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
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San Francisco, CA 94105

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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
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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:

- Conduct an annual tank tightness test that can detect a 0.5-gallon-per-hour (gph) leak rate;
- 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.
- 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;
- 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
- 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:
  - 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);
  - Perform vapor monitoring using a tracer compound capable of detecting a 0.1-gph leak at least every two years;
  - 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
  - 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

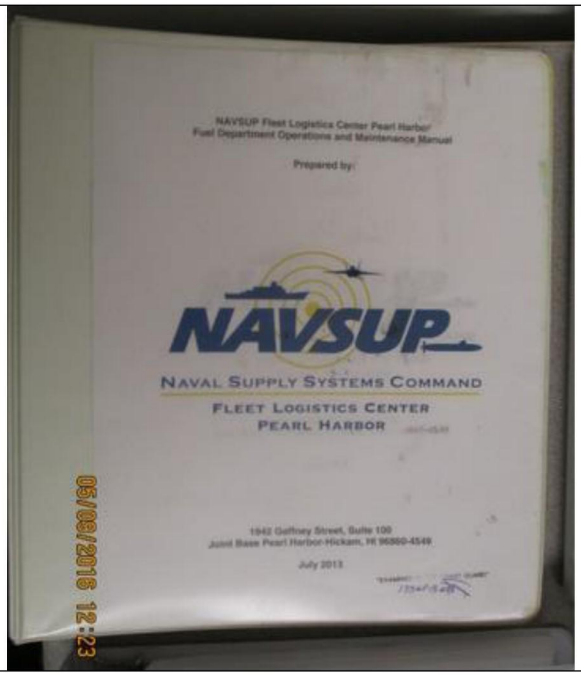
Review of documentation and facilities as required	All	Bldg. 1757, 2nd Floor Conf. Room	0800-1600	Continuation of previous days review as required. Limited SME availability

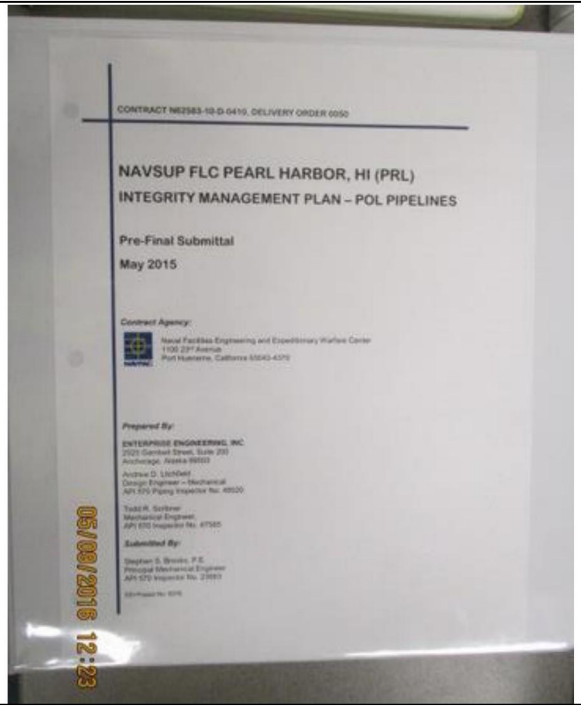
Day 4 – Thursday, 12 May 2016

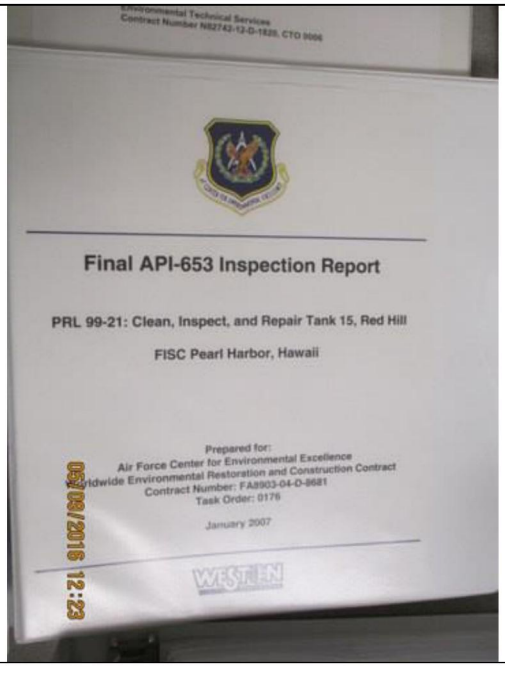
Review of documentation and facilities as required	All	Bldg. 1757, 2nd Floor Conf.Room	0800-1600	Continuation of previous days review as required. Limited SME availability

ATTACHMENT B

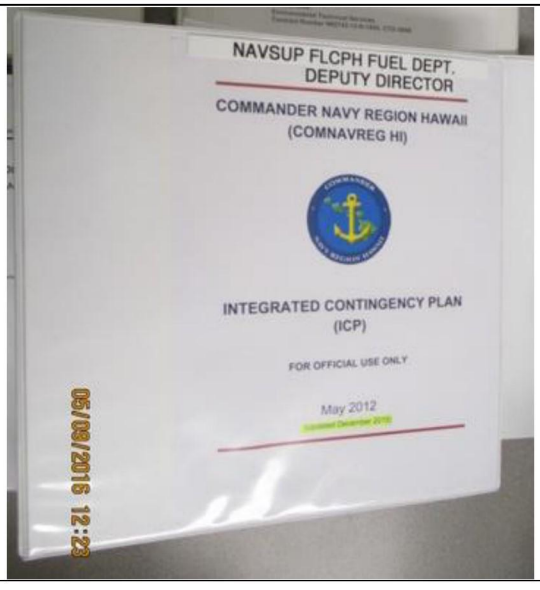
Photograph Log

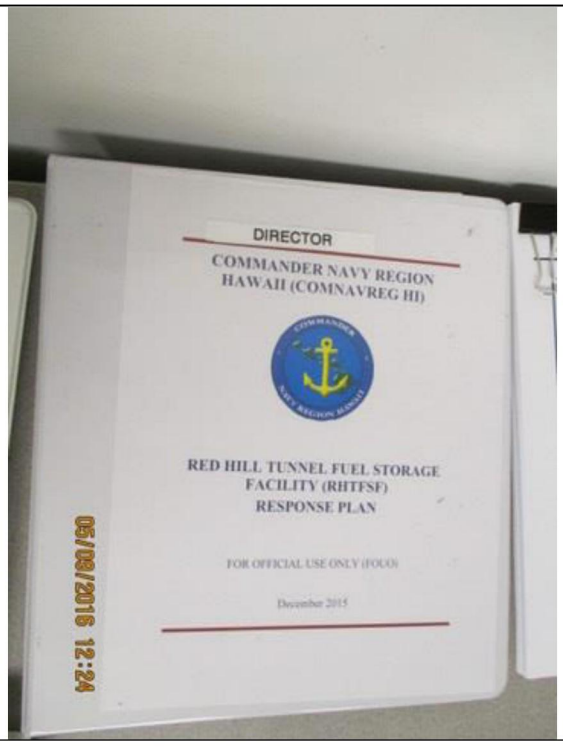
DATE TAKEN: 5/9/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 1	
COMMENTS: Fuel Department Operations and Maintenance Manual	

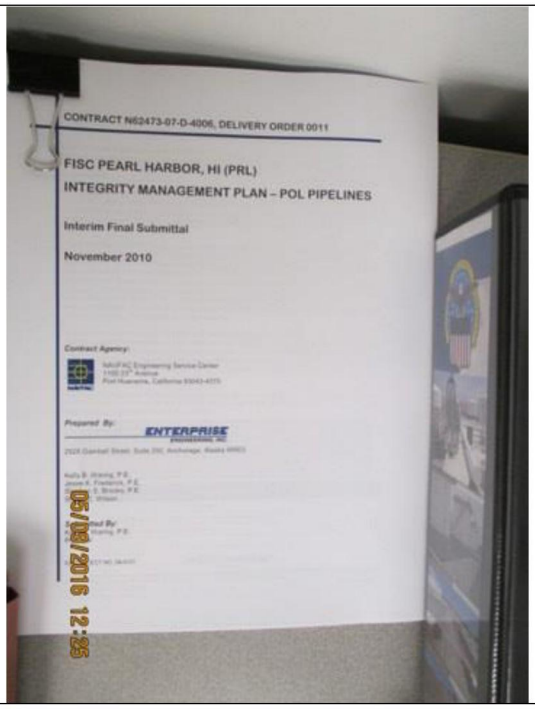
DATE TAKEN: 5/9/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 2	
COMMENTS: Integrity Management Plan – POL Pipelines (May 2015)	

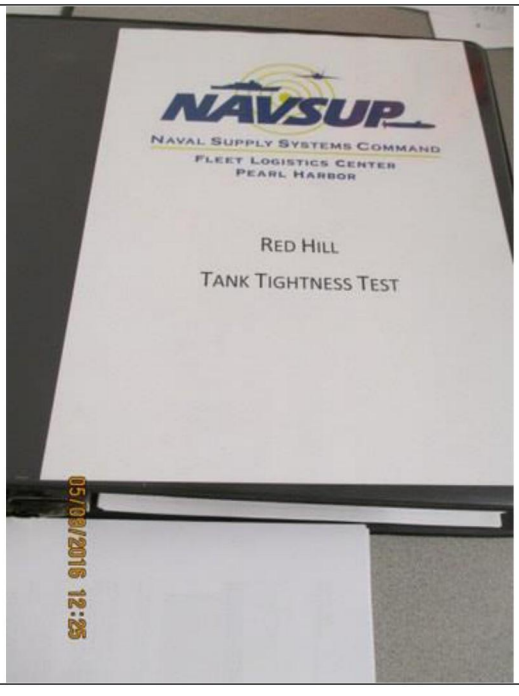
DATE TAKEN: 5/9/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 3	
COMMENTS: Final API-653 Inspection Report for Tank 15 (January 2007)	

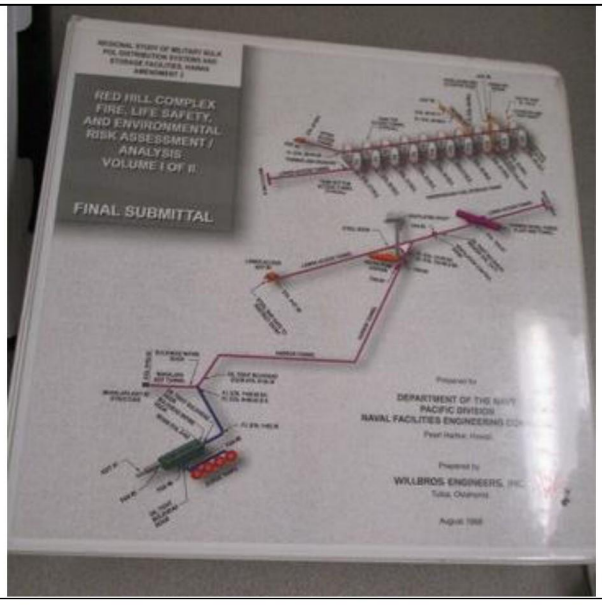
DATE TAKEN: 5/9/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 4	
COMMENTS: 2013 Spill Control and Countermeasure (SPCC) Plan for Commander, Navy Region Hawaii (CNRH)	

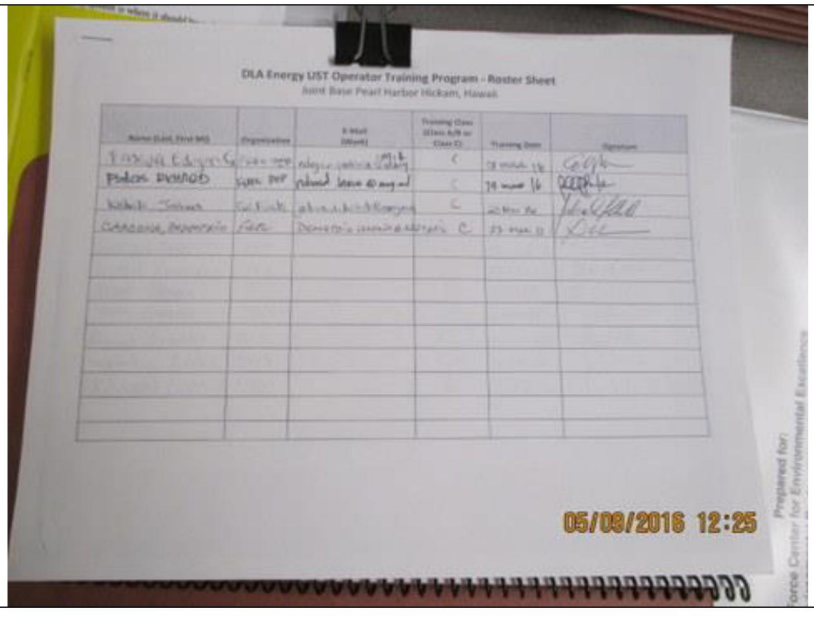
DATE TAKEN: 5/9/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 5	
COMMENTS: Integrated Contingency Plan	

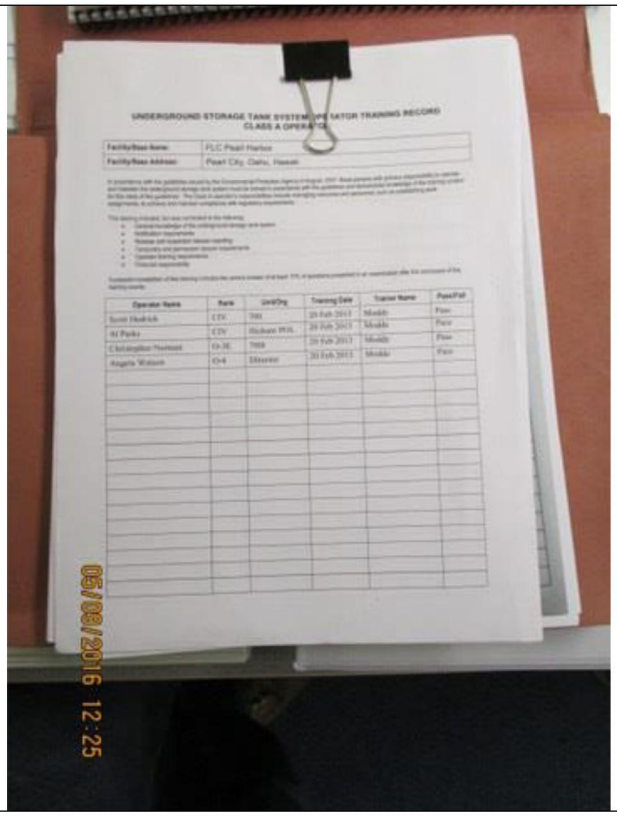
DATE TAKEN: 5/9/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 6	
COMMENTS: Red Hill Tunnel Fuel Storage Facility Response Plan	

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

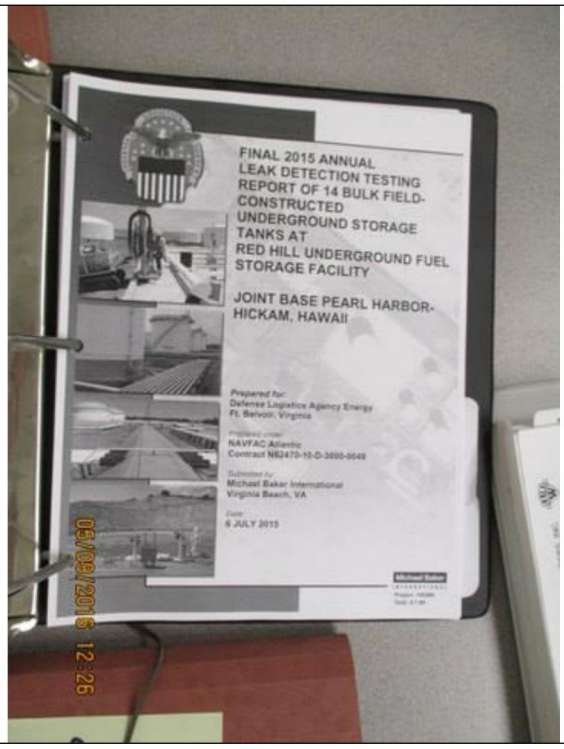
DATE TAKEN: 5/9/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 8	
COMMENTS: Tank Tightness Test Binder	

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	

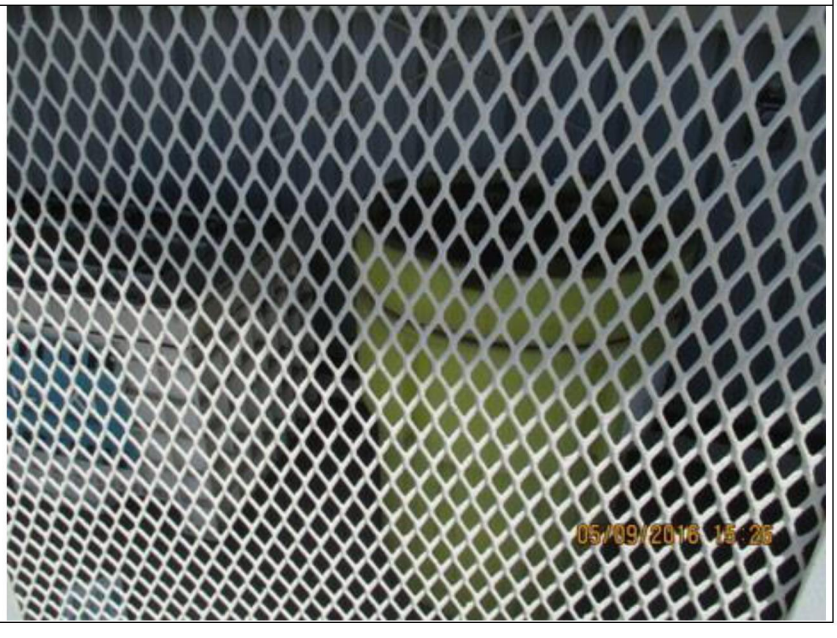
DATE TAKEN: 5/9/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 15	
COMMENTS: One "Hotel" of four on the Hotel Pier, with risers for all three fuels stored at the Red Hill Facility	

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	

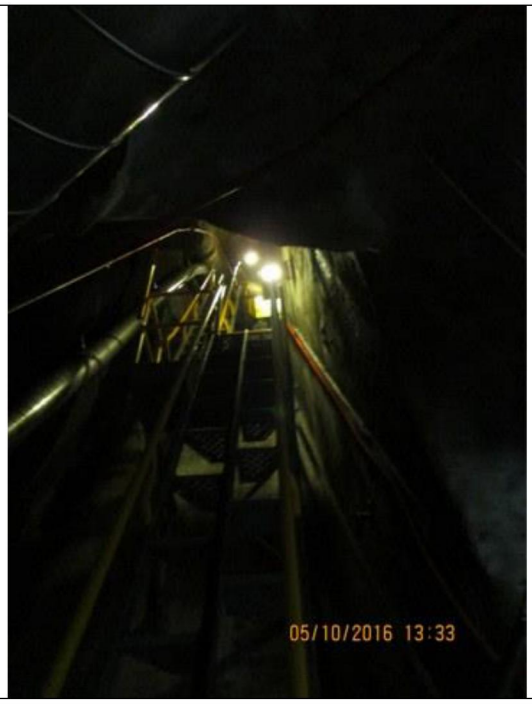
DATE TAKEN: 5/9/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 30	
COMMENTS: Pumphouse	

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	

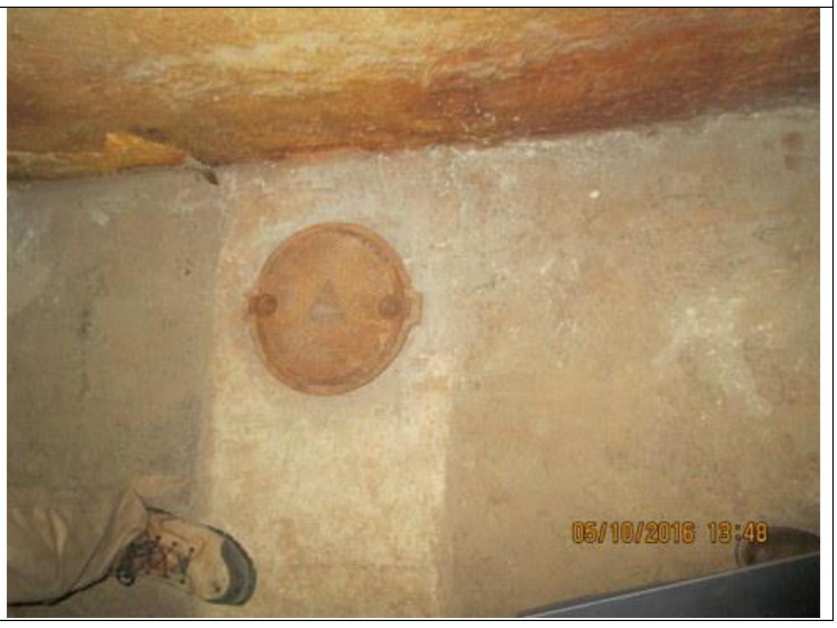
DATE TAKEN: 5/9/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 32	
COMMENTS: Pipelines supported by concrete wall in tunnel	

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	

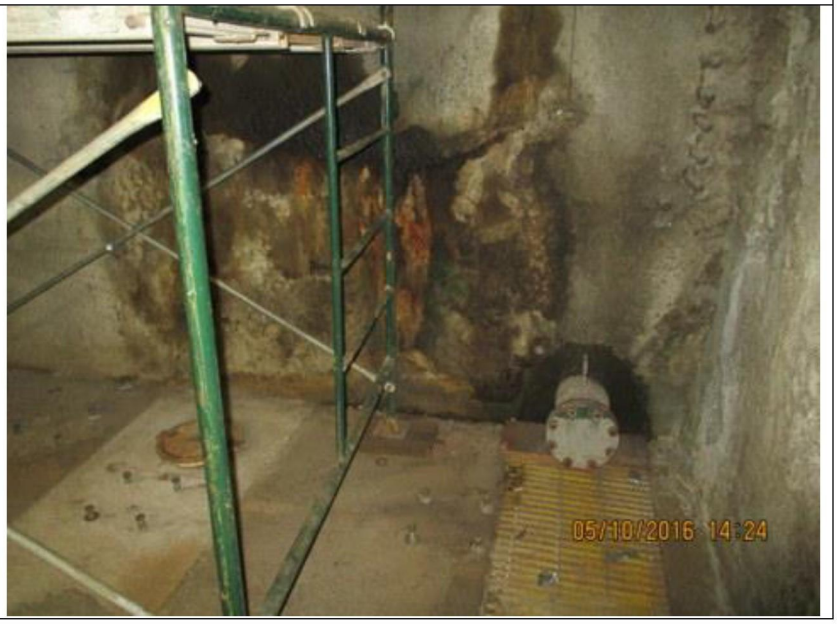
DATE TAKEN: 5/10/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 39	
COMMENTS: Tell-tale system on Tank 19 (Tank 19 has been permanently removed from service and the tell-tale system has been decommissioned).	

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)	

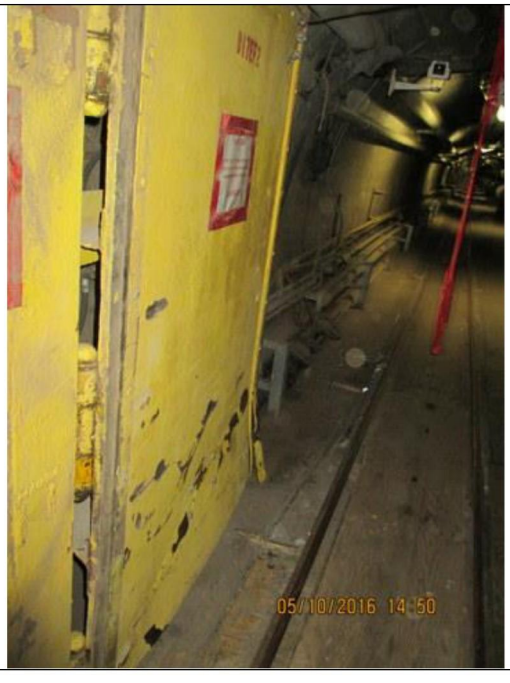
DATE TAKEN: 5/10/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 47	
COMMENTS: Spill kit in tunnel	

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	

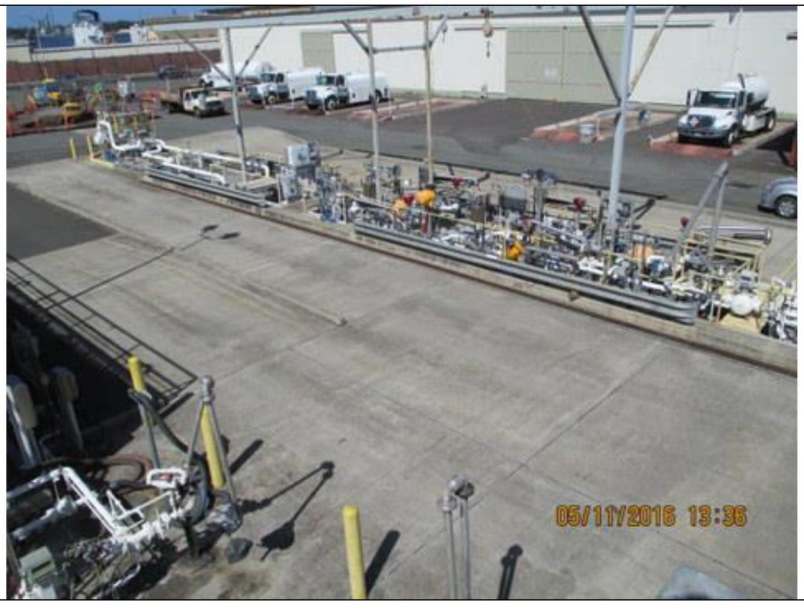
DATE TAKEN: 5/10/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 58	
COMMENTS: Sump and float switch in tunnel	

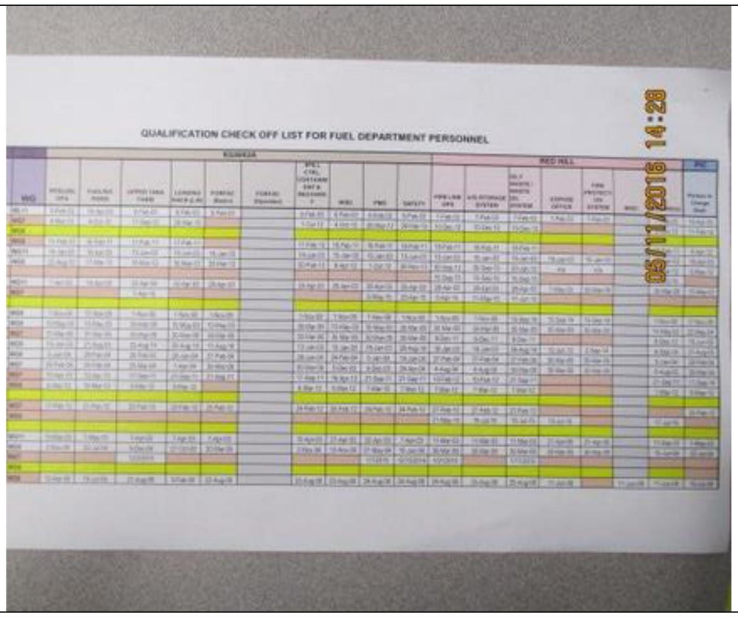
DATE TAKEN: 5/11/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 59	
COMMENTS: Rectifier near Hotel Pier showing no voltage or current	

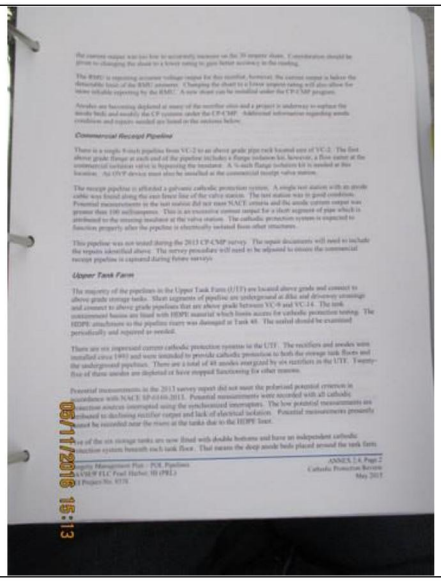
DATE TAKEN: 5/11/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 60	
COMMENTS: AST tank in Upper Tank Farm	

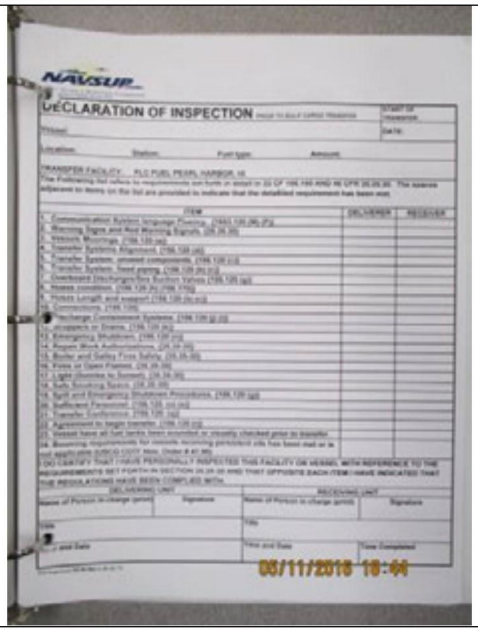
DATE TAKEN: 5/11/2016	
TAKEN BY: Chris Krejci	**SITE LOCATION:** Red Hill Facility
PHOTO #: 61	
COMMENTS: Truck loading rack	

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: 147036
Task: 4.1.89

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

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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: 9 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 2006. 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

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.

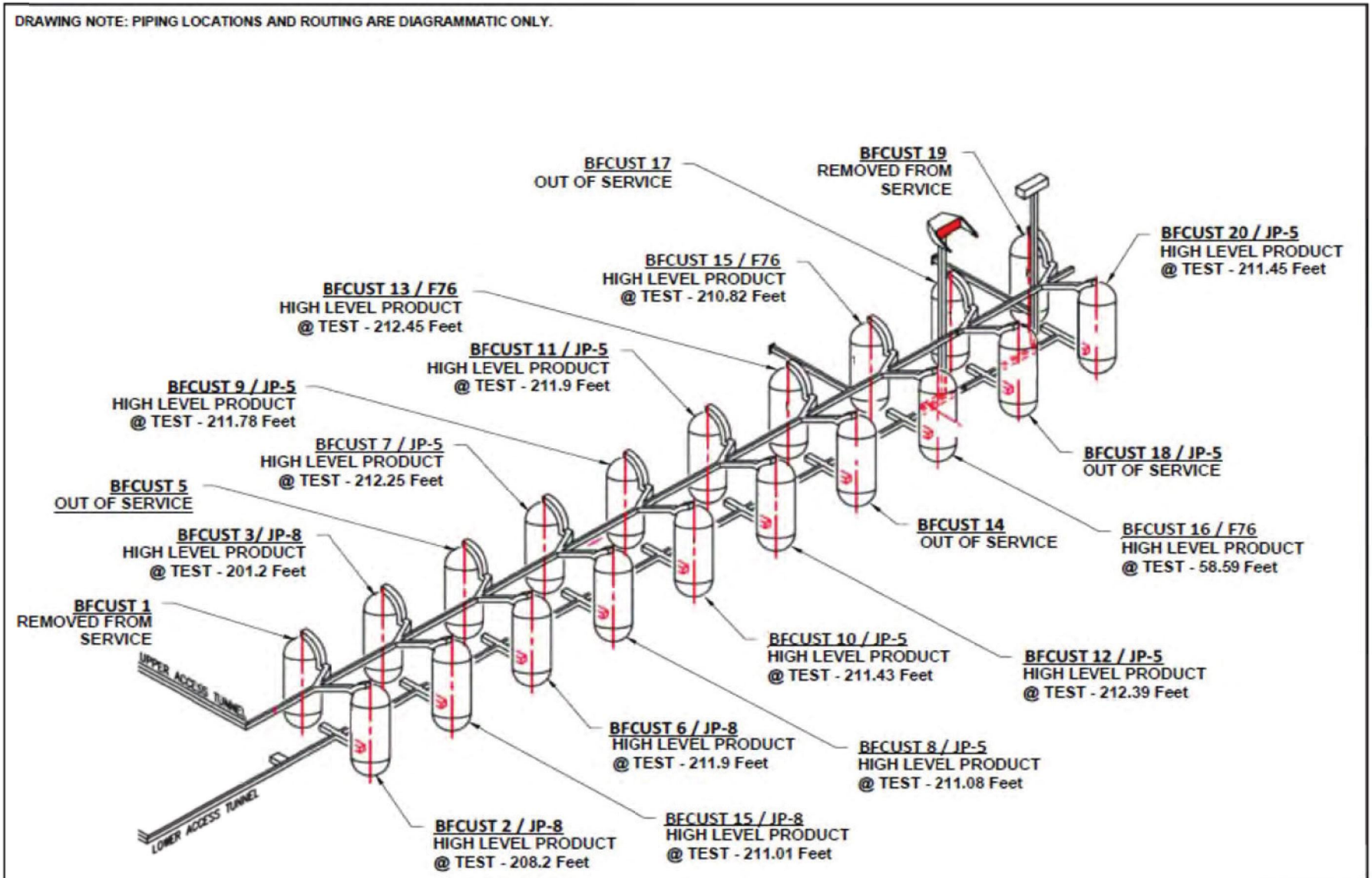
1.4 Project Scope

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: Diameter (Inches) / Length (Feet): 3/4	4	6	8	12	20	Total Length (Feet)	Volume (Gallons)	Comments
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	5.3	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 2-1: Red Hill System Layout



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 ft² 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 ft² ÷ 1,257 ft²) x 0.078 gph].

Leak rate may not be scaled below 0.1 gph.

Example:

For a 100 foot diameter tank with PSA = 7850 ft²; leak rate = [(7850 ft² ÷ 1,257 ft²) 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	58.29	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-3000-0029. 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

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 # 2 an underground fuel storage tank located at FISC Red Hill, Pearl Harbor, HI.

Report compiled by: ______________________
Ricky Slaughter

Date: 03-13-2015

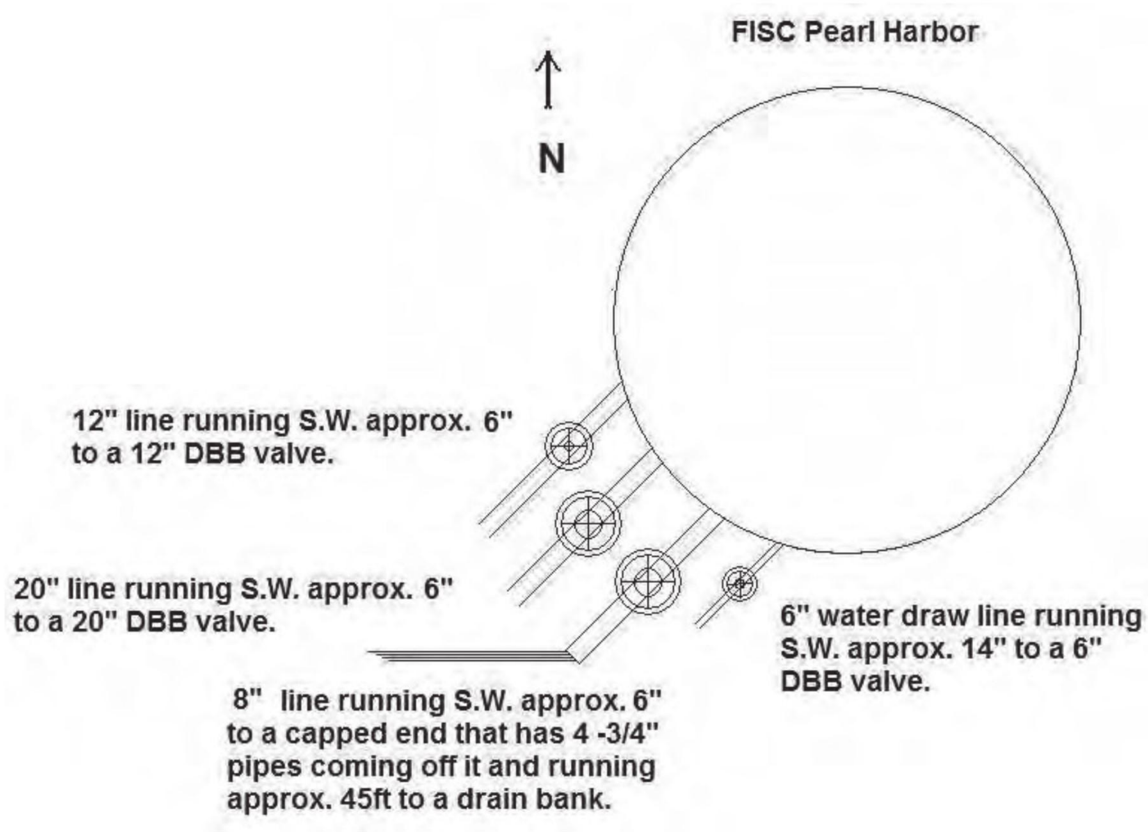
Summary

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

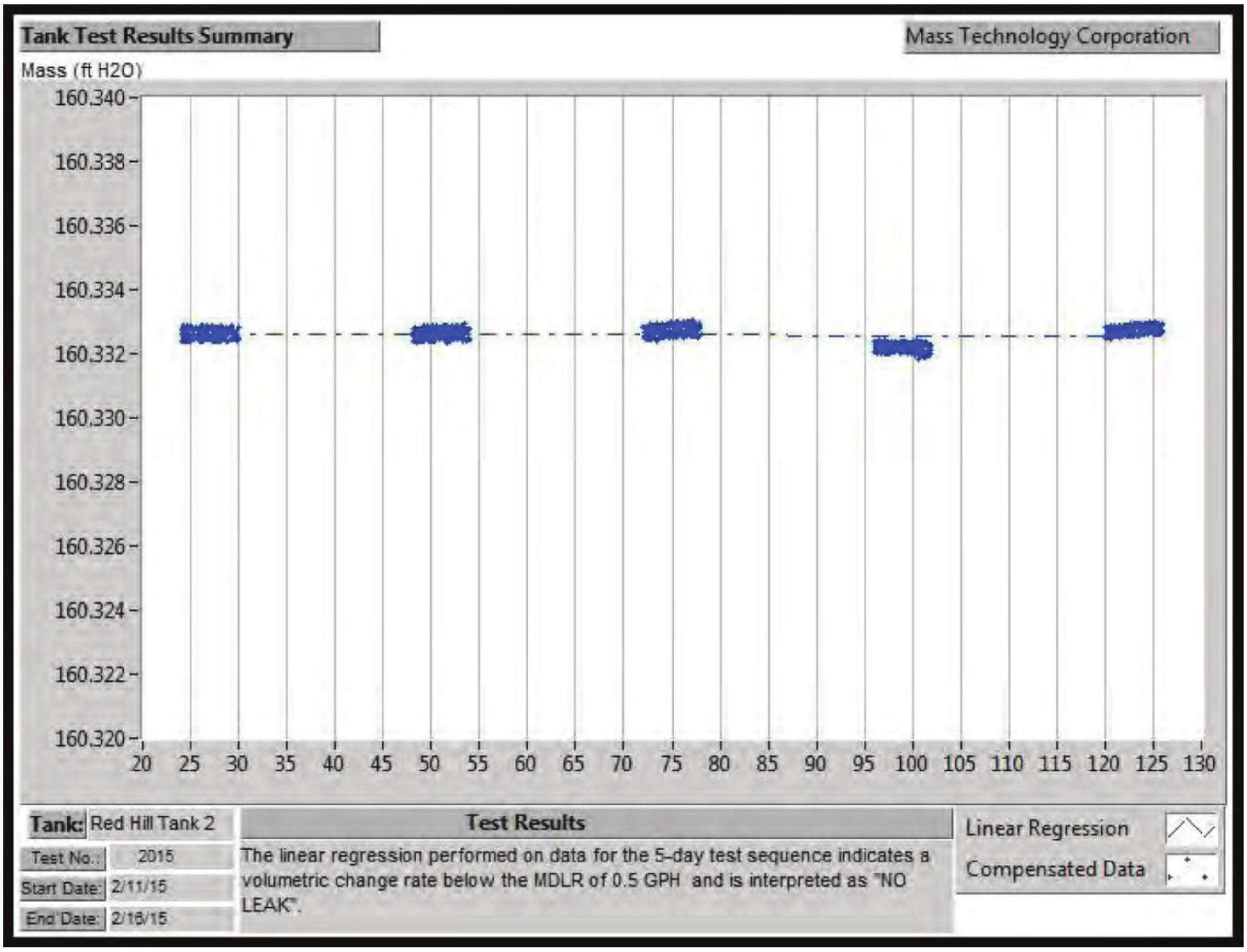


All dimensions, line locations, sizes and valve descriptions have been furnished by the facility operator.

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.



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 # 3 an underground fuel storage tank located at FISC Red Hill, Pearl Harbor, HI.

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

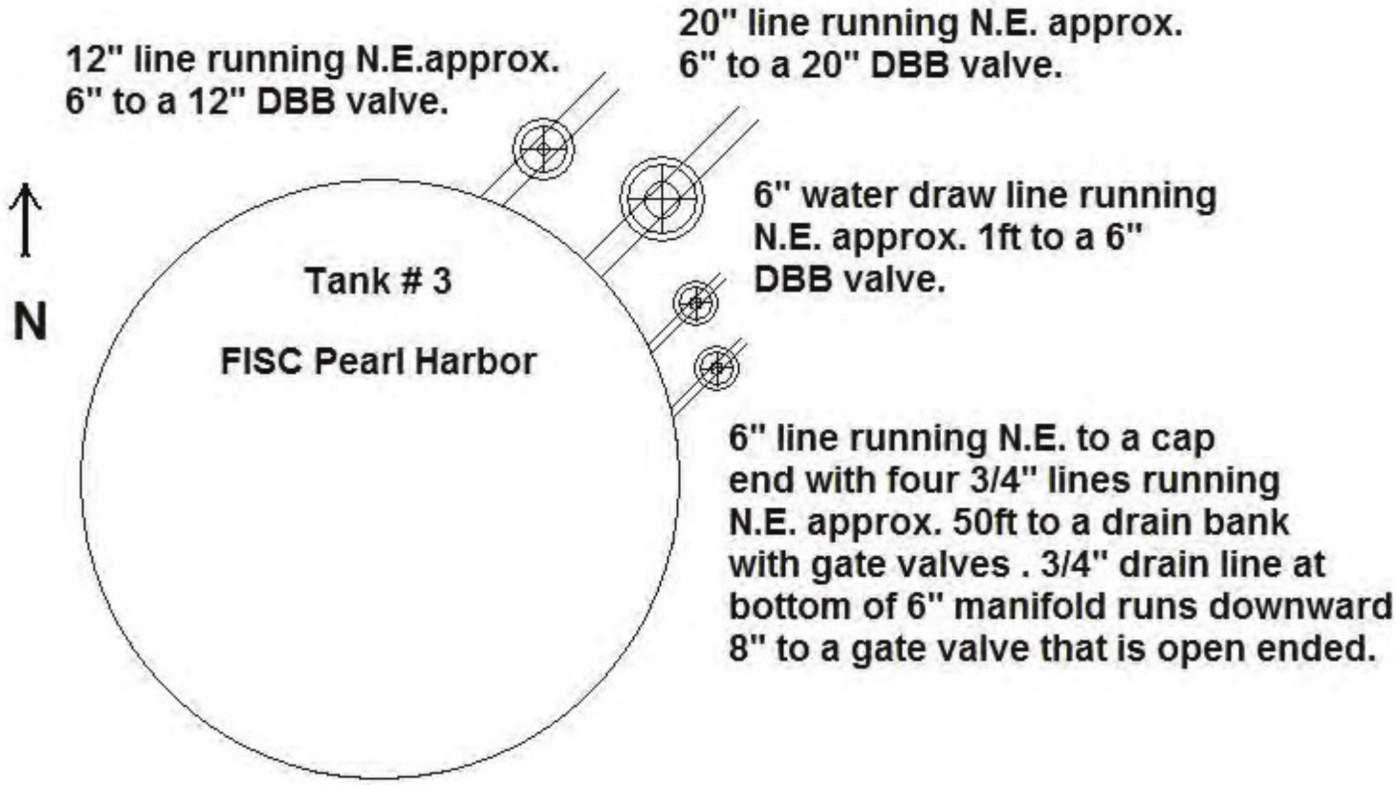
Summary

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 Rickerson	Test Results:	Certified Tight

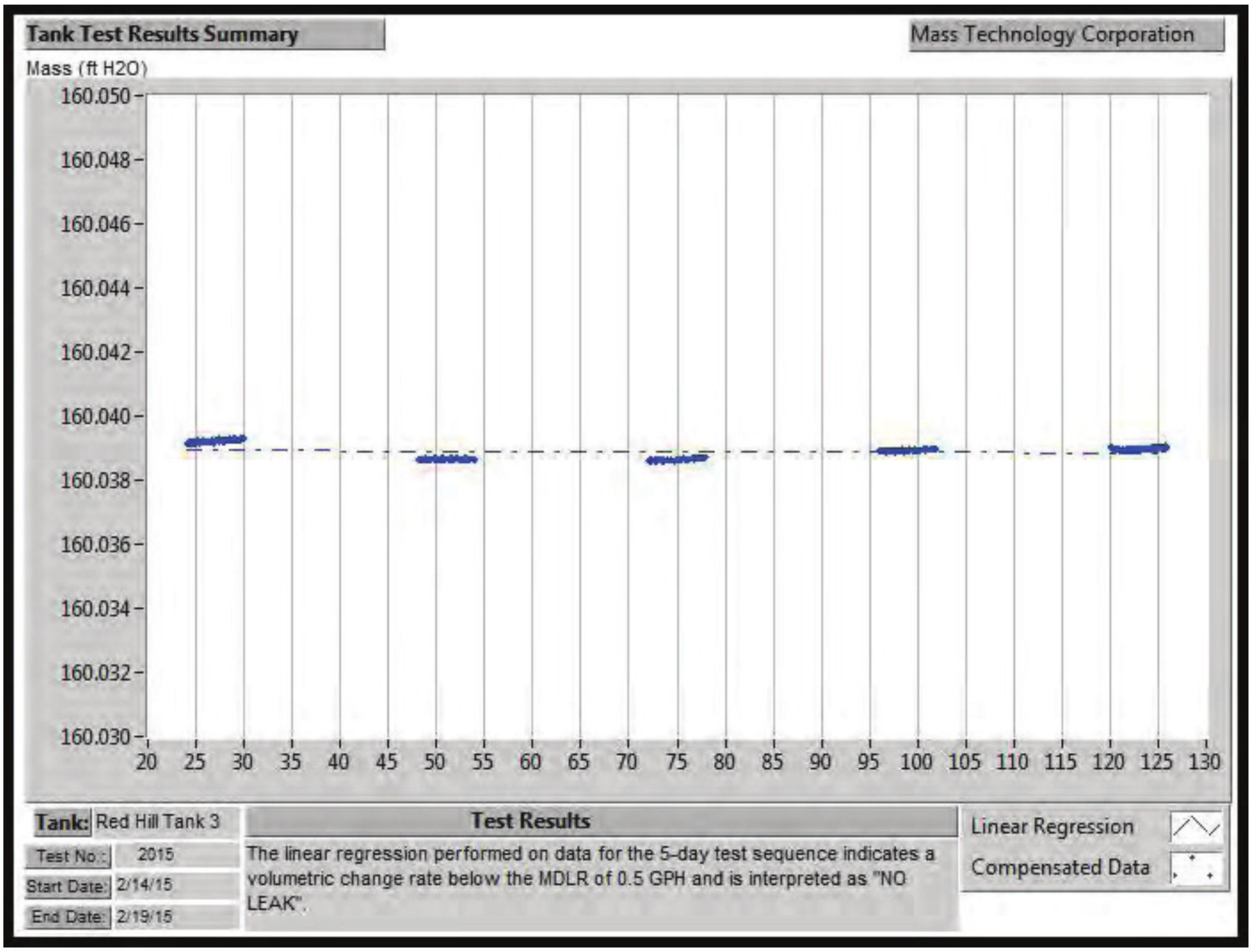


All dimensions, line locations, sizes and valve descriptions have been furnished by the facility operator.

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.



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 # 4 an underground fuel storage tank located at FISC Red Hill, Pearl Harbor, HI.

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

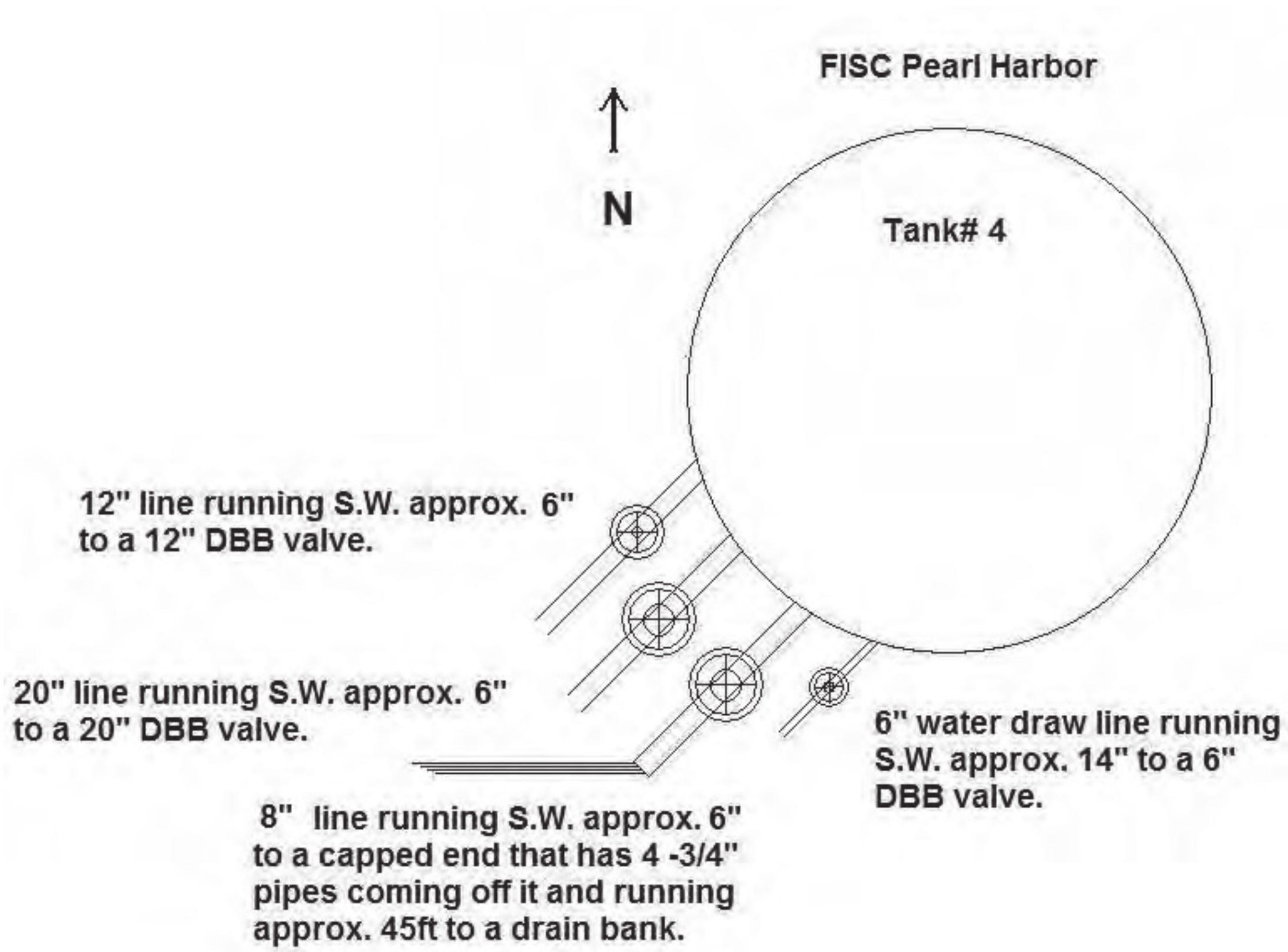
Summary

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

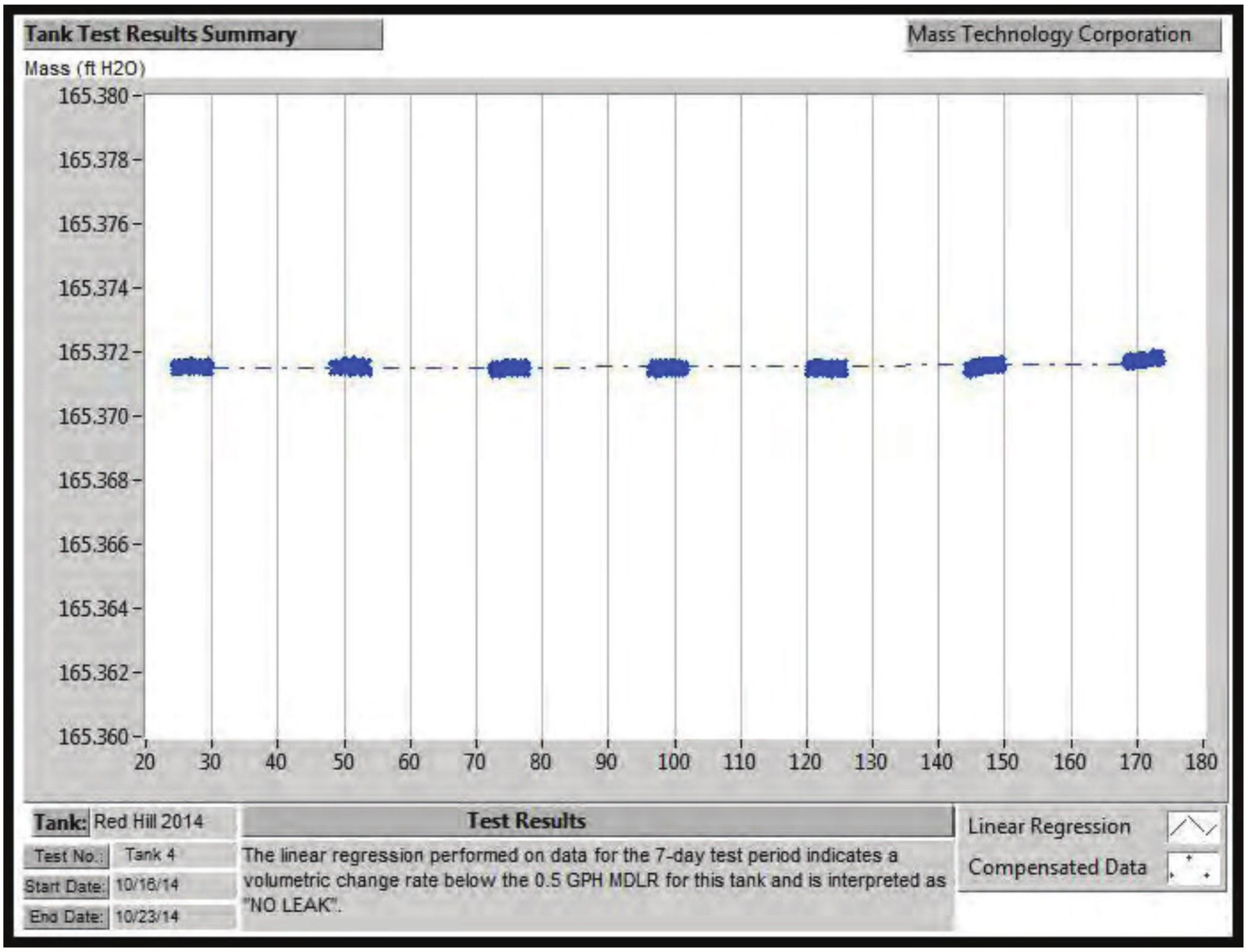


All dimensions, line locations, sizes and valve descriptions have been furnished by the facility operator.

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: Ricky Slaughter

Date: 12-10-2014

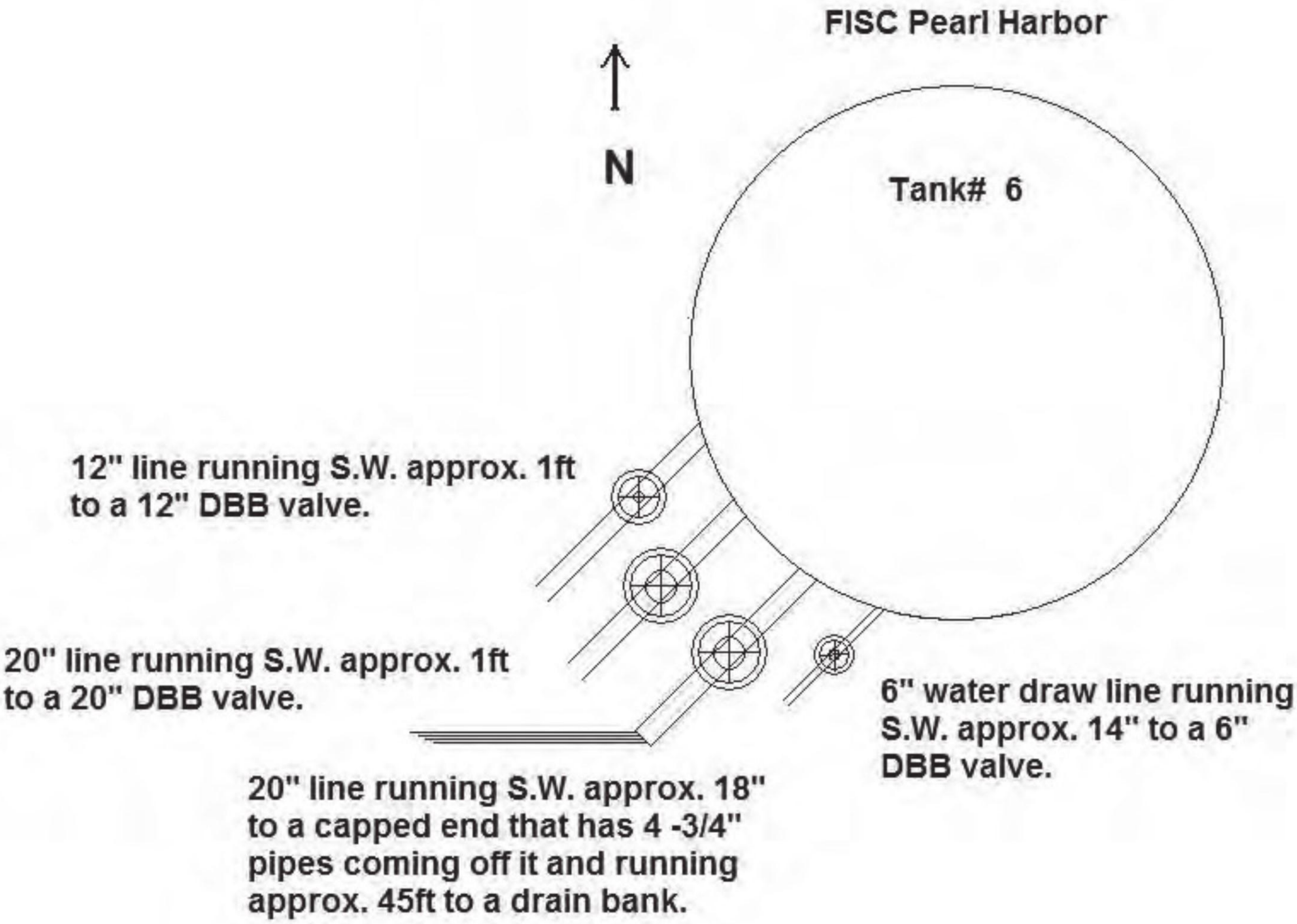
Summary

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

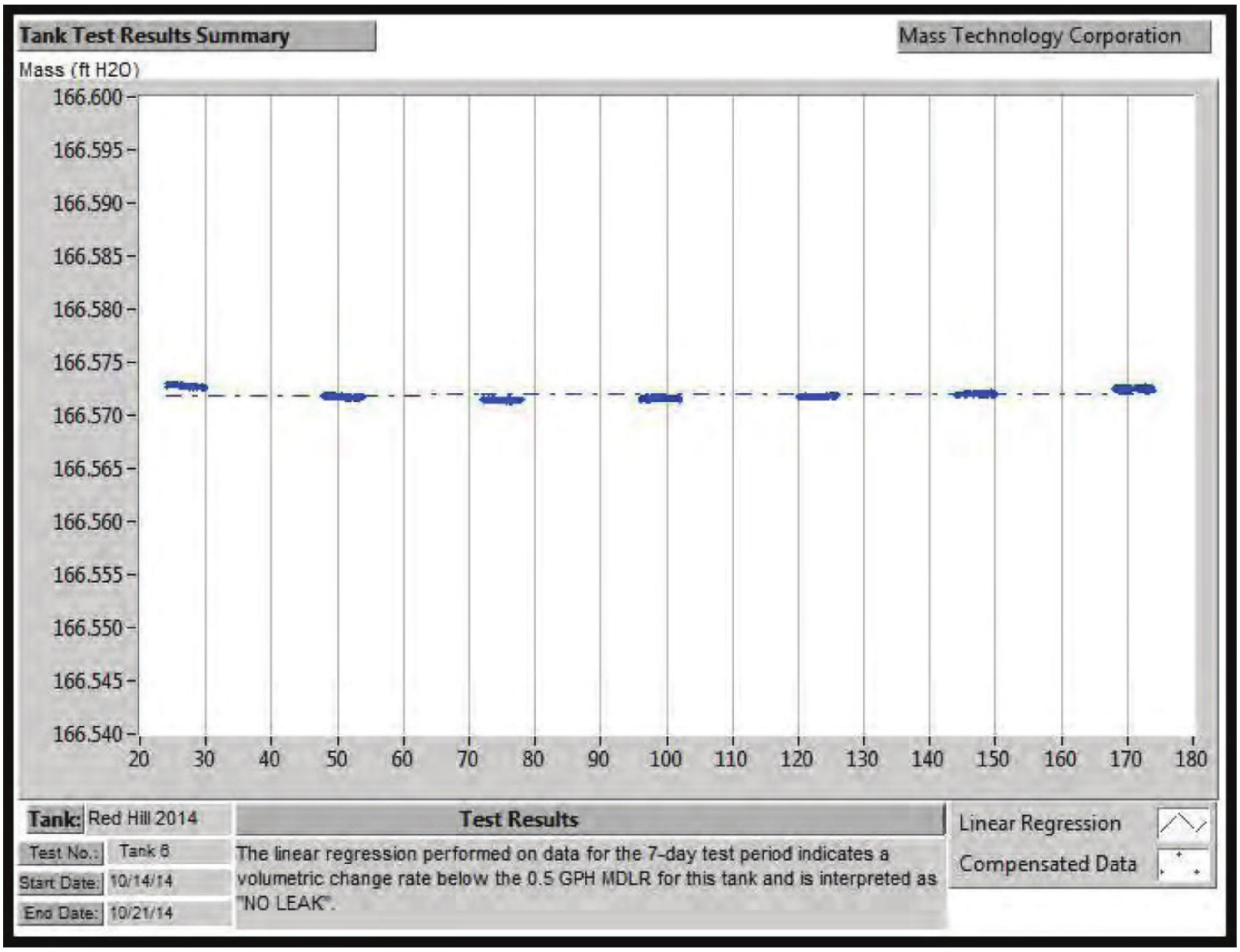


All dimensions, line locations, sizes and valve descriptions have been furnished by the facility operator.

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.



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 Rickerson

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: ______________________ Ricky Slaughter

Date: 12-10-2014

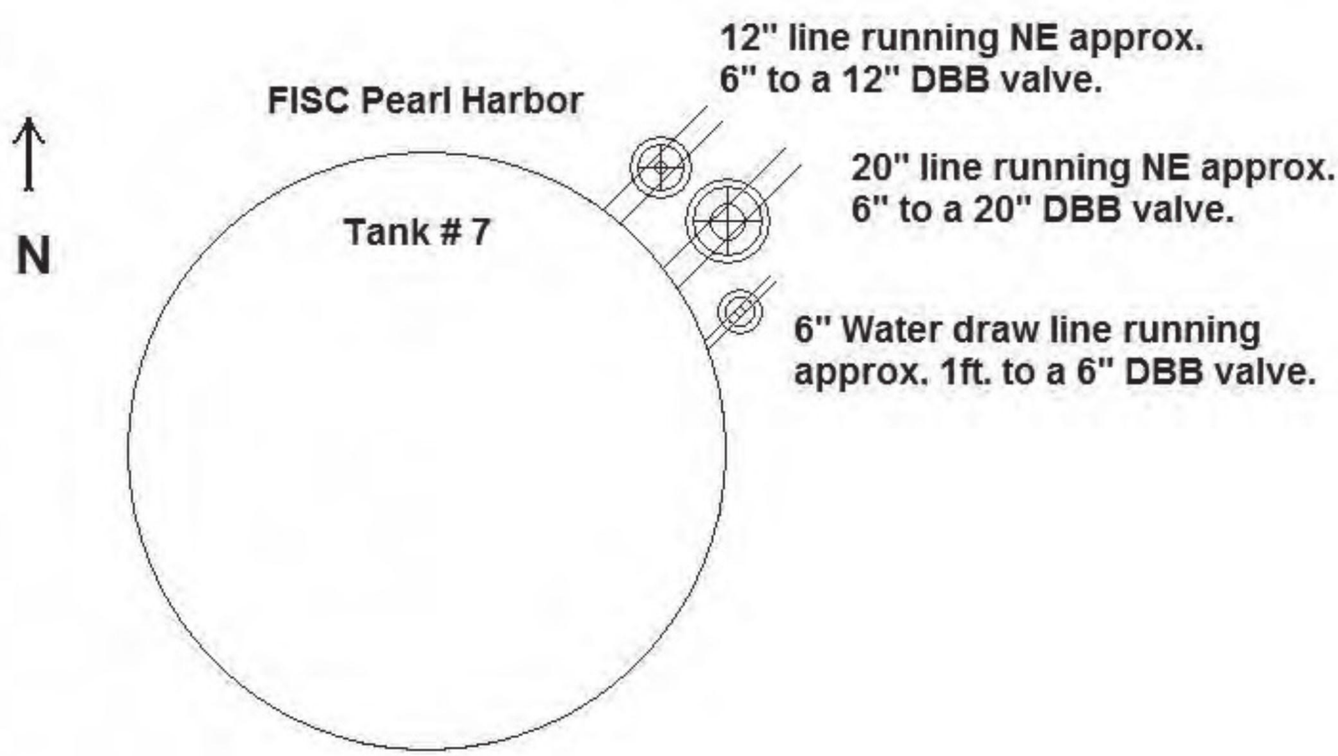
Summary

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:	11/12/2014	Completion Date:	11/22/2014
Unit Operator:	Travis Ricketson	Test Results:	Certified Tight

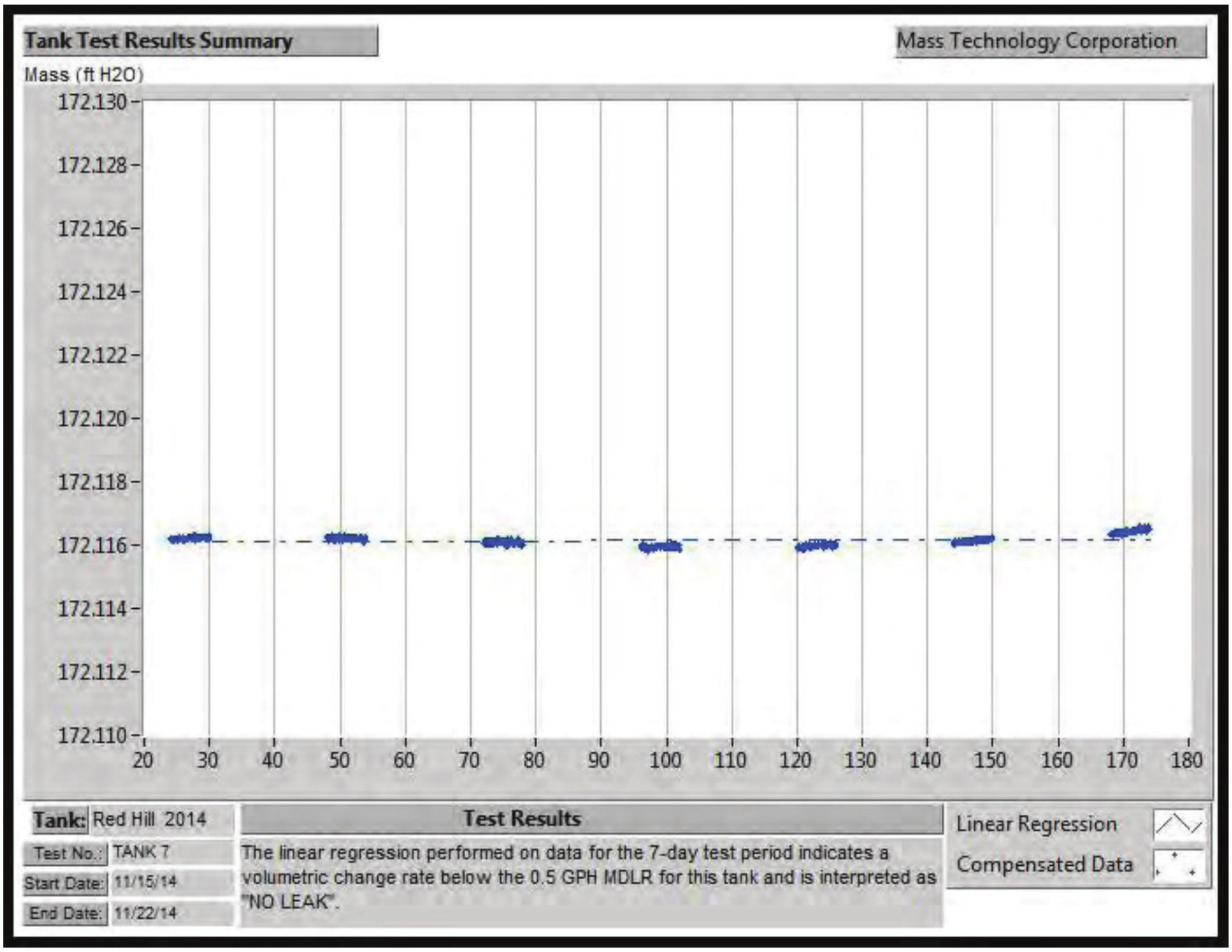


All dimensions, line locations, sizes and valve descriptions have been furnished by the facility operator.

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 Rickerson

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

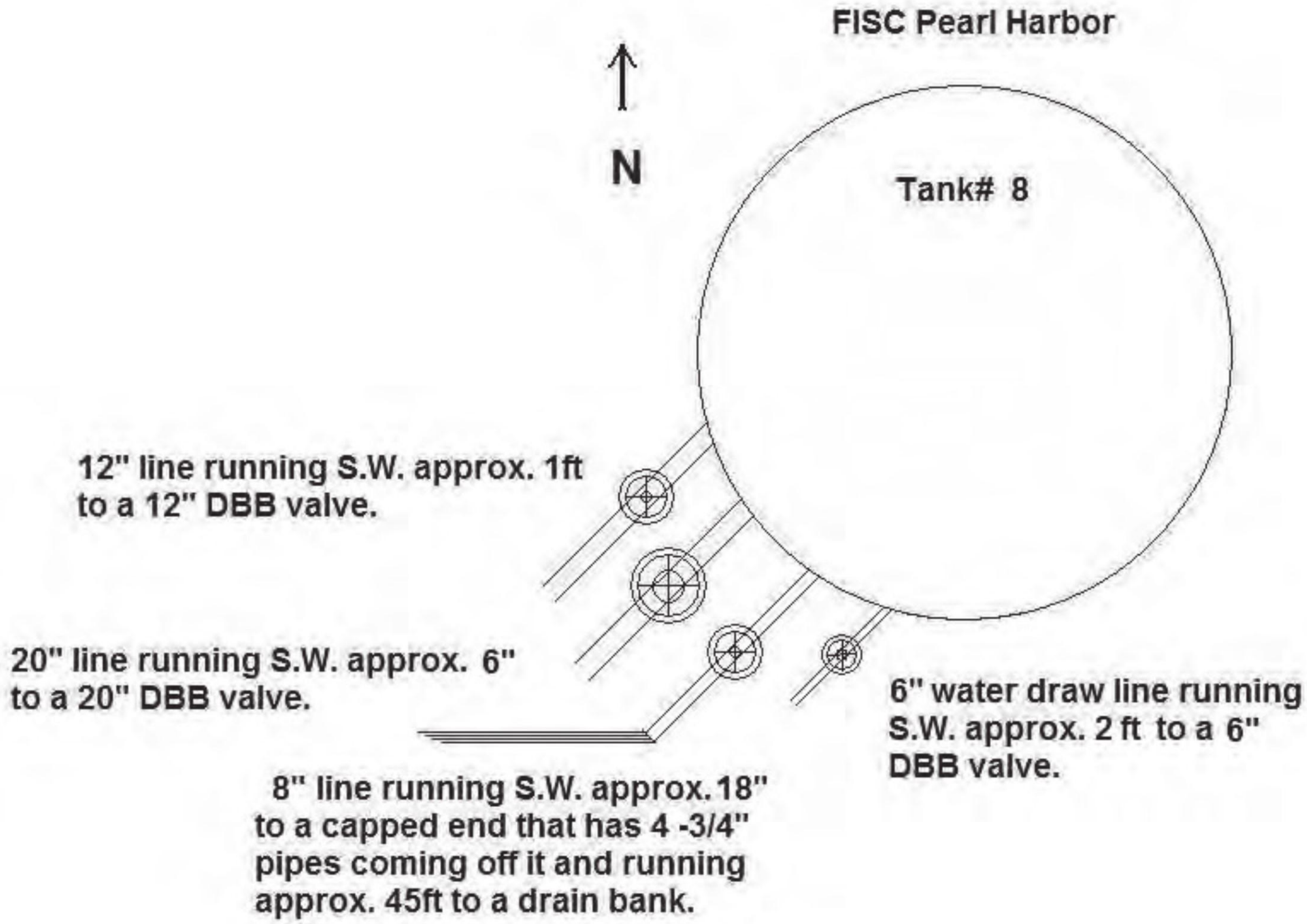
Summary

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 Rickerson	Test Results:	Certified Tight

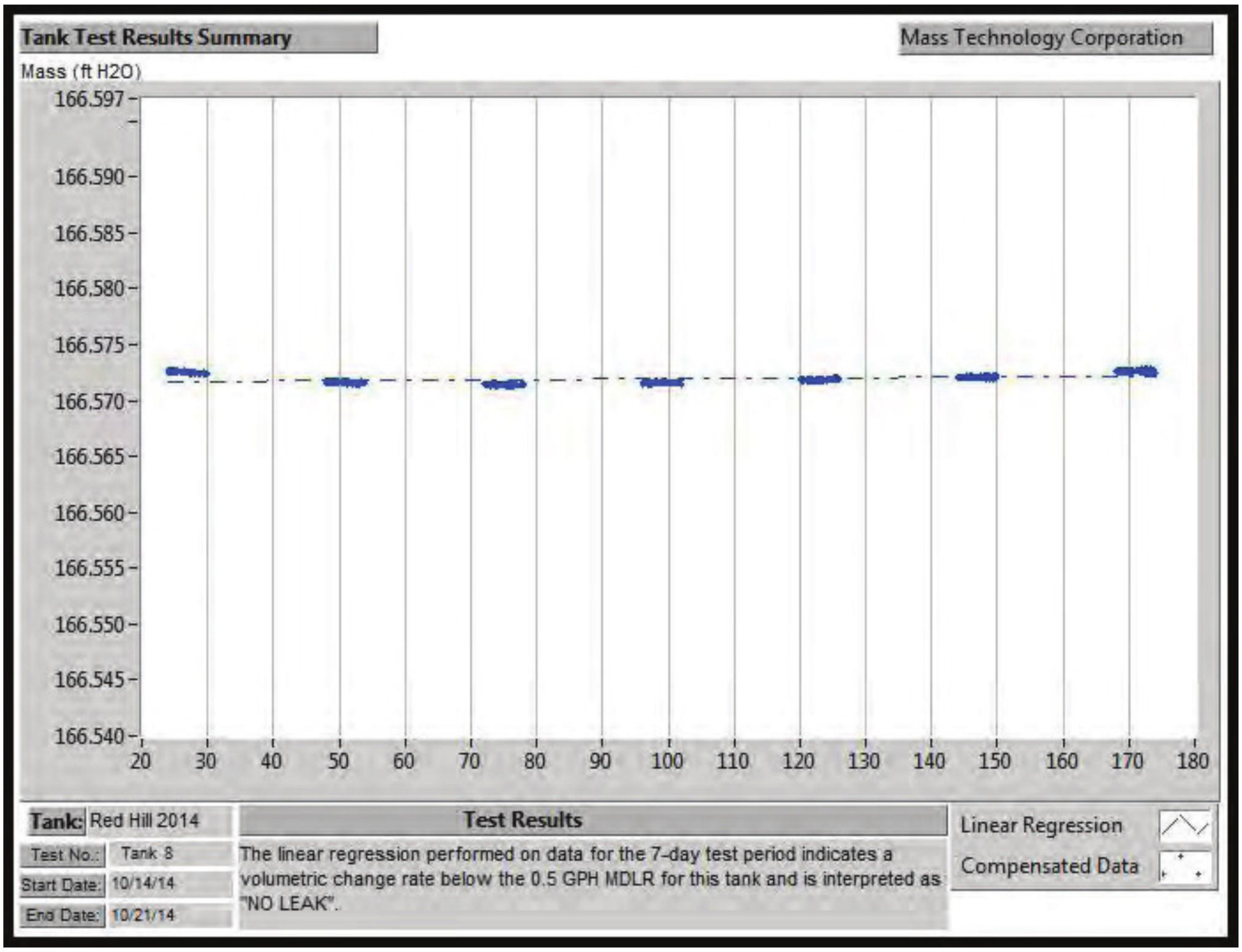


All dimensions, line locations, sizes and valve descriptions have been furnished by the facility operator.

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: ______________________ Date: 12-10-2014
Ricky Slaughter

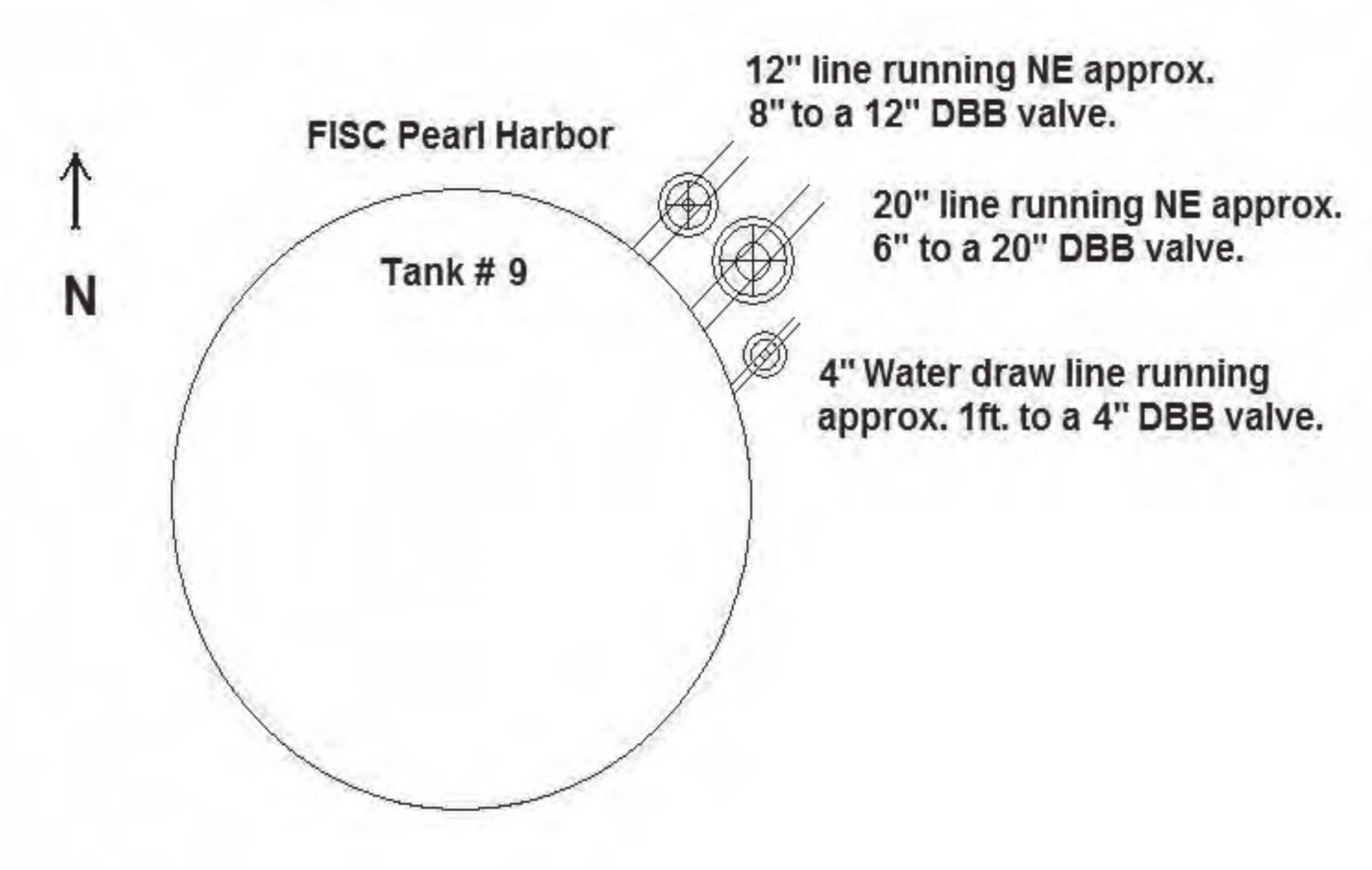
Summary

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

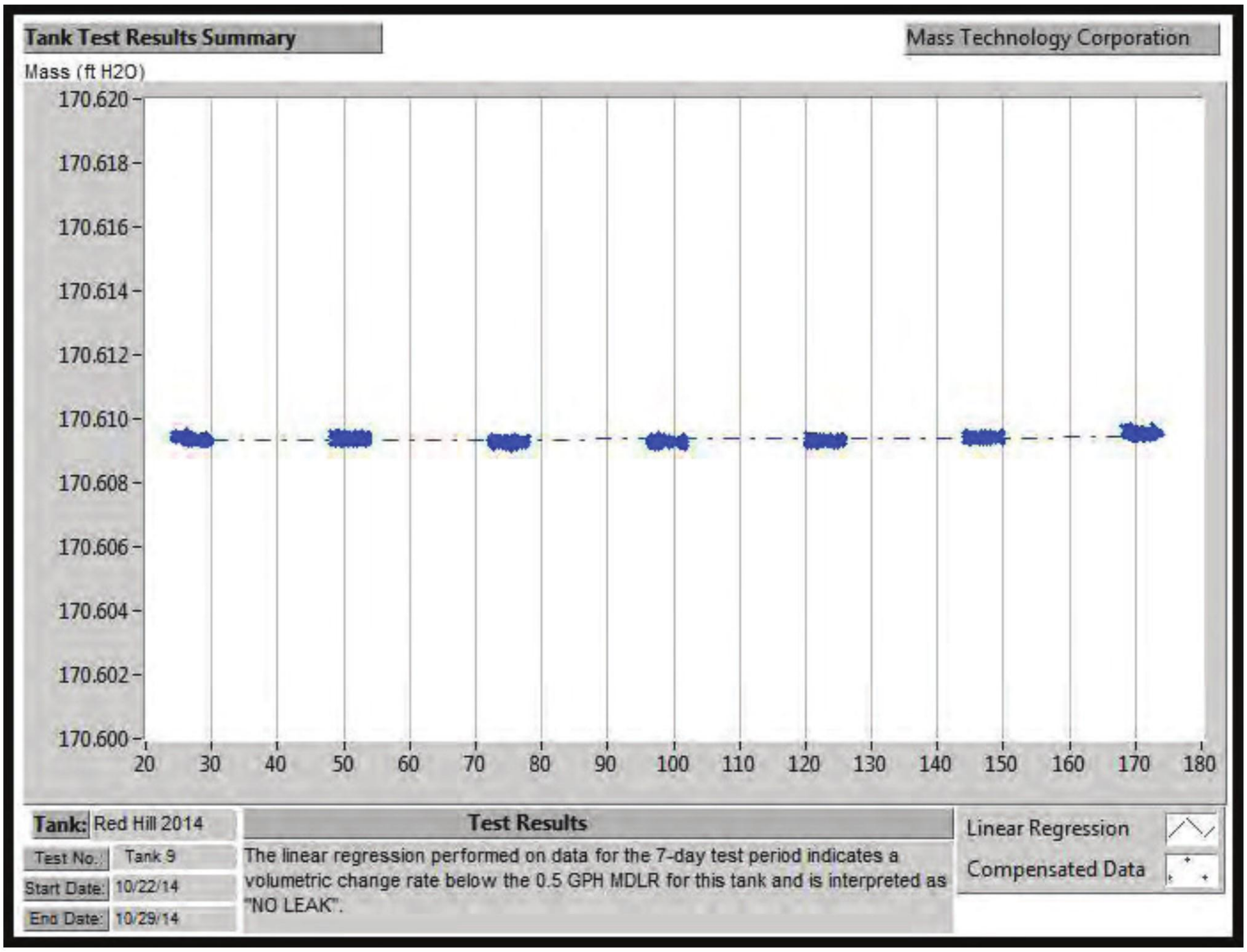


All dimensions, line locations, sizes and valve descriptions have been furnished by the facility operator.

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: Ricky Slaughter

Date: 12-10-2014

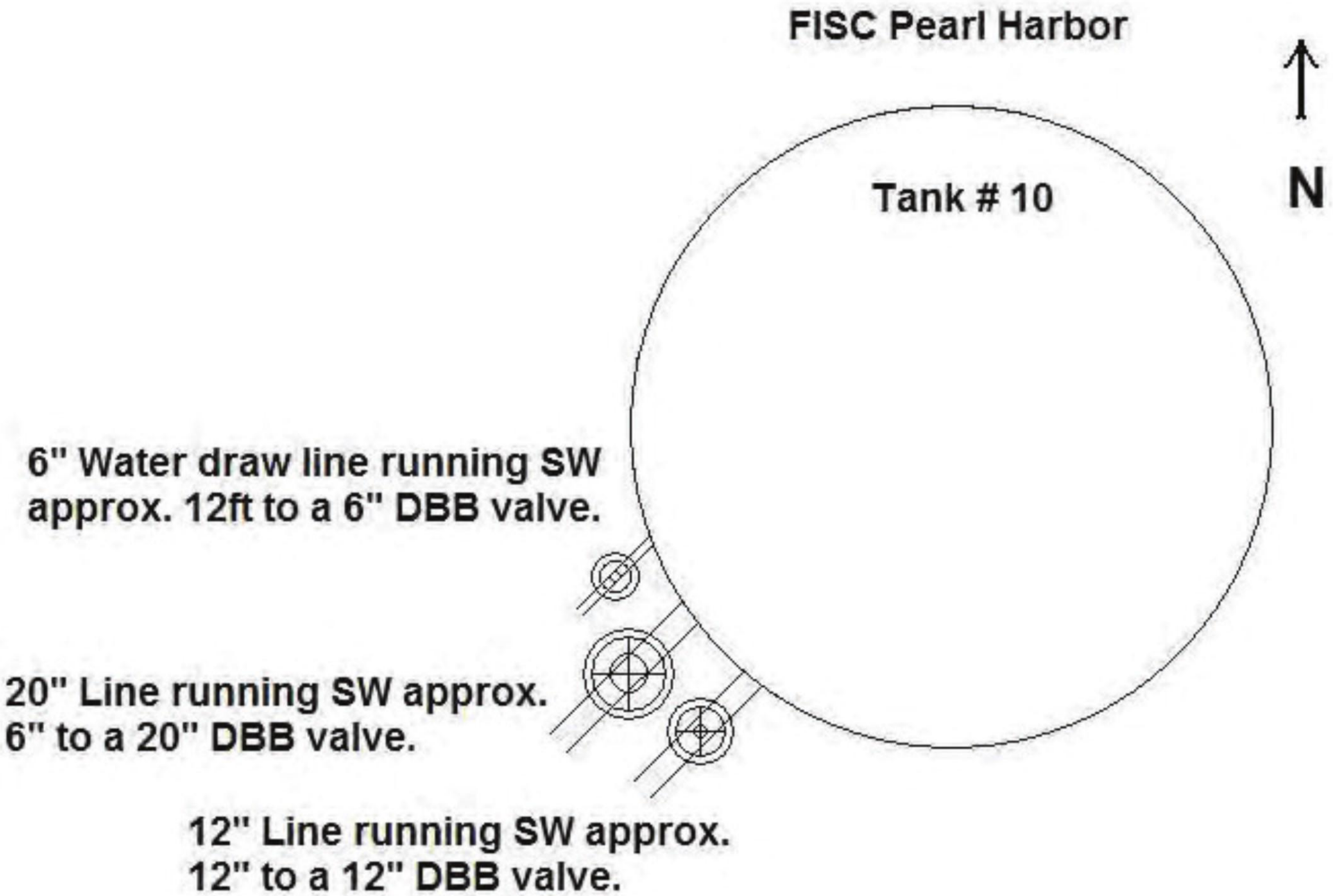
Summary

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

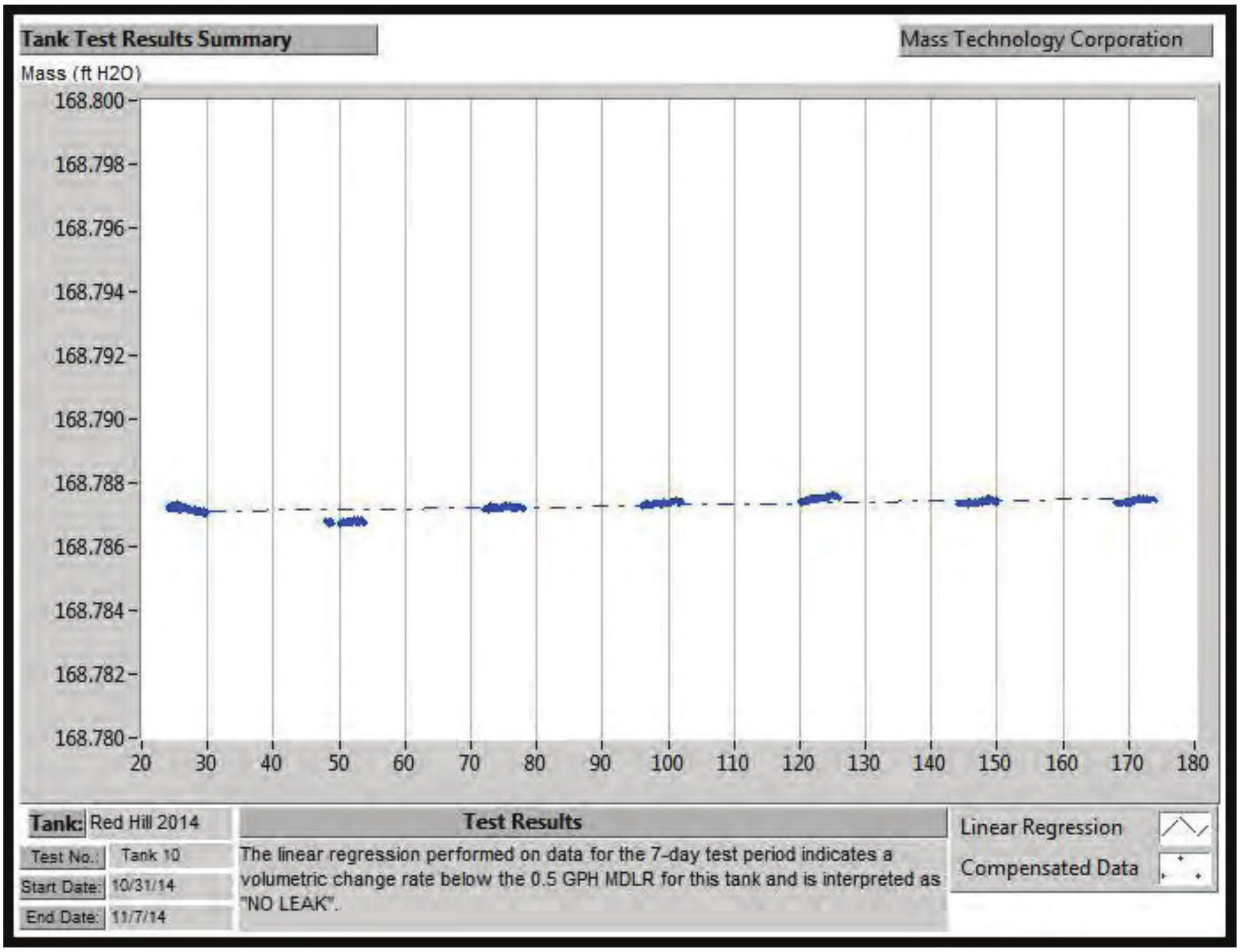


All dimensions, line locations, sizes and valve descriptions have been furnished by the facility operator.

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.



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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 # 11 an underground fuel storage tank located at FISC Red Hill, Pearl Harbor, HI.

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

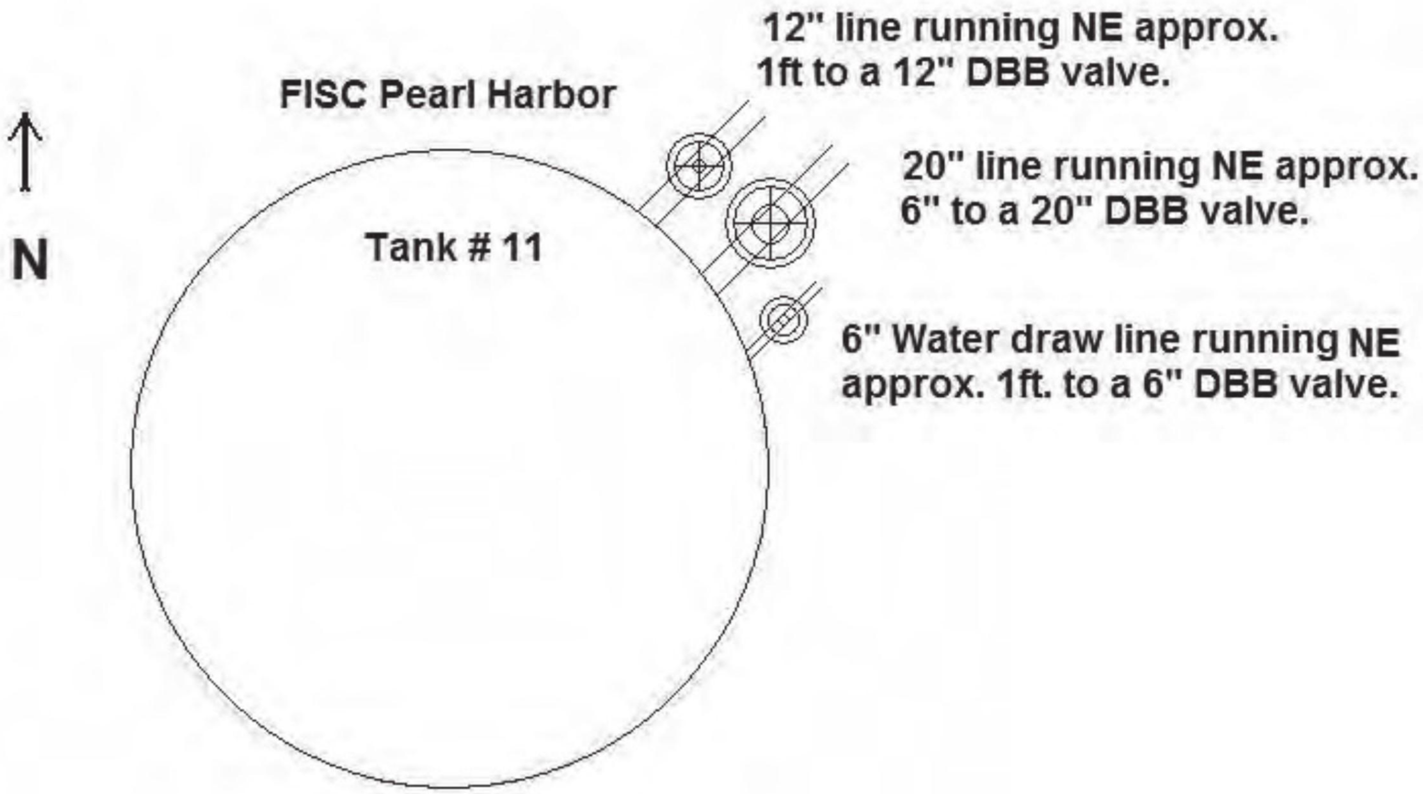
<u>Summary</u>

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 Rickerson	Test Results:	Certified Tight

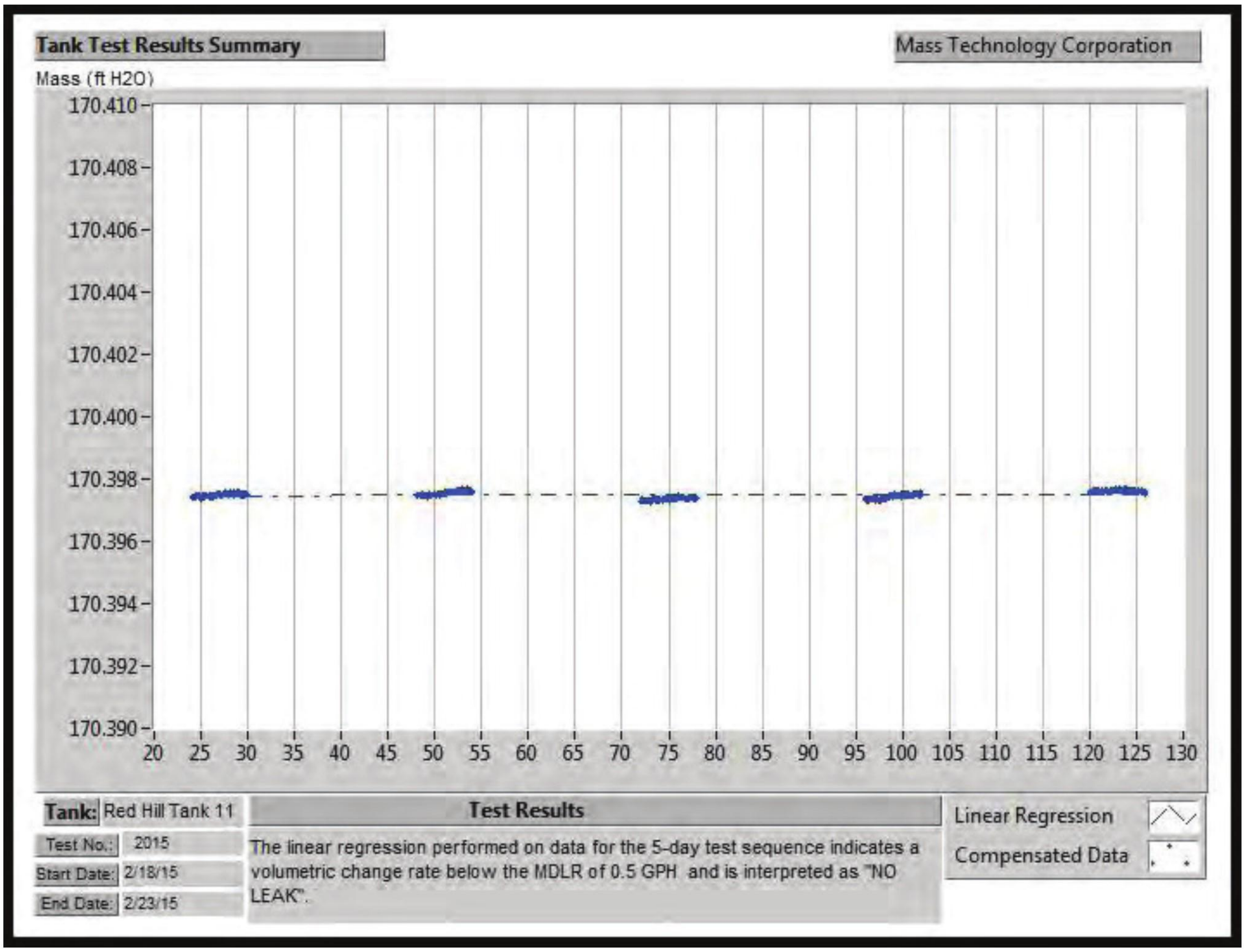


All dimensions, line locations, sizes and valve descriptions have been furnished by the facility operator.

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.



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 # 12 an underground fuel storage tank located at FISC Red Hill, Pearl Harbor, HI.

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

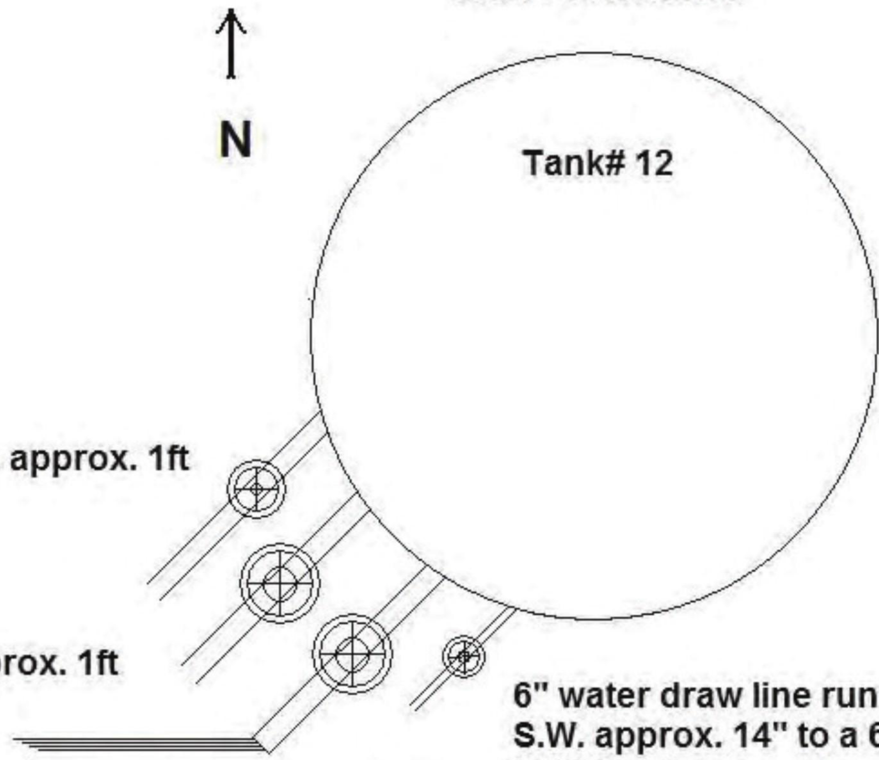
Summary

Testing of Tank # 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:	212.36 ft.
Start Date:	11/09/2014	Completion Date:	11/13/2014
Unit Operator:	Travis Rickerson	Test Results:	Certified Tight

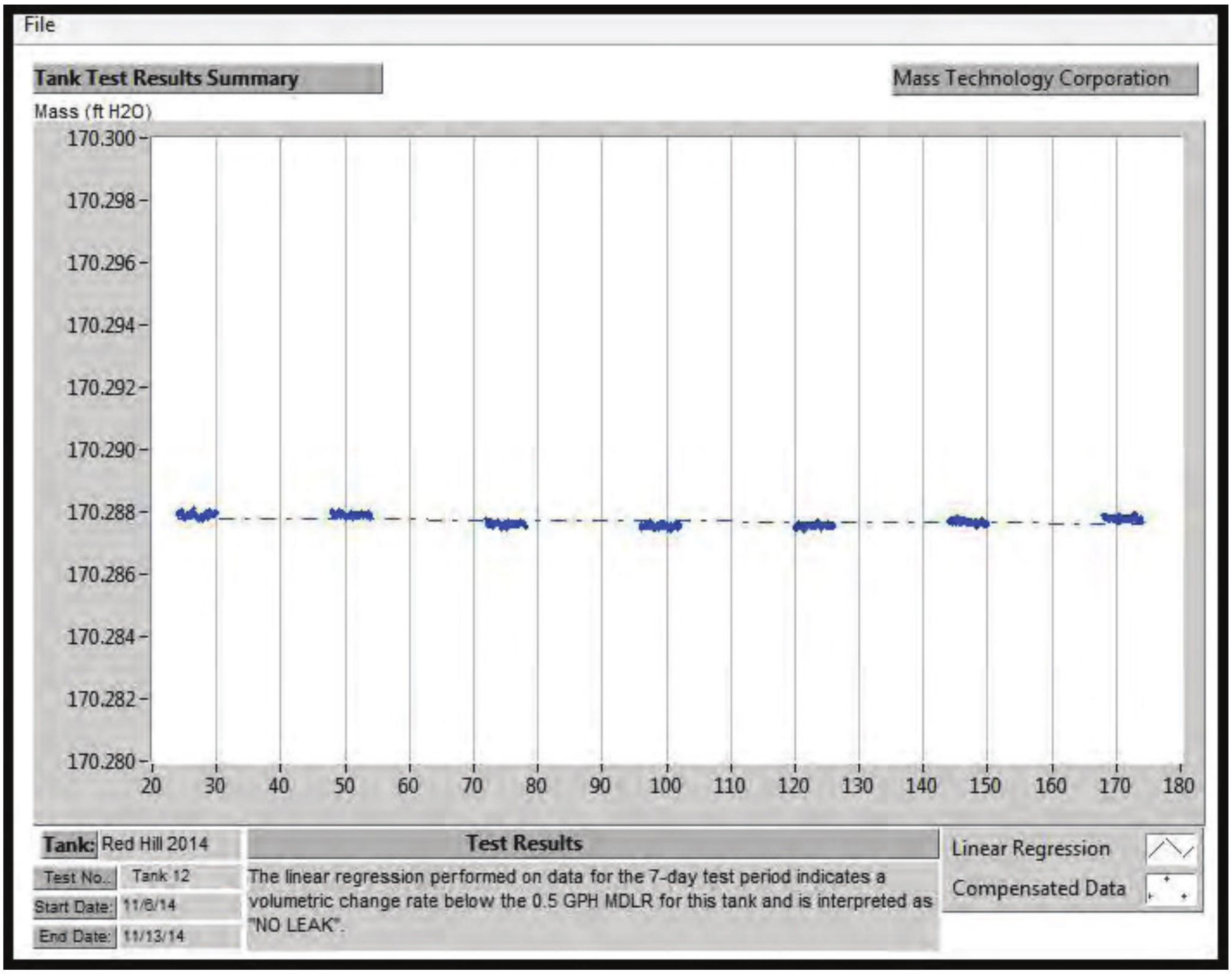


All dimensions, line locations, sizes and valve descriptions have been furnished by the facility operator.

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.



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 Rickerson

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: Ricky Slaughter

Date: 05-18-2015

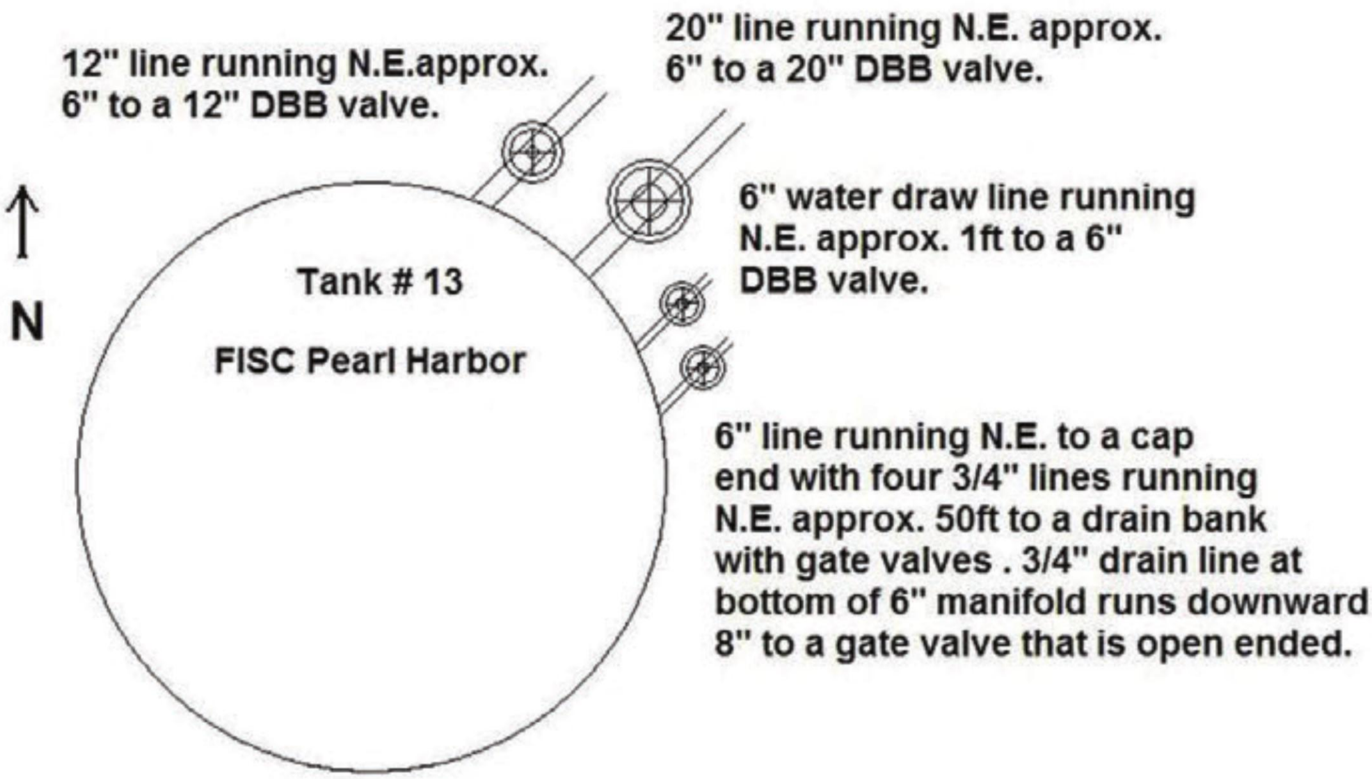
Summary

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.

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

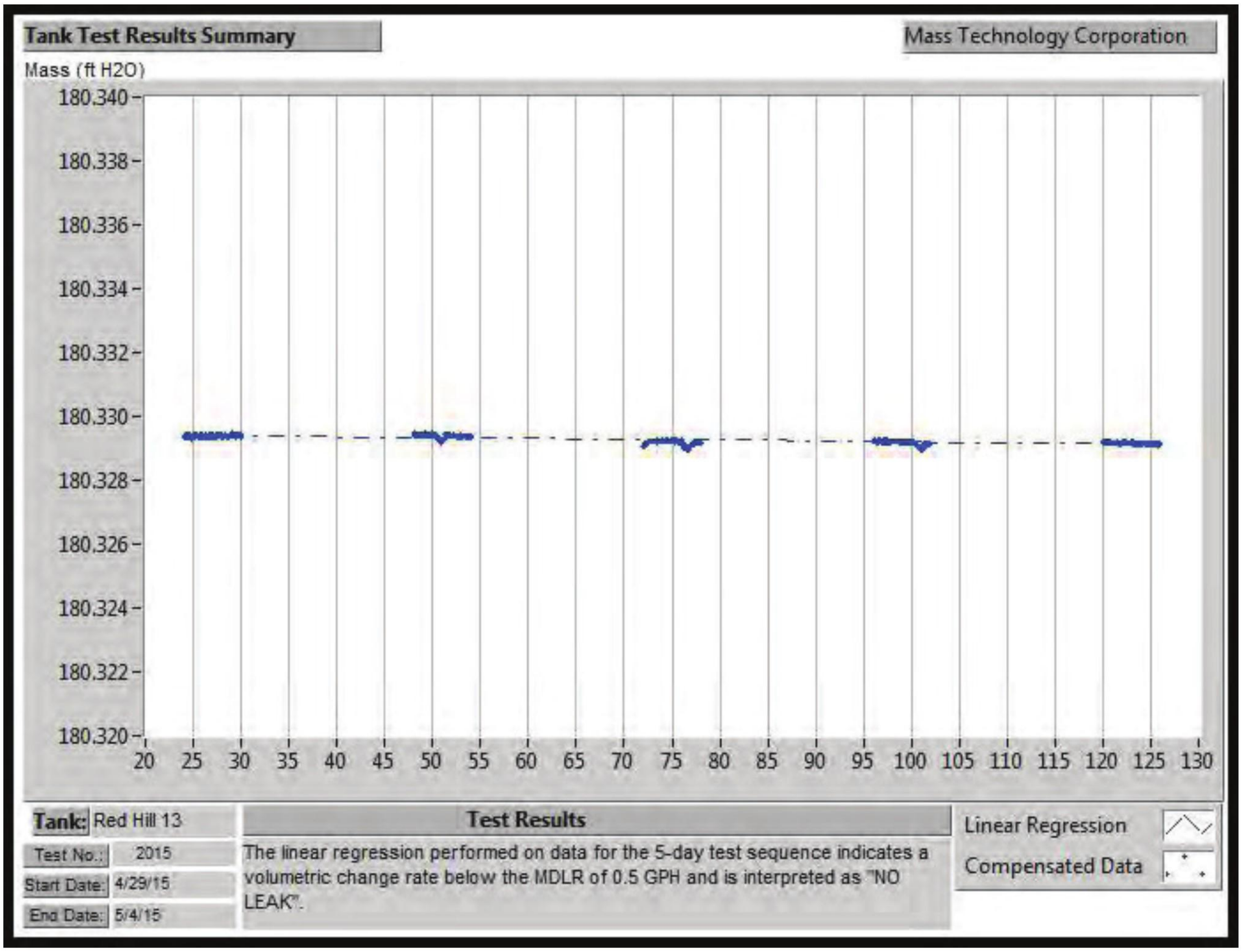


All dimensions, line locations, sizes and valve descriptions have been furnished by the facility operator.

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: ______________________ Ricky Slaughter

Date: 05-18-2015

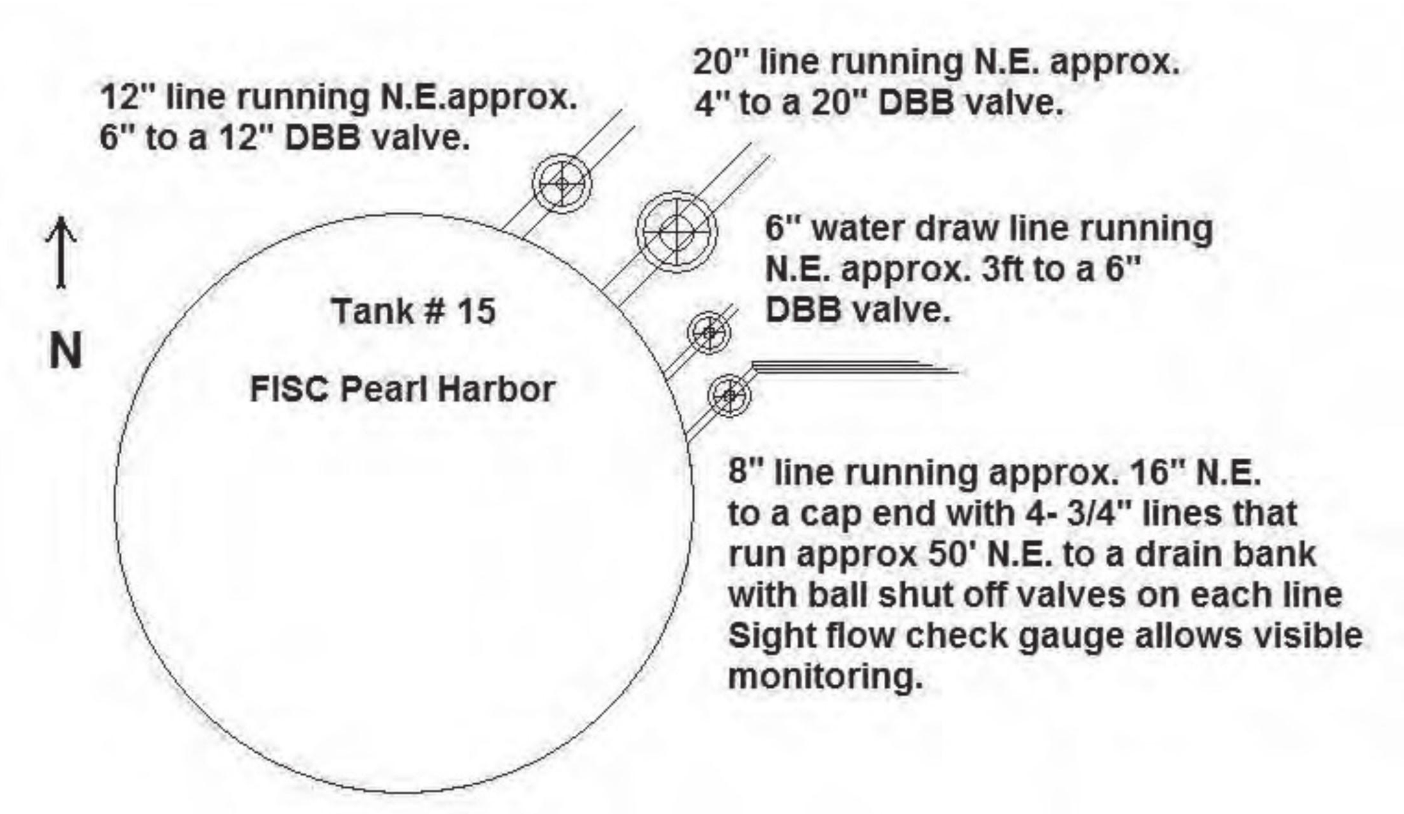
Summary

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

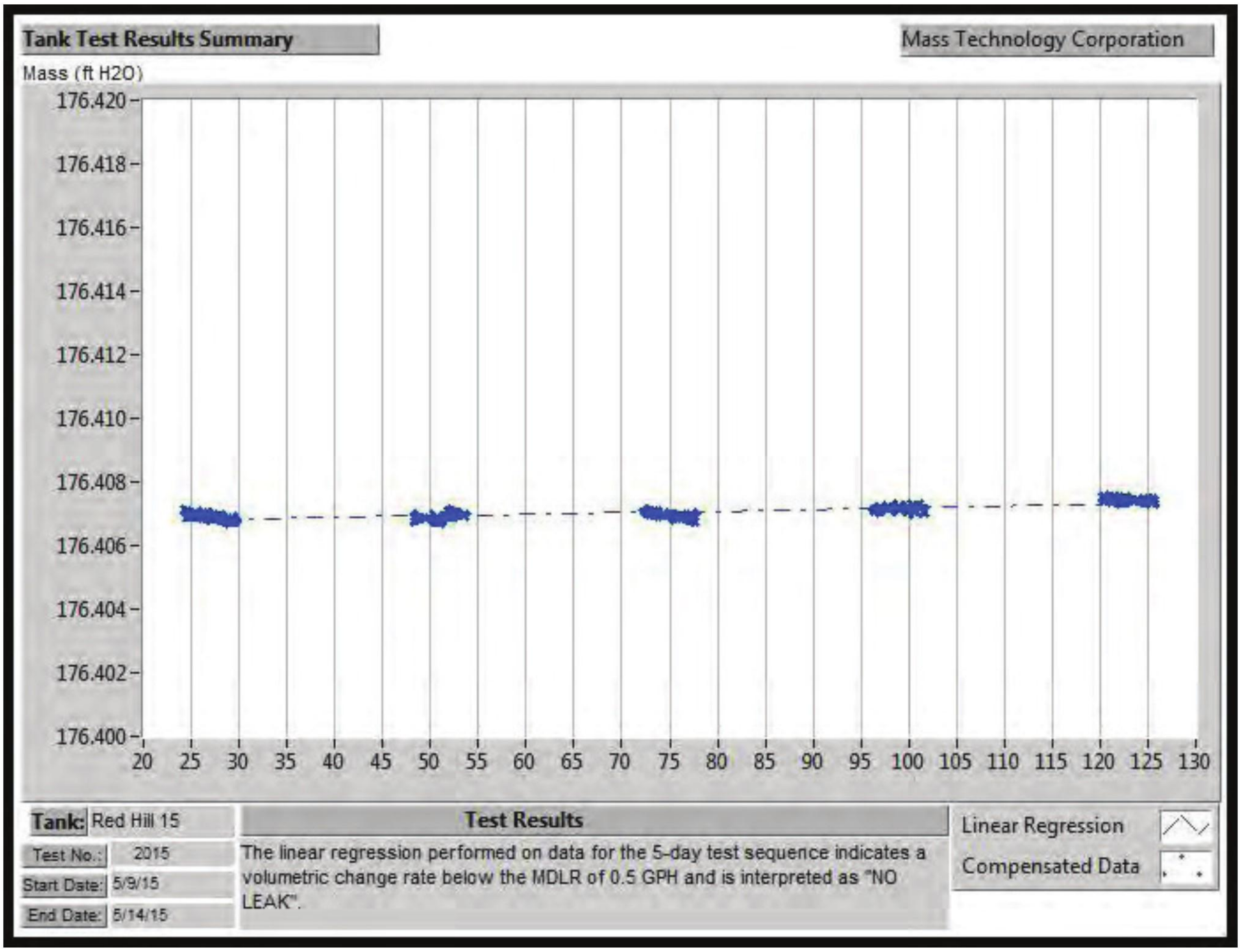


All dimensions, line locations, sizes and valve descriptions have been furnished by the facility operator.

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.



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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 # 16 an underground fuel storage tank located at FISC Red Hill, Pearl Harbor, HI.

Report compiled by: ______________________ Ricky Slaughter

Date: 05-18-2015

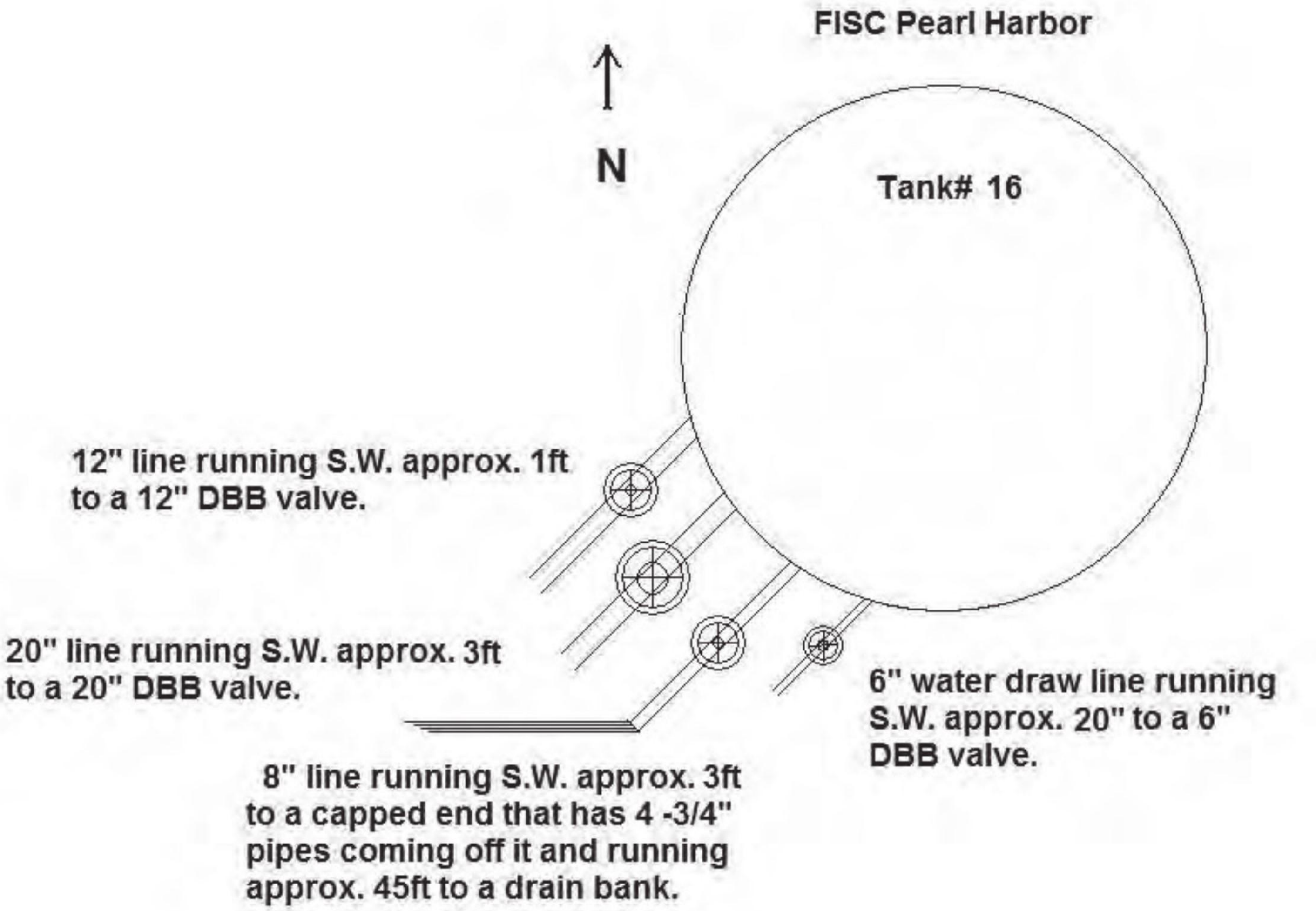
Summary

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.

Tank Data Tank # 16

Diameter:	100 ft.	Height:	250 ft.
Tank Type:	Vertical UST	Contents:	F76
Specific Gravity:	0.84	Product Level:	58.56 ft.
Start Date:	05\04\2015	Completion Date:	05\06\2015
Unit Operator:	Travis Rickerson	Test Results:	Certified Tight

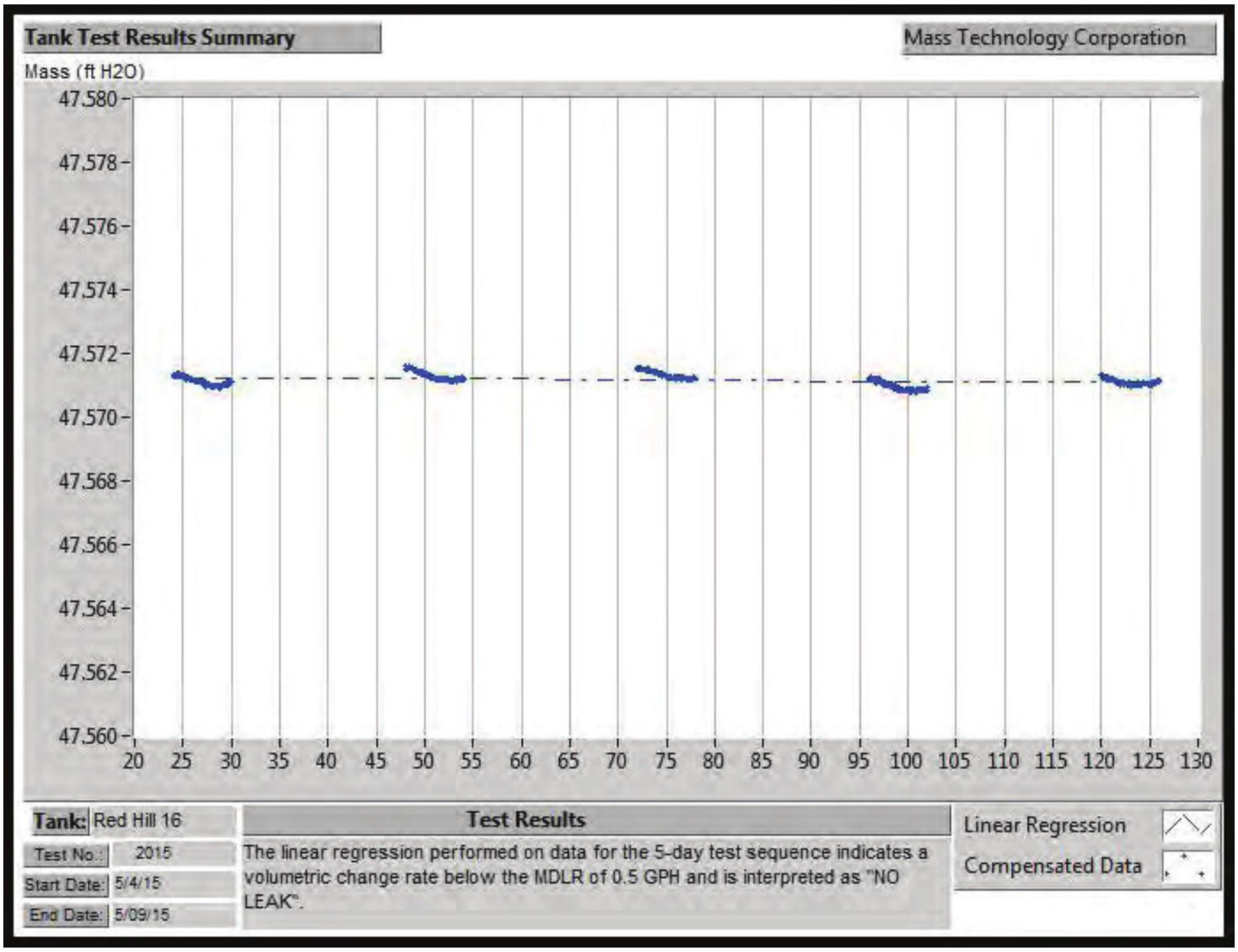


All dimensions, line locations, sizes and valve descriptions have been furnished by the facility operator.

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.



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 Rickerson

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: Ricky Slaughter

Date: 12-10-2014

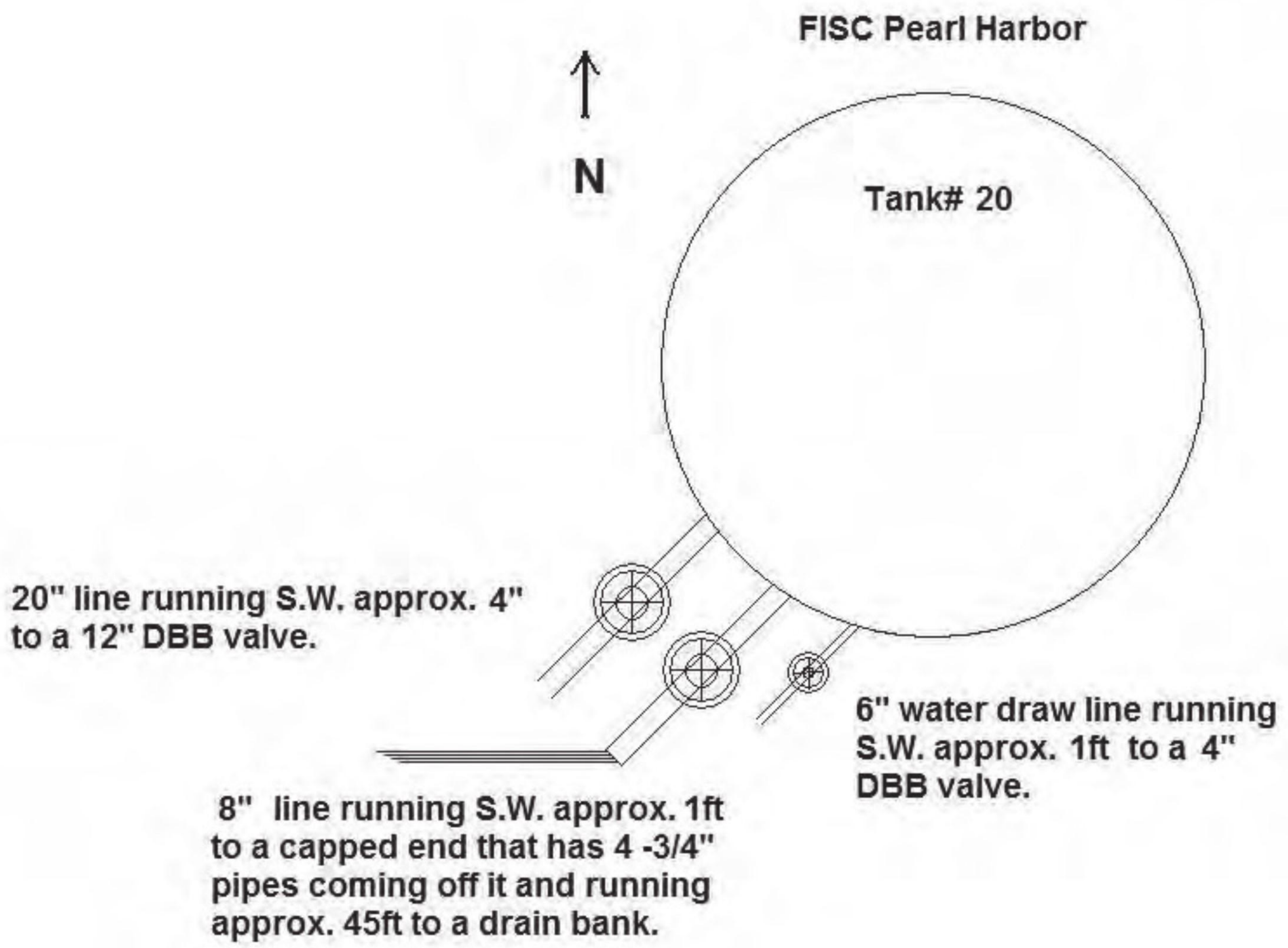
Summary

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 Rickerson	Test Results:	Certified Tight

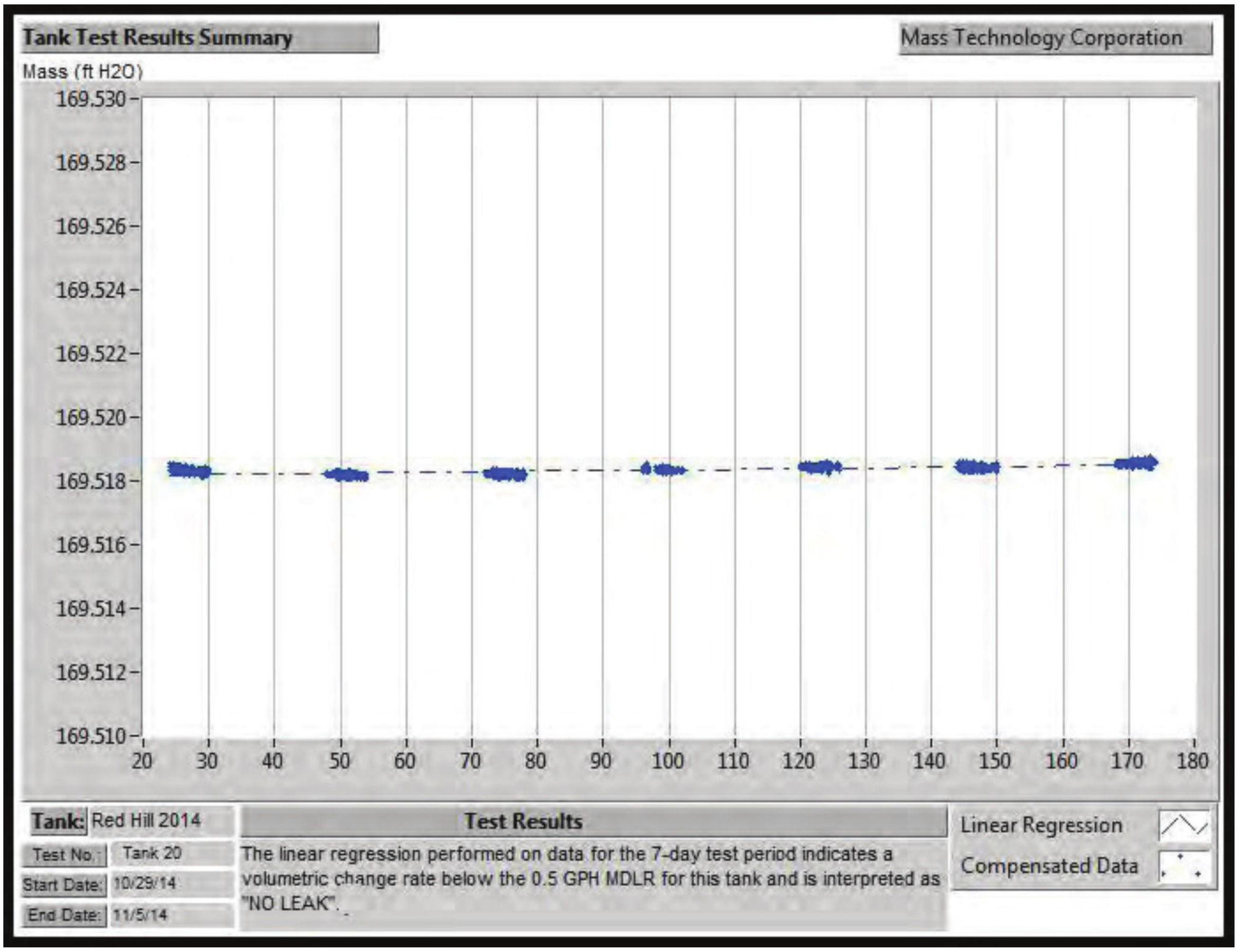


All dimensions, line locations, sizes and valve descriptions have been furnished by the facility operator.

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

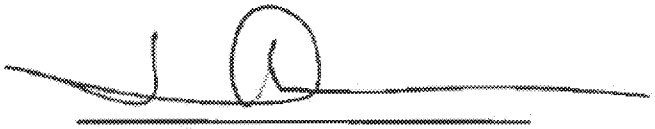
ENCL (2)

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	Sara Peterson
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		