

Commonwealth of Pennsylvania



LAND APPLICATION OF MANURE **A Supplement to Manure Management for Environmental Protection**

Manure Management Plan Guidance

Bureau of Watershed Restoration and Nonpoint Source Management
www.dep.pa.gov

DEPARTMENT OF ENVIRONMENTAL PROTECTION
Bureau of Watershed Restoration and Nonpoint Source Management

DOCUMENT NUMBER: 361-0300-002

TITLE: Land Application of Manure – a supplement to Manure Management for Environmental Protection

EFFECTIVE DATE: Upon publication of notice as final in the *Pennsylvania Bulletin*

AUTHORITY: Section 5(b)(1) and Section 402 of the Pennsylvania Clean Streams Law, 35 P.S. Sections 691.5(b)(1) and 691.402; Section 1920-A of the Administrative Code of 1929, 71 P.S. Section 510-20, and 25 Pa. Code Section 91.36(b).

POLICY: The land application of animal manures and agricultural process wastewater must follow the standards for development and implementation of a plan to manage nutrients for water quality protection using standards outlined in *Manure Management for Environmental Protection* (361-0300-001) and its supplements (collectively referred to as the Manure Management Manual) unless the requirements described in 25 Pa. Code § 91.36(b) are met in another way such as a permit or approval from the Department of Environmental Protection (DEP).

PURPOSE: The purpose of these revisions is to address the diverse planning needs of the regulated community and maintain or improve the feasibility of planning, verification, and implementation of Manure Management Plans developed in accordance with the standards set forth in the Manure Management Manual.

APPLICABILITY: The revisions to this guidance are applicable to all agricultural operations, as defined in 25 Pa. Code § 91.1 and 3 Pa.C.S. § 503, that land apply manure or agricultural process wastewater.

DISCLAIMER: The policies and procedures outlined in this guidance are intended to supplement existing requirements. Nothing in the policies or procedures shall affect regulatory requirements.

The policies and procedures herein are not an adjudication or a regulation. DEP does not intend to give this guidance that weight or deference. This document establishes the framework, within which DEP will exercise its administrative discretion in the future. DEP reserves the discretion to deviate from this policy statement if circumstances warrant.

PAGE LENGTH: 93 pages

PREFACE

This publication supersedes all previous Land Application of Manure supplements to *Manure Management for Environmental Protection* published by the Pennsylvania Department of Environmental Protection (DEP). Due to changes in recommendations and practices, incomplete previous copies of the Land Application of Manure Supplement should be discarded.

Manure Management for Environmental Protection (361-0300-001) and its supplements (collectively referred to as the Manure Management Manual) provide guidelines that comply with DEP regulations concerning animal manures and agricultural process wastewaters. The criteria established in this Land Application of Manure Supplement to *Manure Management for Environmental Protection* are required to be followed by all agricultural operations applying manure or agricultural process wastewater, pasture animals, or manage Animal Concentration Area (ACA) unless the operators obtain a permit or approval from DEP to implement alternative practices.

The completed planning templates within the Land Application of Manure Supplement should be reviewed annually and updated to remain consistent with the operation and manure management practices. When an update is necessary due to changes in the operation or manure management practices, all updates should be consistent with this publication, and previous copies of the Land Application of Manure Supplement and the obsolete planning templates there within should be discarded.

The provisions of this Land Application of Manure Supplement work together with the Agricultural Erosion and Sediment Control Plan required for agricultural plowing and tilling and managing Animal Heavy Use Areas (also known as ACAs). Certain sections of information developed using this Land Application of Manure Supplement can be used as part of the Agricultural Erosion and Sediment Control Plan.

Agricultural operations that are Concentrated Animal Operations (CAOs) under the Nutrient and Odor Management Act Regulations or Concentrated Animal Feeding Operations (CAFOs) under Pennsylvania's National Pollutant Discharge Elimination System (NPDES) CAFO program must follow requirements different from those found in this Land Application of Manure Supplement.

Commonwealth of Pennsylvania
Department of Environmental Protection
Bureau of Watershed Restoration and Nonpoint Source Management
Harrisburg, Pennsylvania

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REQUIREMENTS FOR MANURE MANAGEMENT PLANS

Every agricultural operation, as defined in 25 Pa. Code § 91.1 and 3 Pa.C.S. § 503, in Pennsylvania that land applies manure or agricultural process wastewater (generated on the agricultural operation or received from an importer), regardless of size, is required by 25 Pa. Code § 91.36(b) to have and implement a written Manure Management Plan. This includes manure and agricultural process wastewater application by various types of equipment and/or direct application of manure by animals on pastures and in ACAs. In other words, even agricultural operations that do not mechanically apply manure to the land but have animals on pastures or ACAs are required by regulation to have a Manure Management Plan.

The Manure Management Plan Workbook or Manure Management Plan Short Form formats described in this Land Application of Manure Supplement must be used for the written Manure Management Plan unless the operator receives approval from DEP for an alternative plan format. In addition to developing a written plan, the operator must also complete and maintain records to demonstrate compliance with the Manure Management Plan. Requests for approval of alternative formats should be directed to DEP's Bureau of Watershed Restoration and Nonpoint Source Management, P.O. Box 8555, Harrisburg, PA 17105-8555.

Once completed, the applicable worksheets within the Manure Management Plan Workbook or Manure Management Plan Short Form will become the agricultural operation's Manure Management Plan which must be implemented pursuant to 25 Pa. Code § 91.36(b). The Manure Management Plan should be maintained on the operation and made available to staff from DEP or the county conservation district upon request.

If the Manure Management Plan Workbook is the operator's chosen manure management planning document, the operator should provide a copy of the Manure Management Plan Summary Worksheet in the Manure Management Plan Workbook to the individual that land applies manure.

Failure to follow the Manure Management Plan is a violation of state, and in some cases, federal law.

Manure Management Plans can be prepared by the agricultural operator although the operator may benefit from obtaining assistance from individuals trained and experienced in developing these plans. Assistance may be available from a variety of sources including certified nutrient management specialists, certified manure brokers and haulers, county conservation districts, Natural Resource Conservation Service (NRCS) staff, Penn State University staff and agricultural organizations.

Agricultural operations defined as CAFOs and CAOs are required to develop written plans as well. The nutrient management plans for these animal operations are required to follow a different process and must be developed by a Certified Nutrient Management Specialist.

In addition to obtaining approval from DEP, agricultural operations that choose not to complete one of the planning templates outlined in the Land Application of Manure Supplement may obtain the assistance of a certified planner and utilize the nutrient management planning process under the Nutrient and Odor Management Act, 3 Pa.C.S.A. §§ 501--522 (Act 38) used by CAFOs and CAOs. This alternative planning standard is acceptable to DEP and may provide for some added flexibility in the application of manure on the agricultural operation.

MANURE MANAGEMENT PLANNING OPTIONS

The following Manure Management Planning forms and instructions serve as the standard plan formats for agricultural operations that land apply manure or agricultural process wastewater. Acceptable alternative formats include those approved for use under Act 38 and the CAFO programs. Other planning formats and procedures require DEP approval.

Questions concerning the manure management plan should be directed to the DEP regional office serving the county or the county conservation district. Requests for approval of alternative formats should be directed to DEP, Bureau of Watershed Restoration and Nonpoint Source Management, P.O. Box 8555, Harrisburg, PA 17105-8555.

The Land Application of Manure Supplement has two manure management planning options for agricultural operations: The Manure Management Plan Short Form and the Manure Management Plan Workbook. The Manure Management Plan Short Form may be used to meet the manure management planning requirements on any agricultural operation that can satisfy the criteria outlined on the Manure Management Information section of the Manure Management Plan Short Form.

All agricultural operations that land apply manure or agricultural process wastewater that are not defined as a CAO or CAFO may use the Manure Management Plan Workbook to meet the manure management planning requirements. However, unless an alternative format has been approved by DEP, the Manure Management Plan Workbook must be used to meet the planning requirements if the criteria outlined in the Manure Management Plan Short Form cannot be satisfied by existing and planned conditions on the agricultural operation.

The sections of the Land Application of Manure Supplement that are not applicable to the agricultural operation may be removed for ease of use.



LAND APPLICATION OF MANURE
A Supplement to Manure Management for Environmental Protection

MANURE MANAGEMENT PLAN SHORT FORM

**May Be Completed, Implemented, and Retained
By Agricultural Operations that Land Apply Manure and
Meet the Criteria in the Manure Management Information
Section of the Manure Management Plan Short Form
To Meet the Manure Management Planning Requirements
Described in 25 Pa. Code § 91.36(b).**

MANURE MANAGEMENT PLAN SHORT FORM INSTRUCTIONS

The Manure Management Plan Short Form (Short Form) Instructions describe the required criteria for developing and implementing a manure management plan using the Short Form standard format.

The Short Form includes general operational information and a series of Yes, No, or Not Applicable (NA) questions. Review each question carefully and answer based on the current and continued planned management of any manure that is generated or applied under your management control.

If you answer “Yes” or “NA” to all of the questions found in the Manure Management Information section of this Short Form, no additional documentation is necessary unless it is requested by DEP or a delegated county conservation district.

If you cannot answer “YES” or “NA” to all of items in the Manure Management Information section, you must meet the requirements described in 25 Pa. Code § 91.36(b) in another way. If properly completed, the Manure Management Plan Workbook in Land Application of Manure; Manure Management Plan Guidance (361-0300-002) would meet the regulatory requirements.

1. Contact Information

Insert the contact information for the agricultural operation, including both the name of operator and landowner, operation address, and operator phone and email address. In the final line of the contact information, note the date the plan was developed.

2. General Information

Identify basic information about the operation in the space provided:

- a. Total acres of land receiving manure (pasture, garden, crop) – include all acres receiving manure regardless of whether the manure is directly applied by pastured animals or mechanically applied using a manure spreader, horse-drawn equipment, pitchfork, or any other means.
- b. Animal Information – provide the animal type for all animals on the operation, number of animals of that animal type on a normal production day, weight per animal unit (refer to Agronomy Facts 54 found in Appendix 2), and days per year on the operation. Use additional sheets as necessary.

3. Manure Management Information

The Manure Management Information section of the Short Form is a series of Yes, No, or Not Applicable (NA) questions.

Identify the appropriate response for all items on the Short Form.

Items a. and b. should be consistent with the General Information section of the Short Form.

The following equation should be used to determine the minimum acreage of land receiving manure in item b.:

Total pounds of livestock or poultry ÷ 1,000 = minimum acreage of land receiving manure

Examples: 1 light horse totaling 1,100 pounds, would require a minimum of 1.1 acres receiving manure and 5 medium ewes totaling 875 pounds would require a minimum of 0.875 acres receiving manure.

Next Steps

If a response of "Yes" or "NA" has been recorded to all of the questions found in the Manure Management Information section of this Short Form and all sections of the Short Form are complete, the Manure Management Plan Short Form becomes the agricultural operation's Manure Management Plan which must be implemented pursuant to 25 Pa. Code § 91.36(b).

The Manure Management Plan Short Form should be maintained on the operation and made available to staff from DEP or county conservation district upon request.

No additional documentation is necessary unless it is requested by DEP or a delegated county conservation district.

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MANURE MANAGEMENT PLAN SHORT FORM (EXAMPLE)

The Manure Management Plan Short Form (Short Form) includes general operational information and a series of Yes, No, or Not Applicable (NA) questions. Review each question carefully and answer based on the current and continued planned management of any manure that is generated or applied under your management control.

If you answer “Yes” or “NA” to all of the questions found in the Manure Management Information section of this Short Form, no additional documentation is necessary unless it is requested by DEP or a delegated county conservation district.

If you cannot answer “YES” or “NA” to all of items in the Manure Management Information section, you must meet the requirements described in 25 Pa. Code § 91.36(b) in another way. If properly completed, the Manure Management Plan Workbook in Land Application of Manure; Manure Management Plan Guidance (361-0300-002) would meet the regulatory requirements.

DEP reserves the right to require an alternate method of meeting the regulations including the completion of the Manure Management Plan Workbook and site specific BMPs to address any identified water quality issues.

CONTACT INFORMATION

Name of Operator: Mr. John Q. Public

Name of Landowner(s): Mrs. Jane F. Farmerson

Operation Street Address: 3 Sample Road

City, State and Zip Code: Farm City, PA 12345

Operator Phone number (Home/Barn): 717-555-4567

(Cell): 717-555-3456

Operator Email Address: samplefarm@email.com

Date of Development: June 15, 2022

GENERAL INFORMATION

a. Total acres of land receiving manure (pasture, garden, crop): 20 Acres

b. Animal Information:

Animal Type	Animal Number	Animal Weight / AU (Per Agronomy Facts 54)	Days Per Year
Driving Horse	2	1100	365
Laying Hens	20	3.85	365

MANURE MANAGEMENT INFORMATION

- a. I currently and will continue to maintain less than 8,000 lbs. combined weight of livestock and poultry under my management control as calculated by the procedures outlined in *Agronomy Facts 54, Pennsylvania's Nutrient Management Act (Act 38): "Who Is Affected?"* found in Appendix 2 and have answered Yes or NA to all of the items below. Yes No
- b. For every 1,000 lbs. of livestock or poultry under my management control as calculated by the procedures outlined in *Agronomy Facts 54, Pennsylvania's Nutrient Management Act (Act 38): "Who Is Affected?"* I currently and will continue to maintain at least one acre of land receiving manure (pasture, garden, or crop). Yes No
- c. I currently and will continue to import less than 3,000 lbs. (about 45 cubic feet or 1 pick-up load) of manure for personal use on pasture, garden, or crop. Yes No
- d. All manure that is applied using a manure spreader, horse-drawn equipment, pitchfork, or any other means of mechanically applying manure is currently and will continue to be spread evenly across all acreage receiving manure. Yes No NA
NA is acceptable only if there is no manure mechanically applied on site.
- e. I currently and will continue to maintain at least 100-foot setbacks from all environmentally sensitive areas listed below for all manure that is applied using a manure spreader, horse-drawn equipment, pitchfork, or any other means of mechanically applying manure. Yes No
1. Private or public drinking water wells
 2. Streams, lakes, springs, or ponds
 3. Sinkholes
 4. Areas of concentrated flow including swales, ditches, gullies, etc.
 5. Above ground inlet to agricultural drainage system
- f. I do not currently and will not apply manure between December 15th and February 28th or anytime the ground is frozen at least 4 inches deep or snow-covered. Yes No
- g. I do not currently and will not generate or apply liquid or semisolid manure or store manure in a liquid or semisolid manure storage facility. Yes No
A liquid or semisolid manure storage is a concrete tank, metal tank, under building structure, earthen, clay, or synthetic-lined pond or lagoon, etc. used to store liquid or semisolid manure.

MANURE MANAGEMENT INFORMATION (CONT.)

- h. All solid manure is currently and will continue to be stored under roof or cover and on an a permanent, improved, stabilized, and compacted surface with runoff controls to prevent a polluttional discharge.** Yes No NA

NA is acceptable only if solid manure is not stored on site. For example: if solid manure is produced off site, imported, and immediately applied to a garden or cropland.

- i. All manure that is transported off-site is currently and will continue to be land applied on an agricultural operation according to a site-specific Manure or Nutrient Management Plan or transported to a permitted waste disposal site.** Yes No NA

If manure is transported off-site, records should be maintained including the date of transfer, the name of the person or entity receiving the manure, and estimated amount of the transfer. An example of a manure transfer record can be found on page 16 of the Manure Management Plan Workbook Template found in the Land Application of Manure; Manure Management Plan Guidance (361-0300-002).

NA is acceptable only if there is no manure transported off site.

- j. I currently and will continue to manage all pastures to maintain at least 3 inches of vegetation height and 75% perennial grass cover when animals are present on pasture.** Yes No NA

The pasture, lot, or exercise yard is managed to minimize bare spots and to maintain an average grass height across the pasture at least 3 inches high.

If any bare spots are present, Yes is acceptable only if the bare spots do not cause a direct flow of manure contaminated runoff to streams, lakes, springs, ponds, or sinkholes.

NA is acceptable only if there is no pasture on site.

- k. Under my current and proposed management, there are no barnyards, feedlots, loafing areas, exercise lots or other animal confinement areas prohibiting the growth of pasture.** Yes No

Animal access ways, feeding areas, watering areas, and shade areas or walkways are acceptable if they do not cause a direct flow of manure contaminated runoff to streams, lakes, springs, ponds, or sinkholes.

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MANURE MANAGEMENT PLAN SHORT FORM

The Manure Management Plan Short Form (Short Form) includes general operational information and a series of Yes, No, or Not Applicable (NA) questions. Review each question carefully and answer based on the current and continued planned management of any manure that is generated or applied under your management control.

If you answer “Yes” or “NA” to all of the questions found in the Manure Management Information section of this Short Form, no additional documentation is necessary unless it is requested by DEP or a delegated county conservation district.

If you cannot answer “YES” or “NA” to all of items in the Manure Management Information section, you must meet the requirements described in 25 Pa. Code § 91.36(b) in another way. If properly completed, the Manure Management Plan Workbook in Land Application of Manure; Manure Management Plan Guidance (361-0300-002) would meet the regulatory requirements.

DEP reserves the right to require an alternate method of meeting the regulations including the completion of the Manure Management Plan Workbook and site specific BMPs to address any identified water quality issues.

CONTACT INFORMATION

Name of Operator: _____

Name of Landowner(s): _____

Operation Street Address: _____

City, State and Zip Code: _____

Operator Phone number (Home/Barn): _____

(Cell): _____

Operator Email Address: _____

Date of Development: _____

GENERAL INFORMATION

a. Total acres of land receiving manure (pasture, garden, crop): _____ Acres

b. Animal Information:

Animal Type	Animal Number	Animal Weight / AU (Per Agronomy Facts 54)	Days Per Year

MANURE MANAGEMENT INFORMATION

- a. I currently and will continue to maintain less than 8,000 lbs. combined weight of livestock and poultry under my management control as calculated by the procedures outlined in *Agronomy Facts 54, Pennsylvania's Nutrient Management Act (Act 38): "Who Is Affected?"* found in Appendix 2 and have answered Yes or NA to all of the items below. Yes No
- b. For every 1,000 lbs. of livestock or poultry under my management control as calculated by the procedures outlined in *Agronomy Facts 54, Pennsylvania's Nutrient Management Act (Act 38): "Who Is Affected?"* I currently and will continue to maintain at least one acre of land receiving manure (pasture, garden, or crop). Yes No
- c. I currently and will continue to import less than 3,000 lbs. (about 45 cubic feet or 1 pick-up load) of manure for personal use on pasture, garden, or crop. Yes No
- d. All manure that is applied using a manure spreader, horse-drawn equipment, pitchfork, or any other means of mechanically applying manure is currently and will continue to be spread evenly across all acreage receiving manure. Yes No NA
- NA is acceptable only if there is no manure mechanically applied on site.*
- e. I currently and will continue to maintain at least 100-foot setbacks from all environmentally sensitive areas listed below for all manure that is applied using a manure spreader, horse-drawn equipment, pitchfork, or any other means of mechanically applying manure. Yes No
1. Private or public drinking water wells
 2. Streams, lakes, springs, or ponds
 3. Sinkholes
 4. Areas of concentrated flow including swales, ditches, gullies, etc.
 5. Above ground inlet to agricultural drainage system
- f. I do not currently and will not apply manure between December 15th and February 28th or anytime the ground is frozen at least 4 inches deep or snow-covered. Yes No
- g. I do not currently and will not generate or apply liquid or semisolid manure or store manure in a liquid or semisolid manure storage facility. Yes No
- A liquid or semisolid manure storage is a concrete tank, metal tank, under building structure, earthen, clay, or synthetic-lined pond or lagoon, etc. used to store liquid or semisolid manure.

MANURE MANAGEMENT INFORMATION (CONT.)

- h. All solid manure is currently and will continue to be stored under roof or cover and on an a permanent, improved, stabilized, and compacted surface with runoff controls to prevent a polluttional discharge.** Yes No NA

NA is acceptable only if solid manure is not stored on site. For example: if solid manure is produced off site, imported, and immediately applied to a garden or cropland.

- i. All manure that is transported off-site is currently and will continue to be land applied on an agricultural operation according to a site-specific Manure or Nutrient Management Plan or transported to a permitted waste disposal site.** Yes No NA

If manure is transported off-site, records should be maintained including the date of transfer, the name of the person or entity receiving the manure, and estimated amount of the transfer. An example of a manure transfer record can be found on page 16 of the Manure Management Plan Workbook Template found in the Land Application of Manure; Manure Management Plan Guidance (361-0300-002).

NA is acceptable only if there is no manure transported off site.

- j. I currently and will continue to manage all pastures to maintain at least 3 inches of vegetation height and 75% perennial grass cover when animals are present on pasture.** Yes No NA

The pasture, lot, or exercise yard is managed to minimize bare spots and to maintain an average grass height across the pasture at least 3 inches high.

If any bare spots are present, Yes is acceptable only if the bare spots do not cause a direct flow of manure contaminated runoff to streams, lakes, springs, ponds, or sinkholes.

NA is acceptable only if there is no pasture on site.

- k. Under my current and proposed management, there are no barnyards, feedlots, loafing areas, exercise lots or other animal confinement areas prohibiting the growth of pasture.** Yes No

Animal access ways, feeding areas, watering areas, and shade areas or walkways are acceptable if they do not cause a direct flow of manure contaminated runoff to streams, lakes, springs, ponds, or sinkholes.

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LAND APPLICATION OF MANURE
A supplement to Manure Management for Environmental Protection

MANURE MANAGEMENT PLAN WORKBOOK

**To Be Completed, Implemented and Retained
By All Agricultural Operations that Land Apply Manure or
Agricultural Process Wastewater Unless the Requirements
Described in 25 Pa. Code § 91.36(b) are Met in Another Way
Such as a Permit or Approval from the
Department of Environmental Protection or completion of
the Manure Management Plan Short Form.**

MANURE MANAGEMENT PLAN WORKBOOK INSTRUCTIONS

The Manure Management Plan Workbook Instructions describe the required criteria for developing and implementing a manure management plan using the Manure Management Plan Workbook standard format.

The Manure Management Plan Workbook has a checklist and seven sections as outlined below.

Section 1 – General Information. This section includes general information about the agricultural operation. **The Date of Development, Contact Information, and Operation Information are always required as part of a completed Manure Management Plan Workbook. The Animals Worksheet is required if livestock or poultry are managed on the agricultural operation.**

Section 2 – Mechanical Manure Application. This section documents manure application rates and timing for mechanical application of manure. **This section is required in a complete Manure Management Plan Workbook if manure is mechanically applied on the agricultural operation.**

Section 3 – Operation Map. This section provides an operation map identifying the location of fields, structures, environmentally sensitive areas, and manure application setbacks. **This section is always required in a complete Manure Management Plan Workbook.**

Section 4 – Manure and Agricultural Process Wastewater Storage Facilities and Stockpiling/Stacking Areas. **This section is necessary if the agricultural operation generates agricultural process wastewater, maintains manure storage facilities, or stockpiles or stacks manure.**

Section 5 – Pasture Management. **This section is necessary if the agricultural operation maintains one or more pasture fields.**

Section 6 – Animal Concentration Areas (ACAs). **This section is necessary if the agricultural operation maintains one or more ACAs** (barnyards, feedlots, animal exercise areas).

Section 7 – Recordkeeping. This section provides a description of required recordkeeping and provides forms that can be used for recordkeeping. **This section is always required in a complete Manure Management Plan Workbook.**

To determine what sections are necessary for the operation, the Manure Management Plan Workbook Checklist on Page 1 of the Manure Management Plan Workbook should be reviewed and completed while consulting the section descriptions above.

To complete the Manure Management Plan Workbook Checklist, mark an “X” under the appropriate column heading (“Completed or Reviewed” and/or “Not Needed”) next to the worksheet titles that were evaluated. All worksheet titles should be reviewed.

An example of completed Manure Management Plan Workbook Checklist is located in the Manure Management Plan Workbook Example.

Section 1 – General Information

This section includes the date the plan was developed or updated, contact information for the plan listing the agricultural operation name and address, and the plan preparer name and address. Also included is an agricultural operation information page which provides general information about the agricultural operation and, depending on the responses, directs the operator or planner to other sections of the plan that must be completed. Additionally, the Animals Worksheet is included in this section and must be completed if livestock or poultry are managed on the operation.

1. Date of Development

Identify the date the plan was developed and/or the date the plan was updated on page 2 of the Manure Management Plan Workbook.

Note that the landowner/operator should review the manure management plan annually and must update the plan when necessary to keep the plan consistent with operation and manure management practices.

An example of completed Date of Development is located in the Manure Management Plan Workbook Example.

2. Contact Information

Insert the contact information for the agricultural operation on page 2 of the Manure Management Plan Workbook. Include the name of the operator, landowner(s), the physical and mailing address of the operation, and the phone number and email of the operator.

If the plan is prepared by someone other than the operator, include the name, address and phone number of the person that prepared the plan under the Manure Management Plan Preparer Contact Information heading on the contact information page.

An example of completed Contact Information is located in the Manure Management Plan Workbook Example.

3. Operation Information

Complete the appropriate response on the Operation Information Page in the Manure Management Plan Workbook.

- a. List the **crop rotation(s)** used on the agricultural operation.
- b. List the number of acres, owned and/or rented, available for **mechanical manure application**. Pasture acres should be noted once, in letter c.
- c. If the agricultural operation contains pasture, list the number of acres, owned and/or rented, used for **pastures**. If the agricultural operation has or uses pasture areas, the operator must complete the Pasture Management Worksheet in the Manure Management Plan Workbook.
- d. Add b + c for the total acres available for manure, and identify the total in item d.
- e. Identify if **animals** are on the agricultural operation. If animals are on the agricultural operation, operator must complete the Animals Worksheet in the Manure Management Plan Workbook.
- f. Identify any **environmentally sensitive areas** located on the agricultural operation and rented land or within 100 feet from the property boundary of the agricultural operation or rented land. If any environmentally sensitive areas are identified, the operator must complete the Environmentally Sensitive Areas Worksheet in the Manure Management Plan Workbook and mark these areas on the operation map to be used by the manure applicator.
- g. Indicate whether there will be mechanical **application of manure during winter**. If so, complete the Winter Application Worksheet in the Manure Management Plan Workbook. Winter application is the mechanical application of manure from December 15 through February 28, anytime the ground is frozen at least 4 inches, or anytime that the ground is snow covered.

- h. Identify if **agricultural process wastewater** is generated on site. Agricultural process wastewater is wastewater from agricultural operations, washing, cleaning or flushing pens, milk houses, barns, manure pits, direct contact swimming, washing or spray cooling of livestock or poultry, egg washing, or dust control. If so, complete the Agricultural Process Wastewater Worksheet in the Manure Management Plan Workbook.
- i. Indicate if the agricultural operation has any **manure storage facilities**. If the agricultural operation has any manure storage facilities, including concrete tanks, metal or other fabricated tanks, under-building structures, earthen or synthetically-lined manure storage ponds or lagoons, or solid manure stacking pads, the operator must complete the Manure Storage and Stacking Worksheet in the Manure Management Plan Workbook.
- j. Indicate whether the agricultural operation has any **solid manure stockpiling/stacking areas**. If the agricultural operation has manure stockpiling/staking areas (either at the barn (farmstead area) or in crop fields), complete the Manure Storage and Stacking Worksheet in the Manure Management Plan Workbook.
- k. If the agricultural operation has any **Animal Concentration Areas (ACAs)**, identify if they are located on owned or rented land. ACAs are barnyards, feedlots, loafing areas, exercise lots or other similar animal confinement areas as outlined in the glossary of the Land Application of Manure Supplement. Agricultural operations with ACAs must complete the ACA Worksheet in the Manure Management Plan Workbook.
- l. Indicate if the manure spreader used to mechanically apply manure will be calibrated prior to manure application. Refer to Agronomy Facts 68 found in Appendix 3 of the Land Application of Manure Supplement for manure spreader calibration procedures.

An example of a completed Operation Information Page is located in the Manure Management Plan Workbook Example.

4. Animals Worksheet

This worksheet is required if animals are housed on the operation. Complete calculations 1 and 2 as described on the Animals Worksheet of the Manure Management Plan Workbook.

If it is determined that an operation has an animal density of greater than or equal to 2 AEUs/acre and 8 or more total AEUs, the operation is considered a CAO and is then regulated under Pennsylvania's Nutrient Management Act (Act 38). In the event an operation is determined to be a CAO, the operator should consult with a certified nutrient management specialist before proceeding with the remainder of the Manure Management Plan Workbook.

Calculation 1.

- a. Identify the Animal Type in Column (a).
- b. Identify the number of animals housed on site on a normal production day in Column (b).
- c. Refer to *Agronomy Facts 54, Pennsylvania's Nutrient Management Act (Act 38): Who is Affected?* found in Appendix 2 of the Land Application of Manure Supplement. According to the weights identified in Agronomy Facts 54, identify the average weight of each animal in Column (c).
- d. Animal Unit (AU): Complete the following equation and place the result in column (d):
$$\text{Column (b)} \times \text{Column (c)} \div 1,000 = \text{Column (d)}$$
- e. Identify the number of days per year the animals are housed on site in column (e).
- f. Animal Equivalent Unit (AEU) per Animal Type: Complete the following equation and place the result in column (f).
$$\text{Column (d)} \times \text{Column (e)} \div 365 = \text{Column (f)}$$

- g. Add all AEUs identified in column (f), and record the total in the box next to the word "Total"

Calculation 2.

- a. Enter the total from Column (f) in Calculation 1 next to Total AEUs.
- b. Enter the total from the Operation Information Page, Letter d, next to the total acres available for manure.
- c. AEUs per Acre: Complete the following equation and place the result in the space next to AEU/Acre.

$$\text{Total AEUs listed above} \div \text{Total Acres listed above} = \text{AEU/Acre}$$

An example of a completed Animals Worksheet is located in the Manure Management Plan Workbook Example.

Section 2 – Mechanical Manure Application

This portion of the plan includes four components related to mechanical application of manure: environmentally sensitive areas, plan requirements for winter application and the application rates and timing for each crop group. The plan must include manure and agricultural process wastewater from all sources including manure generated on the agricultural operation and manure imported to the agricultural operation.

The information developed under this section is placed on the Manure Management Plan Summary in the Manure Management Plan Workbook. The operator must apply manure according to the completed summary to meet the Manure Management Plan requirements within the Manure Management Plan Workbook.

1. Environmentally Sensitive Areas Worksheet

Operators may not mechanically apply manure within the following areas, regardless of the slope of the land or the ground cover:

- a. Within 100 feet of the top of the bank of a stream or spring which flows during the time of year when manure is being applied and within 100 feet of a lake or a pond. The setback to an intermittent stream or spring is only applicable to manure applications when the stream or spring is flowing. A stream or spring does not include a culvert outlet or a roadside swale that drains stormwater into a field where the stormwater infiltrates into the ground.

* An operator can reduce this stream, spring, lake or pond setback to 50 feet where a soil test done within the last 3 years shows phosphorus levels (Mehlich 3-P levels) of less than 200 parts per million (ppm) and the operator uses no-till practices and if residue is removed, plants a cover crop on the field.

* The stream, spring, lake, or pond setback can be further reduced to 35 feet where the operator establishes or maintains a permanent vegetated buffer along the water body.

The 100-foot stream, lake, springs, and pond setback cannot be reduced by implementing the practices listed above for manure applied during the winter period. Winter applied manure requires a 100-foot setback from streams, springs, lakes, and ponds regardless of conservation practices used within that 100-foot distance.

- b. Within 100 feet of an existing open sinkhole.
- c. Within 100 feet of an active private drinking water source such as a well or a spring.
- d. Within, at a minimum, 100 feet of an active public drinking water source. In some cases, state and federal laws may establish greater distances.
- e. Within the channel of a non-vegetated concentrated water flow area such as a swale, gully, or ditch. For example, this would include a rock lined swale, but would not include a grassed waterway.
- f. For winter application, a setback of 100 feet from an above ground inlet to an agricultural drainage system (such as inlet pipes to piped outlet terraces) where surface water flow is toward the above ground inlet.

On the Environmentally Sensitive Areas Worksheet of the Manure Management Plan Workbook:

- a. Identify each field (both owned and rented) that contains or borders on an environmentally sensitive area.
- b. Identify the environmentally sensitive area feature type.
- c. Identify the setback distance for mechanical application of manure (see discussion above).

Additionally, the setback or restricted areas associated with all environmentally sensitive areas should be shown on the Operation Map in the Manure Management Plan Workbook.

An example of a completed Environmentally Sensitive Areas Worksheet is located in the Manure Management Plan Workbook Example.

2. Winter Application of Manure Worksheet

For purposes of this portion of the Manure Management Plan, winter includes any one of the following:

- a. December 15 through February 28; or
- b. Anytime the ground is frozen at least 4 inches; or
- c. Anytime that the ground is snow covered.

Winter application can lead to significant environmental problems if manure is not prevented from getting into streams, lakes, springs, and ponds. Winter application is discouraged. DEP encourages operators to seek other management solutions such as solid manure stacking and liquid manure storage. Operators that apply manure in the winter will need to meet the following criteria:

- a. The maximum application rate **for the winter season** is 5,000 gallons per acre of liquid manure or 20 tons per acre of dry non-poultry manure per acre or 3 tons of dry poultry manure per acre.
- b. A setback of 100 feet from an above ground inlet to an agricultural drainage system (such as inlet pipes to piped outlet terraces) where surface water flow is toward the above ground inlet.
- c. All fields must have at least 25% crop residue at application time or an established and growing cover crop. Hay fields, sod and pasture fields and fields with an established cover crop should be given highest priority for winter application.
 - * The 25% crop residue provision generally excludes winter manure application to corn silage fields that do not have an established cover crop, corn grain fields where a significant portion of the fodder has been removed, and low yielding soybean fields.
- d. Manure may not be applied during winter on fields with slopes greater than 15%. NRCS soil survey slope designations of "A," "B," or "C" slopes are acceptable for winter application determinations.
- e. An application setback of 100 feet from the top of the bank of a stream which generally flows during the winter or spring, and within 100 feet of a lake or a pond, along with all the other application setbacks outlined in Section 2.1.

Operators using a Certified Nutrient Management Planner to develop a nutrient management plan for the agricultural operation using the Act 38 plan format, or obtaining approval from DEP or county conservation district, may be provided added flexibility in the application of manure during the winter.

On the Winter Application Worksheet of the Manure Management Plan Workbook:

- a. Identify each field (both owned and rented) where there may be winter spreading by mechanical means.
- b. Identify whether the manure is liquid or solid and the type of livestock or poultry generating the manure.
- c. Identify the selected application rate of manure for the winter season for each field where winter application is planned to occur.
 - * The maximum application rate **for the winter season** is 5,000 gallons per acre of liquid manure or 20 tons per acre of dry non-poultry manure per acre or 3 tons of dry poultry manure per acre.
- d. For each field, identify the percentage of crop residue and the type of residue or vegetative cover that will be growing on the field in the winter.
 - * A minimum of 25% of crop residue on all fields or established and growing vegetative cover is required at the time of manure application. For instructions on how to calculate the percentage of crop residue, contact the local county conservation district or NRCS for assistance.

- e. Identify the average slope of the field where winter application will take place. The slope cannot exceed 15%.
- * Field slope designations will generally be identified in the operator's Agriculture Erosion and Sediment Control Plan (Ag E&S Plan). Further assistance may be available through the local NRCS office, conservation district, or a Certified Nutrient Management Planner.

Identify any environmentally sensitive areas and the associated setbacks in the winter application fields on the Environmentally Sensitive Areas Worksheet and in Operation Map in the Manure Management Plan Workbook.

An example of a completed Winter Application Worksheet is located in the Manure Management Plan Workbook Example.

3. Manure Management Plan Summary (Application Rates and Timing)

The Manure Application Plan Summary must describe the manure application rate(s) by crop group and must include manure imported to the agricultural operation. It is a summary sheet of the manure application amounts and timing developed using the processes described below. This summary is used by the manure applicator to identify acceptable application rates.

In determining manure application rates, operators have three options.

- a. Use the phosphorus removal values from the Manure Application Rate Tables in Appendix 1 based on the crop group and manure type; **or**
- b. Establish application rates based on the applicable Nitrogen or Phosphorus Balance Worksheets (NBS) (not including the PA Phosphorus Index option); **or**
- c. Have an individual trained to implement the Pa Phosphorus-Index (such as a Certified Nutrient Management Specialist, a Manure Hauler or Broker or other individual who has received PA Phosphorous Index training) develop this section of the plan using the "PA Phosphorus Index".

It is acceptable to use a combination of approaches when calculating nutrient application rates.

- a. **Manure Application Rate Tables – Appendix 1 provides detailed instructions on how to determine phosphorous removal rates for manure application using these charts.** To use the charts in Appendix 1, the operator must know at least the type of manure, the crop to be grown and the realistic optimum crop yield. These charts have only been developed for the maximum annual phosphorous removal rate application of common manure types and crops found in Pennsylvania. If the operator would like to apply nutrients above the phosphorous removal rate (not to exceed the nitrogen needs of the crop), other manure types, or to other crops not included in the charts, the **NBS** or the **Phosphorus Index (Option 3 on the Balance Sheet)** (developed by an authorized planner) must be used. The NBS is available from the DEP regional office, county conservation district, Penn State Extension office, Certified Nutrient Management Specialist or at <https://extension.psu.edu/programs/nutrient-management/manure/plan-writing/manure-management-plan-nutrient-balance-worksheet>.
- b. The agricultural operator may apply manure to the nitrogen needs of the crop if a soil test for phosphorous taken in the past 3 years shows soil phosphorous levels less than 200 ppm (Mehlich 3-P levels) and the application rate was determined using the **NBS or Phosphorous Index (Options 3 on the Balance Sheet)**.
- c. To determine mechanical application rates on pasture, first account for any manure directly deposited by livestock or poultry as Other Organic Sources Applied, row "C" on the NBS.

On the Manure Management Plan Summary of the Manure Management Plan Workbook:

- a. List the crop groups (based on crop type and realistic expected yield) and realistic optimum expected yields for all the crops grown on the agricultural operation and any rented property in the first column.
 - * If the agricultural operation uses more than one manure group on the crop, a separate crop listing should be provided for each manure group. Additionally, if manure is applied in multiple seasons, the plan should show a line for application for each season. For example, a grass hay crop receiving manure in both spring and summer would require two lines in the summary. One line with the spring application rate listed, and separate line for application in the summer, with the summer application rate listed.
- b. List the manure group to be used on the crop group (such as solid dairy, liquid dairy, liquid swine, solid layer, solid broiler, etc.).
- c. List the application season, Spring, Summer, Fall, or Winter.
 - * Each crop group where winter application is planned must be evaluated using the **Winter Application Worksheet** in the Manure Management Plan Workbook.
- d. List the application rate for each application of manure. For liquid manure the rate is expressed in gallons per acre and for solid manure the rate is expressed in tons per acre.
 - * For liquid manure, no single application can exceed 9,000 gallons unless applied in accordance with § 83.294(e). If any application rates are greater than 9,000 gallons, then split the application into multiple applications with no evidence of pooling between applications.

Identify the method for calculating the application rate. Use “C” if the rate comes from the **Manure Application Tables** in Appendix 1, “NBS” if the rate comes from a **Nitrogen or Phosphorus Nutrient Balance Worksheet** and “PI” if the rate was developed by an authorized planner using the **Phosphorus Index**.
- e. List the application season and incorporation timing. Incorporation timing is the number of days after application of manure before the manure is mechanically incorporated using equipment such as an injector system, a disk, field cultivator, or chisel.
- f. When applicable, list the commercial Nitrogen and Phosphorus fertilizer planned to meet crop nutrient needs for the various crop groups.
- g. List the fields where the crop group may be used.

Identify if soil tests were taken in the past 3 years and if the results indicate soil phosphorous levels (Mehlich 3-P) less than 200 ppm in the checkbox below the table.

An example of a completed Manure Management Plan Summary is located in the Manure Management Plan Workbook Example.

Section 3 – Operation Map

The Manure Management Plan Workbook must include a map or maps identifying the lands included in the plan. An excellent map on which to record the necessary Manure Management Plan information is the Agricultural Erosion and Sediment Control Plan (or Conservation Plan) map. The operator can also use a U.S. Geological Survey (USGS) map or a “hand drawn” map. Penn State University’s PAOneStop found at the following link, <https://paonestop.psu.edu/nutrientmgmt/login.aspx>, is an excellent resource for developing a map.

The map should be inserted on page 8 of the Workbook.

The map must identify:

1. The boundaries of the agricultural operation.
2. Individual field boundaries for all fields included in the plan.
3. Field identifiers (name or number) and acreage of each field.
4. The identification of average slopes or the average NRCS slope designation for all fields being used for winter application. An NRCS soil survey map can be used to satisfy this requirement. These soil maps are available at the county conservation district or NRCS office.
5. The location of all environmentally sensitive areas and setbacks identified on the Environmentally Sensitive Areas Worksheet.
6. The location of proposed or existing manure storage facilities.
7. The location of manure stockpiling or stacking areas.
8. The location of all pastures.
9. The location of all Animal Concentration Areas.
10. The location and names of all roads adjacent to or within the agricultural operation.

An example of a completed Operation Map is located in the Manure Management Plan Workbook Example.

Section 4 – Manure and Agricultural Process Wastewater Storage and Stockpiling/Stacking Areas

1. Agricultural Process Wastewater Worksheet

If any agricultural process wastewater is generated on site (water system overflow, wash water, milk house wastewater, egg wash water, etc.), the Agricultural Process Wastewater Worksheet must be completed.

Regardless of if the agricultural process wastewater is stored separately or added to manure, the planned application, transfer, and/or storage of all agricultural process wastewater must be described in the Manure Management Plan Workbook on the following:

1. Plan Summary Worksheet
2. Manure Storage and Stacking Worksheet, and/or
3. Transfer Records

If the agricultural process wastewater is handled in some other way, that method must be described on the Agricultural Process Wastewater Worksheet in the Manure Management Plan Workbook.

The Manure Management Plan Workbook must list all types of agricultural process wastewater generated on site. If the agricultural process wastewater is directed to a manure or waste storage facility, that facility must be identified in the Agricultural Process Wastewater Worksheet. If the agricultural process wastewater is handled in some other way, the operator should consult with the county conservation district, NRCS, or a private consultant for management recommendations and technical assistance. The plan developed in consultation with the conservation professionals listed above, must be recorded on the Agricultural Process Wastewater Worksheet. Use multiple pages if necessary.

On the Agricultural Process Wastewater Worksheet in the Manure Management Workbook:

1. Identify the type of agricultural process wastewater generated on site.
2. Identify if the agricultural process wastewater is directed to a manure or waste storage facility.
 - a. List the manure or waste storage facility identified on the Manure Storage Worksheet that receives the agricultural process wastewater.
 - b. If the agricultural process wastewater is not directed to a manure or waste storage facility, the operator should immediately contact the county conservation district, NRCS, or a private consultant for management recommendations and technical assistance and list the date of contact, and name and affiliation of the person contacted.
 - i. After consulting with a conservation professional listed above, describe the management strategies for agricultural process wastewater generated on site as discussed.
 - ii. Identify the implementation date or planned implementation date for the management strategies described above.

An example of a completed Agricultural Process Wastewater Worksheet is located in the Manure Management Plan Workbook Example.

2. Manure Storage and Stacking Worksheet

a. Manure Storage Facilities

It must be documented in the Manure Management Plan Workbook how manure and agricultural process wastewater that is not immediately applied is properly stored. Manure storage facilities are used for safely containing manure and agricultural process wastewater until it can be properly applied or processed. Manure storage facilities include earthen ponds or lagoons with various liners such as concrete, bentonite, and/or membrane products like HDPE, concrete tanks located outside or under the barn, above ground steel tanks, and roofed stockpiling/stacking facilities.

The plan must list all manure storage and stacking areas on the Manure Storage and Stacking Worksheet of the Manure Management Plan Workbook. For liquid or semisolid manure storage facilities, the plan must document the type, date of construction, estimated capacity, and documentation of the environmental evaluation of the structure as outlined below. For constructed solid manure stacking pads/facilities, the plan must document the type, size, date of installation and any problems identified with the structure.

Liquid or semisolid manure storage must be evaluated by the operator, on at least a monthly basis. Specifically, for liquid or semisolid manure storage facilities, the operator must document that there is:

1. No evidence of overtopping or leakage from the manure storage facility. The operator must maintain a minimum 12-inch freeboard for all ponds and a minimum 6-inch freeboard for all other manure storage facilities at all times.
2. No visible cracking, rodent holes, tree or shrub growth on the berms or other problems with manure storage facilities that would lead to leakage.
3. No visible slope failures, visible deterioration or tears of any liner, or knowledge of any local water pollution issues associated with the storage facility.

No specific monthly documentation is required for constructed solid manure storage facilities.

Written records – such as the Manure Storage Facility Record Monthly Inspection Form in the Manure Management Plan Workbook – must be maintained as part of the Manure Management Plan to demonstrate that these requirements are being met.

Any problems identified in 1-3 above need to be addressed immediately.

In addition, the design and construction of liquid or semisolid manure storage facilities constructed after January 29, 2000 must be certified by a registered professional engineer unless a water quality permit is obtained by the owner or operator. The owner or operator must retain a copy of the certification and provide a copy to DEP or delegated county conservation district upon request.

If the owner or operator does not have a copy of the certification, the owner or operator should contact a registered professional engineer for assistance.

b. Manure Stockpiling/Stacking

Some agricultural operations have one or more stockpiling/stacking areas around the barn (farmstead area) or in the field to handle situations when direct manure application is impractical.

Manure stacking in the farmstead area must use an improved stacking pad or covered area. NRCS, the county conservation district, or a private consultant can provide assistance with this requirement.

The requirements relating to stacking of manure in other areas, (not on the farmstead) such as on crop fields are:

- a. Keeping all stockpiles/stacks at least 100 feet from sensitive areas such as streams, springs, lakes, and ponds, 100 feet from any open sinkhole, 100 feet from any drinking water well (public or private). These stacks cannot be placed within an area of concentrated water flow such as a swale, ditch, or waterway.
- b. Stockpiling/stacking manure on properly constructed improved stacking pads whenever possible. When stockpiling/stacking on unimproved areas in crop fields, the stockpiles/stacks should not be in the same location each year.
- c. Placing these areas at the top of a hill (this includes the area within 100 feet from the top of the slope), where possible, diverting upslope water away from stockpile/stacking areas.
- d. Placing stacks on areas with less than 8% slope.
- e. The manure must be dry enough to allow for stacking at least 4 feet in height. When stacked on the application field, the volume needs to be limited to the amount that can be spread on fields nearby to the stack.
- f. When stacked on the application field, cover stockpiled/stacked manure with a plastic tarp or other similar water repellent cover if it will be in place for more than 120 days. Manure stacked on a properly managed improved stacking pad does not need to be covered.

On the Manure Storage and Stacking Worksheet of the Manure Management Plan Workbook:

1. Identify the type of storage(s) and stacking area(s) and the year(s) of construction.
 - a. For liquid or semisolid manure storage facilities constructed after January 29, 2000, the owner or operator must obtain a water quality management permit, unless the design and construction of the facility was certified by a registered professional engineer (PE). A copy of the PE certification should be available on site. Identify “yes” if a copy of the PE certification is available on site.
 - b. If the operator does not have a copy of the certification, the owner or operator should contact a professional engineer for assistance. If a copy is not available on site, identify the date a PE was contacted.
2. Identify the approximate size and volume of existing liquid and semisolid manure storages and/or the dimensions of existing stacking areas and indicate if the manure storage is exposed to precipitation.
3. Identify any additional materials added to the manure storage(s) or stacking area(s) including bedding, silage leachate and/or agricultural process wastewater. If agricultural process wastewater is added to the storage or generated on site, the Agricultural Process Wastewater Worksheet in the Manure Management Plan Workbook must be completed.

4. Identify if the agricultural operation has adequate manure storage capacity to implement the Manure Management Plan according to the application recommendations outlined on the Manure Management Plan Summary of the Manure Management Plan Workbook.

The operator should contact the county conservation district, NRCS, or a private consultant for management recommendations and technical assistance if there is any question regarding the adequacy of manure storage capacity on the agricultural operation.

5. Identify if the requirements for stacking of manure outside the farmstead (such as on crop fields) are met for all applicable stacking areas.
6. Identify any actions or best management practices needed to address identified problems related to manure storage and the planned implementation date (season and year) for each practice or action.

Examples of problems related to manure storages: *Inadequate storage volume, leaking facilities, inadequate maintenance, runoff from a stack that directly reaches a water body, professional engineer certification is not on site (if applicable) etc.*

An example of a completed Manure Storage and Stacking Worksheet is located in the Manure Management Plan Workbook Example.

Section 5 – Pasture Management

All pastures on the agricultural operation must be listed in the Manure Management Plan and identified on the operation map. Agricultural operations have several choices for managing pastures:

1. The agricultural operation can develop a grazing plan meeting the requirements of the NRCS Pennsylvania Technical Guide Practice Standard 528 for Prescribed Grazing, **or**
2. The operation can manage pastures by minimizing bare spots and maintaining at least 3 inches of vegetation height and 75% perennial grass cover when animals are present on pasture.

If any fields are overgrazed, then those fields should be managed as an Animal Concentration Area (See the Animal Concentration Areas Worksheet). Overgrazing means that the pasture is not meeting either of the pasture management guidelines identified in the above checkboxes.

On the Pasture Management Worksheet:

1. Indicate the planned pasture management approach in the check boxes provided and the date implemented or planned.
2. Though there is no regulatory requirement to do so, if the agricultural operation is managing pastures in one of the two methods listed above AND animals are excluded from streams, seeps, ponds, and other surface waters AND drinking water is available to all livestock meeting their daily water requirements, the operator should indicate the length of the exclusion fence, the average width of the excluded area, and the date the practice was installed.

An example of a completed Pasture Management Worksheet is located in the Manure Management Plan Workbook Example.

Section 6 – Animal Concentration Areas

Animal Concentration Areas (ACAs) (also called “Animal Heavy Use Areas”) are barnyards, feedlots, loafing areas, exercise lots or other similar animal confinement areas are areas that will not meet the pasture management requirements identified on the Pasture Management Worksheet. ACAs do not include areas managed as pastures as described on the Pasture Management Worksheet or cropland. However, ACAs may exist within areas maintained as a pasture and must be addressed. Animal access ways, feeding areas, watering areas, shade areas or walkways are not considered ACAs if water from or precipitation onto these areas does not result in runoff of manure or sediment to streams, lakes, springs, ponds, or sinkholes.

ACAs need to be managed to:

1. Divert clean water flow from upslope fields, driveways, barn roofs, etc., away from the ACA;
2. Direct polluted runoff or allow it to flow from the ACA area into a storage facility or best management practice such as a correctly sized and well-maintained vegetative filter strip;
3. Limit animal access to surface waters to only properly implemented livestock crossings. Animals may not have free access to streams adjacent to or within ACAs;
4. Minimize the size of denuded areas such as sacrifice lots;
5. Keep areas where animals congregate – such as feed racks, shade, and gates – as far away from a water body as practical to prevent manure runoff into surface water. It is recommended to keep ACAs at least 100 feet away from surface water, unless a vegetated buffer of at least 35 feet in width is used;
6. Where appropriate, include relocation of movable structures creating ACAs – such as hay rings – at least annually where practical, to minimize ACA development and manure concentration; and
7. Routinely, generally four times per year, remove accumulated manure from ACAs, where practical, to minimize the potential for polluted discharges.

Agricultural operations that have ACAs and are using the Manure Management Plan Workbook to meet planning requirements must list the ACA on the Operation Information Page of the Manure Management Plan, complete the Animal Concentration Area Worksheet, and locate the ACA on the operation map. The plan needs to identify Best Management Practices (BMPs) that are currently being implemented to prevent pollution and, where necessary, include a schedule for obtaining assistance to develop and implement additional BMPs that require appropriate expertise in design or where additional time is needed to obtain the financial resources to implement the necessary BMPs.

Operators working with a design professional (conservation district, NRCS, Certified Nutrient Management Planner, etc.) can be provided up to 3 years from the date the plan is developed to fully implement that plan. However, implementation should begin as soon as possible.

On the Animal Concentration Areas Worksheet:

1. List the date contact was made with an agency or other party to help determine appropriate Best Management Practices (BMPs) to address the ACA. Additionally, list the individual and agency or party that was contacted.
2. Describe the management strategies, current or proposed, for any ACAs on the operation.
3. Complete the BMP schedule. Identify the date implemented in the “Date” row of the ACA block if BMP has been implemented. List the planned date for implementation in the “Date” row of the ACA block if the BMP is planned. If installed, list the amount installed in the units listed in the “Amount” row of the ACA below. Record N/A if the BMP does not apply.

An example of a completed Animal Concentration Areas Worksheet is located in the Manure Management Plan Workbook Example.

Section 7 – Recordkeeping

Operators are required to maintain two types of records. First, the Manure Management Plan Short Form or the Manure Management Plan Workbook including all applicable worksheets must be retained and be made available to DEP or the county conservation district upon request. Second, the operators must maintain records to demonstrate that the Manure Management Plan has been implemented. Again, these records must be made available to DEP or the county conservation district upon request.

The Manure Management Plan Workbook contains optional blank reporting forms that the operator can use to document that they are properly implementing the manure management plan requirements. Each of these records covers one calendar year of manure application. These records must be retained for a period of at least three years and must be available for review by DEP or the county conservation district upon request.

The Manure Management Plan Workbook Example includes completed recordkeeping forms.

1. **Manure Application Records**

Manure application records demonstrate that the field application requirements of the Manure Management Plan are being implemented and may be recorded on the Manure Application Rate Record form. The notes column is optional and may be utilized to record information relevant to the time of manure application including weather or ground conditions on the day(s) of, prior, or after manure application.

2. **Crop Yield Records**

Crop yield records demonstrate that the yield goal for the crop was attained in the calendar year and may be recorded on the Crop Yield Record form. The notes column is optional and may be utilized to record information relevant to crop yield.

3. **Manure Transfer Records**

Manure transfer records demonstrate the destination, type, and amount of manure transferred off the agricultural operation. The Manure Transfer Record form may be used to record the necessary transfer information.

4. **Manure Storage Records**

To prevent discharges of manure from manure storage facilities, it is important to inspect these facilities on at least a monthly basis. The Manure Storage Facility Record Monthly Inspection Form is used for these routine inspections. Whenever a problem is identified, the operator must immediately take steps to resolve the problem.

Note: Manure Depth (column 3) plus Depth of Surface of Manure to Freeboard (column 4) plus freeboard should equal the total storage depth.

Next Steps

Once all applicable worksheets in the Manure Management Plan Workbook and associated recordkeeping documentation are complete, they become the agricultural operation's Manure Management Plan which must be implemented pursuant to 25 Pa. Code § 91.36(b).

The applicable worksheets in the Manure Management Plan Workbook and associated recordkeeping documentation must be maintained on the operation and made available to staff from DEP or the county conservation district upon request.



MANURE MANAGEMENT PLAN WORKBOOK (EXAMPLE)

CHECKLIST

	Manure Management Plan Page No.	Completed or Reviewed	Not Needed
Section 1 – General Information			
Date of Development	2	X	
Contact Information	2	X	
Operation Information	3	X	
Animals Worksheet *	4	X	
Section 2 – Mechanical Manure Application			
Environmentally Sensitive Areas Worksheet	5	X	
Winter Application Worksheet	6	X	
Manure Management Plan Summary	7	X	
Section 3 – Operation Map			
Operation Map	8	X	
Section 4 – Manure and Agricultural Process Wastewater Storage and Stockpiling/Stacking Areas			
Agriculture Process Wastewater Worksheet*	9	X	
Manure Storage Worksheet	10	X	
Section 5 – Pasture Management			
Pasture Management Worksheet	11	X	
Section 6 – Animal Concentration Areas			
ACA Worksheet	12	X	
Note: regulations require all operations with crops or ACAs to also have an Agricultural Erosion and Sediment Control Plan meeting the requirements of 25 Pa. Code Chapter 102. Additional information can be obtained from the county conservation district.			
Section 7 - Recordkeeping			
Recordkeeping Forms	13-16	X	

*New worksheet for DRAFT June 5, 2023

MANURE MANAGEMENT PLAN WORKBOOK

Section 1 – General Information

DATE OF DEVELOPMENT

(See Workbook Instructions Page 3)

Date of Development: January 22, 2014

Date of Update(s): June 15, 2022

Note that the owner/operator is expected to evaluate the manure management plan annually and update the plan when necessary to keep the plan consistent with operation and manure management practices.

CONTACT INFORMATION

(See Workbook Instructions Page 3)

Operation Name: Sample Farm

Name of Operator: Mr. John Q. Public

Name of Landowner(s): Mrs. Jane F. Farmerson

Operation Physical Address: 3 Sample Road

City, State and Zip Code: Farm City, PA 12345

Operation Mailing Address: 3 Sample Road

City, State and Zip Code: Farm City, PA 12345

Phone Number (Home/Barn): 717-555-4567

(Cell): 717-555-3456

Email Address: samplefarm@email.com

Manure Management Plan Preparer Contact Information (if other than owner/operator)

Preparer Name: Mr. John Smith

Preparer Organization: Fertilizer Sales Company

Physical Address: 35 Spreader Lane

City, State and Zip Code: Spreader City, PA 23456

Phone Number (Business): 601-555-4567

(Cell): 601-555-3456

Email Address: fertilizersales@sales.com

MANURE MANAGEMENT PLAN WORKBOOK

OPERATION INFORMATION

(See Workbook Instructions on Page 3)

- a. **Crop Rotations used on the Operation (use additional sheets as necessary):** 4 years corn silage, 4 years mixed hay
-

- b. **Acres available for mechanical application of manure (excluding pasture):**

Owned: 120 Rented: 50

The term "Mechanical application" as used in this document means the application of manure by a person through any mechanical means such as a manure spreader, irrigation system, horse-drawn equipment, or a pitchfork. The term does not include direct application of manure by animals on pastures and/or in Animal Concentration Areas. Pasture Areas should only be noted once, in letter c.

- c. **Pasture Areas:**

Yes No

If yes, list acres: Owned: 20 Rented: _____

If the operation contains pasture, then complete the Pasture Management Worksheet.

- d. **Total acres available for manure: (b. + c.)** 190 Acres

- e. **Animals on the operation:**

Yes No

If animals are on the operation, complete the Animals Worksheet. Refer to Appendix 2, Agronomy Facts 54, Pennsylvania's Nutrient Management Act (Act 38) for additional information.

- f. **Environmentally Sensitive Areas:**

Private or public drinking water wells Yes No

Streams, lakes, springs, or ponds Yes No

Sinkholes Yes No

Areas of concentrated flow including swales, ditches, gullies, etc. Yes No

For winter application, above ground inlet to agricultural drainage system Yes No

If the operation contains any environmentally sensitive areas, then complete the Environmentally Sensitive Areas Worksheet and identify the environmentally sensitive areas on the Operation Map.

- g. **Winter Application:** Is manure applied during the winter? Yes No

If yes, then complete the Winter Application Worksheet.

- h. **Agricultural Process Wastewater:** Is any agricultural process wastewater generated on site? Yes No

If yes, then complete the Agricultural Process Wastewater Worksheet.

- i. **Manure Storage Facilities:** Is manure stored in a manure storage facility Yes No

(concrete tank, metal tank, under building structure, earthen, clay, or synthetic lined pond or lagoon, solid manure stacking pad, etc.)?

If yes, then complete the Manure Storage and Stacking Worksheet.

- j. **Solid Manure Stockpiling or Stacking:** Yes No
Is manure stockpiled or stacked in outdoor areas?
If yes, then complete the Manure Storage and Stacking Worksheet.
- k. **Animal Concentration Areas (ACAs):** Yes No
If yes: Owned: Rented:
If the operation contains any ACAs, then complete the ACA Worksheet.
- l. **Manure Spreader Calibration:** The manure spreader used to apply all manure will be calibrated according to the recommendations in Agronomy Facts 68 found in Appendix 3 prior to manure application. Yes No NA

EXAMPLE

MANURE MANAGEMENT PLAN WORKBOOK

ANIMALS WORKSHEET

Use Additional Sheets as Necessary
(See Workbook Instructions on Page 4)

1. Animal Unit and Animal Equivalent Unit Calculation:

Animal Type (a)	Animal # (normal production day) (b)		Average Weight (lb.) (c)				Animal Unit (AU) (d)		Days on operation per year (e)				Animal Equivalent Unit (AEU) (f)
Dairy Cows	60	×	1,450	÷	1,000	=	87.00	×	365	÷	365	=	87.00
Broilers	10,000	×	3.55	÷	1,000	=	35.50	×	210	÷	365	=	20.42
		×		÷	1,000	=		×		÷	365	=	
		×		÷	1,000	=		×		÷	365	=	
		×		÷	1,000	=		×		÷	365	=	
Total												107.42	

Refer to page 14 and *Agronomy Facts 54, Pennsylvania's Nutrient Management Act (Act 38): Who is Affected?* found in Appendix 2 when completing the Animals Worksheet.

If the operation maintains greater than or equal to 2.00 AEU/acre and 8 or more total AEU's according to Calculation 2, the operation is regulated under Pennsylvania's Nutrient Management Act (Act 38), and the operator should consult with a certified nutrient management specialist before proceeding with the remainder of the Manure Management Plan.

2. AEU/Acre Calculation:

Total AEU's (1f) = 107.42

Total acres available for manure
(Operation Information Page, Letter d) = 190

Total AEU's ÷ Total Acres available for manure = AEU's/Acre

107.42 AEU's ÷ 90 Acres = .56 AEU/Acre

MANURE MANAGEMENT PLAN WORKBOOK

Section 2 – Mechanical Manure Application

ENVIRONMENTALLY SENSITIVE AREAS WORKSHEET

Use Additional Sheets as Necessary
(See Workbook Instructions on Page 6)

All Environmentally Sensitive Areas listed should appear on the operation map as described in Section 3 of the Instructions.

Field Identification	Environmentally Sensitive Area (stream, lake, pond, spring, sinkhole, drinking water source, concentrated flow area)	Setback or restricted distance for mechanically applied manure
1	Stream	50' (cover crop)
16	Home water well	100'
10	Stream	35' (buffer)

MANURE MANAGEMENT PLAN WORKBOOK

MANURE MANAGEMENT PLAN SUMMARY

Use Additional Sheets as Necessary
(See Workbook Instructions Page 8)

Crop Group and Yield (a)	Manure Group (b)	Application Season (c)	Planned Application Rate from C, NBS, PI * (d)	Incorporation Timing (e)	Commercial Fertilizer Application Rate (f)	Fields where this crop group can be used (g)
Corn Silage 23 tons	Liquid dairy	Spring	9,000 gallons NBS	Unincorporated	110 lbs. N	1-25
Corn Silage after alfalfa 23 tons	Liquid dairy	Spring	9,000 gallons NBS	Unincorporated	4 lbs. N	1-25
Corn Silage 23 tons	Liquid dairy	Fall	9,000 gallons NBS	Unincorporated	110 lbs. N	1-25
Corn Silage 23 tons	Solid dairy	Fall	25 tons NBS	Unincorporated	110 lbs. N	1-25
Grass Hay 5 tons	Liquid Dairy	Spring	7,000 gallons NBS	Unincorporated	190 lbs. N	1-25
Gray Hay 5 tons	Liquid Dairy	Fall	7,000 gallons NBS	Unincorporated	190 lbs. N	1-25
Grass Hay 5 tons	Solid Dairy	Winter	20 tons NBS	Unincorporated	150 lbs. N	22

Soil test results taken in the last 3 years indicate phosphorous levels (Mehlich 3-P levels) are less than 200 ppm. Yes No

If soil samples are over 3 years old or indicate phosphorous levels greater than or equal to 200 ppm, then base manure application rates on the phosphorous removal charts, a NBS calculated to phosphorous removal, or the Phosphorous Index developed by an authorized planner.

*C - The application rate was taken from the charts in Appendix 1. **Appendix 1 contains an explanation and example of how to use the rate charts when filling out this Manure Management Plan Summary.**

NBS - The application rate was calculated using Nutrient Balance Sheet.

PI - The application rate was calculated by a Certified Nutrient Management Planner using the Phosphorus Index.

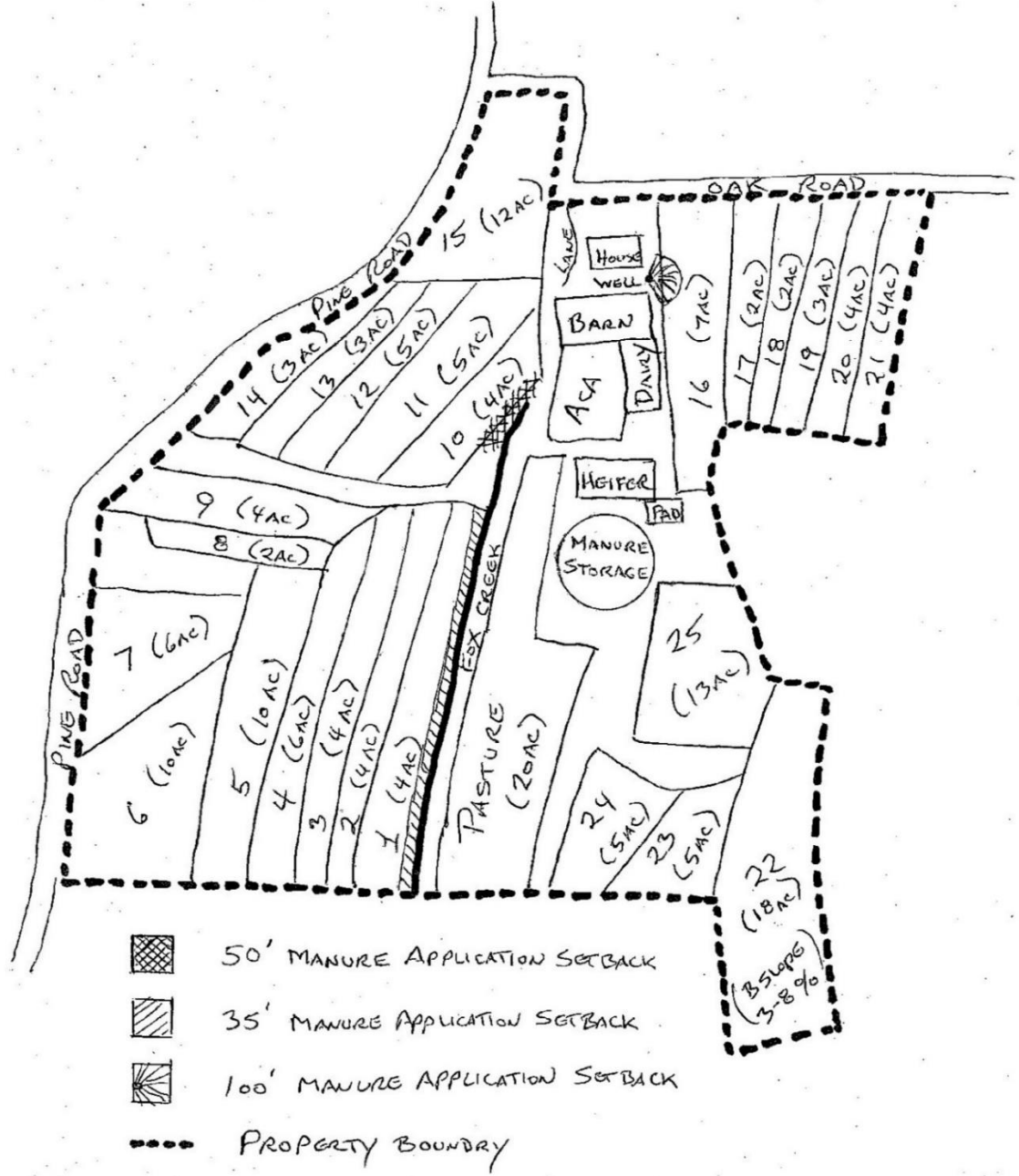
No single application can exceed 9,000 gallons unless applied in accordance with 25 Pa. Code § 83.294(e). If any application rates are greater than 9,000 gallons, then split the application into multiple applications with no evidence of pooling between applications.

MANURE MANAGEMENT PLAN WORKBOOK

Section 3 – Operation Map

INSERT OPERATION MAP
(See Workbook Instructions Page 10)

SAMPLE OPERATION MAP



MANURE MANAGEMENT PLAN WORKBOOK

Section 4 – Manure and Agricultural Process Wastewater Storage and Stockpiling/Stacking Areas

AGRICULTURAL PROCESS WASTEWATER WORKSHEET

Use Additional Sheets as Necessary
(See Workbook Instructions Page 11)

1. Type of agricultural process wastewater generated on site (water system overflow, wash water, milkhouse wastewater, egg wash water, etc.)

Milk house wastewater

2. Agricultural process wastewater is directed to a manure or waste storage facility listed on the Manure Storage and Stacking Worksheet and land applied according to recommendations in the Manure Management Plan Summary? Yes No

- a. If yes, identify the manure or waste storage facility or facilities listed on the Manure Storage and Stacking Worksheet that receive(s) the agricultural process wastewater.

N/A

- b. If no, the operator should immediately contact the county conservation district, NRCS, or a private consultant for management recommendations and technical assistance. Identify the date, name, and affiliation of the contact in the space below.

Date of Contact January 27, 2022

Name and Affiliation of Contact John Brown, York County Conservation District

- i. Description of management strategies for agricultural process wastewater generated on site discussed with the county conservation district, NRCS, or private consultant.

Flouted tank & manifold waste transfer system with sized and engineered Vegetated Treatment Area

- ii. Implementation Date (or Planned Implementation Date): June 15, 2022

MANURE MANAGEMENT PLAN WORKBOOK

MANURE STORAGE AND STACKING WORKSHEET

(Include Information for Each Manure Storage Facility and Stacking Area)
Use Additional Sheets as Necessary
(See Workbook Instructions Page 12)

1. Type of storage(s) and stacking area(s) (concrete or metal tank, under building structure, earthen or clay or synthetically lined pond or lagoon, exposed concrete pad, roofed solid manure stacking pad, etc.) and year(s) of construction:

Concrete circular tank constructed in 2005; Manure stacking pad constructed in 1998

a. A copy of the professional engineer certification is kept on site for all liquid or semisolid manure storages constructed after January 29, 2000. Yes

b. If a copy of the certification is not available, provide the date a registered professional engineer was contacted _____

2. Approximate size and volume of existing liquid and semisolid manure storages and/or the dimensions of existing stacking area(s), indicate if exposed to precipitation.

Concrete Tank 92' diameter, 11' deep (excluding freeboard of 6 inches) exposed to precipitation, 550,000 gallons capacity
Stacking pad 50' by 60', not exposed to precipitation

3. Additional materials added to the manure storage(s) or stacking area(s) including bedding, silage leachate, and/or agricultural process wastewater (see the Agricultural Process Wastewater Worksheet):

Tank - milk house water
Pad - straw bedding used for stacked manure

4. The operation maintains adequate manure storage to apply manure according to the application recommendations outlined on the Manure Management Plan Summary. Yes No

5. All manure stacking or stockpiling areas not on the farmstead meet the following criteria: Yes No

- a. At least 100 feet from environmentally sensitive areas.
- b. On properly constructed and improved stacking areas whenever possible.
- c. On the top of a hill where possible, diverting upslope water away from the areas.
- d. On less than 8% slope.
- e. Manure is dry enough to stack at least 4 feet in height.
- f. The volume of stacked manure is limited to the amount that can be spread on near-by fields.
- g. Covered with a water-repellant cover if it will be in place for more than 120 days.

6. Actions or best management practices needed to address identified problems related to manure storage and/or stacking and the planned implementation date (season and year) for each practice or action:

Tank - No problems found with tank

Pad - Need to direct clean water away from pad; To be completed in Spring of 2022.

MANURE MANAGEMENT PLAN WORKBOOK

Section 5 – Pasture Management

PASTURE MANAGEMENT WORKSHEET

(See Workbook Instructions Page 15)

List all pastures in the Manure Management Plan and identify these pastures on the operation map.

1. Identify the pasture management approach below:

- I am implementing grazing plan meeting the requirements of the Natural Resources Conservation Service Pennsylvania Technical Guide Practice Standard 528 for Prescribed Grazing.
- I am managing or will manage my pastures by the date listed below to maintain at least 3 inches of vegetation height and 75% perennial grass cover when animals are present on pasture.

Date Implemented or Planned Implementation Date June 15, 2015

2. If one of the above boxes are checked and animals are excluded from streams, seeps, ponds, and other surface waters, and clean drinking water is available to all livestock meeting their daily water requirements, identify the additional information below.

Exclusion Fence Length (ft) 1,550 **Average Width of Excluded Area (ft)** 35

Installation Date of Fence and Watering System June 20, 2020

If any fields are overgrazed, then those fields should be managed as an Animal Concentration Area (See the Animal Concentration Areas Worksheet). Overgrazing means that the pasture is not meeting either of the pasture management guidelines identified in the above checkboxes.

MANURE MANAGEMENT PLAN WORKBOOK

Section 6 – Animal Concentration Areas

ANIMAL CONCENTRATION AREAS WORKSHEET

(See Workbook Instructions Page 16)

1. Technical Assistance:

Some operations may need technical assistance to develop and implement BMPs on Animal Concentration Areas (ACAs) and/or develop a plan to minimize bare spots and maintain at least 3 inches of vegetation height and 75% perennial grass cover while animals are present on the pasture. The operator has no more than 3 years from the date of developing the Manure Management Plan to implement BMPs or establish pasture conditions on ACAs. DEP believes that most operations will be able to implement BMPs on a much shorter time frame but recognizes that more time may be needed for some costly BMPs.

Operators with ACAs requiring corrective actions should immediately contact the local conservation district, NRCS, or a private consultant and should document that contact and the time frame for developing and implementing BMPs.

List date contact was made to the assisting agency/party to help in these efforts: March 1, 2022

List who was contacted to assist in these efforts: John Brown, York County Conservation District

2. Describe the management strategies for any ACAs on the operation.

Installation of gutters and downspouts and heavy use area protection directing water to the concrete tank manure storage facility in the summer of 2022. Installation of fencing and stream crossing to locate congregation areas away from the stream.

3. BMP Implementation Schedule

Identify the date implemented in the "Date" row of the ACA block if BMP has been implemented. List the planned date for implementation in the "Date" row of the ACA block if the BMP is planned. Record N/A if the BMP does not apply.							
If installed, list the amount installed in the units listed in the "Amount" row of the ACA block.							
ACA Name or Location (Refer to Operation Map)	Divert clean water around ACA (Number of Systems)	Improve and stabilize the surface material of the ACA (Sq. Ft)	Direct polluted water to storage or vegetated treatment area	Limit access to streams through stabilized crossings and watering areas	Limit size of denuded areas	Locate area where animals congregate (feed areas, shade, etc.) away from streams	
ACA #1	Date	7/15/2022	7/15/2022	7/15/2022	9/15/2022	Yes	9/15/2022
	Amount	1 system	3,000 sf				
	Date						
	Amount						
	Date						
	Amount						
	Date						
	Amount						

MANURE MANAGEMENT PLAN WORKBOOK

Section 7 – Recordkeeping Forms

MANURE APPLICATION RATE RECORD JANUARY 1, 2022 THROUGH DECEMBER 31, 2022

Use Additional Sheets as Necessary
 (See Workbook Instructions Page 17)

Date	Field Identification	Acres	Manure Group	Crop Group	Application Rate	Notes
10-2-22	10, 12, 13	3	Liquid Dairy	Corn Silage	6,500 gal	EXAMPLE
4/22	1, 3, 5, 7	24	Liquid dairy	Corn Silage	9,000 gal	
4/25	2, 4, 6, 8	22	Liquid dairy	Grass Hay	7,000 gal	
10/5	9, 11, 13	12	Solid dairy	Corn Silage	25 tons	
10/15	10, 12, 14, 16	29	Liquid dairy	Grass Hay	7,000 gal	
10/15	15, 17, 19	17	Liquid dairy	Corn Silage	9,000 gal	

MANURE MANAGEMENT PLAN WORKBOOK

CROP YIELD RECORD JANUARY 1, 2022 THROUGH DECEMBER 31, 2022

Use Additional Sheets as Necessary
(See Workbook Instructions Page 17)

Field Identification	Crop Group	Date Harvested	Yield Goal	Actual Yield Harvested	Notes
1, 3, 5, 7, 9	<i>Corn Silage</i>	<i>Sep 2022</i>	<i>21 Tons</i>	<i>22 Tons</i>	<i>EXAMPLE</i>
1,3,5,7,9,11, 13,15,17,19, 21,23,25	Corn Silage	September	21 tons	22 tons	
2,4,6,8,10,12 14,16,18,20, 22,24	Grass Hay	May and August	5 tons	4 tons	

MANURE MANAGEMENT PLAN WORKBOOK

MANURE TRANSFER RECORD JANUARY 1, 2022 THROUGH DECEMBER 31, 2022

Use Additional Sheets as Necessary
 (See Workbook Instructions Page 17)

Date	Name of Importer/Broker	Address and Phone Number Importer/Broker	Manure Group	Amount of Manure Transferred	Crop Group and Application Rate
4/20	<i>EXAMPLE</i> Bill Jones	55 Manure Road Manure Town 717-555-4567	Solid Beef	20 Tons	Unknown
4/20	Bill Jones	55 Manure Road Manure Town 717-555-4567	Solid Beef	20 tons	Unknown
10/5	Bill Jones	55 Manure Road Manure Town 717-555-4567	Solid Beef	1 tons	Unknown

MANURE MANAGEMENT PLAN WORKBOOK

MANURE STORAGE FACILITY RECORD MONTHLY INSPECTION FORM

Use Additional Sheets as Necessary
(See Workbook Instructions Page 17)

Storage Name	Inspection Date	Manure Depth (liquid)	Depth of Surface of Manure to Freeboard (liquid)	Leak Detection System Inspections. Are there any leaks, overflows, or seepages? Describe.	Structural Integrity. Are there cracks, erosion, slope failures, liner deterioration, rodent holes, large vegetation, excessive or lush vegetation, fencing issues, loading area issues? Describe.
<i>EXAMPLE</i> Liquid Dairy	1/1/2022	3.5 feet	7.5 feet	None	<i>No problems observed</i>
Liquid dairy	1/1/2022	3.5 feet	7.5 feet	None	No problems observed
Same	2/1/2022	5 feet	6 feet	None	Same
Same	3/1/2022	6.5 feet	4.5 feet	None	Same
Same	4/1/2022	8 feet	3 feet	None	Same
Same	5/1/2022	1 foot	10 feet	None	Same
Same	6/1/2022	2.5 feet	8.5 feet	None	Same

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MANURE MANAGEMENT PLAN WORKBOOK

CHECKLIST

	Manure Management Plan Page No.	Completed or Reviewed	Not Needed
Section 1 – General Information			
Date of Development	2		
Contact Information	2		
Operation Information	3		
Animals Worksheet *	4		
Section 2 – Mechanical Manure Application			
Environmentally Sensitive Areas Worksheet	5		
Winter Application Worksheet	6		
Manure Management Plan Summary	7		
Section 3 – Operation Map			
Operation Map	8		
Section 4 – Manure and Agricultural Process Wastewater Storage and Stockpiling/Stacking Areas			
Agriculture Process Wastewater Worksheet*	9		
Manure Storage Worksheet	10		
Section 5 – Pasture Management			
Pasture Management Worksheet	11		
Section 6 – Animal Concentration Areas			
ACA Worksheet	12		
<p>Note: regulations require all operations with crops or ACAs to also have an Agricultural Erosion and Sediment Control Plan meeting the requirements of 25 Pa. Code Chapter 102. Additional information can be obtained from the county conservation district.</p>			
Section 7 - Recordkeeping			
Recordkeeping Forms	13-16		

*New worksheet for DRAFT June 5, 2023

MANURE MANAGEMENT PLAN WORKBOOK

Section 1 – General Information

DATE OF DEVELOPMENT

(See Workbook Instructions Page 3)

Date of Development: _____

Date of Update(s): _____

Note that the owner/operator is expected to evaluate the manure management plan annually and update the plan when necessary to keep the plan consistent with operation and manure management practices.

CONTACT INFORMATION

(See Workbook Instructions Page 3)

Operation Name: _____

Name of Operator: _____

Name of Landowner(s): _____

Operation Physical Address: _____

City, State and Zip Code: _____

Operation Mailing Address: _____

City, State and Zip Code: _____

Phone Number (Home/Barn): _____

(Cell): _____

Email Address: _____

Manure Management Plan Preparer Contact Information (if other than owner/operator)

Preparer Name: _____

Preparer Organization: _____

Physical Address: _____

City, State and Zip Code: _____

Phone Number (Business): _____

(Cell): _____

Email Address: _____

MANURE MANAGEMENT PLAN WORKBOOK

OPERATION INFORMATION

(See Workbook Instructions on Page 3)

a. **Crop Rotations used on the Operation (use additional sheets as necessary):** _____

b. **Acres available for mechanical application of manure (excluding pasture):**
Owned: _____ Rented: _____

The term "Mechanical application" as used in this document means the application of manure by a person through any mechanical means such as a manure spreader, irrigation system, horse-drawn equipment, or a pitchfork. The term does not include direct application of manure by animals on pastures and/or in Animal Concentration Areas. Pasture Areas should only be noted once, in letter c.

c. **Pasture Areas:** Yes No

If yes, list acres: Owned: _____ Rented: _____

If the operation contains pasture, then complete the Pasture Management Worksheet.

d. **Total acres available for manure: (b. + c.)** _____ Acres

e. **Animals on the operation:** Yes No

If animals are on the operation, complete the Animals Worksheet. Refer to Appendix 2, Agronomy Facts 54, Pennsylvania's Nutrient Management Act (Act 38) for additional information.

f. **Environmentally Sensitive Areas:**

Private or public drinking water wells Yes No

Streams, lakes, springs, or ponds Yes No

Sinkholes Yes No

Areas of concentrated flow including swales, ditches, gullies, etc. Yes No

For winter application, above ground inlet to agricultural drainage system Yes No

If the operation contains any environmentally sensitive areas, then complete the Environmentally Sensitive Areas Worksheet and identify the environmentally sensitive areas on the Operation Map.

g. **Winter Application:** Is manure applied during the winter? Yes No

If yes, then complete the Winter Application Worksheet.

h. **Agricultural Process Wastewater:** Is any agricultural process wastewater generated on site? Yes No

If yes, then complete the Agricultural Process Wastewater Worksheet.

i. **Manure Storage Facilities:** Is manure stored in a manure storage facility (concrete tank, metal tank, under building structure, earthen, clay, or synthetic lined pond or lagoon, solid manure stacking pad, etc.)? Yes No

If yes, then complete the Manure Storage and Stacking Worksheet.

- j. Solid Manure Stockpiling or Stacking:** Yes No
Is manure stockpiled or stacked in outdoor areas?
If yes, then complete the Manure Storage and Stacking Worksheet.
- k. Animal Concentration Areas (ACAs):** Yes No
If yes: Owned: Rented:
If the operation contains any ACAs, then complete the ACA Worksheet.
- l. Manure Spreader Calibration:** The manure spreader used to apply all manure will be calibrated according to the recommendations in Agronomy Facts 68 found in Appendix 3 prior to manure application. Yes No NA

MANURE MANAGEMENT PLAN WORKBOOK

ANIMALS WORKSHEET

Use Additional Sheets as Necessary
(See Workbook Instructions on Page 4)

2. Animal Unit and Animal Equivalent Unit Calculation:

Animal Type (a)	Animal # (normal production day) (b)		Average Weight (lb.) (c)				Animal Unit (AU) (d)		Days on operation per year (e)				Animal Equivalent Unit (AEU) (f)
		×		÷	1,000	=		×		÷	365	=	
		×		÷	1,000	=		×		÷	365	=	
		×		÷	1,000	=		×		÷	365	=	
		×		÷	1,000	=		×		÷	365	=	
		×		÷	1,000	=		×		÷	365	=	
Total													

Refer to page 14 and *Agronomy Facts 54, Pennsylvania's Nutrient Management Act (Act 38): Who is Affected?* found in Appendix 2 when completing the Animals Worksheet.

If the operation maintains greater than or equal to 2.00 AEU/acre and 8 or more total AEU's according to Calculation 2, the operation is regulated under Pennsylvania's Nutrient Management Act (Act 38), and the operator should consult with a certified nutrient management specialist before proceeding with the remainder of the Manure Management Plan.

2. AEU/Acre Calculation:

Total AEU's (1f) = _____

Total acres available for manure
(Operation Information Page, Letter d) = _____

Total AEU's ÷ Total Acres available for manure = AEU's/Acre

_____ AEU's ÷ _____ Acres = _____ AEU/Acre

MANURE MANAGEMENT PLAN WORKBOOK

Section 2 – Mechanical Manure Application

ENVIRONMENTALLY SENSITIVE AREAS WORKSHEET

Use Additional Sheets as Necessary
(See Workbook Instructions on Page 6)

All Environmentally Sensitive Areas listed should appear on the operation map as described in Section 3 of the Instructions.

Field Identification	Environmentally Sensitive Area (stream, lake, pond, spring, sinkhole, drinking water source, concentrated flow area)	Setback or restricted distance for mechanically applied manure

MANURE MANAGEMENT PLAN WORKBOOK

WINTER APPLICATION WORKSHEET

Use Additional Sheets as Necessary
(See Workbook Instructions Page 7)

Field Identification	Type of Manure (Liquid or Solid, Animal Type)	Winter Season Application Rate	Percentage of Crop Residue	Type of Residue or Vegetative Cover	Field Slope Percentage

MANURE MANAGEMENT PLAN WORKBOOK

MANURE MANAGEMENT PLAN SUMMARY

Use Additional Sheets as Necessary
(See Workbook Instructions Page 8)

Crop Group and Yield (a)	Manure Group (b)	Application Season (c)	Planned Application Rate from C, NBS, PI * (d)	Incorporation Timing (e)	Commercial Fertilizer Application Rate (f)	Fields where this crop group can be used (g)

Soil test results taken in the last 3 years indicate phosphorous levels (Mehlich 3-P levels) are less than 200 ppm. Yes No

If soil samples are over 3 years old or indicate phosphorous levels greater than or equal to 200 ppm, then base manure application rates on the phosphorous removal charts, a NBS calculated to phosphorous removal, or the Phosphorous Index developed by an authorized planner.

*C - The application rate was taken from the charts in Appendix 1. **Appendix 1 contains an explanation and example of how to use the rate charts when filling out this Manure Management Plan Summary.**

NBS - The application rate was calculated using Nutrient Balance Sheet.

PI - The application rate was calculated by a Certified Nutrient Management Planner using the Phosphorus Index.

No single application can exceed 9,000 gallons unless applied in accordance with 25 Pa. Code § 83.294(e). If any application rates are greater than 9,000 gallons, then split the application into multiple applications with no evidence of pooling between applications.

MANURE MANAGEMENT PLAN WORKBOOK

Section 3 – Operation Map

INSERT OPERATION MAP
(See Workbook Instructions Page 10)

MANURE MANAGEMENT PLAN WORKBOOK

Section 4 – Manure and Agricultural Process Wastewater Storage and Stockpiling/Stacking Areas

AGRICULTURAL PROCESS WASTEWATER WORKSHEET

Use Additional Sheets as Necessary
(See Workbook Instructions Page 11)

1. Type of agricultural process wastewater generated on site (water system overflow, wash water, milkhouse wastewater, egg wash water, etc.)

2. Agricultural process wastewater is directed to a manure or waste storage facility listed on the Manure Storage and Stacking Worksheet and land applied according to recommendations in the Manure Management Plan Summary? Yes No

a. If yes, identify the manure or waste storage facility or facilities listed on the Manure Storage and Stacking Worksheet that receive(s) the agricultural process wastewater.

b. If no, the operator should immediately contact the county conservation district, NRCS, or a private consultant for management recommendations and technical assistance. Identify the date, name, and affiliation of the contact in the space below.

Date of Contact _____

Name and Affiliation of Contact _____

i. Description of management strategies for agricultural process wastewater generated on site discussed with the county conservation district, NRCS, or private consultant.

ii. Implementation Date (or Planned Implementation Date): _____

MANURE MANAGEMENT PLAN WORKBOOK

MANURE STORAGE AND STACKING WORKSHEET

(Include Information for Each Manure Storage Facility and Stacking Area)
Use Additional Sheets as Necessary
(See Workbook Instructions Page 12)

1. Type of storage(s) and stacking area(s) (concrete or metal tank, under building structure, earthen or clay or synthetically lined pond or lagoon, exposed concrete pad, roofed solid manure stacking pad, etc.) and year(s) of construction:
 - a. A copy of the professional engineer certification is kept on site for all liquid or semisolid manure storages constructed after January 29, 2000. Yes
 - b. If a copy of the certification is not available, provide the date a registered professional engineer was contacted _____
2. Approximate size and volume of existing liquid and semisolid manure storages and/or the dimensions of existing stacking area(s), indicate if exposed to precipitation.
3. Additional materials added to the manure storage(s) or stacking area(s) including bedding, silage leachate, and/or agricultural process wastewater (see the Agricultural Process Wastewater Worksheet):
4. The operation maintains adequate manure storage to apply manure according to the application recommendations outlined on the Manure Management Plan Summary. Yes No
5. All manure stacking or stockpiling areas not on the farmstead meet the following criteria: Yes No
 - a. At least 100 feet from environmentally sensitive areas.
 - b. On properly constructed and improved stacking areas whenever possible.
 - c. On the top of a hill where possible, diverting upslope water away from the areas.
 - d. On less than 8% slope.
 - e. Manure is dry enough to stack at least 4 feet in height.
 - f. The volume of stacked manure is limited to the amount that can be spread on near-by fields.
 - g. Covered with a water-repellant cover if it will be in place for more than 120 days.
6. Actions or best management practices needed to address identified problems related to manure storage and/or stacking and the planned implementation date (season and year) for each practice or action:

MANURE MANAGEMENT PLAN WORKBOOK

Section 5 – Pasture Management

PASTURE MANAGEMENT WORKSHEET

(See Workbook Instructions Page 15)

List all pastures in the Manure Management Plan and identify these pastures on the operation map.

1. Identify the pasture management approach below:

- I am implementing grazing plan meeting the requirements of the Natural Resources Conservation Service Pennsylvania Technical Guide Practice Standard 528 for Prescribed Grazing.
- I am managing or will manage my pastures by the date listed below to maintain at least 3 inches of vegetation height and 75% perennial grass cover when animals are present on pasture.

Date Implemented or Planned Implementation Date _____

2. If one of the above boxes are checked and animals are excluded from streams, seeps, ponds, and other surface waters, and clean drinking water is available to all livestock meeting their daily water requirements, identify the additional information below.

Exclusion Fence Length (ft) _____ **Average Width of Excluded Area (ft)** _____

Installation Date of Fence and Watering System _____

If any fields are overgrazed, then those fields should be managed as an Animal Concentration Area (See the Animal Concentration Areas Worksheet). Overgrazing means that the pasture is not meeting either of the pasture management guidelines identified in the above checkboxes.

MANURE MANAGEMENT PLAN WORKBOOK

Section 6 – Animal Concentration Areas

ANIMAL CONCENTRATION AREAS WORKSHEET

(See Workbook Instructions Page 16)

1. Technical Assistance:

Some operations may need technical assistance to develop and implement BMPs on Animal Concentration Areas (ACAs) and/or develop a plan to minimize bare spots and maintain at least 3 inches of vegetation height and 75% perennial grass cover while animals are present on the pasture. The operator has no more than 3 years from the date of developing the Manure Management Plan to implement BMPs or establish pasture conditions on ACAs. DEP believes that most operations will be able to implement BMPs on a much shorter time frame but recognizes that more time may be needed for some costly BMPs.

Operators with ACAs requiring corrective actions should immediately contact the local conservation district, NRCS, or a private consultant and should document that contact and the time frame for developing and implementing BMPs.

List date contact was made to the assisting agency/party to help in these efforts: _____

List who was contacted to assist in these efforts: _____

2. Describe the management strategies for any ACAs on the operation.

3. BMP Implementation Schedule

Identify the date implemented in the "Date" row of the ACA block if BMP has been implemented. List the planned date for implementation in the "Date" row of the ACA block if the BMP is planned. Record N/A if the BMP does not apply.						
If installed, list the amount installed in the units listed in the "Amount" row of the ACA block.						
ACA Name or Location (Refer to Operation Map)	Divert clean water around ACA (Number of Systems)	Improve and stabilize the surface material of the ACA (Sq. Ft)	Direct polluted water to storage or vegetated treatment area	Limit access to streams through stabilized crossings and watering areas	Limit size of denuded areas	Locate area where animals congregate (feed areas, shade, etc.) away from streams
	Date					
	Amount					
	Date					
	Amount					
	Date					
	Amount					
	Date					
	Amount					

MANURE MANAGEMENT PLAN WORKBOOK

MANURE TRANSFER RECORD JANUARY 1, _____ THROUGH DECEMBER 31, _____ Use Additional Sheets as Necessary (See Workbook Instructions Page 17)

Date	Name of Importer/Broker	Address and Phone Number Importer/Broker	Manure Group	Amount of Manure Transferred	Crop Group and Application Rate
4/20	<i>EXAMPLE Bill Jones</i>	<i>55 Manure Road Manure Town 717-555-4567</i>	<i>Solid Beef</i>	<i>20 Tons</i>	<i>Unknown</i>

MANURE MANAGEMENT PLAN WORKBOOK

MANURE STORAGE FACILITY RECORD MONTHLY INSPECTION FORM

Use Additional Sheets as Necessary
(See Workbook Instructions Page 17)

Storage Name	Inspection Date	Manure Depth (liquid)	Depth of Surface of Manure to Freeboard (liquid)	Leak Detection System Inspections. Are there any leaks, overflows, or seepages? Describe.	Structural Integrity. Are there cracks, erosion, slope failures, liner deterioration, rodent holes, large vegetation, excessive or lush vegetation, fencing issues, loading area issues? Describe.
<i>EXAMPLE Liquid Dairy</i>	<i>1/1/2022</i>	<i>3.5 feet</i>	<i>7.5 feet</i>	<i>None</i>	<i>No problems observed</i>

GLOSSARY

The following terms, when used in this Land Application of Manure Supplement have the following meanings, unless the context clearly indicates otherwise:

Agricultural Erosion and Sediment Control Plan (Ag E&S Plan) – As defined in 25 Pa. Code § 83.201, a site-specific plan identifying BMPs to minimize accelerated erosion and sedimentation from agricultural runoff required by 25 Pa. Code Chapter 102. The agricultural erosion and sediment control components of a conservation plan meet this requirement if consistent with the requirements of Chapter 102.

Agricultural operations – As defined in 25 Pa. Code § 91.1, the management and use of farming resources for the production of crops, livestock or poultry as defined in 3 Pa.C.S. § 503.

Agricultural process wastewater – As defined in 25 Pa. Code § 91.1, wastewater from agricultural operations, including from spillage or overflow from livestock or poultry watering systems, washing, cleaning or flushing pens, milkhouses, barns, manure pits, direct contact swimming, washing or spray cooling of livestock or poultry, egg washing or dust control.

Animal Concentration Areas (ACAs) –

- (i) Barnyards, loafing areas, exercise lots or other similar animal confinement areas that will not maintain a growing crop, or where manure deposited by animals is in excess of crop nitrogen needs.
- (ii) The term does not include areas managed as pastures (when the pasture management provisions in Section 6 are followed) and cropland.
- (iii) Animal access ways, feeding areas, watering areas, and shade areas or walkways are not considered ACAs if they do not cause a direct flow of manure contaminated runoff to streams, lakes, springs, ponds, or sinkholes.

Animal Concentration Areas can also be referred to as “Animal Heavy Use Areas.”

Best management practices (BMPs) – Activities, facilities, measures, planning or procedures that are effective and practicable to manage nutrients to protect, maintain, reclaim, and restore the quality of waters and existing and designated uses of surface and ground water.

Concentrated water flow areas – As defined in 25 Pa. Code § 83.201:

- (i) Natural or manmade areas where runoff is channeled and conveyed directly to surface water or groundwater.
- (ii) The term includes, but is not limited to, ditches, waterways, gullies, and swales.

Crop group – A crop with a given yield potential and consistent management approach. Appendix 1 of this document provides some examples of commonly used crop groups in Pennsylvania.

Crop Rotation – The process of changing the crops planted in a field in a planned sequence.

Environmentally Sensitive Areas – An area or feature on or near an agricultural operation where special care is needed to ensure water quality is protected. Examples include streams, lakes, springs, ponds, sinkholes, active water wells, gullies, waterways, and above ground intakes to pipe outlet terraces.

Farmstead – Buildings and adjacent surface areas of an agricultural operation.

Freeboard – The vertical distance between the maximum designed surface elevation of manure or agricultural process wastewater in a liquid or semisolid manure storage facility and the top elevation of the facility.

Improved stacking pad – A permanent, improved, stabilized, and compacted surface area with runoff controls to prevent a polluttional discharge that is used for the storage of solid manure which is capable of being stacked at least 4 feet high.

Livestock – As defined in 25 Pa. Code Chapter 83,

- (i) Animals raised, stabled, fed or maintained on an agricultural operation with the purpose of generating income or providing work, recreation or transportation.
- (ii) Examples include: dairy cows, beef cattle, goats, sheep, swine and horses.
- (iii) The term does not include aquatic species.

Manure –

1. Animal excrement (urine and feces), including poultry litter and composted manure, which is produced at an agricultural operation.
2. The term includes materials such as bedding, wastewater, wash water, and other materials which are commingled with that excrement.

Manure group – As defined in 25 Pa. Code § 83.201, a portion of the manure generated on an agricultural operation that is distinct due to factors including species, handling practices, manure consistency, anticipated nutrient content or application season.

Manure Management Manual (MMM) – As defined in 25 Pa. Code § 91.1, the guidance manual published by the Pennsylvania Department of Environmental Protection that is entitled “Manure Management for Environmental Protection” including its supplements and amendments. The manual describes approved manure management practices for all agricultural operations as required by 25 Pa. Code §91.36 (relating to pollution control and prevention at agricultural operations).

Manure Storage Facility – As defined in 25 Pa. Code § 91.1, a permanent structure or pond, a portion of a structure or pond, or a group of structures or ponds at one agricultural operation, utilized for the purpose of containing manure or agricultural process wastewater. This includes concrete, metal or other fabricated tanks and underbuilding structures, as well as earthen and synthetically-lined manure storage ponds.

Mehlich 3-P – The soil test method required to be used to determine phosphorus levels in a field for purposes of the Land Application of Manure Supplement.

Manure Management Plan (MMP) – A written site-specific plan outlining the acceptable practices for the land application of manure and agricultural process wastewaters under 25 Pa. Code §91.36 (relating to pollution control and prevention at agricultural operations).The term includes a plan established using either of the formats contained in this Land Application of Manure Supplement.

Mechanical application – The application of manure by a person through any mechanical means such as a manure spreader, irrigation system, horse-drawn equipment, or a pitchfork. The term does not include direct application of manure by animals on pastures and/or in Animal Concentration Areas.

Nutrient Management Plan (NMP) – A written site-specific plan, including NMP amendments, outlining the acceptable practices for the handling and land application of manure and all plant nutrient sources

meeting the requirements established under Pennsylvania's Nutrient Management Program implemented through the regulations of State Conservation Commission (25 Pa. Code Chapter 83).

Pasture – Land used for grazing animals that is managed:

1. under a grazing plan meeting the requirements of the Natural Resources Conservation Service Pennsylvania Technical Guide Practice Standard 528 for Prescribed Grazing; or
2. to maintain at least 3 inches of vegetation height and 75% perennial grass cover.

Permanent vegetated buffer – A permanent strip of perennial vegetation (existing or established) parallel to the contours of, and perpendicular to, the dominant slope of the field, located between the field and the protected land feature (stream, lake, pond, sinkhole) and has flow characteristics that are primarily sheet flow with no obvious concentrated flow (converging rills, ephemeral gullies, classic gullies) into/within/leaving the buffer.

APPENDIX 1

LAND APPLICATION OF MANURE
A supplement to Manure Management for Environmental Protection

MANURE APPLICATION
RATE TABLES



MANURE APPLICATION RATE TABLE INSTRUCTIONS

How to use Manure Application Rate Tables to determine the manure application rate:

To use the Manure Application Rate Tables, the operator must know at least the type of manure, the crop to be grown and the realistic optimum crop yield. These charts have only been developed for the maximum annual phosphorous removal rate application of common manure types and crops found in Pennsylvania. If the operator would like to apply nutrients above the phosphorous removal rate (not to exceed the nitrogen needs of the crop), other manure types, or to other crops not included in the charts, the **Nitrogen or Phosphorus Balance Worksheets (NBS)** or the **Phosphorus Index (Option 3 on the Balance Sheet)** (developed by an authorized planner) must be used. The NBS is available from the DEP regional office, county conservation district, Penn State Extension office, Certified Nutrient Management Specialist or at <https://extension.psu.edu/programs/nutrient-management/manure/plan-writing/manure-management-plan-nutrient-balance-worksheet>.

The guidance below provides a step-by-step example for determining manure application rates as a part of Manure Management Plan (MMP) development. See example Manure Application Rate Table (Figure 1).

1. Find the Manure Application Rate Table with the Crop Group that will receive the manure application identified in the upper left corner of the table.
 - In the example, the manure is being applied to Corn Silage. Therefore, the Corn Silage Manure Application Rate Table is used.
2. Identify the Manure Type being applied.
 - In the example, the manure being applied is Liquid Dairy.
3. Determine the realistic expected yield for the crop group. Then find the corresponding Yield Group at the top of the Manure Application Rate Table.
 - In the example, the corn silage has an expected yield of 23 ton/acre. Therefore, select the 22 ton/A” Yield Group. When the expected yield is between two yield groups, round down to the lower yield group.
4. Determine the intersection of the Manure Type row and the Expected Yield Group Column. This intersection is the maximum annual manure application rate for the crop group.
 - In this example the maximum manure application rate is 7,000 gal/acre. See the example Manure Application Rate Table (Figure 1).

IMPORTANT NOTE ABOUT THE MANURE RATE TABLES

No single application can exceed 9,000 gallons unless applied in accordance with § 83.294(e). If any application rates are greater than 9,000 gallons, then split the application into multiple applications with no evidence of pooling between applications.

Figure 1:

Corn Silage			Expected Yield (T/ac, 65% moisture)				
P removal rate	4	lbs P ₂ O ₅ /T	17	22	27	33	38
Manure Type	P ₂ O ₅ Analysis	Analysis Units	Manure Application Rate (T/ac or gal/ac)				
Solid Dairy	4	lbs/Ton	17	22	27	33	38
Liquid Dairy	13	gal	5000	7000	8000	10000	12000
Solid Swine	10	lbs/Ton	7	9	11	13	15
Liquid Swine	20	gal	3000	4000	5000	7000	8000
Layer	58	lbs/Ton	1	2	2	2	3
Broiler	43	lbs/Ton	2	2	3	3	4
Beef Cow/Calf	7	lbs/Ton	10	13	15	19	22
Beef Steer	5	lbs/Ton	14	18	22	26	30
Horse	5	lbs/Ton	14	18	22	26	30
Sheep and Goats	8	lbs/Ton	9	11	14	17	19
Turkey	55	lbs/Ton	1	2	2	2	3
Veal	13	gal	5000	7000	8000	10000	12000

MANURE APPLICATION RATE TABLES - CORN

Corn Silage			Expected Yield (T/ac, 65% moisture)				
P removal rate	4	lbs P ₂ O ₅ /T	17	22	27	33	38
Manure Type	P ₂ O ₅ Analysis	Analysis Units	Manure Application Rate (T/ac or gal/ac)				
Solid Dairy	4	lbs/Ton	17	22	27	33	38
Liquid Dairy	13	lbs/1000 gal	5000	7000	8000	10000	12000
Solid Swine	10	lbs/Ton	7	9	11	13	15
Liquid Swine	20	lbs/1000 gal	3000	4000	5000	7000	8000
Layer	58	lbs/Ton	1	2	2	2	3
Broiler	43	lbs/Ton	2	2	3	3	4
Beef Cow/Calf	7	lbs/Ton	10	13	15	19	22
Beef Steer	5	lbs/Ton	14	18	22	26	30
Horse	5	lbs/Ton	14	18	22	26	30
Sheep and Goats	8	lbs/Ton	9	11	14	17	19
Turkey	55	lbs/Ton	1	2	2	2	3
Veal	13	lbs/1000 gal	5000	7000	8000	10000	12000

Corn Grain			Expected Yield (bu/ac)				
P removal rate	0.4	lbs P ₂ O ₅ /bu	110	150	190	230	270
Manure Type	P ₂ O ₅ Analysis	Analysis Units	Manure Application Rate (T/ac or gal/ac)				
Solid Dairy	4	lbs/Ton	11	15	19	23	27
Liquid Dairy	13	lbs/1000 gal	3000	5000	6000	7000	8000
Solid Swine	10	lbs/Ton	4	6	8	9	11
Liquid Swine	20	lbs/1000 gal	2000	3000	4000	5000	5000
Layer	58	lbs/Ton	1	1	1	2	2
Broiler	43	lbs/Ton	1	1	2	2	3
Beef Cow/Calf	7	lbs/Ton	6	9	11	13	15
Beef Steer	5	lbs/Ton	9	12	15	18	22
Horse	5	lbs/Ton	9	12	15	18	22
Sheep and Goats	8	lbs/Ton	6	8	10	12	14
Turkey	55	lbs/Ton	1	1	1	2	2
Veal	13	lbs/1000 gal	3000	5000	6000	7000	8000

MANURE APPLICATION RATE TABLES – SMALL GRAIN

Small Grains (wheat/rye/oats/barley)			Expected Yield (bu/ac)				
P removal rate	1	lbs P ₂ O ₅ /bu	40	60	80	100	120
Manure Type	P ₂ O ₅ Analysis	Analysis Units	Manure Application Rate (T/ac or gal/ac)				
Solid Dairy	4	lbs/Ton	10	15	20	25	30
Liquid Dairy	13	lbs/1000 gal	3000	5000	6000	8000	9000
Solid Swine	10	lbs/Ton	4	6	8	10	12
Liquid Swine	20	lbs/1000 gal	2000	3000	4000	5000	6000
Layer	58	lbs/Ton	1	1	1	2	2
Broiler	43	lbs/Ton	1	1	2	2	3
Beef Cow/Calf	7	lbs/Ton	6	9	11	14	17
Beef Steer	5	lbs/Ton	8	12	16	20	24
Horse	5	lbs/Ton	8	12	16	20	24
Sheep and Goats	8	lbs/Ton	5	8	10	13	15
Turkey	55	lbs/Ton	1	1	1	2	2
Veal	13	lbs/1000 gal	3000	5000	6000	8000	9000

Small Grain Silage			Expected Yield (T/ac, 65% moisture)				
P removal rate	7	lbs P ₂ O ₅ /T	4	6	8	10	12
Manure Type	P ₂ O ₅ Analysis	Analysis Units	Manure Application Rate (T/ac or gal/ac)				
Solid Dairy	4	lbs/Ton	7	11	14	18	21
Liquid Dairy	13	lbs/1000 gal	2000	3000	4000	5000	6000
Solid Swine	10	lbs/Ton	3	4	6	7	8
Liquid Swine	20	lbs/1000 gal	1000	2000	3000	4000	4000
Layer	58	lbs/Ton	0	1	1	1	1
Broiler	43	lbs/Ton	1	1	1	2	2
Beef Cow/Calf	7	lbs/Ton	4	6	8	10	12
Beef Steer	5	lbs/Ton	6	8	11	14	17
Horse	5	lbs/Ton	6	8	11	14	17
Sheep and Goats	8	lbs/Ton	4	5	7	9	11
Turkey	55	lbs/Ton	1	1	1	1	2
Veal	13	lbs/1000 gal	2000	3000	4000	5000	6000

MANURE APPLICATION RATE TABLES – COOL-SEASON GRASS HAY

Cool-Season Grass Hay			Expected Yield (T/ac, dry hay equivalent, 10% moisture)				
P removal rate	15	lbs P ₂ O ₅ /T	3	4	5	6	7
Manure Type	P ₂ O ₅ Analysis	Analysis Units	Manure Application Rate (T/ac or gal/ac)				
Solid Dairy	4	lbs/Ton	11	15	19	23	26
Liquid Dairy	13	lbs/1000 gal	3000	5000	6000	7000	8000
Solid Swine	10	lbs/Ton	5	6	8	9	11
Liquid Swine	20	lbs/1000 gal	2000	3000	4000	5000	5000
Layer	58	lbs/Ton	1	1	1	2	2
Broiler	43	lbs/Ton	1	1	2	2	2
Beef Cow/Calf	7	lbs/Ton	6	9	11	13	15
Beef Steer	5	lbs/Ton	9	12	15	18	21
Horse	5	lbs/Ton	9	12	15	18	21
Sheep and Goats	8	lbs/Ton	6	8	9	11	13
Turkey	55	lbs/Ton	1	1	1	2	2
Veal	13	lbs/1000 gal	3000	5000	6000	7000	8000

APPENDIX 2

LAND APPLICATION OF MANURE A supplement to Manure Management for Environmental Protection

AGRONOMY FACTS 54 Pennsylvania's Nutrient Management Act (Act 38): Who is Affected?





Agronomy Facts 54

Pennsylvania's Nutrient Management Act (Act 38): Who Is Affected?

In spring 1993, the Pennsylvania legislature passed and the governor signed the Nutrient Management Act (Act 6) into law. The regulations implementing this law went into effect in 1997. In 2002 the State Conservation Commission began an effort to revise these regulations. In summer 2005, the Pennsylvania legislature replaced Act 6 with Act 38 as part of the Agriculture, Communities, and Rural Environment (ACRE) initiative. The new regulations, now falling under the new Act 38, were finalized in 2006 and went into effect in October of that year.

These revised regulations include several significant changes in the state's nutrient management program, including changes to who is affected by the regulations. This fact sheet addresses the question "Who is affected (regulated) by this legislation and regulations?"

CONCENTRATED ANIMAL OPERATIONS

The act states that "concentrated animal operations" will be required to develop and maintain a nutrient management plan. Concentrated animal operations (CAOs) are defined as agricultural operations where the animal density of all livestock on the farm exceeds 2 animal equivalent units (AEUs) per acre on an annualized basis. This animal density criteria has not changed in the new regulations; however, two significant changes were made. First, the definition now includes all livestock, including nonproduction animals such as horses used for recreation and transportation. Second, an operation with fewer than 8 AEUs is not considered to be a CAO regardless of the animal density.

Animal Equivalent Units

An AEU is 1,000 pounds of live weight of any animal on an annualized basis. Annualized means that if animals are not present on an operation for a whole year, the animal units are adjusted for the proportion of time during the year that animals are present on the operation. The calculation involves determining the number of AEUs of all animals on the farm based on the number of animals and their average weights and then adjusting that for the actual number of days (out of 365) that the animals are on the operation. To determine the number of AEUs on a farm, the following

formula can be used for each type of animal and then added together to get the total AEUs on the farm:

$$\text{AEUs for each type of animal} = [\text{average number of animals on a typical day that the animals are there} \times \text{animal weight (lb)} \div 1,000] \times [\text{number of days the animals are on the operation per year} \div 365]$$

Table 1 (page 3) lists standard animal weights that are used to calculate AEUs. It is strongly suggested that these standard animal weights be used for this calculation. However, if the farmer has records of actual weights of the animals on the farm, these may be used to determine the appropriate animal weight to be used for this calculation if the records are complete enough to justify the use of the nonstandard weights. Note that for growing animals, an average weight for their growth over the year is used. For example, for medium broilers that grow from 0.09 to 5 pounds per animal over the growth cycle, the average weight would calculate to be 2.55 pounds per animal.

Acres Suitable for Application of Manure

The acreage number used in the animal density calculation is all acres, owned and rented, that are suitable for the application of manure. This acreage is determined to be those lands that meet the following criteria:

- Cropland, hay land, or pastureland (owned or rented) that is an integral part of the operation
- Land that is under the management control of the operator
- Land that is or will be used for the application of manure from the operation

Farmstead and forestland cannot be included in this calculation as land suitable for manure application.

Animal Density

The number of acres that meet the criteria listed above are then divided into the total AEUs on the farm to determine the overall animal density for the operation. Use the blank worksheet on page 4 to calculate the animal density on your farm.



PennState Extension

Concentrated Animal Operations Requirements

A CAO as defined under the original regulations that was in existence on the effective date of the revised regulation (October 1, 2006) should already have an approved nutrient management plan. The following are the new plan submission requirements of CAOs as defined in the revised regulations:

- A new CAO that comes into existence after the effective date must have an approved plan prior to the commencement of manure operations.
- An agricultural operation that is planning an expansion that will result in that operation becoming a CAO must have an approved plan prior to the expansion.
- An agricultural operation that because of loss of land suitable for manure application now meets the criteria for a CAO must submit a nutrient management plan within six months after the date of the loss of land.

EXAMPLE CAO CALCULATIONS

The following is an example of an AEU per acre calculation.

Example Farm Data

Animal Inventory	110 dairy cows @ 1,450-lb average weight each
(Average weights taken from Table 1)	35 heifers @ 1,000-lb average weight each
	20 calves @ 420-lb average weight each
	15,000 large broilers @ 3.55-lb average weight each
Production Period	Cows = 365 days per year
	Broilers = 5 flocks for 57 days each, or 285 days per year
Land Inventory	Farmstead = 5 acres
	Woodland = 3 acres
	Pasture = 4 acres
	Cropland, home farm = 60 acres
	Cropland, rented farm = 36 acres

This example farm would be defined as a CAO and would be required to develop and implement an approved nutrient management plan. The animal density criterion is not to be construed as prohibiting development or expansion of agricultural operations that would exceed the criterion. It simply means that these operations will be required to have an approved nutrient management plan. Farms with an animal density higher than 2 AEU's per acre are likely to have more nutrients than can be fully used by the crops grown on the farm. Thus, nutrient management plans for CAOs will often describe on-farm manure utilization and procedures for moving some manure off the farm.

OTHER REQUIRED PLANS

Farms receiving financial or technical assistance from different federal, state, local, or private funding sources may also be required to have a nutrient management plan. Any farm that violates the Clean Streams Law may also be required to develop a nutrient management plan.

VOLUNTARY PLANS

Farms with fewer than 2 AEU's per acre and farms with fewer than a total of 8 AEU's on the operation are encouraged to voluntarily develop nutrient management plans. Nutrient management plans, whether required or voluntary, can improve farm profits, help protect the environment, provide some protection from liability, and enhance the image with the general public of agriculture as a good steward of our natural resources.

FOR MORE INFORMATION

For more information, contact the Penn State Extension office in your county or your local conservation district. For a summary of the Nutrient Management Act and regulations, see "Agronomy Facts 40: Nutrient Management Legislation in Pennsylvania: A Summary of the 2006 Regulations," available from your Penn State Extension county office.

Using this example data and the worksheet, the calculation of animal density (AEUs per acre) for this farm would be as follows:

ANIMAL TYPE	NO. ANIMALS	X ANIMAL WEIGHT (LB)	X PROD. DAYS	÷ FACTOR =	AEU
Dairy	110	x 1,450	x 365	÷ 365,000 =	159.5
Heifers	35	x 1,000	x 365	÷ 365,000 =	35.0
Calves	20	x 420	x 365	÷ 365,000 =	8.4
Broilers	15,000	x 3.55	x 285	÷ 365,000 =	41.6
		x	x	÷ 365,000 =	
		x	x	÷ 365,000 =	
		x	x	÷ 365,000 =	
				Total* =	244.5
			Acres available for manure**		÷ 100
			AEUs/acre		= 2.45

*If this figure is less than 8, then the farm would not be a CAO, regardless of the AEU/acre figure calculated below.

**Includes only cropland, hayland, and pastures; for this example there are 96 acres of cropland/hayland and 4 acres of pasture.

Table 1. Standard animal weights used to calculate animal equivalent units to identify concentrated animal operations.

TYPE OF ANIMAL	STANDARD WEIGHT (LB) DURING PRODUCTION (RANGE)	TYPE OF ANIMAL	STANDARD WEIGHT (LB) DURING PRODUCTION (RANGE)
Dairy, Holstein/Brown Swiss		Poultry, Turkey	
Calf: 0–1 year	420 (90–750)	Tom brooder: 0–6 weeks	3.36 (0.22–6.5)
Heifer: 1–2 years	1,000 (750–1,250)	Hen brooder: 0–6 weeks	2.74 (0.22–5.25)
Cow	1,450	Hen regular: 6–12 weeks	11.13 (5.25–17)
Bull	1,700	Hen heavy: 6–16 weeks	14.63 (5.25–24)
Dairy, Guernsey/Ayrshire		Tom: 6–18 weeks	25.25 (6.5–44)
Calf: 0–1 year	350 (70–630)	Poultry, Duck	
Heifer: 1–2 years	865 (630–1,100)	Starter: 0–17 days	1.36 (0.22–2.5)
Cow	1,200	Finisher: 17–38 days	4.88 (2.5–7.25)
Bull	1,600	Developer: 0–196 days	3.21 (0.22–6.2)
Dairy, Jersey		Layer	6.85 (6.2–7.5)
Calf: 0–1 year	275 (50–500)	Poultry, Game Birds	
Heifer: 1–2 years	675 (500–850)	Guinea, growing: 0–14 weeks	1.91 (0.06–3.75)
Cow	1,000	Guinea, mature	3.75
Bull	1,200	Pheasant, growing: 0–13 weeks	1.53 (0.05–3.0)
Beef		Pheasant, mature	3.0
Calf: 0–8 months	300 (100–500)	Chukar, growing: 0–13 weeks	0.52 (0.04–1.0)
Replacement heifer: 8 months to 1 year	500 (300–700)	Chukar, mature	1.0
Finishing: 8–24 months	950 (500–1,400)	Quail, growing: 0–13 weeks	0.26 (0.02–0.5)
Replacement heifer: 1–2 years	875 (700–1,050)	Quail, mature	0.5
Bull	1,500	Swine	
Cow	1,400	Nursery pig	35 (13–57)
Backgrounding cattle	500 (300–700)	Wean to finish	143 (13–273)
Veal		Grow finish	165 (57–273)
Calf: 0–20 weeks	280 (95–465)	Gestating sow	450
Poultry, Layer		Sow and litter	470
Pullet, white egg: 0–16 weeks	1.38 (0.08–2.67)	Boar	450
Pullet, brown egg: 0–16 weeks	1.54 (0.08–3.0)	Sheep, Larger Breed	
Breeder hen, white egg: 17–70 weeks	3.25 (2.7–3.8)	Lamb: 0–1 year	95 (10–180)
Breeder rooster, white egg: 17–70 weeks	4.37 (3.67–5.06)	Ewe	225
Breeder hen, brown egg: 17–70 weeks	3.55 (2.9–4.2)	Ram	300
Breeder rooster, brown egg: 17–70 weeks	4.78 (4.5–5.06)	Sheep, Medium Breed	
White egg: 18–75 weeks	3.13 (2.82–3.44)	Lamb: 0–1 year	80 (10–150)
White egg: 18–90 weeks	3.14 (2.82–3.46)	Ewe	175
Brown egg: 18–75 weeks	3.85 (3.35–4.34)	Ram	225
Brown egg: 18–90 weeks	3.85 (3.35–4.34)	Sheep, Smaller Breed	
Poultry, Broiler		Lamb: 0–1 year	45 (10–80)
Medium: 0–35 days	2.55 (0.09–5.0)	Ewe	100
Large: 0–53 days	3.55 (0.09–7.0)	Ram	125
Roaster male: 0–7 weeks	4.70 (0.09–9.3)	Goats, Meat	
Roaster female: 0–9 weeks	4.95 (0.09–9.8)	Kid: 0–1 year	65 (5–125)
Breeder pullet: 0–20 weeks	2.55 (0.09–5.0)	Doe	150
Breeder cockerel: 0–20 weeks	3.55 (0.09–7.0)	Buck	200
Breeder hen: 20–65 weeks	6.75 (5.0–8.5)		
Breeder rooster: 20–65 weeks	8.75 (7.0–10.5)		

(continued)

Table 1. (continued)

TYPE OF ANIMAL	STANDARD WEIGHT (LB) DURING PRODUCTION (RANGE)	TYPE OF ANIMAL	STANDARD WEIGHT (LB) DURING PRODUCTION (RANGE)
Goats, Dairy		Draft Horses	
Kid: 0–1 year	45 (5–85)	Foal: 0–6 months	360 (120–600)
Doe	125	Weanling: 6–12 months	800 (600–1,000)
Buck	170	Yearling 12–24 months	1,150 (1,000–1,300)
Miniature Horses and Donkeys		Two-year-old: 24–36 months	1,450 (1,300–1,600)
Foal: 0–6 months	35 (25–45)	Mature	1,800
Weanling: 6–12 months	60 (45–75)	Bison	
Yearling: 12–24 months	100 (75–125)	Calf: 0–1 year	275 (50–500)
Two-year-old: 24–36 months	150 (125–175)	Yearling: 1–2 years	650 (500–800)
Mature	200	Cow	1,000
Ponies and Donkeys		Bull	1,600
Foal: 0–6 months	65 (30–100)	Deer	
Weanling: 6–12 months	150 (100–200)	Fawn: 0–6 months	36 (7–65)
Yearling: 12–24 months	300 (200–400)	Yearling doe: 6–18 months	95 (65–125)
Two-year-old: 24–36 months	400 (300–500)	Yearling buck: 6–18 months	110 (65–155)
Mature	600	Mature doe	145
Light Horses and Mules		Mature buck	200
Foal: 0–6 months	190 (80–300)	Alpaca	
Weanling: 6–12 months	450 (300–600)	Young	80 (15–145)
Yearling: 12–24 months	700 (600–800)	Mature female	145
Two-year-old: 24–36 months	900 (800–1,000)	Mature male	170
Mature	1,100	Llama	
		Cria: 0–1 year	75 (25–125)
		Yearling: 1–2 years	213 (125–300)
		Mature	350

Using this worksheet to determine if your farm is a CAO:

ANIMAL TYPE	NO. ANIMALS	X ANIMAL WEIGHT (LB)	X PROD. DAYS	+ FACTOR =	AEU
		X	X	÷ 365,000 =	
		X	X	÷ 365,000 =	
		X	X	÷ 365,000 =	
		X	X	÷ 365,000 =	
		X	X	÷ 365,000 =	
		X	X	÷ 365,000 =	
		X	X	÷ 365,000 =	
				Total* =	
			Acres available for manure		÷
			Animal density: AEU/acre**		=

*If the total AEU's on the farm is less than 8, the farm is not a CAO, regardless of the animal density.

**Farms with an animal density of greater than 2 AEU's per acre are defined as CAOs.

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APPENDIX 3

LAND APPLICATION OF MANURE A supplement to Manure Management for Environmental Protection

AGRONOMY FACTS 68 Pennsylvania's Nutrient Management Act (Act 38): Who is Affected?





Manure Spreader Calibration

Manure spreader calibration is an essential and valuable nutrient management tool for maximizing the efficient use of available manure nutrients. Planned manure application rates listed in nutrient management plans must correlate with actual application rates. Calibrating the manure spreader is the only way to know actual manure application rates.

Manure spreader calibration combined with soil test recommendations and manure analysis results enable the determination of nutrient application rates that meet crop nutrient needs. The most critical and challenging aspect of both soil and manure analysis is obtaining a representative sample to submit to the laboratory. It is critical to learn and follow recommended soil and manure sampling procedures in order to obtain a representative sample and test results. The manure nutrient levels and crop nutrient requirements from test results are used to determine manure application rates that will adequately meet crop needs. Manure spreader calibration ensures that manure application rates are realistic, practical, and attainable.

Manure application rates are determined by equipment speeds and settings along with application management, such as overlaps. Manure spreader calibration can be used two ways in nutrient management planning:

Before planning— Spreaders can be calibrated to determine the rates that can be applied at typical application settings and speed. These rates are then used as the possible planned rates when the nutrient management plan is developed.

After planning— Spreaders can be calibrated to meet planned application rates by changing speeds, settings, or management. In this case, desired application rates are determined as the nutrient management plan is developed and the spreader is calibrated accordingly.

OVERVIEW OF SPREADER CALIBRATION

An application rate is defined as the amount of manure applied per unit of land area. For manure, it is usually expressed in tons per acre (solid) or gallons per acre (liquid). Generally, application rate equals the amount of manure applied (in tons or gallons) divided by the area covered (in acres).

Manure spreader calibration requires reliable estimates of both the amount applied and area covered. There are two common calibration techniques. The **swath or load-area method** involves measuring both the amount of manure in a typical spreader load and the land area covered by applying one load of manure. While this method can be used for all manures, it is the best method for liquid manure applicators. The **tarp or weight-area method** involves weighing the manure spread over a small surface and computing the amount of manure applied per acre. This method is the best method for solid manure applicators.

CALIBRATION METHODS

Below are descriptions of the two most common calibration methods.

Swath (Load-Area) Method

Liquid manure applicators used in pump-and-haul application systems are best calibrated by the swath or load-area method, which involves land applying a full load of manure and measuring the land area covered. If possible, choose an area that is typical of the land where manure will be spread. If appropriate, a relatively level area long enough for the load to be applied in a single pass makes measurements and calculations simpler. A rectangular field pattern should be used to make measuring easier. The application rate of PTO-driven spreaders depends on ground speed. Therefore, it is important to maintain a uniform ground speed throughout the swath length. Ground-driven spreaders deliver reasonably uniform application rates regardless of ground speed.

For liquid application equipment, application rates and patterns vary depending on ground speed or PTO speed, gear box settings, gate openings, operating pressures, spread widths, and overlaps. To change the application rates, adjust-

ments must be made in tractor/PTO speeds, spreader output settings, or application management. The calibration process should be followed for each change or combination of changes. Several calibration passes may be necessary to determine the settings required for the desired application rate.

Use the swath (load-area) method procedure and record sheet provided at the end of this publication for this calibration method.

Tarp (Weight-Area) Method

Solid manure applicators are best calibrated by the tarp or weight-area method, which involves measuring the amount of manure (weight) applied over a small measured area (tarp). The application rate is determined by dividing the amount (weight) of manure collected on the tarp by the size of the collection area (tarp).

For solid application equipment, applications rates and patterns vary depending on ground speed or PTO speed, gear box settings, gate openings, operating pressures, spread widths, and overlaps. To change the application rates, adjustments must be made in tractor/PTO speeds, spreader output settings, or application management. The calibration process should be followed for each change or combination of changes. Several calibration passes may be necessary to determine the settings required for the desired application rate.

Use the tarp (weight-area) method procedure and record sheet provided at the end of this publication for this calibration method.

DETERMINING MANURE SPREADER CAPACITY

The load-area method of manure spreader calibration requires knowledge of the manure spreader’s capacity. Manure spreader capacity can be determined by one of the following methods.

Manufacturer’s Capacity Ratings

The rated capacity for liquid spreaders can be used directly if the spreader is typically filled to capacity. In many cases, the spreader is not fully loaded. Therefore, adjustments must be made for less than full capacity.

The rated capacity of box-type solid or semisolid spreaders must be adjusted according to the fullness of a typical load of manure. Make sure to note whether the rating specifications are for “heaped or piled” or “level” loads.

If there is any uncertainty about the rate capacity, then a more accurate method is needed to measure the actual volume of manure.

Measure Spreader Volume

Spreader volume can be estimated by using the calculations in Figure 1. All dimensions used in the following formulas must be in feet in order to obtain volumes that are in cubic feet. After calculating volume in cubic feet, convert the cubic feet to pounds and then convert pounds to tons or gallons based on manure density using the conversion factors in Table 1.

Figure 1. Calculating estimated manure spreader volumes.

Solid or Semisolid

- [A] Box spreader (level load)*
volume = length x width x depth
- [B] Box spreader (piled load)*
volume = length x width x [depth + (stacking height** x 0.8)]
- [C] Round-bottom open-top spreader (level load)
volume = length x depth x depth x 1.6
- [D] Round-bottom open-top spreader (piled load)
volume = length x depth x 1.6 x (depth + stacking height**)

Liquid

- [A] Box spreader (level load)*
volume = length x width x depth
- [C] Round-bottom open-top spreader (level load)
volume = length x depth x depth x 1.6
- [E] Tank spreader (round)
volume = length x tank diameter x tank diameter x 0.8
- [F] Tank spreader (noncircular)
volume = length x width x depth x 0.8

*For a box spreader with sloping sides, use an average width.
**Stacking height is the height of any rounded manure above level.

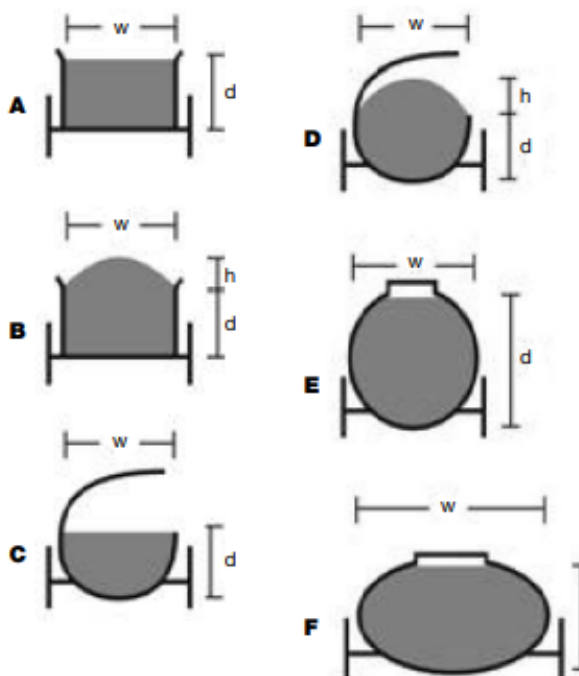


Table 1. Commonly required conversions for manure spreader volumes.

To convert from	To	Multiply by
bushels	cubic feet	1.24
gallons	cubic feet	0.134
gallons	pounds	8.3 (liquid)
gallons	tons	0.0041 (liquid)
cubic feet	gallons	7.48
cubic feet	tons	0.031 (liquid) or 0.0275 (solid)
cubic feet	pounds	62 (liquid) or 55 (solid)

See the next page for instructions to determine the actual manure density.

Weigh Manure Load

The most accurate way to determine the capacity of a spreader is to directly weigh the spreader. The spreader should be weighed using drive-on scales or weigh pads.

First, weight the spreader empty and then weight at least three typical loads of manure. Obtain an average weight of the full loads and subtract the weight of the empty load to determine the weight of the manure. Convert this weight to tons or gallons.

DETERMINING MANURE DENSITY

Manure density (weight per cubic foot) varies with moisture content primarily depending on the amount of bedding. To calculate a more accurate estimate of manure density, use the procedure below.

1. Weigh an empty 5-gallon bucket. Record the weight in pounds.
2. Fill the 5-gallon bucket with a typical sample of the manure to be applied and weigh the bucket and manure. Record the weight in pounds.
3. Subtract the weight of the empty bucket (step 1) from the weight of manure and bucket (step 2). Record the weight of manure in pounds.
4. Repeat steps 2 and 3 at least six times and calculate the average manure weight (add the six weights together and divide by six). Record average weight of manure in pounds.
5. Multiply the average manure weight (step 4) by 1.5 to obtain the estimated manure density in pounds per cubic foot. Record the manure density in pounds per cubic foot.

SWATH (LOAD-AREA) METHOD CALIBRATION PROCEDURE

Obtain calibration equipment and supplies.

- Measuring wheel (available from any farm supply catalog, such as NASCO).
1. Determine manure spreader capacity.
 - Use manufacturer's ratings or actual weighing of the spreader, or estimate by using spreader volume calculations described above.
 - Record the capacity in gallons (liquid manure) or tons (solid manure).
 - Load the spreader consistently with the capacity determination above.
 2. Spread one full load of manure in a rectangular pattern. Note the details of the operating conditions (e.g., tractor gear, throttle setting, PTO speed, tractor speed, spreader settings).
 3. Measure the length and the effective application width of the application coverage area.
 - Record the distances in feet.
 - An alternative method of measuring the application length is to note the ground speed and time required to make the application pass. To calculate length covered, multiply the ground speed (in mph) by the number of seconds by 1.46 feet per second.
 4. Calculate the size of the coverage area.
 - Multiply the length by the width and divide by 43,560 square feet per acre.
 - Record the coverage area in acres.
 5. Calculate the application rate.
 - Divide the volume of the spreader load of manure (step 1a) by the acres covered (step 4b).
 - Record manure application rate in gallons or tons per acre.
 6. Repeat the calibration procedure one or two more times.
 - Repetition is necessary to increase reliability of the application rate. A certain amount of variation is inevitable. However, if there is significant variation among repetitions, check over the equipment and review your calibration procedure to try to determine the cause of the variation.
 - Repeat steps 2 through 5.
 - Calculate the average of each of the measured manure application rates.
 - Record the final calibrated rate in gallons or tons per acre.

MANURE SPREADER CALIBRATION RECORD SHEET – SWATH (LOAD-AREA) METHOD

Spreader Identification			
Date			
1. Determine the capacity of the spreader (use gallons for liquid manure and tons for solid manure).			
a. Spreader capacity	gallons or tons		
2. Spread one full load in a rectangular pattern.			
Forward speed, gear, or throttle setting			
PTO speed or setting			
Spreader gate opening setting			
3. Measure the coverage area.			
	Trial 1	Trial 2	Trial 3
a. Spread area width	feet	feet	feet
b. Spread area length	feet	feet	feet
4. Calculate the area covered.			
a. Spread area (3a x 3b)	ft ²	ft ²	ft ²
b. Spread area (4a ÷ 43,560)	acres	acres	acres
5. Calculate the manure application rate.			
a. Application rate (1a ÷ 4b)	gallons or tons/acre		
6. Average each of the calibration trials to determine the final application rate.			
Final calibrated application rate (average of trials in 5a)			gallons or tons/acre

Tarp (Weight-Area) Method Calibration Procedure

Obtain calibration equipment and supplies.

- Tarp or plastic (heavy) sheet approximately 100 square feet in size (9 x 12, 10 x 10, 10 x 12, etc.)
 - Tent pegs or long nails
 - Scales (spring-tension or platform)
 - Bucket (optional to assist in weighing)
1. Measure the exact surface area of the tarp or plastic sheet (length x width).
 - Record the surface area in square feet.
 - Weigh the “empty” tarp or plastic sheet. If using a bucket, weigh the tarp or plastic sheet with the bucket.
 - Record the weight (empty) in pounds. (3a)
 2. Position the tarp in the field where the manure can be spread.
 - Place it far enough into the field to allow enough distance to get the spreader in gear and the tractor up to the desired speed.
 - Avoid placing the tarp where the beginning or end of the load is likely to fall.
 - Secure each corner of the tarp with a tent peg or long nail.
 - Spread the first pass of manure directly over the center of the tarp.
 - Operate the spreader at the speed normally driven when applying manure.
 - Note the details of the operating conditions (e.g., tractor gear, throttle setting, PTO speed, tractor speed, spreader settings).
 - Spread two additional passes on opposite sides of the center of the tarp.
 - Apply these passes at the normal spreader overlap spacing.
 3. Remove and fold the tarp.
 - Be careful not to spill any of the collected manure.
 - If using a bucket for weighing, place the manure and tarp in the bucket.
 - Weigh the tarp and manure (and bucket).
 - Record the weight (gross) in pounds (step 3b).
 - Subtract the empty tarp weight (and bucket if using a bucket) (step 3a) from the gross tarp weight (step 3b).
 - Record the weight of collected manure in pounds.

4. Determine the manure application rate.
 - Divide the amount of manure collected (in pounds) (step 3c) by the tarp area (in square feet) (step 1a).
 - Multiply this value by 21.8 (43,560 ft²/acre ÷ 2,000 lbs/ton) to convert pounds per square foot to tons per acre.
 - Record the manure application rate in tons per acre.
5. Repeat the calibration procedure one or two more times.
 - Repetition is necessary to increase reliability of the application rate.
 - Repeat steps 2 through 4.
 - Calculate the average of each of the measured manure application rates.
 - Record the final calibrated rate in tons per acre.

MANURE SPREADER CALIBRATION RECORD SHEET – TARP (WEIGHT-AREA) METHOD

Spreader Identification			
Date			
1. Measure tarp surface area. Weigh the empty tarp and record under 3a below. Spread and secure the tarp or plastic sheet in the field.			
a. Tarp surface area:	width x	length =	ft ²
2. Spread manure over the center of the tarp and on each side of the tarp at the normal overlap spacing.			
Forward speed, gear, or throttle setting			
PTO speed or setting			
Spreader gate opening setting			
3. Fold and weigh the tarp (and weighing container) with an accurate set of spring-tension or platform scales.			
	Trial 1	Trial 2	Trial 3
a. Empty weight	lbs	lbs	lbs
b. Gross weight with manure	lbs	lbs	lbs
c. Net weight (3b – 3a)	lbs	lbs	lbs
4. Calculate the manure application rate.			
a. Application rate (3c ÷ 1a)	lbs/ft ²	lbs/ft ²	lbs/ft ²
b. Application rate (4a x 21.8)	tons/acre	tons/acre	tons/acre
5. Average each of the calibration trials to determine the final application rate.			
Final calibrated application rate (average of trials in 4b)			tons/acre

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