



December 2015

# ARMY CORPS OF ENGINEERS

## Actions Needed to Improve Cost Sharing for Dam Safety Repairs

Accessible Version

# GAO Highlights

Highlights of [GAO-16-106](#), a report to congressional requesters

## Why GAO Did This Study

The Corps operates over 700 dams, which are aging and may require major repairs to assure safe operation. At some dams, sponsors that benefit from dam operations share in the cost of operating and repairing these dams based on original congressional authorizations for dam construction or subsequent agreements with the Corps. Since 2005, the Corps initiated an estimated \$5.8 billion in repairs at 16 dams with urgent repair needs; sponsors are to share repair costs at 9 of these dams.

GAO was asked to examine cost sharing for Corps dam safety repairs. This report examines how, over the last 10 years, the Corps (1) determined cost sharing and (2) communicated with sponsors regarding cost sharing. GAO reviewed relevant laws and Corps regulations; analyzed dam safety projects' documentation for the 16 dams the Corps selected for repairs since 2005; conducted site visits to a non-generalizable sample of three dams based on cost share determinations and range of sponsors; and interviewed Corps officials and sponsors.

## What GAO Recommends

GAO recommends that the Corps clarify policy guidance on (1) usage of the state-of-the-art provision and (2) effective communication with sponsors to establish and implement cost sharing agreements for all dams, including the three named in this report. The Department of Defense concurred with GAO's recommendations.

View [GAO-16-106](#). For more information, contact Lori Rectanus at (202) 512-2834 or [rectanusl@gao.gov](mailto:rectanusl@gao.gov).

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### Actions Needed to Improve Cost Sharing for Dam Safety Repairs

#### What GAO Found

The U.S. Army Corps of Engineers (Corps) determined sponsors' (such as water utilities and hydropower users) share of costs for dam safety repairs pursuant to regulations, but did not apply a provision in a statutory authority that reduces sponsors' share. The Corps determined these cost shares based on analyses of the potential ways each dam could fail, and in consideration of statutory requirements regarding which type of cost sharing arrangement, or authority, would apply given these possible failure scenarios.

- The Corps applied its *Major Rehabilitation* authority at 11 of the 16 dam safety repair projects GAO reviewed for repairs associated with typical degradation of dams, such as embankment or foundation erosion through seepage. Under this authority, sponsors are to pay their full agreed-upon cost share of the repair.
- The Corps applied its *Dam Safety Assurance* authority at 5 of the 16 dam safety repair projects GAO reviewed for repairs that resulted from the availability of new hydrologic or seismic data. Under this authority, sponsors' agreed-upon cost share is reduced by 85 percent.

The Corps did not apply one provision of its *Dam Safety Assurance* authority—related to repairs needed due to changes in state-of-the-art design or construction criteria (state-of-the-art provision)—since the enactment of the enabling legislation in 1986. Since that time, the Corps has not provided guidance on the types of circumstances under which the state-of-the-art provision applies and has not had a consistent policy position regarding the provision. For example, the Corps' latest regulation states in one section that the state-of-the-art provision will not be applied because of the difficulty in defining terminology, while another section allows for consideration on a case-by-case basis. Without clarifying the circumstances under which the state-of-the-art provision applies, and implementing the policy consistently, the Corps is at risk of not applying the full range of statutory authorities provided to it, contributing to conditions under which, as discussed below, sponsors have taken actions opposing the Corps.

In GAO's review of 9 dams with sponsors, the Corps did not communicate with or effectively engage all sponsors. For example, a federal sponsor that markets hydropower generated at two dams disagreed with the Corps' decision to not apply the state-of-the-art provision of its *Dam Safety Assurance* authority, which, if used, would reduce this sponsor's cost share by about \$410 million. This sponsor has proceeded to set its power rates in anticipation of paying the reduced cost share, creating uncertainty for the recovery of federal outlays for repairs. In addition, GAO found the Corps was not effective in reaching agreement with other sponsors on cost-sharing responsibilities at three dams because it did not have clear guidance for effectively communicating with sponsors. For example, the Corps did not engage a sponsor to ensure cost share payment at one dam and, at another dam, delayed executing agreements that would ensure sponsors' cost shares. Because the Corps did not effectively engage these sponsors, some are deriving benefits absent agreements with the Corps, while others that have agreements have not been notified of their final cost-sharing responsibility. As a result, these sponsors' cost share payments (about \$3.1 million) are uncertain.

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## Abbreviations

ASA(CW)	Assistant Secretary of the Army for Civil Works
Corps	U.S. Army Corps of Engineers
DSAC	Dam Safety Action Classification
DOD	Department of Defense
DSO	Dam Safety Officer
IWTF	Inland Waterways Trust Fund
PMA	Power Marketing Administration
Reclamation	Bureau of Reclamation
SEPA	Southeastern Power Administration
WRDA	Water Resources Development Act of 1986

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December 10, 2015

The Honorable Barbara Boxer  
Ranking Member  
Committee on Environment & Public Works  
United States Senate

The Honorable Bill Shuster  
Chairman  
The Honorable Peter DeFazio  
Ranking Member  
Committee on Transportation and Infrastructure  
House of Representatives

The Honorable David Vitter  
United States Senate

The U.S. Army Corps of Engineers (Corps) operates 709 dams<sup>1</sup> that provide numerous benefits for a wide range of customers, including protecting communities from floods, generating hydropower, and supplying water from reservoirs. While the Corps' dams comprise a small portion of the country's more than 87,000 dams,<sup>2</sup> they are a part of the aging national infrastructure.<sup>3</sup> For example, the American Society of Civil Engineers estimates that by 2020, 70 percent of all dams in the United

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<sup>1</sup>A dam is an artificial barrier constructed for the purpose of storage, control, or diversion of water. The Corps defines dams as being (1) 25 feet or more in height or (2) having an impounding capacity at maximum water storage elevation of 50 acre-feet or more.

<sup>2</sup>The Corps maintains and publishes the *National Inventory of Dams*, which contains information about dams in the United States and its territories.

<sup>3</sup>According to the American Society of Civil Engineers, in 2013, the majority of dams, 69 percent, were owned by a private entity. Federal, state, and local governments owned and operated the remaining dams. According to Corps' data, Corps dams represent about 50 percent of all federally-owned dams.

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States will be over 50 years old.<sup>4</sup> Currently, the average age of the Corps' 709 dams is 56 years.<sup>5</sup>

The age and criticality of dam infrastructure requires the Corps to conduct regular maintenance and, in some cases, major repairs to assure continued safe operation. The Corps currently estimates the cost of fixing all of its dams that need repair at \$24 billion. Since 2005, when the Corps adopted its current risk-informed approach to dam safety, it has initiated repairs of 16 dams in urgent need of repair, the costs for which range from tens to hundreds of millions of dollars per dam, with total repair costs estimated at about \$5.8 billion. At some dams, sponsors or organizations, such as water utilities or hydropower users, that benefit from dam operations share in the cost of the repairs. In this context, you asked us to review issues concerning cost sharing for dam safety repairs. This report examines how, over the last 10 years, the Corps (1) determined cost sharing for dam safety repairs and (2) communicated with sponsors regarding cost sharing for dam safety repairs.

To address these objectives, we reviewed relevant federal laws and Corps engineering regulations related to dam safety and cost sharing. For each of the 16 dam safety repair projects funded for design or construction from fiscal year 2007<sup>6</sup> to fiscal year 2016, we analyzed Corps dam safety documents and compared them against the Corps' latest *Safety of Dams* regulation.<sup>7,8</sup> We interviewed Department of Defense and Corps headquarters officials about how the Corps determined and communicated with sponsors about cost sharing for dam

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<sup>4</sup>American Society of Civil Engineers. *2013 Report Card for America's Infrastructure* (March 2013).

<sup>5</sup>According to Corps data, most Corps dams were built during the 1960s and 1970s, with 75 percent of dams serving multiple purposes related to flood control, irrigation, navigation, water supply, hydropower generation, and recreation. More than half of the Corps' dams are located on or east of the Mississippi River.

<sup>6</sup>Fiscal year 2007 was the first fiscal year that reflected the Corps' current risk-informed dam safety approach initiated in 2005. The Corps' risk-informed approach is described in more detail later in the report.

<sup>7</sup>We did not evaluate the accuracy or legal sufficiency of the Corps' application of cost-sharing formulas and calculations.

<sup>8</sup>U.S. Army Corps of Engineers, *Safety of Dams—Policy and Procedures*, Regulation No. 1110-2-1156 (Mar. 31, 2014).

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safety repairs. In particular, we interviewed officials about the Corps' process for dam safety repairs, key decision points for determining cost sharing, communication with sponsors, and tracking of cost share payments. We interviewed Corps officials at the 11 district offices where the 16 dams are located about their decisions associated with cost sharing and about their communication with sponsors. We also interviewed the federal, state, local, and private sponsors identified by the Corps about their cost sharing in these dam safety repair projects (see app. I for the list of sponsors we interviewed). We asked the sponsors about the terms of their agreements with the Corps, their history of being a sponsor, the financial impacts of cost sharing for dam safety repair projects, and the Corps' communication with them regarding the projects and cost sharing. We compared communications between sponsors and the Corps against requirements for such communications described in the Corps' latest *Safety of Dams* regulation. Additionally, we conducted site visits to a non-generalizable sample of 3 dams in the Corps' Nashville, TN, and Tulsa, OK, districts based on the Corps' cost sharing determinations and the range of project sponsors (e.g., hydropower, water supply). At these sites we observed dam safety repair projects and interviewed Corps officials and sponsors.

We conducted this performance audit from November 2014 to December 2015 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

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## Background

The Corps is the world's largest public engineering, design, and construction management agency, responsible for water resources infrastructure such as dams, levees, hurricane barriers, and floodgates in every state.<sup>9</sup> Through its Civil Works program, the Corps plans, designs, and operates water resources infrastructure projects. The Civil Works program is organized into 3 tiers: a national headquarters in Washington,

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<sup>9</sup>Located within the Department of Defense, the Corps has both military and civilian responsibilities. The Corps' Military program provides, among other things, engineering and construction services to other U.S. government agencies and foreign governments. This report discusses the Civil Works program.

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D.C.; 8 regional divisions that were established generally according to watershed boundaries; and 38 districts nationwide. In addition, the Corps maintains national and regional centers that provide technical services to Corps divisions and districts, such as support of dam safety repair projects.

The Assistant Secretary of the Army for Civil Works (ASA(CW)), appointed by the President, establishes the strategic direction, develops policy, and supervises the execution of the Civil Works program. The Corps headquarters and regional division offices primarily implement policies and provide oversight to district offices. The Corps headquarters' Dam Safety Officer (DSO), a civilian official, is responsible for all dam safety activities, including establishing policy and technical criteria for dam safety and prioritizing dam-safety-related work. The eight divisions, commanded by military officers, coordinate civil works projects in the districts within the eight respective geographic areas. The Corps districts, commanded by military officers, are responsible for planning, engineering, constructing, and managing water resources infrastructure projects in their districts as well as coordinating with the Corps' sponsors.

Most of the Corps' dams are one of two types: earthen or concrete.<sup>10</sup> According to Corps data, about 68 percent of Corps dams have earthen embankments, constructed of various types of materials such as clay, silt, sand, or gravel. Another 30 percent of Corps dams are concrete dams.<sup>11</sup> Dams can have various features, such as spillway gates and conduit outlets, to control water releases, as well as auxiliary spillways to divert water flows in the event of expected maximum flood conditions. (See Figure 1.)

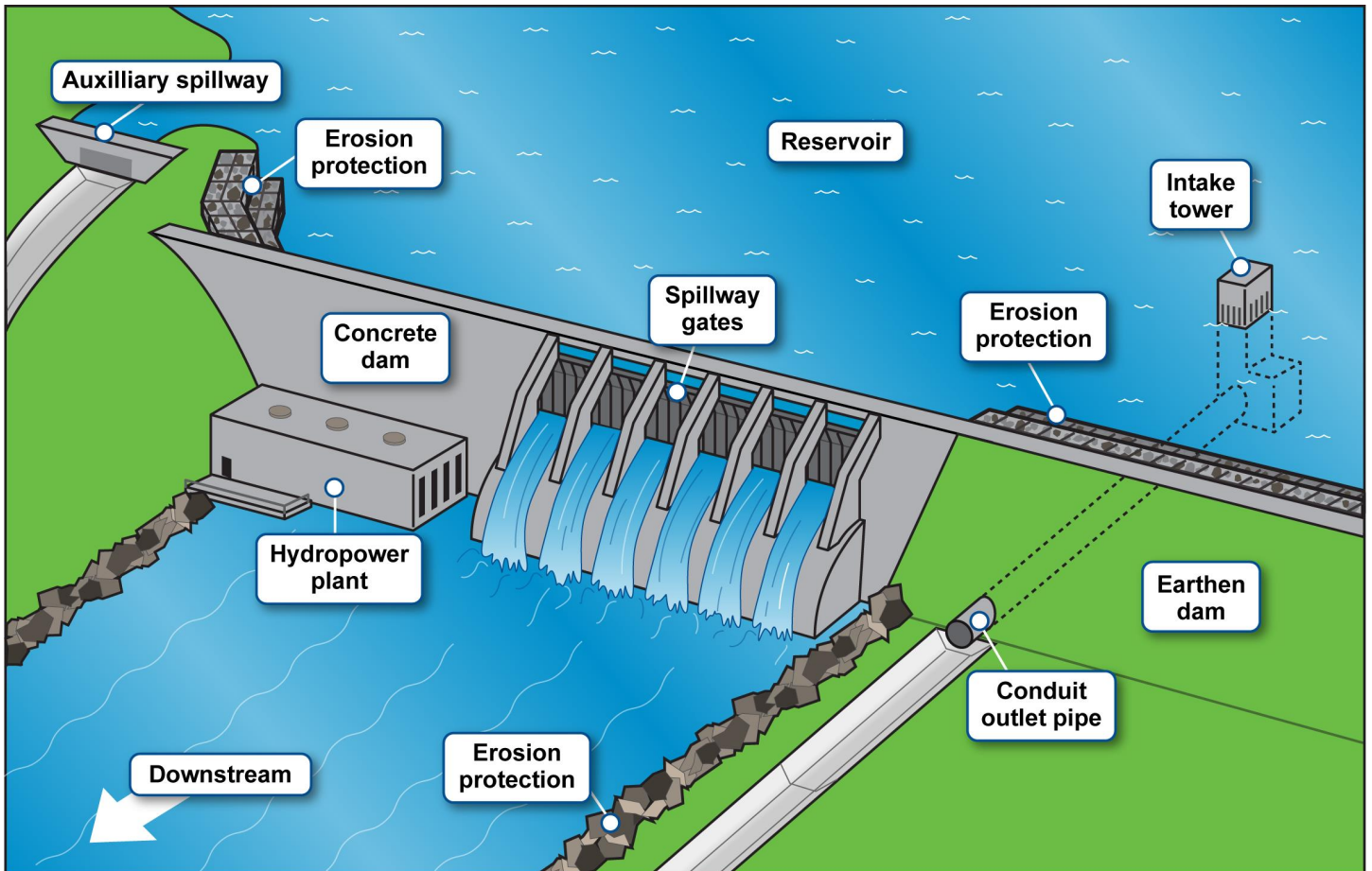
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<sup>10</sup>Some of the Corps' dams are combination earthen and concrete dams. The Corps categorizes dams by their primary type.

<sup>11</sup>The remaining 2 percent of the Corps' dams are other types.



Figure 1: Illustration of Dam Types and Features



Source: GAO. | GAO-16-106

## The Corps' Dam Safety Repair Process

To ensure continued safe operation, Corps dams undergo routine maintenance, such as cleaning of drains and mowing of embankments, but in some cases require major repairs, which, as defined by the Corps, are those that cost over \$16 million. These repairs may be to:

- rehabilitate spillway gate equipment to safely pass excess water,

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- fill voids in embankments or foundations with grout,<sup>12</sup>
  - build cutoff walls to prevent erosion to embankments or foundations from seepage,<sup>13</sup>
  - build shear walls to increase dam stability,<sup>14</sup>
  - increase dam's height to prevent overtopping, or
  - anchor a dam to its foundation.<sup>15</sup>

Since 2005, the Corps has used a risk-informed approach to select dams for safety-related repairs. While integrating traditional engineering analyses and standards, the risk-informed approach aims to identify and prioritize the most critical dam safety risks rather than eliminate all potential risks. To that end, the Corps has developed the Dam Safety Action Classification (DSAC) system, based on a 5-point scale, to help guide key decisions for dam safety repairs. This risk classification system reflects the probability of a dam's failure and resulting potential consequences due to failure.<sup>16</sup> As of July 2015, the Corps has placed 309 dams (about 44 percent) in actionable categories (DSAC 1, 2, and 3) because the dams were determined to be at moderate to very high risk of failure. In particular, the Corps has classified 17 dams as DSAC 1 (very high urgency), 76 dams as DSAC 2 (high urgency), and 216 dams as DSAC 3 (moderate urgency).<sup>17</sup> From fiscal year 2007 to fiscal year 2016, the Corps selected 16 of these DSAC 1 and 2 dams for repairs.

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<sup>12</sup>Grout is a fluidized material injected into soil, rock, concrete, or other construction material to seal openings and to lower the permeability and/or provide additional structural strength.

<sup>13</sup>A cutoff wall is a wall of impervious material, usually of concrete, asphaltic concrete, or steel sheet piling constructed in the foundation and abutments to reduce seepage beneath and adjacent to the dam.

<sup>14</sup>A shear wall is a structural element used to resist lateral forces parallel to the plane of the wall. Normally, a series of walls are built at set intervals along the downstream foundation of a dam to resist movement, or separation, of a dam from its foundation.

<sup>15</sup>Multi-strand cables connecting the dam to its foundation can be installed and placed in tension to anchor the dam and prevent its displacement.

<sup>16</sup>Dam failure is characterized by the sudden, rapid, and uncontrolled release of impounded water. Possible consequences of dam failure include loss of life and property.

<sup>17</sup>The Corps has categorized 398 dams as DSAC 4 (low urgency) and none as DSAC 5 (normal urgency). As of July 2015, two Corps dams were not classified: one newly constructed and one newly added to the inventory.

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According to the Corps' *Safety of Dams* regulation,<sup>18</sup> once a dam has been selected as needing repair according to its DSAC designation, the Corps is to take the following steps to study, design, and construct a dam safety repair project.<sup>19</sup>

- *Study:* Corps district officials are to conduct a dam safety modification study to determine a long-term solution. This study is to involve risk analyses, determination of potential failure modes, evaluation of alternatives to address potential failures, and development of a recommended technical solution with its estimated cost.<sup>20</sup> The study also is to identify cost share sponsors and to recommend an applicable authority for cost sharing purposes (discussed later in this report) under which to implement the repair work. The results of the study are published in a dam safety modification report, which is forwarded to division and headquarters officials, including the DSO, for review and approval of recommended repairs. The Corps districts are to communicate to sponsors and the public about dam failure risks and potential repairs during the study phase. Once approved by Corps' DSO and ASA(CW), the cost estimate in the dam safety modification report is used as a basis to request funds from Congress for design and construction.
- *Design:* Project design takes place at the Corps districts and dam safety production centers,<sup>21</sup> involving investigation of site conditions, such as testing soils, engineering analysis, and development of design plans and specifications. In addition, further risk analyses are to be conducted as well as expert reviews of the design. During the project's design, the Corps districts are also to communicate to sponsors and the public about their plans for conducting repairs.

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<sup>18</sup>U.S. Army Corps of Engineers, *Safety of Dams—Policy and Procedures*, Regulation No. 1110-2-1156 (Mar. 31, 2014).

<sup>19</sup>Some dam safety repair projects in our review did not fully follow the risk-informed process because they were initiated prior to the process being instituted.

<sup>20</sup>A recommended solution may not require a repair. To reduce the risk of dam failure, the Corps may, for example, lower the reservoir impounded by the dam.

<sup>21</sup>Regional Dam Safety Production Centers assign a lead engineer to support technical development of a project. In addition, the Dam Safety Modification Mandatory Center of Expertise—a national center of expertise—provides technical support to the project.

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- *Construction:* Project construction, managed by district officials, is typically carried out through contracts with private companies. Construction for dam safety repairs can take multiple years and involve several contracts. To assure construction quality, the Corps districts are required to conduct regular inspections. In addition, Corps officials are to continue their outreach and communications with sponsors and the public throughout the construction period.

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## Cost Sharing Sponsors

Sponsors share in the costs of dam safety repairs based on original congressional authorizations for dam construction or subsequent sponsors' agreements with the Corps. A wide array of entities can be cost sharing sponsors, including federal, state, and local agencies as well as private entities. Sponsors may be identified at the time of original dam construction or at a later time. Congressional authorizations or sponsors' agreements with the Corps delineate the benefits sponsors receive as well as their responsibilities and cost sharing obligations. Cost sharing terms are unique to each sponsor at each dam. Commensurate with benefits derived from use of a dam, sponsors typically pay a percentage of a dam's annual operations and maintenance costs, as well as the same percentage of total costs of major dam safety repairs. Cost sharing percentages can range from under 1 percent, such as for small water supply users, to over 50 percent, such as for hydropower users, depending on a sponsor's agreement with the Corps.

Sponsors' payment mechanisms for dam safety repairs vary. When the Corps determines a need for dam safety repairs, it typically budgets for and funds the entire amount of the repair upfront. Sponsors, responsible for sharing in the design and construction costs for dam safety repair projects, pay their cost shares in different ways as described below and in table 1. However, not all Corps dams have cost sharing sponsors. The federal government fully funds the repairs of those Corps dams that do not have sponsors.<sup>22</sup>

- Non-federal sponsors, depending on their agreement with the Corps, are to pay their cost share either on a "pay-as-you-go" basis or at the end of the project. Sponsors that are identified at the time of initial dam construction typically pay their cost share on a pay-as-you-go

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<sup>22</sup>According to the Corps, non-federal interests that are not project sponsors may provide contributions such as granting rights-of-way or easements in support of repair projects.

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basis. In these situations, sponsors contribute their cost share while project design and construction are ongoing. Sponsors—typically water utilities—that enter into agreements with the Corps subsequent to the dam’s initial construction have the option to pay as you go or in lump sum, with interest, at the end of the dam safety repair project, once all costs are finalized and calculated. According to Corps officials, non-federal sponsors may seek an exception to amortize their cost share payments over time following project completion. The Corps collects and tracks payments submitted by non-federal sponsors and transmits them to the U.S. Treasury.

- Federal sponsors of Corps dams are the U.S. Department of Energy’s four Power Marketing Administrations (PMA).<sup>23</sup> PMAs sell the electrical output of federally owned and operated hydroelectric dams.<sup>24</sup> PMAs market wholesale power by entering into contracts with customers, with preference given to not-for-profit public-owned utilities, to sell power at set rates.<sup>25</sup> Through their rates, PMAs recover all costs associated with power production and transmission, including their cost share for dam safety repairs, which they remit directly to the U.S. Treasury. PMAs are to recover all associated power production costs within a reasonable period of time, which the Department of Energy has traditionally considered to be 50 years or less.

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<sup>23</sup>The four PMAs are: The Bonneville Power Administration (BPA), the Western Area Power Administration (WAPA), the Southeastern Power Administration (SEPA), and the Southwestern Power Administration (SWPA).

<sup>24</sup>Under federal statute, power generated at Corps dams beyond what is needed for dam operations is to be delivered to the Secretary of Energy who is to transmit and dispose of such power in a manner as to encourage the most widespread use at the lowest possible rates to consumers consistent with sound business principles (16 U.S.C. § 825s).

<sup>25</sup>To set rates, PMA Administrators propose draft rates, which are approved on an interim basis by the Deputy Secretary of Energy, and notify the public of proposed 5-year rates through *Federal Register Notices*. Rate schedules become effective upon confirmation and approval by the Secretary of Energy.

**Table 1: Cost Sharing Payment Mechanisms and Recipients for Federal and Non-Federal Sponsors of the U.S. Army Corps of Engineers' Dam Safety Repair Projects**

	Non-federal sponsors		Federal sponsors
	Original agreement (at time of dam construction)	Subsequent agreement (after dam construction) <sup>a</sup>	Power Marketing Administrations
<b>Payment mechanism</b>	Pay as you go	Pay as you go Lump sum upon project completion	At project completion; payment can be over a period of up to 50 years
<b>Payment recipient</b>	U.S. Treasury through Corps	U.S. Treasury through Corps	U.S. Treasury directly

Source: GAO analysis of U.S. Army Corps of Engineers' documentation. | GAO-16-106

<sup>a</sup>In general, section 1203 of the Water Resources Development Act of 1986 provides that payment of costs may be made over a period of up to 30 years from the date of a project's completion, with interest, for projects covered by section 1203. According to Corps officials, under Corps policy, while such an amortized payment is available to sponsors that do not have an existing agreement with the Corps, sponsors that do have an existing agreement with the Corps are required to pay using pay as you go or lump sum upon project completion options. Corps officials further provided that they allow for sponsors to seek an exception to this policy.

## The Corps Has Determined Cost Sharing Based on Ways in Which a Dam May Fail, but Has Not Applied One Provision That Reduces Sponsors' Cost Share

### A Dam's Potential Failure Mode Drives the Corps' Decision on Cost Sharing

According to the Corps' *Safety of Dams* regulation,<sup>26</sup> during a dam safety modification study, Corps district officials are to identify and analyze all the potential ways that a dam could fail. Such potential failure modes can include: (1) embankment or foundation erosion through seepage; (2)

<sup>26</sup>U.S. Army Corps of Engineers, *Safety of Dams—Policy and Procedures*, Regulation No. 1110-2-1156 (Mar. 31, 2014).

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inability of a dam to safely pass excess water during expected maximum flood conditions (hydrologic failure mode); or (3) inability of a dam to withstand the expected maximum earthquake (seismic failure mode). Once potential failure modes, among other things, are determined, Corps district officials are to generate a dam safety modification report that reviews alternatives and recommends a technical solution to address the potential failure modes.

For cost sharing purposes, the regulation requires the district to recommend in the report one of the two types of cost sharing arrangements or authorities: Major Rehabilitation authority or Dam Safety Assurance authority. The potential failure mode is the primary factor in determining the applicable authority, in addition to consideration of policy and statutory requirements:

*Major Rehabilitation:* According to Corps officials, this authority applies to dam safety repairs associated with typical degradation of dams over time. Under this authority, sponsors are to pay their full cost share. For example, if a sponsor's agreed cost share is 10 percent, then the sponsor is responsible for 10 percent of the total cost of the dam safety repair project. (See Table 2.) The Corps' regulation requires application of Major Rehabilitation authority if embankment or foundation erosion through seepage or instability is determined to be the potential failure mode.

*Dam Safety Assurance:* In certain situations, however, the Corps can apply its Dam Safety Assurance authority, which significantly reduces sponsors' cost shares. This authority, based on Section 1203 of the Water Resources Development Act (WRDA) of 1986, applies to safety-related dam modifications needed as a result of new hydrologic or seismic data or changes in state-of-the-art design or construction criteria deemed necessary for safety purposes (state-of-the-art provision).<sup>27</sup> This authority reflects, in part, the availability of new information—such as current hydrologic models or seismic studies—that could indicate a dam's increased vulnerability and greater risk of failure. Application of this authority reduces a sponsor's responsibility to 15 percent of its agreed cost share, effectively reducing a sponsor's cost share obligation by 85 percent. For example, if a sponsor's agreed cost share is 10 percent, then the sponsor is responsible for 15 percent of this amount, meaning that it

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<sup>27</sup>Pub. L. No. 99-662, §1203, 100 Stat. 4082, 4263 (1986) (codified at 33 U.S.C. § 467n).

would be responsible for 1.5 percent of the total cost of a dam safety repair project. (See Table 2.)

**Table 2: Hypothetical Cost Sharing Example of a \$50-Million Dam Safety Repair Project with 10 Percent Sponsor Cost Share**

<b>Sponsor's cost share</b>	<b>Major Rehabilitation</b>	<b>Dam Safety Assurance</b>
Cost sharing responsibility based on agreement	Full (100 percent)	Reduced (15 percent)
Percent of total project cost	10	1.5
Amount of cost share	\$5 million	\$750,000

Source: GAO analysis | GAO-16-106

The final determination of cost sharing authority is reviewed through the Corps' chain of command. The Corps' DSO is to review and approve the dam safety modification report and determination of funding authority. Subsequently, the ASA(CW) office is to review the DSO decision and determine if it concurs.<sup>28</sup> Sponsors have no formal role in the Corps' authority determination. According to Corps officials, while the sponsors are typically involved in cost sharing discussions, funding authority determination is a federal responsibility and not subject to appeals from sponsors.

### The Corps Consistently Determined Cost Sharing Based on Potential Failure Mode

The Corps applied either its Major Rehabilitation or Dam Safety Assurance authority to the 16 dams selected for dam safety repairs from fiscal year 2007 to fiscal year 2016, selecting the funding authority to address each dam's determined potential failure mode consistent with its regulation. (See app. II.) The total estimated cost for these repairs is \$5.8 billion.

- For 11 of the 16 dams the Corps applied its Major Rehabilitation authority. At 9 of these 11 dams, the potential failure mode was determined to be embankment or foundation erosion through seepage, and the Corps implemented dam safety repair projects

<sup>28</sup>While authority determination is a Corps responsibility, on two occasions Congress has specifically authorized or directed the Corps to apply its Dam Safety Assurance authority. These involved projects at Fern Ridge dam, OR (Pub. L. No. 110-114, § 5120, 121 Stat. 1041, 1240 (2007)) and Beaver Lake dam, AR (Pub. L. No. 102-377, 106 Stat. 1315, 1318 (1992), Pub. L. No. 102-580, § 209(f), 106 Stat. 4797, 4830 (1992)).



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under its Major Rehabilitation authority consistent with its regulation.<sup>29</sup> Sponsors for these dams are to pay their full cost share, estimated at \$574 million of the total \$4.2 billion in repairs.<sup>30</sup>

- For the 5 remaining dams, the Corps applied its Dam Safety Assurance authority because repairs were determined to be the result of new hydrologic or seismic data indicating the potential inability of these dams to safely pass excess water during expected maximum flood conditions or to withstand the expected maximum earthquake. The sponsors for these dams are to pay 15 percent of their cost share—which cumulatively total an estimated \$31 million of the total \$1.6 billion in repairs for these dams.<sup>31</sup>

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### The Corps Did Not Apply One Provision of Its Dam Safety Assurance Authority That Reduces Sponsors' Cost Share

While the Corps applied the Dam Safety Assurance authority to 5 of 16 dams in our review based on the availability of new hydrologic or seismic data, it did not apply the Dam Safety Assurance authority's state-of-the-art provision to any of these dam safety repair projects. According to ASA(CW) officials, the Corps has not applied the state-of-the-art provision since enactment of the enabling legislation (WRDA of 1986).

When asked why the Corps had not applied this provision, ASA(CW) officials said that they would consider applying the state-of-the-art provision on a case-by-case basis, but they have never been presented with a case that they determined to have merited it. Additionally, ASA(CW) officials were unable to define the conditions under which the provision could apply or to provide a hypothetical example of a dam safety issue that would lead them to use it.

The circumstances under which the state-of-the-art provision might apply have not been identified in the Corps regulations, and the Corps has not had a consistent policy position regarding when the state-of-the-art provision might apply. The Corps' 1997 regulation states that dam safety repairs required due to state-of-the-art changes would be decided on a case-by-case basis, but does not identify criteria for how the cases would

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<sup>29</sup>The potential failure modes of the remaining two dams were gate failure and erosion along a conduit pipe.

<sup>30</sup>Seven of the 11 dams have sponsors. The remaining 4 dams are 100 percent federally funded.

<sup>31</sup>Four of the 5 dams have sponsors. The remaining dam is 100 percent federally funded.

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be selected. However, in 2011, and again in the 2014 update, the Corps' *Safety of Dams* regulation discusses application of Dam Safety Assurance authority only with regard to new hydrologic or seismic data, stating that the state-of-the-art provision would not be applied. Specifically, the 2014 regulation notes the difficulty of defining the state-of-the-art provision and states that because the state-of-the-art "terminology makes it difficult to define the kinds of repairs that would be applicable, [...] it is not used."<sup>32</sup> The same 2014 regulation states that use of the state-of-the-art provision must be decided on a case-by-case basis by the ASA(CW).

Internal control standards state that information and effective communication are needed for an agency to achieve all of its objectives.<sup>33</sup> Moreover, internal controls guidance states that effective communication may be achieved through clear policy. However, the Corps' current regulation is not clear as to what is meant by "state-of-the-art design or construction criteria deemed necessary for safety purposes" in the statutory provision. Thus, this lack of clarity coupled with the Corps' inconsistent policy position has hindered the Corps from applying the state-of-the-art provision in a manner consistent with other Dam Safety Assurance provisions. Without clarifying the circumstances under which the state-of-the-art provision applies and implementing the policy consistently, the Corps is at risk of not applying the full range of statutory authorities provided to it, thereby raising questions about the appropriate allocation of federal and non-federal funding for dam safety repairs. As discussed later in this report, the Corps' inaction in setting a clear policy for a provision under which sponsors face significant financial impacts has contributed to conditions under which sponsors have asserted their own terms for use of the provision or are considering taking legal action against the Corps.

In contrast, another federal agency has applied a similar state-of-the-art provision to its dam safety repairs.<sup>34</sup> The U.S. Department of the Interior's

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<sup>32</sup>U.S. Army Corps of Engineers, *Safety of Dams—Policy and Procedures*, Regulation No. 1110-2-1156 (Mar. 31, 2014).

<sup>33</sup>GAO, *Standards for Internal Control in the Federal Government*, AIMD-00-21.3.1 (Washington, D.C.: November 1999).

<sup>34</sup>We did not evaluate the effectiveness of this agency's dam safety repair efforts or the extent to which it consistently applied the applicable state-of-the-art provision as part of this review.

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Bureau of Reclamation (Reclamation) has a similar statutory authority enacted by the Reclamation Safety of Dams Act of 1978, which requires sponsors' cost share at 15 percent when modifications result from new hydrologic or seismic data, or changes in state-of-the-art design or construction criteria deemed necessary for safety purposes.<sup>35</sup> According to Reclamation officials, while Reclamation has not developed a definition for the state-of-the-art design or construction criteria, it has operationalized and applied the state-of-the-art provision exclusively to modify 30 dams since 1978, primarily in situations where defensive dam safety measures, such as filters and drainage mechanisms, were lacking or were not consistent with the current state of the practice.<sup>36</sup>

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## Some Corps Districts Did Not Communicate with Sponsors or Engage Them Effectively, Potentially Reducing Payments Received from Sponsors

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<sup>35</sup>43 U.S.C. § 508(b) enacted by Pub. L. No. 95-578, § 4(b), 92 Stat. 2471 (1978).

<sup>36</sup>As of July 2015, Reclamation solely applied the state-of-the-art provision to safety repairs at 30 dams. It applied the state-of-the-art provision in combination with a hydrologic and/or seismic provision at an additional 21 dams.

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The Corps Did Not Effectively Communicate Its Cost Sharing Determination, Contributing to Uncertainty Regarding Sponsor Payment

The Corps' lack of clarity and a consistent policy position regarding the state-of-the-art provision under the Dam Safety Assurance authority has contributed to disagreements with a major sponsor and uncertainty regarding sponsor payment. In this case, Southeastern Power Administration (SEPA),<sup>37</sup> the federal PMA sponsor for Center Hill (Tennessee) and Wolf Creek (Kentucky) dams, has disagreed with the Corps' decision to repair the dams under its Major Rehabilitation authority rather than the state-of-the-art provision of the Dam Safety Assurance authority. (See Figure 2.) SEPA has asserted that the Dam Safety Assurance authority should apply to these projects.<sup>38</sup> SEPA has taken this position, in part, because while dam safety repairs at Wolf Creek were originally determined to be under the Major Rehabilitation authority,<sup>39</sup> Corps district officials had subsequently recommended using the Dam Safety Assurance authority based on application of the state-of-the-art provision.<sup>40</sup> SEPA was aware of the district's recommendation to change the authority determination to Dam Safety Assurance. However, the ASA(CW) ultimately did not support this recommendation noting that erosion caused by seepage—the potential failure mode identified at these dams—has consistently and categorically been addressed through application of the Major Rehabilitation authority. According to SEPA officials, the conflicting actions of Corps district and headquarters officials

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<sup>37</sup>SEPA markets hydropower generated by Corps dams to not-for-profit public-owned utilities in the states of Georgia, Florida, Alabama, Mississippi, Illinois, Virginia, Tennessee, Kentucky, North Carolina, and South Carolina.

<sup>38</sup>See SEPA's notice of proposed rates at 80 Fed. Reg. 30451 (May 28, 2015). In addition, on October 2, 2015, SEPA issued a notice of interim approval of rates based upon the application of section 1203 of the Water Resources Development Act of 1986 (80 Fed. Reg. 59742 (Oct. 2, 2015)). In the notice of interim approval of rates, SEPA notes, however, that as it continues to finalize its rate calculation, it also continues to discuss, analyze, and seek guidance from other relevant agencies. SEPA further provides that interagency discussions on funding authority remain ongoing and that a reconsideration of such interim rates could occur if, as a result of those discussions, other relevant federal agencies provide a factual and legal basis for a contrary determination regarding the applicability of section 1203 of the Water Resources Development Act of 1986.

<sup>39</sup>See U.S. Army Corps of Engineers, *Wolf Creek Dam, Jamestown, Kentucky: Seepage Control Major Rehabilitation Evaluation Final Report* (July 11, 2005).

<sup>40</sup>Wolf Creek dam was the first of the two dams to undergo dam safety repairs. Both Center Hill and Wolf Creek dams are located in the Cumberland River basin and, according to Corps documents, have the same underlying geology and dam safety concerns. SEPA has argued that Dam Safety Assurance authority similarly applies to repairs at both dams.

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on authority determination created uncertainty for SEPA regarding the Corps' position.

**Figure 2: Center Hill, TN, (left) and Wolf Creek, KY, Dams**



Source: U.S. Army Corps of Engineers. | GAO-16-106

SEPA stated that the need for repairs to Center Hill and Wolf Creek dams is based on state-of-the-art design and construction practices and notes that the Corps consulted with recognized international experts to design the cutoff walls being built at these dams to address the effects of seepage. According to SEPA officials, current repairs based on state-of-the-art practices are being made at these two dams, in part, because previous repair efforts did not adequately address site conditions contributing to seepage.<sup>41</sup> Conversely, Corps officials told us that seepage naturally occurs at all dams and periodically needs to be addressed, such as through implementation of repair projects. Moreover, according to Corps officials, the “karst” limestone upon which the Center Hill and Wolf Creek dams are built is prone to increasing seepage over time because of the dissolution of soluble rock foundation. Concrete cutoff walls put in place at Center Hill and Wolf Creek dams under current projects were designed to consider these effects and, according to Corps officials, constructed as permanent seepage control measures.

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<sup>41</sup>SEPA officials cited the Corps' July 2005 report (see footnote 39) as the basis for their comments. According to this report, original design and construction techniques of the 1930s and 1940s used at Wolf Creek were inadequate to control seepage in the “karst” geology beneath the dam. In addition, according to this report, installation of a grout curtain and cutoff wall from 1968 to 1979 failed to adequately limit seepage.

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Because of the high cost of repairs to these two dams—estimated at about \$958 million, for which SEPA's share under its original congressional authorization is about 50 percent—SEPA officials have expressed concern about the agency's ability to recover costs if the projects are considered under the Major Rehabilitation authority. Under this authority, SEPA's cost to recover for both dams is estimated at about \$482 million. Officials said that if SEPA were obligated to recover this amount, its hydropower rates could become prohibitively expensive. As a result, according to these officials, SEPA's customers might terminate their contracts and acquire energy via more economical options, such as energy derived from natural gas or coal. If the Corps were to apply its Dam Safety Assurance authority to these repairs under, for example, the state-of-the-art provision, SEPA's cost to recover would be reduced to about \$72 million (85 percent reduction).

The outcome related to the disagreement between the Corps and SEPA has significant implications given that mitigating the effects of seepage, as evidenced by our review, is a common reason for making safety-related repairs. In recent rate-making notices, SEPA has based its proposed rates on the Dam Safety Assurance authority for dam safety repairs at Center Hill and Wolf Creek dams. This action signals SEPA's position that it should pay the reduced cost share (about \$72 million) provided under this authority, and without resolution, recovering federal outlays for funding the majority of project costs (about \$410 million) remains uncertain. In moving forward to resolve this disagreement, it is important that potential impacts on aging dam infrastructure, hydropower rates, and the federal budget are considered in a coordinated, strategic approach.

SEPA's rate actions could set precedent and create uncertainty for the federal government if sponsors at other dams also assert that the state-of-the-art provision applies to projects that mitigate the effects of seepage. For example, the Corps determined that repairs to mitigate the effects of seepage were needed at 9 of the 16 dams we reviewed, with a total estimated cost of about \$4 billion. If other sponsors at these dams were to follow SEPA's example, the federal government could potentially receive reduced cost share payments from these sponsors. Further, in light of its aging infrastructure, more Corps dams could require seepage-related repairs in the future. A policy that clarifies the Corps' application of the state-of-the-art provision could help to minimize potential disagreements with sponsors and lead to greater certainty concerning the federal government's and project sponsors' cost sharing obligations.

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## The Corps Has Not Engaged Some Sponsors Effectively, Potentially Reducing Sponsors' Payment to the Federal Government

The Corps' *Safety of Dams* regulation requires Corps districts to engage sponsors by notifying them during the study phase about the dam safety repair project and their estimated financial responsibility. The regulation further states: "Requirements for cost sharing and the identification of non-Federal sponsors (or partners) must occur very early in the study process to ensure that the non-Federal interests are willing cost share partners. Uncertainty about sponsorship and the lack of meaningful sponsor involvement in the scope and extent of dam safety repairs can cause delays to the dam safety modification work." As mentioned previously, under the Corps' regulations, Corps district officials are also expected to communicate with sponsors throughout project design and construction as well as officially notify sponsors of their final cost share payment upon the project's completion. Additionally, internal control standards state that managers should effectively communicate with external stakeholders that may have a significant impact on the agency achieving its goals.<sup>42</sup>

While the Corps *Safety of Dams* regulation identifies when communication with sponsors is to occur, it does not provide clear guidance on how to effectively communicate with sponsors to establish and implement cost sharing agreements. Based on our discussions with state, local, and private sponsors of the dams we reviewed, we found that the Corps has generally established good relationships with these non-federal sponsors and communicated project status information; however, some Corps districts were not timely or effective in communicating and reaching agreement on cost sharing responsibilities. Of the 16 dam safety repair projects we reviewed, 9 had sponsors,<sup>43</sup> and—as discussed below—at 3 of the 9 dams the Corps did not communicate with the sponsors in a manner that would ensure their meaningful involvement and willingness to be cost sharing partners, as required by its regulation. According to the agreements, these sponsors are to pay their cost share to the Corps, which remits these funds to the U.S. Treasury. However, at least three sponsors have expressed concerns and indicated resistance about paying their determined cost shares, estimated to be about \$3.1

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<sup>42</sup> [GAO/AIMD-00-21.3.1](#)

<sup>43</sup> While 11 of the 16 dams in our review had sponsors, only 9 dams had sponsors that were organizations. The Inland Waterways Trust Fund, the sponsor for 2 remaining dams, is a funding source financed through a fuel tax for construction and rehabilitation of locks and dams on the Inland Waterways System.

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million. Because the Corps does not have clear guidance to ensure effective communications with sponsors, it did not adequately communicate or reach agreements on cost sharing responsibilities with these sponsors. As a result, these sponsors' plans for paying their cost shares are uncertain, leaving the recovery of federal outlays from these sponsors similarly uncertain.

- *Tuttle Creek Dam:* At Tuttle Creek dam (Kansas), the Corps identified and contacted one water supply sponsor during the study phase (2000–2002) of a dam stabilization project as well as notified the sponsor of its estimated cost share, but otherwise did not effectively engage the sponsor throughout the project to ensure the sponsor's cost share payment. In a 2002 letter to the Corps, the sponsor asserted its position that it should not be required to pay for repairs to stabilize the dam, a repair that would enable the dam to withstand the expected maximum earthquake. In the sponsor's opinion, the sponsor was not responsible for sharing costs related to changes in the Corps' design standards or to address what the sponsor felt were design flaws. In 2003, the Corps responded to the sponsor reiterating the sponsor's responsibility for sharing in the costs of the project. The Corps' written response included its estimate of the sponsor's cost share, approximately \$770,000, and described payment options: pay-as-you-go or lump sum at the end of construction. According to the sponsor, it did not raise any further objections and, in a subsequent telephone conversation with Corps district officials, indicated its preference to use the pay-as-you-go option because it would be unable to afford a lump sum payment. Since 2003, the sponsor received briefings on the status of the project; however, the Corps did not follow up or otherwise engage the sponsor to pay incrementally while construction was ongoing. Construction was completed in 2010, but as of October 2015, the Corps had not requested payment or notified the sponsor of its final cost share. Corps officials told us that they are preparing a billing letter to send to the sponsor.
- *Rough River Dam:* At Rough River dam (Kentucky), the Corps' 2012 dam safety modification report stated that the project to grout and construct a 1,700-foot cutoff wall would be completed at full federal expense with no cost sharing sponsors. However, subsequent reviews by Corps headquarters identified water supply contract holders, and in 2013, the Corps notified three water supply sponsors of their cost sharing responsibilities for the dam safety repair. Due to uncertainty in identifying sponsors and delays in executing agreements with them, as discussed below, the Corps may experience challenges collecting these sponsors' cost shares when



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the project is finally complete, estimated to be no later than 2021. Specifically:

- One sponsor has had a water use agreement with the Corps since 1978, but has not been drawing water from the reservoir since 2007. In 2013, the Corps requested that the sponsor remove its water intake structure from the reservoir. However, in the same year, as mentioned previously, the Corps notified this sponsor of its cost sharing responsibilities for the dam safety repair project. In May 2015, the Corps signed a termination agreement with the sponsor under which the sponsor will not share the costs of the project. While the Corps is not expecting to collect a cost share, its interaction with the sponsor indicates a lack of effective communication.
- Although the Corps notified a second sponsor of its cost sharing responsibilities in 2013, this sponsor currently does not have a cost sharing responsibility for the dam safety repair project because the sponsor paid upfront for “major capital replacement” as part of its 1966 agreement with the Corps.<sup>44</sup> This provision of the agreement is to expire in April 2016, and according to Corps officials, a supplement to the agreement is being developed. The supplement would include this sponsor’s cost sharing responsibility in the current project. However, we were not able to reach this sponsor to confirm its intention to be a cost sharing sponsor, and it remains uncertain whether the Corps should expect a future agreement to cover current project costs.
- The third sponsor has been drawing water from the reservoir since 2002, when the sponsor negotiated terms of its water use with the Corps under a draft contract. Despite drawing up to 1.6 million gallons per day from the reservoir, the sponsor has not paid the Corps for water use and operations and maintenance expenses because a contract between the parties has not been executed. As a result, despite notifying the sponsor of its cost sharing responsibilities in the dam safety repair project in 2013, the Corps has no mechanism to compel payment from this sponsor. According to the sponsor, it has tried to finalize the 2002 contract numerous times, but the Corps did not finalize the agreement in any of these instances. In July 2015, a

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<sup>44</sup>In its agreement with the Corps, the sponsor paid \$56 upfront for “major capital replacement” required during the 50-year term of the agreement (i.e., until 2016).

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Corps district official told us that Corps headquarters is reviewing the negotiated agreement; however, uncertainty about cost sharing exists until all parties execute a contract.

- *Center Hill Dam:* At Center Hill Dam (Tennessee), the Corps identified three water supply sponsors during the study phase but generally had minimal interactions with them to communicate cost sharing estimates and responsibilities. While two sponsors accept their cost sharing responsibilities and estimated cost sharing amounts, one sponsor disagrees with the Corps' application of the Major Rehabilitation authority. Similar to the argument made by SEPA, which is also a sponsor at this dam, this water supply sponsor stated that the repairs being made to address the effects of seepage at the dam incorporate state-of-the-art design and construction practices and that the Corps should apply the state-of-the-art provision, thereby reducing this sponsor's cost share. Under the Major Rehabilitation authority, this sponsor has a \$1.9 million cost share. According to this sponsor, a municipal water utility, covering this cost would require raising water rates approximately 50 cents per household per month. The sponsor is contemplating a legal challenge if the Corps does not apply the state-of-the-art provision to lower this sponsor's cost share according to a sponsor official. The Corps has maintained its position that application of its Major Rehabilitation authority is appropriate for this dam safety repair.

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## Conclusions

Considering the significant cost of dam safety repair projects, and the number of dams that could need repairs in the future, implementing a dam safety program as effectively as possible is important. This implementation would include adequately defining conditions for key policy determinations to ensure the appropriate allocation of federal versus non-federal funds for dam safety repairs.

However, the fact that the Corps has not developed policy guidance on the types of circumstances under which the state-of-the-art provision of its Dam Safety Assurance authority might apply, and has not had a consistent policy position, limits the Corps' ability to ensure the effective implementation of the dam safety program. Without clarifying the circumstances under which the state-of-the-art provision applies and implementing the policy consistently, the Corps is at risk of not applying the full range of statutory authorities provided to it. Moreover, because of the financial implications of its authority determinations for sponsors, the Corps' inaction in setting a clear policy for this provision contributes to

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conditions under which it is potentially exposed to adverse actions of these sponsors.

The Corps' engagement of project sponsors is critical to the successful implementation of dam safety repair projects not only to ensure the continued provision of benefits, such as water supply and hydropower generation, but also to recover federal outlays used to fund projects upfront. Because the Corps has not always effectively communicated with or engaged sponsors, some are deriving benefits from dams absent an agreement with the Corps while other sponsors that have agreements either have not been notified by the Corps of their final cost share responsibility or dispute the Corps' cost sharing determination and may raise a legal challenge. While the Corps' *Safety of Dams* regulation provides guidance to district offices for communicating with sponsors, greater clarity about effective communication requirements to establish and implement agreements with sponsors would help the Corps ensure equity in its treatment of sponsors and make certain that the federal government receives expected cost share payments.

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## Recommendations

To improve cost sharing for dam safety repairs, we recommend that the Secretary of Defense direct the Secretary of the Army to direct the Chief of Engineers and Commanding General of the U.S. Army Corps of Engineers to clarify policy guidance:

- on the types of circumstances under which the state-of-the-art provision of the Dam Safety Assurance authority might apply to dam safety repair projects.
- for district offices to effectively communicate with sponsors to establish and implement cost sharing agreements during dam safety repair projects. For all dams, including the three dams named in the report, this would involve communicating estimated and final cost sharing amounts, executing agreements, and engaging sponsors to ensure cost share payment.

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## Agency Comments

We provided a draft of this report to the Department of Defense (DOD) for official review and comment. In its written comments, which are reprinted in appendix III, DOD concurred with our recommendations and described the actions it plans to take within the next 18 months.

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In response to our recommendation to clarify policy guidance on the types of circumstances under which the state-of-the-art provision of the Dam Safety Assurance authority might apply, the department stated that the ASA(CW) will clarify the usage of the provision within the next 18 months.

Regarding our recommendation to clarify policy guidance for district offices to communicate with sponsors to establish and implement cost sharing agreements, DOD stated that ASA(CW) will review and clarify policy, guidance, and business practices related to communication with sponsors within the next 18 months. With respect to the three dam safety repair projects identified in our report, the department stated that the ASA(CW) will engage with their sponsors to establish a path forward to recouping the federal investment in the Corps' work, including finalization of water supply agreements.

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We are sending copies of this report to the appropriate congressional committees and the Secretary of Defense, the Secretary of the Army, the Chief of Engineers and Commanding General of the U.S. Army Corps of Engineers, and other interested parties. In addition, the report will be available at no charge on GAO's website at <http://www.gao.gov>.

If you or your staff have any questions, please contact me at (202) 512-2834 or [rectanusl@gao.gov](mailto:rectanusl@gao.gov). Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made key contributions to this report are listed in appendix IV.



Lori Rectanus  
Director, Physical Infrastructure Issues

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# Appendix I: List of Sponsors Interviewed

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The table below lists all sponsors we interviewed for this report. Not all sponsors for the dams included in our review were available for interview. Additionally, because the Southeastern Power Administration (SEPA) is a major cost sharing sponsor, we interviewed the Tennessee Valley Public Power Association, an organization that represents 155 local utilities across seven states that purchase wholesale power marketed by SEPA.

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**Table 3: List of 10 Sponsors Interviewed**

<b>Dam, State</b>	<b>Sponsor(s)</b>
Bolivar and Dover, OH	Muskingum Watershed Conservancy District
Canton Lake, OK	Oklahoma City Utilities Department
Center Hill, TN	City of Cookeville Department of Water Control, DeKalb Utility District, City of Smithville, Southeastern Power Administration
Isabella, CA	Kern River Watermaster <sup>a</sup>
Pine Creek, OK	International Paper Company
Rough River, KY	Grayson County Water District
Tuttle Creek, KS	State of Kansas (Kansas Water Office)
Wolf Creek, KY	Southeastern Power Administration

Source: GAO | GAO-16-106

<sup>a</sup>The Kern River Watermaster represents five interests: (1) Kern Delta Water District, (2) Buena Vista Water District, (3) City of Bakersfield, (4) North Kern Water Storage District, and (5) Kern County Water Agency.

# Appendix II: List of 16 Dam Safety Repair Projects Reviewed

These projects received funding for design and construction from fiscal year 2007 to fiscal year 2016

S.N	Dam name, state	Potential failure mode	Repair	Project sponsor	Cost sharing agreement's %	Authority	Final/latest project cost	Estimated cost sharing amount
1	Addicks & Barker Dams, TX	Embankment erosion through seepage	<ul style="list-style-type: none"> <li>Construct new outlet structures with three gated conduits to pass water at Addicks and Barker</li> <li>Grout and abandon in place existing outlet structures at Addicks and Barker</li> <li>Construct 1,400-foot long cutoff wall along Barker</li> </ul>	None	N/A	MR	\$129,883,000	N/A
2	Bluestone Dam, WV	Inability to safely pass excess water during expected maximum flood conditions	<ul style="list-style-type: none"> <li>Stabilize dam with 564 anchors and concrete blocks</li> <li>Construct 330-foot wide auxiliary spillway</li> </ul>	None	N/A	DSA	\$527,300,000	N/A
3	Bolivar Dam, OH	Foundation erosion through seepage	<ul style="list-style-type: none"> <li>Construct 4,500-foot underground concrete wall along embankment</li> <li>Replace 6 service gates and rehabilitate associated machinery</li> </ul>	Muskingum Watershed Conservancy District	23.00%	MR	\$109,284,000	\$25,135,320
4	Canton Lake Dam, OK	<ul style="list-style-type: none"> <li>Inability to safely pass excess water during expected maximum flood conditions</li> <li>Inability to withstand expected maximum earthquake</li> </ul>	<ul style="list-style-type: none"> <li>Stabilize dam with 64 anchors</li> <li>Construct 480-foot wide auxiliary spillway</li> </ul>	Oklahoma City Utilities Department	25.50%	DSA	\$183,800,000	\$7,030,350 <sup>a</sup>
5	Center Hill Dam, TN	Embankment erosion through seepage	<ul style="list-style-type: none"> <li>Grout and construct 1,000-foot concrete cutoff wall along main dam embankment</li> <li>Construct 900-foot wide reinforcing berm downstream of auxiliary dam embankment</li> </ul>	Southeastern Power Administration City of Cookeville Department of Water Control City of Smithville Dekalb Utility District North Alabama Bank	42.545% 0.5330% 0.0320% 0.0530% 0.0100%	MR MR MR MR MR	\$364,200,000 \$1,941,186 \$116,544 \$193,026 \$36,420	\$154,948,890

**Appendix II: List of 16 Dam Safety Repair  
Projects Reviewed**

S.N	Dam name, state	Potential failure mode	Repair	Project sponsor	Cost sharing agreement's %	Authority	Final/latest project cost	Estimated cost sharing amount
6	Clearwater Lake Dam, MO	Embankment erosion through seepage	Grout and construct 4,200-foot concrete cutoff wall along embankment	None	N/A	MR	\$211,440,000	N/A
7	Dover Dam, OH	Inability to safely pass excess water during expected maximum flood conditions	<ul style="list-style-type: none"> <li>• Raise dam by 8 feet along 860-foot length</li> <li>• Stabilize dam with 140 anchors</li> </ul>	Muskingum Watershed Conservancy District	23.00%	DSA	\$60,000,000	\$2,070,000 <sup>a</sup>
8	East Branch Dam, PA	Embankment erosion through seepage	Grout and construct 2,100-foot concrete cutoff wall within the embankment	None	N/A	MR	\$248,000,000	N/A
9	Emsworth Dam, PA	<ul style="list-style-type: none"> <li>• Gate failure</li> <li>• Failure of erosion protection</li> </ul>	<ul style="list-style-type: none"> <li>• Install 14 new gates and gate hoisting systems</li> <li>• Install 1,700 feet of erosion protection across both dams and 120 feet downstream of both dams</li> </ul>	Inland Waterways Trust Fund	50%	MR	\$160,000,000	\$48,146,000 <sup>b</sup>
10	Herbert Hoover Dike, FL	Embankment erosion through seepage	<ul style="list-style-type: none"> <li>• Install internal erosion protection through entire length of embankments (80 miles)</li> <li>• Replace 28 and remove 4 water control structures</li> </ul>	None	N/A	MR	\$2,069,510,000	N/A
11	Isabella Dam, CA	Main and auxiliary dams: <ul style="list-style-type: none"> <li>• Inability to safely pass excess water during expected maximum flood conditions</li> </ul> Auxiliary dam: <ul style="list-style-type: none"> <li>• Inability to withstand expected maximum earthquake and fault rupture</li> <li>• Embankment erosion through seepage</li> </ul>	Main dam: <ul style="list-style-type: none"> <li>• Raise dam by 16 feet along 2,000-foot embankment</li> </ul> Auxiliary dam: <ul style="list-style-type: none"> <li>• Raise dam by 16 feet along 3,500-foot embankment</li> <li>• Construct 80-foot wide downstream buttress along 3,500-foot embankment</li> <li>• Construct new emergency spillway 900-foot wide</li> </ul>	North Kern Water Storage District; Buena Vista Water Storage District; Kern Delta Water District; City of Bakersfield; Kern County Water Agency	21%	DSA	\$680,771,000	\$21,444,287 <sup>a</sup>
12	Lockport Dam, IL	Embankment erosion through seepage	<ul style="list-style-type: none"> <li>• Construct 4,300-foot slurry trench wall along right embankment</li> <li>• Construct 1,200-foot roller-compacted concrete wall on right embankment to replace existing wall</li> <li>• Rehabilitate 2.5 miles of existing concrete cutoff wall along left embankment</li> </ul>	Inland Waterways Trust Fund	50%	MR	\$149,175,575	\$14,400,000 <sup>c</sup>

**Appendix II: List of 16 Dam Safety Repair  
Projects Reviewed**

S.N	Dam name, state	Potential failure mode	Repair	Project sponsor	Cost sharing agreement's %	Authority	Final/latest project cost	Estimated cost sharing amount
13	Pine Creek Dam, OK	Embankment erosion into and along conduit pipe	<ul style="list-style-type: none"> <li>• Construct 124-foot concrete cutoff wall</li> <li>• Install 480-foot steel pipe liner for conduit</li> </ul>	International Paper Company	8%	MR	\$29,900,000	\$2,392,000
14	Rough River Dam, KY	Embankment erosion through seepage	Grout and construct 1,700-foot concrete cutoff wall along embankment	Grayson County	0.0868%	MR	\$147,000,000	\$127,596
				City of Leitchfield	0.0380%	MR		\$55,860
15	Tuttle Creek Dam, KS	Seepage and piping after embankment slope failure caused by a seismic event	<ul style="list-style-type: none"> <li>• Construct 351 shear walls</li> <li>• Rehabilitate equipment for 18 gates</li> </ul>	State of Kansas, Kansas Water Office	2.49%	DSA	\$166,700,000	\$622,625 <sup>a</sup>
16	Wolf Creek Dam, KY	Embankment erosion through seepage	Grout and construct 4,000-foot concrete cutoff wall along embankment	Southeastern Power Administration	55.113%	MR	\$593,710,821	\$327,211,844

Legend: MR = Major Rehabilitation authority; DSA = Dam Safety Assurance authority

Source: GAO analysis based on U.S. Army Corps of Engineers data. | GAO-16-106

<sup>a</sup>The amount reflects an 85 percent reduction in cost share due to application of the Dam Safety Assurance authority.

<sup>b</sup>The cost share for this project was reduced due to congressional actions in fiscal year 2009.

<sup>c</sup>A portion of this project's cost was shared with the Inland Waterways Trust Fund (IWTF). Prior to fiscal year 2014, the Corps contributed 100 percent to the project. Fiscal year 2014 allocations are 50 percent Corps and 50 percent IWTF.



# Appendix III: Comments from the Department of Defense



SECRETARY OF THE ARMY  
WASHINGTON

INFO MEMO

11-18-15 17:14 OUT

FOR: DIRECTOR, PHYSICAL INFRASTRUCTURE ISSUES, U.S. GOVERNMENT  
ACCOUNTABILITY OFFICE  
DEPARTMENT OF DEFENSE INSPECTOR GENERAL

FROM: Eric K. Fanning, Acting Secretary of the Army

A handwritten signature in black ink, appearing to read "Eric K. Fanning", is placed to the right of the "FROM:" line.

SUBJECT: Army Comments on GAO Draft Report, "Army Corps of Engineers:  
Actions Needed to Improve Cost Sharing for Dam Safety Repairs (GAO-16-106)  
(546062)"

I am pleased to provide the attached approved comments on the subject GAO draft report. Should you have additional questions regarding the Army's position on this matter, please contact the undersigned action officer.

COORDINATION: NONE

Attachment:  
As stated

Prepared By: Ms. Sharron Dacosta-Chisley, (703) 695-6789

Appendix III: Comments from the Department  
of Defense



DEPARTMENT OF THE ARMY  
OFFICE OF THE ASSISTANT SECRETARY  
CIVIL WORKS  
108 ARMY PENTAGON  
WASHINGTON DC 20310-0108

NOV 12 2015

Ms. Lori Rectanus  
Director  
Physical Infrastructure Issues  
U.S. Government Accountability Office  
441 G Street, NW  
Washington, D.C. 20548

Dear Ms. Rectanus:

This is the Department of Defense (DoD) response to the GAO Draft Report, GAO-16-106, "ARMY CORPS OF ENGINEERS: Actions Needed to Improve Cost Sharing for Dam Safety Repairs," dated December 2015 (GAO Code 546062).

The DoD concurs with comment to the two recommendations in the GAO report, and will be taking steps to address these recommendations within the next 18 months. Specifics regarding our planned efforts are enclosed. The DoD appreciates this opportunity to address the GAO recommendations for clarifying policy and improving communications between the Corps of Engineers and its Federal and Non-Federal sponsors.

Very truly yours,



Jo-Ellen Darcy  
Assistant Secretary of the Army  
(Civil Works)

Enclosure

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**GAO DRAFT REPORT DATED DECEMBER 2015  
GAO-16-106 (GAO CODE 546062)**

**“ACTIONS NEEDED TO IMPROVE COST SHARING FOR DAM  
SAFETY REPAIRS”**

**DEPARTMENT OF DEFENSE COMMENTS  
TO THE GAO RECOMMENDATION**

**RECOMMENDATION 1:** GAO recommends that the Corps clarify policy guidance on usage of the state of the art provision.

**DoD RESPONSE:** Concur, with comment. The Assistant Secretary of the Army for Civil Works (ASA(CW)) will clarify policy guidance on usage of the state-of-the-art provision within the next 18 months.

**RECOMMENDATION 2:** GAO recommends that the Corps clarify policy guidance on effective communication with sponsors to establish and implement cost sharing agreements for all dams, including the 3 named in this report.

**DoD RESPONSE:** Concur, with comment. The ASA(CW) will review and clarify policy, guidance, and business practices related to communication with all stakeholders regarding Corps' major rehabilitation and dam safety repair work. With respect to the water supply sponsors at Tuttle Creek Dam, Rough River Dam, and Center Hill Dam, the ASA(CW) will engage with current sponsors to establish a path forward for recouping Federal investment in the Corps' work, including finalization of water storage agreements. The ASA(CW) will develop policy that ensures those entities that are required to pay a portion of the cost of such work, or reimburse the U.S. Treasury Department, execute agreements for this payment or reimbursement prior to the initiation of any major rehabilitation or dam safety repair, with the exception of work needed to address emergency situations. With respect to the Power Marketing Administrations' incorporation of hydropower costs into their rate making pursuant to section 5 of the Flood Control Act of 1944, the ASA(CW) will develop agreements related to the scope and costs of work to be conducted, allocation to hydropower, and the Power Marketing Administration incorporation of those

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costs into future rate-making. All of these activities will take place within the next 18 months.

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# Appendix IV: GAO Contact and Staff Acknowledgments

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## GAO Contact

Lori Rectanus, (202) 512-2834 or [rectanusl@gao.gov](mailto:rectanusl@gao.gov)

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## Acknowledgments

In addition to the contact named above, Michael Armes, Assistant Director; Irina Carnevale, Analyst in Charge; Geoffrey Hamilton; Georgeann Higgins; Vondalee Hunt; Davis Judson; SaraAnn Moessbauer; Joshua Ormond; and Amy Rosewarne made key contributions to this report.

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# Appendix V: Accessible Data

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## Agency Comment Letter

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Text of Appendix III:  
Comments from the  
Department of Defense

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SECRETARY OF THE ARMY

WASHINGTON

INFO MEMO

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FOR: DIRECTOR, PHYSICAL INFRASTRUCTURE ISSUES, U.S.  
GOVERNMENT ACCOUNTABILITY OFFICE

DEPARTMENT OF DEFENSE INSPECTOR GENERAL

FROM: Eric K. Fanning, Acting Secretary of the Army

SUBJECT: Army Comments on GAO Draft Report, "Army Corps of  
Engineers: Actions Needed to Improve Cost Sharing for Dam Safety  
Repairs (GAO-16-106) (546062)"

I am pleased to provide the attached approved comments on the subject  
GAO draft report. Should you have additional questions regarding the  
Army's position on this matter, please contact the undersigned action  
officer.

COORDINATION: NONE

Attachment: As stated

Prepared By: Ms. Sharron Dacosta-Chisley, (703) 695-6789

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OFFICE OF THE ASSISTANT SECRETARY CIVIL WORKS

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NOV 12 2015

Ms. Lori Rectanus

Director

Physical Infrastructure Issues

U.S. Government Accountability Office

441 G Street, NW

Washington, D.C. 20548

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Jo-Ellen Darcy

Assistant Secretary of the Army

(Civil Works)

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GAO DRAFT REPORT DATED DECEMBER 2015 GA0-16-106 (GAO CODE 546062)

"ACTIONS NEEDED TO IMPROVE COST SHARING FOR DAM SAFETY REPAIRS"

DEPARTMENT OF DEFENSE COMMENTS TO THE GAO RECOMMENDATION

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DoD RESPONSE: Concur, with comment. The Assistant Secretary of the Army for Civil Works ASA(CW) will clarify policy guidance on usage of the state-of-the-art provision within the next 18 months.

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DoD RESPONSE: Concur, with comment. The ASA(CW) will review and clarify policy , guidance, and business practices related to communication with all stakeholders regarding Corps' major rehabilitation and dam safety repair work. With respect to the water supply sponsors at Tuttle Creek Dam, Rough River Dam, and Center Hill Dam, the ASA(CW) will engage with current sponsors to establish a path forward for recouping Federal investment in the Corps' work, including finalization of water storage agreements. The ASA(CW) will develop policy that ensures those entities that are required to pay a portion of the cost of such work, or reimburse the U.S. Treasury Department, execute agreements for this payment or reimbursement prior to the initiation of any major rehabilitation or dam safety repair, with the exception of work needed to address emergency situations. With respect to the Power Marketing Administrations' incorporation of hydropower costs into their rate making pursuant to section 5 of the Flood Control Act of 1944, the ASA(CW) will develop agreements related to the scope and costs of work to be conducted, allocation to hydropower, and the Power Marketing Administration incorporation of those

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Chuck Young, Managing Director, [youngc1@gao.gov](mailto:youngc1@gao.gov), (202) 512-4800 U.S. Government Accountability Office, 441 G Street NW, Room 7149 Washington, DC 20548