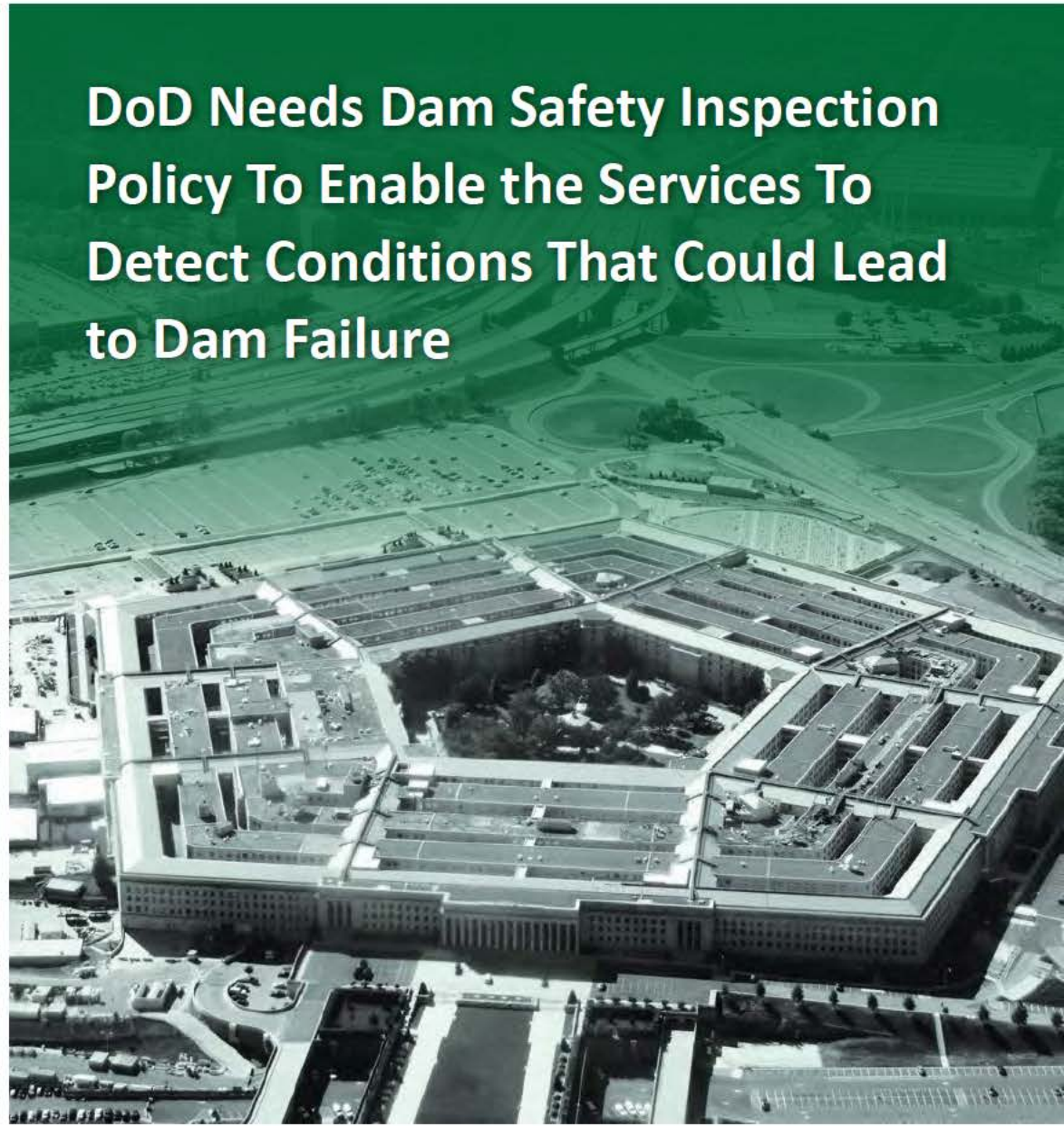


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INSPECTOR GENERAL

U.S. Department of Defense

DECEMBER 31, 2014



DoD Needs Dam Safety Inspection Policy To Enable the Services To Detect Conditions That Could Lead to Dam Failure

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Results in Brief

DoD Needs Dam Safety Inspection Policy To Enable the Services To Detect Conditions That Could Lead to Dam Failure

December 31, 2014

Objective

The audit objective was to determine whether DoD dam safety inspections adequately assessed the operations, maintenance, and structural stability of dams to mitigate public safety risks.

Finding

~~(FOUO)~~ DoD dam safety inspections did not adequately assess the operations, maintenance, and structural stability of dams. The formal, special, intermediate, and informal inspections of the 47 non-statistically selected dams from the Army, Marine Corps, Navy, and Air Force were not consistent with the frequency, scope, or inspector qualifications provided in the Federal Guidelines for Dam Safety. This occurred because DoD does not have policy requiring installations to implement a dam safety inspection program consistent with the Federal Guidelines for Dam Safety. Without an adequate inspection program, dam owners and managers cannot detect and address deteriorating conditions that could cause dam failure. Delays in the detection of deteriorating conditions could cause repair costs to rise. Additionally, potential dam failures place military and surrounding civilian communities at a greater risk for loss of life, and could result in mission failure or threaten access to a safe water supply.

Recommendations

We recommend that the Under Secretary of Defense for Acquisition, Technology, and Logistics establish DoD dam safety inspection policy that is in accordance with the Federal Guidelines for Dam Safety, which define inspection frequency, scope, and inspector qualifications and outline the need to develop and maintain inspection support documentation.

We recommend that the Secretaries of the Army, Navy, and Air Force, and the Commandant of the Marine Corps implement a dam safety inspection program in accordance with DoD dam safety inspection policy, after that policy is issued.

Management Comments and Our Response

The Under Secretary of Defense for Acquisition, Technology, and Logistics, the Secretary of the Navy, and the Secretary of the Air Force, did not respond to the draft report and we request that they provide comments to the final report by February 27, 2015. Comments from the Deputy Assistant Secretary of the Army for Installation, Housing and Partnerships, responding for the Assistant Secretary of the Army Installations, Energy and Environment, and from the Staff Director, responding for the Commandant of the Marine Corps, meet the intent of the recommendation. Therefore, we request no additional comments. Please see the Recommendations Table on the back of this page.

Recommendations Table

| Management | Recommendations Requiring Comment | No additional Comments Required |
|---|--|--|
| Under Secretary of Defense for Acquisition, Technology, and Logistics | 1 | |
| Secretary of the Army and Commandant of the Marine Corps | | 2 |
| Secretaries of the Navy and Air Force | 2 | |

Please provide comments by February 27, 2015.



**INSPECTOR GENERAL
DEPARTMENT OF DEFENSE
4800 MARK CENTER DRIVE
ALEXANDRIA, VIRGINIA 22350-1500**

December 31, 2014

MEMORANDUM FOR UNDER SECRETARY OF DEFENSE FOR ACQUISITION,
TECHNOLOGY, AND LOGISTICS
ASSISTANT SECRETARY OF THE AIR FORCE (FINANCIAL
MANAGEMENT AND COMPTROLLER)
NAVAL INSPECTOR GENERAL
AUDITOR GENERAL, DEPARTMENT OF THE ARMY

SUBJECT: DoD Needs Dam Safety Inspection Policy To Enable the Services To Detect
Conditions That Could Lead to Dam Failure (Report No. DODIG-2015-062)

~~(FOUO)~~ We are providing this report for your review and comment. Inadequate processes for inspecting DoD dams leave installation personnel, missions, and other downstream communities vulnerable to catastrophic flooding in the event of dam failure. We conducted this audit in accordance with generally accepted government auditing standards. We considered management comments on a draft of this report when preparing the final report.

DoD Directive 7650.3 requires that recommendations be resolved promptly. The Under Secretary of Defense for Acquisition, Technology, and Logistics, the Secretary of the Navy, and the Secretary of the Air Force, did not respond to the draft report and we request that they respond to the final report by February 27, 2015. Comments from the Deputy Assistant Secretary of the Army for Installation, Housing and Partnerships, responding for the Assistant Secretary of the Army Installations, Energy and Environment, and from the Staff Director, responding for the Commandant of the Marine Corps, meet the intent of the recommendation. Therefore, we request no additional comments.

Please provide comments to conform to the requirements of DoD Directive 7650.3. Please send a PDF file containing your comments to audrco@dodig.mil. Copies of your comments must have the actual signature of the authorizing official for your organization. We cannot accept the /Signed/ symbol in place of the actual signature. If you arrange to send classified comments electronically, you must send them over the SECRET Internet Protocol Router Network (SIPRNET).

Please direct questions to Ms. Carol Gorman, Assistant Inspector General, Readiness and Cyber Operations, at (703) 669-7331 (DSN 664-7331).

A handwritten signature in cursive script that reads "Amy J. Frontz".

Amy J. Frontz
Principle Assistant Inspector General
for Auditing

Contents

Introduction

| | |
|-----------------------------|---|
| Objective | 1 |
| Background | 1 |
| Review of Internal Controls | 3 |

Finding. Dam Safety Inspections Not Adequate

| | |
|--|----|
| DoD Dam Inspections Were Not Consistent With Federal Guidelines for Dam Safety | 5 |
| DoD and the Services Lack Adequate Dam Safety Inspection Policy | 12 |
| Adequate Dam Safety Inspections Could Reduce Repair Costs and Prevent Dam Failure | 13 |
| Management Actions Taken During the Audit | 15 |
| Recommendations, Management Comments, and Our Response | 15 |

Appendixes

| | |
|--|----|
| Appendix A. Scope and Methodology | 18 |
| Use of Computer-Processed Data | 20 |
| Use of Technical Assistance | 20 |
| Prior Coverage | 20 |
| (FOUO) Appendix B. Dams Reviewed by Installation and Hazard Potential | 21 |

Management Comments

| | |
|--------------------------------|----|
| Department of the Army | 23 |
| Commandant of the Marine Corps | 24 |

Acronyms and Abbreviations

Introduction

Objective

Our audit objective was to determine whether DoD dam safety inspections adequately assessed the operations, maintenance, and structural stability of dams to mitigate public safety risks. See Appendix A for scope and methodology.

Background

As of August 2013, DoD reported that it was the owner and manager of 322 dams. Most of the DoD dams are earth embankment-type dams as shown in Figure 1. DoD-owned and managed dams are used for a variety of purposes, including water supply and recreation. Regardless of their purpose, dam failure can lead to property damage and loss of life. The 1976 failure of the Teton Dam in Idaho, a Federal earth embankment dam over 300 feet high, prompted public and governmental concern for dam safety. Congressional and Federal agency investigations of the Teton Dam failure led to Congress initiating new Federal legislation for dam safety.

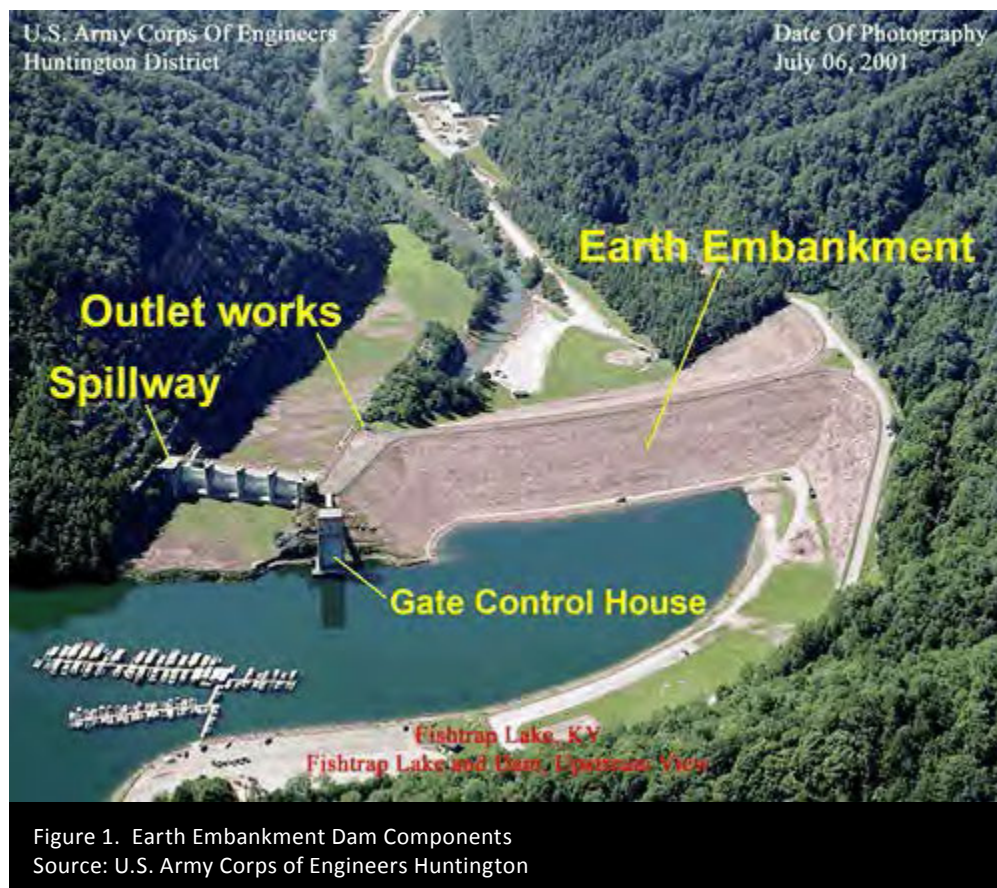


Figure 1. Earth Embankment Dam Components
Source: U.S. Army Corps of Engineers Huntington

Public Law 104-303, “Water Resources Development Act of 1996,” October 12, 1996, established the National Dam Safety Program and directed the Federal Emergency Management Agency to develop and implement the program to encourage better dam safety practices. The program establishes dam safety standards for Federal Agencies and includes guidelines and training aids for dam safety inspections. Public Law 104-303 defines a dam as any artificial barrier, 25 feet or more in height from defined points, or has a storage capacity of 50 acre-feet or more, that has the ability to collect and confine water for storage or control. Public Law 104-303 refers Federal agencies (agencies that design, own, operate, maintain, or regulate the construction, operation, or maintenance of a dam) to the Federal Emergency Management Agency published Federal Guidelines for Dam Safety (Federal guidelines), for dam safety management practices for all Federal agencies.

Federal Guidelines for Dam Safety

The Federal guidelines¹ state that Federal agencies responsible for the operation or regulation of dams should establish a periodic inspection program, which includes formal, special, intermediate, and informal inspections. The review of a dam’s operations, maintenance, and structures varies based on the type of inspection performed. When the series of inspections are performed, they should provide continuous surveillance of a dam’s condition and help ensure early detection of changes that could indicate structural problems. The Federal guidelines establish three hazard potential classifications used to classify dams according to the extent of potential harm to life and property downstream from the dam (for example, the installations or surrounding communities).

- High—likely loss of life; adverse impact to the economy.
- Significant—unlikely loss of life; adverse impact to the economy.
- Low—unlikely loss of life; limited impact to the economy.

The Federal guidelines also prescribe the frequency, scope,² and inspector qualifications for dam safety inspections, which vary based on the type of inspection performed. The frequency, scope, and inspector qualifications are part of a periodic inspection program to verify the structural integrity of the dam throughout its operating life and ensure that human life and property are protected.

¹ The Federal guidelines are listed in Appendix A.

² Scope represents the extent to which the inspections cover the operations, maintenance, or structural stability of the dam.

Roles and Responsibilities

The Federal guidelines state that the heads of Federal agencies are responsible for ensuring the adequacy of their agency’s dam safety program. Additionally, agencies should:

- conduct internal reviews of dam safety procedures;
- develop and implement dam safety policy;
- provide resources and procedures for safe design, construction, operation, and inspection of each dam under their jurisdiction; and
- establish a dam safety office (officer).

The Federal guidelines apply to all Federal agencies responsible for the planning, design, construction, operation, maintenance or regulation of dams, including DoD.

There is no organization at the Office of the Secretary of Defense–level designated with DoD dam safety responsibility; however, DoD Directive 5134.01, “Under Secretary of Defense for Acquisition, Technology, and Logistics,” December 9, 2005, (Incorporating Change 1, April 1, 2008), states that the Under Secretary of Defense for Acquisition, Technology, and Logistics is responsible for establishing policies and procedures for managing DoD installations and environment to support military readiness. Since dams are located on DoD installations, the Under Secretary of Defense for Acquisition, Technology, and Logistics is responsible for establishing policy that assists DoD installations in managing their dams and ensuring dam safety. DoD dams are part of installation infrastructure and real property, and, therefore, installation commanders are responsible for managing dams on their installations.



There is no organization at the Office of the Secretary of Defense-level designated with DoD dam safety responsibility.

Review of Internal Controls

DoD Instruction 5010.40, “Managers’ Internal Control Program Procedures,” May 30, 2013, requires DoD organizations to implement a comprehensive system of internal controls that provides reasonable assurance that programs are operating as intended and to evaluate the effectiveness of the controls. We determined that DoD did not have adequate controls in place to assess the maintenance, operations, and structural stability of DoD dams. Specifically, we determined that the formal,

special, intermediate, and informal inspections of the Army, Marine Corps, Navy, and Air Force, (the Services) dams were inconsistent with the frequency, scope, and inspector qualifications provided in the Federal guidelines. We will provide a copy of the report to the senior official responsible for internal controls at the Under Secretary of Defense for Acquisition, Technology, and Logistics, and at each Service.

Finding

Dam Safety Inspections Not Adequate

~~(FOUO)~~ DoD dam safety inspections did not adequately assess the operations, maintenance, and structural stability of dams. The formal, special, intermediate, and informal inspections of the 47 non-statistically selected dams from the Army, Marine Corps, Navy, and Air Force reviewed³ were not consistent with the frequency, scope, or inspector qualifications provided in the Federal Guidelines for Dam Safety (Federal guidelines). This occurred because DoD did not have a policy requiring installations to implement a dam safety inspection program consistent with Federal guidelines. Without an adequate inspection program, dam owners and managers cannot detect and address deteriorating conditions that could cause dam failure. Delays in the detection of deteriorating conditions could cause repair costs to rise. Additionally, potential dam failures place military and surrounding civilian communities at a greater risk for loss of life, and could result in mission failure or threaten access to a safe water supply.

³ See Appendix B for a list of the 47 dams reviewed.

DoD Dam Inspections Were Not Consistent With Federal Guidelines for Dam Safety

DoD dam safety inspections at the 47 dams reviewed were not consistent with the frequency, scope, and inspector qualifications provided in the Federal guidelines. Although formal inspections of the Services' dams were conducted by qualified inspectors, the frequency and scope of the inspections were not always consistent with the frequency and scope stated in the Federal guidelines. In addition, the special, intermediate, and informal inspections varied in frequency, scope, or inspector qualifications prescribed in the Federal guidelines.

Frequency

The frequency of the formal, special, intermediate, and informal inspections of the Service installation dams was inconsistent with Federal guidelines. Federal guidelines recommend the following frequency for each inspection.

- Formal Inspections—periodically at intervals not to exceed 5 years.
- Special Inspections—immediately after unusually large floods and after the occurrence of significant earthquakes, sabotage, or other unusual events reported by operating personnel.

- Intermediate Inspections—preferably on an annual basis, but at least once every 2 years, where there is a high probability that dam failure could result in loss of life. For other dams, frequency should be based on the dam’s size, importance, and potential for damage to property.
- Informal Inspections—continuous surveillance of the dam and immediately after any unusual event such as large floods, earthquakes, suspected sabotage, or vandalism.

Of the 47 dams reviewed, 33 dams received formal inspections within the 5-year interval as recommended by the Federal guidelines. Specifically, 31 dams at the following four installations received formal inspections at least once every 5 years.

- Fort Bragg, North Carolina;
- Fort Campbell, Kentucky;
- Marine Corps Base (MCB) Camp Pendleton, California; and
- Naval Weapons Station (NWS) Seal Beach, California.

Formal inspections varied for the three dams at Naval Support Activity (NSA) Crane, Indiana—two dams received formal inspections at least once every 5 years, and one dam was not inspected within that timeframe.⁴

The 13 dams at the following three installations were not inspected at least once every 5 years:

- MCB Quantico, Virginia;
- Arnold Air Force Base (AFB), Tennessee; and
- Air Force Academy, Colorado.

The frequency of special, intermediate, and informal inspections was also inconsistent with the Federal guidelines. For example, Table 1 illustrates that none of the installations performed special and informal inspections consistent with the frequency prescribed in the Federal guidelines.

⁴ We considered the overall frequency of NSA Crane formal inspections as inconsistent with Federal guidelines because the formal inspections, for all three dams, were not conducted at least every 5 years.

Table 1. Frequency of Installation Dam Inspections Consistent With Federal Guidelines

| Military Service Installations | Inspection Frequency Consistent With Guidelines | | | |
|--------------------------------|---|---------|--------------|----------|
| | Formal | Special | Intermediate | Informal |
| Fort Campbell | Y | N | N | N |
| Fort Bragg | Y | N | N | N |
| MCB Camp Pendleton | Y | N | N | N |
| MCB Quantico | N | N | N | N |
| NSA Crane | N | N | N | N |
| NWS Seal Beach | Y | N | N | N |
| Arnold AFB | N | N | Y | N |
| Air Force Academy | N | N | Y | N |

The inspection frequency also varied across the Services. For example, at MCB Camp Pendleton, Public Works Department (PWD) personnel stated that instead of informal inspections, they relied on training range personnel, grounds crews, and users of the lakes and dams to inform them of any conditions that needed attention. However, PWD personnel could not provide a record of any such communication. At NWS Seal Beach, PWD personnel stated that they did not perform special inspections. The Air Force Academy and Arnold AFB were the only two installations of the eight reviewed that could support that intermediate inspections were performed at least once every 2 years (biennially), as stated in Federal guidelines. For four of the eight installations, installation personnel stated that they performed special, intermediate, or informal inspections; however, there was no documentation supporting that they performed these inspections. Federal guidelines state that proper documentation of the dam's current condition and past performance is necessary to assess the adequacy of operations, maintenance, surveillance, and proposed corrective actions. Also, all inspection observations should be documented and a complete inspection record should be readily available for reference. The inspectors need the prior inspection records to help them identify changes in a dam's condition, which could indicate problems requiring corrective action.

Scope

The scope of the formal, special, intermediate, and informal inspections of the Service installation dams was inconsistent with Federal guidelines. Federal guidelines provide the following scope for each inspection.

- Formal and Special Inspections—review all pertinent records regarding instrumentation, operation, maintenance, investigations, design, and construction. Detailed inspections of a dam's associated structures and

equipment should include a diving inspection of underwater structures affecting the integrity of the dam. Prepare checklists to cover the condition of structural, electrical, and mechanical features. Verify that operating instructions are available and understood, instrumentation is adequate, and structures are performing as designed.

- Intermediate Inspections—conduct a thorough field inspection of the dam and associated structures and a review of the records of inspections documented at and following the last formal inspection.
- Informal Inspections—identify and report abnormal conditions. Give particular attention to detecting evidence of, or changes in, leakage; erosion; sinkholes; boils; seepage; slope instability; undue settlement; displacement; cracking; deterioration; and improper functioning of drains and relief wells. Immediately report conditions that seem critical or dangerous. Engineering and operating specialists should prepare instructions or checklists specifically for the project.

~~(FOUO)~~ Federal guidelines also state that excess vegetation and trees hinder the ability to perform adequate inspections. The dam safety inspection reports we reviewed indicated that excess vegetation hindered complete or thorough formal inspections of dams at all eight installations visited (23 of the 47 dams reviewed). Also, installation personnel did not have records or documentation to support the scope of their special, intermediate, and informal inspections. Table 2 illustrates that all of the installations had inconsistencies in the scope of their formal, special, and informal dam inspections; and, all but one installation had inconsistencies in the scope of their intermediate inspections.

Table 2. Scope of Installation Dam Inspections Consistent With Federal Guidelines

| Military Service Installations | Inspection Scope Consistent With Guidelines | | | |
|--------------------------------|---|---------|--------------|----------|
| | Formal | Special | Intermediate | Informal |
| Fort Campbell | N | N | N | N |
| Fort Bragg | N | N | N | N |
| MCB Camp Pendleton | N | N | N | N |
| MCB Quantico | N | N | N | N |
| NSA Crane | N | N | N | N |
| NWS Seal Beach | N | N | N | N |
| Arnold AFB | N | N | N | N |
| Air Force Academy | N | N | Y | N |

(~~FOUO~~) The inspection scope also varied across the Services. For example, at Fort Campbell, the scope of the formal inspection of the dams was not adequate due to the inability to perform a thorough inspection, at times, because of excess vegetation. Specifically, one formal inspection stated, “heavy brush and large woody vegetation has taken root on the crest, upstream and downstream embankment slopes, downstream toe, abutments, and around the principal spillway and primary emergency spillway, thus, making a thorough visual inspection impossible.” Figure 2 shows excessive vegetation at Golden Eagle Dam, Fort Campbell.



(~~FOUO~~) Both the 2007 and 2012 formal inspection reports for the dams at NWS Seal Beach noted that vegetation made it difficult for the inspectors to complete a close inspection. Also, at NSA Crane, PWD personnel stated that they performed special and informal inspections of the three dams and used the Indiana State Department of Natural Resources inspection checklists to conduct the intermediate inspections. However, PWD personnel could not provide a record or support documentation of the inspections.

Inspector Qualifications

At the eight installations we visited, the inspectors that conducted the formal dam inspections were properly qualified, but inspector qualifications for the special, intermediate, and informal inspections varied. Inspector qualification requirements are based on the type of inspection performed. Federal guidelines state that inspectors should be selected carefully, have qualifications commensurate with their assigned responsibility level, and receive dam safety inspection training.⁵ Federal guidelines provide the following inspector qualifications for each inspection:

- **Formal and Special Inspections**—highly trained specialists including licensed professional engineers experienced in the investigation, design, construction, and operation of dams. Inspectors should have appropriate specialized knowledge in structural, mechanical, electrical, hydraulic, and embankment design; geology; concrete materials; and construction procedures.
- **Intermediate Inspections**—technically qualified engineers, experienced in the operation and maintenance of dams and trained to recognize abnormal conditions. Inspectors should be familiar with all permanent documentation, especially the operation and maintenance histories for the dam.
- **Informal Inspections**—dam tenders or operation and maintenance personnel that have sufficient training and experience to allow them to recognize abnormal conditions, and they must have demonstrated their ability to perform operation and maintenance functions. Personnel must be provided adequate written instructions on performance of responsibilities. Procedures for monitoring structural performance, observing the structure, its foundation, abutments, and associated structures, and reporting abnormal conditions must be clearly defined and understood by these personnel.

At seven of the eight installations, inspector qualifications were inconsistent with Federal guidelines for special and informal inspections. Only at the Air Force Academy was the dam safety inspector (contractor) qualified to perform special, intermediate, and informal inspections as stated in the Federal guidelines (Table 3).

⁵ The Federal guidelines do not define all types of training when discussing qualifications, except where they discuss training on inspection procedures. However, we found the following example of training during the audit: U.S. Army Corps of Engineers' Dam Safety Course.

Table 3. Qualifications of Installation Dam Inspectors Consistent With Federal Guidelines

| Military Service Installations | Inspector Qualifications Consistent With Guidelines | | | |
|--------------------------------|---|---------|--------------|----------|
| | Formal | Special | Intermediate | Informal |
| Fort Campbell | Y | N | Y | N |
| Fort Bragg | Y | N | Y | N |
| MCB Camp Pendleton | Y | N | N | N |
| MCB Quantico | Y | N | N | N |
| NSA Crane | Y | N | N | N |
| NWS Seal Beach | Y | N | N | N |
| Arnold AFB | Y | N | Y | N |
| Air Force Academy | Y | Y | Y | Y |

Seven installations used U.S. Army Corps of Engineers (USACE) personnel, and the Air Force Academy used 10th Civil Engineer Squadron contractors, as inspectors to perform formal inspections. These inspectors were professional engineers with specialized training that was consistent with Federal guidelines. For example, members of the USACE team that performed formal inspections of the MCB Camp Pendleton dams were professional engineers with specialization in geotechnical engineering and hydrology.⁶

For the special, intermediate, and informal inspections, the inspectors were not always qualified in accordance with Federal guidelines. For example, at MCB Quantico, personnel were not qualified to perform all three types of inspections. MCB Quantico engineering personnel did not have dam safety training, and the facilities maintenance personnel and operating personnel at the water treatment plant were not trained to identify abnormal conditions in earth embankment dams. Federal guidelines state that personnel involved in inspections should be trained for the requirements of these duties. The training should cover:

- information needed to prepare for inspections;
- critical features that should be observed;
- inspection techniques; and
- preparation of inspection reports.

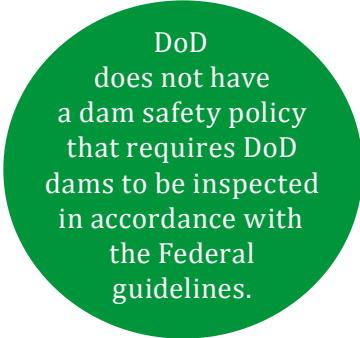
⁶ Geotechnical engineering is a science that applies geology to engineering. Geology is a science that studies rocks and layers of soil. Hydrology is a science dealing with the distribution and circulation of water on and below the earth's surface.

DoD and the Services Lack Adequate Dam Safety Inspection Policy

There is no DoD-level policy that implements the Federal guidelines or requires dam safety inspections. The Army and Navy each issued dam safety policy, but their policies were not consistent with the Federal guidelines. For example, the Navy policy did not require installations to designate dam safety management and include responsibilities for dam safety inspections. Both the Army and Navy policies did not require periodic reviews of dam safety inspection procedures.

No DoD Dam Safety Inspection Policy

DoD does not have a dam safety policy that requires DoD dams to be inspected in accordance with the Federal guidelines. The Federal guidelines state that the heads of Federal agencies are responsible for the development and implementation of policy, resources, and procedures for the safe design, construction, operation, and inspection of each dam under their jurisdiction. Additionally, Federal guidelines state that the heads of Federal agencies should establish a dam safety office (officer) which reports directly to the head of the agency or designated representative; however, DoD has not established a dam safety office. Dam safety office (officer) responsibilities include surveillance and evaluation of the agency's administrative and technical or regulatory practices related to dam safety; recommending improvements in the practices when evaluation reveals safety-related deficiencies; and maintaining an inventory of agency dams. Since the Under Secretary of Defense for Acquisition, Technology, and Logistics is responsible for establishing policies and procedures for the management of DoD installations and environment to support military readiness, the Under Secretary should develop and oversee the implementation of DoD dam safety policy across the Services. Developing DoD policy requiring the implementation of Federal guidelines, which define inspection frequency, scope, and qualifications and outline the need to develop and maintain inspection support documentation; will provide consistency and clear direction regarding dam safety inspections across the Military Services and their installations.



DoD does not have a dam safety policy that requires DoD dams to be inspected in accordance with the Federal guidelines.

Inconsistent Dam Safety Policy Across the Services

Dam safety policy across the Services was inconsistent, and was not always consistent with the Federal guidelines. The Army and Navy each had Service-level policies requiring dam safety inspections and the implementation of Federal guidelines for the inspections. However, their Service-level policies were not always consistent with the Federal guidelines. For example, the Army policy did not require reviews of dam safety inspection procedures as prescribed in the Federal guidelines. The Navy policy did not include a requirement for installations to designate dam safety inspection responsibilities or ensure qualified personnel performed inspections, as identified in the Federal guidelines. Neither the Air Force nor the Marine Corps had Service-level policy for dam safety inspections. Also, only one of the eight installations visited—the Air Force Academy—had installation level policy governing dam safety inspections. However, that installation policy followed the Colorado dam safety inspection policy, which did not always align with the Federal guidelines. To provide consistent and clear direction and ensure adequate dam safety inspections, Military Service Secretaries should implement a dam safety program throughout their Service installations that is based on the DoD-level policy, when issued.



Dam safety policy across the Services was inconsistent, and was not always consistent with the Federal guidelines.

Adequate Dam Safety Inspections Could Reduce Repair Costs and Prevent Dam Failure

~~(FOUO)~~ Without an adequate inspection process, the cost of repairing dams could rise, and dams could fail, resulting in loss of life and property, and mission failure. According to the Federal guidelines, the purpose of a periodic inspection program is to verify, throughout the operating life of the project, the structural integrity of the dam and associated structures to assure protection of human life and property. Periodic inspections disclose conditions which might disrupt operation or threaten dam safety in time for them to be corrected. Vegetation is a problem with dams. Uncontrolled vegetation can conceal animal burrowing and erode the dam's structure, which can lead to dam failure. Tree roots can destroy structural components of the dam (spillways and outlets). Of the 47 dams reviewed, the inspection reports identified 31 dams that could not be thoroughly inspected mainly because of vegetation issues. For example, the ^{(b) (7)(E), (b) (7)(F)} [redacted] dams at ^{(b)(7)(E) (b)(7)(F)} [redacted] had vegetation and deterioration of the dams' structures.

(FOUO) The (b) (7)(E), (b) (7)(F) dams (b) (7)(E), (b) (7)(F) hold water for the (b) (7)(E), (b) (7)(F) water supply. During the 2009 formal inspection of those dams, the USACE inspection team determined that vegetation obstructed visual inspection of the structural components, revealed cracking of the (b) (7)(E), (b) (7)(F) dam, shown in Figure 3, and recommended more in-depth investigation of the structures. During our observations of (b) (7)(E), (b) (7)(F) dams in April 2014, cracking of the (b) (7)(E), (b) (7)(F) dam still existed.



(FOUO) Based on the “Probable Maximum Flood” computation,⁷ if the (b) (7)(E), (b) (7)(F) dam failed, it could cause portions of (b) (7)(E), (b) (7)(F), including (b) (7)(E), (b) (7)(F), to flood up to (b) (7)(E), (b) (7)(F). (b) (7)(E), (b) (7)(F)

(FOUO) When intermediate and informal inspections are consistently conducted in accordance with the Federal guidelines, unusual circumstances or changes in parts of the dam’s structure can be detected. Had (b) (7)(E), (b) (7)(F) personnel conducted intermediate and informal inspections, conditions such as excess vegetation could have been addressed. Additionally, the cracks in the concrete wall of the (b) (7)(E), (b) (7)(F) dam may have been detected before the damage became expensive

⁷ According to Federal guidelines, “Probable Maximum Flood” is a flood that would result from the most severe combination of critical meteorological and hydrologic conditions possible in the region.

~~(FOUO)~~ to repair. USACE inspectors estimated in 2010 that the repairs to the (b)(7)(E) (b)(7)(F) dams would cost from \$1.99 million to \$5.79 million, and \$0.56 million, respectively, depending on the repair alternative. As of our visit to (b)(7)(E) (b)(7)(F) in April 2014, there were no repairs to the dams. However, on September 29, 2014, USACE awarded a contract for \$8.22 million on behalf of (b)(7)(E) (b)(7)(F) for dam repairs. The contract amount allocated to the (b)(7)(E) (b)(7)(F) dams was \$5.74 million, and \$0.89 million, respectively.

Management Actions Taken During the Audit

During the audit, the Marine Corps and Navy initiated actions to address the lack of adequate dam safety inspection guidance. In late April 2014, the Commandant of the Marine Corps issued a policy that required Marine Corps installation dams to be inspected by the USACE every 3 years. In June 2014, Headquarters, Naval Facilities Engineering Command personnel updated Navy policy to establish guidance for installation dam safety inspections. Although both policies were not fully consistent with the periodic inspection program outlined in Federal guidelines, we consider this a step toward improvement.

Recommendations, Management Comments, and Our Response

Recommendation 1

We recommend that the Under Secretary of Defense for Acquisition, Technology, and Logistics establish DoD dam safety inspection policy that is in accordance with the Federal Guidelines for Dam Safety, which define inspection frequency, scope, and inspector qualifications and outline the need to develop and maintain inspection support documentation.

Management Comments Required

The Under Secretary of Defense for Acquisition, Technology, and Logistics, did not respond to the recommendations in the report. We request that the Under Secretary of Defense for Acquisition, Technology, and Logistics provide comments on the final report.

Recommendation 2

We recommend that the Secretaries of the Army, Navy, and the Air Force, and the Commandant of the Marine Corps, implement a dam safety inspection program in accordance with DoD dam safety inspection policy, after that policy is issued.

Department of the Army Comments

The Deputy Assistant Secretary of the Army for Installations, Housing and Partnerships, responding for the Assistant Secretary of the Army Installations, Energy and Environment, agreed, stating that the Army will update Army Regulation 420-1 after DoD issues a dam safety inspection policy pursuant to Recommendation 1. The Deputy Assistant Secretary also stated that the Army's existing dam safety inspection program, detailed in Army Regulation 420-1, complies with Public Law and Federal Guidelines for Dam Safety.

Our Response

Comments from the Deputy Assistant Secretary of the Army for Installations, Housing and Partnerships meet the intent of the recommendation. We disagree that the Army's dam safety inspection program fully complies with Federal guidelines. For example, as outlined in the report, the Army policy does not require periodic reviews of dam safety inspection procedures as included in the Federal guidelines. However, updates to the Army guidance, based on the new DoD dam safety policy, should ensure that the regulation meets the guidelines. Therefore, no additional comments are required.

Secretary of the Navy Comments Required

The Secretary of the Navy did not respond to the recommendations in the report. We request that the Secretary of the Navy provide comments on the final report.

Secretary of the Air Force Comments Required

The Secretary of the Air Force did not respond to the recommendations in the report. We request that the Secretary of the Air Force provide comments on the final report.

Commandant of the Marine Corps Comments

The Staff Director, responding for the Commandant of the Marine Corps, agreed and stated that by December 31, 2014, the Commandant of the Marine Corps will issue guidance that conforms with Section 215 of Public Law 104-303, "Water Resources Development Act of 1996," and the Federal Guidelines for Dam Safety. The Marine Corps will update its new guidance to conform with the new DoD dam safety inspection policy as needed.

Our Response

The Staff Director did not specifically state that the Marine Corps would develop a dam safety inspection program. However, issuance of guidance that conforms with the Public Law, the Federal Guidelines for Dam Safety, and the new DoD dam safety inspection policy meets the intent of the recommendation. Therefore, no additional comments are required.

Appendix A

Scope and Methodology

We conducted this performance audit from October 2013 through November 2014 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 objective.

To accomplish our audit, we reviewed available DoD dam safety inspection reports from 2008 through 2013. We selected dams that were owned and managed by the Army, Marine Corps, Navy, and Air Force. We excluded dams managed by USACE because those are public dams that do not directly affect DoD missions or personnel readiness and are not managed with DoD appropriations. We reviewed Public Laws, Federal, DoD, Army, and Marine Corps guidelines, regulations, and memorandums with publication dates ranging from 1986 to 2014. We interviewed officials who were responsible for installations, facilities, and maintenance from the following entities.

- Deputy Under Secretary of Defense for Installations and Environment;
- Headquarters, USACE, Washington D.C.;
- Headquarters, Naval Facilities Engineering Command, Washington, D.C.;
- Headquarters, Marine Corps, Arlington, Virginia;
- Fort Campbell, Kentucky;
- Fort Bragg, North Carolina;
- NSA Crane, Indiana;
- NWS Seal Beach, California;
- MCB Camp Pendleton, California;
- MCB Quantico, Virginia;
- Air Force Academy, Colorado; and
- Arnold AFB, Tennessee.

During those interviews, we:

- identified personnel responsible for the management of dams within the Army, Marine Corps, Navy, and Air Force;
- obtained and compared applicable criteria to the actual procedures and methods used to ensure dams are operational, maintained, and structurally stable;
- determined the adequacy of Service-level policies and procedures based on Federal and USACE dam safety best practices related to inspections and maintenance;
- obtained and analyzed available inspection results for each selected dam to determine if inspections were performed on time, identified issues as intended, and were reported so that responsible officials could take appropriate and timely action when needed; and
- determined if personnel responsible for dam safety and for performing inspections were qualified engineers.

We selected a nonstatistical sample of 47 dams on 8 installations from a universe of 322 Military Service owned and managed dams. We selected locations with a combination of two or more Military Services or Hazard Potential Classifications and geographic proximity to each other.

Engineers from the DoD Office of Inspector General, Technical Assessment Division, provided assistance during our reviews of the dams. The Technical Assessment Division engineers and the team physically observed conditions at 28 of the 47 dams reviewed. Icy conditions at NSA Crane prevented physical observation of one dam.

We reviewed the following Federal guidelines.

- FEMA 64, "Emergency Action Planning for Dam," July 2013;
- FEMA 65, "Earthquake Analysis and Design of Dams," May 2005;
- FEMA 93, "Federal Guidelines for Dam Safety," April 2004;
- FEMA P-94, "Selecting and Accommodating Inflow Design Floods for Dams," August 2013;
- FEMA 145, "Dam Safety: An Owner's Guidance Manual," December 1986;
- FEMA 333, "Hazard Potential Classification System for Dams," April 2004; and
- FEMA 534, "Technical Manual for Dam Owners: Impacts of Plants on Earthen Dams," September 2005.

Use of Computer-Processed Data

We did not rely on computer-processed data to support our audit findings and conclusions.

Use of Technical Assistance

We consulted with the DoD Office of Inspector General, Quantitative Methods Division, while determining our nonstatistical audit sample. Also, engineers within the DoD Office of Inspector General, Technical Assessment Directorate, assisted us in determining whether the dam safety inspections adequately assessed the operations, maintenance, and structural stability of DoD dams and accompanied us on site visits to visually assess dam conditions.

Prior Coverage

No prior coverage has been conducted on DoD dam safety during the last 5 years.

~~(FOUO)~~ Appendix B

~~(FOUO)~~ Dams Reviewed by Installation and Hazard Potential

| Military Service Installation | Dam | (FOUO) Hazard Potential |
|----------------------------------|------------------------|------------------------------------|
| (FOUO) Army | | |
| Fort Bragg, North Carolina | Big Muddy Lake | (b) (7)(E), (b) (7)(F) |
| | Hutaff Lake | |
| | Kiest Lake | |
| | Lake Lindsey | |
| | Little Muddy Lake | |
| | McArthur Lake | |
| | McFadyen Lake | |
| | McKellars Lake (Upper) | |
| | Mott Lake | |
| | Simmons Fields Lake | |
| | Smith Lake | |
| | Texas Pond | |
| | Andrews Church Lake | |
| | Boundary Line Lake | |
| | Holland Lake | |
| | Hurley Lake | |
| | McKellars Lake (Lower) | |
| | McKiethan Lake | |
| | Overhills No. 1 | |
| | Water Treatment Plant | |
| Water Treatment Plant (Upstream) | | |
| Wyatt Lake | | |
| Subtotal | | 22 |
| Fort Campbell, Kentucky | Lake Taal | (b) (7)(E), (b) (7)(F) |
| | Golden Eagle | |
| | Lake Kyle | |
| Subtotal | | 3 |

~~(FOUO)~~ Dams Reviewed by Installation and Hazard Potential (cont'd)

| Military Service Installation | Dam | (FOUO) Hazard Potential |
|--------------------------------------|-------------------------|------------------------------------|
| (FOUO) Marine Corps | | |
| MCB Camp Pendleton, California | Lake O'Neill | (b)(7)(E), (b)(7)(F) |
| | Pilgrim Creek Lake | |
| | Pulgas Lake | |
| | Case Springs | |
| Subtotal | | 4 |
| MCB Quantico, Virginia | Breckenridge | (b)(7)(E), (b)(7)(F) |
| | Lunga | |
| | Dalton Pond | |
| Subtotal | | 3 |
| (FOUO) Navy | | |
| NWS Seal Beach, California | Lake Norconian South | (b)(7)(E), (b)(7)(F) |
| | Lake Norconian West | |
| Subtotal | | 2 |
| NSA Crane, Indiana | Greenwood Lake | (b)(7)(E), (b)(7)(F) |
| | Seed Tick | |
| | Lake Gallimore | |
| Subtotal | | 3 |
| (FOUO) Air Force | | |
| Air Force Academy, Colorado | Kettle Creek Dry | (b)(7)(E), (b)(7)(F) |
| | Non-Potable Reservoir 1 | |
| | Kettle Lake 2 | |
| | Kettle Lake 3 | |
| | Non-Potable Reservoir 2 | |
| | Non-Potable Reservoir 3 | |
| | Non-Potable Reservoir 4 | |
| Subtotal | | 7 |
| Arnold AFB, Tennessee | Elk River | (b)(7)(E), (b)(7)(F) |
| | Secondary Reservoir | |
| | Retention Reservoir | |
| Subtotal | | 3 |
| TOTAL NUMBER OF DAMS REVIEWED | | 47 |

Management Comments

Department of the Army



DEPARTMENT OF THE ARMY
OFFICE OF THE ASSISTANT SECRETARY OF THE ARMY
INSTALLATIONS, ENERGY AND ENVIRONMENT
110 ARMY PENTAGON
WASHINGTON DC 20310-0110

SAIE-IHP

08 DEC 2014


MEMORANDUM FOR Inspector General, Department of Defense, 4800 Mark Center Drive, Alexandria, VA 22350-1500

SUBJECT: DoDIG Draft Report: DoD Needs Dam Safety Inspection Policy to Enable the Services to Detect Conditions That Could Lead to Dam Failure

1. Thank you for the opportunity to comment on the subject draft report. The Army is asked to comment on recommendation #2:

We recommend that the Secretaries of the Army, Navy, and the Air Force, and the Commandant of the Marine Corps, implement a dam safety inspection program in accordance with DoD dam safety inspection policy, after that policy is issued.

2. The Army's dam safety inspection program is detailed in Army Regulation 420-1, chapter 7, section VI. The inspection program is in compliance with Public Law and Federal Guidelines for Dam Safety as established by the Federal Emergency Management Agency (FEMA) of the Department of Homeland Security. The Army concurs with recommendation #1 in that DoD publish a dam safety inspection program policy. The Army will comply with recommendation #2 by updating Army Regulation 420-1 after DoD issues a dam safety inspection program policy.


Deputy Assistant Secretary of the Army
Installations, Housing and Partnerships

Commandant of the Marine Corps



DEPARTMENT OF THE NAVY
HEADQUARTERS UNITED STATES MARINE CORPS
3000 MARINE CORPS PENTAGON
WASHINGTON, DC 20350-3000

IN REPLY REFER TO:
7510
DMCS-A

12 DEC 2014

From: Commandant of the Marine Corps
To: Program Director, Readiness and Cyber Operations, Office
of the Inspector General, U.S. Department of Defense

Subj: DEPARTMENT OF DEFENSE INSPECTOR GENERAL DRAFT AUDIT
REPORT, PROJECT NO. D2014-D000RA-0061.000, DOD NEEDS DAM
SAFETY INSPECTION POLICY TO ENABLE THE SERVICES TO DETECT
CONDITIONS THAT COULD LEAD TO DAM FAILURE, DATED
NOVEMBER 7, 2014

Ref: (a) DODIG Memo of November 7, 2014 on D2014-D000RA-0061

Encl: (1) Marine Corps Responses

1. Official response required by the reference is provided at the enclosure.
2. The Marine Corps appreciates the opportunity to respond to the draft report.
3. If you have any questions about the response, please contact



Staff Director

Copy to:
NAVINGEN (N11)
DC, I&L

Commandant of the Marine Corps (cont'd)

**DEPARTMENT OF DEFENSE INSPECTOR GENERAL (DODIG) DRAFT REPORT
DATED 7 NOVEMBER 2014
PROJECT # D2014-D000RA-0061**

**"DOD NEEDS DAM SAFETY INSPECTION POLICY TO ENABLE THE
SERVICES TO DETECT CONDITIONS THAT COULD LEAD TO DAM
FAILURE"**

**UNITED STATES MARINE CORPS COMMENTS
TO THE DODIG RECOMMENDATIONS**

RECOMMENDATION 2: DODIG recommends that the Secretaries of the Army, Navy, and the Air Force, and the Commandant of the Marine Corps, implement a dam safety inspection program in accordance with DoD dam safety inspection policy, after that policy is issued.

USMC RESPONSE: Concur with Recommendation 2. In advance of any DOD dam safety inspection policy, the Commandant of the Marine Corps will be issuing guidance that conforms Section 215 of Public Law 104-303, "Water Resources Development Act of 1996," and FEMA Federal Guidelines for Dam Safety (Federal Guidelines) by 31 December 2014. This policy will be updated to conform with any DoD dam safety inspection policy, after that policy is issued as needed.

Encl (1)

Acronyms and Abbreviations

- AFB** Air Force Base
- MCB** Marine Corps Base
- NSA** Naval Support Activity
- NWS** Naval Weapon Station
- PWD** Public Works Department
- USACE** U.S. Army Corps of Engineers

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U.S. DEPARTMENT OF DEFENSE

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For more information about DoD IG reports or activities, please contact us:

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