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ADEM Hearing Officer
Office of General Counsel
Alabama Department of Environmental Management
P.O. Box 301463
Montgomery, AL 36130-1463

Via electronic mail only

Re: Proposed Revisions to ADEM Administrative Code Chapter 335-13-16

Dear ADEM Hearing Officer:

The Southern Environmental Law Center, Black Warrior Riverkeeper, Inc., the Alabama Rivers Alliance and the Center for Biological Diversity (Conservation Groups) collectively submit these comments addressing proposed amendments to Administrative Code Chapter 335-13-16, “Requirements for Beneficial Use of By-Product Materials for the Purpose of Land Application” (Proposed January 16, 2022).¹ The proposed amendments change existing regulations for the beneficial use of by-product materials for the purpose of land application and add new standards and procedures for the operating criteria for Food Processing Residuals (FPR), and FPR Treatment Impoundments.

The Southern Environmental Law Center is a nonprofit, environmental organization dedicated to protecting natural resources, preserving special places and promoting vibrant communities throughout the Southeast. Black Warrior Riverkeeper is an Alabama nonprofit clean water advocacy organization with more than 6,000 members that is dedicated to the protection and restoration of the Black Warrior River and its tributaries. The Alabama Rivers Alliance is a statewide network of more than 50 watershed-based organizations and more than 600 individual members working to protect Alabama's 132,000 miles of rivers and streams. The Center for Biological Diversity is a nonprofit membership

¹ On July 22, 2019, ADEM issued an initial draft of the biosolids regulatory program. Industry supplied critical comments and that draft was changed substantially before ADEM issued the final proposed draft for public comment on November 18, 2019. On March 30, 2020, certain of the Conservation Groups appealed ADEM’s initial version of Administrative Code Chapter 335-13-16. On October 8, 2021, the Environmental Management Commission (AEMC) denied that appeal and issued an order finding that ADEM’s administrative action adopting Administrative Code Chapter 335-13-16 complied with applicable law, statutes and regulations. ADEM’s subsequent issuance of the January 16, 2022 revisions to Administrative Code Chapter 335-13-16 that are the subject of these comments mooted the 2020 appeal.

organization with more than 1.7 million members and online activists, including just under 11,000 in Alabama and is known for its work protecting endangered species through legal action, scientific petitions, creative media and grassroots activism.

While we are encouraged to see the Alabama Department of Environmental Management (ADEM or the Department) respond to some of the concerns about the biosolids regulatory program raised by certain of the Conservation Groups in the administrative appeal, the proposed amendments, in key provisions, are still vague, subjective and lacking in clear definitions and standards. Without clear, objective standards, these regulations will continue to be difficult to enforce. Worst of all, the proposed amendments fail to adequately protect human health and the environment, especially with respect to toxics and emerging contaminants. Our specific concerns with regard to each Chapter are set forth below.

Ala. Admin. Code r. 335-13-16-.02 (Definitions)

In the proposed amendments, ADEM missed several opportunities to develop better definitions for the by-products land application regulatory program.

“Agronomic Rate”

The definition of “agronomic rate” contained in the original proposed rule (proposed July 22, 2019) appropriately relied upon technical standards developed by the Natural Resources Conservation Services (NRCS), which are the United States Department of Agriculture’s (USDA) tried and true metrics based upon years of science, engineering, and experience. Those standards are objective, reliable and can be applied in a consistent manner.

However, the definition was changed dramatically in ADEM’s final version of the definition to replace the NRCS technical standards with “acceptable industry technical standards and guidelines...”² Unfortunately, ADEM’s proposed amendments to the by-products land application regulatory program leave this deficient definition in place.

We continue to oppose this language, which is so vague and undefined that it is impossible to know what standards or guidelines would apply, who would deem them to be acceptable, and what metrics or factors would be applicable. The burden of applying this nebulous, subjective standard would fall on ADEM, which is concerning given ADEM’s current lack of manpower and resources to carefully

² This change was requested in a comment letter dated July 22, 2019, by Jeff Retzke, Senior Environmental Manager at Denali Water Solutions, who wrote that Alabama has “historically” used nitrogen “uptake” rates set by Auburn University. ADEM later issued a cease and desist order to Denali, temporarily shutting down its operation of spreading poultry byproducts in north Jefferson County for multiple failures to comply with state regulations. Numerous residents affected by Denali’s operations complained about the smell and the impact on their homes, community and quality of life. *See, e.g.*, <https://abc3340.com/news/local/waste-sludge-causing-a-stink-in-north-jefferson>.

examine plans submitted by permit applicants' engineers or technical consultants. ADEM indicated in sworn testimony as part of the Conservation Groups Appeal that the standard is tied to agronomic rates issued by universities like Auburn or Alabama A&M or other acceptable (to ADEM) agricultural entities, but none of this information is codified in the regulations. As a result, the standard remains undefined and vague. Even if the standard were codified, it will still be less definitive and inferior to the established NRCS standard. And if ADEM decides something is not acceptable, would this poorly-defined standard allow it to defend the decision, or have enough teeth to enforce against a distributor? We doubt that it would. To properly protect human health and the environment, ADEM should simply adopt and apply the NRCS standards. This provision should be revised to reinstate the NRCS standards or cite other specific written standards which are known to all stakeholders and can be applied on something other than an ad hoc basis.

“By-Product”

ADEM has similarly failed to address or limit the broad definition of “by-product” which we criticized in our comments on the original land application regulatory program. ADEM expanded the definition which industry requested (expanded from material generated “as a result of water or wastewater treatment...” to include “residual materials from industrial or manufacturing processes”).

This vague and extremely broad description fundamentally changes the definition and potentially brings all manner of untested industrial waste products under the provision, including Class B biosolids, which are often laden with metals and other pollutants, chicken sludge containing beaks, feathers and other body parts (which we have seen complaints about), coal ash, and out-of-state sewage waste which could allow future “beneficial” land application like that which created the “poop train” fiasco in 2017 in which sewage sludge from New York and New Jersey was land applied to the exterior slopes of the Big Sky Environmental Landfill as a supposed “soil amendment.” Waste associated with the biosolids was seen spilling from containers as they were hauled by trucks to the landfill in West Jefferson County.³

Residents loudly complained of the waste’s horrid stench in West Jefferson, North Birmingham, and Parrish. Zoning changes were challenged, lawsuits were filed, and business licenses were revoked – all necessary efforts by local governments trying to protect their residents, communities, and environment from unwanted nuisance in the face of inaction by ADEM. The exterior slopes of the landfill drain via stormwater into tributaries to Village Creek and the Locust Fork of the Black Warrior River. During much of the “poop train” fiasco, Big Sky Environmental failed to perform its stormwater discharge monitoring as required by its NPDES permit, and ADEM failed to exercise the necessary regulatory oversight by fining the company for its negligence. No one wants to see a repeat of that

³ <http://www.wvtm13.com/article/west-jeffco-residentsreporting-waste-spills-along-route-to-local-dump-site/11651995>.

disaster, but this provision is so broad that it seems to invite such abuses and endangerment of public health and the environment.

At a minimum, a great deal of clarification is needed about the intended scope of this provision and ADEM should provide examples of what it considers these industrial and manufacturing materials to include, and what, if anything, is excluded.

“Putrescible Material”

The prohibition against land application of “putrescible” material is still absent from the land application regulatory program (although it was defined in the original July 2019 draft in subpart (8)).⁴ As numerous citizen complaints to ADEM document, unfettered land application of decomposing organic matter results in noxious odors, attracts flies and vectors and is incompatible with human health and enjoyment of the environment by anyone living or recreating near land applied putrescible materials, like poultry processing sludge. ADEM has expressed the view in the past that it cannot independently regulate or abate odor problems ... so why would the Department implement a regulation that makes it much more likely that unbearable odors, which it says it lacks authority to address, are a pervasive problem for the public? We respectfully submit it would be a mistake to do so and will only lead to further public outcry and rancor, as well as potential nuisance suits. The provisions of the regulations which address vectors and odors⁵ impose only minimal requirements on generators and distributors and will be difficult for ADEM to enforce. The regulatory program still does not give ADEM the absolute authority to address problems with odor and vectors; instead, if storage and application practices or a BMP plan is not effective at controlling vectors or odors, all ADEM can do is to require additional practices or revised BMPs. That limited authority offers little help or relief to a neighbor or community being overwhelmed by the odor and pests associated with improper land application of biosolids and FPR.

⁴ Alabama Farmers Federation recommended no limits on odor and “nuisance” should not be considered; as a result, the November 2019 final draft eliminated the definition of “*putrescible*” material.

⁵ Ala. Admin. Code r. 335-13-16-.03(4)(d) (“The Distributor must provide the landowner information including the material characterization as required by ADEM Admin. Code r. 335- 13-16-.07(3), any potential *odor* issues, and any crop restrictions ...); r. 335-13-16-.04(2)(c)7. (“Description of best management practices to be implemented at each site to protect human health and the environment including but not limited to preventing run-off, managing run-on, and minimizing *odors*”; r. 335-13-16-.04(2)(d)2.(ii) and (iii) (“The plan shall include best management practices and mitigation actions detailing the handling, transportation, and application of the by-product material to minimize” *vectors* and *odors*.); r. 335-13-16-.07(2)(a) (“One of the land application requirements listed below shall be met when FPR is land applied: Subsurface injection (material is placed underneath the soil surface and is immediately incorporated into and under the soil surface), unless otherwise approved by the Department on a case by case basis. The Department may require the Distributor to demonstrate that the requested alternative method of application will provide control of *odors* and *vectors* at least as effectively as subsurface injection ...).

At a minimum, these regulations should make an effort to meaningfully deal with the problem of noxious odors and disease vectors caused by land application of byproduct materials, rather than minimally addressing the problem and inviting future disputes. Prohibition against land application of “*putrescible*” material (defined in the original draft in subpart (8)) would accomplish this goal and must be restored to the regulatory program.

New Definitions

We are pleased that ADEM has added several new definitions to the program. While many of these new definitions address FPR, the revised program also includes a new definition of “biosolids” that more closely comports with federal biosolid regulations. ADEM has added “Class B Biosolids” and slightly revised the definition of “Class A Biosolids.” Both definitions incorporate 40 C.F.R. § 503.32 as a baseline, which is the correct approach.

Ala. Admin. Code r. 335-13-.03 (Requirements for land application)

We are pleased that ADEM has eliminated Subpart (1) (b) of Ala. Admin. Code r. 335-13-.03, which previously provided only that by-product material must be “*adequately characterized*” to confirm it is adequately protective of human health and the environment. However, the former version of the regulation offered no specifics of what the characterization process would be, how it would be carried out, by whom, and how results of this “characterization” would be documented.

ADEM has corrected some, but certainly not all, of these deficiencies. Under the revised regulations, the waste must be “characterized [as required by ADEM Admin. Code r. 335-13-16-.04(2)(c)10.]; 2. Possess physical and/or chemical properties which make the material suitable for the intended agronomic application rate as defined in ADEM Admin. Code r. 335-13-16-.02; and 3. Not be a hazardous waste as defined in ADEM Admin. Code r. 335-14-1-.02.”

These revisions mean that generators that produce ≥ 100 short tons per year must test *once* for *e coli* and nine Appendix I constituents. *See* Ala. Code r. 13-16-.04(2)(b)10).⁶ ADEM can, in its discretion, order testing for more constituents. However, ADEM does not propose additional sampling and soil testing requirements to ensure there will be no lasting contamination of soil or water, which is a critical error.

One of the major critiques of EPA’s own biosolids regulatory program is its identification of at least 352 pollutants in biosolids (beyond the nine metals and *e coli* bacteria used by EPA and now ADEM to characterize waste) that could not be evaluated for further regulation due to a lack of data or

⁶ The Appendix I constituents are arsenic, cadmium, copper, lead, mercury, molybdenum, nickel, selenium and zinc.

risk assessment tools.⁷ Sixty-one of these pollutants are designated as acutely hazardous, hazardous or priority pollutants in other programs.⁸ Pollutants commonly found in biosolids can also include pharmaceuticals, steroids and PFAS/PFOA. As a result, a 2018 Office of the Inspector General’s (OIG) report on EPA’s regulation of biosolids found that “EPA’s controls over the land application of sewage sludge (biosolids) were incomplete or had weaknesses and may not fully protect human health and the environment.”⁹ The Department’s representatives acknowledged the report in testimony and echoed the concerns expressed by EPA/OIG, but the revised regulations do not address those concerns.

ADEM’s limited characterization program here is similarly flawed. ADEM has made a promising start by requiring generators to test for specific constituents. The problem is that the constituent list is too limited, and the one-time testing requirement is too little to properly determine impacts on human health and the environment in the near or long term. Thorough characterization of the material must be at the heart of these regulations. The Department and the public must know exactly what the material is and what it consists of; that it is free of toxins, heavy metals, PCBs, PFAS/PFOA and other chemicals presently unregulated by EPA, pharmaceuticals, and more—all of which are frequently present in sewage sludge; and bacteria, viruses and pathogens—which are frequently present in poultry processing or sludge. The Department should require detailed testing and lab results, which are available for public review, to demonstrate the chemical makeup of any material to be land applied. Accurate characterization is too important for the Department to defer and delegate all responsibility for testing and characterizing the material to generators and distributors that have their own financial incentives. ADEM should expressly prescribe a system of checks and balances to ensure testing results are verified, and the results of testing must be made available to the public via ADEM’s website. In addition, ADEM should implement of system of regular sampling and testing of soils where land application has occurred to ensure no contamination is occurring and that beneficial use goals are being accomplished, as opposed to dumping of polluted wastes.

The revised Ala. Admin. Code r. 335-13-.03(b)(3) corrects a significant problem with the earlier version of the regulations: formerly, the program provided at (1)(c) that the material must not be “hazardous waste,” but failed to specify how, when, and on what basis the Department would make the hazardous waste determination. The revised r. 335-13-16-.03(1)(b)3 states that “hazardous waste determination” will be made by reference to the definition of “hazardous waste” contained in Ala. Admin. Code r. 335-14-1-.02. While that addition is a slight improvement, the definition means that ADEM could approve the spreading of special waste, hazardous waste treatment residue or delisted hazardous wastes, any one of which could have pervasive and long lasting effects for human health and the environment. We ask ADEM to specify how, when, and on what basis the Department will make the

⁷ USEPA Office of Inspector General, *EPA Unable to Assess the Impact of Hundreds of Unregulated Pollutants in Land-Applied Biosolids on Human Health and the Environment* (November 15, 2018) (OIG Report), found at https://www.epa.gov/sites/default/files/2018-11/documents/_epaig_20181115-19-p-0002.pdf.

⁸ *Id.*

⁹ *Id.*

“hazardous waste” determination. Exactly what will the regulated parties have to submit to the Department in terms of sampling and testing to ensure it does not contain hazardous waste? Where will those test results be housed and will they be available to the public for review? All of these details should be spelled out with specificity in the regulations, and it must not be left up to the regulated parties to make the determination.

ADEM has now added a requirement that generators and/or distributors “conducting Mine-Land Recovery activities must utilize biosolids, as defined in this chapter, and must adhere to all applicable requirements of 40 C.F.R. § 503,” which we endorse. *See* Ala. Admin. Code r. 335-13-.03(3). In addition, the regulations appear to prohibit Mine-Land Recovery activities from using FPR, which is the right decision.

We ask ADEM to develop a more specific list of what can ---and more importantly cannot--- be land applied. The Department makes a start in this direction by adding and refining use-specific standards at Ala. Code r. 335-13-16-.03(4). However, these standards are largely narrative and will be difficult to enforce. Our comments on the previous iteration of the biosolids regulatory program asked ADEM to restore the requirement of a NRCS Comprehensive Nutrient Management Plan (CNMP) in Ala. Code r. 335-13-16-.03. ADEM’s Form 569 now requires a CNMP from distributors or suppliers, but there is no requirement for a CNMP in the *regulations*. Because the requirement of a CNMP is critical, we ask ADEM to specifically require a CNMP in the regulations. Otherwise, a CNMP becomes a “lesser” requirement subject to change or modification. ADEM could change Form 569 without notice and comment, which is wrong.

Finally, we again ask ADEM to remove the exemption of Class A biosolids and “industrial by-products approved by the Department on a case-by-case basis...” from the OP and NMP requirements. In the current version of the regulation, ADEM has revised Ala. Admin. Code r. 335-13-16-.03(4)(c)1 to provide that a “[r]evised NMP is not required for properties on which only Class A Biosolids are land applied.” In addition, Ala. Admin. Code r. 335-13-16-.03(4)(c)2 states that an “exemption from the development of an NMP may be requested for an industrial by-product.” Although the new version of the regulation requires that the waste must be characterized according to Ala. Admin. Code r. 335-13-16.07(3) and excludes FPR material; material generated by a municipal or private WWTP; or hazardous waste as defined by r. 335-14-1-.02, the revised regulation still allows ADEM too much discretion to exempt industrial by-products without objective standards. Moreover, this assumption that Class A biosolids cause no adverse impacts to human health and the environment has been seriously questioned if not refuted by the OIG Report.¹⁰ The OIG cites a 2002 guidance document published by the U.S. Centers for Disease Control and Prevention (CDC)¹¹ which found that “Class A biosolids can present a

¹⁰ See OIG Report, *supra*, at FN6.

¹¹ Department of Health and Human Services, CDC, National Institute for Occupational Safety and Health, *Guidance for Controlling Potential Risks to Workers Exposed to Class B Biosolids* (July 2002), found at <https://www.cdc.gov/niosh/docs/2002-149/pdfs/2002-149.pdf>.

potential health risk since some chemicals and biological constituents found in Class A biosolids are not regulated by the EPA,” *id.* at 2; and a 2017 study by the U.S. Geological Survey (USGS)¹² finding runoff of pollutants into waterways, often mobilized by rainfall on agricultural fields, sometimes as long as a month after heavy rainfall events, as a result of land application of biosolids. Thus, Class A biosolids should be subject to the same OP and NMP requirements.

The exemption of any “industrial by-products” of the Department’s choosing, on an ad hoc basis, is similarly problematic. The Department should not include a subjective, case-by-case loophole which could undermine the whole framework of these regulations in an arbitrary and unscientific manner. The purpose of the NMP is to ensure and demonstrate that any authorized land application is truly beneficial and such a plan should be required for any form of land application to create public confidence that no illicit “discarding or disposing” is taking place.

We question the wisdom of exempting any by-products from the OP and NMP requirements under any scenario. However, ADEM cannot exempt any by-products without clear and comprehensive standards, testing methodologies and record keeping and disclosure requirements, none of which are present in the proposed exemptions for Class A biosolids and “industrial by-products.”

Ala. Admin. Code r. 335-13-16-.04 (Registration Application Requirements)

In the proposed amendments to the biosolids regulatory program, ADEM has made several improvements in Ala. Admin. Code r. 335-13-16-.04, which addresses notification and registration. However, there are additional steps ADEM can take to better ensure the protection of human health and the environment.

Ala. Admin. Code r. 335-13-16-.04 (1)(a)(2) only identifies the “type” of material to be applied by general description; regulated parties should be required to disclose in much more detail the chemical composition of the material as well as the origin of the material. The proposed amendments to Ala. Admin. Code r. 335-13-16-.03 add the minimal testing requirements of Appendix I. In addition, Ala. Admin. Code r. 335-13-16-.04(1)(b) now requires general type or classification, such as “FPR, Class A, Class B, etc.” However, the regulations must eliminate catchalls like “etc.” Instead, ADEM must require regulated parties to disclose in much more detail the chemical composition of the material applied, as well as the origin of the waste material to be applied.

In addition to notice of county of application, we support ADEM’s addition in the revised regulations of a requirement for physical address and GPS coordinates to specifically identify where application will take place. *See* Ala. Admin. Code r. 335-13-16-.04(2)(c)(8); *see also* Ala. Admin. Code

¹² Gray, James L., Borch, T, Furlong, E.T. Davis, J.G., Yager, T.J., Yang, Y, and Koplin, D.W. “Rainfall runoff of anthropogenic waste indicators from agricultural fields applied with municipal biosolids.” *Science of the Total Environment* Vol. 580 (February 2017): 83-89.

r. 335-13-16-.05(1)(a). ADEM has also added a disclosure of the timing and method of application and BMPs. The plan must describe BMPs, Ala. Admin. Code r. 335-13-16-.04(2)(c)(7), and also include BMPs and mitigation actions “detailing the handling, transportation and application” of the material to minimize vectors, birds, odors, fugitive dust emissions and time in transit, Ala. Admin. Code r. 335-13-16-.04(2)(d).2. (i) through (vi). Timing is addressed by r. 335-13-16.05(1) and (2) – distributors must notify ADEM electronically at least 48 hours before the start of application, estimate the duration of application, and notify ADEM within seven days of completion of application. These are all positive changes.

ADEM has also improved the regulatory program by requiring registrants to disclose the precise methods by which they intend to land apply. *See* Ala. Admin. Code r. 335-13-16-.04(2)(c)(6). In addition, initial notifications, registration applications, OPs, NMPs, and annual reporting will be include in ADEM’s “e-File” system (other than small volume applicers \geq 100 short tons per year), providing greater transparency to the public. *See* Ala. Admin. Code r. 335-13-16-.04(2) (Distributors that manage and land apply \geq 100 short tons per year must submit electronically a completed Form 569, the type of material being land applied; an NMP (with minimum requirements provided at r. 335-13-16-.04(2)(c); signed permission from landowners where waste will be applied; testing results for Appendix I constituents); Ala. Admin. Code r. 335-13-16-.04(5)(b) provides that the OP must be filed electronically and r. 335-13-16-.09 states that all reporting, submittals and correspondence for recordkeeping and reporting must be submitted electronically).

We continue to object to the language in Ala. Admin. Code r. 335-13-16-.04(2)(b)(1) which allows the NMP to be certified by “appropriate professionals approved by the Department,” instead of requiring that the plan be certified by a person certified by the NRCS for nutrient management planning or by a professional engineer licensed in the State of Alabama. There is no definition or explanation as to who are “other certified professionals approved by the Department.” This is an ill-advised revision as the Department is scrapping an established national or technical standard and replacing it with an undefined, subjective term that will place interpretive burdens on the Department, lead to unpredictable determinations and will translate into fewer protections for human health and the environment in Alabama.

Ala. Admin. Code r. 335-13-16-.05 (Operating Criteria)

With regard to the 500-foot buffers specified in subsection (4)(a) and (c), we oppose the continued exemption of Class A biosolids in for the reasons discussed above relating to insufficient data and the unknown dangers of such biosolids. We also object to the continued exemption of “industrial by-products” (Ala. Code r. 335-13-16-.05(c)) as this exemption could swallow the rule and conceivably exclude any materials land applied under these regulations from the 500-foot buffer requirement.

Unfortunately, ADEM has retained the confusing language at Ala. Code r. 335-13-16-.05(d) tying the 100-foot buffer to “surface waters of the State” as defined in 335-6-10. This unnecessarily complicates the definitional issues and we urge that the Department should instead utilize Ala. Admin. Code r. 335-6-10-.02 (11), which defines "State Waters" or "Waters of the State" as "all waters of any river, stream, watercourse, pond, lake, coastal, or surface water, wholly or partially within the State, natural or artificial. This does not include waters which are entirely confined and retained completely upon the property of a single individual, partnership or corporation unless such waters are used in interstate commerce." We think the 100-foot buffer should be applicable to all "State Waters" and that doing so will create a clearer and more easily enforceable provision. It simply does not make sense to use different or parsed definitions of jurisdictional waters from one regulatory program to the next.

Ala. Admin. Code r. 335-13-16-.09 (Reporting)

Although ADEM requires reports every year, Ala. Admin. Code r. 335-13-16-.09(3), given the nature of the materials being applied, the potential proximity to the public and the implications for human health and the environment, we ask ADEM to require reports every six months.

Ala. Admin. Code r. 335-13-16-.07 (Operating Criteria for Food Processing Residuals)

The creation of a set of operating criteria specific for poultry processing wastes and other food processing residuals (FPR) is much needed, as evidenced by the incredible volume of complaints that land application of poultry sludge has generated. However, as written, the site restrictions for land applications of FPR set forth in Ala. Admin. Code r. 335-13-16-.07(1)(a)(1)-(7) regarding food crop harvesting restrictions, grazing restrictions, and restricting public access to land after FPR application raise questions about what party is being regulated and how these provisions are to be enforced by the Department.

As one example, Ala. Admin. Code r. 335-13-16-.07(1)(a)(3) states “food crops with harvested parts below the surface of the land shall not be harvested for thirty-eight (38) months after application of by-product material” yet it is unclear whether a distributor could be held accountable for violating this prohibition or if ADEM would enforce this regulation against a farmer harvesting a crop prematurely or the landowner. The regulations do not purport to hold farmers or landowners accountable, but how could ADEM successfully enforce these provisions against a distributor that does not retain control of and responsibility for the site? At a minimum, the regulations should require distributors to make all restrictions on use of crops or livestock known to landowners, in writing, and to obtain written confirmation that landowners will adhere to the regulations if they engage in land application of FPR.

When land applying FRP, a distributor must either inject the material below the soil surface or raise the pH of the FPR to twelve or higher for thirty minutes by alkali addition under Ala. Admin. Code r. 335-13-16-.07(2)(a)-(b). While some level of either pretreatment or subsurface injection is a step in

the right direction to help mitigate noxious odors, these regulations do not (and absolutely should) require a quantifiable reduction in pathogens in accordance with the specific standards set out in the 40 C.F.R. § 503 Subpart B regulations. Additionally, ADEM should remove the “case by case basis” exception language that would allow FPR to be applied on the surface of the land without any pretreatment.

Ala. Admin. Code r. 335-13-16-.08 (Operating Criteria for Food Processing Residuals Treatment Impoundments)

The proposed regulations governing FPR treatment impoundments state that such impoundments “must be NRCS certified” (Ala. Admin. Code r. 335-13-16-.08(5)) but fail to specify to which NRCS standard. Regulating these impoundments using objective NRCS criteria is a good step, but ADEM must specify which standard is applicable. NRCS standards for manure storage impoundments exist, but FPR is a different waste stream with different characteristics, and, to our knowledge, there is no existing NRCS standard for poultry sludge and FPR impoundments.

There is currently no requirement in ADEM’s regulations for there to be liners for FPR treatment lagoons. We advise that ADEM specify in the regulations that FPR treatment impoundments must be lined and provide the applicable NRCS standard detailing the type of liner and engineering requirements.

Under Ala. Admin. Code r. 335-13-16-.08(7) the grease cap thickness of an FPR treatment impoundment can be up to 25% of the maximum depth of the impoundment, meaning an impoundment with a maximum depth of 10 feet could have 2.5 feet of grease. This is problematic because such a thick grease crust prevents any aerobic digestive process from occurring. We recommend ADEM significantly revise downward the allowable grease cap thickness.

Ala. Admin. Code r. 335-13-16-.10 (Variances)

After attempting to design a comprehensive program to regulate the application of biosolids, ADEM concludes the program by adding a regulation that states the Department “may grant individual variances ... from specific provisions of this chapter that are in addition to or more stringent than federal regulations.” Ala. Admin. Code r. 335-13-16-.10. Any variance “must be granted based upon the procedures of ADEM Admin. Code rs. 335-13-8-.02 through 335-13-8-.05 whenever it is found by the Department, upon presentation of adequate proof, that non-compliance with one or more of these provisions will not threaten the public health or unreasonably create environmental pollution.” *Id.*

This regulation is the exception that will swallow the entire biosolids regulatory program. Whether something is “in addition to or more stringent than federal regulations” can be a subjective determination. There is no standard in ADEM’s regulations that supplies what constitutes “adequate

proof:” it is largely left to the discretion of ADEM. The procedures of ADEM Admin. Code rs. 335-13-8-.02 through 335-13-8-.05 offer little in the way of objective guidance or a standards for decisions. The regulations merely provide that the applicant must provide “a clear and complete statement” of the relief sought; an “assessment, with supporting factual information, of the impact that the variance will impose on the public health and the environment;” additional information that may be requested by the Department; a “concise factual statement of the reasons the petitioner believes that non-compliance with the particular provisions of Division 13 will not threaten the public health or unreasonably create environmental pollution; fees; and the names and mailing addresses of all property owners whose property, per county tax records, is adjacent to the proposed site. Ala. Admin. Code r. 335-13-8-.02. Worse yet, there is no requirement of scientific study or data to support the petition for variance. Significantly, the proposed regulation fails to incorporate Ala. Admin. Code r. 335-13-8-.12, which would provide for public comment and a possible hearing on any proposed variance, which wrongly shields decisions on variances from the public.

In the absence of objective standards and public participation, we believe ADEM should strike Ala. Admin. Code r. 335-13-16-.10 entirely from the biosolids regulatory program. This proposed regulation represents a giant leap back from the transparency and accountability ADEM is trying to promote in its revised regulations.

Other States’ Regulation of Land Application of Waste

In fashioning a more protective program, ADEM can learn from what other states are doing to regulate biosolids and other by-product wastes. The neighboring states of Georgia and Florida regulate only the land application of sewage sludge, also known as biosolids. Mississippi and Tennessee regulate the land application of biosolids and other waste streams, such as food processing residuals, as Alabama’s proposed regulations attempt to do. The individual state regulatory programs are briefly described below with positive examples of effective regulation highlighted.

A. Georgia

Georgia’s land application regulations apply only to the “beneficial use of sewage sludge through land application.”¹³ Sewage sludge may only be land applied in Georgia at an agronomic rate defined in the regulations (similar to the federal definition at 40 C.F.R. § 503.11) that both provides the nitrogen needed by the relevant crop type and minimizes the amount of nitrogen in the sludge that moves through the root zone of the crop and into groundwater.¹⁴ “Bulk amounts” of sewage sludge (defined as sludge that is not given away in a bag or other container) may not be applied to land in Georgia “at greater than agronomic rates except on reclamation sites” and agronomic rates “shall be

¹³ GA Reg. 391-3-6-.17(1).

¹⁴ GA Reg. 391-3-6-.17(2)(c).

calculated using the sludge application rate determination procedures as determined by the EPD.”¹⁵ Apppliers are not allowed to apply bulk sewage sludge to any site where nitrogen requirements have already been met for the year.¹⁶

Numeric ceiling concentration limits for certain pollutants (nine metals) are set by Georgia’s regulations incorporating tables similar to those found in the federal regulations at 40 C.F.R. § 503.13 (and adopted by ADEM’s proposed revisions).¹⁷ Testing and analysis to determine toxicity of sludge must be carried out according to the methods set forth in 40 C.F.R. § 503.8, and concentration rates vary depending on whether the material is being applied to agricultural lands, forests, reclamation sites, or home lawns and gardens.¹⁸ Based on the amount of sewage sludge applied, monitoring varying in frequency from once a year to once a month is required for listed pollutants, vector reduction, and pathogen density.¹⁹ We urge ADEM to adopt a similar monitoring program, especially with regard to toxicity testing given the wide variety of pollutants that may be in biosolids or FPR. Persons who prepare bulk sewage in Georgia for application must provide the distributors with “written notification of the analytical results obtained.”

Georgia’s regulations also prescribe a variety of pretreatment options with objective criteria for sewage sludge, including the use of “an aerobic process for at least fourteen days” which heats the materials to reduce vectors. Or, in lieu of pretreatment, bulk land application of sewage sludge to agricultural land must be injected below the surface of the land or incorporated into the soil within six hours after land application to reduce vectors.²⁰ Again, we ask ADEM to enact comparable provisions to protect public health and the environment.

In order to provide some protection for state waters from run-off of sludge, Georgia’s regulations disallow the application of bulk sewage sludge onto land that is “flooded, frozen, or snow covered so that the bulk sewage sludge enters a wetland or other waters” without a water pollution permit, and buffer restrictions apply.²¹ ADEM should add a similar provision to Alabama’s by-products land application program.

¹⁵ GA Reg. 391-3-6-.17(10)(d).

¹⁶ GA Reg. 391-3-6-.17(9)(c).

¹⁷ See GA Reg. 391-3-6-.17(5).

¹⁸ *Id.*

¹⁹ GA Reg. 391-3-6-.17(11).

²⁰ GA Reg. 391-3-6-.17(8).

²¹ GA Reg. 391-3-6-.17(10)(b)-(c).

Georgia does **not** allow for the land application of “food processing residuals,” which it defines under its regulations pertaining to solid waste management as “organic material generated as a by-product of the food-processing sector that is non-hazardous and contains no domestic wastewater...the term applies to use as a feedstock in the composting or anaerobic digestion process and does not include dissolved air flotation (DAF) skimmings or fats, oil, and greases.”²² Because Georgia’s definition of FPR excludes DAF skimmings, fats, oils, and greases, it would not permit land application of the poultry sludge being land-applied in Alabama, which fosters the use of Alabama farmland as a dumping ground for Georgia waste producers. .

However, poultry waste sludge under Georgia’s regulation would be categorized as “dissolved air flotation (DAF) skimmings or sludge generated from food processing” which is a Category D Feedstock in Georgia’s solid waste management regulations.²³ The poultry sludge waste Alabama’s proposed regulations call FPR would, under Georgia’s regulations, qualify as a Class D Feedstock that must be composted in an enclosed structure “constructed of asphalt, concrete, or a composite liner system” (a Class 5 Composting Facility under Georgia’s regulation).²⁴ Class D Feedstocks in Georgia, including sludge generated from food processing, is also subject to testing: “At a minimum, the Division will require applicants to provide an analysis of metals and proof of compostability of the potential feedstock, including C:N ratio and soluble salt.”²⁵ Class 5 Composting Facilities in Georgia that can treat poultry sludge wastes may not be located in a 100-year floodplain, must submit a hydrogeological assessment, and must conduct an odor assessment that determines potential impacts on the neighboring community.”²⁶ Further, before any finished compost from one of these facilities can be applied to land, it must be tested monthly, bimonthly, or quarterly (depending on volume) and must be in compliance with both metals and pathogens standards.²⁷

To put a finer point on it, the poultry sludge waste that Alabama’s regulations let distributors store in unlined impoundments and then land apply is much more stringently regulated in Georgia where it must be composted in a contained system. Tennessee requires such wastes to be stored in a lined lagoon with groundwater monitoring, and Mississippi flat out bans from land application all putrescible materials. Alabama should learn from these examples and implement similarly protective regulations. If not, these adjacent states will be exporting their waste to Alabama --- and it will become our problem.

²² GA Reg. 391-3-4-.16(2)(m).

²³ GA Reg. 391-3-4-.16(4)(a)(4).

²⁴ GA Reg. 391-3-4-.16 (5)(e).

²⁵ GA Reg. 391-3-4-.16(4)(a).

²⁶ GA Reg. 391-3-4-.16(6)(b)-(c).

²⁷ GA Reg. 391-3-4-.16(8).

B. Mississippi

Mississippi permits the land application of a wider class of “by-products” defined as “solid waste material that is generated as a result of the manufacture of a primary product that, barring any form of alternate or beneficial use of that material, would otherwise be discarded at a landfill or other solid waste disposal facility.”²⁸ By-products may not contain concentrations of eight metals exceeding the limits set forth in an Appendix to the Mississippi regulations (similar to the tables in 40 C.F.R. § 503.13 adopted by Alabama), and if a by-product material does contain constituents that exceed a given concentration limit, it must be analyzed “by the Toxicity Characteristic Leaching Procedure (TCLP) to confirm that the material does not exceed the leachability standards.”²⁹

Under Mississippi’s regulations the land application of putrescible materials is prohibited: “The solid waste or by-product, proposed for beneficial use, must not be a putrescible waste...or have other similar characteristics for potential nuisance.”³⁰ Putrescible materials are defined as “solid wastes, which are capable of being decomposed by micro-organisms with sufficient rapidity to cause nuisances from odors or gases.”³¹ As stated previously, we believe Alabama should adopt a similar provision prohibiting the land application of putrescible materials.

Regarding the land application of sewage sludge, Mississippi’s regulations incorporate and explicitly reference the federal standards for the use and disposal of sewage sludge at 40 C.F.R. § 503.³² In addition, sludge applications are subject to grazing restrictions, pathogen reduction procedures, and consumption restrictions for human food crops.³³ Although ADEM has imposed similar restrictions on the land application of FPR, the Alabama regulations do not contain grazing restrictions, pathogen reduction procedures, and consumption restrictions for human food crops where biosolids are applied. To protect human health and the environment, we urge the Department to make these restrictions applicable across the board to any application of biosolids or FPR.

Mississippi does not define “agronomic rate” in its regulations for land application of by-products. However, for some land-applied wastes, Mississippi provides specific plant available nitrogen (PAN) levels for certain specific crops and maximum cumulative pollutant loading rates for five metals.³⁴

²⁸ 11 Miss. Admin. Code Pt. 4, R. 9.1C(4).

²⁹ 11 Miss. Admin. Code Pt. 4, R. 9.3(B)(3)(b).

³⁰ 11 Miss. Admin. Code Pt. 4, R. 9.2(A)(1)(c).

³¹ 11 Miss. Admin. Code Pt. 4, R. 9.2(C)(9).

³² 11 Miss. Admin. Code Pt. 4, R. 1.8(J).

³³ 11 Miss. Admin. Code Pt. 4, R. 1.8(K)-(N).

³⁴ 11 Miss. Admin. Code Pt. 4, R. 1.8 Tables 1 and 2.

C. Tennessee

Tennessee’s regulation of the land application of sewage sludge or biosolids mirrors and incorporates by reference the federal regulations found in 40 C.F.R. § 503 Subpart B.³⁵ Numeric ceiling concentration limits are imposed on nine metals, as well as cumulative contaminant loading rates.³⁶ Monitoring for pollutants, pathogen density, and vector attraction reduction requirements are required between once and twelve times per year, depending on the number of dry tons per year applied to the land.³⁷ We urge ADEM to adopt a similar approach to ensure the near term and long term protection of human health and the environment.

Tennessee regulations set forth mineralization rates as default values in calculating agronomic rates, except for at reclamation sites, and nitrogen requirements are specified by crop, resulting in a precise and scientifically-supported calculation of agronomic rates, which we endorse as a much more sound approach than the nebulous standard utilized in the Alabama draft regulations.³⁸

Like Georgia, Tennessee adopted the federal 503 regulations in the land application of bulk sewage sludge onto land that is “flooded, frozen, or snow covered so that the bulk sewage sludge enters a wetland or other waters of the State of Tennessee” is prohibited without a water pollution permit, and site restrictions such as buffers apply.³⁹ Tennessee also sets forth specific pathogen and vector reduction level requirements matching federal regulatory requirements.⁴⁰ We ask ADEM to do the same in Alabama’s regulatory program.

Tennessee’s regulations also contain a section regarding land application facilities of wastes *other* than sewage sludge, including “solid wastes from food processing facilities” which are subject to the requirements to have a permit-by-rule in Tennessee.⁴¹ Any waste lagoons or impoundments for such wastes “must be of an engineered design...and include a liner and groundwater monitoring system capable of detecting leakage from the storage unit.”⁴² Such impoundments may not be located in a

³⁵ Tenn. Admin. Code § 0400-40-15-.02(1)(a).

³⁶ Tenn. Admin. Code § 0400-40-15-.02(3)(b).

³⁷ Tenn. Admin. Code § 0400-40-15-.02(6).

³⁸ Tenn. Admin. Code § 0400-40-15-.02(4)(d).

³⁹ Tenn. Admin. Code § 0400-40-15-.02(4).

⁴⁰ Tenn. Admin. Code § 0400-40-15-.02(5).

⁴¹ Tenn. Admin. Code § 0400-11-01-.13(1)(b)(3).

⁴² Tenn. Admin. Code § 0400-11-01-.13(2)(b)(1).

floodplain (unless it can be demonstrated that no washout will occur) or in a wetland.⁴³ And if the waste impoundment is located in an “area of highly developed karst terrain,” the applicant for the facility must demonstrate that it “will not cause any significant degradation to the local groundwater resources.”⁴⁴ We ask ADEM to consider similar regulations to protect ground and surface waters.

Land application facilities of waste streams including food processing residuals in Tennessee must submit “analytical data for each of the waste streams proposed for land application” to the state, and the analytical data must “completely characterize the wastes proposed for land application.”⁴⁵

In its operational standards section for land application facilities, Tennessee’s regulations require facilities where wastes are to be land-applied for agronomic benefits to “demonstrate that the rate at which waste is to be land applied will benefit crop production without exceeding crop nutrient needs or hydraulically overloading the receiving soils.”⁴⁶ Moreover, Tennessee regulations stipulate that “land application of waste must not result in an accumulation of harmful levels of waste constituents in crops or in the environment.”⁴⁷ Alabama regulations should do the same.

D. Florida

Florida’s regulatory program for biosolids, like those for Tennessee and Georgia, mirrors the requirements outlined in the federal 503 regulations for pollutant loads, pathogen controls, and vector controls, except that the land application of “reclaimed water” (defined as “water that received at least secondary treatment and basic disinfection and is reused after flowing out of a domestic wastewater treatment facility”) is expressly excluded from the definition of “biosolids” and is subject to its own regulatory requirements which include specific pretreatment requirements.⁴⁸

Nutrient management plans (NMPs) for land application of biosolids in Florida are linked to the USDA-NRCS Florida Field Office Technical Guide, which provides technical guidance on the preparation of NMPs.⁴⁹ An NMP for biosolids must be “prepared and signed by a person certified by the NRCS for nutrient management planning or prepared...by a professional engineer licensed in the State

⁴³ Tenn. Admin. Code § 0400-11-01-.13(2)(b)(2)-(3).

⁴⁴ Tenn. Admin. Code § 0400-11-01-.13(2)(b)(4).

⁴⁵ Tenn. Admin. Code § 0400-11-01-.13(2)(b)(7).

⁴⁶ Tenn. Admin. Code § 0400-11-01-.13(2)(c)(1).

⁴⁷ Tenn. Admin. Code § 0400-11-01-.13(2)(c)(3).

⁴⁸ See Fla. Admin. Code § 62-640.200(6) (defining “biosolids”); Fla. Admin. Code § 62-610.200(48) (defining “reclaimed water”); *see generally* Fla. Admin. Code §§ 62-640.100-880 (setting forth requirements for the land application of biosolids); Fla. Admin. Code §§ 62-610.100-890 (setting forth requirements for the land application of “reclaimed water”).

⁴⁹ Fla. Admin. Code § 62-640.500(2).

of Florida.”⁵⁰ There is no loophole for the approval by an “appropriate professional” as currently exists in Alabama’s proposed regulations. A Florida biosolids NMP must “identify the recommended crop nutrient needs for nitrogen and phosphorus (i.e. crop nutrient demand) for the crops to be grown on each application zone” and include “realistic annual yield goals for each crop identified.”⁵¹ We recommend that Alabama take a similar approach.

Alabama’s By-product Land Application Regulations Must Include Monitoring for PFAS

Per- and polyfluoroalkyl substances (PFAS) refer to a group of thousands of human-made chemicals that do not readily break down in nature and can bioaccumulate over time. These chemicals have been manufactured and used in the United States since the 1940s in a wide range of consumer, commercial, and industrial products, including in non-stick cookware, food packaging, stain and water-resistant clothing, firefighting foams, and many other products. Wastewater generated at industrial facilities that produce or process PFAS, leachate from landfills that contain PFAS-laden wastes, municipal wastewater with background levels of PFAS and contaminated storm water all transport PFAS to municipal wastewater treatment plants. According to the Interstate Technology Regulatory Council (ITRC), typical treatment methods at these plants do not remove or destroy PFAS.⁵² Concerningly, there is evidence that exposure to PFAS can lead to adverse human health effects such as decreased fertility, increased cholesterol levels, reduction of immune system response, and developmental effects or delays in children such as low birth weight.⁵³

Because conventional wastewater treatment plants do not treat or remove PFAS, these chemicals can become concentrated in sewage sludge.⁵⁴ Monitoring for some of the most prevalent and well-studied PFAS compounds (PFOA, PFOS, and PFBS) in biosolids and creating screening concentration limits prior to field application is crucial because crops can uptake PFAS, transporting these likely carcinogens back up the food chain and into human bodies.

Due to the risks presented by PFAS, some states are proactively moving to protect human health, soil health, and water quality from the dangers posed by PFAS contamination. In 2019, Maine’s Department of Environmental Protection began requiring “all sludge/biosolids program licensees and sludge/biosolids composting facilities to test their material for PFOA, PFOS, and PFBS.”⁵⁵ Maine DEP

⁵⁰ Fla. Admin. Code § 62-640.500(3).

⁵¹ Fla. Admin. Code § 62-640.500(5)(f)(1)-(3).

⁵² <https://www.wwdmag.com/biosolids-management/addressing-impacts-pfas-biosolids>.

⁵³ <https://www.epa.gov/pfas/our-current-understanding-human-health-and-environmental-risks-pfas>.

⁵⁴ <https://www.wwdmag.com/biosolids-management/addressing-impacts-pfas-biosolids>.

⁵⁵ Maine Department of Environmental Protection, Memorandum Re: Requirement to analyze for PFAS compounds, at 2 (2019), available at https://www1.maine.gov/dep/spills/topics/pfas/03222019_Sludge_Memorandum.pdf

set testing requirements and screening concentration levels for those three PFAS compounds, and now “sludge/biosolids and sludge/biosolids-derived compost or products may not be land applied if the screening concentrations...are exceeded.”⁵⁶ Similarly, Massachusetts DEP now requires quarterly monitoring of PFAS in residual material to be land applied⁵⁷ and New Hampshire is in the process of determining PFAS concentration limits for land-applied biosolids.⁵⁸

ADEM must join these states in addressing PFAS contamination because it is already a significant problem in Alabama. EPA tested wells and ponds in Lawrence, Limestone and Morgan counties⁵⁹ where biosolids from Decatur Utilities were spread and found over 80% of the tests showed contamination by PFAS, including six drinking water wells in Limestone County.⁶⁰ This problem was created because the biosolids were only tested *after* application. Water resources in Alabama have also been affected by PFAS, including the well-publicized contamination of the Tennessee River by manufacturer 3M.⁶¹ Given the pervasiveness of PFAS, it is likely that with little testing performed, there will be areas of additional contamination of land and water by biosolids and other waste sludges containing PFAS. If ADEM fails to impose a PFAS testing requirement in the current regulatory program, the Department risks wholesale contamination of farm land and drinking water for years to come.

The AEMC has prudently made PFAS one of its priority issues and has asked Director LeFleur and ADEM to keep the EMC abreast of developments with PFAS contamination in Alabama. We implore ADEM to respond to the AEMC’s well founded concern and set PFAS monitoring requirements—as other states are doing to protect their residents and environment from the harmful effects of PFAS—for biosolids, food processing residuals, and all other wastes that are allowed under these regulations to be applied to land as a “beneficial by-product.” ADEM should then begin to develop screening concentration limits for certain PFAS chemicals present in waste sludges to determine if they can safely be land-applied. At the very least, implementing testing, monitoring, and recordkeeping requirements for the most prevalent and well-studied PFAS compounds (like PFOA, PFOS, and PFBS) will help ADEM begin to collect data on PFAS being applied to land.

⁵⁶ *Id.*

⁵⁷ <https://www.mass.gov/info-details/per-and-polyfluoroalkyl-substances-pfas#pfas-in-residuals->

⁵⁸ New Hampshire Department of Environmental Services, Interim Best Management Practices for Emerging Contaminants in Biosolids, Fact Sheet WD-WEB-29 (2020), available at <https://www.des.nh.gov/sites/g/files/ehbemt341/files/documents/web-29.pdf>

⁵⁹ <https://fluoridealert.org/news/alabama-pfoa-contaminated-sludge-spread-in-lawrence-county/>.

⁶⁰ *Id.* All six well owners had to hook into city or county water systems.

⁶¹ <https://www.al.com/news/huntsville/2021/10/decat-ur-morgan-county-announce-98-million-settlement-with-3m-over-chemicals.html>

CONCLUSION

As a final note, we request that the Department officially agree to review and revise these regulations as warranted and at the least every two years. Data on the impacts of by-product land application is currently insufficient and inconclusive, according to the EPA OIG, and is in a constant state of flux as new contaminants that are not effectively removed from waste water treatment sludge or are present in industrial and manufacturing wastes are identified and studied.

ADEM must recognize that solid waste consists of a lot more than just beneficial nutrients and fertilizer. “In fact, thousands of chemical contaminants have been identified in sewage solids including: 27 metals, PFAS, microplastics, flame retardants, pesticides, personal care products, pharmaceuticals, and hormones.”⁶² Many of these contaminants are persistent, accumulative, and found in the environment decades later:

[I]n 1979, the EPA banned polychlorinated biphenyls (PCBs), yet PCB levels in many Puget Sound English soles, herring, and Chinook salmon are dangerously high and still increasing in some cases, even 30 years later. There are currently 195 bodies of water in Washington state (including Lake Whatcom) that are listed as impaired by PCBs.⁶³

The best way to stop this kind of legacy pollution ... is to stop putting these pollutants, chemicals and toxics into our environment in the first place, especially not directly onto our farmland. But, with a proposed regulatory program that will not even require generators or distributors to properly characterize their waste or to measure its long term effects on the environment, ADEM will only exacerbate, not eradicate, the serious problems presented by the land application of biosolids and FPR.

We appreciate your consideration of these comments and suggestions and look forward to your response.

⁶² EPA. 2009. *Targeted National Sewage Sludge Survey Sampling and Analysis Technical Report*. EPA-822-R-08-016. Retrieved from: <https://www.epa.gov/sites/production/files/2018-11/documents/tnsss-sampling-anaylsis-tech-report.pdf>; Chad, A. et al. 2006. “Survey of Organic Wastewater Contaminants in Biosolids Destined for Land Application.” *Environmental Science & Technology* 2006 40 (23), 7207-7215. DOI: 10.1021/es0603406; OIG Report, all cited in McDade, K. *Bellingham Will Process Sewage Into Fertilizer* (MCDade), found at <https://www.re-sources.org/2022/02/bellingham-will-process-sewage-into-fertilizer/#:~:text=February%202022%20update%3A%20Bellingham%20Public,on%20fields%20that%20grow%20food..>

⁶³ 9. West, J.E., O’Neill, S.M. & Ylitalo, G.M. “Time Trends of Persistent Organic Pollutants in Benthic and Pelagic Indicator Fishes from Puget Sound, Washington, USA.” *Arch Environ Contam Toxicol* 73, 207–229 (2017), found at <https://doi.org/10.1007/s00244-017-0383-z>; and Department of Ecology. Washington State Water Quality Assessment & 303(d) list, found at <https://ecology.wa.gov/Water-Shorelines/Water-quality/Water-improvement/Assessment-of-state-waters-303d>; both cited in McDade, *supra*.

Sincerely,



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