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DEPARTMENT OF HEALTH

STATE OF HAWAII

ENVIRONMENTAL HEALTH DIVISION, DEPARTMENT OF HEALTH, STATE OF HAWAII, Complainant, v. UNITED STATES DEPARTMENT OF THE NAVY, Respondent.	Case No. 21-UST-EA-02 **DECLARATION OF JAMES G. MEYER**

DECLARATION OF JAMES G. MEYER

I, James G. Meyer, declare as follows:

1. I am the Commanding Officer of Naval Facilities Engineering and Systems Command (NAVFAC) Hawaii located at Joint Base Pearl Harbor, Hawaii (JBPHH). I am also assigned as the Regional Engineer for the Commander, Navy Region Hawaii, located at Pearl Harbor. I hold a Bachelor's degree in Mechanical Engineering and Naval Science from the University of Wisconsin, a Master's degree in Civil Engineering from Stanford University, a Master's in Business Administration from City University of Seattle, and I am a registered professional engineer in the State of California. NAVFAC Hawaii provides facilities engineering, real estate, and environmental management services to the Navy, other DoD and non-DoD tenants within

Navy Region Hawaii. Our major customers include Navy Region Hawaii/Joint Base Pearl Harbor-Hickam, Pearl Harbor Naval Shipyard/Intermediate Maintenance Facility, Marine Corps Base Hawaii, U.S. Pacific Fleet, U.S. Pacific Air Forces, and U.S. Indo-Pacific Command.

2. I make this declaration in support of the Respondent, United States Department of the Navy's ("Navy") opposition to the Emergency Order of December 6, 2021, which the Complainant, Environmental Health Division, Department of Health, State of Hawaii ("DOH"), issued concerning an overview of the effected Navy water system on Oahu and current and planned efforts to restore the Red Hill shaft and protect the aquifer. I make this declaration based upon personal knowledge and I am competent to testify as to all matters stated herein.

3. As Commanding Officer of NAVFAC Hawaii I have been assigned to provide, direct, and oversee the Navy's local response and address efforts to eliminate any risk to human health, safety and the environment posed by recent events from the Red Hill Facility. I have been Commanding Officer of NAVFAC Hawaii since August 7, 2020.

4. The Navy (and in part the Army) owns and operates a water system located in Honolulu, Hawaii that serves potable water on military installations, Public-Private Venture Housing (PPV Housing), and the military community and facilities associated with Joint Base Pearl Harbor-Hickam. The Navy's system also services limited areas adjacent to its installations, which were prior government enclaves the Navy transferred to state and local governments. The system is comprised of three Maui-style drinking water supply wells: 1) the Red Hill Shaft; 2) the Navy Aiea-Halawa Shaft; and 3) the Waiawa Shaft. As indicated in **N-2A**, Ford Island is located in the center of that diagram. To the right of Ford Island is the Red Hill Shaft (indicated by a red star). The Red Hill Shaft normally supplies about 15% of our water. The Red Hill Shaft has been off-line since November 28, 2021. I am aware that on November 28, following reports

from Navy Housing residents of an odor in the water, no fuel transfers to, from or between Red Hill tanks took place. I understand that the last fuel movement to, from, or between Red Hill tanks took place on November 26, which was a transfer of F-24 jet fuel from Red Hill Tank 4 to Upper Tank Farm Tank 46 (outside and apart from the Red Hill facility). To the left of the Red Hill Shaft on **N-2A** is the Aiea-Halawa Shaft. This is a different resource than the Honolulu Board of Water Supply's (HBWS) Halawa Shaft. The Navy's Aiea-Halawa Shaft normally supplies about 5% of our water. Navy Aiea-Halawa Shaft has been off-line since Friday, December 3, 2021, in coordination with the HBWS. Near the left-center top of **N-2A** is the Waiawa Shaft. The Waiawa Shaft normally supplies about 80% of our water. With the Red Hill and Aiea-Halawa Shafts off-line, the Waiawa Shaft is currently the sole source of Navy water. That level of production is adequate and we are also utilizing water conservation measures.

5. The Navy is currently working around the clock to restore the Navy water distribution system. The source of the water problems is fuel contamination in the Red Hill Shaft. We know from testing that the Red Hill Shaft was contaminated with jet fuel (JP5), and that the contaminant was new fuel, which strongly indicates that the source of the fuel was the November 20, 2021 release. As indicated above, the Red Hill Shaft has been isolated since November 28, so no new contamination is being introduced into the water distribution system. The only water being injected into the system is from the Waiawa Shaft which has been verified clean through multiple tests.

6. First step in cleanup is to directionally flush multiple volumes of clean water through the system. The system volume is about 25 million gallons. How fast this system flush can be completed is very dependent on the flush volume. It could be completed in as quickly as four (4) days if there were limited or no restrictions. With our planned approach of in-line GAC

treatment, we anticipate up to 18 days to perform the complete system flush. We are working closely with the DOH to conduct this flushing in a way that is safe for the environment and the people of Hawaii, to include our military families. Flushing operations will commence now that a detailed plan and notice of intent have been approved by DOH and EPA, as of Friday, December 17, 2021. The Navy has conducted over 100 detailed samples of the water distribution system as a whole and all samples have come back within environmentally acceptable limits (one exception is a dead end section of pipe near the Aiea-Halawa pump station which is not representative of the distribution system or the actual Navy Aiea-Halawa Well). The Navy Aiea-Halawa Well has been directly tested and there are no contaminants. Commencing the week of December 19, we plan to utilize twenty-one (21) to twenty-five (25) (1Million Gallons per Day (MGD)) Granular Activated Carbon (GAC) filtration systems situated throughout the various neighborhoods working to filter through hydrants to achieve the complete system flush. Accordingly, it is our assessment that this flush can be done safely.

7. The next step toward system restoration is to flush each individual home and effected facility. We will have more detailed plans on how to do this as we continue to examine each location. It is our assessment that this individual flushing could be accomplished in as quickly as two (2) to four (4) days per housing community. Throughout this flushing, we will continue a rigorous sampling protocol to evaluate the water as well as protect the environment and the people of Hawaii. These flushing and sampling plans have been developed in collaboration with representatives from the DOH, Environmental Protection Agency (EPA), HBWS (invited), Hawaii Department of Land and Natural Resources (DLNR), City and County of Honolulu, and the University of Hawaii Water Resources Research Center. This group is sharing expertise with environmental regulators for the purpose of achieving partnering solutions and it is our goal to

continue to work through this coalition of experts. After evaluation of the testing results, we will work closely with the DOH and other stakeholders to declare our water safe.

8. Next, our plan is to remediate the Red Hill Well and protect the aquifer. There is confirmed to be some amount of petroleum contamination there and we are working to remove that fuel out of the Red Hill Well. In the near term, we have worked in coordination with the DOH to have Navy divers enter the water well shaft for purposes of inspecting it and characterizing the release, and we have gotten approval to commence skimming product removal activities. Pumps are being used to directly remove the petroleum contamination floating on top of the Red Hill Well. Navy Mobile Diving and Salvage Unit (MDSU) ONE skimming operations captured a total of approximately 31,000 gallons of a water/fuel mixture to date. This mixture is being sent to the Fleet Logistics Center (FLC) oil/water separator on the installation which will inform the rough quantity of fuel recovered. In addition, industrial absorbent material will be placed in the Red Hill shaft during the next pause in skimming operations. This absorbent material will soak up petroleum, which will be removed from the Red Hill Well along with the absorbent material after being in place for about 24 hours.

9. We are also working to perform significant cleanup by pumping large volumes of water out of the Red Hill Well. This will also protect the rest of the aquifer by pulling any contaminates towards the Red Hill Well. On December 9, 2021, NAVFAC Pacific, our higher echelon Command here in Hawaii, awarded a task order under a Global Contingency Services Contract to Vectrus Systems Corporation of Colorado Springs, Colorado for approximately $6.8 million for two (2) granular activated carbon (GAC) water filtration units capable of filtering a total of up to 10 million gallons per day (MGD). These large GAC units are en-route from Michigan and other locations; we have coordinated military airlift to bring them here. These are

huge units requiring multiple airlifts, and then significant effort to assemble, connect, and begin operating. Nonetheless, our goal is to have them completely up and operating within approximately 2 weeks. We are also working with the DOH, DLNR and other stakeholders on where to send this water and to ensure that required permitting is attained. It will be clean filtered water that is safe for the environment.

10. The aforementioned 21-25 (1MGD) GAC units for neighborhood flushing, on the other hand, will begin to arrive on December 18, 2021 and will be put into service within a matter of days to flush the distribution system.

11. One of our challenges throughout this event is the lack of an on-island water testing capability that can analyze to the sensitivity levels we need. All of our samples are being flown to certified third party labs on the Mainland which adds time. Both Navy and DOH have some local capability but not at the sensitivity levels we really need. We are working with local interests to develop this capability in Hawaii and would prefer that this capability be operated by a third party entity. We need this capability on-island in order to improve our testing efficiencies. I believe this would greatly benefit the DOH's sampling and testing program as well.

12. Lastly, we are in the process of working to purchase a permanent treatment facility utilizing the Military Construction process.

13. The Navy's investigation into how fuel reached the Red Hill Well is ongoing. But we know the source of the fuel from the November release was from an Aqueous Film Forming Foam (AFFF) fire suppression recovery line that is designed to collect wastewater and fuel from firefighting events and transport the waste to above ground storage tanks. The AFFF return lines are powered by sump pumps, which are separate from the sump pumps in the other drainage

systems, such as the groundwater collection systems. The firefighting system, and its collection lines, is not connected to the Red Hill Facility fuel lines or tanks.

14. The working theory under investigation is that the fuel entered the AFFF collection system from a known fuel pipeline release that occurred on May 6, 2021 in the lower access tunnel beneath the tank farm. From the point of release, the fuel migrated downgrade and collected in the AFFF system, where the sump pumps pumped into the AFFF recovery line. Both the May 6, 2021 and November 20, 2021 releases were caused by human error that led to releases from pipes; both were also discrete events.

15. As to the fuel storage tanks at Red Hill, the Navy takes numerous precautions to ensure that the tanks are safe. The tanks are closely monitored at all times via the Automated Fuel Handling Equipment (AFHE) operated by control room operators. Roving patrols and other NAVSUP FLC Pearl Harbor Fuels Department personnel continually monitor the access tunnels and the facility. The Navy conducts regular inspections, tests, preventative maintenance, and repairs to ensure the integrity of the tanks. These efforts include semi-annual tank tightness testing as well an EPA and DOH approved Tank Inspection Repair and Maintenance (TIRM) process. According to a Red Hill Facility Evaluation Report submitted to the Environmental Protection Agency in June 2017, "key construction components of the tanks exceed or meet most modern day construction standards," and "the implemented inspection technologies and methods meet or exceed industry standard." *See* **N-2B.**

16. The Navy's semi-annual leak detection testing performed on the eighteen Red Hill underground storage tanks (UST) that are in service, utilizes a leak detection method listed with the National Work Group for Leak Detection Evaluators (NWGLDE). The NWGLDE is a working group comprised of eleven (11) members, ten (10) from state regulators whose full time

positions are to regulate storage tank systems, and one member from the U.S. EPA. The NWGLDE approves leak detection methods, which the petroleum and oil lubricant (POL) industry uses as the accepted industry standard. The Navy's NWGLDE leak detection method is commonly referred to as Tank Tightness Testing.

17. Tank Tightness Testing is conducted with a mass-based leak detection and monitoring system. To perform the tests, the tanks are fully isolated from the remaining fuel system. The testing system is deployed in the tanks from the tank gauging gallery, which is above the tank, and lowered to the bottom of the tank. The testing system has very sensitive tank gauging sensors that measure temperature and take multiple mass readings of the fuel. The readings are then compared over time to identify extremely small changes, which in the end are expressed as mass changes in gallons per hour.

18. At the Red Hill Facility, Tank Tightness Testing is performed under contract with NAVFAC Atlantic. The Navy performs semi-annual Tank Tightness Testing with the approved measurement system twice as often as the Hawaii Administrative Rules require. **N-2C**.

19. Currently only 14 Red Hill Tanks contain fuel. Tanks 1 and 19 are permanently empty and are no longer in use. Tanks 14 and 18 are empty because they were in various phases of inspection and repair in the TIRM program when the Navy stopped operations. Tanks 13 and 17 are empty because they have recently completed the TIRM process.

20. Between April 6, 2021, and May 18, 2021, each of the Red Hill Facility USTs that currently contain fuel underwent the first of a semi-annual NWGLDE approved Tank Tightness Test. Each of the tanks passed the test and conformed with the Minimum Detectable Leak Rate (MDLR) in HAR § 11-280.1. **N-2D**. Between October 5, 2021 and October 30, 2021, Tank 5 was tested again, but to a MDLR of .1 gallon per hour in accordance with HAR § 11-280.1-

43(3). The lower MDLR in HAR § 11-280.143(3) is required when a tank has been returned to service, which was required for Tank 5 following inspection and repairs. **N-2E.** And between October 6, 2021 and November 10, 2021, twelve of the other Tanks that currently contain fuel underwent their second semi-annual Tank Tightness Test. Each of them again passed the test and conformed with the MDLR in HAR § 11-280.1. **N-2F.** Tank 16 was not tested in the fall of 2021 because, during the testing event, its product level was low due to operations. A delivery was not available to raise the level and perform the test. Because HAR § 11-280.1 requires tanks to be tested annually, Tank 16 remains compliant with the regulations.

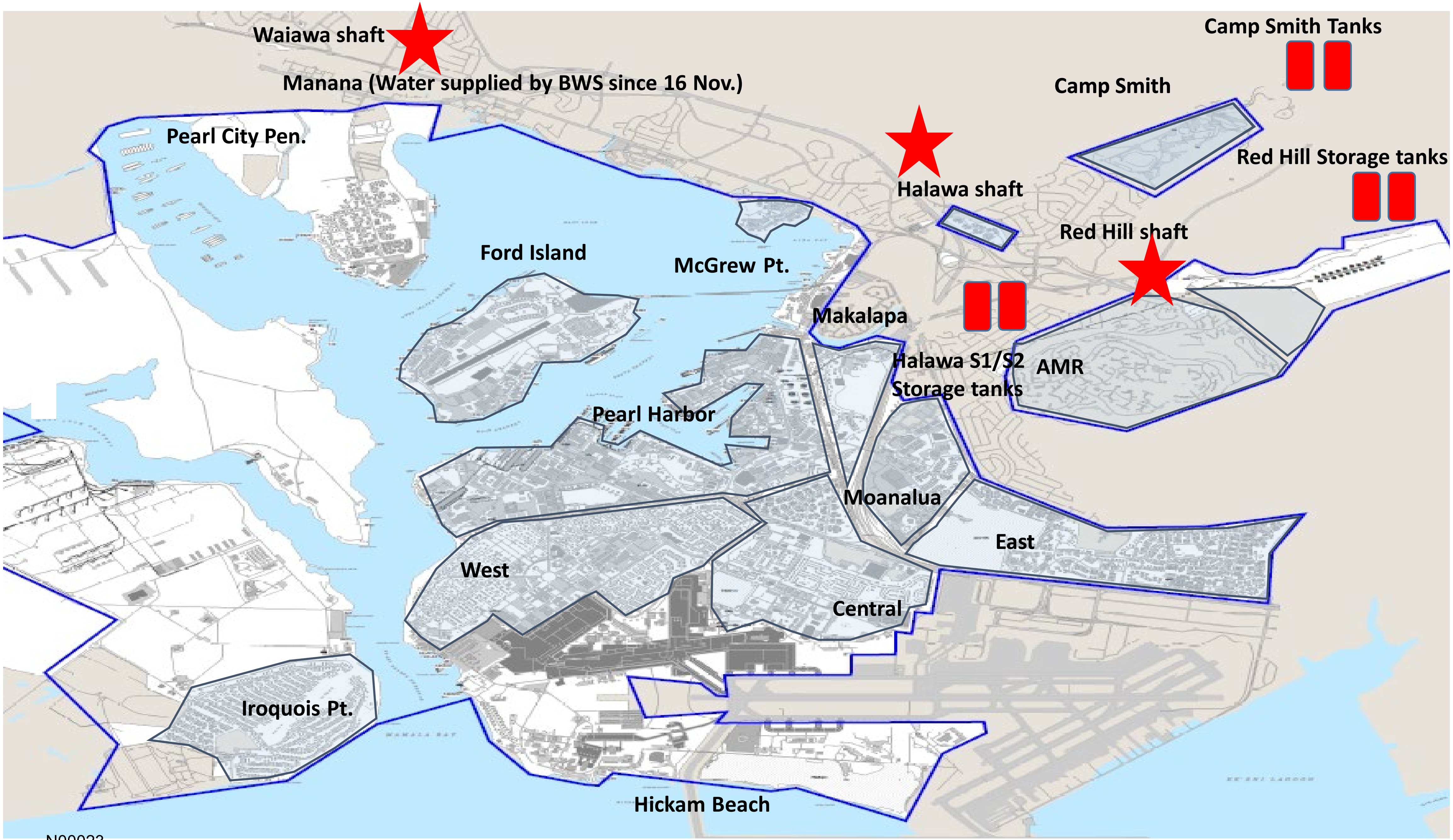
Since the Navy began its Tank Tightness Testing regimen, no Red Hill Tank has failed a Tank Tightness Test. From the time Red Hill Facility operations stopped, each of the 14 tanks that contain fuel have been isolated from the remaining fuel system.

21. Finally, attachment **N-2G** addresses another of the testing methodologies we currently employ to monitor the groundwater in the vicinity of the Red Hill facility. These consist of small shafts drilled vertically into the ground which are designed to allow access to various depths within the groundwater to provide a means to obtain samples. This assists us with understanding the horizontal and vertical movement of the groundwater and would also allow us to capture samples of contaminants, if any, for identification and tracing of any movement over time. Attachment **N-2G** depicts the significant increase in groundwater monitoring wells we have established over recent years to enhance our testing capabilities.

22. I declare under penalty of perjury that the foregoing facts are true and correct to the best of my knowledge and belief.

Dated: Honolulu, HI; December 18, 2021.

/S/James G. Meyer
James G. Meyer



N00023

Mapped areas of the Navy Water Distribution System

Released by the Navy 12/14/2021

Exhibit N-2A

Underground Storage Tank System Evaluation Final Report

Red Hill Bulk Fuel Storage Facility
Joint Base Pearl Harbor-Hickam

June 2017

Submitted to:

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION 9
75 Hawthorne Street
San Francisco, CA 94105

Submitted by:

Atlas Geotechnical
Eastern Research Group, Inc.
PEMY Consulting
Powers Engineering and Inspection, Inc.

Date of Report:	June 13, 2017
Date of Evaluation:	May 9 to 12, 2016
Weather:	Sunny, Approximately 75° Fahrenheit
Facility Owner:	Department of the Navy
Facility Address:	Red Hill Bulk Fuel Storage Facility Building 1757 (Administrative Office) Joint Base Pearl Harbor-Hickam Pearl Harbor, HI 96860
Facility Phone:	(808) 473-7801 (John Floyd, Deputy Director)
Inspector(s):	Jade Geronimo, Powers Engineering and Inspection, Inc. Ryan Hubbard, Aspen Controls Christopher Krejci, Eastern Research Group, Inc. Steven Linder, U.S. EPA Phil Myers, PEMY Consulting Bobby Ojha, U.S. EPA Gary Powers, Powers Engineering and Inspection, Inc. Omer Shalev, U.S. EPA Doug Schwarm, Atlas Geotechnical Roy Ilaga, Hawaii Department of Health George Tabil, Hawaii Department of Health

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ATTACHMENTS

I. OBJECTIVE

The United States Environmental Protection Agency (EPA) Region 9 requested that a team of subject matter experts including ERG conduct a baseline evaluation of the underground storage tank (UST) system and peripheral equipment at the Red Hill Bulk Fuel Storage Facility (Red Hill Facility) under EPA's Contract Number EP-W-15-006, Work Assignment ERG-1-11. The purpose of the baseline evaluation was to provide an overall assessment of the Facility's ability to be operated in a manner that prevents release of fuel into the environment.

II. GENERAL FINDINGS

To achieve the objective of the baseline assessment, the evaluation team undertook to verify the operational status of the UST system with respect to industry standards, UST requirements of Resource Conservation and Recovery Act (RCRA) Subtitle I under 40 CFR Part 280, and Hawaii's state-specific regulations.

ERG has 15 years of experience supporting EPA in analyzing aboveground storage tanks (ASTs) and USTs and assessing compliance with tank regulations. ERG supported the assessment by evaluating the facility's operations against existing and likely forthcoming state and federal UST requirements for field-constructed tanks. To augment ERG's experience, ERG collaborated with Aspen Controls (AC), Atlas Geotechnical (AG), PEMY Consulting (PEMY), and Powers Engineering and Inspection (PEI). AC has more than 30 years of specialized experience focusing on tank gauging systems as well as automation and control systems. AC was tasked with evaluating the control systems used in the facility to handle all fuel transfer and storage operations. Their primary focus was to review the level gauging system and overfill alarm system for the storage tanks and compare them to systems found in typical petroleum industry terminals. PEMY has more than 30 years of experience specializing in tanks and piping ownership issues, including environmental analyses, reliability, and risk management. AG has more than 40 years of experience specializing in geomechanics and geotechnical risk management. PEMY and AG evaluated the facility's tanks and piping from a reliability and risk management perspective. PEI has more than 28 years of experience inspecting and managing fuel systems, including tanks, pipes, and pressure vessels. PEI was tasked with evaluating the facility's tank and piping inspections, as specified in API Standards 579, 650, and 653.

The assessment occurred on May 9 through 12, 2016. On the morning of May 9, the evaluation team first met with Mr. Steve Turnbull, Red Hill Facility Regional Program Director, at the facility's security gate and proceeded to enter the facility. Upon arrival at the facility, the Navy provided an introductory presentation on the facility's operations and the evaluation team proceeded according to the schedule summarized in Attachment A. Over the first three days of the assessment, the evaluation team viewed the main areas of the facility associated with the UST system, including the Hotel Pier, control room, pumphouse, Surge Tunnel, Upper and Lower Tank Galleries, Tank 5 (inside view), Harbor Tunnel, Upper Tank Farm (AST farm), and truck loading rack. On May 12, 2016, the assessment closed with an exit conference that included representatives from the Navy and Hawaii Department of Health (HDOH). Mr. Jade Geronimo, PEI, and Mr. Christopher Krejci, ERG, took photographs during the assessment. Attachment B contains ERG's photographs. PEI's photographs were provided separately to EPA Region 9 staff by Secure Digital (SD) card.

The evaluation team did not identify areas of noncompliance with current state or federal regulations; however, most of the regulations for UST systems were not yet in effect at the Red Hill Facility, due to EPA's deferral of regulations for field constructed tanks. The evaluation team generally found that systems and management practices in place at the Red Hill Facility meet or exceed best practices for petroleum terminals and bulk fuel storage facilities.

III. REGULATORY BACKGROUND AND INDUSTRY STANDARDS

In 2015, EPA revised the UST regulations and added new requirements for field constructed tanks. EPA's summary of the new regulations can be found at https://www.epa.gov/ust/field-constructed-tanks-and-airport-hydrant-systems-2015-requirements. Federal UST regulations can be found at 40 CFR Part 280. Hawaii UST regulations can be found in the Hawaii Administrative Rules, Chapter 11-281. A brief summary of the regulations applicable to the Red Hill Facility beginning October 13, 2018, is provided below.

- ***Tank Release Detection*** – Field constructed tanks with a capacity greater than 50,000 gallons must meet either the release detection requirements in Subpart D (except groundwater monitoring and vapor monitoring must be combined with inventory control as described below) or use one or a combination of the following alternative methods of release detection:

- o Conduct an annual tank tightness test that can detect a 0.5-gallon-per-hour (gph) leak rate;
- o Use an ATG system to perform release detection at least every 30 days. This method must be combined with a tank tightness test that can detect a 0.2 gph leak rate. The ATG must achieve a one gph detection limit in combination with a tank tightness test every three years or a two gph detection limit in combination with a tank tightness test performed every two years.
- o Perform vapor monitoring using a tracer compound placed in the tank system capable of detecting a 0.1-gph leak rate at least every two years;
- o Inventory control at least every 30 days that can detect a leak equal to or less than 0.50 percent of flow-through combined with one of the following:
  - ▪ A tank tightness test that can detect a 0.5-gph leak rate at least every two years;
  - ▪ Vapor or ground water monitoring at least every 30 days; or
- o Another method approved by the implementing agency.

- ***Piping Release Detection*** – Owners and operators of underground piping[1] associated with field-constructed tanks greater than 50,000 gallons must follow either the release detection requirements in Subpart D (except ground water monitoring and vapor monitoring must be combined with inventory control as described below) or use one or a combination of the following alternative methods of release detection:
  - o Perform a semiannual or annual line tightness test at or above the operating pressure that meets the detection limits specified in the regulations (0.5 to 1.5 gph depending on piping section volume);
  - o Perform vapor monitoring using a tracer compound capable of detecting a 0.1-gph leak at least every two years;
  - o Combine inventory control at least every 30 days that can detect a leak equal to or less than 0.50 percent of flow-through with one of the following:
    - ▪ A line tightness test;
    - ▪ Vapor monitoring or ground water monitoring at least every 30 days; or
  - o Another method approved by the implementing agency.
- ***Spill Prevention*** – Field constructed tanks must meet the same spill requirements as other regulated UST systems. Spill catchment basins (spill buckets) must be either double walled (with periodic monitoring of the integrity of both walls of the spill bucket) or tested periodically for proper operation per the new spill prevention equipment testing requirements.
- ***Overfill Prevention*** – Field constructed tanks must meet the same overfill requirements as other regulated UST systems. Overfill prevention equipment must be inspected periodically for proper operation according to EPA's 2015 revisions to the overfill prevention equipment testing requirements.
- ***Corrosion Protection*** – For field constructed UST systems in use as of October 13, 2015, owners and operators must meet corrosion protection requirements for their tanks and piping in contact with the ground that routinely contain regulated substances. Tank and piping materials must be constructed either of fiberglass-reinforced plastic, cathodically protected and coated steel, steel jacketed with a noncorrodible material, or metal without corrosion protection if the tank is determined to not cause a release due to corrosion. All cathodic protection systems must be tested within 6 months of installation and at least every 3 years thereafter.
- ***Operator Training*** – UST Operators must be trained for Class A, B, and C Operator status. Training requirements for each type of operator are listed at 40 CFR §280.242.

State and federal UST system owners are exempt from meeting financial responsibility requirements.

The most common industry standard by which storage tanks are assessed is the API 653 standard. Although the standard is designed specifically for ASTs, several components of the standard and inspection process have been modified by the Navy and their contractors to assess the integrity and suitability for service of the tanks in

[1] Note that piping associated with the Red Hill USTs is located mostly in tunnels or above ground. Some sections of pipe penetrate the concrete plugs beneath the tanks, concrete support structures for the pipes, or earthen material where the pipelines emerge from the tunnel system.

question. The US Navy has employed a directive or scope of work of inspection to assess the tank using a modified API 653 inspection.

Most API 650/653 designed tanks have surfaces that are externally and internally accessible for inspection. A common design is a cylindrical shape that rests on the ground or concrete which makes the bottom of the tank inaccessible externally. Testing processes like Magnetic Flux Leakage (MFL) scanning of the bottom have been an accepted industry standard to inspect for soil-side corrosion. In many cases, the corrosion rate of the bottom plates is the controlling factor for the tanks suitability for service.

IV. RED HILL INFRASTRUCTURE

IV.a Tanks

IV.a.1. Findings

Upon review of original design drawings and historical documents, overall, key construction components of the tanks exceed or meet most modern day construction standards. Based on a limited review of historical inspection reports, the methods of tank inspection that have been applied at Red Hill were the best that could be implemented with the limitations in place, and no historical issues of concern have been noted related to structural integrity. For the Red Hill Facility tanks, nearly 100 percent of the external surface of the tank cannot be visually inspected. The Navy has scoped out the use of non-destructive testing to inspect the internal surfaces of the Red Hill tanks using the following: low frequency electromagnetic technique (LFET) and BFET (balanced field electromagnetic technique), longitudinal and shear-wave ultrasonic testing. The implemented inspection technologies and methods meet or exceed industry standard.

Limited review of previous inspections indicates no structural integrity, tank verticality, or out-of-roundness issues of immediate concern. Since the main USTs are located approximately 100 feet below ground and encased in concrete with a ¼-in steel liner, concerns of external factors are minimal. Damage mechanisms like distortion of the steel plates or other damage due to stress, seismic events, and settlement, which normally impact an AST are minimal or non-existent.

The evaluation team identified the following findings related to tank leak detection:

- Each tank in operation during the evaluation had successfully passed at least one tightness test with a detection limit of 0.5 gph since October 2014. Tanks 5, 14, 17, and 18 were not recently tested, but they were temporarily out of service during the inspection. Tank 1 and 19 are also permanently out of service.
- The first unscheduled fuel movement (UFM) report generated each month for the five months prior to the evaluation (see Attachment C) demonstrated that each UFM had been resolved in a logical manner based on a detailed investigation of the incident. Based on the observation that the gauges used to generate the UFMs are only accurate to within 3/16 of an inch, however, it can detect inventory losses during operation almost continuously.
- All soil gas data for the past few years were below action levels except near Tank 5 for a few months after the January 2014 release. While this empirically validates the system, no information was available on the leak detection limit for the soil gas system.
- Groundwater samples had the following exceedances in the first quarter of 2016 for Total Petroleum Hydrocarbon - Diesel[2]:

    - MW01 - 430 µg/L
    - MW02 - 6,500 µg/L
    - MW03 - 150 µg/L
    - OWDF01- 320 µg/L

  It should be noted that EPA does not consider the groundwater monitoring activities at the Red Hill Facility to be within the scope of the facility's leak detection activities.

[2] The HDOH Environmental Action Level is 100 µg/L and Site-Specific Risk Based Level is 4,500 µg/L

IV.a.2. Observations

The Red Hill Facility comprises 24 USTs (including 20 storage tanks and 4 surge tanks) in addition to numerous ASTs and associated piping and equipment. The storage tanks are located at the highest elevation within the facility, whereas the surge tanks are adjacent to the pumphouse located downhill from the storage tanks.

The Department of the Navy constructed the USTs from 1940 to 1943, by excavating native soil and rock from the site, pouring a concrete enclosure for the tanks, covering the native material with gunite, and lining the concrete with carbon steel plates. The UST system has carbon steel, single-wall piping that connects the USTs to filling and dispensing stations at various piers and to a truck loading rack located along Pearl Harbor's shoreline. A pumphouse near the base of the Red Hill Facility provides the pressure required to lift fuel to the USTs. Adjacent to the pumphouse are four surge tanks that provide equalization for pipeline pressure and mitigate the operational issues that could result from the downhill flow of fluids due to the elevation difference across the system (more than 300 feet when the tanks are filled to the maximum allowable fluid level).

On May 9, the evaluation team reviewed available drawings for the Red Hill Facility USTs. On May 10, the evaluation team toured the Red Hill Facility USTs and viewed several pieces of leak detection equipment, including tank gauges, soil gas monitoring wells, and groundwater monitoring wells. The evaluation team also entered and viewed Tank 5 from a catwalk suspended approximately 195 feet above the bottom of the tank.

Based on PEI's review of the general design details, it is most likely that if potential leak paths are present under the steel liner, the product would likely stay between the steel liner and the concrete outer shell. It is possible for small cracks to develop in the steel liner that may allow fuel to escape or water to get behind the steel liner. Most likely these risk items would be at the cold joints near the upper and lower spring lines. The Navy does not currently fill the large USTs at Red Hill above the upper spring line. Historical data notes that water may have gotten under/behind the steel liner. Water can be corrosive to the steel plates over time. PEI suggests that besides cracks in the concrete outer shell, groundwater may have found its way under/behind the steel plates through the path dug to the roof vent or air shaft.

The applicable UST regulations exempt from cathodic protection requirements metal tanks and piping which are encased or surrounded by concrete (80 FR 41565). The 20 main storage USTs and the four surge tanks are encased in concrete, although pipes and nozzles penetrate the concrete plugs that form the tanks' foundations. Impressed current systems provide cathodic protection for several ASTs that are connected to the Red Hill Facility system in the downhill portion of the facility (near the shoreline), as well as an aboveground slop tank located near the Red Hill USTs. See the piping section (Section IV.b) for more information on the evaluation team's assessment of the Red Hill Facility's corrosion protection program.

The Red Hill Facility employs three methods of leak detection: (1) annual tank tightness testing; (2) ATG; and (3) soil gas monitoring. Although the Navy conducts groundwater monitoring, EPA does not consider this activity to be a leak detection method at this site. Each of these methods, including groundwater monitoring, is described in the subsections below. In addition to these methods, the Red Hill Facility previously employed the use of a tell-tale system comprising a series of steel pipes that penetrated the walls of the USTs near the tank bottom to observe fluid outside the steel shell of each tank; however, this system was decommissioned at all of the tanks and is no longer used due to concerns regarding corrosion and vulnerability of the tell-tale piping to leakage.

Tank Tightness Testing

Beginning in 2015, tank tightness testing at the Red Hill Facility occurs on an annual basis for all in-service storage tanks and surge tanks. The tank tightness testing system is Mass Technology Corporation's Mass Technology Precision Mass Measurement System (MTPMMS). It uses a flexible probe inserted to the bottom of the tank through the gauge port on the top of the tank. The device measures the differential pressure between a point at the bottom of the tank and another point immediately above the surface of the fuel, over a period of 5 days when the tank is closed to any fuel transfer. At the conclusion of the test, the tester conducts a statistical trend analysis of the pressure data to determine whether a leak exists. The Navy's consultant reports that this test can detect a total leak of as little as 0.5 gph, with a 95 percent confidence and a five percent probability of false alarm. 0.5 gph is the current detection limit specified in the regulations for tank tightness testing. MTPMMS has been third-party certified for bulk UST leak detection by Wilcox and Associates. It was first piloted at the Red Hill Facility in 2008 using a 2-day test that was reported to have a total leak detection limit of 0.7 gph, and implemented full-scale in 2009. Testing also occurred in 2011 and 2013. Starting in 2014, the testing contractor revised the test method detection limit to 0.5 gph, based on the consistency of previous biennial test data and the results of a simulated leak evaluation performed by Ken Wilcox Associates, Inc. The tank tightness testing report in Attachment C contains the most recent test records prior to the date of the facility evaluation for all tested storage tanks except Tank 18.

ATG

ATGs on each of the Red Hill Facility tanks are calibrated at least once per year to an accuracy of 3/16 of an inch. The Navy also verifies ATG measurements after each fuel movement with a tape measure calibrated annually by the National Institute of Standards and Technology. Any discrepancies between the ATG measurements and manual gauging greater than 3/16 of an inch[3] are investigated to identify potential leaks.

The Navy attempts to detect any unscheduled fuel movements (UFMs), including leaks, from their UST system by collecting and processing ATG data using the Automatic Fuel Handling Equipment (AFHE) System. SPAWAR's contractor, Englobal, administers the AFHE system, and control room operators receive alerts of any potential UFMs. AFHE accounts for volumes that move through the UST system using flow meters, and ATG data combined with strapping charts. Under static conditions (no fuel transfers), AFHE generates a warning alarm any time there is an apparent net loss or gain of more than half an inch of fuel in one of the tanks[4], and a critical alarm for more than 0.75 inches. During scheduled fuel transfers, AFHE generates a warning alarm for more than one inch and a critical alarm for more than 1.5 inches. The evaluation team interviewed Mr. Teren Young from Englobal, who explained the configuration of the Supervisory Control and Data Acquisition (SCADA) system and the associated instrumentation and equipment. He presented an overview of how the control room interfaces with the instrumentation and how the computer acquires data from the field sensors.

The Navy investigates any UFM alarm and documents the results of the investigation in a UFM report. The Navy also conducts a visual trend analysis of ATG data using Excel Graphs that cover from several months to more than a year. During the assessment, interviews with Navy staff and reviews of relevant documents did not indicate that the Navy had made a formal determination as to the ATG's limit of detection (in gph).

Soil Gas Monitoring

ERG reviewed soil gas data for the past few years. The Navy collects soil gas samples from three co-located wells (completed at depths described as "shallow," "medium" and "deep"[5]) at each of the active storage tanks and analyzes them in the field for volatile organic compounds (VOCs) using a photoionization detector (PID). The Navy does not add any tracer compounds to their tank system. The PID displays readings in units of ppb total VOCs. The Navy compares the results to an action level representing half of the calculated vapor concentration for fuel-saturated water (280,000 parts per billion by volume [ppbv] for tanks containing jet fuel and 14,000 ppbv for tanks containing marine diesel).

Groundwater Monitoring

ERG reviewed the quarterly groundwater monitoring report for the first quarter of 2016. The Navy collects groundwater samples from four wells located in the lower access tunnel, one sampling point in the Red Hill Shaft, and five groundwater monitoring wells outside of the Red Hill Facility tunnel system. The Navy collects samples on a quarterly basis and analyzes the samples for petroleum constituents. The Navy compares results to site-specific risk-based levels (SSRBLs) for total petroleum hydrocarbons as diesel fuel (TPH-d) and benzene, as well as HDOH Environmental Action Levels (EALs). The Navy also measures each well in the Red Hill Facility tunnel for the presence of light non-aqueous phase liquids.

IV.a.3. Limitations and Recommendations

Although tank level systems may be able to detect smaller inventory losses, a leak of less than 0.5 gph (4,380 gallons per year) from any of the tanks may not be detectable with the facility's annual tank tightness testing.

[3] Note that 3/16 of an inch of product loss in the barrel of a cylindrical tank that is 100 feet in diameter translates to approximately 1,000 gallons of product loss.
[4] Note that ½ of an inch of product loss in the barrel of a cylindrical tank that is 100 feet in diameter translates to approximately 2,500 gallons of product loss.
[5] Navy staff were not able to provide information on the specific depths of each well during the evaluation.

IV.b Piping

IV.b.1. Findings

Piping components in the tunnel system between the Red Hill Facility storage tanks and the pumphouse appear to be in generally good condition, as do piping components from the surge tank into the pump manifolds. Although the evaluation team noticed minor surface defects and pitting on the pipeline in some areas (example in Figure 1), there were no major issues observed on the piping. Any potential leak paths in these areas would likely be contained by the tunnel system and the oil-tight doors, and would likely be detected by pressure drops monitored in the control room.

Figure 1. Example of Pitting on Pipeline in Lower Access Tunnel

Piping systems at the Upper Tank Farm (where the system's ASTs are located) are in generally good shape and have been designed and maintained to modern standards. Any potential product loss in this area would likely be contained by the liner located beneath the Upper Tank Farm tanks and equipment, and would likely be detectable with a pressure drop in the piping system.

Based on the observation that many of the rectifiers in the downhill portion of the facility exhibited significant changes in voltage and current over the period of time reviewed by the evaluation team, some of the impressed current systems on the piping at the Red Hill Facility may not be functioning properly.

IV.b.2. Observations

After exiting the tanks, the steel pipes run along the side of an open tunnel down to the pumphouse. They are suspended against the wall by a series of steel supports located approximately 30 feet on center. Roughly every 1,000 feet, the pipes penetrate a concrete wall that is approximately 3 feet thick. In some cases, the pipes are in direct contact with the concrete. In others, they are sleeved with various non-metallic materials.

Pipes running between the pumphouse and the filling/dispensing locations (e.g., Hotel Pier, truck rack) also receive cathodic protection from impressed current systems where they emerge from the underground tunnel to the surface. Aboveground piping has a protective layer of noncorrodible material, as shown in Attachment B.

The Navy monitors pressure in each of the three pipelines that convey product between the USTs at the top of the Red Hill Facility tunnel and at the pumphouse. Pressure transducers directly outside the pumphouse report to the main control room. Facility staff noted that any catastrophic release of fuel would be obvious to the control room almost immediately through the drop in pressure observed in the affected pipeline.

In addition to pipeline pressure monitoring, the Navy routinely conducts tightness tests on pipelines near the shoreline that are regulated by the U.S. Coast Guard. The Navy has not yet implemented routine line tightness testing for the portion of the facility uphill from the pump station, but during the evaluation Navy staff noted that they plan to implement routine line tightness in these areas soon.

The Navy has carried out an extensive API 570 inspection of the piping system connecting the pumphouse at Pearl Harbor to the Red Hill Facility tank farm. The API 570 inspection has been performed in addition to 'pigging' of the lines in 2010 and 2015. PEI has reviewed the API 570 inspection reports and concludes that the piping system inspection process meets or exceeds industry standard.

During the evaluation, ERG collected voltage and current readings from the easily accessible rectifiers. However, many of the rectifiers read zero voltage and current, and Red Hill Facility staff indicated that rectifiers are routinely checked using a multimeter, because some of the meters on the rectifiers do not function properly. During the evaluation, ERG requested information on all rectifier readings for the two months prior to the evaluation for all impressed current systems, as well as a summary of what the voltage and current values should be for each item. Attachment D summarizes the data provided by the Navy, along with the maximum percent change observed in the voltage and current over the two-month period of interest.

After the evaluation, Navy personnel indicated that some of the rectifiers had zero readings as a result of the Upper Tank Farm piping and AST cathodic protection system awaiting repairs at the time of the evaluation. As of May 9, 2017, the cathodic protection contractor has made repairs to all rectifiers with the exception of rectifiers 9, 12, and 13 which are scheduled for repair in June 2017. Navy personnel noted that the cathodic protection system has a number of redundancies that still enable cathodic protection coverage with the noted rectifiers off line.

IV.b.3. Limitations and Recommendations

None.

IV.c Controls

IV.c.1. Findings

The Red Hill Facility control system contains all of the expected components and features, and is by far exceeding industry standards by upgrading a system that is only 10 to 12 years old.

IV.c.2. Observations

During the evaluation, Navy personnel noted that the facility was in the middle of a "refresh" of the entire instrumentation system. The old system was systematically being replaced with a new system in phases. The inspection focused on both the current system in use and the evaluation of the new system being installed.

As with any facility handling fuel storage and movements, there is a central computer server that is controlling and monitoring the whole facility. These systems are generally called SCADA systems and have many different configurations determined by the needs of the facility. The SCADA system that was installed at the Red Hill Facility is quite large in scale and scope for the needs of this facility. This server also acts as the alarm logging and history database for the facility and stores all the data to be retrieved at any time. Also, there is a redundant computer server that is always running and mirroring the data in the main server that can take over immediately in case of a computer malfunction. The main control room for the facility is where the HMI (Human Machine Interface) is located for the operator. This is the primary workstation during normal operations. There is always an operator at these controls during normal conditions (24 hours per day, 7 days per week) and additional operators are used during all cargo movements within the facility to assist the main operator. There are also remote workstations located in other locations where full access to the SCADA system is available anytime. These locations are mainly used in the event of a failure in the main control room or other emergency.

From the central operations room, almost every aspect of the operations can be controlled and monitored in real time. The server acts as the master controller for the whole facility. The server communicates and controls the equipment by connecting through a series of PLCs (Programmable Logic Controllers). Through the PLCs, the operator can control valves, pump and receive levels, pressures, flows and temperatures. The SCADA server also handles all alarms and shutdowns. The SCADA system monitors all parameters of the field instruments and will alarm and shutdown necessary systems when the values have gone into alarm. Most alarms in the system are "hard coded" in the system, meaning there is no way for the operator to change or override the alarms in the system. The operator can set "service or operational limits" in the system to assist them in tracking the progress of cargo operations. The server also has video and facility access security systems tied in so the operator can view of these areas.

The design of the SCADA system at Red Hill Facility is one that allows for complete control of the facility and allows for ease of future expansion and/or isolation of systems that might be out of service for repairs.

The new SCADA system being installed is very similar in design and application but it is being updated with new PLCs and computer servers for reliability and future upgrades. The system is also being set up with remote workstations just like the previous system. Most industrial facilities are running SCADA systems that are more than 10 years old unless they have gone through a recent upgrade.

The purpose of the SCADA system is to show the values from all field instruments. The Red Hill Facility has just under 800 field instruments and all of these instruments are inventoried and controlled through a computer tracking system. Each instrument is assigned a bar code that can be scanned into the computer system and a complete history of this device can be accessed. The computer system also keeps track of the calibration requirements for each instrument. Through the computer system, a general service/calibration schedule is generated to allow the technicians to maintain/calibrate field devices at all times. During the inspection, the technician demonstrated the process for the items that were to be calibrated that day. The technician logged into the system and went to a page that informed him of the instruments that were due for inspection/calibration. The technician can select the device in the database and the complete history and description of the device can be found. In this database, the make, model, and serial number of the device can be found, the page number where the device can be found on the piping and instrumentation diagrams (P&IDs) drawings, and the calibration data. The database also has the information of when the item was replaced and the previous instruments details.

Once the technician selects the device to be calibrated, the system will open an instruction/sign off page for the device. The technician can work with operations and follow the instruction to isolate and calibrate the device. Throughout this process, the technician has to “approve” or “check off” each step of the calibration and report the findings. During the whole calibration process, the SCADA system is monitored to make sure the proper alarms are being set off or cleared during the process. The instructions in the database list the alarms and require the technician to acknowledge the presence of the alarm in the SCADA system. After the technician is finished with the calibration, the system will either mark that the unit passed and record the calibration information or, if the unit fails the calibration, the computer system will generate a “trouble ticket” for the device that will show up as a repair item for the technician.

The technician also explained and demonstrated how the system can be audited to make sure the calibrations/inspections are completed. A report is generated after the calibration. The report has time/date stamps when this was performed on the instruments. With this report, the operator/technician can log into the SCADA system and pull up the alarm history for the device. The alarm history of the SCADA system should match the time/date stamp found on the report from the database. The history of the logs can go back at least several years and allows for a complete audit of the history of calibrations and inspections.

The Red Hill Facility presents a unique situation for TLI (Tank Level Indication) due to the size of the tanks. The 20 tanks built into Red Hill are 250 feet tall which is far taller than any industry standard tanks. This does create an issue that there is not an “off-the-shelf” solution to monitor and measure the level of product in the tank. The facility has been working with manufacturers of the TLI equipment to put together a level gauging system needed to accurately monitor the levels in the tanks. The system they are currently using was made by GSI (Gauging Systems, Inc.) and has been a reliable system that has allowed them to maintain 3/16 of an inch accuracy. This accuracy is well within industry standards and allows for accurate and reliable measurement of the product during all operations of filling and draining these tanks. The TLI units are connected directly to the PLC units for each tank and are connected to the SCADA system so the operator is seeing real time data in the control room and there is no delay. From these TLI units, the SCADA system can control the alarms for each tank.

In addition to the TLI units, each tank is equipped with an independent level switch. This level switch is powered independently from the TLI Unit. This acts as a backup for the tank to make sure the tank does not overfill with product. The level switch is a mechanical unit that, once activated, will send a signal to the SCADA system for alarm and a signal to the main control valve for the tank to close. In essence, the facility uses an automated overfill protection system (AOPS) as outlined in the 4th edition of API 2350 and meets the criteria established for existing AOPS.

On May 10, the evaluation team reviewed P&IDs and noted that drawings appeared to be complete, based on prior knowledge of the Red Hill Facility and equipment observed during walkthroughs. P&IDs included numbered instrument loops, terminal blocks, piping flows, branches, and lines. The evaluation team also reviewed and discussed the process of updating drawings. Navy staff explained that the technician receives his own copy of the drawings and identifies needed updates during his normal work. At the end of the year, all of his changes are submitted to SPAWAR and the drawings are updated for the next year. The terminal then receives the new set of drawings and the process is repeated.

In conjunction with the ATGs which are monitored constantly at the control room, each of the Red Hill Facility USTs contains a high-low alarm, which indicates when a tank is approaching maximum allowable fill height, as well as a high-high alarm, which indicates when the UST has been filled to the maximum allowable fill height. These alarms report to the control room. The high-high alarm also triggers closure of the skin valve on each tank, to prevent overfill. Facility staff noted that none of the Red Hill Facility USTs are typically filled beyond 88 percent, so the upper dome of each tank is not normally filled with fluid. Tank gauges are calibrated on at least a semi-annual basis and checked by manual tank gauging after each fuel transfer.

The Red Hill Facility also prevents overfills by working carefully with each ship's crew during fuel transfers. Fuel transfer operations are planned and documented through standardized Notice of Receipt and Declaration of Intent protocols. Fuel transfer volumes are verified before initiating transfer, and the control room communicates directly with ship staff via radio. Although control room operators typically taper off flow rates to avoid hydraulic hammer, operators have the ability to cease any fuel transfer process immediately. The four surge tanks provide flow equalization and mitigate hydraulic hammer in these circumstances. The control room and surge tanks are located adjacent to the pump house, which the evaluation team visited on the afternoons of May 9 and 10.

IV.c.3. Limitations and Recommendations

None noted.

IV.d Hotel Pier

IV.d.1. Findings

The Hotel Pier is the main fueling pier associated with the Red Hill Facility, and is regularly inspected by the Coast Guard along with all of the other piers. It has all of the expected secondary containment, emergency shutdown systems, and alarms.

Figure 2. Overview Photo of the Hotel Pier

IV.d.2. Observations

After the opening conference on May 9th, the field team viewed the Hotel Pier (see Figure 2). The Hotel Pier is the main loading and unloading pier adjacent to Building 1757. This location also births the largest ships of any pier connected to the UST system. The Hotel Pier comprises four "hotels" (each "hotel" is a group of connections for the JP-5, JP-8, and F-76 pipelines). The Hotel Pier is made of concrete with spill and leak containment; it does not have any loading arms. It had all the expected environmental controls such as drip channels sloped to the pier's storm sewer system, emergency shutdown systems, and alarms. Any spills or stormwater that land on the Hotel Pier drains to the storm sewer system located beneath the pier. When no ships are present, the storm sewer drains directly to the harbor through an outfall located near the southeast corner of the pier. However, when a ship approaches the pier for the purposes of fuel transfer, Navy personnel close a valve near the outfall which redirects any fluid in the storm sewer to the Navy's Fuel and Oil Recovery Facility (FOREFAC) for wastewater treatment. In this manner, the storm sewer system beneath the Hotel Pier provides secondary containment for all fuel transfer equipment at the pier.

During the evaluation, Navy personnel noted that the U.S. Coast Guard inspects the Hotel Pier annually for compliance with Title 33 of the Code of Federal Regulations. After the inspection, the Navy will either receive a citation from the Coast Guard if any deficiencies are noted, or a single sheet of paper indicating that no deficiencies were found. ERG reviewed this documentation for the past few years and noted that the Coast Guard determined the Hotel Pier to be in compliance during recent inspections.

Piping systems at the Hotel Pier and lower tank farm are in generally good shape and have been designed and maintained to modern standards. Any potential product loss may seep into the harbor but would be detectable with product loss and pressure drop in the piping system.

Thorough operational procedures are in place at the pier system in the form of visual inspection and maintenance procedure on the piping system to prevent such incidents.

ERG observed multiple visible and audible alarms on the Hotel Pier, but did not test the alarms during the evaluation.

IV.d.3. Limitations and Recommendations

Since the Coast Guard regularly inspects the piers, ERG and PEMY recommend that EPA and HDOH leave the Hotel Pier and other piers out of future inspection plans for Red Hill Facility.

IV.e Other Components

IV.e.1. Findings

No concerns were noted at the truck loading rack or Upper Tank Farm.

IV.e.2. Observations

The evaluation team visited the truck loading rack on May 11th. At the truck loading rack, fuels are dispensed to trucks, but no fuel is added to the system. The field team observed secondary containment structures at the truck loading rack, including curbing, grading of concrete, and a central sump. All observed structures were in good condition with no major debris or visible cracking.

The Upper Tank Farm has ASTs with leak detection and double bottoms. A large leak or overfill may cause product to migrate outside the tank and into the lined tank farm.

ERG observed multiple visible and audible alarms at the Truck Loading Rack, but did not test the alarms during the evaluation.

IV.e.3. Limitations and Recommendations

None noted.

V. FACILITY OPERATIONS

V.a Staff

V.a.1. Findings

The Red Hill Facility already has a training program in place that meets the requirements of the UST regulations that will soon be applicable to the facility. Although the facility did not conduct an annual refresher training in 2014 (likely due to furloughs), they have otherwise been conducting annual training on a regular basis.

V.a.2. Observations

On May 10, the evaluation team reviewed operator training records. ERG determined that the Navy is already meeting training requirements. ERG reviewed training records for the past three years, which were provided by the Navy's training supervisor, Eric Seman. The Navy provides operators of the UST system with annual, generic UST training through USTtraining.com, and one-time, site-specific training on specific operations that each employee will support at the facility. Mr. Floyd noted that operators cannot advance to the position of control room operator until they acquired a specific amount of experience in the operations group (e.g., as a "rover").

The generic UST training includes separate training classes for Class A/B and Class C operators. ERG briefly reviewed the slides provided during the training and verified that the curriculum was appropriate for the different classes of UST operators. ERG also reviewed the matrix that tracks site-specific training and noted that it generally covers the work areas relevant to UST system operation. ERG was able to verify training records for most of the individuals with whom ERG interacted during the evaluation.

V.b Recordkeeping

V.b.1. Findings

Records and documents maintained for the Red Hill Facility's UST system were generally in order, readily accessible, and up-to-date.

V.b.2. Observations

The evaluation team reviewed the following documents for the Red Hill Facility while on-site:

- P&ID Drawings;
- Facility Response Plan;

- Integrated Contingency Plan;
- UST tank tightness testing records;
- Tank gauge calibration records;
- UST operator training records;
- Pipeline Integrity Management Plans from 2010 and 2015;
- Draft pigging report from 2010;
- As-built diagrams from the 1940s illustrating the original construction of the USTs;
- Unscheduled fuel movement (UFM) reports;
- Monthly rectifier readings;
- API 653 inspection reports from 1998;
- Tank assessment reports (TARs) from 2007; and
- Fuel Department Operations Manual.

The facility maintains all records on-site. In addition to documents reviewed on-site, the evaluation team requested copies of the following documents for further evaluation after the close of the on-site portion of the assessment:

- Integrity Management Plan from 2015;
- Draft pigging report for 2010;
- First UFM report (including the resolution of any issues noted) for each month from December 2015 to April 2016;
- Monthly rectifier readings for fuels for March and April 2016, along with parameters used to evaluate the readings;
- API 653 inspection report from 1998 and TARs from approximately 2007 for each of the 20 tanks that was inspected;
- Fuel Department Operations Manual;
- Copy of slide from inspection introductory presentation showing general layout of the facility;
- Description of any corrosion protection, overfill prevention, and leak detection practices/equipment used for the surge tanks, as well as an as-built drawing that illustrates the construction of the surge tanks; and
- Summary of current status of Modified API 653 inspections for the 20 storage USTs and 4 surge tanks, API 653 inspections of the Lower Tank Farm ASTs, and API 570 inspections of each section of piping.

The Navy provided all of these documents through a rolling submission that ended in November 2016.

V.b.3. Limitations and Recommendations

PEI has not performed a thorough review of all inspection reports due to a lack of availability. The Navy provided full tank inspection reports for Tank 5 only.

V.c General Housekeeping

In general, housekeeping was excellent throughout the areas observed by the evaluation team.

V.d Emergency Response

V.d.1. Findings

The evaluation team verified that emergency response plans were in order, readily accessible and up-to-date. The team also verified that facility staff are adequately trained for emergency response activities and possess a working knowledge of what is required in the event of a spill or other type of release.

V.d.2. Observations

As discussed in the recordkeeping section (Section V.b), the evaluation team reviewed the site-specific Facility Response Plan, Integrated Contingency Plan, and Fuel Department Operations Manual. In addition to reviewing these plans, the evaluation team discussed emergency response activities with facility staff (e.g., to respond to spills in the harbor) and talked through emergency response drills that facility staff execute to ensure operational readiness.

V.d.3. Limitations and Recommendations

None noted.

ATTACHMENT A

Red Hill Facility EPA and HDOH Site Visit Agenda

Day 1 – Monday, 09 May 2016

Topic/Activity	Group	Location	Time	Remarks
Joint in-brief for EPH/HDOH and Board of Water Supply	ALL	Bldg. 1757, 2nd Floor Conf. Room	0730-0815	Introductions, facility overview, safety/security brief, and temporary badging
Records Review	All	Bldg. 1757, 2nd Floor Conf. Room	0830-1050	- Review of how equipment records are kept - Maintenance and inspection practices - Compliance with standards - Type of instrumentation - Reliability of system configuration - Emergency response procedures - Equipment and training records - Alarm systems, procedures, and reliability of controls systems - Records related to staining in the tunnels or below tanks
Walk-down of Hotel Pier	All	Hotel Pier	1100-1200	Observe spill protection systems
Lunch			1200-1330	
Transit to Adit 1	All	Bldg. 1757 to Adit 1	1330-1345	Transportation provided by FLC GOV's
Control Room, Pump House, Surge Tunnel	All	UGPH	1345-1530	Walk-thru of control room to include instrumentation, computer systems and controls
Transit to Bldg. 1757	All	Bldg. 1757	1530-1600	Transportation provided by FLC GOV's
Debrief and pre-brief Day 2 schedule	All	Bldg. 1757, 2nd Floor Conf.Room	1600-1630	

Day 2 – Tuesday, 10 May 2016

Transit to Adit 5	All	Bldg. 1757 to Adit 5	0730-0800	Two 7 PAX GOV's
Walk-down of Red Hill Upper Tank Gallery from Tank 15/16 to Tank 5	All	Adit 5 to Tank 5	0800-0845	View visible portion of tank externals in upper gallery
View Tank 5	All	Tank 5	0845-0915	Observe tank 5 from pedestrian walkway No Photography

Day 2 – Tuesday, 10 May 2016

Walk-down of Red Hill Lower Tank Gallery from Tank 20 to Red Hill Shaft	All	Lower Tank Gallery	0915-1015	View oil tight doors, corrosion monitoring locations, determination of piping wall thickness, kinds of piping, API fire rating of valves etc.
View Red Hill Shaft	All	Red Hill Shaft	1015-1030	NAVFAC EV to coordinate access and viewing of RH Shaft
Walk entire Harbor Tunnel from Red Hill Shaft to Adit 1	All	Harbor Tunnel	1030-1200	View piping in tunnels
Travel from Adit 1 to Bldg. 1757	All	Bldg. 1757	1200-1215	FLC GOV's
Lunch			1215-1330	
Records Review	All	Bldg. 1757, 2nd Floor Conf. Room	1330-1530	Continuation of previous days review as required.
Debrief and pre-brief Day 3 schedule	All	Bldg. 1757, 2nd Floor Conf. Room	1530-1600	

Day 3 – Wednesday, 11 May 2016

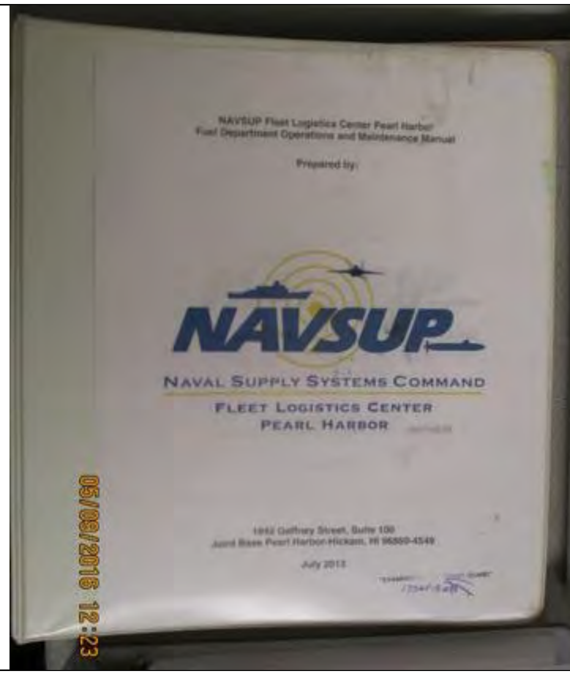
Review of documentation and facilities as required	All	Bldg. 1757, 2nd Floor Conf. Room	0800-1600	Continuation of previous days review as required. Limited SME availability

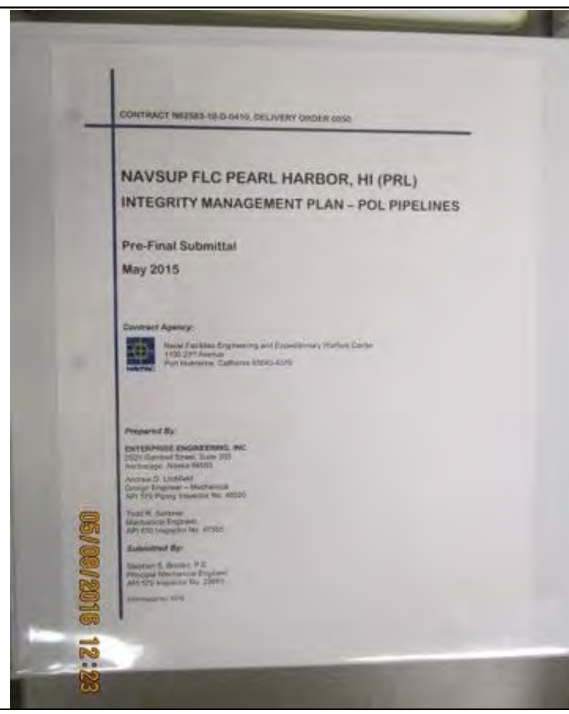
Day 4 – Thursday, 12 May 2016

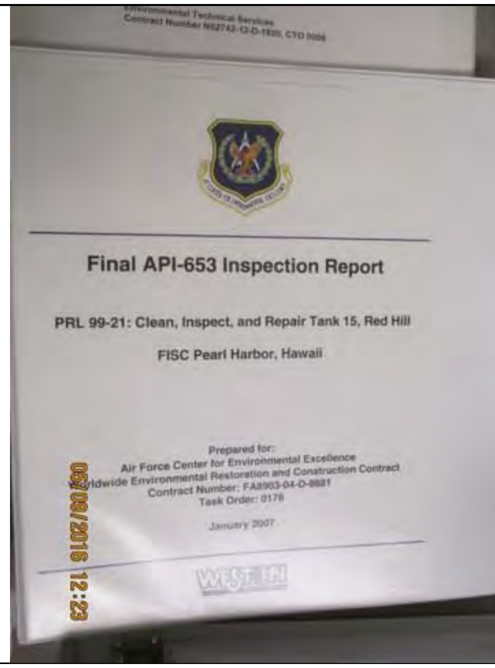
Review of documentation and facilities as required	All	Bldg. 1757, 2nd Floor Conf.Room	0800-1600	Continuation of previous days review as required. Limited SME availability

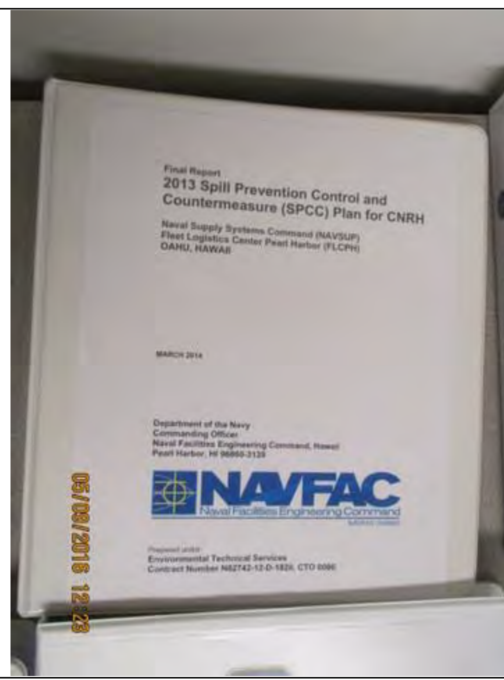
ATTACHMENT B

Photograph Log

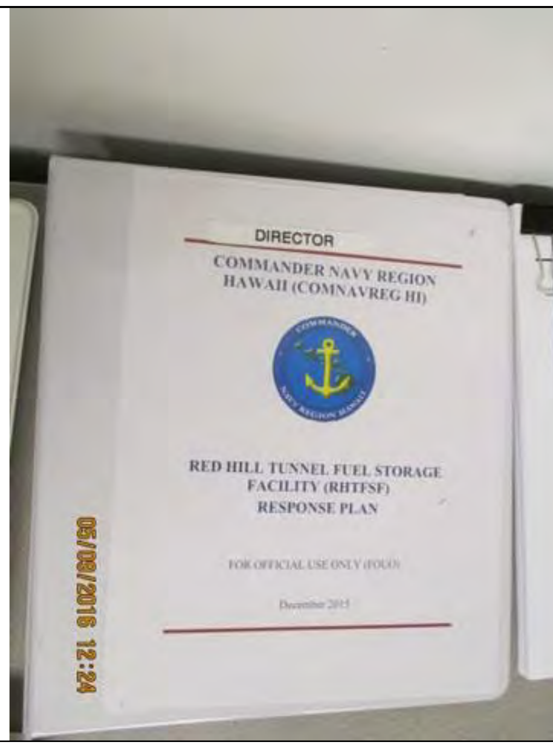
DATE TAKEN: 5/9/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 1	
COMMENTS: Fuel Department Operations and Maintenance Manual	

DATE TAKEN: 5/9/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 2	
COMMENTS: Integrity Management Plan – POL Pipelines (May 2015)	

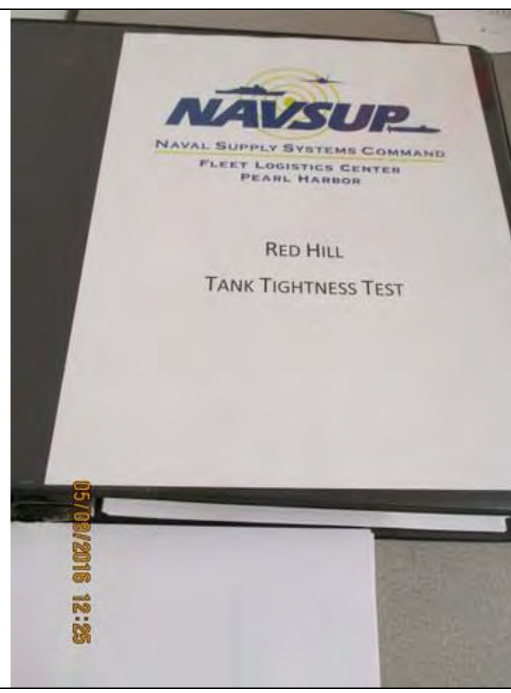
DATE TAKEN: 5/9/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 3	
COMMENTS: Final API-653 Inspection Report for Tank 15 (January 2007)	

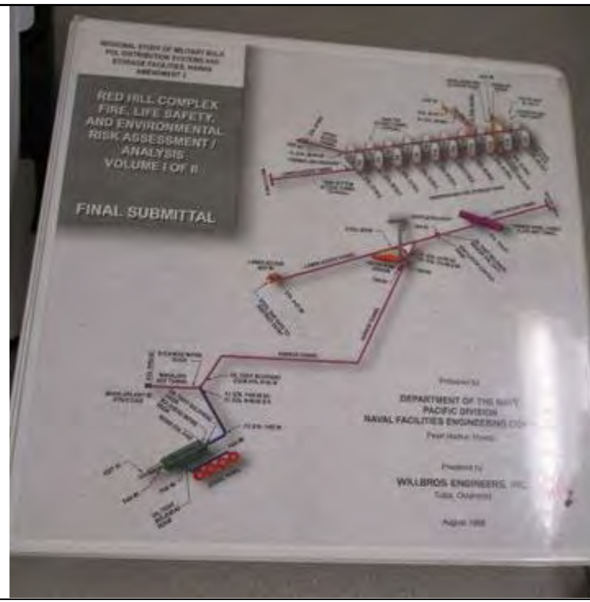
DATE TAKEN: 5/9/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 4	
COMMENTS: 2013 Spill Control and Countermeasure (SPCC) Plan for Commander, Navy Region Hawaii (CNRH)	

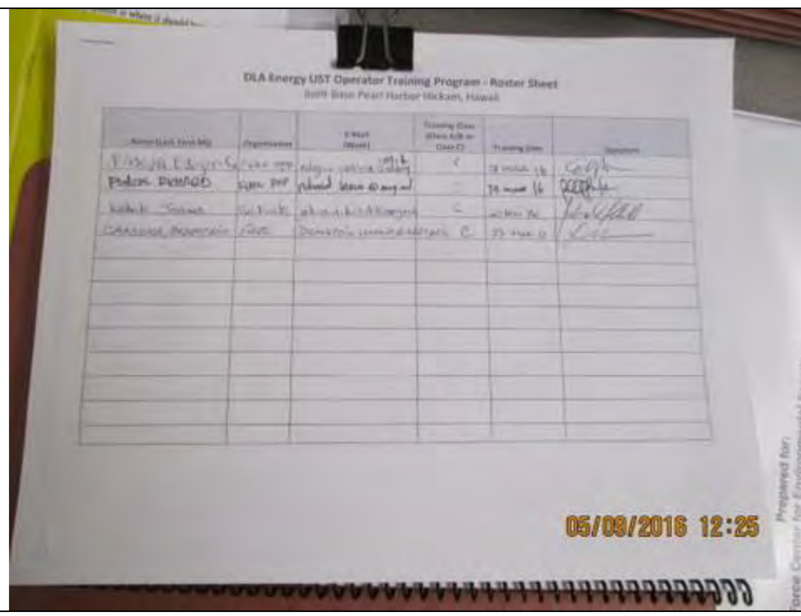
DATE TAKEN: 5/9/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 5	
COMMENTS: Integrated Contingency Plan	

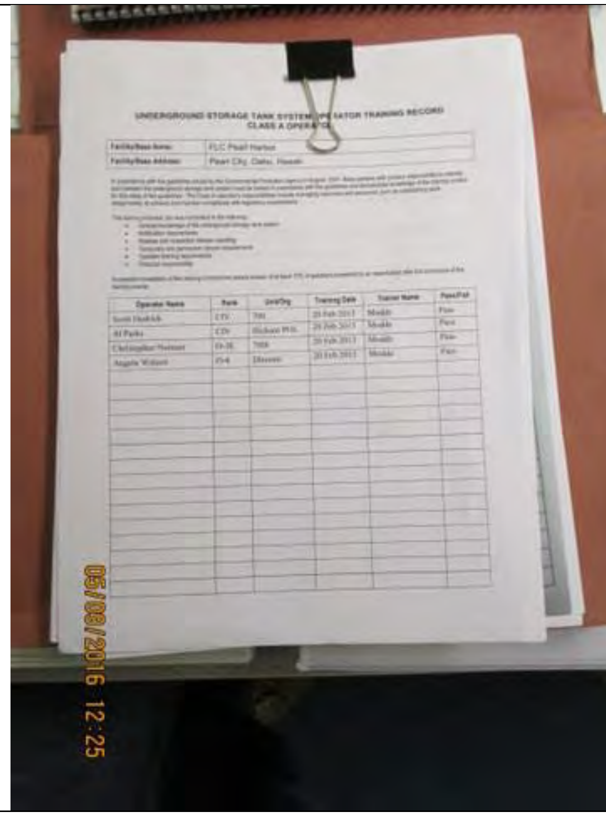
DATE TAKEN: 5/9/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 6	
COMMENTS: Red Hill Tunnel Fuel Storage Facility Response Plan	

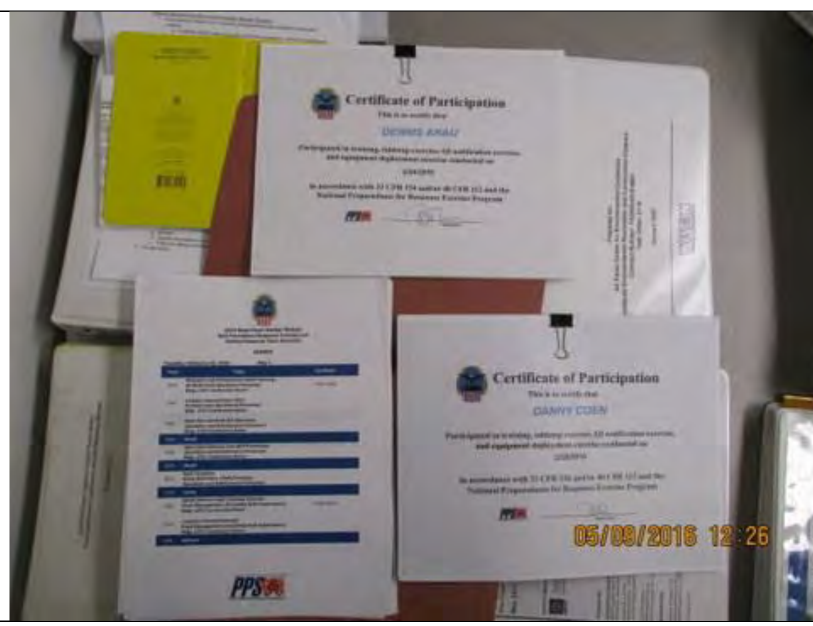
DATE TAKEN: 5/9/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 7	
COMMENTS: Integrity Management Plan – POL Pipelines (November 2010)	

DATE TAKEN: 5/9/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 8	
COMMENTS: Tank Tightness Test Binder	

DATE TAKEN: 5/9/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 9	
COMMENTS: Fire, Life Safety, and Environmental Risk Assessment	

DATE TAKEN: 5/9/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 10	
COMMENTS: UST Operator Training Program – Roster Sheet	

DATE TAKEN: 5/9/2016	
TAKEN BY: Chris Krejci	SITE LOCATION: Red Hill Facility
PHOTO #: 11	
COMMENTS: UST System Operator Training Records	

DATE TAKEN: 5/9/2016	
TAKEN BY: Chris Krejci	SITE LOCATION: Red Hill Facility
PHOTO #: 12	
COMMENTS: UST System Operator Training – Certificates of Participation	

DATE TAKEN: 5/9/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 13	
COMMENTS: Final 2015 Annual Leak Detection Testing Report	

DATE TAKEN: 5/9/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 14	
COMMENTS: Pipelines running from Hotel Pier	

DATE TAKEN: 5/9/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 15	
COMMENTS: One “Hotel” of four on the Hotel Pier, with risers for all three fuels stored at the Red Hill Facility	

DATE TAKEN: 5/9/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 16	
COMMENTS: Telephone at Hotel Pier	

DATE TAKEN: 5/9/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 17	
COMMENTS: Trailer mounted flowmeter	

DATE TAKEN: 5/9/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 18	
COMMENTS: Hotel Pier looking east from the end of the pier toward Red Hill	

DATE TAKEN: 5/9/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 19	
COMMENTS: View of docks adjacent to pier illustrating the boom system in place to control oil spills in emergencies	

DATE TAKEN: 5/9/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 20	
COMMENTS: Spill response kits inside of cage on Hotel Pier	

DATE TAKEN: 5/9/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 21	
COMMENTS: Alarm system at Hotel Pier	

DATE TAKEN: 5/9/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 22	
COMMENTS: Emergency response number posted	

DATE TAKEN: 5/9/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 23	
COMMENTS: Diversion valve for Hotel Pier storm water drainage system	

DATE TAKEN: 5/9/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 24	
COMMENTS: Hotel Pier alarms	

DATE TAKEN: 5/9/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 25	
COMMENTS: Emergency response number posted	

DATE TAKEN: 5/9/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 26	
COMMENTS: Pipes entering the ground running uphill from the Hotel Pier. Above-ground piping is covered with a layer of noncorrodible material.	

DATE TAKEN: 5/9/2016	
TAKEN BY: Chris Krejci	SITE LOCATION: Red Hill Facility
PHOTO #: 27	
COMMENTS: Pumphouse	

DATE TAKEN: 5/9/2016	
TAKEN BY: Chris Krejci	SITE LOCATION: Red Hill Facility
PHOTO #: 28	
COMMENTS: Pumphouse	

DATE TAKEN: 5/9/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 29	
COMMENTS: Pumphouse	

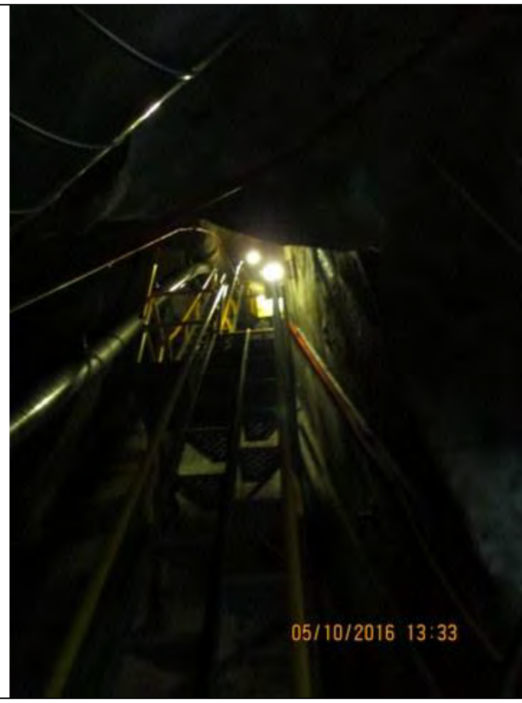
DATE TAKEN: 5/9/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 30	
COMMENTS: Pumphouse	

DATE TAKEN: 5/9/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 31	
COMMENTS: Tile covering French drain beneath Red Hill Facility tunnel	

DATE TAKEN: 5/9/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 32	
COMMENTS: Pipelines supported by concrete wall in tunnel	

DATE TAKEN: 5/10/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 33	
COMMENTS: Tank vent associated with one of the storage USTs.	

DATE TAKEN: 5/10/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 34	
COMMENTS: Minor cracking in tunnel floor	

DATE TAKEN: 5/10/2016	
TAKEN BY: Chris Krejci	SITE LOCATION: Red Hill Facility
PHOTO #: 35	
COMMENTS: Stairway leading to gauging port on top of underground storage tanks	

DATE TAKEN: 5/10/2016	
TAKEN BY: Chris Krejci	SITE LOCATION: Red Hill Facility
PHOTO #: 36	
COMMENTS: SP-26 Underground storage tank nozzle and skin valve	

DATE TAKEN: 5/10/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 37	
COMMENTS: Cover for soil vapor monitoring wells	

DATE TAKEN: 5/10/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 38	
COMMENTS: Pipeline running to fuel oil recovery (FOR) process	

DATE TAKEN: 5/10/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 39	
COMMENTS: Tell-tale system on Tank 19 (Tank 19 has been permanently removed from service and the tell-tale system has been decommissioned).	

DATE TAKEN: 5/10/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 40	
COMMENTS: Tell-tale system on Tank 19 (Tank 19 has been permanently removed from service and the tell-tale system has been decommissioned).	

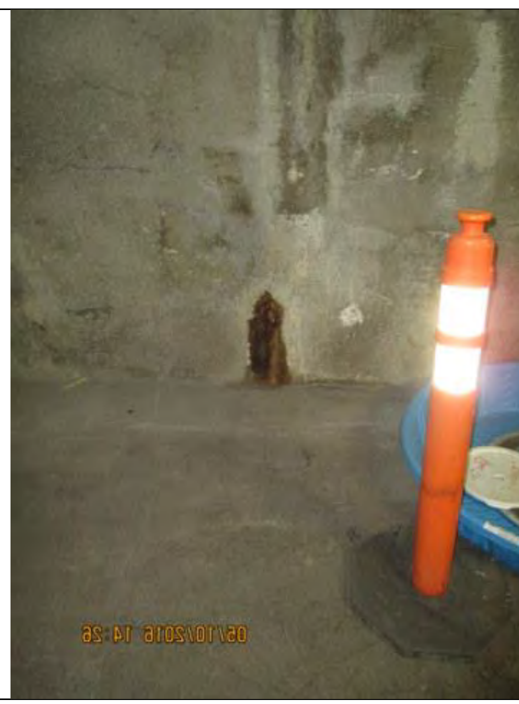
DATE TAKEN: 5/10/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 41	
COMMENTS: Skin valve on tank nozzle	

DATE TAKEN: 5/10/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 42	
COMMENTS: Pitting on pipeline	

DATE TAKEN: 5/10/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 43	
COMMENTS: Typical surface defects on pipeline	

DATE TAKEN: 5/10/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 44	
COMMENTS: Staining on Tank 5, just below and to the right of the nozzle.	

DATE TAKEN: 5/10/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 45	
COMMENTS: Tank penetrations near the bottom of Tank 5	

DATE TAKEN: 5/10/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 46	
COMMENTS: Staining on tunnel wall (appearance similar to bunker oil)	

DATE TAKEN: 5/10/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 47	
COMMENTS: Spill kit in tunnel	

DATE TAKEN: 5/10/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 48	
COMMENTS: Typical flush-mounted groundwater monitoring well near underground storage tanks	

DATE TAKEN: 5/10/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 49	
COMMENTS: Pipelines supported by concrete wall in tunnel	

DATE TAKEN: 5/10/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 50	
COMMENTS: Pipelines supported by concrete wall in tunnel	

DATE TAKEN: 5/10/2016	
TAKEN BY: Chris Krejci	SITE LOCATION: Red Hill Facility
PHOTO #: 51	
COMMENTS: Flashing lining tunnel walls in some areas	

DATE TAKEN: 5/10/2016	
TAKEN BY: Chris Krejci	SITE LOCATION: Red Hill Facility
PHOTO #: 52	
COMMENTS: Oil-tight door	

DATE TAKEN: 5/10/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 53	
COMMENTS: Counterweight for oil-tight door	

DATE TAKEN: 5/10/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 54	
COMMENTS: Flashing lining tunnel walls in some areas	

DATE TAKEN: 5/10/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 55	
COMMENTS: Typical Surface defects noted on piping, showing failure of the pipeline protective wrap. Facility staff noted that this does not affect piping integrity, and the protective wrapping is actually scheduled for removal.	

DATE TAKEN: 5/10/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 56	
COMMENTS: Markings describing pipe defects	

DATE TAKEN: 5/10/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 57	
COMMENTS: Pipe support in tunnel	

DATE TAKEN: 5/10/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 58	
COMMENTS: Sump and float switch in tunnel	

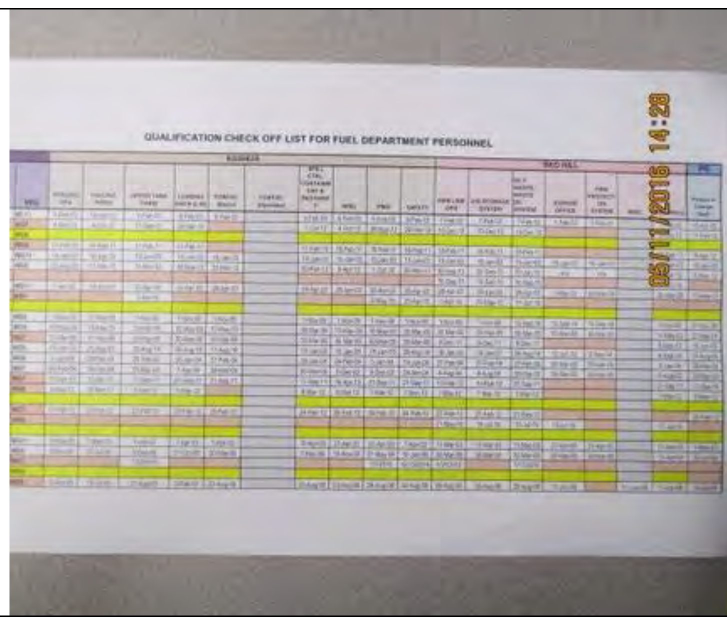
DATE TAKEN: 5/11/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 59	
COMMENTS: Rectifier near Hotel Pier showing no voltage or current	

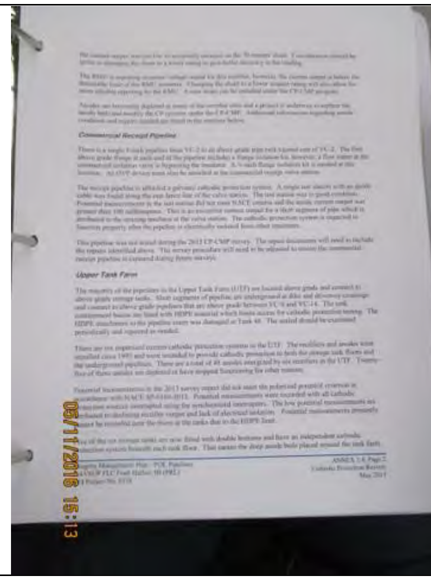
DATE TAKEN: 5/11/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 60	
COMMENTS: AST tank in Upper Tank Farm	

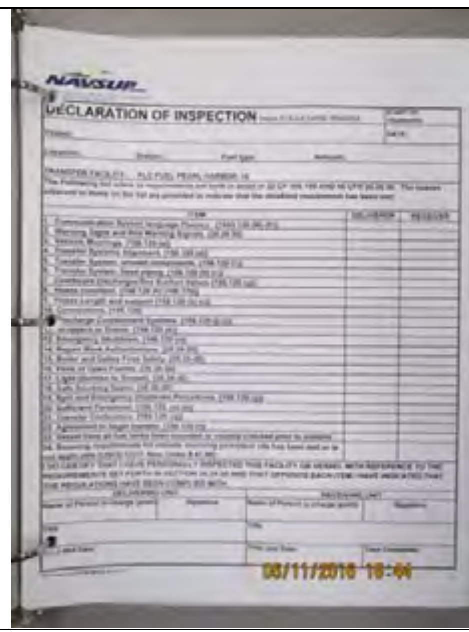
DATE TAKEN: 5/11/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 61	
COMMENTS: Truck loading rack	

DATE TAKEN: 5/11/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 62	
COMMENTS: Truck loading rack	

DATE TAKEN: 5/11/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 63	
COMMENTS: Truck loading rack	

DATE TAKEN: 5/11/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 64	
COMMENTS: Spreadsheet documenting operator training (names have been cropped out).	

DATE TAKEN: 5/11/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 65	
COMMENTS: Text from 2015 Integrity Management Plan describing cathodic protection systems on-site.	

DATE TAKEN: 5/11/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 66	
COMMENTS: Declaration of inspection form	

DATE TAKEN: 5/11/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 67	
COMMENTS: Tank tightness testing records	

ATTACHMENT C

Release Detection Records

FINAL 2015 ANNUAL LEAK DETECTION TESTING REPORT OF 14 BULK FIELD-CONSTRUCTED UNDERGROUND STORAGE TANKS AT RED HILL UNDERGROUND FUEL STORAGE FACILITY

JOINT BASE PEARL HARBOR-HICKAM, HAWAII

Prepared for:
Defense Logistics Agency Energy
Ft. Belvoir, Virginia

Prepared under:
NAVFAC Atlantic
Contract N62470-10-D-3000-0048

Submitted by:
Michael Baker International
Virginia Beach, VA

Date:
6 JULY 2015

Michael Baker INTERNATIONAL

Project: 140296
Task: 4.1.89

N00078

Exhibit N-2B

FINAL 2015 ANNUAL LEAK DETECTION TESTING REPORT OF 14 BULK FIELD-CONSTRUCTED UNDERGROUND STORAGE TANKS AT RED HILL UNDERGROUND FUEL STORAGE FACILITY

JOINT BASE PEARL HARBOR-HICKAM, HAWAII

Prepared for:

Defense Logistics Agency Energy
Ft. Belvoir, VA

Prepared under:

NAVFAC Atlantic
Contract N62470-10-D-3000-0048

Prepared by:

Michael Baker International

Virginia Beach, Virginia

6 JULY 2015

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LIST OF ABBREVIATIONS AND ACRONYMS

AOC	Administrative Order on Consent
BFCUST	Bulk field-constructed underground storage tank
BMP	Best Management Practice
CMP	Centrally Managed Program
CNRH	Commander Navy Region Hawaii (CNRH)
DOH	Department of Health
DLA	Defense Logistics Agency
EPA	Environmental Protection Agency
F-76	Marine diesel fuel
FISC	Fleet Industrial Supply Center
Ft^2	Square feet
gph	Gallons per hour
in	Inch
JB	Joint Base
JP-5, 8	Jet Propellant 5, 8
MDLR	Minimum detectable leak rate
Michael Baker	Michael Baker International
MTC	Mass Technology Corporation
NAVFAC	Naval Facilities Engineering Command
NWGLDE	National Work Group on Leak Detection Evaluations
P_D	Probability of detection
P_{FA}	Probability of a false alarm
PSA	Product surface area

PROFESSIONAL ENGINEER CERTIFICATION:

Final 2015 Annual Leak Detection Testing Report
Of 14 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: 6 July 2015

EXECUTIVE SUMMARY

The scope of this project was initially to perform biennial leak detection testing of 18 Bulk Field-Constructed Underground Storage Tanks (BFCUST) at JBPHH. However, in 2014 the Commander Navy Region Hawaii, Defense Logistics Agency (DLA) Energy, The State of Hawaii Department of Health and the Environmental Protection Agency Region 9 negotiated an Administrative Order on Consent (AOC) which requires the annual testing of the BFCUST at Red Hill. Although at the time this testing project began, in late 2014, the AOC had not yet been officially signed by all parties, DLA Energy and the Navy instructed Michael Baker to change to the new proposed annual frequency and move up the testing event to begin in October 2014.

Fourteen of the eighteen BFCUSTs (BFCUST 1 – 4, 6 – 13, 15, and 16) were Mass Technology Corporation leak detection tested from 14 October 2014 through 14 May 2015 with no detectable leak above the test method's minimum detectable leak rate of 0.5 gallons per hour resulting in passed tests. The leak detection test of BFCUST 16 was successful, however, it was not conducted at the fill height (~210 feet) due to operational limitations; testing was conducted at ~58 feet. Three BFCUSTs (BFCUST 5, 14 and 17) were out of service during the test event for internal inspection. One BFCUST (BFCUST 18) was out of service for maintenance of piping and therefore not available for testing.

Annual leak detection testing of the 14 BFCUSTs should be initiated on or before the new annual anniversary date of 14 October 2015 under DLA Energy's Leak Detection Centrally Managed Program (CMP) to comply with the AOC requirements. In addition, the DLA Energy Leak Detection CMP should be notified immediately when BFCUST 16 can be filled to its full fill height and the remaining four BFCUSTs (BFCUST 5, 14, 17 and 18) are each placed back in service in order for leak detection testing to be completed to comply with the AOC agreement.

1.0 INTRODUCTION

1.1 Purpose of Project

The Defense Logistics Agency (DLA) Energy contracted Michael Baker International (Michael Baker), through Naval Facilities Engineering Command (NAVFAC) Atlantic Contract N62470-10-D-3000-0048 to perform biennial leak detection testing of 18 Bulk Field-Constructed Underground Storage Tanks (BFCUSTs) at the Red Hill storage complex, Joint Base (JB) Pearl Harbor-Hickam, Hawaii. However, in 2014 the Commander Navy Region Hawaii (CNRH), DLA Energy, The state of Hawaii Department of Health (DOH) and the Environmental Protection Agency (EPA) Region 9 negotiated an Administrative Order on Consent (AOC) which requires the annual testing of the BFCUST at Red Hill. Although at the time this testing project began, in late 2014, the AOC had not yet been officially signed by all parties, DLA Energy and the Navy instructed Michael Baker to change to the new proposed annual frequency and move up the testing event to begin in October 2014. The testing is being conducted under DLA Energy's Leak Detection Centrally Managed Program (CMP) to meet annual test requirements of AOC. A copy of the AOC is provided in Appendix A.

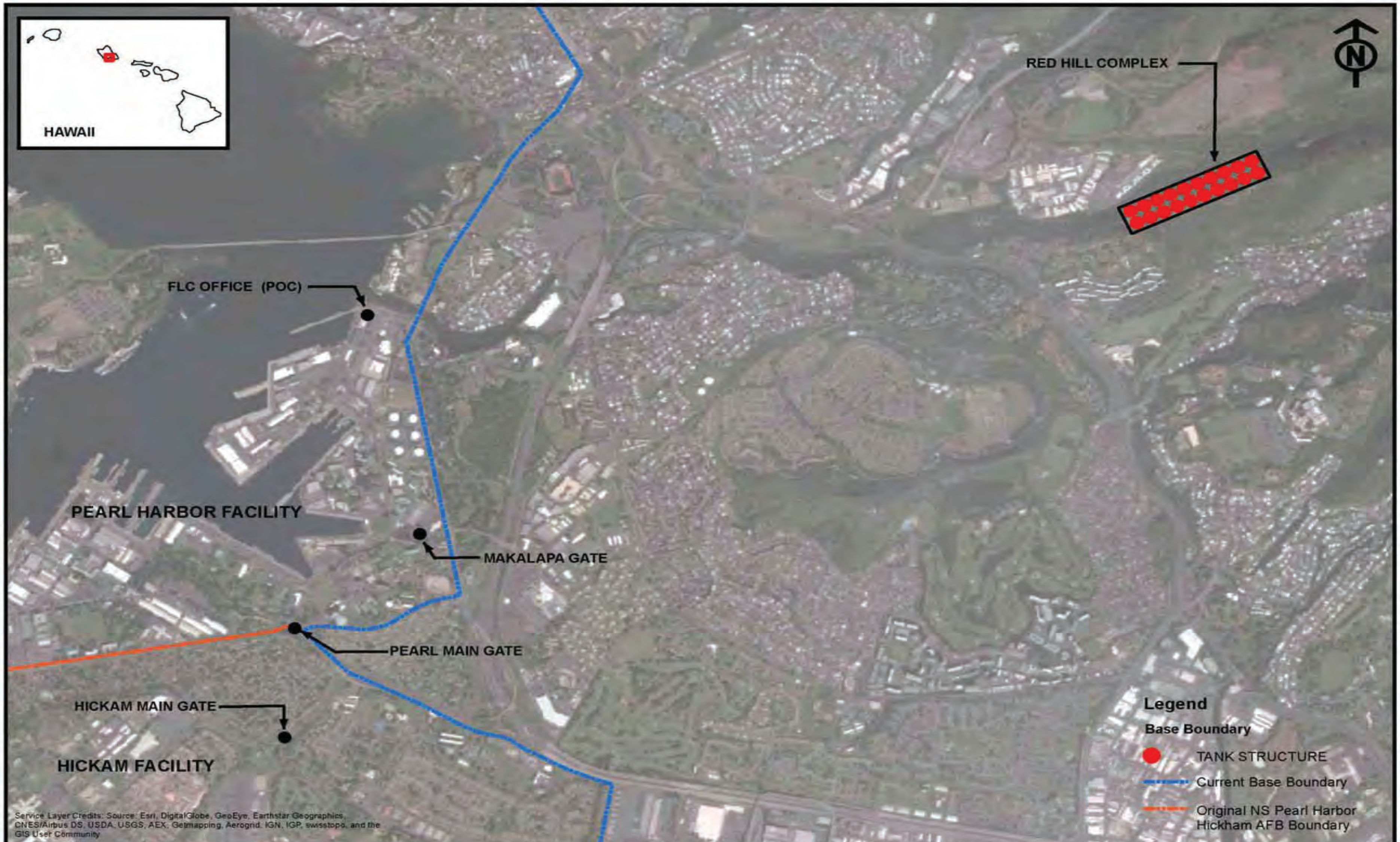
1.2 Site Background and History

JB Pearl Harbor- Hickam is located on the island of Oahu, approximately 8 miles northwest of Honolulu, Hawaii. The fueling operations at JB Pearl Harbor-Hickam are under the Navy's Fleet Logistics Center Pearl Harbor.

The Red Hill storage complex is located approximately three miles north-east of the base (Figure 1-1). The Red Hill storage complex was constructed between 1940 and 1943. The Red Hill storage complex consists of 20 BFCUSTs (BFCUST 1 – 20) that are each 12,600,000-gallon single-walled steel, that are 100-feet in diameter and 250-feet in height. Eighteen of the 20 tanks are in-service; BFCUSTs 1 and 19 were permanently removed from service prior to 2009. BFCUST 2 – 6 store Jet Propellant (JP)-8, BFCUST 7 – 12, 18 and 20 store JP-5, and BFCUST 13 – 17 store F-76. The top and bottom portions of the BFCUSTs are accessible via a tunnel system. The BFCUSTs receipt, issue, and water drain piping are connected to JB Pearl Harbor Navy Facility via carbon steel piping of various diameters located in the tunnel system associated to the bottom portion of the BFCUSTs. All piping isolation valves are equipped with double block and bleed valves.

In response to a product spill in January 2014 from BFCUST 5, when it was placed back in service after completing internal inspections and repairs, an AOC was negotiated between the CNRH, DLA Energy, Hawaii DOH and the EPA Region 9 which requires the annual testing of the BFCUST at Red Hill. The biennial test event originally schedule to begin in February 2015 was moved up to start in October 2104 and revised to annual testing to meet AOC requirements.

Figure 1-1: Location Map – Red Hill Storage Complex



DATE: JUNE 2015 SCALE: NTS DGN / DWN / CHK BY: MC / JES / MC JOB: 140296 TASK: 4.1.89	Michael Baker INTERNATIONAL Michael Baker International Virginia Beach, VA	FIGURE 1-1 BASE OVERVIEW 2015 ANNUAL RED HILL BFCUST LEAK DETECTION TEST REPORT JB PEARL HARBOR-HICKAM, HAWAII

N00086

Exhibit N-2B

1.3 Historical Leak Detection Results

Prior to this test event leak detection testing was conducted biennially as a DLA Energy Leak Detection CMP best management practice (BMP). The last biennial tests on 15 of the 18 BFCUSTs were completed from 23 January 2013 through 5 April 2013. The Mass Technology Corporation (MTC) leak detection tests were successful with no detectable leaks above the test method's minimum detectable leak rate (MDLR) of 0.7 gallons per hour (gph) (Ref 01). BFCUSTs 5, 14, and 17 were out-of- service during the 2013 test event for internal inspections and were not tested.

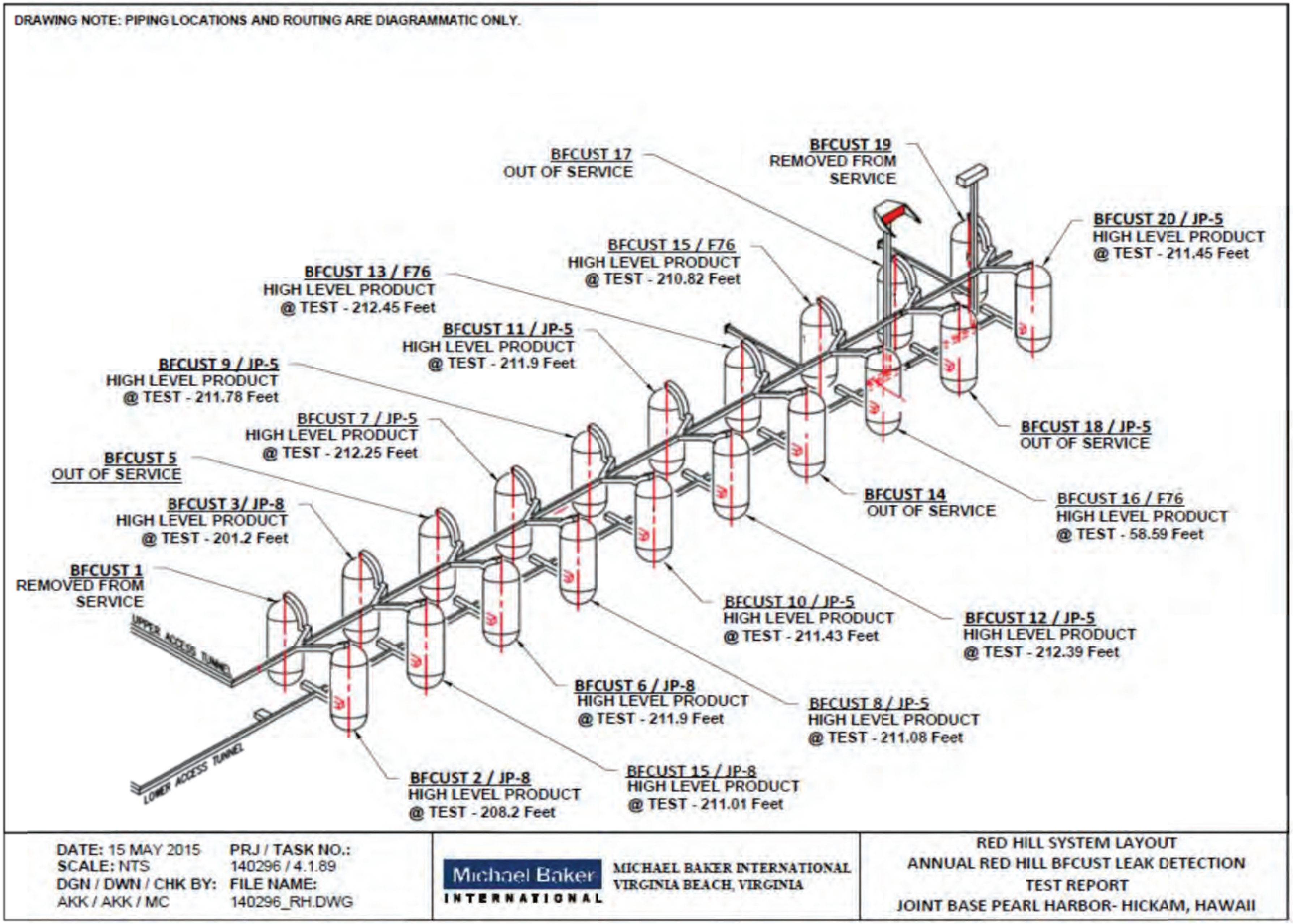
1.4 Project Scope

MTC leak detection tests on 14 of the 18 BFCUSTs were performed from 14 October 2014 through 14 May 2015. Note that the 2015 biennial test event of the Red Hill tanks, initially schedule for the first quarter of 2015, was initiated in October 2014 in response to the annual test requirements agreed upon in the AOC. Table 1-1 provides a description of the systems tested. Figure 1-2 provides a layout diagram of the Red Hill storage complex.

Table 1-1: Items Tested

Asset Designation	Tank Diameter (Feet)	Tank Height (Feet)	Tank Volume (Gallons)	Product	Associated Tank Piping								Comments
					Diameter (Inches) Length (Feet)						Total Length (Feet)	Volume (Gallons)	
					3/4	4	6	8	12	20			
BFCUST 1	100	250	12,600,000	-	-	-	-	-	-	-	-	-	Permanently Removed from Service
BFCUST 2	100	250	12,600,000	JP-8	-	-	1.2	0.5	0.5	0.5	2.7	13	-
BFCUST 3	100	250	12,600,000	JP-8	50	-	1.7	-	0.5	0.5	52.7	14	-
BFCUST 4	100	250	12,600,000	JP-8	-	-	1.2	0.5	0.5	0.5	2.7	13	-
BFCUST 5	100	250	12,600,000	JP-8	-	-	1.2	-	1	2.5	4.7	44	Out-of-Service for Inspection
BFCUST 6	100	250	12,600,000	JP-8	-	-	1.2	-	1	2.5	4.7	44	-
BFCUST 7	100	250	12,600,000	JP-5	-	-	1	-	0.5	0.5	2	12	-
BFCUST 8	100	250	12,600,000	JP-5	45	-	2	1.5	1	0.5	50	21	-
BFCUST 9	100	250	12,600,000	JP-5	-	1	-	-	0.7	0.5	2.2	12	-
BFCUST 10	100	250	12,600,000	JP-5	-	-	12	-	1	0.5	13.5	31	-
BFCUST 11	100	250	12,600,000	JP-5	-	-	1	-	1	0.5	2.5	15	-
BFCUST 12	100	250	12,600,000	JP-5	-	-	1.2	-	1	2.5	4.7	44	-
BFCUST 13	100	250	12,600,000	F-76	50	-	1.7	-	0.5	0.5	52.7	14	-
BFCUST 14	100	250	12,600,000	F-76	-	-	1.2	-	1	2.5	4.7	44	Out-of-Service for Inspection
BFCUST 15	100	250	12,600,000	F-76	50	-	3	1.5	0.5	0.3	55.3	17	-
BFCUST 16	100	250	12,600,000	F-76	-	-	1.7	3	1	3	8.7	58	-
BFCUST 17	100	250	12,600,000	F-76	-	-	3	1.5	0.5	0.3	55.3	17	Out-of-Service for Inspection
BFCUST 18	100	250	12,600,000	JP-5	-	-	1.7	3	1	3	8.7	58	Out-of-Service for Maintenance
BFCUST 19	100	250	12,600,000	-	-	-	-	-	-	-	-	-	Permanently Removed from Service
BFCUST 20	100	250	12,600,000	JP-5	-	-	1	1	-	0.3	2.3	8	-

Figure 1-2: Red Hill System Layout



N00089

Exhibit N-2B

1.5 Project Team

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

1.6 Qualifications of Testing Procedures Used

The testing procedures used were those defined as the MTC - Precision Mass Measurement Systems SIM-1000 / CBU-1000 (24 hour test) leak detection method. Determination of leakage is based on the criteria established in the Ken Wilcox Associates, Inc. third party evaluation as listed by the National Work Group on Leak Detection Evaluations (NWGLDE) (Ref 02). The MTC Precision Mass Measurement System (24 hour test) is certified with a capability to detect leaks on a tank proportional to the product surface area (PSA) with a probability of detection (P_D) of 95 percent and probability of a false alarm (P_{FA}) of 5 percent. Due to the height of the tanks, a total of 120 hours of testing was performed for each test, consisting of 48 hours for initial stabilization of tank and product and five consecutive 24 hour test events (120 hours).

By performing a number of non-overlapping tests in sequence and averaging the resultant leak rates, a modified threshold can be established for declaring a leak. Through standard statistical analysis, the larger the number of tests used in the averaging will result in a lower threshold and, therefore, a smaller size leak can be detected with a 95 percent P_D.

24 hour test 50,000 gallons or greater

For tanks with PSA of 1,257 ft^2 or less, leak rate is 0.1 gallons per hour (gph) with PD = 97.9% and PFA = 5%.

For tanks with larger PSA, leak rate equals [(PSA in ft^2 ÷ 1,257 ft^2) x 0.078 gph].

Leak rate may not be scaled below 0.1 gph.

Example:

For a 100 foot diameter tank with PSA = 7850 ft^2; leak rate = [(7850 ft^2 ÷ 1,257 ft^2) x 0.078 gph] = 0.49 gph.

Using the statistical analysis of five test events: 0.49 gph ÷ Square Root of 0.49 gph = 0.2178 gph.

The 0.7 gph MDLR previously quoted for the testing of the Red Hill tanks in 2009, 2011, and 2013 was established during the inaugural biennial test event in 2009. Due to the height and unconventional spherical bottom construction of the tanks, MTC established a conservative test MDLR of 0.7 gph. Based on the consistency of the previous biennial test data and the results of a simulated leak evaluation performed by Ken Wilcox Associates Inc. in May 2009 (Ref 03), MTC is confident in revising the test MDLR to 0.5 gph. The 0.5 gph MDLR is still conservative relative to the test method calculated rate of 0.22 gph.

2.0 LEAK DETECTION TESTING AND RESULTS

MTC's test reports are provided in Appendix A. The 14 BFCUSTs were leak detection tested with no detectable leak above the established test method's MDLR of 0.5 gph. BFCUSTs 5, 14, 17, and 18 were out-of-service during the test event and, therefore, not tested. In addition, BFCUST 16 was temporarily isolated from receiving additional fuel during the test event, due to fuel quality issues and was tested at less than the tank's high product level. Test results are listed in Table 2-1.

Table 2-1: Test Results

Asset Designation	Height (Feet)	Diameter (Feet)	Test Product Height (Feet)	Product	Certified MDLR (gph)	Test Date	Result
BFCUST 1	250	100	Permanently Removed from Service				
BFCUST 2	250	100	208.2	JP-8	0.5	11 February – 16 February 2015	Pass
BFCUST 3	250	100	210.2	JP-8	0.5	14 February – 19 February 2015	Pass
BFCUST 4	250	100	211.01	JP-8	0.5	16 October – 23 October 2014	Pass
BFCUST 5	250	100	Out-of-Service for Inspection				
BFCUST 6	250	100	211.9	JP-8	0.5	14 October – 21 October 2014	Pass
BFCUST 7	250	100	212.25	JP-5	0.5	15 November – 22 November 2014	Pass
BFCUST 8	250	100	211.08	JP-5	0.5	14 October – 21 October 2014	Pass
BFCUST 9	250	100	211.78	JP-5	0.5	22 October – 29 October 2014	Pass
BFCUST 10	250	100	211.43	JP-5	0.5	31 October – 7 November 2014	Pass
BFCUST 11	250	100	211.9	JP-5	0.5	18 February – 23 February 2015	Pass
BFCUST 12	250	100	212.39	JP-5	0.5	6 November – 13 November 2014	Pass
BFCUST 13	250	100	212.45	F-76	0.5	29 April – 4 May 2015	Pass
BFCUST 14	250	100	Out-of-Service for Inspection				
BFCUST 15	250	100	210.82	F-76	0.5	9 May – 14 May 2015	Pass
BFCUST 16	250	100	58.59	F-76	0.5	4 May – 9 May 2015	Pass
BFCUST 17	250	100	Out-of-Service for Inspection				
BFCUST 18	250	100	Out-of-Service for Maintenance				
BFCUST 19	250	100	Permanently Removed from Service				
BFCUST 20	250	100	211.45	JP-5	0.5	29 October – 5 November 2014	Pass

3.0 CONCLUSIONS AND RECOMMENDATIONS

3.1 Conclusions

Fourteen of the 18 BFCUSTs passed the 2015 biennial leak detection testing. BFCUSTs 5, 14, 17 and 18 were out-of-service and were not tested. The test of BFCUST 16 test was not conducted at the fill height (~210 feet) due to operational limitations; testing was conducted at ~58 feet.

3.2 Recommendations

Annual leak detection testing of the 14 BFCUSTs should be initiated on or before the annual anniversary date of 14 October 2015 under DLA Energy's Leak Detection CMP to comply with AOC agreement. In addition, the DLA Energy Leak Detection CMP should be notified immediately when BFCUST 16 can be filled to its full fill height and when remaining four BFCUSTs (BFCUST 5, 14, 17 and 18) are each placed back in service in order for leak detection testing to be completed to comply with AOC agreement.

4.0 REFERENCES

Ref 01 Final 2013 Biennial Integrity Testing Report Of Bulk Field Constructed Underground Storage Tank 2 – Red Hill Underground Storage Fuel Storage Facility, Joint Base Pearl Harbor - Hickam, Hawaii. Prepared for DLA Energy, Ft. Belvoir, Virginia, under NAVFAC Atlantic Contract N62470-10-D-3000-0026. Dated; 17 April 2013.
(Typical individual tank report for 15 BFCUSTs tested - 2013 Biennial test event)

Ref 02 Listing by the NWGLDE (22nd Edition): Mass Technology Corporation – Precision Mass Measurement Systems SIM-1000 and CBU-1000 (24 hour test) – BULK UNDERGROUND STORAGE TANK LEAK DETECTION METHOD (50,000 gallons or greater).
Issue Date: 23 August 1999
Revision Date: 29 December 2011
http://www.nwglde.org/evals/mass_technology_a.html

Ref 03 Testing of the Mass Technology Corporation SIM-1000 Leak Detection System on 12 Million Gallon Tanks at Red Hill. Prepared for: Michael Baker Jr. Inc. Prepared By: Ken Wilcox Associates, Inc.
Dated 7 May 2009

APPENDIX B –

MASS TECHNOLOGY CORPORATION TEST REPORTS

Precision Leak Measurement Report
P.O. Box 1578
Kilgore, Texas 75662

FISC Red Hill
Pearl Harbor, HI

Project Manager – Mr. Mark Caldon

Site Supervisor – Travis Ricketson

Scope of Work: Furnish all required management, labor, services, materials and equipment to perform the required annual tightness testing of Tank # 2 an underground fuel storage tank located at FISC Red Hill, Pearl Harbor, HI.

Report compiled by: ______________________ Date: 03-13-2015
Ricky Slaughter

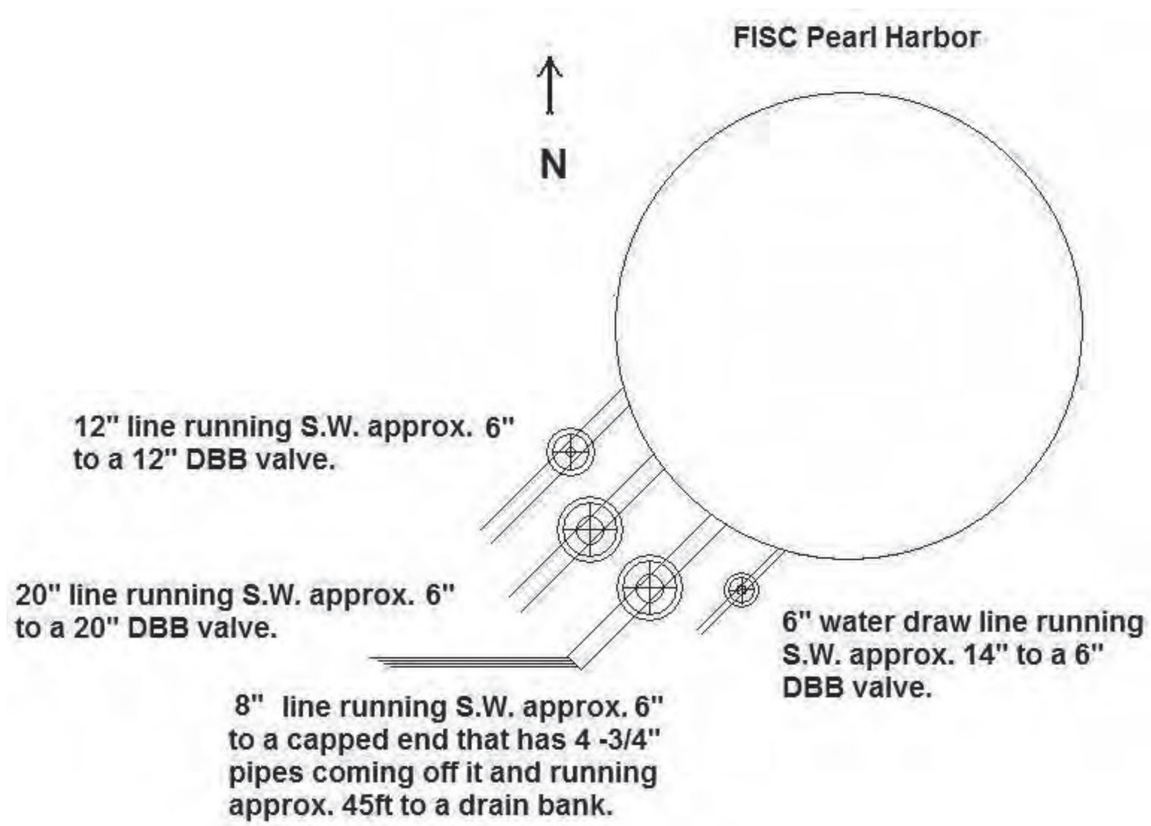
Summary

Testing of Tank # 2 a 12,600,000 gal underground storage tank located at FISC Red Hill, Pearl Harbor, Hawaii commenced February 11, 2015 and was completed February 16, 2015. The result of that testing is that the tank system is determined to be tight to isolation. All tank valves were adequately secured such that no unusual readings were noted. Testing was performed using the Mass Technology Corporation protocols set out in the third party evaluations. All tank valves were adequately secured such that any fluid loss was isolated to leakage. Therefore, the containment integrity of the tank was not compromised and the test is considered conclusive.

Tank # 2: After 120 hours of testing the tank is certified to be tight.

Tank Data Tank # 2

Diameter:	100 ft.	Height:	250 ft.
Tank Type:	Vertical UST	Contents:	JP-8
Specific Gravity:	0.80	Product Level:	208.2 ft.
Start Date:	02/11/2015	Completion Date:	02/16/2015
Unit Operator:	Travis Ricketson	Test Results:	Certified Tight

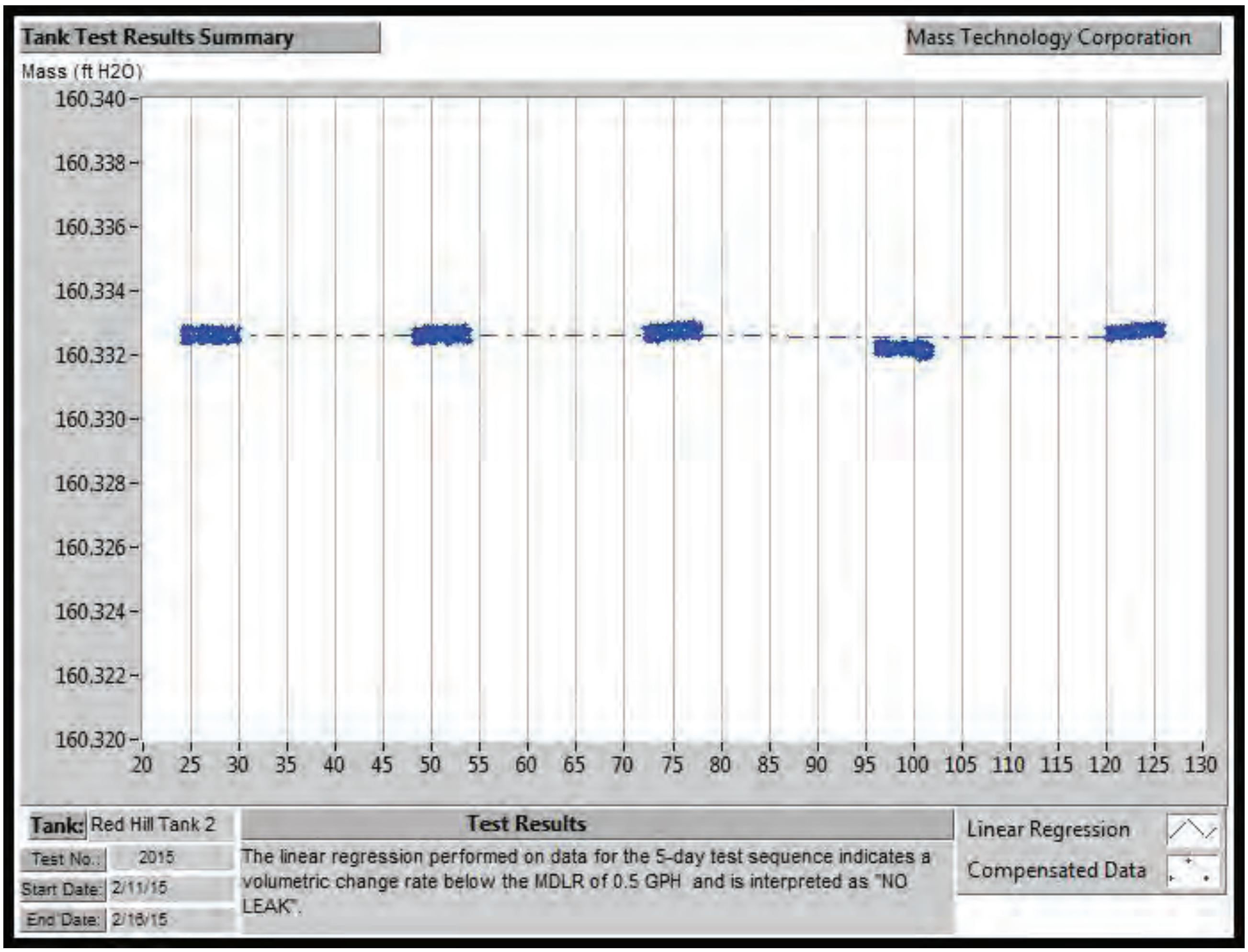


All dimensions, line locations, sizes and valve descriptions have been furnished by the facility operator.

Results

The fluid mass data was recorded over a 120-hour period. A linear regression of the recorded fluid mass data resulted in a change rate detected below the minimum detection level of 0.5 gallons per hour. All tank valves were adequately secured such that any fluid loss was isolated to leakage. Therefore, the containment integrity of the tank was not compromised and the test is considered conclusive.

Tank # 2 is certified to be tight.



Precision Leak Measurement Report
P.O. Box 1578
Kilgore, Texas 75662

FISC Red Hill
Pearl Harbor, HI

Project Manager – Mr. Mark Caldon

Site Supervisor – Travis Ricketson

Scope of Work: Furnish all required management, labor, services, materials and equipment to perform the required annual tightness testing of Tank # 3 an underground fuel storage tank located at FISC Red Hill, Pearl Harbor, HI.

Report compiled by: ______________________ Date: 03-13-2015
Ricky Slaughter

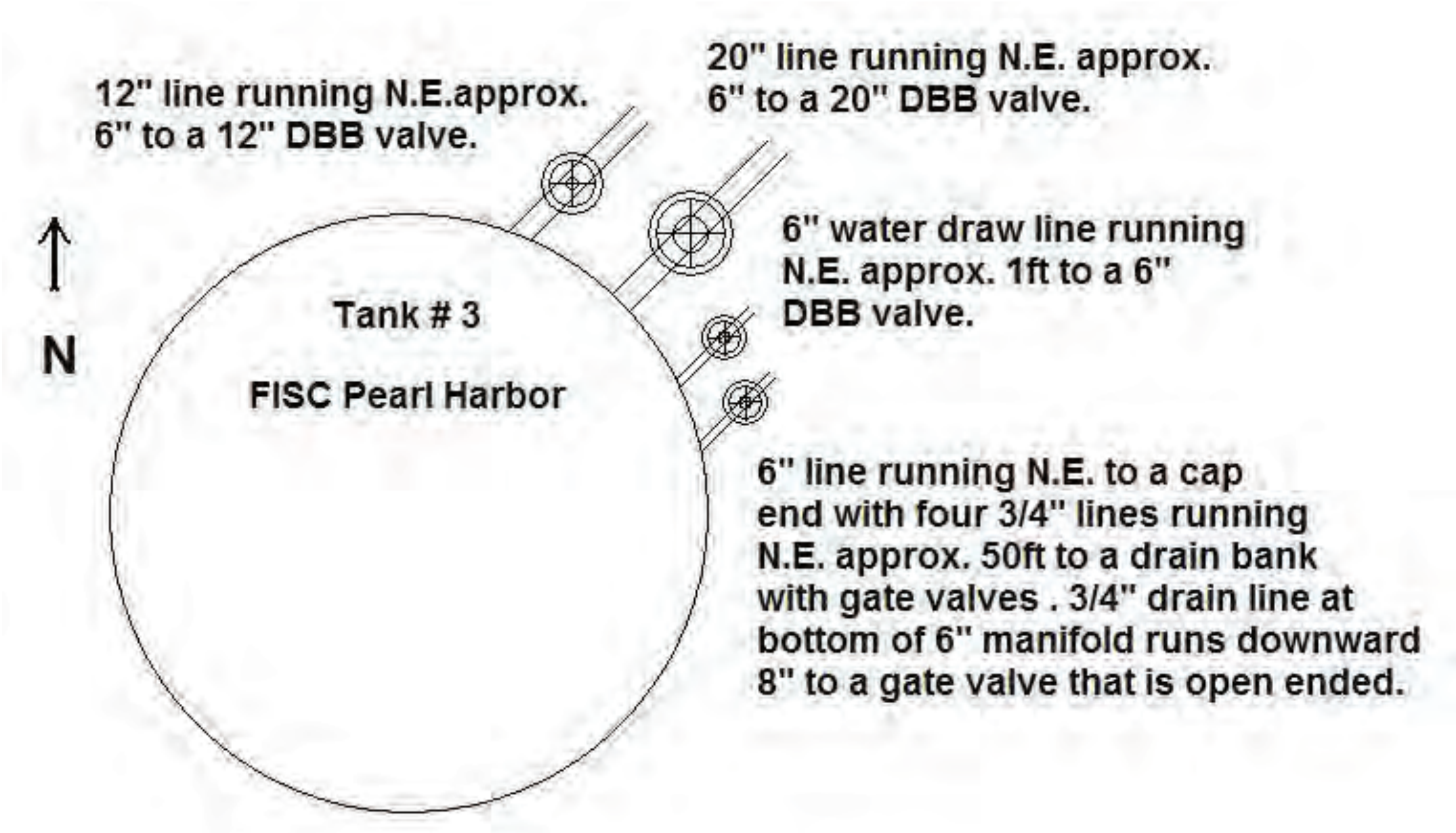
Summary

Testing of Tank # 3 a 12,600,000 gal underground storage tank located at FISC Red Hill, Pearl Harbor, Hawaii commenced February 14, 2015 and was completed February 19, 2015. The result of that testing is that the tank system is determined to be tight to isolation. All tank valves were adequately secured such that no unusual readings were noted. Testing was performed using the Mass Technology Corporation protocols set out in the third party evaluations. All tank valves were adequately secured such that any fluid loss was isolated to leakage. Therefore, the containment integrity of the tank was not compromised and the test is considered conclusive.

Tank # 3: After 120 hours of testing the tank is certified to be tight.

Tank Data Tank # 3

Diameter:	100 ft.	Height:	250 ft.
Tank Type:	Vertical UST	Contents:	JP-8
Specific Gravity:	0.80	Product Level:	210.2 ft.
Start Date:	02/14/2015	Completion Date:	02/19/2015
Unit Operator:	Travis Ricketson	Test Results:	Certified Tight

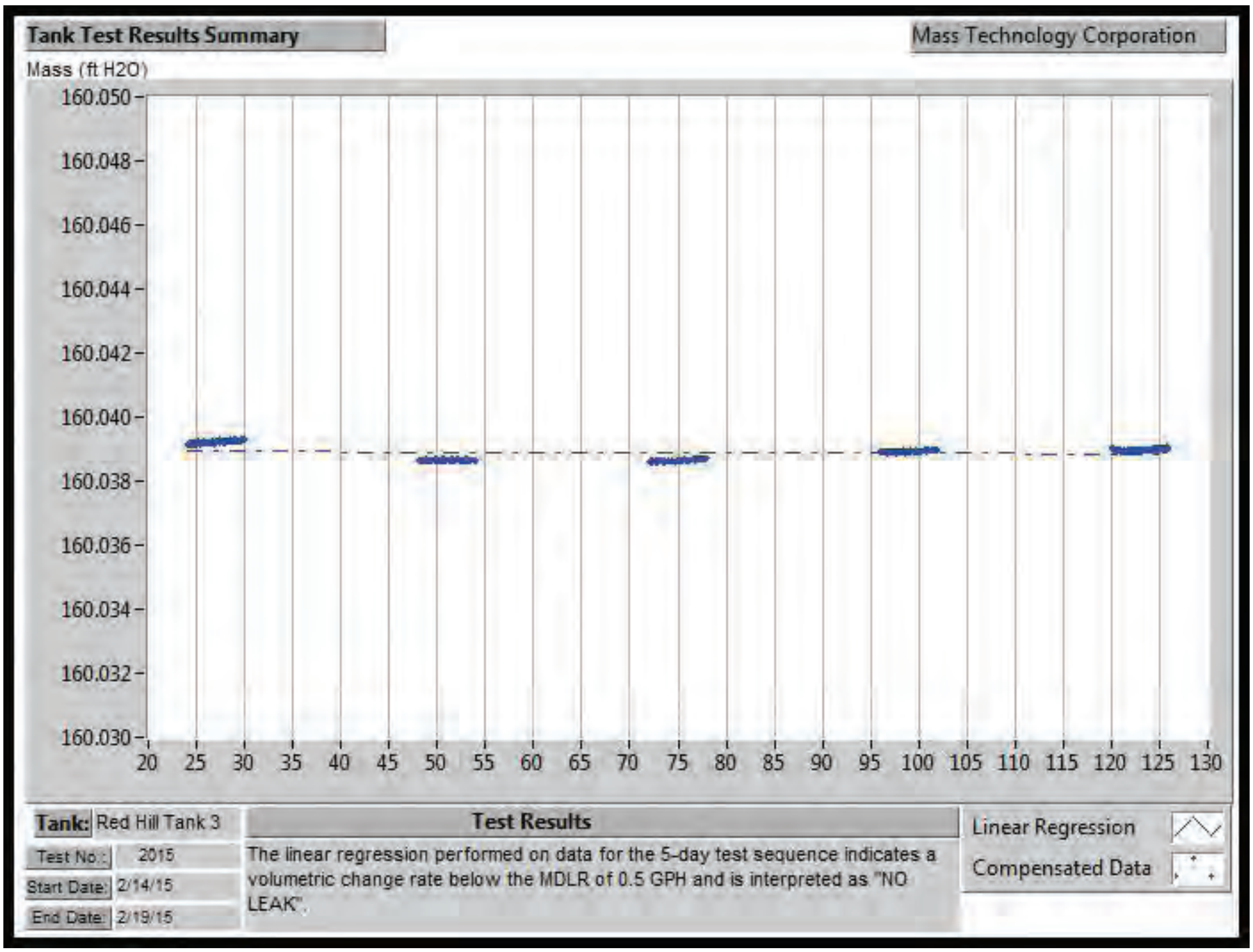


All dimensions, line locations, sizes and
valve descriptions have been furnished
by the facility operator.

Results

The fluid mass data was recorded over a 120-hour period. A linear regression of the recorded fluid mass data resulted in a leak rate detected below the minimum detection level of 0.5 gallons per hour. All tank valves were adequately secured such that any fluid loss was isolated to leakage. Therefore, the containment integrity of the tank was not compromised and the test is considered conclusive.

Tank # 3 is certified to be tight.



Precision Leak Measurement Report
P.O. Box 1578
Kilgore, Texas 75662

FISC Red Hill
Pearl Harbor, HI

Project Manager – Mr. Mark Caldon

Site Supervisor – Travis Ricketson

Scope of Work: Furnish all required management, labor, services, materials and equipment to perform the required annual tightness testing of Tank # 4 an underground fuel storage tank located at FISC Red Hill, Pearl Harbor, HI.

Report compiled by: ______________________ Date: 12-10-2014
Ricky Slaughter

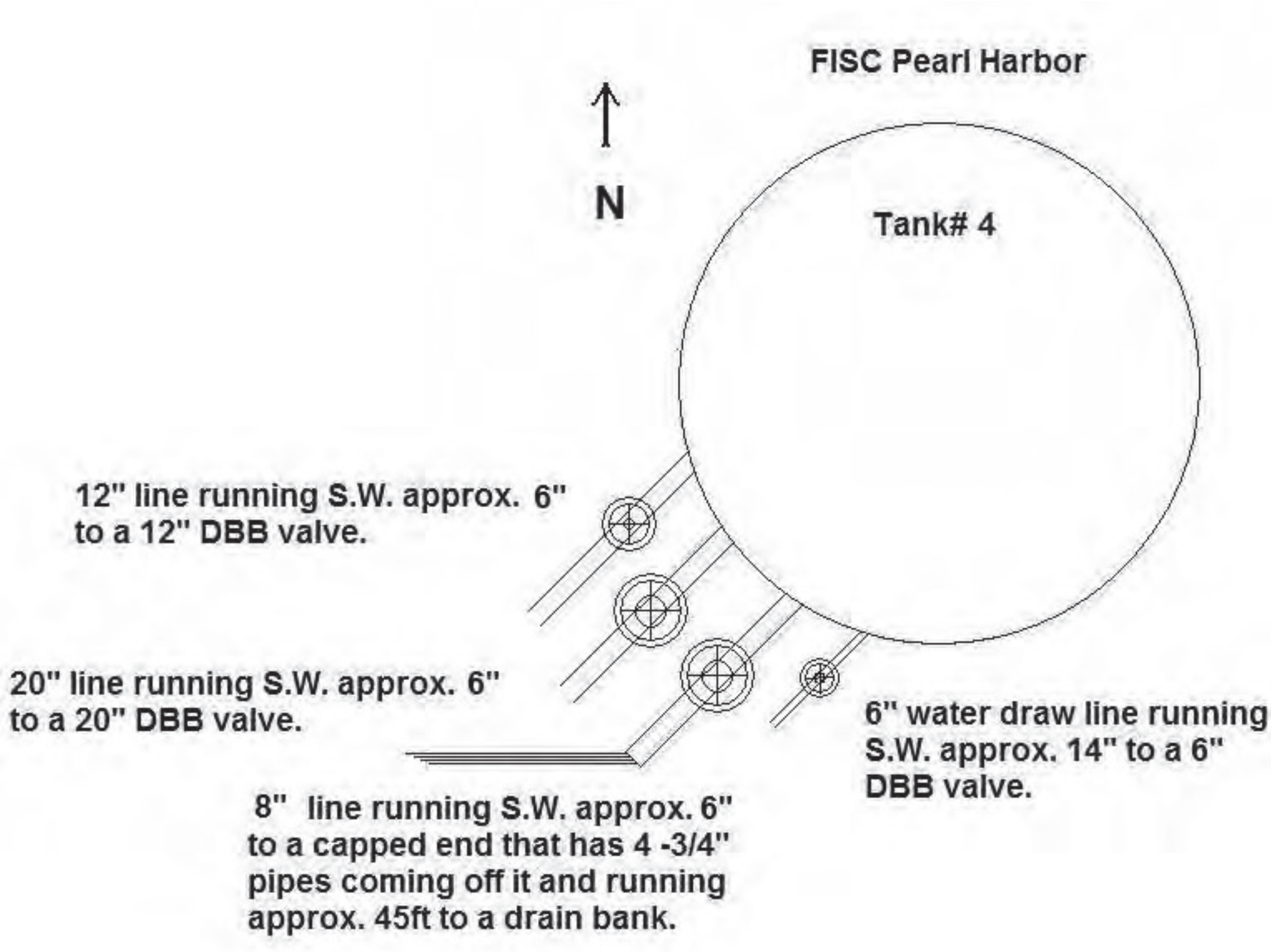
Summary

Testing of Tank # 4 a 12,600,000 gal underground storage tank located at FISC Red Hill, Pearl Harbor, Hawaii commenced October 16, 2014 and was completed October 23, 2014. The result of that testing is that the tank system is determined to be tight to isolation. All tank valves were adequately secured such that no unusual readings were noted. Testing was performed using the Mass Technology Corporation protocols set out in the third party evaluations. All tank valves were adequately secured such that any fluid loss was isolated to leakage. Therefore, the containment integrity of the tank was not compromised and the test is considered conclusive.

Tank # 4: After 168 hours of testing the tank is certified to be tight.

Tank Data Tank # 4

Diameter:	100 ft.	Height:	250 ft.
Tank Type:	Vertical UST	Contents:	JP-8
Specific Gravity:	0.80	Product Level:	211.01 ft.
Start Date:	10/16/2014	Completion Date:	10/23/2014
Unit Operator:	Travis Ricketson	Test Results:	Certified Tight

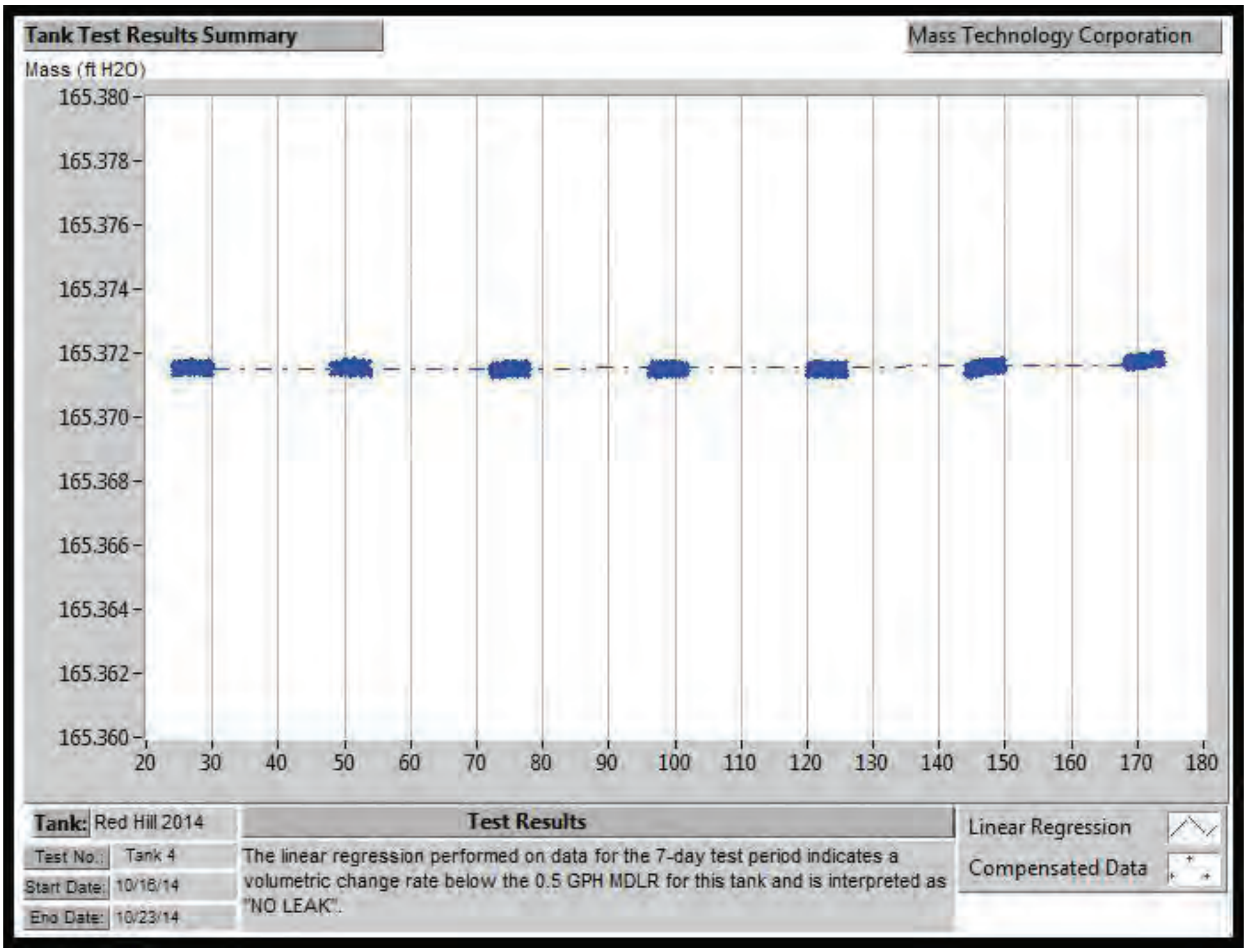


All dimensions, line locations, sizes and valve descriptions have been furnished by the facility operator.

Results

The fluid mass data was recorded over a 168-hour period. A linear regression of the recorded fluid mass data resulted in a leak rate detected below the minimum detection level of 0.5 gallons per hour. All tank valves were adequately secured such that any fluid loss was isolated to leakage. Therefore, the containment integrity of the tank was not compromised and the test is considered conclusive.

Tank # 4 is certified to be tight.



Mass Technology Corporation

Precision Leak Measurement Report
P.O. Box 1578
Kilgore, Texas 75662

FISC Red Hill
Pearl Harbor, HI

Project Manager – Mr. Mark Caldon

Site Supervisor – Travis Ricketson

Scope of Work: Furnish all required management, labor, services, materials and equipment to perform the required annual tightness testing of Tank # 6 an underground fuel storage tank located at FISC Red Hill, Pearl Harbor, HI.

Report compiled by: ______________________ Date: 12-10-2014
Ricky Slaughter

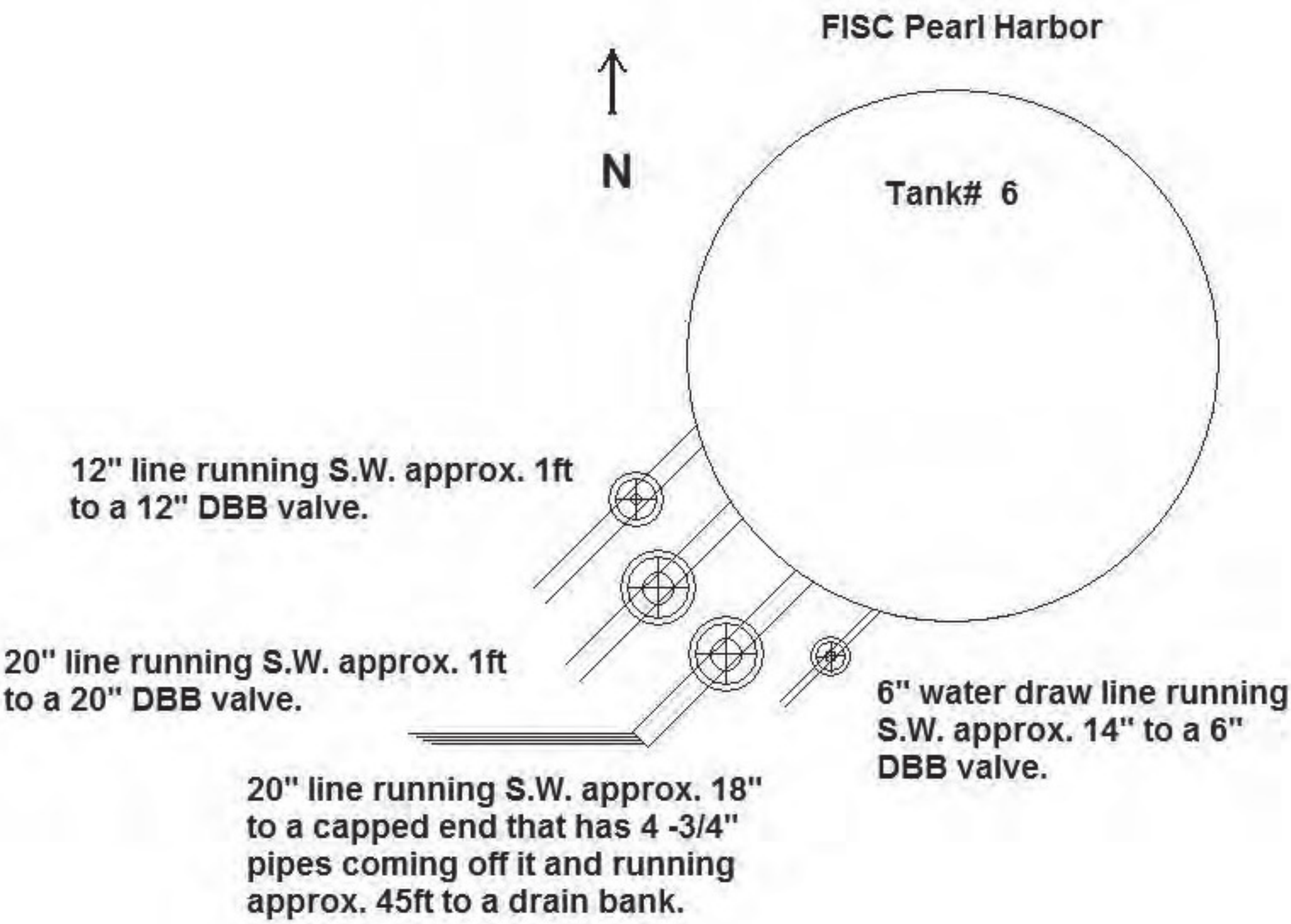
Summary

Testing of Tank # 6 a 12,600,000 gal underground storage tank located at FISC Red Hill, Pearl Harbor, Hawaii commenced October 14, 2014 and was completed October 21, 2014. The result of that testing is that the tank system is determined to be tight to isolation. All tank valves were adequately secured such that no unusual readings were noted. Testing was performed using the Mass Technology Corporation protocols set out in the third party evaluations. All tank valves were adequately secured such that any fluid loss was isolated to leakage. Therefore, the containment integrity of the tank was not compromised and the test is considered conclusive.

Tank # 6: After 168 hours of testing the tank is certified to be tight.

Tank Data Tank # 6

Diameter:	100 ft.	Height:	250 ft.
Tank Type:	Vertical UST	Contents:	JP-8
Specific Gravity:	0.80	Product Level:	211.9 ft.
Start Date:	10/14/2014	Completion Date:	10/21/2014
Unit Operator:	Travis Ricketson	Test Results:	Certified Tight

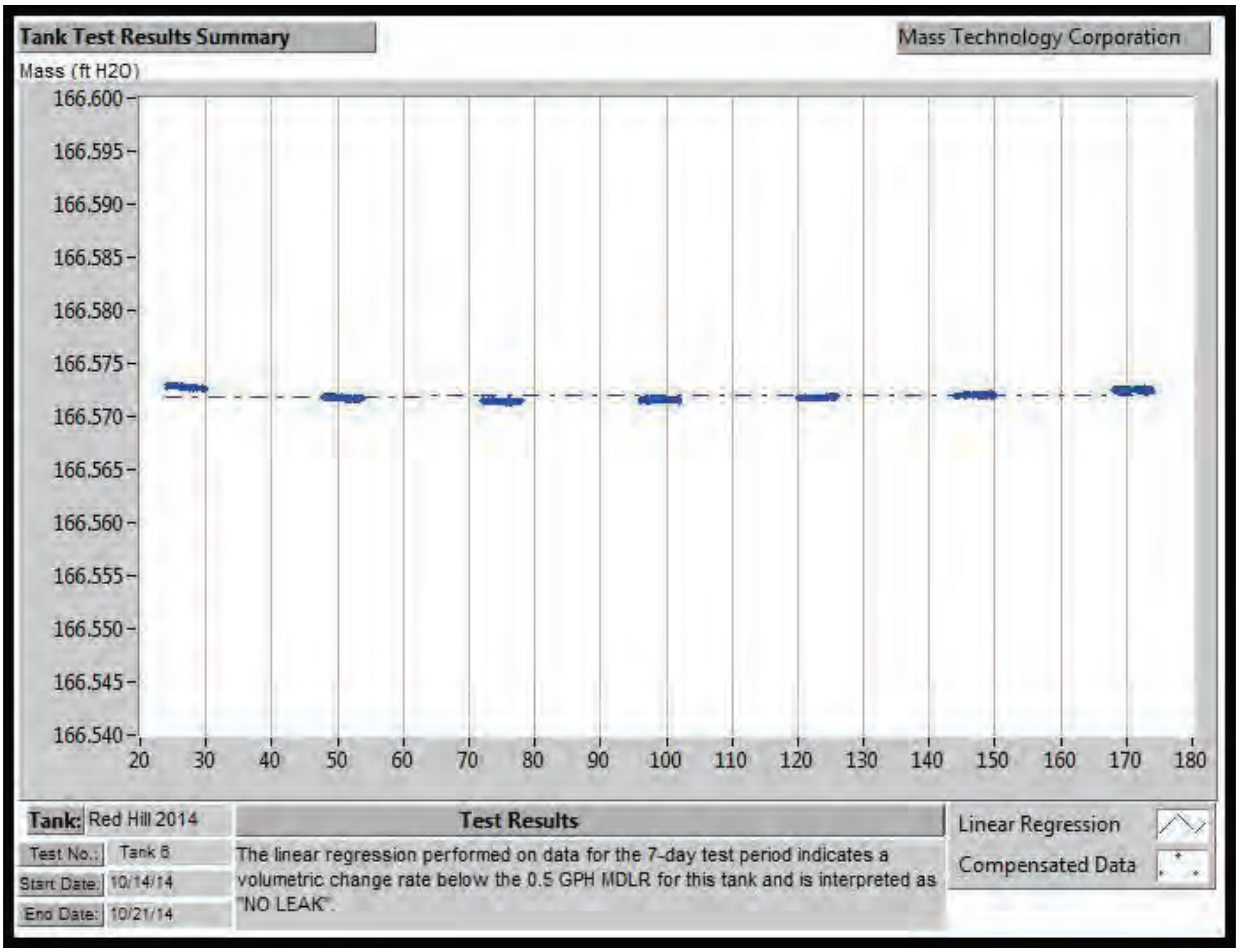


All dimensions, line locations, sizes and valve descriptions have been furnished by the facility operator.

Results

The fluid mass data was recorded over a 168-hour period. A linear regression of the recorded fluid mass data resulted in a leak rate detected below the minimum detection level of 0.5 gallons per hour. All tank valves were adequately secured such that any fluid loss was isolated to leakage. Therefore, the containment integrity of the tank was not compromised and the test is considered conclusive.

Tank # 6 is certified to be tight.



Precision Leak Measurement Report
P.O. Box 1578
Kilgore, Texas 75662

FISC Red Hill
Pearl Harbor, HI

Project Manager – Mr. Mark Caldon

Site Supervisor – Travis Ricketson

Scope of Work: Furnish all required management, labor, services, materials and equipment to perform the required annual tightness testing of Tank # 7 an underground fuel storage tank located at FISC Red Hill, Pearl Harbor, HI.

Report compiled by: ______________________ Date: 12-10-2014
Ricky Slaughter

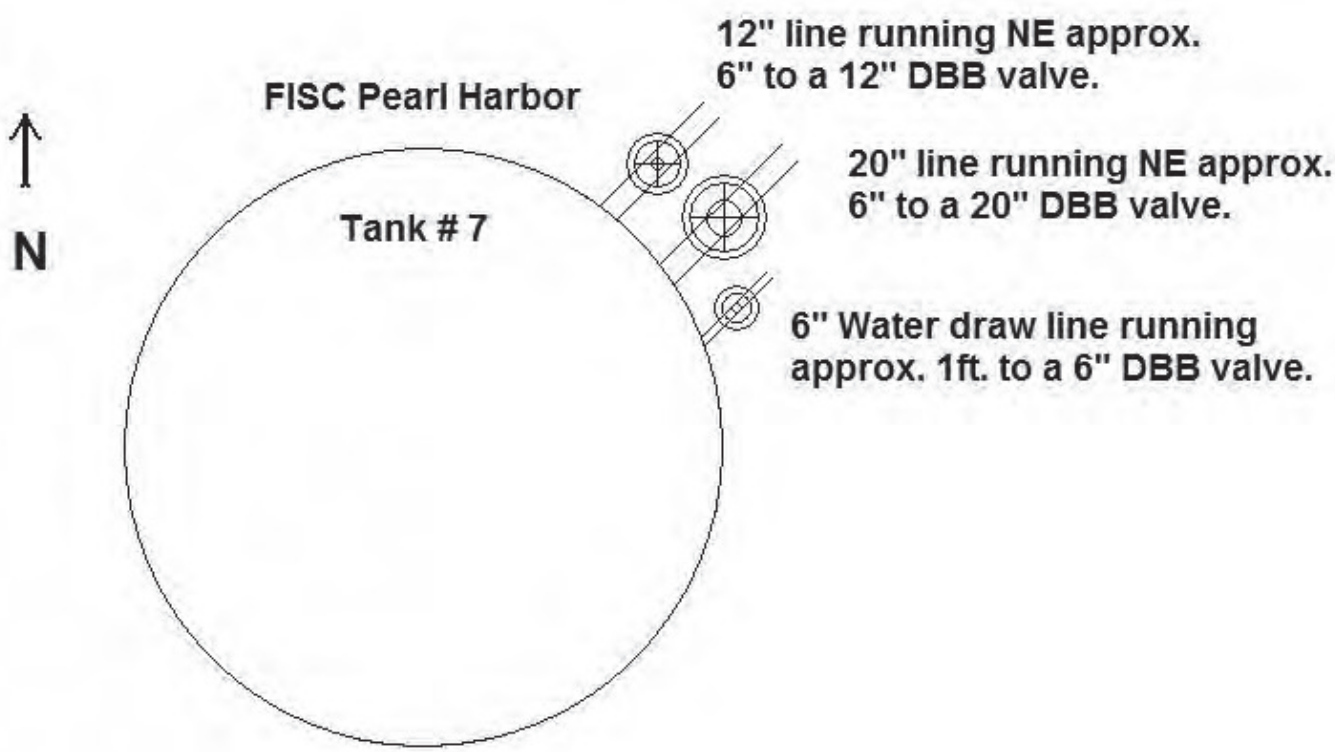
Summary

Testing of Tank # 7 a 12,600,000 gal underground storage tank located at FISC Red Hill, Pearl Harbor, Hawaii commenced November 15, 2014 and was completed November 22, 2014. The tank contained JP-5 and a precision leak test was conducted. The result of that testing is that the tank system is determined to be tight to isolation. All tank valves were adequately secured such that no unusual readings were noted. Testing was performed using the Mass Technology Corporation protocols set out in the third party evaluations. All tank valves were adequately secured such that any fluid loss was isolated to leakage. Therefore, the containment integrity of the tank was not compromised and the test is considered conclusive.

Tank # 7: After 168 hours of testing the tank is certified to be tight.

Tank Data Tank # 7

Diameter:	100 ft.	Height:	250 ft.
Tank Type:	Vertical UST	Contents:	JP-5
Specific Gravity:	0.82	Product Level:	212.25 ft.
Start Date:	11/15/2014	Completion Date:	11/22/2014
Unit Operator:	Travis Ricketson	Test Results:	Certified Tight

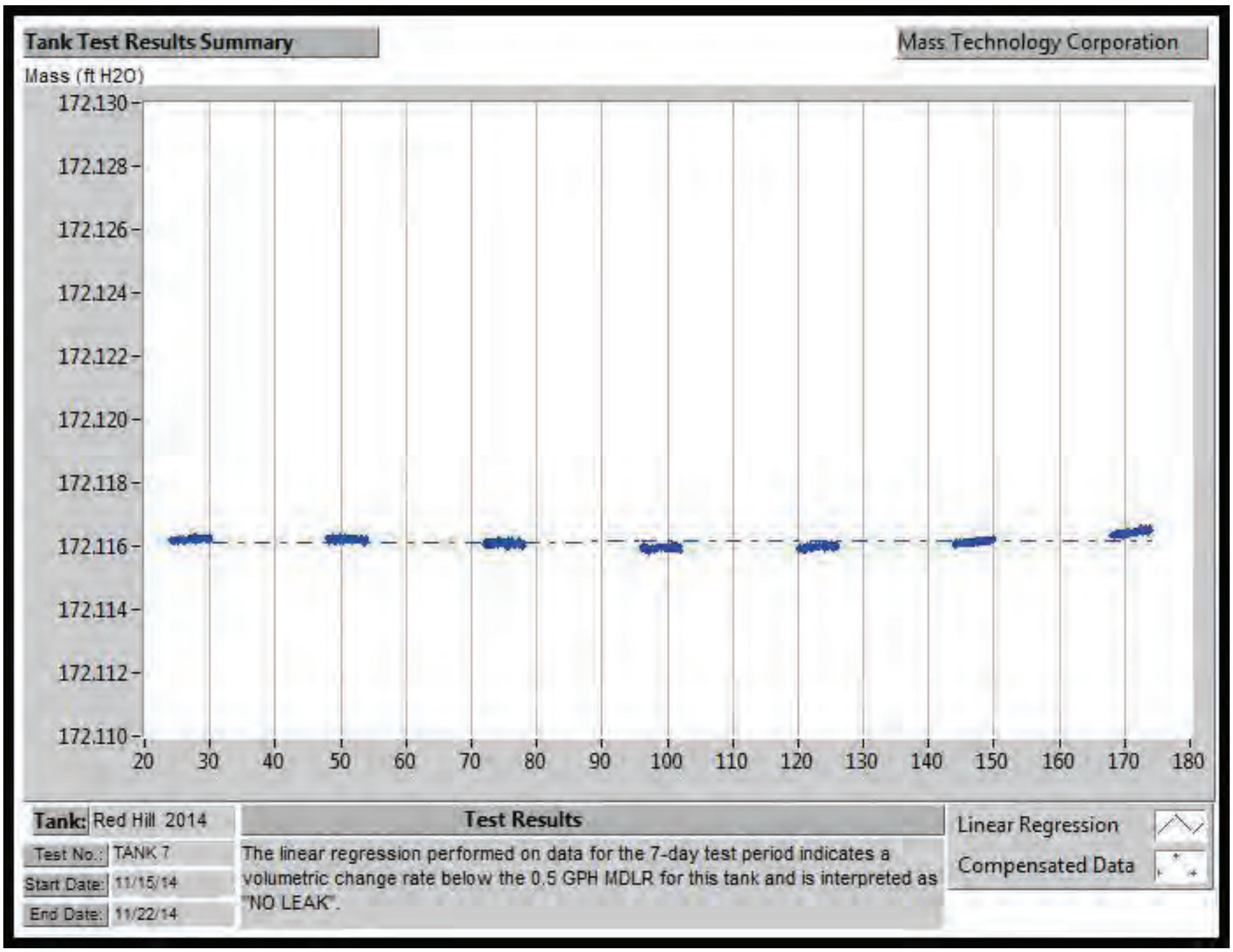


All dimensions, line locations, sizes and valve descriptions have been furnished by the facility operator.

Results

The fluid mass data was recorded over a 168-hour period. A linear regression of the recorded fluid mass data resulted in a leak rate detected below the minimum detection level of 0.5 gallons per hour. All tank valves were adequately secured such that any fluid loss was isolated to leakage. Therefore, the containment integrity of the tank was not compromised and the test is considered conclusive.

Tank # 7 is certified to be tight.



Mass Technology Corporation

Precision Leak Measurement Report
P.O. Box 1578
Kilgore, Texas 75662

FISC Red Hill
Pearl Harbor, HI

Project Manager – Mr. Mark Caldon

Site Supervisor – Travis Ricketson

Scope of Work: Furnish all required management, labor, services, materials and equipment to perform the required annual tightness testing of Tank # 8 an underground fuel storage tank located at FISC Red Hill, Pearl Harbor, HI.

Report compiled by: ______________________
Ricky Slaughter

Date: 12-10-2014

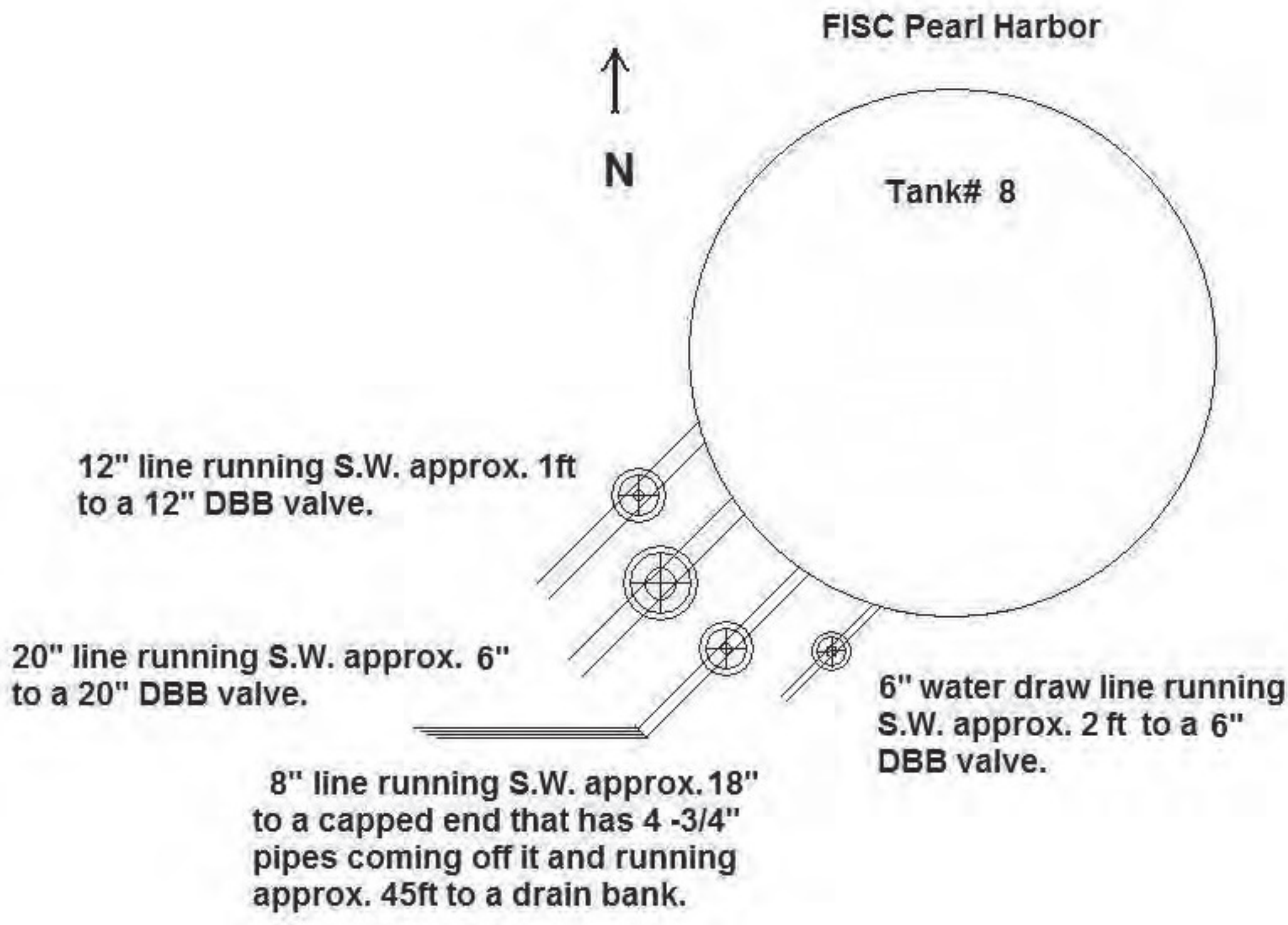
Summary

Testing of Tank # 8 a 12,600,000 gal underground storage tank located at FISC Red Hill, Pearl Harbor, Hawaii commenced October 14, 2014 and was completed October 21, 2014. The tank contained JP-5 and a precision leak test was conducted. The result of that testing is that the tank system is determined to be tight to isolation. All tank valves were adequately secured such that no unusual readings were noted. Testing was performed using the Mass Technology Corporation protocols set out in the third party evaluations. All tank valves were adequately secured such that any fluid loss was isolated to leakage. Therefore, the containment integrity of the tank was not compromised and the test is considered conclusive.

Tank # 8: After 168 hours of testing the tank is certified to be tight.

Tank Data Tank # 8

Diameter:	100 ft.	Height:	250 ft.
Tank Type:	Vertical UST	Contents:	JP-5
Specific Gravity:	0.82	Product Level:	211.08 ft.
Start Date:	10/14/2014	Completion Date:	10/21/2014
Unit Operator:	Travis Ricketson	Test Results:	Certified Tight

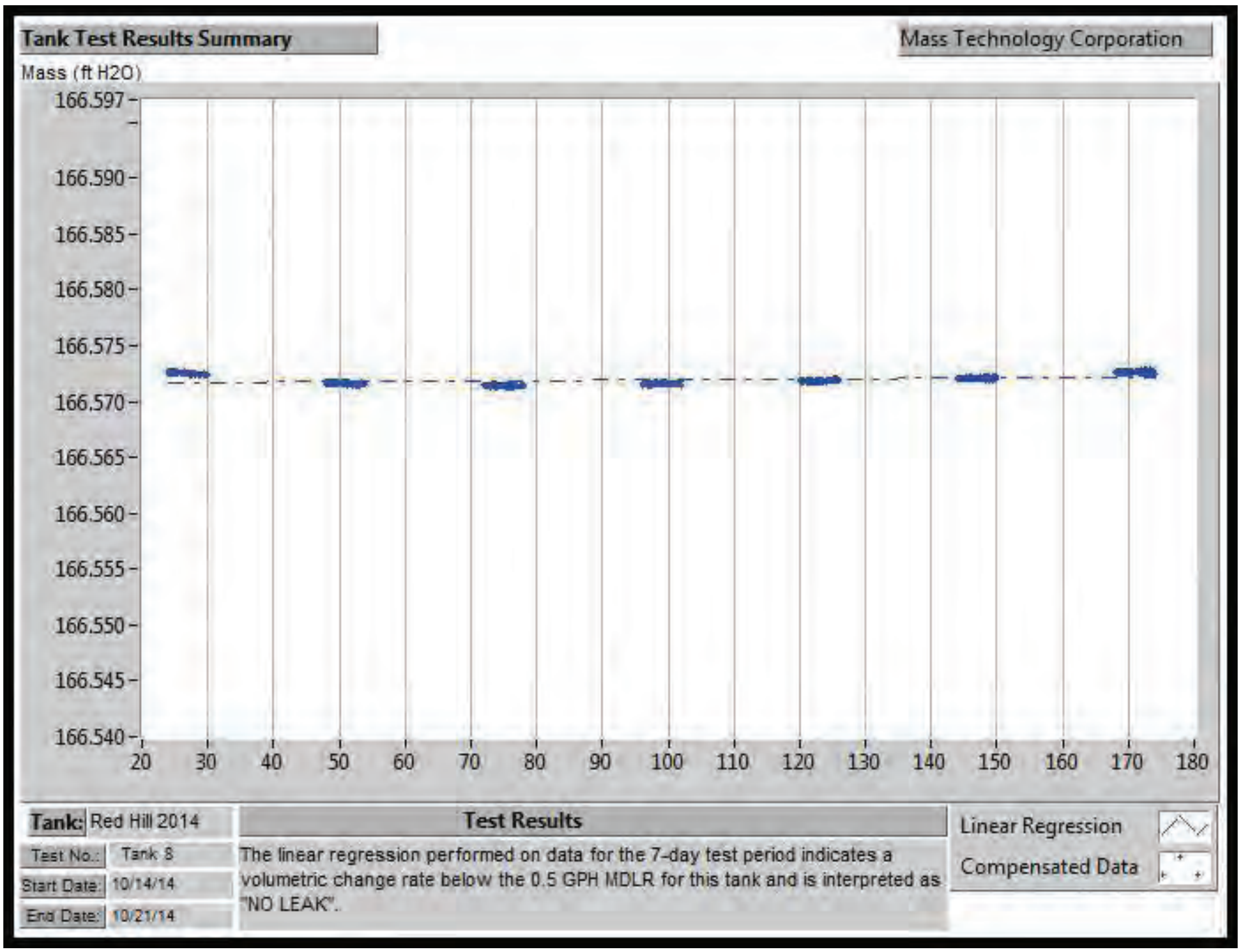


All dimensions, line locations, sizes and valve descriptions have been furnished by the facility operator.

Results

The fluid mass data was recorded over a 168-hour period. A linear regression of the recorded fluid mass data resulted in a leak rate detected below the minimum detection level of 0.5 gallons per hour. All tank valves were adequately secured such that any fluid loss was isolated to leakage. Therefore, the containment integrity of the tank was not compromised and the test is considered conclusive.

Tank # 8 is certified to be tight.



Precision Leak Measurement Report
P.O. Box 1578
Kilgore, Texas 75662

FISC Red Hill
Pearl Harbor, HI

Project Manager – Mr. Mark Caldon

Site Supervisor – Travis Ricketson

Scope of Work: Furnish all required management, labor, services, materials and equipment to perform the required annual tightness testing of Tank # 9 an underground fuel storage tank located at FISC Red Hill, Pearl Harbor, HI.

Report compiled by: ______________________ Ricky Slaughter

Date: 12-10-2014

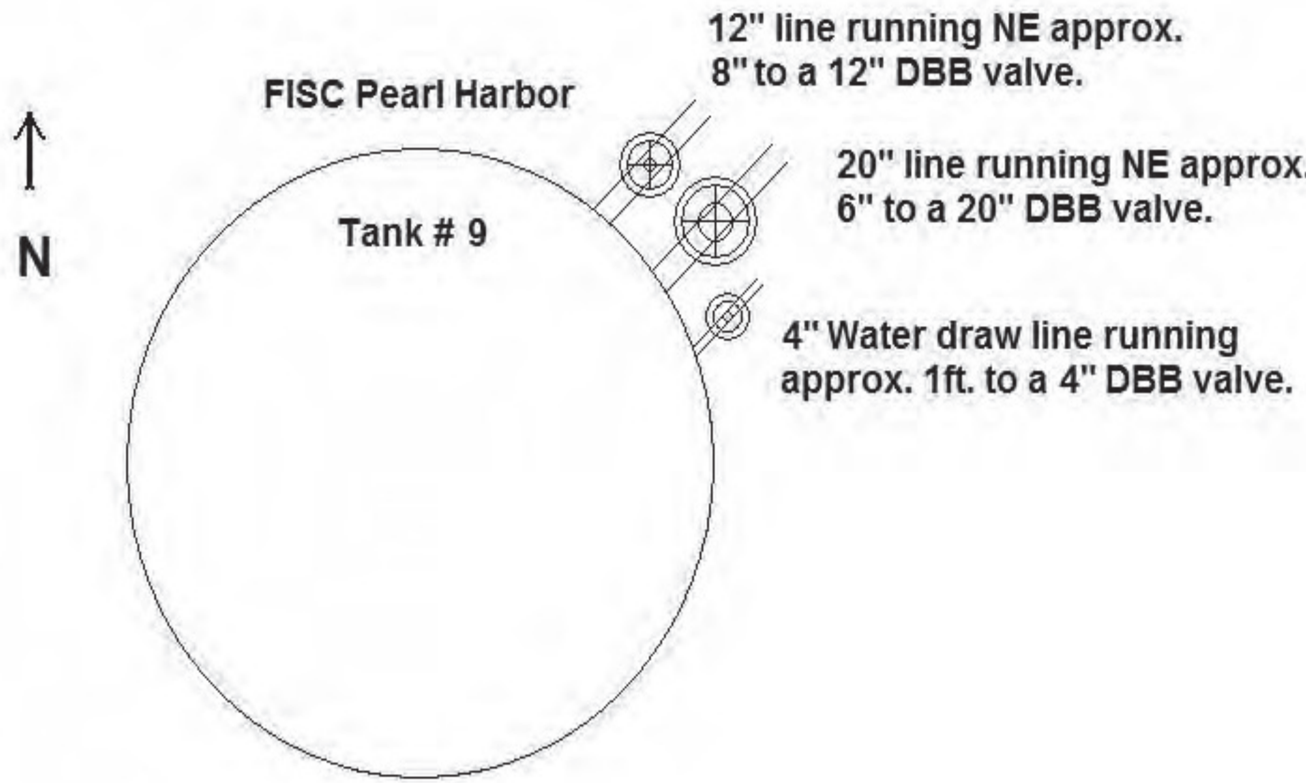
Summary

Testing of Tank # 9 a 12,600,000 gal underground storage tank located at FISC Red Hill, Pearl Harbor, Hawaii commenced October 22, 2014 and was completed October 29, 2014. The result of that testing is that the tank system is determined to be tight to isolation. All tank valves were adequately secured such that no unusual readings were noted. Testing was performed using the Mass Technology Corporation protocols set out in the third party evaluations. All tank valves were adequately secured such that any fluid loss was isolated to leakage. Therefore, the containment integrity of the tank was not compromised and the test is considered conclusive.

Tank # 9: After 168 hours of testing the tank is certified to be tight.

Tank Data Tank # 9

Diameter:	100 ft.	Height:	250 ft.
Tank Type:	Vertical UST	Contents:	JP-5
Specific Gravity:	0.82	Product Level:	211.78 ft.
Start Date:	10/22/2014	Completion Date:	10/29/2014
Unit Operator:	Travis Ricketson	Test Results:	Certified Tight

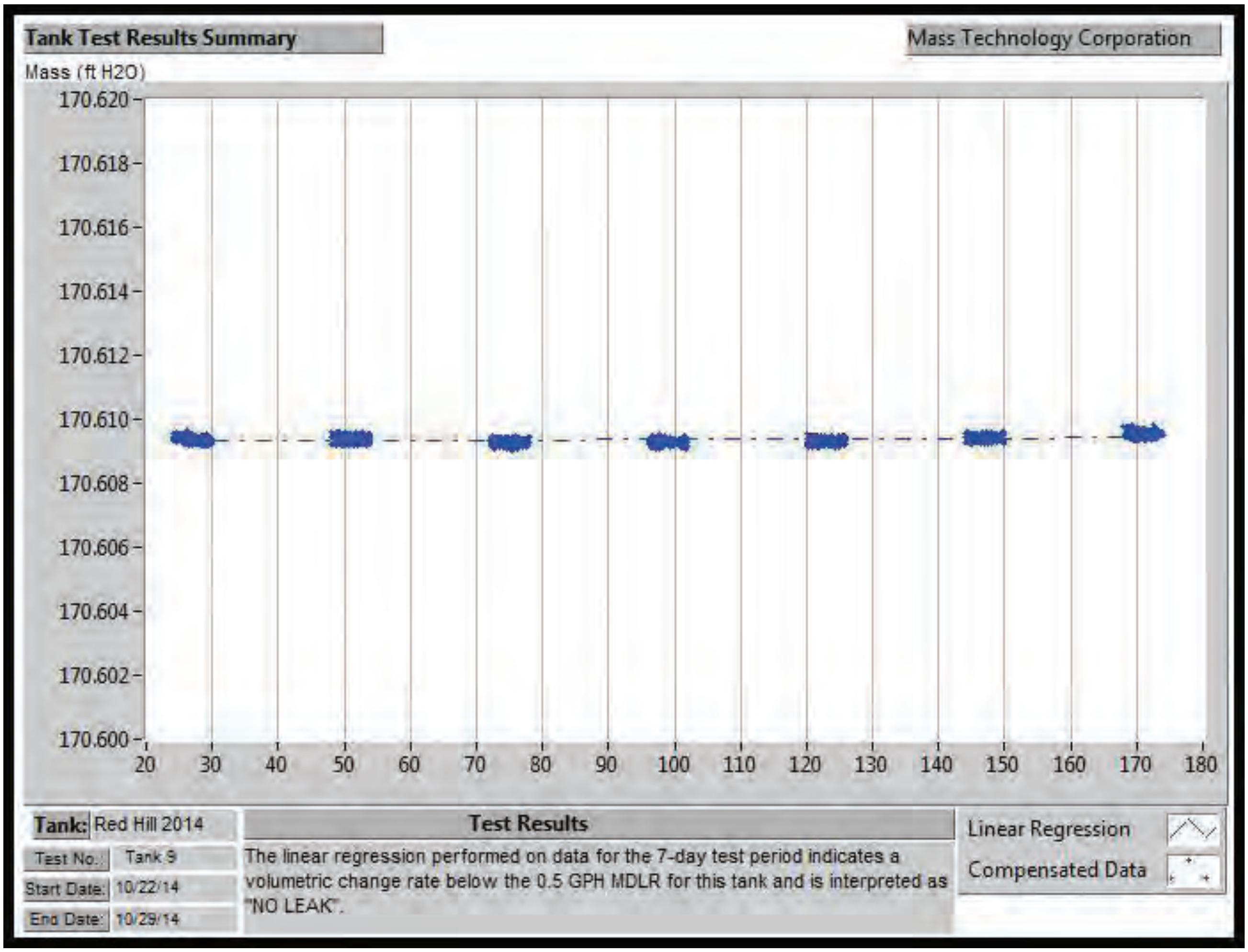


All dimensions, line locations, sizes and valve descriptions have been furnished by the facility operator.

Results

The fluid mass data was recorded over a 168-hour period. A linear regression of the recorded fluid mass data resulted in a leak rate detected below the minimum detection level of 0.5 gallons per hour. All tank valves were adequately secured such that any fluid loss was isolated to leakage. Therefore, the containment integrity of the tank was not compromised and the test is considered conclusive.

Tank # 9 is certified to be tight.



Precision Leak Measurement Report
P.O. Box 1578
Kilgore, Texas 75662

FISC Red Hill
Pearl Harbor, HI

Project Manager – Mr. Mark Caldon

Site Supervisor – Travis Ricketson

Scope of Work: Furnish all required management, labor, services, materials and equipment to perform the required annual tightness testing of Tank # 10 an underground fuel storage tank located at FISC Red Hill, Pearl Harbor, HI.

Report compiled by: ______________________ Date: 12-10-2014
Ricky Slaughter

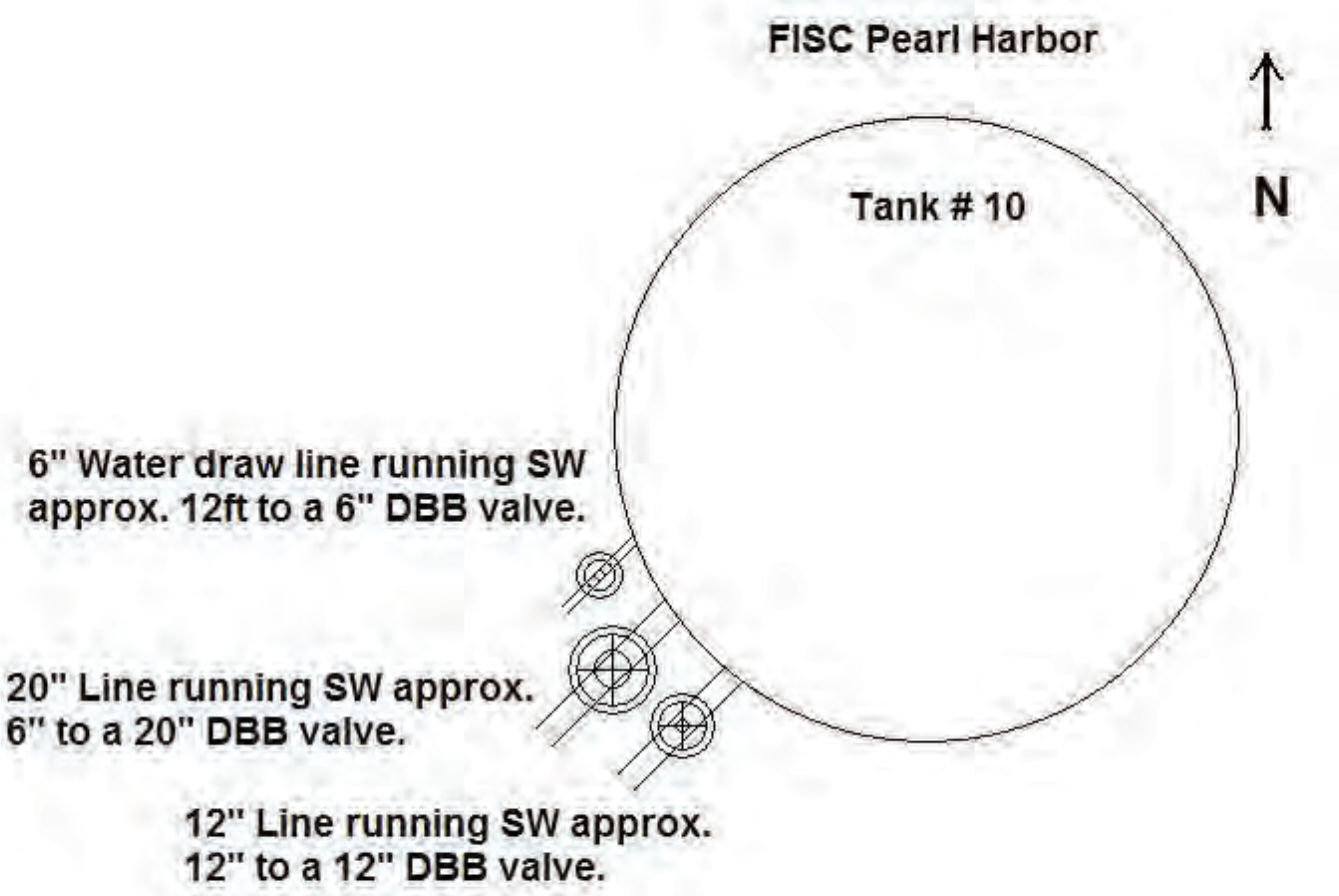
Summary

Testing of Tank # 10 a 12,600,000 gal underground storage tank located at FISC Red Hill, Pearl Harbor, Hawaii commenced October 31, 2014 and was completed November 7, 2014. The tank contained JP-5 and a precision leak test was conducted. The result of that testing is that the tank system is determined to be tight to isolation. All tank valves were adequately secured such that no unusual readings were noted. Testing was performed using the Mass Technology Corporation protocols set out in the third party evaluations. All tank valves were adequately secured such that any fluid loss was isolated to leakage. Therefore, the containment integrity of the tank was not compromised and the test is considered conclusive.

Tank # 10: After 168 hours of testing the tank is certified to be tight.

Tank Data Tank # 10

Diameter:	100 ft.	Height:	250 ft.
Tank Type:	Vertical UST	Contents:	JP-5
Specific Gravity:	0.82	Product Level:	211.43 ft.
Start Date:	10/31/2014	Completion Date:	11/07/2014
Unit Operator:	Travis Ricketson	Test Results:	Certified Tight

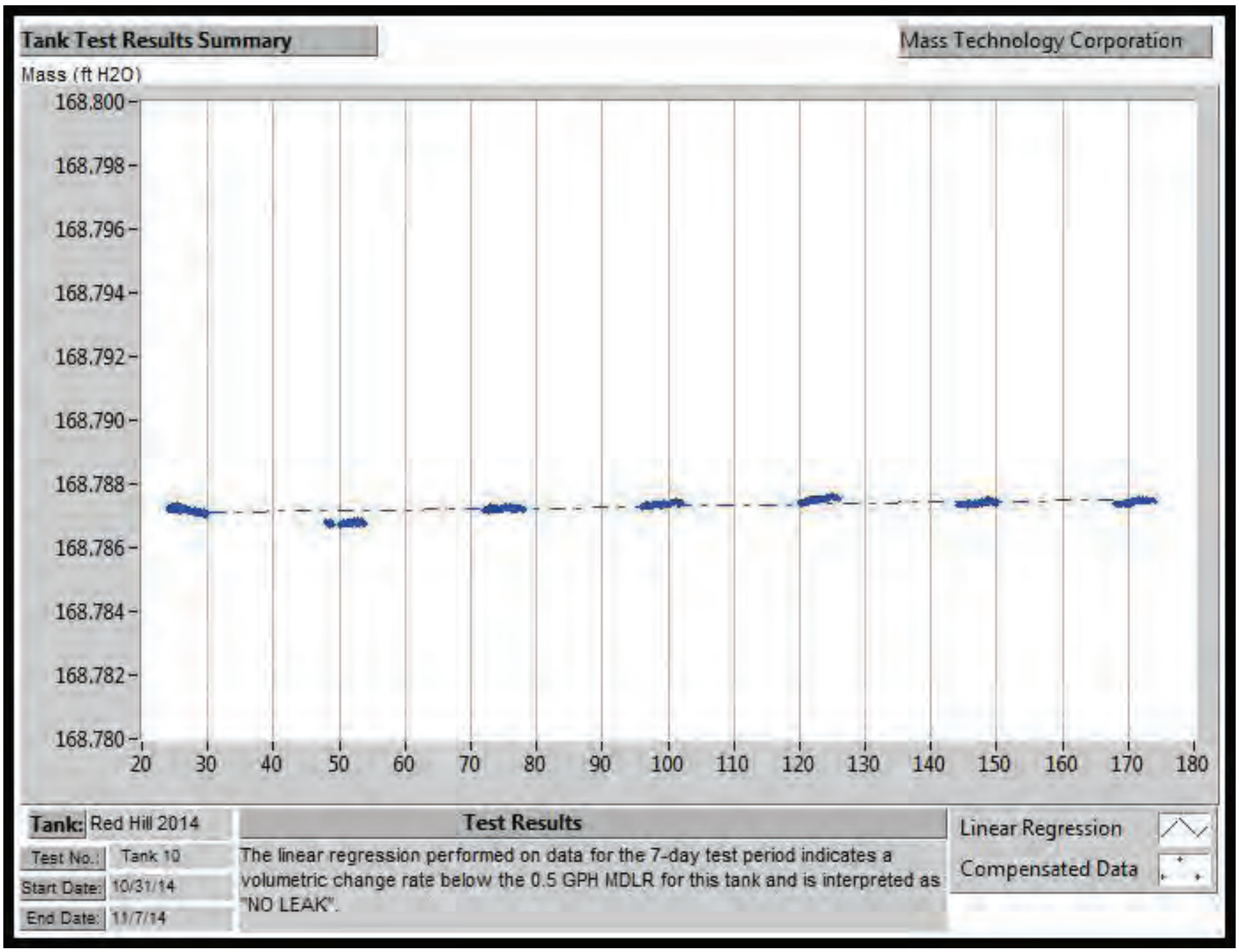


All dimensions, line locations, sizes and valve descriptions have been furnished by the facility operator.

Results

The fluid mass data was recorded over a 168-hour period. A linear regression of the recorded fluid mass data resulted in a leak rate detected below the minimum detection level of 0.5 gallons per hour. All tank valves were adequately secured such that any fluid loss was isolated to leakage. Therefore, the containment integrity of the tank was not compromised and the test is considered conclusive.

Tank # 10 is certified to be tight.



Precision Leak Measurement Report
P.O. Box 1578
Kilgore, Texas 75662

FISC Red Hill
Pearl Harbor, HI

Project Manager – Mr. Mark Caldon

Site Supervisor – Travis Ricketson

Scope of Work: Furnish all required management, labor, services, materials and equipment to perform the required annual tightness testing of Tank # 11 an underground fuel storage tank located at FISC Red Hill, Pearl Harbor, HI.

Report compiled by: ______________________ Date: 03-13-2015
Ricky Slaughter

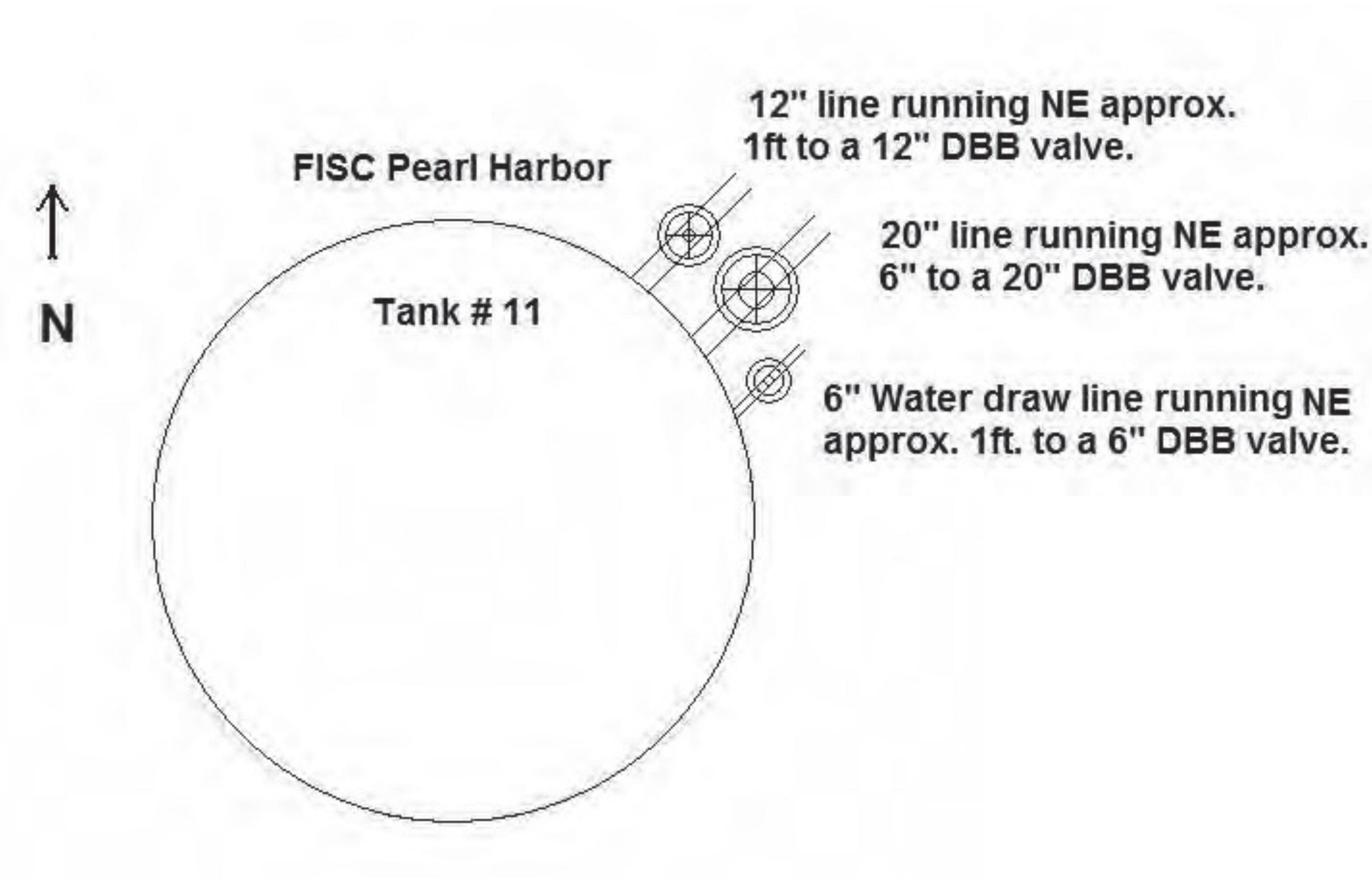
Summary

Testing of Tank # 11 a 12,600,000 gal underground storage tank located at FISC Red Hill, Pearl Harbor, Hawaii commenced February 18, 2015 and was completed February 23, 2015. The result of that testing is that the tank system is determined to be tight to isolation. All tank valves were adequately secured such that no unusual readings were noted. Testing was performed using the Mass Technology Corporation protocols set out in the third party evaluations. All tank valves were adequately secured such that any fluid loss was isolated to leakage. Therefore, the containment integrity of the tank was not compromised and the test is considered conclusive.

Tank # 11: After 120 hours of testing the tank is certified to be tight.

Tank Data Tank # 11

Diameter:	100 ft.	Height:	250 ft.
Tank Type:	Vertical UST	Contents:	JP-5
Specific Gravity:	0.82	Product Level:	211.9 ft.
Start Date:	02/18/2015	Completion Date:	02/23/2015
Unit Operator:	Travis Ricketson	Test Results:	Certified Tight

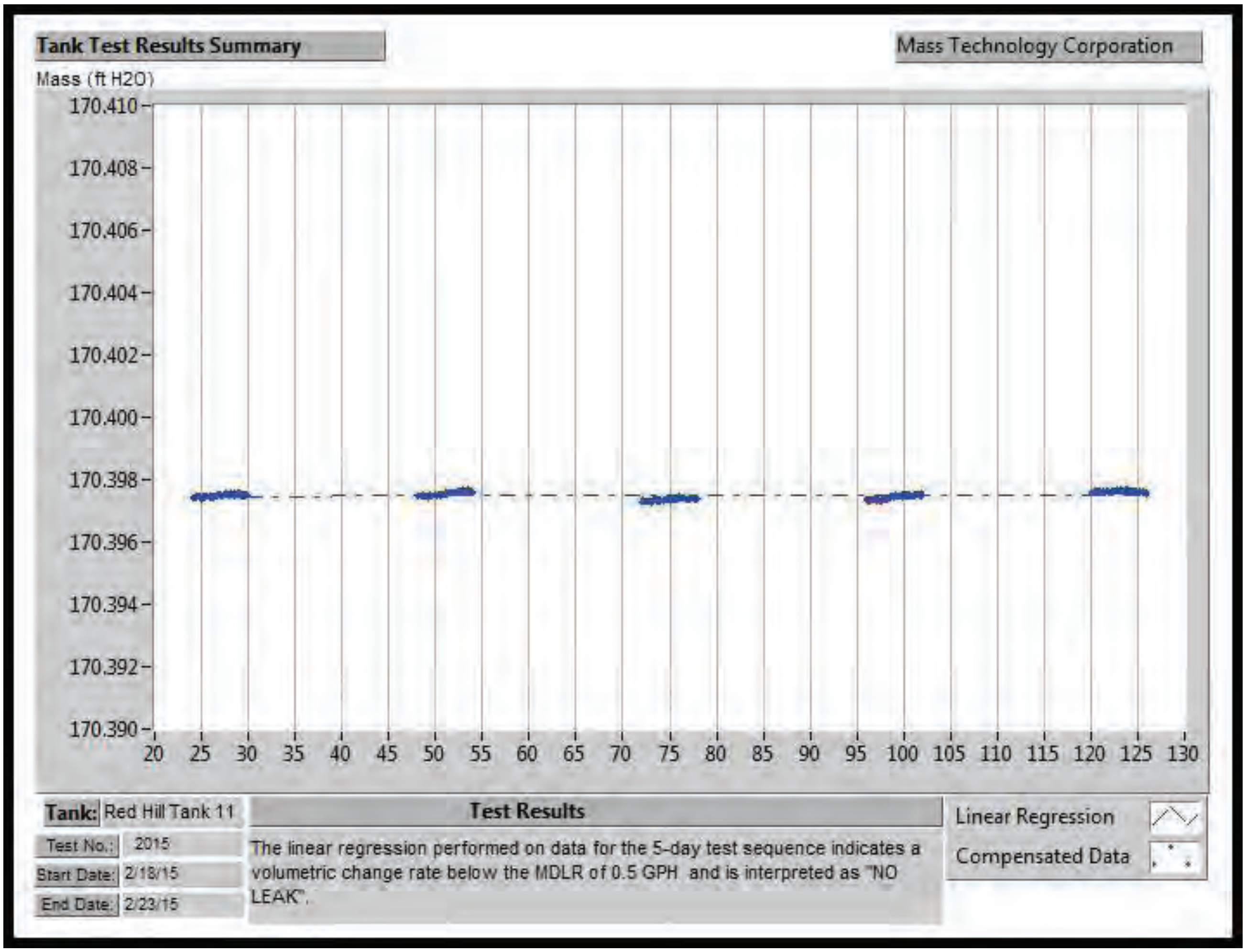


All dimensions, line locations, sizes and valve descriptions have been furnished by the facility operator.

Results

The fluid mass data was recorded over a 120-hour period. A linear regression of the recorded fluid mass data resulted in a leak rate detected below the minimum detection level of 0.5 gallons per hour. All tank valves were adequately secured such that any fluid loss was isolated to leakage. Therefore, the containment integrity of the tank was not compromised and the test is considered conclusive.

Tank # 11 is certified to be tight.



Precision Leak Measurement Report
P.O. Box 1578
Kilgore, Texas 75662

FISC Red Hill
Pearl Harbor, HI

Project Manager – Mr. Mark Caldon

Site Supervisor – Travis Ricketson

Scope of Work: Furnish all required management, labor, services, materials and equipment to perform the required annual tightness testing of Tank # 12 an underground fuel storage tank located at FISC Red Hill, Pearl Harbor, HI.

Report compiled by: ______________________
Ricky Slaughter

Date: 12-10-2014

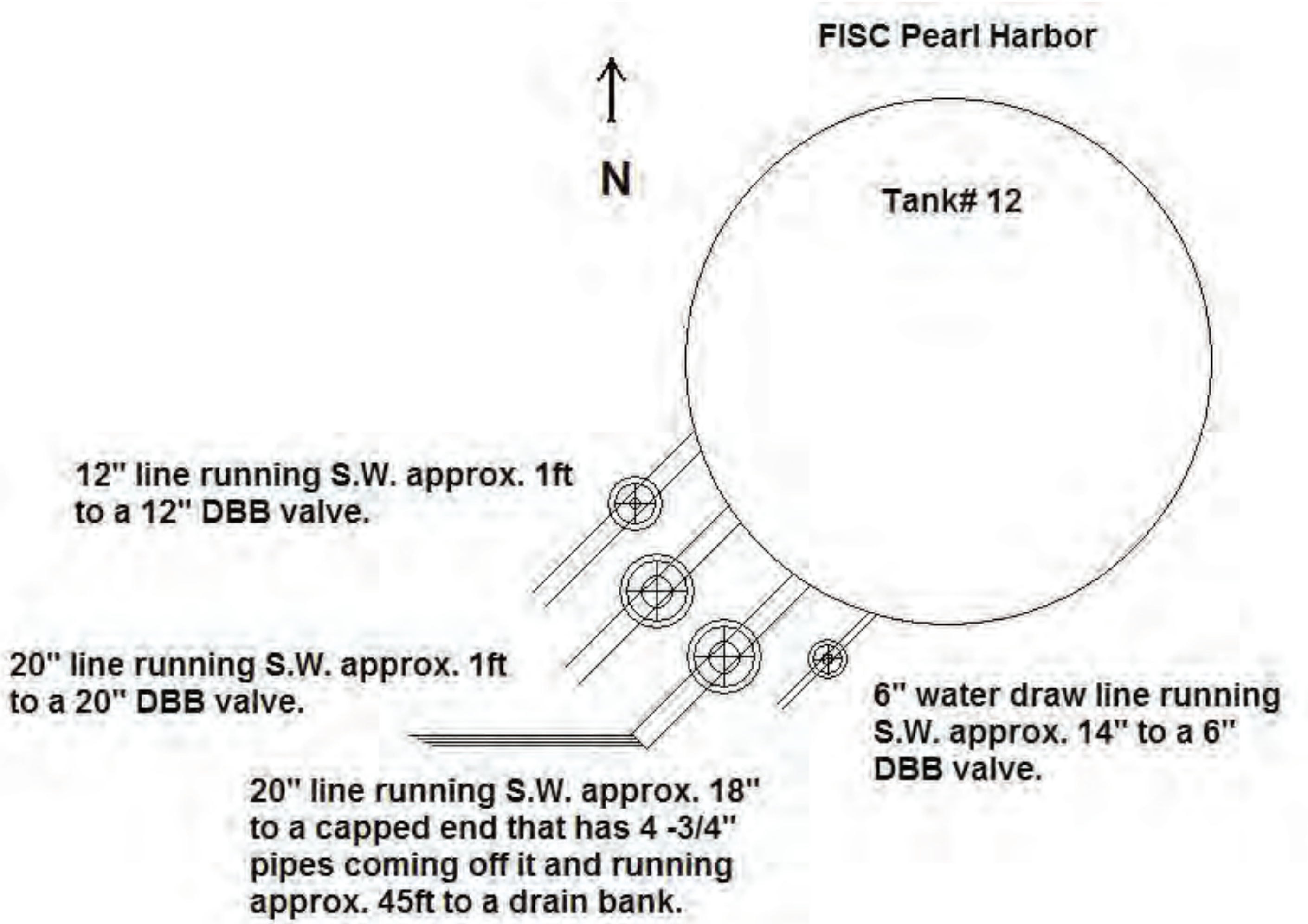
Summary

Testing of Tank # 12 a 12,600,000 gal underground storage tank located at FISC Red Hill, Pearl Harbor, Hawaii commenced November 6, 2014 and was completed November 13, 2014. The result of that testing is that the tank system is determined to be tight to isolation. All tank valves were adequately secured such that no unusual readings were noted. Testing was performed using the Mass Technology Corporation protocols set out in the third party evaluations. All tank valves were adequately secured such that any fluid loss was isolated to leakage. Therefore, the containment integrity of the tank was not compromised and the test is considered conclusive.

Tank # 12: After 168 hours of testing the tank is certified to be tight.

Tank Data Tank # 12

Diameter:	100 ft.	Height:	250 ft.
Tank Type:	Vertical UST	Contents:	JP-5
Specific Gravity:	0.82	Product Level:	212.39 ft.
Start Date:	11/06/2014	Completion Date:	11/13/2014
Unit Operator:	Travis Ricketson	Test Results:	Certified Tight

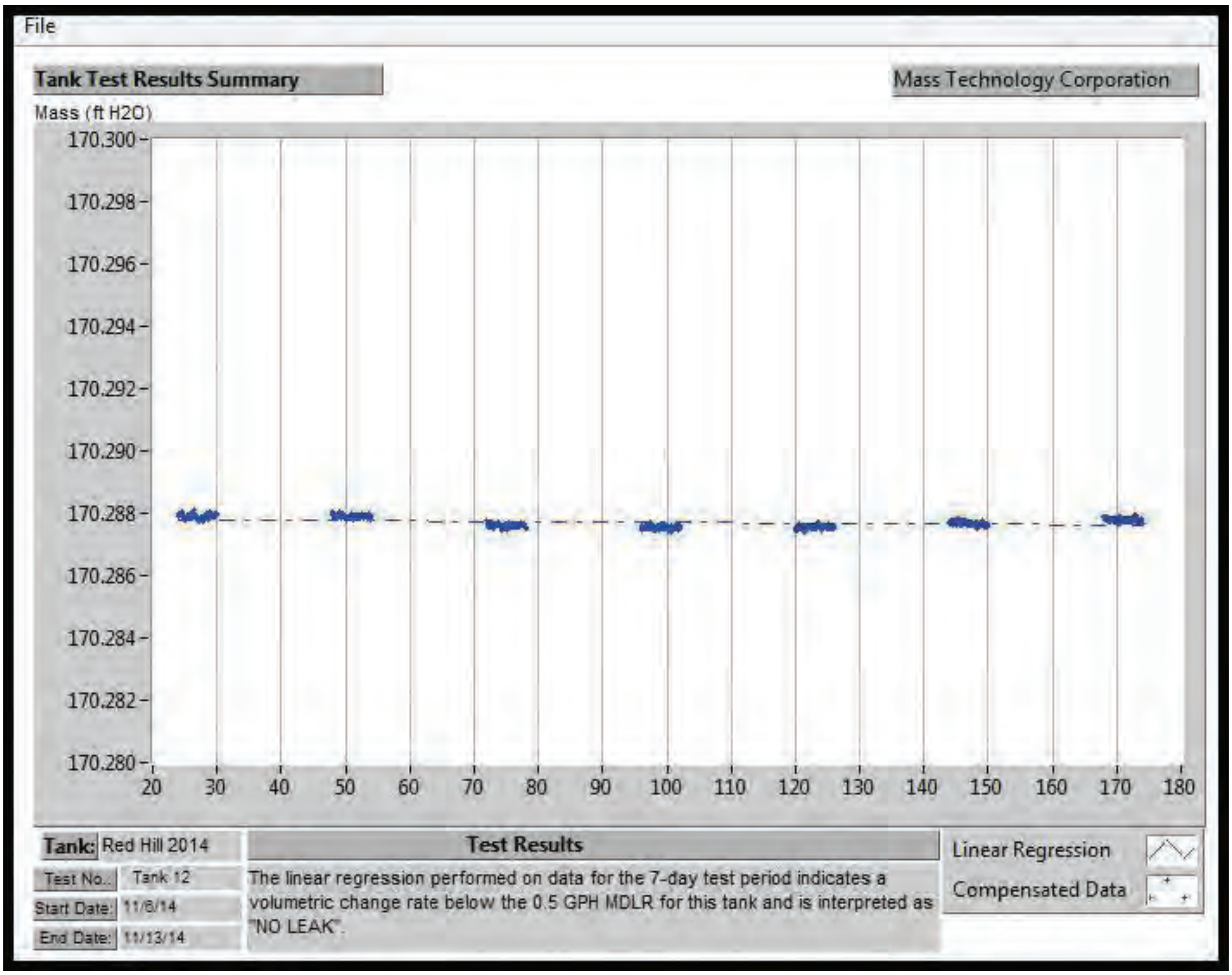


All dimensions, line locations, sizes and valve descriptions have been furnished by the facility operator.

Results

The fluid mass data was recorded over a 168-hour period. A linear regression of the recorded fluid mass data resulted in a leak rate detected below the minimum detection level of 0.5 gallons per hour. All tank valves were adequately secured such that any fluid loss was isolated to leakage. Therefore, the containment integrity of the tank was not compromised and the test is considered conclusive.

Tank # 12 is certified to be tight.



Precision Leak Measurement Report
P.O. Box 1578
Kilgore, Texas 75662

FISC Red Hill
Pearl Harbor, HI

Project Manager – Mr. Mark Caldon

Site Supervisor – Travis Ricketson

Scope of Work: Furnish all required management, labor, services, materials and equipment to perform the required annual tightness testing of Tank # 13 an underground fuel storage tank located at FISC Red Hill, Pearl Harbor, HI.

Report compiled by: ______________________ Date: 05-18-2015
Ricky Slaughter

Summary

Testing of Tank # 13 a 12,600,000 gal underground storage tank located at FISC Red Hill, Pearl Harbor, Hawaii commenced April 29, 2015 and was completed May 4, 2015. The result of that testing is that the tank system is determined to be tight to isolation. All tank valves were adequately secured such that no unusual readings were noted. Testing was performed using the Mass Technology Corporation protocols set out in the third party evaluations. All tank valves were adequately secured such that any fluid loss was isolated to leakage. Therefore, the containment integrity of the tank was not compromised and the test is considered conclusive.

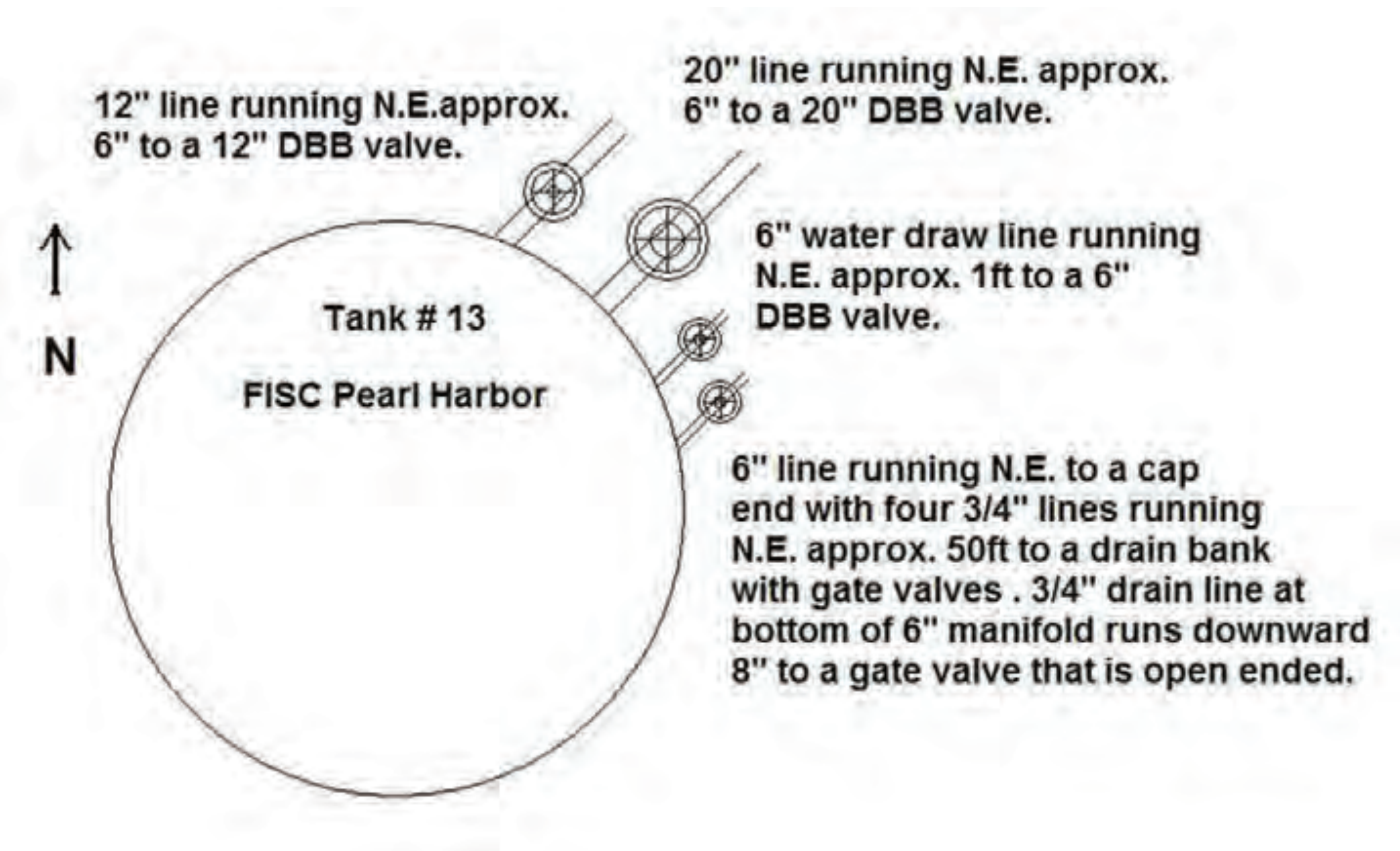
Tank # 13: After 120 hours of testing the tank is certified to be tight.

N00126

Exhibit N-2B

Tank Data Tank # 13

Diameter:	100 ft.	Height:	250 ft.
Tank Type:	Vertical UST	Contents:	F76
Specific Gravity:	0.84	Product Level:	212.45 ft.
Start Date:	04/29/2015	Completion Date:	05/04/2015
Unit Operator:	Travis Ricketson	Test Results:	Certified Tight

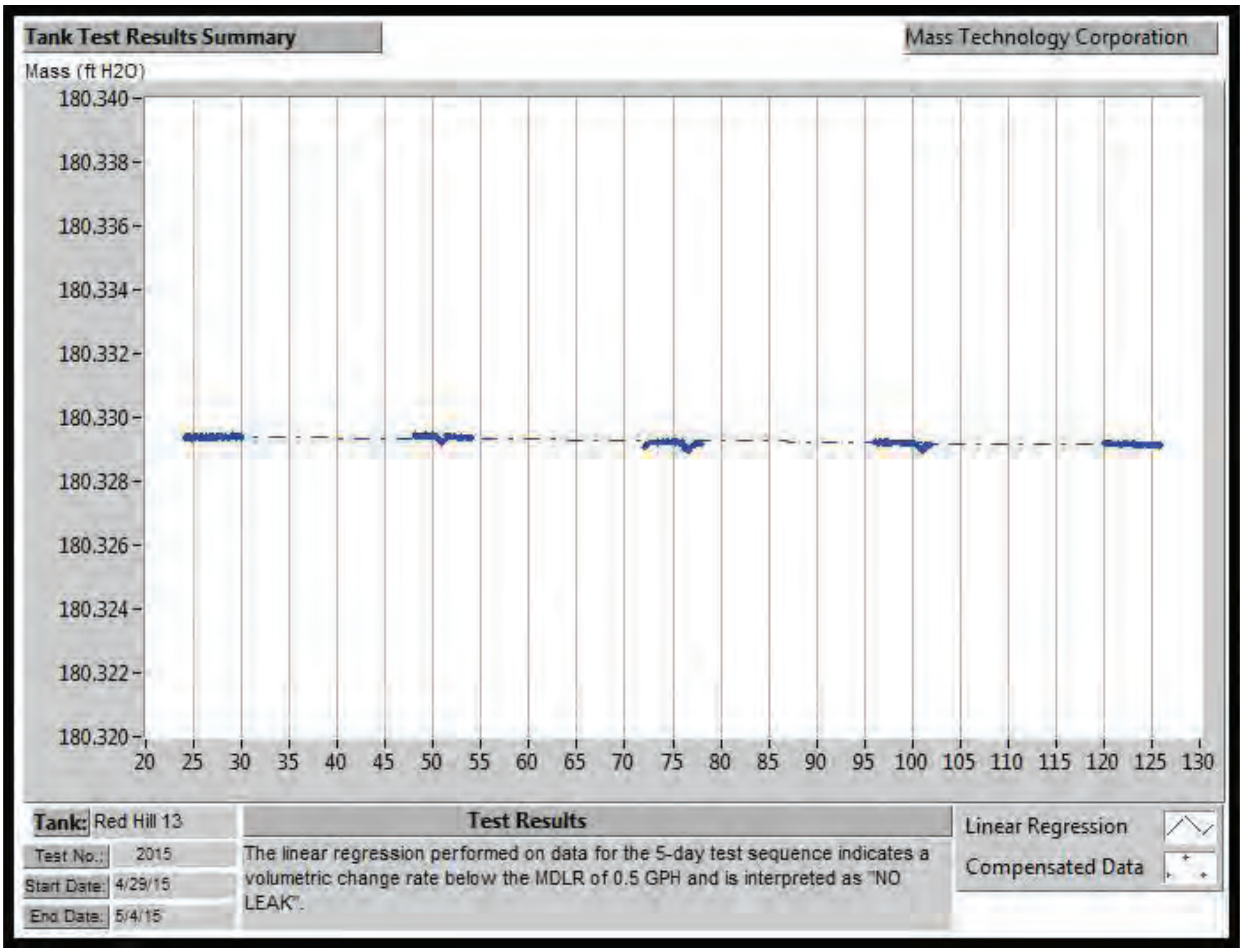


All dimensions, line locations, sizes and valve descriptions have been furnished by the facility operator.

Results

The fluid mass data was recorded over a 120-hour period. A linear regression of the recorded fluid mass data resulted in a change rate detected below the minimum detection level of 0.5 gallons per hour. All tank valves were adequately secured such that any fluid loss was isolated to leakage. Therefore, the containment integrity of the tank was not compromised and the test is considered conclusive.

Tank # 13 is certified to be tight.



Mass Technology CORPORATION

Precision Leak Measurement Report
P.O. Box 1578
Kilgore, Texas 75662

FISC Red Hill
Pearl Harbor, HI

Project Manager – Mr. Mark Caldon

Site Supervisor – Travis Ricketson

Scope of Work: Furnish all required management, labor, services, materials and equipment to perform the required annual tightness testing of Tank # 15 an underground fuel storage tank located at FISC Red Hill, Pearl Harbor, HI.

Report compiled by: ______________________ Date: 05-18-2015
Ricky Slaughter

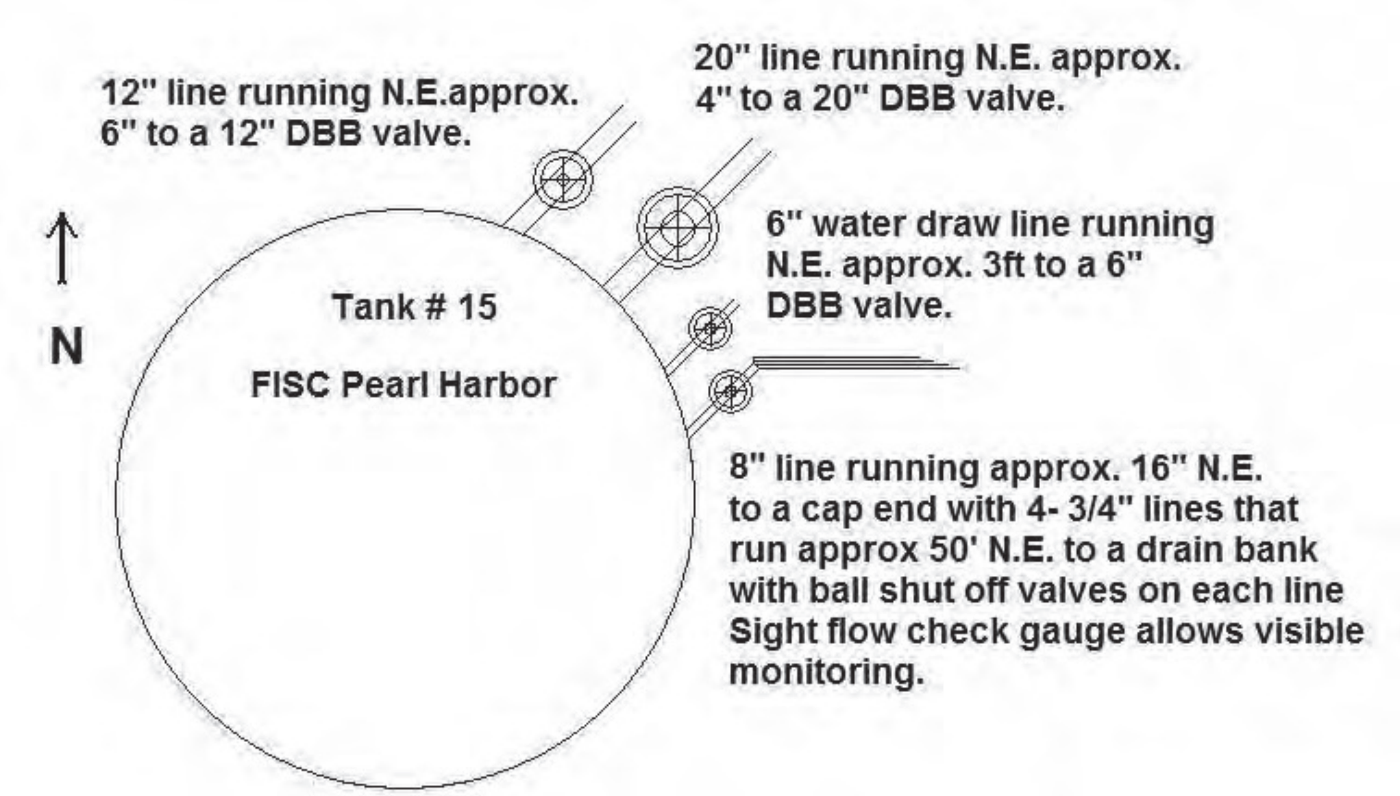
Summary

Testing of Tank # 15 a 12,600,000 gal underground storage tank located at FISC Red Hill, Pearl Harbor, Hawaii commenced May 9, 2015 and was completed May 14, 2015. The result of that testing is that the tank system is determined to be tight to isolation. All tank valves were adequately secured such that no unusual readings were noted. Testing was performed using the Mass Technology Corporation protocols set out in the third party evaluations. All tank valves were adequately secured such that any fluid loss was isolated to leakage. Therefore, the containment integrity of the tank was not compromised and the test is considered conclusive.

Tank # 15: After 120 hours of testing the tank is certified to be tight.

Tank Data Tank # 15

Diameter:	100 ft.	Height:	250 ft.
Tank Type:	Vertical UST	Contents:	F76
Specific Gravity:	0.84	Product Level:	210.82 ft.
Start Date:	05/09/2015	Completion Date:	05/14/2015
Unit Operator:	Travis Ricketson	Test Results:	Certified Tight

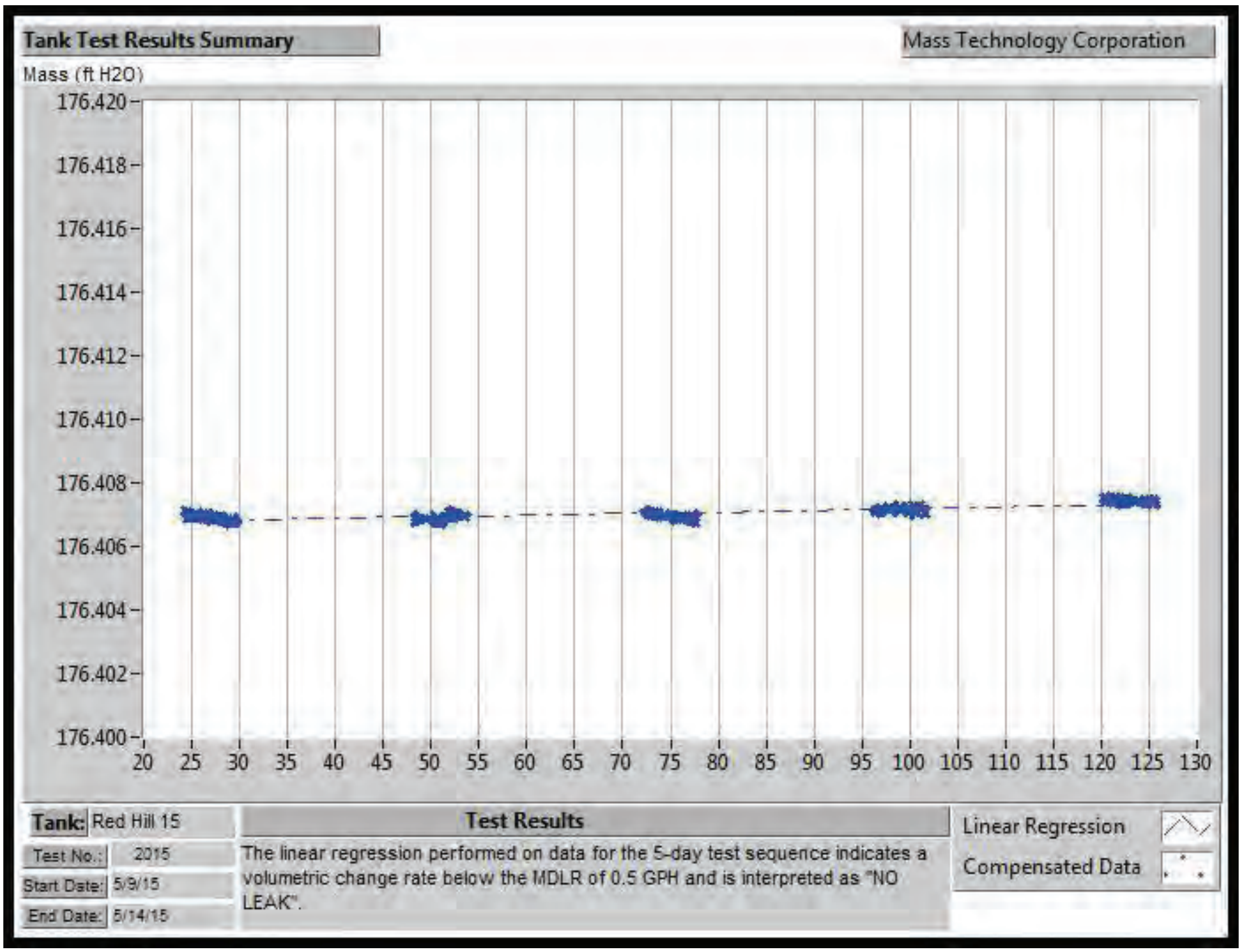


All dimensions, line locations, sizes and valve descriptions have been furnished by the facility operator.

Results

The fluid mass data was recorded over a 120-hour period. A linear regression of the recorded fluid mass data resulted in a change rate detected below the minimum detection level of 0.5 gallons per hour. All tank valves were adequately secured such that any fluid loss was isolated to leakage. Therefore, the containment integrity of the tank was not compromised and the test is considered conclusive.

Tank # 15 is certified to be tight.



Precision Leak Measurement Report
P.O. Box 1578
Kilgore, Texas 75662

FISC Red Hill
Pearl Harbor, HI

Project Manager – Mr. Mark Caldon

Site Supervisor – Travis Ricketson

Scope of Work: Furnish all required management, labor, services, materials and equipment to perform the required annual tightness testing of Tank # 16 an underground fuel storage tank located at FISC Red Hill, Pearl Harbor, HI.

Report compiled by: ______________________
Ricky Slaughter

Date: 05-18-2015

Summary

Testing of Tank # 16 a 12,600,000 gal underground storage tank located at FISC Red Hill, Pearl Harbor, Hawaii commenced May 4, 2015 and was completed May 9, 2015. The result of that testing is that the tank system is determined to be tight to isolation. All tank valves were adequately secured such that no unusual readings were noted. Testing was performed using the Mass Technology Corporation protocols set out in the third party evaluations. All tank valves were adequately secured such that any fluid loss was isolated to leakage. Therefore, the containment integrity of the tank was not compromised and the test is considered conclusive.

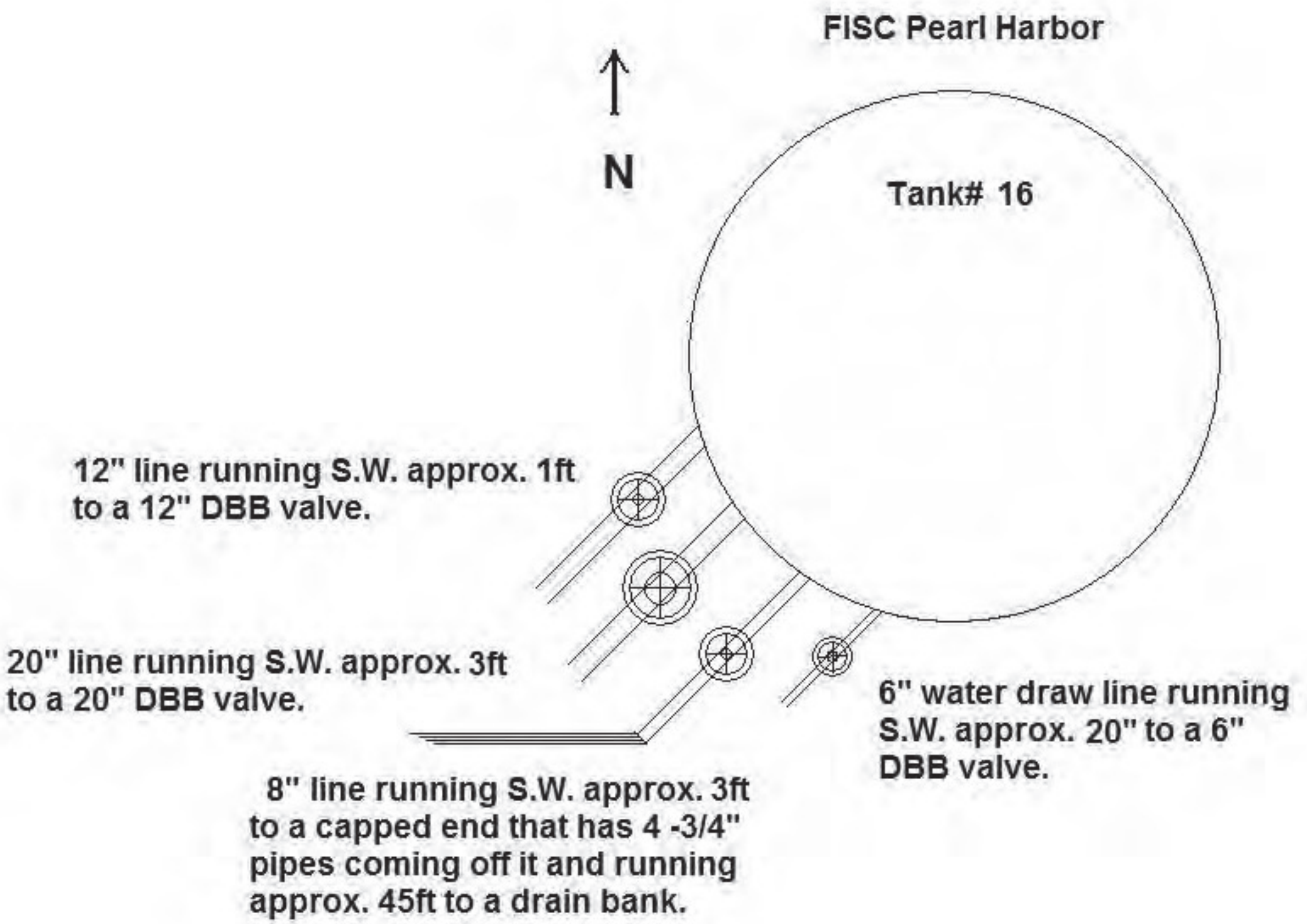
Tank # 16: After 120 hours of testing the tank is certified to be tight.

N00132

Exhibit N-2B

Tank Data Tank # 16

Diameter:	100 ft.	Height:	250 ft.
Tank Type:	Vertical UST	Contents:	F76
Specific Gravity:	0.84	Product Level:	58.59 ft.
Start Date:	05/04/2015	Completion Date:	05/09/2015
Unit Operator:	Travis Ricketson	Test Results:	Certified Tight

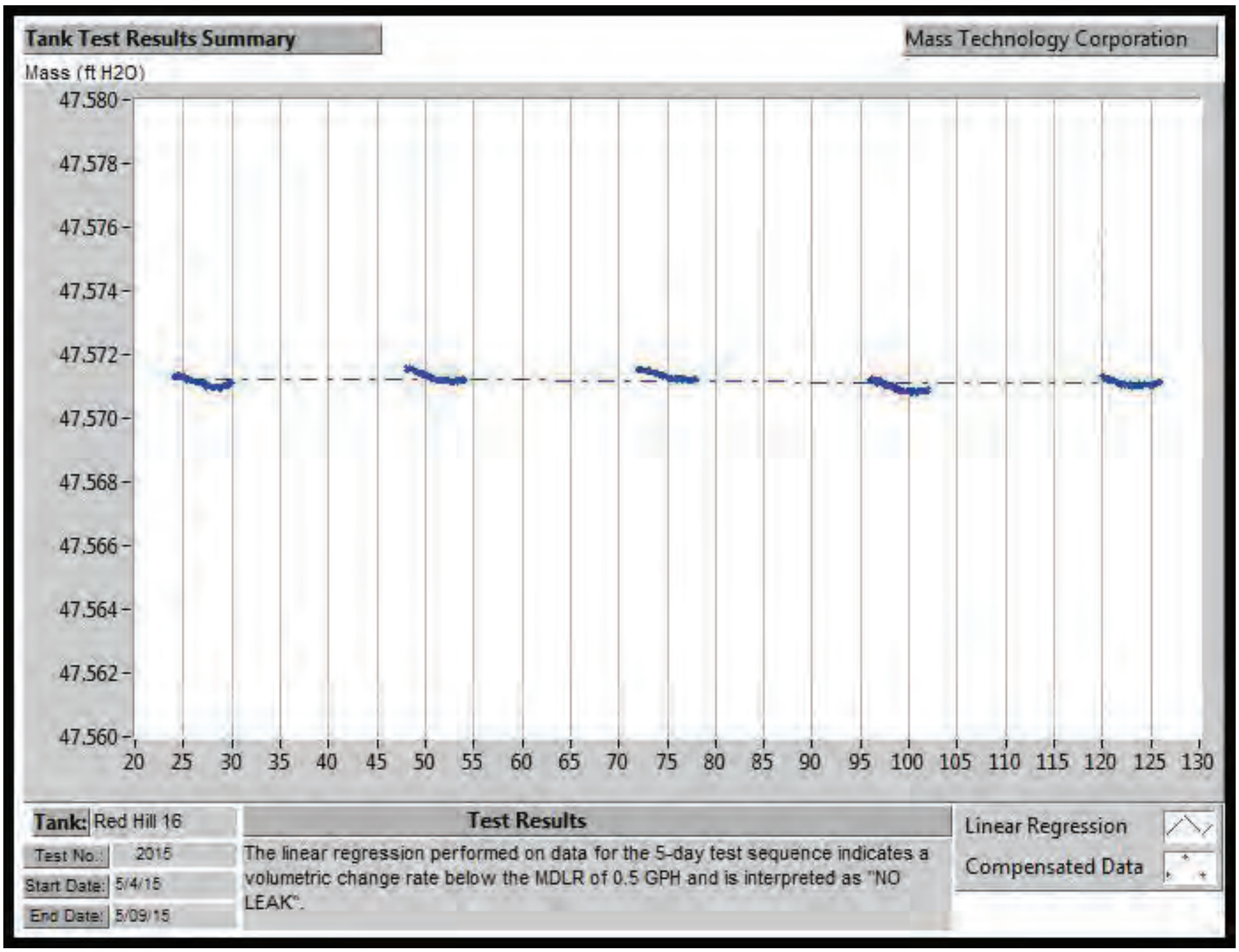


All dimensions, line locations, sizes and valve descriptions have been furnished by the facility operator.

Results

The fluid mass data was recorded over a 120-hour period. A linear regression of the recorded fluid mass data resulted in a change rate detected below the minimum detection level of 0.5 gallons per hour. All tank valves were adequately secured such that any fluid loss was isolated to leakage. Therefore, the containment integrity of the tank was not compromised and the test is considered conclusive.

Tank # 16 is certified to be tight.



Precision Leak Measurement Report
P.O. Box 1578
Kilgore, Texas 75662

FISC Red Hill
Pearl Harbor, HI

Project Manager – Mr. Mark Caldon

Site Supervisor – Travis Ricketson

Scope of Work: Furnish all required management, labor, services, materials and equipment to perform the required annual tightness testing of Tank # 20 an underground fuel storage tank located at FISC Red Hill, Pearl Harbor, HI.

Report compiled by: ______________________ Date: 12-10-2014
Ricky Slaughter

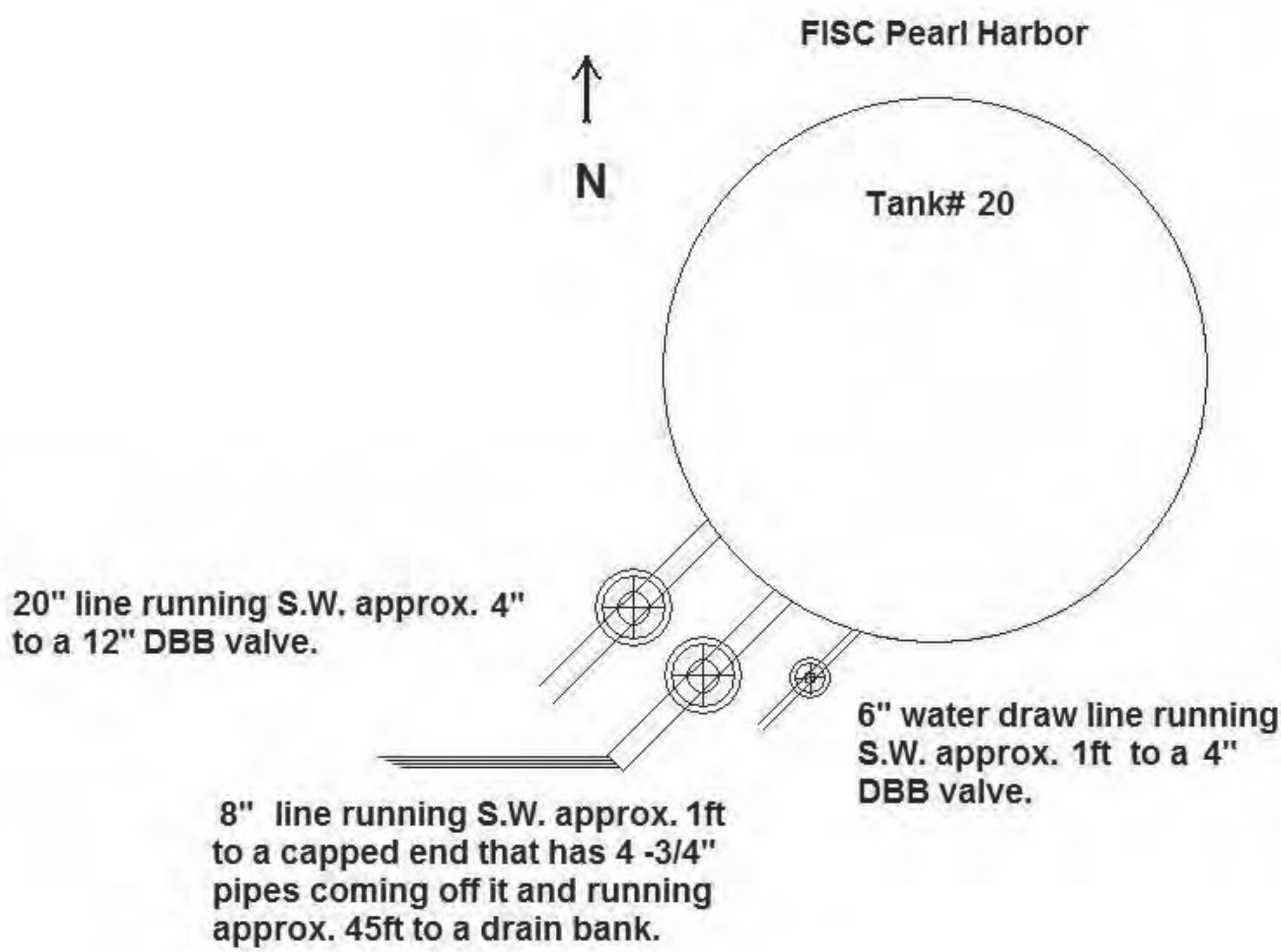
Summary

Testing of Tank # 20 a 12,600,000 gal underground storage tank located at FISC Red Hill, Pearl Harbor, Hawaii commenced October 29, 2014 and was completed November 5, 2014. The tank contained JP-5 and a precision leak test was conducted. The result of that testing is that the tank system is determined to be tight to isolation. All tank valves were adequately secured such that no unusual readings were noted. Testing was performed using the Mass Technology Corporation protocols set out in the third party evaluations. All tank valves were adequately secured such that any fluid loss was isolated to leakage. Therefore, the containment integrity of the tank was not compromised and the test is considered conclusive.

Tank # 20: After 168 hours of testing the tank is certified to be tight.

Tank Data Tank # 20

Diameter:	100 ft.	Height:	250 ft.
Tank Type:	Vertical UST	Contents:	JP-5
Specific Gravity:	0.82	Product Level:	211.45 ft.
Start Date:	10/29/2014	Completion Date:	11/05/2014
Unit Operator:	Travis Ricketson	Test Results:	Certified Tight

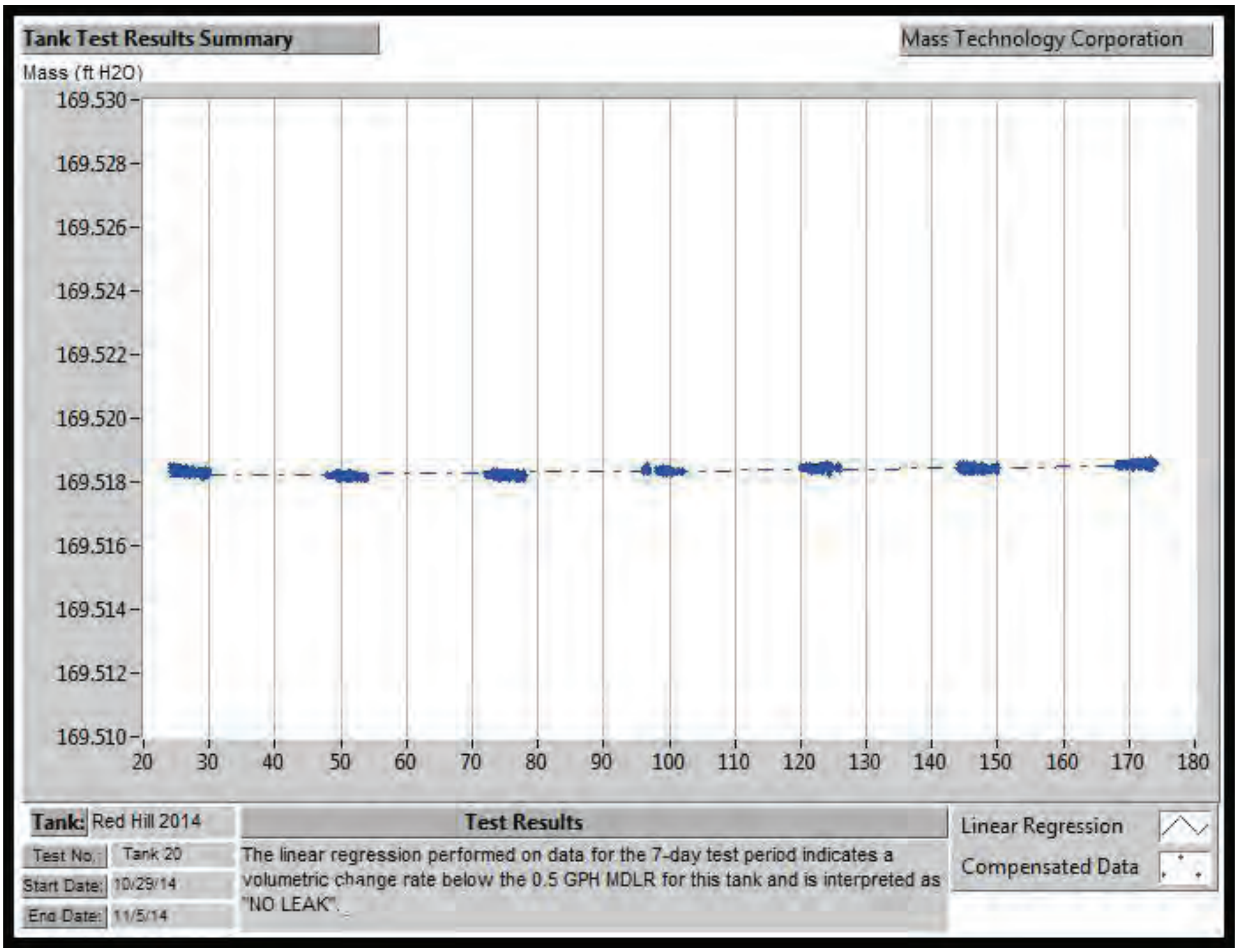


All dimensions, line locations, sizes and valve descriptions have been furnished by the facility operator.

Results

The fluid mass data was recorded over a 168-hour period. A linear regression of the recorded fluid mass data resulted in a leak rate detected below the minimum detection level of 0.5 gallons per hour. All tank valves were adequately secured such that any fluid loss was isolated to leakage. Therefore, the containment integrity of the tank was not compromised and the test is considered conclusive.

Tank # 20 is certified to be tight.



UFM REPORT

12/25/2015

Background:	EXAMPLE: At (time), on (Day of the week), December 25, 2015, Red Hill tank 0110 had a UFM
Action:	At (time) placed the tank into an evolution to remove the alarm
	At (time) the Red Hill Rover checked lower and upper tunnels
	(all Conditions were normal or the following problems were found)
	At (time) the Red Hill rover top gauged tank 0110
	The comparison from the last top gauge is 01/16"
Cause:	I believe the AFHE computer for tank 0110 may need calibration or to be reset. Tank 0110 dropped down to 207'-09-15/16". The tank is still in an evolution for AFHE fuel level movement and for monitoring. Also, the BS&W has risen from 0'-00-00" to 05'-07-05/16". The BS&W level alarm has been activated on AFHE for tank 0110.

Top Gauge of Tank 0110:

	Date:	Time:	Top Gauge	Rover Name
Previous:	20-Dec-15	4:00 PM	211'-08-06/16"	D. Cardona
Current:	25-Dec-15	5:20 AM	211'-08-06/16"	J. Espenida

Originator and Review:

		Name
Created by:	Concur/Do Not Concur	Alex Bayudan
Bulk Supervisor:	Concur/Do Not Concur	Sam Perfecto
Fuel Operation Supervisor:	Concur/Do Not Concur	Tom Williams
Deputy Director:	Concur/Do Not Concur	John Floyd
Director:	Concur/Do Not Concur	LCDR Lovgren

Encl (1)

WEEKLY UFM SUMMARY REPORT 2/11/2016

Background:	Example: For the week of 04 - 11 February, there were no UFM to Report.
Action:	No action required
Cause:	N/A

Top Gauge of Tank 0110:

	Date:	Time:	Top Gauge	Rover Name
Previous:				
Current:				

Originator and Review:

		Name
Created by:	N/A	Edgar Pascua
Bulk Supervisor:	Concur/Do Not Concur	Sam Perfecto
Fuel Operation Supervisor:	Concur/Do Not Concur	Tom Williams
Deputy Director:	Concur/Do Not Concur	John Floyd
Director:	Concur/Do Not Concur	LCDR Lovgren

ENCL (2)

MEMORANDUM FOR THE RECORD 31 December 2015

From: Williams, Thomas M., NAVSUP Pearl Harbor, Code 703, Fuel Operations Supervisor

Subj: MEMORANDUM FOR THE RECORD (MFR) ISO UFM REPORTS FROM 25 DECEMBER TO 31 DECEMBER 2015

The purpose of this MFR is to record that no UFMs were reported for the period starting 25 December 2015 and ending 31 December 2015 from the UGPH Operators and there were no UFMs logged on the AFHE system.

T. M. Williams

UFM REPORT

1/20/2016

Background:	ISSUE 2190 FROM TK#1811I TO FLCPH T/T
Action:	MID SHIFT OPERATOR SET UP EVOLUTION FOR ISSUE
Cause:	SET UP WRONG METER NUMBER, OPERATOR ERROR

Top Gauge of Tank 0110:

	Date:	Time:	Top Gauge	Rover Name
Previous:				
Current:				

Originator and Review:

		Name
Created by:	Concur/Do Not Concur	ALTON DAITE
Bulk Supervisor:	Concur/Do Not Concur	Sam Perfecto
Fuel Operation Supervisor:	Concur/Do Not Concur	Tom Williams
Deputy Director:	Concur/Do Not Concur	John Floyd
Director:	Concur/Do Not Concur	LCDR Lovgren

UFM REPORT

02 Feb 16

Background:	Red Hill tank 0104 activated UFM alarm during manual input.
Action:	Tank topped off pass ops limit for Mass Tech high level testing. In process of manual gauging to complete transfer record after transfer.
Cause:	Operator's error; cannot calculate tank level pass ops limit on manual input from AFHE. Tom Williams Comment: No fuel moved. This was caused by the operator putting a manual level entry ionto the AFHE system after the tank was filled to above the High operating limit. The manual change reverted to the actual level and that made it seem like there was fuel movement.

:

	Date:	Time:	Top Gauge	Rover Name
Previous:				
Current:				

Originator and Review:

		NAME
Created by: E. Pascua	~~Concur/Do Not Concur~~	Edgar Pascua
Bulk Supervisor:	Concur/Do Not Concur	Sam Pellecter
Fuel Operation Supervisor:	Concur/Do Not Concur	Tom Williams
Deputy Director:	Concur/Do Not Concur	~~John Floyd~~
Director:	Concur/Do Not Concur	LCDR Lovgren

UFM REPORT

3/22/2016

Background:	At 2338, on March 22, 2016, Surge Tank 1 had a UFM
Action:	At 2339 placed the tank into an evolution to remove the alarm Gauge and inspection not needed as this was casued by operator error
Cause:	During alignment of system for HIE (F-24) delivery, HIE was not able to provide fuel when their pumps were turned on. In the process of trouble shooting, DFSP Pearl Harbor alignment was shifted to verify flow path was open. Operator did not set up the evolution to include surge 1, so when fuel flowed into surge 1, it caused an UFM alarm. Since this was operator error, the UFM protocols were not required.

Top Gauge of Tank 0110:

	Date:	Time:	Top Gauge	Rover Name
Previous:	N/A			
Current:	N/A			

Originator and Review:

		Name
Created by:		Ron Hendricks
Bulk Supervisor:	Concur/Do Not Concur	Sam Perfecto
Fuel Operation Supervisor:	Concur/Do Not Concur	Tom Williams
Deputy Director:	Concur/Do Not Concur	John Floyd
Director:	Concur/Do Not Concur	LCDR Lovgren

Encl (1)

UFM REPORT

4/2/2016

Background:	At 1644, on April 2, 2016, Red Hill tank 0112 had a UFM
Action:	At 1644 placed the tank into an evolution to remove the alarm At 1700 the Red Hill Rover checked lower and upper tunnels all Conditions were normal At 1720 the Red Hill rover top gauged tank 0112 The comparison from the last top gauge is 01/16"
Cause:	I believe communications for AFHE computer for tank 0112 have failed as evidenced by no movement of fuel in tank 0112 as verified by Top Gauge. Englobal called and emailed. Supervisor called. COC emailed.

Top Gauge of Tank 0110:

	Date:	Time:	Top Gauge	Rover Name
Previous:	15-Mar-16	2:22 PM	211'-07-00/16"	K. Lindo
Current:	2-Apr-16	4:35 PM	210'-07-01/16"	J. Espenida

Originator and Review:

		Name
Created by:	R.J.H	Ron Hendricks
Bulk Supervisor:	Concur/Do Not Concur	Sam Perfecto
Fuel Operation Supervisor:	Concur/Do Not Concur	Tom Williams
Deputy Director:	Concur/Do Not Concur	John Floyd
Director:	Concur/Do Not Concur	LCDR Lovgren

Encl (1)

ATTACHMENT D

Recent Cathodic Protection System Rectifier Readings

Site Name	Report Date	Report Time	Channel 1 Volts	Channel 2 Amps	Maximum % Change in Volts	Maximum % Change in Amps
Rect #09 @ UTF Tank #48 & Piping	3/6/2016	19:00	7.85	12.822	32%	497%
	3/21/2016	19:00	10.7	0.018		
	4/5/2016	19:00	11.11	0.018		
	4/13/2016	4:39	11.04	0.012		
	4/20/2016	19:00	11.2	0.018		
Rect #10 @ UTF Tank #55 & Piping	3/6/2016	19:00	11.62	16.842	1%	2%
	3/21/2016	19:00	11.64	17.13		
	4/5/2016	19:00	11.68	17.148		
	4/13/2016	4:39	11.68	17.142		
	4/20/2016	19:00	11.65	17.052		
Rect #11 @ UTF Tank #54 & Piping	3/5/2016	21:00	1.19	-0.012	6%	200%
	3/20/2016	21:00	1.15	-0.006		
	4/4/2016	21:00	1.12	0.012		
	4/13/2016	4:39	1.14	0.018		
	4/13/2016	2:37	1.13	0.006		
	4/27/2016	7:00	1.13	0		
Rect #12 @ UTF Tank #53 & Piping	3/5/2016	19:00	0.87	0.018	37%	133%
	3/20/2016	19:00	0.85	0.03		
	4/4/2016	19:00	0.86	0.012		
	4/13/2016	4:39	0.82	0.024		
	4/19/2016	19:00	1.16	0.006		
Rect #13 @ UTF Tank #46 & Piping	3/5/2016	21:00	12.82	7.11	2%	13%
	3/20/2016	21:00	12.69	7.56		
	4/4/2016	21:00	12.65	7.914		
	4/13/2016	4:39	12.68	8.106		
	4/19/2016	21:00	12.58	8.124		
Rect #14 @ UTF Tank #47 & Piping	3/6/2016	19:00	5.98	27.168	1%	6%
	3/21/2016	19:00	5.95	27.888		
	4/5/2016	19:00	5.99	28.068		
	4/13/2016	4:39	6	28.134		
	4/20/2016	19:01	5.96	26.364		
Rect #16 @ Fitness Center	3/6/2016	19:00	2.33	0.048	1%	81%
	3/21/2016	19:00	2.35	0.024		
	4/5/2016	19:00	2.33	0.054		
	4/13/2016	4:39	2.32	0.03		
	4/20/2016	19:00	2.32	0.03		

Site Name	Report Date	Report Time	Channel 1 Volts	Channel 2 Amps	Maximum % Change in Volts	Maximum % Change in Amps
Rect #20 @ Hotel Pier	3/5/2016	19:00	17.14	0	147%	550%
	3/20/2016	19:00	16.94	0.012		
	4/4/2016	19:00	16.92	0.012		
	4/8/2016	19:01	0.68	0.516		
	4/8/2016	15:11	0.68	0.012		
	4/8/2016	14:57	15.55	0.444		
	4/8/2016	13:43	0.68	0		
	4/13/2016	4:39	17.18	0.006		
	4/15/2016	10:21	15.58	-0.276		
	4/15/2016	7:57	0.66	0.012		
	4/18/2016	3:09	17.43	0.006		
	4/29/2016	19:00	17.08	0.012		
Rect #23 @ VC-15 (North Avenue)	3/6/2016	5:00	3.48	7.944	1%	7%
	3/21/2016	5:00	3.49	7.704		
	3/21/2016	3:11	3.47	7.536		
	4/5/2016	5:00	3.46	7.542		
	4/13/2016	4:39	3.46	7.668		
	4/18/2016	3:09	3.48	7.662		
	4/20/2016	5:00	3.45	7.44		
Rect #24 @ Multi Product Tank 301	3/9/2016	2:59	2.46	1.308	1%	2%
	3/24/2016	2:59	2.47	1.304		
	4/8/2016	3:00	2.45	1.296		
	4/13/2016	4:39	2.45	1.318		
	4/23/2016	2:59	2.46	1.32		
Rect #27 @ VS-1A	2/29/2016	19:00	0.83	0.006	16%	86%
	3/15/2016	19:00	0.83	0.006		
	3/30/2016	19:00	0.74	0.006		
	4/13/2016	4:39	0.75	0.012		
	4/14/2016	19:00	0.74	0.006		
	4/29/2016	19:00	0.71	0.006		
Rect #46 @ UTF Tank 46	3/6/2016	3:19	6.61	15.636	0.5%	0.3%
	3/21/2016	3:19	6.62	15.654		
	4/5/2016	3:19	6.62	15.654		
	4/13/2016	4:39	6.64	15.684		
	4/20/2016	3:19	6.63	15.654		
Rect #47 @ UTF Tank 47	3/6/2016	3:30	6.01	23.31	0.3%	1.1%
	3/21/2016	3:30	6.02	23.154		
	4/5/2016	3:29	6.01	23.298		

Site Name	Report Date	Report Time	Channel 1 Volts	Channel 2 Amps	Maximum % Change in Volts	Maximum % Change in Amps
	4/13/2016	4:39	6.03	23.418		
	4/20/2016	3:30	6.03	23.382		
Rect #48 @ UTF Tank 48	3/5/2016	21:48	15.43	3.928	0.5%	1.8%
	3/20/2016	21:49	15.5	3.88		
	4/4/2016	21:49	15.5	3.92		
	4/13/2016	4:39	15.48	3.952		
	4/19/2016	21:48	15.43	3.952		
Rect #53 @ UTF Tank 53	3/5/2016	23:06	5.8	25.914	1%	1%
	3/20/2016	23:06	5.84	26.136		
	4/4/2016	23:06	5.81	25.896		
	4/13/2016	4:39	5.81	25.974		
	4/19/2016	23:06	5.83	26.04		
Rect #54 @ UTF Tank 54	3/6/2016	0:59	6.18	20.94	1%	2%
	3/21/2016	3:11	6.2	21.144		
	4/5/2016	0:59	6.21	21.204		
	4/13/2016	4:39	6.22	21.234		
	4/20/2016	0:59	6.21	21.276		

Mr. Jonathan McKay
Senior Associate Counsel
Navy Region Southwest
750 Pacific Highway
San Diego, CA 32132
Phone 619-705-5261
jonathan.c.mckay@navy.mil

DEPARTMENT OF HEALTH

STATE OF HAWAII

In the Matter of the Application of UNITED STATES NAVY For an Underground Storage Tank Permit for the Red Hill Bulk Fuel Storage Facility	DOCKET NO. 19-UST-EA-01 WRITTEN TESTIMONY OF CHRISTOPHER D. CAPUTI; CERTIFICATE OF SERVICE

I provide this written testimony on behalf of the United States Navy in the above-captioned contested case before the Hawaii Department of Health (DOH).

1. I have 28 years of experience providing engineering and management support to petroleum storage tank environmental regulatory compliance programs, including petroleum storage tank system leak detection testing, petroleum storage tank system design, storage tank management plans, spill prevention, control, and countermeasure plans, and oil spill preparedness and planning support. My resume is attached.

2. I have supported the DLA Leak Detection CMP since its inception in 2006, executing thousands of regulatory required leak detection, or release detection, test events at over 200 Department of Defense installations worldwide, including leak detection testing at the Red Hill Bulk Fuel Storage Facility, Joint Base Pearl Harbor-Hickam, Hawaii.

3. I have a Bachelor of Science Degree in Civil and Environmental Engineering.

4. I am a Licensed Professional Engineer in the State of Virginia.

5. I was asked to provide technical support regarding the Release Detection aspects of the Underground Storage Tank Permit for the Red Hill Bulk Fuel Storage Facility, specifically:

   a. What is the current method of Release Detection for tanks F-1 to F-20 and F-ST1 to F-ST4?
   b. Why was the current method of Release Detection for tanks F-1 to F-20 and F-ST1 to F-ST4 chosen?
   c. Explain the current method of Release Detection for tanks F-1 to F-20 and F-ST1 to F-ST4.
   d. Explain what scaling and averaging of the leak detection method is and how it applies to the current method of Release Detection for tanks F-1 to F-20 and F-ST1 to F-ST4.
   e. Why does the current method of Release Detection remain the proposed approach to Release Detection for tanks F-1 to F-20 and F-ST1 to F-ST4?

f. What is the current method of Release Detection for the underground piping associated to tanks F-1 to F-20 and F-ST1 to F-ST4?

g. Explain the Pressure Testing of the underground piping associated to tanks F-1 to F-20 and F-ST1 to F-ST4.

6. My technical support, are set forth in the letter attached to this testimony, which was prepared under my supervision. The conclusions in this letter include:

a. The Release Detection applied to tanks F-1 to F-20 and F-ST1 to F-ST4 meets State of Hawaii UST regulations, HAR 11-280.1-43(10).

b. The Release Detection of the underground piping associated to tanks F-1 to F-20 and F-ST1 to F-ST4 was appropriately applied to those sections under the jurisdiction of the Hawaii UST program, and meets State of Hawaii UST regulations, HAR 11-280.1-44(A)(i).

c. The Pressure Testing of the underground piping associated to tanks F-1 to F-20 and F-ST1 to F-ST4, was appropriately applied to those sections under the jurisdiction of the U.S. Coast Guard and meets U.S. Coast Guard regulations, 33 CFR 156.170.

Executed this 15th day of January 2021, Virginia Beach, Virginia.

Chris Caputi

CHRISTOPHER D. CAPUTI

January 15, 2021

Mr. Jonathan McKay
Senior Associate Counsel
Navy Region Southwest
750 Pacific Highway
San Diego, CA 32132

Re: Hawaii Department of Health hearing for Docket No. 19-UST-EA-01; contested draft permit for the Navy Red Hill Underground Fuel Storage Facility.

Dear Mr. McKay,

Michael Baker International (Michael Baker) was contracted by the U.S. Department of the Navy to provide technical support regarding the above referenced case and specifically the Release Detection aspects of the Red Hill permit application, related to the bulk field constructed underground storage tanks (BFCUSTs) and associated underground pipelines. Additionally, clarification of the pressure integrity testing of underground pipelines at Joint Base Pearl Harbor-Hickam to comply with U.S. Coast Guard regulations is provided.

Red Hill Permit Application – Release Detection

Navy Exhibit 038 lists two items related specifically to Release Detection (also known as tightness testing and leak detection testing).

Operation Requirements:

Owners or operators must:

14. Provide a method, or combination of methods, of release detection that is installed, calibrated, operated, and maintained in accordance with §11-280.1-40, HAR.

SPECIAL CONDITIONS

5. Perform semi-annual tank tightness testing on tanks F-1 to F-20 and F-ST1 to F-ST4 in accordance with the description provided under the heading "Tanks – Release Detection" on page 3 of the letter portion of the permit application received by DOH on 23 May 2019 for any and all tanks storing product. The Permittee may additionally implement release detection methods consistent with a New Release Detection Alternatives Decision Document approved by DOH under AOC SOW section 4.8 and subchapter 4 of chapter 11-280.1, HAR.

Section 1: Release Detection – BFCUSTs

Current Method of Leak Detection

The current form of Release Detection employed on tanks F-1 to F-20 and F-ST1 to F-ST4 is semi-annual leak detection testing performed by utilizing the Mass Technology Corporation (MTC) Precision Mass Measurement System (PMMS) LDS, with Static In-Tank Measurement (SIM) 1000 (24-hour) leak detection method. The leak detection method is a third-party evaluated method listed with the National Work Group for Leak Detection Evaluators (NWGLDE). In the most general terms, this leak detection method functions as a very sensitive level gauging system that measures the mass (weight) of the liquid column in the tank by directly measuring pressure and temperature and looks for changes to that mass over a 24-hour period of time.

Why was this Leak Detection method chosen?

In 2007 Michael Baker was tasked by Defense Logistics Agency (DLA) to perform an evaluation of leak detection approaches and requirements for all DLA capitalized fuel systems at Joint Base Pearl Harbor-Hickam, Hawaii. At that time, it was a common tasking by DLA to evaluate sites for inclusion into their newly established Centrally Managed Program for Leak Detection (aka the DLA LD CMP). Michael Baker staff mobilized to Pearl Harbor and collected site data to support the evaluation of the current (or technically suitable) leak detection approaches for the Joint Base Pearl Harbor-Hickam fuel systems including the Red Hill facility.

The results of that evaluation identified the Red Hill BFCUSTs (tanks F-1 to F-20 and F-ST1 to F-ST4) as reasonable candidates to apply point-in-time leak detection testing as a Best Management Practice (BMP) since, at that time, there were no state or federal requirements for leak detection for the Red Hill BFCUSTs. The MTC CBU-1000 leak detection method (similar in concept to the MTC PMMS LDS, with SIM-1000 leak detection method) was the most technically acceptable test by the DLA LD CMP for BFCUSTs at the time.

The selection of leak detection test methods utilized by the DLA LD CMP and the Navy, both at that time and currently, follows accepted industry standard approach. This approach focusses on identifying the leak detection criteria required for the site (either by regulation or self-imposed) and selecting a method that is capable of meeting those criteria. UST owners do not need to be experts to determine how the leak detection method meets all applicable technical requirements because the industry has streamlined that process. The industry relies on two interconnected processes to help choose methods that are technically acceptable; independent third-party evaluations and listed on the National Work Group for Leak Detection Evaluations (NWGLDE).

The use of independent, third-party evaluated methods is key in the process of leak detection method selection. This process provides for the inventor, or vendor, of a leak detection method to present scientifically substantiated claims on the performance of their leak detection method and submit their test method for third-party review. This approach eliminates the need for end users of the leak detection method to rely on vendor marketing claims or to perform their own engineering performance evaluation, and allows the end user to rely on the results of a scientific evaluation of the leak detection method by an independent third-party to identify the leak detection method's actual performance capabilities. The independent third-party evaluation does not explore or analyze the actual method's process (data collection, equipment type, analysis) only the actual results of a test compared to the "known" result of the evaluation data. Simply stated, a third-party evaluation of a release detection method is performed by utilizing the test method and comparing the measured leak rate results of that test compared to an induced and known leak rate established by the evaluator. This is repeated for multiple induced leak rates (including zero gph) and a statistical analysis of those results is completed. From that evaluation of results the third-party evaluator arrives at the Minimum Detectable Leak Rate (MDLR) of the test system.

The NWGLDE is an independent work group that focuses on the process of the third-party evaluations of leak detection methods. The work group is comprised of 11 members: ten state regulators and one member from the U.S. EPA. All members of the NWGLDE are state or federal employees whose full-time job is to regulate storage tank systems. As presented in their web site (http://www.nwglde.org/), the mission of the NWGLDE is to review third-party evaluations of leak detection methods to determine if each third-party evaluation was performed in accordance with acceptable evaluation protocols as identified by the U.S. EPA and/or other regulatory performance standards, if applicable. If the third-party evaluation is deemed to have been performed in accordance with these protocols, the NWGLDE lists the leak detection method and any exceptions they may note.

Due to the rigor of the independent third-party evaluation and the NWGLDE listing of vetted leak detection methods, DLA, the Navy, and Michael Baker did not need to perform their own technical analysis of the inner workings (data collection or analysis) of any of the leak detection methods that were selected for use under the DLA LD CMP to be sure the method met the regulatory requirements. The technology, engineering and specific processes that a test vendor develops for their specific leak detection methods are usually proprietary in nature. This industry standard approach of applying independent third-party evaluations and NWGLDE listing allows for the determination of the performance standards of a leak detection method without the need to analyze, and thus divulge or expose any proprietary systems and processes used by that method. Rather, the industry only focuses on evaluation of the final results of the leak detection method to determine how well the system works.

In 2008, and prior to execution of the first point-in-time leak detection testing at Red Hill, the Navy and DLA engaged Michael Baker to further evaluate leak detection testing options for the Red Hill BFCUSTs, with the goal of identifying options for a permanently installed solution. A formal Market Survey was conducted that considered various technologies with any potential to perform leak detection on these BFCUSTs. The results of that Market Survey concluded that due to the small market presence of these types of tanks (BFCUSTs), there were not many realistic options for permanent leak detection that were readily available in the industry, and none that could be considered “Plug-and-Play” on the BFCUSTs at Red Hill. It was noted that from a permanent installation perspective, considerable engineering would need to be performed to implement a solution. The directive from DLA to the Navy was that in the absence of any fully installed permanent solution, Michael Baker should begin to implement point-in-time leak detection testing utilizing a third-party evaluated, NWGLDE listed, leak detection method that could be implemented without considerable construction or major impacts to facility operations. The method recommended by Michael Baker to the Navy and DLA that met those criteria was the MTC CBU-1000 leak detection method. The Navy and DLA accepted that recommendation and Michael Baker executed the first biennial leak detection testing event on the Red Hill BFCUSTs in 2009.

It should be noted that in 2009 MTC released an improved/simplified version of the CBU-1000 leak detection method. The updated version is the MTC PMMS LDS, with SIM-1000. The concept of this leak detection method remained the same, however improvements to the technology, including the elimination of the need for nitrogen gas cylinders, greatly improved the ability to easily deploy the test equipment. Since this leak detection method also was listed on the NWGLDE as a viable method, DLA and the Navy accepted the recommendation to employ this updated version of the technology in the biennial leak detection testing.

A brief explanation of the MTC Leak Detection test method

The MTC PMMS LDS, with SIM-1000 is a mass-based leak detection and monitoring system that is deployed for each test and is not permanently fixed to the infrastructure of the Red Hill BFCUSTs. The PMMS LDS, with SIM-1000 is deployed from the tank Gauging Gallery (directly above the tank) by lowering a pressure transducer to the bottom of the tank, and an array of temperature sensors to the lower hemisphere of the tank. The pressure transducer and the array of temperature sensors are each connected by cable to the MTC PMMS LDS, with SIM-1000 computer located in the Upper Tunnel area (approximately the upper third of the tank), where leak detection data points are continuously logged and processed using proprietary software developed by MTC. In preparation for leak detection testing, confirmation that the tank has been fully isolated (i.e. closing isolation valves) from the remaining fuel system is required.

In laymen's terms the MTC leak detection method is a very sensitive tank gauge (a device used to measure the fuel level in a tank) that takes multiple measured mass readings and compares them to identify extremely small changes over time. At the end of a test event the measured mass changes are expressed in gallons per hour (gph) and are compared to the MDLR of the system as determined by its third-party evaluation. Any measured leak rate above the MDLR is a failing test. Any measured leak rate below the MDLR is a passing test.

Scaling and Averaging

The concepts of scaling and averaging are critical to the understanding of how the MTC leak detection method provides results specific to the Red Hill BFCUSTs. The first concept to consider is scaling. Scaling refers to how the MDLR established for a leak detection method under its third-party evaluation could be applied to other tanks of differing sizes. The MDLR of the MTC leak detection method resulted from their third-party evaluation on an evaluation tank of a specific size (volume = 120,000-gallons and Product Surface Area = 1,257-square feet). The evaluation of the MTC leak detection method resulted in a MDLR for the evaluation tank to be 0.1 - gallons per hour (gph). In order for the MTC leak detection method to be utilized on other tanks not of the exact size as the evaluation tank, a mathematical formula was developed by the third-party evaluator to allow MDLRs of other size tanks to be calculated. This is the concept of scaling, whereby the MDLR of the evaluation tank is "scaled" in relation to the size of the tank to be tested. Specifically, for the MTC PMMS LDS, with SIM-1000, the formula developed under the third-party evaluation and listed by the NWGLDE is as follows:

From the NWLDGE listing (http://www.nwglde.org/evals/mass_technology_a.html) for the MTC SIM-1000 and CBU-1000 (24-hour test):

> Mass Technology Corp.
> Precision Mass Measurement Systems SIM-1000 and CBU-1000 (24-hour test)
> BULK UNDERGROUND STORAGE TANK LEAK DETECTION METHOD (50,000 gallons or greater)
> Leak rate is proportional to product surface area (PSA).
> For tanks with PSA of 1,257 ft^2 or less, leak rate is 0.1 gph with PD = 97.9% and PFA = 2.1%.
> Calculated minimum detectable leak rate is 0.078 gph with PD = 95% and PFA = 5%.
> For tanks with larger PSA, leak rate equals [(PSA in ft^2 ÷ 1,257 ft^2) x 0.1-gph].
> Example:
> For a tank with PSA = 2,000 ft^2; leak rate = [(2,000 ft^2 ÷ 1,257 ft^2) x 0.1-gph] = 0.16-gph.

Specifically, for the large BFCUSTs at Red Hill the scaling is calculated as follows:

For a 100-foot diameter tank, the PSA = 7,850 ft^2

So using the NWGLDE listed formula:

The MDLR for one 24-hour test = [(7,850 ft^2 ÷ 1,257 ft^2) x 0.1 gph] = 0.62 - gph.

This result brings up the obvious question, how does one get better MDLR results if one can only scale the results based on the PSA? The industry standard approach to address that issue is to employ "averaging". In the context of leak detection testing the term averaging refers to the ability to perform several non-overlapping tests and reduce the overall MLDR of those tests. Specifically, for the MTC leak detection method, the listing in the NWGLDE identifies that the use of averaging of this method is acceptable.

From the NWLDGE listing (http://www.nwglde.org/evals/mass_technology_a.html) for the MTC SIM-1000 and CBU-1000 (24-hour test):

Comments Tests only portion of tank containing product.
As product level is lowered, leak rate in a leaking tank decreases (due to lower head

pressure).
Consistent testing at low levels could allow a leak to remain undetected.
Evaluated in a nominal 120,000 gallon, vertical underground tank with product surface area (PSA) of 1,257 ft^2.
Averaging of multiple tests may be used to improve the performance of the system.

The formula for averaging the MDLR based on multiple tests is as follows:

The MDLR of multiple tests = the MDLR of one test ÷ square root of the number of tests

Since 2015, each leak detection test event at Red Hill was conducted for five days. The first two days allow for test equipment stabilization, followed by three (3), 24-hour, non-overlapping tests. The resulting MDLR is calculated as follows:

MDLR(three tests) = MDLR of one test ÷ Square Root of 3.
MDLR (three tests) = 0.62 ÷ Square Root of 3
MDLR (three tests) = 0.62 ÷ 1.73
MDLR (three tests) = 0.36-gph

This averaging allows the MTC test method to get to an MDLR below 0.5-gph. However, since the regulatory required MDLR was specified as 0.5-gph, the test was only reported to that level of sensitivity.

Prior to any regulatory requirements, the BMP leak detection testing performed from 2009 through 2013 at Red Hill utilized measured results compared to values above those obtainable by the formulas identified on the NWGLDE listing as a conservative approach to testing these unique tanks. A conservative value of 0.7-gph was set for the MDLR for this BMP testing. Then beginning in 2015, and continuing through the most recent 2020 testing events, the MDLR used has been 0.5-gph, which is the current regulatory requirement.

<u>Why does this method remain the choice for the current approach to Leak Detection?</u>

The DLA LD CMP has reevaluated options for leak detection of the Red Hill BFCUSTs on several occasions to ensure that the most appropriate method was being implemented. The first was in 2015 when the federal UST regulations were revised and these BFCUSTs were then required to have Release Detection performed on an annual basis. Utilizing the standard industry approach to selecting appropriate leak detection methods, a review of the NWGLDE listing that could meet the requirements for this testing was undertaken. Once again, the most logical and technically acceptable option to meet the federal regulatory requirements for leak detection on the Red Hill BFCUSTs was to perform annual point-in-time leak detection testing utilizing the MTC PMMS LDS, with SIM-1000 to a MDLR of 0.5-gph.

In 2016 the Navy instructed Michael Baker to further evaluate an alternative leak detection method to the MTC leak detection method that could perform point-in-time leak detection testing on these BFCUSTs to meet federal regulatory requirements. This evaluation focused on utilizing the Vista Precision Solutions, Inc (VPSI) Low-Range Differential-Pressure (LRDP) Leak Detection System that had been third-party evaluated in 2001 in two of the BFCUSTs at Red Hill. The VPSI leak detection method requires several components to be constructed inside the tank, which requires considerable construction activities including emptying and cleaning the tank. Tanks F-9 and F-16 still had that leak detection equipment existing in place and in 2016 these systems were evaluated by VPSI and leak detection tests were attempted utilizing that equipment. The results of that 2016 evaluation were that only one of the two leak detection units was still usable and able to give leak detection testing results. It was concluded that although VPSI was a potential option for leak detection testing at Red Hill, the numerous logistical and construction challenges associated with installing and maintain that equipment was not as favorable as continuing to utilize the MTC leak detection method.

In 2017 the most comprehensive evaluation for potential Release Detection methods for the Red Hill BFCUSTs was initiated to comply with the requirements of the Red Hill Administrative Order on Consent (AOC). This evaluation, performed by Michael Baker, attempted to identify the best options, either currently available or new/innovative technologies, for Release Detection on the BFCUSTs. Initially, as part of this evaluation Michael Baker identified potential candidates including both those previously known, as well as any new or innovative technologies that had not been previously considered.

Six forms of leak detection were ultimately selected and agreed to by the AOC stakeholders (including the U.S. EPA, the Hawaii Department of Health [DOH], and the U.S. Navy and DLA) for further evaluation. Essentially, blind testing of the six leak detection methods was undertaken on one of the tanks at Red Hill.

Controlled "leaks" were induced while the six leak detection methods performed leak detection testing. The results of that leak detection testing indicated that the MTC leak detection method was capable of achieving leak detection results comparable with those considered initially in 2008 when the leak detection method was first selected for use at Red Hill. While the duration of time of the standard test for the 2017 AOC evaluation is different than the standard point-in-time leak detection testing (one 48-hr. test vice three 24-hr. tests) the conclusion of that evaluation is that the MTC leak detection method is capable of achieving test results at the MDLRs required by the current federal regulatory requirements, and similarly, current State of Hawaii regulatory requirements. This evaluation underwent review by the U.S. EPA and Hawaii DOH and ultimately, they stated that they agreed with that conclusion.

In a letter (Attached as Enclosure 1) from the U.S. EPA and Hawaii DOH to the Navy regarding these results dated August 30, 2018 the U.S. EPA/DOH acknowledges that "the site specific technology study described in this report indicates that two of the vendor's technologies [MTC and VPSI] tested meet or exceed the current regulatory standard 0.5 gallons per hour for annual tank tightness testing described in Hawaii Administrative Result 11-280.1-43(10)(A)."

The letter also goes on to say that "In addition to our [the U.S. EPA and Hawaii DOH] internal review, we had our expert tank contractor review the report and provide their comments which are attached to this letter"

The comments from the expert tank contractor, dated 24 August 2018 and attached to the U.S. EPA / Hawaii DOH letter, by PEMY Consulting, state "PEMY agrees that the process of vendor selection, use of industry standards and protocols for conducting the test, and the types of technologies that are available to fulfil the leak detection goals at Red Hill[s] are all reasonable and appropriate".

PEMY goes on to offer the recommendation that "a detailed spreadsheet that does the calculations and which is reviewable and auditable and downloadable to the public should be and approved to ensure that the statistical calculations are correct now and into future testing as well as to ensure the process is repeatable and auditable." Michael Baker disagrees that this recommendation is necessary due to the fact that the system results have already been established in the independent third-party evaluation as well as with the additional scrutiny afforded by the NWGLDE listing process. Calling for the review of the analysis in which a leak detection system performs these calculations would be challenging as it would divulge the proprietary algorithms used to calculate the test results. As stated previously, third-party evaluations of leak detection systems focus on comparing actual results and not criticism or suggestions of how those results are achieved. Since these third-party evaluations check the accuracy and precision of their measured leak rate compared to a known leak rate induced by the evaluator, the NWGLDE approval renders an independent evaluation of the underlying data unnecessary.

Conclusions

Michael Baker, the DLA LD CMP and the Navy have undertaken multiple evaluations to review leak detection methods at Red Hill. Utilizing the industry standard approach to leak detection method selection, the NWGLDE listings, the MTC leak detection method was identified as a valid testing approach. Specifically scaling and averaging are utilized to get the specific MDLRs for the tanks at Red Hill, all of which are industry accepted approaches discussed in the NWGLDE listing for the leak detection method. Finally, considerable scrutiny by the U.S. EPA and Hawaii DOH during an evaluation of the MTC leak detection method employed on the Red Hill BFCUSTs resulted in their acknowledgement that use of the MTC leak detection method is appropriate.

Section 2: Release Detection – BFCUST Piping

The letter portion of the permit application received by DOH on 23 May 2019 (Navy Exhibit 095) includes excerpts of the 2019 Annual Leak Detection Testing Report of Petroleum Pipelines. This report was prepared for DLA, under Naval Facilities Engineering Command (NAVFAC) Atlantic contract, certified by Christopher D. Caputi of Michael Baker, and submitted by Michael Baker. That report documents leak detection testing at Joint Base Pearl Harbor-Hickam, Hawaii and includes underground pipelines within Naval Station Pearl Harbor and Hickam Airfield Facility of which are associated with Red Hill BFCUST system.

The report documents that the underground piping for Red Hill was leak detection tested utilizing leak detection methods that are third party evaluated and listed with the NWGLDE to meet the MDLR for each test section in accordance with HAR 11-280.1-44(4)(A)(i). The pipeline testing executed under this project was performed utilizing Hansa Consult of North America (HCNA) methods version 2.0 and 2.1. These leak detection methods are standard approaches to leak detection testing of bulk piping systems throughout the Department of Defense and commercial industry and were selected based on having appropriate third-party evaluations and listings on the NWGLDE website. It should be noted that no averaging is applied to these test results.

The HCNA leak detection testing method essentially perform multiple pressure tests at varying pressures and their proprietary analysis can determine a measured leak to compare to the MDLR established by their independent third-party evaluation. If the measured leak rate is calculated to be below the established MDLR of the piping being tested, then the test is considered a pass. If the measured leak rate is above the MDLR the result is considered a fail. Different versions of the HCNA method are used based on the volume of the section being tested.

Although the piping being tested is ultimately associated to the BFCUSTs at Red Hill, this in no way influences how the HCNA systems addresses testing the piping. The HCNA method employed to test these pipes utilizes the same approach as they would to test any bulk piping system. This testing is unaffected by the size of the tanks to which the piping is connected and is only affected by the volume of the piping section being tested.

Section 3: Bulk Piping Static Liquid Pressure Testing

The letter portion of the permit application received by DOH on 23 May 2019 (Navy Exhibit 130) includes excerpts of the 2019 Annual Static Liquid Pressure Testing Report of Petroleum Pier Pipelines. This report was prepared for DLA, under NAVFAC Atlantic contract, certified by Christopher D. Caputi of Michael Baker, and submitted by Michael Baker. This report documents pressure testing at Joint Base Pearl Harbor-Hickam, Hawaii and includes underground pipelines within Naval Station Pearl Harbor which are associated with Red Hill but are regulated under Title 33, Code of Federal Regulation, Part 156, Section 170 (33 CFR 156.170) and are under the jurisdiction of the U.S. Coast Guard.

The 2019 testing report documents that the underground piping was static liquid pressure tested in conformance with industry standard practices acceptable to the U.S. Coast Guard. The testing is required to ensure that no leaks occur under a static liquid pressure of at least 1.5 times the maximum allowable working pressure as required in 33 CFR 156.170. In very simplistic terms, this type of testing is performed by pressurizing a pipeline section and ensuring that there are no unaccounted-for losses of pressure.

Additionally, the testing utilizes visual inspection of all portions of the piping located above grade for signs of any leaks or weeps. This method of pipe leak detection or integrity evaluation is the longest serving and most basic approach of testing employed in the industry. Like the HCNA leak detection method mentioned previously, no special accommodations are required to be performed to employ this method related to the fact that the piping is associated to the BFCUSTs at Red Hill.

Michael Baker subcontracted Pipeline Petroleum Services, Inc. (PPSI) to perform the static liquid pressure testing. Testing was performed per the requirements of 33 CFR 156.170. The test equipment, inspections, procedures, and passing criteria used by PPSI were performed in conformance with the following:

- American Petroleum Institute Recommended Practice – 1110: Pressure Testing of Liquid Petroleum Pipelines.
- Title 49 CFR Part 195, Subpart E: Pressure Testing.
- California State Fire Marshal's Pressure Testing Requirements for Hazardous Liquid Pipelines.
- American Society of Mechanical Engineers (ASME) B31.3: Process Piping.
- ASME B31.4: Pipeline Transportation Systems for Liquid Hydrocarbons and Other Liquids.

The equipment used to monitor the test and record test data was third-party calibrated by Standard Calibrations, Inc. and MadgeTech. The supervisor from PPSI that was on site during testing has over 20 years of static liquid pressure testing experience with a working knowledge of the applicable regulations and test standards.

This simple, yet effective testing method allows Naval Station Pearl Harbor to maintain compliance with Title 33, Code of Federal Regulation, Part 156, Section 170.

Christopher D. Caputi, P.E.

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Mark Manfredi
Red Hill Regional Program Director
850 Ticonderoga Street, Suite 110
Joint Base Pearl Harbor Hickam, Hawaii 96860-5101

August 30, 2018

Re: Approval of Red Hill Administrative Order on Consent ("AOC") New Release Detection Alternatives Report – Section 4 – Release Detection / Tank Tightness Testing

Dear Mr. Manfredi:

The U.S. Environmental Protection Agency ("EPA") and the Hawaii Department of Health ("DOH"), collectively the "Regulatory Agencies", have reviewed the *New Release Detection Alternatives Report* ("Report") submitted by the U.S. Department of the Navy ("Navy") and Defense Logistics Agency ("DLA") on July 26, 2018. The Regulatory Agencies have determined the Report satisfies the requirements of Section 4.6 of the Red Hill AOC SOW. The Report, prepared by Navy and DLA expert engineering contractors, identifies and evaluates leak detection alternatives that can be applied to the tanks at the Red Hill Bulk Fuel Storage Facility ("Facility"). Pursuant to 7(b) of the Red Hill AOC, the Regulatory Agencies approve the Report.

In addition to approval of the Report, as discussed at our recent Tank Upgrade Alternatives ("TUA") Decision Meetings the week of August 13th, selection of the leak detection is closely tied with the tank upgrade approach. Therefore, we suggest that the decision process for the TUA Decision be combined with the decision for leak detection improvements. Given that we have already had preliminary discussions regarding expectations for leak detection, we intend to conclude decision discussions on both TUA and Release Detection by the end of October thus requiring the Navy to submit a proposed TUA and Release Detection Decision by the end of the calendar year. Please respond to this letter regarding our proposal for combination of TUA and -Release Detection into one proposal document.

As we discussed in the meetings the week of August 13th, the Navy needs to consider a range of potential failure modes in order to design a comprehensive approach to leak detection and response. Generally, the Regulatory Agencies believe the appropriate leak detection for Red Hill tanks will likely involve multiple detection systems combined with alarms and procedures to build a high degree of confidence that a release can be identified rapidly and stopped to mitigate or prevent damage to nearby resources or potentially harmful exposure.

The site specific technology study described in this report indicates that two of the vendor's technologies tested meet or exceed the current regulatory standard 0.5 gallons per hour for annual tank tightness testing described in Hawaii Administrative Rule §11-280.1-43(10)(A). However, the Navy and DLA should keep in mind that the AOC requires the use of Best Available Practicable Technology ("BAPT"). Therefore, if exceeding the regulatory standard is practicable, then it is required by the AOC for Red Hill.

In addition to our internal review, we had our expert tank contractor review the report and provide their comments which are attached to this letter. Our expert's comments are primarily forward looking, and should be addressed during our decision meeting and the Navy/DLA's leak detection - and TUA decision documents.

If you have any questions, please contact us.

Sincerely,

Steven Linder
for

Omer Shalev
Red Hill Project Coordinator
EPA Region 9

Roxanne Kwan
Red Hill Project Coordinator
State of Hawaii, Department of Health

Enclosures: PEMY Review of New Release Detection Alternatives Report, 24 August 2018.

cc: Captain Marc Delao, Navy (via email)

PEMY Consulting

PEMY Review of NEW RELEASE DETECTION ALTERNATIVES REPORT ADMINISTRATIVE ORDER ON CONSENT - SECTION 4.6 RED HILL BULK FUEL STORAGE FACILITY JOINT BASE PEARL HARBORHICKAM, HAWAII

Prepared for: Defense Logistics Agency Energy Fort Belvoir, Virginia Prepared under: Naval Facilities Engineering Command Atlantic Contract N62470-16-D-9007 Delivery Order N6247018F4014 Submitted by: Michael Baker International Virginia Beach, Virginia Date: 25 July 2018

Overview

The report adequately covers the subject of the required leak detection requirements for future leak testing at Red Hills. AOC Section 4.6 requires the issue of "The New Release Detection Alternatives Report" which shall include:

a. A description of existing practices;

b. Static and dynamic release detection system alternatives;

c. Tank tightness alternatives;

d. Comparison of the effectiveness of existing and alternative technologies; and

e. A decision matrix.

PEMY has reviewed the document and concludes it fulfills the objectives required by the AOC.

Discussion

PEMY agrees that the process of vendor selection, use of industry standards and protocols for conducting the test, and the types of technologies that are available to fulfill the leak detection goals at Red Hills are all reasonable and appropriate.

Although not required in this report, there is little discussion related to the effectiveness of leak detection in concert with other methods as a combined integrity system. For example, vapor monitoring is mentioned but not in the context of how it could be used to enhance the efforts of the leak detection process. It is important that stakeholders have input on the use of leak detection and how it supplements the general tank integrity plan effectively.

The report should (but does not) state the fundamental difference between the MTC versus the Vista and the GSI systems. MTC cannot or does not adjust for temperature distortions caused by the lower hemispherical portion of the tank. VPSI takes this into account by use of the curved tubes. GSI takes it into account by multiple measurements throughout the liquid. MTC does not take this into account. PEMY will shortly be providing a white paper on this issue.

Approval Recommendations

PEMY recommends the report should be approved with certain conditions:

- The frequency of formal leak testing be negotiable to establish a final plan for leak detection working in concert with other monitoring systems. A credible decision process should be used to decide on when to test the tanks. This includes working out the protocol for alarm settings and what must happen when the soil vapor sampling process shows high hydrocarbon vapor levels.
- The leak detection protocol for the ongoing testing should be redrafted and finalized with any changes that were applied to the procedures for the 2018 leak tests for approval by stakeholders.
- A detailed spreadsheet that does the calculations and which is reviewable and auditable and downloadable to the public should be and approved to ensure that the statistical calculations are correct now and into future testing as well as to ensure that the process is repeatable and auditable.
- Development of new methods as to how the GSI system can be applied to improve the protocols for the AFHE system should be undertaken since it is able to use mass measurement during normal operations. The development should consider integrating not only the current AFHE system and the GSI system but any other potential improvements to the operational side of leak monitoring.
- Consideration should be given to a formal review of how to make the leak testing program more automated to the extent possible within the framework of the protocol by use of automation to the extent possible.

Michael Baker
INTERNATIONAL

We Make a Difference

Christopher D. Caputi, P.E.

Technical Manager & Subject Matter Expert

Years with Michael Baker:
18
Years with Other Firms:
10

Degrees

B.S., 1991, Civil and Environmental Engineering, Clarkson University

A.S., 1987, Engineering Science, Tompkins Cortland Community College

Licenses/Certifications

Professional Engineer, Virginia, 2000, 0402032382

Specialized Experience

28 years of petroleum storage tank compliance and design experience

Has supported DLA-Energy Leak Detection Centrally Managed Program since 2006 in executing thousands of test events at over 200 DOD installations worldwide

Since 2015, SME on seven NAVFAC Atlantic compliance task orders ($27.9M) supporting DLA-Energy Leak

General Qualifications

Mr. Caputi has experience as an engineer with an emphasis in civil engineering and environmental compliance. His expertise lies in petroleum storage tank (PST) and POL system design, storage tank management plans, spill prevention, control and countermeasure plans (SPCCs), spill response planning, and underground storage tank and piping systems integrity testing.

Mr. Caputi is an industry-recognized SME in PST compliance and has given numerous presentations at DOD workshops on environmental compliance of fueling systems, oil spill planning and response and training, and PST management. Since 2006, his primary role has been SME and program management support to DLA-Energy's Leak Detection Centrally Managed Program (CMP) for petroleum assets in the execution of approximately $15M annually for PST asset leak detection, regulatory-driven compliance testing, and BMP testing at over 200 Navy, USMC, and DLA-E facilities, **including leak detection testing at the Red Hill Bulk Fuel Storage Facility**. His support to the DLA-E has focused on optimizing testing technologies and strategies, with the goal of consistently meeting regulatory compliance requirements. Additional support to DLA-E included participating in updates to the OEBGD, various FGSs, UFC 3-460-01 & 03 and negotiations with USEPA on the 2015 updates to 40 CFR 280.

Experience

Since 2009, Mr. Caputi has serviced as a technical consultant and Subject Matter Expert to NAVFAC Atlantic, DLA Energy and FLC Pearl Harbor for the execution of annual leak detection testing of the 18 in-service bulk fuel storage tanks at the Red Hill, HI Bulk Fuel Storage Facility.

N62470-16-D-9007; Task Order N6247018F014: Defense Fuel Supply Point Red Hill Administrative Order on Consent Evaluation for Red Hill Bulk Fuel Storage Facility, Joint Base Pearl Harbor-Hickam, Hawaii. *NAVFAC Atlantic.* Subject Matter Expert in UST Leak Detection. Planned and executed a technical evaluation of best available leak detection systems for the unique field-constructed USTs at the Red Hill, HI Bulk Fuel Storage Facility. Supported the Navy and DLA-E in responding to a Consent Order with USEPA Region 9 and the State of Hawaii that required an evaluation of best available leak detection systems for the field-constructed USTs. Facilitated extensive coordination with stakeholders and three leak detection vendors during a 60-day on-site technology evaluation. Participated in data review meetings with the Navy, USEPA Region 9, and Hawaii Department of Health. Co-authored the leak detection evaluation summary report and presented findings to USEPA Region 9 and the

State of Hawaii.

Firm Cost: $1,365,828.00
Total Project Cost: $1,365,828.00
Completion Date: 2/28/2019
N42470-16-D-9007; Task Order 0004: Military Fuel System Tightness Testing and Pressure Testing at U.S. Navy, Marine Corps, and DLA-Energy Facilities, Worldwide. *NAVFAC Atlantic.* Technical Manager and Subject Matter Expert. Oversaw a structured team of Project Managers, Engineers and other Technical Professionals to execute a multi-million-dollar program focused on Leak Detection Testing and Environmental Compliance to Support DLA Energy. Michael Baker provided PST environmental compliance and pollution prevention engineering support to NAVFAC Atlantic and DLA-E at Navy, Marine Corps, and other DLA-Energy facilities worldwide. This delivery order included compliance support at 43 installations in 14 states (CA, CT, FL, GA, HI, MD, ME, MS, NC, NV, SC, TX, VA, WA), as well as eight OCONUS installations in Cuba, Greece, Italy, Japan, and Spain. Michael Baker staff completed a wide range of PST compliance activities on this delivery order, including PST and pipeline leak detection testing of bulk fuel storage facilities. This task order also included **CY 2019 semi-annual and annual leak detection testing of the in-service bulk storage tanks at the Red Hill Bulk Fuel Storage Facility** to meet the requirements of the Administrative Order on Consent (AOC), signed September 2015, between the Commander Navy Region Hawaii, DLA Energy, the State of Hawaii Department of Health, and the United States Environmental Protection Agency Region 9 and meets the regulatory requirements stated in the Hawaii Administrative Rules.

Firm Cost: $8,736,603
Total Project Cost: $8,736,603
Completion Date: 5/28/2020

N62470-16-D-9007; Task Order N6247018F4143: 2018 Red Hill Bulk Fuel Storage Facility Annual Leak Detection Testing. *NAVFAC Atlantic.* Technical Manager and Subject Matter Expert. Responsible for executing CY 2018 annual leak detection testing of 18 bulk field-constructed storage tanks at Red Hill. Oversaw QA/QC activities and provided client coordination. Annual leak detection testing was performed to meet the requirements of the Administrative Order on Consent (AOC), signed September 2015, between the Commander Navy Region Hawaii, DLA Energy, the State of Hawaii Department of Health, and the United States Environmental Protection Agency Region 9 and meets the regulatory requirements stated in the Hawaii Administrative Rules.

Firm Cost: $325,097
Total Project Cost: $325,097
Completion Date: 9/27/2019

N62470-16-D-9007; Task Order N6247018F4006: Military Fuel System Tightness Testing and Pressure Testing at U.S. Navy, Marine Corps, and DLA-Energy Facilities, Worldwide. *NAVFAC Atlantic.* Technical Manager and Subject Matter Expert. Oversaw a structured team of Project Managers, Engineers and other Technical Professionals to execute a multi-million-dollar program focused on Leak Detection Testing and Environmental Compliance to Support DLA Energy. Michael Baker provided regulatory-required and best management practice leak detection tests or compliance actions at Navy, USMC, and DLA-E fuel facilities worldwide, supporting DLA-Energy's leak detection Centrally Managed Program

(CMP). Over a 14-month base period of performance, Michael Baker managed the execution of 134 discrete leak detection and compliance action tasks supporting the DLA-Energy Leak Detection CMP at 46 CONUS and five OCONUS Navy, USMC, and DLA-Energy installations, including off-loading facilities, storage tanks, hydrant fueling systems, and pipelines.

Firm Cost: $5,651,909
Total Project Cost: $5,651,909
Completion Date: 7/31/2020

Naval Shipyard Infrastructure Optimization Program, Pearl Harbor Naval Shipyard, Hawaii, Portsmouth, Naval Shipyard, Maine, Puget Sound Naval Shipyard, Washington, Norfolk Naval Ship, Virginia. *NAVFAC Pacific.* Senior Engineer. Responsible for developing a scope of work and associated rough order of magnitude (ROM) costs to provide a comprehensive adaptive re-use proposal plan for the shipyard's historical facilities. The study examined each historical facility and proposed adaptive re-use ideas, perceived barriers and explored alternative solutions to those barriers. Upon completion, the study will serve as a tool to advise the Area Development Team and associated stakeholders of viable options for consideration over the 20-year SIOP development period. Deliverables included a real estate study and a fuels study at Pearl Harbor and an adaptive re-use plan for historical facilities at Puget Sound, Portsmouth and Norfolk.

Firm Cost: $272,895
Total Project Cost: $272,895
Estimated Completion Date: 12/31/2020

2021 Semiannual Leak Detection Testing Report of 14 Bulk Field-Constructed Storage Tanks at Red Hill Fuel Storage Complex

Joint Base Pearl Harbor-Hickam, Hawaii

Prepared under:
NAVFAC Atlantic Contract
N62470-16-D-9007, Delivery Order N6247021F4014

Prepared for:
Defense Logistics Agency Energy and
Naval Facilities Engineering Systems Command Atlantic

Prepared by:
Michael Baker International
Virginia Beach, Virginia

Date:
29 June 2021

Michael Baker INTERNATIONAL

N00172

Exhibit N-2D

Michael Baker
INTERNATIONAL

2021 Semiannual Leak Detection Testing Report of 14 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

Prepared by:

Michael Baker International

Virginia Beach, Virginia

29 June 2021

N00173

Exhibit N-2D

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LIST OF ABBREVIATIONS AND ACRONYMS

BFCUST	Bulk Field-Constructed Underground Storage Tank
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
JB	Joint Base
JP-5	Jet Propellant 5
MDLR	Minimum Detectable Leak Rate
Michael Baker	Michael Baker International
Proprietary Information	Proprietary Information
N/A	Not Applicable
NAVFAC	Naval Facilities Engineering Command
NWGLDE	National Work Group on Leak Detection Evaluations
POC	Point(s) of contact
UST	Underground Storage Tank

PROFESSIONAL ENGINEER CERTIFICATION

2021 Semiannual Leak Detection Testing Report of
14 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: 29 June 2021

EXECUTIVE SUMMARY

The scope of this project is to perform semiannual 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 semiannual leak detection testing is performed in accordance with the Defense Logistics Agency (DLA) Energy Leak Detection Centrally Managed Program (CMP) pollution prevention Best Management Program (BMP).

Prior to mobilization, three BFCUSTs (BFCUSTs 1, 17, and 19) were not included in this project. BFCUSTs 1 and 19 are permanently out-of-service and BFCUST 17 is temporarily out-of-service and will be tested upon return to service under a separate project.

Upon mobilization and system review, three BFCUSTs (BFCUSTs 13, 14, and 18) were removed from testing due to being temporarily out-of-service. Consequently, the final 2021 semiannual leak detection testing event included 14 BFCUSTs (BFCUSTs 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 15, 16, and 20) at the Red Hill Fuel Storage Complex at JB Pearl Harbor-Hickam.

The semiannual leak detection testing of 14 BFCUSTs (BFCUSTs 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 15, 16, and 20) was performed, by Proprietary Information , between 6 April and 18 May 2021, with no detectable leak above the test method's minimum detectable leak rate, resulting in passing tests. BFCUSTs 7 and 8 were tested at less than tank high level, per base request, due to operational issues at the time of testing.

In accordance with the DLA Energy Leak Detection CMP pollution prevention BMP, semiannual leak detection testing of BFCUSTs should be initiated on or before 6 October 2021 to align with the annual BFCUST leak detection testing effort.

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 semiannual 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 semiannual leak detection testing is performed in accordance with the Defense Logistics Agency (DLA) Energy Leak Detection Centrally Managed Program (CMP) pollution prevention Best Management Program (BMP).

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. Note: BFCUST 13, 14, 17, and 18 are temporarily out-of-service and not included in this report.

1.3 Historical Testing Results

The semiannual leak detection testing of 13 BFCUSTs under the DLA Energy Leak Detection CMP was most recently performed, by Proprietary Information between 2 March and 19 April 2020, with no detectable leak above the test method's minimum detectable leak rate (MDLR), resulting in passed tests. BFCUSTs 7, 8, and 20 were tested at less than tank high level, per base request, due to operational issues at the time of testing. BFCUSTs 13, 14, 17, and 18 were removed from testing due to being temporarily out-of-service.

The leak detection testing of BFCUST 5 under the DLA Energy Leak Detection CMP was most recently performed by MTC, between 4 March and 20 April 2020, at four different product levels, with no detectable leak above the test method's MDLR, resulting in passed tests.

The annual leak detection testing of 17 BFCUSTs under the DLA Energy Leak Detection CMP was most recently performed by Proprietary Info, between 6 October and 16 November 2020, with no detectable leak above the test method's MDLR, resulting in passed tests. BFCUSTs 8 and 20 were tested at less than tank high level, per base request, due to operational issues at the time of testing. BFCUSTs 13, 14, 17, and 18 were removed from testing due to being temporarily out-of-service.

1.4 Project Scope

The scope of this project is to perform semiannual leak detection testing of BFCUSTs at the Red Hill Fuel Storage Complex at JB Pearl Harbor-Hickam, Hawaii.

Prior to mobilization, three BFCUSTs (BFCUSTs 1, 17, and 19) were not included in this project. BFCUSTs 1 and 19 are permanently out-of-service and BFCUST 17 is temporarily out-of-service and will be tested upon return to service under a separate project.

Upon mobilization and system review, three BFCUSTs (BFCUSTs 13, 14, and 18) were removed from testing due to being temporarily out-of-service. Consequently, the final 2021 semiannual leak detection testing event included 14 BFCUSTs (BFCUSTs 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 15, 16, and 20) at the Red Hill Fuel Storage Complex at JB Pearl Harbor-Hickam.

Table 1-1 provides a project summary. Figures 1-1 and 1-2 provide overviews of JB Pearl Harbor-Hickam, and the Red Hill Fuel Storage Complex, 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) 4	6	8	12	20	Total Length (Feet)	Volume (Gallons)
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	JP-5							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	Critical Infrastructure		12,700,000	JP-5	Critical Infrastructure						8

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

Figure 1-1: JB Pearl Harbor-Hickam Overview

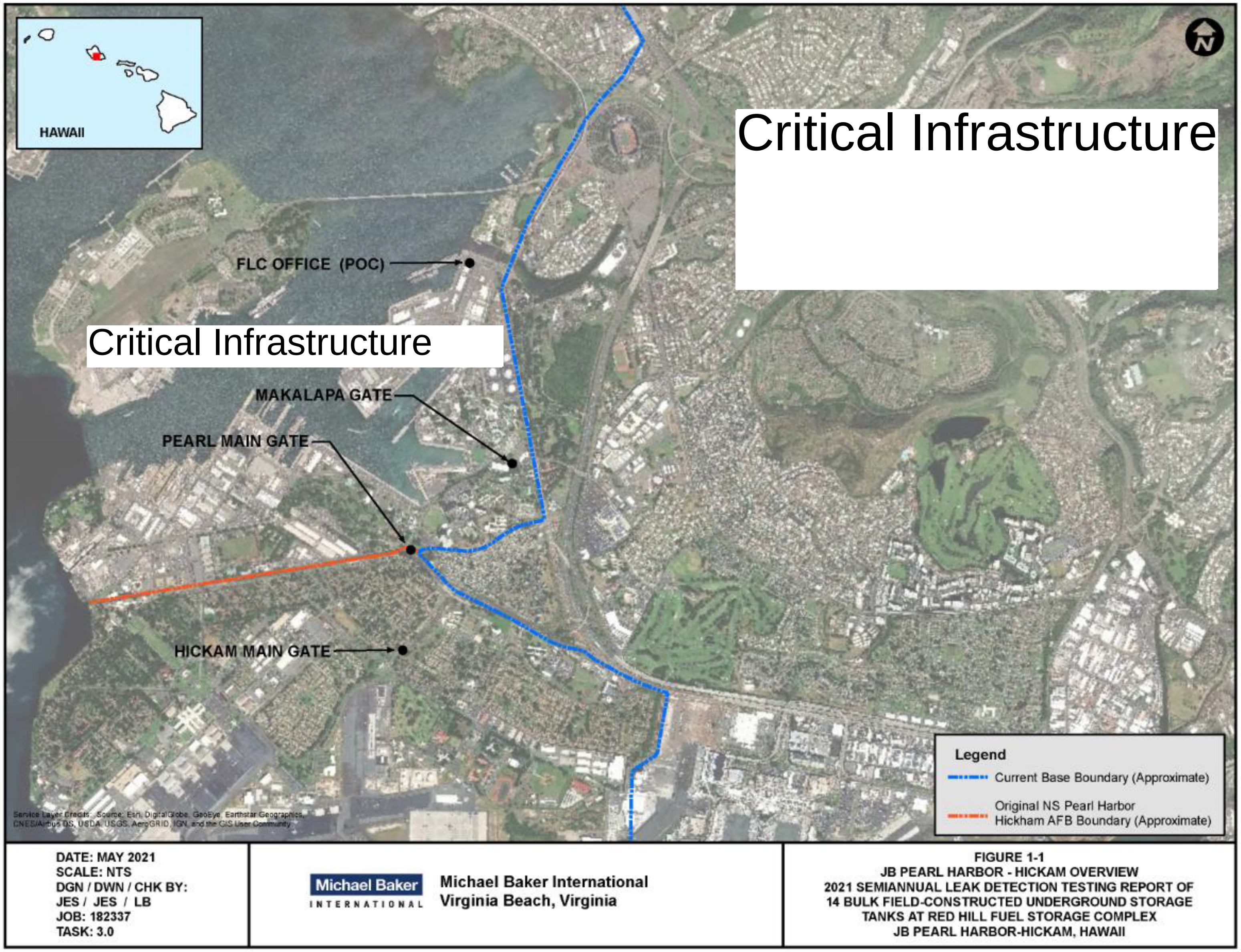

Figure 1-2: Red Hill Fuel Storage Complex Overview

Critical Infrastructure

DATE: MAY 2021 SCALE: NTS DGN / DWN / CHK BY: JES / JES / LB JOB: 182337 TASK: 3.0	Michael Baker INTERNATIONAL	Michael Baker International Virginia Beach, Virginia	FIGURE 1-2 RED HILL FUEL STORAGE COMPLEX OVERVIEW 2021 SEMIANNUAL LEAK DETECTION TESTING REPORT OF 14 BULK FIELD-CONSTRUCTED UNDERGROUND STORAGE TANKS AT RED HILL FUEL STORAGE COMPLEX JB PEARL HARBOR-HICKAM, HAWAII

1.5 Project Team

Michael Baker subcontracted Proprietary Inform to perform the semiannual 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

Proprietary Information

2.0 TESTING RESULTS

The Proprietary Inforr test report is provided in Appendix A.

The semiannual leak detection testing of 14 BFCUSTs (BFCUSTs 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 15, 16, and 20) was performed, by Proprietary In, between 6 April and 18 May 2021, with no detectable leak above the test method’s MDLR, resulting in passing tests. BFCUSTs 7 and 8 were tested at less than tank high level, per base 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	Not Tested – Permanently Out-of-Service							
	BFCUST 2	Critical Infrastructu	12,000,000	F-24	Proprietary Information	0.5	5 May - 10 May 2021	Pass	Proprietary Information
	BFCUST 3		12,000,000	F-24		0.5	30 April - 5 May 2021	Pass	
	BFCUST 4		12,000,000	F-24		0.5	12 May - 17 May 2021	Pass	
	BFCUST 5		12,700,000	F-24		0.5	21 April - 26 April 2021	Pass	
	BFCUST 6		12,700,000	F-24		0.5	16 April - 21 April 2021	Pass	
	BFCUST 7		12,700,000	JP-5		0.5	19 April - 24 April 2021	Pass	
	BFCUST 8		12,700,000	JP-5		0.5	25 April - 30 April 2021	Pass	
	BFCUST 9		12,700,000	JP-5		0.5	7 May - 12 May 2021	Pass	
	BFCUST 10		12,700,000	JP-5		0.5	26 April - 1 May 2021	Pass	
	BFCUST 11		12,700,000	JP-5		0.5	14 April - 19 April 2021	Pass	
	BFCUST 12		12,700,000	JP-5		0.5	9 April - 14 April 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	8 April - 13 April 2021	Pass	
	BFCUST 16		12,700,000	F-76		0.5	2 May - 7 May 2021	Pass	
	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	11 May - 16 May 2021	Pass	

Table Notes:
1. Tank tested at less than tank high level, per base request, due to operational issues at the time of testing.

3.0 CONCLUSIONS AND RECOMMENDATIONS

3.1 Conclusions

Fourteen BFCUSTs (BFCUSTs 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 15, 16, and 20) passed the 2021 semiannual leak detection testing.

3.2 Recommendations

In accordance with the DLA Energy Leak Detection CMP pollution prevention BMP, semiannual leak detection testing of BFCUSTs should be initiated on or before 6 October 2021 to align with the annual BFCUST leak detection testing.

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

APPENDIX A

Proprietary Information

TEST REPORT

Proprietary Information

Proprietary Information

Proprietary Information

Proprietary Information

Proprietary Information

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Proprietary Information

Proprietary Information

2021 Leak Detection Testing Report of Bulk Field-Constructed Underground Storage Tank 5 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:
10 November 2021

Michael Baker
INTERNATIONAL

N00232

Project: 182337
Task: 3.0

Exhibit N-2E

Michael Baker INTERNATIONAL

2021 Leak Detection Testing Report of Bulk Field-Constructed Underground Storage Tank 5 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

Prepared by:

Michael Baker International

Virginia Beach, Virginia

10 November 2021

N00233

Exhibit N-2E

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LIST OF ABBREVIATIONS AND ACRONYMS

BFCUST	Bulk Field-Constructed Underground Storage Tank
DLA	Defense Logistics Agency
F-24	Commercial Aviation Jet Fuel with Military Additives
FLC	Fleet Logistics Center
gph	gallons per hour
HAR	Hawaii Administrative Rules
JB	Joint Base
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
UST	Underground Storage Tank

PROFESSIONAL ENGINEER CERTIFICATION

2021 Leak Detection Testing Report of
Bulk Field-Constructed Underground Storage Tank 5 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: 10 November 2021

EXECUTIVE SUMMARY

The scope of this project is to perform leak detection testing of bulk field-constructed underground storage tank (BFCUST) 5, at the Red Hill Fuel Storage Complex at Joint Base (JB) Pearl Harbor-Hickam, Hawaii. The 2021 leak detection testing of BFCUST 5 is being performed at the direction of the Naval Facilities Engineering Systems Command (NAVFAC) Atlantic and the Defense Logistics Agency (DLA) Energy Leak Detection Centrally Managed Program to conduct testing capable of detecting a 0.1 gallon per hour (gph) leak rate.

The leak detection testing of BFCUST 5 was performed, by Proprietary Information, between 5 and 30 October 2021, with no detectable leak above the test method's minimum detectable leak rate of 0.1 gph, resulting in a passing test.

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 leak detection testing of bulk field-constructed underground storage tank (BFCUST) 5 at the Red Hill Fuel Storage Complex at Joint Base (JB) Pearl Harbor-Hickam, Hawaii. The leak detection testing of BFCUST 5 is being performed at the direction of the Naval Facilities Engineering Systems Command (NAVFAC) Atlantic and the Defense Logistics Agency (DLA) Energy Leak Detection Centrally Managed Program to conduct testing capable of detecting a 0.1 gallon per hour (gph) leak rate.

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 Pearl Harbor.

Fuels stored at Red Hill Fuel Storage Complex include commercial aviation jet fuel with military additives (F-24), Jet Propellant 5, and diesel fuel marine. 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 removed from service prior to 2009. BFCUSTs S1224 through S1227 are utilized as surge tanks during receipt and issue operations. The top and bottom portions of BFCUSTs 1 through 20 are accessible via a tunnel system. 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. This report includes the leak detection testing of BFCUST 5 only.

The State of Hawaii has 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). Hawaii has received state UST program approval from United States Environmental Protection Agency (USEPA) and has revised state UST regulations to incorporate and meet the 2015 federal revisions to 40 CFR 280. The Hawaii Administrative Rules (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. 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. In addition, HAR 11-280.1-43(3) contains the compliance requirements for owners and operators of USTs placing USTs back into service after repairs to conduct tank tightness testing capable of detecting a 0.1 gph leak rate.

1.3 Historical Testing Results

The leak detection testing of BFCUST 5 was last performed under the DLA Leak Detection CMP, by Proprietary In , between 4 March and 20 April 2020, at four different product levels, with no detectable leak above the test method's minimum detectable leak rate (MDLR), resulting in passing tests.

1.4 Project Scope

The scope of this project is to perform leak detection testing of BFCUST 5 at an MDLR of 0.1 gph, at the Red Hill Fuel Storage Complex, JB Pearl Harbor-Hickam, Hawaii.

Table 1-1 provides a project summary. Figures 1-1 and 1-2 provide overviews of JB Pearl Harbor-Hickam and the Red Hill Fuel Storage Complex, respectively.

Table 1-1: Project Summary

Fuel System	Designation	Tank Diameter (Feet)	Tank Height[1] (Feet)	Tank Volume[2] (Gallons)	Product	Associated Tank Piping				Comments
						Diameter (Inches) Length (Feet)		Total Length (Feet)	Volume (Gallons)	
						6	20			
Red Hill Fuel Storage Complex	BFCUST 5	Cr tical In	Critical In	12,700,000	F-24	Critical	Critical	Critical I	38	Testing performed at MDLR of 0.1 gph.

Table Notes:
1. Tank height is rounded to the nearest foot.
2. Tank volume is rounded to the nearest hundred thousand gallons.

Figure 1-1: JB Pearl Harbor-Hickam Overview

DATE: NOVEMBER 2021 SCALE: NTS DGN / DWN / CHK BY: JES / JES / MC JOB: 182337 TASK: 3.0	Michael Baker INTERNATIONAL Michael Baker International Virginia Beach, Virginia	FIGURE 1-1 JB PEARL HARBOR - HICKAM OVERVIEW 2021 LEAK DETECTION TESTING REPORT OF BULK FIELD-CONSTRUCTED UNDERGROUND STORAGE TANK 5 AT RED HILL FUEL STORAGE COMPLEX JB PEARL HARBOR-HICKAM, HAWAII

Figure 1-2: Red Hill Fuel Storage Complex Overview

Critical Infrastructure

DATE: NOVEMBER 2021 SCALE: NTS DGN / DWN / CHK BY: JES / JES / MC JOB: 182337 TASK: 3.0	Michael Baker INTERNATIONAL	Michael Baker International Virginia Beach, Virginia	FIGURE 1-2 RED HILL FUEL STORAGE COMPLEX OVERVIEW 2021 LEAK DETECTION TESTING REPORT OF BULK FIELD-CONSTRUCTED UNDERGROUND STORAGE TANK 5 AT RED HILL FUEL STORAGE COMPLEX JB PEARL HARBOR-HICKAM, HAWAII

1.5 Project Team

Michael Baker subcontracted MTC to perform the 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

Proprietary information

Proprietary Information

2.0 TESTING RESULTS

The Proprietary Inf test report is provided in Appendix A.

The leak detection testing of BFCUST 5 was performed by Proprietary Information , 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.

The results summary is listed in Table 2-1.

Table 2-1: Results Summary

Fuel System	Designation	Height[1] (Feet)	Capacity[2] (Gallons)	Test Product Height (Feet)	Certified MDLR (gph)	Test Date	Result
Red Hill Fuel Storage Complex	BFCUST 5	Critical In	12,700,000	Critical Infrastru	0.1	5 – 30 October 2021	Pass

Table Notes:
1. Tank height is rounded to the nearest foot.
2. Tank volume is rounded to the nearest hundred thousand gallons.

3.0 CONCLUSIONS

The 2021 leak detection testing of BFCUST 5 at 0.1 gph resulted in a passing test.

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

APPENDIX A

Proprietary Information

Proprietary Information

Proprietary Information

Proprietary Information

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

N00251

Exhibit N-2F

Michael Baker INTERNATIONAL

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

Prepared by:

Michael Baker International

Virginia Beach, Virginia

3 December 2021

N00252

Exhibit N-2F

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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
Proprietary Information	Proprietary Information
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.

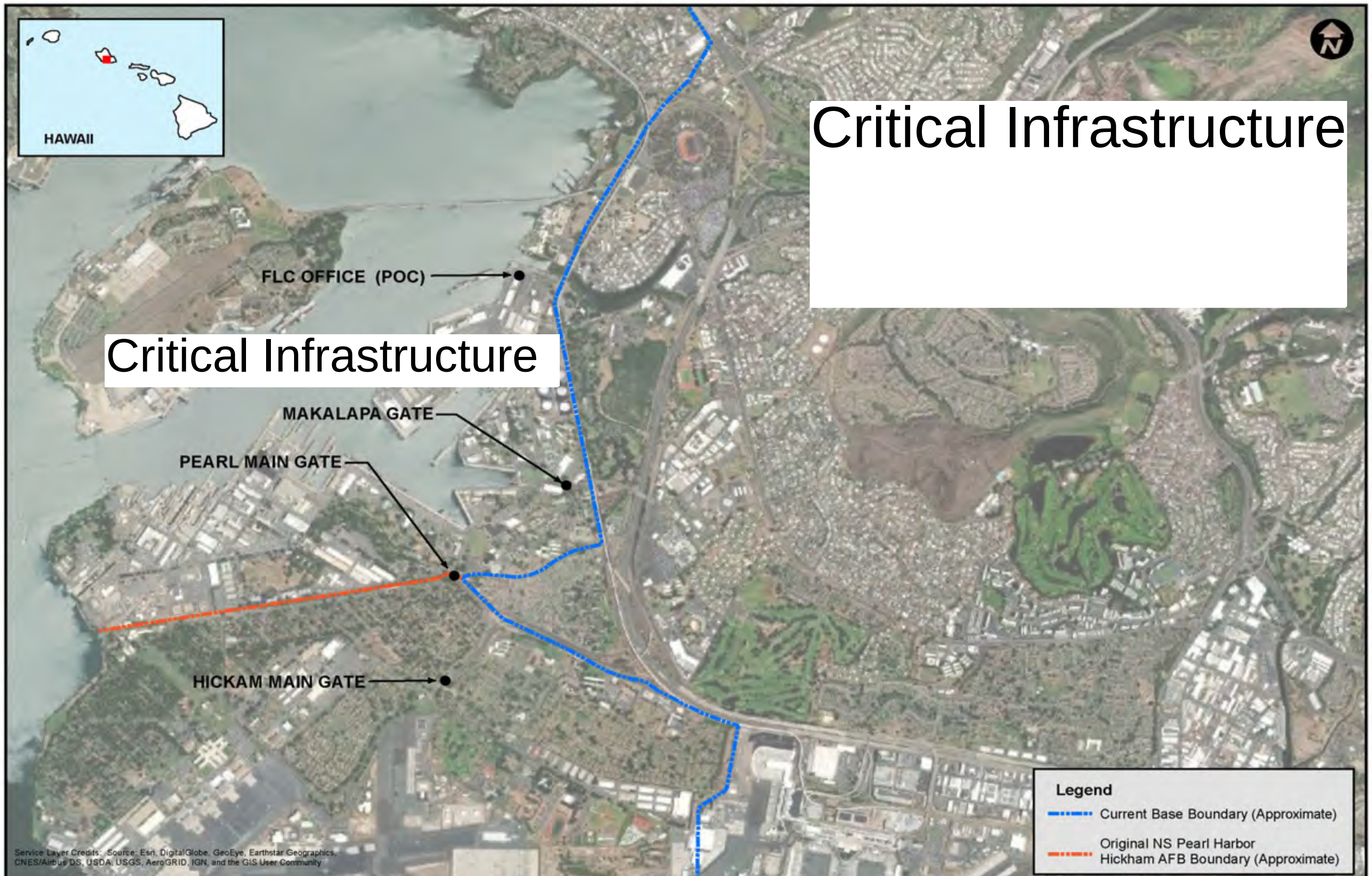
The final 2021 annual leak detection testing effort included 16 BFCUSTs identified as BFCUSTs 2, 3, 4, 6, 7, 8, 9, 10, 11, 12, 15, and 20, located at the Red Hill Fuel Storage Complex and BFCUSTs S1224, S1225, S1226, and S1227, located at the Underground Pump House Facility at JB Pearl Harbor-Hickam. 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 130e	Critical Infrastructure	12,000,000	F-24	Critical Infrastructure						13
	BFCUST 3	130e		12,000,000	F-24							13
	BFCUST 4	130e		12,000,000	F-24							13
	BFCUST 5	130e		12,700,000	F-24							38
	BFCUST 6	130e		12,700,000	F-24							44
	BFCUST 7	130e		12,700,000	JP-5							12
	BFCUST 8	130e		12,700,000	JP-5							20
	BFCUST 9	130e		12,700,000	JP-5							12
	BFCUST 10	130e		12,700,000	JP-5							31
	BFCUST 11	130e		12,700,000	JP-5							15
	BFCUST 12	130e		12,700,000	JP-5							44
	BFCUST 13[1]	130e		12,700,000	F-76							13
	BFCUST 14[1]	130e		12,700,000	JP-5							21
	BFCUST 15	130e		12,700,000	F-76							15
	BFCUST 16	130e		12,700,000	F-76							60
	BFCUST 17[1]	130e		12,700,000	JP-5							15
	BFCUST 18[1]	130e		12,700,000	JP-5							28
	BFCUST 19	Permanently Out-of-Service										
	BFCUST 20	130e		12,700,000	JP-5	Critical Infrastructure						8
Underground Pump House Facility	BFCUST S1224	130e		420,000	F-24							25
	BFCUST S1225	130e		420,000	JP-5							25
	BFCUST S1226	130e		420,000	F-76							59
	BFCUST S1227	130e		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



DATE: NOVEMBER 2021 SCALE: NTS DGN / DWN / CHK BY: WRH / JES / MDC JOB: 182337 TASK: 3.0	Michael Baker INTERNATIONAL Michael Baker International Virginia Beach, Virginia	FIGURE 1-1 JB PEARL HARBOR - HICKAM OVERVIEW 2021 ANNUAL LEAK DETECTION TESTING REPORT OF 16 BULK FIELD-CONSTRUCTED UNDERGROUND STORAGE TANKS AT RED HILL FUEL STORAGE COMPLEX JB PEARL HARBOR-HICKAM, HAWAII

Figure 1-2: Red Hill Fuel Storage Complex Overview

Critical Infrastructure

DATE: NOVEMBER 2021 SCALE: NTS DGN / DWN / CHK BY: WRH / JES / MDC JOB: 182337 TASK: 3.0	Michael Baker INTERNATIONAL	Michael Baker International Virginia Beach, Virginia	FIGURE 1-2 RED HILL FUEL STORAGE COMPLEX OVERVIEW 2021 ANNUAL LEAK DETECTION TESTING REPORT OF 16 BULK FIELD-CONSTRUCTED UNDERGROUND STORAGE TANKS AT RED HILL FUEL STORAGE COMPLEX JB PEARL HARBOR-HICKAM, HAWAII

Figure 1-3: Pump House Facility Overview

Critical Infrastructure

DATE: NOVEMBER 2021 SCALE: NTS DGN / DWN / CHK BY: WRH / JES / MDC JOB: 182337 TASK: 3.0	Michael Baker INTERNATIONAL Michael Baker International Virginia Beach, Virginia	FIGURE 1-3 PUMP HOUSE FACILITY OVERVIEW 2021 ANNUAL LEAK DETECTION TESTING REPORT OF 16 BULK FIELD-CONSTRUCTED UNDERGROUND STORAGE TANKS AT RED HILL FUEL STORAGE COMPLEX JB PEARL HARBOR-HICKAM, HAWAII

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

Proprietary Information

Proprietary Information

2.0 TESTING RESULTS

The Proprietary Infon 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	Not Tested – Permanently Out-of-Service							
	BFCUST 2	Critical Infrastructure	12,000,000	F-24	Proprietary Information	0.5	20 October - 25 October 2021	Pass	Proprietary Informatic
	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

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:

3357

N00274

Exhibit N-2F

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 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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Exhibit N-2F

APPENDIX B

Proprietary Information *TEST REPORTS*

Proprietary Information

Proprietary Information

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Proprietary Information

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Proprietary Information

Proprietary Information

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Proprietary Information

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Exhibit N-2F

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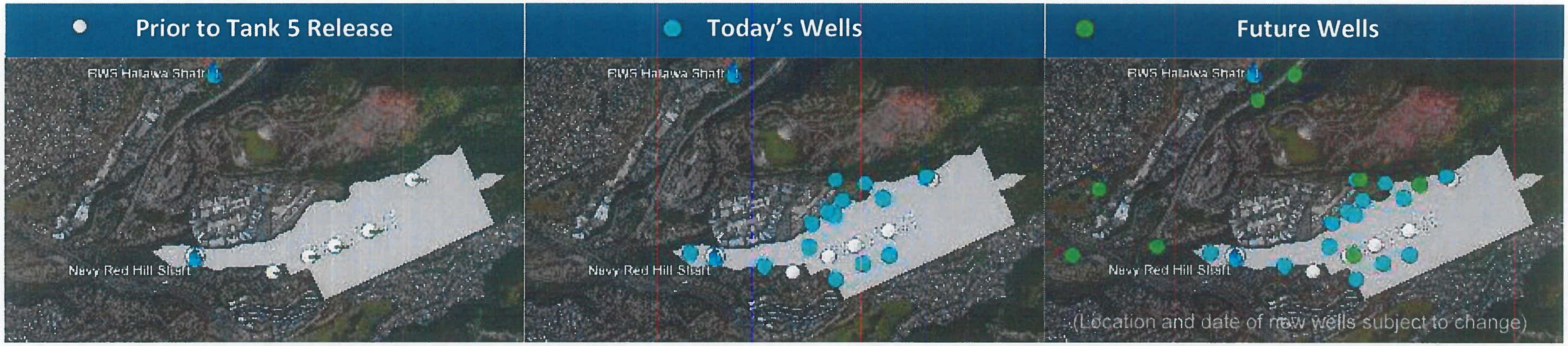
Proprietary Information

Proprietary Information

What is the purpose of Groundwater Monitoring Wells?

- Monitoring wells are critical elements of groundwater investigation
- Monitoring wells are drilled into the ground to provide a way to sample, then analyze groundwater, including water in an aquifer
- Monitoring wells can be designed to allow sampling solely from the bottom of the well, or from various depths from the bottom to the top
- Monitoring well sampling can be used to help understand the horizontal and vertical movement of groundwater over time, and are an essential element of groundwater flow modeling
- Monitoring well sampling is also used to capture samples of contaminants for identification, and to trace their movement over time



Monitoring well data are vital to understanding groundwater conditions