



TETRA TECH, INC.

June 3, 2020

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Berkeley, California 94710

Sara Ziff  
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**Subject: Corporation Yard, Triplicates Sampling Approach  
Richmond Field Station  
University of California, Berkeley**

Dear Ms. Nakashima and Ms. Ziff:

On behalf of the University of California Berkeley, Tetra Tech, Inc. proposes to conduct additional data gap sampling as a follow-up to the removal action conducted at the Corporation Yard in 2017-2018 and data gap sampling presented in the Corporation Yard Data Gaps Sampling Results letter, dated November 22, 2019. This letter also provides clarifications regarding the results presented in the November 2019 letter and recent discussions regarding relative standard deviations (RSD) and the calculations of a weighted 95 upper confidence limit of the mean (weighted 95UCL).

### **PROPOSED SUPPLEMENTAL TRIPLICATE ANALYSIS**

The purpose of this investigation is to further determine the mean concentrations of polychlorinated biphenyls (PCB) within the near surface (0-2 inches below ground surface) within the Corporation Yard between Building 120 and the fence line south of Building 185. This area is covered by DU9 through DU17, shown on Figure 1. In response to DTSC recommendations for additional triplicate analysis provided on May 15, 2020, UC Berkeley proposes to collect laboratory and field triplicates at DU9, DU10, and DU13. Total PCB sample results presented in the November 2019 letter are presented on Figure 1.

### **Sampling Approach**

Incremental sampling methodology (ISM) will be used to collect soil samples from DU9, DU10, and DU13. ISM was selected for this project to provide a comprehensive and thorough evaluation of chemical concentrations in a specific volume of soil, or decision unit. The result of each ISM sample will be used as the mean concentration for the decision unit it was collected from. The approach presented below is consistent with the ISM sampling presented in the November 2019 letter.

- A minimum of 75 increments will be collected from within each decision unit. The corners and edges of each decision unit will be marked with flags, and the spacing of increments will be determined in the field based on the shape of each decision unit. The precise location of each increment is not critical, as long as they are distributed evenly throughout the decision unit. Increments will be collected from the top 2 inches of the native surface with a disposable scoop or other disposable sampling apparatus. In some areas, the native surface is the current surface cover; however, where gravel is present, the gravel will be removed prior to collecting the increment. Each increment will be approximately 20 grams of soil.
- Increments from each decision unit will be placed directly into a 32-ounce glass jar, or multiple jars if necessary. The target weight of each ISM sample is approximately 1.5 kilograms. Each jar will be labeled and packed into an insulated cooler; the use of ice packs is not necessary for the preservation of samples analyzed for PCBs. The samples will be transported under chain-of-custody procedures to Agriculture & Priority Pollutants Laboratories, Inc. (APPL) in Clovis, California.
- Field triplicates will be collected from all three decision units. A field triplicate consists of the collection of 75 increments thrice within the same decision unit from different locations. The primary purpose of the field triplicate is to evaluate the effectiveness of the ISM sample to capture any PCB contaminant variability within the decision unit. The field triplicate results will also inherently include any laboratory variability discussed below.

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

### **Analyses and Reporting**

Soil samples will be processed according to APPL's internal ISM protocol. The 1.5 kilogram sample will be ground and subsampled to a final analytical aliquot of 30 grams. Samples will be analyzed for PCBs by EPA Method 8082 with 3540C Soxhlet extraction.

One laboratory triplicate will be identified from each field triplicate set and analyzed for PCBs by the laboratory three times. Each laboratory triplicate will be ground, subsampled, and evaluated separately. The primary purpose of the laboratory triplicate is to evaluate the effectiveness of the subsampling protocol and any laboratory variability. Together, the field and laboratory triplicates constitute a nested triplicate.

The field and laboratory triplicates will be used to calculate RSDs for DU9, DU10, and DU13 in further support of the weighted 95UCL for the entire area defined above. UC Berkeley will provide preliminary recommendations regarding the appropriate use of each nested triplicate result in conjunction with all previous sampling results for the area, including discrete samples presented in the Site Characterization Report, Figure 6-8, included as an attachment to this letter.

Following discussion with DTSC and EPA, the sample results will be presented in a sampling letter report providing complete details regarding the updated weighted 95UCL. The data collected during this investigation will ultimately be presented with the comprehensive data following completion of all Corporation Yard removal action activities.

## **NOVEMBER 2019 LETTER CLARIFICATIONS**

The Corporation Yard Data Gaps Sampling Results letter, dated November 22, 2019, provided a summary of data gaps investigation and the sampling event conducted at the East Meadow, adjacent to the Corporation Yard Boundary, as defined by the Final Removal Action Workplan, dated July 18, 2014. The purpose of the letter was to provide the mean concentrations of PCBs within the near surface (0-2 inches below ground surface) within the entire Corporation Yard, Building 185, and north of Building 197.

The November 2019 letter included a discussion of quality assurance based on the ISM results of the laboratory and field triplicate sample results. The collection of triplicates allowed for the calculation of the RSD for each triplicate set. The laboratory RSD provides an indication of the variability associated with subsampling and analytical procedures. The field RSD provides an indication of how well the sample result represents the average concentration of the area sampled. The field RSD inherently includes variability associated with subsampling and analytical procedures.

The November 2019 letter provided a qualitative summary of the triplicate results and RSDs using several lines-of-evidence to support the conclusions. The evaluation was not intended to provide the basis for applying a confidence interval to a risk-based evaluation.

### **RSD Calculations**

Subsequent to submittal of the November 2019 letter, EPA, DTSC, and UC Berkeley have conducted several meetings to discuss the strategies and technical approaches for transitioning from a “not-to-exceed” PCB concentration compliant with the Toxic Substances Control Act (TSCA) Section 761.61(a) presented in the Removal Action Workplan (RAW) to a risk-based approach compliant with TSCA Section 761.61(c). As a part of those discussions, UC Berkeley has proposed the calculation of a weighted 95UCL to meet the needs of a risk-based approach with a confidence interval applied.

The weighted 95UCL calculation: (1) normalizes the areal dimensions of the sample results to ensure that results from larger areas are more represented than smaller areas, and (2) incorporates the measured variability measured in triplicate results to the singlet sample results. The application of the triplicate results within the weighted 95UCL calculation is independent of the qualitative analysis of the triplicate results presented in the November 2019 letter. The approach for calculating a weighted 95UCL for the area south of Building 120 and outside of the previous excavation boundary was presented to EPA and DTSC on May 8, 2020, and is summarized below. This area is represented by sample results from DU09 through DU17. The calculation of a weighted 95UCL for this area is consistent with the Corporation Yard boundary evaluated in the risk assessment conducted in support of the RAW, as shown on RAW Figure 2-3, included as an attachment to this letter.

- The weighted 95UCL calculation applies triplicate results from decision units which are most representative of the decision units they will be applied to. For DU9, DU10, and DU12 through 17, triplicate results from DU11 were selected because they best represent the conceptual site model for contaminant release as the other decision units, and the concentrations are similar with regards to concentrations.

- The weighted 95UCL applies only the field triplicate results and not the laboratory triplicate results, since the field triplicates best represent how well the sample results represent the average concentration of the area sampled.
- The weighted 95UCL applies the first laboratory triplicate sample reported, not the average of the three laboratory triplicates. This supports the statistical evaluation of the three field triplicate results since they are all singlet results, and the third is not an average. The first laboratory triplicate reported is always the result selected, regardless of concentration.

Consequently, the RSD values presented in the November 2019 letter are different than the RSD values presented in the weighted 95UCL equations presented during the May 8 meeting. The letter presented the average of the three lab results (0.23 micrograms per kilogram [ $\mu\text{g}/\text{kg}$ ]) to calculate the field RSD; however, the weighted 95UCL uses only the first lab triplicate DU11-T3A, which was reported as non-detect.

The surrogate value for the non-detect result is based on an evaluation of half the reporting and method detection limits for Aroclor 1254 and 1260, which are the primary detected PCBs.

- The Aroclor 1254 half reporting limit was  $65 \mu\text{g}/\text{kg}$  and the method detection limit was  $54 \mu\text{g}/\text{kg}$ . If the actual concentration was  $65 \mu\text{g}/\text{kg}$ , then the method detection limit of  $54 \mu\text{g}/\text{kg}$  would have resulted as  $65 \text{ J } \mu\text{g}/\text{kg}$ , which it was not. As a result, half the method detection limit of  $27 \mu\text{g}/\text{kg}$  is the appropriate surrogate concentration for Aroclor 1254.
- The Aroclor 1260 half reporting limit was  $65 \mu\text{g}/\text{kg}$  and method detection limit was  $90 \mu\text{g}/\text{kg}$ . If the actual concentration was  $65 \mu\text{g}/\text{kg}$ , then the method detection limit of  $90 \mu\text{g}/\text{kg}$  would have resulted as a non-detect, which it was. As a result, half the reporting limit of  $65 \mu\text{g}/\text{kg}$  is the appropriate surrogate concentration for Aroclor 1260.

The surrogate sample result used for the weighted 95UCL for DU11-T3A is  $27 \mu\text{g}/\text{kg} + 65 \mu\text{g}/\text{kg} = 0.092 \mu\text{g}/\text{kg}$ .

The RSD based on the field triplicate set from DU11-T1 ( $0.060 \mu\text{g}/\text{kg}$ ), DU11-T2 ( $0.070 \mu\text{g}/\text{kg}$ ), and DU11-T3A ( $0.092 \mu\text{g}/\text{kg}$ ) is 21%, which differs from the November 2019 letter presenting 80% RSD.

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

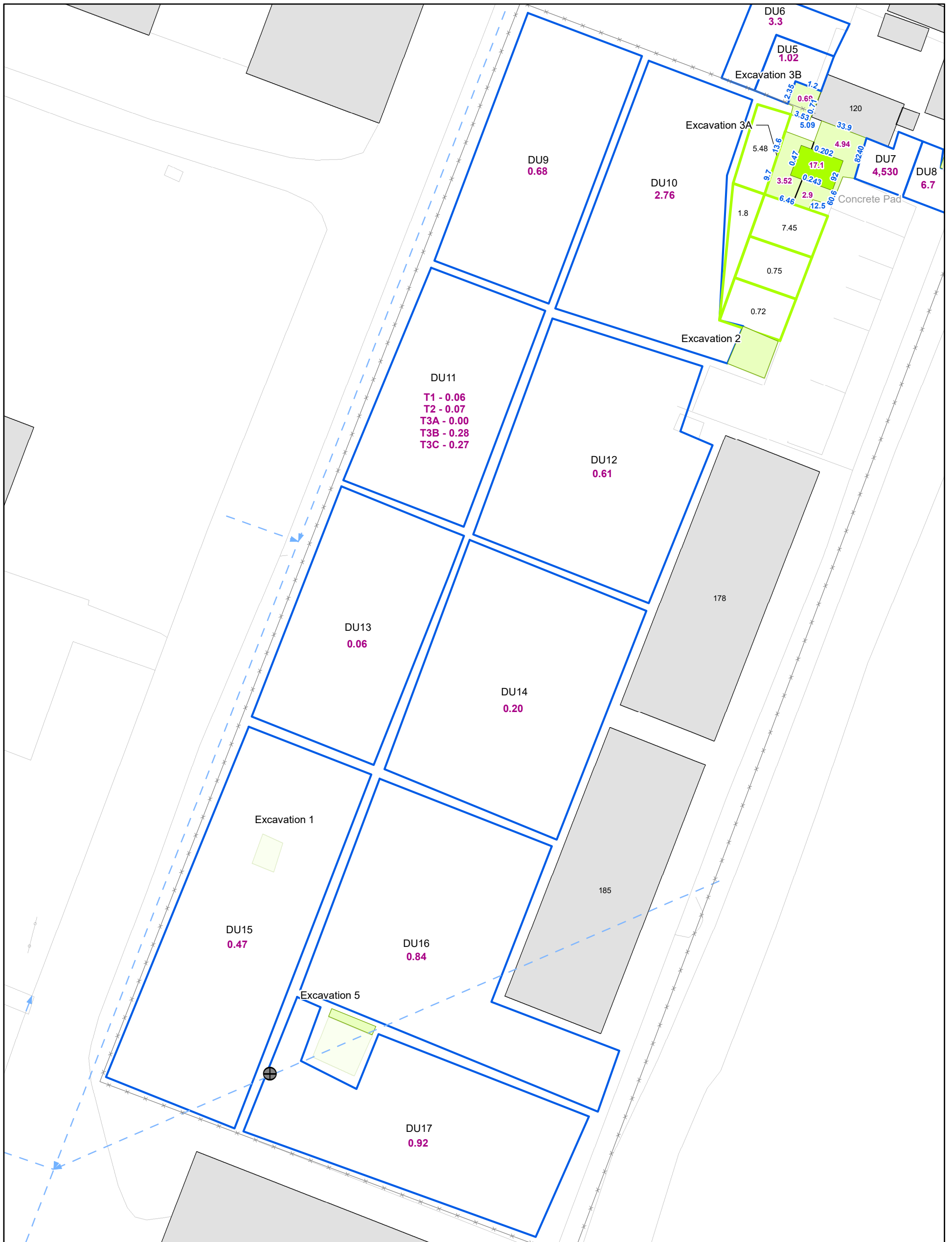
Sincerely,



Jason Brodersen, P.G.  
Project Manager

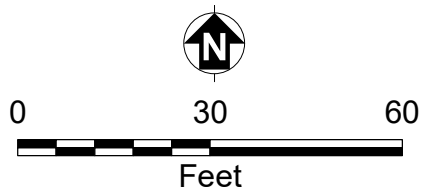
Attachments: Figure 1  
Figure 6-8, Site Characterization Report  
Figure 2-3, Removal Action Workplan

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



- Final Excavation Depth 1.5 feet
- Final Excavation Depth 3.5 feet
- New Decision Unit
- Buildings
- Fenceline
- Roads and other Landscape Features

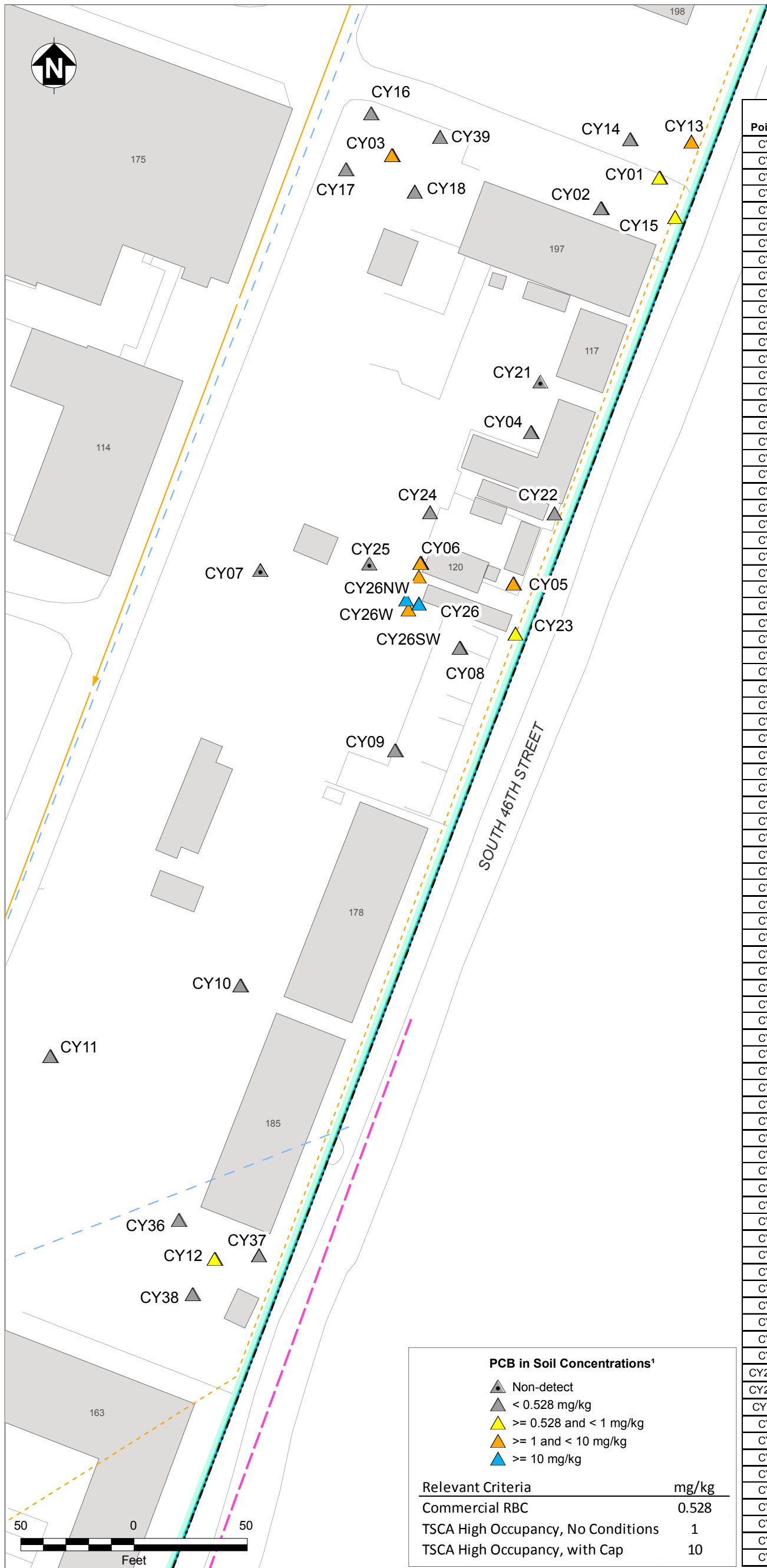
Note:  
1. Results presented are total PCBs shown in mg/kg.



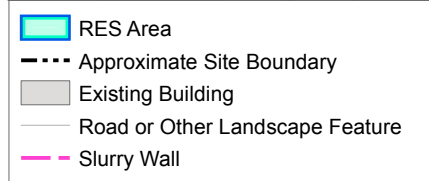
Richmond Field Station Site  
University of California, Berkeley

**FIGURE 1**  
**DECISION UNITS 9 THROUGH 17**





Point ID	Depth (feet bgs)	Aroclor-1254	Aroclor-1260	Total PCB
CY01	0-0.5	0.72	0.035 U	0.72
CY01	2-2.5	0.041 U	0.041 U	0 U
CY01	4-4.5	0.042 U	0.042 U	0 U
CY01	6-6.5	0.038 U	0.038 U	0 U
CY02	0-0.5	0.2	0.035 U	0.2
CY02	2-2.5	0.038 U	0.038 U	0 U
CY02	4-4.5	0.042 U	0.042 U	0 U
CY02	6-6.5	0.043 U	0.043 U	0 U
CY02	6-6.5	0.038 U	0.038 U	0 U
CY03	0-0.5	2.3	0.036 U	2.3
CY03	2-2.5	0.038 U	0.038 U	0 U
CY03	4-4.5	0.04 U	0.04 U	0 U
CY03	6-6.5	0.04 U	0.04 U	0 U
CY04	0-0.5	0.056	0.035 U	0.056
CY04	2-2.5	0.038 U	0.038 U	0 U
CY04	4-4.5	0.04 U	0.04 U	0 U
CY04	6-6.5	0.038 U	0.038 U	0 U
CY05	0-0.5	3.3	0.037 U	3.3
CY05	2-2.5	0.038 J	0.038 U	0.038
CY05	4-4.5	0.04 U	0.04 U	0 U
CY05	6-6.5	0.041	0.038 U	0.041
CY06	0-0.5	5.5	0.18 U	5.5
CY06	0-0.5	5.4	0.18 U	5.4
CY06	2-2.5	0.039 U	0.039 U	0 U
CY06	2-2.5	0.039 U	0.039 U	0 U
CY06	4-4.5	0.04 U	0.04 U	0 U
CY06	4-4.5	0.04 U	0.04 U	0 U
CY06	6-6.5	0.04 U	0.04 U	0 U
CY06	6-6.5	0.04 U	0.04 U	0 U
CY07	0-0.5	0.037 U	0.037 U	0 U
CY07	2-2.5	0.039 U	0.039 U	0 U
CY07	4-4.5	0.039 U	0.039 U	0 U
CY07	6-6.5	0.037 U	0.037 U	0 U
CY08	0-0.5	0.035 U	0.033 J	0.033
CY08	2-2.5	0.04 U	0.04 U	0 U
CY08	4-4.5	0.042 U	0.042 U	0 U
CY08	6-6.5	0.039 U	0.039 U	0 U
CY09	0-0.5	0.11	0.041 U	0.11
CY09	2-2.5	0.041 U	0.041 U	0 U
CY09	4-4.5	0.041 U	0.041 U	0 U
CY10	0-0.5	0.029 J	0.039 U	0.029
CY10	2-2.5	0.04 U	0.04 U	0 U
CY10	4-4.5	0.041 U	0.041 U	0 U
CY11	0-0.5	0.089	0.037 U	0.089
CY11	2-2.5	0.04 U	0.04 U	0 U
CY11	4-4.5	0.041 U	0.041 U	0 U
CY12	0-0.5	0.97	0.036 U	0.97
CY12	2-2.5	0.041 U	0.041 U	0 U
CY12	4-4.5	0.041 U	0.041 U	0 U
CY13	0-0.5	4.3	0.0043 U	4.3
CY13	2-2.5	0.0054 J	0.0022 UJ	0.0054
CY14	0-0.5	0.0017 J	0.0022 UJ	0.0017
CY14	0-0.5	0.00078 UJ	0.0022 UJ	0 U
CY14	2-2.5	0.00078 UJ	0.0022 UJ	0 U
CY15	0-0.5	0.021 U	0.8	0.8
CY15	2-2.5	0.0044 J	0.0022 UJ	0.0044
CY16	0-0.5	0.064	0.0043 U	0.064
CY16	2-2.5	0.00078 UJ	0.0022 UJ	0 U
CY17	0-0.5	0.054 J	0.0022 UJ	0.054
CY17	2-2.5	0.00078 UJ	0.0022 UJ	0 U
CY18	0-0.5	0.072 J	0.0022 UJ	0.072
CY18	0-0.5	0.045 J	0.0022 UJ	0.045
CY18	2-2.5	0.0031 J	0.0022 UJ	0.0031
CY21	0-0.5	0.00078 U	0.0022 U	0 U
CY22	0-0.5	0.019	0.0022 U	0.019
CY22	2-2.5	0.055 J	0.0022 UJ	0.055
CY23	0-0.5	0.6	0.055 UJ	0.6
CY23	2-2.5	0.36	0.055 U	0.36
CY24	0-0.5	0.082	0.0022 U	0.082
CY24	2-2.5	0.014	0.0022 U	0.014
CY25	0-0.5	0.00078 U	0.0022 U	0 U
CY25	2-2.5	0.00078 U	0.0022 U	0 U
CY26	0-0.5	110	2.2 U	110
CY26	2-2.5	7.2	0.22 U	7.2
CY26NW	0-0.5	1.1	0.022 U	1.1
CY26SW	0-0.5	8.3	0.22 U	8.3
CY26W	0-0.5	12	0.22 U	12
CY36	0-0.5	0.0092 J	0.0022 U	0.0092
CY36	2-2.5	0.00078 UJ	0.0022 UJ	0 U
CY37	0-0.5	0.091	0.0057 U	0.091
CY37	0-0.5	0.26	0.0057 U	0.26
CY37	2-2.5	0.0034 J	0.0022 UJ	0.0034
CY38	0-0.5	0.13	0.0022 U	0.13
CY38	2-2.5	0.00078 UJ	0.0022 UJ	0 U
CY39	0-0.5	0.062	0.0022 U	0.062
CY39	2-2.5	0.17 J	0.0022 UJ	0.17



- Sanitary Sewer Lines:**
- Existing Sewer Line
  - Removed Sewer Line
  - Abandoned Sewer Line
- Storm Drain Line:**
- Underground Culvert
  - Underground Culvert, Abandoned (Grouted at Manholes)

Notes:  
All soil data for the analyte collected as part of the FSU investigation are shown.  
Results in table are presented in mg/kg.

1 Total PCB concentration is the sum of detected concentrations of Aroclors -1254 and -1260 in each sample. The maximum concentration at each location is represented.  
Below ground surface  
California Department of Toxic Substances Control  
Estimated  
Milligram per kilogram  
Polychlorinated biphenyl  
Risk-Based Concentration  
Research, Education & Support Area  
Toxic Substances Control Act  
Not Detected

bgs  
DTSC  
J  
mg/kg  
PCB  
RBC  
RES  
TSCA  
U

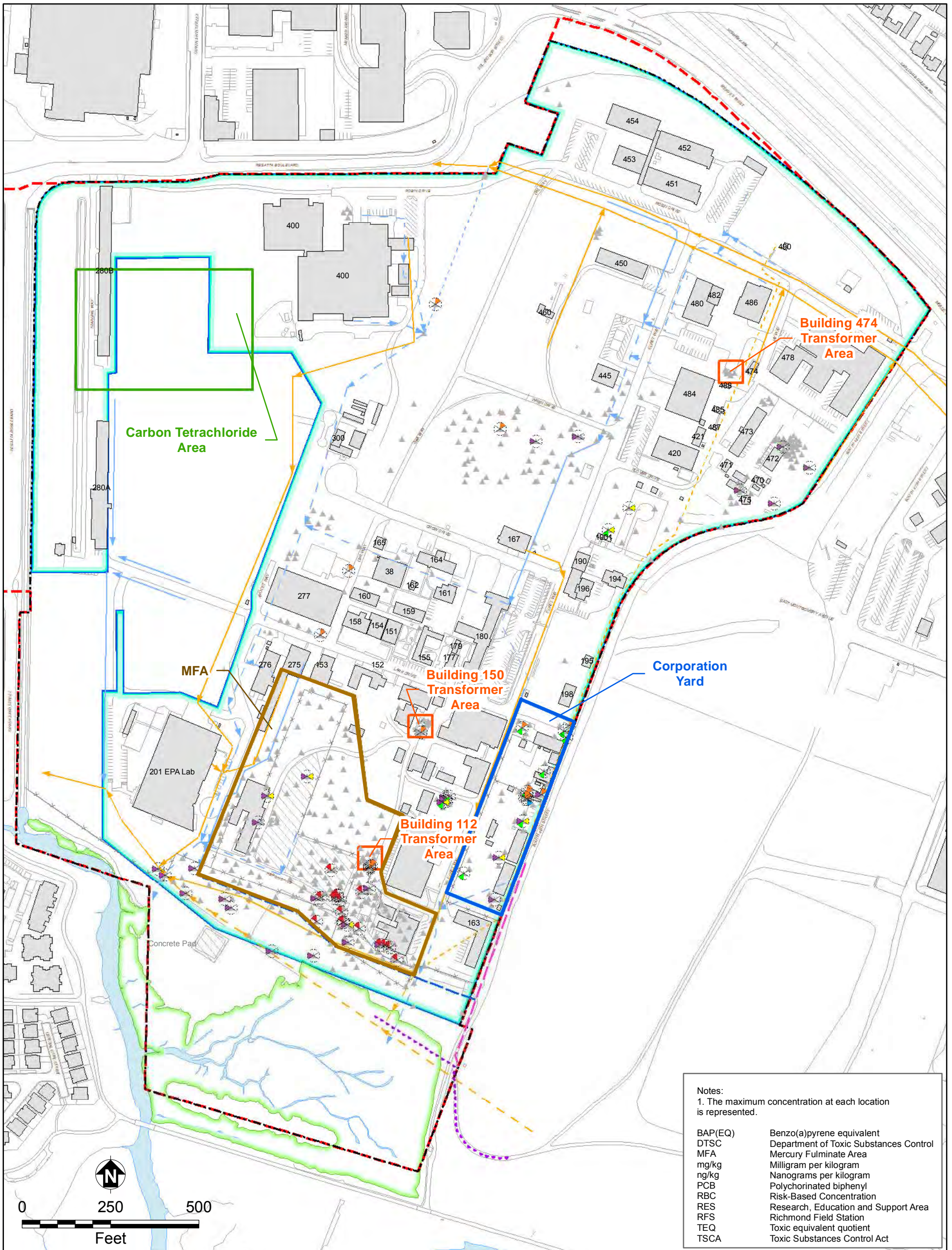


**Proposed Richmond Bay Campus**

**FIGURE 6-8  
PCB CONCENTRATIONS IN SOIL  
IN THE CORPORATION YARD**

Site Characterization Report





- Soil Sampling Locations**
- ▲ All Chemical Concentrations < Remedial Goals
  - ⊗ Mercury Concentrations<sup>1</sup> ≥ 275 mg/kg (Commercial RBC)
  - ⊗ PCB Concentrations<sup>1</sup> ≥ 1 mg/kg (TSCA High Occupancy, No Conditions)
  - ⊗ Lead Concentrations<sup>1</sup> ≥ 320 mg/kg (Commercial RBC)
  - ⊗ Dioxin TEQ Concentrations<sup>1</sup> ≥ 16.4 ng/kg (Commercial)
  - ⊗ BAP(EQ) Concentrations<sup>1</sup> ≥ 0.4 mg/kg (Background)
  - ⊗ Arsenic Concentrations<sup>1</sup> ≥ 16 mg/kg (Background)
- Area Boundaries**
- MFA
  - Corporation Yard
  - Transformer
  - Carbon Tetrachloride

- Slurry Wall
- Biologically Active Permeable Barrier
- Former Seawall (Approximate)
- Fenceline
- Asphalt/Concrete Pads
- Buildings
- Marsh Boundary
- Surface Water
- RES Area within the
- Portion of RFS Property Subject to DTSC order, Defined as
- Richmond Bay Campus
- Roads and other Landscape Features



Richmond Bay Campus

**FIGURE 2-8  
RES SOIL SAMPLING LOCATIONS  
WITH REMEDIAL GOAL EXCEEDANCES**

Removal Action Workplan