



Strategic Plan for the National Dam Safety Program Fiscal Years 2012 through 2016

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FEMA

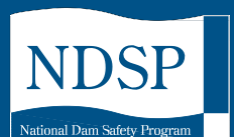


Table of Contents

Foreword.....	ii
Executive Summary	iii
I. Introduction.....	1
Purpose of this Strategic Plan.....	1
The Challenge.....	1
Meeting the Challenge.....	1
II. Vision, Mission, and Strategic Priorities	5
III. Goals and Objectives	6
Goal 1: Reduce the likelihood of dam failures	6
Goal 2: Reduce the potential consequences resulting from dam failures.....	9
Goal 3: Promote public awareness of the benefits and risks related to dams	11
Goal 4: Promote research and training for State dam safety and other professionals	13
Goal 5: Align relevant Federal programs to improve dam safety	16
IV. Conclusion	17
V. Abbreviations and Acronyms.....	18

Foreword

I am pleased to present this *Strategic Plan for the National Dam Safety Program Fiscal Years 2012 through 2016*.

The Federal Emergency Management Agency (FEMA) prepared this document pursuant to United States Code 33 U.S.C. § 467 et seq., as amended. This document provides a straightforward, realistic, and executable Strategic Plan for the National Dam Safety Program (NDSP) based on the most efficient and effective uses of NDSP resources to reduce losses from dam failures in the United States. The goals, objectives, strategies, and priorities will serve as formal guidelines for all NDSP efforts.



FEMA developed this Strategic Plan in coordination with the NDSP's two advisory boards: the National Dam Safety Review Board and the Interagency Committee on Dam Safety.

The continued success of the NDSP hinges on the linked roles of the Federal, State, and private partners, all of which have independent responsibilities related to dam safety. These partnerships are predicated on a common vision and shared mission, which serve as the basis of Program direction and planning.

Sincerely,

A handwritten signature in black ink, appearing to read 'W. Craig Fugate'. The signature is stylized and somewhat cursive.

W. Craig Fugate
FEMA Administrator

Executive Summary

This Strategic Plan for the National Dam Safety Program (NDSP) for Fiscal Years (FY) 2012 through 2016 was developed on behalf of the Administrator of the Federal Emergency Management Agency (FEMA), as required by the Dam Safety Act of 2006 (33 U.S. Code [U.S.C.] § 467 et seq., as amended).

The Plan presents the goals and objectives established by FEMA and its partners in the NDSP to reduce the hazards from dam failures in the United States. To achieve the goals and objectives, the Plan identifies the following supporting activities in the program areas funded under the Dam Safety Act of 2006: State assistance; research; training; and data collection, tracking, and analysis using the National Inventory of Dams (NID).

FEMA developed this Strategic Plan in coordination with the NDSP's two advisory boards: the National Dam Safety Review Board (NDSRB) and the Interagency Committee on Dam Safety (ICODS). The collective membership of the NDSRB and ICODS includes representatives from the following agencies and groups:

- FEMA, the NDSP lead agency
- Department of Energy
- Department of the Interior
- Department of Labor
- Federal Energy Regulatory Commission
- International Boundary and Water Commission
- Nuclear Regulatory Commission
- Tennessee Valley Authority
- United States Army Corps of Engineers
- United States Department of Agriculture
- States
- Private sector

Throughout this Strategic Plan, the term “NDSP” refers to FEMA and all of the partners whose activities contribute to meeting the mission, goals, and objectives of the Program.

The continued success of the NDSP hinges on the linked roles of the Federal, State, and private partners, all of which have independent responsibilities related to dam safety. These partnerships are predicated on a common vision and shared mission, which serve as the basis of Program direction and planning.

The NDSP **Vision** is:

The benefits and risks of dams are understood and risks are managed to improve public safety, economic strength, national security, and sustain the environment.

The NDSP **Mission** is:

Reduce risks to life, property, and the environment from dam failure by guiding public policy and leveraging industry best practices across the dam safety community.

The realization of the NDSP mission will require developing and applying knowledge based on research and engineering best practices; making the public more aware of the risks from dam failures; and assisting State, local, and private-sector leaders in the development and adoption of consistent and comprehensive standards and policies. FEMA has established five overarching, long-term strategic goals, with 12 associated objectives, to support the mission:

Goal 1: Reduce the likelihood of dam failures

Objective 1: Assess all high- and significant-hazard potential dams for the risks they pose to life, property, and the environment

Objective 2: Reduce the number of deficient dams in the United States

Objective 3: Learn from dam failures in the United States and worldwide to improve dam safety programs

Objective 4: Support effective Federal and State dam safety programs

Goal 2: Reduce the potential consequences resulting from dam failures

Objective 5: Promote a program of Emergency Action Plan (EAP) implementation, compliance, and exercise for all high- and significant-hazard potential dams in the United States

Objective 6: Improve consequence evaluation for dams nationwide

Goal 3: Promote public awareness of the benefits and risks related to dams

Objective 7: Convey the risk posed by dams to motivate and effect change

Objective 8: Convey the important and unique roles of Federal and State dam safety programs in keeping Americans safe from dam failures

Goal 4: Promote research and training for State dam safety and other professionals

Objective 9: Establish and implement a national course of study for State dam safety professionals

Objective 10: Improve the awareness and understanding of dam risks for other professionals with roles in dam risk management

Objective 11: Promote understanding of the knowledge and techniques needed to safely evaluate, operate, maintain, design, and construct dams

Goal 5: Align relevant Federal programs to improve dam safety

Objective 12: Leverage the resources, capabilities, and authorities of the Federal partners to promote the mission, goals, and objectives of the NDSP and achieve greater efficiencies

These goals and objectives were developed in accordance with the Dam Safety Act of 2006 and in concert with the NDSRB, ICODS, and the stakeholder community. For each goal, Chapter III outlines objectives, implementation strategies, and anticipated outcomes.

The Plan includes seven new strategic priorities that directly support the goals and augment other ongoing agency activities needed to meet the goals. FEMA will emphasize these priorities during the Strategic Plan period. The priorities are:

- Research and deploy innovative technologies and solutions
- Provide continued training and education to dam safety professionals
- Develop consistent standards and guidelines
- Employ decision making processes and tools for assessing risk
- Formulate a National Dam Risk Management Framework
- Manage Program resources and prioritize investments
- Promote public awareness and properly engage key stakeholders

This Plan provides a straightforward strategy for meeting Program goals and objectives. Successful execution of this Plan will involve refining existing policies, being responsiveness to legislative requirements, and aligning with FEMA initiatives and priorities for all of its programs. The pace of accomplishing the goals and objectives and the strategic priorities discussed above will depend on the resources available to the Program during FY 2012 through 2016.

The Program will keep members and stakeholders abreast of advancements in science and technology, and adjust short- and long-term objectives and developmental efforts accordingly. The NDSP and its partners will remain focused on the elements of this Strategic Plan, but will adapt to contingencies and opportunities that may arise. If a dam failure occurs in the United States during the Plan period, the NDSP will initiate efforts to study the effects of that failure, including successes, failures, and unforeseen problems that arose in mitigation, emergency management, response, and recovery practices and policies. FEMA would then adjust this Plan as needed and document lessons learned.

I. Introduction

Purpose of this Strategic Plan

This Strategic Plan for the National Dam Safety Program (NDSP) for FY 2012 through 2016 sets the national agenda for dam safety, as prescribed by the Dam Safety Act of 2006 (33 U.S. Code [U.S.C.] § 467 et seq., as amended), and informs and supports other dam safety programs at the State and Federal levels. This purpose is aligned with the collaborative approach of the Federal Emergency Management Agency (FEMA) to address dam risk in the context of the emergency management lifecycle and to improving the unity of effort across the entire dam safety community. The successful implementation of this Strategic Plan over the next 5 years will support the Nation in preparing for, protecting against, responding to, recovering from, and mitigating dam failures and the risks and vulnerabilities posed by dams.

The Challenge

Dams are a critical and vital part of the American infrastructure. They have contributed to the economic development of the Nation and to the social welfare of the American public. The benefits of dams are many, including irrigation to support agriculture, inland water transportation, hydroelectric power, river navigation, water supply, wildlife habitat, waste management, flood control, and recreation.

The benefits of dams, however, are countered by the risks they can present to the public, property, and the environment if not properly maintained and operated. In the event of a dam failure, the potential energy of the water stored behind even a small dam is capable of causing loss of life and extensive property damage. Despite the strengthening of dam safety programs since the 1970s, dams continue to fail, causing occasional loss of life and millions of dollars in property damage.

In the 1970s, a series of catastrophic dam failures led to the creation of a national program to improve the safety of America's dams. On February 26, 1972, a tailings dam in Buffalo Creek, West Virginia, failed, devastating a 16-mile valley with 6,000 inhabitants. In a matter of minutes, 125 people were killed, 1,100 people were injured, and more than 3,000 were left homeless. On June 5, 1976, Teton Dam in Idaho failed, causing \$1 billion in damages and leaving 11 dead. On November 6, 1977, Kelly Barnes Dam in Georgia failed, killing 39 people, most of them college students.

Meeting the Challenge

For more than 30 years, FEMA has been dedicated to protecting the lives of Americans and their property from the risks associated with dams. Congress first authorized the National Dam Safety Program Act in 1996 (33 U.S.C. § 467 et seq., as amended). The passage of the 1996 Act reflected the culmination of years of collaboration among many in the dam safety community to create the National Dam Safety Program. Since then, Congress has reauthorized the program twice, most recently in 2006.

The Dam Safety Act of 2006, which reauthorized the NDSP's funding levels through FY 2011, continued all of the programs established by the 1996 Act that had been serving to increase the safety of America's dams. These programs grant funds to the States to improve their dam safety programs, provide training for State dam safety staff and inspectors, maintain a database of State performance data and condition ratings managed by the U.S. Army Corps of Engineers, and administer a program of technical and archival research. The Dam Safety Act of 2006 also continued the role of the National Dam Safety Review Board (NDSRB) and the Interagency Committee on Dam Safety (ICODS), both of which advise the FEMA Administrator on national policy issues affecting dam safety.

The NDSP is an investment in preventing dam failures and protecting the lives and property of those at risk from dam failure in America. This Strategic Plan strengthens the Program by setting a course of action over the coming years for continuing to reduce the risks to the American public by improving national dam safety policy and practice.

The purpose of the NDSP, as expressed in the Dam Safety Act of 2006, is to "reduce the risks to life and property from dam failure in the United States through the establishment and maintenance of an effective national dam safety program to bring together the expertise and resources of the Federal and non-Federal communities in achieving national dam safety hazard reduction."

The objectives of the NDSP, which are also set forth in the Dam Safety Act of 2006, are to:

- Ensure that new and existing dams are safe through the development of technologically and economically feasible programs and procedures for national dam safety hazard reduction;
- Encourage acceptable engineering policies and procedures to be used for dam site investigation, design, construction, operation and maintenance, and emergency preparedness;
- Encourage the establishment and implementation of effective dam safety programs in each State based on State standards;
- Develop and encourage public awareness projects to increase public acceptance and support of State dam safety programs;
- Develop technical assistance materials for Federal and State dam safety programs;
- Develop mechanisms with which to provide Federal technical assistance for dam safety to the non-Federal sector; and
- Develop technical assistance materials, seminars, and guidelines to improve security for dams in the United States.

Since the NDSP was first authorized, there have been improvements in the safety of many of the Nation's dams. Nonetheless, the state of the dam infrastructure continues to be a significant concern. In its most recent report card, the American Society of Civil Engineers (ASCE) gave dams a grade of "D" (*2009 ASCE Report Card for America's Infrastructure*, January 2009,

<http://www.infrastructurereportcard.org/>). The 2009 Infrastructure Report Card succinctly articulates the reasons for the increasing dam risk:

“Many dams are determined to be deficient as a result of aging, deterioration, and a lack of maintenance. Often dams are deemed unsafe or deficient as a result of increased scientific and engineering knowledge about large flood events and earthquakes, and the ability to predict a dam’s structural response to such extreme events, which pose a significant safety threat. Many dams were constructed 30 or 40 years ago using the best science and engineering at the time. But as a result of the additional 40 years of historical records and greater abilities to predict increases in loads on dams and the dams’ responses to those events, more dams are being identified as unsafe or deficient.”

Recent dam incidents and failures illustrate the need for the Federal Government to adopt a comprehensive and collaborative approach that factors dam risk into the emergency management equation. Some of these incidents are summarized below.

- On May 14, 2003, Silver Lake Dam in Michigan’s Upper Peninsula failed, causing the failure of the downstream Tourist Park Dam and the evacuation of more than 1,800 people in the city of Marquette. The failures resulted in more than \$100 million in damage, including about \$10 million in damage to utility facilities, \$4 million in environmental damage, and \$3 million in damage to roads and bridges. Twenty homes and three businesses were damaged or destroyed. The We Energies power plant, which generates one-half the electricity produced in the Upper Peninsula, was flooded, causing the closure of two nearby iron mines and the layoff of about 1,100 mine workers for several weeks, until the power plant was repaired. The mine owner estimated that the shutdown cost the local economy about \$1 million a day.
- On March 12, 2004, Big Bay Dam in Mississippi failed only 12 years after construction. The Big Bay Dam failure occurred with only 6 inches of water above the normal pool elevation of 278 feet, sending more than 3 billion gallons of water downstream and inundating 14 miles of valley with depths up to 33 feet. No lives were lost, but the flooding damaged or destroyed 104 structures.
- On March 14, 2006, the century-old earthen dam on the Kaloko Reservoir on the island of Kauai, Hawaii, burst without warning shortly before 7:30 a.m. The flood from the dam failure raced downhill toward the town of Kilauea, with a wall of water reported between 20 and 70 feet high and 200 feet wide. The flood killed seven people and swept several homes off their foundations.
- In June 2006, the Lake Needwood Dam in Rockville, Maryland, developed severe leakage as the lake rose 23 feet above normal. About 2,200 people were evacuated from their homes as a precaution.
- On July 24, 2010, the Lake Delhi Dam in eastern Iowa failed, sending torrents of water into the Maquoketa River and forcing the evacuation of hundreds of homes and vacation

cabins. In Monticello, Iowa, 50 homes and 20 businesses suffered severe flood damage. The cost to reconstruct Lake Delhi Dam is estimated at \$12 million.

There are now approximately 27,000 dams in the United States whose failure would cause property damage or a potential loss of life. Of these, 14,000 are classified as high-hazard potential, meaning their failure would result in probable loss of life. According to the 2009 update to the National Inventory of Dams (NID), only about 55 percent of these dams have an Emergency Action Plan (EAP) to reduce the probability of loss of life and property damage that can result from a dam failure.

The collaborative approach required for dam safety and dam risk management is aligned with Presidential Policy Directive (PPD)-8: National Preparedness, March 2011. PPD-8 established the National Preparedness System, which provides the approach, resources, and tools for meeting the National Preparedness Goal: A secure and resilient Nation capable of preventing, protecting against, mitigating, responding to, and recovering from the threats and hazards that pose the greatest risk.

The National Preparedness System has six main components for improving our preparedness:

- Identifying and assessing risks
- Estimating capability requirements
- Building or sustaining capabilities
- Developing and implementing plans to deliver those capabilities
- Validating and monitoring progress made toward achieving the National Preparedness Goal
- Reviewing and updating efforts to promote continuous improvement

The goals and objectives of the NDSP Strategic Plan support national preparedness by improving the identification and assessment of the Nation's dam risk by leveraging the capabilities and authorities of our Federal, State, and private sector partners. The National Dam Safety Program's commitment to developing and delivering training, research products, and guidance will continue to build and sustain Federal, State, and local capability in dam safety and dam risk management.

The NDSP will remain focused on the elements of this Strategic Plan but adapt to contingencies and opportunities as they arise. In addition to reviewing annual accomplishments and progress, FEMA, the NDSRB, and ICODS will review this Plan annually to determine if changes are needed to improve its applicability and effectiveness.

II. Vision, Mission, and Strategic Priorities

The first step in developing this Strategic Plan was to define the vision and mission for Program direction and planning. The concepts underlying the vision and mission were then expanded to the five goals and 12 objectives that will direct the focus of the Program over the next 5 years. The Program priorities also provide a context for the execution of the Plan. Combined, the vision and mission, goals and objectives, and strategic priorities form a logical foundation and framework for the strategic planning and direction of NDSP.

The NDSP **Vision** is:

The benefits and risks of dams are understood and risks are managed to improve public safety, economic strength, national security, and sustain the environment.

The NDSP **Mission** is:

Reduce risks to life, property, and the environment from dam failure by guiding public policy and leveraging industry best practices across the dam safety community.

The **Program Priorities** for the NDSP are:

- Research and deploy innovative technologies and solutions
- Provide continued training and education to dam safety professionals
- Develop consistent standards and guidelines
- Employ decision making processes and tools to assess risk
- Achieve better alignment of Federal programs that can improve dam safety
- Manage program resources and prioritize investments
- Promote public awareness and properly engage key stakeholders

III. Goals and Objectives

This Strategic Plan builds on five goals that serve as the foundation for the NDSP. These goals, described below, are independent, yet all work together to achieve the Program vision and mission. They are linked in ways that lead logically and ultimately to a reduction of dam risk nationwide. Each goal includes objectives, implementation strategies, and outcomes. To evaluate implementation of the Strategic Plan, FEMA, in coordination with the NDSRB, has established a suite of performance measures for the periodic assessment of the progress being made in Program areas such as State assistance, training, and research.

Goal 1: Reduce the likelihood of dam failures

Reducing the likelihood of dam failures is at the heart of the NDSP vision. The objectives to accomplish this goal encompass the most critical activities for dam safety, including increasing inspections and condition assessments of dams, tracking the rate of high- and significant-hazard potential dam failures in the United States, and supporting other Federal and State dam safety programs.

The risk associated with a dam failing has two distinct components: the probability of a dam failing and the consequences of the failure. The NDSP can significantly reduce the risk to life and property from dam failures by providing Federal and State dam safety officials and dam owners with the tools to identify, prioritize, and mitigate this risk. In turn, information on the risk from dam failure must be shared with the downstream public.

Objective 1: Assess all high- and significant-hazard potential dams for the risks they pose to life, property, and the environment

Currently, the average age of dams in the NID is 52.3 years, and more than 10,000 will cross this threshold (50 years of age) in the next 10 years.

Among dams classified as high-hazard potential, 39 percent (5,345 dams) are more than 50 years old and 6 percent (1,214 dams) are more than 100 years old. It is important to note that of the 83,987 dams included in the NID, approximately 14 percent (12,000 dams) have no date for year completed, and 1,300 of these are high-hazard potential dams.

To deal with the aging infrastructure, the NDSP established a performance measure for the State assistance component of in 2006. As a result, State inspections of high-hazard potential dams have increased dramatically since data were first collected for 1998-1999. This progress will continue to be a priority for the NDSP for the next 5 years.

The key to understanding why regular inspections of dams are important is to recognize that a dam is a man-made structure constructed of materials that are subject to erosion, corrosion, weathering, and deterioration. Depending on multiple factors, a dam may deteriorate slowly or quickly, but every dam will deteriorate over time. If problems with the dam go unnoticed, and repair and maintenance measures are not taken, the dam can fail, causing possible loss of life, property damage, and environmental damage downstream.

Objective 2: Reduce the number of deficient dams in the United States

The NID has collected condition data on State-regulated high-hazard-potential dams since 2009. The NID's Conditions Ratings are as follows:

- **Satisfactory** – No existing or potential dam safety deficiencies are recognized.
- **Fair** – No existing dam safety deficiencies are recognized for normal loading conditions. Rare or extreme hydrologic and/or seismic events may result in a dam safety deficiency.
- **Poor** – A dam safety deficiency is recognized for loading conditions that may realistically occur. Remedial action is necessary.
- **Unsatisfactory** – A dam safety deficiency is recognized that requires immediate or emergency remedial action for problem resolution.
- **Not Rated** – The dam has not been inspected or has been inspected but, for whatever reason, has not been rated.

For those dams rated “Poor or “Unsatisfactory,” the Program will encourage its Federal and State regulatory partners to take the following actions:

- Formally notify dam owners of conditions that make the dam rated as “Poor” or “Unsatisfactory”
- Formally notify State and local emergency management authorities of dams rated as “Poor” or “Unsatisfactory”
- Establish operation restrictions on the dams that are rated as “Poor” or “Unsatisfactory”
- Formally notify dam owners of the deadline to make the dam improvements
- Support the efforts of regulatory agencies and the States to decommission dams that cannot be improved to Satisfactory condition
- Educate dam owners, consultants, and State dam safety program on state-of-the-practice methodologies and cost-effective techniques to remediate defective dams
- Ensure that new and remediated dams are constructed using best engineering practices so that they do not develop future dam safety problems.

Objective 3: Learn from dam failures in the United States and worldwide to improve dam safety programs

Proactive measures help to establish resilient communities. Dam failures, if properly documented, provide invaluable information on the cause of the failure, failure modes, changes in design loading conditions, design or construction deficiencies, operation and maintenance deficiencies, or the effects of normal age and deterioration. This documentation serves as the foundation for lessons learned from dam failures and ultimately to the transfer of those lessons into the knowledge, best practices, and tools to reduce dam failures and address the consequences

of dam failures. Dam failure data can also provide insight into emergency planning response, flood warning and evacuation, flood mitigation, and community resilience.

Dam failures, either catastrophic or incidental, have occurred throughout the history of the United States, and many have resulted in loss of life. Tracking the rate of high- and significant-hazard potential dam failures, and creating a centralized database, will provide a base rate for dam failure and ultimately help improve the effectiveness of the NDSP.

The NDSP will facilitate the development and implementation of a comprehensive, up-to-date database of dam incidents and failures reported by Federal and State dam safety agencies. At a minimum, the database will include fields for dam characteristics, type of failure or incident initiation, the response of the structure, the consequences of the event (lives lost and property damage costs), and the resulting mitigation or corrective action. The database will be used to track the trends of events over time, and document lessons learned and how they will be applied to decrease the risks of dam failure. Trends to be reported to Congress may include number of incidents and failures per year by type and hazard potential of dam, number of lives lost, amount of property damage in dollars, cost of repairs in dollars, cost of emergency response in dollars, and the cost of recovery/cleanup in dollars.

Objective 4: Support effective Federal and State dam safety programs

There are more than 84,000 dams in the United States. Of those, 4 percent are federally owned, and 96 percent are owned by State or local governments, or the private sector, in which case they are regulated by the respective State. This diversity in ownership and regulatory authority poses challenges in ensuring national consistency in dam safety policies.

To reduce the risk from dam failures, FEMA, through the NDSP, supports State dam safety programs. With the exception of Alabama, all States and the Commonwealth of Puerto Rico have legislatively mandated dam safety programs and participate in the NDSP State assistance program. These programs help to build resilient communities by establishing strong relationships with local stakeholders such as dam owners, dam operators, and emergency managers.

The NDSP provides assistance to State dam safety programs for the following types of activities:

- Program operations
- Guidance and policy documents
- Training for State dam safety officials
- Technical assistance

In addition, FEMA, in consultation with ICODS and the NDSRB, collaborates with other Federal agencies to ensure that information on dams is shared with stakeholders to build awareness across the agencies of dam safety issues and activities, and to bring research and engineering best practices to the community as a whole.

Implementation Activities:

The following strategies will be employed to achieve the objectives of Goal 1:

- Promote and coordinate information sharing on risk assessment guidelines and tools among the ICODS agencies and other Federal agencies in the Dam Sector.
- Identify all high-hazard potential dams that require an EAP.
- Establish a mechanism to collect and analyze data on historic failures of high- and significant-hazard potential dams. This information is imperative to demonstrate the effectiveness of the Program.
- Develop an incentive strategy for the States to achieve the highest standards, as defined by the Program, in condition assessments and inspections.

Goal Outcome: State dam safety programs that are effective and work toward the goals of this Plan. The achievement of this outcome should result in the ability of State dam safety programs to encourage and implement proactive policies, guidance, and tools to ensure the safety of their dams.

Goal 2: Reduce the potential consequences resulting from dam failures

This goal addresses the second component of the risk equation: the consequences of a dam failing. Although impact varies from one incident to another, the common impact is the risk to life and property. Therefore, effective measures must be in place to reduce the magnitude of the impact.

Emergency action planning, particularly for those dams that pose the greatest risk, is one of the cornerstones of Goal 2. Equally important are the NDSP's ongoing efforts to improve the consequence evaluation of dam failure. Initiatives and strategies in both of these areas are discussed below and under Objectives 5 and 6.

Emergency planning, including the preparation and exercising of EAPs, is one of the primary safeguards against the loss of life and property damage that can result from the failure of a high- or significant-hazard potential dam. EAPs are essential because they identify the area downstream of the dam that would be flooded after a failure; establish the communication between the dam owner and emergency response personnel; provide for notification and evacuations conducted by police, fire, and rescue teams; and predict the timing of the dam break flood wave. It is essential that first responders have critical emergency action planning information to conduct safe and successful evacuations, save lives, and help keep responders out of danger. It is also important to exercise EAPs to detect and eliminate errors and to ensure that the parties know their roles in an emergency. In many of the dam failures that have occurred in recent years, the implementation of an EAP for the dam has been credited with reducing or eliminating loss of life.

In the event of a dam failure, the potential energy of the water stored behind even a small dam is capable of causing loss of life and significant property and environmental damage. The consequences associated with the failure or misoperation of dams include:

- Impacts on health and safety caused by inundation of downstream population areas, special needs facilities, industrial areas, and other critical infrastructure assets
- Economic and environmental impacts to the community and surrounding areas
- Direct impact on local government capabilities and the availability of critical government services
- Indirect effects associated with the disruption or loss of critical functions provided by critical facilities, such as water supply, power generation, and navigation
- Impact on public confidence, such as psychosocial or behavioral changes

Objective 5: Promote a program of EAP implementation, compliance, and exercise for all high- and significant-hazard potential dams in the United States

Today, there are 13,990 high-hazard potential dams and 12,662 significant-hazard potential dams in the United States. Approximately 62 percent of State-regulated high-hazard-potential dams have an EAP. Since the establishment of the NDSP, Federal agencies and State governments have made significant progress in increasing the number of high- and significant-hazard potential dams with EAPs. The dam safety community recognizes, however, that much more must be done to reach the objective established in January 2006 by the NDSP: achieve 100 percent compliance for EAPs for high-hazard potential dams. The need for emergency action planning is heightened by the aging of dams in the United States.

The NDSP will monitor progress toward this objective by reviewing data on emergency action planning, including exercising of EAPs with the local emergency responders of the community; this information is being collected and tracked through the NID. FEMA will support this objective by developing products to help dam owners prepare EAPs and by educating dam owners and the public on the need for emergency action planning for dams.

Objective 6: Improve consequence evaluation for dams nationwide

The NDSP will lead the nationwide effort to promote community resilience to dam failure by improving response capabilities and consequence evaluation. The NDSP will work closely with the emergency management community through appropriate partner organizations to implement a strategy for increasing EAP compliance and exercising EAPs nationwide. The NDSP will emphasize coordination in developing EAPs and local emergency operations plans, and encourage the integration of EAP exercises into the local emergency management drill and exercise regime. This strategy will also include partnering with FEMA Protection and National Preparedness to complete the development of technical assistance and training opportunities for local emergency managers. For example, guidance from National Preparedness on Threat and Hazard Identification and Risk Assessment helps State and local emergency management

officials establish informed and defensible capability targets for responding to dam failure. This partnership effort will focus on emergency operations plan development and improving the understanding and management of consequences associated with dam failure.

The NDSP will also support multidisciplinary research designed to advance the evaluation of health and safety, economic, and environmental impacts of dam failure or misoperation. This research will lead to the development of tools, guidance, and other products for dam owners and operators, regulators, emergency managers, and other local officials that will improve the understanding, assessment, and management of dam failure or misoperation. The NDSP will work with its emergency management partners on research products that support emergency preparedness and response by households, emergency management organizations, and communities, emphasizing organizational planning and innovation to improve response. The NDSP and its emergency management partners will also use findings from research on other hazards and factors that affect the processes of physical, social, and economic recovery, and will incorporate that information into guidance and tools specific to dam hazard consequences.

Implementation Activities:

- Identify all high- and significant-hazard potential dams with current EAPs
- Identify all high- and significant-hazard potential dams that require EAPs and take the appropriate corrective measures to make sure a current EAP is in place
- Develop and disseminate guidelines on the frequency of exercising EAPs
- Develop a mechanism by which the NDSP can track the percentage of EAPs exercised
- Collaborate with appropriate partner organizations to develop guidance and products that improve local response capabilities

Goal Outcome: Improved response, mitigation, and emergency planning capabilities leading to community resiliency.

Goal 3: Promote public awareness of the benefits and risks related to dams

Many Americans are unaware that they are living downstream of a dam, much less downstream of a deficient dam. Further, many Americans are not aware that they are living downstream of a deficient dam that does not have an EAP to provide for warning and evacuation in the event the dam fails. In some cases, there is an EAP, but those living downstream are not aware of it.

The NDSP will support public awareness initiatives, including the development and dissemination of materials to all appropriate audiences. The NDSP will support local campaigns to help the public prepare for, respond to, and recover from dam failures. This will also include raising public awareness on the benefits of building and maintaining dams in the United States.

In general, dams may pose risks to downstream populations if they are not properly managed and operated. In some cases, even dams that are properly managed and operated can still pose a risk to the downstream population if it becomes necessary to release the water. Despite these risks, dams are vital to sustaining and supporting the Nation's growth and continuous demand for

water. Although dams are built for many different purposes and provide different benefits, the most important is water supply for domestic and industrial use. Other benefits include:

- Flood control and prevention by storing water
- Agriculture irrigation for food supply
- Generation of clean and renewable energy or Hydropower
- Recreation and tourism

The public awareness campaign will also include messages about the benefits of the National Flood Insurance Program (NFIP) and how NFIP flood insurance can help communities and individual property owners manage the risks of flooding related to dams.

To increase public awareness, the Program will strive to reach the widest range of diverse audiences in a cost-effective manner. A variety of methods will be employed to reach audiences, including outreach campaigns, in partnership with local communities, targeted to the public, consumers, and businesses; articles and presentations for professionals and public groups; dissemination of informational materials at public forums and conferences; cooperative efforts with other Federal agencies and the States; and communications initiatives to increase public awareness of dam risk and how to take the appropriate mitigation actions.

Objective 7: Convey the risk posed by dams to motivate and effect change

The NDSP will support comprehensive knowledge and technology transfer efforts. The NDSP will also prepare, maintain, and widely disseminate guidance and related information on the dam hazard and mitigation efforts.

The NDSP will promote the recognition of dam risks in corporate, financial, and business continuity planning, and in the insurance industry. This will be done in part through promoting cooperation and opportunities to work with associations and similar groups and other stakeholders, where appropriate.

FEMA will promote dam risk mitigation at the State and local levels, using the NDSP State assistance program and other FEMA programs, to enable the States and localities to develop mitigation, preparedness, and response plans. The NDSP will support the establishment and operation of multi-State groups when mitigation and response planning efforts cross State boundaries. The NDSP will also promote the training and professional development of the staffs of State regulatory agencies to ensure dam safety requirements are effectively applied and enforced. The NDSP will investigate the cost-effectiveness, impact, and acceptability of various incentives to increase public and private dam loss reduction actions.

Objective 8: Convey the important and unique roles of Federal and State dam safety programs in keeping Americans safe from dam failures

The NDSP will support comprehensive dam safety public awareness programs, including the development and dissemination of materials to appropriate and diverse audiences. The Program will support public access to locality-specific information to help the public, consumers, and

businesses prepare for, respond to, and recover from dam failures. Working with local partners, the NDSP will distribute fact sheets, preparedness handbooks, scenario study results, and other materials to areas of the United States at risk.

The NDSP strives to employ public outreach strategies, methodologies, and products, and communicate lessons learned through FEMA’s Risk Mapping, Assessment, and Planning (Risk MAP) Program. Established in 2009, Risk MAP builds on the successes of the Flood Map Modernization Program, with a vision to deliver quality data that increase public awareness and lead to action that reduces risk to life and property.

Implementation Activities:

- Develop and implement a national dam safety awareness program targeting the public, schools and universities, and private interest groups to convey the importance of the program and the risks and benefits of dams
- Develop and disseminate unified messaging material that includes facts, key messages, and information about basic products
- Become more active in promoting the NDSP at major conferences and events
- Examine the use of social media strategies and tools and implement these strategies and tools, where appropriate
- Actively participate in Risk MAP projects to increase flood risk awareness and highlight specific dam safety issues

Goal Outcome: Increased public understanding of dam safety issues, benefits, and risks.

Goal 4: Promote research and training for State dam safety and other professionals

Developing research products and providing training for dam safety professionals—with a focus on State dam safety staff—are two cornerstones of the NDSP. The Program will not only develop research products in the form of technical guidance, policies, engineering best practices, and safety guidelines, but will also promote the efficient and effective implementation and application of these products at the State and Federal levels. Similarly, the Program will ensure that training courses are developed and delivered to State dam safety professionals in collaboration with the industry, and according to the Program’s priorities and the needs of the community.

Objective 9: Establish and implement a national course of study for State dam safety professionals

Training is an NDSP strategic priority. The Dam Safety Act of 2006 and predecessor legislation provides funds for the training of State dam safety professionals. Since 1998, FEMA has set aside program funds for this purpose. FEMA and its partners will continue to evaluate the States’ needs for dam safety training and respond to their requests for specific training.

Training funds for State dam safety officials have been a mainstay of the NDSP. Each year, an amount is provided directly to State officials to cover the costs of attending technical training identified by the individual States. This flexibility allows the States to focus their training on their specific needs.

Moreover, during the Training Summit held in 2011 (see Objective 10 below), the NDSP emphasized the need to collaborate with partners to deliver the most value to recipients in the midst of budget realities. The Program will continue to collaborate with industry to design and deliver courses that meet the needs of users.

Objective 10: Improve the awareness and understanding of dam risks for other professionals with roles in dam risk management

There is now a national dam safety training program in place that provides continuous technical training to meet the needs of the dam safety community, including government, consulting engineers, dam owners, the emergency management community, and other professionals. In FY 2010, more than 3,000 stakeholders were trained at dam safety workshops, seminars, and courses across the United States. The development and promotion of training will continue to be a NDSP priority.

The NDSP held a Dam Safety Training Summit in Washington, D.C., in August 2011. The primary purpose of the Summit was to develop the framework for a National Dam Safety Training Plan by drawing upon the expertise of the participants. The following were outcomes of the Summit:

- Defined a vision for dam safety training
- Identified training and awareness audiences
- Defined training topic areas and conducted an initial assessment of required training not currently offered
- Developed the Training Plan management structure

The Program has also developed a curriculum of courses needed to ensure that State dam safety and other professionals have adequate knowledge and skills to meet NDSP goals and objectives. The NDSP will ensure that the community is aware of this curriculum through conferences, webinars, and other events hosted by Program partners.

Objective 11: Promote understanding of the knowledge and techniques needed to safely evaluate, operate, maintain, design, and construct dams

The NDSP will support research to advance technical and engineering knowledge of cost-effective dam design methods.

The NDSP, in collaboration with its emergency management partners, will support basic multidisciplinary research on mitigation of, response to, and recovery from dam failure and incidents that integrates engineering, social, behavioral, public policy, and economic research. A framework to link science and engineering with research in the social sciences will consist of

four elements: risk assessment, risk perception, risk communication, and risk management. The framework will include studies on mitigating losses from future dam failures and will define the roles of the private and public sectors in helping to reduce losses.

The NDSP, in collaboration with its emergency management partners, will also support basic research on the levels of risk and vulnerability faced by the Nation from dams so that risks can be reduced, community resilience increased, and costs of damage lessened. The NDSP will also support multidisciplinary research on societal response and to decisions about adopting hazard mitigation practices and policies, as made by households, private businesses, corporations, and State and local governments. Emphasis will be placed on social and economic incentives that can facilitate the adoption of mitigation measures that recognize that individuals focus on short-term horizons and hence do not consider the long-term benefits of investing in dam hazard mitigation measures. The NDSP will support studies on communicating information on dam hazard and risk and the long-term benefits of investing in mitigation measures.

In collaboration with its emergency management partners, the NDSP will also support research on emergency preparedness and response by households, emergency management organizations, and communities, emphasizing organizational planning and innovation to improve response. The NDSP will also support research on those factors that affect the processes of physical, social, and economic recovery from disasters.

Implementation Activities:

- Establish a body of knowledge for dam safety professionals
- Explore new course-delivery mechanisms and venues
- Improve access to training through webinars and other technologies
- Continue to survey the needs of State and Federal dam safety professionals and existing programs to identify resources and ongoing needs
- Encourage the States to develop a database of dam safety engineers and the specific courses they have taken
- Continue to work with key stakeholders to improve the technology transfer process
- Establish an ad hoc group to explore new business model options for dam safety research
- Establish a nationwide agenda for dam safety research
- Collaborate with other organizations and agencies, such as the National Science Foundation, to increase the number of research projects that may enhance our ability to reduce the risk to the public

Goal Outcome: Adequately trained State dam safety professionals; enhanced, focused, and comprehensive research and development products

Goal 5: Align relevant Federal programs to improve dam safety

Achieving better alignment of Federal programs that can improve dam safety is one of the NDSP's strategic priorities. Stronger alignment will not only result in the more tangible outcome of a reduction in the potential consequences to life and property from dam failure, but will also ensure a unity of effort, promote mutual understanding of the key priorities, and realize other synergies.

Objective 12: Leverage the resources, capabilities, and authorities of the Federal partners to promote the mission, goals, and objectives of the NDSP and to achieve greater efficiencies

The NDSP will use ICODS and the NDSRB as a starting point for potential alignment with other Federal programs. The ICODS and NDSRB members will identify and evaluate programs within their respective agencies to determine potential alignment opportunities with other Federal programs that advance the NDSP strategic goals. After assessing the feasibility of the opportunities, ICODS and the NDSRB will develop a concrete plan to realize the envisioned alignment. FEMA also will identify opportunities that align with the goals and objectives of the NDSP across FEMA and the Department of Homeland Security.

This alignment will result in an increase in collaboration, sharing of best practices, potential cost reduction, addressing risk in a more comprehensive manner, sharing of tools and products, reduction of duplicative efforts, and increase in cross-governmental partnerships. This will ultimately lead to a reduction of dam risks and the associated consequences.

Communicating with the program managers at Federal agencies in the dam sector (ICODS and others) to confirm their understanding of the NDSP synergies, goals, and objectives will be an important step in achieving outcomes associated with this goal. Conversely, it will be important for FEMA, as the lead agency of the NDSP, to understand the missions and goals of its Federal partners and convey information on those missions and goals to its internal and external constituents as part of its leadership role.

Implementation Activities:

- Increase collaboration with other Federal agencies, in particular those agencies represented on the ICODS
- Increase exposure of the Program through conferences, webinars, and briefings for the purpose of aligning programs

Goal Outcome: Increased unity of effort to improve dam safety in the United States.

IV. Conclusion

This document provides a straightforward, realistic, and executable Strategic Plan for the NDSP for FY 2012 through 2016. The Plan is based on what is required and practical, and it presents the most efficient and effective uses of NDSP resources to reduce losses from dam failures in the United States. The goals, objectives, strategies, and priorities will serve as formal guidelines for all NDSP efforts. The Plan is based on a realistic assessment of the anticipated constraints the NDSP will face during the years covered by the Plan.

During the Strategic Plan period, FEMA and its NDSP partners will keep abreast of advancements in science and technology, adjusting both short- and long-term efforts to take advantage of them. To support this, the NDSP will conduct workshops and other planning initiatives to highlight new technology breakthrough areas and their applications. These activities will be organized in partnership with members of the dam safety professional community. If a major dam failure occurs in the United States during the Plan period, the NDSP will study the effects and impacts of that event. These studies will assess what worked, what failed, and what unforeseen problems arose in mitigation, response, and recovery practices and policies. Should this occur, this Plan may be overtaken by events and need significant revision.

FEMA and its partners will also continue to explore developing partnerships with its stakeholder community: academic, industry, government, technical, and professional organizations involved with the dam risk reduction process. Through these efforts, unanticipated but welcome opportunities may emerge that require timely response from the NDSP. As a result of this strategy, the NDSP will remain focused on the elements of this Plan but adaptable to contingencies and opportunities as they arise.

V. Abbreviations and Acronyms

ASCE	American Society of Civil Engineers
EAP	Emergency Action Plan
EMI	Emergency Management Institute
FEMA	Federal Emergency Management Agency
FY	Fiscal Year
ICODS.....	Interagency Committee on Dam Safety
NDSP	National Dam Safety Program
NDSRB	National Dam Safety Review Board
NFIP	National Flood Insurance Program
NID	National Inventory of Dams
PPD	Presidential Policy Directive
Risk MAP.....	Risk Mapping, Assessment, and Planning
U.S.C.....	U.S. Code