DRAFT

RESPONSE ACTION MEMORANDUM

Generator Fuel Spill Site (SS014)
Maui Space Surveillance Complex,
Haleakalā, Hawaiʻi

Prepared by:

Department of the Air Force

July 2024

Table of Contents

List of Figures

List of Tables

Attachments

ACRONYMS AND ABBREVIATIONS

bgs	Below Ground Surface
BTEX	Benzene, Toluene, Ethylbenzene, and Xylene
CFR	Code of Federal Regulations
COPC	Chemical of Potential Concern
cy	cubic yard(s)
DAF	Department of the Air Force
DLNR	Department of Land and Natural Resources
DRO	Diesel Range Organics
DU	Decision Unit
EAL	Environmental Action Level
EC	Engineering Control
EHE	Environmental Hazard Evaluation
LT-EHMP	Long-Term Environmental Hazard Management Plan
ERA	Environmental Risk Assessment
FAA	Federal Aviation Administration
ft	Foot/Feet
GRA	General Response Actions
HDOH	State of Hawaiʻi Department of Health
HHRA	Human Health Risk Assessment
HO	Haleakalā High Altitude Observatory
IC	Institutional Controls
IfA	Institute for Astronomy
kg	Kilogram(s)
LUC	Land Use Controls
mg/kg	Milligrams per Kilogram
MSSC	Maui Space Surveillance Complex
NAA	No Action Alternative
RAM	Response Action Memorandum
RAO	Remedial Action Objectives
SCAE	Site Characterization and Alternatives Evaluation
SCP	State Contingency Plan
sf	Square Feet
TCRA	Time Critical Removal Action
TGM	Technical Guidance Manual
TPH	Total Petroleum Hydrocarbons
UH	University of Hawaiʻi
USAF	United States Air Force
USSF	United States Space Force
VOC	Volatile Organic Compound

1.0 SITE LOCATION AND DESCRIPTION

This Draft Response Action Memorandum (RAM) presents the preferred remedial alternatives selected by the Department of the Air Force (DAF), which includes the United States Air Force (USAF) and the United States Space Force (USSF) for the Generator Fuel Spil Site (SS014) located within the Maui Space Surveillance Center (MSSC) boundary. The MSSC is located within the Haleakalā High Altitude Observatory (HO) near the summit of Haleakalā on the Hawaiian island of Maui (Figure 1).

This RAM summarizes pertinent site information, summarizes investigation data and the associated environmental hazards, documents the basis for remediation, and describes the rationale for selection of the preferred remedial alternative. The RAM is based on the information presented in the Site Characterization and Alternatives Evaluation (SCAE) report (USAF, 2024). The RAM was prepared in accordance with the Hawaii State Contingency Plan (SCP) (Hawaii 1997) and the *Technical Guidance Manual for the Implementation of the Hawaiʻi State Contingency Plan* (TGM) (HDOH 2008).

1.1 Site Description

The HO site consists of 18 acres adjacent to the boundary of Haleakalā National Park and the Kula Forest Reserve, which are large open natural areas with limited development or disturbance.

The site was formally designated for observatory use by an executive order of the Governor of Hawaiʻi in 1961 and is managed and operated by the University of Hawaiʻi (UH) to support high-quality, high-impact research, education, and space surveillance. HO is not part of the Haleakalā National Park. The primary use of the MSSC is to perform 24/7 deep space surveillance and satellite tracking, while also supporting research and development projects and collaborating with outside organizations for space-monitoring efforts. Due to year-round viewing conditions and a relatively stable climate, the facility routinely performs deep space observational operations and has the capability of projecting lasers into the atmosphere.

1.2 Historic Land Use

The MSSC has been an essential site for space surveillance and electro-optical research for over 60 years. The site was officially designated as the HO by an Executive Order in 1961. UH developed plans for the MSSC which were used by the United States Army Corps of Engineers to begin construction in 1963, and the complex began operation in 1965 under the Air Force Systems Command. The MSSC is currently managed by the USSF.

1.3 Cultural and Historic Resources

The project site is in an area of cultural and historic significance. According to Hoʻomanaʻo (remembrances, recollections) of many Native Hawaiians interviewed for the recent cultural impact assessments, for the ancient Native Hawaiians, Haleakalā — which includes the Kolekole area on which HO resides — is considered a piko (the navel, or center of Maui Nui a Kama (Greater Maui). It is a Puʻu Honua (sacred refuge, or place of peace), which Hawaiian ancestors believed was a Wao Akua, or place where gods and spirits walk. The cultural resources of Kolekole date back more than a thousand years and are an integral part of the Hawaiian culture, both past and present. In ancient times, commoners could not even walk on the summit because it belonged to the gods. The sacred class of na poāo kāhuna (priest)

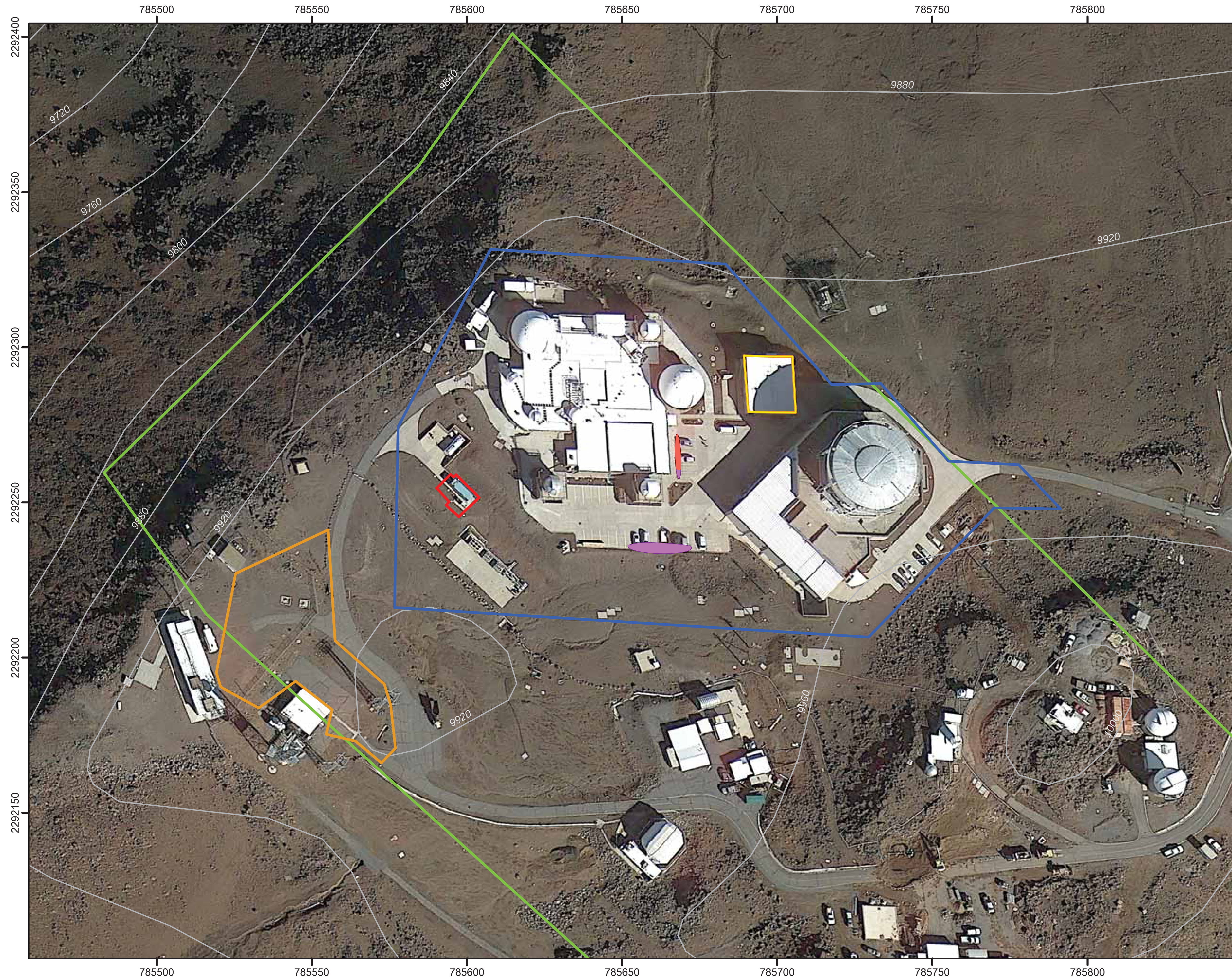


Figure 1
Site Location Map
Maui Space Surveillance Complex
Haleakalā, Maui

Legend

- 10m Elevation Contours
- Maui Space Surveillance Complex (MSSC)
- Haleakalā High Altitude Observatory Site (HHAOS)
- Fuel Spill Location
- Butler Building
- Equipment Staging Area

Supersack Staging Areas

- CA-01
- CA-02

Note: Boundaries are georeferenced from Maui Space Surveillance Complex Intergrated Natural Resource Management Plan. Basemap is georeferenced from Google Earth.

Scale: 1:1,080
Datum: NAD 1983 PA11
Coordinate System: UTM Zone 4N
Map Units: Meter

0 5 10 20 30 40 50 60 Meters

0 25 50 100 150 200 250 Feet

used the summit area as a learning center. It was a place where the kāhuna could absorb the tones of ancient prayer and balance within the vortex of energy, for spiritual manifestations, the art of healing, and the study the heavens for navigation purposes. Kolekole itself was a very special religious place used by the Kahuna Poʻo (head priest) as a training site in the arts. There are numerous gods and goddesses said to reside on the summit, in the crater, and all around the mountain (HDOH 2006).

1.4 Current/Future Land Use

HO is managed by the University of Hawaiʻi Institute for Astronomy (UH IfA) on behalf of the landowner, the State of Hawaiʻi Department of Land and Natural Resources (DLNR). MSSC is a tenant on the HO and leases the land from the DLNR. As part of the lease agreement, any MSSC actions involving ground disturbance or major construction activities must obtain a permit from the Hawaiʻi State Office of Conservation and Coastal Lands within the DLNR through a representative from the UH IfA to include complying with all federal law and regulations. MSSC is also a tenant, on a portion of the site, to the Federal Aviation Administration (FAA). As part of this lease agreement, the DAF is also expected to confer with the FAA on any new activity on FAA property.

Since 1961, consistent land uses for MSSC include hosting a suite of telescopes dedicated to conducting astronomical research and advanced space surveillance. MSSC hosts small, medium, and large-aperture tracking optics, including the Department of Defense's largest optical telescope designed for tracking and imaging satellites, with visible and infrared sensors to collect data on near-Earth and deep-space objects (Space Base Delta I, 2023).

The likely future land use of the MSSC site is continued hosting of astronomical research and space surveillance facilities for the foreseeable future. Continued use of the MSSC is contingent on renewals of leases with the DLNR and the FAA in 2031 and 2027, respectively.

1.5 Spill and Investigation History

A lightning strike occurred on January 29, 2023, that resulted in the emergency generator fuel spill. Contractor personnel working on the MSSC site discovered the leak on January 30, 2023. An estimated 700 gallons of fuel leaked onto the generator pad and the surrounding soil, impacting approximately 750 square feet (6.5 feet (ft) wide by 115 ft long) of surface soil. The fuel was a mixture of low sulfur diesel and Jet A fuel oil, respectively. Notifications of the spill were made to State of Hawaiʻi Department of Health (HDOH) and the United States Environmental Protection Agency (EPA) (Pacific Air Forces, 2023a) on January 30, 2023.

1.5.1 Phase 1 - Time Critical Removal Action

In March 2023, the Phase 1 Time Critical Removal Action (TCRA) was completed to investigate and remove soil impacted from the fuel spill. The impacted area was excavated to a minimum depth of 2 ft. An area of approximately 5 ft by 5 ft, immediately north of the northeast corner of the generator pad, was excavated to a depth between 3 to 4 ft. Deeper excavation could not be performed due to the presence of utilities and the risk of undermining the generator.

Excavated soil was placed into 41 supersacks, with a total estimated volume of approximately 30 cubic yards (cy) (USAF, 2023). The excavated area was lined with a heavy poly sheeting prior to being backfilled with native soil from the upgradient slope north/northeast of the generator. The supersacks containing the excavated soil were temporarily stored at the MSSC pending a remediation plan.

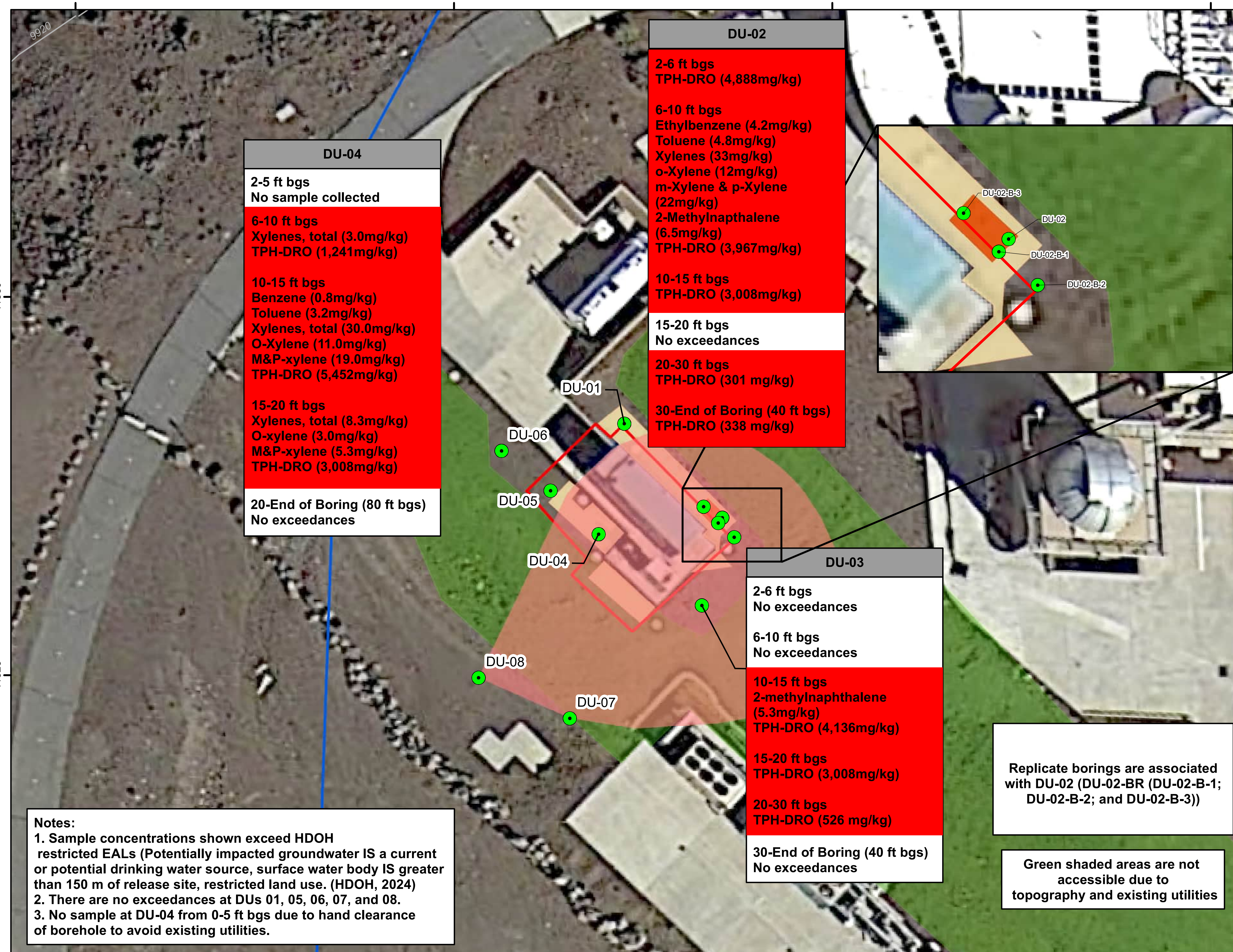
1.5.2 Phase 2 - Site Characterization and Alternatives Evaluation

The Phase 2 SCAE was conducted in 2023 to define the nature and extent of contamination, quantitatively estimate risks to human health and the environment, and evaluate remedial alternatives. Data gathered from soil sampling were used to update the conceptual site model and perform a human health risk assessment (HHRA) and an ecological risk assessment (ERA).

As part of the SCAE, 52 composite soil samples were collected from eight soil borings drilled in the area surrounding the Generator Spill Site. Six of the soil borings were drilled to a depth of 40 feet below ground surface (bgs), one boring to 80 feet bgs, and one boring to 55 feet bgs. None of the soil borings encountered groundwater. In addition, four multi increment soil samples were collected from the excavated soil contained in the 41 supersacks. All soil samples were submitted to an offsite laboratory for analysis of Diesel Range Organics (DRO), benzene, toluene, ethylbenzene, and xylenes (BTEX), and polycyclic aromatic hydrocarbons.

1.6 Magnitude and Extent of Contamination

Fuel constituents were detected in soil above both the Tier 1 (the most conservative) Hawaii Department of Health (HDOH) Environmental Action Levels (EAL) (HDOH, 2024) and the site-specific EALs (HDOH, 2024) identified in the SCAE (USAF, 2024). Exceedances of the site-specific EALs are limited to the proximity of the generator pad, primarily from 2 to 40 feet bgs, approximately 750 square feet (sf) of the adjacent soil (Figure 2). Access constraints due to the site's topography to the south and southeast limited characterization efforts. While the lateral extent of contamination remains undefined, soil contamination (i.e., concentrations of contaminants above the site-specific EAL) was not identified in either of the two borings downslope and southwest of the generator (borings Decision Unit (DU)-07 and DU-08).



Notes:
1. Sample concentrations shown exceed HDOH restricted EALs (Potentially impacted groundwater IS a current or potential drinking water source, surface water body IS greater than 150 m of release site, restricted land use. (HDOH, 2024)
2. There are no exceedances at DUs 01, 05, 06, 07, and 08.
3. No sample at DU-04 from 0-5 ft bgs due to hand clearance of borehole to avoid existing utilities.

Figure 2
Soil Boring Results
Maui Space Surveillance Complex
Haleakalā, Maui

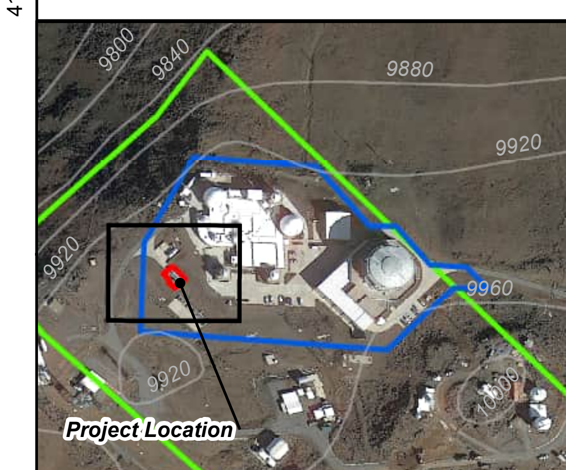
Legend

- DU Borehole Locations
- Area of Interest (AOI)
- TCRA Soil Excavation to 2ft
- TCRA Soil Excavation to 4ft
- Inaccessible Area
- Fuel Spill Location
- Maui Space Surveillance Complex (MSSC)
- Haleakalā High Altitude Observatory Site (HHAOS)

N

Scale: 1:250
Datum: NAD 1983
Coordinate System: StatePlane Hawaii 2
Map Units: Meters

0 2 4 6 8 10 Meters
0 5 10 20 30 40 50 Feet



2.0 ENVIRONMENTAL HAZARD EVALUATION

The Environmental Hazard Evaluation (EHE) is intended to identify potential environmental hazards associated with Chemicals of Potential Concern (COPC) concentrations in soils through comparison with HDOH EALs established for common environmental hazards. The EHE includes both remaining in-situ contaminated soils and excavated soil that is contained in supersacks. A summary of these common environmental hazards includes:

- Direct exposure: exposure to contaminants via incidental ingestion, dermal absorption, and inhalation of vapors or dust in outdoor air
- Vapor intrusion: emission of volatile contaminants from soil into overlying buildings
- Leaching: leaching of contamination from soil by infiltration of surface water (rainfall, irrigation, etc.) and downward migration of leachate into underlying groundwater
- Terrestrial ecotoxicity: toxicity to terrestrial flora and fauna
- Gross contamination: contamination present in sufficient quantity to potentially mobile free product, odors, aesthetics, explosive hazards, and general resource degradation.

2.1 Chemicals of Potential Concern

To determine COPCs, the SCAE screened sample concentrations against the HDOH Tier 1 EALs (HDOH, 2024). Based on this analysis, the following COPCs were identified for Site SS014:

- DRO
- Naphthalene
- 1-Methylnapthalene
- Benzene
- 2-Methylnapthalene
- Ethylbenzene
- Toluene
- Xylenes

2.2 Exposure Setting

The SCAE identified several potential environmental hazards and estimated the lateral and vertical extent of soil contamination resulting from the spill. Leaching, gross contamination, and direct exposure to construction/trench workers were identified as the primary potential hazards at the site. Impacts to terrestrial ecological habitats were ruled out as the top several feet of impacted soil were excavated and replaced with clean fill.

Due to the depth of groundwater beneath the site (if present, is deeper than 80 feet bgs underlying the site), the plastic liner, and the clean fill cap, leaching is not anticipated to pose a significant environmental hazard at the site. Although the plastic liner does not cover the entire lateral extent of soil contamination, it should still reduce surface water infiltration. In addition, the clean soil cap will prevent direct human and ecological exposure to contaminated subsurface soils. Based on results of the SCAE, gross contamination is present from 2 to 40 feet bgs and is not anticipated to pose a significant hazard except during excavation activities. Direct exposure to the public and onsite workers was ruled out due to the clean fill cap within the site. However, a direct exposure hazard exists for construction/trench workers within the contaminated zone.

2.3 Potential Human/Ecological Receptors

Potential human receptors at the MSSC include:

- Current and future workers (e.g., military personnel, site workers, and authorized workers performing grounds maintenance)
- Current and future construction workers (including civilian contractors)
- Visitors (including Hawaiians visiting onsite ahus)
- UH IfA staff (who work on an adjacent site, within walking distance of MSSC)
- Trespassers (adult and child)

Several species of flora and fauna, listed as either threatened or endangered under both state and federal endangered species regulations, have been observed in or near the boundaries of MSSC including the ʻAhinahina (Haleakalā Silversword; *Argyroxiphium sandwicense* ssp. *macrocephalum*), the Hawaiian dark-rumped petrel (ʻuaʻu*; Pterodroma phaeopygia sandwichensis*), Hawaiian goose (nēnē; *Nesochem sandvicensis*), and the Hawaiian hoary bat (ʻōpeʻapeʻa; *Lasiurus cinereus semotus*) (KC Environmental Inc., 2010). However, none of these species have been observed within the boundaries of the site.

2.4 Exposure Pathway Analysis

An exposure pathway describes the mechanisms by which human or ecological exposure to contaminants can occur assuming no removal/remedial action or protective control was in place. An exposure pathway is considered complete if a human or ecological receptor could be exposed to a contaminant via that pathway. Assuming continued commercial/industrial land use, potential pathways for receptors to be exposed to contaminants in soil, groundwater, and surface water are outlined below.

<u>2.4.1 Soil Exposure Pathways</u>

Current and future potentially complete exposure pathways for soil include the following:

- Construction workers dermal contact with, inhalation, or incidental ingestion of contaminated soils and dust
- Construction worker inhalation of outdoor air contaminated by vadose zone volatile organic compounds (VOC)

Although unlikely for this site, contaminants in soil can leach to groundwater, acting as a secondary source; therefore, the soil-to-groundwater pathway is considered in areas where there is a potentially complete groundwater exposure pathway.

The following pathways are considered incomplete due to the clean fill cap:

- Visitor and/or onsite worker dermal contact with, inhalation, or incidental ingestion of contaminated shallow soils and dust
- Visitor and/or onsite worker inhalation of outdoor air contaminated by vadose zone VOCs
- Terrestrial wildlife contacting contaminated soils
- Terrestrial wildlife consuming soil invertebrates that have accumulated bioaccessible contaminants from the soil

2.4.2 Groundwater Exposure Pathways

An assessment of the leaching potential indicates that contamination to groundwater is not expected. Furthermore, the SCAE investigation did not encounter groundwater in any of the borings advanced, indicating groundwater is not present within at least 80 ft of the surface, and DRO is confined to site soil. As such, the drinking water exposure pathway is considered incomplete because the likelihood of leaching to groundwater is minimal. To further confirm this assessment, Synthetic Precipitation Leaching Procedure data will be collected during the Phase 3 remedial action. This additional data will provide evidence supporting the conclusion that the potential for contaminants to reach and impact groundwater is minimal.

The potential for direct exposure to groundwater was also evaluated. Groundwater is not documented within several miles of the site. There is no perched groundwater known at the summit of Haleakalā, and the SCAE investigation did not encounter groundwater in any of the borings advanced, which reached depths of 80 ft. This lack of groundwater presence at shallow depths suggests that there is no potential for human or ecological receptors to come into contact with groundwater at the site and the direct exposure pathway is considered incomplete.

2.4.3 Surface Water Exposure Pathways

Current and future potentially complete exposure pathways for stormwater ponding at the site were ruled out due to the TCRA excavation, the presence of a clean fill soil cap, and the type of soil present. The nearest surface water body is an intermittent stream approximately 1.9 miles downslope of the MSSC (KC Environmental Inc., 2010).

2.4.4 Soil Vapor and Soil Vapor Intrusion

To date, soil vapor data for the site is limited to photoionization detector readings (0 to 1,572 parts per million in headspace measurements, with negligible impacts to ambient air). These readings indicate the presence of VOCs and the potential for direct exposure to soil vapor exists at the release area. However, this area is generally not frequented by people as it is an open space with a generator and not located near primary use spaces at the site. In addition, general exposure is further reduced by the plastic liner placed at the release area during the Phase 1 removal action. As such, subsurface workers are considered the primary potential receptor and may encounter soil vapor during remedial activities.

The potential for soil vapor intrusion into nearby buildings was also assessed. The nearest building is approximately 70 ft to the east of the release location and about 15 ft uphill, while a second building is approximately 85 ft northwest, also approximately 15 ft uphill. The distance and elevation difference reduces the likelihood of soil vapor migrating into these buildings. Currently, there are no plans to construct a new building directly over the spill site. However, if a building were to be constructed in the future, there is potential for soil vapor intrusion due to the presence of volatile compounds in the soil. Given the current site usage and the lack of plans for new construction, the soil vapor intrusion pathway is considered incomplete under current conditions.

2.5 Environmental Hazard Evaluation Summary

A screening-level Human Health Risk Assessment (HHRA) was conducted as part of the SCAE to evaluate the potential adverse health effects on human and ecological receptors due to contaminants present at the spill area. This assessment, guided by established risk-based screening procedures, involved a detailed analysis of contaminant levels, exposure pathways, toxicity values, and risk characterization. DRO was the primary COPC identified, with soil as the main medium of interest. Construction workers were identified as the potential receptors for in-situ soil and were expected to be primarily exposed through dermal contact, inhalation, or incidental ingestion of contaminated soils and dust. The screening-level risk assessment concluded that there are no unacceptable risks associated with cancerous or noncancerous health effects within the AOI. Furthermore, unacceptable risks are not identified for ecological receptors as the bioactive zone of the soil was removed and capped with clean fill during the Phase 1 TCRA.

The Ecological Risk Assessment (ERA) focused on the potential impacts on ecological receptors resulting from exposure to soil contaminated with DRO and associated chemicals. The ERA identified DRO, 1-methylnaphthalene, and 2-methylnaphthalene posing risks to invertebrates. However, no threatened or endangered invertebrates were noted at the site and the overall risk to mobile and wide-ranging wildlife was considered low. Unacceptable risks were not identified for ecological receptors as the bioactive zone of the soil was removed and capped with clean fill during the TCRA.

Although COPCs exceed site specific EALs, human health and ecological risks within the site are managed effectively under current conditions. Table 1 summarizes environmental hazards at the site. Figure 3 presents the conceptual site model.

Table 1 – Summary of Environmental Hazards

Primary Source(s)	Primary Release Mechanism(s)	Secondary Source(s)	Potential Environmental Hazards		Hazard Present Under Site Conditions	
					Current	Future
Generator	Spill	Soil	Risk to Human Health[1]	Direct Exposure	No	Yes
				Vapor Intrusion into Buildings	No	Yes[8]
			Risk to Terrestrial Ecological Habitats[2]		No	No
			Leaching[3]		Yes	Yes
			Gross Contamination[4]		Yes	Yes
		Groundwater	Risk to Human Health[5]	Direct Exposure	No	No
				Vapor Intrusion into Buildings	No	No
			Risk to Aquatic Ecological Habitats[6]		No	No
			Gross Contamination[7]		No	No
		Soil Vapor	Vapor Emissions		Yes	Yes

Notes:
[1] Includes direct exposure to contaminated soil, vapors and dust from soil, and vapor intrusion into overlying buildings.
[2] Assumes significant terrestrial, ecological habitat is impacted by contamination with resulting toxicity to flora and fauna.
[3] Although leaching from soil to groundwater is unlikely at this site, it is not ruled out as the liner may not prevent infiltration in all impacted areas.
[4] Includes potential explosive hazards, odors, interference with construction work (e.g., soil reuse and disposal), and related concerns.
[5] Based on ingestion of contaminated groundwater, via dermal exposure, and vapors during showering and other water use.
[6] Assumes discharge of contaminated groundwater into an aquatic habitat; COPCs in groundwater screened using acute aquatic toxicity levels for sites > 150 meters from a surface water body.
[7] Includes potential taste and odor concerns for drinking water, presence of free product, explosive hazards, odors, sheens, interference with construction work (e.g., dewatering), and other related concerns.
[8] Potential future risk if new building is built overlying or adjacent to fuel spill site.

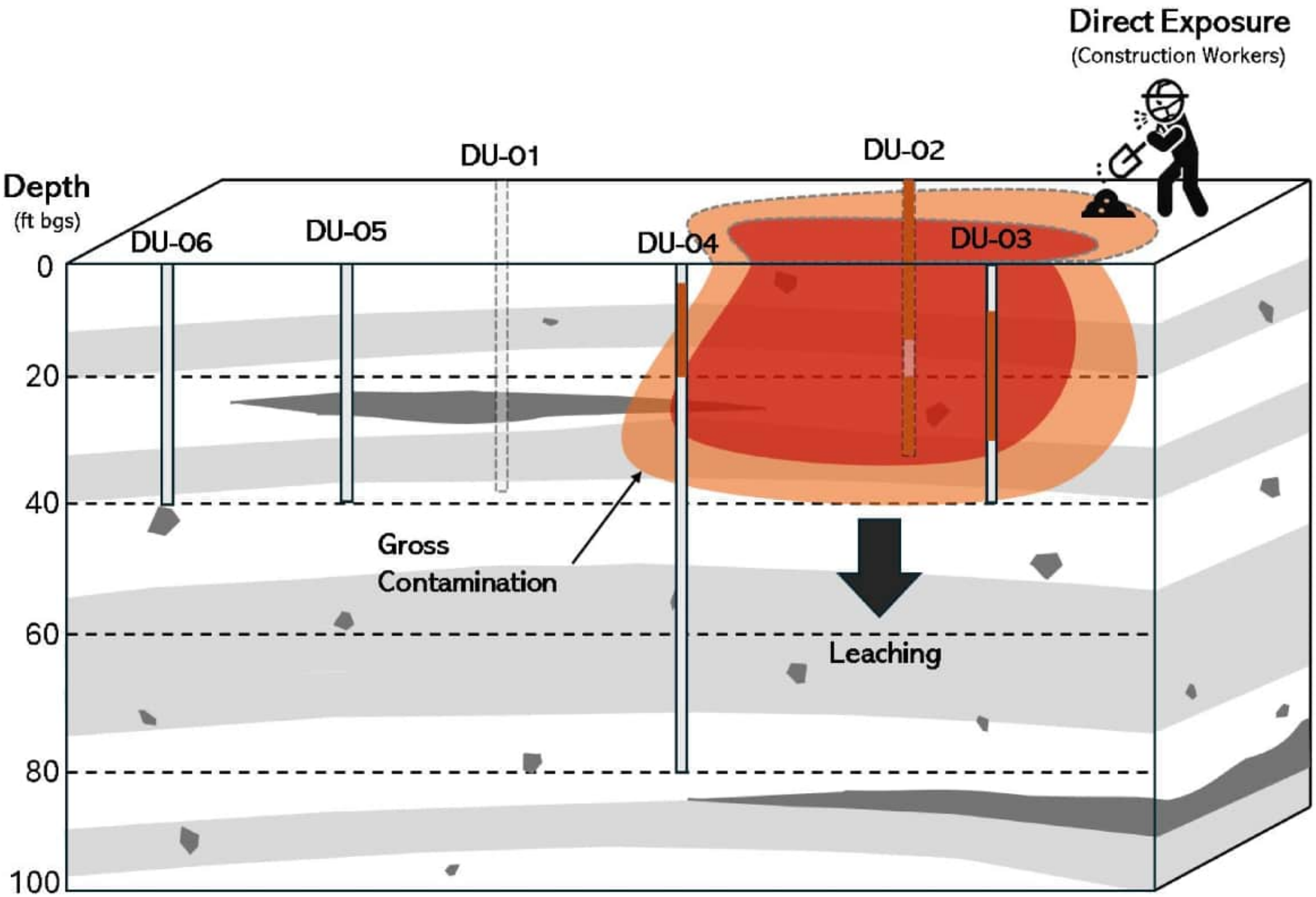


Figure 3
Conceptual Site Model
Maui Space Surveillance Complex
Haleakalā, Maui

Legend

- Above restricted EALS
- Above unrestricted EALS
- No exceedances
- Coarse layer
- Fine layer
- Basalt
- DU Borehole Locations
- 10m Elevation Contours
- Maui Space Surveillance Complex (MSCC)
- Haleakala High Altitude Observatory Site (HO)
- Fuel Spill Location

N

Scale: 1:300
Datum: NAD 1983 PA11
Coordinate System: State Plane
Map Units: Meters

0 0.75 1.5 3 4.5 6 Meters

0 5 10 20 Feet

Drawn By: AConde
Revised: 7/4/2024

3.0 REMEDIAL STRATEGY

3.1 Development of Remedial Action Objectives

The Remedial Action Objectives (RAOs) established for the site guides the development of remedial alternatives and focuses the comparison of acceptable alternatives. RAOs assist in clarifying the goal of achieving an acceptable level of protection for human health and the environment by reducing the likelihood of exposure to environmental contaminants based on the current and anticipated future land use activities. RAOs should identify site characteristics, COPCs, and potential outcomes (TGM Section 16.2).

The RAOs established for the site are developed to be protective of human health and the environment and prevent exposure to DRO and associated COPCs (identified in Section 2.1) in the site via the ingestion, dermal contact, and inhalation of particulates exposure pathways at concentrations above EALs. The RAOs include the following:

- Achieve cleanup of in-situ soil to below site-specific EALs (shown in Table 2) and below Tier 1 EALs (shown in Table 3) for supersacked soil.
- Minimize potential adverse impacts to the community and the environment during implementation of the remedial action.

Potential exposure to the COPCs within the site is limited by controlled access to the facility and the location of the remaining contamination in the subsurface. In addition, clean surface fill placed over remaining contamination following the TCRA represents a de facto exposure barrier to the remaining soil. The large vertical and horizontal distances from the release area to potential groundwater sources coupled with the relatively small volume of fuel spilled precludes the possibility that the release could migrate to groundwater and affect a water supply. Therefore, groundwater RAOs are not considered for this release.

3.2. Applicable Remedial Action Levels

The SCP specifies that the EALs must establish acceptable exposure levels that are protective of human health and be developed by considering several factors including applicable requirements, cancer risk/non-cancer hazards identified in the risk assessment, and factors related to technical limitations and other pertinent information (Hawaii, 1997). Section 11-451-15(b) of the SCP specifies the requirements for establishment of cleanup levels. Once it is determined that remedial action is warranted, risk-based EALs for individual COPCs are developed based on a chemical-specific target cancer risk of 1 x 10-6 and cumulative cancer risk is managed in the range of 1 x 10-6 to 1 x 10-4. EALs based on noncancer effects should result in hazard indices (HIs) for target organ systems at or below 1. The HDOH Tier 1 EALs incorporate these calculations and are used for the site.

Analytical results of soil samples were screened against the Tier 1 EALs to identify COPCs. Since the supersacked soil is planned to be reused as unrestricted cover or fill in the vicinity of the fuel spill following remediation, Tier 1 EALs are used as the remedial action levels for the supersacked soils.

For in-situ soil, COPC concentrations were than compared to site-specific EALs. The site-specific EALs were determined based on the site location and current and future site use (i.e., restricted land use above a drinking water resource and located greater than 150 meters from surface waters) (HDOH, 2024), which are applicable to the site. The site-specific EALs represent the remedial action levels for the in-situ soils.

3.3 Estimation of Soil Volumes Needing Remedial Action

Analytical results from the soil samples were compared against the site-specific EALs that are applicable to the site.

3.3.1 Subsurface Contaminated Soil

Concentrations of contaminants that exceeded the site-specific EALs are presented in Table 2 and shown on Figure 2. The volume of subsurface soil exceeding site-specific EALs is estimated at 1000 cy, based upon a surficial area of 750 sf and a soil depth between 2 and 40 feet bgs.

Table 2: In-Situ Soil Sample Results Exceeding Site-Specific HDOH EALs

DU/ Location Description	Analytes	Result (mg/kg)	HDOH Tier 1 EALs (unrestricted) (mg/kg)[1]	HDOH Site-Specific EALs (restricted) (mg/kg)[2]
DU-02-A, 2-6ft ft bgs	TPH-DRO[C10-C28]	4,888[3]D,Q (2,600)	180	210
DU-02-B, 6-10 ft bgs	1-Methylnaphthalene	5.8 M	0.89	4.2
	2-Methylnaphthalene	8.5 D	1.9	4.1
	Naphthalene	6.4[3] (3.7)	3.1	4.4
	TPH-DRO [C10-C28]	12,023[3]D,Q (6,400)	180	210
DU-02-C, 10-15 ft bgs	TPH-DRO [C10-C28]	3,008[3] D,Q (1,600)	180	210
DU-02-E, 20-30 ft bgs	TPH-DRO [C10-C28]	301[3] (160)	180	210
DU-02-F, 30-40 ft bgs	TPH-DRO [C10-C28]	338[3] (180)	180	210
DU-03-C, 10-15 ft bgs	2-Methylnaphthalene	5.3	1.9	4.1
	TPH-DRO [C10-C28]	4,136[3] D,Q (2,200)	180	210
DU-03-D, 15-20 ft bgs	TPH-DRO [C10-C28]	3,008[3] D (1,600)	180	210
DU-03-E, 20-30 ft bgs	TPH-DRO [C10-C28]	526[3] (280)	180	210
DU-04-B, 6-10 ft bgs	Xylenes, Total	3.0 D	1.4	2.1
	TPH-DRO [C10-C28]	1,241[3] (660)	180	210
DU-04-C, 10-15 ft bgs	Toluene	3.2 D	0.78	3.2
	Xylenes, Total	30 D	1.4	2.1
	o-Xylene	11 D		
	m-Xylene & p-Xylene	19 D		
	TPH-DRO [C10-C28]	5,452[3] (2,900)	180	210
DU-04-D, 15-20 ft bgs	Xylenes, Total	8.3 D	1.4	2.1
	o-Xylene	3.0 D		
	m-Xylene & p-Xylene	5.3 D		
	TPH-DRO [C10-C28]	3,008[3] D (1,600)	180	210
DU-02-BR,6-10 ft bgs	Ethylbenzene	4.2	0.90	3.7
	Toluene	4.8	0.78	3.2
	Xylenes, Total	33	1.4	2.1
	o-Xylene	12		
	m-Xylene & p-Xylene	22		
	1-Methylnaphthalene	4.9	0.89	4.2
	2-Methylnaphthalene	6.5	1.9	4.1
	TPH-DRO [C10-C28]	3,967	180	210

Notes:
Lab Qualifiers:
D-The reported value is from a dilution, M- Manual integrated compound, Q- One of more quality control criteria failed
[1] HDOH EALs, Table A-2. Soil Action Levels, Potentially impacted groundwater IS a potential drinking water source; Surface water body IS located within 150m of release site (HDOH, 2024).

[2] HDOH Site-Specific EALs, Table I-2, Table E-1, and Table C-1b. Soil Action Levels for Direct Exposure, Leaching, and Vapor Emissions to Indoor Air (respectively), Groundwater IS a current or potential drinking water source; Surface water body is NOT located within 150m of release site, Restricted Use (HDOH, 2024).

[3] Value adjusted upward by the replicate RSD (DU-02-BR), according to Technical Guidance Manual (TGM) Section 4 Appendix L, Table L-1. Values in parentheses ( ) are non-adjusted raw data values from the laboratory (Eurofins Denver).

3.3.2 Supersacked Soil

One of the samples collected from the supersacked soil contained a concentration of DRO that exceeded the Tier 1 EAL (Table 3). The results represent approximately 30 cy of soil requiring remedial action.

Table 3: Supersacked Soil Sample Results Exceeding Tier 1 HDOH EALs

DU/ Location Description	Analytes	Result (mg/kg)	HDOH Tier 1 EAL (mg/kg)[1]
DU-CA-01-A	TPH-DRO[C10-C28]	650	180
DU-CA-02-A	TPH-DRO[C10-C28]	777	180

Notes:

[1] HDOH Tier 1 EAL, Table A-1. Soil Action Levels, Groundwater IS a potential drinking water source; Surface water body is located within 150m of release site (HDOH, 2024).

3.4 General Response Actions

General response actions (GRAs) are broad categories of possible response actions that can be expected to accomplish the RAO except for the No Action Alternative (NAA). Inclusion of the NAA is recommended by the TGM (16.2.2.2) as a baseline alternative against which all other alternatives are compared. GRAs considered for the MSSC release will address the RAOs by preventing exposure to or removing contaminants from the site. The general response actions considered in this evaluation include:

- NAA
- Land Use Controls (LUCs) and Long-Term Environmental Hazard Management Plan (LT-EHMP)
- Excavation and Treatment
- In-Situ Treatment

GRAs and the associated remedial technologies that were considered are presented in Table 4 (in-situ soil) and Table 5 (supersacked soil).

3.5 Identification and Screening of Remedial Technologies

This section describes the technology types and process options considered for each GRA. The evaluation describes the advantages and limitations of each technology and basis for retaining them as viable options for alternative development. The technologies identified in this section are not necessarily comprehensive of all existing technologies but includes the potentially applicable technologies based on site conditions and risk assessment results. The goal of technology screening is to select at least one representative technology type to simplify the subsequent development and evaluation of remedial alternatives. The technologies are representative of what is available at the time that the SCAE was written in accordance with HDOH guidelines. If new technologies become available and will be addressed during the Remedial Design phase.

The alternatives evaluation focused on the DRO release. The potentially applicable GRAs and associated technologies are identified and reduced by evaluating the options with respect to criteria considering their effectiveness, implementability, and cost. These criteria are described below.

3.5.1 Effectiveness

The technical effectiveness of a process option is the ability to perform as part of an overall alternative that can meet the RAO under site-specific conditions and limitations. The technical effectiveness evaluation is used to determine which technologies would be effective, and to what degree, based on the nature and extent of contamination and site characteristics. Remedial technologies that are not likely to be effective are not retained for further evaluation.

3.5.2 Implementability

Implementability refers to the relative degree of difficulty anticipated in implementing a particular technology/process option under the regulatory and technical constraints posed at the site. Implementability is evaluated in terms of the technical and administrative feasibility of constructing, operating, and maintaining the technology/process options, as well as the availability of services and materials. Technical feasibility refers to the ability to construct, reliably operate, and meet technology-specific regulations for process options until a remedial action is complete; it also includes operation, maintenance, replacement, and monitoring. Implementability also includes consideration of the community acceptance of the remedial action.

3.5.3 Cost

Costs are evaluated on a relative order-of-magnitude basis and fall within the recommended accuracy range of +50% to -30% and include costs for implementing the remedial action as well as any post-removal monitoring costs, as appropriate, until the RAO is met. It is important to include the long-term and life cycle costs so that decision makers are informed about the total costs for each alternative. Cost plays a limited role in the screening of process options. Relative capital and operation and maintenance costs are used rather than detailed estimates. At this stage in the process, the cost analysis is made based on engineering judgment, and each alternative is evaluated as to whether costs are high, moderate, or low.

Table 4: In-Situ Soil Remedial Option Evaluation

Remedial Technology/Action	Effectiveness[1]	Implementability[2]	Cost[3]	Considered Further
Excavation and Treatment				
Disposal	High	Moderate	High	No
Aeration	High	Low	High	No
Thermal Desorption	Moderate	Moderate	High	No
Chemical Oxidation	High	Low	High	No
In Place (In-situ) Treatment				
No Action (i.e., Natural Source Zone Depletion)	Low	High	Low	Yes
Engineering & Institutional Controls	Moderate	High	Low	Yes
Air Sparging (i.e., Air Injection)	Only applicable to groundwater			No
Anaerobic Bioremediation	More effective for chlorinated solvents, energetic compounds and other; doesn't work well for diesel			No
Passive Bioventing	Moderate	High	High	No
Active Bioventing	Moderate to High	Moderate	High	Yes
Soil Vapor Extraction	Low	Moderate	High	No
Thermal Desorption	Moderate	Low	High	No
Chemical Oxidation	Low	Low	High	No

Notes:
[1] Evaluated based on ability to sufficiently reduce toxicity, mobility, and/or volume, minimize short-term impacts and residual risk, afford reliable long-term protection, comply with applicable requirements, and achieve protection. High = all listed evaluation criteria are met to a relatively high degree; moderate = all listed evaluation criteria are met to at least a moderate degree or higher; low = one or more evaluation criteria could not be met.
[2] Evaluated based on availability of equipment, facilities, specialists needed, and the compatibility of technology with site conditions as well as ability to obtain necessary approvals and community acceptance. High = materials, facilities, and specialists are readily available, technology is compatible with site conditions, and approval/acceptance is likely; moderate = materials, facilities, and specialists may be obtained with effort, the technology and/or site conditions may require adaptation for compatibility, and/or approvals/acceptance may encounter roadblocks; low = materials, facilities, and specialists may be obtained with significant difficulty, the technology is not compatible with site conditions, and/or approvals/acceptance are difficult to obtain.
[3] Evaluated based on capital costs (direct, indirect, and opportunity), annual cost of operations and maintenance, and contingency costs. High = over $1,000,000; moderate = $250,000 to $1,000,000; low = less than $250,000.

Table 5: Supersacked Soil Remedial Option Evaluation

Remedial Technology/Action	Effectiveness[1]	Implementability[2]	Cost[3]	Considered Further
No Action (i.e., Natural Source Zone Depletion)	Low	High	Low	Yes
Disposal	High	High	High	No
Aeration	High	High	Low	Yes
Thermal Desorption	Moderate	Moderate	High	No
Chemical Oxidation	High	Low	Moderate	No
Engineering & Institutional Controls	Moderate	High	Low	Yes
Air Sparging (i.e., Air Injection)	Only applicable to groundwater			No
Anaerobic Bioremediation	More effective for chlorinated solvents, energetic compounds and other; doesn't work well for diesel			No
Passive Bioventing	Better suited for in situ soil			No
Active Bioventing	Better suited for in situ soil			No
Soil Vapor Extraction	Better suited for in situ soil			No

Notes:
[1] Evaluated based on ability to sufficiently reduce toxicity, mobility, and/or volume, minimize short-term impacts and residual risk, afford reliable long-term protection, comply with applicable requirements, and achieve protection. High = all listed evaluation criteria are met to a relatively high degree; moderate = all listed evaluation criteria are met to at least a moderate degree or higher; low = one or more evaluation criteria could not be met.
[2] Evaluated based on availability of equipment, facilities, specialists needed, and the compatibility of technology with site conditions as well as ability to obtain necessary approvals and community acceptance. High = materials, facilities, and specialists are readily available, technology is compatible with site conditions, and approval/acceptance is likely; moderate = materials, facilities, and specialists may be obtained with effort, the technology and/or site conditions may require adaptation for compatibility, and/or approvals/acceptance may encounter roadblocks; low = materials, facilities, and specialists may be obtained with significant difficulty, the technology is not compatible with site conditions, and/or approvals/acceptance are difficult to obtain.
[3] Evaluated based on capital costs (direct, indirect, and opportunity), annual cost of operations and maintenance, and contingency costs. High = over $1,000,000; moderate = $250,000 to $1,000,000; low = less than $250,000.

3.6 Development of Remedial Alternatives

Three remedial alternatives were considered.

<u>Alternative 1 – No Action</u>

The "no action" alternative does not require active response to locate, remove, dispose of, or limit the exposure to any COPCs present within the site. Alternative 1 provides a baseline for comparison of other alternatives.

<u>Alternative 2 – Land Use Controls and Environmental Hazard Management Plan</u>

Land use controls (LUCs) are physical, legal, or administrative mechanisms designed to mitigate risks associated with potential contaminant exposure. LUCs can be divided into two categories: engineering controls (ECs) and institutional controls (ICs). ECs are physical limits to access and exposure such as barriers or fencing. ICs are comprised of legal and administrative mechanisms such as environmental covenants, land use restrictions, and informational controls. The DAF is responsible for implementing and maintaining LUCs. LUCs would be maintained until the concentrations of COPCs in soil were at levels allowing for unrestricted use of the site.

A LT-EHMP is required for managing contamination in place (TGM 18.5.16). LT-EHMPs provide pre-planned measures for protecting human and ecological receptors from exposure and periodic inspections to ensure ECs and ICs remain effective. The LT-EHMP would be maintained until COPC concentrations were acceptable for unrestricted use of the site.

Specific LUCs will be developed in detail (and added to/revised) when the EHMP is drafted. LUCs will include the following:

<u>In-situ Soils</u>

- Clean fill cap (already in place)
- Plastic liner (already in place)
- Dig permits/procedures for minor subsurface disturbance (a construction-EHMP required for major subsurface work)
- Annual inspection and reporting requirements

<u>Supersacked Soil</u>

- Handling procedures
- Engineering controls (liner and cover)
- Annual inspection requirements.

<u>Alternative 3 – Land Use Controls and Long-Term Environmental Hazard Management Plan, Active Bioventing (in-situ soils only), and Aeration (supersacked soil only)</u>

This alternative includes the components of Alternative 2 (LUCs and LT-EHMP) and adds active bioventing of in-situ soils and aeration of supersacked soil. The LT-EHMP will be required following implementation and completion of the remedy since the remedy includes leaving in-situ soil exceeding the Tier 1 EALs.

Active bioventing involves using an electric blower that mechanically extracts air from venting wells resulting in increasing air circulation to subsurface soils. This will increase microbial metabolic rates due to the additional oxygen being circulated through the soil. Extracted air would be treated to remove fuel vapors prior to exhausting to the atmosphere.

Aeration is proposed to remediate the approximately 30 cy of petroleum-contaminated cinder and soil excavated during the initial release response. The excavated material will be removed from the current bulk sacks and placed into a bermed and lined cell for treatment to decrease the remaining petroleum and constituent concentrations. Once the soil has been treated to Tier 1 EALs, the soil will be returned to the site as fill or cover material.

4.0 EVALUATION OF REMEDIAL ACTION ALTERNATIVES

The evaluation of alternatives is based on criteria specified by the SCP. The criteria are divided into two categories (threshold and primary balancing) and are presented in Table 6. The remedy evaluation process considers effectiveness, site risk, the ability to implement the technology at the site, and the cost to implement that technology. According to the SCP, all remedies shall be cost-effective. Thus, remedial approaches can be eliminated from consideration if they are either higher in cost than an alternative remedy that is just as protective, or significantly higher in cost than an alternative remedy that is only slightly less protective.

4.1 Evaluation Criteria

4.1.1 Threshold Criteria

Threshold criteria are requirements that each alternative must meet to be eligible for selection as the preferred alternative. These relate to statutory requirements which must be satisfied to proceed with the alternative. The threshold criteria consist of overall protection of human health and the environment and compliance with applicable requirements (unless a waiver is obtained).

4.1.2 Primary Balancing Criteria

Primary balancing criteria are used to form the basis for comparison among alternatives that meet the threshold criteria. The primary balancing criteria include effectiveness, implementability, and cost.

Table 6: Criteria for Detailed Analysis of Alternatives

Criterion	**How the Criterion is Applied**
Threshold Criteria	
Overall Protection of Human Health and the Environment	Checks to assess whether the alternative provides adequate protection of human health and the environment and whether it meets the RAO.
Compliance with Applicable Requirements	Verifies compliance with Applicable Requirements.
Primary Balancing Criteria	
Effectiveness	Assesses the degree to which the alternative employs treatment to reduce toxicity, mobility, or volume of contaminants. Considers the ability of the alternative to maintain protection of human health and the environment over time.
Implementability	Assesses the technical and administrative feasibility of implementing the alternative, including factors such as the relative availability of goods and services. Evaluates the issues and concerns the public may have regarding the alternative.
Cost	Presents the total cost estimated for each alternative.

4.2 Remedial Alternative Evaluation

Each alternative is evaluated to determine if it meets the threshold criteria of overall protectiveness and compliance with applicable requirements. In this section, the performance of the remedial action alternatives under each of the SCP criteria is examined relative to one another. The following comparative analysis presents a narrative discussion describing the strengths and weaknesses of the alternatives with respect to each SCP criterion. Table 7 summarizes the remedial alternative evaluation.

4.2.1 Overall Protectiveness

All the alternatives, except Alternative 1, meet the project RAO. Alternative 1 would not be protective of human health and the environment because it does not address contaminants and does not provide controls to prevent exposure to COPCs.

4.2.2 Compliance with Applicable Requirements

Compliance with applicable requirements is necessary for any alternative to be considered feasible. Alternative 1 would not meet applicable requirements. Alternatives 2 and 3 would be compliant with all identified applicable requirements.

4.2.3 Effectiveness

The effectiveness criterion includes an assessment of the degree to which the alternatives employ treatment which reduce toxicity, mobility, or volume. Only Alternative 3 would reduce the toxicity, mobility, or volume of contamination through treatment. Alternative 2 reduces mobility to a degree that the clean cap and liner reduces infiltration and potential leaching. The use of treatment technologies to achieve the RAO is dictated by the hierarchy of remedial alternative selection provided in HAR 11-451-8 and detailed in the HDOH HEER Office TGM Section 16.2.2.1.

The effectiveness criterion also considers the length of time needed to implement an alternative and the risks the alternative poses to workers, residents, and the environment during implementation. No active remedial actions would be included under Alternatives 1 or 2; therefore, there would be no increased risks (relative to baseline conditions) to human health or the environment during implementation of these alternatives, except in the event a selected LUC requires soil disturbance during installation. There would be increased risks to human health and the environment during well and system installation associated with Alternative 3, but these risks would be mitigated using appropriate worker safety and contaminated soils handling measures as well as compliance with environmental standards.

Additionally, the effectiveness criterion considers the ability of an alternative to maintain protection of human health and the environment over time. Alternative 1 would not be effective in the long-term because no remedial components or LUCs would be enacted to help prevent exposure to contaminants in soil. Alternative 2 would only be effective in the long-term through maintenance to prevent exposure to contaminants during natural degradation. Alternative 3 would be effective in the long-term due to treatment of contaminants.

4.2.4 Implementability

This criterion assesses the technical and administrative feasibility of implementing the alternative, including factors such as the relative availability of goods and services. Alternative 1 would be readily implementable in a technical sense because no remedial components would be performed. Administratively, Alternative 1 may not receive regulatory approval because exposure pathways would not be addressed. Alternative 2 is slightly more difficult to implement than Alternative 1 as it would involve developing an LT-EHMP and installing LUCs.

Implementability would be more difficult under Alternative 3 since it requires the installation of wells, acquisition of specialized treatment equipment, dependent on the availability of space and source of suitable electricity, and will require frequent operation and maintenance.

4.2.5 Cost

The progression of total Present Value from least expensive to most expensive alternative is Alternative 1 ($0), Alternative 2 ($204,894), and Alternative 3 ($2,573,378).

Table 7: Remedial Alternatives Analysis Summary

Criterion	Alternative 1: NAA	Alternative 2: LUCs and LT-EHMP	Alternative 3: LUCs, LT-EHMP, Active Bioventing, and Aeration
Threshold Criteria			
Overall protection of human health and environment	No change	Protective of human and ecological receptors	Protective of both human and ecological receptors
Compliance with applicable requirements	No	Yes	Yes
Primary Balancing Criteria			
Effectiveness	Natural source zone depletion only. No action and therefore no additional risk. Does not eliminate risk to human receptors; potential for unrestricted use on the order of decades.	Natural source zone depletion only. Immediately effective upon installation; no remedial action and therefore no additional risk. Reduces but does not eliminate risk to human receptors; potential for unrestricted use on the order of decades.	Reduction in volume by treatment. Immediately effective upon installation; slight short-term risk during installation. Reduce risk to human or ecological receptors up-front; potential for unrestricted use in 3 to 7 years.
Implementability	High	High	High
Cost	$0.00	$204,894	$2,573,378
Relative Performance	**Not acceptable**	**Fair**	**Best**

Note:
Criterion from SCP (HAR 11-451015) TGM Section 16.2.3

5.0 PROPOSED REMEDY

The preferred remedy is Alternative 3 (LUCs, LT-EHMP, active bioventing, and aeration). Figure 4 presents the layout of the proposed bioventing wells and extent of the land use control area. The alternative is deemed the most advantageous for the site, striking a balance between immediate risk management and long-term contaminant treatment. This preferred alternative is recommended for implementation to address the site's current conditions, both the in-situ and excavated contaminated soil, and safeguard against potential future risks.

The LT-EHMP will serve as the initial protective measure. It will include physical and administrative controls developed based on the findings of the EHE to manage the risks associated with subsurface contaminants. Active bioventing will treat subsurface contamination by accelerating microbial degradation of the fuel. Aeration of the supersack soil will allow impacted soil to remain on-site while reducing the contaminant mass.


785575
785600
785625
2292275
2292250
2292225
9920
DU-01
DU-02
DU-03
DU-04
DU-05
DU-06
DU-07
DU-08
Figure 4
Remedial Alternatives Map
Maui Space Surveillance Complex
Haleakalā, Maui
Legend
DU Borehole Locations
Bio Venting Well Locations
10m Elevation Contours
Land Use Control Area
Inaccessible Area
Fuel Spill Location
Maui Space Surveillance Complex (MSSC)
Haleakalā High Altitude Observatory Site (HHAOS)
N
Scale: 1:300
Datum: NAD 1983 PA11
Coordinate System: State Plane
Map Units: Meters
0 1.75 3.5 7 10.5 14
Meters
0 5 10 20 30 40 50
Feet
9800
9840
9880
9920
9960
Project Location

6.0 REFERENCES

Hawaii, 1997. Hawaii State Contingency Plan (SCP), Hawaii Administrative Rules Title 11, Chapter 451. November 14.

HODH, 2006. Uniform Environmental Covenants Act (UECA). HRS 508C. 2006. Updated 2012.

_____, 2008. *Technical Guidance Manual for the Implementation of the Hawaii State Contingency Plan.* HDOH Hazard Evaluation and Emergency Response Office, Updated July 2021.

_____, 2024. *Evaluation of Environmental Hazards at Sites with Contaminated Soil and Groundwater*. HDOH Hazard Evaluation and Emergency Response Office. Spring 2024.

KAYA Associates, Inc., 2010. Integrated Cultural Resources Management Plan 2010-2015 Maui Space Surveillance Site Haleakala, Maui, Hawaii. KAYA Associates Inc. for AFRL.

KC Environmental Inc. (KC), 2010. *Management Plan*. Haleakalā High Altitude Observatory Site Haleakalā, Maui, Hawaiʻi. KC Environmental Inc. for UH IfA. 8 June.

Pacific Air Forces, 2023a. *Maui Space Surveillance Complex Diesel Fuel*. Accessed on 6 April 2023. Accessed at: https://www.pacaf.af.mil/News/US-Space-Forces-Indo-Pacific-News/Article/3297308/maui-space-surveillance-complex-diesel-fuel-spill/. 1 February.

USAF, 2016. *Draft Integrated Natural Resources Management Plan, Maui Space Force Station, Maui, Hawaiʻi*.

_____, 2023, prepared by Tetra Tech. *Removal Action Report Backup Generator Disel Spill Initial Response Action Maui Space Surveillance Complex (MSSC), Haleakala, Maui Country, Hawaii*. Presented to NRC/US Ecology. April.

_____, 2023b. *Final Work Plan, Environmental Remediation Services to Conduct Spill Response Site Characterization and Alternatives Evaluation at Maui Space Surveillance Complex, Haleakalā, Hawaiʻi*. Honolulu: GSI North America Inc. for USAF. June.

_____, 2024. *Site Characterization and Alternatives Evaluation Report, Maui Space Surveillance Complex, Haleakalā, Hawaiʻi*. Honolulu: GSI North America Inc. for USAF. March.

USEPA, 1988. "Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Interim Final, October 1988 (EPA/540/G-89/004) (Office of Solid Waste and Emergency Management [OSWER] Directive 9355.3-01)." USEPA, Superfund Policy. October. Accessed 2023. Accessed at http://www.epa.gov/superfund/policy/remedy/pdfs/540g-89004-s.pdf.

Attachment 1

HDOH Review Correspondence

JOSH GREEN, M.D.
GOVERNOR OF HAWAIʻI
KE KIAʻĀINA O KA MOKUʻĀINA ʻO HAWAIʻI

KENNETH S. FINK, MD, MGA, MPH
DIRECTOR OF HEALTH
KA LUNA HOʻOKELE

STATE OF HAWAII
DEPARTMENT OF HEALTH
KA ʻOIHANA OLAKINO
P. O. BOX 3378
HONOLULU, HI 96801-3378

In reply, please refer to:
File:
210917 JO

July 11, 2024

Ms. Jennifer Wehrmann
USAF Remedial Project Manager
AFCEC/CZOP
10471 20th Street, Suite 348
JBER, Alaska 99506-1822
Transmitted via e-mail to: *jennifer.wehrmann@us.af.mil*

Facility/Site: **Haleakala MSSC Fuel Spill Site**

Subject: **1) Backcheck of Response to Comments (RTCs) for the *Draft Response Action Memorandum*; and 2) Review of the revised *Draft Response Action Memorandum, Generator Fuel Spill Site (SS014), Maui Space Surveillance Complex, Haleakala, Hawaii,* dated July 2024**

Dear Ms. Wehrmann:

The Hawaii Department of Health (HDOH) Hazard Evaluation and Emergency Response (HEER) Office has conducted backcheck of the RTCs and reviewed the July 2024 revised *Draft Response Action Memorandum (RAM)* for the Generator Fuel Spill site at the Maui Space Surveillance Complex (MSSC). HDOH finds the response comments and revisions made to the Draft RAM sufficient except for the following:

HDOH 17 June 2024 Comment: HDOH has updated the Environmental Action Levels (EALs). Please refer to and use the updated Spring 2024 EALs in this report, which can be found at https://health.hawaii.gov/heer/guidance/ehe-and-eals/. Please apply these EALs to the report globally (e.g., Table 2, Table 3, applicable in-text references, Section 6.0).

- Section 1.6, 2nd sentence, Page 4: Please revise the estimated depths and volume of subsurface soil exceeding the site-specific EALs, as a larger volume of soil now exceeds the site-specific EALs.
- Section 3.3.1, Page 13: Please revise the estimated depths and volume of subsurface soil exceeding the site-specific EALs, as a larger volume of soil now exceeds the site-specific EALs.
- Section 4.2.5 and Table 7, Page 23: If necessary, please revise the estimated cost for Alternative 3, as all supersack soil is above the unrestricted EALs and additional in-situ soil is above the site-specific EALs.

Please make the recommended revisions, finalize the report, and submit a copy to the HEER Office for our files. Feel free to contact me at 808-586-4249 or via e-mail at jennah.oshiro@doh.hawaii.gov if you have any questions. Thank you.

Sincerely,

Jennah Oshiro

Jennah Oshiro
Remedial Project Manager
Hazard Evaluation and Emergency Response Office
Hawaii Department of Health

JOSH GREEN, M.D.
GOVERNOR OF HAWAI'I
KE KIA'ĀINA O KA MOKU'ĀINA 'O HAWAI'I

KENNETH S. FINK, MD, MGA, MPH
DIRECTOR OF HEALTH
KA LUNA HO'OKELE

STATE OF HAWAII
DEPARTMENT OF HEALTH
KA 'OIHANA OLAKINO
P. O. BOX 3378
HONOLULU, HI 96801-3378

In reply, please refer to:
File:
210555 JO

June 17, 2024

Ms. Jennifer Wehrmann
USAF Remedial Project Manager
AFCEC/CZOP
10471 20th Street, Suite 348
JBER, Alaska 99506-1822
Transmitted via e-mail to: jennifer.wehrmann@us.af.mil

Facility/Site: **Haleakala MSSC Fuel Spill Site**

Subject: **1) Backcheck of Response to Comments (RTCs) for the *Draft Response Action Memorandum*; and 2) Review of the revised *Draft Response Action Memorandum, Generator Fuel Spill Site (SS014), Maui Space Surveillance Complex, Haleakala, Hawaii,* dated June 2024**

Dear Ms. Wehrmann:

The Hawaii Department of Health (HDOH) Hazard Evaluation and Emergency Response (HEER) Office has conducted backcheck of the RTCs and reviewed the revised *Draft Response Action Memorandum (RAM)* for the Generator Fuel Spill site at the Maui Space Surveillance Complex (MSSC). Please see the attached RTC matrix for HDOH's backcheck comments. Additionally, HDOH has one additional comment.

- HDOH has updated the Environmental Action Levels (EALs). Please refer to and use the updated Spring 2024 EALs in this report, which can be found at https://health.hawaii.gov/heer/guidance/ehe-and-eals/. Please apply these EALs to the report globally (e.g., Table 2, Table 3, applicable in-text references, Section 6.0).

Feel free to contact me at 808-586-4249 or via e-mail at jennah.oshiro@doh.hawaii.gov if you have any questions. Thank you.

Sincerely,

Jennah Oshiro

Jennah Oshiro
Remedial Project Manager
Hazard Evaluation and Emergency Response Office
Hawaii Department of Health

Enclosed: RTC Matrix for *Draft Response Action Memorandum, Generator Fuel Spill Site (SS014), Maui Space Surveillance Complex, Haleakala, Hawaii*

JOSH GREEN, M.D.
GOVERNOR OF HAWAIʻI
KE KIAʻĀINA O KA MOKUʻĀINA ʻO HAWAIʻI

KENNETH S. FINK, MD, MGA, MPH
DIRECTOR OF HEALTH
KA LUNA HOʻOKELE

STATE OF HAWAII
DEPARTMENT OF HEALTH
KA ʻOIHANA OLAKINO
P. O. BOX 3378
HONOLULU, HI 96801-3378

In reply, please refer to:
File:
000000 JO

May 8, 2024

Ms. Jennifer Wehrmann
USAF Remedial Project Manager
AFCEC/CZOP
10471 20th Street, Suite 348
JBER, Alaska 99506-1822
Transmitted via e-mail to: *jennifer.wehrmann@us.af.mil*

Facility/Site: **Haleakala MSSC Fuel Spill Site**

Subject: **Review of *Draft Response Action Memorandum, Generator Fuel Spill Site (SS014), Maui Space Surveillance Complex, Haleakala, Hawaii*; dated April 2024**

Dear Ms. Wehrmann:

The Hawaii Department of Health (HDOH) Hazard Evaluation and Emergency Response (HEER) Office has reviewed the *Draft Response Action Memorandum (RAM)* for the Generator Fuel Spill site at the Maui Space Surveillance Complex (MSSC) and has the following comments:

Specific Comments:

1. Section 1.5.2, Page 4 (PDF p.8): Recommend including in this section the range of boring depths or the depth of the deepest boring and stating that groundwater was not encountered.

2. Section 1.6, Page 4 (PDF p.8), 1st sentence: Recommend adding that fuel constituents *in soil* were found above the EALs.

3. Section 2.0, Page 6 (PDF p.10): Include why the supersack soil is being excluded from this evaluation.

4. Section 2.2, Page 6 (PDF p.10), 2nd paragraph, 1st sentence:

    a. Suggest including the estimated depth to groundwater.

    b. The plastic liner is not located over the entire potentially impacted area. Please revise the sentence.

    c. The clean cap fill will not significantly impact the leachability of the contaminants, as soil is porous and would not prevent water from infiltrating. The soil cap would only prevent direct human and ecological exposure at the surface. Please revise the sentence.

5. Section 2.3, Page 7 (PDF p.11), 1st paragraph, 3rd sentence: The sentence appears incomplete. Recommend revising the sentence so it is a complete sentence.

6. Section 2.4.2, Page 7 (PDF p. 11):

   a. This paragraph appears to be attempting to rule out two different groundwater exposure pathways. The first exposure pathway mentioned is from drinking contaminated drinking water, as the section states that groundwater is not used for drinking water. The second exposure pathway implied is from direct exposure, as it is stated that there is no potential for contact with groundwater because it was not encountered during the *Site Characterization and Alternatives Evaluation Report* (SCAE). Please discuss these two exposure pathways separately.

   b. 1st sentence: As previously commented on the SCAE (HDOH comment letter dated 13 February 2024, Comment #19 and #42), HDOH considers the site to be over a drinking water resource, as it is above the Underground Injection Control (UIC) line. For more information on determining drinking water utility, please refer to the HDOH comment letter dated 13 February 2024 for the draft SCAE. Refrain from stating that the groundwater under the site is not utilized as drinking water. To state that contamination to groundwater is not expected because leaching to groundwater is unlikely is an acceptable assessment and this exposure pathway (i.e., drinking water) may be incomplete, but a better/clearer discussion on why it is considered incomplete should be included. Please do not use the rational that the groundwater below the site is not a drinking water resource as HDOH considers it one, and instead provide evidence why leaching to groundwater is not possible/probable which would explain why the exposure pathway is incomplete.

   c. Last sentence: This is a separate exposure pathway than was discussed in the first sentence. Please thoroughly discuss why no direct exposure to groundwater is expected, such as estimated depth to groundwater and no perched groundwater encountered within the SCAE, as well as the depth of the deepest boring (i.e., 80 feet). This exposure pathway may be incomplete, but a better/clearer discussion why it is incomplete needs to be included.

7. Section 2.4.3, Page 8 (PDF p.12): Include information for surface water bodies, such as "there is no surface water within "x" feet of the site."

8. Table1, Page 9 (PDF p.13):

   a. "Soil Vapor" and "Vapor Intrusion into Buildings": Soil vapor/vapor intrusion are not discussed in the preceding sections. Please discuss soil vapor/vapor intrusion including the distance to the nearest building(s) to explain why the exposure pathway is incomplete. For "future," are there soil vapor hazards if a building were constructed over the spill site in the future?

   b. <u>"Risk to Terrestrial Ecological Habitats" under "Groundwater":</u> Please revise this to "Risk to <u>*Aquatic*</u> Ecological Habitats."

9. <u>Section 3.1, Page 11 (PDF p.15), 3rd paragraph, 1st bullet:</u> Is this Remedial Action Objective (RAO) also applicable to the supersack soil or only for the in-situ soil? Please specify in this section.

10. <u>Section 3.3.2, Page 14 (PDF p.18):</u> HDOH recommends comparing the supersack soil analytical results to the Tier 1 EALs and remediating the soils to below these levels so that the soil can be reused without restrictions. If the supersack soil is only remediated to the site-specific EALs, then it should not be used elsewhere on the site and cannot be used even within the project boundary without land use controls (LUCs), especially as topsoil, as this may pose a direct exposure hazard.

11. <u>Section 3.6, Page 18 (PDF p.22), Alternative 2</u>:

    a. Under this alternative, how would the supersack soil be managed under a Long-Term Environmental Hazard Management Plan (LT-EHMP)? Is the assumption that the supersack soil would remain at its current location indefinitely? Please elaborate on this alternative as it relates to the supersack soil.

    b. Include in this paragraph that annual inspections of LUCs would be required under this remedy, including supplemental annual reports. The annual inspections and reports will be included in the LT-EHMP.

    c. Please include the specific LUCs that would be implemented under this alternative, as these were not included in the SCAE.

12. <u>Section 3.6, Page 18 (PDF p.22), Alternative 3</u>:

    a. Please mention in this section that the LT-EHMP will be required following implementation of the remedy (i.e., active bioventing) and following completion of the remedy, as the remedy plans to leave in-situ soil exceeding the Tier 1 Environmental Action Levels (EALs).

    b. <u>2nd paragraph, last sentence:</u> If air is being blown (i.e., pushed) from the vent into the soil, it is unclear how the air pushed through the soil will be collected from the soil for treatment. Recommend providing a better explanation on how the active bioventing will work or providing a simplified diagram.

    c. <u>Last paragraph:</u> Include in this paragraph what is planned for the supersack soil following aeration. If it is anticipated that the soil will still be above the Tier 1 EALs following aeration, it is recommended that the soil not be reused outside the site boundary. If soil is anticipated to be below the Tier 1 EALs following treatment, then the soil may be reused at the site without restrictions.

    d. <u>Last paragraph:</u> Is aeration an effective method for diesel remediation? It seems that aeration would be effective for gasoline and other volatiles, but less so for heavier fuels (e.g., diesel). If the method for remediation using aeration is through bioremediation and not volitization, please state this.

Feel free to contact me at 808-586-4249 or via e-mail at jennah.oshiro@doh.hawaii.gov if you have any questions. Thank you.

Sincerely,

Jennah Oshiro

Jennah Oshiro
Remedial Project Manager
Hazard Evaluation and Emergency Response Office
Hawaii Department of Health

Generator Fuel Spill Site (SS0014), MSSC Haleakalā
Maui, Hawai‘i
April 2024

Comments received via letter dated 8 May 2024, 17 June 2024, and 11 July 2024

Reviewer contact information:

Name: Jennah Oshiro (Remedial Project Manager)	**Phone Number:** (808) 586-4249
Organization: HDOH HEER Office	**E-mail Address:** jennah.oshiro@doh.hawaii.gov

Item	Section	Page	Comment	Response	HDOH Backcheck
1	Section 1.5.2	Page 4 (PDF P.8)	Recommend including in this section the range of boring depths or the depth of the deepest boring and stating that groundwater was not encountered.	Concur. The text has been updated as suggested. Please refer to the red line/strikeout (RLSO) document for changes made.	Comment resolved.
2	Section 1.6	Page 4 (PDF P.8)	Recommend adding that fuel constituents *in soil* were found above the EALs.	Concur. The text has been updated as suggested. Please refer to the RLSO document for changes made.	Comment resolved.
3	Section 2.0	Page 6 (PDF P. 10)	Include why the supersack soil is being excluded from this evaluation.	Concur. The supersack soil is not being excluded from this evaluation. This section has been updated to clearly identify the supersacked soil. Please refer to the RLSO document for changes made. In addition, references to “excavated soil” were changed to “supersacked soil” except for statements indicating excavated soil was placed in supersacks.	Comment resolved.
4	Section 2.2	Page 6 (PDF P. 10)	a. Suggest including the estimated depth to groundwater. b. The plastic liner is not located over the entire potentially impacted area. Please revise the sentence. c. The clean cap fill will not significantly impact the	a. Concur. None of the soil borings completed at the site to date have identified groundwater at the site. The text has been updated to indicate that groundwater, if	Comments resolved.

Item	Section	Page	Comment	Response	HDOH Backcheck
			leachability of the contaminants, as soil is porous and would not prevent water from infiltrating. The soil cap would only prevent direct human and ecological exposure at the surface. Please revise the sentence.	present, is assumed to be greater than 80 feet deep. b. Concur. However, the plastic liner, which was placed at the bottom of the area excavated where subsurface contamination was greatest, is expected to reduce surface water infiltration in this immediate area. Clarification to the text has been added. c. Concur. The sentence has been revised to indicate that the plastic liner should serve to reduce surface water infiltration to the subsurface and prevent direct human and ecological exposure. Please refer to the RLSO document for changes made.	
5	Section 2.3	Page 7 (PDF p.11)	1st paragraph, 3rd sentence: The sentence appears incomplete. Recommend revising the sentence so it is a complete sentence	Concur. The text has been rewritten to read as follows: "Several species of flora and fauna, listed as either threatened or endangered under both state and federal endangered species regulations, have been observed in or near the boundaries of MSSC including the ʻAhinahina (Haleakalā Silversword; *Argyroxiphium sandwicense* ssp. *macrocephalum*), the Hawaiian dark-rumped petrel (ʻuaʻu*;* *Pterodroma phaeopygia sandwichensis*), Hawaiian goose (nēnē; *Nesochem sandvicensis*), and the Hawaiian hoary bat (ʻōpeʻapeʻa; *Lasiurus cinereus semotus*) (KC Environmental Inc., 2010). However, none of these species have been observed within the boundaries of the site."	Comment resolved.
6	Section 2.4.2	Page 7 PDF p.	a. This paragraph appears to be attempting to rule out two different groundwater exposure pathways. The first exposure	a. Concur. The text in Section 2.4.2 has been revised to now read:	Comments resolved.

Item	Section	Page	Comment	Response	HDOH Backcheck
		11)	pathway mentioned is from drinking contaminated drinking water, as the section states that groundwater is not used for drinking water. The second exposure pathway implied is from direct exposure, as it is stated that there is no potential for contact with groundwater because it was not encountered during the *Site Characterization and Alternatives Evaluation Report* (SCAE). Please discuss these two exposure pathways separately. b. 1st sentence: As previously commented on the SCAE (HDOH comment letter dated 13 February 2024, Comment #19 and #42), HDOH considers the site to be over a drinking water resource, as it is above the Underground Injection Control (UIC) line. For more information on determining drinking water utility, please refer to the HDOH comment letter dated 13 February 2024 for the draft SCAE. Refrain from stating that the groundwater under the site is not utilized as drinking water. To state that contamination to groundwater is not expected because leaching to groundwater is unlikely is an acceptable assessment and this exposure pathway (i.e., drinking water) may be incomplete, but a better/clearer discussion on why it is considered incomplete should be included. Please do not use the rational that the groundwater below the site is not a drinking water resource as HDOH considers it one, and instead provide evidence why leaching to groundwater is not possible/probable which would explain why the exposure pathway is incomplete. c. Last sentence: This is a separate exposure pathway than was discussed in the first sentence. Please thoroughly discuss why no direct exposure to groundwater is expected, such as estimated depth to groundwater and no perched groundwater encountered within the SCAE, as well as the depth of the deepest boring (i.e., 80 feet). This exposure pathway may be incomplete, but a better/clearer discussion why it is	"An assessment of the leaching potential indicates that contamination to groundwater is not expected. Furthermore, the SCAE investigation did not encounter groundwater in any of the borings advanced, indicating groundwater is not present within at least 80 ft of the surface, and DRO is confined to site soil. As such, the drinking water exposure pathway is considered incomplete because the likelihood of leaching to groundwater is minimal. To further confirm this assessment, Synthetic Precipitation Leaching Procedure (SPLP) data will be collected during the Phase 3 remediation. This additional data will provide evidence supporting the conclusion that the potential for contaminants to reach and impact groundwater is minimal. The potential for direct exposure to groundwater was also evaluated. Groundwater is not documented within several miles of the site. There is no perched groundwater known at the summit of Haleakalā, and the SCAE investigation did not encounter groundwater in any of the borings advanced, which reached depths of 80 ft. This lack of groundwater presence at shallow depths suggests that there is no potential for human or ecological receptors to come into contact with groundwater at the site and the direct exposure pathway is considered incomplete."	

Item	Section	Page	Comment	Response	HDOH Backcheck
			incomplete needs to be included.	b. Concur. Text in Section 2.4.2 has been revised. Please refer to response to Comment 6a. c. Concur. Text in Section 2.4.2 has been revised. Please refer to response to Comment 6a.	
7	Section 2.4.3	Page 8 (PDF p.12)	Include information for surface water bodies, such as "there is no surface water within "x" feet of the site."	Concur. In Section 2.4.3, the following has been added: "*The nearest surface water body is an intermittent stream approximately 1.9 miles downslope of the MSSC (KC Environmental Inc., 2010).*"	Comment resolved.
8	Table 1	Page 9 (PDF p.13)	<u>a. "Soil Vapor" and "Vapor Intrusion into Buildings":</u> Soil vapor/vapor intrusion are not discussed in the preceding sections. Please discuss soil vapor/vapor intrusion including the distance to the nearest building(s) to explain why the exposure pathway is incomplete. For "future," are there soil vapor hazards if a building were constructed over the spill site in the future? <u>b. "Risk to Terrestrial Ecological Habitats" under "Groundwater":</u> Please revise this to "Risk to <u>*Aquatic*</u> Ecological Habitats."	a. Concur. Table 1 has been revised to read "Yes" for soil vapor intrusion into buildings – future, and soil vapor – current and future. Additionally, new Section 2.4.4 Soil Vapor and Soil Vapor Intrusion has been added to read: "*To date, soil vapor data for the site is limited to photoionization detector readings (0 to 1,572 parts per million in headspace measurements, with negligible impacts to ambient air). These readings indicate the presence of volatile compounds and the potential for direct exposure to soil vapor exists at the release area. However, this area is generally not frequented by people as it is an open space with a generator and not located near primary use spaces at the site. In addition,*	Comment partially resolved. <u>Table 1</u> Under "Soil: Risk to Human Health: Vapor Intrusion into Buildings" change "Yes" to "**No**" for "Current" as there currently are no vapor intrusion hazards into buildings (no buildings present over project site or nearby buildings). 06/25/2024 USAF - Change made as suggested. Revise Table 1 to account for hazards present to subsurface construction workers. Recommend revising last row from "Vapor Intrusion into Buildings" to "**vapor emissions**" or something similar to account for soil

Item	Section	Page	Comment	Response	HDOH Backcheck
				general exposure is further reduced by the plastic liner placed at the release area during the Phase 1 removal action. As such, subsurface workers are considered the primary potential receptor and may encounter soil vapor during remedial activities. *The potential for soil vapor intrusion into nearby buildings was also assessed. The nearest building is approximately 70 ft to the east of the release location and about 15 ft uphill, while a second building is approximately 85 ft northwest, also approximately 15 ft uphill. The distance and elevation difference reduces the likelihood of soil vapor migrating into these buildings. Currently, there are no plans to construct a new building directly over the spill site. However, if a building were to be constructed in the future, there is potential for soil vapor intrusion due to the presence of volatile compounds in the soil. Given the current site usage and the lack of plans for new construction, the soil vapor intrusion pathway is considered incomplete under current conditions."* b. Concur. Change has been made as suggested. Please refer to the RLSO document for changes made.	vapor hazards that may be present **outside** of buildings. 06/25/2024 USAF - Change made as suggested. Revise note 8 so that it corresponds to "Soil: Risk to Human Health: Vapor Intrusion into Buildings: Yes" under "Future." 06/25/2024 USAF - Removed the 8 footnote from soil vapor (i.e., the footnote no longer applies) and applied it to soil only.
9	Section 3.1	Page 11 (PDF p.15)	3rd paragraph, 1st bullet Is this Remedial Action Objective (RAO) also applicable to the supersack soil or only for the in-	Concur. The bullet has been revised to read:	Comment resolved.

Item	Section	Page	Comment	Response	HDOH Backcheck
			situ soil? Please specify in this section.	"Achieve cleanup of *in-situ* soil to below site-specific EALs *and below Tier 1 EALs for supersacked soil.*"	
10	Section 3.3.2	Page 14 (PDF p.18)	HDOH recommends comparing the supersack soil analytical results to the Tier 1 EALs and remediating the soils to below these levels so that the soil can be reused without restrictions. If the supersack soil is only remediated to the site-specific EALs, then it should not be used elsewhere on the site and cannot be used even within the project boundary without land use controls (LUCs), especially as topsoil, as this may pose a direct exposure hazard.	Concur. This section has been revised to compare to Tier 1 EALs. Other sections of the document have been revised to indicate that Tier 1 EALs will be applied to the supersacked soil. Please refer to the RLSO document for changes made. Section 3.2 was revised to explain that Tier 1 EALs are applied to supersacked soil since it will be used as unrestricted cover/fill upon completion of the remedial action. Table 2 was revised to include the both the unrestricted and restricted EALs. The footnote to Table 3 was revised to indicate use of the Tier 1 EALs for the supersacked soil.	Comment partially resolved. Confirm that the highlighted response of "in-situ" should be "supersacked soil" and revise the report text as necessary. 06/25/2024 USAF - Response corrected, no changes necessary for document.
11	Section 3.6	Page 18 (PDF p.22) Alternative 2	a. Under this alternative, how would the supersack soil be managed under a Long- Term Environmental Hazard Management Plan (LT-EHMP)? Is the assumption that the supersack soil would remain at its current location indefinitely? Please elaborate on this alternative as it relates to the supersack soil. b. Include in this paragraph that annual inspections of LUCs would be required under this remedy, including supplemental annual reports. The annual inspections and reports will be included in the LT-EHMP. c. Please include the specific LUCs that would be implemented under this alternative, as these were not included in the SCAE.	a. Concur. The assumption is that the soil would remain at its current location (or an acceptable alternative location) until concentrations are below Tier 1 levels. Section 4.2.3 has been revised to indicate this scenario would require long term maintenance. The LT-EHMP would include specific measures for the management of the supersack soil to ensure it does not pose a risk to human health or the environment. These measures would include handling procedures, engineering controls (geotextile fabric, signage), and inspection requirements.	Comments resolved.

Item	Section	Page	Comment	Response	HDOH Backcheck
				b. Concur. The requirement for annual LUC inspections and reporting has been added. c. Concur. Specific LUCs will be developed in detail (and added to/revised) when the EHMP is drafted. Currently, LUCs that are being considered for initial evaluation include the following: In situ: clean fill cap (already in place), plastic liner (already in place), soil vapor monitoring (biweekly during in-situ remediation), dig permits/procedures for minor subsurface disturbance (C-EHMP required for major subsurface work), inspection and reporting requirements, fence and signage under consideration pending additional Phase 3 characterization data. Supersacks: Landfarms covered with geotextile fabric, signage/access restrictions, inspection and reporting requirements.	
12	Section 3.6	Page 18 (PDF p.22) Alternative 3	a. Please mention in this section that the LT-EHMP will be required following implementation of the remedy (i.e., active bioventing) and following completion of the remedy, as the remedy plans to leave in-situ soil exceeding the Tier 1 Environmental Action Levels (EALs). b. 2nd paragraph, last sentence: If air is being blown (i.e., pushed) from the vent into the soil, it is unclear how the air pushed through the soil will be collected from the soil for treatment. Recommend providing a better explanation on how the active bioventing will work or providing a simplified diagram.	a. Concur. Text in Section 3.6 has been revised to state that the LT-EHMP will be required following implementation of the remedy. b. Concur. Air will be extracted from vent wells and treated before exhausting to the atmosphere. Clarification has been added. Remedial technology details will be provided in the forthcoming remedial action work plan.	Comments resolved.

Item	Section	Page	Comment	Response	HDOH Backcheck
			c. Last paragraph: Include in this paragraph what is planned for the supersack soil following aeration. If it is anticipated that the soil will still be above the Tier 1 EALs following aeration, it is recommended that the soil not be reused outside the site boundary. If soil is anticipated to be below the Tier 1 EALs following treatment, then the soil may be reused at the site without restrictions. d. Last paragraph: Is aeration an effective method for diesel remediation? It seems that aeration would be effective for gasoline and other volatiles, but less so for heavier fuels (e.g., diesel). If the method for remediation using aeration is through bioremediation and not volatilization, please state this.	c. Concur. Once the soil is treated to meet the Tier 1 EALs, it is expected to be returned to the site as fill or cover material. d. Concur. The contaminant source was a mixture of diesel and Jet A. Jet A is a more volatile fuel and should be effectively remediated through aeration. A combination of aeration and bioremediation will be performed as part of the remedy. Also, as part of the Phase 3 field activities, microbial DNA analysis will be conducted to verify the bioremediation aspect. Additionally, the use of geotextile fabric is planned for use instead of plastic to allow for photodegradation as well.	
13	Global		HDOH 17 June 2024 Comment: HDOH has updated the Environmental Action Levels (EALs). Please refer to and use the updated Spring 2024 EALs in this report, which can be found at https://health.hawaii.gov/heer/guidance/ehe-and-eals/. Please apply these EALs to the report globally (e.g., Table 2, Table 3, applicable in-text references, Section 6.0).	EALs were reviewed and TPH-DRO was the only COC that the EAL changed. Revisions were made through the document.	Comment resolved.
14	Global		HDOH 11 July 2024 Comment: a. Section 1.6, 2nd sentence, Page 4: Please revise the estimated depths and volume of subsurface soil exceeding the site-specific EALs, as a larger volume of soil now exceeds the site-specific EALs. b. Section 3.3.1, Page 13: Please revise the estimated depths and volume of subsurface soil exceeding the	a. Estimated depths & volume for the in situ soil. The text has been updated to include the revised depth and volume of soil *potentially* *exceeding* the EALs are 2-40 ft bgs and 1000 cubic yards of soil. The square footage doesn't change.	Comments resolved.

Item	Section	Page	Comment	Response	HDOH Backcheck
			site-specific EALs, as a larger volume of soil now exceeds the site-specific EALs. c. Section 4.2.5 and Table 7, Page 23: If necessary, please revise the estimated cost for Alternative 3, as all supersack soil is above the unrestricted EALs and additional in-situ soil is above the site-specific EAL	b. Estimated volume for supersacked soil. The volume of soil in the supersacks has not been revised (the volume of material removed is considered the entire volume that needs to be treated), therefore the costs did not change either. c. Revised reference for HDOH 2024	
			End	Thank you for providing comments.	