Red Hill Bulk Fuel Storage Facility - Tank Upgrade Alternative Decision Process

29 September 2017

Executive summary. The Navy recognizes the importance of this Tank Upgrade Alternative (TUA) decision and has developed a thorough and detailed process that will lead to the Navy's TUA recommendation to the Regulators. The Navy has identified 13 important sources of information and data that will be thoughtfully integrated into a final Navy TUA decision. This memorandum explains each of these 13 data inputs as well as provides the timeline for decision-making. Decision-making objectives have been carefully identified to ensure compliance with the AOC/SOW entered into by the Navy and the Regulators. The process outlined in this memorandum includes the opportunity for interested stakeholders and the community to provide comment. The Navy believes this decision process will integrate the elements of sustainability, and state-of-the-art science with thoughtful judgment and appropriate decision-making criteria to reach the best outcome possible.

Purpose: This document describes the decision making process and identifies the information sources the Navy and the Defense Logistics Agency (DLA) (collectively "Navy") will use to select the Best Available Practicable Technology (BAPT) for a Tank Upgrade Alternative (TUA) in accordance with Section 3 of the Administrative Order on Consent Statement of Work (AOC/SOW) dated 28 September 2015 (the decision referred to as the "Navy TUA Decision"). The 6 TUAs which will be evaluated using the process described in this document are briefly summarized in Appendix A. The Navy TUA Decision will be made under the time line described in Appendix B. The U.S. Environmental Protection Agency (EPA) and State of Hawaii Department of Health (HDOH) (collectively the "Regulators") will then assess the Navy TUA Decision – approving or disapproving it. Although there are schedule times and meetings for stakeholder input, stakeholders should feel free to provide input to the Navy, via the Regulators, at any time during this Decision Process.[1]

The Navy TUA Decision will determine what is the BAPT for the TUA, subject to considerations of sustainability and regulatory approval. BAPT is defined in the AOC/SOW to mean "the release prevention methods, equipment, repair, maintenance, new construction, and procedures, or any combination thereof, that offers the best available protection to the environment and that is feasible and cost-effective for the Tanks at the Red Hill Bulk Fuel Storage Facility (RHBFSF). The selection and approval of BAPT, under both the Navy TUA Decision and Regulators' review, shall be based on, but not be limited to, consideration of the following factors: (1) the risks and benefits of the particular technology; (2) the capabilities, feasibility, and requirements of the technology and facilities involved; (3) the anticipated operational life of the technology; and (4) the cost of implementing and maintaining the technology. Reliance on any one of these factors to the exclusion of other factors is inappropriate" The Navy will also consider sustainability issues throughout the decision process and review its sustainability

[1] Non-DOD Stakeholders wishing to provide input into this Decision Process may do so by submitting to: United States Environmental Protection Agency Region IX, 75 Hawthorn St, San Francisco, CA 94105. State of Hawaii Department of Health, P.O. Box 3378, Honolulu, HI 96801-3378. Red Hill Regional Program Director, Naval Facilities Engineering Command, Hawaii, 400 Marshall Rd, JBPHH, HI 96860.

criteria with the Regulators and other stakeholders as appropriate before finalizing an ultimate TUA decision.

Background: The NAVSUP Fleet Logistics Center, Pearl Harbor, Red Hill Bulk Fuel Storage Facility was constructed during August 1940 to September 1943. The RHBFSF consists of twenty underground reinforced concrete fuel storage tanks with a ¼ inch steel liner. The capacity of each tank is approximately 12.5 million gallons for a total facility capacity of approximately 250 million gallons. Of the 20 storage tanks, 18 remain in commission. Current Department of Defense (DoD) requirements allow for up to three tanks to be temporarily removed from service to allow for tank inspection, repair and maintenance.

The 2014 Release. On December 9, 2013, the Navy placed Tank No. 5 at the RHBFSF back into service after it had undergone routine scheduled maintenance. The maintenance work consisted of cleaning, inspecting, and repairing the tank; followed by certifying the tank that it was suitable for service by an American Petroleum Institute (API) certified inspector. Upon returning Tank No. 5 into service, the Navy commenced filling the tank with JP-8 fuel. On January 13, 2014, Navy discovered a loss of fuel from Tank No. 5, immediately notified the HDOH and the EPA, and defueled the tank. On investigation, the Navy determined the release was primarily caused by human error – failure to: 1) perform adequate repairs 2) perform proper quality control and quality assurance 3) follow return to service procedures – rather than any structural or equipment failure. This human error issue has since been addressed so that a future occurrence related to this is minimized.

Response to the Release. In response to the 27,000 gallon fuel release reported by the Navy, an Administrative Order on Consent (AOC) between the Navy, DLA, EPA, and the HDOH was agreed upon and signed by all parties on 28 September 2015. The AOC requires the Navy to assess what upgrades, if any, are needed in the RHBFSF. Due to the challenge in assessing and upgrading a one-of-a-kind facility that must remain operational, the time frame established in Section 3 of the AOC/SOW was largely based on the best information available at the time; the current Tank Inspection Repair and Maintenance (TIRM) cycle, upgrading at most 3 tanks at a time, and assessing the upgrades as they occur. As such, each 3-tank upgrade under consideration is allotted approximately 3 years to complete. Consequently, under the AOC, the Navy has 22 years from the signing of the AOC to select and install an approved BAPT on all 18 operational RHBFSF tanks. Any tank not upgraded with an approved BAPT at the end of the 22 year period shall be removed from service until such BAPT is installed.

Navy TUA Decision Overview: The process for selecting a BAPT for the TUA began before the signing of the AOC in September 2015 when the Navy, in anticipation of the AOC, contracted for several studies to be prepared in support of Red Hill upgrades and has continued since. Under the AOC, the TUA decision process starts with the approval of the TUA Report, which the Navy will submit to the regulators by 8 December 2017. With approval of the TUA Report, the Navy has 60 days to begin TUA Decision Meetings with the AOC parties and upon closing of those meetings, Navy has 60 days to submit a TUA Decision Document and Implementation Plan. An approved TUA decision is anticipated mid CY2018. Upon approval of the TUA Decision Document and Implementation Plan, the Navy will commence the funding, procurement and acquisition process to implement the approved TUA.

TUA Decision inputs: The Navy TUA Decision is complex; it involves the gathering of numerous data sourced from several engineering disciplines, environmental disciplines, and social disciplines; then weighed and evaluated by stakeholders with varying priorities utilizing appropriate decision-making aids. The 13 primary sources of information to be considered in making the TUA decision include the following (see also Appendix C):

- Input #1 TIRM. Information from the TIRM Procedures Decision Document and Implementation plan, AOC/SOW Section 2, will provide a baseline with regards to cost and time from which other alternatives can be compared. Additionally, this TIRM document will provide information with regards to current maintenance procedures and practices.

- Input #2 TUA Report and review of TUA Attributes.[2] The TUA Report, AOC/SOW Section 3.3, will provide a comparison of each of the 6 TUAs across 21 attributes rating each attribute in a five level scale (some of the ratings are binary* or, such as cost, have no rating, but simply the reported value**). The TUA Report is not a decision document nor will it provide a TUA recommendation. Rather, this report, provided by a qualified Navy contracted consultant, will provide an engineering analysis of various attributes for each of the 6 TUAs under consideration and will be used by the Navy in their analysis of which TUA to propose for implementation. The attributes currently being evaluated in the TUA Report include:

    1. Constructible
    2. Testable*
    3. Inspectable*
    4. Repairable
    5. Practicable
    6. Attainment of Goals
    7. Successful Implementation Elsewhere
    8. Reliability*
    9. Impact on Storage Volume
    10. Consistency with Local Policies and Resolutions**
    11. Provides Secondary Containment*
    12. Dependency on Existing Tank Integrity
    13. Release Detection Integral to Construction
    14. Release Detection System other than Interstitial Monitoring Required**
    15. Release Detection System Testable
    16. Testing and Commissioning Procedures
    17. TIRM Requirements for Inspection of Existing Tank prior to application of Tank Upgrade
    18. TIRM Requirements for Future Integrity Inspections
    19. Impact on Operating and Maintenance Requirements and Procedures
    20. Tank Upgrade Construction Cost Estimate (Planning Level)**

[2] At the time of preparing this document the TUA Report was still in draft form and due to the Regulators 8 December 2017. Therefore, information contained in this document related to the TUA Report is subject to change before the TUA Report's final submission.

21. Tank Upgrade Duration

The Navy will collect input from various stakeholders on the TUA Attributes and will assess whether and how to incorporate such stakeholder input into the Navy Decision Process.

- Input #3 Release Detection. Section 4 of the AOC/SOW includes a study and field evaluation of several release detection technologies. The results of this leak detection study will be further evaluated by the Navy for consideration of which system could be installed to best enhance release detection capabilities at the facility. In conjunction with the evaluation of these release detection technologies, an operational evaluation will be completed to provide an estimate of the total quantity of fuel which could potentially be released given the technology selected combined with the ability of the operators to respond and remove the source of release.

- Input #4 Non-Destructive Evaluation (NDE). Section 5 of the AOC/SOW includes an evaluation of the effectiveness of non-destructive testing procedures used at RHBFSF. Current inspection practices include 100% electro-magnetic scanning of the tank's steel liner backed up by additional ultrasonic and magnetic particle testing to detect any flaws that may exist. The evaluation of this common industry practice will involve comparing scan results with the actual condition of coupons removed from the tank. The results will be used to determine the reliability of this practice for assessing the condition of the tanks' steel liners and for accurately predicting the appropriate interval to the next inspection.

- Input #5 Environmental. Sections 6 and 7 of the AOC/SOW involve long term studies to investigate and remediate releases, to evaluate the ground water flow and develop contaminate fate and transport models. Recently, an accelerated approach has been initiated to provide interim data on these modeling efforts which should provide sufficient information to inform the TUA decision from a groundwater impact perspective. In addition, other environmental factors will also be considered such as CO2/environmental footprint, etc.

- Input #6 Risk Assessment. From Section 8 of the AOC/SOW a Quantitative Risk and Vulnerability Assessment (QRVA) is being completed. This report is due in Nov 2018 and to the extent advance information is available to inform a TUA decision in 2018, it will provide data as to the probable frequency, volume, and location of future releases. The Navy will collect input from various stakeholders on Risk Assessment and will assess whether and how to incorporate such stakeholder input into the Navy Decision Process. In addition, an interim human health risk assessment is being conducted to evaluate key pathways, Chemical of Concern (COC) and potential drinking water criteria

- Input #7 Alternate Site Location. This study will be completed by January, 2018 and will provide sufficient information to weigh the feasibility and risk associated with replicating Red Hill's current capacity and capability at another site compared to the feasibility and risk associated with any of the Tank Upgrade Alternatives. Of course, sustainability factors will also be part of this analysis.

- Input #8 Stakeholder perspectives. The Navy will provide external (other than AOC party) stakeholders and Subject Matter Experts, as well as the community, the opportunity to comment and provide their perspective concerning the criteria and the Navy's TUA selection.

- Inputs #9 Reports and Data on past operations. Beyond sources of information specifically contained in the above reports and documents the Navy will utilize other official reports, such as operating requirements and tank maintenance reports, to further inform the TUA decision.

- Input #10 Telltales ICW single wall TUA variants. Original design and construction of the RHBFSF included a "telltale" system as a means of detecting the presence of fuel between the steel liner and concrete wall. While the original design experienced problems with clogging and corrosion, the concept is still considered to have merit, using updated technologies and materials, and is being further evaluated.

- Input #11 Pilot program. The Navy may propose a pilot programs to evaluate technologies and use data and conclusions drawn from such pilot programs in the development and evaluation of a TUA. A pilot program may only be deployed in a Tank with approval from the Regulatory Agencies. The Pilot Program shall define and specify: (1) the overall operational design of the pilot program; (2) the technology to be applied; (3) the procedural aspects to be implemented; (4) the Tank(s) to which the pilot program will be introduced; (5) the performance criteria and method of evaluating the success of the pilot program; and (6) a plan for terminating the pilot program. Any proposed pilot program shall at least be designed to provide environmental protection substantially equivalent to that of the currently approved BAPT at the time of the pilot program approval.

- Input #12 Emergency Water Supply Measures. The Navy will also consider potential contingency measures that could be put in place such as identifying other potential sources for drinking water or achieving capture of groundwater and associated COC's beneath Red Hill including the installation of water treatment plants, to be immediately available and activated in the unlikely situation existing drinking water sources become unusable due to contamination.

- Input #13 Expert Judgment. Although the Navy intends to use computer based decision aid software to help objectively analyze the information available, it is generally understood that no computer or decision tool should be relied upon to make the final TUA decision. In the end that decision will be largely informed by Navy and various stakeholder groups and professionals in their fields employing their best expert judgment.

Assumptions that underlie the Navy decision process: In the absence of clear and definitive evidence, certain assumptions are needed to make a timely TUA Decision. Some initial assumptions include:

- Ground water modeling used to inform the TUA decision will be based on current or reasonably anticipated water production from supply wells and data from the monitoring well network
- Chemical composition of fuels stored at Red Hill does not significantly change
- Navy operational requirements do not change between now and the next scheduled TUA evaluation (5yrs)

- Based on industry standards, current NDE Practice is effective
- Interim Environmental data is sufficient for an initial TUA decision
- Existing "state of the art" technology is considered sufficient for meeting government regulations

Key objectives in the Navy TUA Decisions: As Navy analyzes the available information there are fundamental considerations that must be adhered to; things we shall do and things we shall not do; specifically, we must:

1. Protect public health and environment
2. Meet DoD Operational Requirements for RHBFSF
3. Comply with AOC
4. Comply with government regulations
5. Meet Acceptable environmental performance criteria and risk reduction defined as: Localized limited impact such that any contamination from Red Hill will be evaluated to determine if: 1) it may adversely impact a water supply well and 2) if so, that appropriate contingencies are in place so that water pumped from such a supply well will meet federal maximum contaminate levels (MCL) as well as HDOH criteria. In addition, the interim risk assessment will also evaluate other potential COC's from a drinking water perspective to ensure that human health is protected relative to use of potable water.

Detailed Objectives: The following objectives provide broad guidance for Navy decision makers and serve as a means by which the ultimate success of the TUA Decision and AOC writ large will be measured.

- Minimize risk of fuel release
- If a release should occur, ensure that it can be detected and contained so as not to present an adverse risk to water supply wells and other potential receptors
- Ensure that appropriate risk pathways are evaluated
- Enhance community acceptance and understanding of RHBFSF use and operations
- Protect ground water resources of Oahu
- Protect the Drinking Water through assurance that drinking water levels are not exceeded in water discharged from supply wells or shafts.
- Retain operational/strategic capacity through 2037
- Maintain Inventory Management Plan required capability and capacity throughout upgrade period
- Maintain or reduce existing maintenance requirements/life cycle costs
- Retain/build/maintain public confidence
- Decision process will employ transparent, efficient and effective methodologies

Initial TUA Analysis Leading to the Navy TUA Decision: The decision making process for the Navy TUA Decision will be assisted by Navy subject matter experts who have been involved in the Red Hill program and thus are already familiar with the technical issues to be considered. Each member of this team of experts will review all of the attributes and information described in this document (as well as other supporting documentation) and assign an initial relative weighting to each attribute corresponding to the salience that attribute holds in the ultimate Navy TUA Decision. Each member will then rate each

TUA against each attribute on a relative scale in order to obtain a comparison of how each TUA rates against the others. Having a weighting for each attribute and a relative comparison of each TUA against the attributes, an assessment can be made as to how each TUA falls out relative to each other. Using decision aid software, weightings can be varied to ascertain the impact of these factors on an ultimate decision. Additionally, each attribute, along with each TUAs attribute rating, will be "binned" into one (or more is some cases) of the following categories to assess each TUAs relative performance in that category. As with the individual attributes, each of these categories can be weighted to further assess which TUA is the strongest candidate. These five categories include:

- Operational Performance
- Environmental Factors and Performance
- Construction Feasibility/Performance
- Capital and Life Cycle Cost
- Community factors

The Navy recognizes importance of weighting in such an "attribute" analysis and will consider using a sensitivity analysis to look at various weighting approaches and options.

Evaluating and integrating the 13 decisional inputs: After assessing the five categories described above, the Navy will likely undertake other specific evaluation tools and methods to help characterize the pros and cons of each of the Alternatives. All of the 13 decisional inputs will be carefully considered by decision support teams as well as the senior decision team. A senior decision team will craft a recommendation to present to the Navy senior command. In this phase of the decision process, the Navy may use multiple decision teams in an effort to ensure that all decisional inputs are carefully considered and evaluated from a broad range of perspectives. In so doing the Navy will consider the attributes, carefully review the consequences of each decision along with any uncertainties associated with each decision, trade-offs among alternatives and linkages between the TUA decision and later decisions concerning the facility. The Navy team will carefully consider, so as to avoid, common decision errors to ensure the highest quality decision is made on this important matter. The approximate time line for this effort is shown in Appendix B.

Initial approval of the Navy TUA Decision: The first step in the process for selecting a TUA will be by local Hawaii DoD commands including NAVFAC Hawaii, Defense Logistics Agency, Pacific, NAVSUP Fleet Logistics Center, Pearl Harbor and Navy Region, Hawaii. Eventual approval authority with in DoD will reside with Secretary of Navy (SECNAV)/Office of the Secretary of Defense (OSD) or their designees.

Review of the Navy TUA Decision by the Regulators. After DoD approval of a proposed BAPT, the proposed TUA will be provided to the regulating agencies, EPA and HDOH, in the form of a TUA Decision Document, for final approval. Within 30 days of the final EPA/HDOH approval, Navy and EPA are required to brief the House Armed Services Committee (HASC) of the decision. Within the course of this process, external stakeholders as well as the public will be provided the opportunity to comment.

Attachments

Reference Documents

List of key agencies and organizations (tied to decisional input)

Appendix A. Six TUA Alternatives

Appendix B. Decisional Times

Appendix C. Diagram of Decision Flow

Reference documents

1. Administrative Order On Consent, EPA DKT NO. RCRA 7003-R9-2015-01, DOH DKT NO. 15-UST-EA-01, 28 September 2015
2. Red Hill Facility Tank Inspection, Repair, And Maintenance Procedure Decision Document Administrative Order On Consent (AOC) Statement Of Work (SOW) Section 2.4, SSR-NAVFAC EXWC-CI-1745, 24 April 2017
3. Red Hill Facility Tank Inspection, Repair, And Maintenance Report Administrative Order On Consent (AOC) Statement Of Work (SOW), Section 2.2, SSR-NAVFAC EXWC-CI-1655, 11 October 2016
4. 3.2 TANK UPGRADE ALTERNATIVES (TUA) Scope of Work Outline Final Submission, Contract N62742-13-D-0001, Delivery Order 0009, 9 September 2016
5. Administrative Order on Consent Section 4.5, New Release Detection Alternatives [Report], Scope of Work, 19 June 2017
6. Red Hill Facility, Corrosion And Metal Fatigue Practices Report, Administrative Order on Consent (AOC) and Statement of Work (SOW) Section 5.2, 4 April 2016
7. Red Hill Bulk Fuel Storage Facility, Scope Of Work For Destructive Testing, Administrative Order on Consent (AOC) and Statement of Work (SOW) Section 5.3.2, 30 May 2017
8. Work Plan / Scope of Work, Investigation and Remediation of Releases and Groundwater Protection and Evaluation, Red Hill Bulk Fuel Storage Facility, Rev 1, 5 November 2016
9. Work Plan / Scope of Work, Investigation and Remediation of Releases and Groundwater Protection and Evaluation, Red Hill Bulk Fuel Storage Facility, Rev 2, 4 January 2107
10. Section 8.2: Risk/Vulnerability Assessment Scope of Work, Red Hill Bulk Fuel Storage Facility, 13 April 2017
11. Performance Work Statement, Red Hill Alternative Location Study, Red Hill, DFSP Pearl Harbor, HI, 21 June 2017

List of key agencies and organizations

AOC Parties
U.S. Navy
Defense Logistics Agency (DLA)
U.S. Environmental Protection Agency (EPA)
State of Hawaii Department of Health (HDOH)

Department of Defense (DOD)
NAVSUP Fleet Logistics Center Pearl Harbor
Defense Logistics Agency Pacific (DLA PAC)
Naval Facilities Engineering Command Hawaii (NAVFAC HI)
Naval Facilities Engineering and Expeditionary Warfare Center (NAVFAC EXWC)
Naval Facilities Engineering Command Pacific (NAVFAC PAC)
Commander Navy Region Hawaii (CNRH)
Naval Supply Systems Command (NAVSUP)
Naval Petroleum Office
Commander, U.S. Pacific Fleet (COMPACFLT)
Commander, U.S. Pacific Air Forces (PACAF)
U.S. Pacific Command (PACOM)
Commander Naval Installations Command (CNIC)
Naval Facilities Engineering Command Head Quarters (NAVFAC HQ)
Office of the Chief of Naval Operations (OPNAV)
Defense Logistics Agency Head Quarters (DLA HQ)
Office of the Secretary of the Navy (SECNAV)
Office of the Secretary of Defense (OSD)

Other Agencies
U.S. Geological Survey (USGS)
State of Hawaii Department of Land and Natural Resources (DLNR)
DLNR Commission on Water Resource Management (CWRM)
Honolulu Board of Water Supply (HBWS)
Oahu Neighbor Hood Boards
State of Hawaii and Federal Legislature

Appendix A

Tank Upgrade Alternatives : In accordance with the AOC/SOW the following Alternatives form the primary options being considered for the Best Available Practicable Technology as applicable to the RHBFSF.

1. Restoration of existing tank employing new techniques and procedures as described in the TIRM Decision Document and Implementation Plan, Section 2.4 of the AOC/SOW

2. Restoration of existing tank employing new techniques and procedures as described in the TIRM Decision Document and Implementation Plan to also include fully coating the tank interior with polysulfide modified epoxy novolac coating

3. Complete removal of existing steel liner and replace with new carbon steel

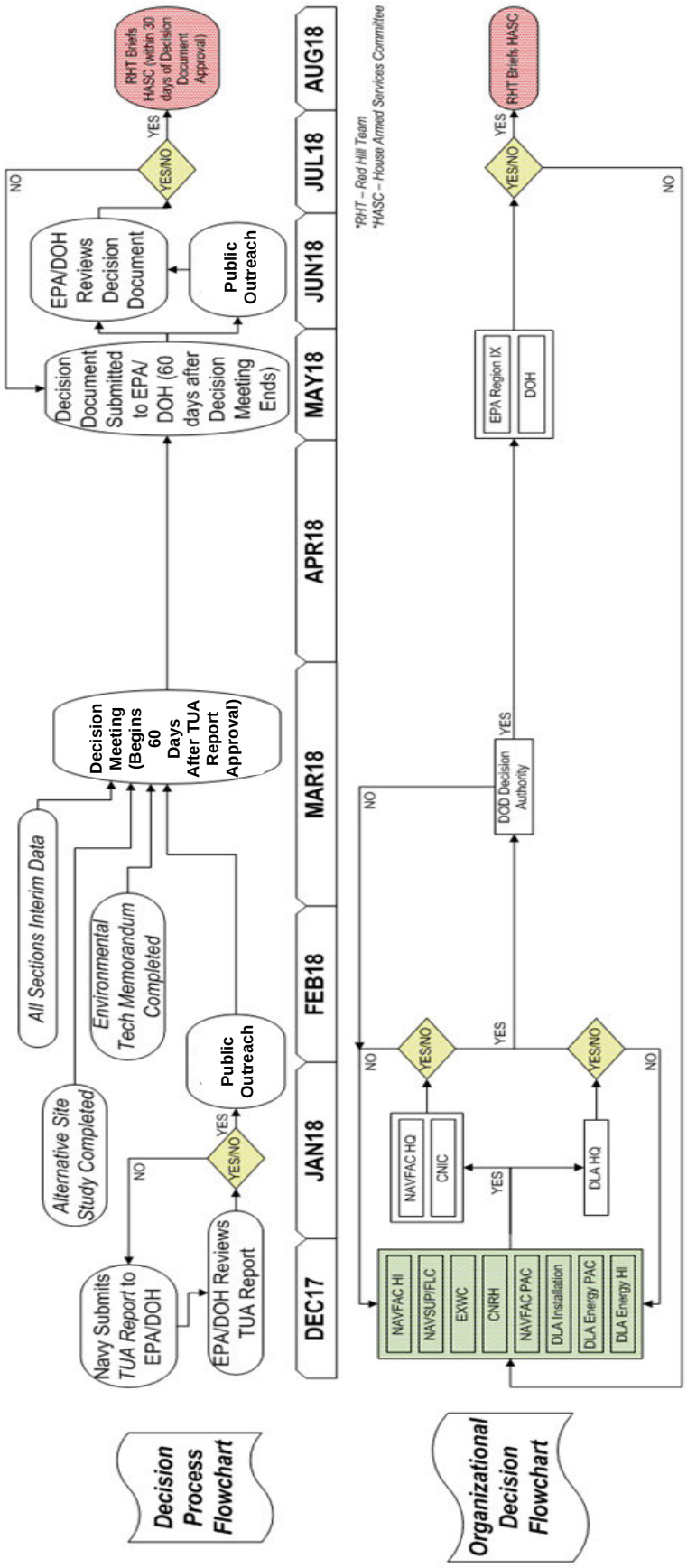
4. A composite tank consisting of the existing steel liner forming an outer hydraulic barrier with a new inner liner of ¼" steel plate forming a new primary hydraulic barrier. A 3" interstitial space would be formed between the two steel liners, to be filled with concrete or grout to transmit the hoop stresses to structural components. The interstitial space would be fitted with piping and channels to carry away any fluid which may penetrate the primary liner and be channeled to an observation/detection device and thus serve as a form of leak detection

5. A composite tank consisting of the existing steel liner forming an outer hydraulic barrier with a new inner liner of ¼" duplex stainless steel plate forming a new primary hydraulic barrier. A 3" interstitial space would be formed between the two steel liners, to be filled with concrete or grout to transmit the hoop stresses to structural components. The interstitial space would be fitted with piping and channels to carry away any fluid which may penetrate the primary liner and be channeled to an observation/detection device and thus serve as a form of leak detection

6. A double wall tank consisting of the existing tank and steel liner serving as an outer hydraulic barrier and a new carbon steel tank erected inside the existing tank steel with a 5' annular space in between permitting visual inspection of the exterior of the new tank. The new tank will be designed in accordance with applicable sections of API 650 for above ground storage tanks.

Appendix B

Decision Time line:



Appendix C

Decision Flow: