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Supplemental Manure Spreading Guidelines to Reduce Water Contamination Risk During Adverse Weather Conditions

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Executive Summary

- Depending on conditions in the field, manure spreading can cause water quality problems and has resulted in DEC action and a fine to one New York Concentrated Animal Feeding Operation (CAFO) in 2004.
- DEC may take action if staff observe "gross water quality violations" caused by farm practices that can be traced to the source, *even if the practice was in compliance with the Comprehensive Nutrient Management Plan (CNMP) of the farm.*
- While following a CNMP *will not* prevent manure runoff in all possible circumstances, careful management should reduce risk.
- Producers and planners are encouraged to consider the following to reduce risk of major runoff leading to a water quality violation:
    - Identify lowest risk fields for spreading as a last resort (e.g. in cases where storage is full, etc.).
    - Before spreading, especially during wet or snowy periods, evaluate runoff potential along with other management needs: soil wetness, weather forecast for rainfall or snowmelt, presence of diversion or field ditches and drainage tile, rate per acre and total amount of manure to be applied.
    - When conditions for runoff are high, consider delaying the application, reducing rate/acre, reducing the total amount applied, and/or applying smaller amounts of manure over a period of days rather than hours.

Why Supplemental Guidelines?

Manure is routinely applied to agricultural fields. Land application of manure is the most cost-effective and generally accepted method for handling and removing manure from animal housing facilities. Without storage facilities, manure may need to be land applied at times when there is higher risk for runoff and nutrient losses and little crop uptake of the nutrients. However, even with storage, manure may need to be applied under adverse conditions in order to manage the storage facility within acceptable levels.

In order to reduce the risk of manure nutrients being transported to surface or groundwater, nutrient management planning tools have been developed. For example, the New York Phosphorus Index (NY PI) was designed to reduce soil P accumulation near transport sensitive areas, and to estimate relative runoff risk of dissolved and particulate phosphorus from

manure or fertilizer spreading activities. This assessment is based on various field attributes and the likelihood of runoff occurring during a certain time of year. The NY PI evaluates spreading suitability in any given season or month based on historical averages (location risk), but it does not consider the actual conditions on the ground for any given day (present conditions risk). The New York Nitrate Leaching Index (NY NLI) was similarly developed to evaluate the nitrate leaching risk based on long term precipitation averages and general soil drainage characterization (expressed as hydrologic group). **These planning tools are risk *indicators*, and were not developed to *quantify* actual manure or nutrient movement (e.g, wash off) during runoff events, or losses of pathogens, etc.**

Though rarely enforced in agriculture, under New York State law a surface water quality violation occurs when human activities cause "substantial visible contrast with natural conditions" (ECL 17-0501). In the winter of 2003-04, DEC took enforcement action on a farm where it was determined that a "gross" water quality violation resulted from manure spreading, even though no fish were killed, *and even though the spreading plan met NRCS 590 standards and allowed for manure to be applied on that field, at that rate, during that time period*. The violation stemmed from application of the total annual field allowance on a moderately sloped field, nearby to a stream, during the winter, when heavy rains were predicted. This citation was a clear sign to all producers and planners that following a CAFO plan does not prevent an enforcement action when actual water quality violations occur.

The water quality violation enforcement mentioned above indicates that planners and producers could use additional guidelines to evaluate existing field conditions and to improve manure spreading decisions. Significant rainfall or snowmelt events contribute a substantial portion of the nutrient and sediment load to water bodies and where these conditions can be anticipated, producers should strive to not apply the manure or to reduce runoff risk through careful management. The supplemental guidelines were developed to describe conditions that reduce allowable manure application and to introduce the concept of CNMPs identifying fields that are safer for manure application or stockpiling when conditions are less favorable.

There are many situations where some discoloration of nearby surface water is unavoidable, especially when rainfall closely follows manure spreading or tillage practices. The guidelines below are provided to help evaluate high risk manure spreading conditions where extra care is required. These guidelines are suggested to address DEC concerns and to help producers better address the present conditions and answer the following basic question: ***"Given the current soil and ground conditions and the weather forecast, should manure be applied to all or part of this field today?"***

Supplemental Spreading Guidelines

There are ten factors to evaluate before spreading at any point in time that can be divided into three groups: (1) weather conditions; (2) field conditions; and (3) manure application management. Each will be addressed below.

Weather Conditions:

1. *Forecast shows probability of precipitation? When? How much?*
   Weather forecasts for 24 to 48 hours out are quite accurate with respect to the probability of precipitation. If the probability is 30 to 50% or more, it is quite likely some precipitation will

occur. This is particularly true when the precipitation is expected to occur from a wide-area low front type storm, compared to 'isolated' thundershowers. Unfortunately, forecasting how much rain will fall is more difficult and predictions tend to be less accurate, although significant improvements have been made in recent years. If the expected precipitation amount is 0.25 inches or less, there is usually little risk of runoff, even from wet and frozen soils. Precipitation amounts of 0.25 to 0.5 inches will produce some runoff from wet soils, but not much from soils that have high infiltration capacities providing they aren't already in a saturated or frozen condition. It is difficult to simplify the runoff risk for different soil and site conditions when precipitation exceeds 0.5 inches, but it would be a good idea to try to avoid manure applications when amounts are expected to exceed 1 inch.

2. *Warm front expected to generate significant snowmelt?*
   Warm fronts can occur at anytime throughout the winter and the likelihood of generating runoff from snowmelt increases quickly when the temperature approaches about 40°F for 6 hours or more. An older snowpack will require a high(er) temperature or longer duration to produce runoff. If nighttime temperatures also remain above freezing, the runoff risk is higher. It's a good idea to evaluate fields for manure spreading when snowmelt occurs. The most risky runoff locations within a field are soon exposed because the snow cover tends to disappear more quickly where the runoff is occurring.

Field Conditions:

3. *Soil moisture/saturation, % of field capacity, frozen or not:*
   The soil drainage classification is probably the best general soil index to evaluate soil moisture status during the winter months. The poorly drained soils will be the wettest throughout the soil profile. These soils are somewhat slower to freeze and tend to generate the first runoff. Larger 4-wheel drive equipment and drainage improvements may make these soils accessible for spreading manure, but the runoff risk will be greater.

4. *Ground cover (vegetation, residue cover, and roughness):*
   A good ground cover intercepts rainfall and reduces the tendency for runoff water to move quickly across the surface. Ground cover and vegetated buffers help to trap and filter suspended manure particles and soil.

5. *Slope and slope length:*
   The risk for runoff is not necessarily greater for steeper slopes because it is more dependent on the soils infiltration rate. Runoff risk on sloping soil will be greatest, however, for soils with a low infiltration rate or when soils are frozen. Slope length is usually not a good indicator of runoff risk but manure applications made at the top of a long slope should be less risky than those made at the top of a short slope, especially when good ground cover is present. The risky locations to apply manure on sloping soils are usually at the base of concave slopes where water often emerges.

6. *Drain tile, surface inlets, ditches, etc.:*
   By their very nature these are hydrologically active areas and the NRCS nutrient management standard calls for setbacks to be put in place around surface inlets, ditches, etc., when there is a direct surface connection. These setbacks are especially important when

spreading under wet conditions. Spreading manure near and upslope of surface ditches that go across the slopes (i.e., those which intercept water) will be more risky than where ditches tend to run parallel with the major slope. Spreading manure on fields that have tile drainage, especially those which are installed in soils that exhibit preferential flow (tending to have more clay), and when the tiles are flowing and discharge directly to a watercourse, is risky.

7. *Nearby surface water:*
   Higher risks are experienced where surface runoff from a field is expected to flow directly to a stream or waterbody. This is most likely to occur in fields that are both close to surface water and where the field surface is oriented toward the waterbody.

Manure Application Management:

8. *Manure consistency:*
   Liquid manure is more likely to move across the surface as runoff or through soil to tile lines, depending on conditions. Semi-solid or bedded pack manure is somewhat less risky in many conditions.

9. *Method of application:*
   Manure that is surface applied presents a higher risk because the material is less able to mix and react with soil. An enriched layer of manure on the soil surface increases runoff risk. Where acceptable from a soil erosion control and groundwater protection standpoint, manure may be injected or incorporated to reduce runoff risk.

10. *Application rate and total spreading volume:*
    An operation spreading 3 or 4 tons of manure each day over time does not present the same level of risk as one that may spread many days worth of manure in one or two days. High rates of liquid manure applied over many acres at the same time can be very risky in some conditions.

Watch Out and be Prepared for These

High risk spreading conditions are more likely when one or more of the following conditions exist:

1. Significant rainfall or snowmelt is predicted within 24-48 hours.
2. Soil is frozen, snow covered or saturated [Comment; deep (>8 in.) snow cover may not be all that risky because snow captures the material in the pack, and melts off the bottom].
3. Tile drains are flowing at least moderately from field drainage (as opposed to ground water interception).

Under the conditions above, extra precautions must be taken on fields, or parts of fields, with the following characteristics:

1. Significant surface runoff or subsurface flow can reach a stream or ditch.
2. Orientation toward a stream or watercourse and slope is greater than 3-5%.
3. There is little or no ground cover from crop residue, sod or cover crop.

Take Home Message

In high risk conditions, producers should work with the CAFO planner to adjust the manure spreading date, rate and method to account for the increased risk, even if the P index evaluation allows spreading during that part of the year. Spreading in these conditions should occur on lower risk fields or parts of fields. In situations where this is not possible, precautions include: reducing application rates, introducing or increasing setback distance, and/or applying manure over a period of several days as opposed to all in one day. As conditions of risk increase, application rates need to be reduced further and other safety measures need to be applied in proportion to the increased risk. Planners should strive to identify lower risk fields for high risk spreading conditions and producers need to work closely with planners to develop a sound spreading plan in these conditions.

CNMP's should include the identification of a field or two where, under extreme conditions such as full storage, manure can be temporarily stored or over-applied. Wherever possible, these fields should be less than 5% slopes and as far as practical from any stream or ditch, preferably at least 500 feet.

Predicting weather is tricky business, and these guidelines will not prevent runoff. Increasing awareness of the conditions that contribute to runoff and shifting plans accordingly should reduce the possibility of causing a water quality violation. Producers and planners should carefully evaluate existing storage capacity to determine if manure management options can be improved during periods of significant rainfall or snowmelt.