Request for Rattlesnake Creek LEMA Submitted to the Chief Engineer, Kansas Department of Agriculture, Division of Water Resources

XXXX XX, 2017

In an effort to address Rattlesnake Creek streamflow concerns and to provide a remedy to the Quivira National Wildlife Refuge ("the Refuge") impairment in Big Bend Groundwater Management District #5 ("the District"), the District Board of Directors proposes the following ten-year plan be submitted via the Local Enhanced Management Area ("LEMA") process per K.S.A. 82a-1041for an area designated in Attachment 1.

Overview and Goal Expression

The goal of the LEMA is to address conditions which require regulation in the public interest regarding streamflow and aquifer depletion within an area of enhanced management (Attachment 1) and to provide streamflow augmentation to the Rattlesnake Creek stream channel. The LEMA is intended to reduce the hydrologic stress from irrigation operations on the aquifer and interrelated stream systems, while capturing other sources sufficient to restore the supply to prior uses on the stream system. The particular objectives are to temper by half the growth of future streamflow depletion, and to restore the useful supply to diversion points on the lower reaches of Rattlesnake Creek.

This LEMA shall exist only for the ten-year period beginning January 1, 2018 and ending December 31, 2027. The proposed LEMA shall include all points of diversion whose source of supply is within the LEMA boundaries.

The LEMA will combine the efforts of several parties to create a holistic approach to stabilizing the use of water in and around the Rattlesnake Creek subbasin. The District is seeking partner agencies at the state and federal levels in addition to working with both public and private organizations to bring all available resources together into a unified plan.

1) Background

The District has, for the past forty (40) years, striven to fulfill the following mission statement:

> *"Big Bend Groundwater Management District #5 was organized 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 (K.S.A. 82a-1020-1035) establish the right of local landowners and water users to determine their own destiny with respect to the use of groundwater within the basic law of the State of Kansas"*

In the years leading up to the establishment of the District, the local landowners made a large investment to construct and operate wells for irrigation, stockwater, industrial and other types of beneficial use. The District's management programs and subsequent regulations have greatly limited the groundwater development in many areas of the District.

In the District's first management program approved June 6, 1976, the Board of Directors recognized the unique nature of the local area and implemented guidelines to protect and conserve the Great Bend Prairie aquifer. These included strict monitoring of water use with flow meters, well spacing requirements, discouragement of waste of water and encouragement of the re-used water sources. In the 1979 district management program, the Board of Directors implemented a safe yield policy and maximum reasonable quantity for irrigation to limit the development even further. The District further solidified the safe yield for the area through the promulgation of K.A.R. 5-25-4 in 1980. By revising K.A.R. 5-25-4 in 1984, the Board of Directors further limited the safe yield policy to 3,000 acre-feet ("AF") in a two-mile radius. The District formally closed to new appropriations on December 17, 1998 through another revision to K.A.R. 5-25-4. As a result of these management objectives and regulations, the water level declines have been limited. In severely dry years, the District does experience declines in the local Great Bend Prairie aquifer. However in years of average to above average precipitation, the District recharges quickly.

In 1993, the Rattlesnake Creek Partnership ("Partnership") was formed to develop and implement solutions to water resource concerns within the subbasin. The Partnership was comprised of the District, Water Protection Association of Central Kansas ("Water PACK"), Kansas Department of Agriculture – Division of Water Resources, and United States Fish and Wildlife Service. In 2000, the Partnership developed the Rattlesnake Creek Management Program ("program") following several years of hydrologic study and public outreach. The program utilized new management tools (end gun removal, water banking, augmentation, multi-year flex accounts, etc.), education outreach program, and enhanced compliance and enforcement to achieve the established goals. Several of these programs were voluntary/incentive based tools that were not available at the beginning of the program. In fact, some of the programs did not get significant participation until after 2012. As a result, not every conservation goal outlined in the program was met at the end of the program in 2012.

In 1999, a task force was established to study the viability of water banking in Kansas. The task force determined that water banking could be a powerful incentive-based tool for conservation that will result in water being put to its most economic and beneficial use. However, there was no mechanism in Kansas statutes that would allow their establishment in Kansas. In 2001, K.S.A. 82a-761 *et seq*. was adopted by the legislature. K.S.A. 82a-765 requires that each chartered water bank will result in a savings of 10% or more in the total amount of groundwater consumed for a representative past period. In 2005, the Central Kansas Water Bank Association ("Association") became the first chartered water bank in the state. While the Association covers the same geographic boundaries, has the same staff, and utilizes the same monitoring network as the District, the Association is governed by a separate board of directors and funded entirely through its own administrative fees. The Association has undergone several changes since its inception in 2005, but still offers the same services to the water users of the region. The Association offers area water users with two programs for the flexible use of the water resource. The first program is for the transfer of a portion of the historical water use of a water right(s) to other areas within the same subbasin. The second program allows a portion of unused water to be preserved for future use at the same location. These programs have gained in popularity and giving water users added water use flexibility while conserving water.

In 2008, the District, with technical assistance and peer review from the Partnership, contracted with Balleau Groundwater Inc. to develop a high-resolution hydrologic model of the District

(Balleau Groundwater, Inc., 2010). This hydrologic model is designed to have seven layers representing unique geologic formations below the ground surface. One of the primary reasons for multiple layers is to be able to track the movement of water between these layers. This is especially important for the area surrounding the Refuge, where the tracking of poor quality water will be important. The model has been the primary tool utilized by KDA–DWR and other stakeholders to evaluate the effects of groundwater pumping and surface drainage within the subbasin. However, the majority of the work conducted by KDA–DWR to date has been done using an alternative version of the model which flattens the seven layers into a single layer. When evaluating water movement, specifically lower quality water, the seven-layer model is the only option available that can conduct this analysis properly.

On April 8, 2013, the Service officially filed an impairment claim on the Rattlesnake Creek against junior appropriators within the subbasin. The Service stated that junior appropriators were reducing the flows in the Rattlesnake Creek such that their use prevented the Service from exercising Water Right File No. 7,571. Following this filing, the Chief Engineer and KDA-DWR staff began investigating the hydrologic effects of junior pumping on the subbasin. The District's hydrologic model was used to conduct this investigation in addition to further discussions with Service staff regarding water management at the Refuge. In July 2016, the Chief Engineer published the final report detailing the investigation (Barfield, 2016).

Since 2016, the District has submitted proposals to the Service in an effort to settle the impairment through agreement (Big Bend Groundwater Management District No. 5, 2016) (Big Bend Groundwater Management District No. 5, 2017). These proposals have been declined. The District remains committed to working to resolve the impairment utilizing the most current science and the most effective tools and programs available.

2) Reduce Hydrologic Stress and Augment Depleted Flows

a. The District will work with water right holders and users to enhance the water use efficiency for all types of use within the LEMA boundary including, but is not limited to, irrigation, municipal, stockwater, recreation, domestic, and industrial uses.

i. Irrigation Use: This will be achieved by requiring the removal of any nozzle that is larger than the previous nozzle on the center pivot system. Effective January 1, 2018, all of these types of end nozzles will be removed to prevent the wetting of the acres beyond the end of the center pivot system.

District staff has compiled a database of the end guns within the LEMA boundary. These locations are indicated in Attachment 2. As of January 2015, the District determined that there were 1306 end guns installed on center pivot systems within the LEMA boundary. The District has worked hard to estimate the water savings that will result by removing end guns. Several methods for estimating the water savings have been evaluated and the most accurate estimation would be based on the actual water use history of the area and the average application rate for the end guns. It is estimated that ten percent of water pumped through the center pivot system passes through the end gun. The historic water use (1990-2016) is approximately 177,000 AF for the water rights that had an end gun installed at the time of the District's assessment. In 2010, the

District partnered with USDA-NRCS through the Agricultural Water Enhancement Program ("AWEP") to remove end guns from 85 center pivot systems. The historic water use (1990-2010) for those systems is approximately 12,825 AF for those systems that participated in AWEP. The District feels it is important to recognize the water users that participated in AWEP in an effort to highlight their past conservation efforts. Therefore, by assuming that 10% of the water used historically went through the end guns, the District estimates a savings of 18,982 AF. Modeling suggests that this amount of reduction in pumping will lessen the growth of future depletion at Zenith, but will not produce the halving of the trend that is sought as an objective. Additional management action is needed to meet that target. The model suggests that another 3500AFY of consumptive use needs to be curtailed in the focused area 5 to 10 miles around St John (Attachment 3), to attain the targeted halving of future depletion trends.

In addition to the removal of end spray nozzles on center pivot systems, the use of other technologies that increase the efficiency of water use will be promoted. Such technologies include, but not limited to, mobile drip irrigation, soil moisture probes, telemetry monitoring, and variable rate irrigation.

Water technology farms are a good way to showcase these technologies to nearby producers. Through these farms, producers can see how the implementation of new technologies can save water while maintaining or improving the economic viability of the area. Through the LEMA, the District will work to promote the establishment of additional technology farms within the LEMA boundary.

ii. Municipal Use: According to the U.S. Geological Survey, (Lanning-Rush & Restrepo-Osorio, 2017) the average gallons per capita per day (gpcd) for public water suppliers (PWS) in Kansas is 114 gpcd over the past 5 years. There are seven PWS within the LEMA boundary:

Public Water Supplier	GPCD (2011-2015)	UFW (2011-2015)
Belpre	152	21 %
Greensburg	283	11 %
Haviland	152	8 %
Macksville	123	12 %
Mullinville	203	15 %
Stafford	124	12 %
St John	140	20 %

The U.S. Geological Survey study also calculated the percent unaccounted for water (UFW) for each PWS. The gpcd and ufw are listed above.

The Great Bend Prairie Regional Advisory Committee ("the RAC") has a goal to attain less than 20% water loss by 2025. The RAC's goals go on to reach less than 10% water loss by 2045. The District will work with the RAC and each municipality to reduce the gpcd and ufw. This will involve educational outreach to schools and public service groups.

iii. Stockwater Use: There are thirteen feedlots within the LEMA area. The District will work with each facility, KDA–DWR, and KLA to improve the efficiency of water delivery where feasible through existing tools available. Some of these tools are the utilization of thermostatically controlled tanks vs continuous flow water tanks and the implementation of water reuse systems. The water savings will be on a case by case basis.

iv. Recreation Use: There are 31 water rights within the LEMA area for recreation use. The District intends to work with each to ensure the water being utilized for this use is put to beneficial use when appropriate for the area in which they are diverting water.

v. Industrial Use: There are 26 water rights for industrial use within the LEMA area. These uses will be reviewed to determine if where water efficiencies can be gained. Encourage the use of lower quality water where feasible as a replacement for high quality water.

3) Schedule and Verification of LEMA Operation

a. End-Gun Program

Reducing the stress from pumping will entail taking action to curtail some of that use. The District has records of each such water operation. The District will verify the quantity conserved through the removal of end guns by analyzing the nozzle size, pressure, duration of end gun operation, manufacturer data sheets, gpm during operation, and volume in AF per year for each end gun. The end guns removed during the AWEP activity provide a portion of this information and water users will be asked to provide any remaining information needed. Representative numbers (12 to 20) of sites will be chosen from those systems that participated in AWEP to confirm quantities for typical set-ups per manufacturer and geometry. This curtailment of end gun use is to be implemented in the first year of the LEMA. A few dozen pre-1957 priority operators can be excluded from the end gun curtailment program. Image analysis of wetted footprint as indicated by change in vigorous vegetation will be used to support a cumulative acreage from the sites with end guns removed during the implementation period. An example image of year 2017 end gun acreage to be verified as dry in the future is Attachment 4. The reduced vegetation area and NIR will be compared to the reported and validated data of water pumped to show whether deficit or surplus irrigation was applied. The characteristic consumptive fraction will be used in the model calculation of results at Zenith gage.

An additional 3500 AFY of consumptive use will be curtailed by administration in the area, nominated Area D by the CE, of focused impact on the stream in the vicinity of St John (Attachment 3).

The response expressed as lesser growth, by half of the "no action" trend, of depletion at Zenith gage and at the diversion points of Quivira NWR will be seen slowly during and beyond the 10-year LEMA period. It is not practical to measure that response at the gage, due to the other factors (weather and a myriad of variables in streamflow other than irrigation) that affect the baseline in the absence of the LEMA program. This "with and

without, but for, or counterfactual" problem for observing the effects of a management intervention is systematic and often insurmountable in hydrologic field data where the signal sought is smaller than the background variation. As an alternative means of verifying effects, monitoring and verification of the beneficial impact of the end gun program will be reported for each review period using the model. The model will be applied as it was used for identifying the projected amount of impairment in the Chief Engineer's report. The verified change in water consumption from farm inspection and from image analysis will represent the reduced stress. The response at Zenith gage will be solved for in a manner analogous to the impairment report.

b. Augmentation Program

In 2014, Governor Sam Brownback signed into law a provision specific to the Rattlesnake Creek subbasin to "allow augmentation for the replacement in time, location and quantity of the unlawful diversion, if such replacement is available and offered voluntarily." This legislation had overwhelming supporting testimony from several groups from across the State that resulted in unanimous action from the Kansas legislature to approve this bill. The concept of augmentation is to utilize the aquifer underground as a reservoir to supply water to the stream in times of shortage.

Augmentation will be implemented from a to-be-constructed wellfield designed for 15 cfs (cubic feet per second) capacity. Based on the analysis conducted by Balleau Groundwater Inc. ("BGW"), the intent of augmentation is to provide an additional tool to enhance the unique habitat the Refuge provides for various endangered species. The ability to utilize underground storage of water in times of need further protects "the biological integrity, diversity and environmental health of the Refuge." The area surrounding the Refuge has been underdeveloped for large scale irrigation historically due to the water quality in the upper zones of the aquifer. However, this area does have a substantial quantity of water that can be appropriated in a sustainable manner. The sources supporting the augmentation wellfield have been examined in a water-accounting model as was done in the impairment analysis. The yield is supported by induced capture of evapotranspiration from adjacent water-logged soils and wetland vegetation, in addition to sources captured from formerly-rejected recharge by making space available in the aquifer. Rattlesnake Creek is to be augmented by waters that are now lost to the atmosphere, bypassed as storm runoff in Peace Creek, or discharged as brackish baseflow to the east. This further supports the concept of augmentation as a remedy for the impairment at the Refuge.

According to the various augmentation studies conducted within this subbasin, there are several key factors that need to be addressed. These include, but are not limited to: wellfield location, wellfield capacity, pumping rate, delivery rate, water quality, delivery frequency, and delivery location. The District has analyzed augmentation for each factor.

i. Location

A wellfield south of the Refuge has been identified as an optimal location for the foreseeable future. The precise locations of this wellfield have not been finalized as further studies will be needed to determine water availability and quality. However, a conceptual augmentation system is shown in Attachment 5. The water table in this area is stable

enough to support augmentation. The large-scale development for irrigation and other practices has been limited due to the natural water quality in the area. The water quality in the upper zones of the aquifer is very similar to the water quality already feeding the Little Salt Marsh. The conceptual wellfield is thought to overlie areas that can safely yield higher quantities of freshwater without risk of up-coning of poor quality water. Further site specific test drilling will be required to ensure proper placement of wells in a way to protect the upper zone of the aquifer from degradation. The multi-layer aquifer model simulates shallow fresh-water ingress to the wells at a higher rate and volume, dominating and diluting any smaller upward migration from saline sources. Observation wells will be installed to provide additional locations to test water quality and verify water table elevations, and eventual trends of water quality. The concept is to use a location in T23S, R10W south of Peace Creek and west of Salt Marsh Road. Wells will be sited with screen lengths and depths to access the yield and quality of water suited to the Refuge requirement as presented, or the range of 3000 to 9000 µS/cm in terms of Specific Conductance.

ii. Diversion & Delivery Rate

The District will pay the cost to develop, construct, and operate a 15 cfs wellfield south of the Refuge. The Chief Engineer has indicated that 15 cfs is the appropriate max flow rate/instantaneous capacity. Water will then be delivered directly to the Rattlesnake Creek channel immediately upstream of the Refuge. The discharge released to the stream is intended to make up the diversions required to serve the Refuge water right file # 7571 of 1957 priority date. Depletion of the stream will be relieved to the extent that the end gun program slows the future growth of effects on the stream. That effect is not expected to fully reverse trends or to provide a complete offset of future depletion; thus the augmentation wells will serve to deliver flow sufficient to meet the objective for serviceable supply on this reach of Rattlesnake Creek. Water lines will be installed in a manner that will minimize any disturbance to surface lands and utilize already authorized right of ways where possible to get access to the creek channel. This delivery location complies with the statutory requirement of K.S.A. 82a-706b (a)(2) to allow augmentation as a remedy. It is assumed that an NPDES permit will be applied for and approved due to the similarity of ground and surface-water quality in the area. Kansas Surface Water Quality Standards recognize the chloride content of Rattlesnake Creek above Little Salt Marsh being 1400 mg/l.

iii. Real-Time Operation

The hands-on operation of the augmentation wellfield does not hinge on knowing the magnitude of effects from the end gun program. The wellfield will deliver a make-up flow to the stream depending on conditions of streamflow and diversion requirement as observed. Diversion requirements are given by the Refuge and applied with practical considerations in the Chief Engineer impairment analysis and subsequently. The 15 cfs wellfield has the ability to serve those requirements. Calculations and diversion reports suggest that about one-third of the time augmentation will not be needed, one-third of the time the 15cfs will be needed, and a wellfield release of 5 or 6 cfs will characterize the middle third of days. The Refuge is understood to have operable storage capacity to accommodate at least a week's volume if the deliveries over or under perform for a few cfs for a few days. The District proposes that the delivery rate be set weekly in coordination with Refuge requests and DWR staff review of conditions on the stream. Rain, high flows

or bypass of the Refuge diversions would warrant shut-down of augmentation delivery, then restoration when those conditions pass. The Refuge reports about 25cfs as the peak month average diversion rate. If that is the current diversion capacity on the Refuge, then augmentation can be shut down at higher flows. The Refuge and District will need to coordinate such factors. A practical protocol for augmentation timing and flow rates is to be developed in coordination with the interested parties. As confidence in standard practice is realized, the initial hands-on control of discharge might be handed over from The District to DWR or Refuge staff.

iv. Annual Water Quantity

The augmentation well field will release an adequate volume of suitable groundwater delivered to the creek channel for use by the Refuge to meet the management objectives for maintaining forage and habitat. The water provided will be measured for rate and quality at the point it is placed in the creek channel. The capacity of the wellfield exceeds the 5000AFY amount suggested to relieve the impairment of the Service's water right at the Refuge in the Chief Engineer's final impairment report. In the Chief Engineer's final impairment report, the analysis conducted was retroactive and reviewed any impairment that may have occurred prior to the Refuge's claim of impairment in 2013. Based on a prospective analysis by BGW that looks at years after the 2013 claim of impairment, augmentation pumping is sustainable, effective, and does not degrade the quality of water the Refuge requires. The authority for such water will be processed in the same manner as any other water right with KDA–DWR. This evaluation by KDA–DWR will further ensure that there will not be an increase in permitted consumptive use in the area. The new appropriative water right will be considered non-consumptive as the quantity authorized will be combined and limited to the authorized quantity already appropriated under Water Right File No. 7571. In no calendar year will the combined quantity diverted from the augmentation well fields and the surface diversions at the Refuge exceed 14,632 AF.

v. Water Quality

The quality of this water would fall within the specified range (3000 to 9000 µS/cm) presented by the Service. The water quality can be managed based on the requirements of Refuge staff by providing more or less fresh water from redundant capacity of wells with varying water quality. As stated before, the water quality in the aquifer surrounding the Refuge is to the source of the baseflow water quality utilized in Little Salt Marsh. As a result, the water quality at the Refuge will not be altered in suitability for use through the implementation of the augmentation plan. Coordination with Kansas Department of Health and Environment will be crucial in this process to ensure the water quality of the Rattlesnake Creek stream channel is maintained throughout this project.

vi. Drought

In times of severe drought, as defined by the Palmer Drought Severity Index of -3.0 or less, augmentation will continue to be provided to those water management structures defined in the Service's water conservation plan as adopted in October 2000. The following is the implementation plan for initializing the Drought Contingency Plan per the October 2000 water conservation plan:

1. *If the mean daily January flow at Zenith gage (Rattlesnake Creek near Zenith) is*

less than 25 cfs, the Refuge will anticipate that a drought year may occur.

2. *A review will be made in July using the Palmer Drought Severity Index to determine if drought conditions exist. Palmer Drought Severity Index in Region 8 of Kansas is -3.0 or lower, most diversions to the north of Pools 14A and 14B will cease, and water will be primarily concentrated in Pools 5, 7, 10A, 10B, 11, 14A, and 14B.*
3. *Diversions from the Little Salt Marsh (Pool 5) will continue to be made until it is determined that wildlife habitat in the Little Salt Marsh is being detrimentally affected to the point that it offsets the benefits of putting it in another unit, at which time all diversions out of the Little Salt Marsh will cease.*
4. *Water will primarily be maintained in Pools 5, 7, 10A, 10B, 11, 14A, and 14B, unless sufficient precipitation occurs to raise the Palmer Drought Severity Index to greater than -1.0 or streamflow recovers to the point where it becomes possible to fill units to the north of the designated units.*

Augmentation shall not occur in times of bypass flow or times of release from storage in Little Salt Marsh. The augmentation water must be put to a concurrent beneficial use or held in storage for later beneficial use.

4) Central Kansas Water Bank Association

a. The District is fortunate to have the only functioning water bank in the state of Kansas. This provides a unique opportunity to allow for additional flexibility in the water use of the area while implementing real water conservation. In the early years (2005-2010), there was little participation in the Association due to restrictive rules, uninformed public, and confusing methodologies. The Association has addressed these issues through public outreach meetings and amendments to statute, rules, and policies governing water bank activity. In recent years there have been significant advances in the participation from area water users. It is anticipated that this growth will continue in coming years. The Association is beginning another evaluation required by statute by an independent panel of experts in water law, economics, geology, and hydrology. The District intends to work with the Association to update the programs to promote the movement of water away from highly sensitive areas within the Rattlesnake Creek subbasin.

b. The review process will take time to be completed. As a result, it is difficult to estimate the outcome of the review in addition to the timeliness of the updates.

c. The District has partnered with The Nature Conservancy ("TNC") to pursue funding to incentivize the transfers of water out of areas of concern. The intent of this funding is to provide added financial incentive to water users in priority areas to deposit water into the Association for use outside of these priority areas. By providing financial incentive it is believed that this will further promote these transfers and provide added water conservation for areas of high impact to the stream channel.

5) Violations

a. The LEMA order of designation shall serve as initial notice of the creation of the LEMA and its terms and conditions to all water right owners within the Rattlesnake Creek LEMA area on its effective date.

b. Upon the District learning of an alleged violation, District staff will provide DWR with the information the District believes shows the alleged violation. DWR, under its discretion, may investigate and impose restrictions and fines as described below or allowed by law.

c. In the event that the District or DWR determine that a water user is operating the a center pivot system with a functional end gun installed, DWR will address these violations as follows:

i. operation of the end gun within the first six months of the LEMA plan will result in notification of the offense to the landowner;
ii. operation of the end gun following the first six months of the LEMA plan will result in an automatic one-year suspension of the water right and a $1,000 fine for every day of operation up to a maximum of $10,000.

d. DWR will address violations of the authorized quantities as follows:

i. exceeding any total allocation quantity of less than 4 AF within the allocation period will result in a $1,000 fine for every day the allocation was exceeded;
ii. exceeding any total allocation quantity of 4 AF or more within the allocation period will result in an automatic two-year suspension of the water right and a $1,000 fine for every day the allocation was exceeded up to a maximum of $10,000.

e. In addition to other authorized enforcement procedures, if the District Board finds by a preponderance of evidence of watering of unauthorized acres, waste of water, meter tampering, removing the meter while pumping, or any other overt act designed to alter the metered quantity as described in K.A.R. 5-14-10 occurred, then the District Board will make a recommendation to the Chief Engineer that a written order be issued which states:

i. the nature of the violation;
ii. the factual basis for the violation; and
iii. that the water right is suspended for 5 years.

6) Meters

a. All water right owners shall be responsible for ensuring their water flow meters are in compliance with state and local law(s). In addition to maintaining compliance and reporting water usage annually from each point of diversion, all water right owners shall Install and maintain an alternative method of determining the time that the well is operating. This information must be sufficient to be used to determine operating time in the event of a meter failure. Should the alternative method fail or be determined inaccurate the well shall be assumed to have pumped its full annual authorized quantity for the year in question.

Well owners/operators are encouraged to give the details of the alternative method in advance to District staff in order to insure that the data is sufficient.

b. Any water right owner or authorized designee who finds a flow meter that is inoperable or inaccurate shall within 48 hours contact the district office concerning the matter and provide the following information:

i. water right file number;
ii. legal description of the well;
iii. date the problem was discovered;
iv. flow meter model, make, registering units and serial number;
v. the meter reading on the date discovered;
vi. description of the problem;
vii. what alternative method is going to be used to track the quantity of water diverted while the inoperable or inaccurate meter is being repaired/replaced;
viii. the projected date that the meter will be repaired or replaced; and
ix. Any other information requested by the District staff or Board regarding the inoperable or inaccurate flow meter.

c. Whenever an inoperable or inaccurate meter is repaired or replaced, the owner or authorized designee shall submit form DWR 1-560 Water Flowmeter Repair/Replacement Report to the district within seven days.

d. This metering protocol shall be a specific annual review issue and if discovered to be ineffective, specific adjustments shall be recommended to the chief engineer by the advisory committee.

7) Advisory Committee

a. The Rattlesnake Creek LEMA Advisory Committee shall be appointed and maintained by the District board consisting of XX members as follows: one (1) District staff; one (1) District Board Member; one (1) representative of the Division of Water Resources, Kansas Department of Agriculture as designated by the Chief Engineer; and the balance being stakeholders from within the Rattlesnake Creek LEMA area. One of the Rattlesnake Creek LEMA members shall chair the committee whose direction shall be set to further organize and meet annually to consider:

i. water use data;
ii. water table information;
iii. economic data as is available;
iv. compliance and enforcement issues;
v. any new and preferable enhanced management authorities become available;
vi. other items deemed pertinent to the advisory committee.

8) LEMA Order Reviews

a. The initial term of the LEMA will be ten (10) years, which would allow the parties to revisit the terms and evaluate its efficacy after a meaningful period of observation.

b. In addition to the annual LEMA Order reviews per Section 7, the Rattlesnake Creek LEMA Advisory Committee shall also conduct a more formal LEMA Order review at two discrete times in within the term of the LEMA. The first of these times will be at 6 months prior to year six of the LEMA (2023). The second review shall be 18 months prior to the ending date of the LEMA Order. Review items will focus on economic impacts to the LEMA area and the local public interest. Water level data may be reviewed.

c. The committee, in conjunction with KDA–DWR and the District, shall also produce a report following this review to the chief engineer and the District board which contains specific recommendations regarding future LEMA actions. All recommendations shall be supported by reports, data, testimonials, affidavits or other information of record.

9) Alternative Corrective Controls

a. The first LEMA Order review identified in Section 8 shall be conducted in a manner to determine if further revisions to the order are necessary at that time. The committee, in conjunction with KDA–DWR and the District, shall review:

i. The reports and imagery of end gun acres reduced will be examined alongside the model results for the volume saved. The 3500AFY of reduced CU near St John will also be assessed. If the program is considered successful, no modified controls will be necessary. If considered ineffective, then the options in b. below will be implemented.

ii. The implementation of Section 3 will be reviewed to determine the effect augmentation has on the immediate area surrounding the well field. The goal for augmentation implementation is a fully-operational 15 cfs well field and delivery system to the Rattlesnake Creek stream channel. If the wellfield has not been completed to deliver water, then a implementation schedule will be ordered.

b. If the goals are not met before the first LEMA Order review, the following corrective controls will be implemented in 2023.

i. [OPTION 1 (MDS/Priority)] For the period 2023-2027, the water right allocations shall be adjusted as follows:

1. water rights with priority date after August 15, 1957 and before April 12, 1984 shall have the annual appropriations reduced by XX% for the five-year period;
2. water rights with priority date after April 12, 1984 shall have the annual appropriations reduced by XX% for the five-year period.

3. A well field implementation compliance schedule may be ordered.

ii. [OPTION 2 (Everyone)] For the period 2023-2027, all water rights with priority date after August 15, 1957 shall have the annual appropriations reduced by XX% for the five-year period.

iii. [OPTION 3 (Spatial)] For the period 2023-2027, the water right allocations shall be adjusted as follows:

1. water rights located within the area designated as having greater than 60% stream response at the Zenith gage station and with priority date after August 15, 1957 shall have the annual appropriations reduced by XX% for the five-year period;
2. water rights located within the area designated as having less than 60% stream response at the Zenith gage station and with priority date after August 15, 1957 shall have the annual appropriations reduced by XX% for the five-year period.

iv. [OPTION 4 (Spatial +MDS)] For the period 2023-2027, the water right allocations shall be adjusted as follows:

1. water rights located within the area designated as having greater than 60% stream response at the Zenith gage station and with priority date after August 15, 1957 shall have the annual appropriations reduced by XX% for the five-year period;
2. water rights located within the area designated as having less than 60% stream response at the Zenith gage station and with priority date after April 12, 1984 shall have the annual appropriations reduced by XX% for the five-year period;
3. water rights located within the area designated as having less than 60% stream response at the Zenith gage station and with priority date after August 15, 1957 and before April 12, 1984 shall have the annual appropriations reduced by XX% for the five-year period.

10) Impairment Complaints

a. While this program is being undertaken, the District stakeholders request that any impairment complaint filed in the district while this management plan is in effect, which is based upon either water supply issues or a regional decline impairment cause, be received by the Chief Engineer, and be investigated by the Chief Engineer with consideration to the on-going Local Enhanced Management Area activities.

11) Water Level Monitoring

a. The District maintains a routine water level measurement network throughout the Rattlesnake Creek subbasin area. This monitoring will continue throughout the term of the LEMA plan. In addition to the existing network, the District will install observation wells as necessary to monitor the impact of the augmentation well field. These measurements will be a part of the existing WIZARD database curated by the Kansas Geological Survey.

12) Water Quality Monitoring

a. The District has been monitoring the surface water quality along the Rattlesnake Creek channel for several years. This monitoring will continue throughout the term of the LEMA plan no less than on a quarterly basis. The observation wells that will be installed around the augmentation well field will be sampled routinely to enhance the understanding of the water quality in this area. Coordination with Kansas Department of Health and

Environment will be crucial in this process to ensure the water quality of the Rattlesnake Creek stream channel is maintained throughout this project.

13) Coordination

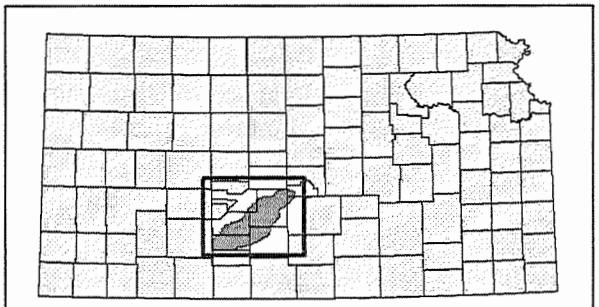
a. The District stakeholders and the Board of Directors expect reasonable coordination between the Chief Engineer's office and the District board on at least the following efforts:

i. Development of the LEMA Order resulting from the LEMA process;
ii. Compliance and enforcement of the Rattlesnake Creek LEMA order

519 References

520 Balleau Groundwater, Inc. (2010). *Hydrologic Model of Big Bend Groundwater Management*
521 *District No. 5.* consultant report prepared for Big Bend GMD #5.
522 Barfield, D. (2016). *Final Report of the Chief Engineer.* Manhattan: Kansas Department of
523 Agriculture - Division of Water Resources.
524 Big Bend Groundwater Management District No. 5. (2016). *Stakeholder Proposal in Connection*
525 *with USFWS Impairment Complaint.* Stafford: Big Bend Groundwater Management
526 District No. 5.
527 Big Bend Groundwater Management District No. 5. (2017). *Second Stakeholder Proposal in*
528 *Connection with USFWS Impairment Complaint.* Stafford: Big Bend Groundwater
529 Management District No. 5.
530 Lanning-Rush, J., & Restrepo-Osorio, D. (2017). *Public-Supply Water Use in Kansas 2015.* U.S.
531 Geological Survey.
532

PROPOSED LEMA BOUNDARY



By formal motion on August 11, 2017, Big Bend GMD#5 is pursuing a Local Enhanced Management Area (LEMA) within the area shown.

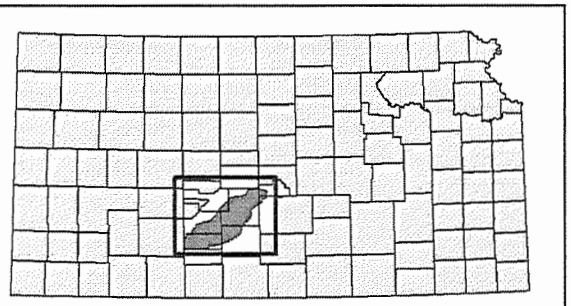
The principle goal of the LEMA is to increase the efficiency and reduce waste of water within the region.

LEMA area
909,368 acres

Points of Diversion
1948 wells

This map was created using WIMAS data and represents water right conditions as of August 11, 2017.
GMD#5 exercises great care in creating data presentations but, offers no guarantee of accuracy or completeness of the data.

PROPOSED LEMA BOUNDARY



Index Map

By formal motion on August 11, 2017, Big Bend GMD#5 is pursuing a Local Enhanced Management Area (LEMA) within the area shown.

The principle goal of the LEMA is to increase the efficiency and reduce waste of water within the region. Shown are the locations of the end guns as determined a District site survey.

LEMA area
909,368 acres

Points of Diversion
1948 wells

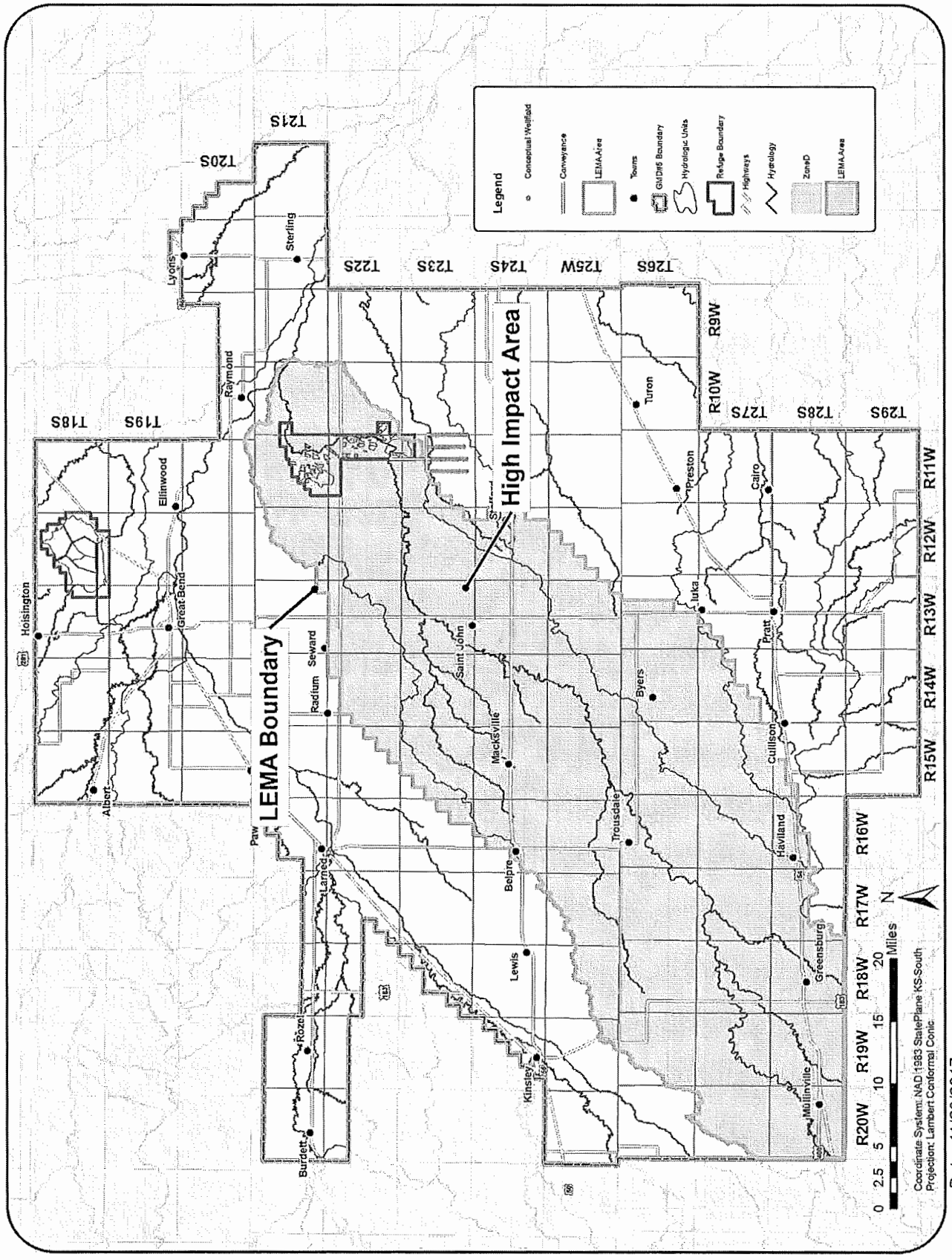
End Gun Locations
1306 Center Pivots

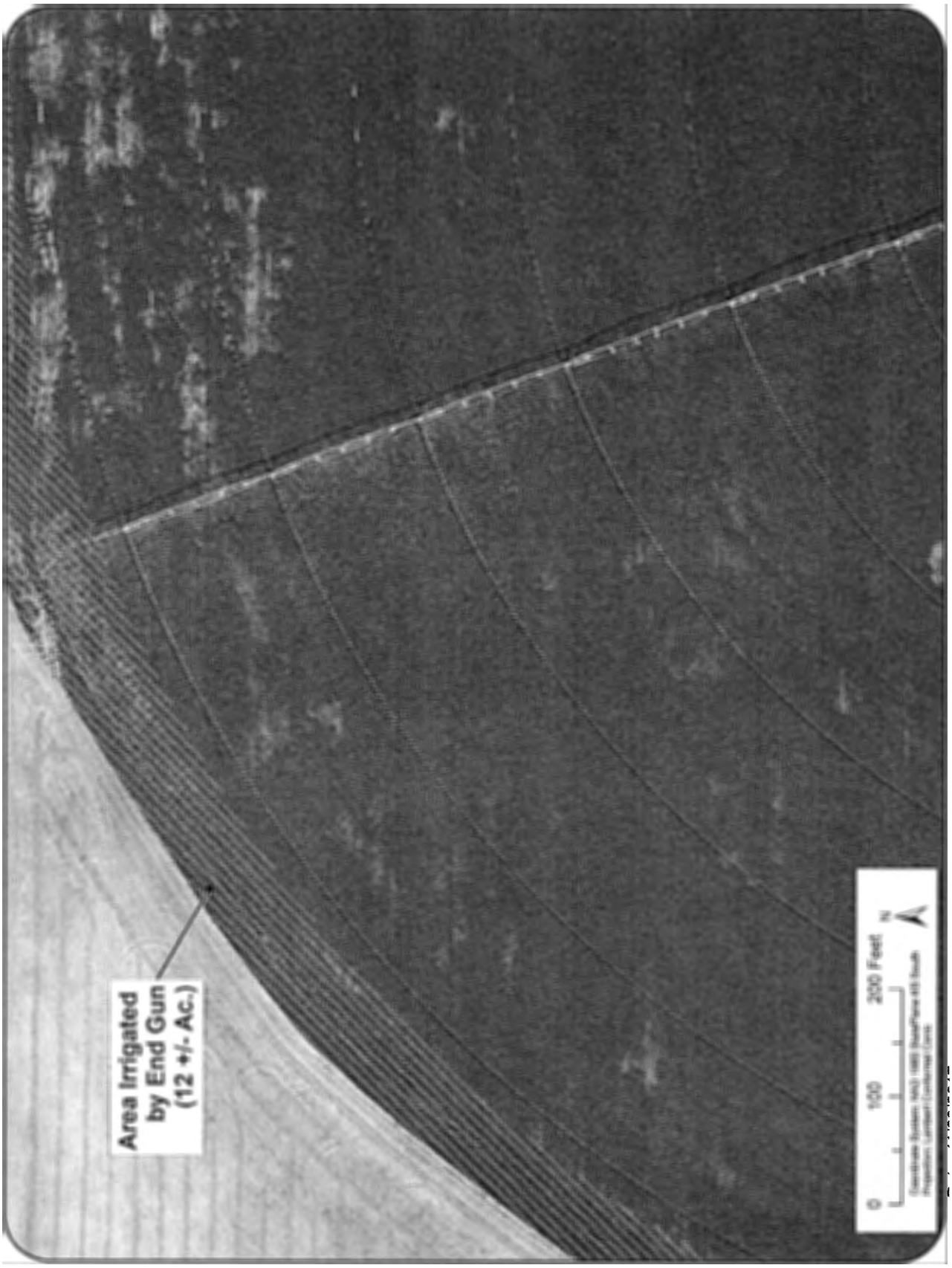
Legend

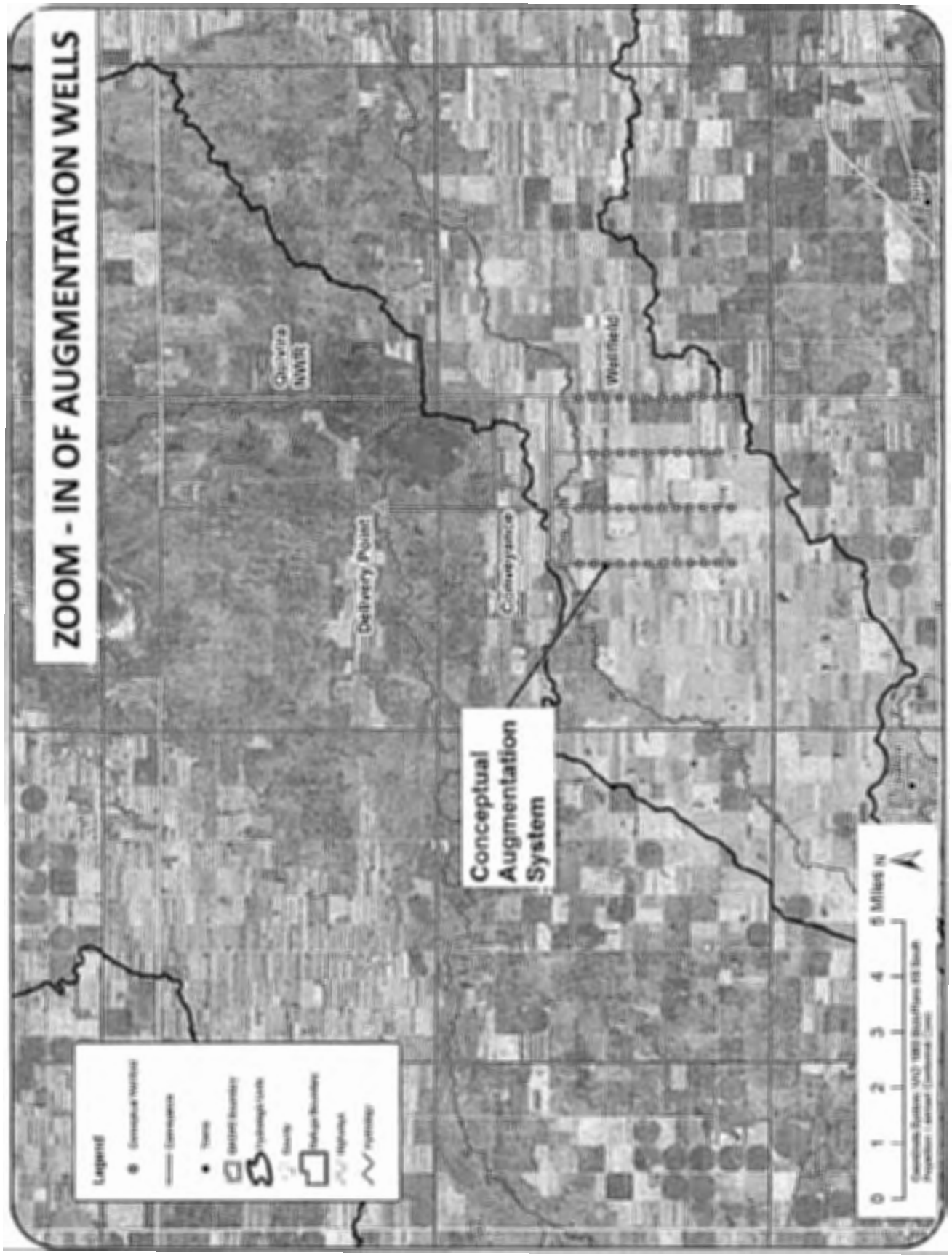
- Subbasin Boundary
- County Boundary
- Township Boundary
- End Gun Location
- Point of Diversion
- Section Boundary

Coordinate System: NAD 1983
Projection: UTM Zone 14N
November 17, 2017

This map was created using WIMAS data and represents water right conditions as of August 11, 2017.
GMD#5 exercises great care in creating data presentations but, offers no guarantee of accuracy or completeness of the data.

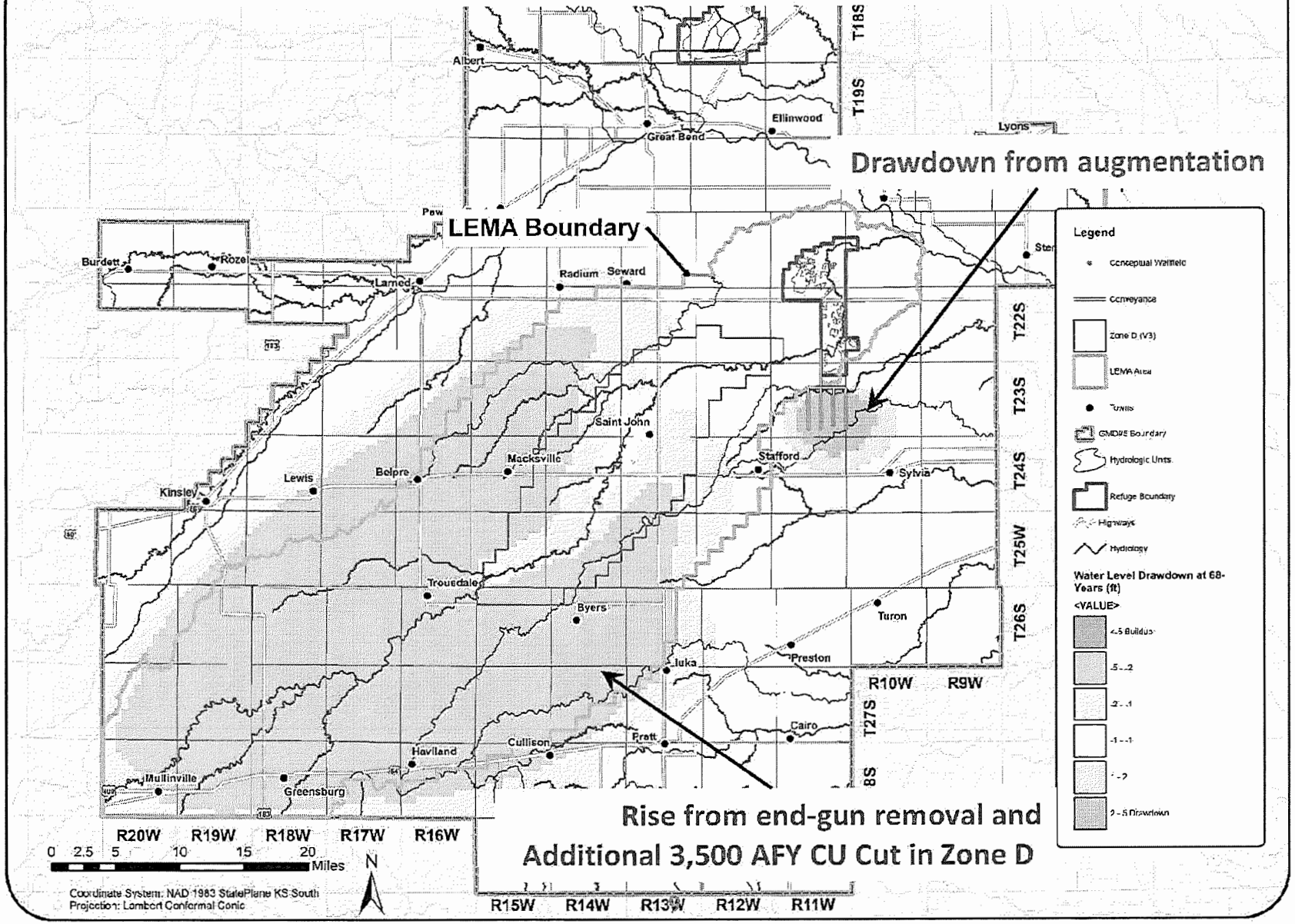

LEMA Boundary
High Impact Area
Legend
Conceptual Wellfield
Conveyance
LEMA Area
Towns
GMD#5 Boundary
Hydrologic Units
Refuge Boundary
Highways
Hydrology
ZoneD
LEMA Area
T21S
T20S
T19S
T18S
T22S
T23S
T24S
T25W
T26S
T27S
T28S
T29S
R9W
R10W
R11W
R12W
R13W
R14W
R15W
R16W
R17W
R18W
R19W
R20W
Sterling
Lyons
Raymond
Ellinwood
Hoisington
Great Bend
Albert
Radium
Seward
Saint John
Macksville
Preston
Cairo
Iuka
Pratt
Byers
Cullison
Trousdale
Haviland
Belpre
Lewis
Kinsley
Greensburg
Mullinville
Burdett
Rozel
Larned
Paw
Turon
0 2.5 5 10 15 20 Miles
N
Coordinate System: NAD 1983 StatePlane KS South
Projection: Lambert Conformal Conic
Date: 11/29/2017


Area Irrigated
by End Gun
(12 +/- Ac.)
0
100
200 Feet
N



Date: 8/28/2017

WATER-LEVEL CHANGE AT END OF 68-YEAR PROJECTION: END GUN REMOVAL PLUS ADDITIONAL ~3,500 AFY CUT IN ZONE D



Date: 12/4/2017

Line 18	The LEMA doesn't have to be limited to 10 years. What is going to happen after 10 years? Might want to address.
Lines 19-20	"source of supply within the LEMA boundaries" may be problematic. Folks on the border may have a good argument that wells just outside the border have their source of supply at least partially within the LEMA.
Lines 108-109	May need to work on this definition of an end gun. Could there be a situation where a CP has varying sizes of nozzles to regulate pressure? Maybe reference the last nozzle on the CP?
Lines 110-111	Is there any flood irrigation in the basin? Will it be a problem to regulate end guns but allow flood to continue?
Lines 112-133	To evaluate the effectiveness of this plan, KDA needs the district's end gun database including the AWEP information, the modeling work performed by Balleau Groundwater to support these statements, and any other information used to determine the assumed savings from end gun removal and the reduction in the rate of growth in groundwater pumping depletions to streamflow effected by end gun removal and curtailment of 3,500 acre-feet of consumptive use in "Area D".
Line 134	"end spray nozzles" – different nomenclature for end guns. Might be clearer to be consistent.
Lines 134-137	We strongly support the promotion of efficiency through new technology. It would be helpful to elaborate on how the district will promote these things; cost-share programs, help with grants, other…
Lines 171-174	The process described herein is better represented as estimation, not verification. Please provide examples of how this will be done and how it will be used to estimate savings in acre-feet.
Lines 183-186	We are not clear on how to read the phrase "…compared to the reported and validated data of water pumped…" We are concerned that in the case where a CP system was deficit irrigating with an end gun, even though the area wetted by the end gun may be dried up, the remaining circle under the CP system could receive more water and be closer to NIR or even surplus irrigation. We want the LEMA to be successful from the outset and we are concerned that the 10% estimated savings may be overstated in the general case.
Lines 187-189	The plan will need to identify which water rights will be curtailed and will need to provide explanation and justification as to why the board has chosen to request curtailment of those rights. What exactly is meant by "consumptive use" in this context?
Lines 197-199	Regarding the phrase "As an alternative means…", is this section contemplating that there is another, equally valid means of verifying the effects of end gun removal and curtailment?
Lines 201-203	How is the change in water consumption verified by farm inspection and image analysis? Please provide more detail on this methodology. KDA and GMD need to come to an understanding on what the model will be used for. KDA holds that the model should be used to set the goal for pumping reductions and then the pumping reductions should be evaluated by analyzing water use.

KDA initial review comments/questions

Lines 222-224	We are not clear on the concept of "…sources captured from formerly-rejected recharge by making space available in the aquifer."
Line 253-254	We suggest that the sentence read, "*Based on conversations with the CE, we have determined* that 15 cfs is *an* appropriate max flow rate/instantaneous capacity"
Lines 293-294	It is appropriate to measure the rate and quality at the project outfall, but to the extent that water is lost to the system between the augmentation project and the refuge, the refuge should not have to suffer that loss.
Lines 294-296	We suggest that the sentence be modified to "The capacity of the wellfield exceeds the 5000AFY amount suggested to relieve the impairment, *in most years,* of the Service's water right at the Refuge in the Chief Engineer's final impairment report."
Lines 338-339	Are we clear enough on the operations of the refuge to make this provision? Also, are the times of bypass and release defined clearly enough to avoid future confusion?
Line 438	Section 7 does not seem to describe a LEMA order review, rather it prescribes a review of the status of the water resource and economic factors that may be affected by the LEMA.
Line 445	It is not clear which review "this review" is referring to, the first or second one.
Lines 452-455	We need the detailed methodology to support this evaluation. We need to know the measure of success as a quantity of reduced pumping. The years that are going to be evaluated need to be clearly spelled out. KDA determined that a 15% reduction in pumping in a specified area would reduce the growth in depletions by half. KDA needs to see the level of pumping reductions that GMD5 (Balleau Groundwater) has determined to be sufficient to reduce the growth of depletions by half. KDA acknowledges that the reduction in depletions will take time and is subject to the variations in hydrology from year to year. KDA has developed a regression model that shows the close relationship between precipitation and evapotranspiration. We think this relationship can be used in conjunction with a quantified pumping reduction goal to ensure that the intended reduction in the growth of depletions is accomplished. In the end KDA will use water use records and the precipitation/evapotranspiration relationship to verify that the pumping reductions have been implemented.
Lines 459-460	We are concerned that per K.S.A. 82a-706b(a)(2) augmentation cannot be ordered. "*...allow augmentation for the replacement in time, location and quantity of the unlawful diversion, if such replacement is available and offered voluntarily.*" We think that the LEMA should contain corrective controls that will resolve the impairment if augmentation is not implemented or is implemented in a lesser way than is described in the draft plan.
Lines 461-462	KDA is committed to the provision that, if the specific reductions in water use required to halve the rate of growth in depletions are not accomplished in the first review period, then the shortfall will be added to the obligation in the second review period. By way of example only; if the modeling analysis showed that 100 units of pumping would need to be cut over 10 years at an average cut of 10 unit per year, then at 6 years, we would expect to see 60 units cut. If only 40 units were cut after 6 years then 60 units would have to be cut in the

	remaining 4 years to achieve the 100 units in 10 years. So it needs to be with this LEMA plan.
Line 469	See comment above re: Lines 459-460