



OFFICE OF ENVIRONMENT, HEALTH AND SAFETY  
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February 28, 2024

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700 Heinz Avenue  
Berkeley, CA 94710

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U.S. Environmental Protection Agency, Region 9  
75 Hawthorn Street  
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**Subject:            Sampling Results for Western Stege Marsh Near-Surface Sediment Samples  
                         January 31, 2024 Sampling Event  
                         Richmond Field Station Site, University of California, Berkeley**

Dear Ms. Yuen and Ms. Ziff:

University of California, Berkeley Office of Environment, Health & Safety staff conducted the annual Public Health Assessment recommended marsh sediment sampling at the Richmond Field Station Site on January 31, 2024. The objective of the sampling effort was to characterize near-surface sediment in remediated portions of the Western Stege Marsh, as well as to evaluate incidental sediment contact by marsh restoration workers. This letter provides the rationale for the selected sampling locations, a summary of field sampling protocols, including minor adjustments from previous years, and sample results. A figure showing the sampling locations is presented at the end of this letter. Complete analytical results are presented in Attachment 1.

### **Sample Locations**

Incremental sampling methodology (ISM) sampling was selected for this project to provide a comprehensive and thorough evaluation of chemical concentrations in a specific area of potential exposure, or decision unit. The ISM sampling strategy for this project was based on selecting a decision unit to best represent potential exposure by workers involved in restoration activities within remediated marsh areas.

In January 2008, UC Berkeley established site-specific boundaries of the areas where marsh restoration activities may be performed. Based on this information, one decision unit, identified as Western Stege Marsh Decision Unit 1, was identified to evaluate possible exposure areas within remediated portions of the marsh under this sampling activity. This decision unit was first sampled in January 2008, and then once every subsequent year until 2020, after which sampling transitioned to every two years (even-numbered years). The location and extent of the Western Stege Marsh Decision Unit 1 are presented on the figure at the end of this sampling letter. The decision unit encompassed an area recommended for sampling in the Public Health Assessment, Evaluation of Exposure to Contaminants at the University of California, Berkeley, Richmond Field Station, as prepared by the California Department of Public Health and Agency for Toxic Substances and Disease Registry, dated March 13, 2008. The health assessment report concluded that there was an unknown potential health risk to marsh restoration workers posed by recontamination of sediment in the remediated marsh.

Surface samples at depths of 0 to 2 inches below ground surface (bgs) were collected because the decision unit is intended to characterize near-surface soils. The rationale for this sampling interval is that the sediment which workers may be exposed to during planting or weeding on the marsh plain. The near-surface sediment also represents any sediment that may be migrating within slough channels and being deposited on top of clean Bay Mud used as backfill in 2002 to 2004. Two previous sampling events were conducted in this decision unit in 2005 and 2006 using a discrete sampling methodology.

### **Field Sampling Protocols**

The near-surface sediment sample was collected on January 31, 2024. The decision unit was identified in the field based on the description above and consistent with previous sampling events. One ISM surface soil sample was collected from the decision unit. The ISM soil sample consisted of 80 subsamples, or increment locations, collected from 0 to 2 inches bgs. The number of increments was increased from 50 in previous samples to 80 samples in January 2018 due to guidance from Federal EPA that recommends a minimum of 75 increments be collected for assessment of PCB concentrations using ISM methodology.<sup>1,2</sup>

The ISM sampling technique was used to obtain sufficient near-surface soft sediments from the decision unit to account for both compositional and distributional heterogeneity of any possible contamination. The sampling protocol followed these steps:

1. The field sampler began at a corner of the decision unit and sampled in an orthogonal pattern, moving from east to west to collect subsamples from 80 locations with the decision unit. The location of these subsamples, shown in approximation on the attached figure, was not critical as long as they were distributed throughout the decision unit. The subsamples were collected using one clean metal spoon or disposable trowel for the decision unit.

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<sup>1</sup> U.S. Environmental Protection Agency. (2019). *Incremental Sampling Methodology (ISM) at Polychlorinated Biphenyl (PCB) Cleanup Sites*. Retrieved February 28, 2020 from EPA: <https://www.epa.gov/pcbs/incremental-sampling-methodology-ism-pcb-cleanup-sites>

<sup>2</sup> Ibid. (2017). *PCB Facility Approval Streamlining Toolbox: A Framework for Streamlining PCB Site Cleanup Approvals*. Retrieved February 28, 2020 from EPA: [https://www.epa.gov/sites/production/files/2017-06/documents/06072017\\_final\\_pcbfast\\_toolbox\\_508compliant.pdf](https://www.epa.gov/sites/production/files/2017-06/documents/06072017_final_pcbfast_toolbox_508compliant.pdf)

2. The 80 subsamples were placed into clean, unused 32 ounce glass jars as they were collected. The final sample consisted of two full 32-ounce jars.
3. The entire sample was placed on ice, and delivered via courier to McCampbell Analytical, Inc., in Pittsburg, California, after the sampling event, on January 31, 2024, for analysis by the McCampbell Analytical Multi-Incremental Sub-Sampling (MIS) Procedure with subsampling to a 30-gram sample for PCBs and a 10-gram subsample for metals analyses. A copy of the chain-of-custody form is presented in Attachment 1.

## **Sample Results**

The sample was submitted for analysis of metals and polychlorinated biphenyls (PCB) using the methods listed below.

- Metals by EPA Method 6020 with extraction Method 3050B
- PCB analysis by EPA Method 8082 with Soxhlet Extraction Method 3540C

Pesticide analysis was excluded from this year's sampling event because review of pesticide analyses from previous sampling events dating from 2008 to 2017 determined that pesticides are not a chemical of concern. This is consistent with the March 17, 2010 Final CDPH and ATSDR Public Health Assessment's evaluation of marsh sediments and surface water at the RFS which identifies PCB and metals and potential exposure risks. Previous pesticide analyses are included for reference and will be included in future reports.

PCBs were not detected in concentrations greater than or equal to 0.25 milligrams per kilogram (mg/kg). The lab noted that the reporting limit was high because the sample had to be diluted due to a cluttered chromatogram. When asked for clarification, the lab chemist stated that they observed a very large sulfur peak that prevented full volume injection of the sample and that it was likely the reason for the co-elution and raised baseline.

Arsenic was reported at a concentration below its background concentration of 16 mg/kg. All other metals analyzed were reported at concentrations less than the applicable commercial/industrial screening level or not detected. The sampling results and screening criteria are presented in the tables following this letter.

The January 2024 sampling results were compared with the 2008 through 2022 sampling results from the same decision unit, as well as with averages from discrete samples collected from the same area during sampling events in 2005 and 2006. The analytical results from the 2024 sampling event are similar to the previously collected data; no trends have been identified.

Ms. Nicole Yuen  
Ms. Sara Ziff  
February 28, 2024  
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If you have any questions or comments regarding this submittal, please call me at (510) 725-2528.

Sincerely,

A handwritten signature in black ink, appearing to read "Alicia Bihler". The signature is fluid and cursive, with the first name "Alicia" written in a larger, more prominent script than the last name "Bihler".

Alicia Bihler  
Environmental Programs Manager

Enclosures:     Analytical Summary Tables  
                     Sample Location Figure

Attachment 1: McCampbell Analytical Results Work Order Number 2401L71 Revision 1

**POLYCHLORINATED BIPHENYLS (PCB) RESULTS  
REPORTED IN MILLIGRAMS PER KILOGRAM (mg/kg)**

Screening Criteria	PCBs <sup>(1)</sup>			
	Aroclor-1248	Aroclor-1254	Aroclor-1260	Total Aroclors
<i>Commercial worker</i>	0.528	0.588	0.595	0.577
<i>Construction worker</i>	3.99	2.29	4.01	3.98
<i>Maintenance worker</i>	3.99	4.00	4.01	3.98
<i>Off-Site Receptor</i>	3.07	4.15	6.44	2.61
<i>Other</i>	1 <sup>(2)</sup>	1 <sup>(2)</sup>	1 <sup>(2)</sup>	1
<i>Category I Criteria</i>	1	1	1	1
<i>Category II Criteria</i>	1	1	1	1
<b>Sample Location</b>				
WSM 16 discrete sample mean <sup>(3)</sup> March 1, 2005	0.19 <sup>(4)</sup>	0.14 <sup>(5)</sup>	0.054	0.384
WSM 30 discrete sample mean <sup>(3)</sup> June 13, 2006	0.22 <sup>(6)</sup>	ND	0.016 <sup>(7)</sup>	0.236
WSM DU1-001 January 17, 2008	0.081	0.053	0.021 J	0.155
WSM DU1-002 February 4, 2009	0.18	0.10	0.05	0.33
WSM DU1-003 February 18, 2010	0.31	0.16	0.036 J	0.506
WSM DU1-004 February 22, 2011	0.048 U	0.048 U	0.048 U	ND (<0.048)
WSM DU1-005 February 3, 2012	0.034 U	0.096	0.068	0.164
WSM DU1-006 February 4, 2013	0.010 U	0.010 U	0.010 U	ND (<0.010)
WSM DU1-007 February 27, 2014	0.19	0.042 U	0.03 J	0.268
WSM DU1-008 January 27, 2015	0.094	0.097	0.036	0.227
WSM DU1-009 January 21, 2016	0.100	ND (<0.0097)	ND (<0.0097)	0.100
WSMPHA17 January 18, 2017	ND (<0.012)	0.033	0.018	0.051
WSM2018PHA January 26, 2018	ND (<0.160)	ND	0.410	0.410
WSM2019PHA January 25, 2019	ND (<0.066)	ND (<0.066)	ND (<0.066)	ND
WSM2020PHA January 31, 2020	ND (<0.033)	0.15	ND (<0.033)	0.15
WSM2022PHA January 24, 2022	0.24 A	ND (<0.050)	ND (<0.050)	0.24
WSM2024PHA January 31, 2024	ND (<0.25)	ND (<0.25)	ND (<0.25)	ND (<0.25)

Notes:

**Bold values** indicate that the result exceeded the Category I criterion.

Screening criteria based on the Final Soil Management Plan, Revision 2, Table C-1, December 31, 2019.

- (1) All other PCBs not detected
- (2) Other criteria for PCBs are based on Toxic Substances Control Act (TSCA) criteria for high occupancy areas with no cap
- (3) For detect-only data, the mean is the arithmetic mean. For chemicals with non-detect measurements, this value is the arithmetic mean with one-half the detection limit substituted for non-detect measurements.
- (4) Thirteen detections
- (5) Eleven detections
- (6) Nineteen detections
- (7) Twelve detections
- J Estimated Value
- NA Not available
- ND, U Not detected
- A The reported value is determined using a "single point" calibration by GC-ECD as allowed by the method.

**PESTICIDE RESULTS**  
**REPORTED IN MILLIGRAMS PER KILOGRAM (mg/kg)**

Screening Criteria	Pesticides <sup>(1)</sup>													
	Aldrin	Alpha-bhc	Heptachlor	Heptachlor expoxide	Endosulfan I	Dieldrin	Endrin	Endosulfan sulfate	4,4' -DDD	4,4' -DDE	4,4' -DDT	Alpha- Chlordane	Gamma- Chlordane	Methoxychlor
<i>Commercial worker</i>	0.184	0.235	0.626	0.330	6,030	0.093	159	3,180	6.18	9.28	7.06	6.10	6.10	--
<i>Construction worker</i>	1.41	1.58	5.14	2.59	1,990	0.623	43.1	855	4.3	70.5	49.9	43.60	43.6	--
<i>Maintenance worker</i>	1.415	1.58	5.14	2.59	49,600	0.623	1,080	21,400	41.5	70.5	49.9	43.60	43.6	--
<i>Off-Site Receptors</i>	0.984	2,120	1.03	0.910	10,300	830	--	34,000,000	55,300	60.7	39,400	42.0	42.90	--
<i>Category I Criteria</i>	0.184	0.235	0.626	0.330	1,990	0.0926	43.1	855	4.31	9.28	7.06	6.10	6.10	--
<i>Category II Criteria</i>	1.84	2.35	6.26	3.30	19,900	0.926	431	8,550	43.1	92.8	70.6	61.0	61.0	--
<b>Sample Location</b>														
WSM 16 discrete sample mean <sup>(2)</sup> March 1, 2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
WSM 30 discrete sample mean <sup>(2)</sup> June 13, 2006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
WSM DU1-001 January 17, 2008	0.017 U	0.017 U	0.017 U	0.017 U	0.017 U	0.033 U	0.033 U	0.033 U	0.033 U	0.033 U	0.033 U	0.017 U	0.017 U	0.17 U
WSM DU1-002 February 4, 2009	0.060 U	0.060 U	0.060 U	0.060 U	0.060 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.060 U	0.060 U	0.60 U
WSM DU1-003 February 18, 2010	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.063 U	0.063 U	0.063 U	0.063 U	0.063 U	0.063 U	0.032 U	0.032 U	0.32 U
WSM DU1-004 February 22, 2011	0.017 CJ	0.034 U	0.034 U	0.033 CJ	0.0037 UJ	0.029 CJ	0.046 CJ	0.031 UJ	0.038 UJ	0.066 U	0.044 CJ	0.023 UJ	0.034 U	0.012 UJ
WSM DU1-005 February 3, 2012	0.0023 CJ	0.006 U	0.006 U	0.0031 J	0.006 U	0.012 U	0.012 U	0.012 U	0.0037 J	0.0036 CJ	0.0041 CJ	0.0015 CJ	0.0015 CJ	0.06 U
WSM DU1-006 February 4, 2013	0.017 U	0.017 U	0.017 U	0.017 U	0.017 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.017 U	0.017 U	0.17 U
WSM DU1-007 February 27, 2014	0.037 U	0.037 U	0.037 U	0.0095 CJ	0.037 U	0.072 U	0.072 U	0.072 U	0.072 U	0.072 U	0.072 U	0.037 U	0.037 U	0.37 U

	Aldrin	Alpha-bhc	Heptachlor	Heptachlor epoxide	Endosulfan I	Dieldrin	Endrin	Endosulfan sulfate	4,4' -DDD	4,4' -DDE	4,4' -DDT	Alpha- Chlordane	Gamma- Chlordane	Methoxychlor
WSM DU1-008 January 27, 2015	0.0042 U	0.00048 C J	0.00069 C J	0.0042 U	0.0042 U	0.0042 U	0.016 C J	0.0081 U	0.0077 C J	0.0081 U	0.18 C	0.00042 U	0.00042 U	0.00042 U
WSM DU1-009 January 21, 2016	ND ( $< 0.034$ )	ND ( $< 0.034$ )	0.040 ( $< 0.034$ )	ND ( $< 0.034$ )	ND ( $< 0.034$ )	ND ( $< 0.034$ )	ND ( $< 0.067$ )	ND ( $< 0.067$ )	ND ( $< 0.067$ )	ND ( $< 0.067$ )	ND ( $< 0.067$ )	ND ( $< 0.034$ )	ND ( $< 0.034$ )	ND ( $< 0.34$ )
WSMPHA17 January 18, 2017	ND ( $< 0.033$ )	ND ( $< 0.033$ )	ND ( $< 0.033$ )	ND ( $< 0.033$ )	ND ( $< 0.033$ )	ND ( $< 0.033$ )	ND ( $< 0.065$ )	ND ( $< 0.065$ )	ND ( $< 0.065$ )	ND ( $< 0.065$ )	ND ( $< 0.065$ )	ND ( $< 0.033$ )	ND ( $< 0.033$ )	ND ( $< 0.33$ )
WSM2018PHA January 26, 2018	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
WSM2019PHA January 25, 2019	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
WSM2020PHA January 31, 2020	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
WSM2022PHA January 24, 2022	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
WSM2024PHA January 31, 2024	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

Only chemicals that were detected or have screening criteria are listed.  
 Bold values indicate that the result exceeded the Category I criterion.

Screening criteria based on the Final Soil Management Plan, Revision 2, Table C-1, December 21, 2019.

- (1) All other pesticides were not detected.
  - (2) For detect-only data, the mean is the arithmetic mean. For chemicals with non-detect measurements, this value is the arithmetic mean with one-half the detection limit substituted for non-detect measurements.
- C Relative percent difference between columns exceeds 40%  
 J Estimated Value  
 NA Not available – samples collected in 2005, 2006, 2018, 2019, and 2020 were not analyzed for pesticides.  
 U Not detected (method blank contamination)



**METAL RESULTS**  
**REPORTED IN MILLIGRAMS PER KILOGRAM (mg/kg)**

Screening Criteria	Metals																							
	Aluminum	Antimony	Arsenic (I)	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
Commercial worker	NA	467	0.253	217,000	232	778	NA	1,750,000	347	46,700	818,000	320	NA	25,600	187	5,840	11,100	NA	5,840	5,840	NA	11.70	5,780	350,000
Construction worker	NA	142	0.85	2,120	21.4	36.6	NA	531,000	21.1	14,200	248,000	320	NA	213	39.6	1,770	60.4	NA	1,730	1,770	NA	3.54	351	106,000
Maintenance worker	NA	3,540	1.77	53,100	128	73	NA	13,300,000	34.1	354,000	6,190,000	320	NA	5,340	989	44,200	1,180	NA	44,200	44,200	NA	88.5	8,780	2,650,000
Off-Site Receptors	NA	--	888	709,000	1,590	909	NA	--	424	--	--	--	NA	71	42,500	--	14,700	NA	28,400,000	--	NA	--	142,000	--
Other	NA <sup>(2)</sup>		16 <sup>(1)</sup>						73 <sup>(2)</sup>					5,900 <sup>(2)</sup>			280 <sup>(2)</sup>							
Category I Criteria	NA	142	16	2,120	21.4	36.6	NA	100,000	73	14,200	100,000	320	NA	5,900	39.6	1,770	280	NA	1,730	1,770	NA	3.54	351	100,000
Category II Criteria	NA	1,420	16	21,200	214	366	NA	100,000	730	100,000	100,000	800	NA	5,900	396	17,700	604	NA	17,300	17,700	NA	35.4	3,510	100,000
Sample Location																								
WSM 16 discrete sample mean <sup>(3)</sup> March 1, 2005	NA	ND	55.7	ND	0.84	1.2 <sup>(3)</sup>	NA	86.44	ND	118	NA	51.56	NA	NA	2.59	ND	85.75	NA	1.15 <sup>(4)</sup>	ND	NA	ND	ND	276
WSM 30 discrete sample mean <sup>(3)</sup> June 13, 2006	NA	6.2 <sup>c</sup>	55.3	78.1	0.61	1.24 <sup>(5)</sup>	NA	89.4	14.8	136	NA	82.1	NA	NA	3.5	2.4 <sup>(6)</sup>	81.4	NA	1.03 <sup>(7)</sup>	0.29 <sup>(8)</sup>	NA	0.51 <sup>(9)</sup>	81.5	321
WSM DU1-001 January 17, 2008	28,000	2.4	15	53	0.53	0.38 J	2,700	74	13	67	46,000	32	15,000	470	1.6	0.50 U	69	3,300	1.0 U	0.50 U	8,200	1.0 U	67	140
WSM DU1-002 February 4, 2009	8,800	1.3	22	31	0.89 U	0.52 J	2,600	39	10	79	26,000	44	9,600	620	1.8	1.3	48	3,900	0.73 J	0.89 U	30,000	0.89 U	39	210
WSM DU1-003 February 18, 2010	24,000	3.9	26	61	0.60	0.68 J	3,900	81	12	100	38,000	52	13,000	330	2.6	0.89 J	73	4,900	1.2 J	0.96 U	21,000	1.9 U	71	260
WSM DU1-004 February 22, 2011	23,000	11	35	57	0.67	0.50 J	3,700	78	13	110	36,000	59	13,000	360	3.0	1.8	75	4,900	2.0 U	0.34 J	23,000	2.0 U	68	280
WSM DU1-005 February 3, 2012	20,000	0.45 J	29	51	0.76 J	0.49 J	3,500	72	12	90	38,000	52	12,000	590	2.3	1.6	68	4,700	1.1	0.47 J	22,000	0.11 J	54	230
WSM DU1-006 February 4, 2013	28,000	1.2 U	28	60	0.61	0.31 J	3,600	84	16	96	45,000	56	13,000	510	2.0	1.8	83	4,600	1.2 U	0.43 J	14,000	1.2 U	77	240
WSM DU1-007 February 27, 2014	24,000	1.2	48	64	0.77 J	0.93 J	3,900	100	19	140	60,000	83	16,000	790	1.9	4.5	94	5,200	1.4	0.64 J	22,000	0.31 J	86	400
WSM DU1-008 January 27, 2015	23,000	0.50 J	25	52	0.66	0.41 J	3,900	76	15	59	37,000	41	12,000	780	1.5	1.3	76	4,200	1.1	0.29 J	17,000	0.15 J	72	190

	Aluminum	Antimony	Arsenic (1)	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
WSM DU1-009 January 21, 2016	NA	0.88	<b>19</b>	47	0.65	2.0	NA	80	14	77	NA	38	NA	NA	2.2	2.2	73	NA	ND ( $<0.5$ )	0.25	NA	0.81	70	180
WSMPHA17 January 18, 2017	NA	ND ( $<2.0$ )	6.8	20	0.17	0.64	NA	30	4.6	29	NA	19	NA	NA	0.54	0.94	28	NA	ND ( $<2.0$ )	ND ( $<0.25$ )	NA	ND ( $<0.49$ )	29	110
WSM2018PHA January 26, 2018	NA	ND ( $<2.0$ )	13	21	0.21	0.27	NA	26	4.6	22	NA	17	NA	NA	0.46	0.63	24	NA	ND ( $<2.0$ )	ND ( $<0.25$ )	NA	ND ( $<0.51$ )	26	73
WSM2019PHA January 25, 2019	NA	ND ( $<2.0$ )	16	33	0.43	0.49	NA	53	9.3	52	NA	34	NA	NA	0.32	1.0	47	NA	ND ( $<2.0$ )	ND ( $<0.25$ )	NA	ND ( $<0.49$ )	49	140
WSM2020PHA January 31, 2020	NA	ND ( $<2.0$ )	<b>22</b>	50	0.50	0.34	NA	79	14	80	NA	42	NA	NA	0.61	1.6	71	NA	ND ( $<2.0$ )	0.33	NA	ND ( $<0.50$ )	64	180
WSM2022PHA January 24, 2022	NA	0.72	16	50	ND ( $<0.50$ )	ND ( $<0.50$ )	NA	65	8.9	52	NA	32	NA	NA	1.0	1.6	59	NA	0.57	ND ( $<0.50$ )	NA	ND ( $<0.50$ )	59	150
WSM2024PHA January 31, 2024	NA	ND ( $<0.5$ )	5.8	22	ND ( $<0.5$ )	ND ( $<0.5$ )	NA	26	4.6	23	NA	14	NA	NA	0.33	1.1	27	NA	ND ( $<0.5$ )	ND ( $<0.5$ )	NA	ND ( $<0.5$ )	25	81

Notes:

**Bold values** indicate that the result exceeded the Category I criterion.

Screening criteria based on the Final Soil Management Plan, Revision 2, Table C-1, December 31, 2019.

NA Not available  
ND Not detected  
J Estimated Value  
U Not detected

(1) Arsenic screening value based on DTSC-approved ambient concentration developed for the adjacent Campus Bay site.

(2) Screening levels for cobalt, manganese, and nickel were updated, and aluminum was eliminated as a chemical of concern in the Final SMP, Revision 1.

(3) For detect-only data, the mean is the arithmetic mean. For chemicals with non-detect measurements, this value is the arithmetic mean with one-half the detection limit substituted for non-detect measurements

(4) Fifteen detections

(5) Eight detections

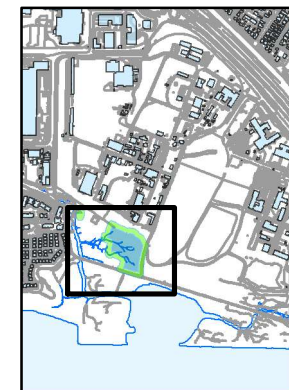
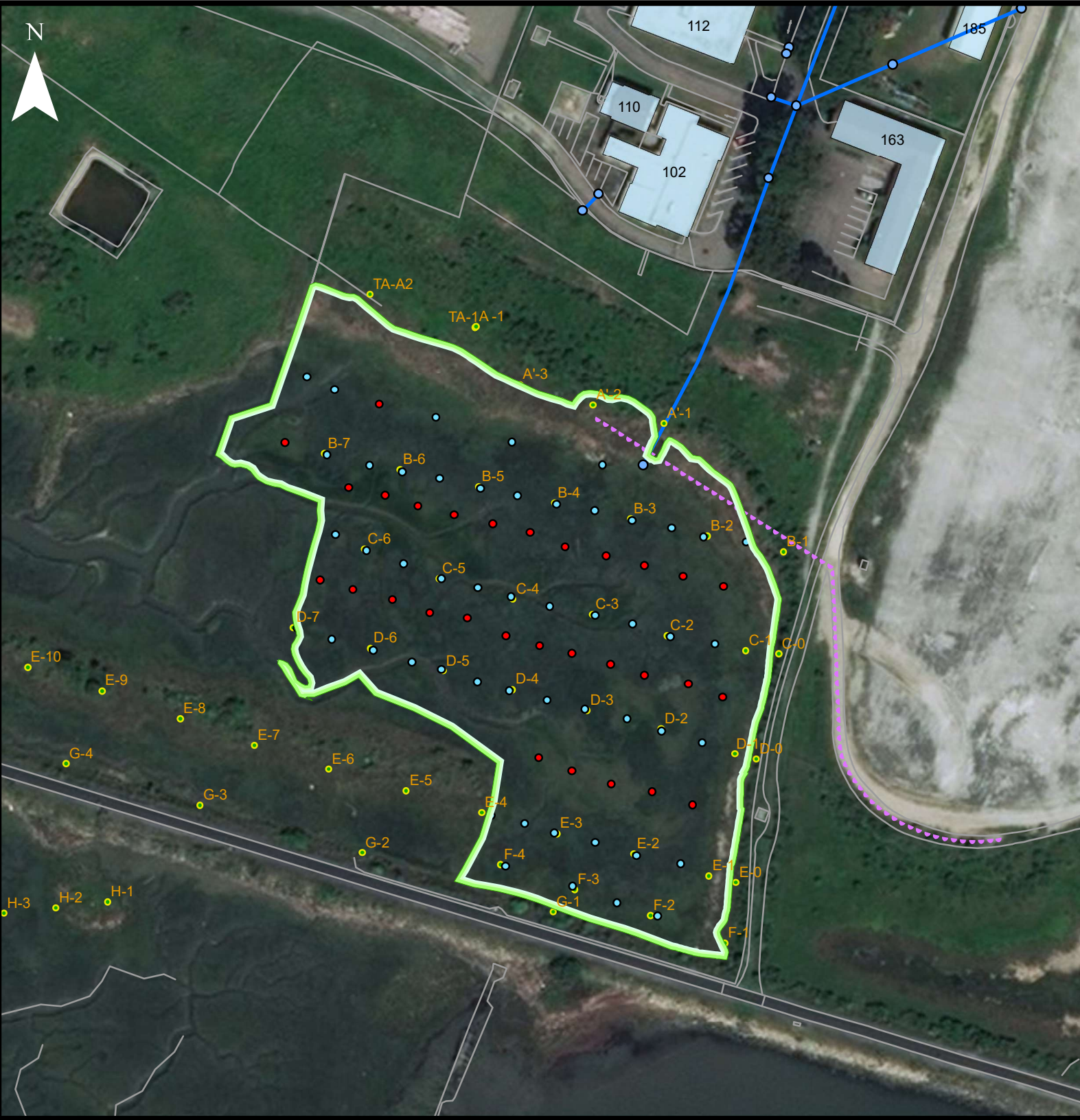
(6) Eleven detections

(7) Twenty-two detections

(8) Twenty-six detections

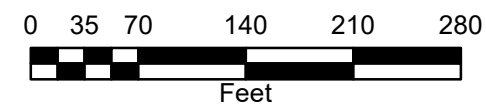
(9) Only thirteen detections

(10) Two detections



## 2022 PHA Sampling Locations

- Decision Unit 1 boundary
- Increments added in 2018
- Increment location (approximate)
- Vegetation Quadrats
- Biologically Active Permeable Barrier



**Berkeley EH&S**  
UNIVERSITY OF CALIFORNIA

**Richmond Field Station Site**  
University of California, Berkeley

**WESTERN STEGE MARSH  
NEAR SURFACE SAMPLING  
JANUARY 31, 2024**

# **Attachment 1**

McC Campbell Analytical Results

WO# 2401L71 Revision 1



# McC Campbell Analytical, Inc.

"When Quality Counts"

## Analytical Report

**WorkOrder:** 2401L71 **Amended:** 02/20/2024

**Revision:** 1

**Report Created for:** UC Berkeley EH & S

Hazardous Materials Facility  
Berkeley, CA 94720-1155

**Project Contact:** Kevin Keller

**Project P.O.:** BB01155336

**Project:** RFS WSM PAA

**Project Received:** 01/31/2024

Analytical Report reviewed & approved for release on 02/15/2024 by:

Jennifer Lagerbom

Project Manager

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## Revision History

**Client:** UC Berkeley EH & S  
**Project:** RFS WSM PAA

**WorkOrder:** 2401L71

<u>Date</u>	<u>Revision</u>	<u>Reason</u>
02/20/2024	1	Revised to include the PCB data from a less dilute injection



## Glossary of Terms & Qualifier Definitions

**Client:** UC Berkeley EH & S

**WorkOrder:** 2401L71

**Project:** RFS WSM PAA

### Glossary Abbreviation

%D	Serial Dilution Percent Difference
95% Interval	95% Confident Interval
CCV	Continuing Calibration Verification.
CCV REC (%)	% recovery of Continuing Calibration Verification.
CPT	Consumer Product Testing not NELAP Accredited
DF	Dilution Factor
DI WET	(DISTLC) Waste Extraction Test using DI water
DISS	Dissolved (direct analysis of 0.45 µm filtered and acidified water sample)
DLT	Dilution Test (Serial Dilution)
DUP	Duplicate
EDL	Estimated Detection Limit
ERS	External reference sample. Second source calibration verification.
ITEF	International Toxicity Equivalence Factor
LCS	Laboratory Control Sample
LCS2	Second LCS for the batch. Spike level is lower than that for the first LCS; applicable to method 1633.
LQL	Lowest Quantitation Level
MB	Method Blank
MB % Rec	% Recovery of Surrogate in Method Blank, if applicable
MDL	Method Detection Limit <sup>1</sup>
ML	Minimum Level of Quantitation
MS	Matrix Spike
MSD	Matrix Spike Duplicate
NA	Not Applicable
ND	Not detected at or above the indicated MDL or RL
NR	Data Not Reported due to matrix interference or insufficient sample amount.
PDS	Post Digestion Spike
PF	Prep Factor
RD	Relative Difference
RL	Reporting Limit <sup>2</sup>
RPD	Relative Percent Difference
RRT	Relative Retention Time
RSD	Relative Standard Deviation
SNR	Surrogate is diluted out of the calibration range
SPK Val	Spike Value

<sup>1</sup> MDL is the minimum measured concentration of a substance that can be reported with 99% confidence that the measured concentration is distinguishable from method blank results. Definition and Procedure for the Determination of the Method Detection Limit, Revision 2, 40CFR, Part 136, Appendix B, EPA 821-R-16-006, December 2016. Values are based upon our default extraction volume/amount and are subject to change.

<sup>2</sup> RL is the lowest level that can be reliably determined within specified limits of precision and accuracy during routine laboratory operating conditions. (The RL cannot be lower than the lowest calibration standard used in the initial calibration of the instrument and must be greater than the MDL.) Values are based upon our default extraction volume/amount and are subject to change.





## Glossary of Terms & Qualifier Definitions

**Client:** UC Berkeley EH & S

**WorkOrder:** 2401L71

**Project:** RFS WSM PAA

SPKRef Val	Spike Reference Value
SPLP	Synthetic Precipitation Leachate Procedure
ST	Sorbent Tube
TCLP	Toxicity Characteristic Leachate Procedure
TEQ	Toxicity Equivalents
TNTC	"Too Numerous to Count;" greater than 250 colonies observed on the plate.
TZA	TimeZone Net Adjustment for sample collected outside of MAI's UTC.
WET (STLC)	Waste Extraction Test (Soluble Threshold Limit Concentration)

### Analytical Qualifiers

a2	Sample diluted due to cluttered chromatogram.
h7	Copper (EPA 3660B) cleanup

### Quality Control Qualifiers

F1	MS/MSD recovery and/or RPD is out of acceptance criteria; LCS validates the prep batch.
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## Case Narrative

**Client:** UC Berkeley EH & S  
**Project:** RFS WSM PAA

**Work Order:** 2401L71  
February 15, 2024

### ISM Extraction Procedure:

Sample prepared per the Interstate Technology & Regulatory Council (ITRC). 2012. Incremental Sampling Methodology. ISM-1. Washington, D.C.: Interstate Technology & Regulatory Council, Incremental Sampling Methodology Team. [Www.itrcweb.org](http://www.itrcweb.org).

Sample aliquots are weighed for extraction after the air-drying step outlined in the ISM method; therefore, all associated data is reported on an "air dried" basis.



## Analytical Report

**Client:** UC Berkeley EH & S  
**Date Received:** 01/31/2024 15:00  
**Date Prepared:** 02/13/2024  
**Project:** RFS WSM PAA

**WorkOrder:** 2401L71  
**Extraction Method:** SW3540C  
**Analytical Method:** SW8082A  
**Unit:** mg/kg

### Polychlorinated Biphenyls (PCBs) Aroclors w/ Soxhlet Extraction

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
WSM2024PAH	2401L71-001A	Soil	01/31/2024 10:30	GC22 02162442.D	287855

Analytes	Result	RL	DE	Date Analyzed
Aroclor1016	ND	0.25	5	02/16/2024 22:32
Aroclor1221	ND	0.25	5	02/16/2024 22:32
Aroclor1232	ND	0.25	5	02/16/2024 22:32
Aroclor1242	ND	0.25	5	02/16/2024 22:32
Aroclor1248	ND	0.25	5	02/16/2024 22:32
Aroclor1254	ND	0.25	5	02/16/2024 22:32
Aroclor1260	ND	0.25	5	02/16/2024 22:32
Aroclor1262	ND	0.25	5	02/16/2024 22:32
Aroclor1268	ND	0.25	5	02/16/2024 22:32
PCBs, total	ND	0.25	5	02/16/2024 22:32

Surrogates	REC (%)	Limits	Date Analyzed
Decachlorobiphenyl	104	50-150	02/16/2024 22:32

**Analyst(s):** CK

**Analytical Comments:** a2,h7



## Analytical Report

**Client:** UC Berkeley EH & S  
**Date Received:** 01/31/2024 15:00  
**Date Prepared:** 02/13/2024  
**Project:** RFS WSM PAA

**WorkOrder:** 2401L71  
**Extraction Method:** SW3050B  
**Analytical Method:** SW6020  
**Unit:** mg/Kg

### CAM / CCR 17 Metals

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
WSM2024PAH	2401L71-001A	Soil	01/31/2024 10:30	ICP-MS5 161SMPL.d	287745

Analytes	Result	RL	DE	Date Analyzed
Antimony	ND	0.50	1	02/14/2024 13:19
Arsenic	5.8	0.50	1	02/14/2024 13:19
Barium	22	5.0	1	02/14/2024 13:19
Beryllium	ND	0.50	1	02/14/2024 13:19
Cadmium	ND	0.50	1	02/14/2024 13:19
Chromium	26	0.50	1	02/14/2024 13:19
Cobalt	4.6	0.50	1	02/14/2024 13:19
Copper	23	0.50	1	02/14/2024 13:19
Lead	14	0.50	1	02/14/2024 13:19
Mercury	0.33	0.050	1	02/14/2024 13:19
Molybdenum	1.1	0.50	1	02/14/2024 13:19
Nickel	27	0.50	1	02/14/2024 13:19
Selenium	ND	0.50	1	02/14/2024 13:19
Silver	ND	0.50	1	02/14/2024 13:19
Thallium	ND	0.50	1	02/14/2024 13:19
Vanadium	25	0.50	1	02/14/2024 13:19
Zinc	81	5.0	1	02/14/2024 13:19

Surrogates	REC (%)	Limits	
Terbium	104	70-130	02/14/2024 13:19

**Analyst(s):** WV



## Quality Control Report

**Client:** UC Berkeley EH & S  
**Date Prepared:** 02/13/2024  
**Date Analyzed:** 02/15/2024 - 02/16/2024  
**Instrument:** GC22, GC40  
**Matrix:** Soil  
**Project:** RFS WSM PAA

**WorkOrder:** 2401L71  
**BatchID:** 287855  
**Extraction Method:** SW3540C  
**Analytical Method:** SW8082A  
**Unit:** mg/kg  
**Sample ID:** MB/LCS/LCSD-287855  
2401L71-001AMS/MSD

### QC Summary Report for SW8082A

Analyte	MB Result	MDL	RL	SPK Val	MB SS %REC	MB SS Limits
Aroclor1016	ND	0.050	0.050	-	-	-
Aroclor1221	ND	0.050	0.050	-	-	-
Aroclor1232	ND	0.050	0.050	-	-	-
Aroclor1242	ND	0.050	0.050	-	-	-
Aroclor1248	ND	0.050	0.050	-	-	-
Aroclor1254	ND	0.050	0.050	-	-	-
Aroclor1260	ND	0.050	0.050	-	-	-
Aroclor1262	ND	0.050	0.050	-	-	-
Aroclor1268	ND	0.050	0.050	-	-	-

#### Surrogate Recovery

Decachlorobiphenyl	0.055			0.05	109	50-150
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Analyte	LCS Result	LCSD Result	SPK Val	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Limit
Aroclor1016	0.18	0.19	0.15	119	124	60-140	4.11	20
Aroclor1260	0.18	0.19	0.15	120	126	60-140	4.95	20

#### Surrogate Recovery

Decachlorobiphenyl	0.055	0.056	0.050	110	111	50-150	0.969	20
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Analyte	MS DF	MS Result	MSD Result	SPK Val	SPKRef Val	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD Limit
Aroclor1016	5	0.16	0.17	0.15	ND<0.25	106	111	60-140	5.15	20
Aroclor1260	5	0.16	0.16	0.15	ND<0.25	109	109	60-140	0.628	20

#### Surrogate Recovery

Decachlorobiphenyl	5	0.044	0.043	0.050		88	86	50-150	2.75	20
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## Quality Control Report

**Client:** UC Berkeley EH & S  
**Date Prepared:** 02/13/2024  
**Date Analyzed:** 02/14/2024  
**Instrument:** ICP-MS4  
**Matrix:** Soil  
**Project:** RFS WSM PAA

**WorkOrder:** 2401L71  
**BatchID:** 287745  
**Extraction Method:** SW3050B  
**Analytical Method:** SW6020  
**Unit:** mg/kg  
**Sample ID:** MB/LCS/LCSD-287745

### QC Summary Report for Metals

Analyte	MB Result	MDL	RL	SPK Val	MB SS %REC	MB SS Limits
Antimony	ND	0.10	0.50	-	-	-
Arsenic	ND	0.084	0.50	-	-	-
Barium	ND	0.73	5.0	-	-	-
Beryllium	ND	0.086	0.50	-	-	-
Cadmium	ND	0.080	0.50	-	-	-
Chromium	ND	0.17	0.50	-	-	-
Cobalt	ND	0.063	0.50	-	-	-
Copper	ND	0.19	0.50	-	-	-
Lead	ND	0.089	0.50	-	-	-
Mercury	ND	0.039	0.050	-	-	-
Molybdenum	ND	0.093	0.50	-	-	-
Nickel	ND	0.28	0.50	-	-	-
Selenium	ND	0.21	0.50	-	-	-
Silver	ND	0.084	0.50	-	-	-
Thallium	ND	0.073	0.50	-	-	-
Vanadium	ND	0.097	0.50	-	-	-
Zinc	ND	1.8	5.0	-	-	-
<b>Surrogate Recovery</b>						
Terbium	520			500	103	70-130



## Quality Control Report

**Client:** UC Berkeley EH & S  
**Date Prepared:** 02/13/2024  
**Date Analyzed:** 02/14/2024  
**Instrument:** ICP-MS4  
**Matrix:** Soil  
**Project:** RFS WSM PAA

**WorkOrder:** 2401L71  
**BatchID:** 287745  
**Extraction Method:** SW3050B  
**Analytical Method:** SW6020  
**Unit:** mg/kg  
**Sample ID:** MB/LCS/LCSD-287745

### QC Summary Report for Metals

Analyte	LCS Result	LCSD Result	SPK Val	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Limit
Antimony	50	50	50	100	100	75-125	0.305	20
Arsenic	50	50	50	101	99	75-125	1.52	20
Barium	500	490	500	99	98	75-125	1.62	20
Beryllium	51	51	50	102	102	75-125	0.254	20
Cadmium	50	50	50	100	99	75-125	1.08	20
Chromium	51	49	50	101	99	75-125	2.35	20
Cobalt	49	49	50	99	97	75-125	1.46	20
Copper	51	50	50	102	101	75-125	1.44	20
Lead	50	50	50	101	100	75-125	0.756	20
Mercury	1.3	1.3	1.25	103	103	75-125	0.466	20
Molybdenum	51	50	50	102	100	75-125	1.77	20
Nickel	51	51	50	102	102	75-125	0.277	20
Selenium	51	50	50	102	100	75-125	1.50	20
Silver	49	49	50	98	97	75-125	0.995	20
Thallium	50	49	50	99	98	75-125	1.31	20
Vanadium	51	50	50	101	99	75-125	1.89	20
Zinc	510	510	500	102	102	75-125	0.197	20
<b>Surrogate Recovery</b>								
Terbium	520	520	500	104	104	70-130	0.0359	20

# McCampbell Analytical, Inc.



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# CHAIN-OF-CUSTODY RECORD

Page 1 of 1

WorkOrder: 2401L71

ClientCode: UCB

☐ EQuIS ☐ Dry-Weight ☒ Email ☐ HardCopy ☐ ThirdParty ☐ J-flag  
☐ Detection Summary ☐ Excel

## Report to:

Kevin Keller  
UC Berkeley EH & S  
Hazardous Materials Facility  
1 Frank Schlessinger Way  
Berkeley, CA 94720-1155  
(510) 812-0269 FAX: (510) 643-7595

Email: k.keller13@berkeley.edu  
cc/3rd Party:  
PO: BB01155336  
Project: RFS WSM PAA

## Bill to:

Accounts Payable  
UC Berkeley  
Hazardous Materials Facility  
Berkeley, CA 94720-1155  
ucinvoice@berkeley.edu

Requested TATs: 10 days;  
5 days;

Date Received: 01/31/2024

Date Logged: 01/31/2024

Lab ID	ClientSampID	Matrix	Collection Date	Hold	Requested Tests (See legend below)											
					1	2	3	4	5	6	7	8	9	10	11	12
2401L71-001	WSM2024PAH	Soil	1/31/2024 10:30	<input type="checkbox"/>	A	A	A	A								

## Test Legend:

1	8082_Soxhlet_S	2	CAM17MS_TTLC_S	3	PRDisposal Fee	4	PRISM
5		6		7		8	
9		10		11		12	

Prepared by: Yvette Cisneros

## Comments:

NOTE: Soil samples are discarded 60 days after receipt unless other arrangements are made (Water samples are 30 days).  
Hazardous samples will be returned to client or disposed of at client expense.



McC Campbell Analytical, Inc.

"When Quality Counts"

1534 Willow Pass Road, Pittsburg, CA 94565-1701  
Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269  
http://www.mccampbell.com / E-mail: main@mccampbell.com

## WORK ORDER SUMMARY

**Client Name:** UC BERKELEY EH & S

**Project:** RFS WSM PAA

**Work Order:** 2401L71

**Client Contact:** Kevin Keller

**QC Level:** LEVEL 2

**Contact's Email:** k.keller13@berkeley.edu

**Comments:**

**Date Logged:** 1/31/2024

☐ WaterTrax ☐ CLIP ☐ EDF ☐ Excel ☐ EQUIS ☒ Email ☐ HardCopy ☐ ThirdParty ☐ J-flag

LabID	ClientSampID	Matrix	Test Name	Containers /Composites	Bottle & Preservative	U**	Head Space	Dry- Weight	Collection Date & Time	TAT	Test Due Date	Sediment Content	Hold	Sub Out
001A	WSM2024PAH	Soil	SW6020 (CAM 17)	2	1LA, Unpres	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	1/31/2024 10:30	5 days	2/7/2024		<input checked="" type="checkbox"/>	<input type="checkbox"/>
			SW8082A (PCBs w/ Soxhlet Extraction)			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		10 days	2/14/2024		<input checked="" type="checkbox"/>	<input type="checkbox"/>

**NOTES:** \* STLC and TCLP extractions require 2 days to complete; therefore, all TATs begin after the extraction is completed (i.e., One-day TAT yields results in 3 days from sample submission).

- ISM prep requires 5 to 10 days to complete; therefore, all TATs begin after the extraction is completed (i.e., One-day TAT yields results in 6 to 11 days from sample submission). Due date listed on WO summary will not accurately reflect the time needed for sample preparation.

- Organic extracts are held for 40 days before disposal; Inorganic extract are held for 30 days.

- MAI assumes that all material present in the provided sampling container is considered part of the sample - MAI does not exclude any material from the sample prior to sample preparation unless requested in writing by the client.

U\*\* = An unpreserved container was received for a method that suggests a preservation in order to extend hold time for analysis.







## Sample Receipt Checklist

Client Name: UC Berkeley EH & S  
Project: RFS WSM PAA

Date and Time Received: 1/31/2024 15:00

Date Logged: 1/31/2024

Received by: Yvette Cisneros

Logged by: Yvette Cisneros

WorkOrder No: 2401L71 Matrix: Soil  
Carrier: Antonio Mason (MAI Courier)

### Chain of Custody (COC) Information

Chain of custody present?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Chain of custody signed when relinquished and received?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Chain of custody agrees with sample labels?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Sample IDs noted by Client on COC?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Date and Time of collection noted by Client on COC?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Sampler's name noted on COC?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
COC agrees with Quote?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	NA <input checked="" type="checkbox"/>

### Sample Receipt Information

Custody seals intact on shipping container/cooler?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	NA <input checked="" type="checkbox"/>
Custody seals intact on sample bottles?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	NA <input checked="" type="checkbox"/>
Shipping container/cooler in good condition?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Samples in proper containers/bottles?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Sample containers intact?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Sufficient sample volume for indicated test?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	

### Sample Preservation and Hold Time (HT) Information

All samples received within holding time?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	NA <input type="checkbox"/>
Samples Received on Ice?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	

(Ice Type: WET ICE )

Sample/Temp Blank temperature	Temp: 2.6°C		NA <input type="checkbox"/>
ZHS conditional analyses: VOA meets zero headspace requirement (VOCs, TPHg/BTEX, RSK)?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	NA <input checked="" type="checkbox"/>
Sample labels checked for correct preservation?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
pH acceptable upon receipt (Metal: <2; Nitrate 353.2/4500NO3: <2; 522: <4; 218.7: >8)?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	NA <input checked="" type="checkbox"/>

### UCMR Samples:

pH tested and acceptable upon receipt (200.7: ≤2; 533: 6 - 8; 537.1: 6 - 8)?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	NA <input checked="" type="checkbox"/>
Free Chlorine tested and acceptable upon receipt (<0.1mg/L) [not applicable to 200.7]?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	NA <input checked="" type="checkbox"/>

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Comments: