

U.S. EPA Region 8
Underground Injection Control Program
AQUIFER EXEMPTION RECORD OF DECISION

This Record of Decision provides EPA’s aquifer exemption (AE) decision, background information concerning the AE request, and the basis for the AE decision.

Substantial or Non-Substantial Program Revision: Non-Substantial

This is a non-substantial program revision because it is associated with the issuance of a site-specific Class V UIC permit action, not a programmatic change or a revision with implications for the national UIC program. The decision to treat this as a non-substantial program revision is consistent with EPA's “Groundwater for Review and Approval of State Underground Injection Control (UIC) Programs and Revisions to Approved State Programs” (Guidance 34) which explains that the determination as to whether a program revision is substantial or non-substantial is made on a case-by-case basis, and with the exception of AEs associated with certain Class I wells or exemptions not related to action on a permit, AE requests are typically treated as non-substantial program revisions.

Date of Aquifer Exemption Application Request: October 11, 2022

Operator: Montalban Oil & Gas Operations, Inc
33 1st Avenue SW
Cut Bank, Montana 59427

Well Class/Type: Class V Industry-Other (5A24)

Well/Project Name: Jody Field 34-2

Well/Project Permit/Docket Number: MT52439-12514

Well API number: 25-073-21838

Field: Loneman Coulee

Tribal Reservation: N/A

Well Surface Location: QtrQtr: NWSW Section: 34 Township: 29N Range: 6W

Well Surface Footage Calls: 2,310 feet from S line; 990 feet from W line

County: Pondera **State:** Montana

Well Surface Latitude: 48.228191

Well Surface Longitude: -112.376628

PROJECT BACKGROUND INFORMATION

The Jody Field 34-2 well was initially authorized to inject into the Sawtooth and Madison formations. On March 15, 2010, 20 feet of the Sawtooth formation and 13 feet of the Madison

formation were exempted ¼-mile from the wellbore. After conducting additional research, the 20 feet of Sawtooth Formation in this area was later determined to be a dense calcareous transitional deposit which is part of the Upper Madison formation. Research included a review of well logs in the area and a review of the US Geological Survey (USGS) Produced Water Database V2.3 across the Sweetgrass Basin in Montana. The USGS Produced Water Database indicates that there are 69 oil and gas wells producing from the Sawtooth Formation within the basin. The two wells located within Pondera County indicate specifically that the Sawtooth Formation is part of the Madison Sun River Dolomite, further suggesting that this zone is transitional within the Upper Madison and not a separate USDW.

A workover to acidize and deepen the well was approved by the Montana Board of Oil and Gas Conservation in August 2022 and the workover was conducted in September 2022. Jody Field 34-2 was deepened by 68 feet for a total open hole height of 81 feet. The well workover revealed that there was not a confining zone of less permeable layers directly beneath the bottom of the original well depth, as previously assumed in the first aquifer exemption. Since the Madison formation is most likely hydraulically connected and there is not sufficient evidence of less permeable layers within the lower Madison formation, an aquifer exemption expansion of the entire Madison Aquifer to a depth of approximately 3,700 feet has been requested for continued injection.

In conjunction with the aquifer exemption expansion request, Montalban Oil & Gas Operations, Inc (MOGO) has also requested to convert the Class II well into a Class V well to allow MOGO to also inject wastewater from Montana Renewables generated from the pretreatment of renewable feedstocks. The renewable feedstocks may include, but are not limited to, vegetable oils (such as soybean oil and canola oil), animal fats (such as beef tallow, choice white grease, and poultry fat) distiller's corn oil, and used cooking oil. The change from a Class II well to a Class V well is required to expand the type of authorized injectate, as Class II wells are limited to wastes from oil and gas production.

DESCRIPTION OF PROPOSED AQUIFER EXEMPTION

Aquifer(s) to be Exempted

Formation: The Sun River Dolomite of the Madison Formation is a regionally extensive fine-grained dolomite of Mississippian Age, with good vuggy and intergranular porosity.

Lithology: Dolomite

Top: 3,451 feet *Bottom:* 3,700* feet *Thickness:* 249* feet

*Depth and thickness are approximate and projected, based on nearby wells (API Numbers 25-073-05439, 25-073-05440 and 25-073-21523).

Total Surface Area of Aquifer to be Exempted: The proposed AE expansion area will remain 126 acres (0.25-mile radius from wellbore).

WATER QUALITY DATA OF THE AQUIFER PROPOSED FOR EXEMPTION

Aquifer Water Quality – TDS: 4,490 mg/L to 6,660 mg/L

Source of WQ Data: The Montana Bureau of Mines and Geology mapped TDS concentrations in the immediately surrounding areas. The data, collected from oil tests or production wells between 1920 and 1977, indicated TDS concentrations in the Sun River Dolomite ranging from around 4,490 to 6,660 mg/L and TDS concentrations in the Madison Formation ranging from around 3,240 to 7,100 mg/L¹. A water sample collected from Jody Field 14-34 (API #25-073-21740), which is 0.3 miles away from Jody Field 34-2, reported a TDS concentration of 5,440 mg/L. A water sample collected from Jody Field 4-1 (API #25-073-21824), which is 0.5 miles away from Jody Field 34-2, indicated a calculated TDS concentration of 5,109 mg/L. A sample from this well prior to initial injection is not available and since the Madison Formation was previously exempted, it is assumed to be less than 10,000 mg/L and a USDW.

Confining Zones

Upper: Jurassic Ellis Group (Swift, Rierdon, and Sawtooth formations)

Lithology: Sandstone and shale (Swift formation), marlstone (Rierdon), and siltstone (Sawtooth)

Top: 3,203 feet

Bottom: 3,418 feet

Lower: Mississippian Mission Canyon and Lodgepole and Devonian Three Forks and Potach Formations

Lithology: tight limestone and shale

Top: 3,700 feet*

Bottom: 4,700 feet*

*Depths are approximate and projected, based on nearby wells (API Numbers 25-073-05439, 25-073-05440 and 25-073-21523).

The geologic top of the Madison formation in this area is measured at a depth greater than 3,400 feet and is separated from other shallow, accessible USDWs by several hundred feet of confining layers.

IDENTIFICATION OF OTHER USDWs

The uppermost USDWs are the Upper Cretaceous Two Medicine Formation and Eagle/Virgelle Sandstone. The depth of these USDWs range from surface to 664 feet below ground surface. The observed TDS values for the Two Medicine Formation and Eagle/Virgelle Sandstone are <3,000

¹ Feltis, R.D., Dissolved-Solids and Ratio Maps of Water in the Madison Group, Montana, Montana Bureau of Mines and Geology, Hydrogeologic Map 3, 1980

mg/L and <5,000 mg/L, respectively.

The Upper and Lower Colorado Group separates the upper USDWs from the Lower Cretaceous USDWs, which include the Dakota Sandstone, Kootenai Formation, and Sunburst Formation. The Lower Cretaceous USDWs are located at a depth of approximately 2,539 feet to 3,135 feet and consist of mostly sandstone with observed TDS values ranging from 7,000 to 12,000 mg/L (Well MT51141-07750).

The Devonian Duperow formation, which is separated from the Madison Aquifer by the Three Forks formation, is considered a USDW in central Montana due to reported TDS concentrations less than 10,000 mg/L. However, there is limited data on the Devonian Duperow Aquifer in this area. Well logs drilled into the Duperow Formation approximately 5 to 6 miles east of the subject well indicate that the Sun River Dolomite is separated from the underlying Duperow Formation by approximately 1,300 feet of confining zone (Mississippian Mission Canyon and Lodgepole Limestone and Upper Devonian Three Forks and Potlatch Formations). Review of well logs of the easternmost well depicted on the cross section (API #25-073-21523) indicate that the Duperow formation in this area of Montana is impermeable from the top of the formation to a thickness of at least 208 feet. A water quality sample from the Devonian Duperow Aquifer was observed to have a calculated TDS under 10,000 mg/L (API #25-073-21523).

INJECTATE INFORMATION

Injected fluids are composed of fluids associated with oil and natural gas production and wastewater from Montana Renewables generated from the pretreatment of renewable feedstocks. The renewable feedstocks may include, but are not limited to, vegetable oils (such as soybean oil and canola oil), animal fats (such as beef tallow, choice white grease, and poultry fat) distiller's corn oil, and used cooking oil. The pretreatment process technology is developed and licensed by Applied Research Associates, Inc. (ARA). The pre-treatment system is currently under construction and final water quality data for the various blends of feedstock are not available. However, the TDS is approximated to range from 5,000 mg/L to 8,000 mg/L based on bench scale analyses from ARA.

BASIS FOR DECISION

Regulatory Criteria under which the exemption is requested and approved

40 CFR § 146.4(a) *It does not currently serve as a source of drinking water;*

The Madison Aquifer does not currently serve as a source of drinking water for the area near the proposed aquifer exemption. An August 2023 search of the Montana Groundwater Information Center (GWIC) indicated no drinking water wells utilize the Madison Aquifer within the nine-township area surrounding the Jody Field 34-2 well. The deepest perforation for any wells used for domestic, household, and municipal purposes in this area is 310 feet, which is over 3,000 feet shallower than the top of the Madison Aquifer (3,418 feet) at the subject well. At this depth, the

well is likely into the Two Medicine formation. The Colorado, Blackleaf, Bow Island, Swift, Rierdon, and Sawtooth confining zones provide additional separation of the shallow drinking water resources from the Madison formation.

The closest Public Water System (PWS) is approximately two (2) miles to the northwest that services Pondera Colony. The total depths of the wells in Pondera Colony are 140 ft and 160 ft, completed in the Two Medicine formation. PWS wells in the nine-township area surrounding the subject well are no deeper than 168 feet.

40 CFR § 146.4(b) *It cannot now and will not in the future serve as a source of drinking water because:*

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

(3) *It is so contaminated that it would be economically or technologically impractical to render that water fit for human consumption;*

The Madison Aquifer at this location is not a valuable potential source of drinking water either now or in the future. The water quality is poor. As noted above, samples indicate the TDS is between 4,490 and 7,100 mg/L TDS. The Madison/Sun River Dolomite section of the Madison Group is hydrocarbon producing². The oil and gas wells in this area have either been plugged and abandoned, shut-in, or converted to injection wells. However, the Jody Field 34-2 well has previously been used to inject produced water from the nearby Jody Field 14-34 well, which is completed in the Madison formation. Average oil and grease concentrations in produced water range from 2 to 565 mg/L and typical benzene concentrations in produced water range from 32 to 778,510 ppb³. The generally accepted level for oil and grease in drinking water is at non-detectable levels. The maximum contaminant level for benzene in drinking water is 5 ppb. If the Madison formation in this area were used for drinking water, significant water treatment would be required to remove the hydrocarbons and reduce TDS to acceptable levels.

The Jody Field 34-2 well is located in a sparsely populated area in Pondera County where the major land use activities are mainly agricultural. Pondera County measures 1,640 square miles and is located approximately 90 miles northwest of Great Falls, which is the third largest city in Montana with a population of 58,700. The population of Pondera County has declined steadily over the past several decades. Based on U.S. Census data, the population of Pondera County decreased by 4 percent (from 6,153 people to 5,898 people) between 2010 and 2020.

The nearest towns with population in the 2020 census are Pondera Colony (~2-3 miles to the

² Gaswirth, Stephanie B., et al, Geologic Assessment of Undiscovered Oil and Gas Resources in the Madison Group, Williston Basin, North Dakota and Montana, U.S. Geological Survey Digital Data Series DDS-69-W, 2010.

³ Gamwo, Isaac K., et al, Solid-Liquid Separation Technologies, Applications for Produced Water, CRC Press, 2022.

northwest) and New Miami Colony (~5-6 miles to the southeast) with a population of 53 and 95, respectively. The Pondera Colony water system uses two groundwater wells as their PWS and the water source is the Two Medicine Formation. Similarly, the New Miami Colony PWS sources water from one groundwater well in the Two Medicine Formation (Montana Department of Environmental Quality PWS database).

For the relatively low population near the Jody Field 34-2 well, more affordable, alternate sources of water supplies are available for current and future population. The shallower Two Medicine formation and Virgelle Sandstone are sources of drinking water for current and future residents in the area. The Dakota, Kootenai, and Sunburst USDWs are below the shallow Quaternary and Tertiary aquifers that are currently used for domestic wells and above the Madison formation. These upper USDWs are of better quality, shallower, and more accessible than the Madison, and would be preferable sources of available drinking water.

With respect to shallow sources, the majority of the shallow Quaternary aquifers are comprised of unconsolidated alluvial deposits from the surrounding mountains. These aquifers are primarily water-table aquifers, and groundwater movement follows the topography in a downstream direction. Recharge to the shallow alluvial aquifers is primarily through rainfall and snowmelt. Deeper Tertiary aquifers in the area range from depths of 100 to 300 feet and include coarse grained interbedded sandstones, channel conglomerates, tuffs and siltstones. Alluvial aquifers are the most used aquifers in the Great Plains region of Montana, due to their high yields and proximity to agricultural land⁴.

Due to the rural nature of the area, it is not practicable or economic to install a centralized deep well as a water source or to pipe water from that source to water users. As indicated, this area is served by small, decentralized water systems that obtain their water from the shallow alluvial aquifer system. The water quality from the shallow aquifers requires little treatment. However, installation of a well in the Madison, with a TDS concentration at approximately ten (10) times the secondary drinking water standard would require expensive treatment and solids handling. The cost to install a shallow domestic well is less than \$10,000. AquaSource is currently drilling a well in Pondera County, 7 miles east of Valier to a depth of 100 feet at a cost of \$7,000, including completion costs. Drilling and equipping of a centralized shallow public supply well is not anticipated to exceed \$175,000. Cost associated with a centralized public supply well in the Madison will likely incur the following expenses:

- Well Drilling and Completion - \$1,000,000+
- Water Distribution - \$1,000,000 per mile
- Water Treatment Facility - anticipated to be greater than \$5,000,000, but dependent on volumes and selected treatment method.

Due to construction and operation and maintenance costs to utilize the Madison formation,

⁴ Noble, Roger A., et al, Occurrence and Characteristics of Groundwater In Montana, Volumes 1 and 2, The Great Plains Region, Montana Bureau of Mines and Geology, 1982.

relative to the availability of shallower or alternative water resources, the depth and location of the Madison formation make recovery of water for drinking water purposes economically impractical.

Other Considerations

The Madison Aquifer is currently exempt between the depths of 3,418 feet and 3,451 feet and horizontally within a radius of 0.25-mile from the Jody Field 34-2 well.

To ensure fluids remain within the 0.25-mile radius from the wellbore, the permit establishes a maximum cumulative injection volume limitation of 7,156,173 bbls, which accounts for the previously injected volume of 205,090 bbls into Jody Field 34-2. The volume calculation assumes a porosity of 9.7% for the injection zone, which was derived from a compensated neutron-formation density log run at the nearby well Field 1-34, located approximately 0.13 miles southeast of Jody Field 34-2. The estimated porosity derived from the 1-34 neutron density log falls within the range found in the literature⁵.

EPA's screening of climate change and environmental justice considerations is discussed in the *Montalban Oil & Gas Operations, Inc, Jody Field Wells Aquifer Exemption Expansion Pondera County, Montana Climate and Environmental Justice Analysis*. Based on a balancing of considerations relevant to EPA's assessment of the regulatory criteria, EPA finds that the additional section of Madison Formation aquifer proposed for exemption will not serve as a source of drinking water in the future.

CONCLUSION AND DECISION

The additional vertical area being requested for exemption is not confined from areas where previous oil and gas production and injection activity has occurred. Given several factors, including that this portion of the Madison is in the middle of an old production field and has high levels of contaminants due to the production and injection activity, is very deep and has documented high TDS concentrations and potential presence of hydrocarbons, is in a remote location with low and declining populations that have better quality alternative drinking water sources within the shallower alluvial deposits, the Madison aquifer at this site does not have potential to serve as a source of drinking water either now or in the future.

Based on review of the entire record, EPA finds that exemption criteria 40 CFR § 146.4(a), 146.4(b)(2), and 146.4(b)(3) have been met, and EPA approves the aquifer exemption request.

Sarah Bahrman, Manager
Safe Drinking Water Branch

⁵ Pasternack, Ira, Nature and Distribution of Mississippian Sun River Dolomite Porosity, West Flank of the Sweetgrass Arch, Northwestern Montana. August 16, 1988.