

**Southwest Kansas**  
**Groundwater Management District No. 3**  
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[www.gmd3.org](http://www.gmd3.org)

May 10, 2019  
(VIA e-mail)

Leslie Ireland  
Division of Water Resources  
Kansas Department of Agriculture  
1320 research park drive  
Manhattan Kansas 66502

RE: Befort additional well change application,  
Water Right, File No. 27,188.

Dear Leslie,

This letter is to provide the boards recommendation and review material for the above referenced application. The letter from DWR allowing 15 days to submit the recommendation concerning this application was received on April 23, 2019. Our request for more time to conduct new well evaluations based on new proposal elements and to follow our fact-finding review process was denied except for two additional days. Based on the denied request for the needed review time, the boards application review process had to be abandoned and only available information was collected for a board review on May 8, 2019.

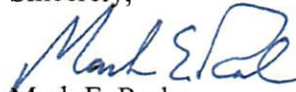
During the review, the board considered available facts and had many unanswered questions or answers in dispute between parties attending the board meeting. The GMD3 well evaluations that included critical wells indicating impairment concerns were reviewed along with other information. There appears to be information indicating that statute and rule standards may not be met for this application. A review of the statewide additional well rule prepared by GMD3 staff also occurred. Both well evaluation and rule review are included with this letter along with the well evaluation guidelines for reference.

Board intent is to learn and to advise the members and the chief engineer on such matters prior to agency action. It is noteworthy that DWR has responded to site specific data, observation GMD3 questions and impairment concerns with the following: *"With respect to the impairment evaluations in our application decisions under K.S.A. 82a-706b and 711, much of that evaluation is done pursuant to statewide and GMD regulations. In the case of the declining Ogallala, statewide rules are supplemented by the Theis evaluation. We feel that the GMD has had sufficient time to review the application. Therefore, we respectfully deny your request for additional time. The application meets existing regulations, including a finding by KDA-DWR that there is no evidence that impairment will occur in the future."* GMD3 found otherwise. The obvious two questions raised by the DWR conclusion for the declining local supply with existing dry wells is by what standard did DWR define impairment and find this conclusion for this statutory review and what is the significance of the discovery of critical wells by GMD3 that will directly suffer the results of an approved proposal.

From Wednesday's (05/08/19) board discussion, the board elected to follow the additional well review and recommendation and request an orderly administrative hearing be conducted to sort out the divergent conclusions of DWR, GMD3 and other parties that may participate. Though more time for GMD review process to evaluate aquifer site specifics and policy were deemed not necessary in the opinion of DWR, it is the recommendation of the board that a hearing be conducted for orderly and transparent fact finding, discovery, determinations and conclusions of law.

Thank you for receiving this recommendation as summarized in the Additional well rule review. Please let us know if you have any questions.

Sincerely,

A handwritten signature in blue ink, appearing to read "Mark E. Rude", is written over the printed name.

Mark E. Rude  
Executive Director

Attachments



## Befort, 27,188 additional well change application review by GMD3

5/7/19 GMD Staff review of the statewide additional well rule.

Rule is in black font with [staff comment in blue font] & GMD3 staff recommendation in red.

**K.A.R. 5-5-16. Additional wells.** (a) *An application to change a point of diversion by adding an additional point of diversion to divert groundwater, by either constructing a new well or moving a portion of a water right to a well that has previously been authorized by the chief engineer, shall not be approved unless the application meets the following requirements:*

[GMD Staff comment: The statewide rule section (a) is written to prohibit approval of additional wells unless rule provisions are met. So even if all provisions of the rule are met, there is no rule requirement to approve an additional well application. This is different than the view communicated by DWR staff that somehow meeting the rule provisions is an adequate basis or demonstration of meeting other statutory provisions of review under the law. Any actual compliance with this rule alone would not be a reasonable basis for application approval.]

*(1) Each proposed point of diversion shall meet the requirements of K.S.A. 82a-708b, and amendments thereto, and any applicable regulations adopted by the chief engineer.*

[K.S.A. 82a-708b provides the sole legal authority for making changes to any existing water right. (a) *Any owner of a water right may change the place of use, point of diversion or the use made of the water, provided such owner shall:*

*(1) Apply in writing to the chief engineer for approval of such proposed change,*

*(2) Demonstrate to the chief engineer that any proposed change is reasonable and will not impair existing rights.*

*(3) Demonstrate to the chief engineer that any proposed change relates to the same local source of supply as that to which the water right relates.*

*(4) ... The chief engineer shall approve or reject the application for change in accordance with the provisions and procedures prescribed for processing original applications to appropriate water ....*

If a water right is to be changed pursuant to K.S.A. 82a-708b, the provisions for processing a new application to appropriate water, found at K.S.A. 82a-708a, 82a-709 through 714, and the appropriate regulations must also be followed.

The Chief Engineer must consider various factors in approving the applicants proposal.

Among other things, K.S.A. 82a-711(a) provides,

*"If a proposed use neither impairs a use under an existing water right nor prejudicially and unreasonably affects the public interest, the chief engineer shall approve all applications for such use made in good faith in proper form which contemplate the utilization of water for beneficial purposes, within reasonable limitations .... "*

Subsection (b) provides:

*"In ascertaining whether a proposed use will prejudicially and unreasonably affect the public interest, the chief engineer shall take into consideration:*

*(1) established minimum desirable streamflow requirements;*

*(2) the area, safe yield and recharge of the appropriate water supply;*



- (3) the priority of existing claims of all persons to use the water of the appropriate water supply;*
- (4) the amount of each claim to use water from the appropriate water supply; and*
- (5) all other matters pertaining to such question.”*

[Note: The Chief Engineer has indicated this provision (5) mandated consideration of the GMD3 management program is contrary to Kansas law. GMD3 opinion is that provision (5) shall include the GMD3 management program and recommendations as part of “all other matters pertaining to such question.”]

Subsection (c) of K.S.A. 82a-711 concludes:

*With regard to whether a proposed use will impair a use under an existing water right, provides that impairment shall include: the unreasonable raising and lowering of the static water level or the unreasonable increase or decrease of the streamflow or the unreasonable deterioration of the water quality at the water user's point of diversion beyond a reasonable economic limit.*

So, by combining the provisions of K.S.A. 82a-708b and K.S.A. 82a-711, if a water right owner proposes a change to an existing water right, the burden is on the owner of the water right to demonstrate to the chief engineer that the proposed change:

- (1) Is reasonable,*
- (2) Will not impair existing water rights [meaning all water rights, permits, and applications with a priority date senior to the change application (senior water rights) not just those water rights that are senior to the original priority,*
- (3) Will not prejudicially and unreasonably affect the public interest [includes the GMD3 management program],*
- (4) Will not cause an unreasonable raising and lowering of the static water level,*
- (5) Will not cause an unreasonable increase or decrease of the streamflow,*
- (6) Will not cause the unreasonable deterioration of the water quality beyond a reasonable economic limit,*
- (7) Will withhold from appropriation that amount of water necessary to establish and maintain for the identified watercourse the minimum desired streamflow.*

**The Chief Engineer must fully employ or consider this analysis in reaching a conclusion at the time of administrative review of the application for final agency action.** The lack of adequate demonstration of these factors may require a modification or denial of the applicant's proposal.

To appropriately apply the GMD3 well evaluation guidelines and calculations into a meaningful “711” evaluation for the applicant and other members under the above review considerations, and in light of the objections of the change by local members, GMD3 has asked DWR for the proper definition of impairment to apply in this case where DWR has studied the local aquifer hydrology. DWR has responded commenting they consider only well-to-well interaction and therefor impairment is not a factor.

GMD3 staff does not understand this response and requested clarification in light of the common knowledge that direct well-to-well interactions is demonstrated in both DWR and GMD3 Theis



calculations and well evaluations, and local wells have gone dry and the continued declining local aquifer supply makes impairment a guaranteed condition and insufficient supply an unavoidable factor that is a question that appears to be avoided by DWR. The findings of critical well conditions under the GMD3 well evaluation guidelines raise impairment concerns as an eminent condition of the additional well application and therefore the necessity for a full impairment evaluation employed or considered in reaching a conclusion under the additional well rule part 5-5-16(a)(1). Thus, a reasonable description of what impairment entails is needed and appropriate for the required impairment consideration. GMD3 continues to ask for one.

The only definition GMD3 currently has available for use as adopted and sustained by the courts and in use by the Chief Engineer administratively within GMD3 as the basis for curtailing pumping and evaluating well-to-well effects is from the Black's law dictionary definition: **when that [action] diminishes, weakens, or injures the diversions of water under a prior right.** (Garetson Bros. v. Am. Warrior, Inc., 51 Kan. App. 2d 370, 389, 347 P.3d 687 (2014), review denied (Jan. 25, 2016)) and associated administrative curtailment of nearby wells.

Economic limit evaluations have not been implemented by the chief engineer nor evaluated by the Kansas courts. DWR recently provided this view to a GMD3 request:

"With respect to your question on economic limit criteria used by DWR in evaluating the potential for impairment, KDA-DWR relies on existing statutory and regulatory requirements, supplemented by our Theis analysis to evaluate the potential for impairment."

DWR has not disclosed what other existing statutory and regulatory requirements they are referring to satisfy this statutory requirement. The only available implementation known to GMD3 staff for this required evaluation exists in the GMD3 well evaluation guidelines, which calculations for this change application have yielded critical well concerns.

The adopted Black's Law definition of impairment, if that is the definition to use, certainly appears to raise immediate concern for the calculated well-to-well effects of the additional well application under present conditions. They demonstrate a genuine impermeant concern for the additional well application in the proposal aquifer setting. So, section (a)(1) of the additional well application appears to not be met.]

(2) The total maximum quantity of water authorized to be diverted each calendar year by the original well or wells, and the additional well or wells, shall not exceed any of the following limits:

(A) The maximum annual quantity of water that has been perfected;

(B) the maximum annual quantity of water authorized to be diverted before approval of the change; or

(C) the maximum consumptive use of water during the perfection period as required by K.A.R. 5-5-3 and as specified in either of the following:

(i) If the water right authorizes the use of water for irrigation use, the consumptive use of water shall be presumed to not be increased in violation of K.A.R. 5-5-3 if the maximum annual



quantity requested does not exceed the quantity in acre-feet calculated by use of the following formula: multiply the maximum number of acres legally irrigated in any one year during the perfection period by the 80 percent chance net irrigation requirements (N.I.R.), as specified in K.A.R. 5-5-12 expressed in acre-feet, and divide that number by a delivery efficiency of 0.85; or

[GMD3 Note: rule 5-5-16(a)(2) condition is met under the change application as consumptive use calculation is greater than the annual quantity that is proposed]

(ii) if the water right authorizes the use of water for irrigation and an additional well or wells are authorized for a beneficial use of water that is not irrigation, the consumptive use of the portion of the water right used for irrigation shall be determined as specified in paragraph (a)(2)(C)(i). The non-irrigation portion of the water right available for diversion shall be determined as specified in K.A.R. 5-5-9 and K.A.R. 5-5-10.

(3) The total maximum rate of diversion that may be authorized for the original well or wells and the additional well or wells shall not be greater than the total maximum rate of diversion that could have been diverted from the original well or wells if they were currently being replaced by new wells at substantially the originally authorized location or locations in the same local source of supply. The maximum rate of diversion be one of the following:

(A) The total rate of diversion based on a current water flow rate test done on the point or points of diversion; or

[GMD3 Note: Requirement not met under the plain language of the rule. A flow test and evaluation are included for one of the two authorized wells (SW well) but not for the east well as required by this regulation section. DWR has stated;

“The application is not proposing restoring pumping capacity but maintenance of such, which is allowed [under the rule.”

However, not all of the present pumping capacity under the water right has been tested to evaluate this provision. GMD3 staff have requested the missing information from DWR and were informed the applicant elected not to do a test and DWR will not be required it. So, there appears to be insufficient information to evaluate section (a)(3) of the rule. Additionally, the test was conducted in March of the year under ideal aquifer conditions that may not be sustainable on average through the year. The aquifer evaluations of DWR provided on Monday, May 6, 2019 may provide additional opportunity to evaluate what can actually be sustained using the amended aquifer report]

(B) a value resulting from a hydraulic analysis, which may include rate tests, pump tests, and water level data, submitted by the applicant and acceptable to the chief engineer based on the veracity of its data and its proper application of scientific principles, showing the current capacity of the aquifer to yield water at the currently authorized point or points of diversion.

(4) A condition shall be placed on the approval of the application for change authorizing the additional well or wells that provides that, for the sole purpose of administering wells concerning direct impairment, the additional well or wells shall be considered to have the priority of the date the application was filed to add the additional well or wells.



[GMD3 staff note: Though not a bad provision in concept, there is some question whether this provision of the rule is lawful under K.S.A. 82a-708(b) based on prior correspondence from DWR to that effect. DWR indicated this to a proposed rule reply to the GMD3 board regarding a duplicate provision in a Long Move draft regulation proposed after the additional well rule was in place, stating this provision is not consistent with the preservation of priority in K.S.A.82a-708(b) and therefor illegal.]

(b) The applicant shall submit the following information:

- (1) A well completion log of the currently authorized well or a stratigraphic log of a test hole located within 300 feet of the currently authorized well;
- (2) the depth of the currently authorized well;
- (3) the current depth to the static water level of the currently authorized well;
- (4) a stratigraphic log of a test hole located within 300 feet of the proposed location of each of the proposed additional well or wells; and
- (5) any additional information that the chief engineer may require to understand the nature of the proposed additional well or wells.

(c) The proposed additional well or wells shall meet one of the following conditions:

- (1) Meet the well spacing requirements to all other wells with a priority earlier than the date on which the change application was filed; or
- (2) demonstrate by a hydraulic analysis, which may include rate tests, pump tests, and water level data, as submitted by the applicant and acceptable to the chief engineer based on the veracity of its data and its proper application of scientific principles, that the approval of an additional well within 300 feet of a currently authorized well location, or within the geographic center of a currently authorized battery of wells, will neither impair any water rights senior to the date on which the application for change was filed nor prejudicially affect the public interest.

(d) Each point of diversion authorized by an approval of an application for change for an additional well shall have a specific assignment of a maximum instantaneous rate of diversion and a maximum annual quantity of water.

[GMD3 staff concern: Again, this rule provision (c)(2)(D) cannot be done properly under provision (a)(3)(A) without a test of the total rate that can be withdrawn by all the wells, which includes the east well authorized under this water right. Additional information is needed to evaluate the application under the purposes of the additional well rule and reasonable application of the rule in GMD3]

(e) Each well authorized by a water right that has been changed under the provisions of this regulation shall be equipped with a separate water flowmeter that meets or exceeds the specifications for water flowmeters adopted by the chief engineer.

(f) Each approval of an additional well or wells shall have a condition that reserves jurisdiction for the chief engineer to review the approval of the additional well or wells at intervals of at least five years,



and not more than 10 years, to determine if the total annual quantity of water actually being withdrawn by all wells authorized by the approval of an application for change is exceeding the total annual quantity of water that could have been physically withdrawn if the additional well or wells had not been approved. If the chief engineer determines during the review that the total annual quantity being withdrawn by all the wells, including the additional wells, exceeds the total annual quantity of water that could have been physically withdrawn by the original well or wells, the total maximum annual quantity that can be withdrawn by all the wells shall be reduced by the chief engineer to the total maximum annual quantity that could have been physically withdrawn by the original well or wells. (Authorized by K.S.A. 82a-706a; implementing K.S.A. 82a-706a and K.S.A. 2016 Supp. 82a-708b; effective Sept. 22, 2000; amended Oct. 24, 2003; amended Sept. 22, 2017.)

[GMD3 Staff concern: DWR has indicated in the last several days the following:

“With respect to your request for information regarding implementation of evaluations under K.A.R. 5-5-16 (f), we have not done any such evaluation for a water right that has been authorized an additional well as per K.A.R. 5-5-16 as we have received no complaints to precipitate such review. All additional wells include permit conditions retaining jurisdiction and reserving the right to review any such approval now and, in the future, if the need arises.”

DWR has indicated that section (f) review has never occurred. Again, the provisions of this section of the rule appear to reserve jurisdiction for the chief engineer for a later date “to determine if the total annual quantity of water actually being withdrawn by all wells authorized by the approval of an application for change is exceeding the total annual quantity of water that could have been physically withdrawn if the additional well or wells had not been approved.” We question if the Chief Engineer is not conducting this evaluation now as required under the rule for all wells under this water right, then how can the Chief Engineer retain this jurisdiction for the future as a condition of approval? Also, there appears to be some question under this provision of the adopted rule whether the Chief Engineer can grant a change application and then later decide at his discretion to alter it under the prescribed authorities from the legislature for review of new application and change applications (See *Clawson v. State*, 49 Kan. App. 2d 789, 792, 315 P.3d 896(2013)).

Additionally, the section (f) of the rule says that in some future time known perhaps to no one at this time, and the Chief Engineer as yet has never actually practiced, “the total maximum annual quantity that can be withdrawn by all the wells shall be reduced by the chief engineer to the total maximum annual quantity that could have been physically withdrawn by the original well or wells. It is GMD3 staff opinion that such an evaluation can and should be done today as part of the prescribed review. What authority does the Chief Engineer have to avoid the present required evaluation and retained jurisdiction to exercise some future discretion when and if determined necessary by DWR? Is there never a final agency action for our members under this statewide additional well rule?

GMD3 staff have been allowed only 15 days to provide a review and recommendation on this change application for an additional well and were told it meets the rules and no board review is necessary. However, the application is in a known impairment concern area. DWR has



responded to requests by GMD3 staff within the 15 day window providing more information and an updated Theis evaluation today as new information that has generated more questions from GMD3 staff and further made evident the need for more time in which to evaluate, provide information to members, receive comments and provide a recommendation to the chief engineer.

The GMD3 preferred process of application review is described in the draft management program under water rights administration program section and includes a process of conducting well evaluations and assimilating information into a report for review by the applicant and the other member water users within one mile of the proposed wells. We have completed well evaluations, which have identified critical well concerns in the area. More time is needed to provide the information to those concerned and receive comments.

The request to DWR for more time than the allotted 15 day to review and develop a recommendation was denied on Monday (5/6/19) in an e-mail stating the following:

*With respect to the impairment evaluations in our [DWR] application decisions under K.S.A. 82a-706b and 711, much of that evaluation is done pursuant to statewide and GMD regulations. In the case of the declining Ogallala, statewide rules are supplemented by the Theis evaluation...*

*We feel that the GMD has had sufficient time to review the application. Therefore, we respectfully deny your request for additional time. You (and DWR) have already solicited comments from the nearbys on a less restrictive change application so there is little to be gained from additional comments. Comments received on the more restrictive application from the nearbys were the same comments.*

*The application meets existing regulations, including a finding by KDA-DWR that there is no evidence that impairment will occur in the future. And of course, our approval will be conditioned appropriately to allow for water administration in the future should it be required.*

*If you would like your recommendation to be considered when processing this application please have it to our office by Friday May 10, 2019 at 5:00 p.m.*

GMD3 staff object to the apparent summary dismissal of concerns of prior water right owners and the concerns and questions of GMD3 with the denial of the request for more time for review. GMD3 staff object to flagrant strong arming by DWR to truncate or hide or dis-allow or minimize findings of facts and opportunity for local water users and land owners and GMD3 public interest presence and purpose on a number of important state policy and public interest concerns. The GMD3 staff object to DWR agency tactics for mis-using administrative authority and discretion to abbreviate regulatory duties and meaningful external party participation supporting an appropriate application review process of an application that will affect private property rights and adversely affect the management program for the area. GMD3 staff object to the DWR actions that prejudicially and unreasonably affect the public interest in prohibiting and discouraging actions that include:



- 1) GMD3 requests for reasonable process for discovery and consideration of the application, available information and facts, some of which were provided with the email denying GMD3 more review time, which further precludes meaningful time for review.
- 2) Adequate time and consideration of the policy and aquifer management concerns of GMD3,
- 3) discovery of facts and opinions that affect member property rights and adopted well evaluations,
- 4) adequate evaluation of new disclosures and apparent potential for other relevant information known or possessed exclusively by DWR,
- 5) dissemination of factual information to concerned member water users and proposed effects on their private property rights,
- 6) DWR to fully employ or consider and conduct statutory duties and standards,
- 7) the intended or unintended lead by DWR of the applicant and others down a prim rose path to after the fact administration of water rights and curtailed pumping,
- 8) restricting time to consider concerns and facts from outside evaluations and the formulation of reasonable recommendations,
- 9) restricting advice and challenge to apparent DWR preconceived and potentially erroneous conclusions that obviously diverge from known facts associated with the application and orderly review with GMD3 and member water right owners.

#### Staff Recommendation:

In consideration of the above review that includes the following:

- That the statewide additional well rule is written to not require approval of an application that may meet all rule conditions, and
- That significant deficiencies exist in the proposal for meeting rule requirements, and
- That a lack of adequate time has been provided by DWR to GMD3 to conduct discovery, fact finding, policy considerations, review process with member water users and formulating a reasonable recommendation to assist the agency in finding appropriate facts and conclusions of law, and
- That there is demonstrated impairment concerns of water rights with critical wells discovered in the well-to-well evaluations of GMD3,

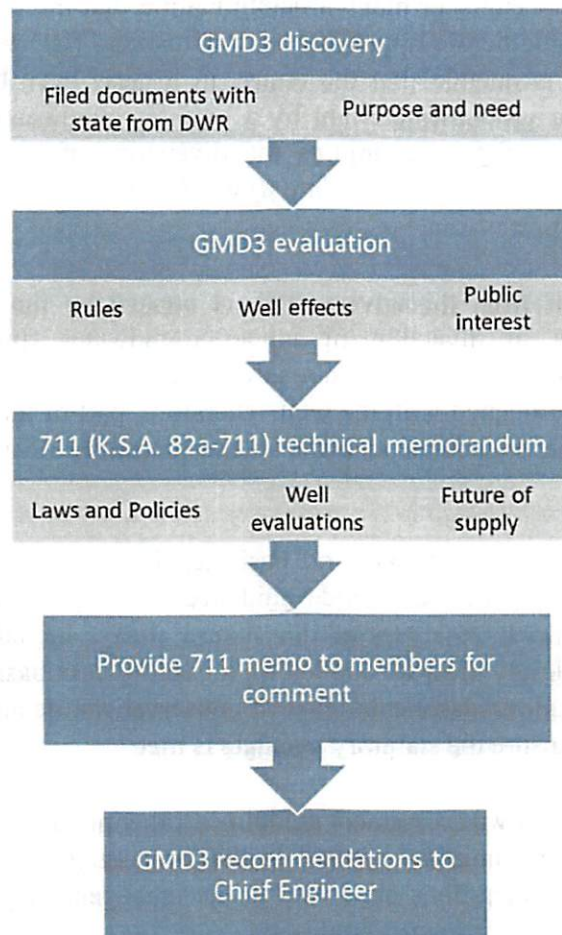
Therefor the staff of GMD3 recommends that the governing body of GMD3 request a hearing process to provide an administrative remedy of the significant concerns associated with the application and application review process, and

if a hearing process is denied, the board should recommend denial of the application in light of the apparent failure of the application proposal to satisfy statute and rule requirements based on site specific information available for consideration in the time allowed.



# GUIDELINES FOR THE ASSESSMENT OF WELL DRAWDOWN ESTIMATES

## FOR WATER RIGHT APPLICATION PROCESSING



**Southwest Kansas**  
**Groundwater Management District No. 3**  
2019

## Introduction

The chief engineer cannot grant an application to appropriate groundwater if the proposed appropriation will impair existing water rights (K.S.A.82a-711 & 82a-711a). Likewise, statutes governing changing location of well pumping (K.S.A.82a-708b, 82a-711 and 82a-711a), injunction for potential or actual impairment of prior rights (K.S.A.82a-717a), limited transfer permits (K.S.A. 82a-743) water conservation areas (K.S.A.82a-745), the GMD Act (K.S.A.82a-1020 et seq.) and administrative rule and regulation waivers (K.S.A. 82a-1904) all require that the chief engineer make a determination that the proposed action does not impair other water rights before approving an application. The statutes, however, do not define impairment. It is notable that the courts in Kansas have been active in defining impairment of a senior groundwater right by a junior groundwater right to be when that diversion diminishes, weakens, or injures the diversions of water under a prior right (*Garetson Bros. v. Am. Warrior, Inc.*, 51 Kan. App. 2d 370, 389, 347 P.3d 687 (2014), review denied (Jan. 25, 2016)).

Impairment may result from the adverse impact created by the action proposed in an application on points of diversion of other groundwater rights (wells). Excessive groundwater-level drawdown at a well may adversely affect or prevent the exercise of the groundwater right(s) associated with the well. Therefore, part of the impairment evaluation involves estimating the drawdown at wells in the proximity of a proposed groundwater diversion.

Guidelines have been developed based on basic legal water use doctrine, hydrogeologic principles, and agency practice to provide guidance in assessing drawdown estimates for impairment determinations. Analyses of this nature always include uncertainty and data limitations, and accordingly must be applied on a case-by-case basis. Due to these factors, guidelines should include a reasonable level of conservatism, depending on circumstances and available data, to ensure the statutory mandate is met.

In addition to these drawdown assessment guidelines, other public interest considerations of the management program must be applied in the processing and review of water right applications. Those considerations are found in the management program document and other resources posted at: <http://www.gmd3.org/>

## Drawdown Assessment Guidelines

The Drawdown Assessment guidelines provide a general approach to assess drawdown estimates on wells in the vicinity of a proposed diversion. Data availability and magnitude of drawdown control how the guidelines should be applied. Only a few steps may be necessary to reach a conclusion where drawdowns are de minimis, but additional steps may be necessary where the drawdown effects are larger or additional information can be discovered. A drawdown allowance defines a de minimis drawdown.

**Fact finding.** An assessment of drawdown begins by identifying the source aquifer, transmissivity (T), storage coefficient (S), and boundary conditions of the source aquifer for a given application. Values of T and S may be obtained from the following sources:



hydrologic investigations by GMD3, state Division of Water Resources, Kansas Geological Survey, calibrated numerical models, and other sources. The values selected should be appropriate for the water bearing formations and thickness expected to be penetrated by the proposed well.

**Theis calculation.** A Theis analysis is typically performed, although numerical models may be used under the proper conditions, to assess 50-year drawdowns due to the proposed pumping schedule on nearby wells of other ownership, including wells owned by any protestant. The estimated drawdown is compared with a drawdown allowance (see Drawdown Allowance section below). If the predicted drawdown is less than or equal to the drawdown allowance, the impairment analysis in most cases may be concluded. Further work may be conducted for applications which have been protested (see Procedures section).

**Drawdown allowance and critical wells.** If drawdown allowance is exceeded (See drawdown allowance section and Table 1), further analysis is done to determine whether wells are critical wells under the proposal. A critical well is one likely to be impaired within 25 years. For this analysis, the proposed drawdown (DP), the existing drawdown (DE), and the dynamic drawdown (DD) are added together to calculate the total drawdown (DT). The DP is determined by a 25 year Theis analysis. The DE is determined using the GMD3 model or other appropriate better data to determine the likely water level decline over the next 25 years. The DD is the estimated drawdown within the well itself as it pumps. The three drawdown components are summed to obtain the total 25-year drawdown (Figure 1).

**Economical constraint.** Following drawdown estimation, an assessment of adverse impacts to existing nearby wells can be made by evaluating well records to select the amount of water level decline that existing wells may tolerate. As water levels decline, the pumping water level may descend to a level where well operations become uneconomical. Sterrett (2007) indicates (p. 429) that it is impractical to pump a well in an unconfined aquifer at a drawdown that exceeds 67 percent of the water bearing sediments. For administrative purposes, a decline rate not to exceed 40% in 25 years, or a value of 70 percent of the initial water column in 25 years is the economical drawdown constraint options for wells completed in unconfined and confined aquifers, whichever is more conservative, unless there is information to the contrary (Figure 2).

**Physical constraint.** In addition to the economical drawdown constraints, drawdowns can interfere with the physical production of groundwater. Factors such as the depth and thickness of the water bearing formation along with the pump and screen setting must be considered to assess the physical constraint (physical drawdown constraint). See Figure 3 and the Estimations section of this document for further explanation.

**Most conservative constraint.** The most conservative constraint, economical or physical, is the smaller of the two. The total drawdown is compared to the most conservative constraint to determine whether the wells of other ownership are capable of supplying water for a 25-year period from the date of application evaluation. If drawdowns exceed the economical or physical constraint, this may be grounds for impairment unless the

drawdowns due to the proposed use are less than or equal to the drawdown allowance, or other options such as deepening the affected well(s) are available. In other words, a proposed well may induce a drawdown up to the most conservative constraint or the drawdown allowance.

## Drawdown Allowance

Preventing any level of new impact on a well is impractical, as this would result in the denial of all applications including those causing relatively small or de minimis impacts. A drawdown allowance is used to define the relatively small impact due to a proposed diversion that may be allowed to occur on wells in which economical and/or physical constraints are exceeded<sup>1</sup>. The drawdown allowance can be used as a screening tool to identify wells that require additional evaluation.

Recommended drawdown allowances are provided in Table 1. In general, the allowance is based on the magnitude of the current saturated thickness<sup>2</sup> of the aquifer in the vicinity of an application in relation to the allowances adopted in the GMD3 guidelines. Special Groundwater Management Areas can be identified to include those areas in which there is a greater depletion rate than 40% in 25 years and the majority of the wells are critical. The values in Table 1 should be applied on a case-by-case basis for any type of geologic formation. If multiple applications have been filed in the same area it may be inappropriate to grant a succession of drawdown allowances on a given well.

TABLE 1  
RECOMMENDED ADDED DRAWDOWN ALLOWANCE  
FOR AREA WITH NO IMPAIRMENT CLAIM

AVERAGE AQUIFER THICKNESS IN THE VICINITY OF A PROPOSED WELL (ft)	TOTAL DRAWDOWN ALLOWANCE OVER 50 YRS (ft)
0 - 50	1.0
>50 - 75	1.5
>75 - 100	2.0
>100 - 125	2.5
>125 - 150	3.0
>150 - 200	3.5
>200	4.0

<sup>1</sup> Wells in which economic and/or physical constraints are exceeded due to total 25-year drawdown are referred to as "critical wells". Wells may become critical due to the use of existing water rights alone or the combined effects of dynamic drawdown, existing uses, and proposed uses if one or more of the drawdown constraints are exceeded.

<sup>2</sup> If data are insufficient to determine the current thickness the thickness may be based on the average water columns obtained from area well logs.



Saturated thickness can be calculated using the nearest monitoring well on the KGS network and local driller's logs. If the proposed well has a log from a winter month, the water level indicated on that log will be used rather than the observation well's water level. If there are no nearby monitoring wells, and there is no current water level from a driller's log from a winter month, the GMD3 model will be used to estimate saturated thickness.

## **Estimations**

### **Drawdown due to Proposed Use (DP)**

The Theis equation is typically used to calculate 50-year drawdowns on nearby wells due to the use of a proposed well. Drawdowns calculated by a numerical model may be used but may not be representative of the actual conditions near a pumping well. This is typically the case if nearby wells are in the same model cell with the proposed well, or if the numerical model over-simplifies well spacing, which is generally the case for circumstances with boundary effects.

The selection of T, S, and boundary conditions should be based on available information and should be reasonable but conservative. If there is uncertainty regarding the aquifer properties or boundary conditions, the GMD3, DWR or KGS should be consulted. If the 50-year drawdowns are less than or equal to the drawdown allowance, no further work to assess impairment is necessary for most applications. Additional work may be conducted if an application is protested or additional information suggests otherwise.

For applications proposing a change to an existing water right (e.g. to change the point of diversion), the effects due to cessation of the move-from well or wells should be included in the analysis. The net drawdowns are obtained by finding the difference between the move-from and move-to effects. A similar approach may be used to compute the net drawdown for additional well applications.

When evaluating an additional well application, for a worst-case scenario, if no pumping distribution has been provided, assume the entire appropriation is derived from the proposed well. One can assume the well is capable of yielding the requested rate and quantity, then recommend a limitation if this poses a critical well problem. Information on well capacities for certain casing diameters may be obtained from Sterrett, Table 9.3 (2007). Information on capacities of the water bearing formations may be obtained from well records. If drawdowns exceed the economical or physical drawdown constraint on nearby wells, consider redistributing the pumping to each well and potentially placing limitations so that either the proposed pumping no longer exceeds drawdown constraints or no longer exceeds the drawdown allowance from Table 1. It may be worthwhile to contact the applicant in some cases to obtain information on the pumping distribution. If the applicant is requesting a new additional well because wells are failing, a greater percentage of pumping should be assigned to the new well. Keep in mind that requests for new additional wells are often made because well yields are inadequate and other GMD3 policy may be applicable.

### Drawdown due to Existing Water Rights (DE)

Numerical groundwater models should be used to estimate 25-year water level decline due to the use of existing water rights. The model should accurately reflect present pumping rates of all wells and realistically project future rates and quantities pumped given declining water levels and aquifer properties. Calculations should be performed to assess the impacts of diverting the full amount of permitted, vested, adjudicated or certified rights. The amount associated with the beneficial use of domestic wells (K.S.A. 82a-705a) should be included in the analysis if not already included in model data.

### Dynamic Drawdown (DD)

The dynamic drawdown represents the self-induced drawdown inside the casing of a well as the pump is cycled on and off. In some situations dynamic drawdown can be a significant portion of the total drawdown in a well. The procedure to estimate the dynamic drawdown depends on data availability. The options for estimating the dynamic drawdown in the order of preference follow.

1. The dynamic drawdown may be measured directly by obtaining the water level when the well is pumping. This information may have been reported on a well record filed for the well in the section for additional statements. Aquifer tests also provide this information. Corrections to observed drawdowns may be necessary if the operational flow of the well is different from the amount permitted, licensed, adjudicated or declared. Corrections may be made by assuming drawdown is proportional to the pumping rate. For domestic wells, the flow rate  $Q$  should represent the permitted diversion in gpm at 60 percent production time ( $Q_{\text{gpm at 60 \%}} = 1.03 \times Q_{\text{af/yr}}$ ) where domestics may be assigned an amount of 15 acre feet, unless other information dictates otherwise.
2. The dynamic drawdown may be estimated if the specific capacity (SC) is available for the well. The specific capacity is the yield of well per unit of drawdown. The dynamic drawdown is equal to the flow rate  $Q$  in gallons per minute (gpm) divided by the SC in gpm/ft ( $DD = Q/SC$ ).
3. The Theis equation and well efficiency may be used to compute the dynamic drawdown. For non-irrigation wells, a radius of 0.50 feet and 60 percent of a day (864 minutes) for time should be used unless there is information to the contrary. The flow rate  $Q$  should represent the permitted diversion in gpm at 60 percent production time ( $Q_{\text{gpm at 60 \%}} = 1.03 \times Q_{\text{af/yr}}$ ). Due to the variable nature of pumping schedules for irrigation wells, typically the drawdown at the end of the irrigation season is calculated assuming full time production during this period. Alternatively, if pumping schedules can be reasonably approximated the operational well yield may be estimated. The drawdown computed represents the water level decline in the aquifer adjacent to the well. To obtain the drawdown inside the casing (dynamic drawdown), the drawdown obtained from the Theis equation should be divided by a well efficiency of 70 percent (0.70) unless there is information to the contrary.



4. It will be unnecessary to determine the dynamic drawdown for domestic wells if a minimum water column of 20 feet is assumed as the column required for operation (see Physical Drawdown Constraint section), unless data availability allows the estimation of dynamic drawdown and other components affecting the lowest practical pumping level (LPPL).

#### Total Drawdown (DT)

The estimated 25-year drawdowns due to the proposed use (DP), existing wells (DE), and self-induced dynamic drawdown (DD) are summed to obtain DT (Figure 1). The drawdown due to the use of existing wells represents the long-term average while the dynamic drawdown represents the instantaneous drawdown as pumps are turned on. Summing the two drawdowns together will produce some double accounting of drawdown, since drawdowns are computed twice for the same well, once in the existing well calculation and again in the dynamic drawdown calculation. However, the overestimation is probably offset by under-estimating the dynamic drawdown by assuming 70 percent efficiency. Lower efficiencies in some wells are expected, especially in older wells.

#### Water Column (WC)

The water column is the difference between the depth to the non-pumping water level (static water level) and depth to the base of the well screen, or production zone, whichever is higher in the well column. In the absence of well screen and production zone information, the total well depth may be used as the base of the water column. Water levels reported on well records may be updated using available water level data in surrounding wells to obtain the current water column. In the absence of field data to project the current water level, a model or water level reported in the well record may be used.

#### Economical Drawdown Constraint (EDC)

The economical drawdown constraint may be calculated one of two ways, whichever is more conservative. One way is based on the percent of initial water column that can be lost before the well loses economical viability. In the absence of more reliable data, a value of 70 percent of the initial water column loss in 25 years may be assumed as an economical drawdown constraint. An alternative EDC more typically used is a calculation of the rate of aquifer decline not to exceed 40% in the next 25 years (Figure 2).

#### Physical Drawdown Constraint (PDC)

**Physical hardship.** Physical hardship is the loss of the required well yield due to excessive water level decline. The physical drawdown constraint is the difference between the depth to the current static water level (or depth to the potentiometric surface) and depth to the LPPL. The LPPL depends on the availability of well completion information such as the depth and thickness of the water bearing zone or confining unit, pump setting, and screen setting.

**Non-domestic wells.** For non-domestic wells in an unconfined aquifer, the LPPL may be assumed at 40 feet above the top of the well screen or pump whichever is highest in the column, unless this assumption is unreasonable (Figure 3). The LPPL may also be assumed

to be 60 feet above the base of the water column, if the screen interval or pump setting is unknown, unless this assumption is unreasonable. The LPPL for non-domestic wells in a confined aquifer may be assumed at the base of the upper confining unit unless this assumption is unreasonable (Sterrett, 2007). If the total drawdown extends below the LPPL that well becomes a critical well.

**Domestic wells.** Due to the relatively low volume of water produced by domestic wells, and other construction factors, some wells may be constructed with pumps set within the screen interval or close to the bottom of the well. The LPPL is typically assumed to be 20 feet above the base of the water column for domestic wells unless a different value is supported. At least 20 feet may be necessary to maintain submerged conditions, to allow a pump setting above the bottom to avoid sediment problems, and to allow for dynamic drawdown and other components (length of pump and net positive suction head).

#### Public Interest Constraint (PIC).

For the OHP Aquifer district wide, a maximum allowable rate of depletion has been used historically as a standard under the management program for more than 40 years. The GMD3 40/25 maximum allowable rate of depletion calculation will be used to insure any proposal will not result in exceeding nor increase and exceeding the rate of aquifer depletion.

#### Water Usability Constraint (WUC).

Usable water column for well evaluations can be significantly reduced by unusable water quality, or water usability depletion of supply. Usability constraints such as saltwater upwelling will be identified as available information may dictate.

#### **Procedures**

The list below provides a general description of the steps that may be required.

1. Select the source aquifer, T, S, and boundary conditions.
2. Estimate the current average saturated thickness of the source aquifer in the vicinity of the application and determine the drawdown allowance using Table 1. If the current thickness is unknown the thickness may be estimated based on a model or well records which show the saturated thickness encountered.
3. Identify all wells within one mile of proposed well.
4. If no wells are identified in which the 50-year drawdown due to the proposed diversion (DP) is greater than the drawdown allowance from Table 1 or other appropriate value, no further analysis is necessary (but Procedure Nos. 5 through 13 may be conducted if the application is protested).



For all wells in which 50-year drawdown due to the proposed diversion (DP) is greater than the drawdown allowance and for all wells owned by the protestant(s) regardless of their location, proceed with the following steps.

5. Estimate the 25-year drawdown due to the proposed diversion (DP) on wells within one-mile radius of the proposed groundwater diversion. In addition, determine the 25-year drawdown due to the proposed diversion (DP) on wells owned by the protestants regardless of their location.
6. Estimate the 25-year drawdown due to existing water rights (DE).
7. Estimate the dynamic drawdown (DD) for each non-domestic well.
8. Add the results from steps 5, 6, and 7 to obtain the total drawdown (DT) for each non-domestic well considered in the analysis ( $DT = DP + DE + DD$ ).
9. For domestic wells, add results from steps 5 and 6 to obtain the total drawdown ( $DT = DP + DE$ ) if it is assumed that domestic wells require a minimum column of 20 feet for operation. For some cases, including an estimate of the dynamic drawdown in the calculation of total drawdown ( $DT = DP + DE + DD$ ) may be appropriate if sufficient information is available to estimate the dynamic drawdown for a domestic well.
10. Multiply the water column by 0.40 to obtain the 40%/25yr economical drawdown constraint (EDC) for each well considered in the analysis, or other as appropriate.
11. Estimate the depth to the LPPL for each well considered in the analysis.
12. Subtract the depth to the current water level (WL) from the depth to the LPPL to obtain the physical drawdown constraint (PDC) for each well considered in the analysis ( $PDC = LPPL - WL$ ).
13. If DT exceeds the economical (EDC) or physical drawdown constraint (PDC) on any well considered in the analysis, then the well is predicted to have less than a 25-year life and is classified a critical well. Since it has already been established that the drawdown due to the proposed well(s) exceeds the drawdown allowance for wells considered in this analysis, proceed to the Application of Results by Decision-Makers section. If no wells are identified where DT exceeds a drawdown constraint, no additional evaluation is necessary, unless other information dictates otherwise.

### **Application of Results by Decision-Makers**

Although the use of a proposed well may cause drawdowns that exceed an economical or physical constraint plus the drawdown allowance, water right decision-makers may weigh other circumstances before rendering a decision. Several considerations are provided below that may influence decision-making.

One consideration is whether the nearby critical well is reasonably completed. This determination is made by considering the average water columns for wells of the same use (domestic or non-domestic) completed in the preceding 10-year period in the vicinity of a proposed well, unless some other time period is more appropriate. Critical wells that have water columns greater than or equal to 70 percent of the average may be considered reasonably completed, unless local information dictates otherwise. For example, for wells of a certain type of use with an average water column of 100 feet, the water column of a well with 70 feet or more would be considered reasonably completed. Excessive impact on a critical well that is not reasonably completed may not be grounds for impairment.

The presence of a reasonably completed critical well in which the drawdown allowance is exceeded may be considered grounds for impairment. However, before this finding can be rendered, additional factors should be considered such as whether the affected well can be deepened or replaced, and well age. The following guidelines are provided:

1. Reasonably completed critical wells which are 25 years or less in age should not be expected to be deepened or replaced by the well owner because GMD3 guidelines attempt to preserve water for 25 years for these wells. Drawdowns on these wells which exceed the allowance may constitute grounds for impairment.
2. If a reasonably completed critical well is more than 25 years in age and can be deepened into the same source as the original well, drawdowns that exceed the drawdown allowance may not be grounds for impairment.
3. If a reasonably completed critical well is more than 25 years in age but cannot be deepened, drawdowns that exceed the drawdown allowance may be grounds for impairment.
4. The decision that a critical well can be deepened or replaced should be based on evidence that deeper wells in the same source exist in the area and can produce the quantity and quality of water sufficient to fulfill the water right.

Decision-makers may also consider additional information provided by the applicant and/or the neighboring water right owner and/or the GMD3 management program when deciding on an application, such as a pumping schedule, a groundwater monitoring plan, corrective impairment or supply depletion controls, or other information. Based on this information, it may be possible to grant conditional approval. Decision makers may consider other physical solutions to remedy impairment. These solutions may include, but not limited to, the connection of the affected party to the applicant's water system or replacement of impaired wells by the applicant or other forms of mitigating hardships. It is important to include a reasonable process of member notification of the proposal and results of evaluation to receive additional information of practical experience operating the area wells and how that information should be incorporated into the fact-finding process for a recommendation and decision.



## References

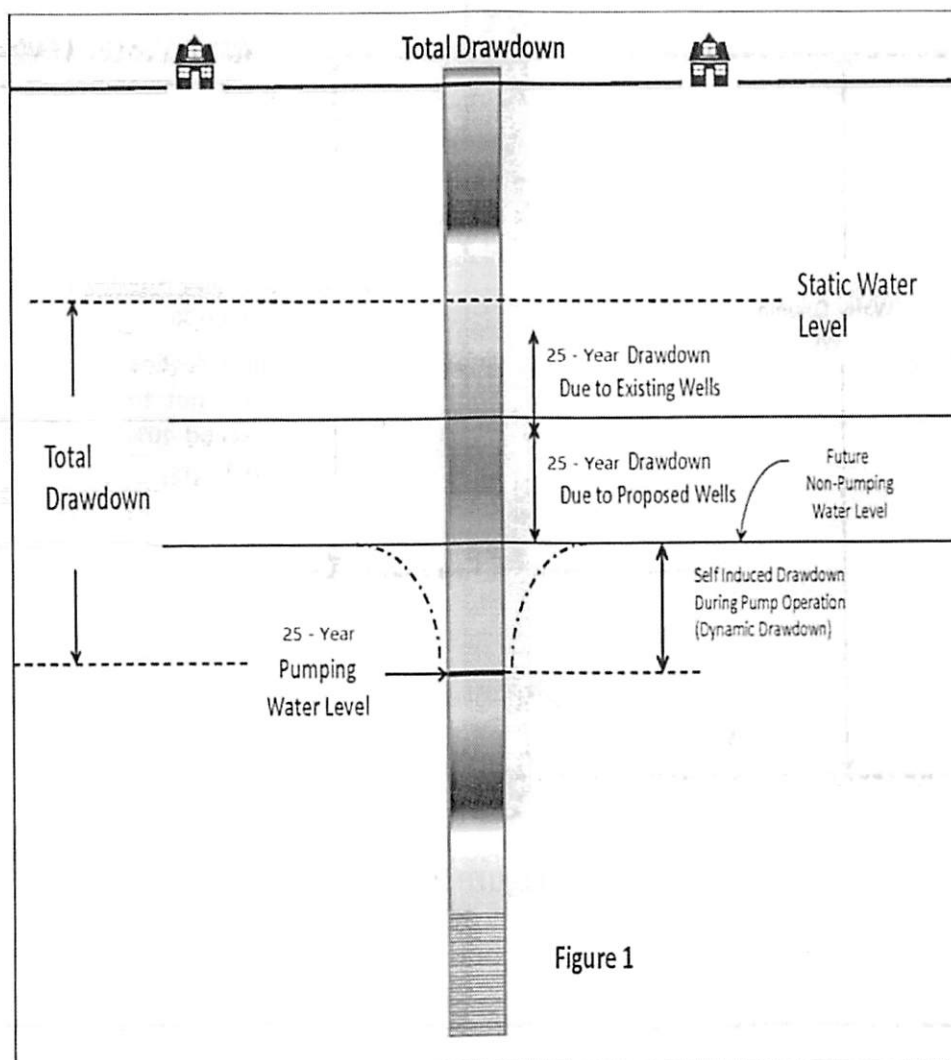
GMD3 Guidelines are adapted in significant part from: NEW MEXICO OFFICE OF THE STATE ENGINEER HYDROLOGY BUREAU REPORT 05-17

Morrison, Tom, 2006, Guidelines for the Assessment of Drawdown Estimates: New Mexico Office of the State Engineer, Hydrology Bureau Report 06-01.

Morrison, Tom, 2016, Guidelines for the Assessment of Drawdown Estimates: New Mexico Office of the State Engineer, Hydrology Bureau Report 16-03. Sterrett, R. J., 2007.

Groundwater and Wells, Johnson Division, St.Paul, MN.

Groundwater and Wells, 2007, 812 pages, Robert J. Sterrett.



## Allowable Economic Drawdown

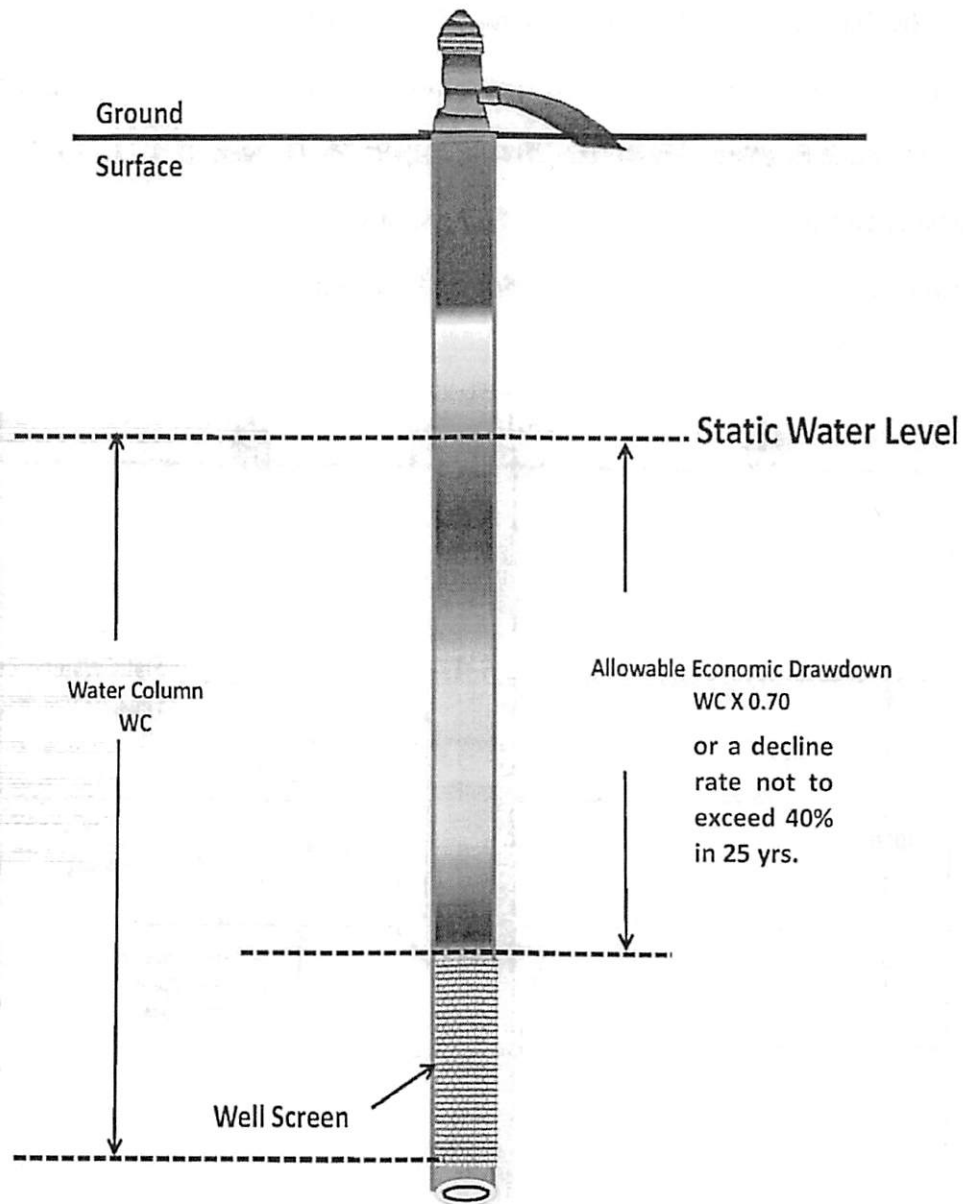
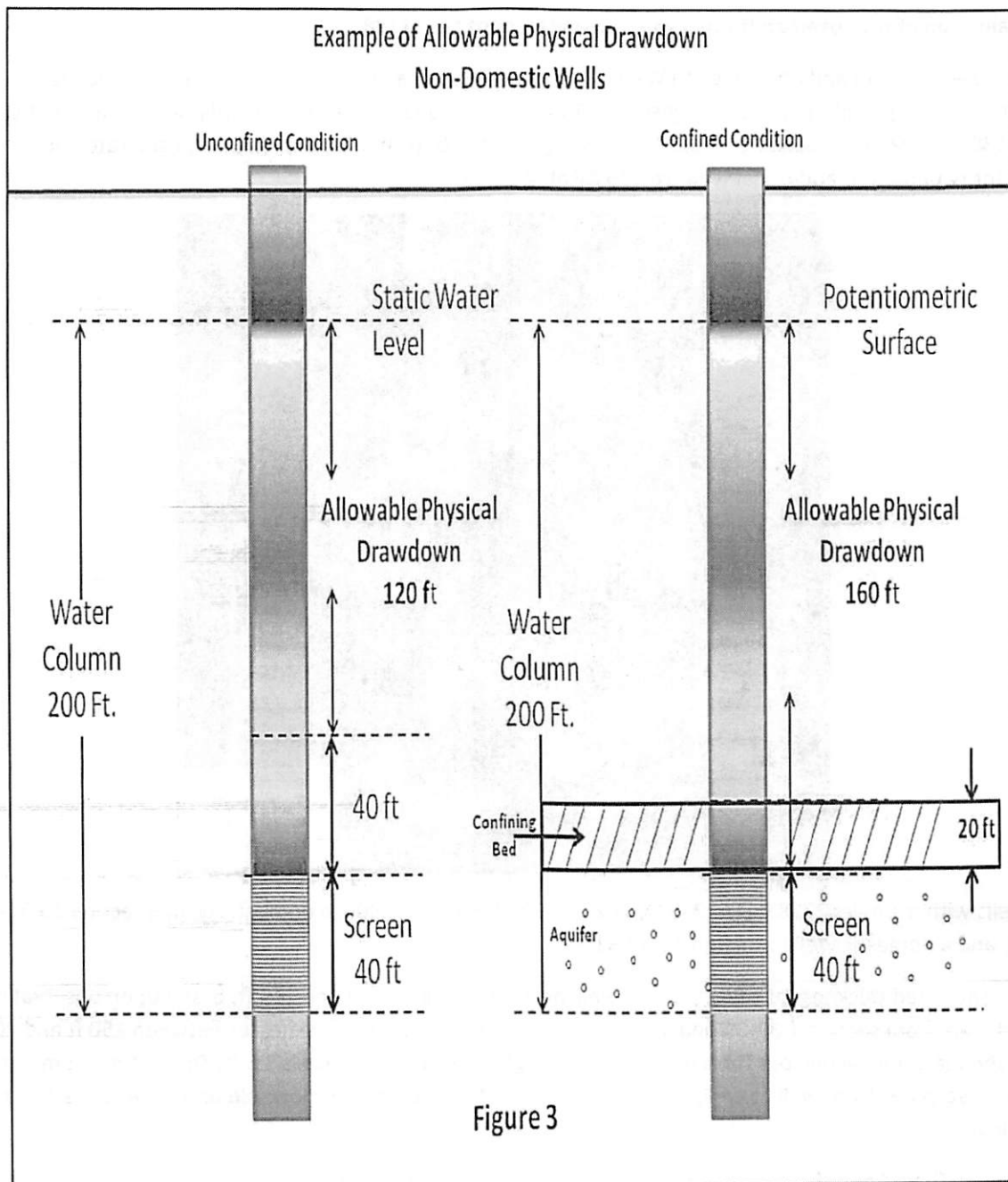


Figure 2





### Evaluation of proposed additional well for Water Right No 27188

Proposed: Add an additional well to Water Right No 27188 to a well location previously authorized under a term permit, to the northwest of 27188 ID 2. Authorized rate and quantity under water right no. 27188 ID2 will be reduced from 536 AF at 1310 gpm to 300 AF at 650 gpm. The proposed rate and quantity under the additional well are 236 AF at 450 gpm.



Wells within 1 mile: 27188 ID 5, 24574, 28263, 19712, 39709, 11906, a domestic well in section 10-32-31, and a domestic well in section 15-32-31.

The saturated thickness at the proposed well location is estimated to be 185 ft, based upon observation well data from section 1-32-31 and local driller's logs. For saturated thicknesses between 150 ft and 200 ft, the maximum allowable Theis drawdown to neighboring critical wells is 3.5 ft. The water column in this area varies from well to well, so the estimated water column and allowable drawdowns are listed below.

**50 year Theis Analysis:** The following values were used to run the analysis:

$S = 0.02664$ ,  $T = 3681 \text{ ft}^2/\text{day}$ ,  $tp_{\text{current}} = 83 \text{ days}$  (based upon observed rate and reported quantity),  
 $Q_{\text{current}} = 1000 \text{ gpm}$  (based upon pump test),  $tp_{\text{proposed}}(\text{ID2}) = 104 \text{ days}$ ,  $Q_{\text{proposed}}(\text{ID2}) = 650 \text{ gpm}$ ,  
 $tp_{\text{proposed}}(\text{Additional Well}) = 119 \text{ days}$ ,  $Q_{\text{proposed}}(\text{Additional Well}) = 450 \text{ gpm}$ .

Theis drawdowns were calculated as follows:

<b>27188 IDS:</b>	<b>Water column = 132 ft</b>
	<b>Drawdown allowance = 3.0 ft</b>
	<b>Drawdown from current location = 8.22 ft</b>
	<b>Drawdown from proposed location = 11.24 ft</b>
	<b>Net drawdown = 3.0 ft</b>
<b>24754:</b>	<b>Water column = 206 ft</b>
	<b>Drawdown allowance = 4.0 ft</b>
	<b>Drawdown from current location = 7.47 ft</b>
	<b>Drawdown from proposed location = 12.16 ft</b>
	<b>Net drawdown = 4.7 ft</b>
<b>28263:</b>	<b>Water column = 115 ft</b>
	<b>Drawdown allowance = 2.5 ft</b>
	<b>Drawdown from current location = 5.41 ft</b>
	<b>Drawdown from proposed location = 8.20 ft</b>
	<b>Net drawdown = 2.8 ft</b>
<b>19712:</b>	<b>Water column = 186 ft</b>
	<b>Drawdown allowance = 3.5 ft</b>
	<b>Drawdown from current location = 10.19 ft</b>
	<b>Drawdown from proposed location = 12.80 ft</b>
	<b>Net drawdown = 2.6 ft</b>
<b>39709:</b>	<b>Water column = 95 ft</b>
	<b>Drawdown allowance = 2.0 ft</b>
	<b>Drawdown from current location = 9.97 ft</b>
	<b>Drawdown from proposed location = 11.81 ft</b>
	<b>Net drawdown = 1.8 ft</b>



**11906:**                      **Water column = 214 ft**  
**Drawdown allowance = 4.0 ft**  
**Drawdown from current location = 8.73 ft**  
**Drawdown from proposed location = 10.58 ft**  
**Net drawdown = 1.8 ft**

**Domestic 10-32-31:**    **Water column = 120 ft**  
**Drawdown allowance = 2.5 ft**  
**Drawdown from current location = 6.27 ft**  
**Drawdown from proposed location = 10.10 ft**  
**Net drawdown = 3.8 ft**

**Domestic 15-32-31:**    **Water column = 186 ft**  
**Drawdown allowance = 3.5 ft**  
**Drawdown from current location = 15.83 ft**  
**Drawdown from proposed location = 18.10 ft**  
**Net drawdown = 2.3 ft**

**Net drawdown exceeds the drawdown allowance for water right nos. 24754, 28263, and the domestic well in section 10-32-31. Critical well evaluation is necessary on those wells.**

**Critical Well Evaluation:**

**24754:    Water Column = 206 ft**  
**DP = 4.33 ft (based upon 25 year Theis calculation using the above parameters)**  
**DE = 35.5 ft (based upon water table declines from the GMD3 model over 25 years)**  
**DD = 65.16 ft (S = 0.02664, T = 3681 ft<sup>2</sup>/day, Q = 621 gpm, tp = 149 days, efficiency = 70%)**  
**DT = 105.0 ft**  
**EDC = 0.4 \* 206 ft = 82.4 ft**  
**PDC = 206 ft – 60 ft = 146 ft**  
**The economic drawdown constraint is more conservative, so it governs.**  
**Total drawdown (105.0 ft) is greater than the EDC, so this well is critical.**

**28263: Water Column = 115 ft**

**DP = 2.45 ft (based upon 25 year Theis calculation using the above parameters)**

**DE = 35.5 ft (based upon water table declines from the GMD3 model over 25 years)**

**DD = 35.74 ft ( $S = 0.02664$ ,  $T = 3861 \text{ ft}^2/\text{day}$ ,  $Q = 342 \text{ gpm}$ ,  $tp = 139 \text{ days}$ ,  $\text{efficiency} = 70\%$ )**

**DT = 73.7 ft**

**EDC =  $0.4 * 115 \text{ ft} = 46.0 \text{ ft}$**

**PDC =  $115 \text{ ft} - 60 \text{ ft} = 55.0 \text{ ft}$**

**The economic drawdown constraint is more conservative, so it governs.**

**Total drawdown (73.7 ft) is greater than the EDC, so this well is critical.**

**Domestic 10-32-31:**

**Water Column = 120 ft**

**DP = 3.92 ft (based upon 25 year Theis calculation using the above parameters)**

**DE = 35.5 ft (based upon water table declines from the GMD3 model over 25 years)**

**DT = 39.4 ft**

**EDC =  $0.4 * 120 \text{ ft} = 48.0 \text{ ft}$**

**PDC =  $120 \text{ ft} - 20 \text{ ft} = 100.0 \text{ ft}$**

**The economic drawdown constraint is more conservative, so it governs.**

**Total drawdown (39.4 ft) is less than the EDC, so this well is not critical.**

**Conclusion:**

**The proposed additional well creates 50 year drawdown affects exceeding the maximum allowable effects under the GMD3 guidelines on the following critical wells:**

- 24754**
- 28263**

**Annual pumping of water right number 27188 ID 2 and the additional well at the proposed rates and quantities is likely to cause impairment with neighboring critical wells. This effect can be mitigated by reducing the rate and/or quantity pumped from the additional well and water right nos. 27188 ID 2 and 27188 ID 5.**

## Jason Norquest

---

**From:** Turney, Brent [KDA] <Brent.Turney@ks.gov>  
**Sent:** Monday, May 6, 2019 4:57 PM  
**To:** Mark Rude  
**Cc:** Meyer, Mike [KDA]; Jason Norquest; claytonbefort@gmail.com; nelson\_seth1@hotmail.com; fred.jones@gardencityks.us; westacre@pld.com; bret.rooney@yahoo.com; Barfield, David [KDA]; Letourneau, Lane [KDA]; Beightel, Chris [KDA]  
**Subject:** RE: Recommendation for Change, File No. 27188  
**Attachments:** 2015-07-06\_Rude Impairment letter.pdf; Theis\_27188\_20190506\_wAttachment.pdf

Mark,

I have met and discussed the issues and comments you provided in your last two emails of [DATE] and [DATE] with the Chief Engineer, Lane Letourneau, and Mike Meyer.

With respect to additional information you have requested, please see enclosed:

1. **An updated Theis evaluation** – While we previously provided our Theis evaluation of November 7, 2018, and while it was apparent that the effects of the reduced rate and quantity on of the requested additional well would have less effects on nearbys, we went ahead and updated the evaluation for your information. See attached evaluation of May 6, 2019. Recall that our Theis methodology, assumptions, and data were provided prior to our October 2017 workshop with the GMDs and discussed in significant detail at the workshop. David Barfield resent this information to you on September 7, 2018 at your request.
2. **John Munson's aquifer characteristics evaluation**

As stated in my previous email, the applicant made the decision to use the rate from only one of the two authorized wells authorized by Water Right, File No. 27,188, to create the proposed additional well. No rate from the second authorized well will be used to create the additional well. As previously noted and in keeping with our historical application of K.A.R. 5-5-16, the well chosen by the applicant has been tested and the applicant has modified the application accordingly to divide the rate of diversion. The modified application satisfies our requirements of K.A.R. 5-5-16(a)(3). No additional rate tests are required to process the application.

With respect to the impairment evaluations in our application decisions under K.S.A. 82a-706b and 711, much of that evaluation is done pursuant to statewide and GMD regulations. In the case of the declining Ogallala, statewide rules are supplemented by the Theis evaluation noted above.

We feel that the GMD has had sufficient time to review the application. Therefore, we respectfully deny your request for additional time. You (and DWR) have already solicited comments from the nearbys on a less restrictive change application so there is little to be gained from additional comments. Comments received on the more restrictive application from the nearbys were the same comments.

The application meets existing regulations, including a finding by KDA-DWR that there is no evidence that impairment will occur in the future. And of course, our approval will be conditioned appropriately to allow for water administration in the future should it be required.

If you would like your recommendation to be considered when processing this application please have it to our office by May XX, 2019 at 5:00 p.m.



Brent

**Brent A. Turney, P.G.**  
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**Division of Water Resources**  
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---

**From:** Mark Rude <[mrude@gmd3.org](mailto:mrude@gmd3.org)>  
**Sent:** Thursday, May 2, 2019 6:18 PM  
**To:** Turney, Brent [KDA] <[Brent.Turney@ks.gov](mailto:Brent.Turney@ks.gov)>; Ireland, Leslie [KDA] <[Leslie.Ireland@ks.gov](mailto:Leslie.Ireland@ks.gov)>  
**Cc:** Meyer, Mike [KDA] <[Mike.Meyer@ks.gov](mailto:Mike.Meyer@ks.gov)>; Jason Norquest <[norquest@gmd3.org](mailto:norquest@gmd3.org)>  
**Subject:** RE: Recommendation for Change, File No. 27188

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Friends,

In lights of a number of factors that include the concerns raised by our members over the current proposal, our hope to provide some reasonable calculations and analysis to the applicant and the neighbors, and the need for some additional information we still don't have, we would like to request more time in which to provide a recommendation.

Thanks for your considerations,

Mark

Mark E. Rude, Executive Director  
Southwest Kansas Groundwater Management District No. 3  
2009 E. Spruce Street  
Garden City, KS 67846  
O (620) 275-7147  
C (620) 272-3001

---

**From:** Turney, Brent [KDA] <[Brent.Turney@ks.gov](mailto:Brent.Turney@ks.gov)>  
**Sent:** Thursday, May 2, 2019 5:30 PM  
**To:** Mark Rude <[mrude@gmd3.org](mailto:mrude@gmd3.org)>; Ireland, Leslie [KDA] <[Leslie.Ireland@ks.gov](mailto:Leslie.Ireland@ks.gov)>  
**Cc:** Meyer, Mike [KDA] <[Mike.Meyer@ks.gov](mailto:Mike.Meyer@ks.gov)>; Jason Norquest <[norquest@gmd3.org](mailto:norquest@gmd3.org)>  
**Subject:** RE: Recommendation for Change, File No. 27188

Mark,

In response to your email concerns about the proposed change in point of diversion File No. 27,188, we feel that no further explanation is needed to define impairment. We have stated in previous correspondence that we will only consider direct well to well impairment and we have determined that in this case it is not a factor.

K.A.R. 5-5-16 does require a test or tests of the wells to be used for an additional well or wells. However, the applicant has made the decision to use the rate from only one of the two authorized wells authorized by File No. 27,188, for the

proposed additional well. If the applicant had proposed to use the rates from both authorized wells to determine the rate for the proposed additional well then a test from the second authorized would have been required. Therefore, a test on the second authorized well will not be required to process the application.  
Brent

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---

**From:** Mark Rude <[mrude@gmd3.org](mailto:mrude@gmd3.org)>  
**Sent:** Thursday, May 2, 2019 2:30 PM  
**To:** Turney, Brent [KDA] <[Brent.Turney@ks.gov](mailto:Brent.Turney@ks.gov)>; Ireland, Leslie [KDA] <[Leslie.Ireland@ks.gov](mailto:Leslie.Ireland@ks.gov)>  
**Cc:** Meyer, Mike [KDA] <[Mike.Meyer@ks.gov](mailto:Mike.Meyer@ks.gov)>; Jason Norquest <[norquest@gmd3.org](mailto:norquest@gmd3.org)>  
**Subject:** RE: Recommendation for Change, File No. 27188

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Brent or others,  
In addition to the description of what constitutes impairment in this area, we also still need the second well test under question (1) per 5-5-16(a)(3). If not tested, would you like for us to get a test?  
Mark

---

**From:** Mark Rude  
**Sent:** Wednesday, May 1, 2019 5:06 PM  
**To:** 'Turney, Brent [KDA]' <[Brent.Turney@ks.gov](mailto:Brent.Turney@ks.gov)>; Ireland, Leslie [KDA] <[Leslie.Ireland@ks.gov](mailto:Leslie.Ireland@ks.gov)>  
**Cc:** Meyer, Mike [KDA] <[Mike.Meyer@ks.gov](mailto:Mike.Meyer@ks.gov)>; Jason Norquest <[norquest@gmd3.org](mailto:norquest@gmd3.org)>  
**Subject:** RE: Recommendation for Change, File No. 27188

Brent,  
Thank you for this response. This is helpful.

I don't see an answer to question 4. A "maybe someday" approach does not answer question 4. Question 4 is not whether impairment may be evaluated someday, but for today's evaluation activity. We are finding members need some assurance of some protection of water right supply afforded to them by the requirements of water rights administration law in a declining supply and also need some administrative confidence over potential future impairment administration against their investment if approved. There is no definition by rule, so rules don't help. So, what is the definition our members are subject to for this area recently studied by DWR? What is the definition of impairment we should use to judge whether it will occur or not? We can then plug that into our calculations and make a recommendation.  
Thanks in advance,



Mark  
Mark E. Rude, Executive Director  
Southwest Kansas Groundwater Management District No. 3  
2009 E. Spruce Street  
Garden City, KS 67846  
O (620) 275-7147  
C (620) 272-3001

---

**From:** Turney, Brent [KDA] <[Brent.Turney@ks.gov](mailto:Brent.Turney@ks.gov)>  
**Sent:** Wednesday, May 1, 2019 12:21 PM  
**To:** Mark Rude <[mrude@gmd3.org](mailto:mrude@gmd3.org)>; Ireland, Leslie [KDA] <[Leslie.Ireland@ks.gov](mailto:Leslie.Ireland@ks.gov)>  
**Cc:** Meyer, Mike [KDA] <[Mike.Meyer@ks.gov](mailto:Mike.Meyer@ks.gov)>; Jason Norquest <[norquest@gmd3.org](mailto:norquest@gmd3.org)>  
**Subject:** RE: Recommendation for Change, File No. 27188

Mark,

I am responding on behalf of Leslie to your email of April 25, 2019. Please find our responses to the questions and comments as outlined in your email.

Brent

1. With respect to your request for tested rate(s) and the sleeve factor used, here is additional information from Mike Meyer which he intended to submit with the application.

The current well is drilled to 390 feet deep (documentation attached with the application from invoice), less than the total aquifer depth in this area based on complete well logs from the local area shows an aquifer depth of 490 to 515 feet below land surface. As documented by Mr. Befort in the application (copy of invoice work order), prior to 2002, the well developed a hole in the casing. Rather than drilling a new well at that time, the owners installed a sleeve in the casing to plug the hole until they felt they needed to re-drill the well. K.A.R. 5-5-16(a)(3)(B) allows for KDA-DWR's interpretation of appropriate rate if the well is not in physical condition to represent the aquifer yield at that location and other reliable data is available to support determination of an appropriate aquifer yield flow rate for that location.

Because the well is over 43 years old, the current pump test from the current location is not representative of the aquifer yield at the local source of supply. Mr. Befort had three options to evaluate while he was contemplating an additional well and the aquifer yield at that location: 1) re-drill the well within 300 feet, gaining over 70' feet of saturated thickness and improved well hydraulics to achieve a rate up to the currently authorized 1310 gpm, 2) pull the pump and have Hydro Resources jet and clean the well to gain additional diversion rate, or 3) settle for the current tested flow rate with adjustment for the reduction in rate caused by the well casing sleeve. Mr. Befort chose the last option rather than spending several thousand dollars to produce a higher flow rate as he is legally entitled to. Mr. Befort's intention is to maintain the current well and pump it at a lower diversion rate to extend the life of the aquifer with two wells. With the DWR test rate at 998 gpm and the proposed additional 10% of rate (as recommended by Hydro Resources in consideration of the well casing sleeve), DWR finds that Mr. Befort's proposal meets the regulation.

2. With respect to your request for information regarding implementation of evaluations under K.A.R. 5-5-16 (f), we have not done any such evaluation for a water right that has been authorized an additional well as per K.A.R. 5-5-16 as we have received no complaints to precipitate such review. All additional wells include



permit conditions retaining jurisdiction and reserving the right to review any such approval now and, in the future, if the need arises.

3. With respect to your information provided from GMD3's draft management program on supplemental wells and "chasing water", we certainly will support GMD3 as they seek to develop regulations to implement the such provisions in a well-reasoned and consistent manner. However, until this is done, applicants are entitled to consideration of their applications under the existing statutes, rules and regulations. The application is not proposing restoring pumping capacity but maintenance of such, which is allowed.
4. With respect to your comments on direct impairment, based on our analysis, we have no evidence to substantiate direct impairment will be caused by approval of applicant's request and, as you are aware K.A.R. 5-5-16 requires that the following condition shall be placed of any additional well:

The application, therefore, is approved subject to the condition that for the sole purpose of administering wells concerning direct impairment, the additional wells shall be considered to have the priority of the date the application was filed to add the additional wells.

If direct impairment of any well with a priority senior to the date the change application is found, KDA-DWR will administer pumping of the additional well accordingly.

5. Finally, with respect to your question on economic limit criteria used by DWR in evaluating the potential for impairment, KDA-DWR relies on existing statutory and regulatory requirements, supplemented by our This analysis to evaluate the potential for impairment.

**Brent A. Turney, P.G.**  
**Kansas Department of Agriculture**  
**Division of Water Resources**  
**1320 Research Park Drive**  
**Manhattan Kansas 66502**  
**(785) 564-6645**  
[Brent.Turney@ks.gov](mailto:Brent.Turney@ks.gov)  
[www.agriculture.ks.gov](http://www.agriculture.ks.gov)

---

**From:** Mark Rude <[mrude@gmd3.org](mailto:mrude@gmd3.org)>  
**Sent:** Thursday, April 25, 2019 6:29 PM  
**To:** Ireland, Leslie [KDA] <[Leslie.Ireland@ks.gov](mailto:Leslie.Ireland@ks.gov)>  
**Cc:** Meyer, Mike [KDA] <[Mike.Meyer@ks.gov](mailto:Mike.Meyer@ks.gov)>; Turney, Brent [KDA] <[Brent.Turney@ks.gov](mailto:Brent.Turney@ks.gov)>; Jason Norquest <[norquest@gmd3.org](mailto:norquest@gmd3.org)>  
**Subject:** FW: Recommendation for Change, File No. 27188

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Leslie,

Thank you for the letter of April 23<sup>rd</sup> providing a revised change app to add the unpermitted well under Water Right, File No. 27,188 as a third well. Staff is currently reviewing the application and we plan to have the policy committee review it and agenda it at our May 8<sup>th</sup> meeting if possible. Several preliminary question have been identified for attention and additional information may exist to provide the requested information.

- 1) 5-5-16 is the statewide additional well rule with general water right administration provisions. Paragraph (a)(3) information may be missing from what you have provided. Specifically (A) total tested rates of the two existing wells or (B) Hydrologic Analysis... Do you have that information? Also, why was there a well sleeve factor used to adjust the well test?
- 2) Also, is there any available information in log or report form available to demonstrate the implementation of section (f) evaluations and whether they have ever occurred under this rule?
- 3) As a matter of information regarding the proposal prejudicing or unreasonably affecting the public interest, the Conservation section of the GMD3 draft management program language forwarded to the chief engineer contains the following general language on Supplemental (additional) wells:
  - a. **Supplemental wells and "chasing water."** Prohibiting adding additional wells to water rights or in use flexibilities between wells for the purpose of adding or restoring groundwater extraction capacity in declining aquifer supply has been a Board policy concern since the 1980's as being inconsistent with the district water conservation strategy. Additional wells to restore extraction capacity raises a "chasing water" concern of disproportionately adding water mining capacity and increasing projected rates of depletion into the future. As cautioned in the description of type (1) water conservation, improving use efficiency carries risk of added capacity to consume every drop of a declining aquifer supply and further reducing already declining supply to other water rights. Individual members may still favor a better management of allocations using additional well sites added to their base water right. Careful evaluation procedures are necessary to identify critical wells under such proposals to: conserve and protect the future local source of supply of prior water rights; preserve local water conservation effort benefits; preserve management program strategies and limits future adverse economic impacts from surprise administrative fiat resulting from impairment claims.
- 4) Concerning direct impairment in this case studied by DWR, we recognize the courts and DWR have relied in other cases on the following definition: "...when that [action] *diminishes, weakens, or injures the diversions of water under a prior right*" (Garetson Bros. v. Am. Warrior, Inc. , 51 Kan. App. 2d 370, 389, 347 P.3d 687 (2014), review denied (Jan. 25, 2016)). We would like to know if this definition is applicable in this case?
- 5) Also, the economic limit standard of 82a-711 has not been implemented by the chief engineer nor evaluated by the court, that we are aware. Are there any economic limit criteria used by DWR?

If you could respond to these questions and provide the needed additional information, it will help us provide an appropriate recommendation.

Thank you for your assistance,

Mark

Mark E. Rude, Executive Director

Southwest Kansas Groundwater Management District No. 3

2009 E. Spruce Street

Garden City, KS 67846

O (620) 275-7147

C (620) 272-3001

---

From: Ireland, Leslie [KDA] <[Leslie.Ireland@ks.gov](mailto:Leslie.Ireland@ks.gov)>

Sent: Tuesday, April 23, 2019 2:54 PM

To: Jason Norquest <[norquest@gmd3.org](mailto:norquest@gmd3.org)>

Cc: Meyer, Mike [KDA] <[Mike.Meyer@ks.gov](mailto:Mike.Meyer@ks.gov)>; Turney, Brent [KDA] <[Brent.Turney@ks.gov](mailto:Brent.Turney@ks.gov)>

Subject: Recommendation for Change, File No. 27188

Jason,

Attached is a letter requesting the review and recommendation of the modified application for this file.

Leslie Ireland, Environmental Scientist  
Kansas Department of Agriculture  
Division of Water Resources - Change Unit  
(785) 564-6633

[Leslie.Ireland@ks.gov](mailto:Leslie.Ireland@ks.gov)

[www.agriculture.ks.gov](http://www.agriculture.ks.gov)





DISCLAIMER: This map is not intended for conveyances, nor is it a legal survey. The information is presented on a best-efforts basis, and should not be relied upon for making financial, survey, legal or other commitments.

May 7, 2019  
09:33 AM



DIVISION OF WATER RESOURCES—KANSAS DEPARTMENT OF AGRICULTURE  
METER FLOW RATE/VOLUME TEST

FILE NO. 27188 Date: 3/19/19 Tester: Mitch French Tested 1 of 2 installations  
Point of Diversion: SE SW SW Sec. 11, T. 32S, R. 31W

Approximately 100 ft. North and 4420 ft. West of SE corner of Sec 11.  
How were distances determined? File Latitude \_\_\_\_\_ Longitude \_\_\_\_\_  
Person(s) present at the test: John Borth Relationship(s) to owner: Tenant

TEST METER INFORMATION: Test meter location GCFO Last verified 2019

Manufacturer Panametrics Model # PT868 Serial # 4539

Sensor is 48 in upstream from open discharge

Sensor is 120 in downstream from elbow

NORMAL CONDITIONS:

R.P.M. POWER UNIT \_\_\_\_\_  
R.P.M. PUMP UNIT \_\_\_\_\_  
Pressure at Pump \_\_\_\_\_ psi

MAXIMUM CONDITIONS

R.P.M. POWER UNIT \_\_\_\_\_  
R.P.M. PUMP UNIT \_\_\_\_\_  
Pressure at Pump \_\_\_\_\_ psi

☒ Non-Intrusive Meter Test Meter Type UTTM Meter Serial No. 4539  
Ending 5137.8 gal. Ending \_\_\_\_\_ gal.  
Beginning 0 gal. Beginning \_\_\_\_\_ gal.  
Difference 5137.8 gal. Meas. O.D. 10.00 Difference \_\_\_\_\_ gal.  
Time 5:08.8 min. Meas. Wall 0.055 min.  
Rate 998.3 gpm. XDCR Setting 219.9 mm Time \_\_\_\_\_ min.  
Material Type Aluminum Rate \_\_\_\_\_ gpm.

Diagnostics:

Signal Strength SS up: 56.2 SS dn: 56.2 (Should be over 55 highest on PVC, up and dn should be close to the same)  
SNDSP: 5652 (Should be close to book value for the soundspeed at measured temp) Temp 60 F  
Delta T (<Delta>): 20.99 Is this number stable? Yes If no please explain: \_\_\_\_\_  
T up: 312.6 T dn: 310.9 (Bad: continuous large fluctuations of 1 microsecond or more)  
Signal Quality: Q up 1376 Q dn 1501 (Should be + - 300 or greater)  
AMPup: 26 AMPdn: 26 (Should be 20 - 28 fluctuations)  
P#up: 465 P#dn: 467 (100 to 900, closest to 500 is best)  
Nfup: 1.0 Nfdn: 1.0 (Should Be 0.85 to 1.0)

☐ Installed Meter Test Manufacturer \_\_\_\_\_ Serial # \_\_\_\_\_ Model # \_\_\_\_\_

Sensor is \_\_\_\_\_ in upstream from \_\_\_\_\_

Sensor is \_\_\_\_\_ in downstream from \_\_\_\_\_

Outside Diameter (Stamped) \_\_\_\_\_ inches (Measured) \_\_\_\_\_ inches  
Inside Diameter (Stamped) \_\_\_\_\_ inches (Measured) \_\_\_\_\_ inches

Ending \_\_\_\_\_ gal. Ending \_\_\_\_\_ gal./AF  
Beginning \_\_\_\_\_ gal. Beginning \_\_\_\_\_ gal./AF  
Difference \_\_\_\_\_ gal. Difference \_\_\_\_\_ gal./AF  
Time \_\_\_\_\_ min. Time \_\_\_\_\_ min.  
Rate \_\_\_\_\_ gpm. Rate \_\_\_\_\_ gpm.

% Error Calculation:  $\frac{\text{Test} - \text{Meter}}{\text{Test}} \times 100$  % error \_\_\_\_\_

☐ Other Flowmeter Use Supplemental Sheet (include meter identification, data and calculations).

COMMENTS: Rate test only. The UTTM held steady at 1027 gpm for the first 3 minutes of testing then began to decrease  
no comparison test as installed meter was removed to make room for DWR meter

- ☐ Good Test  
☒ Adequate Test  
☐ Unacceptable Comparison

Reviewed by Mitch French Date 3-20-19 Entered by \_\_\_\_\_ Date \_\_\_\_\_

WATER RESOURCES  
RECEIVED

APR 23 2019

D. Engelhaupt, E.I.  
KDA-DWR  
5/6/2019

**Theis analysis for File No. 27,188**

A Theis analysis was used to evaluate the impacts of a change in point of diversion for File No. 27,188. The net impact of the change at a nearby domestic well and a point of diversion authorized by File No. 24,754 was evaluated. The assumed transmissivity (3,681.5 ft<sup>2</sup>/day) and storage coefficients (0.02664) are from a seasonal aquifer test analyzed by John Munson, KDA-DWR (Attachment A). The drawdown under the requested rate and quantity was compared to both currently authorized quantity and historic average use (2003-2017) at currently authorized rate. When compared to historic use (average 2008-2017), the proposed change decreases drawdown by 1.86 feet at the domestic well and increases drawdown by 2.60 feet at the point of diversion authorized by File No. 24,754. When compared to currently authorized, the proposed change decreases drawdown by 3.14 feet at the domestic well and increases drawdown by 1.45 feet at the point of diversion authorized by File No. 24,754.

**Table 1: Theis analysis of drawdown at the domestic well compared to historic use.**

Pumping Well <sup>1</sup>	Rate <sup>2</sup> (gpm)		Volume <sup>3</sup> (AF)		Distance <sup>4</sup> (ft)	Drawdown <sup>5</sup> (ft)		Change in Drawdown <sup>6</sup>	
	Base.	Prop.	Base.	Prop.		Base.	Prop.	Feet	% of ST <sup>7</sup>
ID #2	1,310	650	491	300	1,369	20.07	11.11	-8.96	-7.49 %
ID #5	690	690	152	171	4,808	2.82	3.15	0.33	0.28 %
New Well	0	450	0	236	2,052	0.00	6.77	6.77	5.74 %
			643	707	Net:	22.89	21.03	-1.86	-1.55 %

T = 3,681.5 ft<sup>2</sup>/day; S = 0.02664

<sup>1</sup>Sequence within section of the pumping well. Pumping well is authorized by File No. 27,188

<sup>2</sup>Pumping rate. Assumes authorized rate.

<sup>3</sup>Volume pumped. For baseline scenario this is the average use 2003-2017. For ID #5 use on ID Nos. 1 and 3 is included.

<sup>4</sup>Distance between the pumping well and the nearby domestic well

<sup>5</sup>Maximum drawdown after 50-years of pumping cycles under the assumed conditions.

<sup>6</sup>Difference in maximum drawdown between proposed and baseline scenarios.

<sup>7</sup>Difference in maximum drawdowns expressed as percentage of the 2066 saturated thickness as projected by the GMD No. 3 model

**Table 2: Theis analysis of drawdown at the domestic well compared to currently authorized.**

Pumping Well <sup>1</sup>	Rate <sup>2</sup> (gpm)		Volume <sup>3</sup> (AF)		Distance <sup>4</sup> (ft)	Drawdown <sup>5</sup> (ft)		Change in Drawdown <sup>6</sup>	
	Base.	Prop.	Base.	Prop.		Base.	Prop.	Feet	% of ST <sup>7</sup>
ID #2	1,310	650	536	300	1,369	21.02	11.11	-9.91	-8.28 %
ID #5	690	690	171	171	4,808	3.15	3.15	0.00	0.00 %
New Well	0	450	0	236	2,052	0.00	6.77	6.77	5.64 %
			643	707	Net:	24.17	21.03	-3.14	-2.63 %

T = 3,681.5 ft<sup>2</sup>/day; S = 0.02664

<sup>1</sup>Sequence within section of the pumping well. Pumping well is authorized by File No. 27,188

<sup>2</sup>Pumping rate. Assumes authorized rate.

<sup>3</sup>Volume pumped is authorized.

<sup>4</sup>Distance between the pumping well and the nearby domestic well

<sup>5</sup>Maximum drawdown after 50-years of pumping cycles under the assumed conditions.

<sup>6</sup>Difference in maximum drawdown between proposed and baseline scenarios.

<sup>7</sup>Difference in maximum drawdowns expressed as percentage of the 2066 saturated thickness as projected by the GMD No. 3 model

**Table 3: This analysis of drawdown at File No. 24,754 compared to historic use.**

Pumping Well <sup>1</sup>	Rate <sup>2</sup> (gpm)		Volume <sup>3</sup> (AF)		Distance <sup>4</sup> (ft)	Drawdown <sup>5</sup> (ft)		Change in Drawdown <sup>6</sup>	
	Base.	Prop.	Base.	Prop.		Base.	Prop.	Feet	% of ST <sup>7</sup>
ID #2	1,310	650	491	300	4,039	10.00	5.92	-4.08	-3.41 %
ID #5	690	690	152	171	4,038	3.28	3.65	0.37	0.31 %
New Well	0	450	0	236	2,344	0.00	6.31	6.31	5.27 %
			643	707	Net:	13.28	15.88	2.60	2.17 %

T = 3,681.5 ft<sup>3</sup>/day; S = 0.02664

<sup>1</sup>Sequence within section of the pumping well. Pumping well is authorized by File No. 27,188

<sup>2</sup>Pumping rate. Assumes authorized rate.

<sup>3</sup>Volume pumped. For baseline scenario this is the average use 2003-2017. For ID #5 use on ID Nos. 1 and 3 is included.

<sup>4</sup>Distance between the pumping well and the well authorized by File No. 24,754

<sup>5</sup>Maximum drawdown after 50-years of pumping cycles under the assumed conditions.

<sup>6</sup>Difference in maximum drawdown between proposed and baseline scenarios.

<sup>7</sup>Difference in maximum drawdowns expressed as percentage of the 2066 saturated thickness as projected by the GMD No. 3 model

**Table 4: This analysis of drawdown at File No. 24,754 compared to currently authorized**

Pumping Well <sup>1</sup>	Rate <sup>2</sup> (gpm)		Volume <sup>3</sup> (AF)		Distance <sup>4</sup> (ft)	Drawdown <sup>5</sup> (ft)		Change in Drawdown <sup>6</sup>	
	Base.	Prop.	Base.	Prop.		Base.	Prop.	Feet	% of ST <sup>7</sup>
ID #2	1,310	650	536	300	4,039	10.78	5.92	-4.86	-4.06 %
ID #5	690	690	171	171	4,038	3.65	3.65	0.00	0.00 %
New Well	0	450	0	236	2,344	0.00	6.31	6.31	5.27 %
			643	707	Net:	14.43	15.88	1.45	1.21 %

T = 3,681.5 ft<sup>3</sup>/day; S = 0.02664

<sup>1</sup>Sequence within section of the pumping well. Pumping well is authorized by File No. 27,188

<sup>2</sup>Pumping rate. Assumes authorized rate.

<sup>3</sup>Volume pumped is authorized.

<sup>4</sup>Distance between the pumping well and the well authorized by File No. 24,754

<sup>5</sup>Maximum drawdown after 50-years of pumping cycles under the assumed conditions.

<sup>6</sup>Difference in maximum drawdown between proposed and baseline scenarios.

<sup>7</sup>Difference in maximum drawdowns expressed as percentage of the 2066 saturated thickness as projected by the GMD No. 3 model



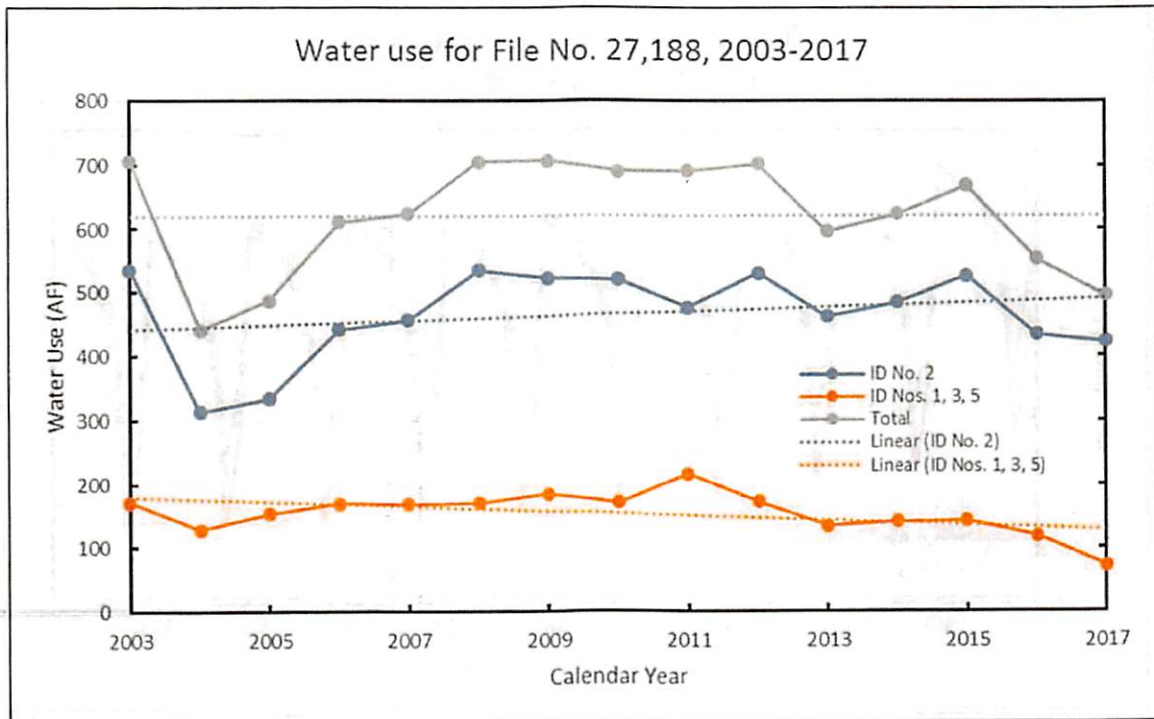


Figure 1: Historic water use on File No. 27,188, 2003-2017

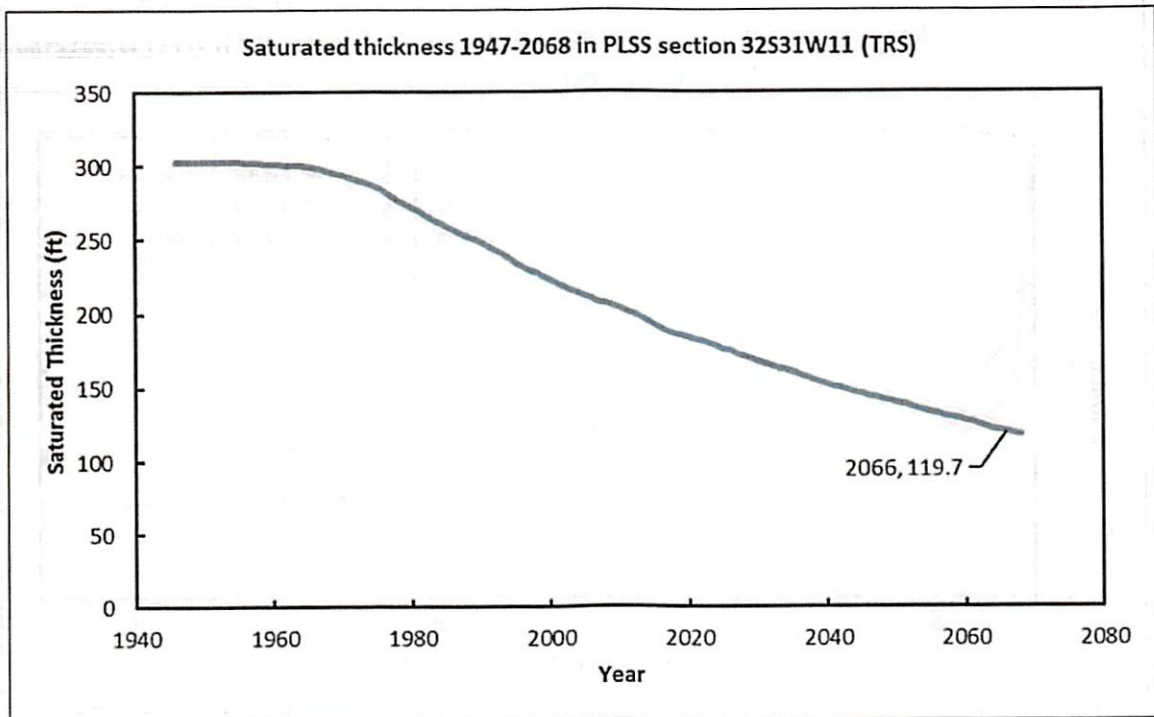


Figure 2: Modeled saturated thickness, 1947-2068

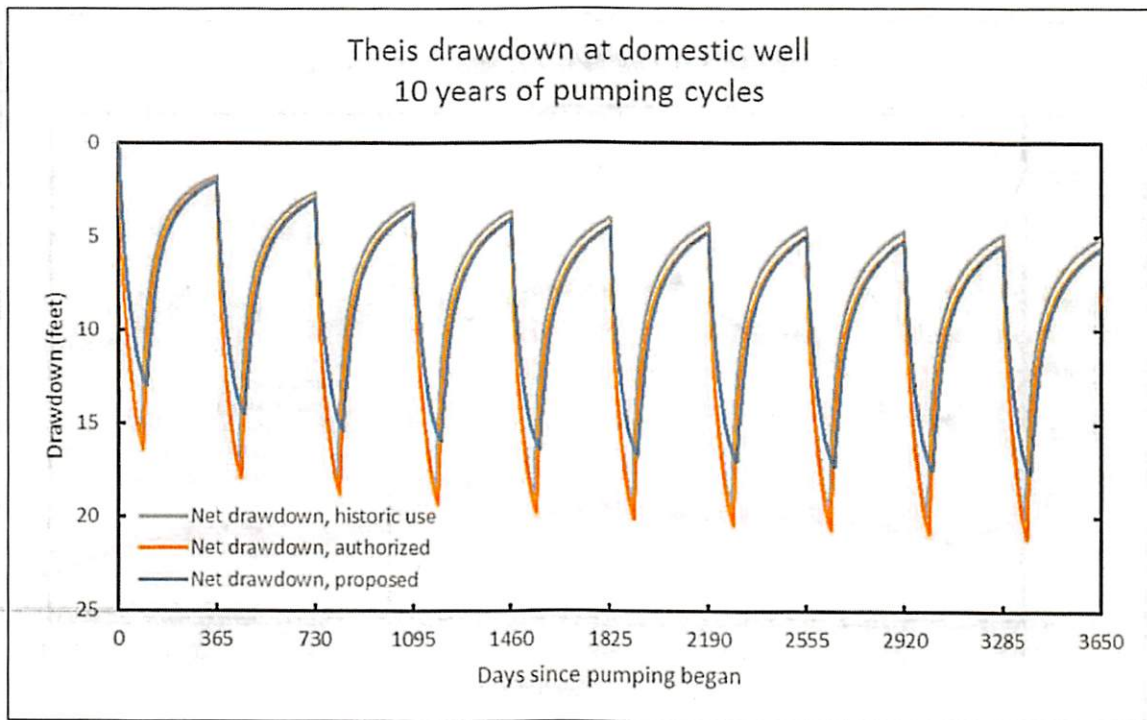


Figure 3: Theis drawdown at the domestic well for the first 10 years of pumping cycles

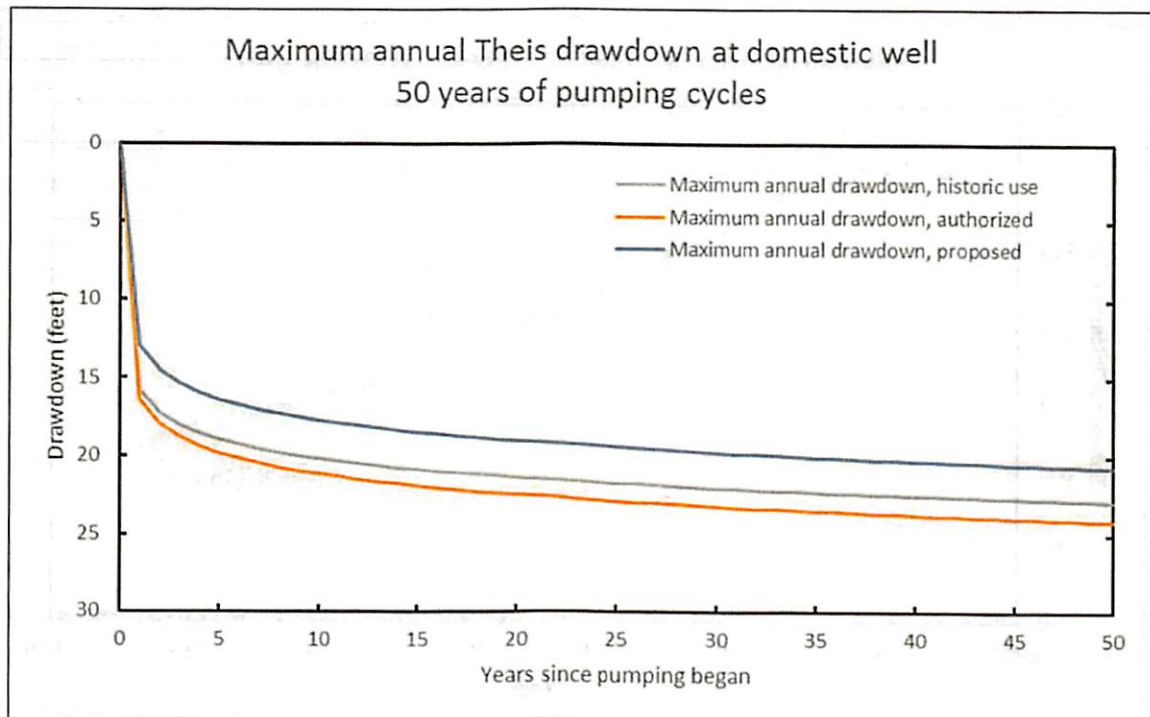


Figure 4: Maximum annual Theis drawdown at the domestic well for 50 years of pumping cycles

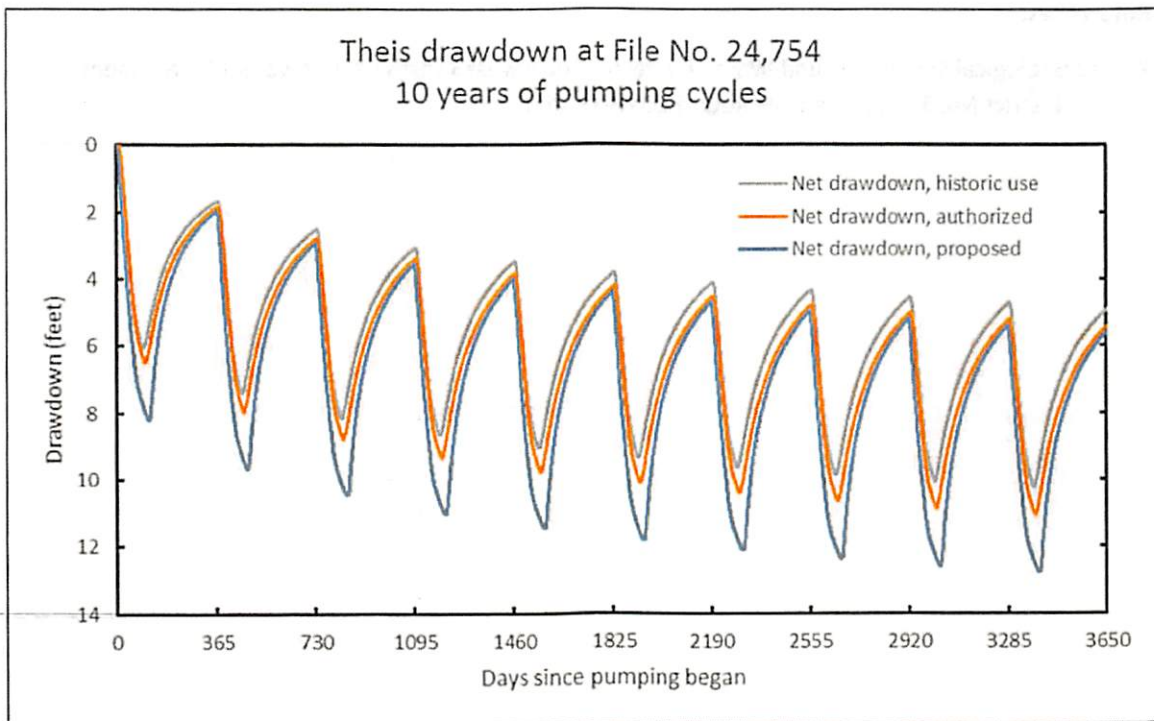


Figure 5: Theis drawdown at File No. 24,754 for the first 10 years of pumping cycles

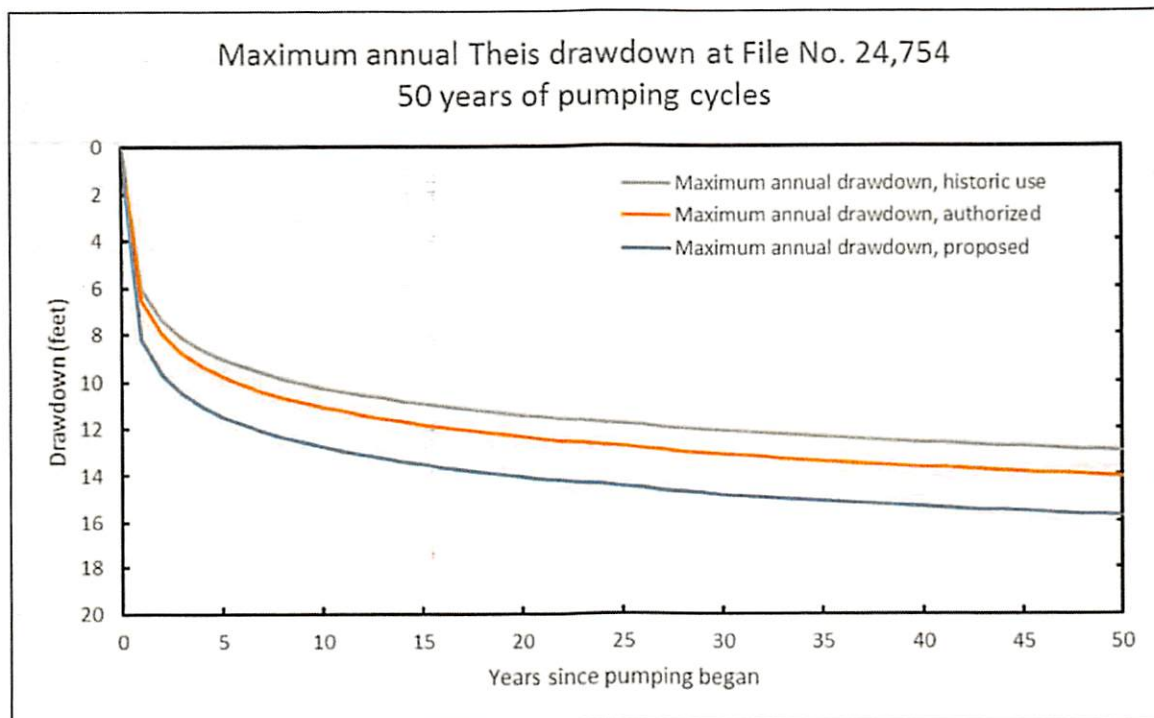


Figure 6: Maximum annual Theis drawdown at File No. 24,754 for 50 years of pumping cycles

**References:**

**Kansas Geological Survey. Ground-Water Model for Southwest Kansas Groundwater Management District No. 3. KGS Open File Report 2010-18. 2010.**



## Seasonal Aquifer Test Proposed Change in Point of Diversion John Borth, Clayton and Sharon Befort File No. 27,188

April 10, 2017 a change in point of diversion for Water Right, File No. 27,188 was filed for a new well for owners Clayton and Sharon Befort and operator John Borth. The new irrigation well is significantly closer to neighboring irrigation well Water Right, File No. 24,754 owned by Darrell Langhofer and to a domestic house well of Scott and Trudy Reiss. Written concerns were received from both parties. The new irrigation well has already been drilled and the chief engineer decided to require an observation well drilled near the new irrigation well so a seasonal aquifer test could be conducted to determine present aquifer properties for the best analysis of potential drawdowns at the complainant's wells. During the 2018 irrigation season data was collected from neighboring irrigation wells for analysis using AQTESOLV<sup>1</sup> to determine aquifer properties. The seasonal aquifer test was conducted by Kansas Department of Agriculture, Division of Water Resources, Technical Services.

An aquifer transmissivity of  $T = 27,538$  gallons per day per foot ( $3,681.5 \text{ ft}^2/\text{day}$ ) and a storage coefficient  $S = 0.02664$  was determined using AQTESOLV. Figure 1.

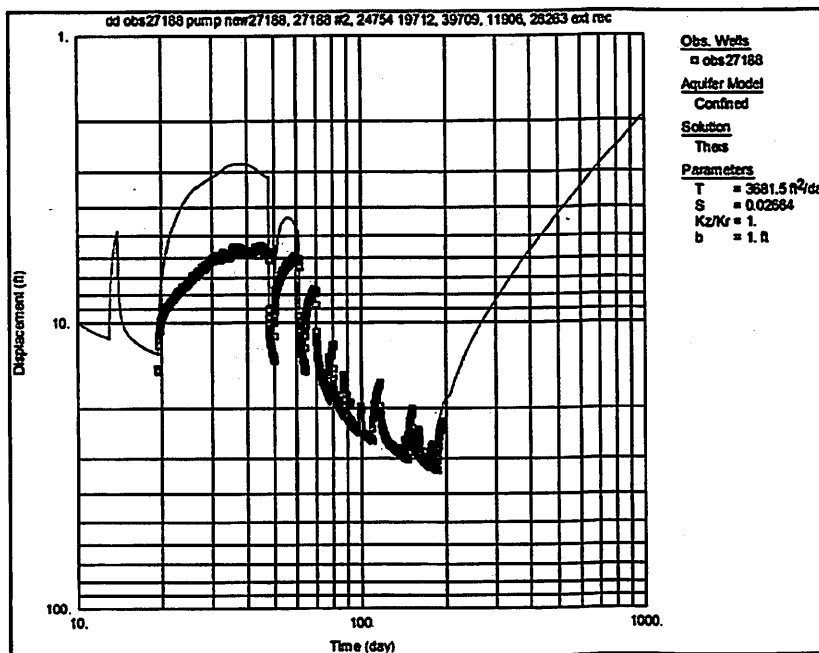
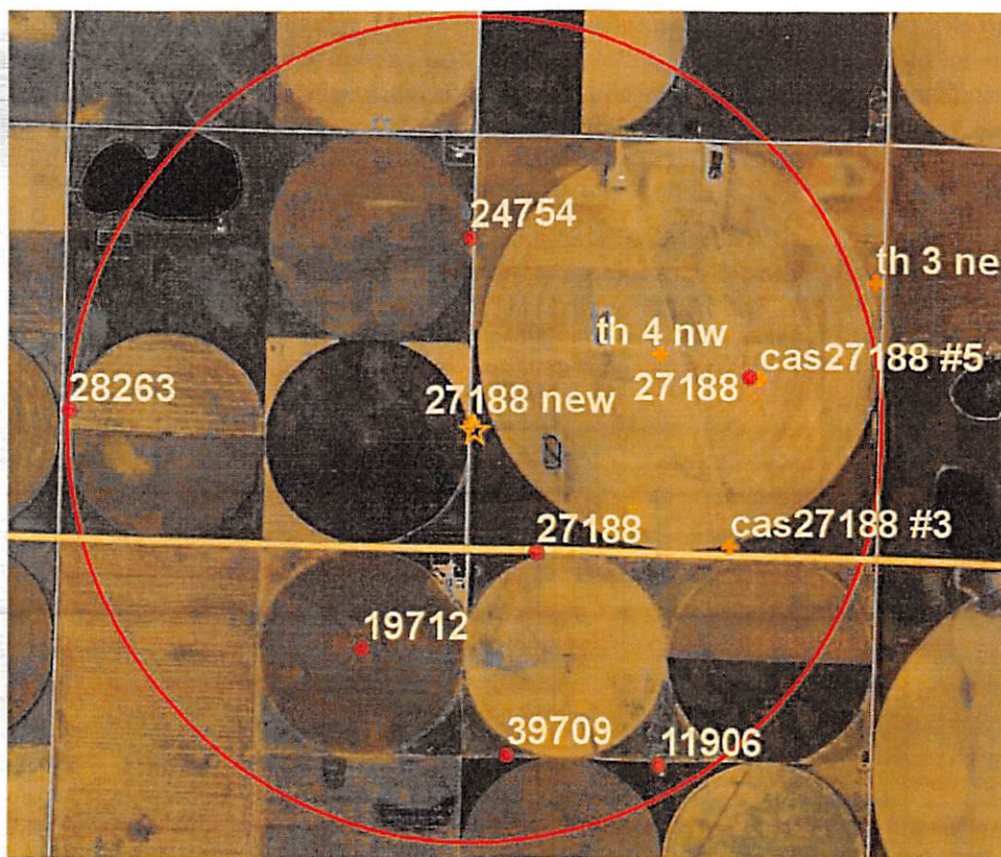


Figure 1 – Curve matching observation well data in black with Theis solution in blue using AQTESOLV.

<sup>1</sup> AQTESOLV is a registered trademark of ARCADIS Geraghty & Miller, Inc. and is an aquifer test analysis software developed and sold by HydroSOLVE, Inc. Kansas Department of Agriculture, Division of Water Resources uses AQTESOLV to determine aquifer properties from aquifer test data.

All seven irrigation wells operated within one mile of the new well were monitored in 2018. **Figure 2.** Water meters were read periodically by field staff. Water level transducers with data loggers were installed at the new irrigation well 27,188, irrigation well 24,754 to the north, and irrigation well 11,906 to the southeast. Water meter monitoring equipment was installed at the nearest irrigation well 27,188 to the southeast to record pumping. Water level transducers with data loggers were also installed in four well casings not being pumped to the east to record water levels at those locations. The aquifer test was based on water level changes at the observation well near the new irrigation well 27,188 and pumping data from the seven irrigation wells. Water level in the well casing labeled "th 3 ne" in Figure 2 outside of the red one-mile circle appeared to be influenced by wells to the north and northeast, not shown in Figure 2, as were well casings labeled "th 4 nw" and "cas27188 #5". Water level at well casing labeled "cas27188 #3" appeared to be influenced from area well pumping but the casing may be partially clogged in the lower formations making it not useful for aquifer test analysis.



**Figure 2 -** New irrigation well 27,188 located in the center of the red one-mile circle. The star to lower right of the new well represents the observation well located 89 feet to the southeast. Farther to the lower right is the other irrigation well 27,188 operated in 2018. The five other irrigation wells operated and monitored in 2018 were 24,754 to the north, 28,263 to the west, 19,712 to the southwest, 39,709 to the south and 11,906 to the southeast. Water levels were monitored at the other four well casing locations to the east labeled "th 4 nw", "th 3 ne", "cas27188 #5", and "cas27188 #3". The Reiss domestic well located in the ne  $\frac{1}{4}$ , ne  $\frac{1}{4}$ , ne  $\frac{1}{4}$  of Section 15, Township 32 South, Range 31 West, is to the south of the new irrigation well 27,188 and is between irrigation wells 19,712 and 27,188.



Well logs were available for five of the seven irrigation wells. Plotting lithologic data in the same chart according to elevation shows all wells were screened in the same elevations. Three well logs were for wells that had water level transducers and data loggers installed so the deepest pumping levels observed could be observed. Water levels in new well 27,188 and neighboring Langhofer well 24,754 both reached about the same pumping depth and appeared to be near the bottom of the primary yielding sand and gravel formation. The Langhofer well appeared to have about 80 feet of screened sandy clay and clayey sand formations between the pumping level and shale. Figure 3.

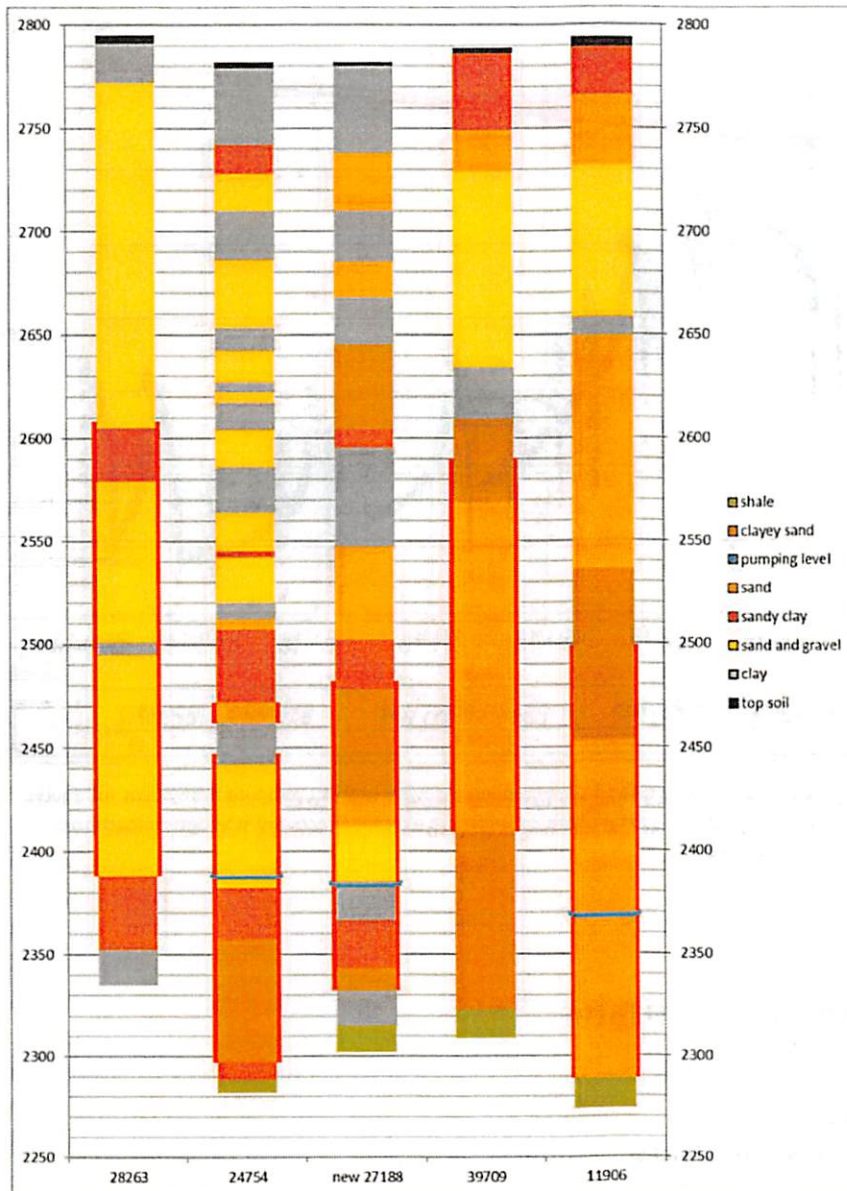


Figure 3 – Lithologic plots of well log data for irrigation wells with available well logs. Deepest pumping levels observed shown as blue lines are near the bottom of the sand and gravel formations in the new well 27,188 and the neighboring Langhofer well 24,754. There appears to be about 80 feet of sandy clay and clayey sand formations between the pumping level and shale in the Langhofer well 24,754 and only 34 feet in the new irrigation well 27,188.



Drawdown at the observation well 89 feet from the new irrigation well 27,188 was used to determine aquifer properties. Area water level was recovering from previous season pumping at the time of first pumping in 2018 so measured water level recovery was extended into the 2018 season to determine total water level drawdown due to pumping. Drawdown was measured from the extended recovery water level rather than from the initial water level when pumping first started. **Figure 4.**

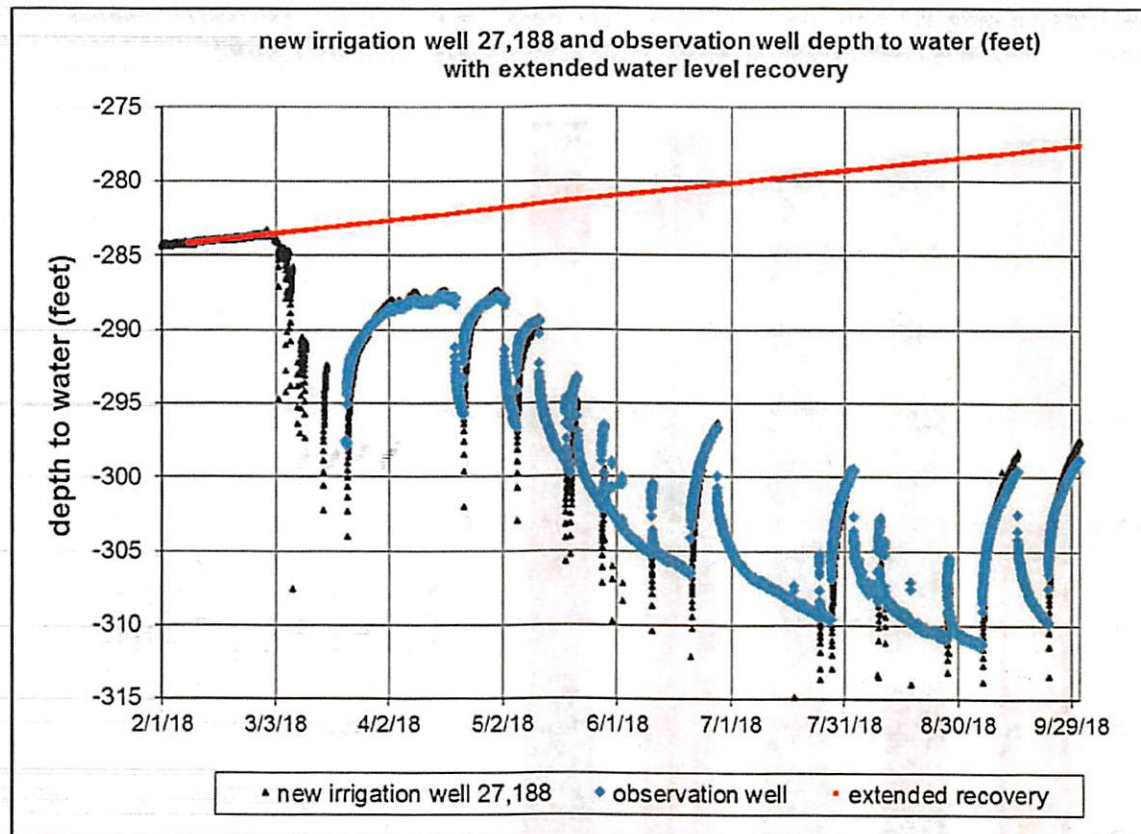


Figure 4—Plots of depth to water at the observation well and the extended recovery used to compute drawdown for aquifer test analysis. The observation well was drilled after seasonal pumping began so extended recovery was determined from water level changes at new irrigation well 27,188.

John Munson  
Groundwater Impairment Investigator  
Water Management Services  
Technical Services  
Division of Water Resources  
Kansas Department of Agriculture

November 1, 2018

Water Rights and Points of Diversion Within 1.00 miles of point defined as:

1612 ft N and 5258 ft W of the SE Corner of Section 11, T 32S, R 31W

Located at: 100.671010 West Longitude and 37.276110 North Latitude

GROUNDWATER ONLY

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=====
File Number   Use ST SR Dist (ft) Q4 Q3 Q2 Q1 FeetN FeetW Sec Twp Rng ID Batt Auth_Quan Add_Quan Unit
A__ 11906 00 IRR NK G      5011 -- NE NE SW 2536 2735 14 32 31W 3 1600 291.00 291.00 AF
A__ 19712 00 IRR NK G      3236 -- -- NC NE 3960 1320 15 32 31W 1 1600 169.00 169.00 AF
A__ 24754 00 IRR NK G      2350 -- SE NE NE 3970 150 10 32 31W 5 2300 540.00 540.00 AF
A__ 27188 00 IRR NK G*     1729 -- SE SW SW 100 4420 11 32 31W 2 1600 536.00 300 AF 536.00 AF
Same          3630 -- NE NW SE 2268 1688 11 32 31W 5 1600 171.00 171.00 AF
A__ 28263 00 IRR NK G      5230 -- SW NW SW 1600 5180 10 32 31W 2 1500 236 AF 2100 452.00 452.00 AF
A__ 39709 00 IRR NK G      4290 -- NW NW SW 2610 4700 14 32 31W 2 1600 291.00 291.00 AF
T__20179074 00 IRR GY G      26 -- SW NW SW 1612 5232 11 32 31W 4 277.00 .00 AF
T__20187035 MF IRR GY G      5011 -- NE NE SW 2536 2735 14 32 31W 3 1455.00 .00 AF
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Total Net Quantities Authorized:   Direct      Storage
Total Requested Amount (AF) =      .00          .00
Total Permitted Amount (AF) =      .00          .00
Total Inspected Amount (AF) =      .00          .00
Total Pro_Cert Amount (AF) =      .00          .00
Total Certified Amount (AF) =    2450.00          .00
Total Vested Amount (AF) =      .00          .00
TOTAL AMOUNT (AF) =    2450.00          .00

```

An \* after the source of supply indicates a pending application for change for the file number.

An \* after the ID indicates a 15 AF exemption was granted for the file number.

A "G" in the Batt column indicates the GEO CTR of a battery. A "B" indicates a well in the battery.

The number in the Batt column is the number of wells in the battery.

Water Rights and Points of Diversion Within 1.00 miles of point defined as:

100.671010 West Longitude and 37.276110 North Latitude

GROUNDWATER ONLY

WATER USE CORRESPONDENTS:

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=====
File Number   Use ST SR

```

A\_\_ 11906 00 IRR NK G

&gt; SCOTT &amp; TRUDY K REISS

&gt;

&gt; 22958 HIGHWAY 160

&gt; PLAINS KS 67869

-----

A\_\_ 19712 00 IRR NK G

&gt; SCOTT &amp; TRUDY K REISS

&gt;

&gt; 22958 HIGHWAY 160

&gt; PLAINS KS 67869

-----

A\_\_ 24754 00 IRR NK G

&gt; DARRELL D LANGHOFER

&gt;

&gt; 20960 ROAD W

&gt; PLAINS KS 67869

>-----

A\_ 27188 00 IRR NK G

> JOHN D BORTH

>

> PO BOX 754

> MEADE KS 67864

>-----

A\_ 28263 00 IRR NK G

> SCOTT & TRUDY K REISS

>

> 22958 HIGHWAY 160

> PLAINS KS 67869

>-----

A\_ 39709 00 IRR NK G

> SCOTT & TRUDY K REISS

>

> 22958 HIGHWAY 160

> PLAINS KS 67869

>-----

T\_20179074 00 IRR GY G

> JOHN D BORTH

>

> PO BOX 754

> MEADE KS 67864

>-----

T\_20187035 MF IRR GY G

> SCOTT & TRUDY K REISS

>

> 22958 HIGHWAY 160

> PLAINS KS 67869

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