

WATER PERMIT NO. 8586-3

Name of Applicant: **Bret Fliehs**

Address: **39865 137th St, Groton SD 57445**

Phone: **605 380-3808**

Amount of Water Claimed: **1.33 cfs**

Total Acres: **140 acres**

Source of Water Supply: **groundwater (up to 20 wells)**

Water to be used for: **irrigation**

County: **Brown**

Type of Waste Disposal System:

Location: **16 miles northeast of Groton**

PRIORITY

Date Received: **1-21-22**

Application/License Fee: **\$ 1050**

Corrected Application Received:

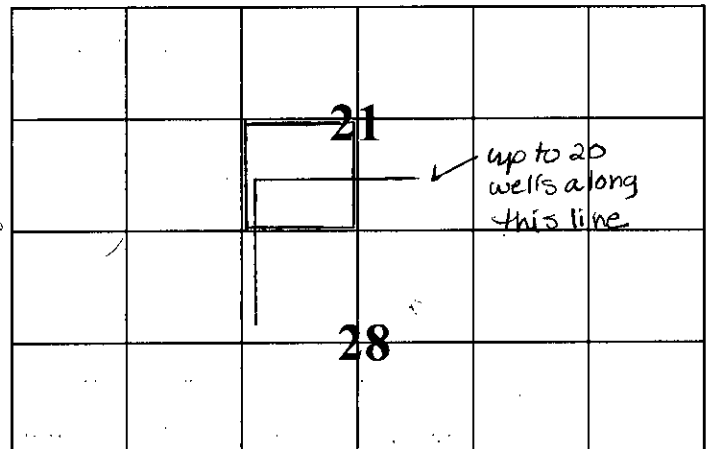
Period of Annual Use: **May 1 – September 30**

Remarks:

Diversion Point: **S 1/2 Sec 21 and W 1/2 NW 1/4**

Section 28; all in T126N-R60W

Land to be Irrigated: **SW 1/4 Sec 21-T126N-R60W**



Depth of Well: **60**

Well Driller:

Remarks:

Type of Map: **aerial**

Prepared by:

Reviewed and the Number Assigned on: **1-24-22**

By: **Karen Schlaak**

Notice of Hearing - date to intervene: _____

**SOUTH DAKOTA
WATER PERMIT NO. 8586-3**

Date of first receipt of application January 21, 2022.

The Chief Engineer, on behalf of the Water Management Board, issues Water Permit No. 8586-3 to Bret Flihs, 39865 137th St, Groton SD 57445 authorizing the construction of the water use system and the placing of water to beneficial use subject to the following limitations, conditions and qualifications:

1. Water Permit No. 8586-3 appropriates 1.33 cubic feet of water per second from up to 20 wells to be completed into the Lake Silt Aquifer (approximately 60 feet deep) located in the S 1/2 Section 21 and the W 1/2 NW 1/4 Section 28 for irrigation of 140 acres located in the SW 1/4 Section 21; all in T126N-R60W. This site is located approximately 16 miles northwest of Groton SD.
2. The amount of the appropriation may not exceed 2 acre feet annually for each acre of land to which water is actually and beneficially applied for irrigation. The water is to be used during the following described annual period: May 1 – September 30.
3. The date from which applicant may claim right is January 21, 2022.
4. The date of approval of Permit No. 8586-3 is April 11, 2022.
5. One-fifth of the construction is to be completed on or before October 11, 2024.
6. All construction is to be completed on or before April 11, 2027.
7. Water is to be put to beneficial use on or before April 11, 2031.
8. Water rights obtained in compliance with the laws of the State of South Dakota may not be unlawfully impaired by this appropriation.

QUALIFICATIONS

1. The wells approved under Water Permit No. 8586-3 are located near domestic wells and other wells which may obtain water from the same aquifer. Water withdrawals shall be controlled 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. 8586-3 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.
4. The Permit holder for Water Permit No. 8586-3 shall contract with a licensed well driller to construct a well to monitor the effect pumping has on water levels. The monitoring well must be completed into the Lake Silt aquifer and shall be located in the public right-of-way. The location of the observation well shall be coordinated with the DANR – Water Rights Program staff and will become part of observation well network operated by the Water Rights Program to routinely record water levels in aquifers throughout South Dakota.

WATER MANAGEMENT BOARD

By: Eric Gronlund
Eric Gronlund, Chief Engineer
Water Rights Program
Department of Agriculture and Natural Resources

APR 28 2022
date



FORM 2: Application for irrigation in South Dakota

(type or print)

RECEIVED

JAN 21 2022

PAID

JAN 21 2022

Ck# 2418

Rec't#

Mail to: DENR - Water Rights 523 E Capitol Ave Pierre, SD 57501-3182 ph. (605) 773-3352	No. <u>8586-3</u> (office use only) Hydrologic Unit <u>10160003</u>	WATER RIGHTS PROGRAM
	Basin <u>James River</u>	
	Newspaper <u>American News</u>	

Application For Permit To Appropriate Water For Irrigation

Type of Application: ☒ New ☐ Vested Right ☐ Amendment/Correction to Permit No. _____

(Use predates Mar 2, 1955)

Description of amendment/correction: (i.e. change diversion point(s), add diversion point(s), change use, etc.)

1. Name to Appear on Irrigation Permit Bret Fliche

Note: The "Name to Appear on Irrigation Permit" must be the name in which the property to be irrigated is held in.

Mailing Address 39865 137th St. Groton SD 57445
(Address) (City) (State) (Zip Code)Phone _____ Mobile 605-380-3808 Email bfliehs@yahoo.com2. Amount of water claimed 1.33 *CFS or 600 **GPM ***AF Total Acreage 140
(*Cubic Feet per Second) (**Gallons per Minute) (***)Acre Feet - storage capacity of dam/dugout or annual use if applicable)3. Source of water supply well field 10-20 wells4. Location of point of diversion see attached map

(example - 3 wells in SW1/4 NE1/4 section 12-T104N-R53W)

S1/2 Sec 21 and W1/2 NW1/4 Sec 28; all in T126N-R60W County Brown5. County or counties where water will be used Brown6. Annual period during which water is to be used May - September

7. List below each forty acre division, or lot, or fraction thereof and show number of acres to be irrigated in each.

(Attach sheet if more space is needed)

Land Description	Acres	Land Description	Acres
<u>SW 1/4 21-126-60</u>	<u>140</u>	<u>SW 1/4 SW 1/4</u>	<u>35</u>
<u>total</u>		<u>SE 1/4 of SW 1/4</u>	<u>35</u>
		<u>NE 1/4 of SW 1/4</u>	<u>35</u>
		<u>NW 1/4 of SW 1/4</u>	<u>35</u>

8. Give a description of the project. (Attach sheet if more space is needed)

Use well field for center pivotI, Bret Fliche Owner, the applicant, certify under
Name of Person Title (if applicable)

penalty of perjury that I have read this application, examined the attached map, and that the matters stated are true. I further certify, if acting on behalf of an entity or individual other than myself, that I am authorized to submit this application.

Supplemental Information

(type or print)

1. Well Information

(check one or both as applicable) ☒ Drilling new well(s) ☒ Using existing well(s)

- a) If new wells, how many _____ Have test holes been drilled ☒ Yes ☐ No Drilled by Lenius well drilling
(if yes, please provide copies of logs) Manikowski well drilling
- b) If existing wells, how many 4 Provide copy of log(s), if available. Drilled by _____

For either Existing or Proposed Wells:

- c) Well Depth (required) 60 Depth to Top of Water Bearing Material _____ Depth to Water from Surface _____
- d) Distance to nearest domestic well on applicant's property none Property owned by others _____

2. Wastewater Disposal System Information

- a) Type of System (i.e. septic tank, drain field) _____
- b) System Capacity (gallons) _____ Year Constructed _____
- c) Connected to the City of _____ Sanitary System _____

3. Dugout Information

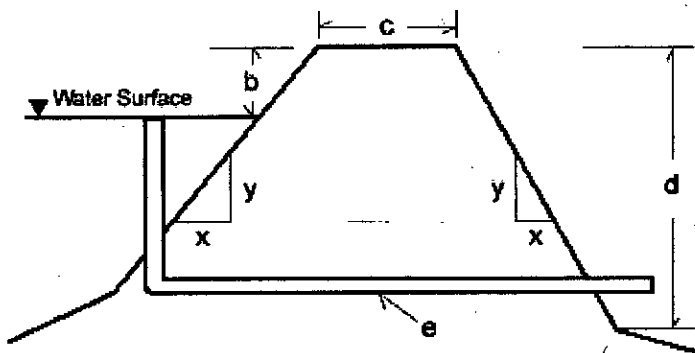
- a) Surface Dimensions _____ Depth _____
- b) Depth to water (ground surface to water level) _____

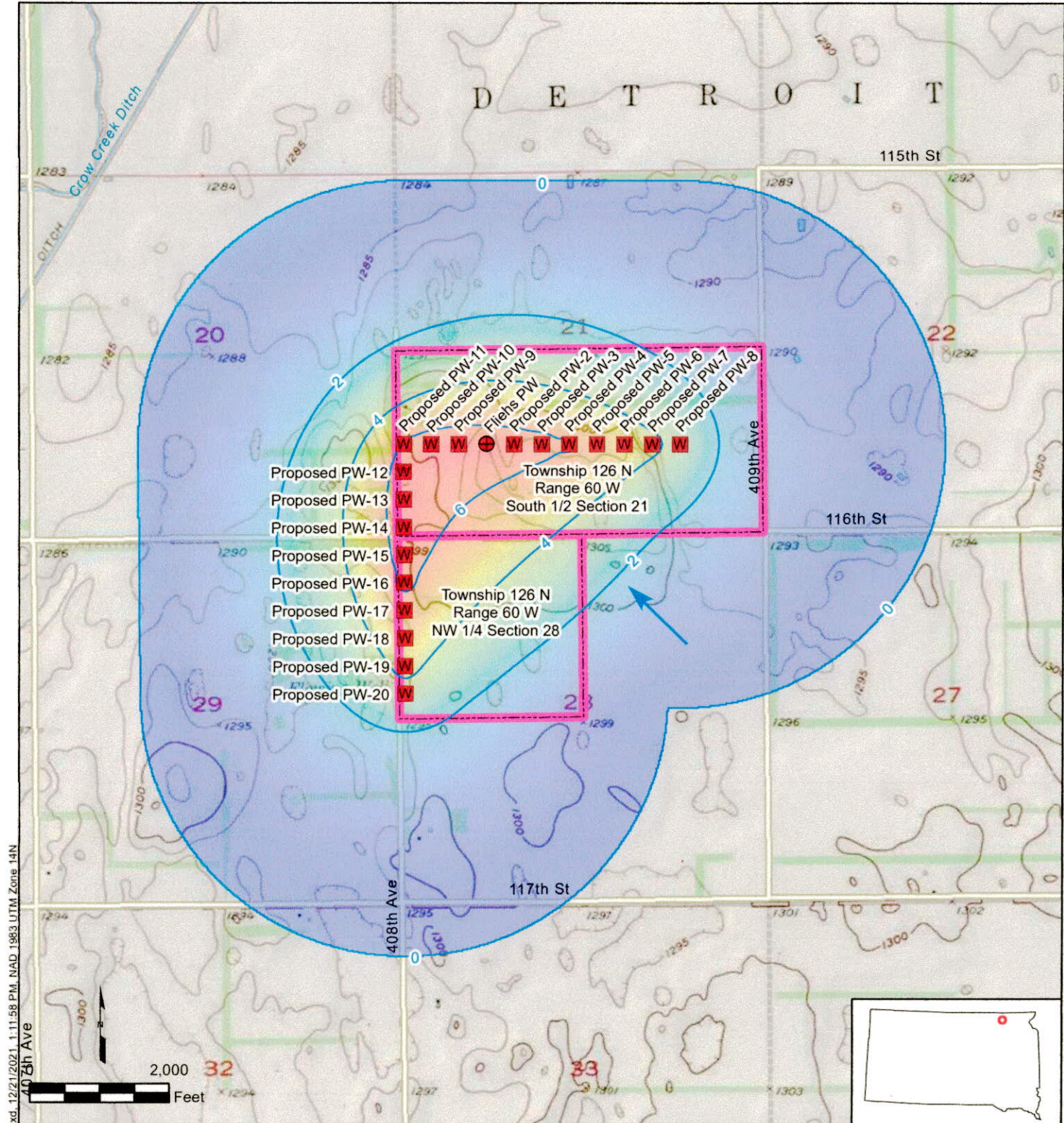
4. Water Storage Dams

If the proposed water use system contains one or more storage dams, please furnish the information requested below for each dam. The locations of the dams need to be shown on the map submitted with the application.

- a) If a private engineering firm or government agency was involved in the design of this dam, please give their name and address:

- b) Freeboard _____
- c) Crest Width _____
Crest Length _____
- d) Height _____
- e) Primary Outlet Capacity _____
If pipe, diameter _____
- f) Secondary Spillway Capacity _____
Spillway Width _____
- g) X & Y Slope (e.g. 3 to 1 is a typical slope)
Upstream _____
Downstream _____
- h) Surface Area of Impoundment _____
- i) Storage _____ Acre Feet
- j) Drainage Area Above Dam _____ Acres





C:\GIS\GIS\Bret Fliehs\maps\5510FLH01_01e_dd.mxd, 12/21/2021, 1:11:58 PM, NAD 1983 UTM Zone 14N



Prepared By:
LRE Water
Innovative Water Resource Solutions
Sioux Falls, South Dakota
(605) 310-1721

BRET FLIEHS
5510FLH01
BROWN COUNTY, SD

**PROPOSED WELL FIELD CONFIGURATION AND
30-DAY CUMULATIVE DRAWDOWN ESTIMATE**

FILE:5510FLH01_01e_dd.MXD

DATE:12/21/2021 | FIGURE: 4



Common Land Unit

- Tract Boundary
- PLSS
- Non-Cropland
- Cropland

Wetland Determination Identifiers

- Restricted Use
- Limited Restrictions
- Exempt from Conservation
- Compliance Provisions

2021 Program Year

Map Created December 28, 2020

Farm 13129

21 -126N -60W

United States Department of Agriculture (USDA) Farm Service Agency (FSA) maps are for FSA Program administration only. This map does not represent a legal survey or reflect actual ownership; rather it depicts the information provided directly from the producer and/or National Agricultural Imagery Program (NAIP) imagery. The producer accepts the data 'as is' and assumes all risks associated with its use. USDA-FSA assumes no responsibility for actual or consequential damage incurred as a result of any user's reliance on this data outside FSA Programs. Wetland identifiers do not represent the size, shape, or specific determination of the area. Refer to your original determination (CPA-026 and attached maps) for exact boundaries and determinations or contact USDA Natural Resources Conservation Service (NRCS).



United States
Department of
Agriculture

Brown County, South Dakota



Common Land Unit

	Tract Boundary
	Non-Cropland
	Cropland

Wetland Determination Identifiers

- Restricted Use
- Limited Restrictions
- Exempt from Conservation
- Compliance Provisions

2021 Program Year

Map Created December 28, 2020

Farm 13129

28 -126N -60W

United States Department of Agriculture (USDA) Farm Service Agency (FSA) maps are for FSA Program administration only. This map does not represent a legal survey or reflect actual ownership; rather it depicts the information provided directly from the producer and/or National Agricultural Imagery Program (NAIP) imagery. The producer accepts the data 'as is' and assumes all risks associated with its use. USDA-FSA assumes no responsibility for actual or consequential damage incurred as a result of any user's reliance on this data outside FSA Programs. Wetland identifiers do not represent the size, shape, or specific determination of the area. Refer to your original determination (CPA-026 and attached maps) for exact boundaries and determinations or contact USDA Natural Resources Conservation Service (NRCS).

RECEIPT

WATER RIGHTS PROGRAM South Dakota Department of Agriculture and Natural Resources

Date January 21, 2022

RECEIVED OF Bret R. Fliehs 39865 137th St. Groton SD 57445

The following amount in fees for services rendered as provided for by law:

Fee for Application for Permit No. <u>8586-3</u> to Appropriate Water, to construct and to put water to beneficial use	\$850.00
Fee for Application for Permit No. _____ to Appropriate Water for Future use	\$ _____
Fee to retain Future Use Permit No. _____ after period of seven years.	\$ _____
Fee for Inspecting Constructed Works, confirming beneficial use and issuing Water License No. <u>8586-3</u>	\$200.00
Fee for Filing Transfer Form _____	\$ _____
Fee for _____	\$ _____
Fee for Issuing New Well Driller's License No. _____	\$ _____
Fee for Renewal of Well Driller's License No. _____	\$ _____
Fee for Issuing Well Pump Installer's License No. _____	\$ _____
Fee for Renewal of Well Pump Installer's License No. _____	\$ _____
(Any Other Work Provided by Law)	
TOTAL	\$1050.00

By Eric Gronlund
Chief Engineer

vm



Technical Memorandum

To: Bret Fliehs
From: Mitch Kannenberg & Mike Plante, LRE Water
Copy to: Adam Mathiowetz, SD DANR
Date: January 18, 2022
Project: Aquifer Pumping Test, Bret Fliehs Irrigation Project
Subject: Aquifer Pumping Results & Information for Irrigation Permit Application

BACKGROUND INFORMATION AND PURPOSE OF PROJECT

During the period from late 2011 to 2013, you hired water well drilling contractors and Banner Associates, Inc. (Banner) to investigate the potential for developing an irrigation system at your agricultural property located in the south one-half (S½) of Section 21 and the northwest quarter (NW¼) of Section 28, Township 126 North, Range 60 West, in Brown County, South Dakota (Site). LRE understands that you hope to irrigate up to 145 acres with an irrigation system comprised of a center pivot and multiple wells. You have indicated that the goal for the irrigation system is to be able to apply approximately 10 to 12 inches of water per growing season on 145 acres at an instantaneous maximum pumping rate of 500 to 600 gallons per minute (gpm).

A 4-inch diameter well (OW-795W) was constructed at the Site in 2011 by Manikowski Drilling, Inc. and three 4-inch diameter wells were constructed at the Site in 2013 by Lenius Well Drilling (Lenius). The three wells constructed by Lenius include the well utilized as the pumping well (Fliehs PW), and two observation wells located approximately 100 feet east (OW-100E) and 200 feet east (OW-200E) of the Fliehs PW. The locations of the wells are shown in Figure 1.

Three short duration pumping tests were conducted by Lenius in 2013. The information from the tests was analyzed by Banner and submitted to the Water Rights Program of the South Dakota Department of Agriculture and Natural Resources (DANR) to support water permit application #7537-3 (which was subsequently denied). In a report to the DANR Chief Engineer (Mathiowetz and Buhler, 2015), the target aquifer was identified as the Lake Silt aquifer. The Lake Silt aquifer is comprised of silt, fine sand and clay deposited in the ancient glacial Lake Dakota (Koch and Bradford, 1976). The purpose of LRE's work on this project was to conduct an aquifer pumping test (Test) designed to provide the

information needed to evaluate the ability of the Lake Silt aquifer at the Site to supply water at the annual volume and rate desired for the irrigation system.

TEST WELL CONSTRUCTION AND SITE GEOLOGY

The Geologic Map of South Dakota (Martin and others, 2004) indicates that the Site overlies lacustrine sediments, including deposits from Glacial Lake Dakota, which is consistent with the information in Koch and Bradford (1976). The former lakebed of Glacial Lake Dakota is often referred to as the Lake Dakota Plain and occupies the entire eastern one-half of Brown County. The silts and fine sands of the Lake Silt aquifer underlie nearly all of the 590,000 acres of the Lake Dakota Plain (Mathiowetz and Buhler, 2015), although the degree of saturation and interconnection is likely variable over this large area. The Lake Silt aquifer for the purpose of this Tech Memo is considered a regional aquifer that extends beyond the Site property boundaries. The total thickness of the silts and fine sands comprising the Lake Silt aquifer at the Site, as inferred from OW-795, is approximately 60 feet.

Information regarding the depths, static water levels, distance from the pumping well and other details for the four wells are summarized in the Aquifer Test Summary Sheet provided in Attachment 1. The well logs are provided in Attachment 2.

TEMPORARY USE AND TEMPORARY DISCHARGE PERMITTING

Prior to conducting the Test, a temporary permit to use public water (temporary use permit) was obtained from the WRP of the DNR. The temporary use permit was effective from October 14, 2021 to November 30, 2021 and authorized a total withdrawal of up to 400,000 gallons of water from the Lake Silt aquifer at a maximum withdrawal rate of 125,000 gallons per day. The Test was conducted in accordance with the provisions of the temporary use permit. The total amount of water pumped from the Lake Silt aquifer during the Test was approximately 179,400 gallons at a maximum daily rate of approximately 59,800 gallons per day.

A temporary discharge permit (#SDG071518) was also obtained from the DNR. Water discharged during the Test was directed via 6-inch diameter aluminum irrigation pipe a distance of 1,000 feet to a drain tile intake located in a small ground surface depression. The drain tile outlet is located in the east ditch of 408th Avenue just south of a culvert underlying the road. Some of the discharged water flowed through the drain tile and some of it flowed overland until it reached the culvert, where it then flowed west to a small

depression. LRE estimated the containment capacity of the depression west of 408th Avenue and found that it had sufficient capacity to retain the water discharged during the Test, and would not “spill over” the lowest elevation of the depression margins (labeled as “spillover saddle” on Figure 1).

LRE conducted monitoring of the well discharge rate and discharged water quality in accordance with the requirements of temporary discharge permit #SDG071518. The discharge monitoring report was submitted to the DANR on November 24, 2021, and the results of the monitoring indicated that the water discharged during the Test was in compliance with the provisions of the temporary discharge permit.

TEST OVERVIEW

The planned pumping rate for the Test was 85 gpm or less. The Test consisted of three periods: 1) Background period (water-level monitoring conducted prior to initiating pumping), 2) Constant Rate Pumping period (water-level monitoring conducted while pumping from Fliehs PW), and 3) Recovery period (water-level monitoring conducted after pumping was discontinued). LRE installed an In-Situ, Inc. LevelTroll pressure recording and logging transducer (transducer) in each of the four wells at the Site on Friday, October 29, 2021.

Water-level data were collected during the Background period from October 29, 2021, to November 2, 2021. The water-levels in all four wells during the Background period were rising due to 2.1 inches of rain (as measured at the Aberdeen Regional Airport) that fell on October 27, 2021. LRE installed a rain gauge at the Site on October 29, 2021, and no precipitation was received at the Site between October 28, 2021, and the end of the Recovery period on November 9, 2021.

LRE applied a mathematical correction to remove the rising groundwater elevation trend (caused by the October 27, 2021, precipitation) from the water-displacement versus time data. Graphs showing the groundwater elevation versus date (trend not removed) and the groundwater elevations with the elevation-trend correction applied are provided in Attachment 3.

LRE also recorded the barometric pressure at the Site with the use of a barometric pressure transducer, and the barometric pressure is included on the graphs provided in Attachment 3. The barometric pressure fluctuations had no measurable effect on the water-levels during the Test.

The submersible pump in the Fliehs PW and the discharge piping were furnished and installed by General Irrigation of Oakes, ND (General Irrigation). Electric power to the pump was provided by a three-phase power connection available at the Site. The water-level displacement with time and discharge rate monitoring data were collected by LRE.

The Constant Rate Pumping period was originally scheduled to begin on November 1, 2021, but was postponed one day due to a delay in the installation of the three-phase electrical power connection supply. Subsequent to the electrical connection, pumping from the Fliehs PW was initiated at 11:10 on November 2, 2021. It was discovered during this initial pumping that the flow meter furnished and installed by General Irrigation was not able to provide accurate flow-rate measurements at the Test pumping rate. LRE procured a 1.5-inch diameter flow meter (manufactured by Sensus) capable of accurate flow measurements at rates from approximately 1 gpm to 160 gpm and delivered the meter to the Site on November 2, 2021. General Irrigation modified the discharge piping and installed the flow meter, in accordance with the manufacturer recommendations, on the morning of November 3, 2021.

The Constant Rate Pumping period was initiated on November 3, 2021, at 09:45 at a pumping rate of 50 gpm. LRE monitored and evaluated the pumping water level trend in the Fliehs PW and concluded that the pumping water level in the Fliehs PW would likely drop below the elevation of the transducer if pumping was maintained at 50 gpm. Consequently, at approximately 6.5 hours into the Constant Rate Pumping period, the pumping rate was reduced to approximately 41 gpm (40.7 gpm). The pumping rate remained constant at 41 gpm throughout the remaining 65.5 hours of the Constant Rate Pumping period.

Pumping was shutdown at 09:45 on November 6, 2021. The duration of the Constant Rate Pumping period was 72 hours, and, with the exception of the pumping rate reduction at 6.5 hours into the Constant Rate Pumping period, the 72 hours of pumping were conducted at a constant rate providing high-quality water-displacement versus time data.

The Recovery period was from November 6, 2021, to November 9, 2021, with water-level data being recorded by the transducers until the transducers were removed on the afternoon of November 9, 2021. At the time of transducer removal, the water-level in the Fliehs PW had recovered to 97.9% of the pre-pumping (static) level.

DRAWDOWN AND RECOVERY SUMMARY

The Constant Rate Pumping period began at 09:45 on November 3, 2021 and was shut down after 72 hours at 09:45 on November 6, 2021. The drawdown measured in the Fliehs PW, OW-100E, OW-200E and OW-795W at the end of the Constant Rate Pumping period was 26.30 feet, 1.60 feet, 0.76 feet, and 0.08 feet, respectively. The 0.08 feet of drawdown at OW-795W is small and was calculated after removing the rising elevation trend correction. Consequently, there is some uncertainty associated with the calculated drawdown at OW-795W. The specific capacity for the Fliehs PW at the end of the Constant-Rate Test was 1.58 gpm/ft., which is consistent with what would be expected for a well completed in a fine-grained, relatively thin aquifer.

Upon shutdown, the water levels in the Fliehs PW, OW-100E and OW-200E recovered to 97.9%, 81.8%, and 70.2%, respectively, of the pre-pumping static water level after 72 hours of recovery. Further details of the Test are provided on the Aquifer Testing Summary Data Sheet provided in Attachment 1 and the water-level versus time graphs (plotted on differing Y-axis scales) provided in Attachment 3.

TEST DATA ANALYSIS

The qualitative analysis of the Test data was conducted primarily by graphing the water-level displacement versus time and examining the plots for information regarding whether drawdown due to pumping occurred at the observation wells, the magnitude of the drawdown, and the presence or absence of boundary conditions (factors that influence the rate of drawdown). These graphs are referred to as Qualitative Plots and are included in Attachment 3.

The quantitative analysis includes a more detailed comparison of the water-displacement versus elapsed time curves with different type curves associated with the applicable analytical solutions, utilizing the commercially available software AQTESOLV Pro version 4.5 (Aqtesolv) produced by HydroSOLVE, Inc. The output from Aqtesolv showing the plots and other data are provided in Attachment 4. The distance-drawdown analysis is also provided in Attachment 4.

The static water levels and construction details as described on the Fliehs PW and OW-795W well logs indicate that the aquifer is confined, and it is assumed that the aquifer is also confined at OW-100E and OW-200E. The aquifer thickness ranges from 27 feet at the Fliehs PW to 45 feet at OW-795W. As indicated previously, geologic logs are not available for OW-100E and OW-200E, consequently, the aquifer thickness at those wells

is assumed to be 27 feet. However, given the difference in aquifer thickness between the Fliehs PW and OW-795W (18 feet), questions regarding the accuracy of the well logs, and limitations of Aqtesolv (the software does not allow drawdown to approach the aquifer thickness for unconfined solutions, and the drawdown of 26.3 feet in the Fliehs PW is nearly equal to the aquifer thickness at the Fliehs PW), an aquifer thickness of 40 was utilized in the quantitative analysis.

During the Constant Rate Pumping period, the Fliehs PW transitioned from confined to unconfined. Therefore, LRE analyzed the Test drawdown versus elapsed time data from the four wells for aquifer parameters of transmissivity (T) and storativity (S) using both the confined and unconfined aquifer solutions of Theis (1935) and Cooper-Jacob (1946). The Test data were also analyzed using the distance-drawdown method, and a graph showing the distance-drawdown data is provided in Attachment 4.

The magnitude of drawdown observed in the Fliehs PW is in part due to the well's poor efficiency, which is estimated to be between 23% to 36%. Additional information relative to the Fliehs PW well efficiency is provided on the distance-drawdown analysis in Attachment 4.

The T&S data estimated from the various solution methods are included in Table 1, as are the hydraulic conductivity (K) values calculated by dividing the applicable T value by the aquifer thickness at the particular observation well. Also included in Table 1 are the minimum, maximum, and geometric mean values of the T, S and K data.

Estimated values of T range from 7,637 to 44,119 gallons per day per foot (gpd/ft), with a geometric mean of 19,718 gpd/ft. Estimated values of S range from 1.94×10^{-3} to 4.90×10^{-2} , with a geometric mean of approximately 1.23×10^{-2} . The range of S values generally straddle the boundary between the S values typical for an unconfined aquifer and the S values typical for a confined aquifer. This may be in part due to portions of the aquifer at the Site transitioning from confined to unconfined during the Constant Rate Pumping period of the Test.

The Theis Recovery solution indicates a S/S' ratio that is less than 1, which suggests the presence of a negative boundary. The potential negative boundary is also apparent, at approximately 2,500 minutes, on the graph showing drawdown (trend corrected) versus elapsed time (semi-log) provided in Attachment 3. The location and nature of the potential negative boundary condition is unknown.

LAKE SILT GROUNDWATER ELEVATIONS

LRE obtained permission from the DANR to measure the groundwater elevations in three DANR Lake Silt aquifer observation wells (Adam Mathiowetz, personnel communication, 2021). The well logs for the three DANR wells are provided in Attachment 1. A freeze plug, of DANR design and manufacture, was present in ML-77B. The freeze plug requires the use of a special tool made specifically for the purpose of installing and removing the freeze plug, which LRE does not have; consequently, no groundwater elevation was obtained from ML-77B.

Groundwater elevation measurements obtained from ML-77A and ML-70R are provided in Table 2, as are groundwater elevations from the Site at nearly coincident times. The groundwater elevations at ML-77A and ML-70R were measured during the Constant Rate Pumping period of the Test for the purpose of illustrating the groundwater flow direction in this area of the Lake Silt aquifer that could potentially be produced during long-term pumping at the Site (if the irrigation system were developed). A groundwater elevation contour map produced with these elevation data is provided in Figure 2. While it is recognized that there are likely local variations in the groundwater flow direction due to differences in the aquifer thickness and degree of saturation within the area shown in Figure 2, a groundwater flow direction from the southeast to the northwest is consistent with the topography of the area.

SITE GROUNDWATER QUALITY

Groundwater samples were collected from the Fliehs PW, OW-200E and OW-795W in mid-October 2021 to obtain information regarding the water quality at the Site prior to conducting the Test. Groundwater quality samples were also collected from the Fliehs PW each day of the 72-hour Constant Rate Pumping period to monitor for pumping-induced water quality changes. The water quality samples were shipped to Ward Laboratories, Inc. of Kearney, NE for analysis of the parameters shown in Table 3. Also shown in Table 3 are the pH, temperature and specific conductance measured by LRE in the field, and the U.S. Environmental Protection Agency (USEPA) Maximum Contaminant Level (MCL) and Secondary MCL for those parameters in Table 3 for which the USEPA has developed drinking water quality standards.

The water quality data indicate that groundwater from the Lake Silt aquifer at the Site is of reasonably good quality, with no concentrations exceeding a MCL or Secondary MCL. The water quality data are also consistent among the three sampled wells, providing further evidence that the Site wells are completed in the same aquifer. Neither the field

measurements nor the laboratory analytical results from the three Fliehs PW samples collected over the Constant Rate Pumping period vary significantly from one day to the other, indicating no significant pumping-induced water quality changes (other than a slight increase in total dissolved solids concentrations and electrical conductivity when compared to the sample collected from the Fliehs PW on October 15, 2021).

WELL FIELD PRODUCTION AND RECHARGE

Based on the aquifer parameters determined from the Test, and the hydrogeologic setting, it is estimated that 20 wells may be required to meet the desired pumping rate of 500 to 600 gpm. From the Test results, a well spacing of 400 feet is needed to minimize well interference. The locations of the 20 wells, at a well spacing of approximately 400 feet, are shown in Figure 3.

The presence of the negative boundary condition, the fine-grained sediments comprising the aquifer matrix, and the limited aquifer thickness of approximately 36 feet, all considered together make it likely that pumping from the well field will need to be cycled to allow for periods of recharge. You have indicated that it is desired to apply one inch of water to the 145 acres per application. Assuming a cumulative pumping rate of 520 gpm, this would require approximately 5 days of pumping (followed by 5 days of non-pumping to allow for recharge). To apply 1 foot of water over the 145 acres in a growing season, utilizing a 5 day on-and-off cycle, would result in 12 separate 1-inch applications of water.

Utilizing the forward modeling solution feature of Aqtesolv, LRE modeled the operation of the well field operating under the conditions described above using the minimum, maximum and geometric mean values of T&S determined from the Test. Figure 4a shows the estimated maximum cumulative drawdown around the well field at the minimum T&S, and Figure 4b illustrates the drawdown and recovery, assuming the minimum T&S values, produced by the 12 cycles of pumping. At the minimum T&S, the cumulative drawdown at each well is approximately 26 feet. This does not include the effects of well efficiency, and at an aquifer thickness of 36 feet, this amount of drawdown is excessive and operation of the irrigation system would not be feasible.

Figures 5a and 5b illustrate the estimated drawdown of the well field modeled using the maximum T&S values, and Figures 6a and 6b illustrate the estimated drawdown of the well field modeled using the geometric mean T&S values. The maximum cumulative drawdown is approximately 3 feet and 8 feet, respectively, and operation of the well field assuming the values of T&S are at the maximum or geometric mean values appears possible.

To issue a water permit, the DANR must have a reasonable degree of confidence that the annual rate of recharge to the aquifer is equal to or greater than the proposed annual withdrawal volume. One method for estimating the volume of recharge is to estimate the area of influence (AOI) produced by the proposed withdrawal, and multiple that AOI by an annual recharge rate to estimate the annual recharge.

Mathiowetz and Buhler (2015), citing Hedges and others (1985), estimated a recharge rate for the Site of from 0.25 to 1.25 inches per year. LRE calculated the AOI (out to a simulated drawdown of 0.1 foot) and the resulting annual recharge using the maximum and mean T&S values determined from the Test. The results of the AOI and recharge calculations are provided in Table 4 and indicate that the annual recharge will be greater than the desired annual withdrawal of 145 ac-ft/yr in three of the four modeled scenarios. The estimated recharge of 112 ac-ft/yr, which is less than the desired 145 ac-ft/yr, was modeled using the maximum T&S (which produces a relatively smaller AOI) and the minimum recharge rate of 0.25 in/yr. However, it should be noted that this method of recharge estimation does not include the recharge that will occur by inflow into the Site laterally from adjoining portions of the Lake Silt aquifer.

It may be possible to meet the desired annual volume and instantaneous pumping rate with fewer than 20 wells, depending on the variability of the aquifer at the Site. However, additional data gathered during future well drilling will likely provide information with which to refine the well field design. In addition, it is likely possible to construct wells that are more efficient than the Fliehs PW. The Fliehs PW is reportedly constructed of PVC screen, and greater efficiency and yield can likely be obtained from a properly designed and developed well constructed with stainless steel screen.

COMMENTS AND RECOMMENDATIONS

It should be noted that there are no irrigation systems utilizing wells completed in the Lake Silt aquifer in the vicinity of the Site. This is likely due to the predominantly fine-grained sediments comprising the aquifer. Consequently, due to the fine-grained nature of the sediments, it is more difficult to construct an economically practical irrigation system in the aquifer. LRE's analysis of the Test results indicate that the aquifer parameters at the Site must be equal to or greater than the geometric mean values of T&S shown in Table 1 for the well field to produce the desired volume at the desired pumping rate.

During extended dry or drought conditions, the static water level of the Lake Silt aquifer at the Site will naturally be lower than it was during the Test. The aquifer thickness is

limited, and the sediments are fine-grained, limiting the regional lateral movement of groundwater into the Site from other portions of the Lake Silt aquifer. Consequently, the volume of groundwater that can be pumped from the Lake Silt aquifer at the Site will be reduced during extended dry or drought conditions.

Operation of the irrigation system will likely require that pumping from the well field be cycled to allow for recovery of water-levels between pumping periods. This is due to the suspected presence of negative boundaries. LRE's analysis indicates that a 5-day on-and-off pumping cycle, resulting in 12 applications of approximately 1-inch of water over the 145 acres during the 5-month growing season, may be appropriate. However, there is uncertainty associated with the long-term production of the proposed well field. That uncertainty could be reduced with the addition of high-quality stratigraphic information from additional drilling and testing conducted prior to or during well field development and operation, and operation of the irrigation system could be revised and optimized with the addition of further hydrogeologic information.

Ward Laboratories, Inc. (Ward) provides information regarding water suitability for irrigation, and no concerns regarding the water quality were raised by Ward based on the water quality analyses conducted on the Lake Silt aquifer samples (Table 3). Prior to construction of the irrigation system, it is recommended that an agronomist or other agricultural or irrigation specialist be consulted regarding the compatibility of the soil at the Site with the groundwater quality of the Lake Silt aquifer.

REFERENCES

Hedges, L.S., Allen, J, and 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, Final Report, prepared for U.S. Army Corps of Engineers, Omaha, NE, contract DACW 45-80-C-0185, 40 p.

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Mathiowetz, A. and Buhler, K., 2015, Supplemental Report to the Chief Engineer on Deferred Permit Application No. 7537-3, Bret Fliehs, November 3, 2015, Water Rights Program, South Dakota Department of Agriculture and Natural Resources.

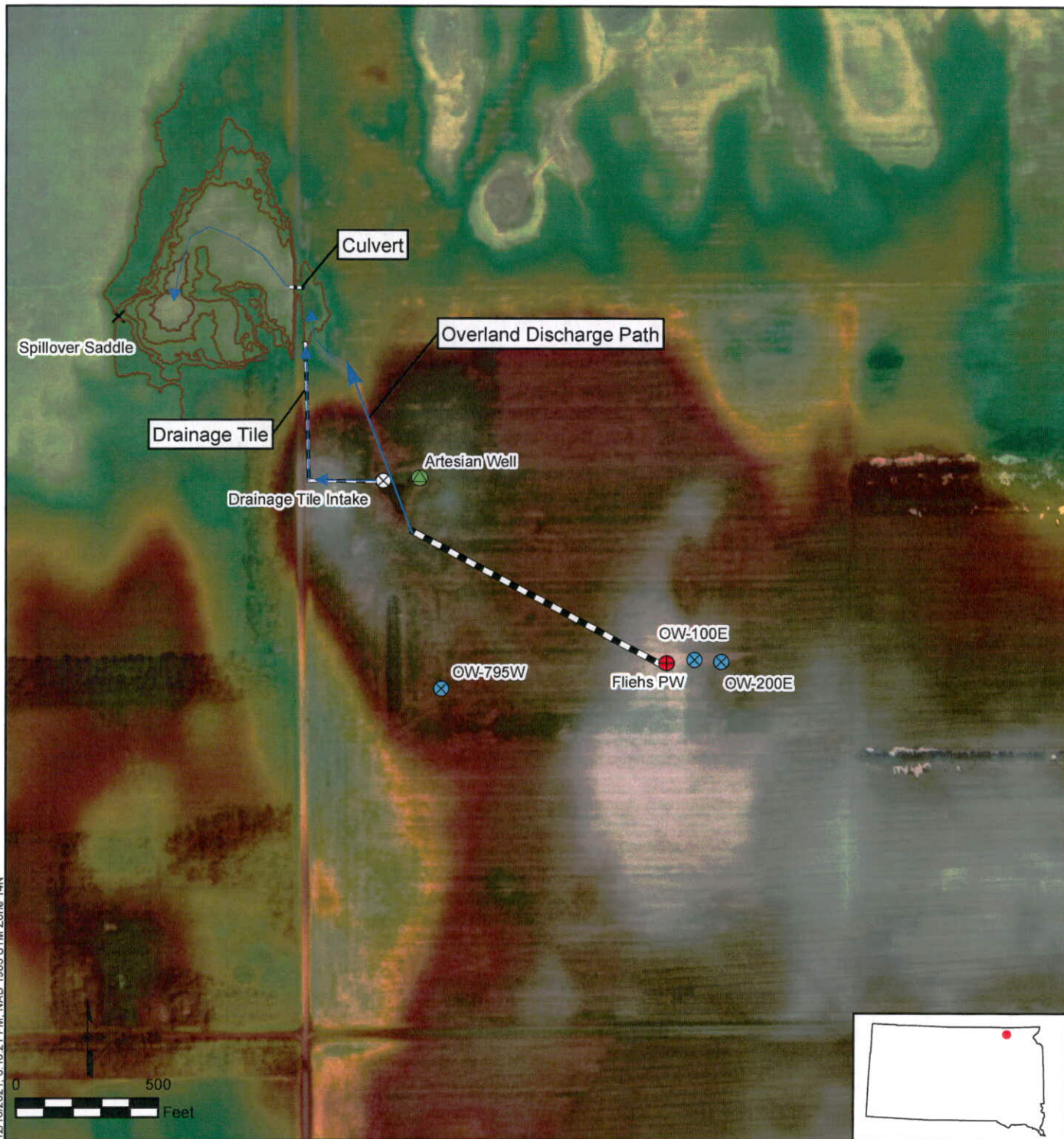
Cooper, H.H. and C.E. Jacob, 1946. A generalized graphical method for evaluating formation constants and summarizing well field history, Am. Geophys. Union Trans., vol. 27, pp. 526-534.

Koch, Neil C. and Bradford, Wendell, 1976, Bulletin 25, Geology and Water Resources of Brown County, South Dakota: Part II: Water Resources, United States Department of the Interior-Geological Survey, prepared in cooperation with the SD Geological Survey, Brown County, and the Oahe Conservancy Sub-District.

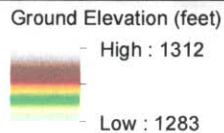
Theis, C.V., 1935, The relation between the lowering of the piezometric surface and the rate and duration of discharge of a well using groundwater storage, Am. Geophys. Union Trans., vol 16, p. 519-524.

FIGURES

C:\GIS\Bret Fliehs\Bret Fliehs\5510FLH01_01c.mxd, 12/16/2021, 6:16:21 PM, NAD 1983 UTM Zone 14N



- | | |
|------------------|-------------------------------|
| Pumping Well | Discharge Pipe |
| Observation Well | Overland Discharge |
| Artesian Well | Drainage Area Contours |
| Tiling Drain | Drainage Area Spillover Point |



Service Layer Credits:
Source: Esri, Maxar,



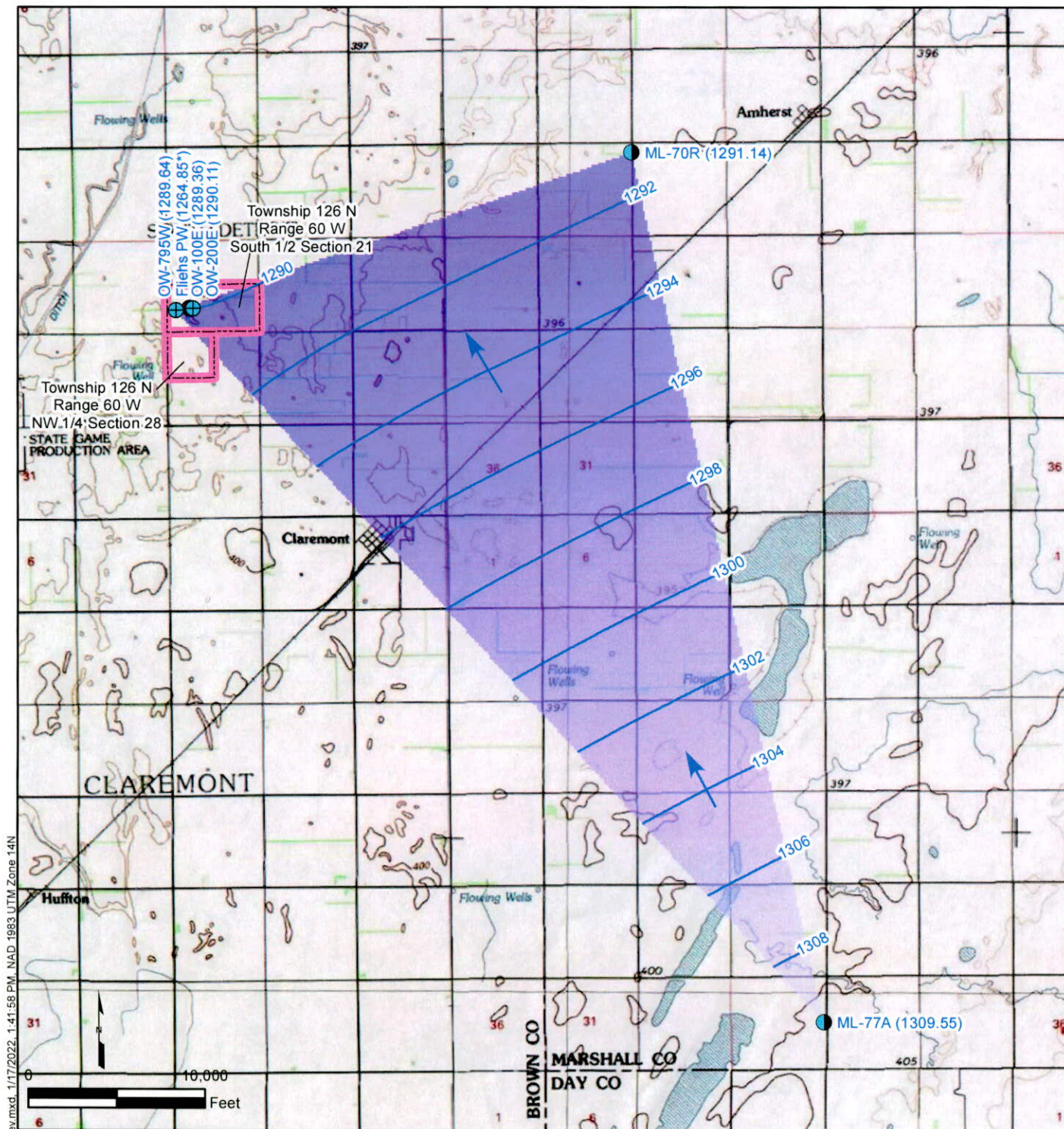
Prepared By:
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Innovative Water Resource Solutions
Sioux Falls, South Dakota
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BRET FLIEHS
5510FLH01
BROWN COUNTY, SD

AQUIFER TEST CONFIGURATION

FILE:5510FLH01_01c.MXD

DATE:12/16/2021 | FIGURE: 1



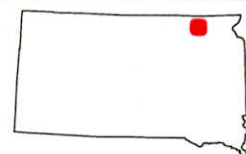
- ✖ Pumping Well
- ⊕ Observation Well
- SDGS Observation Well
- Property Line

- ➔ Groundwater Flow Direction
- Drawdown Contour (feet)
- 1309.55 Groundwater Elevation (feet)
- * Not used in contouring

Groundwater Elevation (feet)

1309.55

1289.36



Service Layer Credits: Copyright: © 2013 National Geographic Society, i-cubed
Source: ESRI Clarity Image

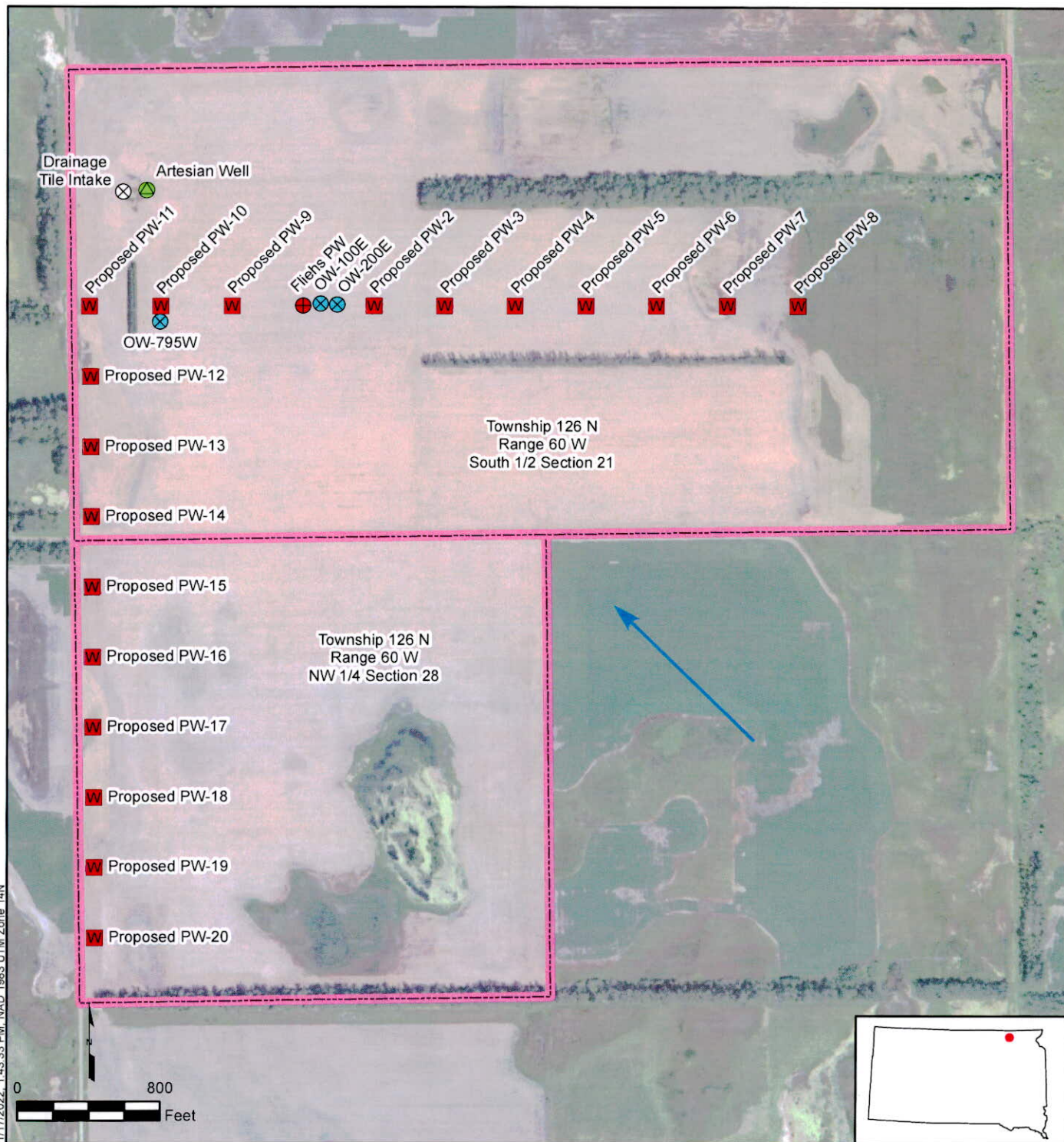


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BRET FLIEHS 5510FLH01 BROWN COUNTY, SD	
REGIONAL GROUNDWATER ELEVATION (11/5/2021)	
FILE:5510FLH01_01f_gwelev.MXD	DATE:1/17/2022
FIGURE: 2	

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C:\GIS\Bret Fliehs\maps\5510FLH01_01d.mxd 1/17/2022 1:43:33 PM NAD 1983 UTM Zone 14N



- Pumping Well
- Observation Well
- Artesian Well
- Tiling Drain
- Proposed Pumping Well
- Presumed Groundwater Flow Direction
- Property Line

Service Layer Credits: SD BIT, BLM
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Source: ESRI Clarity Image



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BRET FLIEHS
5510FLH01
BROWN COUNTY, SD

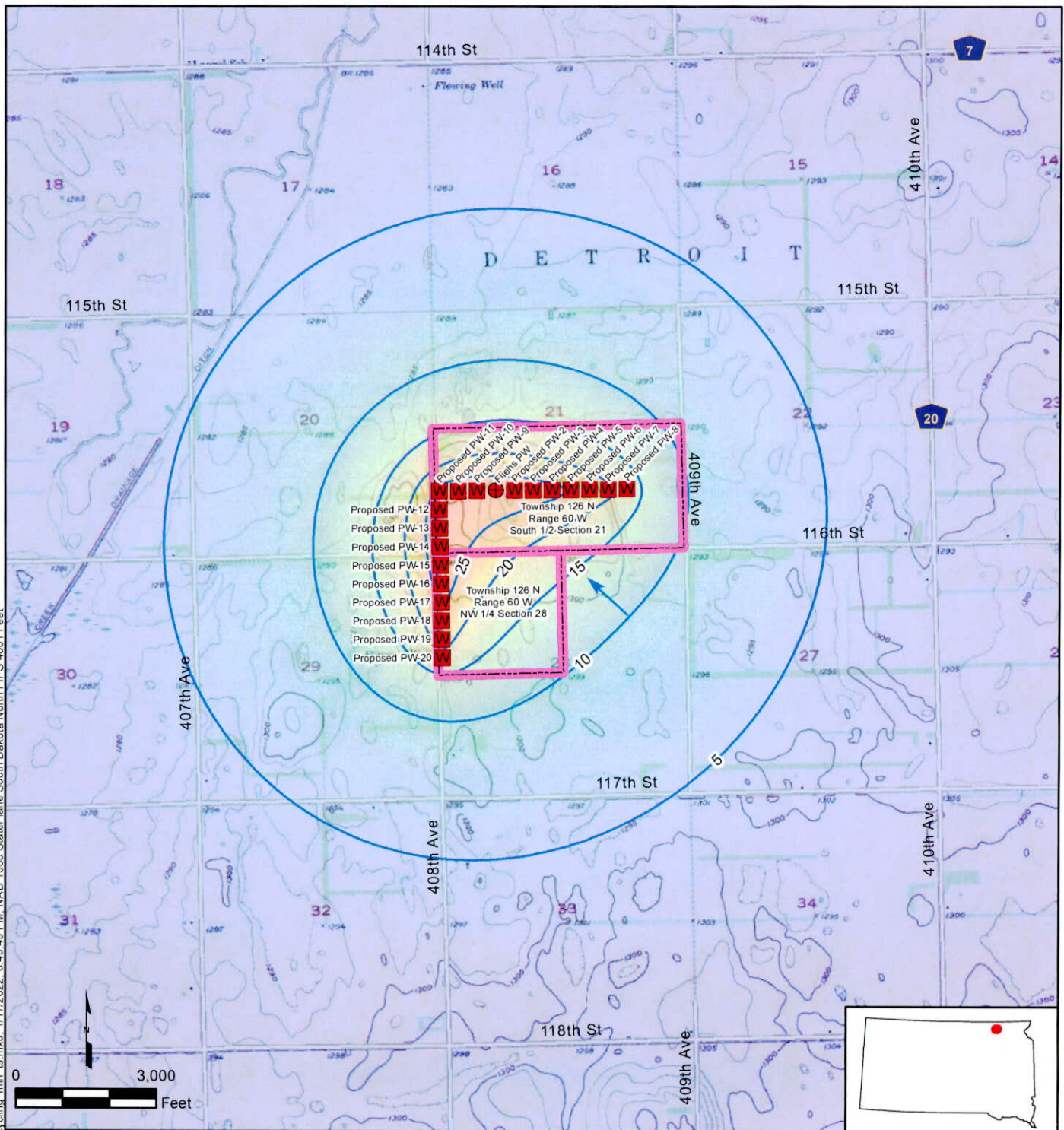
PROPOSED WELL FIELD CONFIGURATION

FILE:5510FLH01_01d.MXD

DATE:1/17/2022

FIGURE: 3

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Pumping Well



Observation Well



Artesian Well



Tiling Drain



Proposed Pumping Well



Presumed Groundwater Flow Direction

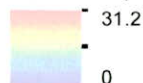


Drawdown Contour (feet)



Property Line

Drawdown (feet)



Service Layer Credits: Copyright © 2013 National Geographic Society, i-cubed
Source: ESRI Clarity Image



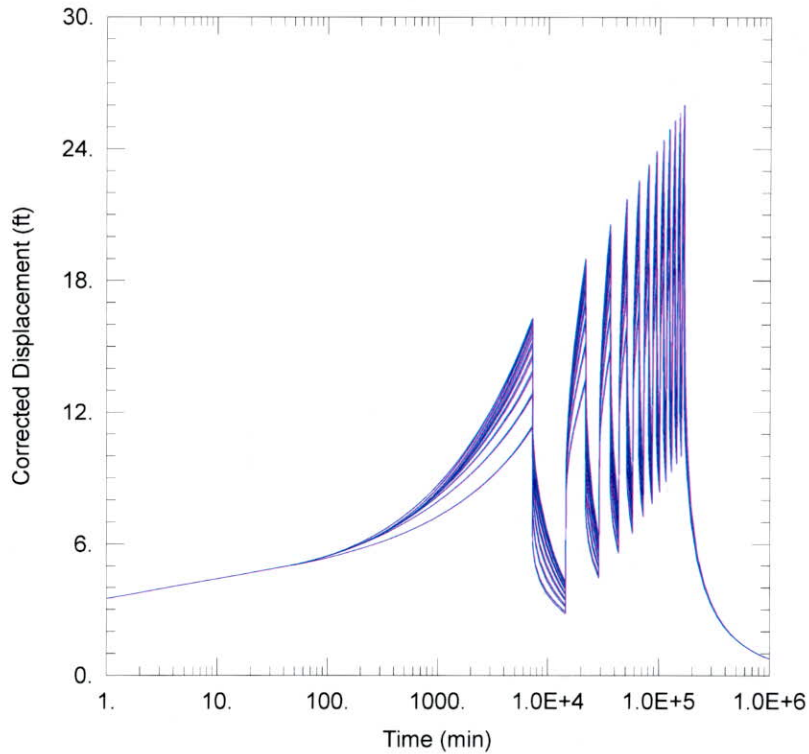
Prepared By:
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BRET FLIEHS
5510FLH01
BROWN COUNTY, SD

PROPOSED WELL FIELD CONFIGURATION AND
CUMULATIVE DRAWDOWN ESTIMATE USING MINIMUM T & S

FILE:5510FLH01_01e_dd_cycling_min.ts.MXD | DATE:1/17/2022 | FIGURE: 4a

FIGURE 4B
AQTESOLV FORWARD SOLUTION USING MINIMUM T & S
WITH 20 PROPOSED WELLS



WELL TEST ANALYSIS

Data Set: U:\...\Proposed wells_FORWARD solution_min TS.aqt

Date: 01/17/22

Time: 20:20:30

PROJECT INFORMATION

Company: LRE Water

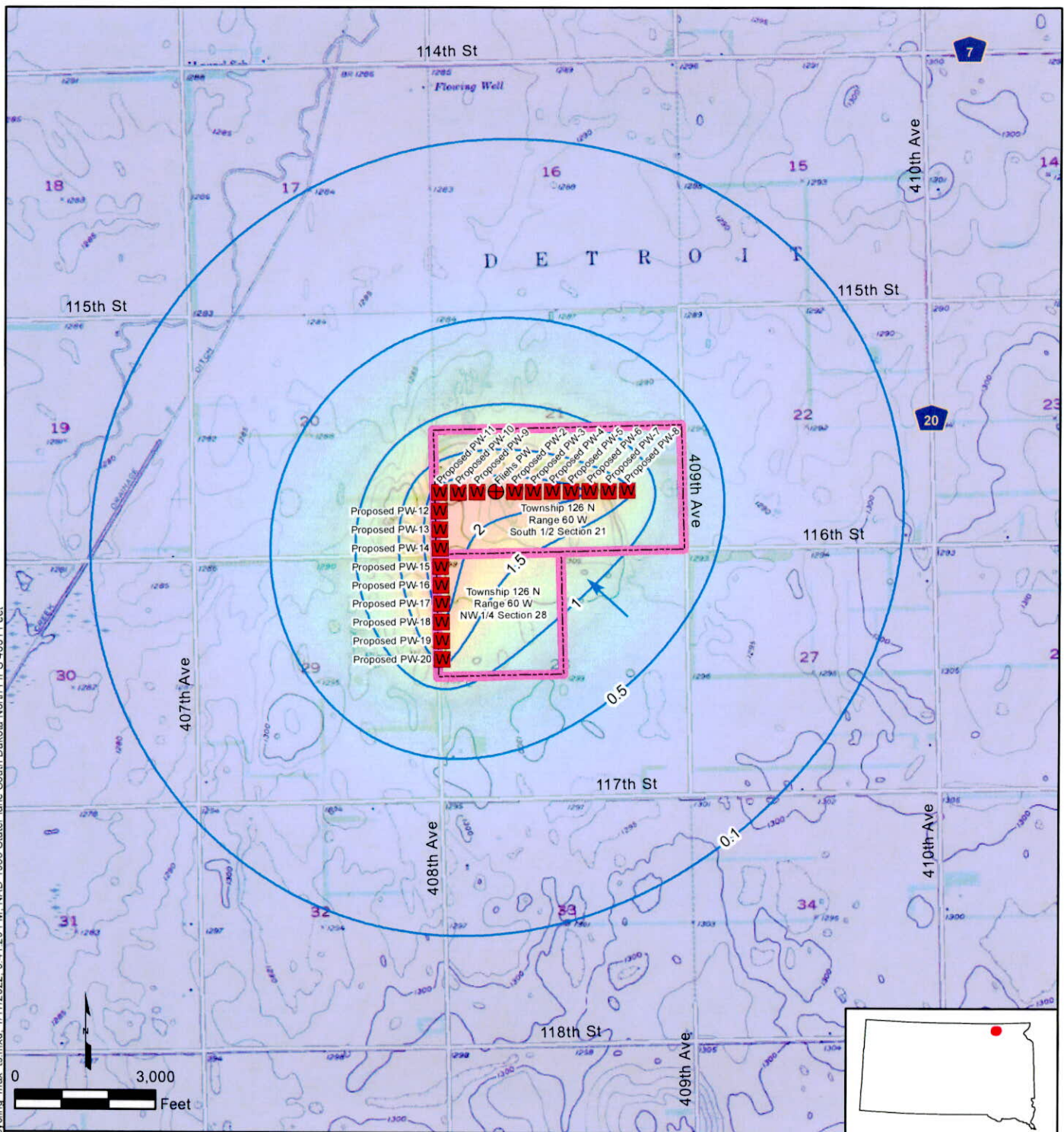
Client: Bret Bliehs

Location: Claremont, SD

WELL DATA

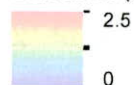
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PW-2	2465234.138689545.0627		PW-2	2465234.138689545.0627	
PW-3	2465634.243689549.9518		PW-3	2465634.243689549.9518	
PW-4	2466034.347689554.8408		PW-4	2466034.347689554.8408	
PW-5	2466434.452689559.7297		PW-5	2466434.452689559.7297	
PW-6	2466834.556689564.6186		PW-6	2466834.556689564.6186	
PW-7	2467234.661689569.5073		PW-7	2467234.661689569.5073	
PW-8	2467634.765689574.396		PW-8	2467634.765689574.396	
PW-9	2464433.928689535.2843		PW-9	2464433.928689535.2843	
PW-10	2464033.823689530.3949		PW-10	2464033.823689530.3949	
PW-11	2463633.718689525.5054		PW-11	2463633.718689525.5054	
PW-12	2463642.099689125.4583		PW-12	2463642.099689125.4583	
PW-13	2463650.48688725.4112		PW-13	2463650.48688725.4112	
PW-14	2463658.861688325.3642		PW-14	2463658.861688325.3642	
PW-15	2463667.242687925.3173		PW-15	2463667.242687925.3173	
PW-16	2463675.623687525.2706		PW-16	2463675.623687525.2706	
PW-17	2463684.005687125.2238		PW-17	2463684.005687125.2238	
PW-18	2463692.386686725.1772		PW-18	2463692.386686725.1772	
PW-19	2463700.768686325.1307		PW-19	2463700.768686325.1307	
PW-20	2463709.149685925.0843		PW-20	2463709.149685925.0843	

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- Pumping Well
- Observation Well
- Artesian Well
- ⊗ Tiling Drain
- W Proposed Pumping Well
- Presumed Groundwater Flow Direction
- Drawdown Contour (feet)
- Property Line

Drawdown (feet)



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Source: ESRI Clarity Image



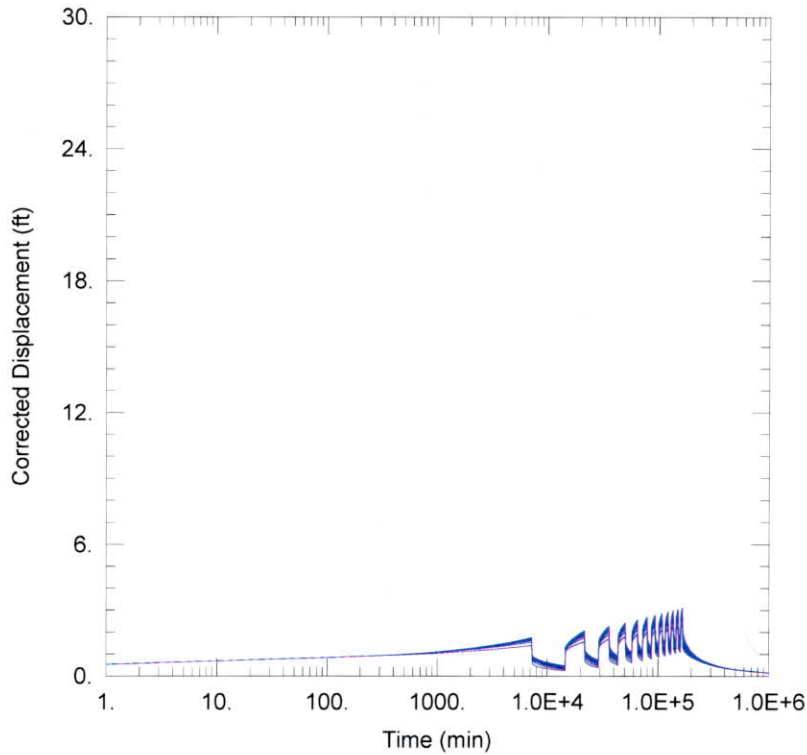
Prepared By:
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Innovative Water Resource Solutions
Sioux Falls, South Dakota
(605) 310-1721

BRET FLIEHS
5510FLH01
BROWN COUNTY, SD

PROPOSED WELL FIELD CONFIGURATION AND
CUMULATIVE DRAWDOWN ESTIMATE USING MAXIMUM T & S

FILE:5510FLH01_01e dd cycling_max ts.MXD DATE:1/17/2022 FIGURE: 5a

FIGURE 5B
AQTESOLV FORWARD SOLUTION USING MAXIMUM T & S
WITH 20 PROPOSED WELLS



WELL TEST ANALYSIS

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Date: 01/17/22

Time: 20:21:14

PROJECT INFORMATION

Company: LRE Water

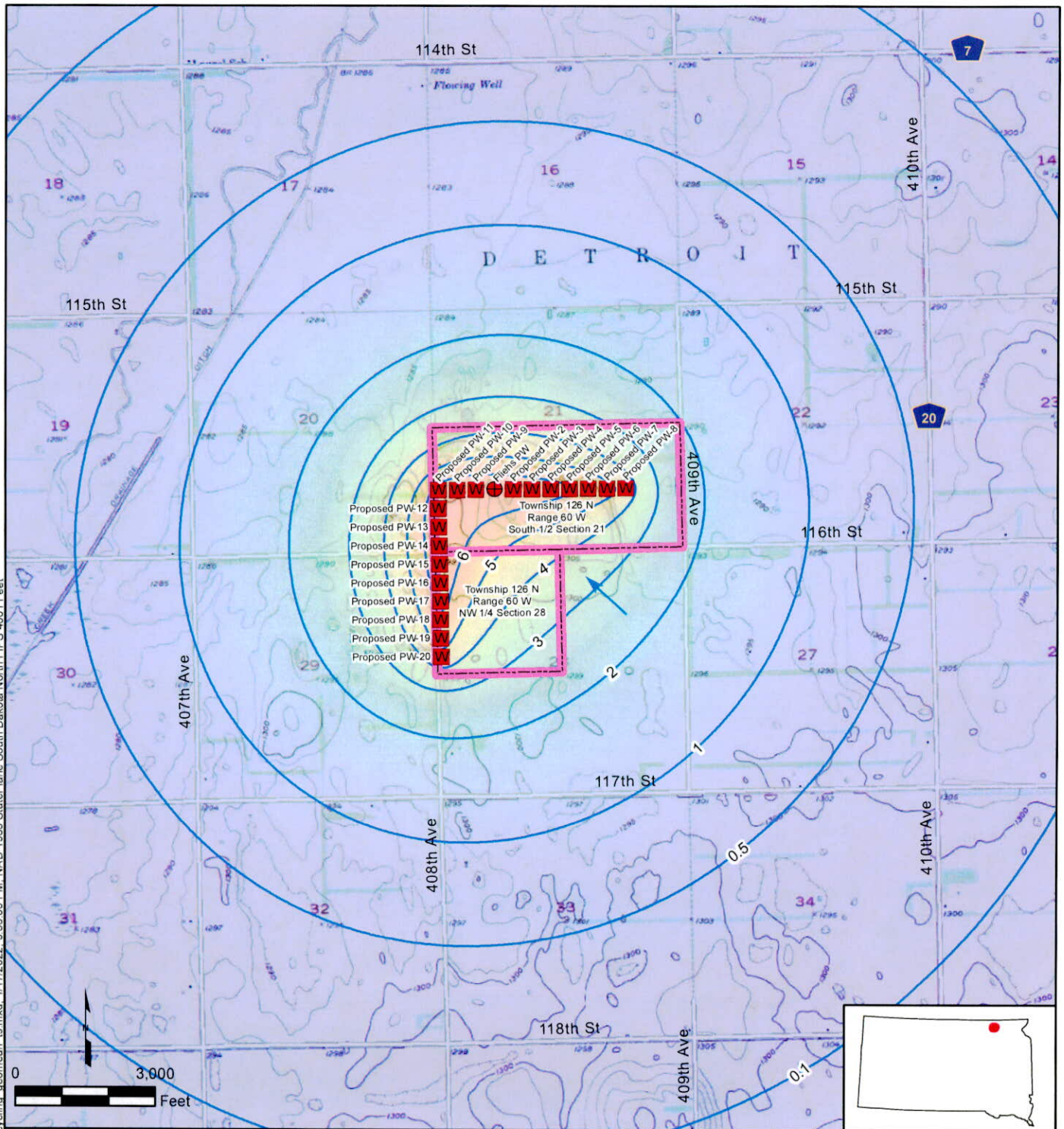
Client: Bret Bliehs

Location: Claremont, SD

WELL DATA

Pumping Wells			Observation Wells		
Well Name	X (ft)	Y (ft)	Well Name	X (ft)	Y (ft)
PW-1	2464834.033689540.1735		PW-1	2464834.033689540.1735	
PW-2	2465234.138689545.0627		PW-2	2465234.138689545.0627	
PW-3	2465634.243689549.9518		PW-3	2465634.243689549.9518	
PW-4	2466034.347689554.8408		PW-4	2466034.347689554.8408	
PW-5	2466434.452689559.7297		PW-5	2466434.452689559.7297	
PW-6	2466834.556689564.6186		PW-6	2466834.556689564.6186	
PW-7	2467234.661689569.5073		PW-7	2467234.661689569.5073	
PW-8	2467634.765689574.396		PW-8	2467634.765689574.396	
PW-9	2464433.928689535.2843		PW-9	2464433.928689535.2843	
PW-10	2464033.823689530.3949		PW-10	2464033.823689530.3949	
PW-11	2463633.718689525.5054		PW-11	2463633.718689525.5054	
PW-12	2463642.099689125.4583		PW-12	2463642.099689125.4583	
PW-13	2463650.48688725.4112		PW-13	2463650.48688725.4112	
PW-14	2463658.861688325.3642		PW-14	2463658.861688325.3642	
PW-15	2463667.242687925.3173		PW-15	2463667.242687925.3173	
PW-16	2463675.623687525.2706		PW-16	2463675.623687525.2706	
PW-17	2463684.005687125.2238		PW-17	2463684.005687125.2238	
PW-18	2463692.386686725.1772		PW-18	2463692.386686725.1772	
PW-19	2463700.768686325.1307		PW-19	2463700.768686325.1307	
PW-20	2463709.149685925.0843		PW-20	2463709.149685925.0843	

C:\GIS\Bret_Fliehs\maps\5510FLH01_01e_dd_cycling_geomean_ts.mxd, 1/17/2022, 9:36:08 PM, NAD 1983 StatePlane South Dakota North FIPS 4001 Feet



Pumping Well



Observation Well



Artesian Well



Tiling Drain



Proposed Pumping Well



Presumed Groundwater Flow Direction

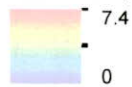


Drawdown Contour (feet)



Property Line

Drawdown (feet)



Service Layer Credits: Copyright© 2013 National Geographic Society, i-cubed
Source: ESRI Clarity Image



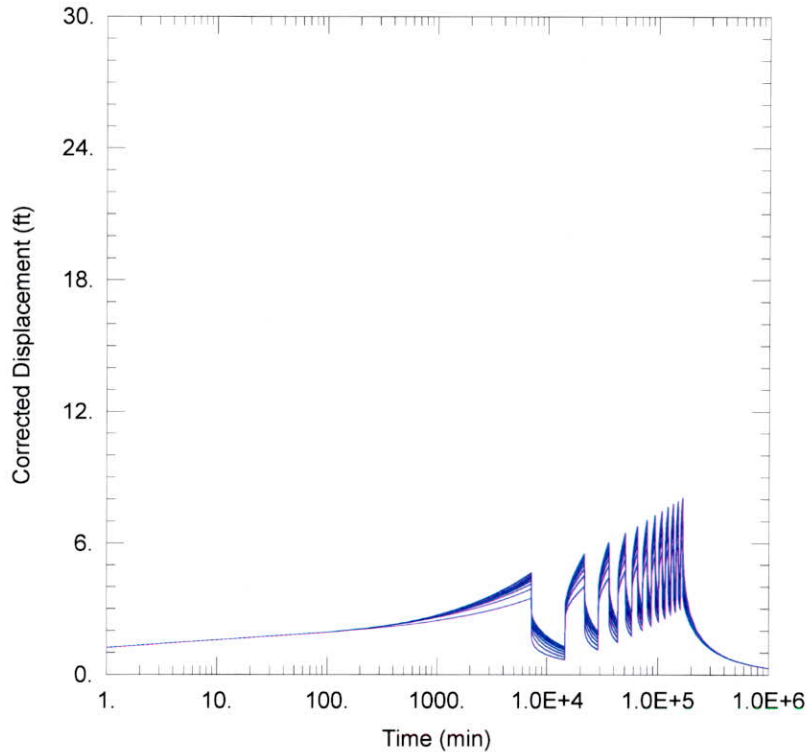
Prepared By:
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BRET FLIEHS
5510FLH01
BROWN COUNTY, SD

PROPOSED WELL FIELD CONFIGURATION AND
CUMULATIVE DRAWDOWN ESTIMATE USING GEOMETRIC MEAN T & S

FILE:5510FLH01_01e_dd_cycling_geomean_ts.MXD | DATE:1/17/2022 | FIGURE: 6a

FIGURE 6B
AQTESOLV FORWARD SOLUTION USING GEOMETRIC MEAN T & S
WITH 20 PROPOSED WELLS



WELL TEST ANALYSIS

Data Set: U:\...\Proposed wells_FORWARD solution_geomean TS.aqt
 Date: 01/17/22 Time: 20:21:43

PROJECT INFORMATION

Company: LRE Water
 Client: Bret Bliehs
 Location: Claremont, SD

WELL DATA

Pumping Wells			Observation Wells		
Well Name	X (ft)	Y (ft)	Well Name	X (ft)	Y (ft)
PW-1	2464834.033689540.1735		PW-1	2464834.033689540.1735	
PW-2	2465234.138689545.0627		PW-2	2465234.138689545.0627	
PW-3	2465634.243689549.9518		PW-3	2465634.243689549.9518	
PW-4	2466034.347689554.8408		PW-4	2466034.347689554.8408	
PW-5	2466434.452689559.7297		PW-5	2466434.452689559.7297	
PW-6	2466834.556689564.6186		PW-6	2466834.556689564.6186	
PW-7	2467234.661689569.5073		PW-7	2467234.661689569.5073	
PW-8	2467634.765689574.396		PW-8	2467634.765689574.396	
PW-9	2464433.928689535.2843		PW-9	2464433.928689535.2843	
PW-10	2464033.823689530.3949		PW-10	2464033.823689530.3949	
PW-11	2463633.718689525.5054		PW-11	2463633.718689525.5054	
PW-12	2463642.099689125.4583		PW-12	2463642.099689125.4583	
PW-13	2463650.48688725.4112		PW-13	2463650.48688725.4112	
PW-14	2463658.861688325.3642		PW-14	2463658.861688325.3642	
PW-15	2463667.242687925.3173		PW-15	2463667.242687925.3173	
PW-16	2463675.623687525.2706		PW-16	2463675.623687525.2706	
PW-17	2463684.005687125.2238		PW-17	2463684.005687125.2238	
PW-18	2463692.386686725.1772		PW-18	2463692.386686725.1772	
PW-19	2463700.768686325.1307		PW-19	2463700.768686325.1307	
PW-20	2463709.149685925.0843		PW-20	2463709.149685925.0843	

TABLES

Table 1
Summary of Aquifer Parameters
Bret Filehs Aquifer Pumping Test
Claremont, SD

Well	Distance to Filehs PW (ft)	Screen Interval (ft bg)	Aquifer Thickness (ft)	Transmissivity (ft ² /day)	Transmissivity (gpd/ft)	Hydraulic Conductivity (ft/day)	Storativity	S/S*	Method of Analysis
Filehs PW	0	45-60	27**	653	4,881	24	NV	NA	Unconfined Theis
				1,477	11,047	55	NV	NA	Unconfined Cooper-Jacob
				2,102	15,720	78	NV	NA	Unconfined Cooper Jacob (Agarwal Recovery)
OW-100E	100	45-60*	27**	2,721	20,355	101	3.89E-03	NA	Confined Theis
				3,081	23,045	114	1.94E-03	NA	Confined Cooper-Jacob
				2,939	21,980	109	NA	0.44	Confined Theis Recovery
OW-200E	200	45-60*	27**	4,717	35,283	175	1.25E-02	NA	Confined Theis
				5,898	44,119	218	6.53E-03	NA	Confined Cooper-Jacob
				4,352	32,551	161	NA	0.53	Confined Theis Recovery
OW-795W	795	40-60	45**	38,170	285,512	787	1.12E-01	NA	Confined Theis (early time)
				1,849	13,828	38	3.80E-02	NA	Confined Theis (late time)
				60,410	451,667	1,246	1.31E-01	NA	Confined Cooper-Jacob (early time)
				3,640	27,226	75	2.41E-02	NA	Confined Cooper-Jacob (late time)
Distance Drawdown	na	na	na	1,770	13,240	44	1.80E-02	NA	Using OW-100E, OW-200E, and OW-795W
				1,021	7,637	26	4.90E-02	NA	Using only OW-100E and OW-200E
			minimum =	1,021	7,637	26	1.94E-03		
			maximum =	5,898	44,119	218	4.90E-02		
			geometric mean =	2,636	19,718	83	1.23E-02		

Notes:

ft: feet

ft bg: feet below grade

ft/day: feet per day

ft²/day: feet squared per day

S/S*: the ratio of storativity during pumping to storativity during recovery. Values > 1 indicate a positive boundary. Values < 1 indicate a negative boundary.

gpd/ft: gallons per day per foot

NA: not applicable

NV: not valid

italicized values in grey not used in the statistics

* assumed, log not available

** assumed 40 feet for the quantitative analysis

Table 2

Lake Silt Aquifer Groundwater Elevations (November 5, 2021)

**Bret Flihs Aquifer Pumping Test
Claremont, SD**

Date	Time	Well	Depth to Water	TOC Elevation	Stickup	Groundwater Elevation	Comment
			(feet bTOC)	(feet)	(feet)	(feet)	
11/5/2021	13:15	ML-77A	5.45	1315	2.64	1309.55	Well is 2-inch diameter PVC & has new lock
11/5/2021	14:00	ML-77B	NA	1310	NA	NA	Well is 2-inch diameter PVC, has freeze plug (no access, no lock)
11/5/2021	14:45	ML-70R	16.86	1308	3.04	1291.14	Well is 4-inch diameter steel with functional lock
11/5/2021	14:42	Flihs PW	47.15	1312	1.04	1264.85	TOC Elevation is approximate, based on ground surface elevation from DEM and stickup height.
11/5/2021	14:44	OW-100E	18.64	1308	0.965	1289.36	TOC Elevation is approximate, based on ground surface elevation from DEM and stickup height.
11/5/2021	14:46	OW-200E	16.39	1306.5	1.44	1290.11	TOC Elevation is approximate, based on ground surface elevation from DEM and stickup height.
11/5/2021	14:48	OW-795W	12.36	1302	1.04	1289.64	TOC Elevation is approximate, based on ground surface elevation from DEM and stickup height.

Notes: TOC - top of casing
bTOC - below top of casing
DEM - digital elevation model

Table 3
Lake Silt Aquifer Water Quality Data
Bret Fliehs Aquifer Pumping Test
Claremont, SD

Analyte	OW-795W October 15, 2021	OW-200E October 14, 2021	Fliehs PW October 15, 2021	Fliehs PW November 4, 2021	Fliehs PW November 5, 2021	Fliehs PW November 8, 2021	Units	MCL	Secondary MCL
FIELD PARAMETERS									
pH	7.45	7.48	7.46	8.23	8.26	8.42	S. U.		6.5 - 8.5
Temperature	46.8	47.7	47.4	47.5	49.7	48.3	°Fahrenheit		
Specific Conductance	704.5	111.8*	668	686	709	725	uS/cm		
PHYSICAL PROPERTIES									
pH (Laboratory Measured)	8.1	8.1	8.1	8.2	8.1	8.2	S. U.		6.5 - 8.5
Electrical Conductivity	660	630	620	710	730	700	umhos/cm		
Estimated Total Dissolved Solids	395	378	371	424	439	418	mg/L		500
Total Hardness (as CaCO ₃)	329	323	321	338	340	338	mg/L		
Sodium Absorption Ratio (SAR)	0.4	0.2	0.2	0.3	0.3	0.3	mg/L		
Adjusted SAR	0.6	0.3	0.2	0.3	0.3	0.3	mg/L		
NON-METALLICS									
Total Alkalinity (as CaCO ₃)	288	279	241	280	286	250	mg/L		
Bicarbonate	347	337	290	337	344	301	mg/L		
Boron	0.08	0.08	0.05	0.05	0.05	0.08	mg/L		
Carbonate	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	mg/L		
Chloride	5	8	8	4	4	4	mg/L		250
Nitrate as Nitrogen	0.1	1.6	1.5	1.4	2.5	2.8	mg/L	10	
Sulfate	23	15	27	31	30	29	mg/L		250
METALS									
Calcium	85.2	70.6	70.3	75.4	76.0	75.2	mg/L		
Iron	0.11	<0.01	0.02	0.10	0.10	0.08	mg/L		0.3
Magnesium	28	35	35	36	36	36	mg/L		
Manganese	0.56	0.41	0.60	0.64	0.64	0.62	mg/L		0.05
Potassium	8	6	6	7	7	4	mg/L		
Sodium	18	10	9	11	11	11	mg/L		

NOTES:

MCL = EPA maximum contaminant level
mg/L = milligrams per liter
uS/cm = micro Siemens per centimeter

CaCO₃ = calcium carbonate

Analyses performed by Ward Laboratories, Inc. of Kearney, NE.

* Data appear erroneous

Table 4

Estimated Recharge

Bret Fliehs Aquifer Pumping Test
Claremont, SD

	Area within the 0.1 ft Drawdown Contour in Figure 5a Using Geometric Mean T & S		Area within the 0.1 ft Drawdown Contour in Figure 4a Using Maximum T & S	
Area of Influence (ft ²) *	583,205,418		233,734,275	
Recharge (in/yr) **	0.25	1.25	0.25	1.25
Recharge (ft/yr)	0.02	0.10	0.02	0.10
Recharge (ft ³ /yr)	12,150,113	60,750,564	4,869,464	24,347,320
Recharge (gal/yr)	90,882,844	454,414,222	36,423,591	182,117,956
Recharge (ac-ft/yr)	279	1,395	112	559

A withdrawal of 145 acre-feet per year is equivalent to 47,245,176 gallons/year.

Value in green exceeds the anticipated withdrawal, indicating more water is recharged than withdrawn.

Value in red does not exceed the anticipated withdrawal, indicating more water is withdrawn than recharged.

Notes:

ft²: feet squared

in/yr: inches per year

ft/yr: feet per year

ft³/yr: cubic feet per year

gal/yr: gallons per year

ac-ft/yr: acre-feet per year

*: area within the 0.1 ft drawdown contour

**: recharge rate from Mathiowetz and Buhler (2015), citing Hedges and others (1985)

ATTACHMENT 1
AQUIFER TEST SUMMARY DATA SHEET

Aquifer Test Summary Data Sheet

Client: Bret Fiehs	Site: Bret Fiehs PW
Task: PW Aquifer Test	City/State: Claremont, SD
Project Number: 5510FLH01	

Pumping Well Information

Pumping Well	Pump	Generator or Power Supply
Pumping Well(s): Fiehs PW	Make: Goulds	Make: power drop
Screen Setting (ft bg): 45-60	Intake (ft bg): 59	Power (ie. 3-ph 480 V): 3 ph, 480 V
Well Radius (in): 2 (4" well)	Column Diameter (in): 1.5	Horsepower: na
Stickup Height (ft): 1.04	Power (ie. 3 ph, 480 V): 3 ph, 480 V	Owner / Rental Source: na
Static Water Level (ft): 21.71	Horsepower: 5	Adjustable: Yes / No na
Measuring/Reference Point: top of casing	Owner / Rental Source: General Irrigation	Max. Allowable Amp Draw (Amps): na
Sand Meter Type: --	Type: Submersible	Max. Allowable Frequency (Hz): na
Sand Concentration (mg/L): na		Max. Allowable Drawdown (ft): na
Notes:		Max. Allowable Motor Temp. (F): na

Aquifer Test Information

Test Type: Constant-Rate Test																																																																																																			
Purpose of Test: To Determine Rate of Constant-Rate Test																																																																																																			
Date of Test: 11/3/2021 - 11/9/2021																																																																																																			
Flow Rate Measurement: ☒ Totalizer, ☐ Acoustic Meter, ☐ Mag Meter, ☐ Orifice Weir, ☐ Other:																																																																																																			
Assisting Subcontractor: ☐ not applicable, ☒ Name: General Irrigation																																																																																																			
Wellhead Manifold and Discharge: The discharge from PW was conveyed away from the wellhead in approximately 1,000 ft of 6" solid irrigation pipe. Discharged water pooled in a small depression and entered a drain tile inlet. The drain tile outlet is in the 408th Ave. ditch south of the culvert on the east side of 408th Ave. The water then flowed north from the drain tile outlet to the culvert, then through the culvert under 408th Ave., and into a ground surface depression west of 408th Ave. LRE estimated the containment capacity of the depression west of 408th Avenue and found that it had sufficient capacity to retain the Test discharge water such that it would not flow farther west and would not "spill over" the lowest elevation of the containing terrain (labeled as "Spillover Saddle" on Figure 1).																																																																																																			
Pumping Well(s): Fiehs PW <table border="1"> <thead> <tr> <th></th> <th>Pumping Rate (gpm)</th> <th>Pumping Duration (hr)</th> <th>Recovery Duration (hr)</th> <th>Start Date</th> <th>Start Time</th> <th>End Date</th> <th>End Time</th> <th>Maximum Drawdown (ft)</th> <th>Specific Capacity (gpm/ft)</th> <th>Recovery (%)</th> </tr> </thead> <tbody> <tr> <td>Fiehs PW Initial rate</td> <td>50.2</td> <td>6.5</td> <td>—</td> <td>11/3/2021</td> <td>9:45 AM</td> <td>11/3/2021</td> <td>4:15 PM</td> <td>23.51</td> <td>2.1</td> <td>—</td> </tr> <tr> <td>Reduced Fiehs PW rate</td> <td>40.7</td> <td>65.5</td> <td>—</td> <td>11/3/2021</td> <td>4:15 PM</td> <td>11/6/2021</td> <td>9:45 AM</td> <td>26.30</td> <td>1.5</td> <td>—</td> </tr> <tr> <td>Fiehs PW shutdown</td> <td>0</td> <td>—</td> <td>76.1</td> <td>11/6/2021</td> <td>9:45 AM</td> <td>11/9/2021</td> <td>1:52 PM</td> <td>—</td> <td>—</td> <td>97.9</td> </tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table>		Pumping Rate (gpm)	Pumping Duration (hr)	Recovery Duration (hr)	Start Date	Start Time	End Date	End Time	Maximum Drawdown (ft)	Specific Capacity (gpm/ft)	Recovery (%)	Fiehs PW Initial rate	50.2	6.5	—	11/3/2021	9:45 AM	11/3/2021	4:15 PM	23.51	2.1	—	Reduced Fiehs PW rate	40.7	65.5	—	11/3/2021	4:15 PM	11/6/2021	9:45 AM	26.30	1.5	—	Fiehs PW shutdown	0	—	76.1	11/6/2021	9:45 AM	11/9/2021	1:52 PM	—	—	97.9																																																							
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Notes:																																																																																																			

Aquifer Test Summary Data Sheet

Client: Bet Fiehs	Site: Bret Fiehs PW
Task: PW Aquifer Test	City/State: Claremont, SD
Project Number: 5510FLH01	

Observation Well Information

Well ID	Well Depth (ft bg)	Screen Setting (ft bg)	Stickup Height (ft)	Approximate Elevation of Top of Casing (ft)	Distance to Pumping Well (ft)	Static Water Level (ft bTOC)	Water Level Data Collection Method (M/T)	Measuring/Reference Point	Transducer Type	Logger Sample Rate (min)	Drawdown at End of Test (ft)	Recovery (Recovery= Pumping Period) (%)
Fiehs PW	60	45-60	1.04	1311	0	21.71	M&T	Top of Casing	In-Situ LevelTroll 500	1	26.30	97.9
OW-100E	60*	45-60*	0.96	1306	100	17.35	M&T	Top of Casing	In-Situ LevelTroll 700	1	1.60	81.8
OW-200E	60*	45-60*	1.44	1305	200	15.94	M&T	Top of Casing	In-Situ LevelTroll 700	1	0.76	70.2
OW-795W	60	40-60	1.04	1301	795	12.44	M&T	Top of Casing	In-Situ LevelTroll 700	1	0.08*	na

Notes: Well logs are only available for Fiehs PW and OW-795W. Driller informed client that OW-100E and OW-200E were constructed identical to the Fiehs PW.
*: depth and screen settings assumed based on log from Fiehs PW.

Additional Information

- Weather Data: ☒ Precipitation, ☒ Barometric Pressure, ☒ Temperature
There was no precipitation during the aquifer test, although there was precipitation received 2 days prior to the test. Barometric pressure and temperature data are provided in the qualitative plots.

- Permits: A temporary discharge permit was obtained for the pumping test (SDG071518) and a Pollution Prevention Plan was developed. The required discharge monitoring report was submitted to the South Dakota Department of Agriculture & Natural Resources.

- Nearby High Capacity or Domestic Wells (Yes, No, or describe): No

- Water Quality Samples: Table 3

Notes:

Footnotes:

F = fahrenheit
ft = feet
ft bg = feet below grade/ground
hr = hour

Hz = Hertz
in = inch
mg/L = milligrams per Liter
min = minute

na = not applicable
ph = phase
TOC = top of casing
TOP = top of port

TOS = top of sounding tube
V = volt
gpm/ft = gallons per minute per foot of drawdown
MT = Manual Measurement or Transducer

ATTACHMENT 2

WELL LOGS

SOUTH DAKOTA WATER WELL COMPLETION REPORT

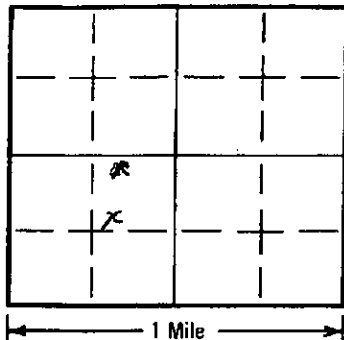
07-92

Location NE 1/4 SW 1/4 Sec 21 Twp 126 Rg 60
 County BROWN
 North

Please mark well location with an "X"

FLIEHS PW

Well-Completion Date

11-15-13

LOCATION:

Distance from nearest potential pollution source (septic tank, abandoned well, feed lot, etc.)? _____ ft. from _____ (identify source).

PROPOSED USE:

☐ Domestic/Stock ☐ Municipal ☐ Business ☒ Test Holes
☐ Irrigation ☐ Industrial ☐ Institutional ☐ Monitoring well

METHOD OF DRILLING:

CASING DATA: ☐ Steel ☒ Plastic ☐ Other

If other describe _____

PIPEWEIGHT	DIAMETER	FROM	TO	HOLE DIAMETER
<u>200 LB/FT</u>	<u>4 IN</u>	<u>+1 FT</u>	<u>45 FT</u>	<u>8 IN</u>
_____ LB/FT	_____ IN	_____ FT	_____ FT	_____ IN
_____ LB/FT	_____ IN	_____ FT	_____ FT	_____ IN

GROUTING DATA

Grout Type	No. of Sacks	Grout Weight	From	To
<u>BENITE</u>	<u>6</u>	<u>5 022 lb./gal</u>	<u>45 ft</u>	<u>45 ft</u>
_____	_____	_____ lb./gal	_____ ft	_____ ft

Describe grouting procedure _____

SCREEN: ☐ Perforated pipe ☒ Manufactured

Diameter 4 IN IN Length 15 FEETMaterial PLASTICSlot Size 18 Set From 45 Feet to 60 Feet

Other information _____

WAS A PACKER OR SEAL USED? ☐ YES ☐ NO

If so, what material? _____

Describe packer(s) and location? _____

DISINFECTION: Was well disinfected upon completion?

YES, How: _____

X NO, Why Not? _____

Laboratory sent to for water
 quality analysis

Well Owner: BRET FLIEHS
 Business Name: 39865 137 ST
 Address: BROTON, S.D. 57446

WELL LOG:

FORMATION	DEPTH	
	FROM	TO
TOP	0	2
YELLOW CLAY	2	19
BLUE CLAY	19	33
FINE SAND	33	60
BLUE CLAY	60	61
TD	61	

STATIC WATER LEVEL 21 Feet

If flowing: closed in pressure _____ PSI

GPM flow _____ through _____ inch pipe

Controlled by ☐ Valve ☐ Reducers ☐ Other _____

Reduced Flowrate _____ GPM

Can well be completely shut in? _____

WELL TEST DATA:

☒ Pumped Describe: SUBMERSIBLE

☐ Bailed _____

☐ Other _____

Pumping Level Below Land Surface

34 1/2 ft. After 70 Hrs. pumped 45 GPM

_____ ft. After _____ Hrs. pumped _____ GPM

If pump installed, pump rate _____ GPM

REMARKS

RECEIVED

DEC 26 2013

WATER RIGHTS
PROGRAM

This well was drilled under license # 209

And this report is true and accurate.

Drilling firm LEWIS WELL DRILLING

Signature of License Representative

Walter Lewis

Signature of Well Owner or Equitable Property Holder:

Bret Fliehs

Date: 12-11-13

51-02-101

SOUTH DAKOTA WATER WELL COMPLETION REPORT

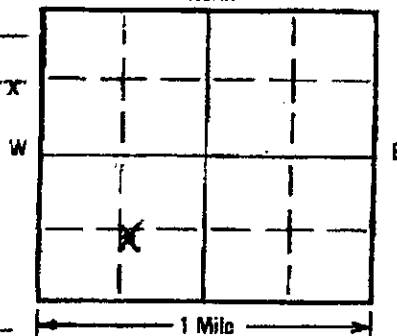
07-92

Location SE 1/4 SW 1/4 Sec 21 Twp 126N Rg 60N
County Brown

Please mark well location with an "X"

OW-795W

Well-Completion Date

12-29-2011

LOCATION:

Distance from nearest potential pollution source (septic tank, abandoned well, feed lot, etc.) 1000 ft. from abandoned well (identify source).

PROPOSED USE:

☐ Domestic/Stock ☐ Municipal ☐ Business ☐ Test Holes
☒ Irrigation ☐ Industrial ☐ Institutional ☐ Monitoring well

METHOD OF DRILLING:

Forward RotaryCASING DATA: ☐ Steel ☒ Plastic ☐ Other

If other describe _____

PIPEWEIGHT	DIAMETER	FROM	TO	HOLE DIAMETER
<u>3/8" LB/FT</u>	<u>4" IN</u>	<u>1.5 FT</u>	<u>40 FT</u>	<u>6 3/4" IN</u>
_____ LB/FT	_____ IN	_____ FT	_____ FT	_____ IN
_____ LB/FT	_____ IN	_____ FT	_____ FT	_____ IN

ROUTING DATA

Grout Type	No. of Sacks	Grout Weight	From	To
<u>Bentonic</u>	<u>2</u>	<u>9.5 lb/gal</u>	<u>0 ft</u>	<u>3.5 ft</u>
_____	_____	_____ lb/gal	_____ ft	_____ ft

Describe grouting procedure Tremie Pipe set to 35' Then Pumped in from bottom upSCREEN: ☐ Perforated pipe ☒ ManufacturedDiameter 4" IN Length 20 FEETMaterial PVCSlot Size 1020 Set from 40 Feet to 60 Feet

Other information _____

WAS A PACKER OR SEAL USED? ☐ YES ☒ NO

If so, what material? _____

Describe packer(s) and location? _____

DISINFECTION: Was well disinfected upon completion?

☒ YES, How: Chlorine

Laboratory sent to for water quality analysis _____

☐ NO, Why Not? _____Well Owner: Brett Fiehs

Business Name: _____

Address: Carleton SD

WELL LOG:

FORMATION	DEPTH	
	FROM	TO
<u>Top Soil</u>	<u>0</u>	<u>1</u>
<u>Yellow Clay</u>	<u>1</u>	<u>15</u>
<u>Fine Grey Sand</u>	<u>15</u>	<u>60</u>
<u>Blue Clay</u>	<u>60</u>	<u>120</u>

STATIC WATER LEVEL 15 Feet

If flowing: closed in pressure _____ PSI

GPM flow _____ through _____ inch pipe

Controlled by ☐ Valve ☐ Reducers ☐ Other _____

Reduced Flowrate _____ GPM

Can well be completely shut in? _____

WELL TEST DATA:

☒ PumpedDescribe: Pumped with 4"☐ Bailed☐ Other _____

Pumping Level Below Land Surface

33 ft. After 1.5 Hrs. pumped 45 GPM

_____ ft. After _____ Hrs. pumped _____ GPM

If pump installed, pump rate _____ GPM

REMARKS

Test well at PivotThis well was drilled under license # 285

And this report is true and accurate.

Drilling Firm Man. Kanski Well Drilling Inc.Signature of License Representative: [Signature]

Signature of Well Owner or Equitable Property Holder: _____

Date: 12-29-2011

Lithologic Logs Database

Lithologic Logs Search for: *water_rights_well like ML-70R*

Page 1 of 1

New Search

Printer Friendly

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Page: Prev 1 Next

Record 1 of 1

Location Information

Legal Location: SE NE NE NE SEC. 18, T. 126 N., R. 59 W.
County: MARSHALL Location: 126N59W18AAAD 1
Latitude: 45.731970
Hydrologic Unit Code: 10160003 Longitude: - 97.958533
Land Owner: Ground Surface Elev. (ft.): 1308 A

Test Hole Information

Project:
Drill Date: 01/01/1955 Geologist:
Company: USBR Geologist's Log:
Drilling Method: Driller:
Test Hole Number: Driller's Log: X
Geophysical Log: NO Total Drill Hole Depth (ft.): 152.0

Well Information

SDGS Well Name: Aquifer: PLEISTOCENE SERIES
Water Rights Well: ML-70R [Water Level Data](#) Management Unit:
Other Well Name: Casing Top Elev. (ft.): 1308.1 I
Casing Type: Casing Diameter (in.): 4.0
Screen Type: Screen Length (ft.): 0.0
Total Casing and Screen (ft.): 37.1 Casing Stick-up (ft.): 0.00

Lithologic Information

<u>Elevation (ft.)</u>	<u>Depth (ft.)</u>	<u>Description</u>
1308.0 - 1307.0	0.0 - 1.0	SOIL
1307.0 - 1302.0	1.0 - 6.0	SILT, CLAYEY; CALCAREOUS, VARVED (LAKE DEPOSIT)
1302.0 - 1294.0	6.0 - 14.0	SILT, SLIGHTLY CLAYEY; CALCAREOUS, VARVED (LAKE DEPOSIT)
1294.0 - 1274.0	14.0 - 34.0	SILT, CLAYEY; CALCAREOUS, VARVED, OXIDIZED TO 15 FEET, CONTAINS ORGANIC MATERIAL AT 31 FEET, VERY SANDY BELOW 32 FEET (LAKE DEPOSIT)
1274.0 - 1269.0	34.0 - 39.0	CLAY, SILTY; CALCAREOUS, MASSIVE (LAKE DEPOSIT)
1269.0 - 1263.0	39.0 - 45.0	SILT, VERY FINE, SANDY; PARTLY OXIDIZED, THIN-BEDDED (LAKE DEPOSIT)
1263.0 - 1175.0	45.0 - 133.0	SILT, SLIGHTLY CLAYEY; CALCAREOUS, LAMINATED (LAKE DEPOSIT)
1175.0 - 1163.0	133.0 - 145.0	SAND, VERY CLAYEY, SILTY, GRAVELLY; CALCAREOUS

1163.0 - 1160.0
1160.0 - 1156.0

145.0 - 148.0
148.0 - 152.0

UNKNOWN
SHALE; FOSSILIFEROUS (PIERRE SHALE)

Lithologic Logs Database

Lithologic Logs Search for: *water_rights_well like ML-77A*

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New Search

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Page: 1

Record 1 of 1

Location Information

Legal Location: NE NE NE SE SEC. 33, T. 125 N., R. 59 W.
County: MARSHALL Location: 125N59W33DAAA 2
Latitude: 45.595524
Hydrologic Unit 10160003 Longitude: - 97.918362
Code:
Land Owner: Ground Surface Elev. (ft.): 1315 T

Test Hole Information

Project:
Drill Date: 01/01/1977 Geologist:
Company: USBR Geologist's Log: X
Drilling Method: Driller:
Test Hole Driller's Log:
Number:
Geophysical NO Total Drill Hole Depth (ft.): 53.0
Log:

Well Information

SDGS Well Name: Aquifer: PLEISTOCENE SERIES
Water Rights ML-77A Management Unit:
Well:
Other Well ML-BR-33 Casing Top Elev. (ft.): 1318.2 T
Name:
Casing Type: STEEL Casing Diameter (in.): 1.5
Screen Type: Screen Length (ft.): 0.0
Total Casing 40.2 Casing Stick-up (ft.): 3.20
and Screen (ft.):

Lithologic Information

Elevation (ft.)	Depth (ft.)	Description
1315.0 - 1310.0	0.0 - 5.0	SOIL AND LOESS
1310.0 - 1300.0	5.0 - 15.0	SILT, CLAYEY, SOMEWHAT LAMINATED; CALCAREOUS
1300.0 - 1295.0	15.0 - 20.0	SAND, SILTY; CALCAREOUS, THIN-BEDDED (MARGINAL LAKE DEPOSIT)
1295.0 - 1270.0	20.0 - 45.0	SILT, CLAYEY; CALCAREOUS, VARVED (LAKE DEPOSIT)
1270.0 - 1267.0	45.0 - 48.0	SAND, CLAYEY, SILTY, GRAVELLY; CALCAREOUS, POORLY BEDDED, CONTAINS MANY SMALL WEATHERED PEBBLES AND SHALE PARTICLES (GLACIAL OUTWASH)
1267.0 - 1262.0	48.0 - 53.0	SHALE (PIERRE SHALE)

Lithologic Logs Database

Lithologic Logs Search for: *water_rights_well like ML-77B*

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[New Search](#)

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[Download Options](#)

Page: [Prev](#) 1 [Next](#)

Record 1 of 1

Location Information

Legal Location: NW NW NE NE SEC. 17, T. 126 N., R. 58 W.
County: MARSHALL Location: 126N58W17AABB
Latitude: 45.733061
Hydrologic Unit 10160003 Longitude: -97.817695
Code:
Land Owner: Ground Surface Elev. (ft.): 1309 T

Test Hole Information

Project:
Drill Date: 01/01/1977 Geologist:
Company: USBR Geologist's Log:
Drilling Method: Driller:
Test Hole Driller's Log: X
Number:
Geophysical NO Total Drill Hole Depth (ft.): 109.0
Log:

Well Information

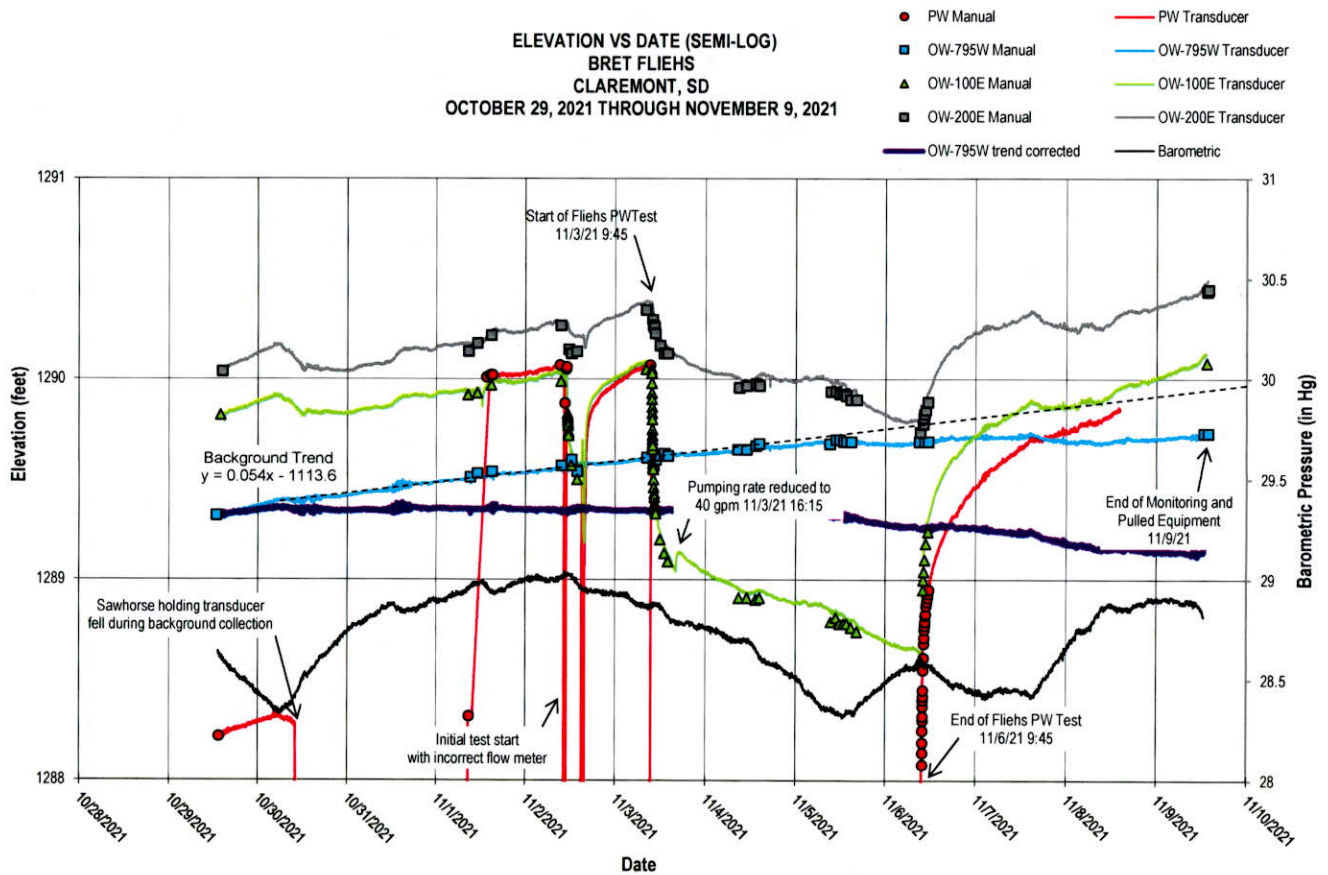
SDGS Well Name:
Water Rights ML-77B [Water Level Data](#) Aquifer: PLEISTOCENE SERIES
Well: Management Unit:
Other Well ML-BR-35 Casing Top Elev. (ft.): 1313.8 T
Name:
Casing Type: STEEL Casing Diameter (in.): 1.3
Screen Type: Screen Length (ft.): 0.0
Total Casing 40.4 Casing Stick-up (ft.): 4.80
and Screen (ft.):

Lithologic Information

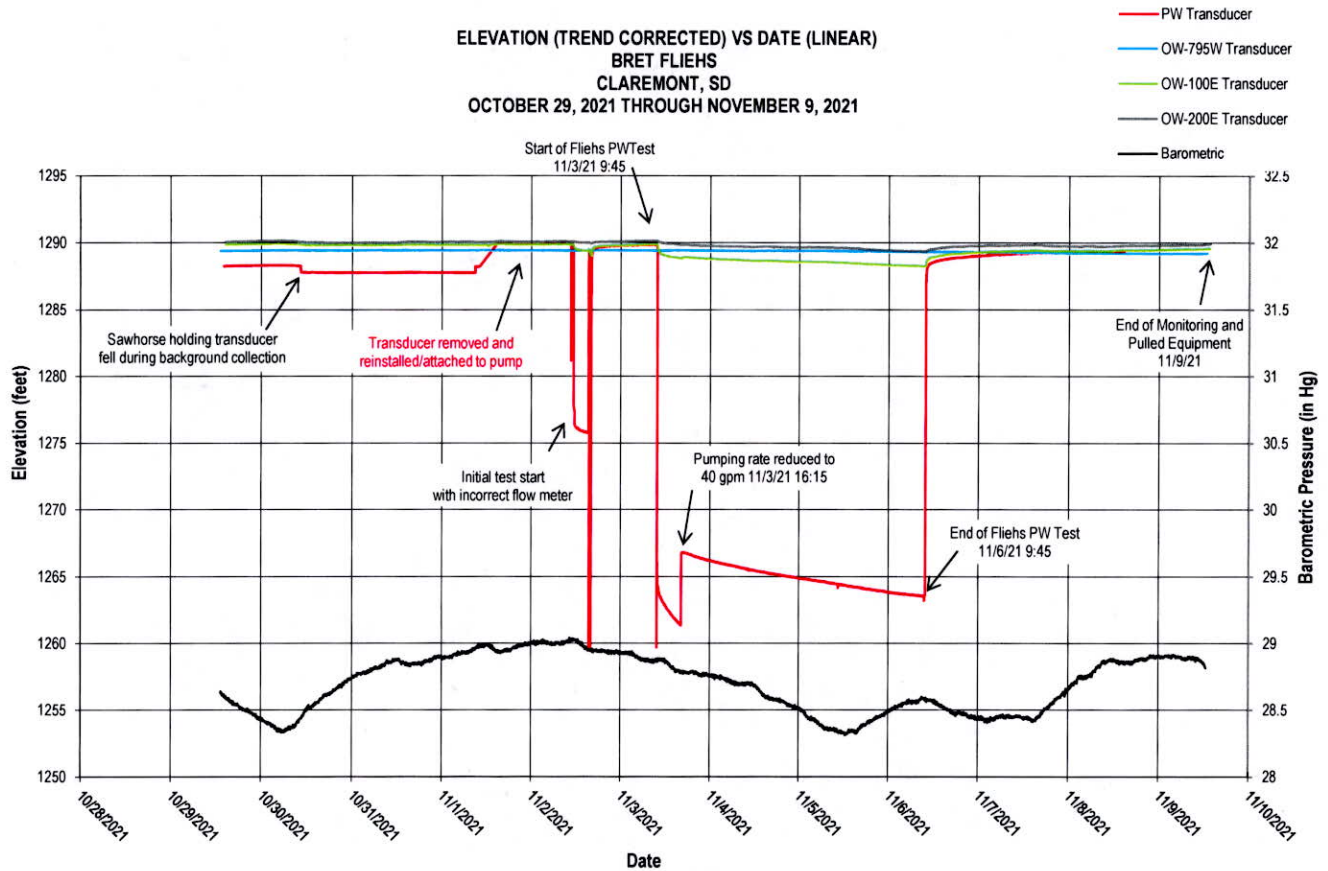
<u>Elevation (ft.)</u>	<u>Depth (ft.)</u>	<u>Description</u>
1309.0 - 1304.0	0.0 - 5.0	SOIL
1304.0 - 1292.0	5.0 - 17.0	SILT, SLIGHTLY CLAYEY, LAMINATED; CALCAREOUS (LAKE DEPOSIT)
1292.0 - 1288.0	17.0 - 21.0	CLAY, SILTY; VERY CALCAREOUS, OBSCURELY BEDDED (LAKE DEPOSIT)
1288.0 - 1284.0	21.0 - 25.0	SILT, SLIGHTLY CLAYEY; CALCAREOUS, CROSS- BEDDED (LAKE DEPOSIT)
1284.0 - 1282.0	25.0 - 27.0	CLAY, SILTY, LAMINATED; CALCAREOUS (LAKE DEPOSIT)
1282.0 - 1218.0	27.0 - 91.0	SILT, CLAYEY AT 32, 53, 66, 73, AND 80 TO 85 FEET; CALCAREOUS, VARVED (LAKE DEPOSIT)
1218.0 - 1209.0	91.0 - 100.0	CLAY, SILTY; CALCAREOUS, SHALEY CLEAVAGE, LAMINATED (LAKE DEPOSIT)
1209.0 - 1204.0	100.0 - 105.0	SAND, SILTY, GRAVELLY; CALCAREOUS, CONTAINS MANY SHALE FRAGMENTS (GLACIAL OUTWASH)
1204.0 - 1200.0	105.0 - 109.0	SHALE (PIERRE SHALE)

ATTACHMENT 3
QUALITATIVE PLOTS

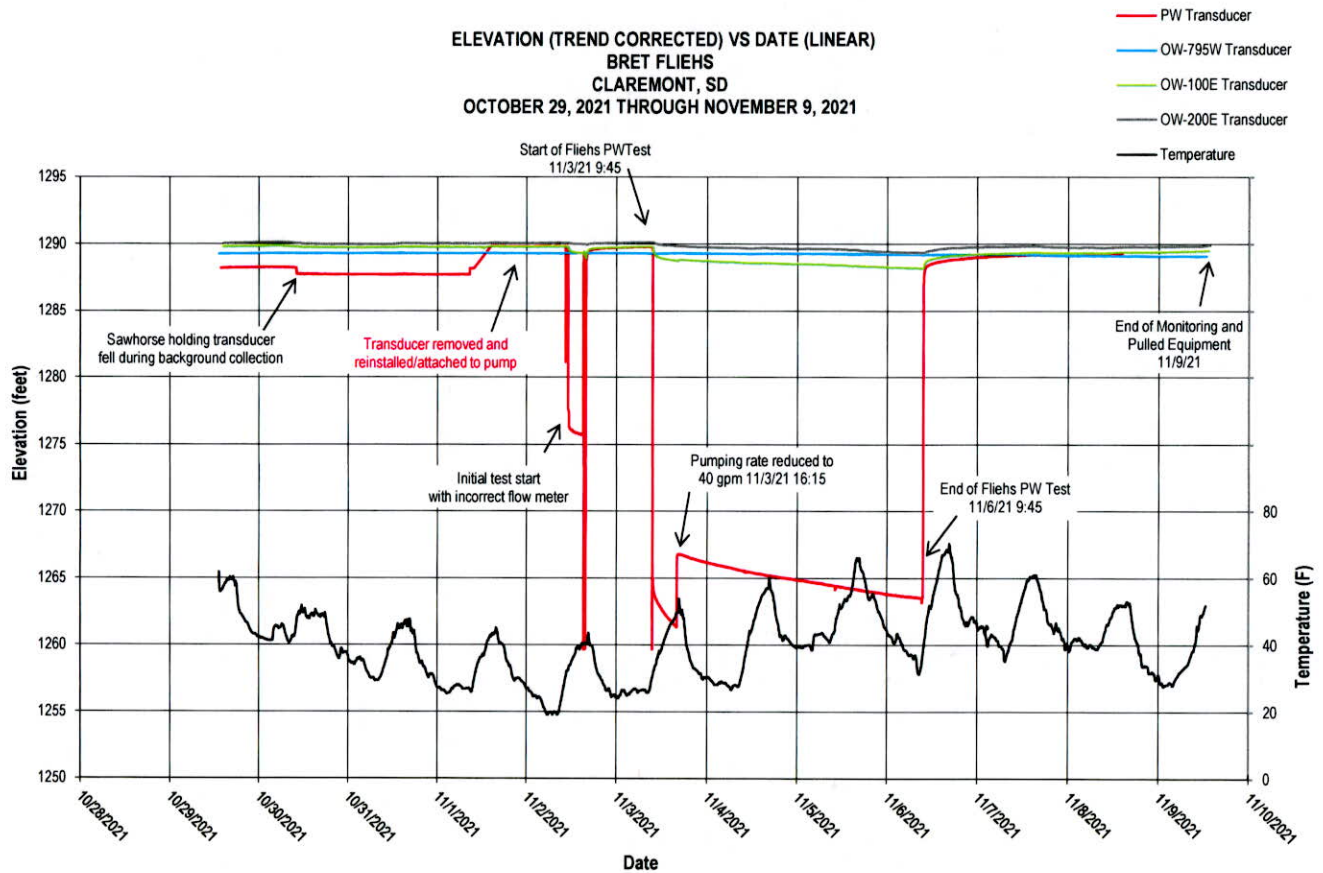
ELEVATION VS DATE (SEMI-LOG)
BRET FLIEHS
CLAREMONT, SD
OCTOBER 29, 2021 THROUGH NOVEMBER 9, 2021



ELEVATION (TREND CORRECTED) VS DATE (LINEAR)
 BRET FLIEHS
 CLAREMONT, SD
 OCTOBER 29, 2021 THROUGH NOVEMBER 9, 2021



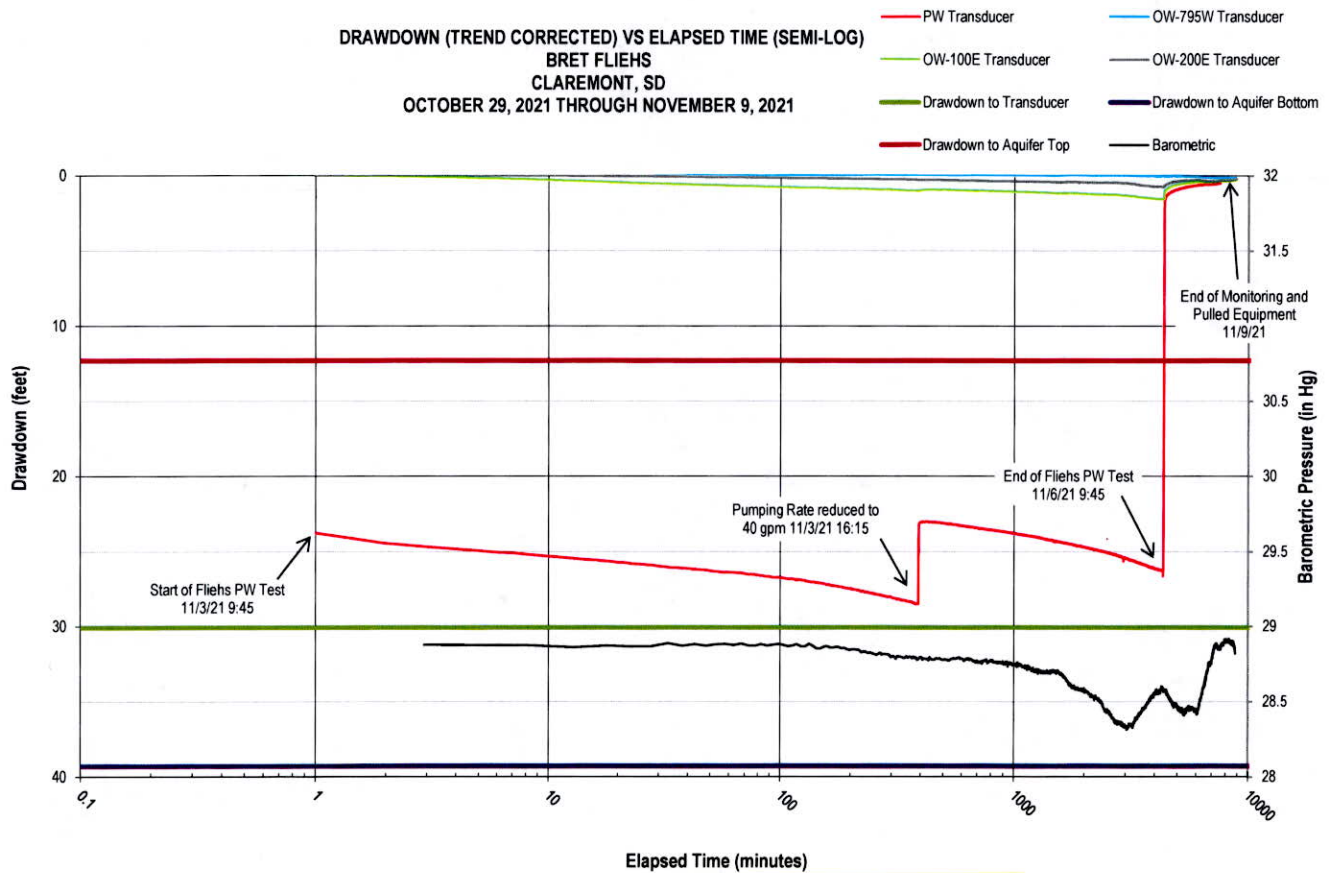
ELEVATION (TREND CORRECTED) VS DATE (LINEAR)
BRET FLIEHS
CLAREMONT, SD
OCTOBER 29, 2021 THROUGH NOVEMBER 9, 2021



DRAWDOWN (TREND CORRECTED) VS ELAPSED TIME (SEMI-LOG)

BRET FLIEHS
CLAREMONT, SD

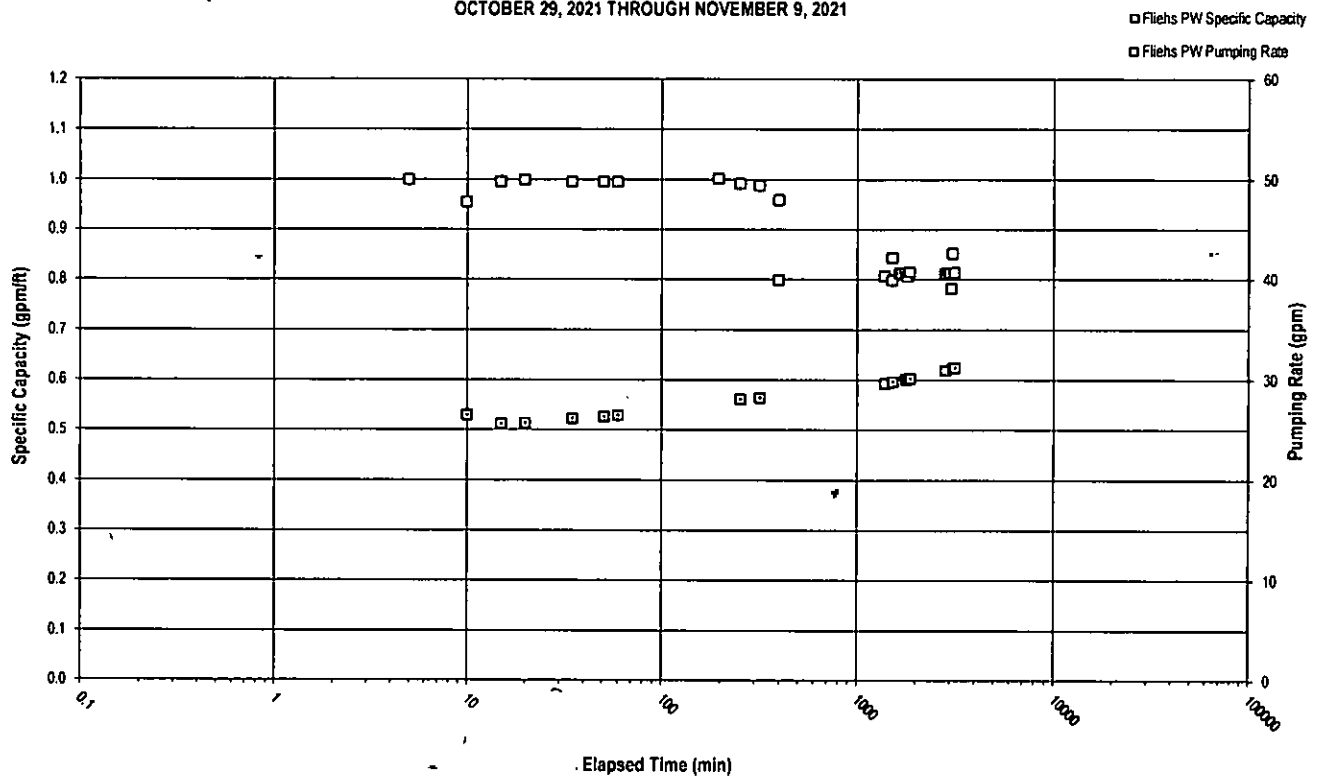
OCTOBER 29, 2021 THROUGH NOVEMBER 9, 2021

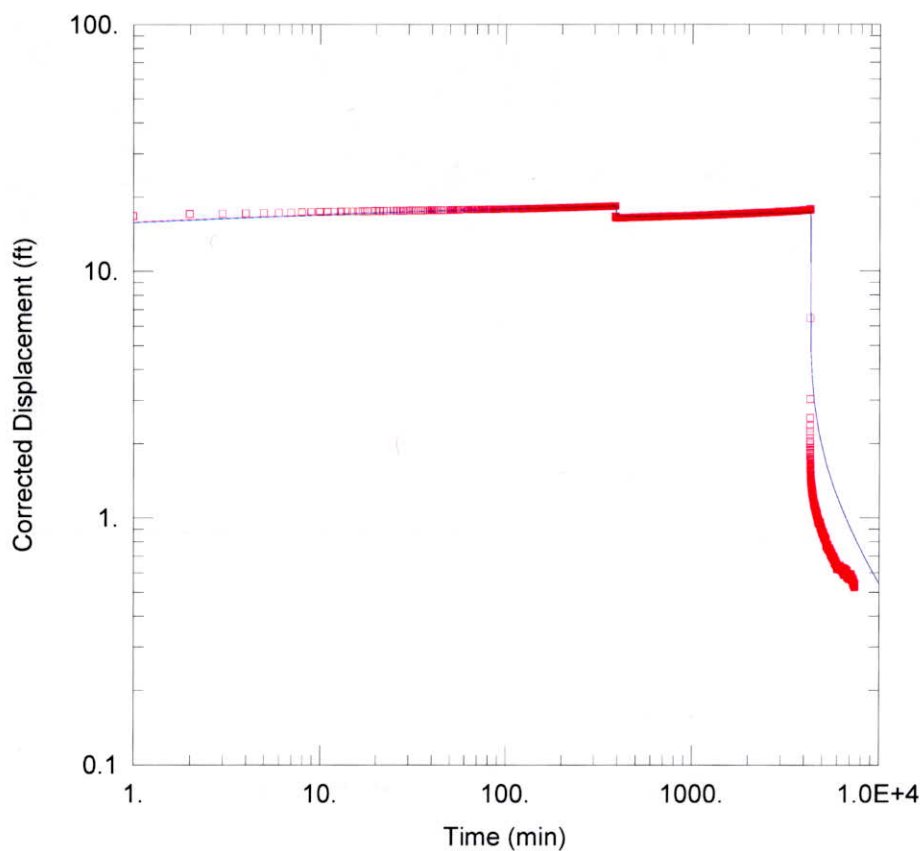


Elapsed Time (minutes)

CHANGE IN SLOPE
INDICATES BOUNDARY
CONDITION
OBS WELL TRANSDUCERS
ARE UNREADABLE ON
THE SAME CHART AS PW

SPECIFIC CAPACITY AND PUMPING RATE VS ELAPSED TIME (SEMI-LOG)
 BRET FLIEHS
 CLAREMONT, SD
 OCTOBER 29, 2021 THROUGH NOVEMBER 9, 2021





WELL TEST ANALYSIS

Data Set: U:\...\Fliehs PW unconf theis.aqt

Date: 11/15/21

Time: 13:29:04

PROJECT INFORMATION

Company: LRE Water

Client: Bret FLiehs

Location: Claremont, SD

Test Well: Fliehs PW

Test Date: Nov. 2021

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
Fliehs PW	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
Fliehs PW	0	0

SOLUTION

Aquifer Model: Unconfined

Solution Method: Theis

$T = 652.5 \text{ ft}^2/\text{day}$

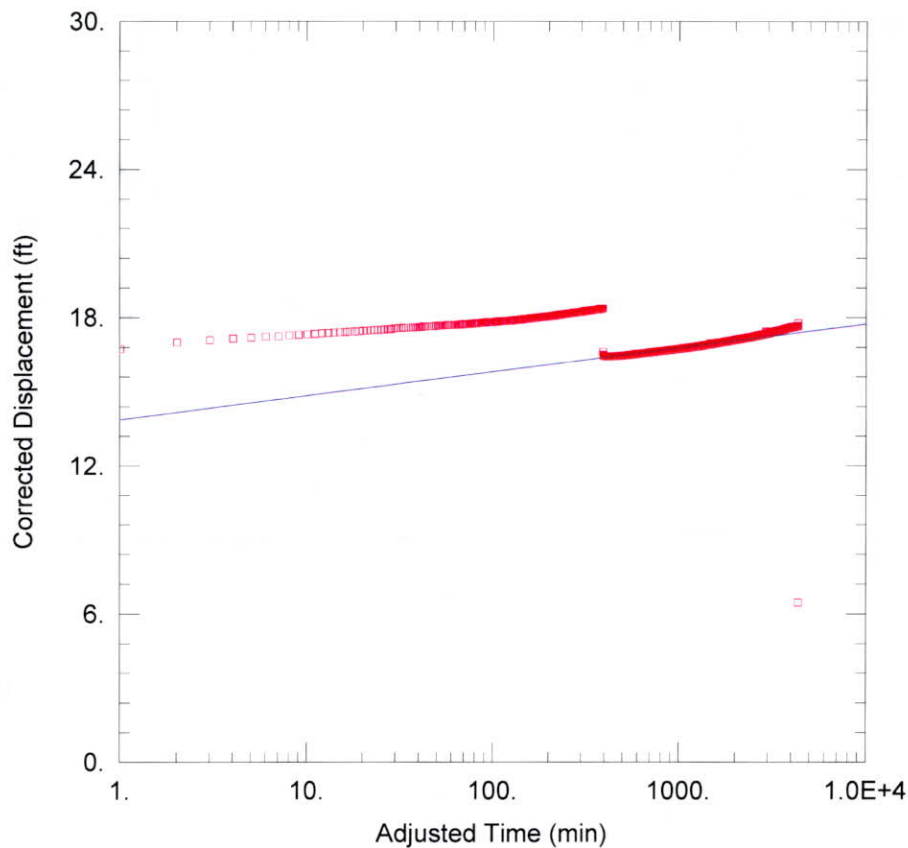
$S = 1.031\text{E-}7$

$Kz/Kr = 1.$

$b = 40. \text{ ft}$

ATTACHMENT 4

QUANTITATIVE PLOTS AND DISTANCE-DRAWDOWN ANALYSIS



WELL TEST ANALYSIS

Data Set: U:\...\Fliehs PW unconf cj.aqt

Date: 11/15/21

Time: 13:29:15

PROJECT INFORMATION

Company: LRE Water

Client: Bret FLiehs

Location: Claremont, SD

Test Well: Fliehs PW

Test Date: Nov. 2021

AQUIFER DATA

Saturated Thickness: 40. ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
Fliehs PW	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
Fliehs PW	0	0

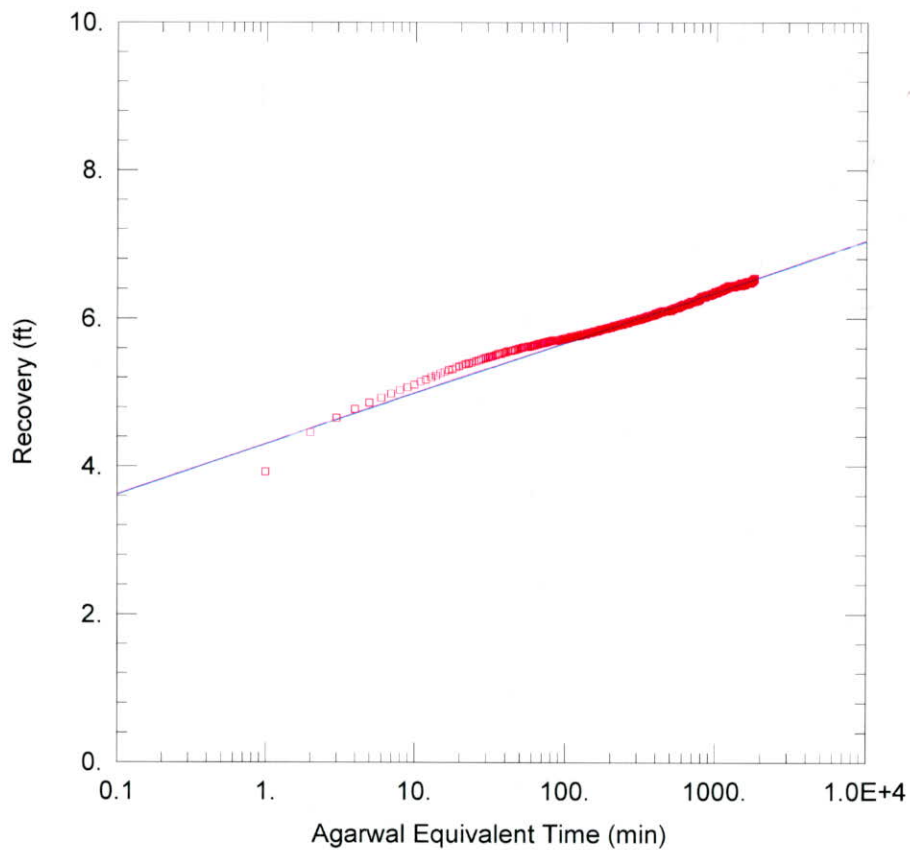
SOLUTION

Aquifer Model: Unconfined

Solution Method: Cooper-Jacob

T = 1476.9 ft²/day

S = 1.196E-13



WELL TEST ANALYSIS

Data Set: U:\...Fliehs PW unconf cj Agarwal.aqt

Date: 11/15/21

Time: 13:29:28

PROJECT INFORMATION

Company: LRE Water

Client: Bret FLiehs

Location: Claremont, SD

Test Well: Fliehs PW

Test Date: Nov. 2021

AQUIFER DATA

Saturated Thickness: 40. ft

Anisotropy Ratio (Kz/Kr): 1442.9

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
Fliehs PW	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
Fliehs PW	0	0

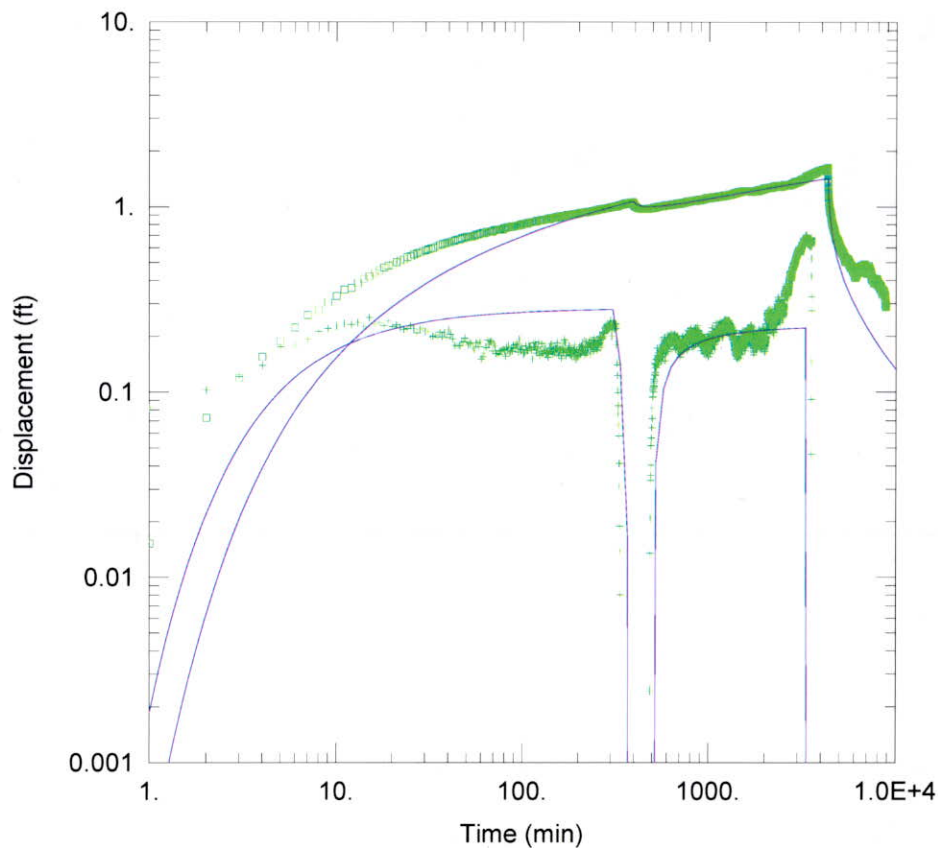
SOLUTION

Aquifer Model: Unconfined

Solution Method: Cooper-Jacob

T = 2101.6 ft²/day

S = 1.459E-5



WELL TEST ANALYSIS

Data Set: U:\...\OW-100E conf theis.aqt

Date: 11/15/21

Time: 13:30:02

PROJECT INFORMATION

Company: LRE Water

Client: Bret FLiehs

Location: Claremont, SD

Test Well: FLiehs PW

Test Date: Nov. 2021

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
FLiehs PW	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
OW-100E	100	0

SOLUTION

Aquifer Model: Confined

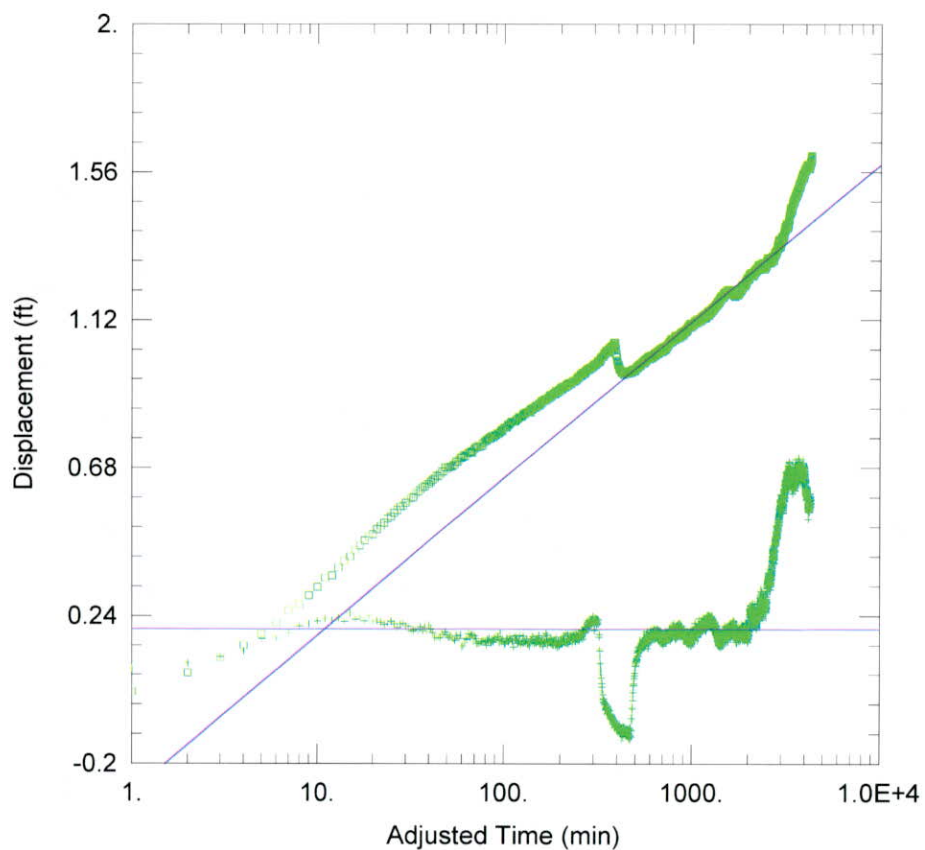
Solution Method: Theis

$T = 2721.3 \text{ ft}^2/\text{day}$

$S = 0.003892$

$Kz/Kr = 1.$

$b = 40. \text{ ft}$



WELL TEST ANALYSIS

Data Set: U:\...\OW-100E conf cj.aqt

Date: 11/15/21

Time: 13:30:21

PROJECT INFORMATION

Company: LRE Water

Client: Bret FLiehs

Location: Claremont, SD

Test Well: Fliehs PW

Test Date: Nov. 2021

AQUIFER DATA

Saturated Thickness: 40. ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells			Observation Wells		
Well Name	X (ft)	Y (ft)	Well Name	X (ft)	Y (ft)
Fliehs PW	0	0	OW-100E	100	0

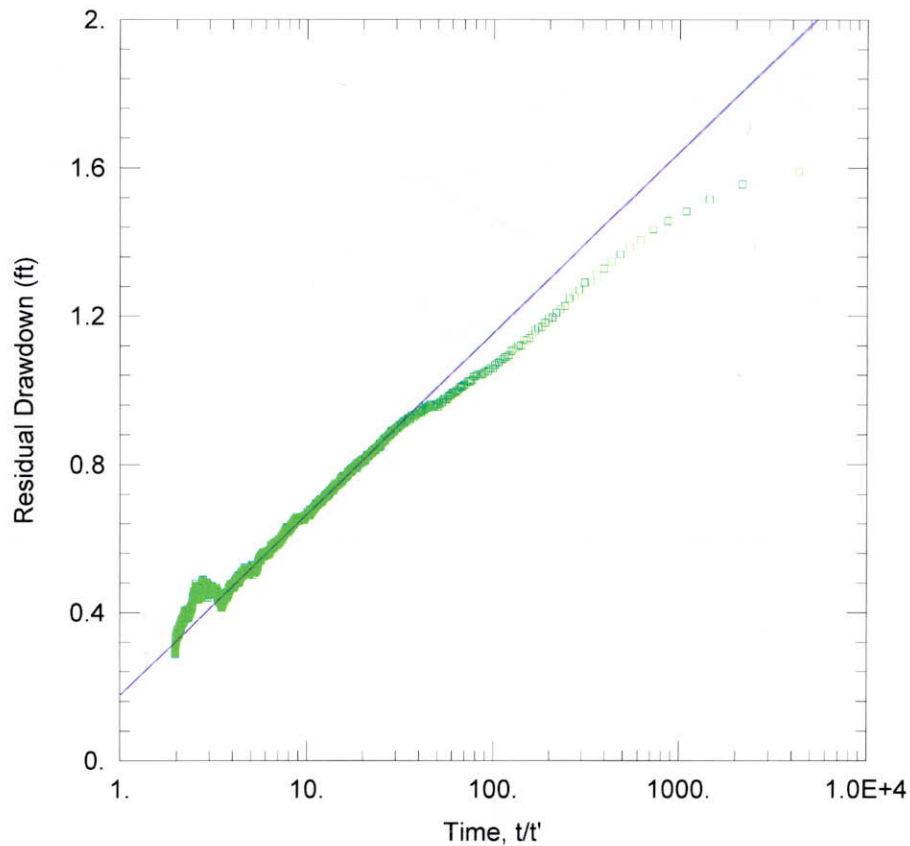
SOLUTION

Aquifer Model: Confined

Solution Method: Cooper-Jacob

T = 3080.9 ft²/day

S = 0.001944



WELL TEST ANALYSIS

Data Set: U:\...\OW-100E conf theis recovery.aqt

Date: 11/15/21

Time: 13:30:10

PROJECT INFORMATION

Company: LRE Water

Client: Bret FLiehs

Location: Claremont, SD

Test Well: Fliehs PW

Test Date: Nov. 2021

AQUIFER DATA

Saturated Thickness: 40. ft

Anisotropy Ratio (K_z/K_r): 1.

WELL DATA

Pumping Wells			Observation Wells		
Well Name	X (ft)	Y (ft)	Well Name	X (ft)	Y (ft)
Fliehs PW	0	0	OW-100E	100	0

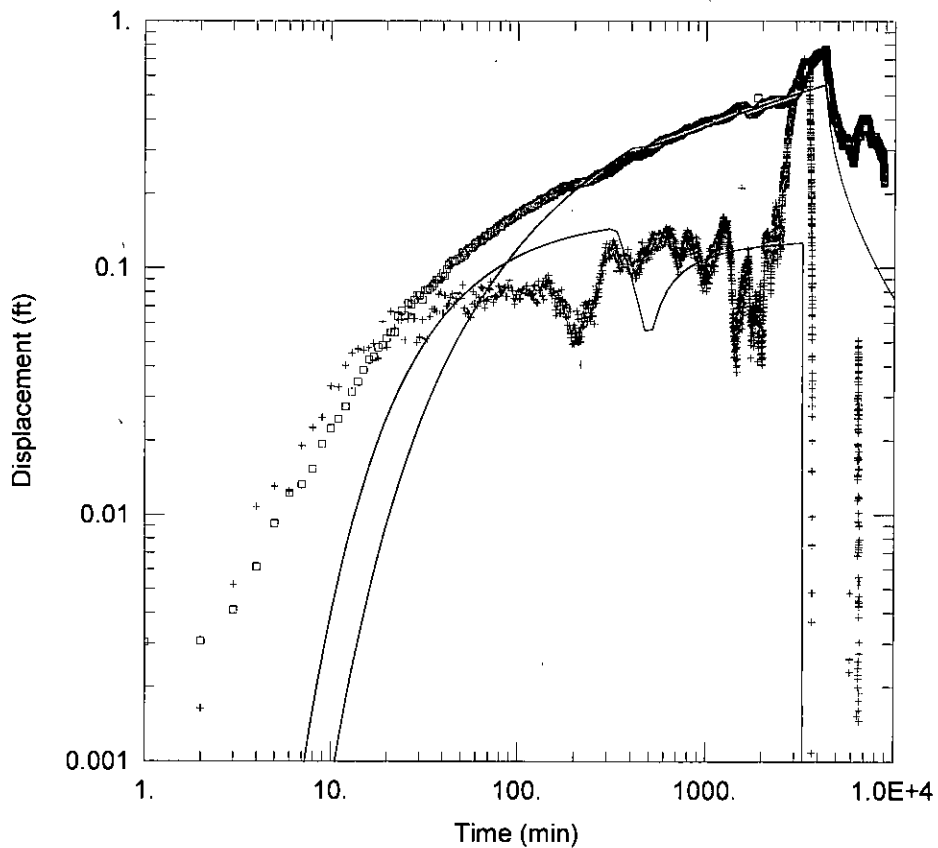
SOLUTION

Aquifer Model: Confined

Solution Method: Theis (Recovery)

$T = 2938.5 \text{ ft}^2/\text{day}$

$S/S' = 0.4362$



WELL TEST ANALYSIS

Data Set: U:\... \OW-200E conf theis.aqt

Date: 11/15/21

Time: 13:31:33

PROJECT INFORMATION

Company: LRE Water

Client: Bret FLiehs

Location: Claremont, SD

Test Well: FLiehs PW

Test Date: Nov. 2021

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
FLiehs PW	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
OW-200E	200	0

SOLUTION

Aquifer Model: Confined

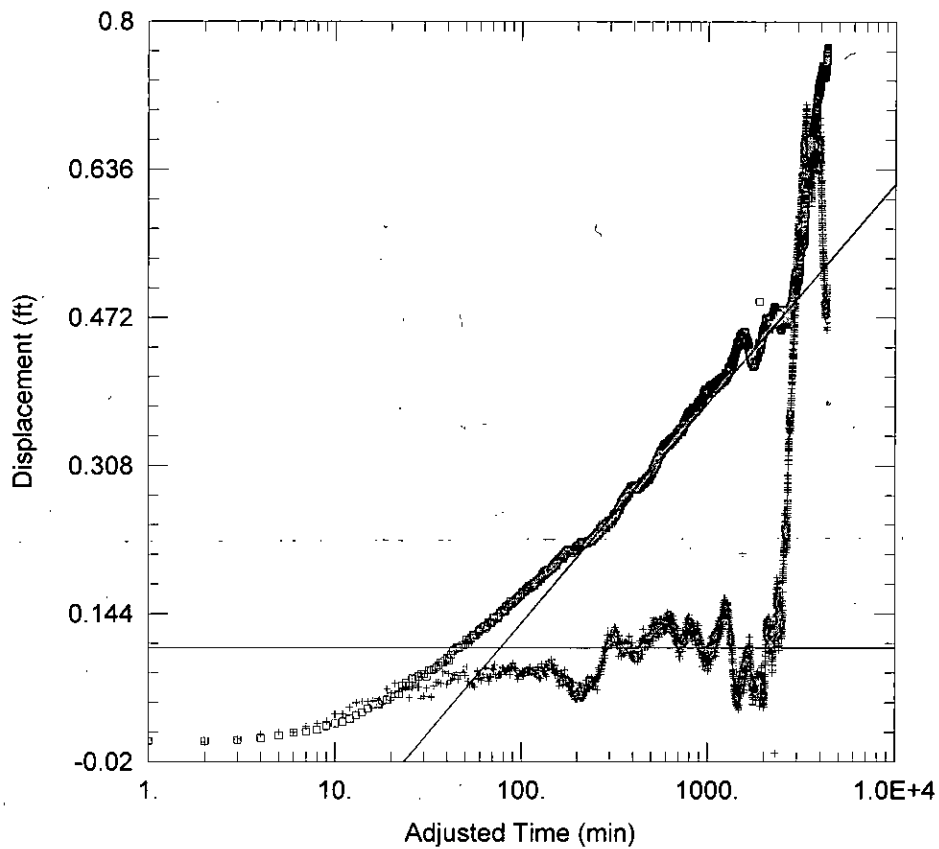
Solution Method: Theis

$T = 4717 \text{ ft}^2/\text{day}$

$S = 0.01245$

$Kz/Kr = 1. \sim$

$b = 40 \text{ ft}$



WELL TEST ANALYSIS

Data Set: U:\...\OW-200E conf cj.aqt

Date: 11/15/21

Time: 13:31:15

PROJECT INFORMATION

Company: LRE Water

Client: Bret FLiehs

Location: Claremont, SD

Test Well: Fliehs PW

Test Date: Nov. 2021

AQUIFER DATA

Saturated Thickness: 40. ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells			Observation Wells		
Well Name	X (ft)	Y (ft)	Well Name	X (ft)	Y (ft)
Fliehs PW	0	0	OW-200E	200	0

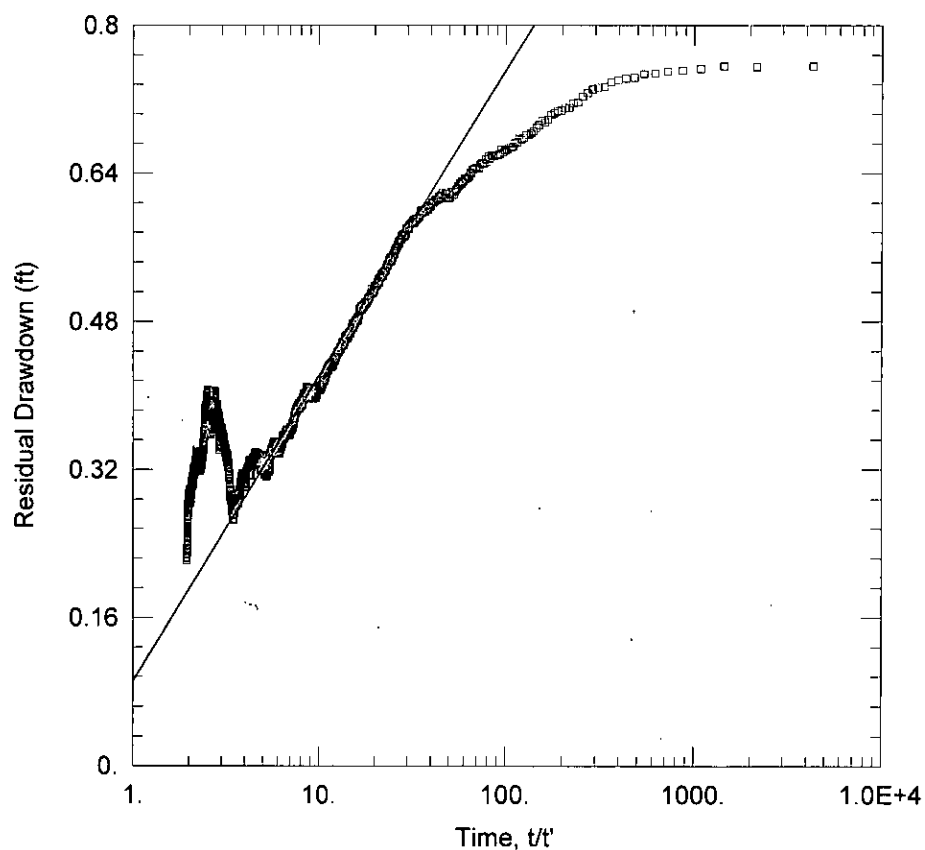
SOLUTION

Aquifer Model: Confined

Solution Method: Cooper-Jacob

T = 5898.2 ft²/day

S = 0.006525



WELL TEST ANALYSIS

Data Set: U:\...IOW-200E conf theis recovery.aqt

Date: 11/15/21

Time: 13:31:23

PROJECT INFORMATION

Company: LRE Water

Client: Bret FLiehs

Location: Claremont, SD

Test Well: Fliehs PW

Test Date: Nov. 2021

AQUIFER DATA

Saturated Thickness: 40. ft

Anisotropy Ratio (K_z/K_r): 1.

WELL DATA

Pumping Wells			Observation Wells		
Well Name	X (ft)	Y (ft)	Well Name	X (ft)	Y (ft)
Fliehs PW	0	0	OW-200E	200	0

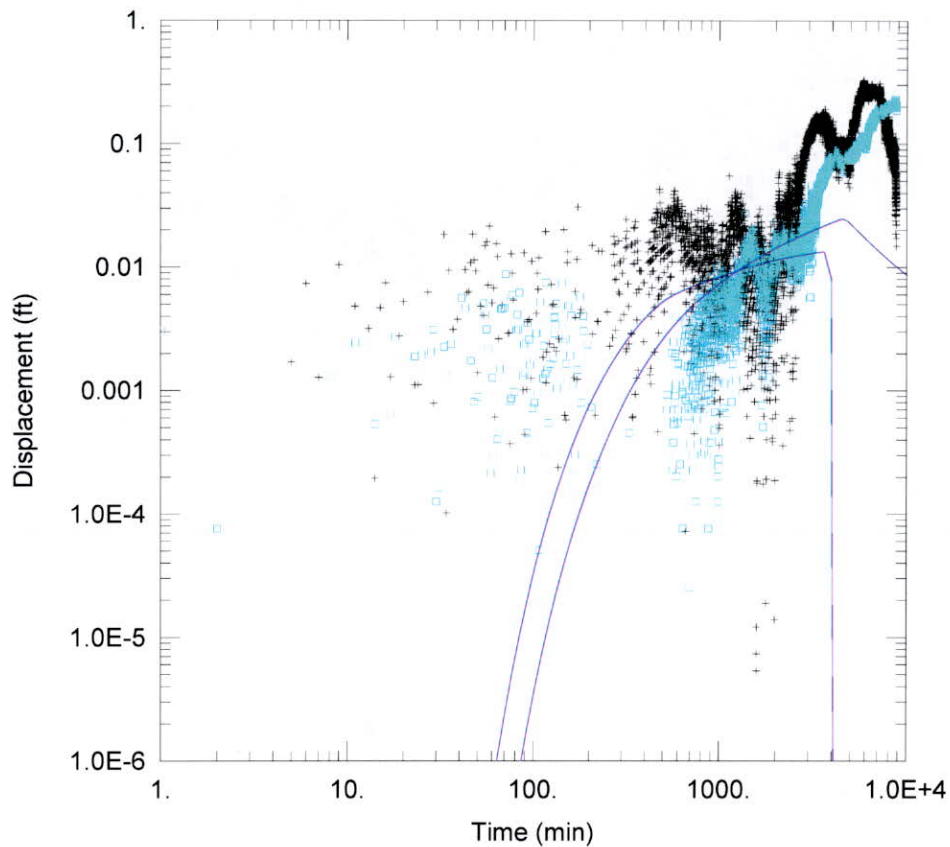
SOLUTION

Aquifer Model: Confined

Solution Method: Theis (Recovery)

$T = 4351.7 \text{ ft}^2/\text{day}$

$S/S' = 0.5294$



WELL TEST ANALYSIS

Data Set: U:\...\OW-795W conf theis early.aqt

Date: 11/15/21

Time: 13:32:25

PROJECT INFORMATION

Company: LRE Water

Client: Bret FLiehs

Location: Claremont, SD

Test Well: Fliehs PW

Test Date: Nov. 2021

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
Fliehs PW	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
OW-795W	795	0

SOLUTION

Aquifer Model: Confined

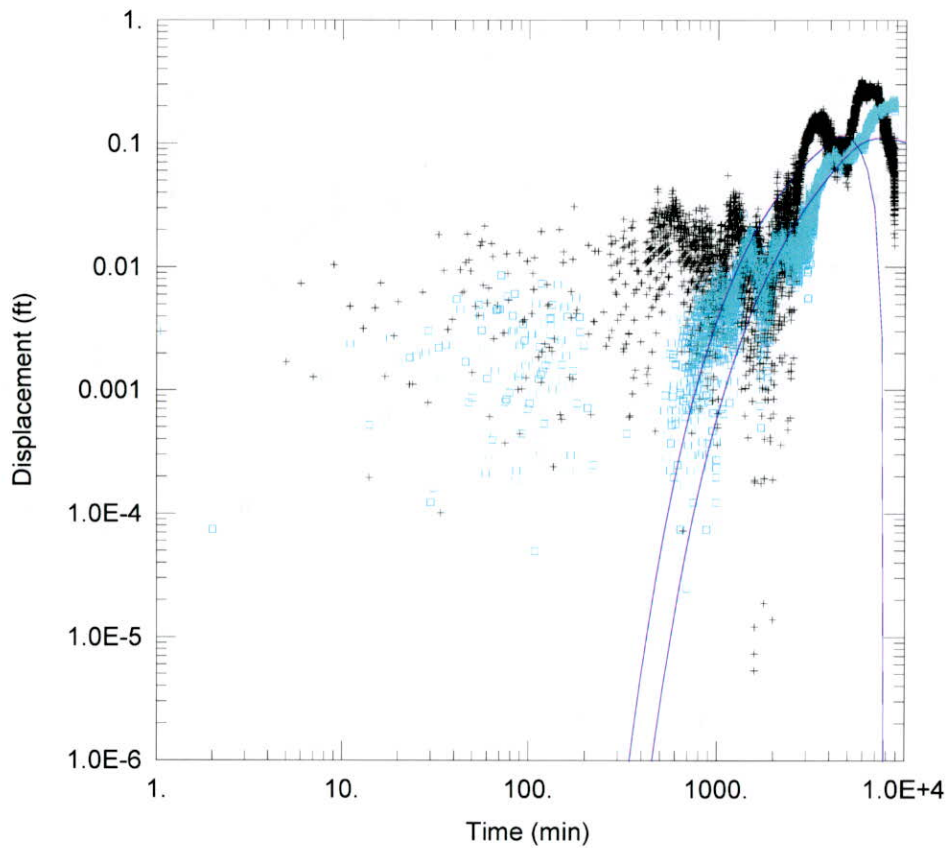
Solution Method: Theis

$T = 3.817E+4 \text{ ft}^2/\text{day}$

$S = 0.1117$

$Kz/Kr = 1.$

$b = 40. \text{ ft}$



WELL TEST ANALYSIS

Data Set: U:\...\OW-795W conf theis late.aqt

Date: 11/15/21

Time: 13:32:18

PROJECT INFORMATION

Company: LRE Water

Client: Bret FLiehs

Location: Claremont, SD

Test Well: Fliehs PW

Test Date: Nov. 2021

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
Fliehs PW	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
OW-795W	795	0

SOLUTION

Aquifer Model: Confined

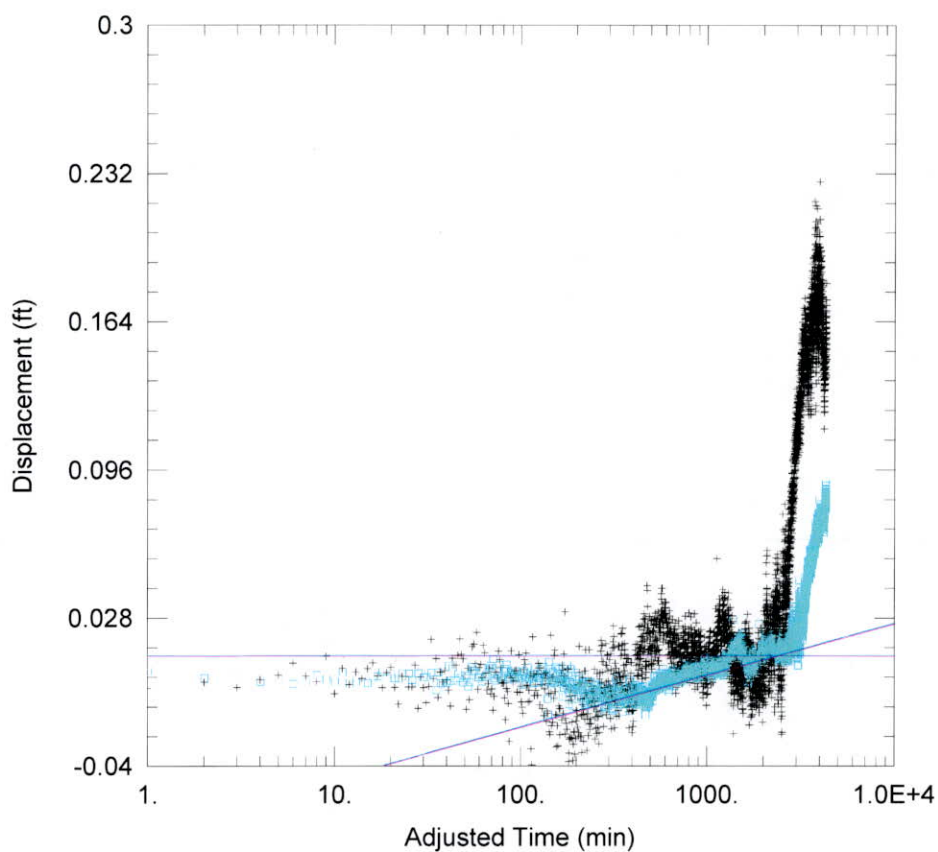
Solution Method: Theis

$T = 1848.7 \text{ ft}^2/\text{day}$

$S = 0.03903$

$Kz/Kr = 1.$

$b = 40. \text{ ft}$



WELL TEST ANALYSIS

Data Set: U:\...\OW-795W conf cj early.aqt

Date: 11/15/21

Time: 13:32:44

PROJECT INFORMATION

Company: LRE Water

Client: Bret FLiehs

Location: Claremont, SD

Test Well: Fliehs PW

Test Date: Nov. 2021

AQUIFER DATA

Saturated Thickness: 40. ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
Fliehs PW	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
OW-795W	795	0

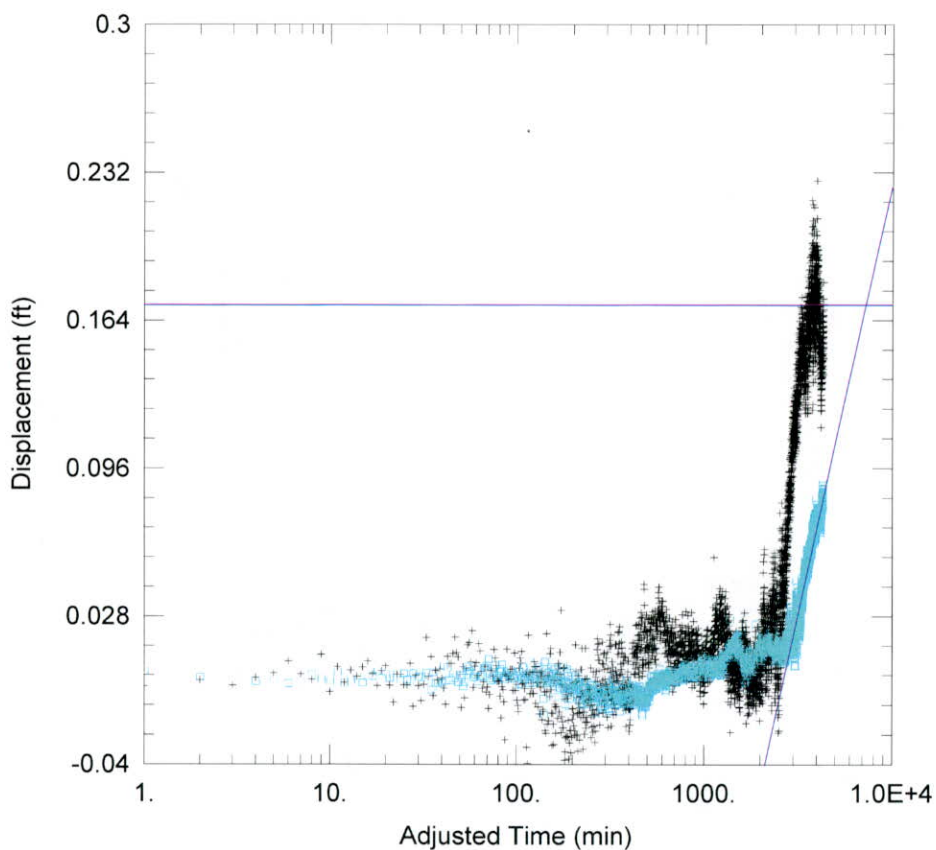
SOLUTION

Aquifer Model: Confined

Solution Method: Cooper-Jacob

T = 6.041E+4 ft²/day

S = 0.1307



WELL TEST ANALYSIS

Data Set: U:\...\OW-795W conf cj late.aqt

Date: 11/15/21

Time: 13:32:32

PROJECT INFORMATION

Company: LRE Water

Client: Bret FLiehs

Location: Claremont, SD

Test Well: Fliehs PW

Test Date: Nov. 2021

AQUIFER DATA

Saturated Thickness: 40. ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
Fliehs PW	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
OW-795W	795	0

SOLUTION

Aquifer Model: Confined

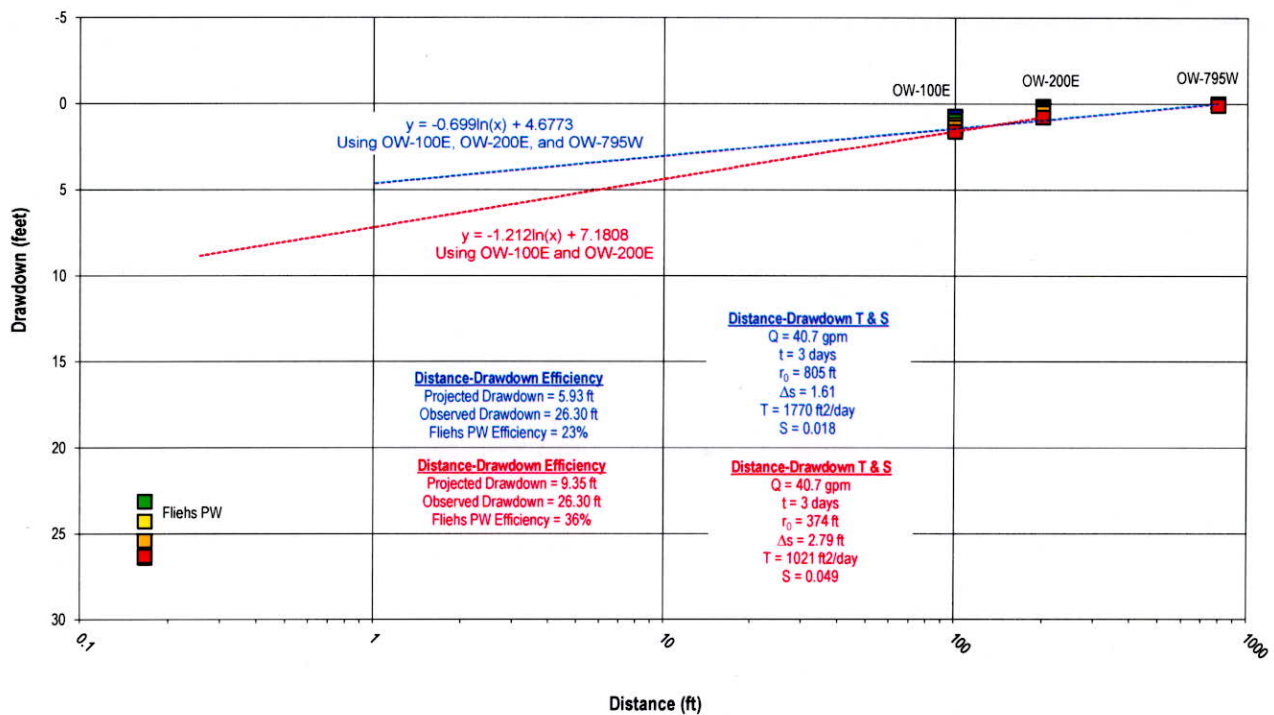
Solution Method: Cooper-Jacob

T = 3639.8 ft²/day

S = 0.02408

DISTANCE-DRAWDOWN (SEMI-LOG)
BRET FLIEHS
CLAREMONT, SD
DRAWDOWN AFTER APPROXIMATELY 1 AND 8 HOURS, AND 1, 2, AND 3 DAYS IN TO FLIEHS PW TEST

- 1-Hour Distance Drawdown
- 8-Hours Distance Drawdown
- 1-Day Distance Drawdown
- 2-Days Distance Drawdown
- 3-Days Distance Drawdown





**DEPARTMENT of AGRICULTURE
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 E. CAPITOL AVE
PIERRE SD 57501-3182
danr.sd.gov

**RECOMMENDATION OF CHIEF ENGINEER FOR WATER PERMIT
APPLICATION NO. 8586-3, Brett Fliehs**

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. 8586-3, Brett Fliehs, 39865 137th Street, Groton SD 57445.

The Chief Engineer is recommending APPROVAL of Application No. 8586-3 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 domestic water uses and water rights, 3) the proposed use is a beneficial use and 4) it is in the public interest as it pertains to matters of public interest within the regulatory authority of the Water Management Board with the following qualifications:

1. The wells approved under Water Permit No. 8586-3 are located near domestic wells and other wells which may obtain water from the same aquifer. Water withdrawals shall be controlled 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. 8586-3 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.
4. The Permit holder for Water Permit No. 8586-3 shall contract with a licensed well driller to construct a well to monitor the effect pumping has on water levels. The monitoring well must be completed into the Lake Silt aquifer and shall be located in the public right-of-way. The location of the observation well shall be coordinated with the DANR – Water Rights Program staff and will become part of observation well network operated by the Water Rights Program to routinely record water levels in aquifers throughout South Dakota.

Continued

See report on application for additional information.

Eric Gronlund

Eric Gronlund, Chief Engineer

March 21, 2022

NOTE: DANR is willing to discuss suitable locations for the observation well. At this time, the preferred location is in the right-of-way along 117th Street between the SE quarter of Section 28 and the NE quarter of Section 33, T126N-R60W in close proximity to the intersection of 117th Street and 409th Avenue. Note that 409th does not have a developed road at this location.

For specific information regarding the details concerning completion of an observation well, please contact Adam Mathiowetz at (605) 773-3352.

**Report to the Chief Engineer on
Water Permit Application No. 8586-3**

Bret Fliehs
15 February 2022

Application No. 8586-3 seeks to appropriate 1.33 cubic feet of water per second (cfs) from up to 20 wells to be completed into the Lake Silt aquifer (approximately 60 feet deep) located in the S $\frac{1}{2}$ Section 21 and the W $\frac{1}{2}$ NW $\frac{1}{4}$ Section 28 for irrigation of 140 acres located in the SW $\frac{1}{4}$ Section 21; all in T126N-R60W. This site is located approximately 16 miles northwest of Groton, South Dakota.

Water Source: Lake Silt aquifer (LK-SILT)

Hydrogeologic Characteristics

The Lake Silt aquifer is composed of the permeable and saturated portions of the lacustrine sediments deposited in Glacial Lake Dakota in the Quaternary Period. The lacustrine sediments are "glaciolacustrine clay and silt with minor sand and gravel" that generally form "flat, low-lying terrain" and are up to 60 feet thick [1]. The Lake Dakota Plain physiographic province underlies portions of Brown, Day, Marshall, and Spink Counties with approximately 590,000 acres underlying Brown County [2]. Lake silt deposits and alluvial deposits underlie most of that area, although their distribution is not homogenous [1].

The applicant submitted two well completion reports for the wells used in an aquifer performance test that was analyzed by Mitch Kannenberg and Mike Plante, of LRE Water [3]. There are also lithologic logs from the SD DANR Geological Survey Program that are near this application [4]. The two well completion reports attached in the Kannenberg and Plante [3] memorandum and four nearby lithologic logs which are in the same sections or adjacent to the sections from which this application proposes to withdraw water. Table 1 shows the geology described by the well drillers or geologists on site [3] [4]. The well drillers for the wells designated as "Fliehs PW" and "OW-795W" were not geologists and it can be difficult to determine the difference between clay and silt from drill cuttings in the field without training. Additionally, "silt" and "clay" are commonly used terms for formations with a mixture of particle sizes that are mostly finer than sand. Therefore, based on the descriptions provided by geologists, the layers the well drillers designated as clay may possibly be silt. The water levels in the two cased wells at the time of completion in Table 1 were 15 feet below grade for OW-795W and 21 feet below grade for Fliehs PW [3]. If the materials the driller described as clay were actually silt, that would mean both wells were unconfined. If the materials described as clay were truly clay, then Fliehs PW would have been confined at the time the well was completed.

Report on Water Permit App. No. 8586-3

Table 1: Selected well completion reports and lithologic logs near this application [3] [4]

FLEIHS PW		OW-795W		Lithologic Log 1		Lithologic Log 2		Lithologic Log 3		Lithologic Log 4	
NE 1/4 SW 1/4 Sec 21 T126N R60W		SE 1/4 SW 1/4 Sec 21 T126N R60W		SW 1/4 NW 1/4 NW 1/4 NW 1/4 Sec. 21 T126N-R60W		SE 1/4 SE 1/4 SE 1/4 SE 1/4 Sec 16 T126N R60W		NW 1/4 NW 1/4 NW 1/4 NW 1/4 Sec 22 T126N-R60W		SW 1/4 SW 1/4 SW 1/4 SW 1/4 Sec. 27 T126N-R60W	
11/15/2013		12/29/2011		09/23/1971		09/24/1971		08/17/1970		1/1/1962	
Depth	Description	Depth	Description	Depth	Description	Depth	Description	Depth	Description	Depth	Description
0 – 2	Top soil	0 – 1	Top soil	0 – 3	Top soil, dark brown, sandy	0 – 3	Top soil, black, sandy	0 – 68	Sand, brown to yellow to gray-brown, very fine, gray at 25 feet	0 – 14	Silt, dark-brown
2 – 19	Yellow clay	1 – 15	Yellow clay	3 – 14	Sand, brown	3 – 17	Clay, brown, sandy	68 – 94	Silt, gray, slightly sandy	14 – 49	Sand, dark-buff, fine, silty
19 – 23	Blue clay	15 – 60	Fine grey sand	14 – 48	Sand, gray	17 – 22	Clay, gray, sandy	94 – 113	Clay, gray, compact	49 – 59	Silt, dark-gray, sandy
33 – 60	Fine sand	60 – 120	Blue clay	48 – 90	Silt, sandy (lake silt?)	22 – 38	Sand, gray	113 – 114	Shale, blue-gray, compact		
60 – 61	Blue clay			90 – 96	Silt, sandy, gravelly (lake silt?)	38 – 105	Clay, gray, silty (lake deposit?)				
				96 – 105	Clay, not as silty as 90 to 96 feet, tough drilling	105 – 106	Clay, gray, pebbly, gravelly (till)				
				105 – 125	Shale	106 – 125	Shale				

Previous Aquifer Testing

In 2013, Lenius Well Drilling attempted a constant-rate aquifer performance test for 61 to 63 hours in the area of this application in order to provide evidence required by the Water Management Board to approve Water Permit Application No. 7537-3 [2]. Mathiowetz and Buhler [2] indicated that the data from the 2013 aquifer performance test attempt was not reliable enough to determine aquifer characteristics. The Water Management Board denied Water Permit Application No. 7537-3 on the grounds that the aquifer performance test did not meet the requirements set forth in its previous order [5].

Constant-Rate Aquifer Performance Test

The applicant submitted a technical memorandum on a constant-rate aquifer performance test completed by LRE Water [3]. Kannenberg and Plante [3] indicated that the applicant intends to use a center pivot sprinkler system as the irrigation method. Kannenberg and Plante [3] used the well designated as Fliehs PW as the pumped well and three observation wells, OW-100E, OW-200E, and OW-795W, which were located 100 feet east, 200 feet east, and 795 feet west of the pumped well, respectively. Kannenberg and Plante monitored the observation wells approximately four days prior to the constant-rate aquifer performance test to observe trends in water level changes due to factors other than the planned aquifer performance test. They observed that the water level elevation in Fliehs PW was 1,289.85 feet, 1,289.83 feet in OW-100E, 1,290.12 feet in OW-200E, and 1,289.34 feet in OW-795W, at the beginning of the test after correcting for trends. This means the water surface in the aquifer was relatively level, with a slight slope declining from east to west.

After Kannenberg and Plante [3] ensured that water levels in the aquifer were relatively stable, the well was pumped at a rate of approximately 50 gallons per minute (gpm) from 9:45 a.m. on November 3, 2021 until 6.5 hours later, when the pumping rate was reduced to approximately 41 gpm for the remainder of the pumping period to 9:45 a.m. on November 6, 2021. They continued observing the wells for a recovery period equal to the total amount of time pumped. Observation Well OW-795W showed a consistent upward trend in the data prior to pumping which Kannenberg and Plante [3] indicated was likely due to a recent precipitation event, so they corrected for the upward trend that occurred prior to pumping. Then, they used Aqtesolv to fit the drawdown data in the pumped well and the observation wells to obtain aquifer characteristics (transmissivity and storage coefficient) using unconfined and confined variants of the Theis [6] equation and the Cooper-Jacob [7] method. In their summary of the various analyses, Kannenberg and Plante [3] excluded two data sets calculated by using an early time interval on OW-795W and they excluded one data set calculated by fitting the version of the Theis [6] equation for unconfined aquifers on measurements of Fliehs PW. The data sets excluded from OW-795W are strong outliers. Kannenberg [8] indicated that they excluded the aquifer properties calculated with the unconfined Theis [6] equation on Fliehs PW because the data did not match the model closely, possibly due to inefficiency in the well [8]. The Kannenberg and Plante [3] memorandum indicates the transmissivity ranged from 7,637 to 44,119 gallons per day per foot (gpd/ft), with a geometric mean of 19,718 gpd/ft. The storage coefficient ranged from 1.94×10^{-3} to 4.90×10^{-2} , with a geometric mean value of 1.23×10^{-2} [3].

In their recovery data analysis, Kannenberg and Plante [3] detected a possible negative boundary at approximately 2,500 minutes (1.7 days) from the time the pump was shut off but were not able

to find the location of the potential negative boundary. A negative boundary indicates an edge of the aquifer or a change in aquifer characteristics such that the aquifer is less transmissive outside that boundary.

Kannenberg and Plante [3] used the distance-drawdown method to estimate the efficiency of the pumped well. Efficiency is a measure of how well the actual well performs compared to ideal circumstances [9]. Using the data from all three wells, they calculated an efficiency of 23%. Using the data from OW-100E and OW-200E only, they calculated an efficiency of 36%.

Using the aquifer characteristics estimated in Aqtesolv, Kannenberg and Plante [3] simulated drawdown in the aquifer assuming the aquifer was 36 feet thick, homogenous, and used a well field of 20 wells configured in an L-shape along the north and west edges of the proposed irrigated acreage. They assumed the applicant would pump in 5-day intervals to apply 1 inch of water per interval with a maximum number of 12 application intervals per year. Using the minimum transmissivity and storage coefficients, Kannenberg and Plante [3] estimated the maximum drawdown after 12 cycles of pumping 1 inch per acre per cycle would be 26 feet in the pumped well. Kannenberg and Plante [3] added, "This does not include the effects of well efficiency, and at an aquifer thickness of 36 feet, this amount of drawdown is excessive and operation of the irrigation system would not be feasible." Using the maximum and geometric mean transmissivity and storage coefficients, Kannenberg and Plante [3] estimated that maximum drawdown in the pumped wells after 12 cycles of pumping 1 inch per acre would be 3 and 8 feet, respectively. Kannenberg and Plante [3] concluded that the applicant's use scenario would be feasible if the maximum or geometric mean aquifer properties were the true values of the aquifer.

Kannenberg and Plante [3] used the maximum and geometric mean aquifer properties to delineate areas of influence where the well field would draw down 1 foot or more in the applicant's use scenario. The area of influence for the well field in the applicant's use scenario was 583,205,418 square feet (approx. 13,400 acres) when they used the area of influence modeled with the geometric mean aquifer properties. The area of influence for the well field was 233,734,275 square feet (5,370 acres) when they used the maximum calculated aquifer properties. When they used the minimum aquifer properties, the area of influence was larger than the extents of the maps provided in the Kannenberg and Plante [3] report. Using a range of recharge rates established for the Lake Silt aquifer by Mathiowetz and Buhler [2], Kannenberg and Plante [3] estimated that recharge to the Lake Silt aquifer in the areas of influence would range between 112 and 559 ac-ft/yr for the smallest area, modeled with the maximum aquifer properties, and recharge to the aquifer would range between 279 and 1,395 ac-ft/yr for the area modeled with the geometric mean aquifer properties.

Kannenberg and Plante [3] stated in their comments and recommendations section "... due to the fine-grained nature of the sediments, it is more difficult to construct an economically practical irrigation system in the aquifer." Overall, they indicated the Lake Silt aquifer might not be a reliable source of water for the applicant's proposed use case scenario during droughts or prolonged dry periods.

Analysis of Test Methodology and Data

Kannenberg [10] submitted all the observation well and flow meter data from the aquifer performance test to the Water Rights Program. Water Rights Staff used a macro [11] in

Microsoft Excel to fit the Theis [6] equation to OW-100E. When a flow rate of 50 gallons per minute was used, a transmissivity of approximately 26,000 gallons per foot per day fit the portion of the curve prior to when the pump rate was turned down. Using a flow rate of 40 gallons per minute, a transmissivity of approximately 24,000 gallons per foot per day fit the portion of the curve after the pump rate was turned down but before the negative boundary condition identified by Kannenberg and Plante [3]. In both cases, a storage coefficient of 1.5×10^{-3} was used. Figure 1 shows the data for OW-100E [10] with the Theis [6] equation models superimposed [11].

The most common methods to analyze an aquifer for its aquifer properties (transmissivity and storage coefficient) are to fit the data collected to the Theis [6] equation or to use the Cooper-Jacob [7] method, which is a simplification of the Theis [6] equation. The Theis [6] equation is based on an idealized conception of a confined aquifer. It assumes the aquifer is homogenous, practically infinite, the well is 100% efficient, the aquifer is under confined conditions, the static water level in the aquifer is flat at any point in space, and that the well screen penetrates the entire aquifer so that no vertical flow occurs in the aquifer, among other assumptions [6] [9]. If the aquifer is under unconfined conditions, the Theis [6] equation must be modified to account for the change in effective aquifer thickness that occurs due to dewatering in the aquifer near the well [12]. The aquifer is confined if the water in the well rises above the top of the water-bearing formation. If the well is unconfined, efficiency calculations by the distance-drawdown method do not apply [9]. Since Kannenberg and Plante [3] used the unconfined modification of the Theis [6] equation and the pumped well was unconfined during the aquifer performance test, it might not have been appropriate to discard aquifer properties calculated with the pumped well in their average under the reasoning that the well was inefficient. Those values are significantly lower than the other values [3], but they are not outliers [13]. Under real-world conditions, the applicant is likely to put the aquifer under similar unconfined conditions inside his proposed array of wells.

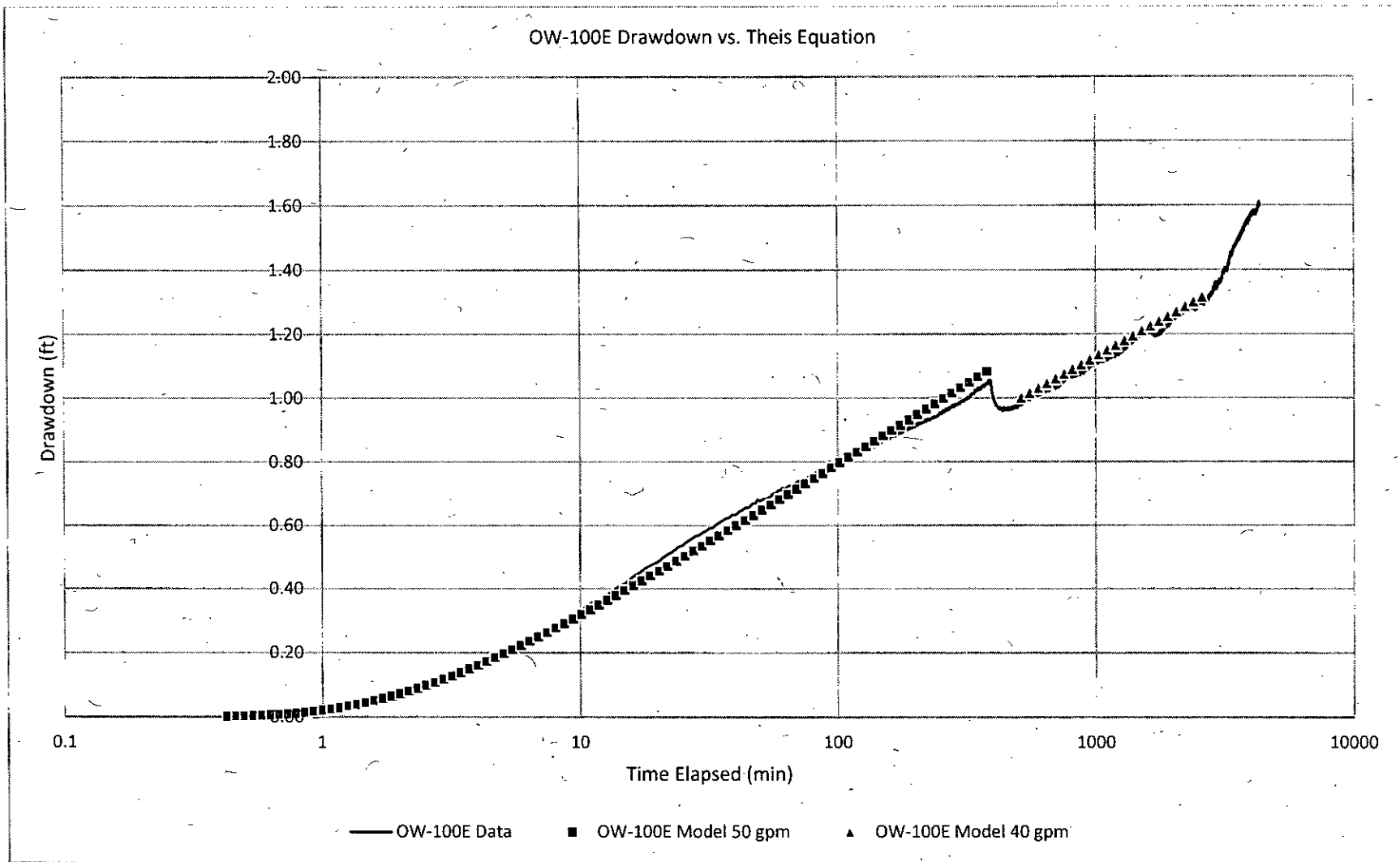


Figure 1: OW-100E data with Theis equation models superimposed.

The Cooper-Jacob [7] method of analysis has additional limitations, so some aquifer properties that Kannenberg and Plante [3] calculated using the Cooper-Jacob [7] method have errors in them because the Cooper-Jacob [7] method was used outside of its limitations. The Cooper-Jacob [7] method uses the straight-line portion of the Theis [6] equation, which only gives reasonably accurate results when a variable in the Theis [6] equation, u (Equation 1), is less than 0.05 according to Fletcher Driscoll [9], or less than 0.01 according to Ferris [12]. When it is applicable, the Cooper-Jacob [7] method can be a faster or mathematically easier way to estimate aquifer properties. However, in the Kannenberg and Plante [3] memorandum, the value of u for OW-200E was approximately 0.08 at the beginning of the time Kannenberg and Plante [3] fit a straight line to the data and was 0.02 at the end of that interval of time, according to Water Rights Staff calculations. For the Cooper-Jacob [7] analyses on OW-795E, the value of u was above 0.05 for all times where the Cooper-Jacob [7] method was used. Therefore, aquifer properties calculated from those analyses will have error in them because the Cooper-Jacob [7] method does not account for when the u value is high.

Equation 1:

$$u = \frac{r^2 * S}{4 * T * t}$$

Where: r is the distance from the pumped well to the observation well, S is the coefficient of storage, and t is the time since pumping began [9]. The coefficient of storage represents the volume of water removed from the aquifer per unit volume of aquifer material and is typically low for confined aquifers [9]. Presentation of this equation can vary depending on if factors are included to convert units [9].

The Theis [6] equation and Cooper-Jacob [7] methods are a means of understanding how different the real aquifer is to an ideal model. Therefore, maintaining a constant rate of discharge is of paramount importance. Ferris [12] recommends that a hydrologist attempting to understand an aquifer's properties via a constant-rate aquifer performance test perform some preliminary tests in order to design the longer-term constant-rate test. Since no aquifer performance tests were done prior to the one detailed in the Kannenberg and Plante [3] report, there was no way to know that 50 gpm was not a sustainable discharge rate for Fliehs PW. The inconsistency of the pump rate in the Kannenberg and Plante aquifer performance test means it is difficult to tell if fluctuations in the water levels in the observation wells are due to fluctuations in pumping or changes in average aquifer properties as the area of influence expands.

Water Rights Staff re-evaluated the geometric average transmissivity and storage coefficient by including aquifer properties calculated with the unconfined Theis method on Fliehs PW and by excluding values calculated that were outliers or the Cooper-Jacob method was used outside of its constraints. The geometric mean transmissivity was approximately 16,000 gallons per foot per day, which is 20% less than the geometric mean calculated by Kannenberg and Plante [3], and the geometric mean storage coefficient was 1.22×10^{-2} , which is 1% less than the geometric mean calculated by Kannenberg and Plante [3]. If the re-calculated mean values are the true aquifer properties, then the area of influence in the aquifer would be larger than the area estimated by the Kannenberg and Plante [3] geometric mean and drawdown would be greater in any given area than the drawdown modeled by Kannenberg and Plante [3].

The Kannenberg and Plante [3] memorandum contains some information necessary to understand the aquifer properties near this application, although some issues in the execution of the constant-rate aquifer performance test cause uncertainty in the resultant aquifer properties

calculated. Water Rights Staff agrees with Kannenberg and Plante [3] that this application may be difficult to develop, and the Lake Silt aquifer might not be a reliable source of water during droughts or prolonged dry periods.

Applicable South Dakota Codified Law (SDCL)

Pursuant to SDCL 46-2A-9, a permit to appropriate water may be issued if there is reasonable probability that there is unappropriated water available for the applicant's proposed use, that the proposed diversion can be developed without unlawful impairment of existing domestic water uses and water rights, and that the proposed use is a beneficial use and in the public interest as it pertains to matters of public interest within the regulatory authority of the Water Management Board. This report will only assess the availability of water and possibility of developing this application without unlawful impairment of existing domestic water uses and water rights.

Pursuant to SDCL 46-6-3.1, 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 the water to the groundwater source. An exception allows water distribution systems to withdraw from groundwater sources older or stratigraphically lower than the Greenhorn Formation regardless of the results of a hydrologic budget. The applicant is not a water distribution system as defined in SDCL 46-1-6(17) and the Lake Silt aquifer is younger and stratigraphically higher than the Greenhorn Formation. Therefore, it is necessary to find that recharge exceeds withdrawals to approve this application.

Availability of Water

Hydrologic Budget

Recharge

Recharge to the Lake Silt aquifer is likely to be mainly from infiltration of precipitation, although some recharge may occur when the stage of hydrologically connected surface water features is higher than the water table in the aquifer. In their supplemental report on Water Permit Application No. 7537-3, Mathiowetz and Buhler [2] indicated that a range between 0.25 and 1.25 inches per year was likely to be the recharge rate to the Lake Silt aquifer. The Lake Silt aquifer underlies multiple counties, but it is unlikely that recharge from a distant part of the aquifer would ever reach the area of this application, but the area of influence can be used as a recharge area. The area of influence using the maximum aquifer property values calculated by Kannenberg and Plante [3] is smaller than the one they modeled with the geometric mean values but it is unlikely that the maximum aquifer property values are realistic. Therefore, the area of influence is likely to be similar to the approximately 13,400 acres modeled by Kannenberg and Plante [3] with the geometric mean aquifer properties. Applying the recharge rate indicated by Mathiowetz and Buhler [2], the recharge to this area of the Lake Silt aquifer is approximately 279 to 1,396 ac-ft/yr.

Discharge

Discharge from the Lake Silt aquifer is likely to be mainly by evapotranspiration and groundwater outflow when the water table in the aquifer is higher than the stage of

hydrologically connected surface water features. Some withdrawals occur from domestic wells [14], but due to the presence of rural water systems in the area of this application, their withdrawal is estimated to be negligible for this hydrologic budget. There are no appropriate withdrawals in the Lake Silt aquifer [15].

Summary of Hydrologic Budget

Estimated recharge to the Lake Silt aquifer within the area of influence of this proposed well field ranges between 279 to 1,396 acre-feet per year. This application seeks to irrigate 140 acres and may withdraw up to 2 acre-feet per acre per year, which is a total of 280 ac-ft/yr.

Kannenberg and Plante indicate in their memorandum that the applicant only intends to use 1 acre-foot per acre per year. Therefore, there is reasonable probability unappropriated water is available for this application.

Observation Wells

The water rights program maintains three wells completed into the Lake Silt aquifer [16]. The nearest observation well to this application is ML-70R, located approximately 5 miles east of this application [16]. At that distance, it is unlikely to represent specific behavior in the aquifer near this application, but it can show general characteristics of the Lake Silt aquifer. If this application is developed, it may be beneficial for the applicant to install an observation well near this application at a location approved by the Water Rights Program. Figure 2 shows water level elevations in the Lake Silt aquifer. The difference between the highest reading from ML-70R and the lowest reading from ML-70R is 20 feet. In general, water levels rise during periods of higher rainfall and decline during periods of lower rainfall [17]. The fluctuation of the water levels with climactic influence indicates natural discharge is occurring and is therefore available for capture. Therefore, based on observation well analysis, there is reasonable probability unappropriated water is available for this application.

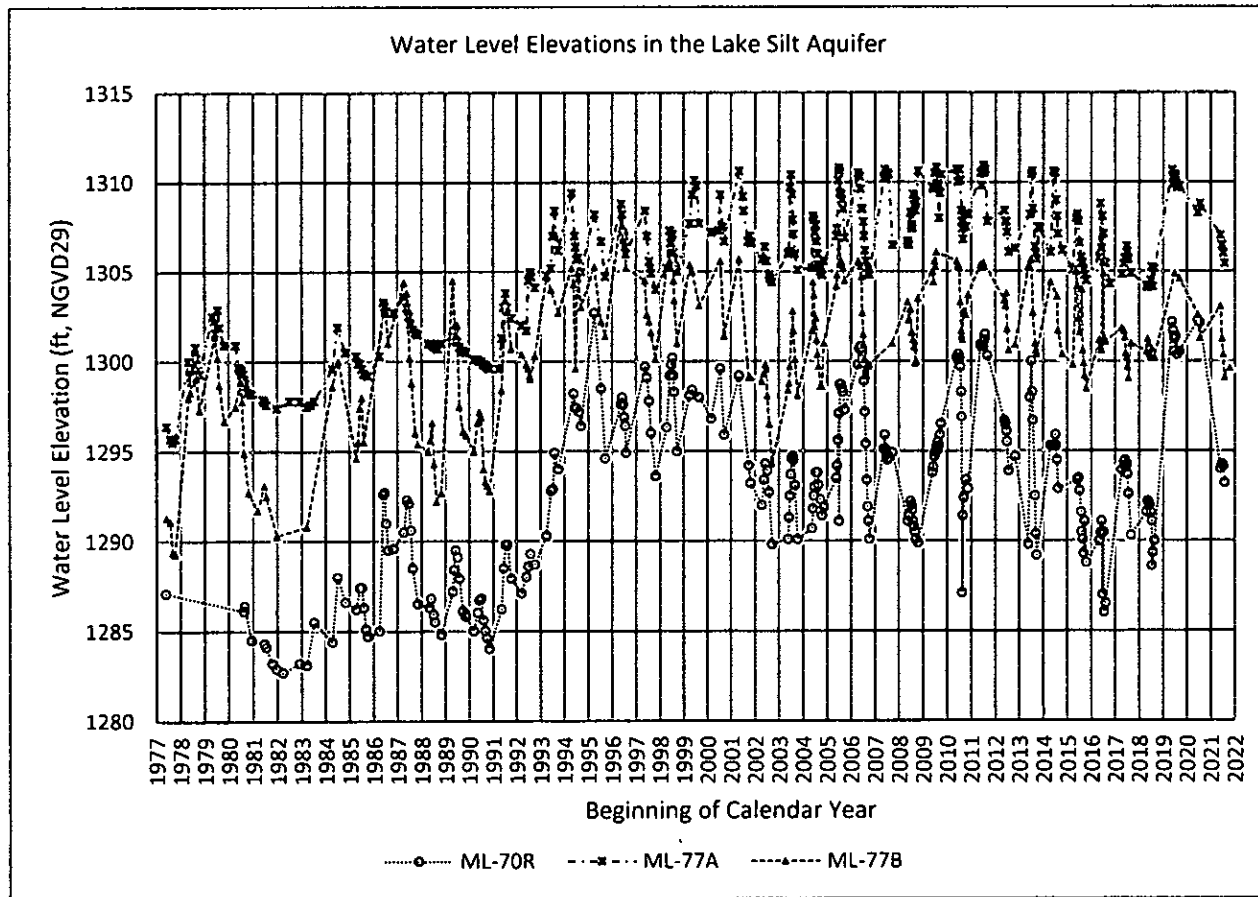


Figure 2: Water level elevations in the Lake Silt aquifer [16]

Potential for Unlawful Impairment of Existing Water Rights or Permits

The nearest domestic well on file with the Water Rights Program that is likely to be completed into the Lake Silt aquifer is located approximately 1.5 miles southeast of the field from which, this application proposes to withdraw [14]. There are no water rights/permits currently completed into the Lake Silt aquifer [15]. Kannenberg and Plante [3] modeled drawdown in the aquifer after the applicant pumps 1 acre-foot per acre of water onto the irrigated land. At the location of the domestic well, the Kannenberg and Plante [3] model indicates drawdown would be approximately 5 feet. If the transmissivity of the aquifer is lower, as indicated by Water Rights Staff calculations, drawdown in the aquifer in that area would be greater than Kannenberg and Plante [3] modeled. The static water level in the domestic well was approximately 10 feet above the top of the aquifer when the well was completed [14], but it was completed during a relatively wet year [17]. The Water Rights Program has historically interpreted an unlawful impairment of existing water rights to occur if a junior water right/permit causes a nearby adequate well with a senior water right/permit to become unable to withdraw at the rate it is entitled to or, if a domestic well is impacted, a water right/permit causes an adequate domestic well to be unable to withdraw at the rate needed to supply reasonable domestic use of water. Administrative Rule of South Dakota (ARSD) 74:02:04:20(6) defines an adequate well as:

...a well constructed or rehabilitated to allow various withdrawal methods to be used, to allow the inlet to the pump to be placed not less than 20 feet into the saturated

aquifer or formation material when the well is constructed, or to allow the pump to be placed as near to the bottom of the aquifer as is practical if the aquifer thickness is less than 20 feet

The domestic well has a 3-inch casing above the water-bearing formation and a 2-inch screen inside of it [14]. While that casing diameter is generally too small for the well to be considered adequate, the Lake Silt aquifer is relatively shallow, and pumps are available that can lift the water from the producing formation at a rate that would be useful for domestic use if the domestic well user has a storage tank. If the applicant caused drawdown in an adequate domestic well such that the domestic well owner could not access needed water, unlawful impairment may occur. Therefore, the applicant should control his withdrawals so that domestic well users near this application are able to withdraw needed water. Since the Lake Silt aquifer is relatively thin and likely to be under unconfined conditions, it is likely that the applicant would impair his own Swells before he is able to unlawfully impair another person's well. Therefore, there is reasonable probability this application can be developed without unlawful impairment of existing domestic uses.

Conclusions

1. Water Permit Application No. 8586-3 seeks to appropriate 1.33 cfs from up to 20 wells to be completed into the Lake Silt aquifer located in the S $\frac{1}{2}$ Section 21 and the W $\frac{1}{2}$ NW $\frac{1}{4}$ Section 28 for irrigation of 140 acres located in the SW $\frac{1}{4}$ Section 21; all in T126N-R60W.
2. The consultant hired by the applicant indicated the applicant intends to use at most 1 acre-foot of water per acre irrigated.
3. Based on the hydrologic budget and the likelihood that the applicant will use at most 1 acre-foot per acre irrigated, there is reasonable probability unappropriated water is available for this application.
4. There is reasonable probability this application can be developed without unlawful impairment of existing domestic uses.



Kimberly C. Drennon, E.I.

Natural Resources Engineer II – DANR Water Rights Program

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- [3] M. Kannenberg and M. Plante, "Technical Memorandum to Brett Fliehs on Aquifer Pumping Results and Information for Irrigation Permit Application," Not Published, LRE Water, Sioux Falls, South Dakota, 2022.
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- [15] SD DANR Water Rights Program, "Water right permit file database," SD DANR Water Rights Program, Pierre, South Dakota, 2022.
- [16] SD DANR Water Rights Program, "Observation wells," Pierre, South Dakota, 2022.
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Schlaak, Karen

From: Schlaak, Karen
Sent: Tuesday, March 22, 2022 12:54 PM
To: Bret Fliehs
Cc: mitch.kannenberg@lrewater.com
Subject: Water Permit Application No. 8586-3
Attachments: 3102.pdf

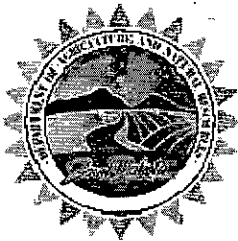
Attached is a copy of the report, chief engineer recommendation and information regarding the public notice for your water permit application. As stated in the letter, please contact the paper as soon as possible to authorize publication and arrange for payment. This information is being mailed to you today.

Karen Schlaak

DANR - Water Rights Program

(605) 773-3352

Website: <https://danr.sd.gov>



LOCALIQ

Aberdeen News
Watertown Public Opinion

PO Box 630567 Cincinnati, OH 45263-0567

PROOF OF PUBLICATION

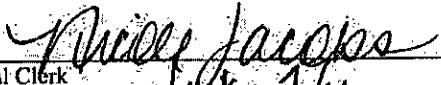
Karen Schlaak
Bret Flichs
39865 137Th ST
Groton SD 57445-6500

STATE OF SOUTH DAKOTA, COUNTY OF BROWN

The AMERICAN NEWS is a daily newspaper of general circulation, printed and published in Aberdeen, Brown County, South Dakota, and has been such a newspaper during the times hereinafter mentioned; and personal knowledge of the facts herein state that the notice hereto annexed was Published in said newspapers in the issue dated:

03/31/2022

That said newspaper is a legal newspaper published five days or more each week; with a bona fide circulation of more than two hundred copies daily; published in the English language within the said county of Brown for more than one year prior to the first publication of said notice; and printed in whole in an office maintained at the place of publication of said newspaper.
Sworn to and subscribed before on 03/31/2022



Legal Clerk



Notary, State of WI, County of Brown

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Notary Public
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APR 20 2022

WATER RIGHTS
PROGRAM

NOTICE OF
APPLICATION NO. 8586-3
to Appropriate Water

Notice is given that Bret Fliehs, 39865 137th St, Groton SD 57445 has filed an application for a water permit to appropriate 1.33 cubic feet of water per second from up to 20 wells to be completed into the Lake Silt Aquifer (approximately 60 feet deep) located in the S 1/2 Section 21 and the W 1/2 NW 1/4 Section 28 for irrigation of 140 acres located in the SW 1/4 Section 21; all in T126N-R60W. This site is located approximately 16 miles northwest of Groton SD. Pursuant to SDCL 46-2A-2, the Chief Engineer recommends APPROVAL of Application No. 8586-3 with qualifications because 1) unappropriated water is available, 2) existing domestic water uses and water rights will not be unlawfully impaired, 3) it is a beneficial use of water, and 4) it is in the public interest as it pertains to matters within the regulatory authority of the Water Management Board. The Chief Engineer's recommendation with qualifications, the application, and staff report are available at

<https://danr.sd.gov/public> or contact Ron Duvall for this information, or other information, at the Water Rights Program address provided below.

Any person interested in opposing this application or recommendation shall allege that the application, upon approval, will cause injury to the person that is unique from any injury suffered by the public in general. The injury must concern a matter either within the regulatory authority found in SDCL 46-2A-9 for approval or denial of the application, or other matter concerning the application within the regulatory authority of the board to act upon as defined by SDCL 46-2-9 and 46-2-11, or both. Any person meeting the petitioner requirements and wishing to be a party of record in a contested case hearing shall file a written petition to oppose the application with BOTH the applicant and Chief Engineer. A petition opposing the application shall be filed on a form provided by the Chief Engineer. The petition form is available online at <https://danr.sd.gov/public> or by contacting the Chief Engineer. The Chief Engineer's address is "Water Rights Program, Foss Building, 523 E Capitol, Pierre SD 57501" or call (605) 773-3352. The applicant's mailing address is given above. If contesting the Chief Engineer's recommendation, the applicant shall also file a petition. A petition filed by either an interested person or the applicant must be filed by April 11, 2022.

The petition shall include a statement describing the unique injury upon approval of the application

on the petitioner, the petitioner's reasons for opposing the application, and the name and mailing address of the petitioner or the petitioner's legal counsel, if legal counsel is obtained. Any interested person may file a comment on the application with the Chief Engineer. The comment shall be filed on a form provided by the Chief Engineer and is available online at <https://danr.sd.gov/public> or by calling (605) 773-3352 or writing the Chief Engineer at the address provided above. Filing a comment does not make the commenter a party of record or a participant in any hearing that may be held. Any comment must be filed by April 11, 2022. If the applicant does not contest the recommendation of the Chief Engineer and no petition to oppose the application is received, the Chief Engineer shall act on the application pursuant to the recommendation with no hearing held before the Water Management Board. If a petition opposing the application or contesting the recommendation is filed, then a hearing will be scheduled, and the Water Management Board will consider this application. Notice of the hearing will be given to the applicant and any person filing a petition. Published once at the total approximate cost of \$47.00. Mar. 31, 2022 #7079445

Schlaak, Karen

From: Schlaak, Karen
Sent: Tuesday, March 22, 2022 11:25 AM
To: Aberdeen News Legals (aan-legals@aberdeennews.com)
Subject: 8586-3, Bret Fliehs
Attachments: 8586-3public.short_final.docx; FORM8.FRM.doc

Attached is a notice to be published on March 31, 2022.

Bret Fliehs, 39865 137th St, Groton SD 57445 (605 380-3808) has been notified to contact you to authorize publication and arrange for payment.

Please send the affidavit or return the attached Proof of Publication form ASAP to the Water Rights Program, 523 E Capitol, Pierre SD 57501.

Let me know if you have questions. Please acknowledge receipt of this email.

Karen Schlaak

DANR - Water Rights Program
(605) 773-3352
Website: <https://danr.sd.gov>



NOTICE OF APPLICATION NO. 8586-3 to Appropriate Water

Notice is given that Bret Fliehs, 39865 137th St, Groton SD 57445 has filed an application for a water permit to appropriate 1.33 cubic feet of water per second from up to 20 wells to be completed into the Lake Silt Aquifer (approximately 60 feet deep) located in the S 1/2 Section 21 and the W 1/2 NW 1/4 Section 28 for irrigation of 140 acres located in the SW 1/4 Section 21; all in T126N-R60W. This site is located approximately 16 miles northwest of Groton SD.

Pursuant to SDCL 46-2A-2, the Chief Engineer recommends APPROVAL of Application No. 8586-3 with qualifications because 1) unappropriated water is available, 2) existing domestic water uses and water rights will not be unlawfully impaired, 3) it is a beneficial use of water, and 4) it is in the public interest as it pertains to matters within the regulatory authority of the Water Management Board. The Chief Engineer's recommendation with qualifications, the application, and staff report are available at <https://danr.sd.gov/public> or contact Ron Duvall for this information, or other information, at the Water Rights Program address provided below.

Any person interested in opposing this application or recommendation shall allege that the application, upon approval, will cause injury to the person that is unique from any injury suffered by the public in general. The injury must concern a matter either within the regulatory authority found in SDCL 46-2A-9 for approval or denial of the application, or other matter concerning the application within the regulatory authority of the board to act upon as defined by SDCL 46-2-9 and 46-2-11, or both. Any person meeting the petitioner requirements and wishing to be a party of record in a contested case hearing shall file a written petition to oppose the application with BOTH the applicant and Chief Engineer. A petition opposing the application shall be filed on a form provided by the Chief Engineer. The petition form is available online at <https://danr.sd.gov/public> or by contacting the Chief Engineer. The Chief Engineer's address is "Water Rights Program, Foss Building, 523 E Capitol, Pierre SD 57501" or call (605) 773-3352. The applicant's mailing address is given above. If contesting the Chief Engineer's recommendation, the applicant shall also file a petition. A petition filed by either an interested person or the applicant must be filed by April 11, 2022.

The petition shall include a statement describing the unique injury upon approval of the application on the petitioner, the petitioner's reasons for opposing the application, and the name and mailing address of the petitioner or the petitioner's legal counsel, if legal counsel is obtained.

Any interested person may file a comment on the application with the Chief Engineer. The comment shall be filed on a form provided by the Chief Engineer and is available online at <https://danr.sd.gov/public> or by calling (605) 773-3352 or writing the Chief Engineer at the address provided above. Filing a comment does not make the commenter a party of record or a participant in any hearing that may be held. Any comment must be filed by April 11, 2022.

If the applicant does not contest the recommendation of the Chief Engineer and no petition to oppose the application is received, the Chief Engineer shall act on the application pursuant to the recommendation with no hearing held before the Water Management Board. If a petition opposing the application or contesting the recommendation is filed, then a hearing will be scheduled, and the Water Management Board will consider this application. Notice of the hearing will be given to the applicant and any person filing a petition.

Published once at the total approximate cost of _



**DEPARTMENT of AGRICULTURE
and NATURAL RESOURCES**

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**NOTE: TO BE SURE OF PUBLICATION ON
THE CORRECT DATES, CONTACT
THE NEWSPAPER RIGHT AWAY.**

March 22, 2022

Bret Flihs
39865 137th St
Groton SD 57445

Dear Mr. Flihs:

Water Permit Application No. 8586-3 for irrigation use has been examined and found to comply with the South Dakota Water Laws and applicable rules. A notice has been sent to the American News printed at Aberdeen SD (Ph # 605 225-4100). You will need to contact the newspaper and authorize publication of this notice. For your information, a copy of the notice, the recommendation of the Chief Engineer and report on the application are enclosed. Please review the notice prior to publication and notify this office, if you have any corrections or questions.

Be sure to contact the above newspaper to authorize publication of your Notice and to arrange for payment. Early contact with the paper can eliminate delays. Upon receiving authorization from you, the publisher has been instructed to publish your notice. The newspaper has also been instructed to send us the Proof of Publication. We must receive Proof of Publication before action can be taken on the application.

Sincerely,

Karen Schlaak

Karen Schlaak
Water Rights Program
(605) 773-3352

enclosures

NOTE: If you plan to contest any part of the Chief Engineer's recommendation, you must file a petition pursuant to the procedures outlined in the attached notice of hearing. The Water Management Board will then consider your concerns during a hearing on the application.



**DEPARTMENT of AGRICULTURE
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 E. CAPITOL AVE
PIERRE SD 57501-3182
danr.sd.gov

APR 28 2022

BRET FLIEHS
39865 137TH ST
GROTON SD 57445

Dear Mr. Fliehs:

Enclosed is Water Permit No. 8586-3 authorizing construction of the water diversion system and beneficial use of the water, not exceeding the limits as specified in the Water Permit.

For specific information regarding details concerning completion of the required observation well, please see recommendation and then call Adam Mathiowetz at 605 773-3352.

Form 10, *Notice of Completion of Works and Application of Water to Beneficial Use*, is enclosed. Please return this completed form after you have finished the system and have put the water to beneficial use. An investigation can then be scheduled so the water license may be issued, thus completing the acquisition of a water right.

An informational sheet *Common Water Right Questions?* is also enclosed. This sheet is intended to answer some of the questions associated with obtaining and keeping a water right.

Sincerely,

Eric Gronlund, Chief Engineer
Water Rights Program
(605) 773-3352

enclosures

0506-3



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JUN 04 2025

Water Rights
Program

DEPARTMENT of AGRICULTURE
and NATURAL RESOURCES

JOE FOSS BUILDING
523 E. CAPITOL AVE
PIERRE SD 57501-3182
danr.sd.gov

NOTICE OF COMPLETION OF WORKS AND
APPLICATION OF WATER TO BENEFICIAL USE

TO: Water Rights Program, DANR
523 E. Capitol Ave.
Pierre, SD 57501-3182
or via email to DANRmail@state.sd.us

Date 6/03/2025

FROM: Bret Fliehs

(name)

605-380-3808

(phone)

39865 137th street

(address)

bfliehs@yahoo.com

(email)

Groton SD 57445

(city, state, zip)

I have completed the construction of the water use system and I have put the water to beneficial use to the maximum extent it is going to be used.

Water Permit No. 8586-3 states that the water use system is to be constructed by

4/11/2027

(date)

, and water is to be put to beneficial use by

4/11/2031

(date)

The water use system was completed on 9/01/2023

(date)

Applying the water to beneficial use was completed on 6/01/2024

(date)

You may schedule an inspection so that the water license may be issued.