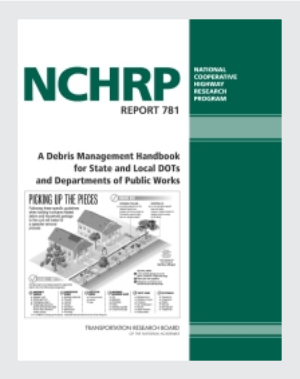

A Debris Management Handbook for State and Local DOTs and Departments of Public Works

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NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

NCHRP REPORT 781

A Debris Management Handbook for State and Local DOTs and Departments of Public Works

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TRANSPORTATION RESEARCH BOARD

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NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

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The needs for highway research are many, and the National Cooperative Highway Research Program can make significant contributions to the solution of highway transportation problems of mutual concern to many responsible groups. The program, however, is intended to complement rather than to substitute for or duplicate other highway research programs.

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FOREWORD

By Stephan A. Parker
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NCHRP Report 781: A Debris Management Handbook for State and Local DOTs and Departments of Public Works provides background and advice to enable a community or agency to better prepare for and respond to disaster-related debris issues. The subjects addressed within the handbook range from development of a plan to final debris disposal and operational closure. It is organized by phase of the debris management cycle, including policy, planning, contracts, segregation, monitoring, site selection, removal, disposal, and reimbursement, as well as hazard-specific considerations. The handbook features several case studies drawing on the experience of local, state, and federal debris managers, offering real-world insight into efficient debris management operations. This handbook will be of interest to community political leaders, state DOTs, local public works agencies, and facilities managers.

Much of the debris from any incident—whether a traffic incident, collapse of aging infrastructure, or major disasters such as a hurricane or tornado—falls on or is pushed onto roads. These roads must be cleared rapidly because they are part of the planned network of emergency routes to bring in first responders, as well as to provide the necessary mobility to get the injured to appropriate medical care or to shelters. In the aftermath of an incident, it is essential to restore the transportation system and other public utilities as quickly as possible. This involves clearing debris and repairing, replacing, or restoring critical transportation infrastructure. During most incidents with limited scope, local and state DOTs or public works departments are financially responsible for physically clearing debris from roads. However, during catastrophic events that create large quantities of debris, the federal government supports state and local efforts in clearing debris, including what lies in the transportation rights of way. To effectively work with federal programs, state and local DOTs need to be better prepared—in terms of training, resources, and expertise—to understand their role in debris clearance and to potentially serve as the lead for debris management. In order for states to succeed, they must equip those that do debris removal for routine incidents—often the public works departments—with the tools necessary to produce a comprehensive debris management plan that, for example, meets the Federal Emergency Management Agency (FEMA) requirements for reimbursement and federal assistance as outlined in the FEMA Catastrophic Planning Initiative and the National Response Framework.

Under NCHRP Project 20-59(37), the research team from Dewberry developed a handbook with recommended practices and procedures for debris management for local, tribal, and state transportation and public works agencies. The development of this guide involved an extensive amount of research and coordination. The authors conducted detailed reviews of applicable regulations and guidelines from federal agencies involved in disaster debris

operations or funding, and consulted individuals working for and with state and local DOTs and DPWs as well as associations, organizations, and firms with experience in debris planning, training, contracting, operations, and monitoring. The research team also contacted representatives from several state departments of emergency management, who provided documentation and advice on various aspects of debris operations. Creating the guide involved review and analysis of case studies. The team reviewed, verified, and summarized all of the obtained background information to provide a clear picture of issues, problems, guidance, and potential solutions. The literature review yielded over 160 debris management publications, led to the creation of a searchable database and other tools, and informed the background that served as the foundation of the handbook. The review of field experience included a survey of local, state, and federal debris staff and in-depth interviews with experienced debris managers. The knowledge gained from these practitioners formed the development of case studies highlighting real-world effective practices and lessons observed.

In addition to the handbook, a methodology report and a PowerPoint presentation describing the entire project are available on the TRB website (www.trb.org) by searching for "NCHRP Report 781."

CONTENTS

Note: Photographs, figures, and tables in this report may have been converted from color to grayscale for printing. The electronic version of the report (posted on the web at www.trb.org) retains the color versions.

SUMMARY

A Debris Management Handbook for State and Local DOTs and Departments of Public Works

Debris issues are varied, widespread, and costly. They have an immediacy that requires quick decision making in order to clear roadways and provide access for emergency vehicles and rescue operations, as well as unobstructed routes to critical facilities. Debris removal and disposal often constitute the single most costly activities faced by local and state jurisdictions after a major disaster. *A Debris Management Handbook for State and Local DOTs and Departments of Public Works* will serve as:

- A single, comprehensive body of knowledge on academic and practical considerations for debris planning and operations.
- A foundation for developing and refining debris-related planning, operations, and training/exercise options for state and local agencies.
- An intuitive guide toward establishing state and local contracting policies and procedures on debris clearance that are conducive to meeting federal agency regulations for reimbursement standards.
- A road map toward enhancing overall debris management programs at the state and local levels, potentially reducing the overall costs related to disasters.

The research report stepped through a two-phased research approach used to develop the handbook, highlighting:

- The **literature review,** which yielded over 160 debris management publications, led to the creation of a searchable database and other tools, and informed the background reports that served as the foundation of the handbook;
- The **review of field experience,** which included a survey of local, state, and federal debris staff and in-depth interviews with experienced debris managers. The knowledge gained from these practitioners formed the development of case studies highlighting real-world effective practices and lessons observed;
- The development of the **handbook** itself, stepping through each phase of the debris management cycle and evaluating hazard-specific considerations; and
- The creation of innovation **tools** designed to aid planning and decision making for debris management operations.

The handbook provides a summary of the information that was gathered during its development. It provides background and advice to enable a community or agency to be better prepared to respond to disaster-related debris issues from likely events. It emphasizes that such entities should develop and exercise a debris management plan prior to an event, rather than be forced to develop a plan during an event and after its occurrence. If the latter occurs, there likely will be delays and issues that could have been prevented. The subjects addressed within the guide range from development of a plan to final debris disposal and operational closure.

CHAPTER 1

Introduction

Synopsis of Issue

It is an unfortunate fact that disasters occur all too frequently in the United States. Disasters range from small local road washouts that a state department of transportation (DOT) or a local department of public works (DPW) quickly resolves, to massive storms that require a wide variety of local, state, and contract assistance to resolve. When these large disasters occur, federal reimbursement is usually made available; however, such reimbursement requires detailed documentation to confirm funds expended.

One of the major concerns associated with large disasters is the resulting debris created by such incidents. The removal, transportation, reduction, and disposal of multiple types of debris are required. Thousands of cubic yards of vegetative debris were generated in Mississippi following Hurricane Katrina in 2005. In New Orleans, massive building replacement was necessary following the floods that resulted from the levee failure during Katrina. Millions of tons of construction and demolition (C&D) debris resulted from the 2001 World Trade Center collapses and the 1994 Northridge, CA, earthquake. The 2013 Oklahoma tornadoes also produced widely scattered residential C&D debris. Following all of these incidents, the collection, hauling, and disposal operations were massive and costly, and required intensive labor and use of equipment. In spite of the multiple disasters in which debris has been a major concern, states, counties, cities, towns, tribal reservations, and territories are seldom adequately prepared to respond.

Target Audience

This guide is intended to assist an audience with varying levels of knowledge and experience managing debris. For those with little knowledge or experience in debris removal operations, it provides an excellent overview of disaster operations. For those with more experience, it provides more detailed information on subjects ranging from contracting to the development of a comprehensive debris management plan.

Why Is Transportation Such a Key Concern After a Debris-Generating Event?

Transportation routes are a key component of both immediate and long-term recovery efforts. Additionally, transportation and related personnel and equipment play key roles in both response and recovery. When large disasters occur, it is important to clear transportation routes as quickly as possible, for a number of reasons. Emergency assistance personnel and vehicles must have access to the impacted area; survivors require various means of transportation to medical care facilities and shelters. Supplies and equipment for repair and rebuilding must have a reliable path of

transportation; debris (sometimes massive amounts) must be removed and disposed of in a proper manner. State DOTs and local DPWs have a tremendous responsibility to respond on short notice and react to these disasters with personnel, equipment, and contracting authorities. These agencies must have individuals who are trained and knowledgeable in responding, quickly assessing needs, making appropriate decisions about mutually exclusive use of resources, and developing both short- and long-term plans related to the debris operations. All of these tasks must be accomplished while addressing multiple demands upon a fixed inventory of personnel and equipment.

Why Did the National Cooperative Highway Research Program (NCHRP) Prepare a Debris Management Handbook?

Issues related to disaster debris continue to create problems for federal, state, and local agencies. NCHRP determined that a handbook that outlines these issues, with guidelines on how to prepare for or improve debris management responses, and provides summaries of effective practices, would be of great benefit. Virtually all community political leaders, state DOTs, local public works agencies, and facilities managers who are responsible for stormwater systems could benefit from having such a guide. The document can serve a multitude of purposes, including:

- A single, comprehensive body of knowledge for all aspects of disaster debris planning and operations.
- A foundation for continually developing and refining debris-related planning, operations, training, and exercises for state and local agencies.
- A guide toward establishing specific contracting policies and procedures on debris removal and disposal operations that are based on the Federal Highway Administration (FHWA) and Federal Emergency Management Agency (FEMA) regulations and meet all reimbursement standards.
- A guideline to understanding the debris-related roles of various federal agencies, primarily the FHWA, FEMA, and the Natural Resource Conservation Service (NRCS).

How Was the Handbook Prepared?

The development of this handbook involved an extensive amount of research and coordination. The authors conducted detailed reviews of applicable regulations and guidelines from federal agencies involved in disaster debris operations or funding, and consulted individuals working for and with state and local DOTs and DPWs as well as associations, organizations, and firms with experience in debris planning, training, contracting, operations, and monitoring. The authors also contacted representatives from several state departments of emergency management, who provided documentation and advice on various aspects of debris operations. Creating the guide involved review and analysis of case studies. The writers reviewed, verified, and summarized all of the obtained background information to provide a clear picture of issues, problems, guidance, and potential solutions.

What Does the Handbook Specifically Provide?

The handbook provides a summary of the information that was gathered during its development. It provides background and advice to enable a community or agency to be better prepared to respond to disaster-related debris issues from likely events. It emphasizes that such entities should develop and exercise a debris management plan prior to an event, or else they will be forced to develop a plan during an event and after its occurrence. If the latter option is selected, there likely will be delays and issues that could have been prevented. The subjects addressed within the guide range from development of a plan to final debris disposal and operational closure.

CHAPTER 2

Planning

Synopsis of Issues

This chapter provides state and local DOTs and DPWs with guidance on how to plan for debris removal and disposal operations following any type of debris-generating event. The planning concepts presented in this chapter expand upon those found within previous debris planning guidance. Traditionally, guidance has suggested that a debris management plan should also address debris management operations. Experiences over the past decade have demonstrated that it is more effective to have a separate debris operations plan, in addition to a debris management plan. Similar to emergency management plans having functional and support annexes that delve into the operational aspects of emergencies, debris operational plans should be developed in conjunction with the management plans. These two debris plans together will provide state and local emergency managers, DOTs, and DPWs with a comprehensive planning approach that leads to more effective debris operations. This chapter draws a distinction between a debris management plan and a debris operations plan, while noting that both documents are necessary to effectively manage debris recovery after any type of event. This chapter also maps out the steps for developing the two planning documents.

Target Audience

- Local and regional DOT and DPW managers.
- State agencies [DOT, General Services Administration (GSA), Department of Environmental Protection (DEP)/Department of Environmental Quality (DEQ)].
- Emergency management planners/emergency operations planners (EOPs).

Why Is Planning for Debris Important?

Debris removal is the critical starting point of both the disaster response and disaster recovery phases. The scope and scale of debris operations often catch communities by surprise; debris removal operations following a disaster can easily account for more than 40 percent of total disaster recovery costs. Communities need to be prepared to implement effective and efficient debris operations immediately following any debris-generating event, with no delays or hesitations. Pre-disaster debris planning efforts allow communities to identify gaps and shortfalls in advance of an event so those items may be addressed. The goal of a well-organized planning process and the resulting plans is to be better prepared to manage disaster-related debris in a more efficient manner. Effective management results in timely access to critical infrastructure and expediting of the recovery process. In addition, for federally-declared disasters, a sound and properly executed debris management plan may better position communities to take advantage of legislation and debris policies that provide supplemental funding for responsive and effective debris operations.

Examples:

Hurricane Ivan: When the storm hit in September 2004, the Escambia County, FL, government had a plan in place and stated that "time spent planning was time well spent." The plan pre-identified contractors and sites for debris processing and removal.

World Trade Center Attacks: On September 11, 2001, the City of New York had a debris plan in place and sites had been pre-identified through its planning process. While the scope and magnitude of the event far exceeded the City's plan, having a plan in place and identified debris sites increased debris management capabilities.

County Wildfires, 2003: A government did not have a debris management plan in place before this incident, which was a major program challenge. The County believes it could have saved time and been reimbursed by FEMA more easily if a plan had been in place.

What Planning Documents Should Be Developed?

The development of effective debris management plans has continually evolved, producing new programs and policies at all levels of government. Historically, debris management plans have enabled jurisdictions to establish roles and responsibilities of all parties associated with debris operations. They have also provided guidance and background for implementing those activities. Some debris management plans do very little, however, to provide guidance for operating effectively when responding to debris-generating events. The debris management plan may describe the most likely types of hazards a community faces, but it offers no suggestions when the actual event does not match the plan. The debris management plan may describe the total landfill capacity for a county with C&D debris, but it doesn't tell a public works department how to determine staging areas when the debris is a mix of vegetation, C&D, household hazardous waste, white goods, etc. The debris management plan may outline staffing options available to a community after a disaster; however, it may not address a situation when much of the staff has been made unavailable; or how a large regional disaster will affect staffing through existing memoranda of understanding (MOUs) or memoranda of agreement (MOAs). The lessons learned from debris-generating events indicate that debris plans need to consider two distinct and separate phases of debris—pre-disaster management and post-disaster operations.

The debris management plan is a document based on anticipated identified threats, risks, vulnerabilities, capabilities, and resources. The management plan establishes the organizational structure (see Chapter 6 on operational structure and organization), roles and responsibilities, applicable policies (federal, state, and local), reporting processes, sequence of events, anticipated duties, and other key components. The debris management plan also includes the anticipated debris-specific issues based on the predicted disaster threats, used as a modeling example (see Chapter 3 on forecasting and estimating).

The debris operational plan is a post-disaster guidance document that modifies the assumptions from the debris management plan and accounts for the specific criteria of a unique disaster event to adapt the debris response and recovery activities. Subsequent chapters will also provide more details on each of the phases of the debris management cycle, some of which should be considered as part of the operational planning process.

What Is a Good Debris Management Plan?

Planning for debris management prepares jurisdictions for the type and quantity of debris they should expect from a designated event (or events). This will allow officials to implement procedures and criteria that will help ensure their reimbursement requests are consistent with

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existing local, state, and federal laws. A good plan also establishes an operating framework identifying key players and their responsibilities, approaches for clearing and removing debris, and strategies for disposal. It may also identify the need for additional resources and applicable points of coordination required to facilitate a smooth, efficient operation.

> *The lessons learned from past events indicate, in order to protect people, debris removal planning should be based on a systematic approach, whereby every component is functional in itself and is coordinated into a cohesive working response.*
>
> —FEMA Public Assistance (PA) Planning Workshop Instructor Guide (*1*)

The purpose of a debris management plan is to establish partnering relationships through communications and pre-planning with individuals that have debris management responsibilities. It outlines the roles and responsibilities and provides policies and guidance for the removal and disposal of debris caused by debris-generating events. The debris management plan should include and address the following:

- Situations and assumptions:
  - Clarify the types of debris-generating events to which the community is susceptible.
  - State any assumptions made in development of the plan.
- Authorities—identify adopted plans, ordinances, etc., that authorize debris management activities.
- Roles and Responsibilities:
  - Primary entities.
  - Support entities.
  - Political entities.
- Organizational structure:
  - Identify individuals by position title rather than name when determining who will function in what position within a debris management organization.
  - Define specific position responsibilities.
  - Follow the Incident Command System (ICS), as outlined in Chapter 6.
- Policies:
  - Private property demolition and debris removal policies.
  - Contracting and procurement policies.
  - Reimbursement policies.
  - Health and safety requirements.
  - Recycling requirements.
  - Environmental and permitting requirements, including historical preservation.
  - Local building condemnation policies following a disaster.
- Public Information Plan:
  - Message
  - Development of public information announcements that may be required.
  - Distribution methodology:
    - Pre-event.
    - Post-event.

What Is a Good Debris Operational Plan?

The purpose of a debris operations plan is to identify required capabilities and unify them with the efforts of organizations into a comprehensive and effective approach. The plan establishes the most efficient and cost-effective methods to resolve disaster debris removal staging, reduction, recycling, processing, and disposal issues. The debris operations plan establishes a

strategy for the debris operations that is flexible and can be adjusted depending on the variables of an actual event. The debris operations plan should include and address the following:

- Debris Management Operational Assessment Base Data:
  - Identification of a "design event" on which the operational approach is based, while stating that the approach is flexible and scalable to address a wide variety of events of differing magnitudes. (Such an event should be a type considered as most likely to occur.)
    - Specifically identify issues and tasks that need to be evaluated and adjusted depending on the event.
  - Types of debris to be considered.
  - Debris estimate methods.
  - Identification of particularly susceptible areas and communities.
  - Debris zones.
  - Debris removal site priorities.
  - Debris hauling routes and traffic impacts.
  - Debris management sites.
  - Resources capabilities (how much debris can force account resources effectively manage).
- Debris Management Strategy:
  - Resource requirements and capabilities
    - Force account.
    - Contractor:
      - Standby contracts.
      - Emergency contracting.
      - Debris operations to be outsourced.
  - Scheduling expectations, capabilities, and assumptions.
  - Clearance:
    - Coordination with emergency responders to clear roadways.
    - Clear priority roadways to promote traffic flow.
    - Establish priorities for both clearance and removal so all parties are aware.
  - Debris site selection, setup, operation, and closing:
    - Alternate sites (should be determined prior to an event).
    - Utilities availability.
    - Permitting requirements.
    - Testing requirements.
    - Debris management site (DMS) safety requirements.
    - Closing requirements.
  - Removal:
    - Curbside pickup.
    - Drop-off centers for the public:
      - Locations.
      - Operational information.
      - Staffing.
    - DMS(s).
    - Timeframes for removal—define how long operations will continue and communicate clearly to the public.
    - Private property debris removal.
    - Debris monitoring plan.
  - Reduction:
    - Methods:
      - None.
      - Chipping/grinding.

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        - Burning:
            - Air curtain operation.
            - Open burning.
        - Recycling.
    - Locations:
        - Curbside.
        - DMSs.
        - Landfill.
  - Disposal:
    - Landfill.
    - Recycling.
    - Landscaping.
- Health and Safety Plan:
  - Pickup and removal operations.
  - Traffic control for debris operations.
  - Opening, operation, and closing of DMSs.
- Documentation and Reimbursement:
  - Documentation and tracking:
    - Accounting codes.
    - Load tickets:
        - Paper.
        - Automated.
  - Force account time tracking.
  - Equipment tracking.
- Final Closeout Checklist:
  - All eligible disaster debris removed to disposal.
  - All DMSs officially closed.
  - All documentation reviewed and submitted.
  - All appropriate agencies notified.
  - All known issues resolved.

When Should Debris Plans Be Written?

Ideally, debris management plans and debris operations plans should be written in a period of "peace time," rather than during or right after an event. When developing plans, the process should be given priority. Making sure there is adequate time for coordination and input improves the understanding and expectations once an event occurs. The debris operations plan will also need to be reviewed and modified when a disaster event occurs, based on the conditions of the actual event. The plans should be reviewed annually and revised as appropriate to reflect changing conditions within a jurisdiction.

In a geographical area that has a "typical" disaster cycle, such as hurricane season, planning should start as far in advance of that season as possible (almost immediately after the end of a season, if feasible).

Who Should Be Involved in the Planning Process?

Debris planning is typically initiated and facilitated by the department or agency responsible for debris. Generally this will be the DPW, department of solid waste management, or DOT. However, sometimes debris plans are written by the emergency management group within a

jurisdiction, in which case its contents and strategies must be coordinated with those responsible for implementing and executing the plans. One issue that can occur at times is that the actual event may not comply with the assumptions used in developing the plans. That is to be expected, and the plans should be developed with that realization. If the plans are properly written, it should be easy to modify the original assumptions in a short time to make them relevant and event specific.

The planning process should include any internal or external department, agency, or organization that would have either a primary or support role in the debris operation. Some examples of agencies that are often involved in debris management may include, but are not limited to:

- DPW.
- Department of Solid Waste.
- Office of Emergency Management.
- Electric utility and cellular telephone providers.
- DOT.
- Parks and Recreation.
- Water/wastewater utility providers.
- Public Information Office and local news media.
- Department of Environmental Quality.
- Land Use/Zoning Department.
- Public Safety.
- Fire and Rescue.
- Historic Preservation.
- Geographic Information System (GIS).

For a debris plan to be effective, it must be approved by upper management personnel in the agencies, departments, or organizations that are identified in the plan as having directing or supporting roles in debris operations.

How Should the Planning Process Be Performed?

Currently, little substantive guidance on how to write debris management planning documents exists outside of FEMA's PA Pilot Program guidance from 2007. While the FEMA PA Pilot Program guidance is a good starting point, consistency among debris plans still varies greatly. As with other types of plans, a debris plan is often developed using a strict template, which limits its effectiveness as well as the ability to create customized strategies for unique situations.

Other planning processes that have clear established guidance are outlined in documents such as the Comprehensive Planning Guide (CPG) 101 issued by FEMA (*2*). For consistency with other emergency planning documents, the process outlined in this chapter follows the CPG 101 guidance. Figure 2.1 depicts that planning process. While this planning process can be followed for both the debris management plan and the debris operations plan, it is important to note that the two plans also can be developed in tandem, given that information from the management plan will be a basis for the operational plan.

Form a Collaborative Planning Team

Planning is best performed by a team. By using a team, relationships can be built and expanded to help bring creativity and innovation to the planning process.

> *Using a team or group approach helps organizations define the role they will play during an operation. Case studies and research reinforce this concept by pointing out that the common thread found in successful operations is that participating organizations have understood and accepted their roles.*
>
> —FEMA CPG 101 v2 (*2*)

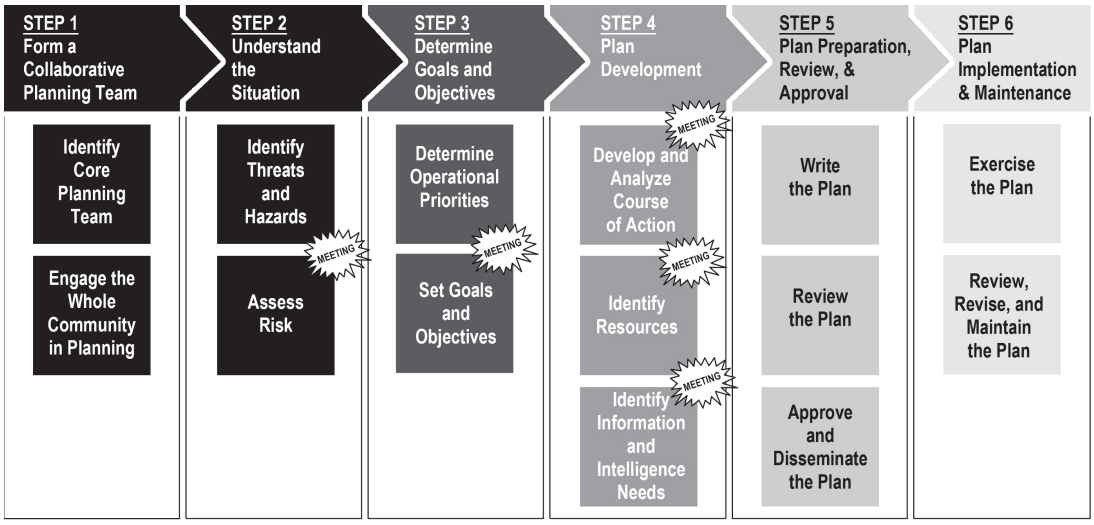

Figure 2.1. Steps in the planning process. (Source: FEMA CPG 101 V2) (2)

The agency responsible for debris management should recruit and establish a planning team. As previously mentioned, the planning team should consist of stakeholders who have a primary or secondary responsibility for debris. CPG 101 provides the following tips for convening a planning team:

- **Plan ahead.** The planning team should receive sufficient notice about where and when the planning meetings will be held. If time permits, ask the team members to identify the time(s) and place(s) that will work for them.
- **Provide information about team expectations.** Planners should explain why participating on the planning team is important to the participants' agencies and to the community itself, showing the participants how their contributions will lead to more effective operations. In addition, budget and other project management concerns should be outlined early in the process.
- **Ask the senior elected or appointed official or designee to sign the meeting announcement.** A directive from the executive office carries the authority of the senior official and sends a clear signal that the participants are expected to attend and that operational planning is important to the community.

Understand the Situation

To provide a reasonable basis for planning, a threat/hazard identification and risk assessment should be performed. For debris planning, this should focus on the types of events to which the state or local jurisdiction is vulnerable, what types of debris could be generated by those events, and what gaps presently exist in capabilities to effectively manage the debris generated. The analysis will help the planning team determine priorities, develop or compare courses of action, and inform decision making.

It is important to note that many times states have state-declared disasters for events that do not meet the criteria for a federal declaration. In many instances, damages from an event are not sufficiently large for either a state or federal declaration, and the entity still has to move the debris. The planning team should consider the varying levels of events that could generate debris, whether large or small, declared or not declared, and consider how resources and coordination need to be scaled depending on the type of event.

Determine Goals and Objectives

Using information from the analysis, the planning team can determine the operational priorities, which establish how the hazard or threat would affect debris operations and what defines a successful outcome for the community. Once the operational priorities are established, goals and objectives can be developed.

Goals and objectives should support the operational priorities and clearly indicate the desired result or end-state they set out to accomplish. This approach fosters a uniform effort and purpose among the primary and support groups and activities involved in implementing the plans.

Goals should be broad, general statements that specify the intended solution to problems identified by the planning team. They indicate what is expected to be achieved to those involved in the operation. They also help identify when components of the operation are complete, and signify that the operation is successful. On the other hand, they could indicate when and where things went wrong or were challenging, and help pinpoint gaps and areas for improvement.

Objectives are more specific and identifiable actions that must be accomplished during the operation, and lead to achievement of the operational goals. The responsible organizations need to translate these objectives into activities, implementing procedures, or operating procedures. The step of developing goals and objectives may bring to light more requirements that will need to be considered in the development of courses of action as well as the capability estimates.

Example: Los Angeles County, CA (Northridge Earthquake) (*3*)

Los Angeles County did not have a debris management plan in place prior to the 1994 earthquake. The County strived to recycle as much of the earthquake-generated debris as possible, so the government was required to create a plan retroactively. Los Angeles County was successful in accomplishing its recycling goal, due in part to a high level of participation and cooperation by residents.

Plan Development

Once priorities, goals, and objectives are determined, the planning team will need to develop and analyze what courses of actions should be taken. According to (and adapted from) CPG 101, developing the course of action will include the following:

- **Establishing a timeline**—This step allows the planning team to identify when certain actions will occur, when critical decisions need to be made, and when resources will be needed.
- **Depicting a scenario**—This scenario is based on the threat/hazard and risk assessment, and is simply meant as a reasonable foundation for planning, not an absolute for what will occur. This is where the scale and types of possible debris-generating events come into play.
- **Identifying and depicting decision points**—This step establishes what decisions need to made and when for the operation to be most efficient and effective.
- **Identifying and depicting operational tasks:**
  - What is the specific action?
  - Who is responsible for the action?
  - When should the action take place?
  - How long should the action take and how much time is actually available?
  - What has to happen before?
  - What happens after?
  - What resources does the person/entity need to perform the action?

Once the requirements are determined, the planning team will need to identify (1) what resources are needed for the operation, and (2) what resources are available. Assignments should

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not be based on availability; rather, assignments should be based on need. By tracking resource obligations and assignments, the planning team can identify resource shortfalls and develop solutions for filling those gaps, either through private contractors or other non-essential staff. It is important to note that resources do not just include required equipment and personnel, but also those facilities vital to the operation. The planning team should consider how individual hazards might affect all identified resources as well.

Throughout this plan development phase, the planning team should keep a list of information and intelligence that is needed for them to make the most informed decisions. They should regularly identify information and intelligence needs and then set deadlines for receiving that information so as not to delay the planning process. A sample planning checklist can be found in Appendix A.

Plan Preparation, Review, and Approval Process

The planning team is now ready to draft the planning document. Adapted from CPG 101, the following is a list of helpful hints for writing any plan that will help ensure readers and users understand their content:

- Keep the language simple and clear by writing in plain English. Summarize important information with checklists and visual aids, such as maps and flowcharts.
- Avoid using jargon and minimize the use of acronyms.
- Use short sentences and the active voice. Qualifiers and vague wording only add to confusion.
- Provide enough detail to convey an easily understood plan that is actionable. The amount of detail a plan should provide depends on the target audience and the amount of certainty about the situation.
- Format the plan and present its contents so that its readers can quickly find solutions and options.
- Focus on providing mission guidance and not on discussing policy and regulations. Plans should provide guidance for carrying out common tasks, as well as enough insight into intent and vision so that responders can handle unexpected events. However, when writing a plan, "stay out of the weeds." Procedural documents [e.g., standard operating procedures (SOPs)/standard operating guidelines (SOGs)] should provide the fine details.
- Ensure accessibility by developing tools and documents (e.g., print, electronic, video) so they can be easily converted to alternate formats.

Once drafted, the planning team will need to initiate a review process. Planning team members can and should review the drafts, but outside, third-party reviewers should also be utilized. Expectations and a timeframe should be associated with the review. Comments and edits should then be evaluated and incorporated as appropriate. The planning team may choose to undergo more than one review cycle, but should keep in mind that at a certain point reviews become counterproductive, so the planning team should only do as many reviews as they feel will provide value.

Final documents should then go through an established approval process prior to implementation. Obtaining an official approval of the plans will validate their importance and establish an even higher expectation for implementation. Depending on which is the primary agency for debris, the agency head and/or state or local jurisdiction leadership should sign off on the plans.

Plan Implementation and Maintenance

To ensure all staff involved in the operations understand the coordination requirements and operational goals and objectives, the plans should be disseminated to all primary and support departments and agencies responsible for any part of the debris operation. These departments

and agencies should be required to train their staff on the plans. It would also be beneficial, and should be required, that the primary agency, in collaboration with the emergency management office, plan and conduct an exercise or series of exercises to further evaluate and validate the plans.

Regardless of the level of detail planned for within the plans, each actual event will present different challenges. Immediately upon the notice of a possible event, or event at the onset, the operational stakeholders should conduct a quick review of the plans and determine what actions may need to be adjusted, added, or omitted based on the nature or scale of the event.

An effective practice for planning is to review and revise plans after any event, exercise, or training. Tracking and discussing the effectiveness of the debris operation is important for improving the plans for the next event.

CHAPTER 3

Debris Estimating

Synopsis of Issues

Two primary questions that arise both during the preparation of debris plans and in the implementation of those plans are "How much debris is there?" and "What is the mix of the debris?" The general categories of debris that might be expected from various types of disasters will be discussed in subsequent chapters, but this chapter will cover how to determine the amount of debris, for both pre-event forecasting and post-event estimating. During the development of debris plans, one of the key components that forms the basis of the plans is the anticipated amount of debris. Immediately after a disaster, an estimate of the amount of debris is extremely important in order to properly deploy resources and immediately begin the cleanup process. A timely estimate of magnitude of debris can provide the basis for:

- Updating the debris plans.
- Estimating impacts to existing waste management facilities.
- Developing estimates of various categories of debris: vegetative, white goods, household hazardous waste, etc.
- Determining whether the work can be accomplished with force account labor.
- Providing volume estimate information to contractors, when they are activated.
- Determining the need for temporary DMSs and the activities that will be required at those sites.
- Working with DOTs and DPWs to minimize traffic issues by developing specific hauling routes.

Target Audience

- Emergency management planners.
- Debris managers.
- Solid waste managers.
- DOT/DPW managers.

Debris Forecasting

Models. Debris forecasting models are used in the planning phase to estimate the amount of debris that might be generated as the result of a potential debris-generating event. In recent years, models have been developed to forecast the amount of debris resulting from specific types of events. These models may also be used immediately before and/or after an event to obtain a first estimate of debris before onsite estimates can be made. The private sector also has developed, and continues to refine, models that can be used with satellite/aerial photography, combined with ground checking, to project debris volumes closely following a disaster event.

Historical Analysis. The most basic forecasting model is frequently called an historical analysis. It uses data from a previous local disaster or from a disaster experienced by a similar in size and demographically common community. By using historical data and interviewing staff involved in the previous debris operation, information for forecasting debris volumes for similar future events can be obtained. That data would then be combined with information such as land-use changes, response capability improvements, changes in landfill capacity, changes in personnel and equipment, modified laws and regulations, as well as other local factors. The resulting analysis should provide a first-cut projection of debris requirements to plan for a selected design event, for the targeted community.

Community-Based Risk Analysis. This method employs land-use maps of the community as a basis for projecting debris. Areas of similar land use are carefully marked and measured. Samples of each land-use type (urban, industrial, etc.) are selected and projected debris volumes for each sample area are calculated. The results from each type of land use are then extrapolated to the total amount of the area that encompasses that particular land use. The results can be added together to obtain a projection for the entire community for the selected design event.

This method has the advantage of providing a rapid means of projecting debris over portions of the community if a disaster does not impact the entire area. The impacted areas can be analyzed separately or a debris projection of all impacted areas can be available rapidly.

U.S. Army Corps of Engineers (USACE). In the 1990s, the USACE developed one of the first models to estimate the amount of debris resulting from hurricanes, using data from Hurricanes Frederick, Hugo, and Andrew. This model defined its design target as a Category 3 hurricane event affecting densely populated areas, and has been widely used for a variety of debris event projections. More recently, USACE has refined its hurricane debris model to reflect experience in estimating debris volumes and has adapted the model to use GIS technology. The storms that occurred in 2004, 2005, and 2008 provided significant experience in debris estimates. The use of ArcGIS (a software product of ESRI) allows rapid numerical calculations and scenario estimates.

The calculations are simple; however, appropriate inputs require some knowledge/information about the probable impact area.

The basic formula is:

$$Q = C(H)(V)(B)(S)$$

Where:

- Q = Volume of debris in cubic yards
- C = Storm intensity factor (increases with increased category of hurricane)
- H = Number of area households (determined by population/average size of household)
- V = Vegetation characteristic (considers vegetative cover)
- B = Commercial/business/industrial use multiplier
- S = Precipitation multiplier (a storm accompanied by or following heavy rains will have more uprooted trees)

Because the more recent model includes greater flexibility in the storm intensity factor (C), the vegetation factor (V), and the storm precipitation factor (S), the factors for that model are included in the tables below. Factors used in the original model can be found in the U.S. Environmental Protection Agency's (EPA's) *Planning for Natural Disaster Debris*, Document ID Number EPA530-K-08-001, issued in March 2008 (*3*).

The C value is expressed in cubic yards (CY) and indicates the increase in debris per household, including buildings, contents, and land foliage.

The vegetative characteristics multiplier, V, focuses on the potential amount of disaster-related debris by taking into account various densities of vegetation, including shrubbery and trees, growing on public rights-of-way. The vegetation V factor is shown in the following table:

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VALUES OF "V"
VEGETATIVE CHARACTERISTICS MULTIPLIER

VEGETATIVE COVER	VALUE OF "V" MULTIPLIER
Light	1.1
Medium	1.3
Heavy	1.5

Following the hurricanes of 2005, USACE reviewed the vegetation factor and found it underpredicted vegetation volumes that occurred in a number of more rural counties. It was apparent that basing vegetative debris significantly on population and households missed a key variable. After review of debris data and discussions with crews involved in debris removal, it was determined that an additional factor of "miles of public roadway as a factor of population density" was needed. While revisions have been made to the model based on these reviews, it has yet to be peer reviewed or published.

The commercial/business/industrial multiplier, B, takes into account areas that are not single-family residential. It includes areas that are considered light retail, schools, apartments, shopping centers, manufacturing, and light industrial. This factor is summarized in the following table:

VALUES OF "B"
COMMERCIAL/BUSINESS/INDUSTRIAL USE MULTIPLIER

COMMERCIAL DENSITY	VALUE OF "B" MULTIPLIER
Light	1.0
Medium	1.2
Heavy	1.3

The amount of rainfall that accompanies a hurricane varies from light to heavy, sometimes called "dry" and "wet." For storms of Category 3 or greater, this designation is very important. Wet storms saturate the soil, resulting in more uprooted trees and increasing the amount of debris that must be removed. Higher intensity storms typically cause more roof damage, exposing structure interiors to the elements and rainfall will also cause more interior contents to be damaged. The table for the S factor is as follows:

VALUES OF "S"
STORM PRECIPITATION MULTIPLIER
(Used in storms of Category 3 or greater)

PRECIPITATION CHARACTERISTIC	VALUE OF "S" MULTIPLIER
None to Light	1.0
Medium to Heavy	1.3

Similar to the vegetation V factor, operational experience also found that modification of the rainfall factor, S, was appropriate with some approximation of expected rainfall (in inches of precipitation) included.

The USACE continues to review and analyze data from tropical storms and hurricanes in an effort to improve the accuracy of the projective formula.

Federal Emergency Management Agency (FEMA). Contractors for FEMA developed a computer model known as HAZUS that provides an estimate of debris resulting from earthquakes. It was originally developed for use on the West Coast of the United States. Subsequent HAZUS modules for flooding and wind events have been constructed. These models are generally used

to develop mitigation plans post-event but have been applied in several cases to events as they occurred. The HAZUS models develop debris values in tonnage and the model results include debris types that are grouped together; conversion to volume estimation can be challenging.

Private Industry Models. Firms in the private sector have been looking into and developing predictive models ranging from the basic to the highly detailed. For example, there are GIS-based models capable of developing debris forecasts before an event, which can include specific post-event weather data to create even more accurate debris estimates following an event. These models can be used on a wide range of disasters, including hurricanes, tornadoes, floods, and even bomb blasts. Some versions of these predictive models have been developed for specific types of disasters, or for specific locations, and must be carefully reviewed to ensure applicability for a desired application.

Debris Estimating

Forecasting the amount of debris that could result from projected disasters provides valuable input for planning and initial response; however, it can be equally important to have a more accurate estimate following the disaster. Having more detailed knowledge about the mix, amount, and location of debris will assist the debris manager in developing priorities for removal, debris reduction and recycling, and establishing sites for temporary (or permanent) disposal. Additionally, the DOT or DPW can provide timely information on transportation routes that will require clearing to expedite debris removal.

There are several methods and techniques that can be used to develop debris estimates, and the selection of which ones to use is based on time, experience of the estimator(s), required accuracy, schedule, etc.

- Ground measurements and calculations of a representative area can be done, and the results extrapolated over areas of similar land use.
- Aerial and satellite photographs of impacted areas taken before and after the disaster can be used. In some instances, post-disaster aerial photographs can only provide extensive information about the extent and magnitude of the area of debris.
- Predictive GIS models that are modified to include disaster-specific details (surge zones, inundation zones, high tide levels, wind band levels, microburst areas, etc.) can produce estimates of debris volumes and locations.
- Any of the remote-sensing approaches combined with systematic ground-based field crews for verification can produce more reliable data results. Equipment used by staff for ground measurements commonly includes measuring tapes, sketch pads, note paper, global positioning system (GPS) units, digital cameras, cell phones, and equipment needed for logistics and safety.

Conversion Factors. Based on a large numbers of disasters and the amounts of resulting debris, several conversion factors and guidelines have been developed that assist in the calculation of a reasonable estimate of debris. Many of these can be found in FEMA Publication 329, *Debris Estimating Field Guide* (*4*). Conversion factors that may be of use are discussed in the following section:

Building and Residences

For many years, the formula for determining the amount of debris generated by a building was

$$\frac{\text{Length} \times \text{Width} \times \text{Height} \times 0.33}{27} = \text{CY}$$

(All building measurements are in feet)
(The constant of 0.33 accounted for air space in the building.)

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Following Hurricane Floyd in North Carolina, FEMA conducted an empirical study and developed a slightly different formula associated with a demolished single-family residence:

$$(\text{Length})(\text{Width})(\text{S})(0.20)(\text{VCM}) = \text{CY}$$

(Length and width must be in feet)

S = Number of stories
0.20 = A constant derived from the study
VCM = A vegetative cover multiplier

The VCM is used to account for the vegetative debris associated with the house based on aerial photography, and is based on the following definitions.

Light (1.1)—Ground is more visible than trees, and canopy cover is sparse, usually new home developments.

Medium (1.3)—Has uniform pattern of open space and tree canopy cover, most common description for vegetative cover.

Heavy (1.5)—Found in mature neighborhoods and woodlots where ground or houses cannot be seen due to tree canopy cover.

When applying the VCM to multi-story houses, the VCM should be applied only to the first-floor square footage.

The following table (Table 3.1) shows the estimated debris from various sizes of single-family residences (from Debris Estimating Field Guide, FEMA 329) (*4*), using this estimation model.

A good application of this tool would be to estimate the total debris from this tornado event, using a picture such as in Figure 3.1, combined with the sizes of houses, and information from Table 3.1. Information on the impacted development indicated the average house was 2400 square feet and a single-story structure. The number of destroyed homes was determined by viewing the aerial photograph and counting driveways. From these two numbers, the debris estimate of much of the impacted area was quickly calculated.

There are additional conversion factors that have been developed by FEMA, the USACE, and debris specialists. These are in common use, and may make estimating faster and easier.

Table 3.1. Estimated debris from destroyed single-family, single-story homes.

Typical House (Square Feet)	Vegetative Cover Multiplier			
	None	Light (1.1)	Medium (1.3)	Heavy (1.5)
1000	200 CY	220 CY	260 CY	300 CY
1200	240 CY	264 CY	312 CY	360 CY
1400	280 CY	308 CY	364 CY	420 CY
1600	320 CY	352 CY	416 CY	480 CY
1800	360 CY	396 CY	468 CY	540 CY
2000	400 CY	440 CY	520 CY	600 CY
2200	440 CY	484 CY	572 CY	660 CY
2400	480 CY	528 CY	624 CY	720 CY
2600	520 CY	572 CY	676 CY	780 CY

Figure 3.1. Damage to residential development by tornado. (Source: FEMA)

Conversion Factor:

1. Debris generated by a wide mobile home = 290 CY.
2. Debris generated by a double-wide mobile home = 415 CY.
3. Personal property brought to the curb from a flooded slab-on-grade home = 25–30 CY.
4. Personal property brought to the curb from a home with a basement = 45–50 CY.
5. Construction and demolition debris: 1 ton = 2 CY.
6. Mixed debris: 1 ton = 4 CY.
7. Vegetative debris:
   a. Hardwoods: 1 ton = 4 CY.
   b. Softwoods: 1 ton = 6 CY.
   c. 15 trees, 8 inches in diameter equals 40 CY (average).
8. One acre of debris 10 feet high = 16,117 CY.
9. Debris generated by a Category 3 to 4 hurricane generally will consist of:
   - 70 percent clean woody debris.
   - 30 percent mixed C&D.
10. Debris generated by a Category 4 to 5 hurricane will generally consist of:
    - 30 percent clean woody debris.
    - 70 percent mixed C&D.

      Of the 70 percent C&D:

      i. 42 percent will be burnable but will require sorting.
      ii. 38 percent will be landfilled
      iii. 15 percent will be metals.
      iv. 5 percent will be soil.

      (It should be noted that this is an estimate based on various hurricanes. The mix will vary depending on the location of the hurricane.)
11. Burning vegetative debris reduces the volume by about 95 percent.
12. Chipping and grinding vegetative debris reduces the volume by about 75 percent.
13. Debris may undergo volume changes during handling/hauling.
14. Leafy vegetation on the ground will have a reduction in volume when it is mechanically loaded into trucks.

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Figure 3.2. Damage to mobile home park 2005 Evansville area tornado. [Source: National Oceanic and Atmospheric Administration (NOAA)]

Figure 3.2 and the conversion factors for mobile homes were used to initially estimate disaster-related debris at this mobile home park.

Example:

In Figure 3.2 above, a review of the aerial photograph indicates that this mobile home park originally held about 160 mobile homes: 52 were totally damaged and 107 were left standing after the tornado.

Of the remaining mobile homes, approximately 14% are double-wide assemblies. Applying that same percentage to the destroyed homes, a reasonable deduction is that 7 were double-wides and 45 were single-wide mobile homes.

Single-wide Debris Estimate	= 290 CY × 45 homes	= 13,050 CY
Double-wide Debris Estimate	= 415 CY × 7 homes	= 2,905 CY
	Total	15,955 CY

It would also be reasonable to estimate that additional debris was created in some of the homes that were not totally destroyed—perhaps an additional 10–15% should be added to the tally. This results in a total estimated debris volume from this mobile home park of approximately 18,000 CY of mixed debris. These procedures and conversion factors provide information that can be used for 1) initial projections before a disaster occurs, and 2) estimates after the disaster. They also provide a means to help develop a workable plan, as well as accelerating the disaster recovery by better understanding the magnitude of the debris management requirement.

Federal, state, and local governmental entities, as well as private firms, continue to develop and refine debris projection and estimating methods. Many of these may be appropriate for specific areas or events; however, they may not provide acceptable projections or estimates in other locations. Before using such models, the software, input, calculating procedures, limitations, and output should be carefully reviewed. The output of any estimating model should not be used as a basis for payment.

CHAPTER 4

Policy

Synopsis of Issue

Debris policies provide clear, specific directions for applying comprehensive rules in a uniform manner to debris management activities. They are the basis for evaluating if work is eligible for reimbursement through publicly-funded grant programs based in compliance with legal, environmental, documentation, and other program requirements. Debris policies are generally formulated by upper-level managers, administrators, and community leaders. After being officially approved, they must be made available to all offices and personnel that are or would be involved in the actions addressed in the policies to help ensure that these individuals clearly understand applicable existing policies. Sometimes people confuse the terms "policies" and "procedures." Policies must clearly state their intended purpose and the approving authority. The simple difference is that while policies are official and approved, procedures show processes to accomplish specific tasks.

According to the results of a 2012 survey that was conducted for the development of this handbook, understanding application of policy is one of the areas of least confidence in the debris management cycle for those responsible for debris operations. The majority of respondents to the survey indicated that their jurisdictions do not have debris management policies in place or they do not know if any policies exist.

Target Audience

- Debris managers.
- Local administrators.
- Legal counsel.

What Is a Debris Policy and What Does It Address?

During and following a disaster, there is often confusion regarding debris-related policies. Many communities are not familiar with federal, state, or even local policies that could impact what can operationally be done, what permits are required, and what is necessary for reimbursement. It is especially important that DOTs and DPWs are aware that such policies exist and how they can affect debris operations and eligible funding.

Public policy is defined by the Public Policy Cycle website, as "a purposive and consistent course of action produced as a response to a perceived problem of a constituency, formulated by a specific political process, and adopted, implemented, and enforced by a public agency" (*5*). A debris removal policy is a public policy that establishes by law, ordinance, or code the responsibility of a designated legal entity to remove and process disaster-related debris. Such

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policies can exist at the federal, state, and local levels to address any or all aspects of the debris management cycle. Some of the issues they can address include:

- Legal authority to remove disaster-related debris.
- Contracting procedures and requirements.
- How debris monitoring should be accomplished.
- Grant applicant eligibility.
- Grant funding eligibility of debris-related activities.
- Debris handling and transport requirements.
- Acceptable debris disposal locations.
- Recycling rates/percentages to be achieved and types of materials to be recycled.
- How measurements are taken.
- Documentation required for reimbursement.
- Requirements for closeout and auditing of program activities.

The following federal agencies have debris and debris-related policies:

- Federal Emergency Management Agency (FEMA)—Public Assistance program debris policies.
- Federal Highway Administration (FHWA)—emergency relief program debris policies.
- Natural Resources Conservation Service (NRCS)—stream debris removal policies.
- U.S. Coast Guard (USCG)—waterway debris removal policies.
- U.S. Army Corps of Engineers (USACE)—debris removal policies.
- EPA—policies related to debris sites, including the handling and disposal of hazardous waste.

Of these federal agencies, state and local agencies engaged in debris operations most commonly engage with FEMA, FHWA, and NRCS on their debris policies. FEMA is a Department of Homeland Security (DHS) agency; FHWA is a component of the Department of Transportation; and NRCS is part of the U.S. Department of Agriculture (USDA). The policies of each of these three agencies are discussed briefly in the following paragraphs.

Federal Debris Policies for FEMA, FHWA, and NRCS

FEMA Debris Policies: The FEMA Public Assistance (PA) program goes into effect for most presidentially-declared disasters. These program policies establish the parameters for cost reimbursement eligibility through the PA program for debris clearance, removal, reduction, and disposal. Maintaining an awareness and understanding of these policies is important for any entity that is eligible for and intends to seek reimbursement from FEMA through the PA grant program or is developing a comprehensive debris management plan. FEMA has developed a series of policies that apply to the PA program. These are commonly known as the 9500 Series. A summary of the 9500 Series policies applicable to debris is listed in Table 4.1 below. The individual policies can be found electronically on FEMA's website at http://www.fema.gov/9500-series-policy-publications or at http://www.fema.gov, by typing "9500 series" into the search box on the main web page, and following the link that is returned from the search.

Additional information about FEMA debris programs and policies are included in the following publications, which can be accessed through the FEMA library on the FEMA website (*6*):

FEMA Publication 325—Debris Management Guide
FEMA Publication 327—Debris Monitoring Guide
FEMA Publication 329—Debris Estimating Field Guide

FHWA Debris Policies: FHWA debris policies are in effect for non-federal, state-declared disasters. The FHWA includes its debris policies in the FHWA Emergency Relief (ER) Manual (*7*). These policies define what is considered "emergency repair" work, address how debris and timber are included in the program, establish timelines for accomplishing the work, and identify limits for

Table 4.1. FEMA debris policies, 9500 Series.

Policy Number	Policy Title	Issue Addressed
9523.4	Demolition of Private Structures	Eligibility of demolition of private structures
9523.5	Debris Removal from Waterways	Eligibility of debris removal from navigable waterways, coastal and inland zones, and wetlands
9523.6	Mutual-Aid Agreements for Public Assistance and Fire Management Assistance	Eligibility of costs incurred through mutual-aid agreements
9523.11	Hazardous Stump Extraction and Removal Eligibility	Hazardous stump removal eligibility
9523.12	Debris Operation—Hand-Loaded Trucks and Trailers	Eligibility of debris removal accomplished using hand loading rather than mechanical equipment
9523.13	Debris Removal from Private Property	Eligibility of debris removal from private property
9525.2	Donated Resources	Establishes criteria to credit applicants for volunteer labor, donated equipment, and donated materials in performance of eligible emergency work
9525.7*	Labor Costs—Emergency Work	Eligibility of labor costs for applicant's permanent, temporary, and contract employees performing emergency work
9525.8	Damage to Applicant-Owned Equipment Performing Emergency Work	Eligibility of damage and extraordinary maintenance to applicant-owned equipment used for emergency work
9580.4	Emergency Work Contracting	Identifies acceptable contracting procedures when contracting for emergency work
9580.8	Eligible Sand Replacement on Public Beaches	Eligibility of emergency and permanent work performed on public beaches
9580.201	Debris Contracting Guidance	Guidance for meeting federal contracting requirements when procuring debris removal and monitoring contracts
9580.202**	Debris Removal Authorities of Federal Agencies	Describes the authorities of various federal agencies involved with debris operations after a federally-declared disaster
9580.203	Debris Monitoring	Provides information on how to properly monitor applicant-managed debris removal operations to ensure compliance with guidelines
9580.204	Documenting and Validating Hazardous Trees, Limbs, and Stumps	Identifies documentation required and validation process for reimbursement of hazardous tree, limb, and stump removal
9580.214	Debris Removal on Federal-Aid Highways	Updates guidance for debris removal from federal-aid roads in accordance with MAP-21
9580.215	Hurricane Sandy: Debris Removal Force Account Labor Costs	Allows for reimbursement of force account labor performing disaster-related debris work

*Parts of this policy have been superseded by 9580.215.

**Parts of this policy have been superseded by 9580.214.

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clearing and hauling. The FHWA ER policies also clearly establish the ineligibility of debris deposited at the curbside by private residents. The relevant language for timber and debris removal can be found in Chapter 13 of the FHWA Emergency Relief (ER) Manual.

NRCS Debris Policies: The NRCS Emergency Watershed Protection (EWP) program policies govern how the NRCS will "provide financial and technical assistance to remove debris from stream channels, road culverts, and bridges . . ." (*8*). Only legal subdivisions of a state can apply for funds, i.e., cities, counties, general improvement districts, etc. An eligible applicant can sponsor a project for public or private landowners.

State and Local Debris Policies: In addition to the federal program policies in place, many state and local governments enact debris management related policies to achieve other objectives, such as maintaining consistency with state environmental regulations, requiring a minimum level of debris recycling, or reducing the amount of landfill space that disaster debris occupies.

At the local level, debris policies also establish who within the local government is responsible for implementing the policy. It also may set forth the actions to be taken in relation to preparation for, response to, and recovery from, a debris-generating disaster. The local debris policy may describe what debris the local jurisdiction will remove using local government resources, and what remains the responsibility of private citizens. Many ordinances state that timeframes for pickup will be established by the magnitude of a specific event, but that the pickup durations for disaster-generated debris will be limited.

Why Is It Important to Have a Debris Policy?

At the local level, having an adopted debris policy clearly establishes what type of work will and will not be performed by the local government after a disaster. The policy establishes the legal authorities of the local agency, or agencies, to perform work as described in the policy or ordinance. It also will identify documentation that might be required to do the work, such as rights-of-entry and hold-harmless agreements. Making these policies available to the public helps manage expectations following a debris-generating disaster of any size and type.

Adoption of local government debris management policies also forms the basis for applying for federal disaster funding, should such assistance become available, by clearly identifying the legal responsibilities of the local government with respect to debris operations. "Legal responsibility" to perform debris removal work is one of the most often appealed topics in FEMA's appeals database, and most of these appeals relate to having legal responsibility and authority to remove debris from private roads, private property, and gated communities. Relying on an existing solid waste removal ordinance as the basis for a public entity to remove disaster-related debris is not always sufficient to meet the requirements of federal grant programs. For example, FEMA's Disaster Assistance Policy (DAP) 9523.13 regarding debris removal from private property states, "Codes and ordinances must be germane to the condition representing an immediate threat to life, public health, and safety, and not merely define the applicant's uniform level of services. Typically, solid waste disposal ordinances are considered part of an applicant's uniform level of services." In other words, a jurisdiction's solid waste removal ordinance is not sufficient to meet the FEMA program requirements for demonstrating a local entity's authority to remove debris from private property. Debris removed from private property by a local jurisdiction may be eligible for FEMA reimbursement if the jurisdiction has a separate ordinance specifically relating to disaster-generated debris that poses an immediate threat to life, public health, and safety, and ensures the economic recovery of the community. Applicants that can demonstrate they have formally adopted, in advance of a disaster, an ordinance authorizing their local government agencies to remove storm-generated debris from private property and gated communities generally have been successful in being reimbursed by federal agencies for their work. Such policies must apply

whether or not an event is of such magnitude that there is a federal disaster declaration. Further, the debris must meet the immediate threat requirement, and such a threat should be identified.

At the state level, debris policies can establish the responsibilities the state will assume versus those that local governments and other entities are expected to assume. State government debris policies also can govern disposal options to achieve specific goals and objectives. For example, such policies may restrict disposal at landfills, specify requirements for the location of DMSs, or encourage/require recycling.

At the federal level, debris policies establish the agency's requirements and parameters to achieve the objectives of its specific debris program. Because federal debris programs are generally reimbursement programs, the policies establish the parameters for who is eligible to apply for assistance, under what circumstances, what debris is eligible, timeframes for accomplishing debris work, and the federal agency's financial obligation to the applicant. Establishing these parameters limits the financial obligations of the federal agency to only the specific work that is accomplished in accordance with the policies of the federal debris program.

Who Develops Debris Policies?

Debris policies at the local government level are approved by community officials who have the legal authority to enact them. The specific person or persons who can enact the policies may vary based on the structure of the local government, but generally they are adopted by community officials such as city councils or county commissioners, and are enforced by city or county managers. In some instances, the enforcement of some aspects of the policies may be delegated to the designated debris manager (often the director of public works or solid waste).

At the state level, debris policies are likely to be formulated by the state DOT and/or state Emergency Management Agency; however, some related policies may be formulated by such agencies as the Department of Natural Resources, Department of Environmental Protection, or Solid Waste Management. Typically, they are included as part of the Debris Management Plan, which is in turn part of the Emergency Operations Plan. They must be formally adopted by the appropriate state political entities (e.g., legislature and/or governor).

At the federal level, some policies may be adopted pre-disaster and others may be issued as disaster-specific policies.

- At FEMA, pre-disaster debris policies are often issued by the Assistant Administrator for Recovery Assistance.
- The FHWA ER program policies are adopted at the national headquarters level in the Office of Program Administration and administered by the division administrators.

The NRCS EWP program is administered by each state's NRCS conservationist, who may request a waiver of program requirements from the Deputy Chief for Easements and Landscape Planning.

How to Develop a Debris Policy

At the local level, the need for disaster-specific debris policies may be identified during the planning process, or may be identified by the debris manager, city or county manager, or other administrator based on previous experience. The actual process of development and adoption is likely to differ based on each jurisdiction's governmental structure, but some basic steps might include:

- Identifying what needs to be addressed. In the case of disaster-related debris removal, the policy might consider what debris will be removed, by whom, and possibly in what timeframe, sites for temporary and final debris disposal, the need to separate debris, etc.

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- Making a local legislator aware of the issue so they can sponsor further study.
- Designating an individual or a special committee to study the issue and draft the language for the policy. In some cases, the local jurisdiction might task a consultant with drafting policy language. It is up to the local jurisdiction to determine who will create the draft language. The policy should consider not only public interest, but also capacity and financial resources available to accomplish the work.
- Having the draft policy language reviewed by the jurisdiction's legal counsel for conformance with existing policies and procedures.
- Adopting a draft policy adopted by the local legislative body that has the authority to enact policies and ordinances on behalf of the jurisdiction. The legislative body should follow its regular adoption process.
- Publishing and communicating the policy to the public to help establish expectations for actions when disaster debris is generated.

The policy should be reviewed after it has been implemented for a period of time to evaluate its effectiveness and any unintended consequences. It may be amended as appropriate. A policy development checklist based on Figure 4.1 below can be found in Appendix B.

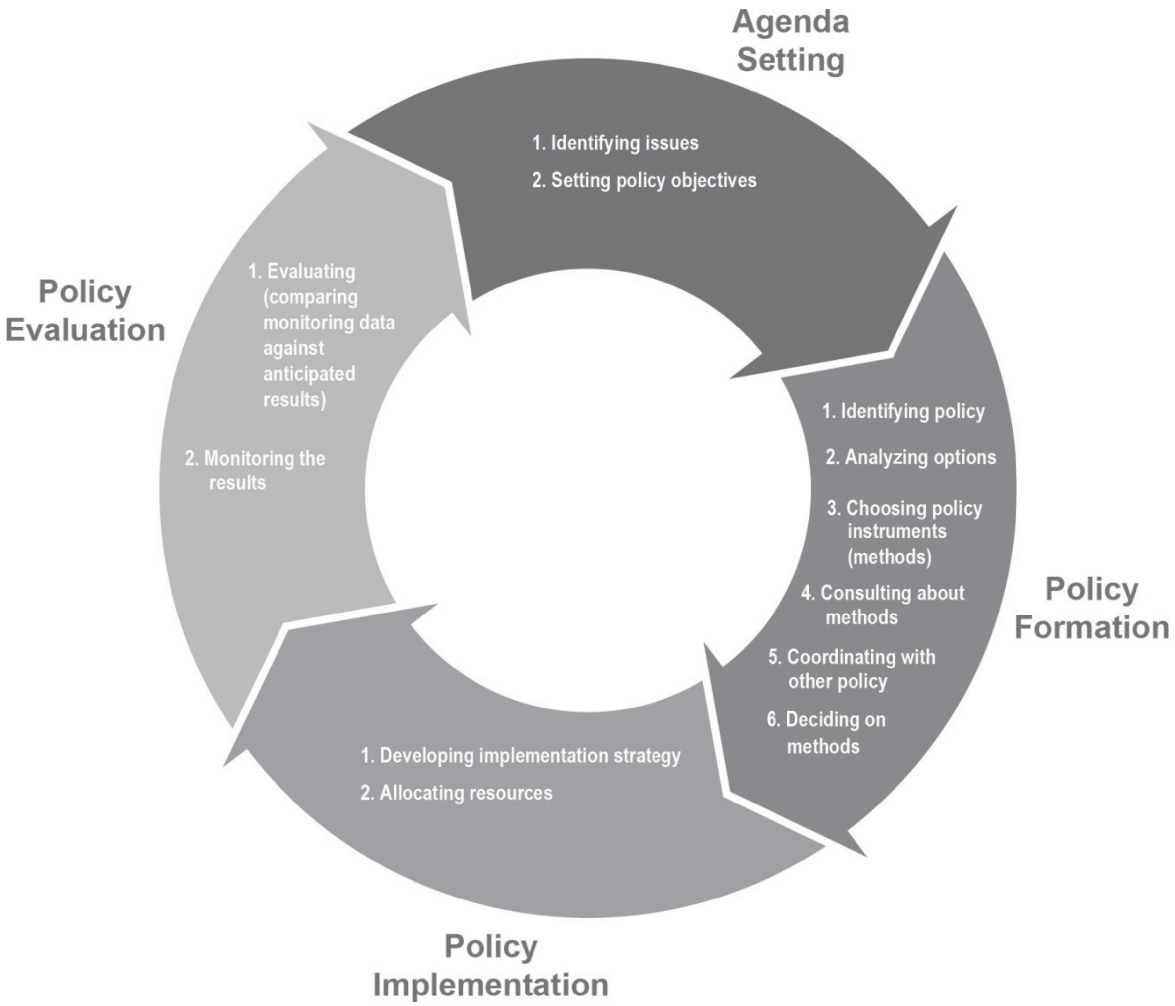

Figure 4.1. The policy formation process can be adapted to develop and adopt a debris management policy. (Adapted from the New Zealand Ministry for the Environment's* Drafting Issues, Objectives, Policies, and Methods in Regional Policy Statements and District Plans, *online version.) (9)

Example: Hurricanes Frances and Jeanne (*10*)

In 2004, Hurricanes Frances and Jeanne struck the City of Fort Pierce, FL, causing widespread debris to be deposited as a result of wind and flooding. The city had adopted an ordinance, *Procedure for Removal of Nuisance,* which gives city agencies the legal responsibility to remove debris causing a nuisance from private property. The ordinance outlines procedures city agencies must follow to legally remove debris from private property. It contains a provision that allows the responsible agency to waive procedures for notifying private property owners before removing debris from private property if removal of said debris will eliminate a threat to public health and safety. Considering the magnitude of the events, the city used the authority granted by this ordinance to remove debris from private property. Because these were federally-declared disasters, the city applied to FEMA for reimbursement of debris removal costs, including the costs for removing debris from private property. FEMA initially denied the claim, but the city was able to successfully demonstrate through the FEMA appeals process that its actions were consistent with, and authorized by, its pre-existing nuisance abatement ordinance.

CHAPTER 5

Contracts

Synopsis of Issue

Experience has shown that debris contracting requirements frequently are not well understood by the entities that may need to issue these types of contracts. Following a disaster, jurisdictions may find that their personnel and equipment are needed for multiple tasks. Awarding a debris contract or contracts will allow their own assets to be used on other high priority tasks. Being familiar with the debris management process, contract requirements and limitations, and complying with federal, state, and local contracting procedures will expedite the award of such contracts. Debris-related contracting (bidding and award procedures, monitoring, documentation, etc) is one of the major issues that may affect reimbursement.

- Jurisdictions need to be aware of, and plan for, contracting for any or all phases of debris operations. Being aware of, and complying with, contracting requirements will help minimize permitting, compliance, and reimbursement issues. Procurement guidelines of the local jurisdiction, as well as the federal agency providing potential funding for debris removal work, must be followed to be in compliance with federal program requirements.
- Debris contracts can be used to supplement resource availability:
  - The jurisdiction should know if and when it plans to use contractor support vs. in-house resources.
  - Contracts may be issued pre- or post-event. The local jurisdiction should consider whether issuing contracts pre- or post-event will work best for it if it intends to use contract resources.
  - Some geographic areas have few contractor resources available. Community officials should understand what contract resources are available in their area and what other entities hold contracts with them to provide emergency services. The jurisdiction should understand who the contractor's priority clients are.
- Types of contracts may be limited depending on the requirements of the federal agency that might provide reimbursement funding. For example, FEMA generally does not allow time-and-materials contracts past the first 70 hours of eligible work performed, nor do they allow cost-plus-percentage-of-cost contracts. [See Title 44, Code of Federal Regulations (CFR), Section 13.36 for DHS/FEMA requirements.] (*11*)

Target Audience

- Debris managers.
- Contracting/procurement personnel.
- Legal counsel.
- Political officials.

Why Is Contracting Important?

Local or state governments responsible for debris management operations might choose to issue debris removal, monitoring, and/or disposal contracts to augment the capabilities of their in-house resources. In many instances, the magnitude of the event and the quantities of debris generated overwhelm the responsible entity's assets. In other cases, the responsible state or local agency might prefer to contract out debris responsibilities so that the agency can focus on its core missions. While citizens might tolerate decreased levels of service for short periods, debris management activities can take months to accomplish, necessitating the augmentation of existing staff and capabilities so that the agency can continue to provide the expected level of normal service to its constituents.

State and local entities that anticipate seeking reimbursement for debris management activities from federal agency grant programs must comply with federal contracting requirements as well as their own procurement regulations. Non-compliance could jeopardize potential federal funding. This, in turn, could mean that the state or local entity is required to pay all of the debris-related costs out of its own funds, adversely impacting the financial well-being of the community.

Example: 2004 Hurricanes (*12*)

After Hurricane Ivan struck the City of Pensacola, FL, on September 16, 2004, the city was responsible for removing vegetative debris from 64 public parks. The city entered into a non-competitively bid time-and-materials contract with a large national firm to remove debris from the parks. Approximately six weeks after the contract was signed, the contractor completed debris removal and invoiced the city for over $1.3 million. The city submitted a reimbursement request to FEMA for the contractor's services. FEMA determined that the contract did not meet federal contracting requirements, as it was not competitively bid, used time-and-materials as the basis for reimbursement, did not include a not-to-exceed limit, did not include a cost analysis, and did not substantiate an immediate threat to public health and property. FEMA compared the $35.53 per CY unit cost paid by the city to the calculated $9.26 per CY unit price for the local market during that time period. FEMA reimbursed the city for the work completed in the first 70 hours after the disaster based on the $9.26 per CY rate, a total of $357,047.

What Is Involved in Debris Contracting?

Contracting for debris management services requires a state or local entity to identify its anticipated needs, which can be assessed using the debris estimating methodologies described in Chapter 3.

The planning committee or debris manager will evaluate available resources to determine conditions under which in-house or contract resources should be used to manage, accomplish, and/or monitor debris removal. In addition to resource capacity and capabilities, financial considerations might be considered when making a determination to issue pre-event debris contracts. The following items also might be considered:

- **Force account**—Because some force account labor is assumed to be working regardless of whether a disaster occurs, the jurisdiction's overall budget might be less severely impacted if these regularly budgeted resources are redirected to performing debris removal. Conversely, diverting force account resources results in routine services not being provided. If debris is widespread, the entity might not be able to reassign personnel to debris activities for long periods of time.
- **Contract labor**—Contractors must be paid as the work is done, and then reimbursement requested from federal agencies. Transfer of funds from the reimbursement programs to the

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agency paying the contractor could take months or even years. However, the use of contractors allows regular services to be provided with minimal interruption, and places more of the documentation burden on the contractor.

- **Mission assignment**—In federally-declared disasters, FEMA has the option to mission-assign the USACE to provide debris removal services to Grantees and Subgrantees. This "option" requires a federal disaster declaration and can have a greater unit cost than using other alternatives, which means that the local jurisdiction's overall cost share total could be higher.

The anticipated debris management needs of the jurisdiction will form the basis for the development of the contract scope of work. The contract scope of work states what task the contractor is to accomplish, where, and in what timeframe. Typically it includes the following information:

- The geographic extents covered by the contract (including maps can be helpful).
- An estimate of the quantities of debris to be removed.
- The work to be performed:
  - Clearance and/or removal and/or disposal.
  - Types of debris (mixed, vegetative, etc.).
  - Whether or not private property debris removal is included. If so, procedures must be clearly spelled out on how to differentiate between removal from public and private property. (Generally, it is best to obtain a determination from the appropriate federal agency on the eligibility of reimbursement for removal of debris from private property *before* such work is done.)
  - Specifies "eligible debris" or "eligible work" only per the regulations, policies, and guidance that govern each reimbursement grant program.
  - The extents and limits of where work is to be performed, for example, in "public rights-of-way" or on "public property" as prescribed by the particular program.
  - Number of passes to be completed.
  - Performance schedule.
  - Methods of documentation to be used by the contractor (e.g., load tickets).
  - Methods of measurement.
  - Equipment requirements.
  - Clearly stated basis of payment, such as cys or tons.
  - Documentation required of the contractor to substantiate invoices.
  - Voucher submittal and payment schedule.
  - Reporting requirements.
  - Safety (require the submittal of a safety plan).
  - Licensing requirements.
  - Penalties.
  - Termination clause. Some debris contracts have a clause that the contract may be terminated without cause with specific written notification.
- Glossary of terms used in the contract.
- Subcontracting provisions, including disclosure of subcontractors to be used.

Sample scopes of work used by the USACE are available online (*13*).

In addition to the scope of work, terms and clauses used in the jurisdiction's contract boilerplate language also would be included in the contract. This language would prescribe issues like bonding requirements, basis for termination, etc. Any scope of work developed should be vetted by the appropriate state or local legal department as well. Some further contract provisions to be considered for inclusion in a debris contract are:

- Federal procurement regulations should be followed regarding inclusion of standard clauses for reasons such as invoicing requirements, payment terms, termination for cause, termination

for convenience, prohibition of debarred contractors and subcontractors, and bonding requirements, among others.
- Execution should be done on a task order basis. This allows the jurisdiction to prescribe what the contractor is to do. It is an effective way of controlling contractor costs.
- The contractor should be required to participate in the local entity's annual training/exercise at no cost.
- Contracts and contract modifications must be in writing; verbal agreements are not recognized.

The state or local entity issuing the contract should follow its usual procurement procedures when soliciting bids for debris contracts. If the contracting entity might seek federal reimbursement for the work, then federal procurement requirements must also be followed. Generally speaking, federal procurement guidelines require the agency issuing the contract to develop the scope of work and cost estimate for the bid solicitation. *Payment to the contractor cannot be contingent upon reimbursement from the federal agency.*

Some contracting requirements can vary by federal agency and program. Three of the federal agency debris management reimbursement programs frequently used by state and local governments are discussed below:

- **FEMA Public Assistance Program**
  - Competitively bid contracts are strongly preferred.
    - Time-and-materials contracts are allowable only for the first 70 hours of work under the PA program.
    - Lump sum/firm fixed price is allowed, but must be reasonable.
    - Unit price is allowed.
    - Cost-plus-percentage-of-cost is *not* allowed.
  - Small purchase orders to secure services or supplies costing less than $100,000 by obtaining several quotes from different sources are acceptable.
  - Sealed bids wherein the contract is awarded based on price (preferred method) are acceptable.
  - Competitive proposals wherein the contract is awarded based on contractor qualifications are acceptable.
  - Noncompetitive proposals are used only if the other three methods are not feasible and the item is available only from a single source; there is an emergency that does not permit delay; or competition has been determined to be inadequate. The basis for the noncompetitive process must be clearly explained and justified. The use of this method and the resulting award must be supported by a cost analysis by the procuring agency.
  - Emergency or expedited contracting procedures can be followed (see FEMA 9580.4) (*14*).
  - "Piggyback" contracts wherein one entity adopts or "piggybacks" on another entity's award of an invitation to bid are strongly discouraged and have caused delays in approval and funding.
  - FEMA Policy 9580.201 (*15*) provides guidance on debris contracting for state and local agencies that plan to seek grant reimbursement from FEMA for contracted debris management services. The guidance contains checklists of what to include in contracts as well as what to avoid and can be found in Appendix C.
- **FHWA Emergency Relief Program**
  - Competitively bid contracts are strongly preferred
  - The following are permissible if the state determines that competitively bid contracts are not feasible:
    - Negotiated equipment rental contracts.
    - Negotiated debris management contracts.
    - Contracts issued based on telephone bid solicitations to a "reasonable minimum number of contractors" (*7*).

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  - Must include FHWA Form 1273 (*16*); this form can be found in Appendix D.
  - In a Memorandum of Understanding between the Bureau of Indian Affairs (BIA) and FHWA, roads on tribal lands designated by BIA as falling under the authority of FHWA must follow FHWA procurement requirements; are likely to require giving preference to Native American firms, subcontractors, and workers; and require providing training and assistance to minority contractors.
  - The FHWA offers a class in Contract Administration for FHWA projects (*17*).
- **NRCS Emergency Watershed Protection (EWP) Program**
  - NRCS works with a local entity known as the Project Sponsor.
  - Federal contract—NRCS enters into an agreement with the local Project Sponsor to do the contracting. Federal Acquisition Regulations, United States Department of Agriculture Acquisition Regulations, and NRCS Acquisition Regulations are followed. Projects costing less than $100,000 can use the Simplified Acquisition Process. Projects costing more than $100,000 must use competitive bidding procedures.
  - Locally-led contracting—This is the preferred method of contracting for the EWP. The Project Sponsor contracts for the work using the appropriate state and local regulations.
  - Force account—The Project Sponsor uses its own personnel and equipment to accomplish the work. This method can be used only for projects with an estimated cost of $150,000 or less.
  - Locally-led with landowner contract—The Project Sponsor enters into a contract with the landowner to accomplish the approved scope of work.
  - Performance of work—This method is used when the Project Sponsor does not have funds available to pay for its share of the installation work or the accounting system needed to keep detailed records required by force account contracting, but has forces (in-house or donated) to perform the work. In this case, the price agreed upon by the Project Sponsor and NRCS is fixed prior to commencement of the work, and recordkeeping is not required.

What Are Other Options for Obtaining Debris Services?

For a variety of reasons, including, but not limited to, jurisdiction size, geographic location, frequency of disasters, and non-availability of qualified contractors, some state and local entities do not wish to enter into contracts for debris services. If in-house resources become overwhelmed in the event of a debris-generating disaster, there are some other methods that might be available to state and local agencies for obtaining needed services. Councils of Government (COGs) or Local Emergency Planning Committees (LEPCs) might award debris management contracts for their members to use as needed. If such a contract is used, the agency awarding a task order should coordinate with the COG or LEPC holding the master contract on the process for issuing a task order. Some states maintain and administer contracts for their local jurisdictions to use, or have laws that designate certain already-contracted entities as having authority to haul debris in the event of a disaster. Local entities that plan to use state contracts should review and understand the contract terms and conditions prior to use.

Example: Local Government Use of Connecticut's State Debris Contract (*18*)

In October 2011, the state of Connecticut endured an unusual snowstorm that toppled many trees and power poles. Two dozen cities and towns turned to contract resources to remove and dispose of the debris; eight issued their own contracts while 16 others used the state's competitively bid, open-ended debris removal contract. The state also had a debris monitoring contract available for use by local governments; many used the contract while a few hired temporary workers and trained them. A post-disaster review of the costs paid by municipalities that used the state's contracts compared to those that issued their own contracts suggests that,

in general, the municipalities that issued their own contracts realized significant savings over the state contract. For example, based on a review of invoices, several of the towns that issued their own contracts would have paid $2.5 million to $4 million more for debris removal if they had used the state contract. Given that the jurisdictions were responsible for paying the 25-percent cost share required by the FEMA PA program, these entities saved between $0.5 million and $1 million of local taxpayer money.

There are several likely reasons that the individually issued contracts generally had lower rates than the state's contract. The state contract's rates were publicly available and allowed other debris removal firms to undercut the state contract's prices to ensure that municipalities that were soliciting bids would award their own contracts rather than use the state's. A difference in fee structures might also account for the overall cost savings. Some contractors charge a separate management fee based on total amount of debris collected but charge lower unit prices for debris removal and disposal, while other contractors do not charge a separate management fee but instead incorporate the fee into their unit prices, generally increasing the unit price for removal and disposal. Lastly, the state's contract was with a large, national firm that has the capacity to do much more than vegetative debris cleanup, which is reflected in their pricing. This particular disaster was primarily a vegetative debris disaster, which some tree and landscaping services that have lower overhead are capable of handling.

The local governments that used the state's contract indicated that they had not previously needed this type of service and so did not have the appropriate contracts in place. They were primarily concerned about public safety, and the state contract allowed them to address this concern. Furthermore, the state's contractors were seasoned in the eligibility issues and documentation requirements of FEMA's PA program. The local governments that used the state contracts believe that the recordkeeping of these firms facilitated quick reimbursement from FEMA.

The result of the analysis has made towns aware of some issues to consider when deciding how to contract for debris monitoring, removal, and disposal services in the future. Acknowledging that "the state contracting process generally is very good," they will analyze the situation and decide on the course of action that makes the most sense for the particular circumstances.

Who Issues Debris Contracts?

Debris management contracts typically are issued by local government agencies or quasi-government entities, as they most often are responsible for clearing and removing debris from public property and rights-of-way within their jurisdictional boundaries. Some state's laws encourage or even prescribe contracting at the state level. Each state and local government agency responsible for overseeing debris management operates under different hierarchical structures within their governments. The following entities might be involved in contracting for debris management services, depending on their particular government structure and legal authorities:

- State or local department of transportation and highways.
- State or local general services administration or equivalent contracting agency.
- State or local emergency management agency.
- Regional coordinating entity such as a council of governments or regional planning committee.
- Local DPW/solid waste authority.
- Local utility department.
- Local emergency management agency.
- Local parks department.
- Local department of natural resources.

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Within the locality or agency, different individuals could participate in development, award, oversight, and payment of the contract. Such individuals could include, but are not limited to:

- City/county manager.
- Department administrator (e.g., director, deputy director).
- Division administrator (e.g., solid waste, streets).
- Contracting officer/contracting specialist.
- Procurement manager.
- Finance officer.
- Debris manager.
- Legal counsel.

The agencies and individuals involved in developing and issuing debris management contracts should coordinate on the technical, boilerplate, and other legal content of the request for services and subsequent award. This will help ensure that the needs of the community will be met while following jurisdictional procurement methods and, as appropriate, meeting federal grant program requirements for contracting.

When Are Debris Contracts Issued?

Contracts for debris management services can be issued before or after a debris-generating event. Contracts that are issued prior to the occurrence of a debris-generating event are called pre-event, prepositioned, or standby contracts, and are strongly preferred by FEMA. State and local jurisdictions that have experienced large debris-generating events highly recommend the use of prepositioned contracts, yet nearly 62 percent of the respondents to our study survey indicated that they did not have prepositioned contracts for debris monitoring, removal, and/or disposal.

Awarding contracts for debris management services in advance of a disaster offers state and local entities several advantages when the services are needed. Pre-event contracts generally are done during "peace time," avoiding the rush associated with just-in-time, emergency-type contracting. By slowly and deliberately developing the scope of work, advertising, and issuing the contract, the awarding entity increases the likelihood that the contract will comply with federal agency contracting requirements for grant reimbursement programs. Pre-event contracting also is regarded as promoting more competitive bidding, which is likely to result in lower bids than when demand is high and resources are scarce, as is typical immediately following a disaster. Once they are in place, pre-event contracts can be activated immediately upon the need to augment existing in-house capabilities, which can provide for a more rapid response and smoother recovery. Because debris management contractors have been pre-identified, the jurisdiction is able to better respond to post-disaster inquiries from other debris contractors that solicit their business by claiming they are "FEMA-approved" or "FEMA-certified." (It is important to note that FEMA does not approve or certify any debris contractors. They do, however, maintain a database of self-registered debris contractors on their website, but firms on that list are NOT certified by FEMA) (*19*).

As with any process, there can be a downside to issuing pre-event contracts. Debris management contractors may hold contracts with multiple clients in close geographic proximity to each other, which could result in a competition for limited resources during emergencies/disasters if the contractor's resources are limited or exceeded. Most debris contractors have agreements with subcontractors to assist in major debris removal/disposal events; however, in large disasters, the primary contractor may have many clients, and may be forced to use less experienced subcontractors. This potential pitfall can be mitigated by issuing multiple contracts and/or including clauses in the contract that require the contractor to provide priority service to the issuing entity.

Some state and local entities want to prepare for procuring debris-related services in the event they are needed but do not wish to execute a prepositioned contract for these services. In these cases, the state or local entity might prepare by issuing requests for qualifications to pre-qualify contractors and then asking the contractors to provide bids if/when needed. The state or local entity might also pre-draft contracts by developing standard boilerplate and other required language. When the scope of the event is known, it is added to the pre-drafted language and a request for proposals or bids is issued.

If a state or local entity has not taken steps to develop pre-event debris management contract language and finds that it needs to contract for debris management services after a disaster has occurred, there are several options that the entity might pursue to expedite the procurement process. One option is to first issue an emergency contract to get field operations underway. If this option is used, the contracting entity should ensure that emergency contracting procedures follow local and state procurement requirements, as well as federal requirements if federal agency reimbursement will be sought. Once the emergency contract is in place and operations are ongoing, the state or local entity can use the duration of the emergency contract to procure long-term debris management services. This process allows them to comply with governing procurement regulations and also negotiate with suppliers to try to get a fair price. Another option is to use mutual-aid resources to supplement force account resources until long-term contracts can be issued. Entities that use this option as a primary source of support should be aware that their mutual-aid partners might be impacted by the same event, which could impede the partner's ability to provide mutual aid.

How to Contract for Debris Management Services

If a state or local agency decides that it will issue debris management contracts, a scope of work and in-house cost estimate should be developed by the issuing agency, typically the DPW or highway department. Within the procuring agency, the technical part of the scope of work may be developed by the debris manager, the debris planning committee, or other knowledgeable personnel. Often the debris-related scope of work is given to the contracts or procurement department and added to boilerplate language containing standard clauses, terms, and conditions. Jurisdictions must follow their own procurements policies and those of the states in which they are located. If a state or local procurement policy is more stringent than the federal policy, then the more stringent policy should be followed.

Example: 2004 Florida Hurricanes (*20*)

In 2004, the state of Florida was hit by four major hurricanes in 5 weeks, resulting in over 53 million cubic yards of debris. Many state and local agencies did not have pre-event debris management contracts in place, and thus had to issue emergency contracts for debris removal, sign and signal repair and replacement, and roadway repairs to federal-aid roads. These agencies learned that it is important to follow federal contracting requirements, regardless of the nature or magnitude of the emergency. For example, the FHWA ER program requires that all contracts include a requirement for using Davis-Bacon prevailing wage rates and FHWA 1273 provisions. Failure to include these could result in emergency expenses being ineligible for reimbursement. Consequently, the Florida Department of Transportation (FDOT) developed a model contract to aid state and local agencies in drafting pre-event contracts as well as issuing emergency contracts.

Once contracts are issued, it is important for the administering agencies to properly manage the contracts. FDOT found that documenting how issues were handled was essential for establishing and maintaining consistency in the FHWA Emergency Relief process. They developed a frequently-asked-questions document for their transportation engineers, which they also shared with other state and local agencies.

CHAPTER 6

Operational Structure and Organization

Synopsis of Issue

Debris management requires a coordinated effort among various departments or agencies within a jurisdiction, as well as outside agencies that have regulatory authority or fulfill a specific support function within the operation. This coordinated effort must be organized such that an appropriate span of control exists, roles and responsibilities are established well in advance, and the approach can be "right-sized" depending on the level of effort required by the debris-generating event. This chapter outlines the establishment of a structure for debris operations using the National Incident Management System (NIMS) and Incident Command System (ICS). NIMS–ICS is used by all levels of government—federal, state, tribal, and local—as well as by many nongovernmental organizations and the private sector.

Target Audience

- Local and regional DOT, DPW managers.
- State agencies (DOT, GSA, DEP/DEQ).

NIMS and the ICS

NIMS identifies concepts and principles that provide a framework for managing emergencies from preparedness through recovery regardless of their size, location, cause, or complexity. The system provides a consistent, nationwide approach and terminology for multiple agencies or jurisdictions to work together before, during, and after a disaster.

The primary components of NIMS are:

- Preparedness.
- Communications and Information Management.
- Resource Management.
- Command and Management.

These four components all represent critical elements of emergency management and related operations—such as debris management—not only during response but throughout the entire lifecycle of emergency management.

The Command and Management component is broken down into three key elements, all important to debris operations:

- ICS.
- Multiagency Coordination Systems (MACSs).
- Public Information.

ICS is a standardized, on-scene, all-hazards incident management approach that:

- Allows for the integration of facilities, equipment, personnel, procedures, and communications operating within a common organizational structure.
- Enables a coordinated response among various jurisdictions and functional agencies, both public and private.
- Establishes common processes for planning and managing resources.

ICS is flexible and can be used for incidents of any type, scope, and complexity. It allows users to adopt an integrated organizational structure to match the complexities and demands of single or multiple incidents.

As previously mentioned, NIMS–ICS is used by all levels of government as well as the private sector. ICS is a national standard of practice as established by Homeland Security Presidential Directive (HSPD)-5 and National Fire Protection Association (NFPA) 1600. It is also applicable across disciplines, and has specific legal requirements when used by the Occupational Safety and Health Administration (OSHA) and other organizations. Finally the system is supported by various professional associations, including the American Public Works Association.

ICS is structured to facilitate activities in five major functional areas, described in Table 6.1.

All of the functional areas may or may not be used based on the incident needs. Small, localized incidents may not fully use each of these components while larger incidents may use all of them. ICS is modular, allowing for a dynamic and agile organization adaptable to the changing needs of an incident.

As a system, ICS is extremely useful; it not only provides an organizational structure for incident management but also guides the process for planning, building, and adapting that structure. Using ICS for every incident or planned event helps hone and maintain skills needed for the large-scale incidents.

The Operations Section is typically where most resources are organized. In order to maintain a proper span of control, as well as for ease of organizing operations based on function, resource type, and/or geography, ICS provides options for additional organization of the Operations Section, as described below.

Branch: An organizational level used when the number of divisions or groups exceeds the span of control. The Branch level is organizationally between Section and Division/Group in the

Table 6.1. The five functional areas of ICS.

Command	Sets the incident objectives, strategies, and priorities and has overall responsibility for the incident.
Operations	Conducts operations to reach the incident objectives. Establishes tactics and directs all operational resources.
Planning	Supports the incident action planning process by tracking resources, collecting/analyzing information, and maintaining documentation.
Logistics	Arranges for resources and needed services to support achievement of the incident objectives.
Finance & Administration	Monitors costs related to the incident. Provides accounting, procurement, time recording, and cost analyses.

Source: FEMA Independent Study Course IS-100 PWb. (*21*)

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Operations Section, and can be either geographical or functional. The person in charge of each Branch is designated as a Director. Most incidents with significant debris operations are likely to be organized at the Branch level.

Division: An organizational level having responsibility for operations within a defined geographic area. The Division level is organizationally between Branches (if activated) and Single Resources. The person in charge of each Division is a Supervisor.

Group: Established to divide the incident into functional areas of operation. Groups are composed of resources assembled to perform a special function, not necessarily within a single geographic division. Groups are organizationally located between Branches (if activated) and Single Resources. The person in charge of each Group is a Supervisor.

Single Resources: An individual piece of equipment and its personnel complement, or a crew or team of individuals with an identified Supervisor who can be available to work at the site of an incident. Single Resources are the most basic elements of organization within the Operations Section. Examples would include a hand crew or a loader.

Strike Team: A set number of resources of the same type operating under the direct supervision of a Strike Team Leader. An example would be four snow plows working together to clear a highway.

Task Force: A combination of mixed resources operating under the direct supervision of a Task Force Leader. An example would be a loader, hand crew, and two dump trucks working together to clear debris.

The application of MACS, another key component of a NIMS, is a process that allows all levels of government and all disciplines to work together more efficiently and effectively. Multiagency coordination occurs across the different disciplines involved in incident management, across jurisdictional lines, or across levels of government. Multiagency coordination can and does occur on a regular basis whenever personnel from different agencies interact in such activities as preparedness, prevention, response, recovery, and mitigation as show in Figure 6.1.

Often, cooperating agencies develop a MACS to better define how they will work together more efficiently, which is often documented in operational plans; however, multiagency coordination can take place without established protocols. A MACS may be put in motion regardless of the location, personnel titles, or organizational structure.

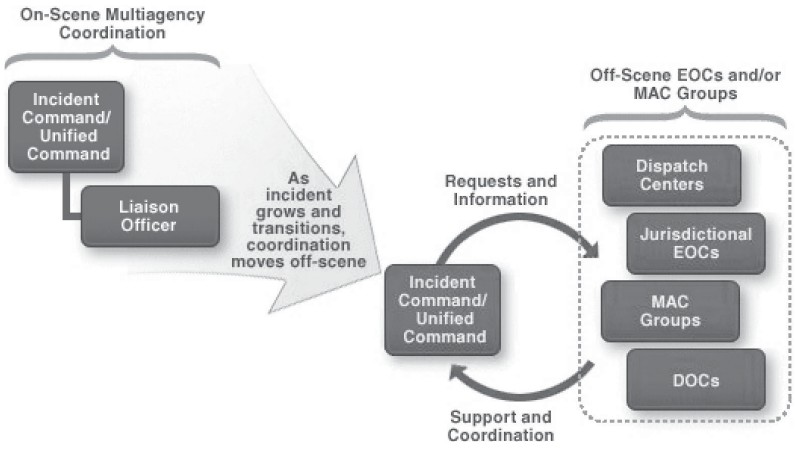

Figure 6.1. Multiagency coordination systems overview (DOC = Departmental Operations Center). (Source: FEMA Independent Study Course IS-701.a) (22)

Initially the Incident Command/Unified Command and the Liaison Officer may be able to provide all needed multiagency coordination at the scene. However, as the incident grows in size and complexity, off-site support and coordination may be required.

Integral elements of MACS are dispatch procedures and protocols, the Incident Command structure, and the coordination and support activities taking place within an activated Emergency Operations Center (EOC). Fundamentally, MACS provide support, coordination, and assistance with policy-level decisions to the ICS structure managing an incident.

Application of ICS and MACS Concepts to Debris Operations

Each jurisdiction's comprehensive emergency management plan or emergency operations plan likely addresses a concept of operations that relates to the application of ICS. Debris plans developed as a functional annex to the jurisdiction's plan should reference this concept of operations and expand upon it to describe the application of ICS and related components of multiagency coordination as they apply specifically to debris operations.

Typically, debris operations are conducted within the jurisdiction's EOC, which is a facility component of multiagency coordination, often organized and operated using the principles of an ICS, with the purpose of managing and supporting incident operations. The EOC provides strategy-level coordination and logistical support to the jurisdiction's designated incident commander, the individual in charge of all tactical operations.

Through the EOC, agency representatives from multiple assisting and supporting agencies can leverage their agency's resources and expertise to the overall effort. Debris operations often require input from multiple agencies, needing technical expertise, regulatory input and authority, and resource support for clearance, removal, and disposal activities. Examples of agency representatives include the National Guard, state department of transportation, state police, state emergency management agency, state environmental agency, and the USACE.

Based on their size and complexity, debris operations are often organized at the Branch level within the Operations Section of the ICS organization. Debris management falls under the direction of the Operations Section Chief who reports to the EOC manager (the EOC's version of the Incident Commander). As part of the ICS organization (see Figure 6.2), they are supported by all other functional areas of the organization, including the command staff (sometimes called management staff in the EOC); Liaison Officer; Safety Officer; and Public Information Officer; the Logistics Section that obtains all needed resources and support; the Finance/Administration Section that handles all costs and contracting support; and the Planning Section that tracks resources and situational information and coordinates the development of the Incident Action Plan (IAP) for each operational period. A sample ICS structure that emphasizes the Debris Operations Branch is shown in Figure 6.3 below.

While not typically seen in ICS organizations, an advanced concept that can be exercised called branch-level planning places a Planning Specialist in the Branch to support the Branch Director in operationalizing their debris management plan and formulating strategic plans and tactical direction in conjunction with the Planning Section (these will ultimately become components of the IAP). This is an ideal application for large and complex debris operations.

Debris operations may become sizeable and complex enough to require their own physical space for management and coordination activities if the EOC is not large enough to accommodate them. In this instance, it would make sense for the Debris Management Branch to relocate to a Departmental Operations Center (DOC). This location could be the local public works offices

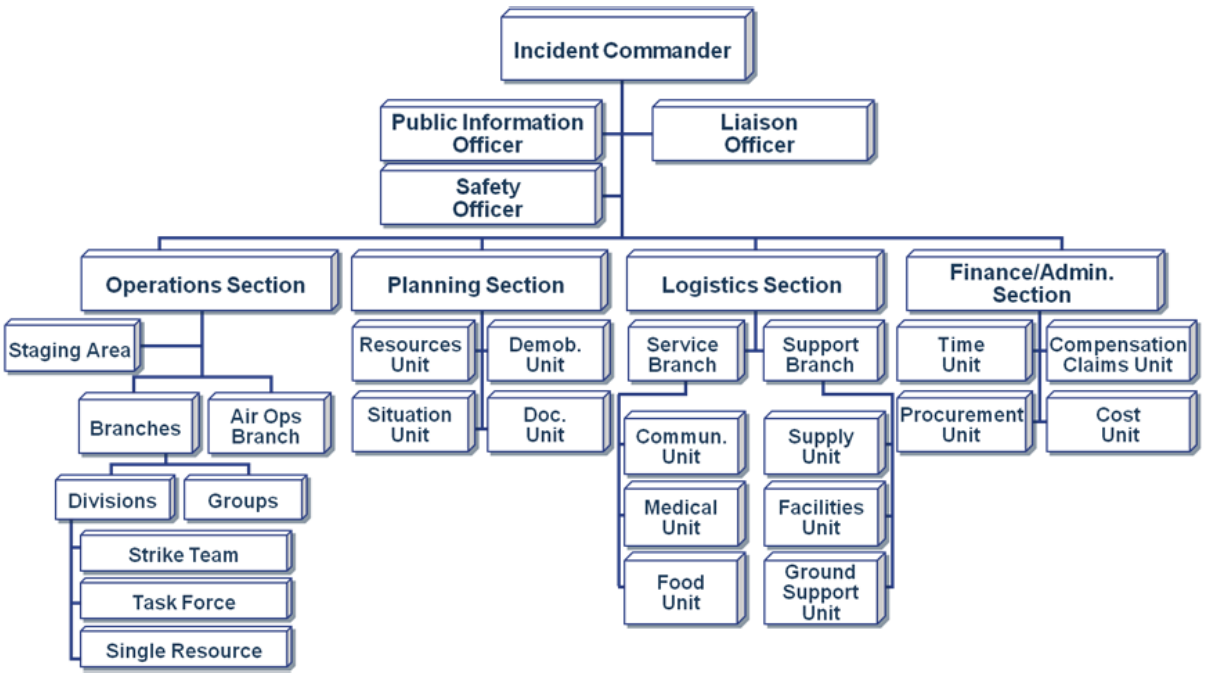

Figure 6.2. Standard expanded ICS structure. (Source: FEMA NIMS ICS-300 Training) (23)

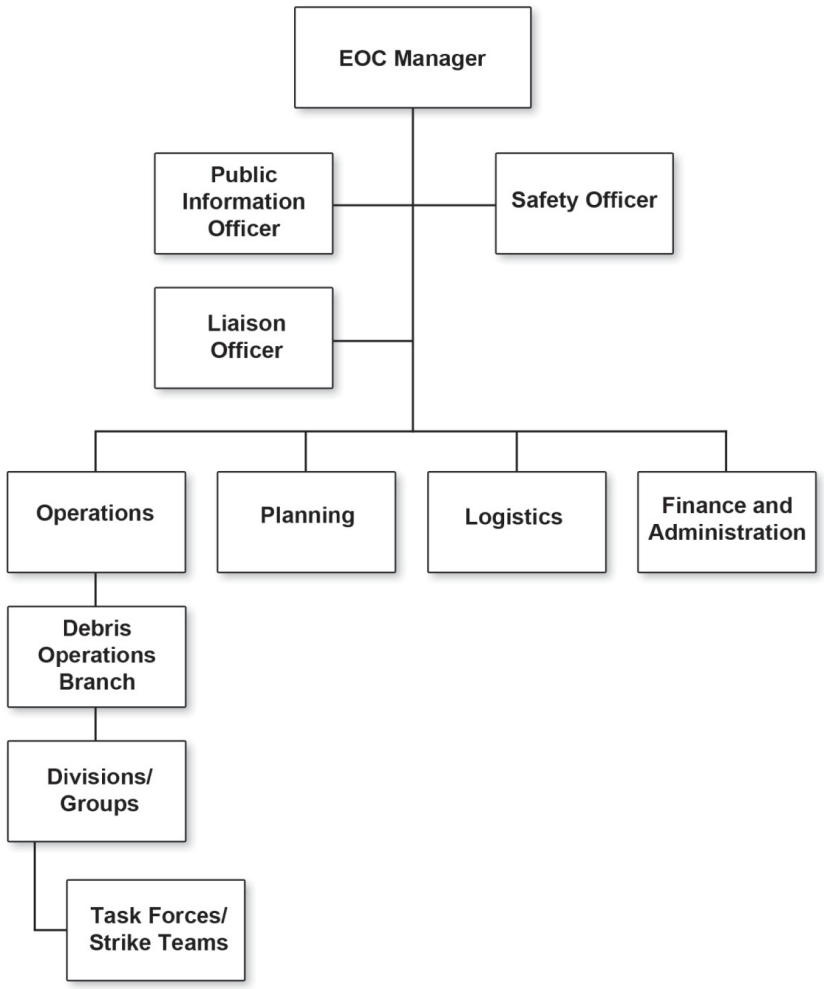

Figure 6.3. Example of ICS structure.

or any other space with the size and infrastructure to support their needs. Just as the location, layout, and necessary resources and support are pre-planned for the EOC, this should also be performed for the DOC. Because of the physical separation of the DOC from the EOC, it may be necessary to have a Debris Branch representative (perhaps the Deputy Debris Branch Director) located in the EOC to facilitate communication and represent the branch in meetings. The DOC may operate in this location or another site for an extended period of time, as the incident evolves from response to recovery and until debris operations are completed.

Structure of Debris Operations

The most commonly asked question in response to any disaster is "Who is in charge?" However, the most appropriate question is "Who is in charge of what?" The challenge in planning the debris operations structure is to identify which roles and responsibilities are needed. Ideally, a jurisdiction or other organization is able to match each of these roles to a position in the current day-to-day structure, although for larger and extended operations this may not be possible. When an incident occurs, an organization needs to consider consulting partner organizations for expertise and supplementary staff. Public works staff from surrounding jurisdictions and staff from state DOTs should be considered, if available. Another option is to request debris specialists from the state emergency management agency, which can contact qualified personnel from around the country.

Positions to consider in planning efforts:

Debris Operations Branch Director (and deputy): Responsible for activating the debris management plan, managing all debris management activities, and coordinating with the operations section chief. This position is likely to be filled by the public works director/superintendent and his/her deputy.

Division/Group Supervisors: Responsible for implementing specific portions of the debris management plan as directed through the IAP. These will include activities specific to the clearance, removal, and disposal of debris. Organizations should consider what operations are likely to occur during nighttime hours and plan for personnel accordingly. These positions will likely be filled by public works supervisors.

Task Force/Strike Team Leaders: Employed as needed to implement specific tactical actions. If they are used, they provide direct supervision to single resources. These positions will likely be filled by public works supervisors or foremen.

ICS training to at least the ICS-300 level is highly recommended for public works directors and superintendents. ICS training to the 100 and 200 level is available online. ICS-300 is only available in a classroom setting. The training officer, city/county emergency manager, or state emergency management agency should be contacted for information.

CHAPTER 7

Removal

Synopsis of Issue

Debris removal involves removing debris from roads, public property, publicly-maintained waterways, and under certain conditions, from private property. Typically, it begins immediately after the disaster event, during the response phase of operations to support emergency responders. It continues during the recovery phase and, depending on the magnitude of the event and availability of resources, can last for years. Removal requires close coordination among all entities involved.

Target Audience

- Debris managers.
- Debris supervisors.
- Solid waste personnel.
- Debris removal personnel.
- Debris removal contractors.
- Debris removal monitors.
- Safety officers.
- Public information officers.
- Utility providers (for demolition).
- Building officials (for demolition).

Why Remove Debris After a Disaster?

Removing debris after a disaster serves multiple purposes. First, clearing debris from the traveled roadway immediately following an event supports life-saving operations by creating a pathway for emergency vehicles to access blocked routes and geographic areas. Once clearance to critical functions is accomplished, prompt removal of debris after a disaster minimizes the threat to life, public health, and safety. In the event that debris is deposited in waterways, its removal is important to prevent flooding of the surrounding area, remove potential sources of contamination, and remove threats to navigation and use of the waterways. It also is a visible sign to the public that the recovery process is in progress. Debris removal from public rights-of-way and public property allows daily activities to resume and government services that are expected by the public to continue. Ultimately, these activities lead to economic recovery of the community.

What Does Debris Removal Involve?

The disaster debris removal process typically involves two phases: clearance and actual removal. To various degrees, both phases involve state DOTs and local DOTs and DPWs. Transportation routes must be opened as quickly as possible. Local personnel and equipment from these agencies are usually some of the first on the scene. The first phase, clearance, usually occurs during the first 24 to 72 hours after the event (response phase). Debris generated by the disaster is pushed to the edge of the rights-of-way to allow emergency response vehicles to access impeded areas (see Figures 7.1 and 7.2). During the planning process, routes are prioritized for clearance based on which ones are essential for emergency operations. The debris management plan must contain procedures for changing prioritization for clearance if necessary according to the actual type and extent of the disaster.

The second phase of the debris removal process is actual removal of debris from public property and public rights-of-way. Removal usually occurs during the recovery phase of the disaster after clearance has been completed. The removal phase focuses on collecting debris that has been generated by the disaster for processing and disposal. Different disaster events generate different types of debris. Table 7.1 summarizes the likely types of debris that will be generated by each disaster event.

Figures 7.3 through 7.8 and 7.10 illustrate the likely types of debris that are commonly generated by each disaster event. Figure 7.9 illustrates placement of debris.

Figure 7.1. Crew using large front loaders to push debris to the curbside on a road leading to a critical facility. (Source: FEMA)

Figure 7.2. Crew opening a blocked lane into a residential area. The debris that is piled up on the road is being hauled. (Source: FEMA)

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Table 7.1. Different disaster events generate different types of debris.

		Typical Debris Streams											
		Vegetative Debris	C&D Debris	Personal Property/ Household Items	Hazardous Waste	HHW	Electronic Waste (e-waste)	White Goods	Rock, Soil, and Sediment	Vehicles and Vessels	Putrescent Debris	Infectious Waste	CBRN—Contaminated Debris
Type of Disaster	Hurricane / Typhoon	●	●	●	●	●	●	●	●	●	●	●	
	Tsunami	●	●	●	●	●	●	●	●	●	●	●	
	Tornado	●	●	●	●	●	●	●		●	●	●	
	Flood	●	●	●	●	●	●	●	●	●	●	●	
	Earthquake		●	●		●	●	●	●			●	●
	Wildfire	●	●	●		●	●	●	●			●	
	Winter Storms	●				●	●						
	Terrorist Incident		●	●	●	●	●	●		●		●	●

Notes:
C&D = Construction and Demolition
HHW = Household Hazardous Waste
CBRN = Chemical, Biological, Radiological, Nuclear

Figure 7.3. Debris generated from a hurricane in St. Thomas. (Source: FEMA)

Figure 7.4. Debris generated from a tornado. (Source: FEMA)

Figure 7.5. Debris generated from a flooding event in California. (Source: FEMA)

Figure 7.6. Debris generated from an earthquake. (Source: FEMA)

Figure 7.7. Debris generated from wildfire. (Source: FEMA)

Figure 7.8. Debris generated from an ice storm. (Source: FEMA)

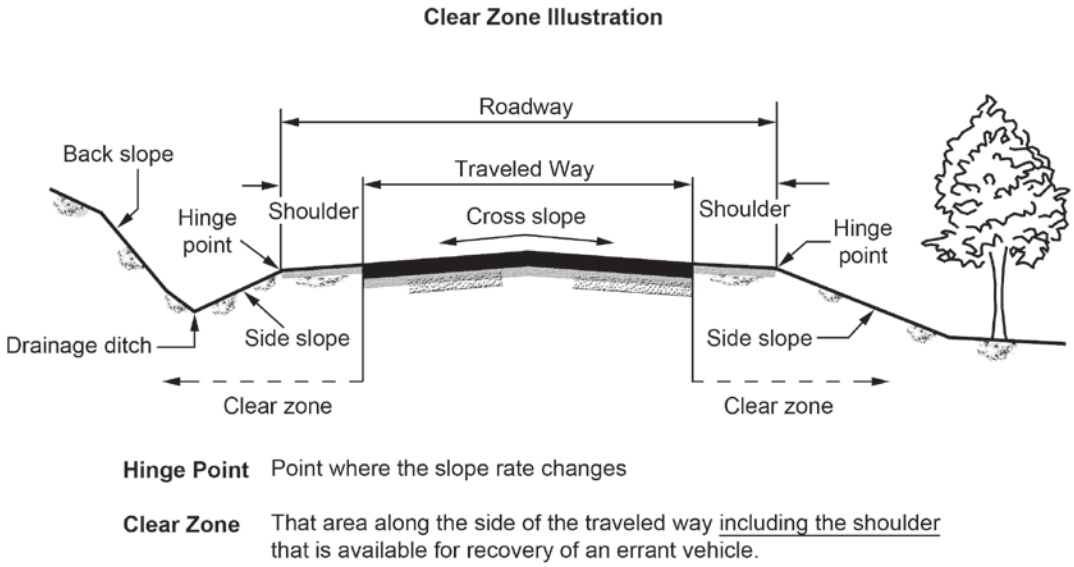

Figure 7.9. Under the FHWA ER program, debris removal generally is eligible for federal reimbursement if the debris is removed from the Clear Zone. (Source: FHWA) (7)

Figure 7.10. Mixed debris left at the curbside, Mississippi. (Source: FEMA)

Removal of Eligible Debris. Each jurisdiction might determine that it will remove all debris from the community, on behalf of its citizens, as is its right to make that determination. However, the focus of a public agency responsible for debris removal is often on collecting only "eligible" debris. As the public agency focuses on collecting eligible debris, the debris collection and removal staff, whether from the DOT, the DPW, other in-house personnel, or contractors, must be cognizant of what is considered eligible. This is particularly important if the agency intends to seek reimbursement for removal costs through a federal grant program. A jurisdiction that opts to remove debris based on guidelines other than those of the federal eligibility programs, and expects to submit a request for reimbursement under those programs, has a requirement to fully document the distinctions between potentially eligible debris and non-eligible debris. Most federal agency reimbursement programs restrict eligible debris to that which is in the public right-of-way or on public property. Some exceptions for private property exist and are discussed at the end of the chapter. Likewise, some private structures might require demolition and subsequent removal of the resultant debris. Typically, this is not eligible for reimbursement under federal reimbursement programs; however, some exceptions exist and also are discussed at the end of this chapter. The specific criteria that each federal agency grant program uses to define eligible disaster debris differs, so it is important to understand under which program debris is being removed so that the appropriate requirements can be met.

FHWA ER Eligibility. The FHWA ER program defines debris as eligible for removal if:

- The debris was generated as a direct result of the disaster.
- Removal is required to minimize damage, protect facilities, or restore essential traffic.
- The debris is located within the cross-section to the outside edge of the road shoulders (see Figure 7.9). Clearing limits can include:
  - The traveled way.
  - "Normal" medians (for divided highways, each direction is treated as a separate roadway).
  - Cut-and-fill slopes.
  - Any additional clearing required to assure the full functioning of the pavement, drainage ditches, and structures.
  - Removal of debris that is considered a safety hazard within the limits of the clear zone. Cut sections should be cleared to the safe distance that assures that no debris causes roadway slope erosion or rolls down to clog ditches or endanger traffic on the pavements and shoulders.

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The FHWA ER program generally limits eligibility to the "first push" to clear the roadway for emergency vehicles to pass and one "pass" of removal from the eligible rights-of-way. The cost of removing debris deposited in the public right-of-way by private citizens, business owners, and others, is not eligible for reimbursement through the FHWA ER program. Neither snow nor ice removal are eligible as debris removal.

FEMA PA Program Eligibility. The FEMA PA program has a number of complex rules governing reimbursement of eligible debris that is removed from public property and rights-of-way after a disaster. A list and summary of these policies is included in Table 4.1 in the Policy chapter of this manual. In general, eligible debris is defined by the FEMA PA program as debris that:

- Is a direct result of a presidentially-declared disaster.
- Occurs within the designated disaster area.
- Is the legal responsibility of the Applicant (agency) at the time of the disaster.
- Eliminates an immediate threat to life, public health, and safety.
- Eliminates immediate threats of significant damage to improved public or private property.
- Ensures the economic recovery of the affected community to the benefit of the community-at-large. This justification for debris operations should be discussed with FEMA before removal, as there are specific requirements that must be met.

NRCS Eligibility. The NRCS EWP program also responds to emergencies created by natural disasters. As part of the program, the removal of debris from stream channels, road culverts, and bridges is authorized "to relieve imminent hazards to life and property caused by floods, fires, windstorms, and other natural occurrences." To be eligible for reimbursement from the EWP program, the work must:

- Reduce a threat to lives and property.
- Be economically, environmentally, and socially defensible.
- Be designed and implemented according to sound technical standards.
- Conserve natural resources.
- Be represented by a project sponsor if performed on public or private land.

When Does Debris Removal Occur?

The debris clearance process can start as soon after the disaster as is safe for the personnel performing the work. If an event occurs with warning, such as a hurricane, responsible agencies sometimes pre-stage personnel and resources at key locations so they can begin the response clearance phase as soon after the disaster as is safe. Generally speaking, the response phase occurs during the first 24 to 72 hours after the disaster occurs, but this timeframe depends on the magnitude of the event, geographic extents of the debris field, and types of debris that are generated from the disaster.

The recovery phase, which includes debris removal, starts after the disaster response is largely complete. In some cases there might be some overlap, depending on the nature and geographic extents of the damage as well as the ongoing search and rescue missions. Debris removal operations continue until the eligible debris is removed or until completion of a timeframe or other conditions that are prescribed by the entity responsible for overseeing debris removal operations and communicated to the public.

Example: Debris Removal Timeframe Limitations (From interview with Karen Kempert, Emergency Manager, Cavalier County, ND, April 2013)

In 2010, the City of Dubuque, IA, experienced a significant rain event during which 15 inches of rain fell in 24 hours, resulting in flooding throughout the "B Branch" and south sides of

the city. The city communicated to residents that the DPW would undertake curbside pickup of debris for a prescribed 2-week period. Residents were instructed to set their debris at the curbside in the public right-of-way for pickup. When the 2-week period ended, pickup of debris reverted to a published residential fee schedule, or residents had the option to take their debris directly to local landfills themselves. Taking this approach provided a service to residents but limited the financial liability of the city for providing the additional debris removal service.

The timeframes for debris removal prescribed by federal agency grant reimbursement programs vary. The FHWA ER program defines the "eligible" debris removal period as occurring within 180 days of the event for non-federal disasters only. FEMA's PA program allows "eligible" debris removal activities to occur within 6 months of the date the disaster is declared for federally-declared disasters only; however, depending upon the amount and extent of the debris, this time can be extended. On a case-by-case basis, states can extend the time to remove debris for an additional 6 months. Any additional time extension must be approved by FEMA, and also is done on a case-by-case basis. The NRCS EWP requires project sponsors to submit their application to a local USDA Service Center, NRCS Field Office, or NRCS State Office within 10 days of the disaster occurrence for urgent situations and 60 days for non-urgent situations. No federal disaster declaration is required for the NRCS EWP program.

Who Clears and Removes Debris from Public Property and Rights-of-Way?

The responsibility for clearing and removing debris from public property and rights-of-way differs based on the governmental structure, regulations, ordinances, and debris management plans of each state or locality. Because clearance occurs quickly after the occurrence of a disaster, debris clearance operations are usually completed using in-house labor and equipment. Typically, the primary agency responsible for debris clearance is the DOT, DPW, or Department of Solid Waste Management. The primary agency coordinates with other departments such as police and fire, emergency management agencies, utility providers, and parks personnel to provide needed support to accomplish clearance activities. These support agencies may have the ability to supply workers and/or equipment to cut and clear debris from emergency travel routes as well as roads to hospitals and other critical facilities. For example, fire departments and parks departments often have personnel trained in the use of chainsaws and with access to this equipment. If the responsible state or local agency has prepositioned contracts in place, they might place their contractors on standby and activate the contracts during or immediately after the disaster. In some instances, coordination is required with private entities. For example, during ice storms, the weight of the ice may cause power poles to fall across roads—sometimes for several miles. The poles need to be moved off the roads to allow traffic; but frequently other debris must be moved before the utilities can access the poles.

During the recovery phase, debris removal operations can range from simple to complex, depending on the quantities and types of debris that the disaster generates. Simple operations require coordination among only a few agencies. However, large, complex removal operations could involve many agencies at all levels of government. Table 7.2 summarizes the agencies and responsibilities at the local, state, and federal levels that could be involved in a debris recovery operation.

Table 7.2. A large number of local, state, and federal government agencies may participate in debris removal operations.

Government Level	Agency	Can Provide…
Local	Department of Public Works Department of Transportation Department of Solid Waste	• Force account labor and equipment • Procurement of debris removal contractors • Information on traffic routes and weight limitations
	Department of Parks and Recreation	• Specialized equipment and expertise for vegetative debris • Procurement of debris removal contractors
	Legal subdivisions of the state	• NRCS EWP sponsorship
	Building/code officials	• Permits for demolition
State	Department of Agriculture	• Disposal of animal carcasses and spoiled crops • Uses for recycled materials (e.g., organic fertilizer)
	Department of Environmental Quality/Protection	• Environmental permits • Environmental compliance reviews • Fact sheets/guidance
	Department of Forestry	• Assistance with debris clearance and removal • Assistance with recycling vegetative debris
	Department of Health and Human Services	• Disposal of animal carcasses • Disposal of infectious and putrescent waste
	Department of Natural Resources	• Disposal permits • Uses for recycled materials • Guidance and fact sheets
	Department of Transportation	• Debris removal from federal-aid roads, state-maintained roads • Debris hauling permits
	State or Tribal Historical Preservation Officer	• Information on historic sites and facilities • Guidance on debris removal from historic properties
Federal	Animal and Plant Health Inspection Service (APHIS)	• Removal and burial of animal carcasses • Planning, surveillance, quick detection, containment, and eradication of invasive species and quarantined plants • Technical assistance
	Department of Energy	• Management of nuclear-contaminated debris
	Department of Health and Human Services	• Support of contaminated debris management activities
	Department of Interior Bureau of Indian Affairs	• Debris removal from Native American lands
	Department of Interior Bureau of Reclamation	• Assistance with debris clearance, removal, and monitoring

(continued on next page)

Table 7.2. (Continued).

Government Level	Agency	Can Provide…
Federal	Department of Labor Occupational Safety and Health Administration	• Advice on worker safety
	Farm Service Agency	• Debris removal from privately-owned land through the Emergency Conservation Program
	Federal Emergency Management Agency	• Public Assistance Program oversight • Reimbursement of applicant eligible debris removal costs • Mission assignment to USACE for debris clearance and removal following large debris-generating disasters
	Federal Highway Administration	• ER program implementation and oversight
	National Oceanic and Atmospheric Administration	• Hydro-surveying to identify hazards and debris and dangers to navigation
	Natural Resources Conservation Service	• Emergency Watershed Protection program implementation and oversight
	Nuclear Regulatory Commission	• Assistance with and advice on radiologically contaminated debris
	U.S. Army Corps of Engineers	• Debris removal operations under mission assignment from FEMA • Technical guidance • Coordination with EPA on Weapons of Mass Destruction (WMD)-type contaminated debris management • Sunken vessel removal • Debris removal from flood control works
	U.S. Coast Guard	• Vessel salvage and vessel debris removal • Debris removal from the Coastal Zone • Oil containment, stabilization, decontamination, collection, and disposal • Technical assistance
	U.S. Environmental Protection Agency	• Oversight of environmental compliance • Technical guidance • Waste sampling • Hazardous waste removal • Identify recycling and reuse opportunities • Coordination with USACE on WMD-type contaminated debris management • Disposal of household hazardous waste through mission assignment from FEMA

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How Is Debris Clearance and Removal Accomplished?

Debris clearance and removal operations can be dangerous for the personnel who are performing the work as well as to the general public. Live power lines may be down and lying across public spaces; and trees that have fallen across roadways need to be cut. Advance planning to identify the most likely hazards and develop strategies for safely working around them is important to implement a successful debris removal operations strategy. Debris management plans should include a health and safety strategy that can be customized to the hazards associated with the particular disaster; and field personnel should be trained and familiar with this strategy. Prior to undertaking clearance and removal activities, debris workers also should be trained in disaster-specific safety measures. Field workers should use the appropriate safety equipment for the work they are performing. Coordination procedures with local electrical providers should be included in the debris management plan, and should be implemented immediately.

Debris clearance and removal operations involve coordination and communication as well as physical removal of debris. Debris clearance and removal operations strategies should be communicated to the public information officer (PIO) prior to beginning clearance and removal operations. This coordination enables the PIO to inform the public about potential hazards, as well as what to expect during debris removal operations and what the public's role would be in the operations. If the debris management plan includes a public information strategy, this strategy should be modified and implemented as appropriate for the particular disaster. Debris clearance and removal operations can proceed more smoothly and efficiently if the public understands the methods and schedule for debris removal.

Example: Importance of Communication to the Public (From interview with Karen Kempert, Emergency Manager, Cavalier County, ND, April 2013)

In 2011, extensive flooding in Minot, ND, generated significant amounts of debris. Karen Kempert, the Emergency Manager for Cavalier County, volunteered to assist the City of Minot with their debris management operations for a 10-day period in July 2011 during the transition from the response to the recovery phase. While working during the disaster, Ms. Kempert observed that the Minot PIOs did not have information about debris operations in their cache of messaging. Informing the public about how to bring debris to the curbside, sort it for removal by city agencies, and deal with debris as contaminants was critical to the success of debris removal operations. Fortunately, the Minot PIOs had a strong network of contacts and were able to reach out to the Grand Forks, ND, PIOs to obtain copies of the public messages and brochures they had developed during the 1997 floods. They then coordinated with the public works department to adapt these materials for dissemination to Minot citizens. Ms. Kempert saw firsthand the importance of having a good public information campaign, and how it could facilitate debris removal operations.

One of the messages that should be communicated to the public is their role in debris removal operations. The public's role depends on the method of removal that the responsible state or local entity uses. Depending on the scale of the event, debris removal may be accomplished by the responsible entity picking up debris from the right-of-way at the curbside, by citizens transporting their debris to collection centers, or by hauling debris to a DMS.

If debris is picked up at the curbside by the state or local entity responsible for debris removal (or their agents), disaster-generated debris is placed by citizens in public rights-of-way for collection. The debris manager will determine the priority of routes for debris removal and establish a schedule. The pickup schedule should be communicated with the public to ensure debris is removed in a timely fashion and to limit the duration of debris removal operations.

"Passes" are made along each roadway to pick up debris for which the jurisdiction has legal responsibility to perform debris removal. The number of passes is determined by the jurisdiction

and is usually contained in their debris management plan. If debris is segregated at the curbside, then multiple passes might be required along the same routes to maintain the segregation of debris types. (See Chapter 8.) Typically the number of passes does not exceed three. Only eligible debris should be removed as defined by the local ordinances and, if relevant, federal grant reimbursement program policies.

Curbside debris removal operations tend to require intensive labor and equipment. Personnel are needed to operate the equipment and vehicles used to remove and haul debris to processing sites, segregate debris, and monitor operations. Equipment needed to remove debris can include:

- Dump trucks.
- Bucket loaders.
- Excavators with grapples.
- Grinders.
- Self-loading trucks with knuckle booms.
- Backhoes.
- Tractors.
- Roll-off trucks.
- Cranes.
- Chainsaws.
- Forklift loader with clamshell attachment.

State and local agencies, especially DOTs and DPWs, can use strategies listed below to increase the efficiency of curbside disaster debris removal operations (*24*). A checklist for curbside removal operations can be found in Appendix E.

- Establish a transportation network with well-defined uses. Classify roads according to their use, vehicle speed, weight limits, and destination linkage.
- Consolidate a transportation network, and then clear entire sectors. Transportation corridors progress from primary routes to secondary feeder roads to residential streets.
- Assign contractors to sectors. Sectors are prioritized so that access to essential services buildings are cleared first.
- Establish the number of passes to be completed (i.e., how many times a truck travels a route to collect debris). Communicate schedule with the general public.
- Have purchasing departments establish prior claim on contractors through Letters of Agreement. (There have been instances when debris contractors sign contracts with multiple entities before or at the beginning of a disaster, and then are unable to meet contractual requirements.) Develop procedures in advance to ensure speedy procurement of services.
- Mark vehicles used in the transportation of debris (government, contractors, and others) by an easily identifiable permit or bar code to ensure unimpeded access to disaster areas.
- Handle all soft goods such as bedding, mattresses, curtains, carpeting, and clothes as soon as possible. No salvageable material are collected from these items, which are extremely heavy and hard to handle and need to be mechanically loaded by bucket loaders and/or excavators with grapples.
- Machine-load trucks hauling debris to maximize space efficiency for each load.
- Reduce debris volume before hauling.

In some instances, it may not be practical or even feasible to collect debris at the curbside for removal. Rather, it is more effective to establish collection centers for citizens to bring their debris. Establishing a collection center requires some pre-planning to ensure efficiency of the operation. The site should be of sufficient size to accommodate large collection bins that will be used to hold segregated debris. The site should provide appropriate entrance and exit routes, and allow easy access for citizens as well as the exchange of full and empty bins. Depending on state and local ordinances, the sites may also need to be permitted prior to operation; the jurisdiction's legal counsel

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may need to investigate potential liability issues that operating such a site could present. Locations of the collection sites and hours of operation should be clearly communicated to the public.

Sufficient staff should be on site to operate the facility and assist residents with sorting their debris and placing it in the correct bins. If collection site usage is limited to residents of the jurisdiction, the collection site staff should verify proof of residency from citizens who are bringing their debris to the site. If this is not done, the site could become a dumping ground for neighboring communities or non-disaster-related debris. The collection site operations staff also needs to determine when the current bins are full and should be exchanged for empty bins.

Whether debris removal is accomplished curbside or at collection centers will be dependent upon a number of considerations specific to a state or local agency's situation. Geography is one significant factor. Curbside removal is most efficient in areas where debris accumulation can be concentrated and multiple passes along roadways can be completed. Generally this condition occurs in closely concentrated population centers such as urban and suburban areas. Collection centers tend to be more efficient in rural or geographically dispersed areas where curbside pickup would be difficult.

Another factor is the quantity of debris that is generated. It is more efficient to complete curbside pickup for large quantities of debris so that trucks are completely filled during a single pass. Collection centers are generally more efficient for disasters where small quantities of debris are generated and can be easily transported by residents to the centers.

Some other considerations include:

- Types of debris generated.
- Urgency of site clearance.
- DMS characteristics.
- Debris recycling possibilities.

Discussion—Assisting Population Segments with Debris Removal

Some segments of the population, such as the elderly and those with access or functional needs, may not be able to move debris from their property to the curbside for pickup, or load and transport it to a collection center. Local government agencies that have assisted these segments of the population to move their debris from private property to public property for collection have learned that the cost of labor and equipment to do so generally is ineligible for federal reimbursement. Subsequently, several communities have identified volunteer organizations that assist these segments of the population to move debris from their property upon request and have included this information in their PIO campaigns.

Special Issues

Private Property Debris Removal and Demolition. When disasters strike, the resulting debris is strewn across both public and private property. Removal of debris falling on public property is generally the responsibility of the government agency that maintains that property on a daily basis. Similarly, debris falling on private property is generally the responsibility of the property owner. Most property owners will clean up the debris on their property and/or enlist the aid of volunteers to accomplish this task and file a claim for reimbursement with their insurance company. Under special circumstances, public entities have removed debris from private property. For example, after Hurricane Katrina, a significant portion of the population was relocated for an extended period of time. While private property owners were displaced, the debris on their property began to pose both a public health threat as well as a threat to the economic recovery of the community. Several jurisdictions proceeded with removing debris from private property to avert further adverse impacts on the community.

Before authorizing demolition of and/or debris removal from private property, key decision makers at the local government level should determine under what circumstances and ordinances this action should and could be taken. The means of legal entry onto the property also should be established and documented.

If a state or local government agency has established its legal authority to enter onto private property for the purposes of demolition, additional steps, shown below, should be followed to accomplish the private property debris removal and/or demolition process (*25*). A checklist for accomplishing removal and demolition from private property can be found in Appendix F.

- Follow local government's normal condemnation procedures (e.g., hearings and notices).
- Verify ownership.
- Secure right-of-entry and hold-harmless agreement from the property owner.
- If property owner cannot be located, a legally authorized local official could exercise public emergency powers to allow entry without owner's permission.
- Complete environmental and historic preservation reviews.
- Coordinate with other agencies as appropriate.
- Document insurance coverage.
- Verify personal property removal.
- For demolition, also:
  - Obtain a building official's assessment of the property condition.
  - Notify lien holder.
  - Conduct necessary inspections (e.g., building, public health, and fire).
  - Notify public of condemnation and demolition in accordance with local procedures.
  - Verify structure is unoccupied.
  - Cap water, well, sewer, gas, and septic lines. Disconnect electrical service. Remove propane tanks.
  - Mark easements and underground utilities.
  - Identify/remove/dispose of asbestos, lead-based paint, other hazardous materials present at the site per governing requirements.
- Record GPS coordinates. Photograph site before and after removal/demolition.
- Segregate, transport, and dispose of (demolition) debris in accordance with the debris management plan. Document debris removal from the site.

In addition to establishing legal authority and following appropriate procedures, state and local agencies that intend to seek reimbursement for private property demolition and/or debris removal must understand and comply with eligibility requirements for the federal programs to which they intend to apply. Each of the federal grant programs has different eligibility criteria regarding private property debris eligibility.

Reimbursement for private property debris removal generally is not eligible under the FHWA ER program. FHWA also does not reimburse for removal of private property debris that has been moved to the right-of-way.

NRCS can fund private and public landowners for debris removal from stream channels, road culverts, and bridges if represented by a project sponsor, which is defined as a legal subdivision of the state:

- City.
- County.
- General improvement district.
- Conservation district.
- Native American tribe or tribal organization as defined in Section 4 of the Self-Determination and Education Assistance Act.

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Private property debris removal is generally ineligible for reimbursement from FEMA's PA program. In certain cases the Federal Coordinating Officer (FCO) might find it eligible if:

- It presents an immediate threat to life or property.
- A public health threat exists.
- The subgrantee can demonstrate that it clearly has a pre-established legal responsibility to remove debris from specific private property, and has done so (or is responsible for doing so) whether or not a federal disaster declaration is made.

Likewise, FEMA PA for demolition of private property generally is ineligible for reimbursement. In certain cases, the FCO might find it eligible if:

- The structures were damaged and made unsafe by the declared disaster, and are located in the area of the disaster declaration.
- The subgrantee certifies that the structures are determined to be unsafe and pose an immediate threat to the public.
- The subgrantee has demonstrated that it has legal responsibility to perform the demolition.
- A legally authorized official has ordered the demolition of unsafe structures and removal of demolition debris.
- The subgrantee has indemnified the federal government and its employees, agents, and contractors from any claims arising from the demolition work.
- The demolition work is completed within the deadlines specified in 44 CFR 206.204 for emergency work.

Jurisdictions should be aware that removing debris from private property without coordinating with the state and FEMA could be considered ineligible for reimbursement. A clear approval should be obtained if this action is contemplated.

While private property is often considered to include single family homes and businesses on individual sites, other types of property that are considered private or commercial by FEMA are mobile home parks and gated communities. Generally, debris removal from these properties is not eligible for reimbursement through FEMA's PA program. As is the case with other private property, the FCO might determine on a case-by-case basis that debris removal from a mobile home park or gated community is eligible. If so, the agency performing debris removal must follow the same requirements and processes that apply to other types of private property. For mobile home parks, the responsible agency must obtain a right-of-entry from each homeowner in the park, as well as from the park owner.

Railway Systems

Generally rail systems are privately owned and operated, and debris removal from rail systems are the responsibility of the corporate owner. There are some situations in which DOTs are responsible for supporting operations of passenger rail systems, which includes removing debris from the railways to allow trains to safely use the rails with minimum service disruptions.

Example (*26*):

Pacific Northwest Rail Corridor (PNWRC), which runs from Vancouver, BC, to Eugene, OR, is subject to mudslides, particularly during the rainy season of December through February. State DOT crews have the responsibility to remove mudslide debris from the railway to allow trains to pass safely. In 2012, 55 trains were cancelled due to land slides.

Debris removal can be required for both railway systems and transit systems. Commonly, debris comes from wet leaves that can cause a slippage hazard on the rails. After natural disasters, a significant debris issue can come from a railway/transit system itself. For example, flooding can wash out ties, rails, and roadbeds, resulting in rail debris that must be removed before new track can be laid. In the proximity of culverts, tunnels, and bridges, heavy floods may have deposited

mud and other debris that would have to be removed, and needed repairs completed before the facility can resume operation.

Debris removal from railways is likely to occur on or near railway property in open air or in tunnels. In some cases of severe flooding, railway tracks could be carried significant distances from their original locations. Removal of these tracks ultimately will be the responsibility of the owner, whether through physical removal of the track debris, or by contracting the work. If the organization responsible for the rail system is a FEMA-eligible public entity, and a federal disaster is declared, the cost of debris removal will be reimbursable. Care should be taken to ensure the debris removal from the specific rail/transit line is not eligible for funding by the Federal Transit Administration.

The equipment required to remove debris from railways generally is the same as is required for removal from roadways. In addition, pumps and generators could be required to remove water from tunnels (*27*). Sometimes, specialty equipment can help expedite operations. After the Joplin tornado, All Railroad Services Corp. used hi-rail log loaders equipped with grapples with saw blades to remove and cut trees and debris from railways in the Joplin area (*28*).

Airports

Following major disasters that affect airports, the Federal Aviation Administration (FAA) provides funding for repairs to the facility from the Airport and Airway Trust Fund. (The FAA has no separate budget for disaster response/repair). Following Hurricanes Katrina and Rita, several airports in Mississippi, Louisiana, and Texas reported significant damage. FEMA and private insurance companies provided funding for some recovery costs/repairs; and the FAA provided additional funding. When reviewing eligibility of funding, there must be a clear understanding of what is eligible from the FAA, what is eligible from FEMA, and what is covered by insurance (*29*).

Marine Debris Removal

Some disasters, such as hurricanes and floods, can result in significant amounts of debris being deposited in waterways. Removal of debris from federally-maintained waterways is the responsibility of a federal agency, usually the NRCS, National Oceanic and Atmospheric Administration (NOAA), USCG, or USACE. Removal of marine debris from non-federal public waters is the responsibility of a state or local agency. Some examples of public waters include non-federally-maintained navigable waterways, coastal or inland zones, and wetlands. FEMA can provide funding for disaster-related debris removal or mission-assign another federal agency to assist with removal if the needs exceed state and local capabilities. If a state or local agency must coordinate and oversee marine debris removal, several methods can be implemented to accomplish the work.

- **Point pickup** is the preferred method if it can be used, because it avoids environmental issues. The debris item is located, and grappling hooks (for smaller items) or cranes (for larger items) are used to lift it out of the water. Divers can assist if necessary. (See Figures 7.11 and 7.12).
- **Manual removal** is accomplished by hand pickers working in shallow water to locate debris by sight or touch and using rakes or hook poles to remove the material. Recovered items are loaded onto small vessels and transported to the shoreline for sorting and disposal.
- **Removal of shoreline debris** can best be accomplished by clearing debris from the waterside during low tide, during removal of wet marine debris from the water (see Figure 7.13). Generally, shoreline debris consists of vegetation and construction and demolition items that lie partially in the water and partially on land. Prior to removal, the responsible party should be identified, as there may be conflicting opinions about who has the authority to perform the task. In some states, the beaches are considered to be state-owned; in others, beach house or business owners may own some portion of the beach; i.e., to the high-water mark. If there is extensive debris in the shoreline area, it may be necessary to sift the debris, similar to the process used on beaches (*30*).

Figure 7.11. Marine debris removal by point pickup method. Hurricane Sandy, New Jersey. (Source: Ali Velasco)

Figure 7.12. Marine debris removal by point pickup method. Hurricane Sandy, New Jersey. (Source: Ali Velasco)

Figure 7.13. Shoreline debris in New Jersey after Hurricane Sandy. (Source: Ali Velasco)

CHAPTER 8

Segregation

Synopsis of Issue

In many mid- to large-size disasters, mixed debris is segregated according to debris type. Segregation of debris provides for easier and more efficient processing and disposal, promotes recycling of specific types of debris, produces the lowest unit disposal costs, and ensures that each type of debris can be treated according to specific governing processing and disposal requirements. Segregation of debris can be accomplished at the curbside by residents or debris removal personnel, or it can be picked up and hauled to a debris management site (DMS) where it is segregated. The location and layout of the DMS and the method of segregation can have a significant impact on the rate of debris removal and reduction, as well as the perceived progress of the community's recovery operation.

Target Audience

- Debris managers
- Environmental managers
- Debris supervisors
- Debris removal workers
- Debris removal contractors
- Debris removal monitors

What Is Debris Segregation and Why Is It Important?

Debris segregation refers to the separation and organization of the entire amount of waste generated by a disaster, according to specific treatment and disposal requirements. Only a well-planned segregation system can ensure that the waste is treated according to its level of hazard, that proper transportation equipment is used, and that the most efficient disposal actions are taken and closely coordinated between the DOT and DPW. The state/community debris management plans should discuss how segregation requirements change with the extent and type of disaster.

The primary reasons for segregating debris are to reduce the impact on limited landfill space, comply with legal requirements governing the disposal of hazardous waste, provide appropriate materials eligible for recycling or reuse, and reduce the unit costs of all debris. If debris generated by an event is not disposed of properly, it could endanger public health as well as the environment. Reducing the volume of some materials before transport saves landfill space. Decreasing the amount of debris may also offer a financial benefit. The salvage money obtained from segregating and reusing or recycling waste may help offset expenses from debris removal operations while maximizing the recovery of materials at a lower cost than disposal. FEMA encourages state and

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local governments, tribal authorities, and private nonprofit organizations to take a proactive approach toward coordination and management of debris removal operations as part of their overall emergency management plans. Such an approach builds an ongoing capability to continue managing similar waste materials in the future.

When Is Debris Segregated?

As soon as the event has passed, there should be an immediate assessment of the debris magnitude, scope, and impact. This evaluation initially focuses on requirements for urgent clearing of debris to allow emergency vehicles access to the area, clearing for emergency operations, and other necessary activities. Simultaneously, an assessment should be made of the actual extent, estimated amount, composition of mixed material, and impact of the overall debris generated by the event. As residents and volunteers begin working in the affected area, an extensive amount of debris may be moved from one location to another. If the positive impacts of segregation are well understood, the overall debris removal effort will be faster.

Who Is Responsible for Segregation?

Clear communication to the public about debris segregation options and policies is key to successful and cost-efficient operations. A jurisdiction's public information officer should work in tandem with the debris manager to develop and disseminate messages regarding the preferred method of segregation for the disaster event. These messages should be provided frequently and clearly stated as soon as possible after the event. In addition, the messages should be made public in different media formats and describe how to segregate debris, which materials are accepted, drop-off locations, schedule for removal, how removal operations might impact traffic flows, and other pertinent information.

Coordinated efforts of homeowners, the business community, local and state government agencies, contractors, and monitors can contribute to effective debris segregation activities, ultimately resulting in more efficient debris removal and disposal operations. To the maximum extent possible, home and business owners and local government and nonprofit officials should be responsible for sorting and segregating debris originating from their property. They should place debris sorted by type in separate piles at the curb in the public right-of-way or on public property for pickup, take segregated materials to designated drop-off points, or assist in preparing debris for removal to a DMS. A table showing examples of the types of debris can be found in Appendix G.

Debris removal contractors normally are responsible for picking up debris; although in some instances, local government agencies use in-house resources to do so. If possible, they pick up segregated debris from the curbside and rights-of-way. If debris deposited at the curbside is mixed, the contractor may be responsible for segregating it at the loading point, or taking it to the DMS for sorting according to the site's operating plan.

Site monitors are tasked with observing curbside loading, as well as truckloads of debris entering a debris management or disposal site. The monitors ensure that materials are properly segregated and deposited in the appropriate locations within the site.

How Is Debris Segregated?

A fundamental component of a disaster debris management strategy is the proper disposal of collected debris. The implementation of disaster debris collection immediately after the disaster event assures the public that recovery efforts are in progress and that the community will return

to normal in a timely manner. The debris type, amount, and urgency determine which collection method, or combination of methods, is used. The primary methods of debris collection are:

- Curbside collection,
- Collection centers, and
- DMSs.

In most disasters, a combination of these methods may be used. Following a disaster, the community must determine what method, or combination of methods, will be used. The advantages and disadvantages of each method for an individual community should be considered. The debris management plan should include a discussion of debris segregation and establish some basis for selection.

Curbside Segregation. While curbside segregation of debris typically is the most efficient and cost-effective method of debris management, it has its limitations. It requires participation by a significant number of disaster-affected citizens and businesses, or the results will be inconsistent. Additionally, the disaster must have been of such a size and type that residents remained in their homes or would be expected to return shortly after the disaster. Residents who are displaced for a significant time cannot be expected to return to clean their properties on a predictable schedule.

Residents are requested to sort debris by type and place it at the curbside, outside of private property. The segregated debris piles should be placed in the right-of-way and clear of obstructions such as mailboxes, fire hydrants, gas meters, and telephone poles, as shown in Figure 8.1. This method of segregation might require additional trucks to remove each type of debris, but overall, it has been found to be the most efficient in densely populated areas. Curbside segregation also can be accomplished by pickup crews, but this process is labor-intensive and can be costly.

The general process of curbside segregation is as follows:

- Household garbage is separated from disaster-related debris.
- Food is removed from white goods prior to placement at curb/drop-off site.
- White goods might be required to have doors removed or secured by duct tape.
- Neighbors might be encouraged to share debris piles.
- Debris is placed away from:
  - Light poles and power poles.
  - Power lines.
  - Fire hydrants.
  - Meters (electric, gas, water).
  - Mailboxes.
  - Other inanimate objects that could obstruct or be damaged during removal operations.
- Debris piles should not protrude into the traveled roadway.
- Debris piles should not remain on private property.

Collection Centers. Collection centers can be an effective way to segregate debris. In rural areas and other places where curbside pickup locations may be too far apart to promote efficient debris removal operations, residents may be asked to bring their debris to designated locations. Some communities may choose this option immediately following a disaster, depending on the types and amounts of debris. This option also may be used following curbside segregation when the amount of segregated debris becomes too little to justify pickups.

At these collection centers or drop-off locations, residents segregate their debris at the site by sorting their debris loads by type. Information on locations, operating hours, and acceptable debris must be made available to the residents. To be effective, collection centers should have individual(s) assigned to assist in segregation at the site, ensure full bins are removed before overflowing and immediately replaced by empty bins, maintaining traffic flow, etc.

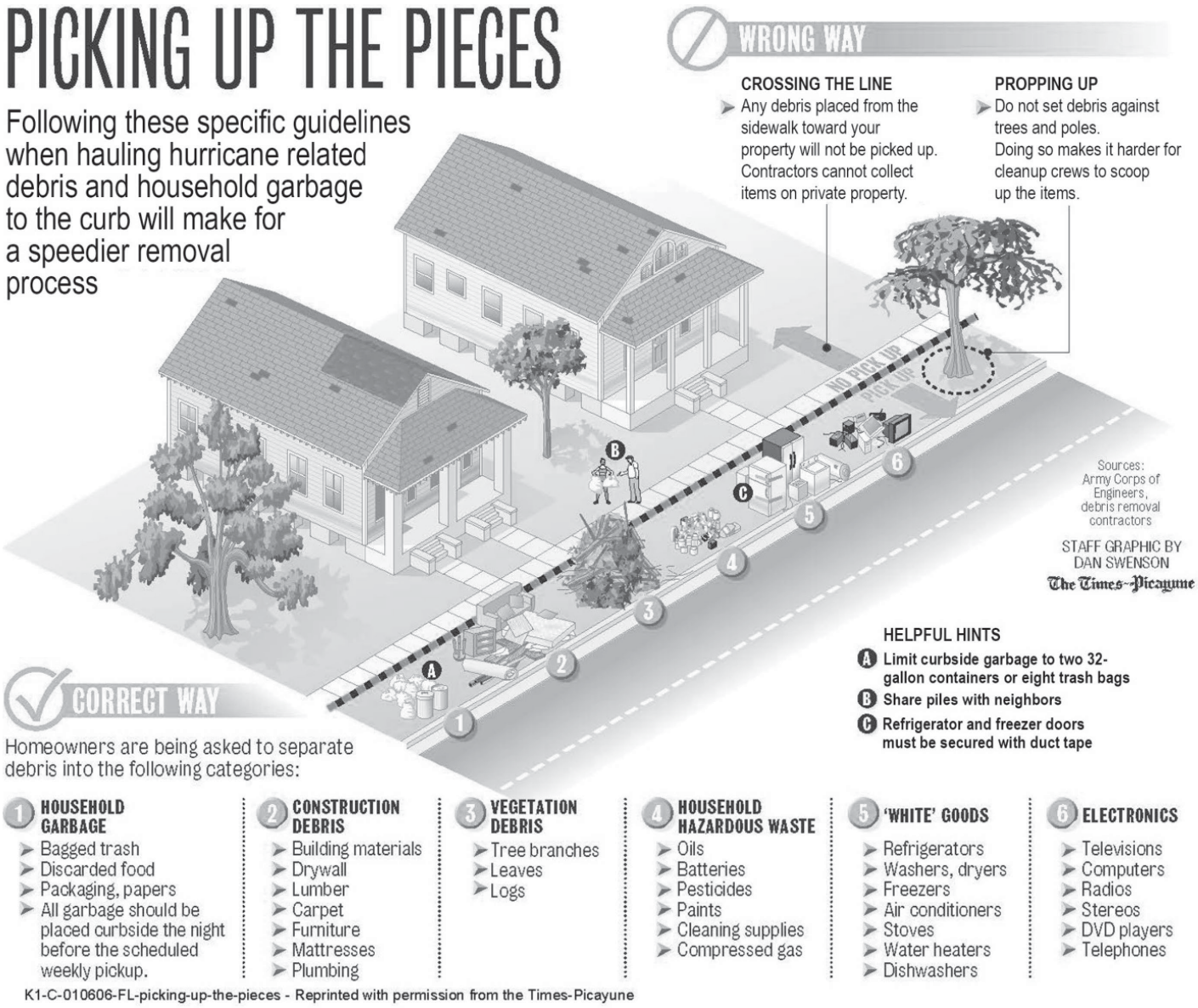

Figure 8.1. A community's strategy of having residents segregate debris at the curbside should be clearly communicated to the public. (© 2014 The Times-Picayune, L.L.C. All rights reserved. Used with permission of NOLA Media Group.)

At drop-off sites, monitors should ensure that:

- Food is removed from white goods prior to placement at the drop-off site;
- White goods have doors removed or secured by duct tape, if necessary;
- Disaster debris does not include household garbage; and
- Hazardous waste and other unacceptable debris is taken to a designated site.

Debris Management Sites (DMSs). In large debris-generating disasters, or as an alternative during smaller incidents, a DMS may be used. A DMS may also be called a Temporary Debris Staging and Reduction Site (TDSR). All waste is brought to the DMS where it is sorted, processed, and prepared for recycling. A DMS requires a significant amount of land and personnel, but can be an efficient place to handle high volumes of material and a worthwhile

Figure 8.2. Mixed debris left at curbside after flooding event. Particularly after floods, or heavy rains on de-roofed homes, a large amount of personal property will be brought to the curbside. (Source: FEMA)

investment. Site layouts should be carefully planned to ensure only the required processes are included. Chapter 9, Debris Management Site Selection, addresses the requirements for a DMS selection.

Entire truckloads of similar debris may be collected and delivered to the DMS. When this occurs, the debris is taken to a specific location at the site and unloaded until it can be reduced. If the load is mixed debris (as shown in Figure 8.2), it is generally deposited at a designated location, segregated by hand, and put in piles according to the debris categories shown in Table 8.1. The piles are then processed according to the jurisdiction's debris management plan and governing federal, state, and local regulations.

Table 8.1. Debris categories.

Debris Type	What Is It?	Description
Vegetative	Includes leaves, brush, limbs, branches, trunks, and stumps.	Reduction can decrease vegetative volume by 75 to 90 percent. Vegetative debris that is free of contaminants can be reused or recycled, further reducing its impact on landfill space. Applicants should check on the possibility of sending the debris to a generating plant.
Construction & demolition (C&D)	Damaged components of buildings and structures such as lumber and wood; gypsum wallboard; glass; metal, roofing material; tile, carpeting, and floor coverings; window coverings; pipe, concrete; fully cured asphalt; equipment; furnishings; and fixtures.	C&D debris that is clear of asbestos and hazardous materials should be recycled to the extent possible, and the remainder disposed of in a permitted C&D landfill. Example: sections of asphalt pavement can be crushed and reused, and bricks can be recycled.

(continued on next page)

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Table 8.1 (Continued).

Debris Type	What Is It?	Description
Hazardous waste	Any material exhibiting at least one of the following four characteristics: ignitability, corrosivity, reactivity, or toxicity. Governed by Resource Conservation and Recovery Act (RCRA).	Special precautions may be required for this type of waste, including wearing personal protective equipment, decontaminating trucks, using special containers, and maintaining chain of custody.
Household hazardous waste	Includes consumer products that exhibit the characteristics of hazardous waste. Examples include some household cleaning products, latex- and oil-based paint, gasoline and oil, batteries, cleaning solvents, pool chemicals, and pesticides.	Handling should be the same as for other types of hazardous waste.
White goods	Includes household appliances such as washers, dryers, refrigerators, freezers, ovens, ranges, heat pumps, water heaters, and air conditioners.	Many white goods contain refrigerants, mercury, or oils that must be removed and processed according to environmental regulations before the white goods can be further processed for recycling or disposal. White goods should also be cleaned of all putrescent debris prior to removal and disposal. Disposal of refrigerators and freezers usually require prior removal or duct taping of doors.
Municipal solid waste	General household garbage such as food, plastics, packaging, and paper.	Can be disposed of in a municipal landfill.
Electronic waste	Includes household electronics that contain hazardous materials such as cathode ray tubes. Common examples are computer monitors and old televisions; however, all electronic waste should be disposed in the same site.	Electronic wastes may also contain chemicals and minerals that require special treatment or disposal methods. Material should be checked by qualified personnel.
Asbestos-containing material	Many older buildings contain asbestos in such items as floor tile, pipe wrapping material, insulation, duct work, shingles, and stucco (among others).	Special handling by qualified personnel is required if asbestos is present.
Infectious waste	Could cause infections in humans: includes blood and blood products, human and animal waste, medical waste, pathological waste, and discarded sharp objects such as needles and scalpels.	Handling, treatment, and disposal of this type of waste is generally under the authority of another agency, such as the Centers for Disease Control or Environmental Protection Agency. Check with the proper agency and ensure contact name and number is contained in the Debris Management Plan.

Table 8.1. (Continued).

Debris Type	What Is It?	Description
Soil, sand, mud, and snow	Soil, sand, mud, and snow.	Should be evaluated to determine if they contain any contaminants. If so, the contaminants should be handled, processed, and disposed of according to environmental regulations governing that type of contaminant. If these debris types are determined to be free of contaminants, they may be combined with other organic materials at the DMS and recycled or reused.
Vehicles and vessels	May be damaged, destroyed, displaced, or lost as a result of a disaster. The owners might abandon them if they have relocated or because of the amount of damage.	Vehicle and vessel debris must be processed to remove all of the fluids such as oils, gasoline, diesel fuel, antifreeze, and any minerals before they can be recycled, salvaged, or destroyed. Care must be taken when handling private vehicles. Most entities have legal processes that must be followed before a privately-owned vehicle can be removed and destroyed.
Putrescent	Includes any debris that could decompose or rot, such as animal carcasses and other fleshy organic matter.	Must be handled in accordance with all applicable local ordinances and state and federal regulations.
Chemically, biologically, radiologically, or nuclear-contaminated debris	Unless the disaster is a terrorist event, this type of debris usually would be associated with hospitals, medical supply facilities, chemical plants, etc.	The segregation, treatment, removal, and disposal of these types of debris should be handled by specialists and overseen by the EPA, which is designated as the lead federal agency for handling these materials according to Emergency Support Function (ESF) #10 in the National Response Framework.
Crime scene debris	Could include any of the other categories of debris.	If the debris is the result of an intentional manmade disaster, it may be considered part of a crime scene. In these cases, law enforcement officials must approve the debris before it is removed from its original location so as not to undermine the integrity of the evidence.

(Table compiled based on information contained in FEMA 325, Debris Management Guide)(*25*)

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Some additional considerations for segregating debris at a DMS:

- Ensure that personnel have appropriate personal protective equipment as needed (e.g., when handling hazardous household waste or electronic waste).
- Locations at the site for various types of debris (e.g., C&D, household hazardous waste, and electronics) should be clearly marked. Conveyor belts can be used to assist with recycling and other processes.
- Vibrating (or manual) screens can be used to remove soil from other debris.
- Food should be removed from white goods prior to additional processing.
- Electronic waste should be segregated by type (e.g., televisions or computers), and placed in piles to a height compliant with local regulations or the debris management health and safety plan to minimize risk of collapse. Electronic waste should be protected from weather, if possible.
- Debris piles should be handled promptly and not allowed to accumulate, to minimize environmental and safety risks, and prevent spontaneous combustion of vegetative debris piles. While there are no standard heights for vegetative debris piles, the maximum height of debris piles generally is in the 10- to 15-foot range to help prevent spontaneous combustion and facilitate working the debris pile. If another height limit is established by local regulations or the debris management health and safety plan, the pile heights should conform to those limitations.
- Vegetative debris piles should be turned frequently to reduce the likelihood of combustion; it is recommended that piles be turned when internal temperatures reach 160 degrees Fahrenheit to dissipate accumulating heat and gases and allow cooling. Piles should be located near firefighting equipment and away from buildings in the event that spontaneous combustion occurs.
- C&D wastes should be processed to remove contaminants such as asbestos-containing materials, white goods, and household hazardous waste. Debris pile heights should conform to local limitations or the height prescribed in the debris management health and safety plan.

CHAPTER 9

Debris Management Site Selection

Synopsis of Issues

While some debris may be taken directly to a landfill or landfills, large disasters usually require the development of a procedure to reduce the volume taken to landfills, or process the debris for recycling. Debris removal operations may be expedited in some jurisdictions by removing the debris to a temporary staging location where it can be processed. Such a site is commonly called a DMS or a temporary debris staging and reduction site (TDSR). While such sites allow debris segregation and processing at a central location, it can be more costly than hauling directly to a landfill; however, the material may require reduction prior to disposal whether or not a DMS is used. Sizing of such sites is extremely important, as they must be of sufficient size to accommodate predicted volumes, mixed debris, and processing needs without adversely impacting the environment, public health, traffic flow, and other regulatory and social considerations. The sites should be as close to the locations of disaster debris as possible to minimize hauling distance and times, yet sufficiently removed from developments. They must be opened, operated, and closed in accordance with federal, state, and local regulations and permit requirements.

Target Audience

- Debris managers.
- Debris management planning committees.
- Local officials.
- Environmental officials.
- Debris supervisors.
- Land-use officials.
- Historic preservation officers.

Use of DMSs

When disasters generate large amounts of debris, counties and cities may not have sufficient space in existing landfills to manage the quantity and mixed composition of debris that is being removed. Under these circumstances, DMSs can be used to facilitate debris removal and disposal operations. There also is the possibility that a DMS can be used for a single purpose. For example, during an ice storm or hurricane there may be massive amounts of vegetative debris scatted over the impact area. While there may be several other kinds of debris, the vegetative debris is predominant. Some communities may develop a vegetative debris reduction site that is used solely for reducing and disposing of that category of debris, and have a second DMS that addresses the

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remaining categories. If the sites are located in separate sections of the community, coordination with the DOT and DPW could result in the reduction of truck traffic in one area.

Why Is Site Selection Important?

Before debris removal operations begin, the debris manager must determine the overall debris removal, processing, and disposal strategy. Typically this strategy is included in the debris management plan, and is one of the most important components. It provides the overall framework for how and where debris will be removed, processed, and disposed. Some issues, that the strategy might address how to accommodate disposal needs when landfill space is limited or recycling mandates have been adopted by the jurisdiction. Increasingly, local jurisdictions are finding that nearby landfill space is limited such that removing debris from public property and hauling it directly to a landfill is no longer feasible; it must first be reduced in volume. Additionally, permitting, constructing, and operating landfills are more difficult and expensive, so maximizing the use of the existing landfill for routine debris is important.

In some locales, recycling debris to achieve a target percentage is mandated through existing local or state ordinances. To expedite removal of debris from public property and rights-of-way, many localities identify temporary staging sites where debris is taken to be segregated, processed, and reduced in volume, allowing the community to meet its goals for recycling and reduced use of landfills while helping to facilitate a faster recovery process. It must be understood that the use of DMSs for temporary storage and processing sometimes increases the overall cost of operations. That is because some of the debris must be hauled twice—once from public property to the staging site and then again from the staging site to the final disposal site. Conversely the use of such sites may expedite the removal and disposal of debris because more can be hauled, segregated, and disposed in a less time. The use of a temporary site also allows existing landfills to continue normal operations.

What Goes into Site Selection?

There are a number of criteria that should be considered when trying to identify land to serve as a DMS. Ideally, the land should be large, relatively flat, already cleared, and publicly owned. DMSs are typically between 50 and 200 acres. The use of larger plots of land means that fewer DMSs (and associated costs) will be needed for temporary staging and processing. The size and number of sites needed by a jurisdiction will depend on the event debris forecasts that are developed as part of the debris management plan. If publicly-owned sites of sufficient size to accommodate the forecast debris volumes are not available, jurisdictions must consider if they will pursue the use of privately-owned lands or MOUs with other jurisdictions. If a jurisdiction decides to use privately-owned land because public lands are not available, lease agreements with all parties having an ownership interest should clearly prescribe all conditions, testing, closeout procedures, timetables, and provisions for temporary waivers regarding normal site use.

One procedure to estimate the required size of a required DMS(s) is based on that developed by the USACE, and is fairly simple. The input for the calculation is as follows:

DE = Debris Estimate in cubic yards.
PH = Average height of debris pile. This is usually about 15 feet, or 5 yards.
SY = Square yards in an acre, or 4,840.
VA (volume of debris per acre) = (SY)(PH). Multiplying the height of the debris pile (in yards) by the square yards in an acre provides the volume per acre of debris.
OA (Operational Areas) Factor = 1.66. This is a factor used to increase the required area to account for roads, safety buffers, burn pits, household hazardous waste areas, equipment maintenance areas, temporary structures, etc.

Example:

Input:

Debris Estimate (DE) = 2,000,000 CY.
Average height of debris pile on site (PH) = 15 feet, or 5 yards.

Calculation:

Volume of debris per acre, or VA = (4,480)(PH), or (4,480)(5) = 24,200 cubic yards per acre.
Area required for debris only = DE/VA, or 2,000,000 CY divided by 24,200 CY/Acre = 82.6 acres.
Total estimated area required = (82.6 acres)(OA factor), or (82.6)(1.66) = 137 acres.

In a situation where insufficient acreage exists at a single site, multiple sites may be required. Normally, a 100-acre storage site can be cycled every 45 to 60 days or once during a recovery period. That means 137/2, or two 69-acre sites could be used.

The number of sites varies with size available, distance from sources, speed of reduction, and removal urgency.

Where Should Sites Be Located?

In addition to considering the size, topography, and ownership of the land that will be needed to temporarily stage and process debris, the location of this land in relationship to the location of both the debris and the residents and businesses in the community is an important consideration. Ideally, a DMS should be close to the location of disaster debris to minimize hauling distances. To meet local, state, and federal environmental ordinances, the land should be located away from floodplains and wetlands. It also should be located away from potable water wells, areas of high groundwater levels, rivers, lakes, and streams. The site should be selected so that debris processing operations do not pose a public nuisance or public health and safety threat. For example, the potential impacts from noise, odor, dust, traffic, and pre-existing conditions are essential to consider in the process of identifying debris storage sites. The use of sites in residential neighborhoods or near schools, hospitals, churches, historic districts, archaeological sites, or other sensitive areas could adversely impact the people who live and work in the vicinity of the site, and debris operations at those locations might cause noise and environmental nuisances.

Debris processing operations require certain infrastructure, the availability of which should be considered during the site selection process. Electricity and water need to be readily available at the DMS to facilitate operations; however, in large-scale disasters in which electricity and water supply are adversely affected, generators and potable water trucks have been used. Potential staging sites also should have ease of access for entry and exit without significantly impeding normal traffic flow adjacent to the site. Removing debris to the temporary staging site is meant to facilitate faster recovery of the community and should not burden any one part of that community by increasing the debris impacts on that sector.

When Does Site Selection Occur?

Pre-Disaster Site Selection. Ideally, sites should be pre-identified during the debris management planning process, and emphasis should be placed on this endeavor. Undertaking site selection during "peace time" allows sufficient time for many options to be evaluated to ensure that the site meets all applicable laws and ordinances that govern this type of land use. Development of a comprehensive checklist to ensure compliance with requirements of all applicable agencies should significantly reduce the time to complete site selection prior to an event. By pre-identifying

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sites, jurisdictions can apply for permits during the response phase of debris operations so that sites can be open at the onset of removal operations, facilitating a faster recovery.

Post-Disaster Site Selection. If sites are not pre-identified prior to a disaster, but the debris manager determines that a staging site will be needed to facilitate debris operations, site selection should begin while preliminary damage assessments are ongoing to minimize delays to removal operations.

During Site Operations. Once sites are selected, they will be operated throughout the recovery phase of the debris operation, and generally will remain open until removal and disposal operations are complete. In some instances, debris reduction operations might continue on a 24-hour basis for a period of time. Closure occurs after all debris has been removed from the DMS, required tests have been completed on the site, and the site has been inspected by all required individuals, departments, and agencies.

Who Selects DMSs?

The debris manager will estimate the size(s) of the site(s) that will be needed and coordinate with land-use officials, other agency leads, and possibly with local politicians to identify potential acceptable sites. If leases or MOUs are needed for acceptable sites that are not owned by the jurisdiction, legal counsel will be needed to negotiate the terms and conditions of the agreements.

When selected, acceptable sites need to be activated for use after a debris-generating disaster. Environmental officials will assist the jurisdiction in complying with local, state, and federal regulatory requirements. They also will advise on required baseline and closeout testing requirements as well as the review and approval of permits for the DMSs. The debris manager will coordinate with local utility providers and other relevant stakeholders to evaluate infrastructure needs and provide support.

How Does Site Selection Occur?

Selection of sites for debris management and processing can be broken down into three phases. These phases can be used for pre-disaster site selection or post-disaster site selection.

- Phase I—Determine if a DMS should be used. Ideally this decision should be made prior to a debris-generating event and included in the debris management plan.
  - Based on the debris estimates developed for planning (or the estimated volume of debris for an actual event), evaluate if the capacity of nearby landfills will accommodate the volume of debris that requires disposal.
  - If debris volume reduction will be completed, determine if it will be done at pickup locations or at a central processing location.
  - If debris will be segregated, determine if the process will take place at the pickup location and hauled directly to the disposal site, or if it will be segregated at a central processing location or hauled from one.
  - Use of DMSs can be more costly to the overall debris operation; however, if debris is segregated at the curbside and hauled directly to disposal locations, multiple removal crews and equipment will be required to make passes along each pickup route, which also could result in higher operations costs.
- Phase II—Identify acceptable parcels of land that could serve as DMSs. Like Phase I, this phase ideally should be completed prior to the occurrence of a debris-generating disaster.
  - If the debris management strategy determines that debris will be hauled to a temporary DMS, determine the size of the site(s) that will be needed based on debris type and volume

projections completed as part of the debris management plan (or observed during the preliminary damage assessment).
  - Use aerial imagery, maps, local knowledge, tax assessor records, and other available information to help identify potential locations. Group them according to ownership (e.g., publicly owned by identifying jurisdiction, publicly owned by neighboring jurisdiction, privately owned).
  - Rank and prioritize the publicly-owned sites according to how well they match the desired-DMS criteria (e.g., large area, open space, access routes, infrastructure). Investigate any historical or archaeological significance of the highest-ranked sites, ensuring that the sum total of the areas of the sites to be investigated will meet the identified space needs. Determine the permits that would be required for operations, and either obtain such permits, or compile the necessary information to expedite permit requests. Discuss permitting with the appropriate agencies to determine how they can be expedited following a disaster.
  - If sufficient publicly-owned space cannot be found within local boundaries, consider regional resources and establish MOUs or MOAs with the owner jurisdictions for use of the identified locations.
  - If regional resources are not available, evaluate the option to lease private land. For private leases, the agreement should cover all of the time that the jurisdiction will be using the site, from baseline environmental studies to releasing the land back to the owner. Leases should stipulate a specific amount of time with an option to extend if debris processing activities have not concluded.
  - Conduct a site visit to the potential sites to evaluate and confirm existing conditions. Estimate the dimensions of the site, note physical features, and take photographs and video of the site and its surroundings.
  - Create preliminary site layouts (see Figure 9.1). Take into account entrances, exit routes, types of material expected at the site (e.g., woody debris, household hazardous waste, white goods, and household debris). These layouts can be adjusted prior to use after an event to suit the actual needs. Figures 9.2 through 9.4 show improper and proper layouts for sites.
- Phase III—Prepare and operate the site. These actions will be implemented after a debris-generating disaster occurs.
  - Re-document current conditions at any previously identified sites prior to active use as DMSs. Take soil and water samples as baseline environmental measures so that post-activity conditions can be compared to pre-activity conditions.

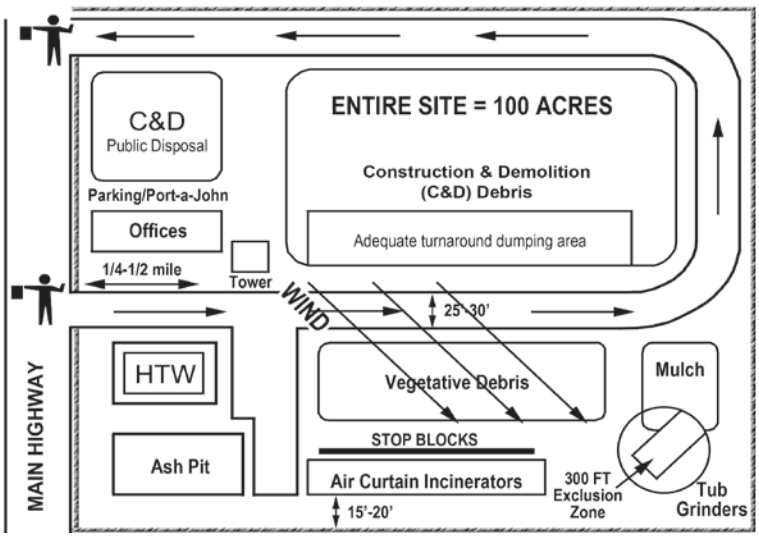

Figure 9.1. TDSR layout (HTW = hazardous/toxic waste). (Source: FEMA)

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Figure 9.2. Improper site layout. The size of this DMS was limited, resulting in "Mount Trashmore." (Source: FEMA)

Figure 9.3. Proper site layout. The size of this DMS was approximately 100 acres and shows separate areas for burning, grinding, and recycling. (Source: FEMA)

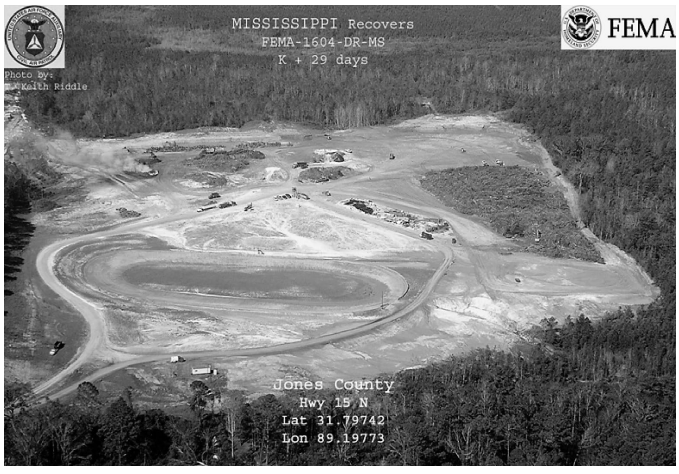

Figure 9.4. Well-organized DMS. (Source: Civil Air Patrol for FEMA)

- Obtain the proper permits to operate the site if this was not completed as part of the debris management planning process. For permits that were obtained, ensure they are still valid. These could include:
  - Waste processing and recycling operations permit.
  - Temporary land-use permits.
  - Land-use variances.
  - Traffic circulation strategies.
  - Air quality permits.
  - Water quality permits.
  - Coastal commission land-use permits.
  - Household hazardous waste permits.
  - Fire department permits.
- Ensure that proper safety measures are taken at the site.
  - Develop a written safety plan for site operations prior to beginning any work at the site. A generic safety plan, or at a minimum, generic safety requirements and checklist, can be developed as part of the debris management plan. If a contract will be awarded for operation of the site, a detailed safety plan should be required from the selected contractor before operations begin.
  - The site should be fenced to control access of unauthorized personnel after hours of operation.
  - Signs should be located at the entrance of the site to indicate hours of operation and materials accepted.
  - Safety monitors at the site should indicate the entry and exit points for truck removal contractors and residents.
  - Employ traffic control personnel if necessary to direct traffic near the site entrance and exit.
  - If possible, every site should have active fire protection devices such as fire extinguishers, fire hydrants, and water connections. If not, measures should be taken to provide fire protection, including water trucks with hoses and spray bars provided by the contractor.
- Properly prepare the site by carefully clearing and grading to promote proper drainage and minimize erosion. Sediment control devices such as silt fences, sand bag barriers, or storm drain inlet protection should be erected to control erosion and prevent discharge of contaminated water into a nearby stream, river, lake, or other body of water.
- Within the site itself, buffer zones should be established and maintained between usage areas at the site. Containment berms should be constructed, and holding areas for ash, household hazardous waste, and fuels also should be created.
- During operations, monitor groundwater, surface water, air quality, ash, and soil. Require immediate documentation and cleanup of any fuel or hydraulic fluid spills. Such spills should be immediately reported if they exceed a previously determined size.
- Keep the flow of debris moving to facilitate removal and disposal operations. The relative locations of reduction operations (e.g., incinerators, tub grinders) should maximize efficiency while adhering to the written safety plan.
- Provide suitable monitoring stations for debris site monitors (additional discussion is available in Chapter 10, Monitoring).
- When debris operations are complete and all debris has been removed from the DMS, the site should be cleaned, final environmental sampling completed, the site restored, and, if the site is owned by another organization or jurisdiction, a release obtained from the property owner, and legal agreements terminated.

Example: Site Selection (From interviews with Woodson Booth, Emergency Management Officer, Cumberland County, NC, and Fire Chief Ben Major, Fayetteville, NC, April 2013)

On April 16, 2011, the City of Fayetteville, NC, was struck by an EF-2 tornado that touched down at the western border of the city and traveled on a northeasterly path. After the tornado

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struck, the city determined that it would use a DMS to process debris, but it had not pre-identified or permitted any sites for this use. Because the local elementary school was partially destroyed by the tornado, it was not going to be in use as a school in the immediate future. Therefore, the grassy fields adjacent to the school playground were identified for use as a DMS. The city entered into a verbal agreement with the school system to use the land. Working with Cumberland County, North Carolina's Emergency Management officials, the city coordinated with the North Carolina Department of Natural Resources to obtain permits to operate the DMS at the school site. Because of their inexperience with large debris disasters and the requirements to obtain DMS permits, the city experienced some initial delays in debris operations, but through additional coordination with the county and the state, overall operations proceeded smoothly with only some minor repairs to damaged playground equipment being required at the end of the operation.

The Cumberland County emergency management officer who coordinated with the city on their debris management site selection and operation, advocates for identifying potential DMSs pre-disaster and establishing an MOA or contract with the landowner for their use. Furthermore, this written agreement should be reviewed and updated annually to reflect any changes in ownership of the land. Finally, the state agency with the authority to issue permits should approve the site as a potential DMS prior to its use.

CHAPTER 10

Monitoring

Synopsis of Issue

A major component of managing debris is the monitoring of debris. Monitoring ensures oversight of health and safety concerns in the field, eligibility (i.e., general compliance with debris removal policies), tracking debris volumes, and successful overall debris operations (validating certifications, efficiencies, and documentation requirements). Effective monitoring helps minimize eligibility and reimbursement issues both during and after the debris removal operations.

While PA eligibility may not be a priority, debris removal eligibility in compliance with the appropriate policies is paramount. All monitors should know and understand current policies for all removal operations, including all local, state, or federal regulations that govern the debris activities.

Those responsible for debris management should understand the policies regarding the removal of the various types of debris likely to be encountered during operations: vegetative; C&D; hazardous waste; household hazardous waste; electronic waste; white goods; soil, mud, and sand; vehicles and vessels; putrescent debris; infectious waste; and chemical, biological, radiological, and nuclear (CBRN) contaminated debris.

Target Audience

- Debris removal monitors.
- Debris managers.
- Debris supervisors.
- Solid waste personnel.
- Debris removal personnel.
- Debris removal contractors.

What Is Debris Monitoring?

Debris monitoring is a proactive means of observing the removal of event-generated debris in the field, ensuring that all debris is "eligible" according to current policies, and that operations are safe, efficient, and documented. Effective debris monitoring is necessary for normal supervision and oversight of the debris removal contractor's activities, regardless of whether the work follows local, state, or federal regulations. Correct debris monitoring operations require comprehensive observation and documentation of work performed from the point of debris collection to final disposal, and involves constant oversight of crews to ensure that workers are performing debris removal in accordance with all applicable federal, state, and local regulations. Failure to properly monitor debris removal operations may jeopardize a jurisdiction's eligibility to claim federal

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reimbursement, if that option is available. Most importantly, debris operations that are sufficiently staffed with trained monitors generally have fewer issues with questionable debris operations.

Types of Debris Monitors

Debris monitors ensure that all applicable debris removal policies are followed by the removal contractors and other field personnel. Current debris management policies may be modified for each debris-generating event as deemed necessary by authorized individuals. Debris monitors are responsible for understanding current policies and regulations.

Debris monitoring should be conducted at the loading, staging, and disposal sites of the operations. While the same policies govern the work performed at all three locations, what the debris monitors accomplish at each is slightly different.

Loading Site

Monitors oversee removal operations at the debris loading site (i.e., right-of-way), ensuring that the debris is eligible according to current policies and that handled debris is not a health and safety concern for the carrying contractors. The loading site monitor's primary responsibility is to ensure that only eligible debris is collected for processing. For a comprehensive list of field monitor duties, please see the job aids in the appendices of this handbook.

At the loading site, monitors document each load of debris, usually using load tickets. The load ticket is one of the primary documentation items used during debris operations. It is essential that these documents be filled out completely and accurately by the monitor and removal contractor. It is imperative to document both the amount of debris collected and the loading capacity of the vehicle hauling the debris (see Figure 10.1). Trucks carrying quantities below their full capacities will have their estimated haul volume adjusted down based on visual inspection by the debris monitor, who will verify the quantity and type of debris contained in the bed of the truck from an inspection tower. The most commonly used unit for measuring debris volume is CY, but occasionally, and in specific instances, measurements may be in tons. (When the measurement is in tons, a debris monitor is stationed at the scales used to weigh the loaded trucks.)

Load tickets not only document the type and quantity of debris collected in each load, they also identify where the load site is located and where the debris was removed. An accurate record

Figure 10.1. Trailer being measured by prime contractor and city monitor. (Source: FEMA)

of debris load locations is important because some eligibility restrictions are based on the location where the debris is originally collected. It is important to separate debris collection efforts from public property and private property, as some programs do not reimburse for any debris from private property deposited in the public right-of-way, and FEMA generally does not reimburse contractors for removing debris on private property. The location of any staging area and final disposal site should also be documented.

Perhaps one of the most critical pieces of information contained on the load ticket is the type of debris being hauled. Part of the debris monitor's job is to help ensure that the various types of debris (e.g., vegetative, C&D, and hazardous waste) are not mixed, or hauled, in the same load. FEMA 327, *Public Assistance Debris Monitoring Guide*, contains an inclusive list of the types of debris likely to be handled, as previously discussed in Chapter 8.

Staging and Disposal Site

Debris monitors also participate in the estimating of debris quantities at the staging centers and final disposal centers. Staging centers are locations at which the debris is often segregated and stored temporarily until transport to the final disposal sites. Vegetative debris is often ground into mulch at the staging sites by the staging site contractor; however, debris segregation can occur at both locations.

Debris monitors generally observe truck loads of debris from a "tower." These towers are often makeshift towers consisting of a high-lift or constructed wooden structure, elevated in the air to view the contents of a truck bed (see Figures 10.2 through 10.6). Observing each load ensures that the trucks are accurately credited for the load hauled, and that the trucks are not artificially loaded (e.g., wetted or fluffed).

Why Is Debris Monitoring Important?

Debris monitoring is important for mainly two reasons: to prepare documentation on behalf of the debris monitor's organization (load tickets), and to supervise the work of hired contractors. The duties of a debris monitor are similar to construction inspecting, which ensures construction activities are done in accordance with contracts and plans.

Figure 10.2. High-lift inspection tower. (Source: FEMA)

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Figure 10.3. Wooden structure inspection tower. (Source: FEMA)

Figure 10.4. Unsafe scissor lift inspection tower. (Source: FEMA)

Figure 10.5. Acceptable tower monitoring station. Scissor lift with terrain tires. (Source: FEMA)

Figure 10.6. Inspection tower at landfill. Debris monitors on site, making capacity calls. (Source: FEMA)

Accurate documentation of debris removal and disposal operations and eligible associated costs is the outcome of a good debris monitoring program. This documentation serves as the basis for the grant applications that authorize reimbursements from federal agencies, if such reimbursement is being sought by the organization. The same documentation would be used to authorize payments to the debris contractors, even if reimbursement is not being sought. Failure to properly document eligible work and costs may jeopardize grant funding. Debris monitoring serves to document eligibility issues that may complicate the reimbursement phase.

If the organization or jurisdiction has contracted for any component of the debris operation, debris monitoring is important to verify that the work completed is within the contract scope of work.

Who Is Qualified to Be a Debris Monitor?

Immediately after a disaster, monitoring activities are likely to be conducted by local agencies' force account labor until monitoring contracts can be activated (if desired or necessary). If local resources are completely overwhelmed immediately after a disaster, the state may be able to provide some additional support on a short-term basis (e.g., state employees, National Guard) until other resources can be obtained. Supplemental resources might also be available through the Emergency Management Assistance Compact (EMAC).

Personnel who serve as debris monitors need to be trained in the requirements of the various debris programs, as well as in how to measure and estimate debris volume. They should be familiar with the local debris management plan and have an understanding of the scopes of work for debris removal contractors. If contractors are used for long-term monitoring assignments, having pre-event debris monitoring contracts in place can expedite deployment to the field and ensure complete documentation of removal operations.

Depending on the organization or jurisdiction's needs and preferences for long-term monitoring, the debris management operation can be staffed using force account labor and/or contracted labor. Contracting should follow applicable procurement requirements such as the Stafford Act, legislation that established guidelines for the government's response to

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disasters. The following key features can help the applicant choose which option is more beneficial to them:

1. Contracted Labor:
   - Contractor assumes all training requirements.
   - Employees serving in a force account labor capacity can resume normal daily functions.
   - Regular and overtime labor hours are reimbursable.
2. Force Account Labor:
   - Employees serving in a force account labor capacity are more familiar with neighboring conditions.
   - After the necessary training, force account labor will be better prepared for future events.
   - Trained construction inspectors are ideal for this assignment, making the process a bit smoother because of their experience in such work.
   - Force account labor hours spent performing disaster-related work should always be tracked separately from labor hours spent doing other work in case federal grant programs permit reimbursement for disaster-related work performed by force account labor.
3. Staff Augmentation/Local Hire:
   - Jurisdictions and other organizations need to have a just-in-time training program set up for training monitors. The program should include a handbook that each monitor can use as a reference.
   - A strong supervisor presence is required for this particular labor (supervisor needs to be a force account person).

Regardless of the source of debris monitors, the importance of their task must be explained before their deployment. Procedures must be explained and understood, and the monitors should have a contact number to call for explanations, answers to questions, and to report issues.

How Is Debris Monitoring Accomplished?

Establishing a thoroughly researched and well-developed debris management plan builds the framework for organized, efficient debris monitoring operations. The debris management plan usually identifies debris operation zones, estimated quantities of debris to be generated by a design event, or events, and DMSs. This information can be used to evaluate the approximate number of monitors that are required for each zone during a prescribed event. Identifying the number of monitors that could be needed allows a jurisdiction to train its employees and/or contract for monitors in advance, so that when an event occurs, operations can begin immediately.

After a debris-generating disaster occurs and debris estimates are developed or refined, the number of monitors that are required for each operational area and site can be determined. Based on the number of required personnel, the jurisdiction can determine if monitoring can be accomplished using in-house resources, contractor personnel, or a combination of both. Personnel can be identified and assigned to roles and operational areas.

Several different types of monitors are assigned to the debris operation, including load site monitors, roving monitors, tower monitors, and field supervisors. Load site monitors observe and document debris removal at the pickup points to ensure compliance with program and contract specifications. They may be assigned to monitor debris removal operations at more than one load point, depending on the provisions of the debris operations plan. Roving monitors can be used in addition to or in lieu of load site monitors, depending on the need. Roving monitors help with contract management by ensuring that the debris management plan, contract, and safety requirements are being met. If they observe non-compliant actions, they should report them to the appropriate manager, either the field manager or the debris manager, depending on

the provisions of the debris management plan. Tower monitors observe and record debris types and volumes as they enter debris management or disposal sites. They also observe unloading at the site to ensure that debris is deposited in the correct location(s) within the site. Field supervisors review and update the operational plan and coordinate scheduling of load site and tower monitors to ensure a sufficient number of personnel are monitoring the removal operations. They also coordinate with federal and state agency personnel, compile and submit daily reports on progress, and help resolve issues that arise in the field.

Sometimes, debris removal contractors will set up a private agreement with homeowners to remove their debris. If this is the case, the debris monitor must ensure that this debris is not moved to the right-of-way or curbside for debris removal. The debris removed by the contractor through a private agreement with the homeowner must be directly taken to the municipal landfill, and in most instances, the contractor should use trucks specifically for contract operations, with the origin of the load clearly marked on the load ticket for the disposal site. In some instances, contractors have used separately marked trucks to haul debris for private homeowners. A debris management plan should incorporate a requirement that trucks hauling debris under a private agreement must have such vehicles clearly marked with appropriate signage.

Example:

After Hurricane Ivan, the debris removal contractors in Pensacola, FL, were allowed to enter private property to remove hazardous leaning trees and stumps. Debris monitors first accompanied the local debris manager to obtain signed waivers from homeowners acknowledging their approval for contractors to remove stumps and hazardous trees from the homeowner's property. The monitor and debris manager together identified, measured, and marked the eligible trees for contractors to remove.

Recommended Tools for Debris Removal Operations

FEMA 325, Debris Management Guide (*25*) suggests the use of all three of the following tools to document debris removal operations. While these tools historically have been paper copies with duplicates, electronic tools have been created and may be available to expedite data management. Sample debris monitoring tools can also be found in Appendix H.

1. Debris Monitor Reports

   As emphasized throughout this guide, documentation is the most important aspect of debris monitoring. Preparing a debris monitoring report will provide consistency to all records, regardless of who performs the work or from which grant program reimbursement is sought. Jurisdictions or organizations conducting debris removal operations are encouraged to develop, and have available, a debris monitoring report format that captures the required information when seeking reimbursement, including:
   - Location(s) of debris pickup and disposal,
   - Actual labor hours worked,
   - Actual equipment hours operated, and
   - Type and specification of equipment used.

   Reports that can be completed electronically in a spreadsheet or database format can be used to easily tabulate data for reimbursement requests.
2. Truck Certification List

   A truck certification list provides a standardized manner of identifying trucks in use and their hauling capacities. This information is important since debris, specifically vegetative debris, is often hauled and billed by volume. A comprehensive truck certification list should include:
   - Size of hauling bed in CY;
   - License plate number;

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- Truck identification number assigned by the owner;
- Short physical description of the truck; and
- A number painted on each truck of a size easily read by debris monitors. This can be the same as the truck identification assigned by the owner; however, it must be painted on the truck.

A computerized bar code system can be used to associate identifying information with a bar code assigned to each truck. The codes are scanned as the truck enters and leaves the DMS or landfill.

3. Load Ticket System

A load ticket serves as the primary debris tracking document and is used to document the volume of debris in each truck and the hauling distance per trip. If the managing organization or jurisdiction uses a contract hauler, the load ticket is often used for billing purposes. Traditionally, load tickets have been carbon paper tickets with at least four identical copies generated for one load of debris. More advanced, electronic tracking tools for use with cell phones, tablets, and laptop computers have been developed and used in the field to reduce human error and facilitate data gathering and management. FEMA PA Publication 325 says the following about the preferred load ticket system:

Historically, debris monitoring operations have used the four-part paper load ticket system. Depending on the size of the event, the manual process of filling out load tickets, transferring copies, and entering data for reporting and data compilation purposes can be very labor and time intensive, and can result in significant levels of human error. Recent advances in automated debris management tracking systems have provided real-time and automated tracking and reporting. Electronic load tickets, computer tablets, and systems employing electronic contractor ID cards allow for instant data tracking, verification, and reporting. Some systems also incorporate truck tracking systems, GPS capability, and enhanced analytical capabilities of debris monitoring data. Other technologies are in development and testing to improve the accuracy of developing debris load estimates.

Applicants should review the alternative procedures available, and make sure that all individuals involved in the debris operations are familiar with the process. In particular, the monitors must be well-trained and knowledgeable to minimize any errors and downtime.

Debris Monitor Job Aids

Debris monitoring requires individuals who are trained in debris operations to observe and document the actions taken to remove disaster-generated debris from eligible areas. In general, there are three overarching functions or roles of debris monitors: field monitoring/roving monitors, site/tower monitoring, and field supervisor. The section below includes a job aid for the three types of monitors.

Regardless of the monitor's role, each individual should bring the following items with them into the field:

- Hard hat,
- Reflective vest,
- Safety glasses,
- Hearing protection,
- Cell phone (fully charged),
- Digital camera/video,
- Protective shoes,
- Long pants,
- Hot, cold, and/or wet weather gear, and
- Sunscreen and supply of bottled water.

Summary of Duties (FEMA 325) (*25*)

Field Monitors/Roving Monitors:
Monitor collection activities at load sites:
Measure and certify (and recertify) truck capacities, which include: • Valid driver's license of truck operator. • Valid truck registration and insurance. • Volumetric capacity of the inside of the loading container. • Calculated deductions of volumetric capacity for dog boxes, round container bottoms, and other volumetric capacity reductions. • Brief physical description of the truck. • Photographs of the truck, container, and driver.
Ensure that debris is segregated at the curbside. Vegetative must be separate from C&D.
Ensure that hazardous waste is not mixed in with other waste types.
Ensure that only eligible debris (according to current policy) is being loaded into the truck; raise questions/issues with a supervisor if it appears that debris outside the contract scope of work is being loaded.
Ensure that trucks are not artificially loaded (e.g., wetted or fluffed).
Observe methods for loading trucks (e.g., mechanical vs. hand loading).
Record equipment used for loading and times of use.
Check the area for safety considerations (e.g., downed power lines, traffic control needs).
Check areas in and around debris piles to identify buried items such as fire hydrants and mailboxes, and help prevent damage from loading equipment.
Record and report any damages caused to streets, curbs, utility meters, mailboxes, and other public property as a result of debris removal operations.
Validate hazardous trees, including leaners, hangers, and stumps. Reference current policy with regards to hanger and stump measurements. Record the following: • Date, • GPS location, • Physical address, and • Time that the work was performed.
Issue field load tickets, documenting: • Debris classification, • Debris load call/volume estimation, • Truck unloading time and date, and • Photographs of loads before and after unloading.
Verify loads are properly contained before leaving the loading area (e.g., tailgates are secured, loads are covered if required).
Ensure compliance with contract scope of work.
Report to supervisor if work is not accomplished in accordance with local, state, and federal ordinances and regulations.
Ensure work area is clear of debris as specified in the contract before moving to a new loading area.
Maintain a log of the number of load tickets issued during the shift, the starting and ending load ticket numbers, problems encountered, and locations where debris was to be delivered.
Ensure that any numbered load tickets that contained an error that was detected is clearly explained.

(continued on next page)

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Field Monitors/Roving Monitors:
Monitor collection activities within debris zones:
Ensure that only eligible debris is being picked up.
Ensure that debris from private property has been moved to the curbside by the property owner and not a removal contractor.
Obtain a written consent form with a wet signature by the property owner before stepping onto private property and/or removing debris from private property.
Support recorded observations with digital photography.
Make multiple visits to each load site daily.
Report any malpractice to field supervisor IMMEDIATELY.

Site/Tower Monitors:
Complete load tickets at debris management and/or disposal sites.
Estimate the volumes of debris that have been transported.
Ensure that trucks are fully offloaded before leaving the debris management/disposal site.
Maintain a log containing the truck numbers and volume of debris hauled, total amount of debris delivered during the shift, and problems encountered.

Field Supervisors:
Manage the debris monitoring operation.
Schedule and deploy debris monitors to the necessary sites.
Oversee daily activities of debris monitors.
Have thorough understanding of the reimbursement program.
Resolve field eligibility and safety issues, and communicate these issues to the applicant.
Collect daily logs from the debris monitors and tabulate truck load data for the daily report.

CHAPTER 11

Reduction and Disposal

Synopsis of Issues

Disposing of disaster debris can pose a challenge to communities. Not only can it be costly, but landfill space is becoming increasingly limited, requiring communities to make alternate plans to dispose of their disaster debris. Certain types of debris are regulated and must be processed, transported, and disposed of in accordance with local, state, and federal requirements, which could require disposal in specially permitted facilities.

To address the issue of limited landfill space as well as cost considerations, some communities employ reduction and recycling methods during debris operations. Volume reduction methods can substantially decrease the volume requirements for landfilling debris. Recycling limits the amount of landfill space required for debris disposal, is environmentally conscious, and can also return revenues to the jurisdiction that is doing the recycling.

Target Audience

- Debris managers,
- Local officials,
- Environmental officials,
- Debris supervisors,
- Landfill owners/operators,
- Debris monitors, and
- Solid waste officials.

Why Are Debris Reduction and Disposal Important?

Debris disposal involves the volumetric reduction and final disposition of disaster-generated debris. Disposal must be accomplished in accordance with all local, state, and federal environmental and health regulations, which can require special handling for different types of debris. Though historically disposal often occurred at landfills, the decreasing availability of space at these facilities is causing jurisdictions to evaluate other options. There are three methods of reduction to consider: chipping and grinding, incineration, and recycling—any of which can be used during operations.

Disasters can generate thousands to millions CY of waste, and any debris in public areas that is not removed and properly disposed of may pose a public health and safety threat (see Figure 11.1

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Figure 11.1. Vegetative debris can be a significant portion of the overall debris generated by many types of disasters. (Source: FEMA)

and 11.2). It is critical that local jurisdictions consider options for reduction and final disposal of disaster-generated debris during the planning phase. This ensures that sufficient space exists in landfills, opportunities are identified for recycling, and all applicable local, state, and federal environmental, health, and transport regulations are addressed.

Reduction methods can greatly reduce the volume of landfill space required for disposal. As the amount of available landfill space decreases nationwide, recycling is becoming a prevalent part of disposal operations. In fact, some local and state governments have set ambitious policy goals and passed laws for solid waste diversion and recycling. Recycling can produce beneficial financial impacts for disaster recovery operations by reducing the amount of waste taken to a landfill, thus reducing the tipping fees paid to the landfill operator. Additionally, some types of debris have market value that can help offset removal costs. Appendix I provides some additional information on debris reduction.

Figure 11.2. This pile of mixed debris at a DMS will be sorted for additional processing. (Source: FEMA)

Figure 11.3. Typical wood chipper. (Source: FEMA)

What Does Debris Reduction and Disposal Include?

Debris disposal generally occurs after segregation and can involve the volumetric reduction of some materials. It is the final resting place for disaster-generated debris, and also the final step in the field operations for debris management. The amount of reduction may depend, in part, on the amount of available landfill space (versus the cost to reduce the waste volume prior to disposition). Reduction methods include:

Chipping and Grinding

Typically, chipping and grinding is the preferred method used to reduce the volume of vegetative debris (see Figures 11.3 and 11.4). However, these methods may also be applied to certain types of rubber, concrete, and metals before they are sent to a recycling plant. Chipping and grinding generally reduce the volume of vegetative debris material by 75 percent (FEMA 325) (*25*), and the residual material may be used for other purposes, such as

Figure 11.4. Typical tub grinder. (Source: FEMA)

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agricultural mulch (but not landscaping mulch), industrial heating and processing, or as landfill cover material.

Several factors should be considered when determining if the chipping and grinding method should be used for reduction. The operations itself can be noisy, with large tractors and tub grinders performing much of the work. Thus, the equipment must be located properly on the site. Additionally:

- The minimum exclusion zone around the grinding equipment is 300 feet because of the potential for flying objects to be ejected from the machines during operation.
- Plastics, soil, and other contaminants must be removed prior to processing to minimize damage and wear and tear on the grinder or chipper.
- Chips or mulch should be stored in piles not exceeding 15 feet in height, unless local regulations or the debris management safety plan prescribe another allowable height.
- Mulch should be ground to the following dimensions: a maximum of 4 inches in length and 0.5 inch in diameter.

If chippers and grinders are used for reduction of vegetative debris, equipment should be operated and maintained in accordance with manufacturers' instructions. Buffer zones around the area of operation should be established to protect public health and safety.

Forklifts, cranes, backhoes and trackhoes, bulldozers, and other similar equipment will be required to place materials into chippers, grinders, and shredders, as well as incinerators, and to load dump trucks for transporting materials to final disposal sites. In the case of equipment fuel or hydraulic fluid spills or leakages, affected areas should be cleaned up quickly, and soils tested to be sure no contamination occurs. Some states require that the spill or leakage be reported and appropriate forms completed and submitted.

Recycling

Recycling is another option for reducing and disposing of debris. Recycling may be particularly applicable to C&D debris, which may include concrete and metals. Recycling plants and reusers of recycled materials often have specific requirements depending on the types of products being supplied (for example, regarding grinding, shredding, and size of material). If recycling is part of disposal operations, it is important to understand the market specifications for these materials. When handled properly and with forethought, recycling can not only reduce the amount of waste brought to landfills; but also provide an economic opportunity to recover a portion of the costs of debris operations. It also can help lower overall debris operations costs by lowering transportation fees and tipping fees and reducing the amount of tracking and monitoring needed for debris operations. Specialty contractors may bid on well-sorted C&D debris. In addition to C&D materials, relatively clean soil may also be recycled; it may be mixed with ash or mulch and reused for agricultural purposes. Other recycling processes include (but are not limited to):

- Metals (including white goods)—separated by ferrous/non-ferrous using an electromagnet (see Figure 11.5).
- Soil—agricultural, must analyze for contaminants before use.
- Construction materials—use directly or reduce for use as aggregate.
- Wood—clean vegetative debris—mulch, fuel, or landfill cover (as previously discussed).
- Sand—Depending on the cleanliness of sand and any specifications, may be reused.

Many states and cities have facilities in the area that recycle a wide range of materials. During development of the debris management plan, recycling possibilities should be carefully researched. Appendix J provides additional information on reuse and recycling methods.

Figure 11.5. Metal maulers can be used in the metals recycling process. (Source: FEMA)

Incineration

A common method used to reduce the volume of vegetative debris is incineration. Burning can result in volumetric reduction of up to 95 percent, and the ash sometimes can be recycled as a soil additive. The incineration process requires a minimum of three steps:

1. Unloading the debris,
2. Moving the debris into an incinerator, and
3. Removing the ash from the incinerator to final disposition. Final disposition may be an appropriately constructed area at the DMS or a landfill. Prior to final disposition, ash should be tested in accordance with federal, state, or local requirements.

Incineration methods available for vegetative volume reduction include:

- Air Curtain Pit Incineration—Vegetative debris is burned in a pit constructed by digging below grade or building above grade and using a specific type of blower (see Figure 11.6). The

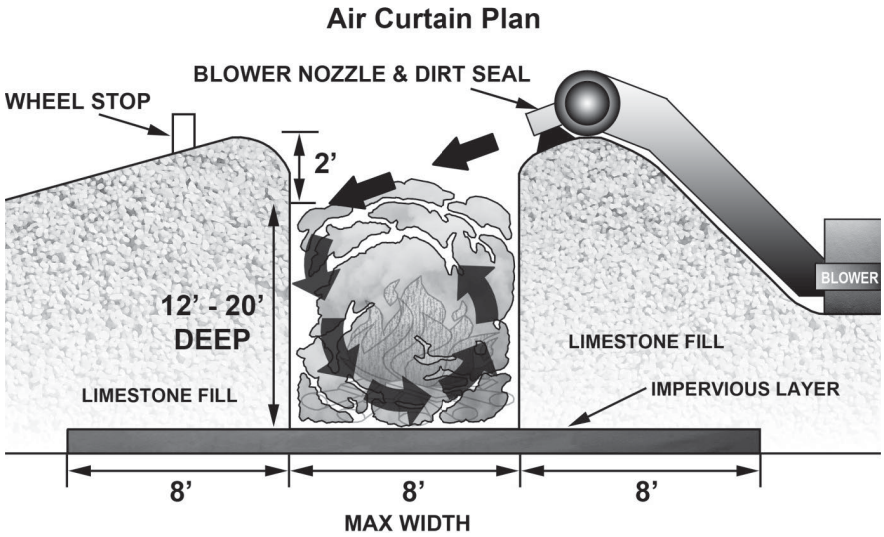

Figure 11.6. Cross-section of an above-the-ground air curtain pit burner. (Source: FEMA)

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pit and blower constitute an engineered system that must work together precisely. As there are no industry standards for design, knowledgeable personnel who are experienced with air curtain pit design and operations should oversee this process. This is extremely important, as the design and construction must be properly completed to ensure efficient operations.

When constructed and operated properly, air curtain pit burners can effectively reduce the volume of vegetative debris by as much as 90 percent (FEMA 325) (*25*) without having an adverse impact on the environment. However, there are some things to consider:

- The pit is typically 8 feet to 9 feet wide and 9 feet to 14 feet deep: length varies based on site size, environmental permitting, and labor and equipment limitations.
- An impervious clay layer at the bottom of the pit should be at least 1 foot thick.
- The ends of the pit are sealed to a height of 4 feet.
- Nozzle ends should be sealed with 1 foot of soil.
- Warning stops are at least 1 foot high.
- Nozzles should be placed on one side of the pit, aimed so the primary air flow hits the opposite side of the pit two feet below the top. This causes the air to circulate down into the pit, causing more complete and efficient burning of the vegetative debris. The air curtain at the top of the pit forms a barrier to keep particulate matter in the pit for additional burning, finally forming ash.
- The blower nozzle should run the complete length of the pit (see Figure 11.7).
- There should be a minimum 100-foot setback between debris piles and the incineration area.
- There should be a minimum safety distance of at least 1,000 feet between an incineration area and the nearest building.
- To prevent explosions, hazardous or contaminated flammable materials should not be placed in the pit.
- All fires should be extinguished 2 hours before ash is removed.
- The ash should be removed before it reaches 2 feet below the lip of the incineration pit.
- Air monitoring devices may be required to ensure particulate matter is adequately contained.

Figure 11.7. Open-air incineration pit. Note nozzles on left side. (Source: FEMA)

Figure 11.8. Portable air curtain incinerator. (Source: FEMA)

- Portable Air Curtain Incineration—This uses the same methods as the air curtain pit incineration, but portable incinerators use a pre-manufactured pit rather than one that is dug or built on site (see Figure 11.8). They are usually more limited in size than the open pit. The primary advantage of a portable unit is that unlike an air curtain pit burner, it is not subject to erosion. This is a good option for sites with high-water tables (where digging a pit is not feasible or desirable).
- Controlled Open-Air Incineration—Vegetative debris is carefully burned in a contained, fixed area. This method generally has little adverse environmental impact and is cost-effective.
- Uncontrolled Open-Air Incineration—Debris is burned without controlling the amount or speed at which the incineration takes place. This method allows debris volume to be reduced quickly. However, this method may not meet environmental regulations and therefore is generally regarded as the least desirable method of burning. If open-air incineration must be used, it is recommended that air quality be monitored to ensure that there are not adverse impacts to the surrounding community and environment.

Conversion Technologies

In some locales burn permits are increasingly difficult to obtain, landfill space is extremely limited, and recycling by itself is not sufficient to meet solid waste management goals set by governing authorities. Under these circumstances, some jurisdictions are exploring conversion technologies. "Conversion technologies" refer to a wide variety of technologies that can convert post-recyclable or residual solid waste into useful products, green fuels, and renewable energy through noncombustion thermal, chemical, or biological processes (*31*). The use of these technologies in addition to recycling has the potential to significantly reduce the amount of solid waste sent to landfills.

Final Disposal

When determining the location and method of the final disposition of the debris, it is important to determine the "final" state of the debris: will it be left whole, reduced, or recycled? Debris left whole may be better suited for the jurisdiction's landfill, or sold for sale to private buyers. Reduced debris could also be disposed of at the landfill, or perhaps used as landfill cover. Reduced debris may also be of interest to private buyers as well. If the jurisdiction's landfill is overburdened, an agreement with a neighboring jurisdiction may be appropriate for final debris disposition.

If an agreement with a neighboring jurisdiction is the option of choice, it is vitally important to understand the landfill rules and regulations, such as tipping fee cost structure. This cost structure may include operating and maintenance costs, permitting fees, capital improvement

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costs, and taxes. The capital improvement costs may be directly related to the landfill itself or may be for projects within the county, and may not be eligible for reimbursement. Sometimes fees may be waived for neighboring jurisdictions.

Where and When Does Debris Reduction/Disposal Take Place?

Where debris disposal takes place in relation to other debris operations components can depend on the steps identified in the debris management plan. If the amount of debris is caused by a relatively small disaster, the plan may require segregation at the curbside rather than hauling to a DMS. Disposal (e.g., grinding and chipping) can then take place curbside as segregated debris would be picked up and then hauled to a landfill. If the plan calls for debris to be taken to a DMS, then disposal typically occurs after segregation. Materials that can be reduced or recycled are treated as they arrive on site. Materials that are not going to be reused, whether they have been reduced or not, are taken to a landfill when there is sufficient volume on-site to warrant trucking them off-site.

- Various Disposal Options and Considerations:
  - Landfills:
    - C&D materials include concrete; asphalt from roads and roofing shingles; metals; bricks; glass; plastics; wood from buildings, salvaged building components (e.g., doors, windows, and plumbing fixtures); gypsum; and trees, stumps, earth, and rock from clearing sites. C&D landfills are regulated by state and local governments and are devoted exclusively to C&D materials.
    - RCRA Subtitle C Landfill—This category of landfill can accept hazardous waste.
    - RCRA Subtitle D Landfill—These municipal and non-hazardous solid waste landfills can accept household hazardous waste exempted from Subtitle C regulations. This category also includes garbage; non-recycled household appliances, residue from incinerated automobile tires, scrap metal, wall board, empty containers, and sludge from industrial and municipal wastewater and water treatment plants and pollution control facilities.
  - Recycling:
    - Recycling centers.
    - Consider any additives to the materials that may make them illegal to recycle.
    - Mulch for agricultural purposes.
  - Fuel for energy recovery plants.
  - Composting—yard waste used as soil conditioner product or used in landfills in place of soil as alternative daily cover.

Who Is Involved in Debris Disposal?

There are potentially many parties involved in debris disposal operations:

Jurisdiction

The jurisdiction that "owns" the debris has overall responsibility for determining the debris management plan, which includes planning for disposal operations. This entity identifies target recycling and reuse rates, methods of reduction to be used (if any), and final disposal sites (landfills). They are responsible for obtaining the proper permits, overseeing contractor performance, and ensuring that proper documentation of operations is maintained. The particular agency having responsibility will vary with each jurisdiction, but typically the department of public works or solid waste is designated as having primary responsibility.

Department of Environmental Quality (DEQ)

The state environmental agency is responsible for issuing permits for reduction activities, particularly incineration. A DEQ also issues approval to use ash from burning operations as a soil or other additive, and oversees handling and disposal of hazardous materials and household hazardous waste.

Department of Transportation

The involvement of the DOT varies with the type of disaster and the needs. If FHWA is providing funding for eligible work, the DOT usually will be the agency that coordinates that work. If FHWA is not involved, the DOT still may be involved. In some disasters, DOT resources may be temporarily reassigned to the disaster area to provide immediate assistance. The agency ensures that trucks used to transport debris meet state requirements, and that debris is transported according to regulations. In many instances, the ability of transportation routes to support the weight of the loaded trucks may also be available from DOT.

Other State Agencies

- Agriculture—May be involved in disposing of agricultural wastes and pesticides. May also assist with disposal of animal carcasses.
- Forestry—May be involved in disposing of wastes such as termite-infested materials.
- Health—May be involved in evaluating disposal methods for animal carcasses, radiological wastes.
- Natural Resources—May assist with identifying recycling opportunities.
- Environmental Protection—May assist in permitting and monitoring plans.

Local Fire Department

Should be notified prior to commencing incineration operations.

Contractors

- Hauling contractors—May assist with expediting reduction by dumping segregated wastes at the appropriate locations within a DMS. Must comply with transportation and environmental regulations when hauling debris to a final disposal site. Working in accordance with the disaster management plan will expedite the operation.
- Debris monitors—Ensure that debris loads are deposited at the appropriate locations within a DMS. Oversee and assist with removing contaminants from debris to be chipped, ground, recycled, and reused. Ensure that debris being hauled to a landfill, either directly from curbside pickup or from a DMS, is disposed of properly.
- Specialty contractors—Bid on and haul recyclable materials to appropriate locations.

Landfill Operators

Identify available space, charge tipping fees, ensure final disposal is completed properly (in accordance with applicable regulations).

Other Jurisdictions

May enter into an agreement to provide facilities or technologies to assist with disposal operations. Identify what level of compensation and taxes, if any, will be paid by the entity being assisted.

Trucks hauling materials to disposal and recycling sites should comply with all local, state, and federal transportation regulations for transporting such wastes (e.g., bed liners, covers, permits, etc.).

CHAPTER 12

Reimbursement

Synopsis of Issue

Debris operations and monitoring can be costly. The impact of major or catastrophic emergencies can quickly exceed local financial resources. Several federal agencies have reimbursement programs in place to provide some compensation to eligible entities for specific categories of expenses in disaster recovery efforts. Much of the time, this compensation will be on a cost share basis. For example, FEMA may reimburse 75 percent of eligible disaster-related expenditures. Other agencies may have different cost sharing programs.

Target Audience

- Finance personnel.
- Debris managers.
- Debris monitors.
- Debris contractors.

What Does Reimbursement Involve?

After a disaster strikes, communities are left with debris that usually impedes transportation and emergency routes, posing a threat to public safety. Local governing entities are then forced to spend their community's funds on debris management activities. The affected communities often need the assistance of the state and federal governments to recover from the event.

Each federal agency that oversees reimbursement for debris removal has different eligibility requirements. Local and state agencies planning to seek reimbursement must be able to demonstrate that they are eligible to apply, that damage occurred to a qualifying facility, that the work performed is appropriate for reimbursement according to program requirements, and that the costs are reasonable. Generally, eligible work must also be completed within certain timeframes and, if a contractor is used to accomplish any or all of the work, the contracting methods used must conform to federal regulations. Additional information regarding contracting can be found in Chapter 5.

The reimbursement programs each require a grant application to be completed. The application format varies based on the program, but generally requires a description of the scope of work required, estimated or actual costs to complete the work, and documentation to substantiate the request.

Documentation is essential to the reimbursement process. An agency applying for a federal reimbursement grant must be able to substantiate labor, equipment, and contractor costs associated with performing eligible work. Depending on the parameters of the reimbursement program, labor costs might include regular and allowable overtime hours associated with performing eligible work, and hourly rates plus fringe benefits. Timesheets for each individual performing eligible work should characterize the task and break it down by regular and overtime hours. Equipment costs could also specify the time equipment was in use (i.e., not idle) performing eligible work as well as hourly equipment usage rates, which typically include operation, insurance, maintenance, fuel, and depreciation. Equipment logs that document when and how certain equipment was used can also document equipment costs. Contractor costs should be substantiated based on the contractual agreement, which typically is based on the volume or weight of debris removed. Truck measurements and/or scale calibration, debris load tickets, and a load ticket database are typically used to document contractor costs.

Photographs can also be useful, to document equipment used for debris operations, trucks used for hauling, and quantities and types of debris piles.

Why Is Reimbursement So Important?

Debris removal is a time-consuming and costly operation that often results in a great expense to the affected communities and private nonprofit institutions, who then seek financial aid from federal and state agencies. Debris removal costs typically can be anywhere from 25 to 85 percent of the total cost of a disaster. FEMA's Debris Management Guide (*25*) published in 2007 states that, "Over the last five years, debris removal operations accounted for approximately 27 percent of the disaster recovery costs." These costs could cripple a local economy if the community had to bear the full expense of debris operations. Federal programs such as the FHWA's Emergency Relief program and FEMA's PA program will reimburse eligible applicants for eligible work at the rate of 75 to 100 percent of the total cost, depending on the program and the terms of the disaster declaration. While the applicant is still responsible for the non-funded portion of the cost, it is significantly less than it would be otherwise.

The following examples demonstrate how expensive debris removal operations can be for a community:

- **Hurricane Andrew**—An initial estimate of debris after the storm was 20 million CY—enough to fill a football field a mile high. Removal took 6 months at an approximate cost of $585 million.
- **World Trade Center**—Approximately 1.6 million tons of debris were removed at a total estimated cost of $1.7 billion, which includes $695 million for debris removal plus $1 billion in liability insurance coverage. (*32*)
- **2003 Southern California fires—**Approximately 64,000 tons, and $13.2 million. (*33*)
- **San Simeon Earthquake**—Approximately $400,000 spent on debris removal. The quake had a magnitude of M6.5 when it struck in 2003. (*33*)
- **Hurricane Katrina**—When the demolition of damaged property in the New Orleans metropolitan area is complete, Hurricane Katrina will have generated more than 100 million CY of disaster debris. Estimates of costs associated with removing and disposing of debris from the disaster range from $2.5 billion to $4.1 billion. To date, disaster debris totals from Katrina are estimated at:
  - 3.4 million CY in Alabama,
  - 45.8 million CY in Mississippi, and
  - 64.3 million CY in Louisiana (this total includes debris from Hurricane Rita (*34*).

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When Does Reimbursement Occur?

Most programs provide reimbursement based on actual costs, and therefore require documentation of all expenses. Most also require that a final inspection take place to verify the work is complete, and that it was accomplished in accordance with program requirements and the agreed upon scope of work. Once the final inspection is finished, the funds are released by the federal agency to reimburse the local or state agency for the work. Many of the programs have provisions that allow some funds to be disbursed prior to project completion; typically this option may be exercised in response to larger disasters where damage is widespread.

Who Reimburses These Costs?

The federal government provides reimbursement programs through several agencies for debris operations expenses. While FHWA and FEMA are the two primary federal agencies that provide funding to DOTs and DPWs for debris removal, other agencies such as NRCS and USACE also have programs that are relevant to certain debris removal actions.

FHWA Emergency Relief Program Eligibility Requirements

The FHWA *Emergency Relief Manual*, Chapter II, defines eligible timber and debris removal such as trees, tree limbs, other woody materials, rocks, gravel, sand, silt, etc. In general, debris eligible for funding by the FHWA ER program must be the result of a disaster, and its removal must minimize damage, protect facilities, or restore essential traffic. The limits of debris removal are to the outside edge of the shoulders (See Figure 7.9, in Chapter 7, Removal) and can include the removal of debris that is considered to be a safety hazard (fixed objects) within the limits of the clear zone.

FHWA Emergency Relief Program Funding

On July 6, 2012, Moving Ahead for Progress in the 21st Century (MAP-21) was signed into law. This legislation maintains the total level of funding for the ER program at $100 million per fiscal year. The federal portion of eligible debris removal can be reimbursed at 100 percent of cost for the first 180 days after the disaster occurs, with Day 1 starting on the date the event occurs. Debris removal outside the specified limits during the first 180 days and beyond is at the normal pro rata share for the affected federal-aid highway.

MAP-21 Impacts on FHWA Emergency Relief Program Application Process

MAP-21 limits the amount of time that state DOTs have to submit an application to FHWA for funding through the ER program. Applications must be submitted within 2 calendar years of the date of the disaster. The application must include a comprehensive list of all eligible project sites and repair costs. Because debris removal activities are to be completed within the first 180 days after the disaster occurs, this requirement to submit the application to FHWA within 2 years after the disaster occurs should not impact funding for eligible debris removal activities under the program unless the extent of the disaster is such that debris removal activities are still ongoing 2 years after the disaster occurs. In this case, the state DOT should follow FHWA ER program procedures for requesting a time extension through the FHWA Division Administrator. A copy of the FHWA's ER Questions & Answers related to MAP-21's impacts on the application process and debris removal eligibility can be found on the FHWA website.

FEMA Public Assistance Program

If a federal disaster declaration is in effect and debris removal work is eligible under the declaration, then FEMA's debris removal eligibility policies, under 44 CFR §206-222, §206-223(a) and (c) and §206-224, respectively, will be applicable to debris located in federal-aid roadways as well as other publicly-maintained roadways. In general, debris removal from the roadways must be complete within 6 months of the date of the declaration. The federal cost share will be the percentage that is in effect for the particular disaster, and will not be less than 75 percent. To be considered as a viable participant, the applicant must submit a Request for Public Assistance (RPA) to the Regional Administrator within 30 days after the designation of the area where the damage occurred. Applications for grant reimbursement through the PA program must be submitted by an eligible applicant performing the debris removal work through the FEMA PA process. The grant application is in the form of a Project Worksheet, which is prepared either by the applicant or FEMA, depending on the size and scope of the project and the applicant's preference.

The state and local DOTs and DPWs must determine which federal agency provides reimbursement for what damages. An applicant may not receive funding from two sources for the same work item and the Stafford Act prohibits such a duplication of benefits. (See FEMA Policy 9525.3, Duplication of Benefits.) A state disaster assistance program is not considered a duplication of federal funding. There are several other agencies discussed below that provide reimbursement or repairs to stipulated disaster-related damaged facilities.

It is important to note for FHWA and/or FEMA funding, if both a federal disaster declaration and a governor's emergency declaration are in effect, but the governor's declaration includes more counties than the federal declaration, then the counties included in the governor's declaration but excluded from the federal declaration are not eligible for FEMA PA funding but are eligible for FHWA ER program funding.

U.S. Army Corps of Engineers

The U.S. Army Corps of Engineers (USACE) has ongoing authority to conduct emergency repair and permanent restoration of damaged flood control works, which are those facilities constructed for the purpose of eliminating or reducing the threat of flooding. These include levees, floodwalls, flood control channels, and dams, among others. Under the Rehabilitation and Inspection Program (RIP), repairs to damaged flood control works that are regularly maintained and in active status at the time the damage occurs can be funded for reimbursement. Locally constructed projects are funded at 80-percent federal share and 20-percent levee owner share. Federally constructed projects are funded at 100 percent of the repair cost. For the repairs to be eligible for funding, the USACE must determine that the benefit-cost ratio is favorable. (*35*)

Natural Resources and Conservation Service—Emergency Watershed Protection Program

The Natural Resources Conservation Service (NRCS) can provide assistance to areas that have been recently damaged by natural disasters through the Emergency Watershed Protection (EWP) program. The NRCS has the authority to remove debris from stream channels and implement conservation practices to mitigate excessive stormwater runoff and prevent excessive soil erosion. The NRCS EWP program does not require a state or federal disaster declaration; it is established and funded by Congress. In most cases, the NRCS EWP program will pay up to 75 percent of the cost of a project, with the remaining costs coming from local sources, and can be made in cash or in-kind services. In areas with limited resources as identified by U.S. census data, the program will pay up to 90 percent of the cost.

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Department of the Interior—Bureau of Indian Affairs

The Bureau of Indian Affairs may help tribal recovery after a disaster by providing resources, such as road maintenance grants. These must be coordinated with the FHWA and FEMA grant programs.

How Does an Applicant Get Reimbursed?

Government agencies and jurisdictions can better prepare for debris-generating events by implementing steps or best practices that would make the reimbursement process easier to complete. A few examples include:

1. Set up separate accounting codes for disaster-related work. This will help to separate emergency-related work from all other types of work.
2. Keep track of equipment usage time with the respective equipment operator.
3. Create a separate file that includes all documents that would be used in the reimbursement program such as timesheets, equipment sheets, receipts, cost estimates, bids, and other records.

Appendix K provides a sample checklist that can be useful for tracking debris-related costs and documentation requirements for reimbursement.

When submitting for reimbursement, almost all funding sources will require detailed documentation, as discussed previously. For debris operations, this includes timesheets; labor, fringe benefit, and equipment rates; equipment usage; awarded contracts; debris load tickets; debris operations reports; photographs; and other records. The detailed backup documentation is used to support development of the grant application. Depending on the program, the grant application may be completed based on estimates and then amended once final costs are known, or it may be submitted only after a final inspection has been completed and final costs have been tallied.

In most federal grant programs, the applicant submits their completed grant application to the state. The state reviews the application for compliance with program requirements, and then forwards the completed applications to the federal agency for processing. When the federal agency processes the request, it releases the funds to the state, which acts as the administrator by disbursing and monitoring the grants awarded to the applicant under the program.

If the federal agency rejects the grant application, the applicant has the right to appeal the rejection. Each agency and program has its own appeal process, and appeals must be made in a timely manner according to the requirements of the particular program.

- **FEMA**—The Grantee (state) first makes the appeal to the FEMA Regional Administrator within 60 days of receipt of notice of the action or decision being appealed. If the FEMA Regional Administrators uphold the rejection, the Grantee can make a second appeal to the FEMA Assistant Administrator at the Agency's Headquarters. This appeal must also be filed within 60 days following notice of the action or decision being appealed.
- **FHWA**—Appeals must be submitted in writing to the Division Administrator within 30 days of the initial finding of ineligibility.
- **NRCS**—Appeals are made to different committees or people depending on the type of program (Title XII or non-Title XII). If an agreement is not reached, mediation is an option. Finally, an appeal to the National Appeals Division can be made.

Understanding the options for getting reimbursement from the various funding sources could mean the difference between 100 percent reimbursement and 0 percent reimbursement. If tracked and done correctly a jurisdiction could recoup the majority of its costs after a debris-generating event; however, even the smallest mistake could jeopardize the entire reimbursement.

The example below, pulled from FEMA's appeals database, outlines a situation in which a jurisdiction applied for both FEMA and FHWA reimbursements (prior to MAP-21).

Example: Hurricane Katrina (*36*)

Following Hurricane Katrina, the city of Waveland, MS, issued a noncompetitive contract for non-hazardous debris removal. FEMA prepared two project worksheets for the debris removal work that was accomplished, one for the original contract period from September 2005 through June 2006, and another for a contract extension period from July 2006 through June 2007. The total of the two project worksheets was in excess of $14.2 million. During final inspection, FEMA de-obligated over $2.5 million for work determined to be under the authority of the FHWA ER program as well as for contract costs determined to be unreasonable. In their appeal to FEMA, the city was able to substantiate that its costs were reasonable and that they were eligible for reimbursement from FEMA for work performed on federal-aid roads after the first pass. The city recouped over $1.6 million of the de-obligated funds, but they had to apply to FHWA for the work they performed that was covered by the ER program.

This example and others like it suggest that understanding the different programs and requirements is important if a jurisdiction hopes to recoup costs and recover from an event.

CHAPTER 13

Special Considerations

Synopsis of Issues

The term "special considerations" describes issues other than program eligibility that could affect the scope of work and funding for a debris management project. Environmental compliance, including regulatory policies, permitting, ecological considerations, and quarantine restrictions, is of special concern. Historic preservation may be an issue in many areas. Additionally, valuables, personal property, animal remains, and human remains must be treated properly when part of a disaster. Finally, debris in and around a crime scene must be moved only after approval by law enforcement officials.

Target Audience

- Debris managers,
- Local officials,
- Environmental officials,
- Debris supervisors,
- Landfill owners/operators,
- Debris monitors,
- Solid waste department, and
- Debris removal contractors.

Special Considerations Definition

The circumstances surrounding a particular debris-generating event could impact how the debris management process is undertaken. Debris management plans should consider these possibilities and establish a framework for addressing them should they arise. Special considerations such as environmental compliance, historic preservation, personal property recovery, and environmental justice are encountered with some frequency. Some other events might require the debris management team and local officials to address topics such as animal remains, human remains, and crime scene evidence.

Environmental Compliance

Why: Environmental compliance can include regulatory, ecological, and/or quarantine issues. Many laws and executive orders mandate compliance with environmental regulations governing topics such as pollution and contamination, ecosystems, and land use. Table 13.1 includes the most common environmental laws and executive orders that could potentially impact debris management operations.

Table 13.1. Summary of laws and executive orders pertaining to debris management.

Legislation	Impact on Debris Operations	Agency Authority
Resource Conservation and Recovery Act	• Requires safe disposal of waste materials in properly permitted landfills. • Encourages recycling of some materials. • Hazardous waste must be properly handled and disposed of in accordance with the requirements of the Act (e.g., properly permitted landfill).	State, EPA
Clean Air Act	Must comply with the requirements of the Act for permitting, reduction, and disposal of debris, including: • Burning debris. • Appliances containing chlorofluorocarbons. • Switches and fluorescent tubes containing mercury. • Asbestos- and lead-containing materials.	State, EPA
Endangered Species Act (ESA)	• Identify endangered species in geographic area of impact – Habitats. – Breeding seasons. • Obtain programmatic agreements as needed to accomplish debris work. • Do not remove, disturb, or otherwise harm protected habitat areas. • Do not place debris management or disposal sites in protected habitat areas.	U.S. Fish and Wildlife Service (USFWS) National Marine Fisheries Service (NMFS)
Fish and Wildlife Coordination Act	Debris removal from waterways that could impact fish and wildlife should be coordinated with USFWS.	USFWS
Clean Water Act (CWA)	• Obtain permits for discharging dredged materials or fill into federal waters. • Prohibits use of wetlands for DMSs. • Coordinate with USACE on how to accomplish debris removal from streams.	USACE
National Environmental Policy Act (NEPA)	Debris activities are generally statutorily exempt from NEPA requirements.	FEMA (for Stafford Act responsibilities)
National Historic Preservation Act (NHPA)	Coordinate debris removal or demolition activities impacting any historic property listed in or eligible for listing in the National Register of Historic Places with the state or Tribal Historic Preservation Office.	State or Tribal Historic Preservation Officer, Advisory Council on Historic Preservation

(continued on next page)

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Table 13.1. (Continued).

Legislation	Impact on Debris Operations	Agency Authority
Coastal Zone Management Act (CZMA)	Debris removal from coastal zones must be done in accordance with the state's coastal zone management plan.	State
Coastal Barrier Resources Act (CBRA)	Debris removal in Coastal Barrier Resources Systems to eliminate an immediate threat to lives, public health and safety, and improved property should be completed in consultation with the USFWS.	USFWS
Farmland Protection Act	Use of farmland for a DMS likely will not comply with the requirements of the Act; verify with state NRCS before using.	NRCS
Executive Order 11988: Floodplain Management	DMSs and disposal sites cannot be located in a floodplain.	FEMA
Executive Order 11990: Wetlands Management	DMSs and disposal sites cannot be located in a wetland.	FEMA
Executive Order 12898: Environmental Justice	Minimize disproportionately high effects of debris operations on neighborhoods and communities with minority or low-income populations (e.g., consider during DMS selection).	Multiple

(Table compiled based on information contained in FEMA 325, Debris Management Guide) (*25*)

Compliance with these laws during debris management operations is important not only from a legal standpoint, but also from a financial standpoint if reimbursement will be sought from federal agency grant programs. Federal agencies must comply with federal laws, and this requirement extends to providing federal funds to complete an activity. A federal agency must document that all applicable laws are being followed to be able to provide funds for disaster-related work. A sample environmental compliance checklist can be found in Appendix M.

Example (*37*)

After the devastating fires that occurred in September and October of 2011 in Bastrop County, TX, burned trees near power lines were cut down and placed alongside the road. Fire victims along these routes placed their debris in the right-of-way for eventual removal. Between the time the debris was placed in the right-of-way and the time it was removed, the endangered Houston toad took residence in the piles. Because FEMA, its Grantees, and Subgrantees must comply with the requirements of the Endangered Species Act, the Houston toad was required to be protected during debris removal activities. A team of Houston toad experts monitored the activities of debris removal and public utility crews to determine if the toad was present in their work areas. When toads were found, the experts coordinated with USFWS to safely handle and relocate the toad.

Where: Environmental compliance issues arise based on where debris is found after a disaster as well as during removal, segregation, processing, and disposal operations. Debris that occurs in environmentally sensitive areas such as waterways, protected species habitats, and contaminated sites have to be removed in accordance with the federal, state, and local laws that apply to the particular site (see Figure 13.1). Debris removal operations likely need to be coordinated with the state and/or federal agency that has oversight of the law governing how certain activities should be accomplished.

Figure 13.1. Located near a body of water and in a wetlands, this DMS does not meet environmental criteria for site selection. (Source: FEMA)

Environmental considerations also arise at debris removal and demolition sites in buildings where asbestos and/or lead-based paint might be present. Lead-based paint could be encountered in buildings constructed before 1978, and asbestos-containing materials (ACMs) are still used in some buildings. Appropriate personal protective measures should be taken by people handling lead-based paint and ACMs, and these materials should be properly treated and discarded in accordance with governing regulations.

If DMSs will be used to facilitate debris management operations, these sites must be selected to comply with governing regulations. Additional discussions about site selection are included in Chapter 9. The sites should be permitted by the appropriate local and/or state authority. The site operations and closure procedures must comply with the permit and applicable laws, ordinances, and other authorities.

Properly processed debris must be disposed of in accordance with governing requirements. Disposal requirements for different types of regulated debris are discussed in Chapter 11. Disposal sites must be properly permitted; disposal of debris such as chipped or shredded vegetative debris through uses such as mulch must be performed in coordination with state environmental agencies.

When: Activities associated with performing life-saving measures immediately after the disaster has occurred are likely exempt from environmental regulations. Once life-saving measures are complete, debris removal and disposal operations must comply with relevant federal, state, and local requirements. Some potential environmental concerns can be identified and appropriate solutions can be addressed during development of the debris management plan. For example, site selection can be planned to comply with environmental justice concerns as well as floodplain management requirements. Other potential environmental issues might be identified in the process of completing preliminary damage assessments and during segregation activities. As these concerns are identified, they should be brought to the attention of the debris manager so they can be properly and expeditiously addressed.

Who: Many of the people directly involved in debris management operations should be aware of governing environmental regulations as well as the potential issues in their communities that might need to be addressed. These people include but are not limited to those outlined in Table 13.2.

How: Debris management operations must comply with all local, state, and federal laws, ordinances, and other requirements that pertain to the types of solid waste generated as disaster

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Table 13.2. Individuals involved in debris management operations and their roles.

Individual or Agency	Role
Debris Manager	Coordinate with appropriate agencies to ensure debris operations meet local, state, and federal regulations. Communicate with contractors on requirements.
Debris Removal Contractors	Comply with local, state, and federal requirements for debris removal and disposal operations. Coordinate with debris manager, other agencies as appropriate.
Debris Monitors	Observe debris operations and raise concerns regarding non-compliance with local, state, and federal regulations to the debris manager.
Local Floodplain Administrator	Identify local floodplains. Coordinate with debris manager on site selection to ensure compliance with floodplain management. Ensure dredging operations comply with floodplain management requirements.
State Department of Environmental Quality	Issue permits. Ensure compliance with environmental requirements.
State Department of Conservation/Natural Resources	Advise on debris disposal and recycling options. Advise on agricultural and other land use as a DMS.
State National Flood Insurance Program (NFIP) Coordinator	Advise on dredging, site selection to ensure floodplain management requirements are met.
EPA	Establish requirements governing the safe removal and disposal of disaster debris. Coordinate with USCG to remove oily and other hazardous debris from coastal zones. Coordinate with USACE on removal of CBRN contaminated debris.
USFWS	Advise on debris removal from waterways that could impact fish and wildlife.
USACE	Provide technical advice for debris operations. Coordinate with EPA on removal of CBRN contaminated debris.
U.S. Coast Guard	Provide technical assistance for contaminated debris in coastal zones. Coordinate with EPA to remove hazardous materials (e.g., oil) from coastal zones.

debris. Debris managers, supervisors, and contractors are encouraged to consult with their state environmental agency regarding requirements for handling, transport, and disposal of disaster debris, particularly regulated debris such as hazardous waste.

When DMSs are identified for sorting and/or processing debris prior to disposal, some steps that are recommended to ensure compliance with environmental regulations include:

- Use GIS or obtain maps to identify areas such as wetlands, open water, and floodplains. Include aerial imagery of these sites.
- Check local experts for information on elevation of groundwater tables to minimize the potential of contaminating groundwater.
- Obtain and overlay maps of habitats for endangered/protected species onto the water/wetlands maps.

- Comply with local, state, and federal requirements for locating DMSs in relation to sensitive areas (e.g., should not be located within certain distances of these areas).
- Consider demographics and traffic studies near potential sites to ensure compliance with applicable regulations and executive orders such as environmental justice.
- Obtain required permits (e.g., burning, ash disposal).
- Complete baseline environmental sampling (e.g., water, soil, air) of DMSs prior to setting up the site.
- Complete ongoing sampling as required by ordinances, regulations, and laws.
- Monitor to ensure that hazardous and other regulated wastes are segregated, properly handled, and properly disposed. Ensure chain of custody is kept. A sample chain of custody form can be found in Appendix L.
- Complete final environmental sampling after all debris operations are complete and cleanup has been accomplished. Compare results of post-operations sampling to baseline sampling to ensure the site has been returned to normal (or as close as possible to meet requirements).

Historic Preservation

Why: Historic preservation compliance is mandated by Section 106 of the NHPA, which was enacted into law in 1966 and last amended in 2006. It is intended to preserve historic and archaeological sites in the U.S. While historic preservation occurs at the local, state, tribal, and federal levels, the Act directs the federal government to provide leadership in preserving, restoring, and maintaining the nation's historic and cultural resources. In so doing, federal agencies that disburse funds for disaster-related work through federal grant programs must ensure that applicable laws such as the NHPA are followed.

What: Debris removal from potentially historic or archaeologically significant sites, as well as removal of demolition debris from historic properties, must comply with historic preservation requirements. An exception will likely be made for life-saving emergency response work, but permanent debris removal might require coordination with the State Historic Preservation Office (SHPO) or Tribal Historic Preservation Office (THPO). Demolition and/or disposal of material from a known or potential historic structure, facility, or site should not be started without notifying the SHPO or THPO and receiving approval, and could require development of a written plan of action for debris operations. Known historic and archaeological sites should not be used for debris storage.

Where: Historic preservation requirements should be followed for any property with the potential to have historic or archaeological significance. Some sites have already been identified and included on the National Register of Historic Places and the list of National Historic Landmarks. SHPOs and THPOs maintain lists of sites included on the registers for their states. The NHPA states that buildings must be at least 50 years old to be considered potentially historic. Debris personnel should confirm that properties 50 years old or older are not historically significant prior to removing debris from these sites.

When: Requirements for historic preservation compliance are likely to be waived during life-saving operations, but after the rescue phase is complete, historic preservation compliance is required by law. Prior to removing debris from public property, sites with known disaster debris should be evaluated against the National Register of Historic Places. Some communities or states have GIS layers with the historic properties coded on them; this can be a useful tool for quickly identifying potential sites requiring compliance with NHPA requirements. Other debris-containing locations with the potential for meeting the definitions of historic or culturally significant sites should also be evaluated to determine if compliance with NHPA is required.

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Who: The debris manager has primary responsibility for ensuring that debris operations personnel and debris contractors comply with the NHPA. The debris manager should consult with the SHPO or THPO on currently listed and identified eligible properties in their communities, as well as sites identified by field personnel during debris management work.

How: Sites with the potential for being historically or culturally significant can be identified by conferring with local historic preservation societies, tax records, and local officials regarding sites of known historic/archaeological significance, as well as by checking the National Register of Historic Places. As historic or culturally significant sites containing disaster-generated debris are identified, the debris manager should confer with the SHPO/THPO to develop a plan for removal of debris from these sites.

Valuables/Personal Property

Why: During a disaster, personal property becomes mixed in with other disaster-generated debris. Some personal property could have monetary or sentimental value. For these reasons, property owners are often anxious to recover their personal belongings and valuables after a disaster. Recovery of personal property with monetary value is also important for insurance purposes, as insurance companies need documentation of what has been recovered and what is lost to be able to process claims.

What: Personal property can include a wide variety of belongings. Some items, such as vehicles, vessels, expensive jewelry, artwork, precious metals, and collectibles, may be insured and their recovery or loss must be documented and reported to insurers. Some items could be potentially dangerous, such as firearms, and should be handled by appropriately trained people. Other items such as photographs and family heirlooms have sentimental value to the owners and are irreplaceable.

Where: While most personal property is likely to be found on residential or commercial property, it could be found anywhere in or near the disaster zone. Wind and water can carry items long distances before depositing them, so personal property might be found anywhere from feet to miles away from points of origin.

When: Personal property is found before as well as during debris operations. Once local officials have determined a disaster area is safe for entry, residents and business owners may be allowed to return during a specified time period before the onset of debris removal operations so that they can search through the debris to find their personal belongings and valuables. Once they have reclaimed the items that they want, debris removal operations in these areas begin according to the debris management plan, and additional sorting by debris removal personnel to find personal property is not likely to occur. However, because debris can be carried far away from its points of origin, some personal property and valuables might be found during debris removal from public property.

In cases of marine debris removal, property owners will not be able to remove much of the debris from the water themselves and will have to rely on marine debris removal operations to recover their property. The process for returning these items to their owners is likely to vary according to jurisdiction, but in general the items should be documented with photographs, date and time they are found, and GPS coordinates of the location where they are found. They then should be tracked through chain of custody forms, and secured until they are turned over to the appropriate local or state authorities for further processing.

Who: If private citizens are permitted back into the disaster area to search for belongings and begin the recovery process, they are likely to find many of their valuables and keepsakes before removing debris from their property for disposal. Workers who are involved in search and rescue

or debris removal and disposal operations may encounter personal property or valuables on public property or even private property if they have authorized entry. Personnel working for departments of public works, solid waste, transportation, and parks and recreation, as well as their contractors, are the most likely individuals to find and recover personal property during debris operations. These individuals should be trained in the proper procedures for cataloging and preserving these items, maintaining chain of custody, and turning the items over to the appropriate authorities for further processing. Coordination with law enforcement officials could also be required when dangerous or illegal items are found. Law enforcement or other designated agencies coordinate with insurance companies on the items recovered during debris operations.

How: Local debris management plans should have a section that addresses how personal property and valuables are handled and processed during debris operations, including the establishment of a central location (or locations) where such items are taken, what proof is required for pickup, and other details. Local debris management plans should also address the process of how residents return to the site. This process should describe how property owners can find out when they can return, and what is required for them to enter the area if it is cordoned off, such as a picture identification showing an address in the area. Depending on the nature of the disaster, if the times of entry to the area by residents and business owners are restricted, those times should be clearly communicated.

If entering onto private property, contact the property owner first to obtain right-of-entry and to give the property owner an opportunity to indicate the presence of valuables or sentimental items that might remain on-site (*38*).

As debris operations are ongoing, items that are potentially dangerous or "unusually valuable" such as firearms, coins, safes, or jewelry may be found. The debris personnel who find the items should start the chain of custody process, which could involve collecting, tagging, and photographing each item. Items collected at a central location for safe storage until they can be turned over to the appropriate authorities may be logged into a database for additional tracking and documentation purposes. The appropriate local or state authorities should be notified so that the items can be transferred as quickly as possible. If recovered items need to be stored for a period of time before they are turned over to authorities, they should be kept in a locked safe or room with restricted access in a facility that is locked and has on-site security 24 hours per day, seven days per week. Titled property such as vehicles and vessels, if authorized for removal, should be taken to a secure storage location managed by the local government.

Animal Carcasses

Why: Animals can also be disaster victims. The death of animals due to disasters can pose logistical issues as well as health-related concerns for the affected communities, and so must be handled effectively and efficiently to assure the general public that the appropriate measures are being taken to safeguard against additional problems such as health risks. Previous disasters, such as Hurricane Floyd in 1999, resulted in the deaths of over 100,000 hogs and 1 million chickens and turkeys that quickly posed public health risks for disease as well as contaminated floodwaters and drinking water supplies (*39*) (see Figures 13.2 and 13.3).

What: The types of animals that live and work in our communities are numerous and diverse. While the species can vary widely, animals can be loosely grouped by type (*40*).

- Pets/companion animals are those in a generally tame condition.
- Livestock/agricultural animals are often considered to be domestic and generally are considered to be farm animals.

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Figure 13.2. Removal of dead hogs, Hurricane Floyd, 1999. (Source: FEMA)

- Exotic or zoo animals are generally considered to be wild animals.
- Research animals could be domestic or wild animals, depending on the type of research being conducted. Rats and mice are the most commonly used animals for these purposes.

Animal carcasses generated as a result of disaster can pose some significant concerns. Disasters that result in a large volume of carcasses will require significant space for storage until they can be properly processed and/or discarded, depending on methods deemed acceptable by the state agriculture department. Some animals could be carrying diseases or their carcasses could become breeding grounds for disease, which could pose a public health threat if not addressed quickly.

Where: Animals carcasses could be found in a number of different places after a disaster. Pets and companion animals that were not able to be rescued could be found in or near residential areas, veterinary clinics, kennels, and at breeding facilities. Domestic farm animals could be found on or near farms, ranches, or in concentrated feeding facilities. Animals used for research are most

Figure 13.3. Disposal of dead hogs, Hurricane Floyd, 1999. (Source: FEMA)

likely to be found on or near university campuses, private companies, nonprofit laboratories, government laboratories, or at other medical or health research facilities.

When: Animal carcass removal should begin as soon as possible after a disaster to avoid creating a health hazard. Removal and disposal should be accomplished in accordance with the local and/or state debris removal plan and in coordination with the appropriate state agencies such as Health and Agriculture. State agencies have recommendations for the appropriate time limits associated with different disposal methods; it is recommended that the appropriate state agency be contacted to verify disposal options and timeframes.

Who: Many local and state plans require farms and other locations where animals are concentrated to have a disposal plan prepared in advance of an event occurring. These plans should be coordinated with local emergency management officials and meet local and state requirements for animal carcass disposal. Farm and ranch owners are expected to handle the animal carcasses on their property after a disaster occurs. Similarly, pet owners generally are responsible for appropriately disposing of their animals' remains in accordance with local and state ordinances within 24 hours of receiving notice of the death (*41*).

When removal is required by public agencies, removal and disposal is likely to be done by debris removal contractors and personnel from the department of public works or solid waste. Removal and disposal operations should be coordinated with the department of health and also animal control as appropriate. If animal carcasses must be transported off-site to another location for processing and disposal, the DOT might need to issue permits, and escorts from local law enforcement officials might be required. Sample requirements for disposal of large quantities of animal carcasses can be found in Appendix N and requirements for disposal of small quantities of animal carcasses can be found in Appendix O.

Depending on the magnitude and location of the disaster, state resources might also be involved in animal carcass removal and disposal (see Table 13.3).

How: Removal and disposal of animal carcasses resulting from disasters should be done in accordance with local and state regulations; local and state animal control, health, and agriculture departments can provide technical guidance and assistance. Because this is a specialized type of

Table 13.3. State agencies that might be involved in carcass removal (*42*) (*43*).

State Agency	Role in Animal Carcass Removal and Disposal
Department of Transportation	Assists with planning for animal transport. Issues transportation permits. Coordinates with debris manager and PIO on public information.
Department of Environmental Quality	Provides technical support for removal and disposal. Issues permits for burning. Advises on landfill permitting and usage.
Department of Health	Advises on disease control, worker health, and safety.
Department of Agriculture/Veterinarian	Might hold prepositioned contracts for removal and disposal that could be activated. Maintains list of haulers. Might have access to incinerators or maintains a list of incinerators.
Department of Natural Resources/Soil and Water Conservation Board	Provides technical support for removal and disposal. Advises on burial, composting, ash disposal.

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debris removal, staff that will be doing this type of work must be trained in the proper methods of collection, loading, transport, and disposal. The work can be both physically and emotionally exhausting; personnel should be rotated frequently (e.g., every few days) to other responsibilities to help prevent burnout. Workers should wear appropriate personal protective equipment (PPE), including tyvek suits, boots, and synthetic impermeable gloves. Safety glasses might also be appropriate.

Removal operations involve moving the carcasses from their deposition locations to disposal sites or storage sites if immediate disposal is not available. Removal could require the use of different types of equipment typically available from departments of public works or transportation. Small animals can be moved by skid steers or bucket loaders, but larger animals may require the use of heavy equipment for removal. Equipment that might be needed to remove and transport animal carcasses after disaster include:

- Skid steer loaders with attachments;
- Front-end loaders;
- Dump trucks;
- Roll-off containers;
- Cranes;
- Chains, hooks, shovels;
- Plastic sheeting (6-mil);
- Poly bags with zipper;
- Absorbent materials (e.g., sawdust, wood shavings, hay, straw);
- PPE;
- Duct tape to seal PPE; and
- Communications equipment.

If storage is required prior to disposal, store in cold areas (e.g., bury in snow piles if available) or place on plastic sheeting and cover with 3 feet of soil (*44*).

Loading animal carcasses for transport requires that special processes be followed. Short-distance transport can be accomplished in lined and covered municipally-owned vehicles, but long distance hauls should be done in lined roll-off containers, lined and covered dump trucks, or other lined and covered "tippable" vehicles. Loading the vehicles used for transport must be done carefully, following a process similar to this one used by Franklin County, MA (*44*):

- Seal off roll-off containers and dump trucks around the gate.
- Double-line the container or truck bed with 6-mil plastic sheeting or polyethylene (poly) bags, leaving sufficient material at the sides to seal the top after loading is complete.
- Load the container with 1-foot thick layer of absorbent material.
- Handling the carcasses as little as possible, carefully load them into the container. Avoid tearing the liner or puncturing the carcass bodies.
- Leave sufficient space to accommodate the expansion of carcasses; 1 to 2 feet of space is recommended.
- After loading, cover carcasses with plastic sheeting attached to the sides and top of the container to prevent leaking, or zip the poly bag.

Trucks that have been properly loaded should transport the carcasses by following a pre-established route. An escort from law enforcement agencies to the disposal sites might be needed and should be coordinated with the appropriate agencies. Acceptable disposal methods will vary based on the types and quantities of carcasses requiring disposal and should be coordinated with the appropriate local and state agencies, such as Health and Agriculture. The disposal area should be isolated from public areas, away from water sources, underground wells, and environmentally sensitive areas. Some disposal options that might be acceptable are shown in Table 13.4.

Table 13.4. Animal carcasses disposal options (*45*).

Method	Description
Rendering	The easiest way to dispose of carcasses, especially those of farm animals. Rendering is a process whereby the carcass is cooked at high temperatures and converted to animal feed or fertilizer. Commercial companies perform this service and might, for a fee, pick up the animals. This method can be used if normal transportation methods and utilities are functional and the rendering company has sufficient trucks and personnel to handle the volume.
Burning	Can be done outside or by using commercial incinerators. Many animal hospitals, humane societies, and diagnostic laboratories have incinerators, given that prior agreements are in place. When burning carcasses outside, it is important to let appropriate governmental officials know ahead of time to assure compliance with laws and ordinances. (May be a time limit for doing this.)
Burial	Can be done only where local ordinances and the terrain permit. The location selected should be approved in advance by the appropriate environmental government agency. Burial might only be permitted at certain locations. Arrangements might also have to be made for heavy equipment to move animals and dig the graves. A good resource for these supplies is the state transportation department and National Guard. The USDA APHIS "Foot and Mouth Disease Emergency Disease Guidelines" and "Hog Cholera Emergency Disease Guidelines" can be consulted for procedures for preparing the burial site.
Composting	Used to dispose of large numbers of poultry carcasses. Composting is the mixing by volume of 1 part carcass to 2 parts litter and 1 part straw in alternate layers in a boxed, enclosed area. The method can also be used for larger animals. Whereas poultry can be placed whole in layers, larger animals need to be cut or ground into smaller parts first. The composting is accomplished by the bacteria in the litter and takes about two weeks to complete. The completed compost pile is odorless and can be used for fertilizer.
Fermentation	Carcasses are mixed with fermentable sugar in a metal container. Bacteria from the digestive tract of the carcasses ferment the material. The finished product can then be used for animal feed.

Human Remains

This is a difficult subject that the researcher have tried to treat with respect, while still conveying the nature of the work that could be required.

Why: Loss of human life can result from natural disasters. The public expects that human remains will be recovered as quickly as possible to allow the friends and relatives of the victims to follow their burial traditions. Human remains that are not quickly recovered also could pose a health and safety risk to the community.

What: Human bodies and body parts could be recovered as a result of any type of disaster. As the human remains are recovered, bodies should be placed in plastic body bags. If these are not available, plastic sheets, bed sheets, or other similar available material can be used. Body parts should be placed in small, portable ice chests prior to transport. Hurricanes and floods also can cause buried coffins to surface and float, and could dislodge human remains from their coffins.

Where: The remains of victims of the disaster could be found under other debris, in buildings, in vehicles, etc., within or near the geographic area impacted by the disaster. Coffins and other human remains carried away by floodwaters could be deposited several miles from their points of origin.

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When: Human remains will most likely be encountered during search and rescue and recovery operations after a disaster has occurred. While it is the objective of every recovery mission to find human remains as quickly as possible, the extent and nature of the disaster could result in some human remains being found weeks or even months into the recovery process.

Who: During search and rescue operations, fire department and emergency services personnel could request public works and transportation departments to identify potential facilities to serve as temporary morgues and also provide heavy equipment and operators to assist with operations by removing large and heavy debris. The local health department can advise on the use of PPE by these personnel during rescue and recovery operations.

While on site, equipment operators may need to coordinate with structural engineers who are evaluating the integrity of structurally unsound or collapsed buildings so that building debris is removed as safely as possible to prevent further shifts in the structures. The operators might also need to coordinate with law enforcement personnel that have canine units on site. If human remains are found during search and rescue or recovery operations, the medical examiner will be notified to take possession. As search and rescue efforts transition to recovery operations, debris removal personnel, including contractors if they are used, could find human remains during debris removal operations. Such individuals should be trained in what to do if this occurs.

If local capabilities to support this work are overwhelmed, the State National Guard might be able to provide personnel and equipment to support local efforts. The State Department of General Services might also be able to provide needed resources such as facilities, materials, and equipment necessary to support operations. If federal agencies are involved in the response efforts, the U.S. Public Health Service's Disaster Mortuary Operational Response Team (DMORT) teams might be available to provide technical assistance with recovery efforts, including providing temporary morgue facilities if the impacted jurisdiction cannot identify appropriate facilities. The Department of Homeland Security's Urban Search and Rescue Response System and the Department of Defense also have resources that can assist with recovering and processing human remains and also with handling potentially contaminated human remains.

How: The local emergency operations plan should contain information on how the removal and handling of human remains will be accomplished in the ESF #8 section or in the mass fatality plan. Any work performed related to demolition or debris removal where human remains could be or are found should be done in support of and in close coordination with search and rescue/recovery operations and the local medical examiner's or coroner's office. Debris management workers should be trained in what their role could be during recovery of human remains after a disaster. They also should be trained in the proper methods used to protect against potential contact with bodily fluids as well as other hazards present at the removal sites. For example, the minimum recommended level of protection is heavy-duty gloves and boots, and workers should use water and soap to clean up after handling human remains. Personnel doing this work should be rotated to other jobs frequently to reduce the psychological toll that is associated with these responsibilities.

When human remains are found by debris management personnel, the appropriate authorities should be notified to ensure that the proper protocols are followed during removal. Often the location where the body is found is marked in some way such as by flagging or spray paint (*46*).

Debris management personnel might be requested to assist the marking process and also with transport of human remains after they have been processed in the field. Personnel who will be assisting with transport should be trained in chain of custody practices to convey human remains from point of origin to point of identification/storage. The transportation process is likely to require the use of enclosed vehicles or tractor trailers; refrigerated vehicles are preferred but might not be available. Transport vehicles should be secured near the recovery site until ready to depart. Some jurisdictions might require a police escort from recovery site to identification

and storage site (*46*). Otherwise, transport should be convoy-style with no stops made along the way using a predetermined travel route coordinated with local law officials (*47*). Once the identification/storage location is reached, chain of custody will be turned over to the coroner or other death management personnel.

In the event that coffins and associated human remains are dislodged from their interment locations as a result of severe flooding, efforts should be made to recover the coffins as quickly as possible and place them in a secure location. If coffins can be recovered by boat crews before floodwaters recede, the coffins can be tied to trees or other relatively stable/anchored objects so they can be retrieved quickly and brought to a designated location for evaluation by the coroner. At the impacted cemetery, exposed remains should be covered and left untouched until the medical examiner or other official is available to assist with searching for, recovering, and identifying the remains. Public works and transportation departments might be requested to provide personnel and equipment to assist with lifting and storing headstones until they can be re-set. The perimeter of the affected cemetery should be secured, and an official or other designated person might be posted at the entrance to the cemetery to answer the questions of loved ones and let them know if their relatives were impacted by the flood.

Crime Scene Evidence

General: The debris management plan should include a general process for debris removal operations at a crime scene. It is important that both law enforcement and debris operations maintain close coordination during cleanup. Key evidence can be ruled inadmissible if not handled properly. For example, a rear axle from the explosive-laden truck was found over a block from the Alfred P. Murrah Building following the 1995 Oklahoma City bombing. The part number was used to track the manufacturer and owner (rental company) of the truck, and eventually led to the bomber. Fortunately, no one had touched or moved the axle before tagging, photographing, and removal by law enforcement personnel.

Why: While the majority of disasters that have occurred in the U.S. historically have been natural disasters, not all fall into this category. Manmade disasters also occur; and while many have been found to be accidental, several have been intentional. Because the origin of a manmade disaster might not immediately be determined as accidental, some manmade disasters are initially treated as potential crime scenes until evidence of a crime is ruled out. Under these circumstances, it is crucial to preserve evidence, including debris, for investigation of possible crimes. For example, the West, TX, fertilizer plant explosion was initially assumed to be an accident. Law enforcement officials subsequently considered the possibility that the incident might have been intentional and instituted a criminal investigation that included "stacking any piece of debris that might be useful on blue tarps and hauling away the rest" (*48*).

What: Crime evidence is mixed in among all of the debris that results from an incident. The types of objects that are considered evidence depend on the nature of the incident and are determined by law enforcement officials. In addition to evidence that a crime has been committed, law enforcement officials look for the remains of victims, personal property of victims, potentially contaminated debris requiring special handling and disposal, and possibly classified or sensitive items or information.

Where: Law enforcement personnel will establish several perimeters around the crime scene with restricted access. Typically they will set up outer perimeter(s) to provide points of access to the site and an inner perimeter close to the actual crime scene where the debris is most likely to be located. Debris operations are likely to occur within the perimeters established by law enforcement, and also possibly at areas designated for processing crime scene debris evidence, as was done at the Fresh Kills landfill after the World Trade Center disaster.

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When: Debris cannot be moved until approved by appropriate law enforcement officials. Debris removal from small debris-generating events usually begins after the search and rescue or search and recovery phase is complete. Debris removal from large debris-generating events might occur concurrently with the rescue and recovery phases to facilitate rescue and recovery operations and preserve evidence. For example, one sector of the crime scene area might be released by law enforcement officials so debris removal from that area can begin while crime scene investigations in other sectors are ongoing.

Who: Local, state, and federal law enforcement personnel coordinate access to the crime scene and all on-site operations within the established perimeters. Fire and rescue personnel conduct life-saving and search and rescue operations, and could require the assistance of the departments of public works, solid waste, transportation, and other local department personnel and equipment during rescue operations. Coordination with structural engineers might also be required to safely move debris to rescue trapped victims. If any type of contamination at the site is suspected, state and federal environmental personnel will oversee proper use of appropriate PPE as well as appropriate decontamination processes for workers and equipment prior to leaving the site.

As the rescue mission transitions to one of recovery, the handling of human remains is coordinated between law enforcement personnel and the medical examiner's office. Debris removal work, whether accomplished by local resources, contractor personnel, or federal assets through a mission assignment, continues to be closely coordinated by the debris manager with law enforcement personnel. Because of the nature of the work, personnel should be rotated frequently in consideration of their psychological well-being.

How: All debris removal work must be done in close coordination with law enforcement and rescue personnel. Because all access points to the crime scene and therefore debris locations are closely controlled by law enforcement personnel, the debris manager needs to identify who will perform the work and what equipment is used. These people and equipment need to be credentialed in accordance with security procedures established for the disaster. The individuals who are identified to work within the crime scene perimeters also must be trained in evidence awareness and the proper use of heavy equipment to perform search and rescue operations. They also likely need certifications to work in a hazardous environment.

Within the crime scene perimeters, no debris should be moved, picked up, or even touched without specific approval by a designated law enforcement official. Once a law enforcement official has indicated that debris can be moved, chain of custody will be established and documented from point of pick up to point of release. This process usually is done in cooperation with law enforcement personnel. If debris that is collected is subsequently identified as potential evidence, it should be documented with the names of the equipment, operators/drivers, date, time, and work zone/location of pickup.

If law enforcement determines that debris needs to be examined for evidence at a remote site, the debris being transported for processing should be accompanied by or monitored by a law enforcement officer until it has been delivered and chain of custody has been transferred. The remote site will have its own logging, tagging, and receiving area. Depending on the nature of the incident, there may be a need for two sites—one for hazardous debris and one for non-hazardous debris. Segregating large debris pieces such as large metal debris from other debris can help expedite operations. Shaker screens can be used to further segregate the remaining debris for additional analysis. Using a conveyor belt provided by the debris operations agency or contractor to analyze and segregate the smaller debris pieces makes the process easier and more productive for law enforcement personnel (*49*). The debris manager might also be asked to provide some weatherproof shelters for workers to continue evaluating and sorting debris during periods of inclement weather. Some sort of refrigerated storage should be available to store evidence.

Separate refrigerated storage could be requested from debris operations management by the medical examiner, if needed for human remains. As debris is processed and released, it should be processed and disposed of in accordance with the local jurisdiction's debris management plan.

If the disaster is a non-conventional weapons of mass destruction–type of event, local agencies are likely to be the first responders on site until state and federal resources arrive. Federal agencies are likely to be tasked with performing much of the long-term recovery work, including debris operations, but local government agencies might continue to have a role in these operations. If, during operations, a contaminant is suspected or confirmed, personnel who continue to work at the site must be trained in the use of the appropriate level of PPE, and OSHA certification to work on hazardous site will likely be required. Debris removal work will be slow because of the precautions that will be required to remove and transport the debris. For example, all debris will have to be containerized prior to transporting it off-site.

CHAPTER 14

More Information

Conclusion

This guide has provided a compilation of industry effective practices gathered from literature reviews and field research to enable a community or agency to be better prepared. The subjects addressed within the guide range from development of a plan to final debris disposal and operational closure. It offers recommendations and insights to enable a community, department, or agency to be better prepared to respond to debris issues from disaster-related events. The guide emphasizes that entities should develop and exercise a debris management plan prior to an event, or else they will be forced to develop a plan during an event and after its occurrence. "An ounce of prevention is worth a pound of cure. . . ." While on the surface, debris removal activities might seem relatively simple, there are a number of considerations and complexities that can arise during operations that advance planning can help to address, including contracting mechanisms, temporary staging and final disposal site selection, environmental issues, and human and animal remains, among others. Communities and agencies that develop and exercise debris management plans in advance of a disaster event are better able to respond to and recover more quickly from the event, allowing their communities to be more resilient. Advance preparation also is likely to limit making mistakes that could jeopardize grant funding if it is available. While advance planning is preferable, the information included in this manual is useful to communities and agencies that are experiencing or are recovering from a recent event to guide their decision making related to debris operations.

References and Resources

The References and Resources sections that follow provide additional information and tools that can be used when searching for more information or for when conducting debris operations. The references provided can be accessed through the web or by contacting the citation sources directly. The tools and resources provided can be used as is or can be adapted for specific needs in each community.

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Acronyms

ACM	Asbestos-Containing Materials
APHIS	Animal and Plant Health Inspection Service
BIA	Bureau of Indian Affairs
C&D	Construction and Demolition
CBRA	Coastal Barrier Resources Act
CBRN	Chemical, Biological, Radiological, and Nuclear
CDC	Centers for Disease Control
CFR	Code of Federal Regulations
COG	Council of Government
CPG	Comprehensive Planning Guide
CRS	Congressional Research Service
CWA	Clean Water Act
CY	Cubic Yard
CZMA	Coastal Zone Management Act
DAP	Disaster Assistance Policy
DEP	Department of Environmental Protection
DEQ	Department of Environmental Quality
DHS	Department of Homeland Security
DMORT	Disaster Mortuary Operational Response Team
DMS	Debris Management Site
DOC	Departmental Operations Center
DOT	Department of Transportation
DPW	Department of Public Works
EMAC	Emergency Management Assistance Compact
EOC	Emergency Operations Center
EOP	Emergency Operations Planner
EPA	Environmental Protection Agency
ER	Emergency Relief
ESA	Endangered Species Act
ESF	Emergency Support Function
EWP	Emergency Watershed Protection
FAA	Federal Aviation Administration
FCO	Federal Coordinating Officer
FDOT	Florida Department of Transportation
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
GIS	Geographic Information System
GPS	Global Positioning System

GSA	General Services Administration
HHW	Household Hazardous Waste
HSPD	Homeland Security Presidential Directive
IAP	Incident Action Plan
ICS	Incident Command System
JFO	Joint Field Office
LEPC	Local Emergency Planning Committee
MACS	Multiagency Coordination System
MAP-21	Moving Ahead for Progress in the 21st Century
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
NEPA	National Environmental Policy Act
NFPA	National Fire Protection Association
NHPA	National Historic Preservation Act
NIMS	National Incident Management System
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPFC	National Pollutant Funds Center
NRCS	National Resources Conservation Service
OES	Office of Emergency Services
OIG	Office of the Inspector General
OSHA	Occupational Safety and Health Administration
PA	Public Assistance
PIO	Public Information Officer
PPE	Personal Protective Equipment
RCRA	Resource Conservation and Recovery Act
RIP	Rehabilitation and Inspection Program
RPA	Request for Public Assistance
SBA	Small Business Administration
SHPO	State Historic Preservation Office
SOG	Standard Operating Guideline
SOP	Standard Operating Procedure
SWANA	Solid Waste Association of North America
TDSR	Temporary Debris Staging and Reduction Site
THPO	Tribal Historic Preservation Office
TRB	Transportation Research Board
USACE	U.S. Army Corps of Engineers
USCG	United States Coast Guard
USDA	United States Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
WMD	Weapon of Mass Destruction

APPENDIX A

Debris Management Plan Checklist (adapted from FEMA P-604 and Massachusetts Local Debris Management Plan Checklist)

Yes	No	
❑	❑	Did you form a Debris Management Planning Committee?
❑	❑	Have you coordinated with other support agencies during development of your debris management plan?
❑	❑	Does the plan outline the roles and responsibilities of the various functions identified (Public Works, Finance, and Solid Waste Departments, etc.)?
❑	❑	Does the plan include an organizational chart with NIMS-compliant positions?
❑	❑	Does the plan include a call-down list with the names and phone numbers for individuals who will be filling the organization positions?
❑	❑	Does the plan identify equipment resources that could be used and where these resources are located?
❑	❑	Does the plan identify any mutual-aid agreements that the jurisdiction has with other parties?
❑	❑	Does the plan clearly identify any local ordinances that pertain to disaster debris management activities?
❑	❑	Has the debris management plan been included as part of the community's overall emergency management plan?
❑	❑	Does the plan include a schedule for training staff and others on the debris management plan?
❑	❑	Does the plan include a schedule for exercising the debris management plan?
❑	❑	Does the plan address health and safety procedures in accordance with state/local health and safety standards/requirements?
❑	❑	Does the plan identify procedures for acquiring required regulatory permits?
❑	❑	Does the plan address the basis for planning which includes assumptions for various events and forecasting/modeling for debris volumes?
❑	❑	Does the plan include priorities for the clearance, collection, and disposal of debris?
❑	❑	Does the plan address recycling?

- ❑ ❑ Is there a process for the collection and disposal of hazardous waste and/or white goods?
- ❑ ❑ Does the plan address debris monitoring of the pickup sites, Debris Management Sites (DMSs) or Temporary Debris Storage and Reduction Sites (TDSRs) and final disposal?
- ❑ ❑ Does the plan identify DMSs or TDSRs and potential landfills for final disposal to include operation and site management procedures and staffing?
- ❑ ❑ Does the plan address the environmental requirements?
- ❑ ❑ Does the plan address contracting/procurement procedures?
- ❑ ❑ Does the plan address the authority and processes for private property debris removal?
- ❑ ❑ Does the plan address the dissemination of information to the general public and media?
- ❑ ❑ Does the plan identify a list of pre-qualified contractors?
- ❑ ❑ Does your jurisdiction have documentation demonstrating how the list was obtained?
- ❑ ❑ Does the plan identify mechanisms for funding debris management activities?
- ❑ ❑ Does the plan include standard forms that will be used by personnel who are executing the debris management plan?
- ❑ ❑ Is the plan available in multiple formats (e.g., hard copy, electronic copy) and stored in multiple locations?

APPENDIX B

Policy Development Checklist

Agenda Setting

- ❑ Identify Issues
- ❑ Set policy objectives

Policy Formation

- ❑ Identify policy
- ❑ Analyze options
- ❑ Choose policy interments (methods)
- ❑ Seek consultation on methods
- ❑ Coordinate with other policy
- ❑ Finalize methods

Policy Implementation

- ❑ Develop implementation strategy
- ❑ Allocate resources

Policy Evaluation

- ❑ Compare monitoring data against anticipated results
- ❑ Monitor results
- ❑ Adjust policy accordingly and when appropriate

Developed based on (*9*).

APPENDIX C

Contracting Checklists

From FEMA Recovery Fact Sheet RP9580.201, Debris Contracting Guidance, issued September 27, 2010.

General Checklist

- ☐ Use competitive bidding procedures to meet procurement requirements for federal grants, as established in 44 CFR § 13.36, *Procurement.*
- ☐ Only use abbreviated emergency procurement procedures that include an expedited competitive bid process if time does not allow for more stringent procedures and if they are allowed under state or local laws, codes, or ordinances.
- ☐ Provide a clear and definitive scope of work in the request for proposal/bids.
- ☐ Require bidders to provide copies of references, licenses, financial records, and proof of insurance and bonding.
- ☐ Ensure that debris removal or monitoring contract costs are reasonable and necessary as defined and required by OMB Circular A-87 and 44 CFR Park 13. *Competitively bid contracts that comply with federal, state, and local procurement regulations and procedures will establish reasonable costs for the work.*
- ☐ Complete and document a cost analysis to demonstrate price reasonableness on any contract or contract modification where adequate price competition is lacking, as detailed in 44 CFR § 13.36(f).

All debris removal contracts must contain the following provisions:

- ☐ All payment provisions must be based on unit prices (volume or weight).
- ☐ Payments based on time-and-materials costs are limited to work performed during the first 70 hours of actual work following a disaster event.
- ☐ Payment will be made only for debris that FEMA determines eligible. (This is an optional provision to protect the applicant.)
- ☐ Contractors must submit invoices regularly and for no more than 30-day periods.
- ☐ A "Termination for Convenience" clause allowing contract termination at any time for any reason.
- ☐ A time limit on the period of performance for the work to be done.
- ☐ A subcontract plan including a clear description of the percentage of work the contractor may subcontract out and a list of subcontractors the contractor plans to use.
- ☐ A requirement that the contractor use mechanical equipment to load and reasonably compact debris into the trucks and trailers.
- ☐ A requirement that the contractor provide a safe working environment.
- ☐ A requirement that all contract amendments and modifications will be in writing.
- ☐ A requirement that contractors must obtain adequate payment and performance bonds and insurance coverage.

Applicants should consider the following when procuring debris monitoring contracts:

- ☐ Debris monitoring contracts must be competitively procured as required by 44 CFR § 13.36, *Procurement.*
- ☐ Debris monitors should not be employed by or affiliated with the debris removal contractor.
- ☐ Debris monitoring contracts are typically time-and-materials contracts and must contain a not-to-exceed clause, pursuant to 44 CFR § 13.36, *Procurement.*
- ☐ The contract should include a requirement that the contractor provide a safe working environment, including properly constructed monitoring towers.
- ☐ Use of a load ticket system to record with specificity (e.g., street address, GPS coordinates) where debris is collected and the amount picked up, hauled, reduced, and disposed of.
- ☐ Debris monitors should be trained and possess skills adequate to fulfill the duties of the job. Labor rates should be commensurate with the skill level required by the job function. Professional engineers and qualifications are not required to perform monitoring duties.
- ☐ The contractor should demonstrate that its staff is familiar with FEMA debris removal eligibility criteria.

Avoidance Checklist

- ☐ DO NOT: Award a debris removal or debris monitoring contract on a sole-source basis.
- ☐ DO NOT: Sign a contract (including one provided by a contractor) until your legal representative has thoroughly reviewed it.
- ☐ DO NOT: Allow any contractor to make eligibility determinations; only FEMA has authority to make final eligibility determinations.
- ☐ DO NOT: Accept any contractor's claim that it is "FEMA Certified." FEMA does not certify, credential, or recommend debris contractors.
- ☐ DO NOT: Award a contract to develop and manage DMSs, unless the debris sites are part of your approved debris management plan or you contact the state or FEMA for technical assistance concerning the need for such an operations. Temporary Debris Storage and Reduction sites are not always necessary.
- ☐ DO NOT: Allow separate line item payment for stumps 24 inches and smaller in diameter; you should treat these stumps as normal debris.
- ☐ DO NOT: "Piggyback" or utilize a contract awarded by another entity. "Piggybacking" may be legal under applicable state law; however, the use of such a contract may jeopardize FEMA funding because these contracts do not meet requirement for competition established in 44 CFR § 13.36. If an applicant requests reimbursement for costs it incurred from a piggyback contract, FEMA will determine the reasonable cost for the performance of eligible work.
- ☐ DO NOT: Award pre-disaster/standby contracts with mobilization costs or unit costs that are significantly higher than what they would be if the contract were awarded post-disaster. Such contracts should have variable mobilization costs depending upon the size of the debris work that may be encountered.
- ☐ DO NOT: Allow for markups due to errors in volume calculations.
- ☐ DO NOT: Allow for miscellaneous items, or for contract contingencies of any kind, including "unknowns."

APPENDIX D

FHWA Form 1273: Required Contract Provisions Federal-Aid Construction Contracts

ATTACHMENTS

A. Employment and Materials Preference for Appalachian Development Highway System or Appalachian Local Access Road Contracts (included in Appalachian contracts only)

I. General

1. Form FHWA-1273 must be physically incorporated in each construction contract funded under Title 23 (excluding emergency contracts solely intended for debris removal). The contractor (or subcontractor) must insert this form in each subcontract and further require its inclusion in all lower tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services).

   The applicable requirements of Form FHWA-1273 are incorporated by reference for work done under any purchase order, rental agreement or agreement for other services. The prime contractor shall be responsible for compliance by any subcontractor, lower tier subcontractor or service provider.

   Form FHWA-1273 must be included in all federal-aid design-build contracts, in all subcontracts and in lower tier subcontracts (excluding subcontracts for design services, purchase orders, rental agreements and other agreements for supplies or services). The design-builder

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shall be responsible for compliance by any subcontractor, lower tier subcontractor or service provider.

Contracting agencies may reference Form FHWA-1273 in bid proposal or request for proposal documents; however, the Form FHWA-1273 must be physically incorporated (not referenced) in all contracts, subcontracts and lower tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services related to a construction contract).

2. Subject to the applicability criteria noted in the following sections, these contract provisions shall apply to all work performed on the contract by the contractor's own organization and with the assistance of workers under the contractor's immediate superintendence and to all work performed on the contract by piecework, station work, or by subcontract.
3. A breach of any of the stipulations contained in these Required Contract Provisions may be sufficient grounds for withholding of progress payments, withholding of final payment, termination of the contract, suspension/debarment or any other action determined to be appropriate by the contracting agency and FHWA.
4. Selection of Labor: During the performance of this contract, the contractor shall not use convict labor for any purpose within the limits of a construction project on a federal-aid highway unless it is labor performed by convicts who are on parole, supervised release, or probation. The term federal-aid highway does not include roadways functionally classified as local roads or rural minor collectors.

II. Nondiscrimination

The provisions of this section related to 23 CFR Part 230 are applicable to all federal-aid construction contracts and to all related construction subcontracts of $10,000 or more. The provisions of 23 CFR Part 230 are not applicable to material supply, engineering, or architectural service contracts.

In addition, the contractor and all subcontractors must comply with the following policies: Executive Order 11246, 41 CFR 60, 29 CFR 1625-1627, Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), Title VI of the Civil Rights Act of 1964, as amended, and related regulations including 49 CFR Parts 21, 26 and 27; and 23 CFR Parts 200, 230, and 633.

The contractor and all subcontractors must comply with: the requirements of the Equal Opportunity Clause in 41 CFR 60-1.4(b) and, for all construction contracts exceeding $10,000, the Standard Federal Equal Employment Opportunity Construction Contract Specifications in 41 CFR 60-4.3.

Note: The U.S. Department of Labor has exclusive authority to determine compliance with Executive Order 11246 and the policies of the Secretary of Labor including 41 CFR 60, and 29 CFR 1625-1627. The contracting agency and the FHWA have the authority and the responsibility to ensure compliance with Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), and Title VI of the Civil Rights Act of 1964, as amended, and related regulations including 49 CFR Parts 21, 26 and 27; and 23 CFR Parts 200, 230, and 633.

The following provision is adopted from 23 CFR 230, Appendix A, with appropriate revisions to conform to the U.S. Department of Labor (US DOL) and FHWA requirements.

1. **Equal Employment Opportunity:** Equal employment opportunity (EEO) requirements not to discriminate and to take affirmative action to assure equal opportunity as set forth under laws, executive orders, rules, regulations (28 CFR 35, 29 CFR 1630, 29 CFR 1625-1627, 41 CFR 60 and 49 CFR 27) and orders of the Secretary of Labor as modified by the provisions prescribed herein, and imposed pursuant to 23 U.S.C. 140 shall constitute the EEO

and specific affirmative action standards for the contractor's project activities under this contract. The provisions of the Americans with Disabilities Act of 1990 (42 U.S.C. 12101 et seq.) set forth under 28 CFR 35 and 29 CFR 1630 are incorporated by reference in this contract. In the execution of this contract, the contractor agrees to comply with the following minimum specific requirement activities of EEO:

a. The contractor will work with the contracting agency and the Federal Government to ensure that it has made every good faith effort to provide equal opportunity with respect to all of its terms and conditions of employment and in their review of activities under the contract.
b. The contractor will accept as its operating policy the following statement:

"It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, sex, color, national origin, age or disability. Such action shall include: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship, pre-apprenticeship, and/or on-the-job training."

2. **EEO Officer:** The contractor will designate and make known to the contracting officers an EEO Officer who will have the responsibility for and must be capable of effectively administering and promoting an active EEO program and who must be assigned adequate authority and responsibility to do so.
3. **Dissemination of Policy:** All members of the contractor's staff who are authorized to hire, supervise, promote, and discharge employees, or who recommend such action, or who are substantially involved in such action, will be made fully cognizant of, and will implement, the contractor's EEO policy and contractual responsibilities to provide EEO in each grade and classification of employment. To ensure that the above agreement will be met, the following actions will be taken as a minimum:
   a. Periodic meetings of supervisory and personnel office employees will be conducted before the start of work and then not less often than once every six months, at which time the contractor's EEO policy and its implementation will be reviewed and explained. The meetings will be conducted by the EEO Officer.
   b. All new supervisory or personnel office employees will be given a thorough indoctrination by the EEO Officer, covering all major aspects of the contractor's EEO obligations within thirty days following their reporting for duty with the contractor.
   c. All personnel who are engaged in direct recruitment for the project will be instructed by the EEO Officer in the contractor's procedures for locating and hiring minorities and women.
   d. Notices and posters setting forth the contractor's EEO policy will be placed in areas readily accessible to employees, applicants for employment and potential employees.
   e. The contractor's EEO policy and the procedures to implement such policy will be brought to the attention of employees by means of meetings, employee handbooks, or other appropriate means.
4. **Recruitment:** When advertising for employees, the contractor will include in all advertisements for employees the notation: "An Equal Opportunity Employer." All such advertisements will be placed in publications having a large circulation among minorities and women in the area from which the project work force would normally be derived.
   a. The contractor will, unless precluded by a valid bargaining agreement, conduct systematic and direct recruitment through public and private employee referral sources likely to yield qualified minorities and women. To meet this requirement, the contractor will identify sources of potential minority group employees, and establish with such identified sources procedures whereby minority and women applicants may be referred to the contractor for employment consideration.

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b. In the event the contractor has a valid bargaining agreement providing for exclusive hiring hall referrals, the contractor is expected to observe the provisions of that agreement to the extent that the system meets the contractor's compliance with EEO contract provisions. Where implementation of such an agreement has the effect of discriminating against minorities or women, or obligates the contractor to do the same, such implementation violates Federal nondiscrimination provisions.
c. The contractor will encourage its present employees to refer minorities and women as applicants for employment. Information and procedures with regard to referring such applicants will be discussed with employees.

5. **Personnel Actions:** Wages, working conditions, and employee benefits shall be established and administered, and personnel actions of every type, including hiring, upgrading, promotion, transfer, demotion, layoff, and termination, shall be taken without regard to race, color, religion, sex, national origin, age or disability. The following procedures shall be followed:
   a. The contractor will conduct periodic inspections of project sites to ensure that working conditions and employee facilities do not indicate discriminatory treatment of project site personnel.
   b. The contractor will periodically evaluate the spread of wages paid within each classification to determine any evidence of discriminatory wage practices.
   c. The contractor will periodically review selected personnel actions in depth to determine whether there is evidence of discrimination. Where evidence is found, the contractor will promptly take corrective action. If the review indicates that the discrimination may extend beyond the actions reviewed, such corrective action shall include all affected persons.
   d. The contractor will promptly investigate all complaints of alleged discrimination made to the contractor in connection with its obligations under this contract, will attempt to resolve such complaints, and will take appropriate corrective action within a reasonable time. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the contractor will inform every complainant of all of their avenues of appeal.
6. **Training and Promotion:**
   a. The contractor will assist in locating, qualifying, and increasing the skills of minorities and women who are applicants for employment or current employees. Such efforts should be aimed at developing full journey level status employees in the type of trade or job classification involved.
   b. Consistent with the contractor's work force requirements and as permissible under Federal and State regulations, the contractor shall make full use of training programs, i.e., apprenticeship, and on-the-job training programs for the geographical area of contract performance. In the event a special provision for training is provided under this contract, this subparagraph will be superseded as indicated in the special provision. The contracting agency may reserve training positions for persons who receive welfare assistance in accordance with 23 U.S.C. 140(a).
   c. The contractor will advise employees and applicants for employment of available training programs and entrance requirements for each.
   d. The contractor will periodically review the training and promotion potential of employees who are minorities and women and will encourage eligible employees to apply for such training and promotion.
7. **Unions:** If the contractor relies in whole or in part upon unions as a source of employees, the contractor will use good faith efforts to obtain the cooperation of such unions to increase opportunities for minorities and women. Actions by the contractor, either directly

or through a contractor's association acting as agent, will include the procedures set forth below:

a. The contractor will use good faith efforts to develop, in cooperation with the unions, joint training programs aimed toward qualifying more minorities and women for membership in the unions and increasing the skills of minorities and women so that they may qualify for higher paying employment.
b. The contractor will use good faith efforts to incorporate an EEO clause into each union agreement to the end that such union will be contractually bound to refer applicants without regard to their race, color, religion, sex, national origin, age or disability.
c. The contractor is to obtain information as to the referral practices and policies of the labor union except that to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information to the contractor, the contractor shall so certify to the contracting agency and shall set forth what efforts have been made to obtain such information.
d. In the event the union is unable to provide the contractor with a reasonable flow of referrals within the time limit set forth in the collective bargaining agreement, the contractor will, through independent recruitment efforts, fill the employment vacancies without regard to race, color, religion, sex, national origin, age or disability; making full efforts to obtain qualified and/or qualifiable minorities and women. The failure of a union to provide sufficient referrals (even though it is obligated to provide exclusive referrals under the terms of a collective bargaining agreement) does not relieve the contractor from the requirements of this paragraph. In the event the union referral practice prevents the contractor from meeting the obligations pursuant to Executive Order 11246, as amended, and these special provisions, such contractor shall immediately notify the contracting agency.

8. **Reasonable Accommodation for Applicants/Employees with Disabilities:** The contractor must be familiar with the requirements for and comply with the Americans with Disabilities Act and all rules and regulations established there under. Employers must provide reasonable accommodation in all employment activities unless to do so would cause an undue hardship.
9. **Selection of Subcontractors, Procurement of Materials and Leasing of Equipment:** The contractor shall not discriminate on the grounds of race, color, religion, sex, national origin, age or disability in the selection and retention of subcontractors, including procurement of materials and leases of equipment. The contractor shall take all necessary and reasonable steps to ensure nondiscrimination in the administration of this contract.
   a. The contractor shall notify all potential subcontractors and suppliers and lessors of their EEO obligations under this contract.
   b. The contractor will use good faith efforts to ensure subcontractor compliance with their EEO obligations.
10. **Assurance Required by 49 CFR 26.13(b):**
    a. The requirements of 49 CFR Part 26 and the State DOT's U.S. DOT-approved DBE program are incorporated by reference.
    b. The contractor or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of DOT-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the contracting agency deems appropriate.
11. **Records and Reports:** The contractor shall keep such records as necessary to document compliance with the EEO requirements. Such records shall be retained for a period of three years following the date of the final payment to the contractor for all contract work and shall

be available at reasonable times and places for inspection by authorized representatives of the contracting agency and the FHWA.

a. The records kept by the contractor shall document the following:
   (1) The number and work hours of minority and non-minority group members and women employed in each work classification on the project;
   (2) The progress and efforts being made in cooperation with unions, when applicable, to increase employment opportunities for minorities and women; and
   (3) The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minorities and women;
b. The contractors and subcontractors will submit an annual report to the contracting agency each July for the duration of the project, indicating the number of minority, women, and non-minority group employees currently engaged in each work classification required by the contract work. This information is to be reported on Form FHWA-1391. The staffing data should represent the project work force on board in all or any part of the last payroll period preceding the end of July. If on-the-job training is being required by special provision, the contractor will be required to collect and report training data. The employment data should reflect the work force on board during all or any part of the last payroll period preceding the end of July.

III. Nonsegregated Facilities

This provision is applicable to all federal-aid construction contracts and to all related construction subcontracts of $10,000 or more.

The contractor must ensure that facilities provided for employees are provided in such a manner that segregation on the basis of race, color, religion, sex, or national origin cannot result. The contractor may neither require such segregated use by written or oral policies nor tolerate such use by employee custom. The contractor's obligation extends further to ensure that its employees are not assigned to perform their services at any location, under the contractor's control, where the facilities are segregated. The term "facilities" includes waiting rooms, work areas, restaurants and other eating areas, time clocks, restrooms, washrooms, locker rooms, and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing provided for employees. The contractor shall provide separate or single-user restrooms and necessary dressing or sleeping areas to assure privacy between sexes.

IV. Davis-Bacon and Related Act Provisions

This section is applicable to all federal-aid construction projects exceeding $2,000 and to all related subcontracts and lower tier subcontracts (regardless of subcontract size). The requirements apply to all projects located within the right-of-way of a roadway that is functionally classified as federal-aid highway. This excludes roadways functionally classified as local roads or rural minor collectors, which are exempt. Contracting agencies may elect to apply these requirements to other projects.

The following provisions are from the U.S. Department of Labor regulations in 29 CFR 5.5 "Contract provisions and related matters" with minor revisions to conform to the FHWA-1273 format and FHWA program requirements.

1. **Minimum wages**
   a. All laborers and mechanics employed or working upon the site of the work, will be paid unconditionally and not less often than once a week, and without subsequent deduction

or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph 1.d. of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed.

The wage determination (including any additional classification and wage rates conformed under paragraph 1.b. of this section) and the Davis-Bacon poster (WH–1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

b.(1) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(i) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(ii) The classification is utilized in the area by the construction industry; and

(iii) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

b.(2) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

b.(3) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Wage and Hour Administrator for determination. The Wage and Hour Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise

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the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

b.(4) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs 1.b.(2) or 1.b.(3) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

c. Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

d. If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

2. Withholding

The contracting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract, or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the contracting agency may, after written notice to the contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

3. Payrolls and basic records

a. Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

b.(1) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the contracting agency. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH–347 is available for this purpose from the Wage and Hour Division Web site at http://www.dol.gov/esa/whd/forms/wh347instr.htm or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the contracting agency for transmission to the State DOT, the FHWA or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the contracting agency.

b.(2) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(i) That the payroll for the payroll period contains the information required to be provided under §5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under §5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

(ii) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

(iii) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

b.(3) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH–347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 3.b.(2) of this section.

b.(4) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

c. The contractor or subcontractor shall make the records required under paragraph 3.a. of this section available for inspection, copying, or transcription by authorized representatives of the contracting agency, the State DOT, the FHWA, or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the FHWA may, after written notice to the contractor, the contracting agency, or the State DOT, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

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4. Apprentices and trainees

a. Apprentices (programs of the USDOL).

Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice.

The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed.

Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination.

In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

b. Trainees (programs of the USDOL).

Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration.

The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration.

Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division

determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed.

In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

c. Equal employment opportunity.

The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

d. Apprentices and Trainees (programs of the U.S. DOT).

Apprentices and trainees working under apprenticeship and skill training programs which have been certified by the Secretary of Transportation as promoting EEO in connection with federal-aid highway construction programs are not subject to the requirements of paragraph 4 of this Section IV. The straight time hourly wage rates for apprentices and trainees under such programs will be established by the particular programs. The ratio of apprentices and trainees to journeymen shall not be greater than permitted by the terms of the particular program.

5. Compliance with Copeland Act requirements.

The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

6. Subcontracts.

The contractor or subcontractor shall insert Form FHWA-1273 in any subcontracts and also require the subcontractors to include Form FHWA-1273 in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

7. Contract termination: debarment.

A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

8. Compliance with Davis-Bacon and Related Act requirements.

All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

9. Disputes concerning labor standards.

Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

10. Certification of eligibility.

a. By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

b. No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).
c. The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

V. Contract Work Hours and Safety Standards Act

The following clauses apply to any federal-aid construction contract in an amount in excess of $100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by 29 CFR 5.5(a) or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

1. **Overtime requirements.** No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.
2. **Violation; liability for unpaid wages; liquidated damages.** In the event of any violation of the clause set forth in paragraph (1.) of this section, the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (1.) of this section, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (1.) of this section.
3. **Withholding for unpaid wages and liquidated damages.** The FHWA or the contacting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (2.) of this section.
4. **Subcontracts.** The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (1.) through (4.) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (1.) through (4.) of this section.

VI. Subletting or Assigning the Contract

This provision is applicable to all federal-aid construction contracts on the National Highway System.

1. The contractor shall perform with its own organization contract work amounting to not less than 30 percent (or a greater percentage if specified elsewhere in the contract) of the total original contract price, excluding any specialty items designated by the contracting agency.

Specialty items may be performed by subcontract and the amount of any such specialty items performed may be deducted from the total original contract price before computing the amount of work required to be performed by the contractor's own organization (23 CFR 635.116).

a. The term "perform work with its own organization" refers to workers employed or leased by the prime contractor, and equipment owned or rented by the prime contractor, with or without operators. Such term does not include employees or equipment of a subcontractor or lower tier subcontractor, agents of the prime contractor, or any other assignees. The term may include payments for the costs of hiring leased employees from an employee leasing firm meeting all relevant Federal and State regulatory requirements. Leased employees may only be included in this term if the prime contractor meets all of the following conditions:
   (1) the prime contractor maintains control over the supervision of the day-to-day activities of the leased employees;
   (2) the prime contractor remains responsible for the quality of the work of the leased employees;
   (3) the prime contractor retains all power to accept or exclude individual employees from work on the project; and
   (4) the prime contractor remains ultimately responsible for the payment of predetermined minimum wages, the submission of payrolls, statements of compliance and all other Federal regulatory requirements.

b. "Specialty Items" shall be construed to be limited to work that requires highly specialized knowledge, abilities, or equipment not ordinarily available in the type of contracting organizations qualified and expected to bid or propose on the contract as a whole and in general are to be limited to minor components of the overall contract.

2. The contract amount upon which the requirements set forth in paragraph (1) of Section VI is computed includes the cost of material and manufactured products which are to be purchased or produced by the contractor under the contract provisions.
3. The contractor shall furnish (a) a competent superintendent or supervisor who is employed by the firm, has full authority to direct performance of the work in accordance with the contract requirements, and is in charge of all construction operations (regardless of who performs the work) and (b) such other of its own organizational resources (supervision, management, and engineering services) as the contracting officer determines is necessary to assure the performance of the contract.
4. No portion of the contract shall be sublet, assigned or otherwise disposed of except with the written consent of the contracting officer, or authorized representative, and such consent when given shall not be construed to relieve the contractor of any responsibility for the fulfillment of the contract. Written consent will be given only after the contracting agency has assured that each subcontract is evidenced in writing and that it contains all pertinent provisions and requirements of the prime contract.
5. The 30% self-performance requirement of paragraph (1) is not applicable to design-build contracts; however, contracting agencies may establish their own self-performance requirements.

VII. Safety: Accident Prevention

This provision is applicable to all federal-aid construction contracts and to all related subcontracts.

1. In the performance of this contract the contractor shall comply with all applicable Federal, State, and local laws governing safety, health, and sanitation (23 CFR 635). The contractor

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shall provide all safeguards, safety devices and protective equipment and take any other needed actions as it determines, or as the contracting officer may determine, to be reasonably necessary to protect the life and health of employees on the job and the safety of the public and to protect property in connection with the performance of the work covered by the contract.

2. It is a condition of this contract, and shall be made a condition of each subcontract, which the contractor enters into pursuant to this contract, that the contractor and any subcontractor shall not permit any employee, in performance of the contract, to work in surroundings or under conditions which are unsanitary, hazardous or dangerous to his/her health or safety, as determined under construction safety and health standards (29 CFR 1926) promulgated by the Secretary of Labor, in accordance with Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3704).
3. Pursuant to 29 CFR 1926.3, it is a condition of this contract that the Secretary of Labor or authorized representative thereof, shall have right of entry to any site of contract performance to inspect or investigate the matter of compliance with the construction safety and health standards and to carry out the duties of the Secretary under Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3704).

VIII. False Statements Concerning Highway Projects

This provision is applicable to all federal-aid construction contracts and to all related subcontracts.

In order to assure high quality and durable construction in conformity with approved plans and specifications and a high degree of reliability on statements and representations made by engineers, contractors, suppliers, and workers on Federal-aid highway projects, it is essential that all persons concerned with the project perform their functions as carefully, thoroughly, and honestly as possible. Willful falsification, distortion, or misrepresentation with respect to any facts related to the project is a violation of Federal law. To prevent any misunderstanding regarding the seriousness of these and similar acts, Form FHWA-1022 shall be posted on each Federal-aid highway project (23 CFR 635) in one or more places where it is readily available to all persons concerned with the project:

18 U.S.C. 1020 reads as follows:

"Whoever, being an officer, agent, or employee of the United States, or of any State or Territory, or whoever, whether a person, association, firm, or corporation, knowingly makes any false statement, false representation, or false report as to the character, quality, quantity, or cost of the material used or to be used, or the quantity or quality of the work performed or to be performed, or the cost thereof in connection with the submission of plans, maps, specifications, contracts, or costs of construction on any highway or related project submitted for approval to the Secretary of Transportation; or

Whoever knowingly makes any false statement, false representation, false report or false claim with respect to the character, quality, quantity, or cost of any work performed or to be performed, or materials furnished or to be furnished, in connection with the construction of any highway or related project approved by the Secretary of Transportation; or

Whoever knowingly makes any false statement or false representation as to material fact in any statement, certificate, or report submitted pursuant to provisions of the Federal-aid Roads Act approved July 1, 1916, (39 Stat. 355), as amended and supplemented;

Shall be fined under this title or imprisoned not more than 5 years or both."

IX. Implementation of Clean Air Act and Federal Water Pollution Control Act

This provision is applicable to all federal-aid construction contracts and to all related subcontracts.

By submission of this bid/proposal or the execution of this contract, or subcontract, as appropriate, the bidder, proposer, federal-aid construction contractor, or subcontractor, as appropriate, will be deemed to have stipulated as follows:

1. That any person who is or will be utilized in the performance of this contract is not prohibited from receiving an award due to a violation of Section 508 of the Clean Water Act or Section 306 of the Clean Air Act.
2. That the contractor agrees to include or cause to be included the requirements of paragraph (1) of this Section X in every subcontract, and further agrees to take such action as the contracting agency may direct as a means of enforcing such requirements.

X. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion

This provision is applicable to all federal-aid construction contracts, design-build contracts, subcontracts, lower tier subcontracts, purchase orders, lease agreements, consultant contracts or any other covered transaction requiring FHWA approval or that is estimated to cost $25,000 or more—as defined in 2 CFR Parts 180 and 1200.

1. Instructions for Certification—First Tier Participants:
   a. By signing and submitting this proposal, the prospective first tier participant is providing the certification set out below.
   b. The inability of a person to provide the certification set out below will not necessarily result in denial of participation in this covered transaction. The prospective first tier participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective first tier participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction.
   c. The certification in this clause is a material representation of fact upon which reliance was placed when the contracting agency determined to enter into this transaction. If it is later determined that the prospective participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the contracting agency may terminate this transaction for cause of default.
   d. The prospective first tier participant shall provide immediate written notice to the contracting agency to whom this proposal is submitted if at any time the prospective first tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.
   e. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180 and 1200. "First Tier Covered Transactions" refers to any covered transaction between a grantee or subgrantee of Federal funds and a participant (such as the prime or general contract). "Lower Tier Covered Transactions" refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). "First Tier Participant" refers to the participant who has entered into a covered transaction with a grantee or subgrantee of Federal funds (such as the prime or general contractor). "Lower Tier Participant" refers

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to any participant who has entered into a covered transaction with a first tier participant or other lower tier participants (such as subcontractors and suppliers).

f. The prospective first tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction.

g. The prospective first tier participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transactions," provided by the department or contracting agency, entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the $25,000 threshold.

h. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the Excluded Parties List System website (https://www.epls.gov/), which is compiled by the General Services Administration (now at Sam.gov).

i. Nothing contained in the foregoing shall be construed to require the establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of the prospective participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

j. Except for transactions authorized under paragraph (f) of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.

* * * * *

2. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion—First Tier Participants:

   a. The prospective first tier participant certifies to the best of its knowledge and belief, that it and its principals:

      (1) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency;

      (2) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

      (3) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (a)(2) of this certification; and

(4) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

b. Where the prospective participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

1. Instructions for Certification—Lower Tier Participants:

(Applicable to all subcontracts, purchase orders and other lower tier transactions requiring prior FHWA approval or estimated to cost $25,000 or more—2 CFR Parts 180 and 1200)

a. By signing and submitting this proposal, the prospective lower tier is providing the certification set out below.

b. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department, or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

c. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous by reason of changed circumstances.

d. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180 and 1200. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations. "First Tier Covered Transactions" refers to any covered transaction between a grantee or subgrantee of Federal funds and a participant (such as the prime or general contract). "Lower Tier Covered Transactions" refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). "First Tier Participant" refers to the participant who has entered into a covered transaction with a grantee or subgrantee of Federal funds (such as the prime or general contractor). "Lower Tier Participant" refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

e. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.

f. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the $25,000 threshold.

g. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the Excluded Parties List System website (https://www.epls.gov/), which is compiled by the General Services Administration (now at Sam.gov).

h. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

i. Except for transactions authorized under paragraph e of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

* * * * *

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion—Lower Tier Participants:

1. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency.

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2. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

* * * * *

XI. Certification Regarding Use of Contract Funds for Lobbying

This provision is applicable to all federal-aid construction contracts and to all related subcontracts which exceed $100,000 (49 CFR 20).

1. The prospective participant certifies, by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:
   a. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any federal contract, the making of any Federal grant, the making of any federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
   b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.
2. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.
3. The prospective participant also agrees by submitting its bid or proposal that the participant shall require that the language of this certification be included in all lower tier subcontracts, which exceed $100,000 and that all such recipients shall certify and disclose accordingly.

ATTACHMENT A—EMPLOYMENT AND MATERIALS PREFERENCE FOR APPALACHIAN DEVELOPMENT HIGHWAY SYSTEM OR APPALACHIAN LOCAL ACCESS ROAD CONTRACTS

This provision is applicable to all federal-aid projects funded under the Appalachian Regional Development Act of 1965.

1. During the performance of this contract, the contractor undertaking to do work which is, or reasonably may be, done as on-site work, shall give preference to qualified persons who regularly reside in the labor area as designated by the DOL wherein the contract work is situated, or the subregion, or the Appalachian counties of the State wherein the contract work is situated, except:
   a. To the extent that qualified persons regularly residing in the area are not available.
   b. For the reasonable needs of the contractor to employ supervisory or specially experienced personnel necessary to assure an efficient execution of the contract work.

   c. For the obligation of the contractor to offer employment to present or former employees as the result of a lawful collective bargaining contract, provided that the number of non-resident persons employed under this subparagraph (1.c) shall not exceed 20 percent of the total number of employees employed by the contractor on the contract work, except as provided in subparagraph (4) below.
2. The contractor shall place a job order with the State Employment Service indicating (a) the classifications of the laborers, mechanics and other employees required to perform the contract work, (b) the number of employees required in each classification, (c) the date on which the participant estimates such employees will be required, and (d) any other pertinent information required by the State Employment Service to complete the job order form. The job order may be placed with the State Employment Service in writing or by telephone. If during the course of the contract work, the information submitted by the contractor in the original job order is substantially modified, the participant shall promptly notify the State Employment Service.
3. The contractor shall give full consideration to all qualified job applicants referred to him by the State Employment Service. The contractor is not required to grant employment to any job applicants who, in his opinion, are not qualified to perform the classification of work required.
4. If, within one week following the placing of a job order by the contractor with the State Employment Service, the State Employment Service is unable to refer any qualified job applicants to the contractor, or less than the number requested, the State Employment Service will forward a certificate to the contractor indicating the unavailability of applicants. Such certificate shall be made a part of the contractor's permanent project records. Upon receipt of this certificate, the contractor may employ persons who do not normally reside in the labor area to fill positions covered by the certificate, notwithstanding the provisions of subparagraph (1.c) above.
5. The provisions of 23 CFR 633.207(e) allow the contracting agency to provide a contractual preference for the use of mineral resource materials native to the Appalachian region.
6. The contractor shall include the provisions of Sections 1 through 4 of this Attachment A in every subcontract for work which is, or reasonably may be, done as on-site work.

APPENDIX E

Curbside Collection Program Checklist

- ☐ Identify/quantify material to be collected (by type and quantity). Recognize that the waste stream is likely to change over time as removal progresses.
- ☐ Determine processing and facility needs. Determine if any facilities in the area have capabilities to process certain types of debris. Evaluate landfill capacities, capabilities to separate and/or recover materials. Evaluate recycling capabilities.
- ☐ Identify labor and equipment needs. Determine what is available in-house, through mutual aid, and through contracts and other resources.
- ☐ Secure funding for the program. Even if the operations are reimbursable through a federal agency, the jurisdiction must provide funds up-front and then seek reimbursement.
- ☐ Review eligibility requirements. Ensure a common understanding of what will and will not be eligible for pickup. If federal reimbursement will be sought, review program eligibility requirements.
- ☐ Select method to locate curbside waste. Determine how curbside waste piles will be identified for pickup (e.g., at street level using staff to do canvassing, use of GIS, etc.).
- ☐ Determine method of implementation. Determine who will conduct pickup (e.g., force account or contractor). Determine if mixed waste streams or segregated material will be picked up at the curb. Determine the number of passes that will be completed.
- ☐ Use drop-off locations, if appropriate. As operations progress, curbside pickup might become inefficient, necessitating the use of drop-off sites to collect remaining debris.
- ☐ Identify temporary storage areas as necessary. Determine if waste will be hauled directly to processing facilities and landfills, or if a debris management site (DMS) will be used to stage and process debris.
- ☐ Identify/establish markets for collected materials. Determine if there is a market or other end use for some of the disaster debris. Consider implementing an incentive program for haulers.
- ☐ Develop methods to encourage reuse or recycling of debris materials. Educate haulers and the public about the benefits of recycling and how to accomplish.
- ☐ Review contract requirements. If contracts will be issued, determine scopes of work. Ensure compliance with all pertinent (e.g., local, state, federal) contracting requirements. As appropriate, have purchasing departments establish prior claim on contractors through Letters of Agreement.

- ☐ Develop tracking/documentation system. Track progress to understand accomplishments and work remaining. Document work to ensure the program is being implemented correctly. Also, maintaining documentation of labor and equipment hours is important for seeking federal reimbursement.
- ☐ Develop a public information program/strategy. Determine messaging, media outlets that will be used to inform the public and other stakeholders about the program, including what will be picked up, a schedule, and an end date for the program. Consider how communication with non-English speaking sectors of the community will be accomplished.
- ☐ Develop monitoring and enforcement programs as required. Inspectors and load tickets are two commonly used methods for monitoring a curbside debris collection program.
- ☐ Establish a transportation network with well-defined uses. Classify roads according to their use, vehicle speed, and destination linkage.
- ☐ Consolidate a transportation network, and then clear entire sectors. Transportation corridors progress from primary routes to secondary feeder roads to residential streets.
- ☐ Assign contractors to sectors. Sectors are prioritized so that access to essential services buildings are cleared first.
- ☐ Mark vehicles used in the transportation of debris (government, contractors, and others) by an easily identifiable permit or bar code to ensure unimpeded access to disaster areas.
- ☐ Handle all soft goods such as bedding, mattresses, curtains, carpeting, and clothes as soon as possible. No salvageable material are collected from these items, which are extremely heavy and hard to handle and need to be mechanically loaded by bucket loaders and/or excavators with grapples.
- ☐ Machine-load trucks hauling debris to maximize space efficiency for each load.

Sources:

Solis, GY; Hightower, HC; Sussex, J; and Kawaguchi, J (1995) Disaster Debris Management. The Disaster Preparedness Resources Center, The University of British Columbia for Emergency Preparedness Canada, British Columbia.

State of Arizona Division of Emergency Management Recovery Section SOP PA, Section 9, Debris Management (May 2008).

APPENDIX F

Private Property Debris Removal and Demolition Checklist

Adapted from FEMA 326, and State of Arizona Division of Emergency Management Recovery Section SOP PA, Section 9, Debris Management.

- ☐ Follow local government's normal condemnation procedures (e.g., hearings and notices).
- ☐ Verify ownership.
- ☐ Secure right-of-entry and hold-harmless agreement from the property owner.
- ☐ If property owner cannot be located, a legally authorized local official could exercise public emergency powers to allow entry without owner's permission.
- ☐ Complete environmental and historic preservation reviews.
- ☐ Coordinate with other agencies as appropriate.
- ☐ Document insurance coverage.
- ☐ Verify personal property removal.
- ☐ Record GPS coordinates. Photograph site before and after removal/demolition.
- ☐ For demolition, also:
  - ○ Obtain a building official's assessment of the property condition.
  - ○ Notify lien holder.
  - ○ Conduct necessary inspections (e.g., building, public health, and fire).
  - ○ Notify public of condemnation and demolition in accordance with local procedures.
  - ○ Verify structure is unoccupied.
  - ○ Cap water, well, sewer, gas, and septic lines. Disconnect electrical service. Remove propane tanks.
  - ○ Mark easements and underground utilities.
  - ○ Identify/remove/dispose of asbestos, lead-based paint, other hazardous materials present at the site per governing requirements.
  - ○ Demolish the structure.
- ☐ Segregate, transport, and dispose of (demolition) debris in accordance with the debris management plan. Document debris removal from the site. Complete and submit required paperwork.

Source: State of Arizona Division of Emergency Management Recovery Section SOP PA, Section 9, Debris Management (May 2008).

APPENDIX G

State of Arizona Division of Emergency Management Recovery Section SOP PA, Section 9, Debris Management Disaster Debris Table

Putrescible & Vegetative Debris	Inert Debris	Construction & Demolition Debris	Personal Property Debris	Damaged White Goods	Hazardous Waste & Special Waste	Damaged Vehicles	Other
• Foods • Leaves • Branches • Uprooted Trees • Shrubs	• Mud • Dirt • Rocks • Sand	• Acrylic • Asphalt • Blinds • Brick • Carpet • Concrete • Drywall • Electrical Wires • Lighting Bulbs • Glass & Mirrors • Insulation • Masonry • Metals • Tiles • Pipes • Plastics • Rubble • Rebar • Utility Poles • Vinyl • Wood	• Beds • Mattresses • Computers • Desks • Telephones • Typewriters • Chairs • Chests • Lamps • Sofas • Artwork • Books • Papers • Clothing • Ceramics • Furniture	• Washing Machines • Dryers • Dishwashers • Refrigerators • Stoves • Hot Water Tanks • Furnaces	Hazardous Waste: • Asbestos • Wastes • Cleaning Agents • Combustibles • Explosives • Fertilizers • Oils • Paints • Pesticides • Radioactive Materials • Solvents • Other Toxics Special Waste: • Dead Animals • Biomedical	• Boats • Cars • Buses • Trucks • Small Planes	• Bi-metal Containers • Plastic & Glass Bottles • Charred Wood • Ash • Sand Bags

Source: State of Arizona Division of Emergency Management Recovery Section SOP PA, Section 9, Debris Management (May 2008).

APPENDIX H

Debris Monitoring Tools (FEMA)

LOAD TICKET	**Ticket No.** 000001
Section 1	
Prime Contractor:	**Date:**
Subcontractor (Hauler):	**Departure Time:**
Driver:	**Truck Plate No.:**
Measured Bed Capacity (cu. yds.):	
Debris Pickup Site Location: **(must be a street address)**	
Debris Type: □ **Vegetation** □ **Construction & Demolition** □ **Mixed** □ **Other:**	
Loading Site Monitor: **Print Name:** **Signature:**	
Remarks:	
Section 2	
Debris Disposal Site Location:	
Estimate Debris Quantity: cu. yds. _____	**Arrival Time:**
Disposal Site Monitor: **Print** **Name:** _____ **Signature:**	
Remarks:	
Copies: White – Load Site Monitor Green – Disposal Site Monitor Canary, Pink, Gold – Onsite Contractor's Representative or Driver	

Debris Loading Site Monitoring Checklist

Date: _____

Arrival Time: _____Departure Time: _____Weather Conditions: _____

Loading Site Location: _____

(Street address or nearest intersection)

GPS Location: **N**_____; **W**_____

Loading Site Monitor's Name _____

(Print Name)

Roving Monitor's Name: _____

(Print Name)

_____

(Signature)

Loading Site

1. Is the Site Monitor filling out the Load Ticket properly? YES NO ☐ ☐

   If NO, explain actions taken:

   _____

   _____

2. Is the Contractor loading eligible debris from the designated right-of-way (approximately 15' from curb)? YES NO ☐ ☐

   If NO, explain actions taken:

   _____

   _____

3. Is the Contractor loading trucks to capacity? YES NO ☐ ☐

   If NO, explain actions taken:

   _____

   _____

4. Identify Contractor's truck numbers observed while on site:

   _____;_____;_____;_____;_____;_____;_____;_____;_____

   _____;_____;_____;_____;_____;_____;_____;_____;_____

5. Were photographs taken at the loading site? YES NO ☐ ☐

   If YES, list photo log numbers: _____;_____;_____;_____;_____

General Notes and Comments: (Include observations within the general area as to overall cleanup activities)

_____

_____

_____

_____(Use reverse side if necessary)

Debris Disposal Site Monitoring Checklist

Date: _____
Arrival Time: _____Departure Time: _____Weather Conditions: _____
Disposal Site Location: _____
(Street address or nearest intersection)
GPS Location: **N**_____; **W**_____
Disposal Site Monitor's Name _____
(Print Name)
Roving Monitor's Name: _____
(Print Name)

_____
(Signature)

Disposal Site

1. Is the Disposal Monitor filling out the Load Ticket properly? YES NO ☐ ☐
   If NO, explain actions taken:
   _____
   _____

2. Is the Disposal Monitor attaching a copy of the Weight Ticket to the Load Ticket? YES NO ☐ ☐
   If NO, explain actions taken:
   _____
   _____

3. Are the Contractor's trucks loaded to capacity? YES NO ☐ ☐
   If NO, explain actions taken:
   _____
   _____

4. Identify Contractor's truck numbers observed while on site:
   _____;_____;_____;_____;_____;_____;_____;_____;_____
   _____;_____;_____;_____;_____;_____;_____;_____;_____

5. Were photographs taken at the loading site? YES NO ☐ ☐
   If YES, list photo log numbers: _____;_____;_____;_____;_____

General Notes and Comments: (Include observations of operations at the landfill)
_____
_____
_____
_____(Use reverse side if necessary)

Debris Disposal Site Load Tracking Log

Debris Disposal Site Load Tracking Log							
Date		Supervisor's Name		Debris Contractor's Site Representative's Name			
Weather: am:			Weather: pm				
Location			Monitor's Name(s)				
Truck No.	Ticket No.	Ticket Owner	Estimated Quantity (CY)	Monitor's Initials	Load Accepted	Load Denied	Remarks

TRUCK CERTIFICATION FORM

DUMP TRUCK

Measurements

Truck Measurements — Length (L) = ____ Width (W) ft = ____ Height (H) ft = ____

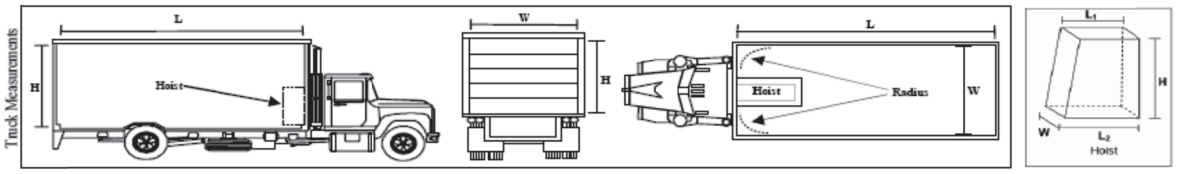
Hoist Measurement — $Length_1$ (L_1) ft = ____ $Length_2$ (L_2) ft = ____ $WidthH$ (W_H) ft = ____ $HeightH$ (H_H) ft = ____

Radius — Radius ft = ____ Height (H) = ____

Calculations

Bed Volume (Basic)	(LxWxH)/27 =	+	cyd
Hoist Volume	((L1+L2/2) x W_H x H_H)/27 =	-	cyd
Radius Volume	($3.14xR^2xH$)/27 =	-	cyd
	Total =		cyd

Cubic Yards



EXTRA TRAILER

Measurements

Truck Measurements (Basic) — Length (L) = ____ Width (W) ft = ____ Height (H) ft = ____

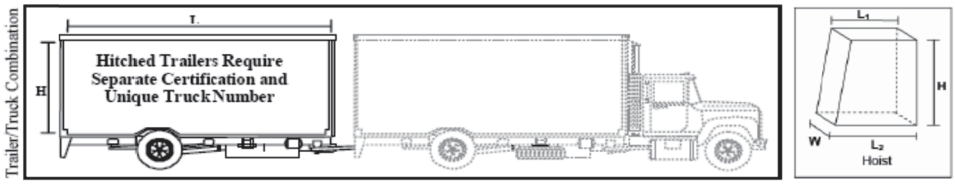
Hoist Measurement — $Length_1$ (L_1) ft = ____ $Length_2$ (L_2) ft = ____ $WidthH$ (W_H) ft = ____ $HeightH$ (H_H) ft = ____

Radius — Radius ft = ____ Height (H) = ____

Calculations

Bed Volume (Basic)	(LxWxH)/27 =	+	cyd
Hoist Volume	((L_1+L_2/2) x W_H x H_H) =	-	cyd
Radius Volume	($3.14xR^2xH$)/27 =	-	cyd
	Total =		cyd

Cubic Yards



ROUND BOTTOM TRUCK

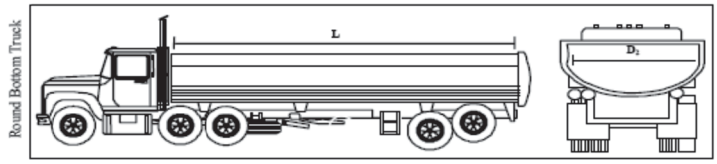
Measurements

Truck Measurements — Length (L) ft = ____ Diameter (D) ft = ____

Calculations

Approx. Volume ($3.14 \times (D/2)^2 \times L$) /27 = ____ cyd (round bottom portion only)

Cubic Yards



TOWER LOCATIONS:
#1 -
#2 -
#3 -

REFERENCE E: SAMPLE MONITORING REPORT
DEBRIS REMOVAL

PAGE_____OF_____

TOWER LOCATION	DAILY COUNT	DATE	TIME	TRUCK NUMBER	CONTENTS	DISC NUMBER	PICTURE NUMBERS	CUBIC YD CAPACITY	% LOAD	LOAD VALUE
#	1							CY	%	CY
#	2							CY	%	CY
#	3							CY	%	CY
#	4							CY	%	CY
#	5							CY	%	CY
#	6							CY	%	CY
#	7							CY	%	CY
#	8							CY	%	CY
#	9							CY	%	CY
#	10							CY	%	CY
#	11							CY	%	CY
#	12							CY	%	CY
#	13							CY	%	CY
#	14							CY	%	CY
#	15							CY	%	CY
#	16							CY	%	CY
#	17							CY	%	CY
#	18							CY	%	CY
#	19							CY	%	CY
#	20							CY	%	CY
#	21							CY	%	CY
#	22							CY	%	CY
#	23							CY	%	CY
#	24							CY	%	CY
#	25							CY	%	CY
#	26							CY	%	CY
#	27							CY	%	CY
#	28							CY	%	CY
#	29							CY	%	CY
#	30							CY	%	CY
PAGE TOTAL										**CY**

APPENDIX I

Debris Reduction Information

Reduction by Grinding and Chipping

- Strong winds and tornadoes present opportunity for a big grinding and chipping operation as the method of debris reduction. The resulting product of the chipping and grinding operation may be used as a landfill product, used as topsoil, or used for residential applications.
- Chipping operations are suitable in areas where streets are narrow or in groves of trees where it is cheaper to reduce the vegetation to mulch and then return it to affected areas.
- The debris manager should work with local environmental and agricultural groups to see if there is any market for mulch.
- When contracting a mulching project the most important consideration is the specification of the size of the mulch. The mulch also must remain free of paper and plastic if used for agricultural purposes. The following information is for the use of mulch as an agricultural product:

  Size: Average size of wood chips is not to exceed four inches in length and one-half inch in diameter. The debris reduction rate for moderately contaminated debris is 100 to 150 cubic yards per hour and when the debris is relatively clean it is 200 to 250 cubic yards per hour.

  Contaminants: The contamination rate for material other than wood products should be less than ten percent of the mulch. Eliminate plastics completely. Use rake loaders to pick up debris because normal loaders pick up earth, which is part of the contaminant list and harms the chipper.
- Chippers are best used in residential areas, orchards, or groves. Trees present a problem if they are pushed to the side of the public right-of-way because of cost associated with transportation.
- Grinders are ideal for use at debris staging and reduction sites due to high volume capacity. Due to high capacity of debris a large storage area is needed for a large grinding operation. Sound protection also becomes a very important issue.

Reduction by Recycling

- Recycling offers an option to reduce debris before it is hauled to the landfill. Recycling is a publicly supported function that has economic values for the recovered materials. Metals, wood, and soils are commonly recyclable. A drawback is the impact of recycling on the environment. In areas of agriculture there may be a large amount of fertilizer use. Therefore, use of soil may be limited due to contamination.
- Recycling, when chosen, should be by a contractor who specializes in sorting debris. Contract monitoring is a part of a recycling operation because the contractors must comply with local, state, and federal environmental regulations.
- Recycling should be given consideration early in a disaster because it may reduce cost of debris removal. The materials capable of being recycled include:
  - **Metals**—Most metals are able to be recycled and do not contain iron. However, trailer frames and other iron containing metals may be included in the recyclable materials. The

metals are separated by the use of an electromagnet. The resulting materials can be sold to metal recycling firms.

- **Soil—**Soil recycling operations use large pieces of equipment to pick up soil. The soil is transported to a staging area and reduction sites where it is combined with organic material that will decompose. Large amounts of soil can be recovered if the material is put through a screen system. The resulting soil can be given back to the agricultural community. The soil also may be used for local landfills as cover materials.
- **Wood—**Wood debris can be ground or chipped into mulch.
- **Construction material—**Concrete or other building materials can be used for other purposes if there is a need for them. The materials also may be shred to reduce volume then used as a cover for landfills.

  Residue material—Residue material that cannot be recycled, such as cloth, rugs, and trash, can be sent to landfills for disposal.

From Ohio Department of Public Safety Ohio Emergency Management Agency Debris Management, Sample County Plan Appendices Appendix J: Temporary Debris Storage and Reduction Site Checklist.

APPENDIX J

State of Arizona Division of Emergency Management Recovery Section SOP PA, Section 9, Debris Management Reuse and Recycling Markets for Disaster Debris

DEBRIS MATERAL	USE	MARKETS
Putrescible & Vegetative Debris	**Food Wastes:** Compost **Trees, Branches, Leaves:** Mulch, Landfill Cover, Fuel	Farms, Composting Facilities, Landscape Companies, Landfills
Inert Debris	Gravel, Backfill, Soil Amendment, Landfill Cover	Cement Manufactures, Soil Amendment/Horticultural Industry, Landscape Companies, Landfills and Construction Companies
Construction & Demolition	**Asphalt:** Recycled Asphalt **Concrete:** Aggregate Base, Sidewalk Backfill, Gravel Road Cap, Decorative Gravel **Construction Lumber:** Reuse, Fuel, Bulking Agents **Construction Plastics:** Reuse or Recycle **Drywall:** Gunite Mix, Soil Amendments, New Drywall, Reuse **Carpet:** Secondary Fibers for Recycled Content Products **Metals:** Scrap Metal	Public Works Construction Contractors, Construction Companies, Asphalt Recyclers, Public Works Departments Construction Companies, Building Restoration & Repair Contractors, Cogeneration Plants, Waste to Energy Plants Plastics Recyclers, Construction Companies, Salvage Dealers Drywall Manufactures Carpet Recyclers and Rag Industry Construction Companies, Metals Recyclers, Salvage Dealers, Smelters and Steel Mills
Personal Property	Repaired and Reused	Resale shops, Non-profit Organizations
Damaged White Goods	Repaired and Reused, Metals Salvaged	Resale shops, Repair Shops, Second Hand Appliance Shops, Scrap Metal Dealers
Damaged Vehicles	Repaired and Reused, Salvage	Resale, Metal Salvage Yards
Hazardous Wastes	**Latex Paint:** Recycle **Used Motor Oil:** Recycle	Paint Manufactures Motor Oil Manufactures
Bi-metal Containers **Plastic & Glass Bottles** **Sand Bags**	Recycled	Standard Recycling Markets Cement Manufactures

Source: State of Arizona Division of Emergency Management Recovery Section SOP PA, Section 9, Debris Management (May 2008).

APPENDIX K

Disaster Cost Tracking Sample

Event Cost Tracking Sheet

Event:

Division:

Date:

Facility/Location Name: _____

Facility/Location Address: _____

Include longitude and latitude if possible _____

_____

Facility/Location Type: Public or Private _____

Damage Summary: *Indicate type of work done and or damage at facility/location. Indicate the type of work needed at facility/location.*

Personnel: *Its very important to track permanent, contracted, and temporary personnel hours for this facility/location to include regular hours worked, overtime hours worked and each employees rate*

Name (indicate permanent, contracted or temp)	Regular Hours Worked	Overtime Hours Worked	Rate	Fringe Benefits

Equipment: *Its very important to track equipment used for this facility/location to include type, hours used, hourly rate and amount of fuel used for each piece of equipment*

Type (include rated horsepower/capacity and rented or owned)	Hours Used/Hours Idle	Hourly Rate	Operator	Fuel Used*
* Fuel used should be tracked for a comprehensive cost, however the rate for each type of equipment would already include potential reimbursement rate.				

Materials: *Its very important to track materials used for this facility/location to include type, whether it was in stock or ordered and amount used*

Type	In stock/Ordered	Amount Used

Debris Removal: *Its very important to track the debris removed from this facility/location to include quantity and type**

Quantity	Type (vegetative, C&D, other)	Location of Pickup	Location of Disposal

* Regular debris removal operations should always follow and be tracked according to the procedures outlined in the Debris Management Plan.

APPENDIX L

USGS Chain of Custody Form

http://pubs.usgs.gov/circ/c1138/c1138.pdf

USGS Mineral Resources Survey Program

Chain of Custody Form

___ of ___ Pages

Submitted By:		Number of Samples:
Received By:		Sample Media:
Data/Time Received:	Job Number:	Lab Numbers:

List Sample Identification Numbers

Custodial Locations

Received By: (Time and Date)	Purpose:	Location:	Returned To: (Time and Date)

APPENDIX M

North Carolina Department of Environment and Natural Resources (NCDENR) Environmental Evaluation Checklist

M-2 A Debris Management Handbook for State and Local DOTs and Departments of Public Works

NCDENR

Division of Waste Management - Solid Waste Section

Emergency Site Selection Evaluation Sheet

Disaster Debris

Site Name: _____ Site Location: _____

Physical Address
or Directions: _____

City: _____ County: _____

Primary Contact: _____ Telephone #: _____

Additional Contact: _____ Telephone #: _____

Approx. Size of Area to be used for Disaster Debris: _____ Acres

GPS Coordinates (decimal degrees): _____ N _____ W

Intended Use of Site:

☐ Staging/Storage for **Removal** ☐ Staging/Storage for **Chipping** ☐ Staging/Storage for **Burning**

Please provide a brief description of planned operations:

Type of Waste:

☐ **Vegetative** Debris ☐ **Demolition** Debris

Comments: _____

Buffers Required *(the following must be clearly delineated with flagging, survey stakes, etc.)*:

☐ 100 feet from property boundaries and on-site structures

☐ 100 feet from residences, private wells (vegetative debris only), and septic tank systems

☐ 100 feet from surface waters

☐ 250 feet from potable wells (demolition debris)

☐ 300 feet from grinding operations to residence and business properties, publicly owned roads or properties

Please attach a site plan and/or aerial photograph showing the boundaries and location of the proposed site.

Additional information can be found at http://portal.ncdenr.org/web/wm/sw/dds

DWM Use Only:

Buffers have met DWM Requirements ☐ YES / ☐ NO

Flood Plain or Flood Prone Areas _____

Wetlands _____

Erosion Control _____

Access, Site Security _____

Safety Issues - Power Lines, Traffic, etc. _____

Coordination with the Division of Air Quality ☐ YES / ☐ NO / ☐ NA

Buffers have met DAQ Requirements ☐ YES / ☐ NO

Coordination with Land Quality Section ☐ YES / ☐ NO / ☐ NA

Coordination with State Historic Preservation Office (SHPO)/Office of State Archaeology ☐ YES / ☐ NO

Coordination with Natural Heritage Program (endangered species) ☐ YES / ☐ NO

General Comments _____

Coordinates Verified ☐ YES / ☐ NO

Solid Waste Section Representative _____ Date of Inspection _____

APPENDIX N

Kansas Department of Health and Environment (KDHEKS) Disposal Options for Large Quantities of Dead Animals

Kansas Department of Health and Environment
Bureau of Waste Management
1000 SW Jackson, Suite 320, Topeka, Kansas 66612-1366

Disposal Options for Large Quantities of Dead Animals

Technical Guidance Document SW-2001-G1

Large numbers of livestock may be killed during a disease outbreak or natural disaster such as a snow storm. These mortalities require special disposal procedures to prevent creating hazards to human health, animal health, and the environment. This technical guidance document (TGD) outlines acceptable practices for the disposal of large quantities of dead animals (six or more animal units as defined in KSA 65-171d). Disposal options for small quantities of dead animals are described in TGD SW-1994-G1.

The Bureau of Waste Management (BWM), along with the Animal Health Commissioner-Kansas Department of Agriculture (785-296-2326), will provide advice on disposal options which meet the requirements of K.S.A. 47-1219 and K.S.A. 65-3407c(a)(5).

The statutory options for disposal, in order of preference, are:

1. Rendering;
2. Composting;
3. Disposal at a municipal solid waste landfill;
4. Burial on site; and
5. Incineration or open burning.

The table on the next page indicates environmental, cultural, and safety factors that may be affected by the different disposal options. Each of these should be considered when determining which disposal method is the best option.

Rendering is the preferred option of disposal for large quantities of dead animals; however, very large quantities of animals or animals with an infectious disease may nullify this option.

Composting may be an option for large numbers of dead animals. If animal mortalities resulted from a disease, contact BWM for guidance on appropriateness of composting.

Disposal at a permitted municipal solid waste landfill is the third most desirable option. These facilities are constructed to safely dispose of organic wastes. However, very large quantities of animals and/or long transport distances may make this option impractical.

Burial on site requires authorization from the Kansas Department of Health and Environment (KDHE). This method may be used for the disposal of whole unprocessed livestock at a location near where the animals died if the deaths were the result of a natural disaster or if the carcasses present an emergency situation (K.S.A. 65-3407c(a)(5)).

A request for disposal must be submitted to BWM on a *Disposal of Solid Waste Without a Permit* (Disposal of Whole Unprocessed Livestock Carcasses) authorization application which includes written approval from the landowner and from the local government or zoning authority.

The following guidelines should be followed when burying animals on-site:

- With the help of KDHE District Office staff, select a site that will be protective of ground and surface water.
- Bury animals within 48 hours unless otherwise authorized.
- Add quick or slaked lime, if necessary, to control odors and thus discourage scavenging.
- Cover animals with a minimum of three feet of soil.

Incineration or open burning may be required by the Animal Health Commissioner to prevent disease transmission. KDHE's Bureau of Air (785-296-1593) must be consulted for approval of location and methods of combustion.

Appendix U-KDHEKS Disposal Options for Large Quantities of Dead Animals

BWM TGD SW-2001-G1: Disposal Options for Large Quantities of Dead Animals

The following table, modified from USDA Animal and Plant Health Inspection Service information, indicates the areas of concern that should be considered when determining which disposal method is the best option. To use this table, decide on the disposal method that is most suited to your situation, then look down the column under the chosen disposal method at the "X"s, "R"s, and "K"s to determine which areas of concern apply to that disposal method. You will need to be sure that all areas marked have been considered and appropriate controls are in place to minimize the impacts of the chosen disposal methods on these areas of concern.

Area of Concern	Method			
	Burial	Incineration or Open Burning	Rendering	Composting
Surface Water	X, K		X, R	X, K
Groundwater	X, K			X, K
Air	X	X, R, K	X, R	X
Wildlife	X			
Public Safety and Worker Health	X	X	X	
Solid Waste	X, K	X		X, K
Vegetation	X	X		
Cultural and Historical	X	X		
Utilities	X	X		
Climate	X	X		X

X- denotes applicability
R- denotes all Federal, State, and local discharge permit requirements must be satisfied in order to mitigate or eliminate any impacts
K- denotes KDHE has specific regulations which must be met

Kansas Department of Health and Environment District Offices

North Central District Office
2501 Market Place, Suite D
Salina, Kansas 67401-7699
(785) 827-9639; NCDOAdmin@kdheks.gov

South Central District Office
130 South Market, 6th Floor
Wichita, Kansas 67202-3802
(316) 337-6020; SCDOAdministrators@kdheks.gov

Northeast District Office
800 West 24th Street
Lawrence, Kansas 66046-4417
(785) 842-4600; NEDOAdmin@kdheks.gov

Southeast District Office
1500 West 7th
Chanute, Kansas 66720-2570
(620) 431-2390; SEDOAdmin@kdheks.gov

Northwest District Office
2301 East 13th Street
Hays, Kansas 67601-2651
(785) 625-5663; NWDOAdmin@kdheks.gov

Southwest District Office
302 West McArtor Road
Dodge City, Kansas 67801-6014
(620) 225-0596; SWDOAdmin@kdheks.gov

For additional information regarding the proper management of solid or hazardous waste in Kansas, you may visit the Bureau of Waste Management website at http://www.kdheks.gov/waste/ or contact the Bureau at: (785) 296-1600, bwm_web@kdheks.gov, or the address at the top of this document.

APPENDIX O

Kansas Department of Health and Environment (KDHEKS) Disposal Options for Small Quantities of Dead Animals

Kansas Department of Health and Environment
Bureau of Waste Management
1000 SW Jackson, Suite 320, Topeka, Kansas 66612-1366

Disposal Options for Small Quantities of Dead Animals

Technical Guidance Document SW-1994-G1

Dead animals comprise a small but identifiable portion of the solid waste generated in Kansas. This technical guidance document (TGD) outlines acceptable practices for the disposal of small quantities of dead animals. Disposal options for large quantities of dead animals are described in TGD SW-2001-G1.

Small quantity

A small quantity of dead animals is less than six animal units, based on the definition found in KSA 65-171d. An animal unit is approximately the equivalent of one cow or two pigs or five ducks.

Small vs. large animals

Acceptable disposal methods are determined in part by the size of the animal. Large animals include cattle, horses, and most other farm animals. Small animals typically include ducks, turkeys, chickens, and household pets. The options for disposal of small quantities of large and small animals follow, listed in order from most preferable to least preferable.

Large animals

1. Take the animal(s) to a commercial rendering facility;
2. Compost the animal(s) on the farm;
3. Direct-haul the animal(s) to a permitted municipal solid waste landfill;
4. Take the animal(s) to a local large animal veterinarian;
5. Bury the animal(s) on the farm.

Small animals

1. Take the animal(s) to a permitted municipal solid waste landfill.
2. Take the animal(s) to a local veterinarian.
3. Take the animal(s) to a pet cemetery or crematory.
4. Bury the animals(s) on-site.
5. Take the animal(s), with proper packaging, to a transfer station. Proper packaging would include placing each animal in a five-gallon plastic pail with a lid or in a doubled-up plastic trash sack.
6. Compost the animal(s) on-site.

On-site burial

The following guidelines should be followed when burying animals on site:

- Bury animals within 48 hours unless otherwise authorized.
- Add quick or slaked lime, if necessary, to control odors and discourage scavenging.
- Cover animals with a minimum of three feet of soil.

For additional information regarding the proper management of solid or hazardous waste in Kansas, you may visit the Bureau of Waste Management website at http://www.kdheks.gov/waste/ or contact the Bureau at: (785) 296-1600, bwm_web@kdheks.gov, or the address at the top of this document.

LOCAL CASE STUDY

Lessons from Two Years of Severe Storms

David Gofstein is the director of Public Works for the Town of Coventry, Connecticut. With a permanent staff of about 16, he has managed debris removal operations for the town for over 10 years. In the past 2 years, severe storms including Hurricane Irene and Hurricane Sandy have created large amounts of vegetative debris and downed power lines in the largely rural community.

Planning

David is careful to keep track of his resources—staff, trucks, equipment. His office manager keeps weekly roll-ups of timecards, and he keeps an index card with the locations of all of his crews at all times. This serves two important purposes: First, it allows him to quickly assess and allocate resources based on the situation, and second, it provides a thorough starting point if his department ever needs to apply for reimbursement.

The town does not have a formal debris management plan but has engaged in detailed planning efforts that inform every debris management operation. David's crews have very specific standard operating procedures (SOPs) for tasks such as clearing debris near downed power lines. In addition, the town holds several mutual-aid agreements with neighboring jurisdictions. But David notes that **an effective debris management operation requires a mix of planning and thinking "on the fly"**—every disaster is different, and no plan can account for every scenario.

Preparedness

David and his team watch weather forecasts carefully. **The most important consideration in the days leading up to a storm is a well-rested staff.** Safe operations require rested crews, and decision making after a storm requires clear-headedness.

Response

After a storm occurs, David's DPW has to make a decision about whether to respond. These decisions are made in consultation with the town manager and depend on a number of factors, including the expected quantity of debris, whether a federal disaster declaration is expected, and the town's current fiscal situation. David notes that, because Coventry is so rural, the residents are often able to push their own debris into woody areas rather than requiring city services.

Operations

If the decision is made to remove debris, David works with the state Department of Transportation to assign and prioritize routes for clearance. He notes that, when residents hear that the town is removing debris, they often place non-storm debris in the public right-of-way for removal; for this reason, he estimates that his **crews collect 10–15% more debris than the storm-related estimate**.

David's crews work closely with utility companies, in particular electric and telecommunications companies. This prevents his crews from touching power lines until they are declared dead, and allows rapid service restoration by removing the most damaging downed trees. Often, David has to balance protecting infrastructure with rapid service restoration—**sometimes, it is faster to push downed trees aside than to remove them, even if it means a little bit more damage to the electric infrastructure**. David notes that he doesn't want to cause a lot of damage, but he has to be willing to make those kinds of calls, especially if it means that emergency vehicles have better access.

After most storms, primary route clearing occurs within the first 48 hours, but depending on the storm, secondary removal can take up to 45 days. David points out that **normal operations don't stop just because there's debris on the road**; the goal is to have the most positive response with the least amount of resources.

Public Information

David notes the importance of understanding the level of service expected by residents, but **he also stresses the importance of setting deadlines within which residents may have their debris cleared**. This helps to limit complaints and prevent endless debris management operations. The town often allows residents to place debris in their driveways until a certain day or bring storm-related debris to the town dump within a certain set of operating hours.

Site Selection and Segregation

The Town of Coventry has landfill space pre-identified, which allows for easy site selection. In the past, the town considered using public spaces such as parks as temporary debris removal sites. However, David's experience is that **even if the site is "temporary," it often takes a very long time to clear all the debris**, and residents don't like to have their parks overrun with debris. Debris managers must know not just to pile debris anywhere there is an opening.

David notes the importance of segregating debris from the very beginning—vegetative debris goes in one area, construction and demolition debris goes in another, and so on. **If crews don't segregate from the very first load, it is impossible to go back through and sort.**

Reduction, Recycling, and Disposal

Most of the debris in Coventry is woody, which means chipping and grinding are often good disposal techniques. Collection and reduction efforts often depend on the situation. For instance, after Hurricane Sandy, **it was quicker to chip debris directly into the woods than to hire a contractor or transport it to a DMS**. In other instances, however, chipping as they cleared slowed crews down significantly, meaning they could not clear routes as quickly as they needed to.

In addition to chipping on the fly, David and the DPW have been able to recycle woody debris in two innovative ways. **Very large trees are cut down to firewood**, which is placed on the curbside for residents to collect. Because of the high demand for firewood, residents claimed it quickly at little or no cost to the city. **Other woody debris is chipped and laid down over foot paths and other public spaces**, saving money for both debris disposal and park maintenance.

Reimbursement

Reimbursement is available through the state when the federal government declares a disaster, and David has applied for reimbursement for several operations. He notes that **records don't have to be especially detailed as long as they are consistent and can be validated**. He ensures that he and anyone reviewing his application can match up every driver with a truck and every truck with its equipment. Dispatch records and time cards help to ensure that this is possible. He does note that it can take time for reimbursement funds to travel from the federal government through the state to the town.

Conclusion

David Gofstein and the Town of Coventry have successfully combined careful planning, resource tracking, and on-the-fly thinking to manage several severe storms over the course of two years. As David says, "The challenge is to be able to accomplish everything without everything you need. If you're able to accomplish everything, you probably have more than what you need."

STATE CASE STUDY

Severe Storms

From January 26–30, 2009, the state of Kentucky was blanketed by a significant ice storm. The storm began in the western part of the state and slowly moved eastward over a period of days, impacting 103 of the state's 120 counties. The storm resulted in over 15 million cubic yards of vegetative debris impacting roads throughout the state, making many routes impassable. The state received a federal disaster declaration on February 5, 2009.

The Kentucky Transportation Cabinet (KYTC) is the state agency responsible for coordinating debris removal from state-maintained roads, including Federal-aid highways. Within the KYTC, the Office of Project Delivery & Preservation's Division of Maintenance is tasked with overseeing debris management. There is a full-time disaster preparedness coordinator who develops and coordinates the statewide debris management program. KYTC also has twelve highway districts that oversee maintenance of the transportation systems within each district, including debris removal.

At the time the ice storm occurred, the KYTC's Disaster Coordinator, Frank Castle, reports that he had been in that position for less than three months. The KYTC did not have a disaster debris management plan (DMP), but it did have a hierarchy of priority state-maintained routes for snow and ice removal: Interstates, parkways, and National Highway System roads are top priority; state secondary roads are second priority; and rural secondary roads are third priority. Using the priority system as the basis for their debris operations for the ice storm, the district forces mobilized to begin clearing roads for emergency vehicles. They cut debris at the edge of the pavement or shoulder to get the roadways clear without removing any debris. During the clearance process, two issues surfaced that had to be overcome:

- Downed utility lines impeded debris clearance operations. KYTC had to coordinate closely with utility providers to remove downed power lines so that debris clearance operations could continue.
- The ice storm destroyed many cell towers and telephone lines in the western part of the state, effectively cutting off communication to several of the highway districts and a significant portion of the population. KYTC tried using their satellite phones, but discovered that ice on the antennas was impacting effective usage and also that the service provider had access to only one satellite, which limited access. Searching for other communication methods, KYTC discovered that while some cell phone providers' towers were inoperable, others still had service, so they purchased pre-paid phones with the providers that still had service and sent them out to personnel working in the impacted areas. They also used the National Guard's HAM radio operators working in the state's emergency operations center to communicate with the highway districts in the western part of the state.

After clearance was accomplished, KYTC was faced with the daunting task of removing and disposing of all of the debris that was generated. Never having had a debris-generating disaster

CS-6 A Debris Management Handbook for State and Local DOTs and Departments of Public Works

of this magnitude before, they did not have debris removal, disposal, or monitoring contracts in place prior to the event. They had learned from a previous disaster that using their existing contract for hazardous tree and brush removal did not comply with federal contracting requirements because, Castle reports, that the scope of work is " just not geared for the big volume disasters." The KYTC determined that first they needed to issue a contract for debris removal. Because they did not have the contracting authority to do this at the time the disaster occurred, they coordinated with the Finance and Administration Cabinet to issue requests for bids. Subsequently, they also issued requests for disposal and monitoring contracts, in that order. The KYTC learned several lessons from this contracting experience, and Castle recommends consideration of the following:

- Every contractor should be required to submit performance bonds. When performance bonds are not required, an agency risks having contractors work for a few days, deciding that they're not going to make enough profit for the project to be worthwhile, and walking off the job.
- Contractors who bid on work in a county or district must agree to do the work at the low bid price. In other words, if multiple contractors bid on the same job and multiple awards are made, all awards will be made at the low bid price. Contractors selected for award have the option of declining the award.
- **Award a debris monitoring contract before you award debris removal or disposal contracts. Castle asserts, "That's something every agency ought to have in advance of a storm."**
- Make reimbursements on the basis of weight rather than volume. Estimating cubic yards of debris is difficult and subjective and can lead to denial of reimbursement by federal agencies under their debris programs. "We're going by the ton because there is less guesswork by the ton," Castle reports. Include a contractual requirement for the contractors to provide certified scales calibrated on a regular basis.

During removal operations, KYTC and their contractors removed vegetative debris from right-of-way to right-of-way on state-maintained roads. They also removed debris from public roads in a few cities and counties with which they had Memoranda of Agreement (MOAs). "The biggest problem there," Castle says, "is that sometimes they (cities and counties) don't follow the same purchasing guidelines as we do, and they did a lot of no-bid contracts that got us in a little bit of hot water . . . but that's something that going forward we're going to be looking out for because there are certain purchasing guidelines, even in an emergency." Disposal contractors and KYTC force account labor were instructed not to pick up utility poles; those were the responsibility of the utilities that had agreements to use KYTC right-of-way.

The debris was transported to designated debris management sites (DMSs). Some of the sites were in the KYTC right-of-way, some were operated by cities or counties through MOAs, and some sites were on agricultural property. "That's another lesson learned," Castle says. "That's one thing in the debris management plan now, that we will not use agricultural property for a DMS . . . We tried to develop a plan where we use our own right-of-way first, and then last resort would be land leases, but then we try to use commercial property. Under no circumstances will we use agricultural property again."

Most of the vegetative debris that was collected was burned using open-air burning. The Kentucky Energy and Environment Cabinet issued permits to the KYTC to conduct open burns to reduce the debris. The Energy and Environment Cabinet posted a list of every permitted burn site, with latitude and longitude as well as what was covered in the permit, on their website so that anyone who was interested could look online to see which sites were approved for which actions in each county. Representatives of the Division of Forestry were

on-site during the burning to ensure that it was accomplished in accordance with the permits. The KYTC worked with the Forestry Division to ensure that debris piles were of the appropriate size and did not get too big for controlled burning. Vegetative debris that was not burned was chipped or ground into mulch.

Nearly all of the reduced vegetative debris was recycled. "Very little if any went to landfills," says Castle. "We recycled pretty well everything; all of our burn, even our ash, could be incorporated into the soil . . . if you incorporate it into the soil, it's fertilizer." Regarding the mulch from chipping and grinding, Castle remarks, "Believe it or not, there was a market for that in different places throughout the state. Some was sold to paper mills, some was mulched to use for gardens, and Kingsford Charcoal took some of it, so we were able to dispose of all the chips and mulch and even sell some of it." The KYTC has had to obtain letters from the Environmental Energy Cabinet to provide to federal agencies stating that the open-air burns as well as the recycling methods used for the debris were conducted in accordance with the policies of the state's Divisions of Air Quality and Waste Management. Castle recommends obtaining this type of documentation and keeping it on file in case it is needed for future reference.

Knowing the importance of tracking disaster costs separately from other expenses, the KYTC set up a separate charge code in their accounting system to use for disaster-related labor, equipment, materials, and contracted expenses. The debris removal contractors used a paper ticket system, so the debris monitoring contractor established a database to which they scanned and coded every paper ticket, invoice, and other documented expense associated for the disaster. This database is on a one terabyte hard drive.

The KYTC also participated in several meetings with FHWA and FEMA to agree on a methodology for which agency would cover which costs. The method that was agreed to was based on load tickets and road miles of public roads. This was particularly important for debris removal that was accomplished by force account labor and equipment, as the state did not generate its own load tickets. Instead, the KYTC set up a web-based mapping system showing federal-aid roads and publicly-maintained roads by county. The number of road miles on the FHWA system was divided by the total miles of publicly-maintained roads in a county to calculate the percentage of roadways on the FHWA system, and that is the amount of reimbursement that FHWA provided on a percentage basis of the total cost of removal for that county. FEMA paid the remaining percentage. So, for example, KYTC performed debris removal in a county having 3,000 miles of federal-aid roads and 10,000 miles total of publicly-maintained roads, FHWA reimbursed KYTC for 30% (or 3,000/10,000) of the total cost of eligible debris removal from roadways in that county. It was important to have written documentation of this agreement as well as what was considered the legal responsibility of the KYTC to remove debris (right-of-way to right-of-way) for future inquiries by FEMA personnel who were not in the meeting regarding eligible costs.

Debris removal operations were completed on June 3, 2009. In September 2009, the KYTC learned that the nesting habitat of the endangered Indiana Bat was in some of the areas where debris removal operations had taken place, and that the nesting season had started on May 15, 2009. To be in compliance with federal environmental requirements for protecting endangered species, the KYTC had to develop a methodology for estimating how much of the bat habitat might have been disturbed by debris removal operations occurring between May 15 and June 3. They made a contribution to the Indiana Bat Conversation Fund administered by the Kentucky Natural Lands Trust based on the estimate they developed. They have added the bat habitat areas to their emergency funding routes website so the information is readily available should it be needed in the future.

Frank Castle states that he took away two significant lessons learned from the 2009 ice storm that he has successfully applied to subsequent disasters, including the 2012 tornadoes that struck the state. He advises:

1. Every state and local agency responsible for disaster debris "needs an emergency operations plan (EOP) and a DMP, and that DMP needs to be part of the EOP. We learned you need both an EOP and a DMP." Both plans should be formally adopted as policy. Other state and local governments that already have these plans are willing to share them as models for developing your own plans. The FEMA debris guides are also good sources of information.
2. Having a pre-event debris monitoring contract in place is critical. Castle asserts, "I don't care if it's a city or a county government, they probably ought to have access to a monitoring company that does more than monitoring, that will come in and do a complete database and work with FEMA, FHWA, and NRCS to do all the documentation, scan everything in . . . put it on a hard drive and give it to the agency they're working for. That's one lesson I think every agency ought to have." Using this contracted resource also allows your agency to dedicate its workforce to providing citizens with the services it is responsible to provide.

Abbreviations and acronyms used without definitions in TRB publications:

A4A	Airlines for America
AAAE	American Association of Airport Executives
AASHO	American Association of State Highway Officials
AASHTO	American Association of State Highway and Transportation Officials
ACI–NA	Airports Council International–North America
ACRP	Airport Cooperative Research Program
ADA	Americans with Disabilities Act
APTA	American Public Transportation Association
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATA	American Trucking Associations
CTAA	Community Transportation Association of America
CTBSSP	Commercial Truck and Bus Safety Synthesis Program
DHS	Department of Homeland Security
DOE	Department of Energy
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
FMCSA	Federal Motor Carrier Safety Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
HMCRP	Hazardous Materials Cooperative Research Program
IEEE	Institute of Electrical and Electronics Engineers
ISTEA	Intermodal Surface Transportation Efficiency Act of 1991
ITE	Institute of Transportation Engineers
MAP-21	Moving Ahead for Progress in the 21st Century Act (2012)
NASA	National Aeronautics and Space Administration
NASAO	National Association of State Aviation Officials
NCFRP	National Cooperative Freight Research Program
NCHRP	National Cooperative Highway Research Program
NHTSA	National Highway Traffic Safety Administration
NTSB	National Transportation Safety Board
PHMSA	Pipeline and Hazardous Materials Safety Administration
RITA	Research and Innovative Technology Administration
SAE	Society of Automotive Engineers
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (2005)
TCRP	Transit Cooperative Research Program
TEA-21	Transportation Equity Act for the 21st Century (1998)
TRB	Transportation Research Board
TSA	Transportation Security Administration
U.S.DOT	United States Department of Transportation