From:	Traster, David
To:	"Orrin Feril"
Cc:	Meier, Brian; Clement, Daniel W; "McCormick, Paul"; Buller, Daniel; "Hansen, Christina J."; Preheim, Lynn; Toby Dougherty; Jon Quinday; Lanterman, Jeff [KDA]; Oleen, Aaron [KDA]; Letourneau, Lane; Pollard-Meek, Amy; Barfield, David [KDA]; Darrell Wood
Subject:	RE: Hays/R9 Technical request
Date:	Monday, July 23, 2018 9:48:33 AM

Thank you, Orrin.

Stream Flow Routing

Burns and McDonnell set the upstream contribution of flow entering the model area to zero beginning in year 18 of modeled scenarios 3-6 in the R9 Ranch Groundwater Model Report. Historic data indicates that the upstream contribution was decreasing and had reached zero in year 17. On further examination, it turns out that beginning with year 18 in the modeled scenarios, the streamflow routing was inadvertently disabled as Mr. Balleau suggested. And we agree with Mr. Balleau's assessment that this is a technical error that should eventually be corrected.

However, this technical error only affects surface flow and, therefore, only those cells in the model through which the River flows. Since there is no flow into the first cell at the south end of the Ranch, the reported results will only change to the extent that (1) surface water enters the River from a source other than flow from the south, i.e., rainfall on the riverbed itself, laminar surface flow, or an unknown ephemeral tributary; or (2) the aquifer is so full that the top of the water table is higher than the base of the River so that groundwater is discharged into the River.

In either of those events, the model still accounts for that water until it leaves the cell that receives it. Because of the technical error, water that enters a cell that does not recharge the aquifer and would otherwise leave the cell as surface flow into the next down-stream cell is no longer accounted for in the model.

Because the model in its current form accounts for less than all of the water in system, correcting this technical error will only favor the Cities. Nevertheless, the Cities are comfortable with the GMD's review of the Change Applications, the Master Order, and the Change Approvals even though correcting the technical error in the model would work to the Cities' benefit.

Irrigation Wells in the Drought Scenario

When Burns and McDonnell was developing the model, consideration was given to scaling up irrigation pumping during the simulated drought as was done for the municipal wells. Bear in mind that the simulated drought was developed at the Chief

Engineer's specific request. And because Burns and McDonnell was developing this portion of the model for the Chief Engineer, he was asked about doing as you have suggested. Ultimately, the Chief Engineer elected not to modify nearby irrigation pumping because doing so involved simply too many unknown variables and the modeled results were already very conservative.

Whether that was the right decision or not is subject to second guessing. As you know, water modeling is always, at best, merely a representation of reality, not reality itself. It can never predict what will happen with absolute precision, and there always comes a point when the return on the investment of time and effort associated with modifying the model does not justify the marginal increase in accuracy that could result. Even more concerning, when changes to the model presume a pattern of behavior that may or may not accurately predict what individual water users may do —all of whom have their own motivations, financial considerations, and risk tolerances—the model's accuracy may be either improved or degraded, it is simply not possible to know.

This uncertainty is particularly applicable to the modeled drought scenario, which is interesting and helpful but is also necessarily speculative. Adding additional variations that are even more speculative isn't likely to improve the results enough to justify the time and expense and could potentially produce a *less* reliable model.

Timing

As you know, the Chief Engineer is obligated to submit the change applications to the GMD for review and recommendation. K.A.R. 5-25-20(a)(1).

In preparation for submittal of the Change Applications, the Chief Engineer submitted Burns and McDonnell's modeling report to you on February 19, 2018, and the modeling files were made available to you at or near that same time.

He submitted the Change Applications, the Master Order, and the Change Approvals to you on May 4, 2015.

Unless the Chief Engineer extends the time for review, the GMD has 15 working days to submit its recommendations to the Chief Engineer. K.A.R. 5-25-20(c). Because of the number of applications and their complexity, the Chief Engineer has unilaterally extended the time for the GMD's review from the end of May to the end of August.

We believe that the Chief Engineer has given the GMD more than enough time to determine whether the proposed changes are consistent with the provisions of the Kansas Water Appropriation Act, the Groundwater Management District Act, and

the related regulations. For that reason, we respectfully request that the GMD comply with the Chief Engineer's August 31 deadline to submit its recommendations to the Chief Engineer.

Dave

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From: Orrin Feril [mailto:oferil@gmd5.org]
Sent: July 16, 2018 10:20 AM
To: Traster, David
Cc: Meier, Brian; Clement, Daniel W; 'McCormick, Paul'; Buller, Daniel; 'Hansen, Christina J.'; Preheim, Lynn; Toby Dougherty; Jon Quinday; Lanterman, Jeff [KDA]; Oleen, Aaron [KDA]; Letourneau, Lane [KDA]; Pollard-Meek, Amy; Darrell Wood
Subject: RE: Hays/R9 Technical request

David,
I feel the District is stuck in the middle trying to figure this out. For brevity, I've merged the original questions and responses together including the information from our consultant (Balleau Groundwater).

1. In the predictive "Long-Term" scenarios, BMcD set the flow of the Arkansas River to zero after year 16. This assumes that there will be no contribution of flow (surface or underground) from the Arkansas River in the future. While this is a conservative approach, it does also disable the Streamflow Routing throughout the remainder of the model. As you are likely aware, the District must look beyond the effects of the changes at the border of the HSU to see if there are any long-term effects on the area.

BMcD:

We did not disable Stream Flow Routing, we simply set the upstream contribution of flow entering the model area to zero. Historic data indicates that the upstream contribution was decreasing, and had already reached zero in year 17. The Stream Flow Routing package is still operating, and if the hydrogeologic conditions result in water levels high enough to contribute to the baseflow of the Arkansas River, the Stream Flow Routing package will generate flow in the river in the reaches where it is appropriate.

BGW:
The files we received have streamflow routing disabled beginning at the point in time when BMcD set the upstream flow contribution entering the model area to zero. Perhaps we received the wrong files or disabling the streamflow routing was inadvertent, since BMcD indicates they did not disable the streamflow routing. The model is not intended to operate without streamflow routing. That is, if we have the files BMcD intended to provide, then we consider the disabled routing to be a technical error that should be corrected.

2. In the Drought Scenario, BMcD replicated the recharge events from 1952-1957 and put it into a timeframe in the future. This is a reasonable process. In addition, BMcD estimated increased pumping from the municipal wells during the drought timeframe to simulate higher demand. However, the irrigation wells around the region were left unchanged. The impact of the irrigation wells in addition to the municipal wells will likely have a greater impact on the aquifer than just the pumping of the municipal wells and the results will change. Again, the District must look at the larger picture of the effect of pumping within the region as a whole.

BMcD:
It is likely that during drought years irrigation pumping will be increased. BMcD modeled the drought conditions based on a request by DWR to evaluate higher pumping from the municipal well field under drought conditions. We varied the municipal pumping based on the projected actual operations under those conditions. We did not change the irrigation demands due to the variability that would be introduced by the substantial number of assumptions required (type of crop, crop rotation, amount of increase for each irrigation well, etc.). It was decided that substantially increasing the municipal pumping, substantially reducing recharge and zeroing the additional flow contribution from the river were an appropriately conservative evaluation to meet the DWR request without adding in a large number of widely variable possibilities for irrigation water usage.

BGW:
It is fine that BMcD was responding to a request from DWR to simulate drought conditions at the municipal wellfield, but from a sound technical standpoint, it is odd to not apply the same reasoning to the irrigation wells. This could be assessed by scaling up the repeated irrigation pumping in a fashion similar to what was done for the municipal wells or perhaps by using the simulated irrigation pumping that occurred during the drought of the early 2000s. Metered irrigation pumping already reasonably accounts for site-specific conditions such as crop type or other on-farm conditions.

We anticipate that these issues can be addressed with straightforward refinements to the simulations in order for the District to complete its technical review of the change applications. Without this information, the District will not be able to provide a recommendation to the Chief Engineer in the coming months. Please let me know if you need additional information or clarification.

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Orrin Feril
Manager
Big Bend GMD#5

From: Traster, David <dtraster@foulston.com>
Sent: Thursday, July 12, 2018 2:30 PM
To: Orrin Feril <oferil@gmd5.org>
Cc: Meier, Brian <bmeier@burnsmcd.com>; Clement, Daniel W <dwclement@burnsmcd.com>; 'McCormick, Paul' <pmccormick@burnsmcd.com>; Buller, Daniel <DBuller@foulston.com>; 'Hansen, Christina J.' <christina.hansen@stinson.com>; Preheim, Lynn <lynn.preheim@stinson.com>; Toby Dougherty <tdougherty@haysusa.com>; Jon Quinday <quinday@russellcity.org>; Lanterman, Jeff [KDA] <Jeff.Lanterman@ks.gov>; Oleen, Aaron [KDA] <Aaron.Oleen@ks.gov>; Letourneau, Lane [KDA] <Lane.Letourneau@ks.gov>; Pollard-Meek, Amy <apollardmeek@foulston.com>
Subject: RE: Hays/R9 Technical request

Orrin, I'm forwarding responses to your questions prepared by Burns and McDonnell. Burns and McDonnell will send the shapefiles you requested separately.

Please let us know if you need anything else in order to complete your review by the Chief Engineer's August 31 deadline.

Dave

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From: McCormick, Paul [mailto:pmccormick@burnsmcd.com]
Sent: July 12, 2018 2:13 PM
To: Traster, David; Buller, Daniel
Cc: Meier, Brian; Clement, Daniel W
Subject: RE: Hays/R9 Technical request

David –

Here are our responses to Orrin's questions.

1. In the predictive "Long-Term" scenarios, BMcD set the flow of the Arkansas River to zero after year 16. This assumes that there will be no contribution of flow (surface or underground) from the Arkansas River in the future. While this is a conservative approach, it does also disable the Streamflow Routing throughout the remainder of the model. As you are likely aware, the District must look beyond the effects of the changes at the border of the HSU to see if there are any long-term effects on the area.

We did not disable Stream Flow Routing, we simply set the upstream contribution of flow entering the model area to zero. Historic data indicates that the upstream contribution was decreasing, and had already reached zero in year 17. The Stream Flow Routing package is still operating, and if the hydrogeologic conditions result in water levels high enough to contribute to the baseflow of the Arkansas River, the Stream Flow Routing package will generate flow in the river in the reaches where it is appropriate.

2. In the Drought Scenario, BMcD replicated the recharge events from 1952-1957 and put it into a timeframe in the future. This is a reasonable process. In addition, BMcD estimated increased pumping from the municipal wells during the drought timeframe to simulate higher demand. However, the irrigation wells around the region were left unchanged. The impact of the irrigation wells in addition to the municipal wells will likely have a greater impact on the aquifer than just the pumping of the municipal wells and the results will change. Again, the District must look at the larger picture of the effect of pumping within the region as a whole.

It is likely that during drought years irrigation pumping will be increased. BMcD modeled the drought conditions based on a request by DWR to evaluate higher pumping from the municipal well field under drought conditions. We varied the municipal pumping based on the projected actual operations under those conditions. We did not change the irrigation demands due to the variability that would be introduced by the substantial number of assumptions required (type of crop, crop rotation, amount of increase for each irrigation well, etc.). It was decided that substantially increasing the municipal pumping, substantially reducing recharge and zeroing the additional flow contribution from the river were an appropriately conservative evaluation to meet the DWR request without adding in a large number of widely variable possibilities for

irrigation water usage.

We will provide shapefiles for 1) the HSU boundary, 2) the R9 Ranch boundary, 3) the proposed locations for the municipal wells, and 4) the "buffer" circles that are identified as the "Proposed Areal Limits of Municipal Well Construction".

Thank you,
Paul

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From: Orrin Feril <oferil@gmd5.org>
Sent: Wednesday, July 11, 2018 10:07 AM
To: Clement, Daniel W <dwclement@burnsmcd.com>
Cc: Meier, Brian <bmeier@burnsmcd.com>; Steve Silver <ssilver@balleau.com>; Dave Romero <dromero@balleau.com>
Subject: Hays/R9 Technical request

Daniel,
Thank you for talking with me this morning. As you suggested, this email will summarize our discussion and provide further detail regarding the items we are requesting. In preliminary discussions with our consultant, it appears there are two technical issues that they would like to have addressed.

1. In the predictive "Long-Term" scenarios, BMcD set the flow of the Arkansas River to zero after year 16. This assumes that there will be no contribution of flow (surface or underground) from the Arkansas River in the future. While this is a conservative approach, it does also disable the Streamflow Routing throughout the remainder of the model. As you are likely aware, the District must look beyond the effects of the changes at the border of the HSU to see if there are any long-term effects on the area.
2. In the Drought Scenario, BMcD replicated the recharge events from 1952-1957 and put it into a timeframe in the future. This is a reasonable process. In addition, BMcD estimated increased pumping from the municipal wells during the drought timeframe to simulate higher demand. However, the irrigation wells around the region were left unchanged. The impact of the

irrigation wells in addition to the municipal wells will likely have a greater impact on the aquifer than just the pumping of the municipal wells and the results will change. Again, the District must look at the larger picture of the effect of pumping within the region as a whole.

In addition to the items identified above, I would like to request a few data files to assist in our review/recommendation process. While the District is capable of replicating these files, it appears they have already been created. For consistency and efficiency, we would like to get a shapefile/geodatabase for 1) the HSU boundary, 2) R9 Ranch boundary, 3) proposed locations for the municipal wells, and 4) the "buffer" circles that identified the "Proposed Areal Limits of Municipal Well Construction".

If you have questions or would like to have a follow up call to discuss these items, I would be happy to have these conversations. In particular, the technical items identified above need to be answered/addressed in order for the District to complete it's technical review of the change applications. Without this information, the District will not be able to provide a recommendation to the Chief Engineer in the coming months. Please let me know if you need additional information or clarification.

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