Carcass Management Course
Off-site Permitted Landfill Module

USDA United States Department of Agriculture

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Overview

Welcome to the Off-site Landfill Module. While completing this module, you may encounter references to the Emergency Management Tools; Health, Safety, and Personal Protection Equipment; Secure Transport; and to Biosecurity, which are broadly covered in their own separate training modules. These modules are found in the Introduction Modules, beginning with the Orientation Module.

> This training module is presented from the perspective that you have already used the MLCh Tool (Matrix, Decision Loop, and Checklist) explained in the Emergency Management Tools Module and selected landfill as the preferred carcass management option.

Effective management of animal carcasses and associated materials is a critical component of a successful response during an animal health emergency. Carcass management measures contain, treat, or destroy contaminated or potentially contaminated materials in order to:

- Prevent spread of a disease outbreak to protect the nation's agricultural industry
- Protect the environment by preventing carcass waste products from contaminating soil, water, and air
- Protect decaying carcasses from insects and scavengers which can transport pathogens to other locations
- Safeguard public health by removing potentially contaminated food products from the human food supply
- Safeguard animal health by removing potentially contaminated feed from the animal feed supply

Objectives

This module presents information in four different lessons:

- Introduction
- Evaluation
- Planning
- Operations

Upon completing this module, you should be able to:

- Describe landfilling as a method for management of carcasses and other related wastes
- Understand the advantages and disadvantages of landfilling
- Consider environmental risks associated with landfilling
- Obtain regulations governing landfilling by consulting with state officials
- Identify factors used to evaluate landfilling as a management option for carcasses and other related wastes
- List critical elements when planning use of landfills
- Recognize key components of landfill operations

Introduction Lesson Overview

Definition: Landfilling involves depositing waste materials in an engineered facility consisting of impermeable liner, leachate collection, and gas control systems designed to prevent environmental contamination and scavenger access to waste.

The general process of landfilling waste is as follows:

- Landfills are made up of cells which contain the waste from one day's operations. Trucks deposit their loads into a daily cell, and larger equipment compacts the deposited waste.
- At the end of the day, the daily cell is covered up with a six inch layer of soil or other cover material to prevent exposure of waste to wind, weather, or scavengers
- The next day, the new cell is begun. Daily cells are grouped into rows and layers called lifts.
- Eventually, the whole landfill is capped and monitored for a number of years through a regulated closure process

Figure 1. Carcass Filled Liner Deposited Into Landfill

Introduction Lesson Contents

This lesson is divided into the following sections:

- Landfill Description – Presents the key features of a landfill and landfill regulations
- Landfill Types – Contains information on the three basic types of landfills found in the United States
- Landfill Design Characteristics – Discusses the basic design of a landfill and its various components and systems
- Landfill Advantages – Describes the benefits of using a landfill as a carcass management option
- Landfill Disadvantages – Covers the difficulties and possible drawbacks associated with use of landfills for carcass management

Description

Landfills are engineered structures built into or on top of the ground in order to isolate waste from the environment (groundwater, air, rain).

Landfills differ from "dumps" in that they have some kind of liner (usually clay or plastic or a composite liner consisting of both clay and plastic) to keep the waste and its decomposition by-products from polluting the surrounding area. Landfills also have some means to monitor the surrounding environment for pollution. In addition, landfills typically have a means for collecting the leachate that is produced through the decomposition of the waste, for further treatment in a wastewater treatment facility. Modern landfills are required to meet design and operating standards outlined in Resource Conservation and Recovery Act (RCRA). These RCRA regulations are contained in Title 40 Code of Federal Regulations (CFR Title 40), Protection of Environment.

Landfills have been used as an effective means of carcass management in many recent animal disease outbreaks throughout the world including a foot and mouth disease outbreak in the United Kingdom (2001), an avian influenza outbreak in Virginia (2003), and an avian influenza outbreak in the Midwestern US (2015).

Figure 2. Landfill Preparation

Types

There are three types of permitted landfills in the United States:

- Municipal solid waste (40 CFR 258) and applicable state regulations
- Hazardous waste (40 CFR 264.1) and applicable state regulations
- Construction and demolition debris (state regulated)

Municipal solid waste landfills are often the most appropriate for catastrophic carcass management because they are commonly found in most areas of the county, they have sufficient safeguards to protect the environment, and they are relatively inexpensive to use. These landfills are generally clay and/or synthetically lined and have leachate collection and gas recovery systems.

In addition to the federal regulations, state and local authorities may have additional, or even more stringent, regulatory criteria that apply to landfills. These regulations contain:

- A variety of requirements designed to protect the environment
- Facility design and operating standards
- A permit compliance program
- Groundwater monitoring programs
- Corrective action measures
- Closure requirements
- Post-closure monitoring requirements

Design Characteristics

Most municipal solid waste landfills have similar design characteristics to protect the surrounding environment:

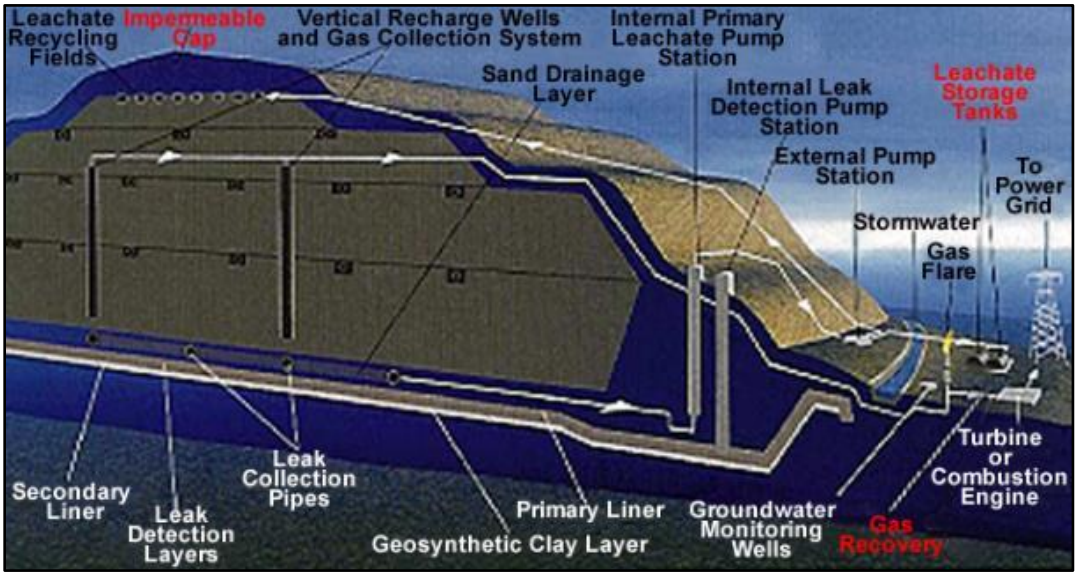
- Cells - Cells are individual units of refuse that are made up of one day's waste. Individual cells are arranged in rows and layers of adjoining cells.
- Liner system - A plastic or clay or both clay and plastic liner system protects trash and resulting leachate from contaminating the groundwater
- Storm water drainage system - The system collects rain water and redirects it so that it doesn't go into the cells. This helps limit the amount of leachate produced. The storm water is collected, processed, and released when it meets regulatory discharge standards.
- Groundwater monitoring wells - These are installed around the perimeter of a landfill so groundwater contamination can be identified and prevented from spreading. Monitoring wells are pipes that are installed into the ground deep enough to intersect groundwater so water can be sampled and tested for leachate chemicals, temperature, and pH.

Design Characteristics (cont.)

- Leachate collection system - A system that collects water and liquid waste decomposition by-products that have percolated through the landfill and contains contaminants. The leachate is then processed in lagoons, discharged to treatment plants or recirculated through the landfill.
- Gas collection system - The system collects landfill gas that is formed during the breakdown of trash. The gas is composed of methane, carbon dioxide, and other trace gases, and typically has a heating value 30-50% that of natural gas. The gas is burned, or captured for energy production.
- Cap and cover system - This system is a very low permeability barrier of plastic, clay, bentonite, or a combination of these materials that seals off the top of the landfill so that it is not exposed to the elements and scavengers.
    - Daily cover is a layer of soil or comparable material which is placed on each cell on a daily basis to prevent scavengers from disturbing the waste
    - When an area of the landfill no longer accepts waste, a deeper layer of cover material is placed on the cell until the landfill is capped

Figure 3. Gas and Leachate Collection Systems (Click on Image to Enlarge It)

(Note: The leak collection pipes are leachate collection pipes, located inside the liner)



Advantages

Perhaps the most significant advantages of landfill carcass management are the fact that the infrastructure for disposing of waste already exists and capacity can be relatively large.

- Carcass management of carcasses and related waste in an existing permitted landfill is simple to implement and immediately available, assuming permission from the landfill owner/operator is obtained
- Municipal solid waste landfills have established features that address many of the issues posed by animal carcasses and related waste including:
    - Fences and barriers to prevent access by scavengers and other fomites, such as people and vehicles
    - Daily cover and final cap to minimize exposure to wildlife and the elements
    - Methane control systems to manage methane produced by decomposing organic materials, to prevent explosion hazards in nearby structures and minimize release of greenhouse gases
    - Leachate management systems to protect soil, surface and ground water
- Landfills can potentially handle a large number of carcasses and related waste
- Landfills are found nationwide and likely to be close to infected sites
- Landfills may be an appropriate option for management of certain infected carcasses and related waste
    - Many viruses are inactivated within 29 days in landfill leachate at 95°F (35°C), or within 40 days at 70°F(21°C) – (Gravier et al, 2009)
    - In the winter in a cold climate, the waste at the perimeter of the landfill may not reach 70°F (21°C) and may be similar to the ambient temperature and may not inactivate most viruses

Disadvantages

Even though carcass management by landfill may be an appropriate option, landfill operators may not accept animal carcasses and related waste. The development of a landfill site is an extremely lengthy, difficult, and expensive process so landfill operators and planning authorities may not sacrifice domestic waste capacity to accommodate carcass material.

- Some landfills may refuse to accept infected carcasses and related waste due to public perception or limited capacity, concerns about leachate management, liability concerns, concerns about worker safety, and corporate and shareholder concerns
- Transportation is required to move infected carcasses and related waste to the landfill
- Landfills may not reach temperatures or conditions necessary to inactivate all pathogens
- Landfills do not destroy waste they simply contain it, which utilizes land that could be used for other productive purposes
- Infectious agents (including fecal coliform bacteria) may persist in landfills for an extended period of time, depending on the infectious agent, the climate where the landfill is located, and where in the landfill the waste is placed
- Landfills may already be contractually obligated to handle routine quantities of waste at or near their daily management capacity, and they may not have sufficient “surge capacity” to accept large quantities of animal carcasses and related waste

Figure 4. Compacting Deposited Waste

Evaluation Lesson Overview

This lesson contains information to help you further evaluate use of an off-site permitted landfill as a carcass management option. During an animal health emergency or other event resulting in catastrophic animal loss, landfills offer many advantages because they may be readily available and may be able to accept a relatively large quantity of carcass material.

Additionally, landfill sites may have the necessary safeguards and protection measures to reduce the risks to the environment.

Factors in the evaluation include:

- Knowing and understanding applicable regulations
- Identifying the waste stream
- Evaluating the landfill site
- Recognizing the environmental impact

Evaluation Lesson Contents

This lesson presents the following Information:

- Regulations – Covers the regulations governing landfill operations
- Waste Stream Evaluation – Contains questions one can use to assess the materials on the infected premises to determine suitable management options
- Landfill Site Evaluation – Has information including questions to assess whether or not a landfill is suitable for carcass management
- Environmental Impact – Includes a discussion of potential environmental impacts, important biosecurity considerations, and public health considerations

Regulations

All waste materials slated for management must be correctly classified by a certified waste management professional to assure that appropriate carcass management and transportation methods are selected. The classification of the waste will depend upon the specific type of incident and the federal agency with primary authority.

The Gateway to State Resource Locations provides access to a variety of state resource locator tools, including state environmental regulations.

Below are some of the considerations for classifying and transporting waste:

- Solid waste – Most animal related waste generated during a response to an animal health incident will be classified as solid waste for management purposes
- Medical and infectious (solid) waste – A portion of the waste material associated with a response to an animal health emergency may be classified as medical and/or infectious waste, such as used sharps or needles, and will be subject to state regulations
- Hazardous materials – If carcasses and related waste are moved under US Department of Transportation authority, infectious waste (including carcasses, bedding, etc. which can cause disease or death in animals or humans) is classified as hazardous material unless a special classification is obtained
    - Hazardous material will require special packaging, manifesting, and transport to an appropriate facility approved to accept the materials
    - It is important to note that the hazardous material classification for transportation is not the same as hazardous waste under RCRA
- Permitted Movement – When infected carcasses and related waste are permitted to move under APHIS/state authority, they will require DOT designation as hazardous material
    - in compliance with 49 CFR 105.5 and 49 CFR 173.134, as well as, other related 49 CFR requirements, and
    - in compliance with incident-specific state and federal requirements for biosecurity, transport method, chain of custody, and cleaning/disinfection (e.g., using VS Form 1-27)
    - Refer to the NAHEMS Guidelines: Quarantine and Movement Control for additional information

Regulations (cont.)

Waste classifications may vary widely in regards to diseased animal carcasses and associated waste materials. Strict consideration must be given to federal laws, as well as state regulations, where the waste is generated and where the waste is disposed of. In some instances, local jurisdictions will also have relevant and applicable regulations to consider.

Classification is a determining factor in considering whether a proposed facility is permitted to accept the waste. Because regulations may vary between states, do not assume all states' waste classification regulations are similar. This is particularly relevant if waste generated during a response is transported across state lines for further processing. It would be wise to always verify that the receiving landfill will accept the specific type of waste. See the Waste Profile Sheet for an example of the type information most landfills require before accepting waste.

Modern landfills are regulated under the EPA Resource Conservation and Recovery Act (RCRA) regulations: 40 CFR, Part 257, Criteria for Classification of Solid Waste Disposal Facilities and Practices and 40 CFR, Part 258, Criteria for Municipal Solid Waste Landfills.

Waste Stream Evaluation

Different facilities may only be able to process certain materials and not others. The sooner carcasses are disposed of; the easier they will be to transport. The following are issues one should consider before contacting landfills:

- What types of affected material?
  - Carcass: type, size, number and condition
  - In-barn manure/litter: type, volume, moisture content, density
  - Stored manure/litter: type, volume, moisture content, density
  - Feed? Quantity and location
  - Eggs? Quantity and condition
  - Bedding? Non-infected manure compost?
  - Paper products? Other debris?
- In what physical state are the materials?
  - Putrefaction results in the gradual dissolution of tissues into gases and liquids
  - Landfills are restricted from accepting liquids. A landfill needs a Research, Development and Demonstration (RD&D) approval to take liquids per 40 CFR 258.4 of RCRA.
- How much material needs to be disposed?
  - If you have more material than local landfills are able or willing to take, you may have to locate landfills outside the control area
  - The material from a large outbreak may have to be sent to multiple facilities as capacities are reached

Landfill Site Evaluation

Municipal solid waste landfills are highly regulated and must comply with federal standards designed to protect human health and the environment.

- When considering using a landfill, consider proximity to uninfected premises
- Evaluate the distance of the carcass management site to the affected premises
- The closer the proximity, the less risk of spreading disease and more trips between premises and landfill that can occur per day

Even though carcass management by landfill may be an allowed option, and a suitable landfill site may be located in close proximity to the affected premises, landfill operators may not be willing or able to accept animal carcasses and related waste due to concerns about public perception or legal liability.

- Also, landfill sites that do accept animal carcasses and related waste, may not be open for access when needed or when convenient

Figure 5. Prepared Landfill Site

Landfill Evaluation Questions

The following questions can help you evaluate the suitability of facilities for disposing of infected carcasses and related waste:

- Is there a means to separate traffic between routine landfill operations open to the public and emergency carcass management operations?
- Can a vehicle cleaning and disinfection station be constructed at the site?
- How far is the carcass management facility from the infected site? Minimizing transport distance saves money and time, and reduces the risk of spreading pathogens.
- Does the facility have a means of establishing the weight and/or volume of the materials being delivered? Since any carcass management effort will involve monitoring the total amount of diseased material being disposed of, it is imperative that a facility have accurate and easily accessible truck scales or some other means to determine how much material is being processed.
- What actions does the facility take to reduce odor and vermin? Ensuring that the operation is following through on their stated procedures, and that these procedures are effective, is important to avoid any negative publicity surrounding the carcass management activities.
- Does the facility have all of the permits required to dispose of this type of material?
- Are the landfill operators trained and medically cleared to wear any required personal protective equipment?

Landfill Evaluation Questions (cont.)

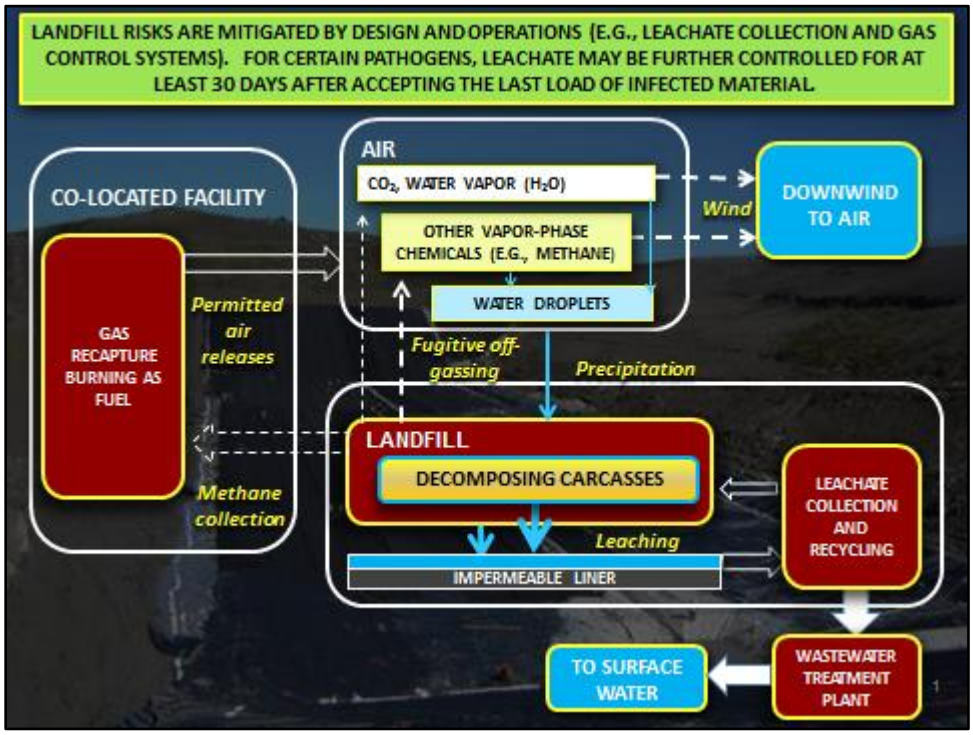
- Does the landfill accept carcasses, by-products (e.g., manure, bedding, litter, egg belts, crates and eggs?)
    - Do these materials need to be processed before the facility will or is able to accept them? For example, landfills may not be able to accept liquid wastes such as raw eggs.
    - Many states prohibit landfilling infectious waste. Therefore, the waste may need to be processed before the landfills can accept them, or you may need to obtain a variance from the state to landfill them.
    - Would the landfill accept either infected or decontaminated PPE, and cleaning and disinfection or virus inactivation waste such as shovels, brooms, buckets, sprayers?
- Who owns and operates the facility?
    - Landfill sites may be privately owned or may be operated by municipalities that might have different acceptance policies. Who owns the facility could affect how likely they are to accept the waste. For example, a municipal landfill that serves the community of the affected farm may be more willing to take the waste/carcasses than a private landfill outside the community.
    - Is the landfill being operated in accordance with its permit? Contact the state regulatory agency about any permit violations and how they were addressed.
    - Some landfills may decline carcasses and related waste and will not participate in emergency carcass management operations because of a lack of trained personnel, equipment, space, and/or stockpiled daily cover material to rapidly cover a sudden influx of carcasses and related waste. In addition, the physical properties of the waste may reduce the stability of the landfill side slopes, preventing waste acceptance.
- Is an agreement already in place with the state that allows emergency carcass management using the method you are considering? This will help speed up implementation of the carcass management process.

Environmental Impact

The byproducts from landfilling animal carcasses and related waste would be generally similar to that resulting from typical operations: leachate and landfill gas. These are normal byproducts of municipal landfills, so systems are already in place to collect and treat these outputs. However, because the composition of animal carcasses differs from that of typical municipal waste, the placement of significant quantities of carcass material in a landfill could affect the quantity and composition of leachate and landfill gas generated, and may affect operations and collection/ treatment systems.

It is important to work closely with the landfill operations staff to ensure the ongoing integrity of the landfill systems if carcasses and related waste are accepted.

Figure 6. Landfill Conceptual Model (Click on Image to Enlarge It)



Environmental Impact Questions

- Does record keeping meet the regulatory requirements for that type of landfill?
    - This is important to identify who may be legally liable, in case there is an environmental release from the landfill in the future
- How is leachate monitored?
    - Is the pathogen of concern likely to survive in the landfill leachate?
    - Bacterial and viral pathogens may be inactivated by leachate with elevated temperatures and extreme pH but some pathogens, such as spore-forming bacteria and prions, have been shown to survive for years
    - Does the landfill have fully functional leachate and gas management systems?
- Is the landfill in compliance with all permit regulations?
- How does the landfill manage waste water from cleaning and disinfecting vehicles and equipment?
- Does record keeping meet the regulatory requirements?
- Who will keep the records?
    - This is important to identify who may be legally liable, in case there is an environmental release in the future

Biosecurity

Biosecurity is a series of management practices designed to prevent the introduction and spread of disease agents on an animal production facility. During an animal disease emergency, biosecurity measures are necessary to keep disease agents out of healthy livestock and poultry populations and prevent the spread of disease agents from infected groups to uninfected groups within the same population.

Below are some biosecurity considerations that apply to landfills. For more comprehensive biosecurity information, refer to the Biosecurity Module.

- Written plans must be in place to prevent disease spread during transportation. For more information, see the Secure Transport Module.
- Workers who handle infectious carcasses and related waste need to take proper precautions and should be equipped with appropriate protective equipment in accordance with site-specific plans. Refer to the Health, Safety, & PPE Module.
- In cooperation with appropriate public health agencies, personnel should be monitored afterward for signs of illness if pathogen of interest may be or has the potential to be zoonotic

> **NOTE**
>
> The agent causing the disease may not be the only agent that poses a risk to personnel. Other potential risks may occur from *Salmonella, Campylobacter*, Q fever and coliforms.

- Ensure proper storage for carcasses and related waste awaiting management to prevent scavenging by wildlife and access by other vectors
- Infected carcasses and related waste should not be placed in landfills without prior regulatory approval
- Site security measures should be in place at the landfill site (e.g., fencing, central entrance, vermin/pest control)
- Space to set up cleaning and disinfection of vehicles before they leave the site

Public Health Considerations

A comprehensive understanding of the type and strain of pathogen associated with the animal disease event is essential to prevent further spread of infection and to safeguard human, animal, and environmental safety and security. Biosecurity measures along with cleaning and disinfection protocols will be governed by the type and strain of pathogen present.

- Care must be taken to conduct operations in such a manner that public health is protected
- Public perception may also present issues for obtaining approval for carcass management at publically owned landfills
- Landfills typically have worked very hard to maintain a good relationship with their surrounding community. This is of particular concern when carcasses and related waste are the result of a disease with zoonotic potential, but even when non-zoonotic, landfills have feared public reaction if they accept infected carcasses and related waste.

The generator of the waste, likely the state or federal government, who has or will pay indemnity for the animals, may remain liable for environmental contamination caused by a landfill even if the government agency isn't responsible for the actual release. More information about how principally responsible parties (PRP) are identified and held liable for cleanup can be found at the EPA website on Enforcement.

Therefore, only well-run landfill operations with minimal violations should be used to avoid future clean-up liability. It is a best practice to consult the state regulatory agency responsible for enforcing landfill regulations, and ask them about suitability of specific landfills for accepting carcasses and related waste.

Public Health Questions

The next few questions can help evaluate public health concerns when using landfill facilities:

- Are there incident and site-specific health and safety plans for the landfill operators that are approved by a credentialed Safety Officer?
- Are landfill operators trained in proper handling of potentially infectious material and the requirements of the health and safety plan? If not, will specialized operators be available for temporary service at the landfill?
- Is employee health and safety monitored and are health and safety rules enforced? If the contaminant poses an increased health risk to employees, it is important that personnel use required protection and are monitored regularly by healthcare workers to ensure they are not exhibiting effects of exposure.

Planning Lesson Overview

This lesson contains information to help you plan for landfilling of carcasses and related waste resulting from an animal health emergency. Planning is essential to ensure that the carcass management task is carried out efficiently and unimpeded by a lack of resources. Successful management of a large number of contaminated animal carcasses and related waste requires proper planning to protect workers, the general public, and the environment.

Important considerations include:

- Classifying and characterizing the waste material
- Identifying and contacting suitable landfills
- Finding adequate carcass storage facilities
- Assessing availability of secure transportation

Figure 7. Depositing a Load into a Cell

Planning Lesson Contents

This material in this lesson is divided into the following key sections:

- Personnel – Highlights requirements and related issues associated with personnel involved with the carcass management activities
- Waste Classification – Discusses the procedures necessary to clearly identify and describe the material being disposed
- Facility Identification – Describes planning considerations for selecting and using a landfill facility
- Materials, Supplies, and Equipment – Provides a list of equipment and supplies which might be needed for landfill operations
- Storage – Provides several considerations for temporary carcass storage until carcass management can commence
- Secure Transportation – Provides a list of important questions to consider before transporting carcasses and related waste

Personnel

There are certain planning aspects that are common to all carcass management options. Those aspects include human health and safety, biosecurity, and physical security, as described below.

- Health and safety – Planning to implement landfill as a carcass management option should include measures to protect workers and the public from hazards associated with loading infected materials for transport, transporting the materials to the landfill, and disposing materials at the landfill. Refer to the Health, Safety, & PPE Module.
- Biosecurity – Planning to use landfill carcass management must include strict biosecurity measures to minimize disease spread when handling infected materials. Refer to the Biosecurity Module.
- Physical Security – Landfill planning efforts should consider security of personnel at the infected premises, security of infected material during transport, and security at the landfill. Below are some ideas for minimizing physical security risks:
    - Providing a single entry point to the infected premises
    - Providing badges to all authorized personnel entering the infected premises
    - Signing in and out of the premises
    - Sealing truckloads at the origin and ensuring the seals are unbroken at the destination
    - Separating routine landfill operations from emergency operations for infected materials, if possible

Figure 8. Briefing the Carcass Management Team

Waste Classification and Characterization

Classification is a determining factor in considering whether a proposed facility is permitted to accept the waste. Because regulations may vary between states, do not assume all states' waste classification regulations are similar. This is particularly relevant if waste generated during a response is transported across state lines. Consult a certified waste management specialist when classifying waste.

Response personnel should perform the following activities under state environmental agency guidance:

- Identify all waste materials designated for management (in accordance with the site-specific carcass management plan, if available). For more information, refer to the Emergency Management Tools Module.
- Mark waste materials and verify with the Disposal Group Supervisor that all designated materials are to be disposed of
- Sort materials by type (recyclables, putrescible waste, debris, and potentially hazardous waste)
- Stage the various waste materials in suitable areas and containerize or enclose in secondary containment putrescible or wet materials to avoid leaching to the environment. Waste materials may require tarp or shelter covering.
- Estimate the quantities of each waste type and record the information
- Characterize each waste type in accordance with all applicable local, state, and federal regulations
    - Improper waste disposal can result in penalties (fines or imprisonment)
    - Improperly disposed waste creates environmental contamination, and clean-up liabilities may also be incurred
    - Document the characteristics of each waste type and label all waste types in accordance with applicable regulatory requirements

Identifying Facilities

For help in locating landfill facilities, you may access the Incident Waste Decision Support Tool (I-WASTE DST) to search for carcass management facilities in each state and/or U.S. Environmental Protection Agency (EPA) region.

Landfill Site Evaluation – The landfill must be constructed and operated in accordance with applicable regulations and the conditions of its operating permit.

Cost Considerations – The fee charged by a landfill is termed a “tipping” fee. For general waste disposal, the fee is based on weight or volume, and may vary with the type of waste deposited. According to an EPA report, the average tipping fee for municipal solid waste in 2013 was $49.78 per ton. The tipping fee for material generated as a result of an outbreak may vary significantly.

Tipping fees do not include costs associated with transportation of carcass material from the site of the outbreak to the landfill.

Material, Supplies, and Equipment

The Disposal Group must identify all necessary materials, supplies, and equipment to carry out the chosen site-specific carcass management method(s).

This list is provided as an example of the types of materials, supplies, and equipment which might be needed for landfilling:

- Health, Safety, PPE and associated personnel decontamination equipment
- Secure transport equipment (driven by trained drivers)
- Vehicle cleaning and disinfection equipment
- Vehicle liners, such as plastic sheeting or specialized bags
- Loading equipment
- Absorbent material to prevent leakage

Figure 9. Examples of Supplies Needed for Cleaning and Disinfection

Material, Supplies, and Equipment (cont.)

- Regulatory authority approved containers, including sharps containers
- Bio hazardous waste bags and containers, if applicable Note: use biohazard bags only for identified biohazard waste. Putting non-biohazard waste into biohazard bags results in excess expenses for carcass management.

Biohazard Waste

Includes plastic ware such as pipettes or pipette tips, culture plates, specimen vials, etc. that are contaminated with biological specimens, bacterial and cell culture material, or nucleic acids. It also includes towels and bench paper that are biologically contaminated (i.e., used where samples or cultures are opened and manipulated). It may also include culture or sample containers (e.g. plastic tubes of blood) that are contaminated with biological materials. The categories are based on the UN assigned by the United Nations Committee of Experts on the Transport of Dangerous Goods (UNECE).

Temporary Carcass Storage

When the Euthanasia Group generates mortalities at a faster rate than the Disposal Group can process them, some means of temporary carcass storage must be provided. It is important to identify where carcasses and related waste can be collected and stored until carcass management can commence. For related guidance, refer to EPA regulations regarding storage and collection of solid waste 40 CFR 243.200-1(a).

Considerations for temporary storage include:

- Can the storage area be secured to prevent unauthorized access, scavengers, odors, rapid decomposition, and potential disease spread to susceptible species?
- Will the carcasses be stored using refrigeration or some other stabilization method such as grinding and preserving them in containers?
    - If so, are the equipment, supplies and materials available?
- Will the storage capacity be sufficient to accommodate the difference between the maximum expected euthanasia rate and the maximum carcass management rate?
    - If not, avoid euthanizing animals at a rate that exceeds carcass management and storage capacity
    - When maximum carcass management and storage capacities are reached, curtail euthanasia until adequate capacity is available
    - Consult with Incident Coordination Group leadership for strategies to minimize the number of animals to be euthanized and managed
- Can wastewater and storm water runoff be controlled from the storage facilities?
- Outline a recordkeeping system for identifying and tracking all carcasses and other materials entering and exiting the storage facilities
- Can the storage facility be adequately cleaned and disinfected during and/or after the response?
- Can storage containers be made leak-proof?
- Is there sufficient space for heavy equipment which may be needed to move large loads?
- What safeguards will be used to protect soil and groundwater from a release of leachate?
- Do safeguards meet all applicable local, state, and federal regulations?
- Ensure the storage method will contain leachate, address pressure buildup, and avoid uncontrolled release of gases and pathogens
    - Consult a certified waste management professional for assistance

Secure Transportation

Transport vehicles will be needed to move carcasses and other materials to the carcass management site. If the waste must travel on public roads, it should be transported in closed, leak-proof trucks or dumpsters. Secondary containment may be needed, depending on the type of waste being transported. Consult a certified waste management professional when developing this section of the carcass management plan. Some transport planning considerations are listed below:

- Does the facility have the needed equipment to unload the material? (E.g., hydraulic dump trailers and tractors)
- Have the carcass management facilities agreed to accept the type and amount of waste you plan to send them and are they permitted appropriately?
- Are all permit, agreement, and/or contract conditions delineated and will the shipments meet the conditions? If not, what corrective actions would be needed?
- Are haulers to be used for the response properly equipped to haul carcasses and related waste in accordance with all applicable laws?
- Are transport vehicles designed to handle the materials to be transported?
- Are the drivers adequately trained in biosecurity?
- Can two-way communications be maintained with the hauler during transport?
- Do shipments require law enforcement escorts?
- Will travel routes from the premises to the carcass management site avoid uninfected farms, road construction, neighborhoods, and densely populated areas?
- Has an alternate travel route been identified?
- What procedures will be followed if the vehicle is damaged during transit?
- How is the waste classified for transport? What DOT packaging standards apply? Are all standards consistently met, including labeling, placarding, and manifesting?
- How will transport vehicle traffic be minimized into the Control Area?

For more information, refer to the Secure Transport Module.

Landfill Facility Suitability

Members of the carcass management team must contact or visit the landfill facility and/or the appropriate state regulatory authorities to ensure the landfill is operated in accordance with all applicable laws and regulations. It is important to contact the landfill in advance to discuss waste acceptance policies, conditions, and cost.

The team should ask the following questions when considering the suitability of a landfill:

- Are landfill personnel trained, equipped, and certified to handle the waste in a biosecure manner or will trained contractors be required?
- Does the landfill have sufficient space for incoming vehicles to avoid causing traffic disruptions on access roads?
- How will vehicle unloading be performed in order to avoid releasing biological agent(s) to the environment?
- Can the waste be covered in the timeframe required by the incident command?
- How will vehicles be cleaned and disinfected after materials have been unloaded at the carcass management site?
- Is leachate managed in a way that will prevent pathogen spread?
- Is the acceptance of animal carcasses and related waste going to impact the landfill's ability to treat and dispose of the leachate?
- Is there an existing contract or agreement in place with the landfill facility?
- Does the facility have sufficient additional capacity to accept the carcasses and related waste while handling their normal routine daily waste quantity?
- Is there an adequate vector control program? Does it need to be enhanced?

Operations Lesson Overview

This lesson contains general procedures in preparing for and disposing of carcasses and related waste by utilizing an off-site permitted landfill. The following topics will be addressed:

- Landfilling procedures
- Secure transport
- Health and safety

Critical steps used during recent U.S. animal disease outbreaks are also included.

Figure 10. Vehicle Cleaning and Disinfection Operations

Operations Lesson Contents

This material in this lesson is presented in a step-wise manner that provides detailed instructions and key steps based on the criteria and measures instituted during recent U.S. animal disease outbreak responses.

- Incident Management – General guidelines to the Disposal Group personnel when dealing with an animal emergency situation
- Landfill Preparation – General guidelines for assessing landfill readiness and need for operational modifications to accept infected biomass
- Infected Premises Preparation – Lists steps for assessing readiness to begin operations
- At the Landfill – General guidelines for safe and proper management of infected carcasses and related waste once delivered to an off-site landfill facility

Incident Management

All Disposal Group personnel should familiarize themselves with the approved site-specific carcass management plan. The Disposal Group Supervisor will review the plan with the Disposal Group and brief them on all relevant aspects of the carcass management effort. For further guidance, refer to the FAD PReP APHIS Foreign Animal Disease Framework: Roles and Coordination.

1. The Incident Coordination Group (ICG) / Incident Management Team (IMT) will ensure there is a system in place to identify carcass management team members with the required expertise.
2. The Disposal Group Supervisor, Disposal Coordinator, or other assigned official will verify credentials, training, and security clearances and arrange just-in-time training as needed for carcass management team members.
3. The Disposal Group Supervisor will prepare briefings and reports for the Operations Section Chief.
4. The Safety Officer will brief all responders on safety precautions and will provide a briefing on the nature of the disease and other circumstances affecting the response.
5. The Safety Officer or Biosecurity Officer will brief all responders on biosecurity protocols.
6. Plans should be developed to be sure that all onsite carcass management related personnel are briefed on safety requirements, site conditions, and tasks.
7. The Public Information personnel will develop material, such as Frequently Asked Questions, to address public concerns.

Landfill Preparation

1. Because it can take time to get the first load accepted by a landfill facility, it is helpful to negotiate agreements with landfills in advance; note however that the federal government cannot issue a contract until there is a bona fide need so any work in advance with landfills can include general guidelines, but will not be an actual contract for services.
2. Based on the list of suitable landfills identified in the planning stage, contact each landfill to ensure they have agreed to accept infected material.
3. Ensure the state has provided permits and permit conditions to the landfill – prior to awarding contracts.
4. Landfills may request indemnity, which the federal government cannot provide. States may be willing to provide such indemnity.
5. Ensure contracting personnel are prepared to award contracts to landfills and pay contractors and landfill operators after their invoices are approved.
6. Visit the landfill to assess site conditions and determine if access road improvements are needed.
7. Coordinate with the landfill operator to
    - Plan traffic routing for trucks and other vehicles
    - Stabilize the roadway, if needed, to support truck weight
    - Select a suitable location for vehicle C&D
    - Identify and select C&D wash water management option(s)
    - Develop or enhance the vector control program

Figure 11. Prepping the Landfill Roads

Infected Premises Preparation

1. Develop a communication plan between the farm and the landfill with a single point of contact to coordinate arrival times and landfill resources.
2. Upon arrival at the farm, the truck driver should remain in the vehicle with the windows closed throughout the loading and unloading process. If the driver must leave the truck before that time, proper biosecurity procedures should be followed.
3. Line the trailer/roll-off container with polyvinyl chloride or polyethylene plastic sheeting (minimum 20-mil thickness) large enough to completely cover the bottom of the trailer and drape up and over the sides and tail gate. Then place a Bio-Zip ™ Sealable Liner or similar inside the trailer/roll-off container in accordance with package instructions.

NOTE

Bio-Zip ™ Sealable Liners are bio-containment bags which are constructed of a thermally-bonded layering of polypropylene and featuring an industrial zippering system. The Bio-Zip ™ Sealable Liners fit securely inside industrial roll-off containers, trailers or truck racks from 10 to 40 cubic yards in total volume.

Disclaimer: This module is not endorsing the product of a specific vendor, but merely used the data on this product as an example.

Infected Premises Preparation (cont.)

4. Place one foot of absorbent material such as wood shavings at the bottom of the bag, then load materials into the trailer/roll-off container carefully to avoid ripping the plastic liner.
5. Allow a minimum of one foot of headspace at the top of the trailer to allow for expansion of the material.
6. When the container is properly filled, zip the bag closed then spray with disinfectant.
7. Securely fasten a tarp over the trailer/roll-off container to prevent damage to the load during highway transport. The tarp must be capable of being cleaned and disinfected.
8. Check trailers/roll-off containers for leakage before leaving the farm.
9. Before leaving the farm, clean vehicles - including tires, wheel wells and undercarriages – to remove organic material. Thoroughly spray the vehicle with a disinfectant registered by the EPA and labeled for the pathogen of concern.
10. Give the truck driver all appropriate paperwork and transport the load to the landfill.
11. Contact staff at the landfill with the time the truck left the farm and an estimated time of arrival at the landfill.
12. Trucks must travel to the landfill under permit by USDA on a route specified by the State Veterinarian, USDA, or other designated official.
13. When trucks arrive at the landfill, check in at scale and obtain a receipt
14. Proceed to carcass management area.
15. Any problems or deviations in these procedures are to be reported to the government site manager immediately.

At the Landfill

1. All employees in the carcass management area will wear PPE in accordance with CDC, OSHA, the incident-specific Health and Safety Plan or other established guidelines. Refer to the Health, Safety, & PPE Module.
    - Segregate access to the carcass management area from ongoing landfill operations; this will be accomplished through a separate access road into the waste cell
    - Stabilize the road, if necessary, with materials identified during the landfill preparation phase, in accordance with government contracts include a stabilized area for trucks to turn around if needed
    - Identify a carcass management area that is strategically sited high in the landfill over existing buried waste, such that any liquids will have to pass through many feet of waste material before reaching the leachate collection system
    - Install a cleaning and disinfection station in accordance with the government contract
    - Ensure controls are in place to prevent scavenging animals from gaining access to the carcass waste
2. Excavate a trench (or multiple trenches) into the existing solid waste, in accordance with all safety requirements to avoid collapse. Mound the excavated material adjacent to the trench.
3. Install GPS stakes for operational reference to locate the trench.

Figure 12. Excavating the Trench

At the Landfill (cont.)

4. Once arriving at the landfill, direct trucks to the carcass management area to dump their loads onto the designated area. Multiple trucks may off-load in the same area, provided off-loading is performed immediately upon arrival at the landfill.
5. Open the back gate of the roll-off boxes using heavy equipment to avoid contact with contaminated material.
6. Gently tip the trailer to allow the Bio-Zip ^{TM} Sealable Liner or similar to slide out into the trench.
7. Cover the bags with at least two feet of excavated trash. Cover the waste prior to accepting any waste during normal business hours.
8. If needed, apply odor control products on top of the waste, such as a spray on product and/or a bio filter constructed of compost, wood chips, or similar material
9. Once emptied, pull truck forward for cleaning and disinfection.
    - Pressure wash with a detergent solution, then apply a disinfectant that has been approved by the USDA
    - Ensure the entire vehicle (excluding the interior of the vehicle cab) is cleaned and disinfected, including tires, wheel wells, undercarriages, and both the internal and external surfaces of truck/trailer beds, sidewalls, tailgates, and tarps

Figure 13. Liner Sliding Into the Trench

At the Landfill (cont.)

10. Collect all cleaning and disinfection wastewater for proper carcass management.
11. Clean and disinfect or dispose of any equipment or personal protective equipment used to manage the carcasses or related material at the end of the day or as appropriate.
    - All material used to manage carcasses and related waste shall be cleaned and disinfected prior to leaving the premises or the carcass management area
    - Maintain vector control

Figure 14. C&D at the Landfill

At the Landfill (cont.)

12. Ensure the landfill manages leachate in accordance with permit conditions
    - Infectious agents may persist in landfills for an extended period of time, depending on the infectious agent, the climate where the landfill is located, and where in the landfill the waste is placed
    - The distance of the infected waste to the leachate collection system affects the amount of agent in the collected leachate
    - The longer it takes the infected leachate to reach the leachate collection system, the lower the pathogen concentration
    - Burial of waste far from the leachate collection system reduces infectious agent concentration in leachate due to time at elevated temperatures
    - The optimal distance depends on the characteristics of the specific infectious agent
    - Burial of waste at least 24 feet deep and at least 60 feet from edges of the landfill will ensure elevated temperatures (73°F to 135°F) (23°C to 57°C) and faster pathogen inactivation
    - Landfills that discharge leachate to ponds or wetlands or spray concentrated leachate directly onto the surface of the landfill may need additional operational controls to minimize pathogen spread

Summary

Congratulations! You have completed the Off-site Permitted Landfill Module. In this module, you have learned to:

- Describe landfilling as a method for carcass management
- Understand the advantages and disadvantages of landfilling
- Consider environmental risks associated with landfilling
- Obtain regulations governing landfilling by consulting with state officials
- Identify factors used to evaluate landfilling as a carcass management option
- List critical elements when planning use of landfills
- Recognize key components of landfill operations

Please click here to download the certificate of completion for this module. You can enter your name on the certificate and save or print it for your records.