



**DEPARTMENT of ENVIRONMENT  
and NATURAL RESOURCES**

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PIERRE, SOUTH DAKOTA 57501-3182

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**RECOMMENDATION OF CHIEF ENGINEER FOR WATER PERMIT  
APPLICATION NO. 8065-3, City of Hecla**

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. 8065-3, City of Hecla, c/o Mayor Jay Osterloh, PO Box 188, Hecla SD 57446.

The Chief Engineer is recommending APPROVAL of Application No. 8065-3 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.

See report on application for additional information.

A handwritten signature in black ink that reads "Jeanne Goodman". The signature is fluid and cursive.

Jeanne Goodman, Chief Engineer  
January 26, 2015

REPORT TO THE CHIEF ENGINEER  
ON  
WATER PERMIT APPLICATION NO. 8065-3  
CITY OF HECLA  
C/O JAY OSTERLOH, MAYOR  
JANUARY 15, 2015

Water Permit Application No. 8065-3 proposes to appropriate water at a maximum diversion rate of 0.033 cubic feet of water per second (cfs) (15 gallons per minute) from an existing well (912 feet deep) completed into the Dakota aquifer in the NE ¼ NE ¼ Section 25; all in T128N-R62W in Brown County. The water will be used by the city for an existing wetland mitigation project.

**AQUIFER: Dakota aquifer (DKOT)**

**AQUIFER CHARACTERISTICS:**

The Dakota aquifer is comprised of interbedded layers of permeable sand and sandstone within the Cretaceous aged Dakota Formation. The lithology of the Dakota Formation is quite variable laterally and vertically. It has been postulated that the explanation for this is the Dakota Formation was deposited in a fluvial environment near the edge of a Cretaceous aged sea (Schoon, 1971). The Dakota Formation is expected to be approximately 240 feet thick at the well site (Schoon, 1971). Schoon (1971) estimated the Dakota aquifer underlies approximately 66,500 square miles of the 77,047 total square miles of South Dakota. The Dakota Formation in eastern South Dakota is estimated to contain 381,104,000 acre-feet (ac-ft) of recoverable water (Hedges et. al, 1982). Allen and others (1985) estimated the Dakota-Newcastle Formation contains approximately 308,442,000 ac-ft of recoverable water in storage in western South Dakota.

In the northeastern portion of South Dakota, including Brown County, the water in the Dakota aquifer is predominantly soft with a majority of wells exhibiting water with a slight to strong saline taste (Erickson, 1955). The water from the Dakota aquifer in northeastern South Dakota is potable but has high sodium as well as sulphates and chlorides (Erickson, 1955). The gradient of the Dakota aquifer in the area of this application is generally west to east (Erickson, 1955).

The well log supplied with the application shows the well was completed October 6, 1914, for Mr. C.E. Nutten. The well was drilled to a depth of 912 feet and had a flow of 15 gallons per minute (gpm) at the time of completion. No closed in pressure is mentioned on the well log. A note included with this application states the well had a flow rate of 0.769 gpm in May 2014.

**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 AVAILABILITY:**

This application proposes to appropriate water from the Dakota 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. The Dakota aquifer is stratigraphically lower than the Greenhorn Formation, but the use is not for 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).

There have been concerns since the early 1900’s regarding the declining head in the Dakota aquifer. Rothrock and Robinson (1938) stated, “There has been a pronounced decline in the artesian head since the first wells were drilled in the area. The decline has not proceeded uniformly but has varied from place to place, depending on local draft...” This decline in artesian head pressure has been well documented. One interpretation of the decline in artesian head pressure is that the Dakota aquifer is being “mined”. Schoon (1971) stated “The fact that withdrawal from the artesian system exceeds recharge is clearly demonstrated by declining pressures.”

The Water Management Board has considered the issue of declining head pressure in the Dakota aquifer several times. The Board has found that past declines of the potentiometric surface do not automatically mean that withdrawals have exceeded recharge (Water Rights, 2010). The Board has concluded that whether withdrawals exceeded the average annual recharge cannot be determined based solely upon a decline in head pressure, and in theory the Dakota aquifer head pressure is stabilizing relative to withdrawals and discharges (Water Rights, 1987). The Board stated in the Findings of Facts and Conclusions of Law for Application No. 5136-3, “The primary reason for declines in the Dakota Formation head pressure is due to water being

discharged without beneficial use through uncontrolled flowing wells” (Water Rights, 1987). The Water Management Board further stated:

“When defining withdrawal for the purpose of interpreting the meaning of withdrawal pursuant to SDCL 46-6-3.1, there is a difference between withdrawal of water for beneficial use and water discharged without beneficial use through uncontrolled flowing wells. Water discharged from uncontrollable flowing wells does not constitute withdrawal (appropriation) pursuant to SDCL 46-6-3.1.”

Ultimately, the Water Management Board’s position has been to optimize development for beneficial use from the Dakota aquifer.

**Observation Well Data:**

Administrative Rule of South Dakota (ARSD) 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 44 observation wells completed into the Dakota aquifer (Water Rights, 2015a). Most of the observation wells, 33, are in Lincoln County and another four wells are also in southeastern South Dakota. There are several rural water systems in and around Lincoln County that withdraw water from the Dakota aquifer. The remaining seven observation wells are spread across south-central and the eastern half of South Dakota.

The nearest observation well completed into the Dakota aquifer to the well site, ED-85A, is approximately 40 miles southwest (Water Rights, 2015a). The rest of the observation wells are all more than 110 miles from the well site (see Figure 1). The hydrographs for the nearest DENR-Water Rights Program observation wells as shown in Figure 1, ED-85A and HD-87A, are shown in Figures 2 and 3, respectively. The U.S. Geological Survey monitored three wells completed into the Dakota aquifer within approximately 20 miles of the well site from the early 1960’s to the late 1980’s (see Figure 1) (Winter, 1994). The hydrographs for the wells are shown in Figures 4, 5, and 6. The wells are labeled by figure number in Figure 1.

A majority of the DENR-Water Rights Program observation wells, 33 out of 43, completed into the Dakota aquifer show a declining water level over the period of record (Water Rights, 2015a). The three wells monitored by the U.S. Geological Survey, shown in Figures 4, 5, and 6, also showed stabilizing water levels over the period of record. It has been accepted by the Water Management Board that the water level of the Dakota aquifer has yet to equilibrate to the withdrawals from the aquifer (Water Rights, 2010). The Findings of Fact and Conclusions of Law regarding Water Permit No. 7165-3 were leveled more specifically at southeastern South Dakota. However, the hydrographs shown in Figures 4, 5, and 6 demonstrate the decline was leveling off, and the hydrographs for the other observation wells generally concur with those three hydrographs. Therefore, the hydrographs for observation wells completed into the Dakota aquifer show there is unappropriated water available for this proposed appropriation.

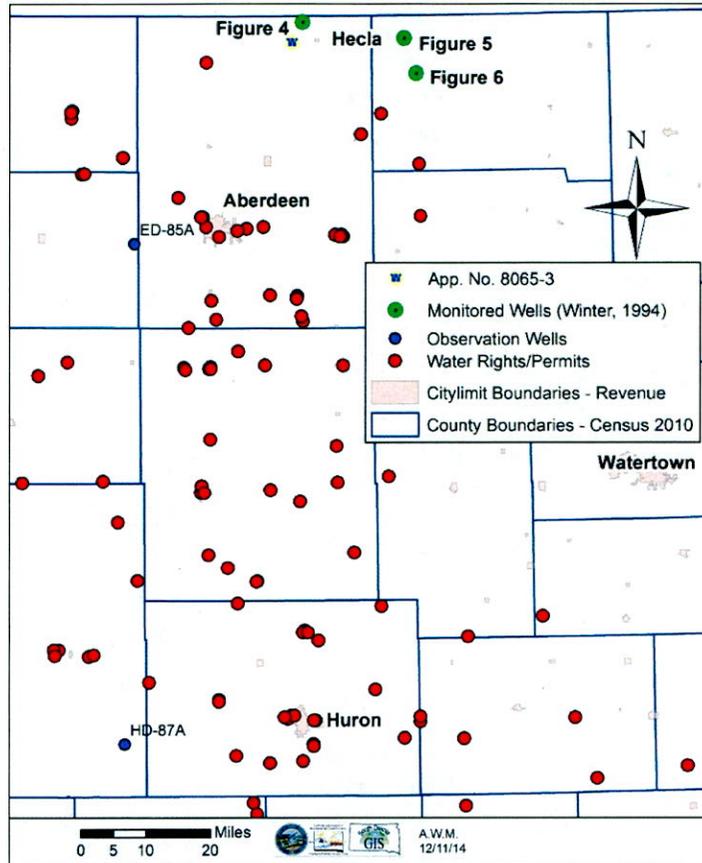


Figure 1- Map of Dakota aquifer water rights/permits, Dakota aquifer observation wells in the region of the well site, and U.S. Geological Survey monitored Dakota aquifer wells (Water Rights, 2015a and 2015b)

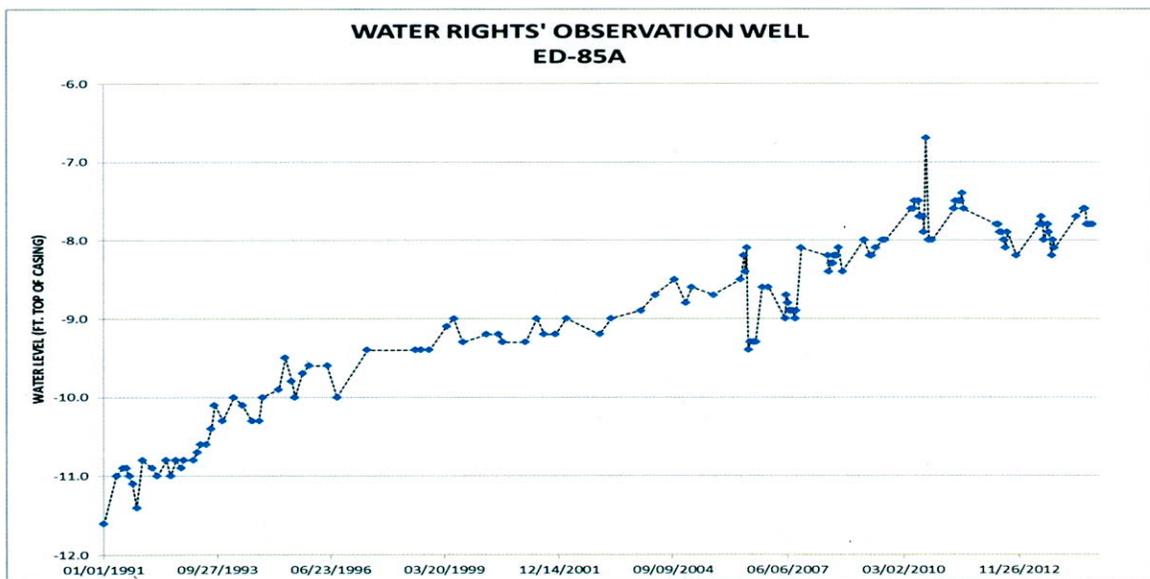


Figure 2- Hydrograph for observation well ED-85A (Water Rights, 2015a)

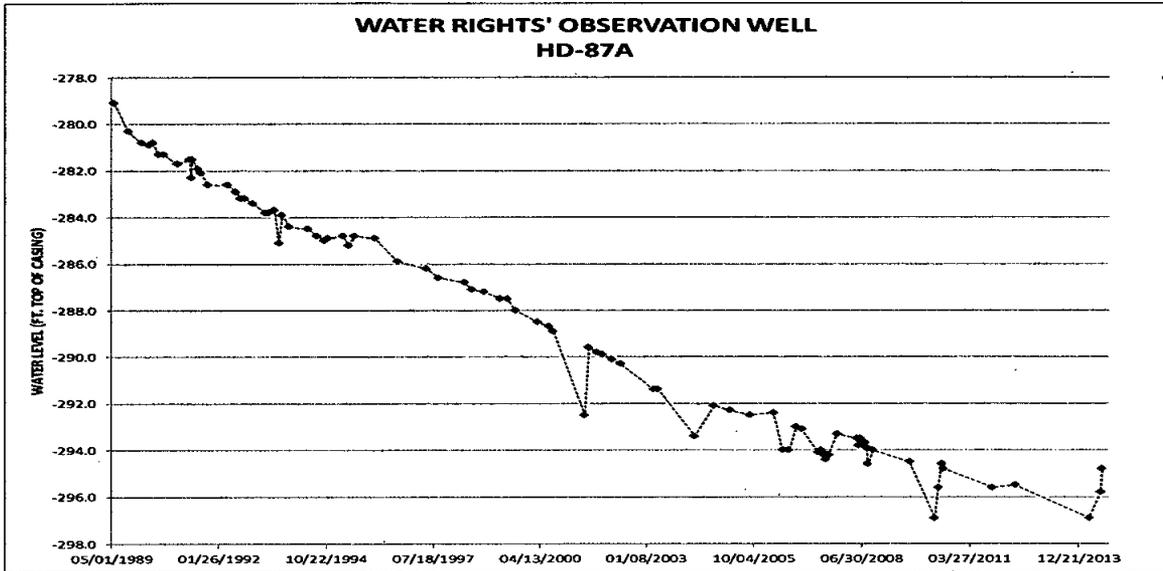


Figure 3- Hydrograph for observation well HD-87A (Water Rights, 2015a)

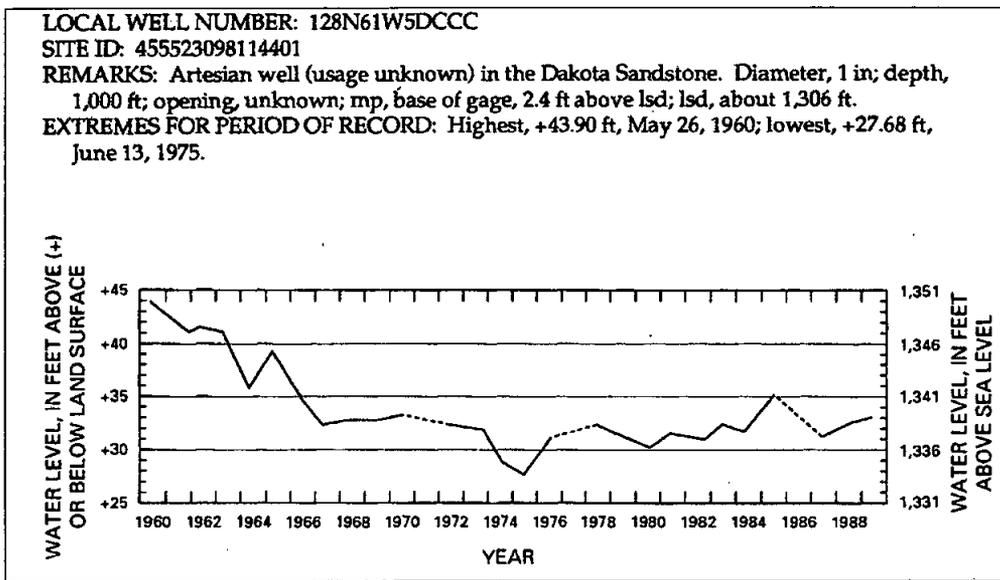


Figure 4- Hydrograph for a U.S. Geological Survey monitored well (Winter, 1994)

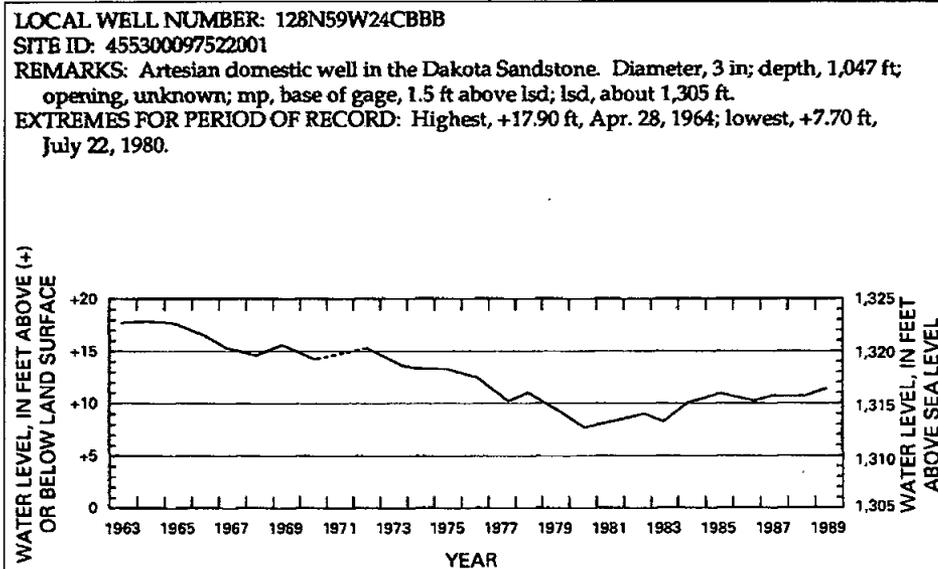


Figure 5- Hydrograph for a U.S. Geological Survey monitored well (Winter, 1994)

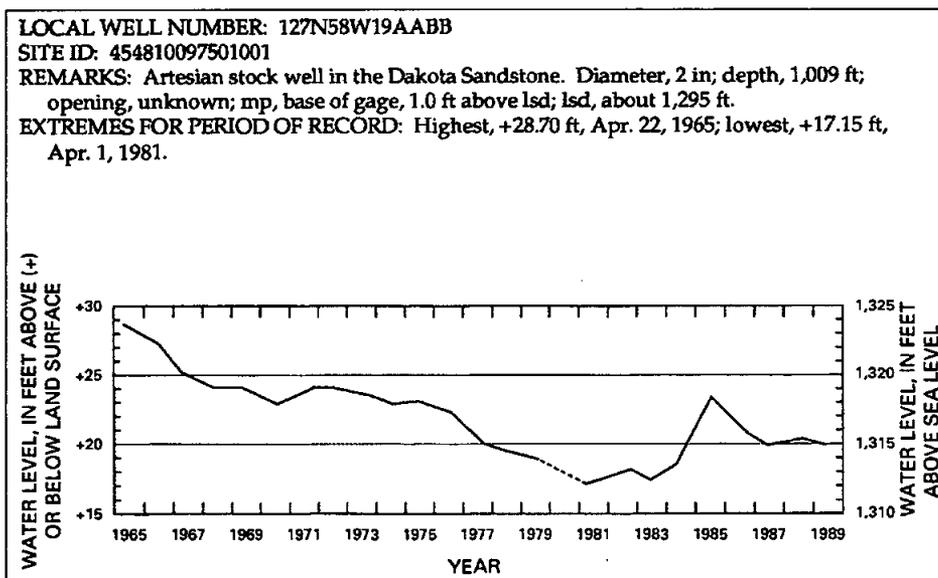


Figure 6- Hydrograph for a U.S. Geological Survey monitored well (Winter, 1994)

**Recharge and Discharge:**

There is insufficient data available to determine recharge to the Dakota aquifer, and thus, compare average annual recharge to the Dakota aquifer with the average annual withdrawal. Furthermore, there is no way to accurately estimate the amount of water flowing to waste from uncontrolled flowing wells. As stated previously, the Water Management Board considers water being discharged without beneficial use from uncontrolled flowing wells does not constitute withdrawal (appropriation) pursuant to SDCL 46-6-3.1.

Currently, there are 229 water rights/permits appropriating and six future use permits reserving water from the Dakota aquifer in South Dakota (Water Rights, 2015b). There are 21 water rights/permits authorized for irrigation purposes. The irrigation water rights/permits authorize the

irrigation of up to 1,569.44 acres. The total diversion authorized by the 208 non-irrigation water rights/permits is 70,779 cfs. However, most of the municipalities are connected to rural water (Friedeman, 2015) and do not pump much or any water from their wells. Therefore, the diversion rate that is actually used is 45,407 cfs. Most of the 45,407 cfs is from the southeastern corner of South Dakota. The City of North Sioux City, the City of Elk Point, and South Lincoln Rural Water System account for approximately 32 percent of the 45,407 cfs. The estimated annual use by the non-irrigation appropriations limited only by diversion rate from the non-irrigation appropriations not served by rural water systems is 15,671 ac-ft/yr. This estimation is based on pumping at the maximum allowable diversion rate for 60 percent of the time. The water rights/permits authorized by an annual volume are estimated to pump the full volume. The estimated annual use by the non-irrigation appropriations limited by annual volume from the non-irrigation appropriations not served by rural water systems is 3,857 ac-ft/yr. That is a total of 19,528.13 ac-ft/yr. Future use permits reserve 3,737 ac-ft/yr and are shown in Table 1.

Permit No.	Name	County	Type	Volume Reserved (ac-ft)
1262C-3	CITY OF CANTON	LN	MUN	674
4817-3	SOUTH LINCOLN RWS	LN	RWS	1448
5101-3	CITY OF LENNOX	LN	MUN	0
5101A-3	CITY OF LENNOX	LN	MUN	0
5155-3	LINCOLN COUNTY RWS	LN	RWS	440
5219-3	CITY OF CANTON	LN	MUN	1175
<b>Sum</b>				<b>3737</b>
LN= Lincoln, MUN= Municipal, RWS= Rural Water System				

Table 1- Future use permits reserving water from the Dakota aquifer (Water Rights, 2015b)

Estimated average annual withdrawal from the aquifer by irrigation appropriations is 139.4 ac-ft/yr and is shown in Table 2. Therefore, estimated expected average annual appropriative use plus reserved volume by appropriative water rights/permits is 23,404 ac-ft/yr.

Davis and others (1968) stated that in 1958 the flow from 46 uncontrolled wells in Bon Homme, Brule, Buffalo, Charles Mix, Gregory, Lyman, and Yankton counties was more than 16 million gallons per day (mgd) (17,920 ac-ft/yr), and the flow from 3,054 Dakota aquifer wells, that were controlled, in the James River valley was also estimated to be approximately 16 mgd. Therefore, 46 uncontrolled flowing wells had as much flow as 3,054 controlled wells. The number of wells completed into the Dakota aquifer has increased significantly since the 1950's. A 1921 map of flowing artesian wells for South Dakota indicated there were hundreds of Dakota aquifer wells in Brown County alone (Works Progress Administration, 1937).

There are many well logs on file with the SD DENR-Water Rights Program for domestic wells completed into the Dakota aquifer (Water Rights, 2015c). Some of the domestic wells are controlled and currently in use. Others are flowing uncontrolled with some of the water being put to beneficial use. There are also a number of uncontrolled flowing wells that are just flowing to waste. Furthermore, water is also flowing to waste from poorly constructed or deteriorating wells. It is likely poorly constructed or deteriorating wells are the primary source of wasted Dakota aquifer water. It is not possible to quantify the volume of any of these categories. While there is no estimate of how much water from the Dakota aquifer is flowing to waste, it is likely that the amount is just as much or more than the amount put to beneficial use by appropriative

users. However, water flowing from uncontrolled flowing wells should be available for capture and use by appropriative rights.

Year	No. of Permits Reporting	Appropriation (ac-ft)	Pumpage (ac-ft)
2013	18	2158.52	262.89
2012	18	2158.52	304.7
2011	18	2158.52	175.77
2010	17	1950.52	178.03
2009	15	1166.52	137.13
2008	14	1106.52	202.05
2007	14	1106.52	205.64
2006	14	1106.52	237.91
2005	12	867.52	150.75
2004	10	726.52	159.63
2003	10	726.52	205.02
2002	10	726.52	184.53
2001	11	740.52	160.85
2000	10	666.52	172.81
1999	10	666.52	101.57
1998	9	633.52	64.76
1997	9	533.12	48
1996	8	527.12	34.38
1995	8	527.12	30.83
1994	7	931.12	51.29
1993	7	1521.52	112.4
1992	5	1501.52	40.4
1991	5	1481.52	165.42
1990	4	1471.52	234
1989	4	1471.52	265.4
1988	4	1471.52	452.8
1987	5	1900.52	1.3
1986	5	1834.76	238.85
1985	5	1554.26	8.1
1984	4	1405.76	0
1983	5	1834.76	64.39
1982	5	1420.52	33.23
1981	4	1469	45
1980	2	729	110
1979	2	729	38
<b>Min</b>	<b>2</b>	<b>527.12</b>	<b>0</b>
<b>Max</b>	<b>18</b>	<b>2158.52</b>	<b>452.8</b>
<b>Avg</b>	<b>8.8</b>	<b>1228.0</b>	<b>139.4</b>

Table 2- Historic irrigation water use from the Dakota aquifer (Water Rights, 1979-2014)

**EXISTING WATER RIGHTS:**

The nearest well authorized by a water right/permit is authorized by Water Right No. 5322-3 for the Town of Frederick and is located approximately 13.5 miles from the well site (see Figure 1) (Water Rights, 2015b). The well site is approximately four miles from North Dakota, and there are no appropriative rights from the “Dakota Group” in North Dakota within approximately eight miles of the well site (ND SWC, 2015).

There are a number of well logs on file for wells completed into the Dakota aquifer with the SD DENR-Water Rights Program (Water Rights, 2015c). It is also likely that there are a number of wells completed into the Dakota aquifer that are not on file with the SD DENR-Water Rights Program in the area of this project.

Since the Dakota aquifer is under confined conditions, measurable drawdown from a flowing well could extend several miles from that well. However, the diversion rate requested by this application, 15 gallons per minute (gpm), is small, but the measured flow from the well is even smaller, 0.769 gallons per minute, there are no other appropriative users within approximately 13.5 miles, and the well was drilled in 1914 and has likely been continually flowing since then. When considering these facts, it is probable that this well will not cause an adverse impact on adequate domestic or appropriative right wells in the area. Furthermore, there has not been a history of contention in Brown County over water use from the Dakota aquifer.

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 appropriative use, particularly irrigation, 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 Dakota aquifer at the well site proposed by this application, some existing well owners may need to lower their pumps. 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.

#### **LOCAL CONCERNS:**

A complaint was filed with the DENR-Water Rights Program in January 2014 regarding the well this application proposes to use. The complaint was filed on behalf of the township board. The complaint stated that flow from the well was encroaching upon the adjacent road and farmland. The road that was mentioned in the complaint runs north and south just east of the well (see Figure 7). The complaint led to a letter stating the responsibilities of a well owner and an application for a water permit being sent to the City of Hecla. The following is an excerpt from a note included with this permit application explaining the need for and use of the well:

“In the design and environmental review process for planning of the treatment facility, wetlands impacts were identified and wetland mitigation was required to comply with funding sources utilized by the City of Hecla for the project.

It was observed at the time, the in-place well flowed to a small area of ponded water west of the well location. As part of the mitigation plan for the project this area was expanded to create additional wetland acres and mitigate for the areas of wetland impacted by the treatment facility project.

The existing well provided a minimum volume of water to the existing and expanded wetland area but provided the beneficial use of maintaining a supply of water to the expanded wetland areas created to mitigate impacted wetlands associated with the project.”

Based on U.S. Department of Agriculture-Farm Service Agency (FSA) satellite imagery there is no evidence that water was encroaching on the road at the time the images were taken in 2004, 2008, 2010, 2012, or 2014. Using IfSAR elevation data (interferometric synthetic aperture radar), it was determined that the farmland in the same section as the well lowers in elevation from west to east by approximately 25 feet and from north to south by approximately six feet (see Figure 7). The elevation contours show that everything slopes towards the James River. If the well was the primary source of water that was encroaching on the road, there would be evidence of that in the aerial imagery. In a note included with the application, the city stated “This flow rate was observed to be minimal at maintaining water levels in the prior existing ponded water area and not sufficient to add water to the mitigation area created adjacent to the original ponded water area.” Therefore, if there was a significant encroachment of water on the road just to the east of the well it is most likely from snow melt or precipitation runoff from the farmland to the west and not from the well.

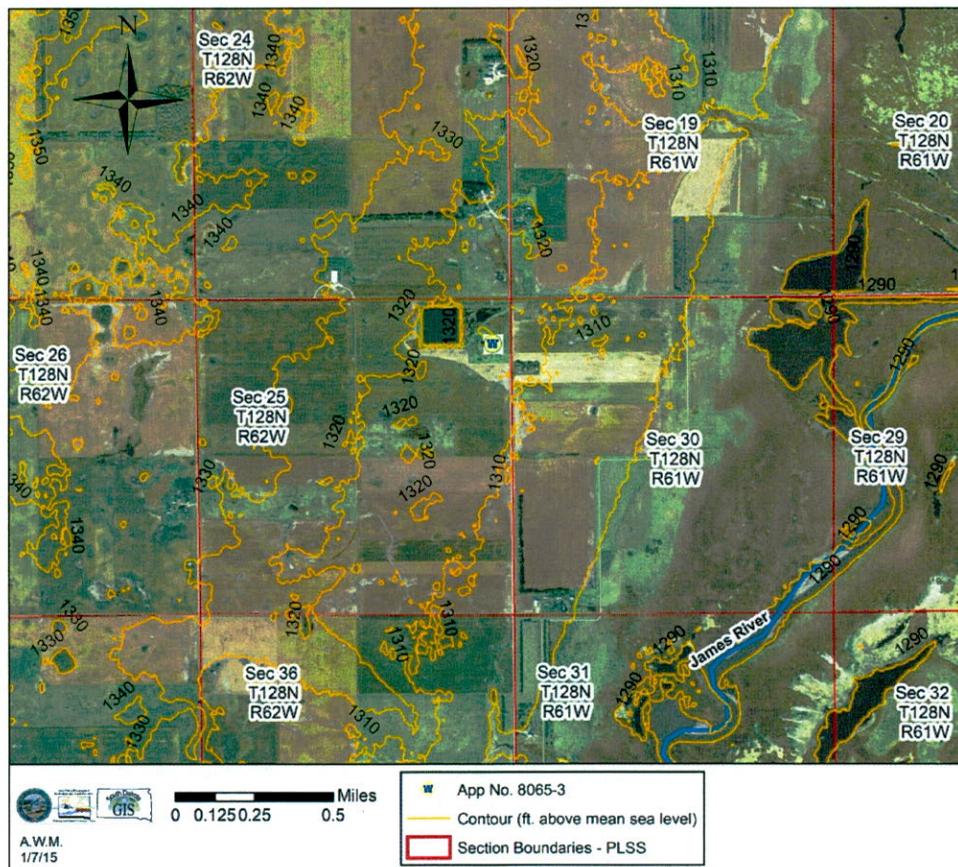


Figure 7- IfSAR 10 foot elevation contours in project section

The construction method of the well this application proposes to use is commonly called a “slim-hole” well and is described in ARSD 74:02:04:35. If the well needs to be replaced, the

replacement well cannot be a “slim-hole” well, because this well requires a permit and ARSD 74:02:04:35 does not allow the new construction of a “slim-hole” well for permitted appropriations.

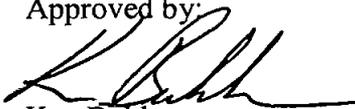
**CONCLUSIONS:**

1. This application proposes to appropriate water from the Dakota aquifer at a maximum diversion rate of 0.033 cfs (15 gpm) from an existing well for use by the City of Hecla in an existing wetland mitigation project in Brown County.
2. Water levels in the Dakota aquifer have declined across much of the State since the first wells were completed into the aquifer.
3. The Water Management Board has concluded that whether withdrawals exceed recharge to the Dakota aquifer cannot be determined solely based on a decline in artesian head.
4. The Water Management Board also concluded that the decline in the potentiometric surface of the aquifer is primarily a result of the waste of water from uncontrolled flowing wells.
5. In reference to SDCL 46-6-3.1, the Water Management Board has concluded that “withdrawals” apply only to water placed to beneficial use via appropriation or domestic use.
6. Flow from uncontrolled flowing wells should be available for capture. Therefore, there is a reasonable probability that unappropriated water is available for this application.
7. There is a reasonable probability that the diversion rate requested by this application can be made without adversely impacting existing water rights/permits and domestic users.
8. A complaint was filed with the DENR-Water Rights Program regarding flow from the well this application proposes to use was encroaching on an adjacent road and farmland. Water encroachment on the road was most likely caused by runoff and snow melt from adjacent farmland to the west of the well site.



Adam Mathiowetz  
SD DENR-Water Rights Program

Approved by:



Ken Buhler  
SD DENR-Water Rights Program

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