



# AEM Tier 2 Worksheet

## Livestock Odor Management

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### Glossary

**Airshed:** An area of impact downwind from a source that is variable in size and location, depending on conditions. The area generally depends on the direction of prevailing winds, the concentration and characteristics of the source, and the dispersion downwind.

**Anaerobic Digestion:** An treatment process using bacteria to decompose organic matter to methane in the absence of oxygen. The resulting effluent is vastly reduced in odor.

**Covered waste storage:** Providing an impermeable cover to waste storages with a flare to incinerate the gases, this reduces odors from storages.

**Earth storage basin:** A facility to hold animal wastes constructed out of appropriate soil. The sides are sloped, giving a larger surface area to volume ratio.

**Heavy Use Area (HUA):** Areas where animals are concentrated, including those that are paved, un-vegetated or result in overgrazed or denuded soil conditions. Also called barnyards, holding areas, sacrifice areas, confinement areas, calf hutch areas, feedlots and winter paddocks.

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### Background

**Odors:** With the trends of larger and more concentrated farms, more nonfarm rural residents unfamiliar with agriculture, and more waste storage systems, farms are coming under increased scrutiny from neighbors regarding odors. Odor is one of the major sources of conflict between livestock producers and the general public. Presently, there is no low cost, complete and easy way to control odors from waste.

Not all people are equally sensitive, nor do they always agree to the severity of an odor once it is detected. People unfamiliar with agriculture who move into rural areas may not tolerate as much odor as a neighboring farmer. Surveys indicate that farmstead appearance can influence how odors are perceived. More attractive farms generate fewer complaints.

The further the odor source is from homes, public use areas, or businesses, the lower the risk of an odor complaint. Neighbors located at lower elevations can be subject to air drainage during still nights and can be surrounded by odiferous air.

The land application of waste from livestock and poultry facilities is the most frequent source of odor complaints from the public. Injecting or incorporating waste, where feasible, will significantly reduce odor emissions from land application. In addition, early morning spreading and consideration of neighbors by avoiding spreading on weekends, holidays, and special events can help reduce the risk of generating neighbor complaints.

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### AEM Principle:

While reducing the potential for water quality problems, it is important that farms consider odor impacts for neighbors or those living in the airshed.

## Glossary Continued...

**Manure ridges:** Manure pushed up from barnyard cleaning operations that escape under the fence, forming lateral piles of decaying solids that potentially will create odors, pollute surface or ground water and provide fly larvae habitat.

**Structural waste storage:** A facility to hold animal wastes constructed out of metal, concrete, or wood; usually with vertical sides and no roof.

**Windbreak:** Linear plantings of multiple rows of trees and/or shrubs.

## Background Continued...

**Gases:** Good ventilation of farm buildings and controlled access to confined spaces is critical to avoid discomfort, injury, or death. Outside the farm buildings these gases disperse and become less detectable. The gases in Table 1, while occasionally produced in quantities that can affect the health of people or animals in the barn, rarely affect the health of people or animals outside the barn. Ammonia and hydrogen sulfide are often the ones measured to regulate odor control but seldom are the source of the main odor detected off-site. Over 160 gases have been identified that may be produced from manure. Many of these cause odors even in very low concentrations. There is a growing concern that ammonia produced from agricultural operations can add to smog and acid rain as well as redeposit as a nutrient on water surfaces, adding to eutrophication.

Table 1. Common gases from decomposition of livestock wastes.

<b>Gas</b>	<b>Toxicity</b>	<b>Odor</b>	<b>Density</b>
Hydrogen Sulfide H <sub>2</sub> S	Toxic at 500 - 600ppm, causes respiratory paralysis, loss of consciousness, and death.	Rotten egg odor detectable at 100 ppm often deadens sense of smell at higher concentrations	Heavier than air
Methane CH <sub>4</sub>	Nontoxic, but high concentration limits oxygen supply, explosive at certain concentrations.	Odorless	Lighter than air
Ammonia NH <sub>3</sub>	Mildly toxic, irritates eyes, nose and throat above 25ppm.	Odor of smelling salts	Lighter than air
Carbon Dioxide CO <sub>2</sub>	Nontoxic, but high concentration limits oxygen supply.	Odorless	Heavier than air

This worksheet is divided into general questions (page 4) followed by the on-farm areas that potentially can impact neighbors with odor issues: animal housing (page 5), heavy use areas (page 6), land application (page 7), liquid waste storage (page 8), and solid manure storage (page 9).

<b>AEM Tier 2 Worksheet: Livestock odor management: General</b>		<b>Potential Concern</b>			
<b>Factors Needing Assessment:</b>	<b>Lower 1</b>	<b>2</b>	<b>3</b>	<b>Higher 4</b>	
<b>What are the procedures for neighbor relations and considerations?</b>	Neighbors are made aware of seasonal activities that may produce odors; complaints or inquiries are always addressed in a timely fashion. Farm owner/manager is engaged in the community.	Most neighbors approached about odorous activities; complaints are addressed, but acted upon slowly.	Some neighbors approached about odors; complaints are largely unaddressed, and seldom acted upon.	Neighbors are not notified in advance of odorous activities (applications), neighbor's complaints or inquiries have gone unanswered. Farm owner/manager is not engaged with community.	
<b>What is the appearance and public/neighbor perception of the farm and its operation?</b>	Topography and vegetation visually screen the facility. <b>OR</b> Appearance of facilities is well maintained. Manure piles are well hidden from view; site is neatly landscaped and well groomed.	Partial screening. <b>AND</b> Facilities appear well maintained. Manure piles and other odor sources are generally hidden from public view.	Manure piles and other odor sources are partially hidden from public view.	Facilities do not appear clean and organized. Manure piles or other odor sources are in plain view of the public.	
<b>Are windbreaks used to reduce odors and screen views?</b>					
<b>Has a Comprehensive Nutrient Management Plan (CNMP) been developed, implemented and kept up to date?</b>					
<b>How clean are the animals?</b>					

<b>AEM Tier 2 Worksheet: Livestock odor management: General</b>		<b>Potential Concern</b>		
<b>Factors Needing Assessment:</b>	<b>Lower 1</b>	<b>2</b>	<b>3</b>	<b>Higher 4</b>
<b>What is the relative odor risk associated with the type of waste handling/ storage/ treatment system used?</b>	Anaerobic digester or other treatment system is included with any waste storage. OR Composted waste storage. OR Waste is stored for less than one week before land applied or exported offsite. OR Properly covered waste storage with an operating flare.		Partially covered waste storage. OR Open lot runoff holding pond. OR Dry waste storage where liquids are separated and drained to separate storage or absorbed by bedding.	Uncovered structural waste storage, or earthen storage basin.
<b>Is waste or spilled feed allowed to accumulate?</b>				
<b>Are mortalities properly composted or disposed?</b>				
<b>Is trash properly disposed of without burning?</b>				
<b>Will expansion, or potential changes create additional odor production, for example, changes from daily spread to storage?</b>				
<b>Is silage spoilage minimized? Does spoiled silage accumulate?</b>				
<b>Does silage leachate pond or is it stored?</b>				

AEM Tier 2 Worksheet: Livestock Odor Management: Animal Housing		Potential Concern		
Factors Needing Assessment:	Lower 1	2	3	Higher 4
What are the characteristics of the drainage around animal housing facilities?	A well-drained site.			Poorly drained site. Water ponds for several days after rain.
Are waterers inspected and repaired to control leaks?				
What is the quality of ventilation inside the barn?	Well ventilated			Poorly ventilated
How is manure controlled, collected and handled?	All solid manure is contained within housing and not allowed to collect around animal housing. <b>AND</b> Properly composted.	Liquid manure handled and collected with no pools. <b>OR</b> Handled as a solid	Some liquid manure occasionally pools or accumulates in and around the animal housing.	Liquid manure regularly pools or accumulates in and around animal housing.
What is the frequency of manure and waste feed removal?	Manure is removed from a facility at least once a day. <b>OR</b> Animals are heavily bedded to maintain dry conditions.		Weekly.	Less than once per week.
Is silage leachate low flow added to an under barn storage?				

<b>AEM Tier 2 Worksheet: Livestock Odor Management: Livestock Heavy Use Area (HUA)</b>		<b>Potential Concern</b>			
<b>Factors Needing Assessment:</b>	<b>Lower 1</b>	<b>2</b>	<b>3</b>	<b>Higher 4</b>	
<b>Is the HUA well-drained?</b>	The HUA is sloped to limit ponding and the surface is smooth.			Ponded liquid exists in barnyard depressions.	
<b>Is the barnyard area sized as small as possible? (See Livestock Heavy Use Area Worksheet)</b>					
<b>What is the HUA surface?</b>	HUA surface is concrete.		HUA surface is soil treated with stabilizer, or constructed of firm stable soil.	HUA soil is easily erodible and prone to rills, gullies, and potholes and therefore difficult to clean.	
<b>Is the HUA cleaned completely?</b>	HUA condition allows complete manure removal. Curbs are installed to assist clean-up.			HUAs are irregularly shaped and not conducive to complete manure removal.	
<b>How often is the HUA cleaned?</b>	Daily.	Periodically during the week.	Weekly.	Monthly.	
<b>Are there manure ridges at fence lines or manure piles?</b>	Curbs are installed to assist in scraping. Manure ridges and piles do not form.			Removal of manure ridges or piles is not a priority.	

<b>AEM Tier 2 Worksheet: Livestock Odor Management: Land Application</b>		<b>Potential Concern</b>		
<b>Factors Needing Assessment:</b>	<b>Lower 1</b>	<b>2</b>	<b>3</b>	<b>Higher 4</b>
<b>Does your waste spreading plan take into account field specific neighbor impacts from odors?</b>				
<b>What is the timing of waste application?</b>	Waste is applied on weekdays in the early morning. Holidays and local special events are avoided.	Waste is applied in the early morning.	Waste is applied in the afternoon.	Waste is applied on weekends and holidays and during the late afternoon when the air is warm and stagnant.
<b>Is spreading equipment kept clean?</b>				
<b>Have you considered application equipment that applies waste closer to the ground?</b>				
<b>Is waste incorporated?</b>	Waste is immediately and completely incorporated.	Tillage, timing, and amount are used to facilitate waste movement into the soil on crop and/or hay fields.		Waste is never incorporated.
<b>Are records of waste spreading kept?</b>				
<b>Do you use a big gun to irrigate waste and if so, do you limit application to when the wind is less than 5 mph?</b>				
<b>Is waste spread evenly and at rates such that it dries quickly?</b>				



AEM Tier 2 Worksheet: Livestock Odor Management: Liquid Waste Storage		Potential Concern		
Factors Needing Assessment:	Lower 1	2	3	Higher 4
What are the characteristics of the waste surface in the waste storage?	Waste inlet pipe is below liquid surface <b>AND</b> Stored waste forms undisturbed crust over the entire surface, <b>OR</b> Waste is held in enclosed waste storage tank <b>OR</b> Completely covered year round with crop residue, plastic membrane or other type of cover, <b>OR</b> Surface aeration maintains oxygen concentration of 1 mg/liter or greater.	Waste inlet pipe is below liquid surface <b>AND</b> Crust forms over only part of storage surface due to regular agitation, wind or other factors, <b>OR</b> Crop residue cover is in place at least six months of year during periods of greatest odor concern.		Waste surface is exposed and does not form a crust.
Is the waste storage surface visible by neighbors or from the road?				
What is the amount and timing of agitation during emptying?	No agitation used during storage emptying. *Samples are taken to determine concentrations as waste storage is emptied to ensure proper nutrient application.	Storage is agitated by stream of waste directed below waste surface. <b>AND</b> Timing of agitation is done to avoid weekend odors.		Storage is aggressively agitated by stream of waste directed above waste surface <b>AND</b> Timing of agitation to avoid weekends is not considered.

AEM Tier 2 Worksheet: Livestock Odor Management: Solid Manure Management		Potential Concern		
Factors Needing Assessment:	Lower 1	2	3	Higher 4
How are manure pile areas (MPA) managed?	Designated manure pile area is used infrequently.	MPAs are avoided for most of year and collected manure is directly land applied. <b>OR</b> MPAs are located in remote areas, away from neighbors. All precipitation and seepage drains away from manure pile. <b>AND</b> MPAs are removed at least once a year.		Manure piling often occurs near public roads or neighbors <b>OR</b> Precipitation and seepage pools in vicinity of manure pile.
How is composting managed?	Only manure or residues (less than 70% moisture) are stockpiled or composted.			Wet manure or residues (over 70% moisture) are commonly stockpiled or composted.
<p>Benefits to other resources can also be possible while working toward improved water quality. Taking stock of how existing and future management affect <b>soil, water, air, plants, animals, energy, greenhouse gases, people, and economics</b> can result in more effective plans and additional benefits to farms and communities both now and into the future.</p> <p><b>Additional Comments:</b></p>				