DEPARTMENT OF ENVIRONMENT
and NATURAL RESOURCES
JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
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RECOMMENDATION OF CHIEF ENGINEER FOR WATER PERMIT APPLICATION NO. 8039-3, Grohs Farms Partnership

Pursuant to SDCL 46-2A-2, the following is the recommendation of the Chief Engineer, Water Rights Program, Department of Environment and Natural Resources concerning Water Permit Application No. 8039-3, Grohs Farms Partnership, c/o Todd Grohs, 509 Slocum Avenue S, Wessington Springs SD 57382.

The Chief Engineer is recommending APPROVAL of Application No. 8039-3 because 1) there is reasonable probability that there is unappropriated water available for the applicant's proposed use, 2) the proposed diversion can be developed without unlawful impairment of existing rights, 3) the proposed use is a beneficial use and 4) it is in the public interest with the following qualification:

1. The wells approved under this Permit will be located near domestic wells and other wells which may obtain water from the same aquifer. The well owner under this Permit shall control his withdrawals so there is not a reduction of needed water supplies in adequate domestic wells or in adequate wells having prior water rights.

2. The wells authorized by Permit No. 8039-3 shall be constructed by a licensed well driller and construction of the well and installation of the pump shall comply with Water Management Board Well Construction Rules, Chapter 74:02:04 with the well casing pressure grouted (bottom to top) pursuant to Section 74:02:04:28.

3. This Permit is approved subject to the irrigation water use questionnaire being submitted each year.

See report on application for additional information.

Jeanne Goodman, Chief Engineer
October 3, 2014

REPORT TO THE CHIEF ENGINEER
ON
WATER PERMIT APPLICATION NO. 8039-3
GROHS FARMS PARTNERSHIP
C/O TODD GROHS
OCTOBER 3, 2014

Water Permit Application No. 8039-3 proposes to appropriate water at a maximum diversion rate of 4.0 cubic feet of water per second (cfs) from two wells (190 feet deep) to be completed into the Crow Creek aquifer in the SE ¼ SE ¼ Section 5 for the irrigation of 320 acres located in the E ½ Section 5; all in T106N-R67W in Jerauld County.

AQUIFER: Crow Creek aquifer (CC)

Aquifer Characteristics:
The Crow Creek aquifer is primarily composed of well-sorted, medium to very coarse sand and gravel (Hamilton, 1985). According to Hamilton (1985), the aquifer underlies approximately 70 square miles (44,800 acres) of Jerauld County. Hedges and others (1982) estimated the Crow Creek aquifer to underlie approximately 40,300 acres of Jerauld County, 1,200 acres of Hand County, and a yet to be delineated area of Buffalo County.

In Jerauld County, Hamilton (1985) estimated the aquifer has 270,000 acre-feet (ac-ft) of water in storage. The aquifer has a thickness ranging from 5 to 98 feet with an average of 30 feet (Hamilton, 1985). The thicker portions are generally composed of several layers (Hamilton, 1985). The aquifer materials can be encountered between 19 to 165 feet below ground surface (Hamilton, 1985). The aquifer is generally under water table conditions, but artesian conditions do exist (Water Rights, 2014b).

The test hole logs submitted with this application indicated there are sand and gravel deposits in several layers from 85 to 190 below ground surface with a static water level between 86 and 90 feet below grade. The aquifer is under unconfined conditions at the proposed well sites but is very close to becoming confined.

South Dakota Codified Law (SDCL) 46-2A-9
Pursuant to SDCL 46-2A-9, a permit to appropriate water may be issued only if there is a reasonable probability that there is unappropriated water available for this applicant's proposed use, that the proposed diversion can be developed without unlawful impairment of existing rights and that the proposed use is a beneficial use and in the public interest. This report will address the availability of unappropriated water and effects on existing rights from the aquifer that are pertinent to this application.

WATER AVAILABILIITY:
This application proposes to appropriate water from the Crow Creek aquifer. The probability of unappropriated water available from the aquifer can be evaluated by considering SDCL 46-6-3.1, which requires "No application to appropriate groundwater may be approved if, according to the best information reasonably available, it is probable that the quantity of water withdrawn

annually from a groundwater source will exceed the quantity of the average estimated annual recharge of water to the groundwater source." If the source of the water is older or lower than the Greenhorn Formation and a public water system has applied for a permit, the Board need not consider the recharge/withdrawal issue. In this case, the aquifer is not stratigraphically lower than the Greenhorn Formation and the applicant is not a public water system.

In applying SDCL 46-6-3.1, the Sixth Judicial Circuit Court ruled in 2005 that if the Water Management Board uses average annual recharge, then it should also use average annual withdrawals to determine if unappropriated water is available from the aquifer (*Hines v. South Dakota Dept. of Environ. and Nat'l Resources, Hughes County 04-37*) (Memorandum Decision, April 29, 2005).

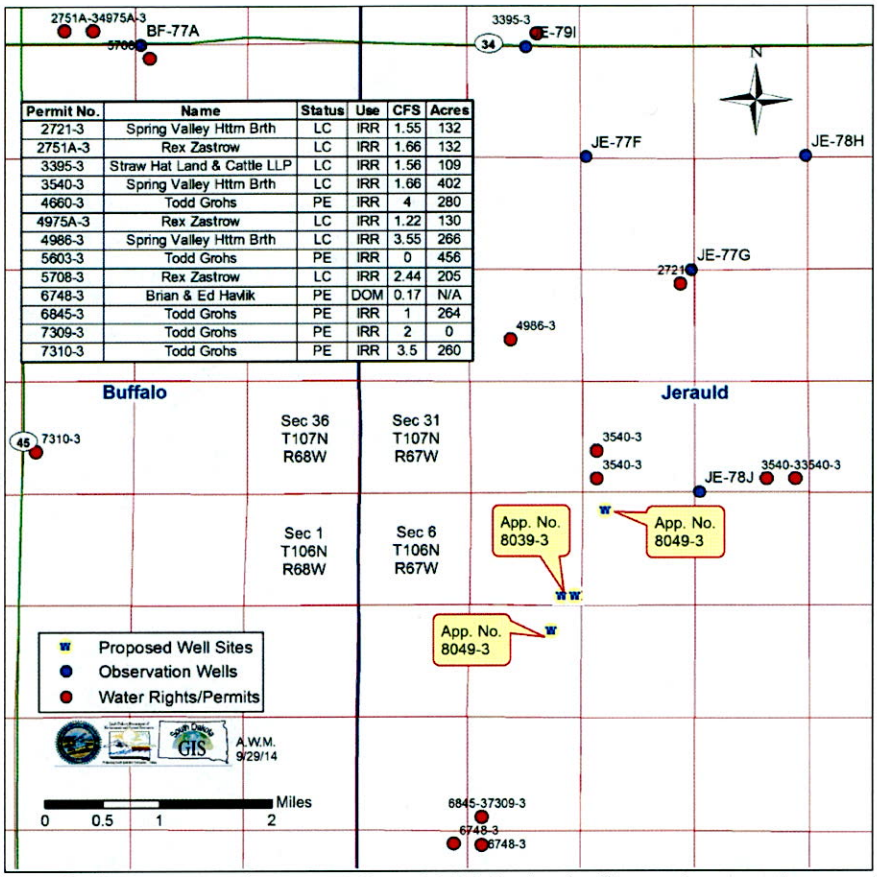
A 2012 First Judicial Circuit Court's rulings ultimately stated that data must be present to show it is probable the average annual recharge exceeds the average annual discharge by at least the amount requested by the water permit application being considered (*Hanson County Dairy v. Robert Bender and Stace Nelson*) (Memorandum Decision, April 11, 2012).

Later in 2012, the First Judicial Circuit Court stated that in deciding whether or not it is probable that the quantity of water withdrawn will exceed the quantity of the average estimated annual recharge is to be based according to the best information reasonably available, and that nothing in South Dakota law requires a recharge study (*Longview Farms, LLP v. South Dakota Dept. of Environ. and Nat'l Resources*) (Memorandum Decision, May 17, 2012).

Observation Well Data:
Administrative Rule of South Dakota Section 74:02:05:07 requires that the Water Management Board shall rely upon the record of observation well measurements to determine that the quantity of water withdrawn annually from the aquifer does not exceed the estimated average annual recharge of the aquifer.

The DENR-Water Rights Program monitors 9 observation wells completed into the Crow Creek aquifer (Water Rights, 2014a). A map of the project area including observation wells and water rights/permits authorized to withdraw water from the Crow Creek aquifer is shown in Figure 1. The hydrographs for the nearest of the observation wells are shown in Figures 2 and 3. The hydrographs for observation wells completed into the Crow Creek aquifer show increasing water levels over the period of record (Water Rights, 2014a).

The water levels in the observation well hydrographs shown in this report are representative of the aquifer. The water level in the observation wells shows good response to climatic conditions. The water level rises (recharge) during wet years and gradually declines during dry years. The climatic effects on water level greatly mask the temporal impacts of well withdrawals. Therefore, recharge to and natural discharge from the Crow Creek aquifer can be captured for pumping, and the hydrographs document that unappropriated water is available for this proposed appropriation.



Permit No.	Name	Status	Use	CFS	Acres
2721-3	Spring Valley Httm Brth	LC	IRR	1.55	132
2751A-3	Rex Zastrow	LC	IRR	1.66	132
3395-3	Straw Hat Land & Cattle LLP	LC	IRR	1.56	109
3540-3	Spring Valley Httm Brth	LC	IRR	1.66	402
4660-3	Todd Grohs	PE	IRR	4	280
4975A-3	Rex Zastrow	LC	IRR	1.22	130
4986-3	Spring Valley Httm Brth	LC	IRR	3.55	266
5603-3	Todd Grohs	PE	IRR	0	456
5708-3	Rex Zastrow	LC	IRR	2.44	205
6748-3	Brian & Ed Havlik	PE	DOM	0.17	N/A
6845-3	Todd Grohs	PE	IRR	1	264
7309-3	Todd Grohs	PE	IRR	2	0
7310-3	Todd Grohs	PE	IRR	3.5	260

Figure 1- Map of the area of App. No. 8039-3 including observation wells and water rights/permits (Water Rights, 2014a and 2014b)

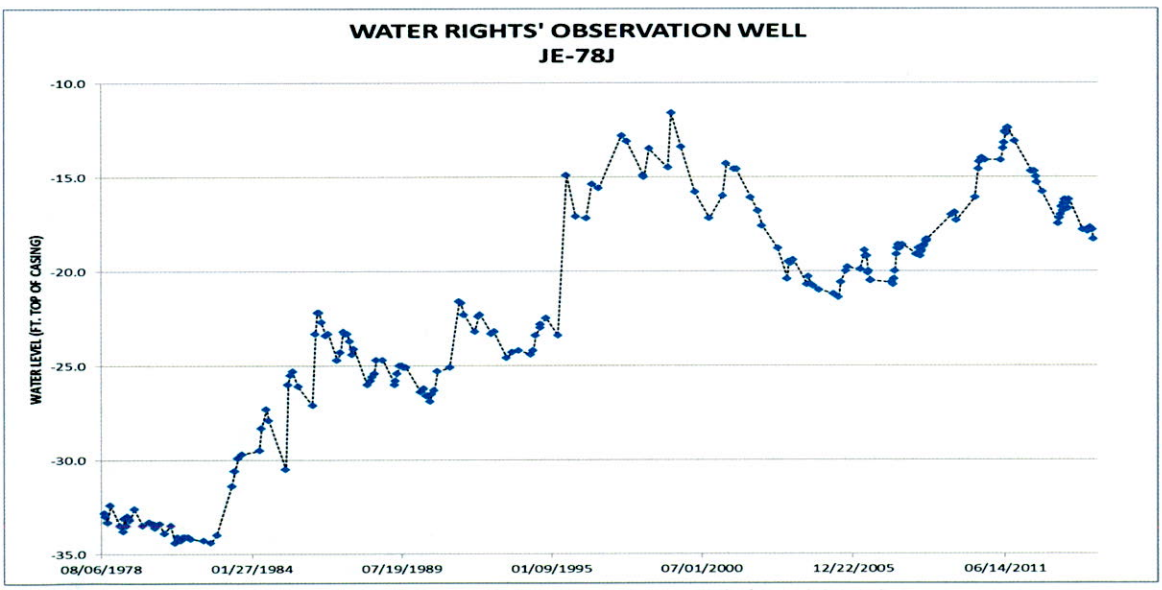


Figure 2- Hydrograph for observation well JE-78J (Water Rights, 2014a)

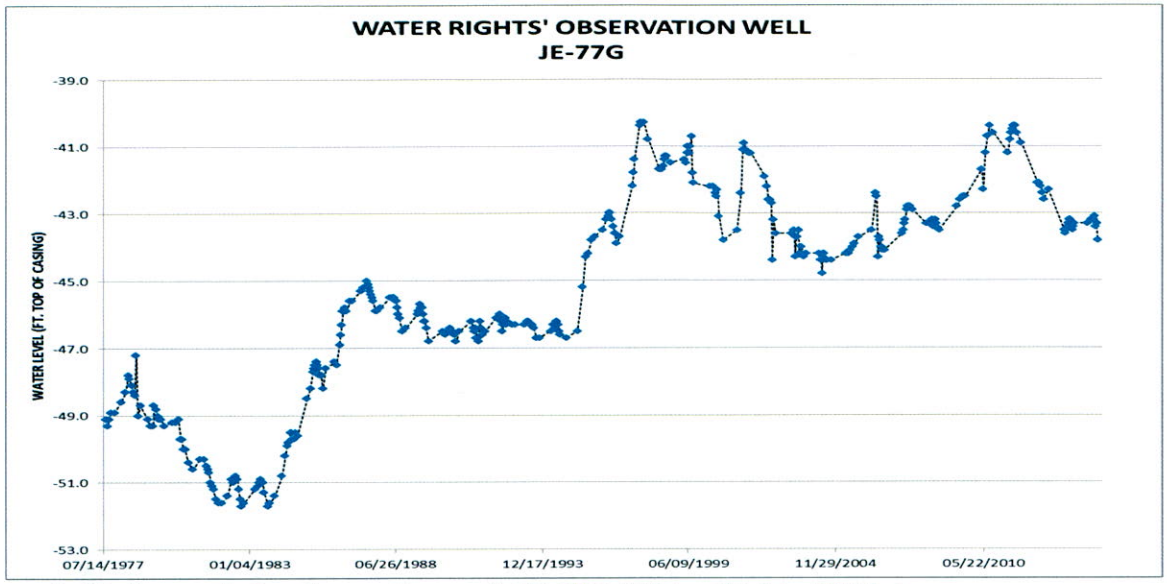


Figure 3- Hydrograph for observation well JE-77G (Water Rights, 2014a)

Recharge and Discharge:

Recharge:

Recharge to the Crow Creek aquifer is primarily through direct infiltration of precipitation where the aquifer in near land surface and some lateral movement of water through more permeable till (Hamilton, 1985). Hamilton (1985) estimated a recharge rate of 2.4 inches. Hedges and others (1985) estimated a recharge rate to the aquifer to be 3.8 inches using observation well analysis. The recharge rates equate to an average annual recharge to the aquifer ranging from 8,300 to 14,190 ac-ft/yr.

Discharge:

Discharge from the aquifer occurs through groundwater outflow along the western edge of the aquifer, evapotranspiration where the aquifer is at or near land surface, and well withdrawals. Currently, there are 28 water rights/permits authorizing the withdrawal of water from the Crow Creek aquifer (Water Rights, 2014b). Water Permit No. 6748-3 is authorized for domestic purposes. The rest of the water rights/permits authorized to withdraw water from the Crow Creek aquifer are for irrigation purposes. The amount of water that can be expected to be withdrawn by the non-irrigation appropriation is estimated by assuming pumping at the maximum permitted diversion rate for 60 percent of the time. Therefore, Water Permit No. 6748-3 is expected to use approximately 74 ac-ft/yr. Average historic irrigation pumpage from the Crow Creek aquifer for 1979 to 2013 is 1,523 ac-ft/yr as shown in Table 1. There are a number of domestic wells completed into the Crow Creek aquifer (Water Rights, 2014c). The total use by domestic wells is insignificant when compared to the appropriative use from the aquifer.

Hydrologic Budget:

Estimated annual appropriative use from the Crow Creek aquifer is 1,597 ac-ft/yr. Estimated average annual recharge ranges from 8,300 to 14,190 ac-ft/yr. Considering the relatively low use compared to the estimated recharge to the aquifer, there is a reasonable probability that unappropriated water is available for this proposed appropriation.

Year	Number of Permits Reporting	Appropriation (ac-ft/yr)	Pumpage Reported (ac-ft/yr)
2013	28	11884.0	3115.76
2012	27	11884.0	4004.14
2011	22	11004.0	1127.04
2010	22	11004.0	551.42
2009	22	11004.0	853.55
2008	21	9964.0	1874.96
2007	16	8384.0	1275.02
2006	13	6796	1756.10
2005	14	6474.0	1103.91
2004	15	6669.0	859.72
2003	15	6669.0	1461.01
2002	15	6669.0	1974.50
2001	15	6669.0	571.49
2000	15	6669.0	1163.43
1999	15	6669.0	793.47
1998	15	6669.0	262.07
1997	15	6669.0	246.00
1996	16	6969.0	1031.00
1995	16	7148.0	858.65
1994	17	7734.4	1162.99
1993	17	7758.4	842.00
1992	18	8353.4	827.00
1991	21	9764.4	2049.00
1990	23	10567.4	1699.00
1989	23	10567.4	2858.70
1988	23	10567.4	3954.30
1987	17	8408.4	1605.00
1986	17	8408.4	966.00
1985	17	8464.4	2055.00
1984	17	8464.4	1481.00
1983	15	7884.4	1705.25
1982	15	8104.4	1144.64
1981	23	12482.0	2370
1980	22	12162.0	2353
1979	22	12162.0	1343
Min	**13**	**6474**	**246**
Max	**28**	**12482**	**4004.14**
Avg.	**18**	**8792**	**1523**

Table 1- Irrigation water use from the Crow Creek aquifer (Water Rights, 1980-2014)

EXISTING WATER RIGHTS:

The nearest well authorized by a water right/permit completed into the Crow Creek aquifer is approximately one mile north of the proposed wells sites as shown in Figure 1 (Water Rights, 2014b). There are a number of domestic wells on file with the SD DENR-Water Rights Program within approximately one mile of the proposed well sites (Water Rights, 2014c).

There is one pending permit, Application No. 8049-3, that proposes to use two wells, one in Section 8 and one in Section 4; all in T106N-R67W. One is to be located approximately one-quarter mile south and the other is approximately 0.8 miles north-northwest of the proposed well sites. The proposed well sites for Application No. 8049-3 are shown in Figure 1.

The observation wells that are within one-half mile of a high capacity irrigation well, such as JE-78J and JE-77G (see Figures 2 and 3), do not show the effects of pumping on water levels in the observation wells. Observation well BF-77A shown in Figure 1 is the only observation well

completed into the Crow Creek aquifer that is under artesian conditions and shows the effects of pumping. However, there is approximately 10 feet of artesian head pressure below the lowest recorded water level in BF-77A, and the water level has always recovered after the end of the irrigation season (see Figure 4). The hydrographs document there are minimal effects from pumping on the water level of the aquifer. Therefore, an adequate well as defined in ARSD 74:02:04:20(6) should not be adversely impacted by pumping this proposed diversion.

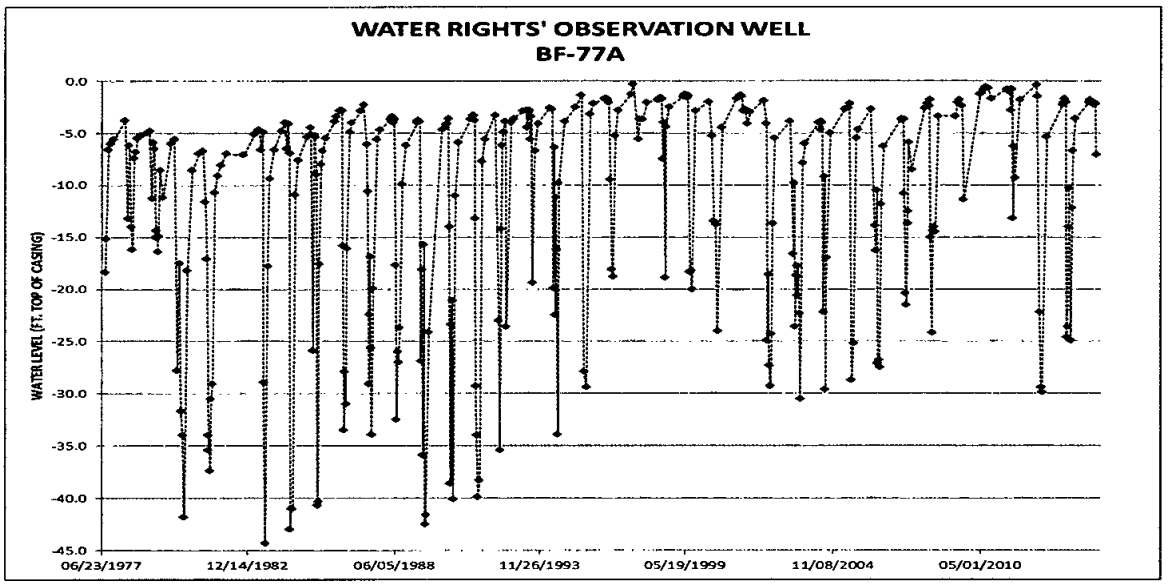


Figure 4- Hydrograph for observation well BF-77A (Water Rights, 2014a)

While the aquifer at the proposed well sites is under unconfined conditions, nearby wells may be confined. SDCL 46-6-6.1 does not protect artesian head pressure as a means of delivery, and the Water Management Board has consistently recognized that to place water to maximum beneficial use a certain amount of drawdown may occur. To balance interests between irrigation use and delivery of water by artesian pressure, the Water Management Board defined an "adversely impacted domestic well" in ARSD 74:02:04:20(7) as:

> "a well in which the pump intake was set at least 20 feet below the top of the aquifer at the time of construction or, if the aquifer is less than 20 feet thick, is as near to the bottom of the aquifer as is practical and the water level of the aquifer has declined to a level that the pump will no longer deliver sufficient water for the well owner's needs"

Depending on the specific characteristics of the Crow Creek aquifer at the well site proposed by this application, some existing well owners may need to lower their pumps to accommodate for deeper water levels. However, when considering the statute (SDCL 46-6-6.1) and rule (ARSD 74:02:04:20(7)), well interference from this proposed appropriation is not likely to cause a significant impact. Therefore, there is a reasonable probability that any interference will not be adverse.

CONCLUSIONS:

1. This application proposes to appropriate water from the Crow Creek aquifer at a maximum diversion rate of 4.0 cfs from two wells for the irrigation of 320 acres in Jerauld County.

2. There is a reasonable probability that unappropriated water is available from the Crow Creek aquifer for this proposed appropriation.

3. There is a reasonable probability that the diversion proposed by this application can be made without adverse impact to existing appropriative or domestic users.

Adam Mathiowetz
SD DENR-Water Rights Program

Approved by:

Ken Buhler
SD DENR-Water Rights Program

REFERENCES:

Circuit Court of South Dakota, First Judicial Circuit, 2012, May 17, 2012 Memorandum Decision re: Longview Farms, LLP v. South Dakota Dept. of Environ. and Nat'l. Resources.

Circuit Court of South Dakota, First Judicial Circuit, 2012, April 12, 2012 Memorandum Decision re: Hanson County Dairy v. Robert Bender and Stace Nelson.

Circuit Court of South Dakota, Sixth Judicial Circuit, 2005, April 29, 2005 Memorandum Decision re: HU04-37 Hines v. SD Department of Environment and Natural Resources.

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Hedges, L.S., Allen, J., Holly D.E., 1985, Evaluation of Ground-Water Resources Eastern South Dakota and Upper Big Sioux River, South Dakota and Iowa, Task 7: Ground Water Recharge; U.S. Army Corps of Engineers Contract DACW 45-80-C-0185.

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