Executive Summary

The Navy's four public shipyards – Norfolk Naval Shipyard, Portsmouth Naval Shipyard, Puget Sound Naval Shipyard and Intermediate Maintenance Facility, and Pearl Harbor Naval Shipyard and Intermediate Maintenance Facility - are essential elements of our national defense. The shipyards are government owned and operated to support an effective and timely response for mobilization, national defense contingency situations, and other emergency requirements. Their primary mission is to provide depot level maintenance to ensure the Navy's nuclear aircraft carriers and submarines are available to meet the nation's needs. The naval shipyards have taken significant steps to better train and improve workforce performance over the past five years and are on an improving trend as witnessed by the on-time delivery of all four aircraft carrier (CVN) availabilities and reduced lost days on submarine availabilities in 2017.

However, the current condition, configuration, and location of supporting facilities, dry docks, and equipment limits the improvements that can be made. Future growth in both the CVN and SSN force to obtain the Navy the Nation needs further exacerbate these challenges. This report compliments a recent Government Accountability Office (GAO) report (17-548, September 2017), reference [1], that found aging facilities, dry docks, and equipment affect the shipyards' ability to meet the Navy's mission requirements.

This report provides the 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 into the 21st century to ensure we are providing the Shipyards the Nation needs. The plan focuses on three major areas for each of the Navy's four public shipyards:

- Dry Dock recapitalization
- Facility layout and optimization
- Capital equipment modernization

Dry Dock Recapitalization

Dry dock investments are needed to support USS GERALD R. FORD Class, USS VIRGINIA Class including VIRGINIA Payload Module (VPM) variants, as well as seismic and flood protection improvements. This capacity deficit is further aggravated by unplanned emergent U.S. Navy Fleet repairs and unanticipated national security contingencies, as well as projected increases in the size of the submarine and aircraft carrier fleet. If not improved, an estimated 68 major maintenance periods (availabilities) will have to be moved, deferred and/or rescheduled primarily due to dry dock obsolescence. This plan restores 67 of the 68 maintenance periods as scheduled, with the lone availability being a submarine inactivation.

Facility Layout and Optimization

Each naval shipyard has its own unique legacy and historical significance and therefore, this optimization effort will strive to acknowledge the historical legacies while moving forward with a modernization and optimization plan. The naval shipyards are comprised of infrastructure from the 19th and 20th centuries, primarily designed for ship construction using early 20th century industrial models. There have been no major recapitalization efforts since the early 20th century. This outdated facility model creates significant production inefficiencies for the maintenance mission on 21st century nuclear powered ships.

The material condition of naval shipyard production facilities is poor. These facilities and supported functions are not arranged or configured to best support nuclear submarine or aircraft carrier depot maintenance throughput. The average production shop facility age for all shipyards is 76 years and the average condition rating for these facilities is 66 (poor), which is below the Navy standard of 80. Each shipyard's contribution to these overall numbers is as follows:

- NNSY has an average age of 84 years and average condition rating of 59 (failing).
- PHNSY & IMF has an average age of 68 years and average condition rating of 67 (poor).
- PNSY has an average age of 95 years and average condition rating of 66 (poor).
- PSNSY & IMF has an average age of 73 years and average condition rating of 73 (poor).

This report provides the strategy to optimally size, configure, and locate facilities at the four public shipyards to best execute current and future mission requirements. This strategy addresses each of the inefficiencies outlined in GAO report 17-548, reference [1], and will reduce total personnel and material travel and movement performed for each future submarine and aircraft carrier availability by an average of 65%, which equates to recovering 328K man days per year.

This annual savings is the equivalent of:

- One CVN non-docking availability or
- One submarine EOH or
- Three submarine inactivations

Further analysis will continue to refine these estimates and when combined with other ongoing initiatives and capital improvements will provide larger process improvement gains within the facilities themselves which equates to significant increases in productive capacity.

Capital Equipment Modernization and Location Optimization

Most naval shipyard capital equipment infrastructure is well beyond effective service life, obsolete, unsupported by original equipment manufacturers, and at operational risk. Continued reliance on this aged equipment infrastructure increases submarine and aircraft carrier depot maintenance availability costs and places schedules at risk. Modernizing naval shipyard capital equipment is essential to improving shipyard efficiency, reducing costs, meeting future capabilities, and providing for Fleet readiness. Private sector average age for industrial equipment is 7 to 10 years, while the average shipyard capital equipment age is 24 years. 68% of shipyard capital equipment is over 10 years old and 39% is over 20 years old. Average capital equipment age at each naval shipyard is:

- Norfolk Naval Shipyard: 29 years
- Portsmouth Naval Shipyard: 17 years
- Puget Sound Naval Shipyard and Intermediate Maintenance Facility: 21 years
- Pearl Harbor Naval Shipyard and Intermediate Maintenance Facility: 19 years

Additional equipment investments are also needed to support new mission requirements, including USS LOS ANGELES Class refueling evolutions at Portsmouth Naval Shipyard, concurrent USS VIRGINIA Class availabilities at Portsmouth Naval Shipyard and Pearl Harbor Naval Shipyard and Intermediate Maintenance Facility, USS VIRGINIA Class introduction at Norfolk Naval Shipyard, and USS GERALD R. FORD Class introduction at Norfolk Naval Shipyard and Puget Sound Naval Shipyard and Intermediate Maintenance Facility.

Estimated Costs

The initial estimated cost for this plan over 20 years is $21B. This estimate will be updated as we execute this plan. This includes $4B for improvements of the dry docks which recovers 67 deferred availabilities and provides needed dry dock capacity and capability for future classes; $3B for capital equipment investments to achieve recapitalization of equipment prior to service life expiration; and $14B for construction costs to provide the optimal layout of facilities within the shipyards which returns productive capacity of 328k man days each year.

Independently, these investments do not completely optimize maintenance throughput to maximize mission readiness. Execution of the entirety of these recommended investments will optimally size, configure, and locate naval shipyard infrastructure to meet mission requirements, and will provide a capital investment strategy guided by a comprehensive, results-oriented management approach.

This investment of approximately $21B represents a requirement that is well beyond Navy's historical facilities investment funding and will require top line budgetary relief and its own program of record in order to avoid unacceptable impacts to other Navy programs that are equally as critical to the Navy's mission. Utility investments and realignment of road networks required to optimize arrangement of shipyard facilities and any significant environmental remediation will be identified as part of the Phase II master plan.

Prioritized investment areas:

- $4B dry dock investment: Required to recover 67 of the projected 68 moved, deferred and/or rescheduled submarine and aircraft carrier maintenance availabilities. Critical to supporting new Class introduction, maintaining dry dock certifications, and seismic and flood protection improvements. Returning 67 aircraft carriers and submarines on time to the Fleet will improve readiness.
- $14B facilities layout and optimization investment: Required to best execute current and future shipyard mission and recover 328K man days per year back to productive work solely by reducing worker and material movement. Also required to fully realize capital equipment return on investment.
- $3B capital equipment investment: Required to modernize the naval shipyard industrial plant, resulting in new technology innovation efficiencies that improve submarine and aircraft carrier depot maintenance throughput and move the needle on availability execution. Capital equipment modernization return on investment typically ranges from 100% to over 700% of investment cost. The maximum capital equipment return on investment beyond modernization, though, will not be fully realized without optimizing facilities layout.

Courses of Action (COAs)

Per agreement - paragraph redacted - not clearly releasable