Environmental Resources Management

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30 September 2008

Mr. John Peard
Hawaii DDepartment of Health
Hazard Evaluation and Emergency Response Office
46 Keawe Street
Hilo, HI 96720

Subject: Sampling and Analysis Plan Amendment
Former Pepeekeo Sugar Company Property
Hakalau, Hawaii

Dear John:

On behalf of Aloha Green, ERM hereby submits for your review and approval an amendment to the Sampling and Analysis Plan (SAP) for the former Pepeekeo Sugar Company property in Hakalau, Hawaii (TMKs: 3-2-9-02:79 & 81). An initial SAP for the project, dated 8 July 2008, was submitted for your prior review and approval. The SAP called for an "Amendment" following the XRF Field Screening study for lead and arsenic, in order to finalize Decision Units for multi-increment soil sampling and laboratory analysis. In this SAP Amendment, we will summarize the findings of the Phase 1 XRF Field Screening and propose the scope of Phase 2 Decision Unit sampling and analysis.

PHASE 1 XRF SCREENING FOR ARSENIC, LEAD AND MERCURY

ERM performed comprehensive X-Ray Fluorescence (XRF) soil screening of soils across the 8.7 acre property on 22-24 July 2008, with infill sampling and analysis on 27-28 August 2008. An initial grid with 50-foot spacing was laid out by measuring tape and pin flags, and surface soils from 0 to 6 inches depth were collected at each sample location in zip-top plastic bags. Samples were analyzed using an Innov-X field portable XRF instrument for arsenic, lead and mercury. Arsenic was the principal target of the investigation, with lead being a secondary concern due to the fact that other sugar facilities have shown lead in soils around older buildings (apparently from lead paint spalling and incorporation into soils). Mercury was added to the target metal list for XRF screening to help resolve the issue of potential release from an on-site seed dipping facility (although use of mercury in this process is not known to have occurred).

Standard reference materials (SRMs) for arsenic were created using native soil from the Island of Hawaii that was known to contain less than 10 mg/kg (parts-per-million or ppm) arsenic. Site-specific SRMs at a range of arsenic concentrations were prepared by spiking these reference soils with known quantities of arsenic. SRMs at 50ppm, 200ppm, 800ppm, 3000ppm and 10,000ppm were prepared. SRMs were analyzed by XRF before, during and after analysis of field samples, and arsenic reported arsenic concentrations are corrected based on SRM calibration curves. For lead and mercury, commercial SRMs from the National Institute for Standards and Technology (NIST) were utilized, since they had certified lead and mercury content.

The initial sampling and XRF analysis of soils was performed on the 50 foot grid. Soil arsenic levels were mapped and an area of elevated soil arsenic was observed near the location of the former pesticide mixing facility. Infill sample locations at 25-foot spacing were placed across this arsenic anomaly to improve delineation of the feature. Maps showing the location of XRF soil screening sample locations and a contour map of surface soil arsenic concentrations are provided as attachments (Figures 1 and 2).

Lead and mercury were also measured using the Innov-X portable XRF. Concentrations of these two metals did not appear to be elevated above background soil levels, and were generally below the Hawaii Department of Health Environmental Action Levels (EALs) for residential exposure. Table 1 shows the concentrations of arsenic, lead and mercury in soils as determined by XRF, with samples with concentrations above EALs shaded. Figure 3 shows histograms of the soil concentrations for lead and mercury with the EALs provided for comparison purposes. Only a few samples had lead and mercury concentrations above EALs; these samples were not significantly above EALs and were not spatially clustered.

TRENCHING AND VERTICAL PROFILING OF SOIL ARSENIC

Eight trenches were excavated by Aloha Green, at locations recommended by ERM, within the arsenic soil anomaly near the northern property boundary. The locations of test trenches are shown on the attached figures. Composite soil samples were collected at 4-inch (10 centimeter) intervals from the surface to the bottom of the trenches (from 3-6 feet depth). Samples were analyzed by portable XRF as per surface

soil samples. In summary, soil arsenic above 100 ppm was observed to extend to depth of 3-4 feet in the area of highest surface soil arsenic (near the former pesticide mixing area) to less than 1 foot depth at some locations downhill (east) of the pesticide mixing area.

TOTAL AND BIOACCESSIBLE ARSENIC ANALYSIS

A set of 12 soil samples are being analyzed for total and bioaccessible arsenic at the University of Colorado; results have not yet been received at the time of this letter report. Samples were selected across a range of total arsenic concentration, and from both surface soils and deeper soils collected from the trenches.

PROPOSED DECISION UNIT MULTI-INCREMENT SAMPLING

Based on findings of the XRF field screening work, and further review of Sanborn fire insurance maps that show the sugar company facilities over time, ERM proposes only one minor change from the sampling plan described in the 8 July 2008 SAP: eliminate the collection of soil samples in the vicinity of the Seed Dipping Operation for analysis of soil mercury. ERM believes the comprehensive XRF screening for mercury clearly eliminates mercury from consideration as a potential site contaminant. The XRF findings support initial HDOH sampling and analysis that found no elevated mercury in soils around the Seed Dipping Operation. In summary, the proposed Decision Units and associated analyses are:

Decision Unit Description	Analysis
Gas and Oil Storage	TPH, PCBs
Carpenter and Electrical Shops	TPH, PCBs
Fertilizer and Oil Storage	Metals, TPH

To close, I hope you find the summary of work to date and proposed additional sampling and analysis to be to your satisfaction. Please do not hesitate to contact me at (808) 521-4404 (office) or (808) 381-9121 (cell) with any questions or comments.

Sincerely,

William G. Cutler, RG
Managing Director

Cc: Steve Shropshire
Jeff Melrose

Project No. 0087434.***
Date: 09/16/08
Drawn By: R. Olson
CAD File: G:\0087434\00\00874300-02.dwg

MAMALAHOA HIGHWAY
OCEAN
LOT 3D
LOT 2C
LOT 1A
LOT 4
WAREHOUSE
WAREHOUSE
CONCRETE
ROCK WALL
PAVED ROAD
ROADWAY LOT
SPIKE FND
PIPE FND.
MANGO TREE
TREE
TMK: (3) 2-9-2: 44
0.305 ACRE

TP1 TP2 TP3 TP4 TP5 TP6 TP7 TP8

JK-40 11 | L175 226 | L225 56.1 | L275 182 | L325 688 | L375 191 | L425 66.7 | L475 13.2 | L525 315 | L575 179
K100 34.6 | K150 16 | K200 56 | K250 307 | K300 13,350 | K350 6379 | K400 141 | K450 23 | K500 385 | K550 232
JK225 132 | JK275 208 | JK325 331 | JK375 1418 | JK425 377 | JK475 264 | JK525 144 | JK575 124
J100 7.9 | J150 14 | J200 14 | J250 49 | J300 55 | J350 416 | J400 369 | J500 229 | J550 206 | J650 22 | J700 19
IJ275 308 | IJ325 738 | IJ375 649 | IJ425 193 | IJ475 | IJ525 330 | IJ575 97
I0 12 | I100 | I150 4.0 | I200 80 | I250 58 | I315 64 | I350 303 | I400 180 | I450 81 | I500 106 | I550 64 | I600 160 | I665 184
HI325 56 | HI375 96 | HI425 13 | HI475 259 | HI525 114
H0 4.5 | H100 148 | H150 30 | H200 16 | H250 20 | H310 9.0 | H350 9.9 | H400 3.4 | H450 13 | H500 290 | H550 85 | H600 24 | H650 148
G0 3.2 | G100 21 | G150 96 | G200 100 | G250 4.5 | G300 | G350 | G400 4.0 | G450 | G500 12 | G550 5.7 | G600 22 | G650 5.2
F150 5.4 | F200 11 | F250 4.3 | F300 | F350 19 | F400 3.1 | F450 12 | F500 4.9 | F550 4.0 | F600 375
E-005 19 | E050 4.6 | E100 4.2 | E200 8.0 | E250 10 | E300 4.3 | E400 3.6 | E450 21 | E500 10 | E550 5.0 | E600 17
D-005 6.3 | D050 4.3 | D100 4.7 | D200 4.7 | D250 3.6 | D300 5.4 | D350 63 | D400 40 | D450 16 | D500 20 | D550 21 | D600 34
C050 8.7 | C0 5.6 | C100 3.4 | C200 22 | C250 15 | C300 4.1 | C350 19 | C400 82 | C450 26 | C500 7.6 | C550 46 | C600 39.5
B050 11 | B-005 6.5 | B100 9.8 | B150 6.2 | B200 12 | B250 14 | B300 6.6 | B350 32 | B400 24 | B450 7.7 | B500 7.4 | B550 7.4 | B600 7.7
A-005 6.9 | A050 9.1 | A100 33 | A150 10 | A200 33 | A250 3.7 | A300 7.7 | A350 18 | A400 12 | A450 33 | A500 18 | A550 5.9 | A600 20

1" = 80' - 0"
0 40' 80' 160' 240'

LEGEND

A600 ■ Arsenic in Surface Soils (0–6 inches depth) Determined by XRF
20 Arsenic Concentration (ppm)
✚ Test Pit Location, Vertical Soil Arsenic Profiles

Note: Corrected to site–specific standard reference materials, not moisture corrected.

Figure 1

Soil Arsenic Screening by XRF Data Posting
Aloha Green Property
TMKs: (3) 2-9-2: 79 & 81
Hakalau, Hawaii

ERM 09/08

Project No. 0087434.***
Date: 09/16/08
Drawn By: R. Olson
CAD File: G:\0087434\00\00874300-02.dwg

MAMALAHOA HIGHWAY
OCEAN
LOT 3D
LOT 2C
LOT 1A
LOT 4
WAREHOUSE
WAREHOUSE
CONCRETE
ROCK WALL
PAVED ROAD
ROADWAY LOT
TMK: (3) 2-9-2: 44
0.305 ACRE
SPIKE FND
PIPE FND.
TREE
MANGO TREE

TP1 TP2 TP3 TP4 TP5 TP6 TP7 TP8

Arsenic Concentration (ppm)
1000
800
400
200
100
50
0

LEGEND
A600 Arsenic in Surface Soils (0–6 inches depth) Determined by XRF
20 Arsenic Concentration (ppm)
Test Pit Location, Vertical Soil Arsenic Profiles

Note: Corrected to site–specific standard reference materials, not moisture corrected.

1" = 80' - 0"
0 40' 80' 160' 240'

Figure 2
Soil Arsenic Screening by XRF
Aloha Green Property
TMKs: (3) 2-9-2: 79 & 81
Hakalau, Hawaii
ERM 09/08

Table 1. XRF Screening Data
Aloha Green Property
Hakalau, Hawaii

				Arsenic[1]	*Lead*	*Mercury*
					mg/kg (ppm)	
Sample ID	***X-Coord***	***Y-Coord***	***EAL ->***	***22***	***400***	***10***
A-005	*5*	*0*		*6.9*	*132.6*	*4.9*
A050	*50*	*0*		*9.1*	*279.9*	*4.5*
A100	*100*	*0*		*32.8*	*973.8*	*4.6*
A150	*150*	*0*		*10.3*	*325.4*	*5.0*
A200	*200*	*0*		*32.9*	*222.0*	*5.6*
A250	*250*	*0*		*3.7*	*120.9*	*4.5*
A300	*300*	*0*		*7.7*	*104.5*	*5.8*
A350	*350*	*0*		*17.7*	*121.3*	*4.3*
A400	*400*	*0*		*12.5*	*70.0*	*4.3*
A450	*450*	*0*		*32.6*	*163.6*	*4.5*
A500	*500*	*0*		*17.6*	*120.0*	*5.3*
A550	*550*	*0*		*5.9*	*88.0*	*4.6*
A600	*600*	*0*		*20.3*	*542.1*	*13.0*
B-005	*5*	*50*		*6.5*	*122.6*	*4.6*
B050	*50*	*50*		*10.5*	*374.9*	*5.0*
B100	*100*	*50*		*9.8*	*344.5*	*4.8*
B150	*150*	*50*		*6.2*	*117.5*	*4.7*
B200	*200*	*50*		*11.7*	*386.7*	*5.1*
B250	*250*	*50*		*14.0*	*435.7*	*6.6*
B300	*300*	*50*		*6.6*	*129.6*	*4.5*
B350	*350*	*50*		*31.7*	*108.7*	*4.5*
B400	*400*	*50*		*24.5*	*173.0*	*4.1*
B450	*450*	*50*		*7.7*	*213.4*	*4.4*
B500	*500*	*50*		*7.4*	*82.5*	*5.2*
B550	*550*	*50*		*7.4*	*202.3*	*4.0*
B600	*600*	*50*		*7.7*	*121.8*	*4.7*
C0	*0*	*100*		*5.6*	*97.7*	*3.9*
C050	*50*	*100*		*8.7*	*224.3*	*4.6*
C100	*100*	*100*		*3.4*	*12.4*	*3.9*
C200	*200*	*100*		*22.1*	*140.5*	*4.9*
C250	*250*	*100*		*15.0*	*398.3*	*6.5*
C300	*300*	*100*		*4.1*	*21.7*	*4.6*
C350	*350*	*100*		*18.9*	*68.6*	*4.3*
C400	*400*	*100*		*81.6*	*147.8*	*4.1*
C450	*450*	*100*		*26.5*	*123.2*	*4.3*
C500	*500*	*100*		*7.6*	*180.3*	*4.2*
C550	*550*	*100*		*46.2*	*150.5*	*4.1*
C600	*600*	*100*		*39.5*		

Table 1. XRF Screening Data
Aloha Green Property
Hakalau, Hawaii

				Arsenic[1]	*Lead*	*Mercury*
					mg/kg (ppm)	
Sample ID	***X-Coord***	***Y-Coord***	***EAL ->***	***22***	***400***	***10***
D-005	5	150		6.3	175.7	3.7
D050	50	150		4.3	48.9	4.2
D100	100	150		4.7	62.6	3.9
D200	200	150		4.7	43.9	4.3
D250	250	150		3.6	22.2	4.0
D300	300	150		5.4	90.2	4.2
D360	360	150		53.0	199.3	4.6
D400	400	150		40.2	391.0	5.6
D450	450	150		15.9	98.8	5.9
D500	500	150		20.5	64.2	5.1
D550	550	150		21.3	158.8	4.2
D600	600	150		34.2	203.1	4.5
E-005	5	200		18.9	1339.5	5.4
E050	50	200		4.6	75.6	4.0
E100	100	200		4.2	32.1	3.9
E200	200	200		8.0	260.5	4.6
E250	250	200		10.4	54.1	4.7
E300	300	200		4.3	44.9	4.3
E400	400	200		3.6	30.7	3.9
E450	450	200		20.7	56.5	4.7
E500	500	200		10.1	32.0	8.0
E550	550	200		5.0	51.8	4.4
E600	600	200		17		
F150	150	250		5.4	73.2	5.3
F200	200	250		10.8	65.5	3.2
F250	250	250		4.3	40.9	4.1
F300	300	250		7.6	221.9	3.9
F350	350	250		18.9	84.9	5.0
F400	400	250		3.1	18.6	3.7
F450	450	250		11.9	93.6	4.5
F500	500	250		4.9	65.5	4.0
F550	550	250		4.0	18.4	4.8
F600	600	250		375.3	174.8	7.4
G0	0	300		3.2	13.6	3.9
G100	100	300		20.9	40.5	5.1
G150	150	300		95.9	67.4	4.2
G200	200	300		99.5	85.1	4.1
G250	250	300		4.5	58.8	4.0
G300	300	300		92.5	842.8	5.9
G350	350	300		21.7	223.8	7.9
G400	400	300		4.0	34.7	5.9
G450	450	300		3.1	11.7	8.6
G500	500	300		11.6	19.4	3.7
G550	550	300		5.7	83.2	4.6
G600	600	300		21.6	104.9	9.8
G650	650	300		5.2	70.4	24.0

Table 1. XRF Screening Data
Aloha Green Property
Hakalau, Hawaii

				Arsenic[1]	*Lead*	*Mercury*
					mg/kg (ppm)	
Sample ID	***X-Coord***	***Y-Coord***	***EAL ->***	***22***	***400***	***10***
H0	*0*	*350*		*4.5*	*27.6*	*4.2*
H100	*100*	*350*		*148.0*	*127.7*	*4.8*
H150	*150*	*350*		*29.7*	*69.3*	*5.1*
H200	*200*	*350*		*15.5*	*133.8*	*4.0*
H250	*250*	*350*		*20.1*	*60.7*	*6.4*
H310	*310*	*350*		*9.0*	*370.4*	*4.6*
H350	*350*	*350*		*9.9*	*74.2*	*4.5*
H400	*400*	*350*		*3.4*	*14.4*	*6.0*
H450	*450*	*350*		*13.0*	*26.0*	*4.7*
H500	*500*	*350*		*290.4*	*150.3*	*5.0*
H550	*550*	*350*		*85.4*	*120.3*	*3.9*
H600	*600*	*350*		*24.1*	*333.4*	*4.5*
H650	*650*	*350*		*148.2*	*87.0*	*6.7*
HI325	*325*	*375*		*56.2*	*30.7*	*4.5*
HI375	*375*	*375*		*96.4*	*62.5*	*4.1*
HI425	*425*	*375*		*12.6*	*12.2*	*4.4*
HI475	*475*	*375*		*259.1*	*95.1*	*4.3*
HI525	*525*	*375*		*114.2*	*191.8*	*5.3*
I0	*0*	*400*		*111.7*	*240.6*	*4.7*
I100	*100*	*400*		*32.6*	*446.6*	*12.0*
I150	*150*	*400*		*4.0*	*52.4*	*5.2*
I200	*200*	*400*		*80.1*	*134.2*	*4.6*
I250	*250*	*400*		*57.8*	*95.6*	*4.4*
I315	*315*	*400*		*64.4*	*149.9*	*4.7*
I350	*350*	*400*		*302.6*	*113.0*	*5.7*
I400	*400*	*400*		*180.2*	*79.4*	*5.0*
I450	*450*	*400*		*81.0*	*50.0*	*4.3*
I500	*500*	*400*		*106.0*	*63.5*	*4.5*
I550	*550*	*400*		*64.0*	*119.5*	*4.5*
I600	*600*	*400*		*160.4*	*191.4*	*6.7*
I665	*665*	*400*		*183.7*	*99.2*	*5.6*
IJ275	*275*	*425*		*307.8*	*85.3*	*4.1*
IJ325	*325*	*425*		*737.8*	*85.5*	*4.4*
IJ375	*375*	*425*		*649.4*	*116.5*	*4.9*
IJ425	*425*	*425*		*193.2*	*71.4*	*4.2*
IJ525	*525*	*425*		*330.4*	*95.4*	*5.9*
IJ575	*575*	*425*		*97.2*	*133.5*	*6.2*
J100	*100*	*450*		*7.9*	*165.3*	*4.4*
J150	*150*	*450*		*14.5*	*112.4*	*4.5*
J200	*200*	*450*		*13.8*	*116.2*	*5.0*
J250	*250*	*450*		*48.5*	*173.9*	*7.6*
J300	*300*	*450*		*55.1*	*96.3*	*4.1*
J350	*350*	*450*		*416.2*	*99.0*	*4.8*
J400	*400*	*450*		*369.0*	*109.2*	*6.4*
J500	*500*	*450*		*229.1*	*111.5*	*4.7*
J550	*550*	*450*		*205.9*	*79.0*	*4.5*
J650	*650*	*450*		*21.6*	*204.4*	*4.3*
J700	*700*	*450*		*19.0*	*123.6*	*7.6*

Table 1. XRF Screening Data
Aloha Green Property
Hakalau, Hawaii

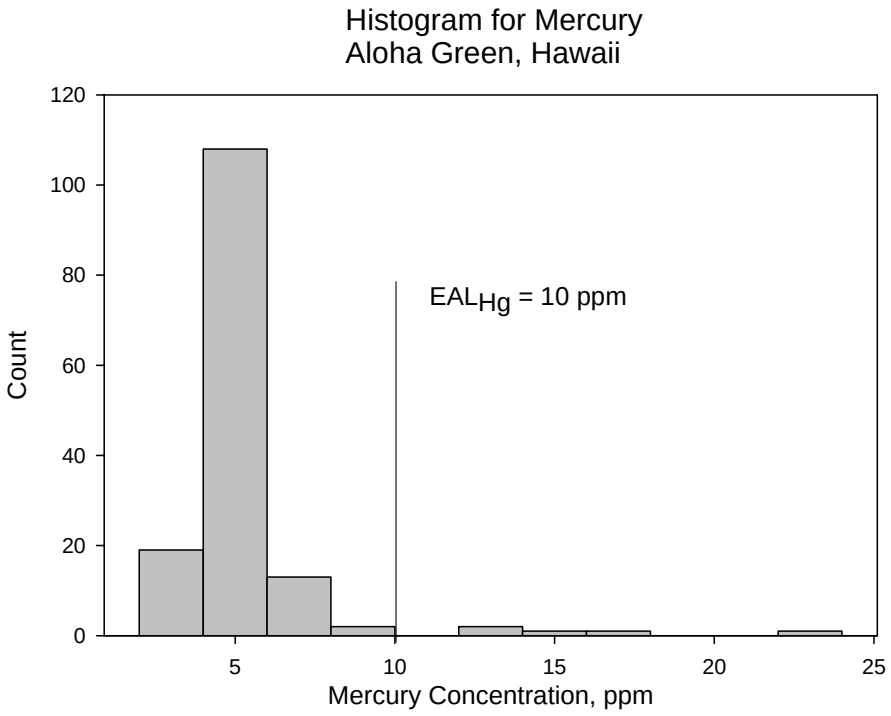
				Arsenic[1]	*Lead mg/kg (ppm)*	*Mercury*
Sample ID	***X-Coord***	***Y-Coord***	***EAL ->***	***22***	***400***	***10***
JK-40	*-40*	*475*		*11*		
JK225	*225*	*475*		*132.4*	*77.9*	*3.7*
JK275	*275*	*475*		*207.5*	*58.7*	*4.2*
JK325	*325*	*475*		*330.7*	*426.9*	*4.6*
JK375	*375*	*475*		*1417.8*	*89.3*	*5.4*
JK425	*425*	*475*		*376.9*	*122.3*	*5.9*
JK475	*475*	*475*		*264.0*	*77.7*	*4.4*
JK525	*525*	*475*		*144.4*	*78.4*	*4.0*
JK575	*575*	*475*		*124.3*	*87.4*	*4.6*
K100	*100*	*500*		*34.6*		
K150	*150*	*500*		*15.8*	*78.6*	*4.8*
K200	*200*	*500*		*55.6*	*60.8*	*3.8*
K250	*250*	*500*		*306.7*	*105.1*	*4.3*
K300	*300*	*500*		*13349.9*	*97.4*	*16.2*
K350	*350*	*500*		*6379.4*	*336.0*	*15.2*
K400	*400*	*500*		*140.6*	*51.4*	*4.4*
K450	*450*	*500*		*23.1*	*19.9*	*3.9*
K500	*500*	*500*		*385.1*	*233.3*	*5.6*
K550	*550*	*500*		*232.2*	*100.5*	*4.6*
L175	*175*	*525*		*226*		
L225	*225*	*525*		*56.1*		
L275	*275*	*525*		*182*		
L325	*325*	*525*		*688*		
L375	*375*	*525*		*191*		
L425	*425*	*525*		*66.7*		
L475	*475*	*525*		*13.2*		
L525	*525*	*525*		*315*		
L575	*575*	*525*		*179*		

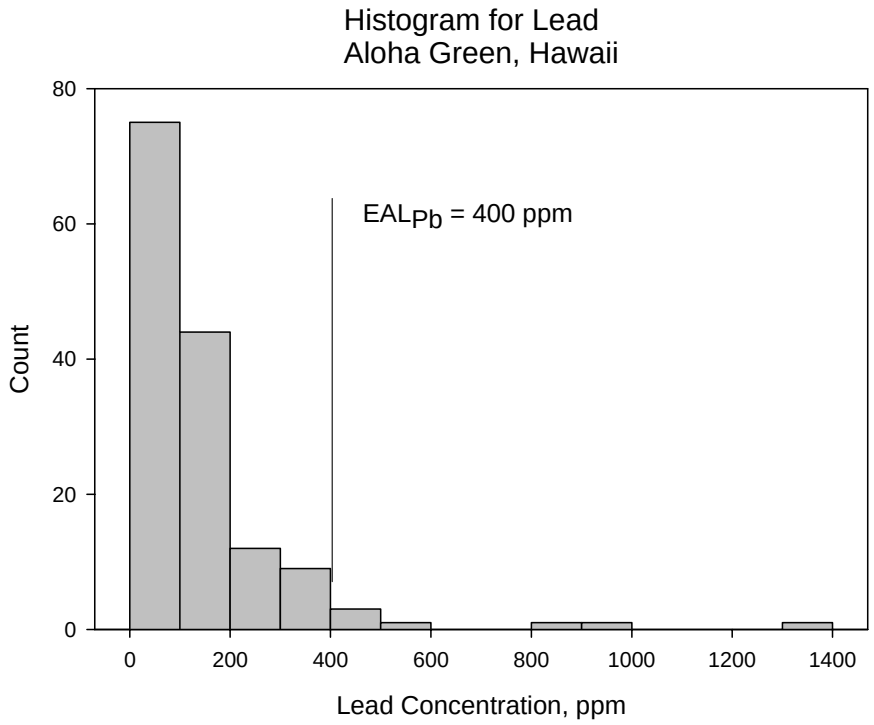
Notes:

1 - For contour mapping, used 1/2 detection limit

2 - Samples missing lead and mercury values were from infill (second) sampling event focussed on arsenic

3 - Shaded values are concentrations above EAL


Histogram for Mercury
Aloha Green, Hawaii
120
100
80
60
40
20
0
Count
EAL$_{Hg}$ = 10 ppm
5
10
15
20
25
Mercury Concentration, ppm


Histogram for Lead
Aloha Green, Hawaii
80
60
40
20
0
Count
EAL$_{Pb}$ = 400 ppm
0
200
400
600
800
1000
1200
1400
Lead Concentration, ppm