OVERVIEW

A nationwide network of 30,000 documented miles of levees protects communities, critical infrastructure, and valuable property, with levees in the U.S. Army Corps of Engineers Levee Safety Program protecting over 300 colleges and universities, 30 professional sports venues, 100 breweries, and an estimated $1.3 trillion in property. As development continues to encroach in floodplains along rivers and coastal areas, an estimated $80 billion is needed in the next 10 years to maintain and improve the nation's system of levees. In 2014 Congress passed the Water Resources Reform and Development Act, which expanded the levee safety program nationwide, but the program has not yet received any funding.

CAPACITY AND CONDITION

Levees are usually earthen embankments or concrete floodwalls, which have been designed and constructed to contain, control, or divert the flow of water to reduce the risk of temporary flooding. Vertical concrete floodwalls may be erected in urban areas where there is insufficient land for an earthen levee.

Most of the levees across the country were built in the middle of the last century by federal, state, and local agencies or by private property owners. The average age of levees in the U.S. is 50 years and many are showing their age. While there are newer or reconstructed levees, a large number of levees were built in response to the widespread flooding on the Mississippi River in 1927 and 1937, and in California after catastrophic flooding in 1907 and 1909.

Every state in America and the District of Columbia rely on levees for flood control to reduce risk to homes, businesses, and property. The nationwide network of levees consists of 30,000 documented miles and up to an estimated 100,000 miles of levees protects millions of people in cities large and small. Levees are critical to reducing risk to the public and property from devastating floods caused by

the rising of rivers during high rain events or from surge and waves during large coastal storm events. With more than half of the U.S. population living within 50 miles of a coast and continued development in flood plains, levees play a critical life safety role. Unfortunately, because this infrastructure often goes unnoticed, citizens are frequently unaware of the risks associated with possible failure of a levee.

According to the U.S. Army Corps of Engineers' (USACE) National Levee Database (NLD), levees are found in approximately 35% of the nation's counties, with nearly two-thirds of Americans living in a county with at least one levee. Earthen embankments make up 97% of all the levees in the USACE Levee Safety Program, while floodwalls make up the remaining 3%. The NLD contains 11,900 individual levee systems accounting for the nearly 30,000 miles of documented levees. The USACE maintains authority over 13,700 miles, while other federal, state, or local agencies are responsible for the remaining 15,400 miles in the NLD. Due to the large inventory of levees outside of USACE's authority, the condition of the nation's levees is largely unknown, but future efforts are planned to gain a better understanding of the nation's levees, as authorized in Water Resources Reform and Development Act of 2014.

The USACE has performed engineering inspections and risk assessments to understand the condition and characterize the flood risk associated with levees in their authority. Currently, USACE has completed risk assessment on over 1,200 levee systems out of the 2,500 in the USACE program. The risk assessment shows that of USACE-owned levees, 5% are high to very high risk, 15% moderate risk, and 80% low risk. The assessments are based on several criteria, including possible loading events such as floods, storms, and earthquakes; level of performance; and consequences of failure. Major deficiencies include culverts, seepage – the biggest risk driver – and vegetation. The numbers of high and moderate risk levees are expected to grow as more inspections are performed, raising awareness of their conditions. Currently, less than half of the levees in USACE's authority have risk assessment and risk characterizations.

Levees function passively or may require active mechanical operations. For example, some levees have gates and pumps, which may require personnel to operate them in times of floods. Levees require regular maintenance and periodic upgrades to retain their level of protection.

FUNDING & INVESTMENT

It is estimated that $80 billion is needed in the next 10 years to maintain and improve the nation's levees. Federal funding is available only for USACE-owned levees. More than half of levees are owned by states and localities, which often have limited budgets for repairs and maintenance.

The 2014 Water Resources Reform and Development Act (WRRDA) created a new National Levee Safety Initiative (NLSI). This program will promote consistent safety standards, create levee safety guidelines, and provide funding assistance to states for establishing participating levee safety programs. WRRDA authorized $395 million to support levee safety initiative. However, since the NLSI was passed, not a single dollar has been appropriated for the program, nor has the program been identified in the Presidential Budget Request as a priority. Even if funds are appropriated for this program, they are not intended to be used for levee repairs, maintenance, or rehabilitation of the infrastructure. Funding the National Levee Safety Initiative to create state programs would be a major step toward improving the

nation's levee infrastructure. Without investment in this program, levees will continue to languish and much of this critical infrastructure's condition will remain unknown.

PUBLIC SAFETY, RESILIENCE & INNOVATION

Levees play a critical role in protecting many American communities and their economies at risk of dangerous flooding. Those in the USACE Levee Safety Program protect over 300 universities, 30 professional sports venues, 100 breweries, and an estimated $1.3 trillion in property. During floods in the summer of 2015, the U.S. Army Corps of Engineers estimated that levees in the South, Central, and Southwestern United States prevented more than $13.1 billion in damage. Along the Mississippi River decades of levee upgrades have prevented $306 billion in flood damage prevention, equating to a 24-to-1 return on investment of that infrastructure. The National Flood Insurance Program (NFIP), which encourages flood risk mitigation activities and requires at-risk homeowners to purchase insurance, saves the national economy $1.7 billion in avoided losses due to flooding.

With ownership and maintenance responsibilities for U.S. levees spread across multiple jurisdictions, the Federal Emergency Management Agency (FEMA), USACE, and local partners have undertaken efforts to increase coordination across agencies for levee inventories, inspections, safety ratings, and public awareness, including development of public safety and information programs.

RECOMMENDATIONS

- Fully fund the National Levee Safety Program passed in the Water Resources Reform and Development Act of 2014.
- Complete the National Levee Inventory for both federal and nonfederal levees.
- Adopt a levee hazard potential classification system.
- Complete levee mapping as outlined in the National Flood Insurance Program reform bill and implement FEMA's new levee mapping and analysis program.
- Increase funding at all levels of government and leverage private funds to address structural and nonstructural solutions that reduce risk to people and property.
- Require insurance where appropriate, and create emergency action plans for levee-protected areas.
- Ensure that operation and maintenance plans cover all aspects of a complex levee system.
- Assess levees using updated hydrology and hydraulic analyses that incorporate the impact of urbanization and climate change, particularly for coastal levees.

GLOSSARY OF TERMS

Culvert – An opening through an embankment for the conveyance of water by mean of pipe or an enclosed channel.

Seepage – The slow movement of water through small openings and spaces in the surface of unsaturated soil into or out of a body of surface or subsurface water.

Levees – Manmade barriers (e.g., as an embankment, floodwall, or other structure) that are built to provide protection from hurricane, storm, or flood protection relating to seasonal high water, storm

surges, precipitation, or other weather events; such a barrier is normally subject to water loading for only a few days or weeks during a calendar year.

Earthen levees – constructed from compacted soil that is typically covered with various surface materials, such as grass, gravel, stone, asphalt, or concrete, to help prevent erosion.

Acceptable Levee Condition – The inspected system is in satisfactory condition, with no deficiencies, and will function as intended during the next flood event

Minimally Acceptable Levee Condition – One or more items have a minor deficiency that need to be corrected, and an engineering determination concludes that the items would not prevent the segment or system from performing as intended during the next flood event

Unacceptable Levee Condition – An unacceptable rating means that one or more items that make up the levee system would prevent the system from performing as intended. It may also mean that a serious deficiency noted in past inspections has not been corrected within the established timeframe

SOURCES

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