The Kentucky Steward's Opposition to the Malpractice of Biosolids Landfarming in Areas of Environmental and Community Concern, Expanded Report

The Kentucky Steward LLC, R. M. True | September 20, 2024

1.0 - CALL FOR STEWARDSHIP

To reiterate my prefacing op-ed, on September 26, 2024 the Board of Adjustments (BOA) of Trimble County, KY will either approve or deny a conditional use permit application that proposes domestic septic waste spreading on hay fields to "provide a service to [the] community."

Following my review of 902 KAR 10.150/160 and 40 CFR 503 (among other directly and indirectly related federal and state references), it is my professional opinion that there are significant deficiencies regarding several processes of domestic septage disposal in Kentucky that resultantly introduce and perpetuate environmental risks, especially at "non-public sites".

This expanded report is intended to provide a more thorough examination of these deficiencies through several topics. It is worth restating, The Kentucky Steward, and its discourse herein, is in no way anti-farmer, anti-private property owner or owner's rights, or anti-landfarming; it does, however, adamantly oppose the *malpractice* of biosolids landfarming itself which is substantiated and perpetuated by the deficiencies discussed herein.

This report is in no way all-encompassing of deficiencies associated with the Department of Public Health's management (or rather mismanagement) of domestic septage disposal in Kentucky. Thus, as it is a timely manner as it relates to the Trimble County, KY BOA's forthcoming decision regarding the conditional use applicant, the discourse that follows is comprised of deficiencies and remarks that closely relate to the situation at hand in Trimble County. It is the hope of The Kentucky Steward this expanded discourse may serve as a *starting point* for a significant, and necessary, overhaul of the practice of biosolids landfarming in Kentucky.

2.0 - PRIMARY OPPOSITION AND OR DEFICIENCIES REGARDING DOMESTIC SEPTAGE DISPOSAL AS CURRENTLY REGULATED BY 902 KAR 10.150/10.160

2.1 - Opposition to the Department of Public Health's Domestic Septage Disposal Approval Process

2.1.1 - Deficiencies regarding the septage disposal site application approval process and the DSF-345 (Site Evaluation) Form itself:

Since the official Application for Site Evaluation and Permit to Operate a Disposal Site (Form DFS-345) requires an approval letter from local planning and zoning (see Item 13 on Figure 1 below), the applicant proposing septic disposal at two separate site locations in Trimble County has offered to the BOA no additional information as it pertains to their proposed septic operations (see Items 1-9), as well as site specific operational data that directly relates to the environmental "upkeep", or management practices, of their sites (see Items 10-12; 14).

ATTACH THESE DOCUMENTS WITH THE APPLICATION

1. ( ) SCALED AND DIMENSIONED SITE PLAN
2. ( ) NUMBER OF ACRES WITH SITE BOUNDARIES
3. ( ) STRUCTURES AND OTHER FACILITIES
4. ( ) PROPOSED DISPOSAL AREAS
5. ( ) SET BACK DISTANCES ON/OFF SITE
6. ( ) NORTH AND PREVAILING WIND DIRECTION
7. ( ) ACCESS ROADS
8. ( ) PROPOSED OPERATIONS PLAN
9. ( ) METHODS AND EQUIPMENT FOR APPLICATION, TREATMENT, RECYCLING, OR STORAGE
10. ( ) PATHOGEN REDUCTION AND VECTOR CONTROL PLAN
11. ( ) LAND USAGE AND NITROGEN REQUIREMENT
12. ( ) APPLICATION RATE
13. ( ) APPROVAL LETTER FROM LOCAL PLANNING AND ZONING
14. ( ) ENDANGERED SPECIES STATEMENT (STATE AND FEDERAL)
15. ( ) DISPOSAL SITE CLOSURE PLAN
16. ( ) CERTIFICATION STATEMENT
17. ( ) WRITTEN CLOSURE PLAN
18. ( ) OTHER REQUIRED BY CABINET

Figure 1 – Snippet 1 of 2 from DFS-345 (Cabinet for Human Resources – Department for Health Services)

Further, since the BOA has yet to approve the applicant, a site evaluation has not been performed by the local health department. This is no surprise. Why execute a site evaluation if the site being considered has yet to be approved? This unfortunately presents itself as a "chicken or the egg" paradox. While it benefits the greater community that the BOA has the right to approve or deny conditional use permit applications rather than deferring exclusively, in this case, to the local health department, it disadvantages the greater community should the BOA approve the conditional use permit when valuable information such as site-specific geotechnical, geologic, and hydrogeologic characteristics are excluded (see Figure 2 for example). Especially when such characteristics would reflect to the BOA and its constituents the proposed site is unfit for septage disposal.

(TO BE COMPLETED BY THE HEALTH DEPARTMENT)

SITE EVALUATION

DISPOSAL METHOD	SITE TOPOGRAPHY	LANDSCAPE POSITION	SOIL TEXTURE	DEPTH TO RESTRCTIVE HORIZON	DEPTH TO WATER TABLE	SOIL DEPTH	AVAILABLE SPACE
SURFACE APPLICATION							
SHALLOW INCORPORATION							
DEEP INCORPORATION							

ARE SET BACK DISTANCES MET? ☐ YES ☐ NO If no, list missing setbacks

Figure 2 – Snippet 2 of 2 from DFS-345 (Cabinet for Human Resources – Department for Health Services)

It also goes without saying, if the applicant believed it would increase their chances of the BOA approving the conditional use permit, they would have coordinated with the local health department and thus offered some, if not all, of these characteristics for the BOA's consideration. It is my understanding that the BOA, accompanied by their legal representation, has visited the applicant's two proposed disposal locations, and that their visit was merely "walking the site down". It is important to note that visual observations of proposed sites offer but little context for site suitability as it relates to soil mechanics and environmental and hydrogeological considerations. Plainly, one must physically investigate site soil and water resource parameters through comprehensive engineering analyses to yield insight regarding site suitability. Thus, considering this reality as well as the applicant's conditional use application being effectively devoid of contextual information, one speculates.

Clearly the applicant finds itself in a convenient position. The current conditional use permit application submitted to the BOA does not require and therefore lacks additional context to the applicants' septage disposal aspirations, and it is likely deemed too rigorous a task to perform either in part or in full any preliminary site evaluation performed by the local health department in an effort to offer to the BOA supplemental site-specific information regarding the proposed septage disposal operation and the operational site(s).

Nevertheless, my professional opinion extends beyond the "chicken or the egg" paradox or the lack of site-specific information offered to the BOA as it pertains to the septage disposal operation or soil characteristics, among other geologic/hydrogeologic information. This is but a minor deficiency as compared to the discourse that follows. Thus, in the succeeding sections I discuss what I consider the greatest, and therefore most troubling deficiencies, regarding domestic septage disposal in Kentucky.

2.1.2 - Deficiencies regarding domestic septage disposal site evaluation criteria (902 KAR 10.150-Section 4)

It is my opinion that there are significant gaps in the domestic septage disposal site evaluation process that could (and likely already have) lead to environmental and public health risks. It is my understanding that local health department professionals utilize 902 KAR 10.150 – Section 4 when evaluating prospective septage disposal sites. The seven criteria listed under Section 4—i) Topography, ii) Landscape position, iii) Soil texture, iv) Depth to restrictive horizon, v) Depth to water table, vi) Depth of soil, and vii) Available space—are then summarized respectively within the DFS-345 Form (i.e. Figure 2 in previous section). Per my review, I have offered below a general list of observed deficiencies specifically relative to '*surface* application of septic waste' as I believe it is not only the most common application process, but most practiced for domestic disposal at "non-public" sites (which is an appropriate lens considering the active conditional use permit in Trimble County, KY). To clarify, the deficiencies presented herein apply (at a much greater magnitude) to both shallow and deep incorporation of septic disposal. Since it is assumed the Trimble County conditional use applicant intends to apply septic via surface incorporation (i.e. it is less involved, less expensive), I have calibrated my review accordingly.

General deficiencies:

1. Limited Scope: Criteria fails to address complex geological and hydrogeological factors that can significantly impact suitability of a site for landfarming.

2. Insufficient consideration of long-term impacts: Criteria fails to fully account for long-term environmental impacts, particularly on groundwater and surface water systems.

3. Inadequate assessment of soil properties: A more thorough analysis of soil properties, including permeability, organic content, and chemical composition, is vital for predicting contaminant transport. Note: Ironically, there has been credible scholarship relating to in-situ soil characterization of prospective septage disposal sites regarding 40 CFR Part 503 cited by the EPA, but the Department of Public Health fails to reference any credible resources commonly utilized in the engineering practice. For a credible source that EPA has cited relative to 40 CFR 503 and that, in my opinion, is more comprehensive in nature pertaining to Site Evaluation Criteria see Guide to Soil Suitability and Site Selection for Beneficial Use (1990), specifically Chapter 3 – Soil Health, and Chapter 4 – Site Selection).

4. Limited hydrogeological analysis: Criteria does not include a comprehensive assessment of groundwater flow patterns, aquifer characteristics, and potential for contaminant migration.

To supplement these general deficiencies, I have provided *specific* deficiencies, as well as recommendations, relative to the seven site evaluation criteria local health inspectors currently utilize for domestic septic waste disposal sites in **Table 1**. Please note, this discourse is but a starting point the Department of Public Health may use to pursue more appropriate site evaluation criteria.

Table 1 - Site Approval Criteria - Deficiencies & Recommendations

Site Approval Procedure	Deficiencies	Recommendations
Topography[1,2,3]	▪ Fails to consider length of the slope, which is crucial in determining erosion potential. ▪ Does not account for underlying geology or soil type, which significantly impacts slope stability. ▪ Ignores potential for localized steeper gradients within a generally acceptable slope.	▪ Implement a more nuanced slope classification system, considering factors like the Revised Universal Soil Loss Equation (RUSLE) ▪ Require detailed topographic surveys (i.e. LiDAR, Surveys by use of Electronic Total Stations) for more accurate slope analysis. ▪ Include geotechnical stability analyses for slopes approaching the 12% threshold.
Landscape Position[1,2,3]	▪ Oversimplifies complex landscape features and their hydrological implications. ▪ Does not adequately address the potential for preferential flow paths in karst environments. ▪ Fails to consider dynamic nature of landscapes, especially in areas prone to erosion or deposition.	▪ Incorporate detailed geomorphological assessments. ▪ Require hydrogeological studies to understand subsurface water movement, especially in karst areas. ▪ Include analysis of historical landscape changes and future projections.
Soil Texture[1,2,3]	▪ Does not account for soil structure, which greatly affects water movement and contaminant transport. ▪ Overlooks the importance of soil organic matter content. ▪ Fails to consider soil depth and layering, which are crucial for understanding contaminant migration potential.	▪ Implement a more detailed soil classification using the USDA soil taxonomy system. ▪ Require soil profile descriptions to at least 8-foot deep, noting horizons and structures. ▪ Include laboratory testing for hydraulic conductivity (ASTM D5084) and organic matter content. ▪ Consider the use of soil-water characteristic curves to understand unsaturated flow behavior.
Depth to Restrictive Zone[3]	▪ The 18” threshold is inadequate for many contaminants, especially considering the potential for preferential flow paths. ▪ Fails to consider the nature and permeability of the restrictive horizon itself. ▪ Does not account for lateral flow above the restrictive layer, which could lead to offsite contamination.	▪ Increase the minimum depth significantly, possibly to 3-6-feet depending on soil type and contaminant characteristics. ▪ Require detailed characterization of the restrictive horizon, including permeability tests. ▪ Implement geophysical methodology to produce detailed mapping of the restrictive layer (if present) ▪ Require modeling of potential lateral flow scenarios.
Depth to water table[2]	▪ An 18” separation from the water table is extremely inadequate for protecting groundwater resources. ▪ Fails to account for seasonal fluctuations in the water table.	▪ Increase the min. separation to at least 10-feet, depending on soil type and aquifer vulnerability. ▪ Require long-term groundwater monitoring to understand seasonal fluctuations. ▪ Implement modeling to predict contaminant transport.

	▪ Does not consider capillary rise in different soil types. ▪ The M2/M4 modifications (allowing for shallow placement of drainage) are potentially hazardous.	▪ Eliminate M2/M4 modifications for shallow water tables, as they present unacceptable.
Soil Depth	▪ 18" of soil depth is insufficient for proper filtration and attenuation of contaminants. ▪ Does not consider the composition and properties of the underlying material. ▪ Fails to account for the potential for soil erosion over time.	▪ Increase the minimum soil depth requirement to at least 3-6-feet. ▪ Require detailed soil profile descriptions, including physical and chemical properties. ▪ Implement leaching tests to assess the soil's capacity to retain contaminants. ▪ Consider the underlying geology and its potential to transmit contaminants.
Minimum Setback Distances	▪ 500-ft for potable water supplies and wells: This may be insufficient, especially considering potential groundwater flow patterns and contaminant transport. ▪ 200-ft for water bodies and karst features: This is alarmingly close, given the high vulnerability of these systems to contamination. ▪ 600-ft. for dwellings and public gatherings: This distance may not adequately protect public health, especially with regard to air quality impacts and odor issues.	▪ Increase setbacks significantly, especially for water resources and karst features (to at least 1,000-2,000-feet). ▪ Implement variable setbacks based on site-specific hydrogeological assessments. ▪ Consider cumulative impacts when multiple sites are in proximity.

1 – Criteria relies heavily on visual and basic physical assessments, which may miss critical subsurface conditions.

2 – Criteria lacks consideration for temporal variations (i.e. season water table fluctuations).

3 – Criteria does not adequately address potential for contaminant transport and long-term environmental impacts.

4 – Reliance on 18-inch threshold is deeply concerning. This depth is insufficient for protecting groundwater and surface water from contamination.

Summary and Recommendations

The deficiencies observed in the domestic septage disposal site evaluation criteria are too many in number, and too significant in magnitude to continue as currently regulated. In addition to the specific recommendations offered herein, I have included below a list of major revisions necessary for a more-comprehensive site evaluation process:

1. Requiring one to several shallow boreholes (to two samples or three-foot beyond closest restrictive horizon to ground surface), as well as groundwater monitoring wells to assess conditions over time; spacing dependent primarily on size of area, but also influenced by unique site characteristics.
2. Implementing a scoring system that weighs multiple factors rather than relying on simple A/M/U classifications. See Guide to Soil Suitability and Site Selection for Beneficial Use (1990) – Chapter 4, Section 'Departures from the ideal soil' – Tables 7-12 for an example of a site selection rating system wherein the rating of one criterion accounts for all criteria (as opposed to scoring each criterion in a vacuum, so to speak, like 902 KAR 10.150 – Section 4).
3. Implementation of professional geotechnical and environmental engineering oversight for site assessments, especially for larger or more complex sites.

In my professional opinion, these criteria, as currently practiced and enforced, are grossly inadequate for protecting environmental and public health. They appear to be based on outdated or oversimplified understanding of contaminant transport and environmental processes. There are no specific practices, sampling and testing methodology (ASTMs or evaluation work plans or detailed narratives) currently present and or cited within 902 KAR 10.150 that are utilized in the professional engineering field. In fact, there are no citations of credible engineering sources at all. Considering KAR/KRS documents are often superfluous in detail and formality, I am likely correctly assuming there is no backchannel or sub-reference the Department of Public Health utilizes for these criteria that is excluded textually from 902 KAR 10.150. If this were the case, in order to properly steward stakeholders of specific disposal sites, the Department of Public Health should immediately revise 902 KAR 10.150 (and other supporting KAR/KRS documents) to include these references for public consumption and due diligence. However, since there is no observable, credible engineering references cited associated with 902 KAR 10.150, it is necessary to assume local health professionals do not utilize any. Therefore, a significant overhaul of the site assessment and evaluation process is vital to ensure the safe and responsible management of septage disposal sites, as well as the ethical stewardship of the local and greater environment.

2.2 - Opposition to Systematic Deficiencies with Delegation of Regulatory Compliance, Record Keeping, and Public Awareness

Additionally, it is my professional opinion that there are systematic deficiencies that extend beyond the approval process of septage disposal sites, specifically with regard to the EPA's delegation of regulatory authority and compliance to the Department of Public Health—and by extension, local health departments (via districts)—as well as deficiencies observed in the Department of Public Health's post-permit approved domestic septage disposal site monitoring, reporting, and effort to exercise public awareness.

2.2.1 - Deficiencies regarding local health professionals lacking the engineering/geologic expertise to properly enforce 902 KAR 10.150/160 (*whether deficient as currently enforced or not)*

It is my professional opinion the delegation of authority and enforcement (or rather lack thereof) to/of local health departments is antithetical to their cause. Local health department professionals (otherwise known as "inspectors") are evidently certified through KRS 211.360(1). After speaking with a state employee (*unnamed*) of the Department of Public Health in Frankfort, KY, it was disclosed to me their inspector certification process primarily includes the completion of a single course offered through the University of Kentucky. I was not made privy to the syllabus or course components. However, considering engineering and geology professionals whether in the consulting industry, like myself, or those that receive consultation (federal and private municipalities, power generation companies, etc.) are required to complete at minimum four-year ABET accredited degrees, and are often incentivized by the industry to complete masters, and in some instances doctorates in these fields, it is troubling the Department of Public Health relies on the completion of one course. As such, it is my opinion local health department inspectors lack the necessary expertise and educational requirements to properly perform the responsibilities granted to them by the Department of Public Health.

I want to be clear here. This observed deficiency does not aim to offend or diminish the intellectual and vocational ability of local health department inspectors. Their many responsibilities, in my opinion, constitute proper stewardship of their communities. However, the Department of Public Health's delegation of authority and enforcement over/of the practice of domestic septic disposal in Kentucky, as I discussed in my op-ed, is analogous to a citizen who is CPR/First Aid certified serving as a surgeon at a trauma center. Both roles involve life saving measures and both a CPR/First aid certified citizen and a trauma surgeon can claim with truth they are 'educated' in life saving measures, but both roles severely contrast with respect to educational requirements, liability, vocational specialization (i.e. trauma surgeons are also not currently cardiologists or dermatologists for example), as well as a matter of effectiveness and ethics with regard to stakeholders of the work. I could posit many similar analogies that characterize the deficiency at hand, but I digress.

Plainly, local health inspectors have been unfortunately and unethically assuming responsibilities that are more apt to engineering/geology professionals. A troubling deficiency that cannot be remedied through the completion of one or two more certification courses (similar to KRS 211.360(1)). Rather, to ethically steward the environment and public, the Department of Public Health—assuming the site evaluation criteria and site monitoring processes are significantly overhauled—shall directly hire engineering/geology experts or retain them as consultants through either case by case or term contracts. The advantages of this approach would either ensure the Department of Public Health maintains sufficient expertise to manage the disposal process on behalf of the environment and communities, as well as defer the risk and thus fault of lack of due diligence or lack of thorough management to consultants.

2.2.2 - Deficiencies regarding the local health departments' septage disposal site monitoring relating to thoroughness and monitoring frequency

<u>Deficiencies regarding the DFS-315 (Site Monitoring) Form</u>

Following the site evaluation and permit approval processes, for an active domestic septic disposal site, local health department inspectors utilize the DFS-315 (Site Monitoring) Form. This form is compartmentalized into two sections, one relating to the septic tank servicing operation, the other the septage disposal site. I am primarily concerned with the latter which is presented as Figure 3 below.

SEPTAGE DISPOSAL SITE

PERMIT NUMBER COUNTY OWNER OPERATOR SITE

ADDRESS CITY STATE ZIP TELEPHONE NO.

1. ( ) (5) Approved vehicles, sanitary
2. ( ) (3) Equipment sanitary
3. ( ) (3) Storage facilities sanitary
4. ( ) (5) Site approved
5. ( ) (5) Permit to operate
6. ( ) (5) Approved methods of disposal
7. ( ) (5) Vector control plan
8. ( ) (5) Pathogen control plan
9. ( ) (3) Application rate not maintained
10. ( ) (5) Nitrogen uptake not maintained
11. ( ) (5) Unapproved waste accepted
12. ( ) (4) Accidental discharge cleaned up
13. ( ) (3) Directs and manages application of septage
14. ( ) (2) Vehicles operators notified of closure
15. ( ) (3) Health department notified of discharge of prohibited waste
16. ( ) (2) Written closure plan available
17. ( ) (3) Written notification provided at land sale
18. ( ) (3) List maintained of vehicles, disposal method, number of gallons
19. ( ) (5) Warning signs posted and adequate
20. ( ) (5) Adequate fencing, barriers, gates
21. ( ) (2) Entry control points locked
22. ( ) (3) Access roads maintained and properly constructed
23. ( ) (2) Plot plan posted
24. ( ) (4) Spot dumping prohibited
25. ( ) (5) Repeat violation

NO CONSIDERATION FOR SOIL / WATER RESOURCES HEALTH FOLLOWING INITIAL SITE EVALUATION

Figure 3 - DFS-315 Form Section 2

Of the 25 components in this section of the DFS-315 Form, there is no component present that accounts for local health department inspectors monitoring the in-situ integrity of soil and water resources following permit approval. Namely, following the site evaluation assessment (which I have noted in Section 2.1.2 is deficient as currently enforced), there is no requirement and thus incentive for health department inspectors to "re-assess" geotechnical, environmental, and hydrogeological considerations for active disposal operations. This deficiency was unfortunately confirmed through correspondence with a local health department inspector upon filing an open records request for DFS-315 Forms for all active/inactive domestic disposal sites in Trimble County.

For context, the above Figure 3 serves as an example of a full inspection report (note: I have whited-out the personal information of the disposal site owner). I was surprised to receive a seemingly bare report, it being only one page. This prompted my request for any associated testing data or remarks on behalf of the inspector pertaining to site soil and water resource characteristics, or any notations in general as it pertains to "upkeep" of the site. To paraphrase the inspector's response: "You have the full reports, that's all there is. There is no testing data as there are no tests…There is no further soil evaluation unless there would appear to be a need for such upon inspection (this would be item#4 [referring to Figure 3 above, DF3-315])."

This constitutes a point of concern. Item No. 4 on the DFS-315 Form only states "Site Approved" (which is likely to be taken literally, as in "This site was approved and thus maintains a permit.") Clearly it is not economically viable to perform many of the ASTMs (among other methodology) I have recommended in Section 2.1.2 – Table 1 during each monitoring assessment. However, considering septage can positively influence or adversely influence soil properties (and thus the ability of an in-situ soil to maintain contaminants such as highly soluble nitrates), there must be some soil (and water where necessary) sampling performed to confirm site soil (and water) properties have remained unaffected, if not improved. The local health department inspector did disclose the following: "If the physical characteristics changed over time and re-evaluation were necessary that would be done, however I have never experienced such a need nor have I heard of any such needs from my counterparts throughout the state nor technical consultants at the state."

This clarification only compounds my concern. First, it is not a possibility, **BUT** certainty that land-applied septage modifies the chemical and physical properties of in-situ soil (and water). Thus, there is no "*If* the physical characteristics change over time", but rather "*When*". Secondly, and more troublingly,

having not heard from other health department inspectors or technical consultants(?)—which as an aside, what capacity do they serve, considering they are clearly absent from the site evaluation and monitoring processes?—of ANY such issues throughout the state is alarming. By this metric, am I to assume that all active (as well as inactive) domestic septic disposal sites (especially "non-public" sites), despite hundreds upon hundreds of thousands of gallons of septic being land applied, have had and will continue to have no adverse influence on their respective soil properties? One speculates.

Notably, there was some semblance of positive reinforcement. The local health department inspector did disclose that upon visual inspection of "noticeable surface compaction or rutting from truck tires, or if any nearby drainage ways changed due to erosion, or if new sink holes presented themselves" further soil evaluation would be needed. Granted, the inspector disclosed that these were things "[they] could imagine might happen" rather than have happened. To be clear, in my opinion, there is likely no domestic septic disposal site where such things have NOT happened (save for sinkhole development which is dependent on location in the state).

Therefore, the DFS-315 Form, and thus the site monitoring process, is deficient as it does not account for the health and integrity of in-situ disposal site soils (and water resources) in perpetuity following the initial site evaluation assessment (which I reiterate is currently deficient as enforced anyway). To properly steward active disposal sites, sampling of in-situ soil (and water where necessary) should be a requirement to be performed during or prior to the monitoring process. In doing so, both the landfarming operator or site owner and the local health inspector can verify the impact on the native soil caused by the applied septic waste.

Deficiencies regarding monitoring frequency

Per 902 KAR 10.160 – Section 8, local health department inspectors are to monitor approved domestic disposal sites at least one time every calendar year. In my opinion, this requirement is grossly deficient. From a geotechnical, environmental, and hydrogeological perspective, annual monitoring is deficient for several key reasons:

1. **Seasonal variations**: Soil conditions, groundwater levels, and surface water flows can vary significantly throughout the year due to seasonal changes in precipitation, temperature, and vegetation. Annual monitoring fails to capture these important variations.

2. **Extreme weather events**: Heavy (or intense) rainfall, prolonged droughts, or freeze-thaw cycles can dramatically alter site conditions, potentially leading to increased contaminant transport or soil instability. These events may occur between annual inspections and go unnoticed, especially if the landfarming operator/site owner has not applied septic recently and thus has not regularly visually inspected their site.

3. **Rapid changes in hydrogeology**: Groundwater levels and flow patterns can change quickly, especially in areas with karst topography or fractured bedrock. Annual monitoring may miss critical shifts in subsurface hydrogeology.

4. **Cumulative effects**: Gradual accumulation of contaminants or subtle changes in soil structure may not be apparent on an annual timescale but could be significant over time.

5. **Delayed detection of problems**: Issues like liner failures, erosion, or unexpected contaminant migration could develop and worsen significantly before being detected in an annual inspection.

6. **Insufficient data for trend analysis** (which to be clear, currently the Department of Public Health does not practice any form of trend analysis anyway): More frequent monitoring would provide better data for identifying long-term trends and potential issues before they develop into greater risks to the site integrity and consequently the environment.

7. **Increased incentives/effectiveness for operator/owner reporting to local authorities**: Currently, per 902 KAR 10.160 and 40 CFR 503, the operator/owner of the septic disposal operation is to provide a variety of written notifications for local authority approval prior to modifying operational approaches or if septic has changed classification (or the origin). If the operator/owner fails to do this, it will go unnoticed by the inspector until the annual site visit. By increasing the frequency of monitoring, it directly incentivizes the disposal site operator/owner to ensure their due diligence in the form of necessary forms, etc. are in order prior to the inspector mobilizing to the site.

8. **Inadequate for early warning and remediation**: More frequent monitoring is necessary to provide early warning of potential environmental or public health risks. Note: It is my understanding that, although I have observed the DFS-315 form as deficient as currently designed, if there are site integrity issues such as surface runoff flowing into a stream, the inspector will require the site operator/owner to correct the issue. What is not understood is how the Department of Public Health empirically characterizes the potential environmental fallout of the loss of site integrity, as well as appropriately penalizes the site operator/owner, in addition to execution of environmental remediation measures.

From a geotechnical perspective, annual site monitoring is insufficient to detect changes in soil stability, erosion patterns, or the development of sinkholes or subsidence, which can occur rapidly in certain geological settings (especially in Kentucky). Environmentally, annual monitoring fails to detect changes in vegetation, wildlife patterns (which can be influenced by ineffective execution of pathogen/vector reduction practices by the site operator/owner), or the progression of contaminants in a timely manner. Hydrogeologically, annual monitoring is inadequate for tracking changes in groundwater quality, flow patterns, or interactions between surface water and groundwater, which can vary significantly over shorter time scales.

In my professional opinion, the complex and dynamic nature of these disposal sites constitutes more frequent and comprehensive monitoring to effectively manage environmental and public health risks. Depending on the site at hand (i.e. some sites are less geologically/hydrogeological complex than others), I recommend at minimum quarterly or even monthly monitoring, coupled with event-based inspections (i.e. after moderate-heavy rainfall events, lingering droughts, lingering freeze cycles and heat waves).

2.2.3 - Deficiencies regarding the local health departments' record keeping (or document controls) of active/inactive septage disposal sites

It is my opinion that there are also deficiencies with the Department of Public Health's and local health department's record keeping, or document controls, of active/inactive septage disposal sites. For the following points, by records I am referring primarily to complete records of all DFS-345 and DFS-315 Forms all active/inactive disposal sites, as both forms—in theory—should offer practically all information regarding disposal site operations and the integrity of each site. Irrespective of my previous sections noting significant deficiencies with each form, the current record keeping process is grossly deficient, and, frankly, ambiguous.

An unnamed state employee from Frankfort, KY for the Department of Public Health disclosed to me several facets of the domestic septage disposal site process as it relates to record keeping: (i) local health departments maintain all records in physical form (hard-copies) at their district, if not local, department offices; (ii) as such, there are no digital files of DFS-345/315 forms that are stored on an accessible database; (iii) they disclosed that state employees/authorities, like themselves, do not have access to any reports of domestic septic disposal sites and managed by specific districts; AND (iv) if there are concerns of landfarming malpractice—or rather non-conformance to KAR/KRS—it is at the discretion of the local health departments to pursue corrective action; and will only 'work its way up the pipeline' to state authorities if the incident is severe enough(?).

While this information was initially both illuminating and troubling, upon filing an open records request (as discussed earlier) for previous DFS-315 Site Monitoring Forms for all active/inactive disposal sites in Trimble County, correspondence with a local health department professional had contradicted my conversation with the state employee. The local health department professional disclosed the following: (i) record retention for inspections is two years; (ii) inspection reports are entered into an electronic database that once entered does not store the exact PDF (or copy) of the inspection; which upon filing open records request the requestee cannot receive the full/exact report as it was filed in the system; (iii) the local health departments utilize an "app" to file inspection reports; And, as I mentioned in Section 2.2.2. (iv) the "full" reports, as in those delivered to requestees, only present the 1-page DFS-315 Form and therefore no attachments pertaining to the disposal site operator's/owner's empirical data or narratives regarding pathogen and vector reduction (see 40 CFR 503.15), among other supplementary data.

Clearly, this is grossly deficient in several ways. Firstly, why did I receive contradictory information from two employees working under the Department of Public Health. Contradiction is perhaps an understatement considering the local health department professional exclusively disclosed record keeping is digital, whereas the state employee said the exact opposite. More importantly, why would record retention for local health departments be two years when disposal site operators/owners are required to maintain records for five years (per 40 CFR 503.17)? Additionally, how does it advantage and properly steward public stakeholders when, upon filing open records request, they are not provided with full reports? To further compound this issue, the local health inspector also disclosed "there is no collection of documentation from the operator, their logbooks are just reviewed."

What is going on here?

This deficiency is analogous to a person filing annual taxes with the IRS, but the IRS deciding to simply *view* a person's tax information rather than file it. There are infinite analogies that can be presented here, but I again digress. This is clearly deficient record keeping and improper document controls, especially as

it involves a highly complex practice with significant environmental and community risks (that is compounded considering the other deficiencies discussed herein).

Thus, the DFS-315 Forms, whether viewed by an employee of the Department of Public Health or by a public stakeholder through an open records request, in their final form present only the following information: a) basic information such as property owner, address, permit no., disposal site ID no.; b) a defined list of monitoring requirements (see Figure 3 in Section 2.2.2 for example); and, c) the overall 'score' of the report in the value of a final number.

This deficiency is alarming. By excluding copies of disposal site operator's/owner's required information—such as data or narratives pertaining to application rates, septic chemical composition, pathogen and vector reduction, etc.)—should significant environmental risks or operational modifications occur, the Department of Public Health, has no paper trail to properly assess any adverse circumstance or lend perspective on potential environmental investigations. Additionally, it is good practice in the engineering industry for your peers to review designs, considerations, etc. prior to finalization. This process is easily achieved through shared access to project files and notes. Such a process is absent in this circumstance. There is seemingly no redundancy in place for another local health professional to "QC" an inspection report. Individuals, no matter their intellect or capabilities, are capable of mistakes. They're human. It's in our nature. By keeping each other accountable, especially in the workplace, mistakes are mitigated. Should I have to explain this process further? I think not.

Thus, a significant overhaul is recommended for the Department of Public Health's record keeping process. In addition to ensuring all department employees have an equal understanding of the record keeping process in place, below are some preliminary recommendations as it relates to the DFS-315 Form for example (some of which are influenced by my experience in the engineering consulting industry). Note: The below list conditionally assumes the DFS-315 Form is modified to account for the deficiencies discussed earlier.

1. The DFS-315 Form shall be complete (all pertinent information retained on form itself), irrespective of which medium one is viewing the report (digital or hard copy);
2. All information required by the disposal site operator/owner (such as application rates, laboratory analysis of septic, pathogen and vector reduction logs, etc.) shall be presented in the form of Appendices appropriately titled per the corresponding components on the DFS-315 Form;
3. The report shall include the information of the primary local health department inspector, but shall conditionally include the information of a secondary professional (that has confirmed the report is in good standing and or accurate as reported by the primary);
4. All reports should be housed on an electronic database accessible to Department of Public Health employees (advisable to protect .pdfs from editing or copy and pasting);
5. All reports are available in digital and hard-copy format;
6. All information presented in the report is tracked/managed in, at minimum, Microsoft Excel sheets (or some other tracking/organization software). In doing so, the data can yield trend analyses that can alert officials of potential environmental risks, among other causes for re-assessment, additional monitoring, or contact to the disposal site operator/owner.

Without pursuing, at minimum, the above recommendations, the Department of Public Health will continue to perpetuate poor stewardship of domestic septic disposal sites which can be substantiated by poor document controls. This observed deficiency was in part influenced by two of the three disposal site DFS-315 reports received by the local health department professional having perfect 100/100 scores.

Given the significant deficiencies noted herein regarding the DFS-315 Form, I could not further evaluate such curious, unlikely scores simply due to the deficiencies regarding record keeping noted herein.

3.0 – Opposition to Systematic Deficiencies regarding EPA federal enforcement of 40 CFR Part 503, especially regarding "non-public" sites

3.1 Deficiencies regarding regulatory order of hierarchy

Deficiencies with regard to management practices, or lack thereof

In light of my observations and noted deficiencies herein, I was hopeful that such significant gaps in the domestic septage disposal site approval process, as well as site management practices—and consequently the local health department's monitoring/reporting of these sites/practices—would be alleviated by a more conservative enforcement of 40 CFR 503 by the Federal Government (EPA). That is to say, I was hopeful federal regulations regarding domestic septage disposal sites and their operations would serve as a safety blanket capable of superseding state regulations.

However, after reviewing "Domestic Septage Regulatory Guidance: A Guide to The EPA 503 Rule (1993)", I discovered the following: "There are no specific Federal management practice requirements for appliers of domestic septage to non-public contact sites in the Part 503 regulation" (46). It is my understanding that 40 CFR 503.14 confirms this fact. There are no "non-public" site management practices regulated by 40 CFR 503. Thus, "non-public" domestic septic disposal sites are excluded from considerations pertaining to threatened or endangered species, landfarming when approved disposal locations are flooded, frozen, or snow-covered, distances to waters of the US, and agronomic rate.

There is also a notable deficiency with regard to the federal EPA offering NO site requirements with respect to various geotechnical, geologic, and hydrogeologic parameters, as well as other basic parameters, as evidenced by Figures 4 and 5 below which were extracted from "A Guide to The EPA 503 Rule" pages 51 and 52, respectively.

FIGURE 8: COMPARISON OF FEDERAL AND SELECTED STATE REQUIREMENTS FOR THE LAND APPLICATION OF DOMESTIC SEPTAGE TO NON-PUBLIC CONTACT SITES

	Federal	Minnesota [1]	Florida
PERMITS REQUIRED	No	No	Yes
Issued By			County
APPLICATION RATE			
Based on:	Crop Nitrogen Requirement	Crop Nitrogen Requirement and Other Nitrogen Impacts	Crop Nitrogen Requirement Max. 500 lbN/acre/yr or 30,000 gal/acre/year
Typical Rate (gallons/acre/year)	38,500	66,700 surface applied or 50,000 injected	
Hydraulic Loading Limits	No	Yes	Yes
Daily Application Rate Max.	No	15,000 gal/acre [2] 10,000 gal/acre [3]	
RECORD KEEPING	Yes	Yes	Yes
Reporting Required	None	None	Quarterly
Years to Be Retained	Five	Not Specified	
Required Information:			
Site Location	Yes	Yes	Yes
Date of Application	Yes	Yes	Yes
Time of Application	Yes	No	No
Number of Acres	Yes	No	Yes
Amount of Septage Applied	Yes	Yes	Yes
Crop Grown	Yes	Yes	Yes
Weather Conditions	No	No	Yes
Certification	Yes	No	No
Depth to Water Table	No	Yes	Yes
Percent Vegetative Cover	No	No	Yes
PATHOGEN REDUCTION	pH 12/2 hours and harvesting restrictions OR Site and harvesting restrictions	Optional	Optional
VECTOR ATTRACTION REDUCTION	pH 12/30 minutes OR Injection Or Incorporation	Optional	pH 12/2 hours

Figure 4 - Federal requirements – "non-public" sites

FIGURE 8 Con't **COMPARISON OF FEDERAL AND SELECTED STATE REQUIREMENTS FOR THE LAND APPLICATION OF DOMESTIC SEPTAGE TO NON-PUBLIC CONTACT SITES**

	Federal	Minnesota [1]	Florida
CROP HARVESTING RESTRICTIONS			
Human Food Crops With Harvestable Portions That Touch the Soil Surface But Are Totally Above Ground	14 Months	12 Months [4]	60 Days [5]
Root Crops	20 Months [6] 38 Months [7]	2 Years [4]	Not allowed
Other Food, Fibers or Feed	30 Days	30 Days [4]	30 Days
Grazing	30 Days [4]	1 Year [4]	30 Days
Turf	1 Year [4]		
ACCESS RESTRICTION (Fencing, posting, remoteness, etc.)	Required for Non-Stablized	Required	Case Specific
SET BACK REQUIREMENTS			
Surface Waters	None	Varies with site slope [8]	3000 ft-Class I and 200 ft-other
Public Water Supply Well	None	1000 ft [8]	500 ft
Private Drinking Water Well	None	200 ft [8]	300 ft
Residence	None	200 ft [8]	300 ft
Property Boundary	None	10 ft [8]	75 ft
Recreational Area	None	600 ft (200 ft trails) [8]	None
Intermittent Streams	None	100 ft [8]	None
Road Right-of-Ways	None	10 ft [8]	None
Holes and Channels	None	Varies with site slope [8]	200 ft
SOIL REQUIREMENTS			
Slope	None	0-6% (if surface spread) 0-12% (injected)	8%
Minimum Soil Depth	None	3 ft	2 ft-permeable
Minimum Depth to Water Table	None	3 ft	None
Available Water Holding Capacity	None	6 inches to bedrock or watertable	None
Permeability	None	>.2/hr (if surface spread) inches <6/hr in at least 1 horizon inches	None
Flooding	None	Free from flooding hazard	None

Notes:
1 = Minnesota's entered information is guidelines, not regulation.
2 = Medium-textured soils.
3 = Fine-textured soils.
4 = Non-treated septage.
5 = Use of septage not allowed on leafy vegetables or tobacco.
6 = If septage remains on the soil surface for four months or longer.
7 = If septage remains on the soil surface for less than four months.
8 = Non-stabilized, surface spread septage.

Figure 5 - Federal requirements – "non-public" sites

Clearly, as evidenced in Figures 4 and 5, EPA requirements pertaining to several aspects of domestic septage disposal explicitly at "non-public" sites is severely lacking. There are no requirements, and thus consideration, relating to reporting, weather conditions, and depth to water table (which is poorly remedied through the Kentucky Department of Public Health's DFS-345 Form) as evidenced in Figure 4. There are also no requirements relating to major setback requirements of: public water supply wells, private drinking water wells, residences, property boundaries, recreational areas, intermittent streams, road right-of-ways, and holes and channels. Regarding soil requirements, there are none. No consideration is given to disposal site slope, minimum soil depth, minimum depth to water table, available water holding capacity, and permeability.

It is clear the EPA has delegated the creation and enforcement of such requirements and considerations to the states and whichever septage disposal management system they adopt. Now, these considerations are loosely required in Kentucky under the Department of Public Health per 902 KAR 10.150 – Section 4 (as well as on the DFS-345 and DFS-315 Forms). I am simply pointing out the deficient nature of relying solely upon state management programs to include soil and water resource considerations in their regulations and statutes. I have no issue with the federal EPA deferring some management controls to state septage disposal programs like Kentucky's Department of Public Health. However, when such state programs and their regulations and statutes contain numerous deficiencies at varying magnitudes, it would benefit American stakeholders for the EPA enforcement of 40 CFR 503 to provide a "safety-blanket", so to speak, with regard to soil and water resource considerations to mitigate environmental risks.

4.0 – Conclusive Remarks

It is my opinion, given the significant deficiencies discussed herein, a significant overhaul is necessary of Kentucky's Department of Public Health's management of domestic septage disposal practice. An overhaul that should provide more protection to the environment and public stakeholders, especially as it relates to "non-public" sites.

I believe many of Kentucky's stakeholders will find this, or parts of this, expanded report useful and informative. I am glad for it. But I also believe some will not. A criticism I can see them readying would be regarding money. They can claim the recommendations offered herein would involve drastic changes in budgetary spending of the Department of Public Health and disincentivize smaller active and prospective domestic septic disposal operations to forego biosolids landfarming. And their claim would be right. Given the recommendations I have presented herein, significant investments and proper money management is required to ensure an effective, environmentally-respectful, biosolids landfarming program. However, this reality does not preclude both the Department of Public Health and the landfarmers it offers permits to from stewarding the environment and their communities.

As is stands, considering the deficiencies discussed herein—and that an overhaul of the system has not yet taken place—**I reiterate: it is my opinion it would be a grave error in judgement for the Trimble County, KY BOA to approve the conditional use permit application on September 26, 2024**. Further, the Kentucky Steward conditionally recognizes several cultural factors—such as (unmitigable) odor control, proximity to stakeholder residencies, property value loss, and internal/external community public perception rightfully hold precedent to influence local governing administrations, like Trimble County's BOA, to deny such applications.

In closing, the *intention* of this expanded report is to serve as a starting point for discussions that may hopefully lead to, first and foremost, public awareness of biosolids landfarming in their local

communities, but ultimately a significant overhaul of the biosolids disposal management program in the beautiful state of Kentucky. In doing so, we can in this practice ethically steward our local environments and communities alike, and foster a progressive stewardship of Kentucky.

I hope my *intention* is realized.