TETRA TECH, INC.

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Submitted Electronically Only

Subject: Eastern Transition Area, Proposed Sampling
Richmond Field Station
University of California, Berkeley

Dear Ms. Yuen and Ms. Ziff:

On November 2, 2021, Tetra Tech collected 36 discrete soil samples within the Eastern Transition Area (ETA) pursuant to the *Phase V, Western Transition Area Sample Results, Richmond Field Station, UC Berkeley* letter, dated October 16, 2020. UC Berkeley recommended the sampling after finding polychlorinated biphenyl (PCB) in some samples during the Mercury Fulminate Area removal action completed in January 2020. During the removal action, PCBs were identified in confirmation samples at the southwestern-most portion of the Mercury Fulminate Area excavation, on the border of the ETA (Figure 1).

In October 2020, based on discussions with DTSC and EPA, UC Berkeley agreed to include the follow-up sampling as a part of the Phase V investigation, given its proximity to the Western Transition Area and since PCBs are the primary chemical of concern in the Phase V investigation. After subsequent discussions, further investigation of this area will be independent of the Phase V investigation and will be referred to as the ETA PCB Area, as shown on Figure 1.

The source of PCB contamination is unknown. The ETA consists of clean fill imported as part of the Western Stege Marsh removal action conducted by UC Berkeley from 2002 to 2004. The imported fill was approved by the California Regional Water Quality Control Board according to industry practices prior. While PCBs were not the primary contaminant of concern of the Western Stege Marsh cleanup activities, there were limited areas with known PCB contamination. Poor soil management practices during the removal action may have led to the PCB contamination identified in the November 2021 sampling event. There are no other known or suspected sources of PCBs in or near this portion of ETA.

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Previous Sampling

Four discrete confirmation samples collected during the Mercury Fulminate Area removal action had PCB levels from 2.2 to 53 mg/kg. Confirmation samples were collected from the sidewall surfaces after excavation. Sample locations and results are shown on Figure 2; sample depths and results are presented in Table 1.

Discrete samples were collected between 0 to 0.5 feet below ground surface (ft bgs) and 2.5 to 3.0 ft bgs at 18 locations for a total of 36 samples, as shown on Figure 2. Samples were collected from a continuous core from the direct push drill rig with disposable trowels. Total PCB concentrations within the 36 samples were detected from 0.096 to 23 mg/kg. Sample results indicated Total PCBs greater than the screening level of 1 mg/kg at 6 of the 18 samples locations; all samples above 1 mg/kg were collected at the 2.5 to 3.0 ft bgs interval.

All samples were analyzed for PCBs by EPA Method 8082 with Soxhlet Extraction. Sample collection, handling, chain-of-custody, and shipping protocols were consistent with the Final Phase V Field Sampling Plan.

Proposed Sampling

Incremental Sampling Methodology (ISM) will be applied to collect and analyze soil samples from decision units (DU) DU01 through DU04 as shown on Figure 3. ISM involves collecting many small soil masses (called "increments") evenly across each decision unit, and then pooling them to form a field sample. ISM was selected to achieve a comprehensive and thorough evaluation of chemical concentrations in a specific volume of soil or within a decision unit. Field quality control (QC), in the form of three independent field samples (i.e., field triplicates), assesses ability of an ISM sample to reliably estimate concentrations within the decision unit and quantify inherent soil and contaminant heterogeneity. A field triplicate will be collected at DU01.

Once received at the laboratory, the ISM sample will be homogenized and then subsampled for analysis. QC to assess adequacy of sample homogenizing, subsampling, and analysis will be conducted on three subsamples taken from one of the field triplicates. The field and laboratory subsampling triplicates form an ISM "nested triplicate" set from which the amount of variability due to field heterogeneity and laboratory procedures will be calculated as a statistic called the relative standard deviation (RSD). An RSD will be calculated for both the field triplicates and laboratory triplicates to measure how much field heterogeneity versus laboratory measurement variability contribute to overall data variability.

While ISM procedures are designed to reduce both field and laboratory contributions to data variability, some variability is inevitable. Measurements provided by a nested triplicate set document whether the procedures sufficiently reduced variability for the site-specific matrix and contaminants. If this QC demonstrates that data variability is too high to support desired decision confidence at the action level, it also indicates which aspect, field sampling, sample processing and subsampling, or the analysis itself needs corrective action to fix the problem. In contrast, sources of data variability are rarely used in this way in discrete sampling programs, which limits options for corrective action if discrete data variability is too high. Soils contaminated with PCB typically have both high field heterogeneity and high subsampling variability, so meticulous procedures must be implemented. ISM was chosen for this work because ISM

procedures will produce PCB data with much lower data variability, and therefore elicit higher confidence than data from discrete sampling.

Field increments will be collected using direct push technology since the target sample depth is 5 ft bgs. Increments will be collected from 0 to 2.5 and 2.5 to 5.0 ft bgs. A field sample will consist of 30 increments collected from each decision unit at each depth. The nested triplicate set at DU01 will consist of 90 borings. While 75 increments are preferred when analyzing ISM samples for PCBs, it is not uncommon for a reduction of increments when collecting ISM sample requiring drilling. Since triplicates will be collected, sample results will still indicate the ability of the 30 increments to represent the soil concentrations.

In addition to chemical results, field triplicate results from DU01 will measure the effectiveness of the ISM sample in capturing PCB contaminant variability within the decision unit. The field triplicate results will inherently include any laboratory variability because each field triplicate is analyzed separately.

The specific ISM procedures for field sampling will be:

1. Corners and edges of each decision unit will be marked with flags to identify borings locations. Triplicate increments for DU01 will be located in a triangle formation equidistant around each point.

2. Increments will be collected from 0 to 2.5 and 2.5 to 5.0 ft bgs. Each increment from a continuous core borehole will be a wedge of soil from the entire length of the core. The wedge will be collected with a disposable sampling equipment. Each increment will be approximately 50 grams of soil resulting in a sample of approximately 1.5 kilograms. Wedge increments from 0 to 2.5 ft bgs from each of the 30 borings at each DU will be combined to form the ISM sample for that depth, and similarly for 2.5 to 5 ft bgs.

3. Increments from each decision unit will be placed into freezer-grade, 1-gallon, sealable bags. The target weight of each ISM sample will be approximately 1.5 kilograms. Each bag will be labeled and packed into an insulated cooler and covered with ice packs. The samples will be transported under chain-of custody procedures to McCampbell Analytical, in Pittsburg, California.

Health and safety measures will follow the *Final Field Sampling Workplan, Appendix B, Health and Safety Plan*, dated June 2, 2010.

Laboratory Processing, Subsampling, and Analyses

Soil samples will be processed according to the laboratory's internal ISM protocol, specifically:

1. The 1.5-kilogram sample will be air-dried as necessary, then passed through a 10-mesh sieve to remove non-soil material (i.e., particles larger than a 2-millimeter [mm] diameter).

2. The sieved soil will be ground to the consistency of sifted flour and spread into a shallow layer in a pan to form a "slab cake" and divided into 30 equal-sized grid cells.

3. A 1-gram increment will be taken from each grid cell, and the 30 increments will be pooled to form an analytical subsample weighing 30 grams.

4. Each 30-gram subsample will be analyzed for PCBs via EPA Method 8082 with 3540C Soxhlet extraction.

One of the field samples within the DU01 field triplicate set will be subsampled and analyzed two additional times (for a total of three subsample analyses) to create the laboratory triplicate set. The second and third independent representative subsamples will be collected in the same way by taking separate increments from the same 30 grid cells.

The primary purpose of the laboratory triplicate set is to evaluate effectiveness of homogenizing and subsampling protocols for site-specific contaminants and the soil matrix. If the procedures are effective, the three subsamples should yield numerically close results. The closer the agreement among the results, the lower the data variability and RSD for the triplicate set. Variability in the analytical processes of sample extraction, extract cleanup, and instrumental measurement is an unavoidable inclusion in subsampling variability.

Together, the field triplicate set and laboratory triplicates from one of the field triplicates constitute a nested triplicate.

Data Evaluation

Field and laboratory triplicates will be evaluated quantitatively and qualitatively to determine overall data usability. Quantitative evaluation involves calculating an RSD of results from the three field and laboratory triplicates as a measure of variability. Qualitative evaluation involves assessing whether concentration of triplicates agree generally (low, moderate, or elevated), and whether they exceed the action level. Low or high variability can indicate complexity of the matrix. Consistently high variability may indicate a complex matrix with "particle effects" that cannot be fully eliminated even by enhanced laboratory protocols such as milling the sample. A data usability determination will be recommended based on results of the quantitative and qualitative analyses.

This field investigation is exploratory in nature, given the unknown history of PCB contamination in the area. Total PCB results will be compared to 1 mg/kg as a screening tool, and no statistical evaluation is currently proposed. Sample results may result in additional investigation, proposed excavation activities, or other cleanup alternatives. UC Berkeley will consult with EPA and DTSC upon receipt of the sample results to determine the appropriate data evaluation or follow-up actions.

If you have any questions or comments regarding this submittal, please call me at (415) 497-9060 or Alicia Bihler at (510) 725-2528.

Sincerely,

Jason Brodersen, P.G.
Project Manager

Attachments: Figure 1 Site Map
Figure 2 Previous PCB Results

Figure 3 Proposed Decision Units
Table 1 Eastern Transition Area PCB Sample Results

cc: Alicia Bihler, UC Berkeley EH&S
John Edgcomb, Edgcomb Law Group

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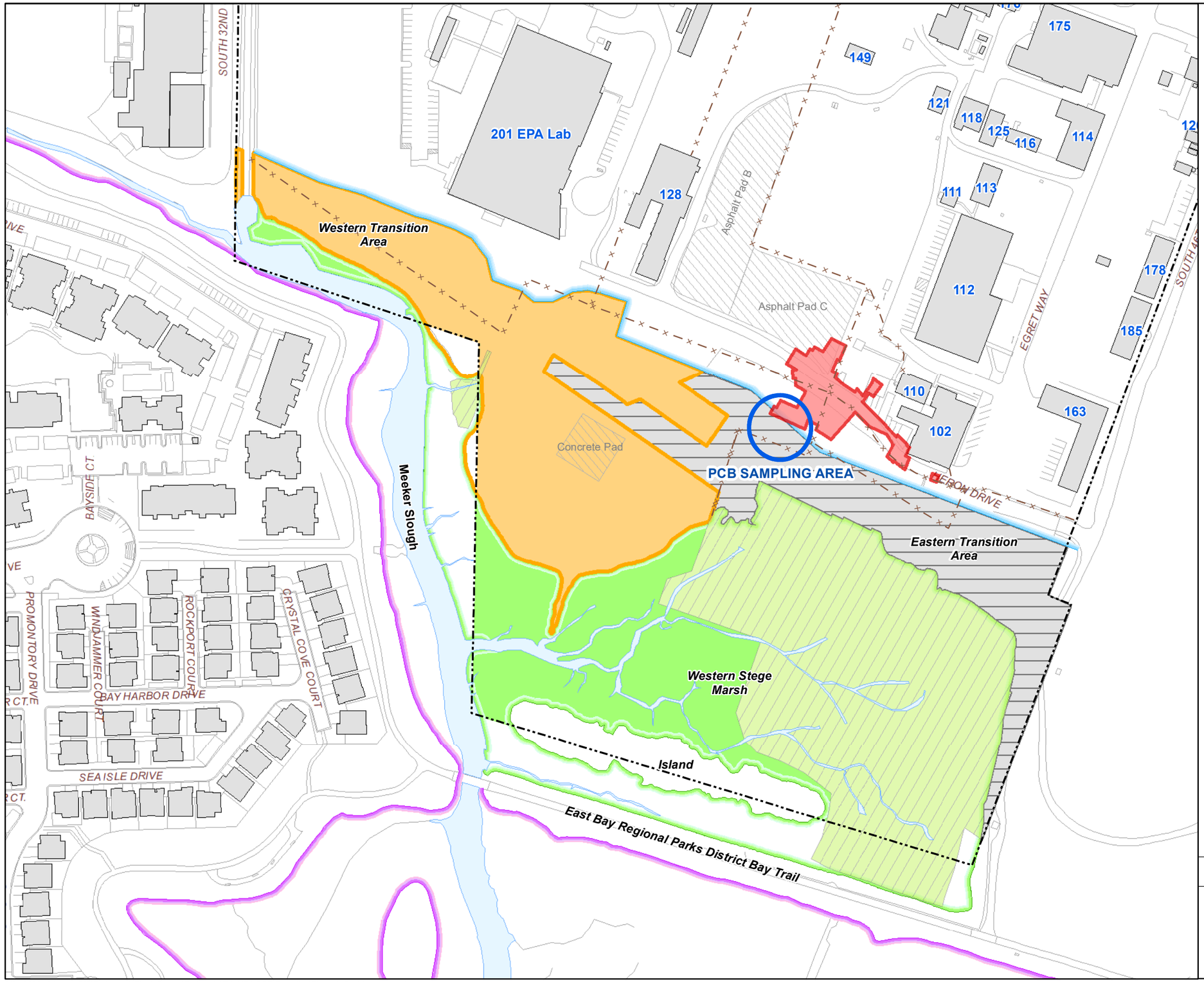

Western Stege Marsh

- Phase V Investigation Area – Old Marsh within UC Property Boundary
- Western Stege Marsh (4.5 ft NGVD)
- Remediated Portion of Western Stege Marsh

Transition Area

- Phase V Investigation Area - Western Transition Area on UC Property
- Western Transition Area
- Eastern Transition Area
- PCB Sampling Area
- Mercury Fulminate Area Excavation Boundary
- Fence Line
- Surface Water
- Former Seawall
- Marsh Boundary West of Meeker Slough (4.5 ft NGVD)
- Richmond Field Station Site

N

0 75 150 300

Feet

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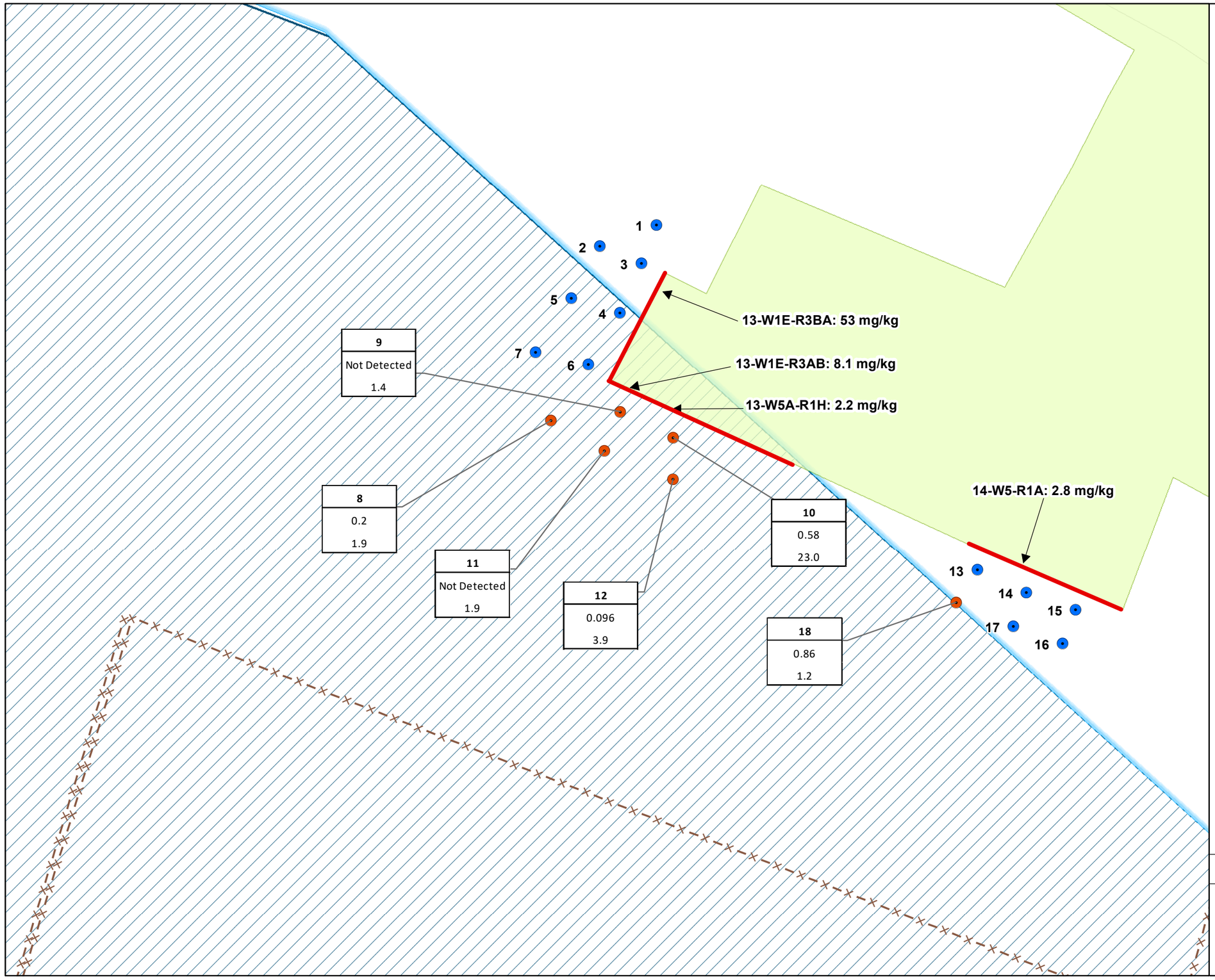
FIGURE 1
SITE MAP

8/31/2022 C:\misc_GIS\Richmond_Field_Station\Projects\WTA-MFA PCB Sampling\Figure1_SiteMap.mxd - michelle.handley



18	Sample Location Number
0.86	Total PCB Result (mg/kg) at 0 to 0.5 ft bgs
1.2	Total PCB Result (mg/kg) at 2.5 to 3 ft bgs

- Total PCB Results Below 1 mg/kg
- Total PCB Results Above 1 mg/kg
- Mercury Fulminate Area Excavation Boundary
- Sidewall Sample
- Eastern Transition Area (Clean Imported Fill)
- Fence Line
- Former Seawall

Notes:
ft bgs feet below ground surface
mg/kg milligrams per kilogram
PCB polychlorinated biphenyls

N

0 4.5 9 18
Feet

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FIGURE 2
PREVIOUS PCB RESULTS

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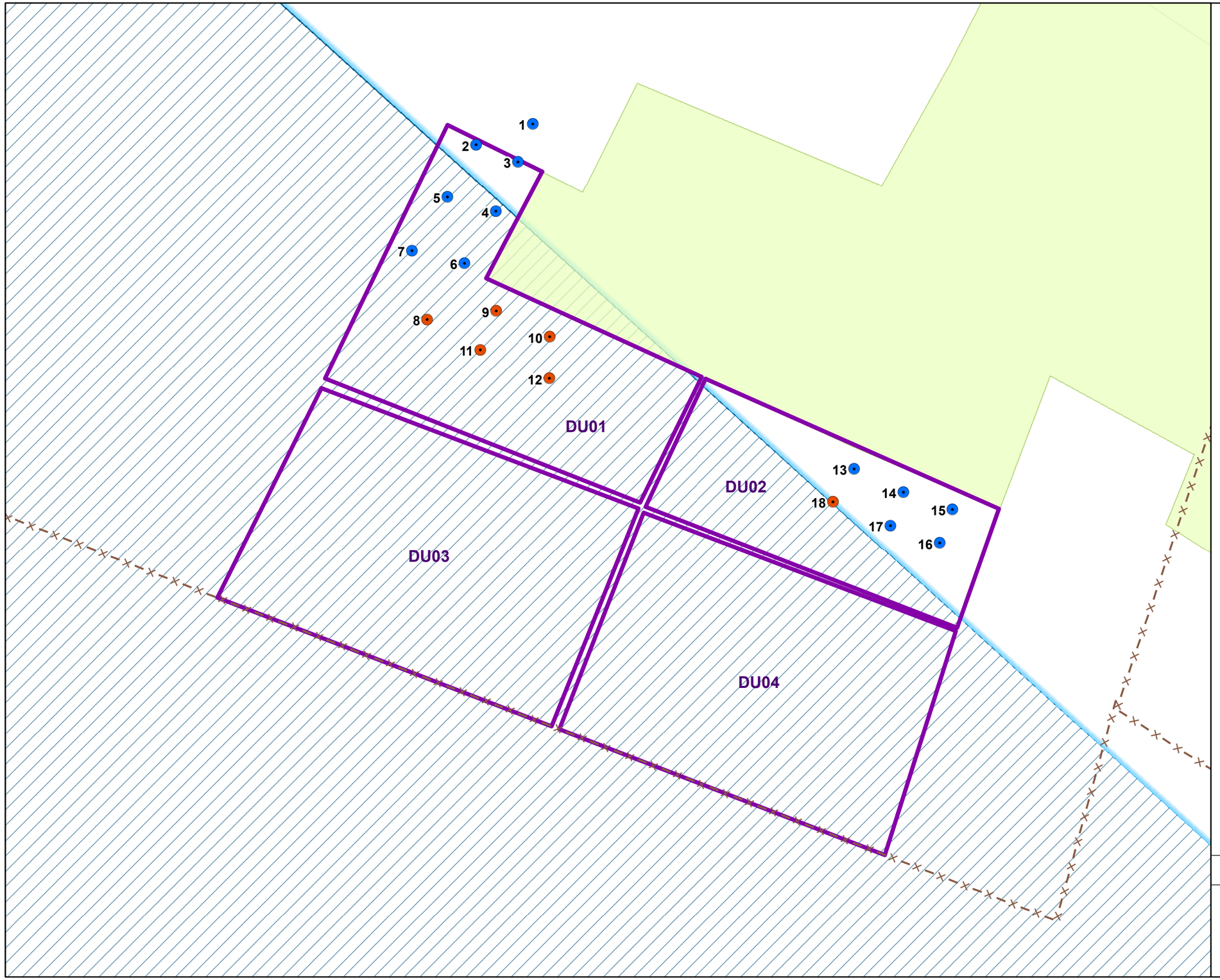

Previous Sample Location - Blue
Previous Sample Location - Red
Proposed Decision Unit
MFA Excavation Boundary
Eastern Transition Area (Clean Imported Fill)
Fence Line
Former Seawall

N

0 4.5 9 18
Feet

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FIGURE 3
PROPOSED DECISION UNITS

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Table 1
Eastern Transition Area PCB Sample Results

Sample ID	Depth (ft bgs)	Total PCBs (mg/kg)
13-W1E-R3AB	1.0 – 1.5	8.1
13-W1E-R3BA	1.5 – 2.0	53
13-W5A-R1H	3.5 – 4.0	2.2
14-W5-R1A	1.4 – 2.0	2.8
1	0 - 0.5	Not detected
	2.5 - 3.0	Not detected
2	0 - 0.5	Not detected
	2.5 - 3.0	0.36
3	0 - 0.5	Not detected
	2.5 - 3.0	Not detected
4	0 - 0.5	Not detected
	2.5 - 3.0	Not detected
5	0 - 0.5	0.082
	2.5 - 3.0	Not detected
6	0 - 0.5	Not detected
	2.5 - 3.0	Not detected
7	0 - 0.5	Not detected
	2.5 - 3.0	0.39
8	0 - 0.5	0.2
	2.5 - 3.0	1.9
9	0 - 0.5	Not detected
	2.5 - 3.0	1.4
10	0 - 0.5	0.58
	2.5 - 3.0	23
11	0 - 0.5	Not detected
	2.5 - 3.0	1.9
12	0 - 0.5	Not detected
	2.5 - 3.0	3.9
13	0 - 0.5	Not detected
	2.5 - 3.0	Not detected
14	0 - 0.5	0.32
	2.5 - 3.0	0.7
15	0 - 0.5	Not detected
	2.5 - 3.0	0.47
16	0 - 0.5	0.17
	2.5 - 3.0	Not detected
17	0 - 0.5	0.21
	2.5 - 3.0	0.67
18	0 - 0.5	0.86
	2.5 - 3.0	1.2

Notes:

ft bgs	Feet below ground surface
mg/kg	Milligrams per kilogram
PCB	Polychlorinated biphenyls
1.9	Sample results in red are above 1 mg/kg