CONFINED ANIMAL OPERATIONS
- MINNESOTA MANURE MANAGEMENT REGULATIONS

Patricia Burford

URS New Zealand, 13-15 College Hill, Auckland 1011

Introduction

The state of Minnesota (MN) has regulated the management of confined animal feeding operations (CAFOs) since the 1980s with expansion of the programme in 2000 to include comprehensive requirements for manure management. This paper provides some of the consenting and manure management planning requirements of the regulations with a focus on controls put in place to protect surface waters from contaminants associated with runoff from areas manure has been land applied. It does not address the rule requirements for siting, design, containment of runoff from feedlots or feed pads or the requirements for feed storage.

Background

MN is a state with many similarities to New Zealand. It has a large agricultural economy, has a population of about 5 million people and, although landlocked, has vast amounts of fresh water with over 12,000 lakes, 148,000 km of streams/rivers and 3.8 million hectares of wetlands. MN also has more than 30,000 registered feedlots, ranging in size from small farms to large-scale commercial livestock operations. These include dairy, swine, poultry and beef operations. Manure management from these feedlots is important for protection of MN's vast freshwater resources. When referring to manure in this paper it is important to note that this also includes all process wastewaters from the feedlot operations such as milk house waste.

"MN Rules Chapter 7020, Animal Feedlots" (feedlot regulations) were promulgated in 2000 following USEPA changes to federal feedlot regulations. Although there were regulations in place in MN prior to this, the current regulations are comprehensive in terms of requirements for manure management. The programme is also well staffed with state and local county feedlot officers working together to implement and enforce the same regulation. Roles are clearly defined with state regulators providing specialist technical input and resources (soil scientist, engineers, training, etc.) for the county feedlot staff.

With the exception of very small operations, CAFOs are required to develop a manure management plan that shows how nitrogen and phosphorus will be managed to control impacts on groundwater and surface water. The availability and suitability of land for manure application is required as part of this planning. Nutrient management planning software, similar to the Overseer software programme, are available for development of manure management plans.

Surface water protection from areas where manures are land applied, are primarily addressed through the use of mandatory management practices. These management practises include, separation distances, use of vegetated buffers and limits on soil phosphorus concentrations. There are also restrictions on winter applications of manure, however those are not presented in this paper due to the climate differences between MN and New Zealand (soils in MN are frozen or snow covered for 4 to 5 months during the winter period). Following is a more

detailed description of how these management practices are used to control runoff and their potential impacts on surface water.

Separation Distances and Vegetative Buffers

Figures 1, 2 and 3 provide graphical descriptions of the requirements for separation distances to surface waters. Vegetated buffers (areas where perennial vegetation is maintained) can be used to reduce the required separation distances. Where vegetative buffers are not present, manure must be incorporated or injected within 24 hours when within the specified distance of the surface water.

Figure 4 shows the separation and management requirements near tile intakes. These intakes are used to drain low areas of fields and provide a direct conduit to surface waters. Therefore manure applied within 300 feet of the tile intake must be incorporated or injected within 24 hours and before a rainfall event occurs.

Soil Phosphorus Concentration Limits

Manure applications are typically based on the nitrogen requirements of the vegetation being grown. However this can result in accumulation of soil phosphorus to levels that increase the risks of impacts on surface waters. Because phosphorus is the limiting nutrient in most surface waters in MN, limits on soil phosphorus and use of separation distances and vegetative buffers as described above are all used as tools to provide controls to prevent excess phosphorus from entering surface waters.

As indicated in Figures 1, 2 and 3, where manure is applied within the specified distance of the surface water and no vegetative buffer is present, soil phosphorus concentrations must be managed to prevent increases in soil phosphorus levels over a six year period. Table 1 provides a summary of the limits required within these special protection zones.

In addition, soil phosphorus management requirements can be placed on areas outside of the special protection areas (refer Table 1) for large CAFOS (defined as having more than 300 animal units). For these cases, site specific assessments would be required to determine the runoff potential of specific application areas. This may include the use of phosphorus indexing tools which help to rate the risk of phosphorus impacts from runoff. Further information on phosphorus indexing can be obtained by referring to the internet links provided at the end of this paper.

A six year timeframe is used for the management of soil phosphorus concentrations. This timeframe has been adopted because of the difficulty in managing phosphorus levels in the soil when evaluated over shorter periods of time. When managed over a six year period, soil phosphorus levels can be controlled through the use of alternative year applications or reduced applications at more frequent intervals. This provides some flexibility to CAFO managers.

Summary and Conclusion

The management practices described in this paper are used by the State of MN to control runoff impacts from manure applications on surface water quality. The management practices include the use of separation distances to specific features, vegetative buffer strips and soil phosphorus limits. These management practices focus on controls to prevent sediment from manure application areas being transported to surface waters. Although these

management practices may not eliminate the effects of manure application on surface water quality, they are considered effective and are required for all CAFOs across the state.

These management practices along with development of comprehensive manure management plans for each CAFO have resulted in improvements in manure management across the state of MN. Along with training and other measures being taken, the regulations provide CAFO managers with an understanding of practical measures that can be taken to minimise the impacts of their operations on the receiving environment.

This paper provides information and resources for reference for individuals working in New Zealand on development water quality protection measures from manure application areas. The management practices described make up a part of the a comprehensive rule that is enforceable and manageable in terms of regulatory controls and continues to be worked with and improved.

Table 1. Summary of soil phosphorus concentration limits and required management practices (taken from Minnestoa Pollution Control Agency, 2005).

Bray P1 (ppm)*	< 22	22 – 75	76 – 150	> 150
Olsen (ppm)*	< 17	17 – 60	61 – 120	> 120
More than 300 ft from lakes, streams, intermittent streams, protected wetlands, or unbermed drainage ditches	No phosphorus management requirements	No phosphorus management requirements	No phosphorus management requirements unless within 300 ft of tile intakes.	***Permit needed if manure is from feedlot with more than 300 au
Less than 300 ft from lakes, streams, intermittent streams, protected wetlands, or unbermed drainage ditches	No phosphorus management requirements	**Prevent long-term build-up of soil P	**Prevent long-term build-up of soil P ***Permit needed if manure is from feedlot with more than 300 au	**Prevent long-term build-up of soil P ***Permit needed if manure is from feedlot with more than 300 au

*If soil P test results are reported in lb/acre, divide by 2 for approximate levels in ppm (e.g., 200 lb/acre = 100 ppm). If a Mehlich III test is used (instead of Bray P1 or Olsen), then the values in the table columns are roughly <30, 31-90, 91 to 180, and over 180.

** The rate and frequency of manure applications must not allow soil phosphorus build-up over any six-year period. Single-year applications can be based on crop nitrogen needs if excess phosphorus is removed by subsequent crops. Depending on the crop, soil type, and manure nutrient levels, soil P build-up can usually be prevented when applying manure one to three times over a six-year period. Phosphorus build-up is not prohibited if a vegetative buffer is planted along the water (see exceptions).

*** Interim permit applications must include a manure management plan that describes how phosphorus will be managed to prevent pollution from phosphorus transport. Options include reducing frequency/amount of application, changing feed or feed additives to reduce phosphorus in manure, soil conservation practices, and planting crops to remove excess phosphorus. The Minnesota Phosphorus Index or NRCS 590 Standard can be used to demonstrate adequate protection of waters.

Key for all Diagrams (Note that all separation distances are given in feet)

Inject or incorporate within 24 hours and before rainfall

Prohibited manure application

Permanent vegetation that does not receive manure applications

P — In addition to N rate limits, P must be managed to prevent long term (6 years) build-up of soil P, where soil P already exceeds 21 ppm Bray or 16 ppm Olsen.

Note: Maximum rates cannot exceed crop N needs for non-legumes or crop N removal for legumes.

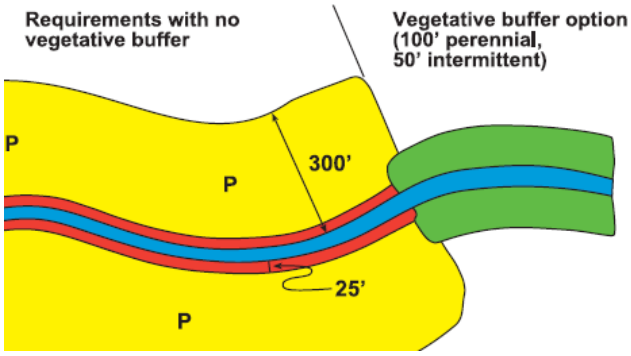

Figure 1. Manure application restrictions adjacent to perennial and intermittent streams (taken from Minnestoa Pollution Control Agency, 2005).

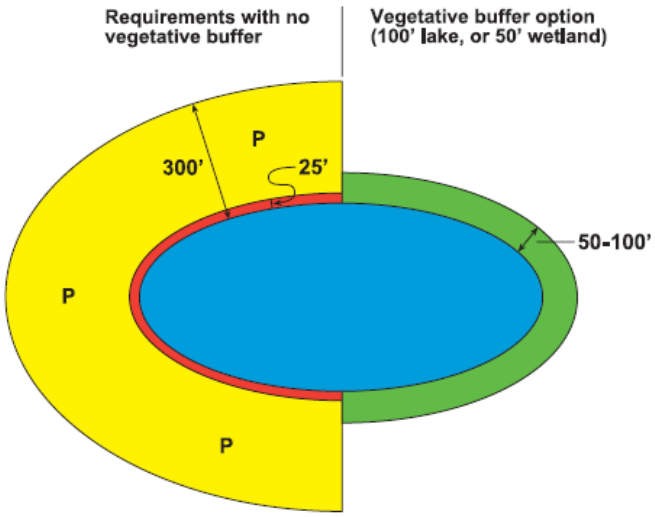

Figure 2. Manure application restrictions adjacent to protected lakes and wetlands as classified by the Minnesota Department of Conservation maps (taken from Minnestoa Pollution Control Agency, 2005).

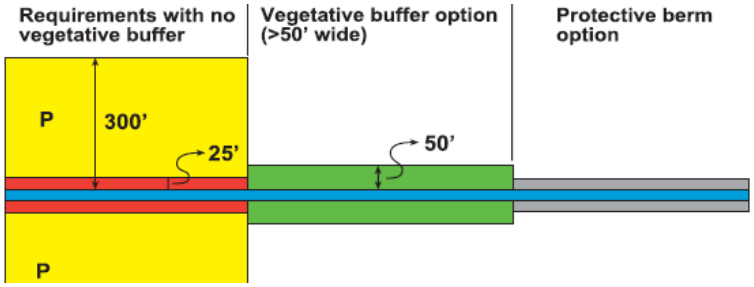

Figure 3. Manure application restrictions adjacent to protected drainage ditches (taken from Minnestoa Pollution Control Agency, 2005).

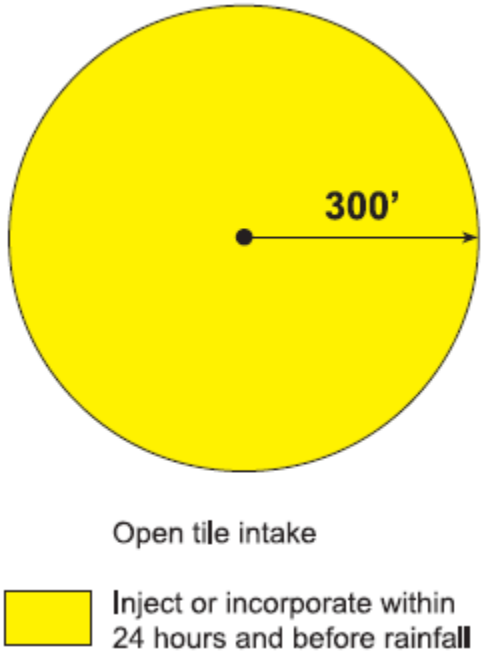

Figure 4. Manure application restrictions near tile intakes (taken from Minnestoa Pollution Control Agency, 2005).

Useful Internet Links

www.pca.state.mn.us/index.php/topics/feedlots/feedlots.html
http://www.manure.umn.edu/applied/application.html
www.epa.gov/agriculture
www.nrcs.usda.gov

References

Minnesota Pollution Control Agency (2005) Applying Manure in Sensitive Areas, State requirements and recommended practices to protect water quality. www.pca.state.mn.us/index.php/view-document.html?gid=3530

Minnesota Rules Chapter 7020, Animal Feedlots. www.revisor.mn.gov/rules