

# Alternate Site Requirements

*Requirements for considering alternate locations are that they must meet or exceed the current facility's capabilities*

## ENERGY INDEPENDENT

Gravity Fed – Alternate sites must be able to operate without electricity & deliver same rates of fuel to the base.



## SECURE

Off the Grid – Alternate sites must be cyber-hardened & Anti-Terrorism Force Protection compliant.

## STRATEGIC

Proximity to Consumers – Alternate sites must be Accessible to Navy, Marines, Army, Air Force, Coast Guard, National Guard, National Oceanic & Atmospheric Administration, Humanitarian Aid, etc.



## CAPACITY

250 Million Gallons – Alternate sites must meet or exceed current capacity.

# Tank Maintenance and Leak Detection

*Recurring tank inspection, repair, and maintenance (TIRM), combined with state of the art leak detection ensure facility integrity.*

## HOW TANKS ARE MAINTAINED

Tanks undergo a rigorous clean, inspect, and repair process (approximately 3 years per tank). The recently completed TIRM Decision Document/ Implementation Plan highlights requirements and improvements: past, current, and future.



Work crew inspecting lower barrel of the fuel tank

## CURRENT METHODS OF LEAK DETECTION



Master Craftsmen operate/monitor tanks 24/7 in a high-tech control room



- Continuous monitoring of alarms and measurements of fuel levels in all tanks
- Annual tank tightness testing
- Monthly soil vapor monitoring

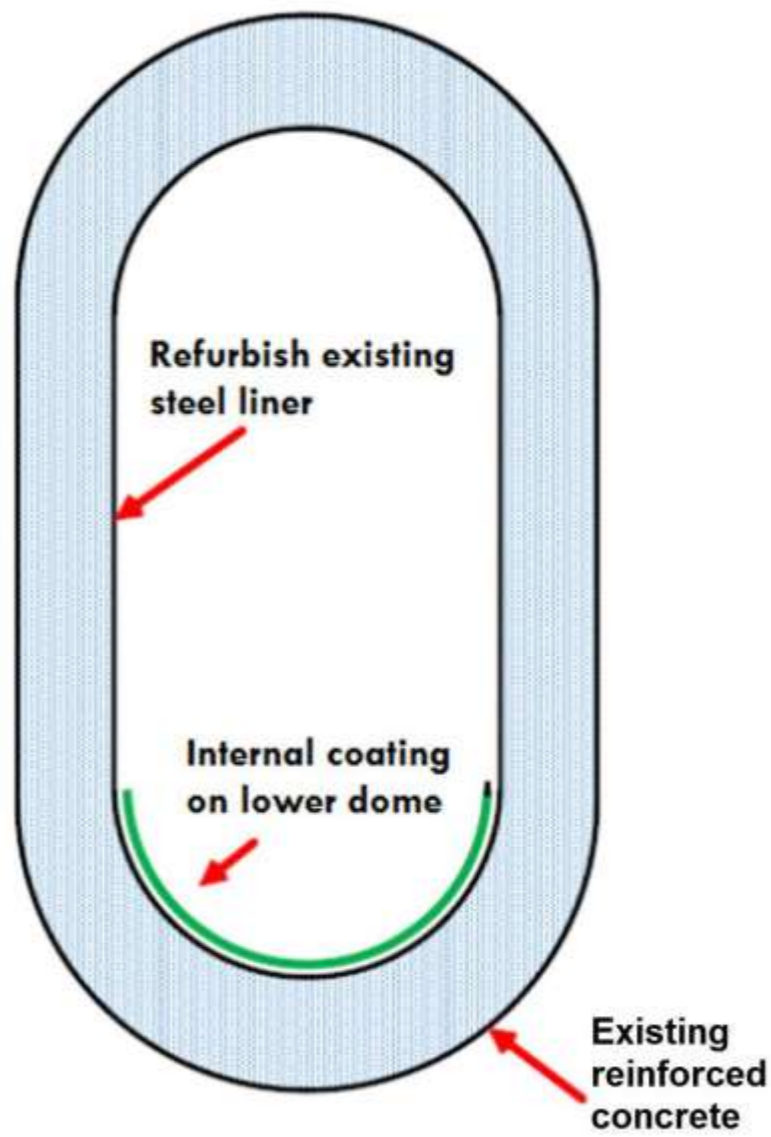
## FUTURE METHODS OF LEAK DETECTION

Section 4 of the AOC-SOW will be completed in 2018 and will determine the best leak detection technology(s) suited to install at Red Hill.

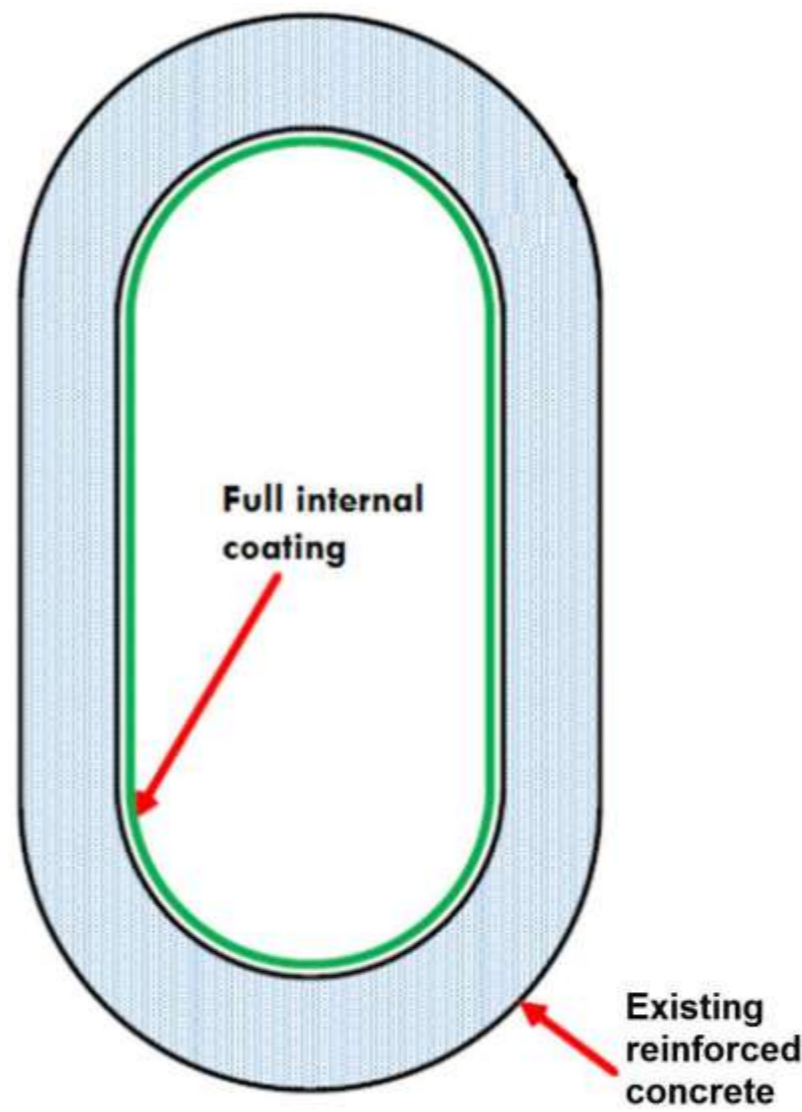
# Tank Upgrade Alternatives

Out of the original 14 alternatives considered, six are being analyzed and rated (three single-wall & three double-wall). The report will be completed by December 08, 2017.

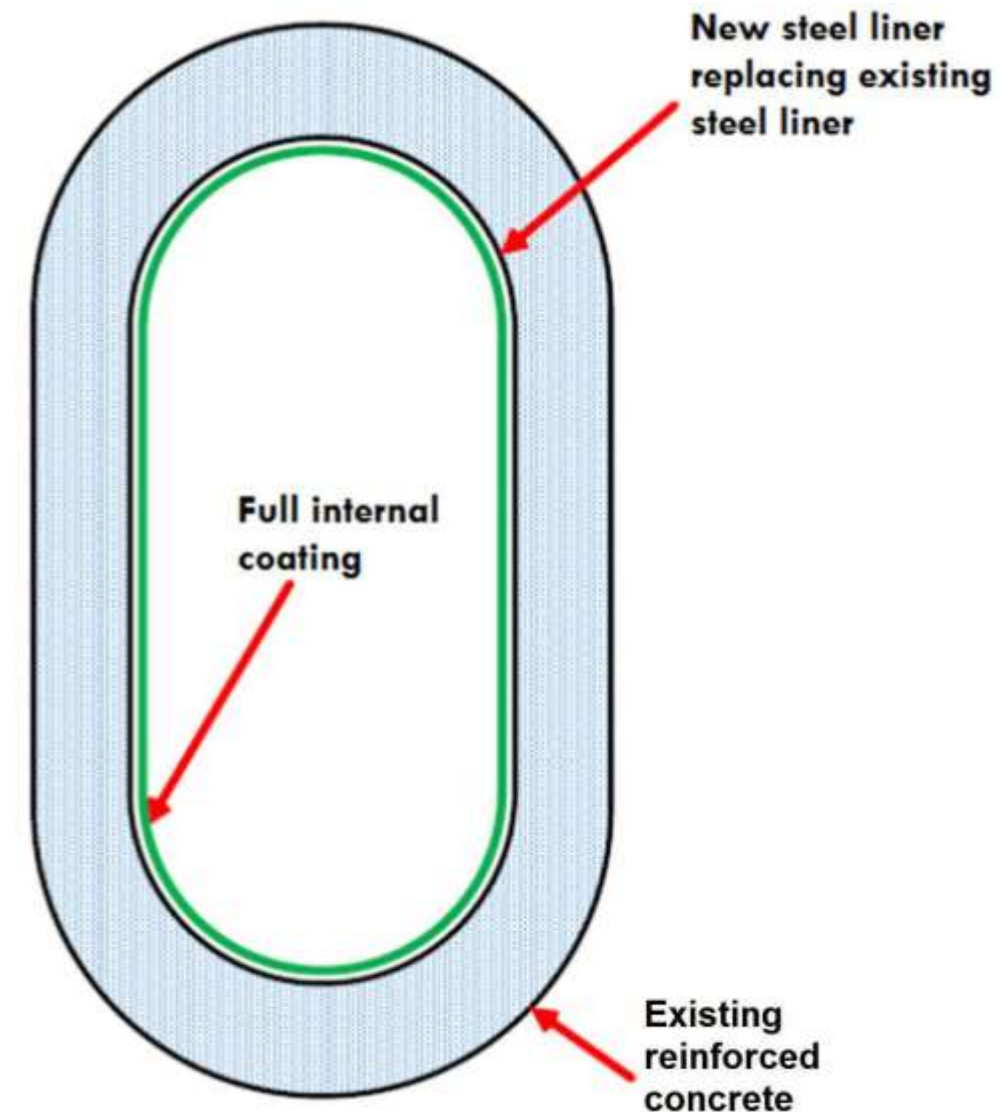
\*Not to scale



**Refurbish/Lower Dome Coating**

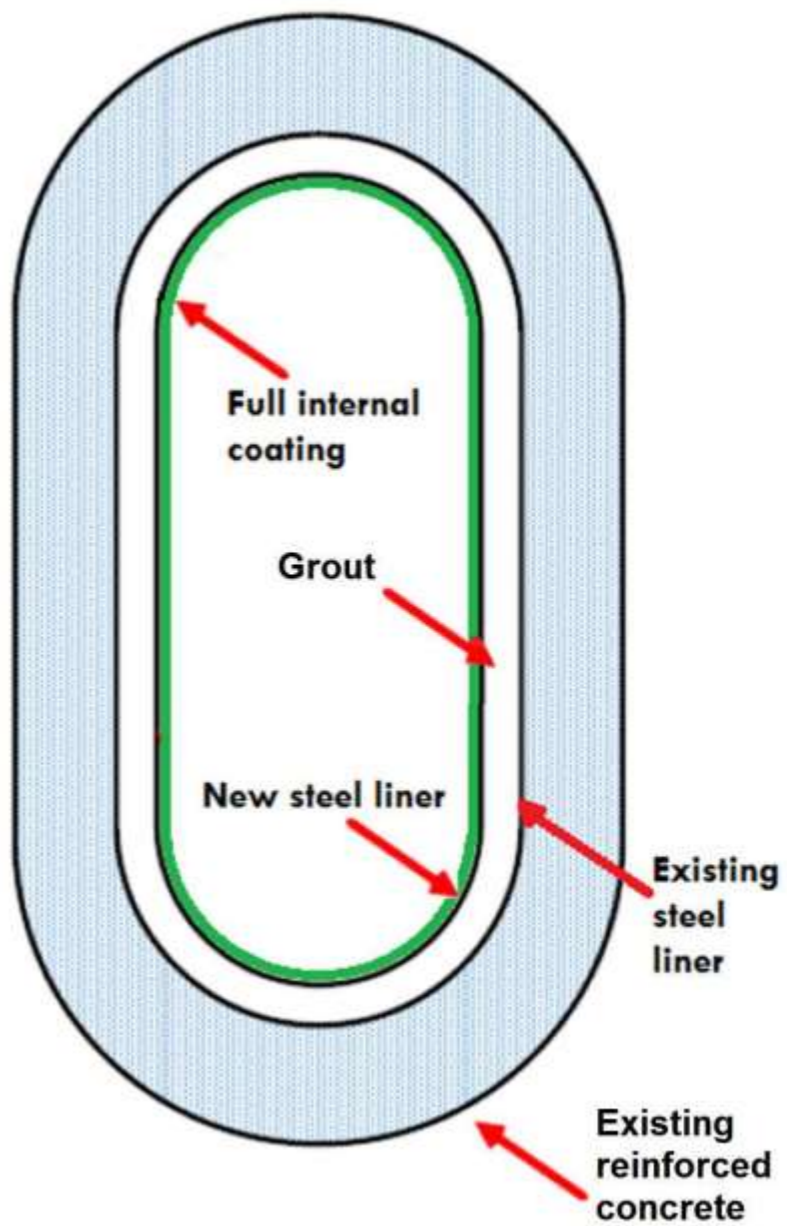


**Refurbish/Full Liner Coating**

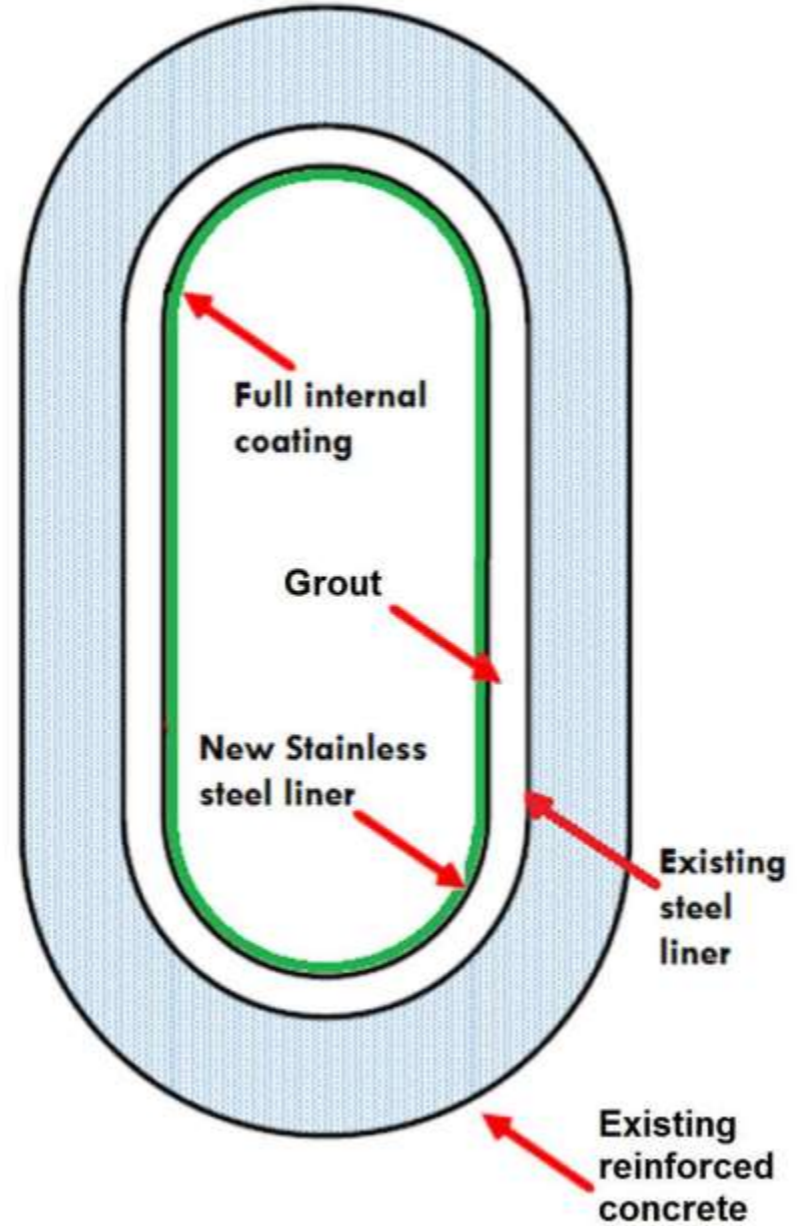


**New Steel Liner/Full Liner Coating**

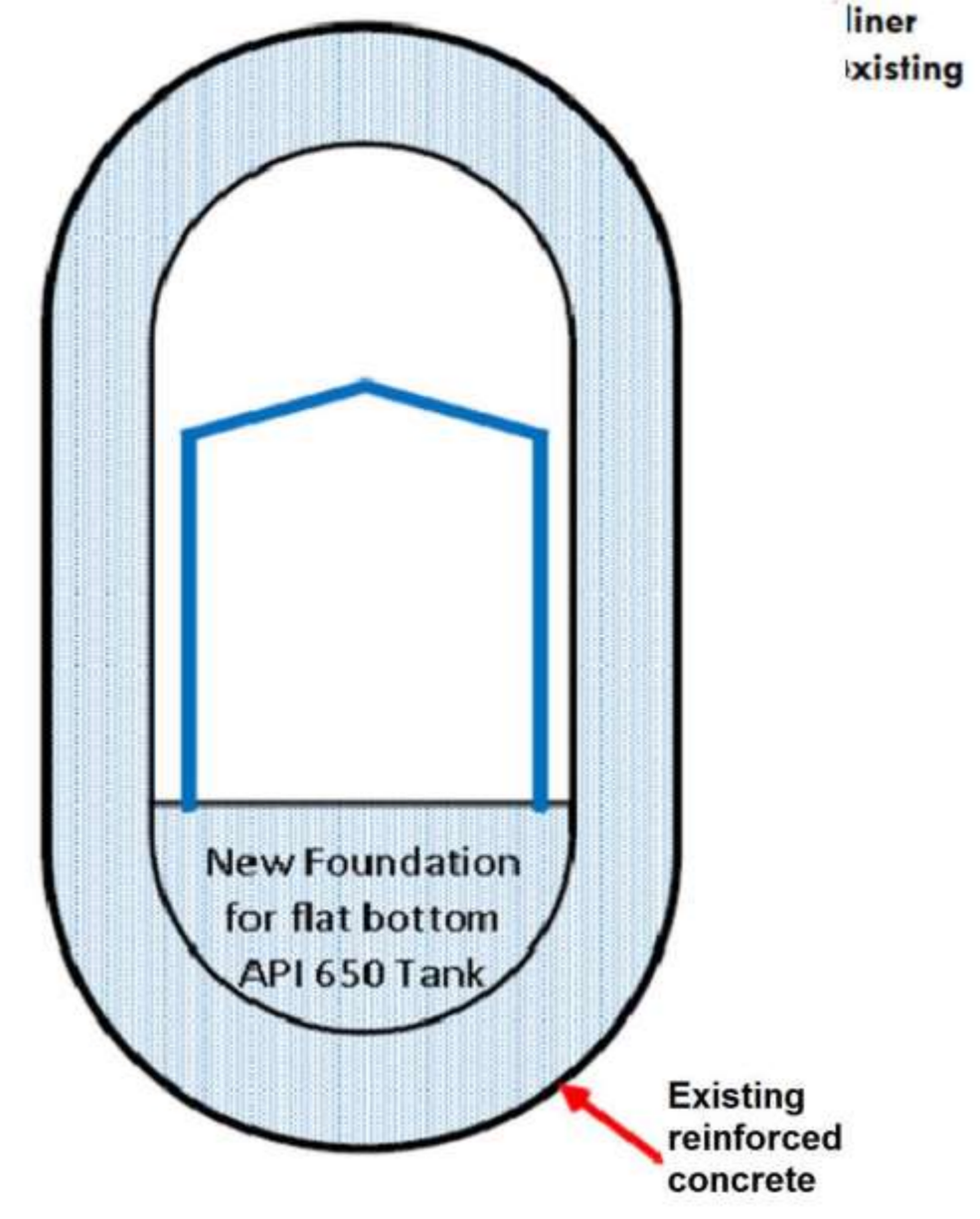
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**Double Wall (Steel)/Full Liner Coating**



**Double Wall (Stainless Steel)/Full Liner Coating**



**Tank Within A Tank**

## ATTRIBUTES

There are 21 attributes being rated. Some examples are:

- \*Constructability
- \*Inspectability
- \*Reliability
- \*Repairability
- \*Cost

# Upgrading Tanks

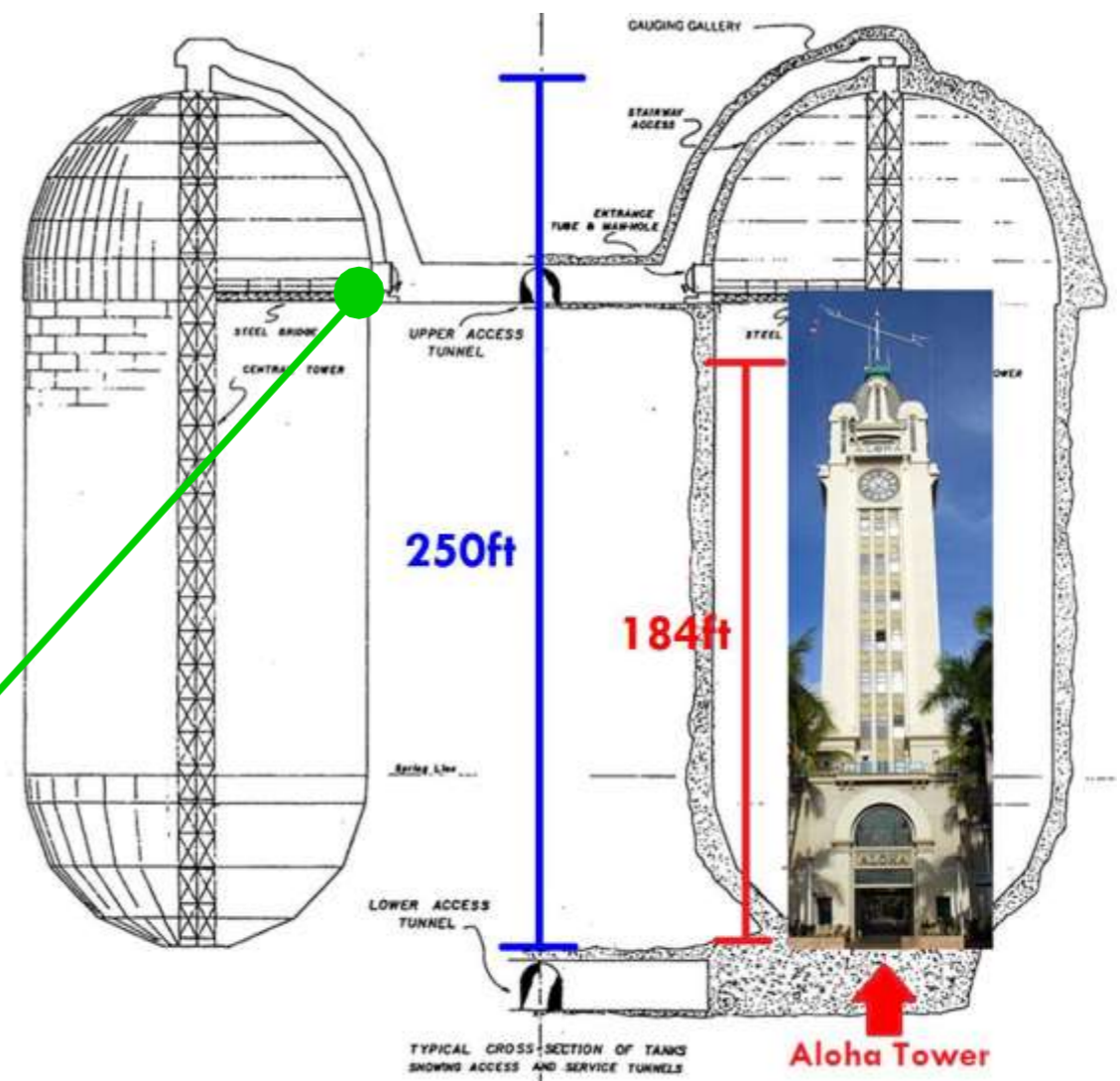
*The Administrative Order on Consent (AOC) tank upgrade schedule is structured and designed to accommodate the demand and scale of the Red Hill Facility.*

## 20 YEARS TO COMPLETE ALL TANKS

Red Hill is a unique, operational facility that does not afford off-the-shelf solutions. The Size, Logistics, and Engineering are all contributing factors to compressing the timeframe.

### SIZE

Each tank is 250ft tall and 100ft in diameter, which equates to ~2.25 acres of steel liner per tank.



### ENGINEERING

- The size and logistics completely change the science/engineering and pose significant challenges.
- All materials, equipment, and people have to mobilize and access each tank through a single hatch deep in a tunnel.



### LOGISTICS

Operational facility that supports an active Pacific Theater.



# Drinking Water

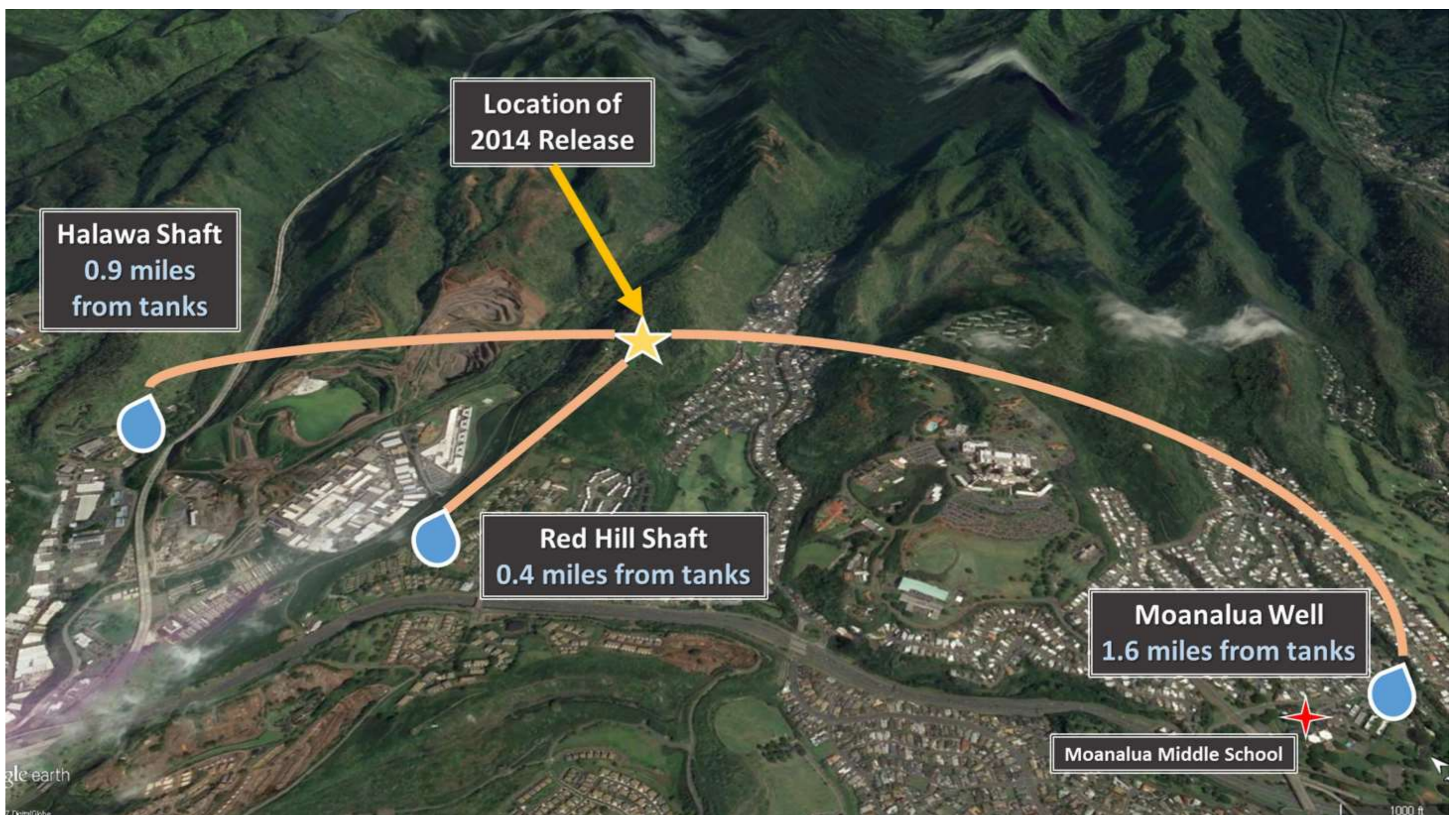
**Drinking Water supplies in the vicinity of Red Hill continue to meet all federal drinking water standards.**

## Public Water Sources Near the Red Hill Underground Tanks

Public Drinking Water Source	Red Hill Shaft	Halawa Shaft	Moanalua Wells
Operator	U.S. Navy	Honolulu Board of Water Supply	
Areas served by water source	Joint Base Pearl Harbor-Hickam (exclusively)	Metropolitan Honolulu-Moanalua Valley to Hawaii Kai	
Associated public water system	Joint Base Pearl Harbor-Hickam	Honolulu Windward- Pearl Harbor	
Population served by system	65,230	630,266	
Relative amount sources represent in the associated system	1 of 3 sources in system	Combined 25% of system	
Within Federal and State Drinking Water Standards	Yes	Yes	Yes
Last date water source was sampled	April 18, 2017	March 8, 2017	March 8, 2017

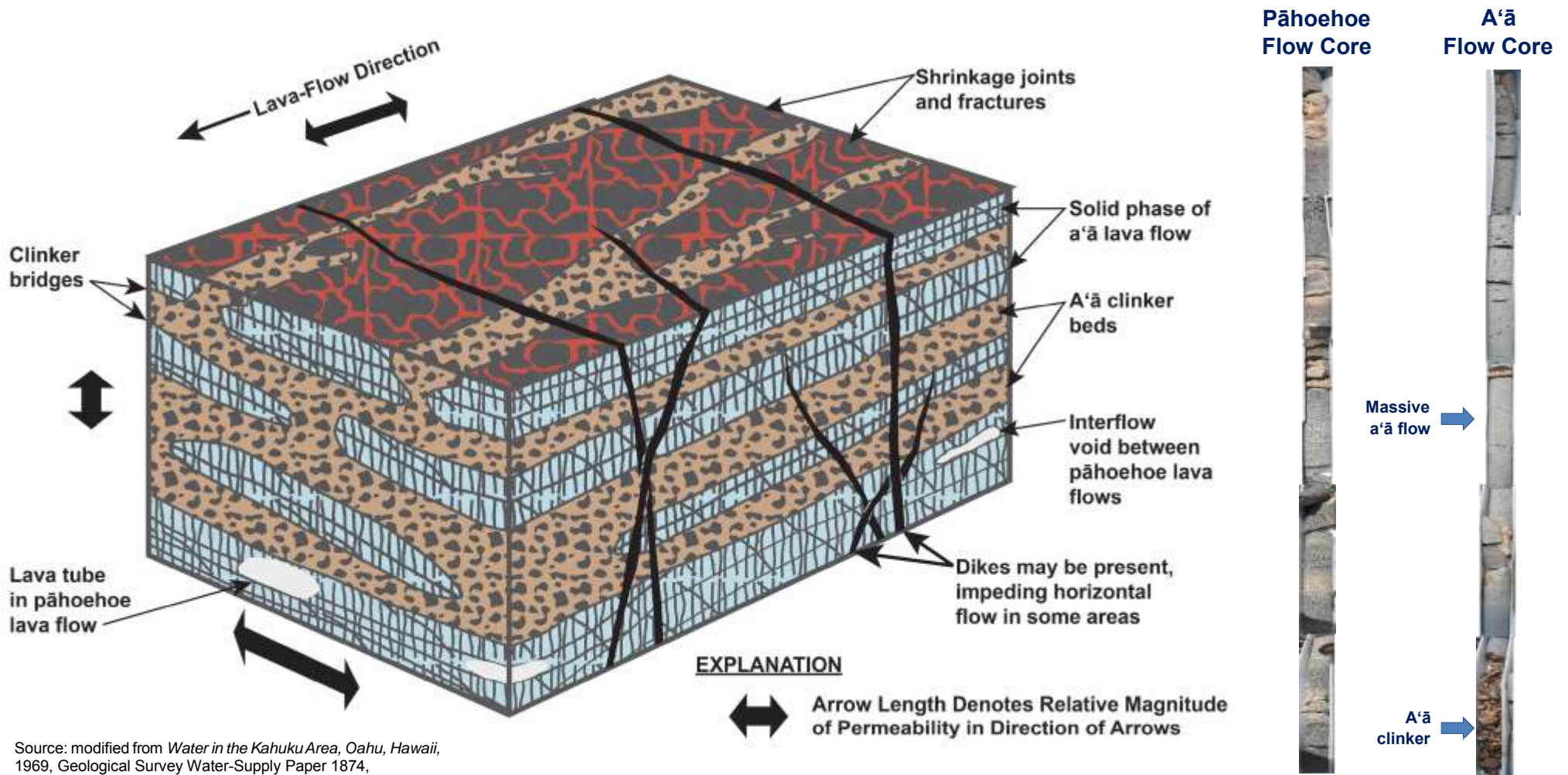
The Safe Drinking Water Act requires testing for more than 90 contaminants including several petroleum-related contaminants, such as Benzene, Toluene, Ethylbenzene, Xylene and Polyaromatic hydrocarbons.

More information is available in the **Consumer Confidence Reports** published by the water system operators.



# Complex Subsurface Geology at Red Hill

The Navy/DLA are collecting geologic data to better understand and evaluate groundwater flow and potential chemical movement beneath the tanks and nearby areas.



Source: modified from *Water in the Kahuku Area, Oahu, Hawaii*, 1969, Geological Survey Water-Supply Paper 1874, by K. J. Takasaki and S. Valenciano.

# Red Hill's Groundwater Monitoring Network

## Navy's Investigation Tasks:

- Evaluate geology
- Investigate subsurface petroleum
- Identify chemicals
- Expand groundwater monitoring network
- Update groundwater flow & contaminant transport models
- Identify appropriate remedies

COPC	RHMW02	
	Concentration (µg/L)	
	April 2017 Validated Result	Maximum Since 2014 Leak
TPH-d	940	6,500
1-Methylnaphthalene	20	71
2-Methylnaphthalene	17	48
Naphthalene	52	160

Legend	
	Drinking Water Supply Well
	Groundwater Monitoring Location with April 2017 Validated Results Above Screening Criteria
	Groundwater Monitoring Location with April 2017 Validated Results Below Screening Criteria
	Newly Installed Groundwater Monitoring Location
	Proposed Groundwater Monitoring Well Location
	Red Hill Tank
	Red Hill Tank 5

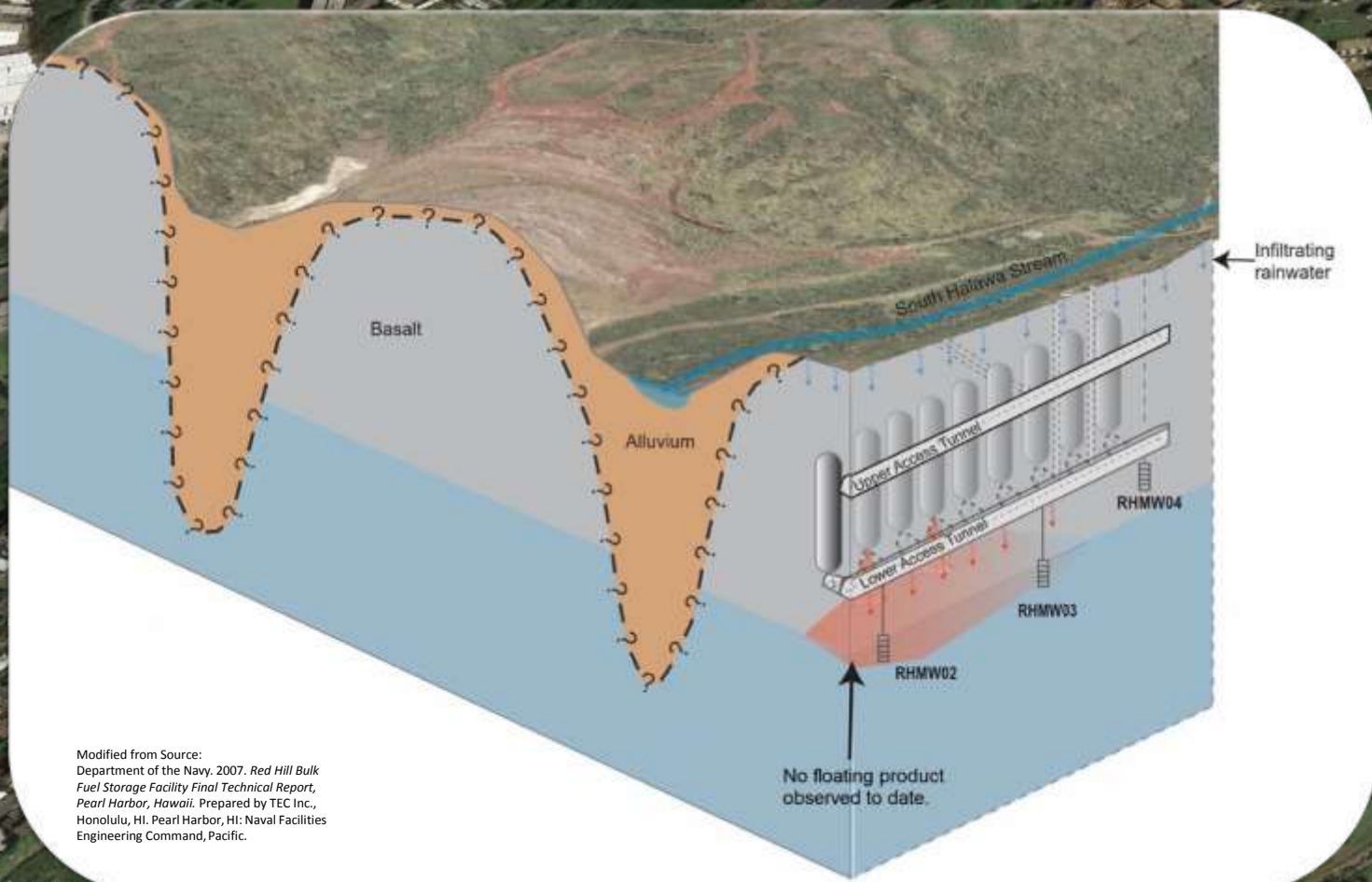
Notes	
1. Acronyms and Abbreviations: COPC Chemical of Potential Concern EAL Environmental Action Levels TPH-d Total Petroleum Hydrocarbons - Diesel range µg/L micrograms per liter	
2. RHMW08, RHMW09, and RHMW10 are newly installed groundwater monitoring wells.	
3. Screening Criteria are Hawai'i Department of Health Environmental Action Levels (EALs).	
<b>COPC</b>	<b>EAL</b>
TPH-d	100 µg/L
1-Methylnaphthalene	6 µg/L
2-Methylnaphthalene	10 µg/L
Naphthalene	17 µg/L
4. Most recent long-term monitoring event validated data from April 2017.	
5. RHMW10 was installed April 2017, and first sampled in May 2017.	

Point of 2014 Leak (Tank # 5)

BWS Hālawā Shaft

Navy Red Hill Shaft

BWS Moanalua Wells



Modified from Source:  
Department of the Navy, 2007. Red Hill Bulk Fuel Storage Facility Final Technical Report, Pearl Harbor, Hawaii. Prepared by TEC Inc., Honolulu, HI. Pearl Harbor, HI: Naval Facilities Engineering Command, Pacific.



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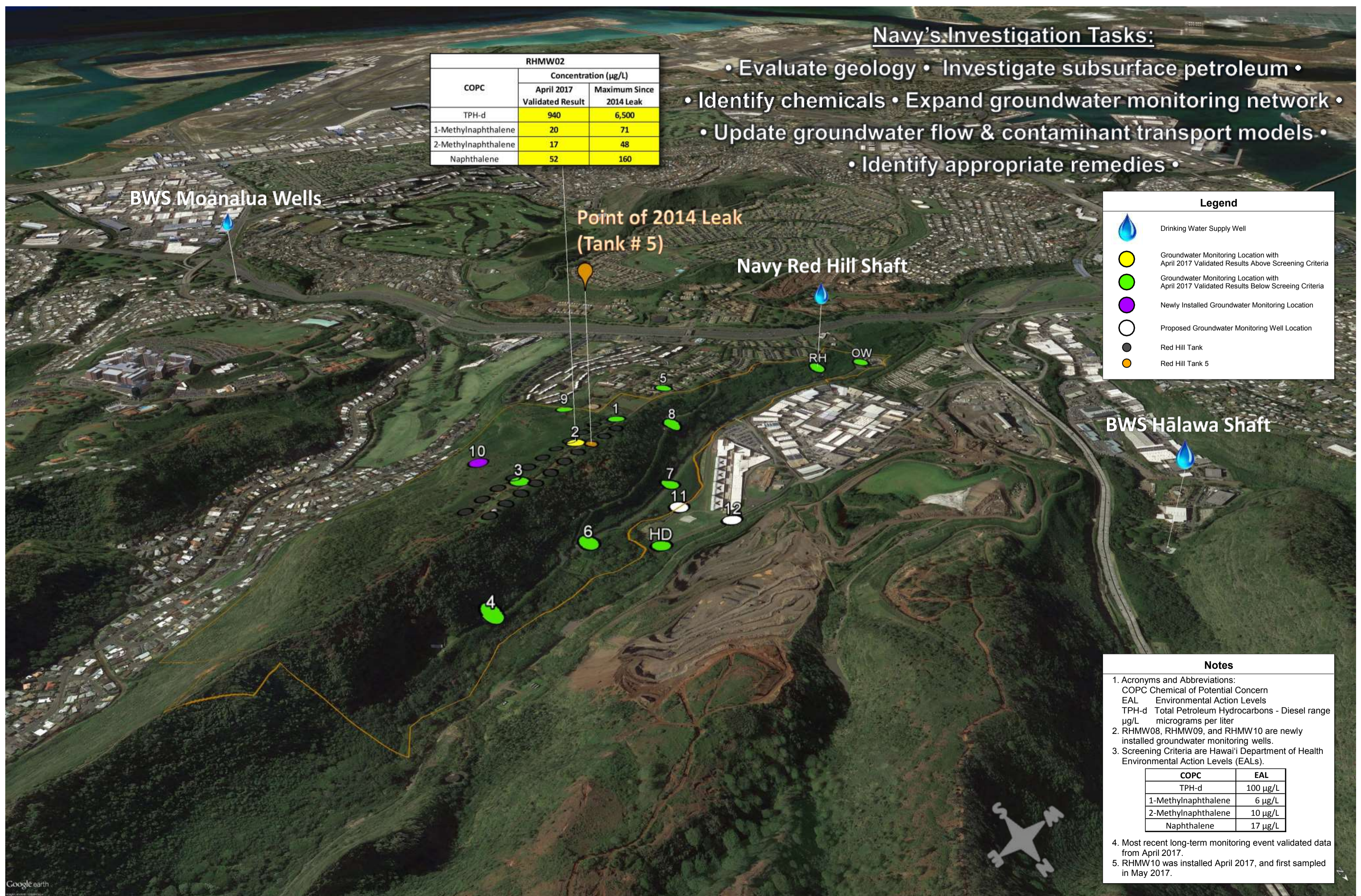
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# Environmental Actions at Red Hill

*The Navy and Defense Logistics Agency continues to monitor and further investigate the area's groundwater and has proposed additional investigative measures to evaluate and protect the groundwater resource.*

