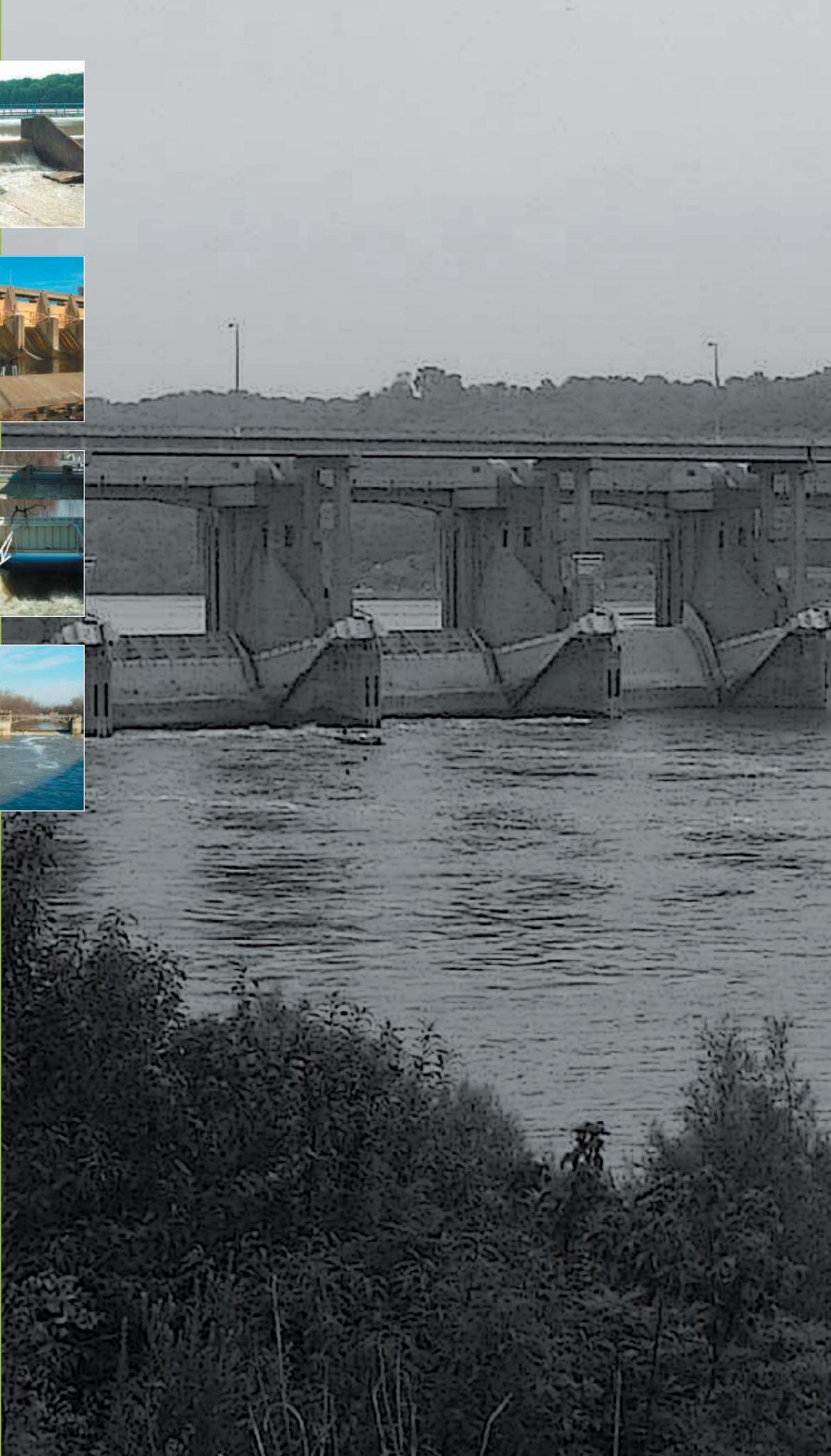
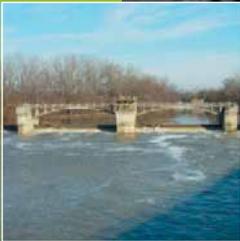


DAMS

GRADE: D-



Introduction

Dams provide essential benefits, including drinking water, power generation, flood protection, irrigation, and recreation. They may be publicly owned and operated by federal agencies, states, cities, and municipalities, or privately owned and operated by individuals, businesses, and corporations. Dams are typically constructed of earthen soils and/or other man-made materials such as concrete. A dam's hazard potential is determined by the anticipated consequences of failure, not the condition of the dam. These classifications include high hazard potential, which indicates anticipated loss of life in the case of a failure; significant hazard potential, which indicates anticipated damage to buildings and important infrastructure; and low hazard potential, which indicates anticipated loss of the dam or damage to the floodplain, but no expected loss of life. A lack of routine frequent inspections, maintenance, and repair can eventually cause a dam to become unsafe.

The failure of several major dams in the 1970s caused the federal government to take notice of the importance of dam safety in the United States. In 1972, the National Dam Safety Act was authorized. This Act called for the U.S. Army Corp of Engineers (USACE) to carry out a national program for the inspection of all non-federal dams listed in the national inventory. Upon completion of the inspection phase of the program, the state dam safety agencies assumed responsibility for the next phase.

The federal government provided assistance with program improvements through the National Dam Safety Act of 1996. The National Dam Safety Program (NDSP) is administered by the Federal Emergency Management Agency (FEMA) and is designed to provide incentive grants to states and training to encourage research.

According to data obtained from the State of Indiana, as of 2008, of the 1,088 dams that are regulated by the State, over 50 percent are identified as needing remediation. While some of these dams are owned and operated by state and municipal entities, approximately 70 percent are owned by private entities.⁷ While these dams are regulated by the State of Indiana, the State does not have sufficient resources, funding, or staff to conduct

dam safety inspections, take appropriate enforcement actions, or ensure proper construction by reviewing plans and performing construction inspections.

As of 2008, Indiana's Dam Safety Program had an annual budget of \$430,000 and five engineers, which equates to 217.6 dams per engineer.⁵ In 2005, Indiana ranked 25th in full-time engineers devoted to dam safety.⁶ Currently in Indiana, high-hazard dams must be inspected every two years, significant-hazard dams must be inspected every three years, and low-hazard dams must be inspected every five years. The Indiana Department of Natural Resources is currently responsible for inspections of significant- and low-hazard dams. Dam inspection is an enormous challenge, considering the investment needs and dam conditions.

Condition

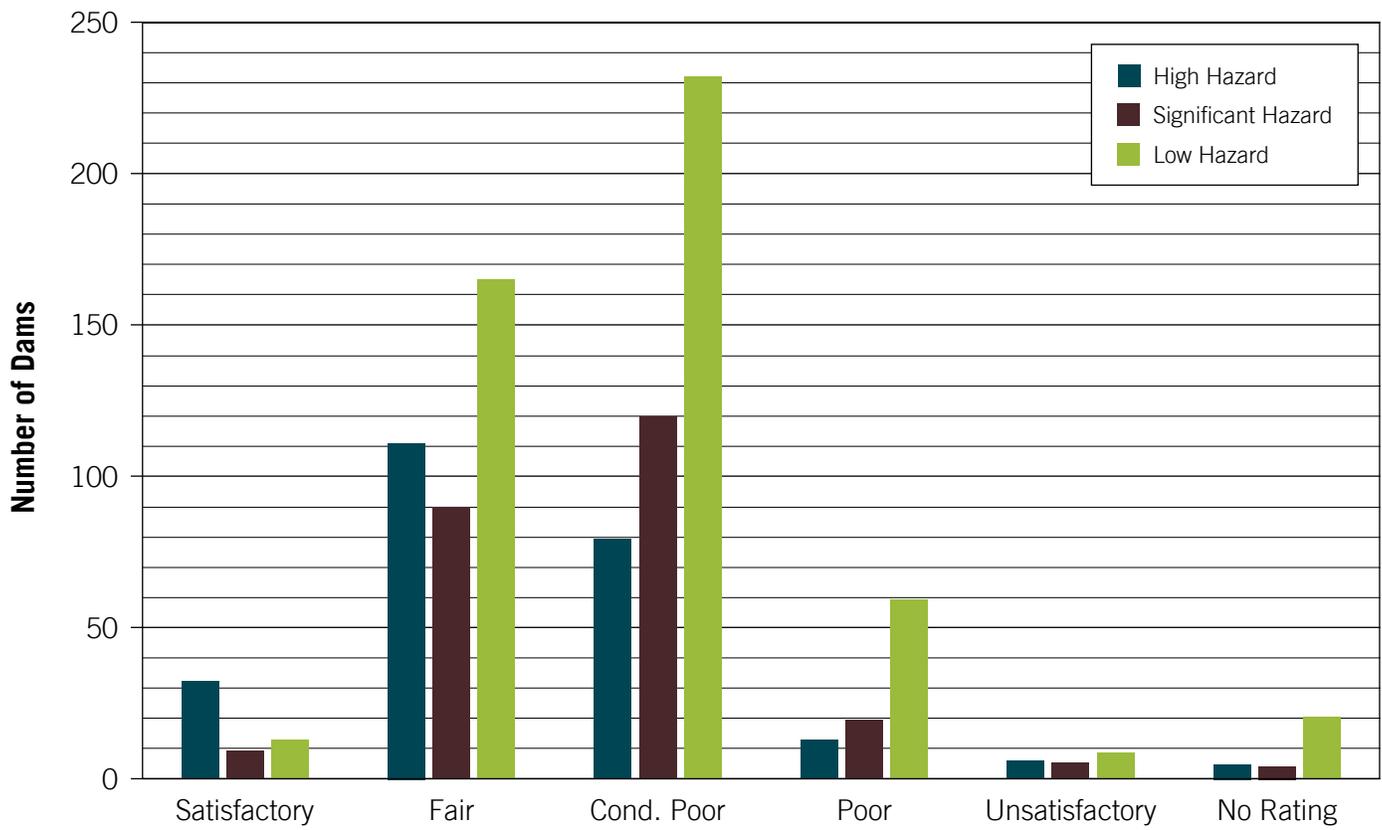
Today, many dams in Indiana are deficient as a result of age, deterioration, and a lack of maintenance. Several of these dams are deemed unsafe or deficient as a result of increased scientific and engineering knowledge about large flood events and earthquakes and the ability to predict a dam's structural response to such events. Many dams were constructed 30 or 40 years ago, but as a result of an 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.

Indiana has 1,088 registered dams, of which 240 are classified as high hazard, 249 as significant hazard, and the remaining 599 as low hazard.¹ These are owned and operated by the state and local governments, public utilities, and private individuals or entities.

The Inventory of State Dams compiles inspection data to provide an overall view of the current condition of the dams in the state of Indiana. Table 1 on the following page illustrates the condition, by hazard classification, of the dams in Indiana. The inventory indicates only 43 percent of Indiana's dams are considered fair or better, with 57 percent of Indiana's dams considered conditionally poor or worse.⁷ At an estimated average repair cost



TABLE 1: INSPECTION RATINGS FOR INDIANA DAMS



of \$750,000 per dam, the total current cost for upgrading the deficient dams with significant and high hazard potentials is approximately \$180 million.

EAP Discussion

An Emergency Action Plan (EAP) is a formal document that identifies potential emergency conditions at a dam and outlines the procedures to follow to minimize property damage and loss of life. A well-prepared and maintained EAP can greatly reduce the potential risk of loss of life in the event of a dam breach.

While there have been successes and improvements in the state-level dam safety programs as a result of the NDSP, the safety and condition of the nation’s dams have not improved overall. The number of emergency action plans (EAPs) has increased nationally; however, the number of high-hazard potential dams nationwide that have EAPs remains at 50 percent.³ Indiana is below the national average, with approximately 15 percent of the state’s high hazard dams having EAPs.⁷ All state-owned high hazard dams have EAPs.⁷

Regulations requiring EAPs varies from state to state. In a survey of state regulatory agencies conducted in 2005 by the National Dam Safety Review Board, it was identified that about 63 percent of the states that responded have

regulations that require a dam owner of a high or significant hazard dam to develop and maintain an EAP.² The State of Indiana currently has no regulations in place that require a dam owner to have an EAP.

Having an EAP for a dam is not just a benefit to the dam owner, but is very helpful for the state and local emergency managers. EAPs allow for the emergency personnel to understand the hazard, respond to evacuations, and properly apply their resources in dealing with a dam safety emergency.

Funding

In 2000, the State of Indiana appropriated funding to repair some of the state-owned dams. While this funding allowed for the analysis and repair of some of the structures, it was not enough to accomplish all of the required remediation. There are still many state-owned structures in need of repairs to address dam safety issues.

The state legislature appropriates funds to IDNR dam upgrade funding on a biennium basis. The appropriations have diminished over the past three cycles of funding. The 2005 appropriation was \$13.5 million, the 2007 appropriation was \$10.5 million, and the 2009 appropriation was \$8 million. These funds are utilized to repair or upgrade state-owned dams. This leaves the remaining 70

percent of dams under other ownership with no state-appropriated funds for addressing safety condition needs.

Funding for municipally and privately owned dams in the state of Indiana is not directly available to these owners. There are some mechanisms that can be used by certain types of dam owners (establishment of a conservancy district), but these mechanisms are very difficult and time consuming to put in place. Direct funding opportunities for dam safety projects in Indiana for private dam owners is currently not available.

Conclusions and Recommendations

The main issue preventing Indiana from providing adequate dam safety and allowing dam owners the mechanism to repair and upgrade their dams is a lack of dam rehabilitation funding on a federal and state level. This is evidenced by the number of dams that have been identified, through inspections, as deficient and in need of repair, and by the investment needs to improve dams that are classified as significant or high hazard. In addition to lack of funding for dam repair and upgrade, lack of regulations requiring high-hazard dam owners to prepare and maintain an Emergency Action Plan continues to be an area of concern. During recent floods in Indiana, most notably in June of 2008, damage occurred to numerous dams, including several dam failures.⁴ Many of the dams that failed or were damaged had been identified during recent inspections as deficient and had been requested to be remediated.

In order to make significant improvements to Indiana's dams—a matter of critical importance to public health, safety and welfare—Indiana needs to:

- Develop a long-term strategic program and plan (including identification of possible funding sources for all types of dam owners) that address the needs to investigate, repair, upgrade, and operate the aging publicly and privately owned dams and increase accountability of dam owners.
- Work with Indiana's congressional delegation to persuade the federal government to fund the National Dam Safety Program and address non-federal public dams through the *Dam Rehabilitation and Repair Act*.

Sources

1. National Inventory of Dams Website. <http://geo.usace.army.mil>.
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4. Association of State Dam Safety Officials. News Archives. June 2008; www.damsafety.org
5. Federal Emergency Management Agency. Draft Report: Dam Safety in the United States, Progress Report on the National Dam Safety Program Fiscal Year 2006 and 2007 (2008)
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7. 2008 Inventory of State Dams. Indiana Department of Natural Resources.

