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Curtis Tobias - Rice (Sec.)  
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February 15, 2017

Will Meeks  
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Department of the Interior  
PO Box 25486, DFC  
Denver, CO 80225-0486

Proposed Scope of Work  
For the Resolution of Impairment Claim- FOR SETTLEMENT PURPOSES ONLY

Dear Mr. Meeks:

Thank you for your letter responding to Big Bend Groundwater Management District #5's ("GMD #5") Proposed Scope of Work for Augmentation for Quivira National Wildlife Refuge ("Refuge").<sup>1</sup> We appreciate your department taking the time to conduct an in-depth review of the proposal with Regional and Headquarters' leadership, as well as the Department of the Interior's Office of the Solicitor.

The GMD #5 Board is disappointed that the Fish and Wildlife Service ("the Service") rejected the Board's first proposal to remedy the claimed impairment of Water Right No. 7571 without proposing an alternative solution. However, the GMD #5 Board has discussed at great length the concerns raised by the Service in its response and remains committed, along with our community of water users, to resolving the Service's impairment claim.

This letter offers additional alternatives in accordance with Chief Engineer David Barfield's request that the basin stakeholders develop a revised settlement offer by February 15, 2017, as reflected in his December 8, 2016 letter. You will see that this revised Proposed Scope of Work offers two possible solutions. We believe these proposals will be very attractive to the Service, since GMD #5 is willing to provide up to 5,000 acre-feet of water per year, which is at the top end of the amount needed, as determined by the Chief Engineer in his Final Report, to relieve the alleged impairment of the Service's water right. In addition to our commitment to provide the certainty of water at critical times to the Refuge, it is important that you know that, pursuant to the Governor's 50-Year Vision for the Future of Water in Kansas, GMD #5 is working with area stakeholder groups to develop a holistic approach to address the long-term, regional sustainability of the Great Bend Prairie aquifer.

As you consider the two options set forth below, we would again strongly encourage you to accept the

<sup>1</sup> For ease of your review, a copy of the Service's response letter as well as the initial Proposed Scope of Work are attached. The factual background and key information contained in the original Proposed Scope of Work are relevant to these proposals as well.

first proposal allowing wells and/or underground pipes on the Refuge so that the water the Refuge needs can be delivered where and when it is needed and in the appropriate quantities. We strongly believe that delivering water through infrastructure on the Refuge is the best use of the water resource and much superior to putting the water in Rattlesnake creek above the Zenith gage, which will result in significant conveyance loss of water and corresponding increases in augmentation pumping and costs. Delivering water precisely, efficiently and without waste is more acceptable to GMD #5's constituency, more sustainable hydrologically and economically, and is required by GMD #5's authorizing statute, in much the same way that the Refuge has such obligations.

We discussed the prospect of on-Refuge augmentation deliveries at our August 22, 2016 meeting. Your response letter states, without elaboration, that the Service has "significant concerns..." with "...the quantity, timing, quality, and the location of water delivery" noting that the Refuge is crucial habitat for the whooping crane and the endangered interior least tern. It is difficult for our membership to understand how our proposal does anything but help your mission by allowing you to manage habitat much more precisely and effectively. Nor does our membership understand how our proposal could "compromise [the Service's] ability to maintain the physical and biological features that are essential to the conservation of those species" as stated in your letter.

During the August 22, 2016 meeting held at the Refuge, representatives of the Service mentioned for the first time that certain federal laws might prevent the Service from accepting GMD #5's proposal. It was the GMD #5 Board's understanding that the Service representatives would research any relevant statutory provisions and report back with a detailed explanation of any legal impediments. While your response letter references the Endangered Species Act, the National Wildlife Refuge System Improvement Act, and the Migratory Bird Conservation Act, it does not point to any particular provision of any of these statutes that would be violated if the Service were to accept GMD #5's proposal.

For instance, the Service's letter states that GMD #5's proposal "would compromise our ability to maintain the physical and biological features that are essential to the conservation of those species pursuant to the Endangered Species Act." In order to understand and respond to the Service's objection, GMD #5 needs the Service to explain what aspects of the proposal would compromise the Service's ability maintain essential features, and how. Similarly, the Service states that "the National Wildlife Refuge System Improvement Act and the Migratory Bird Conservation Act require the Service ensure the protection of the biological integrity, diversity, and environmental health of the Refuge as well as the protection of its fish and wildlife resources." GMD #5 certainly understands this statement, but the Service does not explain how the proposal compromises the Service in fulfilling these duties.

It is critically important to GMD #5's continuing effort to craft a solution, one that complies with both the Refuge's management goals and the Service's legal obligations, that the Service identify the specific statutory provisions with which any proposal must comply. Just as important, the Service needs to explain how GMD #5's first proposal would violate those provisions.

On behalf of the board and staff of GMD #5, we appreciate your willingness to participate in the process of crafting a sustainable solution for the Refuge. GMD #5 is committed to developing a resolution that is reasonable, sustainable, and acceptable to all of the parties involved. In order to most efficiently resolve this matter, we respectfully request that persons in the Service with authority to negotiate a resolution participate directly with us in this process. Having the decision makers from the Service at the table will expedite our discussions, relieve the timing pressure being applied by the Chief Engineer and lessen the significant legal and technical consulting expenses incurred by GMD #5.

The enclosed document describes the framework for a solution that provides enhanced water management at the Refuge. We look forward to your review and comments on this document.

We greatly appreciate your time and consideration in this matter.

Sincerely,

Orrin Feril  
Manager

Enclosure

cc: Project Leader, Quivira National Wildlife Refuge  
Refuge Supervisor, CO/KS/NE  
Rocky Mountain Region Solicitor's Office  
Chief Engineer, Division of Water Resources  
Water Commissioner, Stafford Field Office  
WaterPACK

# **Second Stakeholder Proposal in Connection with USFWS Impairment Complaint**

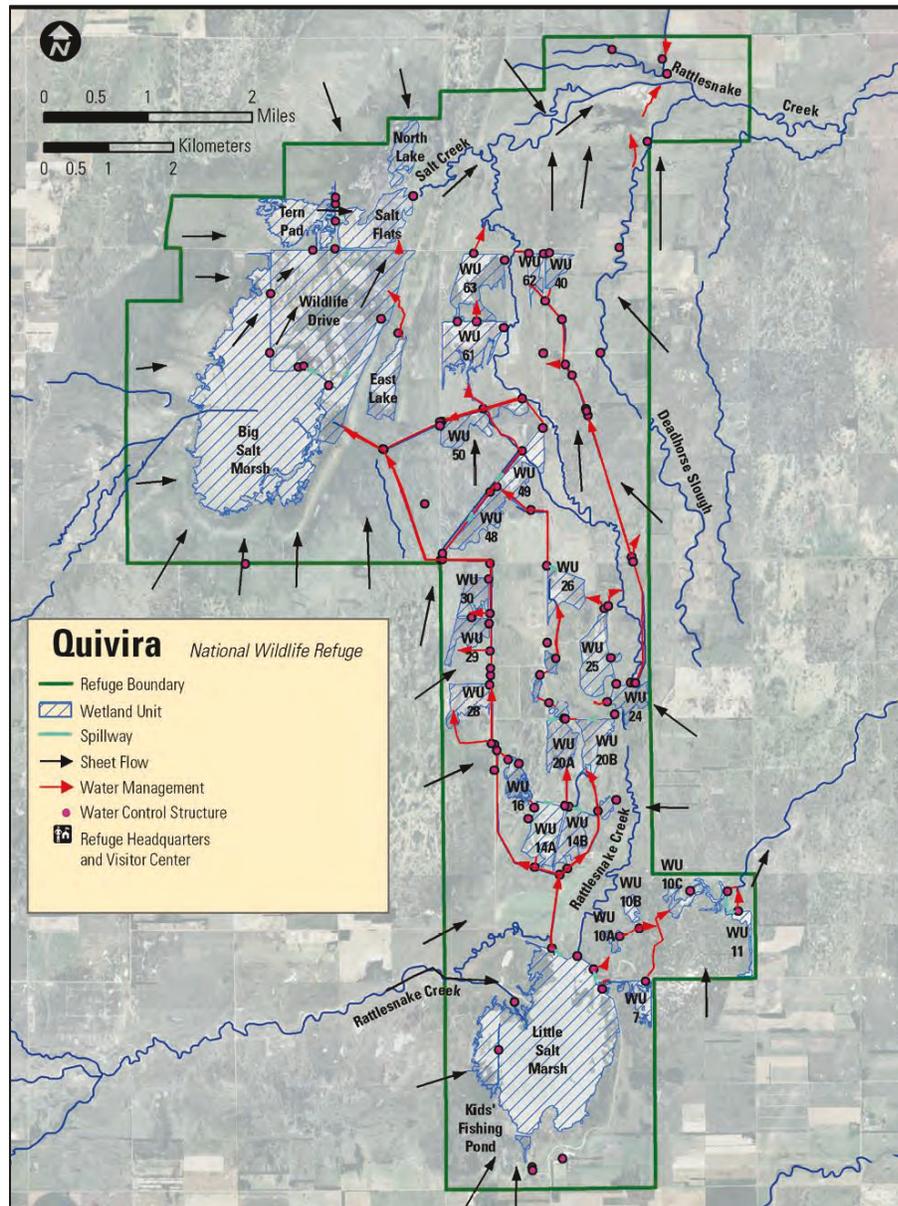
Prepared at the request of  
United States Fish and Wildlife Service

February 15, 2017

Big Bend Groundwater Management District #5

## Background

The United States Fish and Wildlife Service ("the Service") established the Quivira National Wildlife Refuge ("the Refuge") in the mid to late 1950s. The Refuge comprises 22,135 acres of both sandy grasslands and naturally occurring shallow saltwater marshes. These marshes are fed by the naturally occurring groundwater springs in the area and man-made canals that weave throughout the Refuge (Figure 1). The Refuge lies at a critical junction in the central flyway of North America. It provides forage and nesting habitat for several wildlife species throughout the calendar year.

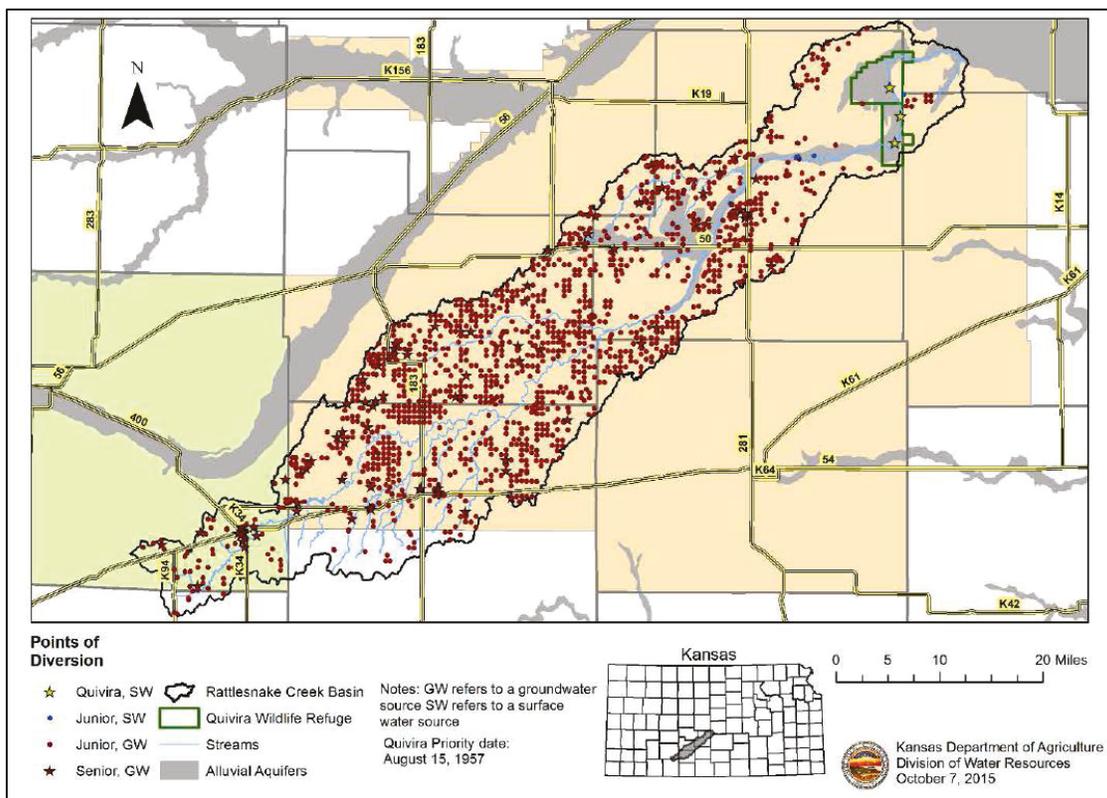


**Figure 1 – Quivira NWR features**  
credit: U.S. Fish & Wildlife Service

The Refuge needs water to meet management objectives established under the 1929 Migratory Bird Conservation Act, 1929 Fish and Wildlife Act, and 1997 National Wildlife Refuge System Improvement Act. In addition to these Federal mandates, several state and federal wildlife conservation plans are being fulfilled through the operation and maintenance at the Refuge. These

Federal statutes and plans are laid out in the Service’s Comprehensive Conservation Plan adopted in 2013. Additionally, the Refuge is a Ramsar Wetland of International Importance, a Western Hemisphere Shorebird Reserve Network site, and a Globally Important Bird Area. The Refuge has been recognized internationally as a location that should be preserved and maintained properly with the objective of providing suitable forage and habitat for a wide variety of avian species.

In order to secure its future with respect to surface flows on the Rattlesnake Creek, the Service needed to obtain a water right from the State of Kansas in the same manner as other water users in the state. In August 1957, the Service applied for 22,000 Acre-Feet ("AF") for recreation use throughout the Refuge. During the following thirty years, the Service worked to complete the diversion works and finalize the perfection of this water right. In April 1996, the Chief Engineer for the Kansas Department of Agriculture – Division of Water Resources ("KDA–DWR") certified Water Right File No. 7,571 for an amount not to exceed 14,632 AF per calendar year at a maximum diversion rate of 300 cubic feet per second ("cfs"). In the cover letter accompanying the certificate, the Chief Engineer noted that “Kansas Water Law does provide a mechanism to prevent impairment of senior water rights, but that does not necessarily mean that the natural flow of a stream will continually be available for use when an appropriator desires, no matter what priority date the appropriator holds.” This declaration applies to all water rights within the State of Kansas. Throughout this same time period, several private landowners followed the same procedure to acquire water rights from the Chief Engineer. Figure 2 shows the distribution of water right diversion points throughout the Rattlesnake Creek subbasin ("the subbasin").



**Figure 2 – Rattlesnake Creek Subbasin & Water Rights**  
 credit: *Kansas Dept. of Agriculture – Division of Water Resources*

Big Bend Groundwater Management District #5 (“GMD #5”) has for the past forty (40) years, strived 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 GMD #5, there was a large investment made by local landowners to construct and operate wells for irrigation, stockwater, industrial and other types of beneficial use. GMD #5’s management programs and subsequent regulations have greatly limited the groundwater development in many areas of GMD #5.

In GMD #5’s very 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. GMD #5 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 AF in a two-mile radius. GMD #5 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, GMD #5 does experience declines in the local Great Bend Prairie aquifer. However in years of average to above average precipitation, GMD #5 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 Big Bend Groundwater Management District #5, 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 2008, GMD #5, with technical assistance and peer review from the Partnership, contracted with Balleau Groundwater Inc. to develop a high-resolution hydrologic model of GMD #5. 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. GMD #5’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 but did not offer any possible remedies to the impairment complaint.

## 1. Augmentation

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. There have been several studies on augmentation within this subbasin in the past: (1) the 1998 Burns & McDonnell study, (2) the 2006 Kansas Water Office study, (3) the 2015 KDA–DWR study, and (4) the 2016 GMD #5 study. The key differences between these studies are shown below in Table 2.

Study	Wellfield Location	Annual Capacity (AF)	Pump Rate* (gpm)	Delivery Rate (cfs)	Water Quality (CI ppm)	Frequency	Delivery Location
<b>Burn &amp; McDonnell</b>	West Edge of Refuge	500 – 2000	800	8 – 42	< 1925	50% of year as needed	Stream West of Refuge
<b>KWO</b>	West Near Hwy 281	1000 – 2000 [1146]	--	21	Freshwater	5 out of 10 years	Stream West of Refuge
<b>KDA</b>	West Near Hwy 281	1200	600	6.7	N/A	Varied	Stream Near Hwy 281
<b>District (Option 1)</b>	East Edge of Refuge	2500	TBD	15	Same as LSM	As needed > -3.0 Palmer Drought	Defined by Refuge Staff
<b>District (Option 2)</b>	West of Refuge	5000	TBD	15	Same as LSM	As needed > -3.0 Palmer Drought	Stream West of Refuge

\* Proposed rate of diversion per well within wellfield.

**Table 2 – Historic Augmentation Studies**  
 credit: Burns & McDonnell, Kansas Water Office,  
 KDA-DWR, GMD #5 in coordination with Balleau Groundwater, Inc.

In review of 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. GMD #5 intends to analyze augmentation for each factor.

Over the past year, GMD #5 has considered augmentation scenarios and has determined two viable options for delivering augmentation to fulfill the impairment determined by the Chief Engineer

in the July 2016 final report. In the September proposal, GMD #5 provided a summary of an efficient and reasonable option for review and critique. In December 2016, the Service declined this initial proposal, but did not provide further explanation. GMD #5 will attempt to provide more details about this proposal in the following section. Additionally, GMD #5 is providing an alternative option for review that while providing more water is not as efficient as the original proposal.

On December 13, 2016, GMD #5 received a document from the Service describing potentially acceptable solutions for remedy action.<sup>2</sup> The document described a delivery capacity of 5,000 AF, which is consistent with the findings of the Chief Engineer. Below we describe two options for augmentation. Option 1 proposes an annual water quantity of 2,500 AF; Option 2 proposes an annual quantity of 5,000 AF. The Option 1 proposal is based on the consideration that canal flow loss at the Refuge is estimated by the U.S. Geological Survey to be 2,726 AF within a year under non-drought conditions.<sup>3</sup> GMD #5 considers water operations without that loss to be more efficient than operations with the loss. If the Service finds it beneficial to mitigate that water loss during times of augmentation by applying the pumped water to areas on the Refuge other than the canals, then Option 1 provides a more efficient method of augmentation than Option 2. We estimate the canal flow loss occurs on about one percent of the wetland habitat described in the October 2013 Refuge Comprehensive Conservation Plan.<sup>4</sup> 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.” Details of Options 1 and 2 are described in the following sections. The area surrounding the Refuge has been underdeveloped for large scale irrigation historically due to the water quality in the upper zone of the aquifer. However, this area does have a substantial quantity of water that can be appropriated in a sustainable manner. This further supports the concept of augmentation as a remedy for the impairment at the Refuge.

## **Augmentation Proposal Option 1**

### **Location**

While not all of the previous studies analyzed the same location west of the Refuge, none of them evaluated a wellfield location east of the Refuge. There are unique reasons for this that will have to be addressed by further studies. Historically, the water table on the east side of the Refuge is shallower and more stable, and also flows away from the Refuge. This makes the sustainability of the eastern wellfield more attractive. The water quality in the upper zones of the aquifer is very similar to the water quality already existing in the Little Salt Marsh. There are confining clay layers that help to prevent future up-coning of the poorer quality water, and it will be GMD #5's obligation to ensure the quality discussed below. 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. Without proper placement, there is a risk to degrade the upper zone of the aquifer to a state that it will become unusable.

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<sup>2</sup> Electronic communication from Mr. Mike Oldham of the Fish & Wildlife Service to Mr. Orrin Feril, GMD#5 Manager, December 13, 2016.

<sup>3</sup> The USGS study estimates 2,726 AF of canal seepage loss without water surface evaporation from the canals; the study considers evaporation from surface water, but does not explicitly break out the quantity for canals (see Jian, Xiaodong, 1998, Simulation of Canal and Control-Pond Operation at the Quivira National Wildlife Refuge, South-Central Kansas: prepared in cooperation with the Kansas Geological Survey, Water-Resources Investigations Report 97-4289 (p. 35, Table 11)).

<sup>4</sup> The Refuge Comprehensive Conservation Plan dated 10/23/2013: Page 64 reports 25 miles of canals (assuming they are 20 feet wide results in 60.6 acres of canals). Page 84 (Table 17) reports a total 5,646 acres of wetland habitat. Accordingly we estimate the canals represent 1.1 percent of the wetland habitat (60.6/5646).

Additionally, observation wells will be installed to provide additional locations to test water quality and verify water table elevations. Based on our observations of the Service's management practices, it also appears that water delivery from the east side would benefit the most important areas of the Refuge, which is the wet soils management area north of the Little Salt Marsh. This is one of the areas that make this Refuge unique.

#### Diversion & Delivery Rate

The current proposal is for GMD #5 to pay the cost to develop, construct, and operate a 15 cfs wellfield (maximum instantaneous capacity/flow rate) at or near the Refuge. Water can be delivered to various locations throughout the Refuge per the designation of Refuge staff including Little Salt Marsh. 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.

#### Annual Water Quantity

This proposal is to provide up to 2,500 AF of groundwater per year for use on the Refuge to meet or exceed the management objectives for maintaining forage and habitat. The Option 1 proposal is also based on an attempt to enhance Refuge water management operations described in the year 2013 Comprehensive Conservation Plan as “time consuming and planning intensive”.<sup>5</sup> Refuge personnel would be able to control where the water is supplied based on where it is needed within the Refuge boundaries. 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 consumptive use in the area. The new appropriation 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.

### **Augmentation Proposal Option 2**

The second option proposed combines pieces from several previous studies. However, there are inherent inefficiencies with this proposal that prevented GMD #5 from proposing it earlier.

#### Location

This option proposes a wellfield west of the Refuge along the Rattlesnake Creek channel. The precise locations of this wellfield have not been finalized as further studies will be needed to determine water availability and quality. The water table in this area is stable enough to support augmentation, as the large scale development for irrigation and other practices has been limited due to the natural water quality in the area. As with the previous option, the water quality in the upper zones of the aquifer is very similar to the water quality already existing in the Little Salt Marsh. A western wellfield might have 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. Observation wells will be installed to provide additional locations to test water quality and verify water table elevations.

#### Diversion & Delivery Rate

The current proposal is for GMD #5 to pay the cost to develop, construct, and operate a 15 cfs

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<sup>5</sup> The Refuge Comprehensive Conservation Plan dated 10/23/2013: Page 47 states “*Water management involves an extensive system of impoundments and dikes, canals and associated water control structures...Maintaining water control infrastructure is essential for us to manage the refuge efficiently, and system operations, such as manipulating water levels, can be time-consuming and planning intensive.*”

wellfield along the Rattlesnake Creek channel west 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 west of the Refuge. 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.

### Annual Water Quantity

This proposal is to provide up to 5,000 AF of groundwater per year delivered to the creek channel for use by the Refuge to meet or exceed the management objectives for maintaining forage and habitat, although there will be years that less than 5,000 AF will be needed. The water provided will be measured at the point it is placed in the creek channel. The amount of 5,000 AF is at the top end of the amount suggested to relieve the impairment of the Service's water right at the Refuge in the Chief Engineer's final impairment report. 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 consumptive use in the area. The new appropriation 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.

By augmenting the Rattlesnake Creek channel directly, the Service will still be at the mercy of the inherent conveyance losses associated with passing the water along the Rattlesnake Creek channel, through the Little Salt Marsh, and the canal system at the Refuge before reaching the management units at the Refuge. As such, this option is not as attractive to the stakeholders, but does comply with the statutory requirement of K.S.A. 82a-706b (a)(2) to allow augmentation as a remedy.

## **2. Administration**

Under either proposal, the Service will need to enter into a formal agreement containing the terms. In addition, those terms would need to be incorporated into an order issued by the Chief Engineer. GMD #5 is willing to work with the Service to develop an efficient augmentation plan. To that end, it may be determined that a hybrid of the two options may be the most feasible. This will be something that can be discussed at the appropriate time.

The following additional terms apply to both of the options outlined above. 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 would not occur in times of bypass flow or release from Little Salt Marsh. The water must be put to a beneficial use. There are criteria pertaining to augmentation that are proposed for the total annual quantity or delivery location (i.e. Water Quality, Term Period, etc.).

#### Water Quality

The quality of this water would fall within a specified range agreed to by the Service. The water quality can be increased or decreased based on the requirements of Refuge staff by providing more or less fresh water. As stated before, the water quality in the aquifer surrounding the Refuge is very similar to the water quality utilized in Little Salt Marsh. As a result, the water quality at the Refuge should not be degraded through the implementation of any augmentation plan.

#### Term Period

The initial term of the agreement would be thirty (30) years, which would allow the parties to revisit the terms and evaluate its efficacy after a meaningful period of observation. In no way does the current proposal of augmentation reduce or negatively affect the Service's certified water right. In any given year, the Service is entitled to divert up to 14,632 AF from the Rattlesnake (less any augmentation that occurs). The addition of augmentation water provides an additional source of water to the Refuge that to date has been unavailable. Throughout this term, GMD #5 understands there may be a need to evaluate the effectiveness of the plan within the term of the agreement. The timing of these review periods will be an item for discussion at a later time.

In addition, GMD #5 will need time to acquire land and water, and both offers are dependent on its ability to do so. This proposal, and GMD #5's obligations, are also dependent on DWR opening the basin and providing the administrative and regulatory approvals necessary to allow GMD #5 to provide the water. GMD #5 will need five years following such acquisitions to complete the construction. If GMD #5 is able, there may be the opportunity for a phased approach to implement the proposal. However, this is dependent on several items that are outside of GMD #5's control.

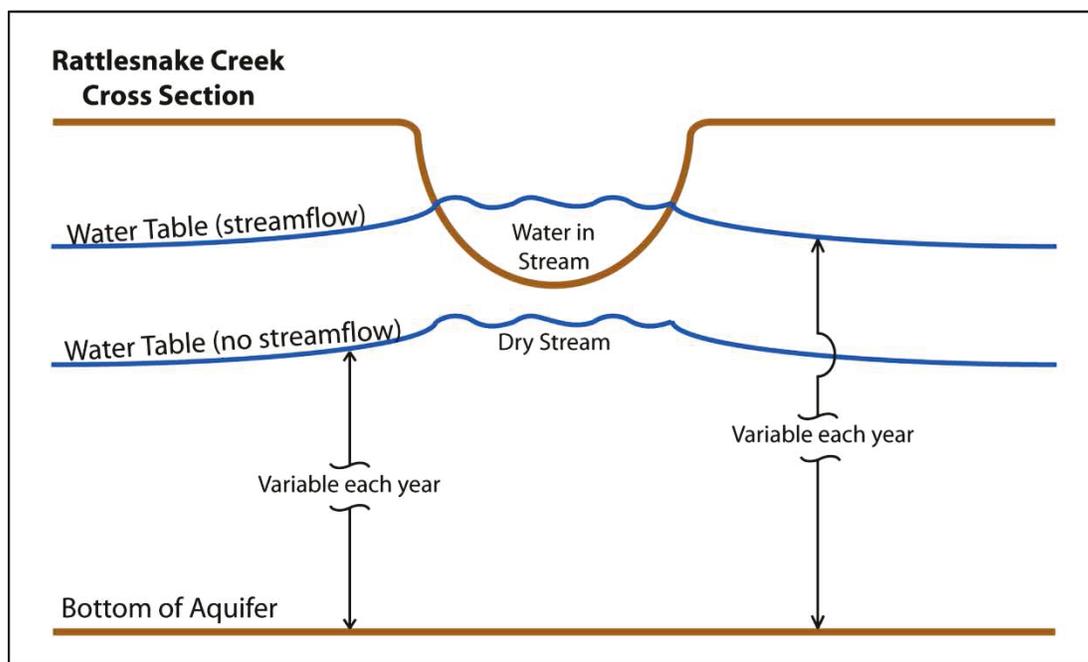
GMD #5 will pay for the cost of operations of the wellfield, including the costs of repairs. The other logistical aspects of the operations can be discussed and determined during negotiations.

The Service must also agree to additional metering (to be discussed and determined), in order to monitor the use of the water.

Augmentation provides a management mechanism not previously available to the Service, since it allows the Service receive water at its request, so long as it conforms to the conditions stated above. The Chief Engineer's analysis establishes that augmentation needed to satisfy Refuge demand is variable each year. Accordingly, in many years, full augmentation will not be required to meet the Service's management plan and stated needs. Language will need to be included in the Order and the agreement that recognizes that fact and prevents the Service from simply calling for full augmentation every year, rather than fully utilizing surface water in Rattlesnake Creek. Also, the agreement and Order will need to contain some agreed upon mechanism for dealing with non-compliance.

The lands upstream of the Refuge are utilized largely by modern agriculture practices. The subbasin is approximately 1,300 square miles in area covering parts of ten counties in the Great Bend

Prairie region. The subbasin is comprised of sand-dune topography on which 1,680 water rights have been certified by KDA–DWR. Over 95% of all water diverted within the subbasin is junior in priority to Water Right File No. 7,571. The primary use of water within the subbasin is irrigation from the groundwater resource. While the western half of the subbasin has experienced a loss in aquifer storage in recent history, the eastern half has seen minimal loss in storage in comparison. The difference between the east and west is the result of several factors including, but not limited to: a marginal increase in rainfall amounts; the aquifer is closer to land surface; and the water quality is less suitable for large scale agriculture. The reduction in aquifer storage does not necessarily indicate the water resource is in jeopardy. However, it means that the aquifer is not high enough to interact with the incised streambanks of the Rattlesnake Creek as frequently (Figure 4). This stream-aquifer interaction is the key factor in the impairment claim filed by the Service on April 8, 2013.



**Figure 4 – Streambank Cross Section**  
credit: *WaterPACK*

In 2015, Balleau Groundwater, Inc., in cooperation with GMD #5 and WaterPACK, used the model to conduct a thorough review of the hydrologic impacts the 2000 Rattlesnake Creek Management Program would have made if the water use reduction goals were met for all of the objectives. This preliminary study indicated that a water use reduction of 27,345 AF would result in a net gain to the Zenith gage, upstream of the Refuge, of 2.3 cfs. The other component of this data is time. According to this analysis, it would take 12 years to achieve the net gain of 2.3 cfs to the Zenith gage.

WaterPACK estimated the economic impact of such a water use reduction within the subbasin to be approximately \$88,320,000 in Fixed Asset Losses and an additional \$8,413,860 in Revenue Losses annually. Kansas State University Agriculture Economics Department estimates that a dollar will circulate the local economy 5-7 times as a result of business revenue generation. When this is factored in, the annual loss to the economy would conservatively be \$42,000,000. The methodology for arriving at these figures can be found in Table 3. Taking into account the time it would take to achieve 2.3 cfs gain to Zenith gage, the local economy would incur approximately \$504,000,000 in lost revenue in 12 years.

Acre-Feet Reduced	Acre-Feet per Center Pivot (typical)	Center Pivots Affected by Reduction
27,345	195	140
Acres per Quarter Section	Total Acres Converted (Center Pivots x Acres)	Land Value Differential (per Acre)
160	22,400	\$4,000.00
<b>Total Loss of Land Value due to Conversion from Irrigated to Dryland</b>		<b>\$89,600,000.00</b>
Acres Irrigated per Center Pivot	Irrigated Acres Reduced (Center Pivots x Irr. Acres)	Additional Revenue Per Acre for Irrigated vs Dryland
130	18,200	\$469.00
<b>Annual Revenue Loss</b>		<b>\$8,535,800.00</b>

**Table 3 - Projected Economic Impact**  
credit: *WaterPACK*

In the near future, GMD #5 will work with other agencies and stakeholder groups to tackle the localized water depletions in the Great Bend Prairie aquifer. GMD #5 is an active participant in the Great Bend Prairie Regional Advisory Committee (“RAC”). This RAC has, with the assistance of GMD #5, established a goal of regional aquifer sustainability, by the year 2025. This goal is being put into action through the RAC’s action plan that was approved by the Kansas Water Authority in October 2016. The RAC acknowledges that groundwater resource issues cannot be resolved with quick, single-pronged approaches. The RAC is working with local stakeholders to develop long-lasting management adjustments to bring the Great Bend Prairie aquifer further into balance. The Rattlesnake Creek subbasin is a part of this process and will be addressed along with the surrounding subbasins. GMD #5 continues to be an advocate for conservative water use within the region and will be a significant contributor to this process.

Recently, The Nature Conservancy in Kansas (TNC), through the Healthy Streams for Kansas Initiative, has targeted the Rattlesnake Creek watershed for groundwater conservation and baseflow improvements. TNC is working with the Kansas Forest Service and other partners to remove Salt Cedar (*Tamarix* spp.) and Russian Olive (*Elaeagnus angustifolia*) from the alluvial area of the watershed. TNC is also interested in providing a framework to enhance the monetary incentive for participation in the Central Kansas Water Bank Association (CKWBA). The CKWBA provides the structure needed for water right holders to lease water annually while conserving water in the process. TNC will also explore funding options to provide cost-share for irrigation efficiency technologies, including but not limited to center-pivot telemetry, soil moisture sensors, variable rate irrigation, and mobile-drip or sub-surface drip irrigation systems. Additionally, TNC will look for opportunities to expand soil health management practices shown to improve soil moisture retention. These programs will be tracked by TNC and partners in order to document overall water savings in the basin. The overarching goal of TNC’s program is to use multiple approaches to restore water balance and improve baseflows in Rattlesnake Creek to meet Quivira NWR’s water right, while avoiding regulation and maintaining the ability of producers to irrigate.

### **Request for Information from the Service**

As counsel for GMD #5 explained during the August 22nd meeting, GMD #5 is unable to

provide more specific siting information for the proposed wellfield without knowing whether the Service will approve the construction of wells and/or the laying of pipes on the Refuge itself. Therefore, GMD #5 needs to know as soon as possible whether any structures or pipes may be sited on the Refuge, and under what conditions.

Also during the August 22nd meeting, GMD #5 received the impression from Service representatives that the persons with the authority to decide whether any structures or pipes associated with augmentation pumping could be constructed on the Refuge were not in attendance. GMD #5 requests that the Service provide these individuals' names and contact information so that GMD #5 may include them in future communications concerning enhanced water management at the Refuge.

GMD #5 is proposing these options to the Service based on several assumptions of the management and operations at the Refuge. As such, the details of this proposal are subject to change based on further discussions and work with the Service to ensure the remedy tool implemented effectively assists the Service's ability to maintain the physical and biological features essential to the conservation of those species pursuant to the Endangered Species Act.

## **Conclusion**

The task of developing a sustainable remedy for the Rattlesnake Creek impairment report is quite complex. The region in which the Refuge lays is predominantly sandy soils and overlays the rechargeable Great Bend Prairie aquifer. Groundwater well development throughout the past 50 years has had an impact on the aquifer to date. However, in the immediate vicinity of the Refuge, there is minimal development due to higher chloride concentrations in the water. This creates an opportunity to craft a remedy that will supply the Refuge with suitable water for its needs via an augmentation wellfield. The monitoring of the water quality and quantity continues to be a top priority for GMD #5.

The Great Bend Prairie aquifer is a valuable resource that generates millions of dollars in revenue annually. While this resource has historically been utilized by the agricultural communities in the region, this proposal is designed to offer the same resource to the wildlife of the area by providing augmentation to enhance the unique habitat the Refuge provides for various species identified as 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."