COMMANDER NAVY REGION HAWAII (CNRH)

RED HILL FUEL STORAGE FACILITY (RHFSF)
RESPONSE PLAN

FOR OFFICIAL USE ONLY (FOUO)

August 2020

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RECORD OF CHANGES/REVIEW

To ensure up-to-date information, this response plan shall be periodically reviewed and updated to reflect changes at the RHFSF. The following table should be used to indicate that periodic reviews have been completed and to record any changes made. This record should be retained in this plan.

RECORD OF CHANGES		
Date	**Change Posted By**	**Summary of Change**
August 2020	Justin Wilson, PCCI, Inc.	General Updates - reorganized existing sections and created new ones (see below) - updated names, commands, and phone numbers - many small edits and grammatical corrections
"	"	Section 1, Introduction - minor edits, added subsections 1.2 and 1.3.
"	"	Section 2, Facility Information - updated section 2.2 (facility description) - added features to Figure 2.4 - deleted section on "red hill oily waste pit" as it no longer exists
"	"	Section 3, Facility History - minor edits - added sections 3.4 and 3.5
"	"	Section 4, Fire and Safety Systems - new section
"	"	Section 5, Leak Detection - new section
"	"	Section 6, Environmental Setting - reorganized section - added subsection (6.2) on land use and zoning - new figures 6.1 and 6.2
"	"	Section 7, Environmentally Sensitive Areas - minor edits
"	"	Section 8, Groundwater and Hydrology - new section
"	"	Section 9, Site Safety Information - minor edits
"	"	Section 10, Response Resources - updated all equipment listing tables - expanded "response personnel", section 10.2 - updated listings and phone numbers for sections 10.4 and 10.6
"	"	Section 11, Waste Management and Disposal - minor edits - updated phone numbers
"	"	Section 12, Evacuations - updated all section to reflect facility improvements
"	"	Section 13, References - checked and updated references

RECORD OF CHANGES		
Date	**Change Posted By**	**Summary of Change**
August 2020	Justin Wilson, PCCI, Inc.	Tabs A & B - updated scenarios to reflect facility improvements such as fire systems, oil proof doors, and communication systems.
"	"	Appendix A, Notifications - checked and updated notifications
"	"	Appendix B, Financial Responsibilities - minor edits - updated phone numbers
v		Appendix C, Spill Information Log - no changes
"	"	Appendix D, Waste Management and Disposal Plan - no changes
"	"	Appendix E, Safety Data Sheets - no change
"	"	Appendix F, Frame Foot Mark Spreadsheet - updated and added features such as fire department hose connections, emergency phones, etc.
"	"	Appendix G, Acronyms - added some new acronyms

RED PLAN

RP.1 CRITICAL ACTIONS FOR FUEL LEAK EMERGENCY

A catastrophic fuel leak may be directly observed by personnel in the tunnel or through the use of security cameras that are strategically located throughout the lower tunnel. The other situation that may identify a major fuel leak would be through the Automatic Fuel Handling Equipment (AFHE) Mass Tank Gauging system. If the system registers an unscheduled fuel movement (UFM), the following actions must be taken:

1. The tank in question will be monitored with security cameras and a Gauger/Rover will be sent to the lower tank gallery to inspect the tank area and skin and sectional valves for evidence of leakage or a valve that is not fully shut.
2. The Gauger/Rover will manually close the tank's suction/fill valves and put the valves into high torque.
3. The Gauger/Rover will manually gauge the tank in question.
4. The Control Room Operator will compare the manual reading to the current AFHE reading and annotate any discrepancies.
5. The Control Room Operator will compare the most recent manual gauge to the last recorded manual measurement to determine if the fuel level has changed.
6. If the most recent manual measurement does not match the last manual measurement and there is a decrease in excess of 3/16", the Supervisory Distribution Facilities Specialist, Bulk Fuel Operations Supervisor, Director and Deputy Director will be notified and the Gauger/Rover will conduct manual measurements every four hours until directed otherwise by management.

For a Catastrophic Fuel Release Notify Control Room Operators at:
Underground Pumphouse: 471-8081 or 473-1075
Building 1757: 473-7804 or 473-7837

Control Room Operator shall:

- Notify all workers in the tunnel using the "giant voice" system.
- Notify personnel by radio or telephone to stop all fueling operations.
- Shut down all fuel pumps using the AFHE Emergency Shutdown Graphical User Interface (GUI) or by pressing Ctl+Alt+F1 on the keyboard.
- Close all open valves via AFHE system.
- Stop all maintenance and hot work.
- Call:

Fuel Director (Emergency Spill Coordinator)	473-7833 or cell: 690-0115
Fuel Deputy Director (if unable to reach Fuel Director)	473-7801 or cell: 780-3703
Supervisory Distribution Facilities Specialist	473-7824 or cell: 216-1341
Bulk Fuel Operations Supervisor	473-7805 or cell: 479-1063
Regional Dispatch Center	911 or 471-7117
NAVSUP FLCPH Command Duty Officer (CDO)	473-1310 or cell: 216-1339

Fuel leaking from a bulk storage tank will flow through the LAT towards the Underground Pumphouse (UGPH). Actions to be taken:

- Warn personnel in the area, if necessary.
- Secure the blast door at the gauger station if it is not closed.
- Workers in the Upper Access Tunnel (UAT) will exit through Adit # 4 or Adit # 5.
- Workers in the LAT (below the tanks) will exit through Adit # 3, Adit # 2, or Adit # 1 if working below Adit # 3.
- All exiting workers will call the Control Room Operator at 471-8081/473-1075 (UGPH) or 473-7804/473-7837 (Building 1757) after exiting the facility to report their situation and relay any observation of a fuel spill.
- Any workers who cannot exit for some reason must find the nearest emergency phone (blue boxes) and call for assistance and/or direction.
- Close the "emergency oil pressure door" at the end of the tank gallery in the LAT. The door can be closed by pressing a push button on the bulkhead adjacent to the door.

Federal Fire Incident Commander shall:

- Establish an emergency command post outside the Adit # 1 entrance if applicable (and safe) or Building 1757 and verify the location of all workers in the tunnel.

Emergency Spill Coordinator (or Alternate) shall:

- Observe security camera feeds at Control Room in Building 1757 to determine source of leak.
- If it is determined that the leak is coming from a tank before the first isolation valve or through an AFHE UFM alarm, direct the Control Room Operator to set up draining of the tank through gravity feed to any available tanks with ullage.
- If leak is coming from pipeline, leave all valves closed.

RP.2 FUEL DEPARTMENT PERSONNEL ACTION

If the leak cannot be immediately stopped or controlled, the following actions should occur immediately:

RP.2.1 Underground Pumphouse Area

- De-energize lower harbor tunnel.
- Close valves behind ventilation building outside Adit # 1.
- Open valve on lower diamond plate area in the UGPH to pump from sump to Tank B1.
- Make as much space in Upper Tank Farm (UTF), Surge Tanks 1 through 4, and interface Tank 301 as possible.
- Close sluice valve for the impoundment area outside of Adit # 1 (see Figure RP.1).
- Move Control Room operations to Building 1757.

RP.2.2 Red Hill Area

- De-energize sump pump at Adit #3, check outlet for fuel.
- Continue to pump from sump pumps in LAT near Tanks 1 and 2 (see Figure RP.2) to Tank 311 outside Adit # 3. There is no level gauge or high-level alarm for Tank 311.

- Dispatch an operator to verify the level of Tank 311 by manually gauging the tank. When high-level is reached, sump pumps will automatically stop. Verify this operation on AFHE.

Figure RP.1: Location of Sluice Valve for Impoundment Area outside Adit # 1

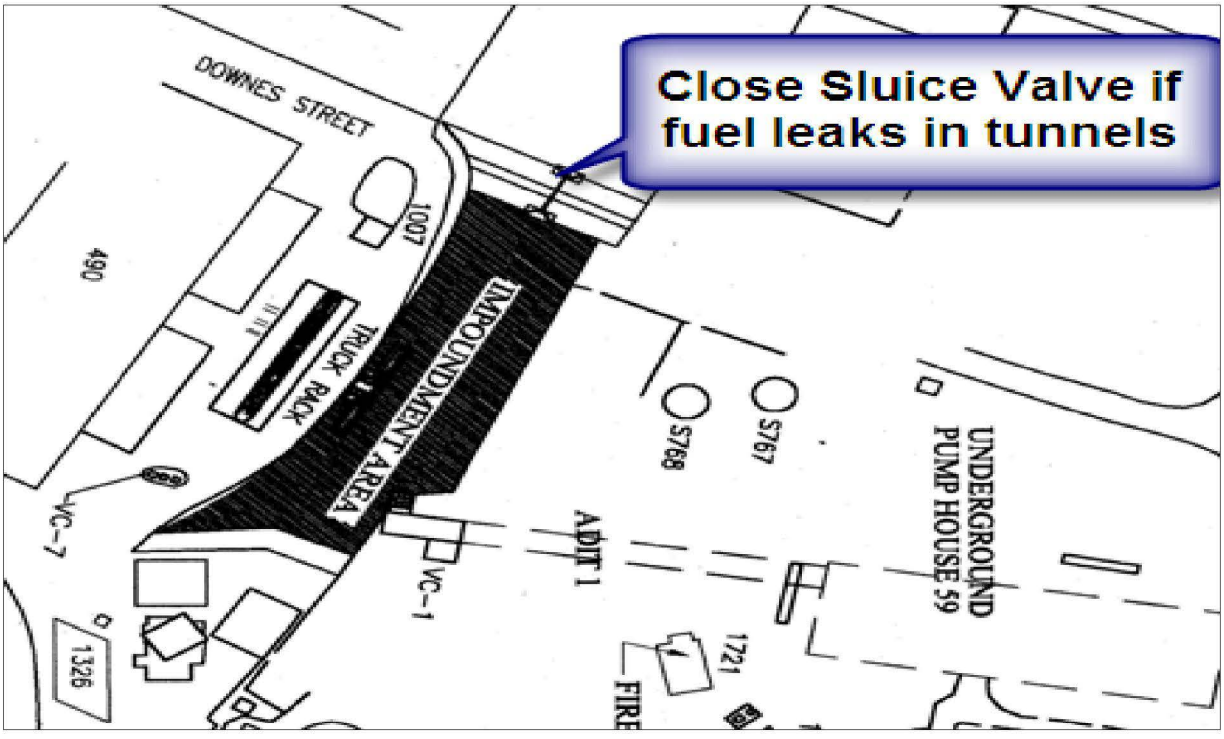
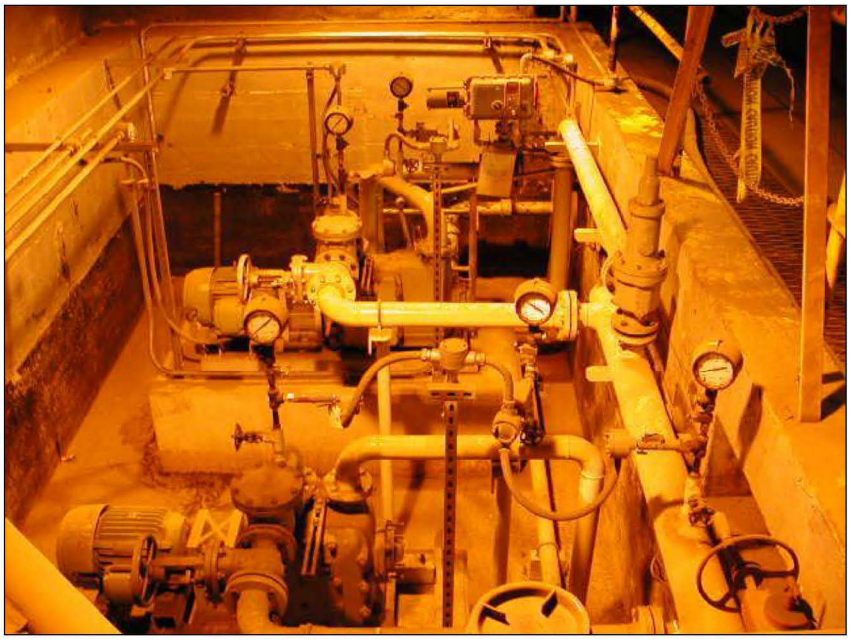


Figure RP.2: Lower Access Tunnel Sump below Tanks 1 and 2



RP.2.3 Waste Oil Tanks B1 & B2

- Monitor both Tanks B1 and B2 for fill level. If Tanks B1 and B2 are nearing 80% of allowable fill, take the next actions.
- Stop all pumping operations sending fuel up the hill. Make sure valves 232T2 and 232T1 are closed to limit line contamination.
- At the bottom of the back stairs of the UGPH underneath the grating, open 4" valve that Tees into 32" pipeline, close valve to sump and open the sump discharge line to the 32" pipeline.
- Line up F-76 to the inside loop and fill up all available F-76 ullage in the UTF and Surge Tanks 3 and 4. Fill past high-level alarms to high-high levels. Monitor tanks closely for overflow.
- If available, fill SWOB or YON barges at Hotel pier from UTF.
- Before last tank reaches high-high level, line up F-76 pipe to outside loops, open valve 0310G and valve 0310H, and start filling interface Tank 301.
- When Tank 301 fill level is high-high, close tank fill valve 0301H and open JP-5 valve 0310D, which will pressurize JP-5 outside loop. Open JP-5 outside loop to Surge Tank 1. Pump Surge Tank 1 to available JP-5 ullage at Red Hill. Fill tanks to high-high level as necessary.
- If more ullage is required, close valve 0310G and 0310H and fill Surge Tanks 3 and 4, if they are not full already. When they are full, de-energize sump pump and pump Surge Tanks 3 and 4 up the hill to diesel tankage.

RP.3 EMERGENCY PHONE LISTS

TABLE RP.1: NAVSUP FLCPH OIL SPILL RESPONSE TEAM

Position	Day Phone	24 Hour Phone	Response Time	Response Job
Fuel Director	473-7833	690-0115	< 1 hour	Emergency Spill Coordinator
Deputy Fuel Director	473-7801	780-3703	< 1 hour	Alternate Emergency Spill Coordinator
Supervisory Distribution Facilities Specialist	473-7824	216-1341	< 1 hour	Operations Section Chief
Bulk Fuel Operations Supervisor	473-7805	479-1063	< 1 hour	Deputy Operations Section Chief
Command Duty Officer	216-1339	216-1339	< 1 hour	Liaison Officer

Note: If the spill size, complexity, or impact is beyond the capability of the Fuel Department to manage, the Emergency Spill Coordinator or the Commanding Officer can contact the Region Navy On-Scene Coordinator (473-4689 or 864-2463) to activate the Region Spill Management Team (SMT). The Region SMT will then establish other Incident Command System (ICS) functions, such as Wildlife Recovery and Rehabilitation Branch, Documentation Unit, Resource Unit, etc. Port Operations is the coordinator for the Facility Response Team (FRT) and can be reached by telephone at 474-6262 or Channel 69.

Tables RP-2 and RP-3 provide contact information for Navy Spill Emergency Response/Cleanup Teams and Navy SUPSALV/Spill Response Contractors, respectively.

TABLE RP.2: CNRH SPILL EMERGENCY RESPONSE/CLEANUP TEAMS				
Name	**Day Phone**	**24 Hour Phone**	**Response Time**	**Response Job**
Port Operations	474-6262 or Channel 69	472-6262	< 1 hour	On-water FRT
NAVFAC HI Emergency Service Desk	449-3100	449-3100	<1 hour	Clean-up / Disposal
Fuel Department Personnel as required	Recall Roster	Recall Roster	<1 hour	Land/Water FRT

TABLE RP.3: NAVY SUPSALV/SPILL RESPONSE CONTRACTORS				
Name	**Day Phone**	**Other Phone**	**Response Time**	**Capability**
Navy SUPSALV	202-781-1731 Ext. 2	202-781-3889 (after hrs.)	< 12 hours	On-water containment and recovery
Pacific Environmental Company (PENCO)	545-5195	524-2307 (fax)	< 12 hours	On-water containment and recovery, and on-land cleanup capabilities.
National Reponse Cororation (NRC) [1]	631-224-9141	631-224-9086 (fax)	< 12 hours	On-water containment and recovery, on-land cleanup capabilities, and dispersant coverage (including dispersant aircraft).
[1]The CNRH NOSC Rep can also access the services of the NRC by going through U.S. Navy SUPSALV.				

RP.4 SPILL INFORMATION LOG

Pending initial emergency actions and notifications, complete the Spill Information Log in Appendix C.

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1.0 INTRODUCTION

1.1 Plan Purpose

The Red Hill Fuel Storage Facility (RHFSF) Response Plan provides response information and procedures for responding to a major oil spill emergency at the RHFSF. Federal regulations require Facility Response Plans (FRPs) to address worst-case discharges that could occur from aboveground storage tank (ASTs) at fuel storage or production facilities (under Title 40, Code of Federal Regulations, Part 112.20 (40 CFR 112.20)). The Red Hill underground storage tanks (USTs) are field-constructed tanks, and as such are deferred from this and many Federal and State UST program requirements. However, due to the unique nature of the RHFSF, the worst-case discharge that could occur within the Commander Navy Region Hawaii (CNRH) area of responsibility (AOR) would be the release of the entire contents of one of the twenty USTs located within this facility. To be better prepared for this unlikely situation, this plan has been developed to assist in the planning and training required to respond to a major release at this facility.

1.2 Plan Organization

This plan is organized into four basic sections:

The Red Plan

This section details the critical actions that Naval Supply Systems Command Fleet Logistics Center Pearl Harbor (NAVSUP FLCPH) fuel personnel must take in the event of a fuel leak emergency at the RHFSF.

The Main Plan

This section provides general information about the RHFSF and the surrounding environment. It summarizes information from existing plans and provides specific information about responding to a major fuel release at the facility. Information covered includes a description of the facility, facility history, fire and safety systems, leak detection system, environmental setting, environmentally sensitive areas, groundwater and hydrology, site safety information, response equipment resources, waste management and disposal procedures, evacuation procedures, and references.

The Scenario Tabs

These tabs outline two different scenarios, a worst-case discharge (WCD) and a maximum most probable discharge (MMPD), that could possibly occur at the RHFSF. Although highly unlikely due to continued upgrades to the facility, each tab describes the scenario and discusses immediate response actions; general response operations; response objectives; maps, diagrams and figures; and response equipment calculations (if applicable). These scenarios are used for planning and training purposes only.

Appendices

The appendices provide supporting information such as notification lists, information on financial responsibility, a spill information log, safety data sheets, a location system for the

facilities tunnels based on frame mark numbers, and a list of acronyms.

1.3 Plan References

Several references were used in the development of this plan; see Section 13 for a complete list of references.

2.0 FACILITY INFORMATION

2.1 Facility Location

The RHFSF is located in a ridge of volcanic rock known as Red Hill on the western edge (leeward side) of the Koolau Mountains that divides South Halawa Valley and Moanalua Valley. It is approximately 2.5 miles northeast of Joint Base Pearl Harbor Hickam (JBPHH) (see Figure 2.1) and occupies approximately 144 acres of land surrounded by Federal, State, and residential property. The majority of the surface topography of the site lies at an elevation of approximately 200 to 500 feet above mean sea level. The Red Hill ridge extends southwesterly toward JBPHH and provides protective cover not only for the underground fuel storage facility, but also for the long tunnel that connects the fuel storage facility with the UGPH, Adit 1.

Figures 2.2 and 2.3 provide a topographic and three-dimensional view of the facility, respectively, with the RHFSF superimposed on both.

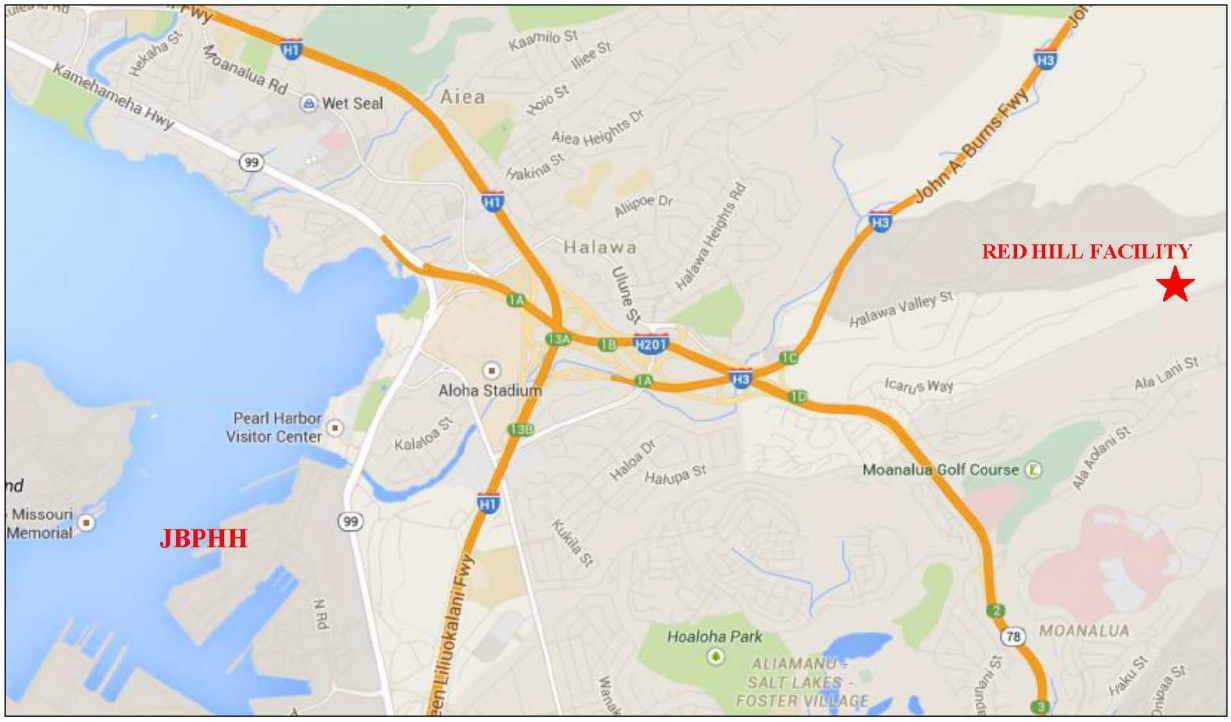


Figure 2.1: RHFSF Location

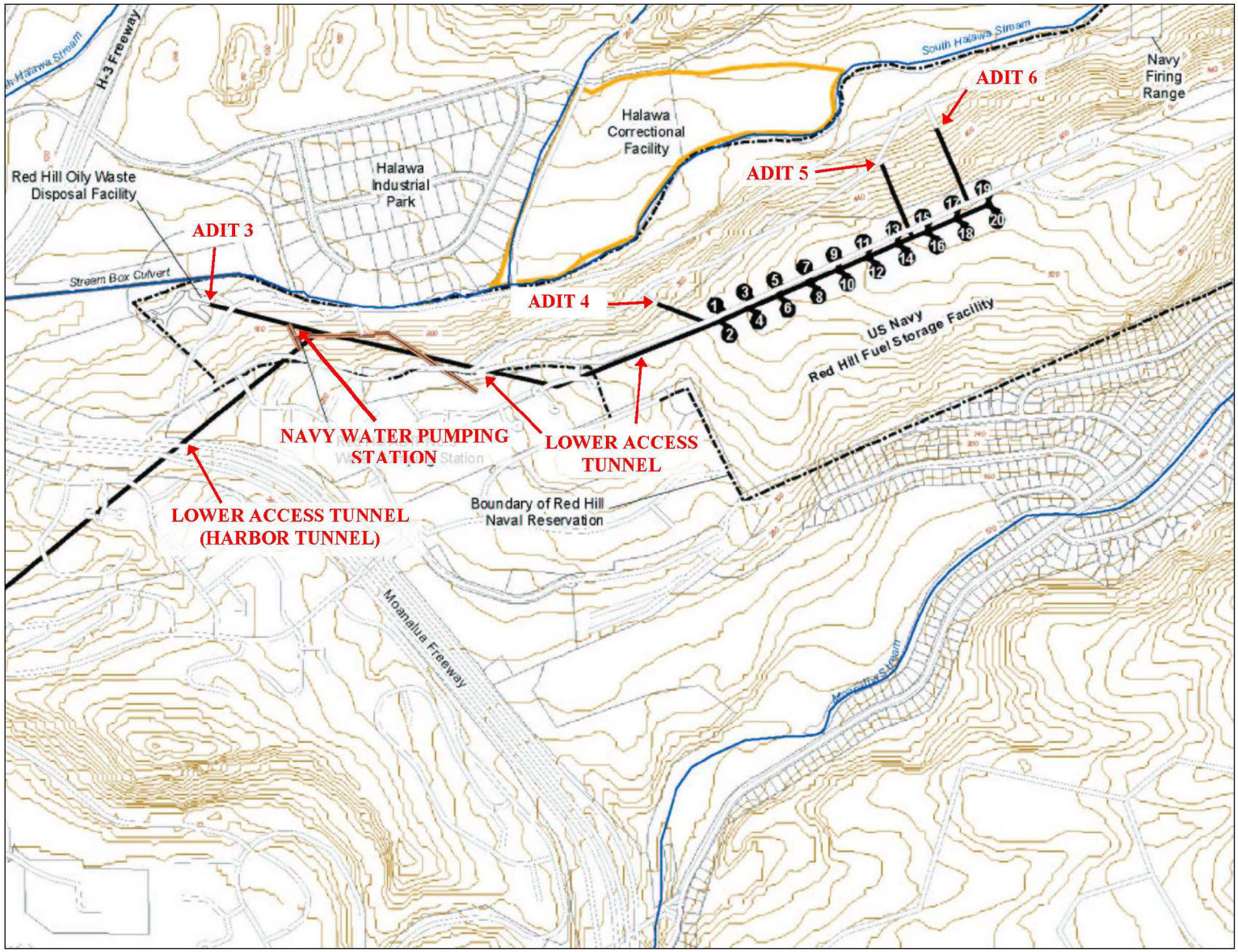


Figure 2.2: Topographic View of the RHFSF

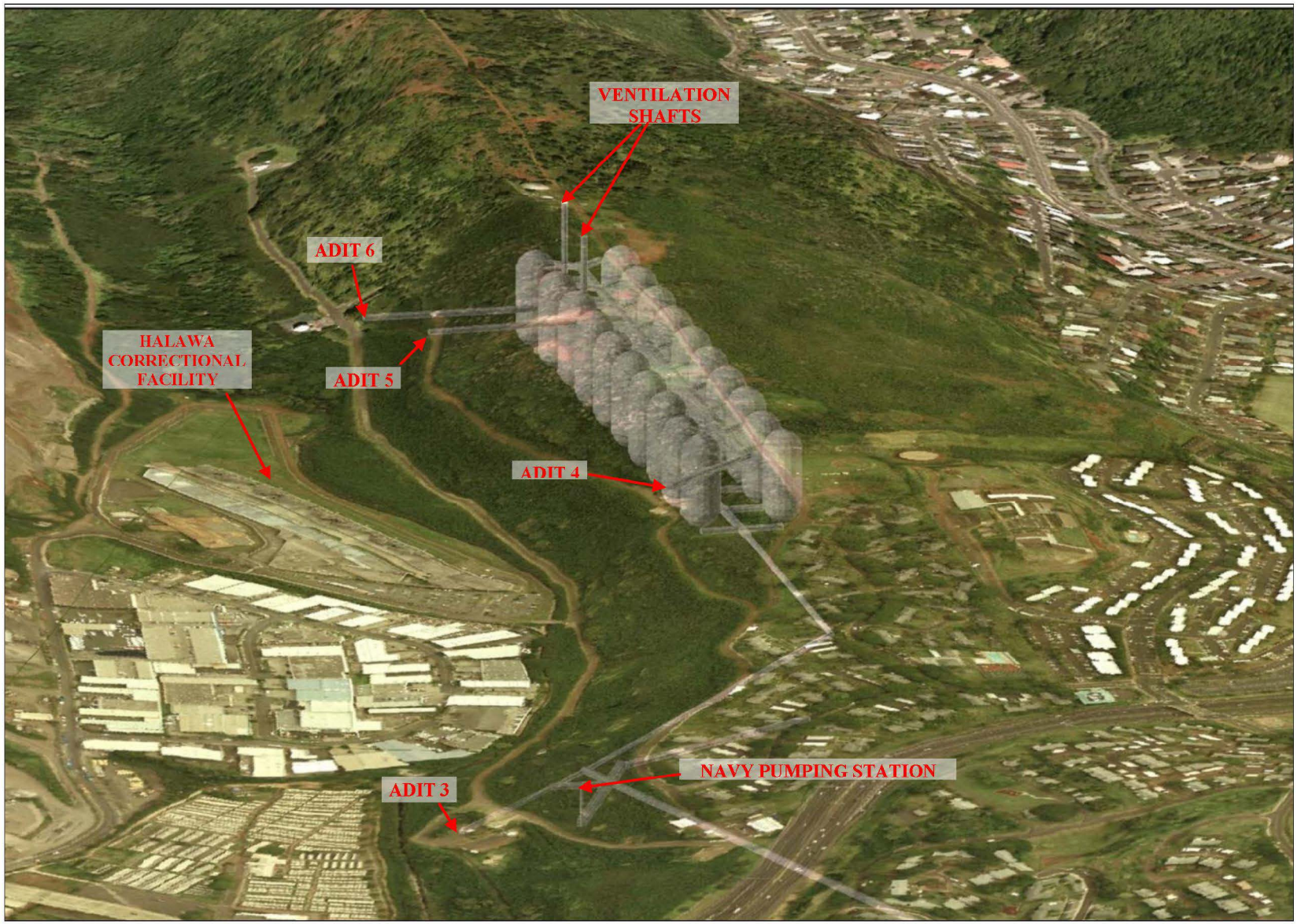


Figure 2.3: Three-Dimensional View of the RHFSF

2.2 Facility Description

The RHFSF consists of sixteen 302,000-barrel and four 285,500-barrel field-constructed USTs containing Jet Fuel Propellant No. 5 (JP-5), North Atlantic Treaty Organization - grade F-24 jet fuel (F-24), and Diesel Fuel - Marine Grade (DFM) (F-76). The tanks are constructed of reinforced concrete and lined with steel. The Primary containment material is steel. The tanks are located in subterranean vaults hollowed out of volcanic basaltic rock. Each tank has the form of a vertical cylinder, closed on top and bottom by hemispherical domes. The cylindrical portion of Tanks 1 through 4 has a height of 138 feet. The cylindrical portion of Tanks 5 through 20 has a height of 150 feet. The radius of the cylinder and domes is 50 feet, making the total height 238 (Tanks 1 through 4) and 250 feet (Tanks 5 through 20) and the diameter 100 feet (all tanks). The upper domes of the tanks lie at depths varying between approximately 110 feet and 175 feet below the existing ground surface. Table 2.1 provides details on the RHFSF storage tanks.

The twenty storage tanks at Red Hill are located 200 feet apart on centers in two straight rows running parallel with the ridge. Two tunnels, the UAT and the LAT, centered between the two rows of tanks provide access to the top and bottom of the tanks (see Figure 2.4). The UAT has its floor at the elevation of the spring lines of the upper domes of the tanks. The floor of the LAT is about 18 feet below the tank bottoms. Each of the tunnels has branches to the tanks, which are located opposite each other. Adits 4, 5, and 6 provide access to the UAT, and Adit 3 provides access to the LAT (see Figure 2.4). Bulkheads separate Tanks 17 through 20 from the remainder of the tanks in both the UAT and LAT. Both bulkheads have oil and fire proof doors for access through the bulkheads. Two elevators, one on each side of the bulkheads, are used for traveling between the UAT and LAT.

The LAT extends from Tank 20 approximately 17,000 feet down to the entrance of the UGPH at grades from 2% to 0.025%. A typical cross-section of the tunnel is approximately 12 feet wide by 10 feet high. The tunnel walls are lined with gunite (sprayed concrete). Three pipelines carry fuel from the storage tanks to the UGPH: a 16" pipeline carrying F-24; an 18" pipeline carrying JP-5; and a 32" pipeline carrying F-76. A narrow gauge train track runs the entire length of the LAT on which a battery-powered locomotive operates to haul personnel and supplies.

Approximately 3,700 feet from Tanks 1 and 2, down the LAT (and Adit 3 spur tunnel) is the entrance to Adit 3. This entrance provides the most direct access to the lower tank area of the fuel storage facility. At the junction of the Adit 3 spur tunnel and the LAT (the Adit 3 "Wye") resides U.S. Navy Supply Well 2254-01. This well provides approximately 24% of the potable water used by the JBPHH Water System. In this area, there is also a ventilation shaft for the tunnel. From this junction the LAT (also known as the Harbor Tunnel from this point) continues approximately 12,500 feet down to the UGPH. Adits 1 and 2 provide access to the LAT near JBPHH. Adit 1 is the entrance to the UGPH and Adit 2 provides access to the Makalapa Adit Tunnel which intersects the LAT. Just inside Adit 2, and a short way down the Makalapa Adit Tunnel, are a set of stairs that lead up to the basement of the Commander, U.S. Pacific Fleet (COMPACFLT) building. Access to the COMPACFLT building is restricted by a steel door located at the base of the stairs (in the tunnel) that is padlocked closed. See Figure 2.4 for a schematic of the RHFSF.

There are three isolation doors located in the LAT to prevent an accidental release of fuel from flowing down unabated to JBPHH. These doors are normally kept open and are designed to automatically close if fuel is released in the tunnel. They can also be closed remotely from the control rooms located in the UGPH and Building 1757. Door A is located in the LAT before the Adit 3 spur tunnel. Door C is located before the intersection of the Makalapa Adit Tunnel (Adit 2) and the LAT. The third door is located at the start of the LAT at the entrance to the UGPH. See Figure 2.4 for the locations of these doors. Two oil and fireproof doors are located in the tank gallery, in both the UAT and LAT, in bulkheads that separate Tanks 17 through 20 from the remainder of the tanks. One other door, Door B, is a steel fire door located on the Adit 3 spur tunnel near the U.S. Navy well. There are also a number of other fire and ventilation doors located throughout the tunnels.

A newly installed "Emergency Oil Pressure Door" (see Section 4, Figure 4.1) at the end of the tank gallery in the LAT is designed to automatically close when oil is detected in its sump (via a high-level float indicating the sump is full) or a nearby push button is activated. Closing of the door activates the fire alarm system which sets off audible and visual alarms throughout the facility and alerts the Federal Fire Department (FFD). The door provides a fuel tight seal once closed and is designed to withhold the contents of one of the facility's storage tanks.

TABLE 2.1: RHFSF TANK CAPACITY

Tank ID	Type	Material	Diameter (Ft)	Height (Ft)	Barrels	Gallons	Fuel Type	Year Built
Red Hill Storage Tanks								
1/0101	UST	RCLWS [1]	100	238	285,742	12,004,164	Empty	1943
2/0102	UST	RCLWS	100	238	285,387	11,986,254	F-24	1943
3/0103	UST	RCLWS	100	238	285,413	11,987,346	F-24	1943
4/0104	UST	RCLWS	100	238	285,246	11,980,332	F-24	1943
5/0105	UST	RCLWS	100	250	302,333	12,697,986	F-24	1943
6/0106	UST	RCLWS	100	250	302,286	12,696,012	F-24	1943
7/0107	UST	RCLWS	100	250	302,460	12,703,320	JP-5	1943
8/0108	UST	RCLWS	100	250	301,928	12,680,976	JP-5	1943
9/0109	UST	RCLWS	100	250	302,458	12,703,236	JP-5	1943
10/0110	UST	RCLWS	100	250	302,350	12,698,700	JP-5	1943
11/0111	UST	RCLWS	100	250	302,761	12,715,962	JP-5	1943
12/0112	UST	RCLWS	100	250	302,250	12,694,500	JP-5	1943
13/0113	UST	RCLWS	100	250	302,724	12,714,408	JP-5	1943
14/0114	UST	RCLWS	100	250	302,846	12,719,532	JP-5	1943
15/0115	UST	RCLWS	100	250	302,536	12,706,515	F-76	1943
16/0116	UST	RCLWS	100	250	302,450	12,702,900	F-76	1943
17/0117	UST	RCLWS	100	250	302,676	12,712,392	JP-5	1943
18/0118	UST	RCLWS	100	250	302,682	12,712,644	JP-5	1943
19/0119	UST	RCLWS	100	250	302,560	12,707,520	Empty	1943
20/0120	UST	RCLWS	100	250	302,498	12,704,916	JP-5	1943
FOR	AST	Steel	21	16	1,008	42,336	W. Oil	1970

TABLE 2.1: RHFSF TANK CAPACITY								
Tank ID	**Type**	**Material**	**Diameter (Ft)**	**Height (Ft)**	**Barrels**	**Gallons**	**Fuel Type**	**Year Built**
Underground Pump House Surge Tanks								
ST1/1224	UST	Steel	60	20	10,042	421,764	F-24	1942
ST2/1225	UST	Steel	60	20	10,050	422,100	JP-5	1942
ST3/1226	UST	Steel	60	20	10,064	422,688	F-76	1942
ST4/1227	UST	Steel	60	20	10,052	422,184	F-76	1942

Note: RCLWS[1] = Reinforced concrete lined with steel

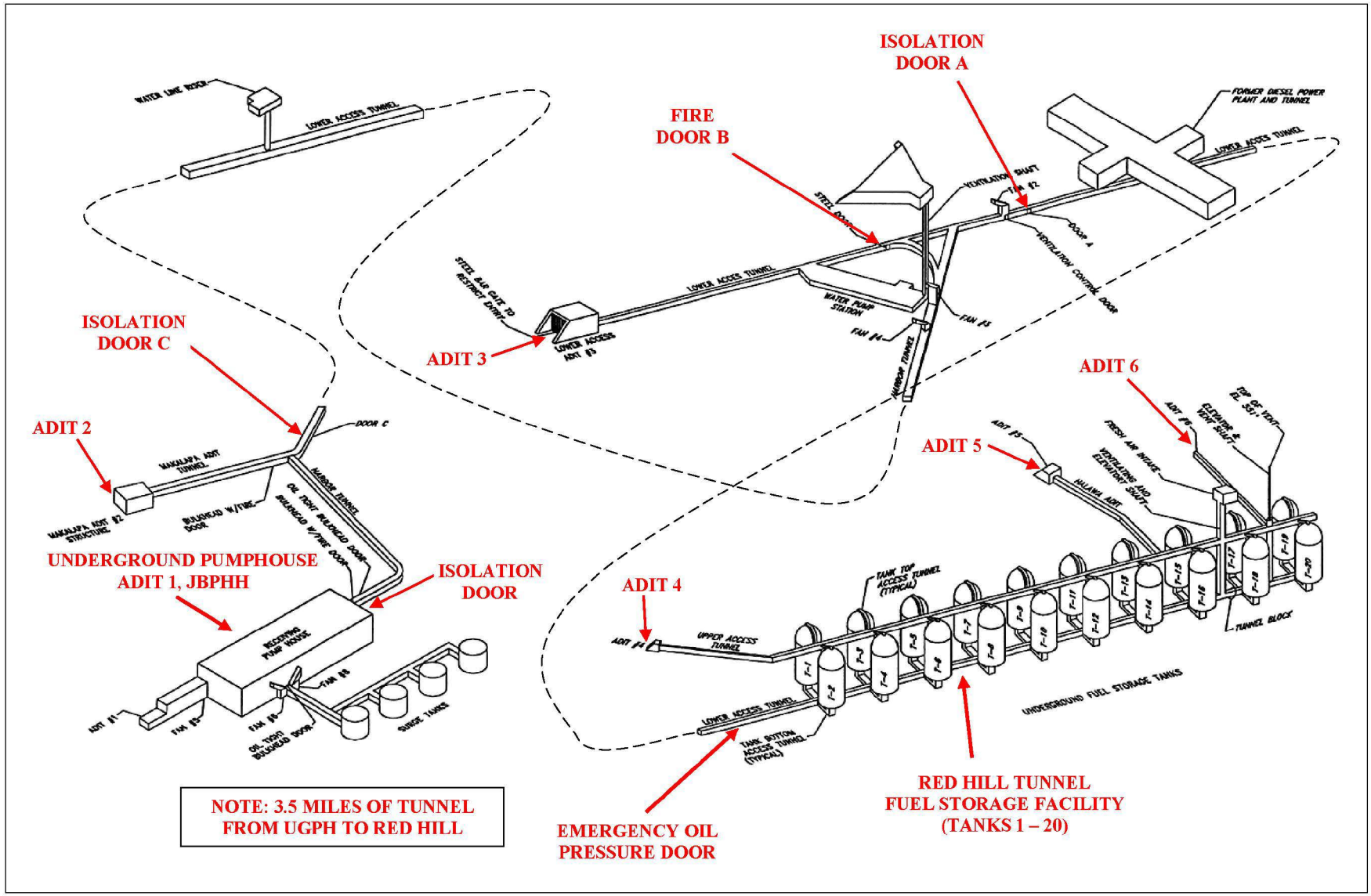


Figure 2.4: RHFSF Schematic

2.3 Underground Pumphouse

The UGPH is used to transfer the receipt of fuel from Hotel Pier uphill into the Red Hill storage tanks. There are four underground surge tanks (each with a capacity of 10,000 barrels) located at the UGPH, along with associated pump, manifolds, and pipelines. These surge tanks help regulate the flow of fuel into the Red Hill tanks. Fuel is issued from the Red Hill tanks by gravity flow.

2.4 Red Hill Diesel Power Plant (Abandoned)

The abandoned Red Hill diesel power plant is located off the LAT between the tanks and U.S. Navy Supply Well 2254-01. A narrow steel door in the LAT marks the location and former entrance to the diesel power plant, this steel door has been completely sealed. The power plant can also be accessed from the Red Hill Facility access road. This entrance is secured by a locked gate.

The power plant was used to provide the facility with electricity when it was first built. The plant was abandoned at an unknown date. Today the facility uses power from the public power grid, but also has backup generators for powering key equipment.

3.0 FACILITY HISTORY AND CONSTRUCTION

3.1 Initial Planning

In a 1938 report, the Navy Shore Development Board at Pearl Harbor expressed a grave concern over the "adequacy and security of the fuel oil storage at Pearl Harbor." At the time, the entire Navy's fuel was stored in unprotected aboveground storage tanks at Pearl Harbor, next to the submarine base. The Board's fears were later echoed by Admiral Chester Nimitz, Commander in Chief of the U.S. Pacific Fleet who was worried about the vulnerability of the Navy's fuel storage tanks to the Japanese.

In the view of these vulnerabilities, the Navy's Fuel Storage Board recommended to the Secretary of the Navy "that the present tank farms be removed as rapidly as appropriations can be obtained to place the oil underground at least to the point of concealment." The board's recommendation, which came on June 25, 1940, resulted in a plan to construct four 300,000-barrel capacity horizontal storage tanks. The tanks were to be set deep into the earth so that they would be impregnable to assault by enemy aircraft and located at a greater distance from Pearl Harbor. The plan also called for the construction of facilities to unload tankers and refuel ships.

Initial design and construction funds of $4,000,000 were provided for the classified project known as "Project 16." An additional $2,250,000 was appropriated in September 1940.

3.2 Facility Design

Regarding the facilities design, the Navy was adamant that the fuel be stored underground; other than that stipulation, the on-site engineers were given a free hand in determining the optimal design of the tanks. The initial design that the engineers came up with was to dig a series of tunnels and insert the tanks inside of them. Finding a suitable site proved problematic as the area around Pearl Harbor was underlain by volcanic rock that was full of cavities, cracks, holes, and bubbles. Navy engineers finally settled on Red Hill, about 2.5 miles northeast of Pearl Harbor, as it was mostly homogeneous basalt.

At the time, Red Hill was not owned by the Navy and was under cultivation for sugar cane and pineapple by local plantations, most of it owned by the Damon Estate. The Navy initially leased the land from the plantations, cleared and leveled it, and then began construction of temporary work camps. Eventually the plantation owners were forced to sell out to the Navy through direct condemnation. The Navy purchased 345 acres in the area at an average price of $242 per acre.

As planning progressed, a consultant engineer named James P. Growden, of the Aluminum Company of America, was brought in to review the plans for the project. He came up with an alternate plan for building the storage tanks. Instead of inserting tanks horizontally in underground tunnels, he suggested excavating large vertical tank chambers. The benefit of this design would be that it would increase the volume of material that could be excavated simultaneously and decrease the amount of heavy equipment needed for hauling muck. It would also decrease the unit cost for rock removal substantially.

3.3 Construction

Initial construction began August 19, 1940. To determine the depth necessary to protect the fuel from Japanese aerial attack, the engineers gathered data from the Army, multiplied it four-fold and rounded the figure off to 100 feet of rock cover. The tanks were to be set up in two parallel rows with two main access tunnels, one above the other, bisecting the rows (see Figure 3.1). Smaller tunnels, or adits, would branch from the main axis tunnels to the tank cavities.

Access Tunnels

Once the tank invert level and radius of curvature were determined the digging of the access tunnels commenced. Both the upper and lower access tunnels were excavated simultaneously (see Figure 3.2). They were constructed like the horseshoe shape of railroad tunnels, flat floors and walls, with an arching ceiling. The tunnels were roughhewn and lined with gunite (sprayed concrete) for increased strength.

Chamber Adits

As the main access tunnels moved past the location of a proposed storage tank, workers began digging the branch lines, or horizontal adits. The adits were smaller, man sized, and were shored with steel H-beams bolted together and sprayed with cement. The lower adit was excavated as far as the center point of the tank and the upper adits were stopped when they reached the outer radius of the proposed tank.

Tank Chamber Excavation

In the upper adit, once the outer radius of the tank had been reached, a ring tunnel was dug around the circumference of the tank chamber. Upon completing the ring tunnel, the miners dug upwards in a hemisphere from all points around the ring, narrowing as they reached the central shaft. Meanwhile, a vertical 12-foot by 12-foot shaft was excavated from the ridgeline through the central axis of the chamber, down to the lower adit (see Figure 3.3). Over 3,000 tons of dynamite was used in excavating the tank vaults and tunnels before blasting operations were completed.

Construction of Upper Tank Domes

Each section of the dome had to be braced with timber, prefabricated above ground in the exact curvature of the dome. This allowed the miners to dig to a template reducing time of excavation. I-beams were sent down and assembled to form ribs around the dome. Sections of steel plates cut so that they could be pieced together to form the dome were sent down and welded together. The wood shoring had to be shortened and replaced to account for the H-beam steel sets and liner plates. A pipe network extending down the central shaft and radiating around the dome was constructed for pouring concrete that would line the tank chambers. Each chamber dome required 70 hours of continuous pouring for 5,000 cubic yards of concrete.

Tank Excavation

As soon as the upper hemisphere concrete had set, workers were lowered down the central shaft to begin excavation of the tank chamber. The miners dug outwards in all directions under the dome, keeping a 30 to 45 degree slope to the center of the shaft, so muck would slide into the

shaft by gravity; greatly reducing labor and transport for the project (see Figure 3.4). At the bottom of the vertical shaft, rock screens (grizzlies) broke up falling rock so it could be transported on conveyors. In the lower adits, an elaborate conveyer belt system was constructed to carry mucked rock one half mile to the surface where it was processed through the crushing plant and batching plant and then sent back into the hill as concrete. The central tank shafts were expanded in a cone under the upper dome until the desired diameter was reached. The miners continued to dig downwards in a cone until they reached the lower hemisphere of the tank chamber. The lining for the lower hemisphere was placed similarly to the top (see Figure 3.5). Any cracks or holes found during excavation were grouted and sealed.

Constructing the Tank Liners

After excavation, the rock walls were gunited, the specification calling for a minimum thickness of 6 inches and a maximum thickness of 1 foot 6 inches. The gunite surface was coated with asphalt and painted with a red earth slurry. Rings of steel ribs were sent into the tank from the shaft above and assembled in the tank to form the skeleton onto which one-quarter inch steel plates were welded to form the tank's inside liner. Concrete was poured into the space between the tank liner and the gunited rock wall. Once the concrete had set, high-pressure grout was injected into the tension cracks and spaces remaining between the concrete and the tank liner (see Figures 3.6, 3.7, and 3.8). The concrete backing varied in thickness from 8 feet at the spring line of the lower dome to two and a half feet at the top of the cylindrical wall. The lower dome of the tank rested on a huge plug of concrete almost 20 feet thick.

Testing the Tanks and Fixing Leaks

Once each tank was completed, it was given a leak test. The tanks were filled with water and if there was more than a ½ inch drop in 24 hours, the tank failed the test. In order to locate the leaks, the tanks were filled very slowly with water, as high-pressure air was injected outside the tank. Welders in boats on the slowly rising pool of water would look for the bubbles of air entering the tank's steel lining, once found they would signal for the water level to be lowered and then weld the leaking seam. When each tank was complete, the top was closed and the access shafts above the tank chambers were filled with concrete.

Completed Project

As the work progressed the number of tanks was increased to fifteen and finally to twenty. As part of the same project, the fuel pier (Hotel Pier) at Pearl Harbor was built and miscellaneous items, such as roads, tunnels, pumps, and emergency work were added until the completed work amounted to more than $42,000,000. Work on the project was completed on September 30, 1943.

The number of men on the project reached a peak of 3,400 in June 1942 and remained at that level until October of 1942 when the first two tanks were completed and turned over to the Navy for operation. By February 1943, the Navy had assumed operation of ten completed tanks. The remaining ten tanks were completed by July 1943.

3.4 Quantities Involved in Building the Red Hill Tanks

Excavation, cubic yards: 1,690,000
Timber, foot board measure: 4,618,000
Tunnel steel supports, pounds: 1,000,000
Grout, sacks of cement: 1,200,000
Reinforcing steel, pounds: 21,000,000
Wire Mesh, square feet: 687,000
Gunite, sacks cement: 578,000
Concrete, cubic yards: 413,000
Structural steel, pounds: 4,000,000
Shaft excavation, cubic yards: 50,000
Steel liner plate, ¼ inch: 45 acres (20,000,000 pounds)

3.5 Quick Facts on Red Hill

Location: Ridgeline between South Halawa Valley and Moanalua Valley
Construction started: August 19, 1940
Construction completed: September 30, 1943
Total construction time: 2 years, 9 months
Cost of construction: $43,000,000
Primary contractor: Morrison Knudsen
Amount of worker on project: 3,400 (peak)
Fatalities: 17 workers
Number of tanks: 20
Capacity of tanks: 16 at 302,000 bbls (12.7 million gals); 4 at 285,500 bbls (11.9 million gals)
Capacity of all 20 tanks: 5,974,000 bbls (251 million gals)
Tank Height: 16 at 250 feet; 4 at 238 feet
Tank Diameter: 100 feet
Depth of tank tops below surface: 110 to 175 feet
Depth of tank bottoms below surface: 360 to 425 feet
Deepest point: Lower tunnel beneath Tanks 19 & 20 (approximately 450 feet)
Length of upper tunnel: Approximately 4,350 feet
Length of lower tunnel: Approximately 17,000 feet
First oil received: Diesel in Tank 1 on September 28, 1942 from tanker SS Fairbanks
First issue to ship: Diesel to submarine USS Tarpon in October 27, 1942
Facility declassified: 1995

Figure 3.1: Red Hill Design Concept

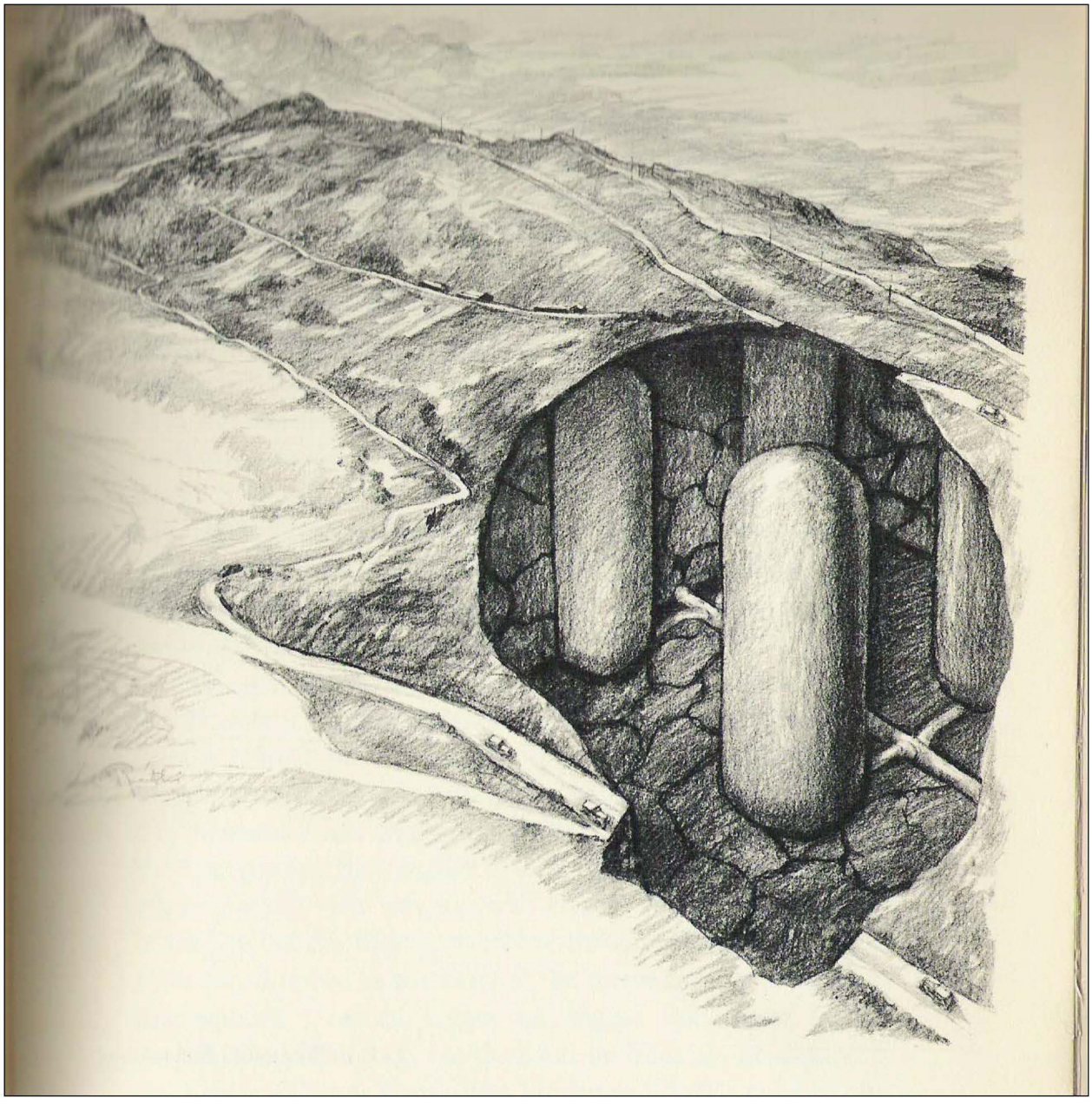


Figure 3.1 is a sketch of the original design concept for the vertically arrayed storage tanks. At the time, nothing like this had ever been attempted previously, where the contractor would use gravity to "flow" rock muck to the base of each cavity where it would be removed by a conveyer system.

Figure 3.2: Side Hill Entrance to Tank Excavations

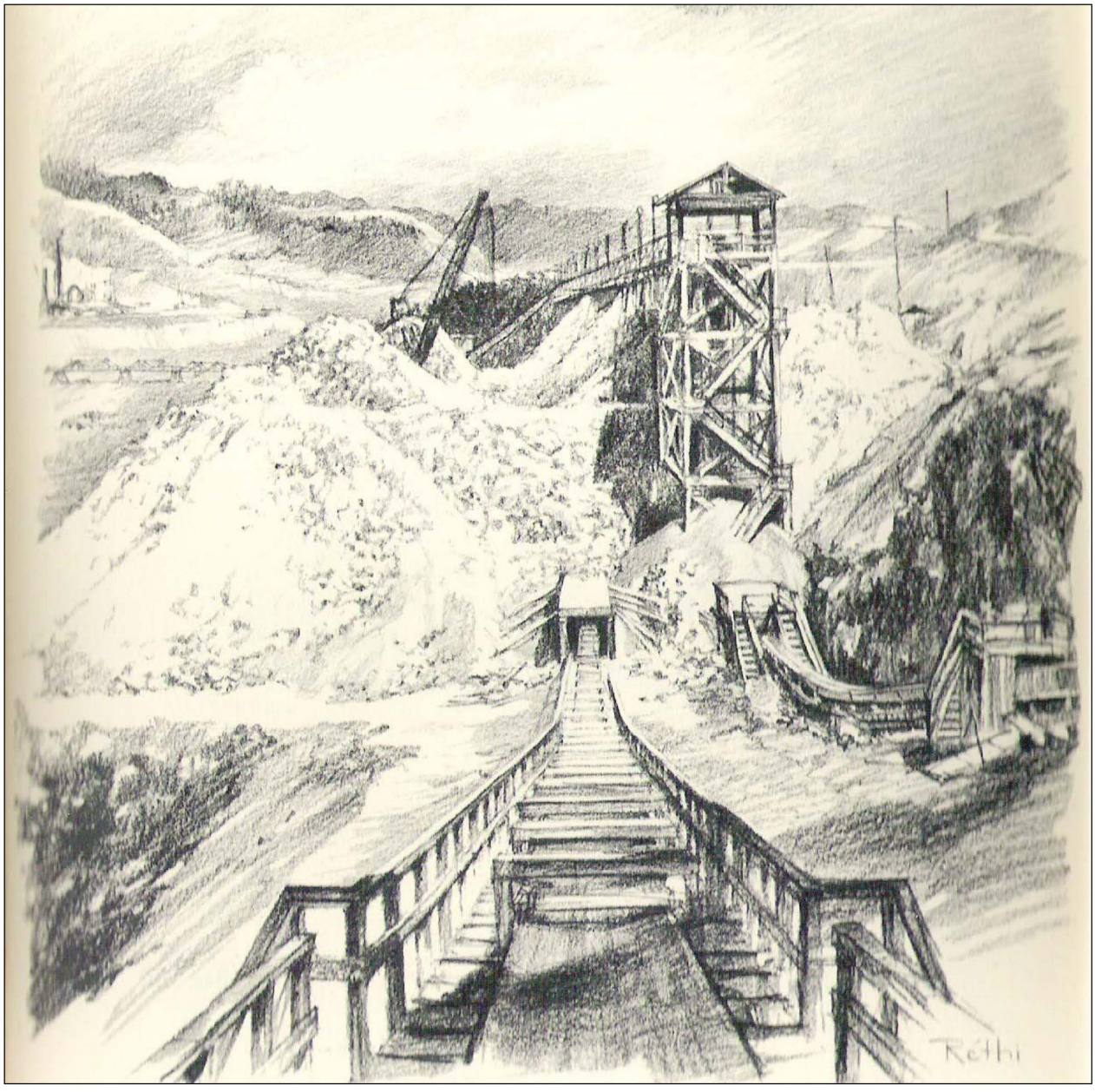


Figure 3.2 is a sketch of the side hill entrance to the tank excavations and lower access tunnel.

Figure 3.3: Chamber Excavation Schematic

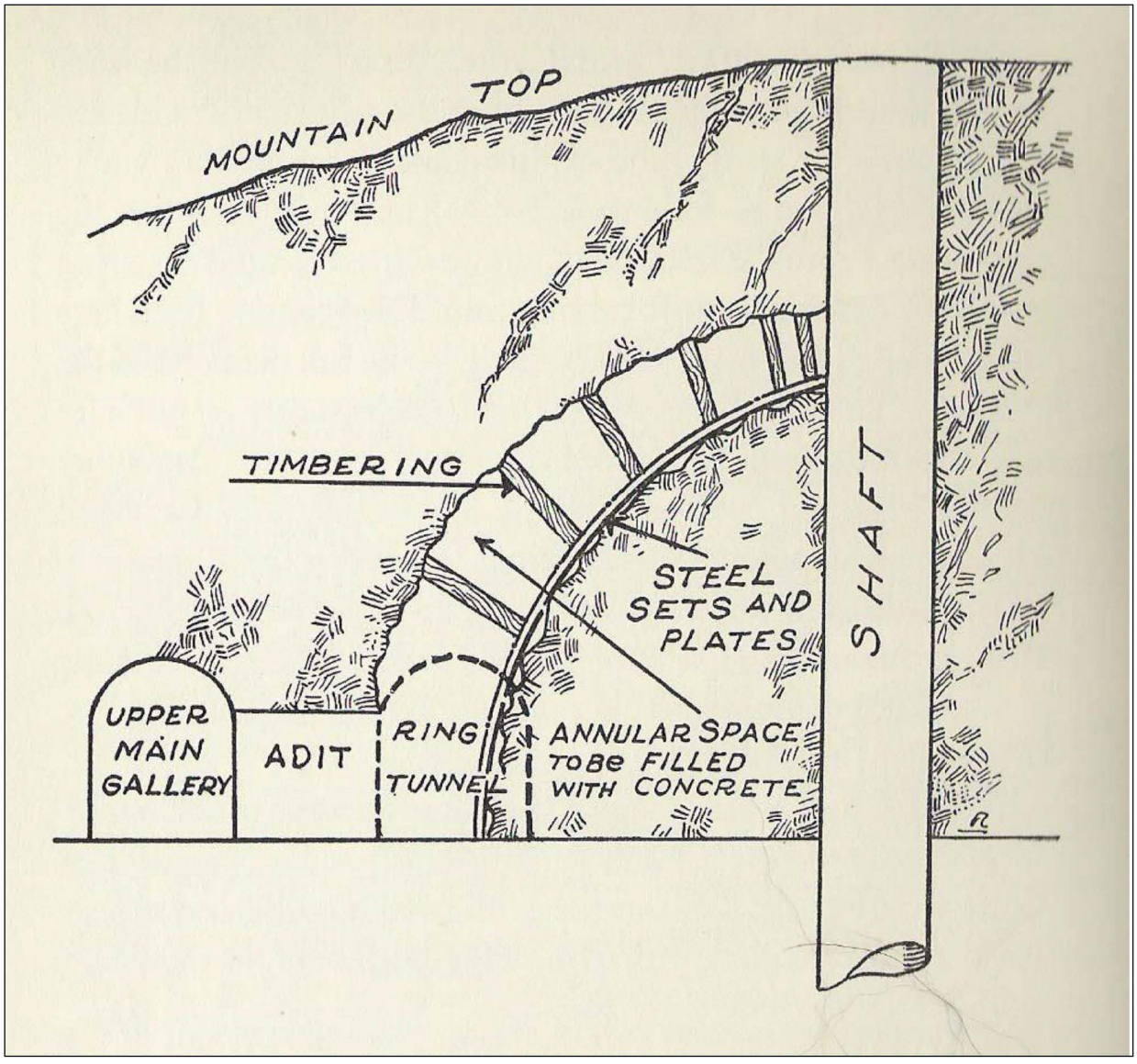


Figure 3.3 displays how each chamber excavation began. The upper dome of each chamber fuel chamber was excavated first, starting with a ring tunnel, and then working upward towards the central shaft.

Figure 3.4: Tank Excavation Process

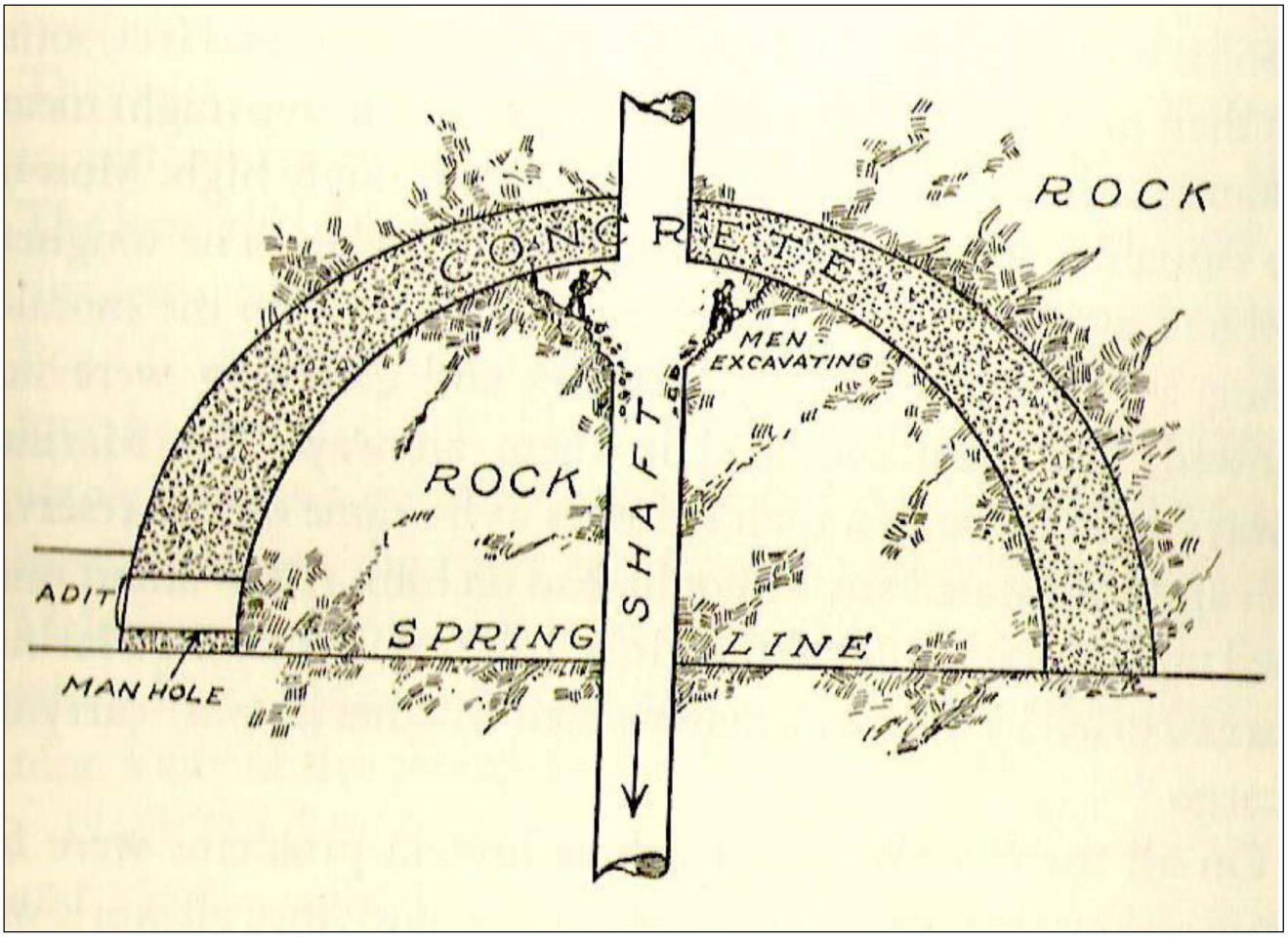


Figure 3.4 displays how the tanks were excavated. After the upper hemisphere dome was concreted, miners began mucking the upper tank chamber, dropping muck by gravity through the central shaft.

Figure 3.5: Lower Tank Dome under Construction

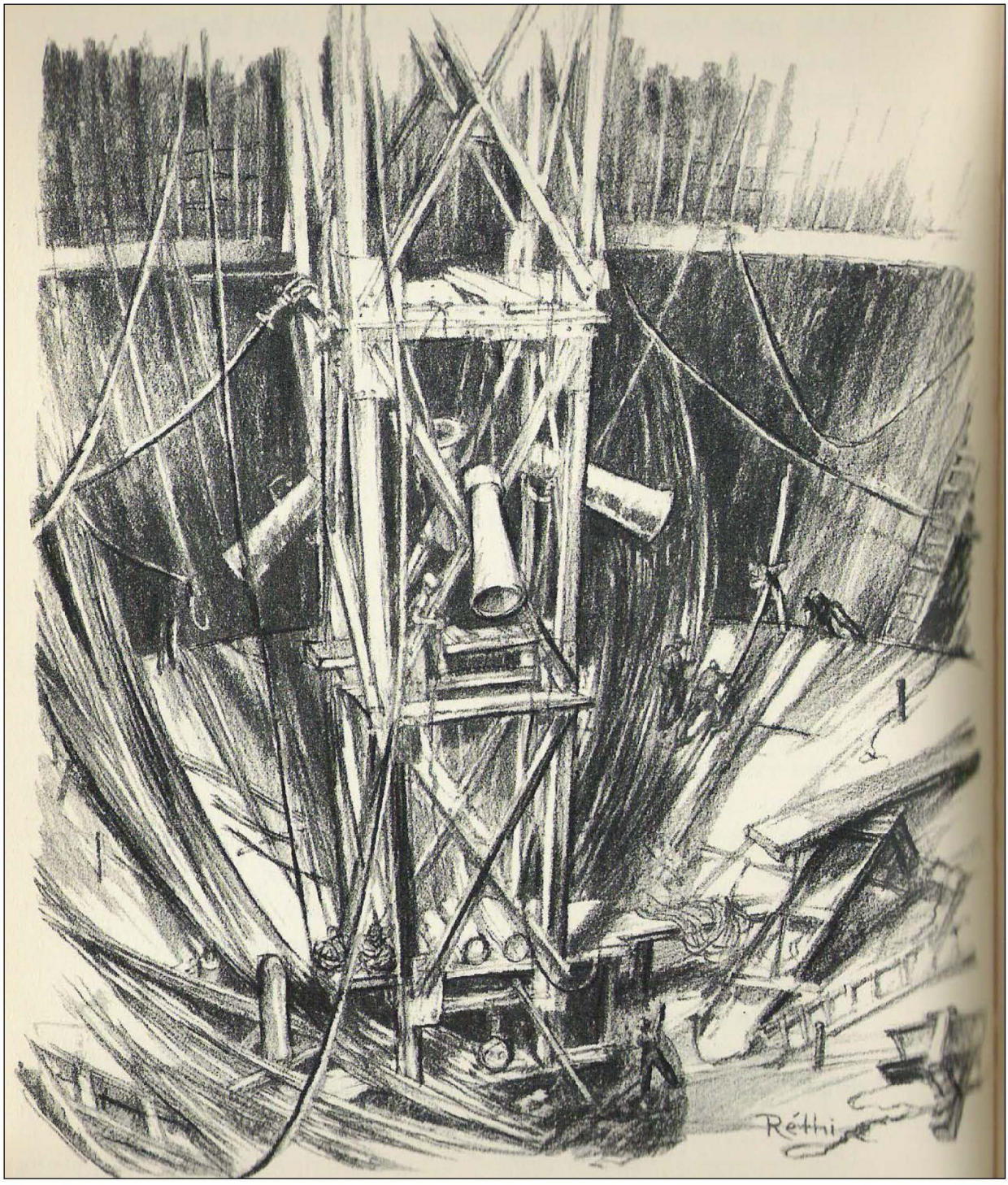


Figure 3.5 shows a sketch of a tank's lower hemisphere under construction and being lined with concrete with an inner steel lining.

Figure 3.6: Construction of Tank Walls

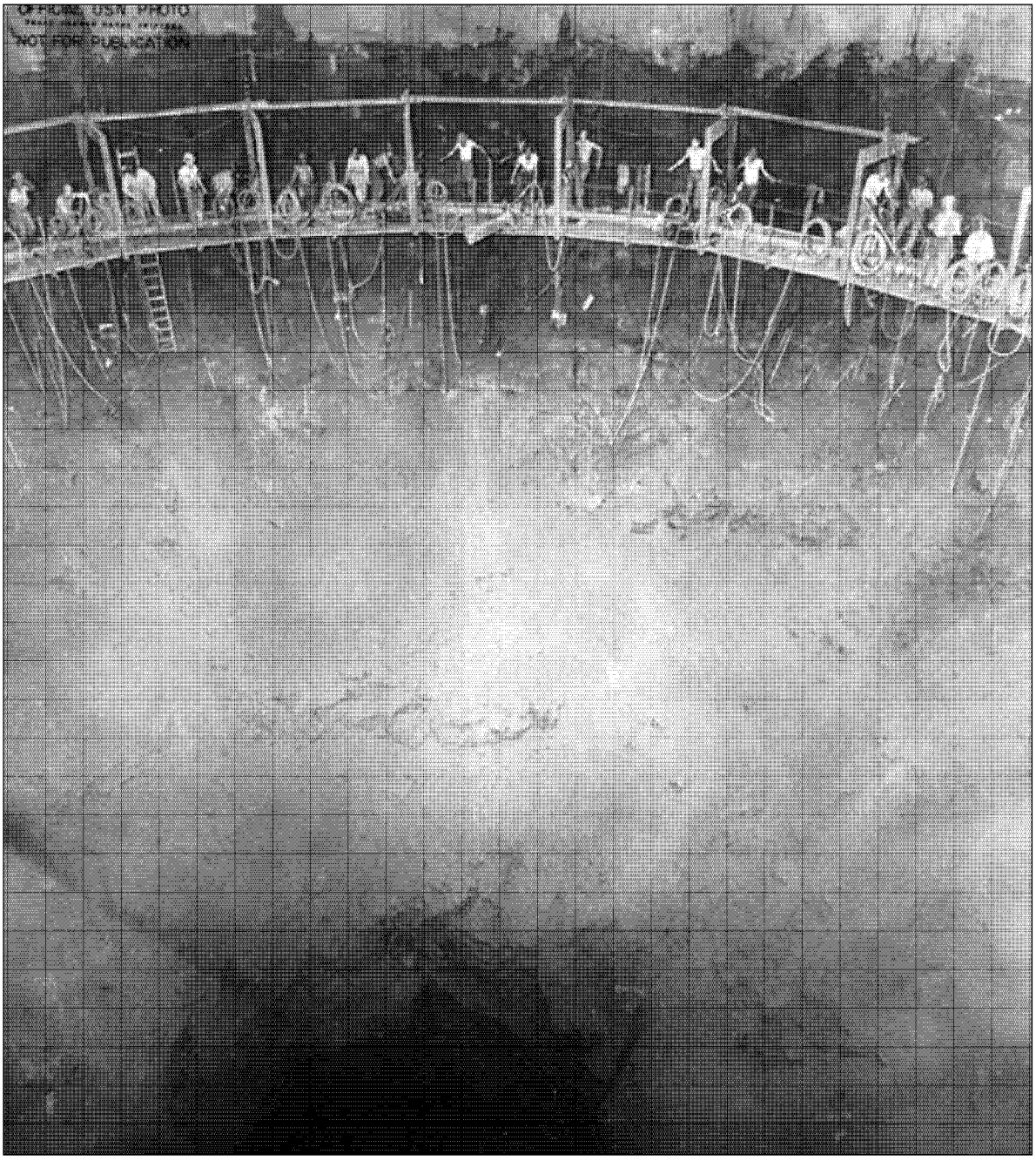


Figure 3.6 shows a picture of workers constructing the tank walls. The picture shows the gunite (concrete spray), asphalt, and red earth slurry being applied to the rock face near the bottom of a chamber.

Figure 3.7: Lining the Walls of the Tank Chamber

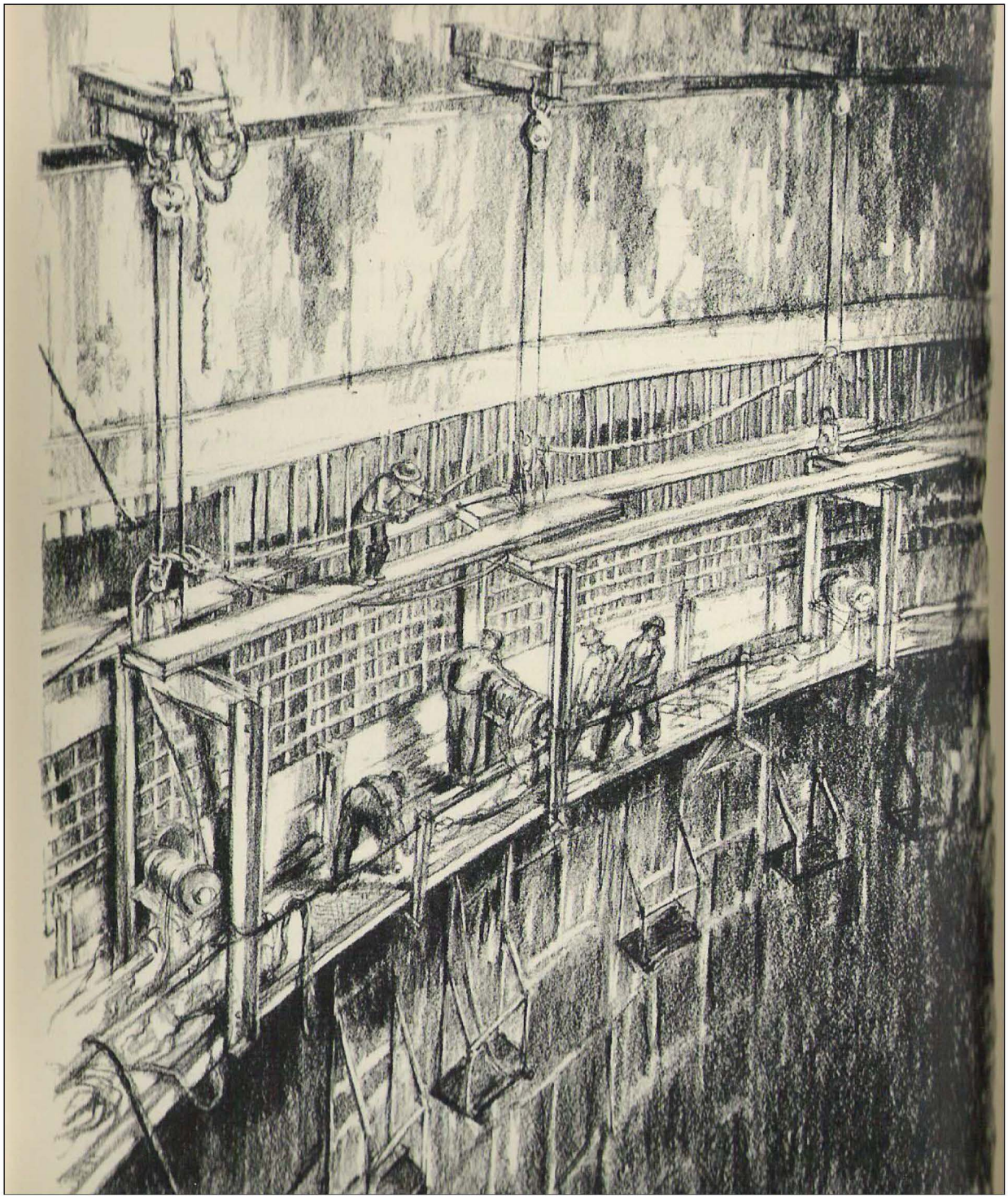
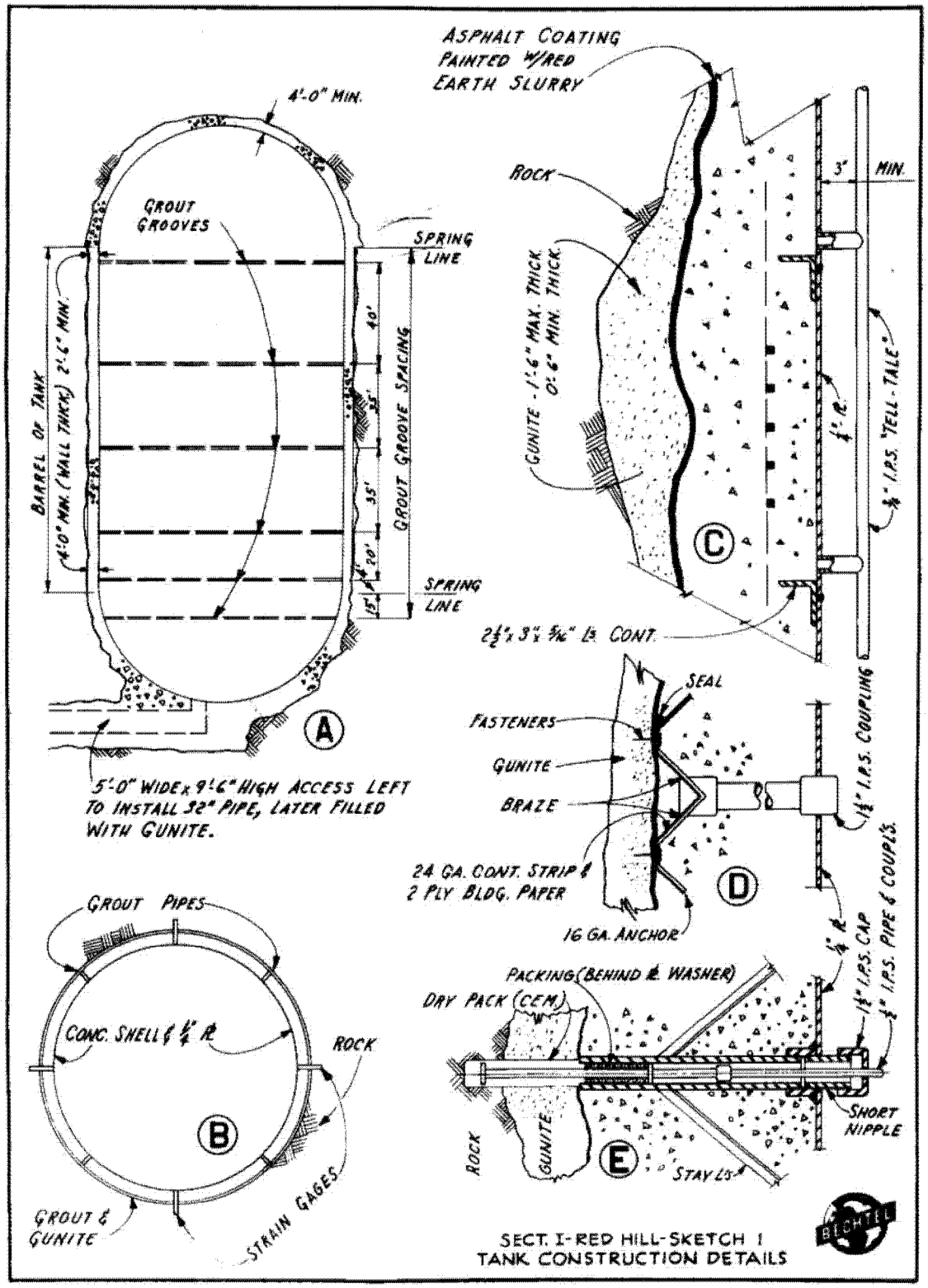


Figure 3.7 is a sketch showing workers lining the walls of the tank chamber. Reinforced concrete was placed against the rock and smoothed continuously; welded steel plate formed the inner liner.

Figure 3.8: Tank Construction Details



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4.0 FACILITY FIRE AND SAFETY SYSTEMS

4.1 Introduction

During the period 2015 through 2019, many safety improvements were made to the RHFSF including a new fire protection system. This section provides a summary of the fire and safety improvements made to the facility during this period.

4.2 Fire Alarm System

4.2.1 Overview

The fire alarm system is a Class A Detection and Mass Notification system that span's the entire facility. The system works with and controls the previously installed fire protection systems located at the UGPH and Buildings 1721 and 1613, which are commonly referred to collectively as the "Cheetha" system. The new system can be controlled from two locations, the UGPH and the Lower Tank Gallery Gauger Station. From these two locations, operators can seek/provide systems checks, updates, alarm logging, mass notifications, and system deactivations. The system consists of the following:

- Fourteen Addressable Nodes that operate initiating devices, notification devices, and auxiliary functions.
- Forty Audio Nodes that control all speakers.
- Five Network Graphic Annunciators (NGAs) that allows user to view events/alarms and acknowledge, silence, and reset the system.
- Six Microphones that allow the operator to make an announcement through a manual page or a prerecorded message.
- Nine Network Stations (NWSs) used for system monitoring and checking of current inputs/alarms. NWSs are located at the entrance to each adit.
- Two King Fisher Panels for monitoring the system and transmitting alarm, supervisory, and trouble event to the Regional Dispatch Center, who dispatches the FFD upon receiving an alarm event.
- One Federal Signal mass notification interface that allows base-side messaging over all speakers.
- Two Direct Digital Control (DDC) interfaces to the fire alarm system that monitors components on the fire protection system.

4.2.2 Description

This section provides a description of the fire protection system.

- The Fire Pumphouse located outside of Adit 6 provides water for the following:
  - A closed head sprinkler system in the UAT
  - Fire department connection (FDC) points in the UAT
  - An aqueous film forming foam (AFFF) closed head sprinkler system in the LAT
  - FDC points in the Tank Gallery of the LAT
- The fire alarm system monitors the equipment inside of the pumphouse that includes fire pumps, jockey pumps, foam pumps, foam jockey pumps, N2 generator, and all valves. Two 250,000-gallon water tanks on top of the ridge above Adit 6 provide water to the pumphouse.

- The UAT (Upper Tank Gallery) is fully monitored by heat detectors and a closed head sprinkler system. This system once activated will start fire pumps in the Fire Pumphouse while also communicating to the FFD through the King Fisher system.
- The LAT (Lower Tank Gallery) is fully monitored by explosion proof heat detectors (Tank 1 to Adit 3), ultra-violet infrared (UVIRs) detectors (Tank 1 through Tank 20), supervised valves (AFFF Foam Closets 1 through 5), and pressure switches (AFFF Closets 1 through 5) which are used in concert to activate the AFFF closed head sprinkler system. This system once activated will start fire pumps and foam pumps in the Fire Pumphouse while also communicating to the FFD through the King Fisher system. Note: the AFFF system once activated can only be suspended at either the UGPH or Gauger Station. Suspension will not stop water flow, but will close releasing solenoids for AFFF concentrate.
- The Harbor Tunnel is fully monitored by explosion-proof heat detectors, however fire suppression is not provided beyond Tanks 1 and 2.
- The UGPH is the overlap section of the existing FM-200/AFFF systems (Cheetah system) with the new fire alarm system. While both heat detectors and UVIR detectors were installed in the UGPH as part of the recent fire system upgrades these are not the releasing devices for either of these systems. In the main pump room, the original 3 infrared (IR) detectors (tied directly to the Cheetah system) are the release devices for the AFFF in the main pump room. Additionally, in the UGPH Control Room and main 12KV transformer room, the original heat detectors (tied to the Cheetah panel) must be tripped for the FM-200 or the AFFF to be released.

4.2.3 Activation

This section discusses how the fire protection system is activated.

- The Fire Pumphouse consists of manual pull stations, thermal heat detectors, and smoke detectors. If one of these devices is tripped, audible and visual alarms activate in the Fire Pumphouse, and the FFD is notified of the alarm.
- The Upper Tunnel and Adit 6 consists of manual pull stations, thermal heat detectors, smoke detectors, and UVIRs detectors. If one of these devices is tripped, audible and visual alarms activate throughout the facility, with the exception of the Fire Pumphouse, and the FFD is notified of the alarm.
- The Lower Tunnel consists of manual pull stations, thermal heat detectors, smoke detectors, and UVIRs detectors. If one of these devices is tripped, audible and visual alarms activate throughout the facility, with the exception of the Fire Pump House, and the FFD is notified of the alarm. If two (2) UVIRs are tripped, or one (1) UVIR and one (1) Nitrogen Low Pressure Switch is activated within the same zone, the AFFF pumps will start, releasing AFFF into the zone. Note: Currently the AFFF system is inactive. Activation of the sprinkler system will release water only.
- For the UGPH the FM-200 system and the Deluge/AFFF system are both controlled by the Cheetah panel located in the UGPH Control Room. Additionally, both systems communicate with FFD from the King Fisher panels located in the front of Adit 1 and in Building 1613. The sequences for activating the FM-200 system is that two (2) existing smoke/heat detectors located in the UGPH Control Room or in the main electrical switchgear room must be activated. Once this occurs the Cheetah system will send the release command to either FM-200 system depending on which area is affected. Additionally, located directly inside of the UGPH Control Room are two emergency release buttons/abort buttons. The first set located

at the corridor entrance to the control room will enable/abort FM-200 in the main fuel control/monitoring room. The second set located at the door between control room and the main switchgear room beyond will work in the same fashion. Should this system be tripped, it will also disable all fueling operations by shutting down pumps and closing valves under the main pump room floor. The sequence for the AFFF release is that two 3IR's (original ones) in the main pump room be activated to release the AFFF foam stored in Building 1613 (located atop Adit 1). The system is an open head deluge system and will flood the entire room.

4.3 Emergency Oil Pressure Door

4.3.1 Description

The new Emergency Oil Pressure Door (OPD), see Figure 4.1, is located just down the LAT past Tanks 1 and 2, and is designed to contain the contents of one of the Red Hill tanks within the Tank Gallery of the LAT. The components of the OPD consist of a Scissor Lift, Maglock, Door, High Level Float and a Push Button on either side of the door. These components are described below:

- The Scissor Lift is an electrically powered hydraulic lift that lowers the platform and attached tracks, allowing the door to close. Upon activation of the Scissor Lift, the hydraulic cylinders raise the platform, retract the legs, and lower the platform to below the door threshold. On loss of power, the Scissor Lift will remain in its current state.
- The Maglock is an electro-magnetic lock that holds the door open until receiving an activation signal. On loss of power, the Maglock fails in the hold position, keeping the door from closing automatically.
- The Door is a reinforced steel door that closes automatically when the Maglock is released, creating a fuel tight seal.
- The High Level Float is located in the lift sump, and indicates when the sump is full. When the float is activated, a signal is sent to the DDC and Fire Alarm System, activating the OPD and notifying FFD of the event.
- The Push Buttons are wall mounted on side of the OPD, allowing the user to activate the OPD manually.

4.3.2 Activation

The OPD is activated by pushing one of the manual push buttons or receiving a high level alarm in the OPD sump. The sequence of events is as follows:

- Button is pushed/high level alarm activated
- Signal sent to DDC to begin OPD operations, simultaneously sending a signal to the Fire Alarm System.
- When the signal is received at the fire alarm system, audible and visual alarms activate throughout the facility (with the exception of the Fire Pumphouse) and the FFD is notified of the alarm.
- The DDC will send a signal to the Scissor Lift, starting the lift operations by raising the lift, retracting the legs, and lowering the lift to below the door threshold.
- Once the "lift lowered" signal is received, the Maglock will release, and the Door will automatically close, creating a fuel-tight seal at the OPD.

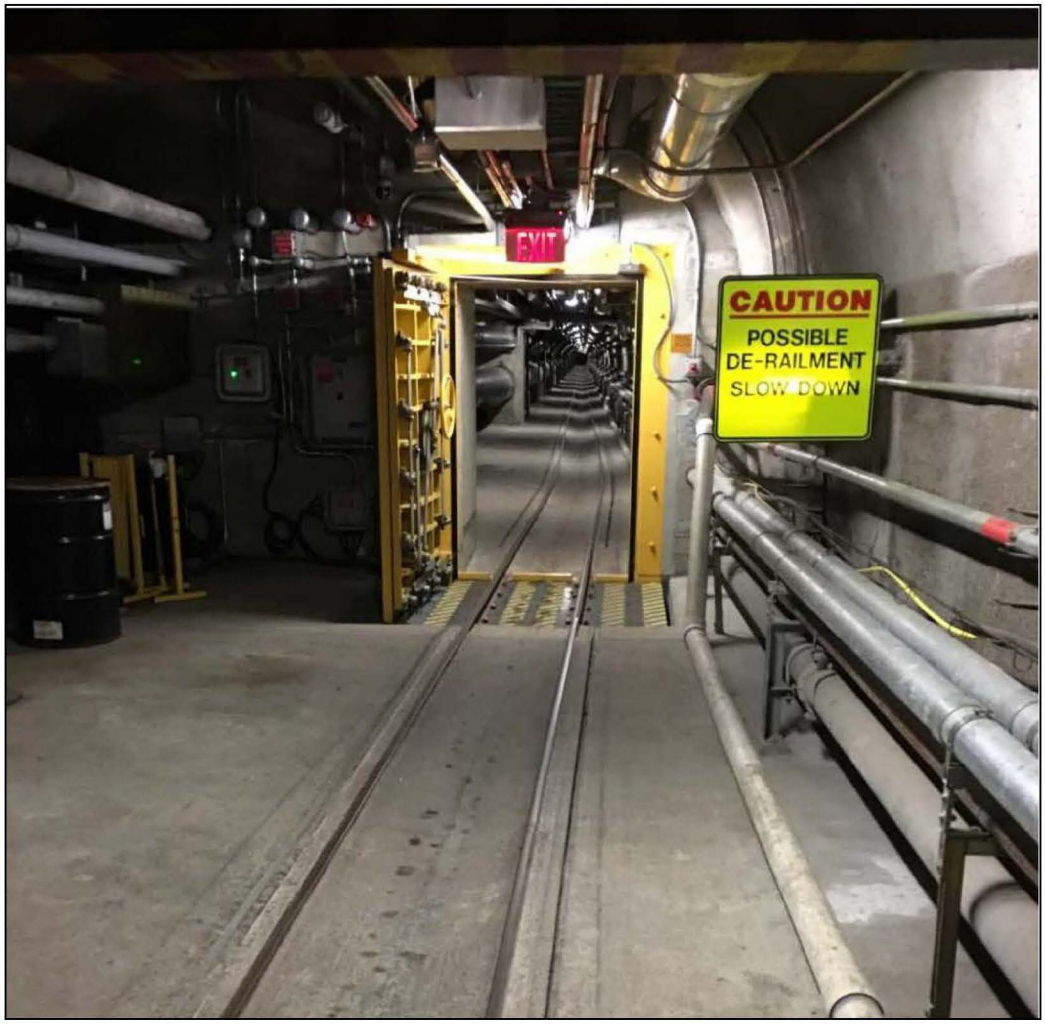

Figure 4.1: Emergency Oil Pressure Door

4.4 Facility Access

The FFD has 24/7 access to the RHFSF through the use of "Knox Boxes", which are located at all adit entrances. A Knox Box is a small wall-mounted safe that holds, in the case of the RHFSF, facility access cards that can open the adit doors. The FFD holds a master key to all boxes at the facility.

The NAVSUP FLCPH Fuel Department tracks all access to the RHFSF by facility workers, contractors, and visitors through a system called "Identipass Plus." The system tracks personnel by logging them in when they scan their access cards at a facility entrance and by logging them out as the scan their cards when exiting the facility. The system will alert the operator in the control room if a door is left open or ajar and can be used to remotely open facility doors. The system will create a log of all events during a shift (personnel who entered the facility, alerts, etc.). In conjunction with this system, the control room operator has access to high-resolution closed-circuit television (CCTV) video cameras at all critical facility locations (adit doors, tanks bottoms, automated valves, etc.). The security cameras have the ability to record, swivel, and zoom in and out.

5.0 LEAK DETECTION

5.1 Past Leak Detection Methods

At the completion of the tanks in the early 1940's leak detection was done using two methods. The first was by conducting hand outage gauging of the tanks. The results were converted to an innage value (fuel level), and the gross volume was determined from the tank strapping tables. The results were then compared to previous static readings for discrepancies.

The second method was by monitoring a configuration of "telltale" piping for evidence of fuel in areas outside the tank walls, between the steel plates and the concrete lining attached to the surrounding rock formation. When functioning properly, the telltale system provided a means of detecting a tank leak in a circumferential segment of the steel lining. The exact location of the leak would be determined by measuring the leakage at several different head pressures and extrapolating to zero rate on a graph of rate versus head. Air would then be introduced behind the steel lining in the suspected area and seams would be tested. The faulty steel lining seam would then be rewelded as necessary.

Over the years, the telltale pipes began to deteriorate and became clogged with fuel residue and other materials picked up between the tank's steel plates and the concrete lining. The system was eventually abandoned as it was determined that it was a major cause of some of the releases. The Asteroid Corporation eventually removed the "telltale" piping from all of the tanks in the 1980's during a cleaning and repair project.

5.2 Current Leak Detection Systems

Currently, NAVSUP FLCPH Fuel Department employs two methods of leak detection: (1) ATG/AFHE and (2) Annual Tank Tightness Testing. In addition, groundwater monitoring and soil vapor monitoring are conducted, but are not considered leak detection system; see Section 8.5 for further details on the Red Hill groundwater-monitoring program.

5.2.1 ATG/AFHE

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 by manually gauging the tanks 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 are investigated to identify potential leaks. In addition, the Navy attempts to detect any UFMs, including leaks, from their UST system by collecting and processing ATG data using the AFHE System. Space and Naval Warfare Systems Command (SPAWAR) 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 1/2 of an inch of fuel in one of the tanks, and a critical alarm for more than 3/4 of an inches. During scheduled fuel transfers, AFHE generates a warning alarm for more than 1 inch, and a critical alarm for more than 1 and 1/2 inches.

The Navy investigates all UFM alarms 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 time periods ranging from several months to more than one year.

5.2.2 Tank Tightness Testing

Tank tightness testing is conducted semi-annually in accordance with 40 CFR 280 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 test can detect a total leak of as little as 0.5 gph, with a 95 percent confidence level and a 5 percent probability of false alarm.

5.2.3 Groundwater Monitoring

Groundwater samples are collected from 16 monitoring wells, five of which are located within the LAT and eleven of which are located outside the tunnel facility. Samples are analyzed for chemicals of potential concern and free product quarterly. Drinking water from the Navy Supply Well 2254-01 is routinely sampled and tested to safe drinking water standards. See Section 8.5 for further details.

5.2.4 Soil Vapor Monitoring

See Section 8.6 for further details.

6.0 ENVIRONMENTAL SETTING

The following information is extracted in part from the Red Hill Bulk Fuel Storage Facility Final Technical Report, Pearl Harbor, Hawaii, August 2007.

6.1 Surrounding Population

Oahu is the center of economic activity for the Hawaiian Islands. Honolulu, located in the south-central portion of the island, is heavily urbanized and densely populated. The RHFSF lies at the northern edge of this urbanized area. This urbanized area stretches from the southern coast of Oahu northward, occupying the majority of the coastal plain.

Oahu (Honolulu County) has a population of approximately 953,207 people (2010 census). Populated areas closest to the RHFSF include Pearl City and Aiea to the west and Honolulu to the south and east. The population of this area is approximately 447,774 according to the 2010 census. To the southwest of the RHFSF is a U.S. Coast Guard and Navy housing complex in the Aliamanu Crater and a residential area located in Moanalua Valley. Joint Base Pearl Harbor-Hickam also lies to the southwest of the RHFSF with a population of approximately 66,300 (US Navy, 2014).

6.2 Land Use and Zoning

The City and County of Honolulu, Department of Planning and Permitting zoning information, indicates that the RHFSF is located on Federal government land (zoned F-1, Military and Federal) with public land located to the immediate north and northeast (zoned P-1, Restricted Parkland). Halawa Correctional Facility is located in the residential area north of the public land (zoned R-5, Residential). The RHFSF is bordered by an industrial development to the north and northwest (zoned I-2, Intensive Industrial) and a quarry to the north and northwest beyond the Halawa Correctional Facility (zoned Ag-2, General Agricultural). See Figure 6.1 for a zoning map of the area.

The John A. Burns Freeway (Interstate H-3) is located to the northwest. Moanalua Village (a residential development), is located immediately adjacent, and south to east of the RHFSF (zoned R-5, Residential). Moanalua Golf Course (zoned P-2, General Parkland and R-5, Residential), a small section of public land (zoned P-1, Restricted Parkland), and the Tripler Army Medical Center (TAMC) (zoned F-1, Military and Federal) are located further south.

A high cliff face with a 100 to 200 feet elevation difference is present between the Facility, and both Moanalua Village and the Moanalua Golf Course. Northeast of the Facility, is public land, which is mostly forested (zoned P-1, Restricted Parkland), and to the east of the Moanalua Village residential development is Moanalua Valley Park (zoned P-2, General Parkland) followed by additional public land (zoned P-1, Restricted Parkland).

Residences, townhouses and apartment buildings are located to the southwest of the Facility (zoned A-2, Apartment), and a public school (Red Hill Elementary School) is also present in this area. The RHFSF continues to the west, and is adjacent to the U.S. Coast Guard Reservation which borders Highway 78. The closest residential property to the RHFSF is the area zoned for apartment buildings located approximately 305 feet southwest of Tank 2. Red Hill Elementary

School is located approximately 1,080 feet southwest of Tank 2. The Moanalua Village residential development is located approximately 880 feet south of Tank 2. The area zoned for apartment buildings is located approximately 2,113 feet southwest of Tank 20 (the tank farthest to the east), and Red Hill Elementary School is located approximately 2,850 feet from Tank 20. The Moanalua Village residential development is located approximately 875 feet south of Tank 20.

The USDA identified no agricultural lands of importance to the State of Hawaii in the immediate vicinity of the Facility (USDA, 1977).

6.3 Soils

Soils in the vicinity of the RHFSF are mapped as Helemano-Wahiawa association consisting of well-drained, moderately fine textured and fine textured soils. These soils are formed from material weathered from basalt and typically range from nearly level to moderately sloping. These soils typically occur in broad areas dissected by very steep gulches.

In the vicinity of the RHFSF, soils consisting of clays and clayey gravels are common to a depth of 10 feet below ground surface. Along the slopes and over much of the open area south of the Schofield Saddle, the basaltic bedrock is covered with 10 to 30 feet of Koolau residuum. These soils were derived from the weathering of the underlying basalt bedrock or were deposited as alluvium/colluvium. The younger alluvium/colluvium deposits were derived from fractured basalts and tuff. Beneath the surficial soils, alternating layers of clay and fractured basalts are present at depth. The western slope of the Halawa Valley is generally barren of soil and consists of outcropping of basalt lava flows to the valley floor.

6.4 Geology

Red Hill is located on the southern edge of the Koolau Range, approximately 2.5 miles northeast of JBPHH. The Koolau formation consists almost entirely of basaltic lava flows that erupted from a fissure line approaching 30 miles in length and trending in a northwest rift zone. During a volcanic quiet period, valleys approaching 600 meters in depth were cut into the Koolau volcanic range as result of erosion, allowing sediment to accumulate in the valley floors. The erosion of the Koolau volcano resulted in the formation of a delta of sediment consisting of silt and sand. The delta increased in thickness as it approached the sea.

Both pahoehoe and a'a lava flows are present in the Koolau formation. Pahoehoe lava is characterized by relatively thin-bedded basaltic flows. It is smooth, fine-grained lava with a rope-like appearance and is characterized by thin-walled vesicles. A'a lava is a jagged, blocky lava flow that contains clinker (coarse rubble). These clinker beds are the more permeable feature of the a'a lava. The a'a lava is typically found in more abundance in the lower flanks of the Koolau Range.

The Facility lies along a topographic ridge between the Halawa and Moanalua Valleys. The ridge is a remnant of the original Koolau shield volcano flank and it is composed of basaltic lava flows. The valleys on either side of the ridge are a result of fluvial erosion and are filled with alluvium/colluvium. Soil boring at the RHFSF indicates that the area is predominantly underlain by pahoehoe lava. See Figure 6.2 for a geologic map of the area.

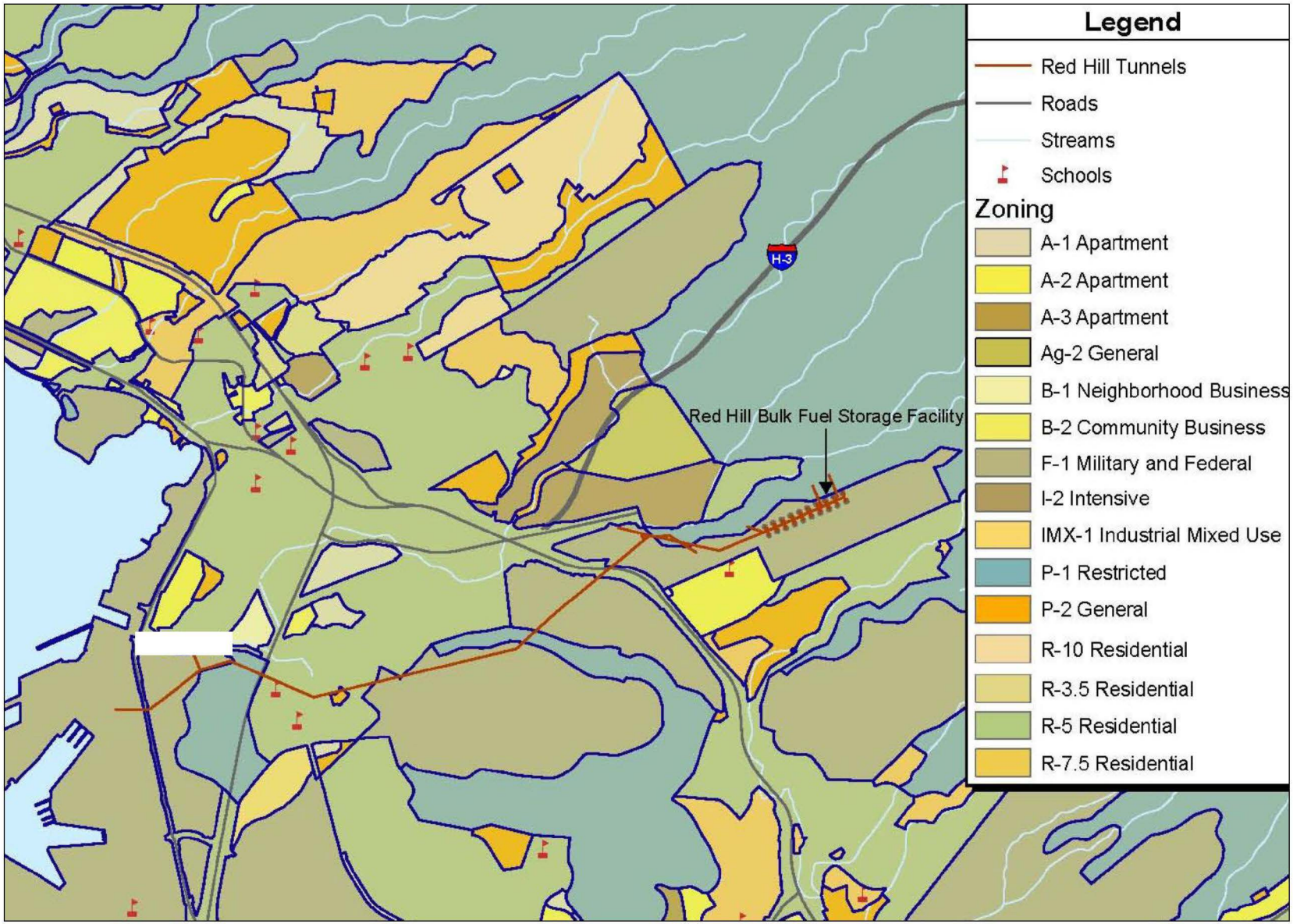

Figure 6.1: Zoning Map

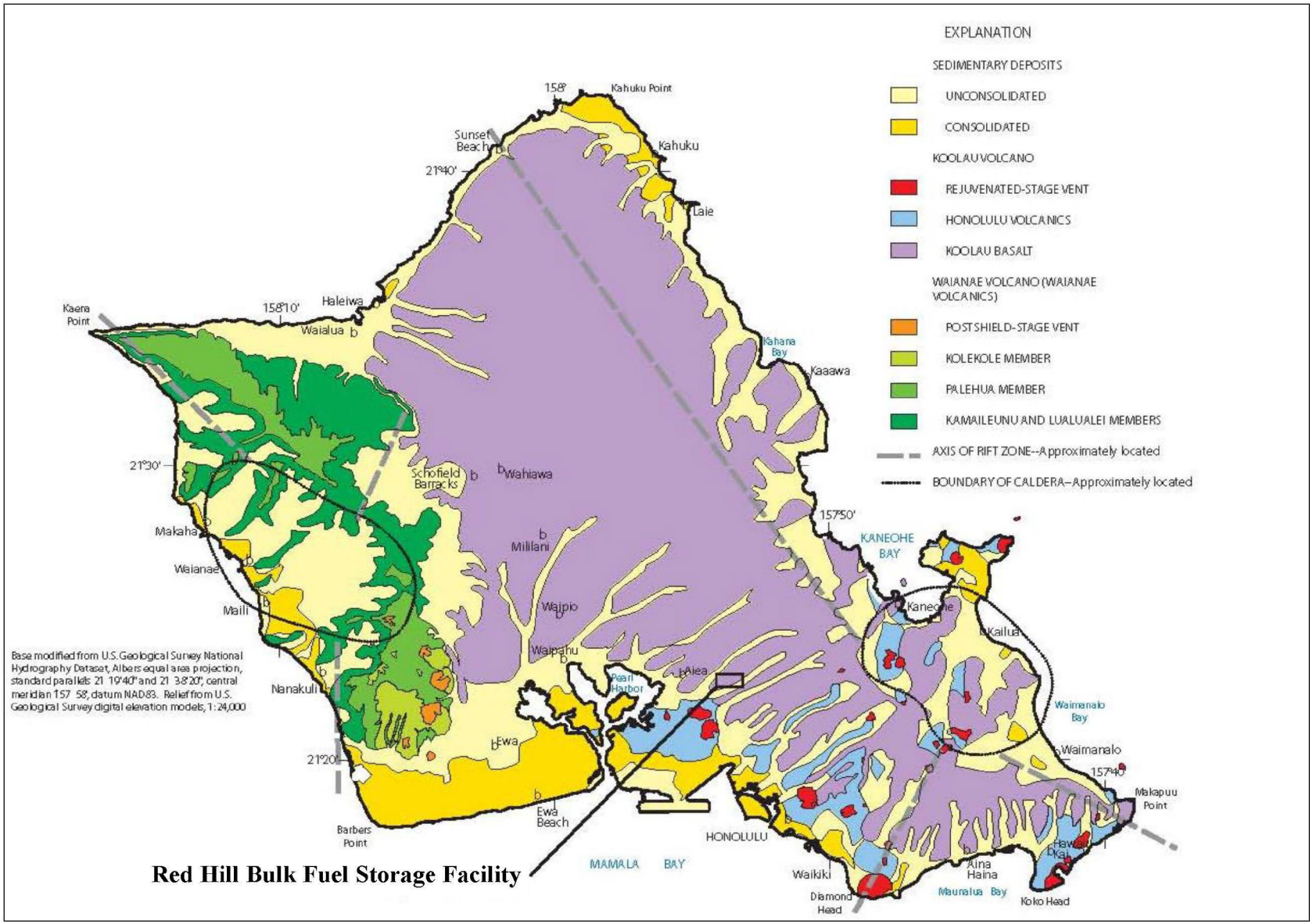

Figure 6.2: Geologic Map of Oahu

7.0 ENVIRONMENTALLY SENSITIVE AREAS

The following information is extracted in part from the Red Hill Bulk Fuel Storage Facility Final Technical Report, Pearl Harbor, Hawaii, August 2007.

7.1 Local Flora

The RHFSF is covered by the following vegetation types:

- Haole Koa (Leucaena Leucocephala) scrub
- Disturbed habitat
- Vegetation communities in developed areas

Haole Koa scrub grows throughout Oahu, primarily in areas that have been disturbed by grazing or human activities. The scrub community on Red Hill is dominated by *Haole Koa,* Guinea Grass *(Panicum Maximum)* and Chinese Violet *(Asystasia Gangetica).* Disturbed habitat is comprised of weedy plant species that can withstand frequent disturbance. The species in this community are similar to those found in nonnative grasslands. These disturbed habitats have a higher amount of non-grass species and sparsely covered areas. The developed habitats are near buildings, roads, or other structures with small amounts of vegetation (i.e., lawns and ornamental bushes). Native and sensitive species were not observed, as the appropriate habitat is not present.

7.2 Threatened and Endangered Species and Critical Habitat

No native or sensitive species are located in the area of the RHFSF. Critical habitat that supports the *Elepaio* (a native bird species) is located over 1.2 miles to the northeast and southeast of the RHFSF. Critical habitat that supports native plant species is also located over 1.4 miles to the northeast of the RHFSF. Three segments of the Honolulu Watershed Forest Reserve, a segment of the critical habitat for the Elepaio bird, and a portion of a wildlife management area are located over 1.7 miles to the southeast of the RHFSF. It is unlikely that a POL discharge from the RHFSF would impact these species.

The endangered Opeapea or Hawaiian Hoary Bat (*Lasiurus Cinereus Semotus*) occurs in both the Waianae and Koolau Mountain Ranges on Oahu, but overall the population on Oahu is relatively sparse compared to other main Hawaiian islands such as Hawaii, Maui, and Kauai. Even though they may occur in low numbers, bats on Oahu can cover a significant amount of terrain, ranging from high elevation mountain areas to coastal areas at sea level. Bats have not been detected at Red Hill; however acoustic surveys have detected bats during the fall in areas around Pearl Harbor. Red Hill has very little roosting habitat for the Hawaiian Hoary Bat, but it is probable that occasionally bats are foraging in and around Red Hill. It is unlikely that a POL discharge from the RHFSF would impact bats, unless the discharge resulted in the removal of trees.

No natural area reserves, preserves, seabird sanctuaries, State monuments, State parks, State park reserves, State waysides, wildlife refuges, hunting areas, or trails are located within the vicinity of the RHFSF. Pearl Harbor, Salt Lake, and the streams near the RHFSF are identified as the nearest wetlands. Coastal resources are at least 3 miles from the RHFSF, and are not considered to be areas of concern for the RHFSF.

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8.0 GROUND WATER AND HYDROLOGY

8.1 Surface Water

Surface water features in the vicinity of the tank farm include South Halawa Stream (approximately 600–800 ft to the north), North Halawa Stream (approximately 4,000–4,500 ft to the northwest), and Moanalua Stream (approximately 1,700–2,000 ft to the south) (Figure 1-1). Potential recharge (runon and operational water use) from the Halawa Quarry north of the tank farm area may also impact groundwater flow in this area. In the area of Halawa Valley, stream flow is isolated from the basal groundwater table and is over deeply weathered rock. These flows may contribute water to perched groundwater within alluvial material (valley fill). Most precipitation percolates to the freshwater-lens aquifer and does not maintain base flows in the streams (Izuka 1992). Groundwater that flows beneath the Facility does not intercept surface water inland of the ocean shoreline (DON 2007). Both South Halawa Stream and Moanalua Stream (to the north and south of Red Hill ridge, respectively) are located approximately 100 ft or more above the groundwater table in the vicinity of the Facility. The bottoms of the Facility's fuel storage tanks are located at least 50 ft below the bottom of these streams

8.2 Groundwater Usage

The RHFSF is approximately 100 feet above the basal groundwater table on the boundary of the Waimalu and Moanalua Aquifer Systems of the Pearl Harbor and Honolulu Aquifer Sector, respectively. Both aquifers are sources of potable water for several public water systems, including the JBPHH Water System, which serves approximately 66,300 military consumers.

U.S. Navy Supply Well 2254-01 is located at the junction of the Adit 3 spur tunnel and the LAT (the Adit 3 "Wye") within the RHFSF and provides between 2.4 and 4.4 million gallons of water per day for the JBPHH Water System. The well is located approximately 2,500 feet hydraulically down gradient from the nearest storage tanks. Water is pumped from a 110-foot deep well shaft with a bottom elevation of -10 feet. Near the bottom of the well is a water development tunnel (or infiltration tunnel) at -3 feet elevation. The water development tunnel is 18 feet high by 6 feet wide and 1,175 feet long. This 1,175-foot tunnel heads east from the well toward the storage tanks. It crosses beneath the LAT and the abandoned diesel power plant, then turns south and passes under the LAT again. A lava tube cross cuts the water development tunnel about 300 feet before the end of the tunnel. The length of the lava tube is unknown. There is continuous water flow at the end of the water development tunnel.

The Halawa Shaft Supply Well 2354-01 is located hydraulically cross-gradient of the RHFSF. This drinking water well is approximately 4,400 feet to the northwest of the RHFSF and pumps water from the basal aquifer. On average, the pumping rate is 7 to 12 mgd from this location (NAVFAC 2019). It is highly unlikely that a POL discharge from the RHFSF would impact this well. Figure 8.1 shows the location of both wells in relation to the RHFSF.

8.3 Aquifers and Groundwater Movement

The western part of the RHFSF overlies the Waimalu Aquifer system, which is part of the Pearl Harbor Aquifer sector, and the eastern portion overlies the Moanalua Aquifer system, which is part of the Honolulu Aquifer sector. Both the Moanalua Aquifer and Waimalu Aquifer systems

are classified as unconfined, basal, and flank. Their status is listed as a currently used, fresh drinking water source that is irreplaceable and has a high vulnerability to contamination.

On the basis of water table measurements conducted in wells near the RHFSF, the basal groundwater surface is approximately 21 feet above mean sea level. Groundwater flow in the Red Hill area is expected to travel approximately parallel to the ridge, with the valley fills in North Halawa Valley (northwest) and Moanalua Valley (southeast) channeling the flow in the westerly to southwesterly direction toward Aliamanu Crater. It should be noted that the Red Hill Ridge is not a hydrogeologic boundary, and there are no geochemical or physical attributes that separate the two aquifers at this location. The likely physical boundary between the Moanalua and Waimalu Aquifer systems is the North Halawa Valley fill, which extends below the water table in the vicinity of the RHFSF and consists of low permeable sediments.

Figure 8.2 presents Oahu's different aquifer sectors along with their sustainable yields in relation to the RHFSF. Figure 8.3 presents the RHFSF in relation to aquifers and the classification codes and status codes for the aquifer systems in the vicinity. Figure 8.4 presents groundwater areas and generalized directions of groundwater movement on the island of Oahu.

8.4 Groundwater Protection Plan

The Red Hill Bulk Fuel Storage Groundwater Protection Plan was developed to mitigate the risks associated with inadvertent releases of fuel from the RHFSF. The plan was published in 2008 (revised in 2009) and was reviewed and updated in 2014. The plan presents a strategy designed to ensure that the RHFSF and Navy Supply Well 2254-01 continue to operate at optimum efficiency in the future. The plan focuses on long-term mitigation, and is not an emergency response plan. The plan documents steps to be taken to prevent unacceptable risks associated with releases at the RHFSF. These steps include:

- Implementation of a tank inspection and maintenance program.
- Description of soil vapor monitoring (SVM) program.
- Description of groundwater sampling and risk assessment.
- Implementation of a groundwater monitoring program that will provide warning of potential unacceptable risks to human health.
- Establishment of responsibilities and response actions that will be implemented when groundwater action levels are exceeded.
- Periodic market survey to evaluate best available leak detection technologies for large field-constructed fuel storage facilities, such as the RHFSF.

8.5 Groundwater Monitoring Program

In accordance with the Red Hill Bulk Fuel Storage Groundwater Protection Plan and Hawaii Administrative Rule 11-280.1, groundwater testing is performed at both the RHFSF and U.S. Navy Supply Well 2254-01. Currently, groundwater samples are collected from 16 monitoring locations both within the RHFSF boundary and at the Halawa Correctional Facility (see Figure 8.5). Samples are analyzed for chemicals of potential concern and free product quarterly. Drinking water from the Navy well is routinely sampled and tested to safe drinking water standards.

Based on the levels of contamination detected at each monitoring location, the monitoring location is assigned to a category, as indicated below. Response actions depend both on the monitoring location at which the contamination was detected and the concentration level indicated in the sampling results.

- Category 1: This category applies to concentration levels for each chemical of potential concern. The detection limit is the smallest concentration that can be detected in the groundwater samples. The Environmental Action Level (EAL) represents the concentration level that could pose a potential adverse threat to human health and the environment. This category requires the least action by the Navy.
- Category 2: This category also applies to concentration levels for each chemical of potential concern. If the sampling events indicate an increasing trend in concentration levels or if the EAL is exceeded, the number of actions to be taken by the Navy increases.
- Category 3: This category only applies to concentration levels of benzene and Total Petroleum Hydrocarbons (TPH). Site-Specific Risk-Based Levels (SSRBLs) for Benzene and TPH were developed because these contaminants are risk drivers for migration of fuel in the groundwater. The SSRBL also represents the concentration level at the RHFSF that could potentially impact the water quality at the Navy well. If the concentration levels fall within this category, the number of required actions increases. Note: SSRBLs for Benzene and TPH are 750 and 4,500 micrograms per liter, respectively.
- Category 4: As above, this category only applies to benzene and TPH contaminants. A monitoring location is placed in this category if the established SSRBL is exceeded. This category requires the highest level of response from the Navy.

Contaminants tested include: benzene, ethylbenzene, methyl tert butyl ether, toluene, xylenes, acenaphthene, benzo(a)pyrene, fluoranthene, naphthalene (volatile organic compounds and polynuclear aromatic hydrocarbons), lead, TPH (diesel range organics and gasoline range organics).

As part of the groundwater-monitoring program, the Navy maintains a complete database of laboratory analytical results from the groundwater sampling events and evaluates concentration trends for chemicals of potential concern over time and with respect to the Hawaii Department of Health (DOH) drinking water EALs. Groundwater is also monitored for concentrations that may indicate that liquid fuel may be in direct contact with groundwater beneath the tanks. The Navy submits concentration trend data and comparisons of sampling results to drinking water EALs to DOH quarterly. See Sections 3, 4, and Appendix C, of the Red Hill Bulk Storage Groundwater Protection Plan for more information on the RHFSF groundwater monitoring program.

8.6 Soil Vapor Monitoring System

The soil vapor monitoring system consists of SVMP beneath each of the 18 active tanks. Tanks 1 and 19 were removed from service in the 1980s and lack SVMPs. Most SVMP are monitored at three different depths (shallow, middle, and beneath each tanks) for Volatile Organic Compounds (VOCs) using a Photo-Ionization Detector (PID). SVMPs were given a SV prefix, followed by the associated tank number, and then the location under the tank: "S" for shallow or front of the UST, "M" for mid depth or middle of the UST, and "D" for deep or outer edge of the UST. Total VOCs are measured down to 1 part per billion and compared to baseline

measurements from the same location. Increasing concentrations over time are a possible indication of fuel leaks at the tested tank. Results are reported monthly to the DOH as required by the Red Hill Bulk Storage Groundwater Protection Plan. The Navy has collected and reported monthly soil vapor for VOCs to the DOH since 2008.

8.7 Groundwater Model Simulations

According to the Red Hill Bulk Storage Groundwater Protection Plan, groundwater model simulations have shown that an extended light non-aqueous-phase liquid (LNAPL) fuel plume of jet propellant (JP-5 or F-24) within 1,099 feet of the Navy Supply Well 2254-01 infiltration gallery resulted in benzene concentrations greater than the Federal maximum contaminant level (MCL) of 5 µg/L in the infiltration gallery. It was estimated that a release as small as 16,000 gallons of JP-5 near Tanks 1 or 2 could result in this condition. The groundwater-monitoring program provides SSRBLs for TPH (4.5 mg/L) and benzene (0.75 mg/L). These are used as indicators that LNAPL may be present.

The Navy/DLA has recently established a Groundwater Modeling Working Group to better collaborate with DOH, EPA, Honolulu Board of Water Supply (BWS), U.S. Geological Survey, University of Hawaii, Engineering firm AECOM, and GSI Environmental in developing a new groundwater model. The working group has developed an interim groundwater model that greatly improves the understanding of the aquifer under the RHFSF. The interim model indicates groundwater flows from the facility to the Navy well.

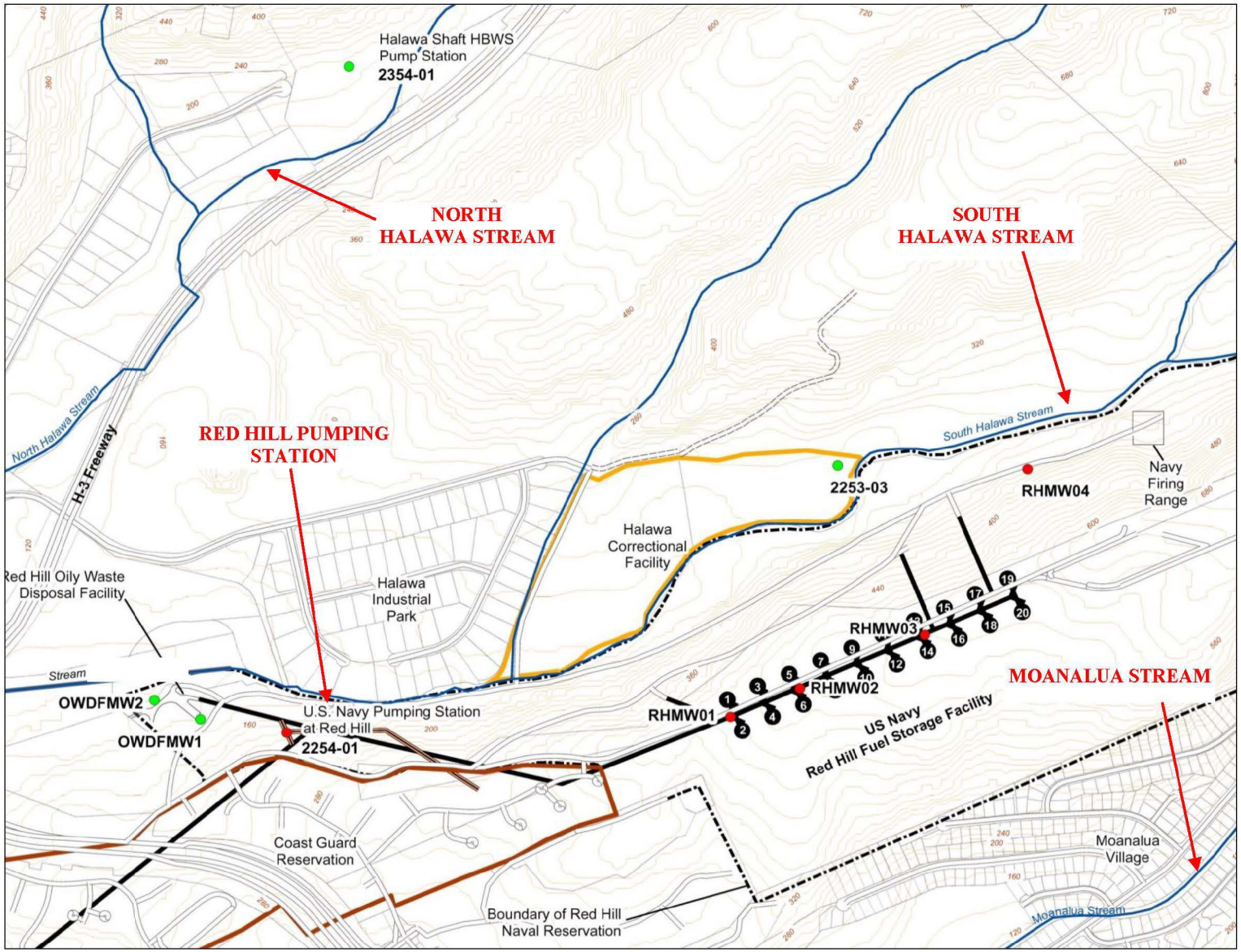


Figure 8.1: Land Use and Stream Locations in Relation to the RHFSF

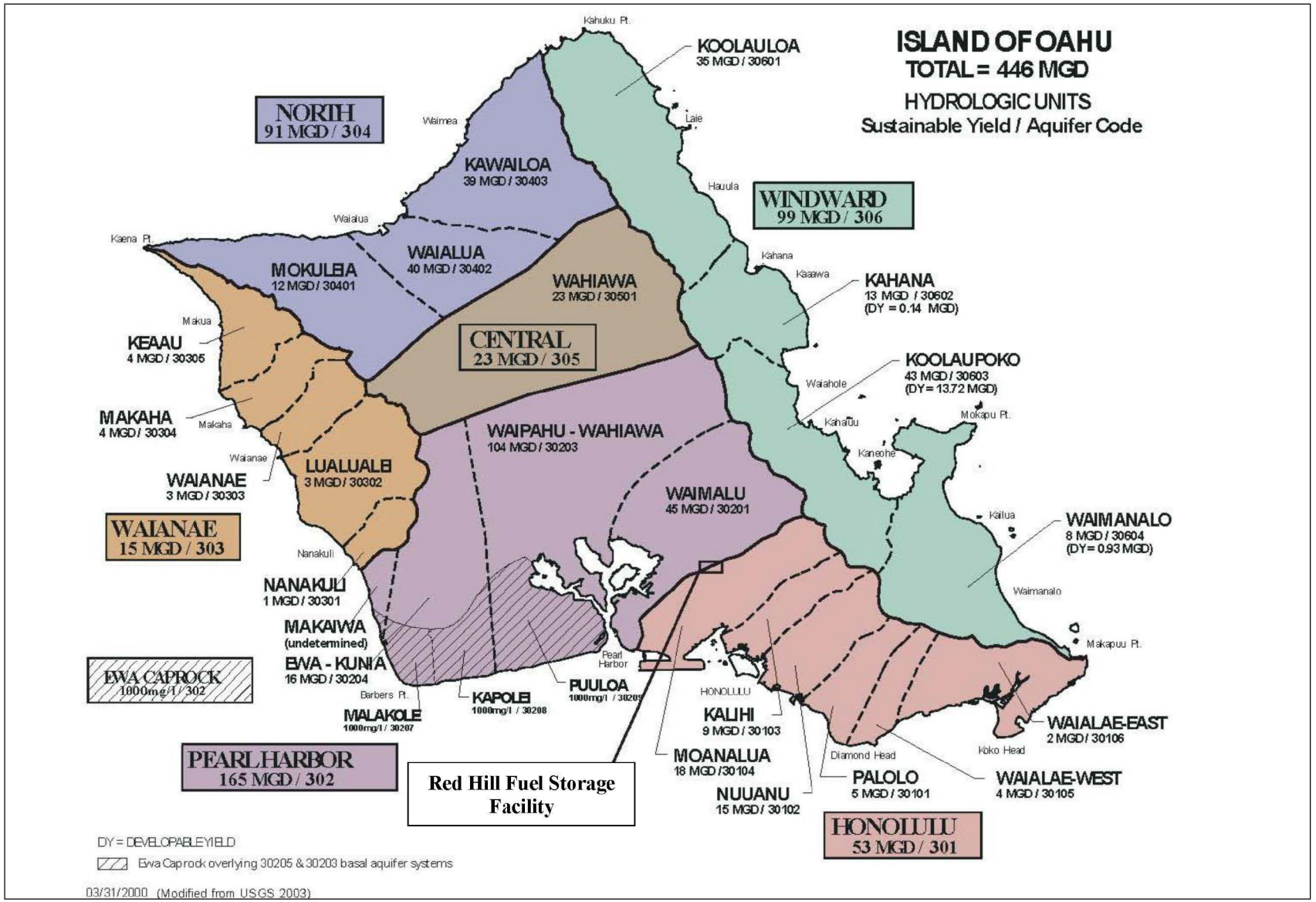
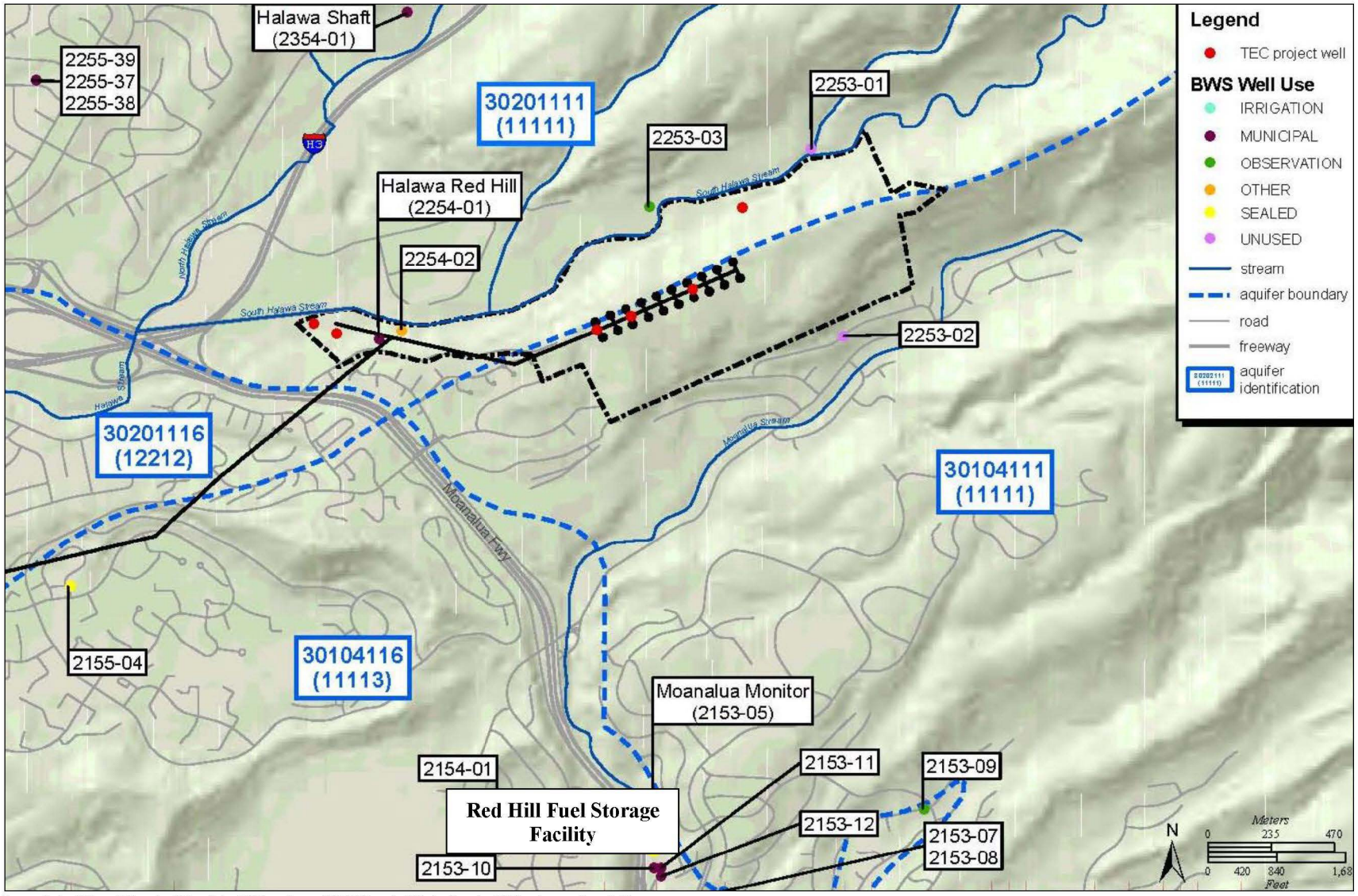


Figure 8.2: Oahu's Aquifer Sectors



Source Data: City and County of Honolulu, GIS base layers DLNR Board of Water Supply, 2005 water supply well IDs.

Figure 8.3: Area Wells and Aquifer Systems

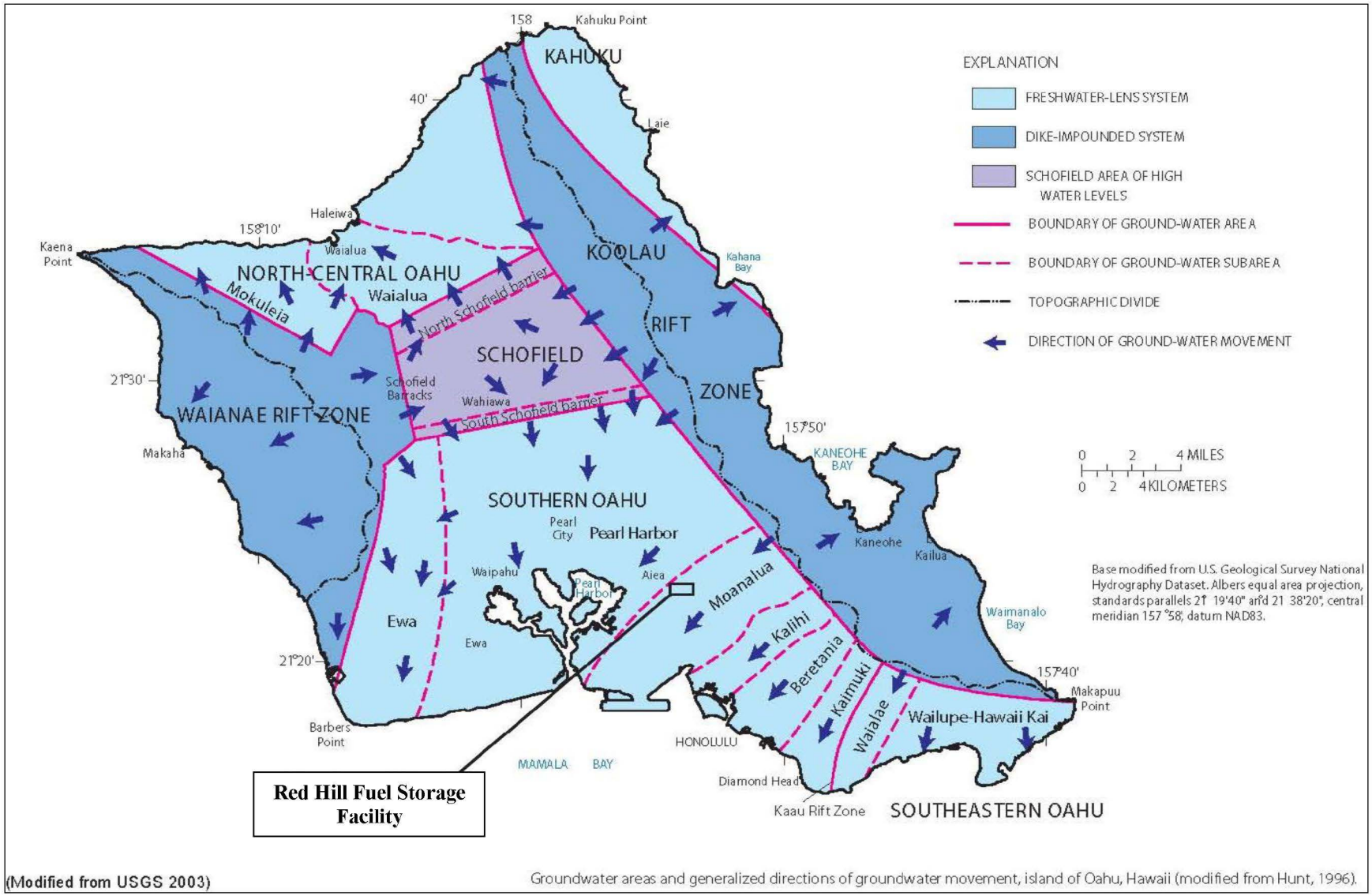


Figure 8.4: Regional Groundwater Flow by Aquifers

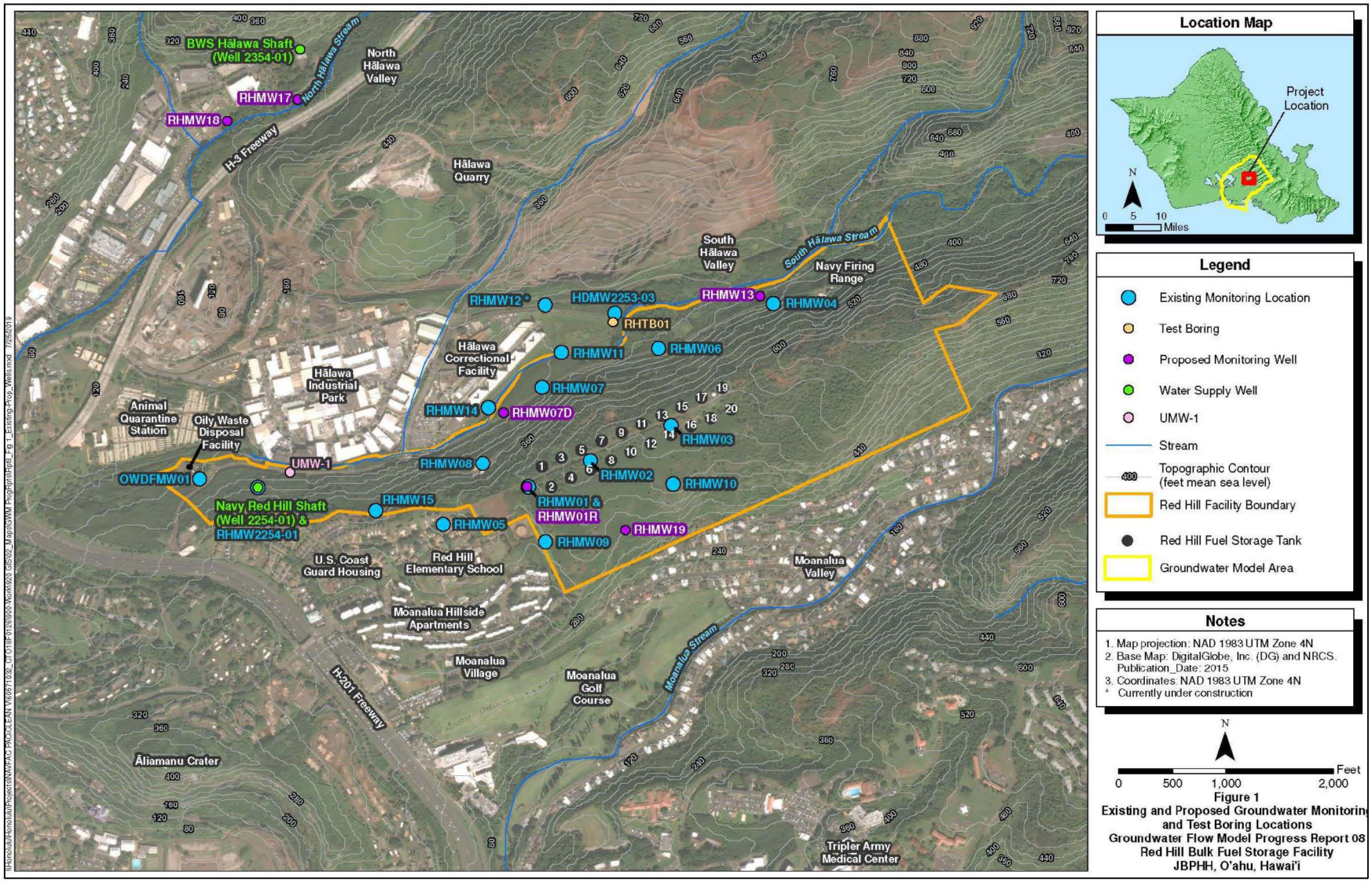


Figure 8.5: Groundwater Monitoring Well Locations

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9.0 SITE SAFETY INFORMATION

9.1 General Safety Information

The safety and security of response and support personnel and others involved in an emergency response incident is the primary concern. The section on health and safety provides a general framework for the protection of oil spill response workers' health and safety and complies with the requirements of State and Federal laws.

The information contained in the health and safety section should be used as a guide by the Safety Officer for preparing and implementing worker health and safety protection measures in order to maximize safety and allow critical oil spill response activities to proceed. Specific site control and emergency response procedures must be developed using forms provided in this outline or other forms developed for this activity. Other procedures for activities such as confined space entry or hot work will require additional controls in order to fulfill the regulatory requirements. The Safety Officer must identify these and other health and safety and regulatory matters. Once identified, the Safety Officer will need to take appropriate action to address those safety issues or regulatory requirements.

9.2 Medical Monitoring

All persons who will be exposed or will have the potential to be exposed to hazardous substances will take part in a medical monitoring program that meets the requirements of 29 CFR 1910.120(f). In general, medical monitoring will be conducted for workers as follows:

- Workers who have the potential to be exposed to hazardous substances at or above the permissible exposure limit (PEL).
- Workers whose duties require them to wear a respirator for more than 30 days/year.
- Workers who are believed to have been exposed to hazardous substances or who exhibit symptoms of exposure.

9.3 Primary Chemical Hazards

The following table lists petroleum products stored in bulk in the RHFSF.

TABLE 9.1: PERMISSIBLE EXPOSURE LIMITS OF PRODUCTS STORED AT RHFSF

Product	TWA [1] (Time-Weighted Average)	STEL [1] (Short Term Exposure Limit)
F-76 (diesel fuel marine)	39 ppm	112 ppm
JP-5 (jet fuel)	42 ppm	120 ppm
F-24 (jet fuel)	44 ppm	125 ppm

Note 1: Values listed are recommendations obtained from "Permissible Exposure Levels for Selected Military Fuel Vapors," National Academy Press, Washington DC, 1996. There are no threshold limit value (TLV) recommendations available from ACGIH or PEL requirements found in 29 CFR 1910.1000.

Safety Data Sheets (SDS) for F-76, JP-5, F-24, and all other products and hazardous chemical substances used at the RHFSF must be on file in each work area where the material is stored or handled. Availability can be through paper copies or electronic access. Example SDSs of the above listed products in Table 9.1 can be found in Appendix E.

9.3.1 F-76 (Diesel Fuel Marine)

Aspiration of liquid into the lungs may cause extensive pulmonary edema (dry land drowning). Prolonged or repeated skin contact will remove skin oils leading to irritation and/or dermatitis. High vapor concentrations are irritating to the eyes and lungs, and may cause headaches, dizziness, and unconsciousness.

9.3.2 JP-5 (Jet Fuel)

JP-5 is a mixture of light hydrocarbons and naphthalene. Naphthalene is a potential irritant to eyes, skin and lungs and may cause changes to the blood, eyes, and kidney after prolonged or repeated exposure. Aspiration of this product into the lungs can cause chemical pneumonia and can be fatal.

9.3.3 F-24 (Jet Fuel)

F-24 is a mixture of hydro-treated light petroleum distillates, antioxidant, anti-static, corrosion inhibitor and metal deactivator. Health studies have shown that petroleum hydrocarbons pose potential human health risks that may vary from person to person. As a precaution, exposure to liquids, vapors, mists, or fumes should be minimized.

Exposures to high concentrations may cause headaches, dizziness, anesthesia, drowsiness, unconsciousness, and other central nervous system effects, including death.

9.3.4 Chemical Exposure

Over-exposure to chemicals can result in significant health issues to the respiratory system, a variety of internal organs, the skin, and the eyes.

The respiratory is the primary route of entry for most toxic substances. Chemicals can irritate the large and medium sized tubes that provide air to the lungs. This irritation can cause an increase in mucus production, which can lead to the development of a continuing cough and a condition called chronic bronchitis. Continued irritation can lead to infections that can either damage the air sacs, leading to emphysema; or cause them to fill with fluid, leading to pulmonary edema. Particulates, such as dusts, may enter the lungs, creating a condition called pulmonary fibrosis. Pulmonary fibrosis occurs when the lungs are not able to remove the dust. This results in the production of scar tissue in the area of the dust impact, which destroys the ability of the air sac to do its job.

Chemical exposure can impact the liver and/or kidneys. Hepatitis (inflammation of the liver) can be caused by exposure to various chemicals. A severe case of hepatitis can lead to cirrhosis of the liver, which can result in liver scarring and reduced liver function. Chemical exposure can affect the ability of the kidneys to do their job. Over-exposure can result in a condition called uremia, which is when the chemicals produced by the body are allowed to build up.

Skin exposure can result in a variety of diseases, including: contact dermatitis – irritation of the skin where the irritant has direct contact with the skin; industrial dermatitis – irritation of the skin resulting from exposure to chemical irritants; and allergic sensitization dermatitis – repeated or frequent chemical contact which results in an allergic reaction. Dermatitis symptoms can range

from a slight reddening of the skin and mild itching to open sores, which may or may not be swollen. Over-exposure to certain chemicals can result in chemical burns. The severity of the burn depends on the chemical, the temperature of the chemical, and the duration of the contact. Like heat burns, chemical exposure can result in first, second, or third degree burns.

Eyes are particularly susceptible to industrial damage. Chemical splashes can damage the cornea, conjunctiva, or lens. Chemical burns to the eye (from exposure to acids or alkalis) can produce scar tissue on the cornea. Foreign objects, including dusts and other solid particulates, can cause irritation, or in some cases, infection and serious damage.

9.4 Secondary Chemical Hazard Identification

Oil and hazardous substance spill responses may require the responder to come into contact with a wide variety of chemicals and materials which may singularly or in conjunction with the site work conditions create various hazards to site workers. Several of these hazards are identified in the following table.

Subjecting response personnel to the hazards identified above can be avoided though the use of the proper Personal Protective Equipment (PPE) and through proper monitoring and supervision by health and safety personnel. The paragraphs following Table 9.2 provide additional information for some of the secondary hazards.

TABLE 9.2: SECONDARY CHEMICAL HAZARDS

Hazard Description	Recommended Protective Equipment	Conditions Under Which Exposure May Occur
Confined Spaces. Inadequate ventilation coupled with limited egress creates potentially hazardous situations for workers. Oxygen deficient, toxic or flammable atmospheres may exist in these areas. All Occupational Safety and Health Administration (OSHA) procedures regarding confined space entry will be followed.	Monitor CO, O_2, toxic and flammable gas levels, and ventilate area. Do not enter a confined space without a confined space entry permit and supervision from the Safety Officer. Safe O_2 levels = 19.5% to 23.5%; flammable gas limits = less than 10% LEL; toxic limits = less than ½ PEL or Threshold Limit Value (TLV) - whichever is the lower value.	Confined spaces may be encountered on vessels, inside tanks, inside buildings, in tunnels, in sumps, in ditches, etc. Product vapors or other emissions resulting from response operations may intensify this hazard.
Diesel and Gasoline Engine Exhaust. Exposure to diesel or engine exhaust may promote inhalation of hydrocarbons, carbon monoxide and particulates. Exposure may irritate eyes and mucous membranes.	Monitor CO and O_2 levels, ventilate area, and use half-mask respirator with organic and particulate filters.	Diesel and gasoline exhaust exposure may occur in poorly ventilated areas in the vicinity of internal combustion equipment. It may also occur in sheltered outdoor areas on calm days or during temperature inversion conditions.
Particulates. Particulates may cause irritation to lungs, eyes, and mucous membranes. Particulates may also have toxic effects (e.g., lead, asbestos, cadmium, and silica).	Use half-mask respirator with particulate filter and appropriate cartridges. Use other PPE for eye and skin protection as needed.	Use powdered or granular oil absorbent (diatomaceous earth, vermiculite, etc.) or other specialty products where particles become airborne and enter the breathing zone of personnel. Wind carried silts, and other dusts may also be a factor.

TABLE 9.2: SECONDARY CHEMICAL HAZARDS		
Hazard Description	**Recommended Protective Equipment**	**Conditions Under Which Exposure May Occur**
High Carbon Monoxide Levels. Carbon monoxide is a colorless and odorless gas, slightly less dense than air and is toxic by inhalation. Carbon monoxide is also highly flammable. Carbon monoxide will cause chemical asphyxiation because it binds to hemoglobin 300 times faster than oxygen. If high concentrations are present, incapacitation or death can result in a few minutes. Exposure to concentration above 4,000 parts-per-million (ppm) can result in death in less than one hour, and concentrations as low as 1,500 ppm can cause collapse, unconsciousness, and possibly death within two hours. (Lower Explosive Limit (LEL) = 12%; Upper Explosive Limit (UEL) = 75% by volume in air)	Monitor CO, and ventilate area. Use of supplied air PPE is required. Do Not enter high CO atmosphere without a confined space entry permit and supervision from Safety Officer. Safe CO levels are less than 50 ppm TWA.	Poorly ventilated areas in the vicinity of internal combustion engines. Acetylene welding, industrial heating equipment and processes involving incomplete combustion may also create this hazard.
Flammable Atmosphere. A flammable gas, vapor, mist, or dust when mixed with air may create a flammable or explosive condition. Volatile vapors or gases will generally be of a sufficient quantity during the initial few hours of a spill to cause a flammable atmosphere.	Conduct flammable gas and oxygen monitoring prior to starting any work. Purge or inert atmospheres when possible. Obtain hot work permits prior to starting any cutting or welding. Safe flammable limits are less than 10% of the Lower Explosive Limit.	Flammable conditions may exist during the initial phase of a spill or at any time in areas where flammable dusts or vapors may concentrate. Holds of vessels and fueling areas are prime locations to find flammable atmospheres.
Low Oxygen Levels. Confined or restricted space atmospheres may be dangerous to life and health if O_2 levels are below 19.5% (oxygen deficient) or greater than 23.5% (oxygen enriched).	Monitor O_2 levels and ventilate area. Do not enter O_2 deficient atmosphere without a confined space entry permit and supervision from the Safety Officer. Supplied air Personal Protective Equipment (PPE) is required. Safe O_2 levels are between 19.5%-23.5%.	Poorly ventilated areas in the vicinity of oxygen consuming materials or equipment. This includes waste undergoing biological degradation or fuel powered equipment in confined or restricted spaces (e.g., tanks).
Other Spill Response Specialty Agents. Due to the varied nature of oil spill cleanup operations, numerous specialty chemicals in solid, liquid, and gaseous phases may be used or stored in work areas.	Obtain and review SDSs for all products. Verify safety precautions and PPE needs. Obtain any required respirator, skin, eye, and splash protection.	Exposure to these materials in poorly ventilated areas or in open areas may occur if workers are unaware of the chemicals' toxic or physical properties.

9.4.1 Hazardous Conditions

The hazards associated with the contaminants listed in the above table are best controlled through early detection, use of PPE, implementation of engineering controls, or by avoiding the hazard. Using common sense and understanding the Health and Safety Plan can accomplish early detection.

9.4.2 Confined Space Entry

Entry into confined spaces (spaces with restricted egress and potentially hazardous atmospheres) will be conducted under the direct supervision of the Safety Officer and through the use of a confined space entry permit. Confined spaces may be oxygen deficient or have flammable or toxic atmospheres. Confined space entry will be permitted only if the parameters listed in the above table are within acceptable limits.

9.4.3 Low Oxygen Levels

In addition to the conditions listed in Table 9.2, oxygen deficiency can also be caused by displacement of the oxygen with other gases or vapors. Gases that pose no other hazard beyond oxygen displacement are called asphyxiants.

Physically, the first sign of oxygen deficiency is an increased rate and depth of breathing. Dizziness, rapid heartbeat, and headache may be noticed when the oxygen level is below 16%. Trouble with physical movement, semi-consciousness, and a lack of concern about the possibility of danger indicate serious oxygen deficiency. Immediate loss of consciousness will result from entrance into an area with little or no oxygen (usually 10% or below).

9.5 Physical Hazards

Physical hazards associated with oil spill cleanup operations are varied and the associated hazards depend upon the site-specific conditions, cleanup operations, and the type of equipment being used. Severe environmental and weather conditions, complex transportation and logistical requirements, long work hours, and intensive labor needs contribute to the high susceptibility of oil spill workers to physical hazards. Table 9.3 summarizes some of the physical hazards associated with spill cleanup operations.

TABLE 9.3: GENERAL PHYSICAL HAZARDS

Hazard Description	Hazard Treatment Guidance	Hazard Abatement Technique
Slip, Trip, Fall. Oil spill responders work in places where poor footing and lighting creates slip, trip, and fall hazards.	Survey responders for possible unknown injuries. If injured, treat with first aid and seek medical attention.	Provide proper illumination in work areas. Keep work areas free of excess clutter. Move cautiously in work areas and use non-slip soles on footwear. Attempt to recognize and avoid or control hazards in the work area. Conduct hazard awareness briefings.
Eye Injuries. An oil spill response may expose workers to numerous eye hazards, including those resulting from chemical exposure, equipment hazards, open flames, and impacts from particulates or other foreign bodies.	If chemicals have contacted a worker's eye, flush eye with water immediately. If particulate is in the eye, flush eye with water. If an object is imbedded in the eye, do not attempt to remove it. Cover the affected eye to prevent further irritation and seek medical assistance.	Use appropriate eye protection such as safety glasses, goggles, and face shields. Avoid exposure to vapors, mists, fumes, and dusts.

TABLE 9.3: GENERAL PHYSICAL HAZARDS		
Hazard Description	**Hazard Treatment Guidance**	**Hazard Abatement Technique**
Back Injuries. The requirement to mobilize and use great quantities of equipment during the oil spill response creates high probability of back injuries. Slips, trips, and falls contribute to back injuries.	Remove worker from the work area to prevent further stress on the worker's back. If necessary, stabilize the victim in a prone position with a backboard to prevent additional injury. Seek medical attention.	Lift objects correctly. Obtain assistance from co-workers. Use mechanical devices to reduce lifting effort. Do back and stretching exercises prior to lifting objects. Bend the legs when lifting instead of bending from the waist.
Handling of Hand Tools and Spill Response Equipment. Tools used in cleanup operations such as shovels, picks, axes, etc. can inflict injury to adjacent workers if adequate distance is not maintained. Improper use of tools may also cause back injuries. Sorbents, containment booms, and waste materials can be heavy and awkward and handling and moving them may cause back injuries.	If injured, treat with first aid and seek medical assistance.	Team leaders must provide orientation for workers to familiarize them with the equipment that is being used. Use hand tools in a manner that will limit physical stress. Take frequent breaks to limit fatigue. Allow water to drain from equipment prior to moving it. Use mechanical devices to handle heavy materials.
Noise Injuries. Sound sources that generate noise greater than 85 decibels include aircraft, outboard engines, generators, compressors, heaters, and heavy equipment. Noises that are greater than 85 decibels may cause permanent damage to hearing.	Monitor noise levels. Remove affected worker from duties that have high noise exposure potential. Provide worker with additional hearing protection equipment. Seek medical assistance as necessary.	Workers should use ear protection equipment or avoid high noise areas.
Site Illumination. Response operations during conditions of poor visibility or darkness may create dangerous or unhealthy conditions for response workers.	Provide substantial amounts of lighting and generator equipment. Personal headlamps and vehicle lighting may be used as supplemental lighting.	Provide adequate lighting. Use headlamps, portable lighting, and equipment lights to illuminate work sites.
Specialty or Heavy Equipment. Mechanical equipment may have exposed moving parts, generate heat capable of causing burns, or generate high pressure liquids or gases which may injure workers. Movement of heavy equipment may cause injuries to personnel.	Perform first aid; seek medical attention immediately.	Read all operating guide manuals. Be aware of any moving parts that may cause injury. Avoid direct exposure to heat or pressure generated by equipment. Wear appropriate PPE to limit possible injury. Install backup alarms on heavy equipment. Ensure all guards are in place.
Vehicle, Aircraft, or Vessel Accidents. Response efforts will in many cases require response personnel to travel by various modes of transportation. The emergency nature of the response may expose worker to marginally safe traveling conditions.	Be aware of your position at all times and know the locations of safe refuges along your intended travel route. Notify the Incident Command Post if an accident occurs and what assistance is required.	During all vehicle, aircraft, or vessel travel, workers will adhere to all established travel safety procedures. This includes fastening seat belts, maintaining communications, and wearing or having easy access to safety equipment such as life vests and survival gear.

TABLE 9.3: GENERAL PHYSICAL HAZARDS		
Hazard Description	**Hazard Treatment Guidance**	**Hazard Abatement Technique**
Heat Stress. Heat stress may occur when a worker is exposed to elevated temperature conditions. Examples of when this may occur include worker suited in protective clothing that limits cooling of the individual and worker subjected to high ambient temperatures.	Move victim to cool, shaded location. Cool victim quickly by wrapping in wet towels. Treat victim for shock. Seek medical assistance immediately.	Taking frequent breaks to cool down and consuming large amounts of liquids may avoid heat stress. PPE can be fitted with cooling equipment. Ventilation may be used to assist with cooling. New site workers must acclimate themselves to the site conditions.
Worker Exhaustion. Spill response activities often involve strenuous tasks and long work hours. Symptoms of exhaustion include loss of concentration, increased frequency of slips, trips, and falls, and worker complaints of cramping and pain. Work exhaustion often manifests itself in other hazards such as accidents and back injuries.	Supervisors must closely observe workers for signs of exhaustion. Once an exhausted worker is identified, he shall be assigned to a less stressful task or removed from labor duties entirely until recovered. Seek medical assistance as necessary.	Close observation by supervisors and use of the buddy system will be used to detect and prevent worker exhaustion. Frequent breaks along with consumption of high-energy foods and liquids will also decrease the likelihood of exhaustion.
Wildlife. Spill workers may encounter a wide variety of wildlife during response activities. Some of the wildlife may be capable of inflicting injuries to or killing response personnel.	Treat injuries with standard first aid methods. Treat victim for shock. Seek medical assistance as necessary.	Wildlife protection procedures will be established for each specific spill event.
Weather. Sudden changes in weather conditions may jeopardize the safety of responders. Ocean storms, high winds, dramatic temperature changes, or fog can all pose a serious threat.	If caught in severe weather, consider options carefully. Evacuation of work site may be necessary.	Obtain daily weather forecasts and updates as available. Preplan work site evacuation plans for worst-case scenarios. Workers should bring extra clothing and emergency survival gear. Communications with the Incident Command Center must be maintained in order to coordinate evacuation or to receive support.
Electric Shock. Electric equipment operated at greater than 12 volts, used inlet or conductive areas, or damaged equipment can produce a severe electrical shock.	Remove victim from contact with energized parts. Administer CPR and first aid as necessary. Obtain medical assistance.	Use intrinsically safe equipment or ground fault interrupter circuits to prevent shock.

9.5.1 Noise

Many factors can have an influence on the ultimate effect of noise exposure. The individual's susceptibility, the intensity and frequency (highness or lowness) of the sound, the length of exposure, and the type of exposure (continuous or impact) can affect the amount of damage caused by the over-exposure. Intensity describes the pressure that the sound or noise makes and is measured in decibels. Loud noises have a high intensity (i.e. a jet engine has an intensity of approximately 130 decibels) and soft noises have a low intensity (i.e. conversation is usually measured between 40 to 50 decibels). Extremely loud and sudden noises (i.e. explosions) can actually rupture the eardrum. It is important to note that an increase of 10 decibels means an ten times increase in noise intensity.

Table 9.4 provided additional information on OSHA standards for noise level exposures.

TABLE 9.4: PERMISSIBLE NOISE EXPOSURE [1]	
Duration Per Day (Hours)	**Permissible Exposure (Decibels)**
8	90
6	92
4	95
3	97
2	100
1.5	102
1	105
0.5	110
0.25 or less	115
Note 1: As per OSHA guidance, noise exposures less than 90 decibels do not contribute to the daily dose.	

When the daily noise exposure (D) is composed of two or more periods of noise exposure of different levels, their combined effect should be considered, rather than the individual effect of each. If the sum of the following formula exceeds 1, then the mixed exposure should be considered to exceed the limit and feasible administrative or engineering controls shall be used. This equation is only to be used for continuous exposure. Exposure to impulsive or impact noise should not exceed 140 dB peak sound pressure level.

D = C1/T1 + C2/T2 + ... + Cn/Tn

Where:

D = Daily noise dose (must not exceed unity)
C = Actual exposure time at given noise level.
T = Permissible exposure time at that level in accordance with the table below.

Examples:

1. For an 8-hour workday, constant noise values are estimated to be 100 decibels for 1 hour and 90 decibels for the remaining 7 hours.

   Therefore, D = 1/2 + 7/8 = 1.375
   Since the result is greater than 1, engineering or administrative controls are necessary to reduce noise dose to unity.

2. For an 8-hour workday, constant noise values are estimated to be 100 decibels for 1 hour, 90 decibels for 3 hours and 85 decibels for 4 hours.

   D – 1/2 + 3/8 = 0.875 (as per OSHA guidance, noise exposures less than 90 decibels do not contribute to the daily dose, so the 4 hours at 85 decibels does not figure into the equation)

Since the result is less than 1, no further engineering or administrative controls are necessary.

Noise monitoring must be conducted during any prolonged response operation.

9.6 Heat Stress Information

Safety problems are common to hot environments, as heat tends to promote accidents due to slippery objects from sweaty palms, dizziness, or the visual distortions from fogged safety glasses.

The frequency of accidents, in general, appears to be higher in hot environments than in more moderate environmental conditions. Working in a hot environment lowers the mental alertness and physical performance of an individual. Increased body temperature and physical discomfort promote irritability, and other emotional states that can cause workers to overlook safety procedures or to divert attention from hazardous tasks.

9.6.1 Heat Index

The heat index combines the effects of heat and humidity. When heat and humidity combine to reduce the amount of evaporation of sweat from the body, outdoor exercise becomes dangerous even for those in good shape. Key rules for coping with heat are to drink plenty of water to avoid dehydration and to slow down and cool off when feeling fatigued or if you develop a headache, a high pulse rate, or shallow breathing. Overheating can cause serious, even life-threatening conditions such as heat stroke. The apparent temperature, which combines the temperature and relative humidity, is a guide to the danger. Figure 9.1 provided at the end of this section to help identify the heat stress index based on the apparent temperature.

9.6.2 Effects of Heat Illnesses

Transient Heat Fatigue

Transient heat fatigue refers to the temporary state of discomfort and mental or psychological strain arising from prolonged heat exposure. Workers unaccustomed to the heat are particularly susceptible and can suffer to varying degrees, including a decline in task performance, coordination, alertness, and vigilance. The severity of transient heat fatigue can be lessened by a period of gradual adjustment to the hot environment (heat acclimatization). The use of a program of acclimatization and training for work in hot environments is advisable. The signs and symptoms of heat fatigue include impaired performance of skilled sensorimotor, mental, or vigilance jobs. There is no treatment for heat fatigue except to remove the heat stress before a more serious heat-related condition develops.

Heat Rash

Heat rash is likely to occur in hot, humid environments where heat is not readily evaporated from the surface of the skin, leaving the skin wet most of the time. Sweat ducts become clogged, and a skin rash can develop. When the rash is extensive or complicated by infection, heat rash can be very uncomfortable and may reduce a worker's performance. Heat rash (or prickly heat) is manifested as red papules and usually appears in areas where the clothing is restrictive. As sweating increases, these papules give rise to a prickling sensation. Prickly heat occurs in skin

that is persistently wetted by unevaporated sweat, and heat rash papules may become infected if they are not treated. In most cases, the worker can prevent this condition by resting in a cool place part of each day and by regularly bathing and drying the skin.

Heat Collapse (Fainting)

A worker who is not accustomed to hot environments and who stands immobile in the heat can faint. Due to the body's attempts to control internal temperature, enlarged blood vessels in the skin and lower body may pool blood rather than return it to the heart to be pumped to the brain. As a result, the exposed individual may lose consciousness. This reaction is similar to that of heat exhaustion and does not affect the body's heat balance. Upon lying down, the worker should soon recover. Keeping active and moving around, should prevent blood from pooling, and the patient can avoid further fainting. However, the onset of heat collapse is rapid and unpredictable. To prevent heat collapse, the worker should gradually become acclimatized to the hot environment.

Heat Cramps

Heat cramps are painful spasms of the muscles that can occur during times of extreme sweating without adequate replacement of the body's salt. They are usually caused by performing hard physical labor in a hot environment. These cramps have been attributed to an electrolyte imbalance caused by sweating. It is important to understand that cramps can be caused by both too much and too little salt. Cramps appear to be caused by the lack of water replenishment. Because sweat is a hypotonic solution (±0.3% NaCl), excess salt can build up in the body if the water lost through sweating is not replaced. Thirst cannot be relied on as a guide to the need for water; instead, water must be taken every 15 to 20 minutes in hot environments. The drinking of large quantities of water tends to dilute the body's fluids, while the body continues to lose salt. Shortly thereafter, low salt level in the muscles can cause painful cramps. The affected muscles may be part of the arms, legs, or abdomen, but tired muscles (those used in performing the work) are generally the ones most susceptible. Cramps may occur during or after work hours and may be relieved by ingesting salted liquids.

Under extreme conditions, such as working for 6 to 8 hours in heavy protective gear, a loss of sodium may occur. Recent studies have shown that drinking commercially available carbohydrate-electrolyte replacement liquids is effective in minimizing physiological disturbances during recovery.

CAUTION - PERSONS WITH HEART PROBLEMS OR THOSE ON A "LOW SODIUM" DIET WHO WORK IN HOT ENVIRONMENTS SHOULD CONSULT A PHYSICIAN ABOUT POTENTIAL HEALTH PROBLEMS.

Heat Exhaustion

Heat exhaustion includes several clinical disorders having symptoms that may resemble the early symptoms of heat stroke. Heat exhaustion is caused by the loss of large amounts of fluid by sweating, sometimes with excessive loss of salt. A worker suffering from heat exhaustion still sweats but experiences extreme weakness or fatigue, giddiness, nausea, thirst, vertigo, or headache. Body temperature might rise, but not above 102 degrees. In more serious cases the victim may vomit or lose consciousness. The skin is clammy and moist, the complexion is pale

or flushed, and the body temperature is normal or only slightly elevated. Heat exhaustion is more likely after a few days of a heat wave than when one is just beginning. Heat exhaustion should not be dismissed lightly, however, for several reasons. One is that the fainting associated with heat exhaustion can be dangerous because the victim may be operating machinery or controlling an operation that should not be left unattended; moreover, the victim may be injured when he or she faints. Also, the signs and symptoms seen in heat exhaustion are similar to those of heat stroke, a medical emergency.

Fortunately, this condition responds readily to prompt treatment. In most cases, treatment involves resting the victim in a cool place and administering plenty of liquids. Victims with mild cases of heat exhaustion generally recover quickly. Those with severe cases may require extended care. There are no known permanent effects.

CAUTION - PERSONS WITH HEART PROBLEMS OR THOSE ON A "LOW SODIUM" DIET WHO WORK IN HOT ENVIRONMENTS SHOULD CONSULT A PHYSICIAN ABOUT POTENTIAL HEALTH PROBLEMS.

Heat Stroke

Heatstroke – including sunstroke – is considered to be the most severe of the heat-related illnesses. **HEAT STROKE IS A MEDICAL EMERGENCY.** Heat can have punishing effects on your body. After excessive exercise or physical labor, your body can overheat, and you may suffer heat exhaustion. In some cases, extreme heat can upset the body's thermostat, causing body temperature to rise to 105 degrees or higher. Heat cramps occur after excessive loss of water and salt; usually resulting from excessive sweating, or after strenuous exercise or labor. During heat exhaustion and heat cramps, the heat-controlling system is still intact, but can be overwhelmed. If this happens, heat exhaustion can progress to heatstroke, a life-threatening medical condition. The primary signs and symptoms of heat stroke are confusion or delirium; lethargy; irrational behavior; loss of consciousness; convulsions; a lack of sweating (usually); hot, dry, red, or spotted skin; and an abnormally high body temperature, e.g., a rectal temperature of 105°F or higher.

Heatstroke occurs when your body's thermostat cannot keep your body cool. Your body relies on water evaporation to stay cool. As your temperature rises, your body reacts by sweating. When this sweat evaporates, it cools your body. The amount of moisture in the air (humidity) determines how readily sweat evaporates. In very dry air, sweat evaporates easily, quickly cooling your body; but in very humid air, sweat does not evaporate. It may collect on the skin or run off your body without affecting your body's climbing temperature. Extremely warm and humid temperatures can quickly overwhelm your body's cooling system – particularly when the air is not circulating. When sweating can no longer keep you cool, body temperature quickly rises, causing the symptoms of heat-related illness.

Sunstroke is a type of heatstroke. In sunstroke – also called heat illness, heat injury, hyperthermia, and heat prostration – the source of heat is the sun. Other types of heatstroke occur after exposure to heat from different sources.

Even a suspicion that someone might be suffering from heatstroke requires immediate professional medical treatment. Regardless of the worker's protests, no employee suspected of being ill from heat stroke should be sent home or left unattended unless a physician has specifically approved such an order. In severe cases, heatstroke can even cause organ dysfunction, brain damage, and death. Any person showing symptoms of heat stroke requires immediate hospitalization. First aid, which should be administered immediately, includes moving the victim to a cool area, removing clothing and applying cool or tepid water to the skin, and vigorously fanning the body to promote sweating and evaporation. Give cool beverages by mouth only if the person has a normal mental state and can tolerate it. Further treatment at a medical facility should include the continuation of the cooling process and the monitoring of complications that often accompany heat stroke. The medical outcome of an episode of heat stroke depends on the victim's physical fitness and the timing and effectiveness of first aid treatment. Early recognition and treatment of heat stroke are the only means of preventing permanent brain damage or death.

Preparing For Work in the Heat

One of the best ways to reduce heat stress in workers is to minimize heat in the work place. However, there are some work environments where heat is difficult to control, such as outdoors where workers exposed to various weather conditions.

Humans, to a large extent, are capable of adjusting to the heat. Adjusting to heat under normal circumstances usually takes five to seven days, during which time the body will undergo a series of changes that will make continued exposure to heat more endurable.

Gradual exposure to heat gives the body time to become accustomed to higher environmental temperatures. Heat disorders in general are more likely to occur among workers who have not been given time to adjust to working in the heat or among workers who have been away from hot environments or who have gotten accustomed to lower temperatures. Hot weather conditions of the summer are likely to affect the worker who is not acclimatized to heat. Likewise, heat in the work environment can affect workers who return to work after a leisurely vacation or extended illness. Under such circumstances, the worker should be allowed to acclimate to the hot environment.

Heat stress depends, in part, on the amount of heat the worker's body produces while a job is being performed. The amount of heat produced during hard, steady work is much higher than that produced during intermittent or light work. One way of reducing the potential for heat stress is to make the job less strenuous or lessen its duration by providing adequate rest time.

Number and Duration of Exposures

Rather than be exposed to heat for extended periods of time during the course of a job, workers should, wherever possible, be permitted to distribute the workload evenly over the day and incorporate work-rest cycles. Work-rest cycles give the body an opportunity to get rid of excess heat, slow down the production of internal body heat, and provide greater blood flow to the skin. Workers employed outdoors are especially subject to weather changes. A hot spell or a rise in humidity can create overly stressful conditions.

Rest Areas

Providing cool rest areas in hot work environments considerably reduces the stress of working in those environments. Rest areas should be as close to the work area as possible and provide shade. Individual work periods should not be lengthened in favor of prolonged rest periods. Shorter but frequent work-rest cycles are the greatest benefit to the worker.

Drinking Water

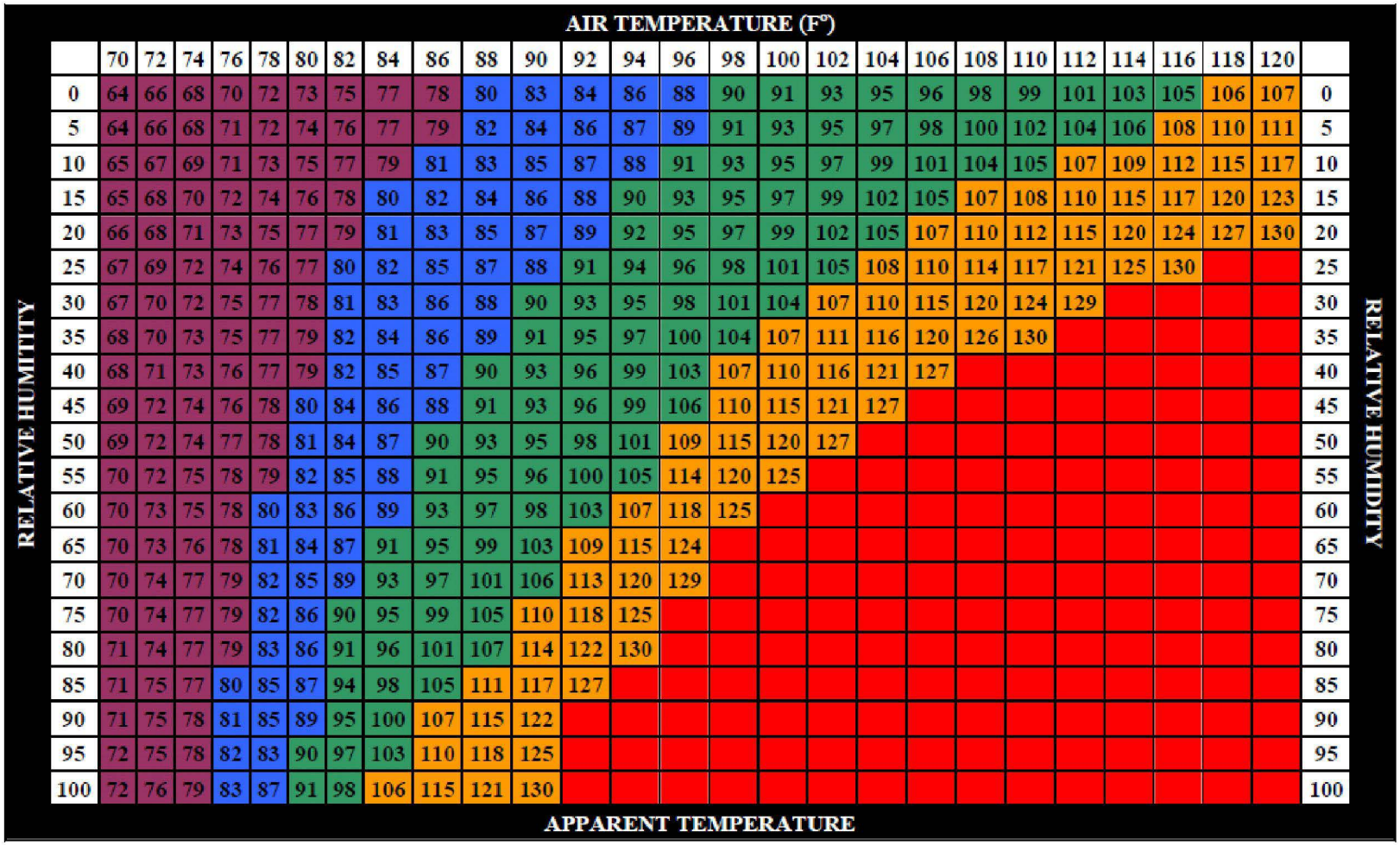
In the course of a day's work in the heat, a worker may produce as much as two to three gallons of sweat. Because so many heat disorders involve excessive dehydration of the body, it is essential that water intake during the workday be about equal to the amount of sweat produced. Most workers exposed to hot conditions drink fewer fluids than needed due to an insufficient thirst drive. A worker, therefore, should not depend on thirst to signal when and how much to drink. Instead, the worker should drink five to seven ounces of fluids every 15 to 20 minutes to replenish the necessary fluids in the body. There is no optimum temperature of drinking water, but most people tend not to drink warm or very cold fluids as readily as they will cool ones. Whatever the temperature of the water, it must be palatable and readily available. Individual drinking cups should be provided. Never use a common drinking cup.

Heat acclimatized workers lose much less salt in their sweat than do workers who are not adjusted to the heat. The average American diet contains sufficient salt for acclimatized workers even when sweat production is high. If, for some reason, salt replacement is required, the best way to compensate for the loss is to add a little extra salt to food. Salt tablets SHOULD NOT be used.

CAUTION - PERSONS WITH HEART PROBLEMS OR THOSE ON A "LOW SODIUM" DIET WHO WORK IN HOT ENVIRONMENTS SHOULD CONSULT A PHYSICIAN ABOUT POTENTIAL HEALTH PROBLEMS.

Protective Clothing

Clothing inhibits the transfer of heat between the body and the surrounding environment. Therefore, in hot jobs where the air temperature is lower than skin temperature, wearing excessive clothing reduces the body's ability to lose heat to the air. When air temperature is higher than skin temperature, however clothing can help to prevent the transfer of heat from the air to the body. The advantage of wearing additional clothes, however, may be nullified if the clothes interfere with the evaporation of sweat (such as rain slickers or chemical protective clothing).



RELATIVE HUMITITY	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116	118	120	RELATIVE HUMIDITY
0	64	66	68	70	72	73	75	77	78	80	83	84	86	88	90	91	93	95	96	98	99	101	103	105	106	107	0
5	64	66	68	71	72	74	76	77	79	82	84	86	87	89	91	93	95	97	98	100	102	104	106	108	110	111	5
10	65	67	69	71	73	75	77	79	81	83	85	87	88	91	93	95	97	99	101	104	105	107	109	112	115	117	10
15	65	68	70	72	74	76	78	80	82	84	86	88	90	93	95	97	99	102	105	107	108	110	115	117	120	123	15
20	66	68	71	73	75	77	79	81	83	85	87	89	92	95	97	99	102	105	107	110	112	115	120	124	127	130	20
25	67	69	72	74	76	77	80	82	85	87	88	91	94	96	98	101	105	108	110	114	117	121	125	130			25
30	67	70	72	75	77	78	81	83	86	88	90	93	95	98	101	104	107	110	115	120	124	129					30
35	68	70	73	75	77	79	82	84	86	89	91	95	97	100	104	107	111	116	120	126	130						35
40	68	71	73	76	77	79	82	85	87	90	93	96	99	103	107	110	116	121	127								40
45	69	72	74	76	78	80	84	86	88	91	93	96	99	106	110	115	121	127									45
50	69	72	74	77	78	81	84	87	90	93	95	98	101	109	115	120	127										50
55	70	72	75	78	79	82	85	88	91	95	96	100	105	114	120	125											55
60	70	73	75	78	80	83	86	89	93	97	98	103	107	118	125												60
65	70	73	76	78	81	84	87	91	95	99	103	109	115	124													65
70	70	74	77	79	82	85	89	93	97	101	106	113	120	129													70
75	70	74	77	79	82	86	90	95	99	105	110	118	125														75
80	71	74	77	79	83	86	91	96	101	107	114	122	130														80
85	71	75	77	80	85	87	94	98	105	111	117	127															85
90	71	75	78	81	85	89	95	100	107	115	122																90
95	72	75	78	82	83	90	97	103	110	118	125																95
100	72	76	79	83	87	91	98	106	115	121	130																100
APPARENT TEMPERATURE																											

	Very Warm: fatigue possible with prolonged exposure.
	Hot: sunstroke, heat cramps, or heat exhaustion possible with prolonged exposure, exercise more fatiguing than usual
	Very Hot - Danger: sunstroke, heat cramps, or heat exhaustion likely with prolonged exposure
	Extreme Danger: heat/sunstroke, heat exhaustion highly likely with continued exposure
	Heat stroke imminent

Figure 9.1: Heat Stress Index

9.7 Site Safety Plan Information

The Site Safety Plan must address the safety and health hazards of each phase of the response operation including the requirements and procedures for employee protection. The Site Safety Plan should include the following:

- A safety and health risk and/or hazard analysis for each response task and operation. The risk/hazard analysis will include the following:
  - Location and approximate size of the response area.
  - Description and duration of the response activities to be performed.
  - Site topography and accessibility by air and roads.
  - Safety and health hazards expected to be encountered.
  - Exposure routes of expected contaminants and other risks, such as potential skin absorption and irritation, potential eye irritation, and concentrations that are immediately dangerous to life and health (IDLH).
  - Present status and capabilities of emergency response teams that would provide assistance to response personnel in the event of an emergency.
  - Health hazards involved or expected from contaminants present and their chemical and physical properties.
- Personal protective equipment to be used by employees during each of the response operations. The requirement for personal protective equipment will be based on the results of the preliminary site evaluation and the guidance provided in the Navy written safety and health program.
- Employee training requirements to assure compliance with the OSHA requirements. The training program section of the Navy written safety and health program should be used as guidance in preparation of this section.
- Medical surveillance requirements to ensure compliance with the OSHA requirements. The medical surveillance program section of the Navy written safety and health program should be used as guidance in preparation of this section.
- A schedule for and the types of air monitoring to be conducted for IDLH conditions, combustible gases, and other conditions that may cause death or serious harm.
- Methods of maintenance and calibration of monitoring and sampling equipment to be used.
- A schedule for and the types of environmental sampling techniques and instruments to be used.
- A site control program for protecting employees involved in response operations. The site control program will include a site map, an indication of the work zones, a description of the "buddy" system, site communications, emergency alert signals, standard operating procedures, or safe work practices, and identification of the nearest medical assistance.
- Standard operating procedures must minimize personnel and equipment contact with spill substances.
- Decontamination procedures that cover all phases of response operations must be developed. These procedures must be communicated to all response personnel and implemented before any response employees or equipment enters areas where they can be potentially exposed.
- An emergency response plan that is a separate section of the Site Safety Plan must be developed that covers:
  - Pre-emergency planning, personnel roles, lines of authority, and communication.

  - Emergency recognition and prevention, safe distances, and places of refuge.
  - Site security and control evacuation routes and procedures.
  - Decontamination procedures (procedures that are not covered by the Site Safety Plan).
  - Emergency medical treatment and first aid.
  - Emergency alerting and response procedures.
  - Personal protective equipment and emergency equipment.
  - Response area topography, layout, and prevailing weather conditions.
  - Procedures for reporting incident to local, State, and Federal governmental agencies.
- A section covering the critique of a response and follow-up.
- Confined space entry procedures.
- A procedure for handling, labeling, and transporting drums and containers of recovered oil and oil-contaminated debris.

9.8 PPE Levels of Protection

9.8.1 Ensemble Level

PPE ensemble levels will be established by the Safety Officer.

9.8.2 General Signs/Symptoms That Indicate Potential Toxic Exposures

- Sudden weight loss or change in appetite;
- Unusual fatigue or new sleeping difficulties;
- Unusual irritability;
- Skin rashes/allergies/sores;
- Hearing loss;
- Vision loss/problems;
- Changes in sense of smell;
- Shortness of breath/asthma/cough or sputum production;
- Chest pains;
- Nausea/vomiting/diarrhea/constipation;
- Weakness/tremors;
- Headaches;
- Personality changes.

9.9 Manifestations of Toxic Effects to Various Target Organs

TARGET ORGAN: skin
MANIFESTATIONS: dermatitis, chloracne, skin cancer
CHEMICAL/PHYSICAL AGENT(S): Hydrocarbon solvents, chlorinated hydrocarbons (e.g., PCB), soap, dioxane, and alcohols

TARGET ORGAN: respiratory system
MANIFESTATIONS: acute pulmonary edema, pneumonitis, asthma, lung cancer
CHEMICAL/PHYSICAL AGENT(S): many forms of dusts, fumes, and vapors

TARGET ORGAN: cardiovascular system
MANIFESTATIONS: arrhythmias, angina

CHEMICAL/PHYSICAL AGENT(S): carbon monoxide, hydrogen sulfide, organophosphates, glues/glue-solvents, and temperature extremes

TARGET ORGAN: gastrointestinal system
MANIFESTATIONS: abdominal pain, nausea, vomiting, diarrhea, bloody stools, hepatic necrosis, hepatic cancer, hepatic fibrosis
CHEMICAL/PHYSICAL AGENT(S): hydrocarbon solvents, halogenated hydrocarbons, organic solvents, petroleum products, organophosphates, and corrosives

TARGET ORGAN: genitourinary system
MANIFESTATIONS: chronic renal disease, bladder cancer
CHEMICAL/PHYSICAL AGENT(S): halogenated hydrocarbons

TARGET ORGAN: nervous system
MANIFESTATIONS: headache, convulsions, coma, peripheral neuropathy
CHEMICAL/PHYSICAL AGENT(S): carbon monoxide, organophosphates, and organic solvents

TARGET ORGAN: auditory system
MANIFESTATIONS: temporary and permanent hearing loss/shift
CHEMICAL/PHYSICAL AGENT(S): loud noise

TARGET ORGAN: ophthalmic system
MANIFESTATIONS: eye irritation, cataracts
CHEMICAL/PHYSICAL AGENT(S): petroleum products and UV radiation

TARGET ORGAN: hematological system
MANIFESTATIONS: anemia, bleeding disorder, leukemia
CHEMICAL/PHYSICAL AGENT(S): benzene

9.10 Safety Data Sheets

SDSs are provided with each delivery of fuel, specific to the manufacturer and production run of the product. On the absence of that specific data, example SDSs from past deliveries can be found in Appendix E.

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10.0 RESPONSE EQUIPMENT RESOURCES

The following sections detail the emergency response equipment that is available to the RHFSF in the event of a major incident from Navy, commercial, and State and Federal sources.

10.1 Navy Resources

10.1.1 Firefighting and Crash Fire Rescue Equipment

TABLE 10.1: FIREFIGHTING & CRASH FIRE RESCUE EQUIPMENT					
Station	**Call Sign**	**Year**	**Make**	**Type**	**Location**
FIRST LINE APPARATUS INVENTORY					
1	E-101	6/2012	Pierce Saber	Pumper	JBPHH, Shipyard
	Tower 120	2007	Pierce	Tower / Platform	JBPHH, Shipyard
	HazMat-151	2004	Pierce	P-31(HazMat)	JBPHH, Shipyard
	Support 154	1996	Mercedes	Class"C"	JBPHH, Shipyard
2	E-102	6/2012	Pierce Saber	Pumper	JBPHH, Subase
	Medic-2	2011	Whl Coach	F-450/Type 1	JBPHH, Subase
3	E-103	6/2012	Pierce Saber	Pumper	Tripler AMC
4	E-104	2006	Pierce	Pumper	Ford Island
5	E-105	6/2012	Pierce Saber	Pumper	Manana, Pearl City
	Tanker-142	2006	Pierce	Tanker	Manana, Pearl City
6	E-106	2010	Pierce	Pumper	JBPHH
	Reserve-136	1994	KME	Pumper	JBPHH
	Medic 6	2011	Whl Coach	F-450/Type 1	JBPHH
	Tanker 143	1994	International	P-26(Water-Dist)	JBPHH
	New Tanker 143	2013	Pierce	Tanker	JBPHH
	ARFF-171	2005	OshKosh	T-1500	JBPHH
	ARFF-172	2006	OshKosh	T-1500	JBPHH
	Crash 175	1986	Oshkosh	P-19(FFGT)	JBPHH
	Crash 176	1994	Teledyne	P-23(FFGT)	JBPHH
	Crash 177	2006	Oshkosh	P-23(Striker)	JBPHH
	Crash 178	1998	Oshkosh	Crash 3TK(FFGT)	JBPHH
7	E-107	2006	Pierce	Pumper	NCTAMS, Wahiawa
	Medic 7	2011	Whl Coach	F-450/Type 1	NCTAMS, Wahiawa
8	E-108	2008	Pierce	Pumper	MCAS, Kaneohe
	New E-108	2013	Pierce	Pumper	MCAS, Kaneohe
	E-112	2010	Pierce	Pumper	MCAS, Kaneohe
	Medic-8	2008	Whl Coach	F-350/Type 1	MCAS, Kaneohe
	Brush 148	*2011*	Pierce	Large Wildland	MCAS, Kaneohe
	Hazmat 156	2002	Pierce	P-30(Med-Rescue)	JBPHH
	HazMat Trailer	2007	Wells Fargo	HazMat Response	MCAS, Kaneohe
	E-109	2010	Pierce	Pumper	West Loch Annex
9	Brush 145	2009	Ford	Medium Wildland	West Loch Annex
	E-110	2006	Pierce	Pumper	Helemano Mil Resv

TABLE 10.1: FIREFIGHTING & CRASH FIRE RESCUE EQUIPMENT					
Station	**Call Sign**	**Year**	**Make**	**Type**	**Location**
FIRST LINE APPARATUS INVENTORY (Cont.)					
10	Brush 147	2009	Pierce	Large Wildland	Helemano Mil Resv
	E-114	2005	Pierce	Pumper	Wheeler AAF
14	Brush 144	2009	Ford	Medium Wildland	Wheeler AAF
	ARFF-173	2007	Oshkosh	T-1500	Wheeler AAF
	ARFF-174	2005	OshKosh	T-1500	Wheeler AAF
	Medic-14	2011	Whl Coach	F-450/Type 1	Wheeler AAF
15	E-115	2008	Pierce	Pumper	Schofield Barracks
	New E-115	2013	Pierce	Pumper	MCAS, Kaneohe
	Truck 119	2005	Pierce	105"	Schofield Barracks
	Tanker 141	2009	Pierce	Tanker	Schofield Barracks
	HazMat-152	1995	International	Medium HAZMAT	Schofield Barracks
	New HazMat-152	10/2013	Pierce	Heavy HAZMAT	Schofield Barracks
	HazMat-153	1994	Pierce	Small HAZMAT	Schofield Barracks
	Brush 146	2009	Pierce	Large Wildland	Schofield Barracks
16	E-116	2003	Pierce	Pumper	Camp H.M. Smith
	TAU-155	2009	Ford F-550	Twin Agent Unit	Camp H.M. Smith
SPECIAL OPERATIONS/RESERVE/SUPPORT/GSA VEHICLES					
1	Storage Trailer	2005	-	Equipment stowage	-
	Storage Trailer	-	-	Equipment stowage	-
	Storage Trailer	2004	Haulmark	Equipment stowage	-
	Special Ops 1	2003	MD288	Mass Decon trailer	-
6	MCI Trailer	-	Wells Fargo	-	-
	Foam Trailer	-	Stanly Emerg	-	-
	Mobile Air Trailer	-	Bauer	-	-
	Pump Test Trailer	2009	Wells Cargo	Pump Test	-
	HazMat Trailer	-	Wells Fargo	-	-
8	HazMat Trailer	2007	Wells Fargo	HazMat Response	-
	HazMat Trailer	-	-	-	-
4	Liberty 1	2006	-	Air Cart	-
WAAF	MAFT (cab)	2000	International	Trainer	-
	MAFT (trailer)	2000	-	Trainer	-
14	Liberty 2	2006	-	Air Cart	-
15	Special Ops 2	2003	-	Mass Decon Trailer	-
	Storage Trailer	2009	Wells Cargo	Equipment stowage	-
RESERVE APPARATUS FLEET					
15	Reserve 131 (101)	2003	Pierce	Pumper	-
10	Reserve 132 (110)	2003	Pierce	Pumper	-
8	Reserve 133 (103)	1997	KME	Pumper	-
6	Reserve 136 (107)	1994	KME	Pumper	-
NAVFAC	Truck 118	1994	Pierce	Tele-Squirt	-

TABLE 10.1: FIREFIGHTING & CRASH FIRE RESCUE EQUIPMENT					
Station	**Call Sign**	**Year**	**Make**	**Type**	**Location**
COMMAND VEHICLES					
HQ	District Chief- 1	2005	Ford	Sport Trac/Command	-
HQ	District Chief- 2	2005	Ford	Sport Trac/Command	-
1	Battalion Chief-4	2007	Chevy	Suburban/Command	-
8	Battalion Chief- 1	2012	Cherokee	SUV/Command	-
14	Battalion Chief- 2	2012	Cherokee	SUV/Command	-
HQTR	Battalion Chief Extra Vehicle	2012	Cherokee	SUV/Command	-
6	Battalion Chief- 3	-	Chevy	Suburban/Command	-
6	Fire Marshall	2006	Chevy	Trail Blazer	-
GSA VEHICLES					
-	FIRE 1	-	-	-	-
-	FIRE 2/3	-	-	-	-
-	Fire Marshal	-	-	-	-
-	SQUAD 161	2006	Ford	F-350	-
-	Supply	-	-	-	-
-	Supply F-350 (Blue)	2003	Dodge Ram	Pick up 7K LB	-
-	Training	-	-	-	-
-	Prevention 9	2003	Silverado	-	-
-	Prevention	2013	Ford Focus (Red)	-	-
-	Prevention	2013	Ford Focus (Red)	-	-
-	Prevention	2012	Chevy Malibu (Gray)	-	-
-	Prevention	2013	Ford Focus (Silver)	-	-
-	Prevention	2012	Chevy Malibu (Gray)	-	-
-	Prevention	2013	Ford Focus (Black)	-	-
-	Prevention	2012	Chevy Malibu (White)	-	-
-	Prevention	2012	Chevy Malibu (Silver)	-	-
-	Prevention	2013	Ford Focus (Red)	-	-
-	Prevention	2013	Ford Focus (Red)	-	-

10.1.2 Heavy Equipment

TABLE 10.2: HEAVY EQUIPMENT*			
Vehicle/Equipment Type	**Year**	**ID #**	**Assignment Name**
TRUCK CARGO PICKUP UP TO 8500 GVWR REGULAR CAB	2006	27766	NFH OPC741
TRUCK CARGO PICKUP UP TO 8500 GVWR REGULAR CAB	2014	29004	NFH OPC741
TRUCK CARGO PICKUP UP TO 8500 GVWR REGULAR CAB	2009	29005	NFH OPC741
TRUCK CARGO PICKUP COMPACT 4X2 UP TO 6100 GVWR EXTENDED CAB	2012	27771	NFH OPC741
TRUCK CARGO PICKUP COMPACT 4X2 UP TO 6100 GVWR EXTENDED CAB	2009	28174	NFH OPC741

TABLE 10.2: HEAVY EQUIPMENT*			
Vehicle/Equipment Type	**Year**	**ID #**	**Assignment Name**
TRUCK CARGO PICKUP COMPACT 4X2 UP TO 6100 GVWR EXTENDED CAB	2009	28175	NFH OPC741
TRUCK MULTISTOP STEP VAN 8501 - 13999 GVWR DUALLY	2016	28176	NFH OPC741
TRUCK STAKE 21000 GVWR AND UP 12-22 FT BED EXTENDED CAB	2015	60034	NFH OPC741
TRUCK STAKE 21000 GVWR AND UP 12 - 22 FT BED REGULAR CAB HTG	2008	28177	NFH OPC741
TRUCK DUMP 5 CY 28000 GVWR	2009	28179	NFH OPC741
TRUCK DUMP 5 CY 28000 GVWR	1997	28180	NFH OPC741
TRUCK DUMP 10 CY 6X4 52000 GVWR	2000	28178	NFH OPC741
TRUCK DUMP 10 CY 6X4 52000 GVWR	1996	60028	NFH OPC741
TRUCK TRACTOR 6X4 43000 GVWR 70000 GCVWR	2016	29069	NFH OPC741
TRUCK TRACTOR 6 X 4 62000 GVWR 100000 GCVWR	1999	29075	NFH OPC741
TRUCK TRACTOR 6 X 4 62000 GVWR	2016	29068	NFH OPC741
TRUCK TRACTOR 6 X 4 62000 GVWR	2016	29070	NFH OPC741
TRUCK TRACTOR 6 X 4 62000 GVWR	2016	29071	NFH OPC741
TRUCK TRACTOR 6 X 4 62000 GVWR	2016	29073	NFH OPC741
TRUCK TRACTOR 6 X 4 62000 GVWR 100000 GCVWR	1990	29067	NFH OPC741
TRUCK TRACTOR 6 X 4 62000 GVWR 100000 GCVWR	2002	28950	NFH OPC741
TRUCK TRACTOR 6 X 4 62000 GVWR 100000 GCVWR	2002	28951	NFH OPC741
TRUCK TRACTOR 6 X 4 62000 GVWR 100000 GCVWR	2002	29076	NFH OPC741
TRUCK TRACTOR 6 X 4 62000 GVWR 100000 GCVWR	2002	29077	NFH OPC741
TRUCK MOUNTED OVERHEAD AERIAL SERVICE ARTICULATING NON OVER-CENTER TO 60 FT WORKING HEIGHT	2011	28953	NFH OPC741
TRUCK MOUNTED OVERHEAD AERIAL SERVICE ARTICULATING NON OVER-CENTER TO 60 FT WORKING HEIGHT	2016	28954	NFH OPC741
TRUCK WRECKER ROLLBACK	2016	29055	NFH OPC741
TRUCK TANK FUEL SERVICING 1 SYSTEM 1 TANK	2011	28956	NFH OPC741
TRUCK TANK FUEL SERVICING 1 SYSTEM 1 TANK	2014	28982	NFH OPC741
TRUCK TANK FUEL SERVICING 1 SYSTEM 1 TANK	2014	28983	NFH OPC741
SEMITRAILER STAKE 2-3 AXLE 20 TON 40-55 FT W/O STAKES	2006	27375	NFH OPC741
SEMITRAILER STAKE 2-3 AXLE 20 TON 40-55 FT W/O STAKES	2006	27992	NFH OPC741
SEMITRAILER STAKE 2-3 AXLE 20 TON 40-55 FT W/O STAKES	2002	28055	NFH OPC741
SEMITRAILER STAKE 2-3 AXLE 20 TON 40-55 FT W/O STAKES	2002	28181	NFH OPC741
SEMITRAILER STAKE 2-3 AXLE 20 TON 40-55 FT W/O STAKES	2006	29046	NFH OPC741
SEMITRAILER STAKE 2-3 AXLE 20 TON 40-55 FT W/O STAKES	2002	29047	NFH OPC741
SEMITRAILER DROP DECK 2 AXLE 20 TON	1988	29006	NFH OPC741
SEMITRAILER DROP DECK 2 AXLE 20 TON	1993	29050	NFH OPC741

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Exhibit N-6L

NAVY0011457

TABLE 10.2: HEAVY EQUIPMENT*			
Vehicle/Equipment Type	**Year**	**ID #**	**Assignment Name**
SEMITRAILER LOWBED 2 AXLE 35 TON NONSTANDARD	1997	29052	NFH OPC741
SEMITRAILER LOWBED 3 AXLE 35 TON	2010	27769	NFH OPC741
SEMITRAILER LOWBED 3 AXLE 35 TON	2010	27770	NFH OPC741
SEMITRAILER LOWBED 3 AXLE 35 TON	1988	29053	NFH OPC741
SEMITRAILER LOWBED 3 AXLE 60 TON AND UP NONSTANDARD	2016	27767	NFH OPC741
SEMITRAILER LOWBED 3 AXLE 60 TON AND UP NONSTANDARD	1999	29054	NFH OPC741
TRAILER HYDRAULIC ELEVATING BODY NONSTANDARD	1992	29056	NFH OPC741
TRAILER LOWBED TRANSPORTER 18001 GVWR AND UP TRAVELING AXLE	2016	29051	NFH OPC741
TRAILER LOWBED TRANSPORTER 18001 GVWR AND UP TRAVELING AXLE	2016	29057	NFH OPC741
SEMITRAILER DEMOLITION REAR DUMP 34 CY	2010	27768	NFH OPC741
SEMITRAILER DEMOLITION REAR DUMP 34 CY	2017	29007	NFH OPC741
SEMITRAILER DEMOLITION REAR DUMP 34 CY	1992	29009	NFH OPC741
SEMITRAILER DEMOLITION REAR DUMP 34 CY	2001	29059	NFH OPC741
SEMITRAILER DEMOLITION REAR DUMP 34 CY	2002	29060	NFH OPC741
SEMITRAILER DEMOLITION REAR DUMP 34 CY	2002	29061	NFH OPC741
SEMITRAILER DEMOLITION REAR DUMP 34 CY	2001	29063	NFH OPC741
SEMITRAILER DEMOLITION REAR DUMP 34 CY	1995	29064	NFH OPC741
SEMITRAILER DEMOLITION REAR DUMP 34 CY	2017	29065	NFH OPC741
TRAILER LOWBED TILT DECK TANDEM AXLE UP TO 60 TON	2015	29010	NFH OPC741
DISTRIBUTER WATER TRUCK/TRAILER COMMERCIAL NONSTANDARD	2015	27990	NFH OPC741
DISTRIBUTER WATER TRUCK/TRAILER COMMERCIAL NONSTANDARD	2015	28171	NFH OPC741
EXCAVATOR CRAWLER MOUNTED HYDRAULIC OPERATED NONSTANDARD	1998	28984	NFH OPC741
EXCAVATOR CRAWLER MOUNTED HYDRAULIC OPERATED NONSTANDARD	2002	28985	NFH OPC741
EXCAVATOR CRAWLER MOUNTED HYDRAULIC OPERATED NONSTANDARD	2002	28986	NFH OPC741
LOADER SCOOP TRACK 1.75 CY BUCKET W/ TEETH	1998	28987	NFH OPC741
LOADER SCOOP TRACK 1.75 CY BUCKET W/ TEETH	2002	28988	NFH OPC741
LOADER SCOOP WHEEL MOUNTED 4X4 NONSTANDARD	2010	27492	NFH OPC741
LOADER SKID STEER NONSTANDARD	1987	27493	NFH OPC741
LOADER SCOOP WHEEL MOUNTED 1.5 CY GP 85 HP CAB	1991	28990	NFH OPC741
ROLLER ROAD 2 AXLE TANDEM 3 - 6 TON	1988	28991	NFH OPC741
ROLLER ROAD 2 AXLE TANDEM 3 - 6 TON	2013	28992	NFH OPC741
TRACTOR WHEELED INDUSTRIAL 4 X 2 60 HP MIN LDR 1 BUCKET BACKHOE	1993	28993	NFH OPC741
TRACTOR WHEELED INDUSTRIAL 4 X 2 60 HP MIN LDR 1 BUCKET BACKHOE	1993	28994	NFH OPC741
TRACTOR WHEELED INDUSTRIAL 4 X 2 60 HP MIN LDR 1 BUCKET BACKHOE	2017	28995	NFH OPC741

TABLE 10.2: HEAVY EQUIPMENT*			
Vehicle/Equipment Type	**Year**	**ID #**	**Assignment Name**
TRACTOR WHEELED INDUSTRIAL 4 X 2 60 HP MIN LDR 1 BUCKET BACKHOE	2017	28996	NFH OPC741
TRACTOR WHEELED INDUSTRIAL 4 X 4 90 HP MIN LDR 1.5 BUCKET BACKHOE	2017	28997	NFH OPC741
TRACTOR WHEELED INDUSTRIAL 4 X 4 90 HP MIN LDR 1.5 BUCKET BACKHOE	1995	28998	NFH OPC741
CLEANER SEWAGE/WASTE COLLECTION 1300 GALLON	2016	29001	NFH OPC741
CLEANER SEWAGE/WASTE COLLECTION 1300 GALLON	2016	29002	NFH OPC741
CLEANER SEWAGE/WASTE COLLECTION 1300 GALLON	2011	29003	NFH OPC741
SWEEPER ROTARY SELF-PROPELLED WHEEL MOUNTED NONSTANDARD	2007	28999	NFH OPC741
SWEEPER ROTARY SELF-PROPELLED WHEEL MOUNTED NONSTANDARD	2010	29000	NFH OPC741

*NAVFAC HI Transportation

10.1.3 Sorbents and Spill Kits

TABLE 10.3: SORBENTS AND SPILL KITS			
Item	**Location**	**Unit**	**In Stock**
PORT OPERATIONS/FRT			
Absorbent Pads	Ford Island Building 3	100 Pads per Bale	30
Absorbent Sweeps (19' x 100')	" "	1 Sweep per Bale	62
Absorbent Boom (8" x 10")	" "	4 Per Bag	32
Various Spill Kits	" "	Kit	Multiple
Organic Absorbent Beads	" "	Box	Multiple
Particulate Absorbent	" "	Bag	Multiple
Dragnet Pom Poms	" "	Unknown	Multiple
Filter Belts for Skimmer (Fine Foam)	" "	Unknown	Multiple
FEDERAL FIRE DEPARTMENT			
Granular Absorbent Floor Dri Brand, Size 24qts.	Station 1	Bag	15
Absorbent Pads, Size 15" x 15"	" "	50/Box	8
2.5 Rolls Absorbent Boom	Station 6	-	-
500 Absorbent Pads	" "	-	-
Granular Absorbent, Size 20 Gallons	Station 8	Overpack	1
Spill Kits For Oils, Coolants, Solvents	Various Stations and Vehicles	Kit	Multiple
Spill Kits for Acids, Caustics, Strong Solvents	" "	Kit	Multiple
Spill Kits for Acid and Caustics	" "	Kit	Multiple
Spill Kit for Non-Aggressive Fluids	" "	Kit	Multiple
Spill Kit for Aggressive Fluids	" "	Kit	Multiple

TABLE 10.3: SORBENTS AND SPILL KITS			
Item	**Location**	**Unit**	**In Stock**
FLCPH FUEL DEPARTMENT			
Absorbent Diapers	Building 1757	Bale	14
Absorbent Diapers	" "	Box	2
Large Suasage Boom (Orange)	" "	Boom	13
Medium Sausage Boom (White)	" "	Boom	11
Small Sausage Boom (Blue)	" "	Boom	35
Small Sausage Boom (Blue)	" "	Box	1
Absorbent Diabers	" "	100 per Bale	4
Small Napkin Oil Absorbents	" "	Pack	3
Sausage Boom	" "	Boom	4
Absorbent Diapers	" "	100 per Pack	5
10" Sausage Boom	" "	Boom	6
Oil Pig Socks	Bldg 2125	Bundle	2
Medium Sausage Boom (White)	" "	Bag	2
Various Spill Kits	Various Locations	Kit	Multiple
NAVFAC HI			
"Speedy Dry" Absorbent	Waste Treatment Plant	Bag	Multiple
Sorbent Pillows	" "	Bag	Multiple
Various Spill Kits	" "	Kit	Multiple

10.1.4 Vacuum Trucks

TABLE 10.4: VACUUM TRUCKS

Topic		Truck Type	Truck Type	Truck Type	Truck Type	Truck Type	Truck Type
NUMBER	ON HAND	1	1	3	1	3	1
MANUFACTURER	BRAND	Isometrics	Isometrics	International	Freightliner	Freightliner	Freightliner
	MODEL	Unk	Unk	Unk	Unk	Unk	Unk
	YEAR	2009	2006	Unk	Unk	Unk	Unk
PICK-UP HEAD TYPE (Manta, weir, etc.)		Weir/Hose Nozzles	Weir/Hose Nozzles	Weir/Hose Nozzles	Weir/Hose Nozzles	Weir/Hose Nozzles	Weir/Hose Nozzles
RECOVERY RATES	NOMINAL (gals/min)	80	80	100	80	80	80
	DE-RATED DAILY (gals/day)	23,040	23,040	3 @ 28,800 Each 86,400 Total	23,040	3 @ 23,040 69,120	23,040
	" " (bbls/day)	549	549	3 @ 686 Each 2,058 Total	549	3 @ 549 1,647	549
	TANK SIZE (gals)	2,000	2,000	2,000 Each	2,000	2,000 Each	4,000
MOBILIZATION	POINT OF CONTACT	Port Operations FRT 474-6262 (24 hr.)	Port Operations FRT 474-6262 (24 hr.)	NAVSUP FLCPH 473-7801	NAVFAC HI Emerg. Service Desk 449-3100	NAVFAC HI Emerg. Service Desk 449-3100	NAVFAC HI Emerg. Service Desk 449-3100
	STORAGE LOCATION	Building 3, Ford Island	Building 3, Ford Island	Fuel Department, Bldg 1757	Hickam Air Field Bldg 2125	BOWTS Facility Bldg 1910	BOWTS Facility Bldg 1910
	CREW NEEDED	1	1	1	1	1	1
	TIME (hrs) (Request on the road)	10 mins	10 mins	10 mins	10 mins	10 mins	10 mins
TOTAL DE-RATED DAILY RECOVERY AVAILBALE ON-SITE FROM VACUUM TRUCKS: 247,680 gals/day (5,897 bbls/day)							

10.1.5 Skimmers

TABLE 10.5: SKIMMERS			
VESSELS SKIMMERS			
Topic		**Type**	**Type**
NUMBER	ON HAND	1	1
MANUFACTURER	BRAND	Kvichak Marine	Kvichak Marine
	MODEL	30' Skimmer Boat	28' Skimmer Boat
	BOAT ID	SK-1	SK-2
	YEAR	2012	2005
TYPE	OPERATING PRINCIPLE	KVICHAK 1 foot wide filterbelt module	KVICHAK 1 foot wide filterbelt module
	MANNED OR UNMANNED	Manned	Manned
RECOVERY RATES	NOMINAL (gals/min)	80	80
	DE-RATED DAILY (gals/day)	23,040	23,040
	" " (bbls/day)	549	549
	BUILT-IN STORAGE (gals)	1,000	1,000
	BLADDER STORAGE (gals)	0	0
MOBILIZATION	POINT OF CONTACT	Port Operations FRT 474-6262 (24 hr.)	Port Operations FRT 474-6262 (24 hr.)
	STORAGE LOCATIONS	Building 3, Ford Island	Building 3, Ford Island
	TRANSPORTATION NEEDED	Skimmer has Trailer	Skimmer has Trailer
	LAUNCH SITE (S)	Building 3, Ford Island	Building 3, Ford Island
	CREW NEEDED	2	2
	TIME (hrs) (Request on water)	<1	<1
TOTAL DE-RATED DAILY RECOVERY AVAILBALE ON-SITE FROM SKIMMERS: 46,080 gals/day (954 bbls/day)			

PORTABLE SKIMMERS			
Manufacturer	**Brand**	**Location**	**On Hand**
Douglas Environmental	Skim-Pac Skimmer	Building 3, Ford Island	2
Douglas Environmental	Skim-Pac Skimmer	Building 3, Ford Island	1
Douglas Environmental	Skim-Pac Skimmer	Building 3, Ford Island	1
Applied Fabric	Harbor Buster Towable Skimmer	Building 3, Ford Island	1
Unknown	Duckbill Skimmer	Fuel Department, Bldg 1757	2
Unknown	Skimmer	Fuel Department, Bldg 1757	2
Unknown	Duckbill Skimmer	Hickam Spill Cart, Bldg 2125	1
Douglas Environmental	Skim-Pac Skimmer	Hickam Spill Cart, Bldg 2125	1

10.1.6 Response Vessels

TABLE 10.6: RESPONSE VESSELS				
Equipment	**How Many**	**Type**	**Location**	**Op. Status**
BOOM-DEPLOYING BOATS	1	2006 Northwind 21' Utility Boat (FRT-1)	FRT Dock, Ford Island	Functional
	1	2007 Workskiff 21' Utility Boat (FRT-2)	" "	" "
	1	2006 Northwind 21' Utility Boat (FRT-3)	" "	" "
	1	2007 Workskiff 21' Utility Boat (FRT-4)	" "	" "
	1	1996 Seaarc Marine 30' Platform Boat (RRP-1)	" "	" "
	1	2006 Almar 30' Platform Boat (RRP-3)	" "	" "
	1	30' Platform Boat (RRP-4)	" "	" "
OTHER BOATS	4	Work Boats	Port Operations	Functional
	4	Tugs	" "	" "
	1	Pilot Boat	" "	" "
	1	Personnel Boat	" "	" "
	1	12' Boat	" "	" "

10.1.7 Boom

TABLE 10.7: BOOM				
Class	**Skirt Size**	**Point of Contacty**	**Amount (ft)**	**Location**
RESPONSE BOOM (STORAGE AND IN-WATER)				
Class II	24 inch	Port Operations FRT 474-6262 (24 hr.)	29,200	Varies
RESPONSE BOOM ON REELS				
Class II	24 inch	Port Operations FRT 474-6262 (24 hr.)	5,000	5 Reels at: Kilo 1, Kilo 9, Sierra 4, Lima Landing, and Hickam Harbor (1,000 ft / reel)
Total Response Boom: 34,200 Feet				
PERMANENT (HARD) BOOM IN WATER				
Perma-Boom	24 inch	Port Operations FRT 474-6262 (24 hr.)	31,500	Varies
PERMANENT (HARD) BOOM ON REELS				
Perma-Boom	24 inch	Port Operations FRT 474-6262 (24 hr.)	400	Arizona Visitor Center where Halawa Stream empties into Pearl Harbor
PERMANENT (HARD) BOOM IN STORAGE				
Perma-Boom	24 inch	Port Operations FRT 474-6262 (24 hr.)	4,600	Building 174
Total Perma-Boom: 36,500 Feet				

10.1.8 Temporary Waste Oil Storage

TABLE 10.8: TEMPORARY WASTE OIL STORAGE		
Equipment	**Capacity**	**Location / POC / Telephone**
BULK STORAGE EQUIPMENT FOR RECOVERED OIL		
Ship Waste Off-Loading Barge (SWOB) # 12 and 48	2 @ 70,000 gals	Waterfront Operations Officer 474-6262
Yard Oiler Navy (YON) Barge # 328, 335, 336	#328 @ 500,000 gals #335 @ 300,000 gals #336 @ 300,000 gals	Fuel Department 473-7833 or 690-0115 (24 hours)
YON Barge # 281	300,000 gals	Waterfront Operations Officer 474-6262
NAVSUP FLCPH Upper Tank Farm Bulk Storage Tanks	Approximately 6,300,000 gals each	Fuel Deptment 473-7833 or 690-0115 (24 hours)
NAVSUP FLCPH FORFAC Bulk Storage Tanks B-1 and B-2	378,000 gals each	Fuel Deptment 473-7833 or 690-0115 (24 hours)
Oil Storage Bladders	1 @ 290,000 gals 2 @ 136,000 gals 2 @ 26,000 gals 1 @ 21,000 gals 6 @ 500 gals	Navy SUPSALV Hawaii ESSM Base (As of November 2017) (202) 781-1731, Option #2 (during work hours) (202) 781-3889 (Duty Officer, after hours)
STORAGE EQUIPMENT FOR CONTAMINATED WASTE/HAZARDOUS WASTES/RESPONSE WASTES AND DEBRIS		
Drums	Multiple @ 55 gal	NAVFAC HI Environmental Services 471-1171
Dumpsters	Multiple @ Variable	NAVFAC HI Environmental Services 471-1171

*Storage capacity if empty and available. Storage systems may not be available.

10.2 Response Personnel

10.2.1 Immediate Response Teams

The Immediate Response Team for OHS spills on land is the FFD. For oil spills on water, the Immediate Response Team is the FRT, which is a contractor run, on-water spill response team based on Ford Island. The Immediate Response Teams are the first responders to OHS spills. Table 10.9 lists the key personnel and contact information for the FRT.

TABLE 10.9: FACILITY RESPONSE TEAM						
Name	**Day Phone**	**24 Hr Phone**	**Response Time (Min)**	**Response Job**	**Training Type**	**Training Date**
Operations Manager	472-9942	472-9942	< 30 min	Operations Leader	ICS/ 40-HOUR HAZWOPER	See training records
23 Personel	Same	Same	< 30 min	Skimmer/ Boat Operator	40-HOUR HAZWOPER	See training records
5 Personel	Same	Same	< 30 min	Decontamination	40-HOUR HAZWOPER	See training records
4 Personel	Same	Same	< 30 min	Vacuum Truck	40-HOUR HAZWOPER	See training records
12 Personel	Same	Same	< 30 min	As Directed	40-HOUR HAZWOPER	See training records
NOTE: The FRT is manned 24-hours/day and operates out of Building 3 on Ford Island.						

10.2.2 Spill Management Team

The Navy policy is to use the Incident Command System (ICS)/Unified Command (UC) for structuring Navy spill response management organizations. These are effective command and control systems specifically designed to be flexible in order to accommodate small to worst-case spills and the changing conditions and dynamics that often occur in a spill response. In addition, the ICS and UCS structures facilitate coordination with regulatory agency personnel, contractors, and public organizations or groups.

The CNRH SMT takes over control from the Fire Department once the emergency phase of the spill is over. The composition of the team, using the ICS structure, will vary depending on the circumstances and scope of the spill as noted earlier. The SMT's structure and positions are discussed in Appendix B of the CNRH Integrated Contingency Plan (ICP).

10.3 Navy Supervisor of Salvage (SUPSALV)

Naval Sea Systems Command (NAVSEA), through the SUPSALV, Code 00C, maintains the largest inventory of pollution response equipment anywhere in the Navy. This equipment is suitable for offshore and salvage-related pollution incidents and is located at four Emergency Ship Salvage Material (ESSM) Warehouses around the country for rapid deployment to pollution sites. Table 10.10 provides an inventory of SUPSALV pollution control equipment along with its location. Along with the equipment, SUPSALV provides trained contractor personnel to operate equipment, and experienced staff operations personnel to assist the NOSC in key decision-making.

TABLE 10.10: NAVY SUPSALV OIL SPILL RESPONSE EQUIPMENT

SKIMMER SYSTEMS

System ID	System	EDRC	ESSM VA	ESSM CA	ESSM AK	ESSM HI
		bbls/day	#	#	#	#
P16100	Modular Vessel Skimmer	3,929	3	4	2	2
P16200	Salvage Support Skimmer	1,056	2	3	0	2
P16300	High Speed Skimmer VOSS	1,510	10	1	1	1
P16310	Class XI VOSS	3,929	1	0	1	0
P16400	Vessel Skimmer	3,929	5	4	1	1
P16500	Heavy Debris Recovery System	2,757	1	1	2	0
P16700	Inland Support Skimmer	651	0	0	2	0
P18100	Vacuum Pump Skimmer	2,400	1	0	0	0
Total EDRC bbls/day			57,730	38,867	24,042	15,409

BOOM SYSTEMS

System ID	System	Boom (ft)	ESSM VA	ESSM CA	ESSM AK	ESSM HI
			#	#	#	#
P16200	Salvage Skim Van	1,000	2	3	0	2
P19070	Oil Containment Boom System, 18" Harbor Boom	2,000	9	8	3	0
P19080	Oil Containment Boom System, USS-18 " IFL Boom	4,000	3	2	5	2

TABLE 10.10: SUPSALV OIL SPILL RESPONSE EQUIPMENT						
BOOM SYSTEMS (Cont.)						
System ID	System	Boom (ft)	ESSM VA	ESSM CA	ESSM AK	ESSM HI
			#	#	#	#
P19090	Oil Containment Boom System, USS-26" Boom	3,200	5	3	3	4
P19100	Oil Containment Boom System (42")	2,000	16	10	7	8
Total Booming (ft)			80,000	56,600	49,600	38,800
TEMPORARY STORAGE						
System ID	System	TSC (bbls)	ESSM VA	ESSM CA	ESSM AK	ESSM HI
			#	#	#	#
P14200	290K Gallon Bladder	6,905	0	0	1	1
P14100	136K Gallon Bladder	3,238	5	4	2	2
P14300	50K Gallon Bladder	1,190	1	2	0	0
P14300	26K Gallon Bladder	619	1	0	0	0
P16100	26K Gallon Bladder	619	1	2	2	2
P14300	21K Gallon Bladder	500	14	0	1	1
P16100	21K Gallon Bladder	500	2	2	0	0
P16400	21K Gallon Bladder	500	5	4	2	0
P16700	1,500 Gallon Bladder	36	0	0	2	0
P16200	500 Gallon Bladder	12	6	9	0	6
P16500	500 Gallon Bladder	12	1	1	2	0
Total TSC bbls			29,202	19,690	16,215	15,191

10.3.1 Contact Information

For spills exceeding CNRH's response capabilities (Tier 2 & 3 spills) SUPSALV can be contacted at 202-781-1731, extension 2. The numbers will connect to NAVSEA personnel who will in turn notify SUPSALV. SUPSALV can respond from their ESSM base at Bishop Point in JBPHH within 6 hours and within 36 and 60 hours from their West Coast and East Coast locations, respectively.

Equipment requests should be initiated from SUPSALV's CAC enabled website - https://secure.supsalv.org. The ESSM Equipment Request link can be found on the left side menu. If commands are unable to access the CAC enabled site, they may use the following PDF. [Request Form PDF] (preferred method) or by naval message, official e-mail, or by FAX using sample format provided below. Additional U.S. Navy guidance is available on the instructions section of the 00C2 Salvage Publications section of SUPSALV's CAC enabled website.

Requests should be forwarded to:
Email: essmmanager@supsalv.org
Phone: 202-781-1731 extension 2, or
Fax: 202-781-4588

Navy Request for ESSM Equipment - Required Content

From:
To: Naval Sea Systems Command (SEA00C) (ESSMManager@supsalv.org)
Subj: REQUEST FOR ESSM EQUIPMENT

Requesting Activity:

Equipment Required:

Justification for Request:

Required Delivery Date:

Anticipated Return Date:

Shipping Instructions:

Provide Shipping TAC or TCN number or appropriate line of accounting.
Provide appropriate line of accounting to cover repair or replacement of lost or damaged equipment/components.

Requestor, Technical P.O.C. Name: Command: Title: Telephone: Fax: Email:

Financial P.O.C. Name: Command: Title: Telephone: Fax: Email:

Additional Information:

10.3.2 Authority to Utilize U.S. Navy SUPSALV

The below letter from the Department of Navy, dated January 10, 2014, authorizes any DOD facility to list in its FRP/ICP the spill response resources owned and managed by U.S. Navy SUPSALV in order to meet their OPA 90 requirements.

DEPARTMENT OF THE NAVY
NAVAL SEA SYSTEMS COMMAND
1333 ISAAC HULL AVENUE SE
WASHINGTON NAVY YARD DC 20376

IN REPLY TO:

5090
Ser 00C25/2002
10 JAN 2014

From: Commander, Naval Sea Systems Command (00C)

Subj: AUTHORITY TO UTILIZE U.S. NAVY SUPERVISOR OF SALVAGE (SUPSALV) OIL SPILL RESPONSE EQUIPMENT

Ref: (a) SUPSALV Ltr Ser 00C25/2016 of 23 May 2008
(b) Oil Pollution Act of 1990 (OPA 90),
(c) OPNAVINST 5090.1(series), Environmental Readiness Program Manual
(d) 40CFR300, National Oil and Hazardous Substances Pollution Contingency Plan

Encl: (1) USCG Tiered Response Requirements, excerpts from 33CFR154, 33CFR155, and 40CFR112
(2) SUPSALV Equipment Capabilities

1. This letter replaces and updates reference (a), including the addition of contract aerial surveillance and dispersant capabilities newly required by reference (b). Pursuant to reference (b), facilities handling threshold quantities of oil are required to maintain Facility Response Plans (FRPs), addressing a full range of spill response scenarios. For each scenario, response equipment and trained personnel are required to respond with a defined capability and within certain time requirements. This letter authorizes any DoD facility to list in its FRP the spill response resources owned and managed by the U.S. Navy Supervisor of Salvage (SUPSALV) to the extent they meet the time and capability requirements of the mandated scenarios.

2. In accordance with reference (c), the Office of the Supervisor of Salvage (SUPSALV) of the Naval Sea Systems Command (NAVSEA Code 00C) is responsible for providing technical support and resources to the Navy Fleet and shore establishment under the oil and hazardous substance (OHS) spill response program. Reference (d) discusses SUPSALV capability to provide spill response assistance, upon request of the On Scene Coordinator (OSC), to other federal agencies. Under its Emergency Ship Salvage Material (ESSM) System, SUPSALV maintains an extensive inventory of centrally-located, open-ocean and catastrophic (on land or afloat) spill response equipment that is strategically

Subj: AUTHORITY TO UTILIZE U.S. NAVY SUPERVISOR OF SALVAGE (SUPSALV) OIL SPILL RESPONSE EQUIPMENT

pre-positioned to provide rapid response to Navy spills. This equipment, with operating personnel, is available for response to any DoD component (and any other federal agency, if requested by the OSC) in the event of large oil spills beyond the capabilities of the facility's locally available spill response assets Access to this equipment is on an actual cost-reimbursable basis for deployment - there is no retainer charge. SUPSALV spill response assets in the United States are located in Williamsburg, VA, Port Hueneme, CA, Pearl Harbor, HI, and Anchorage, AK. SUPSALV military and civilian technical specialists are available around-the-clock to provide further information on available resources and to assist with on-scene emergency response by providing technical assistance and/or coordinating the deployment and management of SUPSALV contractor and ESSM resources as required by the Navy/Federal customer.

3. SUPSALV's equipment inventory is capable of rapid deployment by either air or truck. The gear has been specifically designed to be self-supporting and capable of operating in remote locations if need be. This capability allows SUPSALV to operate in both inland and at-sea environments. SUPSALV personnel, equipment, and technical specialists have extensive operational experience and meet US Coast Guard Oil Spill Removal Organization (OSRO) maintenance, exercise and training requirements.

4. Regulatory agencies have established a combination of required response resources and the times within which the resources must arrive on scene for various spill scenarios, including Worst Case Discharges (WCD). Enclosure (1) provides a summary of WCD Tiered requirements as described in 40CFR112, 33CFR154, and 33CFR155. The geographic dispersion of SUPSALV's Emergency Ship Salvage Material (ESSM) bases allows SUPSALV flexibility in pulling equipment from the closest ESSM site or support contractor site, or by cascading equipment from other bases. This can greatly expedite response times and increase the amount of available assets. Response from the ESSM base in Williamsburg generally meets WCD Tiers 2 and 3 time requirements for the Gulf Coast, East Coast, and Great Lakes, and Tier 3 requirements on the West Coast (except for the Puget Sound area). Response from the ESSM base in Port Hueneme generally meets the WCD Tiers 2 and 3 time requirements for the West Coast and Tier 3 requirements on the Gulf Coast, East Coast, and Great Lakes. This response capability allows most DOD facilities and afloat entities to list SUPSALV as an appropriate responder in their spill contingency plans (such as Facility Response Plans,

Subj: AUTHORITY TO UTILIZE U.S. NAVY SUPERVISOR OF SALVAGE (SUPSALV) OIL SPILL RESPONSE EQUIPMENT

Spill Contingency Plans, and Vessel Response Plans) in order to meet government mandated response requirements (facilities) or voluntary compliance (public vessels). To determine a predicted response time for any specific facility, please call the point of contact at SUPSALV listed below.

5. The SUPSALV web link, www.supsalv.org, may be useful during updates of Oil and Hazardous Substances (OHS) spill contingency plans for Navy and other Department of Defense facilities that cite SUPSALV as a spill response organization. Planning information can be found under the "00C25 Environmental" tab of this website and specifically under "Equipment." General information and equipment descriptions are available as well as the following resources:

- "ESSM Pollution Response Equipment Inventory (By location)" offers users an updated table listing the equipment available at each ESSM location.
- "SUPSALV Contingency Planning" offers users pre-calculated Effective Daily Recovery Capacity (EDRC), Temporary Storage Capacity (TSC) and Feet of Boom for all SUPSALV equipment.
- "ESSM Equipment Request Procedures" provide guidelines for requesting SUPSALV assistance (such as request procedures, funding requirements, and a sample request message).

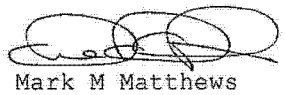
Enclosure (2) lists equipment capabilities using OPA 90 calculations. These figures may be used in determining equipment requirements necessary to meet worst case discharge (WCD) scenarios. Further descriptions of the equipment capabilities can be provided upon request. Each command remains responsible to ensure that they can meet the tiered response requirement criteria outlined in the regulations as applied to their facility.

6. Addressees desiring to include SUPSALV response assets in their contingency planning, or desiring further information, should coordinate with the points of contact listed in this paragraph. Addressees are further requested to distribute information regarding SUPSALV's response resources to their subordinate commands. Questions concerning access to SUPSALV resources can be addressed to the SUPSALV Operations and Ocean Engineering Division at (202) 781-1731, extension 2. Points of contact are Mr. Mike Herb for salvage matters and Mr. Kemp Skudin for pollution response matters.

3

Subj: AUTHORITY TO UTILIZE U.S. NAVY SUPERVISOR OF SALVAGE (SUPSALV) OIL SPILL RESPONSE EQUIPMENT

For after-hours emergencies, contact the NAVSEA Duty Officer at (202) 781-3889.



Mark M Matthews
Supervisor of Salvage and Diving,
Director of Ocean Engineering, USN

DISTRIBUTION:
National Response Team
Regional Response Teams
National Air and Space Administration
National Oceanic and Atmospheric Administration
National Science Foundation
USCG District Offices (dr)
USCG Sector Commands
U.S. Maritime Administration (MAR-610.1)
USNORTHCOM (J3, J5)
Deputy Commandant of the Marine Corps (Installations and Logistics)
HQ USAF (AF/A7C, AF/A7CV)
HQ Air Force Civil Engineer Support Agency (AFCESA)
Air Force Petroleum Agency (AFPA)
HQ Air National Guard (ANG)
Army Corps of Engineers
ATZF-CSS Marine Safety Office (Dept of the Army Watercraft Fleet)
ASAR 63rd RSC/99th RRC (Dept of the Army Reserve Watercraft Fleet)
COMSC (N732)
COMSUBFOR (N451A))
NAVFAC LANT (EV12)
NAVFAC PAC (EV1)
NAVFAC EXWCNAVFAC MIDLANT (N45, EV1)
NAVFAC SOUTHEAST (N45, EV1)
NAVFAC MIDWEST (N45, EV1)
NAVFAC SOUTHWEST (N45, EV1)
NAVFAC NORTHWEST (N45, EV1)
NAVFAC WASH (N45, EV1)
NAVFAC HAWAII (N45, EV1))
NAVFAC MARIANAS (N40, EV1)

Copy to:
USCG Headquarters (CG-533)
USCG Marine Safety Center
Federal Emergency Management Agency

Subj: AUTHORITY TO UTILIZE U.S. NAVY SUPERVISOR OF SALVAGE (SUPSALV) OIL SPILL RESPONSE EQUIPMENT

Environmental Protection Agency
Office of the Secretary of Defense (Joint Director of Military Support (JDOMS))
Missile Defense Agency (SBX-1 Program)
Defense Logistics Agency- Energy
OPNAV (N452)
COMPACFLT (N01CE15, N3, N4, N4655)
CUSFFC (N3, N43, N7)
COMUSNAVCENT (N3, N44, N5)
COMUSNAVEUR, COMUSNAVAF (N3, N5)CNIC (N45)
NAVFACHQ (CWA Program Administrator)
NAVFAC FAREAST (EV1)
COMNAVREG MIDLANT (N451)
COMNAVREG SOUTHEAST (N45)
COMNAVREG MIDWEST (N45)
COMNAVREG SOUTHWEST (N45)
COMNAVREG NORTHWEST (N45G)
COMNAVREG HAWAII (N45)
COMJTFREG MARIANAS (N40)
COMNAVFOR JAPAN (N45)
COMNAVFOR KOREA (N91)
COMNAVREG EURAFSWA (N45)
CCOMNAVREG EURAFSWA, Det Bahrain (EVSWA, N45)
NAVFAC EURAFSWA (EV1)
COMTHIRDFLT
COMFOURTHFLT
COMFIFTHFLT
COMSIXTHFLT
COMSEVENTHFLT
NSWCCD-SSES

TIERED RESPONSE REQUIREMENTS

RESPONSE TIMES:

33 CFR 154 Required Response Times for Marine-Transportation-Related Facilities	Tier 1 Time Hrs.	Tier 2 Time Hrs.	Tier 3 Time Hrs.
High Volume Port Areas (except for a TAPAA facility located in Prince William Sound, see 33 CFR 154.1135)	**6**	**30**	**54**
Great Lakes	**12**	**36**	**60**
All other river and canal, inland, and nearshore areas	**12**	**36**	**60**

33 CFR 155 Required Response Times for Vessels	Tier 1 Time Hrs.	Tier 2 Time Hrs.	Tier 3 Time Hrs.
High Volume Port Areas	**12**	**N/A**	**N/A**
Great Lakes	**18**	**N/A**	**N/A**
All other river and canal, inland, and nearshore areas	**24**	**N/A**	**N/A**
Open ocean (plus travel time from shore)	**24**	**N/A**	**N/A**

40 CFR 112 Required Response Times for Non-Transportation-related Onshore and Offshore Facilities	Tier 1 Time Hrs.	Tier 2 Time Hrs.	Tier 3 Time Hrs.
High Volume Port Areas	**6**	**30**	**54**
Great Lakes	**12**	**36**	**60**
All other river and canal, inland, and nearshore areas	**12**	**36**	**60**

RESPONSE CAPABILITY REQUIREMENTS CAPS BY OPERATING AREA:

February 18, 1998 *(40 CFR 112, 33 CFR 154 & 33 CFR 155)*	Tier 1	Tier 2	Tier 3
All except Rivers and Canals, Great Lakes	**12.5K bbls/day**	**25K bbls/day**	**50K bbls/day**
Great Lakes	**6.25K bbls/day**	**12.3K bbls/day**	**25K bbls/day**
Rivers and Canals	**1.875K bbls/day**	**3.75K bbls/day**	**7.5K bbls/day**

Note: 1) The caps show cumulative overall effective daily recovery capacity requirements, not incremental increases. Also, requirements for a given facility may be less.

Enclosure (1)

10.4 Commercial Resources

10.4.1 Spill Response Contractors

A number of commercial response organizations exist within CNRH NOSC's AOR that can be contracted by using a United States Coast Guard (USCG) Basic Ordering Agreement (BOA). These commercial organizations, listed in Table 10.11, may be considered for response efforts as a supplement to the Navy facility equipment that already exists in the local area.

TABLE 10.11: SPILL RESPONSE CONTRACTORS

Name	Day Phone	Other Phone	Response Time	Capability
PENCO	545-5195	524-2307 (fax)	< 12 hours	Can provide on-water containment and recovery, and on-land cleanup capabilities.
NRC [1]	631-224-9141	-	< 12 hours	Can provide on-water containment and recovery, on-land cleanup capabilities, and dispersant coverage (including dispersant aircraft).

NOTES

[1]The CNRH NOSC Representative can also access the services of the NRC by going through U.S. Navy SUPSALV.

ADDRESSES:

- PENCO, 65 N. Nimitz Hwy, Pier 14, Honolulu, HI 96817
- NRC, 3500 Sunrise Highway, Suite 200, Building 200, Great River, NY 11739

10.4.2 Commercial Barge Services

Table 10.12 lists commercial barge services for the State of Hawaii and may have barges available for use as temporary storage of recoverd oil.

TABLE 10.12: COMMERCIAL BARGE SERVICES

Company Name	Address	Phone Number
American Marine Corporation	65 N. Nimitz Hwy, Pier 14 Honolulu, HI 96817	545-5190
Matson Navigation Company	1411 Sand Island Parkway Honolulu, HI 96819	462-8766
Kirby Offshore Marine, LLC	Pier 21, Honolulu, HI 96813	522-1000
Aloha Marine Lines	709 N. Nimitz Hwy, Pier 29, Honolulu, HI 96817	536-7033
Young Brothers	1331 N. Nimitz Hwy Honolulu, Hawaii 96817	543-9311
Sause Bros.	705 N Nimitz Hwy, Honolulu, HI 96817	521-5082
Healy Tibbits Builders	99-994 Iwaena St., Ste. A Aiea, HI 96701	487-3664

10.5 State Resources

The Hawaii Area Contingency Plan details the resources that are available around the State.

10.6 Federal Response Resources

Table 10.13 provides a matrix of Federal response resources that have expertise in OHS spill response.

TABLE 10.13: FEDERAL SPECIAL TEAMS				
Expertise		**Resources**	**Locations**	**Contact Information**
NSFCC National Strike Force Coordination Center	International case coordination Response equipment location Spill management; logistics; PREP exercises	Coordination of all NSF resources, including coordination of combined strike team responses; National Spill Response Resources Inventory; Logistical coordination and spill management staff . PIAT (element of NSFCC)	Elizabeth City, NC	Contact direct at: (252) 331-6000 or via NRC at: (800) 424-8802 ACTIVATION BY NOSC REP
Navy SUPSALV Supervisor of Salvage	Ocean oil spill abatement Shipboard damage control; Diving/ROV expertise; U/W search/recovery; U/W ship husbandry; Ship salvage plans and operations	Specialized pumping and skimming equipmt; Open ocean boom; Boom mooring equipment & fireboom; ROVs; Shipboard damage control equipment; Ship salvage equipment repair, rigging, command and control; Boats, decon vans; Salvage contracts.	Equipment locations are: JBPHH, HI Port Hueneme, CA Anchorage, AK Williamsburg, VA Worldwide salvage contracts	Contact direct: Day: (202) 781-1731 Press option #2 Night: (202) 781-3889 or via NRC at: (800) 424-8802 ACTIVATION BY NOSC REP
NSF USCG Strike Teams Atlantic Strike Team Gulf Strike Team Pacific Strike Team	Lightering; Pumping; Boom; Skimming; Air monitoring; Site safety; Site security In-Situ burning; Dispersant application; Operational & technical expertise; Damage assessment	Cargo lightering pumps; Dewatering/deballasting pumps; Command posts; Chemical response (Level "A"); Open water oil Containment & recovery systems (OWOCRS); Air monitoring equipment; Temporary storage devises; Communications equipment	Atlantic - Ft Dix, NJ Gulf - Mobile, AL Pacific – Navato, CA	Contact direct at: (609) 724-0008 (Atlantic) (251) 441-6601(Gulf) (415) 883-3311(Pacific) or via NRC at: (800) 424-8802 ACTIVATION BY NOSC REP
NOAA SSC Scientific Support Coordinator	Resources at risk; Chemistry; Liaison with scientific community; Dispersant and bioremediation; Trajectories	CAMEO; Air plume modeling equipment; Oil trajectory modeling equipment; Chemical sampling analysis; Biological and water sampling equipment	USCG District Offices: Seattle, WA RTC Yorktown, VA Governors Island, NY	Contact specific SSC: Day: 725-5903 ACTIVATION BY NOSC REP
PIAT Public Information Assist Team	Public affairs and media management assistance; Public affairs training	Press office equipment; Photodocumentation equipment	Elizabeth City, NC	(252) 331-6000 ACTIVATION BY NOSC REP
Oceana Regional Response Team (ORRT)	Provides technical assistance to OSC's during spill responses	Technical assistance	Hawaiin and Pacific Island	541-2710 EPA 535-3307 USCG ACTIVATION BY NOSC REP

TABLE 10.13: FEDERAL SPECIAL TEAMS				
Expertise		**Resources**	**Locations**	**Contact Information**
EPA ERT Environmental Response Team	Treatment technology Hydrology; engineering; geology; chemistry; Biology; How *clean* is *clean* issue? Health and safety	Sampling equipment to conduct investigations related to the release of oil or hazardous substances; Analytical laboratory available Air monitoring; Underwater ROV	EPA Headquarters, Emergency Response Division Washington DC Edison, NJ Cincinnati, OH	Email: Powell.greg@epa.gov ACTIVATION BY NOSC REP
EPA Region IX Environmental Emergencies	Technical assistance	Technical assistance		(800) 300-2193 ACTIVATION BY NOSC REP
CDC Center for Disease Control	Health hazard info. and assessment of exposure and dosage to individuals; Medical monitoring associated with oil etiologic agents.	Environmental health laboratory services	Atlanta, GA	(404) 639-3311 ACTIVATION BY NOSC REP
ATSDR Agency for Toxic Substance and Disease Registry	Chemical spill response; scientific consultation; medical; toxicological and chemical safety and information; support in evaluating and abating human health hazards	Health hazard and treatment information Medical consultation for exposed individuals and areas Limited air modeling Toxicologic, chemistry and medical officer staff	Atlanta, GA	(800) 232-4636 ACTIVATION BY NOSC REP

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11.0 WASTE MANAGEMENT AND DISPOSAL PROCEDURES

This section provides information on the requirements and procedures to properly collect, store, manage, and dispose of waste resulting from a spill response at the RHFSF.

The types of waste expected from a spill response include:

- Recovered oil
- Oil and water emulsions
- Oil-contaminated wastes such as:
  - Spent sorbents
  - Oil-contaminated debris and materials such as disposable personal protection equipment, rags, plastic bags or sheets, etc.
  - Oiled vegetation, soil and gravel
- Waste decontamination solutions and effluents from equipment and personnel decontamination operations
- Non-contaminated wastes from response operations

In the case of a large spill, where an Incident Command (IC) or UC has been set up, the Planning Section should prepare an incident specific Waste Management and Disposal Plan. This plan provides specific procedures to be used by the Disposal Group to ensure that all oil contaminated wastes generated by the incident are properly managed, containerized, marked and disposed. A template for the Waste Management and Disposal Plan is provided in Appendix D of this plan. This plan is prepared by the Environmental Unit in collaboration with the Disposal Group and shall be reviewed by the Operations Section Chief and the Planning Section Chief. The plan shall be approved by the IC or UC and made part of the Incident Action Plan. The execution of the plan by the Disposal Group shall be monitored by the Environmental Unit for its effectiveness. The plan shall be updated and modified as necessary. Any changes to the plan shall be approved by the IC or UC. It is recommended that a copy of this section be provided with the plan to the Disposal Group as a reference document.

11.1 Responsibility

The IC shall ensure that waste management and disposal operations comply with regulatory requirements and prevent risk to health and safety of response personnel and the public. Management and disposal of oil and wastes generated during cleanup operations is the responsibility of the Disposal Group. During the spill cleanup, the Disposal Group shall:

- Collect spill residue, other contaminated material, and all non-reusable cleanup materials, including disposable clothing, sorbents, brushes, rags, brooms, and containers. Package material in Department of Transportation (DOT) approved containers. Mark and label containers in accordance with DOT and EPA requirements.
- Thoroughly ventilate affected areas, especially if it is within an enclosed area, such as the Red Hill tunnel. Comply with all safety, health and fire protection requirements.

If necessary and requested by the IC, the NOSC shall activate the appropriate contracts or agreements for the cleanup. In the event of cleanup by outside contractor or agency, the NOSC shall maintain on-scene command and support cleanup as needed.

After the spill cleanup, the IC shall ensure that all waste and contaminated items generated by the incident are properly identified, containerized, stored, manifested, and disposed, recycled or reclaimed.

11.2 Waste Collection, Management, and Disposal Process

Wastes shall be collected in drums, tanks, dumpsters or other appropriate containers that are compatible with the contents to avoid leaks, corrosion or adverse chemical reactions. All containers that hold liquids shall be stored on spill pallets or within impervious berms to prevent any leaks from entering streams, storm drains or other waterways. Large containers shall be placed on plastic sheets. Dumpsters that hold oil-contaminated debris shall be lined with plastic to prevent leaks. Containers that hold flammable or combustible materials shall be stored per fire prevention regulations and National Fire Protection Association (NFPA) 30.

Waste disposal shall comply with all Federal and State regulations. Prior to disposal, waste profiles, laboratory analyses, waste manifests and other documents shall be reviewed and approved by the Environmental Unit. Where possible, disposal of non-hazardous waste at H-Power, such as oil-contaminated absorbents, is preferred. Non-hazardous wastes that are to be disposed at local permitted landfills must meet all requirements of the destination facility. The request for clearance number from the landfill facility shall be signed by the Disposal Group Supervisor or the Environmental Unit Leader on behalf of the Region. When ready for transport, non-hazardous waste manifests shall be signed by the Disposal Group Supervisor. As part of the incident demobilization, all areas used to store waste containers shall be inspected for signs of leaks or spills. Clean up any spills and dispose of the wastes per this disposal plan.

The final step in executing the disposal plan is to submit all documents to the Documentation Unit related to waste identification, management and disposal. This includes laboratory analyses necessary to characterize the waste, photographs, manifests, waste profiles, etc. This is necessary to confirm that all wastes were properly managed in accordance with applicable Federal and State regulations and with Navy instructions.

11.2.1 Fuel to be Reclaimed and Sold

In a major fuel release in the tunnel, it is anticipated that this will generate large quantities of fuel that has been contaminated by dirt, debris, water, etc. It is possible that this fuel can be reclaimed and sold by the government. If so, then this is not considered waste, including JP-5. Storage of this fuel while awaiting sale will likely be within existing storage tanks as directed by NAVSUP FLCPH Fuel Director. Transfer of the fuel from these storage facilities to the buyer is not part of the disposal plan procedures.

11.2.2 Waste Characterization

Each waste stream must be characterized to determine if it is a regulated hazardous waste (HW) per Hawaii Administrative Rule (HAR) 11-261. This can be done through user's knowledge of the materials or the process by which these materials became wastes. For example, SDSs can provide data on certain characteristics such as flash point or pH that can be used to make the HW determination.

Table 11.1 provides general guidance on waste material classification and the appropriate disposal strategy. This is a general guide only and it is essential that the classification be verified for each specific incident. If necessary, samples should be analyzed to determine whether the waste meets the criteria of a hazardous waste or whether other disposal or recycling options exist. Laboratory analysis may also be necessary for disposal in permitted industrial landfills.

TABLE 11.1: MATERIAL CLASSIFICATION AND DISPOSAL STRATEGY

Material	Classification	Disposal Strategy	Disposal Facility
Recovered Oil	Reclaimable	Process through NAVSUP FLCPH Fuel Oil Reclamation Facility (FORFAC) as off-specification petroleum for reclamation.	NAVSUP FLCPH FORFAC or permitted used oil processor
	HW	Containerize, label and dispose as HW according to regulatory requirements.	Permitted Treatment, Storage, and Disposal Facility (TSDF)
Oil-Contaminated Wastes	Nonhazardous Waste	Dispose as ordinary solid waste.	Permitted solid waste landfill
	HW	Containerize, label as HW according to regulatory requirements.	Permitted TSDF
Contaminated Soil	Nonhazardous Waste	Consult with Hawaii Dept. of Health to determine disposal or treatment method.	To be determined
	HW	Containerize, label as HW according to regulatory requirements.	Permitted TSDF
Contaminated Equipment	Nonhazardous Waste	Clean according to section maintenance procedures.	N/A
	HW	Decontaminate.	N/A
Waste Chemicals to Include DECON Solutions	Nonhazardous Waste	Process through NAVFAC HI Industrial Waste Treatment Center (IWTC) or contractor	NAVFAC HI IWTC or contractor
	HW	Containerize, label as HW according to regulatory requirements.	Permitted TSDF
Dead Wildlife	Protected Species	Consult with Fish and Wildlife Service.	To be determined
	Other Species	Consult with Fish and Wildlife Service.	To be determined
Personal Protection Equipment	Nonhazardous Waste	Clean and reuse where possible; dispose of as ordinary solid waste if unable to reuse.	Permitted solid waste landfill
	HW	Containerize, label as HW according to regulatory requirements.	Permitted TSDF
Sorbents	Nonhazardous Waste	Dispose of as ordinary solid waste.	Permitted solid waste landfill
	HW	Containerize, label as HW according to regulatory requirements.	Permitted TSDF
Other Response Wastes	Nonhazardous Waste	Dispose of as ordinary solid waste.	Permitted solid waste landfill
	HW	Containerize, label as HW according to regulatory requirements.	Permitted TSDF
Nickel-cadmium Batteries, Mercury Containing Lamps	HW or Universal Waste	Containerize, label as HW or universal waste according to regulatory requirements.	Permitted TSDF or universal waste destination facility
Lead-acid Batteries	Lead-Acid Batteries Being Reclaimed	Turn in to lead-acid battery reclaimer	Permitted battery reclaimer
Recyclable Materials	Nonhazardous	Recycle at the Region Recycling Center Bldg. 159 (474-9207) or private sector recycler	Recycling Center Bldg. 159 or private sector recycler

In some cases, laboratory analysis may be necessary to determine treatability or disposal options, such as possible disposal in the sewer system, at a bioremediation land farm facility, at the City's H-Power facility where it would be burned for energy recovery or disposal at a permitted industrial landfill. Analysis may also be necessary to determine if the wastes are regulated by the EPA as a HW. Sampling methods shall follow EPA SW-846. Use proper sample preparation and storage protocols as required by the analytical laboratory, e.g., sample preservatives, proper containers, cooling, QC blanks, etc. The chain of custody document shall include the waste container identifier. The waste management log shall also use this same identifier and the sample number for tracking purposes.

11.2.3 Waste Accumulation Areas

Wastes shall be stored in areas as determined by the IC or the SMT. If possible, waste storage areas shall be at or near the point where the waste is initially generated. This reduces the distance that the waste is transported from the immediate response site. This also reduces the chances of spills or leaks while the wastes are moved. However, if the quantity of non-HW is large and the storage area interferes with the response or cleanup activities, it may be necessary to store the wastes farther from the incident site. For non-HW, a paved area at NAVSUP FLCPH adjacent to Building 550 to store containers, tanks, etc. could be identified in the plan as a possible non-HW storage area.

Whenever possible, waste accumulation areas should be located away from storm drains, ditches, swales or any drainage system that leads to streams, rivers or Pearl Harbor. Existing paved areas in the area should be considered for use as a waste accumulation area. Where liquids or sludges are stored, consider placing plastic sheets on the ground to prevent any spills from being absorbed into the dirt or gravel. This would contaminate the environment as well as significantly increase the cost of demobilization. Also, storage areas for liquids or sludges should be bermed. Spill kits should be placed in close proximity to these storage areas and personnel should be trained in the proper use of these kits.

11.3 Temporary Storage for Collected Oil and Response Waste

Table 11.2 is an overview of the Navy-owned temporary storage available to CNRH for collected oil and response waste.

TABLE 11.2: TEMPORARY STORAGE FOR COLLECTED OIL AND RESPONSE WASTE

EQUIPMENT	CAPACITY	LOCATION / POC / TELEPHONE
Bulk Storage Equipment for Recovered Oil		
SWOB Barge # 12 and 48	2 @ 70,000 gals.	Waterfront Operations Officer 474-6262
YON Barge # 328, 335, 336	# 328 @ 500,000 gals. # 335 @ 300,000 gals. # 336 @ 300,000 gals.	Fuel Department 473-7833 or 690-0115 (24 hours)
YON Barge # 281	300,000 gals.	Waterfront Operations Officer 474-6262

TABLE 11.2: TEMPORARY STORAGE FOR COLLECTED OIL AND RESPONSE WASTE		
EQUIPMENT	**CAPACITY**	**LOCATION / POC / TELEPHONE**
Bulk Storage Equipment for Recovered Oil		
NAVSUP FLCPH Upper Tank Farm Bulk Storage Tanks	Approximately 6,300,000 gals. each	Fuel Department 473-7833 or 690-0115 (24 hours)
NAVSUP FLCPH FORFAC Bulk Storage Tanks B-1 and B-2	2 @ 378,000 gals. each	Fuel Department 473-7833 or 690-0115 (24 hours)
Oil Storage Bladders	2 @ 136,000 gals. 4 @ 500 gals. 2 @ 26,000 gals. 2 @ 21,000 gals. 1 @ 290,000 gals.	Navy SUPSALV Hawaii ESSM Base (As of 12/2015) (202) 781-1731, Option #2 (during work hours) (202) 781-3889 (Duty Officer, after hours)
Storage Equipment for Contaminated Wastes, Hazardous Wastes, and Other Response Wastes and Debris		
Drums	Multiple @ 55 gals.	NAVFAC HI Environmental Services 471-1171
Dumpsters	Multiple @ Varies	NAVFAC HI Environmental Services 471-1171

Other storage equipment or containers are available from commercial sources. This includes oil-water separators, fractionalization (frac) tanks, intermodal portable tanks (IMO), intermediate bulk containers (IBC), tri-wall boxes, etc. Submit requests to obtain containers or storage equipment to the Logistics Section.

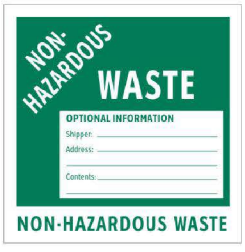
11.4 Waste Container Management

Collection, storage, management and disposal procedures for contaminated wastes generated during the response must be followed closely. Properly handle, label, store, transport, and dispose of oil, oil contaminated debris and other wastes in accordance with Federal, State and local environmental, safety, fire prevention and transportation regulations. Refer to the incident site safety plan for specific safety and health hazard mitigation measures, including PPE requirements. Use heavy duty plastic trash bags and plastic sheets to prevent leaks of liquids from contaminating the ground.

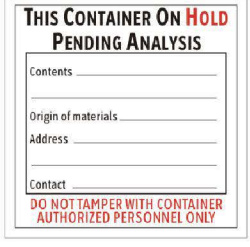
All waste containers shall be labeled when required by applicable Federal and State regulations. Figure 11.1 shows samples of the various labels that shall be applied to containers with waste. Other labels may be used if approved by the Environmental Unit.

FIGURE 11.1: WASTE CONTAINER LABELS

Hazardous Waste



Non- Hazardous Waste



Pending Analysis

In addition, if the waste requires a DOT hazardous material label based on its proper shipping name per 49 CFR 172.101, the HM label shall also be placed on the container next to the waste label while the container is in a storage area. Although not required by law when the container is not being transported, the DOT label alerts others on the hazardous contents of the container. If DOT regulated materials are stored in IMOs, tanker trucks, or other bulk container, placards should be placed per DOT regulations.

Containers must in good condition with no signs of holes, tears, leaks, excessive corrosion, bulging, etc. Containers must be compatible with the materials stored within them. They must be kept closed at all times except when adding or removing materials. All bungs, vents or drum lids must have gaskets that are in good condition to ensure that the container is liquid and vapor tight. Secure all container closures (bungs, vents, retaining bolts, etc.) with a wrench, i.e., not just "finger" tight. Containers to be transported on public roads must meet DOT requirements, including the appropriate performance oriented packaging packing group for that waste per 49 CFR 172.101.

Comply with fire prevention regulations when storing containers that hold flammable or combustible materials or wastes. Segregate containers holding incompatible materials. If required, fire extinguishers of the proper size and type must be placed near the containers with these flammable or combustible materials. If required, store flammable liquids in approved flammable liquid storage cabinets per NFPA 30.

All wastes shall be tracked in a waste log spreadsheet that is managed by the Disposal Group. Each container shall have a unique identifier consisting of the container code, date on which waste was first added into it followed by a sequential number. Use the container code as shown in Table 11.3. The date shall be in "yyyymmdd" format. For example, DM-20150218-1 is the identifier for the first metal drum that received waste on February 18, 2015.

TABLE 11.3: WASTE CONTAINER CODES

Container Type	Container Code	Container Type	Container Code
Burlap, cloth, paper, or plastic bags	BA	Dump truck	DT
Fiber or plastic boxes, cartons, cases	CF	Wooden drums, barrels, kegs	DW
Metal boxes, cartons, cases (including roll-offs)	CM	Hopper or gondola cars	HG
Wooden boxes, cartons, cases	CW	Tank cars	TC
Cylinders	CY	Portable tanks	TP
Fiberboard or plastic drums, barrels, kegs	DF	Cargo tanks (tank trucks)	TT
Metal drums, barrels, kegs	DM	-	-

11.5 Disposal Conditions and Criteria

Table 11.4 provides information on the conditions and criteria for the acceptance and disposal of waste material.

TABLE 11.4: DISPOSAL STRATEGY, DISPOSAL CRITERIA, AND CONDITIONS		
Disposal Strategy	**Disposal Facility and Location/ POC Information**	**Conditions and Criteria for Acceptance and Disposal**
Reclaim oil	NAVSUP FLCPH Fuel Department Director 473-7833 or 690-0115 (cell)	See NAVSUP FLCPH Instruction 4020.1, Fuel Reclamation at Fuel Oil Reclamation Facility
Nonhazardous waste disposal. Seal in drums or in lined dumpsters. Dispose of via contractor or NAVFAC HI	Contractor or NAVFAC HI/ Environmental 471-3858	Contact permitted landfill
Hazardous waste disposal	Permitted TSDF	Pertinent HW Management Plan
Incineration	H-Power, Covanta 682-2099	Only oil-contaminated debris, booms and sorbents approved for incineration by the city and county.
In-situ burning	Oceania RRT 541-2114	Hawaii ACP recommends in-situ burning for an ocean response but must seek RRT approval.
On-shore waste burning for response debris disposal	State On-Scene Coordinator, Elizabeth Galvez, 586-4249	Normally not recommended as a method for disposal.

11.6 General Waste Handling and Disposal Methods

The following briefly describes general disposal methods for various types of response-generated wastes and is provided for guidance only. The specific methods and procedures will be described in the incident specific Waste Management and Disposal Plan. If the collected materials are suspected to be mixed with hazardous wastes (examples: gasoline, halogenated solvents, acid, etc.), keep drummed wastes separate from non-contaminated wastes and notify the Environmental Unit immediately.

11.6.1 Solid Materials / Wastes (non-hazardous waste)

Oiled Natural Inorganic Materials (Oily Soil, Gravel)

1. Place into visqueen-lined dumpsters.
2. Decontaminate equipment used to excavate soil.
3. Sample soil and test if able to dispose at permitted landfill or at bioremediation facility.

Oiled Natural Organic Materials (Vegetation, Leaves, Branches, etc.)

1. Collect in translucent heavy-duty plastic bags, and then double bag to ensure that no leakage occurs.
2. Avoid collecting too much liquid (water or oil) in the bags. Drain excess liquids from bag or place absorbents in the bag before closing. Collect liquids and dispose per below. If only a small amount of liquid is present, add granular absorbents or pads to the bags. Place all bagged wastes into dumpsters or visqueen-lined roll-offs.
3. Transport to the on-site storage area or to central storage area adjacent to Bldg. 550.

Oiled Man-Made Materials (Oily Booms and Absorbent Pads, Oil-Contaminated Debris)

1. Collect in translucent heavy-duty plastic bags, and then double bag to ensure that no leakage occurs.
2. Avoid collecting too much liquid (water or oil) in the bags. Drain excess liquids from bag or place absorbents in the bag before closing. Collect liquids and dispose as oil or oily liquid wastes per below.
3. Place all bagged wastes into dumpsters or visqueen-lined roll-offs at the designated storage area.
4. Transport filled dumpsters to permitted landfill for disposal. If allowed by Covanta, H-Power can accept for incineration.

Oil Saturated Sorbents and Debris

1. The primary method of storage should be in roll off dumpsters. These dumpsters should be lined and covered as is the standard industry practice.
2. If sufficient dumpsters cannot be obtained, then an alternative method is to prepare an area by lining it with two layers of 6 mil plastic. Raise the edge of the plastic to serve as an impermeable berm. If there is a significant amount of oil that may drip from the material, then the plastic should be covered with a sorbent rug.
3. The area must be secured and access must be restricted.
4. Ingress and egress areas for heavy equipment must be maintained in a fashion which does not compromise the integrity of the liner.
5. Consideration must be given to covering the material to prevent excessive rain water from accumulation in the bermed area. This may also be required if the debris may be blown away by strong winds.

Solid Waste from Decontamination (Decon) Operations:

1. Collect dirt, debris, soiled PPE to be disposed, plastic sheeting, etc. in 55-gallon drums at each decon station. Other containers, such as IBCs or tri-walls with plastic sheet liners, may be used if specified in the Waste Management and Disposal Plan.
2. Label as "pending analysis".
3. When all decon operations completed, collect samples, analyze and determine whether it is hazardous waste or if it can be disposed at a local industrial landfill.
4. Dispose based on laboratory analysis and per Environmental Unit.

Waste from Wildlife Rehab Operations:

1. Wastes from rehab operations will be collected in plastic bags. Filled bags will be placed in visqueen-lined roll-off bins and will be managed the same as solid oily debris.
2. Uncontaminated waste, such as paper towels, can be disposed as ordinary trash.

Oiled Animal Carcasses**:**

The disposal of dead oiled wildlife is the responsibility of the Wildlife Branch of the Operations Section. Before removing oiled wildlife carcasses, get specific guidance from the Wildlife Branch. The general handling methods are:

1. Collect in plastic bags.
2. Label with date and time animal found, location found, and person finding animal (name and phone number).
3. Put on ice (chill) but do not freeze.
4. Transport to location designated by Wildlife Branch.

11.6.2 Liquid Materials / Waste (non-hazardous waste)

Oil and Oily Waste:

1. Collect material with pumps or vacuum trucks.
2. Transport to location of temporary storage and empty into collection equipment or tanks.
3. Collect sample, analyze and determine whether or not it can be reclaimed and if it is a HW.
4. If acceptable, reclaim recovered oil through the NAVSUP FLCPH FORFAC. If the oil is unacceptable by the NAVSUP FLCPH FORFAC, dispose per the incident Waste Management and Disposal Plan.

Rinse Water Waste from Decon Operations:

1. Collect rinse water in 55-gallon drums or tote at each decon station.
2. Label container as "pending analysis".
3. When all decon operations completed, collect samples, analyze and determine whether it is HW, if it can be processed as industrial waste water via a contractor or discharged into the sewer system.
4. Dispose based on laboratory analysis and as directed by the Environmental Unit.

Waste from Wildlife Rehab Operations:

1. All oily water recovered from rehab operations will be stored in a portable tank for further analysis / waste characterization.
2. Dispose based on analysis.

11.6.3 Oil in Pearl Harbor or Contributing Streams:

Recovered Product from Skimmer Boats

The On-Water Recovery Group will recover petroleum product from within the harbor using skimmer boats. Minimize the use of absorbent sweeps or pads if possible. When the skimmer tanks are full, the boats shall return to Ford Island or another site designated by the Recovery Group Supervisor and remove the oil with vacuum trucks. The vacuum trucks shall transfer the product to a SWOB or directly into the FORFAC after first tested and approved by the NAVSUP FLCPH Fuel Lab at Building 1685 for acceptance. The recovered product will be transferred from the SWOB via vacuum trucks and taken to the FORFAC for reclamation.

Recovered Product for Shore Side Skimmers

If the oil is near a pier or wharf and accessible to vacuum trucks, the Shore Side Recovery Group will use skimmers and vacuum trucks from dockside and remove the oil. The vacuum trucks will then empty the oil into a SWOB or directly into the FORFAC. Minimize the use of absorbent sweeps or pads if possible.

11.7 Non-Hazardous Waste Disposal Methods

There are several options for disposal of non-hazardous wastes. Each will require review of all documentation by the Environmental Unit. Once approved, the Disposal Group Supervisor can sign the shipping papers. In some cases, disposal at a permitted solid waste landfill will require submitting a request for clearance by the landfill operator. The Environmental Unit will prepare the request and sign the application on behalf of the landowner.

Ordinary trash from the incident command post, rest areas, etc., can be disposed in dumpsters without complying with the requirements stated above. However, ensure that no regulated wastes are disposed as ordinary trash.

11.8 Recyclable Materials

Wherever possible, items should be recycled instead of disposed. These include corrugated cardboard boxes, uncontaminated steel or non-ferrous metals, clean plastic (type 1 or 2), aluminum and glass beverage cans, etc. The Environmental Unit will coordinate with the Region Recycling Center for specific recyclable items that they will accept. Private sector recyclers can also be used.

11.9 Annual Solid Waste Disposal Documentation

At the end of each fiscal year, the amount of wastes disposed, reclaimed or recycled from response and cleanup related to the spill incident for that FY shall be recorded and submitted to NAVFAC HI Code EV13. The Environmental Unit will be responsible for completing this form. This is to comply with the CNO annual solid waste reporting requirements.

12.0 EVACUATIONS

The following evacuation procedures are based on information provided by the FFD. Evacuation routes maps are posted throughout the Red Hill facility.

12.1 Notification of Serious or Facility-Wide Emergency Situation

A serious or facility-wide emergency situation such as a major fuel leak, fire, smoke, or explosion, will require that all or the majority of the RHFSF be notified and evacuated. The preferred means of notification is the activation of the fire alarm pull station, which will activate flashing lights, repeated horn blasts, and recorded verbal announcements throughout the facility.

Fire alarm pull stations, thermal heat detectors, smoke detectors, and ultra violet infrared detectors are located at strategic locations throughout the facility. If one of these devices is tripped, audible and visual alarms will activate throughout the facility and the FFD is notified of the alarm.

Emergency phones (blue boxes) are located throughout the facility and a "giant voice" system enables messages to be broadcast through speakers facility-wide. See Appendix F for the "frame foot mark" location of every emergency phone in the RHFSF.

12.2 Emergency Evacuation Zones, Escape Routes, and Assembly Areas

The RHFSF is divided up into 6 emergency evacuation zones; each zone has a primary and alternate escape route and a designated assembly area as shown in Figure 12.1. Evacuation route maps are located throughout the facility and will glow in the dark in the case of a power failure. Note that for emergency evacuation zones 5L and 6L, in the LAT, that you must take one of the elevators, located on either side of Tanks 17 and 18, up to the UAT to reach your primary escape route exit. In the case of a power failure, there are escape ladders adjacent to each elevator that provide access to the UAT.

In the event of an emergency requiring evacuation of the RHFSF, all employees, visitors, and contractors are to leave the facility by the designated primary escape route for their emergency evacuation zone. Once out of the RHFSF personnel shall gather in their designated assembly areas and remain there until receiving further instructions. Should the primary escape route be in a hazardous area, employees will then use the alternate escape route and assemble outside the nearest adit that is deemed to be safe. Employees will report to their supervisor. Supervisors will notify the Control Room Operator at 471-8081 as to the status of personnel assigned to them. The Control Room Operator tracks all personnel (employees, contractors, and visitors) that scan in and out of the RHFSF using the "Identipass Plus" system. The operator will check his system count against the "Head Count" provided by supervisors to account for all personnel.

Depending on the emergency, the COMPACFLT Building (Building 250) may need to be evacuated due to its proximity to the Adit 2 Spur Tunnel. The Regional Dispatch Center will notify the COMPACFLT Command Duty Officer at 471-3201 of any serious or facility-wide emergency within the RHFSF.

12.3 General Emergency Evacuation Procedures

ALL PERSONNEL SHALL BE FAMILIAR WITH THESE PROCEDURES BEFORE THE NEED TO EVACUATE THE RHFSF EVER ARISES.

- All personnel must be familiar with the emergency evacuation zones at the RHFSF and the associated primary and alternate escape routes (see Figure 12.1).
- When an evacuation is announced, STOP WORK. Keep calm and avoid panic, and move to the designated assembly area for your zone.
- When evacuating the RHFSF, WALK to your designated exit. DO NOT RUN, nor linger.
- Leave the RHFSF and report to your designated assembly area (if safe), or to a safe area away from the adit. REPORT to your supervisor once outside the adit or building and follow his/her instructions. Stay in your assigned safe area until instructed otherwise.
- Emergency escape Self-Contained Self-Rescue (SCSR) breathing apparatuses are available for use by trained NAVSUP FLCPH employees and accompanied guest, to escape or shelter in place in hazardous atmospheric conditions. Emergency escape SCSR breathing apparatuses are located in storage lockers located near Tanks 1 and 19 in the upper and lower tunnels, and also outside the Control Room at Adit 1.
- Supervisor must conduct a "Head Count" and report to the Control Room Operator at 471-8081 when his/her employees have cleared the facility, and if anyone is missing. Contractors will be responsible for accounting for all of their employees and reporting to the Control Room Operator.
- Determine the need for evacuation of residential and commercial areas near the incident site. Evacuation distances and directions will be defined based on consultation of the appropriate technical references (e.g., DOT Emergency Response Guidebook), expert advice (e.g., Fire Department Chief in case of actual potential fire or explosion), actual conditions (e.g., confined spaces, movement of toxic fumes), and response plans.
- If nearby residential and commercial areas or base residents need to be evacuated, initiate and coordinate the evacuation procedure in accordance with the CNRH Emergency Management (EM) Plan and contact the CNRH Navy On-Scene Coordinator (NOSC) for assistance (473-4689 work, 864-2463 cellular, ROC 473-3215).

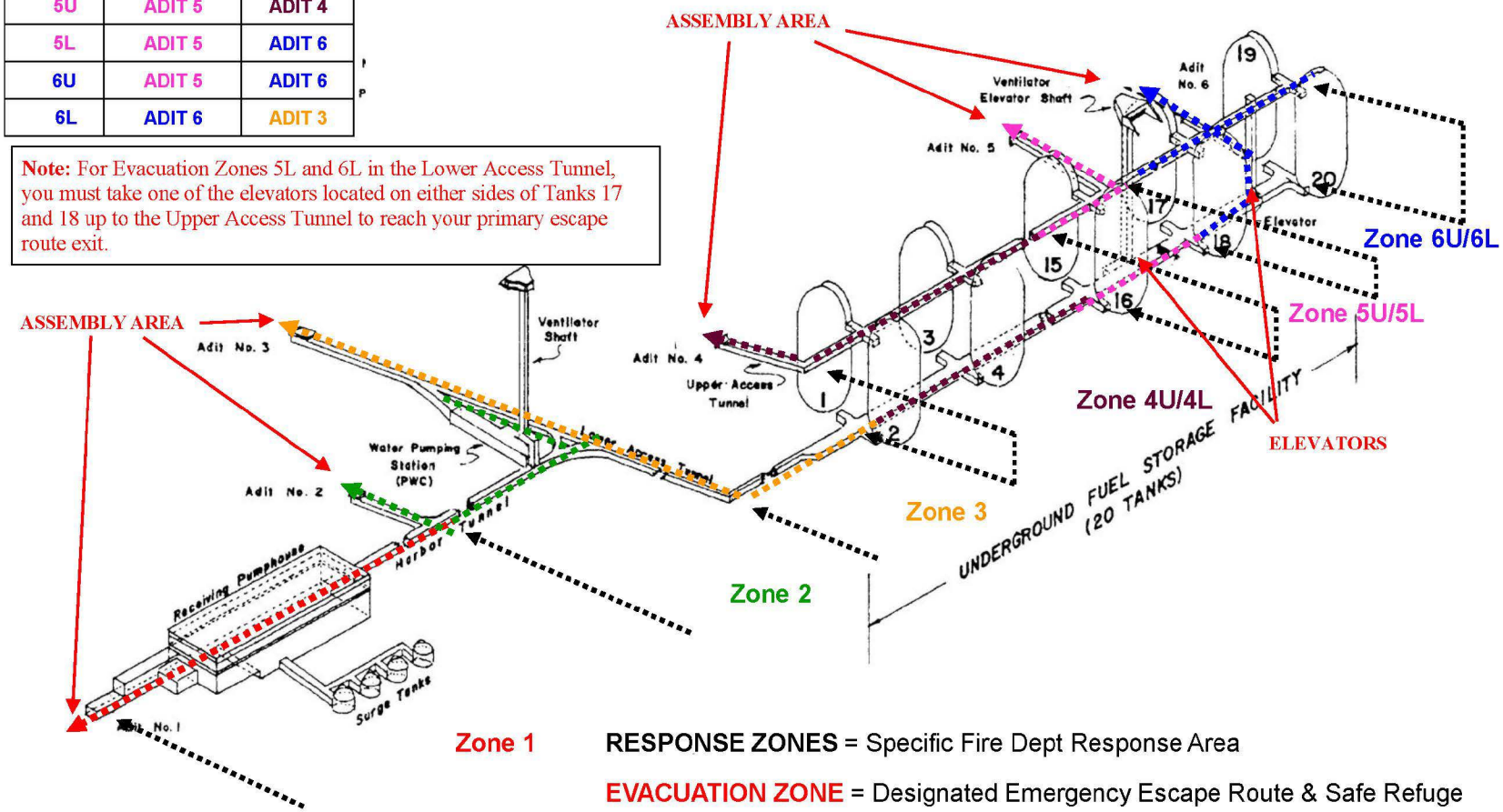
ZONE	ESCAPE ROUTE	ALT. ROUTE
1	ADIT 1	ADIT 2
2	ADIT 2	ADIT 3
3	ADIT 3	ADIT 6
4U	ADIT 4	ADIT 5
4L	ADIT 3	ADIT 6
5U	ADIT 5	ADIT 4
5L	ADIT 5	ADIT 6
6U	ADIT 5	ADIT 6
6L	ADIT 6	ADIT 3

Note: For Evacuation Zones 5L and 6L in the Lower Access Tunnel, you must take one of the elevators located on either sides of Tanks 17 and 18 up to the Upper Access Tunnel to reach your primary escape route exit.

Figure 12.1

RED HILL TUNNEL FUEL STORAGE FACILITY

EMERGENCY EVACUATION ZONES



RESPONSE ZONES = Specific Fire Dept Response Area

EVACUATION ZONE = Designated Emergency Escape Route & Safe Refuge

****ADIT OF EXIT MARKS THE EVACUATION POINT****

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13.0 REFERENCES

The following references were used in the development of this plan:

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APPENDIX A - NOTIFICATIONS

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TABLE A.1: SPILLER NOTIFICATION CHECK-OFF LIST		
Agency Or Department	**Phone No.**	**Notified**
Qualified Individual / NOSC Representative	473-4689 (Office) 864-2463 (24-hour)	Person Notified: _____ Date / Time Notified: _____
National Response Center (NRC)	800-424-8802 (24-hour) 202-267-2675 (Direct #)	Person Notified _____ Date / Time Notified: _____ Report No (as applicable): _____
Hawaii State Emergency Response Commission (HSERC) Provide follow-up written notification within 30 days of initial notification	586-4249 (Days) 247-2191 (After Hours)	Person Notified: _____ Date Notified: _____ Time Notified: _____ Report No. (as applicable): _____
Honolulu Local Emergency Planning Committee (LEPC) Provide follow-up written notification within 30 days of initial notification.	723-8960 (24-hour) 911 (Emergencies)	Person Notified: _____ Date / Time Notified:_____ Report No. (as applicable):_____
Honolulu Board of Water Supply If Navy well at Red Hill Facility is threatened.	748-5000, Ext. 1	Person Notified: _____ Date / Time Notified:_____
Provide follow-up navy message within 24-hours of discovery	See OPNAVINST 5090.1(Series) Message Reports Format	NA

TABLE A.2: INTERNAL NOTIFICATIONS		
Contacts	**Day Telephone**	**24-Hour Telephone**
NOSC (Admiral - CNRH)	473-2200	473-3215/3216 Regional Operations Center (ROC)
NOSC Representative	473-4689	864-2463 (24-hour)
Alternate NOSC Representative	471-1171 x 210	864-2463 (24-hour)
COMPACFLT Area Environmental Coordinator (AEC)	471-0632	471-3201 (CDO)
Regional Dispatch (Fire Dept., Security, Medical)	911 471-7114	911 471-7114
JBPHH Quarterdeck	473-1222	473-1222

TABLE A.2: INTERNAL NOTIFICATIONS		
Contacts	**Day Telephone**	**24-Hour Telephone**
JBPHH Emergency Operations Center (EOC)	448-2752/2753	448-2752/2753
JBPHH Security	911 or 474-2222	911 or 474-2222
CNRH ROC	473-3215/3216	473-3215/3216
Safety	473-1169	473-1169
Liaison	473-4141	368-3150
Public Information	473-2875	554-4813
Legal	473-4731	864-2461
CDOs a. COMPACFLT b. NAVSUP FLCPH c. NAVFAC HI d. NCTAMS PAC e. PHNSY & IMF	 a. 471-5452 b. 216-1339 c. 778-4839 d. 653-5385 e. 449-8000 x 1339	 a. 471-5452 b. 216-1339 c. 778-4839 d. 653-5385 e. 473-8000 x 1339
NAVFAC HI Emergency Service Desk	449-3100	449-3100
NAVFAC HI Environmental	471-3858	471-3858
NAVSUP FLCPH Fuel Department Control Room, Adit 1 Control Room, Building 1757 Fuel Service Center (Hickam Bulk Tanks)	473-7801 471-8081/473-1075 473-7804/473-7837 449-2509	 216-1339 (CDO) 216-1339 (CDO)
Port Operations Control Tower	474-6262 or Channel 69	474-6262 or Channel 69
Facility Response Team (FRT)	472-9942	472-9942
COMPACFLT Salvage Officer	474-5490/6372	471-5452 (Duty Officer)
Emergency Ship Salvage Material (ESSM) Base Hawaii	423-7055 423-6535 (fax)	423-7055 423-6535 (fax)
Mobile Diving Salvage Unit 1 (MDSU 1)	471-9292	471-9292
Navy SUPSALV	202-781-1731 (Option #2) 202-781-3889 (After Hours)	202-781-1731 (Option #2) 202-781-3889 (After Hours)
COMNAVSURFGRU MIDPAC	473-3560	473-3560
Rainbow Bay Marina	473-0279	473-0279
USS Arizona Memorial	422-3399	422-3399
USS Bowfin Submarine Museum & Park	423-1341	423-1341
USS Missouri Memorial	455-1600	455-1600

TABLE A.3: EXTERNAL NOTIFICATIONS		
Agencies To Notify	**Action**	**Telephone Number**
US Coast Guard Sector Honolulu	In the event the NOSC cannot be contacted, notify the USCG Sector Honolulu.	843-3811
US Coast Guard District 14 Command Center	Additional resources.	800-331-6176

TABLE A.3: EXTERNAL NOTIFICATIONS		
Agencies To Notify	**Action**	**Telephone Number**
Hawaiian Islands National Wildlife Refuge	Contact if wildlife, wetlands, or refuges are threatened or impacted.	792-9548
U.S. Fish and Wildlife Service, Pacific Island Office	Notify if Federal natural resources are threatened or impacted.	792-9400
National Park Service - USS Arizona	Noftify if park lands or memorials are threatened or impacted. Superintendent, USS Arizona Memorial.	422-3399
NOAA – Scientific Support Coordinator (SSC)	For advice on scientific issues, communicate with scienitific community, coordinate state and Federal agency requests for specific study assistance and assist On-Scene Coordinator with spill movements and trajectories.	206-849-9926 (office)
NOAA – National Marine Fisheries Service Pacific Island Regional Office	Notify if protected marine species are threatened or impacted. Notify as a natural resources trustee and to assist in spill response if turtles are injured.	725-5000 725-5215 (fax)
Agency for Toxic Substances and Disease Registry	Health information related to the toxicity, chemistry, and decontamination of harzardous materials.	800-232-4636 (24-hr)
Hawaii Poison Control Center	Provides toxological information and medical treatment advice for responders.	800-222-1222 (24-hr)
Honolulu Department of Emergency Management	Department of Emergency Management	723-8960 524-3439 (fax)
Oceania Regional Response Team (RRT)	Notify if public health emergency exists, or may occur.	972-3081 (EPA) 541-2103 (USCG)
NOAA Weather Service	Weather and water conditions and forecasts.	973-5286 (24-hr)
FEMA – Pacific Area Office	If incident presents or may present a MAJOR disaster.	851-7900

TABLE A.4: SPILL RESPONSE CONTRACTORS				
Name	**Day Phone**	**Other Phone**	**Response Time**	**Capability**
PENCO	545-5195	524-2307 (fax)	< 12 hours	Can provide on-water containment and recovery, and on-land cleanup capabilities.
NRC [1]	631-224-9141	-	< 12 hours	Can provide on-water containment and recovery, on-land cleanup capabilities, and dispersant coverage (including dispersant aircraft).

Notes:

[1]The CNRH NOSC Representative can also access the services of the NRC by going through U.S. Navy SUPSALV.

Addresses:

- PENCO, 65 N. Nimitz Hwy, Pier 14, Honolulu, HI 96817
- NRC, 3500 Sunrise Highway, Suite 200, Building 200, Great River, NY 11739

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APPENDIX B - FINANCIAL RESPONSIBILITY

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APPENDIX B - FINANCIAL RESPONSIBILITY

B.1 NAVY RESPONSIBILITY

B.1.1 Pollution Response Funding

Naval activities are mission-funded to perform "housekeeping" cleanup associated with minor pollution incidents. However, the spiller is responsible for all costs incurred for the response and cleanup of pollution incidents caused by a Navy ship or activity. The major claimant or Type Commander (TYCOM) of the spiller is ultimately responsible for funding of the response/cleanup effort. Because major pollution incidents occur so infrequently, there is no funding earmarked to support oil and hazardous substance (OHS) cleanup activities in the Department of Defense (DOD) Future Years Defense Plan (FYDP). Consequently, no naval activity has a pre-established source of emergency funding for pollution cleanup.

B.1.2 NOSC Responsibility

It is CNRH's or the local responding activity's responsibility to initiate immediate effective response activities for Navy OHS pollution incident that occurs within its area of responsibility (AOR). The NOSC or responding activity should seek a formal line of accounting data, funding citation, or reimbursement from the spiller's chain of command as soon as possible. Lack of an immediate funding transfer from the spiller to the responder must not delay unified Navy action. In those situations where the NOSC must initiate response actions without advance funds from the spiller, the cost verification procedures described in Section B.1.8 are critical.

B.1.3 Initial Emergency Funding

When a medium or major pollution incident occurs, the responsible party (spiller) must quickly identify and allocate funds for cleanup expenses. When appropriate, initial funding can be provided by a responding local Navy shore activity for later reimbursement. If funds greater than those initially available from the spiller or local shore activity are required, the spiller's TYCOM or major claimant should be requested to provide additional funds. An estimate of funds required and a schedule of when those funds must be available should be developed by the CNRH SMT in particular the Operations Group, as soon as possible during the first phases of the response.

B.1.4 Funding Limitations

The amount of funding immediately available should not limit the extent of the initial response effort. When necessary, contracts for outside sources may be written with limited periods of performance and cost ceilings to the extent of available funds. Follow-on negotiations and contract modifications can be implemented as additional funds are received. The availability of follow-on funding availability will be directly related to the severity of the pollution incident. When appropriate, CNRH should contact the spiller's next in command and request prompt funding of the cleanup operation.

B.1.5 Estimating Cleanup Costs

During the initial pollution assessment, the CNRH SMT should evaluate the magnitude of the incident and estimate all cleanup costs. Exact cost estimating is not necessary. However, failure to properly estimate costs could delay final funding of the cleanup effort as repetitive funding transactions are briefed and executed through the spiller's chain of command. Assistance in estimating cleanup costs for large or complex operations should be obtained from Navy SUPSALV or USCG Sector Honolulu.

B.1.6 Navy Reimbursement Procedures

At the conclusion of the response, a full accounting of all funds received and expenses incurred during the response must be made. After the full accounting, requests to the spiller for reimbursement of any costs incurred by CNRH or other commands for the pollution response can then be made. The following are examples of pollution response expenditures that are reimbursable from the spiller's major claimant:

- Navy Working Capital Funded (NWCF) activity cost including full labor costs and overhead.
- Travel and per diem costs of personnel who were requested to directly support the response effort.
- Local or state government costs in direct support of the response effort.
- Requested and approved overtime for Navy civilian personnel.
- Fuel expended by Navy or government vessels, vehicles, and aircraft which were requested by the NOSC to support the response.
- Supplies, materials, or minor equipment procured specifically for the response.
- Rental or lease of equipment obtained specifically for the response.
- Transportation of equipment not otherwise funded.
- Cost of civilian cleanup or disposal companies who were directly contracted by the NOSC.
- Contracted scientific/technical support.
- Repair, maintenance, and refurbishment of equipment used in the response.
- Return transport of equipment not otherwise funded.
- Final disposal of recovered oil, hazardous substance (HS), and debris.

B.1.7 Funding Documentation

All requests for equipment or services must be documented. A verbal request must be confirmed by an appropriate funding document or other acceptable record containing the full line of accounting data with cost ceilings from the spiller, major claimant, or TYCOM.

B.1.8 Cost Verification

When services or equipment are contracted, the NOSC is responsible for verifying that the contractor performs as required by contract and that costs submitted for payment are factual. The assignment of additional on-site personnel may be required for proper cost verification.

Commercial contracts issued for pollution cleanup contain provisions for daily cost summaries and specify the method for verification of performance.

B.2 DLA ENERGY RESPONSIBILITY

B.2.1 Reimbursement for Spill Related Costs

To be funded for spills, prompt notification to DLA Energy must be made. Spills should be handled at the facility level as an emergency situation. This means that facilities should not wait for funding from DLA Energy before committing funds to begin responding to a release. Prompt cleanup will limit total cleanup costs by minimizing the spread of contamination. DLA Energy will "reimburse" for funds used in spill response and/or cleanup costs that involve DLA Energy managed petroleum as long as proper documentation is provided and the spill did not result from gross operator negligence (see Section B.2.6). DLA Energy will not reimburse the facilities for military and civilian personnel salaries except for those overtime hours of federal civilian employees directly involved in the spill response and/or cleanup. If it is determined that a spill has occurred and that not all of the product identified is from the current spill, DLA Energy will only fund those costs which can be associated with the current spill.

B.2.2 Documentation Requirements

Documentation needed for spill response and cleanup funds include the following:

- Situation report or incident report
- Breakdown of costs associated with initial response and cleanup efforts
- Itemized costs for proposed cleanup actions
- Projected schedule for long-term remediation costs

DLA Energy will review costs submitted for funding and will fund applicable spill related costs.

B.2.3 Situation Report

DLA Energy requires that the spiller include the following information in a situation report (to the extent practicable) to NAVSUP and DLA Energy as soon as possible. The initial report should not be delayed in an attempt to gather additional information. This following list is not all inclusive; any additional information relevant to the spill event should be identified and forwarded to NAVSUP and DLA Energy as soon as it becomes available:

- Date of spill event
- Type of fuel spilled/released
- Amount of spill/release (in gallons)
- Cause of spill/release
- If spill/release has been contained
- Current status of initial response
- Amount of product recovered to date
- Navigable waters impacted by product, if any

The following information should be included in a follow-up report to DLA Energy and NAVSUP:

- If spill/release caused by equipment failure, then;
  - Has equipment been repaired?
  - Has equipment been tested (include test dates)?
    - What type of testing was done?
    - What are the results of testing?
  - Has a project been prepared to repair/replace the equipment?
  - What is current status of repair project?
- Will a site assessment be required?
  - When will site assessment begin?
- Will further remediation be required? If remediation will be required then:
  - What type of remediation is being considered?
  - Have federal, state or local authorities been informed of the planned remediation?
  - Has the appropriate regulatory agency given approval of the remediation plan?
- Has groundwater been impacted?
  - Is affected groundwater a source of drinking water?

Provide copies of any maps which identify the spill site and the location of the impacted area. Maps should be of adequate scale to indicate the impacted area and should identify all structures in the immediate area of the spill site

B.2.4 Spill Management

DLA Energy will not assume management of any portion of the spill response/cleanup. Management of the response/cleanup effort will remain the responsibility of the CNRH SMT or NAVSUP FLCPH. If requested by the spiller, DLA Energy will provide guidance/assistance with the cleanup effort, when possible. DLA Energy assumes no operational responsibility at any facility unless so requested by the activity.

B.2.5 DLA Funding Request

Facilities should request environmental compliance funding (includes POL spill cleanup) from DLA Energy via the online DLA Enterprise External Business Portal (EEBP) found at: https://business.dla.mi. Once a request is entered into EEBP, the request is automatically routed to Major Command (MAJCOM) for approval and sent to the respective service control point (SCP). Supporting documentation should be included with the request, such as statements of work, contract award documents, invoices, and other documents.

The SCPs verify the EEBP request is eligible for funding and ensures that valid and complete environmental funding requests are channeled to DLA Energy for processing. For a funding request to be considered eligible for DLA Energy funds, it must directly support the DLA bulk petroleum management mission and be related to capitalized product. Funds for approved requests will be provided through a military interdepartmental purchase request (MIPR).

B.2.6 Non-Fundable Costs

Once DLA Energy-owned product has been delivered to the end user vehicle (e.g.: refueling truck, aircraft, ship etc.) it is no longer the responsibility of DLA Energy. For example, flight line spills, over the road truck spills, vehicle fuel dumping, ship to ship fuel transfer, spills

resulting from gross operator negligence, etc., would not be eligible for DLA Energy cleanup funding. Costs associated with these types of spills will be funded by the individual military service

B.2.7 Contact Information

DLA Energy - Customer Interaction Center
Telephone: 877-352-2255
DSN: 877-352-2255

DLA Energy - Operations Center (24/7)
Telephone: 571-767-8420

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APPENDIX C - SPILL INFORMATION LOG

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TABLE C.1: SPILL INFORMATION LOG	
SECTION 1 – INITIAL RELEASE INFORMATION **(Initial notifications must not be delayed pending collection of data)**	
Spiller:	**Discoverer:**
Phone # (duty & non-duty):	Phone # (duty & non-duty):
Incident Description:	
Date of Spill:	Time of Spill:
Spill Location:	
Spilled Product:	
Total Amount Spilled (specify units-gals, lbs., etc.):	
Spill Description (size/color/fumes/etc.):	
SECTION 2 – RELEASE INFORMATION DETAILS	
Source and Cause of Incident:	
Spill Source/Cause:	
Operations(s) Under Way When Spill Occurred:	
Response Actions:	
Actions Taken to Stop Release:	
Containment Method Planned/Used:	
Clean-Up Method Planned/Used:	
Parties Performing Spill Containment/Clean-Up: Samples Taken: Yes ____ No_____ Volume of Product Recovered (in gallons):	

TABLE C.1: SPILL INFORMATION LOG	
Impact/Health Threats:	
Number of Injuries:	Number of Deaths:
Describe Any Evacuations Including Number Evacuated:	
Describe Any Property Damaged:	
Description of Environmental and Health Threats Including Areas Threatened:	

Notifications:

NOSC: Yes ___ No ____ Date: _____ Time: _____

NRC: Yes ___ No ___ Date:_____ Time:_____ Report No._____

SERC: Yes ___ No ___ Date:_____ Time:_____ Report No._____

LEPC: Yes ___ No ___ Date:_____ Time:_____

Other Notification:

Department/Command/Agency	Date	Time	Phone	POC

APPENDIX D - WASTE MANAGEMENT AND DISPOSAL PLAN

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TABLE D.1: WASTE MANAGEMENT AND DISPOSAL PLAN		
1. Incident Name:	**2. Operational Period (Date/Time):** From: To:	**WASTE MANAGEMENT AND DISPOSAL PLAN**

SOLID WASTES Covered by Plan

Type	Description	Est. Volume(s)
☐ Oiled Natural Inorganic (Dirt, Gravel, Etc.)		
☐ Oiled Natural Organic (Grass, Branches, Etc.)		
☐ Oiled Man-made Materials (PPE, Sorbents, Etc.)		
☐ Oil-contaminated Wildlife Carcasses		
☐ Other		

Waste Stream:	Suspected HW?	HW Code(s):	Determined by:
	☐ Yes ☐ No		☐ User Knowledge? ☐ Laboratory Analysis?
	☐ Yes ☐ No		☐ User Knowledge? ☐ Laboratory Analysis?
	☐ Yes ☐ No		☐ User Knowledge? ☐ Laboratory Analysis?
	☐ Yes ☐ No		☐ User Knowledge? ☐ Laboratory Analysis?
	☐ Yes ☐ No		☐ User Knowledge? ☐ Laboratory Analysis?
	☐ Yes ☐ No		☐ User Knowledge? ☐ Laboratory Analysis?

Comments:

WASTE MANAGEMENT AND DISPOSAL PLAN Page 1 of _____

N01336

Exhibit N-6L

NAVY0011514

TABLE D.1: WASTE MANAGEMENT AND DISPOSAL PLAN		
LIQUID WASTES Covered by Plan		
Type	**Description**	**Est. Volume(s)**
☐ Oil / Water Mixtures		
☐ Reclaimable Petroleum Products: ☐ JP-5, ☐ F-24, ☐ F-76, ☐ _____		
☐ Waste Water		
☐ Decontamination Liquids		
☐ Other		

Waste Stream:	Suspected HW?	HW Code(s):	Determined by:
	☐ Yes ☐ No		☐ User Knowledge? ☐ Laboratory Analysis?
	☐ Yes ☐ No		☐ User Knowledge? ☐ Laboratory Analysis?
	☐ Yes ☐ No		☐ User Knowledge? ☐ Laboratory Analysis?
	☐ Yes ☐ No		☐ User Knowledge? ☐ Laboratory Analysis?
	☐ Yes ☐ No		☐ User Knowledge? ☐ Laboratory Analysis?
	☐ Yes ☐ No		☐ User Knowledge? ☐ Laboratory Analysis?
Comments:			
WASTE MANAGEMENT AND DISPOSAL PLAN		Page ___ of _____	

TABLE D.1: WASTE MANAGEMENT AND DISPOSAL PLAN		
Samples *(If no samples to be taken, check box: ☐ and explain in comments below)*		
Media to be sample:		
Laboratory Name(s):		
Sampling / Analysis Plan Attached? ☐ Yes ☐ No		
Comments:		
Temporary Waste Storage		
Waste Stream	**Storage Container Type**	**Estimated Capacity / Number Required**
Storage Locations		
Preferred Location, Site Manager	Ground/Runoff Protection Required for Storage Area?	Liners/Cover Protection Required for Storage?
	☐Yes ☐No	☐Yes ☐No
	☐Yes ☐No	☐Yes ☐No
	☐Yes ☐No	☐Yes ☐No
	☐Yes ☐No	☐Yes ☐No
	☐Yes ☐No	☐Yes ☐No
Comments:		
WASTE MANAGEMENT AND DISPOSAL PLAN	Page ___ of _____	

TABLE D.1: WASTE MANAGEMENT AND DISPOSAL PLAN		
Disposal Methods		
Disposal Method:	**Waste Stream:**	**Disposal Resource (Provide EPA ID No. for TSDF):**
Permitted Landfill on Oahu		
Land farm / Soil Bioremediation		
Wastewater Treatment Plant		
Industrial Wastewater Treatment		
Permitted HW TSDF		
Permitted Mainland Landfill		
Reclaiming		
Recycling		
Other:		
Permits Required for Disposal:		
Comments:		
WASTE MANAGEMENT AND DISPOSAL PLAN		Page ___ of _____

TABLE D.1: WASTE MANAGEMENT AND DISPOSAL PLAN			
Waste Transportation			
Waste Stream:	Is Waste a DOT HM?	Waste Transportation Method	Transportation Resource
	☐ Yes ☐ No		
	☐ Yes ☐ No		
	☐ Yes ☐ No		
	☐ Yes ☐ No		
	☐ Yes ☐ No		
	☐ Yes ☐ No		
	☐ Yes ☐ No		
	☐ Yes ☐ No		
	☐ Yes ☐ No		
	☐ Yes ☐ No		
Permits Required for Disposal:			
Comments:			
WASTE MANAGEMENT AND DISPOSAL PLAN			Page ___ of _____

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TABLE D.2: CONTAINER LOG

Container ID	Description, Volume	Contents	Location	Date Tested	Sample ID	Waste Type	Date Waste Transported	Manifest No.	Destination Facility	TSDF EPA ID	First Transporter	Transporter EPA ID	Date TSDF Rec'd
EXAMPLE DM-20150304-1	1A1 55 gal steel	PPE	Staging Area 1	3/29/09	xxxx	Non-HW	4/16/09		PVT Landfill		PCS	Hixxxxx	
EXAMPLE DM-20150304-2	1H2 55 gal, poly	Decon rinse water	Adit 3 Decon station	3/25/09	xxxx	Non-HW	5/1/09		Unitek Solvent Services		Phillips Services	Hixxxxx	

TABLE D.2: CONTAINER LOG													
Container ID	**Description, Volume**	**Contents**	**Location**	**Date Tested**	**Sample ID**	**Waste Type**	**Date Waste Transported**	**Manifest No.**	**Destination Facility**	**TSDF EPA ID**	**First Transporter**	**Transporter EPA ID**	**Date TSDF Rec'd**

APPENDIX E - SAFETY DATA SHEETS

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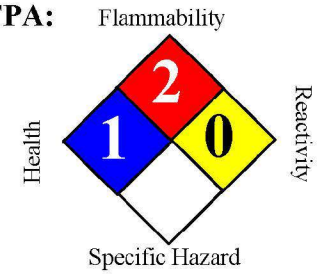
Safety Data Sheet
Jet Fuel

NFPA:



SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Jet Fuel			
Synonyms	:	Jet Fuel - A, B, A-I, A-50, High Sulfur, Military, Jet A & B Aviation Turbine Fuel, Jet A-I, Jet A; Avjet For Blending; Jet Q Turbine Fuel, Aviation Fuel; Turbine Fuel; JP-4; JP-5; JP-8, Av-Jet, 888100004452			
SDS Number	:	888100004452	**Version**	:	2.15
Product Use Description	:	Fuel			
Company	:	For: Tesoro Refining & Marketing Co. 19100 Ridgewood Parkway, San Antonio, TX 78259			
Tesoro Call Center	:	(877) 783-7676	**Chemtrec (Emergency Contact)**	:	(800) 424-9300

SECTION 2. HAZARDS IDENTIFICATION

Classifications : Flammable Liquid – Category 3
Aspiration Hazard – Category 1
Skin Irritation – Category 2
Specific Target Organ Toxicity (Single Exposure) – Category 3
Chronic Aquatic Toxicity – Category 2

Pictograms

Signal Word : **Danger**

Hazard Statements : Flammable liquid and vapor.
May be fatal if swallowed and enters airways – do not siphon by mouth.
Causes skin irritation. Repeated or prolonged skin contact can cause skin irritation and dermatitis.
May cause drowsiness or dizziness by inhalation.
May cause irritation of respiratory system.
Toxic to aquatic life with long lasting effects.

Precautionary statements

Prevention	Keep away from heat, sparks, open flames, welding and hot surfaces. No smoking. Keep container tightly closed. Ground and/or bond container and receiving equipment. Use explosion-proof electrical equipment. Use only non-sparking tools if tools are used in flammable atmosphere. Take precautionary measures against static discharge. Wear gloves, eye protection and face protection as needed to prevent skin and eye contact with liquid. Wash hands or liquid-contacted skin thoroughly after handling. Do not eat, drink or smoke when using this product. Do not breathe vapors or mists. Use only outdoors or in a well-ventilated area.
Response	In case of fire: Use dry chemical, CO2, water spray or fire fighting foam to extinguish. If swallowed: Immediately call a poison center, doctor, hospital emergency room, medical clinic or 911. Do NOT induce vomiting. Rinse mouth. If skin irritation persists, get medical attention. If inhaled: Remove person to fresh air and keep comfortable for breathing. Get medical attention if you feel unwell.
Storage	Store in a well ventilated place. Keep cool. Store locked up. Keep container tightly closed . Use only approved containers.
Disposal	Dispose of contents/containers to approved disposal site in accordance with local, regional, national, and/or international regulations.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS-No.	Weight %
Kerosene (petroleum)	8008-20-6	100%
Naphthalene	91-20-3	0 to 3%
Ethyl Benzene	100-41-4	0 to 1%
Trimethy Benzene	95-63-6	0 to 1%
Ethyl Benzene	100-41-4	0 to 1%

SECTION 4. FIRST AID MEASURES

Inhalation	:	If inhaled, remove to fresh air. If not breathing, give artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.
Skin contact	:	Take off all contaminated clothing immediately. Wash off immediately with soap and plenty of water. Wash contaminated clothing before re-use. If skin irritation persists, seek medical attention.
Eye contact	:	In case of eye contact, remove contact lens and rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Seek medical attention

		immediately.
Ingestion	:	Do NOT induce vomiting. Do not give liquids. Seek medical attention immediately. If vomiting does occur naturally, keep head below the hips to reduce the risks of aspiration. Monitor for breathing difficulties. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.
Notes to physician	:	Symptoms: Aspiration may cause pulmonary edema and pneumonitis. Treatment: Do not induce vomiting, use gastric lavage only. Remove from further exposure and treat symptomatically.

SECTION 5. FIRE-FIGHTING MEASURES

Suitable extinguishing media	:	Carbon dioxide (CO2), Water spray, Dry chemical, Foam, Keep containers and surroundings cool with water spray., Do not use a solid water stream as it may scatter and spread fire., Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.
Specific hazards during fire fighting	:	Fire Hazard. Do not use a solid water stream as it may scatter and spread fire. Cool closed containers exposed to fire with water spray. Sealed containers may rupture when heated. Above the flash point, explosive vapor-air mixtures may be formed. Vapors can flow along surfaces to distant ignition source and flash back.
Special protective equipment for fire-fighters	:	Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing.
Further information	:	Exposure to decomposition products may be a hazard to health. Standard procedure for chemical fires.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions	:	ACTIVATE FACILITY'S SPILL CONTINGENCY OR EMERGENCY RESPONSE PLAN if applicable. Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to contain spill areas. Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.
Environmental precautions	:	Carefully contain and stop the source of the spill, if safe to do so. Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection.
Methods for cleaning up	:	Take up with sand or oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal - caution, flammable vapors may accumulate in closed containers. Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

SECTION 7. HANDLING AND STORAGE

Precautions for safe handling	:	Keep away from fire, sparks and heated surfaces. No smoking near areas where

material is stored or handled. The product should only be stored and handled in areas with intrinsically safe electrical classification.

: Hydrocarbon liquids including this product can act as a non-conductive flammable liquid (or static accumulators), and may form ignitable vapor-air mixtures in storage tanks or other containers. Precautions to prevent static-initated fire or explosion during transfer, storage or handling, include but are not limited to these examples:

(1) Ground and bond containers during product transfers. Grounding and bonding may not be adequate protection to prevent ignition or explosion of hydrocarbon liquids and vapors that are static accumulators.

(2) Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil or diesel) is loaded into tanks previously containing low flash point products (such gasoline or naphtha).

(3) Storage tank level floats must be effectively bonded.

For more information on precautions to prevent static-initated fire or explosion, see NFPA 77, Recommended Practice on Static Electricity (2007), and API Recommended Practice 2003, Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents (2008).

Conditions for safe storage, including incompatibilities : Keep away from flame, sparks, excessive temperatures and open flame. Use approved containers. Keep containers closed and clearly labeled. Empty or partially full product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose containers to sources of ignition. Store in a well-ventilated area. The storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

: Keep away from food, drink and animal feed. Incompatible with oxidizing agents. Incompatible with acids.

: Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Guidelines

List	Components	CAS-No.	Type:	Value
OSHA Z1	Naphthalene	91-20-3	PEL	10 ppm 50 mg/m3
	Ethyl Benzene	100-41-4	PEL	100 ppm 435 mg/m3
ACGIH	Naphthalene	91-20-3	TWA	10 ppm
		91-20-3	STEL	15 ppm
	Kerosene (petroleum)	8008-20-6	TWA	200 mg/m3
	Ethyl Benzene	100-41-4	TWA	100 ppm 434 mg/m3
			STEL	125 ppm 543 mg/m3

Protective measures : Keep out of reach of children.

Engineering measures : Use only intrinsically safe electrical equipment approved for use in classified areas. Emergency eye wash capability should be available in the vicinity of any potential

		splash exposure.
Eye protection	:	Goggles and face shield as needed to prevent eye and face contact.
Hand protection	:	Gloves constructed of nitrile, neoprene, or PVC are recommended.
Skin and body protection	:	Chemical protective clothing such as DuPont TyChem ®, Barricade or equivalent, recommended based on degree of exposure. Consult manufacturer specifications for further information.
Respiratory protection	:	NIOSH/MSHA approved positive-pressure self-contained breathing apparatus (SCBA) or Type C positive-pressure supplied air with escape bottle must be used for gas concentrations above occupational exposure limits, for potential of uncontrolled release, if exposure levels are not known, or in an oxygen-deficient atmosphere.
Work / Hygiene practices	:	Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	Clear to straw colored liquid
Odor		Characteristic petroleum or kerosene-like odor
Odor threshold		0.1 - 1 ppm typically reported
pH		Not applicable
Melting point/freezing point		Gel point can be about -15°F; freezing requires laboratory conditions
Initial boiling point & range		154 - 372 °C (310° - 702 °F)
Flash point		38°C (100°F) Minimum
Evaporation rate		Higher initially and declining as lighter components evaporate
Flammability (solid, gas)		Flammable vapor released by liquid
Upper explosive limit		5.0 %(V)
Lower explosive limit		0.7 %(V)
Vapor pressure		< 2 mm Hg at 20 °C
Vapor density (air = 1)		> 4.5
Relative density (water = 1)		0.8 g/mL
Solubility (in water)		0.0005 g/100 mL
		3.3 to 6 as log Pow

Partition coefficient (n-octanol/water)	
	210 °C (410°F)
Auto-ignition temperature	
	Will evaporate or boil and possibly ignite before decomposition occurs.
Decomposition temperature	
	1.6 mm^2/s at 40°C
Kinematic viscosity	
Conductivity (conductivity can be reduced by environmental factors such as a decrease in temperature	Diesel Fuel Oils at terminal load rack: At least 25 pS/m Ultra Low Sulfur Diesel (ULSD) without conductivity additive: 0 pS/m to 5 pS/m ULSD at terminal load rack with conductivity additive: At least 50 pS/m JP-8 at terminal load rack: 150 pS/m to 600 pS/m

SECTION 10. STABILITY AND REACTIVITY

Reactivity : Vapors may form explosive mixture with air. Hazardous polymerization does not occur.

Chemical stability : Stable under normal conditions.

Possibility of hazardous reactions Can react with strong oxidizing agents, peroxides, acids and alkalies.

Conditions to avoid : Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources. Avoid static charge accumulation and discharge (see Section 7).

Hazardous decomposition products : Ignition and burning can release carbon monoxide, carbon dioxide, non-combusted hydrocarbons (smoke) and, depending on formulation, trace amounts of sulfur dioxide. Diesel exhaust particals may be a lung hazard (see Section 11).

SECTION 11. TOXICOLOGICAL INFORMATION

Skin irritation : Irritating to skin. Repeated or prolonged contact can cause dryness, cracking and dermatitis. Liquid may be absorbed through skin in toxic amounts if large areas of the skin are repeatedly exposed.

Eye irritation : May cause eye irritation.

Inhalation Inhalation of vapors or mist may result in respiratory tract irritation and central nervous system effects including headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure and death.

Chronic Exposure Similar products produced skin cancer and systemic toxicity in laboratory animals following repeated applications. The significance of these results to human exposure has not been determined.

Further information : Kerosene does not have a measurable effect on human reproduction or development.
Kerosene is not listed as carcinogenic by NTP, OSHA, and ACGIH. IARC has listed kerosene as a probable human carcinogen.
Some petroleum distillates have been found to cause adverse reproductive effects in laboratory animals.
Acute and chronic exposure to kerosene may result in CNS effects including irritability, restlessness, ataxia, drowsiness, convulsions, coma and death. The most common health effect associated with chronic kerosene exposure is dermatitis.

Component:

Kerosene (petroleum)	8008-20-6	Acute oral toxicity: LD50 rat 4 hour Dose: >5,000 mg/kg Acute dermal toxicity: LD50 rabbit Dose: >2,001 mg/kg Acute inhalation toxicity: LC50 rat Dose: >5,000 mg/l Exposure time: 4 h Skin irritation: Classification: Irritating to skin. Result: Skin irritation
Naphthalene	91-20-3	Acute oral toxicity: LD50 rat Dose: 2,001 mg/kg Acute dermal toxicity: LD50 rat Dose: 2,501 mg/kg Acute inhalation toxicity: LC50 rat Dose: 101 mg/l Exposure time: 4 h Skin irritation: Classification: Irritating to skin. Result: Mild skin irritation Eye irritation: Classification: Irritating to eyes. Result: Mild eye irritation Carcinogenicity: N11.00422130

Carcinogenicity

NTP	Naphthalene (CAS-No.: 91-20-3)
IARC	Kerosene is not listed as carcinogenic by NTP, OSHA, and ACGIH. IARC has listed kerosene as a probable human carcinogen. naphthalene (CAS-No.: 91-20-3) Kerosene (petroleum) (CAS-No.: 8008-20-6)
CA Prop 65	WARNING! This product contains a chemical known to the State of California to cause cancer. Naphthalene (CAS-No.: 91-20-3)

SECTION 12. ECOLOGICAL INFORMATION

Additional ecological information : Release of this product should be prevented from contaminating soil and water and from entering drainage and sewer systems. U.S.A. regulations require reporting spills of this material that could reach any surface waters. The toll free number for the U.S. Coast Guard National Response Center is (800) 424-8802. Naphthalene (91-20-3) one of the ingredients in this mixture is classified as a Marine Pollutant.

Component:

Naphthalene	91-20-3	Toxicity to algae: EC50 Species: Dose: 33 mg/l Exposure time: 24 h

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal	:	Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

SECTION 14. TRANSPORT INFORMATION

CFR

Proper shipping name	:	Fuel, aviation, turbine engine
UN-No.	:	1863
Class	:	3
Packing group	:	III

TDG

Proper shipping name	:	Fuel, aviation, turbine engine
UN-No.	:	UN1863
Class	:	3
Packing group	:	III

IATA Cargo Transport

UN UN-No.	:	UN1863
Description of the goods	:	Fuel, aviation, turbine engine
Class	:	3
Packaging group	:	III
ICAO-Labels	:	3
Packing instruction (cargo aircraft)	:	366
Packing instruction (cargo aircraft)	:	Y344

IATA Passenger Transport

UN UN-No.	:	UN1863
Description of the goods	:	Fuel, aviation, turbine engine
Class	:	3
Packaging group	:	III
ICAO-Labels	:	3
Packing instruction (passenger aircraft)	:	355
Packing instruction (passenger aircraft)	:	Y344

IMDG-Code

UN-No.	:	UN 1863
Description of the goods	:	Fuel, aviation, turbine engine
Class	:	3
Packaging group	:	III
IMDG-Labels	:	3
EmS Number	:	F-E S-E
Marine pollutant	:	Yes

SECTION 15. REGULATORY INFORMATION

TSCA Status	:	On TSCA Inventory
DSL Status	:	All components of this product are on the Canadian DSL list.
SARA 311/312 Hazards	:	Acute Health Hazard Chronic Health Hazard Fire Hazard

CERCLA SECTION 103 and SARA SECTION 304 (RELEASE TO THE ENVIROMENT)
The CERCLA definition of hazardous substances contains a "petroleum exclusion" clause which exempts crude oil. Fractions of crude oil, and products (both finished and intermediate) from the crude oil refining process and any indigenous components of such from the CERCLA Section 103 reporting requirements. However, other federal reporting requirements, including SARA Section 304, as well as the Clean Water Act may still apply.

California Prop. 65 : WARNING! This product contains a chemical known to the State of California to cause cancer.

Naphthalene 91-20-3

SECTION 16. OTHER INFORMATION

Further information

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Revision Date : 11/17/2012

40, 41, 42, 43, 139, 141, 263, 1117, 1333, 1450, 1640

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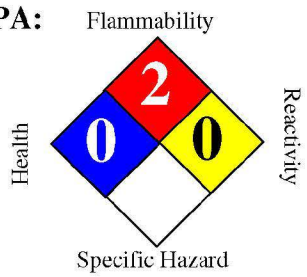
Material Safety Data Sheet
Diesel Fuel - High Sulfur

NFPA:



TESORO

HMIS III:

HEALTH	1
FLAMMABILITY	2
PHYSICAL	0

0 = Insignificant, 1 = Slight, 2 = Moderate, 3 = High, 4 = Extreme

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Diesel Fuel - High Sulfur			
Synonyms	:	Heating Oil, Gas Oil Light Straight Run, High Sulfur Diesel Fuel #1, High Sulfur Diesel Fuel #2, Marine Diesel Fuel, F76, 888100004572			
MSDS Number	:	888100004572	**Version**	:	2.8
Product Use Description	:	Fuel			
Company	:	For: Tesoro Refining & Marketing Co. 19100 Ridgewood Parkway, San Antonio, TX 78259			
Tesoro Call Center	:	(877) 783-7676	**Chemtrec (Emergency Contact)**	:	(800) 424-9300

SECTION 2. HAZARDS IDENTIFICATION

Emergency Overview

Regulatory status : This material is considered hazardous by the Occupational Safety and Health Administration (OSHA) Hazard Communication Standard (29 CFR 1910.1200).

Signal Word : WARNING

Hazard Summary : Combustible Liquid

Toxic

Potential Health Effects

Inhalation : Vapors or mists from this material can irritate the nose, throat, and lungs, and can cause signs and symptoms of central nervous system depression, depending on the concentration and duration of exposure.

Eyes : Eye irritation may result from contact with liquid, mists, and/or vapors.

Skin : Skin irritation leading to dermatitis may occur upon prolonged or repeated contact. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are repeatedly exposed. Long-term, repeated skin contact may cause skin cancer.

Ingestion : Harmful or fatal if swallowed. Do NOT induce vomiting. This material can irritate the mouth, throat, stomach, and cause nausea, vomiting, diarrhea and restlessness. Aspiration hazard if liquid is inhaled into lungs, particularly from vomiting after ingestion. Aspiration may result in chemical pneumonia, severe

lung damage, respiratory failure and even death.

Target Organs : Kidney, Liver, Central nervous system, Eyes, Skin

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS-No.	Weight %
Fuels, diesel, No 2; Gasoil - unspecified	68476-34-6	100%
Naphthalene	91-20-3	1 - 5%
Xylene	1330-20-7	1 - 5%
Nonane	111-84-2	0.75 - 1%
1,2,4-Trimethylbenzene	95-63-6	0.75 - 1%
Sulfur	7704-34-9	0.5% Maximum

SECTION 4. FIRST AID MEASURES

Inhalation : Move to fresh air. Give oxygen. If breathing is irregular or stopped, administer artificial respiration. Seek medical attention immediately.

Skin contact : Take off all contaminated clothing immediately. Wash off immediately with soap and plenty of water. Wash contaminated clothing before re-use. If skin irritation persists, seek medical attention.

Eye contact : Remove contact lenses. Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. If eye irritation persists, seek medical attention.

Ingestion : Do NOT induce vomiting. Ingestion may result in nausea, vomiting, diarrhea and restlessness. Aspiration may cause pulmonary edema and pneumonitis. Seek medical attention immediately.

Notes to physician : Symptoms: Dizziness, Discomfort, Headache, Nausea, Disorder, Vomiting, Lung edema, Aspiration may cause pulmonary edema and pneumonitis. Liver disorders, Kidney disorders.

SECTION 5. FIRE-FIGHTING MEASURES

Form : Liquid

Flash point : 38 ℃ (100 ℉) Minimum for #1 Diesel ; 52℃ Minimum for #2 Diesel

Lower explosive limit : 0.7 %(V)

Upper explosive limit : 5 %(V)

Suitable extinguishing media : Carbon dioxide (CO2), Water spray, Dry chemical, Foam, Keep containers and surroundings cool with water spray.

Specific hazards during fire fighting : Fire Hazard Do not use a solid water stream as it may scatter and spread fire. Cool closed containers exposed to fire with water spray.

Special protective equipment for fire-fighters	:	Wear self-contained breathing apparatus and protective suit. Use personal protective equipment.
Further information	:	Exposure to decomposition products may be a hazard to health. Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions	:	Consider wind direction; stay upwind and uphill, if possible. Evacuate nonessential personnel and remove or secure all ignition sources. Evaluate the direction of product travel, diking, sewers, etc. to contain spill areas. Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact. Ensure adequate ventilation. Use personal protective equipment.
Environmental precautions	:	Carefully contain and stop the source of the spill, if safe to do so. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection. Discharge into the environment must be avoided. If the product contaminates rivers and lakes or drains inform respective authorities.
Methods for cleaning up	:	Take up with sand or oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal - caution, flammable vapors may accumulate in closed containers. Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

SECTION 7. HANDLING AND STORAGE

Handling	:	Keep away from fire, sparks and heated surfaces. No smoking near areas where material is stored or handled. The product should only be stored and handled in areas with intrinsically safe electrical classification.
Advice on protection against fire and explosion	:	Hydrocarbon liquids including this product can act as a non-conductive flammable liquid (or static accumulators), and may form ignitable vapor-air mixtures in storage tanks or other containers. Precautions to prevent static-initated fire or explosion during transfer, storage or handling, include but are not limited to these examples: (1) Ground and bond containers during product transfers. Grounding and bonding may not be adequate protection to prevent ignition or explosion of hydrocarbon liquids and vapors that are static accumulators. (2) Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil or diesel) is loaded into tanks previously containing low flash point products (such gasoline or naphtha). (3) Storage tank level floats must be effectively bonded. For more information on precautions to prevent static-initated fire or explosion, see NFPA 77, Recommended Practice on Static Electricity (2007), and API

Recommended Practice 2003, Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents (2008).

Dust explosion class : Not applicable

Requirements for storage areas and containers : Keep away from flame, sparks, excessive temperatures and open flame. Use approved containers. Keep containers closed and clearly labeled. Empty or partially full product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose containers to sources of ignition. Store in a well-ventilated area. The storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

Advice on common storage : Keep away from food, drink and animal feed. Incompatible with oxidizing agents. Incompatible with acids.

Other data : No decomposition if stored and applied as directed.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Guidelines

List	Components	CAS-No.	Type:	Value
OSHA Z1	Naphthalene	91-20-3	PEL	10 ppm 50 mg/m3
	Xylene	1330-20-7	PEL	100 ppm 435 mg/m3
ACGIH	Diesel Fuel	68476-30-2	TWA	100 mg/m3
ACGIH	Naphthalene	91-20-3	TWA	10 ppm
		91-20-3	STEL	15 ppm
	Xylene	1330-20-7	TWA	100 ppm
		1330-20-7	STEL	150 ppm
	Nonane	111-84-2	TWA	200 ppm

Engineering measures : Use only intrinsically safe electrical equipment approved for use in classified areas.

Eye protection : Safety glasses with side-shields reference to 29 CFR 1910.133

Hand protection : Gloves constructed of nitrile, neoprene, or PVC are recommended. Consult manufacturer specifications for further information.

Skin and body protection : If needed to prevent skin contact, chemical protective clothing such as of DuPont TyChem®, Saranex or equivalent recommended based on degree of exposure. The resistance of specific material may vary from product to product as well as with degree of exposure.

Respiratory protection	:	A NIOSH/ MSHA-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited. Refer to OSHA 29 CFR 1910.134, ANSI Z88.2-1992, NIOSH Respirator Decision Logic, and the manufacturer for additional guidance on respiratory protection selection. NIOSH/MSHA approved positive-pressure self-contained breathing apparatus (SCBA) or Type C positive-pressure supplied air with escape bottle must be used for gas concentrations above occupational exposure limits, for potential of uncontrolled release, if exposure levels are not known, or in an oxygen-deficient atmosphere.
Work / Hygiene practices	:	Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Form	:	Liquid
Appearance	:	Clear, straw colored
Odor	:	Characteristic petroleum (kerosene) odor
Flash point	:	38 °C (100 °F) Minimum for #1 Diesel ; 52°C Minimum for #2 Diesel
Thermal decomposition	:	No decomposition if stored and applied as directed.
Lower explosive limit	:	0.7 %(V)
Upper explosive limit	:	5 %(V)
Freezing point	:	Not applicable
Boiling point	:	160 °C(320 °F)
Vapor Pressure	:	<2mm Hg at 20°C at 20 °C (68 °F)
Relative Vapor Density	:	5.7 (Air = 1.0)
Water solubility	:	Negligible
Percent Volatiles	:	100 %
Conductivity (conductivity can be reduced by environmental factors such as a decrease in temperature)		Diesel Fuel Oils at terminal load rack: At least 25 pS/m Ultra Low Sulfur Diesel (ULSD) without conductivity additive: 0 pS/m to 5 pS/m ULSD at terminal load rack with conductivity additive: At least 50 pS/m but conductivity may decrease from environmental factors such as temperature drop. JP-8 at terminal load rack: 150 pS/m to 600 pS/m

SECTION 10. STABILITY AND REACTIVITY

Conditions to avoid	:	Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources. Keep away from strong oxidizers. Viton ® ; Fluorel ®
Materials to avoid	:	Strong oxidizing agents Peroxides
Hazardous decomposition products	:	Carbon monoxide, carbon dioxide and noncombusted hydrocarbons (smoke). Diesel exhaust particulates may be a lung hazard - see Section 11.
Thermal decomposition	:	No decomposition if stored and applied as directed. No decomposition if used as directed.
Hazardous reactions	:	Keep away from oxidizing agents, and acidic or alkaline products.

SECTION 11. TOXICOLOGICAL INFORMATION

Carcinogenicity

NTP	:	Naphthalene (CAS-No.: 91-20-3)
IARC	:	Naphthalene (CAS-No.: 91-20-3)
OSHA	:	No component of this product which is present at levels greater than or equal to 0.1 % is identified as a carcinogen or potential carcinogen by OSHA.
CA Prop 65	:	WARNING! This product contains a chemical known to the State of California to cause cancer. Naphthalene (CAS-No.: 91-20-3)
Skin irritation	:	Irritating to skin.
Eye irritation	:	Irritating to eyes.
Further information	:	Studies have shown that similar products produce skin cancer or skin tumors in laboratory animals following repeated applications without washing or removal. The significance of this finding to human exposure has not been determined. Other studies with active skin carcinogens have shown that washing the animal's skin with soap and water between applications reduced tumor formation. Positive mutagenicity results have been reported. Repeated over-exposure may cause liver and kidney injury IARC classifies whole diesel fuel exhaust particulates as probably carcinogenic to humans (Group 2A). NIOSH regards whole diesel fuel exhaust particulates as a potential cause of occupational lung cancer based on animal studies and limited evidence in humans.

Component:

Fuels, diesel, No 2; Gasoil - unspecified	68476-34-6	Acute oral toxicity: LD50 rat Dose: 5,001 mg/kg Acute dermal toxicity: LD50 rabbit Dose: 2,001 mg/kg Acute inhalation toxicity: LC50 rat Dose: 7.64 mg/l Exposure time: 4 h Skin irritation: Classification: Irritating to skin. Result: Severe skin irritation Eye irritation: Classification: Irritating to eyes. Result: Mild eye irritation
Naphthalene	91-20-3	Acute oral toxicity: LD50 rat

		Dose: 2,001 mg/kg Acute dermal toxicity: LD50 rat Dose: 2,501 mg/kg Acute inhalation toxicity: LC50 rat Dose: 101 mg/l Exposure time: 4 h Skin irritation: Classification: Irritating to skin. Result: Mild skin irritation Eye irritation: Classification: Irritating to eyes. Result: Mild eye irritation Carcinogenicity: N11.00422130
Xylene	1330-20-7	Acute oral toxicity: LD50 rat Dose: 2,840 mg/kg Acute dermal toxicity: LD50 rabbit Dose: ca. 4,500 mg/kg Acute inhalation toxicity: LC50 rat Dose: 6,350 mg/l Exposure time: 4 h Skin irritation: Classification: Irritating to skin. Result: Mild skin irritation Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product. Eye irritation: Classification: Irritating to eyes. Result: Mild eye irritation
Nonane	111-84-2	Acute oral toxicity: LD50 mouse Dose: 218 mg/kg Acute inhalation toxicity: LC50 rat Exposure time: 4 h
1,2,4-Trimethylbenzene	95-63-6	Acute inhalation toxicity: LC50 rat Dose: 18 mg/l Exposure time: 4 h Skin irritation: Classification: Irritating to skin. Result: Skin irritation Eye irritation: Classification: Irritating to eyes. Result: Eye irritation
Sulfur	7704-34-9	Acute oral toxicity: LD50 rat Dose: 5,001 mg/kg Acute dermal toxicity: LD50 rabbit Dose: 2,001 mg/kg Acute inhalation toxicity: LC50 rat Dose: 9.24 mg/l Exposure time: 4 h Eye irritation: Classification: Irritating to eyes. Result: Mild eye irritation

SECTION 12. ECOLOGICAL INFORMATION

Biochemical Oxygen Demand (BOD) : No data available

Chemical Oxygen Demand (COD)	:	No data available
Adsorbed organic bound halogens (AOX)	:	Not included
Additional ecological information	:	Keep out of sewers, drainage areas, and waterways. Report spills and releases, as applicable, under Federal and State regulations.

Component:

Naphthalene	91-20-3	Toxicity to algae: EC50 Species: Dose: 33 mg/l Exposure time: 24 h
1,2,4-Trimethylbenzene	95-63-6	Toxicity to fish: LC50 Species: Pimephales promelas (fathead minnow) Dose: 7.72 mg/l Exposure time: 96 h Acute and prolonged toxicity for aquatic invertebrates: EC50 Species: Daphnia Dose: 3.6 mg/l Exposure time: 48 h
Sulfur	7704-34-9	Acute and prolonged toxicity for aquatic invertebrates: EC0 Species: Daphnia magna (Water flea) Dose: > 10,000 mg/l Exposure time: 24 h

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal : Consult federal, state and local waste regulations to determine appropriate waste characterization of material and allowable disposal methods.

SECTION 14. TRANSPORT INFORMATION

CFR

Proper shipping name	: DIESEL FUEL
UN-No.	: 1202 (NA 1993)
Class	: 3
Packing group	: III

TDG

Proper shipping name	: DIESEL FUEL
UN-No.	: UN1202 (NA 1993)
Class	: 3
Packing group	: III

IATA Cargo Transport

UN UN-No.	: UN1202 (NA 1993)
Description of the goods	: DIESEL FUEL
Class	: 3
Packaging group	: III

ICAO-Labels	: 3
Packing instruction (cargo aircraft)	: 366
Packing instruction (cargo aircraft)	: Y344

IATA Passenger Transport

UN UN-No.	: UN1202 (NA 1993)
Description of the goods	: DIESEL FUEL
Class	: 3
Packaging group	: III
ICAO-Labels	: 3
Packing instruction (passenger aircraft)	: 355
Packing instruction (passenger aircraft)	: Y344

IMDG-Code

UN-No.	: UN 1202 (NA 1993)
Description of the goods	: DIESEL FUEL
Class	: 3
Packaging group	: III
IMDG-Labels	: 3
EmS Number	: F-E S-E
Marine pollutant	: No

SECTION 15. REGULATORY INFORMATION

OSHA Hazards : Combustible Liquid
Toxic by ingestion
Severe skin irritant
Moderate eye irritant
Possible Cancer Hazard

CERCLA SECTION 103 and SARA SECTION 304 (RELEASE TO THE ENVIROMENT)
The CERCLA definition of hazardous substances contains a "petroleum exclusion" clause which exempts crude oil. Fractions of crude oil, and products (both finished and intermediate) from the crude oil refining process and any indigenous components of such from the CERCLA Section 103 reporting requirements. However, other federal reporting requirements, including SARA Section 304, as well as the Clean Water Act may still apply.

TSCA Status : On TSCA Inventory

DSL Status : All components of this product are on the Canadian DSL list.

SARA 311/312 Hazards : Fire Hazard
Acute Health Hazard
Chronic Health Hazard

SARA III US. EPA Emergency Planning and Community Right-To-Know Act (EPCRA) SARA Title III Section 313 Toxic Chemicals (40 CFR 372.65) - Supplier Notification Required

Components	CAS-No.

Naphthalene	91-20-3
Xylene	1330-20-7
1,2,4-trimethylbenzene	95-63-6

PENN RTK — US. Pennsylvania Worker and Community Right-to-Know Law (34 Pa. Code Chap. 301-323)

Components	CAS-No.
Sulfur	7704-34-9
1,2,4-trimethylbenzene	95-63-6
Nonane	111-84-2
Xylene	1330-20-7
Naphthalene	91-20-3
Fuels, diesel, No 2; Gasoil - unspecified	68476-34-6

MASS RTK — US. Massachusetts Commonwealth's Right-to-Know Law (Appendix A to 105 Code of Massachusetts Regulations Section 670.000)

Components	CAS-No.
Sulfur	7704-34-9
1,2,4-Trimethylbenzene	95-63-6
Nonane	111-84-2
Xylene	1330-20-7
Naphthalene	91-20-3

NJ RTK — US. New Jersey Worker and Community Right-to-Know Act (New Jersey Statute Annotated Section 34:5A-5)

Components	CAS-No.
Sulfur	7704-34-9
1,2,4-Trimethylbenzene	95-63-6
Nonane	111-84-2
Xylene	1330-20-7
Naphthalene	91-20-3
Fuels, diesel, No 2; Gasoil - unspecified	68476-34-6

California Prop. 65 : WARNING! This product contains a chemical known to the State of California to cause cancer.

Naphthalene 91-20-3

SECTION 16. OTHER INFORMATION

Further information

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as guidance for safe handling, use, processing,

storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

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Revision Date : 01/27/2011

28, 34, 35, 37, 75, 90, 97, 108, 109, 1046, 1053, 1076, 1536, 1747, 1749, 1751, 1754, 1757, 1760, 1936

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APPENDIX F - FRAME FOOT MARK SPREADSHEET

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APPENDIX F - FRAME FOOT MARK SPREADSHEET

The Frame Foot Mark Spreadsheet was developed as a location system for the Red Hill facility's Lower Access Tunnel. The spreadsheet uses the support frames located throughout the Lower Access Tunnel as location points. Each frame has been given a number, starting with frame number 1 and ending with frame number 690. The spreadsheet starts at tank 20 and ends at the entrance to the UGPH. Starting from tank 20 the distance to the entrance to the UGPH is 17,000 feet. The spreadsheet provides the frame number, feet from tank 20, delta from tank 20 (in feet), delta from the UGPH (in feet), feet from UGPH, and information and comments about items of interest located in the vicinity of the numbered frame (if applicable). Using this spreadsheet allows someone in the tunnel to know exactly how far they are from the UGPH or from Tank 20.

Table F.1: FRAME FOOT MARK SPREADSHEET

Frame	Feet From Tank 20	Delta (From Tank 20) Feet	Delta (from UGPH) Feet	Feet From UGPH	Information and Comments
TK 20	0	0	0	17000	Tanks 20 & 19
1	23	23	23	16977	Emergency Phone
2	40	17	17	16956	46' Bulkhead Door
3	63	23	23	16927	
4	84	21	21	16912	
5	106	22	22	16888	FDC
6	131	25	25	16864	163' Elevator #73 (Access to Adit #6), Fan and Fire Control Panels, SCSR (15 Units)
7	153	22	22	16845	
8	178	25	25	16817	AFFF Zone #1, AFFF Mixing Closet
9	202	24	24	16796	198' Bulkhead Door
10	223	21	21	16774	Tanks 18 & 17
11	244	21	21	16750	240' Bulkhead Door, Emergency Phone
12	268	24	24	16726	
13	286	18	18	16711	298' Fire Evac. Zone 5L Sign, AFFF Sump, FOR Sump, Sump Pump Control
14	310	24	24	16681	299' Oil Tight Door
15	327	17	17	16670	335' Elevator #72 (Access to Adit #5)
16	340	13	13	16650	Gauger Office, Emergency Phone
17	356	16	16	16630	
18	380	24	24	16609	Rest Room
19	403	23	23	16594	
20	424	21	21	16572	Tanks 16 & 15
21	443	19	19	16551	Train Battery Charger, Emergency Phone
22	465	22	22	16527	AFFF Zone #2, AFFF Mixing Closet
23	487	22	22	16508	
24	511	24	24	16484	
25	534	23	23	16463	FDC
26	556	22	22	16440	
27	581	25	25	16414	

Table F.1: FRAME FOOT MARK SPREADSHEET					
Frame	**Feet From Tank 20**	**Delta (From Tank 20) Feet**	**Delta (from UGPH) Feet**	**Feet From UGPH**	**Information and Comments**
28	604	23	23	16394	
29	625	21	21	16371	Tanks 14 & 13
30	643	18	18	16351	Emergency Phone
31	665	22	22	16326	120/208/480V Taps, AFFF Sump, Sump Pump Control
32	687	22	22	16308	Smoke Door (Between Frames 31 & 32)
33	712	25	25	16283	Camera
34	734	22	22	16264	FDC
35	757	23	23	16238	
36	781	24	24	16215	
37	804	23	23	16193	
38	826	22	22	16170	Tanks 12 & 11
39	842	16	16	16153	Fire Evac Zone 4L Sign, Emergency Phone
40	866	24	24	16123	120/208/480V Taps, AFFF Zone #3, AFFF Mixing Closet
41	887	21	21	16110	
42	912	25	25	16082	
43	935	23	23	16063	FDC
44	958	23	23	16038	
45	983	25	25	16013	
46	1005	22	22	15993	
47	1021	16	16	15974	
48	1026	5	5	15963	Tanks 10 & 9, Emergency Phone
49	1045	19	19	15933	
50	1067	22	22	15925	120/208/480V Taps, AFFF Sump, Sump Pump Control
51	1089	22	22	15906	Smoke Door #4 (Between Frames 50 & 51)
52	1113	24	24	15882	
53	1136	23	23	15861	FDC
54	1153	17	17	15843	
55	1182	29	29	15808	
56	1205	23	23	15797	
57	1228	23	23	15768	Tanks 8 & 7, Emergency Phone
58	1246	18	18	15750	AFFF Zone #4, AFFF Mixing Closet
59	1268	22	22	15723	120/208/480V Taps
60	1291	23	23	15704	
61	1312	21	21	15684	FDC
62	1335	23	23	15659	
63	1359	24	24	15637	
64	1384	25	25	15613	
65	1406	22	22	15592	

Table F.1: FRAME FOOT MARK SPREADSHEET					
Frame	**Feet From Tank 20**	**Delta (From Tank 20) Feet**	**Delta (from UGPH) Feet**	**Feet From UGPH**	**Information and Comments**
66	1428	22	22	15567	Tanks 6 & 5
67	1447	19	19	15548	Fire Evac Zone 4L Sign, Emergency Phone
68	1468	21	21	15524	120/208/480V Taps, AFFF Sump, Sump Pump Control
69	1492	24	24	15502	Smoke Door # 3 (Between Frames 68 & 69)
70	1513	21	21	15484	FDC, Camera
71	1538	25	25	15456	
72	1562	24	24	15436	
73	1583	21	21	15414	
74	1598	15	15	15396	
75	1610	12	12	15378	
76	1620	10	10	15365	
77	1629	9	9	15354	Tanks 4 & 3
78	1647	18	18	15335	Emergency Phone
79	1656	9	9	15335	120/208/480V Taps, AFFF Zone #5, AFFF Mixing Closet
80	1666	10	10	15316	
81	1678	12	12	15305	
82	1693	15	15	15292	
83	1708	15	15	15280	
84	1723	15	15	15265	FDC
85	1738	15	15	15250	
86	1753	15	15	15235	
87	1768	15	15	15220	
88	1783	15	15	15205	
89	1798	15	15	15190	
90	1810	12	12	15178	SCSR (15 Units)
91	1820	10	10	15165	
92	1830	10	10	15153	Tanks 2 & 1
93	1848	18	18	15135	Emergency Phone, Camera
94	1856	8	8	15135	480V Tap, AFFF Sump, Sump Pump Control
95	1866	10	10	15115	120/208V Taps
96	1884	18	18	15099	Smoke Door #2 (Between Frames 95 & 96)
97	1907	23	23	15084	Main Sump (Pumped to Tan 311), Fire Evac Zone 3 Sign
98	1927	20	20	15069	FDC
99	1944	17	17	15049	
100	1962	18	18	15028	Train Track Switch
101	1980	18	18	15011	1989' 32" Sectional Valve MOV-0154 (F-76)
102	1997	17	17	14994	

Table F.1: FRAME FOOT MARK SPREADSHEET					
Frame	**Feet From Tank 20**	**Delta (From Tank 20) Feet**	**Delta (from UGPH) Feet**	**Feet From UGPH**	**Information and Comments**
103	2003	6	6	14987	Block 4, Emergency Oil Pressure Door
104	2024	21	21	14955	Block 5
105	2049	25	25	14945	Survey Marker, Monitoring Well
106	2074	25	25	14924	2090' = 25+00
107	2112	38	38	14886	
108	2138	26	26	14873	
109	2163	25	25	14836	
110	2188	25	25	14810	
111	2213	25	25	14785	Emergency Phone
112	2238	25	25	14760	
113	2263	25	25	14735	
114	2288	25	25	14710	
115	2313	25	25	14685	480V Tap
116	2339	26	26	14659	
117	2362	23	23	14637	
118	2389	27	27	14607	
119	2414	25	25	14586	
120	2439	25	25	14559	
121	2464	25	25	14534	
122	2489	25	25	14509	2491' = 21+00
123	2514	25	25	14484	
124	2539	25	25	14459	
125	2564	25	25	14434	
126	2589	25	25	14409	
127	2614	25	25	14384	
128	2639	25	25	14359	
129	2665	26	26	14333	
130	2690	25	25	14309	2698' 120/208V Taps, 2707' 480V Tap
131	2715	25	25	14283	2723 = 18+ 69.72
132	2740	25	25	14258	2749 Survey Marker
133	2765	25	25	14233	
134	2790	25	25	14208	2792 = 18+00
135	2815	25	25	14183	2840 Concrete Bulkhead
136	2863	48	48	14135	1847' Block 37
137	2882	19	19	14139	1829' Block 38
138	2889	7	7	14103	2890 = 17+00, Start of "S-Curve"
139	2908	19	19	14072	
140	2923	15	15	14069	2935 Survey Marker
141	2940	17	17	14048	
142	2956	16	16	14034	

Table F.1: FRAME FOOT MARK SPREADSHEET					
Frame	Feet From Tank 20	Delta (From Tank 20) Feet	Delta (from UGPH) Feet	Feet From UGPH	Information and Comments
143	2974	18	18	14015	
144	2989	15	15	14002	2994' = 27+00, 2013 Concrete Bulkhead
145	3039	50	50	13949	
146	3064	25	25	13959	
147	3089	25	25	13909	3094 = 26+00
148	3114	25	25	13884	
149	3139	25	25	13859	
150	3164	25	25	13834	3176' Block 50
151	3189	25	25	13809	
152	3215	26	26	13783	3218 480V Tap
153	3239	24	24	13760	
154	3265	26	26	13732	
155	3290	25	25	13709	3295 = 24+00
156	3315	25	25	13683	
157	3340	25	25	13658	
158	3365	25	25	13633	
159	3390	25	25	13608	
160	3415	25	25	13583	
161	3440	25	25	13558	3451' Block 61, Survey Marker, Fire Evac Zone 3 Sign (Adit 3 - .40 mi, Adit 6 - .56 mi via Elev. 73)
162	3465	25	25	13533	
163	3490	25	25	13508	3495' = 22+00
164	3515	25	25	13483	
165	3540	25	25	13458	
166	3565	25	25	13433	
167	3590	25	25	13408	3595' = 21+00
168	3615	25	25	13383	
169	3640	25	25	13358	Emergency Phone
170	3665	25	25	13333	
171	3690	25	25	13308	3695' = 20+00
172	3740	50	50	13258	3715' Concrete Bulkhead
173	3766	26	26	13257	3722' 120/208V Taps, 3730' 480V Tap
174	3791	25	25	13208	
175	3816	25	25	13182	3829' Block 76
176	3841	25	25	13157	
177	3866	25	25	13132	
178	3891	25	25	13107	3896' = 18+00
179	3916	25	25	13082	
180	3941	25	25	13057	
181	3966	25	25	13032	3953' Survey Marker

Table F.1: FRAME FOOT MARK SPREADSHEET					
Frame	Feet From Tank 20	Delta (From Tank 20) Feet	Delta (from UGPH) Feet	Feet From UGPH	Information and Comments
182	3991	25	25	13007	3979' Block 82, Fire Evac Zone 3 Sign (Adit 3 - .3 mi)
183	4016	25	25	12982	3996' = 17+00
184	4041	25	25	12957	4053' Block 85, Survey Marker
185	4067	26	26	12931	
186	4092	25	25	12907	4096' = 16+00, 480V Tap
187	4117	25	25	12881	4130' Block 88
188	4142	25	25	12856	4154' Survey Marker
189	4167	25	25	12831	
190	4192	25	25	12806	
191	4217	25	25	12781	Fire Evac Zone 3 Sign (Adit 3 - .2 mi)
192	4242	25	25	12756	4254' Block 93, Survey Marker
193	4267	25	25	12731	
194	4292	25	25	12706	4297' 14+00, 4316' 120V Dplx, 4322 Drop Track Door, Emergency Phone
195	4341	49	49	12657	4352' Fan Door (2 Exhaust Fans)
196	4368	27	27	12654	
197	4393	25	25	12607	4415' Concrete Bulkhead
198	4449	56	56	12549	Block 100, Adit 3 "WYE" Upper Track Switch, Adit 3 Exit Door, Emergency Phone
199	4473	24	24	12556	Block 101, 120/208/480V Taps, Fire Evac Zone 3 Sign
200	4497	24	24	12500	Block 102, Emergency Phone
201	4521	24	24	12476	Block 103
202	4545	24	24	12452	Block 104
203	4566	21	21	12431	Block 105, 4572' Sectional Valves
204	4583	17	17	12411	Block 106, 4597' Emergency Phone, 4606' Concrete Bulkhead, Train Track Switch
205	4635	52	52	12355	4648' Back of NAVFAC Water Pumping Station
206	4659	24	24	12366	
207	4684	25	25	12313	4691' 120/208V Taps, 4708' Harbor Tunnel Fan Door
208	4710	26	26	12288	Start of Harbor Tunnel
209	4735	25	25	12264	Fire Evac Zone 2 Sign
210	4760	25	25	12238	
211	4785	25	25	12213	
212	4810	25	25	12188	
213	4836	26	26	12162	
214	4861	25	25	12138	
215	4885	24	24	12113	182' 120/208V Taps
216	4911	26	26	12086	
217	4936	25	25	12063	
218	4961	25	25	12037	260' Air Drop

Table F.1: FRAME FOOT MARK SPREADSHEET					
Frame	Feet From Tank 20	Delta (From Tank 20) Feet	Delta (from UGPH) Feet	Feet From UGPH	Information and Comments
219	4986	25	25	12012	
220	5011	25	25	11987	
221	5036	25	25	11962	
222	5061	25	25	11937	120/208V Taps
223	5086	25	25	11912	
224	5111	25	25	11887	
225	5136	25	25	11862	
226	5161	25	25	11837	
227	5186	25	25	11812	
228	5211	25	25	11787	
229	5236	25	25	11762	
230	5261	25	25	11737	568' Fire Evac Zone 2 Sign
231	5286	26	26	11711	593' 480/208V Taps, 588' LCP 12
232	5312	24	24	11688	
233	5336	26	26	11661	
234	5362	25	25	11636	
235	5387	25	25	11612	
236	5412	25	25	11586	
237	5437	25	25	11561	
238	5462	25	25	11536	113+00
239	5487	25	25	11511	
240	5512	25	25	11486	825' 120/208V Taps
241	5537	25	25	11461	
242	5562	25	25	11436	112+00
243	5587	25	25	11411	
244	5612	25	25	11386	
245	5637	27	27	11359	
246	5664	56	56	11305	980' Concrete Bulkhead
247	5720	25	25	11311	
248	5745	25	25	11284	
249	5770	24	24	11229	
250	5794	26	26	11202	
251	5820	26	26	11177	Fire Evac Zone 2 Sign, 120/208V Taps
252	5846	24	24	11155	
253	5870	25	25	11128	1180' Air Line Drop
254	5895	26	26	11101	
255	5921	25	25	11078	
256	5946	25	25	11053	1253 = 108+00
257	5971	23	23	11029	
258	5994	27	27	11000	

Table F.1: FRAME FOOT MARK SPREADSHEET					
Frame	Feet From Tank 20	Delta (From Tank 20) Feet	Delta (from UGPH) Feet	Feet From UGPH	Information and Comments
259	6021	25	25	10977	
260	6046	25	25	10954	1348' 120/208V Taps
261	6071	25	25	10927	1354' = 107+00
262	6096	25	25	10902	
263	6121	25	25	10877	
264	6146	25	25	10852	1455 = 106+00
265	6171	24	24	10828	
266	6195	26	26	10801	
267	6221	25	25	10777	
268	6246	25	25	10753	1561' 480/208V Taps
269	6271	24	24	10728	
270	6295	26	26	10701	1599' Fire Evac Zone 2 Sign (Adit 3 - .45 mi.), Emergency Phone
271	6321	27	27	10675	
272	6348	25	25	10653	1656' = 104+00
273	6373	25	25	10626	
274	6396	23	23	10602	
275	6423	27	27	10573	
276	6448	25	25	10552	1755' Pipeline Vents
277	6473	25	25	10525	
278	6499	25	25	10500	
279	6524	25	25	10475	1826' 120/208V Taps
280	6549	25	25	10450	
281	6572	23	23	10427	
282	6596	24	24	10401	1895' Compressed Air Line Drop
283	6620	24	24	10378	
284	6645	25	25	10353	
285	6669	24	24	10330	101+00
286	6692	23	23	10306	
287	6716	25	25	10280	
288	6741	24	24	10258	
289	6781	39	39	10218	2053' Concrete Bulkhead, Curve
290	6805	25	25	10208	2106' 120/208V Taps
291	6830	25	25	10169	Fire Evac Zone 2 Sign (Adit 3 - .54 mi.)
292	6856	25	25	10144	Air Line Ends
293	6881	25	25	10119	
294	6906	25	25	10094	
295	6931	25	25	10069	2235' = 98+00
296	6956	26	26	10043	Emergency Phone
297	6981	24	24	10020	
298	7006	25	25	9993	

Table F.1: FRAME FOOT MARK SPREADSHEET					
Frame	Feet From Tank 20	Delta (From Tank 20) Feet	Delta (from UGPH) Feet	Feet From UGPH	Information and Comments
299	7031	25	25	9969	
300	7056	25	25	9944	2357' 120/208V Taps, 97+00
301	7082	26	26	9918	
302	7106	25	25	9894	
303	7132	25	25	9868	
304	7157	25	25	9843	
305	7181	25	25	9818	
306	7207	25	25	9793	
307	7232	25	25	9768	
308	7257	25	25	9743	
309	7282	25	25	9718	2582 LCP 10, 480/208V Taps
310	7307	25	25	9693	Fire Evac Zone 2 Sign (Adit 3 - .63 mi.)
311	7332	25	25	9668	
312	7358	25	25	9643	2658' = 94+00
313	7383	25	25	9618	
314	7408	25	25	9593	
315	7433	26	26	9567	
316	7458	24	24	9544	2758' = 93+00
317	7483	25	25	9517	
318	7508	26	26	9492	
319	7533	25	25	9468	2836' 120/208V Taps
320	7558	25	25	9442	2859' = 92+00
321	7583	25	25	9417	
322	7609	25	25	9392	
323	7634	25	25	9367	
324	7659	25	25	9342	
325	7684	25	25	9317	
326	7709	25	25	9292	
327	7733	25	25	9267	
328	7758	25	25	9242	NAVFAC Water Line Hot Tap 3/4" NPT (Weep)
329	7783	25	25	9217	
330	7808	25	25	9192	3110' 120/208V Taps
331	7833	26	26	9166	3116' Fire Evac Zone 2 Sign (Adit 3 - .73 mi)
332	7858	24	24	9143	
333	7883	25	25	9116	
334	7908	25	25	9092	
335	7933	26	26	9066	3259' = 88+00
336	7958	25	25	9042	3263' Concrete Bulkhead
337	7984	25	25	9016	
338	8009	25	25	8991	

Table F.1: FRAME FOOT MARK SPREADSHEET					
Frame	Feet From Tank 20	Delta (From Tank 20) Feet	Delta (from UGPH) Feet	Feet From UGPH	Information and Comments
339	8035	25	25	8966	
340	8060	25	25	8941	3358' = 87+00, 120/208V Taps
341	8085	25	25	8916	
342	8110	25	25	8891	
343	8135	25	25	8866	
344	8160	25	25	8841	3458' = 86+00
345	8185	25	25	8816	
346	8210	25	25	8791	
347	8235	26	26	8765	
348	8260	25	25	8741	
349	8285	24	24	8716	3583' LCP9, 480/208V Taps
350	8310	26	26	8689	3593' Fire Evac Zone 3 Sign (Adit 3 - .82 mi), Emergency Phone
351	8335	24	24	8667	
352	8360	26	26	8639	
353	8385	25	25	8616	3678' Dent in 32"
354	8410	25	25	8590	
355	8436	26	26	8564	
356	8460	24	24	8541	3760' = 83+00
357	8485	25	25	8514	
358	8511	25	25	8490	
359	8537	25	25	8465	3839' 120/208V Taps
360	8562	25	25	8440	
361	8587	26	26	8414	
362	8612	25	25	8390	
363	8638	26	26	8363	
364	8662	24	24	8340	3962' = 81+00
365	8687	25	25	8313	
366	8712	25	25	8289	
367	8737	25	25	8264	
368	8762	25	25	8239	
369	8787	25	25	8214	4092' Fire Evac Zone 2 Sign
370	8812	25	25	8189	4117' 120/208V Taps, Uni-Strut on ground
371	8838	26	26	8163	
372	8863	25	25	8139	
373	8887	24	24	8114	
374	8913	26	26	8087	
375	8938	25	25	8064	Emergency Phone
376	8963	25	25	8038	4263' = 78+00
377	8988	25	25	8013	4270' Concrete Bulkhead
378	9011	24	24	7989	

Table F.1: FRAME FOOT MARK SPREADSHEET					
Frame	Feet From Tank 20	Delta (From Tank 20) Feet	Delta (from UGPH) Feet	Feet From UGPH	Information and Comments
379	9037	26	26	7962	
380	9061	24	24	7940	4365' 120/208V Taps
381	9086	25	25	7913	
382	9111	25	25	7889	
383	9136	25	25	7864	
384	9161	25	25	7839	
385	9211	50	50	7789	
386	9238	27	27	7787	
387	9262	24	24	7740	Fire Evac Zone 2 Sign
388	9287	25	25	7712	
389	9312	25	25	7688	
390	9337	25	25	7663	
391	9362	25	25	7638	
392	9387	25	25	7613	
393	9412	25	25	7588	
394	9438	26	26	7562	
395	9462	24	24	7539	
396	9487	25	25	7512	
397	9512	25	25	7488	
398	9537	25	25	7463	
399	9562	25	25	7438	
400	9587	25	25	7413	
401	9612	25	25	7388	
402	9638	26	26	7362	
403	9662	24	24	7339	
404	9687	25	25	7312	
405	9712	25	25	7288	
406	9736	24	24	7264	
407	9761	25	25	7238	
408	9786	25	25	7214	
409	9811	25	25	7189	
410	9838	27	27	7162	
411	9862	24	24	7140	
412	9888	26	26	7111	
413	9913	25	25	7088	
414	9938	25	25	7062	
415	9963	25	25	7037	
416	9988	25	25	7012	
417	10013	25	25	6987	
418	10039	26	26	6961	

Table F.1: FRAME FOOT MARK SPREADSHEET					
Frame	Feet From Tank 20	Delta (From Tank 20) Feet	Delta (from UGPH) Feet	Feet From UGPH	Information and Comments
419	10063	24	24	6938	
420	10088	25	25	6911	
421	10113	25	25	6887	
422	10138	25	25	6862	
423	10163	25	25	6837	
424	10188	25	25	6812	
425	10213	25	25	6787	
426	10240	27	27	6760	
427	10264	24	24	6738	
428	10289	25	25	6710	Fire Evac Zone 2 Sign
429	10314	25	25	6686	Emergency Phone
430	10364	50	50	6636	
431	10389	25	25	6636	
432	10414	25	25	6586	
433	10440	26	26	6560	
434	10465	25	25	6536	
435	10490	25	25	6510	
436	10515	25	25	6485	
437	10540	25	25	6460	
438	10565	25	25	6435	
439	10590	25	25	6410	
440	10615	25	25	6385	
441	10641	26	26	6359	
442	10665	24	24	6336	
443	10690	25	25	6309	
444	10715	25	25	6285	
445	10740	25	25	6260	
446	10765	25	25	6235	Fire Evac Zone 2 Sign
447	10791	26	26	6209	
448	10817	26	26	6184	
449	10842	25	25	6159	
450	10867	25	25	6133	
451	10892	25	25	6108	
452	10917	25	25	6083	
453	10942	25	25	6058	
454	10967	25	25	6033	
455	10992	25	25	6008	
456	11017	25	25	5983	
457	11043	26	26	5957	
458	11067	24	24	5934	

Table F.1: FRAME FOOT MARK SPREADSHEET					
Frame	Feet From Tank 20	Delta (From Tank 20) Feet	Delta (from UGPH) Feet	Feet From UGPH	Information and Comments
459	11092	25	25	5907	
460	11117	25	25	5883	
461	11142	25	25	5858	
462	11167	25	25	5833	
463	11192	25	25	5808	
464	11217	25	25	5783	
465	11245	28	28	5755	
466	11268	23	23	5735	
467	11294	26	26	5704	
468	11319	25	25	5682	
469	11344	25	25	5656	
470	11369	25	25	5631	
471	11394	25	25	5606	
472	11419	25	25	5581	
473	11445	26	26	5555	
474	11471	26	26	5530	Fire Evac Zone 2 Sign
475	11495	24	24	5506	
476	11520	25	25	5479	
477	11545	25	25	5455	
478	11595	50	50	5405	
479	11620	25	25	5405	
480	11643	23	23	5357	
481	11670	27	27	5328	
482	11695	25	25	5307	
483	11720	25	25	5280	
484	11745	25	25	5255	
485	11770	25	25	5230	
486	11795	25	25	5205	
487	11820	25	25	5180	
488	11843	23	23	5157	
489	11870	27	27	5128	
490	11895	25	25	5107	
491	11921	26	26	5079	
492	11946	25	25	5055	
493	11971	25	25	5029	
494	11996	25	25	5004	
495	12021	25	25	4979	
496	12044	23	23	4956	
497	12071	27	27	4927	
498	12096	25	25	4906	

Table F.1: FRAME FOOT MARK SPREADSHEET					
Frame	Feet From Tank 20	Delta (From Tank 20) Feet	Delta (from UGPH) Feet	Feet From UGPH	Information and Comments
499	12121	25	25	4879	
500	12146	25	25	4854	
501	12171	25	25	4829	
502	12197	26	26	4803	
503	12221	24	24	4780	
504	12245	24	24	4754	
505	12272	27	27	4727	
506	12297	25	25	4705	
507	12323	26	26	4677	
508	12348	25	25	4653	
509	12373	25	25	4627	Emergency Phone
510	12398	25	25	4602	
511	12423	25	25	4577	
512	12447	24	24	4553	
513	12473	26	26	4526	
514	12498	25	25	4503	
515	12524	26	26	4476	
516	12549	25	25	4452	
517	12574	25	25	4426	
518	12599	25	25	4401	
519	12616	17	17	4384	
520	12662	46	46	4330	
521	12686	24	24	4335	
522	12708	22	22	4291	
523	12731	23	23	4266	
524	12752	21	21	4246	
525	12772	20	20	4224	
526	12794	22	22	4201	
527	12812	18	18	4185	
528	12838	26	26	4155	
529	12878	40	40	4123	
530	12903	25	25	4112	
531	12929	26	26	4071	
532	12953	24	24	4048	
533	12978	25	25	4021	Fire Evac Zone 2 Sign
534	13003	25	25	3997	
535	13026	23	23	3972	
536	13054	28	28	3949	
537	13079	25	25	3921	
538	13103	24	24	3896	

Table F.1: FRAME FOOT MARK SPREADSHEET					
Frame	Feet From Tank 20	Delta (From Tank 20) Feet	Delta (from UGPH) Feet	Feet From UGPH	Information and Comments
539	13126	23	23	3872	
540	13154	28	28	3849	
541	13179	25	25	3821	
542	13204	25	25	3796	
543	13227	23	23	3771	
544	13254	27	27	3748	
545	13279	25	25	3721	
546	13304	25	25	3696	
547	13329	25	25	3671	
548	13354	25	25	3646	
549	13379	25	25	3621	
550	13404	25	25	3596	
551	13427	23	23	3573	Evacuation Map
552	13454	27	27	3544	
553	13479	25	25	3523	Ribcage START
554	13504	25	25	3496	3518' = 35+00 EL 109.11
555	13529	25	25	3471	
556	13555	26	26	3445	3437' 120/208V Taps
557	13579	24	24	3421	3370' Concrete Bulkhead, 3417' = 34+00
558	13638	59	59	3362	3363 NAVFAC 30" Water TEE Into Overhead
559	13655	17	17	3345	3356' 6" 150# Flange On NAVFAC 24" Water
560	13680	25	25	3320	
561	13704	24	24	3296	3316' = 33+00 EL 108.85
562	13730	26	26	3270	
563	13755	25	25	3245	
564	13780	25	25	3220	
565	13805	25	25	3195	3216' = 32+00 EL 108.99
566	13828	23	23	3172	
567	13855	27	27	3145	3155' 120/208V Taps
568	13880	25	25	3120	
569	13905	25	25	3095	3116' = 31+00 EL 108.87
570	13930	25	25	3070	3085' Fire Evac Sign (Adit 2 - .44 mi Adit 3 - 2.02 mi)
571	13955	25	25	3045	
572	13981	26	26	3019	
573	14005	24	24	2995	3016' = 30+00 EL 108.42
574	14028	23	23	2972	
575	14056	28	28	2944	
576	14081	25	25	2919	2916' = 29+00 EL 107.65
577	14106	25	25	2894	2900' 120/208V Taps

Table F.1: FRAME FOOT MARK SPREADSHEET					
Frame	Feet From Tank 20	Delta (From Tank 20) Feet	Delta (from UGPH) Feet	Feet From UGPH	Information and Comments
578	14131	25	25	2869	
579	14156	25	25	2844	
580	14181	25	25	2819	
581	14206	25	25	2794	2815' = 28+00 EL 107.51
582	14230	24	24	2770	
583	14256	26	26	2744	
584	14280	24	24	2720	
585	14306	26	26	2694	2715' = 27+00 EL 107.43
586	14332	26	26	2668	2670' 480/208V Taps, LCP3
587	14357	25	25	2643	
588	14382	25	25	2618	
589	14407	25	25	2593	
590	14430	23	23	2570	Emergency Phone
591	14457	27	27	2543	2557' Fire Evac Sign (Adit 2 - .34, Adit 3 - 2.12 mi)
592	14494	37	37	2506	2515' Concrete Bulkhead
593	14519	25	25	2481	
594	14544	25	25	2456	
595	14562	18	18	2438	
596	14581	19	19	2419	120/208V Taps
597	14607	26	26	2393	
598	14627	20	20	2373	
599	14647	20	20	2353	
600	14667	20	20	2333	
601	14685	18	18	2315	
602	14723	38	38	2277	2300' Concrete Bulkhead, Tunnel Curve
603	14748	25	25	2252	
604	14773	25	25	2227	2214' = 22+00, EL 106.89
605	14797	24	24	2203	2205' 120/208V Taps
606	14824	27	27	2176	
607	14848	24	24	2152	
608	14873	25	25	2127	
609	14898	25	25	2102	2114' = 21+00 EL 106.77
610	14924	26	26	2076	
611	14949	25	25	2051	
612	14974	25	25	2026	
613	14998	24	24	2002	2013' = 20+00 EL. 106.72
614	15024	26	26	1976	
615	15049	25	25	1951	
616	15074	25	25	1926	1932 BDA7, 1937' 120/208V Taps
617	15099	25	25	1901	

Table F.1: FRAME FOOT MARK SPREADSHEET					
Frame	Feet From Tank 20	Delta (From Tank 20) Feet	Delta (from UGPH) Feet	Feet From UGPH	Information and Comments
618	15124	25	25	1876	
619	15149	25	25	1851	
620	15174	25	25	1826	
621	15198	24	24	1802	1813' = 18+00 EL. 106.56
622	15224	26	26	1776	
623	15249	25	25	1751	
624	15303	54	54	1697	1719' Concrete Bulkhead, Tunnel Curve
625	15327	24	24	1673	1677' 480/208V Taps, LCP2
626	15352	25	25	1648	
627	15377	25	25	1623	
628	15403	26	26	1597	Fire Evac Zone 2 Sign (Adit 2 - .16 mi, Adit 3 - 2.30mi)
629	15426	23	23	1574	
630	15450	24	24	1550	
631	15475	25	25	1525	
632	15498	23	23	1502	1512' = 15+00, EL 106.17
633	15524	26	26	1476	
634	15547	23	23	1453	
635	15573	26	26	1427	1412' = 14+00 Survey Mark, 120/208V Taps
636	15598	25	25	1402	
637	15622	24	24	1378	
638	15647	25	25	1353	
639	15671	24	24	1329	
640	15696	25	25	1304	
641	15719	23	23	1281	
642	15745	26	26	1255	
643	15769	24	24	1231	
644	15794	25	25	1206	1212' = 12+00 Survey Mark
645	15819	25	25	1181	
646	15845	26	26	1155	120/208V Taps
647	15868	23	23	1132	1120' Fire Evac Sign Zone 1 (Adit 1 - .31 mi)
648	15893	25	25	1107	1111' = 11+00 Survey Mark
649	15917	24	24	1083	1060' Auto-shut Door, Concrete Bulkhead
650	15975	58	58	1025	1037' Track Switch
651	15986	11	11	1014	Adit 2 Spur, Sectional Valves, Emergency Phone
652	16016	30	30	984	992' Concrete Bulkhead
653	16041	25	25	959	972' Spare Breakers (4@)
654	16066	25	25	934	Fire Evac Zone 1 Sign
655	16091	25	25	909	9+00 Survey Mark
656	16116	25	25	884	

Table F.1: FRAME FOOT MARK SPREADSHEET					
Frame	Feet From Tank 20	Delta (From Tank 20) Feet	Delta (from UGPH) Feet	Feet From UGPH	Information and Comments
657	16141	25	25	859	
658	16166	25	25	834	
659	16192	26	26	808	
660	16216	24	24	784	8+00 Survey Mark
661	16241	25	25	759	
662	16266	25	25	734	
663	16292	26	26	708	7+00 Survey Mark
664	16317	25	25	683	679' 480/208V Taps, LCP1
665	16342	25	25	658	674' Fire Evac Zone 1 Sign (Adit 1 - .22 mi)
666	16367	25	25	633	
667	16392	25	25	608	6+00 Survey Mark
668	16417	25	25	583	
669	16442	25	25	558	
670	16467	25	25	533	520' 120/208V Taps
671	16492	25	25	508	Emergency Phone
672	16517	25	25	483	
673	16542	25	25	458	
674	16567	25	25	433	
675	16592	25	25	408	
676	16617	25	25	383	4+00 Survey mark
677	16642	25	25	358	
678	16667	25	25	333	
679	16692	25	25	308	3+00 Survey Mark
680	16717	25	25	283	
681	16764	47	47	236	251' Concrete Bulkhead
682	16780	16	16	220	233' Survey marker
683	16800	20	20	200	
684	16825	25	25	175	
685	16846	21	21	154	
686	16868	22	22	132	
687	16889	21	21	111	Fire Evac Zone 1 Sign
688	16910	21	21	90	Emergency Phone
689	16930	20	20	70	
690	16945	15	15	55	
691	17000	55	55	0	Harbor Tunnel START

APPENDIX G - ACRONYMS

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APPENDIX G - ACRONYMS

ACGIH	American Conference of Governmental Industrial Hygienists
ACP	Area Contingency Plan
AEC	Area Environmental Coordinator
AFFF	Aqueous Film Forming Foam
AFHE	Automated Fuel Handling Equipment
AOR	Area of Responsiblity
API	American Petroleum Institute
AST	Aboveground Storage Tank
ATG	Automatic Tank Guage
BBL	Barrels
BGS	Below Ground Surface
BOA	Basic Ordering Agreement
CADO	Civilian Assistant Duty Officer
CCTV	Closed Circuit Television
CDO	Command Duty Officer
CFM	Cubic Feet per Minute
CFR	Code of Federal Regulations
CNRH	Commander, Naval Region Hawaii
DDC	Direct Digital Control
DFM	Diesel Fuel - Marine Grade
DLA	Defense Logistics Agency
DOD	Department of Defense
DOH	Department of Health
DRMO	Defense Reutilization and Marketing Office
DRP	Disaster Response Plan
EAL	Environmental Action Level
EOC	Emergency Operation Center
EPA	U.S. Environmental Protection Agency
ERP	Emergency Response Plan
ERT	Environmental Response Team
ESSM	Emergency Ship Salvage Material
ETA	Estimated Time of Arrival
F-24	Jet A Aviation Fuel (NATO)
F-76	Diesel Fuel - Marine Grade
FACP	Fire Alarm Control Panel
FDC	Fire Department Connection
FFD	Federal Fire Department
FORFAC	Fuel Oil Reclamation Facility
FRT	Facility Response Team
FRP	Facility Response Plan
FYDP	Future Years Defense Plan
GAL	Gallon(s)
GPM	Gallons per Minute
GUI	Graphical User Interface

HAR	Hawaii Administrative Rules
HRR	Hawaiian Remediation and Recycling
HS	Hazardous Substance
HT	Harbor Tunnel
HW	Hazardous Waste
IAP	Incident Action Plan
IC	Incident Commander
ICP	Incident Command Post
ICP	Integrated Contingency Plan
ICS	Incident Command System
IDLH	Immediately Dangerous to Life and Health
IN	Inch
IR	Infrared
IWTC	Industrial Waste Treatment Center
JBPHH	Joint Base Pearl Harbor-Hickam
JP-5	Jet Fuel Propellant No. 5
LAT	Lower Access Tunnel
LEL	Lower Explosive Limit
LNAPL	Light Non-Aqueous Phase Liquid
MCL	Maximum Contaminant Level
MOV	Motor Operated Valve
MGD	Million Gallons per Day
MSHA	Mine Safety and Health Administration
MSL	Mean Sea Level
MTPMMS	Mass Technology Precision Mass Measurement System
NATO	North Atlantic Treaty Organization
NAVFAC	Naval Facilities Engineering Command
NAVSEA	Naval Sea Systems Command
NAVSUP FLCPH	Naval Supply Systems Command Fleet Logistics Center Pearl Harbor
NGA	Network Graphic Annunciators
NIMS	National Incident Management System
NOAA	National Oceanic and Atmospheric Administration
NOSC	Navy On-Scene Coordinator
NFPA	National Fire Protection Association
NRC	National Response Center
NRC	National Response Corporation
NSF	National Strike Force
NSFCC	National Strike Force Coordination Center
NWCF	Navy Working Capital Fund
NWS	Network Station
OHS	Oil and Hazardous Substance
OPA	Oil Pollution Act
OPD	Oil Pressure Door
OSHA	Occupational Safety and Health Administration
ORRT	Oceania Regional Response Team

OWOCRS	Open Water Oil Containment and Recovery System
PARS	Personnel Accountability Reporting System
PEL	Permissible Exposure Limit
PENCO	Pacific Environmental Company
PIAT	Public Information Assist Team
PIC	Person in Charge
PID	Photo-Ionization Detector
POL	Petroleum, Oil, and Lubricants
PPE	Personal Protective Equipment
PPM	Parts per Million
PSIG	Pounds per Square Inch Gauge
R.A.C.E	Rescue, Alert, Contain, Evacuate
RDC	Regional Dispatch Center
RHFSF	Red Hill Fuel Storage Facility
RIC	Rapid Intervention Crew
ROC	Regional Operations Center
RP	Red Plan
SCRC	Self-Contained Self-Rescue
SDS	Safety Data Sheets
SFO	Senior Fire Official
SMT	Spill Management Team
SOSC	State On-Scene Coordinator
SPCC	Spill Prevention, Control and Countermeasure
SSC	Scientific Support Coordinator
SSRBL	Site-Specific Risk-Based Levels
STEL	Short Term Exposure Limit
STT	Surge Tank Tunnel
SUPSALV	Supervisor of Salvage
SVM	Soil Vapor Monitoring
SVMP	Soil Vapor Monitoring Point
SWOB	Ship Waste Offload Barge
TLV	Threshold Limit Value
TPH	Total Petroleum Hydrocarbons
TSDF	Treatment, Storage and Disposal Facility
TWA	Time Weighted Average
TYCOM	Type Commander
UAT	Upper Access Tunnel
UC	Unified Command
UEL	Upper Explosive Limit
UFM	Unscheduled Fuel Movement
UGPH	Underground Pumphouse
USCG	United States Coast Guard
UST	Underground Storage Tank
UVIR	Ultra-Violet Infrared Detector
VOC	Volatile Organic Compounds
YON	Yard Oiler Navy

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TAB A
WORST-CASE DISCHARGE SCENARIO

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1.0 WORST-CASE DISCHARGE SCENARIO

Disclaimer: All spill volumes, release rates, release timelines, and fate and effect of the released product are purely hypothetical and have been developed for planning and training purposes only.

1.1 Introduction

The worst-case discharge scenario involves the complete release of the contents of the largest bulk storage tanks at the RHFSF. Tank 14 is at capacity with 302,846 barrels (12,719,532 gallons) of JP-5. An earthquake of magnitude 8.0 hits Oahu and cuts power at the RHFSF. A section of 20" diameter piping between the outlet of Tank 14 and the skin valve cracks and fails, resulting in the uncontrolled emptying of the tank.

In this scenario, oil will flow down the LAT/HT towards the UGPH and Adit 2. If all the isolation doors in the tunnel were left open and failed to close due to the power outage, fuel would eventually fill the UGPH and escape Adit 1. Fuel would also escape Adit 2, following topographic and drainage features around the COMPACFLT Buildings (352 and 400), discharging into Halawa Stream via stormwater drains.

While it is extremely unlikely that a tank failure resulting in the loss of the entire storage capacity will occur, CNRH recognizes the need to develop these procedures for planning and training purposes.

Information on the worst-case discharge is provided in Table A.1.

TABLE A.1: WORST-CASE DISCHARGE INFORMATION	
Calculated WCD	302,846 bbls
Oil Group	Group 1 – Non-persistent
Operating Area	Nearshore / Inland

1.2 Actions to Prevent a Worst-Case Discharge

Actions to prevent or mitigate a worst-case discharge include:

- Close the OPD located just down the LAT, past Tanks 1 and 2. The door can be closed by pushing the manual push button on the bulkhead to the side of the door. The door will also automatically close when the high-level float in the OPD lift sump indicates that the sump is full. Closure of the door triggers the fire alarm system.
- Close the three isolation doors located in the LAT; Doors A, C, and the entrance to the UGPH. These doors are designed to stop a spill from migrating down the tunnel and will automatically close in the event of an oil spill.
- FLCPH Fuel Department maintain a heightened inspection and maintenance program for the Red Hill facility. All tanks are currently undergoing, or will undergo, a modified American Petroleum Institute (API) 653 inspection process. Tanks are pressure tested semi-annually, pipelines are regularly inspected and pressure tested.
- FLCPH Fuel Departments conduct regular Oil Pollution Act (OPA) 90 spill training and exercises.

1.3 Fuel Escaping Adit 2

Fuel escaping Adit 2 would pool in parking areas surrounding Building 352 and 400 and migrate through storm water drains into Halawa Stream. Figure A.1 provides a drainage map for the area and shows drainage flow direction, storm drain locations, and drainage outfalls into Halawa Stream.

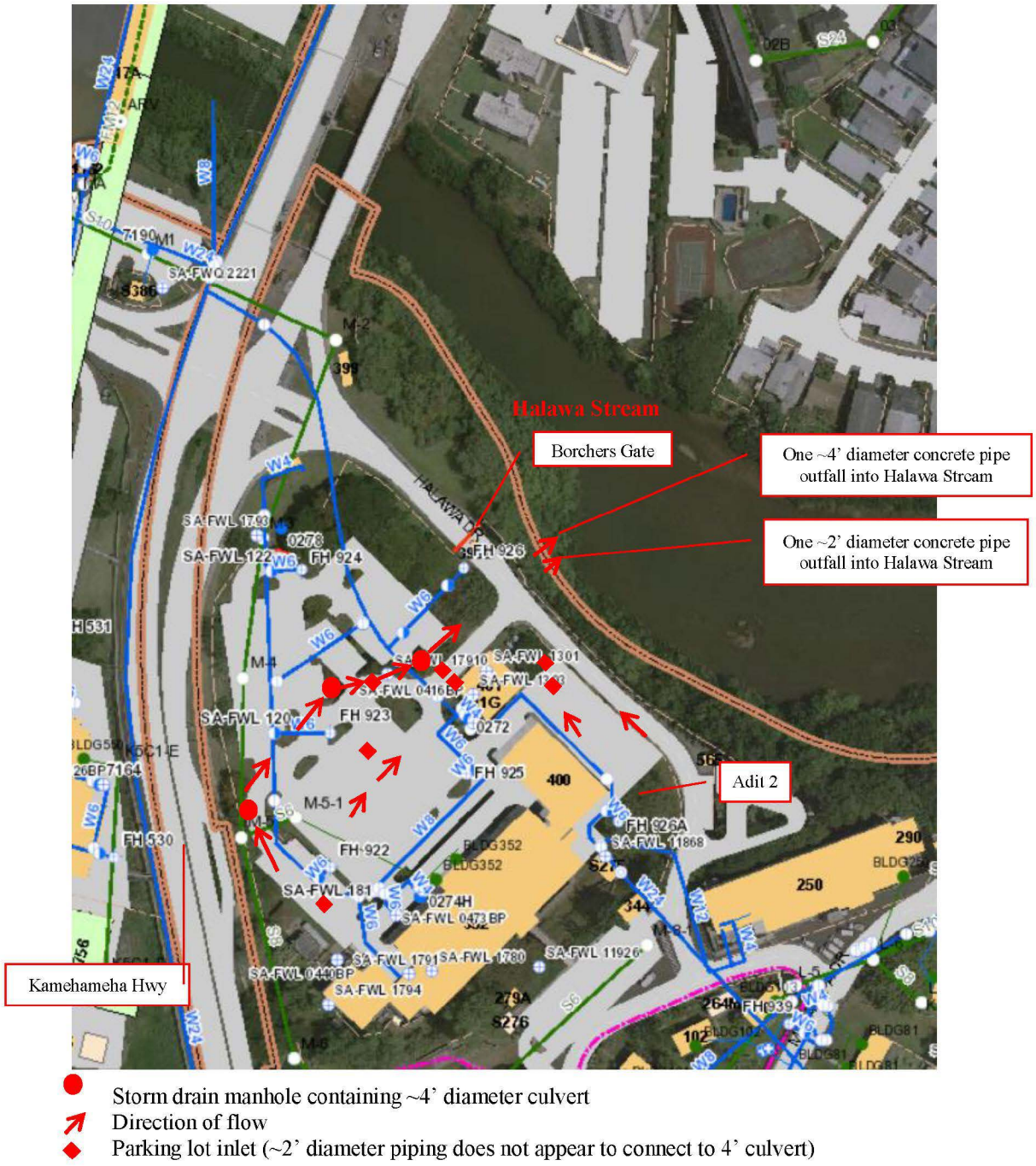

Figure A.1: Drainage Map for Area around Adit 2

1.4 Fuel Movement on Water

Under normal Trade Wind (northwest) conditions fuel that makes its way into Halawa stream, and then Pearl Harbor, would be expected to move toward Ford Island and affect piers Hotel, Bravo, Mike and Sierra. Under Kona Wind (south) condition, winds would tend to move the fuel toward the shoreline of the USS Arizona Visitor Center, Aiea Bay, and Ford Island.

2.0 IMMEDIATE RESPONSE ACTIONS

2.1 Fuel Department Personnel

1. Immediately alert nearby personnel who may be exposed to the effects of the discharge.
2. Activate nearest fire alarm.
3. Evacuate the facility, tunnels, and adits (see Section 12).
4. Notify the Control Room Operator.
5. If properly trained, authorized, and it is safe to do so, initiate available on-site countermeasures (if applicable).

2.2 Control Room Operator

1. Stop all fueling operations.
2. Activate emergency shutdown procedures if safe to do so (see Red Plan for procedures).
3. Close all motorized valves on pipelines.
4. Notify the Supervisory Distribution Facilities Specialist at 473-7824 or 216-1341 (cell) and Deputy Fuel Director at 473-7801 or 780-3703 (cell). If unable to reach Deputy Fuel Director, call the Fuel Director at 473-7833 or 690-0115 (cell).
5. Report spill immediately to Regional Dispatch Center at 911 or 471-7117.
6. Notify the COMPACFLT CDO at 471-3201 to initiate immediate evacuation of Buildings 250, 352 and 400.
7. Notify NAVSUP FLCPH CDO at 216-1339 (cell).
8. Account for the number of personnel (workers and contractors) evacuated.
9. Assess the situation, including:
   - Source and extent of release
   - Status of operation shutdown
   - Number of injured and their conditions
   - Probable direction of vapors
   - Estimate quantity of release
   - Direction of movement of release
   - Status of ignition sources
10. Follow all emergency standard operating procedures.
11. Refer to Red Plan at the beginning of this plan for additional action.
12. Document all actions.

2.3 Fuel Director/Emergency Coordinator

1. Immediately notify:
   - Navy On-Scene Coordinator at 864-2463.
   - National Response Center at 800-424-8802 or 202-267-2675.
   - State Emergency Response Commission at 586-4249 or 247-2191 (after hours).

- Local Emergency Response Committee at 723-8958.

2. Submit Operation Report (OPREP-3) Navy Blue Message followed by an Oil or Hazardous Substance Spill/Release Message if directed by the NOSC or IC.
3. Refer to Red Plan at the beginning of this plan for additional action.

2.4 Navy On-Scene Coordinator

1. Ensure that all proper notifications were made (see Appendix A of the CNRH ICP).
2. Activate Navy SUPSALV to assist Port Operations FRT.
3. Recall CNRH SMT.
4. Establish command center and staging area.
5. Activate emergency response contractors if needed (see Appendix E of the CNRH ICP).

2.5 Safety Officer

1. Evaluate immediate public health and safety risks.
2. Recommend site control measures to isolate public from possible exposure (such as recommending evacuation or shelter in place).
3. Assess environmental conditions (such as air and water monitoring).
4. Conduct site safety evaluation and develop site safety plan.

3.0 INITIAL RESPONSE

The Federal Fire Chief, or senior fire official, will assume the duties of the IC and take control of the spill during the emergency phase. The FFD will attempt to control the release, rescue the injured, monitor site safety, and guard against the possibility of fire. A major priority for the FFD will be to ensure the safety of the residents of both JBPHH and surrounding communities, and to the responders and other emergency personnel.

Due to the nature and volume of the spill, the areas surrounding Adit 1 and 2 at JBPHH and the USCG housing near the Red Hill facility may need to be evacuated due to the risks from vapor, fire, and explosions. The IC, in consultation with the NOSC and Safety Officer, will decide if additional evacuations will be needed for the base and surrounding communities.

- If facility personnel and base residents need to be evacuated, the IC will initiate the evacuation in accordance with the CNRH EMP.
- If communities' off-base need to be evacuated the IC will coordinate with the Hawaii Emergency Management Agency (HIEMA) 733-4300 and the Honolulu Fire Department 831-7771 in implementing community evacuation plans.

Concurrent with public safety evacuations, the FFD will conduct air monitoring at key areas, including the Red Hill facility, ventilation shafts, and adit entrances.

Once the initial emergency actions are implemented, the NOSC will assume direct control of the spill response and cleanup.

4.0 RESPONSE STRATEGIES

4.1 For Oil Escaping and Remaining in the Tunnel

Under this scenario, the HT and Adit 2 Spur Tunnel will be inundated with oil, with oil reaching the Adit 2 entrance in just 22-25 minutes after the release. Oil will quickly start to escape Adit 2, with approximately 10.5 million gallons escaping over the next few hours. Figure A.2 provides aerial photos of Adit 2. Response strategies and operations are discussed in the following paragraphs. (Note: other response strategies not discussed below may be used to respond to this scenario.)

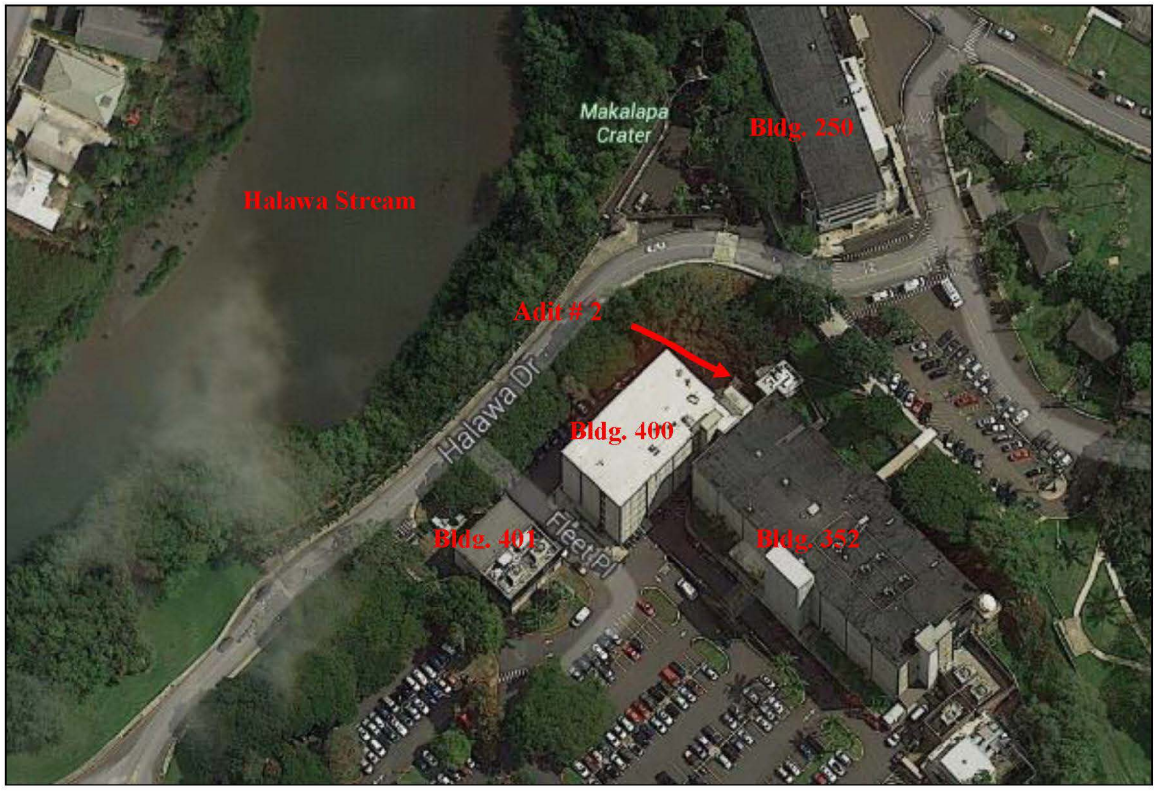

Figure A.2: Aerial Photo Showing Location of Adit 2

Containing Oil Escaping Adit 2

Adit 2 is located within a natural depression with steep embankments behind and to the sides of the adit (sees Figure A.2). Directly in front of the adit are Buildings 352 and 400 which have large parking areas surrounding them. With less than one hour to respond, there will be little time to take countermeasures such as building an earthen berm. However, storm drain blockers should be considered for the parking areas to prevent oil from reaching Halawa Stream. Oil captured in the parking area could be pumped into tank trucks and transferred to empty storage tanks and/or a SWOB barge (see Section 10 for options). A key consideration while responding to this scenario will be the high accumulations of explosive vapors coming off the oil.

Pumping Oil out of Adits 1 and 2, and Harbor Tunnel

Oil remaining in the tunnels, approximately 1.9 million gallons, will eventually have to be pumped out of the adits and tunnels. The HT sump pumps may be configured to pump oil through the isolation door that separates the HT from the UGPH (see Red Plan). The sump pumps are designed to send oily water (or oil in this case) to the Adit 1 sump which can then be sent to the swale or to Tanks B-1 and B-2 (378,000 gallons each) at the FORFAC facility. From these tanks, oil can be moved to various locations such as the UTF or to a SWOB or YON barge at Hotel Pier (see the Fuel Department's Operations and Maintenance Manual for details). Portable pumps could also be staged outside of Adit 1 to pump oil out of the adits and tunnels. See Section 10 for response equipment listings.

4.2 For Oil that Directly Impacts the Water

For oil that has already impacted Halawa Stream and Pearl Harbor, the strategy will be to contain and recover as much oil as possible near the source of its entry into Pearl Harbor. The overall strategy will be to prevent oil from spreading further into East Loch or the Entrance Channel, and to protect the sensitive shoreline and historical resources in and around the immediate spill location.

With oil impacting the water, the On Scene IC will immediately call the JBPHH Port Operations Control Tower at 474-6262. Port Operations will activate the FRT who will respond with boom, boats, skimmers, and vacuum trucks. Port Operations will also order the evacuation and closure of the Arizona Memorial and clear the area of all vessel traffic.

The FRT will attempt to contain and recover the oil in Halawa Stream before it escapes into Pearl Harbor by booming the entrance to the stream and using skimmers and vacuum trucks to recover oil. Section 4.3 details the containment and oil recovery booming strategy for a release into Halawa Stream.

4.3 Containment and Oil Recovery Booming Strategy for Halawa Stream

Note: This booming strategy is for guidance only. All booming strategies may need to be adjusted depending on the tides, current, wind, availability of equipment, and movement of oil.

Booming Strategy:

Contain and recover oil from Halawa Stream/Pearl Harbor and to protect environmentally sensitive areas.

Site Conditions:

- Near the mouth of Halawa Stream, the water is sufficiently deep for utility boats until approaching the shoreline.
- Booming site is tidal and may be affected by the prevailing Trade/Kona Winds.

Initial Response Equipment:

Boom*: Approximately 800 feet of 24" harbor boom depending on water current and weather conditions. Mouth of stream will be double-boomed with two 400 feet lengths of boom.

Vessels: Two platform boats, four utility boats, and two skimmers

Vacuum Tucks: Seven vacuum tucks are available
- 2 @ FRT, 472-9942
- 3 @ NAVSUP FLCPH, 473-7801
- 2 @ NACFAC HI, 471-8481

Personnel: 2 to 3 crew per vessel; 1 to 2 personnel per vacuum truck

Boom attachments: Connect to fixed objects on both sides of the mouth of Halawa Stream

Initial Response time: < 1hour

*Note: 42" boom available from SUPSALV's ESSM facility located at Alpha Docks. Contact Navy SUPSALV at: 202-781-1731 Option #2 (Day) / 202-781-3889 (24hrs.) / 423-7055 (local)

Oil Recovery:

The mouth of the stream will be boomed with skimmers working within the boomed area recovering oil. Vacuum trucks will be staged on the shoreline adjacent to the stream mouth (Navy side) to recover oil using skimmers.

Staging Areas:

The staging area for vacuum trucks and other response equipment/supplies will be the parking lot near Mike 1 and 2 Piers (see Figure A.3). The staging area for the waterborne response will be the FRT Base on Ford Island (see Figure A.4). Staging areas may be moved depending on wind direction and vapor concentration.

Booming Strategy Map:

Figure A.5 shows an aerial photo depicting the booming strategy for Halawa Stream with the suggested oil recovery site. Figure A.6 shows the same information on a nautical chart.

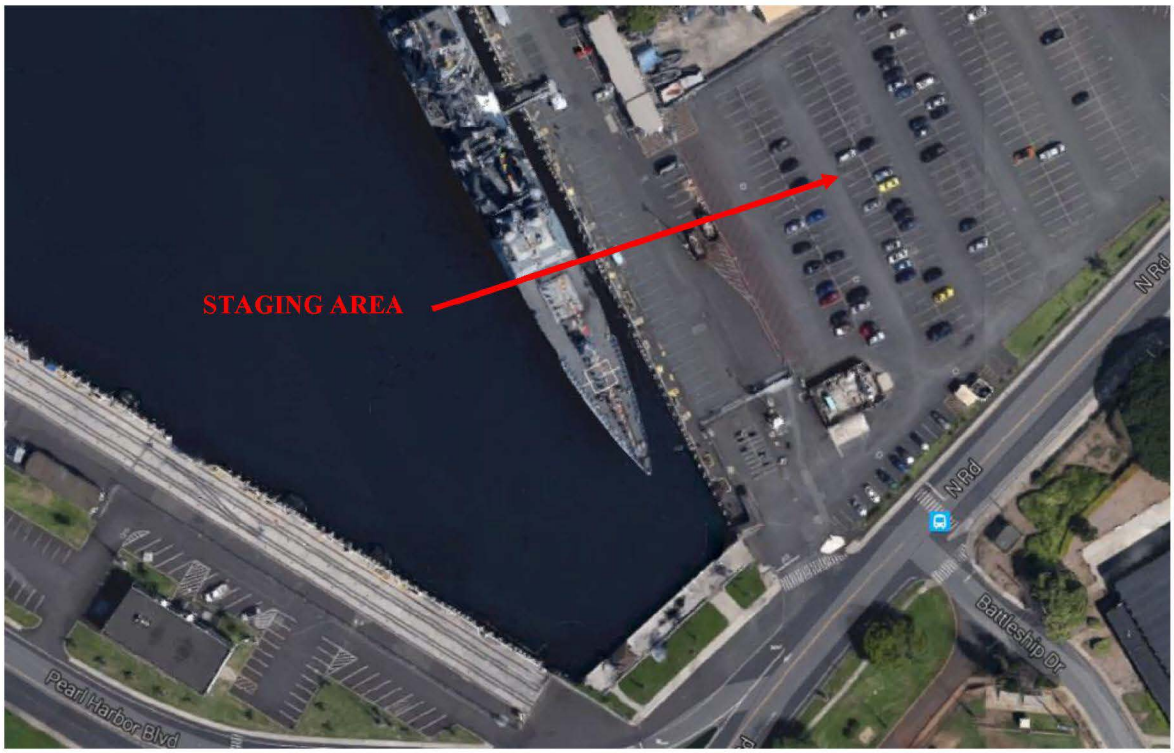

Figure A.3: Staging Area, Mike 1 and 2 Piers

Figure A.4: Staging Area at Facility Response Team Base, Ford Island

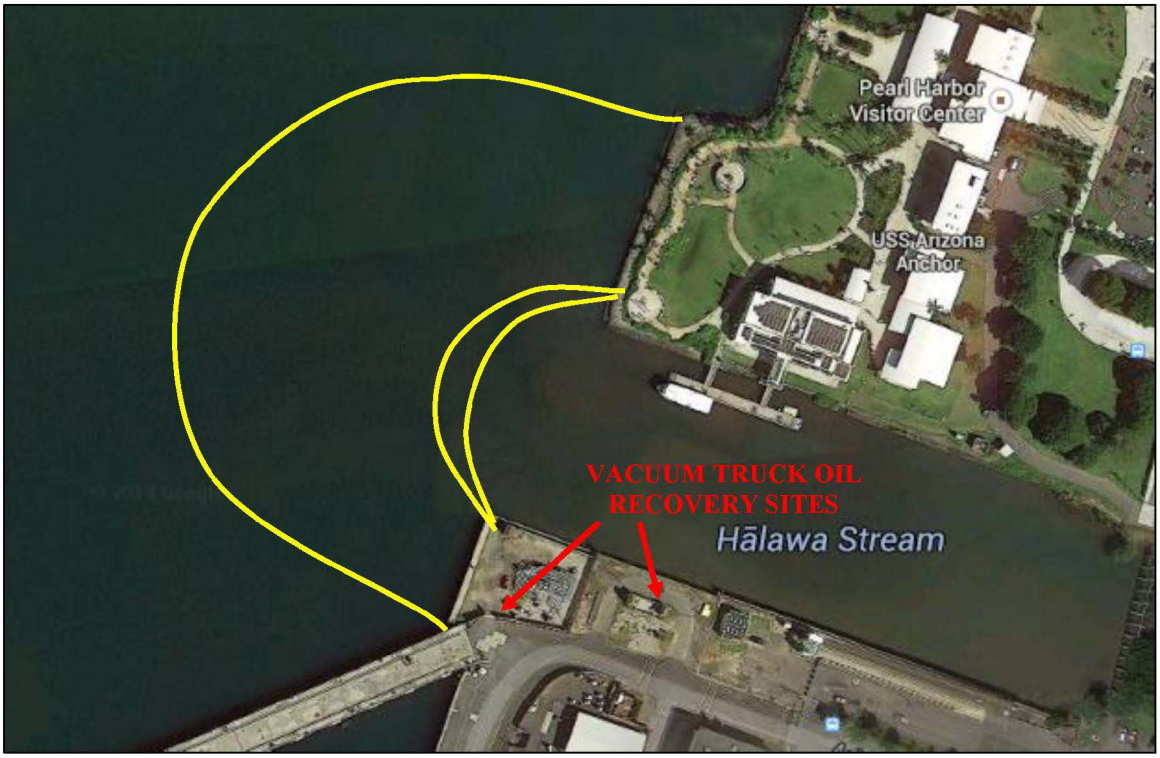

Figure A.5: Aerial Photo Depicting the Booming Strategy and Oil Recovery Site

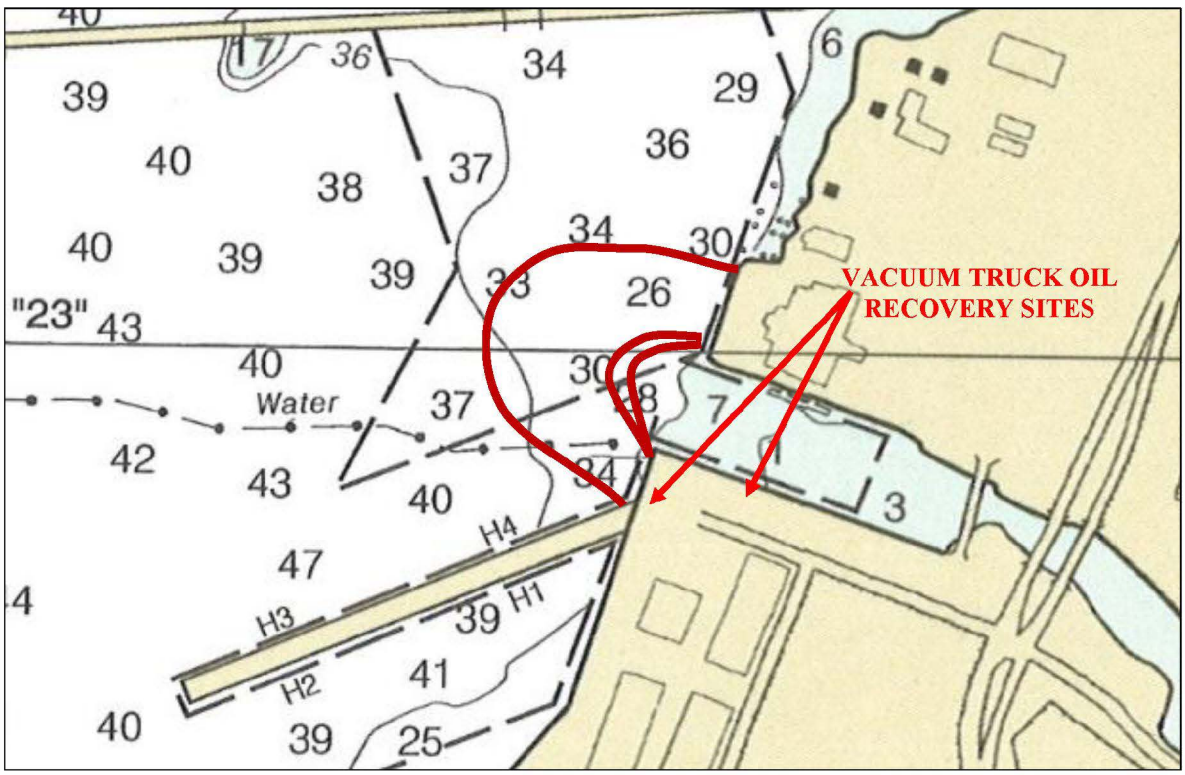

Figure A.6: Nautical Chart Depicting the Booming Strategy and Oil Recovery Sites

4.4 Spill Trajectory

The National Oceanic and Atmospheric Administration (NOAA) oil spill trajectory model GNOME (General NOAA Operational Modeling Environment), can be used to develop spill trajectories. Contact a NOAA Scientific Support Coordinator for assistance at (206) 526-6081 or (206) 849-9926.

4.5 Oil Weathering

NOAA's oil weathering model ADIOS (Automated Data Inquiry for Oil Spills) was used to establish the evaporation rate of a 10.5 million gallon release of F-76 into Halawa Stream under different wind speed conditions over time. The model assumes the fuel enters the water and spreads in an unhindered way. Data will vary depending on weather, currents and other factors at the time of the incident. Table A.2 shows evaporation rates for F-76 over time and Figure A.7 shows NOAA's oil weathering model for the F-76 spill.

TABLE A.2: EVAPORATION RATES FOR F-76 OVER TIME

Wind Speed	Percentage of Fuel Remaining[1]					
	24 Hours	48 Hours	72 Hours	96 Hours	120 Hours	
10 Knots	80%	45%	30%	20%	12%	1,300,000 Gallons Remain
15 Knots	55%	30%	15%	10%	03%	315,000 Gallons Remain
20 Knots	40%	12%	05%	157,500 Gallons Remain		

[1] Using ADIOS and extrapolating down to percentages less than 10%

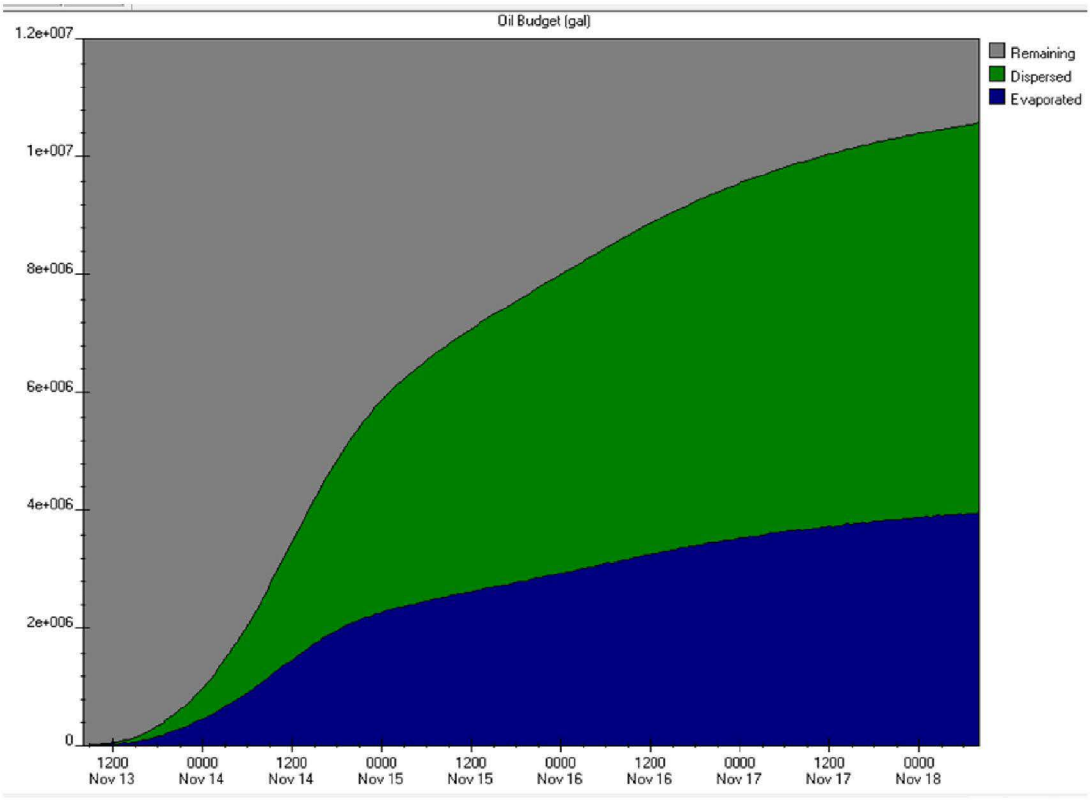

Figure A.7: NOAA Oil Weathering Model for F-76 Spill

TAB B
MAXIMUM MOST PROBABLE DISCHARGE SCENARIO

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1.0 MAXIMUM MOST PROBABLE DISCHARGE SCENARIO

Disclaimer: All spill volumes, release rates, release timelines, and fate and effect of the released product are purely hypothetical and have been developed for planning and training purposes only.

1.1 Introduction

Contractors working in the Tank Gallery area of the LAT accidently damage the 32" F-76 pipeline causing it to rupture. At the time of the accident, fuel transfer operations are being conducted. F-76 is being transferred from the Red Hill storage tanks to a vessel located at Hotel Pier. Within minutes the Control Room Operator notices a reduction in normal transfer pressure and immediately shuts down the pumping operation and closes the motorized block valves along the line. The total volume of fuel in the damaged section of pipeline is released (80,000 gallons) as the breach occurs just above the motorized block valve. Fuel starts to slowly travel down the LAT but is contained in the area by the newly constructed OPD just past Tanks 1 and 2.

2.0 IMMEDIATE RESPONSE ACTIONS

2.1 Fuel Department Personnel

1. Immediately alert nearby personnel who may be exposed to the effects of the discharge.
2. Activate nearest fire alarm.
3. Evacuate the facility, tunnels, and adits (see Section 12).
4. Notify the Control Room Operator.
5. If properly trained and authorized, and it is safe to do so, initiate available on-site countermeasures (if applicable).

2.2 Control Room Operator

1. Stop all fueling operations.
2. Activate emergency shutdown procedures if safe to do so (see Red Plan for procedures).
3. Close all motorized block valves on pipelines.
4. Notify the Supervisory Distribution Facilities Specialist at 473-7824 or 216-1341 (cell) and Deputy Fuel Director at 473-7801 or 780-3703 (cell). If unable to reach Deputy Fuel Director call the Fuel Director at 473-7833 or 690-0115 (cell).
5. Report spill immediately to Regional Dispatch Center at 911 or 471-7117.
6. Notify the COMPACFLT at 471-3201 for possible evacuation of Building 250.
7. Notify NAVSUP FLCPH CDO at 216-1339 (cell).
8. Account for the number of personnel (workers and contractors) evacuated.
9. Assess the situation, including:
   - Source and extent of release
   - Status of operation shutdown
   - Number of injured and their conditions
   - Probable direction of vapors
   - Estimate quantity and direction of movement of release
   - Status of ignition sources
10. Follow all emergency standard operating procedures.
11. Refer to Red Plan at the beginning of this plan for additional action.
12. Document all actions.

2.3 Fuel Director/Emergency Coordinator

1. Immediately notify:
   - Navy On-Scene Coordinator at 864-2463.
   - National Response Center at 800-424-8802 or 202-267-2675.
   - State Emergency Response Commission at 586-4249 or 247-2191 (after hours).
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2. Submit OPREP-3 Navy Blue Message followed by an Oil or Hazardous Substance Spill/Release Message if directed by the NOSC or IC.
3. Refer to Red Plan at the beginning of this plan for additional action.

2.4 Navy On-Scene Coordinator

1. Ensure that all proper notifications were made (see Appendix A of the CNRH ICP).
2. Recall CNRH SMT.
3. Establish command center and staging area.
4. Activate emergency response contractors; if applicable (see Appendix E of the CNRH ICP).

2.5 Safety Officer

1. Evaluate immediate public health and safety risks.
2. Recommend site control measures to isolate public from possible exposure (such as recommending evacuation or shelter in place).
3. Assess environmental conditions (such as air and water monitoring).
4. Conduct site safety evaluation and develop site safety plan.

3.0 INITIAL RESPONSE

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- If facility personnel and base residents need to be evacuated, the IC will initiate the evacuation in accordance with the CNRH EMP.
- If communities off-base need to be evacuated the IC will coordinate with the HIEMA 733-4300 and the Honolulu Fire Department 831-7771 in implementing community evacuation plans.

Concurrent with public safety evacuations, the FFD will conduct air monitoring at key areas, including the Red Hill facility, ventilation shafts, and adit entrances. Once the initial emergency actions are implemented, the NOSC will assume direct control of the spill response and cleanup.

4.0 RESPONSE STRATEGIES

Pumps staged outside the isolation door below Tanks 1 and 2 can be used to pump any free fuel out of the LAT where the spill occurred. Hoses can be run from the pumps to temporary storage located outside of Adit 3. Sump pumps within the spill area may also be used to pump free fuel from the tunnel (see the Fuel Department's Operation and Maintenance Manual for details.

Depending on wind and incident conditions, staging areas for a response to this scenario will be outside of Adit 3 (see Figure B.1). See Section 10 for a listing of response equipment available to the NOSC for responding to the spill in this scenario.

Figure B.1: Aerial Photo Showing Staging Area Outside of Adit 3

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