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Dear Mr. Walters:

The undersigned organizations are pleased to submit comments on the application of Range Resources Appalachia LLC, General Permit Number WMGR097R025, for research and development (R&D) activities involving the use of drill cuttings from natural gas wells as an aggregate in a stabilized soil pavement.

Oil and gas operators face a growing challenge in handling and disposing of the increasing volumes of solid and liquid waste they produce. However, this concern should not be a reason to allow dangerous substances that threaten health and the environment to be used in ways that can have unknown consequences for the public. With this in mind, we offer comments in three parts: objections related to the potential designation of “beneficial reuse” in the context of natural gas operations; ongoing concerns about the likelihood that gas field wastes such as drill cuttings are hazardous and radioactive; and specific concerns about the permit application itself.

Beneficial Use Determination

This permit application presumes that if successful, the proposed R&D process would constitute a beneficial reuse of drill cuttings from shale gas operations. Range Resources even contends that the increased use of drill cuttings in other applications, such as pavement, has broad environmental benefits, including reduced truck traffic and greenhouse gas emissions. However, the applicant fails to substantiate how such benefits would be achieved or sufficiently demonstrate that the waste in question is in fact residual waste.

The assumption that the proposed R&D activity would lead to a beneficial use determination (BUD) for residual waste is not correct in light of the requirements for authorization under the related General Permit. A BUD was never intended to allow operators to circumvent necessary requirements, including evaluations of potential harm to the environment—yet this is precisely what the current General Permit application in fact seeks to do.

The Department’s regulations governing Beneficial Use of Residual Waste (§ 287.611 of PA Code Subchapter H) state that general permits can be issued to prepare waste for beneficial use when the following conditions are met:

- (1) The wastes included in the category are generated by the same or substantially similar operations and have the same or substantially similar physical character and chemical composition. If wastes are not the same or substantially similar and are blended for use, the blend shall be consistently reproduced with the same physical character and chemical composition.
- (2) The wastes included in the category are proposed for the same or substantially similar beneficial use or processing operations.

(3) The activities in the category can be adequately regulated utilizing standardized conditions without harming or presenting a threat of harm to the health, safety or welfare of the people or environment of this Commonwealth. At a minimum, the use of the waste as an ingredient in an industrial process or as a substitute for a commercial product may not present a greater harm or threat of harm than the use of the product or ingredient which the waste is replacing.

According to Section 287.611(a)(1) of the PA Code, drill cuttings can vary greatly in physical character and chemical composition. A report by the United States General Accountability Office has acknowledged the variability of drilling wastes.¹ The intermingling of the cuttings with the waste produced by drilling can result in the mixing of produced waste products with drill cuttings. The character and properties of the cuttings material that could be used vary based on the depth of the well bore; the formations that are drilled and targeted and the characteristics of those formations which contain naturally occurring pollutants and site-specific properties; the type of drilling equipment; the specific drilling additives employed such as drilling muds, fluids, and lubricants; the interactions of the cuttings with the cement; and other site specific conditions.

The current permit application reflects these types of inconsistencies (physical character and chemical composition) because it proposes intermingling of cuttings from different well sites, the use of various additives during drilling, and ambiguous cleaning and processing procedures to pre-treat cuttings (which, as discussed below, the applicant fails to provide). This in turn creates the potential for waste materials to attach to the cuttings that are used. The uncertainty regarding consistency of the drill cuttings means that the requirement for a BUD cannot be met.

According to Section 287.611(a)(3) of the PA Code, a BUD is to be adequately regulated by standardized conditions rather than individual permits. Specifically, “the use of the waste as an ingredient in an industrial process or as a substitute for a commercial product may not present a greater harm or threat of harm than the use of the product or ingredient which the waste is replacing.” Applied here, the plain language of Section 287.611(a)(3) and common sense dictate that the cuttings that might be developed through the proposed R&D process cannot pose a greater threat than the cement or other products that would instead be used as a stabilized soil pavement.

The proposed General Permit application does not conform to this mandate. The current application proposes to use drill cuttings that contain pollutants that cement does not contain. Further, as discussed below, chlorides, barium, strontium and total petroleum hydrocarbons can be contained in the cuttings, as well as radioactive characteristics. These hazardous pollutants clearly pose a greater threat to the environment than plain cement. Therefore, drill cuttings and the pollutants they contain cannot satisfy requirements for a General Permit for a BUD—and thus neither can the R&D permit application.

Hazardous waste classification

The proposed general permit is of great concern because of a significant, longstanding failure of federal and state policies and regulations to accurately characterize wastes from oil and gas operations. The definition of a hazardous waste under the U.S. Resource Recovery and Conservation Act (RCRA) is:

[A] solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may-

A. cause, or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness; or

B. pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed.

In 1988, the United States Environmental Protection Agency (EPA) exempted exploration and production (E&P) wastes from Subtitle C of RCRA.² At the time, the agency provided a comprehensive list of wastes excluded from and included within the scope of the exemption, as well as specifying that “other wastes associated with the exploration, development or production of crude oil or natural gas” could include “rigwash, drill cuttings, and wastes created by agents used in facilitating the extraction, development, and production of the resource, and wastes produced by removing contaminants prior to the transportation or refining of the resource.”

Most states have incorporated the RCRA exemption into their own oil and gas regulations, including Pennsylvania.³ However, EPA itself has stated that, “It is clear that some portions of both the large-volume and associated waste would have to be treated as hazardous if the Subtitle C exemption were lifted.”⁴ Such a view has been supported by documentation of toxicity and ignitability levels high enough to trigger RCRA, were it not for the exemption. This includes a 2009 study analyzing constituents of flowback in West Virginia and Pennsylvania that detected both barium and known carcinogens such as benzene, toluene, ethylbenzene, and xylene in excess of applicable regulatory thresholds.⁵

In effect, the RCRA exemption allows chemicals that are otherwise considered hazardous within the same statute to permeate water and soil and, in turn, degrade the environment and harm human health. In fact, the EPA study used to determine the waste exemption concluded that between 10 and 70 percent of the oil and gas wastes sampled “could potentially exhibit RCRA hazardous waste characteristics.”⁶

Notably, this conclusion was reached long before the advent of high volume horizontal hydraulic fracturing now practiced across Pennsylvania and the United States, and long before the oil and gas industry routinely produced large amounts of wastewater and solid waste containing high levels of salt, chemicals, and both naturally occurring radioactive material (NORM) and technologically enhanced radioactive material (TENORM).

In other words, there is an even greater chance today that E&P waste would meet the definition of hazardous. This is a critical factor for the Pennsylvania Department of Environmental Protection (DEP) to keep in mind when considering permit applications that involve the management of E&P waste—particularly if, as in the current case, a completely new, experimental process is being proposed.

The current application does not include scientific evidence that drill cuttings anticipated for use in the R&D process are non-hazardous. The non-hazardous certification provided in the General Permit application is based on forms and data taken from landfill disposal procedures. In fact, the data used in the application is simply a general characterization of the type of waste that Range Resources might use in the proposed project. We are greatly concerned the landfill certification sheet specifies that it has not conducted “detailed physical, chemical, and radiological characterization of the waste and its leachate.” Certification is instead based only on general Material Safety Data Sheets (MSDS)—which do not relate to volumes or mixtures of chemicals or specific characteristics (such as radioactivity) of the waste in question.

As discussed further below, we question whether the sample waste presented in the application is in fact reflective of what would be used in the proposed project. In addition, it should be noted that

the chemical analysis of even the sample waste raises red flags with regard to its safety and threat to the environment and human health. For example, chlorides and barium were detected at nearly ten times the laboratory's reporting limit (RL), strontium at more than 90 times the RL, and total petroleum hydrocarbons at more than 100 times the RL.

Further, and of great concern with regard to the current permit, currently available scientific data corroborates the presence of radionuclides in hydraulic fracturing waste. Radioactivity is clearly a growing problem. Radiation detectors triggered alarms at Pennsylvania landfills 423 times in 2008 and 1,325 times in 2012, with more than two-thirds of such events attributable to oil and gas wastes.⁷ Although the problem of TENORM in hydraulic fracturing wastes is attracting increasing attention, to date no federal agency has promulgated applicable regulations, although discharges of such fluids are subject to the Clean Water Act and the Safe Drinking Water Act.

DEP's ambiguous approach to the problem is reflected in Pennsylvania's definition of TENORM (at 25 Pa. Code § 287.1), which states, "A technologically enhanced naturally occurring radioactive material is not subject to regulation under the laws of the Commonwealth or the Atomic Energy Act, whose [sic] radionuclide concentrations or potential for human exposure have been increased above levels encountered in the natural state by human activities." Even so, Pennsylvania's Low-Level Radioactive Waste Disposal Act prohibits "shallow" burial of such waste and requires that the Department "develop standards by regulation for the onsite handling and disposal of naturally occurring radioactive materials, ores and their waste products."⁸

One of the principal means of regulating the handling of radioactive hydraulic fracturing wastes at centralized waste treatment facilities is the requirement, in the conditions of the Facility Permit, that operators submit to the Department a copy of, and maintain on premises at all times, a Radiation Protection Action Plan on the Department's specified form (Form X). The Plan may provide for the disposal of TENORM by waste treatment facility or landfill operators without special handling or treatment. However, disposal of TENORM-containing waste in higher volumes, with higher radiation levels, or at higher radium concentrations must be approved by the Department's Director of the Bureau of Radiation Protection, per a radioactivity guidance document.⁹ The Radiation Protection Action Plan in the current General Permit application appears to be lacking with regard to two of these requirements: hydraulic fracturing fluid wastes are clearly produced in far greater volumes and very likely possess significantly higher potential for radioactivity.¹⁰

DEP is currently assessing the radioactivity potential of Marcellus shale gas wastes in its pending TENORM study, a critical undertaking that should be used to change Pennsylvania's severely outdated waste management standards currently used by the Department. Because the results of the pending TENORM study have not yet been aggregated or shared with the public—and because numerous questions exist concerning the health and environmental impacts of shale gas wastes, including drill cuttings—it is inappropriate and premature for the Department to consider a general permit entailing an alleged beneficial reuse of such waste. It should be noted that even the permit applicant recognizes, on Form X, that the results of the TENORM study could affect how oil and gas operators extract, transport, treat, and dispose of potentially radioactive waste.

Permit application inadequacies

The concerns discussed above directly reflect the environmental risks posed by the reuse of drill cuttings. Unfortunately, the permit application does not provide enough information regarding how those risks would be prevented, particularly in an experimental R&D project.

Range Resource's lack of consideration of problems that could arise is underscored by the single sentence response to Section 3.6 of the project narrative, which requires description of corrective actions should the project be unsuccessful: "In the event of failure, the pad will be removed via earthwork excavation and all the materials sent to a landfill for disposal." Again, the narrow focus on the *end results* of the R&D process, suitable pavement material, ignores the possibility that problems could occur *during* the R&D process, such as material leaching into soil or becoming saturated by rain and running off the pad. For these reasons, simply assuming that excavating the material would be a sufficient solution is shortsighted and dangerous.

The flaws and lack of thoroughness of the applicant's proposal are especially apparent when one considers the lack of rationale for the choice of this particular site for R&D. The proposed site for the R&D pad is in close proximity to and directly upslope from Larry's Creek and Dog Run Creek, two streams that are designated as Exceptional Value (EV). Such designated waterways should be afforded additional protection, rather than becoming the site of experimental projects.

The lack of consideration for such risks is also underscored by inconsistencies in the permit application with regard to the relationship between the R&D project area and the Dog Run Hunting Club 4H-6H well site (DEP site ID number 775155). The General Information Form-Authorization Application indicates that a completely new site would be constructed and, according to lines 1 and 2 of the "Facility Information" section, that it would *not* modify or involve an addition to an existing facility, system, or activity. Yet Section 3.3 of the application narrative states that, "The R&D pad will be utilized as an operational pad for a Range Resources Appalachia LLC (Range) natural gas well"—implying that the applicant in fact does view the R&D pad as an addition to an existing site.

At the same time, Range Resources appears to be inappropriately relying on the Dog Run Hunting Club well site to avoid providing detailed information on the R&D project being proposed. Particularly concerning is the lack of any plans on how risks to water and soil quality would be prevented. Section 3.12 of the proposal narrative simply states, "All construction activities associated with the installation of the soil cement stabilized pad will be conducted at a permitted well site, where a contingency plan is already in place for spills, accidents, or other emergencies." This level of discussion is wholly inadequate considering the experimental nature of the activities proposed under the General Permit application.

The Dog Run Hunting Club 4H-6H site was permitted for different uses and conditions than what is being proposed with the WMGR097. Thus the existing contingency plan for a well pad is insufficient evidence of protective measures for a completely new and experimental process. This lack of safeguards is particularly troublesome in light of Range Resource's history of numerous environmental health and safety violations accrued at well sites statewide. Among them have been violations at the same site as the proposed project, where the Dog Run Hunting Club 1H well was cited in 2010 for failure to minimize erosion, maintain erosion and sedimentation controls, and stabilize the site, and in 2011 for the potential of polluting substances entering waters of the Commonwealth. If the Department decides to approve this permit, it should at minimum require a new site-specific contingency plan for the alleged beneficial reuse project.

Additionally, the Project Information section of the authorization application specifies that, "stormwater will be handled in accordance with the facility's ESCGP-2/PCSM permit." Given that the new site for the R&D project will involve approximately six acres of earth disturbance (specified on line 4.0 in the "Coordination Information" section), an Erosion and Sedimentation Control General Permit and plan for Post-Construction Stormwater Management practices would appear to

be required. However, based on the permit application file, it does not appear that the applicant has in fact applied for or plans to apply for a new ESCGP-2.

Instead, Section 3.3 of the narrative states that, “[t]he site will be maintained with proper erosion control and storm water management, per the ESCGP-2. Also per the ESCGP-2 permit for this pad, the pad will remain in place for continuous well operations, access to equipment and with enough buffer around the wells and equipment for safety purposes until all wells are plugged.” The references here to wells and well operations imply that the applicant plans to use the ESCGP-2 issued by DEP to the Dog Run Hunting Club 4H-6H site in August 2013—nearly five months before the current R&D permit was even submitted to DEP.

This is illogical because the conditions presumed by DEP when it approved the Dog Run Hunting Club ESCGP-2 permit (e.g., size and delineation of the site and the extent of earth disturbance) would no longer apply should the R&D pad be built in the same location. If the application is approved, it will be imperative for DEP to ensure that stringent Erosion and Sedimentation (E&S) controls *unique to this site* are in place at the proposed R&D pad itself, particularly because of the experimental nature of what is being proposed and, in turn, the unknown potential for polluting runoff to reach vital waterways.

Because the proposed project represents a new, experimental process, DEP should consider whether it would contradict current waste management policies and regulations. For example, PA Code § 287.132 (a)(3) on chemical analysis of waste sampling states that plans included with permit applications “shall ensure an accurate and representative sampling of the waste.” The project narrative, line 18.0 of the authorization application, and form R1 (Waste Analysis and Classification Plan) indicate that the R&D project is solely for the development of pavement using *vertical* hole drill cuttings. However, according to the DEP’s Permitted Well Inventory database, two of the three wells from which drill cuttings were sampled for purposes of the R&D application—the Laurel Hill 1H and the Corson 1H—are horizontal, unconventional wells. While the third, the Bobst Mountain Hunting Club 1 is a vertical well, all three wells are classified as unconventional.

In addition, a November 16, 2011 letter to oil and gas operators regarding Form 26R, Scott Perry, Director of the DEP Bureau of Oil & Gas, states that, “Certification of waste under §287.54(f) and (g) is specific to each generating location. Therefore, a chemical analysis of drill cuttings from the first well drilled on a pad may be used to certify any subsequent wells on the same pad, but may not be used to certify drill cuttings from other pads, even if the target formation is the same. The same is true of any other waste stream from drilling, hydrofracturing, or production of shale gas wells.” Likewise, PA Code 78.61(b)(1) regarding land application of drill cuttings from above the casing seat requires that the cuttings be generated from the well at the well site only, and PA Code 78.63(a)(1) on the land application of residual waste requires that the waste be from an oil or gas well located on the well site.

However, the waste samples provided in the permit application come from Cogan Township (Laurel Hill Pad B and Bobst Mountain Hunting Club 1) and Anthony Township (Corson Unit 1H), while the R&D project would be in Cummings Township. This aspect of the current General Permit application thus runs afoul of the aforementioned regulations and, in turn, requires the Department’s immediate scrutiny. If Range were to choose to use cuttings from the wells closest to the project site, then the vertical drill cutting presumption on which the permit is based would no longer apply, as the Dog Run Hunting Club Unit consists of horizontal, unconventional wells.

Such uncertainties with the intentions and outcomes of the proposed R&D process would also make

it necessary for DEP to conduct oversight above and beyond routine operations and protocols. In particular, the Department should require extensive sampling of monitoring wells and/or existing water sources in order to track potential releases of pollutants. The one-year duration of sampling proposed by the applicant is insufficient; sampling may need to be conducted well beyond the permit period, as pollutants can migrate into water slowly over time, especially if the material used in the R&D process breaks down. Because the proposed process is experimental and the interaction between drill cuttings and other material is unknown, monitoring would need to occur at the site for as long as the R&D pad is in place and until all potentially polluting material is removed from the site. Such monitoring should only be allowed to end when complete site remediation has occurred.

The need for sampling is particularly relevant because the application does not specify the drilling process that would be employed at the wells supplying the drill cuttings. Nor does it specify the type of drilling mud that would be used, even though drilling muds can attach to cuttings and pose pollution hazards. All drill cuttings and substances used in the R&D process should be sampled for their specific constituents in order to obtain an accurate accounting of the material. In turn, this information is needed to guide water supply monitoring and pre-drill testing and to support future DEP investigations. Materials that could leach from the cuttings or the final product should be tested for Extraction Procedure (EP)-Toxicity using the Toxicity Characteristic Leaching Procedure (TCLP) and should be certified to not exceed any regulatory levels.

The applicant also neglects to describe how contaminants would be removed from drill cuttings to make the material acceptable for use in the R&D process. Some cuttings require washing to remove salts, while others are thermally treated. The wetness or percent of sludge or slurry that would be contained in the drill cuttings must be specified, since liquids or sludges can contain and hold different constituents at different concentrations than dry cuttings and could require different cleaning processes and safe handling procedures. These processes should be fully disclosed and the procedures to be used should require prior approval by the DEP to ensure proper handling, storage, and disposal. Cleaning and processing of drill cuttings have the potential to release contaminants and different forms of material can contain pollutants at varying concentrations and behave differently in the environment—making it necessary to regulate such activities through an individual permit, not a General Permit.

Finally, we are concerned that local government units, specifically municipal governments and agencies (such as Conservation Districts), are not directly involved with this project. While both county and township commissioners have been informed of the application, given the experimental nature of the project, broader input and participation from both the public and local government is necessary and will lead to better decisions by the DEP. Operators and the DEP should actively seek input from local government and the public, which may have information on local conditions and environmental considerations that may not be apparent in the application.

As noted above, the exemptions from RCRA (as well as other federal environmental laws such as the Clean Water and Safe Drinking Water Acts) means that the polluting potential of gas field wastes, including with regard to radioactivity, is a scientific and regulatory “gray area.” Without far more information on the type and potential environmental risks of drill cuttings, it is incumbent upon DEP to clarify how it will address these risks *before* it considers authorizing such wastes as a beneficial reuse.

In conclusion, the Department should reject Range Resource’s WMGR097 application because it is incomplete and lacking in documentation; does not satisfy the requirements for a Beneficial Use Determination; and involves an experimental, unknown process that would

use potentially hazardous and radioactive waste. If approved, the proposed R&D project could well cause irreparable harm to water, soil, natural areas, and the health of both people and wildlife.

Thank you for your time and consideration. Please contact Nadia Steinzor of Earthworks at nsteinzor@earthworksaction.org or 202-887-1872, ext. 109, with any questions or for additional information.

Sincerely,

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¹ U.S. Government Accountability Office, *Energy-Water Nexus: Information on the Quantity, Quality, and Management of Water Produced During Oil and Gas Production*. GAO-12-156, January 2012.

² U.S. Environmental Protection Agency. "Regulatory Determination for Oil and Gas and Geothermal Exploration, Development, and Production Wastes." Federal Register Volume 53, 1988. www.epa.gov/osw/nonhaz/industrial/special/oil/og88wp.pdf.

³ PA Annotated Statutes, in reference to the state's Solid Waste Management Act. 35 Pa. Stat. Ann. §§ 6018.103, 6018.301.

⁴ U.S. Environmental Protection Agency. "Regulatory Determination for Oil and Gas and Geothermal Exploration, Development, and Production Wastes." Federal Register Volume 53, 1988. www.epa.gov/osw/nonhaz/industrial/special/oil/ogreg88.txt.

⁵ T. Hayes. *Sampling and Analysis of Water Streams Associated with the Development of Marcellus Shale Gas*, Gas Technology Institute, report prepared for the Marcellus Shale Coalition. December 2009. <http://energyindepth.org/wp-content/uploads/marcellus/2012/11/MSCCommission-Report.pdf>

⁶ "Regulatory Determination for Oil and Gas and Geothermal Exploration, Development, and Production Wastes." U.S. Environmental Protection Agency. July 6, 1988. 53 Federal Register, 25447. <http://www.epa.gov/osw/nonhaz/industrial/special/oil/og88wp.pdf>

⁷ Timothy Puko, "Radioactive fracking debris triggers worries at dump sites." *Pittsburgh Tribune Review*, May 11, 2013.

⁸ Title 35 of the Pennsylvania Consolidated Statutes, § 7130.102(8).

⁹ Pennsylvania Department of Environmental Protection, Bureau of Radiation Protection and Bureau of Land Recycling and Waste Management, *Final Guidance Document on Radioactivity Monitoring at Solid⁹ Waste Processing and Disposal Facilities*, January 2, 2004.

¹⁰ For example, a Department official has reported that the radioactivity of Marcellus shale fracturing fluids ranges from 300 - 9,000 pCi L⁻¹ ¹⁰ and that the equivalent dose (at an unspecified distance) from the sludge resulting from treatment of fracturing fluid wastes range from 6 - 250 millirem h⁻¹. David J. Allard, Director, Bureau of Radiation Protection, Department of Environmental Protection, *Marcellus Shale & TENORM*,

presentation at Pennsylvania Emergency Management Agency Annual Emergency Management Conference, at 46 (September 24, 2011), limits set forth in the Radioactivity Guidance Document.