2021 Annual Leak Detection Testing Report of 16 Bulk Field-Constructed Underground Storage Tanks at Red Hill Fuel Storage Complex

Joint Base Pearl Harbor-Hickam, Hawaii

Prepared for:
Defense Logistics Agency Energy
Fort Belvoir, Virginia

Prepared under:
Naval Facilities Engineering Systems Command Atlantic
Contract N62470-16-D-9007
Delivery Order N6247021F4014

Submitted by:
Michael Baker International
Virginia Beach, Virginia

Date:
3 December 2021

Michael Baker INTERNATIONAL

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Michael Baker
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LIST OF ABBREVIATIONS AND ACRONYMS

40 CFR 280	Title 40 Code of Federal Regulations Part 280
BFCUST	Bulk Field-Constructed Underground Storage Tank
CMP	Centrally Managed Program
DLA	Defense Logistics Agency
F-24	Commercial Aviation Jet Fuel with Military Additives
F-76	Diesel Fuel Marine
FLC	Fleet Logistics Center
gph	gallons per hour
HAR	Hawaii Administrative Rules
JB	Joint Base
JP-5	Jet Propellant 5
MDLR	Minimum Detectable Leak Rate
Michael Baker	Michael Baker International
NAVFAC	Naval Facilities Engineering Systems Command
NWGLDE	National Work Group on Leak Detection Evaluations
POC	Point(s) of contact
PSA	Product Surface Area
UST	Underground Storage Tank

PROFESSIONAL ENGINEER CERTIFICATION

2021 Annual Leak Detection Testing Report of
16 Bulk Field-Constructed Underground Storage Tanks at
Red Hill Fuel Storage Complex

Joint Base Pearl Harbor-Hickam,
Hawaii

This report has been reviewed by a professional engineer and has been prepared in accordance with good engineering practices. Laboratory results, field notes, and supporting data have been reviewed and referenced correctly.

I hereby certify that I have examined this report and attest that it has been prepared in accordance with good engineering practices.

Engineer: Christopher D. Caputi, P.E.
Registration Number: 032382
State: Virginia
Date: 3 December 2021

EXECUTIVE SUMMARY

The scope of this project is to perform the 2021 annual leak detection testing of bulk field-constructed underground storage tanks (BFCUSTs) at the Red Hill Fuel Storage Complex at Joint Base (JB) Pearl Harbor-Hickam, Hawaii. The annual leak detection testing is performed in accordance with the Hawaii Administrative Rules, Title 11, Chapter 280.1 (HAR 11-280.1).

Prior to mobilization, the following seven BFCUSTs identified as BFCUSTs 1, 5, 13, 14, 17, 18 and 19 were not included in this testing effort. BFCUSTs 1 and 19 are permanently out-of-service; BFCUST 5 was tested in 2021 under a separate project and a separate report was provided; BFCUSTs 13, 14, 17, and 18 are temporarily out-of-service for inspection and will be tested upon return to service under a separate project.

During mobilization, one BFCUST identified as BFCUST 16 was not tested due to having low product level in the tank; base personnel reported that product delivery was not available prior to demobilization.

The final 2021 annual leak detection testing effort included 16 BFCUSTs identified as BFCUSTs 2, 3, 4, 6, 7, 8, 9, 10, 11, 12, 15, and 20, located at the Red Hill Fuel Storage Complex and BFCUSTs S1224, S1225, S1226, and S1227, located at the Underground Pump House Facility at JB Pearl Harbor-Hickam.

The annual leak detection testing of 16 BFCUSTs (BFCUSTs 2, 3, 4, 6, 7, 8, 9, 10, 11, 12, 15, 20, S1224, S1225, S1226, and S1227) was performed, by Mass Technology Corporation, between 6 October and 10 November 2021, with no detectable leak above the test method's minimum detectable leak rate, resulting in passing tests. Seven of the 16 BFCUSTs, identified as BFCUSTs 2, 3, 4, 8, 10, 11, and 12 were tested at product levels significantly below the tank maximum fill height, per base personnel request due to operational issues at the time of testing.

In accordance with HAR 280.1, BFCUST 16 must be tested annually and the BFCUSTs that were temporarily out-of-service must be tested upon their return to service. DLA Energy and NAVFAC Atlantic should be notified once the tanks are available for leak detection testing.

In accordance with HAR 11-280.1, annual leak detection testing of the BFCUSTs at the Red Hill Fuel Storage Complex at JB Pearl Harbor-Hickam must be initiated on or before the anniversary date of 6 October 2022.

The environmental regulatory compliance of this site is the responsibility of the base and the service.

1.0 INTRODUCTION

1.1 Purpose of Project

In support of the Defense Logistics Agency (DLA) Energy, Naval Facilities Engineering Systems Command (NAVFAC) Atlantic contracted Michael Baker International (Michael Baker) through NAVFAC Atlantic Contract N62470-16-D-9007, Delivery Order N6247021F4014, to perform annual leak detection testing of bulk field-constructed underground storage tanks (BFCUSTs) at the Red Hill Fuel Storage Complex at Joint Base (JB) Pearl Harbor-Hickam, Hawaii. The annual leak detection testing is performed in accordance with the Hawaii Administrative Rules, Title 11, Chapter 280.1 (HAR 11-280.1). A copy of the cited regulations is provided in Appendix A.

1.2 Site Background and History

JB Pearl Harbor-Hickam is located on the island of Oahu, approximately eight miles northwest of Honolulu, Hawaii. The Red Hill Fuel Storage Complex is located approximately three miles northeast of the base. The fueling operations at JB Pearl Harbor-Hickam are under the Navy's Fleet Logistics Center (FLC) Pearl Harbor.

Fuels stored at the Red Hill Fuel Storage Complex include commercial aviation jet fuel with military additives (F-24), Jet Propellant 5 (JP-5), and diesel fuel marine (F-76). Fuels are issued and received at the Red Hill Fuel Storage Complex from JB Pearl Harbor-Hickam via a transfer pipeline. The Red Hill Fuel Storage Complex consists of 24 BFCUSTs (BFCUSTs 1 through 20 and BFCUSTs S1224 through S1227) that are constructed of single-walled steel. Two of the 24 BFCUSTs (BFCUSTs 1 and 19) were permanently out-of-service prior to 2009. The top and bottom portions of BFCUSTs 1 through 20 are accessible via a tunnel system. BFCUSTs S1224 through S1227 are utilized as surge tanks during receipt and issue operations. BFCUSTs S1224 through S1227 are located underground on the south side of the underground pump house facility and are accessible through a tunnel on the north side of the tanks. The BFCUSTs receipt, issue, and water drain piping are connected to JB Pearl Harbor-Hickam Navy Facility via carbon steel piping of various diameters located in the tunnel system associated with the bottom portion of the BFCUSTs. All piping isolation valves are double block and bleed valves.

The state of Hawaii implemented underground storage tank (UST) regulations that meet the federal 1988 UST regulations contained in Title 40 Code of Federal Regulations Part 280 (40 CFR 280) and then had received state UST program approval from the United States Environmental Protection Agency (USEPA). Hawaii has since revised state UST regulations to incorporate and meet the 2015 federal revisions to 40 CFR 280 and has not yet received state UST program approval from USEPA. The HAR 11-280.1 contains the compliance requirements for owners and operators of USTs. Subchapter 4, Release Detection, presents the requirements for release detection (or leak detection) for USTs. The HAR Section 11-280.1-43(10) lists the accepted methods of release detection for field-constructed tanks and allows for annual tank tightness testing that can detect a 0.5 gallons per hour (gph) leak rate.

1.3 Historical Testing Results

The annual leak detection testing of 17 BFCUSTs (BFCUSTs 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 15, 16, 20, S1225, S1226, and S1227) under the DLA Energy Leak Detection Centrally Managed Program (CMP) was most recently performed by Proprietary Information between 6 October and 16 November 2020, with no detectable leak above the test method's minimum detectable leak rate (MDLR), resulting in passed tests. BFCUSTs 8 and 20 were tested at much less than tank maximum fill height, per base request, due to operational issues at the time of testing. BFCUSTs 13, 14, 17, 18, and S1224 were not tested due to being temporarily out-of-service.

The semiannual leak detection testing of 14 BFCUSTs (BFCUSTs 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 15, 16, and 20) under the DLA Energy Leak Detection CMP was most recently performed, by Proprietary Inform between 6 April and 18 May 2021, with no detectable leak above the test method's MDLR, resulting in passed tests. BFCUSTs 7 and 8 were tested at levels significantly less than tank maximum fill height, per base request, due to operational issues at the time of testing. BFCUSTs 13, 14, 17, and 18 were not tested due to being temporarily out-of-service.

The leak detection testing of BFCUST 5 was most recently performed under the DLA Energy Leak Detection CMP, by Proprietary Infor between 5 and 30 October 2021, with no detectable leak above the test method's MDLR of 0.1 gph, resulting in a passing test.

1.4 Project Scope

The scope of this project is to perform the 2021 annual leak detection testing of BFCUSTs at the Red Hill Fuel Storage Complex at JB Pearl Harbor-Hickam, Hawaii. The annual leak detection testing is performed in accordance with the HAR 11-280.1.

Prior to mobilization, the following seven BFCUSTs identified as BFCUSTs 1, 5, 13, 14, 17, 18 and 19 were not included in this testing effort. BFCUSTs 1 and 19 are permanently out-of-service; BFCUST 5 was tested in 2021 under a separate project and a separate report was provided; BFCUSTs 13, 14, 17, and 18 are temporarily out-of-service for inspection and will be tested upon return to service under a separate project.

During mobilization, one BFCUST identified as BFCUST 16 was not tested due to having very low product level in the tank; base personnel reported that product delivery was not available prior to demobilization.

The final 2021 annual leak detection testing effort included 16 BFCUSTs identified as BFCUSTs 2, 3, 4, 6, 7, 8, 9, 10, 11, 12, 15, and 20, located at the Red Hill Fuel Storage Complex and BFCUSTs S1224, S1225, S1226, and S1227, located at the Underground Pump House Facility at JB Pearl Harbor-Hickam. Table 1-1 provides a project summary. Figures 1-1 through 1-3 provide overviews of JB Pearl Harbor-Hickam, the Red Hill Fuel Storage Complex, and the Underground Pump House Facility, respectively

.

Table 1-1: Project Summary

Fuel System	Designation	Tank Diameter (Feet)	Tank Height (Feet)	Tank Volume (Gallons)	Product	Associated Tank Piping						
						Diameter (Inches) Length (Feet)					Total Length (Feet)	Volume (Gallons)
						4	6	8	12	20		
Red Hill Fuel Storage Complex	BFCUST 1	Permanently Out-of-Service										
	BFCUST 2	Critical Infrastructure		12,000,000	F-24	Critical Infrastructure						13
	BFCUST 3			12,000,000	F-24							13
	BFCUST 4			12,000,000	F-24							13
	BFCUST 5			12,700,000	F-24							38
	BFCUST 6			12,700,000	F-24							44
	BFCUST 7			12,700,000	JP-5							12
	BFCUST 8			12,700,000	JP-5							20
	BFCUST 9			12,700,000	JP-5							12
	BFCUST 10			12,700,000	JP-5							31
	BFCUST 11			12,700,000	JP-5							15
	BFCUST 12			12,700,000	JP-5							44
	BFCUST 13[1]			12,700,000	F-76							13
	BFCUST 14[1]			12,700,000	JP-5							21
	BFCUST 15			12,700,000	F-76							15
	BFCUST 16			12,700,000	F-76							60
	BFCUST 17[1]			12,700,000	JP-5							15
	BFCUST 18[1]			12,700,000	JP-5							28
	BFCUST 19	Permanently Out-of-Service										
	BFCUST 20			12,700,000	JP-5	Critical Infrastructure						8
Underground Pump House Facility	BFCUST S1224			420,000	F-24							25
	BFCUST S1225			420,000	JP-5							25
	BFCUST S1226			420,000	F-76							59
	BFCUST S1227			420,000	F-76							59

Table Notes:
1. Tank not tested due to being temporarily out-of-service during the 2021 annual event.

Figure 1-1: JB Pearl Harbor-Hickam Overview

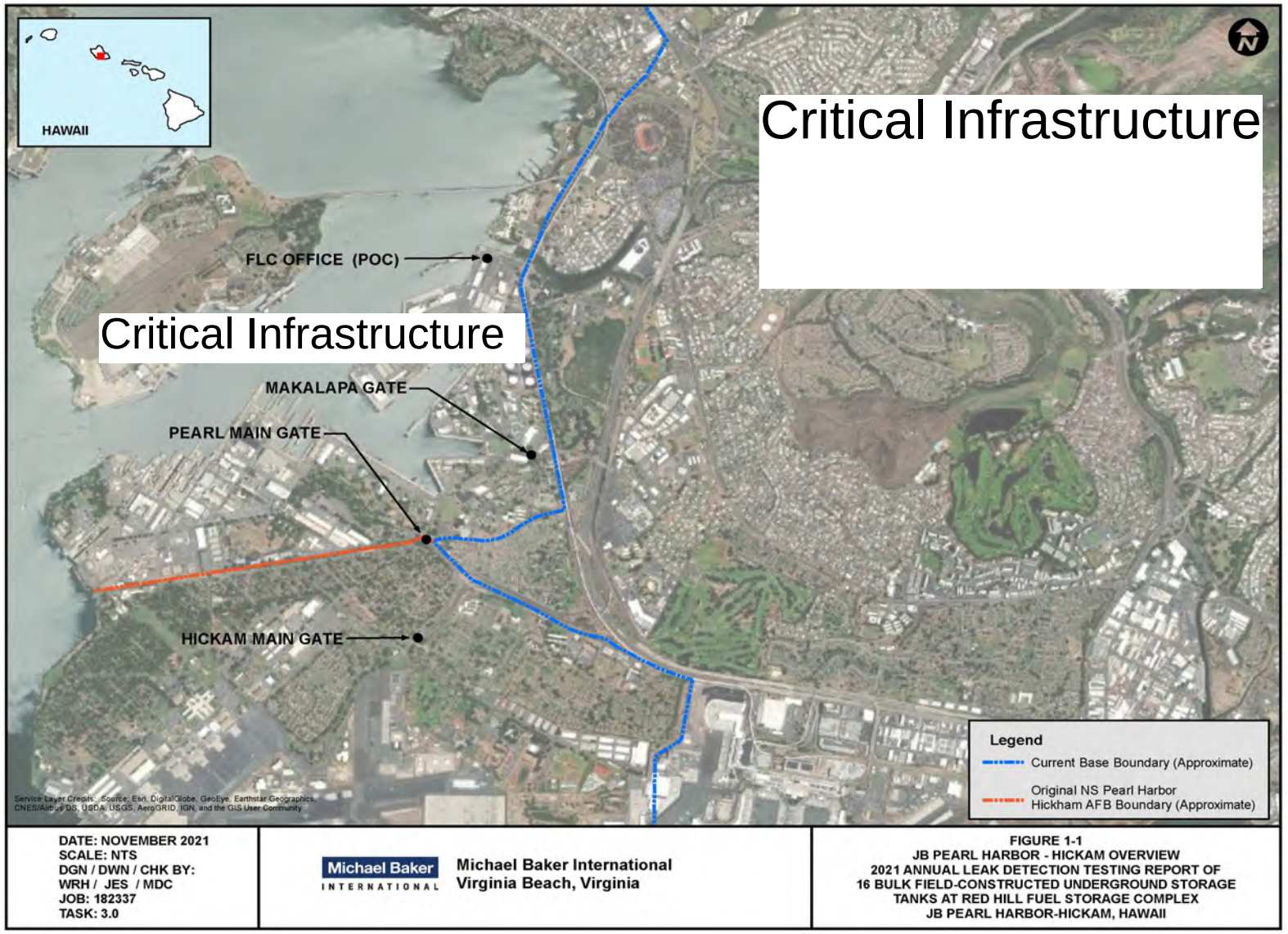


Figure 1-2: Red Hill Fuel Storage Complex Overview

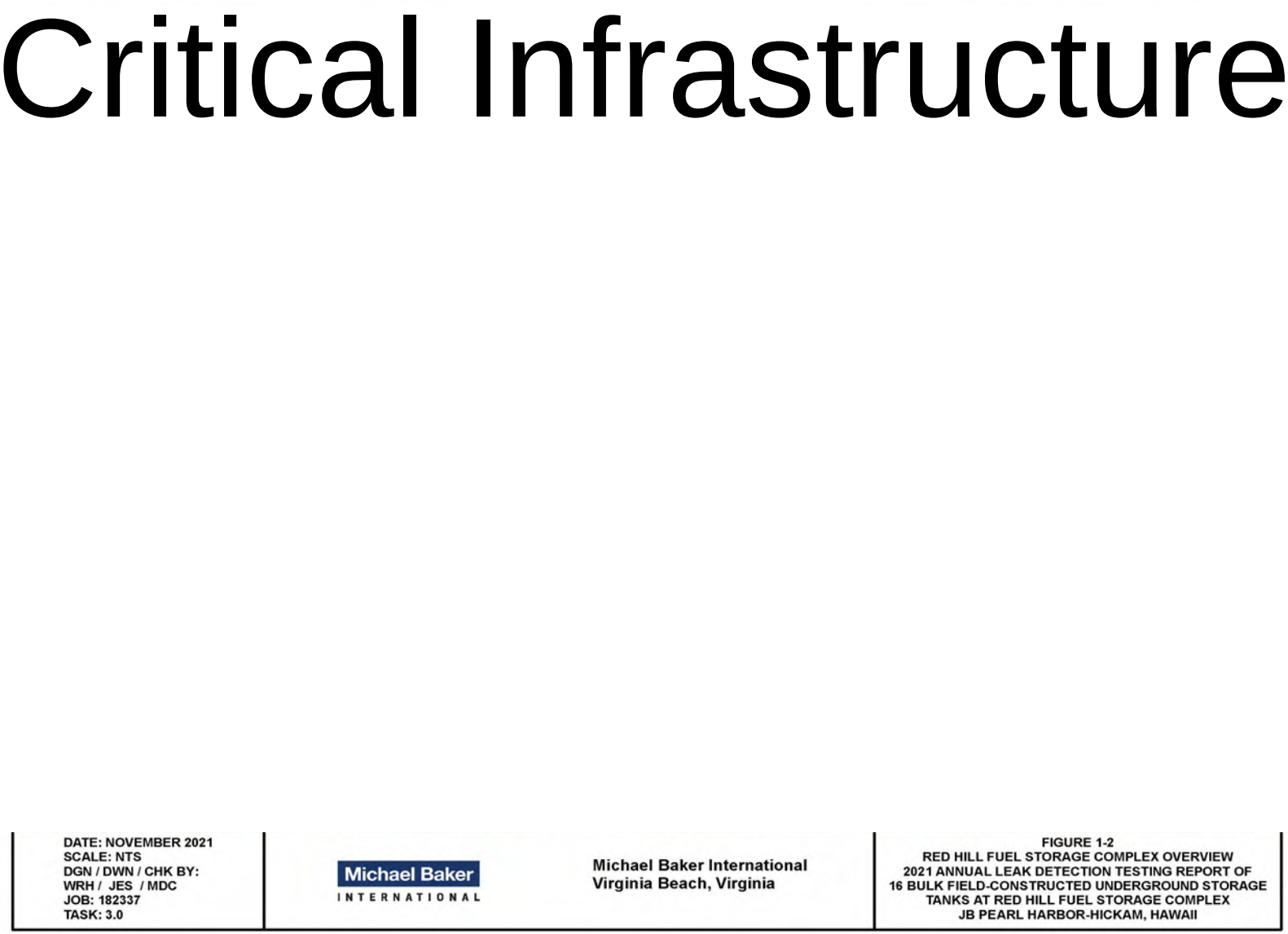
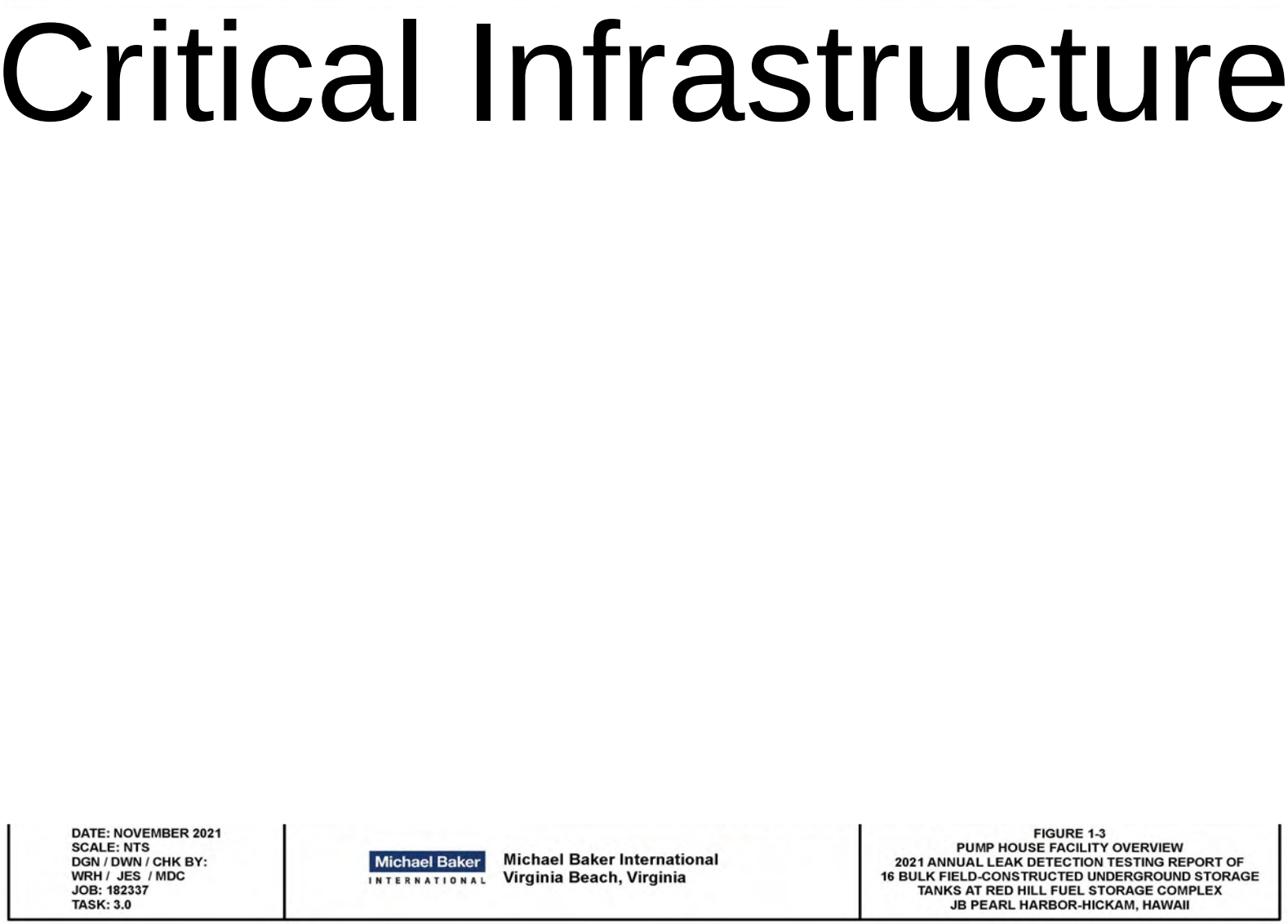


Figure 1-3: Pump House Facility Overview



1.5 Project Team

Proprietary Inform

Michael Baker subcontracted to perform the annual leak detection testing. Field-testing oversight, coordination with facility fuel representatives, quality assurance/quality controls, and final report preparation and submission were provided by Michael Baker personnel.

1.6 Qualifications and Technical Approach

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2.0 TESTING RESULTS

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The test reports are provided in Appendix B.

The annual leak detection testing of 16 BFCUSTs (BFCUSTs 2, 3, 4, 6, 7, 8, 9, 10, 11, 12, 15, 20, S1224, S1225, S1226, and S1227) was performed, by Proprietary Informa between 6 October and 10 November 2021, with no detectable leak above the test method's minimum detectable leak rate, resulting in passing tests. Seven of the 16 BFCUSTs, identified as BFCUSTs 2, 3, 4, 8, 10, 11, and 12 were tested at product levels significantly below the tank maximum fill height, per base personnel request due to operational issues at the time of testing.

The results summary is listed in Table 2-1.

Table 2-1: Results Summary

Fuel System	Designation	Height (Feet)	Volume (Gallons)	Product	Test Method	Certified MDLR (gph)	Test Date	Result	Test Product Level (Feet)
Red Hill Fuel Storage Complex	BFCUST 1	Critical Infrastructure			Proprietary Information	Not Tested – Permanently Out-of-Service			Proprietary Informatic
	BFCUST 2		12,000,000	F-24		0.5	20 October - 25 October 2021	Pass	
	BFCUST 3		12,000,000	F-24		0.5	30 October - 4 November 2021	Pass	
	BFCUST 4		12,000,000	F-24		0.5	25 October - 30 October 2021	Pass	
	BFCUST 5		12,700,000	F-24		Not Tested - Tested in 2021 Under Separate Project			
	BFCUST 6		12,700,000	F-24		0.5	17 October - 22 October 2021	Pass	
	BFCUST 7		12,700,000	JP-5		0.5	6 October - 11 October 2021	Pass	
	BFCUST 8		12,700,000	JP-5		0.5	8 October - 13 October 2021	Pass	
	BFCUST 9		12,700,000	JP-5		0.5	22 October - 27 October 2021	Pass	
	BFCUST 10		12,700,000	JP-5		0.5	27 October - 2 November 2021	Pass	
	BFCUST 11		12,700,000	JP-5		0.5	5 November - 10 November 2021	Pass	
	BFCUST 12		12,700,000	JP-5		0.5	3 November - 8 November 2021	Pass	
	BFCUST 13		12,700,000	JP-5		Not Tested – Temporarily Out-of-Service			
	BFCUST 14		12,700,000	JP-5		Not Tested – Temporarily Out-of-Service			
	BFCUST 15		12,700,000	F-76		0.5	12 October - 17 October 2021	Pass	
	BFCUST 16[1]		12,700,000	F-76		Not Tested			
	BFCUST 17		12,700,000	JP-5		Not Tested – Temporarily Out-of-Service			
	BFCUST 18		12,700,000	JP-5		Not Tested – Temporarily Out-of-Service			
	BFCUST 19					Permanently Out-of-Service			
	BFCUST 20		12,700,000	JP-5		0.5	14 October - 19 October 2021	Pass	
Underground Pump House Facility	BFCUST S1224		420,000	F-24		0.5	4 November – 6 November 2021	Pass	
	BFCUST S1225		420,000	JP-5		0.5	30 October - 1 November 2021	Pass	
	BFCUST S1226		420,000	F-76		0.5	23 October - 25 October 2021	Pass	
	BFCUST S1227		420,000	F-76		0.5	26 October - 28 October 2021	Pass	

Table Notes:
1. Tank not tested in 2021 due to very low product level.

3.0 CONCLUSIONS AND RECOMMENDATIONS

3.1 Conclusions

Sixteen BFCUSTs (BFCUSTs 2, 3, 4, 6, 7, 8, 9, 10, 11, 12, 15, 20, S1224, S1225, S1226, and S1227) passed the 2021 annual leak detection testing.

3.2 Recommendations

In accordance with HAR 280.1, BFCUST 16 must be tested annually and the BFCUSTs that were temporarily out-of-service must be tested upon their return to service. DLA Energy and NAVFAC Atlantic should be notified once the tanks are available for leak detection testing.

In accordance with HAR 11-280.1, annual leak detection testing of the BFCUSTs at the Red Hill Fuel Storage Complex at JB Pearl Harbor-Hickam must be initiated on or before the anniversary date of 6 October 2022.

The environmental regulatory compliance of this site is the responsibility of the base and the service.

APPENDIX A

CITED REGULATIONS

HAWAII ADMINISTRATIVE RULES

TITLE 11

DEPARTMENT OF HEALTH

CHAPTER 11-280.1

UNDERGROUND STORAGE TANKS

Subchapter 3 General Operating Requirements

Subchapter 4 Release Detection

Subchapter 5 Release Reporting, Investigation, and Confirmation

"Remanufacturing of Fiberglass Reinforced Plastic (FRP) Underground Storage Tanks".

(e) The following codes of practice may be used to comply with section 11-280.1-33(a)(6):

(1) Steel Tank Institute Recommended Practice R012, "Recommended Practice for Interstitial Tightness Testing of Existing Underground Double Wall Steel Tanks";

(2) Fiberglass Tank and Pipe Institute Protocol, "Field Test Protocol for Testing the Annular Space of Installed Underground Fiberglass Double and Triple-Wall Tanks with Dry Annular Space"; or

(3) Petroleum Equipment Institute Recommended Practice RP1200, "Recommended Practices for the Testing and Verification of Spill, Overfill, Leak Detection and Secondary Containment Equipment at UST Facilities".

(f) The following code of practice may be used to comply with section 11-280.1-35(a)(1), (2) and (3): Petroleum Equipment Institute Publication RP1200, "Recommended Practices for the Testing and Verification of Spill, Overfill, Leak Detection and Secondary Containment Equipment at UST Facilities".

[Eff 7/15/18; comp JAN 17 2020] (Auth: HRS §§342L-3, 342L-32) (Imp: HRS §§342L-3, 342L-32)

§11-280.1-39 (Reserved.)

SUBCHAPTER 4

RELEASE DETECTION

§11-280.1-40 General requirements for all UST systems. (a) Owners and operators of UST systems

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communication with controller;

(C) Automatic line leak detector: test operation to meet criteria in section 11-280.1-44(1) by simulating a leak;

(D) Vacuum pumps and pressure gauges: ensure proper communication with sensors and controller; and

(E) Hand-held electronic sampling equipment associated with groundwater and vapor monitoring: ensure proper operation; and

(5) Meets the performance requirements in section 11-280.1-43 or 11-280.1-44, as applicable, with any performance claims and their manner of determination described in writing by the equipment manufacturer or installer. In addition, the methods listed in section 11-280.1-43(2), (3), (4), (8), (9), and (10) and section 11-280.1-44(1), (2), and (4) must be capable of detecting the leak rate or quantity specified for that method in the corresponding section of the rule with a probability of detection of 0.95 and a probability of false alarm of 0.05.

(b) When a release detection method operated in accordance with the performance standards in section 11-280.1-43 or 11-280.1-44 indicates a release may have occurred, owners and operators must notify the department in accordance with subchapter 5.

(c) Any UST system that cannot apply a method of release detection that complies with the requirements of this subchapter must complete the change-in-service or closure procedures in subchapter 7. [Eff 7/15/18; comp JAN 17 2020] (Auth: HRS §§342L-3, 342L-32, 342L-33) (Imp: HRS §§342L-3, 342L-32, 342L-33)

§11-280.1-41 Requirements for petroleum UST systems. (a) Tanks. Owners and operators of petroleum UST systems must provide release detection for tanks as follows:

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for releases at least every thirty-one days using one of the methods listed in section 11-280.1-43(4) to (9), except that:

(i) UST systems that meet the performance standards in section 11-280.1-20, and the monthly inventory control requirements in section 11-280.1-43(1) or (2), may use tank tightness testing (conducted in accordance with section 11-280.1-43(3)) at least every five years until ten years after the tank was installed; and

(ii) Tanks with capacity of 550 gallons or less and tanks with a capacity of 551 to 1,000 gallons that meet the tank diameter criteria in section 11-280.1-43(2) may use manual tank gauging (conducted in accordance with section 11-280.1-43(2)).

(B) Tanks installed on or after the effective date of these rules must be monitored for releases at least every thirty-one days in accordance with section 11-280.1-43(7).

(3) UST systems with field-constructed tanks with a capacity greater than 50,000 gallons:

(A) Tanks installed before the effective date of these rules must be monitored for releases at least every thirty-one days using one of the methods listed in section 11-280.1-43(4), (7), (8), and (9) or use one or a combination of the methods of release detection listed in section 11-280.1-43(10); and

(B) Tanks installed on or after the effective date of these rules must be monitored for releases at least every thirty-one days in accordance with section 11-280.1-43(7).

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or

(iv) Meet the standards in paragraph (6)(A) to (E).

(6) No release detection is required for suction piping that is designed and constructed to meet the following standards:

(A) The below-grade piping operates at less than atmospheric pressure;

(B) The below-grade piping is sloped so that the contents of the pipe will drain back into the storage tank if the suction is released;

(C) Only one check valve is included in each suction line;

(D) The check valve is located directly below and as close as practical to the suction pump; and

(E) A method is provided that allows compliance with subparagraphs (B) to (D) to be readily determined. [Eff 7/15/18; comp JAN 17 2020] (Auth: HRS §§342L-3, 342L-32, 342L-33) (Imp: HRS §§342L-3, 342L-32, 342L-33)

§11-280.1-42 Requirements for hazardous substance UST systems. Owners and operators of hazardous substance UST systems must monitor these systems in accordance with section 11-280.1-43(7) at least every thirty-one days. In addition, underground piping that conveys hazardous substances under pressure must be equipped with an automatic line leak detector in accordance with section 11-280.1-44(1). [Eff 7/15/18; comp JAN 17 2020] (Auth: HRS §§342L-3, 342L-32, 342L-33) (Imp: HRS §§342L-3, 342L-32, 342L-33)

§11-280.1-43 Methods of release detection for tanks. Each method of release detection for tanks

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used to meet the requirements of sections 11-280.1-40 to 11-280.1-42 must be conducted in accordance with the following:

(1) Inventory control. Product inventory control (or another test of equivalent performance) must be conducted monthly to detect a release of at least one percent of flow-through plus one hundred thirty gallons on a monthly basis in the following manner:

(A) Inventory volume measurements for regulated substance inputs, withdrawals, and the amount still remaining in the tank are recorded each operating day;

(B) The equipment used is capable of measuring the level of product over the full range of the tank's height to the nearest one-eighth of an inch;

(C) If a manual measuring device is used (e.g., a gauge stick), the measurements must be made through a drop tube that extends to within one foot of the tank bottom. Level measurements shall be to the nearest one-eighth of an inch;

(D) The regulated substance inputs are reconciled with delivery receipts by measurement of the tank inventory volume before and after delivery;

(E) Deliveries are made through a drop tube that extends to within one foot of the tank bottom;

(F) Product dispensing is metered and recorded within the state standards for meter calibration or an accuracy of six cubic inches for every five gallons of product withdrawn, and the meter is calibrated every three hundred sixty-five days; and

(G) The measurement of any water level in the bottom of the tank is made to the nearest one-eighth of an inch at least once a month.

(A) Report a quantitative result with a calculated leak rate;

(B) Be capable of detecting a leak rate of 0.2 gallon per hour or a release of one hundred fifty gallons within thirty-one days; and

(C) Use a threshold that does not exceed one-half the minimum detectible leak rate.

(9) Other methods. Any other type of release detection method, or combination of methods, can be used if:

(A) It can detect a 0.2 gallon per hour leak rate or a release of one hundred fifty gallons within a month with a probability of detection of 0.95 and a probability of false alarm of 0.05; or

(B) The owner and operator can demonstrate to the department that the method can detect a release as effectively as any of the methods allowed in paragraphs (3) to (8), and the department approves the method. In comparing methods, the department shall consider the size of release that the method can detect and the frequency and reliability with which it can be detected. If the method is approved, the owner and operator must comply with any conditions imposed by the department on its use to ensure the protection of human health and the environment.

(10) Methods of release detection for field-constructed tanks. One or a combination of the following methods of release detection for tanks may be used when allowed by section 11-280.1-41.

(A) Conduct an annual tank tightness test that can detect a 0.5 gallon per hour leak rate;

(B) Use an automatic tank gauging system to perform release detection at least

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APPENDIX B

Proprietary Information *TEST REPORTS*

Proprietary Information

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