U.S. Department
of Transportation
**Pipeline and Hazardous
Materials Safety
Administration**

1200 New Jersey Avenue, SE
Washington, DC 20590

December 22, 2022

Mr. Bear Bridges
Belshire Environmental Services Inc.
25971 Towne Centre Drive
Foothill Ranch, CA 92610

Reference No. 22-0029

Dear Mr. Bridges:

This letter is in response to your March 23, 2022, email requesting clarification of the Hazardous Materials Regulations (HMR; 49 CFR Parts 171-180) applicable to Class 7 (radioactive) materials. Specifically, you pose several questions pertaining to scenarios in which natural materials and ore are not subject to subpart I of Part 173 of the HMR and request clarification on how to properly calculate the exempt activity concentration for mixtures of nuclides.

We have paraphrased and answered your questions as follows:

Q1. You ask whether natural materials—which have been processed for purposes other than the extraction of radionuclides—can utilize the 10 times exempt material activity concentration values referenced in § 173.401(b)(4). You provide captured drilling mud or fluids from the installation of monitoring, remediation, or water wells as examples of such natural materials.

A1. As provided in § 173.401(b)(4), natural materials and ores containing naturally occurring radionuclides which are either in their natural state or which have only been processed for purposes other than for extraction of the radionuclides—and which are not intended to be processed for the use of these radionuclides—are exempt from subpart I of Part 173 of the HMR, provided the activity concentration of the material does not exceed 10 times the exempt material activity concentration values specified in § 173.436, or determined in accordance with the requirements of § 173.433. However, the examples you provided do not meet these requirements as the radionuclides would not be contained in natural materials or ores.

Q2. You ask whether § 173.401(b)(4) would apply to residues that have been extracted or generated from other processing of natural materials such as groundwater treatment systems.

A2. Section 173.401(b)(4) applies to residues that have been extracted or generated from other processing of natural materials, but not when those residues have been transferred to other media such as groundwater treatment systems.

Q3. You ask whether it is appropriate to apply the 10 times exempt material activity concentration values to filtration media that is unintentionally capturing naturally occurring radionuclides—such as filter media that is designed to treat an organic or metal contamination—and is inadvertently capturing radionuclides.

A3. The answer is no. Section 173.401(b)(4) does not apply to radionuclides that have been filtered out intentionally or unintentionally as the material has been transferred to media other than natural materials or ores.

Q4. You ask whether it is appropriate to apply the 10 times exempt material activity concentration values to filtration media in water treatment systems that have stages or processes explicitly designed to capture radionuclides for the purpose of removing them to meet drinking, wastewater, or other standards.

A4. See answer A3.

Q5. You ask when determining the exempt activity concentration for mixtures of nuclides provided in § 173.433(d)(6) and/or the exempt consignment activity limit for mixtures of nuclides provided in § 173.433(d)(7), whether the variable "f(i)" is intended to be the fraction of activity attributable to a specific nuclide "i" divided by the total activity of all nuclides in the mixture, or the activity of a single nuclide in the mixture.

A5. The variable "f(i)" in the formula provided in § 173.433(d)(6) is intended to be the fraction of activity concentration of a specific nuclide in the mixture divided by the total activity of all nuclides in the mixture, while "f(i)" in the formula provided in § 173.433(d)(7) is intended to be the fraction of activity of a specific nuclide in the mixture divided by the total activity of all nuclides in the mixture

Q6. You ask whether the example you provided in your email—of a calculation utilizing the formula in § 173.433(d)(6)—is accurate.

A6. The answer is yes.

I hope this information is helpful. Please contact us if we can be of further assistance.

Sincerely,

T. Glenn Foster
Chief, Regulatory Review and Reinvention Branch
Standards and Rulemaking Division

Wolcott

22-0029

From: INFOCNTR (PHMSA)
To: Hazmat Interps
Subject: FW: Copy of physical letter submitted to DOT Hazardous Materials Information Center
Date: Monday, April 18, 2022 11:56:27 AM
Attachments: Formal Interpretative Letter DOT.pdf

Hello Hazmat Interps,

Attached is a request for letter of interpretation.

Thanks,

Jonathon, HMIC

From: Bear Bridges <Bear.Bridges@belshire.com>
Sent: Wednesday, March 23, 2022 4:21 PM
To: INFOCNTR (PHMSA) <INFOCNTR.INFOCNTR@dot.gov>
Subject: Copy of physical letter submitted to DOT Hazardous Materials Information Center

Hello,

I received a voicemail from Alice Dodd requesting that I send a copy of a letter that I submitted to the DOT.

Attached is a PDF copy of the letter that I originally submitted to Shane Kelley for a formal letter of interpretation per the instructions on this webpage: https://www.phmsa.dot.gov/standards-rulemaking/hazmat/hazardous-materials-information-center

The only changes from the original letter are that this is dated with today's date (3/23/2022). The original physical letter was sent in November 2021.

Can you please verify receipt of this email as well as the attached pdf titled "Formal Interpretative Letter DOT".

Please feel free to call me at 949-795-0029 if you need any additional information.

Thank you,

Bear Bridges | Senior Project Manager / Technical Solutions
Belshire Environmental Services, Inc.
25971 Towne Centre Drive, Foothill Ranch, CA 92610
Office: 949-460-5200 | Mobile: 949-795-0029 | Fax: 949-460-5210

belshire
environmental services, inc.
25971 Towne Centre Drive
Foothill Ranch, CA 92610
Office: (949) 460-5200
Fax: (949) 460-5210
www.belshire.com

March 23, 2022

Mr. Shane Kelley
Director, Standards and Rulemaking Division
U.S. DOT/PHMSA (PHH-10)
1200 New Jersey Avenue, SE East Building, 2nd Floor
Washington, DC 20590

Subject: Request for formal letter of interpretation regarding Class 7 Hazardous Materials in particular 49 CFR 173.401(b)(4), 49 CFR 173.433 (6) and 49 CFR 173.433 (d)(7).

Dear Mr. Shane Kelly,

The purpose of this letter is to request a formal letter of interpretation to help clarify several areas of regulation regarding the definition and determination of Class 7 materials. This includes the applicability of the 10 times exempt activity concentration values for natural materials specified in 49 CFR 173.401(b)(4) and calculations required to determine exempt activity concentration and consignment activity levels for mixtures of radionuclides as described in 49 CFR 173.433 (d)(6) and 49 CFR 173.433 (d)(7).

We have reviewed all existing PHMSA Interpretation Letters available through the PHMSAs website and contacted the PHMSA Hazardous Materials Information Center and have not received or found sufficient information to answer the questions below.

Natural Materials and the 10 times exempt material activity concentration values

49 CFR 173.401(b)(4) states that Subpart I – Class 7 (Radioactive) Materials does not apply to the following:

> *Natural material and ores containing naturally occurring radionuclides which are either in their natural state, or which have only been processed for purposes other than for extraction of the radionuclides, and which are not intended to be processed for the use of these radionuclides, provided the activity concentration of the material does not exceed 10 times the exempt material activity concentration values specified in § 173.436, or determined in accordance with the requirements of § 173.433.*

PHMSA Interpretation Letter reference No. 17-0114 states that the term "natural material" means:

> *[M]aterial existing in a form as it would otherwise be in nature, not in a form manipulated by human application.*

We could find no regulatory source for this interpretative definition of "natural material" however after reviewing the Federal Register publication of the final rule (Federal Register Vol. 69 No. 16, Jan 26 2004 3636) the following is stated:

> *The [Class 7 hazardous material] regulations also do not apply to natural materials and ores containing naturally occurring radionuclides when these have been subject to physical or chemical processing, when the processing was not for the purposes of extraction radionuclides, again provided that their activity concentrations does not exceed 10 times the activity concentration in the table in 173.436. Examples of such materials are cement, coal, fertilizers, non-radioactive metals, gypsum, residues from mining and smelting processes, etc.*

The Federal Register goes on to state:

> *The factor of 10 times the regulatory exemption activity concentration values was chosen as providing an appropriate balance between radiological protection concerns and the practical inconvenience of regulating large quantities of material with low activity concentrations of naturally occurring radionuclides.*

Based on these statements it appears the intent of the regulation is to allow natural materials which have been chemically or physically processed (provided it is not for the purpose of extraction of radionuclides) and their residues (e.g. spent filter media and other process wastes) to fall under the 10 times exempt material activity concentration values. The Federal Register explicitly mentions materials which would not meet the strict definition of "natural materials" presented in Interpretation Letter 17-0114 such as cement and fertilizers. We believe that the restrictive interpretation presented in Interpretation Letter 17-0114 does not provide the "appropriate balance" mentioned in the Federal Register as it appears to imply that all materials other than those completely raw and unprocessed "natural materials" at are required to be regulated at the activity concentration levels listed in 49 CFR 173.436 or calculated per 49CFR 173.433.

Our questions related to the topic listed above

Please assume the following assumptions apply to questions 1 through 4:

- None of the materials that contain radionuclides are intended to be or will be further processed for the use of the radionuclides.
- All sources of radionuclides are naturally occurring either present in existing soils or groundwater due to local geologic conditions.

1. Can you please confirm if per 49 CFR 173.401(b)(4) whether or not natural materials which have been processed for purposes other than extraction of radionuclides can utilize the 10 times exempt material activity concentration values? E.g. captured drilling mud or fluids from the installation of monitoring, remediation or water wells which may contain added materials such as drilling additives, lubricants or water.

2. The Federal Register mentions "residues of mining and smelting process" as materials that the 10 times exempt material activity concentration values may apply to. Can you please confirm if 49 CFR 173.401(b)(4) would apply to residues that have been extracted or generated from other processing of natural materials? For example groundwater treatment systems are utilized for a range purposes including treatment of drinking water and remediation of environmental contamination such as clean-up of leaking underground storage tanks. These system can generate residues such as process tank sludges, knockout water and spent filtration media.

3. Would it be appropriate to apply the 10 times exempt material activity concentration values to filtration media that is unintentionally capturing naturally occurring radionuclides? For example filter media that is designed to treat an organic or metal contamination and is inadvertently

capturing radionuclides. An example of this would be a system designed to remove Arsenic with ion exchange resin and Uranium is also being captured in the resin.

4. If a water treatment system has stages/processes explicitly designed to capture radionuclides for the purpose of removing them to meet drinking, wastewater or other standards, rather than the use of the radionuclides, would it be appropriate to apply to the 10 times exempt material activity concentration values from 49 CFR 173.401(b)(4)?

Determining activity concentration and consignment exemption limits for mixtures of radionuclides

The definition of "Radiological Material" from 49 CFR 173.403 states:

> *Radioactive material means any material containing radionuclides where both the activity concentration and the total activity in the consignment exceed the values specified in the table in § 173.436 or values derived according to the instructions in § 173.433.*

For a mixture of radionuclides to determine the relevant exempt material activity concentration limit we follow 49 CFR 173.433 (d)(6) which states:

> *Exempt activity concentration limit for mixture =* $1 / \sum_i f(i) / [A](i)$
> *Where:*
> *f(i) is the fraction of activity concentration of nuclide i in the mixture; and [A](i) is the activity concentration for exempt material containing nuclide i.*

In the below questions we will seek clarification on the following language:

> *f(i) is the fraction of activity concentration of nuclide i in the mixture*

We see two potential interpretations of this statement in particular the word "fraction":

Potential interpretation 1 – f(i) is the activity concentration value of that specific nuclide i. E.g. pCi/g value for a specific nuclide i determined from laboratory analysis of the material.

Potential interpretation 2 – f(i) is the activity concentration of that specific nuclide i divided by the total activity concentration (i.e. the sum of all activity concentrations for all radionuclides) of the mixture. E.g. a number less than one (when in a mixture of nuclides) gained by dividing the activity concentration of the nuclide i by the total activity concentration of the mixture (i.e. the sum of all activity concentrations for all radionuclides).

Our questions related to the topic listed above

5. Can you confirm if when calculating exempt activity (49 CFR 173.436 (6)) and/or consignment limits (49 CFR 173.436 (7)) for a mixture of nuclides that the variable f(i) is intended to be the fraction of activity attributable to a specific nuclide i divided by the <u>total</u> activity of all nuclides in the mixture (i.e. as specified in Potential interpretation 2 described above)?

6. Assuming that f(i) is the fraction of activity concentration attributable to a specific nuclide i divided by the <u>total</u> activity concentration of all nuclides in the mixture can you please confirm

that the example calculation and assessment below is accurate for determination of exempt activity concentration per 49 CFR 173.433(6) is correct?

Solid material (that does not fall under the 49 CFR 173.401(b)(4) 10 times exempt material activity concentration values) contains nuclides with the following activity concentration levels:

U_{nat} 500 pCi/g
Th_{nat} 450 pCi/g
K_{40} 50 pCi/g

Total activity concentration for the mixture is 1,000 pCi/g

Determination of fraction of specific activity concentration:

U_{nat} Fraction of total activity = 500 pCi/g / 1000 pCi/g = 0.5
Th_{nat} Fraction of total activity = 450 pCi/g / 1000 pCi/g = 0.45
K_{40} Fraction of total activity = 50 pCi/g / 1000 pCi/g = 0.05

Values for activity concentration for specific nuclides from 49CFR 173.436

U_{nat} $2.7x10^{-11}$ Ci
Th_{nat} $2.7x10^{-11}$ Ci
K_{40} $2.7x10^{-9}$ Ci

Performing calculation to determine exempt activity concentration limit of mixture:

$1 / [(0.5 / 2.7x10^{-11}$ Ci/g) + (0.45 / $2.7x10^{-11}$ Ci/g) + (0.05 / $2.7x10^{-9}$ Ci/g)] = 2.84×10^{-11} Ci/g

Calculated exempt activity concentration limit for mixture
= 2.84×10^{-11} Ci/g
= **28.4 pCi/g**

The total activity of mixture was 1,000 pCi/g so the material exceeds the exempt activity concentration limit for this specific mixture of nuclides.

Please feel free to contact me via email (bear.bridges@belshire.com) or phone (949-460-5200) if you need any additional details or clarification in order to respond to this letter.

Thank you,
Bear Bridges