

## THE LEEVE MANAGEMENT GUIDE WILL:

- » *Detail procedures, methodologies, and tools for the safe operation and maintenance of levees.*
- » *Provide supplemental resources for carrying out levee-specific activities (e.g., operations and maintenance manual and emergency action plan templates, inspection checklist).*
- » *Highlight the responsibilities of a levee owner/operator to be eligible for post-flood repair assistance under Public Law (P.L.) 84-99 and provide practices for vegetation management per Section 3013 of the Water Resources Development Act of 2014.*

## Levee Management Guide *Purpose and Scope Overview*

During the first phase of stakeholder engagement for the National Levee Safety Program, feedback on the National Levee Safety Guidelines identified a need to consolidate practical information for levee owners/operators in one location and, in some circumstances, provide additional detail on procedures and methodologies as well as supplemental resources to support the safe operation and maintenance of levees. The Levee Management Guide is being developed, with stakeholder input, as a supplement to the National Levee Safety Program Guidelines to consolidate the information needed by anyone who has a responsibility for some or all aspects of the operations, maintenance, and management decisions on levees.

The Levee Management Guide will assist users with understanding and carrying out responsibilities for operating and maintaining a levee from the time it is constructed through its useful life. The content in the Levee Management Guide can also help users develop specific products, such as operations and maintenance manuals and emergency action plans, to document and communicate information specific to an individual levee.

The guide is divided into four primary sections, which are described below.

**Essential Levee Concepts.** It is anticipated that this section will focus on concepts that inform levee operation and maintenance. While the remainder of the guide primarily focuses on the day-to-day activities that are important to keeping the levee and levee owner/operator ready for the next flood, this section provides important context that informs those activities. This includes topics such as the role levees play in flood risk

management and how to use information about levee performance and potential consequences to support levee operation and maintenance and flood preparation activities.

**Activities Before a Flood.** This section will focus on the range of activities that should be carried out to achieve maximum preparedness for a flood event. These activities may include:

**Establishing an Operations and Maintenance Strategy:** Developing strategies for operations, maintenance, rehabilitation, replacement, and inspection activities. The strategy should also provide a framework for inspections, vegetation management, permitting and encroachments, and data management. The Levee Management Guide highlights the benefits of documenting these approaches in an Operations and Maintenance Manual in coordination with others if there is a shared responsibility for management of the levee system.

- » **Security:** Considering security measures related to preventing intentional or unintentional threats to infrastructure or accidents that could result in injury.
- » **Staff Training and Exercises:** Continually educating staff on concepts such as understanding levee operations and recent inspection and risk assessment information. Examples of trainings and exercises are provided.
- » **Communication and Community Engagement:** Communicating planned activities or concerns about the levee system to stakeholders and the public prior to a flood. Community understanding of the levee system and support for levee owners can aid management of the levee system.

## OPERATIONS AND MAINTENANCE OBJECTIVES

- Maintain levee to meet intended level of flood risk reduction
- Effectively train staff and monitor levee to anticipate and respond to emergencies in a timely manner
- Effectively manage cost and budgets
- Allow for secondary community benefits (e.g., recreation) without compromising flood risk reduction

### » Inspection, Maintenance, and Operations of Levee

**Features:** Keeping the levee ready for a flood through regular, ongoing activities specific to each levee feature (e.g., earthen embankments, pump stations, or floodwalls).

- » **Emergency Planning:** Supporting good emergency response planning with activities such as establishing notification procedures for levee staff and related external agencies, developing communication channels with local public officials, training a response team, and developing evacuation plans based on inundation maps and breach modeling, among others.
- » **Activities in Preparation for Forecasted Flooding and Storms:** Taking action before the flood occurs but when flood conditions are forecasted, such as reviewing emergency planning documents, activating the response team, and conducting pre-flood inspections and maintenance.

**Activities During a Flood.** It is anticipated that this section will focus on levee operations during a flood including practices and procedures for managing response teams, conducting inspections during floods, as well as documenting, reporting, and responding to emergency situations. Specifically, it will cover:

- » **Levee Operations:** Using procedures outlined in the levee Operations and Maintenance Manual to take actions to keep water out and remove it from behind the levee if necessary.
- » **Managing Response Teams:** Organizing and managing staff and volunteer response teams, including communication techniques and properly resourcing teams.
- » **Inspections and Performance Data Collection:** Collecting data on levee performance during a flood event, including high water marks. Performance data can help plan future levee improvements and flood response actions.

- » **Incident Reporting:** Reporting performance issues internally and externally, including what information to convey, and how to convey it in accordance with emergency planning documents.
- » **Flood Fight:** Planning for and performing flood fight activities. This section covers common flood fight techniques, materials, and supplies based on observed conditions or incidents, as well as how to request additional materials from units of government.
- » **Flood Response Coordination and Information:** Regularly communicating about the status of activities and severity of issues on the levee to community leaders and emergency managers to help them make decisions regarding public alerts and evacuations.

**Activities After a Flood.** It is anticipated that this section will focus on practices and procedures immediately following a flood to restore the levee to its previous condition and/or begin the recovery process if damages were incurred. Topics covered include:

- » **Post Flood Operations:** Returning the levee to pre-flood conditions, including reopening gates and closures, cleaning, and replenishing flood fight materials.
- » **Flood Fight Material Removal:** Removing the temporary materials used in flood response to maintain levee integrity.
- » **Post Flood Inspection and Levee Performance Assessment:** Identifying damaged locations and collecting information to evaluate levee performance during the flood and inform any needed repairs.
- » **Flood Damage Repairs:** Using inspection information to evaluate and prioritize repairs, distinguishing between short-term “emergency” repairs and “permanent” long-term repairs, and typical repairs considered urgent.
- » **Lessons Learned and Performance Documentation:** Maintaining a record of levee performance, flood response, and emergency management activities is important for ongoing levee risk management and updating emergency action plans. This may include collaboration between the levee owners and other external agencies to collect various documentation.

## SUPPLEMENTAL RESOURCES

Additional resources are being developed to further support levee owners/operators with levee management activities. These products, which are supplemental to the Levee Management Guide, would be adaptable for any user. Draft products under development include:

**Operations and Maintenance Manual Template:** Having a well-documented operations and maintenance manual that provides comprehensive guidance and proven procedures for the consistent implementation of levee activities can improve the overall efficiency of managing the levee. The operations and maintenance manual template will help users create or improve their own operations and maintenance manual. Because every levee is unique and operations and maintenance requirements vary by levee, the template can be customized by inserting levee specific information into the relevant portions of the template and omitting portions that are not applicable.

**Emergency Action Plan Template:** A well-developed emergency action plan that identifies potential emergency conditions and specific actions to take for each condition, including coordinating with appropriate agencies and communicating with members of the affected community, can help reduce the overall impacts of the emergency to people, property, and infrastructure. This document will guide users through developing content appropriate for a levee emergency action plan. Because every levee is unique and emergency response requirements vary by levee, the template can be customized by inserting specific information into the relevant portions of the template and omitting portions that are not applicable.

**Levee Inspection Checklist:** Having a consistent approach to conducting levee inspections can assist inspectors with knowing

what to look for and properly documenting levee conditions, which can ultimately lead to more efficient inspections and better quality of levee data collected. Effective inspections allow for the prompt identification and correction of maintenance issues before they progress to more severe issues that can be costly to repair or result in emergencies during a flood. This document will serve as a tool that can be used to facilitate effective levee inspections.

**Flood Fight Techniques Document:** The capability to detect and respond to levee issues during a flood can significantly decrease the damage sustained to the levee or the likelihood of the issue escalating to levee breach or inundation of the leveed area. This document will cover national best practices for responding to a wide range of levee issues that have been encountered during floods including uncontrolled underseepage, through-seepage, instability, erosion, overtopping and malfunction or mis-operation of a levee feature. Best practices will focus on materials needed and techniques to address these issues.

**Levee Cost Brochure:** Prioritizing work on levees is often necessary, particularly when resources are limited. To make informed levee management decisions, as well as plan for future investments, it is important to understand all the costs associated with an activity. This brochure aims to help users with this understanding by providing high-level ranges of costs for common levee-related activities.

**USACE/FEMA Program Guide:** A wide range of programs exist within USACE and FEMA that can support effective levee management, but navigating the programs can be complex and confusing. This document will present information in an accessible way to help users understand the types of assistance available for specific levee-related activities.

## HOW THE NATIONAL LEEVE SAFETY GUIDELINES, LEEVE MANAGEMENT GUIDE AND SUPPLEMENTAL TOOLS COLLECTIVELY SUPPORT LEEVE OWNER/OPERATORS

 <b>NATIONAL LEEVE SAFETY GUIDELINES</b>	 <b>LEEVE MANAGEMENT GUIDE</b>	 <b>SUPPLEMENTAL RESOURCES</b>
<i>Principles and best practices</i>	<i>Applying principles and best practices considering levee specific circumstances</i>	<i>Templates, checklists, cost information and other tools</i>
<i>High-level concepts for inspection, operation and maintenance</i>	<i>Detailed information regarding “what to look for” and “how to do it” applicable to any levee</i>	<i>Guidance for carrying out activities and developing products using information unique to individual levees</i>
<i>Broad audience</i>	<i>Focused audience (levee owner/operator)</i>	<i>Focused audience (levee owner/operator)</i>