IRRIGATION DATA FROM CHASE, DUNDY, AND PERKINS COUNTIES, SOUTHWESTERN NEBRASKA, 1983

By Diane M. Stephens, Frederick J. Heimes, and Richard R. Luckey

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U.S. GEOLOGICAL SURVEY

Open-File Report 84-471

Lakewood, Colorado

1984

UNITED STATES DEPARTMENT OF THE INTERIOR

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GEOLOGICAL SURVEY

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CONVERSION TABLE

Multiply inch/pound units	By	To obtain metric unit
inch (in.)	25.40	millimeter
mile	1.609	kilometer
acre	0.4047	square hectometer
acre-foot	1,233	cubic meter
square mile (mi^2)	2.590	square kilometer
horsepower	745.7	joule per second
cubic foot per minute	0.4719	liter per second
gallon per minute	0.06309	liter per second

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ABSTRACT

This report summarizes irrigation data collected by the U.S. Geological Survey in Chase, Dundy, and Perkins Counties, southwestern Nebraska. The data were collected as part of a study to better define the relationship between pumpage for irrigation and return flow from applied water (irrigation plus precipitation). The report contains data on crops, site location, discharge, time of operation, and water application for 52 randomly selected irrigation wells that were monitored during the 1983 irrigation season.

INTRODUCTION

The study area consists of Chase, Dundy, and Perkins Counties in southwestern Nebraska (fig. 1). The three counties have a total area of 2,700 mi^2 with 895 mi^2 in Chase County, 920 mi^2 in Dundy County, and 885 mi^2 in Perkins County. The study area is in the High Plains section of the Great Plains physiographic province. Most of the area consists of gently rolling uplands with many small flat areas (Lappala 1978). The southwestern part of the area contains sandhills and some small, inter-dune lakes and marshes. The area is drained by small streams that flow eastward. Bottomlands along the streams comprise a small percentage of the study area.

Irrigation in the study area is nearly all from ground water. There are about 2,800 irrigation wells in the three-county area. Approximately 45 percent of these wells are in Chase County, 26 percent in Dundy County, and 29 percent in Perkins County. Most of the irrigation systems are center-pivot sprinklers. In Chase County, 74 percent of the irrigation systems are center-pivot sprinklers; in Dundy and Perkins Counties 91 percent of the irrigation systems are center-pivot sprinklers. A typical center-pivot sprinkler system irrigates approximately 130 acres. Flood-irrigation systems generally use gated-irrigation pipe.

Corn, the major irrigated crop in all three counties, accounts for 70 percent of all irrigated crops. Wheat, the second most commonly irrigated crop, only accounts for 10 percent of all irrigated crops. Dry beans, sorghum, alfalfa, and other crops also are irrigated in the study area. In recent years, the trend has been to replace irrigated corn with crops that need less irrigation water such as wheat, dry beans, and sorghum.

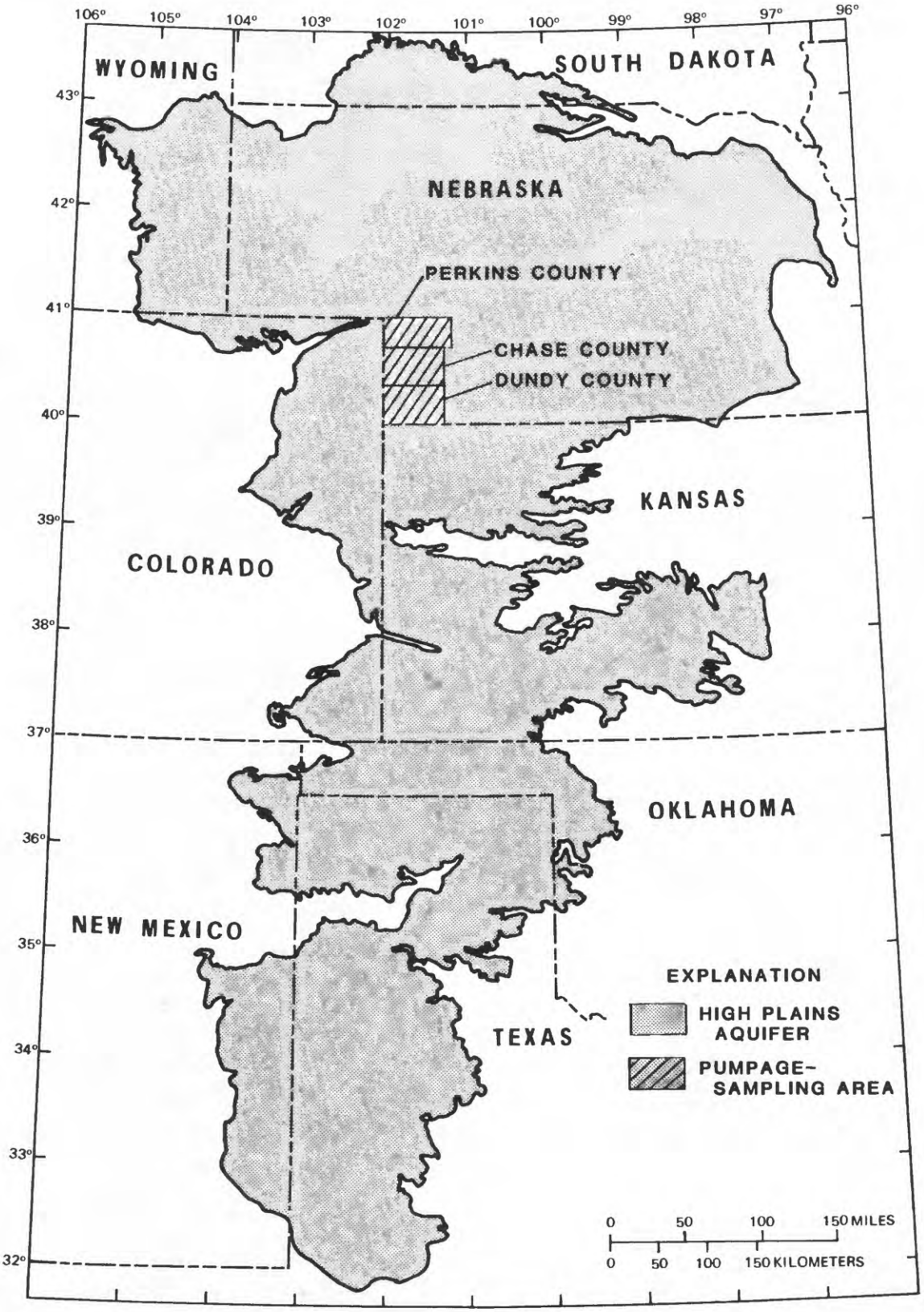

Figure 1.—Location of pumpage-sampling area.

Purpose and Scope

The U.S. Geological Survey High Plains Regional Aquifer System-Analysis Project is conducting a study to better define the relationship between pumpage for irrigation and return flow from all applied water (irrigation plus precipitation), in the three-county, area so future water-level changes can be more accurately predicted. Normal total precipitation from April through October in the Southwest Nebraska Division is 15.94 in (National Climatic Data Center, 1983). During this period in 1983, total precipitation was 2.86 in less than the normal. Most of this deficit occurred during July, August, and September.

The study also will compare measurements made using a Clampitron[1] portable flowmeter with measurements from inline flowmeters to determine discharge from individual irrigation systems. The three-county area in southwestern Nebraska was chosen for this study because it has been designated by the Nebraska Department of Water Resources as a ground-water control area and all irrigation systems in this area are required to have an approved inline flowmeter installed. Therefore, comparisons can be made between the portable flowmeter and inline flowmeters to determine the consistency of measurements from these meters. To meet these objectives, the U.S. Geological Survey collected data on irrigation wells, crops,acreage irrigated, and pumpage for irrigation during 1983. These data are presented in this report.

Acknowledgments

Collection of data for this report relied on the cooperation of the Upper Republican Natural Resources District, the U.S. Department of Agriculture Agricultural Stabilization Conservation Service and Soil Conservation Service, and numerous irrigators whom allowed us access to their irrigation systems. Without their cooperation, this study could not have been conducted.

METHODS OF STUDY

The data presented in this report (tables 1A-4C) were collected during 1983. Data were collected at 52 randomly selected wells. Of these wells, 25 are in Chase County, 15 are in Dundy County, and 12 are in Perkins County. The wells were visited prior to the 1983 irrigation season to obtain initial readings from the inline flowmeters and energy (electric or natural gas) meters. The wells were visited periodically during the summer to obtain data on crops, site location, discharge, time of operation, and water application for the irrigation wells. Discharge measurements were made using the Clampitron portable flowmeter when possible. When it was not possible to use the Clampitron portable flowmeter, discharge measurements were made using standard methods, for example, using a pygmy meter in open-ditch flood-irrigation systems. Discharge also was measured using the inline flowmeter installed on the irrigation well. Volumetric inline flowmeters and energy meters also were used to estimate the time of operation of the irrigation well.

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[1]The use of brand names in this report are for identification purposes only and does not constitute endorsement by the U.S. Geological Survey.

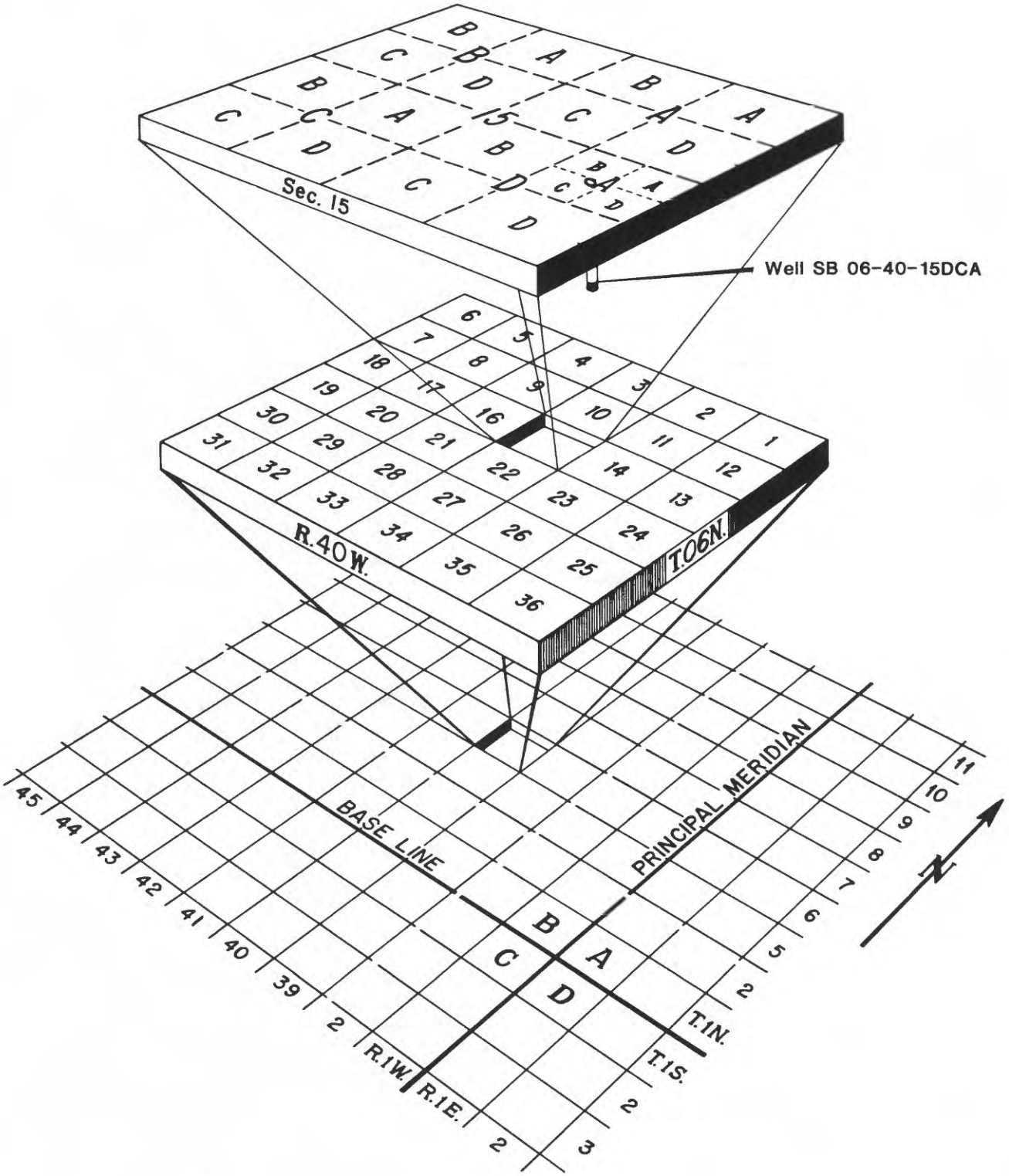

Figure 2.—System of numbering wells.

IRRIGATION DATA

Explanation of Terms for Tables 1A-1C

TABLE 1A-1C—CROP AND WELL DATA

Well location
Local numbering system used for tables 1A-1C; see figure 2

Well identifier
The "well identifier" is a 15-digit number generated from the original latitude and longitude of the well location in degrees, minutes, and seconds with a 2-digit sequence code at the end to locate multiple wells within a 1-second area. The well identifier is unique for each well and is not changed once it has been entered into the U.S. Geological Survey's computer files.

Irrigated-crop data
Type —Type of crop(s) irrigated at the site
System—Type of irrigation system used:
- Pivot = Center pivot
- Flood = Ditch or gated pipe
- Sprinkler = Sprinklers other than center pivot

Acres —Acreage of crop(s) irrigated at the site
Source—Source of acreage information:
- ASCS = Agricultural Stabilization and Conservation Service of U.S. Department of Agriculture
- Est. = Estimated
- Meas. = Measured acreage

Well data
Depth —Depth of well, in feet below land surface
Discharge pipe diameter—Diameter of discharge pipe, in inches
Pump horsepower —Rated pump-motor horsepower from motor plate
Power source —Pump power source:
- Elec. = Electric motor
- N. gas = Natural-gas engine
- Diesel = Diesel engine
- LP gas = Liquid-propane engine

Power rating—
- Electrical meter = Instantaneous kilowatt demand, in kilowatts
- Natural gas meter = Instantaneous natural gas demand, in cubic feet, per minute

Remarks —PIK; a program of U.S. Department of Agriculture for producers to receive compensation in lieu of harvesting crop (fields were fallow and not irrigated)

Table 1A.—Crop and well data for irrigation sites in Chase County

Well location	Well identifier	Irrigated-crop data				Well data					Remarks
		Type	System	Acres	Source	Depth (feet)	Discharge-pipe diameter (inches)	Pump horse power	Power Source	Power Rating	
SB-05-39-03-CC	402532101441101	wheat	pivot	129.3	ASCS	351	8.6	—	elec.	—	—
SB-05-39-04-BA	402559101452001	wheat	pivot	133.5	ASCS	335	8	—	n. gas	—	—
SB-05-39-21-B	402320101451801	corn cane	pivot	70.1 57.4	ASCS ASCS	320	8	—	diesel	—	—
SB-06-37-19-DA	402813101331601	corn popcorn	pivot	75.4 44.9	ASCS ASCS	275	8	—	diesel	—	—
SB-06-40-06-B	403111101542601	corn	pivot	120.0	ASCS	308	10	60	elec.	22	—
SB-06-40-09-AAC	403018101513601	corn	pivot	103.8	ASCS	292	8	—	n. gas	—	—
SB-06-40-15-DCA	402901101502701	corn	pivot	180.7	ASCS	340	8	100	elec.	79	—
SB-06-41-11-C	402954101564001	corn	flood	99.6	ASCS	250	10	—	elec.	22	—
SB-07-36-13-CBA	403421101213001	corn	flood	206.9	ASCS	221	8.6	150	elec.	126	—
SB-07-36-18-DAC	403411101362301	alfalfa wheat	flood	37.0 30.0	ASCS	150	6.6	—	LP gas	—	—
SB-07-36-32-CDD	403127101255001	corn	flood	46.6	ASCS	204	6	—	LP gas	—	—
SB-07-38-23-BCC	403338101361901	corn	pivot	63.3	ASCS	320	8	75	elec.	77	—
SB-07-39-09-D	403505101444701	beans	pivot	130.0	ASCS	290	8	100	elec.	68	—
SB-07-39-28-B	403255101451701	corn oats	pivot	34.1 35.0	ASCS ASCS	320	8	75	elec.	53	—
SB-07-40-07-CCB	403508101544001	corn	flood	67.0	Meas.	275	10.7	60	elec.	52	—

Table 1A.—Crop and well data for irrigation sites in Chase County--Continued

Well location	Well identifier	Irrigated-crop data				Well data					Remarks
		Type	System	Acres	Source	Depth (feet)	Discharge-pipe diameter (inches)	Pump horse power	Power Source	Power Rating	
SB-07-40-27-AAC	403255101503401	corn	pivot	130.2	ASCS	310	8	100	elec.	63	—
SB-07-40-34-ADC	403148101504601	corn	pivot	440.9	ASCS	316	8	350	elec.	326	—
SB-07-41-18-AA	403440102004001	corn	pivot	126.6	ASCS	902	8	75	elec.	64	—
SB-07-41-25-B	403256101553501	corn beans	pivot	65.0 64.8	ASCS ASCS	300	8	100	elec.	78	—
SB-07-42-25-BAB	403309102021001	corn beets	flood	90.0 100.0	ASCS ASCS	260	8.6	100	elec.	77	--
SB-08-36-07-BBD	404047101271101	—	pivot	130.4	ASCS	360	8	—	elec.	—	PIK
SB-08-37-22-A	403902101300201	corn	pivot	131.3	ASCS	320	8	—	n. gas	—	—
SB-08-38-12-C	404022101350901	corn	pivot	105.5	ASCS	214	8	—	diesel	—	—
SB-08-38-21-DD	403824101380301	corn	pivot N pivot S	73.3 128.1	ASCS ASCS	220	6	—	diesel	—	N=north S=south
SB-08-41-31-BAB	403729101012001	alfalfa	pivot	34.3	ASCS	220	6.6	—	diesel	—	—

Table 1B.—Crop and well data for irrigation wells in Dundy County

Well location	Well identifier	Irrigated-crop data				Well data					Remarks
		Type	System	Acres	Source	Depth (feet)	Discharge-pipe diameter (inches)	Pump horse power	Power Source	Power Rating	
SB-02-38-07-B	400931101393201	corn	pivot	113.7	ASCS	210	8.6	75	elec.	58	—
SB-02-38-20-BA	400749101382101	corn	pivot	110.4	ASCS	215	8	75	elec.	58	—
SB-02-39-13-D	400815101400301	corn soybeans	pivot	89.4 32.6	ASCS ASCS	200	8	—	n. gas	—	—
SB-02-39-28-BB	400652101440101	corn	pivot	131.0	ASCS	137	8.6	—	elec.	59	—
SB-02-40-02-ACDD	401011101481601	corn	pivot	126.0	ASCS	—	8	—	LP gas	—	—
SB-02-40-02-BBAA	401034101483201	—	pivot	133.5	ASCS	215	8	—	LP gas	—	PIK
SB-03-38-06-D	401514101385701	corn	pivot	133.0	ASCS	305	8	—	n. gas	—	—
SB-03-38-17-BABC	401359101382101	alfalfa	sprinkler	67.3	ASCS	160	8	—	n. gas	—	—
SB-03-39-26-AA	401207101412401	alfalfa	flood	182.7	ASCS	149	8	60	elec.	51	—
SB-03-40-06-B	401532101531101	—	pivot	127.8	ASCS	300	8		LP gas	—	PIK
SB-03-40-36-CAC	401103101471101	corn	pivot	174.8	ASCS	—	8	—	diesel	—	—
SB-03-42-10-DA	401423101023901	corn	pivot	176.5	ASCS	295	8	150	elec.	118	—
SB-04-38-04-AA	402050101363801	corn	pivot	130.0	Est.	230	8.6	—	n. gas	—	—
SB-04-40-08-D	401928101513001	wheat —	pivot	63.2 67.7	ASCS ASCS	320	8.6	—	elec.	—	— PIK
SB-04-41-23-CAC	401746101552801	—	pivot	123.3	ASCS	320	8.6	—	LP gas	—	PIK

Table 1C.—Crop and well data for irrigation wells in Perkins County

Well location	Well identifier	Irrigated-crop data				Well data					Remarks
		Type	System	Acres	Source	Depth (feet)	Discharge-pipe diameter (inches)	Pump horse power	Power Source	Power Rating	
SB-09-37-09-DDB	404538101321001	corn	pivot	133.8	ASCS	433	8	100	elec.	74	—
SB-09-39-06-ABC	404659101483401	corn	pivot	60.3	ASCS	312	8	100	elec.	—	—
SB-10-36-08-ACC	405110101262601	corn cane	pivot	65.0 35.0	ASCS ASCS	537	8	100	elec.	—	—
SB-11-35-33-BDB	405256101190501	corn	pivot	62.9	ASCS	460	8	150	elec.	—	—
SB-11-36-01-CAC	405654101223801	corn	pivot	130.0	ASCS	440	8	100	elec.	—	—
SB-11-38-15-A	405511101381201	corn	pivot	126.6	ASCS	477	8	—	diesel	—	—
SB-11-39-09-DD	405602101461101	corn beans cane	pivot	61.7 60.0 7.5	ASCS ASCS ASCS	407	8	125	elec.	—	—
SB-11-40-22-BBB	405455101522701	—	pivot	127.0	Est.	438	8.6	—	engine	—	PIK
SB-11-40-23-DDA	405418101501901	beans	pivot	125.0	ASCS	—	8	150	elec.	—	—
SB-12-36-30-B	405906101282601	barley	pivot	106.4	ASCS	420	8	100	elec.	—	—
SB-12-38-20-BBD	410000101410501	wheat	pivot	111.3	ASCS	420	8	—	n. gas	—	—
SB-12-40-25-CCC	405827101502301	corn	pivots	260.0	Est.	398	10.7	—	elec.	—	One well for two pivots

Explanation of Terms for Tables 2A-2C

TABLE 2A-2C—DISCHARGE DATA

Well Location
Local numbering system used for tables 2A-2C; see figure 2

Discharge Data

Date	—Date when measurement was made
Discharge	—Measured discharge, in gallons per minute
Clampitron	—Portable flowmeter used
Inline	—Flowmeter installed in irrigation system (see remarks)
Other	—Other standard method of discharge measurement (see remarks)
Remarks	—PIK; a program of U.S. Department of Agriculture for producers to receive compensation in lieu of harvesting crop (fields were fallow and not irrigated)
	—McCrometer, Water Specialties, and Sparling; are brands of inline flowmeters

Table 2A.—Discharge data for irrigation wells in Chase County

Well location	Discharge Data				Remarks
	Date	Discharge (gallons per minute)			
		Clamp-itron	In-line	Other	
SB-05-39-03-CC	4/11/83	—	—	—	No data for wheat
SB-05-39-04-BA	4/11/83	—	—	—	No data for wheat
SB-05-39-21-B	7/12/83	893	925	—	McCrometer
	8/02/83	832	861	—	Do.
SB-06-37-19-DA	7/14/83	734	—	—	Inline flowmeter not working
	8/01/83	762	892	—	McCrometer
	8/02/83	785	844	—	Do.
	8/26/83	729	788	—	Do.
SB-06-40-06-B	7/12/83	—	619	—	McCrometer
	8/17/83	644	565	—	Do.
	8/24/83	—	527	—	Do.
SB-06-40-09-AAC	7/12/83	929	945	—	McCrometer
	8/04/83	960	951	—	Do.
SB-06-40-15-DCA	7/12/83	1375	1303	—	McCrometer
	8/24/83	1340	1307	—	Do.
SB-06-41-11-C	7/12/83	1423	1400	—	Water Specialties
	8/02/83	1725	1459	—	Do.
	8/24/83	1503	1341	—	Do.
SB-07-36-13-CBA	7/14/83	1160	1190	—	McCrometer
	8/05/83	1218	1164	—	Do.
SB-07-36-18-DAC	—	—	—	—	Owner never used well
SB-07-36-32-CDD	8/05/83	—	986	—	Unable to obtain measurement
	8/26/83	—	876	—	with Clampitron
SB-07-38-23-BCC	7/14/83	949	878	—	McCrometer
	8/01/83	863	866	—	Do.

Table 2A.--Discharge data for irrigation wells in Chase County--Continued

Well Location	Discharge Data				Remarks
	Date	Discharge (gallons per minute)			
		Clamp-itron	In-line	Other	
SB-07-39-09-D	7/12/83	911	—	—	Inline flowmeter not working
	8/05/83	798	825	—	Water Specialties
SB-07-39-28-B	7/13/83	668	—	—	Inline flowmeter not working
	8/17/83	680	—	—	Do.
SB-07-40-07-CCB	7/13/83	—	1516	—	Water Specialties
	8/18/83	—	1352	1386	Water Specialties and pygmy meter
SB-07-40-27-AAC	7/13/83	—	847	—	McCrometer
	8/04/83	—	830	—	Do.
	8/16/83	875	818	—	Do.
	8/26/83	820	823	—	Do.
SB-07-40-34-ADC	7/12/83	2544	2542	—	McCrometer
	8/02/83	2466	2542	—	Do.
	8/04/83	2543	2525	—	Do.
	8/18/83	2572	2469	—	Do.
	8/26/83	2433	2481	—	Do.
SB-07-41-18-AA	7/12/83	884	912	—	McCrometer
	7/12/83	893	912	—	Do.
	8/17/83	861	887	—	Do.
	8/24/83	852	881	—	Do.
SB-07-41-25-B	7/13/83	865	841	—	McCrometer
	8/02/83	837	830	—	Do.
	8/24/83	855	850	—	Do.
SB-07-42-25-BAB	7/12/83	1557	1466	—	McCrometer
	8/02/83	1475	1507	—	Do.

Table 2A.--Discharge data for irrigation sites in Chase County—Continued

Well location	Discharge Data				Remarks
	Date	Discharge (gallons per minute)			
		Clamp-itron	In-line	Other	
SB-08-36-07-BBD	5/12/83	--	--	--	No crop grown
SB-08-37-22-A	7/15/83	1002	1026	--	McCrometer
	8/04/83	863	1003	--	Conditions were unsuitable for accurate Clampitron measurement
	8/26/83	935	984	--	McCrometer
SB-08-38-12-C	7/15/83	991	981	--	McCrometer
	8/01/83	988	999	--	Do.
	8/26/83	926	931	--	Do.
SB-08-38-21-DD	7/13/83	466 N	480 N	--	McCrometer N=North pivot
	7/13/83	734 S	715 S	--	Do. S=South pivot
	8/03/83	458 N	503 N	--	Do. N=North pivot
	8/03/83	757 S	757 S	--	Do. S=South pivot
	8/26/83	475 N	511 N	--	Do. N=North pivot
	8/26/83	732 S	722 S	--	Do. S=South pivot
SB-08-41-31-BAB	7/13/83	444	415	--	McCrometer
	8/24/83	420	422	--	Do.

Table 2B.—Discharge data for irrigation wells in Dundy County

Well location	Discharge Data				Remarks
	Date	Discharge (gallons per minute)			
		Clamp-itron	In-line	Other	
SB-02-38-07-B	7/11/83	793	707	—	Sparling
	8/02/83	782	713	—	Do.
	8/25/83	780	717	—	Do.
SB-02-38-20-BA	7/11/83	757	—	—	Inline flowmeter not working
SB-02-39-13-D	7/11/83	892	879	—	McCrometer
	8/04/83	795	752	—	Do.
SB-02-39-28-BB	7/16/83	750	710	—	McCrometer
	8/01/83	712	641	—	Do.
	8/25/83	684	632	—	Do.
SB-02-40-02-ACDD	7/16/83	1365	1230	—	Water Specialties
	8/01/83	1322	1216	—	Do.
	8/04/83	1376	1192	—	Do.
	8/25/83	1414	1304	—	Do.
SB-02-40-02-BBAA	5/12/83	—	—	—	PIK
SB-03-38-06-D	7/16/83	1003	928	—	Sparling
	8/02/83	862	889	—	Do.
SB-03-38-17-BABC	8/17/83	783	803	—	McCrometer
	8/25/83	762	839	—	Do.

Table 2B.--Discharge data for irrigation wells in Dundy County--Continued

Well location	Discharge Data				Remarks
	Date	Discharge (gallons per minute)			
		Clamp-itron	In-line	Other	
SB-03-39-26-AA	8/25/83	950	--	--	Inline flowmeter not installed
SB-03-40-06-B	--	--	--	--	PIK
SB-03-40-36-CAC	7/16/83	1952	1878	--	McCrometer
SB-03-42-10-DA	8/01/83	1015	1094	--	McCrometer
	8/22/83	983	1091	--	Do.
SB-04-38-04-AA	7/16/83	1042	1013	--	McCrometer
	8/02/83	1078	1042	--	Do.
	8/04/83	1064	1027	--	Do.
	8/25/83	1100	1060	--	Do.
SB-04-40-08-D	5/13/83	--	--	--	PIK
SB-04-41-23-CAC	5/13/83	--	--	--	PIK

Table 2C.--Discharge data for irrigation wells in Perkins County

Well location	Discharge Data				Remarks
	Date	Discharge (gallons per minute)			
		Clamp-itron	In-line	Other	
SB-09-37-09-DDB	7/14/83	781	755	—	McCrometer
	8/26/83	738	737	—	Do.
SB-09-39-06-ABC	7/15/83	820	909	—	McCrometer
	8/03/83	790	889	—	Conditions were unsuitable for accurate Clampitron measurement
SB-10-36-08-ACC	7/15/83	650	—	—	Inline flowmeter not working
	8/03/83	718	716	—	Sparling
	8/23/83	651	641	—	Do.
SB-11-35-33-BDB	8/03/83	870	873	—	Water Specialties
SB-11-36-01-CAC	7/15/83	775	746	—	Water Specialties
	8/03/83	773	767	—	Do.
	8/26/83	819	788	—	Do.
SB-11-38-15-A	7/14/83	808	752	—	McCrometer
	8/03/83	714	739	—	Do.
	8/23/83	719	710	—	Do.
SB-11-39-09-DD	7/15/83	728	700	—	McCrometer
	8/03/83	677	681	—	Do.
	8/23/83	649	661	—	Do.
SB-11-40-22-BBB	—	—	—	—	PIK
SB-11-40-23-DDA	8/03/83	884	933	—	Water Specialties
	8/04/83	870	927	—	Do.
SB-12-36-30-B	7/15/83	661	684	—	Water Specialties
SB-12-38-20-BBD	—	—	—	—	No data for wheat
SB-12-40-25-CCC	7/15/83		1086	—	McCrometer
	8/18/83	1347	—	—	

Explanation of Terms for Tables 3A-3C

TABLE 3A-3C—TIME OF OPERATION

Well Location
Local numbering system used for tables 3A-3C; see figure 2

Date
Begin —Beginning date of time measurement
End —Ending date of time measurement

Inline flowmeter time—Time computed from inline flowmeter, in hours

Energy meter
Type —Elec. = Electric meter
—N. gas = Natural-gas meter
Time —Time computed from energy meter, in hours

Other —Time from other sources, if applicable
Source —Source of other time of operation data
Time —Time computed from other source, in hours

Remarks —PIK; a program of U.S. Department of Agriculture for producers to receive compensation in lieu of harvesting crop (fields were fallow and not irrigated)
—McCrometer, Water Specialties, and Sparling; are brands of inline flowmeters

Table 3A.—Time-of-operation data for irrigation wells in Chase County

Well location	Date		Inline flowmeter time (hours)	Energy meter		Other		Remarks
	Begin	End		Type	Time (hours)	Source	Time (hours)	
SB-05-39-03-CC	—	—	—	—	—	—	—	No data for wheat
SB-05-39-04-BA	—	—	—	—	—	—	—	No data for wheat
SB-05-39-21-B	4/11/83	10/25/83	753	—	—	engine	752	McCrometer; engine hour meter other source of time
SB-06-37-19-DA	5/12/83	8/26/83	—	—	—	—	—	No data
	8/26/83	10/27/83	157	—	—	—	—	McCrometer
SB-06-40-06-B	4/14/83	8/17/83	906	elec.	851	—	—	McCrometer
	8/17/83	8/24/83	184	elec.	171	—	—	Do.
	8/24/83	10/25/83	110	elec.	255	—	—	Do.
		Total	1200	Total	1277			
SB-06-40-09-AAC	4/15/83	8/04/83	561	gas	566	—	—	McCrometer
	8/04/83	10/25/83	736	gas	959	—	—	Do.
		Total	1297	Total	1525			
SB-06-40-15-DCA	4/15/83	8/18/83	1175	elec.	1242	—	—	McCrometer
	8/18/83	8/23/83	97	elec.	96	—	—	Do.
	8/23/83	8/24/83	12	elec.	15	—	—	Do.
	8/24/83	10/25/83	246	elec.	245	—	—	Do.
		Total	1530	Total	1598			
SB-06-41-11-C	4/15/83	8/24/83	680	elec.	668	—	—	Water Specialties
	8/24/83	10/25/83	292	elec.	291	—	—	Do.
		Total	972	Total	959			
SB-07-36-13-CBA	5/12/83	7/14/83	218	elec.	219	—	—	McCrometer
	7/14/83	8/05/83	458	elec.	452	—	—	Do.
	8/05/83	8/26/83	356	elec.	353	—	—	Do.
	8/26/83	10/24/83	487	elec.	482	—	—	Do.
		Total	1519	Total	1506			

Table 3A.—Time-of-operation data for irrigation wells in Chase County—Continued

Well location	Date		Inline flowmeter time (hours)	Energy meter		Other		Remarks
	Begin	End		Type	Time (hours)	Source	Time (hours)	
SB-07-36-18-DAC	—	—	—	—	—	—	—	Owner did not operate well
SB-07-36-32-CDD	5/12/83	10/24/83	369	—	—	engine	369	McCrometer
SB-07-38-23-BCC	5/12/83	7/14/83	181	elec.	177	—	—	McCrometer
	7/14/83	8/03/83	226	elec.	224	—	—	Do.
	8/03/83	10/24/83	272	elec.	266	—	—	Do.
		Total	679	Total	667			
SB-07-39-09-D	4/15/83	8/23/83	717	elec.	797	—	—	Water Specialties
	8/23/83	10/25/83	180	elec.	183	—	—	Do.
		Total	897	Total	980			
SB-07-39-28-B	4/14/83	7/12/83		elec.	380	—	—	Inline flowmeter not working
	7/12/83	7/13/83	—	elec.	15	—	—	Do.
	7/13/83	8/02/83	—	elec.	259	—	—	Do.
	8/02/83	8/17/83	—	elec.	202	—	—	Do.
	8/17/83	10/25/83	—	elec.	560	—	—	Do.
				Total	1416			
SB-07-40-07-CCB	5/11/83	8/16/83	445	elec.	459	—	—	Water Specialties
	8/16/83	8/18/83	7	elec.	8	—	—	Do.
	8/18/83	8/24/83	89	elec.	99	—	—	Do.
	8/24/83	10/25/83	181	elec.	143	—	—	Do.
		Total	722	Total	709			
SB-07-40-27-AAC	4/14/83	7/13/83	266	elec.	273	—	—	McCrometer
	7/13/83	8/16/83	712	elec.	704	—	—	Do.
	8/16/83	8/26/83	107	elec.	105	—	—	Do.
	8/26/83	10/25/83	256	elec.	249	—	—	Do.
		Total	1341	Total	1331			

Table 3A.—Time-of-operation data for irrigation wells in Chase County—Continued

Well location	Date		Inline flowmeter time (hours)	Energy meter		Other		Remarks
	Begin	End		Type	Time (hours)	Source	Time (hours)	
SB-07-40-34-ADC	4/14/83	8/02/83	537	elec.	544	—	—	McCrometer
	8/02/83	8/18/83	346	elec.	350	—	—	Do.
	8/18/83	8/24/83	86	elec.	85	—	—	Do.
	8/24/83	10/25/83	265	elec.	194	—	—	Do.
		Total	1234	Total	1173			
SB-07-41-18-AA	5/11/83	8/17/83	885	elec.	875	—	—	McCrometer
	8/17/83	8/24/83	125	elec.	124	—	—	Do.
	8/24/83	10/25/83	208	elec.	207	—	—	Do.
		Total	1218	Total	1206			
SB-07-41-25-B	4/15/83	7/13/83	180	elec.	171	—	—	McCrometer
	7/13/83	8/02/83	326	elec.	295	—	—	Do.
	8/02/83	8/24/83	288	elec.	268	—	—	Do.
	8/24/83	10/25/83	187	elec.	178	—	—	Do.
		Total	981	Total	912			
SB-07-42-25-BAB	4/14/83	8/02/83	485	elec.	478	—	—	McCrometer
	8/02/83	8/24/83	337	elec.	342	—	—	Do.
	8/24/83	10/25/83	605	elec.	622	—	—	Do.
		Total	1427	Total	1442			
SB-08-36-07-BBD	—	—	—	—	—	—	—	No crop
SB-08-37-22-A	5/12/83	7/15/83	122	gas	192	—	—	McCrometer
	7/15/83	8/04/83	248	gas	176	—	—	Do.
	8/04/83	8/26/83	264	gas	262	—	—	Do.
	8/26/83	10/24/83	232	gas	230	—	—	Do.
		Total	866	Total	860			

Table 3A.—Time-of-operation data for irrigation wells in Chase County—Continued

Well location	Date		Inline flowmeter time (hours)	Energy meter		Other		Remarks
	Begin	End		Type	Time (hours)	Source	Time (hours)	
SB-08-38-12-C	5/12/83	7/15/83	285	—	—	engine	358	McCrometer
	7/15/83	8/23/83	664	—	—	engine	850	Do.
	8/23/83	8/26/83	52	—	—	engine	63	Do.
	8/26/83	10/24/83	155	—	—	engine	183	Do.
		Total	1156				1454	
SB-08-38-21-DD	5/12/83	7/13/83	24 N	—	—	—	—	McCrometer N=North
			26 S	—	—	—	—	Do. S=South
	7/13/83	8/03/83	190 N	—	—	—	—	Do. N=North
			249 S	—	—	—	—	Do. S=South
	8/03/83	8/26/83	196 N	—	—	—	—	Do. N=North
			210 S	—	—	—	—	Do. S=South
	8/26/83	10/24/83	152 N	—	—	—	—	Do. N=North
			129 S	—	—	—	—	Do. S=South
		Total	562 North					
			614 South					
SB-08-41-31-BAB	5/11/83	7/13/83	84	—	—	—	—	McCrometer
	7/13/83	8/24/83	422	—	—	—	—	Do.
	8/24/83	10/25/83	74	—	—	—	—	Do.
		Total	580					

Table 3B.--Time-of-operation data for irrigation wells in Dundy County

Well location	Date		Inline flowmeter time (hours)	Energy meter		Other		Remarks
	Begin	End		Type	Time (hours)	Source	Time (hours)	
SB-02-38-07-B	4/14/83	8/02/83	636	elec.	636	--	--	Sparling
	8/02/83	8/25/83	412	elec.	410	--	--	Do.
	8/25/83	10/25/83	188	elec.	191	--	--	Do.
		Total	1236	Total	1237			
SB-02-38-20-BA	4/14/83	7/11/83	--	elec.	218	--	--	Inline flowmeter not working
	7/11/83	8/02/83	--	elec.	479	--	--	Do.
	8/02/83	10/25/83	--	elec.	452	--	--	Do.
				Total	1149			
SB-02-39-13-D	4/14/83	8/04/83	612	--	--	--	--	McCrometer
	8/04/83	8/25/83	331	--	--	--	--	Do.
	8/25/83	10/25/83	178	--	--	--	--	Do.
		Total	1121					
SB-02-39-28-BB	5/13/83	7/16/83	62	elec.	63	--	--	McCrometer
	7/16/83	8/01/83	353	elec.	360	--	--	Do.
	8/01/83	8/25/83	230	elec.	224	--	--	Do.
	8/25/83	10/27/83	189	elec.	203	--	--	Do.
		Total	834	Total	850			
SB-02-40-02-ACDD	5/13/83	7/16/83	337	--	--	--	--	Water Specialties
	7/16/83	8/01/83	278	--	--	--	--	Do.
	8/01/83	8/25/83	394	--	--	--	--	Do.
	8/25/83	10/27/83	222	--	--	--	--	Do.
		Total	1231					
SB-02-40-02-BBAA	--	--	--	--	--	--	--	PIK
SB-03-38-06-D	4/14/83	7/16/83	232	--	--	--	--	Sparling
	7/16/83	8/02/83	220	--	--	--	--	Do.
	8/02/83	8/25/83	276	--	--	--	--	Do.
	8/25/83	10/25/83	129	--	--	--	--	Do.
		Total	857					

Table 3B.--Time-of-operation data for irrigation wells in Dundy County--Continued

Well location	Date		Inline flowmeter time (hours)	Energy meter		Other		Remarks
	Begin	End		Type	Time (hours)	Source	Time (hours)	
SB-03-38-17-BABC	4/14/83	8/17/83	551	n. gas	592	--	--	McCrometer
	8/17/83	8/25/83	178	n. gas	98	--	--	Do.
	8/25/83	10/25/83	53	n. gas	50	--	--	Do.
		Total	782	Total	740			
SB-03-39-26-AA	4/14/83	8/25/83	--	elec.	808	--	--	Inline flowmeter not working
	8/25/83	10/25/83	--	--	--	--	--	New meter installed
SB-03-40-06-B	--	--	--	--	--	--	--	PIK
SB-03-40-36-CAC	5/13/83	7/16/83	273	--	--	--	--	McCrometer
	7/16/83	8/25/83	541	--	--	--	--	Do.
	8/25/83	10/27/83	127	--	--	--	--	Do.
		Total	941					
SB-03-42-10-DA	5/14/83	8/01/83	652	elec.	661	--	--	McCrometer
	8/01/83	8/22/83	340	elec.	326	--	--	Do.
	8/22/83	10/27/83	268	elec.	282	--	--	Do.
		Total	1260	Total	1269			
SB-04-38-04-AA	4/14/83	7/16/83	300	n. gas	310	--	--	McCrometer
	7/16/83	8/02/83	299	n. gas	305	--	--	Do.
	8/02/83	8/25/83	686	n. gas	831	--	--	Do.
	8/25/83	10/25/83	56	n. gas	587	--	--	Gas meter hours exceed actual elapsed hours
		Total	1341	Total	2033			
SB-04-40-08-D	--	--	--	--	--	--	--	1/2 wheat and 1/2 PIK
SB-04-41-23-CAC	--	--	--	--	--	--	--	PIK

Table 3C.--Time-of-operation data for irrigation wells in Perkins County

Well location	Date		Inline flowmeter time (hours)	Energy meter		Other		Remarks
	Begin	End		Type	Time (hours)	Source	Time (hours)	
SB-09-37-09-DDB	5/12/83	7/14/83	322	elec.	333	—	—	McCrometer
	7/14/83	8/26/83	788	elec.	792	—	—	Do.
	8/26/83	10/24/83	163	elec.	170	—	—	Do.
		Total	1273	Total	1295			
SB-09-39-06-ABC	5/11/83	7/15/83	130	elec.	129	—	—	McCrometer
	7/15/83	8/03/83	210	elec.	208	—	—	Do.
	8/03/83	10/24/83	216	elec.	239	—	—	Do.
		Total	556	Total	576			
SB-10-36-08-ACC	5/12/83	8/03/83	203*	elec.	510	—	—	* Sparling inoperable
	8/03/83	8/23/83	252	elec.	236	—	—	part of season
	8/23/83	10/24/83	279	elec.	277	—	—	Do.
		Total	734*	Total	1023			
SB-11-35-33-BDB	5/11/83	8/03/83	269	elec.	272	—	—	Water Specialties
	8/03/83	8/26/83	213	elec.	214	—	—	Do.
	8/26/83	10/24/83	213	elec.	216	—	—	Do.
		Total	695	Total	702			
SB-11-36-01-CAC	5/11/83	8/03/83	640	elec.	650	—	—	Water Specialties
	8/03/83	8/23/83	327	elec.	284	—	—	Do.
	8/23/83	8/26/83	14	elec.	39	—	—	Do.
	8/26/83	10/24/83	285	elec.	298	—	—	Do.
		Total	1266	Total	1271			
SB-11-38-15-A	5/11/83	8/23/83	636	—	—	engine	598	McCrometer
	8/23/83	10/24/83	194	—	—	engine	226	Do.
		Total	830			Total	824	

Table 3C.—Time-of-operation data for irrigation wells in Perkins County—Continued

Well location	Date		Inline flowmeter time (hours)	Energy meter		Other		Remarks
	Begin	End		Type	Time (hours)	Source	Time (hours)	
SB-11-39-09-DD	5/11/83	7/15/83	146	elec.	141	—	—	McCrometer
	7/15/83	8/03/83	172	elec.	187	—	—	Do.
	8/03/83	8/23/83	341	elec.	438	—	—	Do.
	8/23/83	10/24/83	171	elec.	129	—	—	Do.
		Total	830	Total	895			
SB-11-40-22-BBB	—	—	—	—	—	—	—	PIK
SB-11-40-23-DDA	5/11/83	8/03/83	163	elec.	163	—	—	Water Specialties
	8/03/83	8/04/83	19	elec.	19	—	—	Do.
	8/04/83	10/24/83	187	elec.	187	—	—	Do.
		Total	369	Total	369			
SB-12-36-30-B	5/11/83	7/15/83	316	elec.	—	—	—	Water Specialties
	7/15/83	8/03/83	10	elec.	—	—	—	Do.
		Total	326					
SB-12-38-20-BBD	—	—	—	—	—	—	—	No data for wheat
SB-12-40-25-CCC	5/11/83	7/15/83	206	—	—	—	—	McCrometer
	7/15/83	8/04/83	94	—	—	—	—	Do.
	8/04/83	8/18/83	262	—	—	—	—	Do.
	8/18/83	10/24/83	398	—	—	—	—	Do.
		Total	960					

Explanation of Terms for Tables 4A-4C

TABLE 4A-4C—WATER APPLIED

Well Location
Local numbering system used for tables 4A-4C; see figure 2

Pumpage
Inline —Acre-feet of water pumped; measured by the inline flowmeter
Sampling —Acre-feet of water pumped; calculated by multiplying average Clampitron discharge by total hours of operation computed using the energy meter or other source (inline flowmeter used for time of operation if no other source available)

Irrigated acres—Acreage of irrigated crop

Water applied

Inline —Inches of water applied to crop; calculated by multiplying pumpage (acre-feet) from inline flowmeter by 12 (to convert feet to inches) and dividing by acreage of crop
Sampling —Inches of water applied to crop; calculated by multiplying pumpage (acre-feet) from sampling by 12 (to convert feet to inches) and dividing by acreage of crop

Remarks —PIK; a program of U.S. Department of Agriculture for producers to receive compensation in lieu of harvesting crop (fields were fallow and not irrigated)

Table 4A.—Summary of water applied to crops in Chase County

Well location	Pumpage (acre-feet)		Irrigated acres	Water applied (inches)		Remarks
	Inline	Sampling		Inline	Sampling	
SB-05-39-03-CC	—	—	129.3	—	—	No data for wheat
SB-05-39-04-BA	—	—	133.5	—	—	No data for wheat
SB-05-39-21-B	118.4	—	127.5	11.1	11.2	—
SB-06-37-19-DA	—	—	120.3	—	—	No time-of-operation data
SB-06-40-06-B	122.8	150.7	120.0	12.3	15.1	—
SB-06-40-09-AAC	227.2	159.3	103.8	26.3	30.7	—
SB-06-40-15-DCA	365.8	380.2	180.7	24.3	26.5	—
SB-06-41-11-C	240.1	273.7	99.6	28.9	33.0	—
SB-07-36-13-CBA	326.4	329.8	206.9	18.9	19.1	—
SB-07-36-18-DAC	—	—	—	—	—	Owner did not irrigate
SB-07-36-32-CDD	67.0	—	46.6	17.3	—	No discharge measurement
SB-07-38-23-BCC	108.8	111.2	63.3	20.6	21.1	—
SB-07-39-09-D	136.6	154.3	130.0	12.6	14.2	—

Table 4A.--Summary of water applied to crops in Chase County--continued

Well location	Pumpage (acre-feet)		Irrigated acres	Water applied (inches)		Remarks
	Inline	Sampling		Inline	Sampling	
SB-07-39-28-B	--	178.6	69.1	--	30.5	--
SB-07-40-07-CCB	201.2	178.9	67.0	36.0	32.4	Average discharge from pygmy meter
SB-07-40-27-AAC	203.2	200.4	130.2	18.7	19.1	--
SB-07-40-34-ADC	572.6	542.3	440.9	15.6	14.8	--
SB-07-41-18-AA	198.5	193.9	126.6	18.8	18.4	--
SB-07-41-25-B	152.8	143.1	129.8	14.1	13.2	--
SB-07-42-25-BAB	393.6	402.8	190.0	24.9	25.4	--
SB-08-36-07-BBD	--	--	--	--	--	No data, no crop
SB-08-37-22-A	158.5	147.2	131.3	14.5	14.0	One clampitron measurement not used in calculations
SB-08-38-12-C	206.4	259.4	105.5	23.5	29.5	
SB-08-38-21-DD North Pivot	52.4	3.9*	73.3	8.6	--	*Engine hour meter not working properly
SB-08-38-21-DD South Pivot	83.3	6.2*	128.1	7.8	--	
SB-08-41-31-BAB	44.9	46.4	34.3	15.7	16.1	Time of operation from inline flowmeter

Table 4B.--Summary of water applied to crops in Dundy County

Well location	Pumpage (acre-feet)		Irrigated acres	Water applied (inches)		Remarks
	Inline	Sampling		Inline	Sampling	
SB-02-38-07-B	161.6	178.8	113.7	17.1	18.9	--
SB-02-38-20-BA	125.2	160.1	110.4	13.6	17.4	--
SB-02-39-13-D	154.7	174.2	122.0	15.2	17.1	Time of operation from inline flowmeter
SB-02-39-28-BB	100.1	111.9	131.0	9.2	10.2	--
SB-02-40-02-ACDD	273.3	--	126.0	26.0	--	--
SB-02-40-02-BBAA	--	--	--	--	--	PIK
SB-03-38-06-D	149.3	147.2	133.0	13.5	13.3	Time of operation from inline flowmeter
SB-03-38-17-BABC	117.2	105.4	67.3	20.9	18.8	--
SB-03-39-26-AA	--	--	182.7	--	--	Flowmeter not installed part of season
SB-03-40-06-B	--	--	--	--	--	PIK
SB-03-40-36-CAC	327.3	338.2	174.8	22.5	23.2	Time of operation from inline flowmeter
SB-03-42-10-DA	253.4	233.4	176.5	13.0	15.9	--
SB-04-38-04-AA	258.3	268.4	130.0	23.8	24.4	Estimated acreage; time of operation from inline flowmeter
SB-04-40-08-D	23.3	--	130.9	2.1	--	1/2 wheat, 1/2 PIK
SB-04-41-23-CAC	--	--	--	--	--	PIK

Table 4C.—Summary of water applied to crops in Perkins County

Well location	Pumpage (acre-feet)		Irrigated acres	Water applied (inches)		Remarks
	Inline	Sampling		Inline	Sampling	
SB-09-37-09-DDB	172.7	181.1	133.8	15.5	16.2	—
SB-09-39-06-ABC	93.3	87.0	60.3	18.6	17.3	—
SB-10-36-08-ACC	88.1	126.8	100.0	10.6	15.2	—
SB-11-35-33-BDB	111.7	112.5	62.9	21.3	21.5	—
SB-11-36-01-CAC	178.5	184.6	130.0	16.5	17.0	—
SB-11-38-15-A	114.6	113.4	126.6	10.9	10.7	—
SB-11-39-09-DD	104.6	112.9	129.2	9.7	10.5	—
SB-11-40-22-BBB	—	—	—	—	—	PIK
SB-11-40-23-DDA	63.0	59.6	125.0	6.0	5.7	
SB-12-36-30-B	41.2	39.7	106.4	4.6	4.5	Time of operation from inline flowmeter
SB-12-38-20-BBD	55.8	—	111.3	6.0	—	—
SB-12-40-25-CCC	201.6	238.1	260.0	9.3	11.0	Estimated acreage; Time of operation from inline flowmeter

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☆U.S. GOVERNMENT PRINTING OFFICE: 1984—780-543/9431