United States Government Accountability Office

Report to Congressional Committees

June 2023

NAVY READINESS

Actions Needed to Address Cost and Schedule Estimates for Shipyard Improvement

Accessible Version

GAO-23-106067

GAO Highlights

Highlights of GAO-23-106067, a report to congressional committees

June 2023

NAVY READINESS

Actions Needed to Address Cost and Schedule Estimates for Shipyard Improvement

Why GAO Did This Study

The Navy's four public shipyards are critical to maintaining the readiness of its fleet of aircraft carriers and submarines. However, the condition of their dry docks and facilities is poor, and their equipment is generally past its useful life. Further, the Navy reports that without improvements to shipyard infrastructure, it will be unable to support almost a third of the planned maintenance periods for aircraft carriers and submarines through 2040, hindering fleet readiness. In 2018, the Navy estimated it would require $21 billion and 20 years to implement the SIOP; however, the projected costs and scope of the effort have grown.

The National Defense Authorization Act for Fiscal Year 2022 includes a provision that GAO assess the Navy's progress in implementing the SIOP. This report evaluates the extent to which the Navy (1) has developed a full cost and schedule estimate for the SIOP, (2) used cost and schedule estimating best practices for the Portsmouth Naval Shipyard dry dock project, and (3) planned funding for the Portsmouth and Pearl Harbor Naval Shipyards dry dock projects that align with cost estimates. GAO analyzed cost and schedule documentation, reviewed SIOP reports, and interviewed Naval shipyard officials.

What GAO Recommends

GAO is making three recommendations, including that for all key SIOP projects, the Navy update its risk analyses associated with its cost estimates throughout the design process and improve its use of best practices for schedule estimates. The Navy concurred with these recommendations.

View GAO-23-106067. For more information, contact Diana Maurer at (202) 512-9627 or maurerd@gao.gov.

What GAO Found

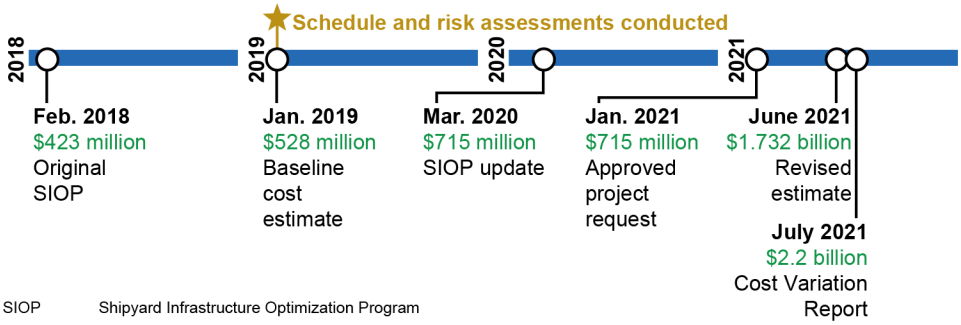
The Navy has not developed a full cost and schedule estimate for its Shipyard Infrastructure Optimization Program (SIOP)—an effort to improve its dry docks, facilities, and equipment—and reports that it will not be able to do so until fiscal year 2025. In the interim, the Navy plans to provide annual updates of the estimated costs of SIOP projects it intends to undertake during the next 5 years. The Navy reports that it cannot develop an estimate for the full SIOP until 2025, after each shipyard completes their detailed infrastructure plans identifying specific facility projects. In 2022, the Navy completed its first plan for Pearl Harbor Naval Shipyard. The Navy's estimated cost for Pearl Harbor increased significantly—from an estimated $6.1 billion in 2018 to $16 billion in 2022. The Navy faces challenges developing a reliable cost and schedule estimate for the full SIOP and its associated efforts, including project uncertainty, volatile commodity prices, and a lack of expertise completing dry dock projects.

The Navy's cost and schedule estimates for the Portsmouth Naval Shipyard dry dock project followed most, but not all, GAO best practices. The dry dock project at Portsmouth Naval Shipyard is the first and only key SIOP project underway as of January 2023. GAO identified two issues with the estimates:

- The Navy's cost sensitivity, risk, and uncertainty analyses were based on the preliminary design and were not updated to reflect the final design (see fig.). The cost estimate grew from $528 million for the baseline cost estimate to $2.2 billion for the final amount, in part due to a lack of competition.
- The Navy's schedule did not accurately determine key tasks or document the flexibility available in its activities without affecting the program's finish date.

Following cost and schedule estimating best practices for key SIOP projects would help Navy leadership make informed decisions, prepare for unanticipated costs, and focus on critical activities, which could improve SIOP results.

Changes in Cost Estimates for Portsmouth Naval Shipyard Dry Dock Project



SIOP Shipyard Infrastructure Optimization Program

Source: GAO analysis of Navy documents. | GAO-23-106067

Reports on the Navy's enacted and planned funding for two dry dock projects align with current cost estimates and incorporate significant cost increases experienced to date. In its 2023 five-year plan, the Navy estimated it would cost $3.6 billion for the dry dock project at Pearl Harbor and $2.2 billion for the dry dock project at Portsmouth. As of March 2023, the Navy had received $1.6 billion for these projects and requested, or planned to request, an additional $4.2 billion.

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Abbreviations

DOD	Department of Defense
ICE	Independent Cost Estimate
NAVFAC	Naval Facilities Engineering Systems Command
NAVSEA	Naval Sea Systems Command
PMO 555	SIOP Program Management Office
SIOP	Shipyard Infrastructure Optimization Program

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U.S. GOVERNMENT ACCOUNTABILITY OFFICE
441 G St. N.W.
Washington, DC 20548

June 28, 2023

The Honorable Jack Reed
Chairman
The Honorable Roger Wicker
Ranking Member
Committee on Armed Services
United States Senate

The Honorable Mike Rogers
Chairman
The Honorable Adam Smith
Ranking Member
Committee on Armed Services
House of Representatives

The Navy's public shipyards are critical to maintaining the readiness of its fleet of nuclear aircraft carriers and submarines and supporting ongoing operations around the world. The four public shipyards—Norfolk Naval Shipyard in Virginia, Pearl Harbor Naval Shipyard and Intermediate Maintenance Facility in Hawaii, Portsmouth Naval Shipyard in Maine, and Puget Sound Naval Shipyard and Intermediate Maintenance Facility in Washington—provide the Navy with the capability to perform depot- and intermediate-level maintenance on ships, emergency repairs, ship modernization, and ship deactivations.[1]

[1]For this report, we will be referring to Pearl Harbor Naval Shipyard and Intermediate Maintenance Facility as Pearl Harbor Naval Shipyard. Depot-level maintenance consists of tasks such as repair, overhaul, refurbishment and rebuilding. Intermediate-level maintenance requires higher skills and greater capacity than organizational-level maintenance and is normally accomplished in a centralized repair facility. Ship modernization is a major maintenance availability scheduled primarily for the installation of high priority warfare improvement alterations.

Our prior work found that the condition of the naval shipyards is poor, and their capital equipment is generally past its useful life.[2] Their dry docks are unable to support newer ship classes, such as the Ford class aircraft carrier and some Virginia class attack submarines, and are vulnerable to flooding and seismic risks. In addition, the shipyards' inefficient layouts contribute to thousands of days of maintenance delay for aircraft carriers and submarines. Absent improvements, the shipyards will be unable to support about a third of the Navy's planned maintenance availabilities for aircraft carriers and submarines through 2040. We recommended that the Navy develop a plan to improve the shipyards' infrastructure and incorporate results-oriented practices, such as goals and metrics, in its efforts. The Navy agreed with our recommendations and has taken some actions to address them.[3]

Recognizing that existing shipyard facilities may not be configured to efficiently and effectively support the Navy's readiness needs, the Senate Armed Services Committee directed the Secretary of the Navy to submit an investment strategy addressing the facilities, equipment, and infrastructure requirements of the shipyards.[4] In response, the Navy issued the Shipyard Infrastructure Optimization Plan (SIOP) in February 2018.[5] The Navy's 2018 plan called for shipyard improvements in three areas—dry docks, facilities, and capital equipment. The Navy initially estimated this would take over 20 years and cost $21 billion. However, in 2019 we reported that this estimate omitted key costs that could add billions to the ultimate price.[6] Specifically, we reported that without high-quality estimates, the Navy risked cost overruns, missed deadlines, and

[2]See GAO, *Naval Shipyards: Actions Needed to Improve Poor Conditions that Affect Operations*, GAO-17-548 (Washington, D.C.: Sept. 12, 2017); *Military Depots: Actions Needed to Improve Poor Conditions of Facilities and Equipment That Affect Maintenance Timeliness and Efficiency*, GAO-19-242 (Washington, D.C.: April 29, 2019); and *Military Depots: DOD Strategy for Addressing Deteriorating Facilities and Equipment is Incomplete*, GAO-22-105009 (Washington, D.C.: May 9, 2022).

[3]For more information on the Navy's efforts to address the recommendations, see GAO-22-105009.

[4]S. Rep. No. 115-125, at 113 (2017), accompanying a bill for the National Defense Authorization Act for Fiscal Year 2018.

[5]The Navy has since renamed it the Shipyard Infrastructure Optimization Program.

[6]See GAO, *Naval Shipyards: Key Actions Remain to Improve Infrastructure to Better Support Navy Operations*, GAO-20-64 (Washington, D.C.: Nov. 25, 2019).We noted at the time that the SIOP cost estimate did not include costs for program activities, utilities, environmental remediation, historical preservation, or inflation.

performance shortfalls. We recommended the Navy enhance the quality and reliability of its shipyard infrastructure plan by incorporating GAO's cost estimating best practices and determining clear shipyard roles and responsibilities for implementing the plan.[7] The Navy concurred with these recommendations and has taken some actions to implement them.[8]

The National Defense Authorization Act for Fiscal Year 2022 includes a provision for us to submit a report on the progress of the Secretary of the Navy in implementing the Shipyard Infrastructure Optimization Program.[9] This report examines the extent to which the Navy (1) has developed a full cost and schedule estimate for the SIOP, (2) used best practices for cost and schedule estimating for the Portsmouth Naval Shipyard dry dock project, and (3) aligned funding for the Portsmouth and Pearl Harbor Naval Shipyards' dry dock projects with cost estimates.

For our first objective, we reviewed the Navy's SIOP cost estimates issued in 2018 through March 2023, including those for projects they expect to complete in the next five years. Where available, we reviewed shipyard-specific plans the Navy developed to inform their cost and schedule estimates. We also analyzed challenges the Navy identified in estimating costs, such as the effect of commodity price volatility on the Navy's cost estimates. For our second objective, we determined how the Navy developed their cost and schedule estimates for the Portsmouth Naval Shipyard dry dock project, the first and only key SIOP project under construction as of January 2023.[10] We evaluated these estimates against

[7]GAO, *Cost Estimating and Assessment Guide: Best Practices for Developing and Managing Program Costs*, GAO-20-195G (Washington, D.C.: Mar. 12, 2020).

[8]For example, the Navy implemented a program office to manage the SIOP, instituted regular reporting internal to the Navy and externally to Congress, improved its performance metrics for tracking maintenance delays to better capture infrastructure issues, and defined clear shipyard roles and responsibilities.

[9]Pub. L. No. 117-81, § 355(d) (2021).

[10] The Navy refers to the Portsmouth Naval Shipyard dry dock project as P-381 and the Pearl Harbor Naval Shipyard dry dock project as P-209. For the purposes of this report, we refer to these dry dock projects as the Portsmouth Naval Shipyard dry dock project and the Pearl Harbor Naval Shipyard dry dock project. We chose the Portsmouth Naval Shipyard dry dock project because it is the first key project done under the SIOP effort, though its planning began prior to the introduction of SIOP. The Navy considers it a critical project for increasing its shipyard capacity to meet future demand. In addition, as the first new dry dock construction project conducted by the Navy in some time, it serves as a model for later SIOP dry dock projects.

GAO best practices for cost estimates and project schedules.[11] For our third objective, we analyzed the Navy's 5-year plans for funding key SIOP projects. We compared these plans to the Navy's cost estimates for these projects. For all three objectives, we reviewed documentation and interviewed cognizant Navy officials. Appendix I provides additional details on our scope and methodology.

We conducted this performance audit from May 2022 to June 2023 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

History and Purpose of the Naval Shipyards

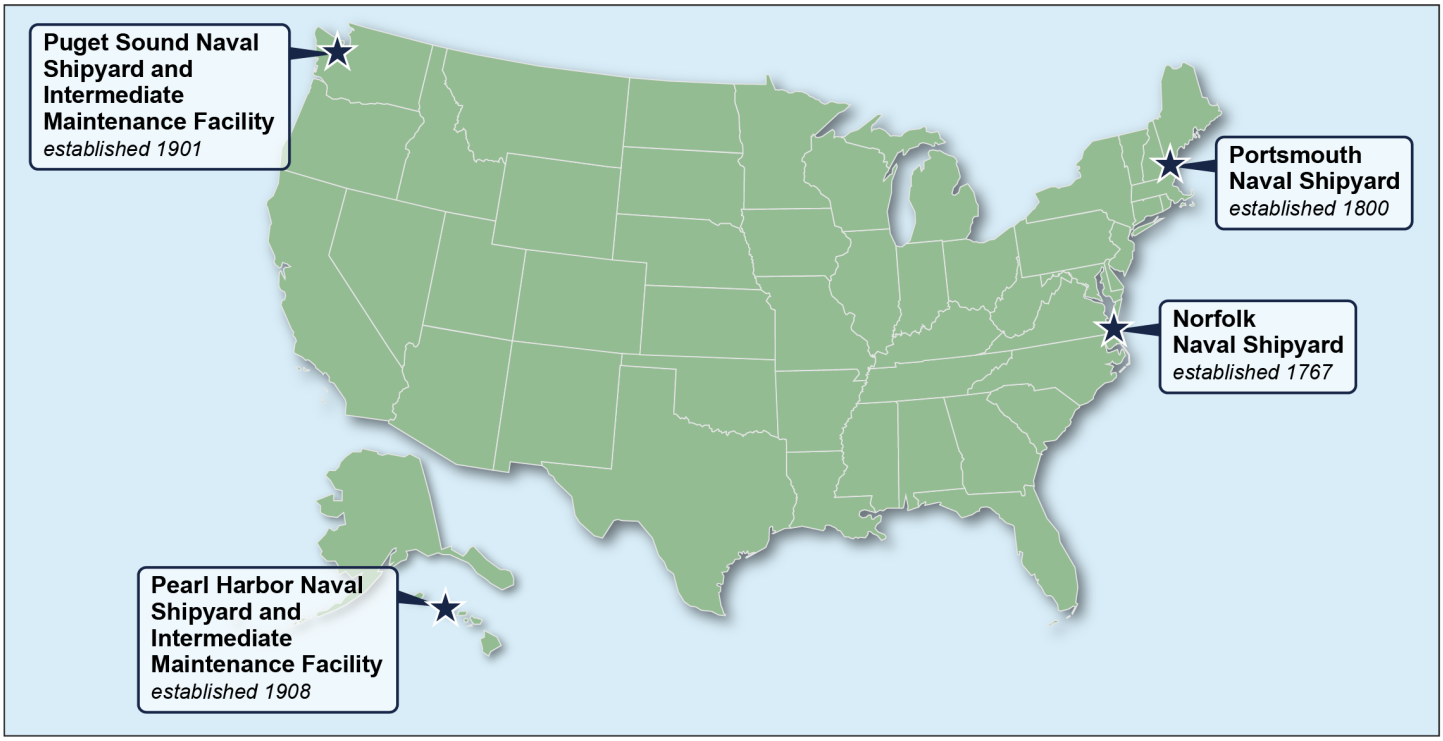
The Naval shipyards were originally designed to build wind- and steam-powered ships and range in age from 115 years to 256 years old (see figure 1). Over the years, the Navy has adapted them into highly industrialized, large-scale operations that are essential to national defense. Shipyards also fulfill the legal requirement for the Department of Defense (DOD) to maintain a government owned and operated critical logistics capability to support an effective and timely response for mobilization, national defense contingency situations, and other emergency requirements.[12] However, as we have reported, the shipyards' age, residual configuration for the shipbuilding mission, and poor condition reduces their efficiency for their modern-day mission of repairing nuclear-powered ships and submarines.[13]

[11]Specifically, we used GAO, *Schedule Assessment Guide: Best Practices for Project Schedules*, GAO-16-89G, (Washington, D.C.: Dec. 22, 2015) and GAO-20-195G. These guides establish a consistent methodology based on best practices for developing, managing, and evaluating capital program cost and schedule estimates.

[12]10 U.S.C. § 2464(a).

[13]See GAO-17-548.

Figure 1: Map of Naval Shipyards as of March 2023



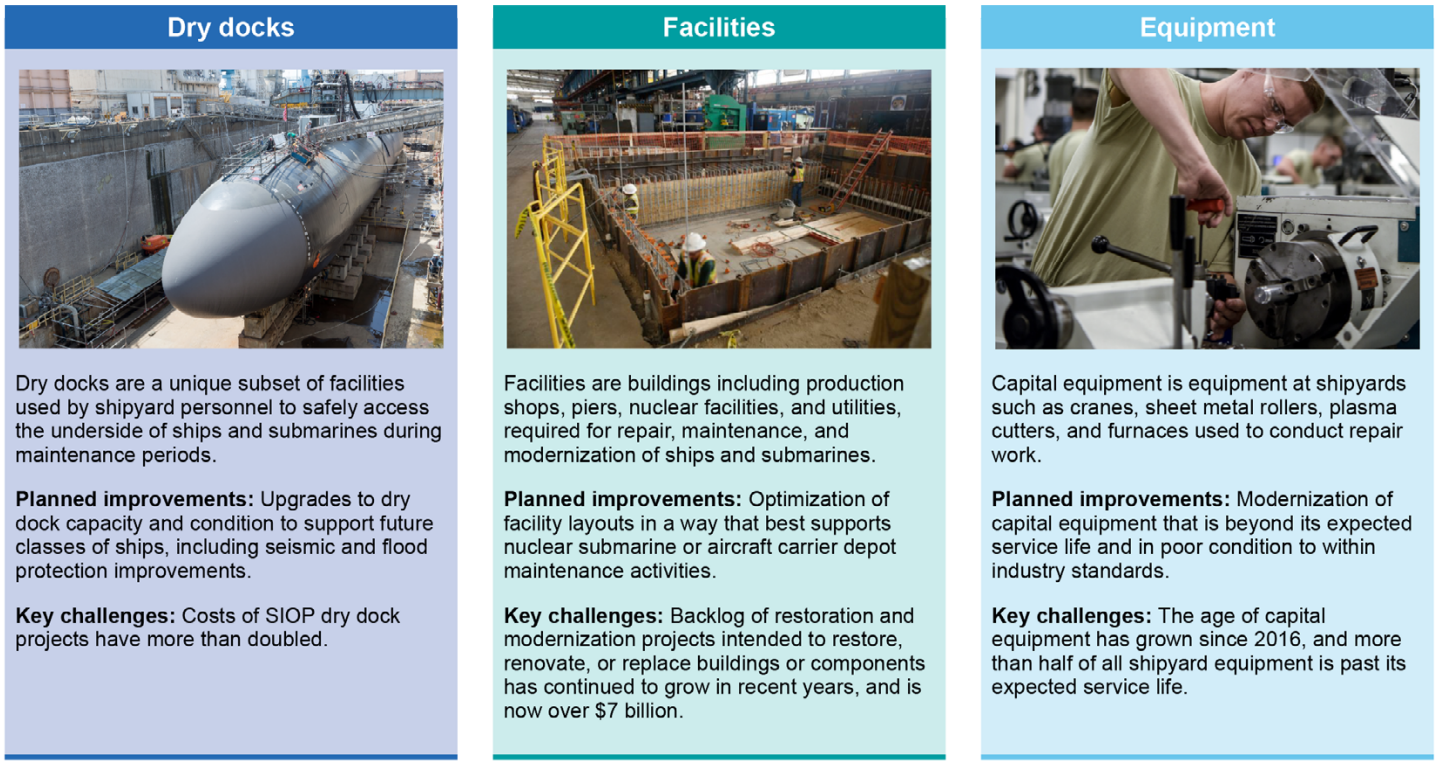
Source: Map Resources and GAO analysis of Navy documents. | GAO-23-106067

Navy's Shipyard Infrastructure Optimization Plan

The Navy developed the congressionally directed SIOP to mitigate infrastructure deficiencies at the public shipyards. This 2018 plan covered a 20-year span and was the last time the Navy provided an estimate for the full costs expected across the four naval shipyards for dry dock improvements, facilities, and capital equipment. At the time of the plan, the Navy estimated these improvements would cost $21 billion. For some infrastructure improvements, the Navy relied on preexisting plans to address identified deficiencies. The 2018 plan also outlined the Navy's strategy for developing a more detailed approach for mitigating other infrastructure deficiencies. The 2018 plan served as the Navy's engineering analysis and strategy for the optimal placement of facilities and major equipment at each public shipyard, including a 20-year investment strategy for infrastructure investments needed to improve shipyard performance. The 2018 plan proposed a series of improvements

to the public shipyards' dry docks, facilities, and capital equipment (see figure 2).

Figure 2: Main Elements of the Navy's Shipyard Infrastructure Optimization Program (SIOP)



Source: GAO analysis of Navy documents; U.S. Navy; GAO; Airman 1st Class P. Tenorio. | GAO-23-106067

In June 2018, Naval Sea Systems Command established a program management office (PMO 555) to plan, develop, schedule, budget, and sustain the implementation of the SIOP.[14] Navy guidance issued in April 2022 further clarified roles and responsibilities for the SIOP, and in particular noted that the Navy would treat the SIOP as a major defense

[14]Naval Sea Systems Notice 5450, *Establishment of the Shipyard Infrastructure Optimization Program Management Office,* § 3 (June 5, 2018).

acquisition program.[15] For example, the Navy created a program office to manage the SIOP, which is consistent with treating it as a major acquisition program. However, SIOP officials noted that the SIOP differs from other major acquisition programs. Specifically, it does not involve constructing the same or similar items repeatedly, as might be the case with a weapon system. Program office officials have told us that they intend to tailor the usual steps involved in a major acquisition program to better fit the SIOP.[16]

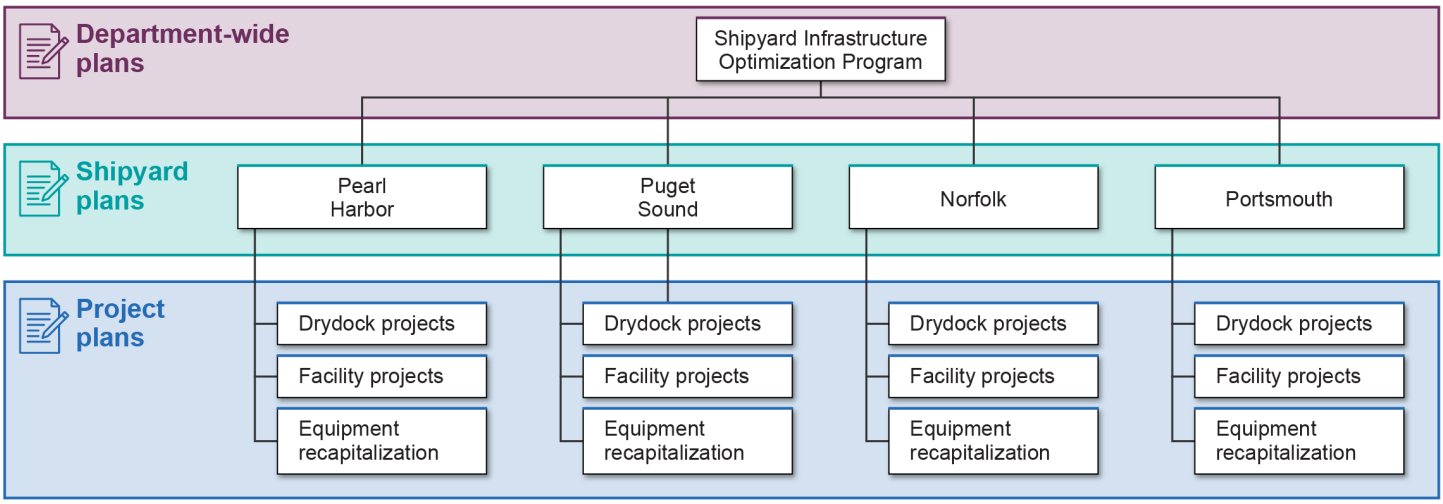
The Navy is also creating shipyard-specific plans to help clarify the costs and timelines for the intended infrastructure improvements at each shipyard.[17] The Navy is basing its shipyard-specific plans on modeling and simulation studies intended to optimize the efficiency of the maintenance process. The Navy intends to use these shipyard-specific plans to guide the key improvements at each shipyard. Each of those shipyard-specific plans, furthermore, will include a number of individual dry dock projects, facility projects, and capital equipment recapitalization. Figure 3 summarizes the relationship between the Navy's various plans to support SIOP implementation.

[15]Chief of Naval Operations Memorandum, *Roles and Responsibilities for the Shipyard Infrastructure Optimization Program* (Apr.21, 2022). Major defense acquisition programs generally proceed through a number of phases—including technology maturation, engineering and manufacturing development, and production and deployment—interspersed with a series of milestone reviews and other key decision points before moving on to the next phase. DOD Directive (DODD) 5000.85, *Major Capability Acquisition* (Aug. 6, 2020) (incorporating Change 1, Nov. 4, 2021).

[16]For example, program office officials noted that the SIOP would most likely not require the same amount of research, development, testing, and evaluation as a normal weapon system.

[17]See, for example, Assistant Secretary of the Navy for Research, Development, and Acquisition, *The Shipyard Infrastructure Optimization Program (SIOP): Updated Five-Year Plan* (Apr. 21, 2022).

Figure 3: Hierarchy of Naval Shipyard Infrastructure Optimization Program (SIOP) Related Planning



Source: GAO analysis of Navy information. | GAO-23-106067

Navy Has Not Updated Its Cost and Schedule Estimate for 20-Year SIOP Effort, but Has Estimates for the Next 5 Years

The Navy has not updated its 2018 cost and schedule estimate for the 20-year SIOP effort as of March 2023. The Navy cited several challenges that complicate creating a complete cost and schedule estimate including project uncertainty, volatile commodity prices, and obtaining expertise in challenging project areas. In April 2022, the Navy issued its first 5-year SIOP cost estimate covering projects it intended to undertake from fiscal year 2023 through fiscal year 2027. The Navy also has begun developing four shipyard-specific plans, which it expects to complete by the end of fiscal year 2025. The Navy completed the first of these plans, for Pearl Harbor Naval Shipyard, in July 2022.

Navy Has Not Updated Its Complete Cost and Schedule Estimate for SIOP

In February 2018, the Navy issued an initial program-wide cost and schedule estimate for the SIOP, which the Navy told us was a rough estimate. The initial estimate outlined a 20-year improvement effort that would cost about $21 billion. However, the Navy has not updated its initial

SIOP cost and schedule estimate from February 2018, and in March 2023, Navy officials told us the 2018 estimate is no longer accurate. Specifically, in 2018 the Navy estimated it needed 14 dry dock projects at an estimated cost of about $4.5 billion to ensure it had enough capacity to conduct future carrier and submarine repairs. However, in its 5-year SIOP update issued in April 2022, the Navy estimated the first two of these projects at Portsmouth and Pearl Harbor would cost over $5 billion and exceed the original estimate for all 14 dry dock projects.[18] In addition, the estimated costs for facility infrastructure improvements at Pearl Harbor increased by 122 percent—from $5.4 billion in 2018 to over $11.9 billion in 2022.[19]

The Navy stated in its March 2023 SIOP update that they are unable to develop a full cost and schedule estimate for the SIOP until fiscal year 2025, when the Navy plans to complete its detailed shipyard-specific plans identifying their specific facility projects.[20] Prior to the enactment of the James M. Inhofe National Defense Authorization Act in December 2022, Navy officials told us there was no requirement for a program-wide cost and schedule estimate that covers the entire 20 year SIOP effort.[21] In March 2023, Navy officials told us the Navy plans to annually update its estimated costs and schedule for the following five years of SIOP projects until it completes a full cost and schedule estimate for the entire 20-year SIOP.

[18]Assistant Secretary of the Navy for Research, Development, and Acquisition, *The Shipyard Infrastructure Optimization Program (SIOP): Updated Five-Year Plan* (Apr. 21, 2022).

[19]SIOP program officials noted that this is the estimated cost for the preferred course of action laid out in the Pearl Harbor plan, but that leadership had not yet approved that course of action as of March 2023.

[20]The Navy reiterated in March 2023 that the shipyard-specific plans would not be complete until fiscal year 2025.

[21]Section 356 of the James M. Inhofe National Defense Authorization Act for Fiscal Year 2023, Pub. L. No. 117-263(2022) requires the Navy to ensure that the shipyard optimization program office includes all costs, such as inflation, program office activities, utilities, roads, environmental remediation, historic preservation and alternative workspace when developing a detailed cost estimate. The inclusion of these elements is a cost estimation best practice. The Secretary of the Navy briefed the Armed Services committees in February 2023 on the implementation of section 356 requirements.

Navy Faces Challenges Developing a Complete Cost and Schedule Estimate for SIOP

Navy officials told us that they face several challenges in developing a complete cost and schedule estimate, including project uncertainty, volatile commodity prices, and obtaining expertise in challenging project areas.

Project uncertainty. Navy SIOP officials reported they are not sure which specific facility projects they will include in the SIOP because the Navy is still developing shipyard-specific plans. The Navy intends for the four shipyard-specific plans to identify the new facilities they plan to build, the facilities and equipment they plan to upgrade, and any modifications to facility layout to improve maintenance efficiency. Until the Navy completes the shipyard specific plans, Navy officials told us they will have gaps in the data they say the Navy needs to provide a complete and accurate cost and schedule estimate for the entire SIOP (see sidebar).

While the Navy initially estimated that it would complete the four shipyard-specific plans by fiscal year 2022, the Navy had completed only one for Pearl Harbor Naval Shipyard as of March 2023 (see figure 4). The Navy's September 2021 SIOP update to Congress cited funding constraints as the reason for this change in schedule. In March 2023, SIOP officials told us that they expect to complete all four shipyard plans by the end of fiscal year 2025. Furthermore, Navy officials told us they expect the estimated costs in the completed shipyard plans will be "rough estimates" until they complete individual project-specific plans. However, completing the shipyard plans will provide the Navy a better sense of the necessary facility projects needed to accomplish the goals of the SIOP, even if the cost estimates for those individual facility projects might take longer to complete.

More Detailed Shipyard Plans Clarify Projects

Some anticipated projects have changed since the 2018 estimate as the Navy completed more detailed planning. This planning includes conducting modeling and simulation to optimize the most critical parts of the industrial process at the shipyard, such as by reducing travel time of personnel and material during the maintenance process. For example, key facilities such as maintenance shops are currently located at significant distances from where personnel work, requiring them to walk several miles each day, which adds time and cost to the maintenance process.

SIOP officials told us that the layout changes identified during shipyard-specific planning are one reason why they believe a cost and schedule estimate would be premature until they complete all the shipyard planning. For example, officials at Pearl Harbor noted that they initially intended to combine as many shops as possible under a single large repair facility, known as a waterfront production facility. However, analysis conducted during their shipyard plan development showed limited benefit to moving some shops closer to the location of the repairs. As a result, the Navy revised its plan to relocate all maintenance activities into a single facility.

Source: GAO discussions with Naval shipyard and SIOP officials. | GAO-23-106067

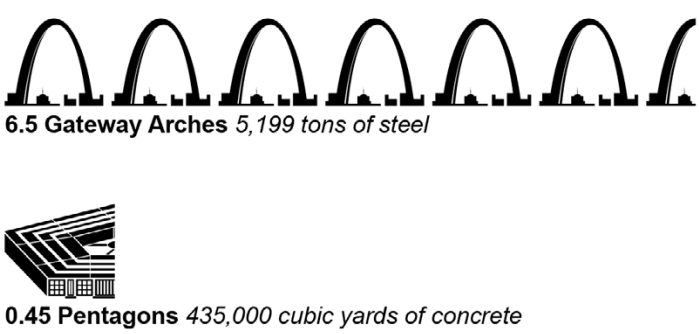
Figure 4: Progress Made by Naval Shipyards in the Shipyard-Specific Planning Phase, as of March 2023

Source: Source: GAO analysis of Navy documentation. | GAO-22-106067

Volatile prices for commodities. The Navy reported that volatile prices for commodities have made it challenging to determine how much materials will cost. Navy project management officials specifically cited concrete and steel as commodities with volatile prices that complicated their ability to estimate costs accurately. The Navy uses significant amounts of concrete and steel in dry dock construction (see figure 5).

Figure 5: Amount of Steel and Concrete Estimated for Portsmouth Naval Shipyard Dry Dock Project

Portsmouth Dry Dock Project
34,000 tons of steel
196,800 cubic yards of concrete

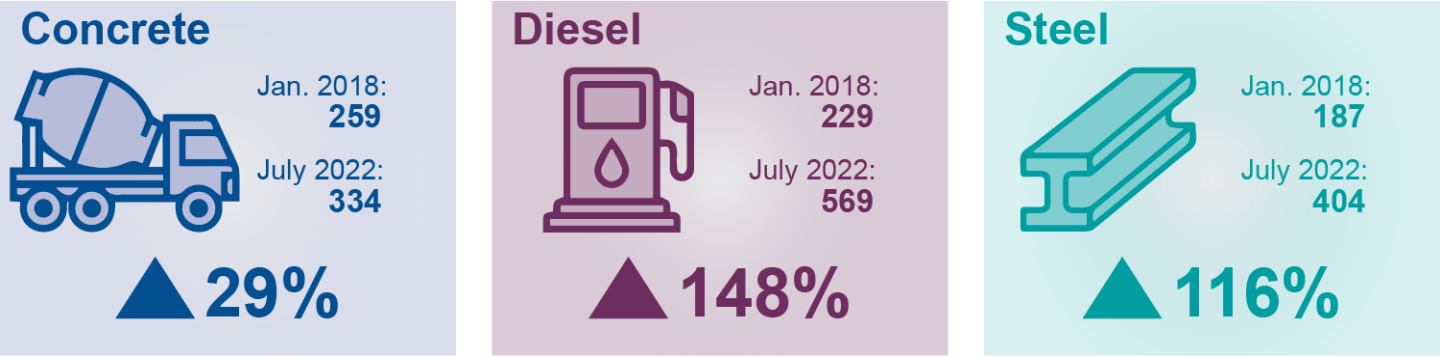


Source: GAO analysis of dry dock planning documents; U.S. Navy. | GAO-23-106067

A Navy notification to Congress reported that some commodity prices, such as steel, had doubled between 2020 and 2021.[22] We looked at cost growth for steel and other commodities between January 2018 and July 2022 and found that growth was also significant over that period (see figure 6).

[22]Authorized military construction project costs may be waived and an increase approved by the secretary concerned if the appropriate committees of Congress are notified of the amount of the increase and the reasons for it, among other required notification elements. 10 U.S.C. § 2853.

Figure 6: Price Index Growth of Concrete, Diesel, and Steel, between January 2018 and July 2022



Source: GAO analysis of Federal Reserve data. | GAO-23-106067

Effects of Insufficient Expertise on Cost Estimates

The Navy designed its first dry dock plan for Portsmouth shipyard to allow the contractors to use unused shipyard space to construct a new concrete casting facility. However, the contractors preferred using existing facilities instead of building a new facility. As a result, none of the submitted proposals for the project made use of this space, and the Navy's original cost estimate increased.

Source: GAO discussions with Portsmouth shipyard officials. | GAO-23-106067

Obtaining expertise. Navy officials told us they lack a sufficient number of professional staff with experience in the development and execution of dry dock projects, which comprise a large portion of the overall cost of the SIOP. According to Navy officials, dry dock projects are unique due to their size, complexity, environmental challenges, and their location in working shipyards. The U.S. Navy last built a dry dock over 40 years ago. As a result, Navy officials have told us that they rely mostly on external designers, vendors, and construction contractors to provide the skills to execute these projects (see sidebar).

Navy Developed a 5-Year SIOP Cost Estimate and is Developing Shipyard-Specific Plans

In March 2023, the Navy released a 5-year SIOP plan for fiscal years 2024 through 2028. In the plan, the Navy estimated it will cost about $9.9 billion over the next five fiscal years to complete necessary planning and begin construction of the initial SIOP projects (see table 1). More than 40 percent of this amount—approximately $4.2 billion—is for dry dock projects at Portsmouth Naval Shipyard and Pearl Harbor Naval Shipyard, both of which we consider key SIOP projects.[23]

[23]The Navy does not have a standard definition across all shipyards for what constitutes a key SIOP project, according to SIOP program officials. In this report, we consider the Portsmouth Naval Shipyard dry dock project and the Pearl Harbor Naval Shipyard dry dock project as key SIOP projects because they are essential to shipyard operations and will allow the Navy to recover many of the 68 unsupported maintenance periods through fiscal year 2040. In addition, the Navy considers these dry docks to be the foundational investment at each shipyard due to their size and complexity.

Table 1: Navy's Planned Spending on Shipyard Improvement Efforts, Fiscal Years (FY) 2024–2028, dollars in millions, Then-Year Dollars

	FY24	FY25	FY26	FY27	FY28
Program Management	46	52	54	54	55
Shipyard Planning	41	28	27	24	24
Restoration and Modernization Projects	208	327	189	134	136
Military Construction	2,285	1,717	1,913	1,220	409
Capital and Other Equipment	146	157	160	257	260
Total	**2,727**	**2,281**	**2,343**	**1,689**	**885**

Source: GAO analysis of Navy information. | GAO-23-106067

In March 2023, SIOP officials told us that they plan to publish annual updates of the estimated costs for the following five years of SIOP projects, and each service is now required to produce annual 5-year plans for improving depots infrastructure.[24] In addition, the Navy is required to submit biannual updates on the SIOP's progress, as well as an annual report detailing the use of all funding to support the SIOP investments.[25] The Navy completed its first annual funding report in January 2023.[26]

The Navy is also creating shipyard plans that outline infrastructure needs specific to each shipyard. In July 2022, the Navy completed the first of these four shipyard-specific plans for the Pearl Harbor Naval Shipyard. SIOP and shipyard personnel developed Pearl Harbor's shipyard plan

[24]In December 2022, a statutory requirement was enacted requiring all military departments to provide annual updates on their 5-year depot modernization and improvement plans. Pub. L. No. 117-263, § 373 (2022) (amending title 10, U.S. Code by inserting new section 2473). These plans will include goals, anticipated costs, necessary environmental or engineering studies, and project sequences. Other reporting requirements related to SIOP include biannual briefings on the SIOP's progress through July 2025 and an ongoing annual requirement for the Navy to report on all funds used for SIOP each year. William M. (Mac) Thornberry National Defense Authorization Act for Fiscal Year 2021, Pub. L. No. 116-283, § 346 (2021) (biannual reporting requirement on SIOP progress); National Defense Authorization Act for Fiscal Year 2022, Pub. L. No. 117-81, § 355(c) (2021) (annual reporting requirement on SIOP funds).

[25]William M. (Mac) Thornberry National Defense Authorization Act for Fiscal Year 2021, Pub. L. No. 116-283, § 346 (2021) (biannual reporting requirement on SIOP progress); National Defense Authorization Act for Fiscal Year 2022, Pub. L. No. 117-81, § 355(c) (2021) (annual reporting requirement on SIOP funds).

[26]Assistant Secretary of the Navy for Research, Development, and Acquisition, *Report to Congress: Shipyard Infrastructure Optimization Program* (Jan. 30, 2023).

over 2 years, incorporating results from 17 advanced planning studies.[27] The Navy used the advanced planning studies to justify and determine which specific facility projects they wanted to include to achieve the SIOP goals. The complete version of each of these shipyard-specific plans will include preliminary cost and schedule information for local shipyard projects.

The Navy intends to use the shipyard-specific plans to help generate cost savings and maximize maintenance speed. Preliminary analysis conducted by Pearl Harbor officials suggests that this may be possible. For instance, the Navy's shipyard plan for Pearl Harbor estimated a potential savings of 85 days per maintenance period if the Navy implements all planned projects. The Navy also reported that the optimization efforts at Pearl Harbor could result in an estimated $7 billion worth of efficiencies gained over time.[28] However, this optimization would take time to achieve. The Navy's preferred course of action presented in the Pearl Harbor shipyard-specific plan estimates it will take over 20 years and cost about $16 billion to conduct the necessary dry dock, facility, and capital equipment improvements at this one shipyard.[29]

Navy's Estimated Cost to Implement SIOP at Pearl Harbor Has Increased

In July 2022, the Navy completed a shipyard-specific plan for Pearl Harbor to inform estimates for the overall SIOP costs—including dry dock, facility optimization, and capital equipment costs. The Navy's estimated costs to implement the plan significantly increased due to several factors, such as expanding the scope of individual projects as well as identifying additional projects that were not part of the original cost estimate. As noted previously, the Navy intends to complete a shipyard-specific plan for each of the four public shipyards.

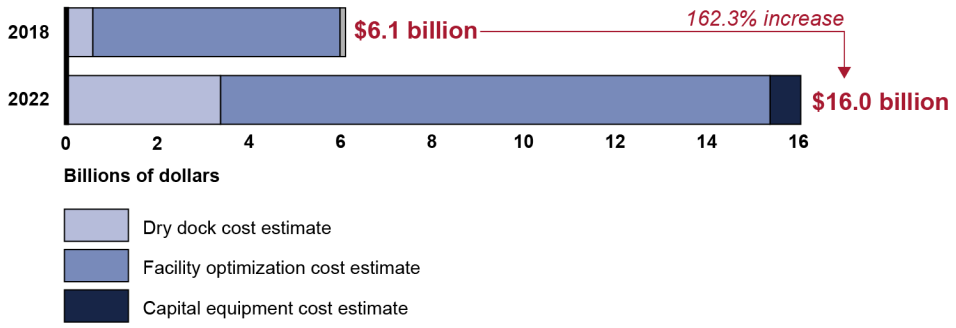
[27]Advanced planning studies are detailed reviews of certain aspects of the shipyard—such as utilities, historic areas, and flooding risk.

[28]The Navy estimated the $7 billion cost savings by using a 67-year average facility life cycle, as specified in the Naval Facilities Engineering Command Publication (P) 442, *Economic Analysis Handbook* (Nov. 2013). They identified 103 major maintenance periods over this 67-year timeframe, with an estimated savings of about $68 million each.

[29]In March 2023, SIOP program office officials told us the Navy had not yet made a final decision on what course of action they would pursue.

The Navy's July 2022 shipyard-specific plan for Pearl Harbor Naval Shipyard estimated the cost to complete the SIOP projects for the preferred alternative at Pearl Harbor at $16 billion, an increase of $9.9 billion or 162 percent above the 2018 estimate (see figure 7).

Figure 7: Comparison 2018 and 2022 Shipyard Infrastructure Optimization Program Cost Estimates for Pearl Harbor Naval Shipyard, Then-Year Dollars



Source: GAO analysis of Navy documents. | GAO-23-106067

Accessible Data for Figure 7: Comparison 2018 and 2022 Shipyard Infrastructure Optimization Program Cost Estimates for Pearl Harbor Naval Shipyard, Then-Year Dollars

	Dry dock cost estimate	Facility optimization cost estimate	Capital equipment cost estimate
2018	0.59	5.4	0.12
2022	3.38	12.0	0.67

The Navy attributed this increase to a number of factors, such as increased scope of individual projects and identifying additional projects that were not part of the original cost estimate. For example, the Navy expanded the scope of its dry dock project between 2018 and 2022. In 2018, the Navy had intended to modify one of the existing dry docks to enable it to meet Navy needs. However, in March 2020, the Navy reported that additional planning and design work determined that this was not feasible. Specifically, Navy officials stated that this work showed that while it was possible to increase the size of the existing dry dock to meet Navy needs, it was not possible to add the required weight capacity to the dry dock. The Navy reported that instead, the best approach for satisfying the requirement to accommodate Virginia class submarines was to build a new, larger dry dock. This led to a roughly $3 billion increase in the estimated cost.

Furthermore, the Navy identified the need for additional facility projects. Specifically, Navy officials told us that the 2022 Pearl Harbor shipyard plan had about twice as many facility projects as the 2018 SIOP. In addition, Pearl Harbor's 2022 shipyard plan included costs for inflation, environmental remediation, and utilities that were not included in the 2018 SIOP, which we previously reported could add billions to the ultimate cost of SIOP.[30] This change in facility requirements accounted for about $6.6 billion in increased costs.[31] This new total included revised costs from projects included in the initial 2018 plan, new costs from projects that the Navy added as part of the shipyard-specific planning effort, and costs that the Navy had not included in its the 2018 plan, such as for inflation, environmental remediation, historical preservation, and utilities. The benefit to these improvements, according to Navy analysis, is that the revised shipyard layout will allow it to repair submarines sooner and more efficiently. The Pearl Harbor plan calculates a potential reduction in average repair times by as much as 85 days, with related reductions in future maintenance costs. Shorter repair times would also be a crucial improvement, given the role that timely maintenance plays in supporting Navy readiness.

Navy Did Not Fully Follow Cost and Schedule Estimating Best Practices for Portsmouth Dry Dock Project

The Navy has developed detailed cost and schedule estimates for the Portsmouth Naval Shipyard dry dock project, the first and only key SIOP project underway as of January 2023.[32] The Navy's cost and schedule estimates for this project followed most, but not all, GAO best practices for producing reliable cost and schedule estimates. Specifically, the cost

[30]See GAO-20-64.

[31]In the 2018 *Shipyard Infrastructure Optimization Plan*, the Navy reported that the cost estimate for facility optimization was a rough estimate that excluded some unknown costs, including utility upgrades, realignment of road networks, and significant environmental remediation work. The Navy also reported that they would develop more accurate cost estimates for facility optimization as they implement the SIOP.

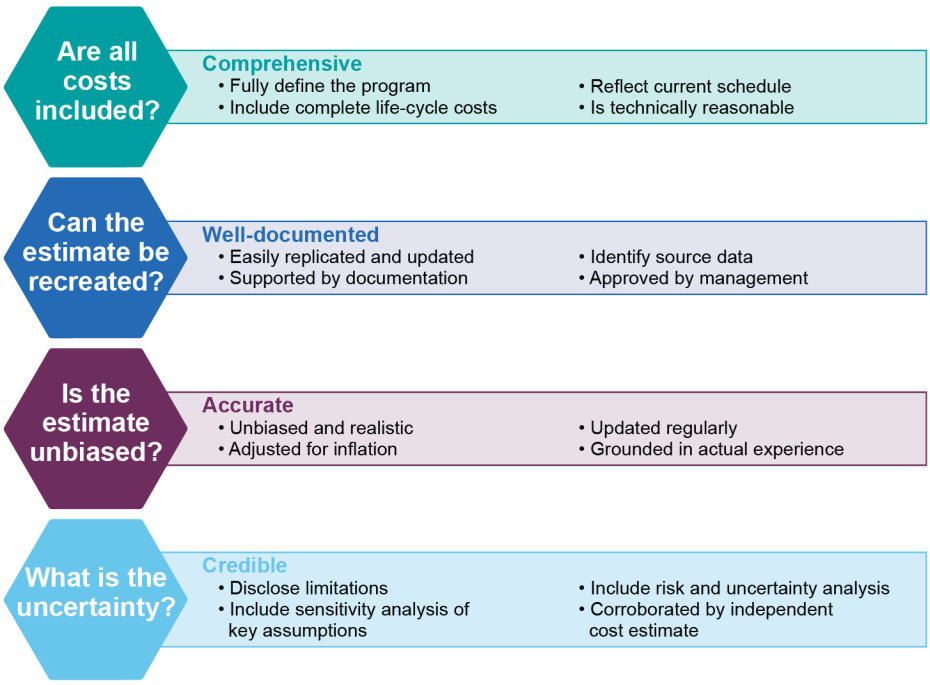
[32]We chose the Portsmouth Naval Shipyard dry dock project because it is the first key project done under the SIOP effort, though its planning began prior to the introduction of the SIOP. However, the Navy considers it a critical project for increasing its shipyard capacity to meet future demand. In addition, as the first new dry dock construction project conducted by the Navy in some time, it serves as a model for later SIOP dry dock projects.

estimate did not fully analyze risk, and the schedule estimate was partially well constructed.

Dry Dock Cost Estimate Followed Most Best Practices, but Did Not Fully Analyze Risks

Based on our analysis of the Portsmouth Naval Shipyard dry dock project cost estimate against GAO best practices, the Navy followed most of the best practices. However, GAO determined the Navy did not adopt best practices that are designed to ensure the cost estimate is credible. GAO's best practices for cost estimates are used to determine whether an estimate can be considered comprehensive, well-documented, accurate, and credible (see figure 8).[33]

Figure 8: GAO's Characteristics and Best Practices for Reliable Cost Estimates



Source: GAO. | GAO-23-106067

Of these four characteristics, the Portsmouth dry dock cost estimate substantially met two— comprehensive and well-documented—and fully

[33]GAO-20-195G.

met the accuracy characteristic. However, the estimate only minimally met the credible characteristic (see table 2).

Table 2: Summary of GAO's Assessment of Portsmouth Naval Shipyard Dry Dock Cost Estimate Compared to Best Practices

Characteristic	Overall Assessment	Best Practice	Individual Assessment
Comprehensive	**Substantially met**	The cost estimate includes all life cycle costs.	Substantially met
Comprehensive	**Substantially met**	The cost estimate is based on a technical baseline description that completely defines the program, reflects the current schedule, and is technically reasonable.	Substantially met
Comprehensive	**Substantially met**	The cost estimate is based on a work breakdown structure that is product-oriented, traceable to the statement of work, and at an appropriate level of detail to ensure that cost elements are neither omitted nor double-counted.	Partially met
Comprehensive	**Substantially met**	The cost estimate documents all cost-influencing ground rules and assumptions.	Partially met
Well documented	**Substantially met**	The cost estimate documentation shows the source data used, the reliability of the data, and the estimating methodology used to derive each element's cost.	Substantially met
Well documented	**Substantially met**	The cost estimate documentation describes how the estimate was developed so that a cost analyst unfamiliar with the program could understand what was done and replicate it.	Substantially met
Well documented	**Substantially met**	The cost estimate documentation discusses the technical baseline description and the data in the technical baseline are consistent with the cost estimate	Met
Well documented	**Substantially met**	The cost estimate documentation provides evidence that management reviewed and accepted the cost estimate.	Partially met
Accurate	**Met**	The cost estimate is based on a model developed by estimating each work breakdown structure element using the best methodology from the data collected.	Met
Accurate	**Met**	The cost estimate is adjusted properly for inflation.	Partially met
Accurate	**Met**	The cost estimate contains few, if any, minor mistakes.	Substantially met
Accurate	**Met**	The cost estimate is regularly updated to ensure it reflects program changes and actual costs.	Met
Accurate	**Met**	The cost estimate documents, explains, and reviews variances between planned and actual costs.	Met
Accurate	**Met**	The cost estimate is based on a historical record of cost estimating and actual experiences from other comparable programs	Met
Credible	**Minimally met**	The cost estimate includes a sensitivity analysis that identifies a range of possible costs based on varying major assumptions, parameters, and data inputs.	Minimally met

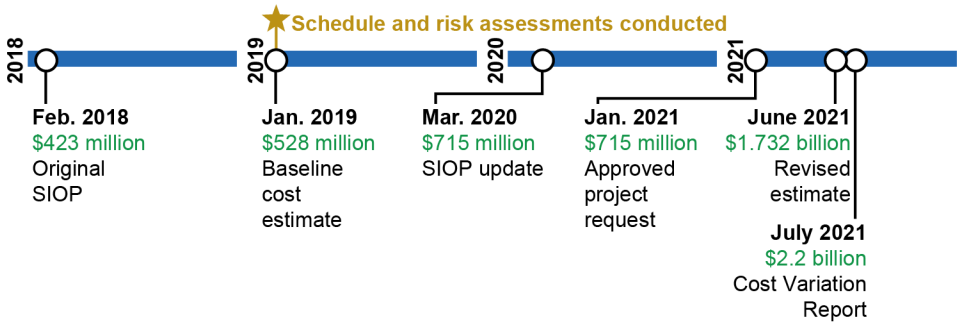
Characteristic	Overall Assessment	Best Practice	Individual Assessment
Credible	**Minimally met**	The cost estimate includes a risk and uncertainty analysis that quantifies the imperfectly understood risks and identifies the effects of changing key cost driver assumptions and factors.	Minimally met
Credible	**Minimally met**	The cost estimate employs cross-checks—or alternate methodologies—on major cost elements to validate results.	Minimally met
Credible	**Minimally met**	The cost estimate is compared to an independent cost estimate that is conducted by a group outside the acquiring organization to determine whether other estimating methods produce similar results.	Not met

Source: GAO analysis of the Navy's cost estimate. | GAO-23-106067

Note: Not met—Navy provided no evidence that satisfies any of the criterion. Minimally met—Navy provided evidence that satisfies a small portion of the criterion. Partially met—Navy provided evidence that satisfies about half of the criterion. Substantially met—Navy provided evidence that satisfies a large portion of the criterion. Met—Navy provided complete evidence that satisfies the entire criterion.

The Navy minimally met most of the best practices within the credible characteristic. The Navy conducted the risk analysis for the Portsmouth Naval Shipyard dry dock project costs in January 2019. However, the costs of the project changed significantly after that date as the scope of the project grew (see figure 9). The Navy did not conduct a new risk analysis after it finalized the project design. For example, the Navy acknowledged different construction approaches but did not model them as a risk, which the Navy later cited as a leading driver in the subsequent cost increase.

Figure 9: Timeline of Changes to Portsmouth Naval Shipyard Dry Dock Cost Estimate



SIOP Shipyard Infrastructure Optimization Program

Source: GAO analysis of Navy documents. | GAO-23-106067

The GAO *Cost Estimating and Assessment Guide* notes that uncertainty is always present in cost estimates, so it is necessary for cost estimators

to identify the cost elements that represent the most risk and, if possible, quantify that risk.[34] Credible cost estimates clearly identify limitations resulting from uncertainty or bias surrounding the data or assumptions. Major assumptions are varied and alternative outcomes recomputed to determine how sensitive outcomes are to changes in the assumptions and parameters. Credible cost estimates include the following best practices:

- A **sensitivity analysis** identifies key elements that drive cost and permits what-if analysis, which are often used to develop cost ranges and risk reserves.
- A **risk and uncertainty analysis** identifies, among other things, the level of confidence associated with achieving the cost estimate.
- **Cross-checks** on cost estimating methodologies involve applying different methods to estimate high-value cost elements and determine if they produce similar results.
- An **independent cost estimate** (ICE) provides an independent view of expected program costs that tests the program office's estimate for reasonableness.

Sensitivity analysis. The Navy conducted a Cost and Schedule Risk Analysis for the Portsmouth Naval Shipyard dry dock project, which included a sensitivity analysis, in January 2019, 19 months before it completed the project's design. This "baseline" cost estimate was $528 million at the design stage, representing a maturity level of 15 percent.[35] While the sensitivity analysis appropriately analyzed the effects of different major cost inputs, the Navy performed it on an estimate at a low level of design maturity and did not update it to reflect the later estimate that informed the budget request for the Portsmouth Naval Shipyard dry dock project funding.

Without an up-to-date sensitivity analysis that reveals how changing cost factors affect the cost estimate, stakeholders on current and future projects will not fully understand which variable most affects the cost estimate. For example, in its early risk analysis, the Navy identified the number of bidders to the project as a major cost risk and estimated that

[34]GAO-20-195G.

[35]A project's maturity level, often expressed as a percentage, represents how much of the design process is complete. For example, a fully designed project has a maturity of 100 percent. Alternatively, a developing project might have a maturity of 15 percent or 50 percent.

the cost could increase by up to 15 percent without sufficient competition. Lack of competition was later identified in the July 2021 Cost Variance Report as a driving factor for the project's cost increase from $715 million to $2.241 billion, an increase of over 300 percent. For management to make informed decisions on current and future projects, there should be a clear link between the technical baseline parameters, assumptions, and cost model inputs examined by cost estimators in the sensitivity analysis.

Risk and uncertainty analysis. As mentioned previously, the Navy did not perform a risk analysis on the final estimate. The June 2020 estimate detailed examples of risks that could potentially affect the project's construction cost but did not quantify their potential impact. The Navy cited several of the risks identified in that estimate as increasing the project cost from $715 million to $2.241 billion in the July 2021 cost variation request:

- skilled labor shortages or labor turnover due to competition from other projects;
- lack of interest by qualified bidders (i.e. less than three bidders);
- material and labor cost increases higher than expected; and
- delays in labor force access to the site.

If the program conducts its risk and uncertainty analysis upon a less defined design, management may get a false sense of security that the program has accounted for all risks and based the analysis on sound data. When this happens, management may make program decisions based on faulty information. Unless estimators provide a range of costs, decision-makers on current and future projects will lack information on cost, schedule, and technical risks, and will not have insight into the likelihood of executing the program within the cost estimate. In addition, without an updated risk and uncertainty analysis, management cannot determine a defensible level of contingency for future projects that is necessary to cover increased costs resulting from unexpected design complexity, incomplete requirements, and other uncertainties.

Cross-checks. The Portsmouth Naval Shipyard dry dock project estimate does not contain any documented cross-checks. Cost analysts conduct cross-checks using different methods to estimate high-value cost elements and determine if they produce similar results. Navy officials stated that they conduct cross-checks as a best practice, but were unable to provide documentation for these checks. One example of a cross-

check officials said they performed was comparing costs of drilled shafts and concrete production, which are elements that represent nearly half of the entire estimate. However, absent documentation for these cross-checks, the value they can provide to stakeholders is limited. Unless current and future estimates document cross-checks, the estimates will have less credibility because stakeholders will have no assurance that alternative estimating methodologies would produce similar results.

Independent cost estimate. The Navy did not conduct an ICE for the Portsmouth Naval Shipyard dry dock project. Navy officials noted that they followed standard Navy policy in developing the various estimates and Naval Facilities Engineering Systems Command does not typically conduct ICEs. We consider an ICE one of the best and most reliable methods for validating an estimate. Organizations that are independent of the program office's acquisition chain of command typically perform an ICE, which provides an independent view of expected program costs that tests the program office's estimate for reasonableness. Therefore, ICEs can provide decision makers with additional insights into a program's potential costs—in part, because they frequently use different methods and are less burdened with organizational bias. Moreover, ICEs tend to incorporate adequate risk and, therefore, tend to be more conservative by forecasting higher costs than the program office.

In 2019, we recommended the Navy obtain an independent cost estimate for the full SIOP and the Navy agreed to do so.[36] However, the Navy told us that it must complete the shipyard-specific plans before being able to conduct an ICE on the full SIOP. Navy officials also told us they intend to establish requirements for independent cost estimates for some SIOP projects in an upcoming revision to guidance and SIOP policy, in part due to new statutory requirements.[37] In addition, officials stated that the Navy would likely obtain an ICE for other large upcoming projects, such as the

[36]GAO-20-64. Specifically, we recommended that the Navy get an independent cost estimate for the SIOP. The Navy concurred with that recommendation, but has yet to complete the shipyard-specific plans that will identify the complete list of projects, which will encompass the SIOP.

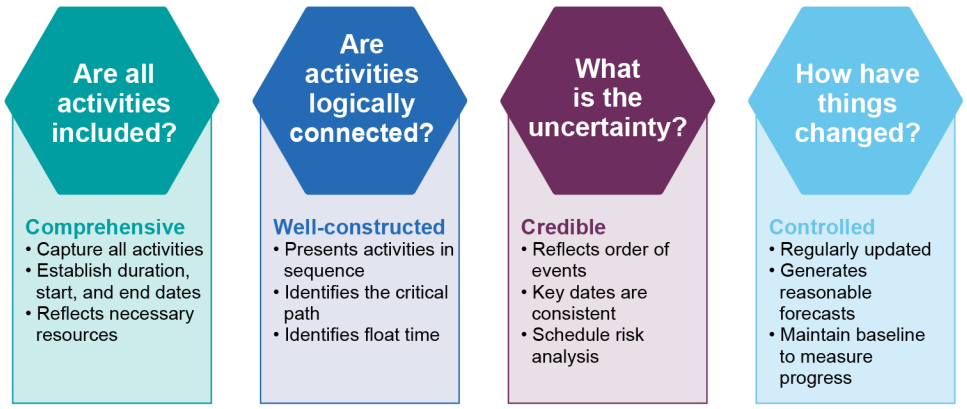
[37]The National Defense Authorization Act for Fiscal Year 2022 requires the Navy to provide the congressional defense committees with updated cost estimates for covered SIOP projects that either meet the standards of the Association for the Advancement of Cost Engineering for a Level One or Level Two cost estimate or is an independent cost estimate. Covered projects are SIOP projects with a contract awarded on or after Oct. 1, 2024, and are valued at $250 million or more. Pub. L. No. 117-81, § 355(b).

dry dock project at Pearl Harbor and the multi-mission dry dock project at Puget Sound.

Dry Dock Schedule Estimate Followed Most GAO Best Practices, but Was Partially Well-Constructed

The Portsmouth Naval Shipyard dry dock project schedule estimate also followed most GAO best practices but only partially followed the best practices for being well-constructed. A reliable schedule estimate should be comprehensive, well-constructed, credible, and controlled (see figure 10).[38] A schedule is considered reliable if the assessment ratings for each of the four characteristics are substantially or fully met. If any of the characteristic ratings are not met, minimally met, or partially met, then the schedule cannot be considered reliable.

Figure 10: GAO's Characteristics and Best Practices for Reliable Schedule Estimates



Source: GAO. | GAO-23-106067

Of these four characteristics, the Portsmouth Naval Shipyard dry dock project schedule estimate substantially met two characteristics—comprehensive and credible—and fully met the controlled characteristic. However, the schedule estimate is not reliable because it only partially met the well-constructed characteristic (see table 3).

[38]GAO-16-89G.

Table 3: Summary of GAO's Assessment of Portsmouth Dry Dock Schedule Estimate Compared to Best Practices

Characteristic	Overall Assessment	Best Practice	Individual Assessment
Comprehensive, reflecting • all activities as defined in the program's work breakdown structure • labor, materials, travel, facilities, equipment, and the like needed to do the work and whether those resources will be available when needed • how long each activity will take, allowing for discrete progress measurement with specific start and finish dates	**Substantially met**	1. Capturing all activities	Partially met
Comprehensive, reflecting • all activities as defined in the program's work breakdown structure • labor, materials, travel, facilities, equipment, and the like needed to do the work and whether those resources will be available when needed • how long each activity will take, allowing for discrete progress measurement with specific start and finish dates	**Substantially met**	3. Assigning resources to all activities	Partially met
Comprehensive, reflecting • all activities as defined in the program's work breakdown structure • labor, materials, travel, facilities, equipment, and the like needed to do the work and whether those resources will be available when needed • how long each activity will take, allowing for discrete progress measurement with specific start and finish dates	**Substantially met**	4. Establishing the durations of all activities	Met
Well-constructed, with • all activities logically sequenced with predecessor and successor logic • limited and justified use of unusual or complicated logic • a critical path that determines the activities that drive the program's earliest completion date • total float that accurately reflects the schedule's flexibility	**Partially met**	2. Sequencing all activities	Substantially met

Characteristic	Overall Assessment	Best Practice	Individual Assessment
Well-constructed, with • all activities logically sequenced with predecessor and successor logic • limited and justified use of unusual or complicated logic • a critical path that determines the activities that drive the program's earliest completion date • total float that accurately reflects the schedule's flexibility	**Partially met**	6. Confirming that the critical path is valid	Partially met
Well-constructed, with • all activities logically sequenced with predecessor and successor logic • limited and justified use of unusual or complicated logic • a critical path that determines the activities that drive the program's earliest completion date • total float that accurately reflects the schedule's flexibility	**Partially met**	7. Ensuring reasonable total float	Partially met
Credible, reflecting • the order of events necessary to achieve aggregated products or outcomes • varying levels of activity, supporting activity, and subtasks • a level of confidence in meeting a program's completion date based on data about risks for the program • necessary schedule contingency and prioritized risks based on a robust schedule risk analysis	**Substantially met**	5. Verifying that the schedule can be traced horizontally and vertically	Met
Credible, reflecting • the order of events necessary to achieve aggregated products or outcomes • varying levels of activity, supporting activity, and subtasks • a level of confidence in meeting a program's completion date based on data about risks for the program • necessary schedule contingency and prioritized risks based on a robust schedule risk analysis	**Substantially met**	8. Conducting a schedule risk analysis	Partially met

Characteristic	Overall Assessment	Best Practice	Individual Assessment
Controlled, being • updated regularly by schedulers trained in critical path method scheduling • statused using actual progress and logic to realistically forecast dates for program activities • accompanied by a schedule narrative that describes updates to the current schedule • compared against a baseline schedule to determine variances from the plan • accompanied by a corresponding basis document that explains the overall approach to the program, defines assumptions, and describes unique features of the schedule • subject to a configuration management control process	**Met**	9. Updating the schedule using actual progress and logic	Met
Controlled, being • updated regularly by schedulers trained in critical path method scheduling • statused using actual progress and logic to realistically forecast dates for program activities • accompanied by a schedule narrative that describes updates to the current schedule • compared against a baseline schedule to determine variances from the plan • accompanied by a corresponding basis document that explains the overall approach to the program, defines assumptions, and describes unique features of the schedule • subject to a configuration management control process	**Met**	10. Maintaining a baseline schedule	Substantially met

Source: GAO analysis of the Navy's schedule. | GAO-23-106067

Note: Not met—Navy provided no evidence that satisfies any of the criterion. Minimally met—Navy provided evidence that satisfies a small portion of the criterion. Partially met—Navy provided evidence that satisfies about half of the criterion. Substantially met—Navy provided evidence that satisfies a large portion of the criterion. Met— Navy provided complete evidence that satisfies the entire criterion.

The success of a program depends in part on having an integrated and reliable master schedule that defines when and how long work will occur and how each activity is related to the others. A schedule is necessary for government acquisition programs for many reasons. The program schedule provides not only a road map for systematic project execution but also the means by which to gauge progress, identify and resolve potential problems, and promote accountability at all levels of the program. A schedule provides a time sequence for the duration of a program's activities and helps everyone understand both the dates for

major milestones and the activities that drive the schedule. Well-constructed schedule estimates include the following best practices:

- **Sequencing all activities.** The schedule should be planned so that critical program dates can be met. To do this, activities must be logically sequenced and linked—that is, listed in the order in which they are to be carried out and connected to related activities.
- **Confirming the critical path.** The schedule should identify the program's critical path—the path of longest duration through the sequence of activities. Establishing a valid critical path is necessary for examining the effects of any activity's slipping along this path.
- **Ensuring reasonable float.** The schedule should identify reasonable total float (or slack)—the amount of time a predecessor activity can slip before the delay affects the program's estimated finish date—so that the schedule's flexibility can be determined.

Sequencing activities. We found that the schedule substantially met the best practice of sequencing all activities. Construction activities and logical relationships between activities are determined by those executing the program. The majority of logic is finish-to-start, representing an intuitive, serial flow of work and no activities are missing predecessor or successor logic. The best practice is substantially met because we found a relatively minor number of logic issues. For example, 3 percent of activities have "dangling logic," or logic with an improper tie to an activity's start or end date.

Critical path. We found the schedule partially met the best of practice of ensuring the critical path is valid. The critical path in the Navy's schedule is continuous, and Navy management uses it to focus on activities that will affect key program milestones and deliveries. However, we found 145 critical activities with lags. A lag is used in a schedule to denote the passing of time between two activities. The critical path should be free of lags because lags do not represent work and cannot be assigned resources. In addition, we found there are significantly more critical activities than activities on the schedule's longest path: the schedule's longest path has 782 activities, but the schedule has 3,325 critical activities. The critical path is theoretically the sequence of activities that represents the longest path between the program's start and finish dates. Discrepancies between the critical and longest paths may lead to a misrepresentation of the sequence of activities that actually drives the program finish date.

Reasonable float. We determined that the schedule partially met the best practice for ensuring reasonable total float. Float refers to the amount of time activities in the schedule can slip before delaying the finish milestone. Officials stated that the schedule includes a reasonable amount of total float, and total float is monitored for individual activities as well as the project. However, our analysis showed many instances of unreasonable total float. For example, the schedule has 4,534—44 percent—remaining activities with total float values greater than 335 days (20 percent of the project's 1,677 remaining duration in days). In other words, 44 percent of activities and milestones in the schedule can slip 15 working months before delaying the key finish milestone. In addition, there are 3,543 activities (34 percent) with zero or negative total float values.

Without accurate values of total float, the schedule cannot be used to identify activities that could be permitted to slip and thus release and reallocate resources to activities that require more resources to be completed on time. Any activities that appear to have a great amount of float should be examined for missing or incomplete logic. Given that float is directly related to the logical sequencing of activities and indicates schedule flexibility, management should question what constitutes a reasonable amount of float for a particular schedule.

By using best practices—such as ensuring a valid critical path and reasonable float values—to ensure its schedules are well-constructed, the Navy will be better positioned to determine the activities that drive the program's earliest completion date and accurately reflects the schedule's flexibility.

Navy's Funding Plans for Two Key SIOP Projects Align with Cost Estimates

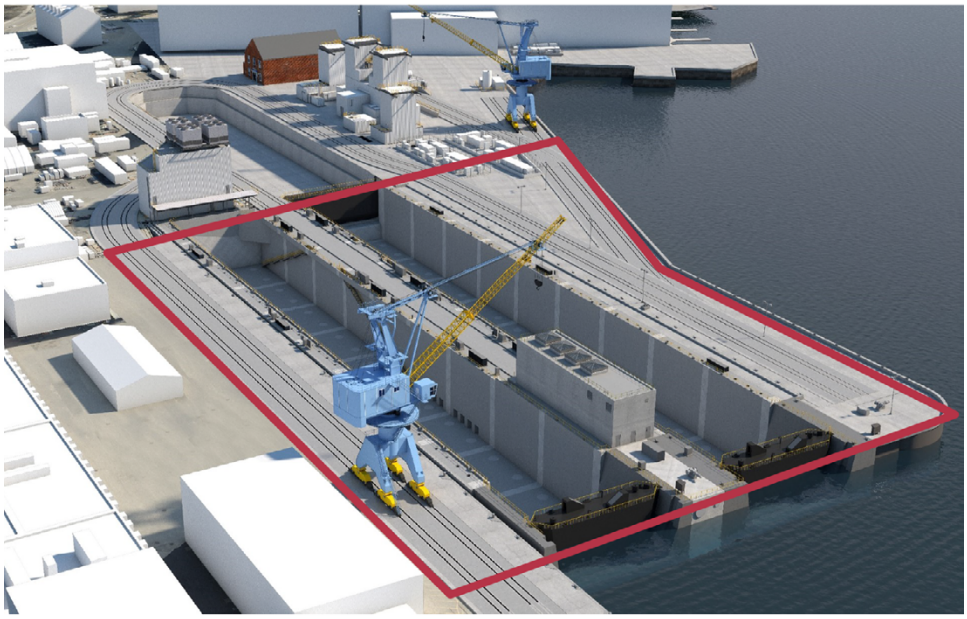
Funding For Two Key SIOP Projects Aligns with Current Navy Cost Estimates

The Navy's planned funding as of March 2023 for two key dry dock projects at Portsmouth and Pearl Harbor aligns with current cost

estimates and incorporates significant cost increases experienced to date.[39]

Dry dock at Portsmouth Naval Shipyard. The dry dock project at Portsmouth Naval Shipyard will construct two additional submarine bays capable of performing maintenance and overhaul of Virginia-class submarines. The Navy proposed this project in 2018 and, as of March 2023, plans to finish it in fiscal year 2028 (see figure 11 for a rendering of the completed dry dock project).

Figure 11: Rendering of Dry Dock Project at Portsmouth Naval Shipyard



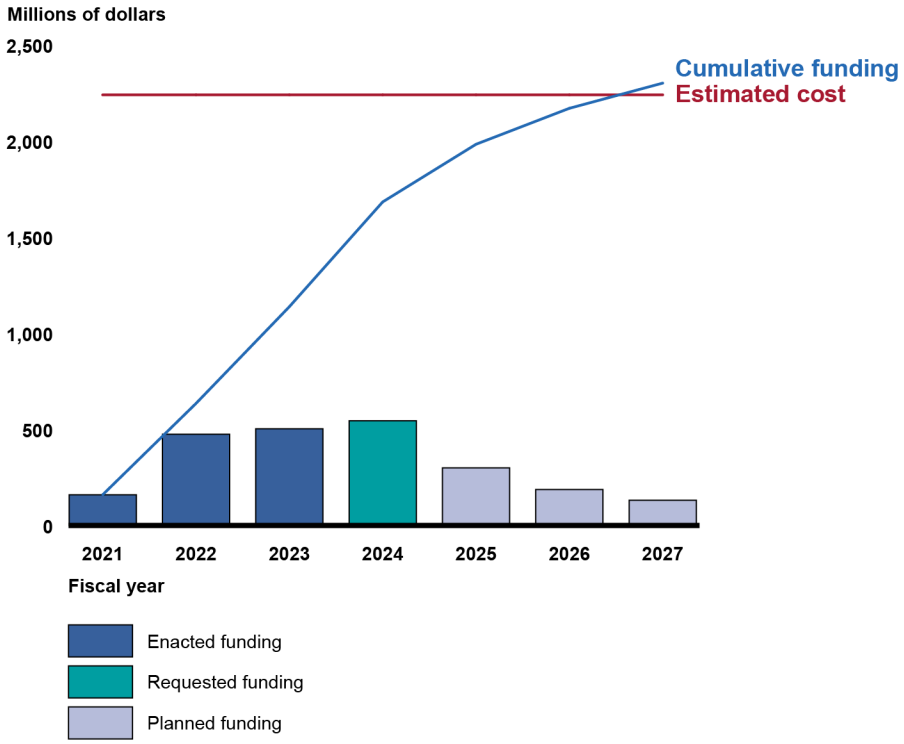
Source: Portsmouth Naval Shipyard. | GAO-23-106067

The Navy's reported enacted and planned funding for the Portsmouth Naval Shipyard dry dock project aligns with its 2021 cost estimate, as shown in figure 12. As of March 2023, the Navy reported that it had

[39]As discussed earlier in this report, the Navy has not created a complete cost and schedule estimate for the SIOP as of March 2023. In the absence of a full cost estimate, we examined the extent to which the Navy had planned funding for two key SIOP projects underway at the time of our review. The Navy does not have a standard definition across all shipyards for what constitutes a key SIOP project, according to SIOP program officials. In this report, we consider these two dry docks as key SIOP projects because the Navy reports they are essential to shipyard operations and will allow the Navy to recover many of the 68 unsupported maintenance periods through fiscal year 2040. In addition, the Navy considers these dry docks to be the foundational investment at each shipyard due to their size and complexity.

received $1.1 billion for the project. The Navy has requested, or plans to request an additional $1.2 billion through 2027 for a total of $2.3 billion. Navy officials told us that the Navy plans to request approximately $60 million more than the estimated cost to accommodate updated inflation rates from the Office of Management and Budget. This enacted and planned funding—about $2.3 billion—generally aligns with the July 2021 Navy estimate of $2.24 billion for the Portsmouth dry dock project.

Figure 12: Navy's 2021 Cost Estimate Compared to Enacted and Planned Funding for Portsmouth Naval Shipyard Dry Dock Project, Fiscal Years 2021–2027, Then-Year Dollars



Source: GAO analysis of Navy documents. | GAO-23-106067

Accessible Data for Figure 12: Navy's 2021 Cost Estimate Compared to Enacted and Planned Funding for Portsmouth Naval Shipyard Dry Dock Project, Fiscal Years 2021–2027, Then-Year Dollars

	Enacted funding	Requested funding	Planned funding	Cumulative funding	Estimated cost
2021	160	0	0	160	2240
2022	475	0	0	635	2240
2023	503	0	0	1138	2240

	Enacted funding	Requested funding	Planned funding	Cumulative funding	Estimated cost
2024	0	545	0	1683	2240
2025	0	0	300	1983	2240
2026	0	0	187	2170	2240
2027	0	0	131	2301	2240

Note: Enacted funding as reported in the Navy's March 2023 SIOP 5-Year Update and April 2022 SIOP 5-Year Update.

In 2018, the Navy initially estimated it would cost $423 million to complete the project. The Navy increased this estimate to $715 million in 2020 as it refined the design. In 2021, the Navy reported additional cost growth for the project and further increased the estimated project cost to approximately $2.24 billion, for a total cost increase from 2020 to 2021 of about $1.53 billion, or about 213 percent. Navy officials attributed this cost increase to several factors, including market conditions for skilled labor; lack of contracting competition; decreased productivity due to congested job site conditions; and commodity price increases, which we discuss in more detail above.

Dry Dock at Pearl Harbor Naval Shipyard. The Pearl Harbor Naval Shipyard's dry dock project includes the construction of a new dry dock (to replace an existing dry dock) that is capable of supporting maintenance of current and future classes of fast-attack submarines (see figure 13). The Navy plans to begin construction on this project in fiscal year 2023 and finish in fiscal year 2028.

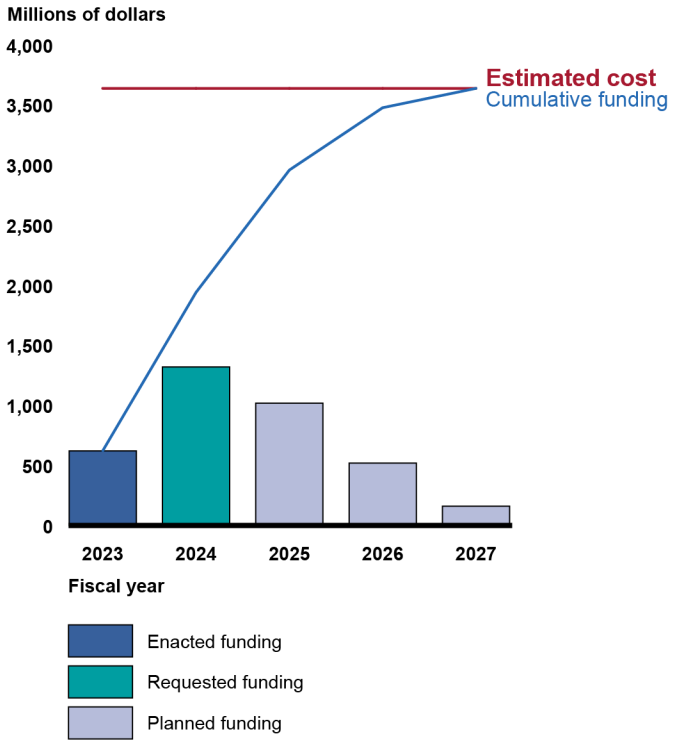
Figure 13: Rendering of Dry Dock Project at Pearl Harbor Naval Shipyard

Source: U.S. Navy. | GAO-23-106067

The Navy's enacted and planned funding for the Pearl Harbor Naval Shipyard dry dock project aligns with its 2022 cost estimate, as shown in figure 14. Specifically, the Navy has received, requested, or intends to request total funding of $3.64 billion from fiscal years 2023 through 2027, which aligns with the Navy's cost estimate of approximately $3.64 billion.[40] The Navy awarded a $2.8 billion task order for the Pearl Harbor dry dock project in March 2023 and has requested $621 million in military construction funds for fiscal year 2023.

[40]According to Navy officials, the Navy's cost estimate for Pearl Harbor Naval Shipyard's dry dock project includes the following elements: design; construction, supervision, inspection, and overhead; and contingency. The Navy based the estimate on the 35 percent design provided by the project's architecture and engineering firm. In fiscal year 2023, the Navy intends to determine whether they will need to adjust the total and annual funding amounts based on the awarded cost and the contractor's execution schedule.

Figure 14: Navy's 2022 Cost Estimate Compared to Enacted and Planned Funding for Pearl Harbor Naval Shipyard Dry Dock Project, Fiscal Years 2023–2027, Then-Year Dollars



Source: GAO analysis of Navy documents. | GAO-23-106067

Accessible Data for Figure 14: Navy's 2022 Cost Estimate Compared to Enacted and Planned Funding for Pearl Harbor Naval Shipyard Dry Dock Project, Fiscal Years 2023–2027, Then-Year Dollars

	Enacted funding	Requested funding	Planned funding	Cumulative funding	Estimated cost
2023	621	0	0	621	3638
2024	0	1319	0	1940	3638
2025	0	0	1018	2958	3638
2026	0	0	519	3477	3638
2027	0	0	161	3638	3638

Note: Enacted funding as reported in the Navy's March 2023 SIOP 5-Year Update.

The Navy's cost estimate for the Pearl Harbor Naval Shipyard dry dock project has also increased over time. In 2018, the Navy estimated the project would cost approximately $278 million. However, in 2020, the

Navy increased its cost estimate to $2.12 billion. According to the Navy, this project increased in cost because the Navy had originally expected to extend an existing dry dock, but decided that a new dry dock would better suit their future maintenance needs.[41] In 2022, the Navy's cost estimate for the project grew again to $3.64 billion, for a total increase from 2020 to 2022 of $1.48 billion or about 70 percent. We discuss the Navy's reasons for this cost growth in more detail below.

The Navy Has Identified Lessons Learned in Estimating Costs for Dry Dock Projects

As a result of the cost estimate increase for the Portsmouth dry dock project, the Navy identified several lessons learned which they could implement in future SIOP projects. Navy officials stated that they applied some of these lessons to the Pearl Harbor Naval Shipyard dry dock project as it went through its design and award process. These lessons applied to contracting, planning, and construction.

- **Increasing contractor competition.** A lack of competition between contractors for the Portsmouth Naval Shipyard dry dock project contributed to the increase in project costs, according to the Navy. Only one contractor submitted a bid for the project. As a result, the Navy implemented several measures to increase competition and decrease risk for contractors bidding on the Pearl Harbor Naval Shipyard dry dock project, including the use of different contracting strategies, according to Navy officials.
- **Improving coordination.** The Navy determined that better coordination in the early stages of planning could improve cost estimates. As a result, the Navy intends to increase the use of subject matter experts to improve design and cost elements. For example, the Navy also allowed contractors for the Pearl Harbor Naval Shipyard dry dock project to provide input on the project design so that Navy cost estimates reflected the contractors' likely construction methods. The Navy reported they had budgeted for underwater divers to weld together joints in their early designs. However, all contractors expressed that they would not use divers. As a result, the Navy found an alternative building model and improved the Pearl Harbor Naval

[41]The Navy originally reported the change in their project plan for the Pearl Harbor Naval Shipyard dry dock project (from extending an existing dry dock to building a new one) in 2020. The Navy reported that their original design to extend the dry dock was not feasible to satisfy the requirement of docking Virginia Class submarines, which are larger than the previous Los Angeles class of attack submarines.

Shipyard dry dock project design and budget estimates to diminish unexpected changes between the design phase and contract award phase.

- **Streamlining construction.** The Navy identified potential improvements to streamline the construction process and address contractor concerns about site access and work delays. For example, contractors noted that they often encountered delays awaiting clearance for workers to enter Pearl Harbor's controlled industrial area.[42] To mitigate this, the shipyard reorganized the controlled industrial area and created a section for contractors to use while they wait for clearance. The Navy also identified other projects that contractors could complete ahead of time to expedite the project, such as dredging for the additional dry dock.

Conclusions

The Navy's four public shipyards are critical for maintaining the Navy's fleet of nuclear powered aircraft carriers and submarines. However, the shipyards have been struggling to support the fleet with inadequate facilities, aging equipment, poorly configured dry docks, and inefficient layouts. Moreover, the shipyards remain vulnerable to serious flooding and seismic risks and are unable to support the Navy's newest ship classes, such as the Ford class aircraft carrier, or fully support the Virginia class attack submarine. Absent improvements, the Navy estimates they will be unable to support almost a third of the maintenance periods planned through 2040.

The Navy is attempting to address these concerns with the SIOP. Redesigning large industrial installations while they continue to perform their maintenance mission is a highly complex endeavor that poses unique challenges. Successful implementation of the SIOP will require sustained management attention and use of best practices for cost and schedule estimating over decades to avoid cost overruns, missed deadlines, and performance shortfalls. However, as of March 2023, the Navy lacks a full and reliable cost and schedule estimate for implementing this decades-long program. The Navy is in the process of completing detailed plans for each shipyard that it can use to develop a

[42]The controlled industrial area is a location within the shipyard where additional security checks are required for entry.

full and reliable cost and schedule estimates for the entire program, but these will not be complete until fiscal year 2025.

The Navy has only completed a full cost and schedule estimate for one key SIOP project to date—the Portsmouth dry dock project. While the Navy has since budgeted sufficiently for this project, it did not fully follow best cost and schedule estimating practices in its early stages and the project experienced significant cost growth and schedule slippage. Specifically, the Navy conducted important sensitivity, risk, and uncertainty analyses on a preliminary design but did not update them to reflect the final design. In addition, the Navy did not document that it used different methods to estimate high-value cost elements to cross check its calculations, a best practice to provide assurance cost estimates are reliable. Without performing and documenting cost estimating best practices for current and future key SIOP projects, the Navy would be at risk for increased costs and schedule slippages resulting from unexpected design complexity, incomplete requirements, and other uncertainties.

In addition, the Navy's schedule documentation only partially followed best practices for well-constructed schedules, raising concerns about its reliability and the potential for delays leading to schedule slippage. By ensuring the Navy follows best practices for cost and schedule estimating for all key SIOP projects, the Navy could reduce the risk that it might request too little funding to achieve its desired outcomes or experience schedule slippages that could adversely affect its ongoing maintenance mission.

Recommendation for Executive Action

We are making the following three recommendations to the Navy:

The Secretary of the Navy should ensure that Program Management Office 555 update the cost sensitivity, risk, and uncertainty analyses of key SIOP projects throughout the design process. (Recommendation 1)

The Secretary of the Navy should ensure that Program Management Office 555 document its use of different methods to cross-check high-value cost elements of future key SIOP projects. (Recommendation 2)

The Secretary of the Navy should ensure that Program Management Office 555 use best practices for well-constructed schedules when developing schedules for key SIOP projects. (Recommendation 3)

Agency Comments

We provided a draft of this report to DOD for review and comment. The Navy's written comments are reprinted in appendix III of this report. The Navy concurred with all three of our recommendations and also provided technical comments, which we incorporated as appropriate.

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

If you or your staff have questions about this report, please contact me at maurerd@gao.gov or (202) 512-9627. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made key contributions to this report are listed in appendix IV.

Diana Maurer
Director, Defense Capabilities and Management

Appendix I: Objectives, Scope, and Methodology

The National Defense Authorization Act for Fiscal Year 2022 includes a provision for us to submit a report on the progress of the Secretary of the Navy in implementing the Shipyard Infrastructure Optimization Program (SIOP).[1] This report examines the extent to which the Navy (1) has developed a full cost and schedule estimate for the SIOP, (2) used best practices for cost and schedule estimating for the Portsmouth Naval Shipyard dry dock project, and (3) aligned funding for the Portsmouth and Pearl Harbor Naval Shipyards dry dock projects with cost estimates.

For our first objective, we reviewed Navy documentation and interviewed Navy officials to determine whether the Navy has an updated cost and schedule estimate for the overall SIOP, and the extent to which the Navy has developed cost and schedule estimates for specific SIOP projects. We compared the Navy's initial 2018 SIOP cost and schedule estimate with the Navy's April 2022 and March 2023 5-year cost estimates. We also interviewed shipyard officials from Portsmouth Naval Shipyard and Pearl Harbor Naval Shipyard, as well as officials from the Navy's SIOP Program Management Office (PMO-555), about the status of their cost and schedule estimates, including challenges they faced when developing these estimates. Additionally, we reviewed the available shipyard-specific plan—developed to inform the cost and schedule estimate—to determine the status of Navy planning efforts. Further, we reviewed cost estimates from the Portsmouth dry dock project and interviewed Navy officials to understand the effect of commodity price volatility on the Navy's cost estimates.

For our second objective, we evaluated the extent to which the Portsmouth Naval Shipyard dry dock project followed GAO best practices for cost and schedule estimating.[2] Specifically, we compared Navy documentation for the project, including cost and schedule estimates, with

[1]Pub. L. No. 117-81, § 355(d) (2021).

[2]GAO, *Schedule Assessment Guide: Best Practices for Project Schedules*, GAO-16-89G (Washington, D.C.: Dec. 22, 2015) and *Cost Estimating and Assessment Guide: Best Practices for Developing and Managing Program Costs*, GAO-20-195G (Washington, D.C.: Mar. 12, 2020).

GAO best practices for cost and schedule estimating. We interviewed Navy officials who were involved in preparing these documents to understand the factors they considered when generating both the cost and schedule estimates. We selected the Portsmouth Naval Shipyard dry dock project because it was the only key SIOP project underway as of January 2023.[3] To determine the extent to which the September 2020 cost estimate for the Portsmouth dry dock project followed GAO best practices, we compared the cost estimate with the four characteristics of high-quality, reliable cost estimates—comprehensive, well-documented, accurate, and credible. As part of this comparison, we assigned a numerical value to each characteristic to represent the extent to which the project cost estimate incorporated the four characteristics of a high-quality, reliable cost estimate. To determine the extent to which the Portsmouth Naval Shipyard dry dock project schedule estimate followed GAO best practices, we compared the Navy's August 2022 integrated master schedule for the Portsmouth dry dock against the four characteristics of a sound schedule—comprehensive, well-constructed, credible, and controlled. As part of this comparison, we assigned a numerical value to each characteristic to represent the extent to which the Portsmouth Naval Shipyard dry dock project schedule estimate incorporated the four characteristics of a sound schedule estimate.

For our third objective, we analyzed Navy budgets for funding two dry dock projects at Portsmouth Naval Shipyard and Pearl Harbor Naval Shipyard and compared them to the Navy's cost estimates for these projects. We selected these two projects as key SIOP projects because the Navy reports that they are essential to shipyard operations, will allow the Navy to recover many of the 68 unsupported maintenance periods through fiscal year 2040, and are considered to be the foundational investment at each shipyard due to their size and complexity. We reviewed documentation including the Navy's initial 2018 SIOP cost and schedule estimate, the Navy's April 2022 and March 2023 SIOP updates, cost estimates, and project-level documentation for both dry dock projects. We also interviewed Navy officials at Portsmouth Naval Shipyard and Pearl Harbor Naval Shipyard to understand the factors that caused the cost estimates to increase over time. We reviewed project-level documentation for the Portsmouth Naval Shipyard dry dock project

[3]We chose the Portsmouth Naval Shipyard dry dock project because it is the first key project executed under the SIOP effort, though its planning began prior to the introduction of SIOP. The Navy considers it a critical project for increasing its shipyard capacity to meet future demand. In addition, as the first new dry dock construction project conducted by the Navy in some time, it serves as a model for later SIOP dry dock projects.

to identify lessons learned that resulted from the cost estimate increase. We reviewed documentation on the Navy's timeframes for completing shipyard-specific plans for each shipyard.

To address all of our objectives, we interviewed officials, and where appropriate, obtained documentation from the following Navy organizations listed below:

- Naval Facilities Engineering Systems Command
  - Shipyard Infrastructure Optimization Plan (SIOP) Program Management Office (PMO-555)
- Naval Sea Systems Command
- Pearl Harbor Naval Shipyard and Intermediate Maintenance Facility
  - Shipyard Infrastructure Optimization Plan (SIOP) Division
- Portsmouth Naval Shipyard
  - Shipyard Infrastructure Optimization Plan (SIOP) Division

We conducted this performance audit from May 2022 to June 2023 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Appendix II: Vertical Briefings

Appendix III: Comments from the Department of Defense

THE ASSISTANT SECRETARY OF THE NAVY
RESEARCH, DEVELOPMENT AND ACQUISITION
1000 NAVY PENTAGON
WASHINGTON DC 20350-1000

JUN 12 2023

Ms. Diana Maurer
Director, Defense Capabilities Management
U.S. Government Accountability Office (GAO)
441 G St NW
Washington, DC 20548

Dear Ms. Maurer:

Enclosed is the Navy's response to GAO Draft Report GAO-23-106067, "NAVY READINESS: Actions Needed to Address Cost Estimates for Shipyard Improvement," dated May 1, 2023. The Navy has provided written comments, a technical review, and a security assessment for this draft report attached to this letter.

I would like to formally state my appreciation for the diligence of your team's review and their willingness to be proactively engaged and collaborative.

My point of contact for this matter is Jeff Cunningham, PMO 555, (757) 297-3430, jeffrey.r.cunningham.civ@us.navy.mil.

Please let me know if I or my office may be of further assistance.

Sincerely,

Frederick J. Stefany
Acting

Enclosures:
As stated

GAO DRAFT REPORT DATED MAY 1, 2023
GAO-23-106067 (GAO CODE 106067)

"NAVY READINESS: ACTIONS NEEDED TO ADDRESS COST ESTIMATES FOR SHIPYARD IMPROVEMENT"

DEPARTMENT OF DEFENSE COMMENTS TO THE GAO RECOMMENDATION

RECOMMENDATION 1: The Secretary of the Navy should ensure that Program Management Office 555 update the cost sensitivity, risk, and uncertainty analyses of key SIOP projects throughout the design process.

DoD RESPONSE: Concur. PEO Industrial Infrastructure (PEO II) and PMO 555 will update Cost Sensitivity Risk Analysis (CSRA) through the design phase.

RECOMMENDATION 2: The Secretary of the Navy should ensure that Program Management Office 555 document its use of different methods to cross-check high-value cost elements of future key SIOP projects.

DoD RESPONSE: Concur. PEO II and PMO 555 will document high-value cost elements of future key projects.

RECOMMENDATION 3: The Secretary of the Navy should ensure that Program Management Office 555 use best practices for well-constructed schedules when developing schedules for key SIOP projects.

DoD RESPONSE: Concur. PEO II and PMO 555 will codify and fully implement best practices for scheduling when shaping development of post-award construction contractor schedule for key SIOP projects.

COMMENTS:

In its draft report, GAO states the following on page 2: *"The Navy's 2018 plan called for shipyard improvements in three areas – dry docks, facilities, and capital equipment. The Navy initially estimated this would take over 20 years and cost $21 billion. However, in 2019, we reported that this estimate omitted key costs that could add billions to the ultimate price."*

Comment 1: The Navy recommends rewording the sentence to read: "The Navy initially estimated this would take over 20 years and cost $21 billion and explicitly stated that the estimate excluded several factors, as it was an initial estimate to set a rough order of magnitude."

Reasoning: 2018 RTC included specific disclaimers (stated on page F-10 of the RTC):

"The following costs are specifically excluded from the cost calculations:

- Dry dock improvements identified in the Naval Shipyard Dry Dock Capacity and Survivability Study (2017)
- Relocation or procurement of shipyard production capital equipment
- Upgrades or reconfiguration of primary utility and communication backbones
- Upgrades or reconfiguration of primary road networks
- Significant environmental remediation
- Special/Unique building foundations"

The 2018 RTC provided a parametric estimate for Rough Order of Magnitude (ROM) cost purposes.

In its draft report, GAO states the following on page 11: *"Navy officials told us they do not have a ready group of experts with the experience needed to complete dry dock projects, which compromise a large portion of the overall cost of the SIOP. According to Navy officials, dry dock projects are unique and difficult to estimate accurately. The U.S. Navy last built a dry dock over 40 years ago. As a result, Navy officials told us they rely mostly on external contractors for this type of construction [...]."*

Comment 2: The Navy recommends rewording the sentence to read: "Navy officials told us they lack a sufficient number of professional staff with significant experience in the development and execution of dry dock projects, which comprise a large portion of the overall cost of the SIOP. According to Navy officials, dry dock projects are unique due to their size, complexity, environmental challenges, and their location in operational shipyards; creating challenges to fully identify the risks of constructing these facilities. The U.S. Navy last built a dry dock over 40 years ago. As a result, Navy officials leverage partnerships with multiple designers, vendors, and construction contractors to provide the competencies to execute these projects."

In its draft report, GAO states the following on page 19: *"Without an up-to-date sensitivity analysis that reveals how changing cost factors affect the cost estimate, stakeholders on current and future projects will not fully understand which variable most affects the cost estimate. For example, in its early risk analysis the Navy identified the number of bidders to the project as a major cost risk and estimated that the cost could increase by up to 15 percent without sufficient*

competition. Lack of competition was later identified in the July 2021 Cost Variance Report as a driving factor for the project's cost increase from $715 million to $2.241 billion, an increase of over 300 percent. For management to make informed decisions on current and future projects there should be a clear link between the technical baseline parameters, assumptions, and cost model inputs examined by cost estimators in the sensitivity analysis.

As mentioned previously, the Navy did not perform a risk analysis on the final estimate. The June 2020 estimate detailed examples of risks that could potentially affect the project's construction cost, but did not quantify their potential impact."

Comment 3: No rewrite suggested; but for context the Navy's cost, schedule, risk analysis (CSRA) was completed in January of 2019, and the OSD Final 1391 was submitted in January of 2020. The Navy has limited ability to influence a project's budget after submission to OSD. CSRA updates should continue after Navy budget submission to keep management informed but will not facilitate further budget changes.

In its draft report, GAO states the following on page 20: "*The Navy did not conduct an independent cost estimate (ICE) for the Portsmouth Naval Shipyard dry dock project. Navy officials noted that they followed standard Navy policy in developing the various estimates and NAVFAC does not typically conduct ICEs."*

Comment 4: The Navy recommends rewording the second sentence to read: "Navy officials noted that deficiency and began to address it by conducting an ICE for the next program dry dock, at the Pearl Harbor Naval Shipyard, and will continue to follow Navy polices in developing independent cost estimates."

In its draft report, GAO states the following on page 41, *"The Navy is also planning the renovations for a second dry dock and expects to begin construction efforts in fiscal year 2029."*

Comment 5: The Navy recommends rewording the sentence to read, "The Navy is also planning renovations for Dry Dock 3."

SENSITIVITY CONCERNS:

None. The report is cleared for open publication.

Accessible Text for Appendix III: Comments from the Department of Defense

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SENSITIVITY CONCERNS:

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Appendix IV: GAO Contact and Staff Acknowledgments

GAO Contact

Diana Maurer, (202) 512-9627 or maurerd@gao.gov.

Staff Acknowledgments

In addition to the contact named above, Suzanne Wren (Assistant Director), James Lackey (Analyst in Charge), Adrian Arcoleo, Jennifer Echard, Jason Lee, Amie Lesser, Felicia Lopez, Amelia Stastney, Brandon Voss, Benjamin Wilder, and Emily Wilson made significant contributions to this report.

Related GAO Products

Naval Shipyards: Ongoing Challenges Could Jeopardize Navy's Ability to Improve Shipyards. GAO-22-105993. Washington, D.C.: May 10, 2022

Military Depots: DOD Strategy for Addressing Deteriorating Facilities and Equipment is Incomplete. GAO-22-105009. Washington, D.C.: May 9, 2022.

Navy and Marine Corps: Services Continue Efforts to Rebuild Readiness, but Recovery Will Take Years and Sustained Management Attention. GAO-21-225T. Washington, D.C.: December 2, 2020.

Navy Maintenance: Navy Report Did Not Fully Address Causes of Delays or Results-Oriented Elements. GAO-21-66. Washington, D.C.: October 29, 2020.

Navy Shipyards: Actions Needed to Address the Main Factors Causing Maintenance Delays for Aircraft Carriers and Submarines. GAO-20-588. Washington, D.C.: August 20, 2020.

Navy Maintenance: Persistent and Substantial Ship and Submarine Maintenance Delays Hinder Efforts to Rebuild Readiness. GAO-20-257T. Washington, D.C.: December 4, 2019.

Naval Shipyards: Key Actions Remain to Improve Infrastructure to Better Support Navy Operations. GAO-20-64. Washington, D.C.: November 25, 2019.

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