**BOARD OF WATER SUPPLY**

CITY AND COUNTY OF HONOLULU
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October 22, 2019

Mr. Omer Shalev
EPA Red Hill Project Coordinator
United States Environmental Protection Agency
Region IX
75 Hawthorne Street
San Francisco, California 94105

and

Ms. Roxanne Kwan
Solid and Hazardous Waste Branch
State of Hawaii
Department of Health
2827 Waimano Home Road
Pearl City, Hawaii 96782

Dear Mr. Shalev and Ms. Kwan:

Subject: Comments of the Honolulu Board of Water Supply on United States Department of the Navy's "Red Hill Bulk Fuel Storage Facility Administrative Order on Consent Tank Upgrade Alternatives and Release Detection Decision Document" dated September 2019 as per Red Hill Bulk Fuel Storage Facility Administrative Order on Consent Statement of Work Sections 3 and 4

The Honolulu Board of Water Supply (BWS) has reviewed the above-referenced United States Department of the Navy (Navy) report (Navy, 2019a) and offers the following comments. Please note that the BWS has submitted letters in the past commenting on various Tank Upgrade Alternative (TUA) documents submitted by the Navy under Red Hill Bulk Fuel Storage Facility (RHBFSF) Administrative Order on Consent (AOC) Section 3 (BWS, 2015a; BWS, 2015b; BWS, 2015c; BWS. 2016a; BWS, 2016b; BWS, 2016c; BWS, 2016d; BWS, 2016e; BWS, 2017a; BWS, 2017b; BWS, 2017c; BWS, 2017d; BWS, 2017e; BWS, 2017f; BWS, 2017g; BWS, 2017h; BWS, 2017i; BWS, 2017j; BWS, 2017k; BWS, 2018a; BWS, 2018b; BWS, 2018c; BWS, 2018d; BWS, 2018e; BWS, 2018f; BWS, 2018g; BWS, 2019a; BWS, 2019b; BWS, 2019c; BWS, 2019d; BWS, 2019e; BWS, 2019f; BWS, 2019g; BWS, 2019h). We are referencing these past letters as they provide context and historical perspective to our comments contained herein.

**General Comments on the Navy's TUA Selection**

On behalf of the nearly one million people living in and around the City and County of Honolulu across the island of Oahu who depend upon us for clean drinking water, the BWS urges the United States Environmental Protection Agency (EPA) and Hawaii Department of Health (DOH) (collectively, "Regulatory Agencies") to reject the Navy's preferred single-wall TUA selection. The analysis proffered by the Navy in its Tank Upgrade Alternatives and Release Detection Decision Document (TUA Decision Document) fails to meet the requirements of federal and state law and the AOC and, therefore, cannot be approved by the Regulatory Agencies. The BWS recommends that the Regulatory Agencies take the only action which, based on available data, can be shown to meet these regulatory requirements and require that the Navy relocate the RHBFSF tanks away from our irreplaceable sole-source groundwater aquifer or upgrade them with secondary containment.

The Navy's proposal to retain the existing single-walled tanks and current practices at the RHBFSF (TUA Option 1A), the least expensive and least environmentally protective of the six TUA options, does not provide adequate safeguards against future fuel releases into our critical drinking water resources. The few additional improvements proposed by the Navy are, for the most part, either reactionary forms of release detection and monitoring that fall short of preventing future releases or vaguely-defined pilot projects that are neither proven nor certain. Rebranding the status quo as "double wall equivalency" or calling it secondary containment does not make it so. The Navy's preferred single-wall TUA is nowhere near equivalent to the actual secondary containment provided by a tank-within-a-tank structure (TUA Option 3A) that would prevent leaks from reaching the environment. Further, the Navy has failed to conduct any meaningful comparison between the impacts associated with TUA Option 1A and TUA Option 3A as required by the AOC.

The Regulatory Agencies have long made clear that the Navy's TUA Decision Document "must include ample justification supporting the Navy's tank upgrade proposal" (EPA and DOH, 2018a). The Navy's TUA selection falls far short of this threshold requirement. Sound science and robust technical analysis must inform any TUA decision, which is currently not possible given that critical AOC analyses necessary to inform a TUA decision have not been completed or approved. Where AOC deliverables are complete, the Navy's interpretation of the data and analyses generated are not conservative, often unsupported, and result in unwarranted assumptions that cannot be used to support a single-wall TUA. There is simply not enough known about the potential fate of releases from the RHBFSF to support moving forward with essentially the same tank inspection, repair, and maintenance practices in place now. In the absence of such data, any TUA decision must be conservative and include more stringent requirements for future operations at the RHBFSF to prevent releases. The proposed TUA Decision Document does not meet these requirements.

The factual and technical record is clear — the likelihood of chronic leaks and potentially catastrophic releases from the RHBFSF tanks are unacceptably high and these risks cannot be sufficiently mitigated by the Navy's current or proposed inspection, repair, and maintenance practices. Laboratory analysis of steel liner samples collected from Tank 14 prove corrosion that leads to through-wall holes is taking place on the side of the liner that the Navy cannot inspect or maintain. This laboratory testing also shows the Navy's ability to find and repair areas of the tank before leaks develop is unreliable, inaccurate 50% of the time, and both over and underestimates the remaining thickness of the tanks' steel liner. Based on these results, the Navy is almost certain to miss locations in the RHBFSF tanks that should be repaired and

could result in releases caused by through-wall corrosion. A risk assessment report prepared by the Navy's own consultant concludes that we can expect greater than a 27% probability of an acute, sudden release of up to 30,000 gallons each year and chronic, undetected fuel releases of 5,803 gallons per year, facility-wide. There is simply no way to justify exposing a critical and irreplaceable drinking water resource to this level of risk. Further, it is clear that the Navy's preferred single-wall TUA cannot be lawfully approved given that it does not satisfy the mandate of Hawaii Revised Statues 342L-32(b) that the RHBFSF tanks must be upgraded to prevent releases for their operational life or the AOC requirement that the Navy select a tank upgrade that prevents releases into the environment. Neither can the Navy modeling work accurately predict where releases from the RHBFSF will go. As the Regulatory Agencies have noted, the Navy's interim groundwater flow model does not reflect conditions measured in the field, including the data collected to date which suggests that a component of groundwater flows from the RHBFSF to the northwest toward the BWS' Halawa Shaft. These important AOC deliverables clearly demonstrate that the existing single-wall tanks at the RHBFSF cannot be operated and maintained in an environmentally protective manner and are not sufficiently protective of our critical drinking water resources. There is no rational connection between the data and analyses in the record and the Navy's TUA selection.

Relocating the RHBFSF tanks or upgrading them with secondary containment is long overdue. Oahu's state-designated drinking water aquifer is one of a kind and cannot be replaced. As an island community, we must be vigilant in protecting this resource because there is no viable alternative from which replenish our drinking water supplies. The potential for migration of fuel contaminants already detected in the groundwater to nearby drinking water wells demands that the considerable risk posed by the RHBFSF be addressed as quickly as possible. The residents of Oahu cannot afford to await the results of a lengthy reevaluation of TUA options in light of this serious threat to our drinking water resources. We all deserve, and the law requires, for the Navy to upgrade the RHBFSF tanks now so as to prevent releases for their operational life. As specified on more than one occasion in 2018, the Regulatory Agencies seek "*zero future fuel releases from the [RHBFSF]*" (EPA and DOH, 2018a; EPA and DOH, 2018b) (emphasis added). Unfortunately, the Navy's preferred single-wall TUA does not come close to meeting this standard or demonstrating why other alternatives that could meet it are not practicable. As the agency charged with managing Oahu's municipal water resources and providing residents with safe and dependable water service, the BWS simply asks the Regulatory Agencies to ensure that the Navy satisfies its legal obligations.

**Factual Background**

The RHBFSF is located on the island of Oahu, Hawaii, approximately 2.5 miles northeast of Pearl Harbor. It occupies approximately 144 acres of land along the western edge of the Koolau Range situated on a topographic ridge that divides the Halawa Valley and the Moanalua Valley directly above a high-quality groundwater aquifer. The EPA has designated Oahu's groundwater aquifer, the Southern Oahu Basal Aquifer, as one of nine sole-source aquifers in EPA Region IX. In 1987, EPA determined that this aquifer is the "principal source of drinking water" for the island, and that "[i]f contaminated, would create a significant hazard to public health" (52 Fed. Reg. 45496).

The Navy stores nearly 200 million gallons of fuel at the RHBFSF in colossal World War II vintage underground storage tanks a mere 100 feet above the very aquifer from which the BWS provides drinking water to residents from Moanalua to Hawaii Kai. These tanks currently contain jet and marine diesel fuel, but have previously stored fuel oil, distillate, aviation

gasoline, and motor gasoline (TEC, 2006). The twenty RHBFSF tanks were field constructed during the early 1940s by mining into the ridge to create cavities for concrete tank shells lined with ¼-inch thick steel plates welded together. Each tank is approximately 250 feet tall, 100 feet in diameter, and provides a fuel storage capacity of up to 12.5 million gallons. Two of the RHBFSF tanks are currently out of service and two or three are generally empty as part of the Navy's ongoing clean, inspect, and repair program. This leaves at least 15 tanks, with a total capacity of at least 187.5 million gallons, in operation directly above Oahu's sole-source aquifer.

Numerous leaks from the RHBFSF tanks have been documented and sampling from under and around the RHBFSF has demonstrated the existence of petroleum contamination in the very aquifer that sustains Honolulu's water supply. In total, at least 55 fuel releases from the RHBFSF have been reported (ABS, 2018). By considering all sources of prior releases, the BWS has identified at least 200,000 gallons of product released to the environment as well as numerous releases since 1983 (Bechtel, 1949; TEC, 2008; DON, 2002, Whitacre, 2014a; Whitacre, 2014b; Whitacre, 2014c; Enterprise Engineering, 2008; BWS, 2018g). Because not all releases are documented and because not all documented releases have volume estimates, this total release volume should be considered a lower bound estimate; it likely under represents the total number of releases and volume of fuel released from the RHBFSF. Groundwater samples from monitoring wells RHMW01 and RHMW02 since 2005 are also indicative of multiple fuel releases as evidenced by detections of petroleum constituents (BWS, 2018f). In January 2014, at least 27,000 gallons of fuel was released from Tank 5 into the environment. As a result, the Navy (and the Defense Logistics Agency) and the Regulatory Agencies entered into an administrative order, the AOC, requiring the Navy to address fuel releases from the RHBFSF and implement infrastructure improvements to prevent future fuel releases.

**Legal and Regulatory Framework for the TUA Decision**

Safeguarding our water supply is not only sensible, it is mandated by federal and state law and the AOC. Federal facilities are required to comply with all federal, state, interstate, and local solid and hazardous waste requirements (including statutes, regulations, permits, reporting requirements, and administrative and judicial orders and injunctions).

Federal Law

The Resource Conservation and Recovery Act (RCRA) gives EPA the authority to control solid and hazardous waste from the "cradle-to-grave." This includes the generation, transportation, treatment, storage, and disposal of hazardous and non-hazardous waste. The 1986 amendments to RCRA enable EPA to address environmental problems that could result from underground tanks storing petroleum and other hazardous substances. Notably, federal regulations require owners and operators to meet underground storage tank requirements "[i]n order to prevent releases due to structural failure, corrosion, or spills and overfills for as long as the [underground storage tank] system is used to store regulated substances" (40 C.F.R. § 280.20; *see also* 40 C.F.R. § 280.252(b) (requiring existing field-constructed underground storage tanks be upgraded or permanently closed)). Where underground storage tank operations "may present an imminent and substantial endangerment to health or the environment" EPA is permitted to issue "such orders as may be necessary to protect public and the environment" (42 U.S.C. § 6973(a)).

Hawaii Law

The Hawaii Constitution requires that, "[f]or the benefit of present and future generations, the State and its political subdivisions shall protect and conserve ... all natural resources, including ... water ... and shall promote the development and utilization of these resources ... in a manner consistent with their conservation" and further declares that "[a]ll public natural resources are held in trust for the benefit of the people" (Haw. Const. art. XI, § 1). Indeed, "[t]he State has an obligation to protect, control and regulate the use of Hawaii's water resources for the benefit of its people" (Haw. Const. art. XI, § 7). The Supreme Court of Hawaii has concluded that this constitutional mandate "encompasses a duty to promote the reasonable and beneficial use of water resources in order to maximize their social and economic benefits to the people of this state" and, moreover, this responsibility is "unlimited by any surface-ground distinction," extending to all water resources, including groundwater (*In re Water Use Permit Applications*, 94 Haw. 97, 133-135, 139 (2000)).

State policy for water resources in Hawaii is likewise directed toward achieving the highest water quality consistent with maximum benefit to the people of the state and "shall be liberally interpreted to obtain maximum beneficial use of the waters of the State" (H.R.S. § 174C-2(c)). Pertinent here, drinking water is the highest beneficial use of groundwater. State law governing underground storage tanks only serves to bolster these public trust commitments, expressly providing that underground storage tank systems "shall be designed, constructed, installed, upgraded, maintained, repaired, and operated to prevent releases of the stored regulated substances for the operational life of the tank or tank system" (H.R.S. § 342L-32(b)(1)).

The AOC

In September 2015 the Navy entered into an enforceable order with the Regulatory Agencies, known as the AOC, requiring the Navy to address fuel releases from the RHBFSF and implement infrastructure improvements to prevent future fuel releases (AOC SOW, 2015). The AOC is a joint administrative action taken by the Regulatory Agencies concurrently and pursuant to their respective federal and state authorities to regulate underground storage tanks and to protect drinking water, natural resources, human health, and the environment. The "primary objectives" of the AOC are "to take steps to ensure that the groundwater resource in the vicinity of the [RHBFSF] is protected and to ensure that the [RHBFSF] is operated and maintained in an environmentally protective manner" (AOC § 1(b)). The AOC recognizes that corrective action by the Navy is "necessary to address potential impacts to human health, safety and the environment ... due to historical, recent and potential future releases at the [RHBFSF]" (AOC § 5(a)(x)).

The Statement of Work (SOW) for the AOC sets forth the various tasks and requirements necessary to accomplish these objectives, including improving existing tank inspection and repair processes, evaluating potential tank upgrades, increasing the frequency of tank tightness testing and fuel inventory monitoring, developing models to better inform groundwater flow and fate and contaminant transport, and preparing a risk and vulnerability assessment. The Navy has submitted and continues to submit deliverables in connection with the various AOC SOW sections. Beginning in 2015 the BWS participated as a subject matter expert in certain AOC meetings to provide valuable technical expertise in support of the AOC process; however, the BWS has not been invited to participate in all of these meetings (with the exception of the Groundwater Model Working Group) since September 2018. The BWS continues to provide

written comment on AOC deliverables, and has submitted over 130 letters to the AOC parties to date on how to address certain issues associated with each of these AOC SOW sections.

The AOC SOW explicitly requires the Navy to identify and evaluate various TUA options, including the risks and benefits of each potential upgrade, and select the best available practicable technology that can be applied to the RHBFSF tanks "to prevent releases into the environment" (AOC SOW § 3). According to the Regulatory Agencies, the environmental work under the AOC "was designed to inform ongoing and future planning decisions and may be particularly relevant to those decisions related to AOC section 3 – Tank Upgrade Alternatives" (EPA and DOH, 2018c). Moreover, the Regulatory Agencies have made clear that a TUA decision must compare the relative environmental performance of each TUA alternative and "must demonstrate to EPA and DOH's satisfaction that groundwater and drinking water resources will be protected" (EPA and DOH, 2018a).

**Navy's TUA Selection is Insufficient to Protect Oahu's Drinking Water**

The Navy's preferred single-wall TUA does not provide adequate safeguards against future fuel releases into our critical drinking water resources. The Navy's TUA Decision Document describes the Navy's TUA selection as retaining the existing single-walled tanks and current practices (TUA Option 1A) while implementing certain improvements including: (1) installing permanent leak detection equipment; (2) testing soil vapor monitoring; (3) applying epoxy coating to tank lower domes; (4) modifying tank gauging to improve fuel level monitoring; (5) decommissioning small tank nozzles that cannot be physically inspected; (6) installing eight additional monitoring wells; (7) conducting a pilot project to consider fully coating tank barrels; (8) implementing "double-wall equivalency" or removal of fuel in the 2045 timeframe; and (9) determining the feasibility for potential construction of a water treatment plant or equivalent engineering controls. While many of these improvements are long overdue, none of them, individually or collectively, are sufficient to prevent releases from the RHBFSF tanks that endanger our drinking water.

- *Release Detection/Monitoring.* Leak detection, soil vapor monitoring, fuel level monitoring, and groundwater monitoring merely detect and/or measure fuel already released into the environment, they do not prevent releases.

- *Nozzle Decommissioning/Lower Dome Epoxy Coating.* Decommissioning some tank nozzles and epoxy coating lower tank domes may reduce the potential for releases from certain vulnerable tank system components, but they do nothing to address the undeniable problem of corrosion progressing through the tank walls from the backside of the steel liners that cannot be visually inspected.

- *Full Epoxy Coating Pilot Project.* To date the Navy has provided no evidence that applying a full epoxy coating to the interior surface of a tank can prevent future releases. Therefore, there is currently no rational basis for relying on a promise to conduct a pilot test to make a finding that such a method will be sufficiently effective, particularly given that the Navy has not even committed to implementing this upgrade on all the RHBFSF tanks if the pilot test is successful. In its TUA Decision Document the Navy states that it will conduct this pilot project to "see if the coating can act as an additional liner (as well as providing corrosion resistance)." We further note that there is no basis to conclude that coating the interior of a tank would constitute an additional liner given that it cannot prevent

backside corrosion from compromising the integrity of the tanks' existing steel liner.

- *Water Treatment Plant Study.* The Navy's TUA selection cannot be reliant upon a treatment plant that does not exist and the Navy has not committed to constructing. In its TUA Decision Document the Navy proposes a three-year study to determine the feasibility of potential construction of a water treatment plant, but does not commit to implementation. Instead, the Navy is clear to limit the scope of the proposed study to estimating the cost and construction schedule for creating the water treatment plant and conditions future action on the availability of military construction funding. Use of a treatment plant, if constructed, to create a "capture zone" around the RHBFSF to clean water contaminated with RHBFSF fuel does not prevent the release of fuel that damages our drinking water aquifer. Treatment should always be a last resort, and not something the Navy can rely on to avoid more protective tank upgrades.

- *"Double Wall Equivalency" Secondary Containment or Removal of Fuel in the 2045 Time Frame.* The Navy purports to commit to providing protection equivalent to double wall secondary containment or removing the RHBFSF tanks by 2045. The BWS would like to support this outcome but is very concerned by the Navy's description of what "double wall equivalency" means. Additionally, we cannot wait until 2045 for the Navy to take actions that are necessary to protect this critical aquifer.

  In its TUA Decision Document, the Navy describes leak detection, tank tightness testing, groundwater monitoring, soil vapor monitoring, trend analysis and fuel inventory monitoring as working together to "provide redundant elements of detection and capture, equivalent to typical provisions of a 'double wall' solution." The Navy's preferred single-wall TUA is not <u>actual</u> secondary containment or a double-wall system and should not be characterized as such. By calling its TUA selection "double wall equivalency," the Navy is effectively taking the position that allowing fuel to be released into the environment and then eventually treating it at a Red Hill Shaft water treatment plant, were one to be constructed in the future, is equivalent to secondary containment that prevents fuel releases to the environment from occurring in the first place. This is misleading, not credible, and inconsistent with any sensible definition of secondary containment. Later in its TUA Decision Document in the appendix addressing legal, statutory, and regulatory requirements the Navy acknowledges that its preferred single-wall TUA does not, in fact, satisfy secondary containment requirements under Hawaii law and further concedes that operation of the RHBFSF beyond 2038 would require an exemption from the Director of DOH from current Hawaii underground storage tank regulations. Finally, the Navy provides no basis for what appears to be an implicit request for an extension to 2045 of the current AOC deadline for tank upgrades of 2037. The BWS strongly opposes any extension to the current tank upgrade deadline and, to the extent the TUA Decision Document is seeking one, requests that the Regulatory Agencies reject it outright. 2037 is already too long to subject our sole-source aquifer to the risk of chronic and potentially catastrophic releases associated with operations at the RHBFSF.

Allowing the Navy to implement its preferred single-wall TUA would result in a continuation of essentially the same practices in place now, with a few additional improvements that are largely reactionary forms of release detection and monitoring or vaguely-defined pilot projects. Upgrades that merely detect leaks from the RHBFSF tanks after they have occurred and monitor the damage these releases inflict upon Oahu's irreplaceable sole-source aquifer are not enough to protect our drinking water. Neither are experimental pilot projects and feasibility studies that the Navy has not committed to implementing on a full-scale basis. The Navy's so-called "double wall equivalency" secondary containment concept is absurd, and the BWS urges the Regulatory Agencies to reject outright any TUA selection that grants acceptance to contamination of the environment. The only way to ensure that our critical drinking water resources are protected from potential fuel contamination is to relocate the fuel to a new facility away from our sole-source aquifer. Short of relocation, upgrading the RHBFSF tanks with actual secondary containment (i.e., a tank within a tank) is the best, and most protective, tank upgrade option.

**Navy's TUA Selection Comes before Important Technical Analyses are Completed**

The Navy's TUA selection is premature in that it attempts to identify the best available practicable technology prior to completing analysis identified in the AOC SOW as being critical to the evaluation process. In order to protect our sole-source groundwater aquifer, any TUA decision must be supported by sound science and robust technical analysis that clearly demonstrates the appropriate tank upgrades will prevent future releases that might impact our drinking water. The AOC SOW states that deploying the best tank upgrade technology to prevent fuel releases can best be accomplished by developing a better understanding of the hydrogeology of the area surrounding the RHBFSF and conducting an assessment of the risk to the groundwater resources posed by the RHBFSF. The Regulatory Agencies likewise recognize that environmental work under the AOC was "designed to inform ongoing and future planning decisions" and, in particular, the TUA decision (EPA and DOH, 2018c). We were therefore surprised that the Navy's proposal comes before important AOC deliverables, including the final conceptual site model, groundwater flow model, contaminant fate and transport model, and planned additional phases of the risk/vulnerability assessment studies, have been completed or approved. As discussed in greater detail below, the currently available data does not support the Navy's TUA selection. Moreover, given the uncertainties associated with the potential fate of fuel released from the RHBFSF and that the Navy's preferred single-wall TUA is the least expensive and least protective TUA option, it would be clear error to approve such a selection unless and until more data is collected and the remaining AOC deliverables have been considered as part of the TUA decision-making process.

**There is Not Enough Data to Support the Navy's TUA Selection**

There is simply not enough known about the potential fate of fuel released from the RHBFSF to justify the Navy's preferred single-wall TUA. The primary objectives of the AOC, and by extension the tank upgrade selection process, are to protect our critical drinking water resources and ensure that the Navy operates and maintains the RHBFSF in an environmentally protective manner moving forward. To demonstrate that the least expensive and least protective TUA option meets the requirements of the AOC and federal and state law, there must be substantial data and robust technical analysis to document that this alternative constitutes the best available practicable technology to prevent releases into the environment. There is not. To the contrary, the Navy's rationale for its preferred single-wall TUA fails to adequately account for the considerable uncertainties arising from the lack of data collected by the Navy's sparse

monitoring well network and the resulting challenges in characterizing the groundwater flow system and the nature and extent of groundwater contamination at and around the RHBFSF. These uncertainties are compounded by the fact that the subsurface conditions in the vicinity of the RHBFSF, where fuel migration occurs in a highly heterogeneous basalt containing preferential flows, is extremely complex. Nowhere in its TUA Decision Document does the Navy recognize, let alone account for, the fundamental problem of a scant well network for monitoring water levels and groundwater contamination near the RHBFSF tanks.

The Navy's current monitoring well network is inadequate and, as a result, there is not enough data available to rationally conclude that fuel released from the RHFSF tanks in a single-wall configuration will not reach drinking water sources. The Navy is essentially reliant upon data from three monitoring wells (RHMW01, RHMW02, and RHMW03) within 450 feet of the twenty RHBFSF tanks, which is far too sparse a monitoring well network for a facility with such a large fuel storage capacity and complex subsurface geology. The BWS offered suggested monitoring well locations to the Regulatory Agencies and the Navy several years ago to try to mitigate this concern (BWS, 2016a). The BWS proposed, as a starting point only, that at least twelve monitoring wells be added within 50 feet of the tanks to monitor both groundwater and soil vapor (BWS, 2016a). The BWS suggested the additional data from these new wells be used to evaluate the locations for additional wells. The BWS also suggested a process (decision tree) to address how decisions would be made for additional well locations and well installation order based on new data (BWS, 2016a), but to date the Navy has neither implemented these recommendations nor provided a reasonable justification for its current approach.

Without a sufficient number of monitoring wells in the right locations, the ability to estimate groundwater flow directions and the properties of contaminant plumes is subject to considerable uncertainty. This uncertainty means the Navy cannot rule out the possibility that fuel releases from the RHBFSF could migrate to and impact critical drinking water receptors like the BWS' Halawa Shaft. Given the lack of data and the complexity of the subsurface conditions in the vicinity of the RHBFSF, the BWS believes that the Regulatory Agencies cannot find that the Navy has sufficient support to demonstrate that its preferred single-wall TUA can be operated in a way that ensures protection of drinking water in the vicinity of the RHBFSF. Because of the considerable uncertainty resulting from the overall absence of data, any TUA decision should be conservative and the upgrade for the RHBFSF selected to prevent releases must be much more stringent than the status quo.

**Available Data and Analysis Does Not Support Navy's TUA Selection**

The justification advanced by the Navy's for its preferred single-wall TUA cannot be reconciled with the data collected and analyses performed to date pursuant to the AOC. The factual and technical record is clear that the likelihood of chronic leaks and potentially catastrophic releases from the RHBFSF tanks are high and these risks cannot be sufficiently mitigated by the Navy's current inspection, repair, and maintenance practices. By selecting its preferred single-wall TUA, the Navy effectively ignores the results of the very environmental work the Regulatory Agencies tasked it with completing as part of the AOC process. Instead, the Navy attempts to support its TUA decision with unwarranted assumptions, improper conclusions drawn from AOC deliverables, and/or incomplete and unapproved Navy work product. The Regulatory Agencies cannot approve these efforts. As discussed in greater detail below, key AOC deliverables pertaining to corrosion and metal fatigue practices, risk and vulnerability assessments, and groundwater protection and evaluation confirm that the RHBFSF tanks pose a substantial threat to our irreplaceable sole-source groundwater aquifer.

| Navy Assumption | BWS Position |
|---|---|
| TUA selection should consider environmental performance, operational performance, practicability, cost and effective risk reduction of all options | State law is clear that all underground storage tanks must be upgraded and operated to prevent releases for the operational life of the tank or tank system |
| After 1983, other than the 2014 release, available records indicate there have been no verified releases of fuel from the RHBFSF | The Navy's claim is contrary to its own reports and existing groundwater data |
| The 2014 release was caused by poor workmanship, ineffective quality control and quality assurance, and inadequate response procedures | This neglects the underlying reason, namely that tank degradation necessitated repairs, and it was the faulty repairs that allowed the release of fuel into our aquifer |
| The Navy's nondestructive evaluation process is a reliable method for detecting corrosion in the tank liner | The Navy's destructive testing has confirmed that the Navy cannot reliably and accurately find all the areas of tank wall thinning that need repair |
| It is appropriate to adopt principles from the API standards for aboveground storage tanks to the RHBFSF tanks | Aboveground storage tank standards are inappropriate for the RHBFSF tanks; instead, the standard should be what is applied to all other underground storage tanks — secondary containment |
| The potential impact of minor and significant releases to the drinking water is accurate within an order of magnitude and is based on current regulated maximum contaminant levels | Unrealistically assumes large storage capacity of vadose (unsaturated) zone, no preferential groundwater flow pathways, high biodegradation rates, and recent fuel releases have not reached the water table |
| RHBFSF is well protected against kinetic attacks | BWS currently takes no position as to this statement |
| In the unlikely occurrence of a major seismic event or other catastrophic release, all of the TUA options would perform in a similar manner | Short of relocation, secondary containment is the most protective way to contain a release from a tank and provides the best chance of surviving a catastrophic event |

The BWS agrees with the Regulatory Agencies that "to the extent that the TUA Decision Document relies upon conclusions drawn from the substance of any of the environmental work being performed pursuant to other sections of the AOC, the quality of the TUA decision will necessarily depend on the quality of the underlying environmental work, or lack thereof, used to support that decision" (EPA and DOH, 2018c). The Navy's TUA selection is based on unwarranted assumptions, improper conclusions drawn from AOC deliverables, and/or incomplete and unapproved Navy work product. There is no rational basis for approving the Navy's preferred single-wall TUA where, as here, the reasoning behind its selection entirely fails to consider and/or runs counter to the information generated to inform a TUA decision. Accordingly, the BWS requests that the Regulatory Agencies reject the Navy's preferred single-

wall TUA and require that the Navy upgrade the RHBFSF tanks with secondary containment or relocate them away from our sole-source groundwater aquifer.

NDE Reliability

One of the critical assumptions upon which the Navy's selection of its preferred single-wall TUA relies is that the non-destructive examination (NDE) methods used to identify areas of the RHBFSF tanks in need of repair are reliable. Such an assumption, however, is without merit, and cannot be used to support the Navy's TUA selection. Steel liner samples, commonly referred to as "coupons," removed from Tank 14 in June 2018 and subjected to destructive testing by IMR Test Labs prove that corrosion that leads to through-wall holes is occurring on the side of the liner that cannot be inspected or maintained. As discussed in greater detail in the BWS' comments (BWS, 2019g) to the IMR laboratory reports (IMR, 2018; and IMR, 2019) and the Navy's destructive testing report (Navy, 2019b) describing IMR's laboratory testing, the Navy's NDE and destructive testing direct comparison work has confirmed that the Navy cannot reliably and accurately find all areas of tank wall thinning that need repair. Since the Navy's NDE is neither accurate nor reliable, it cannot rationally be concluded that the tanks can be operated in a manner that both relies on this faulty NDE and is protective of the environment.

The accuracy and reliability of the NDE techniques used to inspect the steel liner of the RHBFSF tanks is of critical importance to the Navy's TUA selection as the steel liner is the only meaningful barrier protecting the environment. Moisture trapped between the outside face of the RHBFSF underground storage tanks' steel liner and concrete shell causes corrosion to form on the backside of the liner, and that corrosion progresses inward with time. Because this concealed corrosion can be neither directly observed nor prevented, the Navy's maintenance of the RHBFSF tanks is instead reliant upon being able to detect this corrosion damage indirectly using NDE methods and weld new plates over the compromised portions of the liner before the corrosion can grow through the tank wall. The nature of the RHBFSF tanks' construction and the fact that these single-wall, underground tanks have already suffered and will continue to be subjected to ongoing corrosion damage amplify the importance of reliable NDE.

Not only has the Navy failed to establish that its NDE techniques are sufficiently reliable, its own laboratory testing proves that the scanning is inaccurate. For example, destructive testing demonstrated that four of the ten coupons removed from Tank 14 were thinned by corrosion to the point that repair is required (i.e., a remaining wall thickness of less than 0.160 inches) but the Navy's NDE prior to coupon removal only identified two of these locations as needing repair. In addition, the Navy's NDE identified three areas for repair which, in fact, did not need repair based on the destructive testing results. These misidentified areas demonstrate that the Navy's NDE process both over and underestimates the remaining thickness of the tanks' steel tank liner and is clearly inaccurate and unreliable.

Statistical analysis of the NDE versus destructive results further demonstrates the extent to which the Navy is likely to miss locations in the RHBFSF tanks that should be repaired. The surface area of steel liner and length of the welds to be inspected in each tank are enormous—over 1.3 acres of steel plate and several miles of welds per tank. Given the expanses of material to be inspected, it can be assumed that many locations requiring repair will be missed unless there is a demonstratively accurate process for identifying backside corrosion. In recent testimony, the Navy reported up to 2% of the tank liners required repair (Navy, 2018), which translates to about 1,600 square feet (tank surface is 80,000 square feet or 1.8 acres). With the demonstrated unreliability of the Navy's NDE process (50% rate of correctly identifying areas in

need of corrosion repair), it is almost certain that a substantial number of areas needing repair will be missed.

The Navy has not acknowledged the increased risk of fuel release associated with not properly identifying locations of significant backside corrosion and, consequently, this risk is not even considered in connection with the Navy's tank upgrade selection process. Instead, the Navy has taken the untenable position that the existing NDE process is a reliable method for detecting corrosion. The Regulatory Agencies should not allow the Navy to rely upon such a clearly erroneous interpretation of the existing data and analyses to inform a potential TUA decision.

Risk Assessment

The Navy's selection of its preferred single-wall TUA is dependent on a finding that there is a relatively low risk for future chronic or catastrophic releases from the RHBFSF. Such a finding is directly contradicted by the baseline risk assessment report issued by Navy consultant ABS Consulting (ABS, 2018), which substantiates the chronic and potentially catastrophic risks associated with operating enormous fuel tanks a mere 100 feet above a one of a kind state-designated drinking water aquifer. ABS' report details a comprehensive quantitative engineering evaluation of the internal event hazards at the RHBFSF designed to provide a baseline assessment of the level of risk the RHBFSF poses to nearby groundwater resources and to inform tank upgrade selection process decisions. ABS' report confirms that the risk of a sudden, large or undetected, slow fuel release from the RHBFSF to the environment is unacceptably high. According to ABS, the Navy's own consultant, we can expect:

- Greater than 27% probability of a sudden release of between 1,000 and 30,000 gallons of fuel from the RHBFSF each year;
- Greater than 34% chance of a sudden release of more than 120,000 gallons from the RHBFSF in the next 100 years;
- Greater than 5% chance of a sudden release of more than 1 million gallons from the RHBFSF in the next 100 years; and
- 5,803 gallons per year of chronic, undetected fuel releases from the RHBFSF.

As discussed in greater detail in the BWS' comments (BWS, 2019f) to ABS' risk assessment report, these risks to our irreplaceable drinking water resources are simply too high and in no way supportive of the Navy's preferred single wall TUA. A proper response to such findings would be to choose a TUA option that eliminates this significant risk to Oahu's drinking water by relocating the RHBFSF tanks away from our sole-source groundwater aquifer or upgrading them with secondary containment. The Navy's TUA Decision Document references ABS' report as information used to support its decision, but then goes on to outline the Navy's concerns with and repeatedly call into question the accuracy of ABS' baseline risk assessment. The BWS could find no credible technical basis to justify the Navy's rejection of ABS' risk calculations, and requests that the Regulatory Agencies consider the significant risk the RHBFSF poses to our critical drinking water resources when evaluating the Navy's TUA selection.

Groundwater Modeling

The Navy's preferred single-wall TUA is also dependent on the Navy's modeling efforts for evaluating groundwater flow, behavior of contaminants in the environment, contaminant transport pathways, and the potential for exposure of human receptors to drinking water potentially impacted by fuel releases from the facility. As discussed in greater detail in the BWS' comments (BWS, 2019h) to the Navy's latest conceptual site model (CSM) report (DON, 2019c), the Navy's modeling work still does not provide an adequate basis for developing a groundwater flow model, nor should it be used to support an evaluation of contaminant transport pathways and the potential for receptor exposure. To the contrary, several of the key findings presented in the CSM are either unsupported or contradicted by available evidence. For example, the Navy's CSM is deficient in its characterization of certain important site features and conditions, most notably hydraulic gradients and the aquifer properties of preferential flow and saprolite. These features and conditions are important because they largely determine groundwater flow direction and groundwater flow velocity.

A significant issue with the Navy's interim groundwater model has been its inability to reproduce the direction and magnitude of the measured hydraulic gradients. As stated by DOH, a major point of disagreement between the Regulatory Agencies and the Navy's current CSM and interim groundwater flow model is the groundwater flow direction in the vicinity of the RHBFSF tanks (DOH, 2019). The key disparity is that where the modeled groundwater gradients are principally along the axis of Red Hill ridge the measured groundwater gradients are principally across the axis of the Red Hill ridge. It is clear to the BWS and consistent with comments from the Regulatory Agencies that the available evidence does not support the Navy's mountain (mauka) to the ocean (makai) only groundwater flow regime. Despite all the analysis and data that has been presented to the Navy on this issue, the TUA Decision Document still does not appear to consider this information and does not meaningfully discuss any alternative conceptual models for the groundwater flow system. This is a critical flaw that undermines the Navy's entire analysis.

The deficiencies in the Navy's modeling are particularly evident in its development of a clinker-zone model. This model, which was presented to the public as representative of site conditions, includes locating a single clinker zone along the axis of RHBFSF that provides a preferential pathway to Red Hill Shaft. This clinker-zone model effectively manufactures hydrogeological conditions that would act like a conduit for draining shallow groundwater from beneath the fuel tanks to Red Hill Shaft. The Navy continues to advocate for this model even though the physical attributes of the clinker zone are physically and geologically implausible and the simulated hydraulic gradients are opposite of the direction indicated by the measured hydraulic gradients. Simply put, the clinker-zone model is unrealistic and inconsistent with existing site data. The Regulatory Agencies have directed the Navy to use a "conservative" CSM to inform its TUA selection process (EPA and DOH, 2018a). It did not. Thus, neither the Navy's CSM nor its groundwater flow model should be relied upon to support a TUA decision.

As set forth above, the Navy's TUA selection is based on improper conclusions drawn from AOC deliverables as well as flawed and/or incomplete Navy work product and should be rejected. In particular, the Navy's interpretation of existing data and analyses is not conservative, often unsupported, and results in unwarranted assumptions that cannot be used to support its TUA selection. Accordingly, the BWS requests that the Regulatory Agencies reject the Navy's preferred single-wall TUA and take all steps necessary to protect our drinking

water by requiring that the Navy upgrade the RHBFSF tanks with secondary containment or relocate them away from our sole-source groundwater aquifer.

**Navy's TUA Decision Document Does Not Meaningfully Compare Upgrade Options**

The Navy does not provide an adequate basis for selecting its preferred single-wall TUA over the other TUA options. The AOC SOW explicitly requires the Navy to identify and evaluate various TUA options, including the risks and benefits of each potential upgrade. As the Regulatory Agencies have made clear, in order to meaningfully assess the alternatives, the Navy must "compare a TUA's environmental performance during all modes of operation (i.e. during recommissioning, static storage, transient storage) and from different release initiating events (with attention paid to cracks and/or corrosion in the steel liner, and catastrophic hazards, such as major earth movement, explosion, fire, flood)" (EPA and DOH, 2018a). It did not. The Navy's TUA Decision Document cannot be fairly characterized as a robust comparison of the six TUA options and does not adequately consider any of the factors set forth in the Regulatory Agencies' 2018 directives. Instead, the Navy spends almost the entirety of the TUA Decision Document describing and attempting to justify its preferred single-wall TUA. A cursory comparison of the Navy's TUA selection relative to the levels of environmental protection provided by other options is relegated to the appendices of the TUA Decision Document, in which the Navy reproduces portions of the descriptions of the TUA options included in its December 2017 TUA report (DON, 2017). Because the Navy fails to meaningfully compare and assess the environmental effects of the identified alternatives, the Regulatory Agencies should reject the Navy's TUA selection and require the Navy to complete this analysis.

The Navy's refusal to even consider a more protective TUA option appears to hinge on the argument that relocation and tank-within-a-tank secondary containment are not "practicable." But the Navy provides nothing more than conclusory statements in support of its position. These technical and constructability concerns are contradicted by the fact that the Navy's December 2017 TUA report recognizes that secondary containment (TUA Option 3A) "can be constructed in the field at Red Hill using practicable construction means and methods" (DON, 2017). The Navy's desire to implement its preferred single-wall TUA should not override its prior feasibility analysis on secondary containment. Similarly, relocation is a viable option. In fact, the Navy has recently decided to decommission other 1940s-era underground storage tanks and relocate the fuel to new aboveground storage tanks at facilities in Point Loma, California and Manchester, Washington. The BWS recognizes that relocation and secondary containment are more protective and more expensive TUA options but, contrary to the depiction in Navy's TUA Decision Document, these options are feasible and the Regulatory Agencies should require the Navy to acknowledge them as such.

**Navy's TUA Selection Does Not Comply with Hawaii Law**

The Navy's preferred single-wall TUA runs afoul of Hawaii law. As discussed in greater detail above, based on the information currently available to the BWS for review, the Navy's preferred single-wall TUA does not satisfy the mandate of Hawaii Revised Statues Section 342L-32(b) that all underground storage tanks and tank systems must be "upgraded ... and operated to prevent releases ... for the operational life of the tank or tank system" or the AOC requirement that the Navy select a tank upgrade "to prevent releases into the environment." In addition, the Navy's TUA selection does not meet any of the criteria enumerated in Hawaii Administrative Rules Section 11-280.1-20(b) for corrosion protection. Finally, it is unclear to the BWS whether the release detection equipment proposed by the Navy satisfies the leak detection requirements

in Hawaii Administrative Rules Section 11-280.1-43(10)(A). Accordingly, the BWS believes that it is not appropriate for the Regulatory Agencies to approve the Navy's TUA selection. Instead, the RHBFSF tanks should be relocated away from the sole-source groundwater aquifer that nourishes Oahu's drinking water if upgrading the tanks with secondary containment is not feasible.

Corrosion Protection

The Navy's preferred single-wall TUA does not satisfy the requirements of Chapter 11-280.1 of the Hawaii Administrative Rules with respect to corrosion protection. Section 11-280.1-21 prescribes the upgrade requirements for underground storage tank systems. Hawaii Administrative Rules Section 11-280.1-21(a) requires underground storage tank systems with field-constructed tanks installed before the effective date of the current administrative rules, like the RHBFSF tanks, to comply with the performance standards in Section 11-280.1-20(b), among others, or be closed. Hawaii Administrative Rules Section 11-280.1-20(b) enumerates the five criteria by which a tank can comply with the performance standards for corrosion protection:

1. The tank is constructed of fiberglass-reinforced plastic;

2. The tank is constructed of steel and cathodically protected;

3. The tank is constructed of steel and clad or jacketed with a non-corrodible material;

4. The tank is installed at a site that is determined by a corrosion expert not to be corrosive enough to cause it to have a release due to corrosion during its operating life; or

5. The tank construction and corrosion protection are determined by the DOH to be designed to prevent the release or threatened release of any stored regulated substance in a manner that is no less protective of human health and the environment than criteria 1-4.

None of the five allowable corrosion protection alternatives, as stated in the administrative rules, have been met or will be met if the Navy's TUA selection is approved and implemented. The first two options are to construct the tanks with non-corrodible material (plastic) or to employ cathodic protection; neither of these apply to the RHBFSF tanks. The third option requires that steel tanks be clad or jacketed with a non-corrodible material. This is also not applicable to the RHBFSF tanks, as even the Navy's TUA Decision Document recognizes that the tanks at the RHBFSF are concrete tanks with steel liners, not steel tanks (Navy, 2019a; *see also* BWS, 2015a; Navy, 2016; DOH and EPA, 2017a; EPA and DOH, 2017b). Moreover, the steel liners are not clad or jacketed; rather, they have had concrete cast against the unprotected steel surface. In fact, the outside surfaces of the steel liners, in many locations, are not in intimate contact with concrete, and moisture between the steel and the concrete tanks is causing them to corrode. The fourth option is for a "corrosion expert" to determine that the site is not corrosive enough to cause it to have a release due to corrosion during its operating life. The BWS is unaware of any report by a corrosion expert indicating the site is not corrosive enough to cause releases from the RHBFSF tanks. Further, the BWS finds it implausible that this condition could be satisfied considering the documented through-wall corrosion at the RHBFSF

tanks. Finally, the fifth option is for the DOH to independently determine that the existing corrosion protection is no less protective than provided by options 1 to 4 above. The BWS is unaware of any such determination by the DOH or EPA. To the extent the EPA and/or DOH has made an independent determination concerning the existing corrosion protection for the RHBFSF tanks, the BWS requests that the Regulatory Agencies share the analysis that demonstrates the site is not corrosive to the steel liners.

Release Detection

The Navy states in its TUA Decision Document that its current tank tightness testing meets the 0.5 gallon per hour leak rate as specified in HAR Section 11-280.1-43(10)(A) and proposes installing this same release detection equipment permanently as a component of its TUA selection. The Navy does not provide any detailed reference materials in support of its claims. The BWS notes that a prior reference, the *Final 2018 Annual Leak Detection Testing Report of 17 Bulk Field-Constructed Underground Storage Tanks at the Red Hill Fuel Storage Complex* of January 2019, is heavily redacted and therefore the BWS has been unable confirm if the release detection requirements for the RHBFSF tanks has been met. The lack of information in the TUA Decision Document and the redaction of the results in the leak detection report makes it impossible for either the BWS or any member of the public to determine if the permanent release detection equipment meets the tank tightness testing requirements as the Navy claims. The BWS requests that the Regulatory Agencies require the Navy to provide supporting data and analysis for the BWS to review.

Even if the new release detection equipment was to be permanently installed in all RHBFSF tanks, the Navy is only obligated to perform leak detection testing on a semi-annual basis. Both the Naval Audit Service (Naval Audit Service, 2010) and BWS (BWS, 2015b) have previously raised concerns regarding the effectiveness of current leak detection methods in detecting slow, chronic fuel releases. As stated before, BWS continues to strongly urge the Navy to incorporate continuous monitoring of any new technology that allows earlier detection of releases, and in the event the Regulatory Agencies approve a TUA decision, continuous leak detection should be a requirement.

**Summary of Comments**

The BWS cannot, and the factual and technical record does not, support the Navy's recommendation that it retain the existing single-wall underground storage tanks and current practices at the RHBFSF. The AOC and federal and state law require that the RHBFSF tanks be upgraded so as to prevent releases for their operational life and ensure that nearby groundwater resources are protected. The established goal is to have "zero future fuel releases from the facility" (EPA and DOH, 2018a; EPA and DOH, 2018b). The Navy's TUA Decision Document falls far short of demonstrating that the Navy's TUA selection (TUA Option 1A) meets these statutory and regulatory requirements. The factual determinations made and ultimate conclusions reached in the Navy's TUA Decision Document are not conservative, often unsupported, and should be rejected by the Regulatory Agencies. Moreover, allowing any amount of fuel to be released from the RHBFSF tanks would violate Hawaii law and fail to comply with the AOC, both of which require that a TUA decision prevent releases into the environment. Given the extensive leak history at the RHBFSF, the current condition of the aging underground storage tanks, the enormous amount of fuel stored, the location of the RHBFSF relative to our groundwater aquifer, and the potential for impacts to Oahu's critical drinking water resources, the BWS does not agree that the considerable risks associated with

storing nearly 200 million gallons of fuel 100-feet above our sole-source aquifer is sufficiently mitigated by simply continuing with the status quo of attempting to clean, inspect, and repair the Navy's deteriorating single-wall tanks. Accordingly, the BWS requests that the Regulatory Agencies reject the Navy's preferred single-wall TUA and require that the Navy relocate the RHBFSF tanks away from our sole-source groundwater aquifer or upgrade them with secondary containment.

Thank you for the opportunity to comment. If you have any questions, please contact Mr. Erwin Kawata, Program Administrator of the Water Quality Division, at 808-748- 5080.

Very truly yours,

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