SITE SELECTION CONSIDERATIONS AND OPERATIONAL GUIDANCE FOR OUTDOOR EMERGENCY COMPOSTING OPERATIONS

Planning for highly contagious animal diseases is important for both backyard and commercial livestock operations. Livestock producers across the United States are implementing strict biosecurity measures to reduce the risk of disease transmission, but there will be a need to depopulate facilities on short notice if and when a disease is detected.

Partner agencies (multiple programs within Michigan Department of Environment, Great Lakes, and Energy [EGLE] and the Michigan Department of Agriculture and Rural Development [MDARD], along with Michigan State University Extension, the United States Department of Agriculture-Natural Resources Conservation Service [USDA-NRCS], and the Michigan poultry industry) have been working together to address this potential need and plan for contingencies. If depopulation is conducted at a commercial livestock operation, the best way to prevent disease transmission is to compost infected animals at the farm. Many commercial animal operations will be able to compost under roofed structures already constructed on the farm. However, there will be a need to compost outside the roofed structures on the farm premises in some cases.

The Bodies of Dead Animals Act 239 of 1982[1] 1 is administered by MDARD's Animal Industry Division; however, it is every landowner's responsibility to ensure the protection and integrity of our environmental resources. The Natural Resources and Environmental Protection Act (NREPA) (Act 451 of 1994)[2] regulates the discharge of contaminates into the environment and describes EGLE's authority to enforce NREPA.

Administrative Rule 287.655 10(a)(i)[3] requires any farm composting more than 20,000 pounds of livestock to install a protective liner that meets specific criteria outlined in NRCS practice standard 313[4]. Administrative Rule 287.655 10(b)[5] further requires all effluent generated and runoff events during active curing, not retained in the compost be managed in a manner consistent with all applicable federal, state, and local laws as well as being collected in a storage facility meeting NRCS practice standard 313, or reintroduced into the pile.

Adherence to these recommendations does not guarantee compliance with all applicable laws, which include but are not limited to the Bodies of Dead Animals Act, PA 239 of 1982 and Part 115, Solid Waste Management; Part 55, Air Pollution Control; and Part 31, Water Resources Protection of the Natural Resources and Environmental Protection Act, PA 451 of 1994, as amended.

MDARD and EGLE expect any agricultural operation composting livestock due to a disease outbreak to make every reasonable attempt to follow the requirements under the Bodies of Dead Animals Act (BODA), PA 239 of 1982. This includes the utilization of an impermeable liner. If using an impermeable liner is not feasible, this document provides guidance for environmental risk mitigation at the selected composting site. It is important to note that any environmental impacts remain the responsibility of the producer. Additionally, facilities permitted through EGLE should reach out to their local compliance staff for further assistance.

If additional guidance is needed, please contact EGLE at 800-662-9278 and/or MDARD at MDARD-EM-Composting@Michigan.gov.

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[1] https://www.michigan.gov/mdard/animals/disposal
[2] https://www.legislature.mi.gov/(S(5xxn5vmst5lvm13mkxkgvhcg))/mileg.aspx?page=GetObject&objectname=mcl-Act-451-of-1994
[3] https://www.canr.msu.edu/uploads/234/53311/BODARules_June2011.pdf
[4] https://efotg.sc.egov.usda.gov/#/state/MI/documents/section=4&folder=-252
[5] https://www.canr.msu.edu/uploads/234/53311/BODARules_June2011.pdf

Mortality Compost Site Selection Considerations

Please note these site selection considerations have been developed in a coordinated effort by partner agencies to protect human health and the environment. When making a site selection, consider these items in conjunction with The 2017 USDA Emergency Carcass Management Desk Reference Guide[6] and consultation with USDA-recognized Subject Matter Experts (SMEs) involved in the emergency management and disposal of infected materials.

Surface and Groundwater Criteria

Surface Water

- **Site slope**: An outdoor composting site should be sloped to prevent pooling/ponding around the base of composting windrows but should not exceed three percent. If the site slope exceeds three percent, then additional controls to prevent the runoff of compost leachate may be needed.
- **Distance to Surface Water:** Composting windrows should be a minimum of 100 feet from surface water (lakes, streams, drains). However, if distance to surface water is less than 300 feet, additional controls to prevent the runoff of compost leachate from reaching the surface water should be put in place. Selected site cannot be in a 100-year floodplain.
- **Offsite flow paths:** Compost should be handled to avoid the creation of leachate. Any leachate created during the composting process must be managed to prevent discharge to surface water (lakes, streams, drains).
- **Leachate and runoff control:** Following The 2017 USDA Emergency Carcass Management Desk Reference Guide, leachate and runoff controls such as, but not limited to, berms to divert stormwater away from windrows should be put in place. Leachate must be managed to prevent a discharge to surface water (lakes, streams, drains).
- **Flow from tile drains:** There should be no discharge to surface water (lakes, streams, drains) from tile drains. The farm should identify the closest untiled field. If the only on-farm site available contains tile drains, identify the tile location, depth, and tile outlet. The farm must contact EGLE and MDARD representatives to discuss additional site considerations.

Groundwater

- **Depth to groundwater table**: Outdoor composting should not be conducted on sites with less than two feet depth to the groundwater table. If the soil has a greater than two inches per hour permeability rate, but less than four inches per hour permeability rate, depth to groundwater should be at least four feet. Please refer to The 2017 USDA Emergency Carcass Management Desk Reference Guide for more information or contact EGLE and MDARD representatives. Utilize USDA-NRCS Web Soil Survey (WSS)[7] in combination with onsite sampling to evaluate soils on site. If the only on-farm site available cannot meet minimum distances to depth of groundwater table, or if the permeability rate is greater than four inches per hour, the farm must contact EGLE and MDARD representatives to discuss an alternative disposal option.
- **Groundwater flow direction**: Some sites with permeable soils may require groundwater monitoring wells to determine depth to groundwater and groundwater flow direction. A minimum of three wells are required to establish groundwater flow direction, a minimum of one upgradient, and two downgradient wells. Permeable soils are defined as 10^{-4} cm/sec (greater than 1/7 inch per hour) hydraulic conductivity (K) or higher. This is roughly the equivalent of soils described in the field as anything coarser grained than silt or clay (i.e., sandy soils).

[6] https://www.aphis.usda.gov/animal_health/carcass/docs/disposal-guide.pdf
[7] https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm

- **Soil type, profile, confining layer information**: Low permeable (clay/silt loam) sites should be selected whenever possible. Two inches per hour should be the maximum permeability of sites used unless additional requirements are met. Highly permeable soils should be avoided. If a site with higher permeability must be used, the composting process should be spread out over additional area. See "Depth to groundwater table" above for more information as a deeper depth to the water table, base layers, etc. may be required.

Flooding/Ponding Risk and Leachate Control

- **Size of compost area:** The 2017 USDA Emergency Carcass Management Desk Reference Guide states a ratio of 237,500 pounds/43,560 square feet (one acre) should be used for composting area. This is equal to 5.45 pounds of carcass weight/ square foot. The selected site should be adequately sized to meet this ratio. If the only on-farm site available is not large enough to meet this ratio, the farm must contact EGLE and MDARD representatives to discuss potential extra controls or an alternative disposal option.
- **Flooding/Ponding Risk:** Avoid areas prone to flooding or ponding. If the only on-farm site available does not meet these criteria, the farm must contact EGLE and MDARD representatives to discuss an alternative disposal option.
- **Leachate Control:** An impermeable liner material is recommended to be placed under the composting site if located in an area underlain with excessively permeable soils (greater than two inches per hour permeability rate). If a liner is used and causes the collection of runoff/leachate from the composting operations, please contact EGLE and MDARD representatives for containment options and treatment/disposal options for the runoff/leachate collected.

Drinking Water and Water Well Criteria

- **Distance to water wells from composting location**: Site should be 2,000 feet from a Type I or Type IIa well, 800 feet from a Type IIb or Type III well, and 300 feet from a private well. If isolation distances cannot be met, please contact EGLE or MDARD representatives to determine if reduced isolation distances are possible. If the isolation distances cannot be met or acceptably reduced, the abandonment of the existing well and installation of a new well or selection of a different site that meets the isolation criteria may be required.
- **Well logs for site and nearby wells**:
    - If considering reducing the isolation distances, wells located within the isolation distances should meet current construction standards under the Public Health Code. If not, or unknown, abandonment of the existing well and the installation of a new well or selection of a different site that meets the isolation criteria may be required.
    - Evaluate soil profiles that may prevent the movement of groundwater in combination with well depth to determine if reduction in isolation distances may occur. Contact EGLE representatives for more information.
- **Additional hydrogeologic information:** Evaluate additional information such as groundwater flow direction to determine if reduction in isolation distances may occur. Contact EGLE representatives for more information.
- **Additional controls**: Evaluate additional site controls that may reduce risk related to the site (overhead roof, concrete floor, etc.) to determine if reduction in isolation distances may occur. Contact EGLE representatives for more information.
- **Abandoned wells**: If abandoned wells are located within the isolation distance, plugging of the wells is required before site work begins.

Odors and Nuisance

- **Prevailing wind direction:** Selected site should not be directly upwind of non-farm residences or businesses. If the selected site has the potential to impact nearby residences or businesses, outreach or public notice should be given to nearby property owners to notify them of potential odor issues.
- **Isolation Distances:** Outdoor site selection should follow isolation distances described in this document and should also be at least 100 feet from a property line, 300 feet from a neighboring residence, and 500 feet from sensitive receptors such as religious, medical, educational, or nursing facilities. If these distances cannot be met, additional efforts should be taken to control odors, runoff, etc. and additional controls put in place.
- **Odor monitoring plan:** A monitoring and mitigation plan for odors associated with composting should be developed and followed by the farm.

Mortality Composting Operational Best Management Practices

These Best Management Practices (BMPs) are recommended for mortality composting to kill pathogens and result in a quality compost end-product. Use these BMPs in conjunction with the 2017 USDA Emergency Carcass Management Desk Reference Guide[8] and consultation with USDA recognized Subject Matter Experts (SMEs) involved in the emergency management and disposal of infected materials.

Composting and Materials Management

- **Bulk material staging location**: Adequate access to the selected site from the road is needed for heavy trucks and equipment. Adequate space is required to stage carbon sources before being blended into windrows. Wood chips and sawdust are the preferred carbon source/bulking agents.
- **Building windrows**: Adequately sized equipment is necessary to build proper windrows of composting material. A minimum of 24 inches of carbon material (wood chips/ sawdust/etc.) should be placed underneath any animal mortality, manure, etc. The mortalities, manure, etc. should be adequately blended with the proper amount of source bulking agent (wood chips or sawdust) to correctly construct windrows. A carbon cap of several inches should be placed on top to complete windrow construction. Keep the windrow structured in a “conical shape” to shed rainfall and prevent ponding on the windrow top that would allow more rainfall penetration into the windrow.
- **Recording temperatures and moisture content:** Temperatures of the composting materials should be taken daily with a properly sized compost temperature probe. Depending on the length of the windrows, temperatures should be taken somewhere between every 10 - 30 feet and recorded. The USDA SME should be made aware of recorded temperatures to confirm destruction of any applicable viruses or pathogens and to help determine when windrows need to be turned. Moisture content of the composting materials should be assessed daily using a probe to determine the average moisture content of each windrow. Moisture content data should be recorded and shared with the SME to help determine if the windrow should be turned and/or if water should be added to the windrow.
- **Nutrient management:** Outdoor composting that is not performed on an impermeable surface should occur on appropriately sited cropland so that nutrients can be removed through crop production after the compost is removed from the site. After a site is utilized for mortality composting, no other mortality composting can occur on the same location for at least 10 years.
- **Turning windrows outside:** Consulting the USDA SME, the farm can determine when to turn the windrows to oxygenate the composting materials. Proper and adequately sized equipment is necessary to oxygenate the windrows and reduce the amount of potential leachate created. Operations outside have more options for turning due to having more available space. The most ideal operation will turn

[8] https://www.aphis.usda.gov/animal_health/carcass/docs/disposal-guide.pdf

the windrows quickly and then re-cover the windrow with a carbon blanket (like sawdust) as quickly as possible. MDARD and EGLE recognize this as the preferred and recommended method to be used.

- **Pathogen kill and finishing compost:** Composting should be continued until the USDA SME has determined any applicable viruses or pathogens have been eliminated, AND the organic materials have been completely broken down and cured into a mature compost. The best management practices in this guide should be followed until both processes are complete.
- **Finished compost utilization:** Finished compost determined by the USDA SME to be free of the any viruses and any other potential pathogens of concern may be utilized by the farm in normal farm operations in accordance with Generally Accepted Agricultural and Management Practices (GAAMPs).[9] If the farm is unable or does not wish to utilize the finished compost, the compost may be moved off-site (outside of farm operations) to be properly utilized provided the compost has been tested for nutrients and standard compost testing parameters. An example of recommended basic testing parameters can be found at EGLE Compost.[10] Contact EGLE and MDARD representatives for more information on compost utilization.
- **Landfill disposal**: If infectious materials from the farm cannot be composted, the farm must identify a landfill willing and able to take the waste materials. The waste materials should be double bagged in sealable bags approved by the USDA SME before being transported to the landfill. At the landfill, the bagged materials should be immediately buried and covered within the landfill (like asbestos disposal). Please refer to The 2017 USDA Emergency Carcass Management Desk Reference Guide and the USDA SME for more information.
- **Composting documentation**: Provide a record-keeping form for the operator to use listing, at a minimum, the date, amounts and types of material added, compost temperature, weather conditions, and actions taken to manage the compost. Monitoring may include but is not limited to:

    a. Compost Mix: Build a compost mix encouraging aerobic microbial decomposition and avoiding nuisance odors. Blend feedstock, build the compost pile, and handle the compost mix to develop a porous structure for uniform aeration during composting.

    b. Carbon:Nitrogen Ratio: The recommended Carbon:Nitrogen ratio of the initial compost mix is between 25:1 and 40:1. Compost with a lesser Carbon:Nitrogen ratio can be used if nitrogen mobilization and odors are not a concern. If the Carbon:Nitrogen ratio is above optimal, the composting process will be slower

    c. Carbon: If needed, store a dependable source of carbonaceous material with a high Carbon:Nitrogen ratio for mixing with nitrogen rich waste materials. Minimize odors and ammonia volatilization by blending sufficient carbonaceous material with the nitrogenous material (Carbon:Nitrogen ratio).

    d. Bulking Materials: Add bulking materials such as wood chips or sawdust to the mix as necessary to enhance aeration. The bulking material may be the carbonaceous material used in the mix or slowly degradable natural organic material or a nonbiodegradable or slowly degradable material salvaged at the end of the compost period for reuse in additional composting cycles. Make provision for the salvage of any nonbiodegradable or slowly decomposing material used in the composting process.

    e. Moisture Level: Maintain adequate moisture in the compost mix throughout the compost period within the range of 40 to 60 percent (wet basis). Prevent excess moisture from accumulating in the compost. This may require the pile to be covered and/or turned. Consult the USDA SME before turning.

[9] https://www.michigan.gov/mdard/environment/rtf/gaamps
[10] https://www.michigan.gov/egle/about/organization/Materials-Management/composting

f. Temperature of Compost Mix: Manage the compost to attain, and then maintain, the target internal temperature for the duration required eliminate any applicable viruses or pathogens and to meet the desired compost product. Closely monitor temperatures above 165°F. Temperatures that are too high will inhibit the composting process by destroying the thermophilic bacteria. Act immediately to cool piles that have reached temperatures above 185°F to prevent spontaneous combustion.

g. Turning/Aeration: Schedule the turning/aeration frequency to attain the desired amount of moisture removal and temperature control appropriate for the composting method used while maintaining aerobic degradation. Consult the USDA SME before turning.

h. Odors: If initial compost mixing and compost pile structure do not provide adequate odor reduction, strategies may include altering the recipe to add more carbon, modifying the moisture content, modifying the pH by applying a material compatible with compost quality and with any specifications for its end use (e.g., certified organic), or use a biological inoculant.

Additional Resources

- The 2017 USDA Emergency Carcass Management Desk Reference Guide: https://www.aphis.usda.gov/animal_health/carcass/docs/disposal-guide.pdf
- The EGLE Compost Operator Guidebook: https://www.michigan.gov/egle/-/media/Project/Websites/egle/Documents/Programs/MMD/Compost/Operator-Guidebook.pdf
- The Composting Handbook, https://compostfoundation.org/composting-handbook/
- Carcass Composting-A Guide to Mortality Management on Michigan Cattle Farms (E3197), https://www.canr.msu.edu/resources/carcass_composting_a_guide_to_mortality_management_on_michigan_cattle_farms