Doc # 1352427

COLORADO
Oil & Gas Conservation Commission
Department of Natural Resources

1120 Lincoln Street, Suite 801
Denver, CO 80203

March 26, 2020

Mr. Robert Hillegas
Physical Sciences Researcher/Scientist
Colorado Department of Public Health and Environment
Water Quality Control Division
4300 Cherry Creek Drive South Denver,
Colorado 80246-1530

Regarding: Request for Aquifer Exemption: Dakota and Lakota Formations
Sandridge Exploration & Production, LLC
UIC Facility Name: Pintail 16
Well Name: Pintail SWD 0780 #2-16D (API: 05-057-06566)
Jackson County, Colorado
Parts of Sections 15, 16, 21, and 22, Township 7 North, Range 80 West, 6th Prime Meridian

Dear Mr. Hillegas,

Sandridge Exploration & Production, LLC ("Sandridge") has filed an application with the Colorado Oil and Gas Conservation Commission ("COGCC") for an Underground Injection Control ("UIC") Disposal well, the Pintail SWD 0780 #2-16D ("Pintail 2-16D") in Jackson County, Colorado. Lower Cretaceous sandstones in the Dakota (9,690 to 9,747 ft MD, 8,976 to 9,027 ft TVD) and Lakota (9,747 to 9,900 ft MD, 9,027 to 9,173 ft TVD) Formations ("Dakota-Lakota") are the intended injection zones. Analyses of water for total dissolved solids ("TDS") from the Dakota-Lakota had an average TDS concentration of 3,175 milligrams per Liter ("mg/L"). Because the TDS concentration is less than 10,000 mg/L an aquifer exemption is required from the US EPA and the Colorado Water Quality Control Division. The US EPA is currently reviewing this request. (MD = Measured Depth along wellbore, TVD = True Vertical Depth from surface)

Sandridge proposes to dispose of produced water and other Class II wastes from their oil and gas operations, primarily produced water from the Niobrara Formation. The proposed UIC Pintail 2-16D Disposal well is non-commercial, only Sandridge production will be injected.

The Pintail 2-16D is located in Jackson County. The well was planned and drilled directionally. The Surface location is 1,281 ft from the south line and 1,632 ft from the west line of Section 16, Township 7 North, Range 80 West. The Bottomhole is 929 ft from the south line and 310 ft from the east line of Section 16. Overall perforations are at depths of 9,690 to 9,804 ft (MD), 8,975 to 9,078 ft (TVD).

Sandridge send a cover letter (enclosed) to COGCC explaining why they feel an Aquifer Exemption for the Dakota-Lakota is merited. Sandridge also filled out the U.S. Environmental Protection Agency (EPA) Aquifer Exemption Evaluation form (enclosed). A Public Notice of the proposed designation of the Dakota-Lakota as an Exempt Aquifer was published on March 19, 2020 in the Jackson County Star.

Note that last year CDPHE, EPA, and COGCC all concurred on granting an aquifer exemption for the Entrada Sandstone that lies below the Dakota-Lakota in this area. The exemptiion was in the Big Horn 0780 1-17 (API: 057-06585) about 9,400 ft northwest and the Pintail SWD 0780 1-16D (API: 057-06562) about 5,000 ft north-northwest. The Pintail SWD 0780 1-16D and Pintail SWD 0780 2-16D were constructed on the same pad, the 1-16D was drilled to the north and the 2-16D drilled to the southeast. A map showing these relationships is enclosed.

COGCC feels the Dakota-Lakota should qualify as an exempt aquifer. The Dakota-Lakota is too deep to be used as an aquifer, as mentioned injection will be at 9,690 to 9,804 ft (MD), 8,975 to 9,078 ft (TVD). The TDS concentration, 3175 mg/L, is too high for the Dakota-Lakota to be considered as practical public water supply. Because of these characteristics the Dakota-Lakota does not currently serve as an aquifer. In their request for this aquifer exemtion Sandridge states that the cost of drilling, operating, and maintaining a Dakota-Lakota water well, piping or transporting the water to a treatment facility and/or to the municipality, and treating to drinking water standards are all thought to be prohibitive. Sandridge's estimate is about $15,000,000 to drill a water well, treat the water to drinking standards, and deliver it to Waldron, Colorado. Walden, the largest nearby city lies 12 miles to the north-northwest.

Walden is the Jackson County seat with a population of only 734 in 2000 and 608 in 2010. Given a low population density, the lack of large population centers, and low probability of population growth in the area existing shallow water supplies are expected to be adequate.

The proposed Aquifer Exemption Area is used as farmland or rangeland at this time. In a three by three (3 x3) mile area surrounding the Pintail 2-16D the Colorado Division of Water Resources ("DWR") database lists sixty (60) water wells. DWR records indicate the average depth for these wells is 96 ft. The deepest well at 270 feet happens to be the closest one to the Pintail. The surface casing in the Pintail was set at 2,318 ft MD (2,317 ft TVD) so surface casing is adequate. The three closest water wells are highlighted on the exemption maps (enclosed).

The DWR lists the aquifer as "GW" in all twenty-four wells mentioned above. The USGS 1:250,000 map for the area shows water wells were spudded in either (youngest to oldest sediments) undifferentiated alluvium, Pinedale or Bull Lake age (Pleistcene) alluvium, or the Coalmont Formation (Paleocent-Eocene). These shallow groundwater wells and sources are expected to be adequate for current and forseeable farm or ranch needs. The Dakota-Lakota is not needed as a source of water in this area.

If approved the Aquifer Exemption will be limited to the Dakota and Lakota Formations in parts of Township 7 North, Range 80 West of the 6th Prime Meridian in

Jackson County. The exemption will include the W ½ of the SW ¼ of Section 15, the all of the SE ¼ of Section 16, the NE ¼ of the NE ¼ of Section 21, and the NW ¼ of the NW ¼ of Section 22. The area requested for the Exemption is 320 acres.

Please review the enclosed evaluation form and other attachments and grant an Aquifer Exemption for the Dakota and Lakota Formations in the Pintail SWD 0780 2-16D as shown on the enclosed map and outlined in the location description. Feel free to contact me with any questions.

Thank you for your attention.

Sincerely,

Robert A Koehler

Robert P. (Bob) Koehler
UIC Lead - Geology Advisor

Telephone: 303-894-2100 x5147 Email: Bob.Koehler@state.co.us

Attachments:
Wellbore Diagram
2 Exemption Maps
Spreadsheet of Water Analyses Results
Sandridge to COGCC: Pintail SWD 0780 2-16D Cover Letter
EPA Evaluation Form

May 29, 2019

Mr. Bob Koehler
Colorado Oil and Gas Conservation Commission
1120 Lincoln Street, Suite 801
Denver, Colorado 80203

RE: Aquifer Exemption Request

SandRidge Exploration & Production LLC
Pintail SWD 0780 2-16D
API: 05-057-06566
SHL: 1281' FSL & 1632' FWL
16-7N-80W
BHL: 929' FSL & 310' FEL
16-7N-80W
Jackson County, Colorado
Surface: Fee
Mineral Lease: Fee

Mr. Koehler:

SandRidge Exploration & Production LLC ("SandRidge") submitted a Form 33 for the Pintail SWD 0780 2-16D (Document Number 402025133), located in Jackson County, Colorado. In conjunction with the Form 33, SandRidge requests an Aquifer Exemption pursuant to Colorado Oil and Gas Conservation Commission ("COGCC"), Rule 324B.

SandRidge asserts that the requested Dakota/Lakota Aquifer Exemption meets the criteria of COGCC Rules 324B.a.(1) and 324B.a.(2) as the Dakota/Lakota Formation "does not currently serve as a source of drinking water" and "cannot, and will not in the future, serve as a source of drinking water because it is situated at a depth (~9000'MD+) and its location (over fifteen (15) miles from the nearest town of Walden) makes recovery of water for drinking water purposes economically or technologically impractical under current practice. The cost of drilling a water well to this depth, cleaning the water to drinkable standards and transporting via pipeline to Walden would be an estimated cost of approximately $15 million. The aforementioned technical and economical challenge would be too great for Walden, and/or a single individual in the area.

May 29, 2019

The Vaneta 1-32D (API: 05-057-06467) and Judy 1-30 SWD (API: 05-057-06466), both owned and operated by SandRidge, were granted an Aquifer Exemption for the Dakota/Lakota aquifer in 2014 and 2016 on a similar basis as stated above. The basis for which the Aquifer Exemption was granted for the abovementioned SWD wells, still holds true for the Pintail SWD 0780 2-16D.

The Dakota/Lakota formation is found at a depth of 9690' MD. The Dakota/Lakota formation water quality was determined from analyses performed on water/fluid swabbed from the wellbore, and contained approximately 3,200 mg/L of total dissolved solids. The water quality of the Dakota/Lakota formation is too contaminated to be used as quality drinking water. Based on information in the Colorado Division of Water Resources database, the nearest permitted water well is within two (2) miles of the Pintail SWD 0780 2-16D, and was drilled to 60' (Water Well Permit 94382-VE).

The injected fluids will be confined to the Aquifer Exemption boundary as SandRidge will limit injection rates to a maximum of 8500 bbls/day, with a surface injection pressure range from 1500-1750 psi. There is no known technical data that would lead SandRidge to believe the injected fluid would reach any known large fault.

Please contact me at 405-429-5828 or at doverbey@sandridgeenergy.com should you have any questions, or need additional information.

Best regards,

Diane Overbey

Diane Overbey
Regulatory Analyst II

Aquifer Exemption Evaluation

Regulatory Agency: Colorado Oil and Gas Conservation Commission (COGCC) 1425 Program

Date of Aquifer Exemption Request: March 23, 2020

Substantial or Non-Substantial Program Revision: Non-Substantial

Basis for Substantial or Non-Substantial Determination: This AE request is considered non-substantial, consistent with EPA Guidance 34.

Operator: Sandridge Exploration & Production LLC

Well Class/Type: Class II SWD Well

Well/Project Name: Pintail SWD 0780 2-16D/Pintail 16

Well/Project Permit Number: N/A

Well API number: 05-057-06566

Field: Wildcat

Tribal Reservation: No

Well/Project Location: Pintail SWD 0780 2-16D Qtr: SESW Section: 16 Township: 7N Range: 80W

Surface Footage Call: 1281' FSL feet from (NS) line & 1632' FWL feet from (EW) line

Bottom Footage Call: 929' FSL & 310' FEL of Sec 16 Twp 7N Rng 80W

County: Jackson **State**: CO

Latitude: 40.573760 **Longitude:** -106.382210 **(decimal degree, 5-decimals)**

DESCRIPTION OF PROPOSED AQUIFER EXEMPTION (depths are approximate values at the well bore)

Aquifer to be Exempted: Dakota-Lakota Interval **Top**: 9695' MD / 8981' TVD **Bottom:** 9813 MD' / 9086' TVD

Lithology: Sandstone

Water Quality – TDS (mg/L): ~3,175 mg/L **Source of WQ Data**: Swab Pintail SWD 0780 2-16D

Areal Extent and Description of Exempted Aquifer (i.e. radial distance, encompassed TSR)

Total Area of Aquifer to be exempted: ±320 Acres

Description: T7N R80W: W ½ of the SW ¼ of Section 15, the all of the SE ¼ of Section 16, the NE ¼ of the NE ¼ of Section 21, and the NW ¼ of the NW ¼ of Section 22.

Confining Zone(s): Muddy formation above and Morrison formation below the injection zone

Upper: Muddy **Lithology:** Fine to medium-grained sandstones, siltstones, and mudstones **Top:** 9545' MD / 8844' TVD **Bottom:** 9695' MD / 8981' TVD

Lower: Morrison **Lithology:** Multi-colored shales, mudstones, sandstones, and conglomerates with minor limestone, marl, and claystone **Top:** 9813' MD / 9086' TVD **Bottom:** 10307' MD / 9535' TVD

BACKGROUND

USDW(s): At ~8,900' depth, the Dakota-Lakota interval is too deep to be used as USDWs by individuals living in the area due to the cost of drilling, there are no population centers at this location, and it is unlikely any will grow here (due to limited surface water in part), treatment of Dakota formation water could be outrageously costly.

Injectate Characteristics: Produced waters (maximum expected TDS value: 9,000 mg/L), flowback, workover fluids and drilling fluids.

BASIS FOR DECISION

Regulatory Criteria under which the exemption is requested

146.4: X (a) Not currently used as a drinking water source and**:**

- How far from the AE boundary to review of drinking water wells and how was this determined?
  - **The entire county of Jackson County, CO was reviewed. Water well research**
- Identify drinking water wells in area of review, their depths, and provide source of information.
  - **The average depth of water wells for drinking in this are ranges from ~45 - 200'. The deepest in 4 miles around the AE is 455' (Water well permit 266649)**
- Identify any source water assessment and/or protection areas and designated sole source aquifers
- Identify nearest public water supply (PWS).
  - **Walden CO in Jackson Co. ~12 miles away**
- What is the distance of the nearest drinking water well utilizing the aquifer proposed for exemption? If so, is it in close enough proximity to require a capture zone analysis?
  - **There are none. The closest drinking water well in depth (TVD) is ~8,200' shallower**
- Provide map of AE boundary and location of drinking water wells.
  - **Attached**

☐ **(b)(1)** It is mineral, hydrocarbon, or geothermal energy producing, or can be demonstrated by a permit applicant as part of a permit application for a Class II or Class II operation to contain minerals or hydrocarbons that considering their quantity and location are expected to be commercially producible; or

- Projections on future use of the proposed aquifer.
  No projections or proposed projects

Hydrocarbon Production Data:

- Demonstrate historical production having occurred in the project area or field.
  - **None in this county**
- Demonstrate existence hydrocarbon (logs, core data, etc) and estimation of the quantity of the hydrocarbon potential.

Mineral Resources Available:

- A summary of logging which indicates that commercially producible quantities of minerals are present, a description of the mining method to be used, general information on the mineralogy and geochemistry of the mining zone, and a development timetable.

X **(b)(2)** It is situated at a depth or location which makes recovery of water for drinking water purposes economically or technologically impractical; or

- Projections on future use of the proposed aquifer.
  - **Nothing is proposed or projected for this formation**
- Current sources of water supply in the area of the proposed exempted aquifer.
  - **None**
- Availability, quantity and quality of alternative water supply source(s) to meet present and future needs.
  - **None**
- Population trends in the area and analysis of future water supply needs within the general area.
  - **No projected growth or need for water in this formation in this area**
- Well construction and water transportation and/or treatment costs to develop aquifer proposed for exemption compared to costs to develop alternative resource(s).
  Projected cost to drill, treat and transport water in the Dakota-Lakota formation would cost over 15 million dollars.

☐ **(b)(3)** It is so contaminated that it would be economically or technologically impractical to render that water

fit for human consumption; or

NO PROJECTED NEED FOR THIS WATER IN THIS AREA

- Projections on future use of the proposed aquifer.
- Concentrations, types, and source of contaminants in the aquifer.
- If contamination is a result of a release, extent of contaminated area and whether contamination source has been abated.
- Ability of treatment to remove contaminants from ground water.
- Current sources of water supply in the area of the proposed exempted aquifer.
- Availability, quantity and quality of alternative water supply source(s) to meet present and future needs.
- Population trends in the area and analysis of future water supply needs within the general area.
- Well construction and water transportation and/or treatment costs to develop aquifer proposed for exemption compared to costs to develop alternative resource(s).

X **(c)** TDS is more than 3,000 and less than 10,000 mg/l and it is not reasonably expected to supply a public water system.

YES

- Projections on future use of the proposed aquifer.
- Include information about the quality and availability of water from the aquifer proposed for exemption.
- Analysis of the potential for public water supply use of the aquifer. This may include: a description of current sources of public water supply in the area, a discussion of the adequacy of current water supply sources to supply future needs, population projections, economy, future technology, and a discussion of other available water supply sources within the area.

Describe what assurance exist to confine fluids within the AE boundary:

- Discuss injection rate or volume limitation**:**
  - **Injection rate of 0 – 6,000 bbl/day with a surface injection pressure range from 1,000 – 1,750 psi. Volume to be assigned by COGCC based on ¼-mile radius and thickness and porosity of the injection zone.**
- Discuss existence and quality of confining zone(s). (Is the confining zone continuous, are there known fractures?)
  - **The formation directly overlying the Dakota-Lakota interval is the Muddy Formation which is a low porosity, thinly-bedded sandstone that ranges in thickness from ~100-150' thick in the North Park Basin. The underlying Morrison Formation is a thick sequence of shales, mudstones, and siltstones that ranges 200-450' in thickness. Both of these intervals are present throughout the North Park Basin. At this location, the Muddy is 137' thick and the Morrison is 449' thick.**
  - **Faulting and fracturing is present in this part of the basin. However, two Niobrara horizontal wells drilled in the same section in 2019 (Ray Ranch 0780 1-16H and Ray Ranch 0780 2-16H) displayed no evidence of large-scale faulting at the Niobrara stratigraphic level. This could suggest that any local faulting at the Dakota-Lakota stratigraphic level is isolated and confined to deeper, pre-Niobrara rocks.**
  - **An injectivity test was approved by COGCC in 2019 and provided zero issues or cause for concern.**

Public Comment

Public Comment Conducted? **Yes** ☐ No

Results of Public Comment Process: **In process 3/19/2020**

Checklist of Questions to Consider

X **Are there deeper aquifers with poorer quality water that can be used for injection (disposal wells)?**
There may be deeper aquifers however, not economical to deepen the well for injection purposes.

☐ **Proximity to other jurisdictional boundaries?**

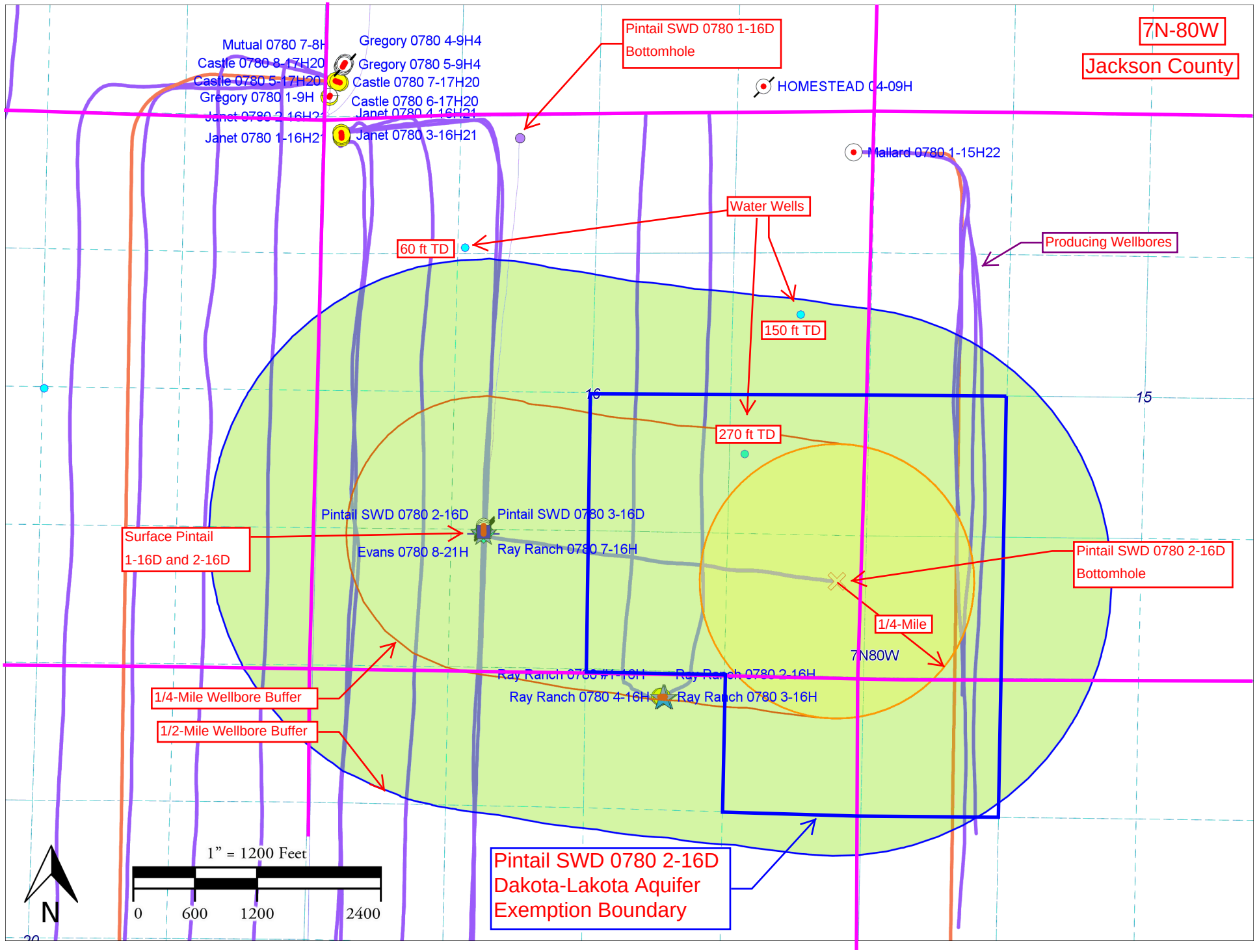
X **Is seismicity a concern in the area?** No.

Will injection of fluids cause any original formation fluid or injectate to migrate to any known USDW?

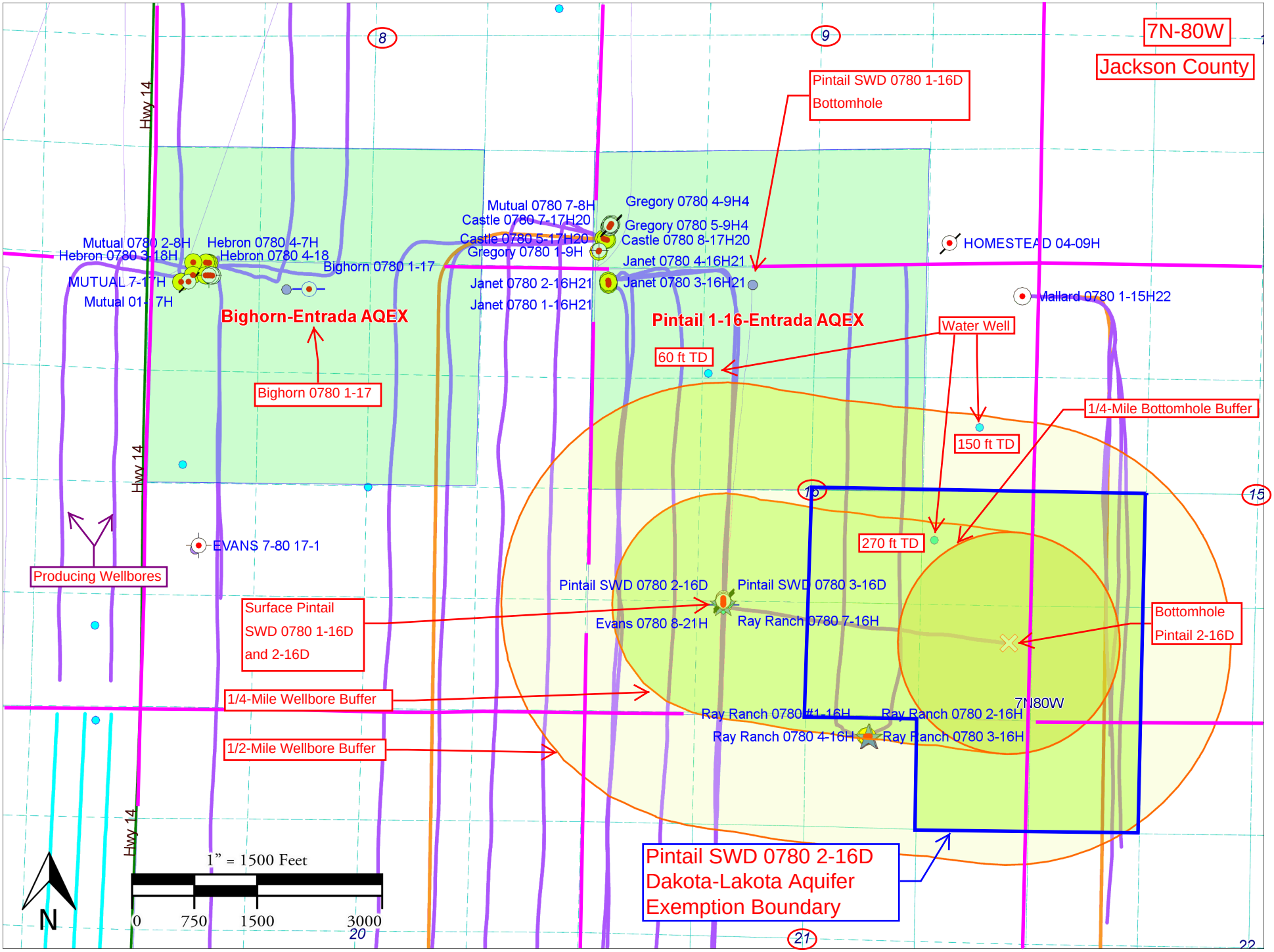
X **Are all wells within the AE boundary and AOR properly cemented to prevent preferential flow paths?** Yes, all wells are properly cemented.

Provide other considerations to support aquifer exemption approval:

Sandridge: Pintail SWD 0780 2-16D Aquifer Exemption



Sandridge: Bighorn 1-17, Pintail 1-16D and 2-16D Area



		Well Name: Pintail SWD 0780 2-16D API: 05-057-06566 Formation: Dakota/Lakota			COGCC Note: Sandridge says full water analysis of every swab run performed by NALCO.						Average from 2/26/2018 9:36 on down = 3172 mg/L
Matrix	**Sample ID**	**Customer**	**Geographic Region**	**Geographic Location**	**System Description**	**Equipment Description**	**Sample Point Location**	**Collection Date**	**Comments**	**pH @ 25°C**	**Dissolved Solids (calculated)**
EWA	AK28046	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/25/2018 16:21		5.85	3.78
EWA	AK28042	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/25/2018 16:30		7.43	2645.58831
EWA	AK28043	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/25/2018 16:42		7.15	3.78
EWA	AK28044	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/25/2018 16:45		7.12	4.41
EWA	AK28045	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/25/2018 16:50		6.32	4.41
EWA	AK28047	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/26/2018 6:30		5.97	3.78
EWA	AK28048	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/26/2018 6:50		6.13	3.78
EWA	AK28049	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/26/2018 7:09		5.76	3.78
EWA	AK28050	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/26/2018 7:30		5.84	3.78
EWA	AK28051	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/26/2018 7:54		5.13	3.78
EWA	AK28052	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/26/2018 8:15		5.28	3.78
EWA	AK28053	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/26/2018 8:29		5.18	3.78
EWA	AK28054	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/26/2018 8:49		5.32	3.78
EWA	AK28055	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/26/2018 9:00		5.56	3.78
EWA	AK28056	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/26/2018 9:18		5.91	3.15
EWA	AK28097	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/26/2018 9:39		7.87	3200.4
EWA	AK28100	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/26/2018 10:17		7.59	3143.7
EWA	AK28102	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/26/2018 10:32		7.95	3131.1
EWA	AK28104	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/26/2018 10:54		7.66	3320.1
EWA	AK28105	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/26/2018 11:10		7.87	3244.5
EWA	AK28106	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/26/2018 11:30		7.34	3225.6
EWA	AK28107	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/26/2018 11:50		7.4	3181.5
EWA	AK28108	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/26/2018 12:30		7.53	3175.2
EWA	AK28061	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/26/2018 13:30		7.4	3200.4
EWA	AK28062	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/26/2018 13:32		7.24	3225.6
EWA	AK28063	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/26/2018 13:50		7.64	3150
EWA	AK28068	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/26/2018 14:00		7.67	3105.9
EWA	AK28069	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/26/2018 14:15		6.67	3099.6
EWA	AK28070	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/26/2018 14:34		6.73	3049.2
EWA	AK28071	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/26/2018 14:58		6.86	3093.3
EWA	AK28075	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/26/2018 15:21		7.26	3074.4

Matrix	Sample ID	Customer	Geographic Region	Geographic Location	System Description	Equipment Description	Sample Point Location	Collection Date	Comments	pH @ 25°C	Dissolved Solids (calculated)
EWA	AK28076	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/26/2018 15:56		7.26	3036.6
EWA	AK28080	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/26/2018 16:16		7.13	3024
EWA	AK28081	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/26/2018 16:40		7.38	3030.3
EWA	AK28083	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/26/2018 17:10		7.61	3017.7
EWA	AK28086	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/27/2018 6:43		7.3	3061.8
EWA	AK28088	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/27/2018 7:00		7.3	3036.6
EWA	AK28089	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/27/2018 7:15		7.35	3036.6
EWA	AK28090	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/27/2018 7:35		6.81	3049.2
EWA	AK28091	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/27/2018 7:50		6.79	3049.2
EWA	AK28092	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/27/2018 8:05		6.79	2954.7
EWA	AK28093	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/27/2018 8:25		6.69	3181.5
EWA	AK28094	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/27/2018 8:50		6.5	3200.4
EWA	AK28095	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/27/2018 9:10		6.13	3225.6
EWA	AK28096	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/27/2018 9:25		6.47	3213
EWA	AK28098	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/27/2018 9:45		6.79	3257.1
EWA	AK28099	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/27/2018 10:00		6.76	3219.3
EWA	AK28101	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/27/2018 10:18		7.1	3231.9
EWA	AK28103	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/27/2018 10:35		7.11	3206.7
EWA	AK28057	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/27/2018 13:04		7.86	3332.7
EWA	AK28058	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/27/2018 13:20		7.77	3313.8
EWA	AK28059	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/27/2018 13:30		7.76	3294.9
EWA	AK28060	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/27/2018 13:50		7.82	3276
EWA	AK28064	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/27/2018 14:07		7.79	3269.7
EWA	AK28065	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/27/2018 14:22		7.98	3263.4
EWA	AK28066	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/27/2018 14:40		7.72	3219.3
EWA	AK28072	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/27/2018 15:05		7.79	3238.2
EWA	AK28073	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/27/2018 15:21		7.93	3238.2
EWA	AK28074	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/27/2018 15:40		7.85	3219.3
EWA	AK28077	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/27/2018 16:05		7.85	3200.4
EWA	AK28078	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/27/2018 16:25		8.02	3225.6
EWA	AK28079	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/27/2018 16:45		7.82	3200.4
EWA	AK28082	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/27/2018 17:10		7.72	3200.4
EWA	AK28084	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/28/2018 6:45		7.73	3194.1
EWA	AK28085	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/28/2018 6:58		7.91	3219.3
EWA	AK28087	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/28/2018 7:15		7.58	3219.3
EWA	AK28067	Sandridge Energy (1505453)	North Park	Pintail	Production System	0780 2-16D SWD	Wellhead	2/28/2018 14:47		8.53	3181.5
											3172.29

Collection Date	Bicarbonate (CaCO3)	Total Alkalinity (CaCO3)	Conductivity (@ 25°C)	Bromide (Br)	Chloride (Cl)	Fluoride (F)	Nitrate (NO3)	Ortho Phosphate (PO4)	Sulfate (SO4)	Aluminum (Al)	Antimony (Sb)	Barium (Ba)	Boron (B)	Calcium (Ca)	Calcium (CaCO3)
2/25/2018 16:21	2167.257	2167.257	6.43	4.2956	1330.6026	4.6583	0.7061	0.6746	83.3176	0.456	4.251	1.025	3.299	103.8	259.1886
2/25/2018 16:30	2122.783688	2122.783688	6.18	3.8469	924.2226	4.9558	0.7405	0.5737	77.3583	-0.666	4.065	0.362	3.454	56.37	140.7559
2/25/2018 16:42	2488.803563	2488.803563	6.3	3.3669	833.5318	5.5759	0.6926	0.6282	81.6055	0.363	4.15	1.117	3.405	117.1	292.3987
2/25/2018 16:45	1771.967063	1771.967063	6.61	5.2092	1536.4977	4.7211	0.6574	0.6793	78.2581	-0.311	3.47	0.775	3.287	55.5	138.5835
2/25/2018 16:50	1740.84825	1740.84825	6.71	4.9811	1583.8013	4.0952	0.5238	0.6642	84.9163	-0.07	3.796	0.537	3.56	62.95	157.1862
2/26/2018 6:30	2524.343063	2524.343063	6.26	3.4389	836.0254	5.605	0.5345	0.6424	78.8775	-0.149	3.54	0.606	3.263	109.4	273.1718
2/26/2018 6:50	2545.11975	2545.11975	6.24	3.4617	842.2824	5.5191	0.5215	0.6365	78.2045	-0.31	3.635	0.824	3.23	109.1	272.4227
2/26/2018 7:09	2539.997625	2539.997625	6.25	3.3566	870.3963	5.3508	0.6811	0.6469	89.3322	-0.081	3.562	1.021	3.3	112	279.664
2/26/2018 7:30	2550.269063	2550.269063	6.25	3.3692	870.9433	5.1467	0.6718	0.6488	88.9305	0.269	4.277	0.873	3.831	109.6	273.6712
2/26/2018 7:54	2576.695313	2576.695313	6.1	3.1455	807.1114	5.3221	0.5058	0.6423	86.2884	0.342	3.715	1.017	3.315	95.44	238.3137
2/26/2018 8:15	2755.039875	2755.039875	5.87	2.657	674.8579	5.5645	0.5183	0	83.6076	-0.302	4.496	0.721	3.186	70.52	176.0884
2/26/2018 8:29	2757.639	2757.639	5.71	2.4988	630.8785	5.6966	0.5131	0.621	81.2602	0.536	3.116	0.831	3.318	56.51	141.1055
2/26/2018 8:49	2755.436813	2755.436813	5.72	2.4751	626.6777	5.8503	0.5107	0.6191	81.0105	-0.067	3.967	0.715	3.125	55.12	137.6346
2/26/2018 9:00	2954.965875	2954.965875	5.59	2.3226	563.446	5.8491	0.5173	0.6232	78.8836	2.646	3.715	3.376	3.214	76.55	191.1454
2/26/2018 9:18	2907.311625	2907.311625	5.49	2.1539	495.804	5.8788	0.5097	0.6126	73.2874	0.186	3.918	0.691	3.122	34.76	86.7957
2/26/2018 9:39	2447.4906	2447.4906	5080	5.1437	448.6352	5.8875	3.8009	1.772	71.3917	-0.021	3.299	0.648	3.198	31.96	79.8041
2/26/2018 10:17	2504.3688	2504.3688	4990	4.9954	385.5219	6.0015	3.5024	0	66.2489	0.037	4.564	1.153	3.028	29.73	74.2358
2/26/2018 10:32	2474.5824	2474.5824	4970	4.9223	363.4172	6.1522	3.3987	0	64.9038	-0.035	4.485	0.446	2.808	26.96	67.3191
2/26/2018 10:54	2236.1616	2236.1616	5270	5.5988	617.0071	5.7529	3.5856	0	76.1696	-0.318	4.432	1.247	3.531	42.37	105.7979
2/26/2018 11:10	2374.9416	2374.9416	5150	5.2711	486.8766	5.8162	3.568	0	72.1632	-0.193	3.332	1.001	3.258	33.02	82.4509
2/26/2018 11:30	2386.206	2386.206	5120	5.1624	457.7309	5.8329	3.5273	0	77.7255	-0.117	4.221	0.967	3.208	30.48	76.1086
2/26/2018 11:50	2465.2458	2465.2458	5050	5.0518	409.0011	5.8343	3.6331	0	74.4811	-0.413	3.934	0.861	3.233	31.17	77.8315
2/26/2018 12:30	2457.5778	2457.5778	5040	4.9649	380.4329	5.8347	3.6033	0	73.5983	-0.433	3.534	0.748	3.266	31.62	78.9551
2/26/2018 13:30	2566.7064	2566.7064	5080	4.9339	371.4222	5.8547	3.5849	1.6998	74.0019	-0.411	4.248	0.874	3.234	41.77	104.2997
2/26/2018 13:32	2547.5526	2547.5526	5120	4.8418	329.3253	5.842	3.4812	1.6992	70.2605	-0.23	4.589	0.796	3.201	32.9	82.1513
2/26/2018 13:50	2502.92885	2502.92885	5000	4.8209	323.0609	6.0235	3.5441	1.7289	71.3499	-0.046	4.454	0.976	3.295	41.81	104.3996
2/26/2018 14:00	2580.24255	2580.24255	4930	4.7878	318.6151	5.9703	3.5291	1.7173	70.6033	0.242	4.247	0.908	3.123	31.6	78.9052
2/26/2018 14:15	2595.99305	2595.99305	4920	4.7845	313.1968	6.065	3.4093	1.7018	72.3777	0.078	3.936	0.688	3.152	30.31	75.6841
2/26/2018 14:34	2565.4022	2565.4022	4840	4.686	279.4818	6.1379	3.397	1.7001	73.0842	-0.095	3.573	0.714	3.91	34.48	86.0966
2/26/2018 14:58	2624.09325	2624.09325	4910	4.7604	304.6227	5.9328	3.4659	1.7346	73.7296	0.012	3.914	0.891	3.258	38.96	97.2831
2/26/2018 15:21	2609.3401	2609.3401	4880	4.6359	255.4927	6.09	3.4935	1.7246	68.6211	0.029	3.896	0.911	3.136	32.81	81.9266

Collection Date	Bicarbonate (CaCO3)	Total Alkalinity (CaCO3)	Conductivity (@ 25°C)	Bromide (Br)	Chloride (Cl)	Fluoride (F)	Nitrate (NO3)	Ortho Phosphate (PO4)	Sulfate (SO4)	Aluminum (Al)	Antimony (Sb)	Barium (Ba)	Boron (B)	Calcium (Ca)	Calcium (CaCO3)
2/26/2018 15:56	2687.69475	2687.69475	4820	4.688	286.0276	5.8912	3.4474	1.7303	72.9399	-0.215	4.658	0.52	3.328	18.31	45.7201
2/26/2018 16:16	2677.06725	2677.06725	4800	4.5705	233.8704	6.1403	3.5218	1.7184	65.8021	0.378	4.239	0.968	3.178	32.16	80.3035
2/26/2018 16:40	2702.9711	2702.9711	4810	4.5624	226.2755	6.3428	3.4474	1.7482	65.1099	-0.218	3.73	1.026	3.01	29.54	73.7614
2/26/2018 17:10	2690.48515	2690.48515	4790	4.5699	226.1422	6.3619	3.4929	1.7297	65.3801	0.089	3.934	1.011	3.178	27.51	68.6925
2/27/2018 6:43	2749.50865	2749.50865	4860	4.5393	212.5604	6.3139	3.4489	1.7239	64.7184	0.117	3.625	1.096	3.015	41.78	104.3247
2/27/2018 7:00	2793.81715	2793.81715	4820	4.5395	209.5574	6.2189	3.5132	1.6713	64.7909	-0.187	4.946	1.052	3.115	43.61	108.8942
2/27/2018 7:15	2721.1632	2721.1632	4820	4.5354	207.8557	6.1808	3.4512	1.6947	64.3534	0.037	4.456	1.079	2.845	43.6	108.8692
2/27/2018 7:35	2765.0902	2765.0902	4840	4.5184	203.9967	6.2092	3.3841	1.6818	65.5081	-0.317	3.644	1.134	3.58	47.07	117.5338
2/27/2018 7:50	2774.9111	2774.9111	4840	4.5075	200.4512	6.225	3.3705	0	65.4785	0.137	3.332	1.056	3.079	39.32	98.182
2/27/2018 8:05	2766.63255	2766.63255	4690	4.5298	198.6192	6.2464	3.4017	0	64.1488	0.009	4.011	1.066	3.025	37.42	93.4377
2/27/2018 8:25	2777.84865	2777.84865	5050	4.4826	186.0442	6.1842	3.3442	0	63.046	-0.391	4.621	1.135	3.11	34.17	85.3225
2/27/2018 8:50	2819.96625	2819.96625	5080	4.4687	184.8491	6.0584	3.3397	0	63.1783	0.006	4.555	1.065	3.161	31.1	77.6567
2/27/2018 9:10	2837.6188	2837.6188	5120	4.4669	179.835	6.3288	3.3375	1.6763	62.3621	0.155	3.762	1.078	2.975	33.22	82.9503
2/27/2018 9:25	2829.4329	2829.4329	5100	4.4546	177.152	6.3604	3.393	1.7087	62.3178	-0.098	4.956	1.071	3.078	30.3	75.6591
2/27/2018 9:45	2843.1669	2843.1669	5170	4.4371	165.3115	6.3817	3.7775	1.6905	60.4167	0.133	4.247	0.959	3.073	29.04	72.5129
2/27/2018 10:00	2834.21255	2834.21255	5110	4.4164	156.0556	6.4472	3.6782	1.7336	58.66	0.114	4.115	1.167	3.002	29.9	74.6603
2/27/2018 10:18	2843.8645	2843.8645	5130	4.3945	144.8363	6.3992	3.3968	1.7308	57.2664	0.008	4	1.085	3.089	30.81	76.9326
2/27/2018 10:35	2821.47045	2821.47045	5090	4.4346	174.0862	6.5474	3.3681	1.8274	57.6404	0.292	3.654	1.089	3.543	29.2	72.9124
2/27/2018 13:04	2581.10775	2581.10775	5290	4.6661	286.7672	6.4748	3.3747	1.8646	65.2714	-0.188	4.114	1.109	3.221	31.32	78.206
2/27/2018 13:20	2667.015	2667.015	5260	4.5885	236.4598	6.3295	3.4869	1.7562	65.4635	0.224	4.214	1.175	3.159	40.23	100.4543
2/27/2018 13:30	2661.4107	2661.4107	5230	4.5761	223.4112	6.2731	3.3123	1.7428	65.9777	0.132	4.645	1.126	3.013	34.23	85.4723
2/27/2018 13:50	2675.205	2675.205	5200	1.2299	211.3986	6.5484	3.3211	0.7796	67.6013	0.07	4.15	1.102	3.184	32.29	80.6281
2/27/2018 14:07	2676.4569	2676.4569	5190	1.2036	194.1948	6.3874	0.6891	0.4694	65.5234	0.185	4.696	1.097	3.096	30.97	77.3321
2/27/2018 14:22	2700.0792	2700.0792	5180	1.1885	186.4956	6.5918	0.6962	0.4407	65.9598	0.228	3.674	1.088	3.07	30.45	76.0337
2/27/2018 14:40	2723.9472	2723.9472	5110	1.1782	181.0148	6.58	0.6742	0.4816	65.6626	-0.403	4.368	1.15	2.913	31.5	78.6555
2/27/2018 15:05	2718.71145	2718.71145	5140	1.1384	163.6905	5.9733	0.7078	0.4393	59.8811	0.266	4.276	1.085	3.111	31.33	78.231
2/27/2018 15:21	2712.9141	2712.9141	5140	1.1541	171.6577	6.5253	0.67	0.4608	65.2757	0.3	3.97	1.079	2.929	27.65	69.0421
2/27/2018 15:40	2706.71895	2706.71895	5110	1.1446	175.4449	6.5457	0.7005	0.4593	64.2639	0.354	4.024	1.094	3.542	29.13	72.7376
2/27/2018 16:05	2722.7304	2722.7304	5080	1.1214	154.1692	6.6973	0.681	0.4647	62.7004	-0.003	3.898	1.189	3.176	27.42	68.4677
2/27/2018 16:25	2748.88575	2748.88575	5120	1.0805	140.2203	6.8721	0.6763	0.4765	60.8132	0.005	4.738	1.089	3.029	29.99	74.885
2/27/2018 16:45	2760.86655	2760.86655	5080	1.0634	128.9042	6.8122	0.6666	0.515	58.6498	0.239	4.191	1.018	2.977	29.28	73.1122
2/27/2018 17:10	2755.8765	2755.8765	5080	1.073	138.8934	6.7902	0.6724	0.5158	61.319	0.16	4.097	1.099	2.968	29.11	72.6877
2/28/2018 6:45	2692.3923	2692.3923	5070	1.0876	140.1741	6.6026	0.6636	0.3555	62.3063	0.029	3.892	1.03	2.961	29.95	74.7852
2/28/2018 6:58	2775.63195	2775.63195	5110	1.0982	144.4209	6.5432	0.6705	0.3987	64.1339	-0.02	4.461	1.127	2.913	39.45	98.5067
2/28/2018 7:15	2791.33335	2791.33335	5110	1.0861	138.8166	6.7774	0.6881	0.4117	62.5521	0.472	4.255	1.187	3.052	38.67	96.559
2/28/2018 14:47	2701.0386	2701.0386	5050	1.0603	122.8171	6.8858	0.7126	0.47	61.0596	0.394	4.006	0.638	2.85	11.09	27.6917

Collection Date	Chromium (Cr)	Cobalt (Co)	Copper (Cu)	Iron (Fe)	Lead (Pb)	Lithium (Li)	Magnesium (CaCO3)	Magnesium (Mg)	Manganese (Mn)	Molybdenum (Mo)	Nickel (Ni)	Phosphorus (P)	Potassium (K)	Silica (SiO2)	Silicon (Si)	Sodium (CaCO3)
2/25/2018 16:21	0.646	0.198	-7.036	28.13	-3.261	4.743	30.5514	7.419	1.42	5.256	0.72	3.226	59.61	123.9123	57.93	3084.7
2/25/2018 16:30	0.654	0.113	-6.798	12.49	0	4.743	18.9057	4.591	1.81	5.633	0.856	3.278	57.16	83.5493	39.06	2910.3
2/25/2018 16:42	0.606	0.224	-7.194	7.26	-2.158	4.648	21.4136	5.2	1.127	5.537	0.579	3.564	55.29	109.5596	51.22	2875.42
2/25/2018 16:45	0.691	0.26	-7.367	19.1	-2.675	4.789	22.5461	5.475	1.322	5.088	0.459	3.66	66.6	99.4849	46.51	3008.4
2/25/2018 16:50	0.759	0.221	-6.629	17.65	-2.206	4.836	28.0148	6.803	1.392	5.594	0.87	3.603	69.73	119.6771	55.95	3110.86
2/26/2018 6:30	0.615	0.247	-7.243	7.337	-1.779	4.961	22.1466	5.378	1.574	5.372	0.449	4.173	53.86	100.3405	46.91	3056.36
2/26/2018 6:50	0.575	0.263	-6.604	11.63	-1.82	4.88	21.0595	5.114	1.28	5.421	0.412	5.221	56.59	104.7468	48.97	2938.64
2/26/2018 7:09	0.668	0.221	-6.605	13.24	-1.993	4.76	21.8831	5.314	1.263	5.42	0.623	3.933	60.99	120.5327	56.35	2929.92
2/26/2018 7:30	0.567	0.24	-7.275	11.76	-1.409	4.732	21.183	5.144	1.142	5.202	0.433	2.02	60.59	122.3508	57.2	3030.2
2/26/2018 7:54	0.624	0.3	-6.861	13.77	-1.824	4.64	20.2235	4.911	1.329	4.907	0.38	5.441	57.73	104.3404	48.78	3014.94
2/26/2018 8:15	0.66	0.345	-7.294	7.944	-1.806	4.636	14.7589	3.584	1.026	5.304	0.25	4.526	54.03	106.7361	49.9	2816.56
2/26/2018 8:29	0.653	0.276	-7.078	11.37	-2.456	4.72	16.5255	4.013	1.084	5.394	0.64	5.304	54.17	114.7146	53.63	2977.88
2/26/2018 8:49	0.565	0.093	-7.342	11	-1.875	4.639	15.319	3.72	1.025	4.954	0.641	2.383	52.84	111.5061	52.13	2875.42
2/26/2018 9:00	0.585	0.285	-6.812	29.05	-2.006	4.629	33.154	8.051	1.213	4.806	0.669	4.912	49.16	123.4417	57.71	2901.58
2/26/2018 9:18	0.593	0.312	-7.169	5.972	-2.041	4.615	13.2888	3.227	0.951	5.476	0.516	5.387	48.24	106.2441	49.67	2960.44
2/26/2018 9:39	0.6	0.329	-7.359	4.866	-2.129	4.711	10.9086	2.649	0.938	5.537	0.736	4.682	43.92	108.4901	50.72	3032.38
2/26/2018 10:17	0.675	0.338	-7.623	4.315	-1.207	4.628	11.2874	2.741	0.883	5.258	0.434	4.483	42.53	113.6879	53.15	2999.68
2/26/2018 10:32	9.397	0.299	-7.193	2.449	-1.545	4.571	10.8427	2.633	0.93	5.407	0.39	2.243	40.21	102.6292	47.98	2912.48
2/26/2018 10:54	0.653	0.215	-7.072	4.373	-0.913	4.635	17.2627	4.192	0.897	5.43	0.438	4.187	46.74	131.8907	61.66	2971.34
2/26/2018 11:10	0.639	0.39	-7.415	4.592	-2.09	4.684	14.4048	3.498	0.92	5.306	0.124	3.789	44.41	123.1208	57.56	3062.9
2/26/2018 11:30	0.654	0.365	-7.162	2.929	-2.307	4.675	13.1817	3.201	0.899	5.074	0.163	4.449	47.23	122.5433	57.29	2884.14
2/26/2018 11:50	0.665	0.13	-7.467	6.285	-1.88	4.622	12.1399	2.948	0.956	4.968	0.162	4.14	45.82	114.9499	53.74	2881.96
2/26/2018 12:30	0.67	0.212	-7.392	7.237	-2.03	4.627	11.8187	2.87	1.036	5.131	0.35	3.222	46.83	113.7734	53.19	2903.76
2/26/2018 13:30	0.614	0.378	-7.155	1.998	-1.829	4.704	12.4652	3.027	0.899	5.443	0.42	4.586	45.11	118.9284	55.6	2986.6
2/26/2018 13:32	0.657	0.43	-7.297	2.322	-2.461	4.611	12.181	2.958	0.855	5.524	0.458	4.781	44.6	117.0033	54.7	3047.64
2/26/2018 13:50	0.626	0.256	-7.416	1.786	-3.222	4.605	11.9875	2.911	0.861	5.26	0.777	4.392	42.31	115.2707	53.89	2988.78
2/26/2018 14:00	0.61	0.427	-7.393	1.692	-2.544	4.597	11.2051	2.721	0.85	5.608	0.311	3.882	43.1	116.5755	54.5	3017.12
2/26/2018 14:15	0.61	0.242	-7.494	2.41	-2.534	4.592	12.1893	2.96	0.832	5.128	0.672	4.187	42.87	113.6665	53.14	2908.12
2/26/2018 14:34	0.624	0.279	-7.517	1.889	-2.862	4.541	11.6992	2.841	0.833	5.142	0.47	3.551	44.32	116.8322	54.62	2975.7
2/26/2018 14:58	0.571	0.146	-7.631	2.598	-2.224	4.57	11.7034	2.842	0.845	5.668	0.459	3.846	44.21	122.9069	57.46	3023.66
2/26/2018 15:21	0.613	0.246	-7.542	2.008	-1.722	4.627	11.0445	2.682	0.844	5.606	0.634	3.811	42.83	115.2065	53.86	2997.5

Collection Date	Chromium (Cr)	Cobalt (Co)	Copper (Cu)	Iron (Fe)	Lead (Pb)	Lithium (Li)	Magnesium (CaCO3)	Magnesium (Mg)	Manganese (Mn)	Molybdenum (Mo)	Nickel (Ni)	Phosphorus (P)	Potassium (K)	Silica (SiO2)	Silicon (Si)	Sodium (CaCO3)
2/26/2018 15:56	0.668	0.272	-7.384	1.993	-1.807	4.565	11.0733	2.689	0.8	5.269	0.428	5.158	43.22	119.0781	55.67	3025.84
2/26/2018 16:16	0.677	0.181	-7.674	2.303	-1.725	4.571	10.3362	2.51	0.849	5.645	0.606	5.086	39.83	113.7306	53.17	3036.74
2/26/2018 16:40	0.677	0.22	-7.482	1.684	-1.871	4.568	10.1385	2.462	0.831	5.078	0.445	3.947	38.37	112.5114	52.6	2975.7
2/26/2018 17:10	0.512	0.32	-7.603	1.686	-0.346	4.533	9.9614	2.419	0.823	4.989	0.089	3.351	39.72	112.8109	52.74	2980.06
2/27/2018 6:43	0.57	0.298	-7.686	1.642	-2.277	4.598	11.9134	2.893	0.872	5.313	0.399	2.825	39.57	117.3669	54.87	2984.42
2/27/2018 7:00	0.618	0.508	-7.498	2.186	-0.889	4.533	11.7692	2.858	0.857	5.282	0.325	4.118	38.9	112.9392	52.8	2919.02
2/27/2018 7:15	0.513	0.284	-7.446	2.209	-2.039	4.577	11.901	2.89	0.854	5.15	0.321	5.128	39.08	114.3723	53.47	2934.28
2/27/2018 7:35	0.622	0.314	-7.726	3.472	-2.267	4.599	11.9504	2.902	0.864	5.036	0.262	2.697	41.29	115.014	53.77	2988.78
2/27/2018 7:50	0.595	0.295	-7.809	3.716	-2.15	4.571	11.2133	2.723	0.858	5.557	0.394	3.594	39.1	111.5489	52.15	2943
2/27/2018 8:05	0.73	0.331	-7.716	4.123	-2.011	4.543	11.0239	2.677	0.857	5.22	0.041	4.823	39.19	110.5649	51.69	2949.54
2/27/2018 8:25	0.636	0.446	-7.692	5.019	-1.685	4.587	10.6244	2.58	0.884	5.157	0.517	4.851	38.9	110.8216	51.81	2973.52
2/27/2018 8:50	0.579	0.185	-7.804	6.122	-2.661	4.609	10.9868	2.668	0.874	5.015	0.454	2.926	40.52	114.9926	53.76	3012.76
2/27/2018 9:10	0.647	0.138	-7.634	3.321	-1.874	4.572	10.7192	2.603	0.861	5.379	0.222	3.05	38.22	111.72	52.23	2980.06
2/27/2018 9:25	0.668	0.415	-7.661	2.463	-1.984	4.561	10.2456	2.488	0.842	5.036	0.364	2.876	39.25	113.1531	52.9	2975.7
2/27/2018 9:45	0.64	0.305	-7.628	2.386	-2.482	4.545	9.8914	2.402	0.855	4.998	0.327	3.459	37.11	110.1585	51.5	2971.34
2/27/2018 10:00	0.63	0.325	-7.673	1.831	-1.9	4.555	10.2085	2.479	0.856	4.754	0.36	4.593	37.29	110.6719	51.74	2988.78
2/27/2018 10:18	0.572	0.229	-7.713	1.882	-2.851	4.65	10.122	2.458	0.84	5.457	0.285	4.39	34.79	111.0997	51.94	2986.6
2/27/2018 10:35	0.669	0.142	-7.641	1.543	-2.835	4.568	11.6869	2.838	0.857	5.244	0.63	4.673	36	125.5807	58.71	2962.62
2/27/2018 13:04	0.648	0.331	-7.657	1.509	-1.984	4.679	13.3464	3.241	0.838	5.564	0.283	2.294	37.09	121.4096	56.76	2932.1
2/27/2018 13:20	0.684	0.291	-7.647	1.561	-2.595	4.608	12.8976	3.132	0.838	4.969	0.363	4.015	38.27	112.7681	52.72	2871.06
2/27/2018 13:30	0.592	0.303	-7.655	1.846	-1.975	4.596	11.9834	2.91	0.831	5.009	0.277	3.437	39.01	114.9285	53.73	2921.2
2/27/2018 13:50	0.679	0.332	-7.614	2.116	-1.401	4.611	11.7034	2.842	0.846	5.213	0.276	4.137	38.81	115.014	53.77	2973.52
2/27/2018 14:07	0.629	0.223	-7.621	1.747	-2.348	4.539	11.0527	2.684	0.834	4.816	0.306	3.348	39.29	111.613	52.18	2951.72
2/27/2018 14:22	0.593	0.413	-7.749	2.208	-2.438	4.542	10.7933	2.621	0.813	5.493	0.102	4.494	38.32	112.7895	52.73	2984.42
2/27/2018 14:40	0.563	0.297	-7.77	1.721	-1.324	4.579	10.8798	2.642	0.824	5.257	0.564	3.313	37.08	111.4419	52.1	2984.42
2/27/2018 15:05	0.584	0.231	-7.561	2.055	-2.115	4.54	10.2579	2.491	0.827	5.07	0.59	3.722	37.13	111.9767	52.35	2977.88
2/27/2018 15:21	0.613	0.255	-7.614	3.218	-2.097	4.588	12.0616	2.929	0.829	5.383	0.602	5.233	38.25	111.4419	52.1	2943
2/27/2018 15:40	0.68	0.26	-7.753	1.809	-1.824	4.508	10.1962	2.476	0.819	5.078	0.6	3.49	38.73	112.4472	52.57	2986.6
2/27/2018 16:05	0.665	0.361	-7.628	1.5	-1.346	4.561	9.7473	2.367	0.824	5.142	0.413	4.506	38.16	107.5275	50.27	2966.98
2/27/2018 16:25	0.574	0.227	-7.713	2.067	-0.78	4.539	9.8914	2.402	0.818	5.15	0.409	2.975	34.26	103.934	48.59	2956.08
2/27/2018 16:45	0.627	0.148	-7.706	1.284	-1.94	4.557	9.7432	2.366	0.813	4.982	0.647	4.382	33.87	100.0624	46.78	2921.2
2/27/2018 17:10	0.598	0.282	-7.678	1.453	-1.324	4.513	9.9903	2.426	0.815	5.083	0.297	4.215	34.63	104.2763	48.75	2940.82
2/28/2018 6:45	0.581	0.169	-7.397	2.184	-1.718	4.625	10.4474	2.537	0.871	5.32	0.117	4.425	37.07	105.2388	49.2	2886.32
2/28/2018 6:58	0.559	0.382	-7.581	2.108	-2.201	4.617	11.4975	2.792	0.838	5.584	0.257	3.327	36.94	110.0302	51.44	2953.9
2/28/2018 7:15	0.611	0.238	-0.196	2.855	-1.719	4.763	11.5922	2.815	0.96	5.393	0.282	6.267	35.82	106.6933	49.88	2975.7
2/28/2018 14:47	0.651	0.27	-7.737	1.886	-1.991	4.567	9.492	2.305	0.79	5.254	0.293	4.755	35.45	103.442	48.36	2980.06

Collection Date	Sodium (Na)	Strontium (Sr)	Sulfur (S)	Sulfur (SO4)	Titanium (Ti)	Vanadium (V)	Zinc (Zn)
2/25/2018 16:21	1415	4.574	29.31	87.93	2.14	3.606	1.219
2/25/2018 16:30	1335	0	29.02	87.06	0	0	0
2/25/2018 16:42	1319	4.242	28.49	85.47	2.097	3.552	1.395
2/25/2018 16:45	1380	4.168	26.04	78.12	2.121	3.682	1.276
2/25/2018 16:50	1427	3.87	32.42	97.26	2.104	3.645	1.219
2/26/2018 6:30	1402	4.175	29.71	89.13	2.103	3.575	1.227
2/26/2018 6:50	1348	4.095	31.23	93.69	2.105	3.684	1.34
2/26/2018 7:09	1344	4.016	30.27	90.81	2.098	3.581	1.47
2/26/2018 7:30	1390	4.071	28.83	86.49	2.114	3.605	1.443
2/26/2018 7:54	1383	3.655	30.13	90.39	2.113	3.521	1.539
2/26/2018 8:15	1292	3.306	27.29	81.87	2.113	3.504	1.075
2/26/2018 8:29	1366	3.249	33.43	100.29	2.112	3.696	1.261
2/26/2018 8:49	1319	3.21	29.01	87.03	2.113	3.599	1.284
2/26/2018 9:00	1331	3.129	31.66	94.98	2.235	3.64	1.464
2/26/2018 9:18	1358	2.892	27.75	83.25	2.139	3.503	1.355
2/26/2018 9:39	1391	2.996	25.85	77.55	2.099	3.64	1.379
2/26/2018 10:17	1376	3.326	23.4	70.2	2.109	3.579	1.253
2/26/2018 10:32	1336	2.817	24.22	72.66	2.129	3.606	1.126
2/26/2018 10:54	1363	3.685	27.16	81.48	2.108	3.551	1.389
2/26/2018 11:10	1405	3.427	25.04	75.12	2.105	3.532	1.267
2/26/2018 11:30	1323	3.144	27.07	81.21	2.114	3.461	1.361
2/26/2018 11:50	1322	3.125	24.39	73.17	2.092	3.578	1.294
2/26/2018 12:30	1332	2.972	25.62	76.86	2.121	3.49	1.259
2/26/2018 13:30	1370	3.178	26.08	78.24	2.112	3.574	1.252
2/26/2018 13:32	1398	3.013	24.95	74.85	2.114	3.56	1.196
2/26/2018 13:50	1371	3.193	23.09	69.27	2.113	3.567	1.15
2/26/2018 14:00	1384	3.076	22.75	68.25	2.094	3.541	1.396
2/26/2018 14:15	1334	2.804	23.69	71.07	2.112	3.49	1.36
2/26/2018 14:34	1365	2.887	23.55	70.65	2.104	3.622	1.177
2/26/2018 14:58	1387	3.058	26.41	79.23	2.108	3.594	1.275
2/26/2018 15:21	1375	3.059	27.39	82.17	2.108	3.51	1.259

Collection Date	Sodium (Na)	Strontium (Sr)	Sulfur (S)	Sulfur (SO4)	Titanium (Ti)	Vanadium (V)	Zinc (Zn)
2/26/2018 15:56	1388	2.413	26.49	79.47	2.123	3.534	1.377
2/26/2018 16:16	1393	3.093	22.69	68.07	2.103	3.562	1.404
2/26/2018 16:40	1365	3.052	25.55	76.65	2.094	3.457	1.123
2/26/2018 17:10	1367	3.035	24.17	72.51	2.1	3.581	1.228
2/27/2018 6:43	1369	3.175	25.02	75.06	2.115	3.618	1.26
2/27/2018 7:00	1339	3.153	25.79	77.37	2.088	3.556	1.25
2/27/2018 7:15	1346	3.164	23.84	71.52	2.12	3.557	1.167
2/27/2018 7:35	1371	3.21	25.77	77.31	2.111	3.688	1.28
2/27/2018 7:50	1350	3.067	22.14	66.42	2.107	3.587	1.309
2/27/2018 8:05	1353	3.104	22.88	68.64	2.121	3.577	1.301
2/27/2018 8:25	1364	3.099	25.27	75.81	2.133	3.682	1.096
2/27/2018 8:50	1382	3.085	23.28	69.84	2.132	3.622	1.395
2/27/2018 9:10	1367	3.09	20.8	62.4	2.125	3.524	1.285
2/27/2018 9:25	1365	3.008	24.22	72.66	2.11	3.452	1.371
2/27/2018 9:45	1363	3.041	24.89	74.67	2.119	3.476	1.306
2/27/2018 10:00	1371	3.116	21.95	65.85	2.108	3.61	1.176
2/27/2018 10:18	1370	3.136	24.82	74.46	2.116	3.513	1.303
2/27/2018 10:35	1359	3.089	21.93	65.79	2.119	3.692	1.264
2/27/2018 13:04	1345	3.169	25.96	77.88	2.101	3.62	1.288
2/27/2018 13:20	1317	3.194	21.72	65.16	2.088	3.474	1.304
2/27/2018 13:30	1340	3.153	24.25	72.75	2.088	3.471	1.334
2/27/2018 13:50	1364	3.134	25.7	77.1	2.134	3.57	1.17
2/27/2018 14:07	1354	3.104	23.87	71.61	2.116	3.615	1.248
2/27/2018 14:22	1369	3.129	21.7	65.1	2.103	3.475	1.297
2/27/2018 14:40	1369	3.129	26.42	79.26	2.109	3.529	1.234
2/27/2018 15:05	1366	3.063	19.68	59.04	2.123	3.569	1.099
2/27/2018 15:21	1350	2.996	25.85	77.55	2.13	3.541	1.259
2/27/2018 15:40	1370	3.062	21.98	65.94	2.118	3.658	1.307
2/27/2018 16:05	1361	3.051	22.55	67.65	2.12	3.561	1.432
2/27/2018 16:25	1356	3.069	21.15	63.45	2.115	3.554	1.815
2/27/2018 16:45	1340	3.027	19.26	57.78	2.116	3.556	1.297
2/27/2018 17:10	1349	3.065	22.45	67.35	2.111	3.597	1.466
2/28/2018 6:45	1324	3.059	24.97	74.91	2.085	3.653	1.211
2/28/2018 6:58	1355	3.11	22.22	66.66	2.082	3.507	1.233
2/28/2018 7:15	1365	3.108	24.18	72.54	2.117	3.631	1.256
2/28/2018 14:47	1367	2.315	21.25	63.75	2.11	3.565	1.176

Current WBD

Wellbore Schematic

Field	N Park Horiz Nbrr
County	Jackson
State	CO
Well	**PINTAIL SWD 0780 2-16D**
SH Location	SEC 16, TWP 7N, RNG 80W
Elevations	8163' KB; 8141' GL
API #	**505706566**

Original Completion (2/23/2018)	x
Current	x
Workover	
Proposed	

Well Bore Data	MD	TVD
Conductor Pipe	51'	51'
55 jts 9-5/8" 36# J-55 csg @	2,318'	2,318'

36# J-55: Cplg OD =10.625" ID=8.921 Drift=8.765 Collapse= 2020 Internal Yield=3520

Cmt'd w/ 433 sxs Class 3 mixed at 12.5 ppg (Yield=2.16), followed by 152 sxs Class 3 mixed at 13.5 ppg (Yield=1.67) @ 13.5, Full Returns - Yes, 85 bbls of cement back to surface

Formations	MD	TVD
Niobrara	8,257'	7,693'
Carlile	8,820'	8,199'
Frontier	9,060'	8,414'
Graneros	9,274'	8,603'
Mowry	9,539'	8,839'
Dakota/Lakota	9,690'	8,976'
Morrison	9,880'	9,147'
Entrada	10,574'	9,787'
Chugwater	10,719'	9,929'

Dakota/Lakota Perf Intervals

Interval 1 (4 spf, 152 Holes, 90° phasing)	9,690'	8,975'
	9,728'	9,010'
Interval 2 (4 spf, 48 Holes, 90° phasing)	9,734'	9,015'
	9,746'	9,026'
Interval 3 (4 spf, 196 Holes, 90° phasing)	9,755'	9,034'
	9,804'	9,078'
10 sks of cement on top of CIBP	9,870'	9,138'
CIBP	9,875'	9,142'
Peforations (Established circulation and pumped cement job)	9,930'	9,192'

Cmt'd w/ 725 sxs mixed at 12 ppg (Yield=2.3), followed by 305 sxs mixed at 13.2 ppg (Yield=1.57) @ 13.2, Full Returns - Yes, 26 bbls of cement back to surface

Peforations (Could not establish circulation for cement job)	10,430'	9,650'
Peforations (Could not establish circulation for cement job)	10,642'	9,853'
255 jts 7" 26# P-110 csg		
Float Shoe (Could not establish circulation for cement job)	10,698'	9,908'

26# P-110: Cplg OD =7.656" ID=6.276 Drift=6.151 Collapse= 6210 Internal Yield=9960

TD @	10,788'	9,997'

Tubing Details	Length	Btm Depth
KB	22'	
3-1/2" 9.3# EUE 8rd tbg for space out	10'	32'
3-1/2" 9.3# J-55 EUE 8rd tbg	9,609'	9,641'
3-1/2" 9.3# EUE 8rd tbg for space out	10'	9,651'
On/Off Tool w/ 2.75" X Profile	2'	9,653'
3-1/2"x7" Halliburton PLT Packer Mid-Point Seals	7'	9,660'
4' Sub 3-1/2" 9.3# EUE 8rd tbg	4'	9,664'
2.75" XN w/ 2.635" NoGo	1'	9,666'
2' Sub 3-1/2" 9.3# EUE 8rd tbg	2'	9,668'
3-1/2" Ceramic pump out disc	1'	9,669'
WLEG	0.48'	9,670'
EOT		9,670'