

WATER PERMIT NO. 1983-1

Name of Applicant: Continental Resources

Address: PO Box 269000, Oklahoma City OK 73126

Phone: 405 234-9000

Amount of Water Claimed: 0.5 cfs (360 AF)

Total Acres: NA

Source of Water Supply: groundwater (one well)

Water to be used for: industrial use

County: Harding

Type of Waste Disposal System:

Location: approximately 15 miles northwest of Buffalo

PRIORITY

Date Received: 7-10-18

Application/License Fee: \$ 1050

Corrected Application Received:

Period of Annual Use: January 1 – December 31

Remarks: Serve as a water source well for injection in an enhanced oil recover project within the Buffalo Red River Units.

Diversion Point: SW 1/4 NE 1/4 Sec 1-T20N-R3E

Land to be Irrigated: NA

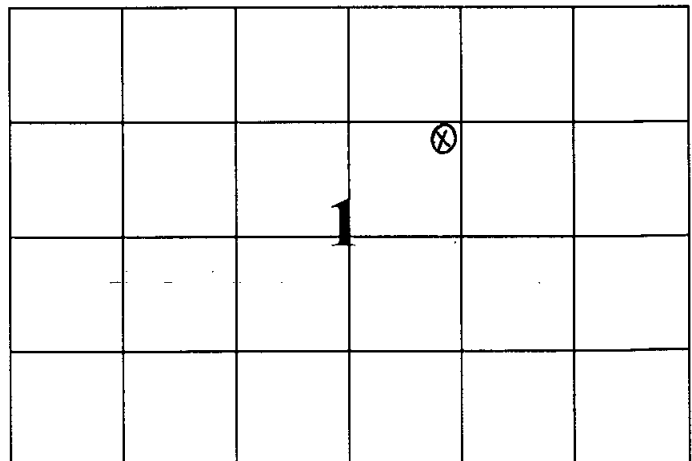
Depth of Well: 4,502 feet deep

Well Driller:

Remarks:

Type of Map:

Prepared by:



Reviewed and the Number Assigned on: 7-10-18

By: **Karen Schlaak**

Notice of Hearing - date to intervenè: _____

**SOUTH DAKOTA
WATER PERMIT NO. 1983-1**

Date of first receipt of application July 10, 2018.

The Chief Engineer, on behalf of the Water Management Board, issues Water Permit No. 1983-1 to Continental Resources, PO Box 269000, Oklahoma City OK 73126 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. 1983-1 appropriates 360 acre-feet of water annually at a maximum pump rate of 0.50 cubic feet of water per second from one well completed into the Inyan Kara Aquifer (4,502 feet deep) located in the SW 1/4 NE 1/4 Section 1-T20N-R3E for industrial use as a water source in an enhanced oil recovery project. This site is located approximately 15 miles northwest of Buffalo SD.
2. The water appropriated shall be used for the purpose of industrial use 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. 1983-1 is October 1, 2018.
5. The date from which applicant may claim right is July 10, 2018.
6. One-fifth of the construction is to be completed on or before April 1, 2021.
7. All construction is to be completed on or before October 1, 2023.
8. Water is to be put to beneficial use on or before October 1, 2027.
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 Permit holder shall report to the Chief Engineer annually the amount of water withdrawn from the Inyan Kara aquifer.
3. Water Permit No. 1983-1 authorizes a total annual diversion of 360.0 acre feet of water.

WATER MANAGEMENT BOARD

By: *Jeanne Goodman*

Jeanne Goodman, Chief Engineer
Water Rights Program
Department of Environment and Natural Resources

OCT 04 2018
date



Mail to: DENR - Water Rights 523 E Capitol Ave Pierre, SD 57501-3182 ph. (605) 773-3352	No. <u>1983-1</u> (office use only) Hydrologic Unit <u>10130302</u>
	Basin <u>Grand River</u>
	Newspaper <u>Nation's Center News</u>
	<u>Black Hills Pioneer</u>

RECEIVED

JUL 10 2018

WATER RIGHTS
PROGRAM**Application For Permit To Appropriate Water Within The State Of South Dakota****Check use(s) of water:**

☐ Municipal	☐ Water Distribution System	☐ Recreational	☐ Institutional
☐ Rural Water System	☐ Commercial	☐ Fish & Wildlife	☐ Geothermal
☐ Domestic (over 18 gpm)	☐ Industrial	☒ Other	<u>Water source for oil field</u>

Type of Application:

(check one)

☒ New	☐ Vested Right (Use predates Mar 2, 1955)	☐ Future Use Reservation
☐ 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.)

1. Name to Appear on Water Permit Continental ResourcesMailing Address PO Box 269000 (Address) Oklahoma City (City) OK (State) 73126 (Zip Code)Phone 405-234-9000 Mobile _____ Email _____2. Amount of water claimed 0.5 *CFS or 225 **GPM and 360 ***AF or _____ Gallons
Flow rate and volume are both required. (*Cubic Feet per Second) (**Gallons per Minute) (***)Acre Feet - storage capacity of dam/dugout or annual use)3. Source of water supply Dakota Formation (4,315'-4,502') Inyan Kara4. Location of point of diversion SWNE Sec 1-20N-3E County Harding
(example - 3 wells in SW1/4 NE1/4 section 12-T104N-R53W)If not a public water supply (e.g. municipal), will water be used outside of the area described above? ☐ Yes ☒ NoIf "Yes," where will water be used? _____
(example - NW1/4 section 12-T104N-R53W)5. County or counties where water will be used Harding6. Annual period during which water is to be used 365 days / year Jan 1 - Dec 31

7. 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 WBRRU 32-1 was drilled as a Red River "B" well in 1989. It was converted to an air-injection well in 1991 to support the enhanced oil recovery project with the West Buffalo Red River Unit.

The lower section of the well bore will be plugged according to the DENR. The Dakota Formation will then be perforated and used as a water source well for injection into the Red River "B" Formation to continue the enhanced oil recover project within the Buffalo Red River Units.

I, Brad Aman VP, Northern Production, 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.

BROSZ ENGINEERING

P.O. Box 357

BOWMAN, NORTH DAKOTA 58623

(701) 523-3340

Please make call - RT, Mr. Y & file in new WF.

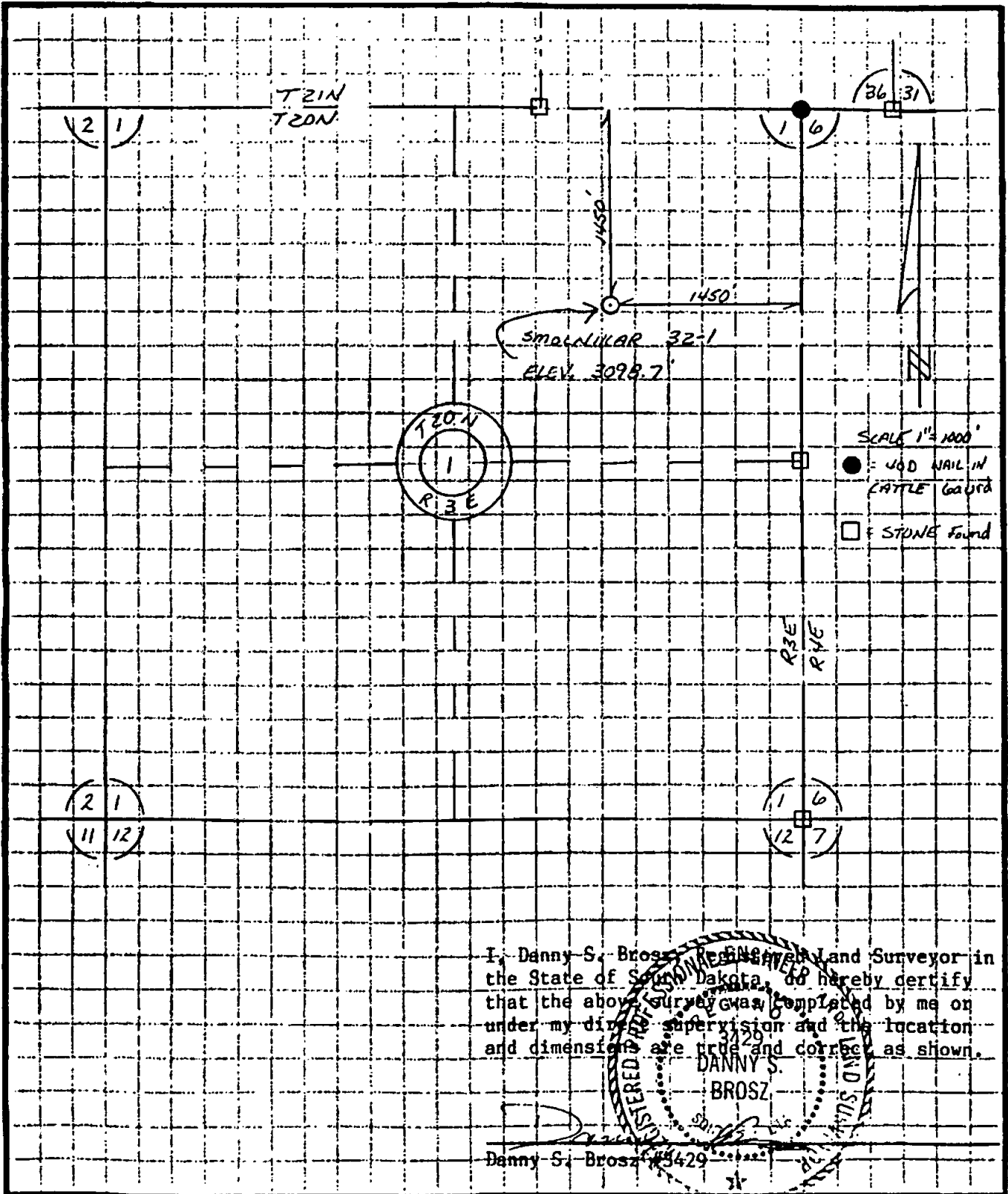
CLIENT K EXPLANATION R

JOB SMOLANDER 32-1 1450' N 1450' E

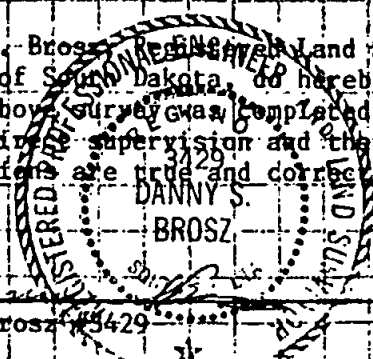
LOCATION SEC. 1, T20N, R3E BWM HARDING Co., SD.

DRAWN BY PAULSON DATE 10-14-88

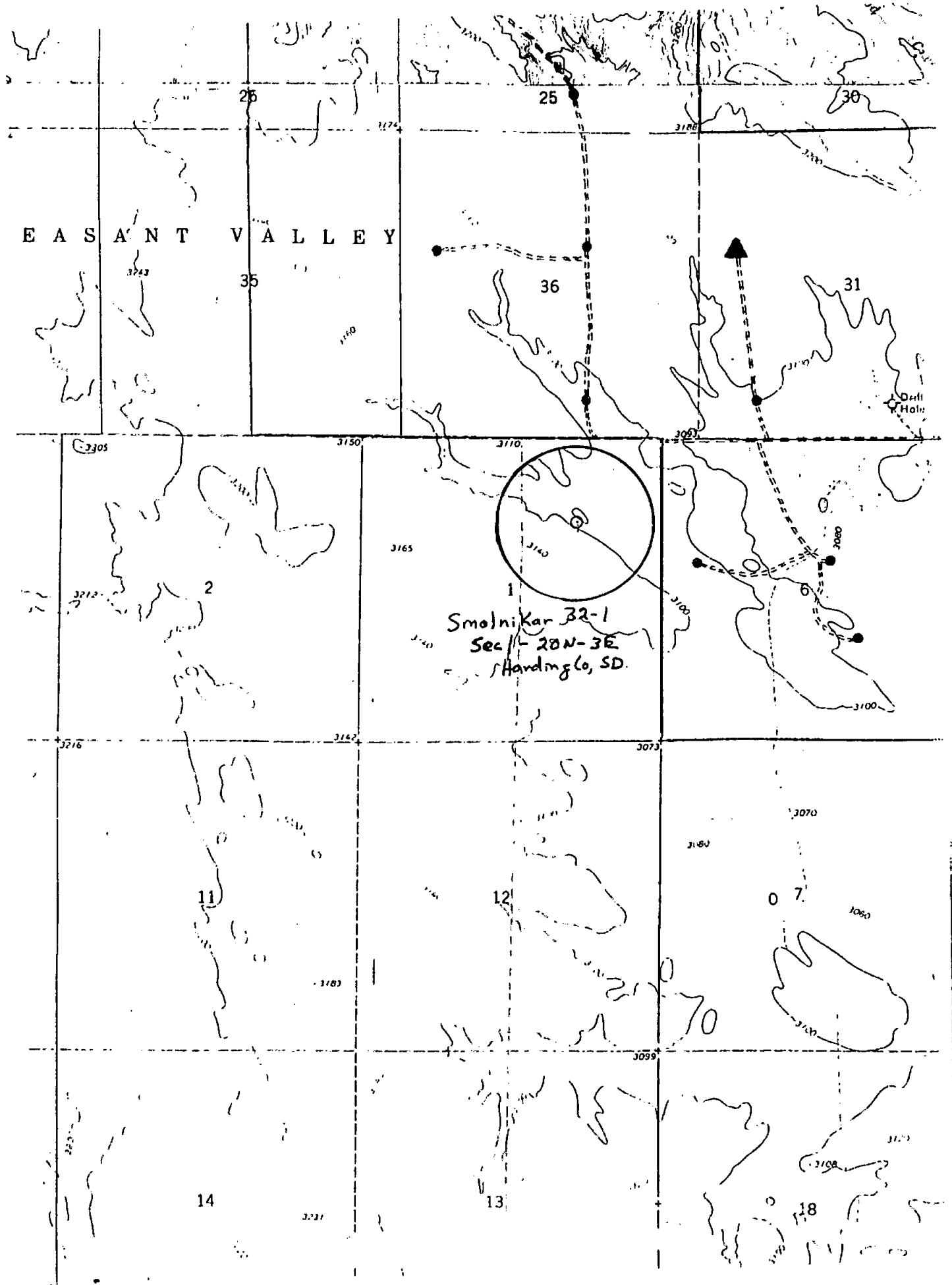
Rev



I, Danny S. Brosz, Registered Land Surveyor in the State of South Dakota, do hereby certify that the above survey was completed by me or under my direct supervision and the location and dimensions are true and correct as shown.



Danny S. Brosz 3429



WELL COMPLETION OR RECOMPLETION
REPORT AND LOG

FARM OR LEASE NAME

SMOLNIKAR

WELL NO.

32-1

FIELD AND POOL OR WILDCAT

BUFFALO

NO. ACRES IN LEASE

80

1/4 SEC. TWP. RGE.

SWNE, Sec. 1-20N-3E

COUNTY

HARDING

TYPE OF COMPLETION

☒ Oil Well ☐ Gas Well ☐ _____
☒ New Well ☐ Work-Over ☐ Deepen ☐ Plug Back ☐ Same Zone ☐ Diff Zone

OPERATOR

Koch Exploration Company

ADDRESS

PO Box 2256 Wichita, Kansas 67201

LOCATION (In feet from nearest lines of section or legal subdivision where possible)*

Surface 1450' FNL 1450' FEL

Top prod. interval

At total depth

PERMIT NO.

1467

DATE ISSUED

3/7/89

PREVIOUS PERMIT NO.

--

DATE ISSUED

--

DATE SPUNDED

4/14/89

DATE T.D. REACHED

4/29/89

DATE COMPL.

6/2/89 (Ready to Prod.)

ELEVATIONS

3112' KB

(OF, BKB, RT, GR, etc.)*

ELEV. CASINGHEAD

3110' FLGE.

TOTAL DEPTH

8350' (MD & TVD)

PLUG. BACK

8348' (MD & TVD)

IF MULTIPLE COMPL.

HOW MANY*

INTERVALS

DRILLED BY

ROTARY TOOLS

XX

CABLE TOOLS

PRODUCING INTERVAL(S), THIS COMPLETION, TOP, BOTTOM, NAME (MD & TVD)*

Red River B 8316' - 33'

DATE DIRECTIONAL
SURVEY SUBMITTED

N/A

TYPE ELECTRIC AND OTHER LOGS RUN (Circle those filed)

Compensated GR - Neutron

WAS WELL CORED

No

CASING RECORD (Report all strings set in well)

CASING SIZE	DEPTH SET (MD)	HOLE SIZE	WEIGHT LBS./FT.	PURPOSE	SACKS CEMENT	AMOUNT PULLED
8-5/8"	3805'	12-1/4"	32# & 24#	Surface	1640sx 50-50 Poz & Glass G to Surface	
5-1/2"	8848'	7-7/8"	17#, 15.5#, & 23#	Production	150sx G (1.15ft ³ /sx) TOC 4560'	
					585sx foamed (1.73ft ³ /sx)	
					100sx G w/Silica flour (1.53ft ³ /sx)	

LINER RECORD

SIZE	TOP (MD)	BOTTOM (MD)	SACKS CEMENT*	SCREEN (MD)	SIZE	DEPTH SET (MD)	PACKER SET (MD)

TUBING RECORD

DEPTH INTERVAL (MD)	HOLES PER FT.	SIZE AND TYPE	PURPOSE	ACID, SHOT, FRAC., CEMENT SQUEEZE, Etc.	AMOUNT AND KIND OF MATERIAL USED	DEPTH INTERVAL (MD)
8316' - 30'	4 HPF	1/2" - Jet	Production		2750 gal 15% HCl	8316' - 30'

PRODUCTION

DATE FIRST PRODUCTION	PRODUCING METHOD (Flowing, gas lift, pumping, size & type of pump)	WELL STATUS (Prod. or shut-in)
6/2/89	2" x 1-1/4" x 24' Pump	Producing

DATE OF TEST	HOURS TESTED	CHOKE SIZE	PRODUCTION FOR TEST	OIL, Bbls.	GAS, Mcf.	WATER, Bbls. & %	OIL GRAVITY-API (Corr.)
6/13/89	24	--	→	13	TSTM	15	32° API

FLOW. TUBING PRESSURE	CASING PRESSURE	CALCULATED 24-HOUR RATE	OIL, Bbls.	GAS, Mcf.	WATER, Bbls. & %	GAS-OIL RATIO
		→				

DISPOSITION OF GAS (Sold, used for fuel, vented, etc.)

Vented - TSTM

LIST OF ATTACHMENTS

CBL, GRN, CCL

I hereby certify that the foregoing and attached information is complete and correct as determined from all available records

SIGNED Ronald J. Miller TITLE Onshore Operations Manager DATE 6/14/89

JUN 22 1989

DO NOT WRITE BELOW THIS LINE

Approved

Date

OIL AND GAS BOARD OF THE STATE OF SOUTH DAKOTA

Secretary

ATLAS WIRELINE SERVICES

COMPENSATED NEUTRON GAMMA RAY

FILE NO.

COMPANY KOCH EXPLORATION COMPANY

RPI NO.

WELL SMOLNIKAR 32-1

FIELD BUFFALO

COUNTY HARDING STATE S.D.

TOPS

BPT 5/1/89

LOCATION:
1450' FNL & 1450' FEL

OTHER SERVICES
NONE

SEC1 TWP 20N RGE 3E

PERMANENT DATUM GROUND LEVEL ELEV. 3099
LOGGING MEASURED FROM KB 13 FT. ABOVE P.D.
DRILLING MEASURED FROM KB

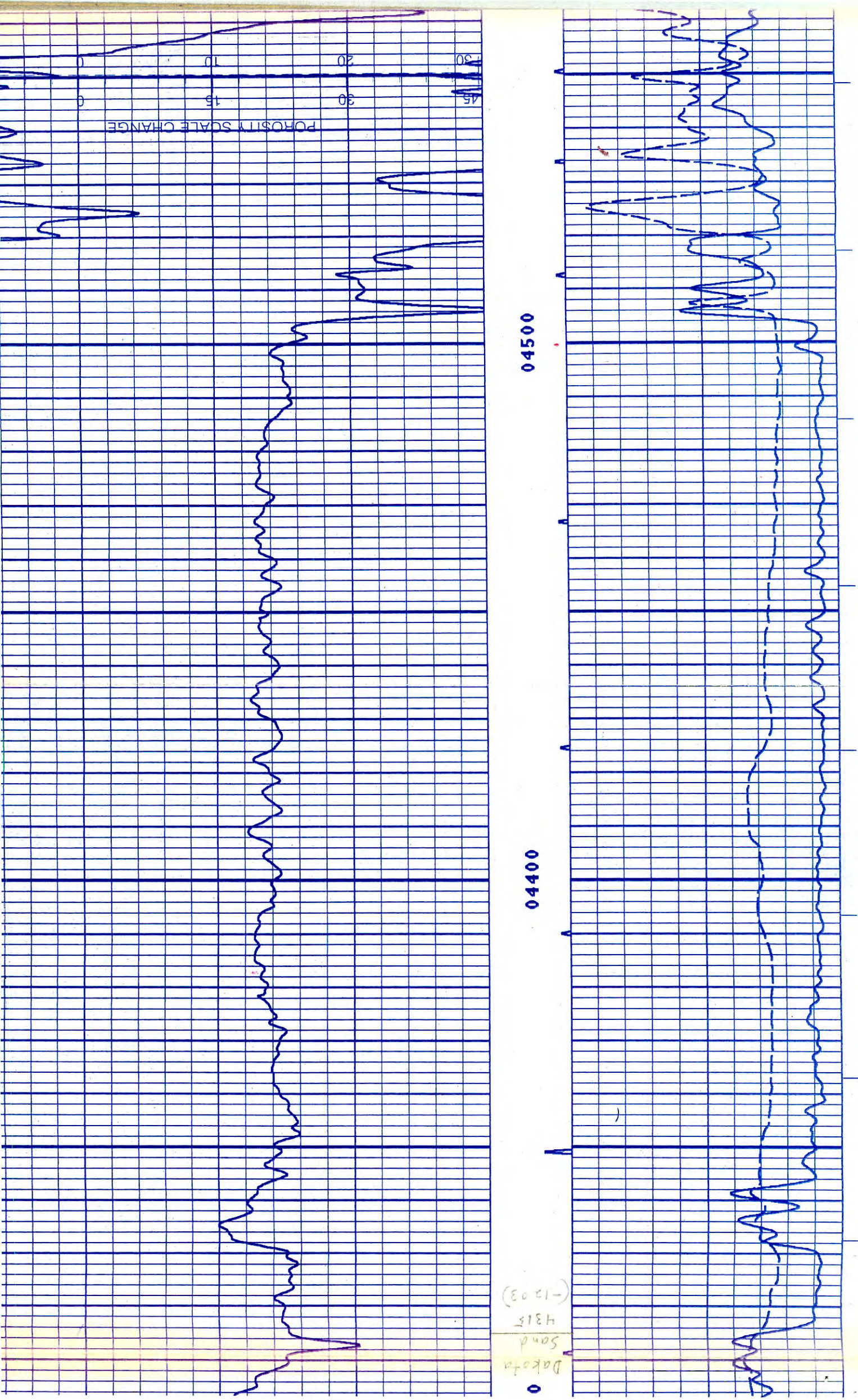
ELEVATIONS
KB 3112
OF
CL 3099

DATE	4/27/89		
RUN	1		
SERVICE ORDER	1932		
DEPTH-DRILLER	8350		
DEPTH-LOGGER	8351		
BOTTOM LOGGED INTERVAL	8350		
TOP LOGGED INTERVAL	10		
CASING - DRILLER	8 5/8	@ 3806	@
CASING - LOGGER	37%		
BIT SIZE	7 7/8		
TYPE FLUID IN HOLE	CARBOFAST INVERT		
DENSITY / VISCOSITY	9.5	50	
PH / FLUID LOSS	-	9.8	
SOURCE OF SAMPLE	N/A		
RM AT MEAS. TEMP.	N/A	@ N/A	@
RMF AT MEAS. TEMP.	N/A	@ N/A	@
RMC AT MEAS. TEMP.	N/A	@ N/A	@
SOURCE OF RMF / RMC	N/A	N/A	
RM AT BHT	N/A	@ N/A	@
TIME SINCE CIRCULATION	4 HOURS		
MAX. REC. TEMP. DEG. F	176		
EQUIP. NO. / LOC.	HL-6307	WILLISTON	
RECORDED BY	DANIEL IHDE		
WITNESSED BY	DON POINDEXTER		

Dakota
Sand
4315
(-1203)

04400

04500



RECEIPT

WATER RIGHTS PROGRAM

South Dakota Department of Environment and Natural Resources

Date July 10

20 18

Continental Resources, Inc. PO Box 268835 Oklahoma City OK 73126

RECEIVED OF _____

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

Fee for Application for Permit No. <u>1983-1</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>1983-1</u>	200	00
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	1050 00

No. **08716**

By

Jeanne Goodman
Chief Engineer

747



**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

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

denr.sd.gov

August 22, 2018

Peter MacIntyre
Continental Resources, Inc.
20 N. Broadway
Oklahoma City, OK 73102

Dear Mr. MacIntyre:

Enclosed you will find your approved sundry request and conditions to plug-back the WBRRU 32-1 well.

If you have any questions or concerns you would like to discuss, please feel free to contact me at 605-773-4201.

Sincerely,

Jeff Klenner
Environmental Scientist II
Minerals and Mining Program

Enclosures

cc. Whitney Kilts – DENR Water Rights



DEPARTMENT of ENVIRONMENT and NATURAL RESOURCES
Minerals & Mining Program
2050 West Main, Suite #1, Rapid City, SD 57702-2493
Telephone: 605-773-4201, FAX: 605-394-5317

RECEIVED FORM 6

AUG 13 2018

DEPT OF ENVIRONMENT & NATURAL
RESOURCES - RAPID CITY

SUNDRY NOTICE AND REPORT ON WELLS

Operator Name: Continental Resources, INC		Telephone: 405-234-9511									
Address: 20 N. Broadway, OKC, OK, 73102											
Permit No.: 1467	API No.: 4006320478	Well Name and Number: WBRRU 32-1	Location: (Qtr-Qtr, Sec, Twp, Rge, County) SWNE Sec 1-T20N-3E								
REPORT OF:											
☐ Acidize	☐ Repairs	☐ Drill without BOP									
☐ Perforate	☐ Gas/Oil Ratio	☐ Construction of Produced Water Handling Facilities									
☐ Fracture Treatment	☐ Work-Over	☐ Conversion of Mud Pit to Evaporation Pit									
☐ Change of Operator	☐ Change in Drilling or Casing Program	☐ Method of Determining Production from Separate Pools									
☐ Spud	☐ Shut-In Pressure	☐ Use Produced Water for Dust Suppression									
☐ Plug and Abandon	☐ Work Affecting Different Source of Supply	☐ Change in Method of Annual Gas Well Open Flow Test									
☐ Pull, Alter or Test Casing	☐ BOP Pressure Test/Program	☐ Atmospheric Discharge of Produced Water									
☐ Squeeze Cement	☐ Tank Battery Meter Tests	☐ Change of Producing Formation									
☐ Change of Elevation	☐ Injection System Problems or Failure	☐ Change of Surface Location									
☐ Mechanical Integrity Test	☐ Commence Injection Operations	☐ Release of Reclamation Liability									
☐ Venting or Flaring Gas	☐ Discontinue Injection Operations	☐ Dissolve Abandoned Field									
☐ Interim or Final Reclamation	☐ Directions to Well Site	☐ Method of Checking Tank Meters									
☐ Spill, Fire, Break, or Blowout	☒ Other: Convert to WSW.	☐ Extend Permit Term Beyond 12 months									
☐ Drilling Progress	REQUEST FOR APPROVAL:										
☐ Working Fluid Level	☐ Temporarily Abandon	☐ Confidentiality of Technical Data									
☐ Change to Dry Hole Marker	☒ Proposed Plugging Program	☐ Change in Injection Fluid, Pressure, or Volume									
	☐ Changes in Cementing Program	☐ Other:									
Describe Proposed or Completed Operations (clearly state all pertinent details, and give pertinent dates, including estimated date of starting any proposed work). Use additional page(s) if appropriate. Continental Resources plans to convert the WBRRU 32-1 to a water supply well using the Dakota Formation. The well will be plugged from 5,000' to TD. A CICR will be set at 5,000 and 325 sacks cmt will be pumped through the retainer. Ten sacks of cmt will be spotted on top of the CICR.											
I hereby certify that the foregoing as to any work or operation performed is a true and correct report of such work or operation. <table border="0" style="width:100%"><tr><td style="width:33%"></td><td style="width:33%">Peter MacIntyre</td><td style="width:33%">Staff Engineer</td><td style="width:100px">8/6/2018</td></tr><tr><td>Signature</td><td>Name (Print)</td><td>Title</td><td>Date</td></tr></table>					Peter MacIntyre	Staff Engineer	8/6/2018	Signature	Name (Print)	Title	Date
	Peter MacIntyre	Staff Engineer	8/6/2018								
Signature	Name (Print)	Title	Date								
FOR OFFICE USE ONLY (forms will be signed and returned only in cases where approval by DENR is required)											
Approved by:		Title: ADMINISTRATOR, MINERALS & MINING PROGRAM Date: 8-22-18									
Conditions, if any: See Attached											



DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

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

denr.sd.gov

CONDITIONS TO SUNDRY NOTICE

CLR: 32-1 WBRRU
20N-3E-1 SWNE, Harding County

Permit: #1444
API: 40 063 20478

Approval has been granted to plug-back this well as detailed on the attached Sundry Notice and Report on Wells (Form #6) with the following additional conditions:

1. The entire casing below the CICR must be filled with cement.
2. Use as a water supply well must be delayed until a water right has been obtained.
3. Please notify this office (605-773-4201) **at least 72 hours** prior to plugging back so a witness can be on location.

Surface Casing TOC=149'
(calculated)

WBRRU 32-1

Stage 1 TOC=3707'
(calculated)
Surface casing set at 3805'

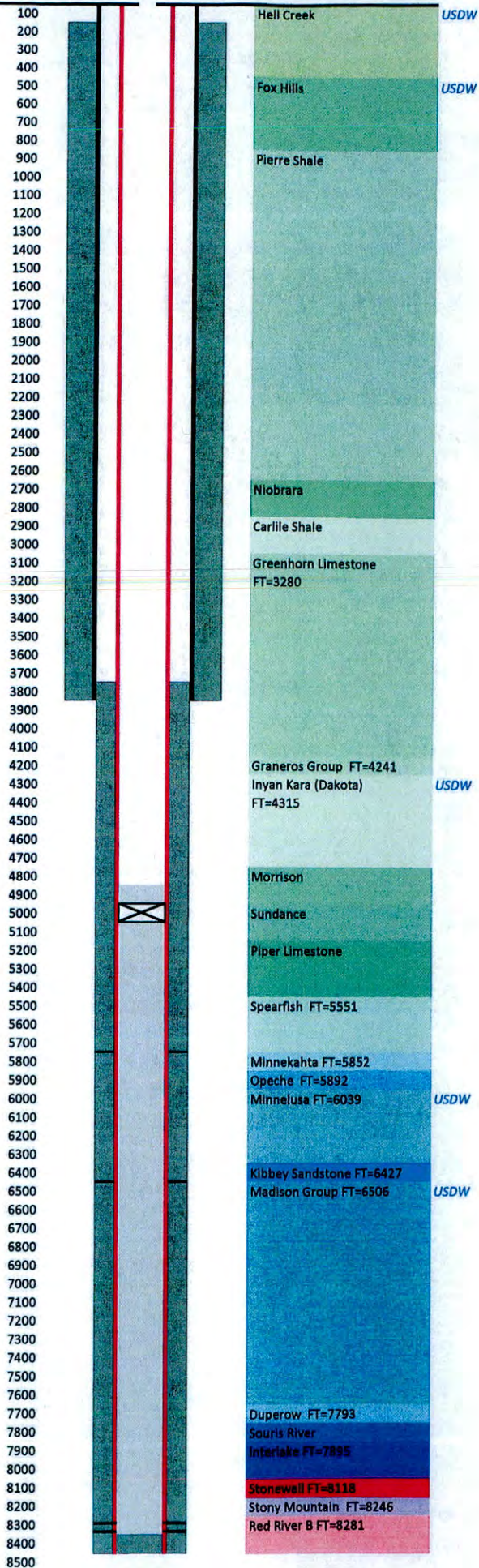
CBL=3800-5650'

10 sx on top CICR
CICR set @ 5000'
325 sx under CICR

CBL=5760-6425'

CBL=6500-8200'

Perfs @ 8316-8330'
PBD = 8348'
Production Casing set @ 8348'
TD = 8350'



DRAWING NOT TO SCALE

Fresh water formations are properly cemented to prevent cross-contamination.



**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE SOUTH DAKOTA 57501-3182
<http://denr.sd.gov>

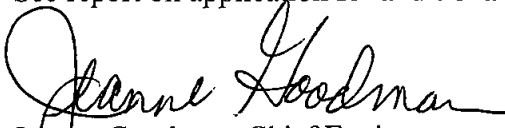
**RECOMMENDATION OF CHIEF ENGINEER FOR WATER PERMIT
APPLICATION NO. 1983-1, Continental Resources**

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. 1983-1, Continental Resources, c/o Brad Aman, PO Box 269000, Oklahoma City OK 73126.

The Chief Engineer is recommending APPROVAL of Application No. 1983-1 because 1) there is reasonable probability that there is unappropriated water available for the applicant's proposed use, 2) the proposed diversion can be developed without unlawful impairment of existing rights, 3) the proposed use is a beneficial use and 4) it is in the public interest with the following 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 Permit holder shall report to the Chief Engineer annually the amount of water withdrawn from the Inyan Kara aquifer.
3. Water Permit No. 1983-1 authorizes a total annual diversion of 360.0 acre feet of water.

See report on application for additional information.


Jeanne Goodman, Chief Engineer
September 10, 2018

Report to the Chief Engineer
Water Permit Application No. 1983-1
Continental Resources
September 4, 2018

Water Permit Application No. 1983-1 proposes to appropriate 360 acre-feet of water annually at a maximum instantaneous diversion rate of 0.50 cubic feet per second (cfs) for industrial use. The proposed diversion point is one well completed into the Inyan Kara aquifer located in the SW ¼ NE ¼ Section 1-T20N-R3E. This is located approximately 15 miles northwest of Buffalo, SD in Harding County.

Aquifer: Inyan Kara (INKR)

Aquifer Characteristics

The well for this application was originally drilled as an oil well in 1989 and was then converted to an air-injection well in 1991. The well was drilled to a total depth of 8,350 feet below grade into Unit B of the Red River Formation. The information provided with this application indicates that to convert this well to a water supply well the lower portion of the well will be plugged with cement, and the interval from 4,315 to 4,502 feet below grade will be targeted for water production. A “Sundry Notice and Report of Wells” for conversion of this well to a water supply well has been filed with the SD DENR Minerals and Mining Program and has been approved (Klenner, 2018).

The water source this application proposes to use is called the “Dakota Formation” in the submitted application. In the Williston Basin, the term “Dakota” is commonly applied to either of two Cretaceous aged sandstone formations, the Newcastle sandstone or the Inyan Kara Group. Historically, there has been debate by geologists over the use of the term “Dakota Formation”, and the subject is discussed at length by Schoon (1971). The Dakota as mapped and described by Schoon (1971) does not extend west into Harding County. The western stratigraphic equivalent to the Dakota Sandstone is the Newcastle Sandstone (Fahrenbach et al, 2010). The Newcastle Sandstone is underlain by the Skull Creek Shale, and the Skull Creek Shale is underlain by the formations of the Inyan Kara Group (Fahrenbach et al, 2010). The Inyan Kara Group is composed of a sequence of interbedded sandstones, siltstones and mudstones contained in the Fall River Formation and the underlying Lakota Formation, (Martin et al., 2004). A review of the available information for this well and area geologic information indicates the targeted interval for water production corresponds to the Inyan Kara Group (Gries, 1981 and SDGS, 2018).

The Inyan Kara is a large regional geologic group that underlies portions of South Dakota, North Dakota, Wyoming, and Nebraska. The Inyan Kara aquifer consists of the permeable and porous portions of the Lower Cretaceous aged Inyan Kara Group. For the purpose of appropriations, the Water Management Board and the DENR-Water Rights Program considers the permeable and porous portions of the Inyan Kara Group a single aquifer. The Inyan Kara aquifer underlies an estimated 23,239,040 acres of Western South Dakota (Allen et al., 1985).

The aquifer underlies the entirety of Harding County with an estimated 22,528,800 acre-feet of recoverable water in storage in the county. The Inyan Kara aquifer is under confined conditions in the area of the well site for this application (Water Rights, 2018a).

South Dakota Codified Law (SDCL) 46-2A-9

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

Water Availability

The probability of unappropriated water being available from an aquifer can be evaluated by considering SDCL 46-6-3.1 which requires "No application to appropriate groundwater may be approved if, according to the best information reasonably available, it is probable that the quantity of water withdrawn annually from a groundwater source will exceed the quantity of the average estimated annual recharge of water to the groundwater source." If the source of the water is older or lower than the Greenhorn Formation and the application is for a water distribution system defined pursuant to SDCL 46-1-6 (17), the Board need not consider the recharge/withdrawal issue. Here, the Inyan Kara aquifer is older or lower than the Greenhorn Formation, however a water distribution system is not involved, therefore the withdrawal/recharge issue must be considered.

Observation Wells

In determining the availability of unappropriated water for a permit application Administrative Rule 74:02:05:07 requires the Water Management Board to rely on the record of observation well measurements, in addition to other data, to determine that the quantity of water withdrawn annually from the aquifer does not exceed the estimated annual recharge.

The Water Rights Program monitors nine observation wells completed into the Inyan Kara aquifer, eight of which are located in and around the Black Hills. The hydrographs for Inyan Kara aquifer observation wells in Western South Dakota indicate the aquifer is dominated by natural conditions which is indicative of water being available for appropriation. The nearest observation well to the well for this application is LA-90B located about 80 miles to the south of the well location for this application. The hydrograph for observation well LA-90B is shown in Figure 1. Due to the distance between the well for this application and observation well LA-90B and the close proximity of LA-90B to the outcrop, LA-90B is not expected to be reflective of the localized aquifer conditions in the area of the well site for this application.

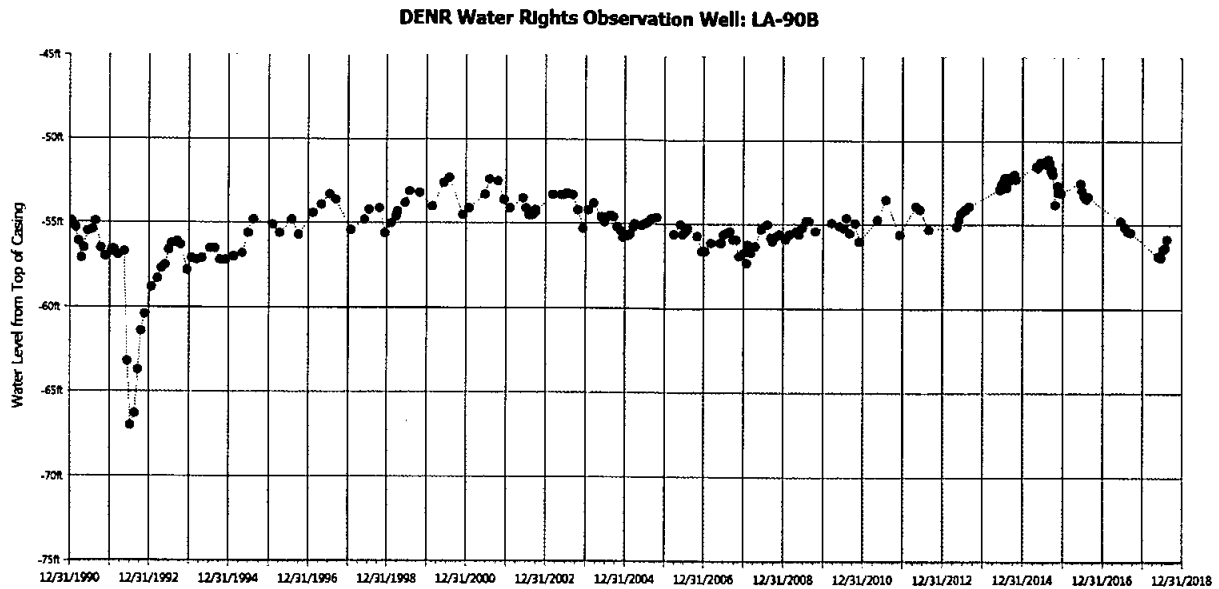


Figure 1: Hydrograph for observation well LA-90B (Water Rights, 2018b)

Hydrologic Budget

Recharge

The average annual recharge to the Inyan Kara aquifer in its entirety has not been quantified. However, using data from 1950-1998 the precipitation component of the recharge from the Black Hills outcrop area in South Dakota was estimated to be 11,600 acre-ft per year by Driscoll and Carter (2001). This estimate was only for the outcrop area located in South Dakota, so there may be additional precipitation recharge to the Inyan Kara aquifer from outcrops in other states. The well site for this application is located approximately 70 miles from the nearest area of Inyan Kara outcrop in South Dakota.

Discharge

Farmer (2018) recently estimated average annual withdrawals from the Inyan Kara aquifer in South Dakota to be 10,451.2 acre-feet per year. The estimate of Farmer (2018) was based on updating the estimate of Buhler (2012) which based a water use estimate on: (1) annual water use reported in the latest public water system survey for municipal, rural water system, and suburban housing development appropriations where applicable; (2) calculated annual use based on permitted animals and rates of 20 gallons per day (gpd) for beef cattle, 5 gpd for swine, 15 gpd per 100 turkeys, and 9 gpd per 100 chickens for large confinement operations permitted by the DENR; (3) irrigation questionnaire reporting for irrigation permits when available; (4) the most current water use reported for non-irrigation appropriations that are required to report, and (5) assuming unreported water rights/permits limited to an annual volume will be used to the maximum and water rights/permits limited by diversion rate will be used 60% of continuous pumping at the maximum diversion rate for their annual use period. Since the Farmer analysis (2018), two water permits (Water Permit Nos. 8334-3 and 1982-1) for the Inyan Kara have been approved. Using the same methodology as Farmer (2018) these two water permits can be

estimated to use less than 146.1 acre-feet of water per year. Assuming that the other water uses have not significantly changed the current estimated average annual withdrawal plus this appropriation is 10,958 acre-feet per year.

Although this estimated average annual withdrawal nearly equals the estimated average annual recharge amount of 11,600 acre-feet per year, it is emphasized that this recharge amount is from precipitation on the outcrop area in the Black Hills only and does not take into account the recharge from other sources (i.e. streamflow across the outcrop or groundwater inflow either from out of state or underlying aquifers).

Localized Hydraulic Budget

From a local perspective, the water use for water rights/permits completed into the Inyan Kara aquifer in Harding County is summarized in Table 1. Buhler (2009) notes that there is some potential that the well supplying Water Permit Nos. 1734-1 and 1870-1 may actually be completed into the Inyan Kara aquifer, therefore they have been included in the localized analysis. Average annual use for the Inyan Kara water rights/permits in Harding County is also presented in Table 1. Estimates assume that water rights/permits limited by maximum instantaneous diversion rate historically use less than 60% of the permitted diversion rate annually, and water rights/permit limited by an annual volume are assumed to use the full annual volume (Water Rights, 2018b). A review of well completion reports on file with the South Dakota Water Rights Program indicates that domestic usage of the Inyan Kara aquifer in Harding County is very limited; most domestic use in Harding County is from the much shallower Fox Hills and Hell Creek aquifers (Water Rights, 2018c). Although information is not available to estimate localized recharge to the Inyan Kara aquifer, comparison of the estimated average annual appropriative use from the Inyan Kara aquifer in Harding County (657.6 acre-feet) to the estimated amount of recoverable water in storage in the aquifer in Harding County (22,528,800 acre-feet) would suggest that water is locally available for appropriation.

Table 1: Inyan Kara and Newcastle Water Rights/Permits in Harding County (Water Rights, 2018b)

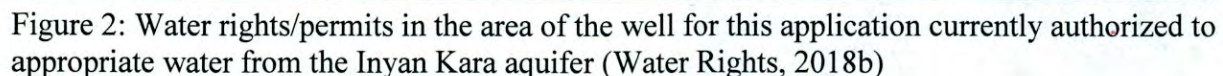
Permit No.	Name	Status	Use	Aquifer	Rate (cfs)	Estimate water use (acre-feet per year)
1350-1	CITATION OIL & GAS CORPORATION	LC	IND	INKR	0.1	43.4
1892-1	PRIMA EXPLORATION INC	PE	IND	INKR	0.333	144.6
1905-1	LUFF EXPLORATION COMPANY	PE	IND	INKR	0.195	84.7
1734-1	LUFF EXPLORATION COMPANY	PE	IND	NCSL	0.044	19.1
1870-1	LUFF EXPLORATION COMPANY	PE	IND	NCSL	0.013	5.6
Total					0.685	297.6

LC- licensed, PE-permitted, IND- industrial, NCSL- Newcastle, INKR- Inyan Kara

Existing Rights

Area water rights/permits completed into the Inyan Kara are shown in Figure 2 and summarized in Table 1. Water Permits Nos. 1734-1 and 1870-1 are also shown in Figure 1. The nearest is Water Right No. 1350-1 located about 3.5 miles to the northwest of the well site for this application. There are only a handful of well completion reports for domestic wells with the

Since the aquifer is under confined conditions in the area of the well, drawdown from pumping may extend a considerable distance from the pumping well. The exact amount of drawdown as the result of pumping under this proposed diversion cannot be quantified without aquifer testing. The well completion report for Water Right No. 1350-1 indicated a static water level of 2,000 feet below grade (October 20, 1987) and a formation top at about 4,367 feet below grade (Water Rights, 2018b and 2018c). Although area wells completed into the Inyan Kara aquifer may experience some drawdown as a result of pumping under this application, if approved, given the amount of artesian head pressure in the area, it is unlikely to be adverse.



The Water Management Board has promulgated rules that allow water to be placed to maximum beneficial use without the necessity of maintaining artesian head pressure for domestic use. The Board has defined an adversely impacted domestic well as “a well in which the pump intake was set at least 20 feet below the top of the aquifer at the time of construction or, if the aquifer is less than 20 feet thick, is as near to the bottom of the aquifer as is practical and the

water level of the aquifer has declined to a level that the pump will no longer deliver sufficient water for the well owner's needs." In the case of Water Permit Application No. 2313-2 for the Coca-Cola Bottling Company of the Black Hills the Water Management Board adopted findings that noted that if the increased costs or decreased production as a result of the impacts of legitimate users on artesian head pressure could be considered an adverse impact it would conflict with SDCL 46-1-4 (Water Rights, 1995). SDCL 46-1-4 requires the water resources of the state be put to beneficial use to the maximum extent of which they are capable (Water Rights, 1995). Ultimately considering the best available information, there is reasonable probability that this application, if approved, will not adversely impact existing water rights/permits or domestic users with adequate wells.

Conclusions

1. Water Permit Application No. 1983-1 proposes to appropriate 360 acre-feet of water annually at a maximum instantaneous diversion rate of 0.50 cfs for industrial use. The proposed diversion point is one well completed into the Inyan Kara aquifer located in the SW $\frac{1}{4}$ NE $\frac{1}{4}$ Section 1-T20N-R3E.
2. The well for this application is a well drilled for oil that is being converted into a water supply well.
3. Based on the available information, there is a reasonable probability that unappropriated water is available from the Inyan Kara aquifer for this application.
4. There is a reasonable probability the diversion proposed by this application from the Inyan Kara aquifer can be made without adversely impacting existing appropriative users of the Inyan Kara aquifer or domestic users of the Inyan Kara aquifer with adequate wells.


for Whitney Kilts
SDDENR-Water Rights Program

References

- Allen, J. C., Iles, D. L., Petres, A. K. 1985. Analysis of Groundwater and Streamflow Data Western Dakotas Region of South Dakota. Tasks 3A.B.C and 4 A.B.: Groundwater Resources Inventory, Final Report. U.S. Army Corps of Engineers Contract DACW45-82-C-0151.
- Buhler, K. 2009. Report on Water Permit Application No. 1905-1 for Luff Exploration Company. SD DENR-Water Rights Program, Joe Foss Bldg., Pierre, South Dakota.
- Buhler, K.A., 2012. Report to the Chief Engineer on Water Permit Application No. 2686-2: Powertech (USA) Inc., SD DENR-Water Rights Program, Joe Foss Bldg., Pierre, South Dakota.
- Discoll, D.G., and Carter, J.M., 2001. Hydrologic Conditions and Budgets for the Black Hills of South Dakota, Through Water Year 1998. Water-Resources Investigations Report 01-4226. U.S. Geological Survey.
- Fahrenbach, M.D., Steece, F. V., McCormick, K. A., McGillivray, G.L., Schulz, L.D. and Redden, J.A. 2010. South Dakota Stratigraphic Correlation Chart. South Dakota Geological Survey. Vermilion, SD.
- Farmer, J. 2018. Report to the Chief Engineer on Water Permit Application 1975-1: Wink Cattle Company. SD DENR-Water Rights Program, Joe Foss Bldg., Pierre, South Dakota.
- Gries, J. P. 1981. Elevation and thickness maps for certain geologic units prepare for the SD DENR. Accessed September 4, 2018.
<http://www.sdgs.usd.edu/sdoil/oilgas_results.aspx>
- Klenner, J. 2018. Environmental Scientist. SDDENR-Minerals and Mining Program, Pierre, SD. Personal Communication. August 22, 2018.
- Martin, J. E., Sawyer, J. F., Fahrenbach, M. D., Tomhave, D. W., and Schulz, L. D. 2004. Geologic Map of South Dakota. General Map 10. South Dakota Geological Survey, Vermillion, SD.
- Schoon, R. A. 1971. Geology and Hydrology of the Dakota Formation in South Dakota. SDGS, Vermillion, SD.
- South Dakota Geological Survey (SDGS). 2018. Oil and Gas Permits Database. Accessed August 31, 2018. <<http://cf.sddenr.net/sdoil/index.cfm>>
- Water Rights. 1995. Water Rights File No. 2313-2 Coca-Cola Bottling Company of the Black Hills. SD DENR-Water Rights Program, Joe Foss Bldg., Pierre, South Dakota.

Water Rights. 2018a. Observation Well Files. SD DENR-Water Rights Program, Joe Foss Bldg., Pierre, SD.

Water Rights. 2018b. Water Right/Permit Files. SD DENR-Water Rights Program, Joe Foss Bldg., Pierre, South Dakota.

Water Rights. 2018c. Well Completion Reports. SD DENR-Water Rights Program, Joe Foss Bldg., Pierre, South Dakota.

RECEIVED

SEP 26 2018

WATER RIGHTS
PROGRAM

Affidavit of Publication

STATE OF SOUTH DAKOTA:

COUNTY OF LAWRENCE:

Letitia Lister of said County and State being first duly sworn, on her oath says: That the BLACK HILLS PIONEER is a legal daily newspaper of general circulation, printed and published in the City of Spearfish, in said County and State by Letitia Lister, and has been such a newspaper during the times hereinafter mentioned; and that said newspaper has a bonafide circulation of at least 200 copies weekly, and has been published within said County in the English language for at least one year prior to the first publication of the notice herein mentioned, and is printed in whole or in part in an office maintained at the place of publication; and that I, Letitia Lister, the undersigned, am the Publisher of said newspaper and have personal knowledge of all the facts stated in this affidavit; and that the advertisement headed:

Notice Of Application
No. 1983-1

a printed copy of which is hereto attached, was printed and published in said newspaper for 1 successive and consecutive weeks, the first publication being made on the 20th day of Sept, 2018, and the last publication on the _____ day of _____, that the full amount of fees charged for publishing same, to-wit: The sum of \$25.41, insures solely to the benefit of the publisher of the BLACK HILLS PIONEER, that no agreement or understanding for a division thereof has been made with any person and that no part thereof has been agreed to be paid to any other person whomsoever.

[Signature]
Subscribed and sworn to before me this 21st day of Sept, 2018

[Signature]
Notary Public, Butte County, South Dakota
My commission expires: 3-21-2023

NOTICE OF APPLICATION NO. 1983-1 to Appropriate Water

Notice is given that Continental Resources, c/o Brad Aman, PO Box 269000, Oklahoma City OK 73126 has filed an application for a water permit to appropriate 360 acre-feet of water annually at a maximum pump rate of 0.50 cubic feet of water per second from one well completed into the Inyan Kara Aquifer (4,502 feet deep) located in the SW 1/4 NE 1/4 Section 1-T20N-R3E for industrial use as a water source in an enhanced oil recovery project. This site is located approximately 15 miles northwest of Buffalo SD.

Pursuant to SDCL 46-2A-2, the Chief Engineer recommends APPROVAL of Application No. 1983-1 with qualifications because 1) unappropriated water is available, 2) existing rights will not be unlawfully impaired, 3) it is a beneficial use of water, and 4) it is in the public interest. The Chief Engineer's recommendation with qualifications, the application, and staff report are available at <http://denr.sd.gov/public> or contact Eric Gronlund for this information, or other information, at the Water Rights Program address provided below.

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 October 1, 2018.

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.

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.

Steven M. Pimer,
Secretary, Department of
Environment and Natural
Resources.

Published once at the
total approximate cost of
\$25.87.

#900
Sep 20

RECEIVED

SEP 26 2018

WATER RIGHTS
PROGRAM

Affidavit of Publication

STATE OF SOUTH DAKOTA:

COUNTY OF HARDING:

Letitia Lister of said County and State being first duly sworn, on her oath says: That the NATION'S CENTER NEWS is a legal weekly newspaper of general circulation, printed and published in the City of Buffalo, in said County and State by Letitia Lister, and has been such a newspaper during the times hereinafter mentioned; and that said newspaper has a bonafide circulation of at least 200 copies weekly, and has been published within said County in the English language for at least one year prior to the first publication of the notice herein mentioned, and is printed in whole or in part in an office maintained at the place of publication; and that I, Letitia Lister, the undersigned, am the Publisher of said newspaper and have personal knowledge of all the facts stated in this affidavit; and that the advertisement headed:

NOTICE OF APPLICATION NO. 1983-1 to Appropriate Water

Notice is given that Continental Resources, c/o Brad Aman, PO Box 269000, Oklahoma City OK 73126 has filed an application for a water permit to appropriate 360 acre-feet of water annually at a maximum pump rate of 0.50 cubic feet of water per second from one well completed into the Inyan Kara Aquifer (4,502 feet deep) located in the SW 1/4 NE 1/4 Section 1-T20N-R3E for industrial use as a water source in an enhanced oil recovery project. This site is located approximately 15 miles northwest of Buffalo SD.

Pursuant to SDCL 46-2A-2, the Chief Engineer recommends APPROVAL of Application No. 1983-1 with qualifications because 1) unappropriated water is available, 2) existing rights will not be unlawfully impaired, 3) it is a beneficial use of water, and 4) it is in the public interest. The Chief Engineer's recommendation with qualifications, the application, and staff report are available at <http://denr.sd.gov/public> or contact Eric Gronlund for this information, or other information, at the Water Rights Program address provided below.

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 October 1, 2018.

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.

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.

Steven M. Pimer, Secretary, Department of Environment and Natural Resources.

Published once at the total approximate cost of \$25.87.

#680
Sep 20

Notice of Application
No. 1983-1

a printed copy of which is hereto attached, was printed and published in said newspaper for 1 successive and consecutive weeks, the first publication being made on the 20th day of Sept., 2018, and the last publication on the day of , , that the full amount of fees charged for publishing same, to-wit: The sum of \$ 25.41, insures solely to the benefit of the publisher of the NATION'S CENTER NEWS, that no agreement or understanding for a division thereof has been made with any person and that no part thereof has been agreed to be paid to any other person whomsoever.

[Signature]
Subscribed and sworn to before me this 24th day of Sept., 2018

[Signature]
Notary Public, Butte County, South Dakota
My commission expires: 3-21-2023

Schlaak, Karen

From: Schlaak, Karen
Sent: Monday, September 10, 2018 1:38 PM
To: Legals (legals@bhpioneer.com)
Subject: 1983-1, Continental Resources
Attachments: 1983-1public.short.docx; FORM8.FRM.doc

Attached is a notice to be published on September 20, 2018 in BOTH the Nation's Center News and the Black Hills Pioneer.

Continental Resources, c/o Bard Aman, PO Box 269000, Oklahoma City OK 73126 (405 234-9000) has been notified to contact you to authorize publication and arrange for payment.

Please send the affidavits 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

SD DENR, Water Rights Program
(605) 773-3352



Instruction to Newspaper - Publish the Notice on September 20, 2018. The applicant is responsible for payment.

NOTICE OF APPLICATION NO. 1983-1 to Appropriate Water

Notice is given that Continental Resources, c/o Brad Aman, PO Box 269000, Oklahoma City OK 73126 has filed an application for a water permit to appropriate 360 acre-feet of water annually at a maximum pump rate of 0.50 cubic feet of water per second from one well completed into the Inyan Kara Aquifer (4,502 feet deep) located in the SW 1/4 NE 1/4 Section 1-T20N-R3E for industrial use as a water source in an enhanced oil recovery project. This site is located approximately 15 miles northwest of Buffalo SD.

Pursuant to SDCL 46-2A-2, the Chief Engineer recommends APPROVAL of Application No. 1983-1 with qualifications because 1) unappropriated water is available, 2) existing rights will not be unlawfully impaired, 3) it is a beneficial use of water, and 4) it is in the public interest. The Chief Engineer's recommendation with qualifications, the application, and staff report are available at <http://denr.sd.gov/public> or contact Eric Gronlund for this information, or other information, at the Water Rights Program address provided below.

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 October 1, 2018.

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.

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.

Steven M. Pirner, Secretary, Department of Environment and Natural Resources. Published once at the total approximate cost of _____.



**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

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

denr.sd.gov

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

September 10, 2018

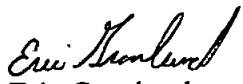
Continental Resources
c/o Brad Aman
PO Box 269000
Oklahoma City OK 73126

Dear Mr. Aman:

Water Permit Application No. 1983-1 for industrial use has been examined and found to comply with the South Dakota Water Laws and applicable rules. A notice has been sent to the Nation's Center News printed at Buffalo SD (Ph # 605 375-3228) and the Black Hills Pioneer printed at Spearfish SD (Ph # 605 642-2761). You will need to contact the newspapers 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 newspapers to authorize publication of your Notice and to arrange for payment. Early contact with the papers 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.



DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE SOUTH DAKOTA 57501-3182
<http://denr.sd.gov>

OCT 04 2018

Continental Resources
c/o Brad Aman
PO Box 269000
Oklahoma City OK 73126

Dear Mr. Aman:

Enclosed is Water Permit No. 1983-1 authorizing construction of the 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,

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

enclosures