THE Cross SECTION

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

Volume 3—No. 7 **"THERE IS NO SUBSTITUTE FOR WATER"** *January 1957*

VOTERS ELECT 3 DISTRICT DIRECTORS AND 13 COUNTY COMMITTEEMEN

Elmer Blankenship of Route 2, Wilson, Lynn County, was elected to serve a two-year term on the Board of Directors of the High Plains Water District by voters in the January 8th Water District annual elections. He will represent the people of Precinct No. 1, which includes Lubbock and Lynn Counties.

A. H. Daricek of Maple, in Bailey County, was elected to the Board of Directors to represent the people of Precinct No. 3, which includes Bailey, Castro, and Parmer Counties.

V. E. Dodson of Hereford, in Deaf Smith County, was re-elected to the Board of Directors to represent Precinct No. 4, which includes Armstrong, Deaf Smith, Potter and Randall Counties.

Misters Blankenship, Daricek and Dodson will serve for the next two years on the Board. They join Gus Parish of Lamb County in District Precinct No. 2 and Marvin Shurbet of Floyd County in District Precinct No. 5, to round out the five-man Board of the District.

W. O. Fortenberry of Lubbock and W. M. Sherley of Lazbuddy are retiring from the Board after serving their people very ably and faithfully.

One Committeeman was elected from each of our thirteen counties to serve a three-year term on the various county committees.

These elected Committeemen are as follows:

ARMSTRONG COUNTY
Jack McGehee, Wayside
BAILEY COUNTY
Ross Goodwin, Route 2, Muleshoe
CASTRO COUNTY
Rodney Smith, Hart
COCHRAN COUNTY
Roy D. Greer, Star Route 2, Morton
DEAF SMITH COUNTY
Austin C. Rose, Jr., 108 Beach St., Hereford
FLOYD COUNTY
Chester W. Mitchell, Lockney
HOCKLEY COUNTY
J. J. Hobgood, Route 2, Anton
LAMB COUNTY
Roy McQuatters, Route 1, Littlefield
LUBBOCK COUNTY
Bill Alspaugh, Box 555, Slaton
LYNN COUNTY
Erwin Sander, Route 1, Wilson
PARMER COUNTY
Lee Jones, RFD, Farwell
POTTER COUNTY
Eldon Plunk, Route 1, Amarillo
RANDALL COUNTY
Leo Artho, Route 1, Canyon

We are happy to welcome these newly elected men to the Board of Directors and to the County Committees.

To the retiring Directors and Committeemen we want to thank each for giving his time and efforts to the vital business of conserving the underground water underlying this area.

Irrigation and water use becomes more extensive each year and our programs necessarily become more varied and intricate. With the guiding hands of aggressive and forward-looking men, such as those of these elected Directors and Committeemen, we can move on together toward a bright and prosperous agricultural, industrial and municipal future.

Color Maps Tell Story

The colored map in this issue of "The Cross Section" is the third in a series; the first, which was published in the November 1956 issue, showed the thickness of the Ogallala formation from the surface of the ground to the bottom of the formation; the second, which was published in the December 1956 isssue, showed the thickness of the saturated portion of the Ogallala formation in 1938—that part of the Ogallala formation from the water table to the bottom of the formation; and the map in this issue shows, by 20-foot intervals, the number of feet that the water levels in wells declined from the spring of 1938 to January 1956. The first two maps covered only the 13 counties that are actively participating in the High Plains Underground Water Conserva-

(Continued on Page 4)

THE STATISTICS

During the month of November, 208 completed wells were registered with the District office and 290 permits issued by the County Committees. During the month of December, 127 completed wells were registered and 389 permits issued. These new permits issued and completed wells follow by Counties:

	Completed Wells		*Permits Issued*	
County	*Nov.*	*Dec.*	*Nov.*	*Dec.*
Armstrong	1	0	0	0
Bailey	29	13	21	18
Castro	10	7	6	33
Cochran	2	1	7	19
Deaf Smith	16	7	23	13
Floyd	17	13	18	35
Hockley	24	26	46	91
Lamb	20	1	33	13
Lubbock	49	33	80	113
Lynn	19	13	37	31
Parmer	18	8	15	13
Potter	0	0	0	0
Randall	3	5	4	10

ARE YOU A FAITHFUL STEWARD OF YOUR GOD-GIVEN RESOURCES?

By J. RALPH GRANT, D. D.

Dr. Grant, pastor of the First Baptist Church, Lubbock, Texas has prepared this article especially for "The Cross Section."

In 1938, the United States government sent one of its leading soil scientists to make a survey of the loss of the fertility of the soil in Mesopotamia, the rich cradle of civilization. That land was literally covered with miniature mountain ranges of silt, piled beside the ancient irrigation ditch-

DR. J. RALPH GRANT

es. Cities were buried deep under the products of soil erosion. Dr. William Loudermilk, the scientist making the investigation, found there were broken remains of a forsaken irrigation system. Dried and caked beds were all that were left of once flowing streams. In this great valley there once lived 40 to 50 million people. They lived well because of the water and the soil. In the same great area now, only four or five million can be supported, and that meagerly.

One of the most precious resources we have is water. Little wonder that even Christ made water the symbol of life, saying, "I am the water of life." Water is not a luxury, but an essential. Without it we would die. Without it, the soil will fail to produce crops.

An eminent soil specialist once said, "We cannot draw on the mineral bank more than we put in, for in so doing bankruptcy is sure to come." These natural resources are God-given and should be held as a sacred trust. Through loss of water and soil erosion, millions of acres are no longer productive in this country. Fifty million acres are gone that were once cultivated. We are told that another fifty million acres are in the stage of going. Apparently we are poor stewards of God's resources.

It has been observed that civilization rests on nine inches of top soil. Yet with a loss of water and failure to properly conserve the soil, little by little that precious top soil is being lost. Chester Davis once said, "No farmer is a good farmer unless he farms to save the soil."

Let us determine to be faithful stewards of God's good earth.

Irrigation Expert Compiles Data On Area

Mr. George Black, Associate Agricultural Agent, Irrigation, Texas Agricultural Extension Service, Lubbock, has compiled the following statistical data on our general area:

With ever increasing acreage going under irrigation, coupled with a rapidly lowering water table, at first glance it might seem that our days are numbered until this might once again be a dust bowl. This situation has been brought about primarily through over expansion without much thought being given to a long range program of irrigated agriculture for this area.

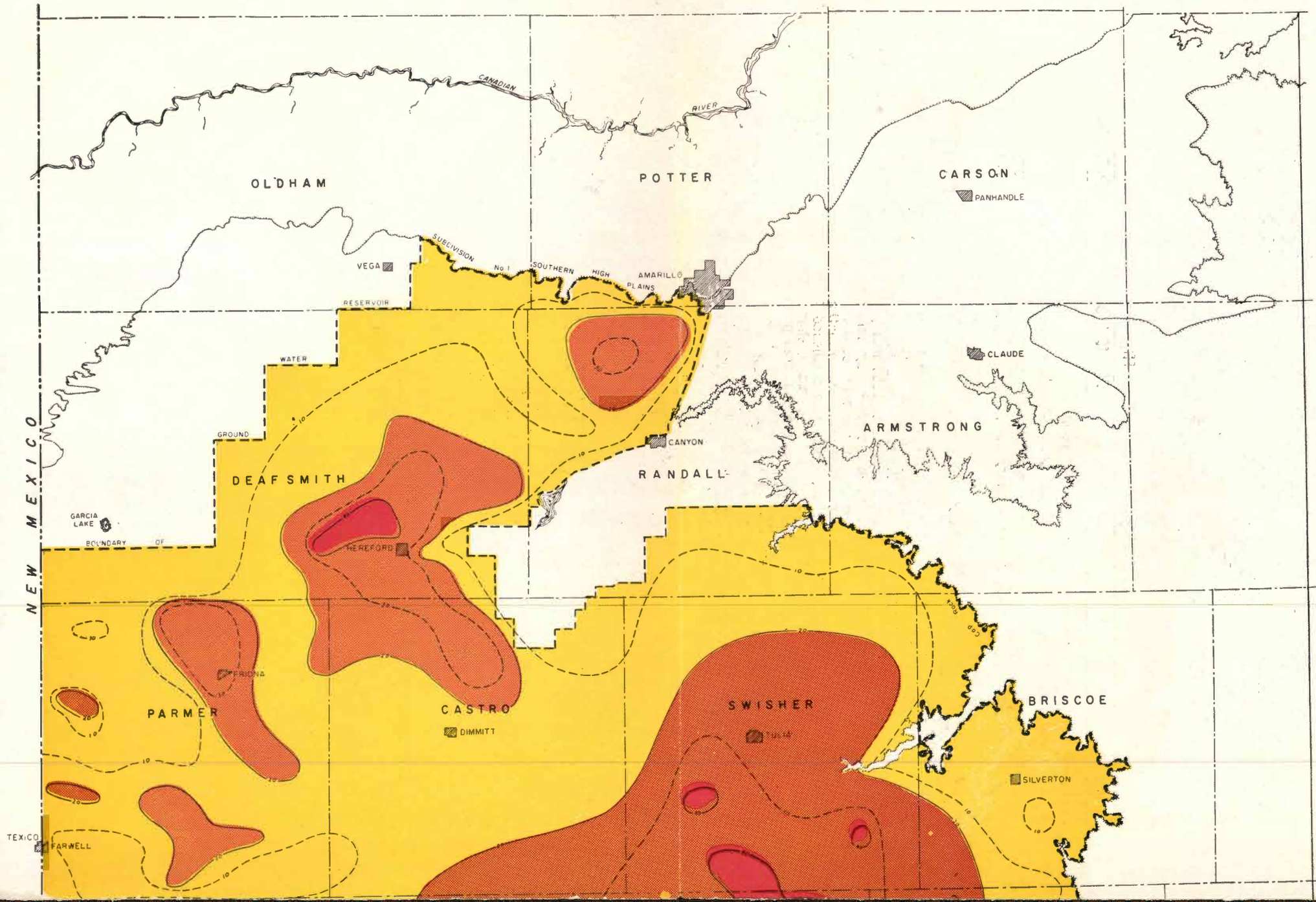
Our irrigated acreage is well in excess of four and one-third million acres with 321,963 new acres going under irrigation this past year. At the present time, we are pumping from 36,572 wells which shows an increase of 3,000 in the last twelve months. When we analyze the situation and come up with facts and figures such as these, we ask ourselves this question, "What steps are we going to take to maintain our irrigated agriculture?"

The High Plains Farmer is not one to stand by when the livelihood and security of his family are threatened, but is a man of action as is indicated by a recent survey to determine the amount of underground irrigation pipe installed on the Plains. This survey shows that there has been over 2,532 miles of underground irrigation pipe installed in the last year.

The installation of underground pipe systems at such an accelerated pace, along with many other water conservation and utilization practices, indicates that we are rising to meet this challenge. Through better under-

(Continued on Page 4)

APPROXIMATE DECLINE OF THE WATER TABLE 1938-1956



BAILEY

LAMB

HALE

FLOYD

MULESHOE

PLAINVIEW

LOCKNEY

FLOYDADA

DOUGHERTY

LITTLEFIELD

MORTON

COCHRAN

HOCKLEY

LEVELLAND

LUBBOCK

LUBBOCK

CROSBY

CROSBYTON

NEW MEXICO

BOUNDARY OF GROUND WATER RESERVOIR

NO. 1 SOUTHERN HIGH PLAINS SUBDIVISION

YOAKUM

PLAINS

TERRY

BROWNFIELD

LYNN

TAHOKA

GARZA

POST

EXPLANATION

10	LESS THAN 20 FEET
30	FROM 20 FEET TO 40 FEET
50	FROM 40 FEET TO 60 FEET
70	FROM 60 FEET TO 80 FEET
	MORE THAN 80 FEET

SCALE

0 5 10 15 20 Miles

PREPARED FROM RECORDS OF THE HIGH PLAINS UNDERGROUND WATER CONSERVATION DISTRICT NO. 1, THE UNITED STATES GEOLOGICAL SURVEY, AND THE STATE BOARD OF WATER ENGINEERS. SUBJECT TO REVISION WHEN ADDITIONAL DATA ARE AVAILABLE.

HIGH PLAINS UNDERGROUND WATER CONSERVATION DISTRICT

MANAGER

THOMAS J. McFARLAND

CHIEF HYDROLOGIST

WILLIAM L. BROADHURST

PREPARED BY

GORDON W. WILLIS

CONSULTING GROUND-WATER GEOLOGIST

SEPTEMBER 1956

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
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Telephone PO2-8088

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ALLAN WHITE
Editor

Color Maps—

(Continued from Page 1)

tion District No. 1; whereas the present map covers the entire Southern High Plains Underground Water Reservoir Subdivision No. 1, including all or parts of 21 counties.

Depths to water in about 500 observation wells throughout the Southern High Plains have been measured and recorded each spring by the U. S. Geological Survey in cooperation with State Board of Water Engineers. The map showing the approximate decline of the water table from 1938 to 1956 was prepared from those records. The locations of the observation wells and the depths to water or changes in water levels from year to year have been published in U. S. G. S. Water Supply Papers and in bulletins and maps by the Board of Water Engineers. The map shows that for the 18-year period from 1938 to 1956 the water levels in wells declined throughout the entire region, but the amount of the decline was less than 20 feet beneath about half the region. The red, gray, and black portions of the map show the areas beneath which the declines were more than 40, 60, and 80 feet respectively. These areas correspond in general to the areas from which the greatest quantities of water were withdrawn.

The decline map has a special meaning in relation to what has happened to our water supply; however, when

it is studied in conjunction with the map showing the thickness of the saturated strata in 1938 it has even greater significance in relation to the quantity of water remaining in storage for future use.

Data On 1956 Drilling

Drilling activity decreased during the year 1956, as compared to the number of wells drilled within the High Plains Water District during 1955.

In 1956 there were 2170 wells drilled and registered with the District office and there were 2617 permits approved by our thirteen County Committees.

These figures are shown below by Counties:

County	*Permits Issued*	*Completed Wells*
Armstrong	1	1
Bailey	216	198
Castro	182	138
Cochran	96	89
Deaf Smith	228	185
Floyd	225	174
Hockley	403	310
Lamb	250	194
Lubbock	568	452
Lynn	225	212
Parmer	161	161
Potter	0	0
Randall	62	56

W. H. Bartlett And Small Irrigation Well Produce Profitable Crop On 43.5 Acres

We published an article in the August 1956 edition of "The Cross Section", entitled "Is the Use of Small Irrigation Wells Profitable?"

We have followed up on this story of Mr. W. H. Bartlett's operation, southeast of Slaton, in Lubbock County, in an effort to advise our readers of the yields obtained in cotton and grain sorghum from his irrigated and partially irrigated land.

As a refresher, you may remember that Mr. Bartlett owns 60 acres of

W. H. Bartlett and his 80 gallon per minute irrigation well.

land and is able to water 51 acres of this total, at least on occasions. He has one 3-inch well which is powered by a 5-horsepower vertical hollow-shaft electric motor. We have pictured above Mr. Bartlett standing beside his pump which produces approximately 80 gallons of water per minute.

For the crop year 1956, Mr. Bartlett planted his allotted 25.5 acres of cotton after having watered the land one time plus 1.5 acres which were planted and then plowed under. He planted to grain sorghum 18 acres of land which was watered one time before planting. Also, he planted 3 acres of grain sorghum and 3 acres of Sudan on land which had not been watered, making a total of 51 acres. Sixteen acres of the grain sorghum was never watered again after planting and the remaining 2 acres received only one other application of water.

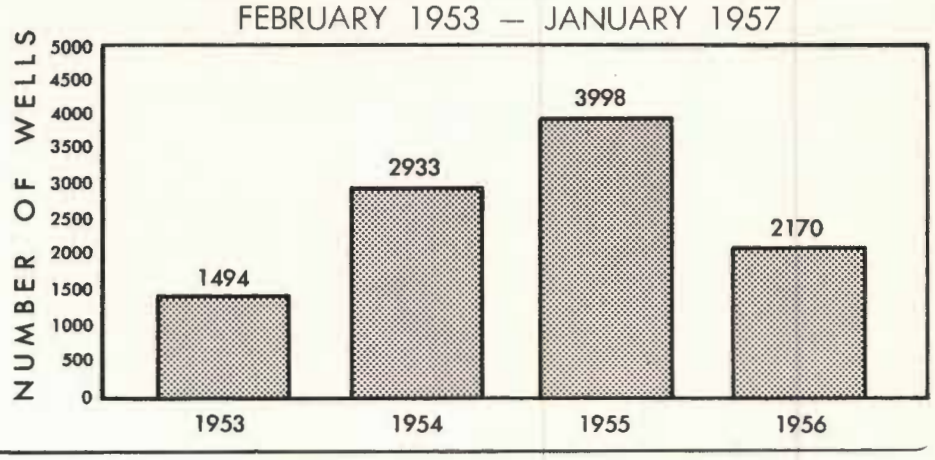
28.5 bales of cotton were gathered from the 25.5 acres, with most bales being graded as white cotton. The grain sorghum acreage yielded a total of 48,000 pounds, or an average of 2,285 pounds per acre. This included the 3 acres which was entirely dry.

After the cotton was planted, only every other row was watered, leaving the remaining rows dry. (This practice was wide spread during the 1956 summer in those areas experiencing marked well yield declines.) Two extremely hot weeks in August are blamed for the cotton yield being low compared to the 36 bales of cotton produced on 24.5 acres of land in 1955.

It does not mean so much to praise a man who has everything needed with which to do a job and does it well, but for the individual who has little to do with and still does a fine job, then much praise is justified. We feel that Mr. Bartlett and his water supply, or lack of water supply, fit into the latter catagory.

IRRIGATION EXPERT—from Page 1 standing of our problems and cooperation in solving them on an area basis, we may find some means by which a satisfactory solution can be reached.

NUMBER OF WELLS DRILLED AND REGISTERED WITH THE HIGH PLAINS WATER DISTRICT FEBRUARY 1953 — JANUARY 1957



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

Second Class Permit

THE Cross SECTION

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Volume 3—No. 8 "THERE IS NO SUBSTITUTE FOR WATER" *February 1957*

TEXAS TECH'S ADULT EDUCATION DEPARTMENT CONDUCTS FORUM

The Fourth Annual Midwinter Forum on Regional Development was held January 22-23 on the campus of Texas Technological College in Lubbock. The yearly event is sponsored by the Adult Education Department and its participants are representatives from Colorado, Kansas, New Mexico, Oklahoma and West Texas.

Tech's president, Dr. E. N. Jones, officially welcomed the registrants to begin the activities of the two-day forum. Walter Prescott Webb, Professor of History, University of Texas, made the principal address during the annual banquet.

The purpose of the Midwinter Forum is to chart a program of regional development on recognized problems too complicated and too broad for individual communities to solve.

Mr. Per Stensland, Director of Tech's Adult Education Department points out the vast amount of study and time that went into preparing for the Forum. "In September 1956, twenty-five leaders of agriculture, business, industry and community life of our region met for two days with representatives of the Texas Tech administration and faculty to outline what seemed to them to be major problems confronting our region.

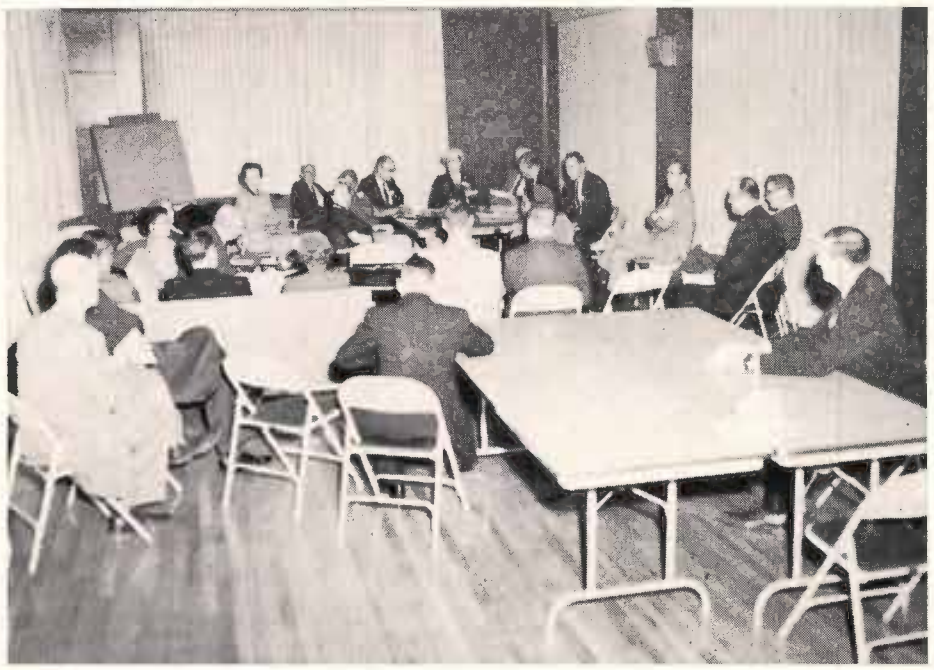
"In November, December and January, over 30 local community roundtables met, some of them as many as three or four times, to explore the regional problems which seemed most important to their communities. In addition to stating the problems as they saw them, these groups were asked to suggest the kinds of factual information needed to help them understand and deal with these problems.

"In December, representatives of radio, TV and the press met to help outline ways in which their media could participate in the development of an information program to present needed facts to people in the areas they serve."

Those leading discussion groups during the Forum were: Walter Prescott Webb, Historian, University of Texas; W. O. Fortenberry, Lubbock area farmer and businessman; Frank Kelley, Magnolia Petroleum Co., Colorado City; N. Casey Fine, Animal Husbandry, Texas Tech; Frank Wilson, Snyder Public Schools; Willa Vaughn Tinsley, Dean of Home Economics, Texas Tech; Joe Tidrow, Andrews Public Schools; R. M. Caveness, President, San Angelo Junior College; and Tom McFarland, Manager, High Plains Underground Water District, Lubbock.

Water supply and development was the number one problem which emerged from each of the study groups. It was recognized by participants in each phase of community planning that all civic and area development depends

(Continued on Page 4)



Pictured above is the Water Panel study group which participated in the Midwinter Regional Forum held on the Texas Technological College campus.

HOCKLEY COUNTY FARMER PROVES THAT WATER CONSERVATION PAYS

Lindsey L. Dycus stands beside an air-vent riser, which is part of his underground pipeline.

Lindsey L. Dycus, Route 2, Levelland in Hockley County owns Labor 12, League 735, which is about 5 miles northeast of Levelland.

Mr. Dycus has two small irrigation wells which produce a combined total of 470 gallons of water per minute. Water from one of these wells had to be transported approximately 350 yards in an elevated ditch in order to use it to the best advantage.

In 1955, and previous years, by using open ditches, Mr. Dycus irrigated approximately 60 acres of land.

Before the 1956 crop year, Mr. Dycus installed 2650 feet of 12-inch underground irrigation pipe. When this installation was made, the elevated ditch, which was difficult to maintain, along with other open ditches were eliminated from the operation. This pipe line ties the two wells together and makes the entire system more flexible by making the supply of water from both wells available at any point along the 2650 foot line, or at various points simultaneously.

During the crop year 1956, with the aid of underground pipe, Mr. Dycus was able to irrigate 87 acres of land. This constitutes an increase of 27 acres or 31 percent over previous years in the amount of land irrigated with the same amount of water, or possibly less. Unquestionably this increased acreage was irrigated with water which was previously lost to open ditch seepage and evaporation.

A new 1684 foot 12-inch underground pipeline has very recently been added to the original line and will be used during the 1957 crop

(Continued on Page 4)

Tom McFarland Heads Ground-Water Panel

The Texas Water Conservation Association amended its Constitution and By-Laws at its January meeting in Austin to include a Ground Water Panel. For the past 13 years the organization has operated with 5 panels including Irrigation, Industrial, Municipal, Navigation and River Authorities. Due to the increasing importance of ground water in Texas the Board of Directors of T.W.C.A. saw the necessity of including the new panel, and electing seven new directors representing the panel.

Tom McFarland, Manager of the High Plains Underground Water Conservation District was elected as Chairman of the panel and Vice President of the T.W.C.A. Other members of the panel include: Martin Giesecke of San Antonio, Judge Jay Myers of Carrizo Springs, Robert Lemon of Perryton, Paul Armstrong of Pecos, Harlan Hugg of El Paso and W. F. White of Baytown.

The High Plains Water Conservation District wishes to compliment the Directors of T.W.C.A. for the action it has taken. There has been a great need for a common meeting place for people with interests in ground water to meet for discussion of their problems.

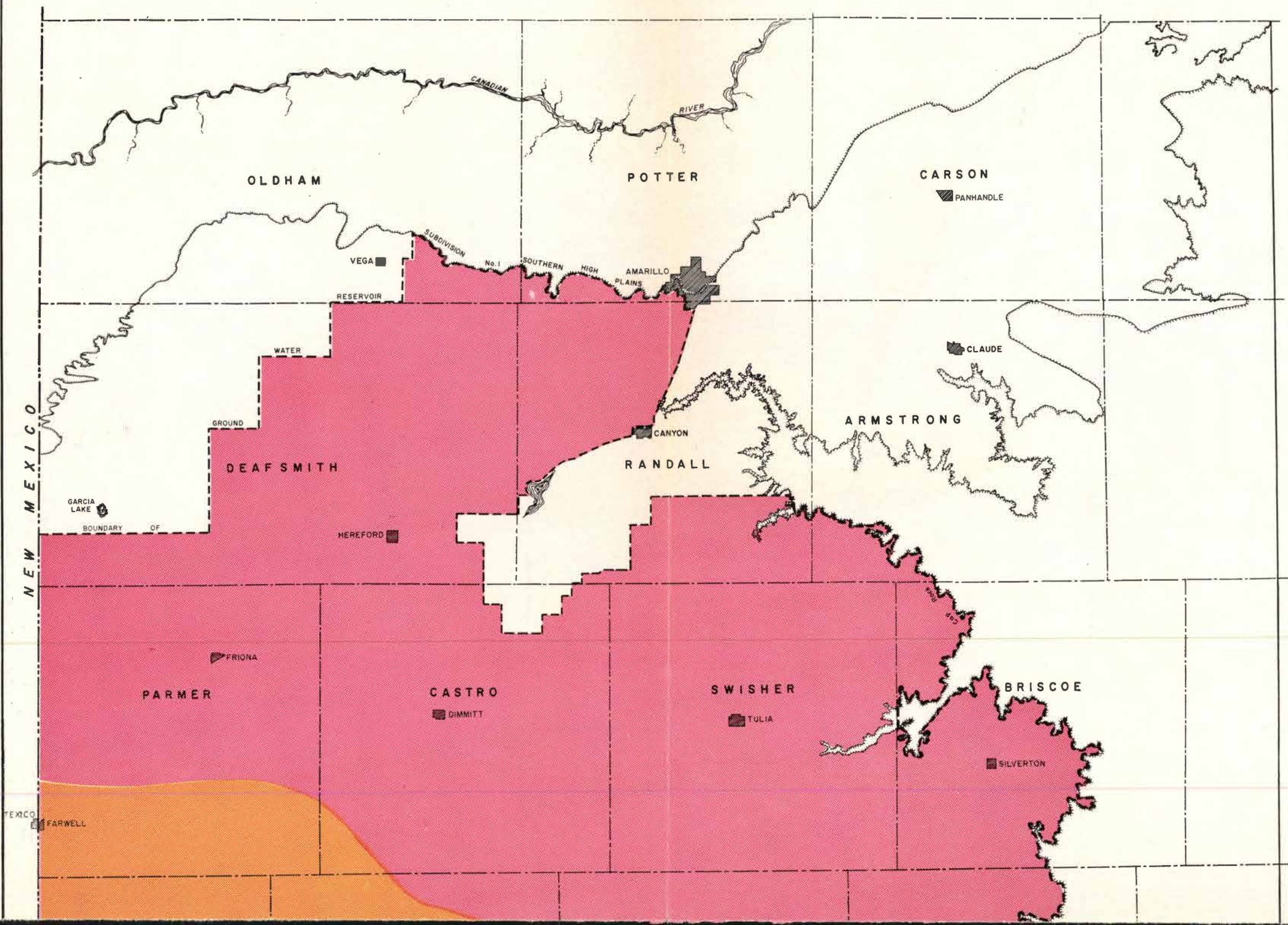
Marvin Shurbet Elected Chairman Of Board

The Board of Directors of the High Plains Water District met on the 4th of February for the first time since the newly-elected members to the Board took office.

Marvin Shurbet, Route 1, Petersburg, who represents District Precinct No. 5 on the Board was elected to serve as Chairman for the year 1957. Elmer Blankenship, Route 2, Wilson, new Board member representing Precinct No. 1 was elected Vice-Chairman. V. E. Dodson, Hereford, re-elected member representing Precinct No. 4 was elected Secretary-Treasurer.

The other members of the Board are Gus Parish, Springlake, who represents Precinct No. 2 and A. H. Daricek, Maple, who represents Precinct No. 3.

GENERALIZED SOILS MAP



MULESHOE
PLAINVIEW
LOCKNEY
BAILEY
LAMB
HALE
FLOYD
FLOYDADA
DOUGHERTY
LITTLEFIELD
MORTON
COCHRAN
HOCKLEY
LUBBOCK
CROSBY
CROSBYTON
LEVELLAND
LUBBOCK
NEW MEXICO
BOUNDARY OF GROUND WATER RESERVOIR
No.1 SOUTHERN HIGH PLAINS SUBDIVISION
YOAKUM
PLAINS
TERRY
BROWNFIELD
LYNN
TAHOKA
GARZA
POST

SCALE

0 5 10 15 20 Miles

EXPLANATION

Moderately heavy clay loam ("Hardlands")

Moderately Sandy Loam ("Catclaw lands")

Sand Hills

N

SOURCE OF INFORMATION

Soil Conservation Service

U. S. Department of Agriculture

and

Agricultural Experiment Station

State of Texas

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ALLAN WHITE
Editor

Regional Forum—

(Continued from Page 1)

upon an adequate supply of fresh water.

The work and efforts which have gone before and into this Forum were certainly well spent. Discussions of mutual problems in an effort to develop measures which are agreed will assist in solving these problems are true democracy at work.

We congratulate Mr. Stensland, and the Adult Education Department of Texas Tech for their work in making possible a meeting such as this Mid-winter Regional Forum.

Conservation Pays—

(Continued from Page 1)

year. Mr. Dycus is hopeful of irrigating some additional land with the water he now has, and in the future plans to drill one more well which should furnish enough additional water to irrigate the choice farmland.

Mr. Dycus and others who have proved and are proving that water conservation is a money-making undertaking deserve our congratulations.

Please Close Those Abandoned Wells!!!

EDITOR
THE CROSS SECTION
1628-B 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)

A. H. DARICEK AND ELMER BLANKENSHIP SWORN INTO OFFICE OF DIRECTOR

Mr. A. H. Daricek, of Maple in Bailey County and Mr. Elmer Blankenship, of Route 2, Wilson in Lynn County were each sworn into the office of Director of the High Plains Underground Water Conservation District by District Judge Robert A. Bean of Lubbock, on February 4th.

In luncheon ceremonies attended by several past Water District directors, Mr. Daricek and Mr. Blankenship took their oath of office to represent the people in their respective District Precincts for a term of two years.

Mr. Daricek represents Bailey, Castro and Parmer Counties on the five-man Board and replaces W. M. Sherley of Lazbuddy; while Mr. Blankenship takes over from W. O. Fortenberry of Lubbock and will represent Lubbock and Lynn Counties.

Marvin Shurbet of Route 1, Petersburg in Floyd County, V. E. Dodson of Hereford in Deaf Smith County, and Gus Parish of Springlake in Lamb County round out the five-man Board of Directors.

A. H. Daricek is shown on the left being sworn into the office of Direcor of the H.P.W.D. by Judge Robert Bean. At right is Elmer Blankenship taking his oath of office as director from Judge Bean.

CORRECTION

In the January issue of "The Cross Section" there appeared an article discussing a statistical report made by George Black, Associate Agricultural Agent, Irrigation, Texas Agricultural Extension Service, Lubbock. The article was entitled "Irrigation Expert Compiles Data on Area." We stated that Mr. Black's report showed that there had been over 2,532 miles of underground irrigation pipe installed in the last year.

Actually, the report stated that there has been over 2,532 miles of underground irrigation pipe installed since 1948, 710 miles or approximately 28 percent of this was installed in the last year.

We want to apologize to Mr. Black for misquoting his report and to our readers for this confusion.

—Editor.

STATISTICS FOR JANUARY

During the month of January, 368 completed wells were registered with the District office and 596 permits issued by the County Committees. These new permits issued and completed wells follow by Counties:

County	*Completed Wells*	*Permits Issued*
Armstrong	1	1
Bailey	8	31
Castro	39	45
Cochran	9	31
Deaf Smith	27	39
Floyd	33	55
Hockley	81	90
Lamb	38	96
Lubbock	74	121
Lynn	28	48
Parmer	20	26
Potter	0	0
Randall	10	13

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Amarillo Artificial Recharge Report Available From Board Of Engineers

Bulletin 5701 of the State Board of Water Engineers, prepared in cooperation with the U. S. Geological Survey, entitled "Artificial-Recharge Experiments at McDonald Well Field, Amarillo, Texas," should be of special interest ,not only to the residents of Amarillo, but to leaders in industry, members of city governments, and thousands of irrigation farmers throughout the entire High Plains region.

The Bulletin contains much technical data regarding the physical characteristics of the water-bearing sands; but it also includes numerous simplified charts and graphs and well written discussions of the problems involved in the process of artificial recharge to the underground reservoir.

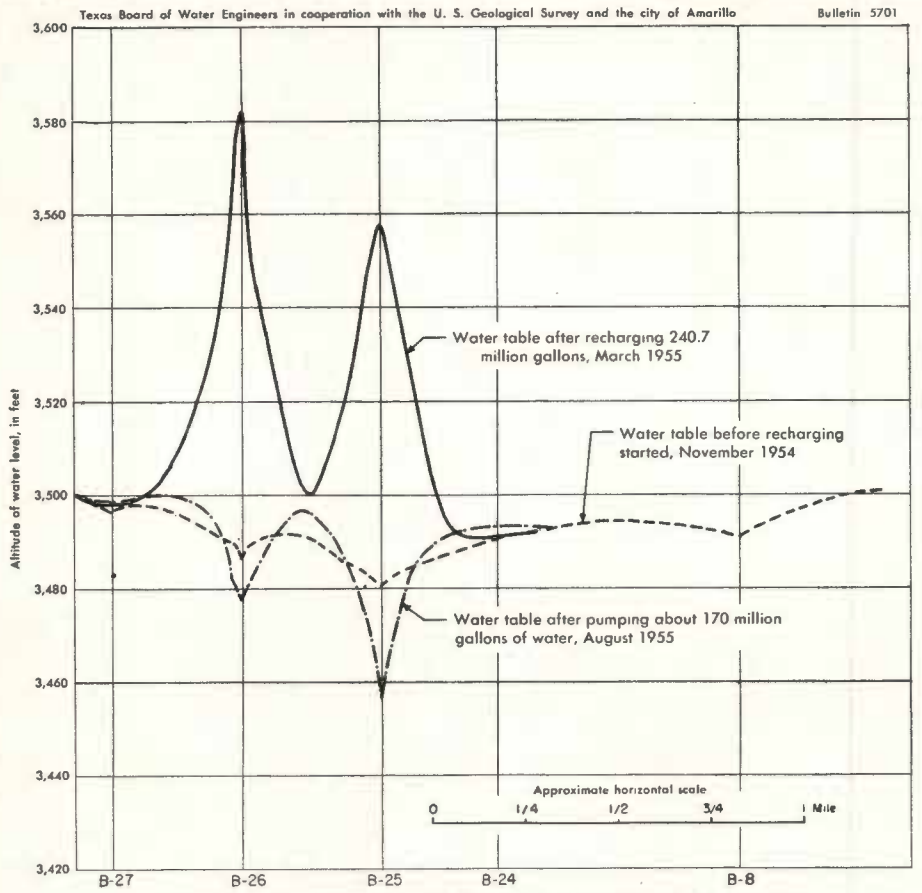
The results of the studies by the authors, E. A. Moulder and D. R. Frazor, Hydraulic Engineers with the U. S. G. S., bring out two points that are important to the High Plains Underground Water Conservation District.

The first point relates to the movement, or more appropriately the lack of extensive movement, of water that was put into the water sands. The information in the illustration showing tne cross-sectional view of the water table in the vicinity of the test sites shows that the injection of 240.7 million gallons of water (approximately 730 acre-feet), into wells B25 and B26 raised the water level in well B25 about 80 feet, but the water levels did not rise appreciably a quarter of a mile from the injection wells. The graph shows also that by pumping from the injection wells most of the recharge water was recovered within one pumping season.

The second point relates to the interference between closely spaced wells, which is significant in so far as related to the well-spacing program of the District. In the second graph well B25 is the injection well, whereas B30, B31, and B32 are observation wells located 100, 200, and 400 feet, respectively, from well B25. The data show that as a result of putting water into well B25 the water levels raised in each observation well but the rise became less and less at greater distance from the injection well. The last part of the graph shows that as a result of pumping from B25 the water levels were lowered in the observation wells, again in proportion to the distance from the pumped wells.

This brief discussion is intended to create an interest in the problem of artificial recharge, not to give a thorough explanation of the report.

Bulletins of the Board of Water Engineers are available for distribution without charge simply by request. The address is 1410 Lavaca Street, Austin, Texas. We urge that each person interested in recharge of the water sands in the High Plains obtain and study Bulletin 5701.



CROSS-SECTIONAL VIEW OF WATER TABLE IN THE VICINITY OF THE TEST SITES, BASED ON OBSERVED WATER-LEVEL MEASUREMENTS

Approximately 102 Million Acre-Feet Of Groundwater Originally In District

By W. L. BROADHURST

W. L. Broadhurst

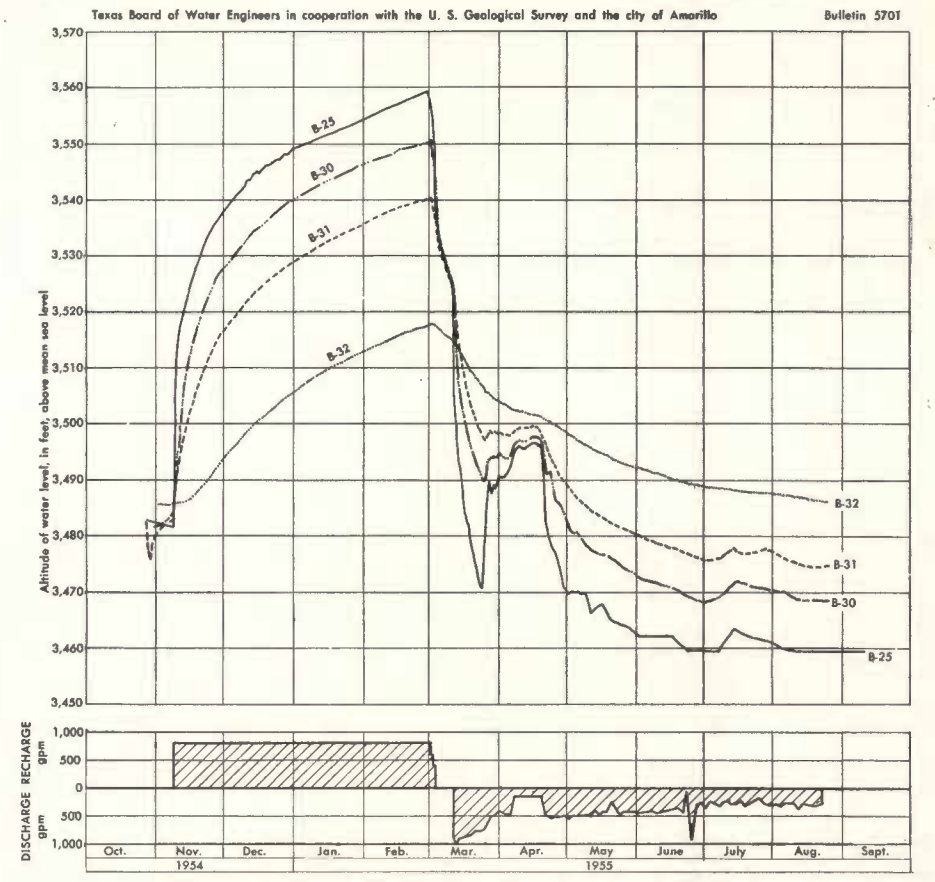
The High Plains in Texas, extending from the Oklahoma Panhandle southward to Midland - Odessa and from the New Mexico State line eastward to the escarpment, occupy 22,000,000 acres. The total amount of ground water in storage beneath the entire region has not been determined, but, before pumping was started, the amount available to wells must have been on the order of three hundred million to four hundred million acre-feet.

The High Plains Underground Water Conservation District No. 1, which includes all of two counties and parts of eleven other counties occupies 5,000,000 acres. The supply of available ground water in storage in the underground reservoir beneath the District in 1938, before large quantities of water had been withdrawn, amounted to approximately 102,000,000 acre-feet; and the withdrawals since 1938 have removed about 18 percent of the stored water.

Although the remaining supply of ground water is not uniformly distributed, neither within the District nor throughout the entire High Plains, it can be seen that the economic supply in general is adequate to meet an anticipated industrial expansion and population growth requirement in the next twenty to twenty five years.

In areas of concentrated development of wells and heavy withdrawals

(Continued on Page 4)



HYDROGRAPHS FOR WELLS B-25, B-30, B-31 and B-32 AND RECHARGE AND DISCHARGE RATE FOR WELL B-25.

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-B 15th Street, Lubbock, Texas.

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ALLAN WHITE
Editor

Study Groups Appointed To Assist High Plains Water District Board Of Directors

Three special study Committees have been appointed to assist the High Plains Water District Board of Directors in their work on special problems.

The first group will be looking into the value of water for agricultural purposes. This committee, as well as the other two, is made up of five men, one from each District precinct. This committee has as its members the following: Leroy Johnson of Shallowater, in Lubbock County; John Gammon of Friona, in Parmer County; Elmer McGill of Olton in Lamb County; Jim Line of Bushland, in Potter County; and J. R. Belt of Lockney, in Floyd County.

The second committee is one which will be studying the District's need for additional rules and changes in present regulations, if needed. This committee is made up of the following men: Earl Reasoner, of Slaton, in Lubbock County; J. D. Hawthorne, of Morton, in Cochran County; Robert Byrd, of Muleshoe, in Bailey County; Frank Begert, of Canyon, in Randall County; and Robert Lee Smith of Lockney, in Floyd County.

The last committee, but by no means the least in importance, is the group that will be studying the various aspects of artificial recharge of our underground sands. This committee is made up of the following men: Lit H. Moore, Jr. of Wilson, in Lynn County; T. R. Davis of Hart, in Castro County; Henry Schmidley of Levelland, in Hockley County; Ed Dziuk of Hereford, in Deaf Smith County; and Tate Jones of Floydada, in Floyd County.

These three committees will study all facts of their respective problems and offer recommendations to the Board of Directors.

Should any individual or group have suggestions pertaining to the business of any one of these study groups, these suggestions will be most welcomed.

Pictured above are members of a new study group which will assist the HPWD Board of Directors in their attempt to determine the value of water used for agricultural purposes. Left to right are, E. L. Thaxton, guest speaker at this meeting, from the Lubbock Experiment Station; Jim Line, Bushland; Elmer McGill, Olton; Leroy Johnson, Shallowater; and John Gammon, Friona. J. R. Belt, member from Lockney was not present.

Above are shown the appointed members of the newly formed study group that will aid the HPWD Board of Directors in determining the need, if any, for additional District regulations. The members are, left to right, Earl Reasoner, Slaton; J. D. Hawthorne, Morton; Frank Begert, Canyon; and Robert Lee Smith, Lockney. Robert Byrd of Muleshoe, remaining Committeeman, was not present for this picture.

Sprinkler System Pays Cochran County Farmer

Mr. E. C. Wynn, who lives west of Morton on Labor 5, League 159 in Cochran County, has irrigated his 177 acres by using open surface ditches and now uses a sprinkler system.

Mr. Wynn's farm is an average South Plains farm having a medium soil. His place lays as do hundreds of others—relatively level.

Mr. Wynn's experience with both irrigation methods is a story of water conservation and perhaps will serve to guide others in their selection of an irrigation system.

In the spring of 1953 Mr. Wynn drilled a 600 gallon per minute well on his farm and during the 1953 and 1954 seasons and during the 1955 pre-planting watering period used a system of open-ditches with which he was able to reach all but about 15 acres of his 145 acres of land that are in cultivation (35 acres are still in native grass).

In 30 days during the spring Mr. Wynn watered 130 acres of land by using open ditches; however, during the growing season in the summer only 100 acres could be irrigated adequately.

After watering his plowed beds in the spring of 1955, Mr. Wynn decided to buy a sprinkler system. In order for the system to be used most efficiently it was necessary to first pipe the water to the center of the farm. This was done by laying an 8-inch steel pipe underground from the well to the center of the farm, which was 840 feet distance. This was accomplished at a cost of $1500.

It was determined that with no changes in the pump's bowl assembly that it would deliver 460 g.p.m. to the sprinkler system at 40 lb. pressure throughout the line.

Mr. Wynn purchased 1320 feet of 6-inch mainline aluminum surface pipe which would reach from the center of the farm to the outside. He also purchased 2730 feet of 5-inch lateral pipe and 92 sprinkler heads. By having twice as much lateral line and twice as many sprinklers as is used at any given time, the well need never be shut down while making new settings. This is very important since it takes Mr. Wynn approximately 1 1/2 hours to change lateral line settings. Multiply this by three sets per day and you would have 4 1/2 hours of lost irrigation time each day without the two separate lateral lines. The cost of the sprinkler system was $5100.

E. C. Wynn of Cochran County, is shown with a portion of the sprinkler system with which he waters his 177 acre farm.

Some additional labor is necessary to operate the sprinkler system. Mr. Wynn, his son and one laborer operated the 177 acre tract with the sprinkler system, an adjoining 177 acre tract which belongs to the son, and which is irrigated by using open ditches, and a 177 acre farm which is worked dry. Besides handling all the sprinkler system sets the laborer did all the weed hoeing on two of the three places. Even though some more labor is involved it is not a tremendous expense as some think.

Also, the cost of operating the pump against the increased head is an item which enters into the picture. Pumping 600 g.p.m. on open discharge Mr. Wynn's engine used approximately 3 1/2 gallons of butane fuel per hour. Pumping 460 g.p.m. through the sprinkler system at 40 lb. pressure the same engine uses approximately 4 1/2 gallons of fuel per hour.

These increased labor and fuel costs are more than offset however, according to Mr. Wynn, by the savings in amount of water pumped and the increased number of acres watered at an increased application rate.

To illustrate these features of the sprinkler system, Mr. Wynn related an event from last year's growing season experiences. While Mr. Wynn's son was irrigating 48 acres of cotton from open ditches with his 400 g.p.m. well, Mr. Wynn was sprinkling 177 acres with his 460 g.p.m. well. As close as could be determined the two farms were wetted to approximately the same average depth, with the sprinkled land the more uniformly wetted.

By using the sprinkler system, Mr. Wynn is able to irrigate the 15 acres of cultivated land which here-to-fore could not be watered. Also, the 35 acres of grassland are watered now which was not previously. Where it took 30 days to water 130 acres of land by using the open-ditches and a well that delivered 600 g.p.m. to the surface, the same 30 days now is sufficient time in which to water 177 acres of land with only 460 g.p.m.

Aside from the above mentioned features which Mr. Wynn likes about his sprinkler system, there is the outstanding features of better weed control and having no problems of plowing through filled but muddy ditches.

Pictured above is the Wynn sprinkler system in action, watering listed beds. The land is wetted to a uniform depth and covers an area of approximately 35 feet in all directions from each sprinkler head. 1 1/2 hours is required to change lateral line settings.

Shown above is a two-way hydrant located at the center of the Wynn farm. 8-inch underground steel pipe carries water to the hydrant from a 460 G.P.M. well. From the hydrant an aluminum surface pipe carries water to the sprinkler heads at either side of the farm.

A LITTLE LIFE IS WORTH MORE THAN A LITTLE TIME . . . CLOSE THOSE ABANDONED WELLS!

EDITOR
THE CROSS SECTION
1628-B 15th Street
Lubbock, Texas

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Past Castro County Committeeman Dies Of Heart Failure

Final rites were held for Stephen J. (Steve) Brockman in the Holy Family Church of Nazareth in Castro County, on March 9. Mr. Brockman died of heart failure on March 6.

Mr. Brockman was a past member of the Castro County Committee of the High Plains Water District, having retired from the Committee in January 1956, after serving faithfully for three years.

Mr. Brockman was born August 31, 1902 in Lawrence, Nebraska. He was the son of the late August and Elizabeth Brockman. In 1909, he and the family moved to Nazareth.

Mr. Brockman was an outstanding farmer and was very active in farm organizations and community improvement programs. He was not married and is survived by two sisters—Mrs. Val Acker and Mrs. Carl Burt; and three brothers—Edward, Martin and Louis—all live in the Nazareth community.

We extend our sympathy to the family and hope that in some small way the knowledge of Steve's dedicated service to his fellow man and community is consoling.

STATISTICS FOR FEBRUARY

During the month of February, 268 completed wells were registered with the District office and 423 permits issued by the County Committees. These new permits issued and completed wells follow by Counties:

County	*Completed Wells*	*Permits Issued*
Armstrong	1	1
Bailey	57	71
Castro	16	36
Cochran	12	18
Deaf Smith	10	21
Floyd	27	31
Hockley	49	80
Lamb	3	0
Lubbock	52	84
Lynn	26	40
Parmer	11	31
Potter	0	0
Randall	4	10

Groundwater Underlying Water District—

(Continued from Page 1)

of water the water table has declined, and in those areas where the aquifer was relatively thin the yields of wells have decreased. As a result of the decreased yields less water has been pumped per well, and as a result of the well spacing now in effect throughout the Water District, it is apparent that in the future the withdrawals per unit of area will necessarily be further reduced. This in turn will automatically reduce the rate of decline of the water table. Data show that currently large withdrawals are designed to produce maximum returns, whereas it is reasonable to expect that in the future smaller withdrawals will be designed to produce optimum returns. The end results will be a diminution of annual withdrawals and at the same time provide a favorable economic condition.

An important factor regarding the future economic stability of the High Plains is the salvage of surface water from the approximately 35,000 depressions which dot the Plains. Surface run-off through streams that escapes beyond the plains escarpments is negligible. However, that portion of the approximately 18 inches of annual rainfall that does run off and collect in the depressions to form intermittent ponds averages perhaps more than a million acre-feet per year. A small percentage of the ponded water moves downward under natural processes to replenish the underground supply, but most of the water is lost from the ponds by direct evaporation.

Artificial recharge to the underground reservoir can be accomplished by draining the ponded water through multi-purpose wells. Experiments have shown that mere pits or holes that penetrate the aquifer soon become clogged with silt and fail to function. Other experiments with multi-purpose wells that are equipped with permanent pumps have demonstrated that periodic pumping during recharging will remove the silt from the well and the recharging may be repeated time after time.

Several propositions to bring water to the Plains from the Mississippi River, from the Great Lakes, and even from the Gulf of Mexico have been discussed but to date neither the engineering nor the economic problems have been solved.

To our knowledge no industrial companies have decided not to locate plants in the Plains because of uncertainties about adequate water supply. As a matter of fact, some industries that process petro-chemicals have established plants in the region, knowing full well that both the ground water supply and the petroleum supply are limited; but apparently they have reasonable assurance that the ground water supply will outlast the petroleum supply.

We have studied records of precipitation throughout the Plains as well as other localities throughout the United States. Although such records show periods of above average precipitation and periods of below average precipitation, we have no data reflecting a longer term shift toward drier climatic conditions.

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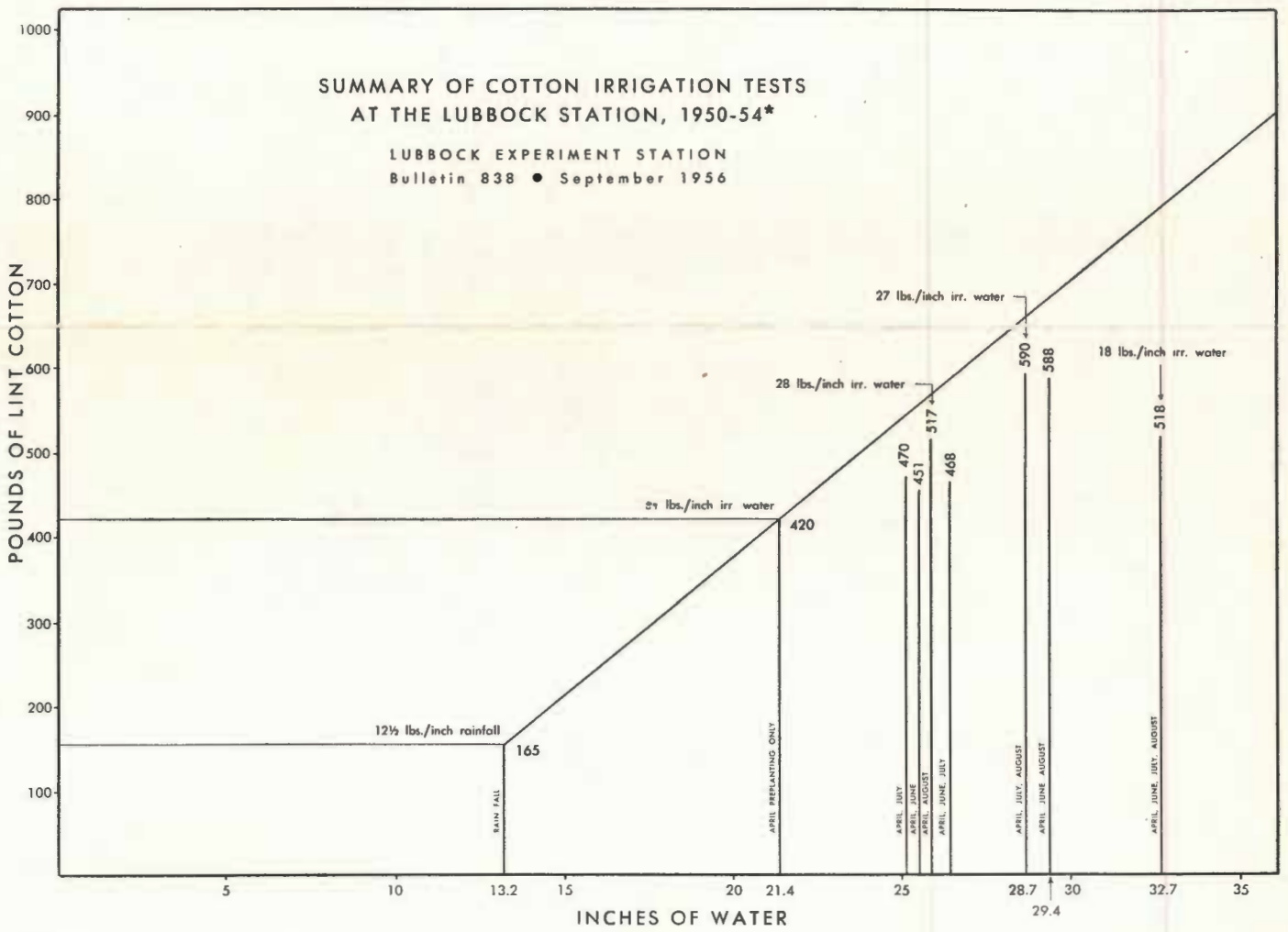

High Plains Underground Water
Conservation District No. 1
1628-B Fifteenth Street
Lubbock, Texas

Second Class Permit

THE Cross SECTION

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

Volume 3—No. 10 "THERE IS NO SUBSTITUTE FOR WATER" *April 1957*

West Texas Chamber Of Commerce Holds Annual Convention In Abilene

The 39th annual convention of the West Texas Chamber of Commerce was held in Abilene on March 27, 28, and 29.

The Water Resources Committee of the Chamber, headed by Mr. Frank Kelley of Colorado City, had two excellent speakers bring before the convention important considerations that will affect West Texas.

Mr. Robert Lowry, Surface Water Hydrologist for the Texas Water Resources Committee, pointed out that the western 56 percent of Texas receives an average of only 17 inches of rainfall annually, which amounts to 140,000,000 acre feet. This amount is equal to a little more than a third of the States' rainfall.

Net evaporation in West Texas, according to Mr. Lowry, averages almost 5 feet a year while the net evaporation in East Texas is negligible.

Runoff of surface water into streams of West Texas is negligible. The western 25 percent of Texas contributes less than 10 percent of the States' total runoff, whereas the eastern 25 percent of Texas contributes approximately 75 percent of the States' total runoff.

In conclusion, Mr. Lowry pointed out that since the aforementioned statements are true, we as a State need to do three things in regard to water:

(1) Stop waste.

(2) Attempt writing State laws which would be applicable to individual areas rather than to the State in general.

(3) State laws should be changed to allow surface waters in one part of Texas to be transported to other parts of the state.

Senator George Parkhouse, of Dallas, said, a greater percentage of runoff waters of Texas should be used before it reaches the Gulf of Mexico. He said the time has come when Texas must quit talking about the water problems and begin doing something to solve them. The time has come, according to Parkhouse, for Texas to begin helping its cities and towns obtain an adequate water supply.

Senator Parkhouse pointed out the vast amounts of money that the State is spending to build highways — he contrasted this amount to that which Texas is spending on water projects. According to the Senator, the amount for highways being many times larger, and the need for water projects greater.

He concluded by saying that even though Texas is twenty-five years late in starting a positive state water pro-

(Continued on Page 2)

Mr. Robert Lowry, Hydrologist with the Texas Water Resources Committee, as he spoke to delegates attending the Water Resources session of the WTCC convention in Abilene.

Senator George Parkhouse, Dallas, as he made a point during his talk on water legislation at the Water Resources Committee meeting of the WTCC convention. Frank Kelley listens at left.

High Plains Water District Will Begin Issuing Well Certficates On May 1st.

On May 1 the district office of the High Plains Underground Water Conservation District will begin issuing certificates of valid water well permits.

A situation has developed lately which we think requires some protection for purchasers of land or mortgagees advancing money on land on the strength of existing wells. For example, suppose a land owner drilled a well in violation of the District rules and before appropriate action could be taken to close the well, the violator either sold or mortgaged the land. This would give the the District the unpleasant task of proceeding against the party who was misled.

The District, to prevent the occurrence of this situation, and prevent a cloud on the land title, will begin issuing certificates to abstracters and attorneys to show what permits have been granted on a particular tract of land. The interested parties may then determine whether or not the wells are at the correct location as specified on the well permits.

The District is perfecting its rec-

(Continued on Page 2)

Water District Board Of Directors Meet In Lengthy Session

The Board of Directors of the High Plains Water District met for three days, March 20, 21, and 22, at the District office in Lubbock. The meeting was conducted primarily for the purpose of reviewing and approving permits and to outline a program of work for the coming year.

Several items of importance that were considered at this meeting include:

The printing of a brochure depicting the Southern High Plains groundwater supply, ground-water development for agricultural, industrial and municipal purposes, and conservation practices. This brochure will go to press in the very near future.

Progress of the farm experiment program which is going forward with the installation of flow-meters and hour-meters which have been placed on farms throughout the Water District, that were recommended by the County Committees.

Well permit certificates were discussed with the District's legal counsel. These certificates, which will be issued by the District office, will certify the validity of well permits that have been issued in compliance with published rules of the District.

Water Bills before the State Legis-

(Continued on Page 2)

STATISTICS FOR MARCH

During the month of March, 487 completed wells were registered with the District office and 414 permits issued by the County Committees. These new permits issued and completed wells follow by Counties:

County	*Completed Wells*	*Permits Issued*
Armstrong	0	0
Bailey	32	28
Castro	36	20
Cochran	18	13
Deaf Smith	19	9
Floyd	28	19
Hockley	69	42
Lamb	76	153
Lubbock	119	70
Lynn	49	13
Parmer	34	44
Potter	0	1
Randall	7	2

PRECIPITATION DURING 1956 AND DEPARTURES FROM LONG-TERM MEANS

Station	*Rainfall*	*Deficiency*
Abernathy	11.15	
Ackerly	7.14	
Amarillo, Airport	9.94	-11.21
Brownfield, 2E	7.78	
Canyon	11.22	- 8.71
Claude	13.19	- 7.22
Crosbyton	7.62	-13.55
Dimmitt, 6E	8.25	-10.75
Floydada, 2 SW	5.32	
Floydada, 9 SE	7.99	
Friona	11.00	- 5.23
Hale Center	11.96	
Hale Center, 14 NW	10.20	
Hart	8.59	
Hereford	7.71	-11.93
Levelland	9.59	
Littlefield	12.20	- 5.55
Lorenzo	7.53	
Lubbock	9.50	- 9.65
Lubbock, Airport	10.83	- 8.08
Morton	8.09	
Muleshoe	8.53	- 9.92
Plains	9.40	
Plainview	9.28	-12.00
Post	4.99	-15.44
Silverton	16.22	
Slaton, 5 SE	8.31	
Sterley	7.59	
Tahoka	10.08	-10.74
Tulia	8.63	-13.57
Umbarger	11.38	
Vega	9.02	-11.43

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ALLAN WHITE
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AN EDITORIAL

This month marks five years of operation for the High Plains Underground Water Conservation District No. 1. On April 2, 1952, Tom McFarland, manager of the District, opened the doors for business in the Lubbock National Bank Building. Since that time much water has passed under the bridge—figuratively and literally — 14,872 well drilling permits have been issued by the thirteen County Committees, ground-water inventories have been made in each of the thirteen counties and a determination has been made of the ground water depleted since 1938 before an appreciable amount of pumping took place; experiments have been conducted on various possibilities of artificially recharging the underground reservoir; efforts have been made to obtain personal income tax deductions for depletion of ground water pumped to produce income; "The Cross Section," which is the District's monthly publication, is being sent to almost 12,000 people in an effort to keep them informed on changing conditions of the ground water supply and other matters regarding ground water and its use; the District has been constantly vigilant to maintain private ownership of ground water in the State of Texas; work with area educational facilities in supplying assistance and information for their programs; experiment farms have been set up in each county in the Water District in order to further prove information that has been developed on test plots by the Texas Experiment Stations; spacing wells, one from another, so as to minimize as far as practicable the drawdown of the water table during the pumping seasons; a constant effort is being waged against the waste of ground water and offering suggestions to aid in a better water management program.

The High Plains Water District is a political entity of the state government and is supported by a five-cent ad valorem tax on each $100. County and State valuation, collected by the county tax collectors from persons, firms, companies, corporations, and all others who own property within the bounds of the District.

The District's governing body is an elected five-man board, with members coming from each segment of the District and serving two-year terms.

The High Plains Water District, and other locally - controlled groundwater conservation districts, are designed under the law to serve as useful tools for the orderly development and most economical use of the ground water according to local concepts.

Five years of District operation has pointed out many important factors that should have been considered twenty years ago in the development of the ground water resources of the High Plains, as well as the entire State of Texas. As water problems in the High Plains become more acute the factual information gathered by the District is becoming increasingly important.

Chamber Of Commerce

(Continued from Page 1)

gram, at least it has now begun.

The Water Resources Committee of the West Texas Chamber of Commerce reported that it would continue to:

(1) Cooperate in the statewide approach toward solution of water problems.

(2) Liaison with the State Board of Water Engineers, Texas Water Resources Committee, committees of Texas Legislature, and with organizations and individuals working in the water resources field.

(3) Participate in research toward control of evaporation of water in surface storage.

Well Certificates—

(Continued from Page 1)

ords so it may furnish certificates on permits of wells drilled after February 1953. This service has been requested many times by people in the legal and abstracting professions.

It is planned to charge $1.00 for each permit certificate to offset the costs involved.

Board Meets—

(Continued from Page 1)

lature were screened as well as Bills which are before Congress.

A program was outlined for the handling of multi-purpose wells and the Tax Depletion case.

Above are pictured members of the newly appointed HPWD study committee on artificial recharge. The committee will study the various aspects of recharging the underground reservoir and make recommendations to the Board of Directors. The members are left to right, Lit Moore, Jr. of New Home, in Lynn County; Henry Schmidley of Levelland, in Hockley County; Ed Dziuk of Hereford, in Deaf Smith County; and T. R. Davis of Hart, in Castro County. Tate Jones of Floydada, Floyd County was not present at this meeting.

Artificial Recharge In The Texas High Plains

The High Plains in Texas occupy about 35,000 square miles or 22,400,000 acres. The areas along the "breaks" of the Canadian River and narrow strips that contribute runoff to Cold Water and Palo Duro creeks on the North Plains, and to Tierra Blannca, Tule, Running Water, Double Mountain, Yellowhouse, and other creeks south of the Canidian River, make up approximately 10 percent of the area. Therefore, the surface area that does not contribute surface runoff to any stream, but does contribute to the numerous depressions, totals about 20,000,000 acres.

Computations based on soil-cover complex data from SCS Field Office and the rainfall-runoff relationship in the SCS Hydrology Guide show that average annual runoff from the High Plains surface is about 0.84 inch. Therefore, the 0.84 inch of runoff from 20,000,000 acres that collects in the depressions is equal to an average of 1.4 million acre-feet a year.

According to unpublished data collected by the U. S. Geological Survey, one county which has 980 square miles contains 1165 depression ponds, an average of one depression to each 538 acres. The area of the depressions covered by water after a general rain and average runoff was found to average about 30 acres. The flat bottoms of the depressions, which in general are void of vegetation, average about 1100 feet in diameter and contain about 22 acres.

If each depression has a drainage area of 538 acres, the 20,000,000 acres contains about 37,000 depressions. If the 1.4 million acre-feet of runoff were uniform throughout the Plains, each depression would catch about 38 acre-feet of water. If each lake has a surface area of 30 acres, the average depth of water would be about 1.3 feet. (As a matter of interest many lakes cover 300 to 400 acres and have depths in excess of 10 feet).

Records of the U. S. Weather Bureau, U. S. Department of Agriculture, Texas Agricultural Experiment Station, and Texas Board of Water Engineers indicate that annual precipitation on the Plains averages 18-20 inches, whereas the total evaporation averages about 80 inches. Net potential evaporation, therefore, is about 60 inches.

In view of the fact that annual net evaporation is perhaps four times greater than the average depth of water in the depressions, 100 percent of the lake water is available to evaporation loss.

A large part of the natural recharge to the underground reservoir is derived from the water that collects in the depressions. But, since studies by the U. S. Geological Survey indicate that total natural recharge to the underground reservoir beneath the Texas High Plains is less than one-tenth of an inch, it follows that at least 90 percent of the water that collects in the depressions is lost into the atmosphere.

If the depressions collect an average of 1,400,000 acre-feet of water a year and 90 percent is lost, the net quantity available for salvage is 1,230,000 acre-feet.

A few years ago the City of Lubbock offered to pay 5c per 1,000 gallons for water in the ground. That would have been at the rate of $16.30 per acre-foot. The farmers refused to sell in the belief that the water was even more valuable for irrigation, which has been true. Recently a project has been proposed to create a ground water district which would deliver irrigation water to a group of farms at about $21.00 per acre-foot. Research by the Texas Agricultural Experiment Station shows that the application of an acre-foot of water during years of average or below average precipitation will increase cotton yield at least 250 pounds per acre, which indicates a gross return of about $75.00 per acre-foot.

If we were to assume that water on the Plains is now worth only $20.00 per acre-foot, the 1,230,000 acre-feet lost from the depressions has a current annual value of $24,600,000.

Each acre-foot of surface runoff that can be economically salvaged by drainage into the underground reservoir through a multi-purpose recharge well will be an additional acre-foot available for future use. Some of the recharge water can be recovered through the well itself, but in time the water will migrate beneath adjoining land and be available to others. Furthermore, each acre-foot of surface water that can be put into the underground reservoir and then withdrawn by the same operator will alleviate the use of underground water already in storage and thereby provide more water for adjoining property. Hence, the artificial recharge program will provide additional water, not only to the property on which the recharge well is located but both directly and indirectly such operation will be a public benefit.

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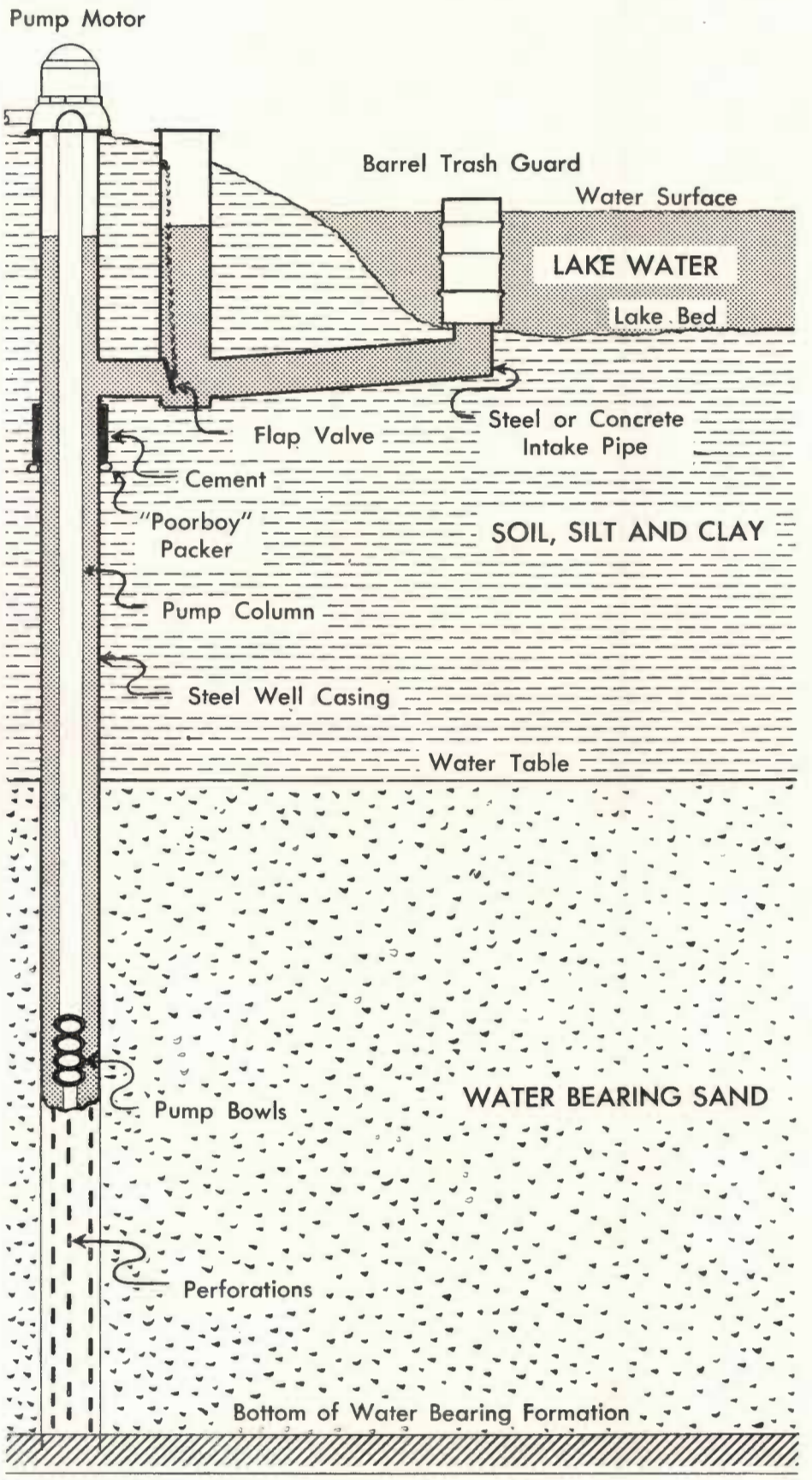
PLAN FOR RECHARGE WELL



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My concern is not whether God is on our side, my great concern is to be on God's side, for God is always right.

—*Abraham Lincoln.*

WHEN YOU MOVE . . .

When you move, please notify "The Cross Section" 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 your paper.

A LITTLE LIFE IS WORTH MORE THAN A LITTLE TIME, CLOSE THOSE ABANDONED WELLS!

WHEN TO IRRIGATE GRAIN SORGHUM

By E. L. THAXTON, Jr., Assistant Irrigation Engineer
*Substation No. 8, Texas Agricultural Experiment Station**

There are many factors which may have an important bearing on when to irrigate grain sorghum. However, I am going to limit my discussion to four major topics. These are: (1) Time of peak water use, (2) Effect of water stress at different stages of growth, (3) Effect of moisture levels on yields, and (4) Efficiency of water use. It will be apparent from some of the graphs that the variety grown may respond differently to any of these four factors.

The first graph is an average of two years data for grain grown near Tulia, Texas where the moisture level was never allowed to go lower than fifty percent of the available water. Under these conditions peak water is reached about ten days before bloom while the plant is in the boot stage. This corresponds to the time that maximum leaf area is developed by the plant. The area between the water use line and the average rainfall line represents the amount of water supplied either by irrigation or from stored water. A well planned irrigation system should provide .33 inch of water daily during the peak use period.

**Tulia work in cooperation with M. E. Jensen, Irrigation Engineer, A. R. S., Amarillo.*

The 1956 irrigation data at Lubbock, Figure 2, shows typical response to different moisture levels. Usually the higher moisture levels make the largest yields. In this test the plots that were irrigated before one-half of the available water was used made 400 pounds more grain per acre than those allowed to use three-fourths of the available moisture before irrigating.

Water stress at any time after planting will lower yields. In 1956, a dry summer, water stress at the time of bloom reduced yields more than at the boot stage or soft dough. In this test yields were reduced as much as 48 percent. The withholding of irrigation in the soft dough reduced yields only 25 percent.

The choice of the right variety for the moisture conditions is important too. The irrigation test at Tulia in 1956 had three moisture levels and three varieties, Figure 3. Each of these varieties responded differently to the moisture treatments. Where moisture was limited to only a preplanting irrigation the short season hybrid made the largest yield. With adequate summer irrigations the late hybrid and the full season standard variety made the greatest yield. However, yield is only one measure of return from irrigation and large yields may not necessarily be the most profitable. For example, if the Tulia data is looked at in terms of efficiency of water use, pounds of grain per inch of water, then you have a different perspective. In this case the two most efficient yields were obtained (1) by the early hybrid which had only a preplanting irrigation and (2) the full season standard variety with moderate irrigations.

The farmer must plan the entire crop production program before planting if grain sorghum production with irrigation is to be as profitable as it can be. The choice of variety will depend to a large extent on the amount of water that will be available. Where the water supply is known to be short only early, short season varieties or hybrids should be planted. If large quantities of water are available full season varieties or hybrids well fertilized should be grown. Usually adapted sorghum hybrids will yield 20 percent more than comparable standard varieties. Planting date should be as late as practical in order to produce the crop with a minimum amount of water. Early plantings require more time to mature and use more water without increasing yields. Late plantings place the period of maximum water use later when temperatures are lower and transportation losses less.

Good yields can be made with only a preplanting irrigation on grain sorghum. Highest yields are normally made by maintaining soil moisture not less than one-half the available moisture. Highest efficiency is made by providing sufficient water to keep the plants out of stress. Short season varieties perform better with limited water than full season varieties. Water stress at any stage of growth reduces yields. Peak water use may go as high as .4 inch per day but a system planned to provide .33 inch during the boot through soft dough will provide adequate water.

CONSUMPTIVE USE BY GRAIN SORGHUM
AVERAGE 1953 - 54 PULLMAN CLAY LOAM

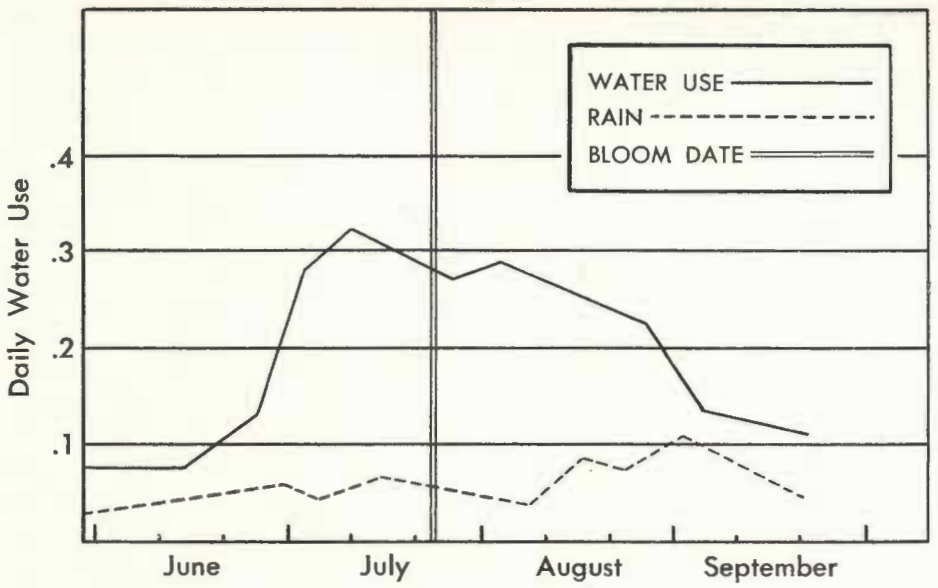

Figure 1.

GRAIN SORGHUM IRRIGATION — LUBBOCK, 1956

Treatment	*Lbs. Gr. per Acre*	*Total Irr. Water*
Preplant only	1666	9
Irrigation before 1/2 used	4496	25
Water Stress at boot	2756	17
Water Stress at bloom	2340	17
Water Stress at soft dough	3283	17
Irrigation before 3/4 used	4116	21
Rainfall only	1090	0

Rainfall 9.25 inches to maturity—Variety, Redbine 66.

Figure 2.

TULIA GRAIN SORGHUM IRRIGATION, 1956

Variety	*No. of Irrigations*	*Inches Irr. water*	*Lbs. grain per acre*	*Total Water*	*Lbs. grain per in. water*
Hybrid RS 590	1	8.0	4165	14.3	292
	4	20.0	5221	26.3	198
	6	28.0	5979	34.3	175
Hybrid Texas 660	1	8.0	1633	14.3	114
	4	20.0	5554	26.3	211
	6	28.0	6583	34.3	192
Redbine 66	1	8.0	1290	14.3	90
	4	20.0	6959	26.3	265
	6	28.0	5897	34.3	172

Figure 3.

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

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THE Cross SECTION

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

Volume 3—No. 11 "THERE IS NO SUBSTITUTE FOR WATER" *May 1957*

State Bar Of Texas Presents One-Day Ground Water Institute In Dumas

The State Bar of Texas in cooperation with the Sixty-Ninth Judicial District Bar Association, presented a one-day Ground Water Institute on April 20 at the Sneed Hotel in Dumas, Texas.

Mr. King Fike of Dalhart was chairman of the arrangements committee. Mr. Wayne Thomas of Hereford acted as master of ceremonies.

The program was broken down into three major categories.

Mr. Victor W. Bouldin, with the law firm Vinson, Elkins, Weems and Searls of Houston, spoke very ably on his subject, "Nature of Ownership of Ground Water." He pointed out legal cases which have brought about a "law-of-capture" doctrine in the State of Texas. This doctrine still applies in areas which are not within the bounds of an Underground Water Conservation District. "Law of capture" means simply that a landowner may drill a well anywhere on his land and pump all the water he wishes, as long as it is used in a beneficial manner.

When land is within the bounds of a Water District then the drilling of wells must be in accordance with the conservation practices approved by the District's Board of Directors.

Mr. Joe R. Greenhill with the firm Graves, Dougherty, and Greenhill of Austin, covered very capably the subject "Regulatory Powers of Underground Water Districts with Emphasis on Well Spacing and Waste."

Well spacing is a proven water conservation practice, according to Mr. Greenhill, since it lessens the interference between wells. The underground water-level is drawn down unduly when wells are drilled too close together. Most water districts in Texas have spacing rules which apply to new wells being drilled.

"Thou Shalt Not" were the three words with which Greenhill summed up the waste section. He pointed out to the attorneys present that waste of ground water was definitely forbidden in the water laws of Texas.

→

The last of the three speakers was Mr. Arthur P. Duggan, Jr., attorney at law from Littlefield. His subject was, "Organization of Underground Water Conservation Districts—Procedure Problems."

Mr. Duggan gave in outlined steps the legal procedure for the organization of a District. The subject was a familiar one to Mr. Duggan in that he was one of the attorneys which helped to draft the State's ground water laws, and he also did much of the legal work in setting up the High Plains Underground Water Conservation District No. 1.

1957 Water Level Measurements Released

Bulletin 5705, published by the Texas Board of Water Engineers in cooperation with the United States Geological Survey, shows water level decline maps for 20 counties in the southern High Plains of Texas.

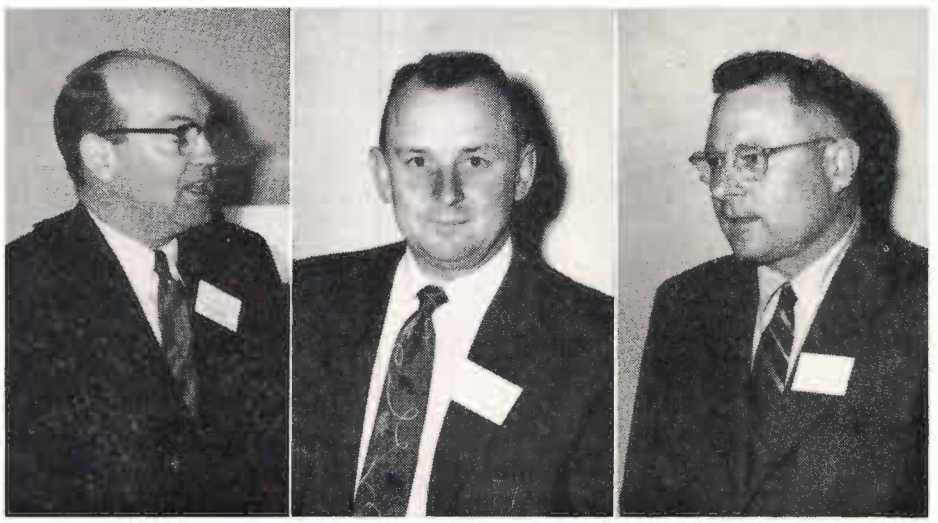
The bulletin shows water-level measurements made in 1954 through 1957. Many of the observation wells used in this program have been measured each year since before extensive irrigation in the southern High Plains began.

The bulletin once again reaffirms that we are pumping water from storage, since over 95 percent of those wells measured show declines in water-level.

If you should be interested in obtaining Bulletin 5705, you may do so by writing the Texas Board of Water Engineers, 1410 Lavaca Street, Austin, Texas.

Question and answer sessions were held after each speaker's address. These sessions gave everyone present an opportunity to ask questions about matters upon which they might have

(Continued on Page 2)



Pictured above are the guest speakers who made up the Ground Water Institute program presented in Dumas on April 20 by the State Bar of Texas. At left is Victor W. Bouldin of Houston, who spoke on the "Nature of Ownership of Ground Water;" at center is shown Joe R. Greenhill of Austin, who spoke on "Regulatory Powers of Water Districts with Emphasis on Well Spacing and Waste;" Arthur P. Duggan, Jr. of Littlefield is shown at right as he talked on "Organization of Underground Water Districts—Procedure Problems.

District Attempts To Establish Ground Water Recharge As 'Great Plains' Practice

New information recently developed by W. L. Broadhurst, Hydrologist for the High Plains Water District, with the assistance of the Soil Conservation Service has brought a new and greater interest in the possibility of establishing ground water recharge as one of the practices to be set up under "The Great Plains Bill." "The Great Plains Bill" is a bill passed by the last Congress to further the cause of Soil and Water Conservation in the Great Plains area.

Information was presented in Washington, D. C. to Don Williams, Administrator for the Soil Conservation Service, on the desirability of including the ground water recharge program as a part of the new practices adopted by the Soil Conservation Service.

The Plains occupy about 35,000 square miles embracing 22,400,000 acres, of which 20,000,000 acres do not contribute run-off to any stream, but do contribute run-off to the numerous depressions which dot the Plains.

Computation shows that the average run-off from the High Plains surface is about 0.84 inches. Therefore, the 0.84 inch of run-off from 20,000,000 acres that collects in the depressions is equal to an average of 1.4 million acre-feet per year.

One county consisting of 980 square miles contains 1,165 depression ponds or an average of one pond to each 538 acres of land. The area of the depressions covered by water after a general rain and average run-off was found to average about 30 acres, of which approximately 22 acres was found to be void of vegetation.

Actual surveys show 90 percent of the water in the wet-weather lakes is lost to evaporation. If the depressions collect an average of 1,400,000 acre-feet of water per year and 90 percent is lost to evaporation, then the net quantity available for salvage by recharge is 1,230,000 acre-feet.

Computations show that the average lake catches about 38 acre-feet of water in years of average rainfall, of which practically all is lost to evaporation.

It is hard to establish the value of an acre-foot of water used for agricultural purposes. Farmers have refused $16.00 per acre-foot for water in the ground. Research has shown as much as $75.00 return per acre-foot from water applied to certain crops in the Plains. If we assume water to be worth only $20.00 per acre-foot, then the 1,230,000 acre-feet lost from the depressions by evaporation has a current annual value of $24,600,000 to the Plains.

Each acre-foot of surface run-off that can be economically salvaged by drainage into the underground reservoir through a multi-purpose recharge well will be an additional acre-foot available for future use.

Some of the recharge water can be recovered through the well itself, but in time the water will migrate beneath

(Continued on Page 2)

STATISTICS FOR APRIL

During the month of April, 355 completed wells were registered with the District office and 270 permits issued by the County Committees. These new permits issued and completed wells follow by Counties:

County	*Completed Wells*	*Permits Issued*
Armstrong	0	0
Bailey	40	53
Castro	26	24
Cochran	20	11
Deaf Smith	21	14
Floyd	33	18
Hockley	44	40
Lamb	41	28
Lubbock	81	60
Lynn	20	7
Parmer	24	10
Potter	0	0
Randall	5	5

THE Cross SECTION

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ALLAN WHITE
Editor

Texas Board Of Water Engineers Release Precipitation Data For April

In a May 9 report, issued by the Board of Water Engineers, was shown rainfall for April and cumulative amounts for 1957.

"Texas rainfall for April followed the same drought breaking trend of earlier months of 1957. Most agricultural areas of the state had above normal rainfall, according to the survey completed May 8 by the State Climatologist, U. S. Weather Bureau, Austin. Flood producing rainfall amounts fell on many of the major watersheds with only one small area in the far southwest, from Midland to El Paso, having less than April normal rainfall. Austin had the wettest month since June, 1941.

Precipitation recorded at U. S. Weather Bureau first-order stations is shown in the following table."

PRECIPITATION DATA FOR APRIL, 1957 (INCHES)

Station	Precipitation	Normal	Departure	Cumulative Precipitation Through Apr. 30, 1957	Cumulative Departures Through Apr. 30, 1957
Abilene	6.62	2.47	+ 4.15	9.85	+ 4.47
Amarillo	2.69	1.45	+ 1.24	6.95	+ 3.20
Austin	9.93	3.96	+ 5.97	18.20	+ 6.51
Brownsville	1.85	1.56	+ .29	9.37	+ 3.92
Corpus Christi	2.20	1.74	+ .46	6.56	+ .36
Dallas	13.85	3.87	+ 9.98	22.88	+11.11
Del Rio	6.49	1.45	+ 5.04	9.24	+ 4.96
El Paso	.09	.27	— .18	1.12	— .21
Fort Worth	12.19	3.85	+ 8.34	19.86	+ 8.35
Galveston	3.76	3.09	+ .67	15.06	+ 1.90
Houston	8.07	3.40	+ 4.67	22.86	+ 9.57
Laredo	2.79	1.61	+ 1.18	6.09	+ 1.71
Lubbock	3.48	1.11	+ 2.37	5.23	+ 2.12
Midland/Odessa	.44	1.41	— .97	2.07	— 1.30
Port Arthur	7.05	3.94	+ 3.11	17.26	+ .01
San Angelo	4.00	2.19	+ 1.81	5.83	+ .71
San Antonio	9.32	3.02	+ 6.30	16.55	+ 8.02
Victoria	7.05	2.44	+ 4.61	18.81	+ 9.04
Waco	13.37	3.97	+ 9.40	22.89	+10.97
Wichita Falls	8.50	2.35	+ 6.15	13.67	+ 6.91
Lake Charles, La.	13.71	4.27	+ 9.44	23.88	+ 5.50
Shreveport, La.	11.19	4.59	+ 6.60	26.86	+ 9.07

Great Plains—

(Continued from Page 1)

adjoining land and be available to others. Furthermore, each acre-foot of surface water that can be put into the underground reservoir and then be withdrawn by the same operator will alleviate the use of underground water already in storage and thereby provide more water for the adjoining property. Hence the artificial recharge program will provide additional water, not only to the property on which the recharge well is located but also to the adjoining area, thus, directly and indirectly, making such an operation a public benefit.

Every effort is being made by the Board of Directors of the High Plains Water District to encourage the adoption of such a recharge program in the practices to be established by the Soil Conservation Service under "The Great Plains Bill." Such a program is much larger than the individual farmer, and consequently, must be viewed for the over-all effect it will have on the reservoir as a whole.

State Bar Presents—

(Continued from Page 1)

been confused.

The Sixty-Ninth Judicial District Bar Association consists of six counties: Deaf Smith, Oldham, Moore, Dallam, Sherman and Hartley. Mr. Bruce Miller, attorney in Hereford, is president of the Association.

We congratulate Misters Bouldin, Greenhill and Duggan for their parts on this program. Also, we want to congratulate those who were instrumental in promoting this institute.

Please Close Those Abandoned Wells!!!

EDITOR
THE CROSS SECTION
1628-B 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)

Experiment Recharge Well Taking Over One Million Gallons Of Water Per Day

By W. L. BROADHURST

At last — the rains came — as we have believed they would for eight long years.

Many people in the High Plains, who are now aware of the diminishing supply of underground water, are concerned with the problem of saving the large quantity of water that has recently collected in the thousands of wet - weather lakes by draining the water into the underground reservoir for storage and future use.

Numerous farmers throughout the High Plains have installed dual-purpose wells near the lakes for the purpose of draining the lakes and producing irrigation water. Such practice has been described by them as highly successful.

Although the practice is not yet fully acceptable to economists and engineers, many of whom are naturally sceptical until shown, the High Plains Water District has developed some important information from the recharge experiment that is being carried out at the Allmon Gin in southwestern Floyd County.

In the fall of 1953 a well was drilled near the edge of the lake. Total depth was about 380 feet. It was cased with 12-inch steel casing, the bottom 150 feet being slotted. It was developed by pumping with a test pump and produced about 1,100 gallons a minute.

A pit was dug around the well and filled with cotton burrs. An 8-inch concrete pipe was laid from the bottom of the lake to the pit, the lake end being equipped with a valve and the pit end had a meter for measuring the flow of water from the lake to the well.

Assistance to the project was given freely by numerous local interests recorded on a sign at the recharge site, including: Southwestern Public Service Company, Fox & Higgins Drilling Co., Petersburg; Bill Wolf Irrigation Service Co., Abernathy; Peerless Pump Division; W. C. Allmon, Route 1, Petersburg; Gifford - Hill - Western, Inc.; Commissioners Precinct No. 1, Floyd County; Commissioners Precinct No. 2, Hale County; West Texas Gas Company.

In June 1954 the area received a heavy rain and the lake caught 52 acre-feet of water. After a few hours wait, in order to let the coarse silt settle to the lake bottom, the valve was opened and the water flowed by gravity into the pit. However, it was soon discovered that the cotton burrs, although fully composted, did not prove satisfactory as a filter. Nevertheless muddy water entered the well at the rate of 1,050 gallons a minute.

The well was not equipped with a pump and as a result, after eight days of recharging, the formation became clogged with silt. A test pump was again installed and after a few hours of pumping several yards of sand and silt were removed from the well and it produced equally as good as after the first development.

This original test proved that the lake water could be drained by gravity into the water bearing formation; but it also proved that unless the mud and silt were removed during the recharging period the formation would become clogged and would no longer take water.

During the last week in April 1957, the area again had about 5 inches of rain and again the lakes became filled with water. In the meantime a concrete meter box was built at the pit-end of the 18-inch concrete pipe, and an 8-inch steel line, equipped with a flap valve, was laid from the meter box to the well. (See sketch in April issue of "The Cross Section"). The pit was filled and a pump base was built around the well.

The land owner, Mr. Bill Allmon, had agreed to install a permanent pump, but the day he intended to set his pump the rains came.

On April 30, 1957, at 10:35 a. m. the valves were opened and the water entered the well at the rate 1700 gallons a minute, going into the formation and filling the well casing. The rate at which the formation took water is indicated in the chart shown below.

It is significant to not that during the first 24 hours the well took water at the average rate of 920 gallons a minute, that during the second and third days the rate was about 770 gallons a minute, and that during the fourth day the rate was 620 gallons a minute, showing that the silt was gradually clogging the sand.

On Saturday May 4, 1957 a 7-stage number 10 pump bowls and 180 feet of 8-inch colum pipe and 10 feet of suction pipe were set in the well. The pump was operated for 4 hours and produced a large quatity of silt, sand, and water at the rate of about 1,000 gallons a minute.

The pump was stopped, the valve was opened, and again water started pouring into the well.

During the next 5 days the pumping and recharging are shown graphically in the illustrations.

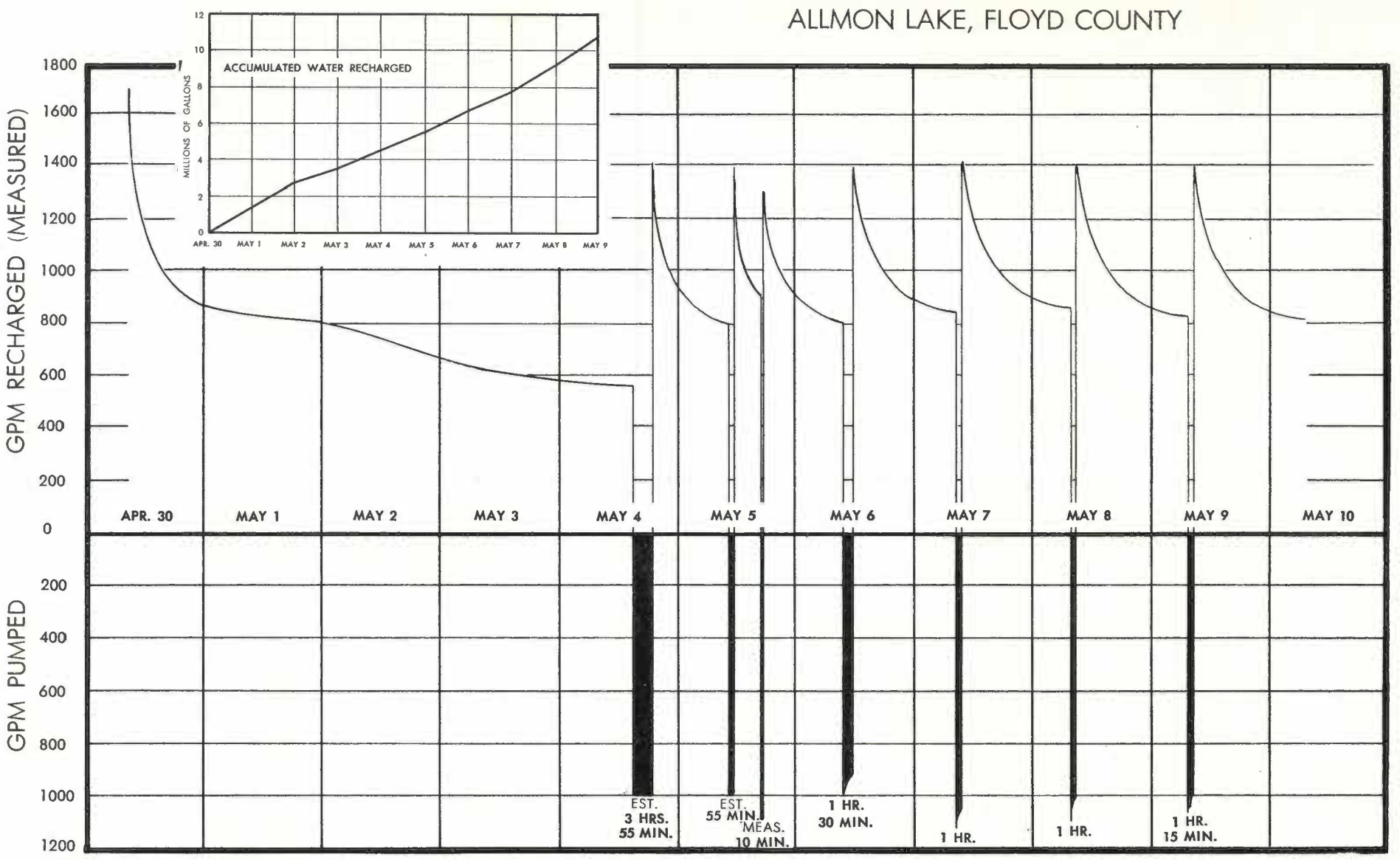
Again it is significant to note that whereas the rate of recharge during the first 4 days of the experiment decreased from 920 gallons a minute to 620 gallons a minute, with pumping only once a day to remove silt, the rate of recharge was maintained at a rate of about 920 gallons a minute until the lake was drained.

Just as the lake was drained the rains came again and the lake refilled to the previous level and the operation of recharging continued.

Although the problems of artificial recharge are not fully solved by any means, the work that has been done by numerous individuals, by the cooperative work of the Board of Water

(Continued on Page 4)

RESULTS OF RECHARGE EXPERIMENT



Study Of Pollution To Underground Water In Levelland Area

A subject which has been of much concern to the water-users in the southern High Plains of Texas, is that one of oil field waste allegedly polluting the supply of fresh underground water.

Mr. Lucky L. Tonroy reported in 1956 on his studies involving possible pollution of the wells in the vicinity of the City of Levelland in Hockley County, Texas.

Mr. Tonroy ran complete chemical analyses on water samples from thirteen wells in the Levelland vicinity; made computations to determine the hydraulic gradient of the underlying watertable; obtained chemical analyses dating back to 1929 from the Bureau of Laboratories of the Texas State Department of Health; and obtained proceedings of litigation dealing with the pollution of fresh underground water in Hockley County.

Mr. Tonroy reports that recent legal cases have been tried in our Texas courts involving this alleged pollution by salt water penetrating from earthern surface disposal pits to the underlying water-table. The courts have held that in certain cases this type pollution was occurring.

The case of Gulf Oil Corporation vs. Alexander (Alexander is a farmer in Hockley County) concerned pollution of fresh water by seepage from an earthern salt water disposal pit used in oil production operation. In finding in favor of Alexander, the court cited Rule 20 of the rules and regulations of the Texas Railroad Commission which states, "Fresh water, whether above or below the surface shall be protected from pollution, whether in drilling, plugging or disposing of salt water already produced."

To determine the hydraulic gradient of the water table (degree of slope of the water table) it was necessary for Mr. Tonroy to make a topographic map of the area and to make many measurements to the water table from the surface.

Mr. Tonroy states that, "A topographic survey, using an alidade and plane table, was made to obtain altitudes of all water wells, of which depths to water table could be measured, and other points throughout the area.

"To maintain accuracy, all traverses commenced and ended at a United States Coast and Geodetic Survey Bench Mark, located atop the south rail opposite the Panhandle and Santa Fe Railroad station in Levelland.

"Depths to the water table were measured in all wells accessible to measurement. Most of these depths were made by reeling a 300 foot steel tape into the well bore with blue chalk applied on the tape to show the exact contact with water. In some wells, a calibrated line with an electrode attached at the end was reeled into the well bore. On contact with water, the circuit was closed and the current registered on an ammeter attached to the reel.

"By subtracting the depth to water of the wells measured from the true elevation of the wells, a water table map could be constructed showing the relief of the water table and the hydraulic gradient.

"Water samples were collected from wells which had been previously chemically analyzed after permission was obtained from the owners. To insure against pollution which could result from water standing in the well casings, and to obtain a sample that was truly representative, the pumps were allowed to run for 15 to 20 minutes."

Mr. Tonroy states, in concluding his report: "Well No. 504 (1 mile west of Levelland), completed in 1936 to a depth of 170 feet with the pump set at 120 feet in the Ogallala group, is the only well in the area showing evidence of pollution. It is located in Labor 9 of League 72 and is approximately a quarter mile southeast (directly down hydraulic gradient) of a large playa lake used for disposing refuse in oil refining.

"The refinery began using the lake some 15 to 20 years ago but has since abandoned operations. No disposal products have been placed into the lake within the past several years. During the first part of its operation, the refinery had used well No. 504 for its water supply. In 1951, the water acquired a bad taste and odor, probably due to the phenols, dissolved gases, and other oily wastes, and a new supply was obtained from a well located where disposal would have no ill effect.

"A chemical analysis of the water was not made of well No. 504 at the time it was drilled, but a water well located 2 miles southeast of No. 504 and pumping water from the same formation was chemically analyzed at the University of Texas in 1939. The analysis of this well appears in Table I alongside well No. 504 under the year 1939. Assuming the water from both these wells to have been similar in chemical composition in 1939, a comparison can be made to determine any change which might have occurred. The analysis made of well No. 504 shows a notable increase in all constituents. Chloride, magnesium, sulphate, and total dissolved solids were all above the accepted standards for irrigation water used in this report.

"For additional comparison, water was analyzed from well No. 558 which is one of the nearest wells to No. 504 and is located north of the playa lake where it would not be affected by waste disposal. As shown in Table I, the water from well No. 504 is considerably higher in all ions.

"It is reasonably certain, then, that well No. 504 has been polluted by the refuse placed into the playa lake.

Similar comparisons of well No. 19, located 2,000 feet down the hydraulic gradient from well No. 504, and the well 2 miles southeast of well No. 504 show slight increases in the amounts of chloride, sodium, and total dissolved solids. This water is by no means polluted, but the increase indicates that some pollution, in the form of NACl2, has begun to reach this well.

"City of Levelland well No. 5 is approximately 7,000 feet from well No. 504, and pollution could be expected to reach it in 1973 assuming an average rate of ground water flow of 320 feet per year. Because the disposal area has been abandoned, pollution may be so dispersed by 1973 that the effects would be negligible on the quality of the water. On the other hand, concentration of pumping from city wells would increase the hydraulic gradient and, therefore, the rate of flow of polluted water which is directly proportional to the hydraulic gradient.

"The movement of salts dissolved with underground water seems especially pronounced and travels farther and faster than bacterial pollutant. In the Santa Fe Springs—Whittier—Montebello district of California, earthern pits containing oil field brines polluted ground water so that wells a quarter mile away became unfit for use in irrigation. There are numerous oil well disposal pits which are northwest of the city wells and up the hydraulic gradient. The practice of ejecting wastes into these pits has been discontinued, and a gravity disposal system is now employed by which the wastes are taken some distance south of Levelland and are injected back into the formation from which they were produced. However, the amount already placed into these earthern pits cannot be determined, and time alone will show the effect it will have on the city water supply."

Recharge Well—

Engineers, U. S. Geological Survey, City of Amarillo at the McDonald Well Field in Randall County, and the work of the Water District shows that the problems can be solved and in the future millions of acre-feet of surface water can be salvaged that otherwise would be wasted.

TABLE I

Well No.	*Ion*	*1939*	*1957*
504	Chloride (Cl)	62*	297
	Calcium (Ca)	69	106
	Magnesium (Mg)	63	121
	Sulfate (SO_4)	184	260
	Bicarbonate (HCO_3)	317	339
	Sodium (Na)	49	104
	Total Solids	583	1150
	Total Hardness	434	764
558	Chloride Cl		91
	Calcium Ca		72
	Magnesium Mg		81
	Sulfate SO_4		249
	Bicarbonate HCO_3		275
	Sodium Na		72
	Total Solids TS		761
	Total Hardness TH		512

**The complete analysis shown in this column is for a water well which is 2 miles S. E. of well No. 504. The water from both wells are from the same formation.*

High Plains Underground Water
Conservation District No. 1
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THE Cross SECTION

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

Volume 4—No. 1 "THERE IS NO SUBSTITUTE FOR WATER" *June 1957*

Multi-Purpose Recharge Well Program Is Discussed With Soil Conservation Service

Mr. R. C. Barnes, Assistant State Conservation Engineer; Mr. Y. E. McAdams, Area Agricultural Engineer; Mr. Les Adkinson, Economist; all of the Soil Conservation Service, and Mr. Ray Billingsley of Texas Tech met with members of the High Plains Water Conservation District last week to discuss the economic justification for the inclusion of a multi-purpose recharge well program as a practice to be established by SCS under the Great Plains Act (P. L. 1021). ⟶

Much interesting information is being developed along the cost-benefit lines as well as the possibility of increasing the economic longevity of irrigation in the High Plains. It is the belief of the District Board that hundreds of thousands of acre-feet of water can be placed in storage annually at a very small proportionate cost to that of impounding water in surface reservoirs. In ground water recharge of the High Plains area, the reservoir is no problem, it is already provided. Transmission lines for water from the underground reservoir to its point of usage are already established. At the same time, pumping costs from an underground reservoir would be lessened by recharge water raising the static water level.

Based on one year's experience in experimental areas, recharge data shows benefits which far exceed the operational costs.

Pictured above with members of the Water District staff are economists and engineers who are assisting the District in paving the way for the inclusion of a multi-purpose recharge well program as a practice to be established by Soil Conservation Service under the Great Plains Act. The group consists of, left to right, Les Adkinson, Soil Conservation Service Economist; Tom McFarland, District Manager; Ray Billingsley, Texas Tech Agricultural Economist; Y. E. McAdams, Area Soil Conservation Service Agricultural Engineer; W. L. Broadhurst, District Chief Hydrologist; and R. C. Barnes, Assistant State Conservation Engineer with the Soil Conservation Service.

Declining Underground Water Levels Spur Interest In Wet-Weather Lake Water

Have you been trying to think of an adequate way of draining the rain water from your wet-weather lake? You more than likely have a lake on your farm because only a very few quarter-sections on the High Plains of Texas exist which do not contain wet-weather depressions or lakes. W. L. Broadhurst, Water District Chief Hydrologist, estimates that there are 37,000 of these lakes in the Plains. It has also been estimated that about 1 1/4 to 1 1/2 million acre-feet of water collects in the lakes during an average rain-fall year. Approximately 90 percent of this water is lost into the atmosphere.

Because this lake water appears to be the only surface water which is available to the High Plains at this time, and because the underground water levels are declining we certainly should begin taking positive action toward salvaging this lake water.

At least one way has been found to drain these lakes artificially into the the underlying sands and gravels and there store the water, without danger of evaporation, for use at a future date. This method uses normal production wells, into which is drained lake water.

You will note in the two aerial photographs below, made by I. G. Holmes Photography, that if all the water shown were placed under-

(Continued on Page 4)

Individuals Practice Various Ways Of Putting Wet-Weather

Pictured above is a permanent combination recharge and production well located on a farm 4 miles west of Lubbock and owned by E. W. McFarling. The lake pictured covers about 20 acres and on June 4 the lake contained approximately 40 acre-feet of water (estimated by W. L. Broadhurst). On June 14 the lake was completely drained into the recharge well. The well is pumped twice each day for 15 minutes in order to clear the well formation of lake mud and silt. The well was drilled 5 years ago to a depth of 190 feet. The recharge part of this installation was constructed at that time and the well has been used since for recharge as well as production. An 8-inch steel pipe carries the lake water to the casing by gravity flow through a gate-valve.

Pictured above is a recharge well on a farm located 3 miles north and 8 miles west of Lubbock which is owned by Russell Bean. Mr. Bean is shown in the picture. The well is at the edge of a 20-acre lake which averages about two feet in depth when filled normally. The lake has been completely drained three times this year and at this time is being drained for the fourth time. The well is pumped twice each day for a period of thirty minutes. Recharge intake extends 350 feet to the deepest part of the lake. Lake water flows into the casing by gravity.

The recharge well pictured above is on land owned by J. A. Howell, about 3 miles west of Idalou. Mr. Howell is standing beside the installation. The 5-inch well is drilled 275 feet deep and cased with 16-inch pipe. The lake, which consists of approximately 10 acres has been drained 5 times this year. On June 17 the lake bottom was dry and ready to plant. About 5 days are required to drain the lake into the well. Mr. Howell normally pumps the well twice a day during the recharging operation for about thirty minutes in order to keep the mud and silt cleaned out of the well.

Another recharge project is shown above. This installation is on land owned by E. C. Jones and is 1 1/2 miles east of Olton. On the platform, which is about 8-feet high is mounted a 6-inch centrifugal pump, engine and fuel tank. When the lake catches water the pump is started and the water transported to either an 8-inch well approximately 500 yards away, through underground pipe, or put on the benched land which surrounds the lake.

Pictured at right is an 18-acre lake and a permanent recharge installation located 3 miles south and 1 east of New Deal on land owned by J. E. Hancock and J. C. Ainsworth. Mr. Ainsworth is pictured by the pump. The well intake in the lake drains water 200 feet through 12-inch concrete pipe to a riser near the well. From the riser a length of 12-inch steel pipe carries the lake water into the casing. This is strictly a gravity drain installation. The well has been taking water constantly since April 25. No silt problems have ever arisen. The lake has been drained twice this year and both times water averaged about 1 1/2 feet deep over the 18 acres. The lake was drained one time in 1956 and the bottom made 250 tons of ensilage. The recharge intake is going to be extended to the deepest part of the lake. The recharge portion of this installation cost approximately $400.00.

Lake Water Into The Underground Reservoir For Future Use

The recharge well shown above is on a farm owned by P. J. James, 4 miles east and 1 mile north of Shallowater. Medford Melton, farm operator, is shown at the well. The lake covers approximately 45 acres; however, 15 acres of it are on the adjoining land. Before May 1 the recharging began and has not been stopped since. The lake has been drained into the well almost completely 4 times, and at the time this picture was taken (June 17) the lake was full again. Pump is started each 12 hours and operated for 20 minutes to pump out silt. An 18-inch concrete line carries the lake water to the well casing where it drains in by gravity. This lake catches run-off water from about 3 square miles, and contains more water than can be handled adequately with only the one well.

This year Mr. E. W. McFarling, who has a permanent recharge installation on his home farm, excavated a hole 8 feet deep, 30 feet wide and 200 feet long in the bottom of a lake on another of his farms 4 miles west of Lubbock. With dirt dug from the hole, Mr. McFarling levelled the bottom of the lake so all water would drain to the hole. The lake was filled by rain. During June, a 2200 lb. trailer was floated at the hole in the lake by 14—55 gallon oil drums. On the trailer is mounted a 4-inch centrifugal pump and engine. The pump delivers lake water to an 8-inch irrigation well. The lake water is discharged into a concrete riser and from there it goes into the pump discharge pipe and into the well. Mr. McFarling rented 440 yards of 2-inch gas line to carry fuel from the irrigation well engine to the centrifugal pump engine.

The above recharge well is 4 miles west of Hart and is on land owned by Willis Hawkins. From the lake the water drains through a dredged ditch to a 15-inch concrete well intake pipe. This pipe joins, at a gate valve, a 15-inch steel line coming from the well casing. The intake at the casing is 9 feet below the surface and is 1 foot below the lake bottom elevation. There are about 30 acres in this lake but not much water gathers in it because of the bench-levelled land which surrounds the lake.

Wayne Prather of Lubbock owns land 3/4 mile north of Woodrow in south Lubbock County and on which an 11-acre lake is contained. On the 10th of June the lake covered 19 acres of land. Above the lake are two irrigation wells—a 5-inch well and an 8-inch well. Mr. Prather, who is pictured above, installed a 6-inch centrifugal pump on top of a 7-foot high terrace with an engine and fuel tank. The centrifugal pump pumps lake water 2200 feet through 6-inch aluminum surface pipe into the discharge pipes of the two irrigation wells. Mr. Prather estimates that approximately 1200 G.P.M. are draining into the two wells from the lake. Each day the centrifugal pump is shut-down and the two irrigation wells pumped for a short period. This pumping of the irrigation wells is done in order to remove silt and mud which travels with the lake water into the wells. It is reported that 6 gallons of fuel per hour are used in this operation.

←

A. S. Nafzger, who lives 2 miles south and 3/4 miles east of Olton, is pictured at left beside his 30-acre lake. In the center of this lake is an un-cased 20-inch well drilled 130 feet deep and filled with 10 yards of 2-inch rock. Five yards of 1-inch rock was piled on top of the well. The idea in this project is to drain the lake water into the well using the rock as a filter. The lake first filled on Easter Sunday and in 12 days was dry. The rains again filled the lake half-full and in one week this water was drained. The lake was again filled full and 4 days later was about two-thirds drained when a 2 1/2-inch rain on June 17 filled the lake to maximum capacity. This installation cost approximately $375.00 and is being closely observed in an effort to determine the merit of this type project.

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-B 15th Street, Lubbock, Texas.

Telephone PO2-8088

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ALLAN WHITE
Editor

District Office

Tom McFarland ..... General Manager
W. L. Broadhurst ..... Chief Hydrologist
Allan White ..... Office Manager
Y. F. Snodgrass ..... Field Representative
Wayne Wyatt ..... Field Representative
Mrs. M. McVay ..... Secretary-Bookkeeper
Dana Abbott ..... General Office

Pictured above is a recharge operation on a farm owned by C. E. Jackson near Doud Switch in southwestern Lubbock County. At one time during the month the lake covered about 160 acres. L. W. Chance, a neighbor, arranged for a 4-inch centrifugal pump and about 200 feet of 6-inch aluminum surface pipe to pump and carry the lake water to a 5-inch well on Mr. Jackson's place. A small 4-cylinder air-cooled engine powers the centrifugal pump. The aluminum pipe is connected to the discharge pipe of the irrigation pump. It is estimated that the well is taking about 300 gallons of lake water per minute. Mr. Jackson is stopping the recharging process every other day and pumping the irrigation well for 30 minutes. This is to clean out the well. About 8-10 gallons of fuel are used each day in the recharge operation and the initial cost was about $500.

Regional Conference Held At Mineral Wells

The Adult Education Department of Texas Technological College held its second regional conference at the Seybold Guest Ranch at Mineral Wells on June 7-9.

The purpose of this conference was to bring together leaders in the West Texas region and consider problems of agriculture, industry and community development.

Marvin Shurbet, Petersburg, President of the High Plains Water District Board of Directors, and W. L. Broadhurst, Chief Hydrologist for the District, attended the conference and reported that it was very productive.

The industrial concerns dealt with ways of diversifying the economic base of the region.

Community development explored ways whereby efforts of individual communities may be strengthened by use of available resources in the region, including the shared experience of other communities.

The agricultural committee considered problems and alternative courses of action.

Of course, one of the most important concerns of all three committees was that of available water supply. All segments of our regional economy depends greatly on an adequate supply of water.

Recharge of the underground water by artificial means was a topic of much interest. Mr. Shurbet and Mr. Broadhurst discussed with the conference delegates steps being taken by the High Plains Water District to determine feasibility of recharging the underground water sands by draining rainwater from the many wet-weather "depressions" which dot the Plains, into the ground through "multi-purpose" wells. "Multi-purpose" means wells which are used for production of water and also used for recharging purposes.

By draining this "depression" water into the underground water sands it can be saved from evaporation until needed for productive use. It has been determined that approximately 90 percent of this "depression" water is naturally lost to the atmosphere. In saving this 90 percent by placing the water in the underground reservoir the regional economy could be strengthened and its life prolonged.

The conference was successful in meeting its goal of informing regional leaders as to possible solutions to many problems of future development.

The Adult Education Department is to be congratulated for its efforts in bringing regional problems into focus.

STATISTICS FOR MAY

During the month of May, 215 new wells were drilled and registered with the District office; 35 replacement wells were drilled; 3 old wells were drilled deeper; and 19 wells were drilled that either were dry or were non-productive for other reasons. 107 permits were issued by the County Committees. The new permits issued and completed wells follow by Counties:

County	*Permits Issued*	*New Wells Drilled*	*Replacement Wells*	*Old Wells Deepened*	*Dry Holes Drilled*
Armstrong	0	0	0	0	0
Bailey	5	17	6	0	1
Castro	6	19	5	0	4
Cochran	4	12	0	0	1
Deaf Smith	17	17	4	0	1
Floyd	0	18	0	0	0
Hockley	14	33	5	0	4
Lamb	21	29	3	1	2
Lubbock	17	32	8	1	6
Lynn	3	7	0	0	0
Parmer	13	17	3	0	0
Potter	0	1	0	0	0
Randall	7	13	1	1	0

Lake Water—

ground, it could help in solving our increasingly important water problem. The pictures show only small areas, but the scene would be the same at almost any point on the Plains.

On pages 2, 3 and 4, of this issue you will see what action is being taken by a few farmers to conserve their lake water. Others are doing the same but space would not permit the inclusion of each project.

THE CROSS SECTION
1628-B 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_____

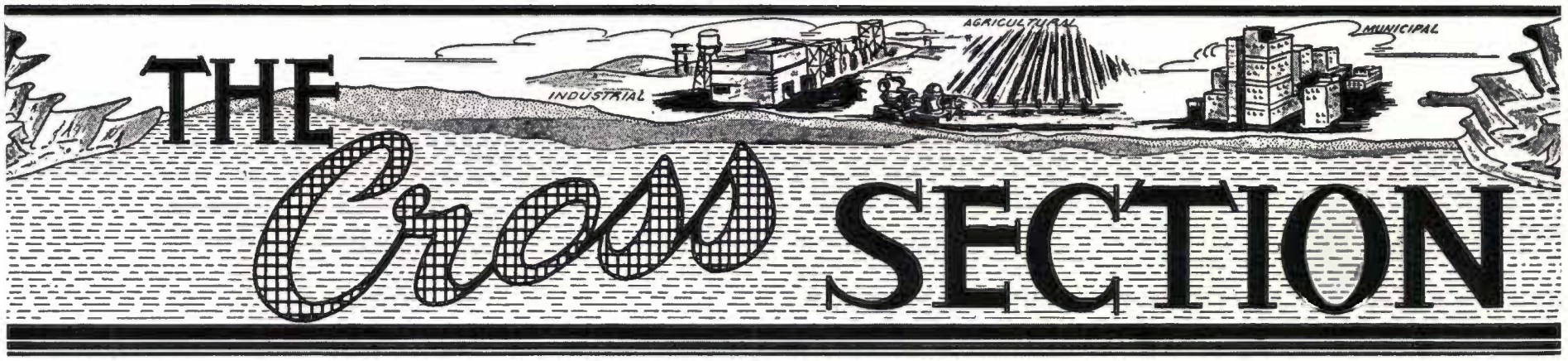
Address_____

City and State_____

(Please cut out and mail to our address)

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

Second Class Permit



THE Cross SECTION

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

Volume 4—No. 2 "THERE IS NO SUBSTITUTE FOR WATER" *July 1957*

An Estimated 42,225 Irrigation Wells In The Texas High Plains Area For 1957

The Texas Agricultural Extension Service has recently released its 1957 Irrigation Survey for the High Plains of Texas.

Mr. D. W. Sherrill, Irrigation Agent, compiled the data contained in the survey from reports made by county agricultural agents.

The survey covers a 42 county area, from the Oklahoma Panhandle to Midland, and from the New Mexico line to the eastern escarpment.

The number of irrigation wells in the High Plains of Texas was estimated to be 42,225, an increase of 5,653 wells over the 1956 number. The number of irrigated acres was also up—4,568,880 acres in 1957, compared with 4,339,493 in 1956. This is an increase of 229,387 irrigated acres.

The number of irrigated farms was up in 1957 to 18,344, as compared to a 1956 total of 17,767. Most of this increase came in counties where irrigation is relatively new.

The survey showed a continued increase in well pumping lifts and a decrease in well pumping capacities.

More than one-half of the irrigation wells and irrigated acres are within the thirteen counties which make up the High Plains Water District. Within the District area, according to the survey 27,369 irrigation wells are in operation and 2,642,910 acres are under irrigation.

For more detailed data contact D. W. Sherrill, Irrigation Agent, Texas Agricultural Extension Service, Texas Technological College, Lubbock, Tex.

The Water District Counties are summarized below:

County	*Total Acres Irrigated*	*Irrigation Wells*	*Farms Irrigated*
Armstrong	23,000	140	87
Bailey	150,000	1,500	750
Castro	320,000	3,000	750
Cochran	80,000	800	320
Deaf Smith	305,000	2,300	530
Floyd	290,000	2,420	1,250
Hockley	250,000	4,300	1,800
Lamb	250,000	4,050	1,750
Lubbock	350,000	4,500	1,800
Lynn	65,000	1,375	550
Parmer	360,000	2,300	1,100
Potter	14,910	34	20
Randall	85,000	650	400

Pictured are participants on the concrete irrigation pipe meeting program presented on the Texas Tech Campus at Lubbock July 17. Left to right are: M. P. Hammond, Plainview; D. W. Sherrill, Lubbock; Tom Cowan, Lubbock; Bruce Spencer, Lubbock; W. L. Sorrells, Temple; Bob Thurman, College Station; A. F. Pillsbury, Berkeley, California; John Koester, Austin; Charles Richter, Dallas; and J. J. Cox, Lubbock.

Concrete Pipeline Meeting Presented

The Texas Agricultural Extension Service in cooperation with the Department of Agriculture at Texas Tech presented a one-day concrete irrigation pipe meeting on July 17. It was held in the Aggie Auditorium on the Texas Tech Campus in Lubbock.

The purpose of this meeting was to inform the people in this area as to the functions of the various governmental agencies in installing concrete pipeline systems, and to offer information concerning good water and soil conservation methods and practices.

The program was planned by D. W. Sherrill, Irrigation Agent with the Extension Service in Lubbock, and Bob Thurmond, Irrigation Specialist with the Extension Service at College Station, was the master of ceremonies. A. F. Pillsbury, Professor of Irrigation at the University of California, was the main speaker. He discussed the new tentative ASAE standards for the design and installation of non-reinforced concrete irrigation pipe systems. He also aired engineering problems associated with concrete pipe lines.

Others who participated in the program were: Tom Cowan, Area Engineer, Soil Conservation Service; M. P. Hammond, Gifford-Hill-Western, Inc.; Charles Richter, Real Estate Loan Officer, Farmers Home Administration, Bruce Spencer, Vice-President, Gifford-Hill-Western, Inc.; W. L. Sorrells, with the State ASC Office; and J. J. Cox, farmer of Lubbock.

Mr. John Koester with the Portland Cement Association, presented a color irrigation sound film at the meeting. This was the first showing of the film in the southwest. Much of the film was made in the Southern High Plains of Texas, and is one of the best films on irrigation that we have seen. It will be available to interested groups through the Extension Service at College Station or through Mr. Sherrill, Texas Extension Service, Texas Technological College, Lubbock, Texas.

Recharge Wells To Be Television Topic

Mr. Joe Wilson, cameraman with the Jamison Film Company of Dallas; was in the local area on July 23-24 and 25 for the purpose of making a television film report to be shown on "Texas In Review." Humble Oil and Refining Company sponsors the television show which is seen in the Lubbock area each Tuesday at 7:30 p. m. over KDUB-TV, Channel 13 and in the Amarillo area each Tuesday at 7:30 p. m. over KFDA-TV, Channel 10.

Mr. D. W. Sherrill, Lubbock Irrigation Agent with the Texas Extension Service, was instrumental in interesting "Texas In Review" on new irrigation developments in the High Plains.

Included in the film story will be: (1) Artificial recharge of underground sands with lake water, (2) Pumping of lake water directly on cropland, (3) Aerial shots of the many "wet-weather" lakes in the Plains, (4) Irrigated crops and (5) field test showing how to check well efficiency.

No definite viewing dates have been established for either the Lubbock or Amarillo areas. We suggest that those interested watch the television news reports for time of showing, or contact D. W. Sherrill, Extension Service, Texas Tech College, Lubbock, or the High Plains Water District Office in Lubbock.

STATISTICS FOR JUNE

During the month of June, 105 new wells were drilled and registered with the District office; 21 replacement wells were drilled; 2 old well were drilled deeper; and 4 wells were drilled that were either dry, or non-productive for other reasons. 40 permits were issued by the county committees. The new permits issued and completed wells follow by counties:

County	*Permits Issued*	*New Wells Drilled*	*Replacement Wells*	*Old Wells Deepened*	*Dry Holes Drilled*
Armstrong	0	0	0	0	0
Bailey	6	15	2	1	1
Castro	3	12	0	0	0
Cochran	3	2	0	0	0
Deaf Smith	10	11	2	1	0
Floyd	2	10	0	0	1
Hockley	7	15	7	0	0
Lamb	0	0	0	0	0
Lubbock	1	19	3	0	1
Lynn	0	6	1	0	1
Parmer	8	14	6	0	0
Potter	0	0	0	0	0
Randall	0	1	0	0	0

The Cross Section

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ALLAN WHITE
Editor

Another Rec

The total quantity of water that has collected since Easter Sunday, 1957, in the thousands of depressions on the High Plains of Texas is unknown. But, based on personal observations of numerous 'lakes' and study of aerial photographs such as those reproduced in the June issue of "The Cross Section," the quantity unquestionably approaches that withdrawn for all uses within the region during 1956. Naturally, we cannot expect such a vast quantity to collect in the depressions each spring—but we can and do expect it at infrequent intervals.

Some of the lake water will move down into the underground reservoir as natural recharge; but, because of the impermeable character of sediments in the bottoms of the depressions, several million acre-feet of water will be lost from the region this year through evaporation.

Man can assist nature in storing some of the lake water underground where it will be available to him for future beneficial uses.

A relatively large lake at the intersection of Farm Roads 54 and 400, about 20 miles northeast of Lubbock, Texas, was shown in the lower right hand corner, page 1, of the June issue of "The Cross Section."

In the latter part of May the lake did not cover either road and the farm buildings in the foreground were on dry land.

Pioneer Natural Gas Company, which supplies natural gas to much of the Plains region, including about 16,000 irrigation wells in the Southern High Plains, was laying a pipe line parallel to Farm Road 54, but owing to high water a hole for the line could not be bored beneath the pavement on Farm Road 400.

Mr. Marvin Shurbet, President of the Board of Directors of the High Plains Underground Water Conservation District, suggested to officials of the company that a recharge well be drilled near the lake in order to complete the pipe line job and at the same time demonstrate to farmers of the area the feasibility of storing the water underground.

Pioneer Natural Gas Company agreed to pay for the project and drilling was started on May 24, 1957.

The well site was 100 feet east of the lake and 150 feet south of Highway 54.

The well was drilled with a hydraulic rotary rig using a 19-inch bit. Sediments that were encountered were sand, sandy clay, and silt, including relatively hard caliche rock at 70 and 200 feet. From 200 to 400 feet the sediments consisted chiefly of coarse-grained water-bearing sand and gravel. Drilling was stopped at 400 feet without penetrating redbeds.

Casing for the well consisted of 15-inch by 1/4-inch steel gas line furnished by Pioneer. Since the well was to be used as a recharge well, the casing was perforated in a somewhat different manner than for an ordinary production well. The general practice for irrigation wells is to cut 4 rows of slots that range from 1/2 to 5/8 inch in width by a foot in length. For the recharge well, 8 rows of slots were cut that ranged from 3/16 to 1/4 inch in width by a foot in length. Wells that are used only for producing water function satisfactorily with the wider slots; but, for a well to be used both for recharging and production, experience had shown that the narrower slots would prevent the pumping of excessive quantities of sand.

By W. L. BROADHURST

The driller's log showed considerable fine-grained water-bearing sand between 100 and 200 feet, but owing to the coarser material below 200 feet, the casing was perforated only from 200 to 400 feet.

As the casing was inserted in the well a 15-inch used automobile tire, which had been cut in half around the center of the tread, was placed around the casing above the perforations to serve as a packer to prevent sloughing of material from above. The other half was placed around the casing at 70 feet opposite the hard layer of caliche. The portions of the tire, with the cups turned up, were held in place by pieces of metal welded to the casing.

After the casing was set, 5 yards of ready-mix concrete was used to fill the annular space between the well bore and the casing, the 70-foot packer serving to prevent the concrete from falling farther down into the well.

A ditch was cut from near the edge of the lake to the well and a 10-inch steel pipe, equipped with a valve, was welded into the casing about 12 feet below ground level. A 4-stage 12-inch pump with 200 feet of 8-inch column pipe was installed in the well, and development was started in the evening of May 29.

On the previous day, May 28, 1957, the lake covered 31.5 acres and, as measured from a boat, had a maximum depth of 8 feet.

During the night of May 29, it started raining. Sunday morning, June 2, the area had received 8 to 10 inches of precipitation; the lake covered an area of 79.3 acres; both roads were under water, No. 54 to a depth of 40 inches; the pump and motor were inundated; and the lake was 13 feet deep.

Obviously on Monday morning, June 3, there was not much that could be done except observe the tremendous quantity of water going into the well down the column pipe of the pump.

The picture 1 was taken by Allan White, Editor of "The Cross Section," on Wednesday, June 5, 1957, after the lake had gone down about 1 1/2 feet. (See high water line on pile of dirt in center of photograph.) On Friday, June 7, the pump was raised and water poured into the well over the top of the casing. At the same time a larger engine mounted on a trailer was moved to the site and thereafter the well was pumped from 30 to 60 minutes each day.

By June 17, the lake, with the recharge well, had gone down 4.2 feet and covered only 44.2 acres whereas a lake of comparable size, 4 miles west, had gone down only 1.2 feet as the result of evaporation and seepage. Hence, by observing the decline in water levels in the two lakes together with the areas covered by water at different times, the quantity of water that went down the recharge well and out into the water-bearing formation was computed. (See Chart).

On the night of June 17, the area received another 3-inch rain and the next morning the lake was back up a foot and again was over Highway 54. However, in a matter of 7 days the lake was down again so water would not run into the well over the top of the casing.

When the rains came on May 29,

charge Well Does The Job

the valve on the intake pipe was closed and because of loose dirt and high water the end of the intake pipe was covered with 10 feet of mud.

From June 24 until July 3 a 6-inch centrifugal pump was used intermittently to pump water from the lake into the well at rates from 1,000 to 1,400 gallons a minute while Mr. Y. F. Snodgrass and Mr. Wayne Wyatt, employees of the Water District, spent many hours up to their necks in mud and water opening the intake pipe and troublesome valve.

On July 3 the intake pipe was uncovered, a ditch was cut from the intake pipe into the lake, a meter was installed on the intake line and the valve was opened, permitting water and loose dirt to gravity flow into the well at a rate exceeding 2,000 gallons a minute. As a result of this operation, although the development pump was operatting at 1,000 gallons a minute, the loose dirt filled the well to within a few feet of the lower end of the suction pipe.

Intermittent pumping during the recharge period from June 7 to July 3, had removed only a few yards of sand, but after the intake valve was opened, pumping and backwashing did not remove the loose dirt that filled the well opposite most of the perforated part of the casing. Consequently, from July 3 to 12, the well took water at the average rate of only 1,100 gallons a minute whereas during the first 15 days the average intake rate was 2,000 gallons a minute. On Friday, July 12, the pipe line job was completed and recharge operations were stopped temporarily.

The water level in a neighboring irrigation well, approximately 700 yards southeast from the recharge well, was measured periodically during the recharge period. At the time the recharging operation was temporarily stopped the water level in this neighboring well stood at 119 feet below the surface. The water level stood at 125 feet below the surface before the recharging operation began.

Picture 2, also by Allan White, was taken during the last days of recharging and shows by way of comparison how much the lake level was lowered, primarily from recharging.

Computations of the cumulative artificial recharge are shown in the graph.

Although considerable difficulty was experienced because of the heavy rains during the period, such difficulties would be eliminated if the recharge wells were drilled while the lakes are dry.

This job was accomplished at a cost of about $3,500. However, the storing of 69,000,000 gallons, or 210 acre feet of water underground, which, if it has a value of only $20.00 per acre-foot, means that in 41 days, we put $4,200 back in the bank. With a clean-out job on the well, proper equipment and management, the well should be good for developing irrigation water and for draining the lake again and again.

"The Gas Jet," official publication of the Pioneer Natural Gas Company, presented an illustrated story of this recharge project in their July 1957 edition. The presentation showed a picture of the lake and recharge well along with a cross-sectional diagram of a typical recharge well.

For those interested in this story, write "The Gas Jet," P. O. Box 511, Amarillo, Texas.

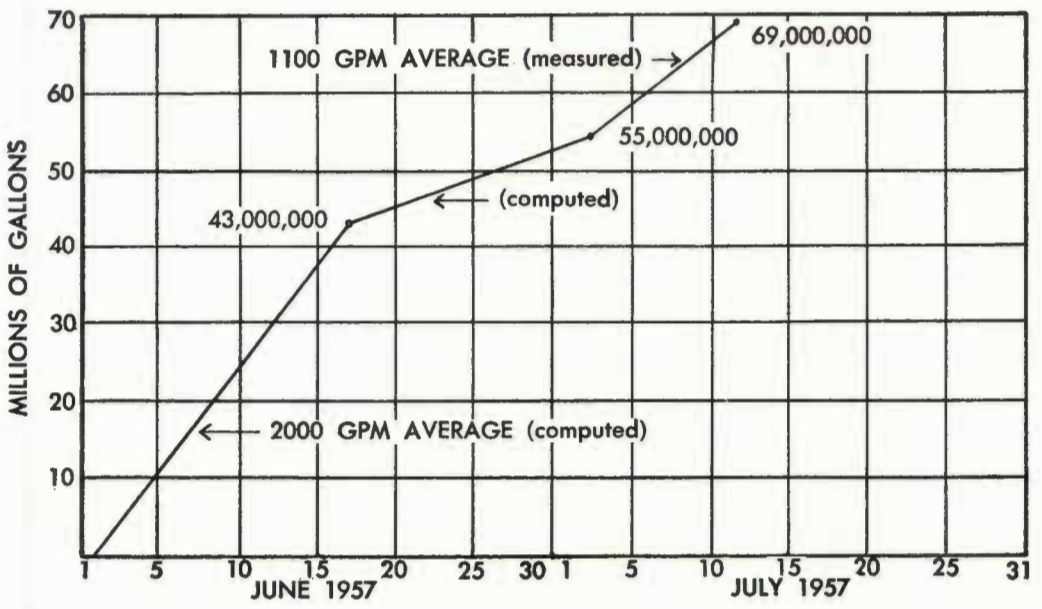
PICTURE 1

PICTURE 2

Recharge Well Experiment

Pioneer Natural Gas Co.

Accumulated Water Recharged



Efficient Use Of Water Is Major Profit Factor

In an interview with Mr. Earnest L. Thaxton, Jr., Assistant Irrigation Engineer, with the Texas Agricultural Experiment Station, Substation No. 8, Lubbock, Texas, it was revealed that many very important factors enter into the efficient use of irrigation water. When most people think of efficient water use, the natural tendency is to think of mechanical controls such as contour furrows, terracing, level borders, proper use of tile, etc. While these practices are of great value in water conservation, there is still another important factor to be considered when looking into the subject of efficient water use.

Mr. Thaxton calls this consideration "biological efficiency," which means obtaining maximum yields of fiber or grain for a given quantity of water. Efficient use of water by the plant is often overlooked because so few farmers understand its importance. It was pointed out by Mr. Thaxton that fully as much water is wasted by inefficient use by the plant, as is lost by runoff and poor distribution. This is particularly true for grain sorghum. Improper timing in applying irrigation water, wrong planting date and selection of wrong variety of seed for the local area are a few examples of practices which bring about inefficient water use by plants.

Several examples were cited by Mr. Thaxton to illustrate the effect that crop management has on water use efficiency. (1) An irrigation on cotton is generally not needed before the first bloom appears. Should an irrigation be applied before the first bloom it may delay fruiting and reduce yield. Late summer irrigations which keep the plant blooming after the last effective bloom date (September 1) may also be detrimental. Even with a mild fall and late frost, as was the case in 1956, an irrigation after August 25 may reduce profit.

To illustrate an actual case where reduced gross profits were experienced due to an early September irrigation, Mr. Thaxton cited the following date which was compiled in a test at the W. T. McEachern Farm in Hale County.

Cutoff Date	*Gross Value of Lint per acre**
August 15	$181.00
August 25	297.00
September 4	283.00

*Based on 1956 loan card values.

According to Mr. Thaxton, plant moisture stress is a very important factor in determining the yield of a cotton crop as well as the return of lint per inch of water. Stress at the beginning of bloom and at mid-bloom has reduced yields on the Experiment Station at Lubbock, and no amount of water at a later date will make up for the loss. However, in 1956 when water was cut off in mid-August and thereby bringing about moisture stress at the end of the bloom period, the yield was not reduced. Normally, in the summer, it would appear to be a good practice to not attempt watering more land than can be irrigated adequately.

Earnest L. Thaxton, Jr., Assistant Irrigation Engineer, Texas Agricultural Experiment Station, Substation No. 8, Lubbock, Texas.

In 1956, records indicate that watering every other furrow during the last irrigation is not as efficient as watering each row. Mr. Thaxton states that more lint per acre inch of water was made by watering every row rather than alternate rows.

April plantings of cotton have never out yielded early May plantings in the 46 years of data at the Lubbock Experiment Station, consequently it would appear advisable to wait until May 10 to plant. Much of the severe weather in late April and early May is also missed by a May 10 planting date and better stands usually are obtained.

It has been determined by weighing the results of a three year test conducted by the Experiment Station that cotton burs applied as a surface mulch prior to listing aids in rising water use efficiency on cotton. Below is a chart which shows the three year average of yield data taken on the Experiment Station, 1954-1956.

No Burs	502 Lbs. Lint
2 Tons Burs Annually	612 Lbs. Lint
4 Tons Burs Annually	652 Lbs. Lint
6 Tons Burs Annually	727 Lbs. Lint

Mr. Thaxton says that in raising grain sorghums, even a greater opportunity to use water more efficiently is presented than with cotton. With proper planting dates and proper seed varieties many South Plains farmers can double their present yields without increasing the amount of water pumped.

The early maturing grain sorghum varieties, such as: Martin, Redbine-58, Redbine-60 and 7078, should be planted as late as June 25, and the late varieties such as Caprock should not be planted before June 5 to make the most efficient use of water. Earlier plantings result in a longer period from planting to bloom and require more water. The longer this period, the more water required. In some cases, Mr. Thaxton feels that this period could be cut down as much as 21 days. Since grain sorghum averages using about .33 inch of water per day, if 21 days could be cut from the time the plant stands in the field the water requirement could be lessened by 7 acre-inches, or almost two summer irrigations, while the grain yield would be the same.

Grain sorghums are a type plant that have only one fruiting stage, and moisture stress at any time after the embryo head is formed will cause a loss in yield. No amount of water after the stress period can replace the previous yield potential. For this reason, grain sorghums are more difficult to irrigate than is cotton.

Mr. Thaxton feels that the farmer should weigh his situation carefully before choosing a seed variety. If he has plenty of water a short season variety would not be practical. On the other hand, with a limited supply of water he would be unwise to plant anything except the short season varieties and hybrids, even though they do not have the high yield qualities but do make excellent use of the limited water. He also points out that when high yields are continuously harvested it will become necessary to supply plant food with commercial fertilizer in order to continue obtaining these high yields of grain.

Mr. Thaxton summed up the interview by stating that he estimates that fully as much water is wasted by poor management as is lost by poorly designed irrigation systems. This waste is not easily detected as are mechanical losses such as tailwater, rainfall runoff, poor distribution, etc., but they do as surely exist. Mechanical waste and losses are definitely avoidable and should be eliminated. Inefficient water use waste can also be eliminated by better crop management based on sound information.

Mr. Thaxton and the Lubbock Experiment Station Staff are to be congratulated for their work and efforts in behalf of the agricultural interests in the Southern High Plains of Texas.

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

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THE Cross SECTION

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

Volume 4—No. 3 "THERE IS NO SUBSTITUTE FOR WATER" *August 1957*

Salt-Water Pollution Is Becoming A Major Concern In Oil-Producing Areas

Salt-water pollution of the fresh water in certain areas within the High Plains Underground Water Conservation District has reached alarming proportions.

In the opinion of our own hydrologist, W. L. Broadhurst, and others qualified to expressed an opinion on the subject, this pollution can be coming from surface pits into which oil field brine is disposed.

According to our information, there is no effective regulation over surface salt-water disposal pits, either by the Railroad Commission which controls oil production in the State, or by the State Board of Water Engineers. The matter is left entirely to the discretion of the oil producer and the land owner to come to a common understanding as to the location and operation of the disposal pits.

The theory that the water will evaporate from the pits and leave the salt deposited at the surface is not altogether true. The thing that happens in most cases is that an oil slick forms on the surface of the salt water thereby preventing evaporation and the water together with the salt in solution percolates through the underlying sediments until it reaches the water-table. The salt does not filter out of the water as it moves through the underground formations, and once polluted, the underground water is not fit for domestic or agricultural uses.

Most of the oil producers are attempting to alleviate this salt-water pollution problem by changing their method of disposal. Many have begun injecting the salt water under pressure back into the same formation from which it came through wells which are cased with solid pipe through the fresh water-bearing section. But, there are others who are not making any effort to change their method of operation. These companies, by continuing such wasteful practice, show that they have no real interest in our area other than for the immediate dollar that can be taken from it.

Pictured at right is one of literally hundreds of surface salt-water disposal pits in the High Plains region.

Early in August, at the invitation of the High Plains Water District, Judge Otha Dent, member of the State Board of Water Engineers, and Robert Littleton, head of the ground-water division of the Board of Water Engineers visited numerous farmers in Cochran, Hockley and Lamb County areas, where most of the pollution is occurring. They talked with these farmers about their problems and explained the State Board's position in the matter. They urged the individual to begin immediately taking periodic water samples from their wells and have samples analyzed for pollution. This would offer an excellent check on the quality of the water being used and serve to indicate changes that might be taking place in the chemical character of the water.

Article 7880-3c of Vernon's Civil Statutes of Texas, which outlines the functions of Underground Water Conservation Districts, defines waste. Subsection (d) under the definition states that waste shall mean:

"(d) The pollution or harmful alteration of the character of the underground water within the underground reservoir of the District by means of salt water or other deleterious matter admitted from some other stratum or strata or from the surface of the ground."

If, as is suspected, the disposal of salt water in open surface pits is causing pollution of the underground watter, then this surface pit disposal method can be placed in the category of "waste."

The legal counsel for the High Plains Water District is at present studying the law to determine what course of action may be open to the Board of Directors in working with both the landowner and the oil producer to solve the pollution problem.

Water District Files Law Suit Against Continued Waste Of Irrigation Water

The High Plains Underground Water Conservation District has filed a law suit involving the waste of irrigation water. The suit, which seeks a permanent injunction forbidding continued waste, has been filed in District Court and names an irrigator as defendant in the case.

Only as a "last resort" measure did the District's Board of Directors decide to take this action. The defendant was given opportunity to alleviate his own waste problem, but he did not see fit to take advantage of them.

While being the first agricultural waste case in the history of the High Plains Water District, this case is also the first ever filed under the present ground-water laws of the State of Texas.

It is the sincere wish of the District's Board that this first case will also be the last that need ever be filed involving waste.

STATISTICS FOR JULY

During the month of July, 70 new wells were drilled and registered with the District office; 9 replacement wells were drilled; 5 wells were drilled that were either dry, or non-productive for other reasons. 113 permits were issued by the county committees. The new permits issued and completed wells follow by counties:

County	*Permits Issued*	*New Wells Drilled*	*Replacement Wells*	*Old Wells Deepened*	*Dry Holes Drilled*
Armstrong	0	0	0	0	0
Bailey	16	7	2	0	0
Castro	9	8	1	0	0
Cochran	3	3	0	0	0
Deaf Smith	18	5	0	0	0
Floyd	11	5	0	0	0
Hockley	5	16	1	0	1
Lamb	19	2	2	0	1
Lubbock	16	17	2	0	3
Lynn	4	2	0	0	0
Parmer	9	5	1	0	0
Potter	0	0	0	0	0
Randall	3	0	0	0	0

Oil-Field Brines Pollute Cochran County

In several parts of the High Plains Underground Water Conservation District, notably in the southwestern part, several irrigation and domestic water wells have been polluted with salt water. This pollution is allegedly caused from oil-field brine, which contains as much as 25 percent salt or 250,000 parts per million and which is produced along with oil, percolating to the water-table from surface disposal pits.

Mr. Dan Valentine has experienced salt water pollution in one of his irrigation wells. Mr. Valentine has 450 acres of farmland 2 1/2 miles west of Whiteface, Cochran County, on which there are 12 oil wells producing both oil and salt water. The oil wells were drilled in 1943-44. At that time, three batteries of tanks were constructed on the farm to store the oil which was pumped. Also, a surface pit was provided at each battery for the disposal of salt water. Mr. Valentine bought the farm without the mineral rights in 1946.

In the fall of 1950 the first irrigation well, number 1 on the farm plat at right, was drilled on the farm. Then in 1952, well number 2 was drilled. These two wells produce fresh water.

In 1955 well number 3 was drilled near the southeast corner of the farm. During a test, it produced 1,200 G. P. M. but, when the production pump was installed in the well it discovered that the water was polluted with salt. The well was located 300 feet due east from one of the salt water surface disposal pits. (This pit handled only about 6 barrels of salt water per day—many pits over our Water District handle much more.) A chemical analysis was made of the well water and it showed a high concentration of sodium chloride (salt). Below are shown the results of chemical analyses of water from well number 3:

Time After Pump Started	*Salt, P.P.M.*
Start	8,090
2 minutes	15,550
7 minutes	2,180
20 minutes	1,890
8 hours	1,590
Last sample	1,530

When General American Oil Company of Texas, the oil producer of this lease, was notified of the circumstances they immediately agreed to drill Mr. Valentine a new well.

The new well (well number 4) was located 195 feet northwest of the well number 3 and was drilled to the base of the fresh water-bearing formation. The well was cased to the bottom, and the section from the surface to the water-table was completely cemented off. This was done in order to control the possibility of salt water moving laterally along a shallow impervious layer of clay and running directly into the well.

A pump was placed in this well and for 3 weeks the water tested approximately 200 p.p.m. salt; then over night, the salt content increased to 6,040 p.p.m. The well was abandoned.

Another well location (well No. 5) was staked 1,200 feet northwest of well number 4 and drilling began. After the drilling and casing operations were completed the well was developed and tested by pumping. The well produced only 700 G.P.M.; consequently, Mr. Valentine would not accept it as a replacement well for well number 3, even though the water quality was good. The well was capped.

DAN VALENTINE

Parts of Labors 3, 4, 9 and 10, League 61, Midland Co. School Land, Cochran County, Texas

450 acres owned by Dan Valentine, Whiteface, Texas

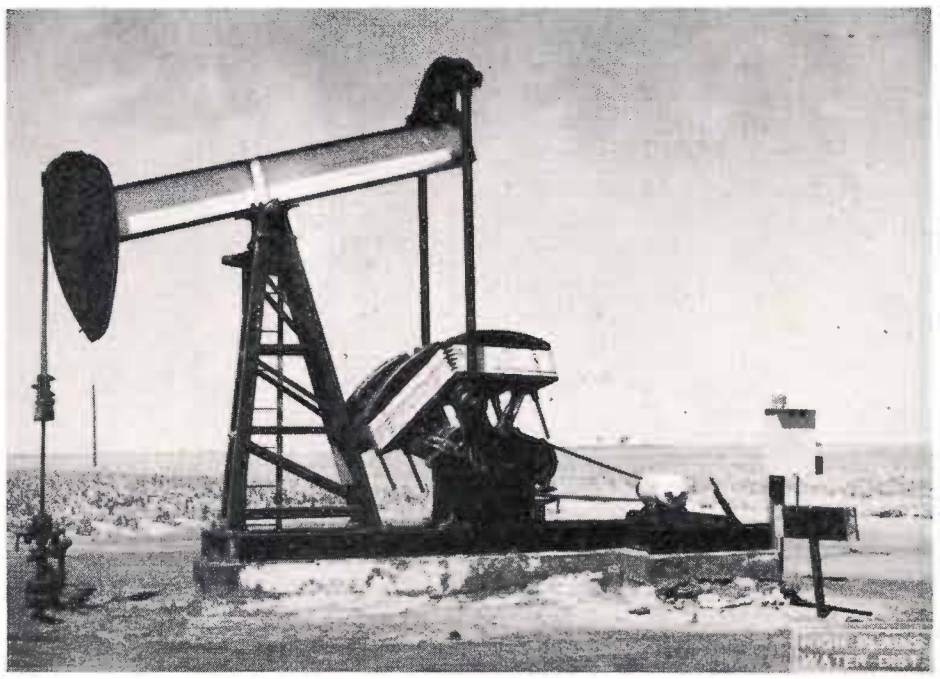
Well number 6 was then drilled 600 feet southeast of well number 5, or half way between well number 4 and well number 5. When completed and tested, the well showed a capacity of 1,200 G.P.M. and showed good quality water. The well was acceptable to Mr. Valentine as a replacement for the well number 3.

General American Oil Company of Texas has completely abandoned the salt water disposal pits on this lease and is now collecting the salt water at each of the 3 batteries in 250 barrel capacity steel tanks. The salt water is piped underground from the 3 tanks to an abandoned oil well approximately 1 mile east where it is injected under 250 pounds pressure back into the oil-bearing formation from which it came.

Mr. Valentine now watches his water supply very carefully. He takes samples periodically from each well and has them chemically analyzed so there can be no doubt in his mind about the water being suitable for agrigultural uses.

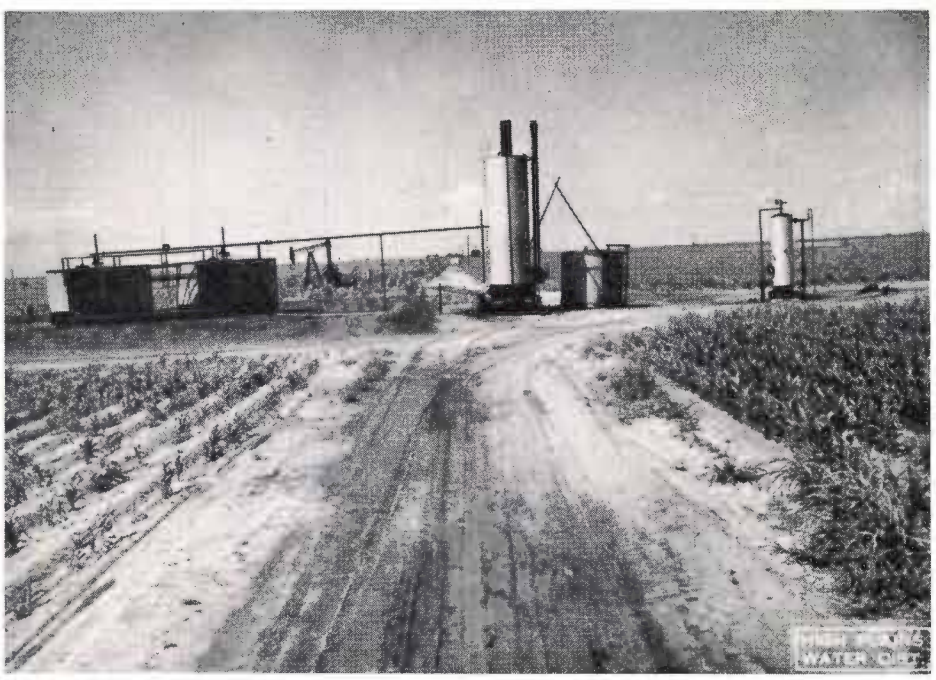
Mr. Valentine's case is only one of many in the oil producing areas of the High Plains Water District, and it points out the cooperation received from General American. Some other companies, according to our information, are making an effort to work with the landowner and to change to salt-water disposal methods which will eliminate further pollution of the fresh underground water. Several other oil producers, however, have made no effort to change from the surface pit method of disposing of oil-field brine.

Farmer's Underground Water Supply



Twelve oil wells are located on Mr. Valentine's land such as the one pictured above. You will note the location of the 12 wells on the farm plat. The dashed lines from each oil well represent the pipelines which transport the oil and salt water to tank batteries and separators. Almost every oil well in the vicinity of this farm produces at least some salt water. Many wells produce considerably more salt water than oil.

Pictured above is a typical surface salt-water disposal pit. Pits similar to this one were formally used on the Valentine farm to dispose of salt water which was produced together with oil. General American Oil Company of Texas has abandoned its surface pits in favor of a much more satisfactory salt-water disposal method. This method is one where the salt water is injected, under pressure, back into the formation from which it came. It is believed, and has been proved in at least one legal case, that salt water from these surface pits percolates through the soil and underground sediments until it reaches the fresh water. After a while the concentration of salt is such that the water supply in the aquifer is polluted and unfit for agricultural uses.

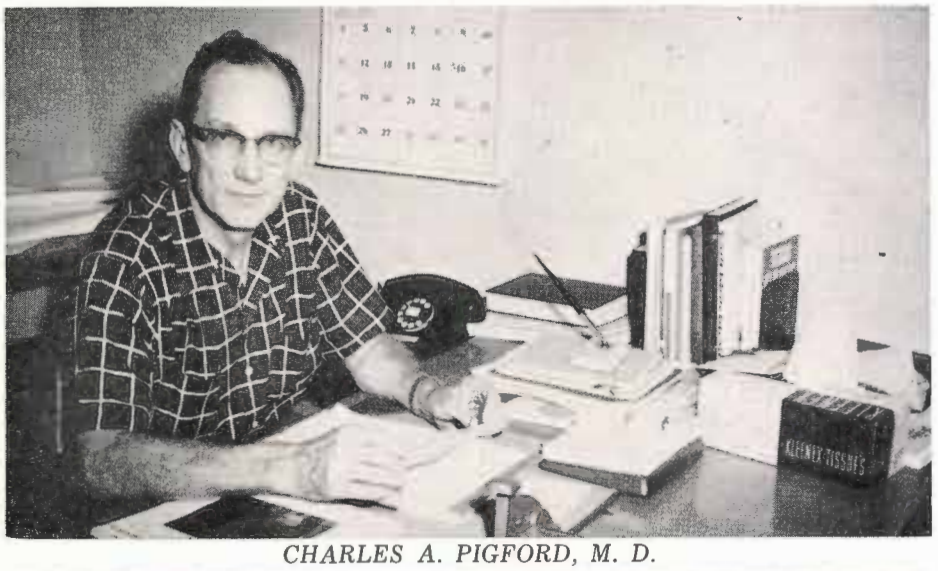


Pictured above is one of three tank batteries and separators on the Valentine farm. Oil and salt water are pumped from the oil wells into these areas where the salt-water is separated from the oil. The oil is then stored in steel tanks where it awaits being transported to a refinery. The separated salt-water is now pumped through an abandoned oil well, under high pressure, into the oil producing formation from which it came. Before the injection well disposal method was employed on this lease, the salt water was pumped into surface disposal pits.

Above is pictured a group inspecting a salt water injection well. Left to right, they are: Robert Littleton, Head of the Ground-Water Division of the State Board of Water Engineers; Y. F. Snodgrass, Water District Field Representative; Judge Otha Dent, Member of the State Board of Water Engineers; Homer Thompson, Cochran County Agricultural Agent; Dan Valentine, Whiteface farmer; and Tom McFarland, Water District Manager. This injection well has replaced the surface salt-water disposal pits which General American Oil Company formally operated on Mr. Valentine's farm. The purpose of the injection well is to serve as a means for pumping salt water produced with oil back into the formation from which it came.

IRRIGATION WASTE WATER - PUBLIC ENEMY NO. 1

Through the past years, we have stressed the importance of conserving irrigation waste water, commonly referred to as "tail-water." We have presented information about the increased costs to the irrigator when he produces more water than is needed by the crop being watered. We have tried to present facts concerning our underground reservoir—how the water is being mined in a manner quite similar to a gold or coal mining operation, and how, consequently, we need to make wise use of every gallon of water pumped so that the economy of the South Plains will be prolonged and future generations left a portion of the bounty which we enjoy.



CHARLES A. PIGFORD, M. D.

If none of the reasons for conservation or economics of water impress you, then perhaps you will at least be interested to know that your "tail-water" may one day be directly responsible for serious illness or death in your own family.

We have been concerned over the increase in the South Plains of the disease encephalitis (sleeping sickness) for some time now and as a result of this concern have interviewed a medical authority concerning a possible relationship between encephalitis and irrigation.

Dr. Charles A. Pigford, Director of the Lubbock City-County Health Unit, has spent considerable time studying this relationship and was most kind to give us the latest information available on the subject.

According to Dr. Pigford, the primary manner in which a person contracts the disease encephalitis is by being bitten by an infected mosquito of the Culex Tarsalis variety. Furthermore, the Culex Tarsalis mosquito is the most prevalent variety which is found in our South Plains area—about 44 - 65 percent of all the mosquitoes are of this variety.

The favorite breeding grounds of the mosquito in our country, according to Dr. Pigford, are the many playa lakes. It fact, 75 percent of all our mosquitoes incubate in these playa lakes. Other breeding places are surface pools, irrigation, road ditches and stream margins. From 6 - 17 percent of all mosquitoes are produced in ditches along roads.

Tests have shown, states Dr. Pigford, that waste irrigation water accounts for 45 - 87 percent of the total mosquito production in the Southern High Plains. Practically all of the remaining production is caused by surface runoff from local rains.

How can we aid in the battle against the mosquito and ultimately against encephalitis?

Dr. Pigford suggests that each person who might be guilty of contributing "tail-water" to a road-ditch or playa lake discontinue the practice immediately. This is the only means of being assured that the mosquito will not reproduce. If the playa lakes fill with runoff water from local rains the best mosquito remedy is to get rid of the lake water as rapidly as practical, in less than 10 days if possible. Mosquitoes need about 10 days in which to reproduce. The lake water might be removed from the surface by means of a recharge well, through which the water could be drained into the underground reservoir. This would make the water available for beneficial purposes at a later date and would also eliminate a breeding place for the mosquito.

Dr. Pigford states that where mosquito production cannot be eliminated by water conservation measures then a certain degree of control may be maintained by chemicals; however, this is a very poor second choice. It should be pointed out that any cotton insecticide will keep mosquitoes under control if applied regularly to the surface of ponds or lakes and in marshy areas. No special formula is needed—merely use any cotton insecticide in the same manner you would normally apply it to a crop.

Dr. Pigford advises that 262 cases of encephalitis were reported on the South Plains in 1956 and that most of these cases occurred in heavily irrigated counties.

There is not even one man who irrigates in this area who would take a gun and intentionally kill himself or another person, and by the same token there should not be even one farmer who would intentionally allow his irrigation water to escape into a lake or depression and thereby make available a breeding place for a mosquito as deady as a gun-weilding killer—the encephalitis virus carrying Culex Tarsalis.

The Cross Section

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

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ALLAN WHITE
Editor

EDITOR
THE CROSS SECTION
1628-B 15th Street
Lubbock, Texas

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THE Cross SECTION

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

Volume 4—No. 4 "THERE IS NO SUBSTITUTE FOR WATER" *September 1957*

Board Acts In Effort To Combat Further Pollution Of Fresh Underground Water

The Board of Directors of the High Plains Underground Water Conservation District No. 1 has recently published an amendment to Rule 2 of the District's Rules.

Rule 2 deals with "waste," and the new sections were added to this rule primarily to combat further pollution of our fresh underground water by oil-field brines.

The amendment will add the two new sections as follows:

(c) No person shall pollute or harmfully alter the character of the underground water reservoir of the District by means of salt water or other deleterious matter admitted from some other stratum or strata or from the surface of the ground;

(d) No person shall commit waste as that term is defined by Section (h), Rule 1 of the Rules of the High Plains Underground Water Conservation District No. 1.

The amendment became effective on September 6, 1957.

Section (h) Rule 1 of the District's Rules, noted in the section (d) above, reads as follows:

(h) The word "waste" as used herein shall have the same meaning as defined by the 51st and 53rd Legislature, as follows:

(1) The withdrawal of underground water from an underground water reservoir at such rate and in such amount so as to cause the intrusion therein of water not suitable for agricultural, gardening, domestic, or stock raising purposes;

(2) The flowing or producing of wells from an underground water reservoir when the water produced therefrom is not used for a beneficial purpose;

(3) The escape of underground water from one underground water reservoir to any other reservoir not containing underground water, as defined in said Section 3c of Article 7880;

(4) The pollution or harmful alteration of the character of the underground water within the underground water reservoir of the District by means of salt water or other deleterious matter admitted from some other stratum or strata or from the surface of the ground; and

(5) Willfully causing, suffering, or permitting underground water produced for irrigation or agricultural purposes to escape into any river, creek, reservoir, drain, or into any sewer, street, highway, road, road ditch, or upon the land of any other person than the owner of such well, or upon public land.

The District is now in the process of advising all oil producers, within its bounds of jurisdiction, of the addition to the Rules and offering all assistance possible in the abandonment of the surface salt-water disposal pits that are still being used.

District Manager To Serve On Committee

Tom McFarland, High Plains Water District Manager, has been appointed to serve on Governor Daniel's 150-man Water Planning Committee.

The Committee held its initial meeting on September 9, in the Senate Chamber at Austin.

The 150-man Committee is composed of a cross-sectional group of people who have been active in working for water conservation. They will attempt to formulate a Statewide water resources development program.

T.W.C.A. Convention To Be In San Antonio

The Thirteenth Annual Convention of the Texas Water Conservation Association will be held at the Gunter Hotel in San Antonio on October 6, 7 and 8.

Among a list of impressive convention speakers will be Governor Price Daniel and Senator Lyndon B. Johnson.

Registration will begin Sunday October 6.

Texans To Decide Fate Of $200 Million Water Development Program November 5

On November 5 the people of Texas will go to the polls and vote on an amendment to the Constitution of Texas. The amendment will add a provision for the issuance and sale of State bonds to create a fund to be known as the Texas Water Development Fund.

The Fund will provide financial assistance to certain political subdivisions for the conservation and development of water resources of the State.

The amendment will also provide for the creation of an agency to administer the Fund and to perform certain other duties. This agency shall be known as the Texas Water Development Board.

The Board will have the authority to issue State bonds in the amount of $100 million dollars (the amendment further provides for an additional $100 million bond issue, if needed. This must be authorized by a two-thirds vote of the Legislature).

The moneys received from the sale of these bonds will be deposited in the Development Fund.

The Development Fund will be used only for the purpose of providing financial aid to river authorities, conservation and reclamation districts, interstate compact commissions and municipalities in the conservation and development of the State's water resources.

Conservation and development is defined in the amendment to include the control, storing and preservation of storm and flood waters, projects involving the waters of rivers and streams, improvements, extensions, construction of dams, reservoirs and other water storage projects, and facilities for transporting water in storage to wholesale purchasers.

Financial assistance to political subdivisions of the State must be repaid to the Fund with interest.

The Legislature may invest surplus moneys available in the Fund. The Legislature may also make appropriations from the General Revenue Fund for paying administrative expenses of the Board.

No new taxes will be needed to finance this program. Moneys received by the Board as repayment of principal and interest on conservation and development loans shall be used to repay the principal and interest on the State bonds.

Representative Leroy Saul of Kress introduced a similar bill to the last Legislature through the Texas Water Resources Committee.

Most West Texans have been against any surface water bill which is financed with an ad valorem tax; however, since no new taxes are needed to finance this proposed amendment and knowing that Texas needs a comprehensive water resources development program for further expansion there is no apparent reason why West Texas can not support this amendment.

Injunction Stops Waste Of Irrigation Water

Judge Robert Bean's 140th District Court issued a temporary court injunction on August 31 against Eldon L. Jones, a Lubbock County irrigator. The injunction was issued to prevent further waste of irrigation "tail-water" from the farm which Mr. Jones operates.

The High Plains Underground Water Conservation District filed suit for the injunction on August 23.

Water District Officials In Washington Meeting

Tom McFarland, Water District Manager, W. L. Broadhurst, District Hydrologist, and Joe Greenhill, Attorney of Austin have recently left Texas for Washington, D. C. where they are scheduled to meet with the Commissioner of Internal Revenue.

The meeting will renew concerted efforts that were begun three years ago when the High Plains Water Dis-

(Continued on Page 4)

STATISTICS FOR AUGUST

During the month of August, 89 new wells were drilled and registered with the District office; 19 replacement wells were drilled; and 3 wells were drilled that were either dry, or non-productive for other reasons. 84 permits were issued by the county committees. The new permits issued and completed wells follow by counties:

County	*Permits Issued*	*New Wells Drilled*	*Replacement Wells*	*Old Wells Deepened*	*Dry Holes Drilled*
Armstrong	1	0	0	0	0
Bailey	9	11	4	0	2
Castro	11	7	0	0	0
Cochran	4	2	0	0	0
Deaf Smith	15	16	2	0	0
Floyd	8	8	1	0	0
Hockley	5	10	1	0	1
Lamb	5	16	8	0	0
Lubbock	8	6	1	0	0
Lynn	1	4	0	0	0
Parmer	11	7	2	0	0
Potter	2	0	0	0	0
Randall	4	2	0	0	0

Children's Home Of Lubbock Experien

The Children's Home of Lubbock, located 4 miles northeast of downtown Lubbock, has lost one irrigation well from salt-water pollution, and is likely to have more wide-spread pollution occur if the oil producers operating in the immediate area do not begin disposing of their brines some way other than through the use of surface salt-water disposal pits.

As was pointed out in an article printed in the August 1957 issue of "The Cross Section," the common practice of disposing of salt water which has been separated from oil, has been to transport it to earthern pits and there, according to common belief the sun and wind evaporated the water and left the salt deposited on the surface. In actual practice however, much of the salty water does not evaporate, but rather it percolates through the soil and sediments to the underlying fresh water. The salt does not filter out of the water as it percolates through the formations.

The Children's Home was given all of the southeast quarter and parts of both the northeast and southwest quarters of Section 25, Block A in Lubbock County by Mrs. Ida S. Collins. Mr. and Mrs. G. W. Williams also contributed the northeast quarter of the adjoining Section 4. A plat showing the combined 360-acre farm layout is shown at the right.

Mr. John B. White, Superintendent of the Children's Home is of course very disturbed about this pollution problem as is his Board of Directors, since it is almost certain to have a bearing on plans for future development. The Home now consists of 4 cottages and each accommodates 18 children and 2 "parents." Also, there are quarters for the superintendent and his family. Future development plans now call for the eventual construction of 16 additional cottages. With a demand for additional domestic water by the projected number of cottages will also come an increased demand for water for landscaping and livestock uses.

In 1941 the first of seven oil wells on what is now the Children's Home property, was drilled by Tobe Foster, an independent oil producer. He later drilled the other oil wells on this land with the exception of the two on the extreme north. They were drilled in 1956 and 1957 by Leland Fikes, another independent producer. Each of these wells produce some brine along with the valuable oil. The brine is now being disposed of in surface salt-water disposal pits as has been the practice in the past. The farm plat shows the locations of the disposal pits.

During 1942, the irrigation well number 1 was drilled. The well would at the time supply a good 8-inch stream of water. There is now a 6-inch pump installed in the well.

In 1952, and 1953, irrigation wells number 2 and 3 were drilled respectively. Both were 6-inch wells and produced water of good quality.

In November 1953, the Children's Home began construction on its first cottage and drilled a domestic water well in the construction area. The water from this well was fresh.

Irrigation wells number 4, 5 and 6 were drilled in 1953, 1954, and 1955, respectively. At that time all three wells produced fresh water. The south quarter also has a domestic water well which is located south of irrigation well number 5.

In the year 1956, the farm operator complained that the crop which was being irrigated with water from well number 2 was responding poorly and unlike crops being watered from the other wells. No action was taken at that time; however, in July 1957 a 50-acre grain sorghum crop which was irrigated with water pumped from irrigation well number 2 was visibly damaged and suffering from yet undiscovered causes. A sample of the water from irrigation well number 2 was analyzed and found to contain 5500 parts per million chloride. The decision was then made to permanently abandon the well.

In February 1957, the domestic well on the south quarter was thought to be polluted. A sample from the well was analyzed and found to contain 2923 parts per million total solids. The well was abandoned for human consumption purposes even though it is still used to water livestock which belongs to the Children's Home. The live-

John B. White, Superintendent

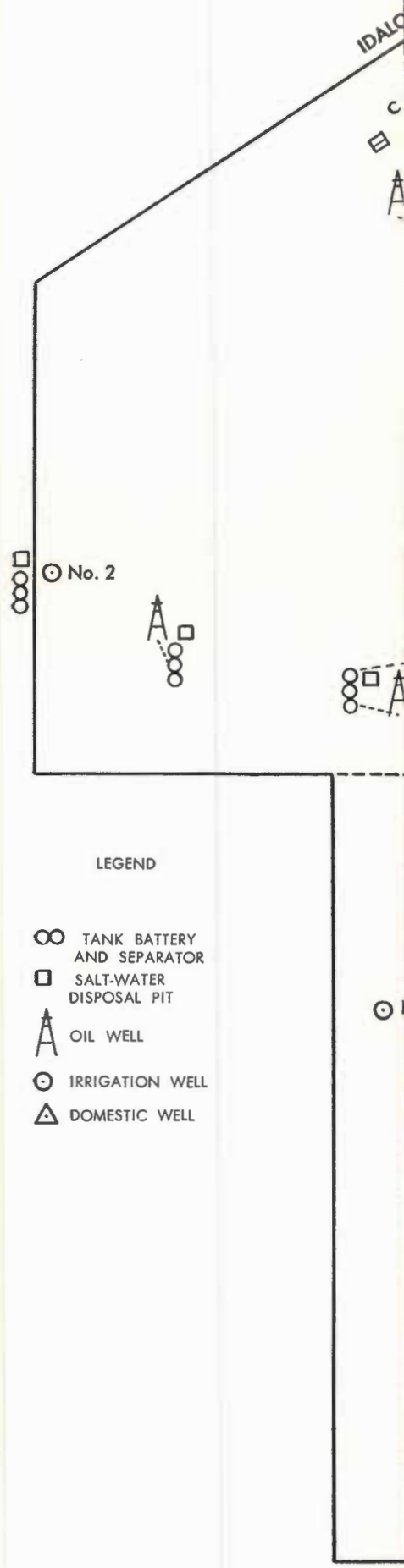
stock were donated to the Home and are used in their educational program.

A Negro family who lives on the south quarter and used the domestic well is now transporting water from a neighboring farm to supply household needs.

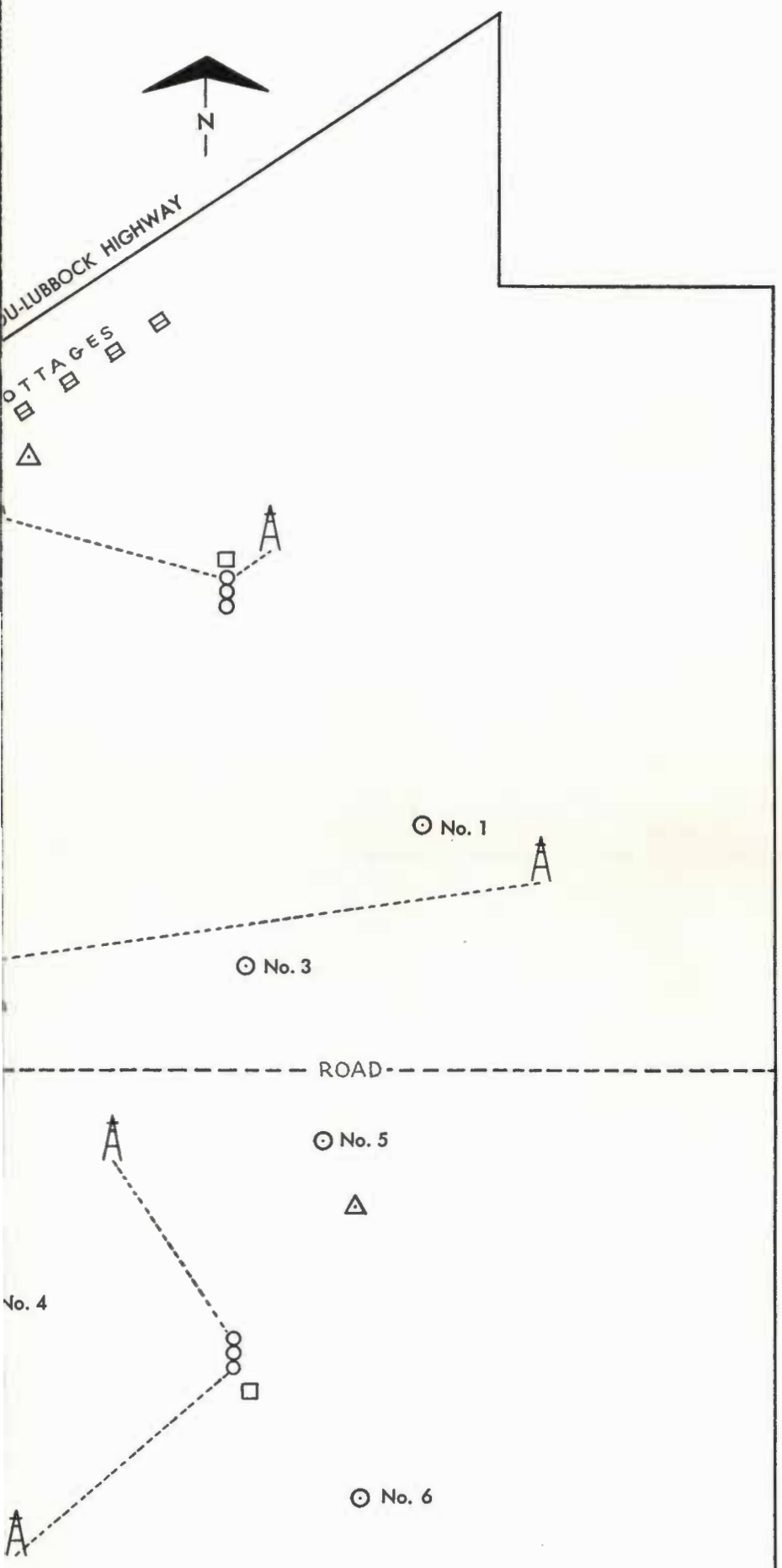
Of primary concern to the Children's Home is naturally the quality of water pumped for use in and about the cottages. On August 10, 1957 a water sample from the domestic well near the cottages showed 108 parts per million chloride.

This story points to another case where oil-field brines are responsible for the pollution of an area's underground water supply and where further pollution is being encouraged by the continued use and operation of surface salt-water disposal pits.

Pictured above is a portion of a 50-acre grain sorghum crop which was irrigated with water from the Children's Home Irrigation Well No. 2. The water was polluted with oil-field brines. In the foreground is shown grain sorghum which is irrigated from a well not polluted. The comparison shows the damage salt can do.



cing Pollution From Oil-Field Brines



Parts of the Southeast, Northeast and Southwest Quarters of Section 25, and the Northeast Quarter of Section 4, Block A.

LUBBOCK COUNTY, TEXAS

360 Acres owned by the Children's Home of Lubbock, Lubbock County, Texas.

Pictured above is a surface salt-water disposal pit which is being used to dispose of oil-field brines on property owned by the Children's Home of Lubbock. This is a relatively new pit but in time the salt water which is put into it will probably percolate to the fresh underlying water. If this occurs, after awhile the concentration of salt will be such that the aquifer will become polluted.

Picture above, in the foreground, is Irrigation Well No. 2, which is located on the illustrated farm plat. In the background can be seen a surface salt-water disposal pit which is on the property that adjoins the west line of the Children's Home. The irrigation well was abandoned in July 1957 because of salt-water pollution.

Pictured above is another surface salt-water disposal pit being used on the Children's Home farm. By using two pits side by side, the theory is that oil on the surface of one pit which is higher in elevation than the other will drain into the lower pit leaving only salt water in the upper pit. This plan supposedly facilitates evaporation by draining off the oil slick which is usually present. It may be noted in the picture that about half the upper pit is still covered by an oil slick.

GOVERNOR APPOINTS 150-MAN WATER PLANNING COMMITTEE

Many folks are asking about the Governor's 150-man Water Planning Committee and what is to be gained by appointing such a committee.

Texas has lagged far behind most other western states in developing its surface streams. Along with the tremendous growth of Texas is coming an increased demand for a more adequate water supply by municipal, agricultural, and industrial interests.

At present the cities and towns in Texas who need an additional water supply for now and the immediate future are taking off in all directions, attempting to supply a solution to their own problem, with no thought or regard as to the river's ultimate potential development.

It appears that if this haphazard method of development continues and unless some master plan is formulated that will enable the conductance of investigations to determine the best means of developing each river basin, Texas will be unable to obtain the utmost from her surface-water resources.

Also, without a state-wide development plan, the state is not in a position to obtain its proper share of public aid in such things as river flood-control and topographic and geologic mapping. Much duplication of effort and overlapping of functions by public agencies in water conservation, control and development may be avoided by a state-wide plan.

Governor Daniel states that "every person who believes in State's rights and local self-government should realize that we have a responsibility to perform if we are going to write our own master plan for water development in Texas in cooperation with other interested agencies.

"It is time to act or abdicate. The Federal agencies stand ready to do their part if Texas will furnish the leadership, and some day they will act without us and perhaps contrary to State and local interests if we continue to delay action."

With these things in mind, the Planning Committee has formulated what stands to be the beginning of a state-wide water development plan.

On September 9 at the first called meeting of the Committee in Austin the following resolution was drafted and adopted:

1.

That the most important element necessary for proper conservation and development of Texas' water resources for the immediate future and for the long-range needs of a rapidly growing State, is the creation of a statewide planning agency to formulate a Statewide Water Plan in cooperation with local, State and Federal agencies, such plan to be responsive to changing conditions.

That we recommend to the Legislature establishment of a Planning Division in the Board of Water Engineers to be headed by a Planning Engineer, with a salary which will attract the best available person for this assignment. We further recommend an appropriation of $1,024,000 to conduct a statewide research and planning program for water resource conservation and development. These funds should provide for increased work on stream measurements, underground water investigations and mapping, water use and quality studies, and a minimum of $400,000 for the State's share of topographic mapping.

That the legislation should provide for full cooperation with, and coordination of planning activities of, all appropriate local, State, and federal agencies, and should be designed to fit the needs of each area and watershed, with local operation and control as provided by law.

2.

That provision be made in such legislation for the State to contract for water conservation storage in federal projects, to be paid for out of revenues, provided there is no River Authority or water district available to so contract and provided that such contract is found necessary by the Planning Engineer and the Board of Water Engineers to preserve and effectuate the Statewide Water Plan for water conservation and development.

3.

That this Committee should organize and conduct a statewide educational campaign on the importance of the amendment creating the Texas Water Development Fund to be voted November 5, 1957. It is suggested that the Governor appoint a campaign subcommittee to keep the members of this Committee informed and supplied with speech and publicity material and that the members of the committee speak before Chambers of Commerce, civic and service clubs, and other organizations in their counties between October 5 and November 5; and for this purpose it is suggested that the Governor appoint additional committee members for any counties not now represented.

Washington Meeting—

(Continued from Page 1)

trict started working toward an income tax deduction for the depletion of underground water in the Texas High Plains.

The District contends that the water which underlies an irrigated farm in the High Plains is at least as valuable as the farmland itself.

The underground water then has a definite monetary value. Couple this fact with the evidence that the underground water reservoir is being mined of its water by pumping, in a similar manner to an oil reservoir being mined, and a definite basis for a depletion allowance is forthcoming.

If it is assumed that land prices and farm crop prices stay about the same as they now are, then it is reasonable to also assume that a farm which is now irrigated will not be as valuable when the underground water is depleted. Also, the same farm will not produce the income that it now does.

The above facts being true should be sufficient evidence for including the High Plains' underground water in the category with other depletable natural resources of our nation.

The Internal Revenue people have indicated that their own investigations substantiate every contention that the Water District makes. The lack of a workable formula for the individual to use in taking a depletion allowance and other minor administrative problems are reasons given for not allowing the deduction at the present time.

The tax deduction would not be unfair to others as a special favor to only the High Plains residents, but would apply to all areas where the High Plains circumstances are duplicated. No one wants special treatment or a ruling that is not deserved, but if our area does have a legitimate claim to an income tax deduction for the depletion of water resources which it can not now legally claim, then certainly we are in order to ask for our just deserts.

It is the belief of the District's Board of Directors that through continued efforts it will be possible to work out a favorable ruling by the Internal Revenue Commission.

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-B 15th Street, Lubbock, Texas.

Telephone PO2-8088

Entered as second-class matter June 22, 1954, at the Post Office at Lubbock, Texas under Act of August 24, 1912, as amended by the Act of August 4, 1947.

ALLAN WHITE
Editor

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

Second Class Permit

THE Cross SECTION

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

Volume 4—No. 5 "THERE IS NO SUBSTITUTE FOR WATER" *October 1957*

District Mgr. Elected TWCA Vice-Pres.

Resolution Lauds Pollution Efforts

The thirteenth annual meeting of the Texas Water Conservation Association was held in San Antonio on October 6, 7 and 8.

The convention delegates, representing all areas of the State, elected Max Starcke, Austin, as President for the coming year. Tom McFarland, Manager of the High Plains Water District, was elected First Vice-President, and J. E. Sturrock, Austin, was re-elected Secretary-Treasurer and General Manager.

The TWCA is an organization composed of members representing every interest and section of the State. The purpose of the organization is to develop a united group, wherein the water problems of the State can be discussed and recommendations developed that will promote the sound and orderly development of the resources of Texas.

One of the resolutions passed during this convention was Resolution No. 4A which reads as follows:

WHEREAS, it has now been proven that pollution of underground water strata has resulted from disposal of salt water in earthen surface salt water disposal pits; and WHEREAS, the Texas Water Conservation Association foresaw this danger and helped prepare and pass in 1949 a statute which makes possible prohibition of this menace within boundaries of underground water conservation districts; and

WHEAREAS, under this statute the High Plains Underground Water Conservation District No. 1 has been established and is now aggressively combatting underground water pollution by such means;

NOW, THEREFORE, BE IT RESOLVED:

1. That High Plains Underground Water Conservation District No. 1 be commended for its fight against underground water pollution.

2. That areas overlying other underground water reservoirs facing such pollution be urged to act to protect such endangered underground waters; and

3. That attention be given the desirability of encouraging the enactment of statewide laws prohibiting pollution of underground water by salt water or other deleterious matter whether from the surface of the earth or from other stratum or strata.

4. That legislation be adopted which will prohibit disposal of brines in surface pits and requiring disposal of said brine into an appropriate underground strata which will not pollute either surface or underground fresh water.

The Association also endorsed the passage of the constitutional amendment for $200 million in State water bonds to be voted on November 5.

The highlight of the convention was an address by Governor Price Daniel in which he urged support for his legislation to create a "planning division" within the State Board of Water Engineers. He called attention to the tremendous responsibility which the Legislature in special session will have before it in providing a realistic Statewide water planning program for the future growth and progress of Texas. The Governor further stated that Texas must set up and finance a planning agency which will study and plan, in cooperation with local, State and Federal agencies, for the present and future water needs of our people.

Other convention speakers were: General L. E. Seeman, Division Engineer with the Corps of Army Engineers; W. A. Dexheimer, Commissioner of the Bureau of Reclamation, R. M. Dixon, Chairman of the State Board of Water Engineers; Senator Carlos Ashley; Representative Waggoner Carr; Paul Walser, Deputy State Conservationist with the Soil Conservation Service; Trigg Twitchell, District Engineer with the U. S. Geological Survey; Byron Tinsley, General Counsel for the Sabine River Authority; and Guy C. Jackson, Jr., President of the National Reclamation Association.

Newly-elected officers of the Texas Water Conservation Association are pictured above. They are, left to right; President Max Starcke of Austin; Vice-President Tom McFarland of Lubbock; and J. E. Sturrock of Austin, re-elected Secretary-Treasurer and General Manager.

$200 Million Constitutional Amendment To Be Voted On Tuesday, Nov. 5

A Constitutional Amendment, which will appear as "Proposition No. 3" on your ballot, will, if passed on November 5, create the Texas Water Development Board and authorize the issuance of $200 million in State bonds for water development.

The Board, if created, will have authority to make interest-bearing loans to cities, towns, water districts and other political subdivisions, to build dams, pipelines and other water conservation facilities.

Loans by the Board may not be made until the project plans are certified as feasible by the State Board of Water Engineers, and may not exceed $5 million or one-third the complete cost of the project involved, whichever is less.

Repayments to the State on loans made, will be used to retire outstanding State bonds and administer the program.

Members to the Development Board will be appointed by the Governor and approved by the Senate. The six-man Board will consist of a lawyer, an engineer, a farmer or rancher, a businessman and two from the field of public or private finance.

The constitutional amendment is a self-supporting, self-liquidating proposal and will not increase taxes. The proposal was passed at the last regular session of the Legislature; in the House of Representatives by a vote of 127-8 and in the Senate by 30-0.

Please use the privilege you have as a free-born American—Cast your vote on November 5 as you see fit.

New District Formed In Hudspeth County

A new underground water conservation district has been created by the people living in the Dell City area of Hudspeth County.

The area involved lies between Pecos and El Paso and is wholely within Hudspeth County.

We extend our congratulations to the people of that area and offer to them our assistance in every way possible.

Irrigation Conference In Lubbock, Nov. 14-15

An irrigation conference of interest to farmers, agricultural leaders and the irrigation equipment industry has been scheduled November 14-15 at the Lubbock Hotel in Lubbock.

This Conference is being sponsored by the newly-formed Texas Inter-Industry Irrigation Council and irrigation specialists from throughout the Nation will be on the program.

Jack Z. Anderson, Administrative Assistant to President Eisenhower, will highlight the Conference. He will talk on "IRRIGATION FARMING—

(Continued on Page 2)

Legislature Considers Governor's Water Bill

The Governor's Statewide Water Planning Bill which is now being considered by the special session of the Legislature, is a bill which can actually be divided into two major categories. (1) It provides for a planning division within the Board of Water Engineers, and (2) it provides for the purchase of water storage facilities behind federally-constructed dams.

The "Planning Division" would be headed by a $17,500 per year engineer and would be a part of the State Board of Water Engineers. It would be authorized to:

(1) Prepare a statewide water plan for the development and use of the States water resources.

(2) To collect and correlate basic data.

(3) To study present and future

(Continued on Page 2)

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ALLAN WHITE
Editor

DRILLERS ELECT HIGH PLAINS MAN

H. D. WHITE

H. D. White, Lubbock well driller, was elected President of the Texas Water Well Drilling Contractors Association at their 10th annual convention. The convention was held in Lubbock on July 26 and 27.

R. M. Armstrong of Lubbock was elected Secretary-Treasurer for the coming year, and William Frank Love of Rockdale was elected Vice-President. Mr. Love died on August 29 and as yet his replacement has not been named by the Association.

The TWWDCA was organized for the purpose of fostering more understanding and cooperation between drillers and as an effort to develop better drilling standards.

The State is divided into five Chapters and each conduct area meetings periodically. The South Plains Chapter meets on the third Monday of each month. M. L. (Heavy) Morgan of Levelland is Chairman of the Chapter.

President H. D. White was born in 1910 and has been drilling wells in the region for the past 30 years. His wife's name is Loveta and they have three children. Willie Ruth, the oldest, is 18 and is a freshman at Texas Tech College. She is majoring in Home Economics. Donald, who is 16, is a student at Tom S. Lubbock High School. Mike, the 2 year old baby, is of course the boss of the entire family.

Mr. White is also a member of the Lubbock Optimist Club, and the family attends the First Methodist Church.

We congratulate Mr. White on his election as leader of the Texas Water Well Drilling Contractors Association for the coming year and Texas drillers for their efforts to further improve the standards of their profession.

Irrigation Conference—

(Continued from Page 1)

A KEY TO BETTER LIVING."

Tom McFarland, Manager of the High Plains Water District; Dr. E. N. Jones, President of Texas Tech; Dr. W. N. Williamson, Assistant Director, Texas Agricultural Extension Service, College Station; and C. I. Wall, President of Pioneer Natural Gas Co., Amarillo, will preside over the Conference sessions.

Other noted authorities on Irrigation included on the program will be Guy Woodward, Educational Director of the Sprinkler Irrigation Association, Salt Lake City, Utah; Dr. Ivan D. Wood, Irrigation Consultant, Denver, Colo.; Dr. Moyle Williams, Chief Agricultural Economist, National Plant Food Institute, Washington, D. C.; E. V. Dignan, Vice President of the U. S. National Bank in Denver, Colo.; Dr. T. R. Timm, Head of Department of Agricultural Economics and Sociology, Texas A&M College; Dr. Robert Hagan, Chairman, Department of Irrigation, University of California; Dr. Marlowe Thorne, Head of Agronomy Dept., Oklahoma State University, Stillwater, Okla.; J. W. Pruitt, Irrigation farmer, Iverness, Miss.; and other officials from leading irrigation equipment companies.

Although planned and sponsored by a Texas Organization, the meeting will be of national importance to the irrigation industry.

Governor's Bill—

(Continued from Page 1)

water needs; rainfall runoff, stream flows, silt loads, ground water supplies, inter-relation of surface and ground waters, and other related factors necessary for water resources planning.

(4) To enter into contracts with others for topographic (land elevations) and geologic mapping.

(5) To establish policies and procedures for cooperation between public agencies and water users. (The bill does not give the "Planning Division" authority to interfere with internal affairs of the public agencies or the water users.

(6) To make recommendations for avoiding duplication of efforts by public agencies.

(7) To make recommendations to the Governor and the Legislature concerning adequacy of existing laws relating to statewide development of water resources. This includes recommendations for amendments to existing laws if needed.

The "Planning Division" would be financed by transferring already appropriated moneys to a special fund for their use.

The second phase of this proposed bill has to do with the purchase of conservation storage space in reservoirs heretofore or hereafter created by construction of federally-built dams.

If no political subdivision in the watershed involved is willing or is capable of buying water storage space from the United States Government, then the Board of Water Engineers may contract with the public agency for the conservation storage space. The purchase price would be paid for in installments with revenues from the ownership of the storage space acquired, or from Board or Legislative appropriations.

The thought behind this section of the bill, is this—in areas where the need for water is not yet great enough for a local political entity to pay the price necessary to acquire additional water for future expansion, the State will buy the storage space when available and resell it when local political subdivisions can afford the expenditure.

One important feature in this respect, is that the bill specifically states that in no case may the Board of Water Engineers obtain or retain conservation storage if a political subdivision stands ready to also acquire the storage space. In other words, the Board may not compete with a local political entity.

The bill has to do with unappropriated flood waters only and points out that nothing in the act shall affect vested rights in underground water, riparian rights, or appropriative rights.

RAINFALL RUNOFF SALVAGED BY TEXAS TECH COLLEGE

Texas Technological College at Lubbock in cooperation with the Soil Conservation Service, has constructed a large diversion ditch for the purpose of diverting runoff water from the road ditches into a large playa lake on the Tech farm. The diversion ditch was constructed on the W 1/2 of Section 2, Block E-2, Lubbock County; or in reference to Lubbock streets, at the intersection of Erskine Road and Quaker Avenue.

William Schweisow, Assistant Professor in Tech's Agricultural Engineering Department, is in charge of the project.

The diversion of runoff water into the lake will play a dual role—one, in conserving water for irrigation and use in artificial recharge of the underground water-bearing formations, and two, in helping to correct a flooding situation in a nearby residential area of Lubbock.

The ditch will divert runoff water from approximately 1,000 acres of neighboring land extending about two miles west. The 1,000-acre runoff area has been a big contributor to flooding of a residential area to the east, including the George C. Wolffarth School. Eventually, this runoff water meanders to the Yellowhouse Creek which cuts through the City of Lubbock.

Rather than permit the flood water to flow through the residential area, damaging property and on into the creek, the runoff water will now be diverted to the playa lake on the Tech land, where it will be available for beneficial uses. The diversion-irrigation spreading system and lake have a capacity of 65 to 80 million gallons.

The diverted water will be used in artificially recharging the underlying sands and gravels, and also will be used for irrigation immediately from the lake. Many farmers irrigated their land from lakes this past summer without pumping any water from underground storage.

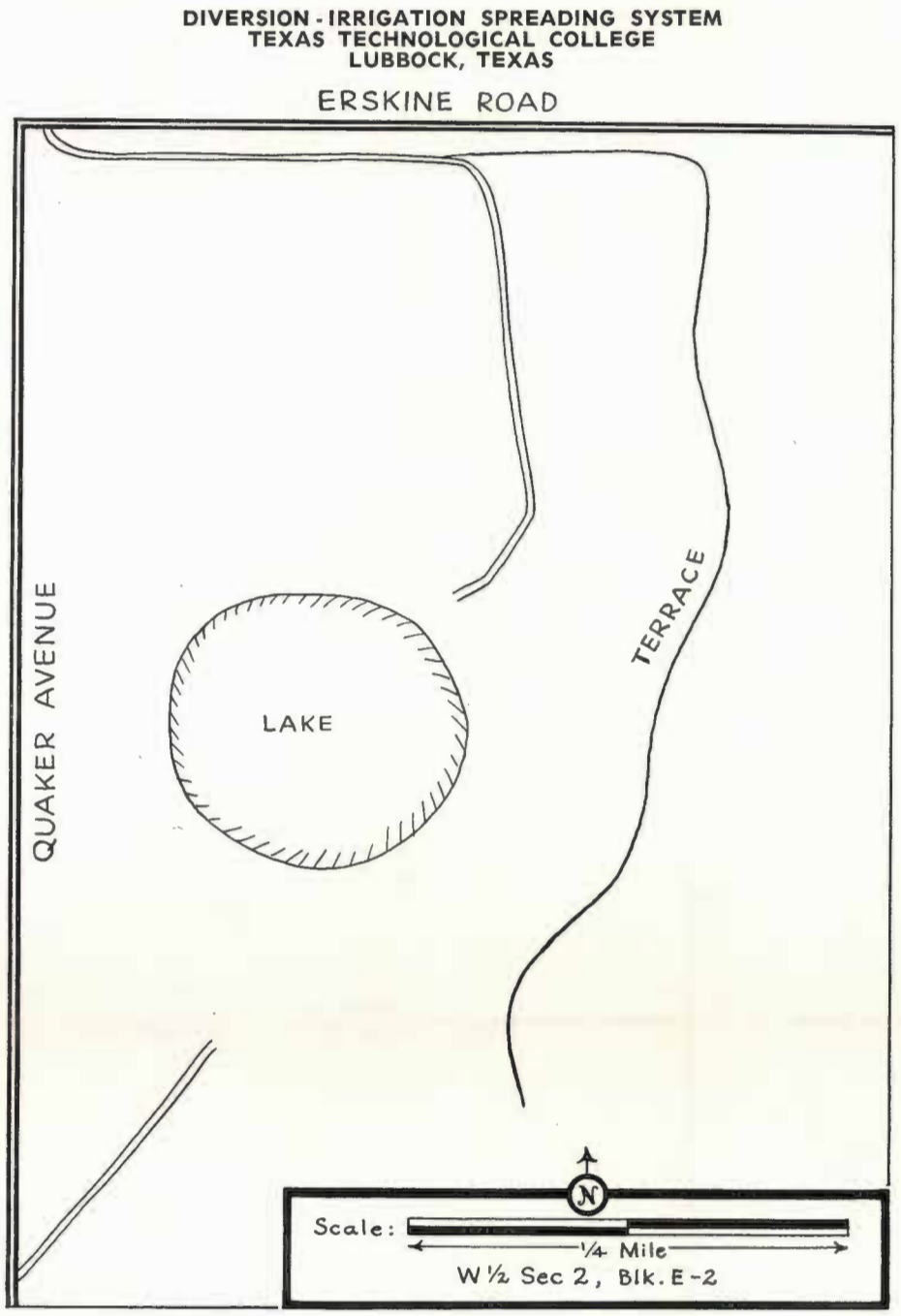
WILLIAM SCHWEISOW

Runoff from small rains will be contained entirely within the lake; however when consequential rains come and runoff is heavy, the lake will overflow to the east. The overflow water will be controlled and distributed over 110 acres of grassland by a meandering terrace east of the lake. The accompanying farm plat shows the terrace and ditch.

The system has been designed to take care of a rain which would have a 3-inch runoff, or 240 acre-feet.

A much smaller diversion ditch has been cut in toward the lake on the west side of the tract to take care of a portion of the runoff water. The runoff water diverted at this point spreads out over grassland before it actually reaches the lake.

Many High Plains farmers will give much thought to such diversion projects as they come to the realization that to continue allowing rainfall runoff to go to waste, while the underground supply of water continues to dwindle, is pure folly.



Pictured at left is shown the inlet to the main diversion ditch. The picture was made looking east down Erskine Road from the intersection of Erskine and Quaker. You will note the dam in each bar-ditch to divert water onto the farm from the road.

Pictured above is a portion of the terrace east of a lake on the Tech Farms. When the lake overflows, the terrace will aid in spreading the water over 110 acres of grassland.

Above is pictured a smaller diversion ditch which is cut in toward the lake from the west side of the farm. The water diverted at this point spreads over grassland before reaching the lake.

DEEP WELL YIELDS SALTY WATER

By W. L. BROADHURST

To further explore the possibilities of a "new" water sand reported to exist in the Triassic redbeds, an 800-foot test well was completed August 31, 1957, which revealed that (1) the static water level stood 290 feet below the land surface; (2) with a pumping level of 480 feet, the well produced only 75 gallons of water a minute; and (3) the water was too salty for irrigation.

Earlier attempts to make such evaluations through testing an abandoned oil well on the H. A. Krause farm 5 miles east and 1 mile north of Petersburg did not produce conclusive results to many land owners of the area because a large quantity of salt was used in the drilling mud.

The recently completed test well is located in the northeast corner of the NW 1/4, Section 30, Block K, Floyd County, half a mile east of the Allmon Gin and 5 1/2 miles east of Petersburg, Texas, on the Marvin Shurbet farm.

The test was made in several stages. First a 20-inch hole was drilled to a depth of 500 feet. Thick sections of water-bearing sands in the Ogallala formation were penetrated and the redbeds were encountered at 452 feet. Then 500 feet of 15-inch solid casing was set and cemented in by Halliburton Oil Well Cementing Company in order to seal off all the water in the Ogallala formation.

The cement was allowed to set for 36 hours and the well was then deepened to 800 feet. Formation cuttings were collected at 10-foot intervals from the drilling fluid which consisted of fresh water from a nearby irrigation well.

As soon as drilling was completed, an electrical well log was made by Halliburton, copy of which is shown. The zones of relatively high resistance shown on the log are siltstones and are nonproductive; the principal sand, which is exceeding fine grained, occurs between 740 and 780 feet. The electrical log indicates mineralized water in the sandy section.

After completion of the electrical log, 10-inch slotted liner was set from 500 to 800 feet. A 6-inch deep-well turbine-type pump was set at 480 feet and the drilling mud was pumped out. After a short period of operation the pump broke suction. The well was pumped intermittently for three days and the maximum yield that could be maintained without breaking suction was 75 gallons a minute.

After the well had been pumped a total of 14 hours, a sample of water was collected. Part of the sample was sent to Texas Testing Laboratories in Dallas and part was sent to the U. S. Geological Survey Laboratory in Austin. The results of the chemical analyses are given in the table below.

This test was a community project sponsored by Pioneer Natural Gas Company, Southwestern Public Service Company, First State Bank of Petersburg, United Motors of Petersburg, Paymaster Farms, Johnny Fullingim, Charles Schuler, T. B. Haynes, J. D. Fox, C. S. Williams, Bill Chandler, Bill Lemons, Clarence Thorpe, Marvin Shurbet, and perhaps others.

Fox Brothers and Bowron of Petersburg drilled the well at cost and Green Machinery Company of Plainview set and pulled the test pump without charge. Floyd County Commissioner Precinct No. 1 did the dirt work, Jimmy Wilson of Floydada furnished the cement for the job, and Petersburg Butane furnished the fuel.

As pointed out by Marvin Shurbet, President of the High Plains Underground Water Conservation District, this test does not condemn the entire region because we know that in some areas fresh water in sufficient volume for irrigation and municipal uses is being obtained from sands in the Triassic rocks. As he said, it does, however, prove that we must make better use of the water we have, recharge the sands with the available water that is now lost by evaporation, and absolutely stop waste. These are musts if we are to prolong the economy of our country.

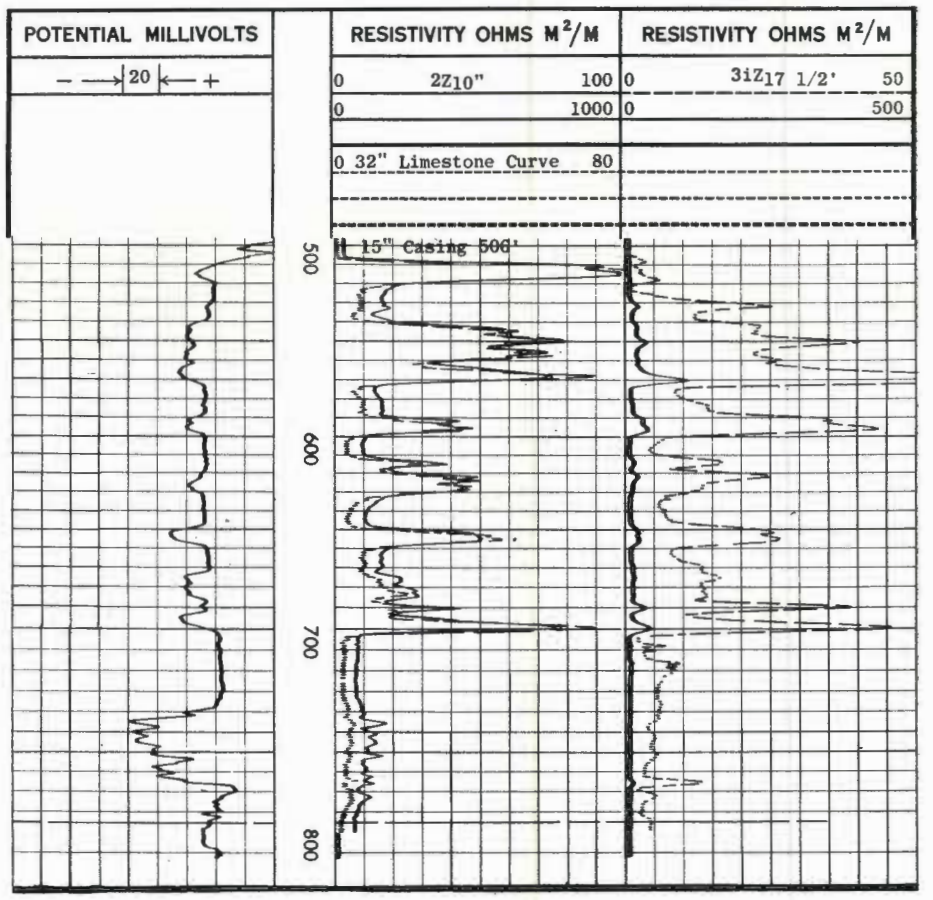
	U. S. G. S.		*Texas Testing Lab.*	
	Parts per million	*Equivalents per million*	*Parts per million*	*Grains per U. S. gallon*
Calcium (Ca)	87	4.34	106	6.15
Magnesium (Mg)	45	3.70	49	2.84
Sodium (Na)	2,170	94.40	1,655	95.99
Potassium (K)	10	.26	106	6.15
Bicarbonate (HCO_3)	419	6.87	188	10.90
Sulfate (SO_4)	463	9.64	184	10.67
Chloride (Cl)	3,020	85.16	2,755	159.80
Dissolved Solids	6,020		5,075	
Hardness as ($CaCO_3$)	402		466	
Non-carbonate	58			
Percent sodium	92		92	
pH	7.9			
Specific Conductance (Micromhos at 25 degrees C)	9,910			

MARVIN SHURBET WATER WELL

NW 1/4, Section 30, Block K, Floyd County, Texas

August 31, 1957

Mud Kind: Fresh Water Res. Ohms m²/m: 10.5 @ 75° F



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Second Class Permit

THE Cross SECTION

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

Volume 4—No. 6 "THERE IS NO SUBSTITUTE FOR WATER" *November 1957*

State Legislature In Special Session Passes Water Planning Bill

The Water Planning Bill which was passed during the first Special Session of the Legislature, creates the Texas Water Resources Planning Division within the State Board of Water Engineers. The Division will be headed by a registered engineer with a maximum salary of $10,000 per year.

The duties of the Planning Division are defined as follows:

1. To develop an inventory as to quantity, quality, and location of all surface water resources of the State.

2. To analyze topographic maps and other data appropriate for the determination of the development of available surface supplies for meeting present and foreseeable needs.

3. To prepare an inventory of information as to available underground water disclosed by geologic and hydrologic investigation of underground reservoirs.

4. To enter into contracts with federal, state and local political subdivisions and agencies including the State Soil Conservation Board and any other persons, firm or corporation for topographis mapping, joint investigation and research in the field of water and soil resource planning.

5. To enter into contracts and agreements with any public agency to carry out a joint program of topographic and geologic mapping of the water sheds of this State and to expend funds specifically appropriated to the State Board of Water Engineers for this purpose.

6. To prepare a present and continuing inventory of the available water resources of the State.

7. To make studies of probable additional beneficial use for surface, ground and underground waters.

8. To prepare and submit to the Legislature a state wide water report of the water resources of the state with a correlation and relationship of these resources and to make recommendations to the Legislature for the maximum development of the water resources of the State, and to furnish the same to all members of the Legislature and elected officers of the State without cost.

The Bill further provides that the State Board of Water Engineers has the authority to enter into agreements for the purchase of water conservation storage space in reservoirs constructed by any agency of the United States government. These agreements are not binding however, until approved by the State Legislature.

Transfer of already appropriated funds will finance the provisions of the Bill, $500,000 from the Texas Prison System and $294,400 from the Texas Commission on Higher Education.

The Bill calls for no new taxes.

American Bar Ass'n. Appoints High Plains Attorney

Arthur P. Duggan, Jr., Littlefield attorney who works with the High Plains Water District on legal problems involving underground water, has recently been appointed a member of a special advisory committee to the Water Rights Committee of the American Bar Association.

Mr. Duggan will serve on the advisory committee with 10 other attorneys and will represent Texas, Louisiana, Mississippi, Alabama, Georgia, Florida and the Canal Zone.

The committee will be concerned with the study of national water rights. It will also study legislation before the Congress that deals with water.

STATISTICS FOR SEPTEMBER AND OCTOBER

County	Permits Issued		New Wells Drilled		Replacement Wells		Old Wells Deepened		Dry Holes Drilled	
	Sept.	Oct.	Sept.	Oct.	Sept.	Oct.	Sept.	Oct.	Sept.	Oct.
Armstrong	1	0	1	0	0	0	0	0	0	0
Bailey	13	4	4	1	3	1	0	0	1	1
Castro	9	4	6	1	2	0	0	0	0	0
Cochran	5	4	0	0	0	1	0	0	0	0
Deaf Smith	11	2	5	4	2	1	0	0	0	0
Floyd	9	0	3	2	2	1	0	0	0	0
Hockley	6	3	3	3	0	0	0	0	0	0
Lamb	17	56	3	1	4	1	0	0	4	0
Lubbock	15	6	10	4	3	2	4	0	2	1
Lynn	1	1	2	0	0	0	0	0	0	0
Parmer	10	16	10	1	0	0	0	0	0	0
Potter	0	0	0	0	1	0	0	0	0	0
Randall	5	9	2	2	0	0	0	0	1	0

Inter Industry Irrigation Conference Hears Outstanding National Authorities

The Texas Inter Industry Irrigation Council held its first annual Irrigation Conference in Lubbock on November 14 and 15.

Specialists from various areas of the United States appeared on the two-day program.

Jack Z. Anderson, President Eisenhower's Administrative Assistant, was the Conference banquet speaker. His remarks pertained primarily to personal experiences in working with fruit and vegetable irrigators on problems of marketing non-supported perishable products. Mr. Anderson pointed out that in his opinion more effort should be expended by all farmers to develop means of obtaining adequate local control of farm matters and less federal control.

Pictured above are, left to right, J. R. Belt, Floyd County Water District Committeeman, Jack Z. Anderson, Presidential Administrative Assistant and Tom McFarland, Water District Manager, as they discuss a new Water District brochure during the Texas Inter Industry Irrigation Conference.

Water District Publishes Brochure

The High Plains Underground Water Conservation District has recently published a brochure entitled, "WATER—Life of the Plains." The brochure illustrates the development and use of underground water in the High Plains. It also discusses basic geologic and hydrologic fact which apply to the area.

A limited number of the brochures will be sent to anyone requesting them, without charge; however, where large numbers are desired it will probably be necessary to charge cost of reproduction.

Tom McFarland, District Manager of the High Plains Water District, served as master-of-ceremonies during the banquet and introduced Mr. Anderson.

Dr. Robert M. Hagan, Chairman, Department of Irrigation, University of California confined his talk to the relationship of plant, soil and water.

J. W. Pruitt, an irrigation farmer from Mississippi, told the Conference that he has continually increased his cotton production from 1.9 bales per acre in 1950 to 5.11 bales per acre in 1956. Mr. Pruitt stated that with a well-planned and well-managed program of irrigation, fertilizers and insect control high yields are possible.

Dr. Ivan D. Wood, Irrigation Consultant of Denver, Colorado, talked on the subject of land preparation. His discussion pointed out that in order for an irrigator to obtain the maximum from his operation it is necessary that the land be levelled for uniform water distribution and penetration. Good soil condition was also pointed out as being important.

E. J. Dignan, Denver, Colorado banker, told the Conference that financing an irrigation farming project should be no different than financing any other business enterprise. A budget should be presented to the banker showing all anticipated expenditures for making the crop and providing for the family. Once the amount of the loan is decided upon the irrigator and his family should not deviate from the budget. Mr. Dignan suggested that the irrigator's wife also sign the loan papers in order to understand fully the obligations of all parties involved.

Others taking part in the program were: Harry P. Burleigh, Bureau of Reclamation, Austin; Wayne Criddle, State Engineer of Utah; Alfred S. Gray, Rain Bird Sales and Engineering, Azusa, California; Robert C. Mueller, W. R. Ames Company, San Francisco, California; Dr. Marlowe Thorne, Oklahoma State University, Stillwater, Oklahoma; Dr. T. R. Timm, Texas A. & M. College, College Station; Jack L. Waddell, Berkeley Pump Company, Amarillo; Dr. Moyle S. Williams, National Plant Food Institute, Washington, D. C.; and Guy O. Woodward, Sprinkler Irrigation Association, Salt Lake City, Utah.

The Irrigation Conference was well attended by persons registering from 17 states and the District of Columbia.

Bill Van Blarcom, Longview pump company executive, was elected to serve as president of the Council for 1958.

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ALLAN WHITE
Editor

RESEARCH SHOWS

By MARVIN E. JENSEN, Agricultural Engineer, Amarillo Experiment Station, Bushland, Texas.

When to irrigate and how much water to apply are questions often asked by wheat farmers of the High Plains of Texas.

Most of the irrigated wheat in this area is grown in counties where the predominate soil series is the Pullman soil. The approximate acreage of wheat under irrigation in this soil series is 350,000 acres. The Pullman soils are deep, slowly permeable and relatively uniform throughout the vast area of the "hardlands."

Probably the major problems encountered in irrigating "hardlands," which have an ideal surface topography, is obtaining adequate penetration of irrigation water. Intake measurements were made at the Amarillo Station in September 1956 on plots receiving three different methods of tillage. There were no differences in the intake rates under the different tillage methods after the plow layer was saturated. However, on the plots that were worked deeper and left in a loose condition the water disappeared from the surface much more rapidly. This indicates that a temporary storage in the plow layer obtained by leaving this layer in a loose, cloddy condition is an important factor in obtaining maximum penetration of irrigation water with a minimum of runoff on graded irrigation systems. The average intake rate per hour obtained from 9 plots ranged from .35 inch at end of the first hour down to .05 inch after 16 hours.

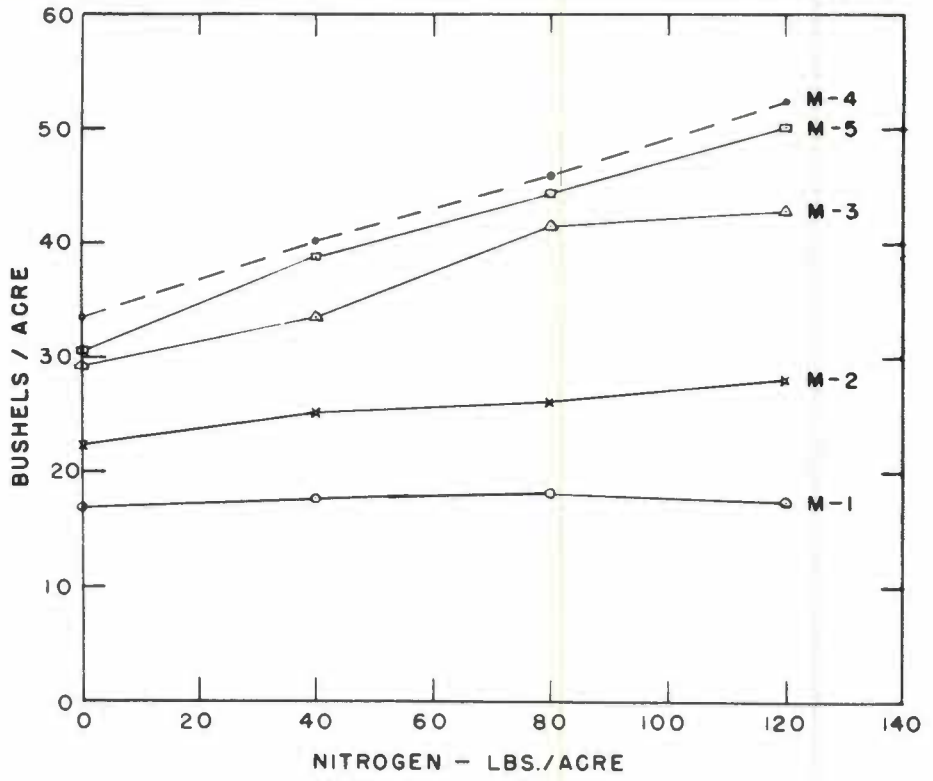
In the fall of 1955 a new irrigated wheat experiment was started at the Amarillo Experiment Station having six moisture treatments and six fertilizer treatments superimposed on each moisture treatment. These plots have been under irrigation for eight years. Only the yields from the nitrogen-fertilized plots on five moisture treatments are plotted in Figure 1. These plots received a uniform application of phosphorus. All moisture treatments were identical from October 1955 through February 1956. All plots were given a preplanting irrigation to a depth of 6 feet and were given two light irrigations in the fall, primarily to improve the stand and develop crown roots. During the first week in February, 1.75 inches of water was received in the form of snow. As the growth of wheat increased in March, the various moisture treatments were irrigated as follows:

MARVIN E. JENSEN

M-1 No spring application.

M-2 One 4-inch application at jointing stage, March 28.

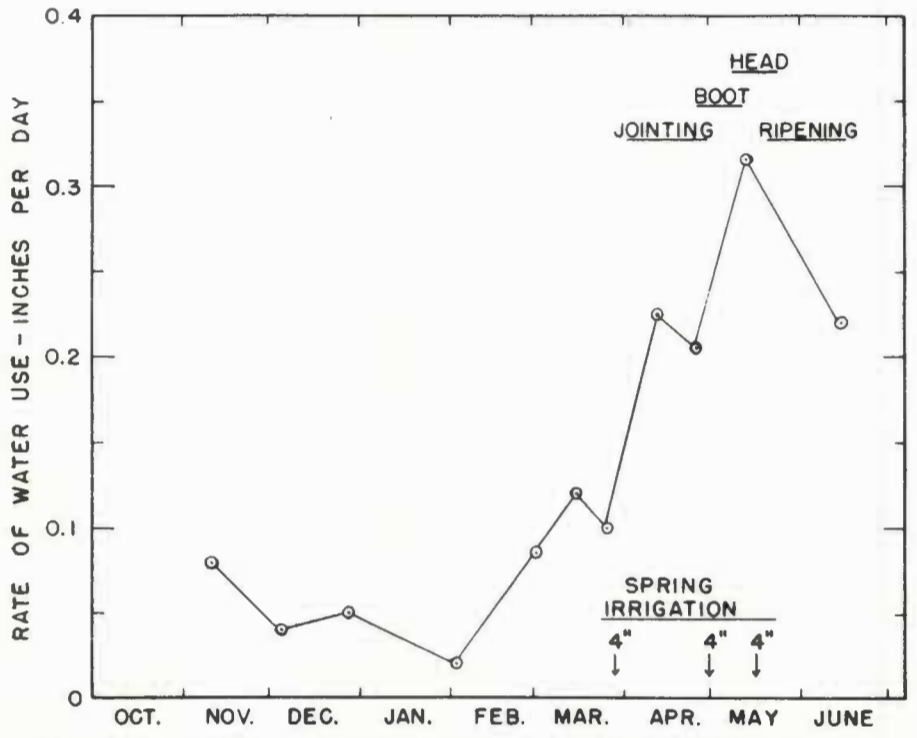
M-3 One 4-inch application at the



THE EFFECT OF SOIL MOISTURE AND NITROGEN ON THE YIELD OF IRRIGATED WINTER WHEAT. AMARILLO EXPERIMENT STATION, 1956.

FIGURE 1

WHEN TO IRRIGATE WINTER WHEAT



RATE OF WATER USE BY WINTER WHEAT UNDER OPTIMUM IRRIGATION CONDITIONS WITH TIME AND AMOUNTS OF SPRING IRRIGATIONS SHOWN. AMARILLO EXPERIMENT STATION, 1956.

FIGURE 2

boot stage, April 16, and a 4-inch application at the flowering stage, May 15.

M-4 One 4-inch application at jointing stage, March 28, one 4-inch application at early boot stage, April 30, and a 4-inch application just after flowering, May 17.

M-5 One 3-inch application on March 16, one 4-inch application April 13, one 4-inch application on May 7, and a 4-inch application on May 23. Because of heavy rain immediately following the last irrigation these plots had to be drained.

M-6 Irrigated the same as M-4 except no irrigation was given May 17.

Only 0.35 inch of rainfall was received from February 4 until May 23, when the wheat was in the soft dough stage. From May 23 to May 31, 4.89 inches of rain was received.

The results of this experiment indicates that proper water management is essential in obtaining an economic response to nitrogen fertilizer. Without adequate soil moisture little or no response to nitrogen can be expected on this soil, See M-1, Figure 1. The most efficient production per inch of water occurred at 80 pounds of nitrogen on M-3 and at 120 pounds of nitrogen on M-4 which is a medium and a fairly high moisture level. These same moisture treatments resulted in less straw per bushel of grain, also.

The stage of growth where maintenance of adequate soil moisture is most critical is in the late boot and early head-stages. This coincides with the peak water use period as plotted for M-4 in Figure 2. An example of what effect a lack of water has during these critical stages occurred on the M-6 moisture treatment which was irrigated at the same time and with the same amounts as M-4, except the M-6 treatment was not irrigated on May 17. Six days later all plots received adequate soil moisture from the heavy rains that occurred. The six days in the early heading stage without adequate water resulted in a decrease of 7.0 bushels at 80 pounds of nitrogen and 9.7 bushels at 120 pounds of nitrogen as compared to the yields obtained on the same fertility levels on the M-4 teratment.

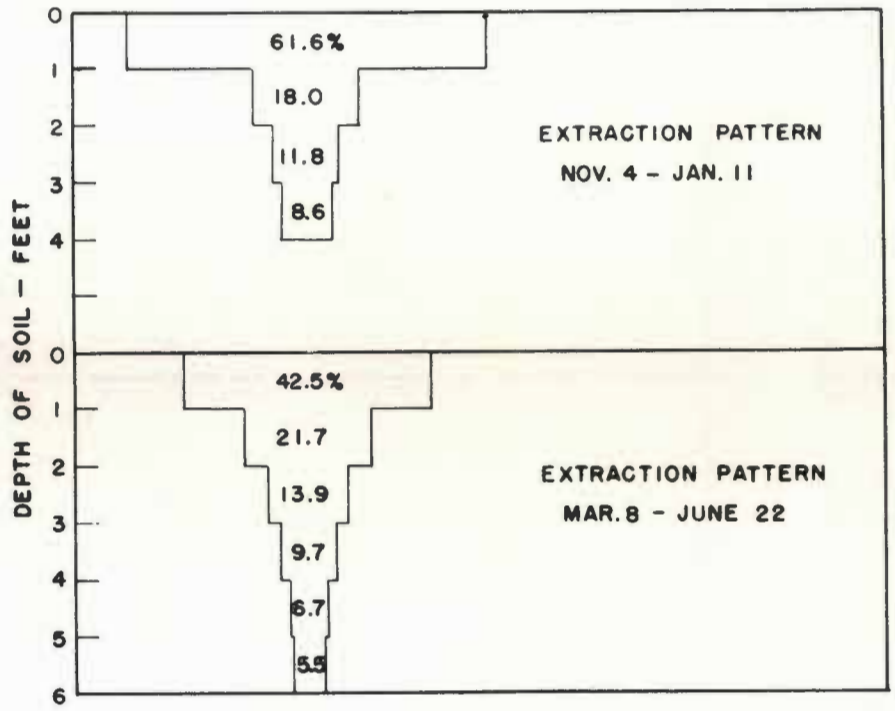
A response to nitrogen is characterized by more vigorous plant growth, especially in early spring. The additional vegetative growth probably accounts for the increased water use with higher nitrogen applications. Even though more water is used with high nitrogen rates, wheat was produced more efficiently with the addition of nitrogen.

In the fall when the wheat roots were relative shallow, 61.6 percent of the soil moisture used came from the top foot of soil. In the spring when the roots were deeper, 42.5 percent of the soil moisture used came from the top foot and 64.2 percent come from the top two feet of soil, Figure 3.

The graph shows that soil water is used from as deep as six feet but the greatest portion of the water is extracted from the top two feet. Therefore it appears desirable to use the entire 6-foot profile for water storage; but since the major portion of the plant roots are in the top three feet of soil this zone should have adequate soil moisture throughout the growing season for maximum yields.

The water use by wheat during the various stages of growth will vary from year to year depending on temperature, wind, relative humidity, and soil moisture. The climate in this area is fairly consistent and the water use can be expected to follow a pattern similar to Figure 2 if adequate soil moisture is maintained.

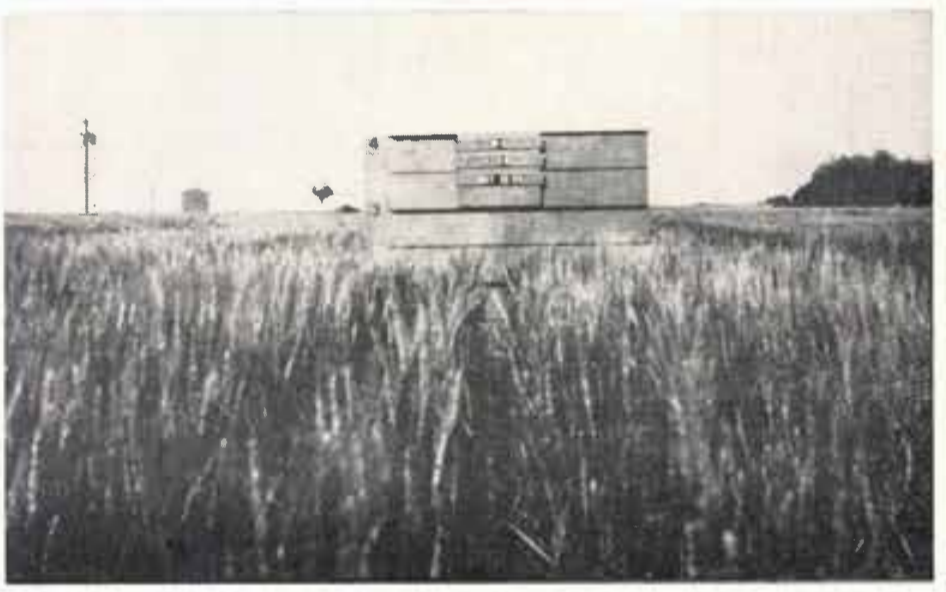
Either inadequate irrigation or over-irrigation results in low efficiency of water used in wheat production.



PERCENT OF TOTAL SOIL MOISTURE EXTRACTED BY IRRIGATED WINTER WHEAT PER FOOT OF DEPTH IN THE FALL AND SPRING ON THE BEST IRRIGATION TREATMENT. AMARILLO EXPERIMENT STATION, 1956.

FIGURE 3

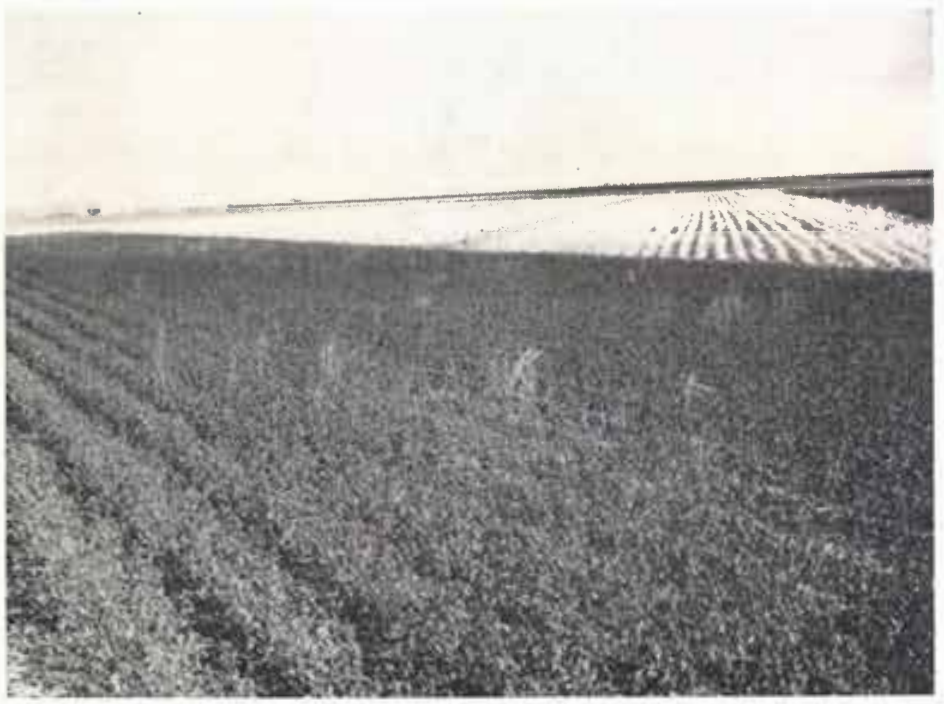
Wheat plot pictured above received the M-4 moisture treatment and no nitrogen.



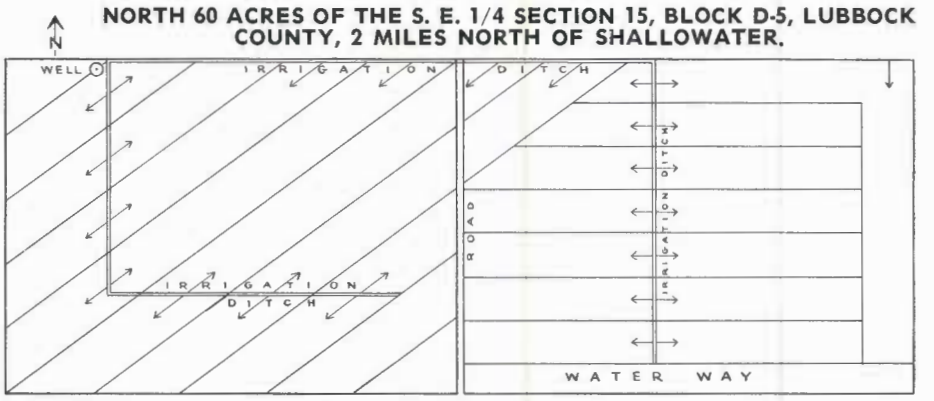
Wheat plot above received the M-4 moisture treatment and 120 pounds of nitrogen. Compare the height and head length with the wheat pictured at the left.

Irrigator Tells Why He Likes Bench-Levelling

Pictured above is Ray Brown, Lubbock County farmer, who has completely bench-leveled a 60-acre tract of farmland north of Shallowater. The farm has a normal slope of 2 to 3 percent, or a 14 foot uniform decline in elevation from the north to the south (less than one-fourth mile) and 11 foot decline from the west to the east (one-half mile). One 500 G.P.M. well is used to irrigate the land.

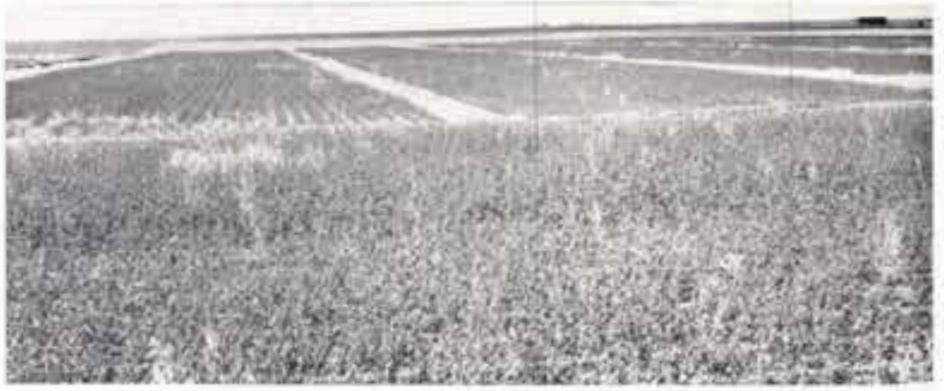


Mr. Brown states that the fuel and oil costs for applying a 6-inch irrigation to the bench-levelled land are $1.44 per acre. The records of an adjoining farm which Mr. Brown has kept show that, in order to wet the entire soil profile to the same minimum depth, the fuel and oil costs have been 4 to 5 times greater. The increased costs are attributed to over irrigating portions of the farm which is not bench-levelled.



Above is pictured a plat of the Brown farm showing the design of the benches. You will note that open irrigation ditches are used. Mr. Brown plans to install an underground closed system at a later date. Irrigation water travels in the open ditches from bench to bench through concrete pipe drops shaped like the letter L.

The above pictured bench is completely level from end to end and from border to border. The bench width allows 28 - 42-inch rows. Each bench on the farm can be worked with 4-row tractor equipment and can take a 12-inch rain, or more, without damage.



The bench pictured in the foreground above is on the east side of the Brown farm. Rainfall runoff which leaves the adjoining farm to the north travels along the north side of the bench-levelled tract to the east bench. The runoff water is allowed to be distributed uniformly on the east bench. When the bench completely fills with water, the benches to the immediate west may take the overflow. After all the runoff water is used that can be, any remaining runoff is directed to the east road where it travels south to the water way which takes it to a natural wet-weather lake.

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

Second Class Permit

THE Cross SECTION

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

Volume 4—No. 7 **"THERE IS NO SUBSTITUTE FOR WATER"** *December 1957*

BOARD OF DIRECTORS

COUNTY COMMITTEEMEN

OFFICE PERSONNEL

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ALLAN WHITE
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Flow-Meter Installa

About one year ago the High Plains Underground Water Conservation District entered into a flow-meter program with several farmers in the District. At the present time, the District is cooperating with eleven irrigators in the program.

The purpose of the flow-meter program is to determine amounts of irrigation water being applied to various crops on various soil types. The farms included in the program also provide an adequate proving ground for studies in crop yields from tracts having received various water treatments.

Each of the eleven irrigators has a flow-meter installed on his well pump in order to measure the quantity of water being produced. Each also has a rain gauge on the farm, with which an accurate record of rainfall may be kept. A record book is furnished by the District. The irrigator records amounts of irrigation water put on various plots and the time used in applying the water.

It is hoped that the information developed through this cooperative program may be helpful to others in their search for better water management practices.

The locations of the eleven farms included in the flow-meter program are described below. You will note the locations are also shown on the map at right.

BAILEY COUNTY

"A" Robert Blackwood, owner and operator. S 1/2 of SE 1/4, Section 32, Block W. 10-inch pump. Open ditches are used. To reach farm, travel east from Muleshoe on Highway 70 for 3 miles; north for 2 1/2 miles; east for 1 1/2 miles and finally north 1/4 mile to well site.

"B" W. L. Broadhurst, owner. SE 1/4 of Section 77, Block Y, State Capitol Land. 8-inch pump. Combination closed and open-ditch system. Farm may be reached by traveling southeast from Muleshoe on Highway 84 for 3 1/2 miles; north for .2 mile; then .4 of a mile back east.

CASTRO COUNTY

Eugene Ivey, owner; Alvin Frazier, operator. NE 1/4 of Section 41, Block T-4, T. A. Thompson Survey. 8-inch pump. Closed irrigation system. To visit farm, travel 5 miles south from Dimmitt on Highway 51; west for 3 miles; north for 1 mile; then back west 1/2 mile to well.

COCHRAN COUNTY

C. C. Slaughter Farms, owner; J. E. Middleton, operator. Labor 82, League 100. 6-inch pump. Sprinkler system. To visit farm travel southeast from Morton on Highway 116; turn south on Farm to Market 2195 for 1 1/4 miles; east 1/4 mile to well.

DEAF SMITH COUNTY

Ed Dziuk, owner and operator. NE portion of Section 108, Block M-7. Two 8-inch pumps. Combination closed and open-ditch irrigation system. To visit farm, travel south from Hereford on Highway 51 for approximately 2 miles; wells are located on the east side of the highway.

FLOYD COUNTY

Bill Daniel, owner and operator. SW 1/4 of Section 10, Block G. 8-inch pump. Open ditch system. To reach farm from the Allmon Gin, which is 5 miles east of Petersburg, travel 3 miles east; north for 1 1/2 miles; east for 1 mile; then north 1/2 mile to well.

LAMB COUNTY

Roy B. McQuatters, Sr., owner; Roy B. McQuatters, Jr., operator. SW 1/4, Section 1, Block 1, R. M. Thompson Survey. 8-inch pump. Combination closed and open-ditch irrigation system. To travel to the farm from Littlefield, go east 4 1/2 miles on Highway 54, continue east on dirt road for 1/2 mile, 200 yards north to house; then east 1/2 mile to well.

LYNN COUNTY

Will Harris, owner and operator. NW 1/4 Section 114, Block 12, E.L. &R.R. Survey. 8-inch pump and 6-inch flow-meter. Combination closed and open-ditch system. To reach the farm from New Home, travel on Highway 2 miles north. Well is located on the east of the highway.

PARMER COUNTY

"A" Walter Kaltwasser, owner and operator. NW 1/4 of Section 5, T-15S R2E (Block Y). 8-inch pump. Combination closed and open-ditch system. To reach farm, travel southeast from Farwell on Highway 84 about 3 miles; turn east on Highway 690 and proceed 4 miles to well on south side of highway.

"B" John Gammon, owner. SW 1/4 of Section 63, Block H. 8-inch pump. Open-ditch irrigation system. To visit the farm, travel 3 miles east of Lazbuddy, then north 1 1/2 miles to the well.

RANDALL COUNTY

H. M. Kinsey, owner and operator. SE 1/4 of Section 42, Block M-6. 6-inch pump. Open-ditch irrigation system. To reach farm, travel north 2 miles on Highway 87 from Happy; 4 miles west on farm to market highway; north 1/2 mile; then 1/2 mile west in field to well.

EDITOR
THE CROSS SECTION
1628-B 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.

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City and State_____

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Please Close Those Abandoned Wells!!!

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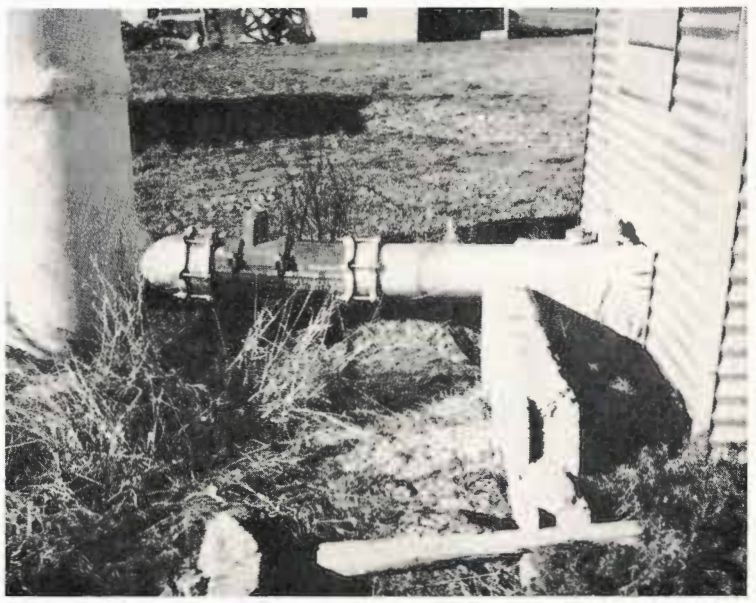
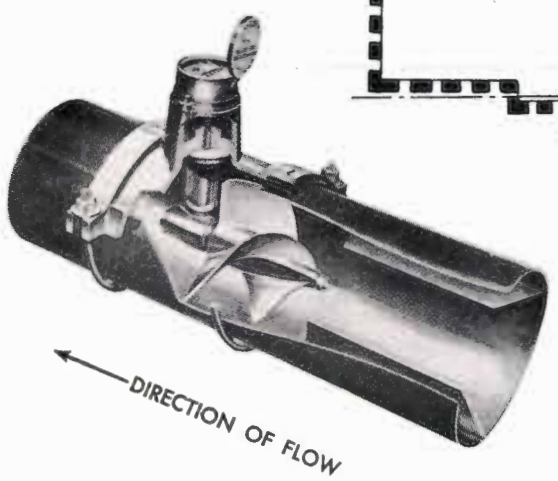


TYPICAL FLOW METER INSTALLATION



CROSS-SECTIONAL VIEW OF LOW PRESSURE FLOW METER

DEAF SMITH
RANDALL
CANYON
HEREFORD
PARMER
CASTRO
DIMMITT
SWISHER
TULIA
FARWELL
A
B
MULESHOE
A
B
PLAINVIEW
BAILEY
LAMB
HALE
FLOYD
FLOYDADA
MOTLEY
MATADOR
LITTLEFIELD
MORTON
COCHRAN
HOCKLEY
LEVELLAND
LUBBOCK
LUBBOCK
CROSBY
CROSBYTON
DICKENS
LYNN
TAHOKA
GARZA
POST
KENT
High
Edge
Eastern
DIRECTION OF FLOW
0 5 10 15 20 Miles

STATE OF TEXAS
BOARD OF WATER ENGINEERS

UNDERGROUND WATER RESERVOIR
DESIGNATION IN THE
OGALLALA FORMATION
SOUTH OF THE CANADIAN RIVER IN TEXAS
SUBDIVISION NUMBER ONE
Austin, Texas Feb. 12, 1951

District Officials To Be Elected January 14th

The High Plains Underground Water Conservation District will hold its annual election of Directors and County Committeemen on January 14, 1958.

The two-year terms of two Directors expire this coming January; also, the three-year terms of two County Committeemen from each county in the District expire.

Each qualified resident voter is urged to vote for the persons of his, or her, choice on January 14.

The nominees whose names will appear on the ballots to replace those whose terms expire are as follows:

FOR DISTRICT DIRECTOR

(One to be elected for each precinct)

PRECINCT No. 2 (Cochran, Hockley and Lamb Counties)

1. Roy Hickman, Morton.
2. J. J. Hobgood, Anton.
3. Roy McQuatters, Sr., Littlefield.
4. _____

PRECINCT No. 5 (Floyd County)

1. Marvin Shurbet, Route 1, Petersburg.
2. _____

FOR COUNTY COMMITTEEMEN

(Two to be elected for each county)

ARMSTRONG COUNTY

(One to be elected)

1. Wayne McNeill, Happy.
2. Willie Modisette, Wayside.
3. _____

(One to be elected)

1. Robert Adams, Wayside.
2. Cordell Mahler, Wayside.
3. _____

BAILEY COUNTY

(One to be elected)

1. Leldon Phillips, Route 2, Muleshoe.
2. _____

(One to be elected)

1. R. E. Ethridge, Route 5, Muleshoe.
2. _____

CASTRO COUNTY

(One to be elected)

1. George Bradford, Dimmitt.
2. _____

(One to be elected)

1. Tom Lewis, Dimmitt.
2. _____

COCHRAN COUNTY

(One to be elected)

1. Lloyd Miller, Morton.
2. Pat Hatcher, Morton.
3. _____

(One to be elected)

1. Earl Crum, Route 2, Morton.
2. Tye Williamson, Morton.
3. _____

DEAF SMITH COUNTY

(One to be elected)

1. Earl Holt, Rt. 3, Hereford
2. Edward Paetzold, Rt. 3. Hereford.
3. _____

(One to be elected)

1. T. L. Sparkman, Rt. 1, Hereford.
2. _____

FLOYD COUNTY

(One to be elected)

1. Robert Kellison, Rt. 2, Lockney.
2. Johnnie Lee, Rt. 2, Lockney.
3. _____

(One to be elected)

1. G. L. Fawver, Rt. 5, Floydada.
2. R. L. Neil, Rt. 5, Floydada
3. _____

HOCKLEY COUNTY

(One to be elected)

1. C. T. Pace, Levelland
2. _____

(One to be elected)

1. Henry J. Schmidley, Route 3, Levelland.
2. _____

LAMB COUNTY

(One to be elected)

1. Melton Wiseman, Rt. 2, Sudan.
2. Henry Gilbert, Sudan.
3. _____

(One to be elected)

1. Willie G. Green, Olton.
2. Elmer L. McGill, Box 404, Olton.
3. _____

LUBBOCK COUNTY

(One to be elected)

1. Earl Weaver, Idalou.
2. Ross Meador, Idalou.
3. _____

(One to be elected)

1. Vernice Ford, 3013 20th Street, Lubbock.
2. George McCleskey, Central American Life Bldg., Lubbock.
3. _____

LYNN COUNTY

(One to be elected)

1. Frank P. Lisemby, Jr., Rt. 1, Wilson.
2. _____

(One to be elected)

1. Earl Cummings, Wilson.
2. Roy Lynn Kahlich, Wilson.
3. _____

PARMER COUNTY

(One to be elected)

1. John Gammon, Friona.
2. _____

(One to be elected)

1. A. B. Wilkinson, Bovina.
2. _____

POTTER COUNTY

(One to be elected)

1. R. C. Sampson, Jr., Bushland.
2. _____

(One to be elected)

1. T. G. Baldwin, Bushland.
2. L. C. Moore, Bushland.
3. _____

RANDALL COUNTY

(One to be elected)

1. James B. Dietz, Rt. 2, Happy.
2. Harold Bryan, Rt. 1, Happy.
3. _____

(One to be elected)

1. W. A. (Bill) Patke, Box 423, Canyon.
2. J. R. Parker, Rt. 4, Amarillo.
3. _____

District Manager Attends Educational Committee Meeting

The Resource Educational Committee of the Texas Education Agency held on December 12 its last quarterly meeting of 1957.

Tom McFarland, High Plains Water District Manager, a member of the Committee, met with the group on the Southern Methodist University campus to further explore the adoption of a plan for conservation education on natural resources of Texas.

Texas is one of the few western states that does not have a required course on conservation education in the public school curriculum.

Andy Anderson, with the Texas Forestry Service, is chairman of the Committee.

STATISTICS FOR NOVEMBER

During the month of November, 80 new wells were drilled and registered with the District office; 11 replacement wells were drilled; and 4 wells were drilled that were either dry, or non-productive for other reasons. 49 permits were issued by the county committees. The new permits issued and completed wells follow by counties:

County	*Permits Issued*	*New Wells Drilled*	*Replacement Wells*	*Old Wells Deepened*	*Dry Holes Drilled*
Armstrong	0	1	0	0	0
Bailey	6	7	5	0	2
Castro	2	7	1	0	1
Cochran	2	6	0	0	0
Deaf Smith	1	11	2	0	0
Floyd	3	11	1	0	1
Hockley	13	4	0	0	0
Lamb	5	6	0	0	0
Lubbock	4	14	0	0	0
Lynn	8	0	0	0	0
Parmer	5	10	1	0	0
Potter	0	0	0	0	0
Randall	0	3	1	0	0

A LITTLE LIFE IS WORTH MORE THAN A LITTLE TIME, CLOSE THOSE ABANDONED WELLS!

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

Second Class Permit