TANK CLOSURE PLAN SUPPLEMENT 4

Detailed Closure Design

May 31, 2025

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Acronyms

ACM	Asbestos-Containing Material
ACO	Administrative Consent Order
AOC	Administrative Order on Consent
AVGAS	Aviation Gasoline
AST	Aboveground Storage Tank
CIR	Clean, Inspect, Repair
CNRH	Commander, Navy Region Hawaii
CPM	Critical Path Method
DLA	Defense Logistics Agency
DoD	Department of Defense
DOH	Hawaii Department of Health
DON	Department of the Navy
EO	Emergency Order
EPA	U.S. Environmental Protection Agency
EPP	Environmental Protection Plan
EST	Estimated Date
EXWC	Engineering and Expeditionary Warfare Center
FOR	Fuel Oil Reclaimed
F-24	F-24 Jet Fuel
F-76	Marine Diesel Fuel
GPM	Gallons Per Minute
HAR	Hawaii Administrative Rules
JBPHH	Joint Base Pearl Harbor-Hickam
JP-5	Jet Fuel Propellant No. 5
JP-8	Jet Fuel Propellant No. 8 / Jet-A / F-24
JTF-RH	Joint Task Force-Red Hill
LAT	Lower Access Tunnel
MCL	Maximum Contaminant Level
NAVFAC	Naval Facilities Engineering Systems Command
NAVSUP	Naval Supply Systems Command
NHPA	National Historic Preservation Act
NLT	No Later Than
NRL	Naval Research Laboratories
PACFLT	United States Pacific Fleet
QV	Quality Verification
RHBFSF	Red Hill Bulk Fuel Storage Facility
RH USTs	Red Hill Underground Storage Tanks
SECDEF	Secretary of Defense
SECNAV	Secretary of the Navy
TBD	To Be Determined
TCLP	Toxicity Characteristic Leaching Procedure
TCP	Tank Closure Plan
TCVP	Tank Cleaning Verification Plan
UAT	Upper Access Tunnel
UGPH	Underground Pumphouse
UST	Underground Storage Tank
VOC	Volatile Organic Compound

1. Introduction

In accordance with the Secretary of Defense's (SECDEF) March 7, 2022, memo, the Department of Defense (DoD) is responsible for the safe defueling and closure of the Red Hill Bulk Fuel Storage Facility (RHBFSF, a.k.a Facility). On September 30, 2022, the SECDEF established the Joint Task Force-Red Hill (JTF-RH) to lead and execute all defueling activities, after which the Department of the Navy (DON) would commence with the permanent closure of the Facility.

On May 23, 2023, the Deputy Chief of Naval Operations for Fleet Readiness and Logistics issued a planning order directing United States Pacific Fleet (PACFLT) to establish a planning cell to provide plans for a Navy Task Force to execute the permanent closure of the RHBFSF. The result of these efforts came to realization on November 7, 2023, when SECDEF ordered the creation of the Navy Closure Task Force – Red Hill (NCTF-RH).

NCTF-RH's mission is to safely and expeditiously execute the permanent closure of the RHBFSF; continue long-term environmental remediation and aquifer restoration efforts, in coordination with state and federal stakeholders; and continue to rebuild trust with the State of Hawaii and the local community of Oahu. This includes executing command and control of all closure elements while providing sustained, iterative planning and schedule deconfliction. Furthermore, sustained, transparent, and high-quality engagement with external stakeholders and the community is paramount to NCTF-RH's success. Figure 1-1 below describes the NCTF-RH mission and the four lines of effort that form its approach to closure of the RHBFSF.

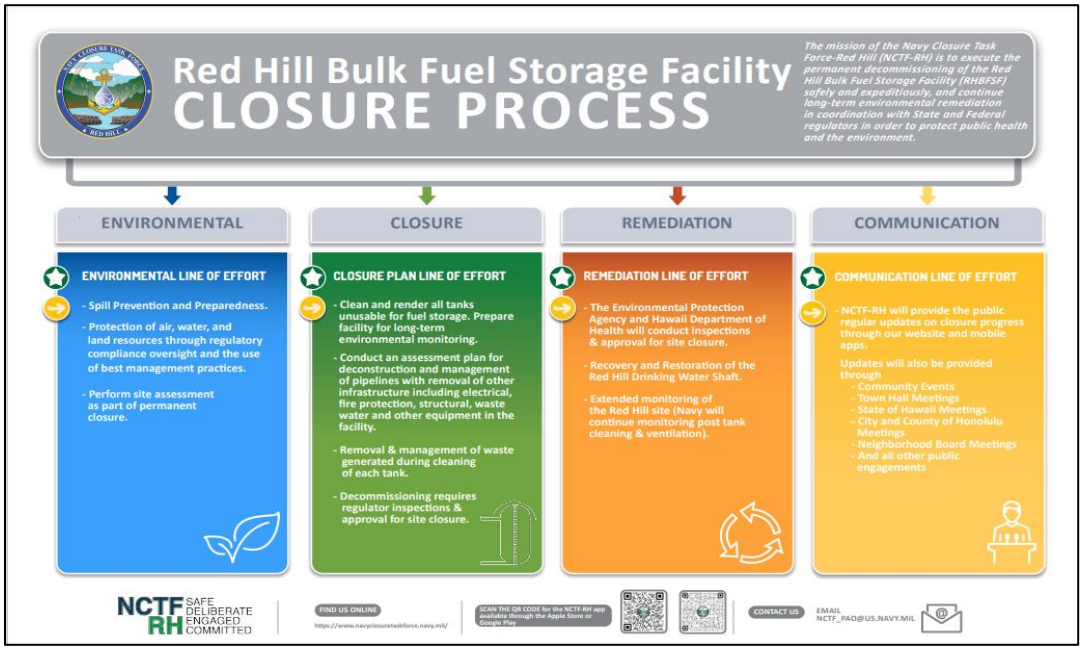


Figure 1-1. Red Hill Bulk Fuel Storage Facility Closure Process.

All defueling, closure, and environmental remediation efforts have and will continue to be conducted in accordance with the requirements set forth in the 2015 Administrative Order on Consent (AOC), signed by the DON, the Defense Logistics Agency (DLA), the Hawaii Department of Health (DOH), and the Environmental Protection Agency (EPA), the May 6, 2022 DOH Superseding Emergency Order (EO) issued under Hawaii Revised Statutes (HRS) § 342L-9, and the 2023 Administrative Consent Order (ACO) issued under the Imminent Hazard provision of the Resource Conservation and Recovery Act (RCRA) (42 U.S.C. § 6973) and signed on June 2, 2023 by the DON, DLA, and EPA. After JTF-RH completed defueling operations in January 2024, NCTF-RH assumed responsibility for the permanent

closure of the RHBFSF on March 28, 2024, marking the interim completion of the Defueling Phase under JTF-RH's scope of work and the commencement of the Closure Phase, as designated in the Superseding EO and ACO. As discussed in Defueling Plan Supplement 3, the removal of residual fuel and sludge remaining after the interim completion of the Defueling Phase will be conducted as part of the tank cleaning process during the Closure Phase.

The 2023 ACO defines the 20 field-constructed bulk fuel underground storage tanks (USTs), four surge tanks, and the pumps, infrastructure, and associated piping between the 20 USTs and the underground pumphouse (UGPH) at the RHBFSF as the 'Facility Subject to Closure'. The DON is required to close the Facility consisted with Hawaii UST regulations – HAR §11-280.1. Pursuant to the 2022 Superseding EO, "the permanent closure of the Facility must occur in a manner approved by [DOH] and as set forth in the Closure Phase of the Closure Plan." The 2023 ACO also requires compliance with Hawaii UST regulations, but goes one step further and divides the Closure Phase into two stages:

- Phase 1 Closure, consistent with HAR §11-280.1-71, requires (1) Emptying and cleaning the Facility Subject to Closure by removing all liquids and accumulated sludges; and (2) (a) Removing the Facility Subject to Closure, (b) filling the Facility Subject to Closure with an inert solid material, or (c) closing in place the Facility Subject to Closure in another manner approved by EPA.
- Phase 2 Closure, consistent with HAR §11-280.1-71 and -72, and HAR §11-280.1, Subchapter 6, requires conducting a site assessment of and any necessary release response for the soil, groundwater, and soil vapor that may have been contaminated by the Facility Subject to Closure.

In accordance with Directive 8 of the 2022 Superseding EO and Section 5 of the 2023 ACO, the DON is required to submit closure plans that, at a minimum, address the following:

- The method of permanent closure (e.g. remove, fill, or close in place);
- A description of the sequence and processes by which the 20 USTs, four surge tanks, and all related fuel pipelines will be prepared for cleaning and then cleaned;
- The infrastructure and procedures needed to perform the work and ensure pipeline integrity before the cleaning process; and
- The disposition and management of any accumulated sludge or waste material from the Facility Subject to Closure.

The history of the Tank Closure Plans (TCPs) submitted to achieve Facility (a.k.a Facility Subject to Closure) closure outlined below details the evolution of the Phase 1 closure process and demonstrates NCTF-RH's adherence to TCP requirements from both EPA and DOH.

1.1 Department of the Navy Tank Closure Plan History

On November 1, 2022, the DON provided an initial TCP to permanently close the 20 USTs, four surge tanks, and associated valves and piping systems at the RHBFSF to the DOH and EPA. The TCP addressed the following:

- Infrastructure Description and Procedures Needed Before Cleaning
- Sequence and Process for Cleaning of Tanks and Piping Systems
- Management of Accumulated Sludge and Materials
- Method of Permanent Closure and Associated Design and Process
- Site Assessment and Release Investigation and Response
- Coordination and Outreach

Before comments were received on the initial TCP, the DON submitted a third-party analysis of alternatives for tank closure on December 22, 2022, which evaluated engineering feasibility, worker safety, impacts to the environment and surrounding community, potential costs, and work schedule for each of the following tank closure alternatives:

- ALTERNATIVE 1: Closure In-Place.
- ALTERNATIVE 2: Closure In-Place and Preparation for Non-Fuel Reuse.
- ALTERNATIVE 3: Closure with Fill.
- ALTERNATIVE 4: Remove Tank Steel Liner and Fill.

The DON received comments on the initial TCP from DOH and EPA on January 10, 2023, and February 9, 2023, respectively. The DON formally acknowledged receipt of DOH's comments and incorporated responses to DOH's comments into TCP Supplement 1. The DON submitted a formal letter response to EPA's comments on February 28, 2023, but the text of TCP Supplement 1 was not updated to reflect these responses. A formal approval was not issued for the initial TCP by either regulatory agency.

On February 28, 2023, the DON submitted TCP Supplement 1, which provided additional information on the following:

- Tank and Pipeline Cleaning;
- Detailed Procedures for Waste Management;
- Facility Response Plan Updates;
- Beneficial Non-Fuel Re-Use Planning Updates;
- Critical Path Method (CPM) Schedule Updates; and
- Responses to DOH Comments on the Initial Tank Closure Plan.

The DON received comments from EPA and DOH on TCP Supplement 1 on April 7, 2023 and May 3, 2023, respectively. Given the short time frame between receipt of DOH's comments and the imminent submittal of TCP Supplement 2, only EPA's comments on TCP Supplement 1 were addressed in the text of Supplement 2. On July 14, 2023, the Navy submitted a formal response to comments to DOH's TCP Supplement 1 comments. A formal approval for TCP Supplement 1 was not issued by either regulatory agency.

On May 23, 2023, the DON submitted TCP Supplement 2, which provided additional information on the following:

- Pipe Demolition and Removal Plan for 3 Fuel Pipelines;
- A Third-Party Assessment of the Long-Term Structural Integrity of the Tanks;
- Surge Tank Cleaning;
- Responses to DOH comments on the Third-Party Analysis of Alternatives for Tank Closure; and
- Responses to EPA comments on 1) the initial TCP, 2) the Third-Party Analysis of Alternatives for Tank Closure, and 3) Supplement 1.

The DON received comments on Supplement 2 from DOH and EPA on July 26, 2023, and August 25, 2023, respectively. The DON submitted a formal response to comments to both regulatory agencies on September 29, 2023. A formal approval for TCP Supplement 2 was not issued by either regulatory agency.

On June 28, 2024, the DON submitted TCP Supplement 3, which provided the following Phase 2 Closure Plan information:

- Site Assessment Work Plan and Executive Summary;
- Additional Information on Release Response Actions; and
- Updated Integrated Master Schedule.

An interim, conditional approval of TCP Supplement 3 was issued by EPA on September 03, 2024. The DON has not yet received DOH approval on TCP Supplement 3.

1.2 Contents of Tank Closure Plan Supplement 4

This Supplement continues to build upon the previous November 1, 2022, December 22, 2022, February 28, 2023, and May 31, 2023, submissions. Supplement 4, Detailed Closure Design, provides the following:

- Closure Strategy;
- Update on Removal of Fuel Pipelines;
- Update on Tank Cleaning Verification Plan;
- Physical Tank Modifications;
- Historical Equipment Connections to the Red Hill (RH) UST System;
- Post-Closure Tank Monitoring; and
- Conclusion.

2. Closure Strategy

With the submission of the third-party analysis of tank closure alternatives on December 22, 2022, the DON formally sought regulatory agency approval for Alternative 1 – Closure in Place as the permanent closure method for the RHBFSF. The DON selected this alternative because it allowed for potential beneficial non-fuel reuse of the tanks while minimizing impacts on the environment, local community, safety concerns, and closure schedule.

The submittal of TCP Supplement 4, Detailed Closure Design, provides the specific closure plan for the RHBFSF. Past DON correspondence indicated that the tank and pipeline closure design would depend on the chosen option for beneficial non-fuel reuse. While reuse can only occur if the tanks are properly closed in place, the DON understands reuse to be outside the scope of the UST permanent closure requirements under the HAR. As stated in TCP Supplement 2, Response to Comments submitted to DOH and EPA on July 26, 2023, and August 25, 2023, respectively, the DON reaffirms its intention to close the RH UST system without regard to the potential non-fuel beneficial reuse.

2.1 Update on Beneficial Non-Fuel Reuse Planning

While Supplement 4 will not include specific information on the status of the beneficial non-fuel reuse determination, the DON continues to gather information to inform a decision. In March 2024, the DON presented a compiled report of three independent studies exploring potential beneficial non-fuel reuse of the RHBFSF for Congressional review. These studies included outreach to community leaders and the public, facilitated by locally-owned research firm Nakupuna Companies, a DoD feasibility and cost analysis performed by the RAND Corporation in accordance with the 2023 National Defense Authorization Act (NDAA), and an investigation into the potential for energy-related reuses completed by the University of Hawaii. Upon Congressional review, the information from these studies will help inform the path forward for any potential beneficial non-fuel reuse once the RHBFSF is closed. Beneficial non-fuel reuse will almost certainly require analysis under the National Environmental Policy Act (NEPA), and the EPA, DOH, and the public will have opportunities to provide input.

2.2 National Historic Preservation Act

The DON recognizes that the RHBFSF is eligible for listing in the National Register of Historic Places under the National Historic Preservation Act (NHPA). Section 106 of the NHPA requires that Federal agencies evaluate the effects of undertakings with the potential to affect historic properties and afford the Advisory Council on Historic Preservation an opportunity to comment, consistent with the procedures set forth in 36 CFR 800 prior to making a decision to proceed with an undertaking. However, successful Facility closure compliant with the May 6, 2022 Superseding EO and the 2023 ACO requires specific actions including the modification or removal of equipment, pipelines and appurtenances related to the storage and delivery of fuel. And while these actions meet the definition of an undertaking (36 CFR § 800.16(y)) and the criteria for adverse effect (36 CFR § 800.5(a)(1)), the Superseding EO and the ACO displace the decision-making authority cited under 36 CFR § 800.2(a), precluding the DON's discretion to consider alternatives. For these reasons, the DON plans to take the following measures toward substantive compliance with Section 106, to the degree possible:

- Meet with the Advisory Council on Historic Preservation, Hawaii State Historic Preservation Officer, National Park Service, and other interested parties to explain that tank and pipeline cleaning, removal of fixtures from within the USTs, and the removal of the three large fuel pipelines, are integral components of the closure plan subject to Regulatory Agency approval;;
- Provide information to consulting parties demonstrating that the RHBFSF, including the equipment subject to removal during closure, were previously documented in a thorough and

highly detailed set of historical, photographic, and engineering documents as part of the 2015 Historic American Engineering Record;

- Provide information to consulting parties throughout the closure process about ongoing documentation efforts using photography and laser scanning using Light Detection and Ranging (LiDAR), for potential 3D modeling, inspection, and management;;
- Reinforce the Navy's commitment to continue providing updates to NHPA Section 106 stakeholders during the execution of the mandatory closure actions to address the effects of closure; and
- Afford the consulting parties opportunities to be informed and provide comments throughout the closure process, consistent with the public involvement requirements of the 2023 ACO.

The DON acknowledges that compliance with EPA and DOH regulatory closure requirements will continue to be prioritized over Section 106 stakeholder comments and/or concerns until closure is complete.

3. Update on Removal of Fuel Pipelines

As stated in TCP Supplement 2, NCTF-RH is proceeding with the removal of the legacy fuel pipeline system to demonstrate to the regulatory agencies, the public, and other stakeholders that the RHBFSF will not be used for fuel storage again. The pipeline system is located inside of a 3.2 mile-long tunnel system that connects the 20 bulk-fuel USTs and four surge tanks to the UGPH located on the Pearl Harbor side of Joint Base Pearl Harbor-Hickam (JBPHH). The pipes and piping infrastructure include a [redacted]-inch JP-5 pipeline, an [redacted]-inch JP-8 (F-24) pipeline, a [redacted]-inch diesel (F-76) pipeline, [redacted]-inch and [redacted]-inch lateral (branch) pipes in the tank gallery, and various types of valves and other operational and structural components.

Pipeline removal is scheduled to occur in the lower access tunnel (LAT) from Pipe Support [redacted] through [redacted] which covers the LAT and harbor tunnel areas extending from Tanks 19/20 to the UGPH, and in the surge tunnel that connects surge tanks ST1-4 to the southeast side of the UGPH. There are no fuel pipes in the upper access tunnel (UAT).

3.1 Lower Access Tunnel Pipeline Removal

On October 24, 2024, the DON submitted the following pipeline removal, demolition, and environmental protection plans from third-party contractor APTIM to DOH and EPA for review:

- *Demolition Work Plan, DE23-1592 Red Hill Pipeline Removal, Red Hill Bulk Fuel Storage Facility*, dated August 2024
- *Environmental Protection Plan, Red Hill Pipeline Removal, RHBFSF*, dated October 2024

In response to these submittals, NCTF-RH received requests for information from EPA and DOH on November 15, 2024 and November 25, 2024, respectively. Formal responses were subsequently submitted to EPA and DOH on December 13, 2024 and December 26, 2024, respectively. While the DON continues to work toward plan approvals with the regulatory agencies, work commenced on the initial phase of the LAT pipeline removal plan in November 2024. The pipeline work and demolition plans provide the planned sequence of operations to safely dismantle and remove the fuel pipeline system from the lower access and harbor tunnels. All work will proceed with regulatory agency concurrence, and in accordance with approved CONOPS and all applicable laws and regulations.

Preparation for pipeline demolition and removal began with residual fuel removal and sampling of pipe coating from the [redacted]-inch, [redacted]-inch, and [redacted]-inch diameter pipes and support brackets from [redacted] through [redacted] and the tank gallery lateral pipes for lead and asbestos analysis. Analytical results previously provided to the regulatory agencies found Asbestos-Containing Material (ACM) in the [redacted]-inch pipe in the tank gallery between [redacted] The ACM was determined to be in good condition but will be removed and disposed of prior to cutting and removal of pipe. Asbestos abatement is currently underway. Since the existing pipes are coated in lead paint, a strip of coating will be removed at each location where the pipes will be cut. The removed material will be sampled to determine the disposal method in accordance with applicable environmental laws and regulations. Piping and appurtenances that are left in place will be maintained by re-painting and sealing in accordance with EPA regulations for lead paint management.

3.1.1 Alternative Closure Strategy for Tank Gallery Pipe Headers

After further consideration of the logistical complexities and safety issues associated with removing the [redacted]-inch, [redacted]-inch, and [redacted]-inch header pipelines in the tank gallery, NCTF-RH explored an alternative closure strategy to mitigate risk. The tight spacing and co-location of multiple pipelines and utility lines in the tank gallery presents significant challenges to safely maneuver equipment and personnel. Many of these pipelines run in parallel and in close proximity to the three header pipes, making safe extraction difficult without extensive re-routing of critical infrastructure, such as power, ventilation, fire suppression, and communication systems. Given these constraints, traditional pipeline removal will be time-consuming and hazardous to both workers and adjacent infrastructure.

Abandoning the tank gallery header pipes in place after filling them with a non-toxic, environmentally safe, and permanent hard-set foam offers a practical and effective alternative. This approach involves filling the [redacted]-inch, [redacted]-inch, and [redacted]-inch header pipes in the tank gallery with the hard-set foam, which requires only a 2-inch injection port for deployment and cures within 24 hours. The foam will also absorb and encapsulate residual fuel and water, which will mitigate corrosion and provide permanent closure without generating any hazardous or non-hazardous waste. Foam filling of all header pipes within the tank gallery is anticipated to take approximately three months. The header pipe segments in the tank gallery represent less than 10% of the total length of RHBFSF pipeline infrastructure, and the remaining approximately 90% of pipeline infrastructure would still be physically removed. This hybrid approach balances operational efficiency, worker safety, and environmental responsibility, allowing for the safe, permanent closure of tank gallery headers while proceeding with the removal of the remaining fuel pipelines.

The anticipated duration of pipeline abandonment and/or removal activities is approximately three years. Pipeline removal will be conducted simultaneously with other Facility closure efforts including tank cleaning and the Site Assessment. The APTIM Pipe Demolition and Removal project will remove the skin valves on Tanks 1, 13, 14, 17, 18, and 19, and the APTIM Tank Cleaning project (discussed below) will remove the skin valves on Tanks 2-12, 15, 16, and 20. The pigging of tank gallery pipe headers and laterals is currently scheduled to begin in July 2025, with the first pipe removal slated for May 2026. NCTF-RH will continue to keep the regulatory agencies apprised of any schedule changes.

3.2 Surge Tank Pipeline Removal

The four surge tanks (ST1-4) were originally connected to the UGPH via fuel pipes that transited the surge tunnel. In accordance with a series of approved CONOPs executed by third-party contractor Pond in 2024, the surge tanks have been isolated from the UGPH through the removal of selected fuel piping, equipment, and appurtenances. In January 2024, residual fuel was drained from the surge tank fuel lines. In March 2024, the JP-5 spool was removed from ST-2 and blinds were installed on the [redacted]-inch skin valve and the [redacted]-inch JP-5 line flange. In September 2024, the surge tanks were air-gapped by performing the following:

- Removal of MOV and installation of blind flanges (ST-1, 3, 4);
- Removal of gate valve and installation of blind flanges (ST-2);
- Removal of [redacted]-inch FOR line spool and installation of blind flanges (ST-1-4);
- Removal of relief line spool and installation of blind flanges (ST-1-4);
- Removal of [redacted]-inch sample line spool and installation of blind flanges (ST-1-4); and
- Removal of pressure safety loop piping (ST-1, 3, 4).

All piping and equipment were verified dry and disposed of in accordance with all applicable environmental regulations. No further pipeline removal is planned for pipelines still directly connected to the surge tanks but there are some remaining segments of dead leg piping in the surge gallery between the surge tank and UGPH that need to be drained, cleaned, and removed. NCTF-RH will continue to keep the regulatory agencies apprised of progress.

4. Update on Tank Cleaning Verification Plan

Tank cleaning operations are underway for the Red Hill bulk fuel USTs. The overall cleaning process consists of the following steps:

1. Sludge watering;
2. Degassing via forced ventilation;
3. Draining sludge water and manual removal of remaining sludge cake;
4. Structural assessment and repair of center tower and catwalk;
5. Pressure washing of tank interior; and
6. Verifying cleanliness of tank interior (Cleaning Quality Verification (QV)).

On October 4, 2024, NCTF-RH submitted the revised Tank Cleaning Verification Plan (TCVP) for the 14 USTs that were active at the time of Defueling (Tanks 2-12, 15, 16, and 20) and the four surge tanks (ST-1-4). This TCVP was updated from the version previously submitted on July 26, 2024 to incorporate all additional comments and conditions from DOH and EPA. The TCVP uses the Society for Protective Coatings (SSPC) Surface Preparation Standard No. 1 – Solvent Cleaning (SP-1) definition of 'clean' and augments the standard visual inspection with a third-party quality verification (QV) inspector with an industry-recognized certification from the Association for Materials Protection and Performance (AMPP) (formerly the National Association of Corrosion Engineers (NACE)), who will conduct the wipe test (a.k.a. "cloth rub test") to demonstrate the cleanliness of tank interior surfaces. The cloth rub testing will be performed over a minimum of 1% of the tank shell surface to assess any visual indications of petroleum contamination. The TCVP also implements multiple layers of quality oversight and review that include cleaning contractor quality control (QC), NCTF-RH quality assurance (QA), third-party quality verification (QV), and regulatory inspection from DOH and EPA. The final QV package includes photographic evidence of tank conditions, cloth rub test results, shell roll out diagrams, a verification activity log, and the third-party QV report. A discussion of additional tank equipment and components that will be cleaned is included in Section 5 Physical Tank Modifications. This comprehensive approach to verification of tank cleanliness represents a collaborative, multilayered effort between various entities, and underscores NCTF-RH's commitment to a methodical and scientifically sound approach to environmental stewardship and regulatory compliance.

Six of the 14 underground storage tanks (USTs or tanks) to be cleaned are in varying stages of the cleaning process, including Tanks 7 and 8, which have finished pressure washing and are awaiting regulatory approval of the Navy's final quality validation (QV) packages. After cleaning Tanks 7 and 8 in accordance with the regulator-approved TCVP, the white cloths used to perform the cloth rub test had visible residue. The AMPP inspector confirmed that the discoloration was not residual fuel. As a good faith effort, NCTF-RH also coordinated the sniffing of the rags with a Photo Ionization Detector (PID) to see if any Volatile Organic Compounds (VOCs) were present. The results indicated weak VOC readings that averaged under 0.5ppm, which is several orders of magnitude below the Lower Explosive Limit (LEL) and two orders of magnitude below the Permissible Explosive Limit (PEL). VOCs detectable at this level do not indicate that any potential contaminants of concern are present at concentrations that would constitute a risk to human health or the environment.

SP-1 defines clean as 'When viewed without magnification, a solvent-cleaned surface shall be free of visible oil, grease, dust, dirt, drawing and cutting compounds and other visible soluble contaminants. Visible means detectable with normal or corrected normal vision without the use of additional test equipment'. The approved TCVP states that 'NCTF-RH will rely on the judgement of the third-party certified inspectors to determine whether residue is associated with fuel or simply that of corrosion products, dirt or dust'. The SP-1 standard is not, and was never intended, to clean to a "white glove" standard. Such a requirement goes well beyond industry standard and the regulatory requirements of Hawaii UST regulation, HAR §11-280.1-

71(c)(1)[2] which requires a UST owner or operator to "[e]mpty and clean the UST and tank system by removing all liquids and accumulated sludges" in order to permanently close the UST or tank system.

Additionally, historical generator knowledge confirms the staining on the cloths is non-hazardous and would not pose a risk to human health or the environment. Red Hill UST system operating records document legacy fuel storage and coating system application, providing a definitive history of all materials that have ever been inside of the tanks. The Navy has stored only three types of fuel in the tanks since the early 1970s (F-24, JP-5 and F-76), and tanks were thoroughly cleaned prior to any change in service. The Navy also has a robust history of the tank coatings that have been utilized over the lifecycle of the tanks. Any deterioration of the tank coatings over time would be captured in the characterization of the sludge and/or washwater from tank cleaning. Laboratory analysis conducted on sludge and tank washwater, generated in support of the tank closure operations, did indicate trace levels of metals and limited amounts of benzene, but the levels were below Maximum Contaminant Level (MCLs)/Toxicity Characteristic Leaching Procedure (TCLP) thresholds. Hence, and because fuel is a recyclable material, both waste streams are classified as non-hazardous waste. If wastes generated and disposed during the cleaning process were determined to be non-hazardous, it is reasonable to conclude that any analysis conducted on the cloth residue would also return non-hazardous results. A risk-based approach supports the conclusion that any material remaining on the tank walls poses no risk to the environment based on evaluation of the cloth rags, generator knowledge of tank contents, waste stream characterization, and implemented engineering controls.

NCTF-RH will continue to follow the approved TCVP in preparation for permanent tank closure.

4.1 Six Out-of-Service Tanks

NCTF-RH proposes a modified cleaning process for the six USTs that were out of service at the time of Defueling (Tanks 1, 13, 14, 17, 18, and 19).

4.1.1 Tanks 13, 14, 17, and 18

Tanks 13, 14, 17, and 18 have been cleaned and empty since 2021. Steps 1-5 of the cleaning process above were conducted for Tanks 13, 14, 17, and 18 in preparation for the last Clean, Inspect, Repair (CIR) scheduled for 2017 - 2021. The tanks were degassed, the sludge was removed, and after completing a structural assessment on the center tower and catwalk, the necessary repairs were made to support boom and basket attachment. The last CIR report generated by APTIM for Tanks 13 and 17 indicated that pressure washing was conducted with detergent, and according to APTIM personnel, the pressure washing protocol currently being used for cleaning the 14 active tanks is the same as was executed for Tanks 13, 14, 17, and 18. After the CIR was completed for Tanks 13 and 17 in 2021, Tank 13 was returned to operation but not to service, and Tank 17 was returned to service but not filled. A partial CIR was conducted for Tanks 14 and 18, during which both tanks were cleaned but not returned to service. The tell-tale leak detection system was removed from the interior of Tank 18, but the holes were not patched.

Despite the recent CIR, each tank will be actively ventilated for safe entry (though degassing should not be necessary) and a new structural assessment will be performed on the center tower and catwalk. As these four tanks have already been thoroughly cleaned, NCTF-RH plans to conduct the cloth rub test and cleaning QV first. If the tanks do not pass the cleaning QV, NCTF-RH will collaborate with the regulatory agencies to determine next steps. Instead of a full pressure wash, a 'spot wash' targeting specific areas may be sufficient based on initial cloth rub test results. These four tanks will also undergo the physical tank modification for closure as described in Section 5. Table 4-1 summarizes the proposed cleaning strategy for Tanks 13, 14, 17, and 18.

Table 4-1. Proposed Cleaning Strategy for Tanks 13, 14, 17, and 18

	Tank 13	**Tank 14**	**Tank 17**	**Tank 18**
Degassing	No	No	No	No
Active Ventilation	Yes	Yes	Yes	Yes
Structural Assessment	Yes	Yes	Yes	Yes
Cleaning QV	Yes	Yes	Yes	Yes
Spot or Pressure Washing	Possibly - Pending QV	Possibly - Pending QV	Possibly - Pending QV	Possibly - Pending QV
Interior tell-tale leak detection system	N/A	N/A	N/A	Plug holes if pressure washing is required; Leave open if not

4.1.2 Tank 19

Tank 19 has been out of service since 1986. During the last CIR completed in 1999, cleaning steps 1-5, as described in Section 4 above, were conducted for Tank 19. After a structural assessment was conducted on the center tower and catwalk, and all necessary repairs were completed to support boom and basket attachment, the tank was pressure washed with detergent. Following the CIR, the tank remained empty until 2007 when it was designated as permanently out-of-service. DOH Form Appendix I *Notification for Underground Storage Tanks* was completed, but it is not known if it was submitted to DOH for review. As Tank 19 still retained all lines and equipment, including the leak detection pipes, it was designated as a 'show tank' to provide an intact example of a typical RH UST and has remained under continuous forced air ventilation since then.

The DON determined there is no further need to maintain Tank 19 as a 'show tank'. As Tank 19 has already been cleaned, NCTF-RH will collaborate with the Regulatory Agencies to determine the means and methods to validate that the tank has remained clean and can be closed in a manner protective of the environment and human health. The most recent structural assessment was completed on the center tower and catwalk within the last five years, so there is no need to perform another one to confirm them safe for attachments. Tank 19 will undergo the physical modifications for closure as described in Section 5. Table 4-2 summarizes the proposed cleaning strategy for Tank 19.

Table 4-2. Proposed Cleaning Strategy for Tank 19

	Tank 19
Last CIR	1999
Degassing	No
Active Ventilation	Yes
Structural Assessment	No
Cleaning QV	TBD
Spot or Pressure Washing	TBD
Interior tell-tale leak detection system	Drain pipes

4.1.3 Tank 1

Tank 1 has been out of service since 1997. In preparation for a change in service from JP-5 to JP-8 (F-24) in 2007, Tank 1 was scheduled for a CIR between 2004 – 2006. During the CIR process, the

tank was cleaned but the coating was observed to be severely deteriorated, and much of it came off during pressure washing. The coating degradation was determined to be severe enough to require a complete recoating before the tank could be returned to service. The cause of the deteriorated coating was not confirmed, but contributing factors are speculated to include a surface bulge at the spring line of the lower dome, inadequate surface preparation, and/or not adequately controlling environmental conditions when the initial coating was applied in the early 1980s. After pressure washing was conducted to remove an estimated 99% of the degraded coating, it was determined that Tank 1 would not be recoated because there was already sufficient JP-8 (F-24) fuel storage capacity available in other RH USTs. The 2007 *Close Out Report for Tank 1*, prepared by Dunkin & Bush, provides before-and-after pictures of coating removal and is included as enclosure 2. The report also documents the disconnection and blinding of the FOR line, the blinding of fuel line nozzles in the LAT, and the blinding of vent piping in the UAT. Tank 1 was closed and considered to be permanently out of service in 2007. DOH Form Appendix I *Notification for Underground Storage Tanks* was completed, but it is not known if it was submitted to DOH for review.

In 2021, approximately 1,600 gallons of non-hazardous water was drained from Tank 1. The source of the water was not confirmed but it was speculated that it could have been due to a lack of ventilation resulting from the blinds installed by Dunkin & Bush in 2006. After installing a plywood door on the UAT manway and a dummy spool on the [redacted]-inch fuel line in the LAT to support passive tank venting, there has been no further water accumulation in the tank over the last four years. The lack of continued moisture accumulation in Tank 1 after these modifications informed NCTF-RH's direction for determining the final venting configuration for the other USTs as described in Section 5.

In 2022, a structural assessment was done on the center tower and catwalk in preparation for a pilot study to explore the installation of a double-walled steel tank liner. The 2022 *Preliminary Engineering Report for Red Hill Tank #1 – Center Tower and Catwalk*, prepared by Hawaiian Engineering Group, confirmed extensive 'corrosion jacking' of the tower bolts and is included as Enclosure 3. Also known as 'oxide jacking' or 'rust burst', this phenomenon can occur when steel exposed to water begins to oxidize, expanding beyond its normal size and causing widespread structural damage. It is likely that this damage occurred slowly over time between 2007 and 2022 when the tank was closed without adequate ventilation.

The tower is unsalvageable and will require a complete demolition and rebuild before entertaining any load bearing activities. As the tank was previously pressure washed and then blasted to remove 99% of the remaining coating, there is no need to utilize a boom and basket for pressure washing and cleaning QV. NCTF-RH does not plan to rebuild the tower. Without a functional center tower, pressure washing, cleaning QV, and pipe removal inside the tank are not possible. Table 4-3 summarizes the proposed cleaning strategy for Tank 1.

Table 4-3. Proposed cleaning strategy for Tank 1.

	Tank 1
Last CIR	2006 (Partial)
Degassing	No
Active Ventilation	Yes
Structural Assessment	No
Cleaning QV	No
Spot or Pressure Washing	No
Interior tell-tale leak detection system	N/A

5. Physical Tank Modifications

NCTF-RH's approach to the permanent closure of the 20 USTs and four surge tanks is to abandon the tanks in place in a safe and environmentally responsible manner that provides public reassurance that the tanks will not be used for future fuel storage or pose a public safety risk. The comprehensive list of physical tank modifications outlined below represents a concerted and robust commitment to close the RH UST system in a manner that is not only compliant with the 2022 Superseding EO and 2023 ACO requirements, but far exceeds the conventional regulatory standards for underground storage tank decommissioning. NCTF-RH has considered all interior, skin, and exterior tank equipment, components, appurtenances, and pipeline penetrations to determine what physical modifications will be required to close each tank while minimizing future monitoring, maintenance, and sustainment requirements. Tank components will either be removed or abandoned in place after being verified empty or dry. This verification will occur in the manner determined to be most practicable. Most of these modifications will take place during tank cleaning operations, but some will be conducted as part of the pipeline demolition and removal scope of work.

Although the 20 USTs and four surge tanks were originally constructed in a relatively uniform manner, the dynamic nature of naval operations and periodic legacy system improvements have resulted in some differences in tank operational configuration. While the proposed closure modifications are based on the best available institutional knowledge and historical documentation of tank construction, it is probable that unexpected elements will be encountered upon entering a tank. To ensure that all differences are appropriately addressed to maintain alignment with the overall closure strategy, NCTF-RH will carefully evaluate each tank element during the cleaning process and provide a summary of planned equipment modifications to the regulatory agencies using the Tank Closure Checklist (Appendix C). NCTF-RH will develop CONOPS as needed, detailing the way forward for each modification. All tank modifications will be documented to provide a historical closure record using the Tank Closure Checklist and a summary spreadsheet.

5.1 The 20 USTs

On December 16, 2024, NCTF-RH submitted the *Principal Physical Modifications* memorandum for regulatory agency approval, and subsequently provided formal responses to EPA and DOH comments on January 31, 2025, and February 3, 2025, respectively. The memorandum outlined the planned physical modifications to 14 of the 20 USTs (Tanks 2-12, 15, 16, and 20) that were in active service at the time of the RHBFSF's defueling. The other six USTs (Tanks 1, 13, 14, 17, 18, and 19) were already empty when defueling began, and some (Tanks 13, 14, 17, and 18) were at various stages of CIR. While some modifications will apply to all 20 tanks, NCTF-RH contends that the documented histories of Tanks 1, 13, 14, 17, 18, and 19 support a modified approach regarding some closure aspects. The proposed physical modifications supporting the permanent closure configuration of the 20 USTs are described below.

Gauging Gallery and Instrumentation Systems. The gauging gallery is a small space above the upper dome of each tank that contains legacy fuel level gauging equipment, as well as several hatches and ports in the floor for [redacted]. The gallery is accessible via a steep metal staircase (Tanks 2-20) or ladder (Tank 1) from the UAT alcove and is ventilated by a ventilation duct and fan in the upper tunnel. Some tanks have a ladder that extends down from the gallery floor to the top of the center tower. A variety of liquid level gauges have been utilized throughout the operational history of the tanks, including floating tape gauges with counterweights, telemeters, and Automatic Tank Gauge (ATG) assemblies. The most recent gauge installation was an ATG - stilling well assembly consisting of a stilling well that extends up from the tank floor, through the gauging gallery floor where it connects to a gauge assembly. In the final closure configuration, all gauging instrumentation will be removed and any associated instrumentation wells will be cut down as close to flush with the tank floor as practicable. The pipe stub will be capped and all disconnected pipes removed from the tank interior. All hatches and ports in the gallery floor will be sealed in a manner that allows for re-opening (e.g. threaded cap) should a future need arise (e.g. [redacted]

(b) (3) (A)). The ventilation duct for the gauging gallery will remain intact and the ladder connecting to the center tower will be abandoned in place (if present). NCTF-RH does not currently know which tanks have this ladder but will confirm during the tank cleaning process. This modification applies to Tanks 2-20. Tank 1's gauging equipment will be removed from the gauging gallery, but any interior components will be abandoned in place (if present).

Manway Hatch. Each tank is accessible from the UAT via an 8-foot manway hatch in the tank skin. In preparation for tank degassing, the hatch cover is removed and secured to the UAT alcove wall. Prior to tank cleaning, the opening will be fitted with a lockable metal door for security and safety. The door includes openings to allow passive ventilation. NCTF-RH has finalized the door design and will share the drawing with DOH and EPA shortly. This modification applies to all 20 USTs.

Center Tower and Catwalk. The center tower is a 4-legged steel construction that spans the full height of the tank from floor to upper dome. The base of the center tower is bolted to the tank floor. A steel catwalk extends from the tower to the 8-foot manway hatch in the UAT. A structural assessment will be performed to determine whether the structures are safe and capable of supporting the attachment of the boom and basket required for the cleaning and QV of the tank shell. All required repairs will be made prior to cleaning, and the center tower and catwalk will be abandoned in place as repaired. This modification applies to Tanks 2-18 and 20.

Tanks 5, 6, and 12 have a spiral staircase around the center tower that will be dismantled and removed to the extent necessary to facilitate tank cleaning. The remainder of the spiral staircase will be abandoned in place. As described in Section 4 *Update on Tank Cleaning Verification Plan*, NCTF-RH does not plan to conduct another structural assessment for Tanks 1 or 19, or to repair the center tower in Tank 1. Tank 19's structural assessment was conducted within the last five years and the extent of structural compromise in Tank 1's center tower will require a complete rebuild. As Tank 1 was previously pressure washed and blasted to remove 99% of remaining coating, there is no need to utilize a boom and basket for pressure washing and cleaning QV.

Tank Shell Liner. The tank shell liner will be verified clean in accordance with the approved Tank Cleaning Verification Plan. Once approved as clean, the shell will be abandoned in place. This modification applies to Tanks 2-20 only. As explained above, and in Section 4 *Update on Tank Cleaning Verification Plan*, Tank 1's shell liner will also be abandoned in place, but will not be verified clean. Tank 18's shell liner still has open holes where the tell-tale leak detection pipes were removed. These holes will remain open unless a full pressure washing is required.

(b) (3) (A)**-inch Pipe with Diffuser**. Each tank is equipped with a legacy (b) (3) (A)-inch fuel pipe with diffuser. Inside the tank, the pipe with diffuser extends up vertically several feet above the tank floor. The diffuser will be removed from the pipe, the pipe cut down as flush as possible with the tank floor, and both the diffuser and cut pipe will be removed from the tank's interior.

Beneath the tank floor, the pipe extends down into the concrete plug below the lower tank dome, reducing to a (b)(3)-inch diameter just before daylighting into the LAT alcove. This segment of pipe will be hand-washed and then abandoned in place. In the LAT alcove, the skin valve on the (b)(3)-inch pipe will be removed and the nozzle will be left unblinded and enclosed in a lockable plywood plenum, providing a passive egress pathway for any residual VOCs and a LAT entry point (b) (3) (A) . This modification applies to Tanks 2-20 only. As described in Section 4, Tank 1's (b)(3)-inch skin valve has already been removed and a dummy spool installed so there is no need to construct a plenum. During the valve removal process, the segment of pipe transiting the concrete plug was drained and confirmed empty, and will be abandoned in place. As the center tower will not be re-built, the fuel pipe with diffuser extending above the tank floor will be abandoned in place (if present).

(b) (3) (A)**-inch Pipe.** Tanks 1-16 are equipped with a legacy (b) (3) (A)-inch diameter fuel pipe. Inside the tank, the primary pipe extends up vertically several feet above the tank floor where it turns at an angle to extend about (b) (3) feet toward the top of the curved section of the lower dome, terminating in an upward-facing nozzle close to the dome wall. The pipe will be cut down as close as possible to the tank floor and the remaining pipe stub will be capped. The cut pipe segment will be removed from the tank's interior. Beneath the tank floor, the primary pipe extends down into the concrete plug below the lower tank dome, reducing to a (b) (3)-inch diameter just before daylighting in the LAT. This segment of pipe will be pressure washed and then abandoned in place. In the LAT alcove, the skin valve on the (b) (3)-inch diameter pipe will be removed and blinded. This modification applies to Tanks 2-16 only. Tank 1's (b) (3)-inch skin valve has already been removed and a blind installed. During the valve removal process, the segment of pipe transiting the concrete plug was drained and confirmed empty, and will be abandoned in place. As previously discussed, any segment of this fuel pipe still remaining above the tank floor will be abandoned in place (if present).

(b) (3) (A)**-inch Pipe.** Tanks 17-20 are equipped with a legacy (b) (3) (A)-inch diameter fuel pipe. Prior to the historical conversion to JP-5, the (b) (3) (A)-inch line functioned as a drain line. It was later modified to serve as a drain and a conduit for tell-tale leak detection piping and sample lines. Inside the tank, the primary pipe sits flush with the tank bottom. In Tank 17, the (b) (3) (A)-inch pipe was later repurposed as a sealed conduit for sample lines and bottom drain piping as part of the 2021 CIR. At the time of its CIR, Tank 18 used the (b) (3) (A) -inch nozzle as an open conduit for tell-tale leak detection piping and sample lines. As a blind flange is currently installed over the LAT penetration, it is assumed that the tell-tale leak detection piping and sample lines were removed from within the (b) (3) (A)-inch pipe conduit. Tank 19 retains tell-tale leak detection piping inside the tank, but the tell-tale leak detection and sample piping is severed from the nozzle in the LAT. NCTF-RH will field verify the termination point of the tell-tale leak detection pipes and sample lines inside the tank. Tank 20 went through CIR in 2008, at which time the tell-tale leak detection piping and sample lines were removed from the (b) (3) (A)-inch nozzle, and the sample lines were routed through the (b)-inch sleeve.

Beneath the tank floor, the (b) (3) (A)-inch pipe extends down into the concrete plug below the lower tank dome, reducing to a (b) (3)-inch diameter just before daylighting in the LAT. This segment of pipe will be flushed and/or confirmed dry and then abandoned in place.

Additional (b)-inch Nozzle. Tanks 5, 6, and 12 are equipped with an auxiliary (b) (3)-inch nozzle designed to serve as a sealed conduit for tell-tale leak detection piping and sample lines. The nozzle is oriented at a 28° angle to intersect the LAT and the top of the second shell course of the lower dome. During Tank 5's 2010 CIR, the additional (b) (3)-inch nozzle was repurposed to function as a sealed conduit for the sample lines and a (b)-inch drain line. These additional (b) (3)-inch nozzles will be actioned as discussed below.

Fuel Oil Recovery (FOR) line(s). Each tank has a bottom drain line that extends from the lowest draining point inside the tank, through the concrete plug below the lower tank dome, into the LAT alcove, and out to the main sump. In the final closure configuration, the existing FOR line will be maintained to provide a long-term egress pathway for moisture that may accumulate inside the tank**.**

As a result of historical modifications and improvement projects, FOR line configuration varies from tank to tank. Each tank was originally equipped with an (b)-inch diameter tank bottom drain line (FOR line) to drain oily water that separated out of the fuel at the bottom of the tank. Due to prolonged exposure to this bottom water, the (b)-inch drain line was prone to extensive corrosion, which sometimes necessitated retirement from service. As each tank was also equipped with a (b)-inch diameter steam-line casing that was never used, it was put into service to replace the compromised (b)-inch diameter bottom drain line in some of the tanks. Based on recent gauging data and visual observations in the LAT, an estimated 10 of the 20 USTs still utilize the original FOR line (Tanks 3, 7, 8, 9, 11, 15, 16, 18, 19, and 20), which has an entrance point flush with the tank floor. An estimated six of the 20 USTs utilize the (-inch steam line casing as a replacement FOR line (Tanks 1, 2, 4, 6, 10, and 12). Tanks 13, 14, and 17 utilize their legacy (b) (3) (A)-inch fuel line as a FOR line conduit, which was determined by tracing the FOR line back to a (b-inch nozzle in the LAT alcove. Tank 5

utilizes a secondary [redacted]-inch diameter pipe as a FOR line. The tentative plan for the Tank 5 FOR line retrofit involves constructing a new FOR line using a [redacted]-inch flexible fuel-rated hose sleeved through the exiting [redacted]-inch diameter pipe. The [redacted]-inch diameter pipe will be cut flush with the tank bottom and a flat cap with a flange will be fabricated to accept the hose.

Each FOR line configuration will be field-verified during tank cleaning to determine what modifications need to be made to minimize moisture retention in the bottom of the tank prior to draining. NCTF-RH will provide a CONOP brief detailing when and how modifications to the pipe height will be made, and regulatory agency input is welcomed prior to commencement of work. Based on historical research and institutional knowledge, NCTF-RH understands that all abandoned legacy [redacted]-inch FOR lines were drained and capped inside the tank, and the LAT penetration was either left open or capped with a low point drain installed. This will be verified during the cleaning process to ensure that all lines are dry. This modification applies to all 20 USTs.

Sample Lines. Each tank was equipped with a legacy fuel sampling system that typically consisted of four to five pipes extending up to different heights inside the tank and feeding into a horizontal manifold that drained to the FOR line in the LAT alcove. Inside the tank, the sample lines extending above the tank floor will be verified empty, cut down close to the tank floor and removed. The sample line segments that transit the concrete plug under the lower tank dome will be flushed and abandoned in place. Once flushed, the sample line protrusions above the tank floor and in the LAT will be capped.

As with the FOR line, the configuration of the sample lines varies between tanks. Sample lines were sometimes routed through the tank floor to the LAT via an [redacted]nch diameter steam condensate return line casing (Tanks 3, 4, 7, 8, 9, 10, and 11), but some tanks utilized an alternative route such as the primary [redacted] inch line as a conduit (Tanks 13 and 14), an [redacted]inch line as a conduit (Tanks 5, 6, and 12), through the [redacted] inch nozzle (Tanks 17-20), or a combination of different routing mechanisms (Tanks 2, 15, and 16). In some cases, it's not entirely clear how the sample lines were routed (Tank 1). NCTF-RH will evaluate each sample line configuration during tank cleaning to ensure that all lines are verified empty. If sample lines are routed through a conduit, the conduit will be inspected for fuel, flushed if found to contain fuel, and abandoned in place.

The final step of the sample line removal process will take place as part of the pipeline demolition and removal scope of work. In the LAT alcove, sample lines will be cut where they daylight from the tank skin and the sample lines and manifold will be removed. NCTF-RH is still determining if this will occur during or immediately following tank cleaning, or sometime after, as currently proposed in the pipeline *Demolition Work Plan DE23-1592*.. This modification applies to Tanks 2-20. Tank 1's sample lines and manifold in the LAT have already been removed. During the removal process, the pipe segments transiting the concrete plug were drained and capped, and will be abandoned in place. Any sample lines extending above the tank floor will be abandoned in place (if present).

Tell-Tale Leak Detection System. Each tank was originally equipped with a tell-tale leak detection system that consisted of (b) vertical pipes spaced evenly around the interior of the tank shell that ran from the bottom of the upper dome, down the tank wall, through the tank floor and the concrete plug under the lower tank dome, to connect to a manual monitoring station in the LAT alcove. The system functioned by utilizing construction elements of the tank shell welds. James A. Gammon, Fuel Superintendent and Engineer from 1980 – 2004, explains the system's design as follows:

> "*To understand how the tell-tale leak detection system was designed to work you have to understand how the steel plates that line the tank walls were constructed. The* (b) *-inch-thick steel plates that formed the shell of the tank are rectangular in shape and were butt welded together. To ensure full penetration welds between plates, a backer strip was placed behind each vertical and horizontal butt weld. For the vertical butt welds, the backer strip was a piece of flat bar. For the horizontal butt*

welds, the backer strip was a piece of angle iron with one leg of the angle flush against the back side of the steel plates and the other leg embedded in the reinforced concrete surrounding the outside of the tank. Just above each horizontal butt weld, a small hole was cut through the (b) (3) (A) *-inch shell plate and a tee was installed to connect the hole through the shell plate to the vertical tell-tale pipe. In operation, if fuel leaked through the shell plate (or through a weld in the shell plate), it would run down the back side of the plate until it came to the leg of an angle iron embedded in the concrete that surrounds the tank. The fuel would then collect on the angle leg and begin to flow horizontally along the angle leg until it reached a hole cut through the shell plate, flowed through the hole and into the tee connected to the tell-tale pipe. The fuel would then flow down the tell-tale pipe to the Lower Access Tunnel to indicate that there was a leak."*

From the late 1940s through early 1970s, design flaws that precluded optimal operation of the leak detection system were identified, including the pipes being too narrow and prone to clogging, and corrosion from constant exposure to tank bottom water. These observations resulted in improvements to the tell-tale leak detection systems in Tanks 17-20 in the early 1960s and Tanks 5, 6, and 12 in the early 1970s. Improvements included increasing the diameter and wall thickness of the pipes to avoid clogging, extending the pipes up to the gauging gallery at the top of the tank for more comprehensive leak coverage, and re-directing the exit point of the pipes away from the tank bottom to avoid premature corrosion.

During the coating of Tanks 1-16 in the late 1970s – early 1980s, a design decision was made to remove the original tell-tale leak detection system. For Tanks 17, 18 and 20, the tell-tale leak detection pipes were to be removed during the next scheduled CIR. The tell-tale system was removed from Tanks 17 and 20 during 2010 and 2008 CIRs, respectively. The process entailed draining, disconnecting the pipes from the tank wall and removing the pipes from the tank interior, after which patch plates were welded over each tell-tale leak detection pipe attachment. At the time of defueling, Tank 18 was undergoing the first CIR since 1968 so it still had the original tell-tale leak detection system installed. The tank was pressure washed, and the tell-tale leak detection pipes were drained and removed from inside the tank, but work stopped prior to welding patch plates over the attachment holes. The holes from the legacy tell-tale leak detection pipes will be left open in Tank 18, unless pressure washing is required. The tell-tale leak detection system was not removed from Tank 19.

While the original tell-tale leak detection system design consisted of (b) (3) (A) vertical pipes, an inventory of tell-tale leak detection pipe protrusions in the LAT revealed some differences in the pipe number, diameter, and routing. Some of these differences are due to the previously mentioned improvement projects in Tanks 5, 6, 12, and 17- 20, but others are presumably due to other unknown efforts. Thirteen of the 20 USTs have (b) (3) pipe protrusions (Tanks 5, 7-11, 13-18, and 20) although the pipe diameter varies. Other tanks have either (b) (3) or (b) (3) pipe protrusions (Tanks 3, 4, and 19), and others appear to have (b) (3) (A) complete sets of tell-tale leak detection pipes (Tanks 1 and 2). The majority of the tell-tale leak detection pipe protrusions in the LAT were capped, which provides strong circumstantial evidence for the system being previously drained. NCTF-RH will field-verify each LAT tell-tale leak detection pipe protrusion to ensure that there is no residual fuel. This modification applies to Tanks 1-18 and 20. Tank 19 still has the complete legacy tell-tale leak detection system installed. The system will be drained and lines cut and capped in the LAT. The system lines inside Tank 19 be dismantled and removed from the tank interior.

Miscellaneous Pipe Protrusions in LAT. NCTF-RH has done a thorough inventory of all small and large legacy pipe protrusions in the LAT alcove for each tank. The function of some of these legacy pipes is not readily apparent but each will be confirmed empty and documented in the Tank Closure Tracking spreadsheet. This modification applies to all 20 USTs.

Table 5-1. Summary of Interior Tank Modifications for 6 OOS USTs

	Tank 1	**Tanks 13, 14, 17**	**Tank 18**	**Tank 19**	**Other Tanks**
Center tower repair	No	Yes	Yes	No	Yes
Tank interior: Remove fuel and sample lines	No	Yes	Yes	Yes	Yes
Tank interior: Remove instrument well	No	Yes	Yes	Yes	Yes
Tank interior: Tell-tale leak detection system	N/A	N/A	Plug holes if pressure washing is required	Remove pipes. No plug or patch plate.	N/A

Tank Venting System. Each tank was originally configured with an atmospheric venting pathway designed to allow for rapid air volume displacement during fuel movements into and out of a tank. The pathway begins with a (b) (3)-inch-diameter vent shaft in the concrete shell of the upper dome. The vent pipe then turns, traveling either through the concrete above the gauging chamber (Tanks 1-12) or inside the gauging chamber (Tanks 13-20), to curve down the side of the tank into the UAT side tunnel. From there, the pipe travels vertically through the side tunnel and under the alcove floor to join up with the main vent pipe running down underneath the UAT floor. Tanks 2, 3, and 19 have a vertical vent shaft that daylights at the Red Hill ridgeline via exhaust outlets (b) (3) (A) respectively. Each outlet provides vent egress for multiple tanks: (b) vents Tanks 1 and 2, (b) vents Tanks 3-16, and (b) vents Tanks 17-20. Tanks 3-16 are also vented via a (b) (3)-inch pipe manifold into the main vent line that discharges outside of (b) (3) Tanks 17-20 are also vented through an outlet on top of Utility (elevator) Shaft (b).

The original atmospheric venting pathway is almost entirely underground, extending from approximately (b) (3) (A) feet below ground surface up to a few feet below grade. The vertical vent pipes extending to the (b) (3) (b) (3) (A) ridgeline exhaust outlets trace a path from the tanks to bombproof slabs, through a bombproof vent outlet to an adjacent surface vent pit that is (b) (3) (A). The bombproof slabs, vent outlets and surface pit are made of (b) (3) (A). The vent outlet has (b) (3) (A) foot diameter ventilation openings and (b) (3) (A) foot, (b)-inch diameter opening with a manhole cover that connects to the surface pit. The surface pit has a (b) (3)-inch-thick slotted concrete cover slab that has (b) (3) (A) vent slots measuring (b)-inches by (b) (3)-inches and spaced (b) (3)-inches on center. The cover slab also has a removable concrete lid to access the pit, and the entire slab is sheltered by a gable-roofed corrugated-metal shelter that is (b) (3) (A).

There have been no significant improvements to the original design of (b) (3) (A), but the change in service for Tanks 17-20 to volatile fuel storage in the 1960s prompted several modifications to (b) as well as to the un-numbered vent structure on top of Utility Shaft (b). Originally constructed in the 1960s as part of both the tank vent and tunnel exhaust system, the Shaft's vent structure was dedicated to venting only Tanks 17-20 in 2014. Tank exhaust piping and conduit extend up through Utility Shaft (b) and into a (b) (3)-foot long by (b) (3)-foot wide by (b) (3)-foot-high vent structure constructed of reinforced concrete that is partially below grade. The roof structure is (b) (3)-inch-thick concrete and surrounded by an (b)-foot-wide parapet that varies in height in accordance with the slope of the hillside. The shelter is open on the (b) (3) (A) side and affixed with a removable screen of metal mesh and covered with a metal roof.

In preparation for degassing, a short section of spool from the (b) (3)-inch diameter tank ventilation shaft in the UAT alcove will be removed and set aside. After degassing is completed, this spool will be placed back in line and the atmospheric vent shaft valve will be set to the open position. This modification applies to all 20 USTs. No modifications are planned for the ridgeline vent structures, and they will be abandoned in place as

currently configured. All forced air ventilation in the tanks will cease after cleaning is complete. NCTF-RH does not anticipate the accumulation of vapor inside the tanks. With the completion of the Defueling Phase and subsequent degassing and cleaning, all significant remaining vapor sources are gone. To address any residual vapor sources, all piping abandoned in place will be confirmed empty and patch plates have been welded over the legacy tell-tale leak detection pipe system connection points through the tank shell to eliminate vapor intrusion from any residual fuel that may remain behind the tank shell. The legacy tell-tale leak detection pipe holes in Tank 18 will be covered or plugged during tank cleaning, if required. PID readings taken in the LAT plenum enclosing the (b -inch valve for Tanks 5, 6, 7, and 8 detected no VOCs even before the tanks were cleaned.

Although the primary driver of vapor movement is gone, the tanks will be closed with several pathways remaining available to support air movement into and out of the tanks. The open atmospheric vent shaft will provide a permanent pathway for air movement, and the tanks will also be able to 'breathe' into the tunnels through the permeable UAT manway hatch and the LAT nozzle as described above. The tunnel ventilation will remain active for the foreseeable future, diluting any passive vapor diffusion from the tanks and providing a safe working environment for ongoing projects. Figures 5-1 and 5-2 below provide detailed drawings of the proposed tank venting closure configuration for closure, and a comparison of tank and tunnel vent pathways.

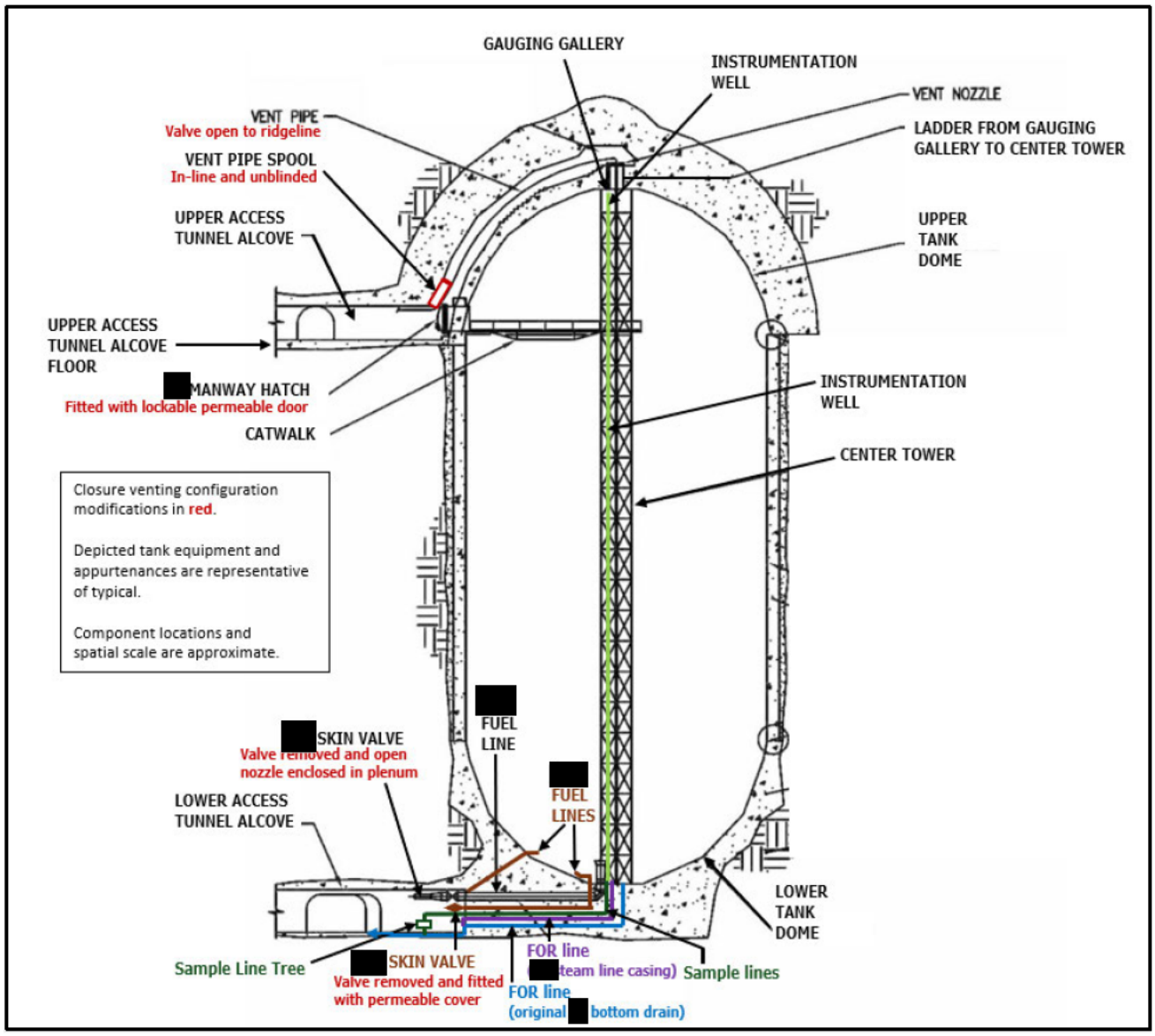


Figure 5-1. Tank Venting System Closure Configuration

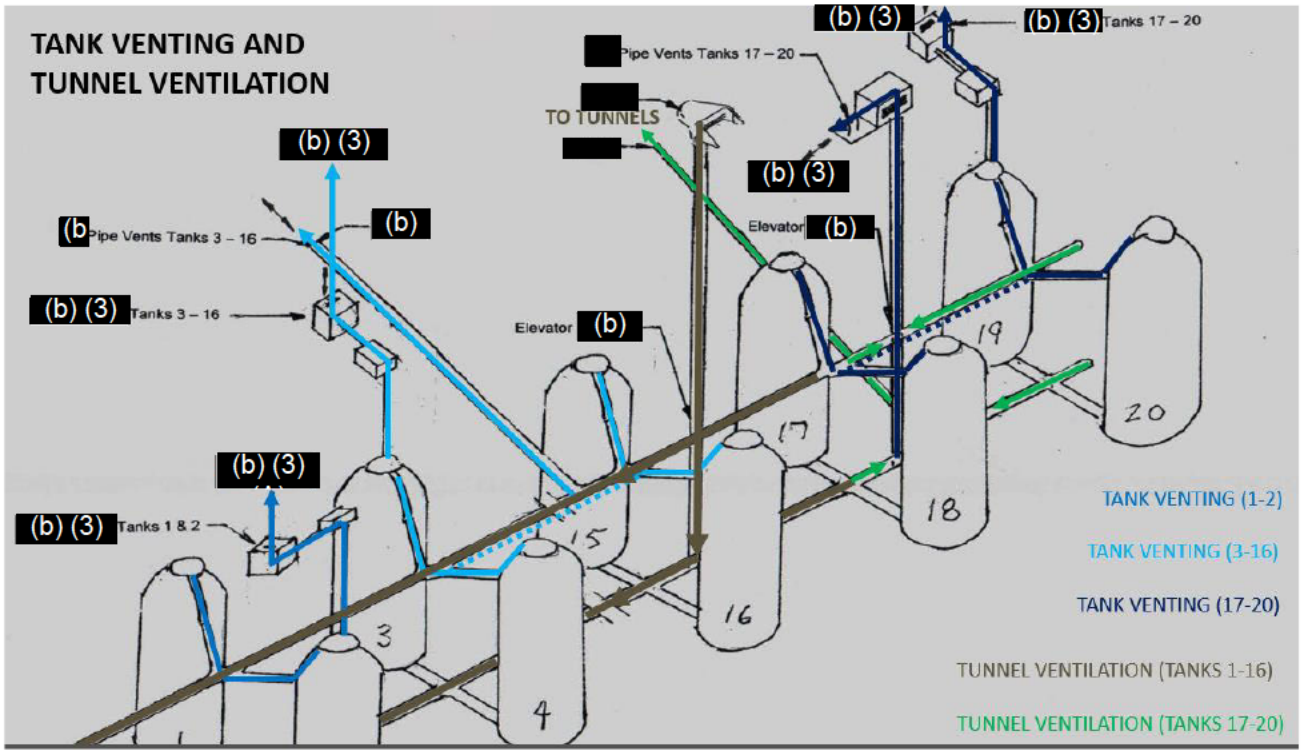


Figure 5-2. Tank and Tunnel Venting Pathways

5.2 Surge Tanks

In TCP Supplement 2, NCTF-RH proposed permanent closure of the surge tanks by filling them with an inert material. After further consideration and in consultation with DOH and EPA, NCTF-RH requested to close the surge tanks in place without fill in accordance with HAR §11-280.71(c)(2) and the 2023 ACO. On September 26, 2024, NCTF-RH submitted the draft memorandum *Structural Considerations for Decommissioning of Surge Tanks at Underground Pump House, Joint Base Pearl Harbor-Hickam, Hawaii* by email for informal regulatory agency review. On October 3, 2024, NCTF-RH submitted a formal memorandum requesting approval to close the surge tanks without fill. DOH and EPA provided comments on October 31, 2024, and November 14, 2024, respectively. NCTF-RH submitted a formal response to comments on February 20, 2025, with the revised, final memorandum *Structural Considerations for Decommissioning of Surge Tanks at Underground Pump House, Joint Base Pearl Harbor-Hickam, Hawaii,* dated November 12, 2024, with revisions on January 27, 2025, enclosed. The memorandum is also included with this Supplement 4 as enclosure 4.

NCTF-RH contends that structural fill is not necessary to ensure safe closure in place for the surge tanks. However, after exploring the hard-set foam as an alternative for tank gallery header pipe closure, NCTF-RH acknowledges that this may also be a viable closure alternative for the surge tanks. After conducting a full cleaning, NCTF-RH will collaborate with the RAs to determine whether filling the surge tanks is necessary for environmental protection.

The four surge tanks (ST-1-4) are much simpler in design than the 20 USTs. Each tank is comprised of a single, cylindrical compartment encased in a reinforced concrete shell, with a capacity of approximately 420,000 gallons. The interior tank shell is lined with [redacted]-inch steel plates. The tanks are accessible from the surge tunnel via a gauging platform and a manway. Regardless of closure method, the surge tanks will undergo the physical modifications described below.

Gauging Gallery and Instrumentation Systems. The gauging gallery is a small space above each surge tank that contains legacy fuel level gauging equipment. The gallery is accessible via a metal staircase that extends vertically up the front (surge tunnel-facing) side of the tank. Several types of liquid level gauges have been utilized throughout the operational history of the tanks, including a [redacted]-inch stilling well for a floating tape gauge/Varec probe, and an [redacted]-inch diameter stilling well with an ATG. The stilling well extends up from the tank floor, through the gauging gallery floor where it connects to the gauge assembly. All gauging instrumentation will be removed, and any associated instrumentation wells will be cut down as close to flush with the tank floor as practicable. The pipe stub will be capped and all disconnected pipes removed from the tank interior. All hatches and ports in the gallery floor will be sealed in a manner that allows them to be re-opened for future use (e.g. threaded cap so the tank can be inspected by dropping in a camera or measuring device). This modification applies to all four surge tanks.

Manway. A [redacted]-inch diameter manway is located toward the top right of the surge-tunnel-facing entrance of each surge tank. The manway will be re-covered in a manner to be determined. This modification applies to all four surge tanks.

Tank Shell. The tank shell liner will be cleaned in accordance with the approved Tank Cleaning Verification Plan. The shell liner will be abandoned in place. This modification applies to all four surge tanks.

Fuel Pipe with Diffuser. As described in Section 3.2, , each surge tank was air gapped by removing a spool from the fuel line just before it entered the tank. The remaining segment of fuel pipe inside the tank extends through the tank face underneath the tank floor, elbowing up to the diffuser that is affixed to the tank floor. This pipe segment will be verified dry and abandoned in place. The diffuser will be opened, confirmed dry and removed. These modifications apply to all four surge tanks.

Tank Venting. Each tank is equipped with a [redacted]-inch atmospheric vent line that extends from the top of the tank shell to a candy cane-style vent located at ground level above the tanks. The venting pathway will be plugged inside the tank in a manner to be determined. This modification applies to all four surge tanks.

6. Historic Connections to RH UST System

Since its construction in the 1940s, new equipment and piping has been added to the RHBFSF UST system to support dynamic operational requirements. Accounting for the status of all historical connections is necessary to state with certainty that all potential fuel sources have been removed. Over the last 20 years, several projects have focused on identifying and removing legacy out-of-service and/or abandoned equipment and piping that was historically connected to the UST system in the tank gallery and the Adit 3 tunnel areas. NCTF-RH presents a determinant summary of these efforts below.

6.1 Former Slop System for Tanks 17-20 and AVGAS line to Pearl City Annex

In the early 1960s, a dedicated slop system was installed to facilitate the removal of oily wastewater generated from periodic tank and pipeline cleaning for Tanks 17 and 18 (which had recently been converted to JP-5 service) and Tanks 19 and 20 (which had been recently converted to AVGAS service). The former slop line system started in Zone 7 and terminated at a 5,000-barrel aboveground slop tank (TK 355) located approximately [redacted] feet [redacted] of Adit 6. Zone 7 encompasses the area in the LAT around Tanks 17-20. After fuel was separated from the water (AVGAS from approximately 1963 to the mid-to-late 1960s, and exclusively JP-5 thereafter), the water was emptied into South Halawa Stream via two outfalls, and the fuel was pumped to a nearby loading stand, where it was loaded onto a truck via aboveground piping for offsite disposal (Earl and Wright 1962).

The [redacted]-inch, JP-5 slop system in Zone 7 drained oily washwater from Tanks 17 – 20 through individual [redacted]-inch slop lines from each tank, that converged into one, [redacted]-inch line before being pumped up Utility Shaft [redacted] and through an access way inside the Adit 6 tunnel. The [redacted]-inch pipe drops below grade through the concrete slab approximately [redacted] feet from Adit 6, emerging above ground outside Adit 6 where it connected to a [redacted]-inch aboveground pipe that drained to the slop tank. The [redacted]-inch slop line system was also equipped with a pig launcher, a surge tank, and various connecting water pipes to facilitate tank and pipe cleaning.

The [redacted]-inch AVGAS slop system transported both AVGAS and oily washwater from Tanks 19 and 20 to the Pearl City Annex. There was a connecting pipe that allowed diversion of oily waste to the Red Hill slop tank but typically anything in the [redacted]-inch line went to Pearl City Annex. From Zone 7, two parallel [redacted]-inch pipes connected, and the contents were pumped up the Utility Shaft [redacted], through an access way inside the Adit 6 tunnel, and continued underground out to the Pearl City Annex. The [redacted]-inch line system was also equipped with a pig launcher and various connecting water pipes to facilitate tank and pipe cleaning.

The slop tank was demolished and removed from the site in 2009, and all pipe and equipment removal was completed in 2011-2012. After draining, the [redacted]-inch slop pipe was blind flanged at the Utility Shaft [redacted] doorway in the Adit 6 tunnel and closed with a pipe plug approximately [redacted] feet below at the base of the Utility Shaft [redacted] in Zone 7. The [redacted]-inch pipe segment from the Utility Shaft [redacted] doorway to the connection point with the [redacted]-inch pipe outside of Adit 6 was confirmed empty and abandoned in place. In Zone 7, all [redacted]-inch slop piping was removed, along with the [redacted] GPM pump, the [redacted]-gallon surge tank, the [redacted]-inch line pig launcher, and all associated water pipes.

After AVGAS storage was discontinued at the Facility in the late 1960s, the AVGAS line from Red Hill to Pearl City Annex was abandoned in place. In 2004, this section of abandoned line was pigged using the [redacted]-inch pig launching system in Zone 7. After pigging, the line was disconnected from the RH UST system at valve chamber [redacted]. In 2011-2012, the [redacted]-inch pipes in Zone 7 were drained and blinded at the base of the Utility Shaft [redacted], and the remaining [redacted]-inch pipes were removed along with the [redacted]-inch line pig launcher and all associated water pipes.

6.2 Former Slop System for Tanks 1-16

In the 1960s, a tank cleaning system including approximately 5,600 feet of [redacted]-inch water pipeline, a transfer pump, and waste oil tank S311 was installed for Tanks 1-16. The pipe ran from Tank S311 through the Adit

3 tunnel and extended into the LAT up to Tank 16. After being cleaned and abandoned in 2002, the pipeline and transfer pump were removed in 2011-2012. Tank S311 is still used for slop oil service, and receives tank washwater via the existing FOR line and main sump in the LAT.

The following reports contain additional details around the cleaning, removal, and disposal of the historical connections discussed above, as well as information on removal of other equipment that did not contain fuel and/or were not connected to the RH UST system, and will be included in TCP Supplement 4 as enclosures 5, 6 and 7:

- *Cleaning and Abandonment of Cross-Country Pipelines, PRL 03-13, Pearl Harbor, Hawaii, Revision 0, January 2005*
- *Demolish JP-5 Slop Tank at the Red Hill Fuel Facility, Fleet and Industrial Supply Center, Pearl Harbor, Hawaii, Revision 0, April 2009*
- *Demolish Abandoned Tank Cleaning Water Piping and JP-5 Pipeline and Appurtenances; RED HILL BULK FUEL STORAGE FACILITY, NAVSUP, FLEET LOGISTICS CENTER, JOINT BASE PEARL HARBOR-HICKAM, HAWAI'I, June 2012*

7. Post-Closure Tank Monitoring

NCTF-RH intends to execute a risk-based, post-closure monitoring strategy that leverages existing environmental monitoring efforts and engineering controls to anticipate and detect any contamination risks. Routine internal inspections of the tanks will not be conducted. There is no regulatory requirement or known precedent for conducting internal inspections of closed fuel storage tanks, including the Record of Decision/Response Action Memorandum approved by DOH on February 3, 2012, for the Kipapa Gulch Fuel Storage Annex at Hickam Air Force Base. Federal regulation 40 CFR 280 (Underground Storage Tanks) emphasizes environmental sampling (e.g. groundwater monitoring, soil vapor probes) as a primary monitoring tool rather than internal inspections for out-of-service tanks. NACE standard SP0193 (External Corrosion Control of On-Grade Carbon Steel Storage Tank Bottoms) highlights external corrosion monitoring techniques that do not require intrusive inspections.

Post-closure entry into closed fuel tanks also presents multiple safety and logistical concerns. Significant operational planning would be needed to coordinate personnel entry, in addition to the extensive specialized training (e.g. confined space, fall protection) and equipment required. The tanks will not be actively ventilated post-closure and without forced ventilation through the entire tank profile, tanks could become oxygen-deficient, which presents a serious and unnecessary health risk. Over time, interior catwalks, ladders, and platforms will deteriorate, increasing risks to personnel. Safely deploying access systems such as booms and baskets requires a maintenance and inspection program for the center tower and catwalk, which is not consistent with abandoning the tanks in place. Should the need for an internal inspection arise, visual inspections can be conducted via the gauging gallery or by other means such as camera or drone deployment.

The RHBFSF USTs were designed with a robust intrinsic containment system that significantly limits the potential for fuel migration. This includes any potential contaminant of concern that may remain on or detach from the shell liner, or any fuel that may be trapped between the liner and the concrete shell. The tanks are embedded within dense basalt rock, which acts as a natural geological barrier. The bedrock (basalt) sides of the tank excavation were coated with approximately [redacted] inches of Gunite to bind loose rock and provide additional stability. After the reinforced concrete shell was poured and cured, the space between the concrete and the Gunite-coated bedrock was filled with pressure-treated grout. The grout served several purposes, including sealing ‘cold joints’ in the concrete shell, filling in gaps between the bedrock and concrete, and pre-stressing the tank structure with a compressive force would counter the force of hydrostatic pressure when the tank was eventually filled with fuel. Inside the tank, a steel liner consisting of welded sections of [redacted]-inch steel plates in the cylinder and domes, and [redacted]-inch steel plate on the tank floor, was affixed to the concrete. A solid plug of concrete approximately [redacted]-feet high and [redacted]-feet long underneath the tank floor stands between the tank and the top of the basal groundwater layer located a minimum of [redacted] feet below. With the fuel removed from the tanks, the head pressure required to push liquid vertically through the subsurface has been eliminated. The Seismic and Geotechnical Hazard (SGH) report *Long Term Structural Integrity of the Red Hill Underground Storage Tanks* issued May 26, 2023, indicated that the tanks remain structurally stable, with no evidence to support significant degradation of steel or concrete within the next 50 or 300 years, respectively. The report concluded that an extreme earthquake event, defined as a ‘once every 10,000 years’ event, and typically only considered for critical infrastructure such as a nuclear power plant, would not impact the tanks. Thus, it is reasonable to conclude that the tank’s containment capability will not be compromised in the reasonably foreseeable future.

DOH and EPA have expressed concern around the potential for top-side groundwater intrusion to accelerate backside (e.g. backside of the steel liner) corrosion. While moisture accumulation could contribute to localized corrosion over time, any corrosion byproducts would remain trapped between the steel liner and concrete shell. The lack of an external migration pathway means that any corrosion-generated material would not reach the surrounding environment. Additionally, should backside corrosion progress to the point where the steel liner was degraded, any released material would drain into the tank’s interior, where it would be captured by the FOR line bottom drain, effectively containing any potential contaminants of concern.

Extensive environmental monitoring has been, and continues to be, conducted within the RHBFSF facility boundary and beyond, providing an ongoing picture of any migration of contaminants of concern. Soil vapor probes installed at multiple depths (~5' and ~20') below each UST have been monitoring hydrocarbon vapors monthly since 2006. Data from these probes show no increasing trends, indicating that any fuel that might be trapped behind the tank shell is not actively migrating through the subsurface. An extensive and expanding network of over 45 groundwater monitoring and sentinel wells provides data on contaminant movement. To date, no significant hydrocarbon detections suggestive of new contaminant migration have been observed near the tanks. Groundwater flow modeling supports the conclusion that if any residual fuel were to migrate, it would be detected by the existing well network before reaching a potential receptor. The Natural Source Zone Depletion (NSZD) pilot study completed in 2017 confirms that natural attenuation processes are actively degrading hydrocarbons over time, further reducing any long-term risk. These lines of evidence collectively demonstrate that there is no active migration of legacy fuel trapped behind the tank shell, further supporting the decision to not monitor the interior of the tanks.

Initial testing of the temperature and humidity inside of Tanks 3 and 13 confirmed stable environmental conditions. The average interior ambient temperature is approximately 10°F above the dew point which makes the formation of condensation extremely unlikely. Additional testing of the environmental conditions inside of Tanks 7 and 8 is planned for the near future. Although these data suggest that de minimis amounts of moisture will be generated inside the tanks, NCTF-RH still plans to implement several engineering controls to minimize moisture accumulation. In Section 5, NCTF-RH discussed the use of the FOR line to capture any intrusive water, corrosion, or contaminants of concern. Each FOR line drainpipe will be modified on a tank-by-tank basis to minimize standing water. The FOR line will remain open at all times to continuously route effluent through the main sump to Tank S311. NCTF-RH intends to coordinate continued inspections and maintenance of the FOR line and Tank S311, or any replacement tank effluent routing pathway, for the foreseeable future. Tank effluent will be tested for a representative suite of analytes prior to disposal, and any exceedance(s) will prompt NCTF-RH to re-evaluate the need for interior visual monitoring. As effluent from all 20 USTs will be combined in Tank S311, it will not be possible to determine which tank is responsible for the exceedance. Therefore, any instituted interior monitoring program will be implemented for all tanks.

Another planned engineering control is to test all tank effluent for chromium, a component of coating primers used in the first two legacy coating systems inside the RH USTs. Over the last 80 years, the interiors of the 20 USTs and the four surge tanks have been coated using several different coating systems. The purpose of the coating is to protect the steel liner from corrosion and to provide an additional barrier to fuel movement beyond the tank interior. After initial construction was completed in the early 1940s, all tanks remained uncoated until the early 1960s. The first applied coating was a 4-step, thin-film polyurethane system developed by Naval Research Laboratories (NRL) which was applied to the entire interior of Tanks 17-20 and the four surge tanks from 1961-1965 and in 1978, respectively. This coating system was comprised of a polyvinyl coat wash primer, a polyurethane primer, an intermediate coating and a polyurethane top coat. The polyurethane primer contained zinc chromate and the intermediate coating contained chromium oxide green pigment. In the early 1980s, Tanks 1-16 were entirely coated with a slightly modified formulation of the original NRL coating, which substituted isopropyl alcohol for ethyl alcohol in the wash primer. Prior to applying the coating, a flame-sprayed layer of aluminum was applied to most of the tank bottoms and the first few feet of the lower tank domes (Tanks 3 and 4 excepted). At the time, it was thought that the coating would adhere better to the porous aluminum in the presence of tank water. Over time, it was discovered that the aluminum interacted with the steel to form aluminum oxide, causing the disbondment of the coating from the steel plates on the tank bottoms. Over the next 30 years (1985-2015), the flame-sprayed aluminum and the coating on top of it was removed with abrasive blasting during scheduled CIRs and other maintenance, and replaced with a new, chromium-free coating system comprised of a two-part epoxy with fluoropolyurethane topcoat. From 2016-2021, a new two-part, chromium-free low-VOC polysulfide (PMNE) coating was utilized during CIR for coating repairs in the lower dome and extension ring areas. In 2021,

surge tanks 1, 3, and 4 had the original 1978 coating removed and were recoated with the PMNE system. A history of coating system utilization and CIRs is included as enclosure 8.

Although the chromium has been removed from the lower dome and floor of all 20 USTs except for Tanks 1 and 19, the barrels and upper domes still retain the original coating system. The condition of the coating varies from tank to tank and also between areas within the tank. As a general rule, it is still in good condition and appears well-adhered and intact in the upper dome and barrel regions, while the coating on the tank floor and first few courses of the barrel has not fared as well. Although the expected life of a coating is speculated to be approximately 20-25 years, an inspection completed in 1998 on Tank 19's original coating found it to be in excellent condition after 37 years, the last 12 years of which the tank was empty. These coating systems are designed to be submerged in fuel, so the fact that the coating was still considered to be in excellent condition after being dry for 12 years supports the likelihood of the coating remaining functional and well-adhered to the tank shell for the foreseeable future. The 2008 CIR report for Tank 20 noted "…the lower dome has approximately 40% coating failure with exposure of the tank steel liner...tank barrel section…noted to have smaller areas of coating failure…upper dome…noted to have the best areas of coating with only minimal failure". At the time of the inspection, the original coating had been in place for 48 years. A 2012 coating inspection of Tank 17 noted, "Coating in fair condition. Small areas have disbonded flaked or deteriorated over the majority of the internal surface. The Lower Dome and floor are in poor condition". At the time of the inspection, the original coating had been in place for 50 years.

In the event that detached coating is discovered inside of the tanks during cleaning, the coating will be collected, removed, and disposed of in accordance with all applicable environmental regulations. Should any additional coating detach from the tank shell liner after cleaning is completed, it will either remain on the tank bottom or be entrained in drainage through the FOR line and transported to Tank S311. In either scenario, it does not pose a risk to the environment. Nevertheless, NCTF-RH will test tank effluent for chromium to monitor for coating degradation. If an exceedance is noted, NCTF-RH will add chromium testing to the groundwater sampling analytical testing profile.

The proposed monitoring strategy ensures environmental protection while avoiding unnecessary and hazardous internal tank inspections. By leveraging existing environmental monitoring networks, engineering controls, and effluent sampling for early detection of contaminants of concern, NCTF-RH's post-closure tank monitoring plan provides a scientifically supported, risk-based strategy to safely and permanently close the tanks.

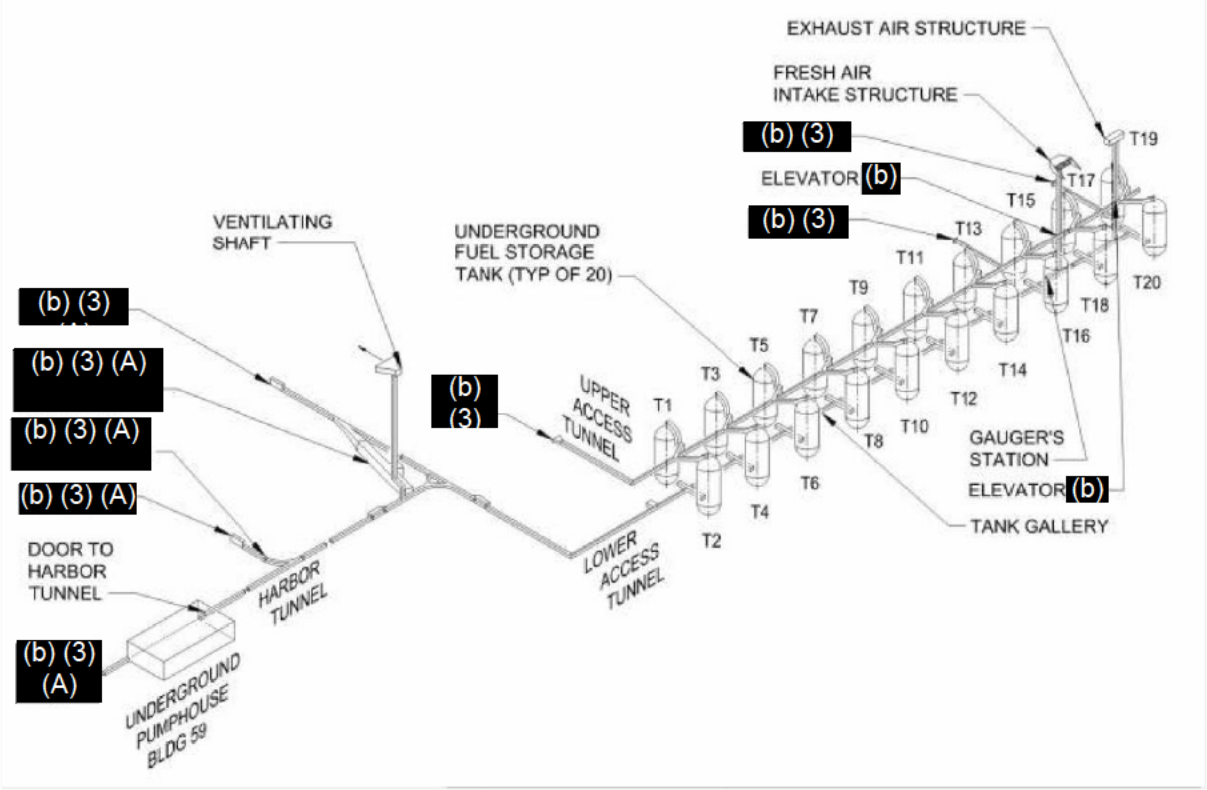
8. Conclusion

The DON, in collaboration with federal, state, and community stakeholders, is committed to the successful permanent closure of the 20 RH USTs, four surge tanks, and associated pipelines. The DON will continue to work with DOH and the EPA to implement the permanent closure of the RHBFSF in a manner that complies with the 2022 Superseding EO, 2023 ACO, and all applicable laws and regulations. Concurrent with the tank closure efforts, the DON will continue to implement existing long-term monitoring and release response actions to address risk to public health and the environment. NCTF-RH is also working to scope future efforts to reduce or remove tunnel system infrastructure that is no longer needed once the tanks are permanently closed.

Appendix A: Updated Plan of Action and Milestones

Target Month	Responsibility	Milestone or Deliverable
NOV 2022	SECNAV	TANK CLOSURE PLAN SUBMITTAL
DEC 2022	CNRH	NOTICE OF INTENT TO CLOSE UNDERGROUND STORAGE TANKS (30 DAYS BEFORE CLOSURE COMPLETE)
	NAVFAC PAC	PROVIDE 3RD PARTY ANALYSIS OF ALTERNATIVES FOR CLOSURE TO DOH
JAN 2023	CNRH	BENEFICIAL REUSE ENGAGEMENT
FEB 2023	CNRH	TANK CLOSURE PLAN SUPPLEMENT 1
MAR 2023	CNRH	PUBLIC STAKEHOLDER ENGAGEMENT
APR 2023	NAVFAC HI	STRUCTURAL ANALYSIS COMPLETED
MAY 2023	CNRH	TANK CLOSURE PLAN SUPPLEMENT 2
JUN 2023	CNRH	PUBLIC STAKEHOLDER ENGAGEMENT – FTAC
JUL 2023	NAVFAC EXWC	CONTRACT AWARD – TANK CLEANING
NOV 2023	CNRH	PUBLIC STAKEHOLDER ENGAGEMENT – FTAC, PUBLIC OUTREACH RESULTS
	NAVFAC HI	DRAFT SAMPLING AND ANALYSIS PLAN
FEB 2024	SECNAV	BENEFICIAL NON-FUEL REUSE REPORT SUBMITTED TO CONGRESS AND REPORT AVAILABLE TO PUBLIC
JUN 2024	CNRH	PRESS RELEASE (SEMI-ANNUALLY AS NEEDED DURING CLOSURE)
	NAVFAC HI	TANK CLOSURE PLAN SUPPLEMENT 3 (SITE ASSESSMENT WORK PLAN)
	NAVFAC HI	TANK CLEANING BEGINS – TANK GALLERY
SEP 2024	NAVFAC HI	SURGE TANK AIR GAPPING
JAN 2025	NAVFAC HI	PIPE REMOVAL PREPARATION BEGINS
FEB 2025	CNRH	TANK CLEANING WEBINAR
MAR 2025	CNRH	PRESS RELEASE – OPERATIONAL UPDATE
JUN 2025	CNRH	INTERIM TANK CLOSURE REPORT: TKS 7 AND 8
NLT MAY 2026	NAVFAC HI	FIRST PIPE OUT OF TUNNEL
NLT JUN 2026	NAVFAC HI	SURGE TANK CLEANING BEGINS
EST MAY 2027	NAVFAC HI	PIPELINE REMOVAL COMPLETE
NLT AUG 2028	NAVFAC HI	ALL TANK CLEANING COMPLETE
NLT SEP 2028	CNRH	LAST INTERIM CLOSURE REPORT SUBMITTED
EST DEC 2028	CNRH	FINAL CLOSURE REPORT SUBMITTED

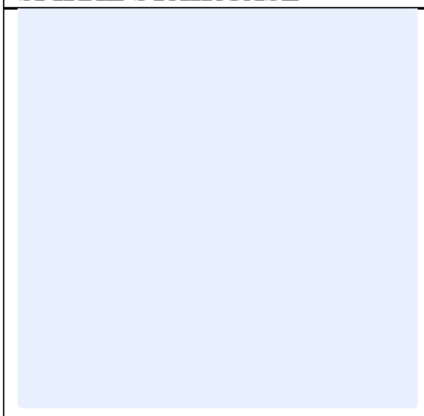
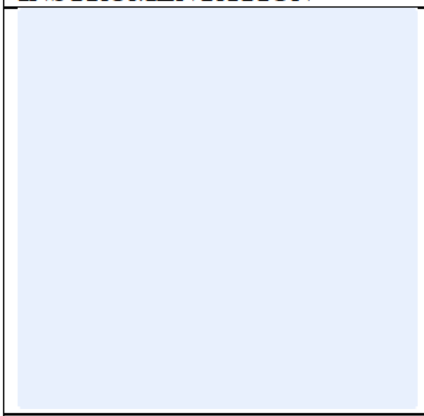
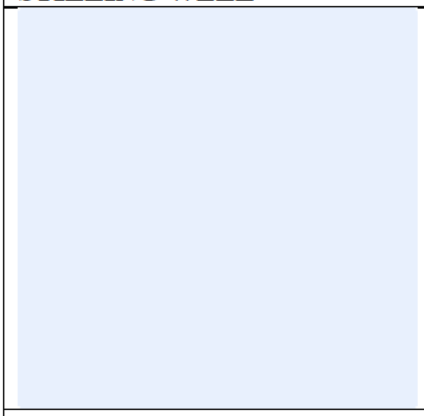
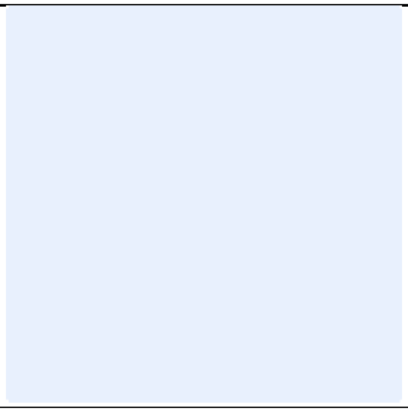
Appendix B: Overview of Red Hill Bulk Fuel Storage Facility



Appendix C: Tank Closure Checklist (with partial photo log)

TANK #	**Date**
Tank Cleaning	
Degassing completed	
Sludge removal completed	
Pressure washing completed	
Final Tier 1 Quality Control Inspection (APTIM)	
Final Tier 2 Quality Assurance Inspection (NCTF CM/ET/QV)	
Tier 3 Quality Validation by AAMP (NACE) Inspector	
Tank Cleaning QV report submitted	
Submittal of Cleaning QV Report	
Regulatory Agency approval of Cleaning QV Report	
Closure Tasks in Tank Interior	
Spiral staircase removed to the extent needed	
Instrumentation removed	
Stilling well cut and removed	
(b) (3) line and diffuser above tank floor cut and removed	
(b) (3) line between tank floor and LAT confirmed dry	
(b) (3) line above tank floor cut and removed. Stub capped	
(b) (3) line between tank floor and LAT confirmed dry	
Auxiliary (b) (3) line conduit confirmed dry. (TKs 5, 6, 12 only)	
(b) (3) line conduit confirmed dry. (TKs 17, 18, 19, 20 only)	
FOR line modification (TKs 5 and 6 - others pending future eval)	
Sample lines inside tank drained, cut and removed. Stubs capped.	
Closure Tasks in UAT	
(b) vent spool replaced; Vent line valve opened	
Steel manway hatch door installed	
Closure Tasks in LAT	
Plenum constructed	
(b) (3) line blinded	
Small legacy lines (b) confirmed dry	
Large legacy lines (b) (3) confirmed dry	
Miscellaneous legacy lines confirmed dry	
Sample lines cut and capped. Lines and tree removed.	

PHOTO LOG

SPIRAL STAIRCASE	
	
BEFORE	AFTER
INSTRUMENTATION	
	
BEFORE	AFTER
STILLING WELL	
	
BEFORE	AFTER