



441 G St. N.W.
Washington, DC 20548

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Congressional Committees

DAM SAFETY: Army Corps' Decisions about and Status of Repayment for Harlan County Dam Repairs

As the largest owner of federal dams, the U.S. Army Corps of Engineers (Corps) operates over 700 dams that provide a wide range of benefits, including protecting communities from floods, generating hydropower, and providing water for irrigation. The Corps conducts routine operations and maintenance activities and, at times, makes major repairs to ensure these dams operate safely. At some dams, nonfederal entities that directly benefit from dam operations—such as power utilities or irrigation districts, called “users” in this report—are responsible for a share of these routine operations and maintenance costs as well as for any major repair costs due to typical degradation of dams over time.¹ However, when the Corps determines that major repairs are needed because of certain conditions set out in law—such as to meet updated “state-of-the-art” design criteria deemed necessary to ensure safe operation of the dam—the Corps is to apply a legal authority that lowers the share of costs users normally pay.²

In Nebraska, the Corps operates the Harlan County Dam and Reservoir, which is a source of water storage used by two irrigation districts, one in Nebraska and one in Kansas. These two irrigation districts are responsible for paying their share of costs incurred by the Corps to operate and maintain the Harlan County Dam.³ In 2018, the Corps completed construction on a roughly \$30 million major repair project of this dam’s “Tainter gates”—a commonly-used type of gate to control the flow of water over the dam—out of concern that they might fail due to a deficient design. For this and other major repair projects, some users have raised questions about how the Corps determines when to use its authority to lower users’ share of costs.

¹In this report, we use the term “irrigation districts” to mean entities established under state law that have entered into contracts with the Bureau of Reclamation to receive water for irrigation purposes, which generally encompasses water used to irrigate land to produce commercial agricultural crops or livestock.

²Applying this legal authority reduces a user’s repayment obligation to 15 percent of the share of costs it normally pays, effectively lowering a user’s cost share by 85 percent. Pub. L. No. 99-662, § 1203, 100 Stat. 4082, 4263 (1986) (codified at 33 U.S.C. § 467n).

³The Bureau of Reclamation manages repayment contracts under which irrigation districts repay their share of costs spent by the Corps to maintain the Harlan County Dam and other Corps-owned dams in the western states used for irrigation.

The America's Water Infrastructure Act of 2018 included a provision for us to review the Tainter gate repair project and repayments for the project at the Harlan County Dam.⁴ This report examines

- the Corps' decisions regarding cost sharing with irrigation districts for the Tainter gate repairs at the Harlan County Dam, and
- the status of irrigation districts' repayment for their share of the costs of repairs at the Harlan County Dam.

More broadly, in enclosure 1, we also compared the Corps' authorities for determining cost sharing with those of the Bureau of Reclamation (Reclamation), which is another major federal owner and operator of dams.

To address these objectives, we examined the Corps' documents, including its *Safety of Dams—Policy and Procedures*,⁵ dam-safety assessment reports, cost reports, and presentations on the Tainter gate repair project. We also interviewed officials from the Corps and the Assistant Secretary of the Army for Civil Works (ASA(CW))—the office that establishes the strategic direction, develops policy, and supervises the execution of the Corps' Civil Works program—to understand the criteria and information used to decide what cost sharing to apply to the Tainter gate repair project. Based on the collected information, we compared the Corps' cost-sharing decisions for the repair project to Corps policy. Since Reclamation manages a dam portfolio similar in scale to the Corps, we examined laws and guidance for Reclamation's cost-sharing authorities for dam safety repairs and compared these authorities to the Corps' authorities. We also interviewed Reclamation officials to understand how they operationalize guidance on cost sharing. To describe the status of repayment contracts, we reviewed Reclamation's repayment contracts with and payments made by the two irrigation districts that use the Harlan County Dam: Kansas-Bostwick Irrigation District No. 2 and Bostwick Irrigation District in Nebraska. We also interviewed officials from both irrigation districts. We focused on fiscal years 2015 through 2018 because these years aligned with the start of the time period covered by the repayment contracts between Reclamation and the irrigation districts to repay repair project costs and included completed fiscal years for which incremental project costs were known. Since the Corps decided in January 2019 to apply its legal authority that lowered the irrigation districts' cost share for some of the repairs made under the project, the Corps and Reclamation subsequently had to recalculate the amounts to be repaid by the irrigation districts. As this recalculation was ongoing at the time we concluded our review, we are reporting on some but not all of the changes to repayment amounts and updated repayment contracts with the irrigation districts.

We conducted this performance audit from December 2018 to July 2019 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.

⁴Pub. L. No. 115-270, § 4303 (2018).

⁵U.S. Army Corps of Engineers, *Safety of Dams—Policy and Procedures*, Engineering Regulation No. 1110-2-1156 (Washington, D.C.: Oct. 28, 2011 and Mar. 31, 2014).

Results in Brief

In January 2019, the Corps decided to apply a formerly unused provision of its legal authority to lower the share of costs of repairing the Harlan County Dam to be paid by irrigation districts that benefit from the dam. In initial planning in 2012 for the project to repair the dam’s Tainter gates to address a design deficiency, the Corps determined that the irrigation districts were to pay their full share of costs for these repairs. Although the repairs to the Tainter gates were needed to meet updated design standards and address safety concerns, the Corps had initially followed long-standing policy to not use the state-of-the-art provision, which it said it did not use because of the difficulty in defining what types of repairs would qualify. However, we recommended in December 2015 and a provision in law subsequently required that the Corps clarify policy guidance on when the state-of-the-art provision might apply. Since then, the Corps and ASA(CW) had been contemplating changes to the policy of not using the state-of-the-art provision and, in January 2019, applied this provision for the first time to the portion of the major repairs at the Harlan County Dam needed to address changes in design criteria for Tainter gates. In March 2019, the Corps, at the direction of the ASA(CW), began implementing a new policy that allows for use of the state-of-the-art provision across its dam portfolio.

Reclamation, the federal agency responsible for managing contracts with irrigation districts at the Corps’ dams in western states, executed repayment contracts with the two irrigation districts that use water from the Harlan County Dam in 2016. These existing repayment contracts allowed the irrigation districts to pay their original roughly \$4.6 million share of repair costs, with interest, over 50 years. However, given the Corps’ recent decision to apply the state-of-the-art provision, the irrigation districts will now repay a lower share of costs for the portion of project repairs needed to address design deficiencies with the dam’s Tainter gates. Following the January 2019 decision, the Corps reexamined the project’s costs and concluded that a majority of these costs were attributable to work covered by the state-of-the-art provision and thus subject to a lower cost share. Overall, the irrigation districts’ repayment obligation is expected to be reduced to approximately \$2.1 million, about half of the original amount owed (see table 1).

Table 1: Irrigation Districts’ Repayment Obligations for Major Repairs at the Harlan County Dam before and after the 2019 Cost-Sharing Decision

	Before January 2019 decision	After January 2019 decision^a
Costs subject to full cost share	\$30,066,096	\$10,686,032
Repayment obligation for this portion of project costs	\$4,615,146	\$1,640,305
Costs subject to lower cost share	\$0	\$19,442,107
Repayment obligation for this portion of project costs	n/a	\$447,655
Total repayment obligation	\$4,615,146	\$2,087,960

Source: GAO analysis of U.S. Army Corps of Engineers (Corps) information. | GAO-19-593R

Note: We report costs for fiscal years 2015 to 2018 because it aligns with the start of the time period covered by the existing repayment contracts between the Bureau of Reclamation and the irrigation districts and includes only completed fiscal years for which incremental project costs are known.

^aWhen reexamining costs following its January 2019 decision, the Corps made minor adjustments to correct classification errors for project costs incurred in fiscal years 2015 and 2017. These adjustments increased the total project cost by about \$62,000.

Reclamation is taking steps to update contracts given these changes; this updating includes amending existing contracts to reflect the lower amount owed for repairs not subject to the lower cost share and executing new contracts for costs to be repaid at the lower cost share. Completing these contract actions will take several months, according to Reclamation officials.

Background

As noted above, the Corps operates dams for a variety of purposes, and commensurate with benefits derived from use of a dam, nonfederal users typically pay a percentage of a dam's annual operations and maintenance costs, as well as costs for major repair projects, like rehabilitating gate equipment or increasing a dam's height to prevent water flowing over the top of the dam. At individual dams, the Corps enters into agreements with nonfederal users, for example municipal and industrial water users, that set out the percentage of operations and maintenance as well as major repair costs the users will repay. These cost-sharing percentages (i.e., the full cost share) for operations, maintenance, and major repairs can range from under 1 percent to over 50 percent, based on the extent of benefits that accrue to the user.

However, for certain major repair projects, the Corps is to apply a legal authority that lowers the users' share of costs. More specifically, Section 1203 of the Water Resources Development Act of 1986 (Section 1203 authority) outlines provisions for making safety-related repairs owing to the availability of new hydrologic or seismic data or changes in the state-of-the-art design or construction criteria deemed necessary for safety purposes (we refer to this last provision as the "state-of-the-art provision").⁶ When one of these provisions applies to a major repair at a Corps dam, the Corps has authority to reduce a user's repayment obligation to 15 percent of its full cost share, effectively lowering a user's cost share by 85 percent. For example, if a user's full cost share is 10 percent, then the user is responsible for 15 percent of this share, or 1.5 percent of costs.

For the Harlan County Dam and Reservoir, in south central Nebraska, two irrigation districts—Kansas-Bostwick Irrigation District No. 2 and Bostwick Irrigation District in Nebraska—contribute to ongoing costs. The Corps operates and maintains the dam, and Reclamation manages repayment contracts with the two irrigation districts that use water from the dam, to pay not only for the water but also for operations and maintenance as well as major repair costs for the dam and other infrastructure used to supply the water.⁷ Under Reclamation's repayment contracts, the irrigation districts are to collectively pay 15.35 percent of costs incurred by the Corps to operate and maintain the Harlan County Dam.⁸

In 2014, the Corps began construction on a \$30 million project to repair the Harlan County Dam's Tainter gates. The 1995 failure of a Tainter gate at the Folsom Dam near Sacramento,

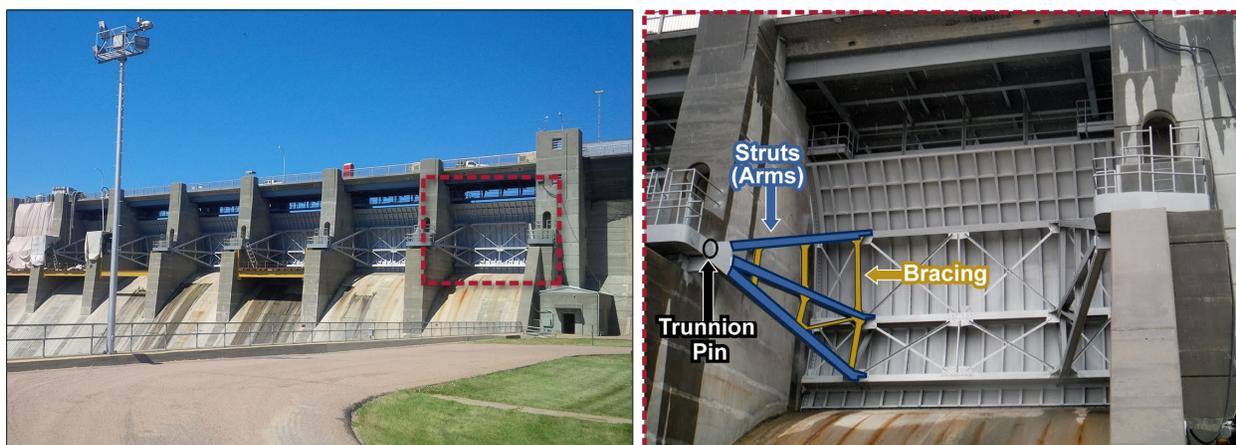
⁶Pub. L. No. 99-662, § 1203, 100 Stat. 4082, 4263 (1986) (codified at 33 U.S.C. § 467n).

⁷In addition to managing contracts with irrigation districts at Corps-owned dams, the Bureau of Reclamation, a component of the Department of the Interior, also owns and operates over 400 federal dams in the 17 western states where it operates.

⁸The Corps and Reclamation have a memorandum of agreement for the Harlan County Dam that stipulates the Corps will annually provide Reclamation with a summary of operations, maintenance, and any major repair costs which Reclamation uses to collect payments from each irrigation district. The Bostwick Irrigation District in Nebraska and Kansas-Bostwick Irrigation District No. 2 split irrigation's share of these costs at the Harlan County Dam based on an agreement between the two irrigation districts.

California, revealed that some of these gates were not designed to accommodate the amount of friction experienced in their operation.⁹ As a result, this friction—which acts on the trunnion pin around which the gate rotates between open and closed positions—can create stress on a gate’s arms, causing them to fail. The Corps has over 1,600 of these gates in its dam portfolio and determined that many gates needed to be rehabilitated so they would not fail. The Tainter gates at the Harlan County Dam were not designed to accommodate this friction, so the project involved rehabilitating the gates, including reinforcing the arms and retrofitting the trunnion pin assembly (see fig. 1), as well as completing other ancillary repairs, like upgrading electrical controls and other gate components. (We refer to this rehabilitation and repair work as the Tainter gate repair project in this report.) Construction work to make the repairs concluded in 2018, and the Corps is now completing the administrative close out of the associated contracts.

Figure 1: Construction at the Harlan County Dam in Nebraska and View of a Tainter Gate at the Dam



Source: U.S. Army Corps of Engineers. | GAO-19-593R

The Corps Recently Implemented a Formerly Unused Provision in Law That Lowers Irrigation Districts’ Share of Repair Costs at the Harlan County Dam

As part of its ongoing monitoring and risk assessments for the Harlan County Dam, the Corps determined that the dam’s Tainter gates needed repairs given the gates’ condition and to meet current design standards.¹⁰ The Corps updated design standards for Tainter gates since the Harlan County Dam was designed and constructed. The dam was completed in 1952 using accepted design standards that did not require trunnion friction to be considered in the gates’ operation. However, the Corps revised its structural engineering manual for Tainter gates in 2000 to require that the gates be designed to account for this friction, following an investigation of the Tainter gate failure at the Folsom Dam discussed above. In 2008, the Corps conducted a risk assessment that found that the Harlan County Dam’s Tainter gates had defects and

⁹The Corps designed and constructed the Folsom Dam, and the dam was then transferred to Reclamation, which has since operated and maintained the dam.

¹⁰The Corps’ process for monitoring dams includes conducting risk assessments to categorize dam safety risks and to prioritize repairs and funding. For more information see GAO, *Army Corps of Engineers: Actions Needed to Improve Cost Sharing for Dam Safety Repairs*, [GAO-16-106](#) (Washington, D.C.: Dec. 10, 2015).

exhibited signs of distress stemming from this design deficiency. As a result, in 2012 the Corps approved a project to repair the gates so they could continue to be safely operated. When planning the Tainter gate repair project, the Corps followed long-standing policy to determine that the irrigation districts were to pay their full cost share and did not apply the state-of-the-art provision of its Section 1203 authority that would lower the cost share. The Section 1203 authority provides for use of the state-of-the-art provision and resulting reduction of users' cost shares. However, as stated in Corps regulation, use of this provision was excluded because of the difficulty in defining the kinds of repairs that would apply.¹¹ Since it was policy not to use the state-of-the-art provision and because the scope of work did not allow for use of other provisions in its Section 1203 authority related to making repairs due to the availability of new hydrologic or seismic data, the Corps decided not to apply this authority, meaning that the irrigation districts would be responsible for paying their full 15.35 percent share of repair costs. The Corps communicated this decision to the irrigation districts through presentations during planning for the Tainter gate repair project. In 2012, the irrigation districts asked the Corps and ASA(CW) to reconsider this cost-sharing decision.

In January 2019, the Corps, working with ASA(CW), decided to apply the state-of-the-art provision—for the first time—to a portion of the Tainter gate repair project at the Harlan County Dam. We had recommended in December 2015 that the Corps clarify policy guidance on the types of circumstances under which the state-of-the-art provision might apply to enable the Corps to use the full range of its statutory authority.¹² Then, a 2016 law directed the Corps to issue guidance relating to use of the state-of-the-art provision.¹³ In response to our recommendation and subsequent statutory mandate, ASA(CW) and the Corps have been taking steps to clarify policy guidance on use of this provision. In relation to these steps, ASA(CW) reviewed and concurred with the Corps' 2019 determination that the state-of-the-art provision applied to the portion of the Harlan County Dam repairs that addressed design deficiencies with the Tainter gates.¹⁴ Applying the provision lowered the irrigation districts' share of costs from 15.35 percent to 2.3 percent for this portion of the repair project.¹⁵

Going forward, the Corps plans to develop new guidance on use of the state-of-the-art provision across its portfolio of dams. Specifically, ASA(CW) issued a memo in March 2019 that directed the Corps to modify its policies, regulations, and guidance to allow use of the state-of-the-art provision.¹⁶ Corps officials said they completed a draft of an Engineering and Construction Bulletin in May 2019 in response to the memo, and as of June 2019, the Corps was reviewing and had not set an issuance date for this bulletin. The bulletin will provide clarification and outline examples of when the provision could apply. Under the new approach for using the provision, Corps' districts—the level of the organization that plans, constructs, and manages projects in specific geographic areas—are to determine when major repairs at a dam are

¹¹*Safety of Dams—Policy and Procedures*, Engineering Regulation No. 1110-2-1156, 2011.

¹²[GAO-16-106](#).

¹³Water Resources Development Act of 2016, Pub. L. No. 114-322, § 1139, 130 Stat. 1628, 1658 (2016).

¹⁴Department of the Army, Assistant Secretary of the Army for Civil Works, *Review of the Cost Allocation for the Harlan County Dam Tainter Gate Replacement, Section 1203 of the Water Resources Development Act (WRDA) of 1986* (Washington, D.C.: Jan. 15, 2019).

¹⁵The resultant 2.3 percent is 15 percent of 15.35 percent.

¹⁶Department of the Army, Assistant Secretary of the Army for Civil Works, *Implementation Guidance for Section 1139 of the Water Resources Development Act of 2016, Dam Safety Repair Projects* (Washington, D.C.: Mar. 22, 2019).

needed due to changes in the state-of-the-art design or construction criteria and for safety purposes, and then are to seek approval from ASA(CW) to apply the provision.¹⁷ According to Corps officials, the new policy will enable the Corps to apply the state-of-the-art provision to major repairs going forward, but the Corps does not plan to apply it retroactively.

Irrigation Districts Have Made Initial Repayments, and Reclamation Is Recalculating Future Payments in Response to the Corps' Use of a Provision to Lower the Districts' Share of Costs

Irrigation districts have started making annual payments required under existing repayment contracts. These contracts allow the irrigation districts to repay their share of costs for the Tainter gate repair project over a 50-year term at 3.25 percent interest, the Treasury rate at the time the contracts were executed.¹⁸ Reclamation executed the repayment contracts with the irrigation districts in 2016 for costs incurred in fiscal year 2015 and amended these contracts in 2017 and 2018 to account for costs incurred in subsequent fiscal years for the multi-year project.¹⁹ See enclosure II for a description of the repayment process and the roles of the Corps and Reclamation in this process.

The existing repayment contracts were based on the Corps' 2012 decision that the irrigation districts pay their full cost share for the Tainter gate repair project—15.35 percent of about \$30 million, which amounts to about \$4.6 million. Through 2018, the irrigation districts had repaid about \$485,000.²⁰ With interest, the irrigation districts were scheduled to make payments totaling over \$8.4 million under the existing repayment contracts that cover costs for the repair project through fiscal year 2017.²¹

Given the Corps January 2019 decision to apply the state-of-the-art provision of its Section 1203 authority, described previously, the irrigation districts will now have to repay a lower share of costs for a majority of the Tainter gate repair project. According to Corps officials, Corps engineering and other staff had to manually reexamine construction contract documents for the project to determine what work and related costs were (1) to repair components of the Tainter gates that were not designed in accordance with state-of-the-art criteria and (2) for routine maintenance of other gate components. In March 2019, the Corps completed this review and

¹⁷We will continue to monitor the Corps' actions to implement new guidance and update the status of our recommendation as appropriate.

¹⁸Pub. L. No. 111-11, § 9603, 123 Stat 991, 1348 (2009). Users can repay project costs over a period of up to 50 years, but Reclamation conducts a financial analysis to determine the minimum appropriate repayment period. Reclamation assesses interest on costs to be repaid based on the rate for applicable U.S. Treasury securities. See Reclamation, *Reclamation Manual, Extended Repayment of Extraordinary Maintenance Costs*, PEC 05-03 (Apr. 17, 2014).

¹⁹The Corps also incurred \$506,545 in costs for the Tainter gate repair project in fiscal years 2012 through 2014, costs that preceded the irrigation districts request to repay their share of costs for the project through long-term repayment contracts. The irrigation districts paid their share of these costs through the annual billing process established with Reclamation to pay for routine operations and maintenance costs.

²⁰The total amount repaid by the irrigation districts includes \$314,583 in upfront payments made when entering into the contracts with Reclamation and \$170,475 in cumulative annual payments made to Reclamation based on the contracts for 2016 to 2018. Reclamation guidance requires that an irrigation district make an upfront payment totaling at least 75 percent of the balance of its reserve fund before entering into a long-term repayment contract.

²¹The total amounts due in existing contracts include principle and interest based on project costs for fiscal years 2015 to 2017 but do not include the irrigation districts' collective share of costs for fiscal years 2018 or 2019.

concluded that about two-thirds of project costs (\$19.4 million) were to address changes in the state-of-the-art design criteria and should be repaid at a lower cost share of 15 percent of the districts' full cost share, while about one-third of project costs (\$10.7 million) were for routine maintenance and should be repaid by the districts at their full cost share. Table 2 summarizes the irrigation districts' repayment obligations before and after the Corps' January 2019 decision.

Table 2: Comparison of Irrigation Districts' Repayment Obligations for Major Repairs at the Harlan County Dam before and after the 2019 Cost-Sharing Decision

	Before January 2019 decision	After January 2019 decision ^a
Costs subject to full cost share (15.35 percent)		
Portion of project costs classified as routine maintenance	\$30,066,096	\$10,686,032
Irrigation districts' repayment obligation for this portion of project costs	\$4,615,146	\$1,640,305
Costs subject to lower cost share (15 percent of full cost share of 15.35 percent)		
Portion of project costs classified as needed to address changes in state-of-the-art design criteria	\$0	\$19,442,107
Irrigation districts' repayment obligation for this portion of project costs	n/a	\$447,655
Total repayment obligation	\$4,615,146	\$2,087,960

Source: GAO analysis of U.S. Army Corps of Engineers (Corps) information. | GAO-19-593R

Note: The \$30 million cost for the Tainter gate repair project is based on information reported by the Corps to the Bureau of Reclamation (Reclamation) for fiscal years 2015 to 2018. We report costs for these fiscal years because it aligns with the start of the time period covered by the existing repayment contracts between Reclamation and the irrigation districts and includes only completed fiscal years for which incremental project costs are known. Corps officials said the agency will incur minimal additional costs for the project in fiscal year 2019 to, among other things, update maintenance manuals and close out the project.

^aWhen reexamining costs following its January 2019 decision, the Corps also made minor adjustments to correct classification errors for project costs incurred in fiscal years 2015 and 2017. These adjustments increased the total project cost by about \$62,000.

Based on the Corps' cost information, Reclamation is now taking two steps pertaining to its repayment contracts with the irrigation districts:

- First, Reclamation will execute new repayment contracts with the irrigation districts to repay project costs attributable to changes in the state-of-the-art design criteria and subject to the lower cost share. In these new contracts, the irrigation districts will be able to make interest-free payments over a period of up to 50 years. According to Reclamation officials, it will take around 9 months to draft, review, submit for public comment, and execute these new contracts.²²

²²The Corps and Reclamation each have different authorities to apply special cost sharing for major repairs needed due to changes in the state-of-the-art criteria and other conditions at dams each agency operates, and the two agencies, following these different authorities, apply percentages differently to calculate a user's cost share. For the Harlan County Dam, the Corps and Reclamation agreed to use the Corps' cost-sharing calculations. See enclosure I for more details.

- Second, Reclamation will amend the existing repayment contracts to recalculate payments based on the new, lower cost for the routine maintenance work included in the project, such as repairs to electrical controls. These contracts are likely to retain the 50-year repayment term at 3.25 percent interest. Reclamation officials said it will take at least 2 months after receiving the cost information from the Corps in March 2019 to amend these contracts. Reclamation officials said they also anticipate that all prior payments made by the irrigation districts will be applied to these amended contracts.

Agency Comments

We provided a draft of this report to the Departments of Defense and the Interior for comment. Defense and Interior told us that they had no comments on the draft report.

We are sending copies of this report to the appropriate congressional committees, the Secretary of Defense, the Secretary of the Interior, and other interested parties. In addition, the report is available at no charge on the GAO website at <http://www.gao.gov>.

If you or your staff have any questions concerning this report, please contact me at (202) 512-2834 or by e-mail at vonaha@gao.gov. Contact points for our Office 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 were Michael Armes (Assistant Director); Joanie Lofgren (Analyst-in-Charge); William J. Cordrey; Elizabeth Erdmann; David Hooper; Vondalee R. Hunt; Jon Melhus; Malika Rice; Amy Rosewarne; Elizabeth Wood; and William T. Woods.



Andrew Von Ah
Director, Physical Infrastructure Issues

Enclosures – 2

List of Committees

The Honorable Lisa Murkowski
Chairman
The Honorable Joe Manchin
Ranking Member
Committee on Energy and Natural Resources
United States Senate

The Honorable John Barrasso
Chairman
The Honorable Thomas R. Carper
Ranking Member
Committee on Environment and Public Works
United States Senate

The Honorable Raul M. Grijalva
Chairman
The Honorable Rob Bishop
Ranking Member
Committee on Natural Resources
House of Representatives

The Honorable Peter A. DeFazio
Chairman
The Honorable Sam Graves
Ranking Member
Committee on Transportation and Infrastructure
House of Representatives

Enclosure I: Information on the U.S. Army Corps of Engineers' and the Bureau of Reclamation's Cost-Sharing Authorities for Dam Safety Repairs

The America's Water Infrastructure Act of 2018 asked us to compare the U.S. Army Corps of Engineers' (Corps) cost-sharing authorities to those of the Bureau of Reclamation's (Reclamation). These two agencies manage dam portfolios similar in scope and collectively own 34 percent of federal dams.²³

- Located within the Department of the Army in the Department of Defense, the Corps has both military and civilian responsibilities.²⁴ Through its Civil Works program, the Corps plans, designs, constructs, operates, and maintains a wide range of water resources projects including dams as well as levees, hurricane barriers, and floodgates. Corps dams have a range of purposes including navigation, flood control, recreation, and ecosystem restoration.
- Reclamation's mission areas and geographic scope are generally narrower than the Corps. Located within the Department of the Interior, Reclamation has financed and constructed projects including dams to provide water to users in 17 western states. Initially, Reclamation's water projects were built almost solely for irrigation to make previously arid and semiarid land more productive. Over the years, water projects grew in size and purpose, often providing not only water for irrigation but also for hydroelectric power, municipal water supply, and other uses.

Both agencies have programs for conducting routine operations and maintenance at dams, like cleaning drains and mowing embankments on earthen dams, as well as for making major repairs when needed to ensure continued safe operation of dams. Each agency receives appropriations and has various authorities to carry out major repairs and ensure the safety of dams. Like the Corps, as described above, Reclamation has agreements in place for sharing the costs for operations, maintenance, and major repairs with users at its dams.

The Corps and Reclamation both have special cost-sharing authorities that may apply to certain major repairs at dams that stem from different laws. For major repairs associated with typical degradation of a dam over time, the agencies would recover the users' full share of costs based on the agreements in place for a dam. However, for each agency, its governing law sets out three provisions under which special cost sharing applies for making major repairs to ensure dam safety: changes in seismic conditions, changes in hydrologic conditions, or changes in the state-of-the-art criteria deemed necessary for safety purposes (see table 3). Reclamation has used all three provisions since receiving its authority in 1978, but through 2018 the Corps had only used the seismic and hydrologic provisions since receiving its authority in 1986.²⁵

²³The Corps owns 709 dams and Reclamation owns 476 dams.

²⁴The Assistant Secretary of the Army for Civil Works establishes the strategic direction, develops policy, and supervises the execution of the Corps' Civil Works program.

²⁵Reclamation has not applied its state-of-the-art provision to any repairs at its dams to address design deficiencies with Tainter gates. Reclamation's use of its state-of-the-art provision is tied to funding specifically used for projects carried out under its safety of dams authority and as deemed necessary for safety purposes. See 43 U.S.C. § 508. Since this funding is limited, Reclamation officials said the agency decided to not pursue this funding for needed Tainter gate repairs. However, they also said repairs needed to correct the deficient design of Tainter gates would technically fall under its state-of-the-art provision though it would also have to qualify under the safety provision.

Table 3: The U.S. Army Corps of Engineers' (Corps) and Bureau of Reclamation's (Reclamation) Cost-Sharing Authorities for Certain Major Repairs to Dams

	Corps	Reclamation
Legislation	Water Resources Development Act of 1986 ^a	Reclamation Safety of Dams Act of 1978 ^b
Text describing when and how authority can be used	<p>[C]osts incurred in the modification by the Secretary of dams and related facilities constructed or operated by the Secretary, the cause of which results from new hydrologic or seismic data or changes in state-of-the-art design or construction criteria deemed necessary for safety purposes, shall be recovered in accordance with the provisions in this subsection:</p> <p>Fifteen percent of the modification costs shall be assigned to project purposes in accordance with the cost allocation in effect for the project at the time the work is initiated. Non-federal interests shall share the costs assigned to each purpose in accord with the cost sharing in effect at the time of initial project construction: Provided, That the Secretary of the Interior shall recover costs assigned to irrigation in accordance with repayment provisions of Public Law 98-404.</p>	<p>[C]osts incurred in the modification of structures under this Act, the cause of which results from new hydrologic or seismic data or changes in state-of-the-art criteria deemed necessary for safety purposes, shall be reimbursed to the extent provided in this subsection.</p> <p>Fifteen percent of such costs shall be allocated to the authorized purposes of the structure, except that in the case of Jackson Lake Dam, Minidoka Project, Idaho-Wyoming, such costs shall be allocated in accordance with the allocation of operation and maintenance charges.</p>
Recipient of repayments from non-federal users	U.S. Treasury	Reclamation Fund, a special fund within the U.S. Treasury that receives revenue from the sale of public land, repayments for constructing projects including dams, water sales, and project power revenues.

Source: GAO. | GAO-19-593R

^aPub. L. No. 99-662, § 1203, 100 Stat. 4082, 4263 (1986) (codified at 33 U.S.C. § 467n).

^bPub. L. No. 95-578, § 4(b), 92 Stat. 2471 (1978) (codified at 43 U.S.C. § 508(b)).

While the agencies have similar authorities for adjusting users' cost sharing under certain circumstances, the Corps and Reclamation use different methods to calculate the users' share of costs under each agency's authorities. However, as noted above, the agencies' authorities are worded differently in law, and each agency has acted to implement its authority accordingly. Below we describe how each agency calculates costs, based on our review of the agencies' policy documents.

- The Corps assigns 15 percent of repair costs in accordance with the cost allocation in effect for the project at the time the work is performed. This method means that a user

pays 15 percent of its full cost share; that is, the user's full cost share is reduced by 85 percent.²⁶

- Reclamation assigns 15 percent of repair costs in proportion to each use of the dam—specifically, in proportion to a dam's reimbursable purposes such as irrigation and hydropower but not to non-reimbursable purposes such as flood control.²⁷ Since the 15 percent of costs are assigned based on the reimbursable purposes and not on the overall cost allocation for the dam, a user may have to pay more or less than its full cost share.

Table 4 illustrates how each agency would calculate cost sharing for major repairs at similarly situated Corps and Reclamation dams, based on our review of the agencies' policy documents and interviews with agency officials. As the table shows, the agencies' different methods can lead to a user having to repay different amounts for the same repairs at similarly situated dams.

²⁶This could be based on the cost sharing for the dam established at initial construction or subsequent reallocation, such as a dam built entirely for flood control that later had irrigation added as a purpose of the dam.

²⁷According to Reclamation policy, costs will be allocated to the reimbursable purposes in proportion to those purposes' share of the reimbursable net economic benefits specified in the modification report prepared for major repairs at a dam, but specific costs will be allocated exclusively to their associated reimbursable purpose. See Reclamation, *Reclamation Manual, Safety of Dams Repayment and Cost Allocation*, PEC 05-05 (Dec. 12, 2011).

Table 4: Examples of How the U.S. Army Corps of Engineers (Corps) and Bureau of Reclamation (Reclamation) Would Apply Cost-Sharing Authorities to Major Repairs at a Hypothetical Dam

Project description	Cost-sharing calculation at a Corps dam	Cost-sharing calculation at a Reclamation dam
<p>The project made \$100 million in dam safety repairs needed due to a change in seismic conditions at the dam.</p>	<p>Example 1: Dam has one reimbursable purpose (irrigation) and one user that benefits from the dam for that purpose. Under the cost sharing agreement in place, this user pays 25 percent of operations and maintenance costs.</p> <p>The Corps first calculates 15 percent of repair costs : $\\$100,000,000 \times 0.15 = \\15 million Then, the Corps assigns the irrigation user's share of costs based on the 25 percent cost allocation in effect: $\\$15,000,000 \times 0.25 =$ \$3.75 million.</p>	<p>Reclamation calculates 15 percent of repair costs. The irrigation user would pay 15 percent of costs, and the cost allocation under the existing agreement would not be applied: $\\$100,000,000 \times 0.15 =$ \$15 million.</p>
<p>Example 2: Dam with two reimbursable purposes (irrigation and hydropower) and one user that benefits from the dam for each purpose. Under cost-sharing agreements in place, the irrigation user pays 10 percent and the hydropower user pays 45 percent of operations and maintenance costs, and these percentages align with the purposes of the dam.</p>	<p>The Corps first calculates 15 percent of repair costs: $\\$100,000,000 \times 0.15 = \\15 million. Then, the Corps assigns each user's share of costs based on the cost allocations in effect:</p> <ul style="list-style-type: none"> • The irrigation user would pay its 10 percent allocation: $\\$15,000,000 \times 0.10 =$ \$1.5 million. • The hydropower user would pay its 45 percent allocation: $\\$15,000,000 \times 0.45 =$ \$6.75 million. 	<p>Reclamation calculates 15 percent of repair costs: $\\$100,000,000 \times 0.15 = \\15 million. Reclamation assigns each user's share of these costs in proportion to its share of reimbursable purposes at the dam.</p> <ul style="list-style-type: none"> • The irrigation user would pay its proportionate share of costs: $\\$15,000,000 \times (10/(10+45)) = \\$15,000,000 \times 0.18 =$ \$2.7 million. • The hydropower user would repay its proportionate share of costs: $\\$15,000,000 \times (45/(10+45)) =$ $\\$15,000,000 \times 0.82 =$ \$12.3 million.

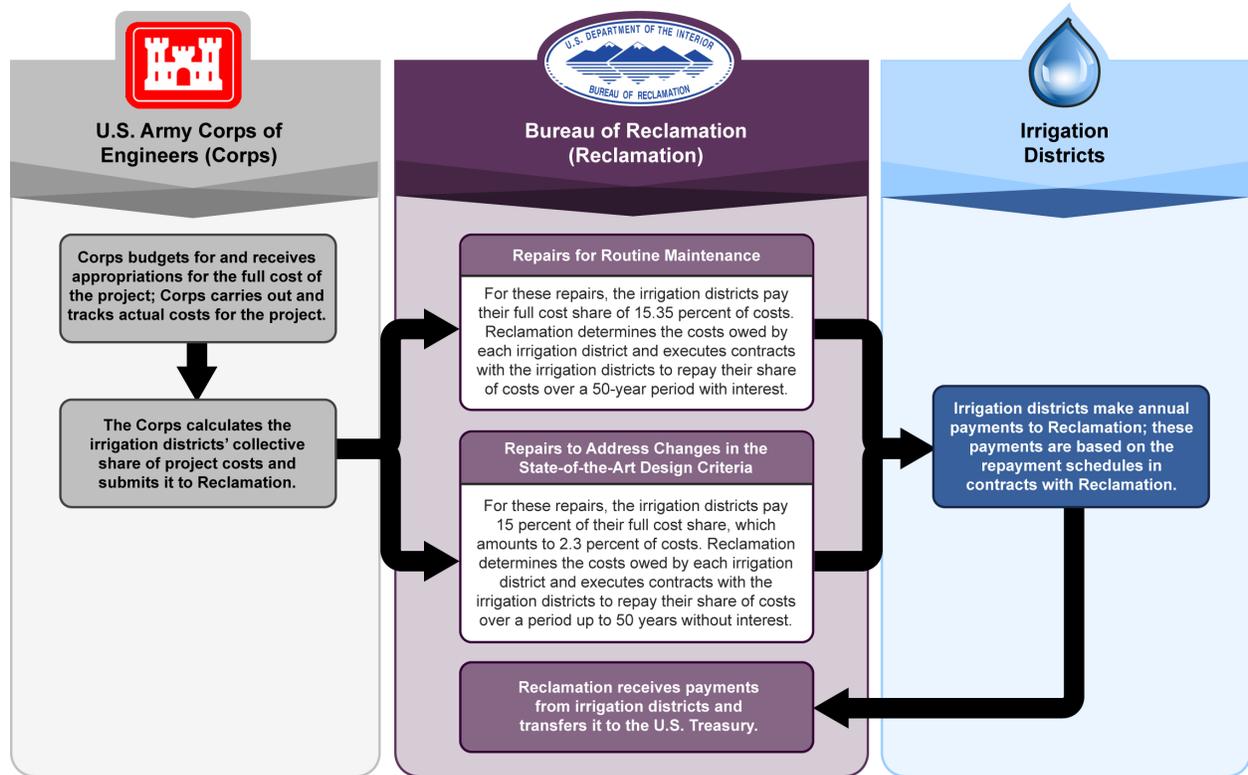
Source: GAO analysis of Corps and Reclamation policies and interviews. | GAO-19-593R

Note: For each example, the remaining percentage of costs for the dam are allocated to non-reimbursable purposes like flood control. The Corps and Reclamation pay the costs allocated to these non-reimbursable purposes out of appropriated funds.

At the 23 Corps facilities where Reclamation manages repayment contracts with irrigation districts, Reclamation relies on the Corps to determine the total amount users are to repay under the Corps' cost sharing authority, according to Reclamation officials and past contracts for major repair projects at such dams. Reclamation uses this information from the Corps to enter into repayment contracts. This procedure is not currently outlined in Reclamation guidance. However, Reclamation has started to communicate this procedure to each of its regional offices, and Reclamation officials said they plan to update relevant guidance to help ensure consistent implementation.

Enclosure II: Process for Repayment Contracts for Major Repairs at the Harlan County Dam

Figure 2: Process for Repayment Contracts for Major Repairs at the Harlan County Dam, as of March 2019



Source: GAO analysis of Corps and Reclamation information. | GAO-19-593R

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