

**PENNSYLVANIA COMMERCIAL  
MANURE HAULER & BROKER  
CERTIFICATION WORKBOOK**

**Manure Hauler Level 2**

**2018**

# Commercial Manure Hauler and Broker Certification Workbook

## Manure Hauler Level 2

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### HOW TO USE THIS WORKBOOK

This workbook is a study guide and reference source for those seeking certification as a **Commercial Manure Hauler Level 2**. Level 2 applicants will need to be familiar with all material **and are subject to testing of all material in the workbook**. A definition of Commercial Manure Hauler Levels is found in Chapter 1. A sampling of test questions follows each chapter of this publication. Answers for sample test questions are provided in Chapter 14.

**THE PENNSYLVANIA DEPARTMENT OF AGRICULTURE ENCOURAGES YOU TO KEEP THIS WORKBOOK WITH YOU AT ALL TIMES WHEN YOU ARE HAULING MANURE.**

### IT CAN BE A QUICK GUIDE FOR:

1. **ACTIONS TO TAKE IN AN EMERGENCY.**
2. **HOW MANURE MUST BE STACKED OR APPLIED.**
3. **WHAT RECORDS YOU MUST KEEP.**

### PROGRAM CONTACT INFORMATION

All program applications and worksheets should be mailed to:

**Michael Aucoin  
Commercial Manure Hauler and Broker Program  
Pennsylvania Department of Agriculture  
State Conservation Commission  
2301 North Cameron Street, Rm. 311  
Harrisburg, Pa 17110  
717-772-5218**

For program applications, worksheets or workbooks please contact the Department of Agriculture or go to the Department website at [www.agriculture.state.pa.gov](http://www.agriculture.state.pa.gov). Select the search tool, and search for 'Manure Hauler' to see a link to the program page.

# CHAPTER 1: ACT 49 INTRODUCTION, DEFINITIONS and CERTIFICATION LEVELS

<p><b>Introduction</b></p> <p><b>WHY MUST I BE CERTIFIED?</b></p>	<p><b>Introduction</b></p> <p>In 2004, the Commercial Manure Hauler and Broker Certification Act (Act 49) was signed into Pennsylvania Law. Any individual who <b><i>transports, land-applies, or brokers manure in a commercial situation</i></b> within the borders of the Commonwealth of Pennsylvania must successfully complete a state certification program.</p>
<p><b>Definitions</b></p> <p><b>DO I NEED TO BE CERTIFIED?</b></p>	<p>The following definitions define who is a commercial manure hauler or broker:</p> <p><b><i>Commercial Manure Hauler</i></b> – A person that transports or land applies manure as a contract agent for an agricultural operator or commercial manure broker under the direction of the operator or broker.</p> <p style="padding-left: 40px;"><b>This means if you are hired by another person to haul or apply manure to another farm or other business, you must be certified.</b></p> <p><b><i>Commercial Manure Broker</i></b> – A person that is not working for or under the control of an agricultural operator and that assumes temporary control or ownership of manure from an agricultural operation and arranges for transport to and utilization at an importing operation or other location.</p> <p style="padding-left: 40px;"><b>This means that if you buy or obtain manure from another person and you then determine where the manure will be hauled to or what land the manure will be applied to, you must be certified as a broker.</b></p> <p><b><i>Supervise or Supervision</i></b> – To be in contact by means of a cell phone, two-way radio or other electronic device or means which allows direct communication between the Level 2 certified commercial manure hauler and the certified commercial manure broker or certified commercial Level 3 hauler.</p> <p><b><u>MANAGEMENT PLANS</u></b> – <b>all manure applications must be done under the guidance of a plan. Three application plans are listed here in general terms. Greater detail on the plans can be found in Chapter 2.</b></p> <ol style="list-style-type: none"> <li>1. <b><i>Manure Management Plan (MMP)</i></b> – A detailed written document that determines the appropriate manure utilization and application protocols. Every farm that generates or utilizes manure in Pennsylvania must have one of these plans, unless the farm uses one of the following plans in its place.</li> <li>2. <b><i>Nutrient Balance Sheet (NBS)</i></b> – A detailed written document, which determines appropriate manure, fertilizer and other nutrient source applications, rates on importing operations.</li> <li>3. <b><i>Nutrient Management Plan (NMP)</i></b> – A detailed written document, which contains best management practices to manage the use of manure and other plant nutrients for crop production and water quality protection.</li> </ol>
<p><b>Certification Levels</b></p> <p><b>WHAT LEVEL OF CERTIFICATION DO I NEED?</b></p>	<p>There are several levels of certification for individuals as follows:</p> <p><b><i>Commercial Manure Haulers:</i></b></p> <p><b>You are hired by another person to haul or apply their manure to another farm or business location.</b></p> <ul style="list-style-type: none"> <li>➤ <b>Commercial Hauler Level 1:</b> <ul style="list-style-type: none"> <li>○ Transports, but does not land-apply manure.</li> <li>○ May transport manure without supervision.</li> </ul> </li> </ul>

	<ul style="list-style-type: none"> <li>○ May stack manure at another location.</li> <li>➤ <b>Commercial Hauler Level 2: (This workbook pertains to this level)</b> <ul style="list-style-type: none"> <li>○ Transports and land applies manure.</li> <li>○ Is an employee - not an owner or a manager of the business.</li> <li>○ Is supervised by a Level 3 hauler or Level 1 or 2 brokers.</li> </ul> </li> <li>➤ <b>Commercial Hauler Level 3:</b> <ul style="list-style-type: none"> <li>○ Land applies and transport manure.</li> <li>○ May work independently, without supervision.</li> <li>○ May hire and supervise a Level 2 Commercial Hauler.</li> </ul> </li> </ul> <p><b>Commercial Manure Brokers may buy or obtain manure from another person and determine what other farmer or business operation is going to receive the manure.</b></p> <ul style="list-style-type: none"> <li>➤ <b>Commercial Broker:</b> <ul style="list-style-type: none"> <li>○ Is an individual who takes ownership of manure from a farm and arranges for transport to and utilization at another farm or location.</li> <li>○ May supervise a Commercial Hauler Level 2.</li> </ul> </li> </ul>
<p><b>Responsibility</b></p> <p><b>WHAT MAY I DO?</b></p> <p><b>WHAT MUST I DO?</b></p>	<p><b>LEVEL 2 HAULERS MAY DO THE FOLLOWING:</b></p> <p>A Level 2 Hauler may haul and apply manure under supervision of a Commercial Manure Hauler Level 3 or Broker 1 or 2. Supervision has been determined to mean communication via radio, cell phone, or some other voice device.</p> <p><b>Certified commercial manure haulers or brokers are responsible for the following activities:</b></p> <ul style="list-style-type: none"> <li>➤ Land-applying manure based on application rates and adhering to any application restrictions noted in a current NMP, NBS or MMP.</li> <li>➤ In the absence of a NMP or NBS, follow application procedures in a Manure Management Plan.</li> <li>➤ Retain records of all manure brokered, hauled or land-applied for inspection by the Department. <ul style="list-style-type: none"> <li>○ This information will be collected by a Level 3 Hauler or Level 1 or 2 Broker (your employer).</li> <li>○ See Chapter 10 'Record Keeping' for details on the types of records you must keep.</li> </ul> </li> <li>➤ Maintain a valid certification.</li> </ul>
<p><b>Certification</b></p> <p><b>WHAT MUST I DO TO BECOME CERTIFIED?</b></p>	<p>To obtain a Commercial Manure Hauler Level 2 certificate, you must:</p> <ul style="list-style-type: none"> <li>➤ Review this Level 2 workbook. Alternatively, you can attend Act 49 Orientation class designed for Manure Hauler Level 3 and Brokers.</li> <li>➤ Complete a verification form that accompanies this workbook and send the verification form to the Department of Agriculture to receive credit.</li> <li>➤ Pass a multiple-choice exam. <ul style="list-style-type: none"> <li>• A program application will be sent to you when you pass the exam.</li> </ul> </li> <li>➤ Complete the application and submit to the Department with the required fee.</li> </ul> <p>Copies of the workbook and verification form may be obtained on the Department's website at <a href="http://www.agriculture.state.pa.gov">www.agriculture.state.pa.gov</a>, and select the search tool, and search for 'Manure Hauler'. You should then see a link to the program page where forms can be found, or by calling (717) 772-5218.</p>

<b>Testing</b>	To find out when and where Level 2 certification testing can be completed contact the Pennsylvania Department of Agriculture at (717) 772-5218 or contact your local County Conservation District
<b>Fees and Certification Terms</b>	<p><b>Fees and certification term lengths are as follows:</b></p> <ul style="list-style-type: none"> <li>➤ Hauler Level 1 = \$10 annual fee</li> <li>➤ <b>Hauler Level 2 = \$60 for 3 years</b></li> <li>➤ Hauler Level 3 = \$300 for 3 years</li> <li>➤ Broker Level 1 = \$325 for 3 years</li> <li>➤ Broker Level 2 = \$350 for 3 years</li> </ul>
<p><b>Recertification</b></p> <p><b><u>HOW DO I RENEW MY CERTIFICATE?</u></b></p>	<p><b>Continuing Education Credits (CECs)</b> are necessary to maintain certification. The following list of CECs must be completed during the 3-year certification term. Retesting is not necessary if CEC requirements are completed.</p> <ul style="list-style-type: none"> <li>➤ Hauler Level 1 = no credits; must complete worksheet every year.</li> <li>➤ <b>Hauler Level 2 = 6 credits</b></li> <li>➤ Hauler Level 3 = 9 credits</li> <li>➤ Broker Level 1 = 9 credits</li> <li>➤ Broker Level 2 = 12 credits; 3 or more of the 12 must pertain to NBS development</li> </ul> <p>You can obtain CECs by attending workshops sponsored by the Department of Agriculture. Available workshops will be advertised through newsletters or on the Department's 'PaPlants' website at <a href="http://www.paplants.state.pa.gov">www.paplants.state.pa.gov</a> under CEC Meeting Search.</p>
<p><b>Revocation</b></p> <p><b><u>CAN THE DEPARTMENT REVOKE MY CERTIFICATE?</u></b></p>	<p><b>Revocation</b></p> <p>The Department of Agriculture may issue a Notice of Violation, deny, revoke, or suspend a certificate for the following reasons:</p> <ol style="list-style-type: none"> <li>1. Violation of the Commercial Manure Hauler and Broker Act (Act 49), the Nutrient and Odor Management Act (Act 38), or Department of Environmental Protection's Manure Management Plan (DEP MMP) Guidance.</li> <li>2. Failure to obtain the necessary continuing education credits.</li> <li>3. A person does not maintain required records.</li> <li>4. A person allows their certificate to lapse.</li> </ol>
<b>Abbreviations</b>	<p><b>Some of the abbreviations found in this workbook include:</b></p> <p><b>CAFO – Concentrated Animal Feeding Operation</b>  <b>CAO – Concentrated Animal Operation</b>  <b>CEC – Continuing Education Credit</b>  <b>CMU – Crop Management Unit</b>  <b>DEP – Pennsylvania Department of Environmental Protection</b>  <b>Department – Pennsylvania Department of Agriculture</b>  <b>MMP – Manure Management Plan</b>  <b>N - Nitrogen</b>  <b>NBS – Nutrient Balance Sheet</b>  <b>NMP – Nutrient Management Plan</b>  <b>P - Phosphorus</b></p>

## ***Chapter 1 Sample test questions***

1. Any commercial person hauling, applying or brokering manure within Pennsylvania must hold a valid certificate.
  - a. True
  - b. False
  
2. This level of commercial manure hauler may transport and land apply manure under supervision.
  - a. Level 1 commercial manure hauler.
  - b. Level 2 commercial manure hauler.
  - c. Level 3 commercial manure hauler.
  
3. The number of Continuing Education Credits (CECs) needed by a Manure Hauler Level 2 in a three-year period.
  - a. 3 CECs
  - b. 6 CECs
  - c. 9 CECs
  - d. 12 CECs
  
4. A Level 1 commercial manure haulers must have supervision.
  - a. True
  - b. False

**CHAPTER 2: LAWS AND REGULATIONS - The following laws and regulations apply to the hauling and land-application of manure in Pennsylvania.**

<p><b>Act 49</b></p>	<p><b>Act 49 - The Commercial Manure Hauler and Broker Certification Law.</b></p> <ul style="list-style-type: none"> <li>➤ Any commercial manure hauler or broker transporting or land-applying manure must hold a valid certificate under the law to operate in Pennsylvania.</li> <li>➤ The law assures that a responsible and knowledgeable person properly handles manure.</li> <li>➤ The law establishes record-keeping requirements for all persons certified under the program.</li> <li>➤ A certified manure hauler or broker, when land-applying manure, must apply manure at <u>rates established</u> in an approved NMP or NBS for the farm, if that farm is a Concentrated Animal Operation (CAO), Concentrated Animal Feeding Operation (CAFO) or imports manure from a CAO or CAFO. <i>(See information on a CAO and CAFO below)</i>. If a farm is not a CAO or CAFO then manure must be applied according to the DEP MMP.</li> </ul>
<p><b>Act 38 Nutrient Management Act</b></p> <p><b>CAO</b></p>	<p><b>The Nutrient Management Connection.</b></p> <ul style="list-style-type: none"> <li>➤ Act 49 also supports exported manure requirements in the Nutrient Management Act (Act 38).</li> <li>➤ Act 38 preserves water quality in Pennsylvania by regulating high-density livestock.</li> <li>➤ Under Act 38, farms called <b>Concentrated Animal Operations (CAO)</b> must have an approved Nutrient Management Plan (NMP).</li> <li>➤ An agricultural operation having an approved Act 38 NMP that exports manure off the operation and uses a commercial manure hauler or broker, <u>must use a hauler or broker that holds a valid certification issued by the Department of Agriculture.</u></li> <li>➤ If a CAO exports manure, a Nutrient Balance Sheet (NBS) must be developed for any other farmland where the manure from the CAO is applied and the manure must be applied to that farm as described in the NBS.</li> </ul>
<p><b>CAFO</b></p>	<p><b>Concentrated Animal Feeding Operation (CAFO) program.</b></p> <ul style="list-style-type: none"> <li>➤ The CAFO program is a water quality program under the Federal Clean Water Act. There are only several hundred farms in the state defined as CAFOs.</li> <li>➤ It was developed to lower the level of pollutants from manure that can get into streams and other water.</li> <li>➤ Similar to the CAO situation above, when manure is exported off the CAFO, a NBS must be developed for any other farmland applying the manure from the CAFO and the manure must be applied to that farm as stated in the NBS.</li> </ul>
<p><b>DEP Manure Management Plan</b></p> <p><b>(DEP MMP)</b></p>	<p><b>Manure Management Plans (MMP)</b></p> <ul style="list-style-type: none"> <li>➤ Beginning on October 29, 2011 all manure must be applied at a planned rate and outside of setbacks listed in that plan.</li> <li>➤ In the absence of a plan noted above (Act 38 NMP or NBS) all manure must be applied as directed by a DEP Manure Management Plan.</li> <li>➤ MMPs can be developed for the farm by anyone including the farmer or certified hauler.</li> <li>➤ Copies of the MMP Guidance can be found on the DEP website (<a href="http://www.dep.pa.gov">www.dep.pa.gov</a>) by searching the site for “Land Application of Manure”.</li> </ul>

<b>PA Clean Streams Law</b>	<ul style="list-style-type: none"><li>➤ The Pennsylvania Clean Streams Law is a water quality law that is meant to lower the amount of pollution that can get into a stream or other water.</li><li>➤ If manure is spilled, spread or stacked too close to a stream or other water it can get into the water and cause problems.</li><li>➤ Any person that allows manure to get into a stream or other water may get a penalty under this law.</li><li>➤ The Clean Streams Law also regulates land application of sewage sludge (Biosolids) that must be applied by permit according to a plan that outlines application rates and setbacks. The Biosolids Certification program is a separate certification program than this manure-oriented program.</li></ul>
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### ***Chapter 2 Sample test questions***

1. What does CAFO stand for?
  - a. Concentrated Animal Operation
  - b. Concentrated Animal Factory Operation
  - c. Concentrated Animal Farm Odor
  - d. Concentrated Animal Feeding Operation
  
2. What does CAO stand for?
  - a. Concentrated Animal Operation
  - b. Concentrated Animal Factory
  - c. Concentrated Animal Odor
  - d. Concentrated Animal Feeding Operation
  
3. If manure is exported from a CAO or CAFO, using a commercial manure hauler, that hauler must be certified.
  - a. True
  - b. False



**CHAPTER 3: BIO-SECURITY - This chapter gives helpful information about proper steps to take to make sure animal diseases are not spread from one farm to another.**

<p><b>Definition of Bio-security</b></p>	<p><b>Definition</b>  <i>Bio-security</i> – Involves steps and procedures a person can take to prevent the introduction and spread of diseases from one herd or flock of animals to another.</p> <ul style="list-style-type: none"> <li>➤ Special precautions must be taken when moving from farm to farm or when moving between animal groups on the same farm.</li> <li>➤ Diseases can be spread when manure attached to a person or equipment is moved to a new farm or to another herd or flock of animals.</li> </ul>
<p><b>Bio-security Protocols</b></p> <p><b>STANDARDS TO PREVENT THE SPREADING OF DISEASES</b></p> <p><b>Lines of Separation</b></p>	<p><b>Protocols</b></p> <ul style="list-style-type: none"> <li>➤ Most farms have bio-security procedures that you should follow in order to prevent disease transfer.</li> <li>➤ Poultry and swine farms are likely to have the strictest bio-security procedures. <ul style="list-style-type: none"> <li>○ Producers may require or request that equipment be washed and sanitized before coming to their farm.</li> <li>○ <i>Before traveling to a new farm, make sure you are aware of the producer's bio-security procedures and follow it!</i></li> </ul> </li> <li>➤ Introduction of disease to a farm causes a loss in animal production. This has a negative impact on farm income, which can have negative impacts on your income.</li> <li>➤ Always ask the farmer if he has bio-security protocols that he follows to prevent disease introduction.</li> </ul> <p><b>Lines of Separation</b> is a protocol where equipment and human traffic patterns at a farm is managed so equipment, feed, and people working with on-site livestock do not physically cross paths with other equipment that may work with multiple farms. For instance, your manure application equipment may need to enter and exit the farm on a path where feed trucks and barn workers do not cross. In this scenario, if you bring an infectious agent to the farm on your tires or boots then the risk of someone (or something) physically crossing your travel path, picking up the infectious agent, and introducing it to the farm's feed system, employees, and animals is minimized. Thus, you can envision a line of separation between the traffic patterns of different people at the farm that are not physically crossed.</p>
<p><b>Spotted Lanternfly</b></p>	<p><b>Spotted Lanternfly (SFL)</b> is an invasive insect that is capable of causing large amounts of damage to agricultural and forest products, such as grape, tree-fruit, hardwood, and landscape products.</p> <p><b>Quarantine Areas and Protocols.</b> Originally discovered in Berks County, controlling the spread of Spotted Lanternfly to new areas is critical. Quarantine restrictions are in place for certain areas of Pennsylvania. If you move into and out of quarantine areas, you must make sure you are not transporting any living life stages of the SLF. Quarantine area maps, protocols for inspection and identification, instructions on what do if you find SLF's, and how to report SLF sightings are supplied by the PA Department of Agriculture and by Penn State University. Further information can be found by searching '<i>Spotted Lanternfly</i>' at these websites.</p> <ul style="list-style-type: none"> <li>➤ PDA - <a href="http://www.agriculture.pa.gov">www.agriculture.pa.gov</a></li> </ul>

	<ul style="list-style-type: none"> <li>➤ PSU - <a href="http://www.extension.psu.edu/spotted-lanternfly">www.extension.psu.edu/spotted-lanternfly</a></li> </ul> <p><b>Spotted Lanternfly Permits.</b> Manure handling businesses moving into and out of a quarantine area are required to have a permit. The Spotted Lanternfly Permit can be completed online at the PDA address listed above. The permit is free of charge. The permit provides evidence that you have completed training on how to follow the rules of the quarantine order.</p> <p><b>A few tips:</b></p> <ul style="list-style-type: none"> <li>➤ Keep abreast of quarantine areas, which can change if the insect is discovered in new areas.</li> <li>➤ Learn how to identify and kill SLF egg masses, nymphs and adults.</li> <li>➤ <b>'Look before you leave'.</b> Inspect your equipment before you leave a site. <ul style="list-style-type: none"> <li>○ Eggs can be found October – May</li> <li>○ Nymphs can be found May – July</li> </ul> </li> <li>➤ Avoid parking equipment under trees. The female SLF often lays eggs on objects that are under the trees she is feeding on. <b>You should try to change your habits about where you park.</b> Park vehicles in open fields, away from tree lines, or in a closed garage if possible.</li> <li>➤ Attain a permit and use the SLF checklist (you will learn about the checklist during permitting).</li> </ul>
<p><b>Sanitizing Equipment</b></p> <p><b>WHAT DO I NEED TO DO WHEN GOING TO ANOTHER FARM?</b></p>	<p><b>Sanitation/Cleaning</b></p> <ul style="list-style-type: none"> <li>➤ Pay careful attention to the proper sanitation of the following items when traveling to a new farm: <ul style="list-style-type: none"> <li>○ Equipment – trucks, tractors, tanks, spreaders, toolbars</li> <li>○ Tires</li> <li>○ Boots</li> <li>○ Clothes</li> <li>○ Hands and body</li> <li>○ Any surface that has been in contact with manure</li> </ul> </li> <li>➤ Bio-security measures should be common sense routine activities, just like washing your hands for dinner.</li> </ul>
<p><b>Increased Risk</b></p> <p><b>WHAT INCREASES THE CHANCE OF SPREADING DISEASE?</b></p>	<p><b>The following items increase bio-security risk:</b></p> <ul style="list-style-type: none"> <li>➤ Multiple farm visits in a single day</li> <li>➤ Direct animal contact</li> <li>➤ Direct manure contact or transfer</li> <li>➤ Unclean equipment</li> <li>➤ Traveling from a farm that has animal health concerns</li> <li>➤ Foreign travel</li> <li>➤ Outbreaks in fly populations</li> </ul>

### ***Chapter 3 Sample test questions***

1. Management measures taken to prevent the transfer of diseases from one farm to another are called:
  - a. Medication
  - b. Disease transfer
  - c. Infectious agents
  - d. Bio-security protocol
  
2. When moving from farm to farm it is good business to wash and sanitize equipment that has contacted manure.
  - a. True
  - b. False
  
3. Travel patterns of manure handlers and their equipment that physically cross paths with employees and vehicles that work directly with a farm's animals increase health risk to the animals. What is the protocol called that prevents the travel paths of these two groups from crossing?
  - a. Biosecurity
  - b. Feed Truck Delivery
  - c. Line of Separation
  - d. Dragline Application
  
4. The Spotted Lanternfly is an invasive insect. Which of the following are you required to attain if you travel into and out of the Spotted Lanternfly Quarantine Area with manure equipment used in the field?
  - a. Pesticide License
  - b. Windshield bug screens
  - c. Spotted Lanternfly Permit
  - d. Spotted Lanternfly Identification Card
  
5. Which of the following is NOT considered a high bio-security risk?
  - a. Single farm visits in a day
  - b. Direct animal contact
  - c. Manure on equipment
  - d. Not washing hands

**CHAPTER 4: SAFETY ISSUES - This section discusses safety problems and gives you helpful information about what to do in case of an emergency.**

<p><b>Spill Response</b></p> <p><b>WHAT SHOULD I DO IF THERE IS A MANURE SPILL</b></p> <p><b>WHAT IF MY EQUIPMENT BREAKS DOWN?</b></p>	<p><b>EMERGENCY SPILL OR LEAK - <i>Response Procedure</i></b></p> <ol style="list-style-type: none"> <li>1. <b>Assure Human Safety</b> <ul style="list-style-type: none"> <li>➤ If a spill or leak happens or you break down on a road – Call safety authorities such as police and firemen. Dial 911 from a phone to do this.</li> <li>➤ Use flares, reflective safety triangles, flags, or traffic cones to warn and slow motorists.</li> <li>➤ Always carry emergency equipment in your vehicles.</li> </ul> </li> <li>2. <b>Stop the Leak <u>at the source</u></b>  <b>If a leak happens while emptying manure storage, you should:</b> <ul style="list-style-type: none"> <li>➤ Stop pumps. Close valves. Shut off power to manure or water pumps.</li> <li>➤ Separate pipes to create an air gap to stop flow due to siphoning.</li> <li>➤ Direct manure to another storage.</li> <li>➤ Plug holes. Build dams on earthen storages.</li> <li>➤ Park on top of flexible piping to pinch it closed.</li> </ul> <b>If a leak happens while on the road, you should:</b> <ul style="list-style-type: none"> <li>➤ Pull off to the side of the road. If possible, pull into a farm field to allow manure to spill onto a crop field where nutrients can be used by the crop.</li> <li>➤ Shut off the valve or plug the leak if possible to stop the flow</li> <li>➤ Build up a berm from soil or stones to stop the manure from running into a stream, ditch, well or storm runoff inlet.</li> </ul> </li> <li>3. <b>Contain and control the existing spill. Limit impact area. Prevent introduction to water.</b> <ul style="list-style-type: none"> <li>➤ Build a containment dam in field or ditch. A hole can be dug to act as a sump area for manure to flow into. Remove manure from these collection areas and apply to cropland. Vacuum tanks can be used to help clean up spilled manure, if you do not have vacuum capabilities on your equipment enter contact information for someone who does into your Emergency Action Plan and phone contact list.</li> <li>➤ Check for tile flows and divert flow from tile inlets.</li> <li>➤ Prevent manure from entering a stream, ditch, well, or storm runoff inlet.</li> <li>➤ Use soil, sand, or hay bales to hold back the manure leak and make an area for it to run into. A shovel should be kept with manure equipment to help clean up small spills and to help control flow of larger spills. Call an excavator if needed.</li> <li>➤ Use absorbent material to soak up the manure such as straw, hay, sawdust, or soil to limit or stop flow.</li> </ul> <p><b><u>ONCE HUMAN SAFETY IS ASSURED, THE SPILL IS STOPPED AT THE SOURCE, AND FLOW IS CONTROLLED MOVE TO STEPS 4 &amp; 5.</u></b></p> </li> <li>4. <b>Notify the proper authorities.</b> <ul style="list-style-type: none"> <li>➤ Many farms and manure hauling companies have Emergency Action Plans that provide phone numbers and other information for reporting spills. The Emergency Action Plan can be found in a farm’s Nutrient Management Plan.</li> <li>➤ Spills on roadways and those that enter surface waters must be reported to authorities. (Pa Department of Environmental Protection, Pa Department of Transportation, Pa Turnpike Commission if the spill was on the turnpike).</li> <li>➤ Write down and make a record of details of the spill and the actions you took. Place this on file to protect you from future legal actions.</li> </ul> </li> </ol>
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	<p><b>5. Clean up the spill.</b></p> <ul style="list-style-type: none"> <li>➤ If the spill happened on a roadway or manure got into a stream, authorities may need to direct cleanup efforts.</li> <li>➤ Always collect spilled manure and absorbent material and dispose of the material through cropland application or placing it in storage.</li> <li>➤ If the spill occurred in an environmentally sensitive area it may be necessary to remove soil from the area.</li> <li>➤ Restore the damaged area. Vegetation may need planted.</li> </ul>
<p><b>Storage Freeboard</b></p>	<p><b>Freeboard in liquid manure storages</b></p> <ul style="list-style-type: none"> <li>➤ Freeboard is the area above the maximum-engineered depth of a storage.</li> <li>➤ Freeboard is a safety capacity area (volume) designed to prevent manure overflow during emergencies, such as extremely heavy rains.</li> <li>➤ <b>NEVER FILL A MANURE STORAGE ABOVE FREEBOARD.</b></li> <li>➤ Freeboard is often 1 or 2 feet of depth from the top of a storage. Ask the farmer what the freeboard is for the storages on their farm.</li> </ul>
<p><b>Gas Concerns</b></p> <p><b>WHAT ARE COMMON MANURE STORAGE SAFETY HAZARDS?</b></p> <p><b>Confined Space Definition</b></p> <p><b>Agitation</b></p>	<p><b>Manure storage areas can produce deadly gasses.</b></p> <ul style="list-style-type: none"> <li>➤ All manure is organic material under microbial degradation. Gasses are a by-product of this decomposition.</li> <li>➤ Gasses produced by manure can be odorless, colorless or explosive. Some deadly gasses are heavier than air and will collect in enclosed area.</li> <li>➤ Always assume gasses are present. Gasses such as Carbon Dioxide are odorless and often considered harmless, but if that gas displaces Oxygen it can cause unconsciousness and death.</li> <li>➤ Gasses can cause you to pass out in just seconds.</li> </ul> <p><b>Confined Spaces</b> are places with limited means of entry and exit that are not designed for normal worker occupancy. Even outdoor manure storages are considered confined spaces even though there may be blue sky above. Once you are inside the fence of an outdoor storage you are in a place not designed for normal worker occupancy.</p> <ul style="list-style-type: none"> <li>➤ Enclosed areas can collect deadly gas. These dangerous confined areas can include manure pits, manure application tanks, and even open-air storages.</li> </ul> <p><b>DO NOT ENTER MANURE STORAGE AREAS THAT ARE CONFINED OR HAVE RESTRICTED VENTILATION.</b></p> <ul style="list-style-type: none"> <li>➤ Only professionals should enter confined spaces while wearing self-contained breathing equipment. They should also have help nearby and be tied to a safety line.</li> <li>➤ <b>IF SOMEONE IS OVERCOME BY GAS.</b> <ul style="list-style-type: none"> <li>○ <u>DO NOT GO INTO A CONFINED SPACE TO RESCUE THEM.</u></li> <li>○ <u>VENTILATE THE SPACE.</u> Open doors, curtains and covers. Turn on fans. <u>Getting fresh air to the unconscious person accomplishes the same goal as getting the person to fresh air.</u></li> <li>○ <u>CALL 911.</u></li> <li>○ Cease manure agitation.</li> </ul> </li> </ul> <p><b>Agitation and movement</b> of manure greatly increase the release of gas that is trapped in the manure. Gas release should be expected every time manure is handled. A simple visual example of this is when a scoop is taken from a manure stack on a cold day and steam is seen escaping from the manure. <b>MOST OF THE TIME GASES PRESENT AN INVISIBLE DANGER.</b></p>

<p><b>Hydrogen Sulfide</b></p> <p><b>Gypsum Bedding</b></p>	<p><b>Hydrogen Sulfide</b> is the <i><b>Most Dangerous Gas</b></i> produced from manure.</p> <ul style="list-style-type: none"> <li>➤ Hydrogen Sulfide (H<sub>2</sub>S) can cause immediate loss of consciousness and death through asphyxiation at levels as low as 600 parts per million (ppm) in the air.</li> <li>➤ Hydrogen sulfide is <i><b>'HEAVIER THAN AIR'</b></i> and <i><b>can accumulate in low spots, confined spaces, or areas with little air movement.</b></i> This can occur outdoors.</li> <li>➤ At low levels H<sub>2</sub>S is often described as smelling like 'rotten eggs'. However, at levels as low as 100 ppm the gas can deaden the sense of smell. This means that you cannot smell the gas at dangerous levels.</li> <li>➤ H<sub>2</sub>S is produced by microbes in manure.</li> <li>➤ Sources of Sulfur contribution to manure (from feed, water, bedding, footbaths) increase the risk of H<sub>2</sub>S production.</li> <li>➤ Anaerobic (oxygen free) zones in manure increase risk of H<sub>2</sub>S production. Deeper liquid manure storages are more likely to produce this gas.</li> <li>➤ One known Sulfur source is gypsum. Gypsum (drywall) is a by-product of industry and is used by many dairy and cattle producers as a bedding component. Gypsum contains Calcium Sulfate (CaSO<sub>4</sub>) and when it enters anaerobic areas such as manure storages the oxygen in its chemical formula may be utilized by bacteria, yielding a gaseous by-product of hydrogen sulfide.</li> </ul>
<p><b>Additional Concerns</b></p>	<p><b>Additional dangers of liquid manure storages.</b></p> <ul style="list-style-type: none"> <li>➤ Falling into liquid manure can mean death even for an excellent swimmer.</li> <li>➤ Because manure is often thicker than water movement can be difficult in the thick material.</li> <li>➤ Swimming motions may increase gas release rates directly into the location above the manure to the area from which you are trying to breath.</li> <li>➤ Steep and slick sides of storages can make it difficult to get out of a storage.</li> <li>➤ Never work alone on jobs where risk of falling into a storage or confined space is moderate or high. It is recommended that each manure tank and pump be fitted with floatation devises attached to a weather resistant line.</li> </ul>
<p><b>Operation Tips</b></p> <p><b>Gas Monitors Recommended</b></p>	<p><b>Safety Tips for Operators</b></p> <ul style="list-style-type: none"> <li>➤ When working inside, such as clean out of a poultry barn; ALWAYS ventilate the area while working. It is tempting to shut down fans to save money, but that comes with health risks.</li> <li>➤ Consider wind direction when setting up handling operations. A breeze at your back as you look at the storage will move dangerous gasses away from the worksite.</li> <li>➤ Avoid working in low-lying areas, or areas where there is 'dead' air.</li> <li>➤ ALWAYS remove agitation equipment out of and away from a storage when performing maintenance. A study by Purdue University showed that 33% of deaths associated with manure occurred during repair and maintenance. These are high-risk times. Take a few minutes to work safely.</li> <li>➤ NEVER reach or work over the edge of an open manure storage.</li> <li>➤ NEVER enter a confined space.</li> <li>➤ When working with a confinement building, such as a swine or poultry house, make sure others do not inadvertently enter the building. Lockout tags should be placed on door and gates to warn others of risk within the building.</li> <li>➤ Purchase or rent a gas monitor. The gas monitor should be worn when handling manure to warn you of dangerous gas levels. The most important gas to monitor is Hydrogen Sulfide. If multi-gas monitors are used also consider monitoring Ammonia, Methane, and Oxygen.</li> </ul>

## ***Chapter 4 Sample test questions***

1. Which are the steps that should be taken during spill response?
  - a. Report the spill to authorities and then pump the manure back into the storage.
  - b. Report to authorities, stop manure at the source and then monitor clean up.
  - c. Assure human safety, stop the flow at the source, contain the existing spill and then notify the proper people and begin cleanup.
  - d. Contain the existing spill, stop the flow at the source, notify the proper people and then put up road safety devises.
  
2. During a manure spill which of the following should be done first?
  - a. Contain running spill
  - b. Notify authorities
  - c. Stop flow at the source
  - d. Look for spill guidelines in an Emergency Action Plan (EAP)
  
3. Freeboard can be ignored during what periods of the year?
  - a. Spring because manure will soon be removed
  - b. Winter because application cannot occur close to water
  - c. Fall because manure will not be applied until the spring growing season
  - d. Freeboard should never be ignored or exceeded.
  
4. Which gas is considered the most dangerous produced from manure?
  - a. Hydrogen Sulfide
  - b. Ammonia
  - c. Methane
  - d. Oxygen
  
5. If wind is blowing from the West to the East, which would be the safest location to work at when considering gas exposure risk?
  - a. North
  - b. South
  - c. East
  - d. West
  
6. All of the following scenarios present gas exposure risks. Statistics show that 33% of manure storage deaths occur during which activity?
  - a. When working on the downwind side of a storage
  - b. During repair and maintenance
  - c. When working in poultry barns where ventilation is shut off
  - d. When working with manure that contains gypsum bedding
  
7. Outdoor manure storages can be considered Confined Spaces.
  - a. True
  - b. False

## CHAPTER 5: EMERGENCY ACTION PLANS

<b>Emergency Action Plan</b>	<b>Emergency Action Plans (EAP)</b> <ul style="list-style-type: none"><li>➤ EAPs provide an action plan to guide emergency response.</li><li>➤ Producers often have an EAP with their Nutrient Management Plan.</li><li>➤ It is recommended that manure-hauling companies develop their own EAPs and keep a copy in each truck or tractor.</li><li>➤ Be familiar with the EAP of the farm(s) or hauling company where you are working.</li></ul>
<b>What Is In An EAP?</b>	<b>EAPs should list the following:</b> <ul style="list-style-type: none"><li>➤ Emergency phone numbers</li><li>➤ Address of farm</li><li>➤ Contact information for earth moving equipment</li><li>➤ Contact information for a hauler or sewage handler that has a tank with vacuum abilities (if your equipment does not have this ability).</li><li>➤ Local agencies that may need to notification of spills</li></ul>

### *Chapter 5 Sample test questions*

1. An Emergency Action Plan contains which of the following?
  - a. Address of farm
  - b. Normal wind direction
  - c. Fields used for manure evacuation
  - d. Directions on how to hide a manure spill
  
2. What is the name of the plan that lists people and agencies that can be contacted in case of an accidental manure release?
  - a. Concentrated Animal Feeding Operation (CAFO)
  - b. Right to Farm Law
  - c. Emergency Action Plan (EAP)
  - d. Emergency Strategy



## CHAPTER 6: NUTRIENT MANAGEMENT CONCERNS

<p><b>Introduction</b></p>	<p><b>Why are there concerns with manure and water quality?</b></p> <ul style="list-style-type: none"> <li>➤ Manure contains nutrients that when introduced to ground or surface water can negatively influence the environment.</li> <li>➤ Manure can contain diseases and nutrients that can cause people and animals to become sick or die.</li> <li>➤ Handling, storing, stacking or land-applying manure in a manner that introduces manure or leaches liquid from manure, into ground or surface water is illegal.</li> <li>➤ Before handling, storing, stacking or land-applying manure, refer to the Best Management Practices (BMPs) of the farm where the manure comes from. Also, check with the importer for BMPs. These recommendations are often found in a Nutrient Management Plan or Manure Management Plan.</li> <li>➤ Manure nutrients of environmental concern are:             <ul style="list-style-type: none"> <li>○ Nitrogen (N)</li> <li>○ Phosphorus (P)</li> </ul> </li> </ul>
<p><b>Nitrogen and Phosphorus In Crop Production</b></p> <p><b>N &amp; P</b></p>	<p><b>Nitrogen (N) and Phosphorus (P)</b></p> <ul style="list-style-type: none"> <li>➤ Crops need to uptake N and P from the soil to grow.</li> <li>➤ Some of the nutrients are supplied by the soil and from crop residues.</li> <li>➤ Additional required N and P are applied to the soil in the form of fertilizers and manure.</li> <li>➤ N and P can take on many different forms in the soil. Some forms can be used by the crops while others cannot.</li> </ul>
<p><b>Nutrients and Water Pollution</b></p>	<p><b>How do nutrients enter water systems?</b></p> <ul style="list-style-type: none"> <li>➤ Both N and P can enter water in the following ways.             <ul style="list-style-type: none"> <li>○ Manure is <i>over applied or spilled</i> directly into a waterway.</li> <li>○ Manure is washed into a waterway as <b>runoff</b> by rain or snowmelt.</li> <li>○ Manure nutrients <i>attach to soil particles</i>, which enter a waterway as <b>sediment</b> from <b>erosion</b> during a <b>runoff</b> event.</li> <li>○ Manure nutrients <b>leach</b> (seep) through the soil and enter underground water.</li> </ul> </li> <li>➤ Surface or ground water sources that are at risk to manure nutrient pollution include the following:             <ul style="list-style-type: none"> <li>○ Streams and rivers</li> <li>○ Ponds and lakes</li> <li>○ Tile inlets (underground field drains)</li> <li>○ Drainage diversions or ditches (fields and roadsides)</li> <li>○ Wellheads</li> <li>○ Sink holes</li> </ul> </li> <li>➤ Some forms of N and P in the soil are more susceptible to loss than others</li> </ul>

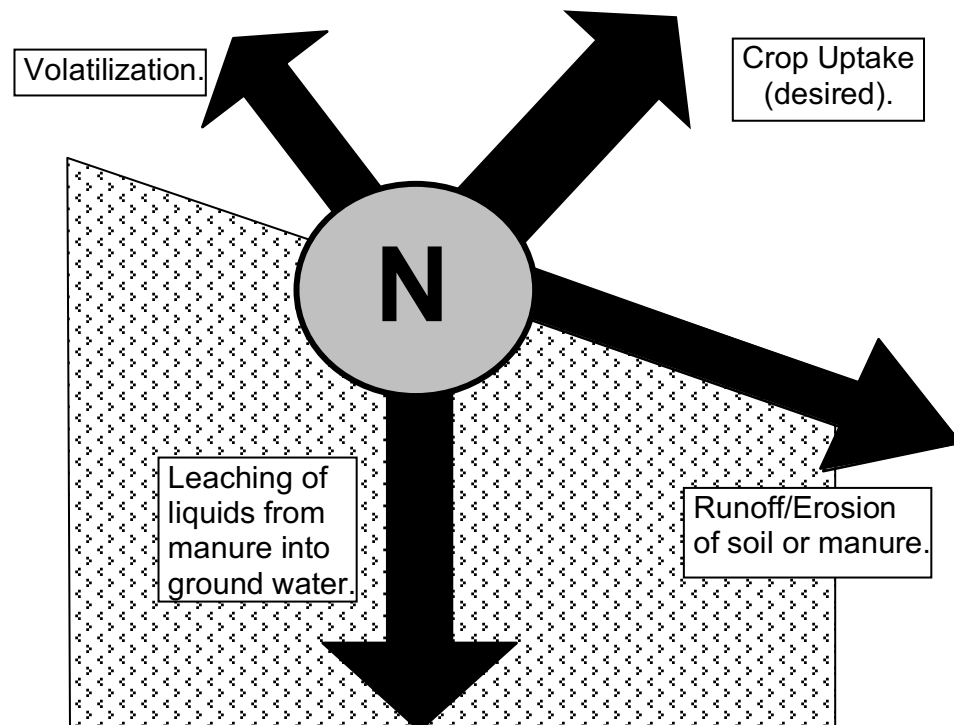
**Nitrogen In  
The  
Environment**

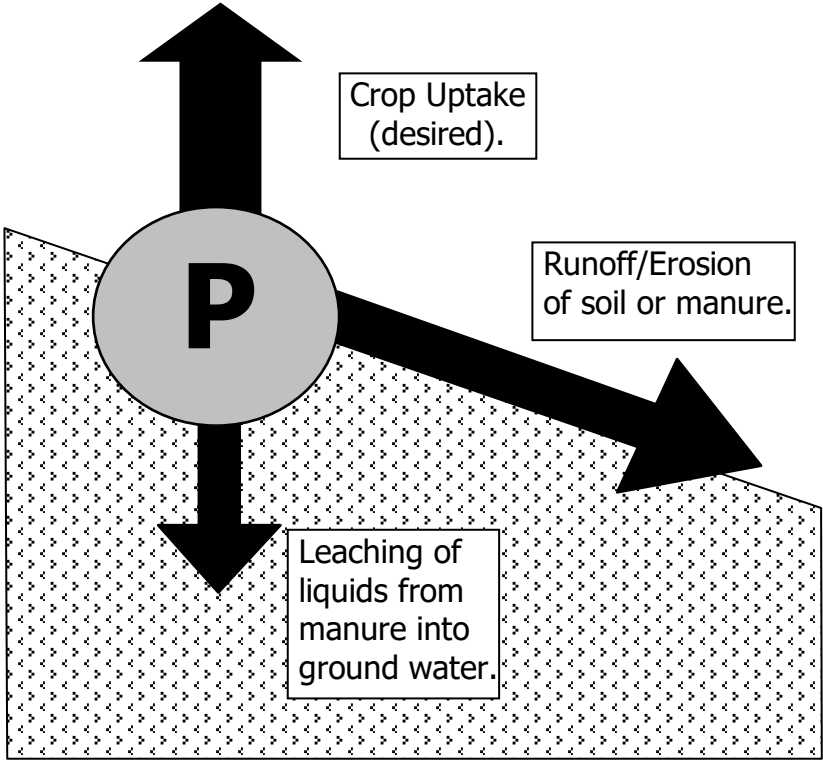
**N**

**Nitrogen (N)**

- Nitrogen can be lost to the environment in many different ways. Crop uptake is desired. Nitrogen from fertilizer or manure can be lost in these ways:
  - Volatilize (vaporize) into the air when manure or urea fertilizer are applied and left on the soil surface
  - Be carried directly off a field in runoff from rain or melting snow
  - Can be carried off the field with soil if erosion occurs
  - Leach through the soil into the ground water
- Manure and fertilizer applications are managed to minimize the loss of the applied nutrients (N and P) to the environment. These management strategies include:
  - Applying manure and fertilizer at a rate that provides maximum crop production with minimal environmental risk
  - Timing of manure and fertilizer application to avoid times of the year when risk of nutrient loss is high
  - Using an appropriate method of manure or fertilizer application
  - Incorporation of manure or fertilizer after application to reduce both volatilization and runoff losses

**The many ways that N can leave the field are illustrated in this diagram.**



<p><b>Phosphorus In The Environment</b></p> <p><b>P</b></p>	<p><b>Phosphorus (P)</b></p> <ul style="list-style-type: none"> <li>➤ Phosphorus is lost from the soil surface when runoff carries manure directly to a water source or when P that is attached to soil that is lost by erosion. When the soil particle washes away, it will carry P with it. In Pennsylvania soils, there is generally little P leaching.</li> <li>➤ To minimize P loss, manure and fertilizer must be applied in ways that do not increase runoff or erosion.</li> <li>➤ Like with N, reducing exposure to runoff and erosion during times of high rainfall or frozen soils is done by managing manure application rates, methods and timing.</li> </ul> <p><b>Phosphorus mainly leaves a field by surface flow. There is no volatilization and little leaching of P.</b></p> 
<p><b>Land Application Rates</b></p>	<p><b>How do you determine manure application rates?</b></p> <ul style="list-style-type: none"> <li>➤ Manure application rates are calculated to meet needs for optimum crop production and to protect the environment. There are tables in the DEP MMP that provide pre-calculated application rates.</li> <li>➤ The following information is used to determine manure application rates: <ol style="list-style-type: none"> <li>1. <i>Soil Test</i> - used to estimate soil nutrient availability and recommend the amount of nutrients from manure or fertilizers required to meet crop nutrient needs.</li> <li>2. <i>Cropping and manure history</i> – used to account for other nutrients already available in the soil regardless of the manure applied.</li> <li>3. <i>Net crop needs</i> - Any nutrient credits from the history or any other nutrients that might be applied (such as starter fertilizer) are deducted from the soil test recommendation.</li> <li>4. <i>Manure Test</i> – A test that determines the amount of nutrients the manure contains.</li> </ol> </li> </ul>

	<p>5. <i>Phosphorus Index</i> – The P-Index tests soils in fields that have potential to pollute waterways and determines if Phosphorus pollution is likely to occur. The P-Index is field specific and tells whether you can spread manure based on P availability in the soil, the geography of the field and potential for runoff.</p> <p>➤ Manure rates will vary depending on soil test results, crop needs, the concentration of nutrients in the manure, and how the manure is applied. This is why you often see different rates required from farm to farm and often even on the same farm for the same crop.</p>
<p><b>Summary</b></p>	<p><b>Chapter Summary</b></p> <p>➤ Manure components (N, P, diseases) can cause water pollution.</p> <p>➤ Restrictions are needed to keep manure from both surface and ground water.</p> <p>➤ Nitrogen and Phosphorus are the nutrients of environmental concern found in manure.</p> <p>➤ MMPs, NMPs and NBSs give environmentally safe manure application rates on a field-by-field basis. These rates protect the environment while providing the proper amount of nutrients needed for crop growth.</p>

### ***Chapter 6 Sample test questions***

1. When found in a Nutrient Management Plan, “N” stands for which of the following elements?
  - a. Neutralizer
  - b. Fertilizer
  - c. Nitrogen
  - d. Nitro Glycerin
  
2. Which of the following are ways that N can be lost from the soil?
  - a. Leaching
  - b. Volatilization
  - c. Runoff
  - d. All of the above
  
3. Which nutrient is one of the manure nutrients that a Nutrient Management Plan application rate can be based on?
  - a. Protein
  - b. Potash
  - c. Phosphorus
  - d. Potassium
  
4. Nutrient Management Plans give environmentally safe manure application rates, while allowing for optimal plant growth.
  - a. True
  - b. False

## CHAPTER 7: LAND APPLICATION ISSUES AND MANURE APPLICATION SETBACKS

<p><b>Manure Nutrient Placement</b></p>	<p><b>The placement of manure nutrients is critical</b> to attain planned crop production <i>and</i> for safeguarding the environment. Placing nutrients in a timely manner or location that put them at risk of transport away from crop uptake is not providing good service to the farm. Instead of <i>Manure Application</i> we really ought to refer to this work as <i>Manure Nutrient Placement</i>.</p> <p>Placing manure nutrients on the field so they do not leave means not only following a plan, but also considering risks associated with items such as ground cover, slope, impending weather, soil conditions, and manure qualities.</p>
<p><b>Application Rate</b></p> <p><b>WHAT MANURE APPLICATION RESOURCES ARE AVAILABLE?</b></p>	<p><b>You can use these sources as guides for manure application rates and setbacks.</b></p> <ul style="list-style-type: none"> <li>➤ Nutrient Management Plan (NMP) - <i>Available from the farmer.</i></li> <li>➤ Nutrient Balance Sheet (NBS) - <i>Available from the importing farmer or broker.</i></li> <li>➤ DEP Manure Management Manual (MMP) <ul style="list-style-type: none"> <li>○ <u>It contains guidelines for all manure application for all farms that do not have a NMP or a NBS.</u></li> <li>○ <b><i>If a farm does not have one of these three plans</i></b> then a commercial manure hauler or broker <b><i>may not apply manure</i></b> on that operation until one of those three plans are written, however a commercial manure hauler or broker may offer to develop a DEP MMP for the farm.</li> </ul> </li> </ul>
<p><b>Maps</b></p>	<p><b>Maps are to be used for application guidance.</b></p> <ul style="list-style-type: none"> <li>➤ All of the plans listed above must contain maps that show the lands where manure is to be applied.</li> <li>➤ These maps must also identify environmentally sensitive areas where manure application is forbidden or restricted. These areas are known as <b>manure application setbacks</b>.</li> <li>➤ It is important to realize that setback allowances can vary between MMP, NMP and NBS plans. Setback distances can vary from field to field, and farm to farm.</li> </ul>
<p><b>Setbacks</b></p>	<p><b>Setback requirements vary between plans.</b>  <u><b>See Chapter 9 Chart for plan-specific guidance.</b></u></p> <p>These setbacks can be hard to memorize. It is recommended that you make copies of the chart for reference in the field. However, if the application plan is correct the necessary application setbacks will be listed in the plan and shown on the plan map.</p>
<p><b>Vegetated Buffers</b></p>	<p><b><u>Permanent vegetative buffers</u></b> are permanent strips of perennial vegetation 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.</p>
<p><b>Winter</b></p>	<p><b>There are special conditions for winter manure applications.</b></p> <ul style="list-style-type: none"> <li>➤ <b>Winter is defined</b> when <i>any one of the following occurs</i>: <ul style="list-style-type: none"> <li>○ The calendar period from December 15 through February 28</li> <li>○ The ground is frozen to a depth of 4 inches.</li> </ul> </li> </ul>

	<ul style="list-style-type: none"> <li>○ The ground is snow-covered, which means even if snow does not cover the entire field, the entire field is still considered snow covered and must follow the winter application restrictions.</li> </ul>
<p><b>Fall and Winter Application</b></p> <p><b>Winter</b></p> <p><b>Fall</b></p>	<p><b>Since crops will not uptake nutrients until spring the risk of nutrient loss from fall and winter application is increased.</b></p> <p>Winter application can only be done on <i>fields that are identified</i> for such application in the MMP, NMP or NBS. Winter application must be done on ground that has <b>25% or more ground cover</b> (vegetation or crop residue).</p> <p>For fall applications, refer to the table below for complete details between types of plans.</p> <p>For lands using a NMP or NBS fall application should be done in one of these manners:</p> <ol style="list-style-type: none"> <li>1. On ground with 25% or more ground cover, OR</li> <li>2. Manure should be injected during application, OR</li> <li>3. Incorporated within 5 days, using minimal soil disturbance consistent with no-till farming, or a field must be planted to a cover crop in time to allow for crop establishment prior to winter.</li> </ol>
<p><b>Maximum Liquid Application Rate</b></p>	<p><b>The maximum manure application rate at one time for liquid manure may not exceed 9,000 gallons/acre.</b></p> <ul style="list-style-type: none"> <li>➤ Soil infiltration rates (the ability of soil to absorb liquid) are limited. This means that application rates above 9,000 gallons/acre are more susceptible to runoff because the liquid is placed on the land more quickly than it can be held by the soil.</li> <li>➤ Lands managed under MMPs have wintertime maximum application rates of: <ul style="list-style-type: none"> <li>○ <b>5,000 gallons/acre</b> for liquid manures</li> <li>○ <b>20 tons/acre</b> of solid manure</li> <li>○ <b>3 tons/acre</b> of solid poultry manure.</li> </ul> </li> <li>➤ It is possible that a field needs more than 9,000 gallons/acre of manure to satisfy the nutrient needs of the crop. Plans should specify manure application timing in these situations. If more than 9,000 gallons/acre is needed to satisfy a plan’s application rate, then a split application is necessary. The second pass should be made only after the first application is dry.</li> <li>➤ 9,000 gallons/acre is about 1/3 of an inch of liquid.</li> </ul>
<p><b>Soil Compaction</b></p>	<p><b>What causes soil compaction?</b></p> <ul style="list-style-type: none"> <li>➤ Soil compaction is related to soil moisture and equipment weight load.</li> <li>➤ More soil moisture means more compaction.</li> <li>➤ Heavy loads increase compaction.</li> <li>➤ Frozen or dry soil will experience minimal compaction.</li> </ul> <p><b>Why is soil compaction bad?</b></p> <ul style="list-style-type: none"> <li>➤ Soil compaction: <ul style="list-style-type: none"> <li>○ Decreases crop yield</li> <li>○ Decreases water holding capacity in soil</li> <li>○ Decreases water permeability (ability for water to seep into the soil)</li> <li>○ Compaction increases the risk of erosion and manure runoff (water cannot sink into the ground and carries manure and soil with it when it runs off).</li> </ul> </li> </ul> <p><b>How to minimize soil compaction.</b></p>

<b>Minimize Compaction</b>	<ul style="list-style-type: none"> <li>➤ 75% of compaction occurs on the first pass, use travel lanes for repeated travel.</li> <li>➤ Increase speed of travel. Shorter load times on the soil reduce compaction.</li> <li>➤ Increase tire footprint with one of the following strategies: <ul style="list-style-type: none"> <li>○ Use flotation tires</li> <li>○ Reduce tire pressure to the minimum allowed</li> <li>○ Use tracks or duels (increase width)</li> <li>○ Increase tire diameter (increase length)</li> </ul> </li> <li>➤ Use 4-wheel drive - it will help reduce soil compaction.</li> <li>➤ <b><i>Avoid driving on wet soils!</i></b></li> </ul>
<b>Even Application</b>	<p><b>Apply manure evenly on cropland.</b></p> <ul style="list-style-type: none"> <li>➤ Even application assures that manure nutrients are available at the planned application rate for all plants in the field. This provides the most economic return of manure nutrients for the producer.</li> <li>➤ Even application can minimize the risk of environmental release of manure nutrients.</li> </ul>
<b>Soil Conservation Measures</b>	<p><b>Soil Conservation measures reduce pollution.</b></p> <ul style="list-style-type: none"> <li>➤ Soil Conservation Plans assure that crops and ground cover help to keep soil in place on the field. These plans match proper crop management with the field's soil, slope and proximity to water to minimize soil loss risks. Certified applicators are required to act in conjunction with conservation planning.</li> <li>➤ Nutrients leave the field when soil erodes.</li> <li>➤ Erosion causes sediment in water bodies. Sediment is Pennsylvania's largest polluter.</li> </ul>

## ***Chapter 7 Sample test questions***

1. According to Pennsylvania's Act 38, which of the following would **NOT** fall in the definition of winter?
  - a. A rare cold spell covers the ground with snow on the 4<sup>th</sup> of July.
  - b. A rare cold spell causes the ground to be frozen 4 inches deep on the 4<sup>th</sup> of July.
  - c. A rare warm spell causes temperatures to soar to 80°F on February 1<sup>st</sup>.
  - d. It is March 1<sup>st</sup>, there is no snow on the ground and the ground is not frozen.
  
2. All manure applications must be done under the guidance of a plan that provides an application rate as well as a map that shows manure application setbacks?
  - a. True
  - b. False
  
3. During the summer, what is the maximum application rate for a single liquid manure application in Pennsylvania?
  - a. 5,000 gallons/acre
  - b. 9,000 gallons/acre
  - c. 20 tons/acre
  - d. 3 tons of poultry litter/acre
  
4. What two conditions are primarily responsible for soil compaction?
  - a. Soil structure & texture
  - b. Water holding capacity & frozen soil
  - c. Heavy loads & wet soils
  - d. Flotation tires & low tire pressure
  
5. How much ground cover is required for winter application?
  - a. 10%
  - b. 25%
  - c. 30%
  - d. 50%



**CHAPTER 8: MANURE STACKING**

<p><b>Field Stacking</b></p> <p><b>HOW &amp; WHERE CAN I UNLOAD AND STACK MANURE?</b></p>	<p><b>Manure can only be unloaded in a marked or selected stacking area on a farm.</b></p> <ul style="list-style-type: none"> <li>➤ Improved stacking pads are preferred unloading locations. Field stacking is a normal agriculture practice but comes with added guidance since outdoor stacking contains inherent risk of nutrient loss.</li> <li>➤ Stacking locations must be identified on the maps of a MMP, NMP or NBS.</li> <li>➤ Only solid manures should be field stacked. Liquid and slurry manures cannot be stacked. Manure should be dry enough to maintain a stack height of at least 4 feet.</li> <li>➤ You must read the farmer’s plan and map to determine where the manure is allowed to be unloaded and how it must be stacked.</li> </ul> <p><b>Locations where manure <i>MAY NOT</i> be unloaded.</b></p> <ul style="list-style-type: none"> <li>➤ Manure may not be unloaded or stacked within 100 feet of streams, lakes, ponds, and active wells.</li> <li>➤ Manure should not be stacked within water concentration flow areas, low areas or swales within a field, above tile drainage, areas susceptible to seasonal high-water tables or flooding, or on slopes greater than 8%.</li> <li>➤ Open sinkholes, agricultural drainage intakes and Exceptional Value wetlands may be marked with stacking setbacks on some farms.</li> <li>➤ The best locations are far from water and on flat areas where the stack is protected from water run-on and where water run-off from the stack is safely directed. The best locations are surrounded with vegetative ground cover.</li> <li>➤ Stacking within 100 feet of the top of a slope is required in some scenarios. This is done to minimize upslope water from running onto the stack.</li> <li>➤ Unless permanent designated stacking pads are present stacking locations must be rotated annually so that no site is used every year. Even if moving only a few feet, some farms require a specific location be used only once every 4 years.</li> </ul> <p><b>Timing/duration</b></p> <ul style="list-style-type: none"> <li>➤ Field-stacked manure must be land applied within 120 days or be covered.</li> </ul> <p><b>Shape – Stacked manure should be shaped in the following way:</b></p> <ul style="list-style-type: none"> <li>➤ In a cone like shape (Conical pile) or windrow</li> <li>➤ Minimum footprint</li> <li>➤ Be cautious of stacking manure so high that the weight of the manure squeezes liquid (leachate) from the bottom of the pile.</li> </ul>
<p><b>Emergency Stacking</b></p>	<p><b>In emergency situations solid manure from farms with a NMP may be stacked in a designated field location.</b></p> <ul style="list-style-type: none"> <li>➤ Emergency field stacking locations should be designated and represented on NMP maps.</li> </ul>

### ***Chapter 8 Sample test questions***

1. Field stacking can occur anywhere as long as the location meets runoff and setback recommendations.
  - a. True
  - b. False
  
2. What is the setback distance from a stream for field-stacked manure?
  - a. 35 feet
  - b. 50 feet
  - c. 100 feet
  - d. 150 feet
  
3. Which types of manure below would be approved for field stacking?
  - a. Poultry litter and horse stable manure
  - b. Dairy slurry
  - c. Swine liquid
  
4. In-field stacking of manure must be managed according to:
  - a. Location
  - b. Shape
  - c. Duration
  - d. All of the above

## CHAPTER 9: SETBACK AND STACKING GUIDANCE CHART

### Pennsylvania Manure Application Setbacks (in feet), Special Situations, and Manure Field Stacking Guidance

The table on the next two pages provides manure application setback guidance for the three types of manure application plans in Pennsylvania. All manure must be applied according to one of these plans.

For all plans the setbacks should be listed in a summary table and shown on a map. Setbacks from surface waters and sinkholes vary between plan programs, but setbacks from wells are the same for all programs. Well setbacks are in a complete circle in all directions regardless of slope or ground cover.

### Pennsylvania Manure Application Setbacks and Requirements

	Sensitive Area	Act 38 Nutrient Management Plans	Act 38 Nutrient Balance Sheets	DEP Manure Management Plans
Surface Waters	Stream Lake Pond	100 feet, or • 35 feet with a permanent vegetative buffer	150 feet, or • 100 feet with a P Index evaluation of the field, or • 35 feet with a permanent vegetative buffer and with a P Index evaluation of the field	100 feet, or • 50 feet, <b>IF</b> current soil test <200 ppm P, no-till practices are used, and cover crops are planted when residue is removed, or • 35 feet with a permanent vegetative buffer
	Existing Open Sinkhole	100 feet, or • 35 feet with a permanent vegetative buffer	100 feet, or • 35 feet with a permanent vegetative buffer	100 feet
Ground Waters	Private Drinking Well or Spring (active wells)	100 feet	100 feet	100 feet
	Public Water Well	100 feet unless wellhead authority requires larger setback	100 feet unless wellhead authority requires larger setback	100 feet unless wellhead authority requires larger setback
Fall	Fall Application	Minimum of 25% ground cover/residue or an established cover crop, or • Inject or incorporate manure within 5 days with minimum soil disturbance	Minimum of 25% ground cover/residue or an established cover crop, or • Inject or incorporate manure within 5 days with minimum soil disturbance	No specific requirements. • Strongly encouraged to follow the specific practices outlined for Act 38.
Winter	Winter Application  For each type of plan, fields receiving winter applications must be listed in the plan, and winter is defined as: • December 15 – February 28, or • Ground is frozen 4 inches or deeper, or • Ground is snow covered.  Winter application is discouraged.  See “Maximum Rates” guidance below.	All setbacks above with the following additions: • 100 feet from above-ground inlet to agricultural drainage system where surface flow is toward the inlet • 100 feet from wetland identified on National Wetlands Inventory if that wetland is within a 100 year floodplain of an Exceptional Value stream and surface flow is toward the wetland • Minimum of 25% ground cover/residue or an established cover crop	All setbacks above with the following additions: • 100 feet from above-ground inlet to agricultural drainage system where surface flow is toward the inlet • 100 feet from wetland identified on National Wetlands Inventory if that wetland is within a 100 year floodplain of an Exceptional Value stream and surface flow is toward the wetland • Minimum of 25% ground cover/residue or an established cover crop	All setbacks above with the following additions: • 100 feet from stream, lake or pond regardless of conservation practices (no 35 feet or 50 feet options). • 100 feet from above-ground inlet to agricultural drainage system where surface flow is toward the inlet • No application on slopes greater than 15%. (A, B, C slopes acceptable) • Minimum of 25% ground cover/residue or an established cover crop

	Sensitive Area	Act 38 Nutrient Management Plans	Act 38 Nutrient Balance Sheets	DEP Manure Management Plans
<b>Channels</b>	Within the channel of a non-vegetated concentrated water flow area such as a swale, gully, or ditch.	No specific requirements. • Application in these high-risk areas is strongly discouraged.	No specific requirements. • Application in these high-risk areas is strongly discouraged.	Never
<b>Maximum Rates</b>	<b>Maximum Application Amount</b> during one pass (rates may be higher but ground must dry between passes).	9,000 gal/acre liquid manure	9,000 gal/acre liquid manure	9,000 gal/acre liquid manure • <b>Maximum Total Winter Rates</b> • 5,000 gal/acre liquid manure • 20 tons/acre solid non-poultry manure • 3 tons/acre dry poultry manure
<b>Infield Manure Stacking</b>	Manure stacks that are placed in or near crop fields for an extended period of time.  Does not apply to: • Manure stacked on the operation farmstead, or • Manure stacked on improved waste stacking facilities, or • Manure composting sites, or • Mortality composting sites, or • Emergency related manure stacking.	Stacked manure must be land applied within 120 days or by the next growing season, whichever is less or covered with an impermeable cover within 3 weeks of stacking. • Manure stacks should not be located within 100 feet of streams, lakes, ponds, and active water wells. • Manure stacks should not be located within water concentration flow areas or on soils where the seasonal high water table is less than 3 feet. • Uncovered manure stacks should be cone or windrow shaped and not be located on excessively drained soils, above subsurface drain tiles, on slopes greater than 8%, and, when on slopes between 3 and 8% no more than 100 feet, from the top of the slope. • Manure stack sites must be rotated so that no site is used more than once every 4 years.	Stacked manure must be land applied within 120 days or by the next growing season, whichever is less or covered with an impermeable cover within 3 weeks of stacking. • Manure stacks should not be located within 100 feet of streams, lakes, ponds, and active water wells. • Manure stacks should not be located within water concentration flow areas or on soils where the seasonal high water table is less than 3 feet. • Uncovered manure stacks should be cone or windrow shaped and not be located on excessively drained soils, above subsurface drain tiles, on slopes greater than 8%, and, when on slopes between 3 and 8% no more than 100 feet, from the top of the slope. • Manure stack sites must be rotated so that no site is used more than once every 4 years.	Manure to be stacked longer than 120 days must be covered with an impermeable cover or stacked on a properly improved stacking pad. • Manure stacks should not be located within 100 feet of streams, lakes, ponds, and active water wells. • Manure stacks should not be located in water concentration flow areas, on slopes greater than 8%, and no more than 100 feet from the top of the slope, and where possible, direct upslope water away from the stacking area. • Manure stacks must be dry enough to maintain a stack height of at least 4 feet. • Manure stack sites must be rotated so that no site is used every year.

**Note:** All setbacks and infield manure stacking sites must be accurately delineated on the farm map as required by each plan type.

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## ***Chapter 9 Sample test questions***

1. Anytime that a 35-foot application setback from a stream is in place there **MUST** be a 35-foot permanent vegetative buffer present in the field.
  - a. True
  - b. False
  
2. If the Phosphorus Index (P-Index) is not completed on a farm importing manure from a CAO or CAFO, then the state requires a conservative setback be in place. Manure application at these importing farms is found in a Nutrient Balance Sheet (NBS). What is the setback at these importing farms from a stream if the P-Index is not completed?
  - a. 150 feet
  - b. 100 feet
  - c. 50 feet
  - d. 35 feet
  
3. What is the manure application setback from an active water well?
  - a. 150 feet
  - b. 100 feet
  - c. 50 feet
  - d. 35 feet
  
4. The manure application setback from a water well is in all directions regardless of slope or ground cover.
  - a. True
  - b. False
  
5. If no cover crop is established, winter application can occur as long as 20% ground cover is present.
  - a. True
  - b. False
  
6. In winter, poultry farms in the DEP Manure Management Plan (MMP) program must minimize application rates to a maximum of 4 tons/acre.
  - a. True
  - b. False
  
7. Across all programs it is illegal to field stack manure on slopes greater than 8%.
  - a. True
  - b. False

## CHAPTER 10: UNDERSTANDING PLANS

<p><b>MMP, NMP and NBS Contents</b></p>	<p><b>Contents</b> – the following items are found in a MMP, NMP, NBS and their maps:</p> <ul style="list-style-type: none"> <li>➤ Listing and acreage of all fields or Crop Management Units (CMUs are groups of fields that are managed in the same way, with the same crop rotation).</li> <li>➤ Manure application rates for each field or crop group.</li> <li>➤ Manure type, time and method of application.</li> <li>➤ <b>Maps</b> – these are a great tool to help you understand application areas and setbacks. Maps include the following: <ul style="list-style-type: none"> <li>• Field/CMU identification, location &amp; boundaries</li> <li>• The location of manure stacking areas</li> <li>• Locations of manure application setbacks - both year-round and fall/winter setbacks.</li> </ul> </li> </ul>
<p><b>Examples</b></p>	<p>The following pages contain samples of:</p> <ol style="list-style-type: none"> <li>1. An Act 38 Nutrient Management Plan Summary Page</li> <li>2. A Nutrient Balance Sheet Summary Page</li> <li>3. Simple Map for a farm importing poultry litter <ul style="list-style-type: none"> <li>• <i>These samples are all from different farms (none of which are real).</i></li> <li>• <i>MMPs sample tables were left out of this workbook because the tables are very similar to the ones presented.</i></li> </ul> </li> </ol> <p>From these plans, a Manure Hauler Level 2 must be able to identify and understand the following:</p> <ul style="list-style-type: none"> <li>• <b>Crop Management Unit (CMU)/Field identification</b> – Identifying and taking manure to the wrong field is in violation of the plan.</li> <li>• <b>Acreage of each CMU/Field</b> – This is helpful when checking to see if you are applying the right application rate as described in the <i>Loads per Field</i> method in Chapter 12. For some plans, CMUs may list more than one field if management across those fields is the same.</li> <li>• <b>Crop</b> – Make sure the plan’s listed crop matches what you see in the field.</li> <li>• <b>Manure Group</b> – Many farms have multiple manure groups and plans are written based on nutrient content of the group matched with the crop.</li> <li>• <b>Application Season</b> – Application during a season not listed in the plan is in violation of the plan.</li> <li>• <b>Application Management</b> – Often this category will list management that will be performed by the producer, but double check that you are expected to be involved with a process such as injection.</li> <li>• <b>Planned Manure Rate</b> – This is very important for the Manure Hauler. Exceeding the planned rate is a violation. Your equipment and abilities must be able to match the rate provided. This rate can be in gallons/acre or tons/acre.</li> <li>• <b>Summary Notes Tables</b> – Summary tables may (not required) list special restriction or concerns for fields across the farm. Haulers are highly encouraged to review the summary notes for all plans.</li> </ul> <p>Maps are very important. Haulers must identify and follow these items from maps:</p> <ul style="list-style-type: none"> <li>• <b>Field Identification and Location</b></li> <li>• <b>Sensitive Area</b> – Locations of items such as streams, lakes, ponds, wells, sinkholes, etc.</li> <li>• <b>Setbacks</b> – Maps are the primary place to identify application setbacks!</li> </ul>

## Nutrient Management Plan Summary

CMU/Field ID	Acres	Crop	Manure Group	Application Season	Application Management	Planned Manure Rate <sup>1</sup>	Starter/Other Fertilizer (lb/A)			Supplemental Fertilizer (lb/A)			Nutrient Balance (lb/A) <sup>2</sup>		
							N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O
A19	4.4	Small Grain Silage				No Manure Applied	0	0	0	79	0	0	0	0	0
A19	4.4	Corn for Silage	Heifer Spring	Spring	Spring: Incorporated within 2-4 days	10 tons/A	0	0	0	136	0	0	0	-61	-73
B8	12.5	Small Grain Silage				No Manure Applied	0	0	0	79	0	0	0	0	0
B8	12.5	Corn for Silage				No Manure Applied	0	0	0	176	0	0	0	0	0
A21	10.4	Small Grain Silage	Heifer Fall	Early Fall	Early Fall: Early Spring Utilization. Incorporated within 3-7 days	10 tons/A	0	0	0	43	0	0	0	-67	-56
A21	10.4	Corn for Silage				No Manure Applied	0	0	0	152	0	0	0	-67	-36
B9	3.8	Small Grain Silage	Heifer Fall	Early Fall	Early Fall: Early Spring Utilization. Incorporated within 3-7 days	10 tons/A	0	0	0	47	0	84	0	-67	0
B9	3.8	Corn for Silage	Cow Spring	Spring	Spring: Incorporated within 2-4 days	7850 gal/A	0	0	0	76	0	88	0	-142	0
B13	5.5	Small Grain Silage	Heifer Fall	Early Fall	Early Fall: Early Spring Utilization. Incorporated within 3-7 days	10 tons/A	0	0	0	43	0	0	0	-67	-76
B13	5.5	Corn for Silage	Cow Spring	Spring	Spring: Incorporated within 2-4 days	7850 gal/A	0	0	0	100	0	0	0	-142	-208
A11	3.4	Small Grain Silage	Cow Fall	Early Fall	Early Fall: Early Spring Utilization. Incorporated within 3-7 days	7850 gal/A	0	0	0	31	0	0	0	-82	-3
A11	3.4	Corn for Silage	Cow Spring	Spring	Spring: Incorporated within 2-4 days	7850 gal/A	0	0	0	92	0	55	0	-157	0
A13	8.3	Small Grain Silage	Cow Fall	Early Fall	Early Fall: Early Spring Utilization. Incorporated within 3-7 days	7850 gal/A	0	0	0	31	0	47	0	-82	0

<sup>1</sup> See rate calibration table (Nutrient Management Plan Summary Notes).

<sup>2</sup> Positive numbers = nutrient deficit; Negative numbers = nutrient excess

## Nutrient Balance Sheet Summary

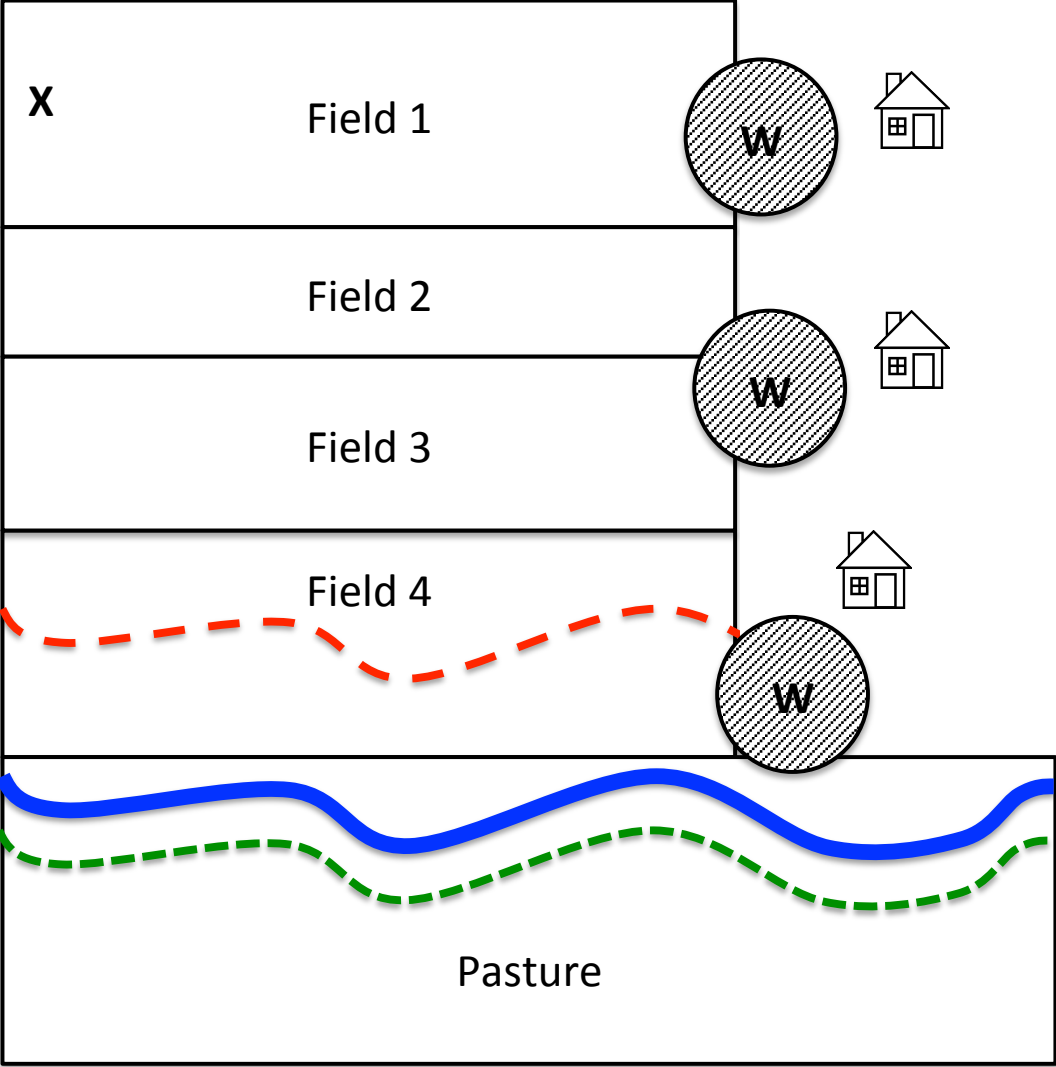
	Crop Group	CMU/Field ID	Manure Group	Application Season	Application Management	Planned Manure Rate	Starter/Other Fertilizer (lb/A)			Nutrient Balance @ Planned Rate (lb/A) <sup>1</sup>			Notes (check)
							N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	
1	Pasture	1	Siegrist Fall	Late Fall	No Incorporation	6250	0	0	0	16	(160)	(117)	
2	Corn After Corn	2-8	Siegrist Spring	Spring	No Incorporation	6250	15	30	30	59	(157)	(139)	✓
3	Corn After Soybeans	2-8	Siegrist Spring	Spring	No Incorporation	6250	15	30	30	9	(157)	(139)	✓
4	Barley (Winter)	2-8	Siegrist Fall	Early Fall	No Incorporation	6250	0	0	0	10	(138)	(101)	✓
5	Soybeans (Summer)	2-8	Siegrist Spring	Summer	No Incorporation	6250	0	0	0	0	(265)	(210)	✓
6	Grass Hay (1 <sup>st</sup> )	9	Siegrist Spring	Spring	No Incorporation	6250	0	0	0				✓
7	Grass Hay (2 <sup>nd</sup> )	9	Siegrist Spring	Summer	No Incorporation	6250	0	0	0	48	(254)	(218)	✓
8	Corn After Alfalfa	10	Siegrist Spring	Spring	No Incorporation	6250	0	0	0	89	(127)	(109)	
9	Corn After Alfalfa	11	Siegrist Spring	Spring	No Incorporation	6250	0	0	0	74	13	(56)	✓
10													







## Nutrient Balance Sheet Summary Notes

	Crop Group	CMU/Field ID	Manure Group	Notes <sup>1,2</sup>
1	Corn After Corn	2-8	Siegrist Spring	Fields 4 – 8 have a 150' manure application setback from the stream.
2	Corn After Soybeans	2-8	Siegrist Spring	Fields 4 – 8 have a 150' manure application setback from the stream.
3	Barley (Winter)	2-8	Siegrist Fall	Fields 4 – 8 have a 150' manure application setback from the stream.
4	Soybeans (Summer)	2-8	Siegrist Spring	Fields 4 – 8 have a 150' manure application setback from the stream.
5	Grass Hay (1 <sup>st</sup> )	9	Siegrist Spring	This application is applied in the spring at green-up. Field 9 has a 100' manure application setback from a well and 150' manure application setback along the stream.
6	Grass Hay (2 <sup>nd</sup> )	9	Siegrist Spring	This application is applied after first cutting. Field 9 has a 100' manure application setback from a well and 150' manure application setback along the stream.
7	Corn After Alfalfa	11	Siegrist Spring	Nutrient balances for P <sub>2</sub> O <sub>5</sub> and K <sub>2</sub> O are based on crop removal and should not be used to determine additional fertilizer needs. The P banking planned rate is applied every 2 years and no other fertilizer and manure phosphorus may be applied. Field 11 has a 100' manure application setback from a sinkhole.
8				



# Manure Application Map



-  Neighboring House
-  Well with 100' Manure Setback
-  Stream
-  150' Manure Setback
-  35' Manure Setback
-  Manure Stacking Location

## **Chapter 10 Sample test questions**

**Use the sample *Nutrient Management Plan Summary Sheet*, *Nutrient Balance Sheet Summary*, and *map* from the previous pages to answer questions.**

1. Using the sample ***Nutrient Management Plan Summary***, what type of manure and how much will be applied to the Small Grain Silage on field B13? (Look closely. Some fields at this farm are listed twice because they are double cropped, receiving both a spring and fall manure.)
  - a. Heifer Spring; 10 tons/acre
  - b. Cow Fall; 7,850 gallons/acre
  - c. Heifer Fall; 10 tons/Acre
  - d. Cow Spring; 7,850 tons/Acre
  
2. Using the sample ***Nutrient Management Plan Summary***, what is the season of application and incorporation time for solid manure applied to Field A19?
  - a. Spring; incorporated same day
  - b. Spring; incorporated within 2–4 days
  - c. Early Fall; incorporated 3–7 days
  - d. Early Fall, No incorporation
  
3. Using the sample ***Nutrient Management Plan Summary***, determine which fields can receive 7,850 gallons/acre from the Cow Spring manure group.
  - a. Fields B9, B13, A11, A13
  - b. Fields B9, B13
  - c. Fields B9, B13, A11
  - d. None, this must be a trick question.
  
4. Using the sample ***Nutrient Balance Sheet Summary***, which field will receive solid manure?
  - a. Field 1
  - b. Fields 2 through 8
  - c. All fields
  - d. None, this must be a trick question.
  
5. Look at the sample ***Nutrient Balance Sheet Summary***. Note that four crop groups are listed in association with fields 2-8. This is because NBSs can be written for multiple years in a crop rotation. Each of these fields will rotate into Barley during their rotation, but not every field will contain barley every year. Which fields can receive fall manure application?
  - a. Only fields rotating into barley
  - b. Only fields rotating out of soybeans if a cover crop is to be planted
  - c. Only fields rotating into soybeans
  - d. Only fields after corn harvest and before cover crop establishment
  
6. Look at the sample ***Nutrient Balance Sheet Summary***. The last column indicates with a check mark that there are Notes in the NBS for Field 9. The notes for this NBS are posted below the summary (although they typically would be found on a separate page). What application setbacks are indicated in the Notes for Field 9?
  - a. 100-foot setback from a stream
  - b. 150-foot setback from a stream
  - c. 100-foot setback from a well
  - d. Both 150-foot setback from a stream and 100-foot setback from a well
  
7. Using the sample ***map***, which fields have application restrictions because of a nearby well?

- a. Fields 1 and 3
  - b. Fields 1, 3, and 4
  - c. Fields 1, 2, 3, and 4
  - d. Fields 1, 2, 3, 4, and Pasture
8. According to the **map**, which of the following is a list of restricted application areas in Field 4?
- a. 100' from well
  - b. 35' from stream and 100' from well
  - c. 100' from well and 100' from stream
  - d. 100' from well and 150' from stream
9. You are to deliver poultry litter to this farm, according to the **map** where can the litter be stacked?
- a. Field 1
  - b. Field 2
  - c. Field 1 or Pasture
  - d. No stacking is allowed on this farm

## CHAPTER 11: RECORD KEEPING

<p><b>Required Records - General</b></p> <p><b>WHAT RECORDS MUST I KEEP FOR HAULING MANURE?</b></p>	<p><b>Act 49 describes required record keeping for manure haulers, applicators and brokers.</b></p> <ul style="list-style-type: none"> <li>➤ Records must be maintained and available for inspection by the Pa Department of Agriculture, or its appointed agent.</li> <li>➤ Records should be <i>kept on file for 3 years</i>.</li> </ul> <p>The following records are required for <u>all commercial hauling, application and brokering</u> of manure. Records should be kept on file and must contain:</p> <ol style="list-style-type: none"> <li>1. <u>Agreement</u> – For CAOs and CAFOs, a written agreement or contract between the commercial hauler and each agricultural operation or broker is needed.</li> <li>2. <u>Copies of current MMP, NBS, or NMP summaries and maps</u> from farms where land application or stacking occur.</li> <li>3. <u>Name and address</u> of the manure supplier, importing operation, and farm where application occurs.</li> <li>4. <u>Name, Certification Number and signature</u> of the hauler or broker involved.</li> <li>5. <u>Field location and number of acres</u> to which manure was applied</li> <li>6. <u>Date and time of application.</u></li> <li>7. <u>Total amount of manure applied to each field and application rate.</u></li> <li>8. <u>Crop group</u> or groundcover for each field.</li> <li>9. <u>Stacking location.</u></li> </ol>
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### *Chapter 11 Sample test questions*

1. Name and address records should be kept for which of the following when they are involved in manure transfer or application?
  - a. Supplier of manure
  - b. Transporter/applicator
  - c. Importing operation
  - d. Broker
  - e. All of the above
  
2. Which two document(s) should the hauler attain and keep copies of?
  - a. Manure application summary tables and Farm maps
  - b. Farm maps and Manure Analysis
  - c. Manure Analysis and Soil Sample Reports
  - d. Crop production records and Fertilizer Rate Records
  
3. Haulers need to include the following information on records:
  - a. Hauler's name
  - b. Certification number
  - c. Signature
  - d. All of the above

## CHAPTER 12: APPLICATION CALIBRATION METHODS

<p><b>Importance of calibrate spreading equipment</b></p>	<p><b>There are many reasons why manure application equipment should be calibrated</b></p> <ul style="list-style-type: none"> <li>➤ Planned application rates assure that manure is neither over applied nor under applied.</li> <li>➤ Planned rates offer economic return on the manure nutrients.</li> <li>➤ Act 38 <i>requires calibration records to be kept on file for all commercial applicators</i> that apply manure for farms that have a NMP or NBS. Generally, this will be the responsibility of application business owners and managers.</li> <li>➤ Applying manure above MMP, NMP or NBS amounts is illegal. It does no good to have a plan developed if manure cannot be accurately applied at plan rates.</li> </ul>
<p><b>Spreader Calibration</b></p>	<p><b>Objective:</b></p> <ul style="list-style-type: none"> <li>➤ The objective of spreader calibration is to document that you are applying manure at a planned rate.</li> <li>➤ Calibration can be completed for both solid (tons/acre) and liquid (gallons/acre) manure.</li> </ul> <p><b>You should be familiar with the “Loads per Field” spreader calibration method below.</b></p>
<p><b>Loads per Field Method</b></p>	<p><b>The Loads per Field Method</b></p> <ul style="list-style-type: none"> <li>➤ This method determines how many loads of manure need to be applied to a field in order to match the planned application rate.</li> <li>➤ This is a very common method used by manure applicators. The following information is needed:             <ol style="list-style-type: none"> <li>1. Acreage of field</li> <li>2. Planned manure application rate</li> <li>3. Capacity of manure application equipment (can be solid or liquid manure)</li> </ol> </li> <li>➤ Once this information is known the number of loads it takes to satisfy the planned application rate is determined by the following calculations.</li> </ul> <p><b>Step 1:</b> Determine the amount of manure needed for entire field =  <i>Field acres X Application rate.</i></p> <p><b>Step 2:</b> Determine the number of loads needed to meet the planned rate =  <i>Amount of manure needed for entire field ÷ Spreader capacity</i></p> <p><u>For example:</u> Determine the number of loads of manure it will take to satisfy the planned rate of 5,000 gallons per acre in a 9-acre field using a spreader with the capacity of 4,500 gallons/load.</p> <p><b>Step 1:</b> Determine the amount of manure needed for entire field =  <i>9 acres/field X 5,000 gallons/acre = 45,000 gallons/field</i></p> <p><b>Step 2:</b> Determine the number of loads needed to meet the planned rate =  <i>45,000 gallons/field ÷ 4,500 gallons/load = 10 loads/field</i></p>

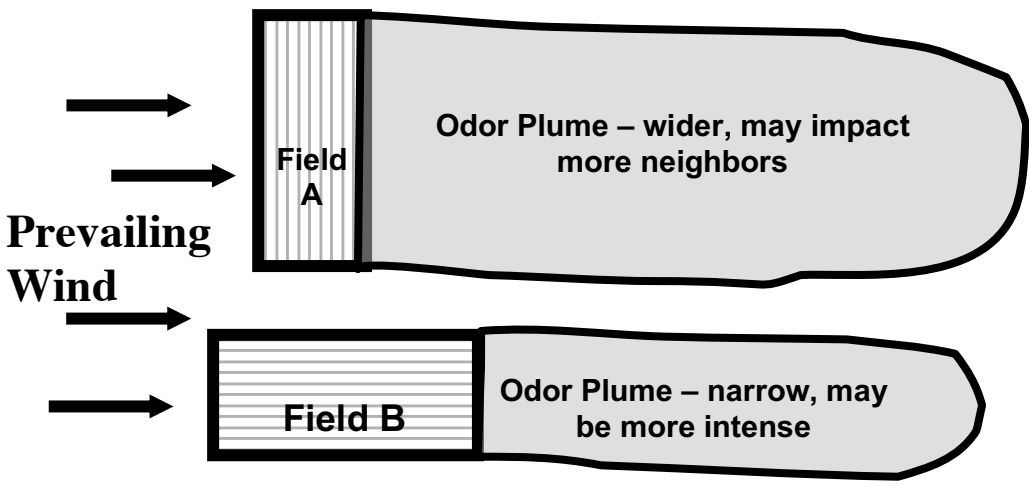
<b>More Information</b>	<p><b>Additional calibration methods</b> are taught at the Manure Hauler Level 3 and Broker certification classroom trainings. Information on these methods are available from the following sources, which can be found with an internet search. Act 49 Program educators can also be contacted to supply this material.</p> <ul style="list-style-type: none"> <li>➤ Penn State Extension, Agronomy Facts 68. Completion of tables in this factsheet can be used to maintain calibration records.</li> <li>➤ Pennsylvania Nutrient Management Program website.</li> <li>➤ Pennsylvania Agronomy Guide: Part 1, Section 2 – Soil Fertility Management.</li> <li>➤ Livestock and Poultry Environmental Stewardship or eXtension websites.</li> </ul>
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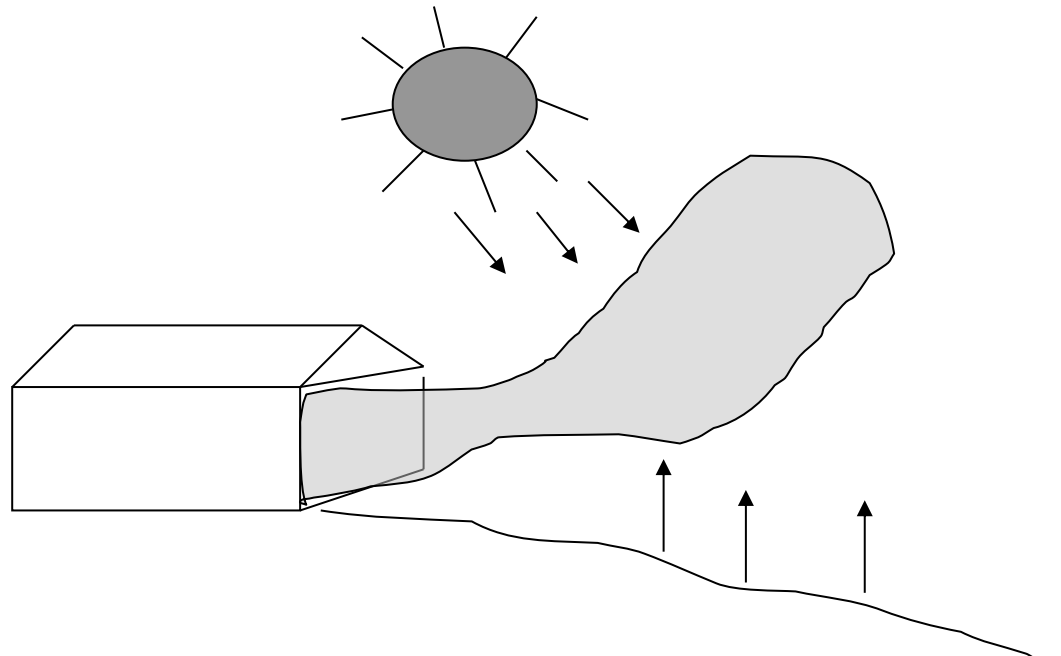
### ***Chapter 12 Sample test questions***

1. Calibration of manure equipment must be performed on commercial equipment and the results should be \_\_\_\_\_.
  - a. Adjusted daily by conducting a new calibration exercise
  - b. Kept on file
  - c. Sent to Pa Department of Agriculture for verification
  - d. Sent to Penn State for statistical analysis
  
2. A 10-acre field needs 6,000 gallons of swine manure per acre. You have a 5,000-gallon tank. How many loads of manure should you apply to the field?
  - a. 10 loads
  - b. 12 loads
  - c. 15 loads
  - d. 18 loads
  
3. You just finished applying 12 loads of manure to a 10-acre field with a 5,000-gallon tank. What was your application rate in the field?
  - a. 4,000 gallons/acre
  - b. 5,000 gallons/acre
  - c. 6,000 gallons/acre
  - d. 7,000 gallons/acre

## CHAPTER 13: ODOR, FLIES AND COMMUNITY RELATIONS

<p><b>Nuisances</b></p>	<p><b>Nuisances are things that prevent a neighbor from reasonably enjoying their property. Some nuisances associated with manure application are:</b></p> <ul style="list-style-type: none"> <li>➤ Odor</li> <li>➤ Flies</li> <li>➤ Noise</li> <li>➤ Dust</li> <li>➤ Lights</li> <li>➤ Manure/Mud on roads</li> </ul>
<p><b>Odor Sources</b></p>	<p><b>Odor can cause public concern.</b></p> <ul style="list-style-type: none"> <li>➤ Manure odor comes from three main sources:             <ol style="list-style-type: none"> <li>1. Livestock buildings and housing areas</li> <li>2. Manure storages</li> <li>3. Manure application</li> </ol> </li> <li>➤ Of these sources <b><i>manure application results in the largest number of community odor complaints.</i></b></li> <li>➤ Act 38 only requires an odor management plan for <b>new or expanding animal housing or storage construction</b> on farms with a NMP. It is helpful to have a working knowledge of how odor affects the community and how to minimize odor.</li> </ul>
<p><b>Odor Plumes</b></p>	<p><b>Odor travels in air on pathways known as odor plumes.</b></p> <p>Some common characteristics of odor plumes:</p> <ul style="list-style-type: none"> <li>➤ Odor plumes travel downwind with a breeze.</li> <li>➤ Odor plumes tend to rise <u>away</u> from the ground on a warm, sunny day.</li> <li>➤ During times known as <b><i>thermal inversion</i></b> odors can become very intense for neighbors.             <ul style="list-style-type: none"> <li>○ During <i>thermal inversion</i>, odors will stay close to the ground and may even follow the land contour downhill, or “sink”.</li> <li>○ During <i>thermal inversion</i> the air is stable with little breeze and the ground may be cool. Odors do not easily disperse at these times.</li> <li>○ These conditions most often occur over night but can occur at any time of day or year.</li> <li>○ Neighbors that live down slope from a farm, especially those that live in a hollow or valley to the south and east of the odor source are most likely to experience thermal inversion odors.</li> </ul> </li> </ul>

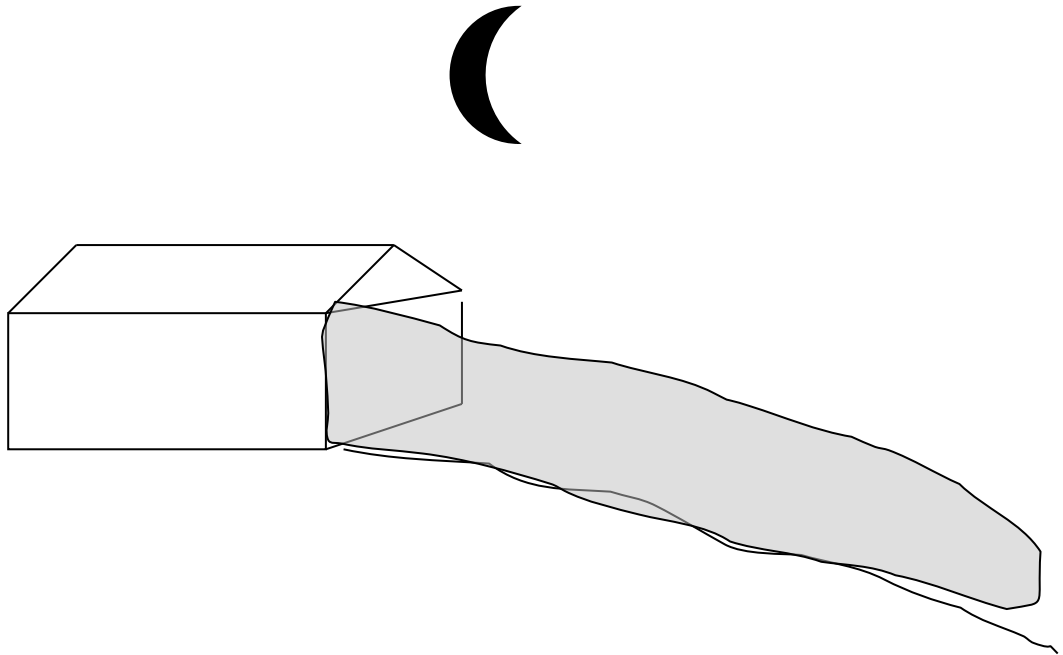
<p><b>Odor Plumes</b></p>	<p><b>This diagram demonstrates odor plumes traveling downwind from two fields with recently applied manure.</b></p> <ul style="list-style-type: none"> <li>➤ If the fields are the same size and receive the same amount of manure from the same source, Field A could impact more neighbors due to its wide plume, while Field B may have more intense odors because the same amount of odorous compounds are in a smaller area.</li> </ul>  <p>The diagram illustrates two scenarios of odor plume dispersion. On the left, four horizontal arrows labeled 'Prevailing Wind' point to the right. Above the wind, 'Field A' is shown as a vertical rectangle with vertical hatching. To its right, a wide, shallow, grey-shaded plume extends downwind. Text next to it reads: 'Odor Plume – wider, may impact more neighbors'. Below this, 'Field B' is shown as a vertical rectangle with horizontal hatching. To its right, a narrow, tall, grey-shaded plume extends downwind. Text next to it reads: 'Odor Plume – narrow, may be more intense'.</p>
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<p><b>Odors during warm days</b></p>	<p><b>During warm sunny days, odors often rise with warming air. During such times odor from applied manure may rise above farm neighbors.</b> Here the odor source is a livestock building but the same principle pertains to land applied manure.</p>  <p>The diagram shows a cross-section of a farm scene. At the top, a sun with rays is shown. Below it, a grey-shaded plume rises from a livestock building on the left. The plume is wider at the base and tapers as it rises. Three vertical arrows point upwards from the ground level towards the rising plume, indicating the upward movement of air and odors.</p>
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<p><b>Thermal Inversion and Odors</b></p>	<p><b>Odors can stay close to the ground during times of thermal inversion. Because of calm cool air, odors may not disperse and accumulate to offensive levels.</b></p>
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Here the odor source is a livestock building but the same principle pertains to land applied manure.



**Odors and Application**

**Some manure application practices can help limit manure odors**

- When applying manure a few common-sense practices may help avoid odor conflict.
  - Injecting or incorporating manure into the soil helps to limit odor emissions.
  - When applying manure close to neighbors choose to apply manure closer to the neighbor's property early on a sunny day. This will allow the manure to dry and rising odor plumes will help to carry odor up and away from the sensitive areas.
  - Avoid manure application near sensitive neighbors around weekends and holidays.
  - Notify and educate the neighbors about manure application processes and timing. Neighbors with a good relationship to the farm and neighbors that understand farm practices are more tolerant of odors.

**Fly Life Cycle**

**Fly Populations can transmit disease and become a nuisance to neighbors.**

- Houseflies have been implicated in the transmission of infectious agents.
- Flies are very prolific. When temperature and moisture are favorable, large population outbreaks can occur. Hot weather allows the fly life cycle to occur in as little as seven days. A female fly lays over 500 eggs in her life.
- Manure is a common breeding area of flies.
- Manure moisture content is important. Many liquid manure systems, with high moisture contents, have little fly problems.
- Most fly outbreaks are associated with solid manure, such as manure from poultry or horse farms.
- Nuisance outbreaks often occur when immature flies (eggs, larva and pupa) found in manure are removed from a manure storage area to an area near residents.

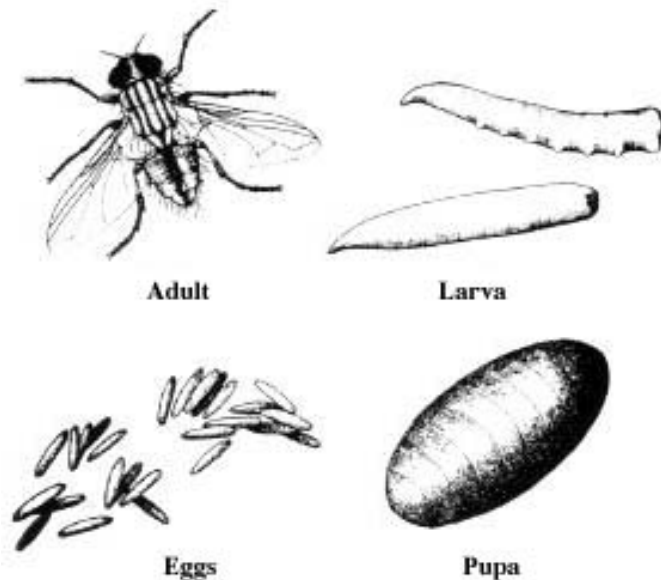
**Inspect Manure!**

**Know how to identify possible fly outbreaks.**

- The following illustration shows different stages of the fly life cycle.
- Eggs and larva are typically white. Larva are known as maggots.
- Pupa can be various shades of light brown to red. Pupa are larva encased in a “shell” that will “hatch” as adult flies.
- **Be able to identify these stages. Inspect manure for large populations of any of these stages. If large populations are noted, take precautionary measures like those listed below.**

**Take Action!**

**Avoid Nuisance Fly Issues!**



**Avoid Fly Population Outbreaks**

**When large numbers of fly eggs, larva or pupa are noted in solid manure action must be taken to prevent a fly population explosion.**

- Following stacking guidelines stack manure for two weeks or longer so composting action will kill many of the immature flies. Covering this stack will make this process more efficient. The pile can be turned every few days to move surviving immature flies into the middle where they will be exposed to higher composting temperatures.
- Larva in manure can be killed with special Larvicides.
- Inform the producer of potential problems. Farm management changes may prevent future issues.

<b>Community Relations</b>	<p><b>Reasons to maintain good community image include:</b></p> <ul style="list-style-type: none"> <li>➤ Avoid complaints and excessive oversight and scrutiny</li> <li>➤ Avoid lost production time</li> <li>➤ Receive feedback – be the first to know about a problem not the last</li> <li>➤ Good image promotes business</li> <li>➤ Your actions influence the image of your client farm.</li> </ul>
<b>Maintain a Good Image</b>	<p><b>Some good business principles to help maintain good community image include:</b></p> <ul style="list-style-type: none"> <li>➤ Appearance - Maintain clean equipment. Dress professionally.</li> <li>➤ Be a courteous driver on public roads.</li> <li>➤ Conduct your business in a responsible manner.</li> <li>➤ Consider the community when making decisions.</li> <li>➤ Be sensitive to public concerns. Address questions and concerns in a professional and educational manner.</li> <li>➤ Talk to the producer to learn if there are any concerns with sensitive neighbors.</li> </ul>

### ***Chapter 13 Sample test questions***

1. The odor source that leads to the most odor complaints is...
  - a. Building exhaust fans
  - b. Liquid manure storages
  - c. Milk house waste streams
  - d. Manure application
  
2. Which of the following is a good management practice to help reduce the risk of odor conflict with neighbors?
  - a. Do not apply manure downwind from building exhaust fans
  - b. Avoid applying manure near neighbors on weekends or holidays
  - c. Apply manure within stream buffers where the neighbors will not expect to smell manure
  - d. Apply manure in the evening so that odor does not evaporate
  
3. Which type of manure is more likely to harbor large immature fly populations?
  - a. Liquid manure
  - b. Solid manure
  
4. Which of the following is a reason for having an effective community relations plan?
  - a. Avoid the need for proper application rates on fields that are more than 150' from a stream
  - b. Avoid stacking areas.
  - c. Avoid CAO and CAFO regulations.
  - d. Avoid possible legal troubles and lost production time.

## **CHAPTER 14: ANSWERS TO SAMPLE TEST QUESTIONS**

### ***Chapter 1 Sample test question answers***

1. True
2. Level 2 commercial manure hauler
3. 6 CECs
4. False, Manure Hauler Level 1 does not need supervision, but a Manure Hauler Level 2 does need supervision.

### ***Chapter 2 Sample test question answers***

1. Concentrated Animal Feeding Operation
2. Concentrated Animal Operation
3. True

### ***Chapter 3 Sample test question answers***

1. Bio-security protocol
2. True
3. Line of Separation
4. Spotted Lanternfly Permit
5. Single farm visits in a day

### ***Chapter 4 Sample test question answers***

1. Assure human safety, stop the flow at the source, contain the existing spill and then notify the proper people and begin cleanup.
2. Stop flow at the source
3. Freeboard should never be ignored or exceeded
4. Hydrogen Sulfide
5. West
6. During repair and maintenance
7. True

### ***Chapter 5 Sample test question answers***

1. Address of farm
2. Emergency Action Plan (EAP)

### ***Chapter 6 Sample test question answers***

1. Nitrogen
2. All of the above
3. Phosphorus
4. True

### ***Chapter 7 Sample test question answers***

1. It is March 1<sup>st</sup>, there is no snow on the ground and the ground is not frozen.
2. True
3. 9,000 gallons/acre
4. Heavy loads & wet soils
5. 25%

**Chapter 8 Sample test question answers**

1. False, all stacking locations must be identified on a map no matter what type of manure or nutrient management plan a farm has
2. 100 feet
3. Poultry litter and horse stable manure
4. All of the above

**Chapter 9 Sample test question answers**

1. True
2. 150 feet
3. 100 feet
4. True
5. False, ground cover needs to be 25% or more
6. False, the maximum winter poultry litter application rate is 3 tons/acre in MMPs
7. True

**Chapter 10 Sample test question answers**

1. Heifer Fall; 10 tons/Acre
2. Spring; incorporated within 2–4 days
3. Fields B9, B13, A11
4. None. The rate of 6250 listed in this plan is obviously a liquid rate. Even though the manure group information on this summary page does not indicate that the manure is liquid, that information would be found elsewhere in the Nutrient Balance Sheet material.
5. Only fields rotating into barley
6. Both 150-foot setback from a stream and 100-foot setback from a well
7. Fields 1, 2, 3, 4, and Pasture
8. 100' from well and 150' from stream
9. Field 1

**Chapter 11 Sample test question answers**

1. All of the above
2. Manure application summary tables and Farm maps
3. All of the above

**Chapter 12 Sample test question answers**

1. Kept on file
2. 12 loads  
 $10 \text{ acres} \times 6,000 \text{ gallons/acre} = 60,000 \text{ gallons/field}$   
 $60,000 \text{ gallons/field} \div 5,000 \text{ gallons/load} = 12 \text{ loads}$
3. 6,000 gallons/acre  
 $12 \text{ loads applied} \times 5,000 \text{ gallons/load} = 60,000 \text{ gallons applied}$   
 $60,000 \text{ gallons applied} \div 10 \text{ acres} = 6,000 \text{ gallons/acre}$   
This could be the same field as question 2.

**Chapter 13 Sample test question answers**

1. Manure application
2. Avoid applying manure near neighbors on weekends and holidays
3. Solid manure
4. Avoid possible legal troubles and lost production time

## **CHAPTER 15: ITEMS TO BRING TO THE MANURE HAULER LEVEL 2 EXAM**

To schedule your examination, contact your local County Conservation District.

1. The Commercial Manure Hauler Level 2 Workbook. This workbook can be used to take the open-book exam.
2. The completed Commercial Manure Hauler Level 2 Workbook Verification Form with supervisor's signature.
3. A completed Commercial Manure Hauler Application if you did not already complete one on PAPlants.