DEPARTMENT OF THE NAVY
COMMANDER
NAVY REGION HAWAII
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5090
Ser N45/0441
March 6, 2018

CERTIFIED NO: 7016 0910 0001 0891 7888

Mr. Omer Shalev
U.S. Environmental Protection Agency, Region IX
75 Hawthorne Street
San Francisco, CA 94105

CERTIFIED NO: 7016 0910 0001 0891 7901

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

Dear Mr. Shalev and Mrs. Kwan:

SUBJECT: ADMINISTRATIVE ORDER ON CONSENT STATEMENT OF WORK SECTION 8.f, RED HILL ALTERNATIVE LOCATION STUDY, RED HILL BULK FUEL STORAGE FACILITY, JOINT BASE PEARL HARBOR-HICKAM, OAHU, HAWAII

The Red Hill Alternative Location Study pursuant to the Administrative Order on Consent ("AOC") Statement of Work ("SOW") Section 8.f, “A comparison of risks and benefits between the current facility and alternative fuel storage facilities” is enclosed.

The purpose of this preliminary study was to identify and evaluate potential locations for alternative bulk fuel storage in support of military forces based on, and transiting through, the island of Oahu, Hawaii. The potential for a new alternative site, as discussed in this study, will be compared with the Tank Upgrade Alternatives discussed in the Tank Upgrade Alternatives Report, AOC SOW Section 3.3, dated 8 December 2017, for ensuing facility upgrades. Several sites were initially identified based on apparent available land mass and then each one was rated on their merits in meeting site selection factors that relate to the mission, constraints, and the environment.

If the decision is made to recapitalize the RHBFSF, more in depth studies, such as a Business Case Analysis and Environmental Impact Statement, will be required. These in-depth studies will thoroughly evaluate the original constraints, potential locations, selection factors, and potential risks.

5090
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March 6, 2018

Should you have any questions, please contact Mr. Mark Manfredi, Navy Region Hawaii, Red Hill Program Director (808) 473-4148 or email at: mark.manfredi@navy.mil.

Sincerely,

R. D. HAYES, III
Captain, CEC, U.S. Navy
Regional Engineer
By direction of the
Commander

Enclosures: Red Hill Alternative Location Study, 5 Feb 2018, Rev 03

Naval Facilities Engineering Command
ENGINEERING AND EXPEDITIONARY WARFARE CENTER

RED HILL ALTERNATIVE LOCATION STUDY

5 February 2018, Revision 03

Submitted by:

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13. SUPPLEMENTARY NOTES

14. ABSTRACT
This study identified 12 potential locations along the southern side of Oahu and ranked them on 14 different selection factors. The best site was determined to be Kapūkaki for many reasons, including: the site is on existing Department of Defense (DoD) property; the project would not displace any existing development; the surrounding land use is compatible with a fuel tank farm; the site is adjacent to the existing POL infrastructure of RHBFSF; and the site's high elevation allows for gravity operations. The estimated cost to construct the 250,000,000 gallons of storage at Kapūkaki is [redacted]. This provides approximately [redacted] in pre-construction expenses, [redacted] for the construction of 40 underground vertical (cut-and-cover) storage tanks at 150,000 bbl each, and [redacted] for demolition and contaminated soil at Red Hill. While the engineering and construction aspects of this extraordinary project appear to be straightforward, the project's size, the environmental/permitting process and tight deadline add a significant amount of risk. It is improbable that the facility could be completed by the mandated September 2037 deadline using traditional DoD programming and procurement methods. Instead, the more likely expected outcome would be completion by September 2051.

15. SUBJECT TERMS

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EXECUTIVE SUMMARY

Naval Facilities Engineering and Expeditionary Warfare Center (NAVFAC EXWC) was tasked to develop a comparison of risks and benefits between the current Red Hill Bulk Fuel Storage Facility (RHBFSF) and an alternative fuel storage facility as part of the Risk/Vulnerability Assessment (RVA) required by the Red Hill Administrative Order on Consent (AOC) Statement of Work (SOW).

This study identified 12 potential locations along the southern side of Oahu and ranked them on 14 different selection factors. The best site was determined to be Kapūkaki for many reasons, including the following:

- The site is on existing Department of Defense (DoD) property.
- The project would not displace any existing development.
- The surrounding land use is compatible with a fuel tank farm.
- The site is adjacent to the existing POL infrastructure of RHBFSF.
- The site's high elevation allows for gravity operations.
- The excavation spoils can be used to fill the RHBFSF's tanks.
- Construction does not require significant fill material.
- The site's security is already in place.
- There is no reduction to the current operational capabilities.
- The site has the lowest estimated construction cost.
- The site has the shortest estimated construction duration.
- The site has the smallest construction carbon footprint.

The estimated cost to construct the 250,000,000 gallons of storage at Kapūkaki is [redacted] (based on a mid-point of construction in 2040). This provides approximately [redacted] in pre-construction expenses, [redacted] for the construction of 40 underground vertical (cut-and-cover) storage tanks at 150,000 bbl each, and [redacted] for demolition and contaminated soil at Red Hill.

While the engineering and construction aspects of this extraordinary project appear to be straightforward, the project's size, the environmental/permitting process and tight deadline add a significant amount of risk. It is improbable that the facility could be completed by the mandated September 2037 deadline using traditional DoD programming and procurement methods. Instead, the more likely expected outcome would be completion by September 2051.

This report is, in essence, a pre-planning document. As such, the estimates and recommendations in this report are educated speculation based upon limited historical data. In addition, the limited historical data, while being related to the construction of DoD fuel storage tanks, is not comparable to the scope and scale of what is being proposed. This is truly a unique

project in many ways, and there is no way to anticipate or predict what will happen over the next 30 plus years. Therefore, the findings of this report should be considered general in nature, as there will be events in the future that have not been anticipated in this report that will affect the scope, cost and time in ways we cannot foresee.

ACRONYMS AND ABBREVIATIONS

ACRONYM	DEFINITION
AOC	Administrative Order on Consent
AOR	Area of Responsibility
ASTM	American Society for Testing and Materials
BBL	Barrel, 42 gallons
BPH	Barrels per hour
CONUS	Continental United States
DFSP	Defense Fuel Support Point
DoD	Department of Defense
EA	Environmental Assessment
E.G.	Example
EIS	Environmental Impact Statement
ESA	Endangered Species Act
ESQD	Explosive Safety Quantity Distance
F-24	NATO Designation for Commercial Jet A Aviation Fuel with additives
F-76	Naval Fuel (Naval Distillate)
IMP	Inventory Management Plan
JBPHH	Joint Base Pearl Harbor Hickam
JP-5	Jet Propellant – amilitary grade of aviation fuel
JP-8	Jet Propellant – amilitary grade of aviation fuel
MACC	Multiple Award Construction Contract
MILCON	Military Construction
NAVFAC	Naval Facilities Engineering Command
NAVFAC EXWC	NAVFAC Engineering and Expeditionary Warfare Center
NEPA	National Environmental Policy Act
NFPA	National Fire Protection Association
NHPA	National Historic Preservation Acty
OCONUS	Outside Continental United States
OPLAN	Operational/Operations Plan
PCAS	Post-Construction Award Services
POL	Petroleum, Oil, and Lubricants
RHBFSF	Red Hill Bulk Fuel Storage Facility
RVA	Risk/Vulnerability Assessment

ACRONYM	DEFINITION
SHPD	State Historical Preservation Division
SOW	Scope Of Work
TUA	Tank Upgrade Alternative
UFC	United Facilities Criteria
UG	Underground
US	United States
USFWS	United States Fish and Wildlife Services

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1.0 INTRODUCTION

This study covers the availability and risk analysis for amove of the RHBFSF to an alternate site while meeting the current infrastructure needs and capabilities present at Red Hill, Defense Fuel Support Point (DFSP) Pearl Harbor, Hawaii. Specifically, this study will supplement the risk factor analysis performed by NAVFAC Pacific for the Red Hill Administrative Order on Consent / Scope of Work (AOC / SOW) Section 8 Risk/Vulnerability Assessment.

The work products of this effort are ultimately for use by the Department of Defense, including Naval Facilities Engineering Command, Naval Supply Systems Command, Defense Logistics Agency, U.S. Pacific Command, Commander, Pacific Air Forces, and Commander U.S. Pacific Fleet. The final work products from this study will be seen by Environmental Protection Agency, Hawaii Department of Health, members of the United States Congress, Hawaii State and City legislators and the public.

The AOC / SOW Section 8 Risk/Vulnerability Assessment includes:

8.a. A risk matrix

8.b. Probability of catastrophic events (seismic events, leaks)

8.c. Completed hydrology studies

8.d. Probability of mechanical and human errors

8.e. Effectiveness of risk mitigation

8.f. A comparison of risks and benefits between the current facility and alternative fuel storage facilities

AOC SOW Sections 8a through 8e are being managed by NAVFAC Pacific. After much discussion on Part 8.f, it was agreed by the AOC SOW Parties that it was not part of the RVA Sections 8.a through 8.e scope and should be executed as an independent document. It will be generated and used as a tool concurrently with the ACO SOW Section 3.3 TUA Report in order to execute AOC SOW Sections 3.4 and 3.5, TUA Decision Meeting and TUA Decision Document and Implementation, and to satisfy the requirements of the House Report FY17 NDAA HASC Brief. The ultimate intent of this report is to cover the requirements in the AOC SOW Section 8.f.

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2.0 CONSTRAINTS AND REQUIREMENTS

2.1 Constraints

The potential alternative location to the current RHBFSF will need to provide capability equal to or greater than the current capability. At a minimum, specific requirement capabilities will include, but are not limited to:

1. Minimum of 250,000,000 gallons of storage for multiple products.
2. Strategically positioned geographically to maximize resupply and sustainment of joint forces during current peacetime and contingency operational plans (OPLANs) in the Indo-Asia-Pacific AOR. Specifically, focus only on alternative(s) located on the island of Oahu, Hawaii in order to provide POL support to Joint Base Pearl Harbor Hickam.
3. Storage shall be hardened with infrastructure capable of withstanding any kinetic effects that Red Hill can currently withstand.
4. Able to withstand an electronic attack, either physical (e.g. electromagnetic pulse) or virtual (e.g. cyber) to ensure continuous operations.
5. Storage is in a Sept similar to those maintained at Red Hill.
6. Storage area is able to operate with the following parameters:
    a) JP5 – Deliver up to [redacted] via means which are not dependent on electrical power, and receive up to [redacted]. Delivery and receipt modes must include deep draft tankers. Additionally, storage shall have issue capability via pipeline connections to airfield locations for contingency support of all existing DoD theater requirements.
    b) JP8 / F24 – Deliver up to [redacted] via means which are not dependent on electrical power, and receive up to [redacted]. Delivery and receipt modes must include deep draft tankers. Additionally, storage shall have issue capability via pipeline connections to airfield locations in full support of all existing DoD theater requirements.
    c) F76 – Deliver up to [redacted] via means which are not dependent on electrical power, and receive up to [redacted]. Delivery and receipt modes must include deep draft tankers.
    d) Capable of simultaneous multi-commodity transfers at the established rates (e.g. able to deliver JP-5 and receive F-76 and/or JP-8).
7. Storage location and/or configuration shall be designed to meet or exceed all environmental laws, regulations and policies with specific consideration to protecting the local natural resources. Favorably weigh locations which are more distant from an aquifer.

In addition to the above operational capabilities, the construction of an alternative site must be essentially complete by September 2037 in accordance with the Red Hill AOC.

2.2 Requirements

As noted above, the alternative location must be hardened with infrastructure capable of withstanding any kinetic effects or electronic attack that Red Hill can currently withstand. The primary defense of Red Hill is the fact that the facility is completely buried 100 feet underground, including all access tunnels. Therefore, the new facility will mimic this key feature to provide identical protection. The minimum requirements to meet the current DoD criteria for underground tanks include:

1. Underground vertical (cut-and-cover) storage tanks constructed in accordance with UFC 3-460-01 are steel-lined reinforced concrete tanks with leak monitoring capability. These tanks may be completely buried, surface-constructed and then covered with embankment, or any variation in between. For the OCONUS Pacific region they are only required in high threat areas or when tanks are required to be constructed within the explosive cordon area or clear zone. The design of underground vertical steel storage tanks shall be in accordance with DoD Standard Design AW 78-24-33 which provides for integral secondary containment/leak detection. The tank is essentially a double-walled tank that will be in compliance with federal, state, and local regulations.

2. Additional information on UFC 3-460-01 can be found on the Whole Building Design Guide's web site at https://www.wbdg.org/ffc/dod/unified-facilities-criteria-ufc/ufc-3-460-01.

3. Additional information on AW 78-24-33 can be found on the Whole Building Design Guide's website at https://www.wbdg.org/FFC/DOD/COS/AW_078-24-27.pdf.

4. The photos on pages 5 through 10 show the various stages of construction of a typical AW 78-24-33 tank.

5. The rendering on page 11 is a concept of how the tanks at the alternative site might be arranged. The top of the tanks would be 100 feet below grade; a main access/pipeline tunnel would run centrally between the tanks; lateral tunnels would be used for piping and personnel access to the bottom and the top of each tank; and the tanks would have a withdrawal line in the center to make them "drain-dry" tanks similar to Red Hill.

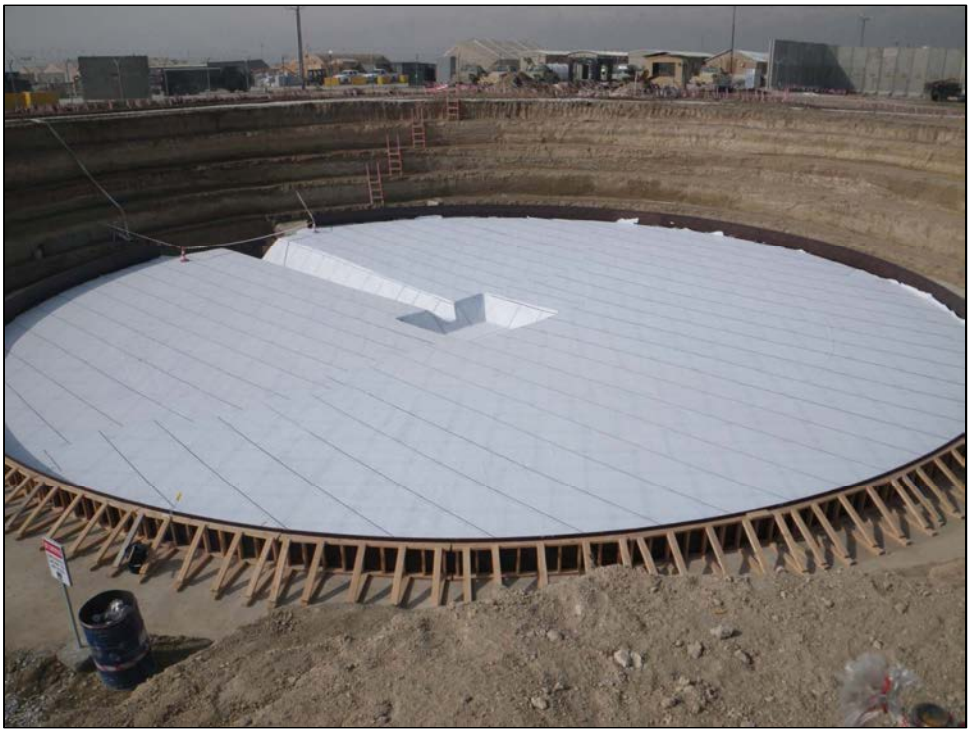
6. In lieu of burying the tanks 100 feet below ground to provide the required kinetic and electronic protection, the underground tanks could be installed at a much shallower depth by covering them with an equivalent thickness of concrete. It appears that this alternative construction method would increase the cost and carbon footprint of the project, but it should be investigated further if the alternative site is ultimately pursued.

7. Each tank should be no larger than 150,000 bbl (6,300,000 gallons) in order to provide adequate operational flexibility and best meet DoD tank design criteria. At 150,000 bbl each, a total of 40 tanks would be required to provide the minimum of 250,000,000 gallons.

8. The tanks will be spaced one tank diameter apart per the UFC 3-460-01. It should be noted that NFPA 30 does not have spacing requirements for vertical or horizontal underground storage tanks and aboveground vertical storage tanks would only need to be to be spaced one-third of a tank diameter.

Photograph 2.2-1
Excavation and initial leveling course.

Photograph 2.2-2
Completed leveling course.



Photograph 2.2-3
Waterproof membrane.

Photograph 2.2-4
Protective grout course.

Photograph 2.2-5
Installation of rebar for reinforced concrete foundation slab.

Photograph 2.2-6
Completed foundation slab with radial drainage gutters.

Photograph 2.2-7
Welded steel tank bottom and first shell course.

Photograph 2.2-8
Welded steel tank bottom with additional shell courses (interior).

Photograph 2.2-9
Completed welded steel tank.

Photograph 2.2-10
Initial formwork and rebar placement for concrete secondary containment.

Photograph 2.2-11
Geosynthetic drainage layer (black material with dimples).

Photograph 2.2-12
Completed underground vertical (cut-and-cover) storage tank.

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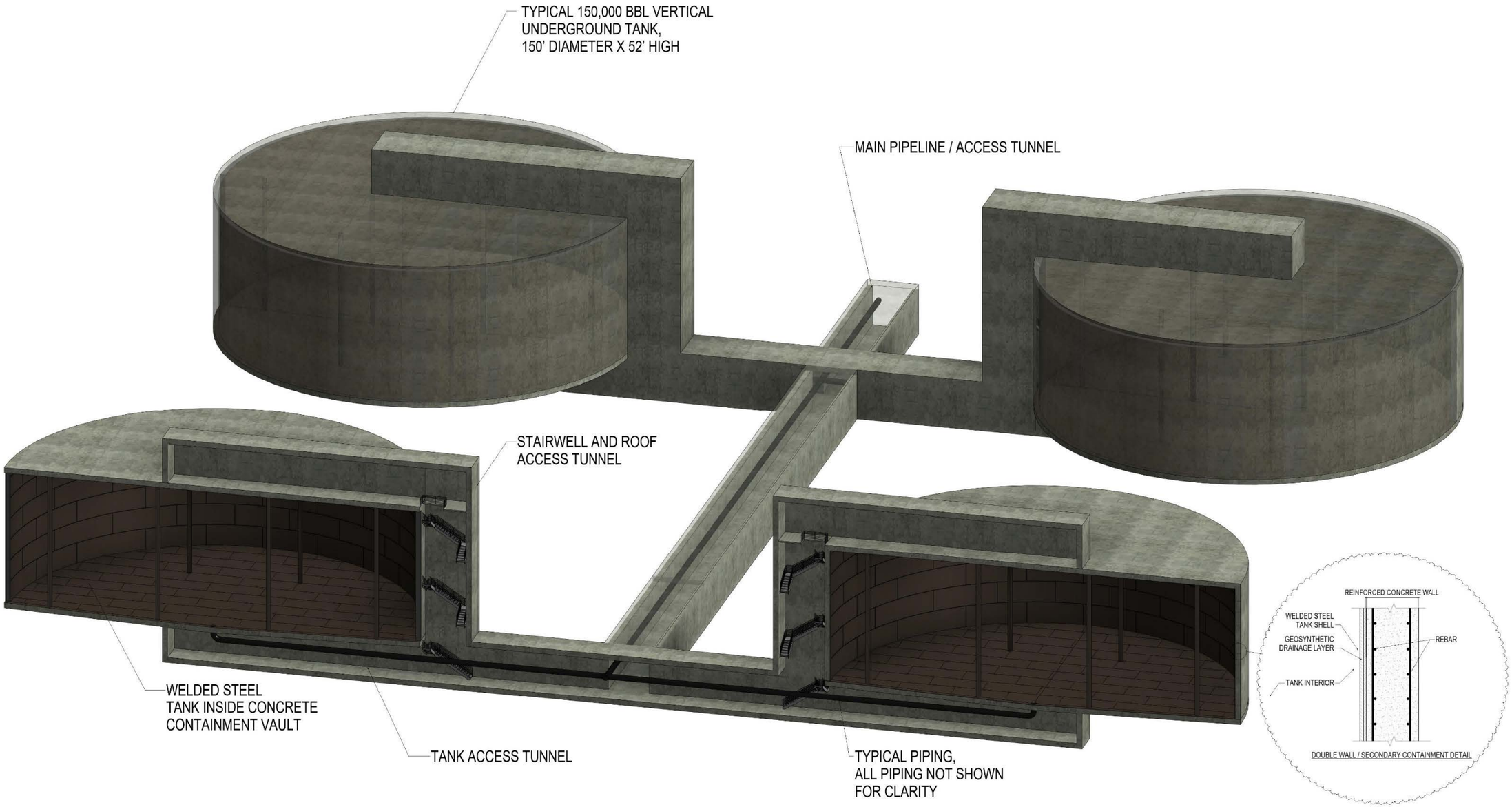

Figure 2.2-1 Rendering – Kapūkaki Tank Concept

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3.0 ALTERNATIVE SITE SELECTION

3.1 General

As noted in the previous section, there are numerous constraints that limit where the alternative site can be located. These constraints also lead to several tank construction related facts that impact where the alternate location could be sited:

- The tanks will need to be constructed underground using the DoD standard underground vertical (cut-and-cover) storage tank design and provided with the equivalent of 100 feet of earth cover to comply with the physical protection requirement.

- It will take 40 tanks at 150,000 bbl each to provide the requested 250,000,000 gallons of storage. The approximate dimensions of each steel tank will be 150 feet in diameter by 52 feet in height.

- The tank bottom must be at or above an elevation of 10 feet to stay out of the water table and at an elevation of 150 feet or more in order to gravity feed Joint Base Pearl Harbor Hickam (JBPHH). If the tanks cannot be installed with their bottoms above 150 feet, then alternative power sources would need to be provided.

- Considering the required 100 feet of earth cover, the tank height of 52 feet and the minimum tank bottom elevation of 150 feet for gravity feed, the natural site minimum elevation should be at least 300 feet.

3.2 Potential Sites Considered

In order to find an alternate location, the initial step was to select multiple potential sites that showed promise. The potential sites were identified upon the basic conditions that the site should be at least 50 acres in size, should not be located in a high value/densely developed site, and it should make common sense to be a fuel tank farm site.

The following 12 potential sites were ultimately investigated:

- Site A – Hickam Field

- Site B – Navy-Marine Golf Course

- Site C – Makalapa Crater Military Housing Area

- Site D – Salt Lake District Park

- Site E – Aliamanu Military/Coast Guard Reservation

- Site F – Quarry

- Site G – Kapūkaki

- Site H – Adjacent to Tripler Army Medical Center
- Site I – Adjacent to Fort Shafter
- Site J – Campbell Industrial Park
- Site K – Lualualei Naval Magazine
- Site L – NAVFAC Hawaii Facilities (between Marshall Road. and Namur Road)

3.3 Location Maps

The 12 potential sites are shown on the following maps:

1. General Vicinity Map – Oahu
2. Potential Sites – JBPHH Map
3. Potential Sites – Campbell Industrial Park Map
4. Potential Sites – Lualualei Naval Magazine Map

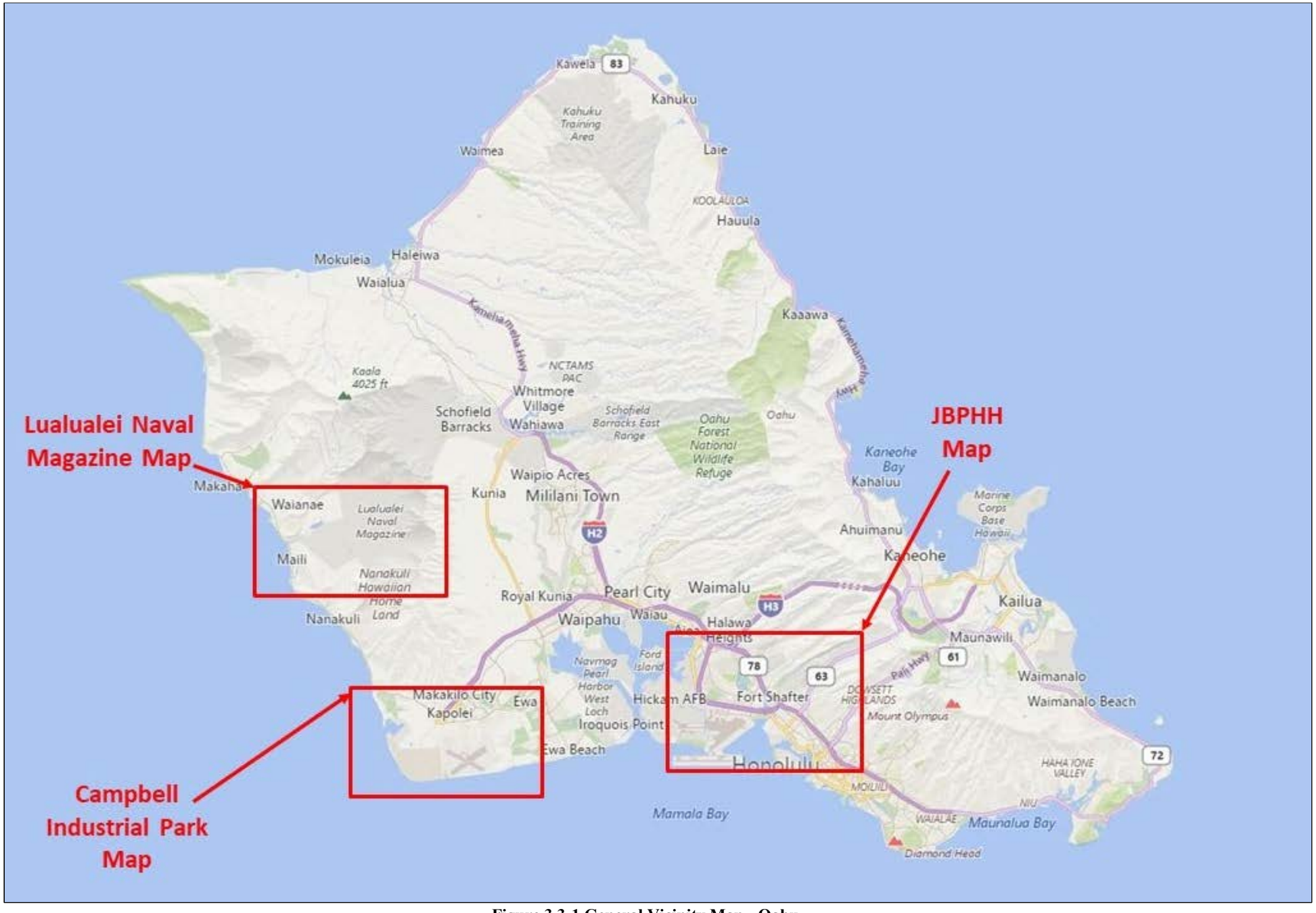

Figure 3.3-1 General Vicinity Map_ Oahu

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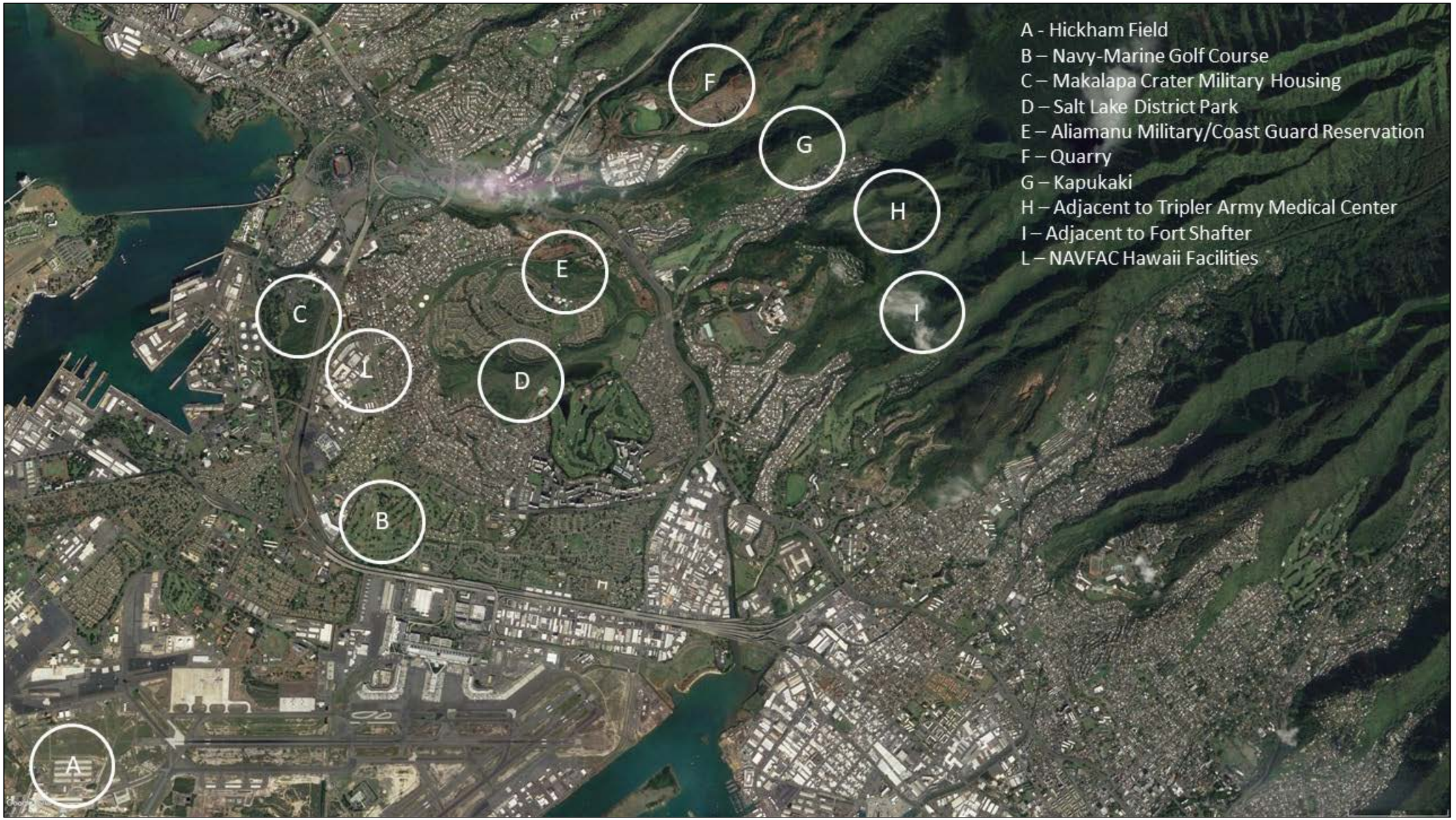

Figure 3.3-2 Joint Base Pearl Harbor-Hickam Map

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Figure 3.3-3 Campbell Industrial Park Map

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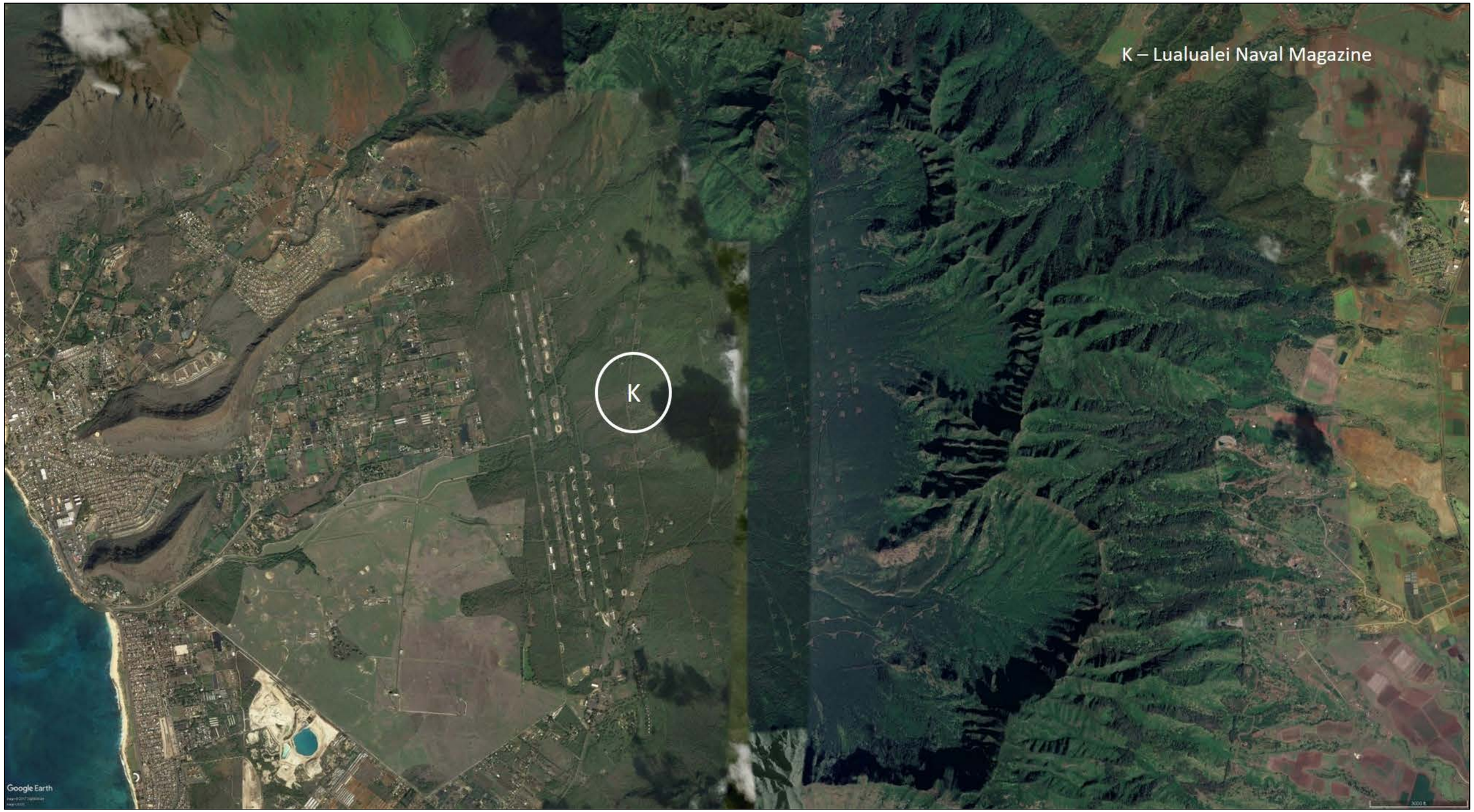

Figure 3.3-4 Lualualei Naval Magazine Map

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3.4 Alternate Site Selection Scorecard

The potential sites were evaluated in a quantitative manner by using a scorecard specifically developed for this study. The scorecard uses the following 14 site selection factors:

- Available Land Size and Shape
- Existing Site Development
- Current Land Ownership
- Surrounding Land Use
- Tank Bottom Elevation
- Existing Contamination
- Proximity to Drinking Water Wells
- Other Environmental Concerns
- Distance to existing JBPHH POL Assets
- Tank Construction Methods
- Construction Cost
- Construction Duration
- Sustainability and Resiliency
- Safety and Security

The scorecard on the following page provides the score for each site on all 14 factors. The basic scoring rationale for each factor is provided as well.

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Table 3.4-1 Alternate Site Selection Scorecard

SITE SELECTION FACTORS	POTENTIAL SITES											
	'A'	'B'	'C'	'D'	'E'	'F'	'G'	'H'	'I'	'J'	'K'	'L'
Available Land Size & Shape 0 = < 50 acres, irregular shape; 10 = > 100 acres, square/rectangular footprint, relatively flat.	8	8	0	0	0	10	5	10	10	5	10	5
Existing Site Development 0 = residential/office buildings/productive use; 5 = greenfield; 10 = brownfield	7	3	0	5	5	0	8	7	7	10	3	3
Current Land Ownership 0 = private residential/commercial, public parks/recreation; 5 = private non-essential industrial; 10 = DoD	10	10	10	0	10	0	10	0	0	5	10	10
Surrounding Land Use 0 = private residential/commercial, public parks/recreation; 5 = government housing; 10 = industrial, greenfield	8	0	5	0	5	10	10	5	3	10	7	5
Tank Bottom Elevation = < 50' elevation (requires diesel-driven pumps and fill); 10 = > 150' (will be gravity-fed system with no fill)	0	0	0	5	5	10	10	10	10	0	10	0
Existing Contamination 0 = documented contamination; 5 = not suspected; 10 = documented clean	3	5	5	5	5	5	5	5	5	5	5	5
Proximity to Drinking Water Wells 0 = < 1 mile; 5 = 1.5 miles; 10 = > 2 miles	5	0	1	0	0	0	0	5	0	5	5	0
Other Environmental Concerns 0 = documented issues (natural, cultural, etc.); 5 = not suspected; 10 = documented clean	5	5	5	5	5	10	2	3	3	10	3	3
Distance to existing JBPHH POL Assets 0 = > 1 mile across private property; 5 = < 5 miles across government property; 10 = < 1 mile across government property	5	5	10	5	10	7	10	3	0	0	0	7
Tank Construction Methods 0 = significant fill required to cover tanks, poor access; 10 = site naturally suited for cut-and-cover tanks, easy access	1	1	1	5	5	10	7	7	7	3	5	3
Construction Cost 0 = private property, significant fill, long distance to JBPHH, environmental issues, existing productive use; 10 = government property, site naturally suited for cut-and-cover tanks, close to JBPHH, no environmental issues	0	1	1	1	5	5	8	5	5	0	0	1
Construction Duration 0 = private property, significant fill, long distance to JBPHH, environmental issues; 10 = government property, site naturally suited for cut-and-cover tanks, close to JBPHH, no environmental issues	0	1	4	0	5	3	8	3	3	0	0	1
Sustainability & Resiliency 0 = significant fill, long distance to JBPHH , environmental issues, susceptible to tsunami, high seismic activity area; 10 = site naturally suited for cut-and-cover tanks, close to JBPHH , no environmental issues; remote to fault lines	0	0	1	8	8	10	8	7	6	0	0	0
Safety & Security 0 = near densely populated areas; 10 = remote from public access, within an existing secure Base perimeter	10	2	3	3	4	8	10	7	6	1	10	3
TOTAL POINTS	**62**	**41**	**46**	**42**	**72**	**88**	**101**	**77**	**65**	**54**	**68**	**46**

Points Scale: 0 (extremely unfavorable) to 10 (extremely favorable)

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3.5 Alternate Site Selection

The result of the scorecard analysis indicates Site G – Kapūkaki as the best alternative site. The Kapūkaki site is the best choice for multiple reasons while all of the other sites have at least one or two significant weaknesses that make them less favorable. A summary of the basic advantages and disadvantages for each site are as follows.

- Site A – Hickam Field

  The Hickam Field site has the available real estate, the land use would not conflict with the surroundings, and it is conveniently located on DoD property. However, the low elevation of the site would require significant fill material to build up the site and necessitate a engine-driven pumping system. These two items alone would add significant and insurmountable increases to the cost, duration, and carbon footprint when compared to Site G – Kapūkaki. The site is also adjacent to one of the active runways, so it may be impossible to raise the site and comply with the airfield clearance criteria.

- Site B – Navy-Marine Golf Course

  The positives for the golf course site are that it is on DoD property, and it has the needed real estate. Unfortunately, a fuel tank farm would not fit well with the surrounding land uses, and the site has all of the same low elevation issues as Site A - Hickam Field.

- Site C – Makalapa Crater Military Housing Area

  This DoD property has available greenspace, but does not have the required real estate. The site also has the same low elevation issues as Site A – Hickam Field, plus it would require the demolition of the historic military housing.

- Site D – Salt Lake District Park

  The only positive for the Salt Lake District Park location is that it sits on the southwest edge of a caldera which would provide some natural cover for the underground tanks. The fact that it is a local public park is sufficient reason enough to reject it as a viable location. In addition, the available real estate is too small, and the site is not high enough to gravity feed JBPHH.

- Site E – Aliamanu Military/Coast Guard Reservation

  This site sits on the northeast edge of the same caldera as the Salt Lake District Park location, but it is on DoD property. In addition, the pipeline tunnel to JBPHH runs along the northern edge of the site. While these are positive attributes, there is insufficient real estate, and the site is not high enough to gravity feed JBPHH.

- Site F – Quarry

  The commercial quarry to the north of Red Hill would be an ideal alternate location. Regrettably, the quarry is one of only two active quarries on the island making it an unlikely candidate.

- Site G – Kapūkaki

  This site is the best choice for many reasons, which include: it sits on DoD property; the site fits well with the surrounding land uses; it will gravity feed to JBPHH; it is adjacent to the pipeline tunnel to JBPHH; the excess spoils can be used to fill the existing RHBFSF's tanks and it has the smallest construction carbon footprint of the potential sites. The only potential negative is its proximity to a nearby drinking water well, but the proven reliability of the underground vertical (cut-and-cover) storage tank's leak detection and secondary containment systems should alleviate any concern.

  As noted above, one of the most significant advantages of selecting Site G is the lower carbon footprint. This is primarily due to three factors: no fill/borrow material is required to build up the site; there are no significant pipelines/tunnels to construct; and the excess excavation spoils can be used to fill the adjacent RHBFSF's tanks. These are just a few examples of using sustainable best management practices as outlined in ASTM E2876-13, Standard Guide for Integrating Sustainable Objectives into Cleanup, to help determine the best site.

- Site H – Adjacent to Tripler Army Medical Center

  The greenspace area in the higher elevations adjacent to the Tripler Army Medical Center would be a worthy site if it was on DoD property and closer to the existing pipeline tunnel to JBPHH.

- Site I – Adjacent to Fort Shafter

  Similar to Site H, this site would be a worthy option if it was on DoD property and closer to the existing pipeline tunnel to JBPHH. In the case of Fort Shafter, the topography is not as flat, and it is farther away from the pipeline tunnel, so it scored lower than Site H.

- Site J – Campbell Industrial Park

  The Campbell Industrial Park was investigated as an alternative site for one main reason: it matches the surrounding land use perfectly. Otherwise, it does not have many attributes that make it a reasonable choice. For instance, the low elevation of the site would require significant fill material to build up the site and necessitate an engine-driven pumping system. In addition, a new 15-mile, fortified/hardened pipeline tunnel would need to be built along the prescribed energy corridor. These

two items by themselves add significant and insurmountable increases to the cost, duration, and carbon footprint when compared to Site G – Kapūkaki.

- Site K – Lualualei Naval Magazine

  The Lualualei Naval Magazine has a few more positive attributes over Site J, such as it is on DoD property and has a high enough elevation for gravity feed to JBPHH. However, it is significantly worse than Site J, because it would require a new 25-mile, fortified/hardened pipeline tunnel. In addition to the pipeline tunnel being longer, the final 10 miles would not be in the already established energy corridor, adding to the cost, duration, and carbon footprint. Lastly, the site could be inside the explosive safety quantity distance (ESQD) making it even less desirable.

- Site L – NAVFAC Hawaii Facilities (between Marshall Road and Namur Road)

  The NAVFAC site's main attribute is that it sits on DoD property and is close to the existing access/pipeline tunnel. Unfortunately, there is not enough available real estate, it would require the relocation of the current NAVFAC functions, the land use would conflict with the surroundings, and the elevation is too low for gravity feed to JBPHH. Therefore, the cost, duration, and carbon footprint are less favorable when compared to Site G – Kapūkaki.

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4.0 COST ESTIMATE

The following cost estimate for the Kapūkaki site was generated using the project comparison estimating (parametric cost estimating) method. This technique uses historical information on total costs from past projects of similar construction, and it is typically used at the very early stages of a project when there are limited amounts of information. For the purposes of this study, the indicated cost should be considered a rough-order-of-magnitude estimate and is only accurate to within 15% to 25%.

Programming Services	[redacted]
Permitting Services	[redacted]
Design Services	[redacted]
Construction	[redacted]
Demolition of Red Hill	[redacted]
Contaminated Soil	[redacted]
Post-Construction Award Services	[redacted]
Estimated Grand Total (rounded)	[redacted]

The construction and demolition numbers are primarily based on recent bidding and awards of CONUS and OCONUS projects with similar tanks and discussions with general contractors that have built and/or demolished DoD underground vertical (cut-and-cover) storage tanks in the past. In current 2017 dollars, the [redacted] estimated construction includes approximately [redacted] per 150,000 bbl tank, while the demolition estimate breaks down to a cost of [redacted] per 300,000 bbl tank. These appear to be reasonable estimates based upon the available historical data and recent experience.

It should be noted that this estimate only includes external costs (consultants, construction contractors, etc.) specifically associated with the construction project. It does not include any operation or maintenance costs associated with the existing tank farm or the new one. It does not include any internal government costs associated with the project from conception to completion, nor does it include indirect project costs (internal or external) associated with public relations, community outreach, etc.

The estimate includes a 58% escalation of current costs based on a 2% annual inflation rate until the estimated mid-point of construction in 2040. The estimated grand total has been rounded up, and does not include any specific contingencies. The estimate assumes normal conditions; it does not assume perfect conditions, nor does it assume the worst conditions. Items that would negatively affect the cost estimate include higher interest rates, unusual spikes in material costs (especially concrete and steel), labor issues in Hawaii, procurement issues that delay or reduce funding, natural disasters, etc. As noted above, the accuracy is very limited at this stage, and the purpose of this estimate is only to establish the approximate magnitude for preliminary budgeting purposes.

Lastly, this cost estimate is based upon the time estimate and procurement method described in the next section. The overall project cost and construction duration are inexorably related, so any changes to the duration will create a proportional increase in the estimated cost. If the project gets delayed, then inflationary pressures, unanticipated changes in conditions and the contractor's extended overhead costs will drive up the cost. If the project gets accelerated, then the cost will go up due to additional pressures on the local pool of labor, raw materials and equipment (which is only exacerbated by Hawaii's size and remoteness).

5.0 TIME ESTIMATE

Constructing a replacement for Red Hill is a project of extraordinary proportions in many ways for the DoD. Therefore, the time estimate, similar to the cost estimate, is only an educated approximation at this conceptual stage. The DoD has not executed a project of this magnitude since it developed the DoD facilities in the Pacific AOR in the 1940's.[1] The time and costs associated with executing a project of this magnitude is greatly increased since the 1940's due to new regulations such as OSHA, Buy American Act, and other constraints as stated in the AOC SOW Section 2.2 Tank Inspection, Repair, and Maintenance Report and AOC SOW Section 3.3 TUA Report. Therefore, the project schedule includes the following time estimates:

Programming ..... 5 years

Permitting ..... 10 years

Design ..... 5 years

Construction ..... 20 years

The above time estimate includes the normal external needs (consultants, construction contractors, etc.) associated with the construction project, as well as reasonable and efficient government reviews and approvals. Similar to the cost estimate, this time estimate assumes normal conditions; it does not assume perfect conditions, nor does it assume the worst conditions. Items that would negatively affect the time estimate include unusual material shortages (especially concrete and steel), labor issues in Hawaii, procurement issues that delay or reduce funding, natural disasters, etc. The estimate does include four one-year delays (or floats in the schedule) for unforeseen conditions. The purpose of this estimate is only to establish the approximate magnitude for preliminary planning purposes, and the accuracy should be assumed to be no better than 15% to 25%.

Construction of the tank farm needs to be essentially complete by September 2037. Assuming the normal planning, budgeting and procurement methods for a single MILCON project, it is highly doubtful this project could be completed in such a time-frame. The technical effort associated with the engineering and construction is straightforward and has much less risk than that associated with its cost.

Most of the risk from a time perspective is the permitting. Based on other similar projects in the Honolulu area, specifically H-3 Highway and the Honolulu Rail Transit Project, it would appear possible, but extremely difficult, to meet the September 2037 deadline in today's anti-development climate. Instead, the more likely outcome would be completion by September 2051.

The other major risk from a time perspective is funding. A single MILCON appropriation of this size for a fuel farm has never been done. However, annual congressional MILCONs have been used in the past to procure similar projects with multiple, large scale MACCs (multiple award construction contracts). In this scenario, each individual contract would be based on available funding and phased in such a manner that it overlaps with the prior contract. Thus, keeping the overall project progressing. This method, while not efficient nor without risk, appears

reasonable based on historical precedent and has an estimated completion date of approximately 2051. See the proposed project schedule on the following page.

Red Hill Alternative Location Study
Project Schedule

ID	Task Name	Start	Finish
1	**Project Construction Schedule**	**10/1/18**	**9/29/51**
2			
3	Programming	10/1/18	9/30/23
4	Permitting	10/1/20	9/30/30
5	Design	10/1/24	9/28/29
6	Bidding and Award	10/1/29	10/1/30
7			
8	**Construction**	**10/2/30**	**9/29/51**
9	Mobilization	10/2/30	9/30/31
10	New Tanks 1-4	10/1/31	9/30/33
11	Demo Existing Tanks 1-2	10/3/33	9/28/35
12	New Tanks 5-8	10/3/33	9/28/35
13	Float	10/1/35	9/29/36
14	Demo Existing Tanks 3-4	9/30/36	9/30/38
15	New Tanks 9-12	9/30/36	9/30/38
16	Demo Existing Tanks 5-6	10/1/38	9/30/39
17	New Tanks 13-16	10/1/38	9/30/39
18	Float	10/3/39	9/28/40
19	Demo Existing Tanks 7-8	10/1/40	9/30/41
20	New Tanks 17-20	10/1/40	9/30/41
21	Demo Existing Tanks 9-10	10/1/41	9/29/42
22	New Tanks 21-24	10/1/41	9/29/42
23	Float	9/30/42	9/29/43
24	Demo Existing Tanks 11-12	9/30/43	9/28/44
25	New Tanks 25-28	9/30/43	9/28/44
26	Demo Existing Tanks 13-14	9/29/44	9/28/45
27	New Tanks 29-32	9/29/44	9/29/45
28	Float	10/2/45	10/1/46
29	Demo Existing Tanks 15-16	10/2/46	10/1/47
30	New Tanks 33-36	10/2/47	9/30/48
31	Demo Existing Tanks 17-18	10/1/48	10/1/49
32	New Tanks 37-40	10/1/48	9/30/49
33	Demo Existing Tanks 19-20	7/1/50	9/30/50
34	Demobilization	10/3/50	9/29/51

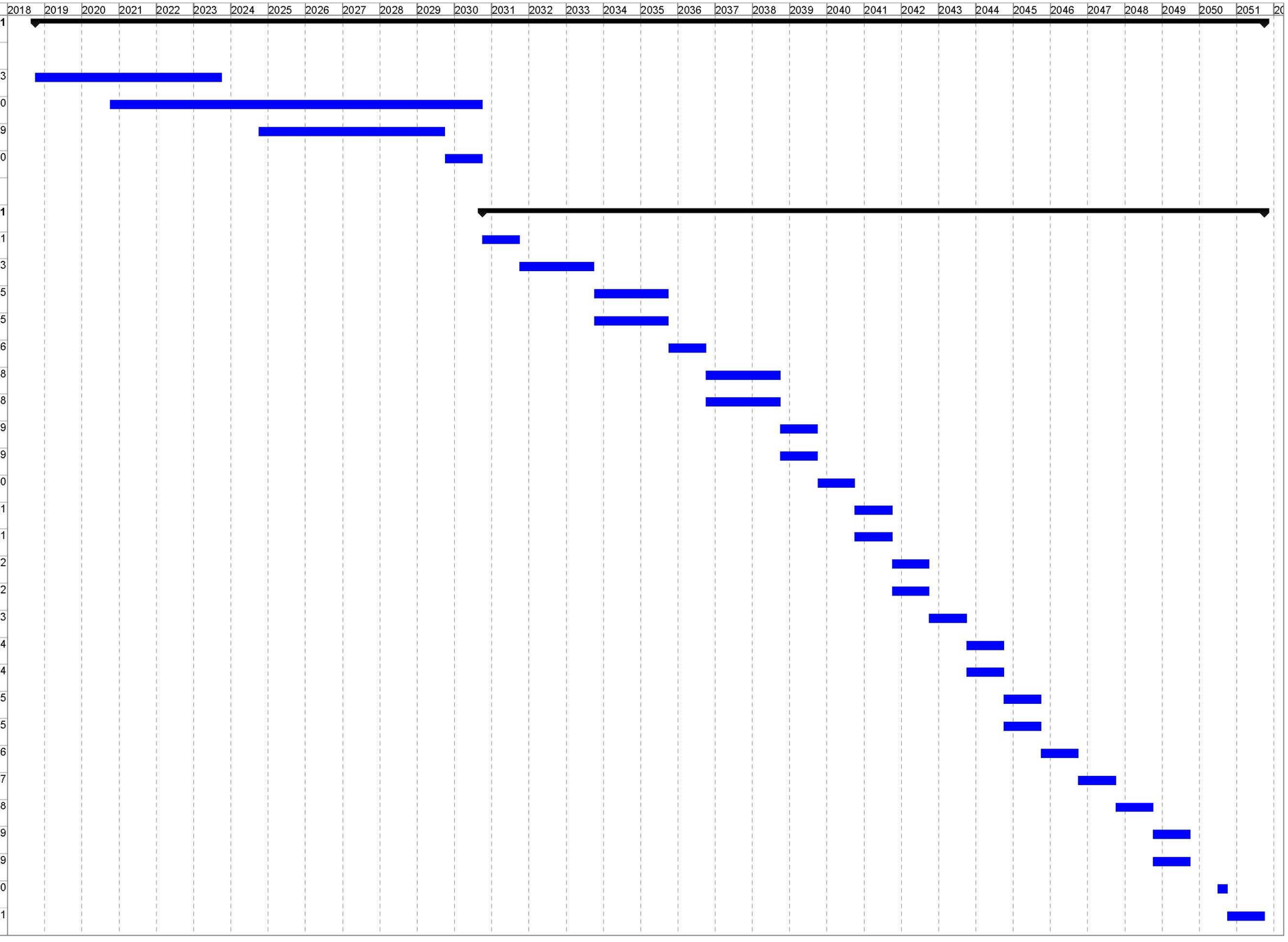

Figure 3.5-1 Time Estimate_ Project Schedule

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6.0 RISK ANALYSIS

6.1 Operational Capability

The proposed alternative site of Kapūkaki presents a very low risk from an operation capability standpoint. The underground vertical (cut-and-cover) storage tank design has been successfully constructed and operated all over the world in many different environments. For example, a number of these have recently been completed in Afghanistan, which is a much more remote and austere environment than Hawaii. The Kapūkaki site is on the same parcel of DoD property as the RHBFSF, and it will accommodate the 40 new tanks. Lastly, the new facility will connect into the existing pipeline tunnel system providing the exact same operational capability that it has today.

1. Storage Capacity

   The proposed construction project will provide 40 underground vertical (cut-and-cover) storage tanks with a nominal storage capacity of 150,000 bbls each. This will meet the stated need for 250,000,000 gallons for multiple products. A proposed layout of the tanks is shown on Figure 6.1-1.

   One potential risk during construction is maintaining the required Inventory Management Plan (IMP). It is anticipated that the construction of new Kapūkaki tanks and the demolition of the existing RHBFSF's tanks must be done simultaneously in order to meet the tight construction deadline. Therefore, phasing is paramount, and no existing tank volume should be taken out of service before an equivalent new tank volume is brought into service.

2. Strategic Positioning

   The alternate location of Kapūkaki satisfies the need to be on the island of Oahu in order to maximize resupply and sustainment of joint forces during current peacetime and contingency operational plans (OPLANs) in the Indo-Asia-Pacific AOR.

3. Hardened Infrastructure

   The proposed tank construction method, based on the DoD's underground vertical (cut-and-cover) storage tank standard design, is a hardened structure designed to resist attack. In addition, the top of each tank will be buried 100 feet below ground (same as the RHBFSF's tanks), and all tunnels will be hardened similarly to the existing ones. Thus, the new infrastructure will be capable of withstanding any kinetic effects that RHBFSF can currently withstand.

   Underground vertical (cut-and-cover) storage tanks are normally constructed using typical excavation equipment, because they only "cut" about half of the tank below the surrounding grade, and they "cover" the other half that is above the surrounding grade. In this case, the entire tank is being constructed so far below the surface that tunneling may offer a better alternative. Tunneling may also reduce the amount of surface disturbance thereby reducing the project's environmental impact. It is beyond the scope of this document to determine exactly how tunneling might be

used, but as long as the tank generally complies with the proven standard design, the contractor should be permitted to use any method.

4. Electronic Attack

   The hardened infrastructure of Kapūkaki will also enable the new facility to withstand the same physical electronic attack (e.g. electromagnetic pulse) that Red Hill can endure. As for a virtual electronic attack (e.g. cyber), the operation and control systems would remain isolated from the internet and electrical grid in order to ensure continuous operations. In addition, the entire system will be designed to allow for a completely manual operation should the internal controls and power systems fail.

5. Secure Area

   The Kapūkaki site is adjacent to the Red Hill site, so it will enjoy the same isolation and security (via active access controls) as the current facility.

6. Operational Mission

   The 40 new tanks will connect to the existing lower tunnel with identical piping that currently serves Red Hill. All of the current operational capabilities will remain undiminished.

   a) JP-5 – The new facility will deliver up to [redacted] via means which are not dependent on electrical power, and receive up to [redacted]. Delivery and receipt modes will include deep draft tankers. Additionally, the storage will have issue capability via the current pipeline connections to airfield locations for contingency support of all existing DoD theater requirements.

   b) JP-8 / F-24 – The new facility will deliver up to [redacted] via means which are not dependent on electrical power, and receive up to [redacted]. Delivery and receipt modes will include draft tankers. Additionally, the storage will have issue capability via the current pipeline connections to airfield locations in full support of all existing DoD theater requirements.

   c) F-76 – The new facility will deliver up to [redacted] via means which are not dependent on electrical power, and receive up to [redacted]. Delivery and receipt modes will include deep draft tankers.

   d) Simultaneous Operations – The new system will be capable of simultaneous multi-commodity transfers at the currently established rates (e.g. able to deliver JP-5 and receive F-76 and / or JP-8).

Figure 6.1-1 Kapūkaki Tank Layout

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6.2 Environmental Protection

A preliminary assessment of existing environmental conditions at Kapūkaki was conducted, and the potential impacts of construction of the site on the environmental resources considered were evaluated. The following sections summarize the evaluation and present any significant findings by resource area considered.

1) Land Use

   Existing State and County land use designations of the site land parcels were evaluated, and existing buildings or population that may be displaced and require relocation was also considered. Because of the use of federal land, National Environmental Policy Act (NEPA) compliant documentation (that is, an Environmental Assessment [EA] or Environmental Impact Statement [EIS]) will be required.

   The northernmost land parcel (TMK: 9-9-010:006) is located within the State Conservation District, within which any proposed activities would require a Conservation District Use Permit (CDUP). However, activities on federal lands in the Conservation District do not require a CDUP. The project will be on federal lands and a CDUP would not be required. If the project extends to non-federal lands in the Conservation District, a CDUP would likely be needed and require further analysis and assessment as part of the State of Hawaii Environmental Review Process.

2) Socioeconomics

   Existing population and demographic characteristics in the area and impacts to the local economy were considered. There are no socioeconomic factors that may potentially present a significant risk to construction of the new tanks at the proposed site location.

3) Parks and Recreational Facilities

   Recreational areas and facilities such as parks, golf courses, and hiking trails in the vicinity were considered. No significant impacts are anticipated.

4) Public Utilities and Services

   Utilities include infrastructure services such as electricity, natural gas, or telecommunications. Public services include police and fire protection, water and solid waste service, and sanitary sewer and wastewater treatment. Coordination with utility companies would be required to determine the presence of any existing utilities within the area and to coordinate any relocation, if required. No significant impacts to public services including police and fire protection, water and solid waste service, and sanitary sewer and wastewater treatment are anticipated since the relocation of the existing facility to the alternative site would not result in significant increase in demand for any public services.

5) Traffic and Roadways

Potential impacts to the existing roadways and traffic conditions were considered. The anticipated period of construction would be for approximately 20 years. During the period of construction, an increase in local traffic would likely occur as a result of personnel moving to and from the construction site and the transportation of equipment and materials. It is likely that the upgrading of existing roadways to accommodate this activity would be required. In addition, the alternative site will require construction of permanent new roadways for access. Therefore, it is anticipated that there is a potential for significant impacts to traffic and roadways associated with the construction of the site.

6) Visual and Aesthetic Conditions

The visual or aesthetic qualities of the area were evaluated, as was the existence of scenic resources identified by any community development plans. Because RHBFSF is mostly an underground facility, no significant impacts to the local visual aesthetics are anticipated. Surface facilities (that is, access gate, fencing, parking areas, and access roads) to be constructed would not be considered significant impacts.

7) Air Quality

Air quality impacts from both construction and site operation were considered. Air quality impacts would be limited to temporary impacts during construction activities, and no significant long-term impacts are anticipated from construction of the new facility. The existing permit requirements at the existing facility would apply to the new facility.

8) Noise and Vibration

Noise (defined as unwanted sound that is undesirable because it interferes with communication, is intense enough to damage hearing, or is otherwise annoying) was considered. A temporary increase in noise levels during construction is anticipated. Impacts would not be significant, but because of the proximity to the residential subdivision (the site is located just outside of the southern boundary), consideration will be needed to mitigate any potential impacts. Blasting activities are not anticipated, however, if required, would need to consider the level of ground vibration created and methods to mitigate potential impacts to RHBFSF as well as nearby properties and residents.

9) Geological Resources

Impacts to surface topography and subsurface geological materials and features were evaluated based on the available information. Site-specific data on soil types and stability would be needed to determine the specific depth and area that would be suitable for installation of the new tanks. Various construction activities, including blasting, could potentially create subsurface fractures that could tap into existing fractures and create preferential pathways. All impacts would need to be

considered and methods to mitigate potential impacts developed, however no significant impacts to geologic resources are anticipated.

10) Hazardous Waste and Materials

Any hazardous waste or materials that were known to or may potentially exist at the site were considered, as were any existing facilities that could be a source of hazardous waste or materials. Based on preliminary research, there are no known release or sites of concern within the Kapūkaki boundary and there are no indications the site was developed or used for commercial or industrial purposes.

Confirmed releases have been reported at the Red Hill Storage Facility, which is the location of existing nature and extent investigations associated with petroleum contamination for the existing Red Hill Facility. The Red Hill Administrative Order on Consent (AOC) Statement of Work (SOW) Section 6, Investigation and Remediation of Releases, is determining the feasibility of alternatives for investigating and remediating releases from the Facility; AOC SOW Section 7, Groundwater Protection and Evaluation, is monitoring and characterizing the flow of groundwater around the Facility.

For purposes of this preliminary evaluation and cost estimating, it was assumed that a total of 20 feet of soil at the RHBFSF is petroleum-impacted and would require disposal.

11) Ecosystems and Biological Resources

Biological resources, including native or naturalized plants and animals and the habitats in which they occur, were evaluated. Based on a meeting with NAVFAC on October 10, 2017, significant biological resources were identified within the site. No additional information is available. Therefore, there is a potential for significant impacts to biological resources within the site.

Consultation with the U.S. Fish and Wildlife Service (USFWS) under Section 7 of the Endangered Species Act (ESA) would be required to determine whether the construction of the site would have any effect on any threatened, endangered, or protected species. A biological study, including a field survey, will most likely be needed to confirm the presence or absence of such species.

12) Water Resources

Surface water, groundwater, and any wetland or waters of the U.S. were considered. The site is located between two streams, one of which is located along the property boundary to the north. Consideration would be needed to avoid any potential impacts to these streams. Aquifers underlying the site are considered a drinking waters source. Leak mitigation, leak detection, and groundwater monitoring program would be required.

13) Archaeological, Cultural and Historic Resources

Based on a meeting with NAVFAC on October 10, 2017, significant historical and cultural resources were identified within the site. No additional information is available. Therefore, there is a potential for significant impacts to archaeological, cultural and historical resources within the site.

Consultation with the State Historic Preservation Division (SHPD) will be required to assess the need for any specific studies to be conducted at Kapūkaki. Determination on the specific impacts on historic properties and the need for any further archaeological work or monitoring will need to be obtained from SHPD before construction. In addition, because the proposed construction needs to comply with HRS 343, a cultural impact assessment will be needed to assess whether construction of the site would have any cultural resources within the affected area. In addition, under the National Historic Preservation Act (NHPA) Section 106, consultation process with Native Hawaiian Organizations will need to be completed.

14) Natural Hazards

Flood zone designations and existing risks of natural hazards, including earthquakes, tsunamis, and sea level rise at the site, were considered. Oahu is designated as Seismic Zone 2A, indicating a location that has a low potential for ground motion created by seismic activity. With design that conforms to specifications and recommendations for seismic design, no significant impacts relative to seismic activity are anticipated. There are no areas within the site area that are known to be significantly prone to any other natural hazards.

15) Secondary and Cumulative Effects

Cumulative impacts are defined as impacts on environmental resources that result from incremental impacts of a proposed activity that, when combined with other past, present, and reasonably foreseeable future projects in an affected area, may collectively cause more substantial adverse impacts. There are no known other projects with overlapping schedules that are expected to cumulatively increase temporary impacts associated with construction activities.

16) Environmental Permitting Requirements

A preliminary evaluation of potential environmental permits and consultation with resource agencies required for the construction of the site was conducted. The following is a summary of the permits and approvals required as identified with the available information:

- Section 106, NHPA
- HRS 6E (Hawaii Historic Preservation)
- Section 7, ESA
- Coastal Zone Management Federal Consistency Determination
- National Pollutant Discharge Elimination System permit

- Construction noise permit/variance
- County permits for construction activities
- Air quality permit(s)

17) Conclusions

Based on the available information and the preliminary evaluation documented in this technical memorandum, the proposed move from the existing Red Hill Facility to the Kapūkaki site is expected to result in potential impacts to traffic and roadways, biological, archaeological, and cultural resources identified at the site and would need to be assessed during the specific design and planning phase of the proposed relocation. Aquifers underlying the site are considered a drinking waters source. Therefore, leak mitigation, leak detection, and groundwater monitoring program would be required. Given the site's proximity to an adjoining location of existing nature and extent investigations associated with petroleum contamination for the existing Red Hill Facility, information from the investigations would warrant further evaluation regarding potential existence of hazardous waste and materials within the site. Secondary and cumulative effects associated with potential traffic and roadway impacts because of construction may also be a potential significant impact. Consultation with the appropriate regulatory agencies would be required. Compensatory mitigation measures would be required if, following consultation with the regulatory agencies, it is determined the proposed move would result in significant impacts to the identified biological, archaeological, cultural, and groundwater resources in the area.

For additional detail and backup information related to the Environmental Protection Risk Analysis, see Appendix A that contains the full report from CH2M.

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REFERENCES

[1] D.O. Woodbury, Builders for Battle: How the Pacific Naval Air Bases Were Constructed (New York: E. P. Dutton and Co., 1946)

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APPENDIX A

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Preliminary Assessment of Potential Environmental Planning and Hazardous Waste Liability Considerations in Support of the Red Hill Alternative Location Study, Red Hill, DFSP Pearl Harbor, HI

PREPARED FOR:	Austin Brockenbrough & Associates, LLC
PREPARED BY:	CH2M
DATE:	January 22, 2018
AGREEMENT NUMBER:	17-107 Red Hill Alternative Location Study
VERSION:	Revised Final
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1.0 Background and Purpose

This technical memorandum has been prepared in support of an alternative location study being performed by Austin Brockenbrough & Associates, LLC (Brockenbrough) to evaluate the potential move of the Red Hill Storage Facility to an alternate site as selected by Naval Facilities Engineering Command (NAVFAC). The study considers the available location and performs a risk analysis of its ability to meet the current infrastructure needs and capabilities present at Red Hill at Defense Fuel Support Point (DFSP) Pearl Harbor. Throughout this memorandum, the alternate site will be referred to as the site, while the facility in its current location will be referred to as the existing Red Hill Facility.

CH2M HILL (CH2M) conducted a preliminary evaluation of the following matters for the site based on the available information:

- Environmental review documentation, regulatory compliance, and potential permitting requirements
- Potential impacts of construction on existing natural resources
- Environmental land use permitting requirements
- Planning-level rough-order-of-magnitude (ROM) cost estimates of probable conceptual environmental mitigation-related construction activities related to the closure of the existing tanks at the Red Hill Facility

2.0 Data Reliance and Assumptions

In preparing this memorandum, CH2M has relied on information provided by Brockenbrough, NAVFAC, and any other parties referenced herein, and on information contained in the files of governmental agencies that was reasonably ascertainable at the time of this assessment. Although there may have been some degree of overlap in the information provided by these various sources, CH2M did not attempt to independently verify the accuracy or completeness of all information reviewed or received during this site assessment, except where a reasonable person with similar experience or background would or should have known of the inaccuracy of the information provided. Findings of this memorandum are subject to change if additional, more reliable information becomes available.

Cost estimates presented in this memorandum have been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final costs of the project will depend on final design, actual labor and material costs, competitive market conditions, final project costs, implementation schedule, and other variable factors. As a result, the final project costs will vary from the estimate presented here. Because of this, project feasibility and funding needs must be carefully reviewed before making specific financial decisions to help ensure proper project evaluation and adequate funding.

Because of the conceptual nature of the existing information, the preliminary evaluation of aboveground support structures was limited to features such as access roads or small support structures. The preliminary evaluation does not include any remedial activities occurring at the Red Hill Facility or supporting facilities outside of the site boundary (that is, pipelines, support buildings and roads, equipment and machinery, or similar).

3.0 Alternative Location Considerations

3.1 Site Location and Project Description

Twelve alternative sites were considered by NAVFAC and Brockenbrough; all were located within Joint-Base Pearl Harbor-Hickam, Lualualei Naval Magazine, and Campbell Industrial Park. On November 3, 2017, CH2M was informed that NAVFAC had selected its Site G as the study site.

The selected site is located immediately northeast of the existing Red Hill Facility within property owned by the United States government, and would not encroach on the existing footprint of the Red Hill Facility. Based on conceptual drawings, the site would occupy approximately 100 surface acres. Forty tanks, each 150 feet in diameter, 52 feet high, and with a capacity of 150,000 barrels, would be installed at the site. Construction of the tanks requires the top of the tanks to be installed at a minimum depth of 100 feet below the proposed surface grade. Two construction methodologies were being considered: excavation and blasting, or tunneling. A total of approximately 1,500,000 cubic yards (CY) to 3,000,000 CY of soil would be displaced because of excavation and blasting construction methods, while approximately 200,000,000 CY of soil is estimated be displaced because of tunneling construction methods.

For this preliminary evaluation, it was assumed that the areas occupied by the tanks at the Red Hill Facility would need to be filled after their hypothetical decommissioning. Soil generated during excavation activities at the alternative site may be used as part of the tank fill at the Red Hill Facility.

3.2 Existing Conditions and Potential Impacts

A preliminary assessment of existing environmental conditions at the site was conducted, and the potential impacts of construction of the site on the environmental resources considered were evaluated (Attachment 1). The following sections summarize the evaluation and present any significant findings by resource area considered.

3.2.1 Land Use

Existing State and County land use designations of the site land parcels were evaluated, and existing buildings or population that may be displaced and require relocation was also considered. Because of the use of federal land, National Environmental Policy Act (NEPA) compliant documentation (that is, an Environmental Assessment [EA] or Environmental Impact Statement [EIS]) will be required.

The northernmost land parcel (TMK: 9-9-010:006) is located within the State Conservation District, within which any proposed activities would require a Conservation District Use Permit (CDUP). However, activities on federal lands in the Conservation District do not require a CDUP. The project will be on federal lands and a CDUP would not be required. If the project extends to non-federal lands in the Conservation District, a CDUP would likely be needed and require further analysis and assessment as part of the State of Hawaii Environmental Review Process.

3.2.2 Socioeconomics

Existing population and demographic characteristics in the area and impacts to the local economy were considered. There are no socioeconomic factors that may potentially present a significant risk to construction of the new tanks at the proposed site location.

3.2.3 Parks and Recreational Facilities

Recreational areas and facilities such as parks, golf courses, and hiking trails in the vicinity were considered. No significant impacts are anticipated.

3.2.4 Public Utilities and Services

Utilities include infrastructure services such as electricity, natural gas, or telecommunications. Public services include police and fire protection, water and solid waste service, and sanitary sewer and wastewater treatment. Coordination with utility companies would be required to determine the presence of any existing utilities within the area and to coordinate any relocation, if required. No significant impacts to public services including police and fire protection, water and solid waste service, and sanitary sewer and wastewater treatment are anticipated since the relocation of the existing facility to the alternative site would not result in significant increase in demand for any public services.

3.2.5 Traffic and Roadways

Potential impacts to the existing roadways and traffic conditions were considered. Based on information from Brockenbrough, the anticipated period of construction would be for approximately 10 years. During the period of construction, an increase in local traffic would likely occur as a result of personnel moving to and from the construction site and the transportation of equipment and materials. It is likely that the upgrading of existing roadways to accommodate this activity would be required. In addition, the alternative site will require construction of permanent new roadways for access. Therefore, it is anticipated that there is a potential for significant impacts to traffic and roadways associated with the construction of the site.

3.2.6 Visual and Aesthetic Conditions

The visual or aesthetic qualities of the area were evaluated, as was the existence of scenic resources identified by any community development plans. Because DFSP Pearl Harbor is mostly an underground facility, no significant impacts to the local visual aesthetics are anticipated. Surface facilities (that is, access gate, fencing, parking areas, and access roads) to be constructed would not be considered significant impacts.

3.2.7 Air Quality

Air quality impacts from both construction and site operation were considered. Air quality impacts would be limited to temporary impacts during construction activities, and no significant long-term

impacts are anticipated from construction of the new facility. The existing permit requirements at the existing facility would apply to the new facility.

3.2.8 Noise and Vibration

Noise (defined as unwanted sound that is undesirable because it interferes with communication, is intense enough to damage hearing, or is otherwise annoying) was considered. A temporary increase in noise levels during construction is anticipated. Impacts would not be significant, but because of the proximity to the residential subdivision (the site is located just outside of the southern boundary), consideration will be needed to mitigate any potential impacts. Blasting activities are not anticipated; however, if required, would need to consider the level of ground vibration created and methods to mitigate potential impacts to the existing Red Hill Facility and nearby properties and residents.

3.2.9 Geological Resources

Impacts to surface topography and subsurface geological materials and features were evaluated based on the available information. Site-specific data on soil types and stability would be needed to determine the specific depth and area that would be suitable for installation of the new tanks. Various construction activities, including blasting, could potentially create subsurface fractures that could tap into existing fractures and create preferential pathways. All impacts would need to be considered and methods to mitigate potential impacts developed. However, no significant impacts to geologic resources are currently anticipated.

3.2.10 Hazardous Waste and Materials

Any hazardous waste or materials that were known to or may potentially exist at the site were considered, as were any existing facilities that could be a source of hazardous waste or materials. Based on preliminary research, there are no known release or sites of concern within the site boundary and there are no indications the site was developed or used for commercial or industrial purposes.

Confirmed releases have been reported at the Red Hill Storage Facility, which is the location of existing nature and extent investigations associated with petroleum contamination for the existing Red Hill Facility. The Red Hill Administrative Order on Consent (AOC) Statement of Work (SOW) Section 6, Investigation and Remediation of Releases, is determining the feasibility of alternatives for investigating and remediating releases from the Facility; AOC SOW Section 7, Groundwater Protection and Evaluation, is monitoring and characterizing the flow of groundwater around the Facility.

For purposes of this preliminary evaluation and cost estimating, it was assumed that a total of 20 feet of soil at the Red Hill Facility is petroleum-impacted and would require disposal. Section 3.4 provides further detail regarding probable conceptual environmental mitigation construction at the Red Hill Facility.

3.2.11 Ecosystems and Biological Resources

Biological resources, including native or naturalized plants and animals and the habitats in which they occur, were evaluated. Based on a meeting with NAVFAC on October 10, 2017, significant biological resources were identified within the site. No additional information is available. Therefore, there is a potential for significant impacts to biological resources within the site.

Consultation with the U.S. Fish and Wildlife Service (USFWS) under Section 7 of the Endangered Species Act (ESA) would be required to determine whether the construction of the site would have any effect on any threatened, endangered, or protected species. A biological study, including a field survey, will most likely be needed to confirm the presence or absence of such species.

3.2.12 Water Resources

Surface water, groundwater, and any wetland or waters of the U.S. were considered. The site is located between two streams, one of which is located along the property boundary to the north. Consideration

would be needed to avoid any potential impacts to these streams. Aquifers underlying the site are considered a drinking waters source. Leak mitigation, leak detection, and groundwater monitoring program would be required.

3.2.13 Archaeological, Cultural and Historic Resources

Based on a meeting with NAVFAC on October 10, 2017, significant historical and cultural resources were identified within the site. No additional information is available. Therefore, there is a potential for significant impacts to archaeological, cultural and historical resources within the site.

Consultation with the State Historic Preservation Division (SHPD) will be required to assess the need for any specific studies to be conducted at the site. Determination on the specific impacts on historic properties and the need for any further archaeological work or monitoring will need to be obtained from SHPD before construction. In addition, because the proposed construction needs to comply with HRS 343, a cultural impact assessment will be needed to assess whether construction of the site would have any cultural resources within the affected area. In addition, under the National Historic Preservation Act (NHPA) Section 106, consultation process with Native Hawaiian Organizations will need to be completed.

3.2.14 Natural Hazards

Flood zone designations and existing risks of natural hazards, including earthquakes, tsunamis, and sea level rise at the site, were considered. Oahu is designated a Seismic Zone 2A, indicating a location that has a low potential for ground motion created by seismic activity. With design that conforms to specifications and recommendations for seismic design, no significant impacts relative to seismic activity are anticipated. There are no areas within the site area that are known to be significantly prone to any other natural hazards.

3.2.15 Secondary and Cumulative Effects

Cumulative impacts are defined as impacts on environmental resources that result from incremental impacts of a proposed activity that, when combined with other past, present, and reasonably foreseeable future projects in an affected area, may collectively cause more substantial adverse impacts. There are no known other projects with overlapping schedules that are expected to cumulatively increase temporary impacts associated with construction activities.

3.3 Environmental Permitting Requirements

A preliminary evaluation of potential environmental permits and consultation with resource agencies required for the construction of the site was conducted. Attachment 2 includes the full list of permits and consultation requirements considered. The following is a summary of the permits and approvals required as identified with the available information:

- Section 106, NHPA
- HRS 6E (Hawaii Historic Preservation)
- Section 7, ESA
- Coastal Zone Management Federal Consistency Determination
- National Pollutant Discharge Elimination System permit
- Construction noise permit/variance
- County permits for construction activities
- Air quality permit(s)

3.4 Cost Considerations

Probable conceptual environmental mitigation construction costs to excavate and remove up to 20 feet of soil at the Red Hill Facility associated with the closure of the existing tanks was prepared (Attachment 3). The cost estimate assuming contaminated soil would be excavated and removed and used to fill the existing tanks that will be abandoned is included in Section 3.4.1.

3.4.1 Cost Assumptions

The cost estimates for the selected scenario were based on the following assumptions:

- Excavation:
  - Footprint of area requiring excavation within the Red Hill Facility is 3,000 feet by 500 feet.
  - A 7000-linear-feet road is needed to access the site.
  - In-place soil sampling will delineate existing contamination.
  - Twenty (20) feet of contaminated soil across the footprint is to be excavated.
- Excavate and Stockpile for Use as Tank Fill Scenario:
  - Excavate contaminated soil and haul to stockpile.
  - Stockpiled material will be used to fill tanks at the existing Red Hill Facility.

3.4.2 Estimated Costs

The following table presents a summary of the estimated costs under the scenario considered.

TABLE 3.1. Summary of Costs – Excavation and Use for Tank Fill Scenario
Red Hill Site Remediation

Low Range (-30%)	Estimated Cost [a]	High Range (+50%)
[redacted]	[redacted]	[redacted]

[a] See Attachment 3, Appendix 1 for cost estimate details

4.0 Conclusions

Based on the available information and the preliminary evaluation documented in this technical memorandum, the proposed move from the existing Red Hill Facility to the site is expected to result in potential impacts to traffic and roadways, biological, archaeological, and cultural resources identified at the site and would need to be assessed during the specific design and planning phase of the proposed relocation. Aquifers underlying the site are considered a drinking waters source. Therefore, leak mitigation, leak detection, and groundwater monitoring program would be required. Given the site's proximity to an adjoining location of existing nature and extent investigations associated with petroleum contamination for the existing Red Hill Facility, information from the investigations would warrant further evaluation regarding potential existence of hazardous waste and materials within the site. Secondary and cumulative effects associated with potential traffic and roadway impacts because of construction may also be a potential significant impact. Consultation with the appropriate regulatory agencies would be required. Compensatory mitigation measures would be required if, following consultation with the regulatory agencies, it is determined the proposed move would result in significant impacts to the identified biological, archaeological, cultural, and groundwater resources in the area.

List of Attachments

Attachment 1
Potential Environmental Impacts Analysis

<table>
<tr><th rowspan="2">Environmental Resource</th><th colspan="3">Significant Environmental Impact?</th><th rowspan="2">Comments</th></tr>
<tr><th>Likely</th><th>Not Likely</th><th>Unknown</th></tr>
<tr><td>Land Use</td><td>X</td><td></td><td></td><td>

Existing Land Use

The alternative site is located on federal land and currently vacant. No building displacements or relocations would be required, and no significant impacts to the existing land use in the area is anticipated. Because of the use of federal land, National Environmental Policy Act (NEPA) compliant documentation (i.e., an Environmental Assessment [EA] or Environmental Impact Statement [EIS]) will be required.

Existing Land Use Designations

The following table presents a summary of the existing land use designations for the four land parcels involved:

<table>
<tr><th>Tax Map Key (TMK)</th><th>State Land Use Designation</th><th>Zoning Designation</th></tr>
<tr><td>1-1-012:003</td><td>Urban</td><td>F-1 (Military and Federal Preservation)</td></tr>
<tr><td>1-1-012:004</td><td>Urban</td><td>F-1 (Military and Federal Preservation)</td></tr>
<tr><td>9-9-010:001</td><td>Urban</td><td>F-1 (Military and Federal Preservation)</td></tr>
<tr><td>9-9-010:006</td><td>Conservation (General)</td><td>F-1(Military and Federal Preservation)</td></tr>
</table>

Land Use Permits - Conservation District Use Permit

The northernmost land parcel (TMK: 9-9-010:006) is classified as Conservation District, General Subzone by the State Land Use Commission, where any activities within require a Conservation District Use Permit (CDUP) pursuant to Hawaii Administrative Rules (HAR) Chapter 13-5. However, activities on federal lands in the Conservation District do not require a CDUP. The project will be on federal lands and a CDUP would not be required. If the project extends to non-federal lands in the Conservation District, a CDUP would likely be needed and require further analysis and assessment as part of the State of Hawaii Environmental Review Process.

Coastal Zone Management (CZM) compliance

No significant impacts on coastal resources or the use of coastal resources are anticipated; however, a federal consistency determination under the Coastal Zone Management Act would be required. The proposed activity is subject to consistency with the CZM program objectives and policies.

Others

There are no other specially designated or protected lands identified within the proposed alternative site.

Based on the findings of potential significant impacts to biological, archaeological, and cultural resources, these are indicative of potential conflicts with the existing land use designations of the site.

</td></tr>
</table>

Environmental Resource	Significant Environmental Impact?			Comments
	Likely	Not Likely	Unknown	
Socioeconomics		X		***Population and Demographic Factors*** As the alternative site would be located within a vacant/unoccupied area, no significant changes to the current population distribution is anticipated. No long-term impacts to the local housing or demographics are anticipated. ***Environmental Justice*** There is no potential for any minority, elderly, handicapped, low-income, transit dependent, or other specific interest group to be disproportionately affected by construction of the alternative site. ***Economic Activity*** Temporary construction-related employment opportunities generated by relocation to the alternative site are anticipated. No significant long-term economic impacts are anticipated, assuming that the alternative site would not require significant changes to the operational and maintenance efforts required for the current site.
Parks and Recreational Facilities		X		There are currently no existing public or recreational facilities within the alternative site location. Nearby public recreational facilities include Moanalua Valley Neighborhood Park, Moanalua Golf Club, Halawa District Park. No impacts to these facilities are anticipated. The closest hiking trail is Kamananui Valley Road located approximately 0.5 mile upslope to the east of the alternative site. Access to this hiking trail would not be impacted by construction activities or operation of the alternative site.
Public Utilities and Services		X		Coordination with utility companies will be needed to check for any existing utilities within the area and to coordinate any relocation if required. Specifically, the following information will be needed before construction: • Any known utilities within the alternative site boundary that may need to be relocated or avoided. • Any special considerations regarding utilities - hazardous or environmentally sensitive situations, time restrictions on interruption of service, security sensitive utilities, the effect of changing grade above or below a utility, the time or process needed to redesign and relocate utilities, if known, and similar. No significant impacts to public services including police and fire protection, water and solid waste service, and sanitary sewer and wastewater treatment are anticipated since the relocation of the existing facility to the alternative site would not result in significant increase in demand for any public services.
Traffic and Roadways	X			Based on information from Brockenbrough, the anticipated period of construction would be for approximately 10 years. During the period of construction, an increase in local traffic would likely occur as a result of personnel moving to and from the construction site and the transportation of equipment and materials. It is likely that the upgrading of existing roadways to accommodate this activity would be required. In addition, the alternative site will require construction of permanent new roadways for access. Therefore, it is anticipated that there is a potential for significant impacts to traffic and roadways associated with the construction of the site.
Visual and Aesthetic Conditions		X		***General*** Temporary visual impacts associated with equipment and ground disturbance during construction activities are anticipated. While surface facilities (i.e., access gate, fencing, parking areas, access roads) would be maintained long-term, they would not be considered significant impacts. In addition, the remainder of the facility would be constructed underground and not visible.

Environmental Resource	Significant Environmental Impact?			Comments
	Likely	Not Likely	Unknown	
				Scenic Resources identified by Community Development Plans The City and County of Honolulu Primary Urban Center Development Plan (2004) identifies the Koolau and Waianae Mountain Ranges and their foothills (notably Red Hill and Puu Ualakaa, or Round Top) as a significant panoramic view. As noted, the surface features at the alternative site would be minimal; therefore, impacts to the existing visual aesthetic conditions within the area should not be significantly altered. ***Other Scenic Resources*** The alternative site is not located on a designated state or federal scenic route and would not constitute a significant visual change from the state Freeways.
Air Quality		X		As reported in the *State of Hawaii Annual Summary 2015 Air Quality Data* prepared by State of Hawaii Department of Health (HDOH), the state is in attainment of all federal and state air quality standards. Temporary impacts from fugitive dust emissions from vehicular movement and soil excavation and exhaust emissions from onsite construction equipment would occur. Blasting of underground cavities within which to install the new tanks would produce toxic and nontoxic gases depending on the types of explosive materials to be used. Air monitoring would be required during construction. No long-term impacts are anticipated. Operation of the new facility would require compliance with HAR 11-60.1 air permitting requirements, which should not differ from the existing permit requirements at the existing facility.
Noise and Vibration		X		Temporary increase in noise levels during construction is anticipated due to the use of construction equipment and vehicles. Because of the proximity to the residential subdivision (located just outside of the southern boundary), consideration will be needed to mitigate any potential impacts. Noise permit/noise variance will be required if noise levels exceeding permissible limits/outside of permitted hours are anticipated during construction activities. No excessive noise due to operation of the new facility at the alternative site is anticipated. Blasting activities to install the new tanks are not anticipated. However, if required, proper planning based on site conditions (e.g., topography, geology, soil water content), blast vibration monitoring, and implementation of blast vibration limits would be required to minimize impacts to the existing Red Hill Facility and nearby properties and residents.
Geological Resources		X		The new tanks would be installed underground and ground surface would be restored to pre-construction elevations after the tanks have been installed; therefore, no significant changes to the existing surface topography of the area is anticipated. Specific site geological data (e.g., soil stability, characteristics, and similar), in addition to those already considered, may need to be collected before construction to check for any conditions that may affect construction methods to be used and specific location and positioning of the new tanks. Various construction activities to construct cavities within which to install the new tanks, including blasting, could potentially create subsurface fractures that could tap into existing fractures and create preferential pathways to the underlying aquifer. All impacts would need to be considered and methods to mitigate potential impacts developed. However, no significant impacts to geologic resources are currently anticipated.

Environmental Resource	Significant Environmental Impact?			Comments
	Likely	Not Likely	Unknown	
Hazardous Waste and Materials		X		Based on a search of federal and state databases as commissioned through a November 2017 EDR computerized environmental report, there are no properties within the alternative site boundary that would have an impact on its environmental condition. Confirmed releases have been reported at the Red Hill Storage Facility, which is the location of existing nature and extent investigations associated with petroleum contamination for the existing Red Hill Facility. The Red Hill Administrative Order on Consent (AOC) Statement of Work (SOW) Section 6, Investigation and Remediation of Releases, is determining the feasibility of alternatives for investigating and remediating releases from the Facility and AOC SOW Section 7, Groundwater Protection and Evaluation, is monitoring and characterizing the flow of groundwater around the Facility.
Ecosystems / Biological Resources	X			Based on the U.S. Fish and Wildlife Service (USFWS) Environmental Conservation Online System (ECOS) (http://ecos.fws.gov/crithab/) database, there are no known designated critical habitat for any threatened or endangered species within the area of the proposed alternative site. However, based on a meeting with NAVFAC on October 10, 2017, significant biological resources were identified within the alternative site. No additional information is available. Therefore, there is a potential for significant impacts to biological resources within the site. Consultation with USFWS under Section 7 of the Endangered Species Act (ESA) would be required to determine whether the construction of the alternative site would have any effect on any threatened, endangered, or protected species. A biological study, including a field survey, will most likely be needed to confirm the presence/absence of such species.
Water Resources		X		***Surface Water*** The proposed alternative site is located between Moanalua Stream and South Halawa Stream. Both streams are listed as impaired waterways (http://health.hawaii.gov/cwb/clean-water-branch-home-page/integrated-report-and-total-maximum-daily-loads/) requiring development of a water pollution reduction plan that establishes total maximum daily loads. As mostly an underground facility, no impacts to these streams would occur. ***Groundwater*** The alternative site is located on the boundary between the Moanalua Aquifer and the Waimalu Aquifer system, which are both classified as basal, unconfined, flank-type, and currently used as a drinking water source. The aquifers are considered fresh, with less than 250 milligrams per liter of chloride, and are considered irreplaceable resources with a high vulnerability to contamination. In addition, the alternative site is located above the Underground Injection Control line, which indicates that the underlying aquifers are considered a drinking water source. A number of supply wells are present in the vicinity including the Navy Red Hill Shaft (2254-01) and Board of Water Supply (BWS) Halawa Shaft (2354-01), which are both located within approximately 1 mile of the alternative site location. Based on previous fuel releases from the existing Red Hill Facility tanks, a leak detection and groundwater monitoring program will likely be required to avoid potential impacts to groundwater underlying the alternative site. ***Wetlands/Waters of the US*** The National Wetlands Inventory identifies two linear features in the project area consisting of South Halawa Stream ("freshwater forested/shrub water") and Moanalua Stream ("riverine"). South Halawa Stream runs along the boundary of the

Environmental Resource	Significant Environmental Impact?			Comments
	Likely	Not Likely	Unknown	
				northern most land parcel within the alternative site area. If construction areas are proposed close to the stream, a delineation of Waters of the U.S. may be required and confirmation of jurisdictional status with the USACE Honolulu District may be required.
Archaeological, Cultural and Historic Resources	X			Based on a meeting with NAVFAC on October 10, 2017, significant historical and cultural resources were identified within the alternative site. No additional information is available. Therefore, there is a potential for significant impacts to archaeological, cultural and historical resources within the site. Consultation with the State Historic Preservation Division (SHPD) will be required to assess the need for any specific studies to be conducted at the alternative site. Determination on whether there would be any impacts on historic properties and the need for any further archaeological work or monitoring will need to be obtained from SHPD before construction. In addition, under the National Historic Preservation Act (NHPA) Section 106, consultation process with Native Hawaiian Organizations will need to be completed.
Natural Hazards		X		***Flood Zone Designation*** According to Federal Emergency Management Agency (FEMA) records, the alternative site is located within Zone X and Zone D. Zone X designates areas outside of the 0.2% annual chance floodplain. Zone D designates areas where there are possible but undetermined flood hazards. FEMA-regulated floodways and floodplains must be kept free of encroachment and obstruction so that the 100-year flood can be carried without substantial increases in flood heights. The proposed facility at the alternative site would be mostly underground; as such, no rise in the 100-year water surface elevations is anticipated. ***Seismic Activity*** Oahu is designated as Seismic Zone 2A, indicating a location that has a low potential for ground motion created by seismic activity. The proposed facility would be designed to conform to specifications and recommendations for seismic design. Therefore, no significant impacts relative to seismic activity are anticipated with the construction of the proposed facility. ***Tsunami Hazards*** The alternative site is not located within the tsunami evacuation zone. No potential issues are anticipated. ***Sea Level Rise*** Given the distance from the shoreline and as an underground facility, the proposed facility is not considered to be vulnerable to the effects of sea level rise.
Secondary and Cumulative Effects	X			The relocation of the Red Hill tanks would not change the capacity of the existing tanks or facility and would not result in any secondary effects such as population change, land development, or any effects on existing public facilities or services. While there are no known other projects with overlapping schedules that are expected to cumulatively increase temporary impacts associated with construction activities, the anticipated period of construction would be for approximately 10 years. During the period of construction, an increase in local traffic would likely occur as a result of personnel moving to and from the construction site and the transportation of equipment and materials. It is likely that the upgrading of existing roadways to accommodate this activity would be required. In addition, the alternative site will require construction of permanent new

Environmental Resource	Significant Environmental Impact?			Comments
	Likely	Not Likely	Unknown	
				roadways for access. Therefore, potential significant secondary impacts related to traffic and roadway are anticipated with the construction of the alternative site.

Attachment 2
Permitting Requirements

Permits/Authorizations

	YES	NO	UNK	COMMENTS
Are any of the following permits required or potentially required?				Permits are required from federal, state, and City & County of Honolulu agencies as noted below.
• Stream Channel Alteration Permit	☐	☒	☐	No work within the stream bed or banks is involved.
• Clean Water Act (CWA) Section 404 Permit	☐	☒	☐	No discharge of dredged or fill into the waters of the U.S. is anticipated.
• CWA Section 401 (Water Quality Certification [WQC])	☐	☒	☐	No federal permits or approvals is required for which proposed construction or operation may result in discharges to state waters.
• Safe Drinking Water Act Section 1424 (e) Sole Source Aquifer (SSA) Protection Program	☐	☒	☐	Proposed project occurs over a U.S. Environmental Protection Agency (EPA)-designated SSA; however, direct federal actions (i.e., funded solely with federal funds), are excluded from EPA review. This project is assumed to be a direct federal action.
• Section 10 Permit (Rivers and Harbors Act)	☐	☒	☐	No work that would impact navigable waters of the U.S. is proposed.
• Section 106 (National Historic Preservation)	☒	☐	☐	As a federal undertaking, consultation with State Historic Preservation Division (SHPD) and Native Hawaiian Organizations (NHOs) will be required.
• Hawaii Revised Statutes (HRS) 6E (Hawaii Historic Preservation)	☒	☐	☐	SHPD concurrence required if triggered by the need for discretionary State/County permit; historic review process would be conducted concurrently with Section 106 consultation.
• Section 7 (Endangered Species Act)	☒	☐	☐	Consultation with the U.S. Fish and Wildlife Service required.
• HRS 195D (Hawaii Conservation)	☐	☐	☒	A biological study may be required to confirm presence of any threatened or endangered wildlife or land plants.
• Conservation District Use Permit	☐	☒	☐	Permit not required for activities on federal lands.
• Coastal Zone Management Federal Consistency Determination	☒	☐	☐	Review and concurrence provided by the Hawaii State Office of Planning

	YES	NO	UNK	COMMENTS
				http://planning.hawaii.gov/czm/
• Federal Emergency Management Agency	☐	☒	☐	No impacts to existing flood zones.
• National Pollutant Discharge Elimination System (NPDES) Permit	☒	☐	☐	Clearing, grading, and excavating activities that disturb an area of 1 acre or more will be involved. Proposed activities may be covered under NPDES General Permit authorizing discharges of storm water associated with construction activities.
• Construction Noise Permit/Variance	☒	☐	☐	Assumed to be required. To be verified during project design development http://health.hawaii.gov/irhb/noiseforms/
• County permits (demolition, grading)	☒	☐	☐	To be determined during project design development
• Staging Area considerations	☒	☐	☐	Staging areas to be identified during design development; will need to be included in environmental analysis and local permits. Staging is likely to occur on federal lands.
• Disposal/Waste Area considerations	☒	☐	☐	Demolition debris will require disposal at approved landfill. Disposal of any excavated material and water from dewatering activities will also require approval.
• Material Source considerations	☐	☐	☒	To be determined during project design development.
• Asphalt or Concrete batch plant considerations	☐	☐	☒	To be determined during project design development. Assumed not to be required.
• Utility line or buried pipe considerations	☐	☐	☒	Avoidance or relocation of existing utilities as required. To be determined during design development.
• Dewatering permit considerations	☐	☐	☒	To be verified during project design development.
• Water rights or appropriation approval considerations	☐	☒	☐	No in-water work will be involved.
• Local, County, or State Air Quality Permit	☒	☐	☐	Operation of new facility will require compliance with Hawaii Administrative Rules 11-60.1, Air Pollution Control.

	YES	NO	UNK	COMMENTS
				If a concrete batch plan is required, an air pollution permit would also be required.
• County Road Access or Encroachment Permit	☐	☐	☒	County road access will not be needed during construction. If use of County roads for transportation of heavy or oversized equipment/material is required, permit(s) may be required.
• State Highway Access or Encroachment Permit.	☐	☐	☒	State highway access will not be needed during construction. If use of State roads for transportation of heavy or oversized equipment/material are required, permit(s) may be required.

Attachment 3
Basis of Estimate and Rough Order of Magnitude Cost Estimate

Basis of Estimate

Red Hill Site G Remediation
Oahu, Hawaii

Conceptual Estimate

Prepared for
Austin Brockenbrough & Associates

November 20, 2017

ch2m SM

Contents

Red Hill Site G Remediation, Oahu, Hawaii
Basis of Estimate

TABLE 0.1
Estimate Information
Red Hill Site G Remediation

Estimate Classification	Class 4
Requested By	John Padre/HNL
Estimated By	Greg Mah-Hing/BAO
Estimator Phone	510-587-7618
Estimate Date	November 20, 2017

1. Purpose of Estimate

The purpose of this estimate of construction cost is to establish an engineer's opinion of probable construction cost at the conceptual level of project development.

2. General Project Description

The objective of this estimate is to support a study on the environmental cost to replace the existing fuel tanks at the Red Hill facility with a new facility at Site G.

This cost estimate presents costs associated with an excavate and remove contaminated soil, and use that soil to fill the existing tanks that will be abandoned scenario. The scenario is described in Section 4 of this document.

3. Overall Costs

Table 3.1 presents a summary breakdown of the selected scenario. The cost presented are strictly those associated with construction of the project.

TABLE 3.1. Summary of Costs – Excavation and Use for Tank Fill Scenario
Red Hill Site G Remediation

Low Range (-30%)	Estimated Costs [a]	High Range (+50%)
[redacted]	[redacted]	[redacted]

[a] See appendix for cost estimate details

This cost estimate has been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final costs of the project will depend on final design, actual labor and material costs, competitive market conditions, final project costs, implementation schedule, and other variable factors. As a result, the final project costs will vary from the estimate presented here.

Because of this, project feasibility and funding needs must be carefully reviewed before making specific financial decisions to help ensure proper project evaluation and adequate funding.

4. Scope of Work

These following tasks are required for either or both scenarios. Under either scenario, the work includes the excavation and removal of contaminated soil.

- Excavation
  - Footprint of existing facility is 3,000 feet by 500 feet.
  - A 7,000-linear-foot road is needed to access the site.
  - In-place soil sampling will delineate contamination.
  - Twenty (20) feet of contaminated soil across the footprint is to be excavated.
- Excavate and Stockpile for Use as Tank Fill Scenario
  - Excavate contaminated soil and haul to stockpile.
  - Use stockpiled material to fill tanks.

5. Indirect Costs

The indirect costs in Table 5.1 are based on percentages recommended by the U.S. Environmental Protection Agency for preliminary project costs.

Table 5.1. Indirect Costs
Red Hill Site G Remediation

Project Activity	Percentage of Remedial Activities Subtotal
Project Management	5.00%
Construction Management	5.00%

6. Escalation Rate

This estimate includes escalation for 10 years at 3%, or 34.4%.

7. Estimate Classification

This cost estimate, as prepared, is considered a Class 4 (Concept Study or Feasibility) estimate as defined by the AACE Cost Estimate Classification System. It is considered accurate to +50% to -30%, based on a 1% to 15% level of project definition. A Class 4 Estimate is being used because of the conceptual nature of information that has been provided.

8. Estimate Methodology

Parts of this cost estimate are considered a bottom-rolled-up-type estimate with cost items and breakdown of labor, materials, and equipment. Budgetary quotations and allowances have been obtained for numerous items.

The estimate also includes some allowance costs that are based on dollars per square feet (SF), cubic yard (CY), or crew hours for certain components of the estimate.

9. Cost Resources

The following is a list of the various cost resources used in the development of this cost estimate:

- R.S. Means, as published in the 2015 Facilities Construction Cost Data Library
- Material supplier historical pricing
- CH2M HILL historical data
- Estimator judgement

10. Labor Costs

The estimate has been adjusted for local area labor rates, based upon prevailing wages for work on Oahu.

11. Taxes

This estimate includes Hawaii GET at 4.71%.

12. Major Assumptions

The estimate is based on the assumption the work will be done on a competitive bid basis and the contractor will have a reasonable amount of time to complete the work. All contractors are equal, with a reasonable project schedule with no overtime, constructed as under a single contract, and no liquidated damages.

General assumptions are as follows:

- The site is unimproved, and there are no facilities to decommission or demolish.
- It is assumed the work will be phased in a manner to prevent as much disruption to nearby communities.

13. Allowances

The estimate includes the following allowance for known work that is not sufficiently detailed at this time:

- Allowance for permits - [redacted]

14. Excluded Costs

The cost estimate excludes the following costs:

- Nonconstruction or soft costs for design, services during construction, land, and legal and owner/neighbor administration costs are excluded.
- Hard rock excavation and blasting is excluded.
- Filling of tanks with excavated materials is excluded.
- No allowance is included for shutdowns or restricted work delays.
- No costs for temporary security have been included in this estimate.

- No salvage value has been included for any materials removed from the site.

15. Reference Documents

The following documents were used to prepare this cost estimate:

- Google Earth Image – Pearl Harbor 4 Oct 2017
- 890458 – Typical Red Hill Tank Elevation.pdf
- 294325_2 Schematic Piping Diagram.pdf

Cost Estimate Appendix
Cost Estimate Detail

Red Hill Site - Use Soil for Tank Backfill Scenario

Red Hill Site Remediation

COST ESTIMATE SUMMARY

Site: Red Hill Site

Location: Red Hill Site
Phase: Earthwork prior to construction
Base Year: 2017
Date: 11/20/2017

Description: This scenario includes work at the existing Red Hill site, removal of contaminated soil and groundwater. Based on available information, contamination at the site extends to 20 ft bgs. Contaminated soil would be removed to approx. 20 ft bgs. Contaminated soil will be used as tank fill.

CAPITAL COSTS

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
Building and Aboveground Structures Demo					
	-	TBD	$0	$0	
SUBTOTAL				**$0**	Not Included
Soil Excavation and Disposal					
Work Plan	1	EA	[redacted]	[redacted]	Cost based on CH2M experience
Survey	20	DY	[redacted]	[redacted]	Cost based on CH2M experience
Permitting	1	LS	[redacted]	[redacted]	Cost based on CH2M experience
Procurement	1	LS	[redacted]	[redacted]	Cost based on CH2M experience
DPS Soil Sampling	10	DY	[redacted]	[redacted]	16 days of DPS drilling to collect multi-increment samples (16DUs, 1 DU per day) for waste characterization and disposal volume optimization.
Soil Testing	1,300	EA	[redacted]	[redacted]	Assumed samples for the following analyses: TPH, VOCs, PAH, metals, TCLP metals for top 20 feet
Preconstruction Submittal	1	LS	[redacted]	[redacted]	Cost based on previous Petroleum Contaminated Soil Excavation and Disposal project
Mobilization/Site Setup	1	LS	[redacted]	[redacted]	Cost based on previous Petroleum Contaminated Soil Excavation and Disposal project
Clear and Grub non-improved Area	34	AC	[redacted]	[redacted]	CH2M estimate
Grading for Access Road	18,670	SY	[redacted]	[redacted]	Rough grade, 7000 lf x 24 ft wide road
Gravel for Road	4,170	CY	[redacted]	[redacted]	Cost based on previous projects on Oahu
Stormwater controls	40,000	LF	[redacted]	[redacted]	CH2M estimate
Soil Excavation, contaminated 20 ft	650,000	CY	[redacted]	[redacted]	Cost based on previous Petroleum Contaminated Soil Excavation and Disposal project
Soil Excavation, remainder of overburden 80 ft	-	CY	[redacted]	[redacted]	CH2M estimate
Blasting for tanks and tunnels	-	CY	[redacted]	[redacted]	CH2M estimate
Excavate blasted material	-	CY	[redacted]	[redacted]	CH2M estimate
Stockpile Management	650,000	CY	[redacted]	[redacted]	Includes haul to stockpile for use in filling tanks
Trans and Disposal of Waste as Tank fill	650,000	TN	[redacted]	[redacted]	Ixcludes cy that goes to fill tanks
Trans and Disposal of Non-Hazardous Waste	-	TON	[redacted]	[redacted]	Cost based on previous Petroleum Contaminated Soil Excavation and Disposal project; 1.5 tons/cy, PVT Landfill
Trans and Disposal of Haz Waste	-	TON	[redacted]	[redacted]	CH2M estimate
Dewatering	11,220,000	GAL	[redacted]	[redacted]	CH2M estimate. Includes dewatering and T&D
Dewatering sampling	60	EA	[redacted]	[redacted]	CH2M estimate
Backfill/Compaction with imported soil	-	CY	[redacted]	[redacted]	Cost based on previous Petroleum Contaminated Soil Excavation and Disposal project. Assumed 1.3 fluff factor.
Demobilization	1	LS	[redacted]	[redacted]	Cost based on previous Petroleum Contaminated Soil Excavation and Disposal project
SUBTOTAL				[redacted]	
Tank and Tunnel Fill					
					Not Included
SUBTOTAL				[redacted]	
SUBTOTAL, Remedial Activities				[redacted]	

Red Hill Site - Use Soil for Tank Backfill Scenario

Red Hill Site Remediation

COST ESTIMATE SUMMARY

Site: Red Hill Site

Location: Red Hill Site
Phase: Earthwork prior to construction
Base Year: 2017
Date: 11/20/2017

Description: This scenario includes work at the existing Red Hill site, removal of contaminated soil and groundwater. Based on available information, contamination at the site extends to 20 ft bgs. Contaminated soil would be removed to approx. 20 ft bgs. Contaminated soil will be used as tank fill.

Undefined Scope and Market Allowance	25%	[redacted]	10% Scope + 15% Bid
SUBTOTAL			
Project management	5%	[redacted]	USEPA 2000, >$10M
Remedial design	0%	[redacted]	N/A
Construction Management	5%	[redacted]	USEPA 2000, >$10M
SUBTOTAL			
Escalation, 10 years	34.40%	[redacted]	
Hawaii GET	4.71%	[redacted]	State of Hawaii - Gross Excise Tax (Gross Receipts Tax).
SUBTOTAL			
TOTAL CAPITAL COST		[redacted]	

TOTAL PRESENT VALUE FOR SCENARIO 2	[redacted]

SOURCE INFORMATION

1. United States Environmental Protection Agency. July 2000. A Guide to Preparing and Documenting Cost Estimates During the Feasibility Study. EPA 540-R-00-002. (USEPA, 2000).
2a. R.S. Means Company. 2004. Environmental Remediation Cost Data - Unit Price, 10th Edition. R.S. Means Company and Talisman Partners, Ltd. Kingston, MA, (Includes Labor, equipment, and materials).
2b. R.S. Means Company. 2017. 32nd Edition.
2c. ECHOS (Environmental Cost Handling Options and Solutions). 2006. 12th Edition.
3. Historical CH2M project cost information
4. Calculations using Historical CH2M project cost information (separate worksheet)
5. The information in this cost estimate is based on the best available information regarding the anticipated scope of the remedial action alternatives. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial action alternatives. **These are order-of-magnitude cost estimates that are expected to be within -30% to +50% of the actual project costs.**