UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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JAN 15 2014

Ref: 8P-W-UIC

Mr. Steven M. Pirner, Secretary
South Dakota Department of Environment and Natural Resources
Joe Foss Building
523 East Capitol
Pierre, South Dakota 57501-3182

RE: Aquifer Exemption Approval:
Inyan Kara Group near the Continental Resources, Inc. Hansen State 34-1 Saltwater Disposal Injection well, Harding County, South Dakota, and Underground Injection Control Program Revision Approval

Dear Mr. Pirner:

As requested, the U.S. Environmental Protection Agency Region 8 Water Program office has reviewed the notices of, and supporting information for, the proposed South Dakota Department of Environment and Natural Resources (DENR) designation of the Inyan Kara Group near the Continental Resources, Inc. (Continental) Hansen State 34-1 Saltwater Disposal (SWD) injection well, Harding County, South Dakota, as an exempted aquifer.

This request is connected with the Continental proposal for the Hansen State 34-1 SWD well to be used for disposal into the Inyan Kara Group of saltwater produced from nearby oil production wells in the Buffalo Field. The DENR UIC permit number for this well is 49-2013. The American Petroleum Institute (API) number for this well is 40-063-20385.

APPROVAL OF PROPOSED AQUIFER EXEMPTION: Based on review of the supporting information provided by DENR, and pursuant to the Code of Federal Regulations at 40 CFR 144.7(b)(3) and the EPA's Groundwater Protection Branch Guidance #34, the EPA hereby approves a non-substantial program revision to include exemption of the Inyan Kara Group within 1,800 feet (ft.) of the Hansen State 34-1 SWD injection well, located at SWSE Section 1, T22N-R3E, between the approximate depths of 4,650 ft. to 4,854 ft., Harding County, South Dakota.

This approval is based in part on the information provided by DENR showing that the Inyan Kara Group in the vicinity of the proposed Hansen State 34-1 SWD injection well is not presently used as a source of drinking water. Also, the Inyan Kara Group, due to the well's depth and location, is not reasonably expected to supply a public water system due primarily to the higher costs of well construction and water treatment (economically impracticable), given the availability of higher quality shallow aquifers in the area. The specific exemption criteria that apply are listed at 40 CFR parts 146.4(a) and 146.4(b)(2). This

approval applies to the location and the injection activities described herein. Additional approvals may be required for additional injection activities.

OVERVIEW: The Hansen State 34-1 SWD well is a former oil well that is proposed to be converted to a UIC Class II SWD injection well. The well would be used to dispose of produced waters from the South Buffalo Red River Unit (SBRRU) of the Buffalo Field. Oil production in the area is primarily from the Red River Formation. The injection zone would be the Inyan Kara Group which is comprised of the Fall River Formation and the Lakota Formation (a.k.a., Dakota Formation). Both of these formations are predominantly sandstones.

The surface casing of this well was set at 1,573 ft. and cemented to surface and the top of cement outside the longstring casing is at a calculated depth of approximately 3,853 ft. in this well. However, there is currently no cement bond log (CBL) for the well. A CBL is planned to be required by DENR to verify the top of cement depth prior to any authorization to inject. Continental proposes to inject through perforations into the Inyan Kara Group between the depths of approximately 4,730 ft. to 4,850 ft. Water quality of the Inyan Kara Group was estimated from analysis of three (3) nearby wells (wells within approximately four (4) miles) to be approximately 7,000 mg/l total dissolved solids (TDS); therefore, the Inyan Kara Group may be considered to be an underground source of drinking water (USDW) in this area. The fluid to be injected will be primarily Red River Formation production water which may exceed 10,000 mg/l TDS.

There are no known drinking water supply wells withdrawing from the Inyan Kara Group in the vicinity of the Hansen State 34-1 injection well within one-half (½) mile. The Fox Hills Formation is a USDW at a depth of approximately 800 ft. and is the primary source of drinking water in the area. The Hell Creek Formation is also a USDW and lies above the Fox Hills Formation. However, the Hell Creek Formation is not used in the area as a source of drinking water. The Fox Hills Formation currently provides an adequate supply of drinking water to residents in the general area. Also, the Fox Hills Formation is expected to provide an adequate supply of drinking water to residents in the general area in the future based on the relatively sparse population even with the current population growth rate of 4.9% (between 2010 and 2011). The estimated cost to drill and complete a water well in the Fox Hills Formation is reported to be approximately $10,000 for this aquifer exemption application (also estimated to be around $30,000 in other nearby areas in the county). The estimated cost to drill and complete a water well in the Inyan Kara Group is reported to be approximately $255,000. Also, the water quality of the Fox Hills Formation is better than the water quality of the Inyan Kara Group (the Fox Hills Formation has reported TDS values of around 1,200 mg/L). As such, there would be less water treatment costs associated with the Fox Hills Formation. Therefore, given the availability of the shallower, higher quality Fox Hills Formation and due to economic considerations associated with well construction, well operation and water treatment, it is unlikely that water wells would be constructed in the Inyan Kara Group in the area.

The upper confining layer includes the Graneros Group shales (hundreds of feet thick) which isolate the injection zone from the shallower aquifers. The lower confining layer includes the Morrison Formation shale (over 100 ft. thick) and other geologic strata which provide isolation beneath the injection zone. Below the injection zone and lower confining layer are two known USDWs: the Minnelusa Formation and the Madison Formation. The DENR has limited the total volume of injectate to approximately 36,500,000 barrels to help ensure that the injectate remains in the exempted portion of the Inyan Kara Group. Also, the DENR has set the maximum allowable injection pressure (at least initially) as 1,500 psi. That injection pressure limitation will help ensure that the upper confining zone is not fractured by injection pressures.

On May 7, 2013, the EPA issued a similar aquifer exemption approval for the Continental 32-33A SWD well. That SWD well and the associated aquifer exemption is also located in Harding County, South Dakota.

The DENR recently held a public comment period on the proposed UIC permit and aquifer exemption for the Hansen State 34-1 SWD well. The public comment period closed on January 2, 2014. No public comments were received by DENR during the public comment period.

Should you have questions or concerns, please contact Tom Aalto of my staff at (303) 312-6949.

Sincerely,

for Debra H. Thomas
Acting Assistant Regional Administrator
Office of Partnerships and Regulatory Assistance

cc: Bill Markley, DENR
Tom Brandner, DENR
Sheldon Hamann, DENR
Brain Walsh, DENR
Mike Lees, DENR
Robert EU Smith, OGWDW