



December 2013

DEFENSE MANAGEMENT

Further Analysis Needed to Identify Guam's Public Infrastructure Requirements and Costs for DOD's Realignment Plan

GAO Highlights

Highlights of [GAO-14-82](#), a report to congressional committees

Why GAO Did This Study

In 2006, the United States and Japan planned to relocate 17,600 U.S. Marines and dependents from Japan to Guam. However, in 2012, representatives from the countries developed a revised plan under which 6,300 Marines and dependents would relocate to Guam.

The Conference Report accompanying the National Defense Authorization Act for Fiscal Year 2013 mandated that GAO evaluate what Guam public infrastructure projects are needed to support DOD's plans. This report (1) describes Guam's public infrastructure; (2) describes the types of assistance DOD generally provides and other funding sources that have been used to fund Guam projects; (3) assesses DOD's efforts to revalidate Guam projects under the revised realignment plan; and (4) assesses the cost estimate for Guam's public water and wastewater infrastructure improvements used to support DOD budget requests. To address these objectives, GAO reviewed policies, technical studies, and budget requests. GAO also interviewed DOD and other relevant federal officials as well as visited Guam and met with Guam officials.

What GAO Recommends

GAO recommends that DOD take actions to revalidate public infrastructure needs on Guam based on the revised realignment size and ensure best practices are used to develop future cost estimates. DOD partially concurred with GAO's recommendations and identified future plans. However, GAO believes further opportunities exist as discussed in the report.

View [GAO-14-82](#). For more information, contact Johana Ayers at 202-512-5741 or ayersj@gao.gov.

DEFENSE MANAGEMENT

Further Analysis Needed to Identify Guam's Public Infrastructure Requirements and Costs for DOD's Realignment Plan

What GAO Found

Some investments have been made to improve Guam's public infrastructure in recent years, but many deficiencies and regulatory compliance issues continue to exist. The reliability, capacity, and age of much of the public infrastructure—especially the island's utilities—indicate a need for additional upgrades to be able to meet current and future demands related to the realignment. Further, some infrastructure sectors, such as water and wastewater, face issues complying with federal regulations. Other sectors, such as the fire and police departments, are experiencing staffing and other shortages that affect their ability to serve Guam's current population.

The majority of the Department of Defense's (DOD) support to defense-affected communities has been historically to provide technical assistance and support community planning and coordination efforts. However, in a few instances DOD has provided public infrastructure funding to communities where proposed basing decisions would generate significant public infrastructure needs that the communities could not support. Generally, DOD's position is that communities should be largely responsible for obtaining funding for public infrastructure requirements related to DOD basing decisions. This funding can come from other federal programs or communities can raise the funds on their own. In the case of Guam, however, some challenges related to limited government revenues and debt capacity has been identified as affecting its ability to do so.

Despite the reduction of Marines and dependents relocating to Guam, DOD has not yet revalidated the public infrastructure requirements based on the revised realignment plan or differentiated between requirements needed to address long-standing conditions and those related to the realignment. This revalidation is not expected to be completed until 2015. Even so, DOD has requested over \$400 million for Guam public infrastructure projects in its budget requests since fiscal year 2012. It is unclear if all of these projects are necessary to the same extent given the reduction in forces. For example, if DOD decides to locate the Marines on the naval base that handles all of its own water/wastewater needs, public water/wastewater improvements would not be needed to support the Marines. Congress has placed limitations on the use of funding, in part until certain information is provided related to the realignment. Without revalidating and differentiating between requirements, DOD cannot clearly identify what Guam public infrastructure requirements are needed to directly support the realignment.

The \$1.3 billion cost estimate for improvements to Guam's water and wastewater systems that DOD has used to support budget requests for fiscal years 2013 and 2014 is not reliable. GAO assessed that the estimate minimally met the best practice criteria for three of the four key characteristics—comprehensive, well documented, and accurate—for a reliable cost estimate as identified in the GAO *Cost Estimating and Assessment Guide* and did not satisfy best practice criteria for the fourth characteristic of being credible. GAO determined that officials adhered to some best practices for a reliable estimate but did not, for example,

- include all relevant costs,
- sufficiently explain why certain assumptions and adjustments were made,
- incorporate any actual costs or inflation adjustments, or
- adequately address risk and uncertainty.

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Abbreviations

BRAC	Base Realignment and Closure
DOD	Department of Defense
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
JGPO	Joint Guam Program Office
OEA	Office of Economic Adjustment
OMB	Office of Management and Budget

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December 17, 2013

Congressional Committees

Given its strategic location, Guam serves as an important staging base and operating location for mobilizing U.S. military forces and equipment within Asia and the western Pacific. In May 2006, the Security Consultative Committee issued the United States-Japan Roadmap for Realignment Implementation (2006 Roadmap) under which the U.S. government anticipated relocating some military forces and their dependents from Okinawa, Japan, to Guam by 2014.¹ At that time, the plan was for approximately 8,600 Marines and 9,000 dependents to move to Guam. The Department of Defense (DOD) previously estimated that at least \$1.3 billion was needed to improve Guam's public infrastructure to accommodate this relocation. Guam's public infrastructure includes the utilities, methods of transportation, equipment, or facilities under the control of a public entity, such as a power authority, or local government for use by the public to support the realignment of forces and dependents.² However, after 6 years of unsuccessful attempts to implement the 2006 Roadmap, the Security Consultative Committee announced in a joint statement in April 2012 a revised realignment plan under which approximately 5,000 Marines and 1,300 dependents would be moved to Guam—approximately 64 percent less than the original plan.³ This revised realignment plan has prompted DOD to review the

¹The Security Consultative Committee includes the U.S. Secretaries of State and Defense and Japan's Minister of Foreign Affairs and Minister of State for Defense. See United States-Japan Security Consultative Committee Document, U.S.-Japan Roadmap for Realignment Implementation (May 1, 2006). A 2009 agreement between the United States and Japan reaffirmed and implemented parts of the Roadmap. See Agreement Concerning the Implementation of the Relocation of III Marine Expeditionary Force Personnel and Their Dependents from Okinawa to Guam, U.S.-Japan, Feb. 17, 2009, Temp. State Dep't No. 09-89.

²The definition of public infrastructure used for this report is based on the definition contained in the National Defense Authorization Act for Fiscal Year 2013. Section 2832 of that Act defined "public infrastructure" as any utility, method of transportation, item of equipment, or facility under the control of a public entity or state or local government that is used by, or constructed for the benefit of, the general public. See Pub. L. No. 112-239, § 2832(d)(2) (2013).

³See United States-Japan Security Consultative Committee, Joint Statement of the Security Consultative Committee (Apr. 26, 2012).

actions previously planned for Guam under the 2006 Roadmap and their effects on Guam, including those related to the island's public infrastructure.

We have previously reported on the challenges associated with Guam's public infrastructure and the realignment of U.S. forces. For example, we found in 2009 that Guam's public infrastructure would likely be inadequate to meet the increased demand resulting from the original 2006 Roadmap realignment plan and that Guam would need to significantly expand its existing public infrastructure for electric power generation, potable water production, wastewater collection and treatment, and solid waste collection and disposal to provide the needed additional utility capacity.⁴ In that we report, we recommended that DOD develop a comprehensive plan for DOD's Guam utility development efforts to be included with DOD's comprehensive Guam master plan. DOD concurred with the recommendation. As we found in May 2013, however, DOD continues to lack an integrated master plan for its current overall Asia posture realignment, including its current plans for Guam, and has not updated its list of utilities and other public infrastructure requirements for Guam.⁵ We, therefore, recommended that as the master planning process continues over the next several years, DOD should develop annual updates on the status of planning efforts for appropriate congressional committees until such time as the master plans are completed for each geographic segment of the realignment. These updates should include, but not be limited to, providing congressional committees with up-to-date information on the status of initiatives, identified requirements and time frames, and any updated cost information linked to specific facilities or projects. DOD concurred and stated that it will provide updates through the completion of the master planning process.

In addition, congressional committees have discussed the uncertainty surrounding cost and schedule information regarding the realignment of

⁴GAO, *Defense Infrastructure: Planning Challenges Could Increase Risks for DOD in Providing Utility Services When Needed to Support the Military Buildup on Guam*, [GAO-09-653](#) (Washington, D.C.: June 30, 2009).

⁵GAO, *Defense Management: More Reliable Cost Estimates and Further Planning Needed to Inform the Marine Corps Realignment Initiatives in the Pacific*, [GAO-13-360](#) (Washington, D.C.: June 11, 2013).

U.S. forces to Guam.⁶ With specific respect to Guam's public infrastructure, the Senate Armed Services Committee noted in 2012 that, until provided with details to adequately assess the strategic impact, feasibility, and affordability of realignment initiatives, it was unwilling to authorize further obligations of funds for projects on Guam in support of the relocation, to include investments proposed for public facility and infrastructure requirements.⁷ In 2011 and 2013, Congress restricted the use of certain DOD funds to support the realignment of Marines until DOD provided to the congressional defense committees' specified information related to its plans to move units to Guam and its overall posture in the Pacific.⁸ The restrictions also imposed limitations on the use of DOD funds for the development of public infrastructure.⁹

The Conference Report accompanying the National Defense Authorization Act for Fiscal Year 2013 mandated that we review the public infrastructure required to support the realignment of U.S. forces to Guam.¹⁰ In this report, we (1) describe the existing condition of Guam's public infrastructure; (2) describe the types of assistance DOD generally provides to defense-affected communities and what other funding sources have been used to fund Guam public infrastructure projects; (3) assess DOD's efforts to revalidate DOD's public infrastructure requirements under the revised realignment plan and differentiate

⁶ See, e.g., H.R. Rep. No. 112-705, at 867-68, 969-70 (2012) (Conference Report, accompanying the National Defense Authorization Act for Fiscal Year 2013); S. Rep. No. 112-173, at 257, 258-59 (2012) (Senate Armed Services Committee report, accompanying a bill for the National Defense Authorization Act for Fiscal Year 2013); S. Rep. No. 112-29, at 8-11 (2011) (Senate Appropriations Committee report, accompanying the Military Construction and Veterans Affairs, and Related Agencies Appropriation Bill, 2012).

⁷ See S. Rep. No. 112-173, at 259. The Committee noted in 2013 that it remained concerned about funds requested for certain Guam public infrastructure projects. See S. Rep. No. 113-44, at 82-83 (2013).

⁸ See Pub. L. No. 112-239, § 2832 (2013) and Pub. L. No. 112-81, § 2207 (2011). Section 2832(e) of the National Defense Authorization Act for Fiscal Year 2013 superseded and repealed section 2207 of the National Defense Authorization Act for Fiscal Year 2012. In addition to the information to be provided by DOD, both provisions also required the submission to the congressional defense committees of a plan coordinated by all pertinent federal agencies, see § 2832(a)(4) and § 2207(a)(4), and contained certain exceptions to the restriction. See § 2832(c) and § 2207(c).

⁹ See § 2832(b) and § 2207(b).

¹⁰ See H.R. Rep. No. 112-705, at 976.

between requirements that address Guam's current public infrastructure needs and those related to the realignment; and (4) assess the extent to which the cost estimate for Guam's public water and wastewater infrastructure improvements used to support DOD budget requests was developed according to the characteristics of a reliable cost estimate.

For each of our objectives, we collected information by interviewing and communicating with officials from the relevant offices within DOD, the Department of the Interior, and other federal agencies that have been assisting Guam to prepare for the realignment. We also conducted a site visit in April 2013 to Guam, where we interviewed the Governor, Speaker of the Guam Legislature, other Guam legislators, Guam Auditor General, and various officials from 12 Government of Guam agencies and departments representing the various public infrastructure sectors on Guam likely to be affected by the realignment. The public infrastructure sectors covered by our review were chosen based on inclusion in (1) prior Government of Guam and DOD project lists developed for the 2006 Roadmap realignment plan, (2) DOD budget requests, (3) prior GAO reports on the realignment of U.S. forces to Guam, and (4) federal agency inspector general reports, as well as those sectors identified by Government of Guam and DOD officials during our interviews. The following eight sectors are included in our review: electric power, water and wastewater, port, solid waste, public health, law enforcement, fire department, and education infrastructure. The highways and other roads sector is not included in our review because Government of Guam and DOD officials did not identify it as a sector likely to be adversely affected by the realignment since existing programs and agencies, such as the Defense Access Roads¹¹ and the Department of Transportation's Federal Highway Administration, are currently allocating funds for road and highway improvements on Guam.

¹¹The Defense Access Roads program provides a method for DOD to pay a fair share for public highway improvements required as a result of sudden or unusual defense-generated traffic impacts or unique defense public highway requirements. Projects may be eligible for funding under the following five criteria: (1) a new access road to an installation is needed to accommodate a defense action, (2) a defense action causes traffic to double, (3) urgent improvements are needed to accommodate a temporary surge in traffic to or from an installation due to a defense action, (4) a new or improved access road is needed to accommodate special military vehicles, such as heavy equipment transport vehicles, or (5) a road is needed to replace one closed for defense needs.

To describe the existing condition of Guam’s public infrastructure, we reviewed federal inspector general reports, technical studies and business case analyses, and questionnaires conducted by DOD for the revised realignment plan. To describe the types of assistance DOD generally has provided to defense-affected communities and the other types of funding sources that have been used to fund Guam public infrastructure projects, we reviewed past congressional hearings records, DOD documents, and community impact analyses to determine previous instances of DOD providing public infrastructure funding to communities as well as Guam’s single audit report schedule of expenditures of federal grant awards to identify examples of non-DOD, federal grant programs from which the Government of Guam has received infrastructure funding. To assess DOD’s efforts to revalidate public infrastructure requirements under the revised realignment plan and differentiate between requirements that address Guam’s current public infrastructure needs and those related to the realignment, we reviewed information on DOD and the Government of Guam’s planning activities related to public infrastructure improvements needed to support the revised realignment plan and compared this information to previous public infrastructure lists developed by the Government of Guam, DOD, and other federal entities to support the 2006 Roadmap realignment plan. To determine the extent to which the cost estimate for Guam’s public water and wastewater infrastructure improvements used by DOD to support its budget requests was developed according to the characteristics of a reliable cost estimate, we reviewed the cost estimating methodology and compared them to the cost estimating guidance in GAO’s *Cost Estimating and Assessment Guide: Best Practices for Developing and Managing Capital Program Costs*.¹² To determine the reliability of the numerical data provided to us by DOD organizations for all of our objectives, we collected information on how the data was collected, managed, and used through interviews of relevant DOD and federal agency officials. By assessing this information against GAO data quality standards,¹³ we determined that the data presented in our findings were sufficiently reliable for the purposes of this

¹²GAO, *Cost Estimating and Assessment Guide: Best Practices for Developing and Managing Capital Program Costs*, [GAO-09-3SP](#) (Washington, D.C.: Mar. 2, 2009). This guide is a compilation of best practices that federal cost estimating organizations and industry use to develop and maintain reliable cost estimates throughout the life of a government acquisition program.

¹³GAO, *Assessing the Reliability of Computer-Processed Data*, [GAO-09-680G](#) (Washington, D.C.: July 1, 2009).

report. Appendix I provides a more detailed description of our scope and methodology.

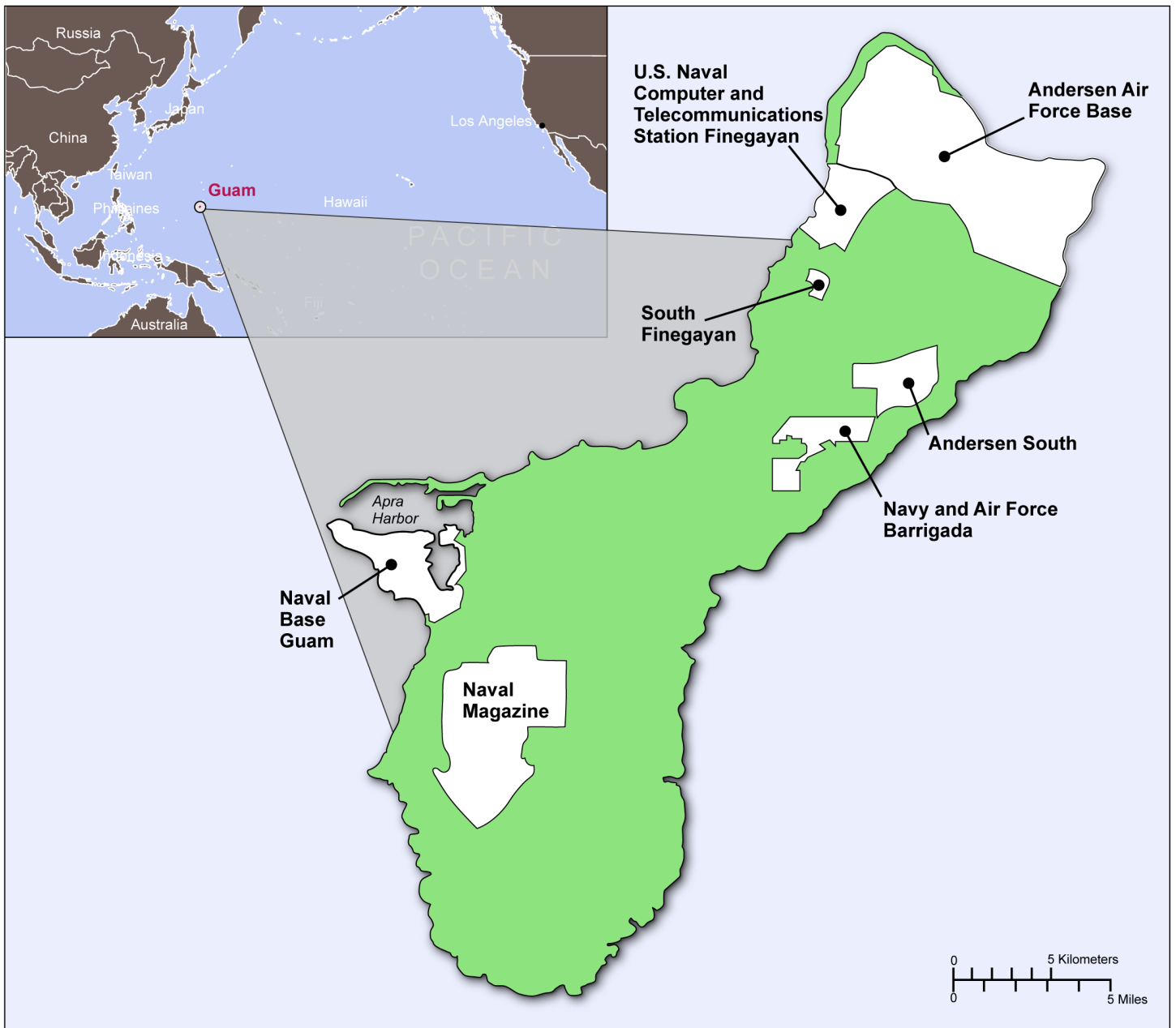
We conducted this performance audit from February 2013 through December 2013, in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

DOD's Guam Realignment Plans

Since Guam became a territory in 1898, the United States has long maintained a significant military presence on the island to support and defend U.S. interests in the western Pacific Ocean region. Guam has been the home to many different military units over the past 60 years and was especially active during the Vietnam War as a way-station for U.S. bombers. DOD currently controls about 27 percent of the island. According to the 2010 U.S. Census, Guam had a population of 159,358, an increase of 2.9 percent from the 2000 Census population of 154,805. DOD estimates that there are at least 16,400 military members and their dependents stationed on Guam. Most of the military members and dependents are attached to one of the two major military installations on the island: U.S. Naval Base Guam, located on the southwestern side of the island at Apra Harbor, and Andersen Air Force Base in the north (see figure 1).

Figure 1: Selected DOD Facilities on Guam



Source: GAO analysis of DOD data; Map Resources (map).

In 2004, the U.S. Secretaries of State and Defense and the Japanese Ministers of Foreign Affairs and Defense began a series of sustained security consultations aimed at strengthening the U.S.-Japan security alliance and better addressing the rapidly changing global security environment. The resulting U.S.-Japan Defense Policy Review Initiative established a framework for the future of the U.S. force structure in Japan and facilitated a continuing presence for U.S. forces in the Pacific theater, including the relocation of military units to Guam. The major realignment initiatives of the Defense Policy Review Initiative were ultimately outlined in May 2006 in a Security Consultative Committee document, the United States-Japan Roadmap for Realignment Implementation (2006 Roadmap)—under which the United States anticipated relocating approximately 8,000 Marines and their estimated 9,000 dependents from Okinawa, Japan, to Guam by 2014.¹⁴ The 2006 Roadmap was subsequently modified by the Security Consultative Committee in April 2012¹⁵ and DOD's current plan is to relocate approximately 5,000 personnel (mostly rotational) and 1,300 dependents to Guam as soon as appropriate facilities are available to receive them.¹⁶ DOD is in the process of determining what military and public infrastructure facilities and live-fire training ranges are necessary to support the proposed reduced realignment plan on Guam, as well as Tinian and Pagan— islands that are part of the Commonwealth of the Northern Mariana Islands.¹⁷

¹⁴Although the 2006 Roadmap referred to approximately 8,000 personnel, the Record of Decision for the Guam and Commonwealth of Northern Mariana Islands Military Relocation referred to approximately 8,600 Marines. See Department of the Army and Department of the Navy, Record of Decision for the Guam and Commonwealth of the Northern Mariana Islands Military Relocation (September 2010).

¹⁵See United States-Japan Security Consultative Committee, Joint Statement of the Security Consultative Committee (Apr. 26, 2012).

¹⁶Rotational refers to Marine Corps units that are deployed for periods of approximately 6 months to any given location.

¹⁷The Commonwealth of the Northern Mariana Islands consists of 14 islands in the western Pacific Ocean, just north of Guam and 5,500 miles from the U.S. mainland. A 1976 covenant between the Commonwealth of the Northern Mariana Islands and the United States provided for the islands' status as a self-governing commonwealth in political union with the United States. See Covenant to Establish a Commonwealth of the Northern Mariana Islands in Political Union with the United States of America, Pub. L. No. 94-241, § 101, (1976) (48 U.S.C. § 1801 note). While some provisions of the covenant went into effect in 1976 and 1978, the full covenant became effective in November 1986. See Proclamation No. 5564, 51 Fed. Reg. 40,399 (Nov. 3, 1986).

Guam Environmental Impact Statement

Before any Marines can relocate to Guam, DOD must examine the environmental effects of its proposed actions, pursuant to the National Environmental Policy Act of 1969.¹⁸ To address this requirement in the past, DOD performed an environmental review of certain proposed actions under the original 2006 realignment plan and released the Guam and Commonwealth of the Northern Mariana Islands Military Relocation Final Environmental Impact Statement (EIS)¹⁹ in July 2010.²⁰ In September 2010, the Department of the Navy announced in the Record of Decision for the Guam and Commonwealth of the Northern Mariana Islands Military Relocation that it would proceed with the Marine Corps realignment, but it deferred the selection of a specific site for a live-fire training range complex on Guam pending further study.²¹ In February 2012, the Department of the Navy gave notice that it intended to prepare a supplemental EIS²² to evaluate locations for a live-fire training range complex on Guam.²³ In October 2012, as a result of the announcement

¹⁸Pub. L. No. 91-190 (1970) (codified as amended at 42 U.S.C. §§ 4321-4347). Under the act, federal agencies must assess the effects of major federal actions—those they propose to carry out or to permit—that significantly affect the environment. The act has two principal purposes: (1) to ensure that an agency carefully considers detailed information concerning significant environmental impacts and (2) to ensure that this information will be made available to the public.

¹⁹An EIS is a document required by the National Environmental Policy Act and implementing regulations for certain major federal actions significantly affecting the quality of the human environment. See 42 U.S.C. § 4332(C); 40 C.F.R. § 1502.3. An EIS provides a full and fair discussion of significant environmental impacts and informs decisionmakers and the public of reasonable alternatives that would avoid or minimize adverse impacts or enhance the quality of the human environment. See 40 C.F.R. § 1502.1.

²⁰Department of the Navy, Final Environmental Impact Statement: Guam and CNMI Military Relocation: Relocating Marines from Okinawa, Visiting Aircraft Carrier Berthing, and Army Air and Missile Defense Task Force (July 2010).

²¹The Departments of the Navy and Army released a Record of Decision in September 2010, which announced their decision to proceed with the Guam and the Commonwealth of the Northern Mariana Islands Military Relocation. See Departments of the Navy and Army, Record of Decision for Guam and CNMI Military Relocation (Sept. 2010); 75 Fed. Reg. 60,438 (Sept. 30, 2010).

²²A supplemental environmental impact statement is a supplement to an existing EIS, conducted when the agency makes substantial changes in its proposed action or when there are significant new circumstances or information relevant to environmental concerns. See 40 C.F.R. § 1502.9(c)(1). Agencies may also prepare supplements when they determine that doing so will further the purposes of the National Environmental Policy Act. See § 1502.9(c)(2).

²³See 77 Fed. Reg. 6,787 (Feb. 9, 2012).

of the revised realignment plan, the Department of the Navy gave notice that it was planning to expand the scope of the ongoing supplemental EIS to also evaluate potential environmental consequences from the construction and operation of the main Marine installation.²⁴ According to DOD, the reduction in the number of Marines and dependents to be relocated to Guam led to a reduction in the amount of land needed for the main Marine installation area, enabling the Navy to identify and consider other alternatives than it had previously analyzed for the 2010 EIS. The expanded supplemental EIS is expected to have three major components.

1. Further evaluation of possible locations for the establishment of a Marine Corps live-fire training range complex on Guam, to include locations on Naval Computer and Telecommunications Station Finegayan, Naval Magazine Guam, and the northwest part of Andersen Air Force Base, among other locations.
2. Determination of the potential environmental consequences of constructing and operating a main Marine Corps installation at several possible locations on Guam: Naval Base Guam, Naval Computer and Telecommunications Station Finegayan, South Finegayan, federal land in the village of Barrigada, and Andersen Air Force Base.
3. Assessment of associated impacts to Guam's public infrastructure.

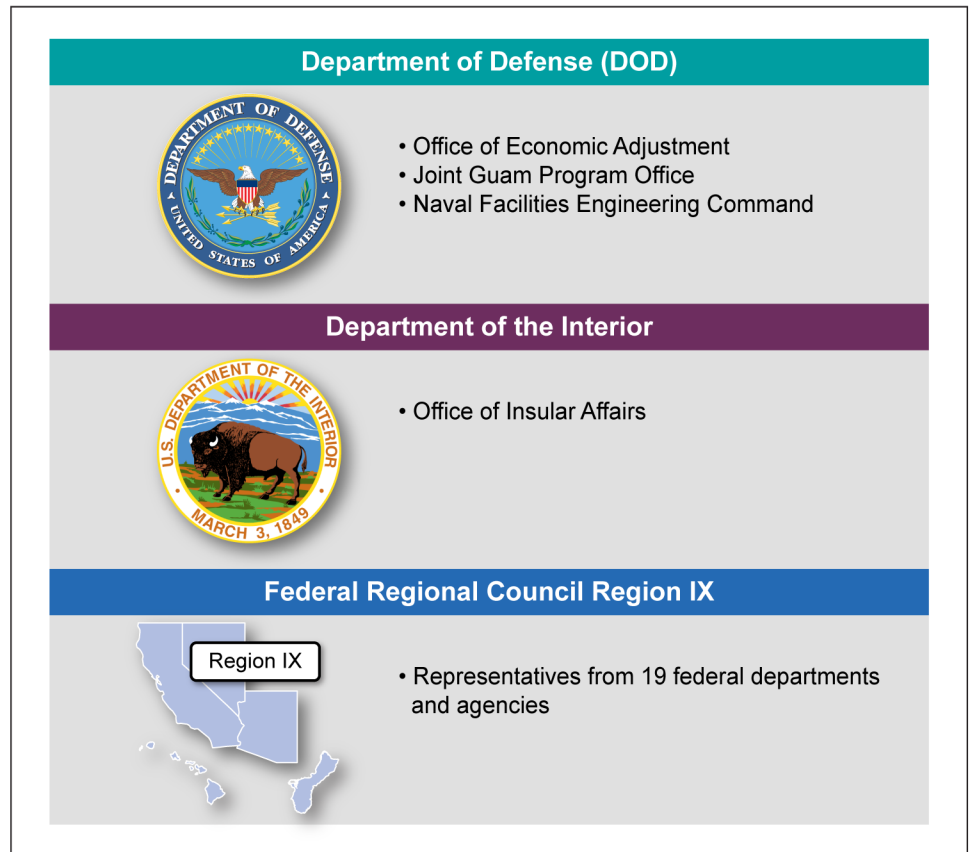
According to Marine Corps officials, the supplemental EIS is expected to be drafted by 2014, and DOD anticipates that a final decision on all matters being evaluated will be released by 2015 via a record of decision.

Federal Framework for Assisting Guam in Preparing for the Realignment

Several federal agencies have been assisting the Government of Guam in planning and preparing for the realignment of U.S. forces (see figure 2).

²⁴See 77 Fed. Reg. 61,746 (Oct. 11, 2012). The notice describes the main installation as a "main cantonment area," which will provide military support functions to relocated Marines, including family housing.

Figure 2: Federal Organizations Assisting Guam



Source: GAO analysis of DOD, Department of Interior, and Federal Regional Council information.

Within DOD, three organizations have been assisting Guam to prepare for the military realignment.

- The Office of Economic Adjustment (OEA) is a DOD field activity that reports to the Deputy Under Secretary of Defense for Installations and Environment, within the office of the Under Secretary of Defense for Acquisition, Technology, and Logistics. The office facilitates DOD resources in support of local programs and provides direct planning and financial assistance to communities and states seeking assistance to address the impacts of DOD’s actions. OEA’s assistance to growth communities is primarily focused on assisting them with organizing and planning for population growth because of DOD activities, commonly referred to as “defense-affected” communities.

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- The Joint Guam Program Office (JGPO) is the DOD office primarily engaged in developing and implementing the military realignment plans. JGPO is a Navy staff office under the direct oversight of the Assistant Secretary of the Navy for Installations and Environment. Specifically, JGPO is leading the coordinated planning efforts among the DOD components and other stakeholders to consolidate, optimize, and integrate the existing DOD infrastructure capabilities on Guam. JGPO also leads the effort to develop the ongoing supplemental EIS.
 - The Naval Facilities Engineering Command contracts for the military construction on Guam and, as the Navy's primary facilities and utilities engineering command, is also helping to prepare the supplemental EIS.

The Secretary of the Interior has administrative responsibility for coordinating federal policy for U.S. insular areas, including Guam,²⁵ regarding all matters that do not fall within the programmatic responsibility of another federal department or agency. Within the Department of the Interior, the Office of Insular Affairs executes these responsibilities. Part of the Office's mission is to empower insular communities by improving the quality of life, creating economic opportunity, and promoting efficient and effective governance.

The Federal Regional Council—Region IX is a consortium of 19 federal departments and agencies that oversee federal activities in four western states and the Outer Pacific Islands including Guam. Federal Regional Councils were established to provide a structure for interagency and intergovernmental cooperation. Membership includes regional representatives from the Departments of Agriculture, Commerce, Education, Energy, Health and Human Services, Homeland Security, Housing and Urban Development, Justice, Labor, the Interior, Transportation, Veterans Affairs, and the Environmental Protection Agency (EPA). The goal of the Federal Regional Council is for federal departments in Region IX to work in a coordinated manner in order to make federal programs more effective and efficient, through the

²⁵The Office of Insular Affairs describes an insular area as a jurisdiction that is neither a part of one of the several United States nor a federal district. Insular area is the current generic term to refer to any commonwealth, freely associated state, possession or territory. There are eight inhabited insular areas of the United States—American Samoa, Guam, Commonwealth of the Northern Mariana Islands, Commonwealth of Puerto Rico, U.S. Virgin Islands, Republic of the Marshall Islands, Federated States of Micronesia, and Republic of Palau.

establishment of task forces and development of reports on issues of concern in the region. The federal regional council meets monthly and has six committees focused upon broad geographic areas and special populations in the vast geographic area of Region IX. One of the committees, the Outer Pacific Committee, contains the Guam Buildup Committee/Task Force. The buildup task force's mission is to help Guam develop a financial assistance strategy and serve as a communication liaison regarding local needs on Guam and federal budget decision-making.

Government of Guam Organization

Guam became a U.S. possession in 1898, initially placed under the control of the U.S. Navy. The Guam Organic Act of 1950²⁶ conferred U.S. citizenship on Guamanians and established the territory's government. Guam's government is organized into three branches: executive, legislative, and judicial. The executive branch is led by the territory's highest elected officials: the governor and lieutenant governor. These officials implement Guam's laws through the departments, bureaus, agencies, and other entities that make up the executive branch of the Government of Guam, such as the departments of public health and social services and education. The legislative branch consists of a single chamber legislature presently with 15 members who are elected for 2-year terms. The judiciary consists of the Superior Court of Guam and the Supreme Court of Guam.

In addition, the following are several autonomous agencies related to public infrastructure that function as part of the Government of Guam:

- The Guam Power Authority manages the generation, transmission, and distribution of electrical power on the island to include engineering, operation, and maintenance activities.
- The Guam Waterworks Authority manages the engineering, operation, and maintenance of the public water and wastewater systems including the sources, treatment, distribution, and storage.
- The Port Authority of Guam operates and maintains the Port of Guam.

The Power and Waterworks authorities are governed by an elected, non-partisan, five-member Consolidated Commission on Utilities. The Port of Guam is presided over by five board members appointed by the Governor

²⁶Pub. L. No. 81-630, ch. 512, 64 Stat. 384 (1950).

of Guam with the advice and consent of the legislature. Each of the agencies collects fees for its services and is able to issue bonds based on these fees and other revenue to finance infrastructure improvements.

Investments Have Been Made to Improve Guam's Public Infrastructure, but Deficiencies and Regulatory Compliance Issues Persist

While some investments have been made to improve Guam's public infrastructure in recent years, many deficiencies continue to exist. The reliability, capacity utilization, and age of much of Guam's public infrastructure indicates a need for additional upgrades to ensure that Guam can meet the demands of its current and future population, regardless of how many Marines and dependents are moved to Guam. For example, existing utility systems—electric power generation, potable water production, and wastewater collection and treatment—are largely operating at or near their maximum capacities and will require infrastructure improvements to meet any increase in demand. In addition, some of Guam's public infrastructure sectors, such as its Waterworks Authority face issues complying with federal regulations. Other sectors, such as the fire and police departments are experiencing shortages in infrastructure, vehicles, and staffing. According to JGPO officials, they intend to perform assessments to determine what improvements are needed by Guam's public infrastructure to support the current realignment plan during DOD's development of the supplemental EIS expected to be completed by 2015. A discussion of DOD's actions to assess Guam's public infrastructure is presented later in the report.

We discuss these issues in more detail below for eight public infrastructure sectors:

1. Electric Power
2. Water and Wastewater
3. Port of Guam
4. Solid Waste
5. Public Health
6. Law Enforcement
7. Fire Department
8. Education

Electric Power

Guam's electric power system has experienced reliability problems, which have resulted in power outages, and is reliant on aging generators approaching the end of their life expectancy. The Guam Power Authority has made investments in its infrastructure to address some of these reliability problems. For example, it secured \$206.5 million in bond financing in fiscal year 2010 to construct a new administration building and to make various generation, transmission, and distribution facility improvements. However, during our April 2013 visit to Guam, Power Authority officials indicated that system reliability continues to be a major concern because the Authority is not able to meet all of its operation and maintenance needs and may not be able to invest in its generators at appropriate levels due to diminished revenues. Officials also noted that multiple improvements are needed to the Authority's peaking and emergency generators, but such improvements will have to be deferred until revenues improve—which directly affects the Authority's ability to reduce customer outage duration and frequency. The electrical system's reliability and age have led to five island-wide power blackouts since November 2010.

- On November 3, 2010, a power outage occurred due to a line that fell at a substation. This outage created a chain reaction that resulted in an island-wide blackout. Power was fully restored after 7 hours.
- On May 9, 2011, a power outage occurred due to a corroded static line that fell on the switchyard. The result of the outage was an island-wide blackout. Power was fully restored after 5 hours.
- On June 4, 2011, a power outage occurred due to a damaged control air pipe at the Marianas Energy Company, an Independent Power Producer which resulted in an island-wide blackout. Power was fully restored after 2.5 hours.
- On June 6, 2013, a power outage occurred due to a fault in the system that originated within the Dededo combustion turbine. The result of the outage was an island-wide blackout. Power was fully restored within 6 hours.
- On July 11, 2013, a power outage occurred due to a generator going off line. The loss of this generator and subsequent issues with the power generation system led to the outage. The result of the outage was an island-wide blackout. Power was fully restored in about 6.5 hours.

The concerns expressed by Authority officials are consistent with the findings of a 2012 Department of the Interior Inspector General report.²⁷ That report found that Guam is susceptible to power blackouts and noted that about a quarter of the Power Authority's generation units were installed before 1976 (see figure 3 for a photograph of an electrical power station location on Guam). The report concluded that if the Authority should have to replace its entire aging infrastructure at the same time, it would require a large financial investment.

Figure 3: Harmon Annex Power Station



Source: DOD Inspector General.

The Power Authority provides all of the electricity on the island for both the public and DOD, with DOD the Authority's largest customer accounting for 22 percent of the Authority's fiscal year 2012 revenues. In terms of infrastructure needed for the realignment, Guam Power Authority officials told us that although the Authority has enough installed capacity (i.e., capacity the generation units were built to produce) to meet DOD's

²⁷U.S. Department of the Interior Office of Inspector General, *Evaluation of Guam Power Authority*, HI-EV-GUA-0001-2011 (Washington, D.C.: Aug. 9, 2012).

realignment needs for electricity generation, some of the units are not operational without major repairs or improvements which will likely have to be made by the Authority. In addition, Authority officials told us improvements to the transmission system, such as additional substations and transmission lines, will need to be made to accommodate the revised realignment plan and will likely need to be funded by DOD.

Water and Wastewater

Guam's water and wastewater treatment systems have a number of deficiencies as a result of natural disasters, poor maintenance, and vandalism. Although the Guam Waterworks Authority invested more than \$158 million in improvements to its water and wastewater systems over the last 10 years, the Authority continues to operate under an order issued by the U.S. District Court for the District of Guam requiring various treatment and infrastructure improvements because of issues related to compliance with the Safe Drinking Water Act²⁸ and the Clean Water Act.²⁹

- Potable water: According to Waterworks officials, Guam's potable water system currently is in noncompliance with the Safe Drinking Water Act. The unreliable drinking water distribution system has historically resulted in bacterial contamination from sewage spills, causing "boil water" notices to be sent to residents. According to a 2012 EPA report, in general, many of the potable water facilities on the island are in poor operating condition as a result of minimal preventative and corrective maintenance actions.³⁰ For example, several of the finished water storage tanks do not provide many of the normal functions of a well-designed and operated water system, and most of the storage tanks are old and deteriorating, have openings and/or leaks, and are susceptible to contamination. According to the EPA, part of the water supply problem stems from some of the water system's old pipes. Distribution lines are repeatedly patched—with some single lengths of pipe having up to 7 patches—instead of being replaced. As a result of problems with distribution lines and maintenance, among other issues, the EPA estimates the Water Authority's water loss rate is about 50 percent. According to EPA,

²⁸ Pub. L. No. 93-523 (1974) (codified as amended at 42 U.S.C. §§ 300f–300j-26).

²⁹ 33 U.S.C. §§ 1251-1387.

³⁰ U. S. Environmental Protection Agency Inspection and Sanitary Survey Report for the Guam Waterworks Authority Public Water System (San Francisco, CA.: Nov. 5, 2012).

studies indicate that the national average water loss rate is about 14 percent.

- **Wastewater:** According to the DOD Inspector General, Guam's existing wastewater plants do not meet primary treatment standards and lack sufficient capacity due to poor conditions of the existing assets.³¹ For example, the Northern District Wastewater Treatment Plant (see figure 4) has a legacy of deferred maintenance and minimal capital improvements that have caused the systems to slowly deteriorate over the years. In addition to not meeting primary treatment standards, according to the EPA, Guam's wastewater facilities, do not meet the requirements of its secondary treatment permit.³² Since 1986, Guam has had variances under section 301(h) of the Clean Water Act, allowing it to discharge primary treated wastewater to Hagatna Bay and the Philippine Sea. However, in November 2011, the EPA disallowed the variances and therefore established full secondary treatment requirements at both the Northern District wastewater treatment plant and the Hagatna plant in the island's central region. According to the Chairman of the Guam Consolidated Commission on Utilities, achieving full secondary treatment at both plants will require between \$300 million and \$500 million in infrastructure improvements and, if funded by Guam alone, would necessitate rate increases that could potentially lead to average monthly water bills of \$250 by 2020—double what the average is now. According to the Chairman, the Commission is currently negotiating with EPA on timelines for achieving secondary treatment and hopes to extend the timelines so as to allow more time to obtain additional funding.

³¹Inspector General of the Department of Defense, *Report on the Program and Contract Infrastructure Technical Requirements Development for the Guam Realignment Program*, DODIG-2012-052 (Washington, D.C.: Feb. 8, 2012).

³²Secondary treatment is the second step in most wastewater treatment systems during which bacteria consume the organic parts of the wastes. This is accomplished by bringing the sewage, bacteria and oxygen together in trickling filters or within an activated sludge process. Secondary treatment removes all floating and settleable solids and about 90 percent of the oxygen-demanding substances and suspended solids. Disinfection by chlorination is the final stage of the secondary treatment process.

Figure 4: Northern District Wastewater Treatment Plant



Source: DOD Inspector General.

In terms of supporting the current military presence on Guam, the Waterworks Authority provides wastewater services to Andersen Air Force Base (including Northwest Field), Naval Computer and Telecommunications Station– Guam, and South Finegayan Navy housing. Naval Base Guam handles all of its own wastewater needs, and both the Navy and Air Force get their potable water from their own wells and the Fena Reservoir. Therefore, DOD only accounted for 2.2 percent of the Authority’s fiscal year 2012 revenues. However, according to representatives of Guam’s legislature and the Chairman of the Consolidated Commission on Utilities, the Guam Waterworks Authority is operating near capacity and cannot meet any surge in demand related to the realignment without significant infrastructure improvements.

Port of Guam

According to the Port Authority of Guam and DOD officials, the Port of Guam (see figure 5) is currently outdated, in need of repairs, and requires expansion in order to support the realignment. Of particular concern is the port wharf. A 2012 DOD inspector general report found that the structural integrity of the commercial wharf, which includes the port’s six berths, is damaged and at risk of failure. The current state of the wharf was caused by a lack of adequate repairs to damages from earthquakes, corrosion, and stresses from ships and cargo-handling equipment. There have been multiple earthquakes in Guam, with the most devastating taking place in August 1993. As a result of this earthquake, the island sustained massive devastation with significant damage to one of the port’s berths, which

required major reconstruction. Although other port berths were also damaged, they were not reconstructed. The DOD Inspector General also found that there are multiple continuous defects that have been documented in various reports and surveys performed on the structural integrity of the wharf bulkhead at the Port—the bulkhead is the vertical face (or wall) of the wharf along which ships are berthed. The report and surveys indicate that the bulkhead was damaged both above and below the water. On the facade, the sides and the surface show cracks and separation, while underwater there is extensive damage to the concrete bulkhead.³³

Figure 5: Port of Guam



Source: DOD Inspector General.

Both DOD and the Government of Guam have identified the Port of Guam as a potential choke point as the realignment moves forward since all materials needed for both military and public construction projects will be transported to Guam by sea and enter through the Port. Port Authority officials told us that the Port has not been modernized since it was constructed in the 1960s and that, typically, most ports are modernized every 20 years. According to Port Authority officials, to accommodate the realignment, the Port requires building modifications, selected modifications to yards where cargo is offloaded, and facility expansion, as well as significant structural integrity improvements to the wharf. For

³³DODIG-2012-052.

example, the port requires a lot of maintenance due to corrosive ocean waters, typhoons, earthquakes, and years of maintenance neglect. Some of the specific improvements identified include site expansion, utilities upgrades, bulkhead fortification, and building renovations. In 2010, DOD provided the Port \$50 million in funding to begin some of these improvements. According to DOD officials, this \$50 million is the amount needed to directly address the requirements of the realignment and will be used for building modifications and modifications to the yard where cargo is offloaded as well as expansion of selected port facilities. In addition, the Port Authority continues to seek non-federal funding sources to allow for successful operations and execution of its mission. For example, according to Port Authority officials, the Authority recently obtained a \$10 million commercial loan to address pier service life extension, financial management system upgrades, and a cargo handling crane purchase and has proposed a 5.65 percent tariff increase across the board to increase revenues. However, according to Port Authority officials, if future military activity requirements extend beyond the Authority's current planned upgrades, there may be a need for additional federal support to accommodate the increased capacity requirements.

Solid Waste

According to OEA officials, Guam's current landfill is environmentally-compliant with sufficient capacity to meet current solid waste disposal needs and has sufficient expansion capacity to meet future needs related to the realignment. Previously, the EPA found Guam's public solid waste operations to be in violation of the Clean Water Act as the Ordot Dump facility, located in the center of the island, was discharging contaminants into the Lonfit River. As a result of a lack of remediation and other actions on the part of the Government of Guam in response to the contamination, in March 2008, the U. S. District Court placed the public solid waste operations under the control of an appointed receiver.³⁴ Since the court order, the receiver has opened a new public landfill and ceased operations at the Ordot Dump facility. According to the Government of Guam, the new landfill bans certain types of waste, including construction and demolition waste. As a result, future organic and realignment solid waste disposal needs will require the government to continue to develop

³⁴ See *United States v. Government of Guam*, Civ. No. 02-00022, 2008 WL 732796, at *10-11 (D. Guam Mar. 17, 2008).

systems to handle landfill-banned waste and construct and open new solid waste disposal areas at the landfill.

Historically, the Government of Guam and DOD used separate solid waste facilities. The Government of Guam disposed of all civilian waste at the Ordot Dump facility and DOD disposed of its solid waste in one of two DOD-operated landfill sites—Andersen Air Force Base and Naval Base Guam. However, the two DOD-operated landfill sites are almost at capacity. DOD has begun sending its solid waste to the new public landfill, paying the current rates set by the receiver.

Public Health

The Government of Guam reported, as part of the ongoing supplemental EIS, that its public health system is undersized for the population it is to serve and is experiencing staff shortages. The following are examples:

- The Guam Memorial Hospital Authority, Guam's only public civilian hospital, is often over capacity and this is exacerbated by the fact that it usually does not have enough nursing staff to operate all of its available acute care beds. According to Guam Memorial Hospital Authority officials' response to a questionnaire conducted for the supplemental EIS, Guam needs approximately 500 acute care beds to fully meet the island's needs using national hospital standards and the Guam Memorial Hospital Authority provides the Guam community with only 162 of those acute care beds. Therefore, according to these officials, the shortage can only be addressed by either expanding the existing Guam Memorial Hospital, building a much larger replacement public civilian hospital, or through the building of a new private hospital that is currently underway. Though there are no current plans to build a new civilian public hospital at this time, the Guam Memorial Hospital Authority is in the process of implementing its 2013 Strategic Plan, which includes identifying the Authority's future expansion needs. The Government of Guam has tried to address some of the hospital's space issues. For example, in fiscal year 2009, it secured \$11 million in bond financing to fund certain infrastructure improvements for the Guam Memorial Hospital Authority, including the expansion and renovation of the emergency department and critical care unit/intensive care unit, the upgrading of its pharmacy department, and the modernization of two hospital elevators.

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- Guam's current mental health and substance abuse facility also faces issues with meeting standards of care. In 2004, the U.S. District Court issued a permanent injunction against Guam's Department of Mental Health and Substance Abuse³⁵ and various Guam officials to address deficiencies in the proper care for the mentally ill and developmentally disabled to address violations of statutory and constitutional standards of care.³⁶ To achieve compliance with the injunction and address continuing problems, the court appointed a federal management team in 2010 and gave the team control over Guam's mental health agencies to remedy the deficiencies.³⁷ According to Government of Guam officials, as a result of the injunction, the Guam Behavioral Health and Wellness Center had to hire additional staff and implement several new substance abuse treatment programs. The officials further explained that to fully implement the mandates of the injunction, a new mental health facility will need to be constructed. On August 22, 2012, the U.S. District Court established a transition period for the return of duties and powers from the federal management team. In January 2013, the federal management team and Guam Behavioral Health and Wellness Center officials presented a transition plan to the court and control was transferred to the Guam Behavioral Health and Wellness Center in February 2013. According to Government of Guam officials, the Guam Behavioral Health and Wellness Center continues to report on a quarterly basis to the U.S. District Court.

In addition to these infrastructure challenges, officials identified a number of challenges related to staffing. For example, Guam has experienced difficulty in recruiting and retaining an adequate number of health care personnel. According to the U.S. Department of Health and Human Services, Guam has been designated as a medically underserved area. Medically underserved areas are areas designated as having too few primary care providers, high infant mortality, high poverty, and/or high elderly population. Likewise, Guam also qualifies as a health professional

³⁵In 2013, the name of Guam's Department of Mental Health and Substance Abuse was changed to the Guam Behavioral Health and Wellness Center.

³⁶See *J.C. v. Camacho*, Civ. Case No. 01-0041, 2010 U.S. Dist. LEXIS 18512, at *2-5 (D. Guam Mar. 2, 2010); *J.C. v. Camacho*, Case No. 01-0041, 2009 U.S. Dist. LEXIS 129232, at *2-3 (D. Guam July 1, 2009), The court issued an amended permanent injunction in 2005.

³⁷See *Camacho*, 2010 U.S. Dist. LEXIS 18512, at *6-14.

shortage area, which is a geographic area, population group, or health care facility that has been designated by the federal government as having a shortage of health professionals. According to Guam public health officials, because of this designation, certain health professionals (e.g., nurses, mid-level providers, chiropractors, health dentists, and psychologists) can apply to work at Guam medical facilities and have the federal government pay for relocation costs and school loans. Generally, it is a 4-year program and people stay for the length of the term but then move away, resulting in turnover that makes it difficult to provide stable care. As we previously found, this is particularly true for insular areas such as Guam because citizens of insular areas are free to migrate to the United States, making it difficult to retain highly educated or skilled workers.³⁸

Military personnel and their dependents generally do not use Guam's health facilities, other than the occasional emergency room visit. However, the Government of Guam anticipates that any DOD civilian or migrant and construction workers associated with the realignment would use the facilities. Guam officials also told us that the island lacks a Center for Disease Control and Prevention level 2 public health lab.³⁹ Since Guam is expected to become a focal point for regional job seekers and foreign construction workers under any realignment scenario, officials told us the island must have the ability to test for and contain various communicable diseases, due to this increase in migration. Government of Guam officials told us, currently, the nearest lab is in Hawaii and many times samples are spoiled and not testable by the time they arrive in Hawaii from Guam.

Law Enforcement

The Guam Police Department is experiencing deficiencies in infrastructure, vehicles, and staffing. In terms of infrastructure, according to Police Department officials, although its four precinct buildings are in good to fair condition, the Police Department does not have a permanent

³⁸GAO, *U.S. Insular Areas: Economic, Fiscal, and Financial Accountability Challenges*, [GAO-07-119](#) (Washington, D.C.: Dec. 12, 2006).

³⁹These labs support containment efforts in the day-to-day work with biological agents. There are four levels of labs and the requirements of the labs vary in terms of required laboratory practices, safety equipment, and facilities based on the type of work performed, information about the infectious agent, and the function of the laboratory. A level 2 lab is suitable for work with agents that pose moderate risks to personnel and the environment.

headquarters building or location. The current police headquarters is located on land owned by the Guam International Airport Authority, which wants the Police Department to vacate the facilities so it can redevelop the property. In addition, according to Guam officials, the adult corrections facility is in poor physical condition, overcrowded, poorly designed, and inefficient. The officials also noted that the judicial center needs at least two additional courtrooms to support current needs and normal population growth.

In addition to these infrastructure challenges, Police Department officials identified a number of challenges in servicing the public because of limited equipment and staffing. According to Guam Police Department officials, the Guam Police Department does not have enough vehicles to fully equip all shifts and have vehicles in reserve for downtime. Police Department officials estimate they need 18 more patrol vehicles to address the vehicle shortage. Likewise, Guam Police Department officials estimated that they need about 160 additional officers to appropriately serve the public. According to Guam Public Law, each village must have a minimum of 2 police officers capable of patrolling and responding to calls at all times, and 1 additional officer is required for each additional 2,000 residents for each shift.⁴⁰ Therefore, according to the Department of the Interior Inspector General, the Guam Police Department should have 464 patrol officers to cover all of its precincts—it currently has 304. According to Guam Police Department officials, the personnel shortfall has caused the department to exceed its overtime budget annually due to excessive overtime work needed to sustain its operations. More recently, in a questionnaire conducted for the ongoing supplemental EIS, Police Department officials stated that prolonged work hours and excessive workload are causing fatigue and unhealthy physical conditions among the personnel. To address its staffing shortage, the department is currently deputizing civilians. According to Guam Police Department Officials, the Guam Police Department is training these civilians and giving them law enforcement authority to perform as police officers, but without compensation. The program has over 100 volunteer members and is increasing.

Military personnel, their dependents, and any contractor or construction worker arriving on Guam because of the realignment would necessarily

⁴⁰ See Guam Code Ann. tit. 10, § 77301(b), (c).

need to rely on the Guam Police Department in case of emergencies. In addition, any person—including military members and their dependents—who is cited or arrested by the Guam Police Department for violating local laws off-base would be processed or prosecuted through Guam’s legal system. As such, Police Department officials told us that any population increase associated with the revised realignment plan would exacerbate the current infrastructure, vehicle, and staffing challenges the department is experiencing and could potentially create new ones as shifts in traffic patterns and land use occur, for example, because of new commercial development, and higher-density housing.

Fire Department

Like the Guam Police Department, Guam’s Fire Department is experiencing deficiencies in infrastructure, vehicles, and staffing. In terms of infrastructure, Fire Department officials told us that the department is currently leasing office space as it does not have a permanent headquarters location. In addition, according to a 2012 Department of the Interior Inspector General report, the Guam Fire Department does not have enough ambulances to service Guam and does not have any reserve vehicles in its fleet.⁴¹ At the time of that report, the Fire Department owned 15 ambulances, and of those, only 3 were in service. Further, according to the report, there has been at least one documented occasion in which the Fire Department had only 1 ambulance to service the entire island. The report also noted that although the Fire Department owns 12 fire trucks, none have ladders with high-rise capabilities to service hotels and other high-rise structures on the island.

In addition to these infrastructure and equipment challenges, Fire Department officials identified a number of challenges related to staffing. For example, Fire Department officials told us that the department does not have enough staff to meet its current needs and that its staffing numbers have dropped below the National Fire Protection Association safety standards which requires a minimum of four personnel on a fire truck. The Fire Department currently has about 250 uniformed firefighters. According to the Chief of the Fire Department, they require about 72 additional firefighters in order to satisfy the 5 to 6 on-duty personnel per engine company standard of the National Fire Protection Association.

⁴¹U.S. Department of Interior Office of Inspector General, *Guam Public Safety*, HI-EV-OIA-0003-2012, (Washington, D.C.: Nov. 20, 2012).

Officials stated that they are slowly trying to address their personnel issues and have received funding from Government of Guam to hire more firefighters. For example, in fiscal year 2013 the Government of Guam provided the Fire Department approximately \$1.8 million for hiring personnel and the Fire Department added 28 new firefighter recruits.

Military personnel and their dependents living off base and any contractors or construction workers associated with the realignment would require the services of the Guam Fire Department for emergencies. As such, like the Guam Police Department, Fire Department officials told us that any population increase associated with the revised realignment would exacerbate the current infrastructure, vehicles, and staffing challenges the Fire Department is experiencing.

Education

The Guam Department of Education has been challenged in meeting its requirements to effectively maintain its facilities with adequate staffing, buses, and supplies, citing continuing budget constraints. In terms of infrastructure, the Department of Education through a public/private partnership constructed five new schools. Additionally, the Government of Guam has secured funds for school infrastructure improvements through bond financing. For example, the Government of Guam in fiscal year 2010 secured approximately \$50 million in bond financing for the construction of a new high school and in fiscal year 2007 secured approximately \$27 million in bond financing for school improvements including Americans with Disabilities Act compliance, asbestos abatement, security and fire alarm systems installation, and other improvements. The Guam Department of Education also received \$75.7 million in fiscal year 2010 through the American Recovery and Reinvestment Act State Fiscal Stabilization Fund. The funding that was received through the American Recovery and Reinvestment Act was focused on improving the existing facilities. A significant portion of the funding went to repairing all of the roofing at all of the schools, upgrading electrical and fire alarm systems, replacing air conditioning units, and renovating a middle school. The Army Corp of Engineers recently completed a study commissioned by the Department of the Interior which estimated \$90 million in deferred maintenance costs. The Guam Department of Education has been working with Guam's Legislature and Governor's Office to identify funding sources to repair and renovate aging school facilities.

Although efforts have been to improve the Department of Education's infrastructure, the department continues to face staffing challenges.

According to Department of Education officials, with an extremely limited pool of applicants, the supply of fully certified, highly qualified teachers on Guam continues to be an issue since teachers on the island can apply to and be hired by the Department of Defense school system. In addition, Guam officials also noted that the school system is experiencing a shortage of school buses and that each of its buses averages five trips per day to transport the island's children to and from school. Generally, children of military service members and DOD civilians attend DOD schools, but it is anticipated that any children of temporary workers associated with the realignment would attend Guam schools.

DOD Generally Provides Planning and Technical Assistance Support to Affected Communities While Public Infrastructure Projects Are Typically Funded by Other Federal Programs or the Communities

Historically, the majority of DOD's support to defense-affected communities has been to provide technical assistance and support community planning and coordination efforts due to Base Realignment and Closure (BRAC) decisions.⁴² However, OEA officials identified a few examples in the past where DOD has provided direct funding to defense-affected communities to provide additional capacity specifically needed to support DOD growth. DOD's position has been that existing federal programs should be leveraged as much as possible to pay for public infrastructure needs and that local communities should largely be responsible for obtaining funding for their public infrastructure requirements. The Government of Guam has obtained non-DOD federal funding for some public infrastructure projects through several federal programs, such as a grant from the EPA to improve the water system. In addition, local communities can also raise their own funds for public infrastructure projects. However, in the case of Guam, some challenges have been identified as affecting its ability to raise funds for such projects.

⁴²DOD describes BRAC as the process the department has used to reorganize its installation infrastructure to more efficiently and effectively support its forces, increase operational readiness and facilitate new ways of doing business. The BRAC process is governed by the Defense Base Closure and Realignment Act of 1990, originally passed as Title XXIX of the National Defense Authorization Act for Fiscal Year 1991, Pub. L. No. 101-510 (1990). It has subsequently been amended many times, including in 2001, when Congress authorized a 2005 BRAC round as part of the National Defense Authorization Act for Fiscal Year 2002, Pub. L. No. 107-107 (2001).

Majority of DOD Support to Communities Has Been for Planning and Technical Assistance Efforts, but Limited Direct Funding for Projects Has Been Made Available

OEA is the primary DOD office responsible for providing assistance to communities, regions, and states affected by significant DOD program changes. A majority of OEA's support to defense-affected communities has been for community planning and coordination efforts because of BRAC decisions. For example, from 2005 through 2012, OEA provided \$76 million in grants to communities affected by BRAC decisions for activities ranging from hiring planners and staff to developing land reuse and redevelopment plans. Much of OEA's assistance in the past was directed toward communities that lost military and civilian personnel because of the closure or major realignment of a base. However, because the 2005 BRAC round and other DOD initiatives created significant growth at many bases, OEA also has assisted defense-affected communities with growth planning. For example, one defense-affected community used OEA funding to hire personnel, maintain offices, and conduct planning. Another community's local redevelopment authority used OEA funding to hire dedicated professional staff and contract with a consultant to prepare a redevelopment plan. For each community it assists, OEA assigns a project manager who can provide assistance in a variety of ways. OEA can provide funds for hiring consultants to assist in developing a reuse plan, information on federal grant money or other available resources, and information on best practices used by other closure communities. In addition, OEA's website provides reports containing lessons learned from other communities and information on other available resources and OEA is currently developing a community forum function on its website where community members can exchange ideas and learn from each other's experiences.

OEA has generally provided funding for technical assistance, but it also has provided public infrastructure funding to local communities. For example, OEA officials noted the public infrastructure funding associated with the construction of Trident submarine bases at Bangor, Washington, and Kings Bay, Georgia. In these two instances, DOD provided millions of dollars in funding for public infrastructure projects to the local communities surrounding Bangor and Kings Bay because DOD's public infrastructure needs would exceed those already in place and serving the communities. During the 1970s, DOD decided to build submarine bases at Bangor and Kings Bay and determined that the subsequent growth would generate significant public infrastructure needs that the local communities could not support. In both cases, the expansion of the bases would require significant construction and result in the eventual influx of significant amounts of personnel to the surrounding communities for which the local governments' public infrastructure was generally inadequate. Congress authorized the Secretary of Defense to provide

financial assistance to the local communities for the costs of providing increased municipal services and facilities.⁴³ For both programs, DOD assigned OEA with responsibility for program management. According to congressional documents, DOD reported that it provided approximately \$55 million, in nominal dollars (i.e., not adjusted for inflation), to communities surrounding Bangor for infrastructure improvements in areas, such as water resources, schools, fire protection, parks, roads, law and justice, social and health services, sewers, and libraries. According to DOD documents, DOD reported providing approximately \$48 million, in nominal dollars, to communities surrounding Kings Bay for infrastructure improvements similar to Bangor, such as utility systems, elementary schools, a city hall, a fire station, and various public vehicles.

Additionally, in some instances, specific appropriations have been made by Congress to OEA's budget for public infrastructure improvements to assist affected communities. For example, in 2011, Congress appropriated \$300 million for use by OEA for transportation infrastructure improvements associated with medical facilities related to recommendations of the BRAC Commission.⁴⁴ Some of the communities receiving funding were Montgomery County, Maryland, for the construction of a pedestrian and bicycle underpass near the Walter Reed National Military Medical Center and the City of San Antonio, Texas, for the construction of a safer highway interchange near Brooke Army Medical Center. In addition, also in 2011, Congress appropriated \$500 million in funding for the construction, renovation, repair, or expansion of public schools located on military installations to address capacity or facility condition deficiencies.⁴⁵ As implemented by OEA, these funds

⁴³ See Military Construction Authorization Act, 1981, Pub. L. No. 96-418, § 802 (1980); Military Construction and Reserve Forces Facilities Authorization Acts, 1975, Pub. L. No. 93-552, § 608 (1974). In both cases, the authorization was linked to the Secretary's determination of an immediate and substantial increase in the need as a direct result of work carried out in connection with DOD actions, and that an unfair and excessive financial burden would be incurred by the communities as a result. See *id.*

⁴⁴ See Department of Defense and Full-Year Continuing Appropriations Act 2011, Pub. L. No. 112-10, § 8110 (2011).

⁴⁵ See Consolidated Appropriations Act, 2012, Pub. L. No. 112-74, § 8118 (2011); Pub. L. No. 112-10, § 8109. Each Act appropriated \$250 million for this purpose.

were available for local educational agencies operating such public schools.⁴⁶

Other Federal Funding Sources Have Been Used to Fund Guam Infrastructure Projects

According to OEA officials, DOD's position is that local communities should largely be responsible for obtaining funding for public infrastructure requirements related to DOD basing decisions. This funding can come from other, non-DOD federal programs, with DOD advocating that existing federal programs should be leveraged as much as possible. Along these lines, several federal agencies have existing programs that have funded public infrastructure improvements on Guam in recent years. For example, EPA, which assists Territories under its Environmental Protection Consolidated Grants program, provided Guam with almost \$6.8 million in fiscal year 2012 to fund drinking water and wastewater system improvements. The Department of the Interior's Office of Insular Affairs provided Guam with over \$6 million in fiscal year 2013 in capital improvement grants to fund a variety of infrastructure needs. Table 1 shows examples of public infrastructure programs for which Guam has received funding from non-DOD federal programs in the last few years.

⁴⁶ See, e.g., Department of Defense Program for Construction, Renovation, Repair or Expansion of Public Schools Located on Military Installations, 76 Fed. Reg. 55,883 (Sept. 9, 2011).

Table 1: Examples of Non-DOD, Federal Programs that Funded Guam Public Infrastructure Projects

Agency	Program	Last fiscal year received funding	Amount provided in last fiscal year funding was received
Department of Agriculture	Community Facilities Loans and Grants: Provide loans, grant and loan guarantees for essential community facilities in rural areas. Priority is given to health care, education and public safety projects. Typical projects are hospitals, health clinics, schools, fire houses, community centers and many other community based initiatives.	2010	\$102,102
Department of the Interior	Capital Improvement Project Funding: Provide grants to be used for capital improvements in the four U.S. territories. A unique feature of these grants is that they may be used to meet the local matching requirement for capital improvement grants of other federal agencies, subject to Office of Insular Affairs approval.	2013	\$6,128,000
Environmental Protection Agency	Environmental Protection Consolidated Grants for the Insular Areas—Program Support: Provides technical, managerial, and financial support in relation to EPA’s consolidated environmental program and Drinking Water and Clean Water grants for the protection of public health and welfare in the Territories of Guam, American Samoa, and the Virgin Islands, and the Commonwealth of the Northern Mariana Islands.	2012	\$6,770,000

Source: GAO analysis of Guam single audits and 2014 executive budget request.

Note: We did not review all potential programs and, therefore, the information we collected should not be viewed as complete.

Despite Revenue Challenges, the Government of Guam Has Obtained Funding through Issuing Bonds

In addition to obtaining funding through non-DOD federal programs, local communities can also raise their own funds for public infrastructure projects. In the case of Guam, two key challenges have been identified as affecting its ability to raise funds. Specifically, according to Government of Guam officials, limited government revenues and limited debt capacity due to its statutory debt limitation hinder its ability to finance its public infrastructure projects. First, Guam has faced an operating deficit over the past few years and current revenues are not sufficient to support operational requirements. The Governor of Guam told us that without a major increase in economic activity and the resulting increase in revenues, the administration will be unable to address additional public infrastructure requirements other than those necessary for basic operations and debt service requirements. Government of Guam officials explained that the major revenue challenges for the government are the

inability of taxpayers to pay taxes, the inability of the government to access military bases to conduct random inspections to ensure military contractors and vendors are in compliance with Guam's tax laws, and the large amount of DOD-controlled land on Guam that is not available for economic development. Two Department of the Interior reports identified that Guam's operating revenues challenges are partly a result of poor tax collection efforts.⁴⁷ At the time of those reports, the Department of the Interior estimated that persistent deficiencies in Guam's tax collection process were resulting in lost tax revenues of at least \$23.5 million each year. Guam officials told us that since those reports were issued they have taken steps to address the findings in the reports and improve their tax collection efforts but that the taxpayer's inability to pay will always be a challenge.

We have previously found that although communities near military growth locations can face growth-related challenges in the short term, such as challenges in providing additional infrastructure, they can expect to realize economic benefits in the long term, such as increased revenue.⁴⁸ An increase in military and federal civilian employees on Guam stemming from the realignment may be a potential source of additional revenue. For instance, Guam receives federal income taxes paid by military and civilian employees of the U.S. government stationed in Guam. Under section 30 of the Organic Act of Guam and a related statute,⁴⁹ the Internal Revenue Service reimburses Guam for the income taxes it collects from federal civilian and military personnel assigned to Guam. The Internal Revenue Service pays section 30 funding to Guam annually. The money represents the income tax paid by federal employees and military service members who work on Guam but not collected locally. This amounted to \$52 million in 2010, and this amount is expected to increase with the

⁴⁷U.S. Department of the Interior Office of Inspector General, *Tax Collection Activities Government of Guam: Revitalized Tax Collection and Enforcement Effort Needed*, P-EV-GUA-0002-2008 (Washington, D.C.: Nov. 26, 2008) and Department of the Interior Office of Inspector General, *Guam's Tax Collection Activities: Office of Insular Affairs Involvement Needed to Achieve Lasting Improvements*, HI-EV-GUA-0002-2008 (Washington, D.C.: Nov. 28, 2008).

⁴⁸GAO, *Defense Infrastructure: High-Level Leadership Needed to Help Communities Address Challenges Caused by DOD-Related Growth*, [GAO-08-665](#) (Washington, D.C.: June 17, 2008).

⁴⁹See Pub. L. No. 81-630, ch. 512, § 30, 64 Stat. 384, 392 (1950) (codified as amended at 48 U.S.C. § 1421h) and 26 U.S.C. § 7654.

realignment thereby providing the Government of Guam with increased revenue. However, Guam officials told us they were concerned that since the composition of the Marines to be relocated to Guam under the revised realignment plan would be mostly rotational, they would not be reimbursed for the income taxes since these personnel may be stationed on Guam for less than 6 months. In response to these concerns, DOD recently announced procedures to account for and reimburse to Guam income tax paid by all U.S. Marines—whether part of a rotational unit or permanently stationed on island. With DOD’s announcement, according to Government of Guam officials, Marines stationed in Guam will be included under section 30, regardless of how long they are on Guam, thereby providing the Government of Guam with additional revenue.

The second challenge identified as affecting Guam’s ability to raise funds is its statutory debt limitation. The Government of Guam’s ability to borrow funds to help pay for public infrastructure projects and programs related to the realignment may be constrained because of a statutory debt limitation contained in the Organic Act of Guam,⁵⁰ depending on the form and terms of the prospective debt. Section 11 of the act places a limitation on government borrowing, limiting Guam’s public indebtedness to no more than 10 percent of the aggregate tax valuation of property on Guam.⁵¹ However, not all government obligations are included in the debt ceiling. For instance, section 11 of the Organic Act notes that bonds or other obligations of the Government of Guam payable solely from revenues derived from any public improvement or undertaking shall not be considered public indebtedness as defined in the Organic Act of Guam. As such, they would not be counted towards the government’s statutory debt limitation. However, whether certain obligations fall into this exception and should not be included in the Government of Guam’s debt limit calculation has generally been a highly litigated issue and may be

⁵⁰See Pub. L. No. 81-630, ch. 512, § 11, 64 Stat. at 387-88.

⁵¹48 U.S.C. § 1423a. Most U.S. states and local municipalities have similar constitutional or statutory limitations on borrowing. Debt limitation provisions “serve as a limit to taxation and as a protection to taxpayers; to maintain ... solvency, both governmental and proprietary; and to keep [local] ... residents from abusing their credit, and to protect them from oppressive taxation.” In *Re Request of Camacho*, 2003 Guam 16, 2003 WL 21697180, at *3 (Guam July 23, 2003) (quoting 15 McQuillin, *The Law of Municipal Corporations* § 41.01, 41.02 (3d ed., 1949)), *reversed on other grounds in Limtiaco v. Camacho*, 549 U.S. 483 (2007).

determined on a case-by-case basis by the Guam courts.⁵² Until the Government of Guam has determined and decided on the form and terms of debt it plans to incur to help fund off-base projects and programs related to the realignment, it is unknown what effect this debt limitation provision will have on the ability of the Government of Guam to incur debt for the purposes of the realignment.

Despite these challenges, the Government of Guam has been able to obtain funding through issuing bonds in the past. For example, in December 2011, the Government of Guam successfully issued \$235 million in bonds to pay unpaid tax refunds and past due cost of living allowances to certain retired government employees. These bonds were financed from revenues generated from the island's business privilege tax. Further, in April 2011, the Government of Guam successfully sold \$90.7 million worth of bonds to construct a new Guam museum and for other projects that benefit Guam's tourism industry, such as the restoration of a community center and bell tower and the construction of a historic monument and plaza to commemorate Ferdinand Magellan's visit to Guam. These bonds were financed from revenues generated from Guam's hotel occupancy tax. These successful bond offerings demonstrate that a market may exist among investors for the Government of Guam's debt, which could be a potential source of funding for its necessary public infrastructure improvements. Further, Guam's autonomous government agencies related to public infrastructure—Power, Waterworks, and Port Authorities—have the ability to issue bonds for infrastructure improvements. Bonds issued by autonomous agencies are often backed by the agencies' own revenue streams, such as customer rates. Guam officials cautioned, however, there is a limit to how much they can raise rates on their customers to increase revenue, particularly since for some utilities, Guam already has relatively high rates when compared to other insular areas and Hawaii. Like other bonds issued by the Government of Guam, the determination of whether a bond issued by one of these agencies would count against the Government of Guam's statutory debt ceiling also depends upon the form and terms of the debt and can be a highly litigated issue.

⁵²Courts have interpreted "debt" to include a wide variety of financial arrangements. For example, the Guam Supreme Court held that bonds issued by the Guam Telephone Authority should be included in the debt ceiling because the Government of Guam was committed to pay to the authority any deficiencies in the bond reserve fund from general tax revenues. *Guam Telephone Authority v. Rivera*, 416 F.Supp. 283 (1976).

DOD Has Not Revalidated Its Guam Public Infrastructure Requirements or Differentiated Between Requirements to Address Long-Standing Conditions and Those Related to the Revised Realignment Plan

DOD has requested funding from Congress for projects to improve Guam's public infrastructure. However, the projects included in these budget requests were validated based on the 2006 realignment plan, and DOD has not revalidated public infrastructure requirements for Guam to reflect the revised realignment plan or differentiated between requirements to address long-standing conditions in Guam's public infrastructure and those specifically related to additional capacity for the realignment. According to DOD, a revised list of Guam public infrastructure requirements and cost estimates based on the revised realignment plan that calls for over 11,000 less people coming to Guam than the previous plan will not be available until 2015 when DOD completes the supplemental EIS. Even so, DOD has requested over \$400 million for Guam infrastructure projects in its budget requests for fiscal years 2012 through 2014. However, since these projects were originally validated on the basis of the 2006 realignment plan, it is uncertain to what extent these projects are necessary or necessary to the same extent given the significant reduction in forces associated with the revised realignment plan and the fact that the potential effect has not been revalidated. Congress has restricted the use of funds until further information is provided related to the realignment plan and imposed other restrictions on use of the funding. It is also unclear to what extent the projects specified in DOD's budget requests are required to address additional capacity to accommodate the current realignment plan or to address long-standing deficiencies in Guam's infrastructure because DOD has not clearly differentiated between these two types of requirements.

An Updated List of Infrastructure Requirements for the Realignment Will Not Be Available Until after the Supplemental EIS

Although a list of public infrastructure projects was developed for the 2006 realignment plan for approximately 17,600 people relocating to Guam, Joint Guam Program Office officials stated that a revised list of Guam public infrastructure requirements and cost estimates based on the current realignment plan for approximately 6,300 people will not be available until sometime in 2015 when DOD completes the ongoing supplemental EIS. In February 2010 after the original realignment plan was announced, the Deputy Secretary of Defense chaired a meeting of the Economic Adjustment Committee, the goal of which was to develop a

Guam public infrastructure funding plan for the original realignment.⁵³ According to OEA officials the Economic Adjustment Committee divided this task into a public infrastructure assessment team and a socioeconomic project assessment team. The public infrastructure team examined Guam's water and wastewater system, port, solid waste, power system, and roads. The socioeconomic project team examined health care, education, cultural resources, emergency services, judicial services, and other public infrastructure throughout the island. Input to the assessments was initially provided by the Office of the Governor of Guam, working with the territory's executive departments, who proposed specific projects within each infrastructure area for further consideration. Finally, a team comprised of officials from federal agencies with purview over one or more of the identified infrastructure areas validated the need, scope, and funding required for each public infrastructure project. Ultimately, the Economic Adjustment Committee developed a list of validated projects needed to prepare Guam for the original realignment plan and these projects were subsequently included in DOD's budget requests (see table 2). The Economic Adjustment Committee considered other projects but did not include them on the validated list and, as a result, the projects were not included in DOD budget requests.

⁵³The Economic Adjustment Committee is chaired by the Secretary of Defense or his designee, and is made up of representatives from 22 federal agencies. The committee is to develop procedures for ensuring, among other things, that communities that are substantially and seriously affected by certain DOD actions are notified of available federal economic adjustment programs. The committee is also to advise, assist, and support the Defense Economic Adjustment Program, which assures coordinated interagency and intergovernmental adjustment assistance concerning defense impact problems and serves as a clearinghouse to exchange information among federal, state, regional, metropolitan, and community officials involved in the resolution of community economic adjustment problems, among other functions. See Exec. Order No. 12,788, 57 Fed. Reg. 2213 (Jan. 15, 1992), *amended by* Exec. Order No. 13,286, § 33, 68 Fed. Reg. 10,619, 10,625 (Feb. 28, 2003) and Exec. Order No. 13,378, 70 Fed. Reg. 28,413 (May 12, 2005), *reprinted as amended in* 10 U.S.C. § 2391 note. In regards to the Guam realignment, the committee was comprised of subject matter experts from the Departments of Agriculture, Defense, Education, Interior, Justice, Health and Human Services, and Housing and Urban Development, as well as the Office of Management and Budget and the Council on Environmental Quality.

DOD Has Requested Funding to Improve Guam's Public Infrastructure

DOD has requested over \$400 million to fund Guam public infrastructure projects in DOD's budget requests for fiscal years 2012 through 2014. Because OEA is the primary DOD office responsible for providing assistance to communities, regions, and states affected by significant DOD program changes, DOD included these projects in OEA's budget requests. Table 2 provides additional details regarding the requests and associated infrastructure projects and justifications.

Table 2: Guam Public Infrastructure Projects Included in OEA's Budget Requests, Fiscal Years 2012 through 2014

Dollars (in millions)				
Project Number	Fiscal year budget request	Project	DOD justification	Amount requested
1	2012	Transfer to Department of the Interior for vehicles and supplies for civilian student transportation.	To allow the civilian school system to support all civilian student growth resulting from the permanent contractor support population growth and to accommodate the current under-capacity school bus fleet in additional to this increased demand.	\$10.1
2	2012	Transfer to the U.S. Department of Housing and Urban Development for construction of Archeological Preservation Act artifact repository	To provide for the preservation and repository of artifacts unearthed during military construction.	22.9
		First phase of the construction of a Guam mental health and substance abuse facility	To address induced population growth impacts (migrant construction labor during the realignment and contractors) that will further strain Guam's mental health and substance abuse system.	
Total fiscal year 2012				\$33
3	2013	Second phase of the construction of a Guam mental health and substance abuse facility.	To address induced population growth impacts (migrant construction labor during the realignment and contractors) that will further strain Guam's mental health and substance abuse system.	20.1
4	2013	Construction of a Guam regional public health laboratory	To replace and relocate the current public health Centers for Disease Control and Prevention level I laboratory with a current Centers for Disease Control and Prevention Level II laboratory, which provide detection capabilities for the increased supplies, construction materials, etc., related to the realignment and protection capabilities for island workers.	12.9
5	2013	First phase of Guam water and wastewater infrastructure improvements.	To address the fragile state of Guam's water and wastewater infrastructure, remedies and new infrastructure are required to support growth resulting from the U.S. Marine Corps relocation to Guam.	106.4

Dollars (in millions)

Project Number	Fiscal year budget request	Project	DOD justification	Amount requested
Total fiscal year 2013				139.4
6	2014	Second phase of Guam water and wastewater infrastructure improvements. <ul style="list-style-type: none"> • Upgrade the Northern District Wastewater Treatment Plant and the Hagatna Wastewater Treatment Plant to full secondary treatment. • Address wastewater collection system deficiencies, including leaking underground fuel tanks (for backup generators) at wastewater pump stations. • Technical support and project development. 	To address the deteriorating condition of Guam’s water distribution and wastewater treatment and collection systems. The requested funding will address public infrastructure deficiencies that (1) impact the public health of DOD personnel and (2) are beyond the financial capability of Guam to correct. The funding also will provide safe, sustainable water resources and capacity critical not only for DOD personnel currently based on Guam and for future DOD growth, but also for current residents of the territory and civilian population growth induced by the military realignment. Additionally, EPA is requiring both wastewater treatment plants to achieve secondary treatment.	273.3
Total of all fiscal years				\$445.7

Source: OEA budget requests.

In response to DOD’s requests for Guam public infrastructure funding, Congress has appropriated some funds, but it has placed limitations on the use of the funds. For example, in 2011, Congress appropriated \$33 million to DOD, acting through the OEA, to assist the civilian population of Guam in response to the military realignment.⁵⁴ However, this funding was subject to restrictions on the expenditure of funds for military and public infrastructure projects in Guam related to the realignment of Marine

⁵⁴ See Consolidated Appropriations Act, 2012, Pub. L. No. 112-74, § 8110 (2011).

Corps forces from Okinawa to Guam.⁵⁵ The National Defense Authorization Act for Fiscal Year 2013 contained similar restrictions,⁵⁶ and in the Consolidated and Further Continuing Appropriations Act, 2013, Congress rescinded \$21 million of the \$33 million appropriated to DOD for fiscal year 2012 for Guam.⁵⁷ OEA requested \$139.4 million for public infrastructure projects on Guam for fiscal year 2013. Congress appropriated \$243.4 million for OEA for fiscal year 2013,⁵⁸ but provided no authorization for use of the funding for public infrastructure projects on Guam. Consequently, according to an OEA official, because DOD did not have the authority to spend the funds for Guam, \$119.4 million was reprogrammed in July 2013 to address shortcomings elsewhere in DOD. As a result, these funds are no longer available to DOD for Guam public infrastructure projects. These congressional actions have implications for DOD's fiscal year 2014 budget request. For example, in its fiscal year 2014 budget request, DOD requested \$273.3 million to fund improvements to the water treatment system on Guam. These funds were intended to fund the second phase of those improvements, as DOD's expectation was that the \$106.4 million requested for fiscal year 2013 would have funded the first phase. While DOD is awaiting congressional action on its fiscal year 2014 budget request, it appears that DOD's request is in advance of need since there was no phase one of the water and wastewater treatment funding and the funds were reprogrammed. As of October 2014, bills pending in Congress varied on the extension of the restriction on the use of funds for the realignment of Marines to Guam, including the restriction related to public infrastructure. While the House

⁵⁵ See National Defense Authorization Act for Fiscal Year 2012, Pub. L. No. 112-81, § 2207(a) (2011). Specifically, the provision restricts the use of funds authorized to be appropriated under the National Defense Authorization Act for Fiscal Year 2012 and amounts provided by the Government of Japan until certain information is provided to the congressional defense committees. See § 2207(a). Additionally, the provision imposed restrictions on the use of DOD funds for the development of public infrastructure projects on Guam absent specific authorization by law. See § 2207(b). The provision contained specified exceptions. See § 2207(c).

⁵⁶ See Pub. L. No. 112-239, § 2832(a), (b) (2013). Section 2832 contained exceptions to the funding restriction, including for required environmental analysis or studies, planning and design of construction projects at Andersen Air Force Base and Andersen South, and to carry out specified military construction projects. See § 2832(c).

⁵⁷ See Pub. L. No. 113-6, § 8040 (2013); 159 Cong. Rec. S1520 (daily ed. Mar. 11, 2013) (Explanatory Statement for the Act, labeling the rescission as "Operation and Maintenance, Defense-Wide Office of Economic Adjustment grant to Guam").

⁵⁸ See 159 Cong. Rec. S1365, 1366 (daily ed. Mar. 11, 2013) (Explanatory Statement).

bill for the National Defense Authorization Act for Fiscal Year 2014 would repeal the restriction from the previous year,⁵⁹ the version of the bill reported by the Senate Armed Services Committee included an extension of the restriction on use of funds to implement the realignment and public infrastructure funding.⁶⁰

DOD Has Not Revalidated the Guam Public Infrastructure Projects Included in Budget Requests or Differentiated Between Current Requirements and Those for the Realignment

DOD has not revalidated the projects identified in its budget requests to reflect the smaller DOD population associated with the revised realignment plan. As a result, it is unclear to what extent these projects are still needed or are scoped appropriately, given the reduced numbers of Marines slated to relocate to Guam. OEA said that some of these projects, such as the artifact repository, should not be affected despite the change in the realignment plans because it is needed to fulfill federal historic preservation requirements and would be required under either plan. However, it is unclear if other projects, such as the water and wastewater improvements and the mental health facility, are still necessary or necessary to the same extent given the significant reduction in forces under the revised realignment plan and the as yet undetermined location of the main Marine Corps installation on the island. According to DOD officials, the projects initially validated by the Economic Adjustment Committee for the 2006 realignment plan and included in DOD budget requests will be reassessed based on the revised realignment plan as part of the supplemental EIS process to be completed in 2015.

DOD also has not clearly differentiated between requirements to address long-standing conditions in Guam's public infrastructure and those to address increased capacity to support the new realignment plan for most sectors. As a result, it is unclear to what extent the public infrastructure projects in DOD's budget requests are needed to support the realignment. For example, one of the possible locations for constructing and operating the main Marine installation being considered under the ongoing supplemental EIS is Naval Base Guam in the southern part of the island. However, this base handles all of its own wastewater needs and gets its potable water from its own wells and the Fena Reservoir, thus not requiring DOD to rely on the public water and wastewater

⁵⁹See H.R. 1960, 113th Cong., § 2832 (as passed by House, June 14, 2013).

⁶⁰See S. 1197, 113th Cong., § 2821 (as reported in the Senate, June 20, 2013); see also S. Rep. No. 113-44, at 239 (2013).

systems. If this location is chosen, it would raise questions about the funding DOD has requested for making improvements to the water and wastewater treatment plant that DOD had justified by citing the need for additional capacity to support the additional troops associated with the realignment. Similarly, DOD has not estimated the extent to which the mental health facility or school bus acquisition projects would actually be used by personnel associated with the new realignment, none of whom were on Guam in 2012 or will be on Guam in 2013 or 2014 even though DOD cited the additional capacity associated with the realignment as a basis for its budget request.

For the electricity sector, we found that DOD has taken steps to differentiate between requirements related to the realignment and those to address long-standing conditions. In February 2013, DOD asked the Guam Power Authority to model what upgrades would be needed to meet the increased demand associated with three of the possible five locations for constructing and operating the main Marine Corps installation. The Power Authority provided DOD with the specific electric transmission and distribution improvements that would be needed and their estimated costs which ranged from \$25 million to \$35 million depending on the location. However, according to our discussions with Government of Guam and DOD officials, DOD has not asked for similar analyses from other affected Guam agencies or begun a comprehensive analysis across all public infrastructure sectors to differentiate between requirements to address existing conditions and what is needed specifically to address additional capacity for the realignment.

The Joint Guam Program Office and Naval Facilities Engineering Command officials told us that they are currently conducting assessments to reexamine and revalidate the need, scope, and funding required for all utilities and infrastructure projects during DOD's development of the supplemental EIS. However, they were uncertain regarding the degree to which the supplemental EIS would fully differentiate between identifying projects that address existing Guam conditions and additional capacity for DOD requirements. Office of Management and Budget guidance containing best practices for cost estimating in the context of capital programming, which includes planning and budgeting, suggests that it is a best practice to continuously update the cost estimating process, based on the latest information available, to keep estimates current, accurate,

and valid.⁶¹ In addition, GAO's *Cost Estimating and Assessment Guide* states that cost estimates should have all cost inputs checked to verify that they are as accurate as possible and that estimates should be updated to reflect changes in requirements.⁶² While we acknowledge that DOD has not completed the supplemental EIS and developed an updated list of public infrastructure project requirements, DOD is requesting funds for existing Guam public infrastructure projects in its budget requests that DOD has not revalidated in light of changes to its realignment plans. Moreover, DOD has not conducted a comprehensive analysis to differentiate between requirements to address long-standing Guam public infrastructure deficiencies and extra capacity to support the realignment. Without such an analysis, DOD will not have the information to identify accurately the costs directly attributable to the realignment and help justify its budget requests to Congress to help pay for the portion of the projects that are attributable to the extra capacity to support the realignment. Both Guam and DOD officials also agreed that developing this type of information would better determine what appropriate amount of Guam public infrastructure improvements DOD should fund and those Guam should fund. Without this information, DOD cannot fully inform Congress of what funding is actually needed to fund public infrastructure development to support the revised realignment plan.

DOD's Cost Estimate to Improve Guam's Water and Wastewater Infrastructure Is Not Reliable

The cost estimate, DOD has used to support its budget requests for water and wastewater infrastructure projects on Guam, did not fully adhere to best practices for developing a reliable cost estimate, which is at the core of successfully managing a project within cost and affordability guidelines. During the development of the EIS, DOD, the Guam Waterworks Authority, and the EPA cooperated to identify and prioritize water and wastewater projects island-wide that were necessary to support the 2006 Marine Corps realignment plan. As part of this effort, DOD (as the EIS sponsor) paid for and EPA (as an EIS cooperating agency) managed a contract with an environmental firm for the development of a refined Guam water and wastewater infrastructure cost estimate. The contractor updated the original 2010 estimate on several occasions with the latest

⁶¹Office of Management and Budget, *Capital Programming Guide: Supplement to OMB Circular A-11: Planning, Budgeting, and Acquisition of Capital Assets*, app. 8 (ver. 3.0 (July 2013)).

⁶²[GAO-09-3SP](#), pp. i and 182.

being in September 2012. That update indicates that approximately \$1.3 billion in improvements are needed for Guam's water and wastewater infrastructure to address existing deficiencies, including out-of-compliance facilities, as well as requirements to support the Marine Corps realignment. DOD used this cost estimate to support its fiscal year 2013 and 2014 budget requests for Guam water and wastewater improvements. However, when reviewing this cost estimate, we were unable to determine which projects within the \$1.3 billion estimate were specifically for capacity increases due to the military realignment and associated with the fiscal years 2013 and 2014 budget requests. In assessing the estimate against best practices, we determined that this estimate is not reliable because it does not include all relevant costs, is based on limited data, and, as documented, lacks many of the key characteristics to be considered a reliable cost estimate. In addition, we found no evidence that actual costs were incorporated into the estimate and that risk and uncertainty were adequately assessed in the estimate.

Office of Management and Budget (OMB) guidance containing best practices for cost estimating in the context of capital programming notes that a disciplined cost estimating process provides greater information management support, more accurate and timely cost estimates and improved risk assessments that will help to increase the credibility of capital programming cost estimates.⁶³ Among other things, OMB's guidance states that credible cost estimates are vital for sound management decision making and for any program or capital project to succeed. It further notes that early emphasis on cost estimating during the planning phase is critical to successful life cycle management of a program or project. Without such an estimate, agencies are at increased risk of experiencing cost overruns, missed deadlines, and performance shortfalls.

Consistent with OMB guidance, in March 2009, we issued a cost estimating and assessment guide that compiled cost estimating best practices from across industry and government.⁶⁴ According to our cost estimating guide, a reliable cost estimate is critical to successfully

⁶³ See Office of Management and Budget Capital Programming Guide: Supplement to OMB Circular A-11: Planning, Budgeting, and Acquisition of Capital Assets, app. 8 (V 3.0 July 2013).

⁶⁴ [GAO-09-3SP](#).

managing capital program costs. Such an estimate provides the basis for informed investment decision making, realistic budget formulation, and accountability for results. Furthermore, the guide indicates that these best practices can be organized into the four characteristics of a reliable cost estimate that management can use for making informed program and budget decisions. Specifically, an estimate is considered

- **comprehensive** when it accounts for all possible costs associated with a program, is structured in sufficient detail to ensure that costs are neither omitted nor double counted, and documents all cost-influencing assumptions;
- **well-documented** when supporting documentation explains the process, sources, and methods used to create the estimate, contains the underlying data used to develop the estimate, and is adequately reviewed and approved by management;
- **accurate** when it is not overly conservative or optimistic, is based on an assessment of the costs most likely to be incurred, and is regularly updated so that it always reflects the current status of the program; and
- **credible** when any limitations of the analysis because of uncertainty or sensitivity surrounding data or assumptions are discussed, the estimate's results are cross-checked, and an independent cost estimate is conducted by a group outside the acquiring organization to determine whether other estimating methods produce similar results.

Each of these four characteristics consists of several best practices (see appendix II for a summary of these practices and our *Cost Estimating and Assessment Guide* for more details on the individual best practices).⁶⁵ We evaluated the estimate against each of the individual best practices, assigning a score on a scale of 1 to 5 to indicate the degree to which the cost estimate met each best practice.

- Not Met (1 point)—DOD provided no evidence that satisfies any portion of the best practice criterion.
- Minimally Met (2 points)—DOD provided evidence that satisfies a small portion of the best practice criterion.
- Partially Met (3 points)—DOD provided evidence that satisfies about half of the best practice criterion.

⁶⁵[GAO-09-35P](#).

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- Substantially Met (4 points)—DOD provided evidence that satisfies a large portion of the best practice criterion.
 - Fully Met (5 points)—DOD provided complete evidence that satisfies the entire best practice criterion.

We then determined the overall assessment rating for each of the four characteristics by totaling the scores assigned to the individual best practices within each characteristic to derive an average score for that characteristic. The average scores fell into the following ranges:

- Not Met = 0 to 1.4
- Minimally Met = 1.5 to 2.4
- Partially Met = 2.5 to 3.4
- Substantially Met = 3.5 to 4.4
- Fully Met = 4.5 to 5.0.

Best practices assessed as not applicable were not given a score and were not included in our calculation of the overall assessment.⁶⁶

To be considered reliable, an estimate must substantially or fully meet all four characteristics. We found that the water and wastewater cost estimate for Guam did not meet one of the characteristics and only minimally met the remaining three. As a result, we determined that the estimate is not reliable. Table 3 provides a summary of the results of GAO's assessment of the Guam water and wastewater cost estimate based on cost estimating best practices. See appendix II for our complete analysis of the individual best practices for each of the characteristics.

⁶⁶This rating scale was developed by GAO staff in consultation with some of the cost estimating experts who helped develop the *Cost Estimating and Assessment Guide*.

Table 3: Summary of GAO’s Assessment of the Guam Water and Wastewater Cost Estimate Based on Best Practices Criteria

Characteristic	GAO assessment summary	Assessment
Comprehensive	<p>Officials outlined and documented the ground rules and assumptions of the project in the estimate. However, because of limited data, we were unable to determine whether risks associated with any assumptions were identified and traced to specific elements. Additionally, the estimate does not include all of the life-cycle costs needed to sustain the infrastructure improvement program. For example, the cost estimate does not include any operation and maintenance costs for equipment and upkeep of improvements made to the water and wastewater infrastructure.</p> <p>Because assumptions are best guesses, best practices state that the risks associated with assumptions need to be identified and assessed. Unless ground rules and assumptions are clearly documented, the cost estimate will not have a basis for areas of potential risk to be resolved. Additionally, excluding operation and maintenance costs will likely increase the cost of the overall estimate. Without a full accounting of life cycle costs, management will have difficulty matching project resources to requirements and will not be reasonably assured of making the right decisions about where to allocate resources.</p>	Minimally Met
Well Documented	<p>Although the documentation describes step-by-step how the estimate was developed and includes all of the material and labor costs for each capital improvement project, the estimate did not include a technical baseline describing the scope and technical details of the program. Additionally, the estimate relied on expert opinion to develop nonqualified work factors, but the expert’s qualifications are not documented, and there is no data supporting the establishment of the factors. Furthermore, the documentation did not sufficiently explain why certain assumptions and cost adjustments were made, which is inconsistent with best practices.</p> <p>Without good documentation, management and oversight officials will not have reasonable assurance that the estimate is credible; supporting data, lessons learned, and reasons why costs changed will not be available for future use; questions about the approach or data used to create the estimate cannot be answered; and the scope of the analysis cannot be thoroughly defined.</p>	Minimally Met
Accurate	<p>Although the estimate has been updated three times, the estimate cannot be considered accurate because sufficient supporting documentation was not available regarding the updates. For example, the September 2012 update to the cost estimate was provided but at a summary level with no detailed supporting documentation. This update made few substantive changes with only a small percentage of the project costs changing and with little explanation for the changes. Additionally, the estimate is not accurate because it does not differentiate between costs specific to the realignment and current Guam deficiencies. As previously discussed in this report, the costs included in the cost estimate, which span 30 years of implementation, reflect both costs to correct long-standing deficiencies and costs for the existing water and wastewater infrastructure, but no costs distinctions were made between long-needed improvements and those needed to meet the current reduced realignment needs. Further, the cost estimate has not been properly adjusted for inflation and there was no evidence that actual costs from any contracts that may exist were included.</p> <p>A lack of cost estimate updates interferes with analysis of changes in program costs and hinders collection of cost and technical data to support future estimates. As called for with best practices, a properly updated cost estimate can provide decision makers with accurate information for assessing alternative decisions. Moreover, without adjusting for inflation, management runs the risk of making decisions on less than likely cost information.</p>	Minimally Met

Characteristic	GAO assessment summary	Assessment
Credible	<p>The cost estimate is not credible because it does not include a sensitivity analysis that identified a range of possible costs based on varying major assumptions and data inputs, which is inconsistent with best practices.^a For example, the credibility of the estimate was lessened because program officials did not perform a sensitivity analysis that would have identified key drivers of costs, such as changes in labor hours and rates. In addition, program officials did not commission an independent cost estimate, which is considered one of the best and most reliable estimate validation methods because it shows whether other estimating procedures produce similar results and it provides an independent view of expected project costs that test the estimate for reasonableness.</p> <p>Without a sensitivity analysis, decision makers lack complete information regarding the potential for cost growth and the reasons for it, and, as a result, may be unprepared to deal with unexpected contingencies. Additionally, an estimate that has not been reconciled with an independent cost estimate has an increased risk of being underfunded because the independent cost estimate provides an objective and unbiased assessment of whether the project estimate's cost can be achieved.</p>	Not Met

Source: GAO.

^aSensitivity analysis examines the effect of changing one assumption or cost input at a time while holding all other variables constant.

OEA officials stated that the intent of the estimate was to develop a preliminary rough-order-of-magnitude estimate in order to provide enough information to get the budget process started for funding urgent Guam water and wastewater improvements. The officials further stated that they believe the estimate was sufficient for this purpose. In addition, according to OEA and EPA officials, the cost estimate was not intended to represent a “budget quality” life cycle cost estimate given the complexity of the project and lack of documentation submitted by the Government of Guam in developing the estimate. Nonetheless, DOD used this cost estimate to support its fiscal year 2013 and 2014 budget requests for funding Guam water and wastewater improvements.

In the future, as DOD updates its list of Guam public infrastructure project requirements when the supplemental EIS is completed and develops the associated cost estimates, it has the opportunity to ensure that the estimates it is using more completely incorporate cost estimating best practices, thereby improving the quality of the cost estimates and making them easier to defend in future budgets and decision making. According to documentation attached to DOD’s fiscal year 2013 budget, DOD emphasized that it cannot continue the practice of starting programs that prove to be unaffordable and according to our *Cost Estimating and Assessment Guide*, whether or not a program is affordable depends a great deal on the quality of its cost estimate. Without a reliable estimate that is updated in response to program changes, Congress is hindered in its ability to assess budgets and affordability. Also, without complete cost

estimates for the potential total financial commitment for operating and maintaining Guam's water and wastewater systems, Congress will not have needed information to weigh the proposed cost of the Marine realignment plans against other demands for resources.

Conclusions

Until DOD has the results of the supplemental EIS and issues a record of decision, it is understandable that DOD will not be able to finalize comprehensive public infrastructure requirements and cost estimates for its planned realignment of Marines and dependents from Japan to Guam. Nevertheless, in the interim, DOD through OEA has continued to request funds for Guam public infrastructure projects without updating its requirements based on the revised realignment plan that calls for a much smaller Marine Corps presence in Guam than previously planned. Furthermore, DOD and the Navy's JGPO have not clearly identified which Guam public infrastructure requirements and costs directly support the additional capacity needed for the realignment and which address current deficiencies. In addition, OEA did not fully incorporate cost estimating best practices in developing its cost estimate for Guam's water and wastewater infrastructure projects that was used to support previous budget requests. Our analysis of the cost estimate and its updates found that the estimate satisfies a small portion of the best practice criteria and thus is not a reliable estimate to support budget requests. Further, two important points emerged: (1) the true cost of this water and wastewater project is not known, and (2) it is unclear whether all of the underlying improvements are needed to support the realignment.

Actions such as revalidating the original list of infrastructure projects, conducting analyses that differentiate existing Guam public infrastructure deficiencies from additional capacity needed to support the realignment, and more fully incorporating cost estimating practices to help DOD identify the costs directly attributable to the realignment would provide DOD with the information it needs to support its Guam budget requests to Congress. Without reliable cost estimates developed for the realignment plan in a manner consistent with GAO's cost estimating guide, DOD will be hampered in achieving its affordability goal of not starting a program without firm cost goals in place and may be seeking funds for public infrastructure projects that may no longer be needed. Furthermore, the credibility of DOD's estimate will be questionable, and Congress cannot be reasonably assured that it is sufficiently informed regarding the funding that may be needed for Guam public infrastructure projects.

Recommendations for Executive Action

To provide DOD and Congress with sufficient information regarding the requirements and costs associated with DOD's current Guam realignment plans and the public infrastructure necessary to support that realignment, we recommend that the Secretary of Defense direct the Department of the Navy's JGPO in concert with OEA take the following three actions:

- Revalidate the need and scope of Guam public infrastructure projects included in DOD budget requests based on the reduced number of Marines and dependents DOD intends to relocate to Guam.
- Conduct a comprehensive analysis across all applicable public infrastructure sectors to determine what infrastructure requirements and costs are needed to address existing deficiencies in Guam's infrastructure and what requirements and costs are needed to directly support the additional capacity needed to support the realignment, and
- As future cost estimates for Guam public infrastructure projects are developed, fully incorporate the best practices identified by GAO for developing high quality cost estimates.

Agency and Third Party Comments and Our Evaluation

We provided a draft of this report to DOD, the Department of the Interior, EPA, and the Office of the Governor of Guam for review and comment. In written comments, which are reprinted in their entirety in appendix III, DOD partially concurred with our three recommendations. DOD, the Department of the Interior, EPA, and the Office of the Governor of Guam provided technical comments that have been incorporated into this report as appropriate.

DOD partially concurred with our first recommendation to revalidate the need and scope of Guam public infrastructure projects included in DOD budget requests. DOD concurred that the need and scope of additional, realignment-related Guam public infrastructure projects will be revalidated as necessary based on the results of the analysis in the ongoing supplemental EIS. However, for the Guam wastewater public infrastructure project, DOD commented that the requested funding is not contingent upon the size of the realignment but rather represents funding for improvements to address noncompliance with EPA regulations. As a result, DOD concluded that the requests associated with the wastewater treatment facilities do not warrant realignment-related revalidation. We disagree. First, while DOD's justifications for the wastewater treatment funding cite the need for remedies and residents' current needs, the justifications also state that the funding and project is required to support growth resulting from the military realignment. Given that the size of the

realignment has been reduced significantly, a revalidation of the wastewater project remains warranted. Second, without a revalidation of the wastewater project, it will continue to be unclear to what extent the requested funds for the project are still necessary or necessary to the same extent given the significant reduction in forces under the revised realignment plan and the as yet undetermined location of the main Marine Corps installation. Specifically, as discussed in the report, a possible location for the main Marine installation is Naval Base Guam, which handles its own wastewater needs and does not require DOD to rely on the public wastewater system. If this location is chosen, DOD would appear to no longer have a basis for its cited need for additional wastewater capacity to support the realignment as part of its budget request justifications.

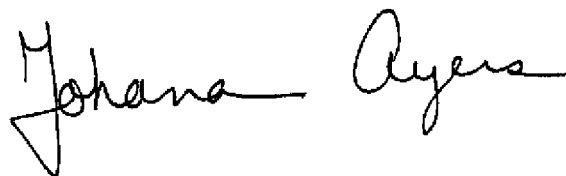
DOD stated that it partially concurred with our second recommendation to conduct a comprehensive analysis across all applicable public infrastructure sectors to determine what infrastructure requirements and costs are needed to address long-standing deficiencies in Guam's infrastructure and which are needed to directly support the realignment. DOD noted that a determination of realignment-related infrastructure requirements and costs is an anticipated outcome of the supplemental EIS. DOD's comments, however, do not address whether it plans to clearly differentiate between those infrastructure requirements and costs needed to address existing deficiencies in Guam's infrastructure and those needed to directly support the additional capacity associated with the realignment, as we specifically recommended. Doing so is important, because as explained in the report, clearly differentiating between existing public infrastructure deficiencies and any additional capacity needed to support the realignment would help DOD more accurately identify the costs directly attributable to the realignment. DOD's analysis would then provide congressional decision makers with information they need to appropriately fund requests for public infrastructure projects on Guam.

DOD partially concurred with our third recommendation to fully incorporate the best practices identified by GAO for developing high quality cost estimates, as future cost estimates for Guam public infrastructure projects are developed. In response to this recommendation, DOD stated that future realignment-related cost estimates and budget submissions will be developed in accordance with DOD's Financial Management Regulation and that final engineering cost estimates for specific projects will be developed in the normal course of executing the fiscal year 2014 program. While budget submissions must

conform to DOD guidance, OMB guidance and our cost estimating and assessment guide, which is a compilation of cost estimating best practices from across industry and government, confirm that cost estimates should conform to best practices and follow certain specific steps to ensure that they are reliable and credible. Development of reliable and credible cost estimates is important, whether as part of budget submissions or in advance of those submissions. As discussed in this report, our analysis of DOD's cost estimate for Guam's largest public infrastructure project—the water and wastewater treatment facility—demonstrates that weaknesses exist in DOD's cost estimating practices that, if left unaddressed, increase the likelihood that costs will increase. By not following best practices in preparing its cost estimate, DOD cannot ensure that the estimate is reliable and credible. As DOD continues to provide information to Congress regarding the realignment, we believe DOD has the opportunity to improve the quality of its estimates by applying cost estimating best practices in its approach. To better inform the budget decisionmaking process of the likely costs, affordability, and scheduling of funding needed to support the Guam realignment, DOD should take every available opportunity to employ best practices and provide Congress with the highest quality cost estimates possible.

We are sending copies of this report to appropriate congressional committees; the Secretary of Defense; the Secretaries of the Army, Navy, and Air Force; the Commandant of the Marine Corps; the Director, Office of Management and Budget; and appropriate organizations. In addition, this report will be available at no charge on our website at <http://www.gao.gov>.

If you or your staff has any questions about this report, please contact me at (202) 512- 5741 or ayersj@gao.gov. Contact points for our Offices of Congressional Affairs and Public Affairs may be found on the last page of this report. GAO staff who made major contributions to this report are listed in appendix IV.

A handwritten signature in black ink that reads "Johana Ayers". The signature is written in a cursive style with a large initial "J" and "A".

Johana Ayers
Acting Director
Defense Capabilities and Management

List of Committees

The Honorable Carl Levin
Chairman
The Honorable James Inhofe
Ranking Member
Committee on Armed Services
United States Senate

The Honorable Tim Johnson
Chairman
The Honorable Mark Kirk
Ranking Member
Subcommittee on Military Construction, Veterans' Affairs,
and Related Agencies
Committee on Appropriations
United States Senate

The Honorable Howard P. McKeon
Chairman
The Honorable Adam Smith
Ranking Member
Committee on Armed Services
House of Representatives

The Honorable John Culberson
Chairman
The Honorable Sanford Bishop
Ranking Member
Subcommittee on Military Construction, Veterans' Affairs,
and Related Agencies
Committee on Appropriations
House of Representatives

Appendix I: Scope and Methodology

To describe the existing condition of the public infrastructure on Guam, we interviewed and collected information from various Department of Defense (DOD) officials, including those in the

- Office of the Under Secretary of Defense for Policy;
- Office of Economic Adjustment (OEA), Office of the Under Secretary of Defense for Acquisitions, Technology, and Logistics;
- Naval Facilities Engineering Command;
- Joint Region Marianas, Department of the Navy; and
- Joint Guam Program Office, Department of the Navy.

We also interviewed other federal officials from the following offices and agencies assisting Guam in preparing for the realignment:

- Office of Management and Budget
- Council on Environmental Quality
- Department of the Interior's Office of Insular Affairs
- Environmental Protection Agency, Region IX
- Department of Health and Human Services, Region IX.

We conducted a site visit to Guam in April 2013, where we met with

- the Governor of Guam,
- the Speaker and other members of the Guam Legislature,
- the Guam Auditor General, and
- officials in Guam's Military Buildup Office.

We also interviewed other Guam officials representing the following public infrastructure sectors on Guam likely to be affected by the realignment:

- Guam Waterworks Authority
- Guam Power Authority
- Consolidated Commission on Utilities
- Guam Department of Public Works
- Port Authority of Guam
- Guam Department of Public Health and Social Services
- Guam Environmental Protection Agency
- Guam Fire Department
- Guam Police Department
- Guam Department of Education
- Guam State Historic Preservation Office.

During our site visit to Guam, we toured Andersen Air Force Base and some of the locations cited in documents related to the supplemental Environmental Impact Statement (EIS) as possible locations for the establishment of a main Marine Corps installation and Marine Corps live-fire training range complex on Guam. We also visited the Northern District Wastewater Plant and Port of Guam which had been cited by DOD and Government of Guam officials as two of the most critical infrastructure sectors requiring improvements.

For the purposes of our review, public infrastructure is defined as including the utilities, methods of transportation, equipment, or facilities under the control of a public entity, such as a power authority, or local government for use by the public to support the realignment of forces and dependents.¹ The public infrastructure sectors covered by our review were chosen based on inclusion in (1) prior Government of Guam and DOD project lists developed for the 2006 Roadmap realignment plan, (2) DOD budget requests, (3) prior GAO reports on the realignment of U.S. forces to Guam, and (4) federal agency inspector general reports, as well as those sectors identified during our interviews by Government of Guam and DOD officials. The following eight sectors are included in our review: electric power, water and wastewater, port, solid waste, public health, law enforcement, fire department, and education infrastructure. The highways and other roads sector is not included in our analysis because Government of Guam and DOD officials did not identify it as a sector likely to be adversely affected by the realignment since existing programs and agencies, such as the Defense Access Roads² and the Department

¹The definition of public infrastructure used for this report is based on the definition contained in the National Defense Authorization Act for Fiscal Year 2013. Section 2832 of that Act defined “public infrastructure” as any utility, method of transportation, item of equipment, or facility under the control of a public entity or state or local government that is used by, or constructed for the benefit of, the general public. See Pub. L. No. 112-239, § 2832(d)(2) (2013).

²The Defense Access Roads program provides a method for DOD to pay a fair share for public highway improvements required as a result of sudden or unusual defense-generated traffic impacts or unique defense public highway requirements. Projects may be eligible for funding under the following five criteria: (1) a new access road to an installation is needed to accommodate a defense action, (2) a defense action causes traffic to double, (3) urgent improvements are needed to accommodate a temporary surge in traffic to or from an installation due to a defense action, (4) a new or improved access road is needed to accommodate special military vehicles, such as heavy equipment transport vehicles, or (5) a road is needed to replace one closed for defense needs.

of Transportation's Federal Highway Administration, are currently allocating funds for road and highway improvements on Guam.

For our first objective regarding the existing condition of Guam's public infrastructure, we reviewed the original EIS, a DOD engineering review, technical studies, and business case analyses and conducted interviews. In addition, we reviewed inspector general reports prepared by the Department of the Interior regarding the condition of specific sectors of Guam's public infrastructure. We reviewed these reports and determined that their methodologies were sufficiently reliable for our purposes. We corroborated the information contained in the inspector general reports by interviewing Guam officials from the relevant public infrastructure sectors to determine the extent to which the findings of the various reports accurately portrayed the condition of Guam's public infrastructure and remained valid. We also reviewed the socioeconomic project needs assessment worksheets developed by Guam and provided to the Economic Adjustment Committee in 2010 as part of the Economic Adjustment Committee's efforts to develop a list of public infrastructure requirements for the original realignment plan. Additionally, we reviewed the completed supplemental EIS questionnaires administered by DOD to Guam to obtain updated information regarding the state of Guam's public infrastructure and potential impact of the revised realignment plan.

For our second objective to describe the types of assistance DOD generally has provided to defense-affected communities and the other types of funding sources that have been used to fund Guam public infrastructure projects, we interviewed OEA officials to identify the most relevant historical examples similar to Guam and reviewed past congressional hearings, DOD documents, and fiscal impact analyses to determine previous instances of where DOD provided public infrastructure funding to communities. To identify examples of non-DOD, federal programs from which Guam has received public infrastructure funding in the past, we interviewed OEA, Department of the Interior, and Government of Guam officials and reviewed Guam's Single Audit report and Summary of Schedule of Expenditures of Federal Awards. To determine Guam's potential for raising additional revenue to fund infrastructure projects, we interviewed Guam officials and reviewed the Government of Guam's 2014 executive budget request and long-term debt abstract.

For our third objective to assess DOD's efforts to revalidate its public infrastructure requirements under the revised realignment plan and differentiate between requirements needed to address Guam's existing

public infrastructure deficiencies and those related to the realignment, we reviewed information on DOD and the Government of Guam's planning activities related to public infrastructure improvements needed to support the revised realignment plan and compared this information to previous public infrastructure lists developed by the Government of Guam, DOD, and other federal entities to support the 2006 Roadmap realignment plan. We interviewed DOD officials regarding the extent to which DOD was revalidating and differentiating between requirements as part of the current supplemental EIS and also interviewed Government of Guam officials from all the infrastructure sectors we reviewed to determine the extent to which they had been contacted by DOD to update or differentiate between requirements. We evaluated DOD's efforts with criteria established in our *Cost Estimating and Assessment Guide: Best Practices for Developing and Managing Capital Program Costs*³ and OMB guidance containing best practices for capital programming. To determine how much DOD has requested to support public infrastructure projects on Guam, we reviewed DOD budget materials and interviewed OEA officials to determine what funding DOD has requested to support public infrastructure projects on Guam related to the realignment, as well as statutory restrictions on the use of these funds for these types of projects.

For our fourth objective to assess the extent to which the cost estimate for Guam's water and wastewater infrastructure improvements used by DOD to support its budget requests was developed according to the characteristics of a reliable cost estimate, we assessed the cost estimating approach used to develop the estimate against best practices found in our 2009 *Cost Estimating and Assessment Guide*.⁴ GAO designed the guide to be used by federal agencies to assist them in developing reliable cost estimates. To develop the guide, GAO cost experts assessed measures applied by cost estimating organizations throughout the federal government and industry and considered best practices for the development of reliable cost estimates. We analyzed the cost estimating practices used to develop the estimate against these best practices. We categorized these best practices into four general

³GAO, *Cost Estimating and Assessment Guide: Best Practices for Developing and Managing Capital Program Costs*, [GAO-09-3SP](#) (Washington, D.C.: Mar 2, 2009). This guide is a compilation of best practices that federal cost estimating organizations and industry use to develop and maintain reliable cost estimates throughout the life of a government acquisition program.

⁴[GAO-09-3SP](#).

characteristics representing practices that help ensure that a cost estimate is (1) comprehensive, (2) well documented, (3) accurate, and (4) credible. Each of these four characteristics consists of several best practices (see appendix II for a summary of these practices and our Cost Estimating and Assessment Guide for more details on the individual best practices). We evaluated the estimate against each of the individual best practices, assigning a score on a scale of 1 to 5 to indicate the degree to which the cost estimate met each best practice.

- Not Met (1 point)— DOD provided no evidence that satisfies any portion of the best practice criterion.
- Minimally Met (2 points)—DOD provided evidence that satisfies a small portion of the best practice criterion.
- Partially Met (3 points)—DOD provided evidence that satisfies about half of the best practice criterion.
- Substantially Met (4 points)—DOD provided evidence that satisfies a large portion of the best practice criterion.
- Fully Met (5 points)—DOD provided complete evidence that satisfies the entire best practice criterion.

We determined the overall assessment rating for each of the four characteristics by totaling the scores assigned to the individual best practices within each characteristic to derive an average score for that characteristic. The average scores fell into the following ranges:

- Not Met = 0 to 1.4
- Minimally Met = 1.5 to 2.4
- Partially Met = 2.5 to 3.4
- Substantially Met = 3.5 to 4.4
- Fully Met = 4.5 to 5.0.

Best practices assessed as not applicable were not given a score and were not included in our calculation of the overall assessment.⁵ We also held detailed discussions with EPA and DOD officials and reviewed program documentation to identify key factors that could affect the potential total costs. We also met with these officials to discuss the results of our evaluation.

⁵This rating scale was developed by GAO staff in consultation with some of the cost estimating experts who helped develop the our *Cost Estimating and Assessment Guide*.

To determine the reliability of the numerical data provided to us by DOD, other federal organizations, and by Government of Guam officials, we collected information on how the data was collected, managed, and used through interviews with relevant officials. By assessing this information against GAO data quality standards,⁶ we determined that the data presented in our findings were sufficiently reliable for the purposes of this report.

We conducted this performance audit from February 2013 through December 2013, 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 the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

⁶GAO, *Assessing the Reliability of Computer-Processed Data*, [GAO-09-680G](#) (Washington, D.C.: July 2009).

Appendix II: Detailed Assessment of the Guam Water and Wastewater Cost Estimate

This appendix provides the detailed results of our analysis of the cost estimate that was used to support the Department of Defense's (DOD) budget requests for funding to improve Guam's water and wastewater systems. Specifically, we assessed the extent to which the cost estimate followed the best practices of a reliable cost estimate as documented in our 2009 *Cost Estimating and Assessment Guide: Best Practices for Developing and Managing Capital Program Costs*.¹ We reviewed the cost estimate for the water and wastewater system and assessed each individual best practice that comprises each of the four characteristics of a reliable cost estimate as summarized in the report's body and assigned a score on a scale of 1 to 5 to indicate the degree to which the estimate met each best practice.

- Not Met (1 point)—DOD provided no evidence that satisfies any portion of the best practice criterion.
- Minimally Met (2 points)—DOD provided evidence that satisfies a small portion of the best practice criterion.
- Partially Met (3 points)—DOD provided evidence that satisfies about half of the best practice criterion.
- Substantially Met (4 points)—DOD provided evidence that satisfies a large portion of the best practice criterion.
- Fully Met (5 points)—DOD provided complete evidence that satisfies the entire best practice criterion.

We determined the overall assessment rating for each characteristic by totaling the scores assigned to the individual best practices within each characteristic to derive an average score for that characteristic. The average scores fell into the following ranges:

- Not Met = 0 to 1.4
- Minimally Met = 1.5 to 2.4
- Partially Met = 2.5 to 3.4
- Substantially Met = 3.5 to 4.4
- Fully Met = 4.5 to 5.0.

¹GAO, *Cost Estimating and Assessment Guide: Best Practices for Developing and Managing Capital Program Costs*, [GAO-09-3SP](#) (Washington, D.C., Mar 2, 2009). This guide is a compilation of best practices that federal cost estimating organizations and industry use to develop and maintain reliable cost estimates throughout the life of a government acquisition program.

Best practices assessed as not applicable were not given a score and were not included in our calculation of the overall assessment.² Table 4 provides the detailed results of our analysis of the cost estimate.

Table 4: GAO’s Assessment of the Guam Water and Wastewater Cost Estimate Based on Best Practices Criteria

Characteristic	Overall assessment	Best practice	Individual assessment	Best practice rating
Comprehensive	Minimally met Average score 2	1. The cost estimate includes all life cycle costs	Minimally met The estimate does not include all of the life-cycle costs needed to sustain the infrastructure improvement program. For example, the cost estimate does not include any operation and maintenance costs for equipment and upkeep of improvements made to the water and wastewater infrastructure. Excluding operation and maintenance costs will likely increase the cost of the overall estimate. Without a full accounting of life cycle costs, management will have difficulty matching project resources to requirements and will not be reasonably assured of making the right decisions about where to allocate resources.	2

²This rating scale was developed by GAO staff in consultation with some of the cost estimating experts who helped develop our *Cost Estimating and Assessment Guide*.

**Appendix II: Detailed Assessment of the Guam
Water and Wastewater Cost Estimate**

Characteristic	Overall assessment	Best practice	Individual assessment	Best practice rating
		2. The cost estimate completely defines the program, reflects the current schedule, and is technically reasonable	<p>Minimally met</p> <p>The estimate includes documentation of the engineering methodology used to develop the cost estimate for each critical infrastructure project. So while the estimate appears to be technically reasonable, it neither reflects the current schedule nor completely defines the program's life cycle. For example, a technical baseline document, describing the scope and technical details of the program, was not provided. A brief discussion and description of individual projects was provided in the technical memorandum. There are multiple, independent projects comprising both the water and wastewater efforts, but none is sufficiently defined to understand the scope of work. In addition, there is no indication that the project's scope or complexity has been updated to reflect more current environmental studies or reports, infrastructure inspections, or other reviews.</p> <p>Understanding the program—including the acquisition strategy, technical definition, characteristics, system design features, and technologies to be included—is key to developing a credible cost estimate. Without these data, the cost estimator will not be able to identify the technical and program parameters that will bind the cost estimate.</p>	2

**Appendix II: Detailed Assessment of the Guam
Water and Wastewater Cost Estimate**

Characteristic	Overall assessment	Best practice	Individual assessment	Best practice rating
3.	The cost estimate work break-down structure is product-oriented, traceable to the statement of work/objective, and at an appropriate level of detail to ensure that cost elements are neither omitted nor double counted. A work break-down structure deconstructs a program's end product into successive levels with smaller specific elements until the work is subdivided to a level suitable for management control.	Minimally met The cost estimates appear to be presented in organizational breakdown structures that show some hierarchal relationship, but the cost estimates are not presented in a work break-down structure as typically seen in DOD with a clearly labeled 1.0, 1.1, 1.1.1, etc. structure. However, both methods of grouping would logically allow management to easily plan and schedule the program's activities and track costs. In addition, there is no schedule identified or any indication of any earned value management or similar cost reporting. Without an adequate work break-down structure, the program lacks a framework to develop a schedule and cost plan that can be used to easily track technical accomplishments. A standard product-oriented work break-down structure facilitates the tracking of resource allocations and expenditures, which can give an agency insight to reliably estimate the cost of future similar programs.	2	
4.	The estimate documents all cost influencing ground rules and assumptions.	Minimally met Although ground rules and assumptions are presented, they are at a very high level and difficult to relate to the individual projects. Additionally, the 2012 update to the estimate did not identify any additions or changes to the assumptions found in the 2010 estimate. According to our Cost Estimating and Assessment Guide, it is imperative that cost estimators document all assumptions well, so that management fully understands the conditions on which the estimate was structured. Failing to do so can lead to overly optimistic assumptions that heavily influence the overall cost estimate, to cost overruns, and to inaccurate estimates and budgets.	2	

**Appendix II: Detailed Assessment of the Guam
Water and Wastewater Cost Estimate**

Characteristic	Overall assessment	Best practice	Individual assessment	Best practice rating
Well documented	Minimally met Average score 2.2			
		1. The documentation should capture the source data used, the reliability of the data, and how the data were normalized.	<p>Partially met</p> <p>The technical memorandum includes the cost estimate, for both summary level and detailed projects, and the ground rules and assumptions and the methodology and calculations. However, there is no discussion or indication if or how the data were normalized, or how reliable the data sources are. The data are primarily generic construction unit cost data or factors, applied to the individual tasks. The basis of the estimate is predominantly engineering judgment, subject matter opinion, and quotes from the Guam Waterworks Authority or quotes provided to the Authority from external suppliers.</p> <p>According to our Cost Estimating and Assessment Guide, data are the foundation of every cost estimate. Depending on data quality, an estimate can range anywhere from a mere guess to a highly defensible cost position. Data are often in many different forms and need to be adjusted before being used. The cost estimator needs information about the source and reliability of the data in order to know whether the data collected can be used directly or need to be modified.</p>	3
		2. The documentation describes in sufficient detail the calculations performed and the estimating methodology used to derive each element's cost.	<p>Partially met</p> <p>The cost estimate utilizes engineering build-up methodology—where the estimate is “built-up” from the lowest component and documents the source of material costs—but does not document the source of labor rates. Additionally, the estimate relied on expert opinion to develop non-qualified work factors. However, the expert’s qualifications are not documented and there is no data supporting the establishment of the factors. Adjustments were made to the estimate to account for complexity, planning and engineering, non-quantified work, and location, but these were not based on site specific or location specific data but rather were developed using engineering judgment. However, there was no indication what experience provided for the engineering judgment.</p> <p>Poorly documented cost estimates can cause a program’s credibility to suffer because the documentation cannot explain the rationale for the methodology or the calculations. Estimates that lack sufficient documentation are not useful for updates or information sharing and can hinder understanding and proper use.</p>	3

**Appendix II: Detailed Assessment of the Guam
Water and Wastewater Cost Estimate**

Characteristic	Overall assessment	Best practice	Individual assessment	Best practice rating
		3. The documentation describes step-by-step how the estimate was developed so that a cost analyst unfamiliar with the program could understand what was done and replicate it.	<p>Partially met</p> <p>The documentation describes step-by-step how the estimate was developed in terms of including all of the materials and labor costs for each critical infrastructure project. However, the documentation does not capture how the scope of the project was determined. It also does not capture at a detailed level how quantities of materials, labor hours, and labor rates were determined.</p> <p>Without good documentation, management and oversight officials will not have reasonable assurance that the estimate is credible; supporting data, lessons learned, and reasons why costs changed will not be available for future use; questions about the approach or data used to create the estimate cannot be answered; and the scope of the analysis cannot be thoroughly defined.</p>	3
		4. The documentation discusses the technical baseline description and that the data in the baseline are consistent with the estimate.	<p>Not met</p> <p>A brief description of each project is included, and the elements of each cost estimate, although limited, appear to be consistent with the type of work and the scope of work defined. However, there is no overarching technical baseline and each project is minimally defined in terms of labor hour requirements and material dollars.</p> <p>Without a technical baseline that provides explicit documentation of the basis of a program's estimates, it is difficult to update the cost estimate and provide a verifiable trace to a new cost baseline as key assumptions change during the course of the program's life.</p>	1
		5. The documentation provides evidence that the cost estimate was reviewed and accepted by management.	<p>Not met</p> <p>Although DOD officials stated that the Joint Guam Program Office and Naval Facilities Engineering Command both reviewed the estimate, no documentation was provided to us clearly showing that the cost estimate was reviewed by the Joint Guam Program, the Office of Economic Adjustment, Naval Facilities Engineering Command, or the Environmental Protection Agency.</p> <p>Because a cost estimate should form the basis for establishing the budget, it is imperative that management understands how the estimate was developed, including the risks associated with source data and estimating methodologies.</p>	1

**Appendix II: Detailed Assessment of the Guam
Water and Wastewater Cost Estimate**

Characteristic	Overall assessment	Best practice	Individual assessment	Best practice rating
Accurate	Minimally met Average score 2.4			
		1. The cost estimate results are unbiased, not overly conservative or optimistic, and based on an assessment of most likely costs.	Minimally met As previously discussed, the costs included in the cost estimate which span 30 years of implementation, reflect both costs to correct long-standing deficiencies and costs for the existing water and wastewater infrastructure, but no costs distinctions were made between long-needed improvements and those needed to meet the current reduced realignment needs. Moreover, given that the estimate was developed based on early conceptual design and not a detailed or engineering design, the method of building the estimate from the "bottom up" from the lowest component is highly questionable. This methodology is generally reserved for estimating programs with greater levels of definition and certainty since it requires a detailed build-up of labor, material, and overhead costs. No risk or sensitivity analysis has been developed. In the absence of cost risk and uncertainty analysis, it is not possible to determine if the estimate is unbiased. Unless the estimate is based on an assessment of the most likely costs and reflects the degree of uncertainty given all of the risks considered, management will be hindered in making informed decisions.	2
		2. The estimate has been adjusted properly for inflation.	Not met Updates were made to the cost estimate in 2011 and 2012; however, costs for all estimate updates were presented in 2010 dollars. Without adjusting for inflation, management runs the risk of making decisions on less than likely cost information.	1
		3. The estimate contains few, if any, minor mistakes.	Met What is provided in the cost estimate documentation appears to contain no mathematical mistakes.	5

**Appendix II: Detailed Assessment of the Guam
Water and Wastewater Cost Estimate**

Characteristic	Overall assessment	Best practice	Individual assessment	Best practice rating
		4. The cost estimate is regularly updated to reflect significant changes in the program so that it is always reflecting current status.	<p>Minimally met</p> <p>The baseline estimate being evaluated was from 2010. Officials indicated that this estimate had been updated in January and November 2011 and again in September 2012. The January 2011 and November 2011 updates were not provided and therefore could not be evaluated. The September 2012 update was provided but at the summary level, with no supporting documentation. The 2012 update made few substantive changes with only a small percentage of the project costs changing and with little explanation for the changes.</p> <p>A lack of cost estimate updates interferes with analysis of changes in program costs and hinders collection of cost and technical data to support future estimates. A properly updated cost estimate can provide decision makers with accurate information for assessing alternative decisions.</p>	2
		5. Variances between planned and actual costs are documented, explained, and reviewed.	<p>Not met</p> <p>There is no evidence from the documentation that actual costs were incorporated into the estimate.</p> <p>Without a documented comparison between the current estimate (updated with actual costs) and the old estimate, cost estimators cannot determine the level of variance between the two estimates. That is, the estimators cannot see how well they are estimating and how the program is changing over time.</p>	1

**Appendix II: Detailed Assessment of the Guam
Water and Wastewater Cost Estimate**

Characteristic	Overall assessment	Best practice	Individual assessment	Best practice rating
		<p>6. The estimate is based on a historical record of cost estimating and actual experiences from other comparable programs.</p>	<p>Partially met</p> <p>Administrative and planning costs were predominantly based on assumed/estimated labor hours by critical trade (senior engineer, junior engineer, and technician). Hours were estimated by labor category and multiplied by a labor rate; then an overhead rate was applied. To this, indirect costs were added to determine unit costs. These costs were then adjusted upward for complexity, planning and engineering, non-quantified work, and location. The basis for the fundamental elements, labor rates, overhead factor, or other adjustment factors, was not provided. While the contractor personnel, who prepared the cost estimate, met with management and staff from the Guam Waterworks Authority to refine the cost estimate, the extent to which these individuals had access to historical records and actual experiences with comparable programs was not documented. Presumably, these costs may be based on general construction industry experience. While we acknowledge that most engineering judgment comes from practical experience, no comparable or analogous projects were identified as a basis for cost adjustments.</p> <p>Historical data provide the cost estimator with insight into actual costs on similar programs, including any cost growth that occurred after the original estimate. As a result, historical data can be used to challenge optimistic assumptions and bring more realism to a cost estimate.</p>	3

**Appendix II: Detailed Assessment of the Guam
Water and Wastewater Cost Estimate**

Characteristic	Overall assessment	Best practice	Individual assessment	Best practice rating
		7. The estimating technique for each cost element was used appropriately.	<p>Partially met</p> <p>Estimates were based on factors from the construction industry and although they appear to utilize more generic data than specific, the technique seems consistent with the construction industry. However, without life cycle cost estimate documentation that completely defines the program, captures source data used, and contains sufficient detail about the methodology used to develop the estimate, we are unable to verify that the source data was based on a historical record of costs from comparable programs.</p> <p>Validating that a cost estimate is accurate requires thoroughly understanding and investigating how costs were constructed. Estimating methods used to develop each cost element should, according to best practices, be thoroughly documented so that their derivation can be traced to all sources, allowing for the estimate to be easily replicated and updated.</p>	3
Credible	Not met Average score 1			
		1. The cost estimate includes a sensitivity analysis that identifies a range of possible costs based on varying major assumptions, parameters, and data inputs.	<p>Not met</p> <p>A sensitivity analysis was not conducted that identified a range of possible costs based on varying major assumptions, parameters, and data inputs.</p> <p>Without sensitivity analysis that reveals how the cost estimate is affected by a change in a single assumption, the cost estimator will not fully understand which variable most affects the cost estimate.</p>	1
		2. A risk and uncertainty analysis was conducted that quantified the imperfectly understood risks and identified the effects of changing key cost driver assumptions and factors.	<p>Not met</p> <p>A risk and uncertainty analysis was not conducted that quantified the imperfectly understood risks and identified the effects of changing key cost driver assumptions and factors.</p> <p>Lacking risk and uncertainty analysis, management cannot determine a defensible level of contingency reserves that are necessary to cover increased costs resulting from unexpected design complexity, incomplete requirements, technology uncertainty, and other uncertainties.</p>	1

**Appendix II: Detailed Assessment of the Guam
Water and Wastewater Cost Estimate**

Characteristic	Overall assessment	Best practice	Individual assessment	Best practice rating
		3. Major cost elements were cross-checked to see whether results were similar.	<p>Not met</p> <p>Major costs elements (projects in this case) were not cross-checked.</p> <p>The main purpose of cross-checking is to determine whether alternative methods produce similar results. If so, then confidence in the estimate increases, leading to greater credibility.</p>	1
		4. An independent cost estimate was conducted by a group outside the acquiring organization to determine whether other estimating methods produce similar results.	<p>Not met</p> <p>An independent cost estimate was not developed for any of the projects.</p> <p>According to our Cost Estimating and Assessment Guide, an independent cost estimate is considered one of the best and most reliable estimate validation methods. It provides an independent view of expected program costs that tests the program office's estimate for reasonableness. Without an independent cost estimate, decisions makers will lack insight into a program's potential costs because independent cost estimates frequently use different methods and are less burdened with organizational bias.</p>	1

Source: GAO

Appendix III: Comments from the Department of Defense



ACQUISITION,
TECHNOLOGY
AND LOGISTICS

OFFICE OF THE UNDER SECRETARY OF DEFENSE
3000 DEFENSE PENTAGON
WASHINGTON, DC 20301-3000

DEC 03 2013

Ms. Johana Ayers.
Acting Director, Defense Capabilities and Management
U.S. Government Accountability Office
441 G Street, N.W.
Washington, DC 20548

Dear Ms. Ayers:

This is the Department of Defense (DoD) response to the GAO Draft Report, GAO-14-82, "DEFENSE MANAGEMENT: Further Analysis Needed to Identify Guam's Public Infrastructure Requirements and Costs for DoD's Realignment Plan," dated October 29, 2013 (GAO Code 351802). Detailed comments on the report recommendations are enclosed.

We appreciate the opportunity to comment on the draft report. Should you have any questions, please contact Ms. Joan Sigler, (703) 697-2139, joan.c.sigler.civ@mail.mil.

Sincerely,

A handwritten signature in black ink that reads "John Conger".

John Conger
Acting Deputy Under Secretary of Defense
(Installations and Environment)

Enclosure:
As stated

GAO DRAFT REPORT DATED OCTOBER 29, 2013
GAO-14-82 (GAO CODE 351802)

“DEFENSE MANAGEMENT: FURTHER ANALYSIS
NEEDED TO IDENTIFY GUAM’S PUBLIC
INFRASTRUCTURE REQUIREMENTS AND COSTS FOR
DOD’S REALIGNMENT PLAN”

DEPARTMENT OF DEFENSE COMMENTS
TO THE GAO RECOMMENDATIONS

RECOMMENDATION 1: To provide DoD and Congress with sufficient information regarding the requirements and costs associated with DoD’s current Guam realignment plans and the public infrastructure necessary to support that realignment, GAO recommends the Secretary of Defense direct the Department of the Navy’s Joint Guam Program Office in concert with the Office of Economic Adjustment take the following action: Revalidate the need and scope of Guam public infrastructure projects included in DoD budget requests based on the reduced number of Marines and dependents DoD intends to relocate to Guam.

DoD RESPONSE: Partially concur. The President’s FY 2014 Budget requests funding for Guam civilian infrastructure improvements needed to address critical issues of noncompliance with EPA permits at civilian wastewater treatment facilities presently utilized by DoD installations. While these improvements will also support any future realignment, the requested funding is not contingent upon the number of Marines and dependents to be relocated, and therefore, does not warrant realignment-related revalidation.

DoD concurs that need and scope of additional, realignment-related Guam public infrastructure projects will be revalidated as necessary based on the results of the analysis in the ongoing Supplemental Environmental Impact Statement (SEIS), for the *Guam and Commonwealth of the Northern Mariana Islands Relocation (2012 Roadmap Adjustments)*.

RECOMMENDATION 2: To provide DoD and Congress with sufficient information regarding the requirements and costs associated with DoD’s current Guam realignment plans and the public infrastructure necessary to support that realignment, GAO recommends the Secretary of Defense direct the Department of the Navy’s Joint Guam Program Office in concert with the Office of Economic Adjustment take the following action: Conduct a comprehensive analysis across all applicable public infrastructure sectors to determine what infrastructure requirements and costs are needed to address existing deficiencies in Guam’s infrastructure and what requirements and costs are needed to directly support the additional capacity needed to support the realignment.

DoD RESPONSE: Partially concur. DoD concurs with the need to determine the requirements and costs needed to address those deficiencies in Guam public infrastructure necessary to support the realignment. Determination of realignment-related infrastructure requirements and costs is an anticipated outcome of the Navy's in-progress SEIS process and will guide the plan to be submitted to the congressional defense committees as called for by Section 2832 (a)(4) of the National Defense Authorization Act, 2013 (Public Law 112-239). In June, 2013, the Department provided a status of its effort in developing a coordinated Federal agency plan regarding investments in Guam's civilian utilities, facilities and infrastructure.

RECOMMENDATION 3: To provide DoD and Congress with sufficient information regarding the requirements and costs associated with DoD's current Guam realignment plans and the public infrastructure necessary to support that realignment, GAO recommends the Secretary of Defense direct the Department of the Navy's Joint Guam Program Office in concert with the Office of Economic Adjustment take the following action: As future cost estimates for Guam public infrastructure projects are developed, fully incorporate the best practices identified by GAO for developing high quality cost estimates.

DoD RESPONSE: Partially concur. The cost information developed to date adequately supports the program-level funding requested in the President's Fiscal Year 2014 Budget for Guam civilian infrastructure improvements to support the existing military presence on Guam. Final engineering cost estimates for specific projects will be developed in the normal course of executing this Fiscal Year 2014 program. Future realignment-related cost estimates and budget justification materials will be developed in accordance with guidance contained in the Department of Defense's Financial Management Regulations.

Appendix IV: GAO Contact and Staff Acknowledgments

GAO Contact

Johana Ayers (202) 512-5741 or ayersj@gao.gov

Staff Acknowledgments

In addition to the contact named above, Laura Durland, Assistant Director; Shawn Arbogast, Rennie Arnold, Grace Coleman, Tisha Derricotte, Adam Hatton, Jim Manzo, Karen Richey, Ophelia Robinson, Michael Shaughnessy, and Amie Steele made key contributions to this report.

Related GAO Products

Defense Management: More Reliable Cost Estimates and Further Planning Needed to Inform the Marine Corps Realignment Initiatives in the Pacific. [GAO-13-360](#). Washington, D.C.: June 11, 2013.

Force Structure: Improved Cost Information and Analysis Needed to Guide Overseas Military Posture Decisions. [GAO-12-711](#). Washington, D.C.: June 6, 2012.

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Defense Infrastructure: Planning Challenges Could Increase Risks for DOD in Providing Utility Services When Needed to Support the Military Buildup on Guam. [GAO-09-653](#). Washington, D.C.: June 30, 2009.

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