

**WATER PERMIT NO. 2577A-2**

Name of Applicant: City of Box Elder

Address: 420 Villa Dr, Box Elder SD 57719 Phone: 605 923-1404

Amount of Water Claimed: 0.67 cfs Total Acres: NA

Source of Water Supply: groundwater (one well)

Water to be used for: municipal County: Pennington

Type of Waste Disposal System:

Location:

PRIORITY Date Received: 10-15-12 Application/License Fee: \$ 100

Corrected Application Received: Period of Annual Use: Jan 1 – Dec 31

Remarks:

Diversion Point: NW 1/4 NE 1/4 Sec 34-T2N-R8E

Land to be Irrigated: NA

Depth of Well: 4350 feet deep

Well Driller:

Remarks:

Type of Map:

Prepared by:

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Reviewed and the Number Assigned on: 10-15-12

By: **Karen Schlaak**

Notice of Hearing - date to intervene: \_\_\_\_\_

|                                                                                                                    |                                                      |                                                      |
|--------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|------------------------------------------------------|
| Mail to:<br>Water Rights Program<br>Joe Foss Building<br>523 E. Capitol<br>Pierre, SD 57501-3181<br>(605) 773-3352 | No. <u>2577A-2</u>                                   | (office use only)<br>Hydrologic Unit <u>10120111</u> |
|                                                                                                                    | Basin <u>Upper Cheyenne</u>                          |                                                      |
|                                                                                                                    | Newspaper <u>Rapid City Journal PO Box 450 57709</u> |                                                      |
|                                                                                                                    | <u>605-394-8306</u>                                  |                                                      |

RECEIVED  
OCT 15 2012  
WATER RIGHTS  
PROGRAM

## Application For Permit To Appropriate Water Within The State Of South Dakota

### Check use(s) of water:

|                                                 |                                           |                                          |                                          |
|-------------------------------------------------|-------------------------------------------|------------------------------------------|------------------------------------------|
| <input checked="" type="checkbox"/> Municipal   | <input type="checkbox"/> Suburban Housing | <input type="checkbox"/> Recreational    | <input type="checkbox"/> Institutional   |
| <input type="checkbox"/> Rural Water System     | <input type="checkbox"/> Commercial       | <input type="checkbox"/> Fish & Wildlife | <input type="checkbox"/> Geothermal Heat |
| <input type="checkbox"/> Domestic (over 18 gpm) | <input type="checkbox"/> Industrial       | <input type="checkbox"/> Other           |                                          |

Type of Application: ☐ New ☒ Vested Right (Use predates Mar 2, 1955) ☐ Future Use Reservation  
(check one) ☐ Place to Beneficial Use Water Reserved by Future Use Permit No. \_\_\_\_\_  
☒ Amendment/Correction to Permit No. \_\_\_\_\_

Description of amendment/correction: (i.e. change diversion point(s), add diversion point(s), change use, etc.)  
Reinstatement 2577-2

- Name of Applicant CITY OF BOX ELDER Phone 605 923-1404  
(check one) ☒ Owner ☐ Tenant/lessee  
Mailing Address 420 VILLAGE BLVD BOX ELDER State SD 57719  
(Street, RR, or Box and City) (Zip Code)
- Amount of water claimed 0.67 \*CFS or 300 \*\*GPM 290 \*\*\*AF  
(\*Cubic Feet per Second) (\*\*Gallons per Minute) (\*\*\*)Acre Feet - storage capacity of dam/dugout or annual use if applicable
- Source of water supply Madison Aquifer
- Location of point of diversion (example - 3 wells in SW1/4 NE1/4 section 12-T104N-R53W)  
1 Well in NW1/4 NE1/4 Section 34 T2N R8E (Well #5)  
County Pennington
- County or counties where water will be used Pennington
- Annual period during which water is to be used January 1 through December 31
- Give a description of the project. When available include any preliminary engineering report or other reports or information that will help explain the project. (Attach sheet if more space is needed)  
The project consists of constructing an approximately 4,350 ft deep well and pump house with electrical control and chemical feed system to tie into a ground storage system to provide municipal water to the City of Box Elder.

STATE OF SOUTH DAKOTA)

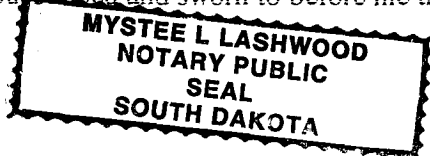
County of Pennington SS

Attachments: Attach Form 2A if diversion is from a well or dugout, or if storage of water is proposed. Attach map and any other technical information. (see instructions)

I, William Griffiths, the applicant, certify that I have read this application, have examined the attached map and that the matters stated are true and that I intend, and am able to complete the necessary construction.

Applicant's signature William Griffiths

Subscribed and sworn to before me this 10 day of October 20 12



Mystee Lashwood  
Notary Public signature

My commission expires  
March 9 2013



**SOUTH DAKOTA  
WATER PERMIT NO. 2577A-2**

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Date of first receipt of application October 15, 2012.

The Chief Engineer, on behalf of the Water Management Board, issues Water Permit No. 2577A-2 to the City of Box Elder, 420 Villa Dr, Box Elder SD 57719 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. 2577A-2 reinstates Permit No. 2577-2. Permit No. 2577-2 appropriates 0.67 cubic feet of water per second (290 acre-feet annually) from one well to be completed into the Madison Aquifer (approximately 4350 feet deep) located in NW 1/4 NE 1/4 Section 34-T2N-R8E. The permit was approved May 8, 2006, and the project was to be completed May 8, 2011, with water being put to beneficial use by May 8, 2015. Permit No. 2577A-2 reinstates Water Permit No. 2577-2 since the project has not been completed.
2. The water appropriated shall be used for the purpose of municipal and may not exceed the amount of water needed for beneficial use.
3. The water is to be used during the following described annual period: January 1 – December 31.
4. The date of approval of Permit No. 2577A-2 is January 14, 2013.
5. The date from which applicant may claim right is October 15, 2012.
6. One-fifth of the construction is to be completed on or before July 14, 2015.
7. All construction is to be completed on or before January 14, 2018.
8. Water is to be put to beneficial use on or before January 14, 2022.
9. 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 well approved under this Permit will be located near domestic wells and other wells which may obtain water from the same aquifer. The well owner under this Permit shall control his withdrawals so there is not a reduction of needed water supplies in adequate domestic wells or in adequate wells having prior water rights.
2. The well authorized by Permit No. 2577A-2 shall be constructed by a licensed well driller and construction 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. In accordance with SDCL 46-1-14 and 46-2A-20, Permit No. 2577A-2 is issued for a twenty year term. Pursuant to SDCL 46-2A-21, the twenty year term may be deleted at any time during the twenty year period or following its expiration. If the twenty year term is not deleted at the end of the term, the permit may either be cancelled or amended with a new term limitation of up to twenty years. Permit No. 2577A-2 may also be cancelled for nonconstruction, forfeiture, abandonment or three permit violations pursuant to SDCL 46-1-12, 46-5-37.1 and ARSD 74:02:01:37.
4. City of Box Elder shall report annually the amount of water diverted from the Madison Aquifer.

**WATER MANAGEMENT BOARD**

By: Garland Erbele  
Garland Erbele, Chief Engineer  
Water Rights Program  
Department of Environment and Natural Resources

FEB 08 2013  
date



# RECEIPT

## WATER RIGHTS PROGRAM

South Dakota Department of Environment and Natural Resources

Date 10/15, 20 12

RECEIVED OF City of Box Elder 520 N Ellsworth Rd #9C Box Elder SD 57719

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

|                                                                                                                         |       |        |
|-------------------------------------------------------------------------------------------------------------------------|-------|--------|
| Fee for Application for Permit No. <u>2577A-2</u> to Appropriate Water, to construct and to put water to beneficial use | 100   | 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. _____                     |       |        |
| Fee for Filing Transfer Form _____                                                                                      |       |        |
| Fee for _____                                                                                                           |       |        |
| Fee for Issuing New Well Driller's License No. _____ for C.Y. _____                                                     |       |        |
| Fee for Renewal of Well Driller's License No. _____ for C.Y. _____                                                      |       |        |
| Fee for Issuing Well Pump Installer's License No. _____ for C.Y. _____                                                  |       |        |
| Fee for Renewal of Well Pump Installer's License No. _____ for C.Y. _____                                               |       |        |
| (Any Other Work Provided by Law)                                                                                        | TOTAL | 100 00 |

No. 05618

By

David E. Felt 29  
Chief Engineer



**DEPARTMENT of ENVIRONMENT  
and NATURAL RESOURCES**

PMB 2020  
JOE FOSS BUILDING  
523 EAST CAPITOL  
PIERRE, SOUTH DAKOTA 57501-3182

denr.sd.gov

**RECOMMENDATION OF CHIEF ENGINEER FOR WATER PERMIT  
APPLICATION NO. 2577A-2, City of Box Elder**

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. 2577A-2, City of Box Elder, c/o Mayor William Griffiths, 420 Villa Drive, Box Elder SD 57719.

The Chief Engineer is recommending Approval of Application No. 2577A-2 for a 20 year term pursuant to SDCL 46-1-14 and 46-2A-20 because although evidence is not available to justify issuing this permit without a 20 year term limitation, there is reasonable probability that there is unappropriated water available for the applicant's proposed use with the following qualifications:

1. The well approved under this Permit will be located near domestic wells and other wells which may obtain water from the same aquifer. The well owner under this Permit shall control his withdrawals so there is not a reduction of needed water supplies in adequate domestic wells or in adequate wells having prior water rights.
2. The well authorized by Permit No. 2577A-2 shall be constructed by a licensed well driller and construction 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. In accordance with SDCL 46-1-14 and 46-2A-20, Permit No. 2577A-2 is issued for a twenty year term. Pursuant to SDCL 46-2A-21, the twenty year term may be deleted at any time during the twenty year period or following its expiration. If the twenty year term is not deleted at the end of the term, the permit may either be cancelled or amended with a new term limitation of up to twenty years. Permit No. 2577A-2 may also be cancelled for nonconstruction, forfeiture, abandonment or three permit violations pursuant to SDCL 46-1-12, 46-5-37.1 and ARSD 74:02:01:37.
4. City of Box Elder shall report annually the amount of water diverted from the Madison Aquifer.

See report on application for additional information.

Garland Erbele, Chief Engineer  
December 19, 2012

REPORT TO THE CHIEF ENGINEER  
ON  
WATER PERMIT APPLICATION NO. 2577A-2  
CITY OF BOX ELDER  
DECEMBER 15, 2012

Water Permit Application No. 2577A-2 proposes to reinstate Water Permit No. 2577-2 which appropriated 290 acre-feet annually (ac-ft/yr) at a maximum diversion rate of 0.67 cubic feet of water per second (cfs) from the Madison aquifer. Water Permit No. 2577-2 authorized diversions from one well approximately 4,350 feet deep located in the NW¼ NE¼ Section 34, T2N-R8E for municipal use. Water Permit No. 2577-2 was approved May 8, 2006, and the project was to be constructed before May 8, 2012, with water placed to beneficial use by May 8, 2015. Water Permit No. 2577-2 was cancelled on October 3, 2012.

Application No. 2577A-2 to reinstate Permit No. 2577-2 is made pursuant to SDCL 46-2A-8.1, which allows for reinstatement with a new priority date, if unappropriated water is available and construction necessary to put water to beneficial use was not completed pursuant to § 46-2A-8 or 46-5-26.-2

**AQUIFER: Madison aquifer (MDSN)**

**GEOLOGY AND AQUIFER CHARACTERISTICS:**

The Madison aquifer is a major regional aquifer that underlies parts of Montana, North Dakota, South Dakota, Wyoming and Canada (figure 1). The aquifer underlies most of western South Dakota and parts of Eastern South Dakota.

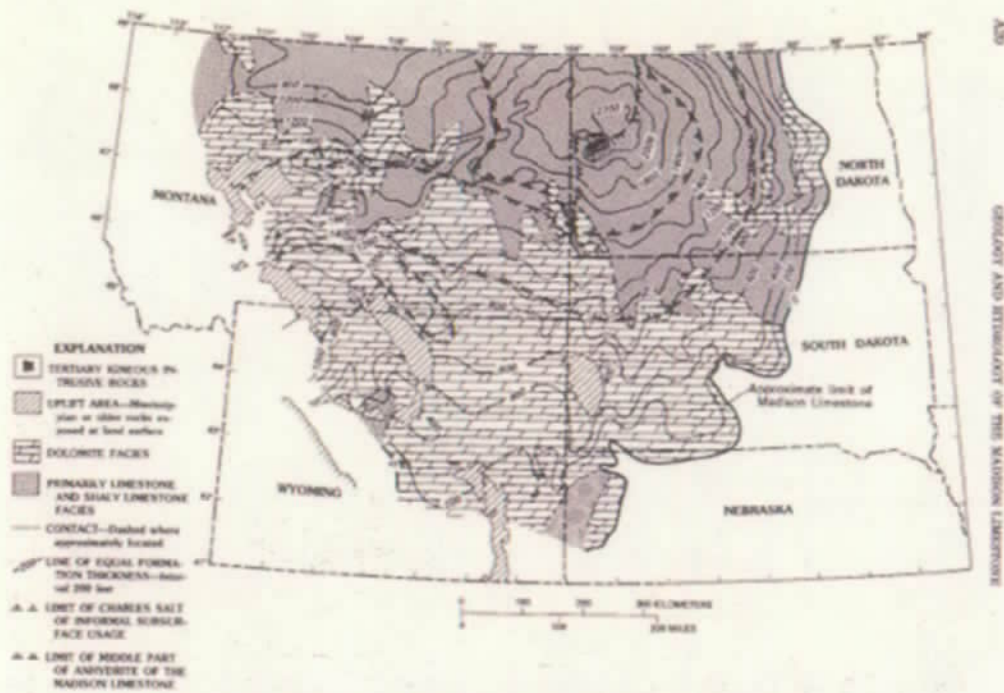


FIGURE 11.—Thickness and rock facies of the Madison Limestone and equivalent rocks (Lower and Upper Mississippian).

Figure 1. Areal extent of the Madison aquifer. Modified from Peterson (1984)

The Madison aquifer contains an estimated 644,827,200 acre-feet of recoverable water in storage in western South Dakota (Allen and others, 1985) and 51,512,300 acre-feet of recoverable water in storage in eastern South Dakota (Hedges and others, 1982).

The Madison aquifer occurs within the Mississippian aged Madison Limestone which is locally known as the Pahasapa Limestone. The top of the Madison Limestone is expected to be approximately 4,000 feet below grade at this proposed well site (Carter and Redden, 1999a). The Madison Limestone is a massive limestone and dolomite with relatively low primary permeability and porosity however, extensive secondary porosity and permeability does occur locally within the Madison. The average porosity of the Madison is estimated to be 11% and the effective porosity from which recoverable water can be obtained by wells is assumed to be 5% (Rahn, 1979). The upper portion of the Madison Limestone in particular is karstic with caves, solution collapse features and enlarged conduits. Long and Putnam (2002) consider the upper 100-200 feet of the Madison Limestone the "Karstic Madison aquifer". The lower portion of the Madison Formation and the underlying Englewood Formation generally form a lower confining zone to the aquifer (Strobel and others, 1999). The Minnelusa Formation unconformably overlies the Madison aquifer and generally serves as an upper confining layer to the Madison. However, fracturing and weathering may result in hydraulic connections in some areas (Putnam and Long, 2009). The Madison is under confined conditions at the well site proposed by this application and the static water level of the well is estimated to be around 550 feet below grade (Strobel and others, 2000).

A number of high yield wells, some capable of producing up to 2,500 gal/min, have been developed in the Madison aquifer where enhanced porosity and permeability features are favorable (Putnam and Long, 2009). The Rapid City area is characterized as having undergone extensive tectonic activity (Long and Putnam, 2002). The Madison is generally considered an excellent aquifer in terms of its potential to supply good quality water to relatively productive wells, especially near the outcrop (recharge area). This well site is located about nine miles east of the Madison outcrop (Strobel and others, 1999).

#### **SDCL 46-2A-8.1**

Pursuant to SDCL 46-2A-9, the Water Management Board may reinstate any water permit with a priority date after March 31, 1977, if unappropriated water is available and construction necessary to put water to beneficial use was not completed pursuant to § 46-2A-8 or 46-5-26. This report will address availability of unappropriated water from the Madison aquifer.

#### **WATER AVAILABILITY:**

The probability of unappropriated water available for appropriation can be evaluated by considering SDCL 46-6-3.1 which requires that:

"No application to appropriate groundwater may be approved if, according to the best information reasonably available, it is probable that the quantity of water withdrawn annually from a groundwater source will exceed the quantity of the average estimated annual recharge of water to the groundwater source."

#### **Water Balance:**

Recharge to the Madison aquifer occurs through streamflow losses and direct infiltration of precipitation at the outcrop area and potentially from upward leakage from lower aquifers.

Recharge to the Madison aquifer in South Dakota has been estimated to range from 140,000 to 400,000 acre-feet per year (Woodward-Clyde, 1981). Woodward-Clyde however, defined the Madison aquifer as everything between the Precambrian and the Cretaceous shales. As part of the Black Hills Hydrology Study, the average annual recharge to the Madison aquifer from 1931-1998 was estimated to be approximately 137,000 ac-ft/yr (Carter and others, 2001a).

Outflow from the Madison occurs primarily through springflow, regional outflow and water use. In addition, although the lower portion of the Minnelusa Formation generally inhibits the movement of water from the Madison aquifer to the Minnelusa aquifer, faults, fractures and collapse features may allow for movement of water between the two aquifers in some areas.

The high cost of Madison wells, except very near the outcrop, and the availability of groundwater from shallower sources, has limited domestic development from the aquifer. Carter and others, (2001b) estimate "Self-supply Domestic" and "Livestock Watering" only account for approximately 2.25% of the water use from the Madison aquifer. In general, well withdrawals from the Madison are for uses which require water rights/permits. The majority of the water rights/permits from the aquifer are from Butte, Lawrence, Meade, Pennington and Fall River Counties. The Madison supplies water for irrigation, geothermal, industrial, and commercial use. However, by far the major use of the aquifer is for water distribution systems (suburban housing development and municipal use). The cities of Spearfish, Belle Fourche, Sturgis, Rapid City, Box Elder, and Edgemont all depend on water from wells completed into the Madison aquifer.

There are currently a total of 163 appropriations, two pending applications, plus one deferred application from the Madison aquifer in South Dakota (Water Rights, 2012b). Appropriations are shown in table 1.

| USE TYPE                     | NO. PERMITS |
|------------------------------|-------------|
| Commercial                   | 12          |
| Domestic                     | 4           |
| Future Use                   | 7           |
| Geothermal                   | 2           |
| Industrial                   | 11          |
| Institutional                | 2           |
| Irrigation                   | 28          |
| Municipal                    | 36          |
| Recreation                   | 1           |
| Rural Water System           | 15          |
| Suburban Housing Development | 45          |

Table 1. Appropriations from the Madison aquifer in South Dakota

Assuming that: (1) future use permits will be fully developed; (2) appropriations with a specified annual volume limitation will divert to their maximum limit; and (3) appropriations limited by diversion rate only, will be used at 60 percent of full time usage at their maximum diversion rate; the appropriations represent a potential maximum annual withdrawal from the Madison aquifer of approximately 55,000 ac-ft/yr. The assumptions used to estimate the potential maximum withdrawal from the aquifer are extremely conservative and represent a "worst case scenario."

Almost all water use from the Madison aquifer is from the Black Hills area. Withdrawals from all wells completed into the Madison aquifer in the Black Hills of South Dakota and Wyoming, were estimated to average 12,310 acre-feet annually from 1987-1996 (Carter and others, 2001b). The “potential maximum annual withdrawal” from the aquifer for 1996, using the assumptions given above for the appropriations in 1996 is 35,831 ac-ft/yr. Applying the 1996 “potential maximum annual withdrawal” to the estimated average annual use ratio to the 2012 “potential maximum annual use” (55,000 ac-ft/yr), will would result in a use of less than 20,000 ac-ft/yr.

The quantities of both the average annual recharge and the average annual use for the Madison aquifer are both small percentages of the amount of water stored in the Madison aquifer so the aquifer can actually withstand several years of drought conditions with only minimal impact to wells or springs. Comparison of average annual recharge and average annual withdrawal estimates for the Madison aquifer indicate that unappropriated water is available from the Madison aquifer. The simple water budget comparing the estimated average annual recharge and the potential withdrawal by existing wells and current appropriations is not intended to suggest that all of the water that is in storage in the Madison or that all of the recharge to the aquifer is available for this appropriation, merely to demonstrate that in general the Madison aquifer is an immense resource that is relatively untapped.

### Localized Hydrologic Budget

On a more localized scale, Long and Putnam (2002) evaluated an area which includes Rapid City and the surrounding area, and Putnam and Long (2009) modeled an area consisting of approximately 1,000 square miles centered just west of the well site proposed by Application No. 2577-2. The estimated water-budget components for the Madison aquifer under steady-state conditions are shown in table 2.

| Madison Water-budget rate (cfs) |                                      |             |
|---------------------------------|--------------------------------------|-------------|
|                                 | Component                            | Total       |
|                                 |                                      |             |
| Inflow                          | Streamflow recharge                  | 36.2        |
|                                 | Areal Recharge                       | 15.1        |
|                                 | Upward leakage from Deadwood aquifer | 6.3         |
|                                 | <b>Total Inflow</b>                  | <b>57.6</b> |
| Outflow                         | Springflow                           | 32.8        |
|                                 | Water use                            | 6.7         |
|                                 | Regional outflow                     | 12.2        |
|                                 | <b>Total Outflow</b>                 | <b>51.7</b> |

Table 2. Estimated water-budget components for the Madison aquifer for steady-state simulation modified from Putnam and Long (2009).

In addition to the components identified in table 3, there may also be leakage from the Madison aquifer to the Minnelusa aquifer in this area. The average net leakage from the Madison to the Minnelusa was estimated to be 8 cfs for a somewhat similar area (Long and Putnam, 2002).

Considering increased well withdrawals can capture water from the regional groundwater outflow, leakage to the Minnelusa aquifer, leakage from the Deadwood aquifer and springflow components of the localized hydrologic budget, there is a reasonable probability that withdrawals from the area will not exceed recharge to the area and unappropriated water is available for this appropriation.

**Observation Well Data:**

The Water Rights Program monitors 26 observation wells completed into the Madison aquifer in the Black Hills area (Water Rights, 2012a). Long-term water level declines are not apparent from any of the Water Rights' Madison aquifer observation wells. Observation well data suggest that at the existing level of development, natural influences dominate the water levels of the aquifer and the effects of pumping as yet are not obvious. The nearest Water Rights' Madison aquifer observation well is over six miles from this well site.

**TERM LIMITATION:**

SDCL 46-2A-20 requires that "... no water permit for construction of works to withdraw water from the Madison formation in Butte, Fall River, Custer, Lawrence, Meade and Pennington counties may be issued for a term of more than twenty years, unless the water management board determines, based upon the evidence presented at the hearing that:

- (1) Sufficient information is available to determine whether any significant adverse hydrologic effects on the supply of water in the Madison formation would result if the proposed withdrawal were approved; and
- (2) The information, whether provided by the applicant or by other means, show that there is a reasonable probability that issuance of the proposed permit would not have a significant adverse effect on nearby Madison formation wells and springs."

Pursuant to SCL 46-2A-21, "at the end of the twenty-year limitation, the board may cancel a permit or amend the permit with a new term limitation of up to twenty years, if the board is unable to make a finding after notice and hearing that sufficient information is available to delete the term."

Although the criteria for approval of a water permit established by SDCL 46-2A-9 are met, (i.e., there is a reasonable probability that unappropriated water is available for the applicant's proposed use, and this proposed diversion can be developed without unlawful impairment of existing rights) evidence is not available to justify issuing this permit without a term limitation of 20 years.

**CONCLUSIONS:**

1. The Madison aquifer is a major regional aquifer and a viable source of water for this proposed appropriation.
2. This application proposes to appropriate 0.67 cubic feet of water per second.
3. There is a reasonable probability that unappropriated water is available in the Madison aquifer to supply this appropriation.
4. Information is not available to justify issuing these permits without a term limitation of 20 years.
5. Following notice and a public hearing, the Water Management Board can cancel this permit or amend it with a new term limitation after twenty years.



Ken Buhler  
SD DENR-Water Rights Program



## REFERENCES:

- Allen, J.C., Iles, D.L., and Petres, A.K., 1985, Analysis of Groundwater and Streamflow Data, Western Dakotas Region of South Dakota, Tasks 3A.B.C. and 4A.B: Groundwater Resources Inventory: US Army Corps of Engineers Contract DAWC 45-82-C-0151, SD DENR-Geological Survey, Vermillion SD
- Carter, J.M., Driscoll, D.G., and Hamade, G.R., 2001a, Estimated Recharge to the Madison and Minnelusa Aquifers in the Black Hills Area, South Dakota and Wyoming, Water Years 1931-98: U.S. Geological Survey Water-Resources Investigations Report 00-4278, 66 p
- Carter, J.M., Driscoll, D.G., and Hamade, G.R., 2001b, Hydrologic Budgets for the Madison and Minnelusa Aquifers, Black Hills of South Dakota and Wyoming, Water Years 1987-96: U.S. Geological Survey Water-Resources Investigations Report 01-4119, 53 p
- Greene, E.A., 1993, Hydraulic Properties of the Madison Aquifer System in the Western Rapid City Area, South Dakota: U.S. Geological Survey Water-Resources Investigations Report 93-4008, 56 p.
- Hedges, L.S., Burch, S.L., Iles, D.L., Barari, R.A., and Schoon, R.A., 1982, Evaluation of Ground-Water Resources Eastern South Dakota and Upper Big Sioux River, South Dakota and Iowa, Task 1: Bedrock Topography [Sic.] and Distribution, Task 2: Extent of Aquifers, Task 3: Ground-Water Storage, Task 4: Computerized Data Base. Prepared for U.S. Army Corps of Engineers, contract DACW 45-80-C-0185
- Long, A.J., and Putnam, L.D., 2002, Flow-System Analysis of the Madison and Minnelusa Aquifers in the Rapid City Area, South Dakota- Conceptual Model: U.S. Geological Survey Water Resources Investigations Report 02-4185, 100 p, 3 pls
- Peterson, J.A., 1984, Stratigraphy and Sedimentary Facies of the Madison Limestone and Associated Rocks in Parts of Montana, Nebraska, North Dakota, South Dakota, and Wyoming: U.S. Geological Survey Professional Paper 1273-A, 34 p.
- Putnam, L.D., and Long, A.J., 2009, Numerical Groundwater-flow Models of the Minnelusa and Madison Hydrogeologic Units in the Rapid City Area, South Dakota: U.S. Geological Survey Scientific Investigations Report 2009-5205, 81 p.
- Rahn, P.H., and Gries, J.P., 1973, Large Springs in the Black Hills, South Dakota and Wyoming: S.D. Geological Survey Report of Investigations No. 107, 46 p., 4 pls
- Rahn, P.H., 1979, Ground Water Resources of Western South Dakota: U.S. Army Corps of Engineers, SDSM&T Project #2533
- Redden, J.A., and DeWitt, Ed, 2008, Maps Showing Geology, Structure, and Geophysics of the Central Black Hills, South Dakota: U.S. Geological Survey Scientific Investigations Map 2777, 44-p. pamphlet, 2 sheets.

- Strobel, M.L., Jarrell, G.J., Sawyer, J.F., Schleicher, J.R., and Fahrenbach, M.D., 1999, Distribution of Hydrogeologic Units in the Black Hills Area, South Dakota: U.S. Geological Survey Hydrologic Investigations Atlas HA-743, 3 sheets, scale 1:100,000
- Water Rights Program, 1992, "Inspection of Permit No. 2085-2" in Water Right No. 2773-2, SD DENR-Water Rights Program, Joe Foss Building, Pierre, SD 57501
- Water Rights Program, 1995, Findings of Fact, Conclusions of Law and Final Decision in the Matter of Water Permit Application No. 2313-2, Coca-Cola Bottling Company of The Black Hills, SD DENR-Water Rights Program, Joe Foss Building, Pierre, SD 57501
- Water Rights, 2007, "Future Use Permit Application 2585-2", SD DENR-Water Rights Program, Joe Foss Building, Pierre, SD
- Water Rights Program, 2008, "Report for Water Permit Application No. 2631-2", Unpublished Report in Water Permit No. 2631-2, SD DENR-Water Rights Program, Joe Foss Building, Pierre, SD 57501
- Water Rights Program, 2012a, Observation Well Files, DENR-Water Rights Program, Joe Foss Building, Pierre, SD 57501
- Water Rights Program, 2012b, Water Permit/Right Files, DENR-Water Rights Program, Joe Foss Building, Pierre, SD 57501
- Water Rights Program, 2012c, Well Completion Report Files, DENR-Water Rights Program, Joe Foss Building, Pierre, SD 57501
- Woodward Clyde Consultants, 1981, Well Field Hydrology Technical Report, for the ETSI Coal Slurry Pipeline Project, U.S. Dept. of the Interior, Bureau of Land Management

# Affidavit of Publication

Jan. 3  
L20752111

## NOTICE OF APPLICATION NO. 2577A-2 to Reinstate Water

### Permit No. 2577-2

Notice is given that the City of Box Elder, Al Todd, Public Works Director, 420 Villa Dr, Box Elder SD 57719 has filed an application for a water permit to reinstate Permit No. 2577-2. Permit No. 2577-2 appropriates 0.67 cubic feet of water per second (290 acre-feet annually) from one well to be completed into the Madison Aquifer (approximately 4350 feet deep) located in NW 1/4 NE 1/4 Section 34-T2N-R8E for municipal use. The permit was approved May 8, 2006, and the project was to be completed May 8, 2011, with water being put to beneficial use by May 8, 2015. Application No. 2577A-2 proposes to reinstate Water Permit No. 2577-2 since the project has not been completed.

Application No. 2577A-2 to reinstate Permit No. 2577-2 is made pursuant to SDCL 46-2A-8.1, which allows for reinstatement with a new priority date, if unappropriated water is available when construction, necessary to put water to beneficial use, is not completed within five years of approval of the permit.

Pursuant to SDCL 46-2A-2, the Chief Engineer recommends APPROVAL of Application No. 2577A-2 subject to a 20-year term limitation because although evidence is not available to justify issuing the permit without a 20 year term limitation, there is reasonable probability that there is unappropriated water available. In accordance with SDCL 46-2A-23, the Chief Engineer will act on this application, as recommended, unless a petition is filed opposing the application or the applicant files a petition contesting the Chief Engineer's recommendation. 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.

Any person interested in opposing or supporting this application or recommendation must file a written petition with BOTH the applicant and Chief Engineer. The applicant must file a petition if contesting the Chief Engineer's recommendation. The Chief Engineer's address is "Water Rights Program, Foss Building, 523 E Capitol, Pierre SD 57501 (605 773-3352)" and the applicant's mailing address is given above. A petition filed by either an interested person or the applicant must be filed by January 14, 2013.

The petition may be informal, but must include a statement describing the petitioner's interest in the application, the petitioner's reasons for opposing or supporting the application, and the signature and mailing address of the petitioner or the petitioner's legal counsel, if legal counsel is obtained. Contact Eric Gronlund at the above Water Rights Program address to request copies of information pertaining to this application. Steven M. Pirner, Secretary, Department of Environment and Natural Resources.

(Published once at the total approximate cost of \$64.38).

STATE OF SOUTH DAKOTA

County of Pennington

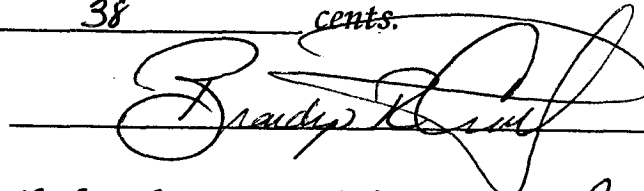
SS:

RECEIVED

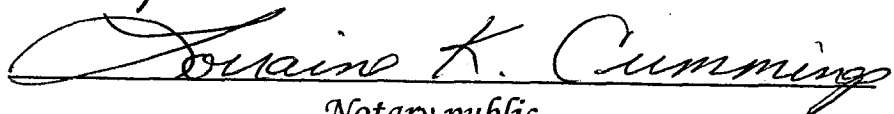
JAN - 9 2013

WATER RIGHTS  
PROGRAM

Brandyn Crawford being first duly sworn, upon his/her oath says: That he/she is now and was at all time hereinafter mentioned, an employee of the RAPID CITY JOURNAL, a corporation of Rapid City, South Dakota, the owner and publisher of the RAPID CITY JOURNAL, a legal and daily newspaper printed and published in Rapid City, in said County of Pennington, and has full and personal knowledge of all the facts herein stated as follows: that said newspaper is and at all of the times herein mentioned has been a legal and daily newspaper with a bonafide paid circulation of at least Two Hundred copies daily, and has been printed and published in the English language, at and within an office maintained by the owner and publisher thereof, at Rapid City, in said Pennington County, and has been admitted to the United States mail under the second class mailing privilege for at least one year prior to the publication herein mentioned; that the advertisement, a printed copy of which, taken from said Rapid City Journal, the paper in which the same was published, is attached to this sheet and made a part of this affidavit, was published in said paper once each week for one successive week, the first publication there of being on the 3<sup>rd</sup> day of January that the fees charged for the publication there of are 64 dollars and 38 cents.



Subscribed and sworn to before me this Ninth day of January, 2013.



Notary public

Dec. 18, 2016

My commission expires





DEPARTMENT of ENVIRONMENT  
and NATURAL RESOURCES

PMB 2020  
JOE FOSS BUILDING  
523 EAST CAPITOL  
PIERRE, SOUTH DAKOTA 57501-3182

[denr.sd.gov](http://denr.sd.gov)

December 20, 2012

Rapid City Journal  
PO Box 450  
Rapid City SD 57709

ATTENTION: Legal Public Notice

Enclosed is a Notice on Application No. 2577A-2 to Appropriate Water. Please publish the notice once on January 3, 2013. The text of the notice can be e-mailed to your paper by contacting Karen Schlaak at (605) 773-3352.

The applicant must verify to you that the notice is to be published and arrange for payment. **Please BILL the APPLICANT for the cost of publication.** The APPLICANT is City of Box Elder, c/o Al Todd, 420 Villa Dr., Box Elder SD 57719 (Ph # 605-923-1404).

**Please send the Water Rights Program an affidavit or the enclosed Proof of Publication form immediately.**

The applicant pays the cost of publication, but the Water Rights Program records require an affidavit or Proof of Publication. Delays in receiving the affidavit can be costly to the applicant.

Sincerely,

  
Eric Gronlund  
Natural Resources Engineer  
605 773-3352

enclosures



**DEPARTMENT of ENVIRONMENT  
and NATURAL RESOURCES**

PMB 2020  
JOE FOSS BUILDING  
523 EAST CAPITOL  
PIERRE, SOUTH DAKOTA 57501-3182

denr.sd.gov

**NOTE: TO BE SURE OF PUBLICATION ON  
THE CORRECT DATE, CONTACT  
THE NEWSPAPER(S) RIGHT AWAY.**

December 20, 2012

City of Box Elder  
Al Todd  
420 Villa Dr  
Box Elder SD 57719

Dear Mr. Todd:

Water Permit Application No. 2577A-2 for municipal use has been examined and found to comply with the South Dakota Water Laws and applicable rules. A notice has been sent to the Rapid City Journal printed at Rapid City SD (Ph # 605-394-8300). You will need to contact the newspaper(s) 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(s) to authorize publication of your Notice and to arrange for payment. Early contact with the paper(s) 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,

Eric Gronlund  
Natural Resources Engineer  
(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.

Instruction to Newspaper - Publish the Notice on January 3, 2013. The applicant is responsible for payment. The text of the notice can be e-mailed to your paper by contacting Karen Schlaak at (605) 773-3352 or email: Karen.schlaak@state.sd.us.

---

NOTICE OF APPLICATION NO. 2577A-2 to Reinstate Water Permit No. 2577-2

Notice is given that the City of Box Elder, Al Todd, Public Works Director, 420 Villa Dr, Box Elder SD 57719 has filed an application for a water permit to reinstate Permit No. 2577-2. Permit No. 2577-2 appropriates 0.67 cubic feet of water per second (290 acre-feet annually) from one well to be completed into the Madison Aquifer (approximately 4350 feet deep) located in NW 1/4 NE 1/4 Section 34-T2N-R8E for municipal use. The permit was approved May 8, 2006, and the project was to be completed May 8, 2011, with water being put to beneficial use by May 8, 2015. Application No. 2577A-2 proposes to reinstate Water Permit No. 2577-2 since the project has not been completed.

Application No. 2577A-2 to reinstate Permit No. 2577-2 is made pursuant to SDCL 46-2A-8.1, which allows for reinstatement with a new priority date, if unappropriated water is available when construction, necessary to put water to beneficial use, is not completed within five years of approval of the permit.

Pursuant to SDCL 46-2A-2, the Chief Engineer recommends APPROVAL of Application No. 2577A-2 subject to a 20-year term limitation because although evidence is not available to justify issuing the permit without a 20 year term limitation, there is reasonable probability that there is unappropriated water available. In accordance with SDCL 46-2A-23, the Chief Engineer will act on this application, as recommended, unless a petition is filed opposing the application or the applicant files a petition contesting the Chief Engineer's recommendation. 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.

Any person interested in opposing or supporting this application or recommendation must file a written petition with BOTH the applicant and Chief Engineer. The applicant must file a petition if contesting the Chief Engineer's recommendation. The Chief Engineer's address is "Water Rights Program, Foss Building, 523 E Capitol, Pierre SD 57501 (605 773-3352)" and the applicant's mailing address is given above. A petition filed by either an interested person or the applicant must be filed by January 14, 2013.

The petition may be informal, but must include a statement describing the petitioner's interest in the application, the petitioner's reasons for opposing or supporting the application, and the signature and mailing address of the petitioner or the petitioner's legal counsel, if legal counsel is obtained. Contact Eric Gronlund at the above Water Rights Program address to request copies of information pertaining to this application. Steven M. Pirner, Secretary, Department of Environment and Natural Resources.

Published once at the total approximate cost of\_\_\_\_\_.



**DEPARTMENT of ENVIRONMENT  
and NATURAL RESOURCES**

PMB 2020  
JOE FOSS BUILDING  
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PIERRE, SOUTH DAKOTA 57501-3182

denr.sd.gov

**FEB 08 2013**

City of Box Elder  
420 Villa Dr  
Box Elder SD 57719

Dear Mr. Griffiths:

Enclosed is Water Permit No. 2577A-2 authorizing construction of your water diversion system and beneficial use of the water, not exceeding the limits as specified in the Water Permit.

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,

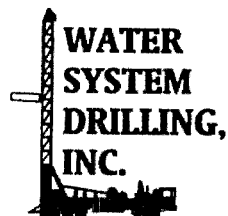
Garland Erbele, Chief Engineer  
Water Rights Program  
(605) 773-3352

enclosures

City, State, Zip: Box Elder, SD 57719

Date: May 10, 2016





## Scott Heimer

6300 Hitt Blvd. · P.O. Box 368 · Gillette, WY 82717-0368

Phone: (307) 686-1747 · Fax (307) 687-0408

### Box Elder #5 Well

#### Cuttings Log

| Footage |   | Cuttings                                                                                                                                                                | Formation   |
|---------|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| 0       | - | 8 Brown & Yellow Clay                                                                                                                                                   |             |
| 8       | - | 370 Dark Green & Gray Shale                                                                                                                                             | Pierre      |
| 370     | - | 450 Black Shale                                                                                                                                                         |             |
| 450     | - | 808 Dark Gray Shale, Siltstone, Calcite                                                                                                                                 | Niobrara    |
| 808     | - | 840 Dark Green, Gray Shale & Limestone                                                                                                                                  |             |
| 840     | - | 900 Dark Gray, Black Shale with Calcite                                                                                                                                 | Greenhorn   |
| 900     | - | 1525 Dark Gray Shale & Calcite                                                                                                                                          | Mowry       |
| 1525    | - | 1554 Gray & Pink Sandstone & Siltstone                                                                                                                                  |             |
| 1554    | - | 1806 Dark Gray, Black Silty Shale                                                                                                                                       | Skull Creek |
| 1806    | - | 1920 Gray, Light Gray Shale, Siltstone<br>Sandstone, & Calcite                                                                                                          |             |
| 1920    | - | 1970 Dark Shale with Sandstone                                                                                                                                          | Inyan Kara  |
| 1970    | - | 2050 Dark Shale with Siltstone                                                                                                                                          |             |
| 2050    | - | 2083 Light Shale with Siltstone                                                                                                                                         |             |
| 2083    | - | 2215 Gray Firm Sandstone                                                                                                                                                |             |
| 2215    | - | 2240 Light Gray Siltstone                                                                                                                                               |             |
| 2240    | - | 2285 Sandstone                                                                                                                                                          |             |
| 2285    | - | 2335 Light Gray Shale with Limestone                                                                                                                                    |             |
| 2335    | - | 2405 Siltstone, Limestone, Shale                                                                                                                                        |             |
| 2405    | - | 2480 Sandstone                                                                                                                                                          | Sundance    |
| 2480    | - | 2595 Gray, Tan Shale, Soft Clay,<br>Yellow & Pale Red Silty Shale                                                                                                       |             |
| 2595    | - | 3130 Red-Brown Siltstone, Shale<br>Calcite, Silt                                                                                                                        | Spearfish   |
| 3130    | - | 3173 Gray, Tan, Pink Limestone<br>Sandy Siltstone                                                                                                                       | Minnekata   |
| 3173    | - | 3255 Red-Brown Siltstone, Calcite<br>Silty Shale                                                                                                                        | Opeche      |
| 3255    | - | 3935 Dolomite, Light Gray, Pink, White<br>Limestone, Dark Gray, Green Shale<br>Black with Calcite, Siltstone, Brown-<br>Red Sandstone, Fine Grain, Gray Pink<br>& White | Minnelusa   |
| 3935    | - | 3954 Limestone Buff, Tan, White                                                                                                                                         | Madison     |
| 3954    | - | 3970 Shale, Clay, Green Gray                                                                                                                                            |             |
| 3970    | - | 4355 Limestone, Pink, Tan, Light Gray<br>to Green Granular Limestone                                                                                                    |             |
| 4355    | - | 4370 Very Pink, Orange Granular Limestone<br>with Siltstone                                                                                                             | TD          |



## Cementing Service Report

9208628

|                                           |                                                   |                         |                               |                                          |
|-------------------------------------------|---------------------------------------------------|-------------------------|-------------------------------|------------------------------------------|
| Client Name<br>Water System Drilling Inc. | Well Name<br>Box Elder                            | Rig                     | Job Date<br>December 11, 2015 | Call Sheet<br>1063185                    |
| Client Representative<br>Mr. Scott Heimer | Surface Well Location<br>Get Well Name and Legals | Down Hole Well Location | Job Type<br>Surface Casing    | Lead Supervisor<br>Merkel, Scott (18103) |

## Well Profile

|                                               |                   |                      |                          |                                |                    |             |             |                   |                 |
|-----------------------------------------------|-------------------|----------------------|--------------------------|--------------------------------|--------------------|-------------|-------------|-------------------|-----------------|
| Well Type                                     | Other             |                      |                          |                                |                    |             |             |                   |                 |
| Maximum Treating Pressure (psi):              | ---               |                      |                          |                                |                    |             |             |                   |                 |
| Predicted Bottom Hole Static Temperature (°F) | 100.00            | @                    | --                       |                                |                    |             |             |                   |                 |
| Bottom Hole Circulating Temperature (°F):     | 90.00             | @                    | --                       |                                |                    |             |             |                   |                 |
| Bottom Hole Logged Temperature (°F):          | ---               | @                    | --                       |                                |                    |             |             |                   |                 |
| Open Hole                                     |                   |                      |                          |                                |                    |             |             |                   |                 |
| <u>Size (in)</u>                              | <u>Excess (%)</u> | <u>TMD From (ft)</u> | <u>TMD To (ft)</u>       | <u>TVD From (ft)</u>           | <u>TVD To (ft)</u> |             |             |                   |                 |
| 14.750                                        | 60.000            | 0.000                | 1,500.000                | --                             | --                 |             |             |                   |                 |
| Casing                                        |                   |                      |                          |                                |                    |             |             |                   |                 |
| <u>Size</u>                                   | <u>Weight</u>     | <u>Grade</u>         | <u>Collapse Pressure</u> | <u>Internal Yield Pressure</u> | <u>Capacity</u>    | <u>I.D.</u> | <u>O.D.</u> | <u>Depth From</u> | <u>Depth To</u> |
| <u>(in)</u>                                   | <u>(lb/ft)</u>    |                      | <u>(psi)</u>             | <u>(psi)</u>                   | <u>(bbl)</u>       | <u>(in)</u> | <u>(in)</u> | <u>(ft)</u>       | <u>(ft)</u>     |
| 10.750                                        | 40.500            | ---                  | --                       | --                             | --                 | --          | --          | 0.0               | 1,550.0         |

## Products

## Stage 1

From Depth (ft): 0

To Depth (ft): 1500

## Acids/Blends/Fluids :

Lead 1: 305 Sacks of Control Set C, Density = 11.5 lb/gal, Volume Pumped = 158 (bbl)  
Water Temperature(°F) = 60, Bulk Temperature(°F) = 35, Slurry Temperature(°F) = 65  
+ 1 % of SCA-6 (Preblend),  
+ 1 % of SCA-1 (Preblend),  
+ 1 % of CaCl2 (Preblend),  
+ 0.25 lb/sack of LCL-7 (Preblend)

Tail: 240 Sacks of 0-1-0 G, Density = 15.6 lb/gal, Volume Pumped = 49.5 (bbl)  
Water Temperature(°F) = 60, Bulk Temperature(°F) = 35, Slurry Temperature(°F) = 65  
+ 1 % of CaCl2 (Preblend),  
+ 0.25 % of LCL-7 (Preblend)

## Fluid &amp; Cement Data

Expected Cement Top: --

## Wellbore Fluid

| Fluid Type      | Viscosity (cP) | Density (lbs/gal) | Yield Point (psi) | Temperature (°F) | Recorded@          |
|-----------------|----------------|-------------------|-------------------|------------------|--------------------|
| Water Based Mud | --             | --                | --                | --               | Dec 10, 2015 17:03 |
| Water           | --             | --                | --                | --               | Dec 10, 2015 17:04 |

## Attachment &amp; Tools

## Down Hole Tools

| Tool Type    | Depth (ft) | Supplier    |
|--------------|------------|-------------|
| Float Collar | 1,511.000  | Third Party |

## Tubular Plugs

| Tubular Plug Type | Size (in) | Supplier |
|-------------------|-----------|----------|
| Rubber Top        | 10.750    | Client   |



## Cementing Service Report

9208628

## Units &amp; Personnel

## Units

| Truck Unit No. | Main Type | Sub Type | Tractor Unit No. | Main Type | Sub Type         | Time On Location | Time Off Location |
|----------------|-----------|----------|------------------|-----------|------------------|------------------|-------------------|
| 444007         | TRAILER   | Iron     | 201385           | PICKUP    | 1 Ton            | 12/11/2015 10:45 | 12/12/2015 02:45  |
| 445030         | TRAILER   | SCM Twin | 745030           | TRACTOR   | Tandem - Tractor | 12/11/2015 10:45 | 12/12/2015 02:45  |
| 446174         | TRAILER   | Bulker   | 746174           | TRACTOR   | Tandem - Tractor | 12/11/2015 10:45 | 12/12/2015 02:45  |

## Crew and Bonuses

| Employee                 | Start Shift      | End Shift        | Second Start Shift | Second End Shift |
|--------------------------|------------------|------------------|--------------------|------------------|
| Merkel, Scott (18103)    | 12/11/2015 22:45 | 12/12/2015 02:45 |                    |                  |
| Bradshaw, Bryant (28992) | 12/11/2015 22:45 | 12/12/2015 02:45 |                    |                  |
| Williams, Ronnie (27131) | 12/11/2015 22:45 | 12/12/2015 02:45 |                    |                  |
| Taylor, Todd (29332)     | 12/11/2015 22:45 | 12/12/2015 02:45 |                    |                  |



## Cementing Service Report

9208628

## Treatment Reports &amp; Remarks

## Volume To Formation

Stage/Plug/Treatment Interval Name

Volume To Formation (bbl)

Stage1

## Treatment Report

| Event #             | Event Time         | Event Description       | Fluid Type       | Rate<br>(bbl/min) | Tubular Pressure<br>(psi) | Annular Pressure<br>(psi) | Stage Volume<br>(bbl) | Total Volume<br>(bbl) |
|---------------------|--------------------|-------------------------|------------------|-------------------|---------------------------|---------------------------|-----------------------|-----------------------|
| 1                   | Dec 11, 2015 22:45 | Arrive On Location      |                  | --                | --                        | --                        | --                    | 0.00                  |
| 2                   | Dec 11, 2015 23:00 | Crew Briefing (Rig in)  |                  | --                | --                        | --                        | --                    | 0.00                  |
| 3                   | Dec 11, 2015 23:45 | Rig in Complete         |                  | --                | --                        | --                        | --                    | 0.00                  |
| 4                   | Dec 12, 2015 00:15 | Crew Briefing (Pre Job) |                  | --                | --                        | --                        | --                    | 0.00                  |
| 5                   | Dec 12, 2015 00:20 | Pressure Test Start     |                  | --                | --                        | --                        | --                    | 0.00                  |
| 6                   | Dec 12, 2015 00:21 | Pressure Test Complete  |                  | --                | --                        | --                        | --                    | 0.00                  |
| 7                   | Dec 12, 2015 00:27 | Pump Preflush           | Water            | 4.00              | 150.0                     | --                        | 10.00                 | 0.00                  |
| 8                   | Dec 12, 2015 00:29 | Mix Cement              | Control Set<br>C | 5.20              | 180.0                     | --                        | 158.00                | 0.00                  |
| Remarks: Yield=2.91 |                    |                         |                  |                   |                           |                           |                       |                       |
| 9                   | Dec 12, 2015 01:00 | Mix Cement              | 0-1-0 G          | 4.00              | 100.0                     | --                        | 49.50                 | 0.00                  |
| Remarks: Yield=1.16 |                    |                         |                  |                   |                           |                           |                       |                       |
| 10                  | Dec 12, 2015 01:15 | Stop                    |                  | --                | --                        | --                        | --                    | 0.00                  |
| 11                  | Dec 12, 2015 01:16 | Drop Plug               |                  | --                | --                        | --                        | --                    | 0.00                  |
| 12                  | Dec 12, 2015 01:18 | Displace Plug           | Water            | 5.00              | 450.0                     | --                        | 138.00                | 0.00                  |
| 13                  | Dec 12, 2015 01:48 | Decrease Pump Rate      | Water            | 2.00              | 380.0                     | --                        | 10.00                 | 0.00                  |
| 14                  | Dec 12, 2015 01:54 | Bump Plug               | Water            | 2.00              | 930.0                     | --                        | --                    | 0.00                  |
| 15                  | Dec 12, 2015 01:56 | Check Float             |                  | --                | 0.0                       | --                        | --                    | 0.00                  |
| 16                  | Dec 12, 2015 02:00 | Rig Out                 |                  | --                | --                        | --                        | --                    | 0.00                  |
| 17                  | Dec 12, 2015 02:30 | Job Complete            |                  | --                | --                        | --                        | --                    | 0.00                  |
| 18                  | Dec 12, 2015 02:45 | Leave Location          |                  | --                | --                        | --                        | --                    | 0.00                  |

Did Float Hold: Yes

Fluid Returns: Yes

Type: Cement

Volume (bbl): 73

Temperature (°F): 65

FDAS Functioning Correctly: Yes

Was the Program Followed As Per Design? Yes

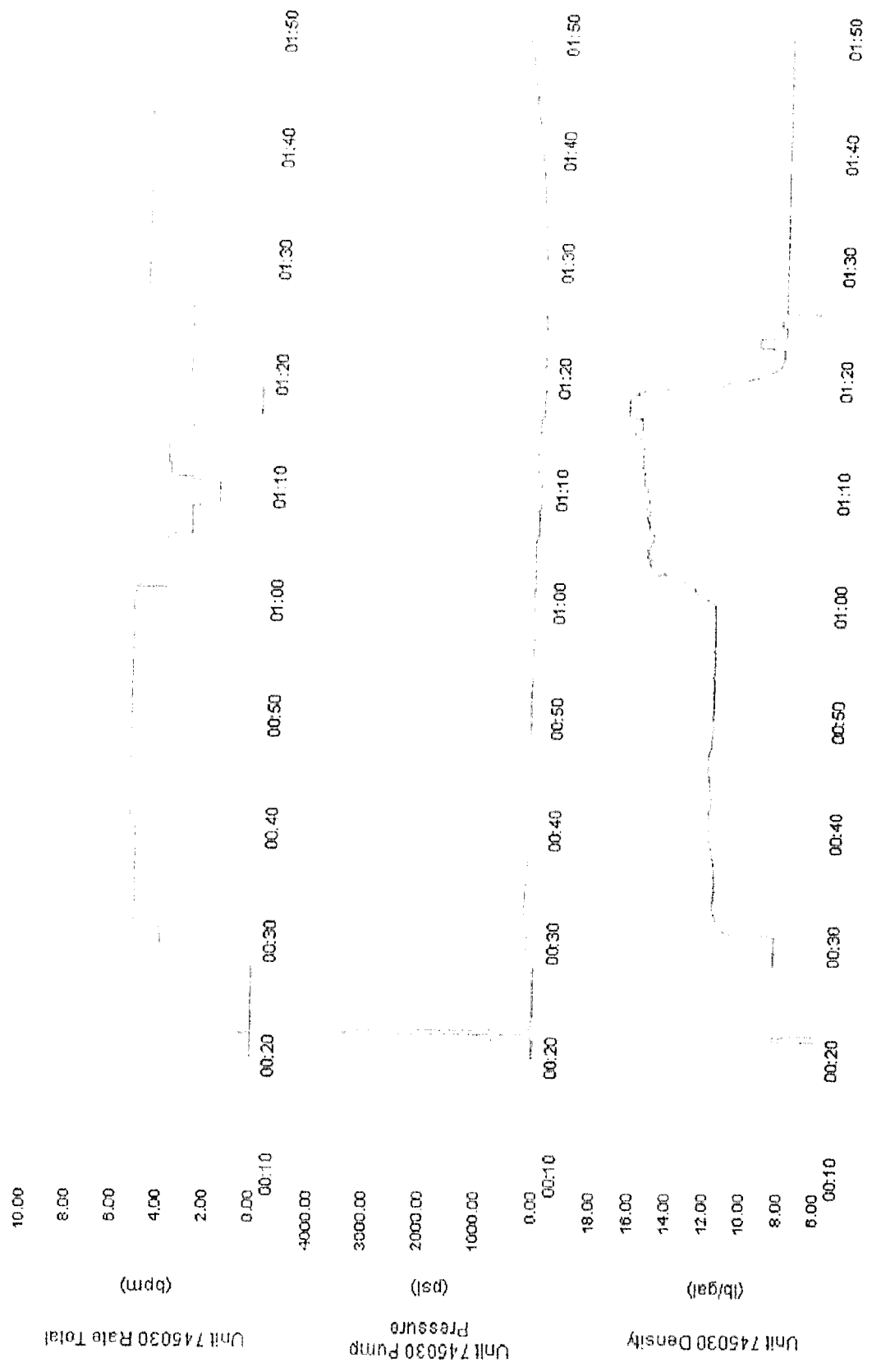
Material Transfer Sheet Number

Material Transfer Sheet Number

52082



|            |                       |            |                  |                  |              |
|------------|-----------------------|------------|------------------|------------------|--------------|
| Client     | Water System Drilling | Client Rep | Mr. Scott Heimer | Supervisor       | Scott Merkel |
| Ticket No. | 9708629               | Well Name  | Box Elder #5     | Unit No.         | 745030       |
| Location   |                       | Job Type   | Surface Casing   | Service District | Miles City   |
| Comments   | Water, Cement         |            |                  | Job Date         | 12/11/2015   |





## Cementing Service Report

9204848

|                                           |                                          |                         |                              |                       |
|-------------------------------------------|------------------------------------------|-------------------------|------------------------------|-----------------------|
| Client Name<br>Water System Drilling Inc  | Well Name<br>Box Elder                   | Rig                     | Job Date<br>January 06, 2016 | Call Sheet<br>1063666 |
| Client Representative<br>Mr. Scott Helmer | Surface Well Location<br>Please Set them | Down Hole Well Location | Job Type<br>Liner Casing     | Lead Supervisor       |

## Well Profile

|                                               |                   |                      |                    |                      |                    |
|-----------------------------------------------|-------------------|----------------------|--------------------|----------------------|--------------------|
| Well Type:                                    | Other             |                      |                    |                      |                    |
| Maximum Treating Pressure (psi)               | ---               |                      |                    |                      |                    |
| Predicted Bottom Hole Static Temperature (°F) | 100.00            | Ⓢ                    |                    |                      |                    |
| Bottom Hole Circulating Temperature (°F)      | 90.00             | Ⓢ                    |                    |                      |                    |
| Bottom Hole Logged Temperature (°F)           |                   | Ⓢ                    |                    |                      |                    |
| Open Hole                                     |                   |                      |                    |                      |                    |
| <u>Size (in)</u>                              | <u>Excess (%)</u> | <u>TMD From (ft)</u> | <u>TMD To (ft)</u> | <u>TVD From (ft)</u> | <u>TVD To (ft)</u> |
| 14.750                                        | 60.000            | 0.000                | 1,500.000          |                      |                    |

| Size  | Weight  | Grade | Collapse Pressure | Internal Yield Pressure | Capacity | I.D. | O.D. | Depth From | Depth To |
|-------|---------|-------|-------------------|-------------------------|----------|------|------|------------|----------|
| (in)  | (lb/ft) |       | (psi)             | (psi)                   | (bbl)    | (in) | (in) | (ft)       | (ft)     |
| 7.000 | 0.000   |       |                   |                         |          |      |      |            |          |

## Drill Pipe

| Size  | Weight  | Grade | Collapse Pressure | Capacity | I.D. | O.D. | Depth From | Depth To |
|-------|---------|-------|-------------------|----------|------|------|------------|----------|
| (in)  | (lb/ft) |       | (psi)             | (bbl)    | (in) | (in) | (ft)       | (ft)     |
| 4.500 | 16.600  |       |                   |          |      |      |            |          |

## Tubing

| Size  | Weight  | Grade | Collapse Pressure | Capacity | I.D. | O.D. | Depth From | Depth To |
|-------|---------|-------|-------------------|----------|------|------|------------|----------|
| (in)  | (lb/ft) |       | (psi)             | (bbl)    | (in) | (in) | (ft)       | (ft)     |
| 4.500 | 0.000   |       |                   |          |      |      |            |          |

## Products

|                                                                                       |
|---------------------------------------------------------------------------------------|
| Stage 1                                                                               |
| From Depth (ft): 0                                                                    |
| To Depth (ft): 1500                                                                   |
| Acids/Blends/Fluids                                                                   |
| Tail: 995 Sacks of 0-1-0 G, Density = 15.8 lb/gal, Volume Pumped = 204 (bbl)          |
| Water Temperature (°F) = 60, Bulk Temperature (°F) = 60, Slurry Temperature (°F) = 60 |
| + 0.3 % of CFL-3 (Preblend)                                                           |
| + 0.3 % of CFR-2 (Preblend)                                                           |
| + 0.2 % of LTR (Preblend)                                                             |

## Fluid &amp; Cement Data

|                      |                |                   |                   |                  |                    |
|----------------------|----------------|-------------------|-------------------|------------------|--------------------|
| Expected Cement Top: |                |                   |                   |                  |                    |
| Wellbore Fluid       |                |                   |                   |                  |                    |
| Fluid Type           | Viscosity (cP) | Density (lbs/gal) | Yield Point (psi) | Temperature (°F) | Recorded@          |
| Water                | --             | --                | --                | --               | Dec 10, 2015 17:04 |



# Cementing Service Report

9204848

## Attachment & Tools

### Down Hole Tools

| <u>Tool Type</u> | <u>Depth (ft)</u> | <u>Supplier</u> |
|------------------|-------------------|-----------------|
| Cement Hanger    | 1,420.000         | Third Party     |

## Units & Personnel

| <u>Units</u>          |                  |                 |                         |                  |                  |                         |                          |
|-----------------------|------------------|-----------------|-------------------------|------------------|------------------|-------------------------|--------------------------|
| <u>Truck Unit No.</u> | <u>Main Type</u> | <u>Sub Type</u> | <u>Tractor Unit No.</u> | <u>Main Type</u> | <u>Sub Type</u>  | <u>Time On Location</u> | <u>Time Off Location</u> |
| 446090                | TRAILER          | Bulker          | 746090                  | TRACTOR          | Tandem - Tractor | 01/06/2016 21:20        | 01/07/2016 02:50         |
| 449090                | TRAILER          | Utility Trailer | 201003                  | PICKUP           | 3/4 Ton          | 01/06/2016 21:20        | 01/07/2016 02:50         |
| 445091                | TRAILER          | SCM Twin        | 745091                  | TRACTOR          | Tandem - Tractor | 01/06/2016 21:20        | 01/07/2016 02:50         |
| 446146                | TRAILER          | Bulker          | 746146                  | TRACTOR          | Tandem - Tractor | 01/06/2016 21:20        | 01/07/2016 02:50         |

### Crew and Bonuses

| <u>Employee</u>           | <u>Start Shift</u> | <u>End Shift</u> | <u>Second Start Shift</u> | <u>Second End Shift</u> |
|---------------------------|--------------------|------------------|---------------------------|-------------------------|
| Regalado, David (18408)   | 01/06/2016 23:20   | 01/07/2016 02:50 |                           |                         |
| Genta Jr, Raymond (27923) | 01/06/2016 23:20   | 01/07/2016 02:50 |                           |                         |
| Reed, Michael (18123)     | 01/06/2016 23:20   | 01/07/2016 02:50 |                           |                         |
| Coombs, Morgan (29609)    | 01/06/2016 23:20   | 01/07/2016 02:50 |                           |                         |
| Dunkel, Aaron (25668)     | 01/06/2016 23:20   | 01/07/2016 02:50 |                           |                         |
| Maalim, Mohamed (29101)   | 01/06/2016 23:20   | 01/07/2016 02:50 |                           |                         |
| Taylor, Todd (29332)      | 01/06/2016 23:20   | 01/07/2016 02:50 |                           |                         |



## Cementing Service Report

9204848

## Treatment Reports &amp; Remarks

## Volume To Formation

Stage/Plug / Treatment Interval Name Volume To Formation (bbl)

Stage 1

## Treatment Report

| Event # | Event Time         | Event Description       | Fluid Type | Rate<br>(bbl/min) | Tubular Pressure<br>(psi) | Annular Pressure<br>(psi) | Stage Volume<br>(bbl) | Total Volume<br>(bbl) |
|---------|--------------------|-------------------------|------------|-------------------|---------------------------|---------------------------|-----------------------|-----------------------|
| 1       | Jan 06, 2016 21:20 | Arrive On Location      |            | --                | --                        | --                        | --                    | 0.00                  |
| 2       | Jan 06, 2016 21:25 | Crew Briefing (Rig in)  |            | --                | --                        | --                        | --                    | 0.00                  |
| 3       | Jan 06, 2016 22:40 | Rig in Complete         |            | --                | --                        | --                        | --                    | 0.00                  |
| 4       | Jan 06, 2016 22:46 | Crew Briefing (Pre Job) |            | --                | --                        | --                        | --                    | 0.00                  |
| 5       | Jan 06, 2016 23:15 | Pressure Test Start     |            | --                | 4 500.0                   | --                        | --                    | 0.00                  |
| 6       | Jan 06, 2016 23:16 | Pressure Test Complete  |            | --                | --                        | --                        | --                    | 0.00                  |
| 7       | Jan 06, 2016 23:19 | Pump                    | Water      | 4.00              | 300.0                     | --                        | 10.00                 | 10.00                 |
| 8       | Jan 06, 2016 23:21 | Mix Cement              | 0-1.0 G    | 4.00              | 450.0                     | --                        | 204.00                | 214.00                |
| 9       | Jan 07, 2016 00:19 | Displace Fluid          | Water      | 4.00              | 350.0                     | --                        | 120.00                | 334.00                |
| 10      | Jan 07, 2016 00:54 | Stop                    |            | --                | 1,490.0                   | --                        | --                    | 334.00                |
| 11      | Jan 07, 2016 01:17 | Forward Circulate       | Water      | 4.00              | 500.0                     | --                        | 134.50                | 468.50                |
| 12      | Jan 07, 2016 01:53 | Stop                    |            | --                | 120.0                     | --                        | --                    | 468.50                |
| 13      | Jan 07, 2016 02:00 | Job Complete            |            | --                | --                        | --                        | --                    | 468.50                |
| 14      | Jan 07, 2016 02:30 | Pre-Departure Meeting   |            | --                | --                        | --                        | --                    | 468.50                |
| 15      | Jan 07, 2016 02:50 | Leave Location          |            | --                | --                        | --                        | --                    | 468.50                |

Did Float Hold: Yes

Fluid Returns: Yes

Type: Cement

Volume (bbl): 85

Temperature (°F): 60

FDAS Functioning Correctly: Yes

Was the Program Followed As Per Design?: Yes

## Material Transfer Sheet Number

Material Transfer Sheet Number

64478

64479

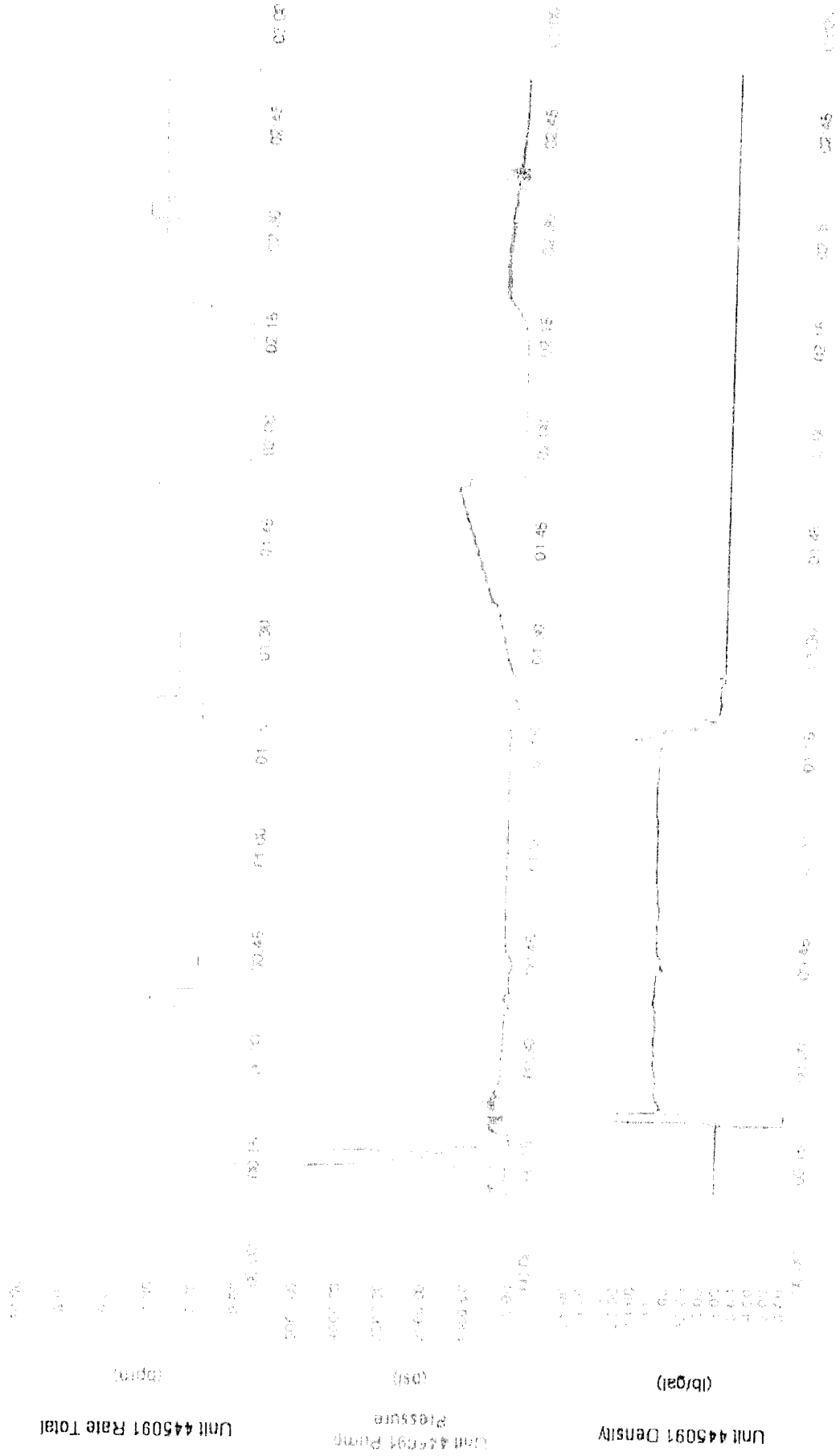




Client: Water Works  
 Ticket No: 9204848  
 Location: Miles City MT  
 Comments:

Casing: Mr. Scott Heimer  
 Well Name: Box Elder  
 Job Type: Liner Casing

Supervisor: Mike Reed  
 Unit No: 445091  
 Service District: Miles City MT  
 Job Date: 01/07/2016



**MIDCONTINENT**

TESTING LABORATORIES, INC.

2381 South Plaza Drive P.O. Box 3388 Rapid City, SD 57709  
(605) 348-0111 -- www.thechemistrylab.com

Received: 03/17/16 at 03:45 PM  
by Kate Shreves

Account: 9639  
Water System Drilling

SCOTT HEIMER  
WATER STSTEMS DRILLING  
PO BOX 368  
GILLETTE, WY 82717

**DRINKING WATER REPORT**

| EPA # | SAMPLE SITE                   | SAMPLE POINT | SAMPLE DATE & TIME | TOTAL COLIFORM<br>SM 9223 P/A | FECAL COLIFORM<br>SM 9223 P/A | NITRATE | ANALYST      | LAB NUMBER  |
|-------|-------------------------------|--------------|--------------------|-------------------------------|-------------------------------|---------|--------------|-------------|
|       | Box Elder Well 5 <sub>1</sub> |              | 03/17/16 03:20 PM  | Absent                        | Absent                        |         | KLS 03/17/16 | 20160317835 |

## Key to Notes:

- 1. Bacteriologically safe for drinking or washing uncooked foods at the time of sampling.

REPORT APPROVED BY:

Steve Distau

REPORT APPROVED DATE:

3/18/2016 2:20:54 PM

DATE PRINTED:

03/30/2016 11:03 AM



Company

WATER SYSTEMS

Field

BOX ELDER MADISON #5

County

PENNINGTON

State

S DAKOTA

Location

Box Elder Madison #5

Well

Box Elder Madison #5

Company

WATER SYSTEMS

Field

BOX ELDER MADISON #5

County

PENNINGTON

State

S DAKOTA

Location

Box Elder Madison #5

Well

Box Elder Madison #5

Company

WATER SYSTEMS

Field

BOX ELDER MADISON #5

County

PENNINGTON

State

S DAKOTA

Location

Box Elder Madison #5

Well

Box Elder Madison #5

Company

WATER SYSTEMS

Field

BOX ELDER MADISON #5

County

PENNINGTON

State

S DAKOTA

Location

Box Elder Madison #5

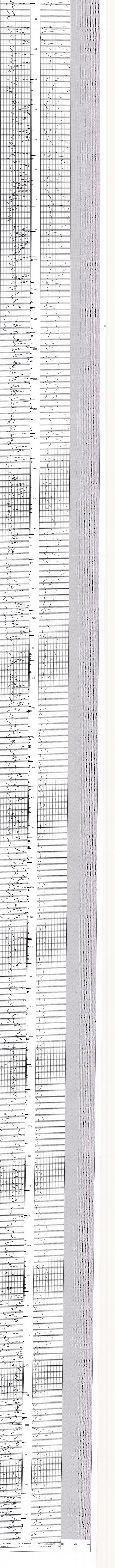
Well

Box Elder Madison #5

All interpretations are subject to the accuracy of the data and the quality of the logs. We cannot and do not guarantee the accuracy or completeness of any interpretation, and we shall not be liable for any loss, costs, damages, or expenses incurred or sustained by anyone relying on any interpretation made by any of our officers, agents or employees. These interpretations are also subject to our general terms and conditions of sale in our current Price Schedule.

Comments

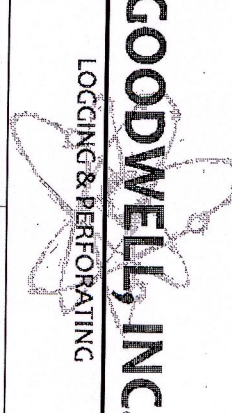
Database File: wsbox.db  
Dataset Pathname: merge3  
Presentation Format: aol, at  
Dataset Creation: Fri Jan 15 10:49:35 2016  
Charted by: [blank]  
Depth in Feet scaled: 1240











MMA-RAY  
CCL  
EUTRON

Company WATER SYSTEMS

Well BOX ELDER MADISON #5

Field

|        |            |       |          |
|--------|------------|-------|----------|
| County | PENNINGTON | State | S.DAKOTA |
|--------|------------|-------|----------|

| Location: | API#: |
|-----------|-------|
|           |       |

| SEC | TWP | RGE |
|-----|-----|-----|
|-----|-----|-----|

Log Measured From G.L.

|          |  |  |
|----------|--|--|
| 12-14-15 |  |  |
|----------|--|--|

|       |  |
|-------|--|
| 1500' |  |
| 1500' |  |

|      |  |
|------|--|
| 1430 |  |
| 15   |  |

|  |  |  |
|--|--|--|
|  |  |  |
|  |  |  |
|  |  |  |

[illegible]

|  |  |  |  |
|--|--|--|--|
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

|  |          |  |
|--|----------|--|
|  | GILLETTE |  |
|  | RHALL    |  |

|              |            |  |
|--------------|------------|--|
| Whole Record | 0.11111111 |  |
|--------------|------------|--|

|  |
|--|
|  |
|--|

|  |  |  |  |  |
|--|--|--|--|--|
|  |  |  |  |  |
|--|--|--|--|--|

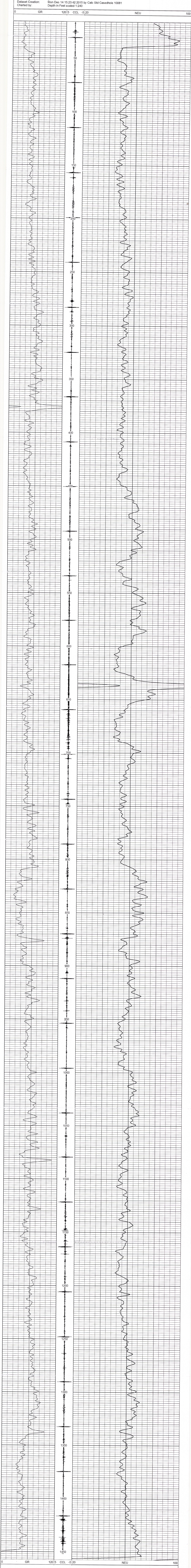
|         |  |  |
|---------|--|--|
| 10 3/4" |  |  |
|---------|--|--|

|  |  |  |  |
|--|--|--|--|
|  |  |  |  |
|--|--|--|--|

|                                                                                                                                                                                                                                                                                                                                                                                                                  |  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| <p>interpretation, and we shall not, except in the case of gross or willful negligence on our part, be liable or responsible for any loss, costs, damages, or expenses incurred or sustained by anyone resulting from any interpretation made by any of our officers, agents or employees. These interpretations are also subject to our general terms and conditions set out in our current Price Schedule.</p> |  |
| <p>Comments</p>                                                                                                                                                                                                                                                                                                                                                                                                  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                  |  |

Dataset Creation: Mon Dec 14 15:23:42 2015 by Calc Std Casedhole 10081  
 Charted by: Depth in Feet scaled 1:240

|   |    |     |   |     |    |    |
|---|----|-----|---|-----|----|----|
| 0 | GR | 120 | 5 | CCL | -5 | 20 |
|---|----|-----|---|-----|----|----|





RECEIVED

JUN 17 2016

WATER RIGHTS  
PROGRAM**Goodwell**  
IncorporatedGAMMA RAY CALIPER  
SP 16" 64"COMPANY WATER SYSTEMS  
WELL BOX ELDER #5  
FIELD CITY OF BOX ELDER  
COUNTY PENNINGTON STATE S. D

LOCATION:

OTHER SERVICES

SEC

TWP

ROE

PERMANENT DATUM

ELEVATION

K. B.

LOG MEAS. FROM GL.

FT. ABOVE PERM DATUM

D. F.

DATE

1-15-16

1-15-16

RUN NO.

DIV

1

TYPE LOG

SP 16" 64"

GR NEU CAL

DEPTH-DRILLER

4370'

4370'

DEPTH-LOGGER

4375'

4375'

BIT LOGGED INTERVAL

4374'

4374'

TOP LOGGED INTERVAL

3950'

3950'

TYPE FLUID IN HOLE

3950'

3950'

SALINITY

3950'

3950'

DENSITY

3950'

3950'

LEVEL

3950'

3950'

MAX. REC. TEMP.

DEG. F.

3950'

OPERATING RIG TIME

B. HALL

B. HALL

RECORDED BY

B. HALL

B. HALL

WITNESSED BY

CHUCK

B. HALL

RUN NO.

BOREHOLE RECORD

TO

NO.

BIT

FROM

TO

SIZE

WGT.

FROM

TO

SURFACE

1500'

4000'

## EQUIPMENT DATA

| GAMMA RAY             |  |  |  | NEUTRON            |  |  |  |
|-----------------------|--|--|--|--------------------|--|--|--|
| RUN NO.               |  |  |  | RUN NO.            |  |  |  |
| TOOL MODEL NO.        |  |  |  | LOG TYPE           |  |  |  |
| DIAMETER              |  |  |  | TOOL MODEL NO.     |  |  |  |
| DETECTOR MODEL NO.    |  |  |  | DIAMETER           |  |  |  |
| TYPE                  |  |  |  | DETECTOR MODEL NO. |  |  |  |
| LENGTH                |  |  |  | TYPE               |  |  |  |
| DISTANCE TO N. SOURCE |  |  |  | LENGTH             |  |  |  |
|                       |  |  |  | SOURCE MODEL NO.   |  |  |  |
|                       |  |  |  | SERIAL NO.         |  |  |  |
|                       |  |  |  | SPACING            |  |  |  |
|                       |  |  |  | TYPE               |  |  |  |
|                       |  |  |  | STRENGTH           |  |  |  |

## LOGGING DATA

| GAMMA RAY |  |  |  | NEUTRON            |  |  |  |
|-----------|--|--|--|--------------------|--|--|--|
| RUN NO.   |  |  |  | RUN NO.            |  |  |  |
| DEPTHS    |  |  |  | LOG TYPE           |  |  |  |
| FROM      |  |  |  | TOOL MODEL NO.     |  |  |  |
| TO        |  |  |  | DIAMETER           |  |  |  |
|           |  |  |  | DETECTOR MODEL NO. |  |  |  |
|           |  |  |  | TYPE               |  |  |  |
|           |  |  |  | LENGTH             |  |  |  |
|           |  |  |  | SOURCE MODEL NO.   |  |  |  |
|           |  |  |  | SERIAL NO.         |  |  |  |
|           |  |  |  | SPACING            |  |  |  |
|           |  |  |  | TYPE               |  |  |  |
|           |  |  |  | STRENGTH           |  |  |  |

REFERENCE LITERATURE :

REMARKS

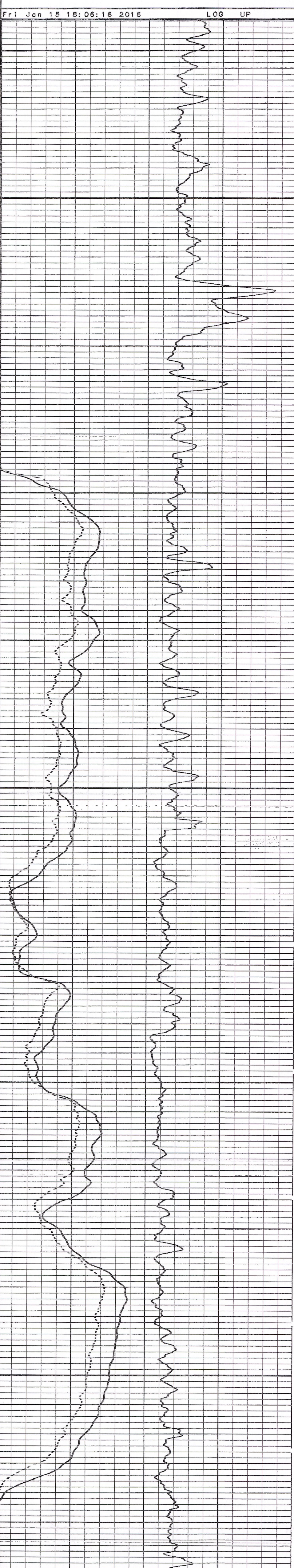
| CHART SCALING |           |        |  |
|---------------|-----------|--------|--|
| 0.00          | GAMMA RAY | 120.00 |  |
| 120.00        | CPS       | 240.00 |  |
| -500.00       | SP        | 500.00 |  |
|               | MVS       |        |  |
| 0.00          | CALIPER   | 20.00  |  |
|               | INCHES    |        |  |



| CHART SCALING |           |        |  |
|---------------|-----------|--------|--|
| 0.00          | GAMMA RAY | 120.00 |  |
| 120.00        | CPS       | 240.00 |  |
| -500.00       | SP        | 500.00 |  |
|               | MVS       |        |  |
| 0.00          | CALIPER   | 20.00  |  |
|               | INCHES    |        |  |

START DEPTH: 4368.72

| CHART SCALING |           |        |  |
|---------------|-----------|--------|--|
| 0.00          | 16"       | 100.00 |  |
| 100.00        | OHMS      | 200.00 |  |
| 0.00          | 64"       | 100.00 |  |
| 100.00        | OHMS      | 200.00 |  |
| 0.00          | NEUTRON   | 100.00 |  |
|               | %POROSITY |        |  |



| CHART SCALING |           |        |  |
|---------------|-----------|--------|--|
| 0.00          | 16"       | 100.00 |  |
| 100.00        | OHMS      | 200.00 |  |
| 0.00          | 64"       | 100.00 |  |
| 100.00        | OHMS      | 200.00 |  |
| 0.00          | NEUTRON   | 100.00 |  |
|               | %POROSITY |        |  |

FRI Jan 15 17:54:00 2016

LOG UP







SD EForm - 1311LD V1

Form 10

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

MAIL TO: PMB 2020

DENR - Water Rights Program  
523 E Capitol Ave  
Pierre, SD 57501-3182

ph. (605) 773-3352

Date

5/3/17

FROM:

City of Box Elder  
(name)420 Villa Dr.  
(address)Box Elder  
(city)S.D.  
(state)57719  
(zip)605-923-1404  
(phone)

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. 2577A-2 states that the water use system is to be constructed by1/14/18  
(date)

, and water is to be put to beneficial use by

1/14/22  
(date)

The water use system was completed on

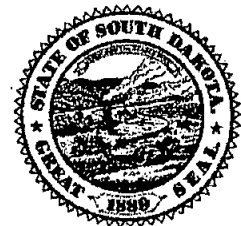
X June 2016  
(date)

Applying the water to beneficial use was completed on

X June 2016  
(date)

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

X  
Bob Kaph







DEPARTMENT of ENVIRONMENT  
and NATURAL RESOURCES

JOE FOSS BUILDING  
523 EAST CAPITOL  
PIERRE, SOUTH DAKOTA 57501-3182

denr.sd.gov

SEP 26 2017

2763-2  
2577A-2

City of Box Elder  
c/o Bob Kaufman, Public Works Director  
420 Villa Drive  
Box Elder SD 57719

Dear Mr. Kaufman:

Enclosed are Water Permit and Water License No. 2763-2. The applicable portions of No. 2577A-2 are incorporated into Water License No. 2763-2. This is the final water right document completing the city's process of obtaining a Water Right. Also, included with the license is a map prepared by the staff engineer who conducted the investigation.

A fee of \$950 was submitted with the permit application. The license fee originally submitted with the Permit No. 2577A-2 will be applied towards No. 2763-2 since the two permits are being incorporated. Therefore, \$200 will be refunded to the city within two weeks.

For your information SDCL 46-6-27 requires that if in the future the owner drills a replacement well and has no plan to use the old existing well, the old well is considered abandoned and must be plugged. Also, any well that is being used or is not considered abandoned must be valved and controlled, if flowing, or sealed and capped so that no leaking occurs either underground or at the surface.

As long as you use the water beneficially, as stated in the Water License, the State Water Laws provide that you have a continuing right to use the water. If you have any questions, please contact our office.

Sincerely,

Jeanne Goodman, Chief Engineer  
Water Rights Program  
(605) 773-3352

enclosures