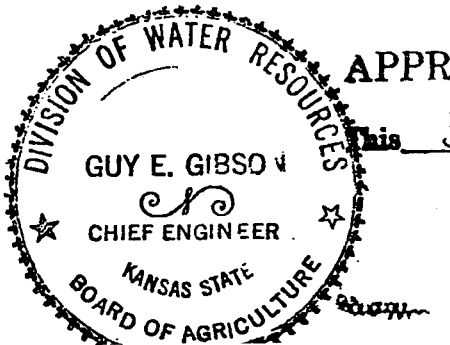
BIG BEND

GROUNDWATER MANAGEMENT DISTRICT

NO. 5

REVISED

MANAGEMENT PROGRAM



APPROVED

This 5th day of January 1979

Guy E. Gibson

Chief Engineer
Division of Water Resources
State Board of Agriculture

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INTRODUCTION

The Big Bend Groundwater Management District #5 was orgainzed through the efforts of concerned citizens to conserve, promote, and manage groundwater resources so that quality and quantity of that resource will be maintained for present and future needs. The groundwater management laws establish the right of local land owners and water users to determine their own destiny with respect to the use of groundwater within the basic law of the State of Kansas.

Russell Herpich, Irrigation Engineer of K.S.U. saw the potential of the Big Bend area for irrigation back in the sixties and the urgent need to conserve and perpetuate this vast natural resource.

The 1972 Kansas Legislature enacted workable legislation enabling the formation of groundwater management districts. The Pratt County Soil Conservation District Board of Supervisors, recognizing the benefits of such a district called a meeting October 16, 1973, to which leaders from area counties were invited to attend. A series of informative meetings followed this meeting, and a steering committee was formed to carry out the organizing of the district according to the Kansas Groundwater Management District Act. The following steering committee began to function April 11, 1974.

Phil Schrack, Chairman	Iuka, Kansas
Nathan B. Hayse, Vice President	Mullinville, Kansas
Boyd Mundhenke, Secretary	Kinsley, Kansas
Larry Panning	Ellinwood, Kansas
Bill Ball	Sterling, Kansas
Omar Schartz	Larned, Kansas
Bob Wendelburg	Stafford, Kansas
Don Brownlee*	Sylvia, Kansas

*Don Brownlee represented Reno County even though he could not be a legal member of the board--7 being the maximum number on the steering committee.

A declaration of intent and a proposed map of the district was filed by the Steering Committee to the Chief Engineer of the Division of Water Resources Kansas Department of Agriculture April 16, 1974.

On October 22, 1975, the description of the lands within the proposed district was certified by the Chief Engineer and a petition was then circulated by the Steering Committee. The petition was approved December 22, 1975, and election called for March 2, 1976, to allow eligible voters of the district to decide whether the district should be organized. Results of the election were 535 votes in favor and 211 opposed, passing by 72% majority.

The Certificate of Incorporation was issued by the Secretary of State March 9, 1976, and has been filed in the Register of Deeds Office in each of the eight counties within the district. An organizational meeting was held March 30, 1976, at the St. John Library for the purpose of electing directors and adopting by-laws. The present directors and terms are as follows:

		(term expires)
Larry Panning, Barton County	President	1981
Omar Schartz, Pawnee County	Vice President	1979
Jerry Mott, Pratt County	Secretary	1980
Willard McClure, At Large	Treasurer	1979
Ray Cudney, Edwards County		1981
John Rosenberger, Kiowa County		1979
Bart Zongker, Reno County		1980
Bill Ball, Rice County		1981
Robert Wendelburg, Stafford County		1980

DESCRIPTION OF THE DISTRICT

Big Bend Groundwater Management District No. 5 is located in south-central Kansas. The name Big Bend originated from the fact that the district lies south of the large bend in the Arkansas River. Included within the district are portions of Kiowa, Edwards, Pawnee, Barton, Rice, Reno, and all of Stafford and Pratt Counties.

It is generally recognized by hydrologists that the groundwater aquifer contained within the Big Bend district exhibits one of the highest recharge rates in the state. Thus, its future relative to irrigation appears better than the Ogalalla groundwater aquifer located in the western one-third (1/3) of Kansas. In certain areas, the saturated thickness has been estimated to exceed 200 feet. Due to the shallow static water table which generally ranges from ten (10) to one hundred (100) feet, irrigation pumping costs are often substantially less than those associated with much of western Kansas.

Approximately 2,524,000 acres of land are located within the district boundaries. As of November 1, 1978, approximately 324,000 acres have been petitioned out, leaving an estimate of 2,200,000 acres remaining under the jurisdiction of the district. As of November 1, 1978, approximately 750,000 acre feet of groundwater are being appropriated for beneficial use within the district.

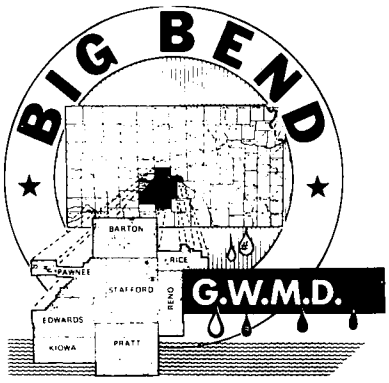
Two major basins are also included within the district. The Cheyenne Bottoms is a structural basin located in south-central Barton County, and the Salt Marsh is a saline basin situated in the east-central portion of the district. Though the geologic origin of these two basins differ, each exhibits saline surface water and groundwater tendencies.

Average annual rainfall ranges from approximately twenty (20) inches along the western periphery to twenty-seven (27) inches along the eastern border.

Due to the majority of soil being in the sandy to sandy loam category, center pivot sprinkler is presently the principal method employed for irrigation; gravity follows a close second.

A potential seven month irrigation season, coupled with moderate rainfall and sandy loam soils all contribute toward the district's potential for growing various types of crops. For example, corn, sorghums, wheat, alfalfa, soybeans, potatoes, melons, truck-gardened crops, and even Christmas trees are grown in the district.

Natural gas, currently our cheapest source of energy, is not always available for irrigation. Thus, more expensive forms of energy such as diesel fuel, LP gas, and electricity are often used. A continued availability of economical sources of energy is a necessity for maintaining the agricultural health of the district.



Big Bend Groundwater Management District

20W 19W 18W 17W 16W 15W 14W 13W 12W 11W 10W 9W 8W 7W

16S 17S 18S 19S 20S 21S 22S 23S 24S 25S 26S 27S 28S 29S 30S

ELLSWORTH CO.

HOISINGTON

US-156

RUSH CO.

GREAT BEND

K-96

LYONS

BARTON CO.

RICE CO.

LARNED

PAWNEE CO.

ST. JOHN

HUTCHINSON

US-50

STAFFORD

KINSLEY

STAFFORD CO.

US-183

EDWARDS CO.

RENO CO.

K-61

K-14

HAVILAND

PRATT

CUNNINGHAM

US-54

GREENSBURG

KIOWA CO.

SAWYER

PRATT CO.

BARBER CO.

KINGMAN CO.

US-281

DISTRICT BOUNDARY

COUNTY LINE

DESCRIPTION OF AREA SOILS

Big Bend Groundwater Management District

A. Area: These are upland, hardland areas of Barton, Pawnee, Pratt, Edwards, Rice, and Kiowa Counties. They consist of well-developed silty and clayey soils. They are dominantly well-drained, deep, fertile soils. Some small places of rock and shale occur on slopes. Water erosion and soil blowing are the major concerns of soil management.

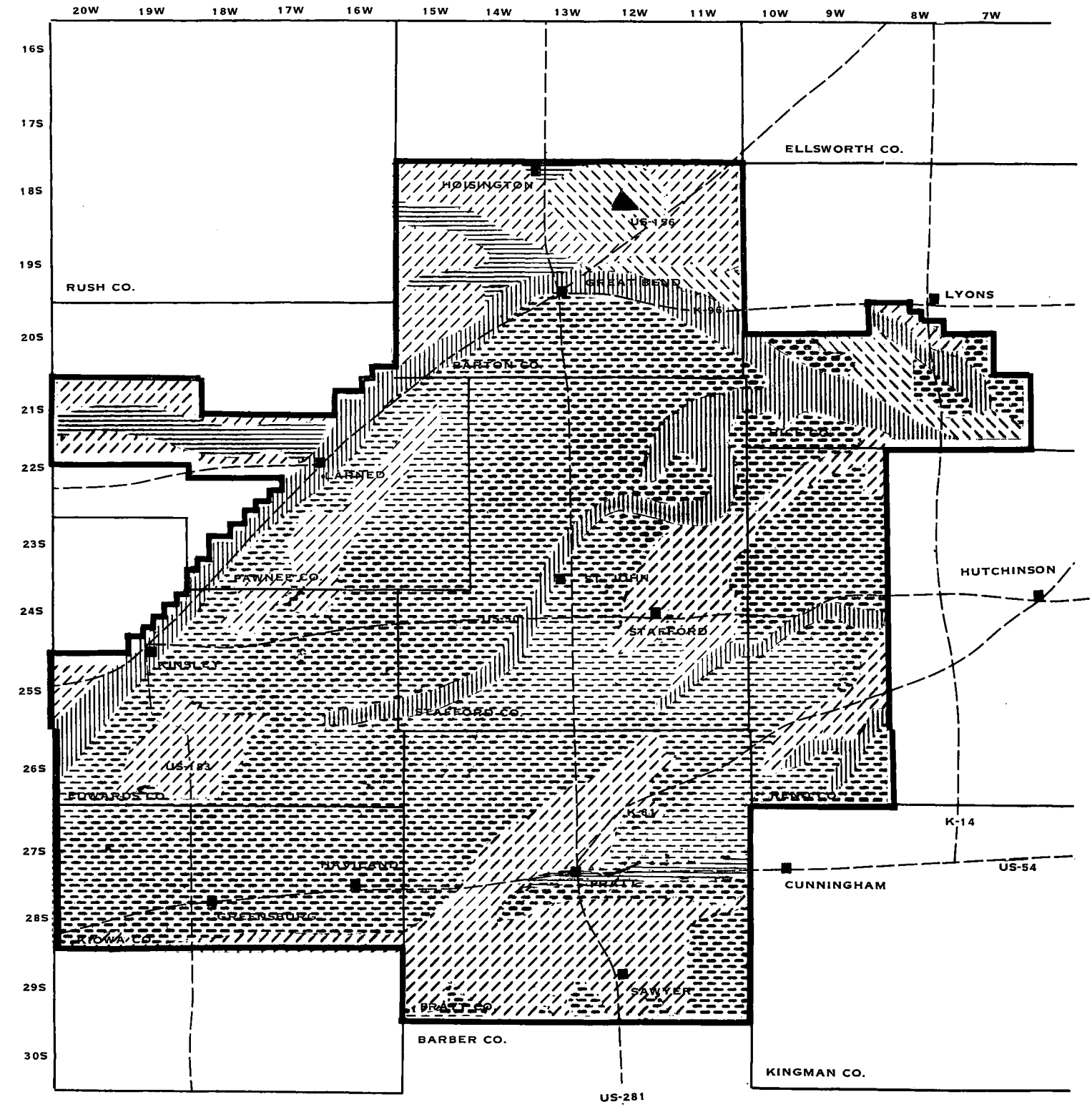
B. Area: These are flood plain areas of the major rivers such as Arkansas River, Rattlesnake Creek, South Fork of the Ninnescah River, and North Fork Ninnescah River. These flood plains consist of poorly drained and somewhat poorly drained sandy and loamy flooded soils. They are deep to shallow over sandy strata with a fluctuating water table. They are slightly to moderately saline. Most are frequently flooded and some small areas have salt-affected spots. The main concerns of soil management are flooding and soil blowing.

C. Area: These are flood plain areas such as the Pawnee River, Walnut Creek, Blood Creek, Deception Creek, Cow Creek and Little Arkansas River. These flood Plains consist of deep, silty and loamy soils and some smaller areas of clayey soils. These are mainly well-drained but are flooded and generally have water tables at depths greater than 6 feet. The main concerns of soil management are flooding and soil blowing.

D. Area: These are uplands, consisting of moderately sandy, and clayey areas of Barton, Pawnee, Edwards, Kiowa, Stafford, Reno, Pratt, and Rice Counties. It is the largest area of the district. It is formed in old alluvium that has been reworked upon the surface by the wind. Soils are deep and range from clay to sand. They are dominantly moderately sandy. They are fertile and well-drained except small areas are low, wet, and poorly drained and formed in clayey alluvium or sandy or loamy materials underlain by clay. Other small high areas are sand hills. The main concerns of soil management are soil blowing and soil drainage of low areas. The slope gradient of this entire area is low or very low and suitable outlets for excess water are difficult to establish.

E. Area: These are terrace and uplands consisting of silty to clayey soil areas mainly in Barton, Rice and Reno Counties along the Arkansas River and Peace Creek. These soils are deep and slowly permeable to very slowly permeable and have varying degrees of salt accumulation layers. Saline and alkali spots are common. The main concerns of soil management are soil blowing and maintaining tilth and fertility.

Big Bend Groundwater Management District



- A. Hardlands
- B. Sandy and Loamy Flood Plains.
- C. Silty Flood Plains.
- D. Loamy, Clayey, and Sandy Uplands
- E. Silty to Clayey Terraces and Uplands.

△ Cheyenne Bottoms

Soil Areas by: Darrell A. Dodge
Soil Scientist: Kansas State Extention

DISTRICT BOUNDARY

COUNTY LINE

GROUNDWATER RELATED PROBLEMS

Two hundred fifty (250) applications for permits to appropriate groundwater were received within the boundaries of the Big Bend Groundwater Management District during the three month period from January 1, 1976 to March 1, 1976. This demonstrates the fantastic growth rate of irrigation in our district. Presently, there are approximately four thousand (4000) points of diversion within the district for which application to appropriate groundwater for beneficial use has been made. Even with the excellent natural recharge associated with the district, areas with shallow saturated thicknesses could display critical declines during prolonged drought periods.

The quality of the major groundwater aquifer is generally quite acceptable over the western portion of the district. However, poorer quality groundwater is often encountered at deeper depths in the eastern one-half (½) of the district. This saline tendency is principally associated with the dissolution of salt from several bedrock formations deposited during the Permian period of geological history, approximately 230-280 million years ago. These formations include the Cedar Hills Sandstone, the Salt Plains Formation, and the Harper Sandstone.

Man-made saline pollution has also occured in various portions of the district. The ancient practice of storing oil field brines in open pits has created unreasonably high salinity groundwater in localized areas. In addition, history has borne witness to the drilling of thousands of holes for oil exploration as well as irrigation purposes. Contamination of fresh-water aquifers may have occured if these holes were not properly plugged. Isolated instances of this type of contamination have arisen on occasion, the brackish water bearing mute testimony to the seriousness of improper plugging.

Questions concerning the future status of our groundwater quality remain. In eastern areas of the district, saline water intrusion into the shallower, fresh groundwater aquifer might occur if groundwater withdrawals become excessive. In addition, the potential for pesticides and herbicides leaking into the groundwater aquifer is as yet undetermined. These and other questions must have answers.

OUTLINE OF THE MANAGEMENT PROGRAM

The Management Program of the Big Bend Groundwater Management District primarily stresses the conservation and management of groundwater resources in order that the quality and quantity of this resource will be maintained to meet the present and future needs.

1. Establish a Data Bank
    a. Measurement of Water Withdrawal
    b. Measurement of Water Level
    c. Determination of Aquifer Recharge
    d. Establishment of a Water Quality Monitoring Program
    e. Collection of Other Pertinent Data

2. Discourage Waste of Water - Encourage Tailwater Re-use Systems

3. Develop an Educational Program Concerning Optimum Water Use

4. Develop Criteria for Proposed Beneficial Uses of Water
    a. Develop Well Spacing Criteria
    b. Develop Guidelines for Appropriation of Groundwater
    c. Other Pertinent Information

5. Explore and Develop Various Methods to Augment Groundwater Recharge

6. Advise in the Management of Drainage Problems and Surface Water

7. Exert Action to Prevent Water Pollution

SYNOPSIS OF THE MANAGEMENT PROGRAM

It is felt that the objectives and purposes of the district can best be accomplished by a combination of programs to provide for the orderly and economical development, wise use and responsible management of water available to the people of the district. This will include the investigation of quantity and quality of water presently available, efficient use and management of existing water.

1. Establish a Data Bank

Research, investigation and collection of data on the hydrological characteristics of the groundwater supplies and their use in the district is essential to develop a comprehensive management program. A great deal of information has been accumulated through state and federal research programs. The district will utilize all available information, and develop or assist with the development of additional information as required to develop management techniques needed. Individual studies of interest to the district are as follows:

A. Water level measurements - utilize data from measurements collected by local, state and federal agencies and expand such data collection within the district as necessary to allow the monitoring of the water level and preparation of water level maps.

B. Aquifer recharge and groundwater withdrawal measurements - utilize pertinent data to determine the degree of recharge to and withdrawal from the principal aquifers within the district.

C. Water quality - study or encourage study to investigate and monitor the quality of groundwater within the district. To locate and identify sources of salt water pollution, whether natural or man-made, and implement such procedures and action as may be needed through appropriate agencies.

D. Water use study - update existing data and collect additional information relative to the number, location and physical characteristics of wells within the district. These data will be used to assess water use within the district and help develop management programs.

E. Interrelationships of surface and groundwater within the district - encourage the study of such relationships by the appropriate state and federal agencies.

F. Legal aspects of water and its use - study the legal aspects of water use, potential management programs and related matters. Provide input into legal or legislative matters affecting the use of water within the district.

2. Discourage Waste of Water - Encourage Tailwater Re-use Systems

A. Irrigation Application Losses - Studies show that under normal irrigation practices, approximately 15 to 30% of the water applied by irrigation is either lost by tailwater runoff or deep percolation in the field. However, tailwater systems to collect and reuse this water are common in various parts of the district. In addition, some of this water apparently re-enters the aquifer as recharge and is only temporarily lost.

Tailwater systems generally offer an economical way of utilizing runoff water, improving the overall irrigation application efficiency, and improving the recharge capability of the system. In addition, they can be utilized to collect rainfall runoff for utilization or recharge to the aquifer. The district will encourage the use of tailwater re-use systems on both surface and sprinkler type irrigation.

B. Industrial and Irrigation Water Waste - Through the development of memorandums of understanding with the Division of Water Resources, Kansas Board of Agriculture, and the State Department of Health and Environment, immediate action will be taken on the pollution and flagrant waste of water.

3. Research and Education on the Conservation and Efficient Use of Water

Continuing research is needed to develop techniques of producing optimum crop yields with minimum water. The district will encourage research on efficient and economical use of water. The district will also provide leadership in the demonstration of the use of efficient irrigation systems and

practices. Special items of interest include:

A. Encouraging optimum irrigation and agricultural practices to minimize the use of water.

B. Encouraging the wide use of water meters and other measurement devices as a management tool to assist with the proper application of water. The district will assist with the selection and procurement of recommended devices, installation instructions and other matters related to their use.

C. Encouraging the development and use of crops requiring less water.

D. Demonstrating methods or practices to more efficiently use rainfall and reduce evapotranspiration.

The district will compile and present information relative to the efficient use of water for irrigation and other purposes. The members of the district will be informed of district programs and activities through news releases, publications, newsletters, and meetings.

4. Water Appropriation Rights

The district recognizes that a water right is a real property right. However, any use of water shall be within the limits of an existing water right. The district will cooperate with the Division of Water Resources, Kansas State Board of Agriculture, to determine reasonable rates of diversion and annual quantities for proposed beneficial uses of water within the district.

The district feels the matter of additional large capacity wells and their location within the district requires special attention to insure the proper management of the available groundwater resources. The planning of this process is essential to protect the public interest and rights of present and future water users within the district. The following policies are hereby adopted to help accomplish this objective:

A. Applications for Beneficial Use of Water

Through an agreement with the Chief Engineer, Division of Water Resources, copies of all new applications filed for a permit to appropriate water for beneficial use within the district will be submitted to the district for

recommendation. The district may assist in the preparation of said applications, but it will be the responsibility of the applicant to submit the application to the Chief Engineer.

B. Well Spacing

1. With the exception of those wells described in subsection no. 3, the minimum spacing of all non-domestic wells described in an application to appropriate water for beneficial use shall be one-quarter (¼) mile from all other non-domestic wells which carry an earlier priority, and one-eighth (1/8) mile from all other earlier priority domestic wells, except those domestic wells whose interests are represented by the applicant's own interests.
2. The location of a well requested under a change in point of diversion shall be no more than thirteen hundred and twenty (1320) feet from the point originally authorized by a vested right, appropriation right or an application to appropriate water for beneficial use. Such wells shall meet the minimum spacing requirement established in section (1) except in instances when the replacement well is drilled within fifty (50) feet of the originally authorized point of diversion.
3. Each non-domestic well which proposes the diversion or withdrawal of groundwater from the dakota aquifer or any other consolidated aquifers shall be one (1) mile from all other wells withdrawing groundwater from the same formation, including domestic wells, but excluding those domestic wells whose interests are represented by the applicant's own interests.
4. If a well is to be abandoned and replaced, the owner or operator shall abandon such well in accordance with Kansas Department of Health and Environment Guidelines when the replacement well is completed.
5. Each application to appropriate water for beneficial use shall include no more than one well per application.

C. Appropriation of Groundwater

The intent of the Big Bend Groundwater Management District is to develop a comprehensive groundwater withdrawal program in order to balance long-term withdrawals with average annual recharge. This concept is generally referred to as the safe-yield concept.

The average annual recharge associated with the unconsolidated deposits located in the Big Bend Area is substantially greater than the recharge associated with the Ogalalla Aquifer in western Kansas. Nevertheless, our groundwater aquifer cannot support unlimited withdrawals of groundwater without eventually depleting this resource.

In January 1977, an expanded program concerning annual water level measurements was initiated through personnel and/or financial contributions from the Division of Water Resources, the Kansas Geological Survey, the United States Geological Survey, and the Big Bend Groundwater Management District. Several years of data acquisition of this type should supply sufficient information to determine the actual degree of recharge to our district. However, portions of our district may well have initiated groundwater mining before this data can be obtained, analyzed and massaged.

A best estimate of average annual recharge to the groundwater aquifer under a precipitation regime averaging twenty-four (24) inches per annum is five (5) inches, or approximately twenty percent (20%) of average annual precipitation. In addition, land under irrigation may apply up to eighteen (18) inches of groundwater in most instances. It is estimated that approximately three (3) to four (4) inches of this additional source of water may be available for recharge. Thus the recharge of groundwater within a two (2) mile radius in an average annual year is estimated as follows:

1. recharge from precipitation: 3350 acre-feet
2. recharge from irrigation: 2650 acre-feet
3. total average annual recharge: 6000 acre-feet

It should be noted that the recharge calculated in (2) assumes that all land within a two (2) mile radius is being irrigated. In reality, however, the procedure outlined in sections (a) through (f) inclusive which follow will probably allow only fifty (50) percent of such land to be irrigated.

The district recognizes this fact and chooses to allow this additional quantity of groundwater to be allocated until such time when future recharge data indicates otherwise.

Based upon these present best estimates, the following guidelines shall be initiated to achieve the district's safe-yield objective:

(a) When an application to appropriate water for beneficial use (other than domestic) is received by the Division of Water Resources, each earlier priority non-domestic well lying within a two (2) mile radius of the proposed point of diversion shall be noted.

(b) The quantities of water authorized by the vested right, prior appropriation rights, and earlier priority applications for permits to appropriate water shall be totaled.

(c) If an earlier priority application, permit, certificate, or vested right covers more than one well, but all wells do not lie within the area designated in (a), then a reasonable quantity of water shall be allocated to each well based upon best available information. If such information is unavailable, the quantities applicable to each of such wells shall be of equal proportions.

(d) The limitation clause ascribed to applications, permits, or certificates which contain wells and/or land covered by prior applications, permits, or certificates shall be in force to determine the maximum quantities of groundwater which may be withdrawn under earlier priority applications.

(e) The quantities of groundwater attributed to the prior rights plus the quantity requested by the application in question shall then be summed. If this total quantity of groundwater exceeds six thousand (6000) acre-feet, the application shall not be approved.

(f) The previous process shall apply only to non-domestic uses of water.

(g) If all the land within the two (2) mile radius of the proposed point of diversion does not lie within district boundaries, then the quantity of water referred to in (e) shall be reduced proportionately by the percentage

of acreage lying out side of said district boundaries.

(h) The quantity of water specified in (e) may be revised as future recharge data is made available to the District.

D. Well Standards

Since well drillers now must complete a log on every well drilled, the Board of Directors would request cooperation with the State Dept. of Health and Environment and Division of Water Resources to have access to log reports and also that all water quality reports filed along with the log report be made available to the Board of Directors.

It is also recommended that all new large capacity wells, greater in capacity than 100 gallons per minute, completed within the district after January 1, 1977 shall be:

1. Equipped with an opening properly designed for a flow meter as approved by the district to measure the capacity and quantity of water diverted by said well.

2. Equipped with an access tube or other such device as approved by the district to allow the measurement of the water level and drawdown in said well.

3. Equipped with check valves to prevent pollution of aquifer by fertilizer, herbicide, insecticide, etc.

E. Allowable Appropriation

Applications for permit to appropriate water for beneficial use shall not be approved nor certified for a quantity of water in excess of one and one half (1½) acre feet per acre irrigated for the use of water intended for irrigation. For other uses, it must be demonstrated to the satisfaction of the Board and the Chief Engineer that the proposed use is reasonable, will not impair an existing right, nor unreasonably or prejudicially affect the public interest.

F. Variances to Management Policies

The District may recommend exceptions to the preceeding policies (A) through (E) on an individual basis to the Chief Engineer provided that it is proven to the satisfaction of the board of directors that such exceptions neither will impair a use under an existing right, nor prejudicially and unreasonably affect the public interest.

5. INCREASING GROUNDWATER RECHARGE

A vitally important aspect is the collection and use of run-off. From the research which has been conducted by the U. S. Geological Survey, it has been found that vast amounts of water can be held and recharged into the aquifer. Due to the land characteristics of our district, rolling sandy pastures, the area has a high degree of recharge rate. The district is fortunate in this asset. The District recommends the following types of structures to facilitate recharge:

A. An embankment-type of construction should be utilized where there are natural waterways. We encourage this type of construction because of its higher degree of recharge.

B. On center-pivots and leveled ground, the construction of tailwater pits located in the lower area which could contain both irrigation tailwater and a 0.7-inch runoff as determined by the local Soil Conservation District.

A return system should be utilized in both types of construction.

The District recommends the use of both types of collection structures, open pits and embankment-type installations, on dryland to control normal rainfall which should benefit the recharging of the aquifer.

In addition, the District may assist in the development of imported water projects or construction of surface water storage structures as alternate sources of water supply.

DISTRICT OPERATION

The district will be managed from an office in St. John, Kansas. Additional offices may be established within the district as necessary. The board of directors will be responsible for setting policy and objectives for the district to accomplish. The district will employ such staff as necessary to carry out the programs of the district. This will initially include a district manager and a secretary.

The board of directors recognizes the need for the best possible management of the available resources. Because of this, as much local input as possible is being directed at new and improved methods of managing the water supply. This will be accomplished through research, education, demonstration projects and management guidelines.

The board of directors will meet the second Thursday each month to review activities of the district and develop programs. An annual meeting for all eligible voters will be held early each year to provide information about the district's progress and allow for input from the membership.