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DEPARTMENT OF THE NAVY
COMMANDER NAVAL AIR FORCE
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FINAL ENDORSEMENT on CAPT (b) (6), USN ltr 5830 of 10 Nov 22

From: Commander, Naval Air Force, U.S. Pacific Fleet
To: File

Subj: COMMAND INVESTIGATION INTO THE INCIDENT INVOLVING BACTERIA AND OTHER CONTAMINANTS WITHIN THE POTABLE WATER SYSTEM ABOARD USS ABRAHAM LINCOLN (CVN 72) ON OR ABOUT 21 SEPTEMBER 2022

1. This command investigation was convened to inquire into the circumstances surrounding the incident involving the presence of bacteria and other contaminants within the potable water system aboard USS ABRAHAM LINCOLN (CVN 72) on or about 21 September 2022 while the ship was underway in the Southern California Operating Area.

2. After review of the investigation and endorsements, I concur with and hereby approve the findings, opinions, and recommendations of the investigating officer. The potable water contamination was caused by a hole in the potable water vent header in the bilge compartment. As the contamination of potable water issue was identified, the Commanding Officer took expert advice from her CVN Heads of Department (HODs), made appropriate decisions to isolate the problem, rapidly develop and implement plans to make/test and distribute CVN generated water, and provide clean water at sea until potable water conditions were fully resolved. These actions, including the communication of real-time conditions and actions to the crew, were commensurate with the rights and absolute responsibility of a Commanding Officer.

**Action Update:** As of 1 November 2022, I have directed the establishment of an Aircraft Carrier Potable Water Working Group, to review all incidents within the past year involving potable water on Aircraft Carriers. This group is specifically chartered to issue a CVN class advisory message and propose changes as required to: 1) potable water maintenance requirements; 2) potable water technical manuals and drawings; 3) shipboard potable water specifications; 4) shipboard water analysis capabilities; 5) shore facility water analysis capabilities; 6) CVN 68 and CVN 78 Class potable water system design; and 7) shipboard and shore preplanned response actions to resolve petroleum product or chemical contamination of the shipboard potable water system. Final message and proposals are due no later than 31 January 2023.

3. I direct all CVN Commanding Officers, Executive Officers, Reactor Officers, Assistant Reactor Officers, and Chief Engineers to review this investigation and provide feedback to the Aircraft Carrier Potable Water Working Group through my Assistant Chief of Staff for Maintenance and Material, CAPT (b) (6).


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4. This investigation is forwarded to Naval Sea Systems Command Naval Engineering & Logistics (NAVSEA 05), Naval Facilities Engineering Command, Bureau of Medicine & Surgery, and Naval Surface Warfare Center Philadelphia Division (NSWC PD) for review and action as deemed appropriate.

5. This investigation and enclosures will be maintained in my Force Judge Advocate office, which may be reached at (619) 545-2778

K. R. WHITESELL

Copy to:
NAVFAC
COMNAVAIRLANT
BUMED
NAVSEA PEO AIRCRAFT CARRIERS
NAVSEA 05
NAVSURFWARCENDIV PHILADELPHIA PA
NAVMCPUBHLTHCEN

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Ref: (a) JAGINST 5800.7G, Chapter II
(b) NAVMED P-5010-6, Manual of Naval Preventative Medicine Chapter 6 Water Supply Afloat
(c) NAVSEA 0989-036-0000 CVN68 Class Steam Plant Manual Chapter 22 Potable Water Fill, Transfer and Stowage Systems

Encl: (1) Appointing Order of 11 Oct 22
(2) CNAF N9 Site Visit Report
(3) USS ABRAHAM LINCOLN (CVN 72) Commanding Officer Underway Standing Order 8
(4) USS ABRAHAM LINCOLN (CVN 72) Main Propulsion Assistant MFR
(5) USS ABRAHAM LINCOLN (CVN 72) Automated Project Data Log (APDL) Watchstander Summary
(6) USS ABRAHAM LINCOLN (CVN 72) Monthly Preventive Medicine Reports
(7) USS ABRAHAM LINCOLN (CVN 72) Two year summary of potable water tanks with positive bacteria samples
(8) USS ABRAHAM LINCOLN (CVN 72) Machinery Division Startup Checklist
(9) Summary of Interview/Email, CVN72 PSNS APS (b) (6)
(10) Summary of Interview/Email, CVN 72 MPM (b) (6)
(11) Summary of Interviews, N9 Watchstander Summary
(12) Summary of Interview/Email, Main Propulsion Assistant
(13) Summary of Interview/Email, Reactor Electrical Assistant
(14) Summary of Interview, LT (b) (6) (17-22) EOOW
(15) Summary of Interview/Email, HMC (b) (6) Preventive Medical Tech
(16) Summary of Interview, USS ABRAHAM LINCOLN (CVN 72) Senior Medical Officer
(17) Summary of Interview, USS ABRAHAM LINCOLN (CVN 72) Reactor Officer
(18) Summary of Interview, USS ABRAHAM LINCOLN (CVN 72) Executive Officer
(19) Summary of Email, USS ABRAHAM LINCOLN (CVN 72) Force Deputy Surgeon
(20) Summary of Interview, N9 Bilge Inspectors
(21) Commander Navy Air Force, U.S. Pacific Fleet MTT3 Report
(22) USS ABRAHAM LINCOLN (CVN 72) Zone 7 Bilge Inspection Report
(23) USS ABRAHAM LINCOLN (CVN 72) Tagout Record Sheet
(24) USS ABRAHAM LINCOLN (CVN 72) Maintenance Control TSIMs Report
(25) USS ABRAHAM LINCOLN (CVN 72) Site Visit Header Pictures
(26) USS ABRAHAM LINCOLN (CVN 72) Equipment Deficiency Log

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(27) Temporary Reactor Officer's Standing Order 22-57

## Preliminary Statement

1. This investigative report is submitted as required by enclosure (1) and is in compliance with reference (a). In summary, I found that corrosion of a carbon steel pipe in USS ABRAHAM LINCOLN's potable water system allowed bilge water to contaminate the water supply of the ship. Programmatic failure coupled with watchstanding practices impeded early identification and implementation of controlling actions by Ship's Force. I am not recommending any individual administrative or disciplinary action.

2. After initial investigative steps, I requested additional time and resources from the convening authority to review logs and conduct interviews as well as the opportunity to consult with subject matter experts on relevant issues. I received support in this form from Commander Naval Air Force, U.S. Pacific Fleet (CNAP) N9, CNAP N43, CNAP N01M Force Surgeon, and the Puget Sound Naval Shipyard (PSNS) San Diego Detachment.

3. I consulted with LCDR (b) (6), JAGC, USN in preparing this report. USS ABRAHAM LINCOLN (CVN 72) provided open access to the ship, personnel, and records to ensure that this investigation could proceed. I encountered no difficulties in conducting this investigation and was able to review the relevant records as needed to make this determination.

## Findings of Fact

*Chronology of Events*

1. Sometime in spring 2022, corrosion produced a hole in a vent header of Potable Water (PW) Tank (b) (3) (A) onboard USS ABRAHAM LINCOLN (CVN 72), hereinafter "LINCOLN." This hole was about 6 inches off the low point in the bilge in (b) Main Machinery Room (b) (MMR) and allowed bilge water to flow into PW Tank (b) (3) (A) whenever bilge levels were high enough.

2. LINCOLN was scheduled to get underway from Naval Air Station North Island Pier Lima on 18 September 2022. [Encl (5)]

3. On 16 September 2022, LINCOLN Reactor Department set watches and started up (b) Reactor in support of their 18 September 2022 underway. On 17 September 2022, (b) Reactor was shut down to support repairs, delaying LINCOLN's underway until 21 September 2022. During this delay, LINCOLN was unable to lower bilge levels after the normal accumulations of startup as they were restricted in pumping due to their proximity to land. [Encl (5)]

4. Between 19-21 September 2022, Bilge levels in (b) MMR exceeded 6 inches. [Encls (2), (5)]

5. On 17 September 2022, PW Tank (b) (3) (A) (located in (b) Main Machinery Room) experienced an unaccounted for change in level adding approximately 2000 gallons to this tank. [Encl (5)]

6. On 18 September 2022, (b) (3) (A) Lower Level Starboard Watch (b) LLS) identified that PW Tank (b) (3) (A) was high out of specification, but no corrective actions were taken. [Encl (5)]

7. (b) LLS attributed this high level to overfilling from pier PW risers. (Encl 2, 5)

8. LINCOLN was not aligned to fill PW tanks from shore between 17 and 21 September 2022. [Encl (2)]

9. On 21 September 2022 at 1129, PW Tank (b) (3) (A) was placed on service, through a common header with PW tanks from both plants, to the ship with PW in support of a 1300 underway. [Encl (5)]

10. Shortly after placing PW Tank (b) (3) (A) in service, the (b) Plant Upper Level Starboard Watch (b) ULS) informed the (b) Plant Chief Machinery Operator (b) CMO) that the water "tastes weird." [Encl (11)]

11. (b) CMO did not inform the operational or administrative chain of command of any issue with PW based on perceptions that transferring from shore to ship PW sources may result in a brief change in taste. [Encl (11)]

12. (b) CMO informed the Water Control Watch (WCW) that "the tank is bad," without elaborating. The WCW understood this statement to mean the free available chlorine (FAC) measurements were out of specification and then shifted PW Tanks in (b) Plant. PW Tank (b) (3) (A) (b) (3) was briefly taken off line but was put back online after sampling. [Encl (11)]

13. At 1503 the ship transited beyond 12 Nautical Miles from land. At this point, LINCOLN's Commanding Officer's Standing Orders allow for transferring water from Distilling Units to PW Tanks. In addition, the Oily Waste Separator may be aligned overboard to support bilge dewatering. [Encl (3)]

14. At 1528 LINCOLN carried out the immediate response actions for a chemistry casualty (b) (b) (3) (A) Although unrelated to the spread of contamination in the PW system, these actions are watch stander intensive, impacting ability to identify PW contamination. [Encl (5)]

15. At approximately 1900, the Engineering Officer of the Watch (EOOW) began to receive reports of PW being possibly contaminated. This included reports that PW had a JP-5-like smell, abnormal taste, and discoloration. [Encl (14)]

16. After these reports, the EOOW directed watchstanders to identify and isolate all PW Tanks that were online at the time of reporting. [Encl (14)]

17. EOOW did not log the contaminated PW casualty but reported it to the Main Propulsion Assistant (MPA). [Encl (5), (14)]

18. At 1926, the ship was greater than 50NM from land and thus was able to pump bilge water overboard. [Encl (5)]

19. At 2054, as a part of the tank shifting ordered by the EOOW in an effort to recover the PW system, PW Tank (b) (3) (A) was placed back in service, reintroducing the source of the contaminated water to the ship's PW system. [Encl (5)]

20. At 2100, the Executive Officer (XO) was informed that there were concerns about PW. XO engaged the Supply Officer (SUPPO) and Chief Engineer (CHENG) to address the issue. [Encl (18)]

21. Around this time, XO noticed a run on the bottled water at the ship's store. XO verified with SUPPO the quantity of bottled water on hand and suspended bottled water sales to ensure adequate bottled water for the crew would be available during the recovery of the PW distribution system. [Encl (18)]

22. At 2129, Medical took the first bacteriological (BACT) sample on PW Tank (b) (3) (A). BACT samples were taken through the night on PW Tanks. BACT samples require an 18 hour incubation time before results are available. [Encl (15)]

23. At 2143, LINCOLN for the second time carried out the (b) (3) (A) secondary chemistry response actions in (b) Propulsion Plant. [Encl (5)]

24. At 2230 XO briefed the Commanding Officer (CO) on the current status of PW contamination. The decision was made for the CO to make a 1MC announcement at cleaning stations the next morning at 0745 to update the crew with the best known information. [Encl (18)]

25. At 2234, (b) (3) (A) PW was taken offline, isolated at the plant riser valve, with (b) (3) (A) PW supplying the ship. [Encl (4)]

26. At 2234, (b) (3) (A) PW system was traced hand-over-hand and no discrepancies were found. [Encl (4)]

27. In the evening of 21 September 2022, the MPA directed chlorination of all (b) (3) (A) PW Tanks to 2 ppm after medical captured the BACT samples in (b) (3) (A). [Encl (4)]

28. On 22 September 2022, the following BACT samples returned positive [Encl (4)]:

a. (b) (3) (A) (Wardroom 3): Coliform
b. (b) (3) (A) (b) (3) Plant): E-Coli, Coliform
c. (b) (3) (A) (b) (3) Plant): E-Coli, Coliform
d. (b) (3) (A) (b) (3) Plant): E-Coli, Coliform

e. (b) (3) (A) Plant): Coliform
f. (b) (3) (A) Plant): Coliform
g. (b) (3) (A) Plant): Coliform

29. On the morning of 22 September 2022, the XO met with the Senior Medical Officer (SMO), CHENG, Reactor Officer (RO), CNAP N9 and SUPPO to discuss the plan going forward. [Encls (16), (17)

30. On 22 September 2022, Caution Tags were hung on the (b Plant PW Tanks that tested positive for BACT to prevent the spread of contaminated water. [Encl (23)]

31. On 25 September 2022, the XO met with leadership to verify current PW configuration were sustainable, conduct root cause analysis, and initiate follow-on recovery. [Encls (4), 18)]

32. On 27 September 2022, LINCOLN commenced PW Tank inspections. The PW Tank covers and gaskets were inspected. There were no discrepancies of the tanks identified in this inspection: all fasteners were properly torqued, approved gasket materials were used, and gasket condition and seating surfaces were all verified. [Encl (4)]

33. RO was on station to verify the openings. XO also observed. [Encls (17), (18)]

34. PW Tank (b) (3) (A) was missed during this inspection. It was mistaken for the aft access to (b) (3) (A) and was not inspected until PSNS opened it on 15 October 2022. [Encl (4)]

35. Ship's Force utilized manual batch adds of (b) (3) (A) to chlorinate (b propulsion plant PW Tanks. FAC samples were pulled from the online PW Pump. A Temporary Reactor Officer Standing Order (TROSO) was issued on 26 September 2022 that provided guidance for (b Propulsion Plant PW operations while PW in (b Propulsion Plant was not available for consumption. [Encls (2), 27)]

36. The WCW Logs and the Maintenance Control Trouble Log on 21 September 2022 show no reports of ship's crew calling in for the water issues. [Encls (14), (24)]

37. There were no reported waterborne illness from LINCOLN's PW contamination on the 21 September 2022 underway. (Encls (15), 16)]

*Material Condition and Configuration of Plant*

38. On 15 October, PW Tank (b) (3) (A) was opened and inspected by Puget Sound Naval Shipyard (PSNS) Shop 99. Upon opening, the bottom of the tank had a visible black substance layer. [Encl (4)]

39. On 18 October, PSNS Shop 99 discovered the hole in a vent header of PW Tank (b) (3) (A). [Encl (9)]

40. The vent header hole is approximately 1 inch x 3 inches and about 6 inches above the low point of the bilge in [redacted] MMR. The hole was covered with rotten material and was about 1-inch wide before the final excavation of the pipe. [Encls (9), (25)]


*Figure 1: Hole in Vent Header to Tank* [redacted]

41. PW Tank [redacted] was last painted in Refueling Complex Overhaul (RCOH) and inspected during the FY20 Planned Incremental Availability (PIA), where it received a "Good/Normal" inspection result. [Encl (10)]

42. The [redacted] MMR bilge was painted during the RCOH and inspected during the FY-20 PIA. [Encl (10)]

43. There is no indication the vent header has been replaced since LINCOLN's construction. [Encl (10)]

44. The Ship's Bilge and Carbon Steel Inspection Program were evaluated as satisfactory during the most recent type CNAP inspection [Encl (21)]

45. PSNS reported that the PW Tank [redacted] vent header is carbon steel and is primed and painted in accordance with the bilge schedule. [Encl (10)]

46. This vent header was last inspected by ship's force on 28 March 2022 and was found to be satisfactory. [Encl (22)]

47. This vent header is not reflected in drawings provided by the local Propulsion Plant Engineering Activity (PPEA) that identifies any sections of the PW system sounding tubes and vent lines as carbon steel as required in accordance with the Steam Plant Manual MP4 for carbon steel inspections. [Encl (2)]

48. Review of the A4W PW system shows a single header for both fill and suction in each plant. [Encl (2) and Ref (c)]

49. Review of the LINCOLN PW system shows that it does not have a chemical addition vessel for batch additions of (b) (3) (A) from a common header to all tanks. [Encl (2) and Ref (c)]

50. When a single plant is configured to provide PW to the ship, normal recirculation and sampling of the PW tanks in accordance with the Steam Plant Manual is not possible before placing the PW tank in service. [Encl (2) and Ref (c)]

51. The Mixed Electrolytic Disinfectant Generators (MEDG), which provides in-line water treatment to the PW Tanks being filled from the distilling units, were not operational during LINCOLN's September to October 2022 underway. [Encls (13), (26)]

52. There are no Casualty Reports (CASREPS) that document the MEDGs material condition [Encl (2)]

*Watchstander Practices*

53. Review of LLS logs show that LINCOLN watchstanders do not make log entries when performing batch adds to chlorinate the PW Tanks. This results in no logging of the amount of (b) (3) (A) added, which tanks were recirculated, and whether FAC samples were positive or negative. [Encl (2)]

54. Prior to LINCOLN's recent deployment, WCW performed all (b) (3) (A) batch additions to the Potable Water tanks. Responsibility shifted back to LLS during the deployment. No training was documented as a part of this shift. [Encl (2)]

55. During interviews, it was discovered LLS watchstanders were not recirculating and sampling PW tanks in accordance with Steam Plant Manual procedures prior to placing the tanks in service due to not being able isolate from the plants PW riser isolation valve. [Encls (2), (11)]

56. The Machinery Division Startup Checklist requires all PW tanks to be recirculated and sampled 48 hours prior to startup to ensure the FAC is within specification and correct as needed. [Encl (8)]

57. Cold Iron Watch logs do not contain any entries for the completion of the 48 hour PW check, nor do the logs indicate PW Pump operation supporting PW Tank recirculation. There are also

no logs entries with FAC sample results from the Machinery Division startup checklist. [Encl (2)]

58. The Machinery Division Startup Checklist was not retained upon completion. [Encl (2)]

59. A new Machinery Division Startup Checklist was not issued after the shutdown on 17 September 2022. [Encl (2)]

60. LINCOLN Medical Preventive Medicine Technician utilized the Colilert-18 system for bacteriological examination of PW in accordance with Chapter 6 of NAVMED P-5010-6. The Colilert-18 BACT test detects Total Coliforms and E-Coli or Fecal Coliforms in water. The results are available after 18 hours. [Encl (15) and Ref (b)]

61. Review of LINCOLN's Monthly Preventive Medicine Reports, show five PW Tanks tested positive for BACT in January through March of 2022. The SMO routes this report through the Food Service Officer (FSO), SUPPO, CHENG, RO, and XO to the CO for review. After each of the positive indications, LINCOLN treated, recirculated, and tested the PW tank of concern. At no point after these indications did LINCOLN put unsafe water into general use. [Encl (6)]

62. LINCOLN does not have a Ship's Instruction for a Water Sanitation Bill, which, though not required by instruction, is a best practice. [Encls (15), (16)]

63. A review of all active CVN's Water Testing Reports found that no other PW Tanks have tested positive for BACT in the past 2 years. [Encls (7), (19)]

64. Ship's Force did not conduct a formal fact finding and critique for the contamination of the PW system. [Encl (2)]

## Opinions

1. The primary root cause of LINCOLN's PW system contamination was material. Specifically, bilge water in CMMR was introduced into PW Tank (b) (3) (A) through a hole in its vent header located a few inches above the bilge deck. When bilge levels were high there was a free flow of bilge water into the tank. The regularly occurring seawater, contaminated with oils and greases that collect in the bilge after normal ship operation resulted in the positive bacteriological results and visual indications observed when PW Tank (b) (3) (A) was opened and inspected by PSNS. Once PW Tank (b) (3) (A) was put online, contamination was then able to spread to other parts of the PW System. [FF (1)-(50)]

2. The MP4 Propulsion Plant Piping and Bilge Inspection Program should have been tracking this piping, but wasn't. This vent header was identified as (b) (3) (A) by PSNS. (b) (3) (A) [redacted] Located in the bilge, the (b) (3) (A) vent header was susceptible to corrosion, leading to premature failure in an operational environment with higher

than normal bilge levels. If covered under the (b) (3) (A) program, this vent header would be inspected as "high interest" piping. The (b) (3) (A) program's inspection scope and periodicity would be more detailed and more frequent. The most recent inspection was in March. If this header had been classified as high interest piping, the next inspection would have occurred in September and a proper inspection likely would have discovered the hole in the vent header and limited the contamination of PW Tank (b) (3) (A). [FF (37)-(45)]

3. The Bilge Inspector for ( MMR performed a satisfactory inspection of the Bilge Zone that contains the vent header. PW Tank (b) (3) (A) was reported to be in acceptable condition. Current condition of the tank indicates that the leak into the tank is likely a recent event. Though a nascent through-pipe leak may have existed in early 2022, it is unlikely that it was large enough to be discovered in the standard ship's force inspection. [FF (37)-(45)]

4. The Colilert-18 system used for medical surveillance testing afloat of the PW Tanks is not viable. The Colilert-18 system is not timely enough to support emergent decision-making. This system requires 18 hours to incubate the sample before it can be evaluated. When testing online PW Tanks at sea, multiple tanks may be expended before the results alert a positive sample. [FF (21), (23), (27), (59)]

5. Basic watch standing principles would have prevented or minimized the spread of the contaminated water in this case. Specifically, there were four missed opportunities for watch standers to identify and address the PW contamination before it spread throughout the ship.

a. Indications of bacterial contamination were available to LINCOLN as early as January of 2022 and in total, 5 PW Tanks tested positive for BACT in early 2022. LINCOLN allowed this deviation to normalize without clearly bounding the problem or taking corrective action. As no other CVN has had a PW Tank test positive for BACT in the past 2 years, this should have been a warning sign. Though LINCOLN was able to address each PW Tank that tested positive before putting that PW Tank back into service, thorough investigation of these results could have provided an opportunity for early root cause identification. [FF (59)-(63)]

b. There is no evidence the PW Tanks were recirculated and sampled 48 hours prior to getting underway in accordance with the startup checklist to verify the quality of the PW. The unexpected 2000 gallon change in PW Tank (b) (3) (A) level on 17 September 2022 was not adjudicated divisionally nor amongst the several duty section watch teams. If it had been, the PW contamination likely would have been discovered before getting underway. [FF (4)-(7), (52)-(58)]

c. There is no evidence PW Tank (b) (3) (A), the first PW Tank placed in service on 21 September 2022, was recirculated and sampled prior to placing online. An unsatisfactory sample would have prevented placing that tank online. [FF (8), (52)-(58)]

d. There were immediate indications of PW contamination when watch teams placed the contaminated PW Tank in service as the taste and texture of the water changed. A questioning

attitude would have allowed for immediate response and minimized the spread of contaminated PW throughout the ship. [FF (8)-(16)]

6. A4W PW system design aggravated the spread of the contaminated water. The recirculation line for each PW Tank combines into a single line which discharges into one of the tank manifolds. Normal operation with recirculating and shifting PW Tanks will shift that contaminated water in the header through the header and PW Tanks recirculated. When contamination of a PW Tank is suspected, there is no way to clear the header without risking contamination of another PW Tank. [FF (46)-(49)]

7. The MEDG units (In-Line Chlorinators) were not available for use during most of the deployment. If available, it would have improved the ability to treat the system when the ship was providing PW from (b) Plant only. The MEDG is the primary method to treat PW on LINCOLN. The secondary method to treat PW is to perform a manual batch add of (b) (3) (A) through the sounding tubes by removing the Tank Level Indicators (TLIs), which exposes the PW Tank being treated. There is higher risk of contamination to the PW Tank using this procedure and system design with the single header does not provide adequate mixing of the chemicals. Additionally, adding (b) (3) (A) through the sounding tube will erode the inner wall of the sounding tube if not properly flushed following the chemical addition, leading to premature failure of the tube and contamination into the PW Tank from the bilge. LINCOLN does not have the ship modification that installed a chemical addition vessel for batch adding (b) (3) (A) to the PW Tanks. When MEDGs are not available, this modification allows for proper mixing of chemicals while filling the PW Tanks. LINCOLN had learned to live without working MEDGs but if they had been present and online, they would have significantly mitigated this issue. [FF (50), (51)]

8. Though not required, a Water Sanitization Bill is a best practice that allows clear delineation of responsibilities to ensure adequate coordination of actions across multiple departments. If LINCOLN had a Water Sanitation Bill in place, early indications of an issue would be more easily identified and addressed. [FF (61)]

9. Once the contamination issue was identified, LINCOLN properly assessed risk to ship force and put the PW system in a safe and known condition while conducting operations at sea. Given the information they knew at the time, they executed corrective actions in a scenario not covered by the relevant engineering and medical manuals. Despite missed opportunities in preventing or mitigating the contamination, the response demonstrated proper risk assessment and aggressive response. [FF (14)-(36)]

## Recommendations

1. LINCOLN conduct a formal critique, separate from this investigation, to fully bound the scope of inactions that if taken may have prevented the event. Use the information obtained from the critique in developing the department and division's changes to day-to-day operations.

2. LINCOLN Reactor Department Leadership at all levels should canvas their Sailors for any procedures that they believe cannot be performed as written or required (i.e. not being able to recirculate and sample due to ship's PW demand) to ensure leadership is fully aware of any further TROSOs or Steam Plant Liaison Inquiry's (SPLI) that may be required to ensure the reactor and propulsion plants are operated in accordance with instructions.

3. LINCOLN should ensure events that occurred regarding contaminated PW being distributed throughout the ship for approximately 24 hours are properly documented, so that engineering logs are a true record of all events for the history of the ship. Correct log entries should include all events that occurred pertaining to PW contamination and actions taken in accordance with the Engineering Department Manual.

4. LINCOLN Reactor Department and Divisions should conduct extensive and detailed watch standing principle and operational expectations training. This should be conducted in small group seminar settings to address deficiencies noted by this investigation and supporting CNAP N9 visit, starting with all Principal Assistants and Division Leading Chief Petty Officers, then Propulsion Plant Watch Officers and Propulsion Plant Watch Supervisors before conducting training with the rest of the department to ensure leadership is trained to enforce standards. Recommended focus areas:

a. Log Taking. To include expectations for what is required to be logged and applicable references. Include input from divisions for specific watch stations, as well as departmental leadership for plant events, performance of trend analysis, questioning attitude regarding out of specification entries, supervisory log reviews, and divisional chain of command log reviews.

b. Watch turnover. Develop a formal requirement of specific pre-watch brief topics to assure all appropriate plant conditions, maintenance, and abnormal conditions are understood by all watch stations for both Condition I and Condition II watches.

5. LINCOLN should assess statements of watch standers regarding the inability to keep up with ship PW demand and perform recirculation's and samples in accordance with the Steam Plant Manual. If found to be valid, write a TROSO to direct actions expected of watch standers in operation of PW. Determine the reason PW demands are above design limits that prevented execution of required procedures. Submit a Steam Plant Liaison Inquiries (SPLI) regarding the inability to operate in accordance with the Steam Plant Manual for CNAP review and technical evaluation.

6. LINCOLN should submit CASREPs for the MEDGs that are not operational. Additionally, verify any other steam plant and reactor plant components that may be degraded and have removed redundancy from plant design.

7. LINCOLN Reactor Department should evaluate the Machinery Division Startup checklist. Consider revising to have each PW Tank listed, identifying current FAC levels, and annotated by a separate initial per tank.

8. LINCOLN Reactor Department should develop a formal standard to use in tracking the status for treatment and testing of PW Tanks.

9. LINCOLN Reactor Department should evaluate the proper level of responsibility for adding chemicals to and sampling PW. If adequate to stay at the LLW level, recommend the following:

a. Create a LLW addendum to include a system checkout pertaining to batch addition of chemicals and recirculating and sampling of PW Tanks as well as a practical factor that includes the demonstration of proper batch treatment utilizing (b) (3) (A) in accordance with Steam Plant Manual tables to PW Tanks.

b. Conduct training with Reactor Propulsion Division Sailors and Propulsion Plant Watch Officers and Propulsion Plant Watch Supervisors on PW chlorination to include: 1) How it is performed with both the MEDG and through batch adding; 2) How it is recirculated and sampled in accordance with the Steam Plant Manual; 3) Expected log entries; 4) Formal processes put in place regarding PW; and 5) Medical's role in ensuring properly chlorinated PW is provided to the ship's crew.

c. Recommend review the Reactor Department Organizational Manual to ensure responsibility is clearly delineated to the appropriate watch station.

10. LINCOLN should consider developing Water Sanitation Bill to clearly delineate responsibilities in accordance with chapter 6 of reference (b).

10. CNAP should coordinate with PPEA to ensure all sections of piping listed as (b) (3) (A) [redacted] are identified and tracked for all CVNs. The PPEA should provide updated drawings to all CVNs and incorporate in Reactor Mechanical's and Reactor Propulsion's division (b) (3) (A) program inspections.

11. Bureau of Medication and Surgery (BUMED) should develop specific ship's medical department PW testing requirements to ensure PW Tanks are tested, prior to removal of shore PW, with adequate time for sample results to be provided for review.

12. Naval Sea Systems Command (NAVSEA) should conduct an all-class review of PW systems. Specifically address the ability of CVN propulsion plants to support :

a. Conducting chemical treatment by both automatic and manual methods.

b. Conducting PW Tank recirculation and mixing.

c. Drawing and performing representative testing for samples of individual PW Tanks when chemically treating and prior to use.

d. Drawing and conducting bacterial samples directly from individual PW Tanks prior to use.

13. NAVSEA should, due to inadequacies identified in the piping configuration for the NIMITZ Class configuration, provide a revised procedure, to:

a. Manually conduct chemical treatment of PW Tanks, ensuring effective mixing in PW Tanks.

b. Recirculate, mix, and provide a representative sample of individual PW Tanks for chemical and bacterial analysis, without risk of spreading contamination to the PW distribution system.

14. NAVSEA should identify and provide adequate testing equipment to verify FAC to levels required by all references for PW Tank recovery. Current analytical test equipment available to ship's force is inadequate in this regard. On board equipment is presently limited to an upper level of 2 parts per million (PPM) (b) (3) (A)

15. NAVSEA should provide procedures for ship's force to isolate and recover contaminated PW Tanks while underway, without risk to contamination of any section of the PW distribution system. In this respect, contamination is anything other than PW that does not meet drinking water criteria.

16. NAVSEA should coordinate with BUMED to determine if procedures are adequate for restoration of PW Tanks following extended non-use periods, such as extended periods in port, and provide any additional procedural requirements, chemical treatment, or testing, for PW Tanks prior to restoration.

17. NAVSEA should develop shipboard sampling test kits for sampling and testing for hydrocarbon contamination in PW while underway.

18. Based on the facts presented in this investigation and my conclusions, I do not recommend any additional administrative or disciplinary action.

(b) (6)

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**DEPARTMENT OF THE NAVY**
COMMANDER NJ\VAL AIR roRCE
UNITED STATES PACIFIC FLEET
BOX 357051
SAN DIEGO CALIFORNIA 92135-7051

5830
SerN00/400
4 Nov22

FINAL ENDORSEMENT on CAPT (b) (6) USN ltr 5830 of 26 Oct 22

From: Commander, Naval Air Force, U.S. Pacific Fleet@
To: File

Subj: COMMAND INVESTIGATION INTO THE INCJDENT INVOLVING JET PROPELLANT-5 WITHIN THE POTABLE WATER SYSTEM ABOARD USS NIMITZ (CVN 68) ON OR ABOUT 16 SEPTEMBER 2022

1. This command investigation was convened to inquire into the circumstances surrounding the incident involving the presence of Jet Propellant-5 (JP-5) in the potable water system aboard USS NIMITZ (CVN 68) on or about 16 September 2022 while the ship was underway in the Southern California Operating Area.

2. After review of the investigation and endorsements, I concur with and hereby approve the findings, opinions, and recommendations of the investigating officer.

Action Update: As of 1 November 2022, I have directed the establishment of an Aircraft Carrier Potable Water Working Group, to review all incidents within the past year involving potable water on Aircraft Carriers. This group is specifically chartered to issue a CVN class advisory message and propose changes as required to: 1) potable water maintenance requirements and standard operating procedures; 2) potable water technical manuals and drawings; 3) shipboard potable water specifications; 4) shipboard water analysis capabilities; 5) shore facility water analysis capabilities; 6) CVN 68 and CVN 78 Class potable water system design; and 7) shipboard and shore preplanned response actions to resolve contamination of shipboard potable water system. Final message and proposals are due no later than 31 January 2023.

3. I direct all CVN Commanding Officers, Executive Officers, Reactor Officers, Assistant Reactor Officers, and Chief Engineers to review this investigation and provide feedback to the Aircraft Carrier Potable Water Working Group through my Assistant Chief of Staff for Maintenance and Material, CAPT (b) (6)

4. This investigation is forwarded to Naval Sea Systems Command Naval Engineering & Logistics (NAVSEA 05), Naval Facilities Engineering Command, Bureau of Medicine & Surgery, and Nava] Surface Warfare Center Philadelphia Division (NSWC PD) for review and action as deemed appropriate.

5. This investigation and enclosures will be maintained in my Force Judge Advocate office, which may be reached at (619) 545-2778.


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Subj: COMMAND INVESTIGATION INTO THE INCIDENT INVOLVING JET PROPELLANT-5 \1/ITHIN THE POTABLE WATER SYSTEM ABOARD USS NIMITZ (CVN 68) ON OR ABOUT 16 SEPTEMBER 2022

K. R. WHITESELL

Copy to:
NAVFAC
CO:MNAVAIRLANT
BUMED
NAVSEA PEO AIRCRAFT CARRIERS
NAVSEA05
NAVSURFWARCENDIV PHILADELPHIA PA
NAVMCPUBHLTHCEN

5830
26 Oct 22

From: CAPT (b) (6), USN
To: Commander, Naval Air Force, U.S. Pacific Fleet

Subj: COMMAND INVESTIGATION INTO THE INCIDENT INVOLVING JET PROPELLANT-5 WITHIN THE POTABLE WATER SYSTEM ABOARD USS NIMITZ (CVN 68) ON OR ABOUT 16 SEPTEMBER 2022

Ref: (a) JAGINST 5800.7G, Chapter II
(b) NAVMED P-5010-6
(c) S9086-SE-STM-010/CH-533
(d) NAVSEA 0989-LP-036-0000

Encl: (1) Appointing Order, 3 October 22
(2) Summary of Witness Interview, CAPT (b) (6), USN
(3) Water Control Watch Out of Service Tank Tracking Sheet
(4) Summary of Witness Interview, MMNC (b) (6), USN
(5) Summary of Witness Interview, LCDR (b) (6), USN
(6) Sequencing Document
(7) Summary of Witness Interview, MMN2 (b) (6), USN
(8) Summary of Witness Interview, LT (b) (6), USN
(9) Summary of Witness Interview, MMN1 (b) (6), USN
(10) Summary of Witness Interview, LTJG (b) (6), USN
(11) Summary of Witness Interview, LCDR (b) (6), USN
(12) Summary of Witness Interview, LCDR (b) (6), USN
(13) Summary of Witness Interview, LT (b) (6), USN
(14) Excerpt from (b) MMR Lower Level Starboard Logs **(Confidential Enclosure)**
(15) Summary of Witness Interview, MMN2 (b) (6), USN
(16) Summary of Witness Interview, MMNFN (b) (6), USN
(17) Summary of Witness Interview, MMN2 (b) (6), USN
(18) Summary of Witness Interview, MMN2 (b) (6), USN
(19) Summary of Witness Interview, MM1 (b) (6), USN
(20) Potable Water System Drawing
(21) Summary of Witness Interview, MM1 (b) (6), USN
(22) Summary of Witness Interview, MM1 (b) (6), USN
(23) Excerpt from (b) MMR Lower Level Starboard Logs **(Confidential Enclosure)**
(24) Excerpt from EOOW Logs
(25) Summary of Witness Interview, CAPT (b) (6), USN
(26) Summary of Witness Interview, CAPT (b) (6), USN
(27) Summary of Witness Interview, CDR (b) (6), USN
(28) Excerpt from Ship's Deck Log
(29) Excerpt from Water Control Watch Log **(Confidential Enclosure)**
(30) Reactor Department Tank Remediation Plan
(31) Summary of Witness Interview, CDR (b) (6), USN

Subj: COMMAND INVESTIGATION INTO THE INCIDENT INVOLVING JET PROPELLANT-5 WITHIN THE POTABLE WATER SYSTEM ABOARD USS NIMITZ (CVN 68) ON OR ABOUT 16 SEPTEMBER 2022

(32) Orange Coast Analytical, Inc. California ELAP Accredited Fields of Testing
(33) Potable Water Sample Analysis Results
(34) NAVSEA 05V Timeline of Events
(35) SPAR CVN 68-0022-22
(36) Summary of Witness Interview, CDR (b) (6), USN
(37) Odor Test Results
(38) SPAR CVN 68-0022-22 Rev A
(39) SPAR CVN 68-0022-22 Rev B
(40) SPAR CVN 68-0022-22 Rev C
(41) WAF CVN 68-2P22-001322(0)
(42) Summary of Witness Interview, MM2 (b) (6), USN
(43) Space Tour Observation
(44) Notes from Telephone Meeting 1 October 22
(45) Main Drainage System Drawing

## Preliminary Statement

1. Pursuant to enclosure (1) and in accordance with reference (a), a command investigation was conducted to inquire into the circumstances surrounding the incident involving the presence of Jet Propellant-5 (JP-5) in the potable water system aboard USS NIMITZ (CVN 68), hereafter "NIMITZ", on or about 16 September 2022 while the ship was underway in the Southern California Operating Area.

2. This reports completion of the command investigation conducted in accordance with reference (a) and enclosure (1) into the incident involving JP-5 in the ship's potable water system and documents resulting recovery actions. All reasonably available evidence was collected. The Convening Authority's directives were met. LCDR (b) (6), JAGC, USN assisted the Investigating Officer (IO) with legal advice. An extension of time to complete the report was requested and granted on 18 October 2022 by the Commander Naval Air Forces Chief of Staff.

3. The Investigating Officer (IO) interviewed 24 individuals and was provided access to all relevant documentation, policies, technical drawings, and ship spaces. Those individuals called on by the IO were professional and cooperative. The timing of events varies slightly from witness to witness. When exact times are not known approximations based on witness interviews are used.

4. Enclosures (14), (23), and (29) are marked with a classification level of confidential. Upon removal of these enclosures, the report should be handled as controlled unclassified information//NOFORN. This document should not be discussed, disclosed or shared with individuals unless they have a direct need to know in the performance of their official duties. In addition to security requirements which must be met, this document is subject to special export controls and each transmittal to foreign governments or foreign nationals may be made only with prior approval of the Naval Sea Systems Command and Commander, Naval Air Forces.

Subj: COMMAND INVESTIGATION INTO THE INCIDENT INVOLVING JET PROPELLANT-5 WITHIN THE POTABLE WATER SYSTEM ABOARD USS NIMITZ (CVN 68) ON OR ABOUT 16 SEPTEMBER 2022

## Findings of Fact

1. In February 2022, the Reactor Officer discovered eight of the ship's twenty-six potable water tanks were out of service and not used to supply the ship with potable water. His investigation revealed the eight tanks had been out of service since at least September 2020. The tanks had caution tags hanging on the suction and fill valves to prevent watch standers from aligning the tanks to supply potable water to the ship. (b) (3) (A) [redacted]. The only record of deficiency with the tanks was an informal tracking sheet maintained at the Water Control Watch desk. The tracking sheet listed tank (b) (3) (A) was out of service for an inoperative tank level indicator (TLI), tank (b) (3) (A) was out of service due to potential bilge contamination, and tanks (b) (3) (A) and (b) (3) (A) were out of service due to seawater contamination. The Reactor Officer directed Reactor Propulsion Division to make plans to clean, inspect, and restore the tanks to service prior to the ship's upcoming deployment. (Encl 2, 3)

2. In March 2022, the ship requested assistance from Puget Sound Naval Shipyard and Intermediate Maintenance Facility (PSNS) to empty several potable water tanks in preparation for inspecting, cleaning, and restoring the tanks to service. PSNS emptied tank (b) (3) (A) for the ship. The tank was subsequently cleaned, inspected, sanitized and restored to service by Reactor Department. PSNS was unable to empty additional tanks during the ship's in port period due to limited time and resources available. (Encl 2)

3. Concerned there would be insufficient time to restore the remaining seven tanks to service, the Reactor Officer directed Reactor Propulsion Division to develop plans to empty and restore the remaining tanks without the assistance of the shipyard. Reactor Propulsion Division developed a sequencing document with procedures to empty the desired tanks by pumping the contents overboard via a hose connected to the potable water system utilizing the ship's installed potable water piping and pumps. The sequencing document included steps to isolate the affected propulsion plant potable water pumps and piping from the ship's potable water distribution system. After isolating the system, the sequencing document directed the system aligned to pump liquid from the desired tank to the hose connection. After the desired tank was empty, a second tank was aligned to flush the system pumps and piping with 1,000 gallons of potable water known to be clean. The purpose of flushing 1,000 additional gallons was to restore system cleanliness before realigning the potable water system for normal operation. The sequencing document was reviewed and approved by the Reactor Officer. The sequencing document was titled, "Sequencing Document to Strip PW Tanks of Unknown Purity using PW Pumps." (Encls 2-6)

4. By 15 September 2022, Reactor Propulsion Division used the sequencing document to empty four additional potable water tanks, (b) (3) (A) [redacted]. These tanks were subsequently cleaned, inspected and restored to service with the exception (b) (3) (A) (b) (3) (A) During inspection, the ship identified the internal coating in tank (b) (3) (A) was degraded and the tank remained isolated pending further evaluation. (Encls 2-5)

5. On 16 September 2022, the (b) (3) (A) Reactor Propulsion Leading Chief Petty Officer directed the (b) (3) (A) Chief Machinery Operator (CMO) to empty potable water tank (b) (3) (A) using the ship's sequencing document. (Encl 4)

6. The Engineering Officer of the Watch (EOOW), Propulsion Plant Watch Officer (PPWO), and Propulsion Plant Watch Supervisor (PPWS) were not briefed prior to the CMO and Lower Level Watch emptying tank (b) (3) (A). The EOOW, PPWO, and PPWS did not participate in, direct, or track the evolution. (Encls 4, 7-13)

7. On 16 September 2022, between 1140 and 1550, liquid in potable water tank (b) (3) (A) was pumped through the (b) (3) (A) potable water system to the dirty drain system via a hose connected downstream of (b) (3) (A) using (b) Potable Water Pump. The (b) potable water pump was operated until it tripped off-line on loss of suction indicating the tank was empty. (Encls 6, 14, 15, 16)

8. The tank level indicator (TLI) for potable water tank (b) (3) (A) was inoperative. (Encl 4, 14, 17, 18)

9. On 16 September 2022, between 1140 and 1200, the liquid pumped from potable water tank (b) (b) (3) (A) appeared to be water and exhibited no noticeable odor. (Encl 17)

10. On 16 September 2022, between 1200 and 1550, the liquid pumped from potable water tank (b) (3) (A) began to exhibit JP-5 odor. (Encls 17, 18)

11. In accordance with the ship's sequencing document, the (b) (3) (A) potable water piping and potable water pumps were isolated from the rest of the ship, while liquid was pumped from potable water tank (b) (3) (A). (Encls 6, 15, 17)

12. On 16 September 2022, between 1550 and 1643, (b) Potable Water Pump was operated to pump 1,100 gallons of clean potable water from tank (b) (3) (A) to flush the potable water piping used earlier in the day to empty potable water tank (b) (3) (A). (Encls 7, 14, 17-19)

13. On 16 September 2022, between 1550 and 1643, the liquid flushed from the (b) (3) (A) (b) (3) (A) potable water system exhibited strong JP-5 odor. (Encls 7, 14, 19)

14. The suction valve for tank (b) (3) (A) is on the potable water manifold located near the aft bulkhead of (b) Main Machinery Room. (Encl 20)

15. The suction valve for tank (b) (3) (A) is on the potable water manifold located near the forward bulkhead of (b) Main Machinery Room. (Encl 20)

16. To reach (b) Potable Water Pump, water pumped from tank (b) (3) (A) travels through some, but not all of the same piping as water pumped from tank (b) (3) (A), leaving a length of piping running the length of the main machinery room unflushed. (Encl 20)

17. Between 1630 and 2000 on 16 September 2022, the (b) (3) (A) PPWO received reports of JP-5 odor coming from water dispensed from a water fountain and a deep sink in (b) (3) (A) Auxiliaries Room. The PPWO reported the odors to the Engineering Officer of the Watch (EOOW). The EOOW directed flushing the areas where odor was experienced. The EOOW made no further reports to his chain of command regarding the water. (Encls 8-10)

18. The water fountains and deep sink in (b) (3) (A) Auxiliaries Room are supplied by the portion of the potable water system used to pump liquid from potable water tank (b) (3) (A) to dirty drains. (Encl 20)

19. At approximately 1700 on 16 September 2022, (b) (3) (A) CMO reported to the Water Control Watch that the potable water in (b) Main Machinery Room exhibited JP-5 odor. The Water Control Watch directed the (b) (3) (A) CMO to continue flushing the potable water system. The Water Control Watch did not make further reports to his chain of command regarding the water. (Encls 7, 21)

20. In the afternoon of 16 September 2022, the Main Propulsion Assistant (MPA) received a cup of water from (b) (3) (A). The water was cloudy and exhibited JP-5 odor. At the time, MPA was not concerned by the water because he knew his division was emptying a tank that had not been used in years, the (b) (3) (A) potable water system was isolated from the rest of the ship, and the potable water piping would be flushed before being used to supply the ship. MPA took no further action and made no additional reports regarding the odor. (Encl 5)

21. After 1,100 gallons of water was flushed through the potable water system from tank (b) (3) (A) (b), the (b) (3) (A) potable water system was aligned for normal operation with (b) (3) (A) 6 open. With (b) (3) (A) open, (b) (3) (A) was aligned for normal operation and could receive water from or transfer water to the rest of the ship's potable water system. (Encls 7, 19)

22. On 16 September 2022, between 1643 and 2000, water was flushed through the sampling connection downstream (b) (3) (A) and the water fountains in (b) Main Machinery Room. (Encl 7)

23. On 16 September 2022, at approximately 2000, the time of watch turnover, the water at (b) (b) (3) (A) appeared clean. However, water dispensed from water fountains in (b) Main Machinery Room had still not cleared. (Encl 7)

24. On 16 September 2022, between approximately 2015 and 2030, the Water Control Watch directed (b) (3) (A) Potable Water Pumps started to supply the ship with water. (Encls 16, 21, 22)

25. On 16 September 2022, at 2035, (b) (3) (A) Potable Water Pumps were started and aligned to supply the ship with potable water from (b) (3) (A). At 2037, (b) (3) (A) Potable Water Pumps were stopped. (Encls 14-16, 23)

26. On 16 September 2022, between 2000 and 2100, the volume of water in potable water tank (b) (3) (A) decreased 1,600 gallons, and the volume of water in potable water tank (b) (3) (A) decreased 800 gallons indicating water from these two tanks was supplied to the ship using (b) (b) (3) Potable Water Pumps. Tanks (b) (3) (A) and (b) (3) (A) had been sampled earlier in the day with normal results. (Encls 14, 15)

27. On 16 September 2022, at approximately 2050, the EOOW and Water Control Watch received reports from the wardroom, staterooms, and berthing of JP-5 in the water. (Encls 11, 22, 24)

28. After receiving reports of JP-5 in the water, the EOOW called the Reactor Office and spoke to the MPA and Reactor Officer about the reports. (Encl 11)

29. After receiving reports of JP-5 in the water, the Water Control Watch directed potable water pump suction shifted to a different potable water tank. (Encls 15, 16, 22)

30. On 16 September 2022, at approximately 2100, the Safety Officer brought a cup of water from the wardroom to the Reactor Office. The water exhibited strong JP-5 odor. The Safety Officer presented it to the MPA and Reactor Officer who were in the Reactor Office at the time. (Encls 2, 5)

31. After receiving reports of JP-5 in the water, the Reactor Officer directed potable water pumps shifted from (b) (3) (A) Potable Water Pumps to (b) (3) (A) Potable Water Pumps. The Reactor Officer reported the problem with the water to the ship's Commanding Officer (CO). (Encl 2)

32. On 16 September 2022, at approximately 2130, the Senior Medical Officer (SMO) received a report from a preventive medical technician of JP-5 in the ship's potable water. The SMO reported the problem to the ship's Executive Officer (XO). The XO reported the problem to the CO. (Encls 25, 26)

33. On 16 September 2022, between approximately 2130 and 2200, potable water was secured to the ship's distribution system and the water in the ship's distribution system was drained overboard via hose connections located on the ship's forward and aft starboard side sponsons. (Encls 2, 4, 5, 11, 24)

34. On 16 September 2022, between approximately 2130 and 2134, watch standers in (b) Main Machinery Room began flushing potable water from tank (b) (3) (A) to dirty drains using (b) (3) (A) (b) Potable Water Pumps as well as recirculating and sampling potable water tanks. The water samples exhibited odor and taste of JP-5. (Encl 4, 14)

35. On 16 September 2022, at 2209, (b) (3) (A) Potable Water Pumps were secured. (Encl 14)

36. On 16 September 2022, at 2205, (b) Potable Water Pump was started. (Encl 23)

37. On 16 September 2022, at 2219, potable water was restored to the ship and supplied from [redacted] (Encls 2, 5, 11, 24)

38. After potable water pressure was restored to the ship, potable water continued to be supplied from [redacted] Potable Water Pumps and flushed through hose connections on the starboard sponsons as well as galley equipment, faucets, showers, and taps in the ship. (Encls 2, 4, 5)

39. On 16 September 2022, at approximately 2230, the CO made a 1MC announcement to inform the crew of the problem with the water and bottled water was available on the mess decks. The CO directed the crew not to use the ship's water. (Encls 5, 25, 26)

40. The Supply Officer directed bottled water be provided with midnight rations and the morning meal on Sunday morning. The Supply Officer opened the ship's store to make cases of bottled water and Gatorade available for sale to the crew for any who desired to purchase it. The Supply Officer shifted the menu to foods that do not require water to prepare, i.e. a "waterless" menu. (Encls 25, 27)

41. On 17 September 2022, at 0124, [redacted] Potable Water Pumps were started and aligned to supply the ship with potable water. The source of the ship's potable water was shifted from [redacted] to [redacted]. (Encls 14, 23)

42. Through the rest of night and early morning until the ship arrived at the pier at Naval Air Station North Island (NASNI) on 17 September 2022, the crew continued to flush water through the potable water system to restore water quality. (Encls 2, 5)

43. On 17 September 2022, at approximately 0615, the XO contacted CSG-11 and Commander Naval Air Force Chief of Staff (CNAF COS) and reported the problem with the ship's potable water. (Encl 25)

44. On 17 September 2022, in the morning, the SMO trained medical department on symptoms and effects of hydrocarbon ingestion so all medical personnel were ready to address concerns crew members might express and treat those with symptoms. People who visited medical complained of minor symptoms common to many ailments upset stomach, nausea, headache, or rash (Encl 26)

45. On 17 September 2022, at 0752, the ship moored at NASNI. (Encl 28)

46. On 17 September 2022, at 0958, the city potable water supply was connected to the ship and aligned to supply the ship with potable water. (Encl 29)

47. On 17 September 2022, at 1048, [redacted] Potable Water Pumps were secured. (Encl 14).

48. After the ship's potable water was supplied from the pier, the XO made 1MC announcements and informed the crew the ship's potable water was connected to the city water supply. The XO provided guidance that if the ship's water exhibited JP-5 odor, to allow it to run to flush the line.

The XO also informed the crew that water was available on the pier from temporary tanks fed from the city water supply. (Encl 25)

49. On 17 September 2022, the MPA under the supervision of the Reactor Officer, developed plans for emptying and refilling potable water tanks to flush and restore the quality of water contained in the ship's potable water tanks. The plan was executed from 17 September 2022 until completed on 1 October 2022. (Encls 2, 5, 30)

50. The CHT system tanks collect water from the ship's toilets, shower drains, sink drains, galley equipment drains, and other sewage and potable water system drains. While in port, the ship normally offloads liquid from CHT tanks via hoses to a collection facility or the base sewer. (Encl 31)

51. After arriving at NASNI, the ship was furnished with a single CHT hose to offload liquid waste from the ship's CHT tanks. While flushing the potable water system, the CHT tanks filled faster than they could be offloaded to the pier. To increase the offload rate, the ship requested a second CHT hose connected to the ship. (Encls 25, 31)

52. On 18 September 2022, while connecting the second hose, a base public works employee asked a Sailor why a second hose was required. The Sailor inaccurately stated the ship was offloading JP-5. The employee understood this to mean the ship was pumping JP-5 into the base sewer and directed the ship to stop all CHT pumping to the pier. The ship stopped pumping CHT and held the CHT in its tanks. (Encls 25, 31)

53. The level in the ship's CHT tanks increased as personnel utilized showers, sinks, laundry, toilets, and other services in the ship. To reduce the water introduced to the CHT tanks, the ship secured laundry and service steam. Later in the day, the ship secured potable water to the ship to avoid overflowing the CHT tanks. The XO and Command Master Chief coordinated with USS CARL VINSON (CVN 70), hereafter "VINSON", leadership to allow NIMITZ Sailors to utilize the VINSON berthing barge for showers. Multiple temporary potable water tanks were also available on the pier for the crew's use. The XO made 1MC announcements to keep the crew apprised of the situation and available resources. (Encl 25)

54. In the evening on 18 September 2022, the Ship CO, XO, NASNI Base CO, and CNAF COS coordinated to resolve the problem with offloading the ship's CHT. Based on better understanding of the situation, the NASNI Base CO authorized the ship to recommence pumping CHT to the pier. (Encl 25)

55. Approximately two hours after CHT pumping commenced, the ship restored normal potable water, shore steam, and laundry services. (Encl 25)

56. On the morning of 19 September 2022 the ship CO, XO, Chief Engineer (CHENG), and Naval Facilities Engineering Systems Command (NAVFAC) representatives met to discuss the ship's CHT system and JP-5 in the ship's potable water. NAVFAC informed the ship the limit for hydrocarbons in the base sewer was 500 ppm and NAVFAC utilizes an independent

laboratory to analyze sewage samples for hydrocarbon. The laboratory was identified as Orange Coast Analytical, Inc. (Encls 25, 31)

57. On 19 September2022, the ship isolated samples from the CHT system and transported them to Orange Coast Analytical for analysis. Analysis results revealed hydrocarbon concentration in the ship's CHT was <0.1 ppm (i.e. less than detectable by lab analysis). (Encls 25, 31)

58. Orange Coast Analytical, Inc is a commercial laboratory located in Tustin, CA. Orange Coast Analytical is accredited by the California Water Board under the state's environmental laboratory accreditation program to conduct the analysis, EPA Method 8015. (Encl 32)

59. Ship's Force does not have capability or procedures to analyze water or CHT to determine the presence or concentration of JP-5 or hydrocarbons. (Encl 31)

60. On 20 September 2022, the ship CO directed water samples from the ship's potable water system isolated and transported to Orange Coast Analytical for analysis. The ship sent initial samples from twelve potable water tanks for analysis. Analysis revealed hydrocarbon concentration ranging from non-detectable in potable water tank (b) (3) (A) to as high as 4.9 ppm in potable water tank (b) (3) (A). (Encl 25, 33)

61. The ship's crew continued to sequence through flushing potable water distribution system piping, draining and refilling potable water tanks, and sending water samples to Orange Coast Analytical for analysis. (Encls 2, 5, 25, 30)

62. On 21 September 2022, the ship engaged CNAF, Naval Sea Systems Command Naval Systems Engineering & Logistics (NAVSEA 05), and Naval Surface Warfare Center Philadelphia (NSWC PD) to verify assumptions regarding the cause of JP-5 contamination of the ship's potable water. NAVSEA identified possible system interfaces as potable water connections to JP-5 purifiers, tank walls, distilling unit ingestion of JP-5 at sea, tank coating system failures, and tank manway cover leaks. All with the exception of tank manway cover leaks were ruled out as causes by visual inspection of system components and record reviews. (Encl 34)

63. On 28 September 2022, the ship released Steam Plant Action Request (SPAR) CVN 68-0022-22 detailing the potable water system problem and actions taken. The ship requested engineering evaluation of the potable water system, additional sampling locations, increasing chlorination levels above 2 ppm, and placing ship's potable water tanks on line to aid in flushing the potable water system. NAVSEA responded on 29 September 2022 concurring with the ship's flushing plan, provided additional sampling locations, guidance to utilize a limit of 0.266 ppm hydrocarbon as determined using EPA 8015 analysis, and non-concurrence on increasing chlorination above 2 ppm due to possible adverse effect on laboratory analysis of water samples for hydrocarbon concentration. (Encl 35)

64. On 28 September 2022, a meeting was held shipboard codifying plans to isolate potable water tanks (b) (3) (A), and (b) (3) (A) by physically gagging the fill and suction

valves and installing plugs internal to the tank suction piping after opening and cleaning each tank. Additionally, potable water tank (b) (3) (A) was reported to have damaged coating and would remain off line and caution tagged until further evaluation by qualified inspectors following return to home port. (Encls 4)

65. On 29 September 2022, the Safety Officer established a four member sniffer team responsible for systematically determining areas of the ship that continued to exhibit odor from the potable water system. The sniffer team commenced daily analysis of 65 sample points throughout the ship for odor. The results were used to target additional flushing of the potable water system. (Encls 36, 37)

66. On 29 September 2022, the ship updated SPAR CVN 68-0022-22 to Revision A with the latest actions and sample results. The trends generally showed decreasing hydrocarbon levels at all tanks and sample points. (Encls 33, 38)

67. On 30 September 2022, the ship updated SPAR CVN 68-0022-22 to Revision B with the latest actions and sample results. Decreasing hydrocarbon trends continued at all tanks and sample points. (Encls 33, 39)

68. On 1 October 2022, the ship updated SPAR CVN 68-0022-22 to Revision C documenting 22 of 26 potable water tanks and 15 of 15 potable water distribution points were sampled and analyzed with satisfactory results for hydrocarbon concentration. The four potable water tanks that were not sampled, (b) (3) (A), and (b) (3) (A), were isolated from the potable water system, were not in service, and not available for use. All results showed hydrocarbon concentration <0.266 ppm. The ship requested NAVSEA concurrence for use of the potable water system. NAVSEA answered SPAR Revision C concurring with use of the potable water system. (Encls 33, 40)

69. On 19 September 2022, the ship authorized work to open, clean, and inspect potable water tank (b) (3) (A). After the manway access cover for tank (b) (3) (A) was removed, Ship's Force discovered the tank contained liquid with strong JP-5 odor. (Encls 41, 42)

70. The manway access cover for potable water tank (b) (3) (A) is located in the bilge of space (b) (3) (A) Air Conditioning and Refrigeration Space. (Encl 43)

71. The gasket for the manway access cover for potable water tank (b) (3) (A) was in poor condition. (Encl 44)

72. The bilge in space (b) (3) (A) does not normally contain JP-5, but the bilge was filled with JP-5 during the ship's deployment in 2020. The ship identified the likely source of JP-5 as back leakage through the main drainage system caused by check valve malfunction. (Encl 31)

73. The bilge in space (b) (3) (A), JP-5 Pump Room (b) (3), contains JP-5 from operation and maintenance of JP-5 distribution and purification equipment that is located in the space. (Encl 43)

74. When the ship is at sea, the bilge in space (b) (3) (A), JP-5 Pump Room (b), is normally emptied using the main drainage system. (Encls 43, 45)

75. The main drainage system includes branch piping that terminates in spaces (b) (3) (A) and (b) (b) (3) (A) and a common piping header connects the branches. Check valves are included in the main drainage system to prevent liquid from being transferred between spaces; however, fluid from the bilge of (b) (3) (A) can be introduced to space (b) (3) (A) through main drainage system piping if the system is aligned incorrectly or malfunctions. (Encl 45)

## Opinions

1. In March 2022, during an in port period, the ship requested assistance from PSNS to empty and clean several potable water tanks that were full of liquid but out of service for suspected seawater contamination. PSNS assisted the ship with emptying tank (b) (3) (A). However, PSNS was unable to accomplish additional tanks due to resource availability and duration of the in port period. For the tank that was emptied, PSNS emptied the tank using a temporary system to pump the liquid out of the tank through an open manway access cover and the ship cleaned, inspected, sanitized, and restored the tank to service. Based on upcoming operational demands that warranted recovering full potable water storage volume, the ship developed a sequencing document with procedures to empty tanks utilizing the ship's installed potable water pumps rather than waiting for shipyard assistance at future in port period or opening the tank manway covers and emptying the tanks utilizing a temporary pump and hoses. Ship's Force does have capability to isolate and empty potable water tanks using a temporary pump and hoses through an open tank top manway; however, the process is time consuming and can be difficult to execute at sea. (FFs 1-3)

2. When developing the sequencing document used to empty potable water tanks, the ship was unaware that any of the tanks contained JP-5. Informal records indicated tank (b) (3) (A) contained a mixture of potable water and seawater. This was a major factor in the ship's understanding and consideration of the risk associated with pumping liquid from tank (b) (3) (A) through the (b) (3) (A) potable water piping. The ship assessed the consequence of contaminating the potable water system with seawater as low, and they planned to restore cleanliness of the potable water system by flushing the piping and pump with clean potable water. The ship did not know or consider the possibility that the tank might contain contaminants other than seawater. (FF 1)

3. The sequencing document the ship developed to empty potable water tanks containing water of unknown purity did not comply with the intent of the governing manuals, reference (b), (c), and (d), for maintaining the potable water system clean and free of contaminants. Additionally, the sequencing document did not contain enough detail to ensure operators flushed all affected potable water piping, nor did it contained provisions for verifying the effectiveness of the flush or system cleanliness prior to using the system to supply potable water to the ship. (FFs 11-25)

4. Ship's Force samples and analyzes potable water for Free Available Chlorine (FAC), bacteriological contamination, odor, and visual observation for color, clarity, and sediment in accordance with references (b), (c), and (d). References (b), (c), and (d) are largely focused on maintaining the potable water system free of bacteriological contamination. Reference (b) provides troubleshooting guidance for water with taste and odor problems. However, none of the manuals provide specific guidance on corrective actions following JP-5, petroleum product, or other chemical contamination of the potable water system. (FF 59)

5. In 2020 or earlier, when the ship's crew first discovered the water in a potable water tank was contaminated with seawater, the crew should have formally documented the deficiency in the equipment deficiency log (EDL) and current ship's maintenance project (CSMP) and promptly executed steps to troubleshoot and correct the source of contamination. Failure to formally document the deficiency and promptly correct the issue allowed the condition to worsen, and it left the problem to future crew members who had no insight into circumstances of the original problem. (FF 1)

6. On 16 September 2022, the ship should have held a pre-evolution brief prior to executing the sequencing procedure to empty potable water tank (b) (3) (A). Pre-evolution briefs are a final check for supervisors to evaluate readiness to execute a planned procedure. In this case a pre-evolution brief should have been attended by the EOOW, PPWO, PPWS, Water Control Watch, CMO, and Lower Level Watch, and it should have included a review of the procedure, expected indications and system response, operator readiness and understanding, stopping points, and communication paths. However, no pre-evolution brief was held. As a result, the EOOW, PPWO, and PPWS were not familiar with the procedure or system lineup, and they were largely unaware that the procedure was being executed. When unexpected conditions (i.e. water with JP-5 odor at water fountains, sinks and sample points) were encountered and reported, the EOOW, PPWO, and PPWS did not recognize the significance, could not provide backup to operators, and they were unable to determine or take appropriate corrective actions to prevent more significant consequences from occurring which ultimately led to spreading JP-5 to the ship's distribution system. (FFs 6, 17, 19, 20)

7. Potable water tank (b) (3) (A) was contaminated with JP-5 during the ship's last deployment between the months of June 2020 and March 2021 when JP-5 leaked into the potable water tank through a deteriorated manway cover gasket. The manway cover is located in the bilge in space (b) (3) (A). JP-5 was likely introduced into the bilge in space (b) (3) (A) during the ship's last deployment due to misalignment or malfunction of the ship's main drainage system. The main drainage system contains connections to tanks that contain JP-5 as well as a bilge suction for space (b) (3) (A), which contains JP-5 system valves, pumps, and purification equipment. The ship's crew was unaware of the presence of JP-5 in potable water tank (b) (3) (A) prior to 16 September 2022. (FFs 1, 69-72, 73-75)

8. JP-5 was spread to the potable water piping, pumps and components located in (b) (3) (A) (b) (3) (A) on 16 September 2022 between 1200 and 1550 when the crew emptied potable water tank

(b) (3) (A). The crew pumped the liquid from potable water tank (b) (3) (A) through the potable water piping in (b) (3) (A) using (b) Potable Water Pump. The liquid was pumped to a hose connected downstream of (b) (3) (A). At this time, JP-5 from tank (b) (3) (A) did not spread beyond (b) (3) (A) because the potable water piping in (b) (3) (A) (b) (3) was isolated from the rest of the ship while the tank was being emptied. (FFs 4, 5, 7, 9-30)

9. JP-5 was spread to the ship's potable water distribution system outside (b) (3) (A) shortly after 2035 on 16 September 2022 after the crew started (b) (3) (A) Potable Water Pumps and aligned the pumps to supply the ship with potable water from (b) (3) (A). (FFs 4, 5, 7, 9-33)

10. JP-5 was spread to the ship's potable water tanks in (b) (3) (A) between 2130 and 2200 on 16 September 2022, when operators attempted to locate the source of JP-5 by recirculating and sampling the potable water tanks in (b) (3) (A). (FF 34)

11. In the evening on 16 September 2022, after JP-5 was spread to the ship's potable water distribution system, the ship's chain of command took appropriate action to keep the crew safe and initiated actions recover the ship's potable water system. Immediately upon notification, the ship's leadership took action to understand and address the problem. Within approximately 30 minutes of notification, potable water was secured to the ship and draining and flushing the system commenced. Within approximately 90 minutes, the Commanding Officer and Executive Officer began making 1MC announcements to keep the crew informed of the situation, and the supply department made bottled water available to the crew and arranged for water tanks on the pier the following morning. The following morning after the ship moored at NASNI, water tanks fed from the city water supply were on the pier and shower facilities off the ship were made available to the crew and remained until the ship departed on 2 October 2022. (FFs 31, 32, 39, 40, 43, 44, 48, 49, 54, 56, 60, 62, 65)

12. Several events occurred after the ship arrived at NASNI that slowed recovery. When the crew was directed to cease pumping CHT on 18 September 2022, they also had to secure flushing the potable water system which slowed recovery for approximately 12 hours. Neither the ship nor shore support facilities had preplanned procedures or response actions to recover a shipboard potable water system contaminated with JP-5. (FFs 52-59, 63)

## Recommendations

1. Recommend NIMITZ evaluate ship's policies and practices for pre-evolution briefing, authorization and control of evolutions, and authorization and control of maintenance.

2. Recommend NIMITZ evaluate ship's policy for review and approval of temporary procedures and sequencing documents.

3. Recommend NIMITZ evaluate ship's policy, procedures, and practice for documenting material deficiencies.

4. Recommend NIMITZ visually inspect all potable water tank manway covers, tank penetrations, and piping located in the bilge for condition and integrity.

5. Recommend NAVSEA and CNAF issue Fleet guidance with lessons learned from this event and direction to inspect potable water tank manway covers, tank penetrations, piping, and components located in the bilge for condition and integrity.

6. Recommend NAVSEA review technical specifications for potable water tank manway access cover gaskets and verify accuracy, consistency, and clarity in applicable drawings, technical manuals, and shipyard work procedures.

7. Recommend NAVSEA and CNAF review and evaluate adequacy of preventive maintenance requirements and documentation for potable water system tanks, covers, piping, vents, sounding tubes, valves, pumps, and other components that, when degraded, could lead to potable water system contamination.

8. Recommend NAVSEA, BUMED, and CNAF review, evaluate, and update policies, guidance, and procedures included in applicable technical manuals (references (b), (c), and (d)) for shipboard potable water quality, potable water system operation, and potable water system maintenance. This evaluation should consider the likelihood and consequence of JP-5, petroleum product, or other sources of contamination of shipboard potable water.

9. Recommend NAVSEA and BUMED review and evaluate adequacy of shipboard potable water specifications and limits.

10. Recommend NAVSEA, BUMED, NAVFAC and CNAF review and evaluate shipboard and shore facility capability for laboratory analysis of potable water, approved laboratory access in Fleet concentration areas, and corrective actions required for potable water that does not meet specifications.

11. Recommend NAVSEA, BUMED, and CNAF develop preplanned corrective actions and response for shipboard potable water system contamination.

12. Recommend NAVSEA review and evaluate adequacy of CVN 68 Class potable water system design for isolating contaminated potable water tanks, sampling tanks, mixing tanks, and preventing cross contamination of tanks and system components.

13. Recommend NAVSEA review and evaluate adequacy of CVN 68 Class potable water tank suction/fill manifold design for obtaining representative water samples from potable water tanks and adequately mixing tanks.

(b) (6)