UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

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OFFICE OF WATER

MEMORANDUM

SUBJECT: Implementation of the Safe Drinking Water Act's Existing Underground Injection Control Program Requirements for Oil and Gas Hydraulic Fracturing Activities Using Diesel Fuels

FROM: Peter Grevatt, Ph.D., Director,
Office of Ground Water and Drinking Water

TO: **[Regional Administrators and State and Tribal UIC Program Directors]**

The purpose of this memorandum is to transmit the attached technical guidance and clarify existing Underground Injection Control (UIC) requirements for hydraulic fracturing (HF) activities where diesel fuels are used in the fracturing fluid and/or propping agents. A key component of our nation's energy future is the safe, responsible development of oil and gas resources. If produced responsibly, greater use of natural gas in lieu of other fossil fuels has the potential to improve air quality, stabilize energy prices, and provide greater certainty about future energy reserves. The U.S. Environmental Protection Agency (EPA) is committed to working with co-regulators and other stakeholders to encourage best practices and ensure that oil and gas development occurs safely and responsibly, in a way that protects drinking water resources.

This memorandum explains the existing requirement under the 2005 statutory amendments to the Safe Drinking Water Act (SDWA) and the EPA's implementing regulations regarding applicability of UIC program permitting requirements that any owner or operator who injects diesel fuels during hydraulic fracturing (HF) related to oil or gas operations must obtain a UIC Class II permit before injection. In addition, this memorandum includes and explains the agency's interpretation of the statutory term "diesel fuels" for use when permitting diesel fuels HF wells.

This memorandum also advises that the agency's Regional Offices consider the recommendations in the attached technical guidance in implementing the UIC Class II requirements, along with industry best practices. EPA permit writers have discretion to consider alternative best practices that are consistent with statutory and regulatory requirements. The EPA Regional Offices should coordinate with state and tribal oil and gas programs and, where appropriate, the Bureau of Land Management, to establish a mechanism to inform owners or operators of applicable existing UIC Program requirements. In addition, the EPA Regional Offices should collaborate with appropriate entities to streamline permitting and share

data where requirements and reporting timeframes are compatible among the various permitting authorities.

Applicability of Class II Requirements:

Underground injection of fluids through wells is subject to the requirements of the SDWA except where specifically excluded by the statute. In the 2005 Energy Policy Act, Congress revised the SDWA definition of "underground injection" to specifically exclude from UIC regulation the "underground injection of fluids or propping agents (other than diesel fuels) pursuant to hydraulic fracturing operations related to oil, gas, or geothermal production activities[1]" (SDWA Section 1421(d)(1)(B)). UIC regulations further provide that "[a]ny underground injection, except into a well authorized by rule or except as authorized by permit issued under the UIC program, is prohibited" (40 CFR 144.11). Thus, owners or operators who inject diesel fuels for HF related to oil and gas operations must obtain a UIC permit before injection begins. Owners or operators injecting diesel fuels for HF without a UIC permit may be subject to enforcement action under Section 1423 of the SDWA.

The classification scheme for UIC wells was first created by and defined in EPA's regulations promulgated in 1980 under Section 1421 of the SDWA. There are six categories of injection wells; five relate to specific injection activities and one (Class V) is a default for permitting activities that do not fall within another class. Since the inception of the UIC Program, Class II has been the primary well classification used for injection wells that are associated with oil and gas storage and production (40 CFR 144.6). Class II is also the well classification for injection wells used for enhanced recovery (ER) of oil or natural gas (40 CFR 144.6(b)(2)). The EPA has determined that HF (as a form of ER) fits within the Class II well category under the agency's UIC Program regulations. The Eleventh Circuit Court of Appeals confirmed this determination when it held in 2001 that wells used for the injection of HF fluids fit within the definition of Class II wells under the UIC Program. *Legal Environmental Assistance Foundation v. EPA*, 276 F.2d 1253, 1263 (11th Cir. 2001). Furthermore, the 2005 amendments to the SDWA require that a UIC Class II permit must be obtained prior to conducting the underground injection of diesel fuels for HF.

Diesel fuels are used in oil and gas production applications other than when injected underground through a well. For example, diesel fuels are used as a component of drilling muds or pipe joint compounds used in the well construction process or in motorized equipment at the surface. In these types of applications, the use of diesel fuels is not subject to UIC Class II permitting requirements because they are considered to be part of the well construction process and not injected for purposes of hydraulic fracturing.

Interpretation of Diesel Fuels:

Congress did not define the term "diesel fuels," and the EPA is interpreting the term in this memorandum to enable implementation of the UIC program under the SDWA and to alleviate uncertainty about the EPA's interpretation of the statutory term. Based on the statutory language, the need for clarity, and in light of comments received on the draft guidance, the EPA is interpreting the

[1] This guidance addresses only Class II permitting activities for diesel fuels hydraulic fracturing.

term to refer to fluids that are associated with specific Chemical Abstracts Services Registry Numbers (CASRNs). For purposes of permitting diesel fuels HF, the agency has identified five CASRNs.

Consistent with the SDWA, the following five CASRNs represent the most appropriate interpretation of the statutory term "diesel fuels" to use for permitting diesel fuels HF under the UIC Program nationwide, at this time:

- **68334-30-5 Primary Name: Fuels, diesel**
  Common Synonyms: Automotive diesel oil; Diesel fuel; Diesel oil (petroleum); Diesel oils; Diesel test fuel; Diesel fuels; Diesel fuel No. 1; Diesel fuel [United Nations-North America (UN/NA) number 1993]; Diesel fuel oil; European Inventory of Existing Commercial Chemical Substances (EINECS) 269-822-7.
- **68476-34-6 Primary Name: Fuels, diesel, No. 2**
  Common Synonyms: Diesel fuel No. 2; Diesel fuels No. 2; EINECS 270-676-1; No. 2 Diesel fuel.
- **68476-30-2 Primary Name: Fuel oil No. 2**
  Common Synonyms: Diesel fuel; Gas oil or diesel fuel or heating oil, light [UN1202] No. 2 Home heating oils; API No. 2 fuel oil; EINECS 270-671-4; Fuel oil No. 2; Home heating oil No. 2; No. 2 burner fuel; Distillate fuel oils, light; Fuel No. 2; Fuel oil (No. 1,2,4,5 or 6) [NA1993].
- **68476-31-3 Primary Name: Fuel oil, No. 4**
  Common Synonyms: Caswell No.[2] 333AB; Cat cracker feed stock; EINECS 270-673-5; EPA Pesticide Chemical Code 063514; Fuel oil No. 4; Diesel fuel No. 4.
- **8008-20-6 Primary Name: Kerosene**
  Common Synonyms: JP-5 navy fuel/marine diesel fuel; Deodorized kerosene; JP5 Jet fuel; AF 100 (pesticide); Caswell No. 517; EINECS 232-366-4; EPA Pesticide Chemical Code 063501; Fuel oil No. 1; Fuels, kerosine; Shell 140; Shellsol 2046; Distillate fuel oils, light; Kerosene, straight run; Kerosine, (petroleum); Several Others.

The EPA may periodically update this list if new products are identified as diesel fuels. Should UIC program directors or permit writers encounter new chemical compounds that may be considered diesel fuels, they should communicate this information to the Chief of the Prevention Branch in the Drinking Water Protection Division.

The attached technical guidance addresses concerns that diesel fuels may contain a number of chemicals of concern including benzene, toluene, ethylbenzene, and xylene compounds (BTEX). BTEX compounds are highly mobile in ground water and are regulated under the SDWA national primary drinking water regulations (NPDWRs) because of the risks they pose to human health. The EPA has set a maximum contaminant level goal (MCLG)[3] and a maximum contaminant level (MCL)[4] for each compound. For example, the MCLG for benzene is zero and the MCL is 0.005 mg/L.[5] People

[2] A Caswell No. is an alphanumeric chemical identifier implemented by Robert L. Caswell in the 1960s and 1970s in conjunction with acceptable common names of pesticides names for labeling purposes.
[3] The EPA sets the level of protection for MCLGs based on the best available science to prevent potential health problems.
[4] The EPA sets MCLs as close to the health goals as possible, considering cost, benefits and the ability of public water systems to detect and remove contaminants using suitable treatment technologies.
[5] US EPA, http://water.epa.gov/drink/contaminants/basicinformation/benzene.cfm

consuming drinking water containing any of these chemicals in excess of the standards set by the EPA over many years could experience:

- An increase in anemia or a decrease in blood platelets from benzene exposure[6];
- An increased risk of cancer from benzene exposure[7];
- Problems with the nervous system, kidneys, or liver from toluene exposure[8];
- Problems with the liver or kidneys from ethylbenzene exposure[9]; and
- Damage to the nervous system from exposure to xylene[10].

BTEX compounds are classified as aromatic hydrocarbons, a class of substances found in petroleum products including diesel fuels. The total content of aromatic hydrocarbons in petroleum products varies based the refining process. The five CASRNs identified as diesel fuels in this memorandum can contain up to 25 percent aromatic hydrocarbons, by weight.[11] These five CASRNs can also contain 20 to 60 percent polynuclear aromatic hydrocarbons (PAHs) by volume.[12] PAHs can be a toxic component of petroleum products and some PAHs are listed as Priority Pollutants under the Clean Water Act[13].

Because other substances used in HF fluids may contain similar levels of BTEX, EPA will work with states and industry to explore approaches to promote voluntary use of safer alternatives in HF fluids.

Finally, the EPA's interpretation of the term "diesel fuels" does not include a *de minimis* threshold. There is nothing in the statute that requires such a threshold. In addition, the inclusion of a *de minimis* level would add regulatory complexity and uncertainty, when the agency's goal is to increase certainty and simplicity. Thus, UIC permit writers are expected to issue a Class II permit for any amount of diesel fuels planned for use in injection during HF.

Technical Guidance for EPA Regional Permit Writers:

The attached document restates existing UIC Class II legal requirements and provides technical recommendations on how the EPA's permit writers, where the agency has direct implementation responsibility, should implement these requirements to address the unique characteristics of HF using diesel fuels and protect underground sources of drinking water from endangerment. The document repeats the EPA's interpretation of the term "diesel fuels" to enable permit writers to determine when a Class II permit is required, and provides technical recommendations based on existing Class II requirements for permit duration and well closure, permit application and review, area of review (AoR),

[6] US EPA, *Ibid*
[7] US EPA, *Ibid*
[8] US EPA, http://water.epa.gov/drink/contaminants/basicinformation/toluene.cfm
[9] US EPA, http://water.epa.gov/drink/contaminants/basicinformation/ethylbenzene.cfm
[10] US EPA, http://water.epa.gov/drink/contaminants/basicinformation/xylenes.cfm
[11] American Petroleum Institute Petroleum HPV Testing Group, "High Production Volume (HPV) Chemical Challenge Program: Gas Oils Category Analysis Document and Hazard Characterization" (submitted to U.S. EPA on October 24, 2012), http://www.petroleumhpv.org/docs/gas_oil/2012_nov15_Gas%20Oils%20CAD%20Final%20Standard%2010_24_2012.pdf (accessed January 15, 2014).
[12] American Petroleum Institute, *Ibid*
[13] 40 CFR Part 423 (Appendix A)—126 Priority Pollutants

and well construction, including mechanical integrity testing, financial responsibility, and public notification.

The EPA Regional Offices should consider the recommendations reflected in the attached technical guidance when issuing permits under the federal UIC permitting program. EPA permit writers have the discretion to consider alternative best practices that are consistent with statutory and regulatory requirements. The agency expects that decisions about permitting HF operations that use diesel fuels will be made on a case-by-case basis, considering the facts and circumstances of the specific injection activity and applicable statutes, regulations, and case law.

Although developed specifically for the UIC program, many of the recommended practices found in this document are consistent with best practices for hydraulic fracturing in general, including from state regulations, voluntary standards from the American Petroleum Institute, and model guidelines for hydraulic fracturing developed by industry and stakeholders. In particular, the recommendations for applying UIC requirements on area of review, well construction, operations, and monitoring – including testing for mechanical integrity of the well and baseline and follow-up water quality monitoring – promote adoption of some best practices identified by industry, some states, and other groups. Some of these practices were also outlined by the Secretary of Energy's Advisory Board (SEAB) Shale Gas Production Subcommittee in its August and November 2011 reports.[14] Thus, states and tribes responsible for issuing permits and/or updating regulations for hydraulic fracturing may also find the recommendations in this document useful in improving the protection of underground sources of drinking water and public health wherever hydraulic fracturing is practiced. The EPA also anticipates that owners and operators may find the recommendations useful in understanding what factors permit writers may consider in issuing permits for HF operations using diesel fuels.

The EPA Regional Offices should continue to coordinate with state oil and gas programs and the appropriate Bureau of Land Management (BLM) office, to establish a mechanism to inform owners or operators of applicable UIC Program requirements and application deadlines. In addition, EPA Regional Offices should collaborate with appropriate regulatory entities to streamline permitting (e.g., between EPA and BLM on BLM-managed lands or with state agencies) such as sharing data where requirements and reporting timeframes are compatible for coordination among the various permitting authorities. Today's memorandum and attached technical recommendations document do not preclude future action under the EPA UIC Program authority if the agency determines that is needed. Any updates to this memorandum or the attached technical recommendations would include a further opportunity for public comment. If you have questions regarding the information presented in the memorandum or the attachment, please contact Ronald Bergman, Chief of the Prevention Branch at 202-564-3823 or bergman.ronald@epa.gov.

Attachment: *Permitting Guidance for Oil and Gas Hydraulic Fracturing Activities Using Diesel Fuels: Underground Injection Control Program Guidance #84*

[14] US DOE, 2011: http://www.shalegas.energy.gov/resources/081811_90_day_report_final.pdf; http://www.shalegas.energy.gov/resources/111011_90_day_report.pdf.