January 2020

Fact Sheet: Proposed Modification of Underground Injection Control Permit AK-1I003-C

What is the proposed in this action?

The U.S. Environmental Protection Agency (EPA) authorizes ConocoPhillips Alaska, Inc. (CPAI) to operate up to three injection wells under Underground Injection Control (UIC) Class I permit AK-1I003-C. CPAI currently operates only one injection well (WD-02) under this permit. In this action, the EPA proposes to modify this permit in response to a request from CPAI to:

1. Increase the maximum allowable injection pressure from 3500 pounds per square inch (psi) to 4200 psi.
2. Add information regarding the construction and operation of a new injection well (WD-03) and changes in facility piping configuration.

Does this modification endanger underground sources of drinking water (USDWs)?

No, the proposed modifications will not endanger USDWs. The permittee has submitted evidence that the increased maximum injection pressure will not fracture the geological confining layer that prevents migration of fluids out of the injection zone. The new well construction and operation will comply with EPA standards to make sure that injected fluids are contained within the designated injection zone.

How can I comment and/or request a hearing?

The EPA will accept public comments and public hearing requests for the proposed permit modification during the public comment period, which begins on August 7, 2020 at 9:00 AM Alaska Time, and ends on September 7, 2020 at 5:00 PM Alaska Time. If you would like to make a comment or request a hearing, review the **"Public Comment"** section at the end of this Fact Sheet.

Where can I find more information?

For more information, please go to www.epa.gov/publicnotices or contact EPA UIC specialist Ryan Gross at gross.ryan@epa.gov or 206-553-6293.

A. Proposed Action

On September 20, 2019, CPAI (the permittee) requested a modification of permit AK-1I003-C. The permit would be modified to:

1. Increase the maximum allowable injection pressure from 3500 psi to 4200 psi.
2. Add information regarding the construction and operation of a new injection well (WD-03) and changes in facility piping configuration.

This fact sheet communicates EPA's considerations in approving the requested modification. All references to figures and attachments referred to in this document reference the modification request submitted by CPAI.

This modification would not change the expiration date of the permit, which is midnight on March 14, 2019.

The modified permit will authorize both the existing (WD-02) and the proposed (WD-03) injection wells to inject into portions of the Sag River and Ivishak formations. The EPA has previously determined that there are no USDWs in the injection zone.

B. Regulatory Framework

The EPA UIC program is authorized by Part C of the SDWA for the principal purpose of protecting USDWs from endangerment by injection wells. A USDW is an aquifer which currently serves as a source of potable water or which, by its potential productivity and natural water quality, could serve as a public water supply. It is defined in the CFR at 40 CFR §144.3.

Primary responsibility for implementing the UIC program in Alaska is shared between the EPA and the Alaska Oil and Gas Conservation Commission (AOGCC). The EPA regulates Class I injection wells, which are used to dispose fluids beneath the lowermost USDW. Class I non-hazardous wells may only inject materials defined as non-hazardous by the Resource Conservation and Recovery Act (RCRA) and materials exempted from RCRA classification because they originate from oil and gas exploration and production.

The AOGCC regulates Class II injection wells. Class II wells are those that dispose of waste fluids brought to the surface from oil and gas production operations, enhance recovery of oil and gas, or store hydrocarbons which are liquid at standard temperature and pressure (40 CFR § 144.6). Class II wells cannot inject hazardous fluids, or those that are not associated with hydrocarbon production activities as described above.

Applicable regulations concerning injection well requirements can be found in 40 CFR §144 and §146. Criteria and standards applicable to Class I wells are found at 40 CFR §146 Subpart B. For more information on injection well classes, see: www.epa.gov/uic/underground-injection-control-well-classes.

The EPA is authorized to modify UIC permits under federal regulations at 40 CFR §124.5 for causes listed in 40 CFR §144.39. This permit is modified because there has been "material and substantial alterations or additions to the permitted facility or activity which occurred after permit issuance which justify the application of permit conditions that are different or absent in the existing permit" (40 CFR §144.39 (a)(1)).

C. Facility Overview

The CRU is a completely independent operation that produces oil which is transported to market via the Trans Alaska Pipeline System. The facility does not have a year-round road connecting it to the existing North Slope infrastructure. Ice roads are built in the winter to bring in supplies. During the 8-9 months per year when ice roads cannot be utilized, the CRU uses air or barge support for supplies. The CRU

started oil production in November 2000, gas injection in December 2000 and seawater injection in January 2001. Currently the field is producing approximately 68,000 barrels of oil per day and 60,000 barrels of produced water per day.

Due to its remote location and seasonal accessibility, disposal of fluid wastes through injection wells is integral to the operation of the CRU. Injection well WD-02 is used for disposal for non-hazardous waste fluids generated at the CRU. CPAI's use of the well reduces the need to transport waste to off-site disposal facilities.

Figure 1. Location of CD1 pad on the North Slope of Alaska

CPAI has not applied for a hazardous waste injection well permit. Therefore, any listed hazardous wastes must be collected, stored, and transported to a RCRA-approved hazardous waste treatment or disposal facility. Those wastes which are hazardous only because of a characteristic may be treated to remove that characteristic, and then injected in a Class I UIC well. The only radioactive substance which may be injected under the proposed permit is naturally occurring radioactive material from sludge or pipe scale, which can be injected into either Class II or Class I injection wells. All wastes that are allowed for injection must either be exempt from hazardous characterization or non-hazardous.

D. Proposed Modifications

1. Maximum Allowable Injection Pressure

The permittee requests a permit modification to increase the maximum allowable injection pressure for both existing well WD-02 and new well WD-03 from 3500 psi to 4200 psi.

This permit allows the permittee to inject at a pressure that would fracture the injection zone but not the confining zone. To support their request for an increase in the maximum allowable injection pressure, CPAI submitted evidence showing that injection at 4200 psi would not fracture the confining zone.

CPAI submitted a fracture study of the formations in which both of these wells will inject. The fracture study used injection data from well CD1-01A, which is located at same facility and injects into the same formations as wells WD-02 and WD-03, but is authorized under permit AK-1I010-B. Using data from March 2019 to February 2020, various scenarios for injection were simulated. The study found that injection at 4200 psi will not cause new fractures or propagate existing fractures in the confining zone.

2. WD-03 Well Construction and Operation

The permittee plans to construct injection well WD-03 with various sizes of casing cemented to the formations intersected by the well bore. Waste will be conveyed through tubing from the surface down to the injection zones. The casing will be perforated in the Sag River injection interval at around 9400 feet MD and in the Ivishak injection interval at around 9786 feet MD.

CPAI plans to use injection well WD-03 for about 20 more years. The forecasted volumes of injected wastes are shown in Table 1.

Table 1. Forecasted WD-03 Class I Waste Disposal Volumes (20 Years Life)

Waste Fluid	Volume Injected (barrels)	%
Domestic Wastewater/Graywater	120,000	0.34
Drilling Fluids and Drill Cuttings	34,000,000	94.92
Produced Water/Workover/Completion Fluids	472,728	1.32
Desalination/Brine	140,400	0.39
Excavation/Stormwater/Containment	908,485	2.54
Other Exempt Fluids	151,960	0.42
Other Non-Exempt Non-Hazardous Fluids	25,087	0.07
Total	35,818,660	100

The permittee will continuously monitor and record injection flow rate and pressure and annular pressure at each well using gauge transmitters with an alarm system.

3. Facility Piping Configuration Changes

The permittee plans several changes to the configuration of the facility supporting the injection wells.

The permittee will install a new 4-inch diameter insulated waste injection pipeline from the northeast end of the existing CD1 pipe rack (near CD1-01A well) to the existing WD-02 well line. The new pipeline will be used in the event CD1-01A Class I disposal well is unavailable and the drill cuttings and slurry must be re-routed to well WD-02. The new 4-inch pipeline is approximately 1,000 feet long and will be insulated and heat traced. Currently, the existing Waste Injection Facility (WIF) is only capable of disposing into the existing CD1-01A Class I well. The re-routing of the additional pipeline will allow the WIF to also be able to inject into well WD-02.

The permittee will also install a new Grind Unit (GU) facility and Cutting Transfer Unit (CTU). These units will operate on the southwest corner of the existing CD1 pad, adjacent to the existing WIF, to meet the demand for additional drill cuttings processing. Waste processed at GU and CTU will be piped to the existing WIF for injection.

Lastly, the permittee will install a new 4-inch diameter insulated and heat traced pipeline on the existing gray water system. This pipeline will allow disposal or gray water into existing injection wells in the CD1 well row (including UIC Class I well CD1-01A and UIC Class II wells CD1-26, CD1-42, and CD1-45) when WD-02 is being used for the WIF injection activities. The new 4-inch diameter pipeline is approximately 1,000 feet long. Currently, a separate pipeline network collects domestic wastewater/graywater from the camp sewage system for injection into the dedicated well WD-02.

E. Environmental Justice and Endangered Species

When this permit was reissued in 2019, the EPA evaluated the impacts of this permit action in regard to environmental justice. This evaluation did not identify any disproportionately high and adverse human health or environmental effects on minority populations and low-income populations. The EPA also evaluated the impacts of activities associate with this permit on species listed under the Endangered Species Act or on critical habitats on which those species depend. These activities will have no effect on the listed species or their habitats.

This modification does not substantially change either of EPA's 2019 findings.

F. Geologic Setting and Injection

The geologic setting at the CRU is favorable for the type of fluid disposal proposed in this permit modification. The permittee has successfully disposed of waste fluids through injection well WD-02 into this injection interval for almost two decades.

1. Injection and Confining Zones

The sedimentary rocks of the Kingak, Sag River, Shublik, Ivishak, and Kavik Formations underlying the CRU constitute the injection and confining layers. Therefore, these formations are of most interest in this permit. Seismic surveys and correlative well logs show that these intervals are continuous over most of the CRU.

Upper Confining Zone:

The upper confining zone is the Jurassic Kingak Formation. This zone is comprised of approximately 1,500 feet of shale, siltstone, and low porosity sandstone. The lowermost 700 feet of the Kingak above the Sag River sandstone is a shale prone interval. The shales were deposited in a marine shelf environment.

Injection Zone:

There are two injection intervals proposed for approval in the permit. Between these two intervals is an intermediate impermeable zone.

The upper injection interval is the Triassic Sag River Formation. This formation is approximately 40 feet thick. It contains fine-grained, glauconitic sandstones interpreted as lower shoreface/shallow marine shelf deposits. This formation has good reservoir properties with an average permeability of 120 millidarcies and a porosity of about 19%.

The two injection intervals are separated by the Triassic Shublik Formation. This layer contains approximately 400 feet of shale, siltstones, and limestones. The base of this formation is predominantly siltstones and shale. The upper section is characterized by limestones. The Shublik is characterized by low porosity and permeability.

The lower injection interval is the Permo-Triassic Ivishak Formation. In the CRU, this formation is 600-700 feet thick. It contains thick-bedded sandstones, thin-bedded conglomerates, and siltstones and mudstones. The uppermost sandstone of the Ivishak Formation is separated from the Shublik Formation by about 150 feet of shale and siltstone. This formation also has good reservoir properties with an average permeability of 30 millidarcies and a porosity of about 15%.

Lower Confining Zone:

The lower confining zone is the Permian Kavik Formation. In the CRU, this formation is 200-250 feet thick. It consists of medium to dark gray, silty shales.

2. Structure

The general structure of the Jurassic and Permo-Triassic sequence at the CRU dips about one degree to the west-southwest. Faults that cut the Ivishak section generally have displacements of less than 50 feet. These faults tend to die out within the overlying thick Jurassic shale section. None of the mapped faults near the WD-02 wells extend from the injection zone through the confining zone.

3. Aquifers

The EPA has determined that there are no aquifers beneath the permafrost in the CRU which qualify (less than 10,000 mg/l TDS) for protection as a USDW. The EPA included this determination in the fact sheet published on December 18, 1998, for UIC permit AK-1I003-A. On the request of CPAI, the EPA confirmed this “No USDW” determination on August 2, 2007. This determination was based on water sample analysis and petrophysical data from nearby wells submitted in 1998 and 2007. These logs showed that the total dissolved solids in all aquifers exceeded 10,000 mg/l.

G. Summary of Relevant Permit Conditions

The conditions specified in the draft permit pertain to the construction, operation, monitoring, reporting, and plugging and abandonment of the well. The following summary briefly describes any permit conditions relevant to the requested modification and the reasons for them.

1. Financial Responsibility (Part I. G.)

The permittee must submit updated financial assurance information before injecting into the newly constructed well.

2. Construction (Part II. A.)

The permittee must notify the Director or an EPA authorized representative at least 30 days before any cementing operations. This notice allows the EPA the opportunity to witness the construction procedures and determine regulatory compliance.

The permittee is authorized to fill the inner annulus with corrosion/freeze-inhibiting fluids that protect against chemical and physical damage to tubing and casing. Permafrost runs from the ground surface to approximately 1550 feet TVD at this location. The annulus space must remain unfrozen for operational and safety reasons.

The permittee must follow the Waste Analysis Plan and manifesting procedures submitted with the permit modification request to ensure only RCRA-exempt or non-hazardous fluids are injected. Some waste streams may require lab analysis to prove non-hazardous determinations.

The EPA requires that UIC Class I injection wells inject fluids through tubing with a packer set immediately above the injection zone. In well WD-03, the packer will be set at 8645 feet TVD and the top of the upper injection zone, according to provided geological information, is around 8700 feet TVD. The EPA approves this proposed packer location.

3. Well Operation (Part II. C.)

The EPA requires regular testing of the integrity and condition of the well components. Testing ensures adequate isolation of the injected fluid from the formation except in the injection zone. Due to the remote location of this facility, the permittee may request an extension of up to three months to the required testing date to accommodate for logistical delays.

The permittee must conduct an annual pressure test of the inner annulus. The inner annulus is the space between the tubing and production casing above the packer. This test verifies that there are no leaks in the tubing, casing, packer, or wellhead. To pass the test, the annulus must be pressurized up to 4200 psi and lose less than ten percent of that pressure over 30 minutes. The pressure must show a stabilizing tendency over the duration of the test.

The permittee must conduct an approved fluid movement upon completion of the injection well and every two years thereafter. This test verifies that injected fluid is not moving along the exterior of the casing outside of the permitted injection intervals. Several methods may be used to conduct this test. The permittee must coordinate with the director or authorized representative in advance to get approval for the test method. Fluid movement tests must be performed at a pressure equal to the average continuous injection pressure observed at the well in the previous six months.

The permittee must conduct tubing inspection tests (e.g. caliper log) every two years. This test verifies that the injection tubing is in good condition and is not likely to leak due to corrosion or erosion soon.

The EPA sets operational limits for this injection well to ensure safe and environmentally protective operation. The maximum allowable injection pressure is 4200 psi. This pressure allows the permittee to use the injection well safely, based on the strength of the geological confining layer that prevents fluids

injected into this well from travelling upward. The maximum allowable annular pressure is 2000 psi. This annular pressure allows for sudden and temporary pressure increases due to changes in the temperature of the injected fluid while not damaging the tubing, casing, or packer.

H. Public Comment

To submit a comment this proposed permit modification, such comments must be submitted during the public comment period beginning on August 7, 2020, at 9:00 AM Alaska Time and ending on September 7, 2020, at 5:00 PM Alaska Time. Because of the COVID-19 pandemic, access to the Region 10 EPA building is limited. Please submit all comments on EPA's proposed permit via email to gross.ryan@epa.gov. If you are unable to submit comments for public hearings via email, please call 206-553-6293 to submit your comment over the phone.

The EPA will hold a virtual hearing to protect public health in light of concerns raised due to COVID-19. The hearing will be held on September 2 at 10:00 AM Alaska Time. To attend the meeting, please call 1-206-800-4483 and enter conference code 266 726 711# when prompted. To help ensure that enough phone lines are available, please register for the virtual hearing by contacting Ryan Gross at gross.ryan@epa.gov or 206-553-6293. Your registration should include your name and whether you would like to speak during the hearing.

After the public comment period ends and all comments have been considered, the Director of the EPA Region 10 Water Division will make a final decision regarding permit issuance. If no substantive comments are received, the conditions in the proposed permit will become final, and the permit will become effective upon issuance. If substantive comments are received, the EPA will address the comments and determine whether to issue the proposed permit, and the permit will become effective upon issuance unless an appeal is submitted. Appeals regarding the SDWA UIC Class I permit should be submitted to the Environmental Appeals Board within 30 days of issuance pursuant to 40 CFR § 124.19.