locate a block-and-tackle and 300 feet of rope with which to haul the boy from the well—just the amount that they needed. Four, the boy followed instructions perfectly in tying securely beneath his armpits the rope that was lowered to him. Had he dropped a second time, while being raised from the well, the shock would probably have killed him.

The boy's name in this story is Harry Stage; however, that's not really important. The important thing about this accident is the fact that many of us here on the High Plains of Texas can read about such things, knowing full well that we have an open abandoned well on our own land, and suffer absolutely no pang of conscience.

By the actions of many of our otherwise good citizens we have a black mark against our region. We literally have hundreds of open wells in our area that have been adanboned. We have hundreds of others that are not closed in a suitable manner to prevent inquisitive boys and girls from uncovering them.

As a result of such accidents as the one described above, the Board of Directors of the High Plains Underground Water Conservation District has drafted a bill that has been introduced in the House of Representatives of the State Legislature by Representative Jesse Osborne of Muleshoe and other Panhandle and South Plains House members. The bill was introduced to the Senate by Preston Smith, Lubbock; Andy Rogers, Childress; and Grady Hazelwood, Amarillo.

The bill provides for the amendment of the statute under which the Water District operates by adding the following subsection:

(11) *To require the owner and/or operator of any land upon which is located an open or abandoned well to close the same in accordance with the provisions of the Acts of the 51st Legislature (1949) p. 509, ch. 281, Art. 1721, Texas Penal Code. An 'Open or Abandoned well', as the term is used in this Act, means any uncovered hole or uncovered well drilled or dug for the purpose of producing water from the underground water reservoir. Provided further, that in the event any owner and/or operator of any such land fails or refuses to close such open or abandoned well within ten (10) days after being requested to do so, in writing, by an officer, agent or employee of the District, the said District, or any person, firm, or corporation employed by said District, is hereby given the authority to go upon said land and properly, safely and securely close said well, and all expenditures incurred by said District in closing said well shall constitute a lien upon the said land as of the date of the completion of the closing of said well. The lien shall be perfected by an affidavit executed by any person conversant with the facts to the effect that such open or abandoned well was in existence, giving its approximate location, that the owner and/or operator of said land was notified and requested to close said well and failed and refused to do so within ten (10) days after such notification, and that said well had been closed by the District or by and through any authorized agent, representative or employee or person, firm or corporation instructed by the said District to close the same, and stating the amount of the expenditures required to properly close the said well. Said affidavit shall be filed in the Deed Records of the county in which such well is located and shall constitute a lien upon said land and shall constitute prima facie evidence in any Court in this State of the illegal existence of such open well and of the violation of Art. 1721 of the Penal Code of the State of Texas, being Acts of the 51st Legislature (1949) p. 509, ch. 281. That such Districts are hereby authorized to formulate, promulgate, and enforce such rules and regulations as may be necessary or appropriate to effectively discharge the powers herein granted. The right of the said District to so close said wells is cumulative and is not exclusive, and any person so failing or refusing to close said well shall be subject to the penalties provided by Art. 1721 of the Texas Penal Code, being Acts of the 51st Legislature (1949) p. 509, ch 281.*

The aforementioned Art. 1721 reads:

"Section 1. *It shall be unlawful for the owner or operator of any well or cistern, as much as ten (10) feet deep, and not less than ten (10) inches nor more than six (6) feet in diameter to fail to keep it entirely covered at all times with a covering capable of sustaining weight of not less than two hundred (200) pounds, except when said well or cistern is in actual use by the owner or operator thereof.*

"Section 1a. *It shall be unlawful for any person who shall drill, dig or otherwise create, or cause to be drilled, dug or otherwise created, any well or hole of as much as ten (10) feet in depth and less than ten (10) inches in diameter to abandon said well or hole without first completely filling said well or hole from its total depth to the surface or plugging the same with a permanent type plug at a depth of not less than ten (10) feet from the surface and completely filling the same from said plug to the surface.*

"This Act does not modify or repeal any existing laws.

"Section 2. *Any person violating the provisions of this Act shall upon conviction be guilty of a misdemeanor and be fined not less than One Hundred Dollars ($100) nor more than Five Hundred Dollars ($500). Acts. 1949, 51st Leg., p. 509, ch. 281."*

The Representatives and Senators sponsoring the bill expect no opposition to its passage.

If you have an open abandoned well on your farm, won't you close it today? Your immediate action could save the life of an area youngster.

NEW DEVELOPMENTS IN ALTERNATE-FURROW IRRIGATION

*By JAMES S. NEWMAN and Y. F. SNODGRASS**

Mr. Grice Herrington has cooperated with the Texas Agricultural Experiment Station and the High Plains Underground Water Conservation District for the past two years, 1959 and 1960. He agreed to keep rainfall records, crop yield records, and to record the date and amount of each irrigation on various fields of cotton.

His farm is located approximately 5 miles northeast of Idalou on a tight, slowly permeable, clay soil (Pullman silty clay loam). Two irrigation wells, one pumping 500 gpm and the other pumping 800 gpm, were used to irrigate 240 acres of land. During wet years, a large lake located on the farm will provide an additional source of irrigation water. Water used on the test fields in 1959 and 1960 was measured with Sparling flow meters. In 1959, water was provided exclusively by the two irrigation wells; however, in 1960, a majority of the water used for summer irrigation was provided by the wet-weather lake. Open ditches were used both years to transport water to the irrigated areas.

The test sites used during 1959 and 1960 were located on soils that had received no previous fertilizer and had been planted to cotton for the previous four years.

All tests in 1959 and 1960 were planted in early May to Lankart-57 cotton on land that was not fertilized. The crop was slightly damaged by sand on June 5, 1959, but recovered to make normal growth. In 1960, plant growth and maturity were delayed approximately two weeks by an extended cool, wet period from June 1 to July 13.

The primary purpose of these tests was to compare alternate and each row irrigation under controlled, large scale conditions and to determine the proper number of hours to irrigate rows that range from 1000 to 1500 feet in length. Data for the 1959 and 1960 tests are given in Tables 1 and 2.

Previous research data revealed that in a majority of the cases where cotton was grown under both alternate and each row irrigation, alternate row cotton produced more pounds of lint per inch of water. It should be pointed out that there was very little difference between the efficiency of the two techniques as revealed in the 1959 and 1960 tests conducted on this farm.

Based on 1959 results, Mr. Herrington decided that alternate furrow 12-hour sets were best adapted to 1000 feet and 1500 feet row lengths, and he used this arrangement to irrigate a majority of the farm in 1960.

It was noted in 1959 that cotton irrigated down alternate rows produced higher quality lint than cotton irrigated down each row. During the same year, this difference in quality was noted in other similar tests. In the 1960 tests, the same trend was noted. Quality differences are shown in Table 3.

Major factors responsible for this difference in quality was believed to have been date of harvest and maturity. Cotton irrigated down alternate rows received less total water and therefore matured sooner.

During 1959, cotton irrigated down alternate rows was machine stripped 13 days sooner that cotton irrigated down each row. As a result of better grades, the early harvested cotton sold for a higher price than that received for the late heavier irrigated cotton even though the yields per acre were lower.

In 1960, this same yield-price trend was noted. The quality difference was believed to have been primarily due to a difference in maturity since all the cotton was harvested at the same time. Late October rainfall prevented early harvesting of the lighter irrigated alternate-furrow cotton.

*Mr. Newman is Assistant Agronomist in charge of irrigation, Experiment Station, Lubbock. Mr. Snodgrass is Field Representative for the High Plains Water District.

TABLE 1. — 1959 TEST

Alternate Furrow	Date Irrigated	Acre Inches Per Irri.	Rainfall	Total Water	Pounds Lint Per Acre	Pounds Lint Per Inch Water	Gross Value/ Acre*
(1) 4 hr. sets 2.57 acres	3-29 to 4-2	6.60					
	7-27	1.81					
	8-5	.81					
	8-14	1.52					
	8-20	1.68					
		12.42	15.00	27.42	610	22.3	$149
(2) 12 hr. sets 4.28 acres	3-29 to 4-2	6.60					
	7-26	3.07					
	8-11	2.36					
	8-21	2.16					
		14.19	15.00	29.19	730	25.0	$177
EACH FURROW							
(1) 4 hr. sets 2.60 acres	3-29 to 4-2	6.60					
	7-27	3.54					
	8-12	2.12					
	8-20	2.24					
		14.50	15.00	29.50	687	23.2	$138
(2) 6 hr. sets 3.28 acres	3-29 to 4-2	6.60					
	7-27	3.51					
	8-12	2.27					
	8-22	1.92					
		14.30	15.00	29.30	740	25.2	$110
(3) 8 hr. sets 4.5 acres	3-29 to 4-2	6.60					
	7-28	4.10					
	8-11	2.65					
	8-22	1.32					
		14.67	15.00	29.67	632	21.3	$131

*Based on 1959 Loan Card value "B" plan. Gross value per acre was determined by lint yield per acre and lint value per pound determined by grade and staple.

TABLE 2. — 1960 TEST

Alternate Furrow	Date Irrigated	Inches Per Irri.	Rainfall	Total Water	Yield Per Acre	Pounds Lint Per Inch Water	Gross Value/ Acre*
(1) 4 hr. sets 2.57 acres	4-1	5.31					
	7-29	1.60					
	8-8	1.79					
	8-19	1.44					
		10.14	25.98	36.12	782	21.6	$185
(2) 6 hr. sets 3.2 acres	4-1	5.31					
	7-29	3.47					
	8-10	1.44					
	8-24	1.53					
		11.75	25.98	37.73	872	23.1	$204
(3) 12 hr. sets 23.94 acres Field No. 4	4-1	5.30					
	8-1 to 2	2.88					
	8-15 to 16	2.01					
	8-22 to 24	1.79					
		11.99	25.98	37.97	873	23.0	$201
(4) 12 hr. sets 24.85 acres Field No. 5	4-1 to 8	5.30					
	8-2 to 8	3.18					
	8-15 to 16	1.95					
		9.94	25.98	35.92	634	17.7	$138
(5) 12 hr. sets 23.25 acres Field No. 6	4-1 to 16	5.00					
	8-4 to 6	2.66					
	8-17 to 16	1.95					
	8-23	.71					
		10.32	25.98	36.30	785	21.6	$184
EACH FURROW							
(1) 4 hr. sets 1.28 acres	4-1	5.31					
	7-29	3.23					
	8-10	2.74					
	8-24	2.37					
		13.62	25.98	39.60	918	23.1	$197
(2) 12 hr. sets 27.1 acres Field No. 7	4-1 to 16	5.00					
	8-5 to 8	4.87					
	8-18	2.25					
		12.12	25.98	33.10	683	17.9	$156

*Based on 1960 Loan Card prices "B" plan. Gross value per acre was determined by lint yield per acre and lint value per pound determined by grade and staple.

TABLE 3. — LINT QUALITY COMPARISON — 1960

Treatment	No. Acres	No. Bales Proces.	Average Yield per Acre	Percent of Bales White	Percent of Bales Lt. Spot.	Average Staple	Gross Value/ Acre*
Alternate Furrow							
4 hr. sets	2.57	4	782	100	0	32.00	$185
6 hr. sets	3.20	5	872	100	0	31.50	$203
12 hr. sets Field No. 4	23.94	40	873	60	40	31.37	$201
12 hr. sets Field No. 5	24.85	31	634	61	39	31.03	$138
12 hr. sets Field No. 6	23.25	35	785	74	26	31.08	$184
		115		68	32	31.21	$182
EACH FURROW							
4 hr. sets	1.28	2	918	0	100	31.00	$197
12 hr. sets Field No. 7	27.1	35	683	24	76	31.16	$156
		37		23	77	31.08	$176

*Based on 1960 Loan Card prices "B" plan.

House And Senate Committees Organized

The Texas Legislature has completed organization of the Conservation and Reclamation Committee in the House of Representatives and of the Water and Conservation Committee in the Senate.

J. W. Buchanan of Dumas has been named chairman of the House committee and George Parkhouse of Dallas was designated chairman of the Senate committee.

Bills that pertain to water conservation and development will be assigned to these committees for study before being considered on the floor of the two chambers.

Other members of the House committee are: Franklin S. Spears, Vice Chairman, San Antonio; Alonzo W. Jamison, Denton; Mrs. Myra D. Banfield;Steve Burgess; James Dee Cole, Greenville; Jack Connell, Jr., Wichita Falls; W. T. Dungan, McKinney; Bob Eckhardt. Houston; Robert Fairchild, Center; Ben A. Glusing, Kingsville; Clyde Haynes, Vidor; Grainger W. McIlhaney, Wheeler; J. W. (Bill) Moore, Ballinger; Menton J. Murray, Harlingen; Jesse M. Osborn, Muleshoe; Rayford Price, Frankston; Leon Thurman, Anson; Vidal Trevino, Laredo; J. E. Ward, Glen Rose; and H. G. Wells, Tulia.

In the Senate, the Parkhouse-lead committee consists of the following members: Martin Dies, Jr., Vice Chairman, Lufkin; Robert W. Baker, Houston; Jep S. Fuller, Port Arthur; Dorsey B. Hardeman, San Angelo; Hubert R. Hudson, Brownsville; Abraham Kazen, Jr., Laredo; Culp Krueger, El Campo; Wardlow Lane, Center; George Moffitt, Chillicothe; Frank Owen, III, El Paso; William N. (Bill) Patman, Ganado; David W. Ratliff, Stamford; Bruce A. Reagan, Corpus Christi; Andy Rogers, Childress; Jarrard Secrest, Temple; and R. A. Weinert, Seguin.

Lamb County Office Location Changed

The Lamb County Committee office of the High Plains Underground Water Conservation District has been moved.

The office is now located at the Calvin Price Accounting office, 514 Phelps Avenue, Littlefield. Mr. Price is the new committee Secretary. He will be available to assist Lamb County residents in filling in applications for well drilling permits and for other services that may be rendered.

Mr. Price is a long-time resident of Littlefield. Go by his office and get acquainted.

"A Primer on Water"

Editor's Note—The following is an excerpt from the new U.S.G.S. booklet, entitled "A Primer on Water." This is the third in a continued series.

PART I HYDROLOGY

Water in the Ground

Did you ever look at a creek on a fine sunny day when there is not a cloud in the sky, and wonder where the water comes from which flows merrily along? We gave a short answer when we said that this water came ultimately from rain or snow. But then one can ask, "Well, where has it been all this time since the last rain?"

In brief, the water has been in the ground. Therefore, it is necessary to know how it got in the ground, how it moves from where it entered the ground to the place where it gets into the river, and how long this journey takes. Let us begin where the rain strikes the ground.

Water Moves Through the Surface Of the Ground

During a heavy rainstorm water may flow down the gutter and the ground gets wet and remains wet or at least damp for days, but we can also remember light rains during which little or no water runs in the gutters and the ground seems dry in minutes after the rain. From these observations we can draw the conclusion that when rain strikes the ground, part of it sinks into the soil and part runs off the surface to gutters or to natural channels. What happens to each of these parts of the total rainfall will be discussed separately.

The surface of the soil has often been compared to a blotter. This is not so good a comparison perhaps as to liken it to a sieve. Imagine a sieve made of a very fine screen. If you held such a sieve under the faucet you can imagine that when the water is coming out of the tap slowly, all the water would flow through the screen. But if the water were turned on more, the bowl of the sieve would fill up and finally overflow because the water could not flow through the fine holes of the screen fast enough to take care of all the water coming out of the faucet.

Imagine again that you had another sieve which had larger holes in the screen and you did the same experiment. Even if the faucet were turned on full, the screen could pass all the water and none would overflow the bowl of the sieve. It can be seen that the rate at which the water can be passed through the screen depends on the size of the holes or openings. Further, the faster the water falls on the screen the l a r g e r will be the amount which does not flow through the sieve but overflows the sides instead.

Exactly the same principle applies to rain on the soil surface. The surface has, in effect, many very small holes or spaces between the grains of sand or the particles of dirt. The soil then acts as a screen or sieve. The larger the particles of dirt, sand, or gravel which make up the ground surface, the larger are the holes or spaces in between and the more the surface acts like the screen with large openings.

When rain falls rapidly on a sandy or gravelly surface, all of it goes through the sieve-like openings into the ground. When rains falls rapidly on a clay or fine-grained soil, however, the rate of passage through the smaller soil spaces is less, and the part which cannot get through the holes flows over the ground in a sheet. This surface part corresponds to the water which overflows the bowl of the sieve when the faucet is flowing strongly.

The process of water sinking into the soil surface is called *infiltration.* The *filt* in the word *infiltration* is similar to the word *filter,* meaning to pass through. The prefix *in* signifies that the process is one of passing into. In this case, water passes into the soil.

That part of the rainfall which does not infiltrate or pass into the soil flows over the surface to a gully or channel and is called surface runoff. But we shall continue to trace the movement of the water which gets into the soil. (To Be Continued)

Supreme Court Rules In Pollution Cases

A recent ruling by the Texas Supreme Court has been noted with much interest by landowners in the southern High Plains.

The ruling was made in two cases that involved the pollution of fresh underground water by oil-field brine.

In the cases, the oil-producing companies claimed that they have a right to do whatever is necessary to produce the oil from beneath the land they have leased—even to polluting the fresh-water supply.

The landowners claimed that the oil producers were negligent in their disposal of brine that ultimately caused the fresh-water pollution.

The court ruled, "We agree that the owner-operator of the lease has the right to use so much of the land, both surface and sub-surface, as is reasonably necessary to comply with the terms of the lease contract and to carry out the purposes and intentions of the parties. It does not follow, however,that the operator may use either the surface or the sub-surface so as to damage the landowner."

Associate Justices Clyde Smith and Robert Hamilton dissented with the court majority.

The court's ruling will strengthen the High Plains Water District's rule against the operation of surface brine disposal pits within its bounds.

WATER - USE FEE RESOLUTION PASSED

The Board of Directors of the West T e x a s Chamber of Commerce has passed a resolution that sets forth their position regarding a matter of vital interest to southern High Plains irrigators.

The resolution expresses the Chamber's opposition to a water-use fee or a water-use tax on water in Texas.

A water-use fee has been proposed by various groups in the state as a possible means of financing the cost of administering the Board of Water Engineers.

Should such a fee be levied, a major portion of the revenue would come from the High Plains region. Most of the State's irrigation wells are located in the High Plains, consequently, the area pumps most of the ground water that's annually produced in Texas.

The resolution was introduced by Henry Sears, W. T. C. C. Director of Hereford, Texas.

The resolution passed by the W.T.-C.C. reads as follows:

WHEREAS, at a regularly scheduled meeting of the Board of Directors of the West Texas Chamber of Commerce held in Wichita Falls, Texas, on the 17th day of February, 1961, there was called to the attention of the Board the fact that the feasibility of a water use tax, sometimes referred to as a water use fee, had been recently considered by the Water Committee of the West Texas Chamber of Commerce and that the feasibility of such a water use tax or water use fee had been considered by the Governor's State-Wide W a t e r Resources Committee recently; and

WHEREAS, after careful deliberation the Board of Directors of the West Texas Chamber of Commerce concluded that such a tax or fee would be adverse to the vast majority of its members and to the entire economy of West Texas and that such a tax would be unfair and discrimanatory; and

WHEREAS, it was the feeling of the members of the Board of Directors of the West Texas Chamber of Commerce that their feelings and sentiments about this matter should be placed on record and made known to their own membership, to the appropriate state officials and to all interested parties.

N O W, THEREFORE, BE IT RESOLVED by the Board of Directors of the West Texas Chamber of Commerce that this Board is unalterably opposed to a water use tax or a water use fee in any form or to the further study of the same and that copies of this resolution be furnished to the chamber members of the organization and that all such action be taken by the Board of Directors of the West Texas Chamber of Commerce as may be necessary or appropriate to oppose such a tax or the study thereof.

We are not opposed to the sale of state-owned water.

ADOPTED this 17th day of February, 1961 at Wichita Falls, Texas.

DRILLING STATISTICS FOR DEC. AND JAN.

During last December, 36 new wells were drilled and registered with the Water District office; 8 replacement wells were drilled; and 1 well was drilled that was either dry or non-productive for other reasons, The County Committees issued 88 new drilling permits.

In January, 37 new wells were drilled; 7 replacement wells were drilled; 5 dry holes were drilled; and 133 new permits were issued.

The permits issued and wells completed for December and January are listed below by counties.

County	*Permits Issued*		*New Wells Drilled*		*Replacement Wells*		*Dry Holes Drilled*	
	Dec.	*Jan.*	*Dec.*	*Jan.*	*Dec.*	*Jan.*	*Dec.*	*Jan.*
Armstrong	0	0	0	1	0	0	0	0
Bailey	2	7	0	1	0	0	0	0
Castro	4	19	2	4	0	1	1	0
Cochran	0	3	1	1	0	0	0	0
Deaf Smith	5	11	7	2	5	1	0	0
Floyd	3	2	2	2	0	0	0	0
Hockley	26	26	7	10	0	1	0	2
Lamb	3	8	2	2	0	0	0	0
Lubbock	20	35	8	9	0	1	0	1
Lynn	10	14	1	1	0	0	0	2
Parmer	14	6	6	4	3	3	0	0
Potter	1	0	0	0	0	0	0	0
Randall	0	2	0	0	0	0	0	0
Total	88	133	36	37	8	7	1	5

High Plains Underground Water
Conservation District No. 1
1628 Fifteenth Street
Lubbock, Texas

Second Class Permit

THE Cross SECTION

A Monthly Publication of the High Plains Underground Water Conservation District No. 1

Volume 7—No. 10 "THERE IS NO SUBSTITUTE FOR WATER" *March 1961*

STATE LEGISLATIVE BRIEFS

H. B. 692, introduced in the Texas Legislature by Jesse Osborn of Muleshoe, has passed the Conservation and Reclamation Committee in the House of Representatives.

This is the "abandoned well" bill that would give underground water conservation districts authority to go on private property to close open or abandoned wells when the owner refuses to do so.

The bill came through both the subcommittee hearings and full committee hearings without any major changes.

Three members of the Board of Directors of the High Plains Underground Water Conservation District—John Gammon, Elmer Blankenship, and T. L. Sparkman, Jr.—testified in behalf of the bill before the full House committee as did Tom McFarland, Manager of the District. Their testimony indicated a need for passage of the bill in order to counteract the growing number of unclosed wells in the southern High Plains area.

Final passage of the bill by the Legislature and the Governor's signature will clear the way for underground water districts to write local rules requiring owners of open wells to close them. If they refuse, the water district may then go upon the land, close the well in some satisfactory manner, and attach a lien to the land for the amount of money expended in closing the well.

"The Cross Section" has for years advocated individual action in closing open wells. You will recall the slogan that you have seen many times—"close that abandoned well—a little life is worth more than a little time." Most abandoned wells in this area have been closed, others remain open as a threat to the lives of our children.

Will you do your part in combatting this problem by closing your open well today—please?

* * * * *

Another pollution control bill has been introduced in the House of Representatives of the Texas Legislature.

The Texas Coordinating Water Committee prepared the bill. It recently was submitted to a Conservation and Reclamation subcommittee headed by Ben Glusing. Hearings are not yet scheduled; however, the bill has been submitted for comment to various State agencies who presently have an interest in pollution control.

It has been understood that the bill would establish a new State agency with a six-man board to provide policy. An administration staff would be headed by a chief engineer.

This bill, and other pending pollution control bills, may have merit and could be exactly what out State needs. We don't know. We do think, however, that serious consideration should be given any bill that would create a new State agency or take authority away from local groups to deal with problems of pollution.

As an example, the High Plains Underground Water Conservation District has solved its major pollution problems by ordering closed the brine pits used for the disposal of salt water produced in connection with oil field operations. This was accomplished on the local level by expending a minimum amount of money and by using legislation already in the statute books. Of course, we realize that salt-water pollution represents only one type of pollution that must be dealt with in our State. Other types may be more difficult to bring under control.

In Texas, there are few areas which are not either included within an underground water conservation district, a river authority, or some other political subdivision that has statutory authority to handle problems of pollution. If the problem can be handled on the local level we think that it should.

Generally speaking, the problem boils down to lack of enforcement.

DRILLING STATISTICS FOR FEBRUARY 1961

During the month of February, 66 new wells were drilled within the bounds of the High Plains Water District; 5 replacement wells were drilled; and 3 wells were drilled that were either dry or non-productive for other reasons. The County Committees issued 115 new drilling permits.

Permits issued and wells completed for February are listed below by counties.

County	*Permits Issued*	*New Wells Drilled*	*Replacement Wells*	*Dry Holes Drilled*
Armstrong	0	0	0	0
Bailey	1	3	0	0
Castro	16	7	2	0
Cochran	8	1	0	0
Deaf Smith	5	4	0	0
Floyd	7	0	1	0
Hockley	30	17	0	0
Lamb	0	1	0	0
Lubbock	19	13	0	2
Lynn	16	11	0	1
Parmer	9	8	1	0
Potter	0	0	1	0
Randall	4	1	0	0
Total	115	66	5	3

DRIVE SHAFT GUARDS IMPORTANT TO IRRIGATION FARM SAFETY

It is apparent to those of us who have occasion to ride through the countryside from time to time that most southern High Plains irrigators have at least one problem that could be alleviated by a very small financial investment and the expenditure of a little time.

The problem—uncovered irrigation pump drive shafts. The solution—installation of a guard around the shaft.

The drive shaft transmits power to the pump from the engine. During engine and pump operation the drive shaft necessarily revolves at high speed. Most drive shafts are completely exposed and present a hazard to individual safety.

Many stories can be told of persons who have had clothing accidentally entangled in drive shafts; consequently, serious injury or death has been inflicted on the persons unlucky enough to be the victims.

Accidents have happened right here in our High Plains Water District. One man was killed a few years ago near Morton when his clothing became entangled in an exposed drive shaft. Another similar incident comes to mind that resulted in agonizing pain and subsequent months of plastic surgery and medical care to the unsuspecting victim of an exposed, whirling drive shaft—a lady was completely scalped when her hair became caught as she observed a well being pumped near Anton. It's miraculous that she's alive today.

Guards can be procured from most pump companies for less than $10.00. Installation is relatively simple and can be done by most well operators. A guard installed around a drive shaft greatly minimizes the possibility of a person accidentally coming in contact with the shaft.

During this period before irrigation is commenced is the time to attend to small but important jobs such as this one described.

Don't wait until tomorrow to attend to this matter—DO IT TODAY!

W. L. BROADHURST ON NATIONAL WATER PANEL

The National Reclamation Association and the Soil Conservation Districts jointly sponsored the recently conducted National Water Research Symposium. The symposium was held March 28-30 in Washington D. C.

W. L. (Bill) Broadhurst, Chief Hydrologist for the High Plains Underground Water Conservation District, was on the program. He served as a floor discussion leader and panel member.

Texans from throughout the State attended the meeting where various problems in the broad field of water conservation were discussed.

Above is shown an irrigation well located in the southern High Plains of Texas. You will note the drive shaft between the engine and pump is covered by a metal guard. The guard is relatively inexpensive and it greatly minimizes the possibility of accidental entanglement in the drive shaft.

WATER-LEVEL MEASUREMENTS IN SOUTHERN HIG

EDITOR'S NOTE

Official water-level measurements for a majority of the observation wells in the southern High Plains of Texas are shown below. These measurements were made by the State Board of Water Engineers in cooperation with the U. S. Geological Survey and the High Plains Underground Water Conservation District.

The map on the opposite page shows the location of the observation wells together with identifying well numbers.

You will note that water-level measurements are shown for 1938, 1950, 1960 and 1961. In some cases the measurements for 1938 and 1950 were not made during those years. In no case, however, do they deviate more than two years from the date shown. The figures under the colums 1960 and 1961 are measurements made in those years. One primary purpose of reporting these particular four years is to show the water level before wide spread pumping was commenced (1938), an intermediate period of well development (1950), and the present level of the water table. By indicating the last two year's measurements, annual fluctuations in the water level may be studied.

Water-levels are made in January each year prior to the beginning of most pumping for pre-planting irrigation.

The figures are in feet below land surface.

Complete water-level measurement records are on file in the Austin office of the State Board of Water Engineers.

ARMSTRONG COUNTY

Well No.	1960	1961
210-M9	110.85	110.56
212-M9	106.40	106.64
21-M10	106.71	105.37
23-M10	117.63	116.87
35-M10	95.04	94.91
46-M10	108.04	108.20
64-M10	116.20	———

BAILEY COUNTY

Well No.	1938	1950	1960	1961
1b	———	96.12	116.63	120.80
2a	———	98.32	110.59	112.60
3b	———	48.75	69.14	76.66
5b	63.32	67.42	98.22	99.55
9	39.29	48.88	79.02	80.65
11a	24.90	28.52	59.16	59.00
21b	22.28	33.42	———	70.40
25	20.32	30.60	62.29	63.00
31	12.96	24.54	49.92	———
33	26.53	41.55	76.09	77.67
34c	63.30	64.36	92.28	93.11
36	16.80	27.51	56.73	56.10
49	23.58	29.73	———	56.60
53	25.46	31.38	62.20	63.10
57a	———	50.90	81.12	———
62	23.61	38.43	71.38	74.60
66a	20.90	37.13	68.65	71.70
67	19.56	37.45	66.48	67.86
69	15.58	29.93	62.40	60.69
95b	———	26.75	61.59	62.92
116a	26.79	37.80	63.89	65.02
117b	34.47	42.22	———	74.60
130a	20.59	26.60	59.48	60.17
131	20.86	26.66	59.89	———
132	21.26	26.96	61.40	*65.96
135	16.61	20.38	56.37	55.28
137	14.07	20.46	———	48.67
141	18.67	16.01	45.67	45.20
205a	54.05	53.10	74.05	74.13
207	92.87	86.87	89.80	90.21
324a	99.01	92.36	———	92.10
450	———	31.00	38.18	40.90
495	———	———	———	92.13
572	———	———	105.03	108.05
573	———	———	27.72	27.80
573a	———	———	29.21	25.59
574	———	———	———	201.06
575	———	———	221.21	220.60
809	———	———	87.67	92.80
811	———	———	101.56	102.30

*pumped recently

BRISCOE COUNTY

Well No.	1938	1950	1960	1961
18	———	———	104.92	104.85
19	———	———	133.02	128.20
107	———	86.93	———	92.00
119	———	83.99	123.40	123.36
122	———	77.80	111.88	113.83
134	———	———	110.52	111.94
148	———	72.66	104.09	106.60
159	———	90.78	131.90	129.55
168	———	93.30	129.60	128.63
170	———	95.95	126.01	128.53
217	———	115.04	144.52	146.96
227	———	78.00	87.30	86.18
234	———	104.03	133.72	136.90
253	———	———	109.36	110.56
254	———	———	88.28	89.05
255	———	———	121.00	121.98
256	———	———	102.08	103.58
257	———	———	186.04	187.40
258	———	———	99.55	100.10

CASTRO COUNTY

Well No.	1938	1950	1960	1961
20	68.18	75.30	117.28	122.43
32	62.97	70.61	102.47	104.10
36	82.74	94.09	———	134.76
40	62.24	72.19	119.10	———
48	80.80	65.50	93.85	89.50
52	71.14	83.26	96.54	105.15
53	57.04	68.68	106.24	108.67
57a	77.24	84.23	124.15	123.97
58a	153.03	151.34	178.62	182.00
201a	153.46	155.04	191.96	193.32
202a	———	148.20	175.25	177.65
278a	———	164.22	198.34	197.63
321a	———	———	175.59	174.96
394	91.18	96.29	127.82	———
410b	———	74.53	106.48	111.50
465a	———	98.32	122.92	124.80
465b	———	———	124.58	123.70
465c	———	———	123.08	122.60
508	79.53	83.15	114.29	112.05
524a	———	82.04	109.19	110.42
528a	———	93.12	126.56	123.15
529	94.16	94.28	120.20	120.70
544a	91.26	94.95	133.25	135.21
587	17.85	———	50.22	47.32
601	———	———	138.24	139.23
602	———	———	136.97	133.02
604	———	———	198.73	197.54
605	———	———	174.07	174.92
606	———	———	188.39	191.60
608	———	———	131.60	134.33
610	———	———	159.03	161.48
611	———	———	110.97	110.38
612	———	———	113.88	111.12
613	———	———	150.30	153.25
614	———	———	191.08	194.57
700	———	———	149.92	148.50
702	———	———	160.77	156.00

COCHRAN COUNTY

Well No.	1938	1950	1960	1961
F-1	———	121.30	128.80	129.75
F-2	———	104.72	136.72	136.55
F-4	———	———	143.03	143.82
1	130.48	149.20	149.90	149.40
12	———	———	150.55	151.78
13	———	———	121.79	122.05
14	———	———	141.98	142.85
15	———	———	103.72	102.40
16	———	———	107.17	107.34
17	———	———	92.48	92.60
18	———	———	131.06	125.84
19	———	———	134.38	135.16
21	———	———	162.89	158.50
22	———	———	155.09	156.21
23	———	———	130.03	126.65
24	———	———	156.06	156.38
25	———	———	138.27	139.34
26	———	———	132.65	131.00
27	———	———	144.27	147.33
28	———	———	142.60	143.35
29	———	———	88.42	89.00
30	———	———	144.18	146.75
31	———	———	126.05	125.29
32	———	———	97.54	97.63
33	———	———	112.93	114.39
34	———	———	171.80	173.55
35	———	———	101.88	101.58
35a	———	———	105.93	105.94
36	———	———	94.18	95.21
37	———	———	137.56	137.34
38	———	———	181.70	182.83
39	———	———	163.43	163.10
40	———	———	117.45	115.29
41	———	———	117.33	118.89
42	———	———	134.48	135.60
43	———	———	115.94	119.40
44	———	———	114.36	119.63
45	———	———	142.90	143.15
46	———	———	151.18	151.17
47	———	———	121.36	121.61
48	———	———	127.81	129.40
49	———	———	170.48	169.95
50	———	———	176.96	177.40
51	———	———	94.37	93.67
52	———	———	87.90	87.72
53	———	———	57.68	55.97
54	———	———	181.33	181.06
55	———	———	136.17	136.95
56	———	———	144.00	144.50
57	———	———	130.54	130.79

CROSBY COUNTY

Well No.	1938	1950	1960	1961
1	113.54	117.95	161.07	158.65
7b	———	131.05	205.90	191.36
8	———	———	147.56	152.05
10b	———	92.58	161.46	159.53
11b	———	90.46	144.67	152.55
11c	———	104.34	161.80	163.70
12b	———	103.09	174.27	177.47
13a	———	92.86	153.20	146.88
14	75.60	91.62	147.87	150.10
17a	93.00	110.30	153.18	155.57
21a	———	106.53	153.10	156.00
23b	———	123.93	161.95	164.74
340a	———	115.85	165.93	169.42
401b	———	80.99	131.87	132.55
412a	———	104.22	———	146.71
415a	———	79.22	102.48	102.76
416	———	———	251.50	252.17
417	———	———	247.03	254.60
G-8	———	———	199.30	197.20
G-7	———	———	192.97	195.64
G-8	———	———	184.04	185.60
G-9	———	———	211.32	213.55

DEAF SMITH COUNTY

Well No.	1938	1950	1960	1961
44	180.90	180.70	190.25	191.50
59	———	———	222.50	———
72a	———	———	247.24	247.58
113a	98.02	105.14	———	132.64
121a	———	———	134.59	———
130a	130.00	130.63	159.93	158.23
140a	———	167.32	182.10	184.54
161	———	———	123.38	———
168	———	———	125.55	125.30
193	———	117.09	137.57	135.53
201	102.90	105.49	133.08	132.27
205	74.48	91.69	———	130.21
212	71.32	84.61	113.34	———
216	66.18	70.92	92.78	94.09
217	90.24	90.10	123.70	115.92
219	73.62	80.92	108.16	108.43
224	55.39	59.46	93.04	90.18
226	49.25	60.09	98.83	———
235	50.62	53.81	70.86	67.62
241	47.15	55.24	69.42	69.59
245	43.80	55.01	65.88	65.47
247	21.53	28.36	50.58	45.89
258	52.77	67.01	98.63	101.21
261	51.25	64.23	97.08	94.99
272	66.99	81.29	116.82	114.29
281a	———	———	128.99	129.02
283	63.00	68.23	91.29	92.62
288	60.79	76.15	111.26	113.38
302	49.20	54.53	68.72	67.84
305	79.42	91.60	130.34	133.02
311	50.72	53.96	87.24	———
315	54.78	60.38	97.30	91.30
322	70.98	84.35	104.18	———
326	87.62	105.93	143.29	145.67
331	75.22	88.60	119.95	123.28
336	85.91	98.57	133.78	134.82
342	74.01	89.05	119.69	123.43
394	———	81.93	100.33	101.52
431b	———	59.71	101.80	103.35
459a	106.20	109.92	———	138.72
486	74.12	90.27	122.85	125.75
502	94.59	111.66	148.40	148.82
506a	74.27	86.85	107.16	109.25
513a	74.66	84.85	109.00	110.07
514	103.62	114.57	143.83	146.20
546	———	125.76	———	148.03
558	———	66.36	80.98	70.55
566	———	190.20	211.22	213.60
919	81.80	91.37	118.07	120.34
934	———	100.00	135.00	136.80
D-30	———	———	184.14	185.08
D-111	———	———	60.00	60.90
D-203	———	———	168.28	170.21
D-303	———	———	295.72	295.52
D-306	———	———	246.77	246.81

FLOYD COUNTY

Well No.	1938	1950	1960	1961
5	50.61	59.84	98.30	100.04
5a	———	57.91	91.80	95.90
20	———	91.17	128.60	132.74
21a	———	91.68	124.15	123.60
32	89.20	99.43	139.90	143.51
42	———	81.90	120.28	119.10
56	59.00	67.38	110.56	———
57	61.01	77.18	125.90	130.30
108	57.53	78.65	131.50	135.80
111	51.46	74.20	109.16	———
112	51.41	74.17	115.10	———
138	———	111.05	142.38	144.45
139	57.90	105.36	140.65	142.74
140	52.54	96.27	131.49	———
143	60.35	95.00	144.23	144.80
157	53.10	80.81	———	143.60
161	58.50	94.52	140.75	144.15
185	———	81.43	136.43	———
263	———	83.78	135.29	136.70
264	———	64.31	105.88	105.36
265	———	86.80	126.65	127.40
315a	———	235.96	———	236.31
326	———	148.50	152.58	154.00
410a	48.59	83.45	129.98	133.00
414	60.66	100.48	143.48	144.69
416	60.24	103.67	143.68	145.10
420	———	111.17	152.60	———
421	57.85	102.56	144.29	147.14
423	———	93.63	143.89	142.00
428a	48.75	84.90	———	137.60
435	57.56	102.20	153.45	156.80
448	48.57	89.49	146.20	148.70
463	47.83	83.21	133.55	———
467	36.32	65.60	117.80	———
472	47.06	80.34	132.52	134.64
478	———	93.29	140.95	144.00
486	33.40	37.92	42.09	41.70
493	———	110.24	148.99	150.43
502	———	70.17	133.65	133.78
510	39.94	59.30	116.25	119.31
511	46.06	77.85	133.19	135.48
519a	49.46	60.21	137.12	139.00
523	57.74	77.90	148.49	151.08
529	110.09	110.10	115.00	116.58
542	———	80.81	145.66	148.94
554	———	91.80	135.72	139.55
546	61.64	74.70	138.93	141.90
562a	132.55	141.50	178.70	181.74
610a	———	209.78	237.22	234.55
610b	———	214.16	239.36	238.50
612	———	———	180.15	181.80
627	———	83.13	129.65	127.08
630	———	112.89	154.46	157.42
652	———	86.46	139.03	141.66
701	———	87.42	139.58	143.44
704	———	101.67	150.79	150.65
720	———	80.15	134.17	141.07
726	———	82.69	111.08	———
727	———	76.68	132.58	137.16
728	———	90.75	140.24	142.16
729	———	87.55	138.98	141.60
730	———	134.73	168.93	173.00
732	———	———	259.10	259.43
733	———	———	252.25	252.07
734	———	———	146.14	148.00

HALE COUNTY

Well No.	1938	1950	1960	1961
31a	———	71.52	112.13	———
36	76.88	87.59	133.79	139.09
40a	———	91.56	128.70	———
81	———	68.11	105.65	109.68
93	———	93.27	139.13	145.35
103	44.89	55.31	86.52	———
105	48.87	63.05	102.00	———
138	———	56.92	86.84	87.90
154	———	77.23	115.45	119.20
159	———	73.99	115.00	117.70
163	———	65.24	106.90	111.80
202	63.66	80.18	126.60	129.90
206	66.96	83.24	124.00	126.50
210	62.97	78.32	118.97	122.17
212	61.52	74.25	106.06	109.83
220	52.35	71.02	112.94	———
225	———	74.29	115.10	116.00
238	45.36	65.30	116.00	122.00
241	47.86	82.75	110.15	115.70
285	———	72.91	116.90	———
305	66.10	84.40	117.93	122.45
316	47.40	65.67	99.56	———
317a	49.56	65.46	98.28	98.61
323	———	76.10	114.40	116.12
330a	44.89	62.82	105.79	110.55
331	———	59.85	102.52	———
334	———	68.55	107.70	111.04
338	45.25	59.20	95.24	96.50
367	———	68.38	114.15	118.65
370	42.25	59.19	102.64	107.70
389	———	63.37	113.60	118.22
435	47.92	67.03	119.95	122.88
436	50.30	73.84	122.66	125.50
454	———	79.80	131.20	133.53
467	32.65	44.60	74.59	76.87
508b	45.70	60.94	119.50	121.53
511	16.88	40.07	85.70	———
539a	55.07	72.68	128.00	131.13
546	———	62.96	117.75	119.95
547a	50.16	68.37	121.34	122.72
553	52.76	62.45	122.10	———
562	———	67.96	110.85	114.80
564	55.73	66.89	121.80	124.96
569	52.56	61.86	89.35	92.77
641	———	76.90	119.80	———
661	———	76.84	120.86	125.20
704a	———	78.99	118.75	122.80
714	———	85.71	126.80	129.90
719c	76.73	80.04	116.65	116.67
724	93.04	96.37	138.90	140.19
798	———	86.00	131.05	133.24
824a	63.90	67.38	———	105.50
825a	64.98	85.80	110.40	112.35
829	———	81.25	114.62	118.00
852a	117.90	120.86	160.47	163.31
859	76.23	87.22	129.45	135.58
906	38.84	44.58	75.47	76.64
923	49.99	54.21	96.45	98.92
929a	41.13	47.94	83.95	86.43
942	51.87	67.78	98.90	99.20
958	57.81	66.24	102.00	———
964	———	82.78	126.15	128.04
978	80.00	89.96	140.50	142.50
1231	———	68.77	109.20	113.20
1336	———	61.42	105.36	105.95
1358	———	73.15	114.80	116.70
1403	———	61.08	100.00	102.10
1417	———	67.62	115.20	118.00
1430	———	51.95	103.65	107.40
1436	———	70.70	120.25	122.90
1529	———	52.61	127.18	131.10
1604	———	71.32	113.60	———
1811	———	107.10	136.05	141.25
1921	———	85.03	115.00	118.41
1957	———	75.44	125.60	———
H-93	———	———	123.50	125.93
K-50	———	———	105.20	108.85
N-27	———	———	114.00	115.88
N-65	———	———	91.60	93.50
P-71	———	———	111.05	113.80
R-36	———	———	133.20	135.45
V-25	———	———	100.97	102.68
V-58	———	———	119.00	120.68
Y-36	———	———	81.10	77.20
Y-38	———	———	75.35	70.83
CC-31	———	———	140.45	143.32
DD-101	———	———	130.54	133.32
GG-76	———	———	109.54	110.90
HH-9	———	———	136.60	139.40
HH-107	———	———	122.05	123.23
HH-118	———	———	92.67	96.16
JJ-50	———	———	137.87	140.58
LL-80	———	———	145.00	———
MM-104	———	———	138.50	143.80

HOCKLEY COUNTY

Well No.	1938	1950	1960	1961
F-2	———	108.61	137.78	138.38
F-7	———	78.17	95.64	98.87
24	26.49	25.33	39.83	29.15
25a	———	27.07	45.38	39.05
28	32.18	35.96	60.22	61.53
29	28.06	39.91	62.18	60.75
207a	———	———	76.11	77.75
247a	———	105.57	132.59	133.71
263a	———	108.37	140.35	141.72
263b	———	112.08	150.37	147.77
281a	———	———	84.11	83.41
429b	———	93.64	134.92	137.43
434	133.20	131.48	178.30	184.77
434a	———	123.94	170.90	178.53
434b	———	89.90	130.16	125.00
443a	———	76.27	101.09	82.70
444	———	71.62	84.80	85.48
447a	———	51.78	79.56	80.72
452	———	67.70	97.69	98.92
453a	———	60.09	92.59	89.49
453b	———	69.42	99.92	101.60
458	82.66	85.63	117.93	120.35
458a	———	63.72	90.82	101.05
528a	———	134.40	173.64	173.02
576	———	89.92	118.98	119.04
662a	———	98.75	120.89	121.12
717	103.92	97.04	112.55	114.52
735a	———	———	151.34	151.13
900	———	———	55.59	47.23
901	———	———	———	132.97

LAMB COUNTY

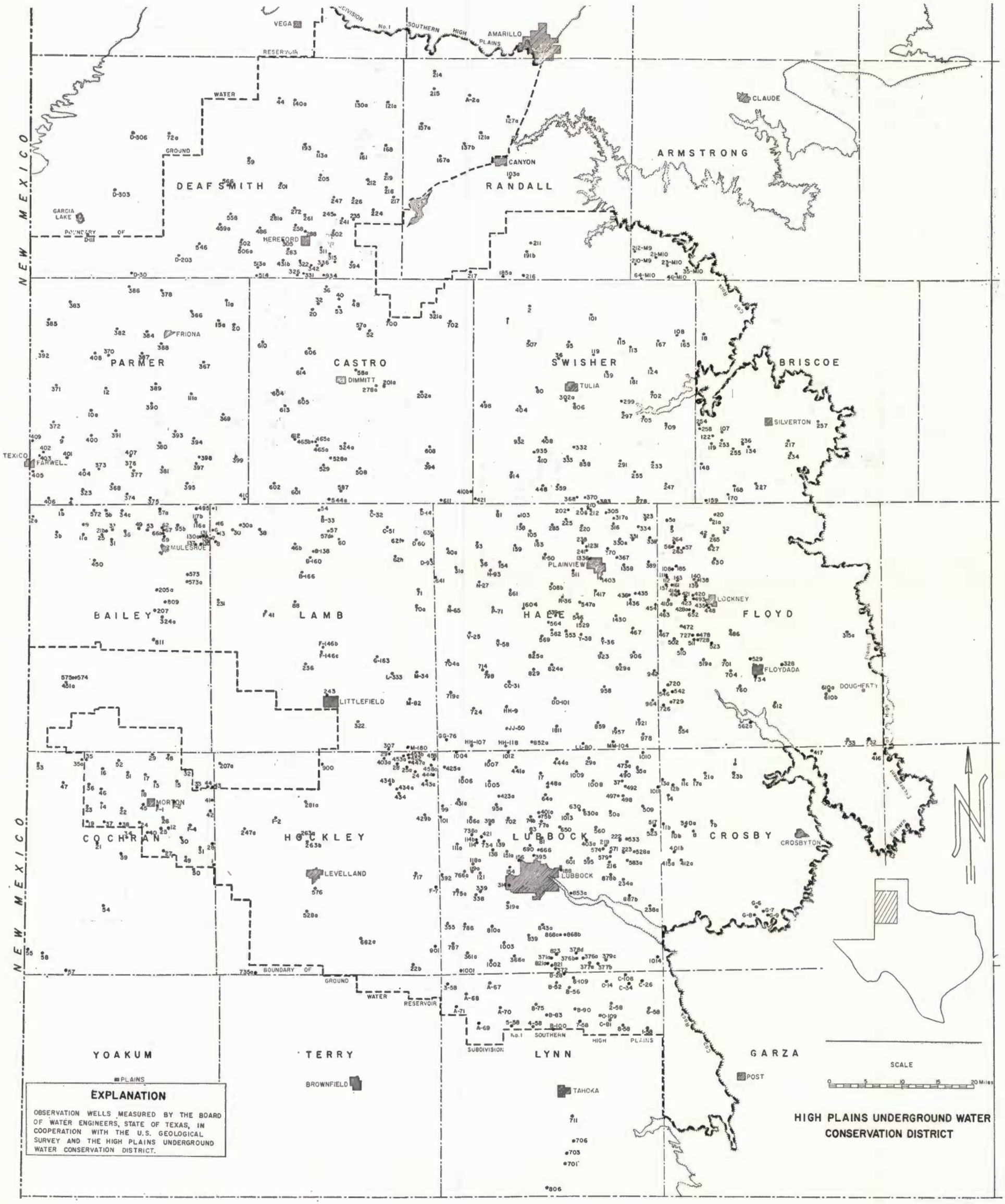
Well No.	1938	1950	1960	1961
1	70.00	70.62	102.77	103.05
6	20.80	27.36	63.00	64.02
7	14.63	22.32	58.20	61.05
8	14.97	20.12	56.27	56.74
13	18.21	27.69	65.26	63.92
16	35.67	41.40	76.80	76.67
30	23.09	29.15	63.44	63.00
30a	———	49.33	79.54	81.90
38	42.16	41.65	69.61	69.28
46b	———	39.84	60.60	61.80
54	88.94	95.77	———	128.18
57	———	89.35	———	129.50
57d	———	97.00	124.94	128.80
60	69.79	74.57	105.97	107.07
62f	———	101.80	141.10	144.12
62h	———	92.32	129.80	127.37
63b	———	99.19	———	144.65
70a	64.15	61.82	83.23	82.02
71	62.18	67.22	93.40	93.56
88	39.03	36.29	46.17	46.15
231	96.52	92.61	111.53	110.18
236	78.12	73.99	94.90	96.02
243	77.65	75.40	81.66	81.66
307	31.70	41.54	72.58	66.52
322	40.75	47.69	84.30	———
B-33	———	96.48	131.72	133.05
B-138	———	47.48	71.43	73.56
B-160	———	49.20	69.33	70.10
C-32	———	87.28	———	116.84
C-51	———	98.35	138.45	139.48
D-14	77.43	80.12	120.98	123.22
D-60	———	87.73	122.30	126.41
D-93	———	98.10	142.67	145.32
F-41	———	38.60	———	65.40
F-146b	———	———	———	78.34
F-146c	———	———	———	107.03
G-163	84.89	89.71	121.25	122.05
L-333	99.14	105.73	130.70	133.40
M-34	74.95	85.46	114.40	115.80
M-82	104.95	109.00	137.10	137.85
M-180	———	85.20	113.24	111.03

LUBBOCK COUNTY

Well No.	1938	1950	1960	1961
17	———	107.30	144.84	147.07
29a	———	93.09	149.55	152.47
35a	———	97.72	147.57	149.95
37	73.15	79.35	124.45	126.96
50a	———	80.95	134.83	138.22
64a	86.02	91.33	127.69	129.97
74b	35.06	———	53.44	54.23
75b	———	72.57	112.05	113.27
77a	69.87	79.98	110.38	112.27
81	42.22	46.00	68.20	68.58
83	———	48.58	73.49	———
95a	———	97.42	126.03	128.29
99	34.35	35.98	59.70	60.28
101	62.31	71.56	110.45	116.67
106a	———	41.46	68.94	71.24
111a	———	87.32	126.65	130.50
114	———	64.96	95.00	96.83
114b	———	60.85	86.65	87.94
118a	80.67	90.93	133.00	134.87
119a	———	85.68	129.94	132.14
121	73.92	82.64	129.47	131.74

(Continued on Page 4)

H PLAINS' OBSERVATION WELLS ARE REVEALING



EXPLANATION

OBSERVATION WELLS MEASURED BY THE BOARD OF WATER ENGINEERS, STATE OF TEXAS, IN COOPERATION WITH THE U.S. GEOLOGICAL SURVEY AND THE HIGH PLAINS UNDERGROUND WATER CONSERVATION DISTRICT.

HIGH PLAINS UNDERGROUND WATER CONSERVATION DISTRICT

THE Cross SECTION

A MONTHLY PUBLICATION OF THE HIGH PLAINS UNDERGROUND WATER CONSERVATION DISTRICT NO. 1

Published monthly by the High Plains Underground Water Conservation District No. 1
1628 15th Street, Lubbock, Texas

Telephone PO2-8088

ALLAN WHITE
Editor

WATER LEVELS—Continued

Well No.	1938	1950	1960	1961
138	39.59	46.12	75.81	73.19
139	25.69	30.41	56.23	54.66
151a	26.68	36.57	75.20	76.32
154	38.18	48.71	76.38	72.71
156	39.98	59.24	76.88	76.17
188	78.12	77.64	95.01	91.82
216	52.28	51.90	80.45	81.31
219	43.00	46.12	78.37	77.90
222	53.12	54.34	108.74	114.30
223	47.41	39.74	55.37	———
234a	———	62.35	76.42	73.20
238a	———	52.32	61.87	59.76
314	45.01	52.92	59.40	———
319a	———	79.00	105.62	107.85
338	———	70.00	109.69	111.77
339	61.73	67.75	103.15	105.31
355	83.64	86.16	112.85	115.47
361a	———	85.70	100.30	100.80
366a	———	91.39	100.93	101.65
371a	———	90.68	123.45	123.53
372	88.05	95.25	129.20	130.85
376a	———	82.47	115.54	116.35
376b	93.06	———	120.50	121.21
377a	———	76.13	111.75	114.31
377b	———	80.35	116.74	116.31
378d	———	———	112.41	113.25
379c	———	68.23	103.68	104.12
392	92.41	94.40	112.55	114.19
395	43.89	54.73	73.50	73.24
398	14.23	18.96	54.05	52.83
401a	70.95	76.77	121.20	116.99
403a	38.56	44.50	75.48	77.02
421	———	42.80	70.35	71.07
423a	———	101.11	129.20	———
425a	———	84.70	106.93	107.92
431a	———	97.16	127.05	128.46
441a	———	128.84	162.77	165.26
444a	———	113.85	156.56	158.77
448a	———	110.82	142.71	145.75
473a	———	96.76	144.40	146.38
490	———	88.84	143.35	144.00
492	———	80.84	123.77	127.19
497	———	92.57	145.74	149.71
498	———	93.90	144.17	148.53
509	———	86.33	134.38	138.49
517	———	98.64	154.28	158.60
523	———	83.06	127.10	128.48
528a	———	68.88	93.95	98.31
533	———	65.98	122.88	129.20
560	———	56.88	107.00	109.68
571	———	43.26	74.89	74.42
574	———	52.86	81.55	83.76
579	———	46.46	76.87	76.08
583a	———	48.01	69.66	68.07
595	———	61.47	93.10	88.94
601	———	66.59	90.43	89.37
630	———	72.27	125.57	127.58
630a	———	71.91	124.44	126.67
650	———	73.60	111.40	114.70
666	52.00	59.24	80.25	80.48
690	———	49.70	77.75	79.28
702	———	83.24	116.05	111.27
734	———	52.76	78.23	78.10
736a	———	46.95	80.30	83.94
766a	———	88.45	126.10	128.44
775a	———	82.64	114.80	118.15
786	———	104.74	135.71	136.40
787	———	86.52	110.60	110.76
810a	———	98.37	122.95	124.25
821	———	94.22	126.03	128.77
821a	———	93.40	124.80	126.33
823	———	94.49	126.24	127.80
839	———	88.84	110.79	111.27
843a	———	76.71	104.48	104.90
853a	———	48.97	52.23	49.26
868a	———	75.27	108.92	110.00
868b	———	88.28	120.10	120.94
878b	———	53.46	85.88	79.38
887b	———	71.74	85.70	85.25
1001	———	———	67.04	66.59
1002	———	———	95.43	94.55
1003	———	———	99.51	105.19
1004	———	———	115.22	116.00
1005	———	———	134.17	———
1006	———	———	161.45	160.19
1007	———	———	140.90	142.44
1008	———	———	143.76	147.37
1009	———	———	140.87	142.45
1010	———	———	147.88	150.06
1011	———	———	134.62	137.16
1012	———	———	120.69	122.36
1013	———	———	118.22	120.69
1014	———	———	186.97	191.98

LYNN COUNTY

Well No.	1938	1950	1960	1961
701	66.16	63.42	65.59	66.85
703	64.12	63.59	61.39	61.22
706	15.05	15.66	———	1.10
711	10.40	17.40	17.10	9.03
806	38.68	———	———	33.42
1-58	———	———	39.30	40.33
2-58	———	———	———	70.38
3-58	———	———	92.07	92.11
4-58	———	———	———	91.53
5-58	———	———	121.86	122.85
6-58	———	———	61.53	62.63
7-58	———	———	46.88	42.31
8-58	———	———	65.50	65.25
A-67	———	———	96.06	92.37
A-68	———	———	105.20	102.57
A-69	———	———	86.47	86.97
A-70	———	———	70.68	68.93
A-71	———	———	87.65	86.96
B-28	———	98.04	134.60	135.02
B-52	———	102.40	119.94	120.55
B-56	———	———	104.30	103.09
B-75	———	———	109.24	109.72
B-83	———	———	———	90.20
B-90	———	———	79.05	78.64
B-100	———	———	67.50	68.07
B-109	———	———	122.23	122.06
C-14	———	———	81.40	82.03
C-26	———	49.82	64.40	61.09
C-34	———	26.91	34.38	22.54
C-81	———	66.42	79.42	79.98
C-108	———	———	86.57	86.66
C-109	———	———	75.48	75.02

PARMER COUNTY

Well No.	1938	1950	1960	1961
4	124.25	116.28	———	136.81
9	210.40	213.59	236.67	239.53
10a	167.62	167.13	197.52	203.58
11a	117.41	118.82	142.05	145.77
12	168.95	161.93	180.60	181.08
15a	138.90	140.88	180.00	185.50
20	———	113.56	141.32	148.10
111a	———	165.46	207.25	206.02
323	102.77	102.16	119.30	122.00
366	———	———	188.90	190.97
367	———	———	245.83	248.52
368	———	———	135.35	137.63
369	———	———	167.92	165.68
370	———	———	284.50	288.46
371	———	———	206.90	210.60
372	———	———	236.74	240.69
373	———	———	160.83	164.19
374	———	———	122.14	123.55
375	———	———	107.98	110.56
376	———	———	170.27	173.30
377	———	———	161.43	164.18
378	———	———	225.66	227.94
380	———	———	200.54	203.16
381	———	———	179.99	182.21
382	———	———	203.46	206.58
383	———	———	225.77	226.50
384	———	———	203.60	201.46
385	———	———	238.34	242.70
386	———	———	296.77	303.30
387	———	———	261.90	266.36
388	———	———	220.60	224.34
389	———	———	237.40	241.09
390	———	———	179.30	183.39
391	———	———	229.21	232.72
392	———	———	304.90	———
393	———	———	189.94	193.72
394	———	———	168.47	168.44
395	———	———	161.78	168.15
397	———	———	192.10	194.70
398	———	———	190.31	193.80
399	———	———	152.30	155.00
400	———	———	236.25	235.35
401	———	———	190.99	197.60
402	———	———	221.10	222.96
403	———	———	195.73	197.87
404	———	———	162.66	165.76
405	———	———	202.90	204.36
406	———	———	———	188.85
407	———	———	195.15	197.53
408	———	———	270.35	272.45
409	———	———	———	236.90
410	———	———	158.03	159.40
411	———	———	279.71	285.18

RANDALL COUNTY

Well No.	1938	1950	1960	1961
A-2a	———	113.79	139.16	139.54
103a	9.35	9.11	4.20	3.79
121a	———	129.13	150.80	153.04
127a	———	135.61	145.75	148.87
137b	———	———	128.20	131.10
157a	———	112.99	120.97	127.36
167a	105.36	———	130.40	134.54
185a	———	———	180.30	173.93
191b	———	154.57	187.65	187.78
211	———	142.12	171.80	172.89
214	———	160.63	189.25	196.47
215	———	130.05	164.50	164.38
216	———	———	163.60	162.90
217	———	———	174.10	173.76

SWISHER COUNTY

Well No.	1938	1950	1960	1961
1	89.50	89.38	107.60	107.79
2	77.78	77.68	78.67	80.76
36	55.80	58.40	89.20	90.00
80	———	71.28	101.70	104.20
95	———	71.32	111.40	———
101	———	72.31	102.44	———
108	71.52	77.26	109.75	109.85
113	58.46	63.98	84.40	88.03
115	57.38	62.98	86.90	87.40
119	———	56.36	83.60	83.22
124	46.91	63.90	81.90	81.35
139	———	52.84	72.65	76.77
165	———	80.87	120.00	118.50
167	52.45	57.50	82.48	83.50
181	———	65.54	90.63	91.62
233	50.85	68.85	102.75	103.20
247	57.34	69.43	106.43	107.07
255	41.43	53.53	84.50	84.98
278	———	80.12	116.35	118.90
291	———	63.10	91.80	93.21
297	———	45.59	75.43	72.68
299	41.70	50.49	62.45	66.76
302a	64.14	67.18	105.37	109.00
332	59.49	75.74	106.19	104.50
333	———	86.57	109.45	110.59
359	74.71	89.75	132.40	134.32
368	74.07	90.79	138.34	142.42
370	72.17	91.72	126.34	———
383	72.16	88.58	123.50	121.82
404	103.51	107.81	134.70	135.22
408	86.90	96.28	132.80	134.14
410	92.70	101.36	120.00	122.76
421	62.71	69.70	101.35	103.86
448	———	90.25	138.80	138.95
498	———	97.19	129.10	129.84
507	———	82.97	117.45	119.76
702	———	46.15	51.55	50.10
705	———	55.55	81.20	78.15
709	———	93.86	108.80	108.95
806	———	63.90	94.97	98.40
858	———	67.50	107.73	107.53
914	———	115.99	150.57	153.12
932	———	105.97	141.00	144.63
935	———	92.75	125.30	127.50

Potter County Committeeman Dies

W. J. (Jess) Hill, Bushland, died March 20 in the Northwest Texas Hospital at Amarillo. Mr. Hill was a member of the Potter County Committee of the High Plains Underground Water Conservation District.

Mr. Hill was born May 28, 1886 in Gainesville, Texas.

Since 1907, he and his wife had lived on the same farm near the Bushland community. He was one of the early advocates of water conservation in the Texas High Plains.

Even though Mr. Hill was an irrigation farmer he primarily was a livestock breeder and feeder. His farm was known as the W. J. Hill and Son Farm. He and his son, W. J. (Jay) Hill, Jr., operated the farm. In the 1930's, Mr. Hill's livestock feeding program was probably the largest in West Texas.

Through the years, Mr. Hill had been involved in almost every program and effort to improve and promote the High Plains of Texas and the plight of its farmers and ranchers.

Survivors in the immediate family include Mr Hill's wife, two sons and three daughters.

High Plains Underground Water
Conservation District No. 1
1628 Fifteenth Street
Lubbock, Texas

Second Class Permit

THE Cross SECTION

A Monthly Publication of the High Plains Underground Water Conservation District No. 1

Volume 7—No. 11 "THERE IS NO SUBSTITUTE FOR WATER" *April 1961*

Directors Take Office---Progress Reports Heard

Conservation Award Will Be Presented To Canadian Official

A. A. Meredith, Executive Secretary of the Canadian River Municipal Water Authority, will be awarded the Individual Water Award at the annual "Save the Soil and Save Texas" awards program next month.

Mr. Meredith was chosen for the outstanding job he has done in the field of Water Conservation as head of the Canadian River Authority. He states that, "there is nothing of more importance to me and nothing I'd rather be called than a real conservationist in the field of water. I think it coud be classed along with the highest calling."

The annual "Save the Soil and Save Texas" awards are presented by the Fort Worth Press. This is the sixteenth annual program.

The award to Mr. Meredith is not only a great honor to him but also a tribute to the High Plains of Texas for having such leadership.

Congratulations Mr. Meredith.

Robert Bean, Judge of the 140th District Court in Lubbock, is shown above at left as he administers the oath of office to three area men. They recently were sworn in as newly-re-elected members of the Board of Directors of the High Plains Underground Water Conservation District. Each will serve a two-year term of office. Left to right, they are T. L. Sparkman, Jr. of Hereford, member representing Armstrong, Deaf Smith, Potter and Randall Counties; John Gammon of Lazbuddy, member representing Bailey, Castro and Parmer Counties; and Elmer Blankenship of Wilson, representing Lubbock and Lynn Counties. Roy Hickman of Morton and J. R. Belt, Jr. of Lockney round out the five-man Board.

Elmer Blankenship of Wilson, John Gammon of Lazbuddy, and T. L. Sparkman, Jr. of Hereford, recently were sworn in to serve two-year terms of office as members of the Board of Directors of the High Plains Underground Water Conservation District. Each was re-elected to the Board by the people in their respective precincts.

Robert Bean, Judge of the 140th District Court at Lubbock, administered the oath of office. The swearing-in ceremonies were held in connection with a luncheon at which progress reports were given to former board members and guests.

Guests attending the luncheon ceremonies included former board members Willis Hawkins of Hart, Marvin Shurbet of Floydada and Gus Parish of Earth. Others attending were attorneys Arthur Duggan of Littlefield and George McCleskey of Lubbock, and Frank Rayner, Engineer stationed in Lubbock with the State Board of Water Engineers.

John Gammon, President of the Water District's Board, presided at the ceremonies. J. R. Belt, Jr. of Lockney and Roy Hickman of Morton are the other members of the present five-man Water District Board.

The series of pictures shown above were taken recently in Lubbock during a luncheon given by the High Plains Underground Water Conservation District. As part of the program, three area men were sworn in as members of the Board of Directors of the Water District. Also, former board members and guests heard reports on progress of water conservation work being carried on by the District. In picture (1) Directors J. R. Belt, Jr. and T. L. Sparkman, Jr. listen as Tom McFarland, Manager of the Water District, explains plans for future projects and undertakings. The comments of Marvin Shurbet of Floydada, former Water District board member, seem to have amused John Gammon in picture (2) Mr. Shurbet has recently filed a test case in the federal courts in an attempt to obtain an income-tax deduction for the depletion of underground water in the Texas High Plains. Picture (3) shows Bill Broadhurst, District Chief Hydrologist, as he explained the Water District's technical projects presently underway and the progress made in this field. Picture (4) shows Gus Parish, former board member, as he addresses the group. His comments concerned the willingness of those interested in the District's activities to lend whatever help they could in furthering the cause of water conservation. George McCleskey, Lubbock attorney, shown in picture (5) explains the legal status of the depletion case filed by Mr. Shurbet. Last, (6), certainly not least, is pictured Arthur Duggan, Littlefield attorney. Mr. Duggan briefly reported on the activities of the Water Laws Committee of the American Bar Association and other important state and national water committees on which he serves.

THE Cross SECTION

A MONTHLY PUBLICATION OF THE HIGH PLAINS UNDERGROUND WATER CONSERVATION DISTRICT NO. 1

Published monthly by the High Plains Underground Water Conservation District No. 1
1628 15th Street, Lubbock, Texas

Telephone PO2-8088

ALLAN WHITE
Editor

"A Primer on Water" – U.S.G.S. Publication

Editor's Note—The following is an excerpt from the new U. S. Geological Survey booklet, entitled "A Primer on Water." This is the fourth in a continued series.

PART I HYDROLOGY

Movement of Water Within the Soil

Did you ever have occassion to dig in the garden soon after a rain and find that the soil was wet for several inches down from the surface but dry below that? Two forces are involved: capillarity and gravity, and they move water downward in the soil.

First, moisture moves downward by being pulled down from below. The pull is rather like that in the wick of a kerosene lamp or a candle. If you place a piece of dry string so that one end is in a pan of water and the other end hanging over the side with its tip lower than the level of the water in the pan, the water gradually will rise up the string and wet the whole length and drip off the tip. This works by the principle of capillary action. A drop of water tends to spread out in a thin film over very small particles such as in the cloth of the wick or the particles of soil. Capillarity is the tendency for a liquid to cling to the surface of a solid material, and this tendency may draw the liquid up, against the pull of gravity, as in the case of a candle wick. Similarly, capillarity may draw water downward into dry soil below the wetter portion.

Second, when the particles of soil are coarse, consisting of large sand grains or small pebbles, water tends to flow downward more or less freely through the holes or spaces, pulled by gravity. Similarly, water may flow downward through holes made by worms or left where roots decay.

Consider what happens to moisture in a deep soil. The soil material lying below the land surface is usually filled partly with water and partly with air. When rainfall infiltrates into the soil, it fills the open spaces and temporarily replaces the air. Water in the larger open spaces, like those between coarse sand particles, move downward more rapidly than the water held in the smaller spaces.

A sandy soil drains rapidly after a heavy rainfall, and after 2 or 3 days only the capillary water is left clinging as a film around the individual soil particles. After gravity has drained out the water in the larger openings, capillary moisture remains like the water left in Monday's wash after wringing. This capillary water can be removed only by drying. At the very surface, evaporation removes the water. Below the surface but in the upper most layers of the soil are the roots of plants. Plants can take up capillary moisture from the soil and thus the soil is dried. In the case of clothes on the line, the air takes up the moisture not removed in the wringing.

Unless there is more rain, the soil dries until the plants wilt. At very low moisture content, soil particles hold on to the moisture so tightly that the plants can no longer pull water from the soil and they die.

So, downward movement of water in soil, may take place by two different processes. The first is a gradual wetting of small particles, the moisture being pulled by capillary forces from the wetted grains to dry ones. The second in rapid flow through the larger openings between particles under the influence of gravity, as if the holes or openings were pipes. The capillary water has been pulled downward from grain to grain. The lower limit of this wetting is marked by the change from wetted grains above to dry grains below and can be thought of as a "wetted front" or the bottom part of the wet soil. Further downward movement stops when the wetted front has progressed so far that all the water which has soaked in the soil is held by capillary attraction to the grains; this capillary water can be removed only by drying.

Rain falling on a dry soil does not spread uniformly throughout that soil. It wets a certain depth of soil and then after the rain ends, the downward movement practically stops. The underlying soil remains relatively dry. To wet the underlying soil more rain must fall.

What Is an Aquifer?

How deep will water go? To answer this we must visualize the nature of the materials making up the near-surface portion of the earth. The earth is like an orange, the skin or rind of which is somewhat different from the inside. The deepest oil well ever drilled by man is about 25,000 feet deep; that is, almost 5 miles. Through that is a deep hole, it is still an insignificant part of the 4,000 miles to the center of the earth. Yet the oil well, even at that depth, has penetrated for deeper than the ordinary cracks and joints found in the near-surface rocks.

Water moves underground through pores, holes ,and cracks which we often see in surface rocks. Many of these openings result from weathering; that is, from the chemical and physical processes of disintegration brought about by rain, air, frost, and heat. This weathering of rocks close to the earth's surface is somewhat like the rusting that eventually discolors the bumpers on your car or the rims on a bicycle. This rust does not harm the metal underneath, but breaks down the surface, develops many small cracks, and causes tiny flakes of metal to loosen from the harder unaltered metal beneath.

The soil in which gardens and trees take root is, in fact, originally derived from hard rock like that found deeper underground, and is thus like the rusted skin, or flaky brown surface, overlying the hard metal of the car's bumper.

As we drive along a modern highway, the roadcut through the hills reveals the change from surface soil to underlying, broken, cracked, and weathered rock. Below the weathered rock is the hard and solid bedrock.

Let us visualize then that the cracks, seams, and minute spaces between particles of weathered rock become fewer and fewer as we go deeper. At some depths these openings are no longer present except infrequently, and the movement of water becomes almost impossible.

There is in rocks, however, another kind of hole that allows the seepage of water to great depth. This is the natural pore space between the grains of the rock itself and differs from what we discussed above in that it does not depend on weathering. A common example of rock with natural pore space is sandstone. Many sandstones originated as beach sand on the shore of an ancient ocean. The sand grains later became cemented together to form rock.

Sandstone is one of the principal

(Continued on Page 4)

BIG PROBLEM IN TEXAS HIGH PLAINS — IRRIGATION "TAILWATER"

By ALLAN H. WHITE, JR.

"Tailwater" is one of the biggest problems that confronts the southern High Plains irrigator.

The word "tailwater" is used to define irrigation water that runs off the land being irrigated, usually at the low end of the field.

The question that immediately comes to mind is, "why don't the irrigators construct low borders at the end of their fields in order to hold the water until it can penetrate into the soil." This is a logical question, and the answer is that most irrigators do just that; however, some do not. Some still allow water to run through the field and off the land until the land becomes adequately wetted. In most instances, "tailwater" problems in our area could be solved by merely constructing these low-end borders. There are farms, however, that have excessive slope and the water could not be held by the low borders. There are also certain crops that tend to become damaged when water is allowed to stand on them for any appreciable time. Some vegatable growers even want irrigation water to continually flow down the furrow until the top of the beds are wet. In these cases borders do not represent a complete answer.

Another solution to the "tailwater" problem is to level the farm land so that neither rain-water nor irrigation water will run off. This allows maximum efficiency from water received and halts soil errosion. From a water and soil conservation standpiont, land levelling is probably the best solution to this problem.

If, then, by levelling the land the problem of "tailwater" could be eliminated, why not level it?

Well, this is what many are recommending—the Soil Conservation Service, the Texas Experimental Station and others. Most agriculturists agree that this is a sound recommendation. It is a most difficult job to accomplish however, because first, to level a farm is expensive and the economics of southern High Plains' agriculture is not presently at the high level it reached and enjoyed ten or fifteen years ago, and second, the big majority of southern High Plains irrigators have proved that they will not farm for long in the manner that they must when their land is "bench-levelled." More labor is required to farm and to irrigate levelled land. Earth borders divide the "benches"—they must be maintained, and weeds that grow on the borders must be controlled.

We reach a point then where some compromise must be made if we are to make strides in conserving our resources and still make a profit from their use. How can we use water more efficiently while awaiting the day when we will have all our land levelled?

Mr. J. G. Evans of Hereford, in Deaf Smith County, feels that he has the answer. He has made progress in the right direction by providing at least a partial solution to his 'tailwater" problem. He has constructed earth sumps, or pits at the low end of his farms. A centrifugal pump has been installed at each sump and pipelines laid from the pumps to the high side of the farms.

All "tailwater" that comes from his fields during irrigation is channelled to these pits. When the pits fill with water, the pumps are started and water is sent to the upper parts of the farms where it can be used.

The picture above shows one of J. G. Evans' pump-back pits in Deaf Smith County. Irrigation "tailwater" gravity flows into the sump where it is picked up by a centrifugal pump and sent back to the high side of the farm through an underground pipeline. The water is thereby put to beneficial use rather than being lost by allowing it to meander to a nearby dry lake via road bar ditches as it once did.

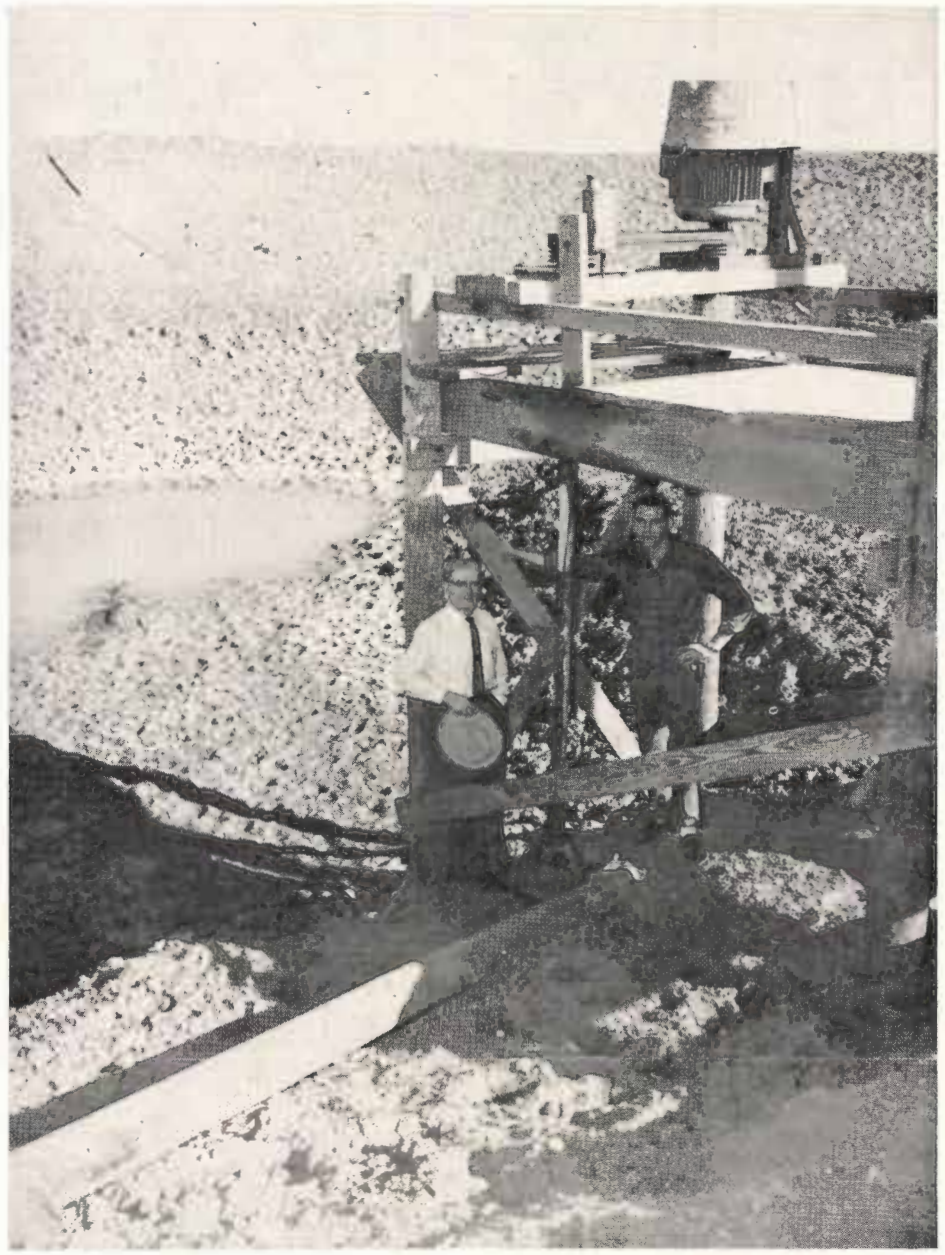
The problem of water conservation is largely alleviated by the operation of these installations; the problem of soil erosion still remains. As was previously stated, this method is probably not the most desirable, but it may be the most practical for the time and the place. Many irrigators would install sump-pump units that will not, for one or more reasons, even consider "bench-levelling" their farms.

Mr. Evans has constructed a recirculating system on each of his two farms. He has constructed and installed on one farm, the East half of Section 8, McIntosh Survey, located 19 miles north and 3 miles east of Hereford, a man-made sump and pumping unit. The other installation is on a farm that he owns jointly with F. L. Eicke, Section 74, Block K-5, located 15 miles north of Hereford. This installation consists of a dam constructed across a small draw. The dam is designed so that excess runoff water from heavy flash rains will spill around each end. These spillways keep the dam from washing out.

To keep the two installations straight in our thinking, and not confuse one with the other, we will first discuss the installation utilizing the dam.

The farm in this instance consists of 640 acres of land on which is raised grain sorghum, wheat and cotton. Construction cost of the dam across the draw was $350. All "tailwater" from the farm is channelled into the reservoir created by the dam. A 6-inch

(Continued on Page 4)



J. G. Evans, Hereford, is shown above at left, with Bruce Fink, High Plains Water District Junior Geologist stationed in Hereford, as he explains the operation of another one of his irrigation "tailwater" pump-back units. This installation involved the construction of a dam across a small draw into which "tailwater" had previously escaped. "Tailwater" still runs into the draw, but now it is pumped back by a centrifugal pump to the farm's irrigation system and put to beneficial use. The electric motor is mounted on the high scaffolding to protect it from water in the reservoir.

This view shows the earth dam across the draw on the Evans' farm. Spillways at each end of the dam protect it from damage by heavy rainfall runoff. According to Mr. Evans, the pump-back unit makes it profitable to recover "tailwater" on this farm in quantities that equals the capacity of a good 6-inch deep well.

Museum Offers "Water & Agriculture" Tours

The West Texas Museum on the Texas Technological College campus is presently sponsoring guided tours entitled, "Water and Agriculture." The tours are made available through a cooperative program of the Museum, the Lubbock Junior League and the Lubbock public schools. They are especially prepared for seventh-grade classes (however, any age is welcome to take the tours and will receive valuable information from so doing).

Mrs. G. H. Sandy, Curator of Education at the Museum, has done months of preparatory work in obtaining information and data for the tours. The High Plains Water District was asked to furnish for the tour certain information concerning the underground water supply available in the southern High Plains.

The Junior League of Lubbock is responsible for furnishing guides to conduct the tours. Mrs. George Gilkerson is chairman of the tour guides and has worked diligently in obtaining the best guides and instructing them.

The tours were commenced this year on March 21, and to date 59 seventh-grade social studies classes from the Lubbock schools have taken the tours. The tour is generally coordinated to correspond with class work.

At the end of each tour, the student is presented a copy of the color comic book entitled, "Chief Running Water's Story of High Plains Water," and each teacher is given a set of issues of the newspaper, "The Cross Section." Both are publications of the High Plains Water District.

The Museum, with illustrations, pictures, charts and other visual aids, is doing a tremendous job in helping to educate our school children concerning the area's most valuable natural resources, water and soil.

The tours are available not only to Lubbock students but to any school in the area.

Teachers, here's your chance for an excellent field trip—contact Mrs. Sandy at the West Texas Museum and request for your class the tour "Water and Agriculture."

Mrs. A. F. O'Brien, Lubbock Junior League Tour Guide, is shown as she explains geologic illustrations to a seventh-grade class during one of the "Water and Agriculture" tours at the West Texas Museum on the Texas Tech campus. The O. L. Slaton Junior High (Lubbock) class is taught by Mrs. Cleo Peek. The tour was in connection with their class social studies.

"A Primer on Water"

(Continued from Page 2)

rocks through which water moves underground. When we see rain fall on a sandy soil or watch water from a receding wave on a beach sink into the sand, it is clear that the holes or spaces between the grains of sand permit water to move through the material. When sand becomes cemented by calcium carbonate (lime) or other material to become sandstone, not all the pores between individual grains are filled completely by the cementing material. The cementing material is found mostly where the grains touch. The spaces between grains remain open. For this reason sandstone is generally porous, and not only can water pass through the rock, but an appreciable volume of water is required to saturate it. There are other porous materials, such as gravels, which were formed in a river bed, then were buried and became part of the bedrock. Such buried gravels may be cemented or may be loose and unconsolidated.

The name for a rock or soil which contains and transmits water and thus is a source for underground water is *aquifer*. *Aqua* means water in Latin, and *fer* comes from a word meaning to yield. An aquifer is an underground zone or layer which is a relatively good source of water. An aquifer may be an underground zone of gravel or sand, a layer of sandstone, a zone of highly shattered or cracked rock, or a layer of cavernous limestone.

To summarize, water underground may move through the pores of rock or soil material and through cracks or joints of a rock whether or not the rock itself is porous. The cracks and joints are numerous near the surface and less frequent at greater depths in the earth. As for the depth of occurrence of porous rocks, folding and other mountain-building forces during geologic time have caused materials, such as beach sand turned to sandstone, to become buried many thousands of feet in some places. But underneath the aquifers everywhere at some depth is rock that is impervious and watertight, because the great pressures at depths have closed up the pores.

Thus, water seeping down from the rainsoaked surface will sink so far but no farther, and it collects above the impervious layer, filling all the pores and cracks of the pervious portions until it overflows into the streams.

(TO BE CONTINUED)

"Tailwater"

(Continued from Page 3)

centrifugal pump powered by a 15 H. P. electric motor is installed on a scaffold in the reservoir. The scaffold was constructed to keep the electric motor out of the water. A pipeline consisting of 300 yards of 6-inch steel pipe was installed from the pump discharge to a point on the farm where the "tailwater" enters a 12-inch concrete irrigation pipeline. From there it may be carried to any part of the farm. The "tailwater" is elevated 26 feet from the centrifugal pump to the point where the steel and concrete lines come together.

The total cost of this installation was about $1950—this includes pipe, pump, motor and dam.

The second installation designed by Mr. Evans to re-circulate "tailwater" is somewhat simpler than the project that involved the building of the dam.

This project was constructed on land that has only a 4-foot range in elevation from the highest point to the lowest point. A sump was dug at the low point--it is approximately 50 feet wide, 200 feet long and 8 feet deep. A 12-inch concrete pipeline is installed below the surface of the land from the sump to a point where it joins an open ditch about one-half mile from the sump. A 6-inch centrifugal pump is installed at the sump. It is powered by a 10 H.P. electric motor.

During irrigation the centrifugal pump is started. It sends water through the pipeline to any desired point on the farm where it can be used as it commingles with underground water.

Four 6-inch deep wells are drilled and equipped on the farm. Mr. Evans states that the sump and centrifugal pump recover "tailwater," that was previously lost, in amounts equal to the output of a strong 6-inch well. He has set 112-1½" irrigation syphon tubes to handle the amount of "tailwater" entering the sump.

Production cost of pumping the "tailwater" is about one-forth the cost of operating one of the farm's deep wells.

Total cost of this complete re-circulating system, including dirt work to construct the sump, pipe, pump and motor, was about $5500.

Mr. Evans is confident that his initial investments pay for themselves at least every five years. Profit realized from the use of "tailwater," having production costs less than ground water, will result in such returns. If consideration were given the savings effected by pumping less ground water, then the profit from using "tailwater" would be even greater.

THE CROSS SECTION
1628 15th Street
Lubbock, Texas
Dear Sir:
I do not now receive THE CROSS SECTION but would like to have it sent to me each month, free of charge, at the address given below.
(Please cut out and mail to our address)
Name_____
Street Address_____
City and State_____

High Plains Underground Water
Conservation District No. 1
1628 Fifteenth Street
Lubbock, Texas

Second Class Permit

THE Cross SECTION

A Monthly Publication of the High Plains Underground Water Conservation District No. 1

Volume 7—No. 12 "THERE IS NO SUBSTITUTE FOR WATER" *May 1961*

Gravel Filters Used In Laboratory To Extract Suspended Solids From Water

Delbert Smith and D. B. Underwood, Texas Technological College students, have recently conducted laboratory studies to determine the practicability of extracting suspended solids from lake water by using gravel filters.

The study was under the direction of William Schwiesow, professor in the Agricultural Engineering Department at Tech, and satisfied the requirements for the course A.E. 430.

One of the major problems encountered in artificial recharge using surface runoff water results from suspended solids in the water. The solids clog the underground formations as the recharge process takes place.

The laboratory experiment was designed to show whether gravel filters could be used to extract a percentage of the suspended solids from the surface water before recharging. A reduction in solids would result in less clogging of the underground formations and consequently longer life for the recharge well.

The materials necessary to build the laboratory experiment were furnished by the High Plains Underground Water Conservation District.

Through the years the Water District has attempted by financial support to interest college students in doing research on water problems that concern the economic life of the southern High Plains' area.

The laboratory structure for testing various filters consisted of a plywood tank, 2.5 feet wide by 4 feet long by 8 feet high. In the structure was placed horizontally a 4-foot length of perforated 15-inch steel pipe. Various sized gravel and sand were placed in the plywood box around and above the perforated pipe to act as a filter. The pipe was covered to a depth of 3 feet. This left room in the top of the plywood structure for 42 inches of water.

A submersible pump was used to pump water from a small pit to the filter box. Clay and silt particles, similar to those found in surface runoff water were placed in the pit together with tap water. A compressed air jet agitated the mixture in the pit.

A 2-inch valve was connected to the discharge of the 15-inch perforated pipe to control the water flow through the filter. A meter attached to the valve measured the outflow.

It was determined in the test that "in order to keep the colloidal content of the outflow at a minimum, the flow rate through the filter should be in the range of 1/4 to 1/2 gpm/ft.^{2}

This means simply that the results indicate that to do a good job, and supply say 750 gallons of water per minute for recharge, the filter should be approximately 600 feet long by 2.5 feet wide by 3 feet deep.

This filter extracted about 85 percent of the suspended solids from the water.

Further studies will be conducted by the Agricultural Engineering Department during this summer. A complete report of the results will be available in the late fall.

D. B. Underwood, left, and Delbert Smith, Texas Tech students watch as meter records quantity of water passing through gravel filter enclosed in box at right. Recharging underground sands with raw lake water presents problems of clogging the formations. The model filter system attempts to simulate field conditions and extract suspended particles that cause clogging.

"Abandoned Well" Bill Passes Legislature Now Awaits Governor's Signature

House Bill 692 has been passed by both houses of the Texas Legislature and now awaits the Governor's signature.

H. B. 692 is the "abandoned well" bill introduced by Rep. Jesse Osborn of Muleshoe. Representatives J. Collier Adams and Reed Quilliam of Lubbock, Olen Petty of Levelland, H. G. Wells of Tulia, and Richard C. Slack of Pecos co-signed the bill. Andy Rogers of Childress, Preston Smith of Lubbock and Grady Hazelwood of Amarillo handled the bill in the Senate. It amends the law under which underground water conservation districts operate by adding several sections that pertain to the closing of open or uncovered wells.

The bill was drafted to give water districts the authority to close open wells in instances where owners refuse to do so. The purpose is to keep some child from falling into such a well.

Through the years "The Cross Section" has had many words to say concerning the danger of leaving abandoned or unused wells open. Stories have been carried that told of children who fell into open wells and what happened to them. It would be a tragic thing for one of our southern High Plains' children to fall into an uncovered well. So uncalled for. With a minimum amount of effort and expense a well can be properly closed.

(Continued on Page 2)

Snodgrass Resigns

Y. F. Snodgrass, Field Representative for the High Plains Water District, has resigned his position in order to enter private business. His resignation is effective June 1. He will farm near the County Line community, west of Abernathy.

Y. F. and his wife, Mary Jo, together with their four boys will move from Lubbock about July 1.

Y. F. joined the Water District staff in January 1955 after being discharged from the U. S. Air Force.

Personnel Changes

The U. S. Geoligical Survey has announced that Allen G. Winslow will succeed Raymond W. Sundstrom as head of all ground water work in Texas.

Mr. Sundstrom has been assigned to the Office of the Branch Area Chief, Rocky Mountain Area, Branch of Ground Water. He will remain in Austin.

THE Cross SECTION

A MONTHLY PUBLICATION OF THE HIGH PLAINS UNDERGROUND WATER CONSERVATION DISTRICT NO. 1

Published monthly by the High Plains Underground Water Conservation District No. 1
1628 15th Street, Lubbock, Texas

Telephone PO2-8088

ALLAN WHITE
Editor

"Abandoned Well" Bill

(Continued from Page 1)

Below is a reproduction of H. B. 692 as it passed the Legislature and went to the Governor's office.

Section 1 Section 1, Subsection 3c, B of House Bill No. 162, Acts of the 51st Legislature, 1949, Chapter 306, Page 559, as amended by Section 6 of House Bill No. 404, Acts of the 54th Legislature, 1955, Chapter 496, Page 1239, is hereby amended by adding a new paragraph (11) at the end thereof, which shall read as follows:

"(11) to require the owner or operator of any land upon which is located any open or uncovered well to close or cap the same permanently with a covering capable of sustaining weight of not less than Four Hundred (400) Pounds, except when said well is in actual use by the owner or operator thereof; an 'open or uncovered well' as that term is used in this Act means any artificial excavation drilled or dug for the purpose of producing water from the underground water reservoir, not capped or covered as required by this Act, which is as much as Ten (10) Feet deep and not less than Ten (10) Inches nor more than Six (6) Feet in diameter; in the event any owner or operator of any land upon which is located such an open or uncovered well fails or refuses to close such open or uncovered well in a manner which is in compliance with this Act within Ten (10) Days after being requested to do so, in writing, by an officer, agent, or employee of the District, any person, firm or corporation employed by said District is hereby granted the authority to go upon said land and to safely and securely close or cap said well in a manner which is in compliance with the provisions of this Act, and all expenditures incurred by said District in closing or capping said well shall constitute a lien upon the land upon which such open or uncovered well is located; provided however, no lien shall be created on any property for more than One Hundred Dollars ($100.00), as of the date of the completion of the closing or capping of said well; said lien shall be perfected by the filing in the Deed Records of the County in which said well is located of an Affidavit executed by any person conversant with the facts to the effect that such open or uncovered well was in existence, giving the legal description of the property upon which it was located, and its approximate location on said property, that the owner or operator of said land was notified and requested to close said well, and failed or refused to do so within Ten (10) Days after such notification, and that said well had been closed by the District, or by an authorized agent, representative, or employee of the District instructed by the said District to close the same, and stating the amount of the expenditures required to properly close said well; said Districts are hereby authorized to formulate, promulgate, and enforce such rules and regulations as may be necessary or appropriate to effectively discharge the powers herein granted; the powers and authority herein granted the District are cumulative or additional, and shall not be considered as abridging or amending in any way Article 1721 of the Texas Penal Code, being Acts of the 51st Legislature, 1949, Page 509, Chapter 281."

Sec. 2. If any section, clause, sentence or provision of this Act or rules and regulations issued pursuant hereto as applied to a particular individual and set of circumstances, shall be held for any reason to be invalid, such holding shall not affect in anywise the validity of the remaining provisions of this Act, or rules and regulations issued hereinunder or the application of this Act, and such rules and regulations to other and different individuals and circumstances not so held invalid, and all those portions of such Act or such rules and regulations not held invalid shall remain in full force and effect.

Sec. 3. The fact that it is imperative that underground water of this State be protected and conserved and the fact that the public safety is adversely affected by open or uncovered wells, create an emergency and an imperative public necessity that the Constitutional Rule requiring bills to be read on three several days in each house be suspended, and said Rule is hereby suspended, and that this Act shall take effect and be in force from and after its passage, and it is so enacted.

Well Drilling Statistics For March And April

During the month of March, 74 new wells were drilled within the bounds of the High Plains Water District; 4 replacement wells were drilled; and 8 wells were drilled that were either dry or non-productive for other reasons. The County Committees issued 75 new drilling permits.

In April, 118 new wells were drilled; 18 replacement wells were drilled; and 2 wells were drilled that were dry. The Committees issued 121 new drilling permits.

Permits issued and wells completed for March and April are listed below by counties.

County	Permits Issued		New Wells Drilled		Replacement Wells		Dry Holes Drilled	
	March	April	March	April	March	April	March	April
Armstrong	1	0	0	3	0	0	0	0
Bailey	1	13	1	4	0	2	0	1
Castro	1	9	2	10	2	2	0	0
Cochran	8	5	1	4	0	0	0	0
Deaf Smith	10	8	5	5	0	1	0	0
Floyd	0	16	2	4	0	1	0	0
Hockley	7	25	19	20	0	1	3	0
Lamb	25	13	4	21	0	8	0	0
Lubbock	14	12	24	20	1	1	3	1
Lynn	8	6	8	17	0	0	2	0
Parmer	0	14	3	10	1	2	0	0
Potter	0	0	0	0	0	0	0	0
Randall	0	0	5	0	0	0	0	0
Total	75	121	74	118	4	18	8	2

CARNAHAN'S IN DEAF SMITH COUNTY RECLAIM IRRIGATION "TAILWATER"

By ALLAN H. WHITE, JR.

C. D. Carnahan and his son Tommy farm 17 miles north and 2 miles west of Hereford, in Deaf Smith County. They own and operate three sections of land (1920 acres). The land is irrigated from twelve deep wells, one located on each quarter-section.

The Carnahans are primarily wheat farmers, even though they do raise grain sorghum and some potatoes, onions, carrots and lettuce. They also run several hundred head of steers and cows. Their livestock program is integrated with their farming operation so that wheat pasture and sorghum bundles are utilized.

The irrigation wells are all connected by 3 1/4-miles of 10-inch plastic underground pipeline. Water from any well can be used on any given portion of the large farm.

A draw meanders along the south side of the Carnahan place. In the past, irrigation "tailwater" from the farm ran into the draw to serve no beneficial purpose.

The Carnahan's decided that if they could retain the "tailwater" before it reached the draw, at the lower side of the farm, it could then be pumped back into the irrigation system and put to beneficial use.

After thorough study and consultation, it was decided that they would try and devise a pilot system that would take care of the "tailwater" from half their land.

This would be a start and would serve as an experiment to determine the best method to use in salvaging water from the remaining 1 1/2 sections. Another reason for doing only half this year, is that if the project were done right, the cost was estimated to be near $8,000 for this one system.

A suitable reservoir site was chosen and the earth-moving work commenced. Dirt removed from the reservoir was used in constructing a dam. Water-ways were provided at the low end of the fields to carry "tailwater" into the reservoir. Spillways were provided at either end to protect the dam against damage from heavy rainfall run-off.

A 8-inch cement asbestos pipeline was installed from the "tailwater" reservoir to a point one-half mile up the farm from the reservoir. At this point the cement asbestos line was connected to the plastic underground irrigation system.

A 6-inch centrifugal pump was installed at the edge of the reservoir on a scaffolding. The scaffolding, or platform, was provided to keep the pump and engine out of water. An automatic priming device is installed on the pump. To protect the engine from heat damage, it has an automatic cut-off that functions when the engine temperature exceeds 200 degrees F.

When the project was completed and all the costs tallied, the total tab read approximately what had been estimated — $8,000 — $2,000 for dirt work, $1,000 for engine and pump, and $5,000 for pipe. This represented a sizable financial investment; but on the other side of the ledger, the Carnahan's now have the equivalent of another good 1,000 gallon per minute well with which they can salvage underground water that previously was lost.

With a maximum lift of 48 feet, water can be pumped from the reservoir to any part of the farm. Because of the minimum amount of lift, the cost of operating the centrifugal pump is only a fraction of the cost required for pumping the same quantity of underground water from one of the deep wells.

A similar project is planned to take care of "tailwater" from the other half of the farm. Actual construction will probably not commence until next fall or winter.

With the re-circulating system in use, the Carnahan's have taken a big step toward lowering irrigation costs. The utilization of every gallon of underground water produced is the ultimate goal. This goal should challange every irrigator in the southern High Plains' area.

Tommy Carnahan and his father, C. D., stand beside the suction pipe of their 6-inch centrifugal pump. The pump is primed automatically and produces approximately 1000 gallons of water per minute.

Dirt removed in constructing the "tailwater" reservoir was used to build the large earth dam shown in the foreground. Irrigation "tailwater" from 960 acres of Carnahan land runs into the reservoir where the centrifugal pump is shown in the background pumps it back to the top-side of the farm where it is used. The Carnahans state that the recirculating system not only saves irrigation water that was previously lost but that it is also better than having another good 8-inch well. The cost of pumping the water is much less than producing the same amount of water from the underground supply.

Large waterways have been excavated along the botom of the fields to carry "tailwater" to the reservoir.

The recirculating pump sends water to any desired point on the Carnahan farm through an underground pipeline system.

"A Primer on Water" – U.S.G.S. Publication

Editor's Note — The following is an excerpt from the new U. S. Geological Survey booklet, entitled "A Primer on Water." This is the fifth in a continued series.

PART I HYDROLOGY

The Water Table

Imagine a dishpan half filled with sand, into which we pour water. The water is absorbed in the sand, seeping down through the spaces between sand grains until it comes to the watertight or impervious bottom of the pan. The sand becomes thoroughly moist before any free water collects at the bottom of the pan. As more water is introduced, a water surface rises gradually until it reaches the surface of the sand.

When there is enough water in the dishpan to saturate the bottom half of the sand, we can find the level of the free water surface by poking a hole in the sand with a finger. This hole turns out to be partly filled with water, and the water level in the hole is the same as the level of the free water surface throughout the body of the sand. We call this level, or surface, the *water table*. The water table is the top of the zone of saturation in the porous material.

Now let us take a spoon and scoop a V-shaped channel across the surface of the bed of sand in our dishpan. If we make this channel deep enough to expose the surface of the zone of saturation, water will appear in the channel.

We can now put away the dishpan and go outdoors to study the real conditions. Rain falls on the surface of the ground and wets the soil and rock materials to successively greater depths if the precipitation continues long enough. Underneath this porous surface at some depth, which may be thousands of feet below the surface, there is an impervious base comparable to the bottom of the dishpan. Above this impervious base free water has collected, and the top of this zone of free water or saturation is the water table.

The water table rises until it is exposed in the bottom of the deepest notch or depression in the area, which is usually a stream-cut valley. The stream channel, being the deepest part of the valley, will correspond to the notch which we cut in the sand in the dishpan. When the water table is high enough to emerge as a free water surface in the stream channel, the water in the channel flows downstream because the channel slopes. Thus water flowing in a river or stream channel long after a rainstorm generally indicates that the water table is high enough to be exposed in the channel. The flow of a river or creek, therefore during fair weather periods is commonly derived from water in the saturated zone of the earth material. In a humid climate there is enough precipitation to raise the water table high enough for even the small rivulets and creeks to run water much of the time. In a dry climate the small channels are dry between rains and only the large deeply cut river channels carry water the year long.

Ground Water Moves From One Place to Another

With this background concerning downward movement of water and the nature of the ground-water table, we can consider the movement of water from one place to another in the ground. For example, you have emptied the garden hose of water after watering the garden. When the hose is disconnected from the faucet, it generally has a good deal of water still in it. To empty it, you hold one end of the hose up in the air and let the other end discharge water onto the ground. We say that water seeks its own level. What we mean is that a water surface tends to become flat, or that water flows toward the place where the surface is low. In other words, it flows downhill. By the same reasoning, unless the water surface slopes, water will not move. In the dishpan example, the water in the saturated portion of the sand will not move anywhere because the surface of the free water is flat. Now if a pitcher of water is slowly poured into the sand along one edge of the dishpan this additional water will temporily make a mound of water in the sand which will force water to flow sideways until all of it is distributed uniformly through the dishpan.

It takes a certain amount of time for the mound of water to flatten out and the general level of the water to be everywhere uniform because water will flow more slowly through the sand than it would as a sheet of water on the surface of the ground. Because of the slow movement of water through the pores, cracks, and minute openings between the grains, the water table in nature is seldom completely flat and horizontal, but has in fact an undulating surface.

When rain falls on this area, part of the rain seeps downward to the water table and builds a mound, just as did the water from the pitcher when poured into the sand at the edge of the dishpan. Also, in a similar manner, the water in the ground flows downslope toward the stream channel. If the water table is high enough, the water will drain out into the stream channel.

To make clear the picture of the water table sloping toward the surface stream the following things were demonstrated by the dishpan example. First, the underground zone of saturation is continuous and has a surface which is not flat as long as water is moving from the high places toward the lowest place. Second, water underground flows downhill in the direction which represents the steepest slope of the water surface. In the example pictured, the lowest point on the surface of the water table is exposed at the stream or river. The stream carries away all the water which flows to it, even when large amounts of rain fall and a large mound of ground water builds up. After the rain has ceased, ground water continues to flow toward the stream and gradually the mound of water flattens out.

Many surface streams and rivers continue to flow even during long periods of dry weather. But our own experience tells us that during a long dry spell the stream progressively gets lower and lower as water in the ground is gradually drained away and the water table approaches a flat or horizonal plane, as it quickly did in the dishpan example. So, when a farmer tells you that his ever-flowing brook is "spring-fed," he is using a popular conception to describe the drainage of ground water into his brook.

To make this picture real, think of some small stream near your home which you see fairly often. When you pass it during a rainstorm, it may be flowing a moderate amount of water. After the rain ceases, the stream will continue to flow for some time. But, depending on the size of the stream you have chosen to think of, it will sooner or later dwindle in flow, only to rise again when another rainstorm comes.

Surface streams are intimately related to water in the ground. Surface streamflow and underground water are terms which apply to the same water. The terms merely make it easier to discuss where the water is at a particular time. Whether one speaks of river water or ground water, it is the same water, having the same source.

How Much Water Can Be Obtained From the Ground

It is not everywhere necessary to go to a surface stream to obtain water. Underneath much of the dry ground surface where we walk and live there is a ground-water reservoir from which water may be obtained by drilling a well. This was shown by the dishpan example. The ground-water reservoir might be a supply of water for our use.

From our discussion so far, it seems that no matter where we are a water table can be found at some depth underground. This is indeed the case, but it is not enough to tell us *how much* water can be obtained from the underground reservoir. To imagine the kinds of differences that exist underground, think of different flower pots that you have watered. Some seem to take a whole pitcher before the bulk of the soil becomes saturated to the top.

(To Be Continued)

Subsoils Can Produce As Well as Topsoils

In discussing the pros and cons of bench-levelling farm land, the one argument that you can always depend on someone presenting for the side of the "aginners" is concerned with the sterility of sub-soils. Sub-soils become the crop planting surface when deep cuts are made.

This argument will not hold water any longer, according to "Soil and Water" magazine. The periodical reports that subsoils can produce as well as topsoil—if they're properly fertilized.

Research shows, according to experiments in the Northern Great Plains, that adding adequate amounts of fertilizer to turned-up subsoil boosted crop yields to the point where they equalled yields on the original topsoil.

EDITOR
THE CROSS SECTION
1628 15th Street
Lubbock, Texas
Dear Sir:

I do not now receive THE CROSS SECTION but would like to have it sent to me each month, free of charge, at the address given below.

Name _____
Street Address _____
City and State _____

(Please cut out and mail to our address)

High Plains Underground Water Conservation District No. 1
1628 Fifteenth Street
Lubbock, Texas

Second Class Permit

THE Cross SECTION

A Monthly Publication of the High Plains Underground Water Conservation District No. 1

Volume 8—No. 1 "THERE IS NO SUBSTITUTE FOR WATER" *June 1961*

CALIFORNIA STATUTE TREATS WATER-WASTER AS CRIMINAL

In Texas, underground water conservation districts have authority only to request of the courts that they issue injunctions against individuals for wasting underground water. However, this is not the case in some of the other western states of this nation. As an example, the High Plains Underground Water Conservation District obtained a copy of a penal statute from the state of California. The statute deals with the waste of water in that state. There, according to the statute, the courts are dealing with a criminal act whereby here the courts are dealing with a civil matter.

The penal statute from California (Stats 1935, c. 29, p. 292, 725.) reads as follows:

"Interference with surface water; damage or obstruction of highway. It is unlawful for any person to do any of the following acts:

"(a) Drain water, or permit water to be drained, from his lands unto any state highway by any means which results in damage to the highway.

"(b) Obstruct any natural water course so as to:

(1) Prevent, impede or restrict the natural flow of waters from any state highway into and through such water course unless other adequate and proper drainage is provided.

(2) Cause waters to be impounded within any state highway, to the damage of the highway.

(3) Cause interference with, or damage or hazard to public travel.

"(c) Store or distribute water for any purpose so as to permit it to overflow onto, to saturate by seepage, or to obstruct any state highway, to the damage of the highway."

Is Texas ready for such stringent laws as the people in California and some other states apparently live by? Something even more severe than the California Statute could be forthcoming in Texas if we as individuals don't attend to our own waste problems.

HAVE A "TAILWATER" PROBLEM?

Madison and M. B. Newton of Anton had a "tailwater" problem, but they solved it. At right, above, "tailwater" is shown as it mixes with well water in an open ditch before the Newtons use it to irrigate onions. For the complete story of how the Newtons reclaim "tailwater," turn to page 3.

SHRINERS HONOR FORMER MEMBERS OF DISTRICT'S BOARD OF DIRECTORS

Two former members of the Board of Directors of the High Plains Underground Water Conservation District have been honored recently in Lubbock for outstanding personal contributions to the High Plains' area of Texas by the South Plains Shrine Club. Each was presented a plaque.

W. O. Fortenberry, Lubbock, long active in the cotton industry and in underground water conservation work, was praised for having worked unselfishly in these fields for "the good of West Texas."

Willis Hawkins, Hart, was cited for his personal contributions to the area when he took the lead to retain cotton allotment acreage in West Texas that was to be moved to East Texas. He filed a law suit against the Agricultural, Stabilization and Conservation Committee challenging their right to make such an acreage change. He won the case and several thousand acres of cotton were retained in West Texas that would have otherwise been lost by our area farmers.

Two more deserving men could not have been so honored.

PLEASE CLOSE THOSE ABANDONED WELLS!

WASTE OF IRRIGATION WATER DISCUSSED AT COUNTY MEETINGS

The High Plains Water District has been conducting meetings in various counties within the District. The purpose of such meetings is to talk with community leaders and County Committeemen about the problems of irrigation water waste. Tom McFarland, Manager of the Water District, is shown as he expresses before three different county groups the concern of the District's Board of Directors in such problems. Jesse Osborn, State Representative from Muleshoe, attended the meeting in Parmer County, group shown at left, where he expressed the opinion that continued waste of irrigation water by some southern High Plains' farmers is jeopardizing efforts in the legislature to maintain private ownership of underground water in Texas.

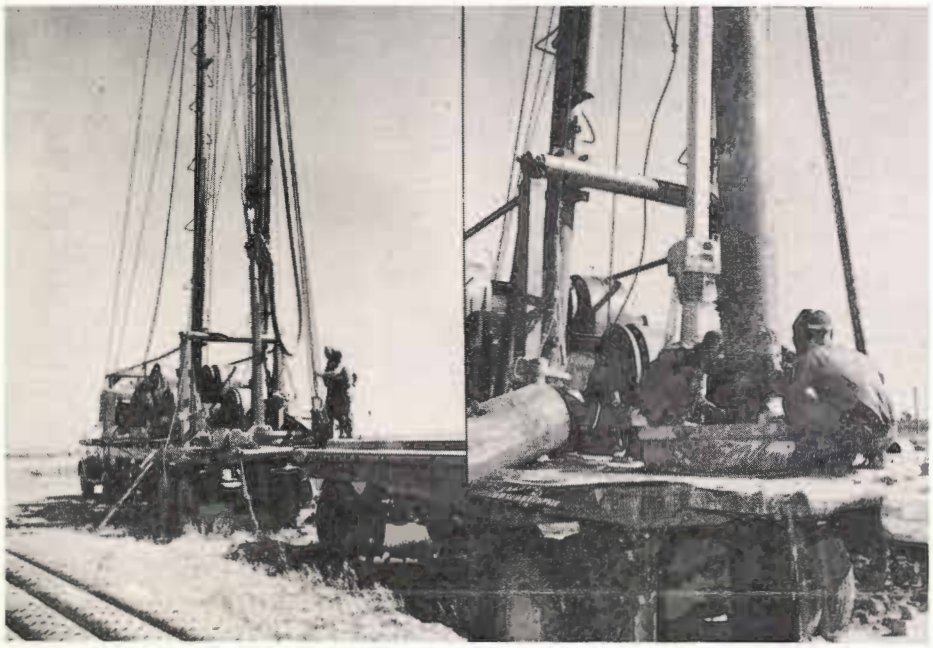
DISTRICT INSTALLS NEW EXPERIMENTAL RECHARGE WELL, FILTER SYSTEM

Rainfall runoff that collects in wet-weather lakes is the only known economic source of surface water for use in replenishing the ground water supply in the southern High Plains of Texas.

Attempts have been made for many years by the High Plains Underground Water Conservation District, and others, to reclaim a part of this runoff water by draining it through wells into the fresh water-bearing underground formation. These attempts have been only partly successful. Complete success has been deterred primarily due to clogging of the water-bearing sands.

In 1953 the High Plains Water District drilled a recharge well at the edge of a wet-weather lake located near the Allmon Gin in southwest Floyd County. When recharging was commenced, the underground formation almost immediately became clogged. Clogging results as the lake water, laden with suspended solid particles of silt and clay, drains through the well into the underground formation. The formation acts as a filter and extracts the solids from the lake water. When a sufficient quantity of particles have been filtered from the water to overburden the adjacent formation the recharge well will cease to function. This is what happened to the experimental well.

In an attempt to overcome the problem of clogging, it was suggested that perhaps an irrigation pump should be installed in the recharge well and pumped at intervals to recover the particles causing the clogging. This was done and it helped to prolong the useful life of the recharge well.



The drilling of the new recharge well in Floyd County is shown at left. The well was completed October 25, 1960. In the foreground note the shutter screen casing used in the water-bearing section of the well. At right, welders position on the well casing a packer made from an old automotive tire. The packer was placed 209 feet below land surface. Cement was poured between the well wall and the steel casing from the packer to the surface. The purpose of the cement is to prevent recharge water from rising in the well outside the casing and thereby causing sloughing of the upper formations.

Shown above is an inflatable "doughnut" ring made of tough neoprene designed to seal off the atmospheric pressure in an irrigation well. By forming a seal, above the recharge inlet, in the annulus between the column pipe and the well casing, a vacuum is created in the well. This allows recharge water to flow free of entrained air into the water-bearing formation.

Tests have shown, however, that not all the solids drained into the well during recharge can ever be pumped back out that same well. It can, therefore, be assumed that even a well that apparently functions trouble-free will in time become inefficient.

In 1960 the Water District's experimental well failed completely. It would not function either as a recharge well or as a production well even after treating it several times with chemicals. The well was abandoned.

The Water District has recently installed a new combination recharge well and filter system near the site of the original well. This project is an experiment to determine whether the major portion of silt and clay can economically be filtered from the lake water before using it for recharge.

The filter system consists of 500 feet of 16-inch steel shutter-screen type casing laid horizontally in a ditch cut in the lake bed and backfilled with pea-sized gravel.

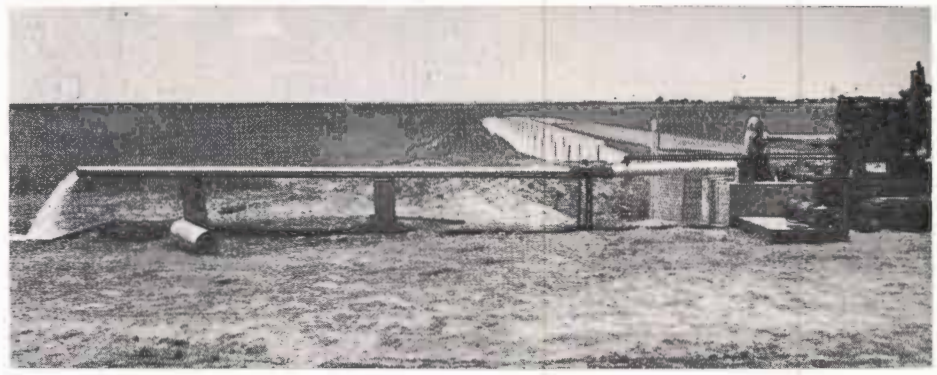
When the lake fills with runoff water, the gravel covered pipeline will be submerged. The lake water will filter through the gravel into the shutter screen and ultimately drain by gravity into the recharge well.

It is anticipated that the experiment will answer the question, "Will the gravel filter extract enough silt and clay from the lake water to add appreciably to the trouble-free life of a recharge well and still allow a sufficient quantity of water for recharge."

A complete and detailed story of the construction of the new recharge well and filtration system will appear in the next edition of "The Cross Section."

A ditch was dug from the recharge well out into the dry lake bed. Sixteen-inch steel shutter-screen type casing was laid in the ditch. The steel pipe was underlain by a 6-inch thick gravel bed.

The completed gravel-filter system is shown above. Pea-sized gravel was used to back-fill the buried perforated pipeline. When rainfall runoff enters the lake it will submerge the pipeline. As the valve is opened to the recharge well the muddy lake water will filter down through the gravel to the pipeline. The filtered water will then move by gravity into the well.



The recently-completed recharge well is drilled to a depth of 435 feet below land surface. An 8-inch turbine-type pump is installed in the well. The well is equipped to produce approximately 900 gallons of water per minute. In the picture, the well is shown being pumped during a recent performance test.

NEWTONS OF ANTON RECIRCULATE IRRIGATION 'TAILWATER'

By ALLAN H. WHITE, JR.

Many elaborate systems used for the recirculation of irrigation "tailwater" are in operation throughout the southern High Plains' area. These elaborate systems are fairly expensive; consequently, they necessarily are installed to take care of irrigation runoff from large tracts of land.

Some irrigators who have minor irrigation "tailwater" problems or who have small tracts of land from which "tailwater" escapes, are wondering whether or not they can afford such investments.

Madison and M. B. Newton farm one mile east of Anton in Hockley County. They have one small tract that is separate and apart from their main farm. It consists of 80 acres of land. On this 80-acre tract is planted 40 acres of onions, 20 acres of cotton and 20 acres of grain sorghum.

In the past, the Newtons allowed "tailwater" from this land to run into the road bar-ditches and meander some distance to a dry lake bed. Thus the "tailwater" that left the farm unused produced no income, nor was it beneficial to anyone.

Because of the initiative of the Newtons, today this situation is changed. No "tailwater" leaves the small farm, it is recirculated and used in the production of crops. This change, of waste to conservation, came about when the Newtons installed a relatively inexpensive recirculating system for their "tailwater."

They installed a pump-back unit consisting of a 3-inch centrifugal pump and 1600 feet of 6-inch aluminum pipe. The pump is powered by a small general-purpose farm tractor.

The Newton's have one good 8-inch irrigation well on their 80-acre tract. Note the flow-meter installed on the discharge pipe of the pump. The meter records the amount of well water produced for irrigation.

The system is portable and, consequently, can be moved from one field to another. It was, however, primarily purchased to be used in connection with the irrigation of the onion crop.

The 40 acres of onions are divided into halves, 20 acres at the top and 20 acres at the bottom. An open ditch is cut between the two patches of onions. Irrigation water is piped from a strong 8-inch well along the topside of the upper 20-acre tract down one side to the open ditch that divides the onions. Well water is used to irrigate both 20-acre tracts. "Tailwater" is used only on the bottom 20-acre plot.

M. B. Newton inspects the small "tailwater" pit at the low corner of the farm. After irrigation water reaches the end of the field, it comes to this corner where it is picked up by the centrifugal pump shown in the foreground and sent through the 6-inch aluminum pipe to an open ditch one-fourth mile up the field. There it commences its journey back down the crop rows.

The Newtons utilize a high border to stop the irrigation water as it runs out the end of the crop rows. No large sump is used with this system, only a small pit at the low end of the border where the suction pipe of the pump is located. "Tailwater" is pumped from the small pit through the 6-inch surface pipe a quarter-mile to the open ditch that divides the two onion tracts. From there is commences its trek back down the thirsty crop rows.

The general-purpose farm tractor shown furnishes power for the 3-inch centrifugal pump. The small pump is completely portable and can be moved anywhere on the Newton's farmland.

To make calculations of the quantity of "tailwater" actually being reclaimed from the small tract, flow meters were placed on the discharge pipe of the irrigation well and on the aluminum pipeline that carries the "tailwater" from the bottom of the field back to the open ditch.

During one recent irrigation, the Newtons kept records. Their findings: The deep well was started and the top 20 acres of onions were watered in 43 hours. The well produced approximately 850 gallons of water per minute. Before the entire 20 acres were irrigated, "tailwater" commenced to pour from the bottom of the field into the open ditch. Syphon tubes were set and "tailwater" from the top 20 acres was thus placed on the bottom 20 acres. When the top 20 acres were irrigated, the well water was then piped to the open ditch and used with the "tailwater" on the bottom 20 acres. To complete irrigation of the lower 20 acres of onions, water from the well was used for only 13.5 hours.

The bottom 20 acre received as near as possible the same amount of water as did the top 20 acres. By utilizing "tailwater" on the lower 20 acres, a savings of 29.5 hours of irrigation time was effected. The flow meter attached to the return system indicated that approximately 300 gallons of water per minute was pumped during the time the recirculating system was used.

About .34 foot of water per acre was applied to the top 20 acres of onions. This water was entirely from the deep well. The bottom 20 acres of onions received .11 foot of well water per acre and .23 foot per acre came from the utilization of "tailwater." The "tailwater" system thus saved a total of 4.6 acre-feet which is equal to 30 percent of the ground water pumped; or, if the water were valued at a conservative $50 per acre-foot, a monetary saving of $225.

As a fertilizer side-dressing to the onion crop, the Newtons applied ammonium nitrate directly in the irrigation water. In the past when the "tailwater" was lost to the bar-ditches and dry lake bed, the fertilizer contained in the water also was lost. Now it is utilized on the crop. This is another savings that cannot readily be figured but nevertheless is a reality.

The cost of the small centrifugal pump was $450. The cost of the 1600 feet of 6-inch aluminum pipe was $1600. The complete system totaled $2050.

Using the $50 per acre-foot value for water, five irrigations each year would pay for the entire pump-back system in less than two irrigation seasons. Most any banker in the southern High Plains' area, or for that matter in the nation, would tell any potential investor that to realize a 50 percent return annually on an investment is almost unheard of. Under these circumstances, most bankers would be real happy to loan money on a unit similar to the one installed by the Newtons.

Neighbor J. W. Hobgood joins Madison and M. B. Newton as they observe "tailwater" pouring into the open ditch. Note, at left, well water also entering the ditch. The amount of "tailwater" is metered as it passes into the last joint of aluminum pipe.

THE Cross SECTION

A MONTHLY PUBLICATION OF THE HIGH PLAINS UNDERGROUND WATER CONSERVATION DISTRICT NO. 1

Published monthly by the High Plains Underground Water Conservation District No. 1
1628 15th Street, Lubbock, Texas

Telephone PO2-8088

ALLAN WHITE
Editor

INSIGNIA PLACED ON DISTRICT'S CARS

Cars and pickup trucks owned by the High Plains Water District have a new insignia painted on their doors. It's blue and white—you'll like it.

Frank Gray Receives Hoblitzelle Award

J. Frank Gray, Lubbock County farmer, has received the 1961 Hoblitzelle Award for the Advancement of Texas Rural Life, senior division.

The presentation was made last month as a highlight of the annual field day at the Texas Research Foundation at Renner near Dallas. Gray received a $5,000 cash award, an inscribed gold medallion, and a certificate.

Gray has 2,100 acres under intensive cultivation on the southeastern edge of Lubbock. His principal source of irrigation water is sewage effluent from the City of Lubbock, and one of his major contributions is his efficient use of such water in his farming operations. His farm is recognized and used as a show place and work shop for students, farmers and agricultural workers.

Wayne Wyatt Joins Water District Staff

Wayne Wyatt, Lubbock, has recently been employed by the High Plains Underground Water Conservation District as a field representative. He will work out of the District office in Lubbock.

Mr. Wyatt worked for the District on a previous occasion. At that time, he was stationed at the field office in Hereford.

Mr. Wyatt is well known throughout the Water District area. He was raised in Girard, a small community near Spur. He completed his high school education at Girard and attended Texas Technological College in Lubbock. He and his wife, Beth, have one small daughter named Liesa. Beth teaches in the Lubbock public schools. The family resides at 1915 East First Street in Lubbock.

National Stubble Mulch Contest – July 26-28

The first National Stubble Mulch Contest will be held in Wichita Falls, Texas on July 26-28. The purpose of this contest is to stimulate interest in the conservation practice of stubble mulch.

It has long been proven that stubble mulching conserves soil and water and improves soil condition. It is our belief that a conservation farmer cannot afford to overlook stubble mulch and other residue management practices.

The National Stubble Mulch Contest is sponsored by Radio Station KWFT, Wilbarger-Wichita and surrounding Soil Conservation Districts, Wichita Falls Chamber of Commerce. Implement Dealers, Texas Agricultural Extension Service, Soil Conservation Service and other local and state organizations.

The contest is open to anyone 18 years of age by January 21, 1961, that owns, operates, or resides on a farm and whose principle income is from farming.

Further information concerning this contest can be secured from the County Agricultural Agents in Texas and the State Extension Conservationists in all other states.

EDITOR
THE CROSS SECTION
1628 15th Street
Lubbock, Texas
Dear Sir:

I do not now receive THE CROSS SECTION but would like to have it sent to me each month, free of charge, at the address given below.

Name _____
Street Address _____
City and State _____

(Please cut out and mail to our address)

WELL DRILLING STATISTICS FOR MAY

During the month of May, 82 new wells were drilled within the bounds of the High Plains Water District; 20 replacement wells were drilled; and 7 wells were drilled that were either dry or non-productive for other reasons. The County Committees issued 99 new drilling permits.

County	*Permits Issued*	*New Wells Drilled*	*Replacement Wells*	*Dry Holes Drilled*
Armstrong	0	0	0	0
Bailey	5	3	2	1
Castro	21	12	2	0
Cochran	5	3	0	1
Deaf Smith	13	9	3	0
Floyd	6	2	3	0
Hockley	8	12	0	1
Lamb	16	8	2	0
Lubbock	10	21	2	3
Lynn	1	10	0	0
Parmer	11	2	6	0
Potter	0	0	0	0
Randall	3	0	0	1
Totals	99	82	20	7

High Plains Underground Water
Conservation District No. 1
1628 Fifteenth Street
Lubbock, Texas

Second Class Permit

THE Cross SECTION

A Monthly Publication of the High Plains Underground Water Conservation District No. 1

Volume 8—No. 2 "THERE IS NO SUBSTITUTE FOR WATER" *July 1961*

During 1960 there were approximately 45,000 irrigation wells in the High Plains of Texas. These wells furnished underground water with which some 5,000,000 acres of farmland were irrigated.

The High Plains' area produces about one-third of the world's total grain sorghum used for feed, about one-sixth of the nation's cotton and enjoys one of the highest standards of living in the world.

Two of our greatest assets, of course, are an abundance of good fertile soil and good quality underground water. In order to make these assets pay dividends, we have purchased the best of equipment with which to work the soil. As an area, we excel when it comes to efficient distribution and use of underground water.

Do we then have no problems, no further progress to make in the field of irrigated agriculture?

We have many problems, among them one big problem that especially looms forcefully in our path. We are using up our accumulated deposit of underground water at a much more rapid rate than the rate at which we receive natural replenishment to the deposit. This is not so much a result of misuse of irrigation water as it is due to the physical fact that we receive practically no natural replenishment to the fresh-water yielding underground reservoir. Almost any amount of extraction by pumps would constitute an overdraft.

Is there then an answer to this problem other than the obvious one —that of shutting down the thousands of wells?

Probably not one answer complete within itself, but assuredly there are partial answers.

First, we need to make every drop of rainfall do its job of creating income. Too much rain water runs off the farmland into the lakes where it eventually is mostly lost to evaporation. With better soil management, a greater percent of the precipitation we receive can be utilized where it falls.

Second, we need to minimize waste of irrigation water. Not only are we faced with obvious waste where irrigation water escapes the farmland into highway bar-ditches, but we also are confronted with the need for improved efficiency of irrigation water applied in the field. We need to make actual determinations as to the need of the crop for water. The fact that our neighbor has commenced to irrigate is not within itself justification for us to commence watering our fields.

Third, with an accelerated emphasis on basic agricultural research we can make more money with the water we pump. Basic research can develop new and better strains of cotton and grain sorghum plants. Plants are needed that do not transpire such a large percent of the moisture taken from the soil, but rather utilizes it in the production of lint or grain.

These are just a few of the things that can and should be done to assure that our area continues for many years to lead in the production of irrigated agricultural crops.

Few industries generate wealth for the community as does irrigated agriculture. We are all dependent upon irrigated agriculture; consequently, we should all do our share to see that it has every opportunity to progress in these rapidly changing times.

* * * * *

Governor Price Daniel, in his call for the special session, has given the State Legislature the green light to introduce any and all water bills, even those of a local nature.

Already two major water bills have been introduced in the House. H.B. 24, which would create a new state agency to control water pollution in Texas, is sponsored by Representatives Cory of Victoria, Glusing of Kingsville and Buchanan of Dumas. A yet-to-be-numbered bill, sponsored by Representative Spears of San Antonio, has also been introduced. It would re-organize the State Board of Water Engineers and change its name to the "Texas Water Commission."

* * * * *

Many irrigators in the southern High Plains are presently watering grain sorghum. If dry weather continues for the next few weeks, most others will soon start their wells.

When crop irrigation gets into full swing, it is almost certain to result in at least some waste.

The High Plains Water District would like to again point out, as its done many times in the past, that for an irrigator to allow "tailwater" to escape from his land into bar-ditches is a violation of the rules of the District.

But must the Water District be placed in a position of trying to force an individual to do what he already knows full well he should do?

Texas is the only state we know anything about that has private ownership of underground water. This fact doesn't seem to be of major interest to most people; however, if some thought were devoted to the analysis of this unique doctrine it would then most certainly take on a greater significance.

In this day when we have occasion to observe first hand more and more individual rights slipping from our grasp and governmental entities assuming a greater influence in nearly every field of endeavor, we here in the High Plains of Texas should do all within our power to individually remedy "tailwater" waste problems on our farms.

The right to individually own underground water in Texas can be retained only if individuals use their water wisely and without waste.

Texas Agricultural Extension Service Compiles High Plains Irrigation Survey

The June 1961 edition of the High Plains Irrigation Survey, compiled by D. W. Sherrill, has recently been published by the Texas Agricultural Extension Service. Mr. Sherrill is the Area Irrigation Specialist for the Extension Service stationed in Lubbock.

The survey is a compilation of estimates made by County Agricultural Agents in 42 High Plains counties of Texas.

According to the survey, there are fewer irrigation wells this year in the area than there were a year ago. This is explained to have resulted because of revisions downward of the total number of wells in certain counties.

The new survey snows a total of 47,502 irrigation wells in the 42-county area.

During the past year, there has been an additional 715 miles of underground irrigation pipe installed in the High Plains, bringing the total to 8,232 miles.

According to the irrigation survey, the total number of acres of land under irrigation increased by only 1,656 acres. The additional acreage increased the total to 4,888,509 acres.

Shown below is a table that presents figures from the irrigation survey for the thirteen counties within the High Plains Water District.

County	No. Irrigation Wells	Total Acres Irrigated	No. Recharge Wells	Miles of Underground Pipe	Acres Irrigated				
					Cotton	Grain Sorghum	Wheat	Vegetables	Others
Armstrong	165	19,912		35	512	12,300	6,000		900
Bailey	1,670	160,000		210	85,000	60,000	8,000	1,900	11,100
Castro	2,700	480,500	5	520	59,000	130,225	80,000	3,750	56,100
Cochran	1,180	116,213	1	210	65,000	35,000	4,000	413	11,800
Deaf Smith	2,300	365,000		350	11,632	110,000	80,000	15,800	147,568
Floyd	2,733	305,500	29	397	87,663	127,605	42,000	965	46,267
Hockley	4,750	250,000	5	510	175,000	50,000	450	350	6,570
Lamb	5,129	360,000	8	1,098	159,000	110,000	4,000	375	87,175
Lubbock	5,410	330,000	15	1,380	200,000	114,875	1,500	875	12,750
Lynn	1,525	80,000	8	150	75,000	3,000		100	1,900
Parmer	2,460	415,000	5	700	49,356	166,000	85,000	1,950	35,140
Potter	34	13,250		15	40	6,500	5,000		580
Randall	775	77,400		70	1,600	45,000	22,000		7,700
Totals	30,831	2,972,775*	76	5,645	968,803	970,505	337,950	26,478	425,550

*Difference in acres irrigated and total acres of various crops irrigated accounted for by soil bank acreage.

Well Drilling Statistics For June

During the month of June, 64 new wells were drilled within the bounds of the High Plains Water District; 19 replacement wells were drilled; and 7 wells were drilled that were either dry or non-productive for other reasons. The County Committees issued 63 new drilling permits.

County	*Permits Issued*	*New Wells Drilled*	*Replacement Wells*	*Dry Holes Drilled*
Armstrong	0	0	0	0
Bailey	3	4	2	1
Castro	16	9	4	0
Cochran	6	9	0	0
Deaf Smith	16	6	7	1
Floyd	4	4	0	1
Hockley	5	10	0	1
Lamb	4	5	2	2
Lubbock	3	10	0	0
Lynn	3	1	0	0
Parmer	1	3	3	0
Potter	0	1	0	0
Randall	2	2	1	1
Totals	63	64	19	7

GRAVEL-FILTER SYSTEM AND NEW RECHARGE WELL COMPLETED I

By BRUCE E. FINK and DONALD L. REDDELL

A declining water-table is one of the more serious problems facing the economy of the High Plains of Texas. In an effort to prolong the supply of fresh water in this area, the High Plains Underground Water Conservation District has for several years conducted an experimental artificial recharge program. This program has consisted of draining rainfall runoff that collects in wet-weather lakes into the underground aquifer through wells.

The High Plains Water District drilled an experimental recharge well October 25, 1960. The new well is located near the Allmon Gin, five miles east of Petersburg, Texas, on the H. Schultzer Homestead, Abstract 983 in Floyd County. This well replaces a recharge well drilled by the District in 1953. Due to siltation and a sand cave in, the older well was lost during the summer of 1960.

The new recharge well, a 19-inch hole, was drilled to a depth of 435 feet. "Redbed" of Triassic age was encountered at 433 feet. Layers of fine-grained sand were logged from 185 feet to 195 feet and from 265 feet to 275 feet. The principal water-bearing zone was logged from 325 feet to 433 feet. It is composed of 85 feet of large-grained quartz sand grading into white and brown pea-sized quartz pebbles and 23 feet of conglomerate made up of sand, quartz, chert and limestone pebbles.

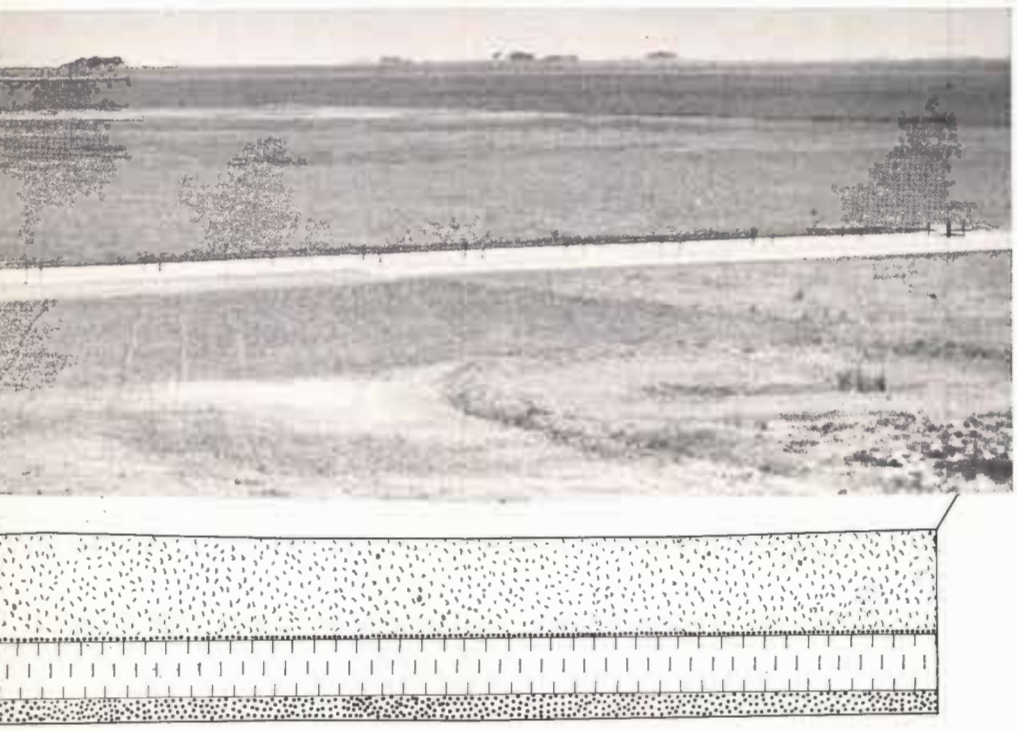
When the drilling was completed, 192 feet of 16-inch steel shutter screen was set at the bottom of the hole and 246 feet of blank 15-inch steel casing set from the shutter screen to the land surface. (The shutter screen and blank casing were furnished free of charge by Green Machinery Company, and Pioneer Natural Gas Company, respectively.) The casing was cemented in the well from a depth of 209 feet to land surface. The purpose of cementing the casing in the hole is to prevent recharge water from rising outside the casing and causing sloughing of the upper formations.

Packers to hold the cement in place until it hardened were made from an automobile tire. The tire was split down the middle of the tread to form two packers which were slipped over the 15-inch well casing. One was placed around the casing at a depth of 229 feet and the other at 209 feet. The packers were positioned on the casing with the concave side up, and they were held in place by cleats welded to the casing. The lower packer served only as a safety precaution. If the top packer failed to hold the cement,

Figure 1 An inflatable "doughnut" seal was installed between the pump's column pipe and the well casing to prevent air from entering the well and becoming entrapped in the water-bearing formation.

Figure 2 Maintainer prepares a channel in the bottom of the wet-weather lake. The channel is the lowest part of the lake; consequently all water drains toward it.

BY HIGH PLAINS UNDERGROUND WATER CONSERVATION DISTRICT



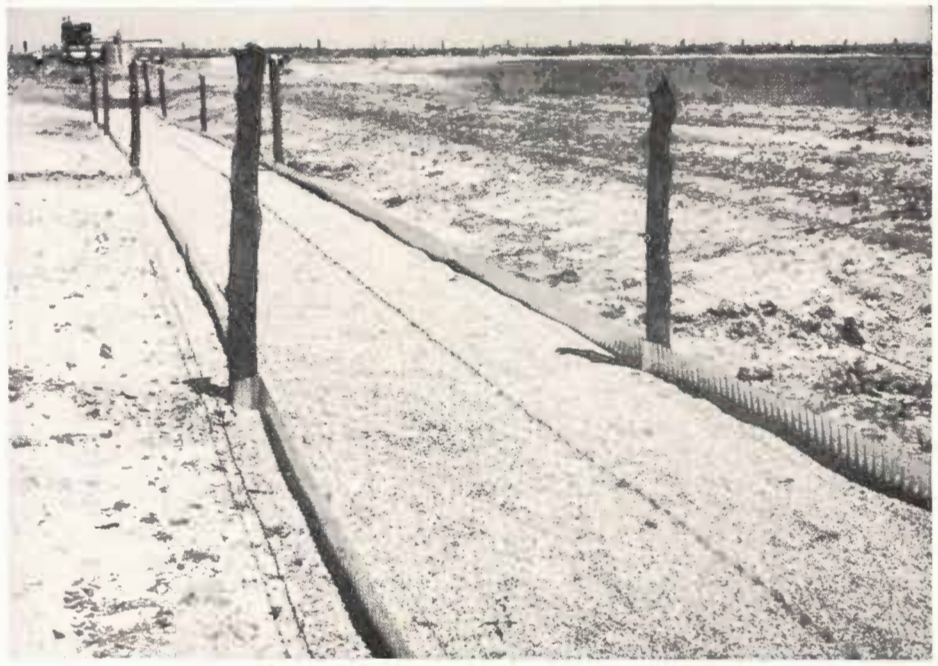


Figure 5 A layer of pea gravel about 30 inches thick, was placed in the trench from just above the shutter screen to ground surface. The pea gravel is designed to filter the lake water.

Figure 3 A trench, 600 feet long, was dug in the bottom of the channel. Fifteen-inch steel shutter screen, 504 feet long, was laid in the trench on a 6-inch layer of gravel.

Figure 4 To prevent overlying pea gravel from passing through the openings in the shutter screen, larger-sized gravel was used to form an envelope around the pipe.

Figure 6 Shown above, left to right, is an air vent, a 12-inch valve extension and a 60-inch steel culvert. The culvert affords an access to a meter and an 8-inch valve.

the second would prevent the cement from falling on down the well and sealing off the aquifer.

A standard turbine-type irrigation pump was set in the well. It consists of 376 feet of 8-inch column pipe, an 8-stage number 10 bowl assembly and 30 feet of suction pipe. The total length of the pump to the bottom of the suction pipe is 414 feet. On June 12, 1961, the static water level in the well was 128 feet below land surface.

A specially adapted inflatable "doughnut" seal of tough neoprene was placed around the column pipe above the recharge intake which is located 11 feet below land surface. (See Fig. 1.) The "doughnut" can be inflated from the surface to form a seal between the column pipe and the well casing. The seal prevents air from entering the well, thereby allowing the cascading recharge water to create a vacuum as it enters the well. The ultimate purpose of the "doughnut" seal is to prevent air from becoming entrapped in the formation and subsequently reducing the recharge-intake rate; and also to prevent air-locking of the pump during periods of pump operation.

Two copper lines are extended down the well between the casing and the column pipe. One line is an air line connected at the surface to a water-level gage and extending 210 feet into the well. The purpose of this line is to determine the water level in the well. The other line is a vacuum line connected at the surface to a vacuum gage and extending a few inches below the inflatable seal. The purpose of the vacuum line is to determine the amount of vacuum being formed in the well during recharge operations.

In the past, recharge experiments of the High Plains Water District have proven to be largely unsuccessful; mainly, because the sediments in the lake water being recharged have caused clogging of the underground formation. Clogging occurs because the underground formation acts as a filter and extracts the sediments from the lake water during recharge. When a sufficient quantity of these sediments have been filtered, the under-

(Continued on Page 4)

THE Cross SECTION

A MONTHLY PUBLICATION OF THE HIGH PLAINS UNDERGROUND WATER CONSERVATION DISTRICT NO. 1

Published monthly by the High Plains Underground Water Conservation District No. 1
1628 15th Street, Lubbock, Texas

Telephone PO2-8088

ALLAN WHITE
Editor

Recharge-Filter System

(Continued from Page 3)

ground formation becomes clogged and will cease to take water.

The results of studies made during the past few years have shown that a 1-hour pumping cycle, after recharging for 23 hours, is an inadequate method of removing the filtered lake sediments from the underground formation. Tests indicate that about 75 percent, or more, of the lake sediments of silt size (0.5-0.005 mm. in diameter) entering a well during a 23-hour recharge period can be removed during a 1-hour pumping cycle immediately following the recharge period; whereas, only about 7 percent of the lake sediments of clay size (smaller than 0.005 mm. in diameter) can be removed during this same pumping period. These tests further indicated that the quantity of clay-sized sediments entering a well represents the largest proportion of the total sediments entering a well, Over a period of time, these clay-sized sediments, if not removed, will clog the formation sufficiently to prevent pumping or recharging.

Because only a small portion of the clay-sized sediments can be recovered during the pumping cycle, studies are being made to attempt to clarify the lake water prior to recharge. Past tests have indicated that the use of chemical flocculating agents is at present an inadequate method of clarifying the lake water. However, some encouraging results have been reported by personnel at Texas Technological College in Lubbock after various filters were used to filter lake water.

To determine the effectiveness of a gravel filter, an experiment at Texas Tech was sponsored during the spring of 1961 by the High Plains Water District. The experiment was conducted by D. B. Underwood and Delbert Lee Smith, Agricultural Engineering students at the college. The results of this experiment indicated that a layer of pea gravel, 30 inches deep, effectively filtered the lake water when the amount of lake water filtered did not exceed half a gallon per minute per square foot of filter surface area. This simply means that the filter should be 500 feet long by 2.5 feet wide by 2.5 feet deep to supply 625 gallons per minute of relatively-clear water.

Using the above results as a guide, a gravel-filtering system was designed and constructed in May 1961 at the new recharge well site.

To effectively drain water from all parts of the lake, a channel 510 feet long, 10 feet wide and approximately one foot deep was cut into the lake bottom as shown in figure 2.

A trench 30 inches wide and approximately 54 inches deep was dug in the bottom of the channel. The trench was cut with a grade toward the well of 0.1 foot per 100 feet. Thirty yards of gravel, approximately one inch in diameter, was placed in the bottom of the trench to a depth of 6 inches. A 15-inch steel shutter screen, 504 feet long, was placed horizontally on top of the 6-inch layer of gravel as shown in figure 3. Forty-two yards of similar gravel was placed in the trench, as shown in figure 4, to form a gravel envelope around the shutter screen. The purpose of this envelope is to prevent smaller pea gravel from passing through the openings of the shutter screen.

Pea gravel (1/16 inch to 1/4 inch in diameter) will actually do the filtering of the lake water. A layer of this gravel, about 30 inches thick, was placed in the trench from just above the shutter screen to ground surface. This 30-inch layer required 156 yards of pea gravel. The finished filter can be seen in figure 5.

To convey the filtered water from the filter to the well, 75 feet of 12-inch concrete pipe and 25 feet of 8-inch steel pipe were installed. A vent was installed in the concrete pipe to release entrained air from the pipeline. The discharge pipe of the pump can also be connected to the vent for the purpose of forcing well water backward through the filter, thus washing the gravel when it becomes clogged with lake-water sediments. The vent also has a third function. Through the vent, samples of filtered water will be obtained by using a hand pump constructed to lift water from the center of the concrete pipe to the surface. Lastly, the amount of head lost by the water passing through the gravel filter can be measured by subtracting the elevation of the water surface in the vent from the water surface in the lake.

At a distance of about 25 feet from the well, the 12-inch concrete pipe was reduced to an 8-inch steel pipe. An 8-inch low pressure flow-meter was placed in the 8-inch steel pipe to record the rate and amount of water recharged. A 12-inch gate valve was placed in the concrete pipe between the vent and the meter so that the water can be shut off if meter repairs become necessary. An 8-inch gate valve was placed in the steel pipe between the meter and the recharge well to control the amount of water flowing into the well. The 8-inch valve will also be used as a choke to maintain a full pipe of water at the meter, thus increasing its accuracy. A 60-inch diameter steel culvert, 16 feet long, was installed around the 8-inch valve and 8-inch meter to provide an access to the meter and valve from the ground surface. The steel culvert, extension for the 12-inch valve, and vent can be seen in figure 6.

The total cost of constructing this recharge-filtering system, exclusive of the well, was $3,415.32. The total cost is broken down into individual items in table 1.

In closing, the authors would like to re-emphasize that the gravel filter, as described above, is an experiment and has not yet been proven as a method of clarifying lake water. The High Plains Water District will release the results of this experiment as they become available.

TABLE 1

Cost of installing the gravel filtering system, exclusive of the well cost.

Item	Cost
14 hours of dirt work with maintainers	$140.00
11½ hours dirt work with a dozer	115.00
Cutting a trench 600 ft. long	60.00
504 ft. of shutter screen	1008.00
228 yards of gravel	852.72
Construction of fence around filter	47.15
78 ft. of 12-in. concrete pipe	74.10
Concrete vent, vent starter, steel to concrete adapter, flange and gasket, labor and mileage to install concrete pipe	134.00
21 ft. of used 8-in. pipe	26.25
14 ft. of used 6-in. pipe	12.60
1 used 8-in. gate valve	35.00
1 new 12-in. hub-end gate valve	135.00
1 new 8-in. flow meter	265.00
1 new 60-in. by 16 ft. culvert	151.84
3 new 8⅝-in. Dresser couplings	36.00
Welding and installing steel pipe	20.00
Hand labor during installation of filter	160.00
Installation of hand pump to draw water samples	25.66
1 14-ft. ladder	12.00
1 Inflatable well seal	105.00
GRAND TOTAL	$3415.32

High Plains Underground Water
Conservation District No. 1
1628 Fifteenth Street
Lubbock, Texas

Second Class Permit

THE Cross SECTION

A Monthly Publication of the High Plains Underground Water Conservation District No. 1

Volume 8—No. 3 "THERE IS NO SUBSTITUTE FOR WATER" *August 1961*

Pump Scalps Girl In Deaf Smith County Mishap

By Allan H. White, Jr.

Little Gloria Contreras awaited her turn to drink from the discharge pipe of the irrigation well. When her time finally came she bent over and put her head below the pump's whirling drive shaft to drink of the cool water. After the hot day in a Deaf Smith County potato field where her father was helping with the harvest, the water tasted so refreshing.

Then it happened. Gloria's beautiful black hair was blown by a gentle summer breeze into the spinning drive shaft. Instantaneously she was scalped.

In feverish desperation to get the 10-year old third grader to a doctor, the group forgot to remove the scalp from the drive shaft. Upon reaching Hereford, approximately fifteen miles to the southeast, the attending physician sent Gloria's father, Juan, back for it. If it could be recovered in a short time there was an outside chance that it might successfully be replaced.

However, because of the thirty-odd miles to make the round trip to the well and back and the added hindrance of darkness, too much time passed and the scalp could not be saved.

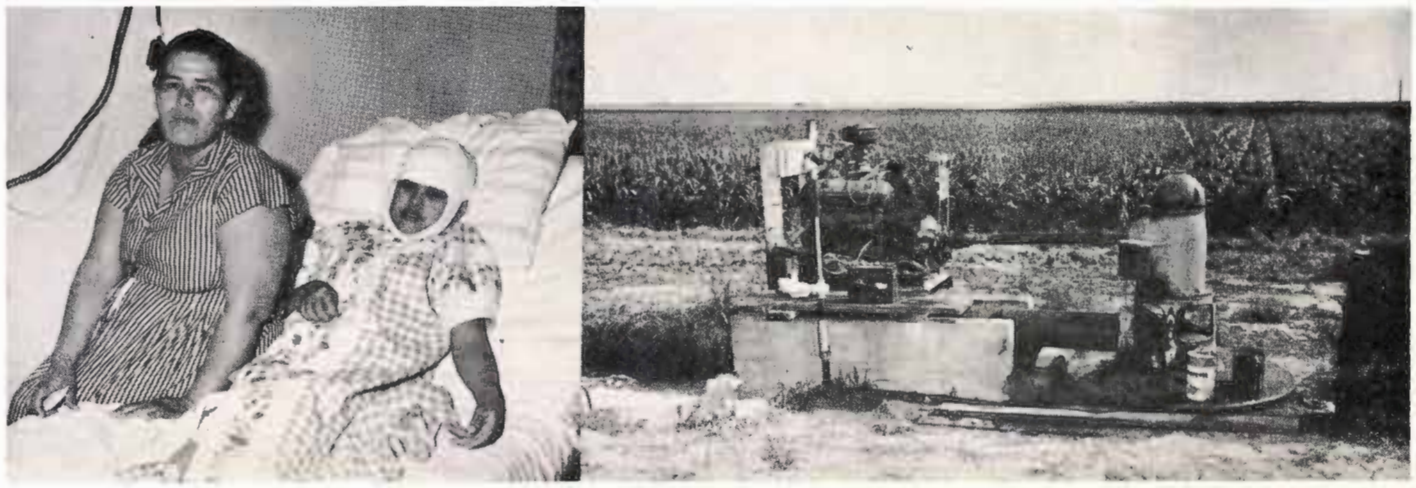
According to Gloria's physician, Dr. L. A. Beyer of Hereford, about 40 percent of the scalp was severed and skin transplants from other parts of Gloria's body will be necessary to properly cover her skull.

To make the story even more heart breaking, this terrible accident could have perhaps been prevented. If a guard had been placed around the drive shaft of the pump the little girl's hair would probably not have become entangled.

If the owner of every well in this area with an exposed drive shaft could have stood with the writer in the Deaf Smith County Hospital and talked with little Gloria and seen the terribly large bandage that covered her head, and looked into the eyes of the weary mother who had left the hospital only momentarily during the weeks following the never-to-be-forgotten evening of August 8, there would not be a single drive shaft uncovered today in the High Plains of Texas. The price for allowing a drive shaft to remain exposed is too high.

Many irrigators will not have an opportunity to read this report on Gloria Contreras; will you appoint yourself a spokesman of one and tell your neighbor and friends about her accident.

You can also suggest that exposed pump drive shafts be covered.



Gloria Contreras, 10-year-old daughter of Mr. and Mrs. Juan Contreras, is shown with her mother in the Deaf Smith County Hospital. On August 8 she was robbed of 40 percent of her scalp by the whirling drive shaft of an irrigation pump located about fifteen miles northwest of Hereford. The third-grader's long hair became entangled in the drive shaft as she was drinking from the well. At right is the irrigation pump involved in the accident

Open House—Sept. 19 At Lubbock Station

The Texas Agricultural Experiment Station Sub-Station No. 8 at Lubbock, will have a field day and dedication ceremonies September 19 at its new quarters, north of the municipal airport on Highway 87.

According to Charles Fisher, Superintendent of the station, everyone's invited to attend. The open house will begin at 1:00 p.m. with tours of the facilities and field work.

Following the tours, a barbecue supper will be served and at about 5:30 p.m. the dedication ceremonies will commence.

"WATER FOR TEXAS" CONFERENCE TO BE HELD SEPT. 6 THRU 8

The seventh annual "Water For Texas" conference will be held on the Texas A & M College campus at College Station, Texas, September 6-8. The 1961 conference theme is: Water-Technical, Conservation, Reclamation and Economic Projections.

The program is to get under way in the Memorial Student Center at 9:00 o'clock Thursday morning, September 7, and will conclude at noon the following day.

Among the speakers who will present papers at the water conclave is W. L. (Bill) Broadhurst, Chief Hydrologist for the High Plains Underground Water Conservation District. His talk will be concerned with geological explorations for water.

All interested persons are invited to attend the conference. The registration fee will be $5.00 per person.

Reservations may be made by contacting W. W. Meinke, chairman 1961 Water for Texas Conference, Texas Engineering Experiment Station, College Station, Texas.

BOARD OF WATER ENGINEERS PUBLISH STATE WATER PLAN

A plan for meeting the water requirements of Texas to the year 1980 has been prepared by the State Board of Water Engineers and submitted to the Governor, the Lt. Governor and the Speaker of the House of Representatives.

The plan was prepared to be used as a guide for future orderly and economic development of the water resources of the State.

The 198-page report, prepared under the direction of Chief Engineer John J. Vandertulip, contains numerour tables, figures and maps, all designed to present the potentialities of the various river basins across Texas.

DRILLING STATISTICS FOR JULY 1961

During the month of July, 53 new wells were drilled within the bounds of the High Plains Water District; 10 replacement wells were drilled; and 3 wells were drilled that were either dry or non-productive for other reasons. The County Committees issued 42 new drilling permits.

County	*Permits Issued*	*New Wells Drilled*	*Replacement Wells*	*Dry Holes Drilled*
Armstrong	0	0	0	0
Bailey	7	1	2	0
Castro	1	4	1	0
Cochran	0	2	0	0
Deaf Smith	7	8	2	0
Floyd	8	8	1	0
Hockley	5	5	0	3
Lamb	1	3	2	0
Lubbock	6	12	0	0
Lynn	3	4	0	0
Parmer	3	4	2	0
Potter	0	0	0	0
Randall	1	2	0	0
Totals	42	53	10	3

THE Cross SECTION

A MONTHLY PUBLICATION OF THE HIGH PLAINS UNDERGROUND WATER CONSERVATION DISTRICT NO. 1

Published monthly by the High Plains Underground Water Conservation District No. 1
1628 15th Street, Lubbock, Texas

Telephone PO2-8088

ALLAN WHITE
Editor

"A Primer on Water" – U.S.G.S. Publication

Editor's note—The following is an excerpt from the U. S. Geological Survey booklet, entitled "A Primer on Water". This is the sixth in a continued series.

PART I HYDROLOGY

How Much Water Can Be Obtained From the Ground

It is not everywhere necessary to go to a surface stream to obtain water. Underneath much of the dry ground surface where we walk and live there is a ground-water reservoir from which water may be obtained by drilling a well. This was shown by the dishpan example. The ground-water reservoir might be a supply of water for our use.

From our discussion so far, it seems that no matter where we are a water table can be found at some depth underground. This is indeed the case, but it is not enough to tell us *how much* water can be obtained from the underground reservoir. To imagine the kinds of differences that exist underground, think of different flower pots that you have watered. Some seem to take a whole pitcher before the bulk of the soil becomes saturato the top. Another might quickly become so full that water seeps out of the drain hole in the bottom before even a cupful of water has been applied.

The pore space, cracks, and joints vary in amount and number between different soils in the different flower pots, and also between different rocks in the earth. The amount of water you poured into the flower pot before it ran out the bottom or overflowed is some measure of the pore space available for storing water. If a particular rock into which we drill a well has a great deal of pore space saturated with water, then large amounts of water may be available to the well. But if the rock has only a small amount of pore space, a well may become dry after only a small amount of water is withdrawn. The amount of pore space available is one of two principal factors which determine whether a given rock or soil will be a good source of water for a well. This first factor is called *specific yield,* meaning the quantity of water which a block of such rock will yield from its cracks and pores.

A rock or soil may have many openings that are all filled with water, but if the pores are small or are not connected so that water can flow freely from pore to pore, one may not be able to obtain from the rock the water it contains. Thus, the second factor governing how a rock will act as a source of water is called *permeability;* that is , how readily the pores are able to transmit or allow the water to move. A rock that will be a good source of water must contain many pores (a good specific yield), and the pores must be large and connected so the water can flow (a high permeability).

Wells

The well we knew in the yard of grandfather's farm was probably a dug well. Well diggers, with shovel, mattock, and spud, put down a hole 5 or 6 feet in diameter, lifting out the dirt by means of a bucket on the end of a rope. When the well was deep enough to reach the water table, or an aquifer, the sides of the hole were strengthened with rock or timbers and the well was complete. A pulley was hung over the top or a curb with windlass was built, and buckets were arranged on a rope. When one wanted water he let the bucket down to the water table, it filled, and he pulled it up on the rope.

A drilled well is different only in that the hole is put down by means of a bit, which is churned up and down in the hole. Or a hole may be bored by a drill similar to the one used to bore a hole in a piece of wood. When the hole is drilled, a pipe, called the casing, is put down so that rock or dirt breaking off the sides of the hole will not clog it. When the hole has been drilled some distance below the water table, the drilling is stopped and a water pipe is lowered inside the casing. To the lower end of the pipe is attached a screen, or what is called a well point. This consists of a length of pipe with many perforations which allow water to enter the pipe but exclude sand or dirt. Water is forced up the pipe by means of a motor-driven pump, or a pump driven by a windmill. Most modern wells which supply water for city or irrigation use are equipped with pumps driven by electricity, gasoline, or fuel oil.

It is interesting to visualize what happens in the vicinity of a well when water is pumped. The pump lifts water out of the hole itself, and thus the water level in the hole is quickly lowered below the general surface of the water table. In the immediate vicinity of the well, water from the pores of the aquifer drains into the hole, lowering the water table near the well. The lowered water table near the well then causes water in pores farther from the well to flow toward the zone near the hole. This occurs on all sides of the well so that the water flows downhill toward the low spot in the water table.

Imagine a large inflated balloon into which you press your finger, causing the taunt rubber to stretch smoothly downward from all sides to the tip of your finger. The shape of the depression made by your finger in the balloon surface resembles a cone. This is exactly the shape of the depressed water surface around the well, and the pumping of the well creates a "cone of depression" in the water table.

We have said that the rate of movement of water through a porous material like sand depends on the slope of the water surface. When water is pumped rapidly from the well, the cone of depression is deeper and steeper than when the pumping is slow. Pumping, whatever its rate may be, produces a cone of depression that will be steep enough to supply water at the rate of pumping, providing there is enough water in the ground and that it can move fast enough through the pores of the aquifer.

How Ground Water Reservoirs Are Replenished

Many miles may separate the place where rain seeps into the earth's surface to become ground water from the places where that water might reappear. In a simple situation discussed earlier we showed that water which falls on a hill might enter the ground and flow toward a stream channel nearby and appear as river flow a short distance from the place it fell as rain. It is also possible for water to flow long distances underground before it appears in a surface stream.

There are large areas where the rocks making up the earth's crust occur in distinct layers and these lay-

(Continued on Page 4)

AGRICULTURAL IRRIGATION IN THE STATE OF TEXAS

By JOHN J. VANDERTULIP,
Chief Engineer,
Texas Board of Water Engineers

EDITOR'S NOTE: The following is a paper presented at Dallas in January, 1961 during the annual convention of Soil Conservation District Supervisors.

In September I had an opportunity to participate in a water conference at Texas A & M College and at that time I met with members of the State Soil Conservation Board. Our discussion of present and future water requirements for agricultural purposes led to the invitation to present some thoughts today on the present water uses for irrigation and the potential water use for irrigated agriculture.

As many of you are aware, The Board of Water Engineers has a Planning Division and a planning function with reference to the State's water resources. Our Associate Planning Engineer, Mr. Garner Jones, formerly with the State Soil Conservation Board, has 20 years of soil and water conservation experience. Two of the other planning engineers also have experience in irrigation. Our Board members also are aware of the important uses made of water for irrigation. I mention these items to illustrate that we are aware of the agricultural contribution to the economy of the State and the relationship of water to continued agricultural production.

It almost seems superflurous to say that in order to see where we are going, we have to look back at where we've been. In water planning the "where we've been" is the location and amounts of water used, the sources of these water supplies and the facilities used to obtain them.

I should like to point out that the concept of obtaining historical water use data and estimating future water requirements is not new and is embodied in our Texas Statutes. Legislative recognition of this principle of determining the future water requirements for distinct regional areas of the State's watersheds was given in Senate Bill 93 of the Forty-second Legislature in 1931. This provision was further elaborated upon in the Texas Water Planning Act of 1957. Section 3 (a) of the Planning Act states two of the functions of the Planning Division it creates shall be

to analyze data appropriate for the determination of the development of available surface supplies for meeting present *and* foreseeable *needs*

AND

to make studies of probable additional beneficial use for surface, and underground water.

In keeping with these directives the Board of Water Engineers has several programs of collection of basic data on water uses. These include both surface water and ground water uses.

Many of you are aware of the basic data collection program of the Board of Water Engineers. This includes cooperative studies to obtain information on stream discharges, chemical quality of surface waters and ground waters and ground water hydrology and geology investigations. In addition the Board maintains a network of silt sampling stations at pertinent points throughout the State. Thirty - eight (38) evaporation stations are operated within the State by the Board of Water Engineers in cooperation with agricultural experiment stations and other groups.

In accordance with the program outlined in the Board's December 1958 Planning report to the Legislature reconnaissance studies of ground water resources of each river basin are now underway throughout the State. These reconnaissance studies are being carried out by the Board's Staff Geologists and by the U. S. Geological Survey under cooperative agreements. One phase of these studies is the inventory of wells and pumping for irrigation, together with municipal and industrial pumping.

A comprehensive, cooperative, endeavor to obtain data on irrigation water uses, sources of water, and areas irrigated was undertaken by the Board with the Soil Conservation Service and the State Soil Conservation Board. Data for 8 river basins in this study were obtained by the Soil Conservation Service under an assignment with the U. S. Study Commission-Texas. The results of this study is now available as BWE Bulletin 6018. Agricultural census data are also available for earlier years.

Having had a certain amount of information to work with—lets look at what these sources of information show with respect to irrigation. In 1919, 586,000 acres were irrigated in Texas, of which 541,000 were irrigated from surface water supplies. At that time a little over 92 percent of our irrigation was from surface water sources. In 1929 the total acreage irrigated was 799,000 acres of which about 68,000 acres were supplied with water from underground sources and 731,000 acres from surface water sources. The percentage of the total served by surface water remained about 92 percent. In 1939 the total irrigated acreage in the State was 1,045,000 acres of which 267,000 were irrigated by underground water. This total acreage grew in the next 10 years by over 2,000,000 acres so that in 1949 we had 3,177,000 acres. Again in the next 9 year period, to 1858, the State total increased to 6,738,000 irrigated acres. Your attention is invited not only to the growth of irrigation, but the source of water for this irrigation. In 1919 and in 1929 the irrigated areas supplied from underground water supplies was only 8 percent of the State total. This amount supplied by ground water grew to 25 percent of the total in 1939. In 1949 58 percent of the total and in 1958 80 percent of the total irrigated acreage in the State was supplied from underground water sources.

While the area irrigated acreage has been increasing throughout the State, the irrigated areas served with water from surface water supplies seems to have stabilized. An increase of about 1/2 million acres served by surface water occurred between 1939 and 1949, but has leveled off and in 1958 was slightly less than that 9 years before.

As has been pointed out, the use of surface water for irrigation in the State has not changed appreciably in recent years, although a tremendous increase in irrigation has taken place with the development of ground water supplies. This suggests that Texas farmers will develop irrigation using ground water supplies to meet future agricultural requirements rather than resort to large scale projects using surface water. This is further indicated by noting that with the exception of the Rio Grande Valley, during the last 20 years only two new surface water irrigation projects as large as 10,000 acres have been developed in Texas.

Since ground water has been the primary source of water for recent increases in irrigation in the State, let's examine this briefly—first, large surface water irrigation projects take 5 to 10 years from inception to the time the first water is delivered to the land. Generally a 10 year period of initiation and actual construction would be a fair estimate. If the project was conceived when crops suitable for that area were in demand there is some likelihood that 10 years later other areas of the country may be over-producing that crop. Or, if several crops are to be grown the agricultural economics may have changed in that 10 year period where agriculturalists and farmers may not be particularly enthusiastic about irrigation.

On the other hand, ground water development can take place rather rapidly on a given tract of land providing that water is available to it. Land can be cleared and leveled and the wells drilled and placed in operation in a space of less than a years time.

All of the above developments which have taken place historically indicate that the agricultural groups in the State and particularly our farmers have felt that they can do the job and do it well. This is borne out by the fact that the irrigation development which we have in Texas has taken place largely through individuals irrigating their own land, on an individual rather than a project basis.

In some areas ground water developments have increased to the point that some "prophets of doom" have forecast an almost immediate depletion of ground water supplies and a resulting decrease in the irrigated acreage. Recognition that some water supply problems exists does not necessarily also recognize that a decrease in acreage will occur. Highly developed ground water irrigation areas have organized under ground water districts which have been active and generally successful in developing conservation measures. This is particularly true of the High Plains which is the largest irrigated area in the United States. Reports completed during the summer of 1960 and currently being prepared for publication indicate that irrigation water in the High Plains will be available for many years. This does not mean that they do not have problems with ground water. In the Southern High Plains, which is the area South of the Canadian River, it is estimated that 36,000,000 acre-feet of water had been removed from storage in the period 1938 to 1958. It is further estimated that an additional 161,000,000 acre-feet of water is recoverable by wells from storage in the Southern High Plains area. (This 161,000,000 acre-feet is not the total volume of water in storage—this is the amount which is recoverable). Irrigation use in the High Plains has been taking water out of storage and with the current state of development additional water will be undoubtedly taken from storage. The fact that this underground water area is on a depletion schedule does not necessarily infer that the area will be doomed agriculturally. Local groups have taken the lead in conservation practices which has been most helpful and which will continue to be helpful. The irrigators are making a more efficient use of the ground water they pump by installing under ground pipe and by ditch-lining to reduce transmission losses. Additionally, there has been the use of recharge wells in many areas to place playa lake water into the underground reservoir so that it can be stored for future use. This increased use of playa lake water after rains has the effect of keeping water in the ground and not evaporating it.

The October 1960 issue of *The Cross Section,* a monthly publication of the High Plains Underground Water Conservation District No. 1, has a very excellent editorial on page 4 of that issue with reference to conservation practices.

Ground water is available in many other areas of the State for the development of irrigation. This is particularly true of the Gulf Coastal area. Ground water irrigation is practiced in the costal region and further increases in irrigated acreage can be anticipated. Development of this additional irrigation appears to be dependent upon the demand for irrigated crops, and whether the increase in financial return from irrigation will be sufficiently large to justify the expenditure.

In planning for irrigation uses crop water requirements need to be known in advance. These crop water requirements have been determined for most major crops for each area of Texas in a recent study by our agency. The results of this staff investigation are available as Bulletin 6019.

Great progress has been made in this generation in improving agricultural practices. Fertilizers, insecticides and selective herbicides have each contributed to the increased crop yields. The use of chemicals in agriculture has provided greater crop yields, and suggests large amounts of irrigated acreage are not needed immediately. Additional research in these fields of endeavor will undoubtedly provide increased crop returns.

In the instance of rice irrigation, the acreage cultivated has decreased, but total production has not correspondingly decreased. As demands for rice rise in the future, the acreage irrigated may increase, but the extent of this increase will be contingent upon complexities beyond the scope of this paper.

Many areas of Texas have sufficient rainfall and crops can be raised successfully most of the time without irrigation. In these areas crops can be assured with a standby supply of irrigation water for infrequent short-duration droughts. The use of "insurance irrigation" will probably increase in the coming years and will be more prevalent in those areas with available ground water supplies. This is indicated by the number of counties in the State where some irrigation has been practiced. In 1958 two hundred twenty-five of our two hundred fifty - four counties were shown to have some irrigation. The use of irrigation in the eastern part of the state, with the exception of that for rice, was generally of the "insurance irrigation" type.

The considerations which have been

(Continued on Page 4)

"A Primer on Water"

(Continued From Page 2)

ers, or strata, differ characteristically in their ability to transmit water. The earth'scrust, as we have seen in many roadside cuts, has been wrinkled, warped, and folded during past geologic ages, and rock layers, therefore, are seldom flat lying. For this reason it is common for a single bed or layer to be exposed at the surface in one place but extend underground as a sheet for miles. Imagine such a layer which is particularly porous, perhaps a layer of sandstone. Where this porous bed appears at the surface, the surface soil, being derived commonly from weathering of the local rock, will probably be sandy and capable of absorbing rainwater easily. This is called the recharge area of groundwater replenishment.

Rain falls on this sandy area, sinks into the ground, and flows downhill. Downhill will be down the slope of the permeable sandstone bed or layer. The water is flowing toward the lowest position of the water table, just as in the dishpan experiment. Note that in this example, the sandstone layer gets deeper and deeper below the ground surface as it extends away from the place the layer was exposed at the surface.

Rain falling on the area underlain by rocks which do not readily absorb water will moisten the upper soil layers, but the rest of the water will flow to the streams and appear as streamflow. That water which wet the soil will be returned to the atmosphere by evaporation and transpiration.

An example from real life may be found in the Middle West where an extensive layer of sandstone underlies a large part of southern Wisconsin, northern Illinois, and Iowa; it is called the Potsdam sandstone. This rock formation happens to be one of the most famous in the country. It was named in 1838 after the village called Potsdam in northern New York State, where it was first identified. This bed is exposed at the surface in a broad belt in central Wisconsin. As one proceeds south from central Wisconsin toward Iowa, the Potsdam is underground but is deeper and deeper below the surface. This sandstone is porous and contains large quantities of water—it is an aquifer. Many cities obtain their water from wells drilled down to this aquifer.

The wells obtaining water from the sandstone are shallow near the recharge area and deeper at a distance from the area where the sandstone is exposed at the ground surface. All the water in the Potsdam sandstone is derived from rain falling on the area where the bed is exposed at the surface. Thus the water drunk by people in Janesville, Wis., in Rockford and Streator, Ill., all fell as rain in central Wisconsin. The water moved southward underground 225 miles from let us say, Portage, Wis., to Streator, Ill.

How long did it take the water to move that distance? Water moves quite slowly in a porous material. Normal rates of travel of water in an aquifer range from 3 feet per day to a few thousandths of a foot a year. In the Potsdam sandstone probably several centuries elapsed between the time a drop fell as rain in Wisconsin and the time that drop was drunk by a person living in Streator.

There are other extensive aquifers such as the Dakota sandstone and the St. Peter sandstone which convey water over great distances, but as a rule most aquifers are only of local extent. Many people who own water wells have fanciful notions about the source of water, believing that it "flows in an underground river from the crest of the Appalachian Mountains," or that it taps a "vein of water having its source in northern Canada" or its source is at the "summit of the Cascade Mountains." Generally they name a cool wet place of sylvan beauty several hundred miles away. The facts are generally more homely and far easier to understand.

There are areas in this country where rainfall is so scanty that only occasionally does enough fall to add any appreciable amount to the groundwater table. In some of the arid parts of western United States water is being pumped which fell as rain during the ice age, at least 10,000 years ago.

Water pumped from a well has been stored underground for months, years, or centuries. Whether a well can be pumped forever depends on whether the water withdrawn from storage is being replaced by new water at an equal rate. It is like dipping water out of a bathtub. If the faucet is turned off, continued dipping of the water, cup by cup, gradually will lower the level of the water in the tub. If the faucet is turned on so there is inflow to compensate for withdrawal, then we may dip indefinitely and the level will remain about the same.

This idea is one of the basic laws in the science of hydrology. When inflow to the storage basin equals outflow or withdrawal, then there is no change in the amount of water in storage. When pumpage and natural drainage from an aquifer proceed at a rate equal to the rate at which rain supplies new water, the ground-water level remains the same. If we pump faster, then the water table falls just as does the water level in the tub when the cup removes water faster than it is supplied by the faucet.

Newspapers have carried many articles about wells going dry during drought years. The wells were being pumped at a rate faster than rain was supplying water for replacement. If pumping proceeds too fast for several months or several years, the groundwater level will fall; but if pumping is stopped sooner or later rainfall will replace the water withdrawn and the water table will return to a level comparable to that which existed before pumping began.

It should be kept in mind that water moves so slowly underground that replenishment by rainfall may take months or years. It would be desirable to pump, on the average, at a rate which is no greater than the rate of replacement of water by precipitation. It is usually difficult, however, to determine just what is the average rate of replenishment. If the amount of water in storage is large, the water level may go down slowly and it may take a long time to find out whether the aquifer is being overpumped.

Let us come back to the example of the bathtub. Imagine that we are dipping water out of the tub with a cup and that we cannot see or hear how much water is coming out of the faucet, but we can see the water level in the tub. We do not want to take water out any faster than it comes in. The only way to find out how fast to dip is to keep watching the level in the tub and continue dipping. After a while if we observe that the water level has gone down, we know that we have been dipping too fast; so we slow down.

Now imagine that three or four of us dip out of the tub at the same time, all with different sizes of cups. Meanwhile, another person is turning the handle of the faucet, on and off, at random. We do not know how much is coming in from the pipe, but we know it comes in at a variable rate. All may have to dip for several minutes before we know whether we are taking up water too fast.

A large aquifer is even more difficult to gauge. Hundreds of wells may be drawing water from it. The area of recharge, where the rain gets into the aquifer, may be miles away. Rain is heavy one year and light another. Pumping may continue for years before one can determine whether there is enough water to keep all the wells supplied indefinitely. By the time it is discovered that pumping has been excessive, towns have grown, and factories and farms have increased their water requirements. No one wishes to give up his well; so everyone keeps on pumping and the water table gets deeper and deeper.

There are many places in the country, such as parts of the Gila River valley of Arizona and the high plains of northwestern Texas, where water levels are progressively going down owing to overdrafts on the groundwater supply. There are very many more places where water levels having once receded to form the cone of depression are steady and the ground water provides a steady supply of water.

There is little mystery to ground water. Its occurrence and its fluctuations have a clear and generally a simple explanation.

Irrigation—

(Continued from Page 3)

noted suggest that additional large scale use of the surface water resources of Texas for irrigation purposes will not occur in the near future. Studies of the future surface water requirements for irrigation will have to be explored in much more economic detail and a continuing program maintained to determine the areas being irrigated and the amounts of water being used. These needs will have to be reviewed in part with respect to agricultural regulations. For example—a new agricultural industry could be developed in West Texas with the irrigation of sugar beets. If Texas were to get one-eighth of the Cuba sugar quota it could develop a new cash crop—with it would go beet sugar processing plants, and as the beet tops are highly nutritious, it would also be an aid to our livestock producers. Sugar beets raised near Pecos, Texas in 1960 had yields of over 25 tons of beets per acre with sugar contents ranging from 17 to over 19 percent. Both values are above average. This crop has a relatively low water requirement and would be suitable for much of West Texas. Sugar beet production can be anticipated if a quota for the State can be obtained.

It goes without saying that we have land available for irrigation in the State. BWE Bulletin 6018 shows there were slightly over 25 million acres of non-irrigated land, similar to those presently irrigated from the standpoint of soils and topography, that would be suitable for irrigation if water were provided. In order for irrigation to take place there has to be a need for the agricultural products. We have the land resources. There are areas where water is available. The key to the irrigation development in the State will be the *need* for the agricultural products in addition to those produced from land presently in production.

High Plains Underground Water
Conservation District No. 1
1628 Fifteenth Street
Lubbock, Texas

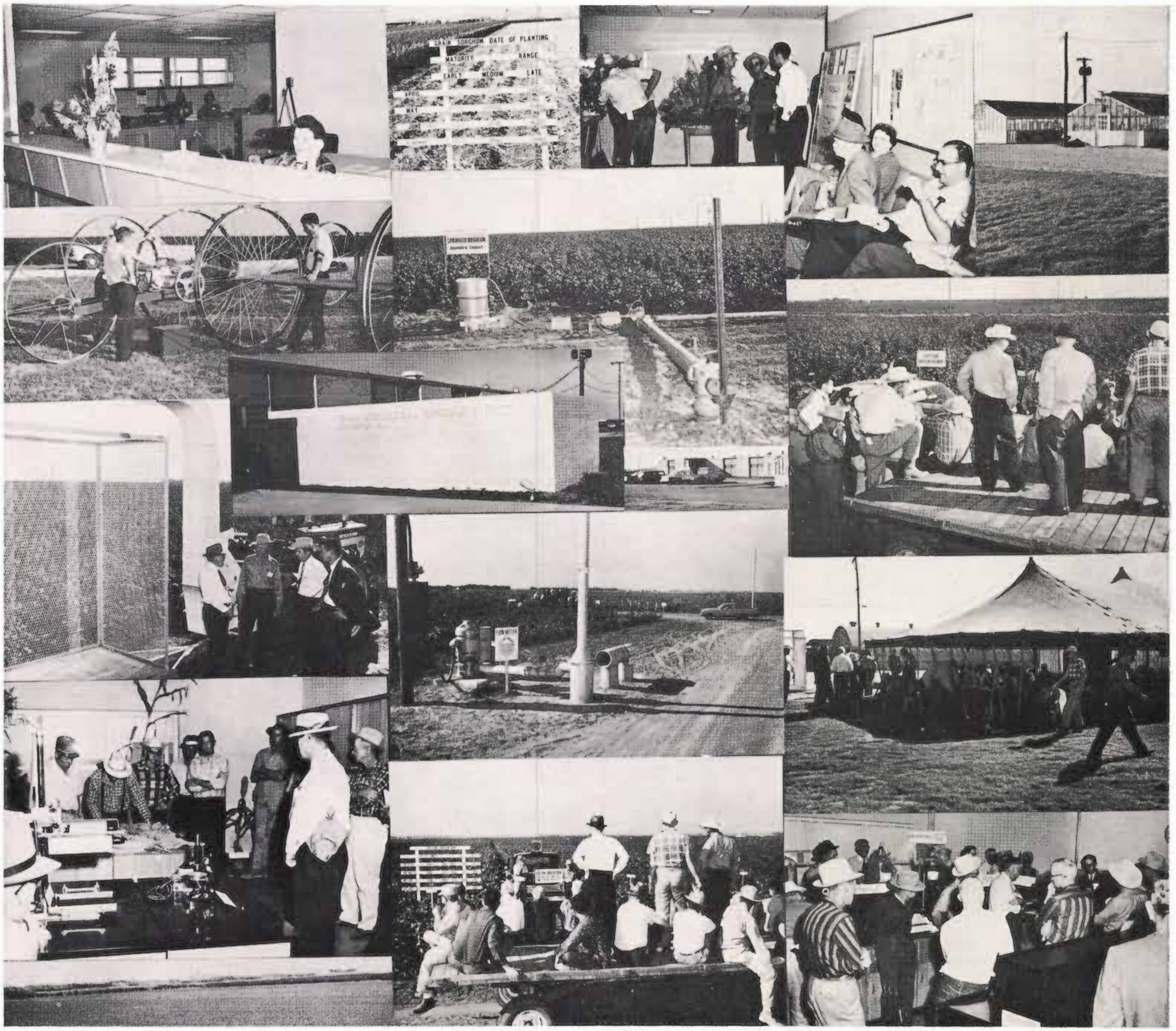
Second Class Permit

THE Cross SECTION

A Monthly Publication of the High Plains Underground Water Conservation District No. 1

Volume 8—No. 4 **"THERE IS NO SUBSTITUTE FOR WATER"** *September 1961*

EXPERIMENT SUB-STATION NO. 8 RECENTLY DEDICATED AT OPEN HOUSE



SEE STORY ON PAGE 3

THE Cross SECTION

A MONTHLY PUBLICATION OF THE HIGH PLAINS UNDERGROUND WATER CONSERVATION DISTRICT NO. 1

Published monthly by the High Plains Underground Water Conservation District No. 1
1628 15th Street, Lubbock, Texas

Telephone PO2-8088

ALLAN WHITE
Editor

:: LETTERS TO THE EDITOR ::

The following letters were selected from several received during the past few weeks. We thought perhaps all our readers would like to have an opportunity to see them.

* * * * *

The Editor
of the Cross Section
High Plains Underground Water
Conservation District No. 1
1628 Fifteenth Street
Lubbock, Texas
Dear Sir,

We read with attention your publications and found them very interesting.

It comes to our mind that perhaps your subscribers would like to get some information on Water Development Problems in Israel.

We are sending under separate cover some of our publications on the subject and would gladly supply you with additional information should you be interested in publishing articles on any of the subjects.

Sincerely yours,
Iona Kahana, MS.
Head, Water Resources
Development Department.
Water Planning for Israel LTD
Tel-Aviv, Israel

* * * * *

Mr. Allan White, Editor
1628 15th
Lubbock, Texas

Dear Mr. White:

Will you please send me sixty (60) copies of the story that appeared in your paper, August 1961, about the little girl who was hurt so badly.

I would like to send one of these articles to everyone in this county that has an irrigation well.

Thank you very much.

Sincerely,
Foster Whaley
Co. Agricultural Agent
Pampa, Texas

* * * * *

The Editor
The Cross Section
1628 15th St. Lubbock
Texas, U. S. A.
Dear Sir:

I am very much interested in your High Plains Underground Water Conservation publication as I find it very informative. I would like to know how I could subscribe to your publication for the benefit of my Co-water well drillers here in the islands. I am connected with this company as field engineer and find your publication very helpful.

Thanking you and wishing you more success.

Respectfully yours,
Agripino Z. Lardizabal
Shamrock Well-Drilling
Enterprises, Inc.
Manila, Philippines

* * * * *

"The Cross Section"
Allan H. White, Jr.
1628 15th
Lubbock, Texas
Dear Mr. White,

We wish to commend you very highly on the high caliber information you publish each month in the Cross Section. We especially refer to the August 1961 edition article "Pump Scalps Girl in Deaf Smith County Mishap" then; the May 1960 issue "Manuel Corral Receives Check from California Drillers."

We all could wish that such things would not happen, but they do. Therefore; we congratulate you highly for giving these the front page in your paper and hope that readers might heed the warning and precaution will be made to prevent even one more.

Keep up the good work!

Sincerely,
W. R. Carter
Bailey County Water Committee
High Plains Underground Water
Conservation District No. 1
Muleshoe, Texas

Castro Committee Office Moves Location

The office of the Castro County Committee of the High Plains Water District has been moved to the Ivey Insurance Company in Dimmitt.

The new offices are located northeast of the courthouse on the square.

Mrs. Connie Ivey is secretary of the Committee. Effective immediately she will be accepting well drilling permit applications at the new office location.

The County Committee meets regularly at 10 o'clock a. m. on the last Saturday of each month. Their meetings will be at the new office location. High Plains Underground Water

Bill Daniel, Floyd County farmer who cooperates in irrigation studies with the High Plains Water District, is shown as he takes a reading from the flow-meter furnished by the District. Data on irrigation is gathered under field conditions throughout the District by such cooperative programs. A sign such as that shown above has been installed by the High Plains Water District on each farm.

Imaginative Research--A Basic Need

Gerald W. Thomas

Dean of Agriculture, Texas Technological College

Back in the year 1700 a *curious* German by the name of Von Helmont decided to find out *what made a plant grow*. This man planted a 5 pound willow twig in exactly 200 pounds of air-dry soil. He grew this willow for 5 years, adding only rain water to the potted plant.

At the end of the 5-year period he carefully removed the willow (roots and all) from the soil. The willow weighed 169 pounds. Von Helmont then weighed the soil and found that it still weighted 199 pounds and 14 ounces. The soil had lost only 2 ounces —yet the willow had gained 164 pounds. *From where had the increase in weight come?*

Von Helmont concluded that, since he had added only water, the increase in weight had come from *water* alone. This conclusion *seemed logic*al but was in error

Forty seven years later an *imaginative* English clergyman discovered that plants must draw foods from the air through the leaves. Recent experiments with radio-active materials have proved that the *major increase in plant weight comes from carbon and oxygen in the air* and not from water, even though water is essential for the process to take place. As a matter of fact scientists found radio-active carbon in over 50 different compounds in the plant in less than one minute after the plant was exposed to the tagged (radio-active) carbon in the air.

In 1779 a *curious* Swiss doctor found that *light was necessary* as a source of energy for plant growth. Later, it was found that growth could take place only when the plants had *chlorophyll* or green material in the leaves.

Remember the 2 ounces of *soil* that were not accounted for? Von Helmont attributed this small loss to *experimental error*. Part of the loss may actually have been experimental error, but, this 2 ounces of soil also provided many *major and minor elements* essential to the living plant including nitrogen, phosphorus, sulphur, potassium, calcium, magnesium, sodium, zinc, boron, copper, molydenum, and others. These elements along with a large array of harmones and growth regulators all contribute to the growth process.

The primary equation involving *air, water, sunlight, chorophyll* and *soil nutrients* is recognized as the natural phenemona which we call *photosynthesis* or food production by plants. A noted scientist stated recently that *the process of photosynthesis in plants is the most important chemical reaction in the world today.* All life is dependent upon this reaction, either directly or indirectly.

This historical example of research in plant science is used here for two purpose—one, to illustrate the *nature of research* and two, to emphasize the *importance* of *imagination, curiosity* and *integrity.*

Research has become a commonly used term in our modern society. One can find numerous concepts of research which vary considerably among organizations and individuals. By and large people use the term rather loosely—realizing only that it has a certain touch of glamor or magic.

Webster's dictionary defines research as, "Studious inquiry; usually critical and exhaustive investigation or experimentation having for its aim the revision of accepted conclusions in the light of newly discovered facts."

Most authorities divide research into two general types:

(1) *Basic or pure* research—observing some definite or specific problem and making a careful solution of it regardless of whether or not it has some practical application.

(2) *Applied research*—research from a practical point of view with the solution actually being put into practice or applied.

Although agriculture is generally considered as an applied science, we are highly dependent upon pure or basic research for many of our concepts. We have utilized many principles of basic research in agriculture since World War II—principles which were discovered over a period of several centuries. Through utilization of these basic principles and through applied research, we have found ways and means to increase per acre production of farm products fantastically. In fact, as the result of application of research findings, our agricultural efficiency has increased so much that our biggest current problem—at least from a short-sighted political viewpoint—is surplus food, feed and fiber.

Can we anticipate similar increases in the per acre or per unit production of agricultural commodities in the next two decades? Pessimistically, I doubt it. It seems to me that in agriculture we are reaching a period where more emphasis must be placed on basic research and/ or more emphasis on basic approaches to applied research.

Progress in research is highly dependent upon the *imagination* of the investigators themselves. Progress is made by people who are curious—people who want to know *what* is taking place, *how, where, when* and *why* it is taking place. Seeking answers to these questions has been, and will continue to serve as the driving force for many scientists and educators. The more closely the investigator studies the *why* of a situation the more *basic* will be the research.

There are several what, where, how, when and why's to be answered concerning the role of our most important resource—*water*—in the photosynthesis process. For example, water is one of the key-controlling factors in plant food production. But, most of the water taken up by the plant root system passes on out the leaves in the transpiration stream. In other words, our *present crop plants are extremely inefficient in the use of water. What* can be done to reduce transpiration loss? *Why* don't we direct more of our research toward water efficiency in plant selection? *What* do we know about root systems as a means of making better use of water in the soil? And, *how* can we increase infiltration and reduce run-off and evaporation? Each time we answer one question two others appear.

Progress in research is also dependent upon the *honesty* or *integrity* of the investigator. One of the major differences between methods of research in the social, biological and physical sciences is the *accuracy* of *measurements* used. The physical sciences are better adapted to *quantitative data;* while the social sciences rely largely on *qualitative* measurements. Most of the agricultural sciences fall somewhere in between. In agriculture it is also *frequently impossible*—and it may not even be desirable—*to control variables experimentally.* In the agricultural fields, where it is not always possible to obtain quantitative measurements, and where an experiment cannot be duplicated under the same conditions due to environmental variables, results are subject to misinterpretation. *Bias* and *prejudice* are pitfalls of agricultural scientists.

One of the more recent advancements in the scientific method has been the use of statistical approaches. *Statistical analysis* will permit research workers to draw valid conclusions from data with very little, if any experimental control of variables. We can obtain *statistical control* in an experiment by (1) proper recognition of variables involved, (2) classification of these variables, (3) analysis of variance and (4) drawing conclusions based upon sampling probability. Other major contributions of the statistical method are in the *design* of *experiments,* in *sampling procedures* and in *tests of techniques.*

In summary, it seems to me that our future progress in agriculture will depend upon more basic approaches to research and more qualified scientists with curiosity, imagination and integrity.

More basic research and new approaches to research are needed in order to continue progress in agriculture. This photo shows how a geiger counter is used to study root systems in plants by following translocation of radioactive phosphorus placed in the soil. This is part of a research project on root systems of plants being undertaken at Texas Tech in cooperation with the Texas Agricultural Experiment Station.

Agricultural Experiment Sub-Station No. 8 Dedicates New Facilities At Lubbock

A combination open-house and field day was held this month at the new research farm and facilities of Sub-station 8 of the Texas Agricultural Experiment Station.

The activities at the station's new headquarters, about 8 miles north of Lubbock on Highway 87 offered farmers, ranchers and businessmen an opportunity to see first-hand the progress being made in agricultural research through the cooperative efforts of local, area and state interests.

In 1909 the sub-station in Lubbock was opened to serve South Plains' farmers, ranchers and industry by providing basic knowledge needed for developing "know-how" of farming in the area.

Since that time, the station has lead the way to more profitable agriculture under the able direction of Superintendents A. L. Paschall 1909-1912; V. L. Cory 1912-1915; R. E. Karper, 1915-1925; D.L. Jones, 1925-1957; and C. E. Fisher, 1957 to date.

Researchers on the station's staff have recognized that probably the most critical of all problems that confront continued agricultural and business prosperity in the southern High Plains is a diminishing supplemental water supply. Consequently, the bulk of work that is done on the station takes into consideration this fact and is aimed not necessarily at "how much production is possible from an acre of land," but rather, "how can we increase production by making more effective use of both rainfall and underground water."

Dr. R. E. Patterson, Dean of Agriculture at Texas A & M College, during a speech at the recent field day had this to say, "Water is a limiting factor of production in many parts of West Texas and, indeed, is one of the state's most important problems. In some parts the supply of water for irrigation is running out rapidly. We must face such questions as 'How long will our supply last?,' What consertion techniques should be initiated?', 'How can we use this supply of water most profitably?', and 'What will alternative land uses be if and when this water is depleted and how will it affect area income?' To answer these

(Continued on Page 4)

UNDERGROUND WATER DEPLETION CASE NEARS TRIAL

One more step was taken this month toward a long-sought goal—the goal is a federal income-tax deduction for the depletion of underground water within the High Plains Underground Water Conservation District.

A pre-trial hearing was held in the U. S. District Court in Amarillo, September 25, before Judge Joseph B. Dooley as a prelude to the full-fledged trial which has been scheduled by the Court for January 3 in Lubbock.

The purpose of the pre-trial hearing was to establish agreement between the attorneys and the Court concerning procedures to be followed in the trial and to agree upon certain stipulated facts pertinent to the case.

Marvin and Mildred Shurbet, a farm couple who reside in southwest Floyd County, filed this most-important legal suit against the Internal Revenue Service. Mr. Shurbet is a former member of the Board of Directors of the High Plains Water District.

The Shurbets contend that property owners who can establish an actual cost in the underground water beneath their land and who are using the water to produce income should be entitled to deduct this cost on their tax returns as the water is exhausted.

The trial of this case will culminate seven years of diligent work by the High Plains Water District.

In 1954, the first of two requests was submitted to the Internal Revenue Service. These requests asked the IRS to consider underground water in the High Plains Water District as a depletable natural resource under existing federal tax laws, thereby making landowners in this area eligible for a tax deduction as depletion takes place.

These requests were submitted to the Internal Revenue Service, but were disallowed. It was determined that the only other feasible means of gaining the tax-deduction was through the courts.

Water Conference To Be Held In New Mex.

The sixth annual New Mexico water conference will be held at the New Mexico State University in Las Cruces on November 1-2.

The theme of this year's meeting will be "Ground Water." The program is devoted completely to the problems involved in the development and use of underground water.

Many interesting leaders in groundwater work are scheduled to speak, including O. M. Hackett, Chief of the Ground Water Branch of the Water Resources Division of the U. S. Geological Survey, Washington, D. C. R. M. Dixon member of the Texas Board of Water Engineers will appear on a panel that will discuss groundwater administration.

The annual conference is open to all interested persons. Additional details may be obtained by writing H. R. Stucky, College of Agriculture, Dept. of Agricultural Economics and Agricultural Business, New Mexico State University, Las Cruces, New Mexico.

Water Board Publishes High Plains Bulletin

A new bulletin of importance to the High Plains' area has been published by the Texas Board of Water Engineers

The bulletin, number 6107, is entitled "A Summary of the Occurence and Development of Ground Water in the Southern High Plains of Texas." It was prepared by the U. S. Geological Survey in cooperation with the State Board of Water Engineers. The cost of printing the bulletin was shared by the State Water Board and the High Plains Underground Water Conservation District.

J. G. Cronin,, Geologist with the U. S. G. S. and author of the bulletin, discusses at length geology of the area, ground water in the Ogallala formation and the outlook for the future of the area.

Much of the field work that preceded the bulletin's completion was done by U. S. G. S. field man Paul Rettman and others stationed in the southern High Plains.

Requests for Bulletin 6107 should be mailed to the Texas Board of Water Engineers, P. O. Box 2311, Capitol Station, Austin, Texas or to the High Plains Water District, 1628 15th, Lubbock.

Sub-Station No. 8—

questions, and prepare to meet the consequences of these things, future research will involve extensive economic research using budgeting techniques to determine the optimum use of water over time; combinations and rotation of crops to attain optimum income; development of management practices to help alleviate the over-all problem; agricultural engineering research in irrigation and production equipment; and a host of other approaches to the problem. Work is currently being done but much more is needed in the future."

The station owns 221 acres of farmland and an additional 90 acres is operated under a long-time lease.

Much of the equipment used in the research programs at the new station was donated by individuals, companies and organizations, including the loan of four flow-meters by the High Plains Underground Water Conservation District. The meters are attached to irrigation wells to calculate the amount of underground water applied to various test plots.

Sub-station No. 8 operates a field station near Brownfield and cooperates with the High Plains Research Foundation at Halfway. Between the three stations, sandy, medium and heavy soils are represented. Off-station experiments are also conducted with various farmers under actual farm conditions.

Many of the farm machines and most of the improvements in cotton and grain sorghum seed varieties that are used in this area today were either introduced or improved as a result of research and experiments conducted by Sub-station No. 8.

Please Close Those Abandoned Wells!

"WATER CONSERVATION" THEME OF WINNING EXHIBITS AT TRI-STATES FAIR

Above are pictured exhibits shown during the recently-held Tri-States Fair n Amarillo. At left is the display prepared by the Shamrock Chapter of the Future Farmers of America organization. The work was under the direction of H. C. Weatherby, Vocational Agricultural instructor at the Shamrock High School. Center, is a display exhibited by Amarillo F. F. A. under the supervision of Herb Davis. At right is an exhibit by the Allison F. F. A. It was prepared as directed by Jim Jacobs, Vocational Agricultural teacher at Allison. Judges of the exhibits were T. L. Leach, Texas Tech College, Lubbock and J. P. Smith, PanTech Farms. The Allison and Shamrock displays were first place winners in their division.

High Plains Underground Water Conservation District No. 1
1628 Fifteenth Street
Lubbock, Texas

Second Class Permit

THE Grass SECTION

A Monthly Publication of the High Plains Underground Water Conservation District No. 1

Volume 8—No. 5 "THERE IS NO SUBSTITUTE FOR WATER" *October 1961*

Procedure For Obtaining Well-Drilling Permit Is Simple And Uncomplicated

With the harvest of this year's crop in progress, thoughts are being turned to the preparation of next year's individual farming programs.

Perhaps a new irrigation well is needed to complete summer watering in shorter periods of time. If so, and the land is located within the High Plains Water District, a thorough understanding of the rules of the District will be helpful.

A permit is required before the drilling of any well is commenced. Small capacity wells are exempt from this rule—wells that are capable of producing only 69 gallons of water per minute, or less.

To obtain a drilling permit, the first thing necessary for the landowner, or his agent, to do is measure with a tape or chain the distance from the proposed well site to the nearest two perpendicular property lines. As an example if it is planned to drill the new well in the northeast portion of the farm, then measure from the new well site to the east property line and from the new well site to the north property line.

After the distance is measured to the nearest two perpendicular property lines, then the distance to the three nearest wells from the new site must be measured. It is necessary to obtain measurements only to those wells that are 440 yards or less from the proposed site. Whether the nearby wells belong to neighbors or to the one who proposes the new well makes no difference.

When these measurements have been obtained, they should then be taken to the Secretary of the County Committee in the county where the well is to be drilled. Each of the thirteen counties that make up the High Plains Water District has a County Committee that consists of five men. Each is a resident of the County and elected by the voters of the County. The Committeemen and their Secretaries are listed on page 2.

The County Committee Secretary will assist the applicant in filling out a well-drilling permit application. The application will include the measured distances furnished by the applicant, and those distances will determine the maximum capacity of the proposed well.

The spacing of a new 4-inch or smaller well must be a minimum distance of 200 yards from the nearest well; a 5-inch well must be a minimum of 250 yards from the nearest well; a 6-inch well must be a minimum of 300 yards from the nearest well; an 8-inch well must be a minimum distance of 400 yards from the nearest well; and a 10-inch or larger well must be a minimum of 440 yards from the nearest well.

The size of the well is ordinarily determined by the size of the column pipe of the pump.

With each permit application, a $10 deposit is required. When a log of the well and a description of the permanent pumping equipment is furnished the Committee by the landowner, the deposit is then returned in full. There is no charge for the drilling permit.

Each permit application must be signed by three of the five County Committeemen before drilling is begun.

J. D. KIRKLAND

Kirkland Named As President Of Texas Water Well Drillers

J. D. Kirkland, widely-known well drilling contractor of Hereford, has been elected president of the Texas Water Well Drilling Contractors Association for the coming year.

Mr. Kirkland's election came during the driller's annual convention held in El Paso August 10-13. R. G. Dixon of Odessa was elected Vice President, and B. F. Block of Sunray was elected to serve as Secretary-Treasurer for the coming year. Grover Haskell of Pampa is president-elect and will succeed Mr. Kirkland in 1963.

W. D. "Dub" Jones of Dumas retires as president of the driller's association after an active year which saw, among other things, a new law passed in the state which will require state licensing of water well drillers and which will enable the establishment of rules to protect underground water from pollution.

Approximately 300 persons registered at the El Paso convention.

T. W. C. A. WILL HOLD CONVENTION IN McALLEN, NOVEMBER 5 AND 6

The 17th Annual Meeting of the Texas Water Conservation Association will be held at the Fairway Motor Hotel in McAllen on November 5 and 6.

The T. W. C. A. promotes and assists in the coordination of plans proposed by agencies of the Federal, State and local governments, associations, and private enterprises, to control, protect, and utilize the water resources of the State.

Speakers on the program include Col. L. H. Hewitt, U. S. Commissioner, International Boundary and Water Commission, El Paso; Maj. Gen. Robert J. Fleming Jr., Division Engineer, Southwestern Division, Corps of Engineers, U. S. Army, Dallas; Leon W. Hill, Regional Director, U. S. Bureau of Reclamation, Amarillo; Ben A. Glusing, Member, Texas House of Representatives, Kingsville; John J. Vandertulip, Chief Engineer, Texas Board of Water Engineers, Austin.

Separate caucuses of the Ground Water, Irrigation, Municipal, Industrial, Navigation and River Authorities panels will be held the morning of November 6, from 8:30 to 9:30. The speech-making and business sessions will begin at 9:30 a. m. and be concluded at 4:00 p. m., followed by the annual meeting of the Board of Directors.

Tom McFarland, General Manager of the High Plains Water District, is First Vice-President of the T. W. C. A. He also serves on the Association's Ground Water Panel. Arthur P. Duggan, Jr., Littlefield attorney, is a member of the Irrigation panel.

John Gammon, President of the Board of Directors of the High Plains Water District from Lazbuddie, is a member of the Resolutions Committee.

According to Max Starcke of Austin, President of the T. W. C. A., all State, Federal, District and local officials, and the public at large are invited to attend the annual convention in McAllen.

The Future Farmers of America Chapter at Spur entered the exhibit shown above in the Panhandle-South Plains Fair held in Lubbock, September 25-30. The exhibit shows the value of using cotton burs on land to improve the soil's water-intake rate. The Smyer High School's Vocational Agriculture Department also prepared an exhibit for the Fair that depicted the value of underground water as determined by how and when it is used

THE Cross SECTION

A MONTHLY PUBLICATION OF THE HIGH PLAINS UNDERGROUND WATER CONSERVATION DISTRICT NO. 1

Published monthly by the High Plains Underground Water Conservation District No. 1
1626 15th Street, Lubbock, Texas

Telephone PO2-8088

ALLAN WHITE
Editor

FARM NOW TO SAVE WATER FOR NEXT YEAR'S CROP

By HARVEY J. WALKER
Assistant Agronomist, Texas Agricultural Experiment Station, Substation No. 8, Lubbock, Texas

In the High Plains area, with an annual average rainfall of near 18 inches and an effective crop production rainfall of 14 inches, efficient use of rainfall and irrigation water is "giant size" in importance. At first glance, efficient water use does not appear to be a difficult problem. Increasing the efficiency of water use by crops requires a positive approach of correcting previous mistakes and lifting a finger to do the practices within individual reach. A farm is built by improvement steps and not by excuses.

HARVEY J. WALKER

While thinking about correcting mistakes, a look at the size of the clods in Figure 1, or seeing them in the field, might lead to the conclusion that grain sorghum is hard on the land. The correct conclusion is that the farm operator needed to be more concerned with having the right soil moisture content before chiseling. A lot of equipment and man hours will be used and moisture lost on this land before a good seedbed can be prepared. Actually, research is indicating that grain sorghum land, if properly fertilized and managed, will produce more cotton than land previously planted to cotton.

In planning fall farming operations, one of the very first decisions to be made is in regard to leveling work. Very often this may be considered too much of a job for the average farm operation. However, with plans for a period of years it is surprising how much can be accomplished. If some degree of leveling is to be done it can be done best after breaking the land with a disc or mold-board plow. Immediately before or after the plowing, a series of readings needs to be taken to determine exactly where adjustments need to be made.

Regular farm operations of leveling can and should be done in the following instances:

(1) Where fields look like water would stand from one end of the row to the other, but a rain or irrigation shows that the water runs off the middle and piles up on the end.

(2) Smaller spots which may either be low or high so that water stands or runs off too fast.

Next a decision must be made on the use of cotton burs. Grain sorghum land that will be planted to cotton next spring will receive the early applications of burs. Due to harvest dates, land in cotton will receive later applications. Cotton burs on irrigated land, over a six-year period, increased cotton lint yields 36 pounds per ton of burs used through a 6 ton rate on mixed land. Pounds of lint per acre-inch of rainfall and irrigation water was increased from 19 pounds on untreated land to 27 pounds on land receiving the 6-ton rate.

Commercial fertilizer should be used to supplement burs during the first two years of application on the same ground. More nitrogen should be applied on grain sorghum land than on cotton land where burs are used due to the greater amount of residue from the sorghum crop.

Other sources of organic material

Figure 1
Grain sorghum to blame? (NOT AT ALL!) This soil was too dry when it was chiseled. For a long time to come, good farming will be necessary to correct this mistake.

SPRINKLER SYSTEMS CONSERVE WATER FOR HOCKLEY COUNTY IRRIGATORS

By ALLAN H. WHITE

The use of sprinkler systems for the irrigation of agricultural crops in the southern High Plains of Texas is a matter of at least some conjecture.

To obtain first-hand knowledge of the practicability of using sprinkler systems, we visited with two men who use them.

Don Montgomery and W. S. Carter live and farm in Hockley County. Both operate 177-acre farms that have predominantly sandy to mixed soils, and both have irrigated with sprinkler systems for a number of years.

Mr. Montgomery has one well from which he irrigates. It produces approximately 750 gallons per minute on open discharge, or about 550 gallons per minute when pumping into the sprinkler system where a discharge pressure of 40 pounds per square inch is needed. He raises cotton, grain sorghum and grasses. The grasses are used in a crop-rotation program. He plants a 15-acre tract to either Indian, Panic or Switch grass and leaves it for two to three years before plowing it up and re-planting on a different 15-acre plot. This practice helps build the soil.

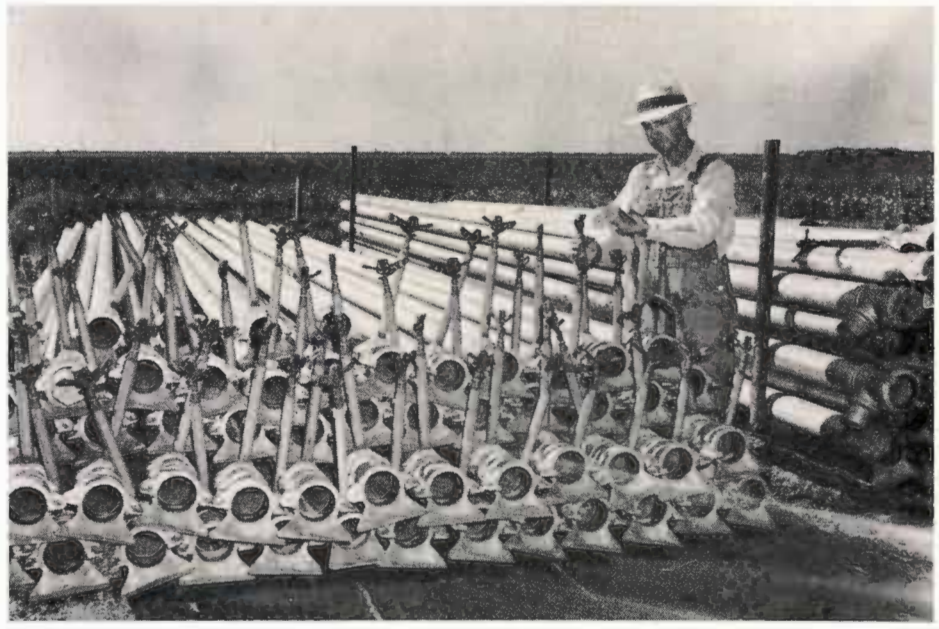
Mr. Montgomery uses two sizes of lateral lines on his sprinkler system, 4-inch and 5-inch. He states that anyone who plans to buy a sprinkler system should at least consider one where the lateral lines are mounted on wheels and will move from setting to setting by using a motor to turn the wheels. This feature will of course add expense to the original cost, however, much of this added initial cost will be offset by lower labor expense.

According to Mr. Montgomery, there are several apparent advantages when using a sprinkler system as opposed to flood-type irrigation. (1) More-nearly uniform distribution of water over the entire tract of land that is being irrigated. (2) Better control of the amount of water needed to restore soil moisture. (3) Elimination of soil erosion.

Now of course, when using a sprinkler system, all is not rosy. There are disadvantages, according to Mr. Montgomery. The big disadvantage that he sees in using a sprinkler system is the fact that farm laborers are much more interested in working on a farm that uses flood-type irrigation rather than a sprinkler-type system. It does not necessarily take so much more time to change sprinkler settings than to change syphon tubes in a ditch, but it is more difficult.

Mr. Montgomery feels that adequate farm labor is going to be more difficult to obtain as time goes by and the man with a manual sprinkler system to operate will be at a disadvantage in competing for laborers.

Mr. Carter has irrigated with a sprinkler system since 1955, after having used a flood-type system for two years prior to that time. He operates an 8-inch well that produces approximately 400 gallons per minute when pumping against 45 pounds per square inch. He uses 5-inch lateral lines.



W. S. Carter is shown above with a part of the 5-inch lateral line pipe used in his sprinkler system. He estimates that he can produce a crop on his Hockley County farm, using the sprinkler system, with one-third less irrigation water than was used previously with a flood-type system.

He states that the big advantage he now has with his sprinkler system, is his ability to uniformly distribute water over his farm. His labor costs have actually decreased from what they were when he watered down the furrow. Because his soil is sandy and unlevel, watering from an open ditch was most difficult and required extremely short runs.

Both men state that when they commenced using sprinklers, their crop yields from the sandy soil increased. They attribute this increase to the fact that over-watering with the flood systems leached valuable nitrogen from the soil.

Mr. Montgomery and Mr. Carter agree that sprinkler systems that are moved by hand should always be designed so that one lateral line can be in operation while the second is being changed to another setting.

Both men state that the use of sprinklers is merely a means to an end. On sandy or rolling land irrigation by flooding is most difficult. The water intake rate is usually two to three times greater on sandy soils than on tight or heavy soils, thus making uniform distribution when watering down the crop furrow on sandy land almost impossible.

When irrigating, a man strives while wetting the land, to do it with minimum soil erosion, and with as much uniformity of distribution as practicable. Mr. Montgomery and Mr. Carter can attain these standards, on their farms, by utilizing sprinkler systems.

Don Montgomery, right, shows Hockley County Agricultural Agent, Bill Taylor, a field of milo that they estimated would yield about 4500 pounds of grain per acre. No pre-plant irrigation was applied because at planting time adequate soil moisture was present. The sorghum was planted July 4 and 90 pounds of nitrogen was applied as a side-dressing on July 25. Two summer irrigations were needed, the first in the early boot-stage of development, the last at full-bloom. A timely 2-inch rain was received September 5. A total of 6-inches of irrigation water was used to produce this crop. It was applied by using a sprinkler system.

must be considered at this time. If manure is going to be used it is more desirable to make the application after leveling and before plowing.

Furrow ends should be closed on land that is fairly level, where the slope is slight, this may be as simple as hitting the power lift before plowing out into the bar ditch to turn. Where the slope is greater, some degree of contour furrows need to be used. Contour levels require the services of a technician. Sometimes row direction can be changed to make better use of rainfall.

"Tail water" loss continues to be excessive in many individual cases. Systems can be used that will reduce this problem. Very often simple practices such as shortened irrigation runs, especially on mixed land, and built up borders on the end of the row will take care of "tail water." Many times these practices aid in more uniform penetration of water into the soil.

Saving water through proper use is the goal in a good farming operation. This goal will be more nearly realized on farms where irrigation systems are consistently improved and soil improvement practices are utilized.

Water And Sewage School Scheduled

The thirteenth annual Regional Water and Sewage Works Short School will be held November 6-8 in Lubbock.

The school will be conducted in the municipal auditorium on the Texas Tech College campus. It is open to all interested persons.

The November 7th morning session will pertain to wells and the problems involved in developing water from wells.

Programs and detailed information may be obtained by writing Ralph Campbell, Chairman, Executive Committee, West Texas Regional Short School, P. O. Box 1495, Lubbock, Texas.

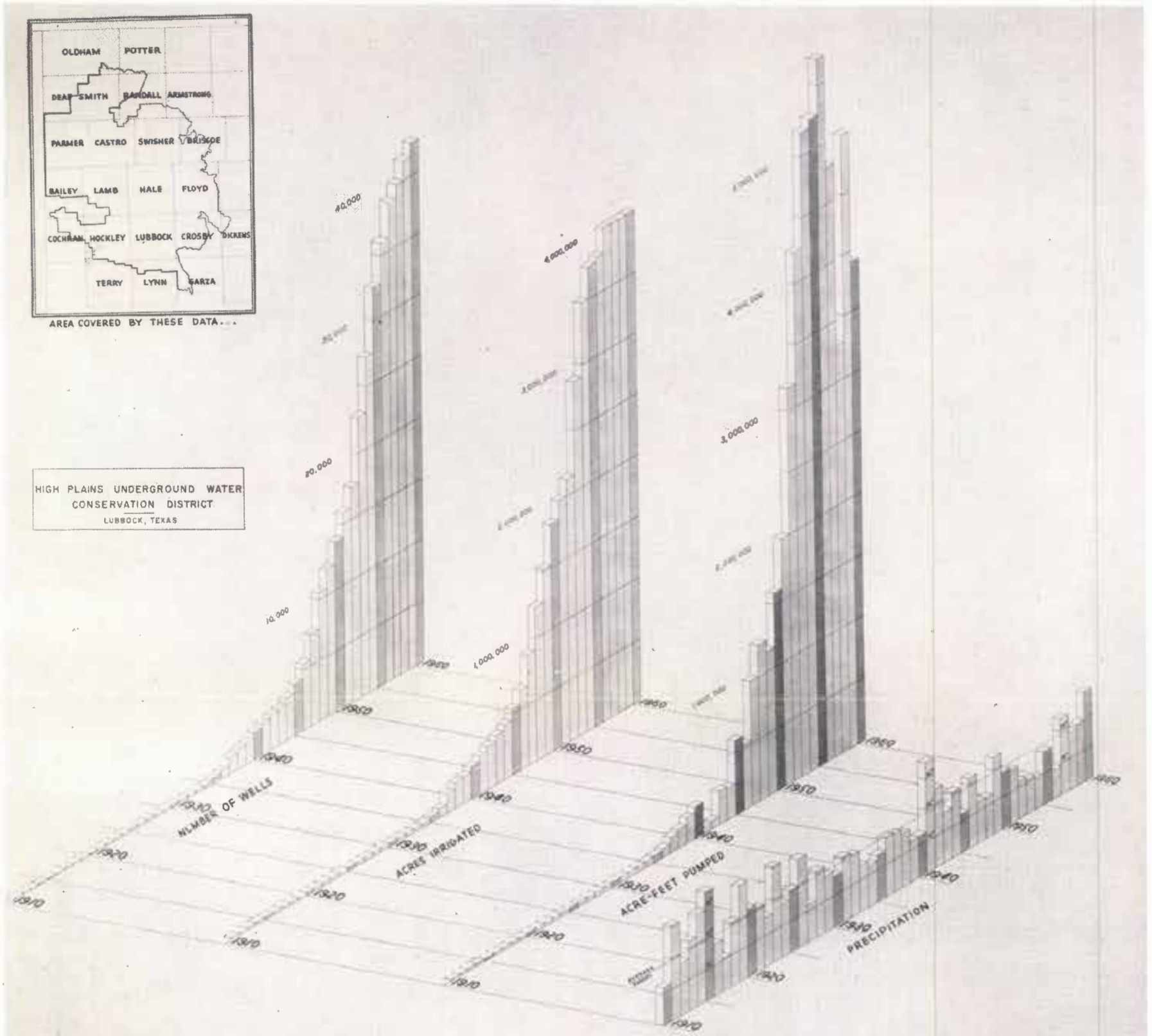
DRILLING STATISTICS FOR AUG. AND SEPT.

During the month of August, 40 new wells were drilled within the bounds of the High Plains Water District; 11 replacement wells were drilled; and 2 wells were drilled that were either dry or non-productive for other reasons. The County Committees issued 72 new drilling permits.

In September, 32 new wells were drilled; 13 replacement wells were drilled; and 4 wells were drilled that were dry. The Committees issued 61 new drilling permits.

Permits issued and wells completed for August and September are listed below by counties.

	Permits Issued		New Wells Drilled		Replacement Wells		Dry Holes Drilled	
	Aug.	Sept.	Aug.	Sept.	Aug.	Sept.	Aug.	Sept.
Armstrong	0	1	0	1	0	0	0	0
Bailey	4	12	6	1	2	0	0	0
Castro	11	3	6	5	4	3	0	1
Cochran	0	1	5	2	0	0	0	1
Deaf Smith	3	5	1	3	1	3	0	0
Floyd	2	5	3	4	0	0	2	0
Hockley	3	10	2	3	0	2	0	0
Lamb	7	3	3	5	1	2	0	0
Lubbock	18	14	8	5	0	1	0	1
Lynn	3	7	4	3	0	1	0	1
Parmer	20	0	2	0	3	1	0	0
Potter	0	0	0	0	0	0	0	0
Randall	1	0	0	0	0	0	0	0
Totals	72	61	40	32	11	13	2	4



PRECIPITATION AND DEVELOPMENT OF IRRIGATION

High Plains Underground Water
Conservation District No. 1
1628 Fifteenth Street
Lubbock, Texas

Second Class Permit

THE Cross SECTION

A Monthly Publication of the High Plains Underground Water Conservation District No. 1

Volume 8—No. 6 "THERE IS NO SUBSTITUTE FOR WATER" *November 1961*

Former District Director Re-Appointed To Red River Authority Board

Virgil Dodson, former member of the Board of Directors of the High Plains Water District from Hereford, has been re-appointed to the Board of the Red River Authority of Texas.

Governor Price Daniel renamed Mr. Dodson to a six-year term on the Board. He has served as a member since the Authority's inception about two years ago.

Although the fact is not normally recognized by most casual observers, several northern counties of the southern High Plains are actually part of the Red River's watershed network. Mr. Dodson represents the interests of these counties in overall basin development and resource planning.

A major, and successful, undertaking of the Red River Authority has been its closure of thousands of oil field brine disposal pits within the River's drainage area. Before much development work can be accomplished on the Red River, considerable pollution, both artificial and natural, must be remedied.

Governor Appoints Carter and Beckwith

Joe D. Carter of Sherman, in Grayson County and H. A. Beckwith of Eagle Pass, in Maverick County, were recently sworn in as members of the three-man full-time Texas Board of Water Engineers.

Joe R. Greenhill, Associate Justice of the State Supreme Court, administered the oath-of-office on November 10 to the new members in the office of Governor Price Daniel at Austin.

Mr. Carter was appointed to a full six-year term and was named chairman of the board by Governor Daniel. He replaces R. M. Dixon of Dallas.

Mr. Beckwith was appointed to fill the unexpired term of office of Durwood Manford, who resigned to accept a position on the State Insurance Board.

Otha F. Dent, longtime resident of Littlefield and former County Judge in Lamb County, is the third member of the Board of Water Engineers.

Mr. Carter and Mr. Beckwith are no strangers to the water problems of the State. Mr. Carter is a former legal counsel for the Water Board and past Executive Secretary of the State Water Development Board. He was also confronted with water resource problems when serving in the Texas Legislature, both as a Representative and as a Senator. Mr. Beckwith served previously as a member of the Board of

(Continued on Page 3)

COLOR SLIDES TELL STORY OF WATER

Bob Hester, Horace Gilmore and Rev. J. B. Sharp, Levelland, pictured above, left to right, watch as the story of water in the southern High Plains is revealed through the color slides being projected on the small screen. The cabinet was prepared by the High Plains Water District, and is being displayed in bank lobbies throughout the area.

District Hydrologist Attends N. R. A. Annual Meeting In Billings, Montana

By WILLIAM L. BROADHURST

The 30th Annual convention of the National Reclamation Association was held in Billings, Montana, October 19-21, 1961. It was attended by about 800 persons, mostly from the 17 Western Reclamation States, including several members of the Congress of the United States.

The general theme of the meeting was " Food and Fiber for our Rapidly Increasing Population."

The objectives of the Association pertain to the promotion of Reclamation Projects throughout the West, which include recommendations on legislation to the Congress.

Considerable opposition to expansion of the Reclamation Programs has been expressed because of the surplus of food and fiber. However, many leaders in the Association point out that most of the agricultural crops grown on Reclamation lands are not in surplus. Futhermore, they show that several years are required to complete a project after it has been authorized.

It seems to me that throughout recorded history, until after World War 1, farming was an art, but during the last 30 to 40 years farming has become a science. And with the improved technology, notwithstanding the rapidly

(Continued on Page 4)

The three members of the Texas Board of Water Engineers are shown above. They are, left to right, H. A. Beckwith of Eagle Pass, Otha F. Dent of Littlefield, and Joe D. Carter of Sherman. Mr. Beckwith and Mr. Carter were recently appointed to the full-time Board by Governor Price Daniel. Mr. Dent represents the western part of the State, including the High Plains area.

THE Cross SECTION

A MONTHLY PUBLICATION OF THE HIGH PLAINS UNDERGROUND WATER CONSERVATION DISTRICT NO. 1

Published monthly by the High Plains Underground Water Conservation District No. 1
1628 15th Street, Lubbock, Texas

Telephone PO2-8088

ALLAN WHITE
Editor

SYSTEM INSTALLED

By ALLAN H. WHITE, JR.

During the Spring of 1961, L. B. Cooper, Lubbock, and August Falkenburg, Estacado, installed a permanent pumping system in a wet-weather lake on a Lubbock County farm. The system was installed on land located 7 miles north and 5 miles east of Idalou, owned by Mr. Cooper and operated by Mr. Falkenburg.

The lake is at the south end of a 320-acre tract. When it is filled to the normal high-water level, it covers about twenty or thirty acres of land.

The lake catches runoff from several hundred acres; approximately one-half of the Cooper land sheds water into the lake.

Before it was decided to install the lake-pump system, Mr. Cooper, a professor in the Education Department of Texas Technological College, and Mr. Falkenburg knew that if they could conceive of some adequate method of recovering water from the lake, it could be inexpensively used in producing crops. Through the years, the four irrigation wells on the Cooper place have decreased in yield to such extent that they no longer produce a sufficient volume of water to irrigate all the crop land as rapidly as is desirable during the summer. In more recent years, plans have been to irrigate anly the cotton land during the summer and not attempt to water the farm's grain sorghum acreage. Of course, this method of irrigating has tended to stifle the farm's potential revenue-earning capacity.

In considering the possible sources of additional water, it was determined that to drill and equip another deep well would cost about $6,000. Rather than put this amount into another well, Mr. Cooper and Mr. Falkenburg decided that a permanent lake-pump system would furnish them, during most years, a fairly dependable supply of water and would require only a fraction of the capital outlay necessary to drill a new well. Besides this, they figured if they had a lake pump, that the crop on several acres of land around the lake, submerged during heavy rainfall runoff, could be saved each year from drowning if the lake water level could be reduced in a relatively short period of time.

The underground irrigation pipeline system installed in prior years on the farm reaches to within 800 feet of the deepest portion of the lake. It was decided that a pipeline could be installed from the lake to this old previously-installed underground pipeline and designed so that water in the lake would gravity flow to this junction point. A lake pump could then be installed at the junction to pick up the lake water and pump it into the irrigation distribution system.

The lake-pump system was constructed as planned.

The new line, 15-inch concrete pipe, installed between the old pipeline and the lake, has a fall of 16-inches from the lake intake to the pump. At the pump, the new pipe is eleven feet below the surface of the land.

The lake pump consists of ten feet of 8-inch column pipe, a 2-stage 10-inch bowl assembly, an 8-inch discharge head, and a 1 to 1 ratio gearhead. It is installed in a concrete circular sump, 30-inches in diameter and 13-feet deep.

The pump is powered by an automotive engine which runs on butane fuel. When in operation, the engine requires about 2 gallons of fuel per hour.

The discharge pipe of the lake pump is attached to a hydrant installed on the end of the old 12-inch concrete pipeline. From there lake water can be pumped to any desired point on the south half of the farm through the underground pipeline system. Extreme pressures resulting from land elevation differences will not permit pumping lake water through the underground distribution system to the northern part of the farm.

During the past summer, the lake caught runoff from two fairly heavy rains. On each occasion, it was estimated that about 50 acre-feet of water was available to the lake pump. Some irrigation "tailwater" from wells was available in the lake most all summer. All the available lake water was put to beneficial use.

One 14-acre tract of land that had no water applied to it other than lake water yielded 7466 pounds of grain per acre. Another tract, consisting of 8 acres, planted to grain sorghum yielded the same amount of grain per acre. This acreage required one summer irrigation from the wells on the farm. Both the 8-acre and the 14-acre tracts were planted in early May using a late-maturing seed variety.

Other grain sorghum was planted

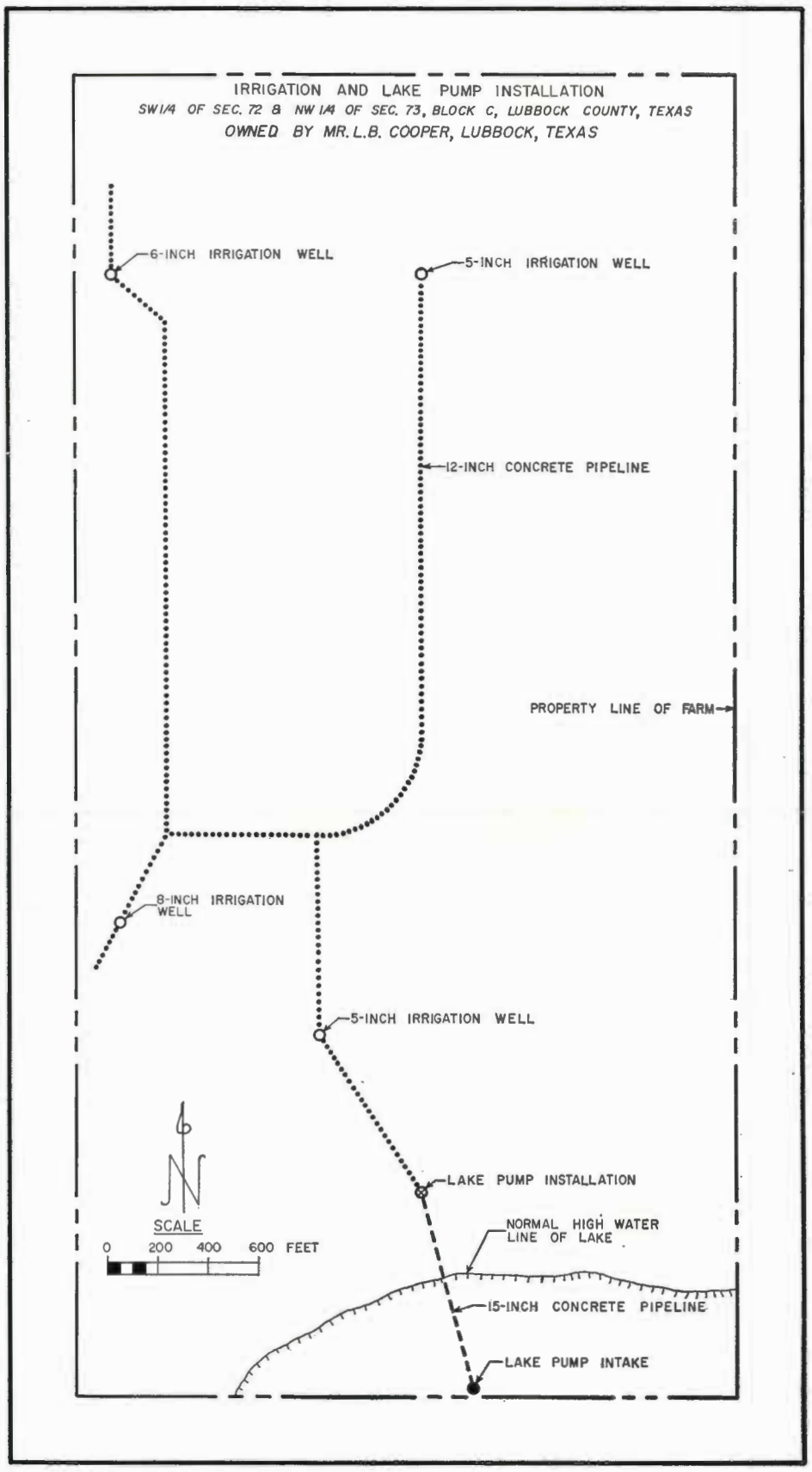
DRILLING STATISTICS FOR OCTOBER 1961

During the month of October, 63 new wells were drilled within the bounds of the High Plains Water District; 22 replacement wells were drilled; and 8 wells were drilled that were dry or nonproductive for other reasons. The County Committees issued 107 new drilling permits.

Permits issued and wells completed for October are listed below by counties.

County	*Permits Issued*	*New Wells Drilled*	*Replacement Wells*	*Dry Holes Drilled*
Armstrong	1	0	0	0
Bailey	6	3	3	1
Castro	12	8	6	0
Cochran	4	0	0	0
Deaf Smith	9	2	4	0
Floyd	7	7	1	0
Hockley	19	9	0	2
Lamb	18	15	4	2
Lubbock	22	10	0	1
Lynn	4	3	0	1
Parmer	4	4	4	1
Potter	0	0	0	0
Randall	1	2	0	0
Totals	107	63	22	8

TO SALVAGE LAKE WATER FOR IRRIGATION



later in June using an early-maturing seed variety. After being heavily infested with Midge, this acreage yielded an average of 4000 pounds of grain per acre. Due to the Midge infestation, a conservative 1000-pound loss per acre in grain yield was estimated.

Cost of the lake-pump system was shared by Mr. Cooper and Mr. Falkenburg. Installation cost of the pipe, $1000., was borne by Mr. Cooper, and capital for the engine and pump, $625., was furnished by Mr. Falkenburg.

Mr. Cooper states that his rent from the 22-acres of early-planted grain sorghum alone almost repaid him his share of the lake-pump system.

Mr. Falkenburg states that, if it were being recontructed, he would make only one change in the system. He says that he would install a high-pressure line between the lake pump and the first deep well. This change would afford the advantage of being able to pump the wells and the lake pump simultaneously. Presently, the lake pump cannot be operated while the wells are pumping into the underground pipeline system. Pressure required to pump against the water-filled pipeline exceeds the specified strength of the standard 12-inch concrete pipe.

August Falkenburg, Estacado farmer, is shown adjusting the intake valve of the lake-pump system installed on the L. B. Cooper farm this past Spring. The intake was located in the deepest part of the wet-weather lake so that all the water would gravity flow to it. The wire fence installed around the intake is placed there to keep trash from entering the pipeline. In the background, near the center, the lake pump can be seen.

Mr. Falkenburg is shown along side the lake pump. The pump is set in a concrete sump, 30 inches in diameter and 13 feet deep. The pump consists of a standard 2-stage 10-inch bowl assembly, 10 feet of 8-inch column pipe, an 8-inch discharge head and a 1 to 1 ratio gearhead. An automotive engine powers the pump. The discharge pipe of the pump is attached to the farms' underground concrete pipeline system.

Appoints–

(Continued from Page 1)

Water Engineers and in more recent years has headed the Water Board's Topographic Mapping Section.

ACKNOWLEDGEMENT

We failed last month to give credit to "The Hereford Brand" newspaper for the use of a photograph of Mr. J. D. Kirkland reproduced in the October, 1961 edition of The Cross Section." We regret this oversight.

EDITOR
THE CROSS SECTION
1628 15th Street
Lubbock, Texas
Dear Sir:

I do not now receive THE CROSS SECTION but would like to have it sent to me each month, free of charge, at the address given below.

Name _____
Street Address _____
City and State _____

(Please cut out and mail to our address)

CONSERVATION CONVERSATION

The new Texas Pollution Control Board, created by the Legislature during the special session this year, will soon be ready to conduct its first meeting.

In accordance with provisions of the law establishing the new state agency, Governor Daniel has appointed three members to the Board. Sam Wohlford of Stratford, rancher and former State Representative, was appointed to represent agriculture and conservation; J. S. Hudnall, Tyler oil man and former president of the Texas Water Conservation Association, was appointed as the member representing oil and gas interests; and C. M. Shigley, Freeport, Assistant General Manager of Dow Chemical Company, was appointed to represent industry. As provided in the law, the remaining three members of the six-man board are Joe D. Carter, Chairman of the State Board of Water Engineers, J. E. Peavy, State Commissioner of Health, and Howard Dodgen, Executive Secretary of the State Game and Fish Commission. Executive Secretary of the new Board is Dave Smallhorst. He is a member of the State Health Department staff.

* * * * * *

"Water Newsletter" reports in its November 6 edition, "Studies conducted by the Water Research Assn. (Redhill, Surrey, England) have shown a relationship between unusually high concentrations of nitrate in water and the incidence of methaemoglobinaemia— an odd illness that affects the blood of babies by hampering the delivery of oxygen to the body's cells. The "poisoning" is cause by the drinking of water containing nitrates in amounts greater than 10 to 20 parts per million. The toxic substance, which cannot be removed from water by any known chemical means, may occur naturally or through pollution by industrial wastes. In every reported case of the disease in the U. S., the nitrate content of the drinking water was greater than 20 parts per million. Fortunately, excessive nitrates are uncommon in public water supplies, except where artificial fertilizers and certain industrial processes have seriously contaminated water resources.

* * * * * *

Members of the thirteen County Committees of the High Plains Water District are at this time in the process of nominating men from their respective areas to run for places on the committees and on the District Board.

The annual High Plains Water District elections will be held January 9, 1962, at which time two men will be elected to the Board of Directors and two men elected to fill vacancies on each County Committee.

The High Plains Water District has recently completed a new display for use in the West Texas Museum on the Texas Technological College campus. The display shows through illustrations, graphs, and photographs, how the Ogallala formation (the principal source of ground water in the High Plains) originated, the development of wells in the area, the uses of ground water, and some practices that individuals can initiate in order to prolong our irrigated agricultural economy.

LETTERS TO THE EDITOR

High Plains Underground Water Conservation Dist. No. 1
1628 15th Street
Lubbock, Texas
Gentlemen:

For some months I have been receiving your monthly publication entitled "Cross Section."

I appreciate very much receiving this in view of the fact it has some mighty interesting articles. My sincere thanks for your courtesy in sending it to me.

Yours very truly,
Samuel Chutkow
Colorado Ground Water Commission
Denver 3, Colorado

* * * * *

Mr. Allan White, Jr., Editor
The Cross Section
High Plains Underground Water Conservation Dist. No. 1
1628 15th Street
Lubbock, Texas
Dear Mr. White:

We were very sorry to learn, from your August publication, of the little girl getting her hair caught in the drive-shaft of an engine-driven pump.

It is some consolation to us to know that, in cooperation with the Safety Department of our State Industrial Commission, our company standards call for guards on all major moving parts of our company-owned gas engine-driven pumping installations.

Attached are two photos showing the drive-shaft and fly-wheel guards. We feel that a gas engine installation can be as safe, if not safer, than electric-drive. We serve both.

Sincerely,
W. L. Kimsey, Manager
Arizona Public Service Co.
Phoenix 2, Arizona

* * * * *

Mr. Allan White, Editor
The Cross Section
1628 15th
Lubbock, Texas
Dear Mr. White:

Just a note to express my appreciation for "The Cross Section." This publication should be "required reading," for every individual in the high plains, irrespective of his occupation.

Best regards,
Tom Sears
Green Acres
Whitewright, Texas

Billings Meeting–

(Continued from Page 1)

increasing population, the trend in the United States is still a widening of the gap between supply and demand. However, it seems that some of our high-level policies for future production of food and fiber are in need of readjustment.

Secretary of Interior Stewart L. Udall, pushed a button to break ground for the construction of Yellowtail Dam on the Big Horn River, the highest and largest concrete structure on the entire Missouri River Basin project system. He states that "with our growing water needs of today, it is difficult to realize that the Yellowtail Dam project was first proposed nearly a half-century ago." Mr Udall indicated that the water to be stored in that reservoir will be used to irrigate additional lands in southern Montana and "with the continuation of this Nation's explosive population growth—plus our increasing commitments abroad in the interest of strengthening the economics of developing countries which can contribute to the cause of freedom—the need for food of all varieties will in the forseeable future outstrip available production and exhaust our surpluses."

However, according to information obtained from "Water Newsletter,"* Mr. Udall has announced a new policy which refuses to permit development of agriculture on federal lands where such development would cause a decline of ground-water levels. The policy is to turn down applications for homesteads where current water requirements for irrigation exceed annual rate of recharge to the underground reservoirs. By the same token, if that reasoning is valid, he should not permit any more development of federal lands for the production of oil at a rate exceeding the replenishment. Furthermore, he should dedicate dams on streams of the West, that will use up dam sites, only at the rate that new dam sites are being created. Otherwise, we will eventually use up the space for surface reservoirs.

We believe that needs for food and fiber will increase and the future production of an adequate supply of these commodities will require coordinated efforts of the American people. However, in development of the facilities to meet these requirements, we believe in the fundamental principles of conservation, based on the knowledge and economic conditions of the times.

*Water Information Center, Inc. Vol 3, No. 20, October 20, 1961.

PLEASE CLOSE THOSE ABANDONED WELLS ! ! !

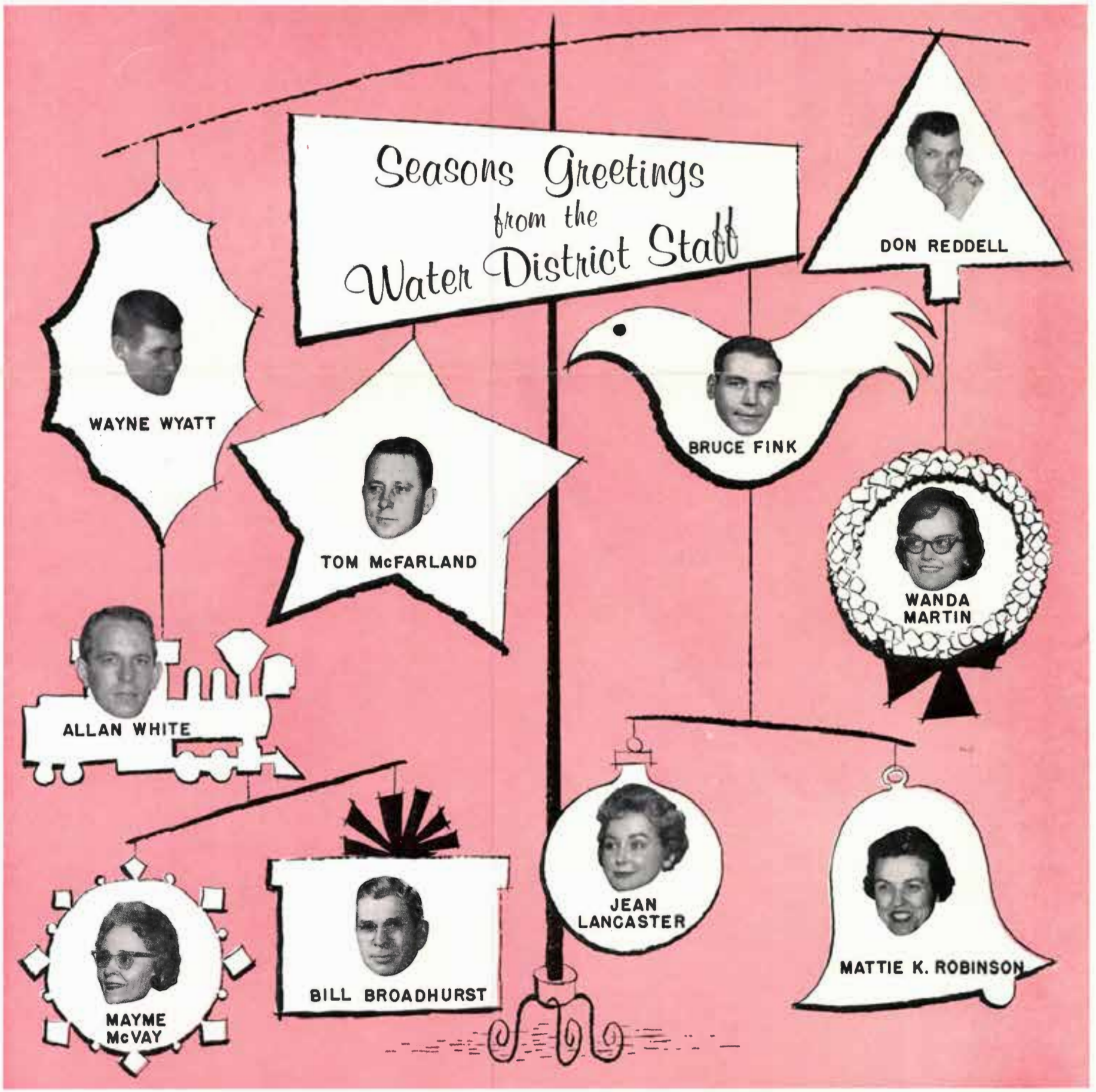
High Plains Underground Water
Conservation District No. 1
1628 Fifteenth Street
Lubbock, Texas

Second Class Permit

THE Cross SECTION

A Monthly Publication of the High Plains Underground Water Conservation District No. 1

Volume 8—No. 7 **"THERE IS NO SUBSTITUTE FOR WATER"** *December 1961*



THE Cross SECTION

A MONTHLY PUBLICATION OF THE HIGH PLAINS UNDERGROUND WATER CONSERVATION DISTRICT NO. 1

Published monthly by the High Plains Underground Water Conservation District No. 1
1628 15th Street, Lubbock, Texas

Telephone PO2-8088

ALLAN WHITE
Editor

TEXAS WATER LAWS AND RIGHTS DISCUSSED BY OTHA F. DENT

Otha F. Dent, Member of the Texas Board of Water Engineers, spoke to County Agricultural Agents this month during an Irrigation Training School in Lubbock, sponsored by the Texas Agricultural Extension Service.

Mr. Dent's comments related to Water Law and Rights in Texas. On the subject of "Ownership and Rights of Ground Water," he had the following to say:

"Around the turn of the century Mr. W. A. East resided on his homestead in Denison, Texas. He had constructed a well on his land which was approximately 5 feet in diameter and 33 feet deep. It was classed or termed as a "good well" and provided adequate water for domestic and household purposes. In 1901 the Houston & Texas Central Railroad Co. constructed a well on its land adjacent to Mr. East. Its well was larger in diameter than Mr. East's well, and 66 feet in depth. The Railroad Company pumped its well at the rate of 117 g. p. m. or about 25,000 gallons per day. This amount was necessary to satisfy the water requirements of its engineers and shops. Neither of the wells produced from the underflow or a subterranean stream, but rather so-called percolating water.

"The heavy pumping by H & T. C. Railroad Company ultimately dried up Mr. East's well. In 1902, East brought suit against the railroad for damages in the amount of $206.25 growing out of the alleged destruction of the well. Little did Mr. East apprehend that the final decision in his cause of action would become a guiding light and set the rule for the Courts to follow in the years ahead relating to the ownership and use of ground water in Texas.

"The case was tried before the court without a jury, and resulted in a judgement for defendant, and Mr. East appealed his suit for damages to the Court of Civil Appeals. (East v. H. & T. C. Ry. Co., 77S. W. 646, Tex. Civ. App., 1903) The Court of Civil Appeals held, in accordance with the law applicable to defined streams, that the railroad's rights to use its well was limited to a reasonable use. The Court found that: (1) the railroad's use of its well was not a reasonable use of its property as land but an artificial use; and (2) if the doctrine of reasonable use, as applied to defined streams is applied, an unreasonable use. The Court of Civil Appeals reversed the trial court's findings and held that East was entitled to damages. The Court cited and relied upon cases holding that the right of a landowner to produce percolating water is not absolute, but is qualified and limited to the amount necessary for the reasonable use of the land, as land; and that the rights of adjoining landowners are correlative.

"Houston & Texas Central Railroad Co. appealed to the Supreme Court and writ of error was granted. (Houston & T. C. Ry. C. v. East, 98 Tex. 146, 81 S. W. 279, 1904) The Court, in what is now considered a landmark decision rejected the doctrine of correlative rights, or reasonable use. It held that since the railroad was making a legitimate use of the water, it could pump all the water it desired from its own land, and Mr. East's damages were *damnum absque injuria* (injury without wrong). There were no allegations nor proof of either malice or waste. The Court said:

'The mere quantity of water taken by the owner from his land has nowhere been held to affect the question. Exhaustion resulting from excavation and pumping . . . .has been considered in several cases to give rise to no liability.'

"The opinion quotes with approval the English rule announced in Acton v. Blundell, 12 Mees. & W. 324, saying:

"The Supreme Court reversed the judgement of the Court of Civil Appeals and affirmed that of the District Court. The Court reasoned that:

'In the absence of express contract and a positive authorized legislation, as between proprietors of adjoining land, the law recognizes no correlative waters percolating, oozing, or filtrating through the earth;and this mainly from considerations of public policy: (1) Because the existence, origin, movement, and course of such waters, and the causes which govern and direct their movements, are so secret, occult, and concealed that an attempt to administer any set of legal rules in respect to them would be involved in hopeless uncertainty, and would, therefore, be practically impossible. (2) Because any such recognition of correlative rights would interfere, to the material detriment of the commonwealth, with drainage and agriculture, mining, the construction of highways and railroads, with sanitary regulations, building, and the general progress of improvements in works of embellishment and utility. The mere quantity of water taken by the owner from his land has nowhere been held to affect the question. Exhaustion resulting from excavating and pumping for mining purposes has been considered in several cases to give rise to no liability. So the authorities generally state that the use of water for manufacturing, brewing, and like purposes is within the right of the owner of the soil, whatever may be its effect upon his neighbor's wells and springs.'

"In the intervening years since 1904 the Supreme Court has relied upon the East decision in several cases relating to ground water, and there is no doubt that the East decision has influenced the Texas law with respect to ownership of oil and gas.

"As might be expected, with the increased use of ground water, the correctness of the East decision has been brought sharply into focus during the past few years. In 1955 the rule of the East case was squarely before the Supreme Court in two cases. The first of these is the Comanche Springs Case from Pecos County. (Pecos County Water Control & Improvement District v. Williams, 271 S. W. 2d 503, Tex. Civ. App., 1955, err. ref., n. r. .e) Here it was seriously and ably contended that the rule of the East case had become obsolete and should either be modified or completely overruled. The El Paso Court of Civil Appeals refused to do so, following the East decision. The question was directly presented to the Supreme Court on application for writ of error, which was refused with the notation, 'no reversible error.'

"The second case is the City of Pleasanton decision. (City of Corpus Christi v. City of Pleasanton, 154 Tex.

HIGH PLAINS WATER DISTRICT TO HOLD ELECTIONS JANUARY 9th

Again the time rapidly approaches for the annual election of Directors and Committeemen for the High Plains Underground Water Conservation District.

The coming elections will be held throughout the District on January 9, 1962.

The terms of two Directors on the District's five-man Board expire this year. Those elected to the Board will serve two-year terms of office.

The terms of office of two Committeemen in each of the thirteen Water District counties also expire this year. Committeemen are elected to serve three-year terms.

Qualified voters who reside within the areas affected by the election will be eligible to cast a ballot. The 1960 poll-tax receipt will be the one used for voting—the receipt used during 1961.

It is not necessary to be a farmer, an irrigator, or involved in any specified occupation to be eligible to vote in this election—this has been a point of misunderstanding in the past. Any qualified voter is eligible.

Cochran, Hockley and Lamb county residents will elect one representative to the Board of Directors. Floyd County residents will also elect one man to the Board.

Polling places are listed below by county. Each voter must cast his ballot in his home county; however, he may vote at any one of the polling places in that county.

Nominees for Directors and Committeemen are also listed below.

VOTING PLACES

Armstrong County

1. Schoolhouse, Wayside

Bailey County

1. Enochs' Gin Office, Enochs
2. Community House, Muleshoe

Castro County

1. Hardware Company, Nazareth
2. County Courthouse, Dimmitt
3. Easter Community Center

Cochran County

1. County Activities Bldg., Morton
2. Star Route Co-Op Gin

Deaf Smith County

1. County Courthouse, Hereford

Floyd County

1. County Courthouse, Floydada
2. City Hall, Lockney

Hockley County

1. City Hall, Anton
2. Farm Center Gin, Ropesville
3. County Courthouse, Levelland
4. Farmer's Co-Op Gin, Whitharral
5. City Hall, Sundown

Lamb County

1. City Hall, Olton
2. City Hall, Sudan
3. Community Bldg., Earth
4. County Courthouse, Littlefield
5. Farmer's Co-Op Gin, Spade

Lubbock County

1. Community Clubhouse, Shallowater
2. City Hall, Wolfforth
3. Old County Courthouse, Lubbock

Lynn County

1. Community Center, New Home
2. City Judge's Office, Wilson State Bank, Wilson

Parmer County

1. City Hall, Friona
2. Wilson & Brock Insurance Agency, Bovina

Potter County

1. Schoolhouse, Bushland

Randall County

1. Randall County Grain Co., Ralph Switch
2. V. F. W. Hall, Canyon

NOMINEES FOR DISTRICT DIRECTOR

Director's Precinct No. 2

(Cochran, Hockley and Lamb Counties)
(One to be Elected)

1. Henry Gilbert, Sudan
2. Roy Hickman, Morton
3. Henry "Chick" Schmidly, Levelland

Director's Precinct No.5

(Floyd County Only)
(One to be Elected)

1. J. R. Belt, Jr., Lockney
2. Ernest Lee Thomas, Floydada

NOMINEES FOR COUNTY COMMITTEEMEN

Armstrong County

(Residents of Commissioner's Precinct No. 3 will elect two)
1. Robert Adams, Wayside
2. R. C. McNeil, Rt. 1, Happy
3. Foster Parker, Rt. 1, Happy
4. John Patterson, Rt. 1, Happy

Bailey County

(Residents of Commissioner's Precinct No. 1 will elect one)
1. Leon Lewis, Rt. 1, Box 98, Muleshoe
2. Loyd D. Throckmorton, Rt. 1, Muleshoe

(Residents of Commissioner's Precinct No. 3 will elect one)
1. Doyle Davis, Star Route, Goodland
2. Rayford Masten, Box 564, Maple

Castro County

(Residents of Commissioner's Precinct No. 3 will elect one)
1. Morgan Dennis, Dimmitt
2. Lester Gladden, Star Rt., Hereford

(Residents of Commissioner's Precinct No. 4 will elect one)
1. Carlos Calvert, Dimmitt
2. H. E. Henley, Rt. 5, Dimmitt

Cochran County

(County residents will elect one Committeeman-At-Large)
1. Ira Brown, Box 774, Morton
2. Lloyd Miller, Box 246, Morton

(Residents of Commissioner's Precinct No. 2 will elect one)
1. George Smith, Box 975, Whiteface
2. L. L. Taylor, Rt. 1, Morton

Deaf Smith County

(Residents of Commissioner's Precinct No. 3 will elect one)
1. Clinton Jackson, 807 N. Main, Hereford

(Residents of Commissioner's Precinct No. 4 will elect one)
1. Billy B. Moore, Wildorado

Floyd County

(Residents of Commissioner's Precinct No. 1 will elect one)
1. L. D. "Buster" Simpson, 832 W. Tennessee St. Floydada
2. Chloma Williams, Rt. 4, Floydada

(Residents of Commissioner's Precinct No. 3 will elect one)
1. Grigsby "Doodle" Milton, Silverton Star Rt., Floydada
2. Don Probasco, Silverton Star Rt., Floydada

Hockley County

(Residents of Commissioner's Precinct No. 1 will elect one)
1. Preston L. Darby, Rt. 1, Ropesville

(Residents of Commissioners Precinct No. 2 will elect one)
1. Earl Miller, Rt. 5, Levelland

Lamb County

(County Residents will elect one Committeeman-At Large)
1. Troy Moss, Rt. 1, Littlefield
2. Doyle Tapley, Rt. 1, Amherst

(Residents of Commission's Precinct No. 2 will elect one)
1. Roger Haberer, Earth
2. Clarence Kelley, Earth

Lubbock County

(Residents of Commission's Precinct No. 1 will elect one)
1. W. W. "Woody" Allen, Rt. 4, Lubbock
2. M. N. Thompson, Rt. 4, Lubbock

(Residents of Commission's Precinct No. 4 will elect one)
1. Bill Hardy, Rt. 1, Shallowater
2. Jay Stanton, Rt. 2, Lubbock

Lynn County

(Residents of Commission's Precinct No. 1 will elect one)
1. Weldon Bailey, Rt. 1, Wilson
2. T. J. Swann, Rt. 1, Wilson

(Residents of Commission's Precinct No. 4 will elect one)
1. Harold Gene Franklin, Rt. 4, Tahoka
2. Robbie Gill, Rt. 1, Wilson

Parmer County

(Residents of Commissioner's Precinct No. 1 will elect one)
1. Joe B. Douglas, Friona
2. Ralph Shelton, Friona

(Residents of Commissioner's Precinct No. 2 will elect one)
1. Carl Rea, RFD, Bovina
2. Walter Schueler, RFD, Friona

Potter County

(Residents of Commissioner's Precinct No. 4 will elect two)
1. L. C. Moore, Bushland
2. Temple Rogers, Rt. 1, Amarillo

Randall County

(Residents of Commissioner's Precinct No. 3 will elect one)
1. Harold Bryan, Rt. 1, Happy
2. Jackie Meeks, Rt. 2, Happy

(Residents of Commissioner's Precinct No. 4 will elect one)
1. A. C. Evers, Rt. 2, Canyon
2. Earnest A. Stocker, Rt. 1, Canyon

THE CROSS SECTION
1628 15th Street
Lubbock, Texas
Dear Sir:
I do not now receive THE CROSS SECTION but would like to have it sent to me each month, free of charge, at the address given below.
Name_____
Street Address_____
City and State_____
(Please cut out and mail to our address)

289, 276 S. W. 2d 798, Sup. Ct., 1955) In this case, the Supreme Court granted the application for a writ of error on a point involving waste of ground water, and in the majority opinion spelled out its reasons for adhering to the English rule of ownership adopted in Texas by the East case.

"Since the Texas Supreme Court has followed the absolute ownership theory of the East case and has held that the courts cannot enjoin anything but wanton and willful waste, it is clearly up to the Legislature to provide for the conservation of ground water and the prevention of waste. Once it is recognized that our ground water supply is confined in separate, relatively well defined reservoirs and that some reservoirs are artesian and some are not, and that each represents a separate problem, it becomes clear that regulation by reservoirs or by sub-divisions thereof is the most practical method of conservation.

"In 1949, prior to the decisions in both the Comanche Springs and the City of Pleasanton cases. The Legislature authorized the creation of districts for the conservation of underground water. In so doing, the Legislature made the following declaration:

'The ownership and rights of the owner of the land . . . in underground water are hereby recognized, and nothing (herein) shall be construed as depriving or divesting such owner . . . of such ownership or rights, subject, however to the rules and regulations promulgated pursuant to this section.'

"The Legislature also declared that the words 'underground water' mean water 'percolating below the earth's surface, and do not include defined subterranean streams or the underflow of rivers.'

"Since conditions in various parts of Texas are dissimilar—the average rainfall varying from 10 inches near El Paso to 56 inches on the Louisiana border—and since the ground water reservoirs, the land use, and the water use vary so widely, a large measure of relatively local autonomy is indicated rather than authority vested in one statewide central agency to regulate all reservoirs by blanket rule. This local regulation approach is the one presently followed by the Texas Legislature, and in the opinion of the writer is a sensible course to pursue in the conservation and utilization of the ground waters of the state."

DRILLING STATISTICS FOR NOVEMBER

During the month of November, 40 new wells were drilled within the bounds of the High Plains Water District; 6 replacement wells were drilled; and 2 wells were drilled that were either dry or non-productive for other reasons. The County Committees issued 83 new drilling permits.

Permits issued and wells completed for November are listed below by counties.

County	Permits Issued	New Wells Drilled	Replacement Wells	Dry Holes Drilled
Armstrong	2	2	0	0
Bailey	3	3	0	0
Castro	7	2	1	0
Cochran	3	0	0	1
Deaf Smith	0	2	0	0
Floyd	7	7	0	0
Hockley	11	2	0	0
Lamb	14	2	0	0
Lubbock	18	11	1	1
Lynn	11	5	0	0
Parmer	7	4	4	0
Potter	0	0	0	0
Randall	0	0	0	0
Totals	83	40	6	2

Ground-Water Depletion Case Comes To Trial January 3, In Lubbock

Final preparations are being made by the High Plains Underground Water Conservation District for the trial of a lawsuit brought by Marvin Shurbet, Floyd County farmer, against the U. S. Internal Revenue Service.

The trial will begin January 3, 1962, in the U. S. District Court at Lubbock; Judge Joseph B. Dooley will preside. The suit is sponsored by the High Plains Water District and is being treated as a test case by the Internal Revenue Service.

During the trial, testimony by witnesses for the plaintiff, Marvin Shurbet, will attempt to show that ground water in the southern High Plains of Texas is a natural deposit and that it is being exhausted by pump extraction.

Plaintiff will further contend that landowners who can establish an actual initial cost in the ground water beneath their land, as distinguished from the cost of the land itself, and who are using that water to produce income, are entitled to deduct this cost of water on their federal income-tax returns as the water is exhausted.

The High Plains Water District has worked for seven years in an effort to establish ground water in the southern High Plains as a depletable natural resource under the federal tax laws. If the court finds that the plaintiff's contentions are valid and justified under the law then all water-users in the area with a like set of circumstances should be eligible to deduct, on their income-tax returns, the cost of the ground water as it is used.

The trial will be open to the public. The court is located on the third floor of the Post Office Building in Lubbock.

CONSERVATION CONVERSATION

Most farmers will tell you that the 1961 crop has been one of the least expensive to produce in many years.

There are perhaps many reasons why this has been true, but at least one reason is certainly attributable to the fact that most crops required only a minimum amount of irrigation water. The snows and rains were extremely timely, coming when great benefit could be realized.

With the 1961 crop now gathered, or being harvested, in most communities of the High Plains, it is time to commence making plans for next year's crop.

Keeping in mind the fact that irrigation is generally one of the greatest expenses involved in producing a crop, it would appear that for you to try and determine how to better utilize natural precipitation, both where it falls and also by pumping from lakes, would be good business. Such practices would minimize the requirements for ground water by next year's crop.

Now is the time to change your rows, level your land, add humus to your soil, do the dirt work in your lake bottom that will make easier pumping runoff water from it, or any other job that you decide will increase the water-use efficiency on your farm.

The loss of irrigation "tailwater" is a problem which confronts most irrigators. This expensive loss can normally be alleviated—it can always be minimized.

With records of the High Plains Underground Water Conservation District indicating that underground water levels are dropping annually, it becomes increasingly apparent that for the southern High Plains to continue as a major agricultural area, rainfall must be used more efficiently.

More than likely, you can make some simple and inexpensive changes in farming methods that could result in a greater net income to you from the crops you harvest.

* * * * *

The January 17, 1961 edition of "Water Newsletter" contained an interesting paragraph explaining the workings of a 1,000-year-old court in Spain. It reads as follows:

"Every Thursday at the stroke of noon, one of the most unusual courts in the world opens session in Valencia, Spain. Convened weekly without interruption since the year 960, the tribunal hears only 'crimes' regarding the *misuse of water* in the fertile irrigated farmlands surrounding the city. Eight judges, one for each of the area's main irrigation ditches, preside over the Tribunal de las Aguas, rendering decisions and levying fines on disputes involving use of water. No appeals are permitted, and in the 1,000-year history of the court, none of its rulings have been disobeyed."

We sometimes think that we here in the southern High Plains of Texas are the only ones with water problems. Apparently this is untrue—the irrigators at Valencia, Spain have been attempting to find the answers to their problems for more than 1,000 years. They don't seem to have all the problems solved yet.

Water-Level Changes To Be Measured

To provide basic water-level data to irrigators, municipalities and industries, the annual water-level measuring program will commence January 8, 1962 in a large portion of the High Plains.

Five State Board of Water Engineers staff members, will measure water levels in 23 southern High Plains counties. Personnel of the High Plains Water District will assist in making measurements within the District.

Several High Plains Electric Cooperatives supplied necessary well data this year to facilitate the addition of many wells in areas heretofore not covered by the observation well program.

Several wells in Castro and Deaf Smith Counties have also been added to the program by the Water District to improve coverage.

A majority of the water-level measurements in these 23 counties will be processed by IBM tabulation and published by the Board of Water Engineers early in 1962.

Water-level measurements made within the District will be published in "The Cross Section."

Floyd-Lamb County Offices Re-Locate

Two County Committee offices of the High Plains Underground Water Conservation District have changed locations during the past month.

The Floyd County office is now located at 325 East Houston Street in Floydada. The location change was brought about by the Floyd County Farm Bureau constructing a new building.

Mrs. Katherine King is the County Committee Secretary.

The Lamb County office has also moved to new quarters. Mr. Calvin Price, Committee Secretary, has relocated his business at 620 Hall Avenue in Littlefield. Hall Avenue is south Highway 385. The building has been completely renovated for the convenience and comfort of Mr. Price's customers.

LETTERS TO THE EDITOR

High Plains Underground Water Conservation District No. 1
1628 15th
Lubbock, Texas

Dear Sirs:

Through the past year we have received a gift subscription to *The Cross Section* from your office. This letter is to let you know that we are grateful for this addition to our research files.

The copies of your magazine are permanently preserved in the Southwest Collection and are utilized by the students and faculty of Texas Tech. Catalogued and available on our shelves, each copy thus reaches a large number of readers; as the years go by and the file grows it becomes increasingly valuable to us and in an indirect way, we hope, to you.

Please accept my sincerest appreciation on behalf of the College and the Museum for this continuing gift.

Sincerely yours,
Seymour V. Connor
Director
Southwest Collection
Texas Technological College
Lubbock, Texas

* * * * *

Mr. Allan White, Jr.
Editor, The Cross Section
High Plains Underground Water Conservation District No. 1
1628 15th Street
Lubbock, Texas

Dear Mr. White:

I appreciate receiving "The Cross Section." I have been deeply impressed by the work your Underground Water Conservation District No. 1 has been doing. I hope that in time your good work will attract the attention of the water users in the Lea County, New Mexico Underground Water Basin, to the end that a similar Conservation District will be authorized by the New Mexico Legislature and established by the Lea County water users.

Yours very truly,
Robert W. Ward
Attorney-At-Law
Lovington, New Mexico

WHEN YOU MOVE . . .

Please notify High Plains Water District, 1628 - 15th Street, Lubbock, Texas, on Post Office Form 22S obtainable from your local postmaster, giving old as well as new address, to insure no interruption in the delivery of "The Cross Section."

PLEASE CLOSE THOSE ABANDONED WELLS ! ! !

High Plains Underground Water
Conservation District No. 1
1628 Fifteenth Street
Lubbock, Texas

Second Class Permit