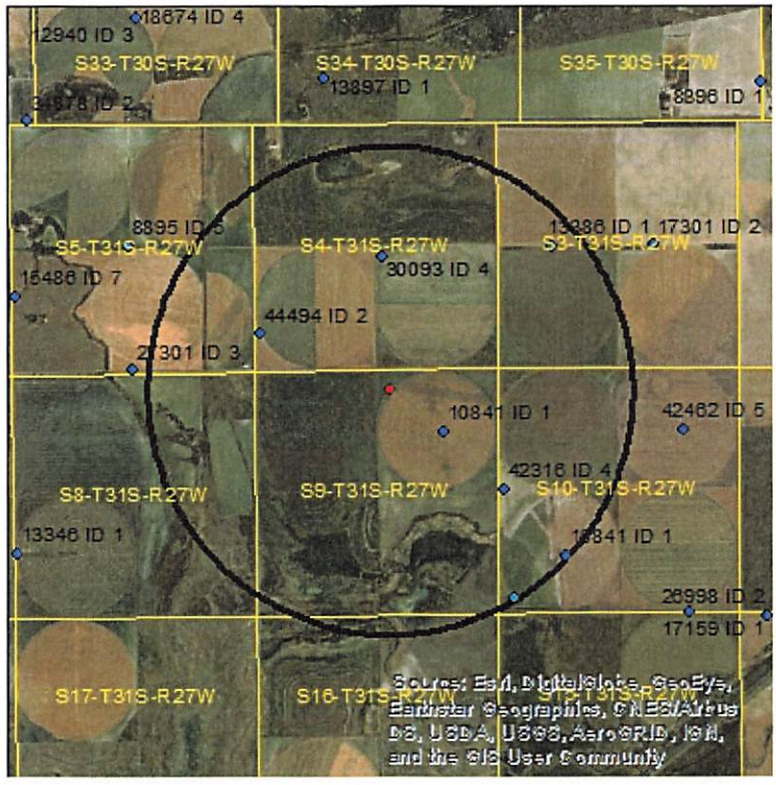
Evaluation of proposed move for Water Right No. 10841 D1

Proposed: Move water right no. 10841 D1 to a new well location 1,471 ft to the northwest.



Wells within 1 mile: 44494, 30093, 13386, 42316, 10841 D2, and a domestic well in section 10-31-27.

The saturated thickness at the proposed well location is estimated to be 273 ft, based upon the GMD3 model. For saturated thickness greater than 200 ft, the drawdown allowance is 4.0 ft.

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

S = 0.0009, T = 960.8 ft^2/day, $tp_{current}$ = 82.5 days, $Q_{current}$ = 500 gpm, $tp_{proposed}$ = 156.3 days, $Q_{proposed}$ = 770 gpm (Note that S and T values were taken from a nearby aquifer test.)

Theis drawdowns were calculated as follows:

44494: Drawdown from current location = 26.3 ft

Drawdown from proposed location = 67.3 ft

Net drawdown = **41.0 ft**

30093: Drawdown from current location = 28.1 ft

Drawdown from proposed location = 68.7 ft

Net drawdown = **40.7 ft**

13386:	Drawdown from current location = 25.9 ft
	Drawdown from proposed location = 57.2 ft
	Net drawdown = **31.3 ft**
42316:	Drawdown from current location = 40.6 ft
	Drawdown from proposed location = 65.8 ft
	Net drawdown = **25.2 ft**
10841 D2:	Drawdown from current location = 29.0 ft
	Drawdown from proposed location = 54.5 ft
	Net drawdown = **25.5 ft**
Domestic 10-31-27:	Drawdown from current location = 28.5 ft
	Drawdown from proposed location = 54.5 ft
	Net drawdown = **26.0 ft**

Net drawdown exceeds the drawdown allowance of 4.0 ft for all wells within 1 mile of the proposed location. Critical well analysis is necessary on those wells.

Critical Well Evaluation:

44494:

Water Column = 269 ft

DP = 41.0 ft (Net drawdown from the proposal indicated above)

DE = 39.7 ft (Water level decline from 2021 through 2046 based upon GMD3 model)

DD = 214.3 ft (S = 0.0009, T = 7187.3 gpd/ft, Q = 500 gpm, tp = 62 days, efficiency = 70%)

DT = 295 ft

Total drawdown of 295 ft is greater than the remaining saturated thickness, so this well **is critical.**

30093:

Water Column = 269 ft

DP = 40.7 ft (Net drawdown from the proposal indicated above)

DE = 39.7 ft (Water level decline from 2021 through 2046 based upon GMD3 model)

DD = 171.1 ft (S = 0.0009, T = 7187.3 gpd/ft, Q = 400 gpm, tp = 60 days, efficiency = 70%)

DT = 251.5 ft

Economic Drawdown Constraint (EDC) = 0.4 * 269 ft = 107.6 ft

Physical Drawdown Constraint (PDC) = 269 ft – 60 ft = 209 ft

Total drawdown of 251.5 ft is greater than the EDC and PDC, so this well **is critical.**

13386:

Water Column = 263 ft

DP = 31.3 ft (Net drawdown from the proposal indicated above)

DE = 29.9 ft (Water level decline from 2021 through 2046 based upon GMD3 model)

DD = 111.1 ft (S = 0.0009, T = 7187.3 gpd/ft, Q = 250 gpm, tp = 124 days, efficiency = 70%)

DT = 172.3 ft

Economic Drawdown Constraint (EDC) = 0.4 * 263 ft = 105.2 ft

Physical Drawdown Constraint (PDC) = 263 ft – 60 ft = 203 ft

Total drawdown of 172.3 ft is greater than the EDC, so this well **is critical.**

42316:

Water Column = 243 ft

DP = 25.2 ft (Net drawdown from the proposal indicated above)

DE = 33.3 ft (Water level decline from 2021 through 2046 based upon GMD3 model)

DD = 212 ft (S = 0.0009, T = 7187.3 gpd/ft, Q = 500 gpm, tp = 51 days, efficiency = 70%)

DT = 270.5 ft

Total drawdown of 270.5 ft exceeds the remaining saturated thickness, so this well **is critical.**

10841 D2:

Water Column = 243 ft

DP = 25.5 ft (Net drawdown from the proposal indicated above)

DE = 33.3 ft (Water level decline from 2021 through 2046 based upon GMD3 model)

DD = 211.9 ft (S = 0.0009, T = 7187.3 gpd/ft, Q = 500 gpm, tp = 50 days, efficiency = 70%)

DT = 270.7 ft

Total drawdown of 270.7 ft is greater than the remaining saturated thickness, so this well **is critical.**

Domestic 10-31-27:

Water Column = 243 ft

DP = 26.0 ft (Net drawdown from the proposal indicated above)

DE = 33.3 ft (Water level decline from 2021 through 2046 based upon GMD3 model)

DT = 59.3 ft

Economic Drawdown Constraint (EDC) = 0.4 * 243 ft = 97.2 ft

Physical Drawdown Constraint (PDC) = 243 ft – 20 ft = 223 ft

Total drawdown of 59.3 ft is less than the EDC and PDC, so this well **is not critical.**

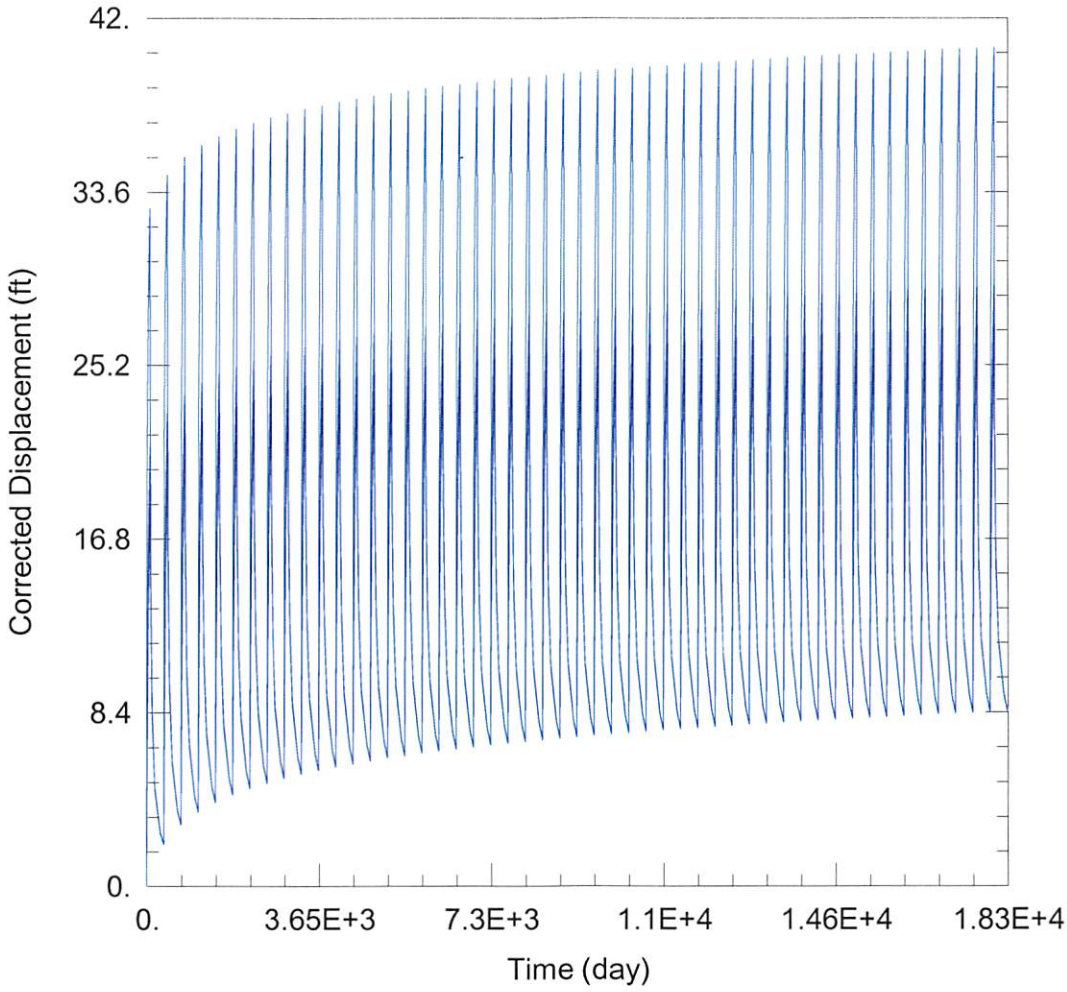
Conclusion:

The proposed change is located near an area with a prior impairment investigation. During this investigation, a pumping test was conducted in 2009, and the specific yield (S) and transmissivity (T) values used to determine well-to-well drawdown effects were drawn from the results of that pumping test. These values are considerably lower than much of the high plains aquifer, and as a result, the calculated well-to-well drawdown effects are very large, and dynamic drawdown requirements (the depth a local well draws into the aquifer to access the water it is currently using) are also very high.

All wells with certified water rights in the area were found to be critical, meaning they are likely to be impaired. In some cases, the total drawdown effects over the next 25 years, when aquifer decline and dynamic drawdown requirements are considered, are estimated to exceed the remaining saturated thickness. These large declines are not actually possible. Instead, the proposed well will likely be incapable of pumping its full annual rate and quantity, and neighboring wells will experience drastic declines in well productivity due to the inability to draw as deep into the aquifer to access a water supply.

Given the information available, it is difficult for GMD3 staff to recommend approval of the application. It is possible that a local aquifer test may prove this area to be different than the location tested in 2009. Better data may provide different results and recommendation. It is also possible that the applicant may agree to a limitation of rate and quantity so that neighboring wells are not flagged as critical through this review process, though those reductions would need to be significant if the aquifer values used are

accurate. Neighbors with questions or concerns should contact GMD3 at (620) 275-7147 or the Division of Water Resources Garden City Field Office at (620) 276-2901 to put concerns on record. Otherwise, the application may be approved as is.



WELL TEST ANALYSIS

Data Set: C:\Users\trevora\Documents\2021_Moves\10841D1\10841 Current.aqt
Date: 08/09/21 Time: 14:30:45

PROJECT INFORMATION

Company: GMD 3
Project: 10841 D1
Location: Meade County

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
10841 Sec 9	157205	180277

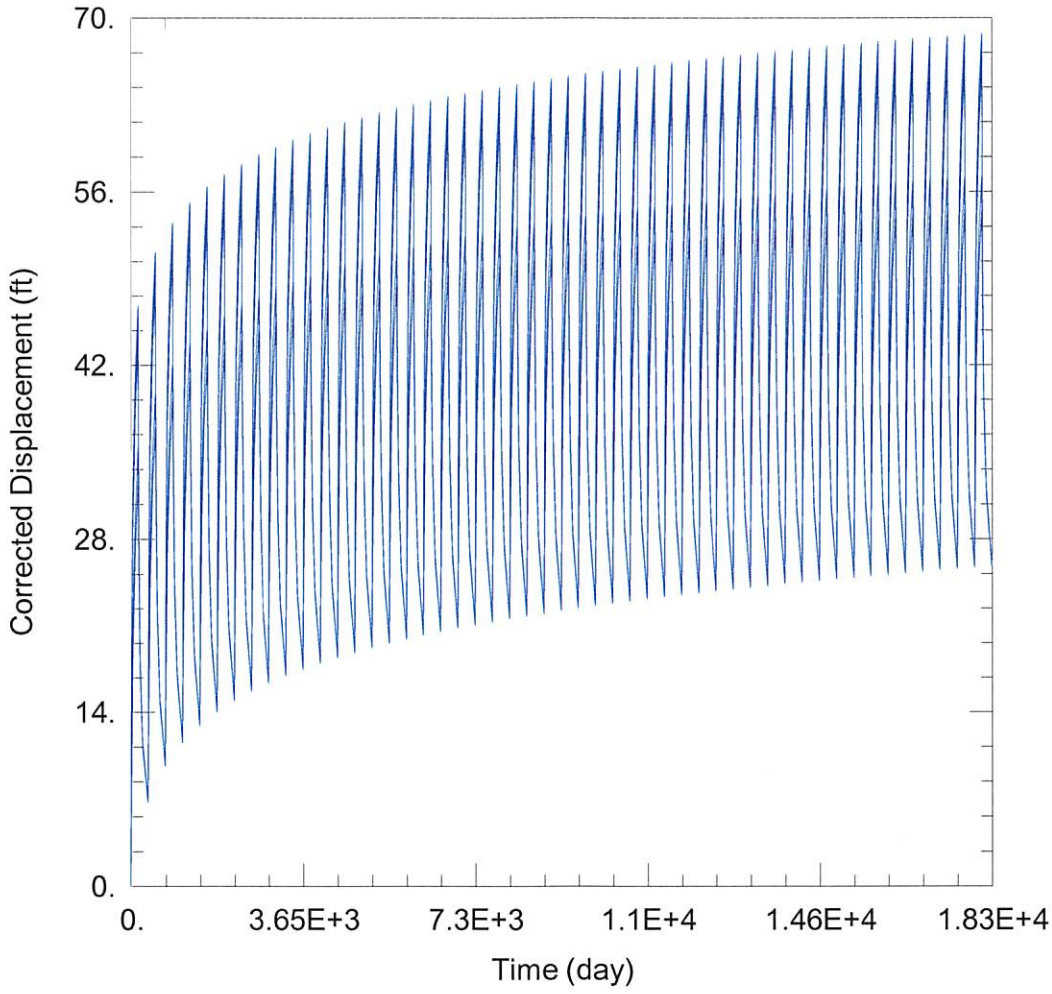
Observation Wells

Well Name	X (ft)	Y (ft)
▫	157205	180277
▫ 44494	153212	182399
▫ 30093	155876	184071
▫ 13386	159536	184274
▫ 42316	158520	179043
▫ 10841 Sec 10	159866	177591
▫ Domestic 10-31-27	158728	176687

SOLUTION

Aquifer Model: Unconfined
Solution Method: Theis

T = 960.8 ft^2/day
S = 0.0009
Kz/Kr = 1.
b = 273. ft



WELL TEST ANALYSIS

Data Set: C:\Users\trevora\Documents\2021_Moves\10841D1\10841 Proposed.aqt
Date: 08/09/21 Time: 14:30:37

PROJECT INFORMATION

Company: GMD 3
Project: 10841 D1
Location: Meade County

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
10841 Sec 9	156041	181175

Observation Wells

Well Name	X (ft)	Y (ft)
▫	156041	181175
▫ 44494	153212	182399
▫ 30093	155876	184071
▫ 13386	159536	184274
▫ 42316	158520	179043
▫ 10841 Sec 10	159866	177591
▫ Domestic 10-31-27	158728	176687

SOLUTION

Aquifer Model: Unconfined
Solution Method: Theis

T = 960.8 ft^2/day
S = 0.0009
Kz/Kr = 1.
b = 273. ft