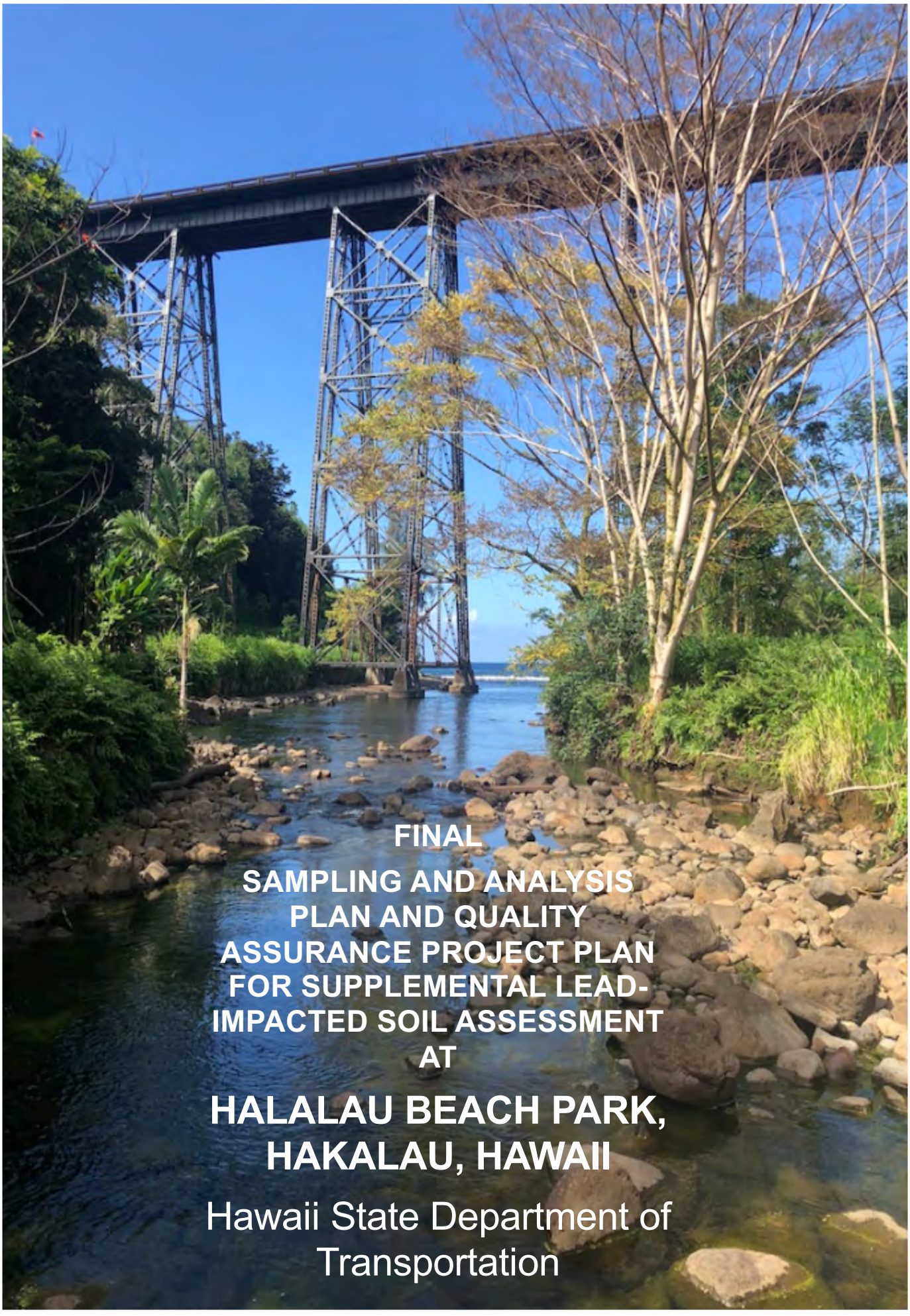

FINAL

SAMPLING AND ANALYSIS PLAN AND QUALITY ASSURANCE PROJECT PLAN FOR SUPPLEMENTAL LEAD-IMPACTED SOIL ASSESSMENT AT

HALALAU BEACH PARK, HAKALAU, HAWAII

Hawaii State Department of Transportation

Sampling and Analysis Plan and Quality Assurance Project Plan for Supplemental Lead-Impacted Soil Response Assessment at Hakalau Beach Park, Hakalau, Hawaii

TMK (3) 2-9-002:080

State of Hawaii Department of Transportation
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February, 2020

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List of Acronyms and Abbreviations

ANSI	American National Standards Institute
bgs	below ground surface
CFR	Code of Federal Regulations
COPC	contaminants of potential concern
DQO	data quality objectives
DU	decision unit
EAL	Environmental Action Level
EPA	United States, Environmental Protection Agency
HAR	Hawaii Administrative Rules
HASP	Health and Safety Plan
HDOH	State of Hawaii Department of Health
HDOT	State of Hawaii Department of Transportation
HEER	Hazardous Evaluation and Emergency Response
HiOSH	Hawaii Occupational Safety and Health Standards
HTGM	HDOH HEER Office Technical Guidance Manual
IDW	investigation-derived waste
LBP	lead-based paint
LCS	laboratory control sample
MDL	method detection limits
mg/kg	milligram per kilogram
mm	millimeter
MRL	method reporting limit
MS	matrix spike
MSD	matrix spike duplicate
OSHA	Occupational Safety and Health Administration
PM	Project Manager
PPE	personal protective equipment
PQL	practical quantitation limit
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
SAP	Sampling and Analysis Plan
SHWB	Solid and Hazardous Waste Branch
TCLP	toxicity characteristic leaching procedure
TMK	Tax Map Key

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1 Introduction and Purpose

This document presents the Sampling and Analysis Plan (SAP) and Quality Assurance Project Plan (QAPP) for the lead-impacted soil response actions at Hakalau Beach Park, Mamalahoa Highway (Route 19), Hakalau, HI (the "site"). The site is accessible from Old Mamalahoa Highway, approximately 13 miles north of Hilo. The Tax Map Key (TMK) is (3) 2-9-002 Parcel 080 (Figure 1). The County of Hawaii owns the site, and the County of Hawaii Department of Parks and Recreation manages the site.

This SAP/QAPP evaluates existing data and provides a framework to assess the lead-impacted soil at the site. This SAP/QAPP follows the HDOH *Technical Guidance Manual Notes: Decision Unit and Multi-Increment* Sample Investigations, March 2011 (Revised August 2016) and the Hawaii Occupational Safety and Health Standards (HiOSH) (HAR Title 12, Chapter 99).*

The SAP/QAPP includes:

- A discussion of the site background;
- A summary of environmental investigations conducted at the site;
- A description the methods and analysis for the follow-up soil investigation
- Sample and analysis quality assurance/quality control
- Soil sampling and analysis shall be limited to characterization of the soil for disposal/reuse at the West Hawaii Sanitary Landfill.

SAP Addendum

Right of Entries (ROEs) to private land owned adjacent to the State of Hawaii Department of Transportation (HDOT) and County of Hawaii Department of Parks & Recreation (P&R) owned parcels comprising the Hakalau Beach Park are currently being negotiated. In the interim, HDOT wants to move forward with sampling HDOT and P&R properties independently of this process until the other ROEs are obtained. To allow sampling be conducted separately from this SAP, and Addendum SAP was prepared which is presented in Attachment 1.

1.1 Site Description

The site is located at Hakalau Beach Park, in Hakalau, HI on the Hamakua Coast. The site is an open, level grassy and dirt site bordered by Hakalau Stream to the north and the Pacific Ocean to the east. The site is within the steep-sided Hakalau Gulch. The site is a public park for used for camping, general recreation, and fishing.

The site is east (makai) of the Hakalau Stream Bridge, which is the suspected source of lead. L Lead-based paints were applied to the bridge structure, and the paint flaked off to the park below resulting in lead-impacted soil. Lead paint abatement was performed on the Hakalau Bridge in 2000 (ESI, 2016b). Another potential source of contaminants is the former Hakalau Sugar Mill which operated in the area from the 1890s until the mid-1970s. During this time, arsenic-based pesticides and mercury-based fungicides were commonly used within the sugar cane industry. Elevated arsenic levels have been found throughout the Hamakua Coast due to this history of sugar cane production and processing.

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Figure 1: TMK Site Location

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2 Previous Sampling Activities

In November 2016, the HDOH HEER Office performed an inspection of the surface soil at Hakalau Beach Park to evaluate whether historical use of lead-based paints on Hakalau Bridge and the agricultural operations previously conducted by Hakalau Sugar may have impacted the park. HDOH used an X-ray Fluorescence [XRF] analyzer to screen for lead, arsenic, and mercury in one composite soil sample. This single exposure decision unit (DU) was located directly below Hakalau Bridge and represented the most probable location of the lead-impacted soil. Thirty increments of soil were collected from the top 2 to 3 inches of soil within this DU. The DU was approximately 120 feet long by 30 feet wide.

Sixteen XRF measurements were taken from the combined incremental soil samples and averaged. The average lead concentration was 196 milligrams per kilogram [mg/kg] and the average arsenic concentration was less than 8.7 mg/kg. Mercury was not detected in any of the XRF measurements (HDOH, 2016). Following this initial screening of soil using an XRF, two additional soil assessments were conducted at the site. These assessments submitted incremental soil samples to the laboratory for analysis for lead. The subsequent assessments also increased the number of DUs to evaluate potential areas of elevated lead exposure to human receptors based on different park use activities (e.g., maintenance, stream bank, fire pit area, etc.). Results were compared to the HDOH Tier 1 EALs for unrestricted land use (200 mg/kg for lead) (HDOH Fall 2011 revised Fall 2017).

In March and April 2016, ESI performed an environmental assessment due to proposed bridge footing repair work planned for Hakalau Bridge (ESI, 2016a). Greyish-black paint chips were collected from the base of four of the steel girders and detected lead concentrations ranging from 89 to 510 mg/kg and arsenic concentrations ranging from 61 to 110 mg/kg. Additionally, red and black paint chips were found on the rocks beneath the bridge and within the vicinity of the steel girders. Lead was detected in the red paint at 11,000 mg/kg, and in the black paint at 2,700 mg/kg. Arsenic was detected in the red paint at 130 mg/kg, and was not detected in the black paint (ESI, 2016a).

Due to high concentrations of lead and arsenic detected in paint on the steel girders of Hakalau Bridge and within paint found on rocks beneath and around the Hakalau Bridge, an additional assessment was performed by ESI on the soils surrounding the Hakalau Bridge. Sampled areas included multiple privately-owned parcels and Hakalau Beach Park (TMK (3) 2-9-002: 080). Multi-incremental soil samples were collected from nine DUs (DU-1, DU-2, DU-3a, DU-4a, DU-4b, DU-5, DU-6, DU-7, and DU-8) as shown in Table 1.

Between September 28 and November 3, 2016, ESI personnel attempted to collected 12 Multi-Incremental soil samples from Hakalau Beach Park (DU-14A, DU-14B, DU-15A, DU-15B, DU-16A, DU-16B, DU-17A, DU-17B, DU-18A, DU-18B, DU-19A, & DU-19B) as shown in Table1.

Soil samples were collected from 0 to 3 inches below ground surface (bgs), and 3 to 6 inches bgs. DU-15 samples were not collected as pavement covered this area and therefore, soil was inaccessible at the time. All soil samples collected within Hakalau Beach Park were sampled by EPA Method 6020 and/or XRF. Sample concentrations for lead ranged from 57 mg/kg to 348 mg/kg. Vertical and lateral delineation of contamination was not performed (ESI, 2017).

2.1 Toxicity Characteristic Leaching Procedure (TCLP)

TCLP is a soil sample extraction method for chemical analysis which simulates leaching through a landfill. If TCLP is detected at concentrations which exceed the Resource Conservation and Recovery Act hazardous waste criteria of 5 mg/L, the material is classified as hazardous waste and cannot be disposed of at a landfill in Hawaii.

In the previous study, based on the analytical results for total lead, the following representative samples were chosen for TCLP analysis from each category (ESI, 2017). Several samples were chosen for the 200 to 1,000 mg/kg concentration range (Table 1).

1. Total lead concentration greater than 8,000 mg/kg (DU-11A).
2. Total lead concentration between 7,000 and 8,000 mg/kg (DU-1B).
3. Total lead concentration between 5,000 and 7,000 mg/kg (DU-21A).
4. Total lead concentration between 1,000 and 5,000 mg/kg (DU-12A).
5. Total lead concentrations between 200 to 1,000 mg/kg (DU-12B, 20A, 20B, 16B, 16A, 18B).

TCLP was detected at concentrations above the Resource Conservation and Recovery Act [RCRA] listed hazardous waste criterium of 5 mg/L in samples DU-1B, 11A, and 21A. The total lead concentration in DU-21A (5,080 mg/kg) was the lowest of the three of these samples. Based on the results of the TCLP lead analysis, if surface soil (0 to 3 inches bgs) and near surface soil (3 to 6 inches bgs) is removed from DUs 1, 2, 11, 21, and 22, the soil will likely be classified as hazardous waste, because the total lead concentrations in the soil from these DUs are all above 5000 mg/kg.

In addition, any soil with total lead concentrations somewhere between 1410 mg/kg (DU-12A, TCLP lead of 1.3 mg/L) and 5080 mg/kg (approximately 1500 - 5000 mg/kg) may likely have TCLP lead results greater than 5 mg/L, and thus be classified as hazardous.

Table 1: Previous Soil Sample Results Hakalau Beach Park

	Lead results below HDOH Tier 1 EAL Unrestricted Land Use (200 mg/kg)
	Lead results above HDOH Tier 1 EAL Unrestricted Land Use (200 mg/kg) but below Construction/Trench Worker Scenario (800 mg/kg)
	Lead results above HDOH Tier 1 EAL above Construction/Trench Worker Scenario (800 mg/kg), but below gross contamination (1000 mg/kg)
	Lead results above gross contamination (1000 mg/kg)

DU	Sample ID	Date	Depth	Lead (mg/kg)	TCLP Analysis
1	DU-1	Apr-16	0 to 3	25000	
1	DU-1D	Apr-16	0 to 3	23700	
1	DU-1T	Apr-16	0 to 3	23600	
1	DU-1B	Oct-16	3 to 6	7880	**26.2**
2	DU-2A	Apr-16	0 to 3	10200	
2	DU-2B	Nov-16	3 to 6	9480	
3a	DU-3a	Apr-16	0 to 6	69.4	
4a	DU-4a	Apr-16	0 to 6	3.81	
4a	DU-9	Apr-16	0 to 6	2.8	
4a	DU-10	Apr-16	0 to 6	2.52	
4b	DU-4b	Apr-16	6 to 18	2.99	
5	DU-5	Apr-16	0 to 3	3730	*
6	DU-6	Apr-16	0 to 3	282	
7	DU-7	Apr-16	0 to 3	2530	*
7	DU-7B	-	3 to 6	Refusal	
8	DU-8	Apr-16	0 to 3	1850	*
11	DU-11A	Oct-16	0 to 3	8820	**31.8**
11	DU-11B	Oct-16	3 to 6	Refusal	
12	DU-12A	Oct-16	0 to 3	1410	1.3

DU	Sample ID	Date	Depth	Lead (mg/kg)	TCLP Analysis
12	DU-23A	Oct-16	0 to 3	1040	
12	DU-24A	Oct-16	0 to 3	897	
12	DU-12B	Oct-16	3 to 6	773	0.57
13	DU-13A	Oct-16	0 to 3	357	
13	DU-13B	Oct-16	3 to 6	372	
14	DU-14A	Sep-16	0 to 3	57	
14	DU-14B	Sep-16	3 to 6	93.4	
15	DU-15A	Sep-16	0 to 3	Paved	
15	DU-15B	-	3 to 6	Paved	
16	DU-16A	Sep-19	0 to 3	339	0.084
16	DU-16B	Sep-16	3 to 6	348	0.14
17	DU-17A	Oct-16	0 to 3	232	
17	DU-17B	Oct-16	3 to 6	161	
18	DU-18A	Oct-16	0 to 3	104	
18	DU-18B	Oct-16	3 to 6	226	0.14
19	DU-19A	Oct-16	0 to 3	28.4	
19	DU-19B	Oct-16	3 to 6	14.1	
20	DU-20A	Oct-16	0 to 3	760	0.23
20	DU-20B	Oct-16	3 to 6	570	0.17
21	DU-21A	Oct-16	0 to 3	5080	**14.2**
21	DU-21B	Oct-16	3 to 6	2720	*
22	DU-22A	Oct-16	0 to 3	3830	*
22	DU-22B	Oct-16	3 to 6	2870	*

Notes: DUs 9 and 10 were replicates. There is no DU 9 or DU 10.
* DU that will be resampled and analyzed with the TCLP for lead (see Section 3.1).

2.2 Toxicity Characteristic Leaching Procedure (TCLP)

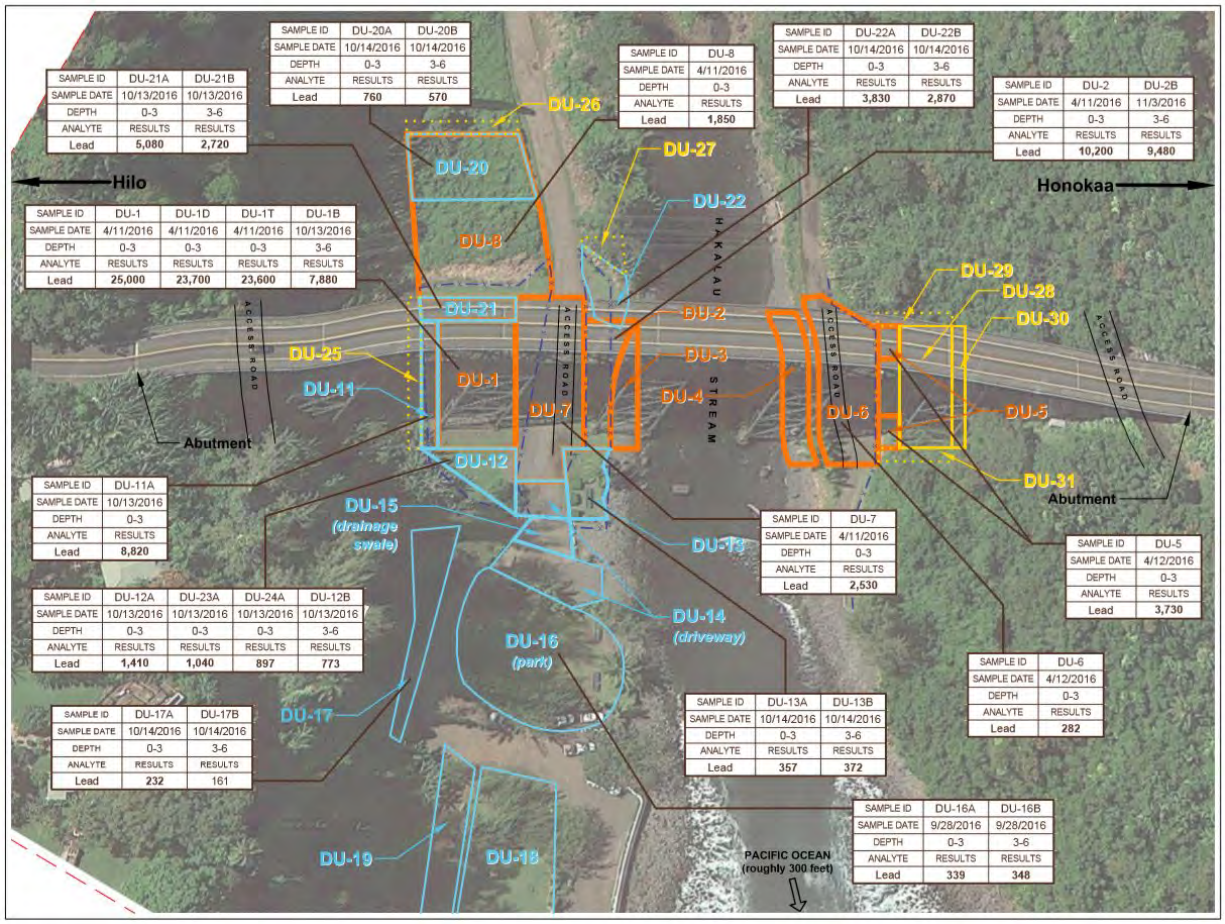
TCLP is a soil sample extraction method for chemical analysis which simulates leaching through a landfill. If TCLP is detected at concentrations which exceed the Resource Conservation and Recovery Act hazardous waste criteria of 5 mg/L, the material is classified as hazardous waste and cannot be disposed of at a landfill in Hawaii.

In the previous study, based on the analytical results for total lead, the following representative samples were chosen for TCLP analysis from each category (ESI, 2017). Several samples were chosen for the 200 to 1,000 mg/kg concentration range.

6. Total lead concentration greater than 8,000 mg/kg (DU-11A).
7. Total lead concentration between 7,000 and 8,000 mg/kg (DU-1B).
8. Total lead concentration between 5,000 and 7,000 mg/kg (DU-21A).
9. Total lead concentration between 1,000 and 5,000 mg/kg (DU-12A).
10. Total lead concentrations between 200 to 1,000 mg/kg (DU-12B, 20A, 20B, 16B, 16A, 18B).

TCLP was detected at concentrations above the Resource Conservation and Recovery Act [RCRA] listed hazardous waste criterium of 5 mg/L in samples DU-1B, 11A, and 21A. The total lead concentration in DU-21A (5,080 mg/kg) was the lowest of the three of these samples. Based on the results of the TCLP lead analysis, if surface soil (0 to 3 inches bgs) and near surface soil (3 to 6 inches bgs) is removed from DUs 1, 2, 11, 21, and 22, the soil will likely be classified as hazardous waste, because the total lead concentrations in the soil from these DUs are all above 5000 mg/kg.

Figure 2: Previous DU Locations (ESI 2017)



SAMPLE ID	DU-1	DU-1D	DU-1T	DU-1B
SAMPLE DATE	4/11/2016	4/11/2016	4/11/2016	10/13/2016
DEPTH	0-3	0-3	0-3	3-6
ANALYTE	RESULTS	RESULTS	RESULTS	RESULTS
Lead	25,000	23,700	23,600	7,880

SAMPLE ID	DU-2	DU-2B
SAMPLE DATE	4/11/2016	11/3/2016
DEPTH	0-3	3-6
ANALYTE	RESULTS	RESULTS
Lead	10,200	9,480

SAMPLE ID	DU-5
SAMPLE DATE	4/12/2016
DEPTH	0-3
ANALYTE	RESULTS
Lead	3,730

SAMPLE ID	DU-6
SAMPLE DATE	4/12/2016
DEPTH	0-3
ANALYTE	RESULTS
Lead	282

SAMPLE ID	DU-7
SAMPLE DATE	4/11/2016
DEPTH	0-3
ANALYTE	RESULTS
Lead	2,530

SAMPLE ID	DU-8
SAMPLE DATE	4/11/2016
DEPTH	0-3
ANALYTE	RESULTS
Lead	1,850

SAMPLE ID	DU-11A
SAMPLE DATE	10/13/2016
DEPTH	0-3
ANALYTE	RESULTS
Lead	8,820

SAMPLE ID	DU-12A	DU-23A	DU-24A	DU-12B
SAMPLE DATE	10/13/2016	10/13/2016	10/13/2016	10/13/2016
DEPTH	0-3	0-3	0-3	3-6
ANALYTE	RESULTS	RESULTS	RESULTS	RESULTS
Lead	1,410	1,040	897	773

SAMPLE ID	DU-13A	DU-13B
SAMPLE DATE	10/14/2016	10/14/2016
DEPTH	0-3	3-6
ANALYTE	RESULTS	RESULTS
Lead	357	372

SAMPLE ID	DU-16A	DU-16B
SAMPLE DATE	9/28/2016	9/28/2016
DEPTH	0-3	3-6
ANALYTE	RESULTS	RESULTS
Lead	339	348

SAMPLE ID	DU-17A	DU-17B
SAMPLE DATE	10/14/2016	10/14/2016
DEPTH	0-3	3-6
ANALYTE	RESULTS	RESULTS
Lead	232	161

SAMPLE ID	DU-20A	DU-20B
SAMPLE DATE	10/14/2016	10/14/2016
DEPTH	0-3	3-6
ANALYTE	RESULTS	RESULTS
Lead	760	570

SAMPLE ID	DU-21A	DU-21B
SAMPLE DATE	10/13/2016	10/13/2016
DEPTH	0-3	3-6
ANALYTE	RESULTS	RESULTS
Lead	5,080	2,720

SAMPLE ID	DU-22A	DU-22B
SAMPLE DATE	10/14/2016	10/14/2016
DEPTH	0-3	3-6
ANALYTE	RESULTS	RESULTS
Lead	3,830	2,870

Blue and Orange outlines areas were sampled. Yellow was recommended as potential follow-up for sample collection by ESI.

3 Sampling and Analysis Plan

This Sampling and Analysis Plan (SAP) describes the work procedures and methods that shall be implemented and adhered to by the during soil sampling activities.

This SAP was developed in accordance with industry standards including the HDOH HEER office TGM (HDOH 2009 and updates).

3.1 Sample Collection

Previous site investigations focused primarily on surface soil (0 to 6 inches). Samples were collected in two depth profiles at 0 to 3 inches bgs and 3 to 6 inches bgs at most DUs unless refusal occurred. DU4a/b was the only sample collected to a depth of 18 inches.

In order to determine the vertical extent of the lead impacted soil, in DUs that have previous been sampled and total lead results were greater than 200 mg/kg, EQI will collect MI soil samples at the following DUs presented in Table 2 at depths of 6 to 9 inches. In reporting of previous sampling at DUs where EQI is recommeding additional deeper sample collection, there is discussion that refusal was encountered beyound the 6 inch soil horizon (ESI 2017). If EQI determines while collecting a sample from the 6 to 9 inch soil layer, that a deeper sample can be collected from 9-12 inches bgs, the deeper soil layer will also be collected. MI soil sampling will be performed in accordance with the HDOH HEER Office sampling guidelines (HDOH, 2008). EQI will employ a systematic random method to select soil increments within each DU. A handheld direct push posthole driver and/or pick and shovel will be used to collect a total of 50 soil cores of approximately 30 grams per increment, for a total of approximately 1500 grams will be collected from each DU.

The samples will be prepared and analyzed in accordance with HDOH HEER Office guidelines (HDOH, 2008) and EPA Methods SW-846 1312 and 6020. The samples that will be analyzed for SPLP lead will be prepared in accordance with American Society for Testing Materials (ASTM) Standard D 6323 (ASTM, 2003).

TCLP Analysis

For the purposes of this investigation, any new sample with total lead concentration between 1500 mg/kg and 5000 mg/kg will be analyzed using TCLP for lead. TCLP analysis will not be performed on samples with total lead results falling above or below this range. Samples below the 1500 mg/kg range will be considered non-hazardous, while samples above 5,000 mg/kg will be assumed fail the 5 mg/L TCLP criteria. Table 1 shows DUs that were previously analyzed for total that had result that fall in this TCLP range that will be resampled and analyzed with the TCLP for lead.

Synthetic Precipitation Leaching Procedure [SPLP]

DU16 will be analyzed using SPLP method for lead. Additionally, the sample that is identified to contain the highest level below 800 mg/kg[1] in the three new DUs planned (DU25-DU27) may also be analyzed using the SPLP method. The SPLP results will be used to evaluate whether

1 800 mg/kg for lead is the HDOH Tier 1 EAL for Construction/Trench Worker Scenario and Commercial/Industrial Land Use

lead concentrations in the surface and subsurface soil are mobile and therefore may pose a risk to ecological receptors.

Table 2: Recommended DU Sample Locations Sept. 2019

DU	Previous Sample ID	Depth (inches)	Previous Lead Results (mg/kg)	Current Use Description	Recommended for Sept. 2019 Sampling?	Target Sample Depth for Total Lead (inches)
1	DU-1	0-3	25000	Area around the bents 4 and 5	Yes. **	6-9
1	DU-1D	0-3	23700			
1	DU-1T	0-3	23600			
1	DU-1B	3-6	7880			
2	DU-2	0-3	10200	Between the road and stream around bent 6	Yes. **	6-9
2	DU-2B	3-6	9480			
3	DU-3a	0-6	69.4	Hakalau Shore: Acceptable for use	No	N/A
4a	DU-4a	0-6	3.81	Hakalau Shore: Around bent 9	No	N/A
4a	DU-9	0-6	2.8			
4a	DU-10	0-6	2.52			
4b	DU-4b	6-18	2.99			
5	DU-5	0-3	3730	Area around bridge bents	Yes. **	6-9
6	DU-6	0-3	282	Access road between Bents 9-10	Yes	6-9*
7	DU-7		2530	Road on southern embankment between bents Bents 5 and 6.	No	N/A
7	DU-7B	3-6	Refusal			

DU	Previous Sample ID	Depth (inches)	Previous Lead Results (mg/kg)	Current Use Description	Recommended for Sept. 2019 Sampling?	Target Sample Depth for Total Lead (inches)
8	DU-8	0-3	1850	Vegetated area	Yes. ** Resample portion inside ROW	3-6 and 6-9
9	DU-9	0-6	2.80	DU 9 does not exist it is a replicate for DU-4 above	No	N/A
10	DU-10	0-6	2.52	See DU-4	No	N/A
11	DU-11A	0-3	8820	Narrow DU south of DU1	No	N/A
11	DU-11B	3-6	Refusal			
12	DU-12A	0-3	1410	Grassy area- likely used by public.	Yes ** - High priority	6-9 and SPLP on 3-6
12	DU-23A	0-3	1040			
12	DU-24A	0-3	897			
12	DU-12B	3-6	773			
13	DU-13A	0-3	357	Grassy area- likely used by public.	DU not within State ROW or County Parcel	N/A
13	DU-13B	3-6	372			
14	DU-14A	0-3	57	Driveway area: acceptable for public use	No	N/A
14	DU-14B	3-6	93.4			
15	DU-15A	N/A	Paved	Paved drainage swale.	No	N/A
15	DU-15B	N/A	Paved			
16	DU-16A	0-3	339	Park area. Heavy use by public.	Yes	6-9 and and SPLP on 3-6
16	DU-16B	3-6	348			
17	DU-17A	0-3	232	Grassy area south of park.	No	N/A
17	DU-17B	3-6	161			

DU	Previous Sample ID	Depth (inches)	Previous Lead Results (mg/kg)	Current Use Description	Recommended for Sept. 2019 Sampling?	Target Sample Depth for Total Lead (inches)
18	DU-18A	0-3	104	Grassy park area at mouth of stream.	Yes	6-9
18	DU-18B	3-6	226			
19	DU-19A	0-3	28.4	Grassy strip west of DU 18. Acceptable for public.	No	N/A
19	DU-19B	3-6	14.1			
20	DU-20A	0-3	760	Vegetated area west of DU-8.	DU not within State ROW or County Parcel	N/A
20	DU-20B	3-6	570			
21	DU-21A	0-3	5080	Directly below bridge.	Yes. **	6-9
21	DU-21B	3-6	2720			
22	DU-22A	0-3	3830	Area between driveway and stream. Potential high use.	Yes: High priority	6-9
22	DU-22B	3-6	2870			

Notes: * = DU9 is a replicated of DU4 and was previously sampled from 12 to 18 inches bgs
** = If solid rock or cobbles encountered no sample will be collected.
N/A = Not Applicable

In addition to collecting samples from previously established DUs for the purposes of further vertical delineation as presented above in Table 2, three additional DUs (DU25-DU27) will be created to further delineate the lateral extent of the lead paint impacts at the site as presented in Figure 3. These three additional DUs have been represented on Figure 3 to depict that sampling will not exceed the limits of the HDOT ROW in the eastern and western boundaries of the DUs. A survey will be performed prior to sampling by HDOT surveyors to establish limits of the HDOT ROW and County of Hawaii owned parcels. Additionally, the southern edge of DU 25 and northern edge of DU 27 have been established based limitations to sampling access posed by the steep incline. In these areas, the steep slopes are present access limitations to potential receptors (i.e., park users and County maintenance crews) and thereby, limit the potential exposure via direct contact to lead in the soil. Because geomorphologic characteristics of these areas under the Hakalau bridge, additional delineation in these areas, is only recommended if SPLP results obtained under this investigation show that that lead is likely to be mobile at concentrations similar to those encountered in this investigation. Samples will be collected at the from the 0-6 inches

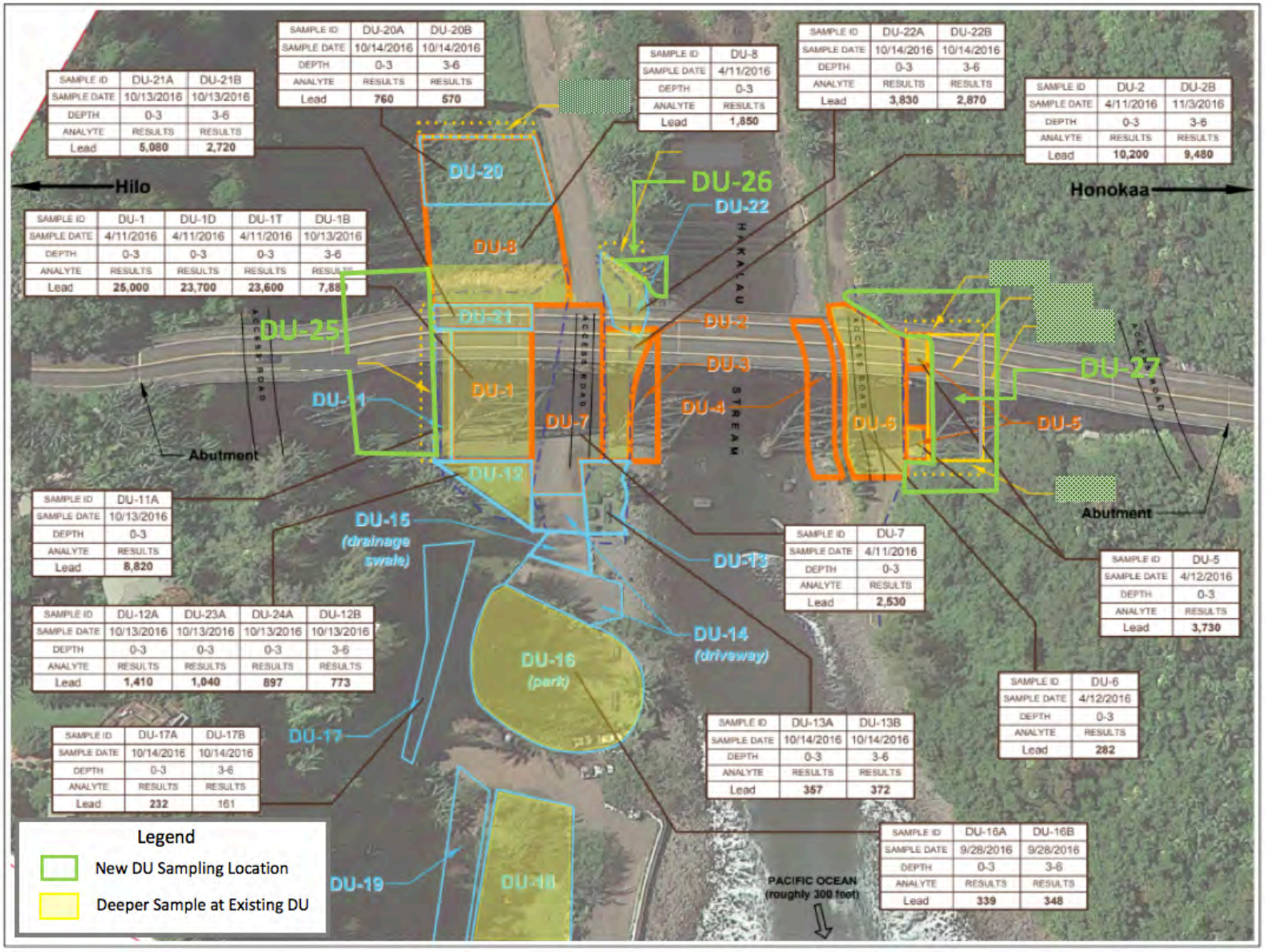
and 6-12 inches bgs soil layers and analyzed for total lead. If refusal is encountered below the 0-6 inch sample depth, the lower unit will not be collected.

Industry standard sampling protocol shall be adhered to during the collection of all environmental samples. Disposable sampling equipment shall be used in order to avoid the risk of cross-contamination and minimize generation of investigation-derived waste (IDW) in the form of decontamination water. To avoid cross contamination sample coring tools will be decontaminated using scrub brush, deionized water, and Alconox ™ (or similar) detergent and rinsed between DU sampling locations. The sampling personnel will don a pair of new, disposable, nitrile gloves prior to the collection of each environmental sample.

At the time of collection, samples shall be placed directly into a Ziploc® bag, labeled with unique sample identification information, placed into a second sealable plastic bag, and placed into a cooler chilled with ice for preservation. The samples shall be chilled and maintained at a temperature of four degrees Celsius (ºC) ± 2ºC and managed under chain-of-custody protocol and documentation until shipment to the analytical laboratory.

General sample locations, collection techniques, etc. shall be photo-documented throughout the field effort. All pertinent information, including sample location, identification, and site description shall be logged in a project-specific field notebook.

Figure 3: Planned Sampling Locations New and Existing DUs



SAMPLE ID	DU-20A	DU-20B
SAMPLE DATE	10/14/2016	10/14/2016
DEPTH	0-3	3-6
ANALYTE	RESULTS	RESULTS
Lead	760	570

SAMPLE ID	DU-21A	DU-21B
SAMPLE DATE	10/13/2016	10/13/2016
DEPTH	0-3	3-6
ANALYTE	RESULTS	RESULTS
Lead	5,080	2,720

SAMPLE ID	DU-8
SAMPLE DATE	4/11/2016
DEPTH	0-3
ANALYTE	RESULTS
Lead	1,850

SAMPLE ID	DU-22A	DU-22B
SAMPLE DATE	10/14/2016	10/14/2016
DEPTH	0-3	3-6
ANALYTE	RESULTS	RESULTS
Lead	3,830	2,870

SAMPLE ID	DU-2	DU-2B
SAMPLE DATE	4/11/2016	11/3/2016
DEPTH	0-3	3-6
ANALYTE	RESULTS	RESULTS
Lead	10,200	9,480

SAMPLE ID	DU-1	DU-1D	DU-1T	DU-1B
SAMPLE DATE	4/11/2016	4/11/2016	4/11/2016	10/13/2016
DEPTH	0-3	0-3	0-3	3-6
ANALYTE	RESULTS	RESULTS	RESULTS	RESULTS
Lead	25,000	23,700	23,600	7,88

SAMPLE ID	DU-11A
SAMPLE DATE	10/13/2016
DEPTH	0-3
ANALYTE	RESULTS
Lead	8,820

SAMPLE ID	DU-7
SAMPLE DATE	4/11/2016
DEPTH	0-3
ANALYTE	RESULTS
Lead	2,530

SAMPLE ID	DU-5
SAMPLE DATE	4/12/2016
DEPTH	0-3
ANALYTE	RESULTS
Lead	3,730

SAMPLE ID	DU-12A	DU-23A	DU-24A	DU-12B
SAMPLE DATE	10/13/2016	10/13/2016	10/13/2016	10/13/2016
DEPTH	0-3	0-3	0-3	3-6
ANALYTE	RESULTS	RESULTS	RESULTS	RESULTS
Lead	1,410	1,040	897	773

SAMPLE ID	DU-6
SAMPLE DATE	4/12/2016
DEPTH	0-3
ANALYTE	RESULTS
Lead	282

SAMPLE ID	DU-17A	DU-17B
SAMPLE DATE	10/14/2016	10/14/2016
DEPTH	0-3	3-6
ANALYTE	RESULTS	RESULTS
Lead	232	161

SAMPLE ID	DU-13A	DU-13B
SAMPLE DATE	10/14/2016	10/14/2016
DEPTH	0-3	3-6
ANALYTE	RESULTS	RESULTS
Lead	357	372

SAMPLE ID	DU-16A	DU-16B
SAMPLE DATE	9/28/2016	9/28/2016
DEPTH	0-3	3-6
ANALYTE	RESULTS	RESULTS
Lead	339	348

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3.2 Investigation-Derived Waste

Waste materials or IDW that will require management and disposal during the field work may include disposable plastic samplers and used PPE. Used PPE and disposable plastic samplers will not require special management or disposal procedures and shall be disposed of as regular trash.

3.3 Laboratory Soil Sample Preparation and Analysis

In general, MI sample preparation involves combining all the increment samples (to be done in the field), air drying and sieving the sample to <2 mm particle size, and collecting a representative subsample of the bulk sample for extraction and chemical analysis.

MI soil samples shall be prepared and subsampled for analyses by Calscience Eurofins using MI sample preparation protocol. Analytical results shall be reported on a dry weight basis.

Table 2: Sample Preparation and Analysis General Summary

Analytical Group	Matrix	Preparation[1]	Analysis[1]
Total lead	Soil	3050B/7471A	6010/7471
TCLP for lead		1311	6010/7470
SPLP for lead		1312	6010/7470

[1]EPA SW-846 Methods

3.4 Site Controls

Access to Hakalau Beach Park is currently controlled by a locked gate at the top of the access road on the south side of the valley. EQI will maintain control site access during the investigation to prevent any entrants to the investigation site.

3.5 Preparation of a Letter Report:

EQI will evaluate the data and prepare a letter report that briefly describes the site investigation purpose, sampling rationale/methodology, sample results, findings, conclusions, and provide recommendations for remedial activities. The report will include data summary tables, figures showing sampling locations, and photographs of sample collection sites.

3.6 Sampling Health and Safety

All unknown soil at the site shall be assumed impacted by COPCs lead and shall be handled as such.

3.6.1 Awareness/Training for Contamination Managed On-Site

Prior to site work, a Health and Safety meeting will be held to address site-specific concerns and summarize the daily activity

It is anticipated that Level C PPE is not needed at the work site during the sampling activities as long as soils are moist, and the likelihood that there is an inhalation risk is low. Level D will be adequate for sampling along with latex gloves and normal environmental sampling decontamination procedures will adequately protect the sampling team from lead exposure. Under normal conditions at Hakalau valley the soils will be damp as a result of the frequent rainfall, however, a sprayer filled with water may be used if the soils are not damp during the sampling activities. Otherwise, Level D will be adequate for sampling within DUs with lead results which exceed construction trench worker scenario of 800 mg/kg.

PPE Levels

EPA PPE Level	Required PPE
Modified Level D	- Long-sleeve shirts and long pants - Safety glasses with side shields (while sampling) - Hard hats - Chemical protective gloves (while sampling) - Reflective Vests, minimum American National Standards Institute (ANSI)/International Safety Equipment Association (ISEA) Class 2 highly visible (where equipment and/or vehicular traffic exist) - Ear protection (in high noise areas, Noise Reduction Rating [NRR])
Level D	- Disposable coveralls, cotton coveralls, or work clothes (long pants and shirts) - Safety glasses with side shields - Chemical protective gloves - Steel-toe shoes - Hard hat - Reflective Vests, minimum ANSI/ISEA Class 2 highly visible (where equipment and/or vehicular traffic exist) - Ear protection (in high noise areas, NRR)
Level C	- Tyvek®, or equivalent (i.e., Comfort-Guard), coveralls/disposal work clothing - Inner Nitrile gloves - Outer Nitrile gloves - Steel-toed shoes - Disposable shoe covers - Hard hat - Reflective Vests, minimum ANSI/ISEA Class 2 highly visible (where equipment and/or vehicular traffic exist) - Full-face respirator with combination dust and organic vapor cartridges. - Ear protection (in high noise areas, NRR)

EPA PPE Level	Required PPE
Level B	- Tyvek®, or equivalent (i.e., Comfort-Guard), coveralls/disposal work clothing - Inner Nitrile gloves - Outer Nitrile gloves - Steel-toed shoes - Disposable shoe covers - Hard hat - Reflective Vests, minimum ANSI/ISEA Class 2 highly visible (where equipment and/or vehicular traffic exist) - Airline or self-contained breathing apparatus - Ear protection (in high noise areas, NRR)

Workers are not allowed to smoke, drink, or eat within the work zone near the potentially contaminated soil.

3.6.2 Use Restrictions to Protect Site Workers and Guests

Use restrictions identified by Hawaii Occupational Safety Hazard office shall be followed, which may include but are not limited to the following. No work or activities that will disturb the current engineering controls shall be permitted without prior approval from the EQI or HDOH HEER Office staff. Only trained personnel may access the site.

4 Quality Assurance Project Plan

4.1 Introduction

This Quality Assurance Project Plan (QAPP) describes QA/QC procedures for sampling activities at the site and incorporates laboratory-specific QA/QC procedures. Laboratory-standard procedures are not reiterated except as necessary to describe the QA/QC plans for this project.

This QAPP was developed in accordance with industry standards and the HDOH HTGM (HDOH 2009 and updates). It is intended to be used in conjunction with the SAP in order to ensure that all activities included with this project shall be conducted in a manner consistent with industry standard methods and techniques to provide data representative of conditions present at the site.

The EQI's Project Manager (PM) shall be responsible for ensuring that the appropriate project personnel have the most current version of this QAPP.

The usability of the data collected during this investigation will depend on its quality. A large number of factors along the sample collection and analysis process have the potential to impact the overall quality of the data generated during the investigation. Adhering to proper sample collection techniques, observing, and documenting chain-of-custody procedures, and using certified laboratories and approved analytical methods will ensure that the quality of data generated by the investigation will accurately represent conditions at the site.

4.2 Data Quality Objectives

The purpose of the Data Quality Objectives (DQO) process is to help determine when enough data of sufficient quality has been collected to enable accurate decision-making. This SAP was developed in accordance with the following:

- ASTM, 2003, D 6323: Standard Guide for Laboratory Subsampling of Media Related to Waste Management Activities
- *HTGM (HDOH 2009 and updates);*
- Technical Guidance Manual Notes: Decision Unit and Multi-Increment* Sample Investigations, March 2011 (Revised August 2016).

Soil sample data for total and TCLP lead shall be used to determine the nature and extent of the release of lead from the Hakalau bridge.

4.3 Data Validation

4.3.1 Quality Assurance Objectives for Data Measurement

QA objectives for data measurement refer to the level of quality required for the data. The level of quality is based on the intended data usage, available laboratory procedures, available resources, and logistical limitations. There are six elements related to the level of data quality including accuracy, precision, representativeness, comparability, completeness, and sensitivity.

4.3.1.1 Accuracy

Accuracy refers to the closeness of the analytical data to the true value of the constituents being measured, as it exists at the site. Although the true value cannot be determined, reliable estimates of the true value can be made using analytical results from a representative subset of the population. Accuracy goals can be met by selecting a probabilistic sampling method where every unit in the population of interest has a theoretically equal chance of being sampled. Consequently, statistics generated by the sample (i.e., mean and standard deviation of the mean) are unbiased (accurate) estimators of true population parameters. Sampling accuracy can also be increased by increasing the number of samples collected, making the data more representative of the population being sampled.

Measurement accuracy shall be determined through the use of calibration checks, matrix spikes (MS) and laboratory control samples (LCS). Accuracy shall be based on percent recovery of spiked samples. Accuracy requirements for the laboratory are those described in the EPA's *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846, 3rd Edition* (EPA 1996).

4.3.1.2 Precision

Precision is defined as the agreement between a set of replicate measurements without assumption or regard about the true value, i.e., the ability to repeat the measurement and get fundamentally the same quantitative result. Sampling precision is commonly achieved by taking an appropriate number of samples from the population and by increasing the physical size (weight or volume) of the samples that are collected and analyzed. Increasing the number of samples collected and/or the size of the samples from a population not only increases sampling precision, but it also has the secondary effect of increasing sampling accuracy. Sampling precision can be determined by comparing multi-increment sample results from the same decision unit. At least two additional DU samples to collect triplicate samples (at separate systematic random locations) in at least one of the planned DUs. This field replicate data will aid in showing the variability of the sampling strategy and collection technique and if it was adequate for decision-making (e.g., in this case, the relative standard deviation (RSD) for replicates should be less than 35%, or likely we would consider less than 50% RSD would be adequate for characterization for disposal in the landfill). RSD is a measure of reproducibility of estimates of the mean provided by replicates. Just as the sample mean and standard deviation are estimates of the corresponding population parameters, the sample RSD is an estimate of the ratio of the population parameters. It provides a measure of the total error associated with the data, although not necessarily the accuracy of the estimate. Replicate RSD data are intended to quantify the total error of the measurement system and attribute that error to either field sampling or laboratory procedures.

Analytical precision shall be determined by the laboratory using MS and matrix spike duplicates (MSD) to measure reproducibility, expressed as relative percent difference. Precision requirements for the laboratory are those described in the EPA's *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846, 3rd Edition* (EPA 1996).

4.3.1.3 Representativeness

Representativeness is the degree that data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness can be achieved by collecting a sufficient amount of samples. The MI sampling approach is a statistically-derived method developed to ensure that samples being

analyzed are representative of the population being sampled. If no unusual problems with the laboratory analyses are identified, then the data shall be assumed to be representative of the samples.

4.3.1.4 Comparability

Comparability expresses the confidence with which one data set can be compared to another. Comparability can be related to accuracy and precision because these quantities are measures of data reliability. Data are considered comparable if collection techniques, measurement procedures, methods, and reporting are equivalent for the samples within a sample set. Comparability for sampling shall be determined to be acceptable based on the following criteria:

- A consistent approach to sampling was applied throughout the program;
- Samples were consistently preserved; and
- Sampling was performed during the same time of year and under similar physical conditions.

4.3.1.5 Completeness

Completeness refers to the number of acceptable data points divided by the possible number of data points for a sampling event or entire project. Test results may be unusable or unacceptable because of sample container breakage, poor laboratory QA, matrix interferences, etc. The completeness goal for this project shall be 90%. If this completion goal is not met, the PM will review this goal and the achievement of other DQO and make a recommendation as to the need for corrective action.

4.3.1.6 Sensitivity

Sensitivity refers to the lowest concentration of an analyte that can be accurately quantified without qualifications in a sample matrix. Such concentrations are generally referred to as “method reporting limits (MRL)” or “practical quantitation limits (PQL),” and should not be confused with “method detection limits (MDL),” which are minimum concentrations of an analyte that can be distinguished for a specific analytical method with 99% confidence that the concentration is greater than zero. The data shall be considered adequately sensitive if either the MRLs/PQLs or MDLs are below regulatory standards for this project.

Data usability shall be based on the use of the acceptance criteria outlined in the referenced tables together with an evaluation of project-specific MS/MSDs, LCSs, and other relevant laboratory QA/QC checks. While it is understood that as a general rule, recoveries of most compounds spiked into samples should fall within the 70% to 130% range, the laboratory acceptance criteria reflect laboratory-specific performance, which accounts for effects of the spike to background ratios or other conditions.

It is possible that matrix effects may cause uncertainties when acceptable laboratory recovery limits are achieved, but the associated sample result and the action level are within the recovery range. In that case, the professional judgment of the EQI shall be used to determine data usability.

4.3.2 Quality Control Samples

QC samples include replicate MI samples. Replicate samples shall be collected from DU-2 and DU-27 for a total of two replicates.

4.3.3 Data Analysis and Reporting

Laboratory turnaround times for this project is fifteen business days, not including shipping. Results of analyses shall be reported by the laboratory via electronic mail.

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ATTACHMENT 1

Addendum SAP

Sampling and Analysis Addendum: State and County Owned Parcels
Hakalau Beach Park, HI
February 2020

This addendum addresses the revised Decision Units (DUs) associated with the SAP and QAPP for Hakalau Beach Park, HI.

Samples will be collected from within the Hawaii Department of Transportation (HDOT) Right of Way (ROW) (TMK 331001999 and 32900299) and Hawaii County-owned parcels (TMK 329002080). Sample collection is anticipated to take place in February 2020. Tax owners of privately held parcels which contain DUs have been contacted by the County of Hawaii and will be sampled pending right of entry approval (ROE). Table 3 identifies the DUs and their locations within their respective tax parcels (Figure 1). Many DUs cross multiple tax parcels and portions which are located on privately held parcels will not be sampled at this time. Once an access agreement has been received with the private landowners, a separate SAP will be submitted for those areas.

DUs with similar prior sample results will be consolidated and sampled at additional depth profiles to provide additional risk assessment results for workers and park users (Figure 2).

MI samples will be collected, processed and shipped in accordance with the SAP/QAPP.

HDOT ROW Revised Decision Units
If land clearance/grubbing is completed prior to sampling, two additional DUs will be established; DU 31 and DU 35. These DUs are located within the HDOT ROW on the embankments of Hakalau Gulch and represent the extent of the bridge. Samples will be collected from a depth of 0 to 3 inches below ground surface (bgs), 3 to 6 inches bgs, and 6 – 12 inches bgs if accessible.

DU32, 33, 34, and 36 will extend the previously sampled DUs depth profiles to 12 inches bgs. DU 33 contains DU1 and DU2 which had the highest total lead results (25,000 mg/kg and 10,200 mg/kg).

Table 1: DU Sample Depth Profiles: County of Hawaii

New DU	DU 31	DU 32	DU 33	DU 34	DU 35	DU 36
Previous DUs	New	8, 22	1, 2, 7, 11, 21	6	New	5
Sample Depth						
0-3	X	Previously Sampled	Previously Sampled	Previously Sampled	X	Previously Sampled
3-6	X	X	Previously Sampled	X	X	X
6-12	X	X	X	X	X	X

Note:
X indicates that a sample will be collected from this soil depth.

County of Hawaii Revised Decision Units

The County of Hawaii parcel had two DUs which met HDOH Tier I EALs for unrestricted land use (DU14 and DU19). These will not be re-sampled.

DU16 and 17 will be consolidated and resampled at a deeper depth profile. These DUs would meet USEPA standards for lead in parks (below 400 mg/kg),but exceeded the HDOH Tier 1 EALs for unrestricted land use (232 to 348 mg/kg) for total lead. DU18 met the HDOH Tier 1 EAL in the surface soil, but slightly exceeded it for 3-6 inches bgs.

Table 2: DU Sample Depth Profiles: County of Hawaii

New DU	DU 37	DU 38
Previous DUs	16, 17	18
Depth		
0-3	Previously Sampled	Previously Sampled
3-6	Previously Sampled	Previously Sampled
6-12	X	X

Note:
X indicates that a sample will be collected from this soil depth.

Table 3: Decision Units Located with Tax Parcels

		Tax Parcels and Owners						
Original Decision Units	Consolidated DUs (2020)	329002025 Wolf, Steven & Maria	331001002 Wolf, Steven & Maria	331001999 HDOT ROW	32900299 HDOT ROW	331001001 Marian Land Co.	329002080 County of Hawaii	331001003 Marian Land Co.
1	33			Portion		Portion		
2	33			Portion		Portion		
3a				Portion		Portion		
4a				Portion		Portion		
4b						Portion		
5	36			Portion		Portion		Portion
6	34			Portion		Portion		Portion
7	33			Portion		Portion		
8	32	Portion	Portion	Portion	Portion			
11	33			Portion	Portion	Portion	Portion	
12						Portion	Portion	
13						Yes		
14						Portion	Portion	
15						Portion	Portion	
16	37						Yes	
17	37						Yes	
18	38						Yes	
19							Yes	
20		Portion	Portion					
21	33			Portion	Yes			
22	32			Portion				
New	31				Yes			
New	35			Yes				

Notes: Color indicates total lead sample results. DU31 and DU35 will be sampled if accessible.

Portion/Yes	Below 200 mg/kg for Total Lead	Yes/Portion	Above 200 mg/kg for Total Lead, below 800 mg/kg	Yes/Portion	Above 800 mg/kg total lead

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FIGURES

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Figure 1

Site Parcel Map

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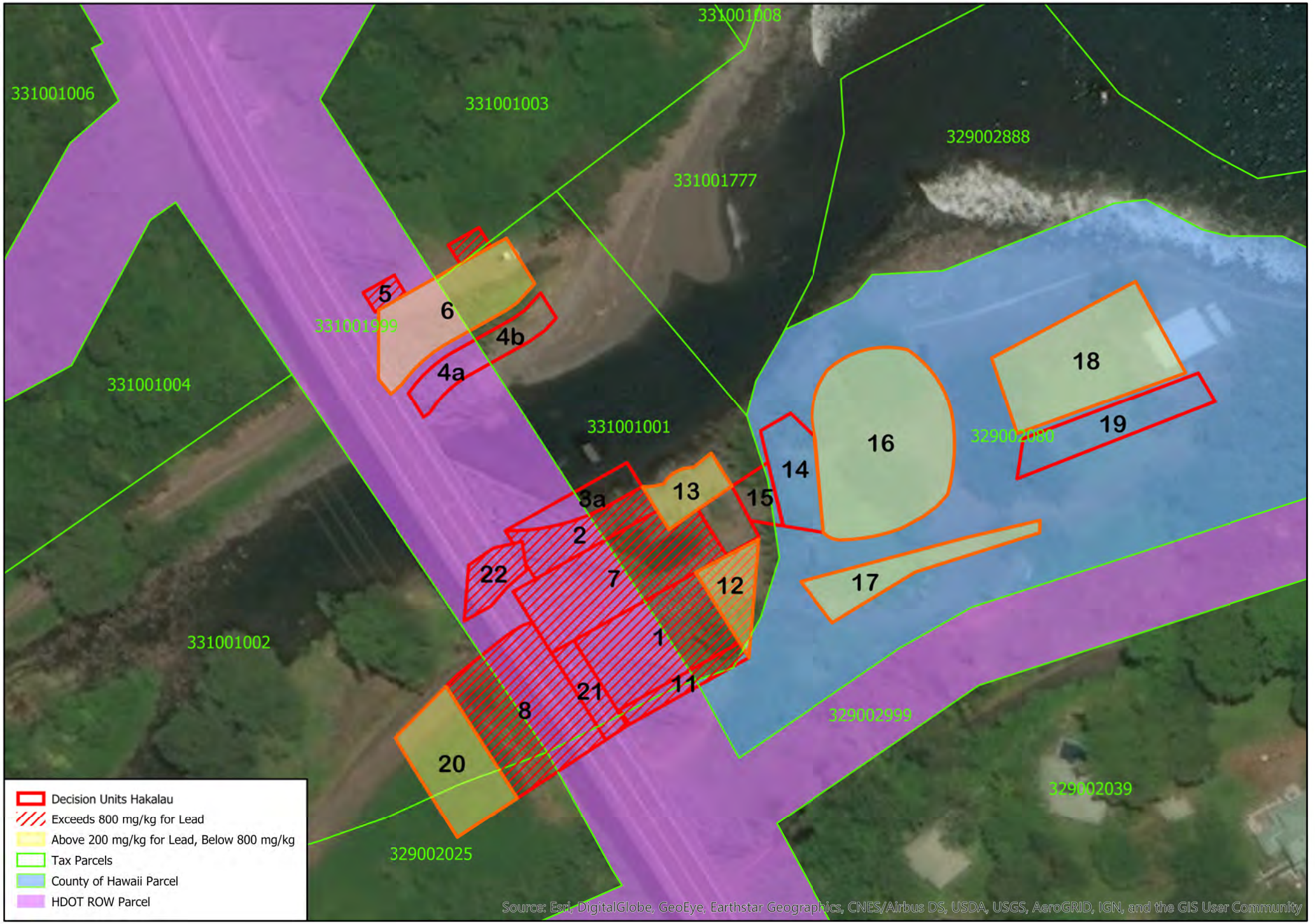

Figure 1
Decision Units, Lead Results and TMKs
Hakalau Beach Park, Hawaii County, HI

Figure 2

Decision Units on HDOT

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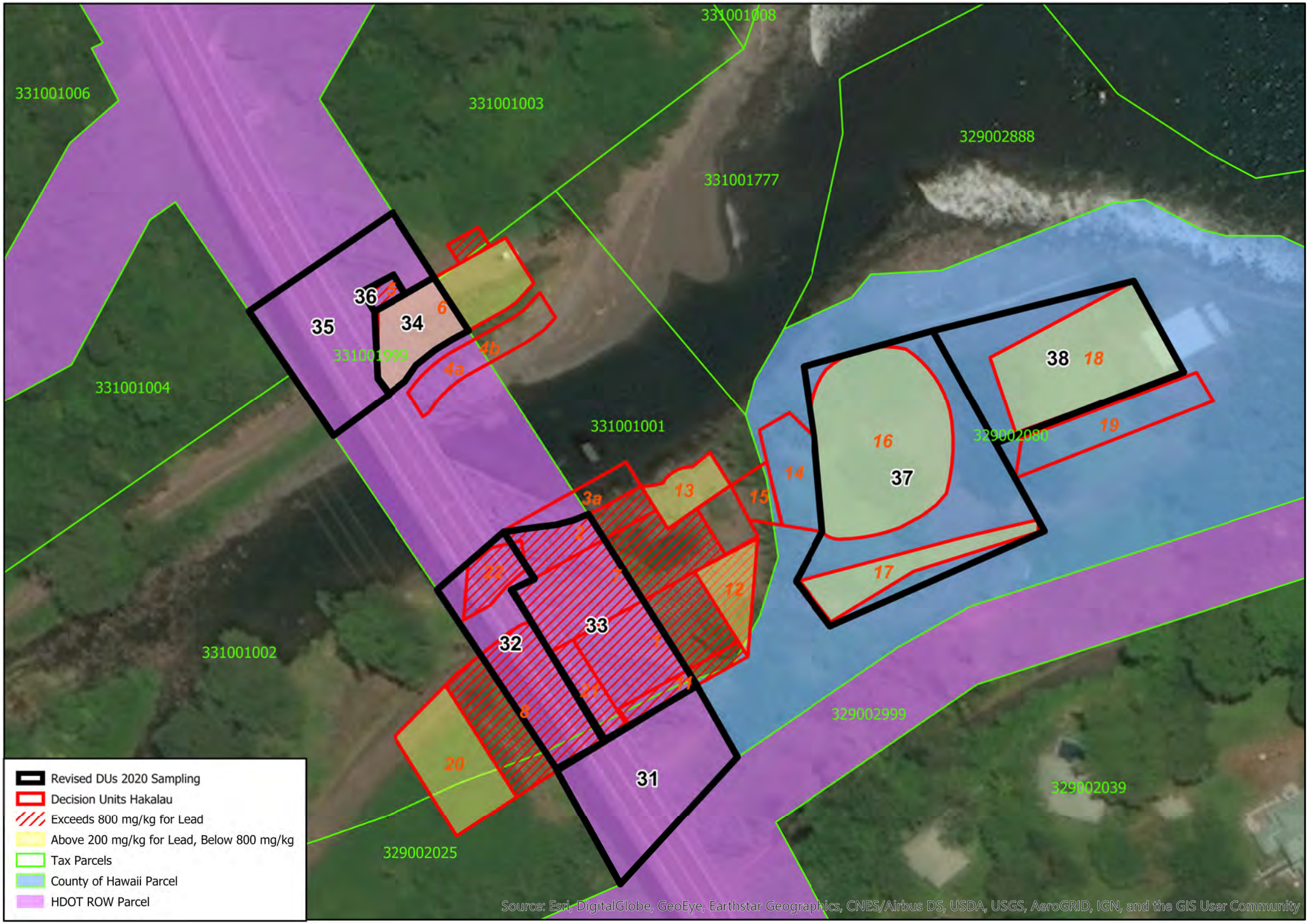

Figure 2
2020 Decision Units and TMKs
Hakalau Beach Park, Hawaii County, HI