STANDARD OPERATING PROCEDURES:
14. DISPOSAL

FAD PReP
Foreign Animal Disease Preparedness & Response Plan

United States Department of Agriculture

United States Department of Agriculture • Animal and Plant Health Inspection Service • Veterinary Services

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The Foreign Animal Disease Preparedness and Response Plan (FAD PReP) Standard Operating Procedures (SOPs) provide operational guidance for responding to an animal health emergency in the United States.

These draft SOPs are under ongoing review. This document was last updated in **January 2014.** Please send questions or comments to:

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14.1 Introduction

During a foreign animal disease (FAD) outbreak, effective disposal of animal carcasses and materials is a key component of a successful response. Proper disposal can help prevent or mitigate the spread of pathogens. The overall goal is to protect the agricultural and national economy through the control and containment of disease by conducting operations in a timely, safe, biosecure, aesthetically acceptable, and environmentally responsible manner. If any materials (for example, bedding or feed) are potentially contaminated with an FAD virus, they must undergo treatment or disposal to inactivate or contain the virus. Wastes requiring disposal following an FAD outbreak include: carcasses; milk products; contaminated manure, litter, and bedding; contaminated feed; contaminated personal protective equipment (PPE); contaminated materials and equipment that cannot be cleaned and disinfected; and antimicrobials from cleaning and disinfecting.

This SOP focuses on the responsibilities of disposal personnel, evaluation of disposal options, selection and execution of optimal methods, and the disposal of related waste for FAD agents that affect livestock and poultry. Key high priority FAD agents include, but are not limited to the following:

- highly pathogenic avian influenza (HPAI)
- foot-and-mouth disease (FMD)
- classical swine fever (CSF)
- Rift Valley Fever (RVF)
- virulent Newcastle disease virus (vNDV).

Several key Animal and Plant Health Inspection Service (APHIS) documents complement this SOP and provide further detail when necessary. For more information, please see the following APHIS documents:

- Foreign Animal Disease Preparedness and Response Plan (FAD PReP)/National Animal Health Emergency Management System (NAHEMS) Guidelines:
  - Biosecurity
  - Cleaning and Disinfection (C&D)
  - Disposal
  - Health and Safety
  - Mass Depopulation and Euthanasia
  - Personal Protective Equipment (PPE).
- FAD PReP SOPs:
  - Biosecurity
  - C&D
  - Mass Depopulation and Euthanasia

- Health and Safety/PPE
- Information Management.

For individuals who have access to the APHIS intranet, these documents are available on the internal APHIS FAD PReP website: http://inside.aphis.usda.gov/vs/em/fadprep.shtml. Publicly available documents are located on the APHIS website at http://www.aphis.usda.gov/animal_health/emergency_management/.

This SOP also draws the latest information from other sources such as current best practices documented on university extensions websites and from working groups. However, because research on best practices is constantly changing and a consensus has not yet been reached on details of specific procedures, the reader should seek the advice of disposal experts and exercise judgment before implementing any of the disposal options. The purpose of this document is to give the reader all the reasonable options and describe the procedures for different disposal methods. This document also serves to give the reader a portal view into the different disposal methods to allow them to choose the option that is most suitable based on Federal, State, and local restrictions pertinent to the specific area of concern. Some useful resources include:

- Cornell University Waste Management Institute—http://cwmi.css.cornell.edu/mortality.htm
- Kansas State University, Purdue University, and Texas A&M University—http://fss.k-state.edu/FeaturedContent/CarcassDisposal/CarcassDisposal.htm
- University of Nebraska at Lincoln Extension—http://www.extension.org/pages/28022/livestock-and-poultry-mortality-composting#Routine_.26_Emergency_Carcass_Composting
- Washington State University Agricultural Extension—http://extension.wsu.edu/agriculture/animals/Pages/default.aspx

14.1.1 Goals

14.1.1.1 Preparedness Goals

The preparedness goals for disposal are as follows:

- Establish disposal protocols or procedures that meet regulatory requirements before an outbreak, for consistency and safeguarding.
- Identify suitable disposal personnel, supplies, materials, and equipment prior to an outbreak.
- Prevent the spread of the disease agent with little or no effect on the environment, considering community preferences, and conserving meat or animal protein if logistically supportable from a biosecurity viewpoint.

14.1.1.2 Response Goals

The response goal for disposal is to properly dispose of contaminated and potentially contaminated materials, including animal carcasses, as soon as possible while maximizing pathogen containment, environmental sustainability, stakeholder acceptance, and cost effectiveness.

14.1.2 Guidelines

State and local regulations and procedures for FAD-exposed or infected animal carcasses, memoranda of understanding, prior contracting, or other mechanisms need to be reviewed and regularly updated to ensure disposal capability.

Disposal will be done in a manner that will support the containment of the outbreak, minimizes the impact to public health and the environmentalm, and conserves meat or animal protein if logistically supportable from a biosecurity viewpoint. If available personnel are insufficient, the Incident Commander or responsible official should request emergency 3D (depopulation, disposal, decontamination) contractor support from the National Veterinary Stockpile (NVS).

In an FAD outbreak where mass animal casualties are likely, any single carcass disposal method may be insufficient to handle the large quantity of animal carcasses, and concurrent disposal options may be necessary. Additionally, multi-step disposal methods such as rendering followed by landfilling may be necessary.

14.1.3 Coordination

The Disposal Group must complete the following coordination activities:

- Coordinate with the Epidemiology Group to select the most appropriate disposal method for infected carcasses and materials.
- Coordinate with the Appraisal and Compensation Group before beginning disposal.
- Coordinate supply requirements and delivery location, date, and time with the Logistics Section.
- Coordinate facility access and personnel requirements with the Facility Manager or designated representative.
- Coordinate with the Mass Depopulation and Euthanasia Group to ensure that
  - the rate of euthanasia does not exceed the rate of disposal,
  - there is minimum delay between the confirmation of death and disposal, and
  - there is a properly chosen location to store the animal carcasses if the time to disposal is prolonged.
- Coordinate with the Biosecurity Group to ensure that the disposal process is conducted in a biosecure manner and that disposal group personnel are familiar with and exercise appropriate biosecurity measures.
- Obtain local regulations and procedures for carcass disposal from the State Animal Health Official or State response team.

- Identify and coordinate required supplies with the C&D and the Mass Depopulation and Euthanasia Groups.

14.1.4 Assumed Ongoing or Completed Response Activities

The following outbreak response activities are assumed in progress or completed before disposal:

- Disease confirmation—completed/ongoing
- Appraisal and compensation—completed/ongoing
- Depopulation—completed/ongoing
- Security measures and crowd control—completed/ongoing
- Quarantine—ongoing
- Movement control (animals, delivery trucks, vehicles, and fomites)—ongoing
- Surveillance—ongoing
- Monitoring, countermeasure use, and inoculation—ongoing
- Biosecurity procedures—ongoing
- Health and safety procedures—ongoing.

14.2 Purpose

This SOP provides APHIS Veterinary Services and other official response personnel with procedures for carcass and related waste disposal in the event of an FAD outbreak. This SOP is relevant in FAD outbreaks of varying sizes whether the outbreak is isolated to a single premises or to spans a region to numerous premises. The Incident Command Structure (ICS) referenced in this SOP is both flexible and scalable.

Deviations from these procedures may be permissible, if necessary, to address a given situation. Details provided in various sections may need to be combined to meet the requirements of a particular situation.

14.3 Responsibilities

The number of personnel and the organizational structure depend on the size and complexity of the incident. This section lays out essential personnel responsibilities for disposal in case of an FAD outbreak.

14.3.1 Federal Authorities

In the event of an FAD outbreak, the State, Tribal, and Federal agricultural authorities will collaborate to execute an animal health emergency response strategy to include disposal and decontamination of the affected animals and related materials, equipment, or infrastructure. These agricultural authorities may need support from other agencies depending on the scope of the outbreak.

The Department of Health and Human Services (HHS), USDA and Environmental Protection Agency (EPA) will:[1]

- Provide technical assistance and guidance to State, Tribal, and local authorities who are coordinating the disposal of animal carcasses and other outbreak-related waste.
- Coordinate with Federal, State, Tribal, and local authorities as well as food and agriculture industry during the investigation, response, decontamination, disposal, and recovery efforts.
- Coordinate with Department of Homeland Security (DHS), State, Tribal, local, and other Federal agencies on public messaging to ensure that communications are consistent and accurate.
- During an animal disease outbreak response under the authority of the Animal Health Protection Act (AHPA), the USDA will coordinate potential further Federal support to this event, with support from EPA and other agencies as specified in the Food Safety Modernization Act.

14.3.1.1 DHS

DHS, USDA, EPA, and HHS work closely together to secure America's food supply. The DHS's veterinary mission will compliment, rather than supplant the mission of veterinarians in other Federal agencies. Food and agriculture security is monitored as a part of the information analysis and infrastructure protection focus of the Homeland Security Operations Center, the primary national-level hub for information sharing and operational coordination relating to domestic incident management.[2]

14.3.1.2 HHS

HHS provides leadership by ensuring the health, safety, and security of the human food supply, animal feed, and animal therapeutics through the Food and Drug Administration (FDA). HHS, through the Centers of Disease Control and Prevention and in coordination with the States, develops and implements surveillance systems to monitor the health of the human population. The FDA is responsible for recalling potentially contaminated food products.

The Secretaries of Agriculture and Health and Human Services, in coordination with the Secretary of Homeland Security and the Administrator of the EPA, shall enhance recovery systems that are able to stabilize agriculture production, the food supply, and the economy, rapidly remove and effectively dispose of contaminated agriculture and food products or infected plants and animals, and decontaminate premises.

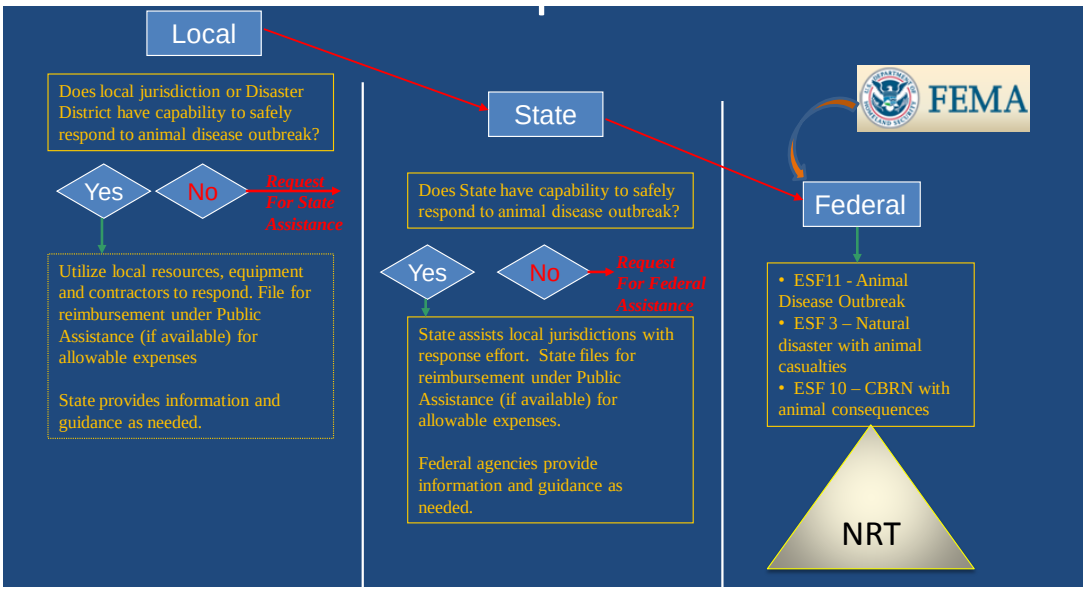
[1] Food and Agriculture Incident Annex
http://www.fema.gov/pdf/emergency/nrf/nrf_FoodAgricultureIncidentAnnex.pdf.
[2] Federal Food and Agriculture Decontamination and Disposal Roles and Responsibilities (2005)
http://www.epa.gov/homelandsecurityportal/pdf/Final_Food_and_Ag_CONOPS.pdf

14.3.1.3 USDA

In regards to the consultation and coordination with other Federal agencies, USDA shall be the lead agency with respect to issues related to pests and diseases of livestock, as stated in the AHPA.

USDA provides leadership by assuring the safety and security of processed meat, poultry and egg products through the Food Safety and Inspection Service (FSIS); and coordinating animal emergency response through APHIS. In a response, if local jurisdiction does not have the capability to respond to an animal disease outbreak, State assistance should be requested as seen in Figure 14-1. Different States have different disposal requirements, so an incident affecting product distributed to a number of States may present additional challenges. If a State does not have the capability to safely respond to an animal disease outbreak, Federal assistance should be requested. APHIS has the authority and experience in the disposal of animals infected with the disease and has, in previous animal disease outbreaks, assisted in the coordination of transportation and disposal of contaminated or potentially contaminated animal material.[2]

Figure 14-1. Disaster Response Levels



Note: FEMA = Federal Emergency Management Agency; ESF = Emergency Support Function; CBRN = Chemical, Biological, Radiological, and Nuclear; NRT = National Response Team.

FSIS has authority and experience in the disposal of contaminated meat, poultry or egg products and has also assisted in the coordination of transportation and disposal of contaminated or potentially contaminated animal products. APHIS has the authority for livestock up to the point of slaughter, but FSIS has authority for evaluating if the livestock is suitable for human consumption as an animal product. When disposal of condemned animal products occurs, FSIS works with State and local government environmental and health departments, as well as EPA regional staff, to develop suitable solutions for the product disposal.[2] In this case, FSIS will provide guidance, and monitor disposal, but the owner of the animal product is held responsible and liable for its safe disposal.

Under the AHPA, if the Secretary of Agriculture determines that there is an extraordinary emergency because of the threat and/or presence in the United States of a pest or disease of livestock, the Secretary may hold, seize, treat, apply other remedial actions to, destroy (including preventative slaughter), or otherwise dispose of, any animal, article, facility, or means of conveyance if the Secretary determines the action is necessary to prevent the dissemination of the pest or disease. The Secretary, in writing, may order the owner of any animal, article, facility, or means of conveyance to maintain in quarantine, dispose of, or take other remedial action with respect to the animal, article, facility, or means of conveyance, in a manner determined by the Secretary.

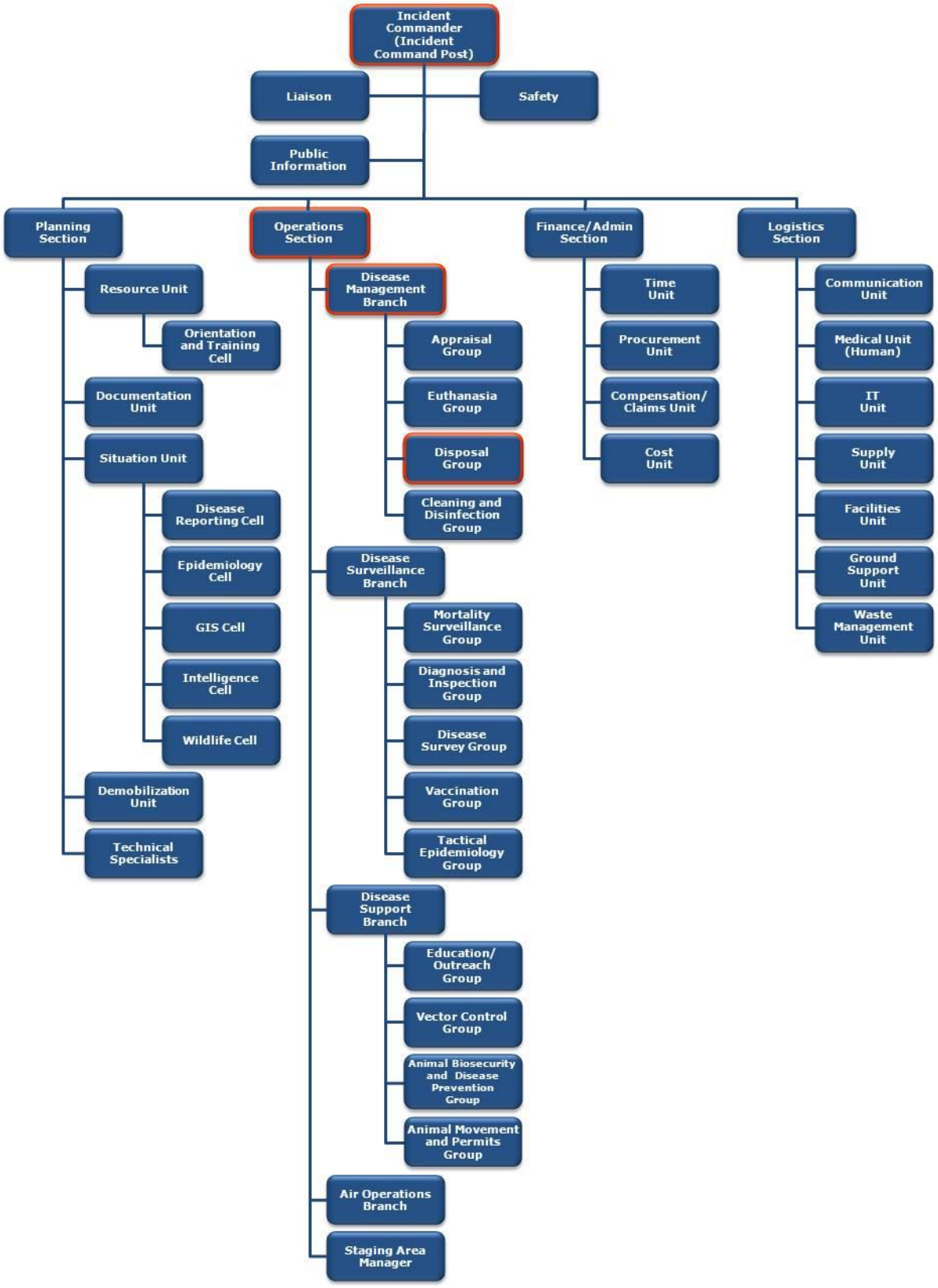
14.3.1.4 EPA

EPA regulates the management of hazardous waste and disposal of non hazardous solid waste. The responsibility for issuing permits and for monitoring and enforcing compliance of municipal solid waste programs has been delegated to the States, which must meet minimum Federal regulatory requirements and implement their own programs at the State and local level. In the event of an FAD outbreak, EPA will support USDA and Incident Command (IC) as specified in the National Response Framework.

14.3.2 ICS

Under the ICS, the Disposal Group is part of the Operations Section and falls under the Disease Management Branch. The number of personnel and the organizational structure will depend on the size and complexity of the incident. Large scale incidents may involve multiple premises and may cover large areas. Figure 14-2 shows an example ICS.

Figure 14-2. Example Incident Command Structure



All APHIS Disposal Group personnel must meet credentialing requirements as outlined in the APHIS Employee Qualification System (EQS). Contracted Disposal Group personnel must meet the credentialing requirements specified in the contract. The Disposal Group Supervisor leads the Disposal Group and reports to the Disease Management Branch Director. Depending on the incident, the Disposal Group Supervisor may deploy a Disposal Group Strike Team or a Disposal Group Task Force. Strike Teams are composed of the same resources with specific skills whereas Task Forces are composed of a variety of resources with more general skills. See Figure 14-3 for the Disposal Group command structure. Further details on the roles and responsibilities of these positions are provided below.

Figure 14-3. Disposal Group Structure

14.3.3 Disposal Group Supervisor

The Disposal Group Supervisor is in charge of all Disposal Teams (Strike Team and Task Force) and Disposal Team members. This is an individual with extensive training and experience in the proper disposal methods of euthanized animals and animal materials, including biohazard materials, generated during a response following an FAD outbreak. The Disposal Group Supervisor must have demonstrated knowledge of applicable environmental and waste transportation regulations. The Disposal Group Supervisor serves as a technical resource for information on current disposal methods and procedures, and consults with a disposal subject matter expert as needed to select a site and method, and to determine the operational timeline. This person also possesses the management skills needed to organize and direct all disposal activities for an incident. The Disposal Group Supervisor reports to the Disease Management Branch Director. Individuals selected as Disposal Group Supervisors should be identified and trained before an animal health emergency occurs.

The NAHEMS Guidelines: Disposal provides additional information on the duties of the Disposal Group Supervisor.

14.3.4 Disposal Team Leader

The Disposal Team Leader supervises a Disposal Team assigned to a clearly defined area. Depending on the size of the response, there may be several Disposal Teams, each with its own Team Leader. The Disposal Team Leader must have demonstrated experience in carcass disposal operations. Two types of teams may be deployed:

- *Disposal Strike Team*—A team with experience and technical knowledge in disposal techniques applicable to an animal disease outbreak. The team employs similar resources to carry out disposal tasks on a specific premises or set of closely related premises.
- *Disposal Task Force*—A team with skills and experience necessary to carry out disposal tasks on large complex premises or a diverse group of premises. This team has a wide variety of resources and does not necessarily possess the technical knowledge in disposal techniques applicable to animal disease outbreaks. An example of a Disposal Task Force might include one with mixed personnel such as veterinarians, police officers, and technicians.

Disposal Team Leaders (Strike Team or Task Force) should be identified well before an outbreak occurs. Team Leaders report to the Disposal Group Supervisor.

14.4 Procedures

Before an FAD outbreak, each State should have a carcass disposal plan or guidance that includes the following:

- Consider all feasible disposal alternatives that apply by consulting with disposal subject matter experts and using the disposal option decision tools located in Section 14.4.3.5.1.
- Collect and record important contact information.
- Identify sources and acquire or stockpile needed equipment and materials for disposal activities.
- Identify services such as the following:
  - Deadstock haulers
  - Heavy equipment operators
  - Disposal/treatment sites (see EPA's Incident Waste Assessment & Tonnage Estimator [I-WASTE] Tool at http://www2.ergweb.com/bdrtool/login.asp for a database of landfills and other disposal sites. Follow the instructions in Box 14-1 to access the database.)
  - Carcass composting expertise and material suppliers
  - Biohazardous waste disposal (sharps, medical waste, etc.)
  - Other ancillary disposal equipment sources for refrigeration, grinders, storage tanks, etc.

Box 14-1. I-WASTE Tool Access Instructions

I-WASTE Tool Access Instructions

1. Logon to http://www2.ergweb.com/bdrtool/login.asp and obtain a password if you do not currently have one.
2. Enter User-ID and Password.
3. Choose treatment and disposal facilities.
4. Enter filter criteria such as facility type (e.g., rendering, incinerators, or landfill)
5. Enter State or EPA region, and click "View List of Facilities" button.
6. If desired, verify current rendering facility list (see http://nationalrenderers.org/about/directory for a complete list of renderers)

14.4.1 Disposal Team Member

Disposal Group Team Members are assigned to work on Infected or Contact Premises and provide front-line assistance in containing and controlling an outbreak. The Disposal Team Supervisor assigns Disposal Group Members to premises. Disposal Team Members usually work individually on assigned premises with the owner and premises staff.

All disposal personnel should be credentialed as outlined in the APHIS EQS (applicable to APHIS personnel) or the terms of the contract (applicable to contracted personnel), and should learn as much as possible about the procedures discussed in these guidelines and in other information sources. They also should participate in educational sessions and emergency response exercises designed to help them expand their knowledge and expertise in the area of animal health emergency management.

14.4.2 Site-Specific Assessment

The assessment phase is an information-gathering phase to assist with planning the disposal response for each premises. Teams that have visited the premises such as the Surveillance Team, the Appraisal Team, and the Mass Depopulation and Euthanasia Team can share basic information about the premises with the Disposal Group Supervisor, who will in turn forward it to the established reporting system (see the Information Management SOP) for inclusion in the system database. The Disposal Group Supervisor may conduct his or her own assessment to obtain information to be used in the site-specific plan discussed in the next section.

Essential information includes

- the owner's name and mailing address of the premises,
- the global positioning system coordinates for the premises and any disposal sites it may contain (if obtainable),
- a topographic or satellite image map of the site, and

- an inventory of the supplies, equipment, and personnel (such as the people who handle the herd on a daily basis) available on-site to facilitate disposal.

14.4.3 Planning—Site-specific Disposal Plan

Planning is essential to ensure that the disposal task is carried out efficiently and unimpeded by a lack of resources. The Disposal Group Leader, in consultation with the owner or the owner's agent and other officers, prepares an FAD site-specific disposal plan. The IC must approve the plan before implementation.

14.4.3.1 Outline

The Disposal Group Leader will provide a written plan detailing how disposal will be performed at a given site. The plan should include the following sections, which are described in more detail in subsequent sections of this plan.

- Background
- Site characteristics
- Waste characteristics
- Selected site-specific disposal options
- Regulatory permits and approvals
- Materials, supplies, and equipment
- Personnel trainings and briefings
- Operational timeline for disposal
- Quality Assurance/Quality Control (QA/QC).

14.4.3.2 Background

This section includes a brief description of the premises including approximate size and number of production-related buildings, general location, type of operation, number of animals for what purpose, how the premises will be managed relative to response, and other general information.

14.4.3.3 Site Characteristics

Obtain a line drawing of the premises and a map of the area from the Natural Resources Conservation Service (NRCS) which maintains an online GIS database of land characteristics that can be used to identify locations for burial. If the NRCS does not have the data, create maps using a geospatial application such as Google Earth, Google Maps, or MapQuest. Show the following features on the drawing and/or map (the list is an example, and is not necessarily all-inclusive):

- Proximity to services and access to roads.
- Response operation access points and staging areas including biosecurity control zones (see the Biosecurity SOP for more details).

- Location of nearest landfills and other disposal facilities (see EPA's I-WASTE Tool at http://www2.ergweb.com/bdrtool/login.asp for database of disposal facilities). Follow the instructions (control-click here) in Box 14-1.

14.4.3.4 Waste Classification

In order to minimize costs and ensure compliance with all environmental regulations, waste materials from a response should be sorted by class and material type. Each State Environmental Agency makes the determination of waste classification; therefore check with the State for the most current information. The site-specific plan should include consideration of the types of waste expected and the corresponding classifications. Once the various waste streams are identified, quantities of each type can be estimated to facilitate efficient transport and to identify appropriate disposal options.

Because of the complexities of classifying waste accurately for transportation and disposal, and the magnitude of the liability for improper disposal, a qualified waste disposal professional should be consulted for assistance with waste classification planning and execution. However, it may be useful for the Disposal Team to understand the process of waste classification or identification so they can organize their work efficiently. Therefore, the following information is provided as background.

14.4.3.4.1 Solid and Hazardous Waste

According to the EPA website (http://www.epa.gov/osw/hazard/wastetypes/wasteid/index.htm):

> The hazardous waste identification (HWID) process is the crucial first step in the hazardous waste management system. Correctly determining whether a waste meets the Resource Conservation and Recovery Act (RCRA) definition of hazardous waste is essential to determining how the waste must be managed. The waste generator has responsibility for determining if a waste is a RCRA hazardous waste. (See: 40 CFR [Code of Federal Regulations] 262.11)
>
> The HWID process consists of four questions:
>
> 1. Is the material a solid waste? (See: 40 CFR Part 261.2)
> 2. Is the waste specifically excluded from RCRA? (See: 40 CFR Part 261.4)
> 3. Is the waste a listed hazardous waste? (See: 40 CFR Part 261.30)
> 4. Does the waste exhibit a characteristic of hazardous waste? (See: 40 CFR Part 261.20)

14.4.3.4.2 Medical/Infectious Waste

In addition to solid and hazardous waste, EPA also provides guidance on medical-infectious waste. According to the EPA website (http://www.epa.gov/wastes/nonhaz/industrial/medical/disposal.htm), medical waste is all waste materials generated at health care facilities, such as hospitals, clinics, physician's offices, dental practices, blood banks, and veterinary hospitals/clinics, as well as medical research facilities and laboratories.

The Medical Waste tracking Act of 1988 defines medical waste as "any solid waste that is generated in the diagnosis, treatment, or immunization of human beings or animals, in research pertaining thereto, or in the production or testing of biologicals." This definition includes, but is not limited to

- blood-soaked bandages;
- culture dishes and other glassware;
- discarded surgical gloves;
- discarded surgical instruments;
- discarded needles used to give shots or draw blood (e.g., medical sharps);
- cultures, stocks, swabs used to inoculate cultures;
- removed body organs (e.g., tonsils, appendices, limbs); and
- discarded lancets.

The EPA-sponsored guidance document on medical waste management for States [Model Guidelines for State Medical Waste Management, Council of State Governments and USEPA Office of Solid Waste. (1992)] defines medical waste as sharps…[and] animal waste…[where] animal waste includes,

> contaminated animal carcasses, body parts, fluids and bedding of animals that have been afflicted with suspected zoonotic disease or purposely infected with agents infective to humans during research, in the production of biologicals, or in the in vivo testing of pharmaceuticals.

EPA further defines infectious waste in its Guide for Infectious Waste Management (EPA530-SW-86-014) as a waste that

> contains pathogens with sufficient virulence and quantity so that exposure to the waste by a susceptible host could result in an infectious disease.

EPA then delegates regulation of medical/infectious waste to the States.

State regulations vary widely in regards to diseased animal disposal. Approximately one-third of States specifically allow landfilling of diseased animal carcasses. Two-thirds of States don't mention landfilling of diseased animals specifically. One State (Arkansas) specifically prohibits landfilling of large animals. Furthermore, some States specifically exclude diseased animals from medical/infectious waste regulations.

In addition to EPA regulations, the US Department of Transportation also requires materials to be classified prior to transport on public roads. According to the Department of Transportation Hazardous Materials Program Definitions and General Procedures at 49 CFR 105.5(b),

> Hazardous material means a substance or material that the Secretary of Transportation has determined is capable of posing an unreasonable risk to health, safety, and property when transported in commerce, and has designated as hazardous under section 5103 of Federal hazardous materials transportation law (49 U.S.C. 5103).

The term includes hazardous substances, hazardous wastes, marine pollutants, elevated temperature materials, materials designated as hazardous in the Hazardous Materials Table (see 49 CFR 172.101), and materials that meet the defining criteria for hazard classes and divisions in part 173 of subchapter C of this chapter. Section 49 CFR 172.101(a) of the Hazardous Materials Table includes Label Code 6.2, Infectious Substances, which are identified in the table as UN2900 (infectious substances affecting animals only) or UN2814 (infectious substances affecting humans).

14.4.3.4.3 Material Types

Once each waste stream is classified as discussed in the previous subsection, then each class can be further sorted by material type to facilitate transport and disposal. For example, the solid waste classification may include wastewater as well as construction debris. The wastewater might be hauled in a tanker and taken to a municipal wastewater treatment plant, while the construction debris might be hauled in dump trucks and taken to a construction and demolition landfill.

EPA's I-WASTE Tool is useful for planners, emergency responders, and other individuals responsible for making disposal decisions and can be found at http://www2.ergweb.com/bdrtool/home.asp. Registered users can access technical information, regulations, and guidance to quickly produce an order of magnitude waste estimate, and access the treatment and disposal facility database and/or other guidance and information.

A list of common waste material types likely to be encountered during a response include:

- Animals carcasses
- Animal products—milk, wool, etc.
- Bedding
- Feed
- Equipment, supplies, and materials (e.g., vaccination or diagnostic syringes, personal protective equipment, trash)
- Debris
- Other.

14.4.3.5 Selecting Site-Specific Disposal Options

The plan should provide details of how to implement all the disposal options that apply to the specific site and situation to facilitate flexibility during the response. The Disposal Group Supervisor may choose to use one or more of the different disposal methods, depending on the circumstances. Because selecting an optimal disposal option in an animal health emergency involves many complex factors and concerns, several tools are provided in the following sections to assist the decision-maker, including a decision matrix, flowchart, and checklist. For detailed planning and implementation procedures for each disposal option, see Attachments A–G. For background information and a more detailed discussion of disposal concepts, see the FAD PReP/NAHEMS Guidelines: Disposal. In addition, Attachment 14.H contains a review of Waste

Management Considerations from the US EPA website at http://www.epa.gov/wastes/homeland/consid.htm#segregation.

14.4.3.5.1 Disposal Option Decision Tools

14.4.3.5.1.1 Disposal Options Matrix

Table 14.1 ranks the disposal options based on 15 different criteria. The first column lists the 15 different criteria and subsequent columns represent the most common disposal options. The footnotes below the table contain additional information for each criterion including an explanation of the ranking for that criterion if applicable. The numbers shown in each box represent the ranking for each criterion as it relates to each option. A higher numerical ranking indicates a more preferable option. Note that the rankings are subjective based on the judgment of the authors and subject to interpretation by the user. When the numerical rankings for each option are totaled and divided by the number of applicable criteria, the average scores can be compared to determine the relative ranking of the various options. The disposal options are listed from left to right in the table in order of preference based on the average numerical ranking. The disposal options with greatest likelihood of exposure to humans within each row are shaded in red, options entailing some exposure are shaded yellow, and options with the least exposure are shaded green. This order of preference is used throughout the rest of this document to prioritize disposal options.

Table 14-1A. Disposal Options Matrix

	Onsite Composting	Rendering	Permitted Landfill	Regional Composting Facility*	Fixed Incineration	Open Burning	Unlined Burial	Mobile Technologies**
Public health risk (1)	3	3	3	3	3	2	1	?
Need to transport carcasses offsite (2)	3	1	1	1	1	3	3	3
Byproducts (3)	3	3	2	3	3	1	1	?
Biosecurity (4)	2	3	2	2	2	1	1	?
Pathogen inactivation (5)	3	3	1	3	3	2	1	?
Cost effectiveness (6)	3	2	3	3	1	1	3	?
Environmentally sustainable (7)	3	3	2	3	2	1	1	?
Volume reduction (8)	2	3	2	2	3	3	2	?
Capacity (9)	2	2	3	2	1	2	3	1
Throughput (10)	2	3	3	2	1	2	2	1
Availability (11)	2	2	3	2	1	3	1	1
Speed to implement (12)	2	2	3	2	2	1	1	?
Public acceptance (13)	3	2	3	3	2	1	1	?
Efficiency (14)	2	3	2	2	2	1	2	?
Operability (15)	2	2	2	2	2	2	3	1
Total Points	37	37	35	35	29	26	26	7
Average Score	2.5	2.5	2.3	2.3	1.9	1.7	1.7	1.4

(*) Regional composting is not discussed further because at the time of this writing there were no regional mortality composting facilities known to the authors. (**) Mobile technologies are relatively untested, resulting in a lack of data with which to rank them against the criteria. Therefore, only five of the 15 criteria were evaluated for mobile technologies. Question marks were not factored into the scores. (1) Public health risk – based on the United Kingdom (UK) 2001 health risk assessment which excluded composting and mobile technologies. (2)Transport carcasses offsite − considered a disadvantage for pathogen containment (if done safely, risk is minimized). (3) Byproducts − If the waste stream from the disposal option is lower volume or less hazardous than carcasses = 3, if it's the same volume or hazard = 2, if waste stream is higher volume or more hazardous than carcasses = 1. (4) Biosecurity − If process can be contained and easily disinfected = 3, if process is somewhat contained, but the processing area is difficult to disinfect = 2, if process is not contained = 1. (5) Pathogen Inactivation − does option inactivate pathogen? (6) Cost effectiveness − cost to perform option from *Kansas State Carcass Disposal: A Comprehensive Review* where <$100/ton = 3, $100/ton − $250/ton = 2, > $250/ton = 1. (7) Environmental sustainability − low risk of environmental contamination and useful end product = 3, low risk of environmental contamination or useful end product = 2, risk of environmental contamination and no useful end product = 1. (8) Volume reduction = process results in less waste volume = 3, same volume = 2, more volume = 1. (9) Capacity − unlimited availability = 3, regional or somewhat available = 2, very limited availability = 1. (10) Throughput − the amount of biomass that can be processed per day. If >50K/day = 3, between 20K - 50K = 2, <20K = 1. (11) Availability of equipment, materials, resources for options − readily available = 3, limitations on some aspects = 2, limitations on all aspects = 1. (12) Speed to implement − how quickly can option begin taking first carcasses including obtaining regulatory approval. (13) Public acceptance − likelihood of public protests where low = 3, medium = 2, and high = 1. (14) Efficiency − amount of inputs (utilities, chemicals, fuel, carbon source) to achieve optimal output (volume reduction, pathogen inactivation) in short amount of time. (15) Operability − ease of implementation, for example simple to do, operators readily trained.

The rankings in tables 14-1A and 14-1B are consistent with the public health risks tabulated by the United Kingdom (UK) Department of Health (now the Department for Environment, Food and Rural Affairs), in "A Rapid Qualitative Assessment of possible risks to Public Health from current Foot & Mouth Disposal Options, Main Report," June 2001. The risk table is shown in Table 14-1B.

Table 14-1B. Summary of Potential Health Risks, Disposal Methods, and Pathways[3]

Potential Public Health Hazard	UK 2001 DISPOSAL OPTION RISK ASSESSMENT					Pathways of Agents to Humans
	Rendering	Incineration	Landfill	Pyre	Burial	
Campylobacter, E. coli (VTEC), Listeria, Salmonella, B. anthracis, C. botulinum, Leptospira, Mycobacterium, TB v. bovis, Yersinia						Private water supplies Direct contact Recreational water use Possibly also shellfish
Cryptosporidium, Giardia						Water supplies Crops, shellfish Direct contact Recreational water use
Clostridium tetani						Contact with contaminated soil
Prions for BSE, Scrapie						Water supplies via leachate, runoff, ash burial
Methane, CO_2						Migration into buildings
Fuel-specific chemicals, metal salts						Inhalation Deposition into food chain
Particulates, SO_2, NO_2, nitrous particles						Inhalation
PAHs, dioxins						Inhalation Deposition into food chain
Disinfectants, detergents						Water supply Inhalation of products
Hydrogen sulfide						Inhalation

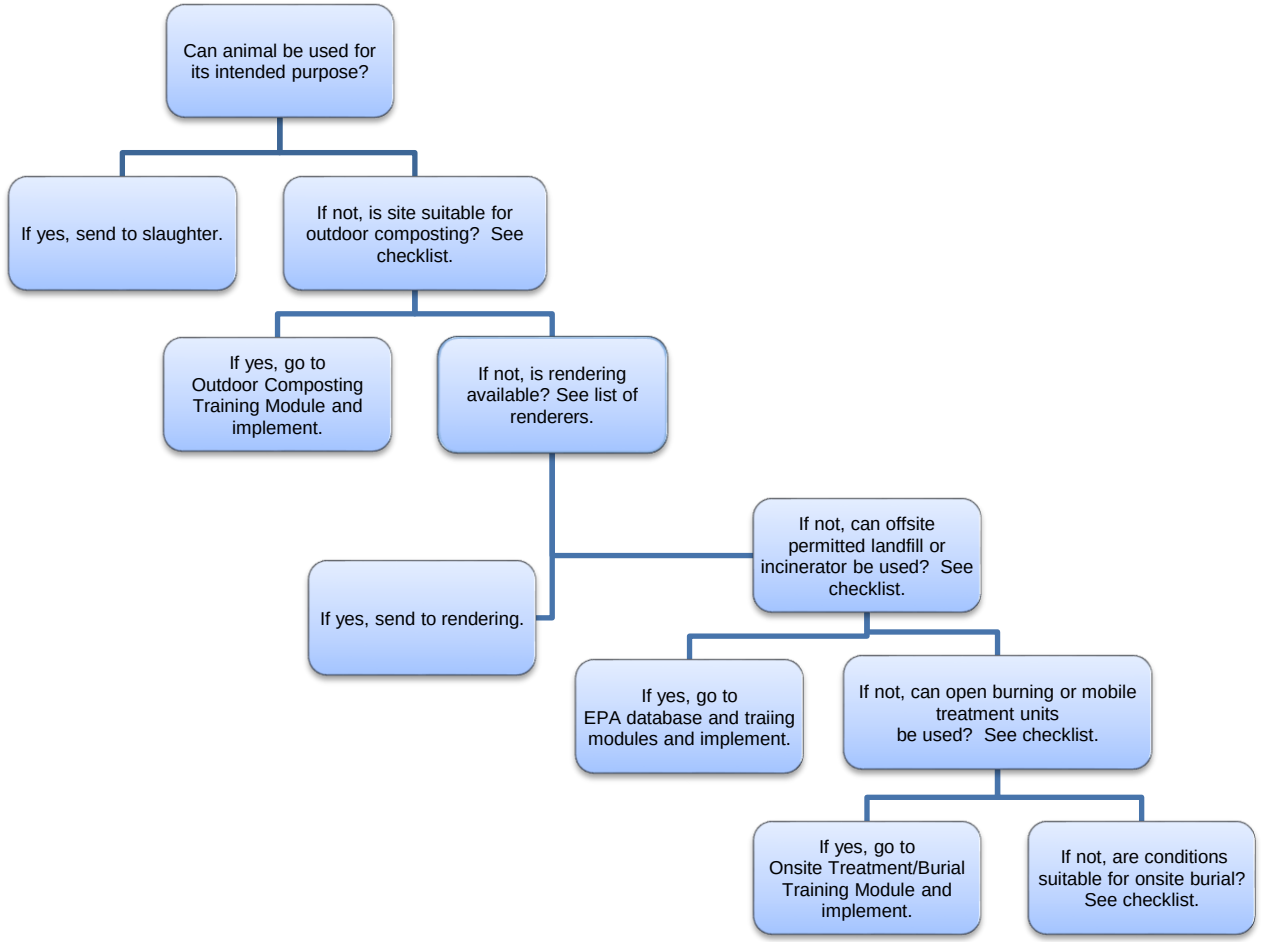
Note: The disposal option with greatest likelihood of exposure to humans within each row is shaded in red, options entailing some exposure are shaded yellow, and options with the least exposure are shaded green; VTEC = Verotoxin-Producing E. coli; TB = Tuberculosis; BSE = Bovine Spongiform Encephalitis; CO_2 = Carbon Dioxide; SO_2 = Sulfur Dioxide; NO_2 = Nitrogen Dioxide; PAHs = Polycyclic Hydrocarbons.

[3] UK Department of Health . A Rapid Qualitative Assessment of possible risks to Public Health from current Foot & Mouth Disposal Options, Main Report. June 2001.

14.4.3.5.1.2 Decision Tree

The decision tree shown in Figure 14-4 corresponds with the checklist below that appears in Box 14-2.

Figure 14-4. Livestock Mortality Disposal Decision Tree



14.4.3.5.1.3 Checklist

Box 14-2 is a disposal option selection checklist which is designed to enable the Disposal Group Supervisor to select the suitable disposal options for a particular site as efficiently as possible.

The questions are in order of preference based on the disposal response goals defined in Section 14.1.1:

- Efficient outbreak containment
- Environmental sustainability including minimizing waste
- Stakeholder acceptance
- Cost effectiveness.

This checklist was developed by USDA APHIS Veterinary Services National Center for Animal Health Emergency Management from information contained in the APHIS Online Carcass Disposal training modules which are available at: http://www.aphis.usda.gov/emergency_response/tools/aphis_role_emergency_tools.shtml. The training modules also include extensive information on the advantages and disadvantages of the disposal options mentioned.

Box 14-2. Disposal Options Checklist

1. Can livestock be used for intended purpose?
   If so, send to slaughter or other processing. If not,
2. Is site suitable for composting?
   a. Are the carcasses poultry and based on the expert opinion of a trained and qualified compost specialist is the house suitable for in-house composting?
      i. Sufficient space to maneuver composting equipment and construct windrows? The facility should contain enough open space and ceiling must be high enough to allow the loader to construct windrows 6 feet high and 12 feet wide. Facilities with columns, such as double-deck houses, restrict such formations.
      ii. Located in an area that is accessible by the composting equipment? This facilitates the delivery of carbon source and compost removal.
      iii. Can doors be secured against scavengers or disease vectors?
      iv. Sufficient local supply of carbon source?
      v. If answer to all above questions is yes, then see In-House Composting Training Module at www.aphis.usda.gov/emergency_response/tools/aphis_role_emergency_tools.shtml and implement in-house composting. If not,
   b. Based on the expert opinion of a trained and qualified compost specialist is the site suitable for outdoor composting?
      i. Based on the expert opinion of a trained and qualified compost specialist, are the site conditions suitable for composting the number of animals affected?
         1) At least 200 feet from water wells, surface water bodies (lakes, streams, rivers, etc.), sinkholes, seasonal seeps or other landscape features that indicate the area is hydrologically sensitive?
         2) Adequate land area to build compost piles (assume approximately one acre per 100 cows)?
         3) Located away from neighbors and/or out of sight?
         4) Located downward from neighbors and/or houses?
         5) Located away from environmentally-sensitive areas?
         6) Located close to the livestock facility or have clear access for transport?
         7) Clear of overhead utility lines?
         8) Void of excess water?
         9) Located on a gentle slope (1%–3%) so there will be no water ponding?

ii. If so, is there a sufficient local supply of carbon source such as wood chips (3 pounds carbon source per pound of livestock)?
iii. If answer to all above questions is yes, then see Outdoor Composting Training Module at www.aphis.usda.gov/emergency_response/tools/aphis_role_emergency_tools.shtml and implement outdoor composting. If not,

3. Is rendering available?
    a. See a complete list of renderers at http://nationalrenderers.org/about/directory or the EPA's I-WASTE Tool at http://www2.ergweb.com/bdrtool/login.asp.
    b. If so, see the Secure Transport Training Module and securely transport to rendering. If not,
4. Transport to offsite permitted landfill or fixed incineration facility for disposal (see I-WASTE at http://www2.ergweb.com/bdrtool/login.asp for list of disposal facilities in your area).
    a. Logon to http://www2.ergweb.com/bdrtool/login.asp.
    c. Enter userid and password (obtain a userid and password if you do not currently have one).
    d. Choose treatment and disposal facilities.
    e. Enter filter criteria such as facility type (e.g., rendering, incinerators, or landfill)
    f. Enter State or EPA region, and click "View List of Facilities" button.
    g. See secure transport and off-site burial and treatment training modules at www.aphis.usda.gov/emergency_response/tools/aphis_role_emergency_tools.shtml and implement off-site disposal.
5. If options 1–4 are unavailable, is site suitable for open air burning?
    a. Based on the expert written opinion of an experienced air quality specialist, will open burning release air pollutants in excess of public health standards? If not,
    b. Does the applicable permitting authority allow open air burning?
        i. Local Fire Department
        ii. State Department of Agriculture or Animal Health
        iii. State Department of Environment or Natural Resources
        iv. USDA APHIS
        v. EPA
    c. If so, can the permit conditions be met?
    d. If so, is there an adequate source of combustible material such as fire wood to keep the fire going?
    e. If yes to all the above questions, then see On-site Burial and Treatment Training Module at www.aphis.usda.gov/emergency_response/tools/aphis_role_emergency_tools.shtml and implement onsite open air burning. If not,
6. Are mobile treatment technologies available for your area?
    a. Contact all appropriate mobile treatment technology vendors.
    b. Verify the units are available for deployment to your site.
    c. Verify your ability to meet all site/utility requirements.
    d. Verify units can be fully disinfected after use.
    e. Verify the units have adequate capacity to meet your needs.
    f. If the capacity is less than needed, can the carcasses be stored/refrigerated while awaiting disposal?
    g. Verify the availability of skilled operators and spare parts to keep the units operational.

h. Is the technology permitted by the applicable regulatory authorities?
    i. State Department of Agriculture or Animal Health
    ii. State Department of Environment or Natural Resources
    iii. USDA APHIS
    iv. EPA
i. If so, can the permit conditions be met?
j. If so, can the technology process byproducts be readily disposed?
k. If the answer is yes to all the above questions, then see On-site Burial and Treatment Training Module at www.aphis.usda.gov/emergency_response/tools/aphis_role_emergency_tools.shtml and implement on-site mobile technologies. If not,

6. Is site suitable for onsite burial?
    a. Are soils suitable (see USDA NRCS online Web Soil Survey)? If so,
    b. Based on the expert written opinion of an experienced groundwater hydrologist, will leachate contaminate groundwater in excess of public health standards? If not,
    c. Is adequate land available for on-site burial? (See excavation volume chart in Attachment 14.I). If so,
    d. Is burial permitted by applicable regulatory authorities? Can permit requirements be met? If so,
    e. Will land owner accept on-site burial and associated environmental liabilities?
    f. If the answer is yes to all the above questions, then implement on-site burial and see the On-site Burial and Treatment Training Module at www.aphis.usda.gov/emergency_response/tools/aphis_role_emergency_tools.shtml.

14.4.3.5.2 Storage

In order to address situations where the Euthanasia Group generates mortalities more quickly than the Disposal Group can process them, some means of temporary carcass storage must be provided. The site-specific plan must address where carcasses can be collected and stored until disposal can commence. According to the EPA regulations regarding storage and collection of solid waste (40CFR243.200-1(a)):

> All solid wastes … shall be stored in such a manner that they do not constitute a fire, health, or safety hazard or provide food or harborage for vectors, and shall be contained or bundled so as not to result in spillage. All solid waste containing food wastes shall be securely stored in covered or closed containers which are nonabsorbent, leak-proof, durable, easily cleanable (if reusable), and designed for safe handling. Containers shall be of an adequate size and in sufficient numbers to contain all food wastes, rubbish, and ashes that a residence or other establishment generates in the period of time between collections. Containers shall be maintained in a clean condition so that they do not constitute a nuisance, and to retard the harborage, feeding, and breeding of vectors. When serviced, storage containers should be emptied completely of all solid waste.

These guidelines can be applied to animal mortalities, which are essentially food waste.

Some planning considerations are listed below:

- 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 to perform the selected method(s)?
- Will the storage capacity be sufficient to accommodate the difference between the maximum expected euthanasia rate and the maximum disposal rate? If not,
- Avoid euthanizing animals at a rate that exceeds disposal and storage capacity. When maximum disposal and storage capacities are reached, curtail euthanasia until adequate capacity is available. Vaccination can be considered as a tool to slow or eliminate the need for euthanasia.
- 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? See the NAHEMS Guidelines: C&D and the C&D SOP.
- 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? Ensure the safeguards will 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 qualified waste management professional for assistance.

14.4.3.5.3 Transport

Transport vehicles will be needed to transport items (carcasses, other materials) to the disposal site whether it is on or off the premises. 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 qualified waste management professional when developing this section of the plan. Some other transport planning considerations are listed below:

- Do disposal facilities selected for this premises have any special requirements for incoming waste shipments?
- Have the disposal facilities agreed to accept the type and amount of waste you plan to send them and are they permitted appropriately?
- Have members of the disposal team visited the facility to ensure it is operated in accordance with all applicable laws and regulations?

- Is there an existing contract or agreement in place with the disposal facility to receive the material?
- 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 in accordance with all applicable laws?
- Are transport vehicles designed to handle the materials to be transported?
- Are the drivers adequately trained in biosecurity (see 49 Code of Federal Regulations [CFR] 172 and 173 Department of Transportation [DOT] regulations for further guidance)?
- Can two-way communications be maintained with the hauler during transport?
- Do shipments require law enforcement escorts?
- What travel routes will be used from the premises to the disposal site? Care must be taken to avoid 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?
- Does the receiving facility have sufficient space for incoming vehicles to avoid causing traffic disruptions on access roads? Does it have a secure location for transport vehicles, freezers, or other means of storage if there is a delay of more than 1 day?
- Coordinate with State and local transportation authorities to verify any transport restrictions and obtain any necessary permit requirements and document these conditions in the site-specific plan.
- How will vehicles be cleaned and disinfected before leaving the affected premises and after materials have been offloaded at the disposal site? See the NAHEMS Guidelines: Biosecurity and Biosecurity SOP for more details.
- How is the waste classified for transport? What DOT packaging standards apply? Are all standards consistently met, including labeling, placarding, and manifesting?
- How will vehicle loading be performed in order to avoid releasing biological agent(s) to the environment?
- How will transport vehicle traffic be minimized into the Control Area?

14.4.3.6 Regulatory Permits and Approvals

The lead emergency response agency or its designee (such as a contractor) is responsible for ensuring compliance with all legal requirements, including obtaining permits or approvals before beginning work. The Disposal Group Supervisor must work with appropriate officials to issue contracts and leases for equipment, supplies, or personnel for disposal operations.

Permits may be issued by a variety of entities for various purposes. Typical permit-requiring activities include:

- storing and transporting infectious or hazardous waste materials,
- operating a treatment or disposal facility,
- implementing the chosen disposal method (for example, fire permits for thermal methods and land use permits for burial),
- discharging waste liquids (such as disinfectant solution or leachate) and air emissions, and
- digging in an area where utilities may be present.

14.4.3.7 Materials, Supplies, and Equipment

The Disposal Group must identify all necessary materials, supplies, and equipment to carry out the chosen site-specific disposal method(s) and include the list in the site-specific disposal plan.

The various disposal options listed below in order of preference (based on disposal options advantages and disadvantages) and may require various types of materials, supplies, and equipment. The lists are not all-inclusive, but are provided as an example of the types of materials, supplies, and equipment which might be needed. For complete lists, consult option-specific specialists.

- *Rendering*. See the materials, supplies, and equipment listed below in the Secure Transport Section.
- *On-Site Composting*. Carbon source, compost thermometers, material-handling equipment, water, electricity, fuel for equipment, vessels (if using), dust suppression system, hand tools, trained compost specialist, active compost culture, compost fleece, and an impermeable base layer if needed.[4]
- *Permitted Landfill*. See Secure Transport materials, supplies, and equipment listed below.
- *Regional Composting*. See Secure Transport materials, supplies, and equipment listed below, as well as On-Site Composting, above.
- *Fixed Incineration*. See Secure Transport materials, supplies, and equipment listed below.
- *Open Burning.* Fuel, structure for ensuring airflow for combustion, ignition source.
- *Unlined Burial*. Earth-moving equipment and operators; sheeting and shoring; and dewatering equipment.
- *Mobile Technologies*. Treatment units, fuel, utility feeds, chemical feeds, spare parts, parallel units, material-handling equipment, dust suppression system (if needed), hand tools, and trained operators.

[4] See USDA APHIS, Carcass Disposal Training Tool: In-House Composting Training Module, http://www.aphis.usda.gov/animal_health/emergency_management/modules_tools.shtml, for details on in-house composting.

- *Secure Transport.*
  - Secure transport vehicles (driven by trained drivers) such as rendering trucks.
  - C&D and/or biosecurity supplies and materials; See the C&D and Biosecurity SOPs.
  - Truck liners, if using trucks that might leak
  - Loading equipment
  - Liner sealing equipment and material
  - Absorbent material to prevent leakage
  - United States DOT approved containers, labels, and placards
  - Suitable containers for the contents that are also compatible with the selected treatment process (that is, biodegradable bags for composting animal bedding and manure).
- *Miscellaneous*.
  - Plastic sheeting
  - biohazardous waste bags and containers
  - sharps containers.

14.4.3.8 Personnel Training and Briefings

The Disposal Group Supervisor works with the Disease Management Director and Operations Section Chief to identify Disposal personnel with the required expertise as identified in the site-specific disposal plan. State emergency management agencies also should be involved to identify disposal personnel with the required expertise (as identified in the site-specific disposal plan) from multiple government and private sources. The Disposal Group Supervisor and Team Leader must verify credentials, training, and security clearances and arrange just-in-time training as needed. The Disposal Group Supervisor will advise the Operations Section Chief of any personnel requirements that cannot be satisfied locally so that additional personnel can be assigned. If appropriate personnel are not readily available, contact the USDA NVS for access to 3D contractors. The Disposal Group Supervisor will ensure up-to-date contact information—names; postal, express mail, and e-mail addresses; and cell, office, and home telephone numbers for personnel willing and qualified to serve as disposal team managers and members.

14.4.3.8.1 Site Security and Safety

Disposal personnel (equipment operators, drivers, contractors) will be briefed on safety requirements, site conditions, and tasks. For donning PPE and other health and safety needs, see the FAD site-specific health and safety plan and the NAHEMS Guidelines: Health and Safety, NAHEMS Guidelines: Personal Protective Equipment, and the Health and Safety/PPE SOP. All personnel entering the site must

- meet security requirements as established by the IC,
- present documentation of verified credentials showing they are qualified to perform their assigned tasks,

- present documentation that they have received all required briefings as defined in the site-specific disposal plan,
- wear the required PPE specified in the site-specific health and safety plan. See the Health and Safety/PPE SOP, and
- follow all Biosecurity procedures specified in the site-specific biosecurity plan. See the NAHEMS Guidelines: Biosecurity and Biosecurity SOP for more information.

14.4.3.8.2 Briefings

All Disposal Group personnel, including the Disposal Group Supervisor, Disposal Team Leader(s), and Disposal Team Members should begin by reading and understanding all aspects of the approved Site-Specific Disposal Plan which was developed in accordance with the Procedures – Planning section, above. The Disposal Group Supervisor will review the plan with all Disposal Group members and brief them on all aspects of the disposal effort, including their duties, the policies and procedures. The Disposal Group Supervisor also will regularly prepare briefings and reports for the Operations Section Chief and notify him or her immediately of any problems.

Other briefings are as follows:

- The Site Safety Officer will brief all responders on safety precautions for each operation in accordance with the site-specific health and safety plan. See the Health and Safety/PPE SOP.
- The Biosecurity Officer will brief all responders on biosecurity protocols before entering the Hot Zone-Exclusion Zone (EZ). See the Biosecurity SOP.
- Orientation Training Group personnel will brief Disposal Group members on the nature of the disease and any other circumstances that might affect the response.

14.4.3.9 Operational Timeline for Disposal

Develop a schedule of all disposal tasks indicating a description of each task, the duration, when each task will start, the order in which the tasks will be completed, and any task dependencies. A Gantt chart developed in a project management software program such as Microsoft Project or similar can be used to facilitate developing the schedule.

14.4.3.10 QA/QC

The Disposal Group supervisor must outline QA/QC metrics to include post-disposal evaluation and inspection necessary to comply with the plan. This section of the FAD site-specific disposal plan must address inspections and spot checks that the Disposal Group Supervisor or designee may perform to ensure strict adherence to all biosecurity measures and required disposal protocols. Document each inspection and conduct spot checks. Documentation should include the following:

- Date and time
- Name and contact information of inspector

- Name and contact information of responsible party engaged in activity
- Location
- Activity observed
- Outcome of observations.

14.4.4 Operations

14.4.4.1 Site Preparation

14.4.4.1.1 Validate Plan

Upon arriving at the premises to begin disposal operations, refer to the site-specific disposal plan for the locations of work areas, access points and staging areas. This should be performed in close cooperation with the Depopulation and C&D teams if they are not the same personnel. In addition,

- ensure that the areas designated in the plan are adequate for the task, and adjust as necessary.
- mark areas in the field with spray paint or caution tape.
- check any changes with the Disposal Group Supervisor to ensure that the changes won't interfere with other activities or be unacceptable to the premises owner/operator.

14.4.4.1.2 Install Features

Install access controls, biosecurity measures, staging pad, and any other features called for in the plan that haven't already been installed.

14.4.4.2 Waste Characterization

Response personnel should perform the following waste related actions:

- Using the Site Specific Disposal Plan for reference, identify all waste materials designated for disposal.
- Mark waste materials if appropriate, and verify with the Disposal Group Supervisor that all designated materials are to be disposed of.
- Sort materials by type, such as recyclables, putrescible waste, debris, and potentially hazardous waste. Consult with a qualified disposal specialist.
- Stage the various waste materials in suitable areas as spelled out in the plan, and containerize putrescible or wet materials to avoid leaching to the environment. Depending on conditions, waste materials may require covering with tarps or even be stored under roof or indoors.
- Estimate the quantities of each waste type and record the information for reference when arranging for disposal.
- Characterize each waste type in accordance with all applicable local, State, and Federal regulations. Consult a qualified waste management specialist to ensure proper

characterization so the correct disposal option can be selected for each waste stream. Improper waste disposal can result in significant penalties, including fines and imprisonment. If improperly disposed waste creates environmental contamination, significant 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.

14.4.4.3 Regulatory Permits and Approvals

During all disposal activities, ensure the work is performed in strict accordance with the conditions of all regulatory permits and approvals obtained during the planning phase, and in accordance with regulatory officials' directions if present during disposal operations.

14.4.4.4 Materials, Supplies, and Equipment

The Disposal Group must obtain equipment and tools to sort, organize, consolidate, collect, stage, move, and manage waste. The site-specific disposal plan lists the items required for disposal. The Disposal Group Supervisor should coordinate with the Logistics and Contracting Sections to identify, order, and stage materials, supplies, and equipment.

14.4.4.5 Disposal Options Implementation

14.4.4.5.1 General

The Site-Specific Disposal Plan identifies those disposal options applicable to the specific site. All identified disposal options may not apply to all types of waste generated during the response. Below is a discussion of the various waste types which may be encountered during the response, and how the disposal options might apply to each waste type.

14.4.4.5.2 Carcasses

Dispose of all carcasses in accordance with the approved Site Specific Disposal Plan.

Implementation procedures for each of the following disposal options are discussed in more detail in the following Attachments:

- 14.A Composting
- 14.B Rendering
- 14.C Landfilling
- 14.D Fixed Incineration
- 14.E Air-Curtain Incineration
- 14.F Open-Air Burning
- 14.G Unlined Burial.

14.4.4.5.3 Manure, Litter, Bedding, Feed, Hay, and Straw

The response may generate large volumes of other waste materials besides carcasses, including potentially infectious manure, bedding, litter, feed, and wool. These materials must be classified in accordance with applicable solid waste rules, and may be considered bio-hazardous. Bio-secure disposal of disease-contaminated manure, litter, bedding, feed, and wool is critical because these materials can contain high levels of virus and can be a significant source of infection for susceptible animals.

14.4.4.5.3.1 Manure

Of the top three preferred disposal options from Table 14-1 (onsite composting, rendering, and permitted landfill), rendering is generally not suitable for manure. Onsite composting can be useful if the site is suitable. If not, the manure may require secure transport to a permitted landfill, or disposal by one of the other options (regional composting, fixed incineration, open burning, unlined burial, or mobile technologies).

According to the UK Environment Agency,[5] manure, litter, and slurry infected with FMD virus, or suspected to be infected with FMD, are considered hazardous waste and should be treated accordingly. Once treated, the manure can be applied to land in accordance with an approved nutrient management plan.

14.4.4.5.3.2 Litter, Bedding, Feed, Hay and Straw

Some FAD viruses are highly transmissible, and litter, bedding, feed, hay and straw that are not properly treated may be a source of transmission. Of the top three preferred disposal options from Table 14-1 (rendering, onsite composting, and permitted landfill), rendering is generally not suitable for manure, litter, bedding, feed or wool. Onsite composting can be useful for these materials if the site is suitable. If not, these materials will have to be securely transported to a permitted landfill, or disposed by one of the other options (regional composting, fixed incineration, open burning, unlined burial, or mobile technologies).

14.4.4.5.4 Sharps and Vaccines

During a response to an FAD outbreak, various types of veterinary medical waste are generated, such as sharps,[6] vaccine vials, and other disposable vaccination-associated equipment, if vaccination is used. These items are typically regulated by States as medical or infectious waste, and should be disposed of in accordance with all applicable local, State, and Federal regulations. Because of the complexity of the applicable regulations, obtain the services of a medical waste disposal contractor to dispose of sharps and other medical wastes generated during the response.

[5] UK Environment Agency. http://www.defra.gov.uk/ahvla-en/disease-control/notifiable/fmd/.
[6] Sharps include needles and syringes, for example.

14.4.4.5.5 PPE

Disposable PPE worn by personnel involved in the eradication effort (for example vaccination personnel, C&D personnel, and appraisal personnel) will require proper disposal to reduce the biosecurity risk. Obtain the services of a qualified waste disposal company for this task.

14.4.4.5.6 Milk and Egg Products

FDA and FSIS have the authority and jurisdiction for use or disposal of milk and eggs, respectively.[7] Refer to the FDA (http://www.fda.gov/Food/default.htm) and FSIS (http://www.fsis.usda.gov/) websites for specific information about milk and egg use or disposal.

The Secure Milk Supply (http://www.securemilksupply.org/) and the Secure Egg Supply (http://secureeggsupply.com/) Plans have additional information on using milk and egg products during outbreaks of FMD and HPAI respectively.

14.4.4.5.7 Disinfectants

During an FAD outbreak response, significant quantities of disinfectant concentrate and solution will be used by response teams. Disinfectant may be used in small amounts by surveillance, assessment, or other support personnel to clean and disinfect footwear, vehicle tires, or small packages when traveling from one location to another. Disinfectant may also be used in large quantities at personnel and vehicle decontamination lines or during premises C&D. Each situation is discussed in more detail below.

14.4.4.5.7.1 Disinfectant Concentrate

Any unused waste disinfectant concentrate should be disposed according to the label instructions. If waste disinfectant concentrate is generated in large quantities (e.g., more than a few containers with small amounts of concentrate left in the bottom), consult a qualified waste disposal professional for classification and disposal services.

14.4.4.5.7.2 Small Quantities of Waste Disinfectant Solution

Small quantities of disinfectant will likely be mixed each morning at a central location, then transported in hand-held sprayers for use throughout the day by surveillance and vaccination teams. At the end of each day, any remaining solution should be disposed in accordance with label directions and employer policy. Disinfectant solution that is sprayed onto footwear, vehicle tires, or small packages may drip from the small objects, but the overspray and runoff is likely to be insufficient quantities to enable collection or subsequent treatment. Therefore, no special disposal procedures are required in this case.

14.4.4.5.7.3 Large Quantities of Waste Disinfectant Solution

Large quantities of disinfectant solution will be used in personnel and vehicle decontamination lines between the Exclusion and Support Zones at affected premises, at vehicle check-points on roadways, and during premises C&D. In this case, all disinfectant solution runoff must be collected and stored prior to disposal. It can be filtered and reconstituted for reuse if feasible;

[7] FSIS, Guidelines for the Disposal of Intentionally Adulterated Food Products and the Decontamination of the Food Processing Facilities, 2006, http://www.fsis.usda.gov/shared/PDF/Disposal_Decontamination_Guidelines.pdf.

otherwise the waste disinfectant solution should be tested, characterized, and disposed as specified by the applicable jurisdiction.

14.4.4.5.8 Pesticides

Pesticides may be used during a response to control vectors in and around the affected premises in a response to a disease such as RVF. Ideally, only the correct amount of pesticides will be mixed to minimize the need to dispose of extra pesticides. If possible, use any remaining pesticides. Observe the following guidelines:[8]

- Obtain the services of a licensed pesticide applicator for pesticide use, in accordance with State law.
- Prepare enough pesticide to treat the required area, without preparing more than needed to avoid disposal issues.
- If remaining pesticide cannot be properly used, check with your local solid waste management authority, environmental agency, or health department to identify means of disposing leftover pesticides. These authorities can also inform you of any local requirements for pesticide waste disposal.
- State and local laws regarding pesticide disposal may be stricter than the Federal requirements on the label. Be sure to check with your State or local agencies before disposing of your pesticide containers.
- If the container is partly filled, contact your local solid waste agency.
- If the container is empty, do not reuse it. Place it in the trash, unless the label specifies a different procedure.
- Do not pour leftover pesticides down the sink, into the toilet, or down a sewer or street drain. Pesticides may interfere with the operation of wastewater treatment systems or pollute waterways. Many municipal systems are not equipped to remove all pesticide residues. If pesticides reach waterways, they may harm fish, plants, and other organisms.

14.4.4.5.9 Ancillary Equipment

Any ancillary equipment requiring disposal, such as tools, filters, feeding equipment and the like, should be disinfected prior to sorting and classifying for disposal. If the equipment is adequately disinfected, it can likely be disposed of as solid waste or debris. However, verify the classification and disposal method with a qualified waste disposal professional to avoid improper disposal with associated liabilities.

14.4.4.5.10 Storage

The rate of disposal should coincide with the rate of euthanasia. However, on some occasions contaminated carcasses will have to be stored prior to disposal. Storage options include, but are not limited to, refrigerated trucks, fixed refrigeration facilities, and preservation tanks (e.g.,

[8] http://www.epa.gov/pesticides/regulating/disposal.htm.

grinding the carcasses and storing with preservative in tanks). Steps for collection and storage are listed below:

1. Select an appropriate storage method based on the Site-Specific Plan and the following:
    a. Availability of fixed or mobile cold-storage facilities.
    b. Availability of biosecure grinders and augers which can be used to transfer ground biomass to tanks for storage with preservatives.
    c. If adequate disposal facilities are unavailable, store the carcasses in leak-proof, covered containers such as lined, covered roll-offs.
2. Set up the temporary storage facility in a dry, cool area downwind from other agricultural and nonagricultural operations, and away from property lines or roads.
3. Ensure the storage method(s) will prevent access by vectors, contain leachate, address pressure build-up, and avoid uncontrolled release of gases or pathogens. Consult a qualified waste management professional and applicable regulatory authority for assistance.
4. Ensure all non-disposable storage equipment and/or facilities can be completely cleaned and disinfected after use.
5. Obtain all necessary services, equipment, personnel, materials and permits/approvals to implement selected storage options(s).
6. Do not store carcasses in unlined/uncovered piles or pits to avoid attracting vectors and contaminating soil and groundwater, unless specifically instructed to do so by regulatory officials.
7. Secure the carcasses and other items waiting preprocessing, transportation, and disposal to prevent unauthorized access, scavengers, and potential disease spread to susceptible species.
8. Keep records on the carcasses entering and exiting the storage facilities.

14.4.4.5.11 Transportation

When transporting contaminated material from the affected premises to off-site locations, disposal personnel must follow special procedures to prevent the spread of disease agents. To ensure secure transportation of items for disposal, do the following:

1. Contact disposal facilities[9] to do the following:
    a. Verify that they will accept potentially infected animal carcasses, the conditions, and the cost.
    b. Request written documentation that their personnel are trained, equipped, and certified to handle the infectious waste in a biosecure manner, or provide training or provide trained personnel.

[9] Discussions with disposal facilities must take place well in advance of a FAD outbreak.

c. Verify the selected off-site disposal location is properly licensed/certified and permitted to handle the type of waste being transported prior to dispatching the first load.

d. Ensure that the off-site disposal facility is prepared to provide a secure location for transport vehicles, freezers, or other means of storage if there is a delay of more than 1 day.

2. Coordinate with State and local transportation authorities to verify any transport restrictions and obtain any necessary permits.

3. Contact two or more local trucking firms (renderers may already have secure transport vehicles that they will contract out for hauling) to do the following:

   a. Verify they are properly equipped to haul carcasses in accordance with State and Federal law.

   b. Ensure that the vehicles are in good mechanical condition and capable of carrying the load without difficulty and that the vehicles are covered with a tarpaulin if they do not have closed tops.

   c. Ensure drivers are adequately trained in biosecurity (see 49 CFR 172 and 173 DOT regulations for further guidance).

4. Coordinate contracting for hauling services with the Finance and Administration section.

5. Review contract or agreement terms for haulers and ensure compliance.

6. Designate primary and secondary travel routes from the premises to the disposal site. Avoid road construction, neighborhoods, and densely populated areas.

7. Ensure the hauler has an emergency plan in case of an accident and review it for adequacy.

8. Ensure a responsible official is available to supervise the system of carcass processing and transport and act as the Contracting Officer's Technical Representative if services are provided by contractors.

9. Ensure the waste is properly transported.

   a. Collect any required waste characterization samples and await results before loading waste for transport.

   b. Ensure waste is properly characterized, that the transport vehicle and paperwork is appropriate to the type of waste, and the shipping destination is appropriate for the waste classification.

   c. Have shipping papers and criteria for the destination; determine whether a manifest is required.

   d. Document each shipment to include

      i. name and location of the disposal facility,

      ii. contact person and information for disposal facility,

      iii. name of the trucking company and contact person,

iv. regular and emergency phone numbers for the disposal facility and trucking company, and

v. certification from waste generator that the waste is properly classified to the best of their knowledge.

e. Prior to loading, verify that transport vehicles are leak proof and meet permit and DOT requirements; that the transport vehicles can be disinfected; that the vehicles are properly lined if they are not inherently leak-proof; and that the load can be securely covered. Transport frozen carcasses in sealed, insulated trucks.

f. Ensure that the driver has a valid State driver's license appropriate for the type of vehicle commissioned to transport the biohazardous waste, and/or a commercial driver's license (CDL) for operating vehicles that require CDL.

10. Load contaminated material only in the Hot Zone-EZ.

11. Take trucks across biosecurity lines a minimal number of times.

12. Ensure that vehicles are marked with the appropriate identifier and in accordance with 49 CFR 172.323 and 49 CFR 172.432, if the vehicle will travel on public access roads or otherwise enter commerce. See Figure 14-6 for the appropriate symbol for biohazard materials transport and Figure 14-7 for infectious substances symbol.

Figure 14-6. Biohazard Symbol[10]

10 "Hazardous Materials: Revision to Standards for Infectious Substances; Final Rule." CFR Title 49, Pt. 172, 2002 ed.

Figure 14-7. Infectious Substance Symbol[11]

13. If applicable, the carrier must sign the hazardous waste manifest (49 CFR 172, Subpart C, section 172.205(c)(2)). See http://www.epa.gov/waste/hazard/transportation/manifest/pdf/newform.pdf for a copy of the Hazardous Waste Manifest.
14. Complete the "Transfer and Chain of Custody Form" (see Attachment 14.H).
15. Determine whether the hauler needs an escort, such as a designated government representative, to accompany the vehicle.
16. Verify the functionality of communications equipment with the hauler during transport.
17. Ensure proper biosecurity measures are in place before containers and vehicles leave affected premises and after materials have been offloaded at the disposal site.
18. Thoroughly clean and disinfect the loaded, sealed vehicle before it leaves the affected premises, and again when it leaves the disposal site. See the Biosecurity SOP.

14.4.4.6 Operational Timeline for Disposal

Disposal operations should be performed in the order specified in the Site Specific Disposal Plan. Significant impacts to the schedule should be promptly discussed with the Disposal Group Supervisor to identify corrective actions if appropriate. Ensure the rate of depopulation does not exceed the rate of storage and disposal.

14.4.4.7 QA/QC

Disposal operations should be monitored at the frequency stated in the plan by the Disposal Group Supervisor, who will verify that all activities are in accordance with the Site Specific Disposal Plan and any applicable regulatory approval or permit conditions. The Disposal Group Supervisor will take immediate action to rectify significant deviations from the approved plan, or gain approval to change the plan if the deviations are needed to accommodate field conditions. In either event, the disposal procedures must be closely followed in order to expedite outbreak control and minimize environmental contamination.

11 "Hazardous Materials: Revision to Standards for Infectious Substances; Final Rule." CFR Title 49, Pt. 172, 2002 ed.

14.4.4.8 Demobilization

Remove miscellaneous debris, equipment, excess materials, disposal byproducts, and other waste in accordance with the Site Specific Disposal Plan, prior to demobilizing from the premises. Leave the facility in broom-clean condition in preparation for subsequent activities.

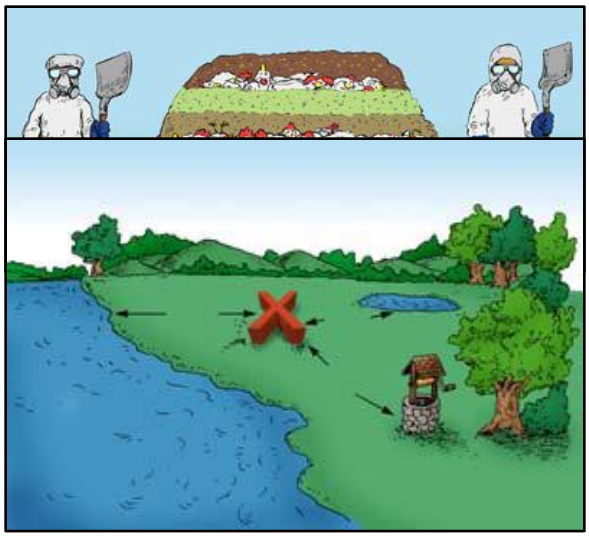
Attachment 14.A Composting[12]

Planning for In-house Poultry Composting

1. Identify service providers for:
    a. Mortality composting. Personnel should be trained on operational procedures, composting procedures, and the proper disposal and composting of animal carcasses. See Attachment 14.K for suggested training on composting.
    b. Heavy equipment operations.
    c. Carbon source production and delivery (assume 2–3 pounds of carbon source per pound of carcass).
2. Identify regulatory requirements and obtain pre-approval.
3. Identify a facility that
    a. has sufficient space to maneuver composting equipment and construct windrows. The facility should contain enough open space and ceiling must be high enough to allow the loader to construct windrows 6 feet high and 12 feet wide. Facilities with columns, such as double-deck houses, restrict such formations;
    b. is located in an area that is accessible by the composting equipment. This facilitates the delivery of carbon source and compost removal; and
    c. offers access doors that can be secured against vandals, scavengers, or disease vectors.
4. Obtain all necessary equipment, supplies, materials, personnel, and services identified in the Site Specific Disposal Plan and as required by the Biosecurity and Health and Safety/PPE SOPs, such as PPE, carbon source, skid-steer or front-end loaders, long-stemmed thermometers, pH meters, bulk-density testing devices, and log books.
5. Ensure all compost team members are trained on proper procedures for composting infected carcasses, biosecurity procedures, work safety issues, and the use of PPE. If they are not, see below.
6. Train personnel on biosecurity, work safety issues, and the use of PPE based on the Site Specific Disposal Plan, the NAHEMS Guidelines: Biosecurity and Biosecurity SOP, and NAHEMS Guidelines: Health and Safety, NAHEMS Guidelines: PPE, and the Health and Safety/PPE SOP.
7. Identify a qualified disposal team member to oversee the composting operations.

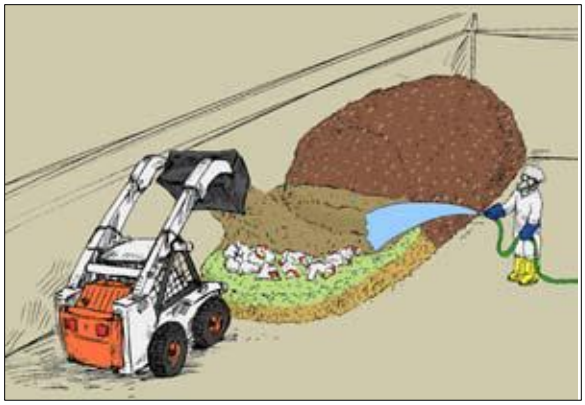
[12] Content and all photos in this attachment are courtesy of Cornell Waste Management Institute. http://cwmi.css.cornell.edu/composting.htm.

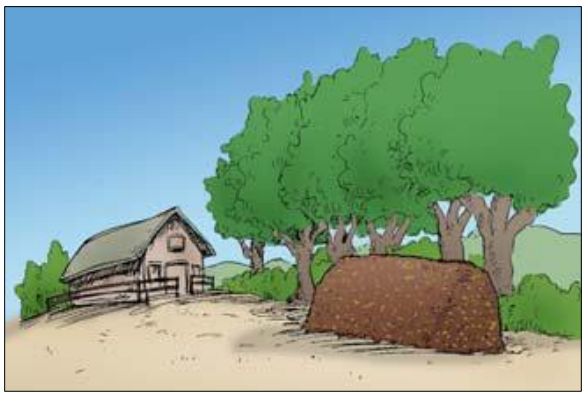
Operations for In-house or Outdoor Poultry Composting



1. Don all required PPE as detailed in the Site-Specific Health and Safety/PPE Plan.
2. Select a site that is well drained and not subject to flooding. Keep piles away from homes and businesses and from water courses, sinkholes, seasonal seeps or other landscape features that indicate the area is hydrologically sensitive.
3. When implementing in-house composting the poultry house will be vented naturally but mechanical ventilation should be turned off.
4. Site cleanliness is an important aspect of composting; it deters scavengers, helps control odors, and helps maintain good neighbor relationships.
5. Push litter and feed off to the side of the barn. Lay an 18 inch deep bed of coarse wood chips, 8–12 feet wide (depending upon structure and equipment constraints) and as long as space permits.
6. Add a 12–15 inch layer of litter and birds, then cover with a 12–15 inch layer of wood chips or other carbon sources.
7. Add another layer of litter and birds until the windrow is two or three layers high and as long as needed.
8. Let sit for 4–6 months, then check to see if carcasses are fully degraded. Do not turn piles for at least 4 months.
9. If your birds and litter are not separate, put a carbon base down (as in step 4), add birds mixed with litter and bedding to 4-5 feet high and continue as follows.
10. Cover with 2 feet of wood chips or other carbon sources to create a bio-filer. The finished section should be 5–7 feet high.

11. Make sure all mortalities are well-covered to keep odors down, generate heat and keep vermin or unwanted animals out of the windrow.
12. Monitoring is the only activity that will occur. Temperature probes will be used to record temperatures and should range from 131°–150°F or 55°–65°C during most of this time period.
13. The primary process in-house, where it reaches thermophilic temperatures, will take 10–14 days. During this time, no turning, agitating, or active aeration should occur.
14. If litter is very dry, add moisture to the layers as you are building them. The compost feedstock should be at 30–40% moisture.
15. After the required time/temperature duration, windrows can be moved outside the buildings for the curing process. Testing for the presence of the disease will be required.
16. Let sit for 4–6 months.
17. Reuse the material as a bed for additional carcass compost piles.

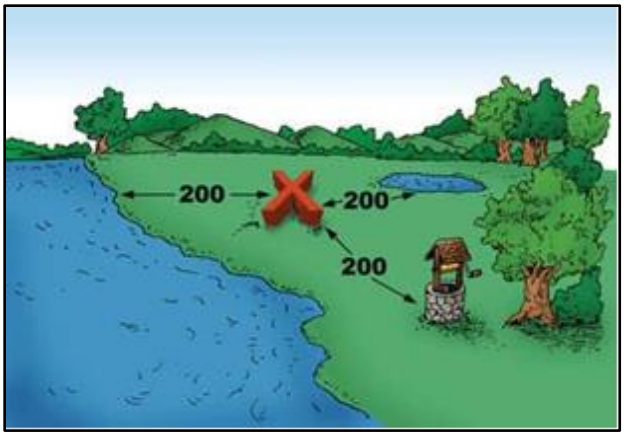


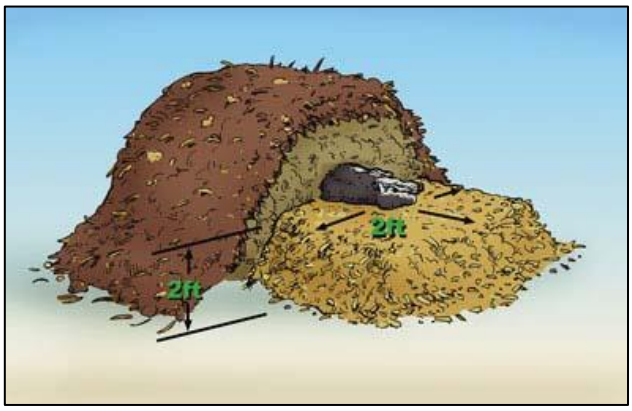


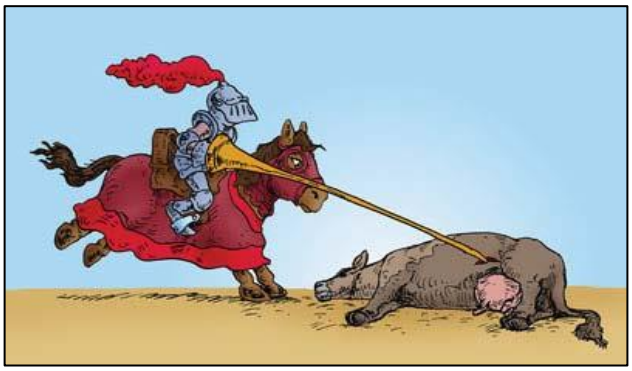
Planning for Outdoor Composting for Livestock Other than Poultry

1. Identify service providers for:
    a. Mortality composting. Personnel should be trained on operational procedures, composting procedures, and the proper disposal and composting of animal carcasses. See Attachment 14.K for suggested training on composting.
    b. Heavy equipment operations.
    c. Carbon source production and delivery (assume 2–3 pounds of carbon source per pound of carcass).
2. Identify regulatory requirements and obtain pre-approval.
3. Identify a composting site that is
    a. large enough to accommodate the windrows (assume 24 feet wide and 6 feet high by required length plus staging and access areas);
    b. located away from neighbors and out of sight;
    c. at least 200 feet from drinking water wells, surface water, and environmentally sensitive areas;
    d. downwind of homes and other dwellings;
    e. accessible in all weather;
    f. clear of underground and overhead utilities;
    g. not interfering with traffic;
    h. on a crowned grade where storm water will not accumulate;
    i. void of excess water; and
    j. capable of being dedicated to composting for several months.
4. Obtain all necessary equipment, supplies, materials, personnel, and services identified in the Site Specific Disposal Plan and as required by the Biosecurity and Health and Safety/PPE SOPs, such as PPE, carbon source, skid-steer or front-end loaders, long-stemmed thermometers, pH meters, bulk-density testing devices, and log books.
5. Ensure all compost team members are trained on proper procedures for composting infected carcasses, biosecurity procedures, work safety issues, and the use of PPE. If not,
6. Train personnel on biosecurity, work safety issues, and the use of PPE based on the Site Specific Disposal Plan, the NAHEMS Guidelines: Biosecurity and Biosecurity SOP, and NAHEMS Guidelines: Health and Safety, NAHEMS Guidelines: PPE, and the Health and Safety/PPE SOP.
7. Identify a qualified disposal team member to oversee the composting operations.

Operations for Outdoor Composting for Livestock other than Poultry

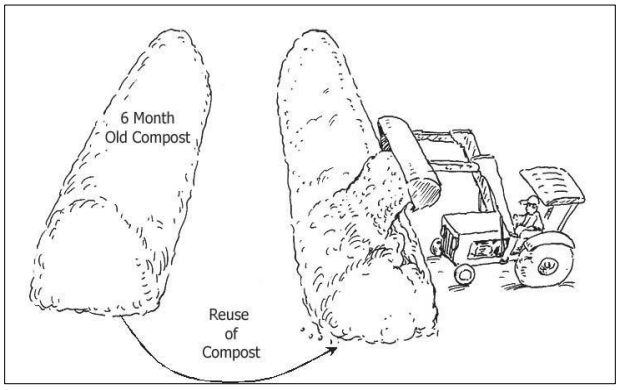






1. Don all required PPE as detailed in the Site-Specific Health and Safety/PPE Plan.
2. Select site that is well drained, at least 200 feet from water courses, sinkholes, seasonal seeps or other landscape features that indicate the area is hydrologically sensitive.
3. Fence the area if desired, and install measures to prevent water run-on and run-off if needed.
4. Construct an impermeable pad if excess leachate production is a concern to the approving authority. The pad could consist of a low-permeability soil base, pavement, or a suitable liner material beneath the pile if the liner will not cause the compost material to slip during inclement weather.
5. Place a 24-inch bed of bulky, absorbent organic material such as 3-inch wood chips over the pad. Ensure the base is large enough to allow for 2-foot clearance around the carcass.
6. Lay animal in the center of the bed. Lance the rumen to avoid bloating and possible explosion. Explosive release of gases can result in odor problems and it will blow the cover material off the composting carcass.
7. Cover carcass with dry, high-carbon material, old silage, sawdust or dry stall bedding (some semi-solid manure will expedite the process). Do NOT stack medium-sized, large, or very large carcasses on top of one another. For young animals, layer mortalities no more than 1 foot thick with a minimum of 2 feet of carbon material between layers.

8. Let sit for 4–6 months, then check to see if carcasses are fully degraded. Do not turn piles for at least 4 months.



9. Remove large bones before using the finished compost.

10. After building the compost piles, disinfect all tools, equipment and other items that may harbor pathogens, and maintain site cleanliness to deter scavengers, control odors, and help good neighbor relations.

11. Maintain a log of temperature, moisture, content, odor, vectors (any unwanted animals), leachate (liquid that comes out of the pile), spills and other unexpected events.

12. Monitor the internal compost pile temperatures daily with 3–4 foot long compost thermometers. The optimal temperature range for composting is between 104°F and 140°F (40°C and 60°C). During periods of extremely cold weather, piles may need to be larger than usual to minimize surface cooling. As decomposition slows, temperatures will gradually drop and remain within a few degrees of ambient air temperature. Don appropriate PPE equipment such as disposable gloves.
    a. Insert a temperature probe carefully and straight down into each quadrant of the pile to allow daily and weekly monitoring of internal temperatures at depths of 10, 20, 30, and 40 inches.
    b. Use the averages to represent the compost pile temperature.
13. If the compost pile does not rise to expected temperature levels within the first 2 weeks of composting, evaluate the initial pile formulation for proper carbon-to-nitrogen ratio (30:1) and the mixture of co-composting materials and carcasses.
14. If building an aerated static pile, the pile must be insulated (covered with a layer of bulking material or finished compost) and maintained at a temperature of not less than 131°F (55°C) for at least 3 consecutive days, monitored 6–8 inches from the top of the pile, to meet pathogen reduction standards typically used for land-applied sewage sludge.
15. Periodically test the moisture content of the compost. Use analytical equipment or the hand-squeeze method. For the hand-squeeze method:
    a. Don appropriate PPE (see the Health and Safety/PPE SOP).
    b. Squeeze a handful of compost material firmly several times to form a ball.
    c. The characteristics of the ball indicates the moisture content:
        i. If it falls apart, the moisture content is much less than 50 percent.
        ii. If it remains intact after being gently bounced three or four times, it is nearly 50 percent.
        iii. If the ball texture is slimy with a musty, soil-like odor and liquid squeezes out, the moisture content is more than 50 percent.
    d. If the moisture content is low and the pile temperature is very high (150° F), rake back the compost cover layer (up to 1 foot) and add enough water to bring the moisture content in the pile up to 50 percent.
    e. If liquid begins to leach out of the pile, spread an absorbent organic material such as sawdust around the pile.
16. Thoroughly clean and disinfect all of the disposal equipment. See the C&D and Biosecurity SOPs.
17. When the compost is finished (typically 4–9 months for a static mortality compost pile, depending on weather and other conditions), it can be used for
    a. a base for the next compost pile,
    b. land application on non-edible crops, and
    c. landfill daily cover.

Attachment 14.B Rendering

In carcass rendering, whole carcasses are mechanically crushed into 2-in^3 cubes of tissues, broken down thermally, and sterilized in a sealed and controllable container using pressurized steam.[13] The process converts the carcasses into 60% water, 20% fat/tallow and 20% meat/bone meal, which is often used as animal feed. Because the rendering plant will likely be located off the affected premises, the carcasses will have to be securely transported to the rendering plant.

Planning

1. Identify carcass rendering plant(s) in the region of the affected premises; ideally one that participates in the Animal Protein Producers Industry (APPI) program to test for Salmonella in the meat and bone meal and has at least one person on site who has received training by the APPI or a certified trainer from an equivalent program. Ensure that the rendering plant has a deodorizing system.
2. Develop a memorandum of understanding with nearby counties if county lines must be crossed to reach the identified rendering plant.
3. Coordinate with the managers of the rendering plants about rendering infected carcasses. All other operations at the plant must stop during the rendering process of potentially infected carcasses. Discuss with the managers at the rendering plant:
    a. The responsible party for C&D after rendering is complete.
    b. Potential compensation for use of the facility.
    c. The volume of carcasses accepted per day.
4. Make all necessary arrangements for the transportation and delivery of carcasses to the plant, making use of the renderer's hauling service if appropriate.
5. Ensure that all rendering plant personnel are trained on proper procedures for rendering infected carcasses, biosecurity procedures, work safety issues, and the use of PPE. If not,
6. Train the rendering plant personnel on biosecurity, work safety issues, and the use of PPE based on the Code of Practice approved October 18, 2004, by the North American Rendering Industry,[14] as well as the Site Specific Disposal Plan, the NAHEMS Guidelines: Biosecurity, Biosecurity SOP, NAHEMS Guidelines: Health and Safety, NAHEMS Guidelines: PPE, and the Health and Safety/PPE SOP.
7. Have a Disposal Team Member available to supervise the rendering process of disease-infected carcasses.
8. Exercise careful and precise inspection to minimize the risk of contamination from carcass materials entering, and of finished products exiting, the processing plant.

[13] http://www.fda.gov/AnimalVeterinary/GuidanceComplianceEnforcement/ComplianceEnforcement/BovineSpongiformEncephalopathy/ucm167655.htm.
[14] http://www.nationalrenderers.org/biosecurity-appi/.

9. Plan to control the harmful compounds, such as nitrogen and sulfur compounds, that may leach from wastewater of the rendering plant to groundwater or pathogens that may be emitted as aerosols from the process, particularly near the grinders.

Operations

1. Don all required PPE as detailed in the Site-Specific Health and Safety/PPE Plan.
2. If possible, use the rendering company's carcass pickup service. Regardless of the transportation provider, the transport of infected carcasses off premises must follow the transportation procedures outlined in Section 14.4.3.5.3.
3. Perform the rendering process within 24 to 48 hours of an animal's death. Delays are acceptable only if carcasses can be stored at a temperature of less than 40 degrees Fahrenheit.
4. Control and record the input rate relative to the size of the rendering vessel and verify that all locations in the vessel reach the minimum temperature and cooking time to inactivate the virus.
5. Properly maintain the carcass-receiving and finished-product sections as "dirty" and "clean" areas of the rendering plant and keep them separated.
6. Workers cannot move between the "dirty" and "clean" areas without personnel decontamination. See the NAHEMS Guidelines: Biosecurity or the Biosecurity SOP.
7. Routinely sanitize the equipment and maintain the tools used on the processing lines and in the facilities.
8. Prevent the drainage of liquids from dirty to clean areas to avoid contaminating the finished products and their transportation system.
9. Implement procedures to monitor odors and investigate and resolve odor-related complaints.
10. Monitor the cooking process.
11. Plan to dispose of the rendered products unless specifically authorized to use for pet feed. Disposal options for rendered product include composting, landfilling, or recycling at a cement kiln.
12. Thoroughly clean and disinfect all of the rendering plant equipment. See the NAHEMS Guidelines: C&D and the C&D SOP and any additional standards for returning the plant to normal production.

Attachment 14.C Landfilling

Planning

1. Identify permitted Subtitle D landfills in the vicinity of the affected premises (see EPA's I-WASTE Tool at http://www2.ergweb.com/bdrtool/login.asp for a database of disposal facilities).
2. Contact identified landfills and ensure operator will accept catastrophic FAD mortalities, and the conditions of acceptance.
3. Verify the availability of adequate carcass storage facilities such as refrigerated rooms, transport vehicles, freezers or other means of carcass preservation.
4. Identify haulers who:
    a. Are equipped to haul carcasses in accordance with State and Federal laws.
    b. Can provide secure, leak-proof, transport for the infected carcasses and contaminated materials.
    c. Employ appropriately licensed drivers.
    d. Possess vehicles in good mechanical condition and capable of carrying the load without difficulty.
    e. Have vehicles which can be covered with a tarpaulin if they do not have closed tops.
    f. Employ drivers adequately trained in biosecurity (see 49 CFR 172 and 173 DOT regulations for further guidance).
    g. Have an emergency plan and associated supplies which address spills/excess leakage; vehicle break-downs; traffic accidents; adverse weather conditions; and terrorist attacks.

Operations

1. Don all required PPE as detailed in the Site-Specific Health and Safety/PPE Plan.
2. Prior to loading each vehicle, confirm with landfill operator(s) that they will accept the load of disease-infected carcasses. Inform landfill contact person about space, personnel, safety, and biosecurity requirements.
3. If the vehicle is not leak-proof with a sealed cover, line the vehicle with plastic sheeting and place one foot of absorbent bedding material over the liner to cushion the load and minimize the risk of puncturing the liner.
4. Puncture/vent the carcass by stabbing the area posterior to the ribs and the thoracic and abdominal cavities.
5. Load punctured carcasses into lined/leak-proof vehicle.
6. Seal full load.
7. Disinfect exterior of vehicle.

8. Prepare all placards and manifests in accordance with applicable regulations.
9. Maintain a log of all shipments including
    a. the amount and type of material hauled;
    b. address of originating premises;
    c. location of landfill, contact name and contact phone number;
    d. transport vehicle license and registration numbers;
    e. driver name and contact information;
    f. supervisor's name and signature;
    g. C&D checklist;
    h. time/date of departure from premises and arrival at disposal site;
    i. unique reference number for each load; and
    j. any unusual circumstances.
10. Transport load to the landfill.
11. Check in at weigh station.
12. Obtain receipt for weight of load and any tipping fees.
13. Proceed to working face of landfill as directed by landfill staff.
14. Have site operators open the tailgate; not the driver.
15. Tip the vehicle into the hollow under the working face or as directed by the landfill operator.
16. Landfill operators should cover carcasses immediately.
17. Proceed to designated biosecurity station to disinfect vehicle before leaving the landfill. See the Biosecurity and Health and Safety/PPE SOPs.
18. Properly clean and disinfect all site machinery used in the operation. See the NAHEMS Guidelines: C&D and the C&D SOP.
19. All individuals involved in the disposal process must wear appropriate PPE. See the NAHEMS Guidelines: Health and Safety, NAHEMS Guidelines: PPE, and the Health and Safety/PPE SOP.

Table 14.C-1 compares recommended actions for handling and disposing of carcasses for routine, noninfectious material and potentially infectious material.

Figure 14.C-1. Recommended Actions for Handling and Disposal of Carcasses During Burial and Landfill[15]

Routine, Noninfectious Material	Potentially Infectious Material (Actions in Addition to Those for Routine Material)
Prepare waste profile paperwork	Excavate site before carcass arrival and cover with soil immediately after burial
Cover transportation vehicles (with tarp or similar covering)	Avoid transportation of carcasses through neighborhoods
Avoid free liquids by using adsorbent materials	Dispose of infectious material in a separate area of the landfill
Minimize odors with quick, efficient handling	Monitor air for presence of bacteria
Avoid personnel coming into direct contact with materials	Use proper personal protection equipment for workers unloading infectious material
Bury as soon as possible	Dispose of material 40 feet above leachate collection system
Keep birds and vermin away from working landfill surface as much as possible	Implement formal bird-control program on landfill surface
Account for stability considerations if volume is large, because subsidence may be significant and the decaying carcasses may be slimy and have little geotechnical strength	Map and record vault disposal area and store information with asbestos data
	Decontaminate transportation vehicles
	Protect heavy-equipment operators by using pressurized cabs
	Hire specialized contractors to handle infectious material (biosecurity)

[15] CAST [Council for Agricultural Science and Technology]. "Ruminant Carcass Disposal Options for Routine and Catastrophic Mortality." Issue Paper, No. 41: January 2009. http://www.cast-science.org/

Attachment 14.D Fixed Incineration

Planning

1. Identify permitted pathological waste incinerators in the vicinity of the affected premises (see EPA's I-WASTE Tool at http://www2.ergweb.com/bdrtool/login.asp for a database of disposal facilities).
2. Contact identified facilities and ensure operator will accept catastrophic FAD mortalities, and the conditions of acceptance.
3. Verify the availability of adequate carcass storage facilities such as refrigerated rooms, transport vehicles, freezers or other means of carcass preservation.
4. Identify haulers who:
    a. Are equipped to haul carcasses in accordance with State and Federal laws.
    b. Can provide secure, leak proof, transport for the infected carcasses and contaminated materials.
    c. Employ appropriately licensed drivers.
    d. Possess vehicles in good mechanical condition and capable of carrying the load without difficulty.
    e. Have vehicles which can be covered with a tarpaulin if they do not have closed tops.
    f. Employ drivers adequately trained in biosecurity (see 49 CFR 172 and 173 DOT regulations for further guidance).
    g. Have an emergency plan and associated supplies which address spills/excess leakage; vehicle break-downs; traffic accidents; adverse weather conditions; terrorist attacks.

Operations

1. Don all required PPE as detailed in the Site-Specific Health and Safety/PPE Plan.
2. Prior to loading each vehicle, confirm with incinerator operator(s) that they will accept the load of infected carcasses.
3. Inform contact person about space, personnel, safety, and biosecurity requirements.
4. If the vehicle is not leak-proof with a sealed cover, line the vehicle with plastic sheeting and place one foot of absorbent bedding material over the liner to cushion the load and minimize the risk of puncturing the liner.
5. Puncture/vent the carcass by stabbing the area posterior to the ribs and the thoracic and abdominal cavities.
6. Load punctured carcasses into leak-proof or lined vehicle.
7. Seal full load.
8. Disinfect exterior of vehicle.

9. Prepare all placards and manifests in accordance with applicable regulations.
10. Maintain a log of all shipments including
    a. the amount and type of material hauled;
    b. address of originating premises;
    c. location of incinerator, contact name, and contact phone number;
    d. transport vehicle license and registration numbers;
    e. driver name and contact information;
    f. supervisor's name and signature;
    g. C&D checklist;
    h. time/date of departure from premises and arrival at disposal site;
    i. unique reference number for each load; and
    j. any unusual circumstances.
11. Transport load to the incinerator
12. Check in at weigh station.
13. Obtain receipt for weight of load and any disposal fees.
14. Proceed to unloading area as directed by facility staff.
15. Have site operators open the tailgate; not the driver.
16. The carcasses should be covered immediately and kept covered until they are moved to temporary storage or to processing.
17. Incinerate the carcasses in accordance with facility protocols.
18. Ensure the facility follows all biosecurity requirements.
19. Proceed to designated biosecurity station to disinfect vehicle before leaving the facility. See the Biosecurity and Health and Safety/PPE SOPs.
20. Properly clean and disinfect all site machinery used in the operation. See the NAHEMS Guidelines: C&D and the C&D SOP.
20. All individuals involved in the disposal process must wear appropriate PPE. See the NAHEMS Guidelines: Health and Safety, NAHEMS Guidelines: PPE, and the Health and Safety/PPE SOP.

Attachment 14.E Air-Curtain Incineration

Planning

1. Consult with appropriate State regulatory agencies for air quality and solid-waste permits for potential sites before initiating operations.
2. Inform local authorities about the planned thermal destruction.
3. Ensure that required equipment for the chosen method is available.
4. Ensure that equipment, and spare parts, are available for the chosen thermal method.
5. Ensure enough trained personnel are available to maintain continuous operations.
6. Provide appropriate sustenance and housing needs for disposal personnel if necessary.
7. Assuming a mobile air-curtain incinerator will be brought to the affected premises, verify the availability of air curtain incineration units and carcass storage facilities such as refrigerated rooms, transport vehicles, freezers or other means of carcass preservation.
8. Consult with USDA NRCS and evaluate the affected premises for the depth to the water table and proper soil conditions.
9. Use refractory boxes on sites with a high water table or on rocky soil and where trenches would be difficult or costly to build.
10. Locate the mobile air-curtain unit in an area that is easily accessible to heavy vehicles hauling carcasses and equipment.
11. Gather the appropriate materials such as solid fuels (straw, hay, coal, kindling wood, untreated lumber). Base the amount of solid fuels to use on the amount of moisture in the wood or other organic sources (hay, grain, stalks, and straw) and the fat and moisture content of the carcasses. Use a fuel-to-carcass weight ratio ranging from 1:1 to 2:1. Ensure availability of enough fuel to last 2-3 days or the length of time needed to maintain uninterrupted supply.

Operations

1. Don all required PPE as detailed in the Site-Specific Health and Safety/PPE Plan.
2. Build the appropriate sized trench based on equipment vendor recommendations, or use refractory boxes. See NAHEMS Guidelines: Disposal.
3. Monitor the wind direction before and during the burning operations.
4. Keep workers out of the path of the flame.
5. Handle the ash in the refractory boxes carefully and dispose of it at a burial or land application site that has been approved by the appropriate regulatory agency.
6. If a large number of animal carcasses (exceeding a cumulative weight of 1 million pounds) require destruction, conduct the thermal destruction at a distance of 2 miles from residential buildings, roads, and utilities.

7. Use proper precautions when dealing with certain FADs such as HPAI to prevent personnel inhalation of airborne pathogens. Personnel must use proper PPE. See the NAHEMS Guidelines: Health and Safety, NAHEMS Guidelines: PPE, and disease specific Health and Safety/PPE SOPs for more information.
8. Thoroughly clean and disinfect all of the disposal equipment. See the C&D and Biosecurity SOPs.

Attachment 14.F Open-Air Burning

This method involves burning on open land and above ground, in a pit, or on pyres.

Planning

1. Calculate the amount of material required to accomplish the open-air burning. One adult bovine carcass is equivalent to five finishing pigs or five adult sheep. One adult bovine carcass will require[16]
   a. 3 bales of straw or hay,
   b. 3 pieces of untreated heavy lumber,
   c. 50 pounds of kindling wood,
   d. 100 pounds of coal pieces that are 6–8 inches in diameter, and
   e. 1 gallon of liquid fuel. Do not use gasoline. The type and amount of fuel used for incineration will be influenced by local fuel availability and conditions. For effective burning, fuel should be as dry as possible.
2. Other equipment includes mechanical chains and lifting equipment. Identify personnel properly trained in the use of this equipment. Fire safety equipment also should be readily available.
3. Build a fire bed that is perpendicular to the prevailing wind.

Operations

1. Don all required PPE detailed in the Site-Specific Health and Safety/PPE Plan.
2. Prepare the bed:
   a. Stake out and fence the selected burning site for the fire-bed construction.
   b. Allow a fire-bed length of 3 feet for each adult cattle carcass, five swine carcasses, or five sheep carcasses. The team may find it helpful to convert the number of carcasses in need of disposal into bovine-equivalent carcasses as seen in Table 14.F-1.[17]

Table 14.F-1. Estimating Bovine—Equivalent Carcasses

Animal	Bovine Equivalent Carcasses
1 adult cow or bull	1 bovine-equivalent carcass
5 adult swine	1 bovine-equivalent carcass
5 adult sheep	1 bovine-equivalent carcass

[16] Recommended incineration materials include straw or hay, untreated heavy timber, kindling wood, coal, and liquid fuel.
[17] To estimate the number of bovine-equivalent carcasses, first list the number and species of carcasses to be incinerated, then convert these figures into a number representing bovine-equivalent carcasses.

c. Lay three rectangular rows of straw or hay bales lengthwise along the line of the fire bed. Rows should be 12 inches apart and each bale should be separated by a 12-inch gap.

d. Place loose straw in the spaces between the rows and bales to provide natural air flow.

e. Place large pieces of lumber lengthwise on top of each row. Distribute large and medium-sized pieces of lumber across the fire bed, leaving 6 to 12 inches of space between them.

f. Place small kindling wood on the fire bed and cover loosely with straw.

g. Spread 6- to 8-inch-diameter coal evenly at the rate of 500 pounds per square yard, or use a liquid field such as diesel or furnace oil over the wood mixture to make a level bed.

h. Lay the carcasses on the fire bed.

i. Position carcasses on their backs with their feet in the air and alternately head to tail.

j. Two goats, sheep, or swine carcasses can be placed on top of each bovine carcass and burned without additional fuel.

k. Place loose straw on top of the carcasses and all spaces in between.

l. Spray liquid fuel over the fire bed with a pump, or use sprinkling cans or buckets.

m. Soak rags in kerosene oil or waste oil and place them every 30 feet along the fire bed for a better and more harmonized ignition.

n. Make sure that people and equipment are at least 25 feet from the burning pile.

o. Have fire equipment readily available.

p. Ignite the fire bed.

q. Occasionally stir the burning pile with front-end loaders.

r. Add more fuel as needed.

s. Bury the ash after all carcasses have been burned completely and the fire has been extinguished.

3. Thoroughly clean and disinfect all of the disposal equipment. See the Cleaning and Disinfection and Biosecurity SOPs.

Attachment 14.G Unlined Burial[18]

Planning

1. Review State and local regulations regarding burial. Individual States regulate the parameters for burial (e.g., quantity of carcasses, depth to water table, and distance to wells, surface water, and property lines).
2. Obtain information from the USDA NRCS Web Soil Survey such as soil maps, drainage, and seasonal water table data.
3. If the Web Soil Survey data indicates the site is suitable for carcass burial, obtain the services of a qualified environmental professional such as a Professional Geologist or Professional Engineer to collect at least three soil borings of the site to the water table. Trench burial has the potential to impact groundwater and generate offensive odors, requiring the water table to be deep and the soil impermeable. Using the soil logs, perform hydrogeological and contaminant transport modeling to assess the likelihood of the burial site contaminating drinking water aquifers.
4. Consult with appropriate State regulatory agencies about permits for potential sites before initiating operations.
5. Verify the site is large enough for on-site burial of the carcasses based on Attachment 14.I Land Area or Excavation Volume Required for Trench Burial, and the FAD/PReP Guidelines: Disposal.
6. Verify the site is accessible to carcass hauling trucks and heavy equipment.
7. Design the excavation size, depth, and side slope angles to prevent cave-ins.
8. Prepare and maintain a list of names and contact information for heavy machinery operators, fire department personnel, law enforcement, public works departments, departments of transportation, and regulatory agencies.
9. Contract with local heavy equipment suppliers and operators to deliver, operate, fuel, and maintain needed heavy equipment. Contract for carcass storage equipment and/or services if needed.
10. Ensure that personnel who will be operating the heavy equipment are properly certified in the use of the equipment.
11. Train disposal personnel on safety, biosecurity, and operational procedures in accordance with the Site Specific Plan.

Operations

1. Obtain all appropriate permits and approvals, including landowner's permission and acceptance of long-term environmental liability, to begin burial.

[18] Mukhtar, S., Boadu, F.O., Jim, Y.H., Shim, W., Vestal, T.A., & Wilson, C.L. (2012). *Managing Contaminated Animal and Plant Materials: Field Guide on Best Practices*.

2. Don all required PPE as detailed in the Site-Specific Health and Safety/PPE Plan.
3. Fence and stake the burial site.
4. Obtain the heavy equipment and machinery (backhoe, scraper, bulldozer, or other equipment) required for excavating.
5. Excavate the appropriate sized trench based on the excavation design parameters.
6. Puncture/vent the carcasses by stabbing the area posterior to the ribs and the thoracic and abdominal cavities.
7. Place carcasses in the trench.
8. Cover the carcasses with the excavated earth, being sure to grade the surface soil to facilitate runoff.
9. Seed the surface of the excavated area to minimize soil erosion.
10. Thoroughly clean and disinfect all of the disposal equipment. See the Cleaning and Disinfection and Biosecurity SOPs.
11. Regularly inspect and maintain the site by adding additional backfill to prevent pooling of water if necessary.
12. Highly recommended: monitor groundwater quality down gradient of the burial site(s) to ensure the ongoing safety of ground water.

Note on Mass Burial

Mass burial involves collecting carcasses from multiple affected premises and placing them in a large burial unit. The disposal unit must meet the criteria for a Subtitle D landfill, including leachate and landfill gas collection and management systems. During the 2001 FMD outbreak in the UK, approximately 20 percent (1.3 million carcasses) of FMD-infected carcasses were disposed using mass burial. Siting, permitting, designing, and constructing a Subtitle D landfill requires extensive site assessment, professional engineering design, and rigorous quality control during construction. The process takes a significant amount of time and funds, and the closed disposal unit requires long-term monitoring and acceptance of future environmental liability by the property owner. It is likely more cost-effective and efficient to establish an agreement with an existing Subtitle D landfill than to site, permit, design, and build a new one in the face of an emergency.

Attachment 14.H EPA Considerations for Waste Management Decisions

There are many considerations that should be taken into account during the decision-making process regarding how and where to manage the waste. Below are questions that you should consider:

- What is the nature of the event?
- How much waste was generated by the incident?
- Are staging and storage areas available for the waste prior to its treatment and disposal?
- What wastes can be segregated into different waste streams?
- Can any of the waste be reused or recycled?
- Should the items or buildings be decontaminated?
- Can the waste be minimized?
- What are the environmental consequences of each option?
- Do the site conditions allow for on-site waste management options?
- What arrangements must be made to transport the waste off-site?
- How much will each waste management option cost?
- How much waste can each waste management option handle?
- Does the waste have to be reduced in size before it can be treated, disposed of, and/or transported?
- What is the public reaction to the available options?
- How quickly does the waste need to be managed?
- Has the facility agreed to accept the waste?
- Does the State, local, or Tribal jurisdiction or private entity involved in the incident have a waste management preference?
- Should the waste be treated prior to its disposal?
- Are multiple options needed or will one suffice?
- What if no waste management options can be found?
- Are there any barriers to the selected waste management approach?

What is the nature of the event?

The nature of the event may influence how the resulting waste is managed. Generally, different types of incidents can generate different kinds of waste. For example, animal disease outbreaks may result in carcasses contaminated with biological agents. Natural disasters may generate large quantities of vegetative debris and construction and demolition materials. The types of waste generated by chemical, biological, radiological, or nuclear incidents are very dependent upon the decontamination and cleanup methods employed during the response as a result of the characteristics of the agent involved. Therefore, depending on the nature of the event, there may be waste management options that are more appropriate, preferable, or available than other options for each type of waste generated. In addition, some options may be required or prohibited for a particular waste stream. There is no one option that is best for all waste streams.

How much waste was generated by the incident?

The amount of waste generated by an incident affects decisions regarding how to manage the waste, including the storage, treatment, and disposal of the waste. Therefore, determining the amount of waste generated helps facilitate effective waste management decision-making during the response. The amount of waste generated partly depends upon the magnitude of the incident and the resulting contamination. Factors such as delivery method of an agent (i.e., chemical, biological, radiological, or nuclear) and environmental conditions (e.g., wind speed, temperature, humidity, and ultraviolet light intensity), which influence the size, shape, intensity, and overall effectiveness of the agent deposition pattern, are important to determining the magnitude of contamination.

Are staging and storage areas available for the waste prior to its treatment and disposal?

Having the capability to stage and store large amounts of waste can aid in waste management, for example, by providing the space needed for sorting waste into different waste streams, isolating hazardous waste in order to keep it from contaminating non-hazardous waste streams, and storing waste until capacity becomes available at a waste management facility. Local communities should identify and secure staging and storage areas before an incident occurs as part of their pre-incident planning and preparation activities.

What wastes can be segregated into different waste streams?

Where feasible, the waste should be segregated into different waste streams, such as vegetative debris, hazardous waste, white goods, sediment, construction and demolition materials, and putrescible waste. Different waste streams can be subject to different Federal, State, local, and Tribal regulations and requirements. In addition, different recycling, treatment, and disposal options may apply to different waste streams, which affect other considerations including cost and environmental consequences. For example, hazardous waste, which is subject to stringent regulations, should be kept separate from other wastes in order to avoid contaminating other waste, which would cause more waste to be deemed hazardous. Vegetative debris can often be recycled or composted, creating a usable product that may generate revenue. EPA's Planning for Natural Disaster Debris Guidance (PDF) provides more information on different waste streams. Waste segregation may not be possible during the initial stages of a response to an incident, but as the cleanup and recovery progresses, waste segregation may become easier to accomplish.

Communities should plan for waste segregation in advance of an incident in order to increase the efficiency and effectiveness of their waste management activities during and after an incident. This pre-incident planning should include the identification of staging and storage areas that are large enough to accommodate waste segregation activities.

Can any of the waste be reused or recycled?

There are reuse and recycling opportunities available for many waste streams, even hazardous waste. Reuse and recycling options should be considered before other options. Reuse and recycling have positive environmental and, possibly, economic impacts. There are many reuse and recycling resources.

Should the items or buildings be decontaminated?

If an item or building has been contaminated by biological organisms, chemical warfare agents, or radiological materials, for example, decontamination may be necessary to remediate the affected item or building. However, not every item can be reused because, in some situations, decontamination is not feasible or even possible. The decision on whether or not to decontaminate an item or building depends upon environmental, economic, public health, and other considerations, which may have to be balanced. For example, decontamination of contaminated materials generates its own waste that requires disposal, including PPE, vehicles, and contaminated water. The amount of waste generated may be small or very large. Therefore, the decision on whether to decontaminate an item or not should in part balance the cost of replacing and disposing of the item, if feasible, with the time and cost of decontaminating the item and disposing of the associated waste. Other factors to consider include whether a facility will accept contaminated waste, the effectiveness of the decontamination process, and public perception.

Can the waste be minimized?

The amount and toxicity of waste needing to be managed should be limited and reduced as much as possible. Waste minimization not only has environmental benefits, but can have economic benefits as well. Communities that prepare and plan for incidents can identify opportunities for minimizing the generation of waste in the first place. In addition, entire waste streams (e.g., vegetative debris) can be diverted from disposal through reuse and recycling opportunities along with wastes such as scrap metal and sediment. Waste that can be treated before disposal, to render the waste less contaminated or non-hazardous, may make the waste cheaper to dispose of.

What are the environmental consequences of each option?

Each management option triggers some environmental concerns, including air emissions, potential groundwater and surface water contamination, disease spread, and soil contamination. The environmental consequences associated with each waste management option with regards to each waste stream vary. When deciding upon a waste management option for a particular waste stream, it is important to minimize the environmental risk as much as possible by choosing an option that is best suited for that waste stream within the context of the particular situation. To help ensure optimal environmental protection, it is important to comply with all applicable Federal, State, local, and Tribal laws and regulations. You should contact your State, local, and

Tribal officials for further information and assistance in selecting the appropriate waste management option(s).

Do the site conditions allow for on-site waste management options?

On-site waste management options include on-site composting, air-curtain incineration, and burial. These on-site options generally are preferable to off-site options, particularly for incidents involving animal disease outbreaks. For animal disease outbreaks, keeping contaminated animal carcasses on-site minimizes the risk of disease spread and increases biosecurity. In addition, removing the need to transport the waste off site simplifies logistics and potentially reduces overall waste management costs. However, on-site options must be carefully considered, and their environmental effects (e.g., air emissions, groundwater contamination, and soil contamination) must be carefully reviewed. The appropriateness of on-site waste management for a particular incident may depend upon Federal, State, local, and Tribal requirements, deed restrictions, weather, groundwater depth, and soil composition among other considerations.

What arrangements must be made to transport the waste off-site?

Arrangements must be made if the waste is being transported to an off-site waste management facility. First, an appropriate off-site waste management facility for each waste stream needs to be identified and located. A facility must be properly permitted or licensed for a particular waste stream in order to be able to accept that waste stream. Also, arrangements should be made in advance with the facility to ensure that the waste will be accepted upon arrival at the destination and not turned away due to capacity limitations or unwillingness to accept the waste as a result of liability concerns or lack of public acceptance. Sometimes, the facility needs advance notice before the waste arrives so that it can prepare for receiving the waste. In addition, the size of the waste may need to be reduced (e.g., ground, shredded) to facilitate its transportation or to meet a facility's requirements. An alternate route to the facility should be planned in case the primary roads were affected by the incident. Next, a sufficient number of transport vehicles should be acquired to transport the waste to the facility. These transport vehicles should have sufficient protection (e.g., liners) against accidental spillage into the environment when necessary. For transporting hazardous waste, a manifest is needed and all US DOT requirements, including placarding, must be adhered to. Furthermore, hazardous waste transporters need EPA identification numbers, and some States require transporters to have permits or licenses. Note that pre-incident planning and preparation can help facilitate these arrangements and limit the time and resources needed for waste management activities during and after an incident.

How much will each waste management option cost?

The Table 14.H-1 provides the relative costs for different waste management options. Actual costs depend upon many factors, including site conditions, transportation, the waste stream, and the waste management facility. As a result, actual costs can be highly variable.

Table 14.H-1. Waste Management Option Relative Cost

Waste Management Option	Relative Cost
Landfill (Subtitle D)	$$
Landfill (Subtitle C)	$$$
Landfill (Construction & Demolition)	$
Trench Burial	$
Mass Burial	$$
Hazardous Waste Incinerator	$$$$
MSW Combustor	$$$
Air Curtain Destructor	$$
Mobile Incinerator	$$$
Autoclave	$$
Composting	$
Rendering	$$

Source: Lemieux, NHSRC, 2007.

How much waste can each waste management option handle?

Actual capacity for each waste management option depends upon various factors, including the waste stream and the waste management facility, and, thus, can vary widely. As part of pre-incident planning and preparation, a community should determine how much waste different waste management options can handle.

Does the waste have to be reduced in size before it can be treated, disposed of, and/or transported?

Some waste management facilities may require the waste brought to them to be no larger than a certain size. Therefore, it is important to check with the waste management facility to determine whether it has any size restrictions. If it does, obtaining sufficient space may be necessary for processing the waste on-site before it can be transported to the facility. Reducing the size of the waste and obtaining space to process the waste may add to waste management costs. However, size reduction may facilitate transportation and lower its costs.

What is the public reaction to the available options?

The public's opinion of each waste management option varies. A community might not like a certain waste treated or disposed of near them or like certain types of waste transported through their neighborhoods. Therefore, as part of a community's pre-incident planning, local officials and community leaders should discuss the available options with local residents, including where the storage and staging areas should be located during an incident. This should be part of a larger risk communication plan, which the community should develop before an incident occurs.

How quickly does the waste need to be managed?

The speed in which the waste needs to be managed (e.g., treated, disposed of) varies with the type of waste and the conditions at the site(s). Some wastes should be managed as quickly as

possible, such as putrescible waste (e.g., food waste), disease-contaminated carcasses, and leaking hazardous waste storage tanks, as these may pose an immediate risk to human health and the environment. Other wastes, such as vegetative debris, can be collected and stored over a period of time in accordance with applicable regulations (e.g., permit requirements, time limitations). Local officials and emergency responders make these decisions in accordance with best practices and Federal, State, local, and Tribal guidance and policies.

Has the facility agreed to accept the waste?

Facilities, such as landfills and incinerators, do not have to accept the waste brought to them. Also, a facility may not have the authority to accept certain types of waste. The permit issued to a facility by the regulatory authority defines the types of waste and allowable quantities that the facility can accept. As a result, facilities that can accept problematic waste streams should be identified before an incident even occurs as part of pre-incident planning and preparation. Once a facility is identified, it is necessary to work with the facility and gain its acceptance before transporting waste to that facility during an incident. For example, a contract can be pre-negotiated with a facility for particular waste streams as part of pre-incident planning and preparation. FEMA's Public Assistance Debris Management Guide (PDF) provides further information on contracted services.

Does the State, Local, or Tribal jurisdiction or private entity involved in the incident have a waste management preference?

It is important to work with the State, Local, and Tribal jurisdictions because these jurisdictions likely have the authority to make waste management-related decisions. Also, the local or Tribal jurisdiction may have a waste management plan that includes information on nearby waste management facilities and the types of waste that can be expected to be generated by the community. If the waste is generated from a private business (e.g., animal carcasses from a poultry farm), the business should have its own waste management plan that can assist in the decision-making process.

Should the waste be treated prior to its disposal?

Whether treatment is appropriate depends upon the characteristics of the waste and the particular situation at hand. For example, if the waste is particularly voluminous (thus making transportation to a disposal facility very expensive and/or unfeasible), then treatment to reduce its volume is likely to be appropriate. Similarly, if waste is particularly toxic, treatment may be needed before it is transported to a disposal facility in order to further protect human health and the environment. It is important to note, however, that treatment options generally create residues or by-products that would need to be tested and properly handled, transported, and managed as well. Therefore, the decision to treat the waste also should address how and where the waste and any resulting residues or by-products will be disposed of or otherwise managed (e.g., recycled).

Are multiple options needed or will one suffice?

Choosing multiple waste management options to handle the waste that may be generated during an incident may be most appropriate, considering the nature and severity of the incident. If an incident produces a relatively small volume of waste, then one option may be sufficient. However, a larger incident may generate multiple waste streams, likely requiring a

comprehensive approach with many different waste management options. The type and nature of the waste streams, level of contamination, lack of storage space or transport vehicles, limited capacity at accessible facilities, a facility's refusal to accept certain types of waste, and available reuse or recycling opportunities are just some of the reasons that make choosing multiple waste management options necessary. Also, different waste management options may be better for different waste streams for environmental, public safety, or economic reasons. Before one or more waste management options are chosen, it is important to assess the different options available and the considerations associated with each along with the different waste streams needing to be managed.

What if no waste management options can be found?

Before selecting a waste management option, consider its availability, feasibility, and cost effectiveness, taking into account the specific incident, site, and waste stream involved. It may be possible that there is no effective option for a waste stream at an incident site within a certain time frame. In this situation, the waste may have to be stored for an indefinite period of time. Contact the applicable State agency for assistance if waste management options cannot be found for the waste.

Are there any barriers to the selected waste management approach?

Even if the decision-making process for how to manage waste from an incident took into account each waste management consideration (e.g., public health and the environment, the type and quantity of waste streams, transportation, cost, and facility permits), there may be community and facility barriers to implementing the selected approach. With regards to the community, there may be, for example, environmental justice concerns with the transportation of waste to a particular waste management facility. Another possible community barrier may be residents who actively oppose waste being sent into their community. Lack of indemnification for waste management facilities and worker safety concerns at facilities are possible facility barriers. These barriers, in addition to political pressure, may preempt all or part of a selected waste management approach. However, having a comprehensive waste management plan in place prior to the incident may mitigate or remove these barriers. Pre-incident planning and preparation provides stakeholders (e.g., State, Local, and Tribal governments, owners of private storage, treatment, and disposal facilities, residents) with an opportunity to work together to find acceptable waste management-related solutions.

Attachment 14.I Land Area or Excavation Volume Required for Trench Burial

This attachment list the land area or excavation volume required for trench burial.

Jurisdiction/ Source	Total Trench Depth (D)	Carcass Depth	Depth Cover	Trench Width (W)	Trench Length (L)	Est. Area or Volume Required	Carcass Equivalents	Other Notes
Literature								
NC (Wineland & Carter, 1997)						50-55 ft3 (~2.0 yd3) per 1,000 broilers or commercial layers 100 ft3 (3.7 yd3) per 1,000 turkeys		Note that the volume estimates were based on a disposal pit design, rather than trench burial.
Australia (Atkins & Brightling, 1985)	~3.5 m (11.5 ft)	1.5 m (5 ft)	2.0 m (6.5 ft) to ground level	3-5 m (10-16.5 ft) determined by equipment used	--	1 m3 (~35 ft3 or 1.3 yd3) per 8-10 mature sheep (off-shears)	--	To calculate the necessary pit volume, including an allowance for cover, a value of 0.3 m3 of excavation per sheep was used.
Australia (Lund, Kruger, & Weldon)	2.6 m (8.5 ft)	--	1 m (3.3 ft)	4 m (13 ft)	6.7 km (~4.2 mi) for 30,000 cattle	30,000 head of cattle requires trench of 70,000 m3 (2.5 million ft3, or 92,000 yd3)	--	Equates to excavation volume of 2.3 m3 (82 ft3 or 3 yd3) per cattle carcass.
N/A (McDaniel, 1991)	9 ft	3 ft	6 ft	7 ft	--	14 ft2 at bottom of pit for each adult bovine	1 adult bovine = 5 mature sheep or hogs	For every additional 3 ft of trench depth, the number of carcasses per 14 ft2 can be doubled. Due to bulky feathers, poultry

Jurisdiction/ Source	Total Trench Depth (D)	Carcass Depth	Depth Cover	Trench Width (W)	Trench Length (L)	Est. Area or Volume Required	Carcass Equivalents	Other Notes
Literature								
						(assuming 3 ft depth, equates to ~42 ft3 or ~1.2 yd3 per adult bovine)		require more burial space per unit of weight than cattle, hogs, or sheep. Estimate space required for poultry by counting carcasses that fill a space of known volume (i.e. truck).
N/A (Sander, Warbington, & Myers, 2002)	9 ft	--	3-4 ft	7 ft	--	14 ft2 per mature cow	--	
N/A (Anonymous, 1973)	--	--	--	--	--	Assume 40 lbs of poultry carcasses per 1 ft3	--	Equates to approximately 1,080 lbs/yd3.
Regulatory Agencies								
AL (USDA, Natural Resource Conservation Service, Alabama)	8 ft (for deep soils where bedrock not a concern)	1 ft max small animals 1 carcass max large animals	2 ft mounded	--	--	--	--	Max size of burial excavation should be 0.1 acre (~4,400 ft2) Excavations over 3.5 ft deep should be sloped on sides at least 1.5 (horiz) to 1 (vert)
TX (USDA, Natural Resources Conservation Service, Texas, 2002)	3 ft min 8 ft max	1 ft small animals 1 carcass large animals	2 ft	4 ft	Adequate for mortality	Total mortality weight ÷ 62.4 lb/ft3 = ~volume of mortality in ft3 Pit excavation = 2-4 times the mortality volume to	--	Pits 6 ft or greater in depth – perform soil tests to a depth two ft below lowest planned excavation Multiple pits – separate by 3 ft of undisturbed or compacted soil For deep soils, carcasses and soil can be placed in multiple layers up to a total

Jurisdiction/ Source	Total Trench Depth (D)	Carcass Depth	Depth Cover	Trench Width (W)	Trench Length (L)	Est. Area or Volume Required	Carcass Equivalents	Other Notes
Literature								
						allow for voids and fill soil Spreadsheet avail on request		depth of 8 ft 62.4 lb/ft3 suggests a density of approximately 1,680 lbs/yd3
APHIS (USDA, 1980)	9 ft or Greater	--	--	7 ft or greater	--	14 ft2 at bottom of pit for each adult bovine	1 adult bovine = 5 mature sheep or hogs	For every additional 3 ft of trench depth, the number of carcasses per 14 ft2 can be doubled. Trench site should be mounded over and neatly graded. Do not pack the trench – decomposition and gas formation will crack a tightly packed trench causing it to bubble and leak fluids.
APHIS (USDA, 2001a)	--	--	--	--	--	42 ft3 (~1.2 yd3) required to bury 1 bovine, 5 pigs, or 5 sheep	--	
Australia (Agriculture and Resource Management Council of Australia and New Zealand, 1996)	~5 m (~16.5 ft)	--	2 m (6.5 ft)	~3 m (~10 ft)	--	1.5 m3 (~53 ft3 or ~2 yd3) per each adult beast or 5 adult sheep	--	Example: Trench 5 m deep x 3 m wide filled with carcasses to within 2.5 m of ground level will accommodate 5 cattle or 25 sheep per linear meter (2.5 x 3 x 1 = 7.5 m3; 7.5/1.5 = 5 cattle or 25 sheep)
Alberta, Canada	4-5 m (13-16.5	--	2 m (6.5 ft)	2 m (6.5 ft)	10 m (33 ft)	31 adult cattle carcasses	1 bovine = 5 adult hogs or	

Jurisdiction/ Source	Total Trench Depth (D)	Carcass Depth	Depth Cover	Trench Width (W)	Trench Length (L)	Est. Area or Volume Required	Carcass Equivalents	Other Notes
Literature								
(Ollis, 2002)	ft)					require trench 4 x 2 x 10 m (DxWxL) (80m3, 2,800 ft3, or 105 yd3 per 31 adult cattle) (~2.6 m3, 92 ft3, or 3.5 yd3 per carcass) 46 adult cattle carcasses require trench 5 x 2 x 10 m (DxWxL)	sheep 1 bovine = 40 broiler chickens (market-ready weight)	

Attachment 14.J Transfer and Chain of Custody Form

Section 1

USDA Facility 123 Main Street Any City, USA 10101 Tel: (218) 560-8070 Fax: (218) 560-8071	Instructions: • All external (inter-entity) transfers are required to have a Transfer/Chain of Custody Form completed prior to movement and filed in the facility logbook. Receiving organization is required to sign and FAX/return 1 copy to USDA once biohazardous waste is received and disposed. • All internal (intra-entity) transfers are required to have a Transfer/Chain of Custody Form completed and filed in the facility logbook. • Transfer/Chain of Custody Form is required to be signed by the Responsible Official (RO) and Principal Investigator (PI).								
Biohazardous [infectious substances] Waste _____ Signature of Responsible Official _____ Signature of Principal Investigator	**Transfer** Use for internal and external transfers. ********** If transfer exceeds 8 actions use second form.		**Received** Use for internal and external transfers. ********** If transfer exceeds 8 actions use second form.		**Type of Transfer** Check box ☑ below and complete Section 2 for external shipping/receiving. ********** For internal transfer provide an entry of each movement in the below columns noting each location code.		**Location Code** ST- Storage LS- Lab to Storage SFD- Storage to Facility Disposal SOD- Storage to Off-site Disposal O- Other (explain)	**Number of Primary Containers/Animals** Use for internal and external transfers. ********** If transfer exceeds 8 actions use second form.	**Remarks**
	Date	Time	Date	Time	Internal ☑	External ☑			
1)					☐	☐		☐☐☐☐☐	
2)					☐	☐		☐☐☐☐☐	
3)					☐	☐		☐☐☐☐☐	
4)					☐	☐		☐☐☐☐☐	
5)					☐	☐		☐☐☐☐☐	
6)					☐	☐		☐☐☐☐☐	
7)					☐	☐		☐☐☐☐☐	
8)					☐	☐		☐☐☐☐☐	

Section 2: External (inter-entity) Shipping and Receiving Information (Check ☑ appropriate box)

Authorization/Ship to: ☐	Received From: ☐	Authorization/Ship to: ☐	Received From: ☐	Instructions: Section 2 provides for two (2) shipping and receiving actions. Check ☑ the appropriate box beginning with the first action-shaded area.
Organization: RO Signature:_____ Date:	Organization: Signature:_____ Date:	Organization: RO Signature:_____ Date:	Organization: Signature:_____ Date:	

Attachment 14.K Training

Having the appropriate training is an important part of an effective response to an FAD outbreak. USDA APHIS recommends that all individuals who are involved, or who anticipate being involved in disposal, to familiarize themselves with the latest methods and techniques. Below lists some of the areas where responders can get additional training:

- Riverside County California Waste Management Department has a video on animal carcass burial in landfills.
- The Ohio State University Extension Office offers several courses in composting at http://oardc.osu.edu/ocamm/t01_pageview/Home.htm, such as
  - a livestock producers program on mortality composting certification offered through their Agriculture and Natural Resources Office, and
  - a compost operators course titled, "Science, Art of Large-Scale composting."
- The Solid Waste Association offers certification programs and educational programs on various solid waste topics: landfilling, composting, and the collection and transfer of solid waste. See http://swana.org/Education/Educate/tabid/53/Default.aspx for a list of programs.
- There is an annual symposium on the Management of Animal Carcasses, Tissue and Related Byproducts. See http://extension.umaine.edu/ByproductsSymposium09/proceedings/InternationalSymposiumProceedings.pdf for a sample of the 2009 proceedings.
- Purdue University's Biosecurity Center Organization offers a Veterinary Homeland Security Graduate Certification Program. A class titled, "Euthanasia and Carcass Disposal" is offered as part of the certification program. The course discusses different disposal methods such as rendering, burial, incineration, and composting. See http://www.biosecuritycenter.org/article/vetHomelandProgram for more information on the certificate program and course offerings.

Attachment 14.L Acknowledgements

The Disposal SOP reflects the efforts of a number of people. Authors include:

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Attachment 14.M Acronyms

3D	depopulation, disposal, and decontamination
AHPA	Animal Health Protection Act
APHIS	Animal and Plant Health Inspection Services
APPI	Animal Protein Producers Industry
BSE	bovine spongiform encephalitis
C&D	cleaning and disinfection
CBRN	Chemical, Biological, Radiological, and Nuclear
CDL	commercial drivers license
CFR	Code of Federal Regulations
CO_2	carbon dioxide
CSF	classical swine fever
DHS	Department of Homeland Security
DOT	Department of Transportation
EPA	Environmental Protection Agency
EQS	Employee Qualification System
ESF	Emergency Support Function
EZ	Exclusion Zone
FAD	foreign animal disease
FAD PReP	Foreign Animal Disease Preparedness and Response Plan
FDA	Food and Drug Administration
FEMA	Federal Emergency Management Agency
FMD	foot-and-mouth disease
FSIS	Food Safety and Inspection Service

HPAI	highly pathogenic avian influence
HHS	Department of Health and Human Services
HSPD9	Homeland Security Presidential Directive 9
HWID	hazardous waste identification
IC	Incident Command
I-WASTE	Incident Waste Assessment & Tonnage Estimator
NAHEMS	National Animal Health Emergency Management System
NO_2	nitrogen dioxide
NRCS	Natural Resources and Conservation Services
NRT	National Response Team
NVS	National Veterinary Stockpile
PAHs	polycyclic hydrocarbons
PPE	personal protective equipment
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act
RVF	Rift Valley Fever
SO_2	sulfur dioxide
SOP	standard operating procedure
TB	tuberculosis
TDD	telecommunications device for the deaf
UK	United Kingdom
USDA	United States Department of Agriculture
VTEC	verotoxin-producing *E. coli*