MAEAP GUIDANCE DOCUMENT FOR COMPREHENSIVE NUTRIENT MANAGEMENT PLANS

Michigan Agriculture Environmental Assurance Program

Approved by MAEAP CNMP Committee – ***August 7, 2007, and November 6, 2007***

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MAEAP GUIDANCE DOCUMENT FOR COMPREHENSIVE NUTRIENT MANAGEMENT PLANS

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INTRODUCTION TO *"MAEAP GUIDANCE DOCUMENT FOR COMPREHENSIVE NUTRIENT MANAGEMENT PLANS"*

The development of a CNMP requires knowledge, skills, and abilities in several disciplines. They include manure and wastewater handling, land treatment practices, nutrient management, and mitigation of resource concerns during the planning process. Planners will ask, "How do I handle that?" for these components. This MAEAP document can assist planners in answering these questions.

This document is managed by the MAEAP CNMP Committee. Suggested changes, corrections, and additions may be submitted to any committee member for consideration by the full committee at any time of the year. Please note the version date on the face page of this document. Note also the date at the end of each question; this date refers to the adoption date for that question and, in some cases, modified dates.

A companion document, the MAEAP CNMP Review Checklist, contains a listing of all the components of a CNMP and whether or not they are required on all farms or only as applicable. The MAEAP CNMP committee considers changes to this document very carefully. Any changes will be published once a year, around January 1. Reviewers will begin using the new version of the checklist about 6 months later (July 1). Both documents are available on the MAEAP website (www.maeap.org).

Changes are outlined and dated with an adopted date in the MAEAP Guidance Document for Comprehensive Nutrient Management Plans (CNMPs). These changes are made to keep your farm in compliance with GAAMPs, State and Federal laws, changes in industry standards, and progress in scientific understanding. All changes published in the MAEAP Guidance Document for CNMPs include an adopted date.

In order to keep your CNMP current, updates with your CNMP provider must include all adopted changes, unless otherwise noted. For example: You developed your CNMP in March of 2001 utilizing 50-80 acre soil sampling areas. In July of 2003, the requirements for soil sampling were modified with an adopted date of January 2004. It is now March of 2004 and time to update your CNMP with your provider. The re-approved CNMP must meet the new soil testing criteria because it is after the adopted date of change. Your certified CNMP provider cannot re-approve your CNMP unless it meets the current guidance.

Adopted June 2005, *Modified August 2007*

OVERVIEW

What do I need to include in the Overview of a CNMP?

The Overview of a CNMP is like an Executive Summary that summarizes pertinent information about the livestock operation, the resources of concern, and issues that the producer wants to address with the CNMP.

Some pertinent points to include in the Overview are:

- The livestock type(s), herd/flock size, and type of livestock operation.
- Whether it is a new, existing, or expanding production facility.
- The type, size, and general construction of the facility and of manure storage system(s).
- Environmental or social concerns (runoff into surface waters? odor complaints? groundwater risk?).
- Future goals and long-term plans such as expansion plans or significant changes that impact nutrient use on the farm.
- Number of acres available for spreading.

The map of the farm headquarters will show the reader information about the size and type of facility. Buildings and other structural features should be labeled and those names should be used consistently throughout the CNMP. Use labels that are typically used by the producer.

Adopted February 2002

CNMP UPDATES

How frequently does my CNMP need to be updated?

The CNMP will be reviewed and updated on an annual basis. The annual review shall incorporate, as appropriate, such updated items as:

1. Fields utilized for manure application.
2. Field-specific manure spreading plan based on most recent soil and representative manure test (soil test must be no more than 3 years old).
3. Implementation schedule to reflect completed projects and new projects.
4. Other changes pertinent to your operation and CNMP.

Adopted December 2002

How frequently does my CNMP need to be reapproved by a Certified CNMP Provider?

Your CNMP will need to be updated and reapproved by a Certified CNMP Provider at least once every three years, if you want re-verification by the Michigan Department of Agriculture every three years.

Your CNMP will also need to be updated and reapproved by a Certified CNMP Provider prior to any of the following circumstances occurring:

1. An increase in the number of animal units that is greater than or equal to 10 percent of the number identified in the CNMP.
2. An increase in the number of animal units that results in a decrease of manure storage capacity time by one month or greater.
3. An increase in the number of animal units where the manure generated by the livestock requires more land for its application than is available at the time of the increase.
4. A decrease in the number of acres available for land application, where the manure/wastewater generated requires more land for its application than will be available after the decrease.

As a minimum, the reapproved CNMP must be signed and dated by a Certified CNMP Provider. A simple log sheet with three columns (printed Certified CNMP Providers name, signature of Provider, and date signed) will suffice.

Adopted December 2002, Modified June 2005

ANIMAL OUTPUTS

What is needed to document and evaluate existing components of a livestock facility?

Existing components are the manure and wastewater handling and storage structures and equipment at the facilities where the livestock are housed. Examples include manure storage facilities, manure transfer pumps and pipes, roof gutter or other clean water diversion facilities, wastewater treatment facilities, etc. Existing components may be included as part of a CNMP only if all of the following are met:

1. The existing component is consistent with the safety guidance of the CNMP.
2. An investigation/inspection of the existing component indicates it is in good operating condition, based on observable and/or measurable features and conditions.
3. The failure of an existing component will not impair the structural integrity or operation of new components.
4. The existing component can be managed as part of the CNMP.

An on-site investigation should be made to determine whether or not an existing component is in good operating condition. The thoroughness of inspection should be in proportion to the risk associated with failure of the component. For example, the investigation of an existing above-ground manure storage facility should be more thorough than the investigation of an existing clean water diversion since the failure of the manure storage would potentially cause more damage than the failure of the diversion.

Following are some key components of a manure storage facility that should be inspected. The investigator will need to determine which items need to be considered, including (but not limited to):

- Liners
- Walls
- Fences
- Embankments
- Size/storage capacity
- Depth to water table
- Inlet pipes, push-offs, and other loading features
- Outlet pipes, ramps, and other unloading features
- Clean water diversion
- Proximity to complementary existing and planned components

For existing storage pond waste storage facilities, the presence of a liner must be verified before it can be determined to be in good operating condition. Storage ponds are generally constructed with earth as the liner and/or structural support for the liner. They typically have side slopes of 1H:1V or flatter and are constructed by excavation or a combination of excavation and earth embankment. They are what many people call "lagoons." Typical liners include compacted clay, natural clay base, flexible membrane (such as HDPE or rubber), and unreinforced concrete. This verification may be accomplished by one of the following methods:

- Obtain as-built construction drawings or construction inspection documentation that proves the installation of a liner during construction, or
- Conduct an on-site liner inspection to document the physical presence of the liner and its composition (i.e., concrete, geosynethic (impermeable membrane), compacted clay, or natural clay base). Physical sampling and analysis of the liner is required for compacted clay and natural clay base liners.

A compacted clay liner may be considered in "good operating condition" if:

- It averages at least 1-foot thick, is covered by at least 1-foot of soil material, and:
  - Has a laboratory permeability (*k*) of 0.0028 ft/day (1 x 10^{-6} cm/sec) or less, or
  - Has a Plasticity Index (PI) of at least 15 and classifies as CL, CH, MH, SC, or GC based on the Unified Soil Classification System (ASTM D 2487 or ASTM D 2488);
- At least one sample from two side slopes of the storage facility are analyzed; and
- The bottom of the waste storage facility is at least 2 feet above the seasonal high water table.

A natural clay base liner may be considered in "good operating condition" if:

- It has a minimum thickness of 10 feet (3 m) below the design bottom elevation of the storage pond and the soil classifies as CL, CH, MH, SC, or GC based on the Unified Soil Classification System (ASTM D 2487 or ASTM D 2488);
- The bottom of the waste storage facility is at least 2 feet above the seasonal high water table; and
- The subsurface investigation is conducted on at least three sides of the waste storage facility.

For existing fabricated structure waste storage facilities, the acceptability of the structure must be verified before it may be considered in "good operating condition." Fabricated structures are generally constructed of reinforced concrete, steel, or timber and typically have vertical side walls. Examples include reinforced concrete tanks below hog finishing barns, Slurry Store structures, and timber-walled solid stacking facilities. Verification may be accomplished by one of the methods listed below. The evaluation of existing components must identify the verification method, describe the observations from on-site inspections, and state the justification for the determination of "good operating condition."

1. As-built records that verify the following:
   - As-built construction drawings and supporting documentation provide evidence that the waste storage facility was installed in accordance with NRCS Waste Storage Facility practice standard.
   - The lowest part of the bottom elevation is at or above the seasonal high water table.

2. On-site inspection evidence that verifies the following:
   - Document the number of years of operation.
   - The lowest part of the bottom elevation is at or above the seasonal high water table.
     - Where site-specific documentation for the seasonal high water table is not available or suitable and where the presence of a seasonal high water table above the bottom elevation of the structure is likely,
       - If there <u>is no</u> evidence of a foundation drain, conduct subsurface investigations at a minimum of three locations surrounding the waste storage facility to determine the presence and elevation of a seasonal high water table. The subsurface investigations should be located as close as practicable to the structure.
       - If there <u>is</u> evidence of a foundation drain, investigate the operation of the foundation drain through observations at the outlet or other observable areas during wet and dry periods to determine if the foundation drain is operational. Document observations and justify conclusions.
     - Where site-specific documentation for the seasonal high water table is not available or suitable and where the presence of a seasonal high water table above the bottom elevation of the structure is <u>not</u> likely, document the evidence supporting the determination that a seasonal high water table above the bottom elevation of the structure is not likely.
   - Visual inspection of the observable exterior and interior features shows:
     - Walls are vertical with no bowing,
     - Concrete walls have no significant vertical cracking and no horizontal cracking (significant cracks are 0.20 inches wide or greater; hairline cracks are not considered significant),
     - Glass-fused steel (Slurry Store) walls/panels have no cracking and no evidence of seepage at the joints,
     - Timber elements have no evidence of rotting or damage that would compromise the structural integrity of facility,
     - Concrete floors have no significant cracking,
     - Wall supports appear to be sound with no evidence of structural damage or deformation,
     - Valves or other outlets are operable and not corroded or plugged; they will not automatically release stored waste below the freeboard volume,
     - Inlets, agitation points, and pump-out locations show only normal wear and no structural damage,
     - Slatted floors are not cracked, loose, or deteriorated to a degree that would compromise the structural integrity of the facility, <u>and</u>
     - Appropriate safety features such as fences, grates, railings, and warning signs are in place and in good condition.

3. Manufacturer verification:
    - For NRCS pre-approved designs that were installed by the manufacturer, such as pre-cast concrete and glass-fused steel panel (Slurry Store) structures, obtain a letter from the manufacturer that the current installation is in accordance with the pre-approved design.

For any type of subsurface drain installed around any waste storage facility, document the estimated or reported extent of the drain and the outlet location.

It should be clearly noted that including an existing component as part of a CNMP is in no way a "certification" of the component by the planner or investigator.

During an on-site investigation of existing components, the inspector should take safety and biosecurity measures. For example, inspectors should not enter an enclosed pit or storage structure or other confined space because of the risk of hazardous gases. For information on biosecurity (i.e., practices to prevent spread of livestock disease from one farm to another), see the APHIS website: http://www.aphis.usda.gov.

If you do not feel you are qualified to make an informed judgment of the condition of structural components of a CNMP, you should obtain the services of an individual qualified to evaluate the component(s) in question.

Livestock operations with 5,000 Animal Units and above may be required to obtain a Ground Water Discharge permit from the Michigan Department of Environmental Quality (MDEQ), Water Division. Livestock operations considered Concentrated Animal Feeding Operations by MDEQ may be required to obtain a National Pollutant Delivery Elimination System (NPDES) permit. These permits may have unique liner requirements for Waste Storage Facilities. The documentation of the liner criteria will need to be included in the Evaluation of Existing Component(s), as appropriate, and identify that the liner meets or does not meet the Ground Water Discharge permit or NPDES permit requirements.

When the evaluation determines that an existing component may NOT be included as part of a CNMP, the CNMP must describe the corrective action that will be taken by the landowner. The planned date for the corrective action must be included in the Schedule of Implementation. When the unacceptable existing component is a waste storage facility, the schedule must show completion of the corrective action no more than three years after the CNMP is signed.

The evaluation of existing component documentation needs to be signed and dated by the person or persons performing the evaluation.

Adopted February 2002, Modified July 2003, Modified June 2004, Modified January 2007, *Modified August 2007 - CNMPs written before December 2005 that meet the Adopted Changes June 2004 do not need to re-evaluate unchanged existing components. All new evaluations must meet the current adopted MAEAP Guidance Document for CNMPs.*

Should I include livestock feed in my CNMP?

Yes, information on storage of silage and other livestock feeds should be included in a CNMP. Document the following information in the CNMP: the type of feed(s); how it is stored and fed to the livestock; and how and where spilled or spoiled feed is disposed of. Solid feeds such as silage and grain feeds can become a water quality concern if rainfall washes these feeds into surface waters. Therefore, good management of feeds is important on the farmsite to minimize the risks to water quality.

Feed rations information will be included in the CNMP when it is used as a management technique to lower the amount of nutrients (i.e., use of phytase in swine rations to decrease the phosphorus content of the manure).

Adopted February 2002

How do I compute runoff volume and peak discharge?

Runoff volume is needed for some components of most CNMPs. The peak rate of runoff, commonly referred to as peak discharge, may also be needed to adequately address unique situations that may be encountered in some CNMPs.

Runoff volume is a primary factor when sizing planned waste storage facilities and assessing the usable capacity of existing waste storage facilities. The need for this information is not always evident, especially if the CNMP Provider is using the Animal Waste Management (AWM) program. With proper training in AWM, most CNMP Providers will not need any further skills at computing runoff volumes.

Peak discharge may have to be computed for unique situations where the actual rate of flow is needed. For example, the person doing an evaluation of an existing manure transfer pipe may need to know the peak discharge from the livestock lot to adequately determine if the existing pipe component "can be managed as part of the CNMP." The peak discharge may also be needed to adequately size a planned two-stage waste storage facility where the runoff from a lot will flow from the first stage of the storage facility to the second stage of the storage facility. Many CNMP Providers may never encounter these and other situations requiring peak discharge. Where peak discharge information is needed, some hydraulic analysis will also typically be needed. This should only be done by persons with specialized training in peak discharge computations and hydraulic analyses.

Where runoff volumes and peak discharges are needed for a CNMP, the NRCS (formerly the Soil Conservation Service or SCS) curve number method must be used. The curve number method is programmed into AWM. The NRCS National Engineering Handbook, Part 630, Hydrology, provides a detailed explanation of the curve number method. Practical application references with tools to facilitate the curve number method computations are NRCS Technical Release No. 55, Urban Hydrology for Small Watersheds, and NRCS National Engineering Handbook, Part 650, Engineering Field Handbook, Chapter 2, Hydrology. These three references are available on line at the NRCS-Michigan engineering reference website:

http://www.mi.nrcs.usda.gov/technical/engineering/neh.html

Use the precipitation values listed on the NRCS-Michigan climate website. This website includes the 24-hour precipitation values by Michigan county for frequencies of 2-, 5-, 10-, 25-, 50-, and 100-years.

http://www.mi.nrcs.usda.gov/technical/engineering/climate.html

Training modules for learning how to use the curve number method are available on line through the NRCS National Employee Development Center at:

http://www.nedc.nrcs.usda.gov/catalog/hydro/hydroseries.html

Adopted September 2005

Why is silage leachate a concern?

Silage is an important feed source for livestock. When properly harvested and stored, it poses little or no pollution threat. But improper handling and storage can lead to a significant flow of silage juices (or leachate) from the silo or bunker. Silage solids can also be washed off-site by runoff waters throughout the year and cause surface water problems.

Leachate is an organic liquid that results from fermentation of harvested plant materials that have a high water content. Physical signs that silage leachate is present include burnt vegetation and staining of soil and concrete around silage storage facilities. Leachate can cause a "septic" odor. This silage leachate is often highly acidic and can be corrosive to concrete and steel. Research has shown that silage and silage leachate can cause serious water quality problems if it enters surface water bodies. Its high organic content feeds bacteria that rob the water of oxygen. The oxygen demand of silage liquid is 100 to 200 times greater than raw municipal sewage. The following table shows how the nutrient content of silage leachate compares with manure:

Constituent	Silage	Dairy Manure
pH	3.6 - 5.5	7.4
Total Phosphorus	500 mg/l	900 mg/l
Potassium	3400 mg/l	3200 mg/l
Organic Nitrogen	3700 mg/l	5600 mg/l
Ammonia-Nitrogen	700 mg/l	
BOD - 5 day	12,000 - 90,000 mg/l	20,000 mg/l
Dry Matter	5 %	15 %
Amino Acids	approx. 1900 mg/l	

Source: Wright, P., NRAES-99; 1999.

Adopted February 2002

What management practices will help reduce the risk of silage leachate?

The solutions to this problem include:

- Harvest and store silage at the appropriate moisture content. The volume and concentration of leachate produced depends on the type of feed material stored, its moisture content, and handling and storage conditions. Of these, moisture is the most crucial factor. Research has found that feed materials stored at 65 percent moisture content or higher can produce excess

leachate. The feed quality of the silage also declines with the higher moisture content. About three-quarters of the leachate is produced in the first three weeks of storage, although flow may continue for up to three months. Silage moisture contents of 62-68 percent for tower silos and 65-70 percent for bunk silos result in optimum quality feed while minimizing risk of leachate formation. The farmer could add absorbent materials such as dried sugar beet pulp, dried corn cobs, hay, or ground grain when filling the silage bunker to reduce the moisture content and reduce the potential for leachate production. (See Publication NCR 574, "Corn Silage Production, Management and Feeding," for more information on silage production.)

- Keep clean water from entering the bunker silo. Diversions, drainage trenches, and roofs or covers over the silo keep clean water from mixing with the silage. This protects the silage quality while decreasing the potential for leachate runoff. For horizontal bunkers, keep the exposed side of silage stack vertical to reduce damage from rainfall and reduce silage losses.

- Keep the loading area clean of spilled silage. Scrape after removing silage from the pile. Silage materials that are not cleaned off of the loading area could then wash off-site with rainwater and when wet will continue to produce silage leachate.

- An emergency backup plan should be developed for those years when high moisture silage is unavoidable. Temporary runoff containment measures could be used such as using sawdust to absorb and stop silage leachate runoff. The sawdust could then be collected and spread on fields.

Adopted February 2002

If management alone doesn't help, what other practices will help control silage leachate?

Silos should be designed and constructed to contain and control leachate flow. Leachate can be diverted to well-ventilated manure storage facilities and then disposed of by land spreading. Engineered systems can be designed which decrease the volume of material to be handled by collecting only the concentrated wastes while diverting the low-concentration wastes to designed grass filter areas.

Adopted February 2002

Is it acceptable to allow runoff to pond into a natural depressional area?

It is not acceptable to allow untreated runoff to collect in natural depressional areas. Polluted runoff can come from feedlots, silage storage areas, or even milkhouse wastewater. Runoff must either be treated or collected and utilized. The nutrients in runoff can cause odor or water quality problems. If you have a sandy, highly leachable soil, then these areas may also pose a groundwater threat. Methods of treatment could include designed filter strips or constructed wetlands. Areas used for temporary storage of untreated runoff must meet design standards for waste storage facilities.

Adopted February 2002

What should be considered in evaluating a manure composting site?

When evaluating a manure composting site, document in the CNMP if the site is covered, has an earthen floor, a prepared floor, and/or if blankets are utilized. Also describe the composting site

with reference to soil types, slope, vegetation, etc. Describe the management practices that are in place to manage leachate and polluted surface runoff. Describe the management of the compost such as windrow or pile design and management, turning frequency, composition, carbon source, and moisture management. Describe the utilization of the finished compost.

Runoff should not leave the landowner's property or have the potential to enter surface waters (roadside ditches, streams, drainage ditches, wetlands, or surface inlets).

Dead animals cannot be composted with manure. See guidelines for carcass composting and the Bodies of Dead Animals Act.

Management of the C:N ratio and moisture content are the most important components for decreasing the risk of leaching or runoff of nutrients. See the following references for management practices:

MI - NRCS Composting Practice Standard (317)
NRAES-54 "On Farm Composting Handbook"
NRCS National Engineering Handbook, Part 637, Environmental Engineering, Chapter 2, Composting
Disposing of Swine Carcasses and After-birth by Composting, Rozeboom et al. ANS Mimeo No. 369, Michigan State University
MI - NRCS Heavy Use Area Protection Standard (561)

Adopted February 2003

How does the isolation distance for water wells affect the CNMP?

Background

Public and private water wells are regulated by the State of Michigan. Grade A dairy farm wells where the water is used for the milkhouse or milking parlor and wells connected to a potable plumbing system where employees have access to well water for consumption are considered public wells. (Use of water for the cleaning and the sanitation of food contact surfaces where the food is consumed by the public makes the water use in Grade A dairies public.) They are regulated under the Michigan Safe Drinking Water Act and generally classified as Type III public wells. All other water wells, including irrigation, livestock watering, or any other well that serves only one owner, are considered private and are regulated under the Michigan Public Health Code.

Minimum isolation distances are required for both "major sources of contamination" and "potential sources of contamination." Major sources of contamination include storages of toxic materials, such as pesticides and fertilizers, or large amounts of less dangerous contaminants, such as animal manure. Potential sources of contamination include small quantities of less dangerous contaminants such as single household septic tanks and drainfields, drywells, and animal and poultry yards. The potential to have an especially serious contamination problem in case of a failure of containment is what differentiates a major source of contamination from a potential source of contamination. In general, practices or facilities meeting the definitions and purposes of NRCS practice standards for Waste Storage Facility (313) or Composting Facility (317) for manure are major sources of contamination. Practices or facilities meeting the definitions and purposes of NRCS practice standard for Manure Transfer (634) generally are potential sources of contamination. Lots where

livestock are concentrated, such as feedlots and exercise lots, manure packs in livestock buildings, and manure transfer facilities such as reception pits and pipelines are also considered potential sources of contamination. Pastures, as defined later in this document, are considered neither major nor potential sources of contamination. Therefore, pastures are not a factor in determining isolation distance for water wells in a CNMP. A deviation from the minimum isolation distance may be granted by the local public health agency when issuing a well construction permit where existing or planned storage facilities are considered.

The minimum isolation distances between sources of contamination and drinking water wells in Michigan are as follows:

Well Type	Minimum Isolation Distance	
	Major sources of contamination	Potential sources of contamination
Private [1/]	150 ft	50 ft
Public - Type IIb and Type III [2/]	800 ft	75 ft

[1/] As defined by Part 127, 1978 PA 368, Michigan Public Health Code.
[2/] As defined by 1976 PA 399, Michigan Safe Drinking Water Act.

The minimum isolation distance from major sources of contamination for existing Type IIb and Type III public wells with a capacity of less than 70 gallons per minute or a projected withdrawal average of not more than 100,000 gallons per day for any 30 consecutive days may be reduced in accordance with the well isolation distance reduction protocol described in Table 1 (following).

Addressing well isolation distances in the CNMP

All wells within 800 feet of any existing or planned animal waste storage facility on the farm must be identified. The minimum isolation distance must be compared with the actual well isolation distance for each well. For each well where the actual isolation distance from an **existing** waste storage facility is not adequate, the CNMP must include the notation below. No corrective action date is necessary.

> *The isolation distance for well _____ from existing waste storage facility _____ does not appear to meet minimum State of Michigan isolation distance requirements.*

For each well where the actual isolation distance from a **planned** animal waste storage facility is not adequate, the CNMP must include the notation below. The corrective action and scheduled date must be shown in the CNMP Schedule of Implementation.

> *The isolation distance for well _____ from planned waste storage facility _____ does not appear to meet minimum State of Michigan isolation distance requirements. Corrective action to the well or waste storage facility must be taken prior to operation of the planned waste storage facility.*

A worksheet entitled "WELL ISOLATION DISTANCE WORKSHEET FOR WASTE STORAGE FACILITIES" is available on the MAEAP website to help CNMP Providers document the well isolation distance assessment. All farm wells must meet the state isolation distance requirements to

be verified under the MAEAP Farmstead System, but not under the Livestock System. Isolation distance requirements can be met by meeting minimum isolation distances, deviation provided by the local health department, or use of the isolation distance reduction protocol.

Where the actual isolation distance from a planned animal waste storage facility is not adequate and the intended corrective action is to request a variance to the well isolation distance criteria, that variance must be obtained before the CNMP is approved. This is to ensure that any planned animal waste storage facility included in the CNMP is feasible. The NRCS State Conservation Engineer or a non-NRCS professional engineer licensed in the State of Michigan may approve variances to the isolation distance criteria with concurrence from the Michigan Department of Environmental Quality.

TABLE 1 - CRITERIA FOR REDUCING THE 800-FOOT MINIMUM WELL ISOLATION DISTANCE FOR MAJOR SOURCES OF CONTAMINATION WITHOUT SECONDARY CONTAINMENT [1/]

FOR EXISTING TYPE IIb AND TYPE III PUBLIC WATER SUPPLIES WITH A CAPACITY OF LESS THAN 70 GPM OR A PROJECTED WITHDRAWAL AVERAGE OF NOT MORE THAN 100,000 GALLONS PER DAY FOR ANY 30 CONSECTIVE DAYS

Isolation distance reduction allowed down to 400 feet where at least one of the following Protection Factor [2/] combinations is documented	Isolation distance reduction allowed down to 200 feet where at least one of the following Protection Factor [2/] combinations is documented
A or, B+D or, C+D or, F	A+B or, F+E or, A+C or, F+B+C or, A+D or, F+B+D or, A+F or, F+C+D

[1/] The actual isolation distance should be maximized to the extent possible.

[2/] PROTECTION FACTORS (use information from well records, as appropriate).

- A - Ground water flow direction is away from well.
- B - Confining material of 10 feet of continuous clay or shale or 20 feet of a continuous clay mixture* below the design bottom elevation of the waste storage facility.
- C - Well casing depth is 100 feet or more.
- D - Well pump capacity is 25 gallons per minute or less.
- E - Confining material (minimum of 10 feet continuous clay or shale or 20 feet continuous clay mixture* below the design bottom elevation of the waste storage facility) + Well casing depth (minimum of 60 feet casing depth) = 100 feet or more.
- F - Waste storage facility constructed with flexible membrane liner, reinforced concrete, or steel or solid manure stacking facility with roof and concrete floor constructed in accordance with USDA NRCS-Michigan Field Office Technical Guide standards and specifications and sited/graded to protect the water supply in the event of failure.

* Note - For continuous clay mixtures, when interpreting water well record information contained under Formation Description, the first material named is the dominant material in the strata being described. For example: (a) If the material is described as "clay/sand/gravel," clay is the dominant material and would classify as a continuous clay mixture; (b) If the material is described as "sand/clay," it would not be acceptable as a continuous clay mixture since sand is the dominant material.

APPLICABILITY

The criteria in this table shall be used where it is necessary to upgrade an existing storage, handling area, tank, or structure for major source contaminants within the 800-foot isolation of a Type IIb or Type III public drinking water well. Tanks or structures that comply with applicable regulations and are located in accordance with the above procedures are considered to be complying with requirements to maintain isolation distance from the well to the contaminant source. **The local health department shall be provided with a copy of the decision whenever this protocol is used to reduce isolation from an existing well.** Wells must be properly constructed and unused wells properly abandoned, as determined by the Michigan Department of Environmental Quality (MDEQ), local health department, or a registered well drilling contractor and bacteriologic and nitrate standard levels meet drinking water standards.

Deviations from isolation distances authorized through issuance of well construction permits by MDEQ or local health department may incorporate alternative or additional criteria in accordance with the Michigan Safe Drinking Water Act (1976 PA 399) or Part 127, Water Supply and Sewer Systems, of the Michigan Public Health Code (1978 PA 368).

Adopted December 2003, Modified September 2005, Modified January 2007

What is needed to "Assess Volume and Site Suitability for Storage?"

The CNMP Checklist includes the requirement to "Assess Volume and Site Suitability for Storage" and then states this is for "Existing" and "Planned." This FAQ is intended to provide definitions and examples to help CNMP Providers understand what is and what is not needed to fulfill this requirement.

Volume refers to the storage capacity, both total and usable, for each storage facility. Capacity is described both volumetrically in units of cubic feet or gallons and by longevity in units of days, months, or years. The volumetric capacity defines the total quantity of manure, bedding, process water, runoff, and direct precipitation (production) that can be stored in the facility and must be removed to empty the facility. The longevity capacity defines the anticipated amount of time it will take to fill the storage facility; i.e., the maximum time duration before the storage will have to be emptied again. The volumetric capacity and longevity are essential for appropriately scheduling land application of the stored waste. If the volumetric capacity and longevity are exceeded before it is time to land apply the contents, there is a higher risk for failure such as overtopping and for environmental pollution due to discharge to surface and/or ground waters. Therefore, a good concept to remember is "the storage capacity required must be determined by the land application schedule." In other words, if the cropping patterns and soil conditions on the farm prevent land application for a period of 8 months in a row, then there needs to be at least 8 months of storage capacity.

Site Suitability refers to the appropriateness of the site for the storage facility. The suitability will be determined by the characteristics of the site that allow, limit, or prevent various types of storage facilities. The site characteristics that determine suitability will vary depending on the type of storage facility. Four critical site characteristics are depth to seasonal high water table, type of seasonal high water table, depth to bedrock, and well isolation distance. Other site characteristics that may determine suitability include, but are not limited to, elevation relative to the source of the waste to be transferred to the storage facility, proximity to surface water bodies and property lines, and traffic patterns on the farm. For existing storage facilities, suitability will be assessed during

the evaluation of existing components. For planned storage facilities, the CNMP Provider only needs to gather enough information about the site to indicate that it is at least "feasible" to install the planned storage facility at the location shown on the farm headquarters map. For example, if the CNMP includes a planned 10-foot deep, in-ground, pond-type storage facility, there should be at least the following documentation to show feasibility:

- One subsurface test hole, pit, or boring at the proposed site showing that there is no bedrock to a depth of at least 10 feet and there is no seasonal high water table to a depth of at least 12 feet (note that the Waste Storage Facility practice standard requires seasonal high water tables be at least 2 feet below the design bottom elevation for pond-type storage facilities).
- If there is a perched seasonal high water table, show evidence that there is a way to drain this water table that would allow the installation of the planned storage facility.
- Completed well isolation distance worksheets showing that the planned Actual Well Isolation Distance is greater than the Minimum Well Isolation Distance or a description of the specific corrective action and scheduled date of the action that will be taken to make the planned Actual Isolation Distance greater than the Minimum Isolation Distance.

A subsurface investigation is normally not needed if the CNMP includes a planned above ground waste storage facility. Subsurface investigations should only be performed by qualified individuals. The CNMP should not include all the subsurface investigations needed for the design of a storage facility. The CNMP Provider does not need to identify the type of liner for the storage facility unless that decision is needed to document the suitability of the site; e.g., if a flexible membrane liner is needed in order to make the planned Actual Well Isolation Distance greater than the Minimum Well Isolation Distance, then that must be stated in the CNMP.

Existing Storage Facility

The general steps for assessing volume and site suitability for an existing storage facility are as follows:

1. Complete the evaluation of existing components.
   a. If the evaluation shows the storage is not acceptable, stop here with the assessment and develop plans for taking corrective action to repair, decommission, and/or replace the storage.
   b. If the evaluation shows the storage is acceptable, continue with the assessment.
2. Determine the storage capacity in terms of volume for the existing storage facility.
3. Determine the daily waste production in terms of volume that is going into the storage facility. (Be sure to include precipitation that lands on the storage facility and runoff water directed to the storage facility.)
4. Divide the storage capacity in terms of volume by the daily waste production to determine the capacity in terms of longevity.
   [Note: Although calculations for steps 2-4 above can be done by hand, using forms in the NRCS Agricultural Waste Management Field Handbook, it is strongly recommended that you use the Animal Waste Management program to do these calculations to ensure accurate considerations for manure production, precipitation, evaporation, and freeboard.]
5. Compare the longevity of the existing storage facility and the number of consecutive days when land application is not possible on the farm.
   a. If the longevity is greater than the number of consecutive days when land application is not possible on the farm, the assessment is that the storage is suitable.
   b. If the longevity is less than the number of consecutive days when land application is not possible on the farm, the assessment is that the storage by itself is not suitable to meet all the storage needs. The CNMP will have to address expansion of the existing storage facility or a new planned storage facility in order to meet all the storage needs.

Planned Storage Facility

The general steps for assessing volume and site suitability for a planned storage facility are as follows:

1. Determine the storage capacity needed in terms of longevity (the number of consecutive days when land application is not possible on the farm).
2. Determine the daily waste production in terms of volume that is going into the storage facility. (Be sure to include precipitation that lands on the storage facility and runoff water directed to the storage facility.)
3. Multiply the daily waste production by the storage capacity needed in terms of longevity to determine the storage capacity needed in terms of volume.
4. Determine the dimensions (width, length, depth, side slopes) of the planned storage facility based on the storage capacity needed in terms of volume.
   [Note: Although calculations for steps 2-4 above can be done by hand, using forms in the NRCS Agricultural Waste Management Field Handbook, it is strongly recommended that you use the Animal Waste Management program to do these calculations to ensure accurate considerations for manure production, precipitation, evaporation, and freeboard.]
5. Compare the width and length dimensions of the planned storage facility with the available area at the proposed location.
   a. If the planned storage facility can fit in the available area, proceed with the assessment.
   b. If it will not fit in the available area, go back to step 4 to modify the dimensions or find another location.
6. Conduct at least one subsurface investigation at the proposed location of the planned storage facility.
   a. If no water table or geology limitations are identified in the subsurface investigation, proceed with the assessment.
   b. If any water table or geology limitations are identified in the subsurface investigation, go back to step 4 to modify the dimensions, identify action to remove the limitation (if there are any), or find another location.
7. Complete the Well Isolation Distance Worksheets.
   a. If the planned Actual Well Isolation Distance is greater than the Minimum Well Isolation Distance, proceed with the assessment.
   b. If the planned Actual Well Isolation Distance is less than the Minimum Well Isolation Distance, provide a description of the specific corrective action and scheduled date of the action that will be taken to make the planned Actual Isolation Distance greater than the Minimum Isolation Distance or find another location.
8. Consider other site characteristics that may determine suitability for the particular site and planned storage facility. Exactly what those site characteristics are will have to be determined by the CNMP Provider on a case-by-case basis.
   a. If there are no other site characteristics that need to be considered or the other site characteristics considered support the feasibility of the planned storage facility for the site, proceed with the assessment.
   b. If any other site characteristics considered do not support the feasibility of the planned storage facility for the site, go back to step 4 to modify the dimensions, identify action to remove the limitation (if there are any), or find another location.
9. Assessment
   a. If steps 5-8 above all indicate to "proceed with the assessment," the assessment is that the planned storage facility is suitable.

b. If any of steps 5-8 above do not indicate to "proceed with the assessment," then the assessment is that the planned storage facility is not feasible and should not be included in the CNMP.

Adopted September 2005

CONSERVATION PRACTICES ON FIELDS USED FOR MANURE APPLICATION

Why should I be concerned about conservation practices on fields used for manure application?

Conservation practices on fields are a distinguishing characteristic of CNMPs from Manure Management Plans. Conservation practices are critical if manure and nutrients are to stay on the land where applied and not end up in adjacent water bodies by overland transport. Applying manure at agronomic rates and/or following generic recommendations from the GAAMPs does not ensure this. For example, a 150-foot setback between a waterbody and the manure application area may be more than adequate for some fields and inadequate for others. Evaluation on a field by field basis is necessary to determine the risks presented in applying manure. Risks include adjacent water bodies, natural draws, surface inlets to underground drainage systems, or gullies that act as intermittent streams that carry manure and nutrients attached to sediment to water bodies. Evaluation includes noting physical characteristics of the field such as predominant slope, soil types, vegetative cover on the field, and climatic information such as wind direction, rainfall duration, intensities, and totals. Management information such as manure application methods (injected, surface applied, irrigated, etc.), typical tillage practices, and typical crop rotation patterns is also important.

All of this information is important to the CNMP Provider so they can answer the basic question, "Is it safe to spread manure on this field?" The answer to this question is not just a simple yes or no. Setback areas in draws where manure is not spread or filter strips along ditches can turn a "no" answer to a "yes." Moving from surface application to injection may reduce risk from overland transport of manure but may increase transport of nutrient-rich sediment. Changes in tillage practices or crop rotations may leave more crop residue on the surface that can dramatically reduce erosion and surface flows. The combinations possible are large and the farmer must ultimately choose which combinations best fit their farm operation. The CNMP Provider plays an important role in suggesting which conservation practices are needed. If you do not feel you are qualified to make an informed judgment on the conservation practices on fields used for manure application, you should obtain the services of a qualified person.

Adopted February 2002

What documentation do I need on the fields where manure is applied?

The following information needs to be included in a CNMP:

1. Maps of fields where manure will be spread. These maps should show: field boundaries; wells; location of sensitive areas such as drains, streams, and tile inlets; sinkholes; wetlands that are within the field or in close proximity; location of subsurface field drainage tile lines (if known); and the existing conservation practices such as designed vegetative buffer strips, grassed waterways, etc. A plat map and an FSA aerial photo are both useful map tools to use.

2. A soils map from NRCS with descriptions of the predominant soil types. The description should describe general soil properties such as soil texture, drainage capability, and if there are surface or ground water risks. The location of small features such as swales, gullies, wet spots, or sand knolls can be noted on the map.

3. A summary of current soil test results and sampling procedures (e.g., MSUE recommendations, grid sampling, etc.).

4. Documentation of the current or planned crop production sequence or crop rotation. A three to five year history of cropping will help for planning nutrient management. Past and realistic expected crop yields are the basis for determining the nutrient requirements for the planned crop. A realistic yield goal is one that can be achieved at least 50 percent of the time. Yield information could come from several sources: personal farm records, reported yields from farm program or crop insurance purposes, historical county or soil survey records, etc.

The purpose of these maps and other soil and site information is to ensure that crop nutrient needs are being met by adequate and proper manure and fertilizer application. The CNMP must also document that manure, soil, and nutrients stay in the field and out of surface and ground water resources.

Achievement of these goals may require that some fields or parts of fields be managed differently regarding manure application. Manure management decisions can be made based on the information gathered in this section of the CNMP.

For more information on maps and soils information, contact your local USDA Service Center.

Adopted April 2002

Should I use the Revised Universal Soil Loss Equation (RUSLE2) or Manure Application Risk Index (MARI)?

One goal of a CNMP is to identify the conservation and management practices needed for erosion control in order to control off-site transport of nitrogen and phosphorus. To determine if erosion control is needed, the soil erosion rate must be estimated. The Revised Universal Soil Loss Equation (RUSLE2) is the procedure available to estimate soil erosion on cropland; therefore, RUSLE2 needs to be used to assess soil loss on all fields included in the CNMP.

RUSLE2 is a tool that combines several physical factors related to soil erosion and can help a planner evaluate erosion and sediment movement on a field-by-field basis. RUSLE2 is used to document the amount of soil erosion taking place on a field, to determine if the erosion rate is in excess of tolerable levels. Soil loss through soil erosion is a relatively invisible process. It can take place for decades before the effects on soil can be seen or shown in reduced crop yields. More importantly, soil erosion can carry soil, manure, and nutrients off fields and into ditches, lakes, and streams, causing water quality problems. Therefore it is important to control soil erosion on fields where manure is applied. Changes in tillage, crop rotations, and use of practices such as cover crops, vegetative filter strips, and other buffers can reduce soil erosion and reduce the risk of off-site movement of manure and nutrients. RUSLE2 becomes a method to document erosion rates before and after these changes in tillage and cropping practices.

If the producer applies manure during the winter months, the Manure Application Risk Index (MARI) must be used to assess which fields are most appropriate for winter spreading, and which fields should be avoided. MARI is used to assess the risk of manure movement from frozen and/or snow-covered fields. MARI can also be used to identify fields which are appropriate for winter spreading in emergency situations, such as if there were a spill or other malfunction in a storage facility and manure needed to be hauled to a field for immediate application.

RUSLE2 and MARI are tools to help assess the potential for off-field movement of manure and nutrient-rich sediment. A field-by-field summary of the results of these assessment tools should also include recommendations for the farmer on which conservation practices would "improve" the field rating and reduce the risk of off-site environmental impacts. For example, a field with a high erosion rate and high runoff potential might show a risk reduction from high to medium risk if conservation tillage were used or if setbacks and filter strips were installed.

For information on RUSLE2 and MARI, contact your local NRCS office.

Adopted February 2002, Modified March 2005, *Modified August 2007 - RUSLE2 must be completed for all new fields and revised calculations. Unchanged fields in existing CNMPs do not need to be re-evaluated.*

How should my CNMP address tiled fields where manure is applied?

All tiled fields which have manure applied to them must have tile risers and tile outlets identified and documented on aerial photos or other maps to be used by the manure applicator. As part of the CNMP development, the fields must be evaluated to determine the suitability for land application of manure and wastewaters. This evaluation considers such factors as tile location and depth, soil type, potential for soil cracking, moisture holding capacity of the soil profile, percent dry matter of the manure, etc. Based on these factors, the CNMP will specify the appropriate application location, time, method, and rate to minimize the potential discharge of manure and wastewaters.

The CNMP should also describe evaluations that will be done at the time of manure and wastewater applications. This evaluation should include such factors as evidence of soil cracking, crop maturity, prior precipitation, forecasted precipitation, etc. Flow from tile outlets will be monitored (visually) before and after manure application, to document that no manure is discharging to surface waters.

The CNMP will also identify immediate actions that could be taken to contain the discharge or minimize the impact of the discharge. These potential actions will be documented in the emergency action portion of the CNMP. The CNMP will also identify the following required documentation if a discharge does occur; location and depth of tile, and the field conditions at the time of the discharge.

Once immediate actions are taken to contain or minimize the discharge, an investigation of the probable cause of the discharge should be conducted. Variables to consider during this investigation include: tile location and depth, soil type, evidence of soil cracking, moisture holding capacity of the soil profile, preferential flow paths, precipitation events (prior, during, and after application), tile system integrity, manure application rate and method, type of tillage used prior to or following application, etc.

Based on the findings of the investigation, the CNMP will be modified accordingly to minimize the potential for future discharges of manure and wastewaters from tile lines.

Adopted February 2003

LAND APPLICATION MANAGEMENT

How do you determine the supporting land base needed for a CNMP?

There are two aspects to consider for nutrient applications. One is to determine how many acres are needed to apply manure nutrients (specifically N and P) annually. A typical crop rotation may be 1-5 years. This can be determined by using manure samples or MWPS-18 2000 Table 6 book values. Refer to *Generally Accepted Agricultural and Management Practices for Manure Management and Utilization*'s (GAAMP) section on "Manure Nutrient Loading." It is required in a CNMP to show that there is sufficient land base available.

The second aspect to address is the long-term sustainability of the farm based on expected phosphorus generated annually. Plan writers should discuss with producers if the P soil test levels are expected to increase, over the long-term, such that it may eventually require more land base or other strategies to continue to apply manure based on the soil test limits in GAAMPs. For this long-term perspective, mass balance or MWPS-18 2000 Table 6 should be utilized to determine total P2O5 generated. Total P2O5 generated should be compared to crop removal from spreadable acres. The CNMP should note the long-term sustainability and may suggest management strategies to extend the sustainability of the plan.

If the CNMP shows there is sufficient land base available, but the long-term sustainability is questionable, the plan can still be approved, but the situation needs to be documented in the CNMP and reviewed when the CNMP is updated.

Adopted April 2002, Modified September 2005

If I have records of animal outputs, do I still need to do a nutrient mass balance or use book values to determine the long-term sustainability of the farm?

Yes, refer to the "Generally Accepted Agricultural and Management Practices for Manure Management and Utilization"(Management of Manure Application to Land section). The estimation of cropland needed to utilize manure nutrients should be calculated by using a nutrient mass balance or MWPS 18 2000 Table 6 book values.

Adopted April 2002

How does the CNMP address nutrient applications to fields?

Appropriate manure applications should be determined by on-farm manure and soil test results and be supported by record keeping. In absence of manure analysis data, use MWPS-18 version 2000 Table 6. A CNMP can be approved if it documents that the nutrient amounts measured by manure tests or book values can be agronomically utilized over the years of the crop rotation.

Adopted April 2002

How are nutrients planned for future crop rotations in a CNMP?

Typical crop rotations (such as 3 years of corn for silage followed by 5 years of hay) are what the farmer generally follows. CNMPs budget the specific crop nutrient needs field-by-field. Because changes in planned cropping patterns are inevitable, the specific nutrient needs for each field will be updated annually (typically by the farmer or an agronomist) once the planned crops are known for the next year. The question then arises, how are nutrients planned for future, less known, cropping years in a CNMP?

One of the most important goals of a CNMP is to show that the nutrients generated can be safely and effectively utilized across the typical rotation. There are many variables that affect the ability to achieve this goal such as current soil fertility, yield goals, spreadable acres by field, multiple year spreading rates, cropping patterns (legume credits), etc. Tools such as MMP or MSUNM account for this balance in detail field-by-field. A detailed, field-by-field nutrient budget must be done for one crop year as part of the CNMP.

However, a large portion of the educational value of a CNMP is helping farmers think through the long-term issues related to manure production on the farm. Problems with needing more land or changing rates may not show up in a tool like MMP until year 3 or 4. This may lead to farmers making large financial or management decisions that are not sustainable. Long-term sustainability is addressed in part by calculating the acres needed by book values or mass balance as discussed in the MAEAP CNMP question: "**How do you determine the supporting land base needed for a CNMP?**"

The CNMP should give information to the farmer that will help them prepare detailed field-by-field spreading plans in future years. Spreading windows of opportunity help farmers' balance what land is available to spread with what volume of manure is generated during broad seasonal time periods.

To further address this issue, a CNMP must contain (in addition to the one year detailed crop budget) the following for each source of agricultural waste:

1. Volume of manure to be spread in each of two seasons (winter, summer and/or other critical time periods) translated to acres.
2. Division of those acres between fields with Bray P1 phosphorus levels above 150 lb/ac and below.
3. When spreading is done at multiple year phosphorus rates, care must be taken to ensure the field is not receiving phosphorus in the "off" years.
4. If many fields test greater than 150 lb/ac Bray P1 phosphorus or the acres needed for spreading are close to the acres available, then the CNMP Provider should ensure that sufficient spreading area is available at the time it is needed throughout the typical rotation.

The following table (in addition to the field-by-field spreading plan for one year) contains the minimum information outlined above:

Spreading Windows						
Spreading Season	Planned Crop (For example)	Application Rate: P_2O_5 removal based (150-300)	Acres available at P_2O_5 removal based rate (0-150)	Application Rate: N based	Acres available at N based rate	Volume
Winter	Corn Grain					
	Corn Silage					
	Soybeans					
	Hay					
	Total acres:					
	Total Volume that could be applied:					
	Volume of manure needed to be spread:					
Summer	Corn Grain					
	Corn Silage					
	Soybeans					
	Hay					
	Wheat					
	Total acres:					
	Total Volume that could be applied:					
	Volume of manure needed to be spread:					

This table provides some indication of the amounts and timing of spreading needed. For example, instead of only 200 acres of hay and wheat stubble needed for summer spreading, 300 acres are needed if P_2O_5 levels are testing greater than 150 Bray P1 and/or it is desirable to maintain or decrease P_2O_5 test levels. Another solution would be to increase storage so spreading is only needed in the spring and fall when all ground is typically available for spreading. Note that the Volume column will reflect estimates of what will be spread only in that time period. Note also that the winter acres must not exceed the acres identified as spreadable by MARI.

The CNMP Provider may substitute MMP, MSUNM, or other detailed field-by-field nutrient plans over the entire length of the planned rotation (not just one year) for the spreading windows table.

Adopted December 2002

When and how should manure samples be utilized for planning land application rates?

Manure sampling can be a useful tool in planning manure applications for crop utilization. Poorly collected manure samples are misleading and should not be used. In general, several manure samples should be collected over time, from any one manure system, to build a baseline of credible and useful information about nutrient content. The sampling procedure needs to be scrutinized if manure test results do not look reasonable.

One set of manure samples may be used in a CNMP if they look reasonable as long as the implementation schedule includes that more will be taken over time to build a baseline. Once two years of manure samples are gathered, and the results are similar, then those manure samples can be used for developing spreading rates within a CNMP.

Manure samples should be compared to either a mass balance or book values. Both of these methods can be found in MWPS 18-1s (use table 6 for book values and 21 for mass balance based on feed rations.) Manure samples are useful for determining manure application rates per acre for crop needs. Mass Balance or Book Values are useful for determining the long-term sustainability of nutrients from manure based on the availability of land for manure applications. A CNMP should assist the producer in planning both for the long-term future of manure applications and the immediate needs of land application. Refer to the Manure GAAMPS for more details. Also refer to the other questions and answers in this document under "Land Application Management."

It is important that manure samples are taken in a manner to ensure credible results. Refer to MSU Extension Bulletin NCR 567 "How to Sample Manure for Nutrient Analysis" for complete details on sampling manure.

Suggestions for obtaining credible samples include:

- Never dip off the top of a manure storage area for a "representative" sample. Nutrients settle to the bottom and this will be a very misleading sample of the entire system's nutrient content.
- Collect samples at the time of mixing and loading. If agitation is used, collect samples after agitation. The goal is to collect a sample that is representative of what is going to the field.
- If the manure has been well agitated, one sub-sample may be enough for a representative sample.
- Collecting a sample toward the beginning of hauling, during the middle, and toward the end; keeping samples separate is a good way to determine how much variation exists in the system.
- If you collect sub-samples every few loads and mix them together for one sample, and there is a lot of variance in the manure, the resulting manure test may be representative of what the total nutrients of the storage system are but not of what was hauled to any one location in the field. This can be used for gaining a better idea of total nutrients produced over time but might not be good for determining rate per acre of application.
- If changes in the consistency of the manure are noted, sample manure accordingly. Example, in a sand bedding situation, you may collect a sample from the skim part which is quite liquid; a sample from the intermediate phase that is referred to as a slurry; and then a sample of the portion that has more sand. This would make for three manure samples.
- Sample each manure system separately, i.e., do not mix sub-samples from three different storage systems into one sample.
- For daily scrap and haul, collect a sample out of the manure spreader before it goes to the field or out of the bucket of the tractor/skid steer. The manure will have incurred some mixing in the process of being scraped and will be more representative than "scooping" one sample off the floor of the barn.
- Continue to collect manure samples over time to maintain records, ensure credibility, and notice any changes over time.
- If there are any significant changes in feed, water, or manure collection and storage, manure samples should be retaken and a new baseline established.

- Sampling straw pack bedding can be challenging. Refer to NCR 567 for directions on sampling. In lieu of a sample, consult MWPS 2000-1S Table 11. These estimates of nutrient content can be utilized for determining land application rates.

Adopted July 2002

What soil sampling protocol should be used?

A fundamental component of farm management is soil fertility. A thorough understanding of fertility in the soils' root zone helps landowners apply the proper mass or volume of inorganic fertilizer, lime, organic residue, and manure. Correctly applying these inputs helps optimize crop yield and minimize losses to the air, surface water, and below the root zone. The fertility status of the soil in a field can be determined from soil samples collected that are representative of the field or areas within the field.

Michigan State University, the Land Grant University in Michigan, has published three publications providing guidance for technicians sampling soils. The primary document is Extension Bulletin 498, revised in January 1998. Sampling Soils for Fertilizer and Lime Recommendations is written by Dr. Darryl Warncke, MSU Crops and Soil Sciences Department. Soil sampling topics discussed include:

- Sampling Uniform Areas
- Soil Sampling Tools
- Sample Collection
- When to Sample and Test
- Frequency of Sampling
- Intense (grid) Soil Sampling

The Sampling Uniform Areas category is summarized below:

> **Composite soil samples that represent no more than 15 acres of a uniform soil area are more likely to be representative of that soil than samples that represent larger areas. Given that large fields may have uniform soil areas that amount to more than 15 acres, one composite sample may be representative of a larger acreage. Soils in most Michigan fields are not uniform; use 15 to 20 acres per composite sample as a general guide unless field variability or uniformity suggest more or less intense sampling is appropriate. However, if a larger field (20-40 acres) has one soil map unit (similar taxonomic characteristics of dominant soils), and has been managed as a single field for the last ten years, then soil cores from the entire field may be used for a single composite sample representing the entire field.**

Two other publications provide similar soil sampling information: MSU Extension Bulletin 1616, Soil Sampling for No-Till and Conservation Tillage Crops, and MSU Extension Bulletin 550A, Fertilizer Recommendations for Field Crops in Michigan.

NRCS Michigan Nutrient Management 590 Standard is a guidance document for CNMP Plan Development. In the category B Soil Testing and Nutrient Analysis by Crop Testing (590, page 2), the soil sampling protocol is based on these three MSU Extension Publications.

For CNMP Plan Providers, please acknowledge this important protocol in preparing your CNMP and conducting your soil sampling efforts (or those assigned this effort). Accurate soil fertility measurements are an important part of CNMP Plan Development. A CNMP is certified only after it includes an acceptable soil sampling/testing protocol in accord with the 590 Nutrient Management Standard.

A description of soil sampling protocol should be included in the CNMP. The description includes soil sampling depth, number of cores per composite, field size (acres) per composite, and date the sample cores were obtained.

Adopted December 2003

For estimating soil fertility on fields 20-40 acres, which soil taxonomic characteristics are acceptable?

Assessing soil fertility is required for determining the nutrient recommendations that are necessary for developing a crop nutrient budget. For sampling methodology, the reference documents are MSU Extension Bulletin 2904 Nutrient Recommendations for Field Crops in Michigan (2004), and MSU Extension Bulletin 498 Sampling Soils for Fertilizer and Lime Recommendations (1998).

Planners and landowners may have a composite soil sample taken from a field size that exceeds 20 acres and is no greater than 40 acres. The NRCS 590 Nutrient Management Standard (February 2005) states on page 2, section B1, third paragraph as follows:

> *"However, if a larger field, 20 to 40 acres, has one soil map unit (**similar taxonomic characteristics of dominant soils**) and has been managed as a single field for the last ten years, then soil cores from the entire field many be used for the a single composite sample representing the entire field."*

For field sizes in this range, planners will use one of the following two approaches:

1. ***Soil Management Group (SMG)**. The reference document MSU Extension Bulletin 1262 Soil Management Units and Land Use Planning (1982) describes the listing of Michigan soils according to dominant texture of the profile and natural drainage characteristics. This reference document may be found at the Michigan NRCS eFOTG web site: http://www.nrcs.usda.gov/technical/efotg/. For the use of assessing soil fertility, the surface texture is the area of interest. The SMGs are largely defined by numeric digits, 1 (fine textures) through 5 (course textures) and natural drainage, a (well drained) through c (poorly drained).*

   Planners can use the first digit for similar taxonomic characteristics. For example if all soils in the field have a SMG of 1 (clay, clay loam, or silty clay loam) or if all soils in a different field have a SMG of 2 (loam or silt loam), then field sizes of 20-40 acres are acceptable. Landowners will resample fields to meet the 20-40 acre rule if more than one SMG occurs in that field.

2. ***Textural Class**. All soil map units have similar surface textural classes without a lithologic discontinuity*. Specifically, the textural classes reside on the USDA Soil Textural Class Triangle (Figure 1). A lithologic discontinuity is defined as an abrupt change in textural class. On the textural class triangle, a lithologic discontinuity occurs when two textural classes are separated by a third textural class. A listing of similar textural classes follows. Each listing*

begins with a textural class found on the triangle. The similar textural classes are then listed. Planners will identify the dominant soil textural class in the field, and then locate that texture as the first texture class in each of the twelve classes below. If all field soil textures are found in that list of similar soils, then the composite sample from the entire field may be used to estimate soil fertility. One example is sandy loam as the dominant soil texture in a 35 acre field. If the other soils in this field are sandy loam, and/or sandy clay loam, and/or clay loam, and/or clay, then the criterion of similar taxonomic characteristics for the dominant soils is met.

a. Sand, loamy sand
b. Loamy sand, sandy loam
c. Sandy loam, sandy clay loam, loam, silt loam
d. Sandy clay loam, sandy loam, clay loam, loam
e. Loam, sandy loam, sandy clay loam, clay loam, silt loam, silty clay loam
f. Silt loam, sandy loam, loam, clay loam, silty clay loam, silt
g. Silt, silt loam
h. Silty clay loam, silt loam, clay loam, clay, silty clay
i. Clay loam, clay, silty clay, silty clay loam, loam, sandy clay loam, sandy clay
j. Sandy clay, sandy clay loam, clay loam, clay
k. Silty clay, silty clay loam, clay loam, clay
l. Clay, sandy clay, clay loam, silty clay loam silty clay

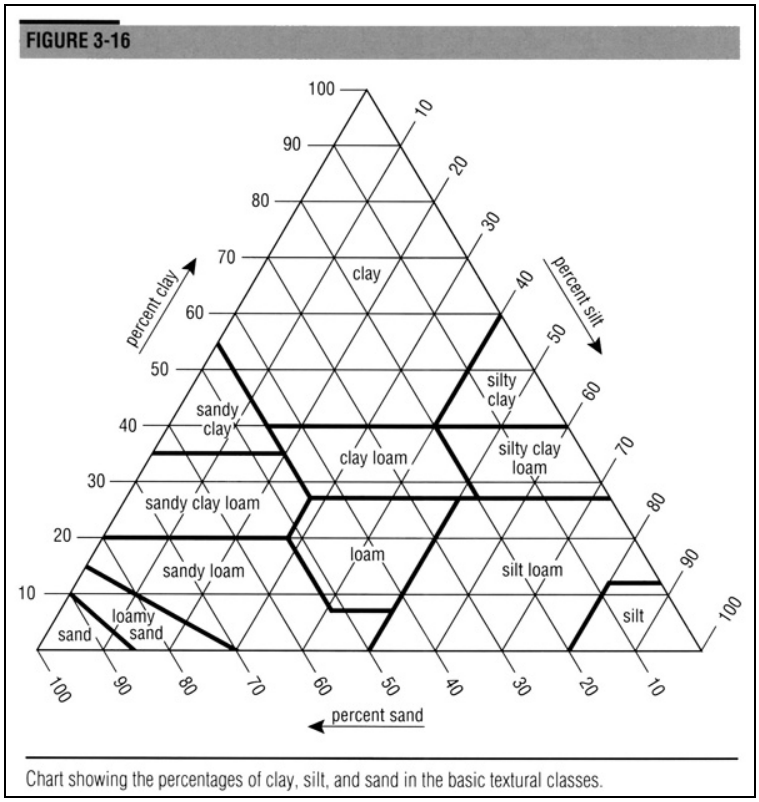

Figure 1 - USDA Textural Class Triangle

* *Lithologic discontinuities are significant changes in particle size distribution or mineralogy that represent differences in lithology, or the gross physical character of soil particles. For the purpose of estimating soil fertility, the term is understood as abrupt textural differences.*

Adopted November 2007

What is a pasture, and must my pastureland be included in my CNMP?

Yes, all land that receives animal manure must be a part of a CNMP and the manure nutrients deposited by the grazing animals must be accounted for in the CNMP. For an area to qualify as pasture, all of the following requirements must be met:

- The land is used primarily for the production of forage upon which livestock graze.
- The predominance of vegetation is a desirable forage species.
- The grazed forage is generally the primary feed source for the livestock. This includes hay harvested from pastures during spring flush and later fed in movable feeders in the pasture.
- Stocking densities and management systems ensure that desirable forage species are present with an intensity of stand sufficient to slow the movement of runoff water and control soil erosion and movement of manure nutrients from the pasture land.

Pastureland is addressed in a CNMP by specifying the following:

- Stocking densities
- Nutrient loading and nutrient removal rates on a large-scale basis (i.e., mass balance of the entire pasture, not paddock by paddock).
- Water quality concerns (e.g., unrestricted cattle access to streams is addressed).
- Erosion control practices.

Pastureland that receives no additional phosphorus (P) beyond the phosphorus in the manure deposited by the grazing animals, and is maintained and managed as a true pasture may continue to be grazed even though soil test levels for phosphorus equal or exceed 300 lb/ac (150 ppm) Bray P1.

Vegetative cover is the most important component in a grazing system. Follow recommendations in NRCS Practice Standard 528A, Prescribed Grazing. A dense vegetation under a prescribed grazing plan removes high rates of N, P, and K from pasture soils, slowly depleting P and K if no additional fertilizer or manure from other sources is applied.

Pastureland could see an increase in phosphorus levels if: (1) the livestock are fed supplemental feeds beyond that supplied by the grazed forage, or (2) additional P is applied to the pasture in the form of fertilizer and/or manure from other areas. If a pasture reaches or exceeds 300 lb/ac (150ppm) Bray P1, grazing can continue but management techniques must be used such that a theoretical mass balance shows a net decrease in soil phosphorus over time.

Adopted February 2002

What is a dirt lot?

A dirt lot is an outside lot for livestock with non-vegetated (exposed dirt) areas. This may be a small fenced area where livestock density precludes sustaining vegetative growth on the soil surfaces.

Fenced fields where an annual crop is grown and where livestock forage for leftover vegetation or lost grain products (corn) are considered cropland, not pastures or dirt lots. In these areas, nutrients should be handled as part of the cropping nutrient program.

Adopted February 2002, Modified April 2002

How must a dirt lot be addressed in a CNMP?

A dirt lot is addressed in a CNMP by describing the following:

- Provisions should be made to collect, store, utilize, and/or treat manure accumulations and contaminated runoff from outside open lots. Maintenance of open lot systems requires manure-handling methods to periodically remove accumulated solid or semisolid manure and control lot runoff. Solid manure is typically transferred from the lot to storage facilities or equipment for application to cropland. The frequency of removal of accumulated manure will depend on the animal density (square feet of lot area per animal), the amount of time the animals spend on the lot, the animal size, and the type of feed system. (Refer to Runoff Control and Waste Management section of the Generally Accepted Agricultural and Management Practices for Manure Management and Utilization.)

- Use guttering or other diversions to reduce the amount of rain or snowmelt that enters a dirt lot. Runoff control is required if runoff from the dirt lot leaves the owner's property or adversely impacts surface and groundwater quality, including runoff to a neighbor's land, a roadside ditch, a drainage ditch, or a stream or lake. Runoff from dirt lots will contain some nutrients and solids. Solid separation structures can be used to separate dirt lot runoff solids from liquids before the liquids are collected and either stored or treated. Runoff water can be stored in a properly designed constructed wetland or storage pond. Runoff can also be diverted to a vegetative filter strip where nutrients will be taken up by the grasses and removed through periodic harvest.

If the animals are moved off the dirt lot in the spring and summer, it is recommended that a cover crop such as rye be planted on the dirt lot.

Adopted February 2002, Modified April 2002

What is a paved lot, and what must be addressed in my CNMP?

A paved lot is an open lot completely covered with an impervious material such as concrete or asphalt paving.

A paved lot is addressed in a CNMP by describing the following:

- Manure removal and utilization.
- Provisions for addressing surface water quality concerns related to runoff.

Use guttering or other diversions to reduce the amount of rain or snowmelt that enters the paved lot.

Runoff control is required if runoff from the paved lot leaves the owner's property or adversely impacts surface and groundwater quality, including runoff to a neighbor's land, a roadside ditch, a drainage ditch, or a stream or lake. Runoff from paved lots will contain some nutrients and solids. Solid separation structures can be used to separate paved lot runoff solids from liquids before the liquids are collected and either stored or treated. Runoff water can be treated or stored in a properly

designed constructed wetland or storage pond. Runoff water can also be diverted to a vegetative filter strip where nutrients will be taken up by the grasses and removed through periodic harvest.

Adopted February 2002

ALTERNATIVE UTILIZATION ACTIVITIES

When manure is given away or sold, does that have to be included in my CNMP?

Yes, the amount of manure given away or sold must be indicated in the CNMP. If the manure that is given/sold is not applied by the generator or his/her contractor, then the following minimum recordkeeping requirements will be specified in a CNMP:

1. Documentation of the amount of manure sold/given.
2. A manure analysis must be provided to the receiving party.
3. The recipient's name and contact information.
4. The date of transfer.
5. General information on proper manure utilization can be provided to the recipient, and if this is the case then this can be noted.

Adopted February 2002

If the farmer who generates the manure applies the manure to someone else's cropland or hires a commercial applicator to apply manure on another person's cropland, what must be included in the farmer's CNMP?

It is the responsibility of the manure generator/applicator to ensure that as much of the manure nutrient resource is available for utilization as possible. For farmers that spread their manure on someone else's ground, or who hire a commercial applicator to apply manure on another person's cropland, the following must be included in the CNMP:

1. Determination of application at agronomic rate. Determination of application rates must be done on a field-by-field basis according to the Land Application Management section of the CNMP outline. Application rates may need to be changed because of field-specific variables that are not nutrient-based such as steep slopes, high nutrient leachability, presence of high water tables, etc. The phosphorus limits found in GAAMPs must be followed. For example, fields between 150 and 300 lb/ac Bray P1 must have manure applied based on crop removal rates for phosphorus, and no manure shall be applied on fields at or greater than 300 lb/ac Bray P1.

2. Setbacks and no-spreading zones. Sensitive areas as listed in the CNMP outline must be identified on field maps where manure is applied. Sensitive areas include streams and drains along or in fields, tile inlets, wetlands, and swales or gullies. See the MAEAP CNMP question: "**What documentation do I need on the fields where manure is applied?**"

3. Risk of runoff from fields due to winter manure application. MARI must be used to assess the field variables that impact the risk of off-site impacts from manure application to frozen or snow covered land, and to explain management decisions that are based on this analysis.

4. Conformance with GAAMPs. Practices for manure application to land are described in the Generally Accepted Agricultural Management Practices (GAAMPs) for Manure Management and Utilization. The manure generator/applicator will need to assess whether the landowner is using management practices that will prevent off-site movement of manure or soil. If there is not a reasonable assurance of this, then the generator/applicator must not spread manure on that field. Contact the Michigan Department of Agriculture for more information on GAAMPs.

This information must be documented in the generator/applicator's CNMP prior to manure application on a field.

Adopted February 2002

INSPECTION, OPERATION & MAINTENANCE, TRAINING

Employee Training

Employee training is very important to fully implement a CNMP. The employee training section of a CNMP should be specific to the farm and may involve both hired persons and family members. The level and intensity of training necessary will vary by the responsibilities of each worker. The farm positions that need specific training should be indicated in the employee training plan.

Fundamental areas in which training should occur include: 1) the basic concepts of environmental stewardship and regulation; 2) the contents, including practical applications and implications of the CNMP; 3) proper operation and maintenance of equipment associated with collecting, storing, handling, treating, transporting, and land-applying manure and wastewater; 4) safety; and 5) emergency response. Items 3-5 should be specific to the farm and detailed in the employee training section of the CNMP. To avoid confusion, items that do not relate to the specific farm should not be included in a CNMP.

Employees responsible for land application of manure should be trained on the land application components within the CNMP. This should include items such as determining the rate of manure to be applied to each field, identifying from the CNMP what spreading precautions exist for each field, how to operate spreading equipment to achieve proper application rates, and safety and emergency response issues.

An employee training plan should indicate person(s) responsible and methods utilized for training of new employees including the initial training of existing workers, routine communication, and updates requiring additional instruction.

Adopted June 2005