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**Engineering and Design**

# USACE Levee Safety Program

FOR THE COMMANDER:

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**Purpose**. This engineer circular establishes the policies for implementing the U.S. Army Corps of Engineers Levee Safety Program and describes the program-specific activities, roles, and responsibilities for federally authorized levees. This document also describes activities that levee sponsors are required to conduct or participate in, consistent with their project agreements. Other U.S. Army Corps of Engineers programs and authorities may reference or use U.S. Army Corps of Engineers Levee Safety Program procedures to meet the technical aspects of their program.

**Applicability**. This circular is applicable to all U.S. Army Corps of Engineers commands having Civil Works responsibilities.

**Distribution Statement**. Approved for public release; distribution is unlimited.

**Proponent and Exception Authority**. The proponent of this circular is the Headquarters, United States Army Corps of Engineers, Engineering and Construction Division Chief. The proponent has the authority to approve exceptions or waivers to this circular that are consistent with controlling law and regulations. Only the proponent of a publication or form may modify it by officially revising or rescinding it.

This circular supersedes EC 1165-2-218, dated 22 April 2021.

# *Summary of Change*

EC 1165-2-218
United States Army Corps of Engineers Levee Safety Program

This administrative revision, dated 16 June 2023:

- Reduces the level of detail in the Levee Inspection and Site Visit Appendix due to subsequently published Standard Operating Procedures.
- Removes redundancies and makes administrative updates regarding how the Levee Safety Program interfaces with other programs, such as the Public Law 84-99 Program.
- Simplifies language describing program requirements to improve clarity and document readability.

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## Glossary of Terms

# Chapter 1
# Introduction and Background

## 1–1. Purpose

This engineer circular establishes the policies for implementing the U.S. Army Corps of Engineers Levee Safety Program and describes the program-specific activities, roles, and responsibilities for federally authorized levees. This document also describes activities that levee sponsors are required to conduct or participate in, consistent with their project agreements. Other U.S. Army Corps of Engineers programs and authorities may reference or use U.S. Army Corps of Engineers Levee Safety Program procedures to meet the technical aspects of their program.

## 1–2. Distribution statement

Approved for public release; distribution is unlimited.

## 1–3. References

See Appendix A.

## 1–4. Records management (recordkeeping) requirements

The records management requirement for all record numbers, associated forms, and reports required by this publication are addressed in the Army Records Retention Schedule. Detailed information for all related record numbers is located on the U.S. Army Corps of Engineers (USACE) Records Management Site https://usace.dps.mil/sites/INTRA-CIOG6/SitePages/Records-Management.aspx. If any record numbers, forms, and reports are not current, addressed, and/or published correctly, see DA Pam 25-403 for guidance.

## 1–5. Associated publications

Policy and/or procedures associated with this circular is found in EP 1105-1-1.

## 1–6. Preface

*a.* Levee safety is one piece of overall flood risk management and includes managing and reducing potential flood damage and loss of benefits associated with levee systems. The goal of levee safety is to ensure that levee systems provide benefits to those living and working behind them. It is accomplished by USACE and levee sponsors working together to understand the benefits and risks associated with levees, build awareness among the public, fulfill daily responsibilities on the levee structure, and take actions to manage the future performance of the levee.

*b.* USACE and levee sponsors have a long history of working together to build and maintain levees and have a responsibility for operation and maintenance for all or a

certain portion of a levee system. The USACE Levee Safety Program builds on this long history to ensure federal levee systems deliver their intended flood risk management benefits.

*c.* The purpose of this document is to provide high-level policies for implementing the USACE Levee Safety Program. The policies of the USACE Levee Safety Program apply to federally authorized levees and do not override requirements in individual levee partnership or cooperation agreements or 33 Code of Federal Regulations (CFR) 208.10 (Local flood protection works; maintenance and operation of structures and facilities).

*d.* This chapter describes the overarching concepts and reasoning behind the USACE Levee Safety Program and how it interacts with other programs. All technical terms are defined in the glossary.

## 1–7. History of the USACE Levee Safety Program

*a.* Responsibility for flood risk management and levee systems has evolved over time. Prior to floods in the early 20th century, flood risk management was primarily a local responsibility; many levees were constructed for a variety of purposes and did not benefit from modern engineering practices.

*b.* After several severe floods, Congress decided there was a federal interest in helping communities reduce the impact of flooding and passed a series of laws authorizing USACE to design, construct, and sometimes maintain levees.

*c.* Other laws passed by Congress established the requirement that a written partnership agreement between USACE and levee sponsors identify the “items of local cooperation” for USACE projects, including operation and maintenance requirements necessary to the functioning of the project for its authorized purposes. The specific levee project authorizations, and therefore, levee sponsor and USACE roles and responsibilities associated with each levee system, are unique.

*d.* In 2005, the devastating impacts of Hurricane Katrina underscored the importance of levees and the need to use a consistent approach to understand and manage levees. USACE created the Levee Safety Program in 2006 as an organizing framework and to improve consistency and coordination in how levee-related activities are implemented across the organization.

*e.* The Levee Safety Program provides tools and resources intended to improve the alignment and effectiveness of decisions made across USACE and in collaboration with levee sponsors. The USACE Levee Safety Program intends to fulfill the following purposes:

(1) Ensure that new and existing federally authorized levees are managed to continue providing the intended benefits to human lives and property.

(2) Encourage the use of appropriate engineering policies, procedures, and technical practices for levee site investigation, design, construction, operation and maintenance, inspection, assessment, and emergency preparedness.

(3) Build public awareness of the benefits and risks associated with living behind a levee.

(4) Develop technical assistance materials to improve the reliability of levees.

## 1–8. Floodplain management activities

*a.* Flood risk is managed through a combination of traditional infrastructure (such as levee embankments and floodwalls) and non-infrastructure approaches, including local land-use planning and ordinances, flood warning systems, and evacuation planning and preparedness. Entities at all levels of government play a role including local communities, states, tribes, and the federal government.

*b.* USACE and Congress recognize that many levee sponsors do not have the authority or the capacity to perform floodplain management activities such as making land-use or zoning decisions. Due to this, integrated approaches to floodplain management will be promoted between all levels of government for those entities that have the authority to do so.

*c.* This circular and the policies of the USACE Levee Safety Program do not add requirements to the levee sponsor that are not part of their project agreement entered into with USACE. All activities discussed in this circular will be assigned and planned as appropriate to reflect existing agreements.

*d.* For any sponsors whose agreements with USACE do not include floodplain management responsibilities, sponsors should still share condition and performance information about their levees with local community leaders and emergency managers to inform their roles.

*e.* Since responsibilities of sponsors may vary, USACE may work with the sponsor, local community leaders, and emergency managers to help them understand the potential impacts of the levee breaching or overtopping.

## 1–9. Working with other programs

*a.* Congress directed USACE and the Federal Emergency Management Agency (FEMA) to work more closely together, speak with one voice, share information across agency boundaries, and work toward a solution for the nation’s levee safety challenges. USACE and FEMA have complementary missions and authorities related to flood risk management, and by working together, both agencies are more efficient and successful. USACE is committed to sharing Levee Safety Program data with FEMA to support local floodplain management decisions or community requests to accredit levees consistent with the National Flood Insurance Program.

*b.* Information from the USACE Levee Safety Program is also used by the USACE Public Law (PL) 84-99 Rehabilitation Program, which provides for repair of eligible flood risk management projects and constructed coastal risk management projects damaged by natural disasters. Many sponsors of federally authorized levees also participate in the PL 84-99 Rehabilitation Program. This document does not set policy for the PL 84-99 Rehabilitation Program, but addresses the areas where information is shared between the programs.

(1) A subset of items evaluated during USACE Levee Safety Program inspections are part of the criteria that determine eligibility for the PL 84-99 Rehabilitation Program. The criteria for a levee to maintain eligibility for the PL 84-99 program is found in interim guidance issued in 2014 (Interim Policy for Determining Eligibility Status of Flood Risk Management Projects for the Rehabilitation Program Pursuant to PL 84-99).

(2) USACE plans to update the criteria to determine a levee's continued eligibility in the PL 84-99 Rehabilitation Program. No change will be made to eligibility criteria without going through the federal rulemaking and public input process. More information about the rulemaking process is available on the main page at https://www.usace.army.mil/Missions/Emergency-Operations/pl-84-99/.

*c.* Levee Safety Program tools can also be applied to support Section 408 (33 U.S. Code [USC] 408) decisions. Section 408 provides a mechanism for USACE to give permission to other entities or individuals to alter an existing USACE Civil Works project without seeking congressional authorization on the condition that the project continues to meet its authorized purpose(s) and the alteration is not injurious to the public interest. USACE can use Levee Safety Program information to understand how a proposed alteration might impact the performance of a levee. More information is available at https://www.usace.army.mil/Missions/Civil-Works/Section408/.

*d.* Levee Safety Program tools and methodologies are used to inform USACE Civil Works projects in the planning, design, and construction phases. Information from previously completed risk assessments and inspections can also be used to inform a study on an existing levee.

*e.* Appendix B further describes how USACE Levee Safety Program information is used within the program and by others.

## Chapter 2
## USACE Levee Safety Program

### 2–1. Purpose and intent

*a.* This document establishes the policies for implementing the USACE Levee Safety Program, and describes activities, roles, and responsibilities for federally authorized levees. This document does not create new obligations for levee sponsors. Each levee sponsor's obligations under USACE authorities are limited to those established in the project agreements between the sponsor and USACE, stated in 33 CFR 208.10, or directed elsewhere in relevant law.

*b.* Many project agreements predate today's understanding that effective flood risk management in areas with levees requires recognizing that levees can overtop and breach, and that actions taken by community leaders and emergency managers to raise public awareness about the risk may reduce the consequences of potential flooding. To reflect this more modern understanding and to reduce potential loss of life and property damage behind levees, this document also provides a set of optional practices recommended for levee sponsors. These practices are focused on ensuring that critical information about the levee and what is at stake behind it is shared in a meaningful and timely way with those who can reduce and manage risk, such as emergency managers, land-use managers, elected officials, and those living and working behind levees.

*c.* The USACE Levee Safety Program includes activities to help USACE and the levee sponsor work together to fulfill the purposes of the program, organized within the following categories:

(1) Inspections and site visits.

(2) Risk assessments.

(3) Levee operation, maintenance, repair, replacement, and rehabilitation (OMRR&R).

(4) Sharing levee information.

(5) National Levee Database.

### 2–2. Levees in the USACE Levee Safety Program

*a.* A levee is a man-made barrier along a watercourse with the principal function of excluding floodwaters from a limited range of flood events from a portion of the floodplain (referred to as "leveed area"). Levees often include features such as embankments, floodwalls, pipes and associated drainage features, closures, pumping stations, floodways, and designed channels.

*b.* A levee system refers to a group of levees and other features that are collectively integral to excluding floodwater from the leveed area (Figure 2–1). The term

“levee segment” is used to identify a discrete portion of a levee system that is operated and maintained by a single levee sponsor. Many levee systems have more than one levee sponsor. Within this document, “levee” and “levee system” are used interchangeably.

*c.* An auxiliary or appurtenant structure for a dam can sometimes be considered a levee. If the structure would likely be necessary without the dam, the structure is managed under the USACE Levee Safety Program. If the structure is needed so the reservoir pool can be used and/or regulated, then the structure is managed under the USACE Dam Safety Program, which is implemented consistent with ER 1110-2-1156.

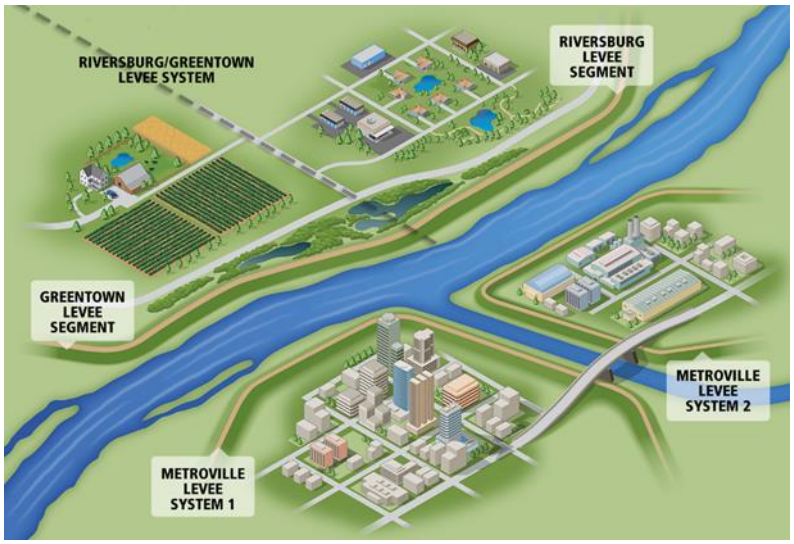



**Figure 2–1. Levee systems may be made up of one or more levee segments**

*d.* The USACE Levee Safety Program includes federally authorized levee systems or segments that are USACE operated or maintained and/or locally operated and maintained.

(1) *Federally authorized and USACE operated or maintained*. These are congressionally authorized levee systems or segments that USACE has full or partial responsibility to operate or maintain, as well as to rehabilitate and modify, as appropriate, under existing authorities.

(2) *Federally authorized and locally operated and maintained*. These are levee systems or segments that are congressionally authorized and operated and maintained by a local public sponsor through a project agreement with USACE. This category includes levees constructed by USACE and those constructed by others, and federally authorized.

*e.* USACE Levee Safety Program activities may be performed for structures or levees constructed under different authorities.

(1) *Non-project segment*. A segment of man-made high ground, not part of the federally authorized project, into which a levee system/segment ties and whose existence and performance is necessary for excluding floodwaters from the leveed area. Some examples of these are roadways, railroads, canals, and other levee embankments. Non-project segments are inventoried, inspected, and assessed if they make up part of the levee alignment and are necessary for the proper functioning of the levee system.

(2) *Non-federally authorized and locally operated and maintained, eligible for the PL 84-99 Rehabilitation Program*.

*(a)* Levee systems locally constructed, operated, maintained, and eligible for the USACE PL 84-99 Rehabilitation Program are subject to the policies set by the USACE PL 84-99 Rehabilitation Program.

*(b)* If these levees become ineligible for the USACE PL 84-99 Rehabilitation Program, they are no longer inspected by USACE unless they are connected to a federally authorized levee segment or the sponsor requests a reevaluation of eligibility.

*f.* Figure 2–2 shows the general percentage of federally authorized levees that are operated and maintained by USACE or by a local public sponsor (by miles).

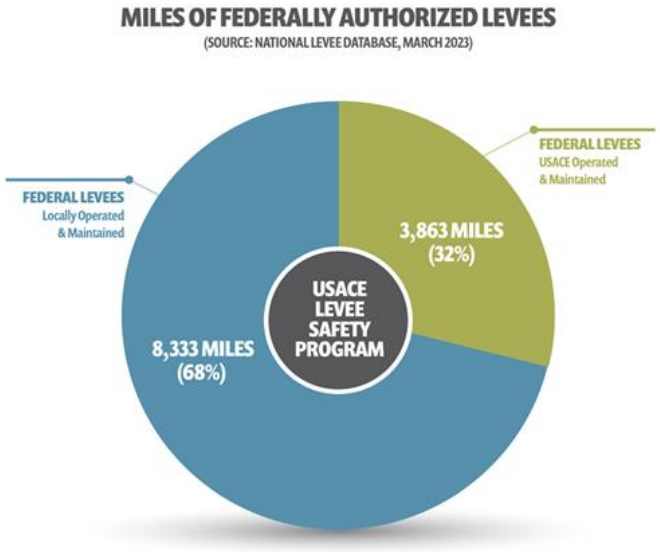



**Figure 2–2. Miles of federally authorized levees that are USACE operated and maintained vs. USACE authorized and turned over to sponsors for local operation and maintenance**

## Chapter 3
## Levee Inspections and Site Visits

### 3–1. Overview

*a.* USACE will assess all federally authorized levees to ensure that they continue to provide their intended benefits.

*b.* Levee inspections assess and document the physical condition of a levee, inform levee management activities, and serve as an important source of information for risk assessments discussed in Chapter 4 and Appendix D. Inspections verify any changed conditions and may capture progress of levee management measures for consideration in subsequent inspections or risk assessments. There are two types of inspections: formal inspections, which are prescheduled, and special inspections, which are unscheduled inspections conducted as needed due to changed conditions or to document performance. More details about levee inspections can be found in Appendix C and the Levee Inspection and Site Visits Standard Operating Procedures.

*c.* A levee site visit is a collaborative activity to observe or verify any changed conditions, provide technical advice to levee sponsors, respond to levee sponsors' questions, or capture progress of levee management measures. A site visit is not a detailed inspection and does not require extensive documentation. Site visits can be conducted at any time and provide the flexibility to engage with levee sponsors and conduct visual observations of the levee system through a site visit summary between scheduled inspections. More details about site visits can be found in Appendix C and the Levee Inspection and Site Visits Standard Operating Procedures.

### 3–2. Frequency

*a.* USACE districts will perform inspections on each federally authorized levee at a minimum of once every 5 years, dependent on available funding.

*b.* In coordination with levee sponsors, USACE districts may choose to perform a special inspection before, during, or immediately after a flood. Inspections occurring during floods are important since they provide data on how the levee is performing with water on it. A special inspection can be conducted in other circumstances, such as after earthquakes or major structural modifications, to observe and record any changed conditions and verify levee integrity.

*c.* USACE districts will coordinate with sponsors to determine the frequency of site visits for each levee and document the frequency in the district's program management plan. See Chapter 8 for more information on program management plans.

*d.* Sponsors will perform their own inspections and provide the results to USACE as required by their project agreements, 33 CFR 208.10, or other law.

### 3–3. Process

*a.* USACE districts will complete inspections and site visits consistent with the USACE Levee Inspections and Site Visits Standard Operating Procedures.

*b.* USACE districts will develop a 10-year outlook of inspection and site visit activities for each federally authorized levee as part of the district program management plan. USACE will review this outlook with each levee sponsor to promote efficiency, reduce scheduling conflicts, and promote positive USACE/sponsor relationships.

*c.* USACE districts will conduct inspections using the USACE Levee Inspection System to record and document observations. Levee inspections will be performed on a system basis, with all components and segments inspected at or near the same time. Formal and special inspections will be completed using the same processes and procedures.

*d.* In coordination with the levee sponsor, USACE districts will customize site visits for each levee. Site visits may cover an entire levee or may focus on specific sections or features.

*e.* USACE districts will invite levee sponsors to participate in inspections and site visits. The district will notify levee sponsors of the date of the scheduled inspection or site visit at least 30 business days in advance. For unplanned special inspections driven by more urgent situations such as flood events, districts will provide as much advance notice as possible to the levee sponsor. The USACE district will make every effort to accommodate the sponsor if the selected dates do not fit a sponsor’s availability.

### 3–4. Results and approval

*a.* After the inspection is completed, all inspection observations related to a specific item are grouped together to provide an overall item rating. An overall segment or system rating will not be assigned.

*b.* USACE districts will compile a report of all findings and share it with sponsors. USACE districts will provide sponsors with a reasonable amount of time to review inspection results to identify any discrepancies or new information that should be considered before the report is finalized.

*c.* USACE district Levee Safety Officers, or the district Levee Safety Program Manager if delegated by the district Levee Safety Officer, will approve inspection results. USACE districts will provide the final deliverable to the levee sponsor within 90 days after the field inspection of the entire levee system is completed.

*d.* USACE districts will document site visits and provide a site visit summary to the levee sponsor within 30 days after the site visit. The district Levee Safety Program Manager signs the site visit documentation.

*e.* USACE districts will approve inspection and site visit documents in the National Levee Database and notify the USACE district Emergency Manager and appropriate FEMA region when new inspection or site visit information is available, especially if results involve the eligibility status for the PL 84-99 Rehabilitation Program or levee accreditation for the National Flood Insurance Program. Inspection and site visit documents in the National Levee Database are not publicly viewable but are available to the levee sponsor.

*f.* At the conclusion of an inspection or site visit, USACE will document recommended actions within a levee risk management summary.

## 3–5. Summary of activities for inspections and site visits

*a.* The required and optional activities for USACE and levee sponsors within each step of an inspection or site visit are outlined in Table 3–1.

*b.* Specific partnership agreements may require activities listed as “Optional” below.

**Table 3–1**
**Inspections and site visits: required and optional activities for USACE and levee sponsors**

| | USACE (Required) | Levee Sponsor (Required) | Levee Sponsor (Optional) |
|---|---|---|---|
| Planning for Inspection or Site Visit | • Coordinate with sponsor to schedule inspection with at least 30 business days' notice | • Provide USACE with operation and maintenance records, inspection reports, and any noted changes to the levee | • Work with USACE to find a date for the inspection |
| Preparing for the Field | • Obtain levee access and required rights of entry | • Ensure USACE access to levee (unlock gates, pump stations, etc.) | • Identify who will represent the sponsor during the inspection |
| Conducting the Inspection or Site Visit | • Walk entire levee (inspections only)<br>• Lead post-inspection briefing | • Operate gates, closures, pumps, and wells, as needed | • Participate during inspection or site visit<br>• Participate in pre-inspection briefing<br>• Participate in post-inspection briefing |
| Documenting the Inspection or Site Visit | • Compile inspection report or site visit summary<br>• Provide report or summary to the sponsor for review | – | • Review inspection report or site visit summary and report any inaccuracies or discrepancies to USACE |
| Final Documentation | • Update or develop levee risk management summary<br>• Provide final deliverable to the sponsor<br>• Advise FEMA and district Emergency Manager of results | • Maintain a copy of the inspection or site visit deliverable in local files | • Share information with community leaders and emergency managers, as needed |

## Chapter 4
## Risk Assessment

### 4–1. Overview

USACE will regularly complete risk assessments on all federally authorized levees to understand their benefits and risks and identify actions to ensure that they continue to provide their intended benefits.

*a.* A risk assessment is a method used across multiple industries to estimate the likelihood and consequences of a particular event. For levees, risk assessments evaluate the hazard and the performance and condition of the levee, which inform the likelihood of levee breach and the potential life loss and structural or property damages that may result from that breach (Figure 4–1).


**Figure 4–1. Components of risk evaluated for levees**

*b.* Risk assessments provide USACE with an approach to understand the risk unique to each levee system that considers a number of factors such as levee condition, potential flooding depth, past levee performance, design and construction information, and proximity of population within the leveed area. Understanding and documenting the levee risk can be used to develop a strategy for performing operation, maintenance, repair, replacement, and rehabilitation that is unique to each levee, since no two levees are alike.

*c.* A risk assessment is a tool that USACE and levee sponsors may use to:

(1) Better understand the most critical areas for a levee system and identify which issues should be prioritized.

(2) Help sponsors make an articulate case for prioritizing investments and solutions with elected officials and decision-makers.

(3) Highlight key information that should be shared with the broader community impacted by the levee.

*d.* USACE districts will encourage levee sponsors to participate during risk assessments. Levee sponsors are the most knowledgeable about their levees and provide valuable information regarding condition and past performance.

*e.* Any licensed Professional Engineer or Professional Geologist may perform assessments, but they must follow the process outlined in this document; be reviewed by the district Levee Safety Officer, division Levee Safety Program Manager, and the Levee Senior Oversight Group; and have a risk characterization approved by the headquarters Levee Safety Officer.

*f.* More detailed information about USACE risk assessments can be found in Appendix D.

## 4–2. Types of risk assessments

*a.* USACE will perform a screening risk assessment on all federally authorized levees.

*b.* A screening risk assessment uses currently available information to inform its findings, considers a suite of standard failure modes, and results in a rough estimate of risk provided in a risk assessment report.

*c.* USACE districts will work with the sponsor, National Cadre, Levee Senior Oversight Group, and headquarters Levee Safety Officer or their delegate, to determine whether a detailed risk assessment would provide more comprehensive recommendations to the levee sponsor.

*d.* A detailed risk assessment is tailored to specific questions of uncertainty in understanding the risk associated with a particular levee, and typically involves the district and risk cadre in gathering new information, explores levee-specific potential failure modes, and can provide more refined numerical probabilities, resulting in a more accurate estimate of risk. The headquarters Levee Safety Officer or a delegate will make the final decision to move forward with a more detailed risk assessment while considering available program resources and priorities.

*e.* For federally authorized levees, levee sponsors or communities may request USACE to perform a risk assessment for the purpose of obtaining a recommendation for accreditation for the National Flood Insurance Program. USACE districts should contact the division Levee Safety Program Manager if a levee sponsor or community is interested in this process. The division Levee Safety Program Manager will coordinate with Headquarters, USACE through the Regional Integration Team.

(1) Consistent with 44 CFR 65.10(e), information from a USACE risk assessment may be used to fulfill the levee performance and design requirements for a levee accreditation decision by FEMA. The non-federal interest may need to provide

additional information to FEMA to fully complete the accreditation and mapping requirements related to operation and maintenance, emergency planning, and interior drainage.

(2) A levee sponsor of a federally authorized levee can perform their own risk assessment to be reviewed and approved by USACE, and then have USACE transmit the risk assessment to FEMA for levee accreditation purposes. The risk assessment must follow all USACE risk assessment procedures, including all technical analysis requirements. The resulting risk assessment must then be reviewed and approved by USACE, including by the Levee Senior Oversight Group. Prior to pursuing this option, levee sponsors should coordinate closely with USACE to gain an understanding of the requirements for the risk assessment.

## 4–3. Frequency

*a.* USACE will conduct risk assessments at a minimum of once every 10 years in conjunction with a formal levee inspection for all federally authorized levees, dependent on available funding.

*b.* For levee systems with an average loss of life of less than 0.1 and a population at risk less than 100, after an initial risk assessment, subsequent risk assessments do not have to be updated every 10 years. Inspections and site visits should continue and if there is a time when there is an indication the average life loss or population has increased, the risk assessment can be updated.

*c.* The risk assessment conducted will generally be the same level of detail as the last risk assessment, which is usually a screening risk assessment. In some cases, a more detailed risk assessment or a more frequent risk assessment may be appropriate; for example if the hazard, levee condition, or characteristics of the leveed area have changed significantly. USACE may also update a risk assessment if there are perceived structural condition changes or if there is an indication that the average life loss or population within the leveed area has increased.

## 4–4. Process

*a.* USACE will assess the risk for each segment within a levee system. USACE will perform a formal inspection in conjunction with all risk assessments to inform understanding of current levee condition and anticipated future performance.

*b.* The following basic steps will be performed for all levee risk assessments:

(1) Scope.

(2) Plan.

(3) Assess.

(4) Review.

(5) Decide.

*c.* More details regarding each of the steps are shown in Table 4–1 and in the Best Practices for Dam and Levee Safety Risk Analysis at https://www.usbr.gov/damsafety/risk/methodology.html.

## 4–5. Results

*a.* USACE and levee sponsors will evaluate all risk assessment information for a levee system and develop a prioritized list of recommendations for levee operation, maintenance, repair, replacement, and rehabilitation and to build risk awareness based on the associated levee risk. The prioritized list will be based on the results of the risk assessment, which are informed by levee inspections and understanding of the current levee condition and historic performance. USACE will identify actions specific to individual levee segments. This information will be included in the levee risk management summary.

*b.* USACE, in coordination with the levee sponsor, will develop the risk characterization, a narrative that describes the benefits of the levee system, most critical performance concerns, consequences, and uncertainty. The risk characterization will include as unique subsections descriptions of levee condition and performance, and consequences.

*c.* USACE districts will provide a summary of all findings and recommended actions for all risk assessments.

*d.* USACE districts will provide levee sponsors the opportunity to review risk assessment results and other draft products to identify discrepancies or new information that should be considered before providing the risk assessment documentation to the division Levee Safety Program Manager.

*e.* Levee sponsors may seek reconsideration of the results of a risk assessment by following the process detailed in Appendix D.

*f.* The Levee Senior Oversight Group will review all risk assessments forwarded by the division Levee Safety Program Manager and make a recommendation for approval of the risk characterization to the USACE headquarters Levee Safety Officer. The USACE district Levee Safety Officer approves the final risk assessment results.

*g.* USACE districts will provide approved risk assessments to the levee sponsor within 30 days after results are approved. The district will notify the USACE district Emergency Manager and appropriate FEMA region when new risk assessment reports are available. Risk assessment documentation in the National Levee Database is not publicly viewable but is available to the levee sponsor.

## 4–6. Summary of risk assessment activities

*a.* The required and optional activities for USACE and sponsors for risk assessments are outlined below (Table 4–1).

*b.* Specific partnership agreements may require activities listed as Optional below.

**Table 4–1**
**Risk assessments: required and optional activities for USACE and levee sponsors**

| | **USACE Districts (Required)** | **Levee Sponsor (Required)** | **Levee Sponsor (Optional)** |
|---|---|---|---|
| Scoping | • Coordinate with sponsor and FEMA region to provide at least 30 business days' notice that a risk assessment will be initiated<br>• Determine type and focus of risk assessment<br>• Identify decisions that the assessment will inform and define key questions that the assessment will answer | – | • Work with USACE district to find suitable dates for the risk assessment<br>• Provide input on key decisions and questions the risk assessment can help answer |
| Data Preparation and Hazard Identification | • Gather pertinent information such as design and as-built documentation, performance history, river/flood gage data, etc.<br>• Identify the likelihood of flooding, seismic hazards, and security hazards to be considered | – | • Provide USACE district with any information regarding changes to the levee since the last visit<br>• Provide USACE district with any information regarding previous flooding |
| Likelihood Assessment | • Estimate the likelihood of breach and overtopping for the most likely scenarios using inspection data, past performance information, and any other information that informs the condition or performance of a levee | – | • Provide USACE district with any information regarding past performance of the levee |

| | USACE Districts (Required) | Levee Sponsor (Required) | Levee Sponsor (Optional) |
|---|---|---|---|
| Consequence Assessment | • Estimate potential loss of life, economic losses, and environmental impacts | – | • Provide USACE with best available information regarding the population and property behind the levee<br>• Provide relevant points of contact to USACE to discuss community evacuation effectiveness and flood awareness<br>• Participate in discussions between USACE and other community members |
| Computing a Risk Estimate | • Calculate the combination of the likelihood of flooding (due to levee breach) within the leveed area and the associated potential for life loss and property damages and plot the results | – | – |
| Risk Characterization | • Work with the levee sponsor to draft a narrative that describes the benefits of the levee system, most critical performance concerns, consequences, and uncertainty<br>• Work with sponsor to draft a prioritized list of recommendations for the levee risk management summary | – | • Work with USACE to draft a narrative that describes the benefits of the levee system, most critical performance concerns, consequences, and uncertainty<br>• Work with USACE to draft a prioritized list of recommendations |
| Review and Approval | • Provide risk assessment results and other draft products to levee sponsor for review<br>• Invite sponsor and FEMA to participate in Levee Senior Oversight Group meeting<br>• Provide risk assessment results to FEMA and district Emergency Manager | – | • Participate in Levee Senior Oversight Group meeting<br>• Review risk assessment results and other draft products and report any inaccuracies or discrepancies to USACE district<br>• Maintain a copy of the risk assessment results in local files |

## Chapter 5
## Operation, Maintenance, Repair, Replacement, and Rehabilitation

### 5–1. Overview

*a.* Levees reduce the probability of flooding within a leveed area. However, continued successful performance of the project depends on the way levee sponsors operate, maintain, repair, and rehabilitate the project. Proper maintenance; establishing effective operational procedures; and repair, replacement or rehabilitation of the levee structure can prevent serious flood damages that could result from breach of any part of the levee.

*b.* Effective levee OMRR&R helps reduce risk. Successful levee OMRR&R should be informed by inspection and risk assessment results to maximize benefits with limited resources.

*c.* Levee operation, maintenance, and repair are routinely performed activities to help sponsors and USACE fulfill daily responsibilities, whereas activities related to replacement and rehabilitation are non-routine and typically require increased time and resources. More detailed information can be found in Appendix E.

### 5–2. Operation, maintenance, and repair activities

*a.* Sponsors of federally authorized levees have been provided an operation and maintenance (O&M) manual, or OMRR&R manual, that contains relevant documentation and reports, maps, drawings, references, and procedures pertinent to the operation and maintenance of their levees. Levee sponsors will operate and maintain their levee, which can include performing regular inspections and testing and monitoring instruments and equipment among other activities, consistent with the O&M manual.

*b.* The required and optional activities for USACE and sponsors within operation and maintenance are outlined below (Table 5–1).

*c.* Specific partnership agreements and O&M manuals may require activities listed as Optional below.

**Table 5–1**
**Operation and maintenance: required and optional activities for USACE and levee sponsors**

| | USACE Districts (Required) | Levee Sponsor (Required) | Levee Sponsor (Optional) |
|---|---|---|---|
| Operation | • Provide technical assistance to sponsors, if requested and authorized<br>• Operate federally operated and maintained levees consistent with the O&M manual or USACE guidance | • Operate levees consistent with the O&M manual | • Request technical assistance from USACE district, if needed |
| Maintenance and Repairs | • Provide technical assistance to sponsors, if requested<br>• Review prioritized list of operation, maintenance, and repair recommendations with sponsor<br>• Work with sponsor to track progress of recommendations and re-prioritize list as needed<br>• Perform routine maintenance and repairs for federally operated and maintained levee segments consistent with the O&M manual or USACE guidance<br>• Upload maintenance records to National Levee Database | • Perform routine maintenance and repairs on levees consistent with the O&M manual<br>• Provide maintenance and repair records to USACE district | • Request technical assistance from USACE district, if needed<br>• Review prioritized list of recommendations based on the latest risk assessment and inspection with USACE |
| Sponsor Inspections | • Upload inspection results and reports submitted from sponsor to the National Levee Database (not publicly viewable) | • Perform inspection consistent with the O&M manual<br>• Provide inspection results to USACE district | – |

## 5–3. Replacement and rehabilitation activities

*a.* USACE districts will use the most updated inspection and risk assessment to inform recommendations for replacement or rehabilitation of levee features and will track and monitor the progress of recommendations for each levee segment, by levee system, in the levee risk management summary.

*b.* USACE districts will be available for technical assistance to sponsors completing levee replacement or rehabilitation activities.

*c.* The required and optional activities for USACE and sponsors within replacement and rehabilitation are outlined below (Table 5–2). Specific partnership agreements may require activities listed as Optional below.

**Table 5–2**
**Replacement and rehabilitation: required and optional activities for USACE and levee sponsors**

| | **USACE Districts (Required)** | **Levee Sponsor (Required)** | **Levee Sponsor (Optional)** |
|---|---|---|---|
| Prioritize Replacement and Rehabilitation Activities | • Develop prioritized list of recommendations based on the latest inspection and risk assessment results with sponsor | – | • Develop prioritized list of recommendations based on the latest inspection and risk assessment results with USACE<br>• Work with others in the community to prioritize recommendations |
| Complete Replacement and Rehabilitation Activities | • Provide technical assistance to sponsors, if requested and authorized<br>• Perform replacement or rehabilitation in order of priority for federally operated and maintained levees | • Complete structural repair, replacement, or rehabilitation<br>• Provide records to USACE district | – |
| Track Replacement and Rehabilitation Activities | • Work with sponsor to track progress of replacement and rehabilitation and re-prioritize list of recommendations as needed<br>• Track progress of replacement and rehabilitation and re-prioritize list of recommendations for federally operated and maintained levees | – | • Work with USACE to track progress of replacement and rehabilitation and re-prioritize list of recommendations as needed |

## Chapter 6
## Sharing Levee Information

### 6–1. Overview

*a.* During inspections and risk assessments, USACE and the sponsor learn information about a levee and can use that information to make decisions about what actions should be taken to manage that levee. Since communities can be impacted by the flood hazard, levee performance and condition, and potential consequences of levee failure, information should be shared with community leaders and emergency managers (See Appendix F).

*b.* The goal for levee sponsors is to communicate levee condition and performance information to those who may need it, such as local emergency management agencies responsible for community evacuation, or local agencies responsible for land-use planning in the community.

*c.* In some cases, levee sponsors may communicate consequence information as well, but because not all levee sponsors have the authority or responsibility to communicate consequence information, USACE may be responsible for communicating that information. To accomplish this, USACE will make some information publicly available in the National Levee Database. USACE may also communicate directly with community leaders and decision-makers, as needed.

*d.* Sharing levee information helps raise awareness about:

(1) Why the levee is there and the benefits it provides.

(2) Potential performance issues associated with the levee.

(3) Actions taken before, during, and after a flood event.

(4) Actions being taken to preserve levee-related benefits.

*e.* This information is helpful to others who have the authority and responsibility in the area behind the levee, such as community leaders and emergency managers.

### 6–2. Shared levee information between USACE and sponsors

*a.* USACE districts will review inspection and risk assessment results with levee sponsors to establish a common understanding of the levee risk, any changed conditions, and recommendations.

*b.* As part of this activity, districts will discuss the following with the sponsor:

(1) Key components of risk, including likelihood and nature of flood threat (hazard), physical condition of the levee and likelihood of breach (performance), and the nature and severity of consequences should the levee breach or be overtopped.

(2) Any areas of uncertainty and the relevance of that uncertainty.

(3) Information about levee segments and how each segment contributes to the overall risk.

(4) Priority and sequencing of recommended risk management activities.

(5) Information that should be shared with others in the area behind the levee and whether USACE or the sponsor will take the lead to share this information.

### 6–3. Sharing levee information with decision-makers in the area behind the levee

*a.* USACE and levee sponsors will work together to develop a strategy to share levee information with those who may need it to make a decision, such as local emergency agencies with responsibility for evacuation, or local agencies responsible for land-use planning in the community.

*b.* Levee sponsors are required to share levee information, such as the levee condition and performance and potential impacts to the leveed area, with others only as directed within their individual project agreements. When agreements do not specify this and the sponsor is unable, USACE will fulfill these responsibilities.

*c.* USACE districts can provide technical assistance to sponsors sharing levee information. USACE districts can assist and serve as the technical expert to explain levee-related risk to the public or other interested parties. Districts can also assist levee sponsors in developing publicly consumable information or other visual tools.

*d.* USACE may also communicate directly with community leaders, decision-makers, and members of the public as needed. When doing so, USACE will coordinate with the levee sponsor and other key partners.

### 6–4. Sharing levee information within the National Levee Database

*a.* Each district will work with levee sponsors to complete publicly available information in the National Levee Database about levees.

*b.* Publicly available fields about a levee should support understanding of:

(1) Why the levee was built and what benefits it provides.

(2) What is known about the levee’s condition and potential performance.

(3) Who and what benefits from or may be at risk should the levee break or fail.

(4) Who is responsible for the levee and what actions are planned to address risks.

*c.* Providing access to this information on the National Levee Database will help USACE and sponsors build public awareness of the benefits and risks associated with living behind a federally authorized levee.

## 6–5. Summary of activities for sharing levee information

*a.* The required and optional activities for USACE and sponsors in sharing levee information are outlined below (Table 6–1).

*b.* Specific partnership agreements may require activities listed as Optional below.

**Table 6–1**
**Sharing levee information: required and optional activities for USACE and levee sponsors**

| | USACE (Required) | Levee Sponsor (Required) | Levee Sponsor (Optional) |
|---|---|---|---|
| Planning | • Develop information sharing strategy and incorporate it into district program management plan | – | • Work with the district to develop a strategy to share levee condition and performance information |
| Sharing Information Between USACE and Sponsor | • Review inspection, site visit, and risk assessment results with sponsor<br>• Work with sponsor to complete publicly available fields in the National Levee Database | – | • Review inspection, site visit, and risk assessment results with USACE district<br>• Work with USACE district to update information in the National Levee Database<br>• Share any information regarding major changes to the levee with USACE district |
| Sharing Information with Others | • Work with sponsors to identify audiences with whom to share levee information<br>• Identify audiences with whom to share levee information (for federally operated and maintained levees)<br>• Work with sponsors to determine optimal delivery of information to the audience(s) (newsletter, town hall meeting, social media, etc.)<br>• Share levee information with those who have authority to manage the hazard and consequences, if deemed necessary (for sponsors without a requirement within their project agreement) | • Share levee condition and performance information with those who have authority to manage the hazard and consequences (only required for sponsors with the requirement within their project agreement) | • Work with USACE district to identify audiences with whom to share levee information<br>• Work with USACE district to determine optimal delivery of information to the audience (newsletter, town hall meeting, social media, etc.)<br>• Share levee information with those who have authority to manage the hazard and consequences (for sponsors without a requirement within their project agreement) |

## Chapter 7
## National Levee Database

### 7–1. Overview

*a.* Under 33 USC Chapter 46, USACE is required to establish and maintain a database with an inventory of the nation's levees that is publicly available to promote public awareness of the benefits and risks associated with living behind a levee.

*b.* The inventory includes the levee's location, general condition information, and an estimate of the number of structures and population within the leveed area. A comprehensive inventory of the nation's levees is a key resource for USACE and sponsors to share information related to their levees.

*c.* More detailed information can be found in Appendix G.

### 7–2. National Levee Database

*a. General*. USACE districts will maintain the priority fields, as identified by the headquarters Levee Safety Program Manager, for federally authorized levees within their areas of responsibility in the National Levee Database (National Levee Database Business Process [January 2023]).

*b. Maintaining data*.

(1) The district Levee Safety Program Manager is responsible for maintaining the National Levee Database data for federally authorized levees and those active within the Rehabilitation Program in their area of responsibility. The district will coordinate updates to levee data with the levee sponsor to ensure data quality and freshness.

(2) FEMA will maintain National Levee Database data related to the National Flood Insurance Program.

*c. Availability of information*.

(1) All information fields within the National Levee Database will be viewable to USACE and other federal agency employees. Levee sponsors will be provided full access to all information fields for the levees for which they are responsible. State, regional, tribal, and local governmental employees will be provided access to information fields for their areas of responsibility relevant to their role or authority.

(2) Many of the information fields within the National Levee Database are viewable by the public. Fields that may pose risk to the security of the levee infrastructure are protected by password/account security and available only to authorized users.

*d. Process*. The general process for maintaining the National Levee Database levee inventory includes obtaining levee data, providing and obtaining database access, uploading data, ensuring data quality, and updating data.

## 7–3. Summary of activities for managing levee data

The required and optional activities for USACE and sponsors within each step of inventory are outlined below (Table 7–1).

**Table 7–1**
**Inventory of levees: required and optional activities for USACE and levee sponsors**

| | **USACE (Required)** | **Levee Sponsor (Required)** | **Levee Sponsor (Optional)** |
|---|---|---|---|
| Obtaining/Updating Data | • Locate or request best available data from sponsor | – | • Provide best available data related to their levee to USACE (generally through inspections) |
| Accessing Database | • Provide sponsors with credentials to access database | – | • Request database access from USACE |
| Uploading Data | • Upload data to database | – | – |
| Ensuring Data Quality | • Perform quality assurance on uploaded data | – | • Review data for accuracy<br>• Provide corrected data to USACE when errors are detected |

## Chapter 8
## USACE Levee Safety Program Personnel and Program Management

### 8–1. Overview

*a.* The USACE Levee Safety Program will be implemented using a coordinated team comprised of staff from the headquarters, division, and district levels. Levee safety personnel at each level of the organization enables efficient coordination and collaboration between districts, divisions, and headquarters, and provides levee sponsors with individual points of contact at each level. USACE responsibilities described in this document can be delegated unless otherwise noted.

*b.* USACE Levee Safety Program management will also provide processes and a structure for planning, managing, and monitoring program implementation. Program management will provide a consistent approach for levee safety personnel to implement the program in partnership with local levee sponsors.

### 8–2. Levee Safety Program personnel

*a.* USACE Levee Safety Program personnel consists of individuals with experience in levee safety with whom sponsors may consistently coordinate and engage. A Levee Safety Officer and Levee Safety Program Manager at the district, division, and headquarters level will provide a consistent point of contact for sponsors. All Levee Safety Officers and Levee Safety Program Managers must follow the formal appointment process.

*b.* The Levee Safety Officer will lead levee safety issues, recommendations, and decisions at each level in the organization. The position of the Levee Safety Officer will be filled by an existing, qualified civil engineer within USACE. The Levee Safety Officer is typically the Chief of Engineering and Construction and must be a registered Professional Engineer.

*c.* The Levee Safety Program Manager will lead coordination and implementation of the Levee Safety Program at each level in the organization. The position of the Levee Safety Program Manager will be filled by an existing, qualified engineer or geologist within USACE. The Levee Safety Program Manager must be a registered Professional Engineer or Geologist.

### 8–3. Levee Senior Oversight Group

*a.* The Levee Senior Oversight Group is comprised of a multi-disciplinary team of levee safety professionals from across USACE to provide consistent program oversight.

*b.* The Levee Senior Oversight Group has a high level of expertise and comprehensive knowledge of levees across the country and will review risk assessment results and provide recommendations to the USACE headquarters Levee Safety Officer and the field regarding levee safety and risk procedures, methods, and results. The

members of the Levee Safety Oversight group are designated by the USACE Levee Safety Officer.

## 8–4. Levee Safety Program management plan

*a.* The Levee Safety Program Manager at each level will create and maintain a program management plan. The program management plan will be reviewed and updated on an annual basis. A program management plan is a formal, approved, living document used to define program requirements and expectations, accountability and performance measurements, and guide program execution. The document will note delegation of program responsibilities when applicable.

*b.* District program management plans will include a 10-year outlook that is coordinated and reviewed annually with each levee sponsor in the district's area of responsibility to outline a tentative schedule of inspections, site visits, and risk assessments that will involve both USACE and the sponsor.

*c.* As part of each district program management plan, districts will develop and maintain a district-level strategy (coordinated with both levee sponsors and FEMA) for sharing levee information corresponding with USACE Levee Safety Program activities. See Appendix F for more information.

## 8–5. Program monitoring

*a. Oversight*. The headquarters Levee Safety Program Manager will monitor the progress of the Levee Safety Program through program metrics, rotating program audits, and periodic external review of the program.

*b. Program metrics*. The headquarters Levee Safety Program Manager will establish specific program metrics to measure USACE's progress in meeting program objectives. The headquarters Levee Safety Program Manager will document metrics in the headquarters program management plan and will review and update metrics as needed. District and division commanders will be required to report progress on metrics.

*c. Rotating program audits*. The headquarters Levee Safety Program Manager will conduct an annual audit on two divisions to review each of their district's implementation of the Levee Safety Program. The audit will analyze compliance with policy, the ability to meet program metrics, engagement with levee sponsors and FEMA, internal coordination with other USACE programs, and quality of levee safety program products and decisions. The process for conducting these audits will be detailed in the headquarters program management plan.

*d. Independent review*. At a minimum of every 5 years, the headquarters Levee Safety Program Manager will initiate an independent review of the USACE Levee Safety Program, which will include a review of policies, procedures, and performance. USACE headquarters will use the results from the review to adapt and improve program implementation.

## 8–6. Program recognition and awards

*a. Headquarters awards*.

(1) Each year, USACE will recognize a levee safety team and individual for exemplary contributions to the Levee Safety Program.

(2) The USACE Levee Safety Program may also recognize outstanding levee sponsors that have been nominated by the districts and divisions.

*b. District and division awards*.

(1) Each year, USACE districts and divisions are encouraged to recognize USACE levee safety professionals for their contributions to the levee safety community of practice and levee sponsors for outstanding operation and maintenance of their projects.

(2) USACE districts and divisions are also encouraged to provide awards to those levee sponsors that have effectively met their commitments in the condition and performance of their levees. The selection of nominees for these awards should be informed by those things for which the sponsors have a responsibility, which typically would include condition and performance activities.

## Appendix A
## References

The following references provide additional context and direction for implementing the USACE Levee Safety Program. Unless otherwise indicated, Army and USACE publications are available at https://armypubs.army.mil/ and https://www.publications.usace.army.mil. United States Code (USC) publications are available at https://uscode.house.gov/.

**Best Practices in Dam and Levee Risk Analysis**
(Available at https://www.usbr.gov/damsafety/risk/methodology.html)

**DA Pam 25-403**
Army Guide to Recordkeeping

**EP 1105-1-1**
Sponsor's Guide to the USACE Levee Safety Program

**ER 1110-2-1156**
Safety of Dams – Policy and Procedures

**ER 1165-2-217**
Civil Works Review Policy, Water Resource Policies and Authorities

**Interim Policy for Determining Eligibility Status of Flood Risk Management Projects for the Rehabilitation Program Pursuant to PL 84-99**
(Available at https://www.mvs.usace.army.mil/Portals/54/docs/LeveeSafety/Flood%20Prep%20Meetings/handouts/6%20Interim_Policy_for_Rehabilitation_Program_21March2014_FINAL%20cva.pdf?ver=2019-02-22-120422-257)

**National Levee Database**
(Available at http://nld.sec.usace.army.mil)

**USACE Levee Inspections and Site Visits Standard Operating Procedures**
(Available at https://iwrlibrary.sec.usace.army.mil/resource/c38542c0-3540-4431-d7fc-e05d3ecabf4a)

**USACE Levee Safety Program**
(Available at https://www.usace.army.mil/Missions/Civil-Works/Levee-Safety-Program/)

**33 CFR 208.10**
Title 33 – Navigation and Navigable Waters; Chapter II – Corps of Engineers, Department of the Army (Parts 203-208); Part 208 – Flood Control Regulations; Section 208.10 – Local flood protection works; maintenance and operation of structures and facilities. (Available at https://www.govinfo.gov/app/details/CFR-2011-title33-vol3/CFR-2011-title33-vol3-sec208-10)

**33 USC 46**
Title 33 – Navigation and Navigable Waters; Chapter 46 – National Levee Safety Program

**33 USC 408**
Title 33 – Navigation and Navigable Waters; Chapter 9 – Protection of Navigable Waters and of Harbor and River Improvements Generally; §408 – Taking possession of, use of, or injury to harbor or river improvements

**33 USC 701n**
Title 33 – Navigation and Navigable Waters; Chapter 15 – Flood Control; §701n – Emergency response to natural disaster

**42 USC 1962d-5b**
Title 42 – The Public Health and Welfare; Chapter 19B – Water Resources Planning; Subchapter IV – Miscellaneous Provisions; §1962d-5b – Written agreement requirement for water resources projects

**44 CFR 65.10(e)**
Mapping of areas protected by levee systems

## Appendix B
## The USACE Levee Safety Program

### B–1. Purpose

This appendix provides an overview of the USACE Levee Safety Program and its role in USACE's authorized responsibilities for levees.

### B–2. A coordinating framework for USACE's responsibilities related to levees

*a.* USACE's authorized responsibilities related to levees are broad. These responsibilities include:

(1) Planning, designing, constructing, and modifying levees when authorized by Congress.

(2) Assessing the condition of existing federally authorized levees with levee sponsors.

(3) Providing recommendations and technical support when requested.

(4) Assessing the benefits to people or property due to a well performing levee system.

(5) Sharing information and tools with other programs, agencies, communities, and the public.

(6) Conducting emergency activities to supplement local efforts when requested.

(7) Rehabilitating eligible levees damaged by flooding.

(8) Performing operation and/or maintenance activities on specific levees as authorized.

*b.* These responsibilities are implemented using a variety of USACE programs such as planning, engineering and construction, emergency management, operations, regulatory, and technical services.

*c.* USACE created the Levee Safety Program as an organizing framework and to improve consistency and coordination in how levee-related activities are implemented across the organization. The Levee Safety Program provides tools and resources improve the alignment and effectiveness of decisions made across USACE and in collaboration with levee sponsors.

*d.* Specifically, the USACE Levee Safety Program provides:

(1) Inspections, engineering analyses, and solutions to support decision-making within the organization and external to the organization (levee sponsors, communities, other state and federal agencies, etc.).

(2) Consistent procedures for USACE to evaluate and make decisions for levees.

(3) Information to help others understand, prioritize, manage, and build awareness regarding the benefits and flood risks associated with levees.

*e.* Information gathered through the USACE Levee Safety Program directly informs actions in other USACE programs such as emergency-related assistance and repairs. USACE has the authority to provide disaster preparedness, operations, rehabilitation, and advance measures assistance. The USACE emergency management community of practice leads these efforts but relies on information from the Levee Safety Program (when levees are involved) to inform how flood preparedness, fighting, and repairs occur. For example, items of concern identified during a recently completed USACE inspection or risk assessment can inform where to locate temporary measures, implement increased monitoring, and preparedness activities for flooding.

*f.* USACE administers the PL 84-99 Rehabilitation Program, which provides for repair of eligible flood risk management projects and constructed coastal risk management projects damaged by natural disasters. The criteria for a levee to maintain eligibility for the PL 84-99 Rehabilitation Program is found in the interim guidance issued in 2014 (Interim Policy for Determining Eligibility Status of Flood Risk Management Projects for the Rehabilitation Program Pursuant to PL 84-99).

*g.* Levee Safety Program tools can also be applied to support Section 408 decisions. Section 408 (33 USC 408) provides a mechanism for USACE to give permission to other entities or individuals to alter an existing USACE Civil Works project without seeking congressional authorization as long as the project continues to meet its authorized purpose(s) and the alteration is not injurious to the public interest. USACE can use the Levee Safety Program's risk assessment methodology to get a better understanding of how a proposed alteration might impact the performance of the levee and whether the benefits of the alteration outweigh any concern of new or worsened areas of stress on the levee.

*h.* Levee Safety Program tools and methodologies are used to inform USACE Civil Works projects in the planning, design, and construction phases. For example, when USACE is completing a planning study and considering an alternative that includes a levee or floodwall, the planning team will use the methodology and steps associated with a risk assessment to understand the benefits of various designs of the levee system. This analysis helps the planning team understand how much flood risk is reduced by the proposed levee. Information from previously completed risk assessments and inspections can also be used to inform a study being completed on an existing levee.

*i.* FEMA uses the tools developed and information gathered by the USACE Levee Safety Program. For example, FEMA and USACE continue to collaborate to develop a shared set of levee data to support separate and shared mission activities. Doing so can increase efficiencies among the agencies, but also helps FEMA and USACE

provide consistent information to those who operate and maintain or benefit from a levee.

*j.* The Levee Safety Program continues to improve the tools, data, and methodologies to support levee-related decisions by USACE and other federal, state, tribal, and local entities responsible for, or benefitting from, levees. Using shared approaches and information for levee-related decisions supports consistent actions for new and existing levees to reduce the risk of flooding to communities and the things they value.

### B–3. Levees and flood risk management

*a.* Levees are an essential tool that communities and businesses rely on to keep floodwaters away from the things they value. Typically, levees are designed to a size and shape to withstand certain flood events and are often built next to or aligned with one another to keep floodwaters out of a certain area. Sometimes multiple levee systems are designed to work together in a larger watershed approach.

*b.* Multiple levees keeping water away from a shared area are often viewed as a system, as they work together to reduce the risk of flooding to people and property. Sometimes these levees are considered a system simply due to the way they function, but some levees are also congressionally authorized to be operated and maintained that way.

*c.* Levee systems can be comprised of individual levees or levee segments, often operated and maintained by a single entity. The authorities and responsibilities of sponsors of individual levee segments vary and are unique to the agreements made when the project was first authorized and constructed.

*d.* USACE and levee sponsors work together to ensure federally authorized levees continue to provide their intended benefits to communities. Doing so requires a keen understanding of levees, including individual segments, as well as the systems they comprise. A weak or low point in any part of a levee system can impact the levee’s continued ability to keep water away from the leveed area.

*e.* USACE is responsible for understanding how individual levees work together and how those levees can impact a community’s need to adopt additional measures to further protect things of value—including people, property, environment, agriculture, cultural resources, navigation, etc.

*f.* The Levee Safety Program is designed to answer questions related to individual levee segments but often combines understanding of how all segments work together as a system. For example, USACE will look at each levee segment and high ground that those segments tie into, such as a railroad, roadway, or another embankment, often referred to as non-project segments, as part of inspections and risk assessments to understand how each piece influences performance of the levee system. USACE also evaluates how the levee system will function within the broader

floodplain, which can include neighboring levees, upstream dams, and other structures that influence the situations in which the levee may see water.

*g.* Focusing Levee Safety Program activities at the system level helps prioritize levee recommendations, resources, and activities on the areas of greatest concern and where the most impact can be made to ensure the levees continue to provide their intended benefits.

*h.* While USACE will recommend activities and actions that consider how the levee functions within the broader floodplain, levee sponsors are not expected or required to take actions that are not within their authorities and responsibilities. Recommendations that extend beyond the footprint of the levee are often most applicable to others such as emergency managers, floodplain managers, or hazard mitigation officers.

*i.* Communicating findings and information from Levee Safety Program activities about the condition and performance of individual levee segments and systems is important for bolstering understanding of the levee, the importance of continued investment, and spurring other actions within the community itself. USACE and levee sponsors will work together to develop a shared understanding of levee information from inspections and risk assessments and an approach to communicate this information with others who may need it.

*j.* USACE works with levee sponsors to ensure results and information from key program activities are communicated so they are relevant and actionable for each levee segment. USACE provides each levee sponsor their individual levee segment results so they know what specific information relates to their areas of responsibility, as well as the information that shows how their levee segment relates to the entire levee system.

*k.* In cases where a finding or recommendation relates to the levee’s system, USACE will work with the sponsor or entity responsible for each levee segment to support understanding and actions to address areas of concern that most impact future levee performance.

*l.* Table B–1 summarizes Levee Safety Program activities and products and how they are used to characterize or communicate levee information by segment or by system.

*m.* Levees are one piece of overall flood risk management. The Levee Safety Program will continue to work with levee sponsors to understand and communicate with those in the leveed area about the condition and performance of levees, the benefits they provide, and the important role they play in reducing flood damages. The Levee Safety Program will also work with levee sponsors and others who make levee-related decisions to ensure those decisions are made using best available, shared information on levees.

**Table B–1**
**Levee Safety Program activities and products**

| Activity | Primary Use | System or Segment Focus |
|---|---|---|
| Inspections | • Document the condition of the levee | • Performed on individual levee segments<br>• When a segment is part of a levee system, USACE will work to inspect all segments at the same time<br>• Results and ratings of specific items are summarized at the segment and system level in an inspection report<br>• Results are shared with the entity responsible for the segment |
| Site Visits | • An optional collaborative activity to observe or verify changed conditions or provide technical advice | • Performed on individual levee segments or unique site locations<br>• Summarized in a site visit summary<br>• Shared with the entity responsible for the segment |
| Screening Risk Assessments | • Characterize the following: likely hazards a levee may face, anticipated performance of the levee based on its condition and how it has performed in the past, who and what is behind and benefiting from the levee, and potential impacts to people and property behind the levee<br>• Uses existing best available information and focuses on a standard set of questions | • Performed on individual levee segments<br>• When a segment is part of a levee system, USACE will complete screenings for all segments of the system collectively<br>• Results are reported at both the segment and system level<br>• The estimated risk for the levee system is based on the highest risk segment |
| Higher-level Risk Assessments (Semi-quantitative and Quantitative) | • Characterize the following: likely hazards a levee may face, anticipated performance of the levee based on its condition and how it has performed in the past, who and what is behind and benefiting from the levee, and potential impacts to people and property behind the levee<br>• Includes gathering new information and focusing on a customized set of questions | • Performed at the system level<br>• Results will include findings and results relevant to individual levee segments |

| Activity | Primary Use | System or Segment Focus |
|---|---|---|
| Levee Risk Management Summary | • Internal tool for USACE and levee sponsors that documents best available levee information<br>• Includes recommended actions for levee sponsors, as well as actions that others can take | • Summarizes best available levee information at the system level<br>• Includes recommendations applicable to individual levee segments |
| National Levee Database | • Publicly available inventory of levees in the United States | • Includes information for individual levee segments and for the system |

## Appendix C
## Levee Inspections and Site Visits

### C–1. Purpose

This appendix provides an overview of the responsibilities for levee inspections and site visits conducted by USACE. For additional procedural details, please refer to the USACE Levee Inspections and Site Visits Standard Operating Procedure.

### C–2. Why inspect levees

*a.* Levees change over time—their slopes can crack, animals can burrow into them, embankments can settle, components wear out, and features can no longer function as intended due to age. Any of these or other changes to the condition of the levee can impact how it responds during a flood.

*b.* Inspections are a key tool that help those responsible for levees keep watch over them, identify areas of concern, and take action to address them. USACE and levee sponsors regularly inspect levees before, during, and after flooding to understand their condition, performance, and any needed actions. Doing so can inform daily and regular activities and maintenance on the levee to keep it in good condition and ready for any future floods.

### C–3. Planning in advance

*a.* USACE will inspect federally authorized levees at least once every 5 years. These inspections, referred to as formal inspections, are planned and scheduled in advance with levee sponsors.

*b.* Special inspections and site visits are additional tools that USACE and levee sponsors can use to document the condition of a levee between planned formal inspections. Both give USACE and levee sponsors flexibility to adjust activities on the levee based on more current information.

*c.* While special inspections follow the same procedures as a formal inspection, they are done as needed between formal inspections to understand any changes in levee conditions or to document performance during a flood event. USACE may also perform site visits between formal inspections. A site visit can be conducted at any time to verify the levee condition or track progress of any actions on the levee. Site visits are not intended to be as detailed as a formal or special inspection, nor do they require extensive documentation.

*d.* District Levee Safety Program Managers are responsible for working with levee sponsors to plan for and schedule levee inspections and site visits as part of their program management plan, which will include a 10-year outlook of Levee Safety Program activities. District Levee Safety Program Managers will use their program management plan and 10-year outlook to inform budget and resource planning.

## C–4. Who inspects levees

*a.* USACE inspects federally authorized levees with a team of engineers and technical experts. The size and composition of the team depends on the size, length, and complexity of the levee system.

*b.* Typically, the USACE inspection team will include engineers and technicians with expertise that aligns with the features of the levee. This can include representation from multiple disciplines, including civil, geotechnical, structural, hydraulic, mechanical, electrical engineering, and geology.

*c.* District Levee Safety Program staff will select levee inspectors based on their qualifications, the type and purpose of the inspection, and the complexity of the levee.

*d.* Every levee inspection (formal or special) will have an inspection team lead who must be a licensed Professional Engineer or Professional Geologist.

*e.* For formal or special inspections, the number of USACE inspection team members should allow for a thorough inspection, physically walking the entire length of the alignment, operating inspection equipment and tools, recording observations, and taking inspection photographs throughout the entire levee.

*f.* The USACE inspection team may also include:

(1) Levee sponsors. As part of developing the program management plan and 10-year outlook, sponsors will have advance notice of planned inspections for their levees and should clarify how they plan to participate. USACE will notify levee sponsors 30 business days in advance of conducting an inspection. For unplanned inspections driven by more urgent situations such as flood events, USACE districts will provide as much advance notice to the levee sponsor as possible.

(2) Members of the risk assessment team. If there is an ongoing or planned risk assessment for the levee system, members of the risk assessment team should be invited to participate. A levee inspection is key to helping a risk assessment team understand the condition and historical performance of levee.

(3) Representatives from other organizations. In some cases, it may be helpful to include others during the inspection based on the activities associated with the levee. For example, representatives from other USACE programs such as emergency management may find it helpful to participate in an inspection to get a better understanding of the levee's performance during a flood. Federal agencies such as FEMA and levee sponsors may also benefit from participating in an inspection in cases where a community may seek accreditation of the levee in the National Flood Insurance Program. These parties' participation will be coordinated with the levee sponsor prior to the inspection. The district program management plan and pre-inspection activities should help inform when it might be appropriate to include others during levee inspections.

## C–5. Inspecting levees as systems

*a.* Levees often operate as a system to keep water out of a shared area (also called the leveed area). The success of the system depends on the condition and performance of each individual segment that is part of it. Due to this, USACE inspects the individual segments that make up a system together. For multi-segment systems, USACE will inspect the entire system at one time or within a relatively short time frame.

*b.* Although levees that compose a system are inspected together, the results and ratings of specific items evaluated are summarized separately for each segment. USACE will prepare inspection reports for each individual levee segment. In cases where a finding or recommendation relates to the system of levees, USACE will work with the sponsor or entity responsible for each levee segment to support understanding and actions to address areas of concern that most impact future levee performance. USACE will also identify those actions that the levee sponsor is responsible for that will best manage their levee segments.

*c.* In some cases, levees include man-made high ground that the levees ties into, referred to as non-project segments. This can include a railroad, roadway, or another embankment. These structures help keep water away from a shared area even though they are not necessarily designed or legislated to be part of the federally authorized project.

*d.* If a non-project segment is unable to withstand floodwaters, the leveed area can be flooded. Monitoring their condition can help USACE and levee sponsors watch for weak points in the system and work to address them in collaboration when possible.

*e.* USACE and levee sponsors will work to inspect non-project segments when they are accessible. In cases where the non-project segment cannot be accessed, the inspection team will record observations based on what is visible.

## C–6. Conducting levee inspections: the Levee Inspection System

*a.* USACE inspects levees using a standard process and checklist that is linked to the National Levee Database. To support consistent use and application of the USACE inspection checklist, inspection teams use the Levee Inspection System, a geographic information system (GIS) software available on global positioning system (GPS)-enabled tablets and devices.

*b.* Data entered in the Levee Inspection System can be synchronized to the National Levee Database, which can be used to review observations, assign an item rating, and generate an initial draft report that summarizes the results. Raw inspection data in the National Levee Database is available to levee sponsors through their unique log-in but is not publicly viewable.

## C–7. Documenting the inspection: inspection ratings

*a.* During the inspection, the inspection team records and documents observations such as an area of high grass, animal burrows, or a well-maintained culvert outlet, for each item in the levee inspection checklist. After the inspection is completed, all inspection observations related to a specific item are grouped together to provide an overall item rating.

*b.* The inspection lead is responsible for finalizing the levee inspection results and will consult inspection team members and other technical subject matter experts as needed for reviewing ratings and documenting final conclusions. All observation descriptions and ratings will then be reviewed and verified or edited to ensure consistency with field conditions and rating guidelines and to ensure appropriate photo(s) are included with each observation.

## C–8. Inspection results and products

Within 90 days of completing the field inspection of the entire levee system, a final, consolidated set of inspection results and products will be compiled and provided to levee sponsors, which may include a transmittal letter (optional), inspection checklist report, levee risk management summary, and the most recent risk assessment results.

## C–9. Site visit procedures

*a.* A site visit is a collaborative activity at a levee system to focus on a particular area of concern, observe or verify any changed conditions, or capture progress on actions for consideration in the next, more detailed inspection. A site visit can be conducted at any time. It provides the flexibility to conduct a visual observation of the levee system between formal inspections.

*b.* USACE districts will notify sponsors at least 30 business days in advance of the site visit when possible, and every effort will be made to accommodate the levee sponsor’s schedule so they are able to attend. The district, in coordination with the levee sponsor, will determine the extent and detail of the site visit, in addition to what expertise is needed to participate on the site visit. Observations and photographs will be documented in a site visit summary form reviewed with the sponsor and finalized by the district Levee Safety Program Manager. A site visit summary will be the final product for a site visit and will be provided to the levee sponsor within 30 days of the site visit.

## Appendix D
## Risk Assessments

### D–1. Purpose

This appendix describes USACE risk assessments, including why and how they are done, who is involved, and how information from them can be used. See Figure D–1 for a summary of information contained in this appendix.


**Figure D–1. Information contained in Appendix D**

### D–2. General information about risk and risk assessments

*a. Floods*.

(1) Dams and levees reduce the risk of flooding to people and property, ensure major rivers are navigable, generate hydropower, provide recreation, provide reliable water sources for the nation, and conserve fish and wildlife.

(2) Dams and levees provide enormous benefits to society. Each year, they prevent an average of $92.4 billion in flood damages in the U.S. Levees have provided most of these benefits in the U.S. (see Figure D–2).

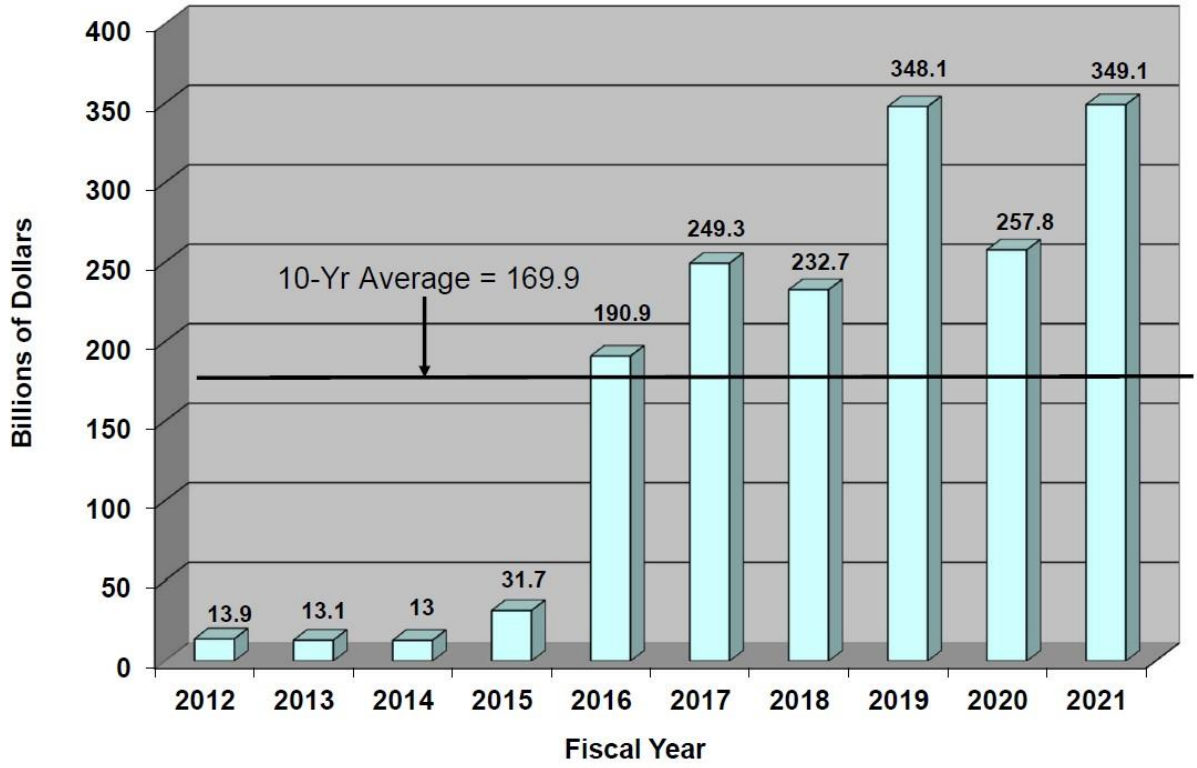



**Figure D–2. Flood damages prevented, by fiscal year**

*b. Historical incidents and observations*.

(1) Although valuable to the nation, these structures could create life-threatening situations if failure were to occur. Some could also create life-threatening situations by operating normally. This has happened hundreds of times across the world, including to levees managed or owned by USACE.

(2) A close look at prior incidents led to the following observations:

*(a)* The majority of structures in the USACE inventory perform well during floods.

*(b)* Dams and levees are systems composed of individual features.

*(c)* Good performance requires that all the features of dams and levees work together.

*(d)* Many structures that failed or had serious incidents met all the relevant design standards.

*(e)* Until the late 1990s, there was no coherent method to evaluate these features as an entire system.

*c. A new approach*.

(1) In coordination with industry and international standards of practice, USACE has been improving the way it looks at levees. As part of this evolution, USACE adapted processes from a variety of sources, including:

*(a)* Other federal agencies.

*(b)* Dutch levee and flood safety practices.

*(c)* Australian dam and flood safety practices.

*(d)* United Kingdom industrial safety practices.

*(e)* Other industry approaches to safety—namely nuclear, aviation, and insurance.

(2) USACE ultimately chose a risk-informed approach to safety for dams and levees. This approach relies on risk assessments and has resulted in more transparency in both the safety evaluations and the resulting decisions. In addition, risk assessment allowed evaluation of how levees could fail beyond only consideration of design standards—USACE now focuses its analyses on potential failure modes (see Figure D–3). A failure mode is a structured way to describe a chain of events that leads to a levee failure. Some of the most common potential failure modes are:

*(a)* Piping and internal erosion of soil embankments or foundations.

*(b)* Stability of embankments and flood walls.

*(c)* Interactions between concrete structures and embankments.

*(d)* Overtopping with breach of embankments.

*(e)* River-side erosion and scour of slopes.

*(f)* Failure due to operational issues such as inability to access and operate gates and closures.

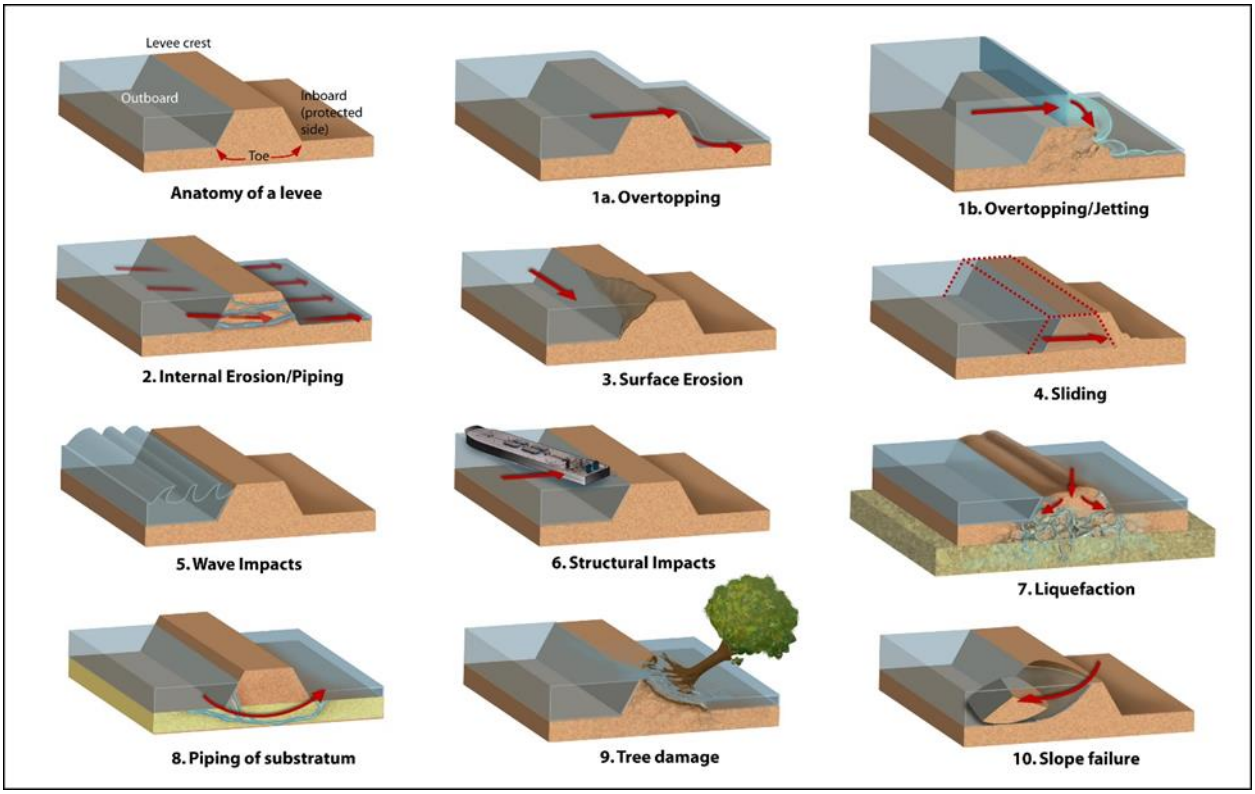



**Figure D–3. Some ways levees fail (Zina Deretsky, National Science Foundation)**

(3) In general, using risk to inform the evaluation of levees has resulted in the following:

*(a)* A better understanding of levees nationwide and ability to put resources where they are most needed and most effective in reducing risk.

*(b)* More transparency in the evaluation of risks and implementation of measures to reduce those risks.

*(c)* A better understanding of what is driving the risks at a given structure, and whether those risks require more attention and prioritizing limited resources.

*(d)* Reducing expenditures on activities which do little to reduce risk.

*(e)* Focusing resources where they will have the most impact.

*(f)* Effectively reducing risk in a cost-effective manner.

*(g)* Improved flood-fighting plans.

*(h)* Improved communications with emergency management agencies.

*(i)* Improved operation and maintenance activities—focusing on areas where risks are the highest.

(4) USACE now uses risk assessments to support all dam and levee safety decisions.

(5) Assessing risk does not imply that levees are risky infrastructure. Instead, risk assessments help owners and sponsors of infrastructure, and the public to understand and quantify the level of risk that still exists with and due to the presence of the infrastructure.

*d. Flood risk and levee risk*.

(1) The term “flood risk” in USACE describes the overall risk of flooding in the area behind the levee. The term “levee risk” refers to the risk associated with the levee system itself. A leveed area becomes flooded when water from a flood source enters the area due to one of four scenarios, referred to as inundation scenarios (see Figure D–4).

(2) These four inundation scenarios are:

*(a)* Breach prior to overtopping: the levee breaches or breaks from a defect within the system.

*(b)* Overtopping with breach: water flows over the top of the levee then the levee breaches due to erosion.

*(c)* Malfunction or improper operation of levee system components: a component of the levee fails, usually a pump station or closure structure.

*(d)* Levee overtopping without breach (also referred to as non-breach): floods exceed the capacity of the levee, but the levee does not breach.

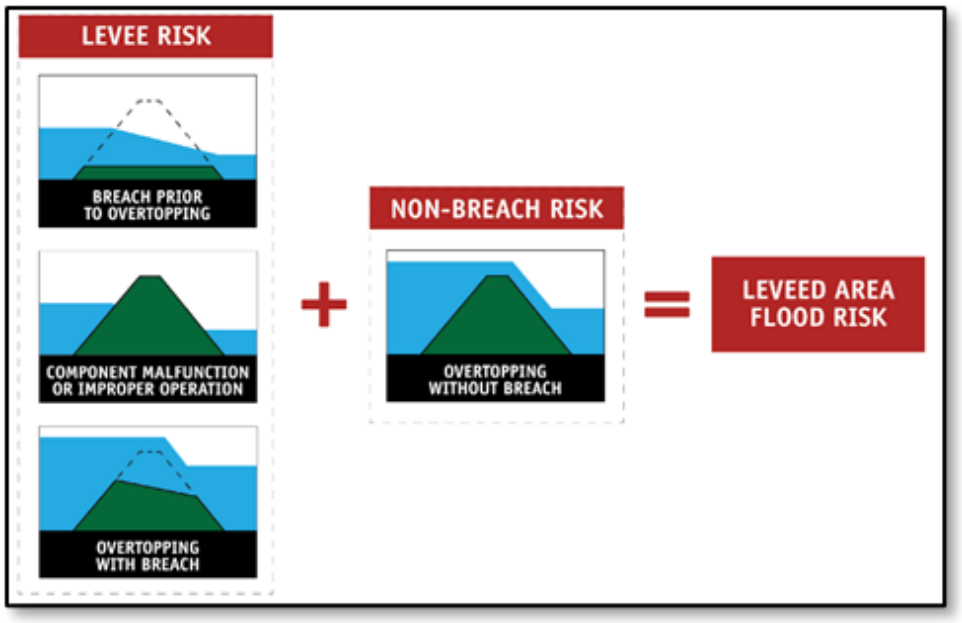



**Figure D–4. Four leveed area inundation scenarios**

(3) Leveed areas can also be flooded from the land side when rainfall exceeds the capacity of the interior drainage features. This scenario is not typically evaluated during risk assessments unless depth of flooding poses a life safety risk.

*e. Terminology*.

(1) Sometimes the words used to describe different aspects of risk can be confusing. Different industries and people use different terms that they are the most comfortable with. USACE has chosen definitions that are the most common in the water resources industry.

(2) Table D–1 includes some common words that are also used and the corresponding words used by USACE.

**Table D–1**
**Common risk terminology**

| Term Used by USACE | Other Terms Used Synonymously |
|---|---|
| Levee Risk | Incremental Risk<br>Structure Risk<br>Breach Risk |
| Flood Risk | Residual Risk<br>Total Risk |
| Non-Breach Risk | Overtopping Risk |

*f.* *Components of risk*.

(1) A risk assessment is a means to determine the most likely ways a levee might fail during flooding and how likely that failure is to occur. A risk assessment also quantifies both the impacts within a community if failure were to occur, and the benefits of having the levee.

(2) During a risk assessment, USACE estimates the likelihood of each of the four inundation scenarios, which involves considering how often the levee experiences flooding and how well the levee performs against the flooding. A risk assessment also identifies the total number of people living and working behind a levee, as well as the number of properties and their value to determine what potential losses may occur in the event of flooding and to quantify the benefits that come from having the levee.

(3) All risk assessments follow the same basic framework of examining the potential hazards, condition and performance, benefits, and consequences should an issue occur (see Figure D–5).

(4) USACE risk assessments are completed following the methods developed and released by the USACE Risk Management Center. The methods are reviewed regularly by experts outside USACE. More detailed information about risk assessment methods can be found at the Risk Management Center's website (www.rmc.usace.army.mil).


**Figure D–5. The components of risk**

## D–3. When would USACE do a risk assessment?

*a. Possible purposes of a risk assessment.* Figure D–6 shows various purposes of USACE risk assessments and how they are initiated.

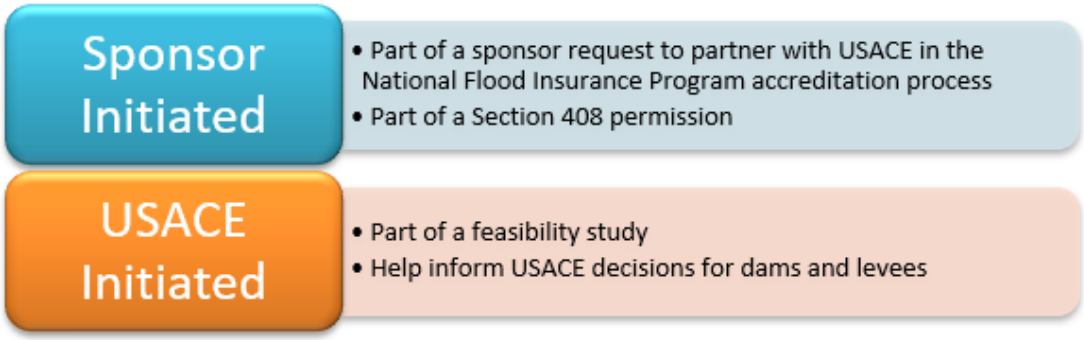



**Figure D–6. Possible purposes of a risk assessment**

(1) Risks are assessed for dams or levees to inform a variety of decisions by USACE. The most common are:

*(a)* Emergency preparedness. Information from risk assessments can be used to plan for evacuation routes, flood-fighting techniques, and priority areas for monitoring during high-water events.

*(b)* Scalable decisions. Risk assessments are used by USACE to support decisions about scope and detail of data collection, analyses, modeling, and increasing or decreasing minimum design requirements. Greater risk, complexity, or cost may require greater analytical detail.

*(c)* Portfolio management. USACE uses risk assessments to understand the risk and prioritize actions and investments across the entire USACE inventory of levees.

*(d)* Feasibility studies. Risk assessments are required to support USACE feasibility studies. Life safety risks and benefits (and other social effects), economic risks and benefits, and environmental risks and benefits are commonly used to evaluate different alternatives.

*(e)* Levee accreditation for the National Flood Insurance Program. USACE will evaluate certain criteria related to levee accreditation during higher level risk assessments. In addition, levee sponsors of federally authorized levees can choose to cost share a risk assessment with USACE to make an accreditation recommendation to FEMA under the National Flood Insurance Program.

*(f)* Section 408 requests. Depending on the scope and scale of a Section 408 request involving a federally authorized levee, risk assessments may be required to support the USACE Section 408 decision.

(2) There are a variety of other reasons to perform a risk assessment on a federally authorized levee. Regardless of the purpose, it is important for USACE and the levee sponsors to agree on the following items before a risk assessment starts.

*(a)* What decision is being made and who is making that decision?

*(b)* What is the appropriate level of effort to support that decision?

*(c)* The roles of all the participants in the process.

*(d)* How the risk assessment will be funded.

(3) Ensuring a common understanding of the scope with levee sponsors is the single most important factor for a successful risk assessment. The most common reason for dissatisfaction with a risk assessment is the failure of USACE and the local sponsor to adequately scope the effort together.

(4) Figure D–7 summarizes the key steps in a risk assessment.

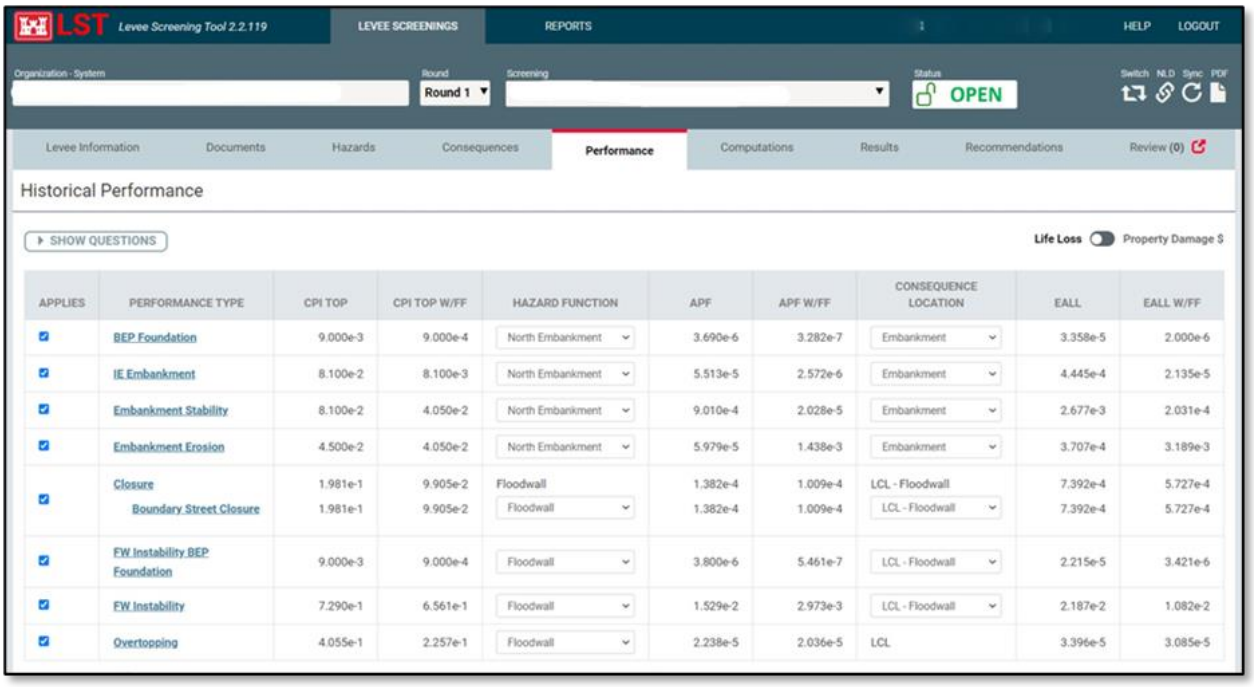

**Figure D–7. Key steps in a risk assessment**

*b. Types of risk assessments*.

(1) There are three different types of risk assessments: screening, semi-quantitative (sometimes abbreviated as SQRA), and quantitative (sometimes abbreviated as QRA).

(2) The level of information and the amount of uncertainty reflected in the risk varies by the type of assessment. As the type of risk assessment becomes more detailed, the accuracy of the risk estimate improves.

*(a) Screening*. A simplified risk assessment that relies on existing data, historical performance, and engineering judgment, and assumes pre-defined performance modes to quickly characterize levee risk. Users combine inspection information with existing, readily available hazard (loading), condition and performance, and consequence information to describe the performance of a levee and the consequences of flooding. Screening risk assessments are completed using the Levee Screening Tool (see Figure D–8).




| APPLIES | PERFORMANCE TYPE | CPI TOP | CPI TOP W/FF | HAZARD FUNCTION | APF | APF W/FF | CONSEQUENCE LOCATION | EALL | EALL W/FF |
|---|---|---|---|---|---|---|---|---|---|
| ☑ | BEP Foundation | 9.000e-3 | 9.000e-4 | North Embankment | 3.690e-6 | 3.282e-7 | Embankment | 3.358e-5 | 2.000e-6 |
| ☑ | IE Embankment | 8.100e-2 | 8.100e-3 | North Embankment | 5.513e-5 | 2.572e-6 | Embankment | 4.445e-4 | 2.135e-5 |
| ☑ | Embankment Stability | 8.100e-2 | 4.050e-2 | North Embankment | 9.010e-4 | 2.028e-5 | Embankment | 2.677e-3 | 2.031e-4 |
| ☑ | Embankment Erosion | 4.500e-2 | 4.050e-2 | North Embankment | 5.979e-5 | 1.438e-3 | Embankment | 3.707e-4 | 3.189e-3 |
| ☑ | Closure | 1.981e-1 | 9.905e-2 | Floodwall | 1.382e-4 | 1.009e-4 | LCL - Floodwall | 7.392e-4 | 5.727e-4 |
| | Boundary Street Closure | 1.981e-1 | 9.905e-2 | Floodwall | 1.382e-4 | 1.009e-4 | LCL - Floodwall | 7.392e-4 | 5.727e-4 |
| ☑ | FW Instability BEP Foundation | 9.000e-3 | 9.000e-4 | Floodwall | 3.800e-6 | 5.461e-7 | LCL - Floodwall | 2.215e-5 | 3.421e-6 |
| ☑ | FW Instability | 7.290e-1 | 6.561e-1 | Floodwall | 1.529e-2 | 2.973e-3 | LCL - Floodwall | 2.187e-2 | 1.082e-2 |
| ☑ | Overtopping | 4.055e-1 | 2.257e-1 | Floodwall | 2.238e-5 | 2.036e-5 | LCL | 3.396e-5 | 3.085e-5 |

**Figure D–8. The Levee Screening Tool 2.0 used to complete all USACE screening risk assessments**

*(b) Semi-quantitative*. Uses currently available information but may also involve gathering new information to inform its findings. These risk assessments transition from choosing pre-defined performance modes to identifying failure modes specific to the levee. This results in a more accurate estimate of risk and a more thorough understanding of the system.

*(c) Quantitative*. Requires the greatest level of effort; it uses currently available information but may also involve gathering new information to inform its findings, considers custom failure modes specific to the levee, and results in the most accurate estimate of risk. Typically, this can be most appropriate for levee systems where the cost to implement actions on the levee exceeds $100 million or the population behind the levee is more than 1,000 people.

(3) Table D–2 summarizes the types of risk assessments and associated level of effort and roles.

**Table D–2**
**Types of risk assessments and associated level of effort and roles**

| Type of Risk Assessment | Level of Effort and Roles |
|---|---|
| Screening | • Low effort<br>• Average team includes two to four people<br>• USACE district leads the assessment with the levee sponsor<br>• Results reviewed by USACE National Cadre<br>• Most effort is in documentation<br>• Team enters information into the USACE Levee Screening Tool |
| Semi-quantitative | • Medium effort<br>• Average team includes 10 people<br>• One or two USACE-approved facilitators lead the effort<br>• Team includes USACE district and the levee sponsor or USACE risk cadre, USACE district, and the levee sponsor<br>• Results reviewed by USACE Levee Senior Oversight Group<br>• Most effort is in understanding failure modes<br>• Teams use spreadsheets and some custom software |
| Quantitative | • The amount of effort varies, but these analyses can sometimes require intense effort<br>• Average team includes 15 people<br>• Two USACE-approved facilitators lead the effort<br>• Team includes USACE risk cadre, USACE district, and the levee sponsor<br>• Results reviewed by USACE Levee Senior Oversight Group or panel of experts<br>• Most effort is in analyzing the levee or foundation<br>• Teams use spreadsheets and custom software |

## D–4. Who participates in a risk assessment?

*a.* A variety of individuals and entities can participate in risk assessments. Although USACE may employ or contract with a variety of national experts to perform risk assessments, local USACE districts and levee sponsors know more about their

system, operation, and past performance. Their participation, and the knowledge they bring to the assessment, is critical to understanding and assessing risk.

*b.* Table D–3 provides a description of potential participants in risk assessments and a broad overview of their roles. Use this table as a general guide. It is important for USACE and the levee sponsors to agree on the participant roles prior to starting a risk assessment.

**Table D–3**
**Potential participants in risk assessments and their roles**

| Entity | Role in the Risk Assessment |
|---|---|
| Levee Sponsors | Levee sponsors or their representatives are encouraged to participate. Levee sponsors bring critical information to the risk assessment regarding the levee, its operation, and performance. The level of participation is up to the sponsor. |
| Consultants Employed by Levee Sponsors | Consultants employed by levee sponsors can participate in any risk assessment involving their levee. Their level of participation is up to the sponsor. |
| FEMA Regional Staff | Staff from local FEMA regions can attend risk assessments. |
| Emergency Management Agencies | Representatives from local emergency management agencies can participate in any risk assessment. Their participation will be coordinated between the levee sponsor and USACE district. |
| USACE Local District Subject Matter Experts | USACE district subject matter experts should participate in any risk assessment involving levees in their district's area of responsibility. USACE districts can facilitate risk assessments with the approval of the Risk Management Center. |
| Risk Cadre | USACE has risk cadres that support risk assessments nationwide. These cadres work across the country, get extensive training, and are familiar with USACE and industry risk assessment practices. When assigned, risk cadre members participate for the duration of the risk assessment. |
| USACE National Centers | Representatives from national centers lead or participate in all types of risk assessments. Many times, facilitators are provided by the national centers. |
| USACE Headquarters | USACE headquarters staff may participate as part of the risk assessment team, but this is unlikely. Headquarters coordinates peer reviews of all risk assessments. |
| Consultants Employed by USACE | Consultants employed by USACE can participate at USACE's discretion. The level of participation is up to USACE. |

## D–5. What happens before risk assessments?

*a. Categories*. Regardless of the type of risk assessment being conducted, teams gather and develop information in the following categories: hazards, condition and performance, and benefits and consequences (see Figure D–9).

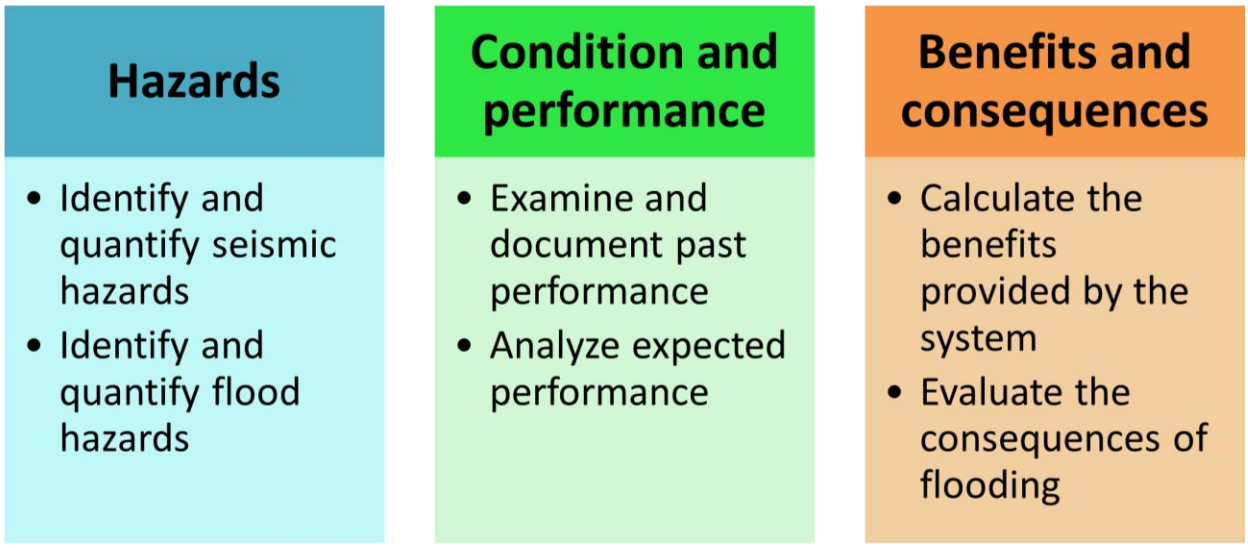



**Figure D–9. Risk assessment information categories**

*b.* *Supporting documentation*. Some types of supporting documentation or information might include:

(1) Design documentation and analyses.

(2) As-built drawings.

(3) Inspection reports.

(4) Levee component testing plan and results.

(5) Performance history documents and photos.

(6) Survey information.

(7) Maps.

(8) Project drawings and reports.

(9) Design memoranda.

(10) Local or regional flood frequency studies and reports.

(11) Historical flood records.

(12) O&M manuals.

(13) O&M records.

(14) Hydraulics and hydrology data.

(15) Geotechnical data.

(16) Structural data.

(17) Information about what is in the leveed area.

*c. Information sources*. This information may be found in the National Levee Database, district files, levee sponsor files, on public webpages, local libraries, county and state public records, consultant offices files, and project office files. The amount of information varies by levee, levee sponsor, and local USACE district. The amount of effort put into developing supporting information should be discussed when the risk assessment scope is determined.

*d. Screening risk assessments*.

(1) Information is collected and prepared before risks are estimated using the USACE Levee Screening Tool. Historical performance, hydrology, operation and maintenance history, as-built drawings, construction activities, and other relevant information is compiled and entered into the Levee Screening Tool. If the levee system has not been surveyed and entered into the National Levee Database, this is typically done before the risk assessment.

(2) Preparation for screening risk assessments is led by the local USACE district. Table D–4 summarizes the roles for preparing for a screening.

**Table D–4**
**Roles for preparing for a screening risk assessment**

| Sponsor and Their Consultants | Local USACE District and Their Consultants | Other USACE Elements |
|---|---|---|
| • Decide on level of participation<br>• Coordinate input and background information with the local USACE district | • Coordinate and assemble the background information about the levee being evaluated including hydrology, performance, analyses, and other relevant background information<br>• Enter the supporting information into the National Levee Database and Levee Screening Tool | • Ensure the corporate tools—primarily the National Levee Database and the Levee Screening Tool—are available<br>• Provide support as needed |

*e. Semi-quantitative and quantitative risk assessments*.

(1) Preparation for semi-quantitative or quantitative risk assessments are done at the local level by the local USACE district and the risk assessment facilitator, in coordination with the levee sponsor. Typically, national teams called risk cadres support these risk assessments. These teams also participate in the preparation phase.

(2) A significant amount of information is prepared before risks are estimated. Historical performance, hydrology and hydraulics, operation and maintenance history, inspection data, as-built drawings, construction activities, and other relevant information is compiled and entered into ProjectWise. Initial consequence estimates for different failure scenarios are developed. If the levee has not been surveyed and entered into the National Levee Database, this is typically done prior to the risk assessment. Table D–5 summarizes the roles for preparing for a semi-quantitative or quantitative risk assessment.

**Table D–5**
**Roles for preparing for a semi-quantitative or quantitative risk assessment**

| Sponsor | Local USACE District | Other USACE Elements |
|---|---|---|
| • Decide on level of participation<br>• Coordinate input and background information with the local USACE district | • Coordinate and assemble the background information about the structure being evaluated including hydrology, performance, analyses, and other relevant background information<br>• Ensure the local sponsor and FEMA are invited to the risk assessment<br>• Enter the supporting information into the National Levee Database and ProjectWise | • Ensure the facilitator is appropriate for the risk assessment<br>• Lead preparation meetings between the sponsor, local USACE participants, and other parties<br>• Ensure flood and earthquake hazards are prepared and ready<br>• Ensure initial consequence assessment is ready for the risk assessment |

## D–6. What happens during risk assessments?

*a. Screening risk assessments*.

(1) Once the background information is prepared, it is entered into the Levee Screening Tool. This is done by the USACE district in coordination with the levee sponsor. The tool quickly estimates the probability of inundation behind the levee, compared to an average levee in the USACE portfolio.

(2) Once completed, the facilitator submits the screening for district and division review, followed by a review by the National Cadre to promote consistency across the enterprise in the understanding of risk for levees.

(3) Table D–6 summarizes the roles for conducting a screening risk assessment.

**Table D–6**
**Roles for conducting a screening risk assessment**

| Sponsor | Local USACE District | Other USACE Elements |
|---|---|---|
| • Participate with the local USACE district when the risk is evaluated using the Levee Screening Tool<br>• Work with USACE to draft a prioritized list of recommendations for the levee risk management summary<br>• Review the results with the local district | • Facilitate the screening<br>• Request assistance from the national team as needed<br>• Work with the sponsor to draft a prioritized list of recommendations | • Ensure the corporate tools—primarily the National Levee Database and the Levee Screening Tool—are available<br>• Provide support as needed<br>• Results reviewed by USACE national experts |

*b. Semi-quantitative risk assessments*.

(1) A key step of a semi-quantitative risk assessment is a meeting that takes place over the course of a week or several weeks, depending on the complexity of the system. A trained facilitator guides the team through a structured process to:

*(a)* Understand the hazards.

*(b)* Identify ways the system could malfunction or fail (failure modes).

*(c)* Assess the relative likelihood (risk) of those events.

*(d)* Identify the consequences of those events.

(2) Examples of these risk matrices are shown below (Figure D–10).

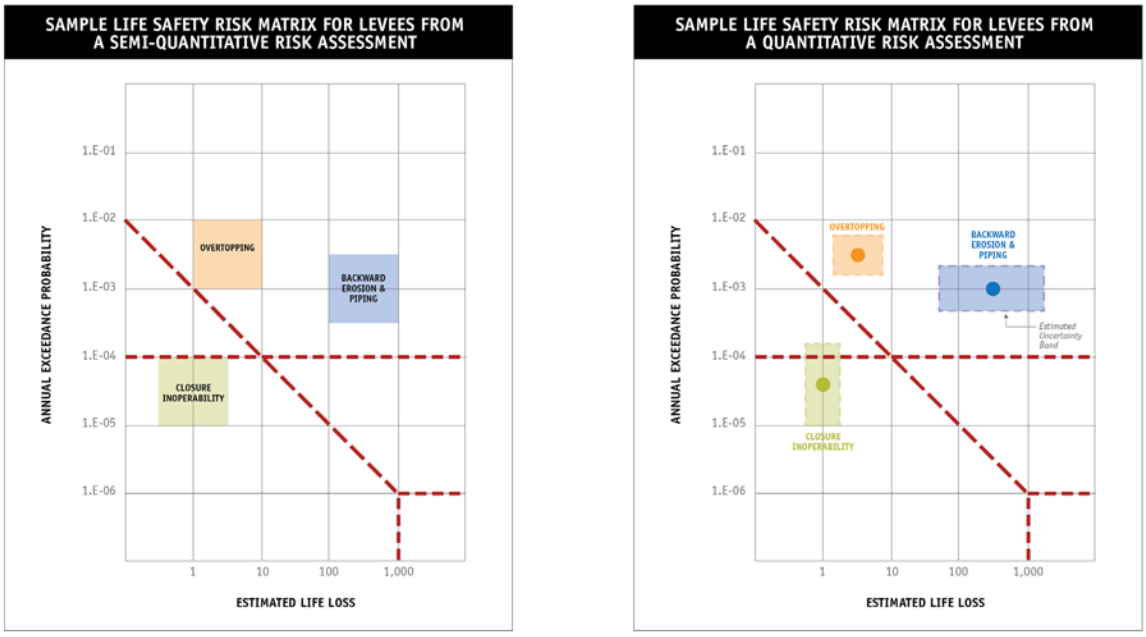



**Figure D–10. Example risk matrices from a semi-quantitative and quantitative risk assessment**

(3) Table D–7 summarizes the roles for conducting a semi-quantitative risk assessment.

**Table D–7**
**Roles for conducting a semi-quantitative risk assessment**

| Sponsor | Local USACE District | Other USACE Elements |
|---|---|---|
| • Participate in the risk assessment at their discretion<br>• Work with USACE to draft a prioritized list of recommendations for the levee risk management summary<br>• Review the report | • Participate in the risk assessment<br>• Provide subject matter experts for the risk assessment<br>• Work with the sponsor to draft a prioritized list of recommendations for the levee risk management summary<br>• Complete the report | • Facilitate the risk assessment<br>• Provide expertise when it is not available at the local district or when requested<br>• Results reviewed by USACE national experts |

(4) Following this meeting, the team prepares a report. A copy of this draft report will be provided to the team, the local district, and the local sponsor 30 days before starting the national review process.

*c. Quantitative risk assessments*.

(1) Quantitative risk assessments are customized to the purpose and scope of the assessment. Experts are chosen from across USACE to provide specific experience related to the system being evaluated. It is critical that local sponsors and those familiar with the operation and maintenance of structures are involved with these risk

assessments; their expertise with the levee system is valuable to the process. The level of involvement is up to the sponsor.

(2) The beginning of these assessments is very similar to semi-quantitative risk assessments and includes a meeting and generating the same matrices. However, the teams then create custom event trees to describe each failure mode, including detailed examinations of uncertainty.

(3) Considerable effort is put into characterizing risks, uncertainties, and choosing ways to portray those risks to USACE and local sponsors. Some examples of how risks are portrayed in quantitative risk assessments are shown in Figure D–11.

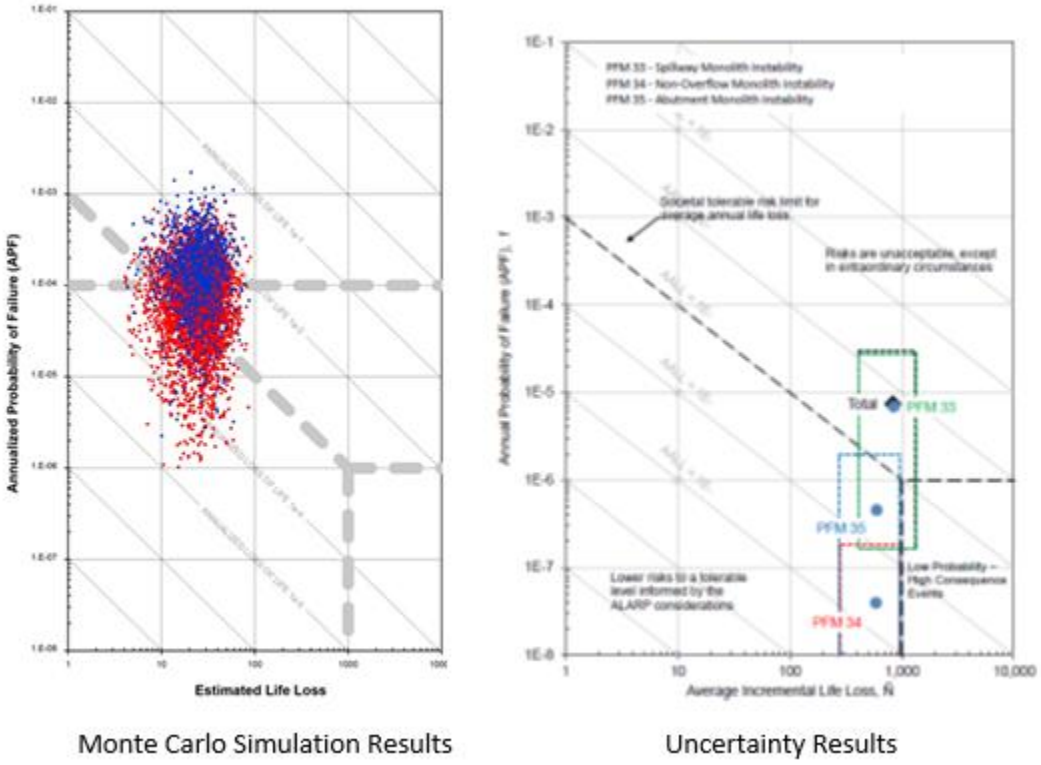



**Figure D–11. Example risk matrices from a quantitative risk assessment**

(4) Table D–8 summarizes the roles for conducting a quantitative risk assessment.

**Table D–8**
**Roles for conducting a quantitative risk assessment**

| Sponsor | Local USACE District | Other USACE Elements |
|---|---|---|
| • Participate in the risk assessment at their discretion<br>• Work with USACE to draft a prioritized list of recommendations for the levee risk management summary<br>• Review the report | • Participate in the risk assessment<br>• Provide expertise in the system being assessed<br>• Provide an internal review of the report<br>• Work with the sponsor to draft a prioritized list of recommendations for the levee risk management summary | • Facilitate the risk assessment<br>• Provide expertise in the relevant areas<br>• Complete the report<br>• Results reviewed by USACE national experts or an external panel of experts |

(5) Following the meeting, the team prepares a report. A copy of this draft report will be provided to the team, the local district, and the local sponsor 30 days before starting the national review process.

(6) Each semi-quantitative and quantitative risk assessment will include an analysis related to levee accreditation for the National Flood Insurance Program. A recommendation related to levee accreditation for the National Flood Insurance Program will be made if the results of a risk assessment have a sufficient level of assurance.

(7) For any type of risk assessment, USACE and levee sponsors will evaluate all risk assessment information and develop a prioritized list of recommended actions for levee operation, maintenance, repair, replacement, and rehabilitation, and building risk awareness. USACE and the sponsor will identify actions specific to individual levee segments.

## D–7. What happens after risk assessments?

*a. Process*. After any risk assessment, USACE follows the same general process outlined in Figure D–12.

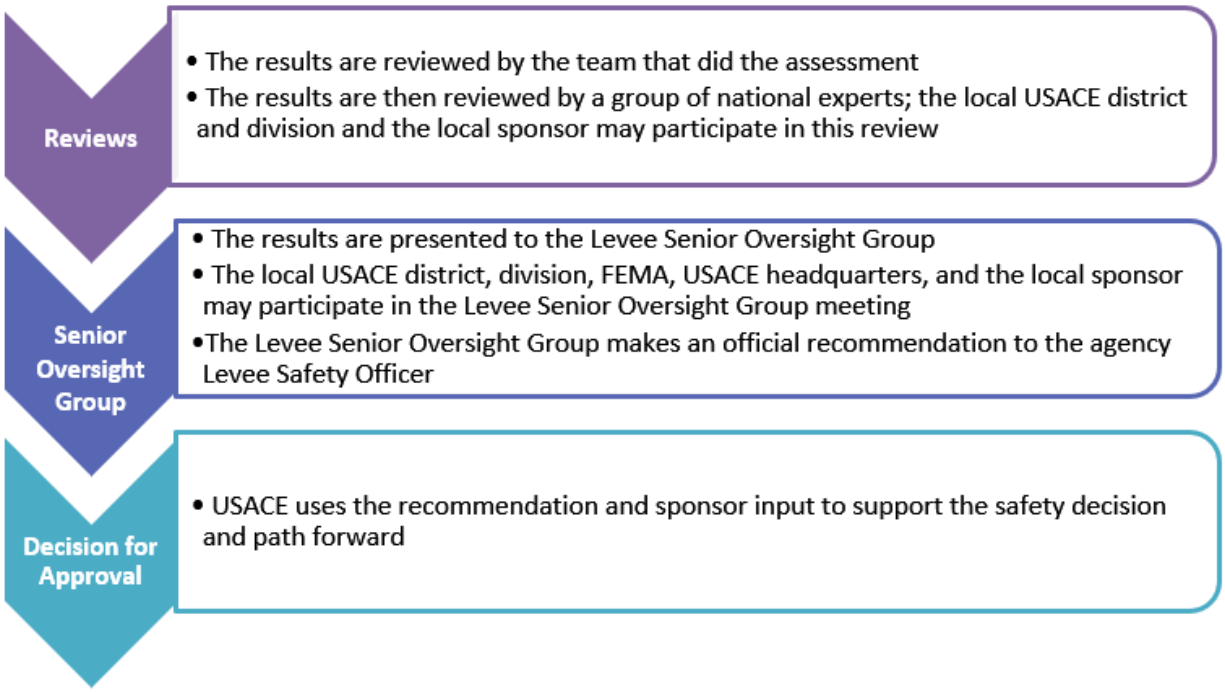



**Figure D–12. Post-risk assessment process steps**

*b. Levee Senior Oversight Group*.

(1) The Levee Senior Oversight Group consists of USACE staff representing key disciplines in levee safety and provides recommendations to the USACE headquarters Levee Safety Officer and deputy Levee Safety Officer on levee risk characterizations, prioritizes levee federal investments, provides direction for levee projects with high potential life safety risk, and other levee safety matters. The group typically makes recommendations for the following activities:

*(a)* Screening risk assessments.

*(b)* Semi-quantitative risk assessments.

*(c)* Quantitative risk assessments.

*(d)* Section 408 alterations with high life-safety risks.

*(e)* Studies or design related to levee systems.

*(f)* Portfolio risk management priorities.

*(g)* Design deviations.

*(h)* Projects with existing risk assessments and baseline risks appearing to change.

*(i)* Policy issues.

*(j)* Other topics identified by the USACE headquarters Levee Safety Officer and deputy Levee Safety Officer.

(2) In addition to making these recommendations, the group classifies each structure within the portfolio to help USACE prioritize its resources. This classification is called the Levee Safety Action Classification (see Table D–9).

**Table D–9**
**Levee safety action classification table**

| Risk Classification | | Actions for Levee Systems and Leveed Areas in this Class (Adapt actions to specific levee system conditions) | Risk Characteristics of this Class |
|---|---|---|---|
| **Very High (1)** | | Based on risk drivers, take immediate action to implement interim risk reduction measures. Increase frequency of levee monitoring; communicate risk characteristics to the community within an expedited timeframe; verify emergency plans and flood inundation maps are current; ensure community is aware of flood warning systems and evacuation procedures; and recommend purchase of flood insurance. Support risk reduction actions as very high priority. | Likelihood of inundation due to breach and/or system component malfunction in combination with loss of life, economic, or environmental consequences results in very high risk. |
| **High (2)** | | Based on risk drivers, implement interim risk reduction measures. Increase frequency of levee monitoring; communicate risk characteristics to the community within an expedited timeframe; verify emergency plans and flood inundation maps are current; ensure community is aware of flood warning and evacuation procedures; and recommend purchase of flood insurance. Support risk reduction actions as high priority. | Likelihood of inundation due to breach and/or system component malfunction in combination with loss of life, economic, or environmental consequences results in high risk. |
| **Moderate (3)** | | Based on risk drivers, implement interim risk reduction measures as appropriate. Verify risk information is current and implement routine monitoring program; assure operation and maintenance is up to date; communicate risk characteristics to the community in a timely manner; verify emergency plans and flood inundation maps are current; ensure community is aware of flood warning and evacuation procedures; and recommend purchase of flood insurance. Support risk reduction actions as a priority. | Likelihood of inundation due to breach and/or system component malfunction in combination with loss of life, economic, or environmental consequences results in moderate risk. |

| Risk Classification | | Actions for Levee Systems and Leveed Areas in this Class (Adapt actions to specific levee system conditions) | Risk Characteristics of this Class |
|---|---|---|---|
| **Low (4)** | | Verify risk information is current and implement routine monitoring program and interim risk reduction measures, if appropriate. Assure operation and maintenance is up to date; communicate risk characteristics to the community, as appropriate; verify emergency plans and flood inundation maps are current; ensure community is aware of flood warning and evacuation procedures; and recommend purchase of flood insurance. Support risk reduction actions to further reduce risk to as low as practicable. | Likelihood of inundation due to breach and/or system component malfunction in combination with loss of life, economic, or environmental consequences results in low risk. |
| **Very Low (5)** | | Continue to implement routine levee monitoring program, including operation and maintenance, inspections, and monitoring of risk. Communicate risk characteristics to the community as appropriate; verify emergency plans and flood inundation maps are current; ensure community is aware of flood warning and evacuation procedures; and recommend purchase of flood insurance. | Likelihood of inundation due to breach and/or system component malfunction in combination with loss of life, economic, or environmental consequences results in very low risk. |
| **No Verdict** | | Not enough information is available to assign a Levee Safety Action Classification. | |

(3) Coming out of a Levee Senior Oversight Group meeting, the following should be accomplished:

*(a)* A system will be assigned a Levee Safety Action Classification.

*(b)* The group and the sponsor will agree on a prioritized list of recommendations and update the levee risk management summary.

*(c)* A memorandum summarizing the outcomes and decisions made during the meeting will be completed and attached to the risk assessment results, then transmitted to the Levee Safety Officer for USACE, the local USACE district, the division, and the sponsor.

*c. Final risk assessment results*.

(1) Agency and sponsor reviews.

*(a)* The USACE risk assessment process will meet the requirements of the USACE Civil Works Review Policy (ER 1165-2-217) and will complete all required reviews.

*(b)* Sponsors are full participants in these reviews and contribute to resolving issues before the results of the risk assessment are briefed to the Levee Senior Oversight Group.

(2) Requests for reconsideration through the Levee Senior Oversight Group.

*(a)* Before any risk assessment is presented to the Levee Senior Oversight Group, the levee sponsor can submit, at any time, a letter of request through the appropriate district Commander to the Levee Senior Oversight Group proposing a different set of recommendations or overall conclusion. The letter should explain the rationale as to why the results should be changed and provide any additional information to support the change.

*(b)* The sponsor will also be given the opportunity to present this rationale to the Levee Senior Oversight Group. The Levee Senior Oversight Group will consider this information when it deliberates.

(3) Final documentation for screening risk assessments.

*(a)* To record and summarize each screening risk assessment, a risk assessment report initially generated in the Levee Screening Tool will be reviewed and verified by the district Levee Safety Program Manager within 30 days of receipt of the final decision memorandum from the Levee Senior Oversight Group.

*(b)* The final written summary will be provided to the levee sponsor as part of the comprehensive deliverable.

(4) Final documentation for semi-quantitative and quantitative risk assessments.

*(a)* Semi-quantitative and quantitative risk assessments will be summarized in a report. Final approval of each report will be by the district Levee Safety Officer and the Director of the Risk Management Center or the director's designee.

*(b)* A copy of the final report will be provided to each levee sponsor within 30 days of the report being finalized.

## D–8. Where to find more information

*a. Reference information*.

(1) USACE has a reference center that contains general information and links to documents and sites with more detailed information about risk assessments: https://www.rmc.usace.army.mil/ReferenceCenter/RiskAssessment.

(2) USACE has a library of references that describe a variety of aspects of risk assessment: http://www.rmc.usace.army.mil/Library/RMC-Publications/.

(3) The Risk Management Center has a list of tools that are used to assess risk: https://www.rmc.usace.army.mil/Software/.

(4) FEMA Products and Tools are available at: https://www.fema.gov/flood-maps/products-tools.

*b. Available training*.

(1) A variety of levee safety and risk assessment training is available from USACE at: https://www.rmc.usace.army.mil/Training/Risk-Assessment/.

(2) The U.S. Society on Dams has several courses that relate to risk assessments are at: https://www.ussdams.org/training-education/.

(3) USACE, the Bureau of Reclamation, the Federal Energy Regulatory Commission, and the Tennessee Valley Authority jointly teach an advanced course in risk assessment at Best Practices in Dam and Levee Safety Risk Analysis: https://www.rmc.usace.army.mil/Training/Risk-Assessment/.

## Appendix E
## Levee Operation, Maintenance, Repair, Replacement, and Rehabilitation

### E–1. Purpose

This appendix provides an overview of how USACE and levee sponsors will work together to prioritize recommendations and track progress of levee management.

### E–2. Managing levees

*a.* The continued success of federally authorized levees directing water away from people and property depends on those responsible for managing them. For many levees, this includes levee sponsors, who play a vital role ensuring the levee continues to remain in working order and taking actions to improve it.

*b.* Levee sponsors are responsible for managing levees consistent with the USACE-issued O&M manual, USACE and sponsor project agreements, and 33 CFR 208.10. This often includes routine activities like mowing the levee, completing inspections, testing or monitoring features on the levee, and rodent management, as well as non-routine activities such as replacing or rehabilitating a portion of the levee.

*c.* Levee management should be continuous and informed by what is known about the levee. In some cases, the activities and options recommended to manage levees can be hard to prioritize due to the time and resources required.

*d.* Levee Safety Program activities and tools are intended to help levee sponsors have a stronger understanding of their levees and which actions have the greatest impact on their future performance. For example, levee inspections can help USACE and levee sponsors identify areas that are deteriorating and that need increased monitoring or action to address. However, risk assessments can often shed light on how those areas could respond during a flood and whether addressing them really makes the most impact for the use of limited resources.

*e.* To help levee sponsors prioritize recommended actions on the levee, USACE will work with levee sponsors to develop a tool that summarizes best available levee information and recommended actions. This tool, referred to as the levee risk management summary, can inform levee management actions and help USACE and levee sponsors monitor, track, and adapt planned levee OMRR&R activities based on changing conditions.

### E–3. Levee risk management summary

*a.* The levee risk management summary is an internal tool that details prioritized recommendations for OMRR&R for each levee system. It is based on best available levee information from formal and special inspections, site visits, and risk assessments and serves as the mechanism to:

(1) Consolidate newly collected information.

(2) Assess how the newly collected information, in combination with other changed conditions, may impact the risk to the leveed area.

(3) Develop, update, and adapt levee management recommendations.

*b.* Since the levee risk management summary is based on information gathered during Levee Safety Program activities, it is typically developed or updated in conjunction with them. USACE will lead development of the levee risk management summary with levee sponsors after each inspection and risk assessment, or when new information is collected or made available.

*c.* USACE will create and store the levee risk management summary in the National Levee Database. The levee risk management summary is available for sponsors but will not be publicly viewable.

*d.* While developing the levee risk management summary, USACE and levee sponsors will review the recommended actions together and discuss opportunities to implement them.

## E–4. Managing levees as systems

*a.* Levee systems are comprised of individual levees or levee segments, often operated and maintained by a single entity. USACE and levee sponsors work together to ensure federally authorized levees continue to provide their intended benefits to communities. Doing so requires management of individual levee segments, as well as the systems they comprise. A weak or low point in any part of a levee system can impact the levee's continued ability to keep water away from the leveed area.

*b.* Since levee segments operate as a system to reduce flood risks, it is important to consider recommendations that support continued success of the entire system. When making recommendations, USACE will consider how segments operate together and provide recommendations that optimize benefits for the entire system.

*c.* Summarizing the condition at the system level requires a synthesis of all segment's information (which may include non-project segments) to determine what is most critical to continued performance. District Levee Safety Program Managers will lead development of the recommended actions summary for the system, working in partnership with levee sponsors.

*d.* Since all recommendations for a system will not be applicable to each individual segment, district Levee Safety Program Managers will lead development of a levee risk management summary for each segment. Levees that are not a part of a system will have a single levee risk management summary specific to their levee. Levees that are part of a system (multiple levee segments often managed by different entities) will have a levee risk management summary specific to their levee that will also include information and recommendations relevant to the system. This can provide sponsors for

levee segments and systems actionable information and support understanding of how a segment contributes to the risk and success of the entire system.

*e.* In cases where findings or recommendations relate to the system of levees, USACE will work with sponsors to coordinate and address them as a system.

*f.* While recommendations in the levee risk management summary will primarily relate to OMRR&R, others may be more relevant to actions in the area behind the levee. In cases where a recommendation extends beyond a levee sponsor's role or authority, USACE and the levee sponsor will work together to identify a more appropriate party to complete that recommendation and agree on a strategy to communicate it with them.

## E–5. Prioritizing recommended actions for levee management

*a.* The levee risk management summary will list the recommended actions in priority order based on what is most critical to the levee. For a multi-segment system, each segment will receive their own list of recommended actions. Some may be completed by one segment's sponsor; some may require coordination between multiple sponsors.

*b.* Recommended actions may involve obtaining a better understanding of the levee system by increasing how often levee inspections or risk assessments are conducted. This may also include sharing levee information with the community and improving evacuation planning and effectiveness.

*c.* Recommended actions often include activities that fulfill daily levee management responsibilities. Some examples include routine pipe inspections, trial closure installations, and monitoring the levee toe during a flood event. Recommendations can include actions to reduce the likelihood and impacts of flooding, which might involve structural repairs or modifications to the levee, such as adding riprap or installing relief wells to reduce seepage.

*d.* Prioritizing and tracking levee management helps USACE and sponsors measure and assess progress in successful levee management over time. The initial levee risk management summary for a levee system will serve as the benchmark against which progress will be measured. Progress on each recommendation identified will be tracked until a recommendation has been marked complete or removed because the recommendation is no longer considered necessary.

## Appendix F
## Sharing Levee Information

### F–1. Purpose

This appendix describes roles and responsibilities for sharing levee information to improve awareness and facilitate informed decision-making.

### F–2. Why USACE shares levee information

*a.* Levees are designed to reduce the risk of flooding to people and property. While levees reduce the risk of flooding, they do not fully eliminate it. Raising awareness of levees, including the benefits they provide, actions being taken to maintain those benefits, known challenges or concerns with maintaining levees, and possible scenarios where the levee may not perform as designed and what could be affected, is a key element of the USACE Levee Safety Program.

*b.* Sharing levee information is an iterative, open exchange of data, advice, and opinions among individuals, groups, and institutions about levees. For the Levee Safety Program, sharing levee information focuses on describing the benefits and flood risks associated with a levee and options to manage that risk. Typically, levee communication includes sharing information about the following topics:

(1) Why the levee is there.

(2) What is behind the levee.

(3) What/who benefits from the levee being there.

(4) How the levee works.

(5) The condition of the levee.

(6) How the levee will perform under a variety of circumstances.

(7) What/who might flood.

(8) How flood risk may change over time.

(9) Opportunities to preserve levee benefits.

(10) Options to manage flood risks.

*c.* Discussing the benefits and risks of levees can facilitate better awareness, understanding, and action internally among peers and decision-makers, and externally with other federal agencies, state, or local governments, elected officials, or individuals. Intentionally engaging audiences in a dialogue to share information in the appropriate context and tone provides an opportunity to learn from, build trust with, and support others who play a vital role in addressing broader flood risk.

## F–3. USACE’s goal for sharing levee information

*a.* The goal of sharing levee information is to build awareness of the benefits and risks associated with living and working behind a levee. Increased awareness can result in added support for and understanding of actions being taken to address areas of concern on the levee, in addition to community and individual decisions to further protect people and property in the area behind the levee.

*b.* The USACE Levee Safety Program has information about levees that will be shared with those who operate and maintain the levee, as well as those who benefit from the levee and who are potentially at risk. To build awareness, USACE will work in collaboration with other USACE communities of practice, sponsors for federally authorized levees, and federal, state, and local agency partners to:

(1) Maintain best available information about levees.

(2) Share information in a clear and simple manner.

(3) Provide access to and support understanding of available information, including how it can be used to inform actions on the levee, and actions by community leaders and decision-makers to manage their flood risks.

(4) Develop a shared communication approach that identifies a lead for communication, key information to share, audiences, ways to reach those audiences, and opportunities to adjust based on changes in risk, levee condition, or audience awareness.

(5) Partner to share levee condition and performance information with those who may need it, such as local emergency management agencies with responsibility for communication and evacuation, or local agencies responsible for land-use planning in the community.

(6) Publicly share baseline information about the Levee Safety Program and levees in the United States, to include where they are, what or who is behind them, their condition, the benefits they provide, and a characterization of their risks using tools such as the National Levee Database and Levee System Summaries.

## F–4. Coordinating with levee sponsors

*a.* Most federally authorized levees are operated and maintained by levee sponsors. Levee sponsors have varying roles and responsibilities unique to the agreements made when the project was first authorized and constructed. Their involvement in all Levee Safety Program activities is essential since levee sponsors know the levee and the community that benefits from it best.

*b.* District Levee Safety Program Managers are responsible for developing and maintaining strong relationships with levee sponsors in their area. Doing so requires regular communication that includes discussions about the levee, check-ins on areas

where the sponsor may need help, notice of planned or upcoming activities, and opportunities to engage in review of related materials.

*c.* Regularly checking in and being comfortable having frank discussions are key to a strong relationship and are the basis for understanding and solving levee-related challenges together.

*d.* USACE will work with levee sponsors to ensure they are included in all Levee Safety Program activities. At a minimum, district Levee Safety Program Managers will work with levee sponsors to:

(1) Ensure they are aware of and invited to participate in all Levee Safety Program activities.

(2) Obtain, verify, and update information about levees.

(3) Provide access to information about their levee in the National Levee Database.

(4) Make clear which information will be publicly available on the National Levee Database and review that information together prior to sharing it.

(5) Discuss risk information about their levee and how it can be used.

(6) Agree to a strategy for sharing levee condition and performance information that aligns with authorities and responsibilities.

(7) Coordinate regularly, particularly for communication-related activities.

(8) Share levee information with others (in a lead or support role, depending on authorities and agreements).

*e.* USACE districts are required to develop a program management plan and 10-year outlook for Levee Safety Program activities. District Levee Safety Program Managers will coordinate with levee sponsors to develop the planned frequency of activities for their levee and document their plans for being involved. For example, district Levee Safety Program Managers will be responsible for engaging levee sponsors in a discussion about the frequency of inspections for their levee and whether site visits may work well to check areas of the levee before the next formal inspection.

*f.* Districts will discuss all Levee Safety Program activities with levee sponsors and develop a shared understanding of their plans for being involved. Limited involvement is often due to resource or authority constraints. Districts will ensure that even when a sponsor cannot participate in all Levee Safety Program activities, they are aware of activities, any impacts or findings relevant to the levee, and are available to discuss findings in detail with the sponsor.

*g.* Having discussions with levee sponsors about Levee Safety Program information requires USACE to understand the results of activities and clearly communicate about them. When discussing levees and risk information, USACE will:

(1) Be specific in plainly describing any issues with the levee and identify which most relate to levee condition or performance.

(2) Make clear what the information means and how it can be used by levee sponsors or others, when applicable.

(3) Recognize the varying entities involved that influence the risk of the levee and that often the levee sponsor role does not extend beyond the footprint of the levee.

(4) Summarize the levee's benefits and risks to provide context for the people or property that could be impacted in the case a levee breaches or overtops.

*h.* While many findings from Levee Safety Program activities can lead to recommendations more relevant to community leaders and decision-makers, such as the development of a community evacuation notice system, most are intended to help levee sponsors. USACE will work with levee sponsors to reach a shared understanding of what the findings mean, what actions may be most impactful to address any levee-related issues, and how USACE can help.

*i.* USACE will work with levee sponsors to agree on an approach to communicate about this information with others. USACE is responsible for sharing levee information to raise awareness of their benefits and risks. Doing so in partnership with levee sponsors can improve the quality of the communication and its relevance to the people and property that benefit from levees.

*j.* For example, levee sponsors may have existing relationships with emergency management agencies in the community and can work directly with them to share levee condition and performance information that could inform emergency planning and preparedness activities. Levee sponsors can also work with USACE to make sure planned communication considers what is most important to the audience and any known local challenges, such as previous flooding that has left communities more concerned or limited resources within the community to act on the information being shared.

*k.* Depending on the specific authorities and agreements in place, USACE and levee sponsor roles for sharing levee information will vary. District Levee Safety Program Managers will review the agreements in place for each levee within their area with levee sponsors and discuss who will lead sharing levee condition and performance information with others. USACE and levee sponsors will agree on an approach, document it in the district's program management plan, and develop communication plans and related materials consistent with this approach.

*l.* For levees without a levee sponsor or where USACE is responsible for operation and maintenance, the district is fully responsible for developing and implementing a strategy to share levee information with community leaders and decision-makers.

*m.* Where USACE is designated to lead levee information sharing on behalf of a levee sponsor, USACE will ensure levee sponsors are provided the opportunity to be part of the development and delivery of levee communication. When publicly sharing levee information, USACE will ensure the levee sponsor is aware of and offered the opportunity to review the information being shared.

*n.* Regardless of who is designated to lead levee information sharing, USACE can serve as a technical advisor and is responsible for ensuring information about the levee is available, actionable, and clear. This may include being available to support levee sponsor communication by collaborating with sponsors to draft, review, test, and deliver communication, attending meetings, or developing resources to communicate about the levee.

### F–5. Coordinating internally with other USACE communities of practice

*a.* USACE's authorized responsibilities related to levees are broad. Information gathered by the Levee Safety Program is often used to support levee-related decisions and activities in other programs. As a result, it is important that Levee Safety Program data is available and up to date in the National Levee Database and accessible to other USACE programs, when applicable. District Levee Safety Program Managers will ensure Levee Safety Program data and information is updated and available to internal partners.

*b.* Division and district Levee Safety Officers and Levee Safety Program Managers will also be responsible for working with division and district leadership to keep them updated on Levee Safety Program activities such as inspections, site visits, risk assessments, and communication. Doing so may identify opportunities for Levee Safety Program staff to collaborate with other USACE communities of practice on technical solutions or for communicating levee information externally.

*c.* When planning to share levee information externally, districts should look internally to see if there are existing relationships, teams, and activities that can be leveraged. For example, USACE emergency managers may have a recurring meeting with a community. Sharing levee condition and performance information during that meeting could help the community identify actions they can take to further safeguard people and property.

*d.* Leveraging existing relationships as well as skills and expertise can help USACE deliver levee information in a way that is useful to and actionable for the audiences who receive it. District Levee Safety Program Managers will engage staff with communication and partnership expertise within their district to assist with any

effort to share levee information externally. For example, staff from public affairs offices can help translate technical information to be clear to anyone who reads it.

*e.* District Levee Safety Program Managers will document planned internal coordination and collaboration related to Levee Safety Program activities as part of their program management plan.

### F–6. Coordinating externally

*a.* Other federal agencies have missions and responsibilities related to understanding, reducing, or communicating the impacts of flooding. Exchanging information with these agencies can extend the use of levee information and inform USACE and levee sponsor understanding of levees within the broader floodplain.

*b.* Where possible, USACE will engage other federal agencies to exchange flood risk information. Doing so may identify opportunities to develop partnered solutions or opportunities to share levee information to build public awareness of levees.

*c.* For example, FEMA and USACE have shared goals of increasing public awareness related to flood risk. In areas with levee systems, USACE typically engages directly with levee sponsors and FEMA engages directly with community officials and levee sponsors. Coordinating these relationships can improve collective understanding of levees, actions to safeguard them, and options at the community level to further protect people and property.

*d.* District Levee Safety Program Managers are responsible for regular coordination with FEMA regional offices on program activities. Doing so can help FEMA and USACE accomplish the following:

(1) Identify levee-impacted areas where FEMA is actively engaging communities to update flood hazard analyses and National Flood Insurance Program maps.

(2) Identify risk and mitigation opportunities and levee accreditation data submittals to coordinate corresponding Levee Safety Program activities.

(3) Ensure alignment of messages and activities, including review of the National Levee Database, between FEMA and USACE to eliminate conflicts and minimize confusion.

(4) Seek to leverage opportunities with FEMA-led community meetings or other engagement activities.

*e.* District Levee Safety Program Managers will work with FEMA regional offices to develop consistent communication related to levees, including with levee sponsors and communities. District Levee Safety Program Managers can be a bridge between FEMA regional offices and levee sponsors and are responsible for sharing levee information with FEMA and ensuring sponsors are aware of what information is being shared.

*f.* This coordination can align district, levee sponsor, and FEMA communication to groups within the same area. District Levee Safety Program Managers are responsible for ensuring this coordination occurs and identifying additional federal partners with mission activities related to levees where additional coordination should occur.

## F–7. Sharing levee information with decision makers in the area behind the levee

*a.* USACE and levee sponsors will work together to share levee information with others. Doing so can help decision-makers in the area behind the levee understand the levee, actions being taken to safeguard it, and options available to further protect people and property.

*b.* Depending on the agreed communication approach between USACE and levee sponsors, USACE or the levee sponsor may lead levee information sharing with others. District Levee Safety Program Managers will be responsible for documenting this approach in their program management plan and leading the development of a communication plan that provides USACE and levee sponsors a shared strategy for talking about levees.

*c.* Communication plans are intended to document the strategy for sharing levee information. They often summarize:

(1) What information will be shared.

(2) Who the information will be shared with.

(3) How information will be shared with identified audiences.

(4) Who will lead or support the strategy.

(5) How the strategy will be reviewed and updated as things change, such as community awareness, levee risks, or impacts to people and property.

*d.* Levee Safety Program communication plans will:

(1) Be drafted by USACE and coordinated with the levee sponsor and FEMA;

(2) Be consistent with USACE and levee sponsor-agreed roles and responsibilities for communicating about levees;

(3) Be clear about who will be involved in reviewing and delivering planned communication;

(4) Be reviewed annually and updated as needed based on changes in messaging, awareness, and levee risk;

(5) Provide baseline messaging and approaches for sharing information to support consistent communication about levees.

*e.* District Levee Safety Program Managers will lead the development of communication plans. In addition to documenting USACE and levee sponsor strategies for communicating about levees, communication plans should also be used to help districts communicate about the Levee Safety Program and related activities.

*f.* Where levee systems span multiple districts or divisions, Levee Safety Program Managers should coordinate to develop a shared approach. Districts can use the headquarters Levee Safety Program Communication Plan as an example when developing district-level plans.

*g.* While districts should use the USACE template for communication strategies, there is no requirement for levee sponsors to develop a communication plan or to use the USACE template.

## F–8. Communicating during a crisis

*a.* Crisis-related communication, or emergency communication, differs from risk and awareness-building communication. Crisis-related communication is directive, one-directional messaging that tells people they are at imminent risk and what they should do.

*b.* While crisis communication typically focuses on motivating people to take immediate actions during an emergency, it is best practice to develop a strategy before the event occurs. This includes considering the likely scenarios that could negatively impact people, developing a planned response to minimize those negative impacts, and establishing a strategy to notify communities or individuals so they can get out of harm's way.

*c.* For USACE operated and maintained levees, USACE will develop and include these communication and notification protocols as part of an emergency action plan consistent with current guidance (ER 1110-2-6075). The emergency action plan will detail evacuation activities, communication protocols with local emergency operations centers and the general public, individual roles and responsibilities during an emergency, and supplies and materials that may be needed.

*d.* USACE and levee sponsors have information that can help local emergency management agencies develop community-based emergency action plans. USACE and levee sponsors should coordinate where possible to ensure local plans account for hazards and scenarios identified during risk assessments.

*e.* While crisis communication is inherently different due to its objective and approach, regular communication with those in the leveed area can elicit information helpful for planning crisis communication. For example, during regular communication, USACE and levee sponsors may learn the community prefers to receive information

from the mayor and that any communication during a crisis should be shared from that office.

*f.* It is best practice to incorporate crisis communication planning, as appropriate, into the overall communication effort. USACE districts may find it helpful to include emergency-related communication templates, plans, and messages as an appendix to the district communication plan.

## F–9. Products and communication opportunities

Table F–1 summarizes tools and opportunities for increased collaboration and coordination. These tools may support both internal communication and getting on the same page about levee information, as well as co-lead efforts to share information externally.

**Table F–1**
**Communication tools and opportunities**

| Tool | Main Uses | Frequency Developed/Updated |
|---|---|---|
| District Program Management Plan | • Document planned activities and roles and responsibilities, including for communication<br>• Describe coordination between USACE, levee sponsors, and FEMA | • Initial draft to be completed by USACE<br>• Reviewed periodically and updated as needed |
| 10-year Outlook of Levee Safety Program Activities | • Develop an advanced schedule of levee safety activities that will inform internal and external communication activities<br>• Plan for activities with levee sponsors and FEMA<br>• Supports projected budget needs | • Initial draft to be completed by USACE with levee sponsors<br>• Reviewed annually and updated as needed |
| Communication Plan/Strategy | • Documents a shared approach for communicating about levees and the Levee Safety Program<br>• Typically includes how districts will talk about the program and key activities<br>• Can include levee-specific messaging, strategies, and tactics<br>• Best practice to include baseline messaging about levees that can be used by levee sponsors or FEMA | • Initial draft to be completed by USACE<br>• Depending on agreed roles, levee sponsors may help review or deliver messaging specific to their levees<br>• Reviewed annually and updated as needed |

| Tool | Main Uses | Frequency Developed/Updated |
|---|---|---|
| Levee Risk Management Summary | • Internal tool for USACE and levee sponsors that documents best available levee information<br>• Developed using information from inspections and risk assessments<br>• Typically includes recommended actions for levee sponsors, as well as actions that others can take<br>• Used to identify topics to communicate | • Initial draft to be completed by USACE with levee sponsors<br>• Updated when there is new information (following inspections, risk assessments, recent flood events, completing recommended actions, etc.) |
| Levee Safety Program Activities | • Activities such as inspections and risk assessments are opportunities to better understand a levee, improve relationships and coordination, and foster shared approaches to communication<br>• Frequent USACE-sponsor coordination makes it easier to talk to others about levees and actions they can take to address components of risk that are not in USACE or the levee sponsor's control | • USACE will discuss frequency of these activities with the levee sponsor as part of developing the program management plan and 10-year outlook<br>• District Levee Safety Program Managers will regularly check in with levee sponsors to let them know about upcoming activities, review what is involved (for example, the steps of a risk assessment and key opportunities to collaborate), confirm availability, discuss results and planned actions, identify where help is needed, and seek feedback for how to be better partners |
| National Levee Database | • Publicly available inventory of levees in the United States<br>• Raise public awareness of levees<br>• Includes fields that support understanding of why the levee was built and what benefits it provides, what is known about the levee's condition and potential performance, who and what benefits from or may be at risk should the levee break or fail, and who is responsible for the levee and what actions are planned to address risk.<br>• Summarize where levees are, their physical attributes/features, what is behind them and is potentially affected should the levee fail, inspection information and risk assessment information when available, and National Flood Insurance Program and PL 84-99 Rehabilitation Program status | • USACE maintains available data<br>• FEMA updates data relevant to the National Flood Insurance Program<br>• USACE reviews and updates the National Levee Database following inspections and risk assessments<br>• USACE notifies and reviews updates with levee sponsors as they are made |

| Tool | Main Uses | Frequency Developed/Updated |
|---|---|---|
| USACE Regional Meetings | • USACE districts frequently host regional or district-specific meetings about flood risk management and levees<br>• Meetings are intended to share information, coordinate on ongoing activities, and partner with other agencies<br>• Meetings can support coordination across communities of practice<br>• When possible, districts should include levee sponsors | • Scheduled by USACE division and district offices<br>• Opportunities to participate can be identified in advance in the program management plan, 10-year outlook, or communication plan |
| Levee District/Board Meetings | • USACE is available to attend meetings the levee sponsor has with its leadership and staff<br>• Engaging in sponsor-led conversations about the levee can help USACE better understand levee sponsor challenges | • As requested by the levee sponsor<br>• Opportunities can be identified in advance in the program management plan, 10-year outlook, or communication plan |
| FEMA Regional Meetings | • USACE is available to attend FEMA regional meetings to coordinate ongoing activities and communication | • As requested by FEMA<br>• Opportunities can be identified in advance in the program management plan, 10-year outlook, or communication plan |

## Appendix G
## National Levee Database

### G–1. Purpose

This appendix describes how the National Levee Database is used and how the levee information in the database is managed and maintained.

### G–2. Overview

*a.* USACE established the National Levee Database to manage an inventory of all known levees in the United States. The inventory is intended to promote public awareness of levees and to support those responsible for levees with a consistent set of information to inform their activities.

*b.* Levees in the United States are owned, operated, regulated, or maintained by a variety of entities, including federal agencies, states, municipalities, levee boards, and private groups. USACE partners with these groups to gather, improve, store, and display information about levees through the National Levee Database.

*c.* The current amount and detail of information for levees in the National Levee Database varies, but generally includes:

(1) The location of the levee.

(2) A summary of its general condition.

(3) An estimate of the number of people and structures within the area behind the levee.

*d.* In addition to making this information available to the public and those responsible for levees, USACE also uses the National Levee Database to support its levee-related activities. For example, USACE stores information related to inspections and risk assessments in the National Levee Database. Doing so allows USACE and those responsible for levees to have a single, shared access point to all information relevant to a levee.

*e.* The National Levee Database includes information about levee segments and summary information for levee systems. Often, federally authorized levees operated and maintained by USACE and levee sponsors include additional information that summarizes:

(1) The benefits the levee provides.

(2) Known areas of concern or maintenance challenges.

(3) Potential impacts to people and property should the levee breach or overtop.

(4) Planned and ongoing work to ensure the levee continues to provide its intended benefits.

*f.* This information is publicly shared to increase awareness of levees and actions being taken to safeguard the structure and inform community and individual actions that further protect the things they value. Since this information is publicly available, it is critical for USACE and levee sponsors to work together when determining what information is shared.

## G–3. Accessing information in the National Levee Database

*a.* Anyone can view summary data and statistics that characterize levees throughout the country in the National Levee Database. For example, the site provides statistics on the number of levees in the U.S., the miles of levees, the average levee age, and how many levees are within USACE's responsibility.

*b.* A subset of data and information for any levee is also publicly available in the National Levee Database. Each levee segment and system has a dedicated page that provides information on the levee and its features. Site visitors can see a map that represents the levee and its alignment. When available, the page includes information that summarizes the most recently completed risk assessment.

*c.* More detailed information about levees is available to other site users such as federal agencies, state, regional, tribal, and local governmental employees, and entities responsible for operating and maintaining levees. Typically, this information includes:

(1) Inspection reports.

(2) Site visit summaries.

(3) Reports summarizing any completed risk assessments.

(4) Levee performance data collected during emergency flood operation.

(5) Documentation related to levee operation and maintenance.

(6) Any other resource relevant to the levee and entity responsible for operating and maintaining it.

*d.* Login credentials are required to access this information.

*e.* Entities responsible for a given levee will have access to all the information available for their levee. For example, levee sponsors for federally authorized levees will be given login credentials and will be able to view documentation related to their levee. However, a levee sponsor or site user cannot view this detailed information for levees for which they are not responsible.

*f.* District Levee Safety Program Managers will be responsible for ensuring levee sponsors have login credentials to view information for their levee. Levee sponsors can also submit a request for login credentials to the National Levee Database help desk (DLL-CEERD-NLD-GENERAL-SUPPORT@USACE.ARMY.MIL), which will coordinate with the district Levee Safety Program Manager.

*g.* Detailed information from an inspection or risk assessment is intended to support levee sponsors' activities on the levee. This detailed information is not publicly available. USACE and levee sponsors will work together to ensure the information available in the National Levee Database is up to date, including information accessible only when logging into the database and information available for the public to see. USACE and levee sponsors will ensure sensitive information such as the location of a specific issue on the levee is only available for the appropriate users.

*h.* All USACE employees can request credentials to log into the National Levee Database and access project-specific levee data. However, not all USACE users can make changes to data or information available. For example, an employee with editing access to the National Levee Database in one USACE district cannot edit detailed information for a levee in another district without the appropriate access rights. Edit capability is assigned by district. Requests for rights to edit or add data must be submitted to the district Levee Safety Program Manager. For example, staff responsible for completing levee inspections require additional access rights to document inspections and should coordinate with the district Levee Safety Program Manager to obtain the appropriate rights.

*i.* Individuals external to USACE and associated with a governmental organization can be given access to more detailed levee information relevant to their role or authority. Typically, federal agency employees with login credentials can view information for all levees in the National Levee Database. In some cases, federal agencies may have editing rights. For example, FEMA maintains information about levee accreditation and is responsible for updating related data in the National Levee Database.

### G–4. Responsibilities for updating and maintaining information in the National Levee Database

*a.* USACE is responsible for maintaining the National Levee Database. A national program manager is assigned to oversee maintenance, enhancements, access, and daily use of the site. Often, this includes supporting USACE district staff responsible for loading data to the National Levee Database and answering questions and requests from external users. For example, the National Levee Database program manager works to address issues with the site appropriately displaying information or its connectivity to other tools such as the Levee Inspection System, which is used to complete USACE inspections and is directly linked to the National Levee Database to more easily share results with levee sponsors.

*b.* USACE districts are the primary editors for levee-specific data for federally authorized levees and those active within the USACE PL 84-99 Rehabilitation Program in their area of responsibility. Districts are responsible for populating or updating data for these levees within the National Levee Database. This can include working to add a new federally authorized levee and related information to the National Levee Database or loading new data for levees that already exist in the National Levee Database. The national program manager is responsible for maintaining data for all remaining levees in the database.

*c.* Districts typically review and update information in the National Levee Database when completing USACE Levee Safety Program activities. For example, after completing an inspection using the Levee Inspection System, the district team ensures information gathered is loaded and correct in the National Levee Database. The district uses the newly populated information to develop a report that summarizes findings and observations during the inspection.

*d.* Similarly, districts update and check data related to risk assessments in the National Levee Database. For example, a screening risk assessment is completed using a web-based tool called the Levee Screening Tool. The tool is connected to the National Levee Database. Once a screening is complete, risk assessment data can be displayed in the National Levee Database and used to produce an initial summary of results.

*e.* Districts are responsible for ensuring files and resources associated with Levee Safety Program activities are available, correct, and reviewed and shared with the levee sponsor. Districts should plan to discuss findings after inspections, site visits, or risk assessments with the levee sponsor. When doing so, the district and levee sponsor will review where data from those activities can be found in the National Levee Database and how they can be used. Districts will also coordinate with the levee sponsor any time data for their levee is being changed. Doing so allows USACE and levee sponsors to correct any errors and ensure the edits are accurate.

*f.* Levee sponsors are not responsible for editing data for their levee in the National Levee Database. However, levee sponsors are encouraged to review data in the National Levee Database, notify USACE when any errors are found, and work with USACE to ensure errors are corrected.

*g.* Levee sponsors also have the option to use the National Levee Database to keep files and information for the levee. For example, summaries from levee sponsor-completed inspections can be a helpful resource for both the sponsor and USACE to inform priorities and activities to maintain the levee. Sponsor inspections can provide timely information between formal USACE inspections that help USACE and sponsors have a more accurate picture of the state and condition of the levee. This information can be used to adjust planned or ongoing activities, or to inform future USACE inspections and risk assessments. USACE can upload these files to the National Levee Database on the levee sponsor’s behalf.

*h.* It is important to note that FEMA is responsible for maintaining National Levee Database data related to the National Flood Insurance Program.

## G–5. How the National Levee Database is used

*a.* The National Levee Database is used to publicly share information about levees. Sharing levee information can help build understanding of:

(1) What a levee is.

(2) What a levee does.

(3) What benefits levees provide.

(4) What is required to keep levees in good working order.

(5) Who manages levees.

(6) What condition levees are in.

(7) What the potential impacts to people and property are, in case a levee fails.

*b.* Increased understanding of levees can bolster support for them, foster recognition of the valuable role they play within a community, and highlight opportunities for community leaders and individuals to take actions that can further protect the things they value.

*c.* Publicly available information in the National Levee Database can also be used by levee sponsors to work within their community to build understanding of what is being done to make sure the levee continues to provide its intended benefits. Levee sponsors can also use this information to communicate levee condition and performance information with those who may need it.

*d.* Information in the National Levee Database can support regional, local, and community planning and activities related to levees and flooding. For example, a community may decide they need to update local evacuation plans in the event of major flooding. Information about the levee within that community could inform the approach the community takes to notify people near the levee if or when they need to evacuate.

*e.* The National Levee Database is also used to support USACE Levee Safety Program activities. For example, districts use the National Levee Database to store important documents about a levee and update relevant fields when inspections or risk assessments are completed. The National Levee Database is also linked to tools such as the Levee Inspection System and Levee Screening Tool. Linking these resources helps USACE easily share results and recommended actions to inform levee management activities.

*f.* Some information about levees in the National Levee Database is used by FEMA. For example, FEMA may rely on USACE information when deciding whether a levee can be accredited or not. In addition, FEMA relies on USACE information within the National Levee Database to identify and represent levees on FEMA-developed resources. This information has been used to inform updates to FEMA's flood insurance pricing methodology. More information about how FEMA has used USACE data to inform its flood insurance pricing methodology is available in Levees in Risk Rating 2.0 (https://www.fema.gov/sites/default/files/documents/FEMA_Levees-in-Risk-Rating-2.0_2_22.pdf).

*g.* Sharing levee data in one location provides USACE, sponsors for federally authorized levees, and other partners a common point for information. Access to the most recent information about a levee can help USACE and levee sponsors prioritize actions on the levee, track progress over time, monitor how changing levee conditions or flood hazards affect levee performance over time, and partner with others to adopt additional measures to further reduce or manage flood risks.

*h.* USACE also uses the National Levee Database to monitor implementation of the program. Districts must update information in the National Levee Database as activities are completed and ensure appropriate coordination occurs with levee sponsors. USACE headquarters is responsible for monitoring districts, identifying challenges that are keeping districts from being successful, and implementing changes so that information collected through the program is accessible to those who need it in a timely and usable fashion.

## Glossary of Terms

| Term | Definition |
|---|---|
| ARIMS | Army Records Information Management System |
| CFR | Code of Federal Regulations |
| DA | Department of the Army |
| EC | Engineer Circular |
| ECB | Engineering and Construction Bulletin |
| EP | Engineer Pamphlet |
| ER | Engineer Regulation |
| FEMA | Federal Emergency Management Agency |
| GIS | Geographic Information System |
| GPS | Global Positioning System |
| O&M | Operation and Maintenance |
| OMRR&R | Operation, Maintenance, Repair, Replacement, and Rehabilitation |
| PL | Public Law |
| U.S. | United States |
| USACE | United States Army Corps of Engineers |
| USC | United States Code |

**Benefits (of a levee system)**
A qualitative or quantitative description of the positive contributions the levee system has or can provide to the community in the leveed area. This can include potential for reducing loss of life; reducing potential flood damages to residential structures and businesses; preventing damages to community services such as schools, hospitals, water treatment plants and other municipal services; preventing damages to roadways; and providing critical time for the population to get out of harm's way during a flood event.

**Breach**
The formation of a gap in the levee system through which water may flow uncontrolled onto the adjacent leveed area. A breach in the levee system may occur prior to or after water flows over the top of the levee (overtopping).

**Community**
Any state, area, or political subdivision thereof, or any Indian tribe or authorized tribal organization, or Alaska Native village, or authorized native organization that has the authority to adopt and enforce regulations for the areas within its jurisdiction.

**Consequences (of flooding)**
The effect, result, or outcome of inundation as reflected in the potential loss of life, economic losses, and adverse environmental impacts.

**Dam**
An artificial barrier, including appurtenant works, constructed for the purpose of storage, control, or diversion of water.

**Deliverable**
A compilation of products used to relay comprehensive results and recommendations for a levee system.

**Economic risk**
The measure of the probability (or likelihood) of direct and indirect economic losses within a leveed area.

**Emergency action plan**
A formal document that identifies potential emergency conditions at a levee and specifies pre-planned actions to be followed to reduce consequences of the emergency.

**Environmental risk**
Risk associated with the likelihood of direct and indirect impacts on environmental, cultural, and historic resources within the leveed area that cannot be measured in monetary terms.

**Federally authorized and USACE operated or maintained levees**
Congressionally authorized levees that USACE has full or partial responsibility to operate or maintain, as well as to rehabilitate and modify, as appropriate, under existing authorities.

**Federally authorized and locally operated and maintained levees**
Congressionally authorized levees that are operated and maintained by a local public sponsor through a project agreement with USACE. This category includes levees constructed by USACE and those constructed by others and federally authorized.

**Flood**
An overflow of water that submerges land which is normally dry.

**Flood risk (or residual risk)**
The risk of flooding in a leveed area that remains at any point in time after accounting for the flood risk reduction contributed by the levee system.

**Formal inspection**
A prescheduled comprehensive levee inspection by a team of subject matter experts led by a professional engineer or professional geologist to document the condition of a levee; inform levee management activities; include specific considerations, such as testing gates; and serve as a primary source of information related to levee condition and performance for risk assessments. Inspections verify any changed conditions and may capture progress of levee management measures for consideration in subsequent inspections or risk assessments.

**Hazard**
An event that causes the potential for an adverse consequence.

**Incident**
An event occurring at a levee system that could potentially result in a levee safety issue.

**Interim risk reduction measure**
An action to reduce levee risk while more long-term and comprehensive risk reduction and management solutions are being pursued.

**Inundation**
In the context of this document, flooding in a leveed area.

**Inundation scenario (for a levee system)**
A scenario which could result in flooding in a leveed area. The four inundation scenarios for a levee system are breach prior to overtopping; overtopping with breach; component malfunction/mis-operation; and overtopping without breach.

**Levee**
A man-made barrier along a watercourse with the principal function of excluding floodwaters from a limited range of flood events from a portion of the floodplain (referred to as “leveed area”).

**Levee accreditation**
The process in which a levee system is evaluated to determine how it will be mapped by FEMA for the purposes of the National Flood Insurance Program.

**Leveed area**
The lands from which floodwater is excluded by the levee system.

**Levee feature**
A structure that is critical to the functioning of a levee system. Examples include embankments, floodwalls, pipes and associated drainage features, closures, pumping stations, floodways, and designed channels.

**Levee Inspection System**
The electronic tool used by USACE to document levee inspections.

**Levee risk (or incremental risk)**
The risk of inundation posed by a levee system for the following three inundation scenarios: prior to overtopping; overtopping with breach; and component malfunction/mis-operation.

**Levee risk management summary**
An internal tool that details prioritized recommendations for operation, maintenance, repair, replacement, and rehabilitation for each levee system based on best available information related to risk assessments, levee inspections, and past performance.

**Levee safety**
The art, science, and practice of managing flood risks posed by levee systems.

**Levee Safety Action Classification**
A system used to compare levees and describe the immediacy of action required to address or reduce the risk. Levees are described as very high, high, moderate, low, or very low risk within this system. A classification is assigned during the risk assessment.

**Levee Safety Officer**
Person appointed to serve as the lead for levee safety issues, recommendations, and decisions at a particular level in USACE.

**Levee Safety Program Manager**
Person appointed to lead the coordination and implementation of the USACE Levee Safety Program at a particular level in USACE.

**Levee Screening Tool**
The electronic tool used by USACE to complete all screening risk assessments.

**Levee Senior Oversight Group**
Consists of USACE staff representing key disciplines in levee safety and provides recommendations to the USACE headquarters Levee Safety Officer and deputy Levee Safety Officer on levee risk characterizations; prioritization of levee federal investments; direction for levee projects with high potential life safety risk; and other levee safety matters.

**Levee segment**
A discrete portion of a levee system that is operated and maintained by a single entity. A levee segment may be composed of one or more levee features.

**Levee sponsor**
A public entity that is responsible for operation and maintenance for all or a certain portion of a levee system. Within this document, levee sponsor refers to entities who operate and maintain federally authorized levees through a project agreement with USACE.

**Levee system (or levee)**
Composed of one or more levee segments and other features that are collectively integral to excluding floodwater from the leveed area.

**Life safety risk**
A measure of the probability and severity of loss of life resulting from inundation of a leveed area.

**Likelihood (or probability)**
A measure of the chance or degree of belief that a particular outcome will occur. A probability provides a quantitative description of the likelihood of occurrence of a particular event. Probability is expressed as a value between 0 (impossible) and 1 (certain). Likelihood can be expressed qualitatively as well (high, medium, or low).

**Mitigation**
Actions taken that reduce potential loss of life and property by lessening the impacts of flood.

**National Cadre**
An independent, multi-disciplinary team trained and approved by the Risk Management Center to provide independent perspective and reviews of screening risk assessments.

**National Flood Insurance Program**
Administered by FEMA, the National Flood Insurance Program is a voluntary program authorized by Congress to mitigate flood losses through community-enforced building and zoning ordinances, and to provide property owners with access to federally backed flood insurance. As part of the National Flood Insurance Program, FEMA issues flood insurance rate maps that depict flood hazards and are used by local communities for the purposes of determining flood insurance and floodplain management requirements. The National Flood Insurance Program requires federally regulated lending institutions to ensure that mortgage loans secured for buildings in high flood hazard areas, referred to as Special Flood Hazard Areas, are covered by flood insurance.

**National Levee Database**
A congressionally authorized database that contains information on levees in the United States.

**No verdict**
An inspection rating and Levee Safety Action Classification assignment given when no access has been obtained to perform an inspection.

**Non-breach risk**
The risk associated with the scenario when the still-water level and/or associated waves, wind runup, or surge exceeds the top of the levee system, but does not result in a breach of the levee system.

**Non-federally authorized and locally operated and maintained levee**
Levee that is locally constructed, operated, and maintained.

**Non-project segment**
A segment of man-made high ground not part of the federally authorized project which a levee system/segment ties into and whose existence and performance is necessary for excluding floodwaters from the leveed area. Some examples of these are roadways, railroads, canals, and other levee embankments. Non-project segments are inventoried, inspected, and assessed if they make up part of the levee alignment and are necessary for the proper functioning of the levee system.

**Overtopping**
A condition that occurs when the elevation of the still-water level and/or associated waves, wind runup, or surge exceeds the top of the levee system. This may or may not result in a breach of the levee system.

**Performance**
How the levee system has functioned or is anticipated to function during specified hazards.

**Potential failure mode**
A structured way to describe a chain of events that leads to a levee breach.

**Preparedness**
Actions taken before a possible future flood event, including planning, training, communication, and anticipation of how the levee will perform based on operation and maintenance, inspections, and assessments.

**Program management plan**
A formal, approved, living document used to define program requirements and expectations, accountability and performance measures, and guidance program execution. These documents include a 10-year outlook of program activities, as well as a strategy for sharing levee information that corresponds with USACE Levee Safety Program activities.

**Project agreement**
Legally binding agreement between the government and a non-federal sponsor (state, municipal government, flood control district, port authority, etc.) for construction or operation and maintenance of a water resources project. It describes the project and the responsibilities of the government and the non-federal sponsor.

**Quantitative risk assessment**
Uses currently available information but may also involve gathering new information to inform its findings, considers custom failure modes specific to the levee, and results in calculated numeric estimates of risk.

**Response**
Actions taken during a flood, including those to save lives and prevent damage.

**Risk**
The measure of the probability (or likelihood) and consequence of uncertain future events.

**Risk assessment**
A systematic, evidence-based approach for quantifying and describing the nature, likelihood, and magnitude of risk. Risk assessments are a tool to determine the most likely ways a levee might breach or overtop, how likely those scenarios are to occur, and the potential impacts within a community.

**Risk cadre**
A multi-disciplinary team of experts trained in conducting risk assessments.

**Risk characterization**
Description of the levee system in the context of risk by considering the key drivers of likelihood of performance, potential consequences, and sources of uncertainty.

**Risk estimate**
The combination of the probability of inundation of the leveed area and the associated consequences typically portrayed in a risk matrix.

**Risk management**
The process of problem finding and initiating action to identify, evaluate, select, implement, monitor, and modify associated risks.

**Screening risk assessment (or levee screening)**
A simplified risk assessment that relies on existing data, historical performance, and engineering judgment, and assumes pre-defined performance modes to quickly characterize levee risk.

**Semi-quantitative risk assessment**
A risk assessment that uses a combination of limited numerical estimates with qualitative descriptions that result in risk estimates based on orders of magnitude.

**Sensitive information**
Information that could pose a security risk or aid those intending to do harm to a levee system.

**Site visit**
A collaborative activity to observe or verify any changed conditions, provide technical advice, and respond to sponsor’s questions, or capture progress of levee management measures for consideration in the next inspection or risk assessment.

**Special inspection**
Unscheduled inspections conducted as needed due to changed conditions or to document performance.

**Uncertainty**
The deficiency or unsureness in information related to the understanding or knowledge of the risk or components of risk.