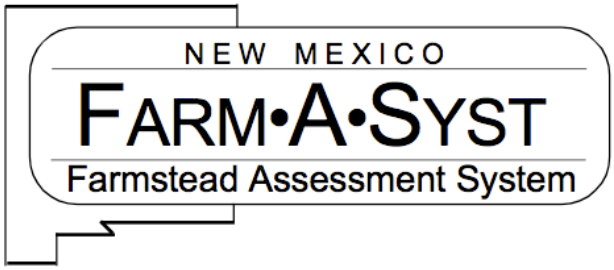
Fact Sheet #7

Reducing the Risk of Groundwater Contamination by

Improving Livestock Waste Storage



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Improving Livestock Waste Storage

Storage of livestock wastes involves simply accumulating wastes in some type of structure until the wastes can be land applied. From an environmental standpoint, this waste storage can be either positive or negative.

Manure storage can provide environmental benefits by allowing wastes to be stored until they can be safely spread, incorporated in the soil and used by a growing crop. The environmental safety of collecting large amounts of manure in one place for an extended period depends on three things:

1) the design and construction of the storage facility
2) the proper land application of the manure once it leaves the storage facility
3) the physical and chemical characteristics of: the soil and subsurface geologic materials within the storage area; and the soil and subsurface geologic materials of the area to which any runoff might flow

Waste storage is an important management option available to livestock producers. Stored manure can be applied to the soil at those times of the year when crops are not actively growing and the soils are open. This allows manure to be injected or incorporated by tillage immediately following application. Handling manure in this way ensures the farmer of the maximum fertilizer value from the waste materials, while reducing risks of groundwater and surface water contamination from the over-application of nutrients.

Stored manure can easily be sampled and tested to determine how much nitrogen, phosphorus and potassium it contains. (When sampling manure, be sure to obtain as representative a sample as possible.) This information, combined with a knowledge of the amount of manure applied per acre, enables a farmer to determine whether additional commercial fertilizer is needed to meet realistic crop production goals.

1. Long-term storage

Livestock wastes can be stored either in solid, semi-solid or liquid states.

- Solid facilities use walls and slabs for stacking of heavily bedded manure.
- Semi-solid facilities use pumps to move manure into containment areas and may separate solids from liquids.
- Liquid facilities hold manure in tanks, pits or bermed areas.

Liquid and semi-solid storage systems are self-contained. Groundwater contamination can occur if the facility is not structurally sound, allowing waste materials to seep into the soil. A threat to surface water exists if pits are not emptied frequently enough, allowing wastes to flow over the top of the structure. Liquid storage systems require the use of pumps and pipes for moving wastes from the barn to the storage structure. These must be carefully installed and maintained to ensure that they do not leak.

For glossary, see Worksheet #7.

Each time they are emptied, carefully check **steel and concrete structures** for cracks or the loss of watertight seals. If any breaks are apparent, repair them immediately. Likewise, check the walls of **earthen waste storage pits** to be certain that liner materials have not been eroded away by pit agitation.

After a period of years, freezing and thawing, as well as wetting and drying, may cause the sidewalls of earthen pits to crack and erode, allowing wastes to seep into the underlying soil or subsurface geologic material. Earthworm channels can also allow wastewater to move through the liner. Groundwater contamination will result if the subsurface materials do not have sufficient ability to break down contaminants contained in the leachate. Evidence suggests that the design life for earthen pits is probably 10 years.

While seepage from in-ground waste storage facilities is not always easy to recognize, there are some tell-tale signs:

- A properly designed structure has the capacity to handle wastes from a specific number of animals for a known number of days. If a pit designed for 180 days of storage and receiving designated waste amounts has not needed pumping for a year, the pit is almost certainly leaking.

- Evaporation from liquid storage pits is minimal, particularly with manure from dairy cattle, which forms a crust when it is stored. If additional liquids have to be added before the pits can be agitated and pumped, they may be leaking. (Monitoring wells installed around the pit upslope and downslope would be required to confirm the seepage.)

Some facilities for storage of solid or semi-solid manure are designed to allow seepage from the waste stack. In these instances, structure design must include treatment for the wastes that seep out. If conditions allow, structures such as picket dams can be used to hold back solids, and grass filter strips help remove remaining pollutants in runoff water. These systems should not be considered on sites with coarse-textured soils, creviced bedrock or shallow water tables. Care must be taken to ensure that the system is not overloaded.

Both systems require maintenance. With grass filter strips, it is important to ensure that the highly concentrated wastes do not "burn" vegetation in the filter strip. (A thick, healthy stand of vegetation allows runoff to seep into the soil and uses the nutrients in the water.)

The best way to handle seepage is to channel it into a watertight holding pond or storage tank. In those areas where sufficient soil is unavailable for the construction of filter strips, or where the construction of a holding pond is not feasible, another option is to build a roof over the structure to eliminate additional water being added to the manure stack. Roofed storage systems require adequate bedding to absorb and retain the liquid portion of the waste.

2. Short-term storage

Short-term storage (usually 30-90 days) is an important option available to farmers. It allows them to hold livestock wastes during periods of bad weather when daily spreading may not be feasible, when crops are growing and land is not available for applying manure, or when there is a shortage of crop acres to handle daily hauling and spreading of manure without the threat of runoff.

Short-term storage, which is restricted primarily to solid manure, has the disadvantage of requiring that the manure be handled twice. Designs are available, though,

for **structures for short-term storage** that facilitate handling and provide effective protection for surface water and groundwater.

Short-term storage systems may be applicable for those farmers who often find themselves having to **stack manure in fields,** particularly during periods of bad weather. This is not a recommended practice. No matter how it is done, it poses a contamination threat to surface water and groundwater. If manure is frequently stacked in fields, it might be appropriate to consider constructing a short-term storage facility.

Likewise, many farmers will scrape manure into **piles in the livestock yard** rather than haul it during bad weather or busy work periods. This practice is not recommended either, because of possible herd health problems and water problems. The severity of those problems depends on characteristics of the livestock yard area where the manure is piled and the area to which runoff flows.

Many farmers have **open housing** for young stock, such as pole sheds, where wastes are allowed to accumulate for extended periods of time. Roofs on these structures keep rain and snow off the manure. These structures are relatively safe for water quality if they are protected from surface water runoff, and if adequate bedding is provided to absorb liquids in the wastes. To minimize water quality impacts, provide adequate bedding to reduce seepage and clean these sheds as frequently as possible.

3. Waste storage location

The location of livestock waste storage in relation to any well is an important factor in protecting the farm water supply. New Mexico Water Supply regulations (part 1, Sec. 110, c, 1&2) states that private wells must be 100 feet from cattle yards and existing or potential pollution sources, such as liquid waste absorption systems, or liquid waste treatment units. Public wells must be 200 feet from these sites.

> Minimum separation distances regulate new well installation or the distance from existing wells to new waste storage facility construction. Existing wells are required by law only to meet separation requirements in effect at the time of well construction. Make every effort, however, to exceed "old regulations," and strive to meet current regulations whenever possible.
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> Observing these separation distances when siting a new facility is a good way to help protect your drinking water. Locating manure storage facilities downslope from the well is also important for protection of your water supply. (For more information about separation distances, and how the condition of your well might affect the potential for contamination, see Worksheet and Fact Sheet #1, *Drinking Water Well Condition*.)
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> While observing these well separation minimum distances may be helping to protect your own well, poorly designed or poorly maintained livestock waste storage facilities could still contaminate the groundwater that supplies other local drinking water wells. Protecting the groundwater resource as a whole can help protect your neighbors' wells, as well as possible drinking water supplies for future generations.

Depth to seasonal high water table or fractured bedrock, along with soil type at the waste storage location, is another important factor. These are among the site vulnerability characteristics in Worksheet #11, *Site Evaluation.*

Depth to water table is sometimes available in the county soil survey, but this varies from county to county. Your district NMED, Soil Conservation Service, or county Extension office may also be able to help you gather this information.

4. Other management factors

Several New Mexico regulations govern animal waste activities. WQCC reg. 2-201 prohibits disposal of refuse into a watercourse or in a manner that might reach a watercourse by leaching or other means. WQCC reg. part 3 controls discharges onto or below ground in order to protect ground water quality. Ground water discharge permits are issued under this regulation. A permit is required for, among other things, discharges of nitrogen above 10 mg/1. WQCC reg. 1-203 governs the reporting, and cleanup of an unanticipated discharge (spills) from storage facilities, and corrective measures to prevent subsequent spills.

Feedlot, dairy, and other confined animal feeding operations may also be subject to federal NPDES permit requirements.

5. Abandoned pits

Abandoned waste storage pits, especially earthen ones, can pose significant water quality problems. Any abandoned structure should be completely emptied. In the case of earthen waste storage facilities, liner materials (to a depth of about two feet) should be removed and spread over croplands. The remaining hole should be filled and leveled. Manure packs from pole sheds no longer in use should also be removed and the wastes land applied. If manure is stacked in fields, it should be removed as soon as conditions permit.

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