Occupational Safety and Health Administration
Columbus Area Office
200 North High Street, Room 620
Columbus, OH 43215

February 9, 2021

To Whom It May Concern,

As concerned residents, former industry workers, scientists, journalists, and researchers who have investigated the radioactive elements of oil and gas waste in the Marcellus shale region, we are filing a complaint with OSHA. We ask that each of the following Ohio Chief's Orders facilities be tested for radiological contamination including, radium (alpha, beta and gamma) exposure for workers. Our research has uncovered undeniable evidence that oil and gas industry workers are being exposed to unsafe levels of radioactivity. Oil and gas workers have not been trained properly, nor been given the necessary safety equipment, and are uninformed of the radiological risks posed by working for this industry. There are no state or federal laws requiring companies to identify oil and gas waste as hazardous (due to the Bentsen and Bevill Amendments exemption under the Resource Conservation and Recovery Act), despite the known presence of radium in oil and gas waste since the 1930's.

A Harvard study published in the Autumn of 2020, made the following determination:

"Our analysis demonstrates that upwind UOGD [unconventional oil and gas development, aka horizontal drilling or fracking] activities could significantly elevate the PR level in downwind communities. UOGD has a larger impact on PR, compared to COGD [conventional oil and gas development or vertical drilling]. Based on previously published health effect analysis of PR, it is possible that the widespread of UOGD could induce adverse health effects to residents in proximity by elevating the PR."

"These associations suggested the existence of some pathways by which UOGD activities could release NORM into the atmospheric environment. Likely mechanisms include the fugitive release of natural gas, which contains a higher-than-background level of radon at wellheads, compressor stations, pipelines, and other associated facilities; the management, storage, discharge and disposal of flow-back and produced water which is rich in NORMs; the accidental spill or beneficial use of produced water in nearby communities; the handling, transport, management, and disposal of radioactive drill cuttings. The results of our negative control analysis suggested the potential transport mechanism of PR independent of atmospheric movement. This association could be explained by the increased off-site radon emission, or by the nearly isostropic dispersion of radon released on site under low-wind condition…Our results showed a remarkable distinction between the impacts of UOGD and COGD on PR. UOGD-specific processes, such as hydraulic fracturing and directional drilling, could potentially explain the larger associated impacts. The high volume hydraulic fracturing process

produced large volumes of flow-back water and drilling mud, which are subsequently stored in the temporary reserve pit adjacent to the drilling site. Most UOGD production states allow the operator to close the reserve pit within up to one year after completing the drilling. This practice potentially enables the NORMs in the produced water to decay into radon above the ground surface and release the radon into the ambient environment. The lateral drilling process produces large volumes of drill cuttings from the unconventional accumulating formation, whose levels of NORMs are higher than those produced during the vertical drilling stage. These drill cuttings are currently not considered hazardous wastes by U.S. EPA. The practice of beneficial use of drill cuttings and land treatment could potentially release radon into the ambient environment"

Additional research into the radiological exposures to workers caused by the oil and gas industry was conducted by scientific journalist, Justin Nobel, and was published in the Rolling Stone Magazine in January 2020.

"The Earth's crust is in fact peppered with radioactive elements that concentrate deep underground in oil-and-gas-bearing layers. This radioactivity is often pulled to the surface when oil and gas is extracted — carried largely in the brine….
Peter, a brine truck driver, was able to transfer 11 samples of brine to the Center for Environmental Research and Education at Duquesne University, which had them tested in a lab at the University of Pittsburgh. The results were striking.

Radium, typically the most abundant radionuclide in brine, is often measured in picocuries per liter of substance and is so dangerous it's subject to tight restrictions even at hazardous-waste sites. The most common isotopes are radium-226 and radium-228, and the Nuclear Regulatory Commission requires industrial discharges to remain below 60 for each. Four of Peter's samples registered combined radium levels above 3,500, and one was more than 8,500.

"It's ridiculous that these drivers are not being told what's in their trucks," says John Stolz, Duquesne's environmental-center director. "And this stuff is on every corner — it is in neighborhoods. Truckers don't know they're being exposed to radioactive waste, nor are they being provided with protective clothing.

"Breathing in this stuff and ingesting it are the worst types of exposure," Stolz continues. "You are irradiating your tissues from the inside out." The radioactive particles fired off by radium can be blocked by the skin, but radium readily attaches to dust, making it easy to accidentally inhale or ingest. Once inside the body, its insidious effects accumulate with each exposure. It is known as a "bone seeker" because it can be incorporated into the skeleton and cause bone cancers called sarcomas. It also decays into a series of other radioactive elements, called "daughters." The first one for radium-226 is radon, a radioactive gas and the second-leading cause of lung cancer in the U.S. Radon has also been linked to chronic lymphocytic leukemia. "Every exposure results in an increased risk," says Ian Fairlie, a British radiation biologist. "Think of it like these

guys have been given negative lottery tickets, and somewhere down the line their number will come up and they will die."

https://www.rollingstone.com/politics/politics-features/oil-gas-fracking-radioactive-investigation-937389/

Furthermore, Science Direct reported the following:

"Hydraulic fracturing of the Marcellus Shale produces wastewaters that are hypersaline and highly enriched in isotopes of radium. Radium is understood to derive from the Marcellus Shale itself, but its source phases and their contributions to wastewater production have not been described. Using sequential extractions and experimental leachates, we characterize two distinct end-members that could contribute Ra to wastewaters, (1) a mineral phase, which hosts labile 228Ra and has 226Ra/228Ra atom ratios 250, and (2) an organic phase, which hosts exchangeable 226Ra and has 226Ra/228Ra 10,000. In leaching experiments we observed rapid extraction of Ra from these phases, with high ionic strength solutions leaching up to 14% of Ra from the shale in just hours. Radium concentrations and 226Ra/228Ra ratios increase with [Ca2+] of the leaching solution, and solutions approaching 1 M Ca2+ produce 226Ra/228Ra ratios compatible with Marcellus wastewaters. In contrast, pure water removes <0.5% of Ra from the shale with low 226Ra/228Ra ratios incompatible with wastewaters. Experimental results and wastewater data together provide a coherent picture, that the distinctive Ra isotopic signature of Marcellus wastewaters results from contemporaneous water-rock interactions that promote desorption of 226Ra from organics during hydraulic fracturing."
https://www.sciencedirect.com/science/article/abs/pii/S0009254118303164

Long-term radiation exposure correlates with incidents of cancer in workers in state**s** where oil and gas drilling has occurred for a longer duration. This is highlighted in this excerpt from a report that was prepared by Stanley Waligora, CHP, of Environmental Designs, Inc. in Albuquerque, NM and Marvin Resnikoff, Ph.D.,in December of 2013. This involves a lawsuit in which 31 workers got cancer due to inadequate protection against radiation. The waste from fracking in Marcellus Shale region poses similar radium exposure hazards to workers. Full report available upon request.

"Radioactive Waste Management Associates has been retained by the Smith Stag law firm to evaluate the radiation and toxic exposures of the 33 plaintiffs involved in the case Coleman et al v. H.C. Price Co. et al.

The aforementioned plaintiffs worked in pipe yards and on onshore and offshore oil production rigs for various companies in Louisiana . During these times, the workers were regularly exposed, without their knowledge, to naturally occurring radioactive material (NORM) in the course of oil field pipe cleaning and refurbishing operations at the pipe yards and oil production rigs. Workers were exposed to radiation through inhalation of the radioactive scale dust, incidental ingestion of radioactive scale dust and radioactive sludge, and to external radiation from the scale and sludge in the oil

production pipes, radiographic inspections and from the scale and sludge deposited on their clothing and the ground of their work areas.

The plaintiffs were diagnosed with cancer, which we determined to be a consequence of their occupational exposures to radiation. Two of the thirty-three plaintiffs were diagnosed with diseases that often precede a cancer diagnosis. The remaining thirty-one plaintiffs involved in the case Coleman et al v. H.C. Price Co. et al. have been diagnosed with cancer, which we determined to be a consequence of their occupational exposures to radiation.

There were no radiation protection programs at the pipe yards and on the oil production rigs on which the workers worked and therefore no radiation measurements were made at the time the work was performed. Thus, the true radiation doses received by these workers will never be exactly known. In this report, a range of likely radiation doses is employed based on the technical literature. It is very likely that workers received doses well in excess of applicable limits to nuclear industry workers. This conclusion is evident even when modest values for exposure factors are used (scale and sludge activities, breathing rates, dust loadings, and so on). The radiation doses received by the workers greatly increased the workers' risk of developing cancer . . .

2.0 Naturally Occurring Radioactive Materials (NORM)

As discussed earlier, the workers were exposed to naturally occurring radioactive materials (NORM) in scale and sludge though a variety of different pathways, including inhalation of scale dust, incidental ingestion of scale dust and sludge, and external direct gamma radiation emanating from radiographic inspections and scale and sludge deposited on the workers' clothing, work equipment, and on the floor of their work areas. Radiation exposure is assumed to have occurred from radium-226 (Ra-226) and radium-228 (Ra-228) and their radioactive decay products . . .

2.1 Radioactivity in Scale

Louisiana contains elevated naturally occurring radioactive materials (NORM) concentrations in its oil and natural gas production equipment. When oil and natural gas are pumped from an underground formation, water contained within the formation is also extracted with the oil and gas. This water, known as produced water, contains dissolved mineral salts, which are radioactive. Uranium and thorium compounds are fairly insoluble and remain in the formation, but Ra-226 and Ra-228, progeny of uranium and thorium, are more soluble in water and become mobilized in the reservoir liquid. As the natural pressure and temperature within the bearing formation falls, the dissolved solids in produced water precipitate out of solution and deposit as scale within the oil production piping. Scale, a hard residue, consists of salts that are composed of mainly barium, calcium, and strontium compounds. Because radium (Ra-226 and Ra-228 combined) shares similar chemical properties with these three elements, it also precipitates to form complex sulfate and carbonate salts in scale. Higher salinity in produced water results in higher radium concentrations, although the presence of high salinity does not necessarily mean that the water contains radium.

Scale is typically found in piping and tubing (oil flow and water lines), injection and production well tubing, manifold piping, and small diameter valves, meters, screens, and filters. According to the American Petroleum Institute (API), radium concentrations in scale tend to be highest in wellhead piping and in production piping near the wellhead, with concentrations as high as tens of thousands pCi/g. The largest volumes of scale have been found in water lines associated with separators, heater treaters, and gas dehydrators.

Scale in an oil production well increases over time, i.e. the scale buildup will be thickest in pipes that have been in the ground the longest. The thickness of scale build up in production piping and equipment may vary from a few millimeters to more than an inch. At times the scale may build up in production equipment to completely block the flow in 4-inch diameter pipes.

. . . Based on these findings, in this report we use a concentration of 6,000 pCi/g for Ra-226 and 2,000 pCi/g for Ra-228 in pipe scale. We assume secular equilibrium between Ra-226 and Ra-228 and their respective progeny, i.e. we apply the same activity in scale (in pCi/g) for the daughter nuclides as their parents.
Used, offshore oilfield production pipes contaminated with radioactive scale were handled onsite by many of the workers who worked on onshore and offshore production rigs and were also sent off-site to various pipe yards where workers cleaned and refurbished the contaminated pipes. Most often, used, contaminated pipes were cleaned by reaming out the scale using a rattler or sandblaster. In addition, pipes were also often cut and refurbished using acetylene torches. The scale removed from the cleaned pipes was generally left on the ground of the pipe yards after cleaning activities.

2.2 Radioactivity in Sludge

Like scale, sludge also deposits within oil production equipment. Sludges tend to accumulate on the oil and water side of the separation process, especially in areas where there are changes in pressure and temperature. The concentrations of radionuclides in sludge depend on the chemistry of the geologic formation and characteristics of the production process. Like scale, the quantity and concentration of sludge changes over time as the quantities of gas, oil, and water in the geologic formation change, with sludge increasing as the well ages and gas and oil are depleted. Sludge deposits usually contain silica and are oily and loose, while dried sludge is more granular and has a consistency similar to that of soil. Some sludge remains oily even when dried. Sludge deposited in oil production equipment during the extraction process is further removed from extraction fluids in the separator, a piece of oilfield production equipment that divides oil, gas and water into separate fluid streams based on their different densities. Thus, the extracted sludge tends to accumulate in the separator. The American Petroleum Institute (API) has determined that the greatest volumes of sludge settle and remain in the oil stock and water storage tanks. Like in scale, it appears that the activity of Ra-226 in sludge is approximately three times greater than that of Ra-228.

2.3 Regulation of NORM in Louisiana Pipe Yards

NORM regulations on contaminated oil production equipment in pipe yards were not enforced in Louisiana until 1989. Long before regulations specific to NORM were promulgated, the oil and gas industry was aware that radioactivity was present in oil production tubulars. Radioactivity in oil and brine was reported as early as the 1930's , the USGS reported radioactivity in Kansas oil fields in the 1950's, and the American Petroleum Institute (API) issued a report in 1982 that analyzed the potential impact of the inclusion of radionuclides into the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process of the petroleum industry. The report described in detail where specific radionuclides were prevalent: Uranium in crude oil, radium in brine, and radon in both oil and brine . The report concluded, "the regulation of radionuclides could impose a severe burden on API member companies". The first rules in Louisiana that specifically addressed NORM in relation to oil field equipment and pipe yards were promulgated by a "Declaration of Emergency" in February 1989. In September 1989, the Division of Radiation Control issued the State's current regulations regarding radioactive materials associated with oil and gas producing operations through the Department of Environmental Quality (DEQ) under Title 33 Part XV, Radiation Protection. The regulations state that individual pieces of incoming pipe yard shipments cannot exceed a dose rate limit of 50 picocuries/hr. Workers who are to handle equipment that exceeds the 50 picocuries/hr-limit require an appropriate license. Workers without an appropriate license could not work. These regulations are discussed in greater detail in section 7.0 of this report . . . "

In conclusion, it is our hope that the information in this complaint justifies your onsite investigation at each of the Ohio Chief's Order facilities, in order to ensure the protection of oil and gas workers from the radiological exposures and associated health impacts. We ask that each of the following Ohio Chief's Orders facilities be tested for radiological contamination, including, radium (alpha, beta and gamma) exposure for workers. Our information below comes from the direct observation and experience of an Ohio oil and gas industry worker. Thank you for your considerations and attention to this crucial issue.

<u>Ohio Chief's Order Facilities</u>

4K Industrial Park, LLC —4K Industrial Park Facility —001 Main Street, Martins Ferry, Ohio 43935—Chief's Order # 2014-01

This facility is taking fracking liquids and setting out to make more solids. At one point, when I worked for Atlantic, the drivers would back up to an old boat launch, to the right of 4K Industrial Park, and get water from the river. They could have also been dumping wastewater in the river.

American Landfill, Inc—American Landfill E&P Waste Facility—7916 Chapel Street SE, Waynesburg, Ohio 44688—Chief's Order # 2019-201

This company is used for pad clean up, and is not very heavily monitored. They put felt down on a containment. It was rubber coated on the bottom and felt on top. They would

fill boxes with that padding and it was saturated with oil and whatever else leaked onto it, including the potential for radioactive materials, and toxic chemicals. American landfill would be getting those types of boxes and containers filled with the contaminated clean up materials from frack sites. How do you take a sample from a mat or carpet? All containment is designed to absorb. It supposedly helps protect the ground from the contamination, but it is not a good designed. You have to dispose of the mats and containment materials. It should be classified hazardous waste. Instead, the workers are not equipped with the proper protective materials, nor are they informed about the potential exposures.

American Mud Works Partners, LTD— American Mud Works Waste Treatment Facility; —47087 Black Walnut Parkway, Woodsfiled, Ohio 43793—Chief's Order # 2020-84

American Mud Works - Woodsfield Facility—7060 Black Walnut Parkway, Woodsfiled, Ohio 43793—Chief's Order # 2018-400

This facility is located adjacent to a senior care facility.

Anchor Drilling Fluids, LLC—Anchor Drilling Fluids Wellsville Facility—2400-A Clark Avenue , Wellsville, Ohio 43968—Chief's Order # 2016-417

Antritt's Lawn Sensations, LTD.—Antritt's Lawn Sensations Newark Facility—11111 Lambs Lane, Newark Ohio. 43055—Chief's Order # 2015-306

Apex Environmental, LLC —Apex Solids Control Facility—11 County Road 78, Amersterdam, Ohio 43903—Chief's Order # 2018-52

This facility is taking brine and settling out solids. It is located in a remote area, where you could do whatever you wanted. No one would be watching you out there This site has the potential for many worker safety hazards and exposures. The truck drivers returning from this site repeatedly made statements like, "They don't care about anything there. It doesn't matter what you bring, how heavy or hot the load is, it just doesn't matter." They take it all and have a very relaxed attitude.

Austin Master Services, LLC—AMS Martins Ferry Facility—801 North First Street, Martins Ferry, Ohio 43935—Chief's Order # 2014-541

The sign on this facility reads, "Radiological Remediation Services". They are taking fracking drill cuttings and other solid material with the goal of de-watering to send material to landfills—-trying to solidify everything by using saw dust, lime gravel and anything they can to make it less radioactive and make it disappear. The workers are not given the proper protective wear and have not been trained properly to be handling radioactive waste materials being processed at this facility.

Belmont Solids Control, LLC—BSC Cadiz Facility—78501 Cadiz-New Athens Road, Cadiz, Ohio 43907—Chief's Order # 2014-04

This site is easily viewed from the public road and it looks very unsophisticated. The containment isn't much to speak of at all. There is a trailer, an open-sided pole barn and dual pits twenty-feet deep, that may or not be lined. There are puddles all over where they unload and do the mixing. Atlantic takes their waste there and it is 50% solid and 50% liquid. Why is it called Belmont Solids? There isn't much containment at this facility. They have a very simple procedure. There are two two dual pits that they have everything dumped into. They make the material solid and then is trucked to landfills for disposal. The workers are untrained and uneducated. They are out there in direct contact with toxic materials and have no idea of the exposure risks. They shovel the material, use pressure washers to clean trucks and tanks. The workers get inside tanks and get covered in the material. They are not wearing respirators and have inadequate protective equipment.

Buckeye Brine—Riverside Park Recycling Facility— 6505 US 36, on 22..Urichsville, Ohio. 44683 —Chief's Order # 2014-04

Dow Cameron Oil & Gas, LLC— Dow Cameron Oil & Gas Facility - Temporary Storage: Dow Cameron Oil & Gas Facility—1470 Adamsville Road, 43701— Chief's Order # 2014-07, and 2016-452

Duck Creek Energy, Inc.— Duck Creek Cleveland Facility—7033 Mill Road Brecksville, Ohio 4414—Chief's Order # 2020-214

Duck Creek Energy, Inc.— Mogadore Facility—246 North Cleveland Avenue Mogadore, Ohio 44260—Chief's Order # 2016-452

This facility takes conventional oil field brine and makes aqua salina—deicing material.

E & R Energy Services LLC— E & R Norwich Facility—9645 East Pike Norwich, Ohio 43767—Chief's Order # 2015-28

GPB E&P OH, LLC—Mud Masters Processing Facility—65054 Wintergreen Road Lore City, Ohio 43755—Chief's Order # 2019-08

Haliburton energy service— Halibutron liquid mud plant—4999 East Pointe Drive, Zanesville, Ohio 43701—Chief's Order # 2014-12

Hillstone-Silcor Treament, LLC Hillstone-Silcor Treatment Facility 61514 Southgate Road Cambridge OH 43725— Cheif's Order # 2016-415

Industrial Waste Control/Ground Tech., Inc. Ground Tech Facility 240 Sinter Court Youngstown OH 44510—Chief's Order # 2016-416

Kimble Company Kimble E&P Waste Facility 3596 State Route 39 NW Dover OH 44622 Chief's Order # 2019-76

Kimble provides big dumpsters at oil and gas sites. This potentially means that they are taking everything to the landfill. The landfill workers are trained in municipal waste issues, not fracking waste. It is possible they do not know that these loads are carrying fracking waste. Exposures to the haulers and landfill workers to radioactive and chemically-laden waste could be very high.

Liqui-Gen Energy, LLC Liqui-Gen Energy, Woodsfield Facility 39.75785, -81.0826645 Woodsfield OH— Chief's Order # 2020-120

Newpark Drilling Fluids, LLC Newpark Norwich Facility 9350 East Pike Norwich OH 43767—Chief's Order # 2018-309

At one time this company specialized in mats to go onto a containment. They would provide workers to place the mats and cleaned up and disposed of the mats. This company used to do one thing, and now they have entered into the waste issue, They are new to the game, and don't know the complexities. Workers most likely being exposed and put in danger.

Newpark Mats & Integrated Services LLC Newpark Mats New Philadelphia Facility 1490 Truss Road SW New Philadelphia OH 44663—Chief's Order # 2019-53

Petta Enterprises of Ohio, LLC Petta Cambridge Facility 713 North Third Street Cambridge OH 43725—Chief's Order # 2015-29

2018-261 Pressure Tech Ohio, LLC Pressure Tech Ohio, LLC - Norwich Facility 7675 East Pike Norwich OH 43767—Chief's Order # 2018-261

Suburban Landfill, Inc. Suburban Landfill E&P Waste Facility 3415 Township Road 447 Glenford OH 43739—Chief's Orders # 2019-132

Sunpro, LLC North Canton Facility 7640 Whipple Avenue NW North Canton OH 44720 — Chief's Order # 2016-397

Sunpro, LLC Sunpro Steubenville Yard Facility 235 North 3rd Street Steubenville OH 43952—Chief's Order # 016-396

Tri-State Environmental Solutions, LLC Tri-State Barnesville Facility 65932 Fairview Road Barnesville OH 43713—Chief's Order # 2018-35

2019-16 TROO Clean Environmental, LLC TROO Clean Facility 41540 National Road Belmont OH 43718—Chief's Order # 2019-16

Tunnel Hill Partners, LP THP Processing Facility 2500 Township Road 205, Route 2 New Lexington OH 43764—Chief's Oder # 2015-313

Respectfully,

Jesse Lombardi, Former National General Manager and Director of Operations (Bridgeport, Ohio division) for Recon Oilfield Services; Operations Manager and Business Development for Atlantic Recovery Services.

Yuri Gorby, PhD, Former Department of Energy Senior Research Scientist

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