



## Testimony

Before the Subcommittees on  
Readiness and Management Support  
and Seapower, Committee on Armed  
Services, U.S. Senate

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# NAVAL SHIPYARDS

## Ongoing Challenges Could Jeopardize Navy's Ability to Improve Shipyards

Statement of Diana C. Maurer, Director, Defense  
Capabilities and Management

Accessible Version

# GAO Highlights

Highlights of [GAO-22-105993](#), a testimony before the Subcommittees on Readiness and Management Support and Seapower, Committee on Armed Services, U.S. Senate

## Why GAO Did This Study

The poor condition of infrastructure at the Navy's four public shipyards directly affects the readiness of the aircraft carrier and submarine fleets they are charged with maintaining. These conditions also affect the Navy's ability to support the national defense. In response, the Navy developed a plan to address the shipyards' infrastructure deficiencies, called the Shipyard Infrastructure Optimization Plan. The Navy estimates it will require \$21 billion and 20 years to implement the plan.

This statement summarizes (1) the Navy's actions to address the shipyards' infrastructure challenges and (2) remaining challenges the Navy faces in implementing the SIOP. It also discusses the Navy's progress in implementing GAO's prior recommendations.

This statement is based on previously published work from 2017 through May 2022 on Navy maintenance, the condition of Naval shipyards, and the Navy's Shipyard Infrastructure Optimization Plan.

## What GAO Recommends

GAO made nine recommendations in prior work cited in this statement. The Navy concurred with these recommendations and has fully implemented five of them. The Navy should continue taking steps to address the remainder of these recommendations, particularly those to develop more accurate cost estimates for the SIOP.

View [GAO-22-105993](#). For more information, contact Diana Maurer at (202) 512-9627 or [maurerd@gao.gov](mailto:maurerd@gao.gov).

May 10, 2022

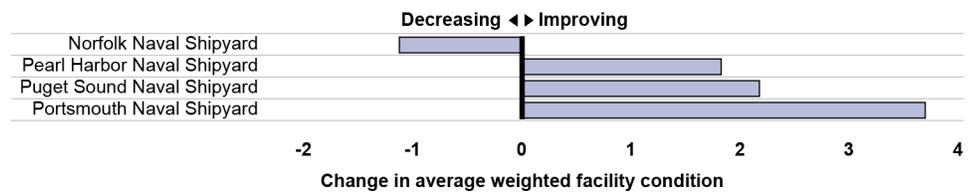
## NAVAL SHIPYARDS

### Ongoing Challenges Could Jeopardize Navy's Ability to Improve Shipyards

## What GAO Found

The Navy has taken several actions to improve its public shipyards in recent years. In 2018, the Navy began a 20-year, \$21 billion effort to modernize and optimize its shipyards, known as the Shipyard Infrastructure Optimization Plan (SIOP). The Navy has also implemented some GAO recommendations in its efforts to improve shipyards, such as creating a program office to manage the SIOP. In addition, the Navy invested in shipyard infrastructure above the minimum level set by Congress. Finally, the average condition of facilities at Navy shipyards has improved at three of the four shipyards from 2016 to 2020.

### Change in Average Weighted Condition Rating at Navy Shipyards, Fiscal Year 2016 - 2020



Source: GAO analysis of service facility condition data. | GAO-22-105993

### Data table for Change in Average Weighted Condition Rating at Navy Shipyards, Fiscal Year 2016 - 2020

Shipyard	Change in Average Weighted Condition Rating
Norfolk Naval Shipyard	-1.12
Pearl Harbor Naval Shipyard	1.83
Puget Sound Naval Shipyard	2.18
Portsmouth Naval Shipyard	3.7

Source: GAO analysis of service facility condition data. | GAO-22-105993

However, the Navy faces a number of remaining challenges to improving the infrastructure at the shipyards.

- The backlog of facility restoration and modernization projects—those intended to restore, renovate, or replace buildings or components—has increased by over \$1.6 billion in the last 5 years.
- The average age of capital equipment has continued to increase. More than half the equipment at the shipyards is past its expected service life.
- The cost of dry dock projects has doubled and may grow further. In 2018, the Navy estimated that it would need \$4 billion to modernize its 17 dry docks. However, the Navy reports that the cost of just the first three dry dock projects has grown by over \$4 billion. This is on top of costs not included in the initial SIOP estimate—such as inflation, utilities, environmental remediation, and historical preservation—which could add billions.
- Initial SIOP schedule goals have slipped. Detailed shipyard investment plans will not be complete until fiscal year 2025, 3 years later than planned.

- Completely implementing the SIOIP will involve funding well above the levels allocated in recent years for shipyard infrastructure; as well as significant planning and sustained management attention over 20 years.

Addressing the remaining GAO recommendations could assist the Navy in reaching its goals of improved shipyard capacity and performance. For example, developing accurate cost estimates will help the Navy articulate its resource needs to fully implement the SIOIP. This includes optimizing facilities and replacing aged equipment in addition to the dry dock improvements already underway. GAO will continue to monitor and assess this multi-year effort, including the Navy's cost and schedule estimates for the SIOIP.

Chairman Kaine and Chairwoman Hirono, Ranking Members Sullivan and Cramer, and Members of the Subcommittees:

Thank you for the opportunity to be here today to discuss our work related to the conditions at the Navy shipyards and the Navy's plan to improve them.

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 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-level maintenance on ships, emergency repairs, ship modernization, and ship deactivations.

The Navy is working to rebuild its readiness while also growing and modernizing its aging fleet of aircraft carriers, submarines, and surface ships. A critical component of rebuilding Navy readiness is implementing sustainable operational schedules, including a carefully orchestrated cycle of maintenance, training, and operations for the entire fleet. Completing maintenance on time is integral to this effort. The Navy's plan to grow the size of the fleet also depends on ships receiving sufficient and timely maintenance to remain operational so that they can reach their expected service lives and remain in the fleet.

In 2017, we reported that the Navy's shipyard infrastructure, including dry docks, facilities, and capital equipment, was in poor condition.<sup>1</sup> Because of this, the shipyards had not been fully meeting the Navy's operational needs. For example, we found that during fiscal years 2000 through 2016, the shipyards had inadequate facilities and equipment, which led to maintenance delays. These delays contributed in part to thousands of lost operational days—days when ships were unavailable for operations—across the Navy's submarine and aircraft carrier fleets. Further, we found that the shipyards would not be able to support almost a third of planned depot maintenance periods for the current fleet of aircraft carriers and submarines over the next 2 decades. We recommended that the Navy develop a plan to improve the shipyards' infrastructure and incorporate

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<sup>1</sup>GAO, *Naval Shipyards: Actions Needed to Improve Poor Conditions that Affect Operations*, [GAO-17-548](#) (Washington, D.C.: Sept. 12, 2017).

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results-oriented practices, such as goals and metrics, in its efforts. The Department of Defense (DOD) agreed with our recommendations.

This statement provides information on the status of the Navy's efforts to improve the shipyards. Specifically, it summarizes (1) the Navy's actions to address the shipyards' infrastructure issues and (2) the remaining challenges the Navy faces in addressing those issues.

The statement is based on reports we issued from 2017 through May 2022 examining Navy maintenance challenges, shipyard conditions and performance, and the Navy's plan to improve the shipyards.<sup>2</sup> To perform our prior work, we analyzed Navy documentation and data on shipyard facility condition, backlogged facility projects, and equipment age, among others; reviewed Navy and DOD guidance; and conducted interviews with Navy officials. The reports cited throughout this statement contain more details on the scope of the work and the methodology used to carry it out. This statement also includes selected updates as of April 2022, as appropriate, based on Navy data, documentation, and discussions with Navy officials.

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

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## Background

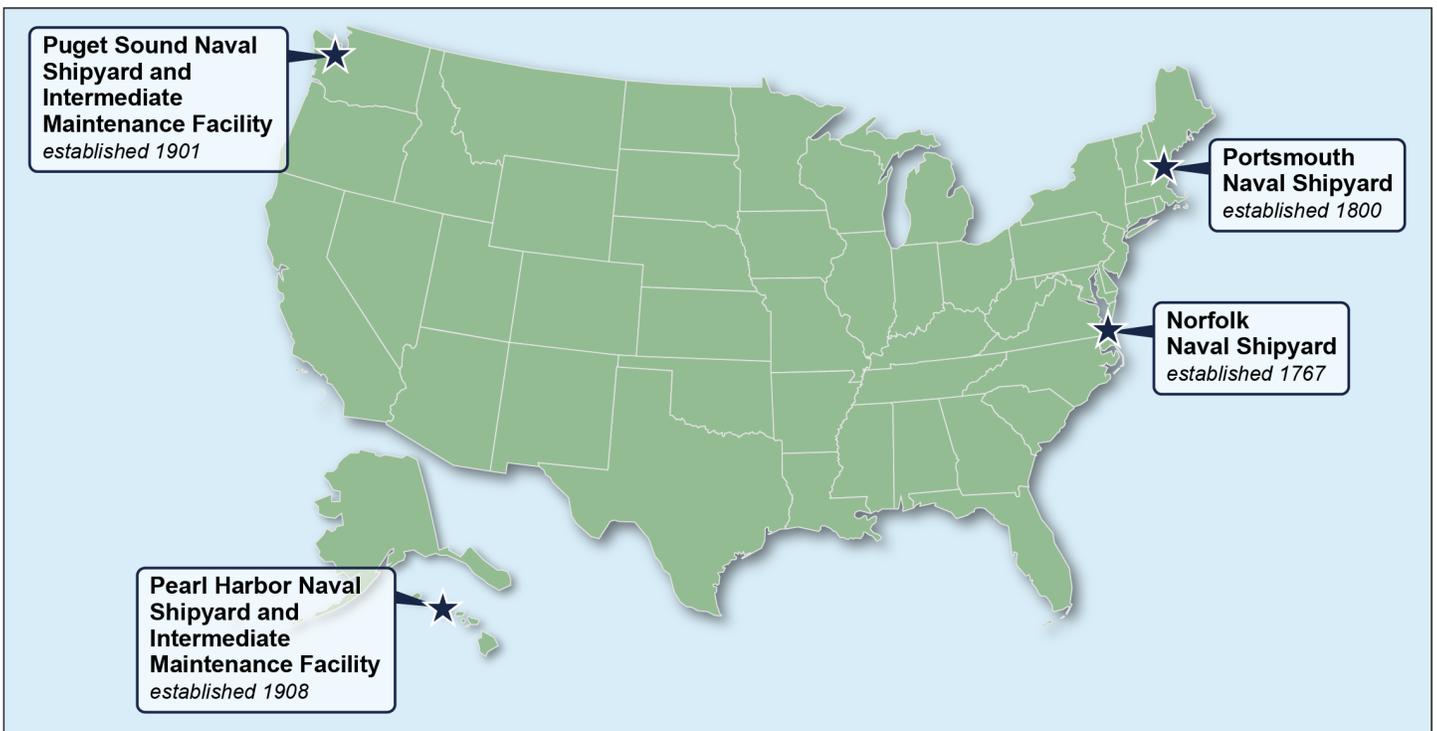
The Navy's public shipyards are highly industrialized, large-scale operations that provide maintenance for ships and submarines. These shipyards are essential to national defense and to fulfill the Department of Defense's (DOD) legal requirement to maintain a critical logistics capability that is government owned and operated. The purpose of this capability is to support an effective and timely response for mobilization, national defense contingency situations, and other emergency requirements.

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<sup>2</sup>A list of related unclassified products is provided in the Related GAO Products pages at the end of this statement.

The naval shipyards were originally designed to build wind- and steam-powered ships, and range in age from 114 years to 255 years (see fig. 1). 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.<sup>3</sup>

Figure 1: Map of Navy Shipyards as of April 2022



Source: Map Resources and GAO analysis of Navy documents. | GAO-22-105993

**Text of Figure 1: Map of Navy Shipyards as of April 2022**

- Puget Sound Naval Shipyard and Intermediate Maintenance Facility, established 1901.
- Pear Harbor Naval Shipyard and Intermediate Maintenance Facility, established 1908.
- Portsmouth Naval Shipyard, established 1800.
- Norfolk Naval Shipyard, established 1767.

Source Map Resources and GAO analysis of Navy documents. | GAO-22-105993

<sup>3</sup>[GAO-17-548](#).

The naval shipyards perform depot-level maintenance, which involves the most comprehensive and time-consuming maintenance work, including ship overhauls, alterations, refits, restorations, nuclear refuelings, and inactivations—activities crucial to supporting Navy readiness.<sup>4</sup> The Navy performs this maintenance during periods designated in its Optimized Fleet Response Plan, an operational schedule of maintenance, training, and deployment periods for the entire fleet. The plan is designed to maximize the fleet’s operational availability to combatant commanders while ensuring adequate time for training personnel and maintaining the ships. We reported in 2016 that successful implementation of the Optimized Fleet Response Plan depends, in part, on the shipyards completing maintenance on time so that maintenance delays do not reduce the time that ships are available for training and operations.<sup>5</sup>

Delays in shipyard maintenance directly affect the Navy’s readiness by hindering its ability to conduct training and operations with its ships. For example, in August 2020 we reported that maintenance delays on aircraft carrier repairs from fiscal year 2015 through 2019 had resulted in a total of 1,128 days of maintenance delay—days that ships were not available for operations.<sup>6</sup> This is the equivalent of losing the use of more than 0.5 aircraft carriers each year. During the same timeframe, maintenance overruns on submarine repairs resulted in a total of 6,296 days of maintenance delay. This was the equivalent of losing the use of more than three submarines each year.

We also reported in 2019 that the naval shipyards lack sufficient dry dock capacity. Because of this, the Navy could not support 68 of the 218 maintenance periods—almost a third—that aircraft carriers and submarines would require through 2040.<sup>7</sup> Specifically, several of the Navy’s 17 dry docks will become obsolete after the Los Angeles class

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<sup>4</sup>The Naval shipyards may also perform some “intermediate level” maintenance which is work generally occurring while a ship is pier-side and on tether, meaning that the ship is capable of ending the maintenance period at any point and getting underway within 4 days.

<sup>5</sup>GAO, *Military Readiness: Progress and Challenges in Implementing the Navy’s Optimized Fleet Response Plan*, [GAO-16-466R](#) (Washington, D.C.: May 2, 2016).

<sup>6</sup>GAO, *Navy Shipyards: Actions Needed to Address the Main Factors Causing Maintenance Delays for Aircraft Carriers and Submarines*, [GAO-20-588](#) (Washington, D.C.: Aug. 20, 2020).

<sup>7</sup>GAO, *Naval Shipyards: Key Actions Remain to Improve Infrastructure to Better Support Navy Operations*, [GAO-20-64](#) (Washington, D.C.: Nov. 25, 2019).

submarines are retired because they will be too small or will lack the appropriate shore-side support to accommodate newer classes of submarines. In addition, no dry dock at any of the naval shipyards can currently support repairs to the Ford class aircraft carrier, even though the Navy accepted delivery of the first ship of that class in 2017.

Recognizing the importance of investing in the depots, Congress passed a law in fiscal year 2007 that requires the Secretary of the Navy to invest in the capital budgets of the Navy depots a total amount equal to not less than 6 percent of the average total combined maintenance, repair, and overhaul workload funded at all the Navy depots for the preceding 3 fiscal years.<sup>8</sup> In fiscal year 2008, the Navy committed to increased capital investment to comply with the law and to improve the overall material condition of these facilities.<sup>9</sup> The Navy acknowledged that there has been a history of under-investment in shipyard needs.

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## The Navy Has Taken Actions to Improve the Shipyards since 2016

The Navy has made several positive steps to improve the shipyards since our 2017 report. For example, the Navy created an investment plan to guide shipyard improvements. The Navy also implemented a number of our shipyard infrastructure recommendations, such as creating a program office responsible for executing the Shipyard Infrastructure Optimization Plan SIOP. In addition, the Navy has been investing in shipyard infrastructure well in excess of the statutory 6 percent minimum. Finally, average facility condition at the shipyards improved from 2016 to 2020.

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### The Navy Created a Shipyard Investment Plan

In February 2018, the Navy issued a plan to address infrastructure deficiencies at the public shipyards known as the (SIOP).<sup>10</sup> The plan calls

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<sup>8</sup>John Warner National Defense Authorization Act for Fiscal Year 2007, Pub. L. No. 109-364, § 332(a) (2006), codified at 10 U.S.C. § 2476. This is also referred to as the “6 Percent Rule.”

<sup>9</sup>Department of the Navy, *Report to Congress on Investment Plan for the Modernization of Naval Shipyards* (Apr. 2013).

<sup>10</sup>Department of the Navy, *Report to Congress: Shipyard Infrastructure Optimization Plan* (Feb. 2018).

for the replacement or modernization of critical shipyard infrastructure—including dry docks, facilities, and a portion of capital equipment—over 20 years, at an estimated cost of \$21 billion.<sup>11</sup> The plan serves 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 plan for infrastructure investments needed to improve shipyard performance. The plan proposes efforts to address limitations with three major facets of the public shipyards’ operations: their dry docks, facilities, and capital equipment (see fig. 2).

**Figure 2: Major Areas for Improvement Identified in the Navy’s Shipyard Infrastructure Optimization Plan**



Source: GAO analysis of Navy documents; Defense Visual Information Distribution Service (photos). | GAO-22-105993

**Text of Figure 2: Major Areas for Improvement Identified in the Navy’s Shipyard Infrastructure Optimization Plan**

- **Dry Docks:** Dry docks are a unique subset of facilities used by shipyard personnel to safely access the underside of ships and submarines during maintenance periods.  
Planned improvements: Upgrades to dry dock capacity and condition

<sup>11</sup>The Navy’s plan included \$4 billion for dry dock improvements, \$14 billion for facility improvements, and \$3 billion for new equipment. It also stated that the recapitalization of shipyard equipment would take longer than the other two efforts (about 30 years) and cost an additional \$1.5 billion over those extra 10 years.

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to support future classes of ships, including seismic and flood protection improvements

- **Facilities:** Facilities are buildings including production shops, piers, nuclear facilities, and utilities, required for repair, maintenance, and modernization of ships and submarines.  
Planned improvements: Optimization of facility layouts in a way that best supports nuclear submarine or aircraft carrier depot maintenance activities.
- **Equipment:** Capital equipment is equipment used at shipyards such as cranes, sheet metal rollers, plasma cutters, and furnaces used to conduct repair work.  
Planned improvements: Modernization of capital equipment that is beyond its expected service life and in poor condition to within industry standards.

Source: GAO analysis of Navy documents; Defense Visual Information Distribution Service (photos). | GAO-22-105993

Optimal placement of facilities is important because depots are large, city-like operations, and travel times between locations ultimately affects maintenance durations. Having an investment strategy to guide planning and execution of multi-million dollar construction projects can help with addressing the scope and timing of projects, along with identifying available funding options. The Navy estimated that the plan could eventually significantly reduce travel times between maintenance activities, save 328,000 labor-days each year (about the equivalent of a submarine availability) and recover most of the maintenance periods (67 of 68 planned ship availabilities over the plan's 20-year lifecycle) it could not support.<sup>12</sup>

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## The Navy Has Implemented Some GAO Recommendations on Shipyards

Since 2017, we have made a total of 9 recommendations directly pertaining to shipyard infrastructure and the SIOP. The Navy has taken some action by implementing five of these recommendations. For example, the Navy:

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<sup>12</sup>An "availability" is the Navy's term for a significant maintenance period for a ship, submarine, or carrier. These maintenance periods can last months or years, and their timely completions are critical to providing the Navy's readiness. The SIOP estimated that the Navy's shortage of dry dock capacity would prevent the Navy from completing 68 availabilities – roughly one third of all availabilities – through 2040.

- **Implemented a program office to manage the SIOP.** In 2017, we recommended that the Navy should conduct regular management reviews that include all relevant stakeholders to oversee implementation of the SIOP.<sup>13</sup> In June 2018, the Navy created a management structure—a program management office (referred to as PMS 555)—to oversee the estimated 20-year-long process of optimizing the shipyards.<sup>14</sup> Shortly thereafter, in September 2018, the Assistant Secretary of the Navy for Research, Development, and Acquisition stated that, though the shipyard optimization effort did not fit all the characteristics of a formal acquisition program, its size and importance required the Navy to treat it as one. As a result, the Navy designated the newly created program office as the acquisition lead for all efforts related to shipyard optimization. Naval shipyard personnel stated that a recent restructuring that organized the SIOP under Naval Facilities and Engineering Command indicates the Navy’s support of the SIOP.
- **Instituted regular reporting internal to the Navy and externally to Congress.** We also recommended in 2017 that the Navy provide regular reporting to key decision makers and Congress on the SIOP’s progress. In September 2018, the Assistant Secretary of the Navy for Research, Development, and Acquisition required that the SIOP program office provide regular updates to an Executive Oversight Council. In addition, in April 2020, the Vice Chief of Naval Operations required the SIOP program office to provide semiannual briefings on its progress to a Resources and Requirements Review Board, which would review the plan’s requirements, resources, and execution. Furthermore, the Navy provided SIOP updates to Congress in February and June of 2020, describing specific efforts, such as military construction and capital equipment that would be needed for the plan. In addition, a mandate in the National Defense Authorization Act for Fiscal Year 2021 required the Navy to submit biannual reports to Congress on the status of the SIOP through fiscal year 2025.<sup>15</sup> Pursuant to this mandate, the Navy provided SIOP status updates to Congress in March 2020 and September 2021.

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<sup>13</sup>[GAO-17-548](#).

<sup>14</sup>NAVSEA Notice 5450, *Establishment of the Shipyard Infrastructure Optimization Program Management Office*, (June 5, 2018).

<sup>15</sup>*William M. (Mac) Thornberry National Defense Authorization Act for Fiscal Year 2021*, Pub. L. No. 116-283, § 346 (2021).

- **Improved its performance metrics for tracking maintenance delays to better capture infrastructure issues.** In 2019, we recommended that Naval Sea Systems Command establish measures for the shipyards to track facility or equipment conditions that lead to maintenance delays.<sup>16</sup> We also recommended that they then implement those measures to identify when facility or equipment conditions lead to maintenance delays. To address those recommendations, the Navy reported in July 2019 that it changed its delay code for maintenance delays. Prior to that, the Navy had a single delay code for all facility, equipment, and tooling-caused delays. After July 2019, the Navy created 3 separate codes - one each for facility, equipment, and tooling-caused maintenance delays, which it could then use to better analyze the effects of these on maintenance throughput. This change allowed the Navy to track the causes of maintenance delays. According to Navy officials, they began generating reports using the new facility, equipment, and tooling delays codes in August 2019. The Navy has used these reports to analyze the most common causes of delays and adjusted equipment maintenance and investment plans, as appropriate.
- **Defined clear shipyard roles and responsibilities.** In 2019, we recommended that the shipyard optimization program office (PMS 555), in coordination with relevant stakeholders, establish clear roles and responsibilities for the shipyards involved in the SIOP.<sup>17</sup> Later that year, Naval Sea Systems Command issued guidance that outlined the staffing, roles, responsibilities, and business rules for the SIOP program office, which included describing its relationships to essential stakeholders such as the shipyards and Navy Installations Command.<sup>18</sup>

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<sup>16</sup>GAO, *Military Depots: Actions Needed to Improve Poor Conditions of Facilities and Equipment That Affect Maintenance Timeliness and Efficiency*, [GAO-19-242](#). (Washington, D.C.: Apr. 29, 2019).

<sup>17</sup>[GAO-20-64](#).

<sup>18</sup>Naval Sea Systems Command Memorandum, *Naval Sea Systems Command Shipyard Infrastructure Optimization Program, Program Management Office, PMS 555 Staffing, Roles, Responsibilities, and Business Rules* (Nov 20, 2019).

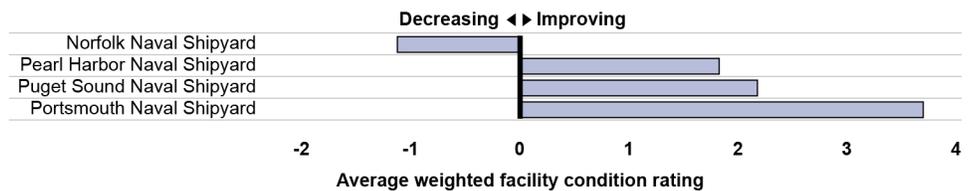
## Investment Funding at the Shipyards Has Exceeded the Statutory Minimum Levels

In May 2022, we reported that the department of the Navy since 2011 invested above the statutory minimum level in its depots, and that most of that investment went to its shipyards.<sup>19</sup> In fiscal year 2007, Congress passed a law requiring each military department to invest in the capital budgets of its depots no less than 6 percent of the average total dollar value of the combined maintenance, repair, and overhaul workload of its depots for the preceding three fiscal years.<sup>20</sup> The capital budget of a depot includes funds to modernize or improve the efficiency of depot facilities, equipment, work environment, or processes in direct support of depot operations. The Department of the Navy has met the statutory minimum investment laid out in section 2476 of Title 10, U.S. Code (section 2476), each year since fiscal year 2011, and a shipyard received less than the 6 percent level only once in the last 10 years.<sup>21</sup>

### Shipyard Facility Condition Has Improved Since 2016

As we reported in 2022, the average facility conditions at the shipyards generally improved between 2016 and 2020 (see fig. 3).<sup>22</sup>

**Figure 3: Change in Average Weighted Facility Condition Rating at Navy Shipyards, Fiscal Years 2016 - 2020**



Source: GAO analysis of service facility condition data. | GAO-22-105993

<sup>19</sup>GAO, *Military Depots: DOD Strategy for Addressing Deteriorating Facilities and Equipment is Incomplete*, GAO-22-105009. (Washington, D.C.: May 9, 2022). In addition to the shipyards, the Department of the Navy also operates Fleet Readiness Centers that provide depot maintenance for its aircraft and Marine Corps Production Plants, which provide depot maintenance for Marine Corps equipment.

<sup>20</sup>Pub. L. No. 109-364, § 332, codified at 10 U.S.C. § 2476.

<sup>21</sup>Norfolk Naval Shipyard, in fiscal year 2017, received 5.9 percent.

<sup>22</sup>GAO-22-105009.

**Data table for Figure 3: Change in Average Weighted Facility Condition Rating at Navy Shipyards, Fiscal Years 2016 - 2020**

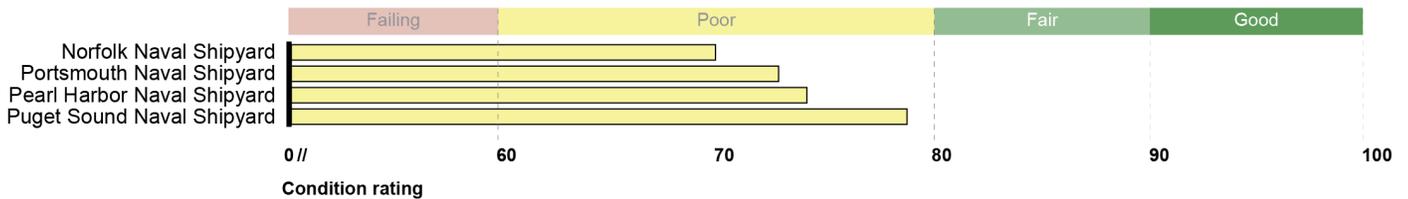
Shipyards	Change in Average Weighted Condition Rating
Norfolk Naval Shipyard	-1.12
Pearl Harbor Naval Shipyard	1.83
Puget Sound Naval Shipyard	2.18
Portsmouth Naval Shipyard	3.7

Source: GAO analysis of service facility condition data. | GAO-22-105993

Note: For this analysis, we weighted the condition ratings by the replacement cost of the facility, also known as the plant replacement value. This is to ensure that costlier facilities weigh more heavily in the condition ratings, so that, for example, an expensive shop plant is weighted as more important than an inexpensive guard shack. This is the same method used by the Navy to calculate its condition averages. The Navy modified its assessment methodology during this time period to provide more detailed assessments of facility condition. We were unable to determine whether this modification had an impact on changes in facility condition ratings.

However, while the condition of the shipyards' facilities generally improved, they are still among the lowest scored depot facilities across DOD.<sup>23</sup> All shipyards have an average facility condition that is in the "poor" category.

**Figure 4: Average Weighted Condition Rating at Navy Shipyards, Fiscal Year 2020**



Source: GAO analysis of service facility condition data. | GAO-22-105993

**Data table for Figure 4: Average Weighted Condition Rating at Navy Shipyards, Fiscal Year 2020**

Shipyards	Average Weighted Condition Rating
Norfolk Naval Shipyard	69.6
Portsmouth Naval Shipyard	72.5
Pearl Harbor Naval Shipyard	73.8
Puget Sound Naval Shipyard	78.4

<sup>23</sup> We reviewed facility condition across 21 DOD depots in an earlier report; for more information about those depots, see [GAO-22-105009](#).

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Note: For this analysis, we weighted the condition ratings by the replacement cost of the facility, also known as the plant replacement value. This is to ensure that costlier facilities weigh more heavily in the condition ratings, so that, for example, an expensive shop plant is weighted as more important than an inexpensive guard shack. This is the same method used by the Navy to calculate its condition averages.

Source: GAO analysis of service facility condition data. | GAO-22-105993

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## The Navy Faces Challenges Improving Shipyard Infrastructure

Notwithstanding these positive steps the shipyards face several challenges in their ongoing efforts to improve their infrastructure. For example:

- The backlog of restoration and modernization projects intended to restore, renovate, or replace buildings or components has continued to grow in recent years, and is now over \$7 billion;
- The age of capital equipment has grown since 2016, and more than half of all shipyard equipment is past its expected service life;
- The costs of SIOP dry dock projects have more than doubled;
- The schedule for SIOP related efforts has slipped by 3 years; and
- Full implementation of the Navy's SIOP would involve funding levels beyond what the Navy has requested in recent years.

Implementing our remaining four recommendations could help the Navy better position itself to improve the accuracy of its funding requests and better manage the complex SIOP effort.

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### Backlog of Facility Restoration and Modernization Projects has Increased Since 2017

In May 2022, we reported that from 2017 to 2020, the backlog of restoration and modernization projects at the Navy shipyards has grown

by over \$1.6 billion, an increase of 31 percent (see table 1).<sup>24</sup> This increase is particularly concerning given that the Navy has invested well over the statutory minimum. Despite regularly meeting that mandated investment level, the backlog of facility restoration and modernization projects at the shipyards continues to grow.

**Table 1. Backlog of Restoration and Modernization Projects at the Navy Shipyards Depots (dollars in millions)**

Military Service	Fiscal year 2017 (in \$millions)	Fiscal year 2020 (in \$millions)	Increase (in \$millions)	Increase (percentage)
<b>Navy Shipyards</b>	5,401	7,063	1,662	31
<b>Norfolk Naval Shipyard</b>	1,460	2,284	824	56
<b>Pearl Harbor Naval Shipyard</b>	1,690	1,826	136	8
<b>Portsmouth Naval Shipyard</b>	761	931	170	22
<b>Puget Sound Naval Shipyard</b>	1,490	2,022	532	36

Source: GAO analysis of military service information | [GAO-22-105993](#)

Furthermore, the Navy may have under stated those costs. We reported in 2017 that facility improvements can sometimes result in unanticipated costs that increase overall project costs. In one example, bringing a 120 year-old historic building up to modern code resulted in unanticipated costs that increased the cost of the project from \$2.5 million to more than 10 times that.<sup>25</sup> While not every project will involve similar additional costs, the potential exists for further unanticipated project growth.

<sup>24</sup> [GAO-22-105009](#). The Navy defines its restoration and modernization backlog as the estimated cost to 1) restore facilities degraded by inadequate sustainment, excessive age, natural disaster, fire, or accident, among other things; 2) renovate or replace existing facilities to implement new or higher standards or accommodate new functions; or 3) replace building components that typically last more than 50 years. The Navy calculates its restoration and modernization backlog through the Facility Readiness Evaluation System, which assesses data for all Navy installations, including the four shipyards. In the mathematical formula used to calculate total restoration and modernization backlog, configuration rating data are used to calculate modernization costs, condition rating data are used to calculate restoration costs, and facility replacement value is used as a weighting factor. Due to the methods the Navy uses to calculate the configuration rating, the restoration and modernization backlog may be under stated.

<sup>25</sup>Originally, the building needed new windows, HVAC, and roof insulation; however, fixing the windows triggered a requirement that the Navy provide a certain level of hurricane wind and anti-terror force protection – adding \$6.8 million to the original cost. The new overall cost – \$9.3 million, up from \$2.5 million - triggered additional requirements based on the cost exceeding a certain percentage of the replacement value of the building, including flood mitigation and asbestos removal. Those requirements added \$25.4 million, for a total of \$34.7 million.

Navy officials told us that the Navy consistently prioritizes other programs—such as weapon system acquisitions—over facility sustainment. For example, Navy officials stated that aircraft, submarine, and ship acquisition initiatives consistently receive priority over facility sustainment because of their perceived greater importance in performing the Navy’s assigned missions. Depot personnel also attributed the increases in the backlog to reduced sustainment, restoration, and modernization funding.

### Shipyards Capital Equipment Remains Past Its Expected Service Life

More than half of all the capital equipment used at the Navy shipyards is beyond its expected service life (see table 2). In addition, the overall average age of capital equipment at the shipyards has grown increased from 22 years in 2016 to 23.6 years in 2020.

**Table 2: Average Age of Depot Capital Equipment by Service, as of Fiscal Year 2020**

	Average Age of Capital Equipment (in years)	Capital Equipment Beyond Expected Service Life (percentage)
Naval Shipyards	23.6	57
Norfolk Naval Shipyard	12.5	63
Portsmouth Naval Shipyard	13.6	41
Puget Sound Naval Shipyard	35.6	65
Pearl Harbor Naval Shipyard	9.4	39

Source: GAO analysis of military service information | [GAO-22-105993](#)

This is still a deficiency the Navy recognizes needs to be addressed. The SIOP includes a goal of modernizing capital equipment that is past its expected service life, which the Navy estimated could cost \$3 billion.<sup>26</sup> Equipment that is beyond its useful life can be inefficient and unreliable, affecting the shipyards’ ability to conduct repair work. We reported in 2017 that aging equipment could be causing the Navy to incur additional repair costs for parts and labor. Unreliable equipment can also result in increased costs and re-work. For example, after it was discovered in 2015 that the analog controls on a furnace used to heat-treat submarine parts

<sup>26</sup>The SIOP covers a 20-year timeframe. Over that time horizon, the Navy plans to spend about \$3 billion on capital equipment. However, the SIOP noted that meeting its goal of recapitalizing aging equipment could take up to 30 years, for a total cost of \$4.5 billion.

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to withstand deep sea pressure were reading inaccurately, Norfolk officials were required to re-inspect 10 years' worth of parts made in that furnace to ensure that they met stringent submarine safety requirements.

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## Cost of Dry Dock Improvements Has Increased

The cost of the Navy's dry dock projects in the SIOP has, according to Navy estimates, grown by over 400 percent since 2018. The Navy estimated in 2018 that its effort to improve the naval shipyards would require \$21 billion over 20 years to implement. However, we reported in November 2019 that this \$21 billion estimate does not include inflation and other significant costs, such as those for utilities, roads, or environmental remediation, which could add billions to the final cost.<sup>27</sup> We reported that developing accurate cost estimates is key to successfully completing a large effort such as the SIOP, and made several recommendations to improve the SIOP's cost estimates.

In 2018, the Navy estimated that it would need to invest about \$4 billion in its dry docks to obtain the capacity to perform the 67 availabilities it cannot currently support.<sup>28</sup> This estimate included 14 dry dock projects planned over the SIOP's 20-year span. However, since 2018, the cost of the initial dry dock projects has increased. For example, the Navy's first three dry dock projects have grown in cost from an estimated \$970 million in 2018 to over \$5.1 billion in 2022, an increase of more than 400 percent. These dry dock projects are critical to the Navy's success in implementing the SIOP, as they will provide the capacity for about two-thirds of the 67 unsupported availabilities.

Given that these projects are still very early in development, the shipyard improvement program office (PMS-555) notes that additional cost increases may be necessary, raising the cost of these projects—and the SIOP in general—even more. Although the Navy's original plan in the SIOP was to improve the dry docks, facilities, and equipment of the shipyards, increasing dry dock costs could crowd out other improvements. Navy officials told us that there is a possibility that the

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<sup>27</sup>[GAO-20-64](#).

<sup>28</sup>The SIOP estimated that the Navy's shortage of dry dock capacity would prevent the Navy from completing 68 availabilities – roughly one third – through 2040. The dry dock projects were a mixture of projects intended to provide capacity to perform those unsupported availabilities, and those intended to mitigate some vulnerability, such as seismic or flooding.

SIOIP could eventually pivot to focusing efforts on the dry docks, given the increasing cost of the projects. If that occurs, the Navy would not realize some of the proposed benefits of the SIOIP – such as reduced travel time and labor days. However, the Navy has not yet released an updated cost estimate for the SIOIP that would take these increases into account. In a September 2021 report to Congress, the Navy stated that an update to the program’s cost estimate will not be issued until they complete detailed investment plans for each shipyard—about 8 years after publishing the original SIOIP and more than a third of the way through its 20-year duration.<sup>29</sup>

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## The Schedule for Completing Initial Shipyard Plans Has Slipped

As we reported in May 2022, the Navy’s effort to complete detailed shipyard investment plans has been delayed by 3 years, which could affect the SIOIP’s schedule.<sup>30</sup> In order to guide infrastructure investment at the shipyards, the Navy plans to complete an Area Development Plan (ADP) for each location. These ADPs are intended to guide the key improvements at each shipyard, using modeling information developed as part of the shipyards’ data collection efforts. In a 2021 report to Congress, the Navy stated it would complete the ADPs by fiscal year 2021. However, in a September 2021 update of that report, the Navy stated the ADPs would be complete four years later, in fiscal year 2025.<sup>31</sup> According to the Navy, funding constraints have led to a slip in completion of the optimization analysis and associated ADPs for each shipyard. While Navy officials told us that these new timeframes will not affect the completion of key projects – such as the dry docks – they could delay construction of other facilities resulting in a reduction in the Navy’s ability to perform its mission.

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<sup>29</sup>Department of the Navy, *The Shipyard Infrastructure Optimization Program (SIOIP): President’s Fiscal Year 22 Budget 5 Year Plan*, September 2021.

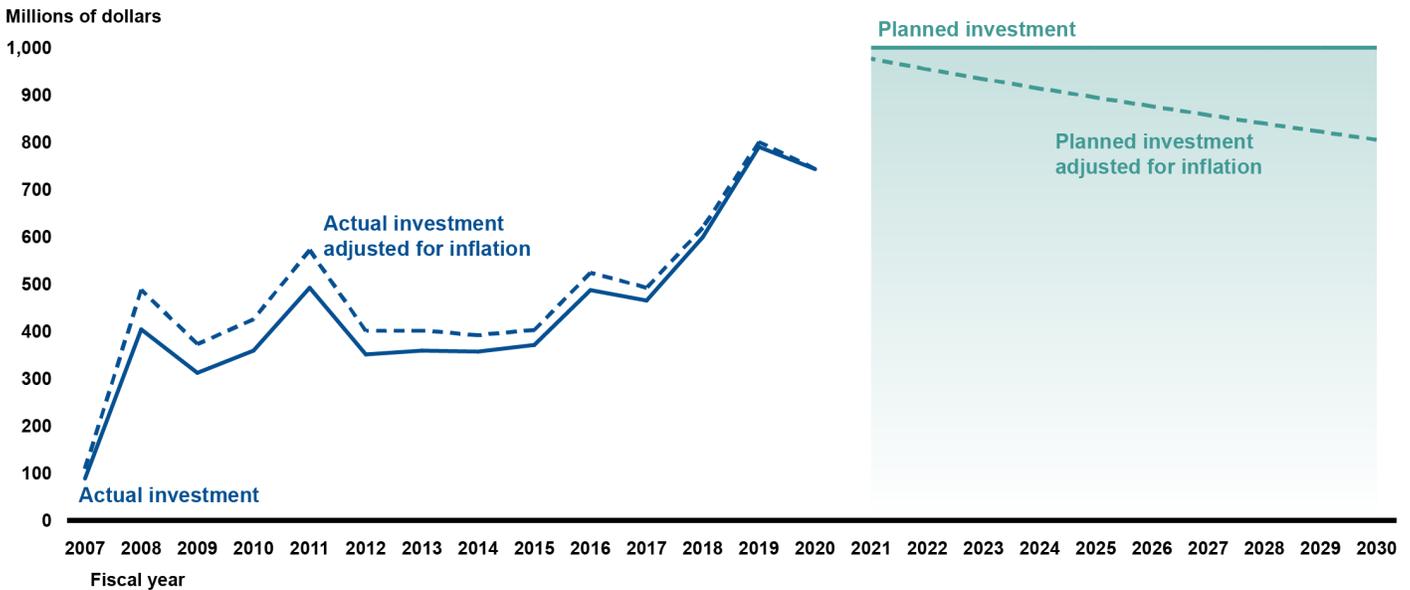
<sup>30</sup> [GAO-22-105009](#).

<sup>31</sup> According to the September 2021 update to the SIOIP, additional funding could accelerate completion of the ADPs for each shipyard into the beginning of fiscal year 2024.

## Full Implementation of SIOP Would Involve Funding Above Recent Levels

Full implementation of the Navy’s SIOP would involve funding levels beyond what the Navy has requested for shipyard infrastructure in recent years. In the SIOP’s 2018 release, the program estimated a cost of about \$1 billion per year until its completion. While the SIOP does not project yearly funding requirements, we reported in 2022 that the Navy’s facility investment has been under that level every year since 2007, although the Navy’s investment levels have climbed since it published the SIOP (see figure 5).<sup>32</sup> We found that funding the original SIOP would equate to an increase of more than 40 percent over the next five years when compared to the Navy’s average over the previous five years. Any cost growth would further increase that gap.

**Figure 5: Navy Shipyard Actual and Planned Investment in Depot Infrastructure Improvements**



Source: GAO analysis of Department of Defense data. | GAO-22-105009

<sup>32</sup> Department of the Navy, *The Shipyard Infrastructure Optimization Program (SIOP): President’s Fiscal Year 22 Budget 5 Year Plan*, September 2021. Navy officials have told us that The update states additional funding could accelerate completion of the ADPs for each shipyard into the beginning of fiscal year 2024.

**Data table for Figure 5: Navy Shipyard Actual and Planned Investment in Depot Infrastructure Improvements**

Year	Actual investment	Proposed investment	Actual investment adjusted for inflation	Proposed investment adjusted for inflation
2007	88.5	--		109.1
2008	104.9	--	--	126.6
2009	114.3	--	--	136.4
2010	101.6	--	--	120.2
2011	105.3	--	--	122.2
2012	155.5	--	--	177
2013	112.6	--	--	125.9
2014	99.2	--	--	108.8
2015	100.6	--	--	109.1
2016	102.8	--	--	110.5
2017	111.4	--	--	117.7
2018	213.3	--	--	220.3
2019	174.9	--	--	177.1
2020	293.7	--	--	293.7
2021	--	153.9	157.6	--
2022	--	234	245.3	--
2023	--	313.4	335.7	--
2024	--	219.7	240.4	--
2025	--	321.1	359	--
2026	--	314.6	359.2	--
2027	--	454	529.5	--
2028	--	217.6	259.2	--
2029	--	231.7	281.9	--
2030	--	221.3	274.8	--

Source: GAO analysis of Department of Defense data. | GAO-22-105993

Note: Proposed shipyard investments from fiscal year 2021 - 2030 are based on the Shipyard Infrastructure Optimization Program's \$21 billion cost estimate over 20 years. Proposed investment amounts are adjusted for inflation and expressed in 2020 dollars using the U.S. Gross Domestic Product Price Index from the U.S. Department of Commerce, Bureau of Economic Analysis.

## The Navy Has Not Yet Implemented Some of GAO's Recommendations to Improve its Shipyard Infrastructure Efforts

Addressing GAO's prior recommendations could assist the Navy in reaching its goals of improved shipyard capacity and performance. For

example, in 2017, we found that the Navy's plan was missing important elements needed to achieve results, such as analytically-based goals and metrics for improvement and a full identification of the shipyards' resource needs.<sup>33</sup> As a result, the Navy risked continued deterioration of its shipyards, hindering its ability to efficiently and effectively support Navy readiness over the long term. We recommended that the Secretary of the Navy develop a comprehensive plan for shipyard capital investment that established (1) the desired goal for the shipyards' condition and capabilities; (2) an estimate of the full costs to implement the plan, addressing all relevant requirements, external risk factors, and associated planning costs; and (3) metrics for assessing progress toward meeting the goal that includes measuring the effectiveness of capital investments.<sup>34</sup>

While the SIOP includes some of the recommended elements, it does not include others. For instance, as of February 2022, the plan did not include metrics for assessing progress toward meeting each of its goals. Navy officials have stated that they intend to develop metrics to meet this element during a second phase that will be complete in fiscal year 2025. To fully implement this recommendation, the Navy should develop metrics to help it assess progress towards meeting its goals that include measuring the effectiveness of capital investments. Until it does, the Navy will be unable to determine whether it is achieving its SIOP goals.

In 2019, we made three additional recommendations addressing the SIOP's first cost estimate.<sup>35</sup> We recommended that the shipyard optimization program office (PMS 555):

- Include all costs—such as costs for inflation, program office activities, utilities, roads, environmental remediation, historical preservation, and alternative workspace—when developing its second, more detailed, cost estimate.
- Use cost estimating best practices—as outlined in the GAO Cost Estimating and Assessment Guide—in developing its second cost estimate, including a program baseline, work breakdown structure, a description of the methodology and key assumptions, inflation, fully addressing risk and uncertainty, and a sensitivity analysis.

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<sup>33</sup>[GAO-17-548](#).

<sup>34</sup>[GAO-17-548](#).

<sup>35</sup>[GAO-20-64](#).

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- Obtain an independent cost estimate of the Naval Shipyards program prior to the start of its project prioritization effort.

Navy officials concurred with all three recommendations and stated that they planned to implement them when the program office secured its second internal cost estimate, which it expected to occur in fiscal year 2022. However, as of March 2022, Navy officials stated that the schedule for completion of the second cost estimate has slipped to fiscal year 2025. We continue to believe that implementing all four recommendations will help the Navy improve the accuracy of its funding requests and better manage the complex SIOPI effort.

In summary, implementing the SIOPI will take several years and require significant planning and management attention, as well as funding over historical levels for depot facility construction, restoration, modernization, and equipment. The Navy has reported that implementing the SIOPI would contribute to improved shipyard performance and ultimately to improved readiness. However, the Navy faces a number of challenges to implementing the SIOPI. With long-term costs still unknown and the ADPIs several years from completion, it remains to be seen whether the Navy will be able to follow through on its dry dock improvement, facility layout optimization, and equipment recapitalization plans. We will soon begin work assessing the Navy's project cost estimates for the SIOPI and will continue to monitor and assess this multi-year effort.

Chairman Kaine and Chairwoman Hirono, Ranking Members Sullivan and Cramer, and Members of the Subcommittees, this concludes my prepared statement. I would be pleased to respond to any questions you may have at this time.

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## GAO Contact and Staff Acknowledgements

If you or your staff have questions about this testimony, please contact Diana Maurer, Director, Defense Capabilities and Management at (202) 512-9627 or [maurerd@gao.gov](mailto:maurerd@gao.gov). Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this statement. GAO staff who made key contributions to this testimony are Suzanne Wren (Assistant Director), James Lackey (Analyst-in-Charge), Ava E. Bagley, Amy Bush, Chris Cronin, Amie Lesser, Felicia Lopez, Michael Silver, Emily Wilson, Elizabeth Wood, and Lillian Moyano Yob.

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*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.

*Navy and Marine Corps: Rebuilding Ship, Submarine, and Aviation Readiness Will Require Time and Sustained Management Attention.* [GAO-19-225T](#). Washington, D.C.: December 12, 2018.

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*Navy Readiness: Actions Needed to Address Costly Maintenance Delays Facing the Attack Submarine Fleet.* [GAO-19-229](#). Washington, D.C.: November 19, 2018.

*Naval Shipyards: Actions Needed to Improve Poor Conditions that Affect Operations.* [GAO-17-548](#). Washington, D.C.: September 12, 2017.

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Letter

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*Military Readiness: Progress and Challenges in Implementing the Navy's Optimized Fleet Response Plan.* [GAO-16-466R](#). Washington, D.C.: May 2, 2016.

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## Strategic Planning and External Liaison

Stephen J. Sanford, Managing Director, [spel@gao.gov](mailto:spel@gao.gov), (202) 512-4707  
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