PRELIMINARY ENDANGERMENT ASSESSMENT REPORT

Pogonip Farm and Garden
333 Golf Club Drive
Santa Cruz, California

01-DTSC-002

Prepared For:
California Environmental Protection Agency
Department of Toxic Substances Control
700 Heinz Avenue
Berkeley, California 94710

Contract No. 19-T4727

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1.0 INTRODUCTION

RMD Environmental Solutions, Inc. (RMD) has prepared this *Preliminary Endangerment Assessment Report* (Report) for the Pogonip Farm and Garden, which is located at 333 Golf Club Drive in Santa Cruz, California (the Site, Figure 1). This preliminary endangerment assessment (PEA) was performed by RMD for the City of Santa Cruz (the City) under the Targeted Site Investigation (TSI) program developed by the California Environmental Protection Agency (Cal/EPA), Department of Toxic Substances Control (DTSC) under Contract No. 19-T4727. The TSI program is funded through a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) 128(a) State and Tribal Response Program grant, administered by the United States Environmental Protection Agency (USEPA).

The approximately 9.5-acre Site is located in the Pogonip Open Space Preserve. The City leased the Site to the Homeless Garden Project (HGP), a non-profit organization, for conversion from recreational open space to an agricultural and educational farm. The City recently learned that a portion of the Site had been used as a skeet and trap shooting range between the 1930s and 1950s. In 2019, a *Phase I Environmental Site Assessment for Recreational Open Space Property* (Phase I Report; Weber, Hayes & Associates [WHA], 2019) identified two recognized environmental conditions (RECs):

- The historic operation of a skeet shooting range with confirmed elevated lead and polycyclic aromatic hydrocarbon (PAH) concentrations in shallow soil samples; and
- The presence of trash and debris primarily observed within the ravine area of the lower meadow where homeless encampments have been established.

1.1 Project Objectives

The PEA was conducted in accordance with the May 5, 2020 *Preliminary Endangerment Assessment Work Plan* (Work Plan) to evaluate the extent and concentration of select metals, primarily lead, and PAHs associated with the historic shooting range in the planned farm and garden areas of the Site. The overall objective of the PEA was to evaluate whether hazardous materials are present that may pose unacceptable human health and environmental risks for the proposed use of the Site as an agricultural and educational farm.

1.2 Scope of Work

To meet this objective, the PEA included the following scope of work:

- Field screening of surface and shallow soil samples for the presence of lead shot and clay target fragments.
- Collection and laboratory analysis of soil samples for suspected contaminants associated with the former shooting range located on Site. Laboratory analysis included metals, specifically lead, antimony, arsenic, copper, and zinc, and PAHs.
- Assess laboratory analytical results to determine the nature, concentration, and general extent of metals and PAHs present in the shallow soil at the Site.
- Compare soil sample analytical results to human health and environmental screening levels presented in the Work Plan (RMD, 2020).

2.0 SITE DESCRIPTION AND BACKGROUND

2.1 Site Location and Description

The Site is identified as the lower meadow of the Pogonip Open Space Preserve in Santa Cruz, California (Figure 1). The Site is the southern portion of the larger Santa Cruz County Assessor's Parcel Number [APN] 001-211-01 (Figure 2). The Site entrance is located at 36.990364°N, 122.036831°W. The Site is currently undeveloped except for a series of dirt roads and hiking trails accessible from Golf Club Drive, which is located along the northern and western Site boundaries (Figure 2). The Site is divided into the eastern lower meadow (east meadow), the western lower meadow (west meadow), which are separated by a ravine, and the proposed northern orchard (north orchard) (Figure 2). A 0.08-acre seasonal wetland has been identified in the northern portion of west meadow. The Site is bordered by additional open space and the Pogonip clubhouse to the northwest, additional open space and a former horse stable to the southwest with Pogonip Creek beyond, a forested slope to the east with a railroad line, Highway 9 and the San Lorenzo River beyond, and a residence, a plant nursery and Santa Cruz METRO office buildings to the south with commercial businesses beyond. The nearest school is the Kirby School, a private school for grades 6 through 12, located approximately 0.25 mile to the southwest. There are no hospitals within one-half mile of the Site.

2.2 Historical Land Use

The following summarizes the historical land use based on information presented in the Phase I Report:

- Beginning in approximately 1850, the area surrounding the Site was used for limestone mining and the production of lime;
- From approximately 1912 through 1986, the Site was part of a social club that included:
    - In 1912, the Site and surrounding open space were developed into an 18-hole golf course and social club. The Pogonip clubhouse is located north of the Site;
    - In 1935, the golf course was turned into polo fields with horse stables located immediately offsite to the west;
    - In 1937, the polo club constructed a skeet shooting range in the west meadow between Golf Club Drive and the ravine;

- o In 1948, a shooting range with a "Remington electrical trap" was added adjacent to the existing skeet shooting range, and the grounds were leveled by grading;
- o A 1956 aerial photograph of the Site shows the shooting range infrastructure removed and the area opened to rangeland; it is not clear when the shooting ranges were closed;
- o From approximately 1958 to 1967, the Site was used for cattle grazing; and
- o In 1987, the clubhouse was posted as unsafe for occupancy.

2.3 Current Land Use

In 1989, the Site was acquired by the City and has since been maintained as recreational open space. A fire break is maintained along the eastern boundary of the Site. During Phase I activities, Site inspection observations included concrete shooting pads and clay target fragments in the west meadow (Appendix A). In addition, the presence of camp sites and some trash and debris, including shopping carts and hypodermic needles, were observed largely in the ravine area.

2.4 Anticipated Land Use

Recent plans for the Pogonip Farm and Garden indicate that a building complex, consisting of an administrative building, a pole barn, two greenhouses, and parking, is planned for the northwest portion of the west meadow along Golf Club Drive with a variety of perennial orchards and row crops across the Site. The *Pogonip Farm & Garden Operations and Management Plan* (HGP, 2017) describes best management practices (BMPs) and garden design considerations that incorporate mitigation measures and avoid sensitive areas of wetlands, erodible soil, slopes, and established native vegetation. The BMPs include:

- No cultivation in gullies and seeps north of the ravine;
- Limited cultivation in select areas with 15% slope;
- A 30-foot wide vegetated buffer between a cultivated field and an adjacent 30% downslope; and
- A 50-foot wide vegetated buffer zone between the edge of wetlands, and further limits planting to trees, perennials, herbs, and plants that require infrequent cultivation within 50-100 feet of a wetland.

These features are incorporated into the proposed garden boundaries. As depicted on Figure 2, the row crops are planned for the southern portion of the west meadow and the east meadow and perennials and orchards are planned for the north portion of the Site.

2.5 Geological and Hydrogeological Setting

As described in the Phase I Report, grassland terraces are composed of fine-grained unconsolidated terrace deposits that overlie bedrock sandstones of the Santa Margarita Formation. Perched shallow groundwater supports seasonal wetlands and seeps. A 345-foot deep water supply well near the Pogonip clubhouse reported a depth to water of 128 feet below ground surface (bgs) in 1993. Previous investigations indicate subsurface soils at the Site consist mainly of sandy silts with fine-grained sand to depths of 2 feet bgs.

2.6 Previous Investigation Activities

The following investigations were previously completed at the Site:

2.6.1 2018/2019 Soil Sampling

HGP conducted agricultural soil testing and incorporated evaluation of the potential agricultural impacts of the lead associated with the historic shooting range (HGP, 2019). This evaluation indicated the following:

- Extractable lead concentrations ranging from 0.9 parts per million (ppm) to 89.8 ppm, which exceeded a laboratory-recommended threshold for safe agricultural use of 22 ppm; and
- Total sorbed lead concentrations ranging from 56.08 milligrams per kilogram (mg/kg) to 145.86 mg/kg, which were below a threshold of 400 mg/kg that would require implementation of modified farming practices (HGP, 2019).

Based on these results, the City decided to conduct additional sampling at the Site.

2.6.2 2019 Soil Sampling

Soil samples were collected from 52 soil borings, each advanced to approximately 2 feet bgs, in the west meadow at the Site (Environmental Investigation Services, Inc., 2019). Twelve 4-part composite samples (B1 through B12) were collected from 48 borings at depths of approximately 0 to 0.5 foot bgs (surface) and 1.5 to 2 feet bgs (shallow). Additionally, one 4-part composite sample (B13) was collected from approximately 0 to 0.5 foot bgs. The surface composite samples were analyzed for select metals (total lead, arsenic, copper, and zinc), PAHs, and total petroleum hydrocarbons (TPHs) as diesel and motor oil (with silica gel cleanup). The 1.5-2 foot bgs composite samples were analyzed for metals only. The 4-part composite sample results at borings B1 and B3 reported lead concentrations exceeding the soil screening level (SL) of 80 mg/kg; therefore, the four individual samples for these locations were also analyzed for lead. Data summary tables and figures from previous reports are provided in Appendix A.

2.7 Updated Screening Level Evaluation of 2019 Soil Sampling Results

The prior screening level evaluation was conducted by comparing the 2019 laboratory analytical results to Regional Water Quality Control Board (RWQCB) Environmental Screening Levels (ESLs; RWQCB, 2019) and background levels for metals (Lawrence Berkeley National Laboratory [LBNL], 2009; Duvergé, 2011). The screening level evaluation was updated to assess an unrestricted land use scenario by using residential USEPA Regional Screening Levels (RSLs; USEPA, 2019) modified per DTSC Office of Human and Ecological Risk Human Health Risk Assessment (HHRA) Note Number 3 (HHRA Note 3; DTSC, 2019) in accordance with PEA Manual (DTSC, 2015). For TPH, RWQCB ESLs were used. Background levels were also considered. Table A summarizes the updated soil screening level evaluation of 2019 soil sampling results.

Table A
Updated Soil Screening Level Evaluation
Concentrations in mg/kg

Constituent	Residential Screening Level	Samples Exceeding Screening Level	Concentration
Metals			
Lead (n=41)	80	B1 (0.5 Composite) B1N-0.5 B1E-0.5 B3 (0.5 Composite) B3N-0.5 B3W-0.5	120 150 110 84 190 89
Arsenic (n=25)	11 (Background)	None	-
Copper (n=25)	3,100	None	-
Zinc (n=25)	23,000	None	-

Table A
Updated Soil Screening Level Evaluation
Concentrations in mg/kg

Constituent	Residential Screening Level	Samples Exceeding Screening Level	Concentration
Total Petroleum Hydrocarbons (n=12)			
TPH as Diesel	260	None	-
TPH as Motor Oil	12,000	None	-
Polycyclic Aromatic Hydrocarbons (PAHs) (n=12)			
Acenaphthene	3,300	None	-
Anthracene	17,000	None	-
Benzo[a]anthracene	1.1	None	-
Benzo[b]fluoranthene	1.1	None	-
Benzo[k]fluoranthene	11	None	-
Benzo[a]pyrene	0.11	B5 (0.5 Composite) B6 (0.5 Composite) B7 (0.5 Composite) B11 (0.5 Composite)	0.44 0.32 0.64 0.19
Benzo[g,h,i]perlyene	Not Established	None	-
Chrysene	110	None	-
Dibenzo[a,h]anthracene	0.028	B5 (0.5 Composite) B6 (0.5 Composite) B7 (0.5 Composite) B11 (0.5 Composite)	0.063 0.066 0.17 0.031
Fluoroanthene	2,400	None	-
Fluorene	2,300	None	-
Indeno[1,2,3-cd]pyrene	1.1	None	-
Phenanthrene	Not Established	None	-
Pyrene	1,800	None	-

Exceedances of background or risk-based screening levels (SLs) are typically used to determine whether restrictions or further actions are warranted. Based on this evaluation, lead, and the PAHs, benzo[a]pyrene and dibenzo[a,h]anthracene, were the only constituents reported at concentrations that exceeded applicable SLs.

3.0 APPARENT PROBLEM

Potential sources of contamination at the Site include the deposition of shot and clay target fragments from the operation of the historic shooting range. Following the closure of the shooting range, the Site was used for cattle grazing, which potentially pushed the shot and clay target fragments from the surface into the shallow soil.

3.1 Conceptual Shooting Range Contaminant Distribution

The distribution of contaminants associated with shooting ranges typically display a systematic pattern (Interstate Technology & Regulatory Council [ITRC], 2005). In general, metals, primarily lead and to a lesser extent antimony, arsenic, copper and zinc, are associated with shot, and PAHs are associated with clay targets. These materials were expected to be deposited on the surface or near surface.

Trap and skeet shooting ranges feature a fan-shaped shot and clay target fall zone radiating from the shooting pads. Although the distribution may vary, the following general dimensions relative to the shooting pads were hypothetically expected:

- 0 to 100 feet – Spent cartridge cases and wads;
- 200 to 325 feet – Clay target fragments; and
- 200 to 700 feet (skeet)/770 feet (trap) – Shot fall zone, with the greatest anticipated shot density at 400 to 600 feet.

The hypothetical distribution of shot and clay target fragments, along with planting areas are shown on Figure 2. These features are augmented with the prior (2019) and recent (2020) soil sampling locations on Figures 3 and 4.

3.2 Site Condition Summary

During previous Site visits, concrete shooting pads and clay target fragments were noted in the west meadow.

Comparison of the 2019 sampling results to the hypothetical distribution indicates the following:

- Samples with lead concentrations exceeding screening levels were limited to surface soil in the northwestern portion of the west meadow (B1 borings) in an area that is outside the hypothetical shot fall distribution, and the northern portion of the west meadow

(B3 borings) near the edge of hypothetical shot fall distribution. Associated soil samples from 1.5-2.0 foot bgs were consistent with background levels providing vertical delineation of the lead exceedances; and

- Samples with PAH concentrations exceeding screening levels were limited to surface soil in the eastern portion of the west meadow (B5 and B7 borings) consistent with hypothetical clay target fall area, and the central portion of the west meadow (B6 and B11 borings) near a former shooting pad location. Associated soil samples from 1.5-2.0 foot bgs were not analyzed for PAHs.

These findings indicate the following data gaps:

- The magnitude of select metals (lead, antimony, arsenic, copper, zinc) concentrations in unsampled areas within the planned planting footprint in the west meadow;
- The extent and magnitude of select metals (lead, antimony, arsenic, copper, zinc) concentrations within the planned planting footprint in the north orchard and east meadow where higher shot fall density is anticipated;
- The extent and magnitude of PAH concentrations within the planned planting footprint in the western portion of the north orchard and east meadow; and
- The vertical extent of PAH concentrations that exceed screening levels in the west meadow and other areas.

4.0 HUMAN HEALTH CONCEPTUAL SITE MODEL

To develop a conceptual understanding of the Site, information regarding potential chemical source, chemical release and transport mechanisms, locations of potentially exposed human receptors, and potential exposure routes were assessed. This information is outlined schematically in the human health conceptual site model (CSM) shown on Figure 5. The CSM associates sources of chemicals with potentially exposed human receptors and associated complete exposure pathways. In this way, the CSM assists in quantifying potential impacts to human health.

As defined by the USEPA (USEPA, 1989), the following four components are necessary for a chemical exposure pathway to be considered complete and for chemical exposure to occur:

- A chemical source and a mechanism of chemical release to the environment;
- An environmental transport medium (e.g., soil) for the released chemical;
- A point of contact between the contaminated medium and the receptor (i.e., the exposure point); and
- An exposure route (e.g., incidental ingestion of soil) at the exposure point.

As described below, these components provide a basis for the CSM.

4.1 Chemical Source, Release, and Transport

To evaluate the first two components necessary for a complete exposure pathway, chemical properties of the detected chemicals and the physical characteristics of the Site were reviewed to identify factors that might allow the release and transport of chemicals. As discussed in Section 3.0, the potential source of impacts at the Site is related to the deposition of shot and clay target fragments. Based on historic land use as a shooting range and previous Site investigations, the chemicals of potential concern (COPCs) include metals and PAHs, which tend to adsorb to soil particles and typically do not readily dissolve into water or volatilize into ambient air. Therefore, this PEA focuses on evaluating direct contact exposure to metals and PAHs in on-Site soil.

4.2 Potential Receptors

The third component necessary for an exposure pathway to be complete is identification of potential receptors at the Site based on anticipated land use. Based on the anticipated future land use as an agricultural and educational farm with a commercial building complex, the following hypothetical receptors were considered in this CSM:

- Future On-Site Unrestricted Receptor; and
- Future On-Site Commercial Worker Receptor.

The unrestricted receptor was included to evaluate an unrestricted land use scenario, which is considered the most protective scenario for potential on-Site receptors including farm and garden workers.

A future on-Site construction worker receptor will be present during redevelopment of the Site; but this receptor will be a short-term receptor, performing activities subject to applicable administrative controls (e.g., Site Management Plan [SMP], Site Health and Safety Plan [HSP], and BMPs). Section 8.1.2 of the human health screening evaluation (HHSE) discusses the hypothetical receptors further.

4.3 Complete Exposure Pathways

The fourth and final component, a complete exposure pathway (i.e., route of exposure) is discussed in combination with the third component (i.e., presence of receptors at an exposure point) to define those exposure pathways considered to be complete and significant for the future on-Site receptors. The exposure pathways assumed to be complete and significant for the hypothetical future on-Site receptors includes the following:

- Incidental ingestion of soil;
- Dermal contact with soil; and
- Inhalation of fugitive dust.

As a working farm and garden, it is assumed that the future on-Site farm and garden worker receptor will grow fruits and vegetables to consume and/or sell to the public. The produce sourced from the Pogonip Farm and Garden will only account for a portion of a potential receptors diet; therefore, is not likely a significant exposure pathway. Evaluation of the exposure pathways listed above for an unrestricted land use scenario are considered adequately protective for the proposed future land use at the Site.

This CSM provides a scientifically defensible basis for the selection of potential hypothetical receptors and the most likely ways they might be exposed to chemicals at the Site. Due to the potential presence of metals and PAHs in soil at the Site, further evaluation of soil impacts was performed, as described in the following sections.

5.0 FIELD ACTIVITIES

The following sections describe the pre-field activities, sampling procedures, sample handling, decontamination, and borehole completion procedures.

5.1 Pre-field Activities

The following pre-field activities were conducted prior to mobilizing for the sampling event.

5.1.1 Site Health and Safety Plan

A HSP covering the field activities described in this Report was provided in the Work Plan. The HSP complies with Federal Occupational Safety and Health Administration (OSHA) regulations (29 Code of Federal Regulations [CFR], Section 1910.120) and California OSHA regulations (8 California Code of Regulations [CCR], Section 5192). Field personnel were required to follow the procedures set forth in the HSP. Based on historical Site information, the work was completed using OSHA Level D personal protective equipment (PPE). Due to the COVID-19 pandemic, field work schedules considered local Shelter-in-Place orders and social distancing protocols were implemented during the sampling activities.

5.1.2 Site Reconnaissance

On February 12, 2020, RMD, DTSC, and City personnel conducted a Site visit to discuss historical Site activities, review proposed sample locations, and evaluate potential access issues. On February 19, 2020, RMD and DTSC personnel conducted a second Site visit to evaluate the potential use of a metal detector to screen surface soil for shot.

Two arcs of concrete pads were observed and appear to define northern and southern shooting ranges. The fan-shaped clay target and shot fall distribution associated with the orientation of shooting pads observed during Site reconnaissance are depicted on Figure 2.

5.2 Borehole Clearance

To confirm the absence of obstructions and as required, the Site was marked with white paint and survey stakes. At least 72 hours before sampling activities were conducted, Underground Services Alert (USA) was notified to mark the locations of potential subsurface utilities beneath the Site.

5.3 Soil Sampling Locations and Depths

Between May 12, 2020 and May 15, 2020, soil samples were collected from 71 boring locations across the Site (Figures 3 and 4). Twenty-six soil borings were located in the west meadow, 12 soil borings were located in the north orchard, and 33 soil borings were located in the east meadow. Soil sample locations were selected based on the planned planting areas, findings of the 2019 soil investigation, and hypothetical shot and clay target fragment fall zones. Soil sampling locations and rationale are presented below in Table B.

Table B
Soil Sample Locations and Rationale

Area	Sampling Location	Rationale
West Meadow	WM-C-1, WM-C-2, WM-C-3, WM-C-4	Confirm previous findings of lead concentrations exceeding soil SLs
	WM-C-5, WM-C-6, WM-C-7	Confirm previous findings of lead below soil SLs
	WM-C-8, WM-C-9, WM-C-10, WM-C-11	Confirm previous lead concentrations, evaluate PAH concentrations exceeding soil SLs and vertical extent of PAH concentrations exceeding soil SLs
	WM-DG-1 through WM-DG-15	Improve data density near the planned building complex, within the wetland buffer, between previous B4 and B5 borings, and in the wooded area between previous B8 and B9 borings
North Orchard	NO-1 through NO-12	Evaluate lateral and vertical extent of lead and PAH concentrations
East Meadow	EM-1 through EM-33	Evaluate lateral and vertical extent of lead and PAH concentrations

During field activities, soil boring locations were measured and recorded using a Garmin eTrex 20x handheld global positioning system (GPS) navigator, which has an estimated GPS location accuracy of around 10 feet, 95% of the time, according to the manufacturer. The GPS coordinates of each boring location are included on the field sampling forms presented in Appendix B and in the GPS data file presented in Appendix C.

5.4 Soil Logging, Screening, Sampling, and Laboratory Analysis

The following presents the soil logging, screening, sampling, and laboratory analysis. A sampling and analysis plan (SAP) was presented in the Work Plan.

5.4.1 Soil Logging

Each of the soil borings were advanced using a hand auger up to an approximate target depth of 2 feet bgs. During boring advancement, soil at approximate 6-inch intervals (0-0.5 foot bgs, 0.5-1.0 foot bgs, 1.0-1.5 foot bgs, and 1.5-2.0 foot bgs) was segregated and placed in a clean resealable plastic bag. Soil was visually inspected and logged using the Unified Soil Classification System (USCS). Visual observations were recorded on field forms and are presented in Appendix B.

5.4.2 Soil Screening

Visual Observations: Soil at the surface and from the four 6-inch intervals was visually inspected for evidence of shot and clay target fragments.

Shot fragments were observed at the following boring locations and depths:

- WM-DG-11 at 0.5 to 2 feet bgs; and
- WM-DG-13 at 1 to 2 feet bgs. Shell casings were also observed at this location.

Clay target fragments were observed at the following boring locations and depths:

- WM-C-9/9A at 0.5 to 1.5 feet bgs;
- WM-DG-11/11A at 0.5 to 1 foot bgs;
- WM-DG-13 at 0.5 to 2 feet bgs; and
- EM-10 at 0 to 0.5 foot bgs.

Observations were noted on the field forms presented in Appendix B and are summarized on Tables 1 and 2.

XRF Screening: Soil from the four 6-inch intervals was also screened with a handheld Olympus Vanta X-Ray Fluorescence (XRF) analyzer to evaluate the vertical distribution of lead in the field. A summary of the XRF measurements includes the following:

- Lead concentrations of more than 1,000 ppm were measured at the following boring locations and depths:
    - WM-DG-13 at 0-0.5 foot bgs;
    - EM-9 at 0-0.5 foot bgs; and
    - EM-10 at 0-0.5 foot bgs.
- Lead concentrations between 500 ppm and 1,000 ppm were measured at the following boring locations and depths:
    - NO-3 at 0-0.5 foot bgs;
    - EM-7 at 0-0.5 foot bgs;
    - EM-8 at 0.5-1 foot bgs;
    - EM-11 at 0-0.5 foot bgs; and
    - EM-21 at 0-0.5 foot bgs.

XRF measurements were conducted in general accordance with USEPA Method 6200. The handheld XRF analyzer was factory calibrated. At the beginning of each day, the XRF analyzer was allowed to warm up for 15 to 30 minutes before analysis of samples, and checked against a manufacturer-provided standard sample. On May 14, 2020, the battery did not fully charge overnight and XRF readings were not recorded the 1.5-2.0 foot bgs interval of boring WM-C-8 and boring WM-C-10. XRF measurements for each boring location and depth were recorded on field forms and results of the standard sample measurements were recorded on an XRF Calibration Log (Appendix B). The downloaded XRF data are presented in Appendix D.

5.4.3 Soil Sample Selection

Two soil samples were collected from each boring location as follows:

- Of the 0-0.5 foot bgs, 0.5-1.0 foot bgs, and 1.0-1.5 foot bgs aliquots, the "surface" soil sample was selected based on the 6-inch soil interval with the highest relative shot/clay target fragment density. XRF readings were considered when similar shot fragment densities were observed. In the absence of field screening indicators (i.e., shot/clay target fragments, elevated XRF readings), the 0-0.5 foot bgs soil interval was sampled;

- The 1.5-2.0 foot bgs soil interval (the "shallow" soil sample); and
- Following daily review of field data, additional soil samples were collected from two borings immediately adjacent to borings WM-C-9 and WM-DG-11. The two additional borings, WM-C-9A and WM-DG-11A, were each advanced to 1 foot bgs for collection of the 0.5-1.0 foot bgs samples where the highest clay target fragment density was observed in each boring.

5.4.4 Soil Sampling Procedures

Soil samples were collected in laboratory-supplied glass jars. The sample containers were labeled, placed in sealable, plastic bags, and stored in a chilled cooler for transportation under standard chain-of-custody procedures to Pace Analytical National Center for Testing & Innovation in Mt. Juliet, Tennessee (Pace), a California-certified laboratory.

5.4.5 Soil Laboratory Analyses

The selected soil samples were analyzed for select metals (lead, antimony, arsenic, copper, and zinc) and PAHs according to the following criteria:

- Metals analysis – Samples were sieved at the laboratory using a No. 10 sieve prior to analysis using USEPA Method 6010B.;
  - Surface samples: Metals were analyzed in surface samples collected at each boring; and
  - Contingency analysis: Shallow samples from each boring were placed on hold at the laboratory pending review and evaluation of the surface sample analyses. Where metals screening levels were exceeded in the surface samples, the shallow sample from the same boring was analyzed for the metal or metals that exceeded screening levels.

- PAHs analysis – Samples were analyzed using USEPA Method 8270 in Selected Ion Monitoring (SIM) mode.
  - Surface samples: PAHs were analyzed in the surface samples collected from borings in the west meadow, and the first row of borings adjacent to the ravine in the north orchard and east meadow;
  - Shallow samples: PAHs were analyzed in shallow samples collected from borings WM-C-8, WM-C-9, WM-C-10, and WM-C-11 in the west meadow, located near previous composite-sample borings B5, B6, B7, and B11 where PAHs in shallow soil samples exceeded screening levels; and
  - Contingency analysis: The remaining surface and shallow samples were placed on hold at the laboratory pending review and evaluation of the requested analyses. Where PAH screening levels were exceeded, the associated shallow sample from the same boring was analyzed for PAHs.

Laboratory analytical reports are presented in Appendix E. Analytical results are summarized on Tables 1 and 2 and in Section 6.0.

5.5 Decontamination Procedures

Reusable augering and sampling devices that were in contact with potentially contaminated soil were decontaminated between each boring location using the following procedures:

1. Knock off loose soil with a brush;
2. Wash with non-phosphate detergent and tap water;
3. Rinse with tap-water;
4. Rinse with distilled water; and
5. Set on clean surface to air dry.

Equipment blanks were collected in the field to evaluate the cleanliness of the sampling equipment. Reusable equipment was tested daily to verify that the decontamination was effective. Four field equipment blanks were collected during the sampling activities and analyzed for metals and PAHs.

5.6 Borehole Completion

Following completion of soil sampling activities, each boring was backfilled to the surface with soil cuttings.

6.0 SOIL ANALYTICAL RESULTS

A total of 103 samples were analyzed for select metals (antimony, arsenic, copper, zinc, and/or lead), including four duplicates, and 48 samples were analyzed for PAHs, including two duplicates. Analytical results were compared with the soil SLs for unrestricted land use with background levels for arsenic as presented in the Work Plan[1]. For reference, the soil SLs are included on the analytical summary tables (Tables 1 and 2) and values that exceed applicable SLs are shaded. The analytical results are briefly described below, summarized in Tables 1 and 2, and presented in Appendix E. Figure 3 depicts the locations of soil samples analyzed for metals with lead concentrations exceeding soil SLs shown and highlighted. Figure 4 depicts the locations of soil samples analyzed for PAHs with concentrations exceeding soil SLs shown and highlighted.

6.1 Metals

A total of 103 samples were analyzed for metals, including 76 surface samples and 27 shallow samples. Twenty-six of the 27 shallow samples were analyzed for lead only. A summary of detected concentrations is presented below.

- Lead was detected above laboratory reporting limits (RLs) in each of the 103 samples analyzed at concentrations ranging from 3.97 mg/kg to 1,670 mg/kg. Lead concentrations exceeded the soil SL of 80 mg/kg in 29 surface samples and four shallow samples;
- Antimony was detected above RLs in 63 of the 77 samples analyzed at concentrations ranging from 0.568 mg/kg to 41.7 mg/kg. Antimony concentrations exceeded the soil SL of 31 mg/kg in one surface sample and was not detected above the soil SL in the one shallow sample analyzed;
- Arsenic was detected above RLs in 72 of the 77 samples analyzed at concentrations ranging from 0.554 mg/kg to 15.9 mg/kg. Arsenic concentrations exceeded the background level of 11 mg/kg in one surface sample and was not detected above the background level in the one shallow sample analyzed;

[1] Soil SLs are based on USEPA Regional Screening Levels (RSLs; USEPA, 2020) modified per DTSC Office of Human and Ecological Risk Human Health Risk Assessment (HHRA) Note Number 3 (HHRA Note 3; DTSC, 2020) in accordance with PEA Manual (DTSC, 2015) for unrestricted land use (residential) and background levels for arsenic.

- Copper was detected above RLs in each of the 77 samples analyzed at concentrations ranging from 4.92 mg/kg to 6,320 mg/kg. Copper concentrations exceeded the soil SL of 3,100 mg/kg in one surface sample and was not detected above the soil SL in the one shallow sample analyzed; and
- Zinc was detected above RLs in each of the 77 samples analyzed at concentrations ranging from 12.9 mg/kg to 28,500 mg/kg. Zinc concentrations exceeded the soil SL of 23,000 mg/kg in one surface sample and was not detected above the soil SL in the one shallow sample analyzed.

6.2 Polycyclic Aromatic Hydrocarbons

A total of 48 samples were analyzed for PAHs, including 40 surface samples and 8 shallow samples. A summary of the detected concentrations is presented below.

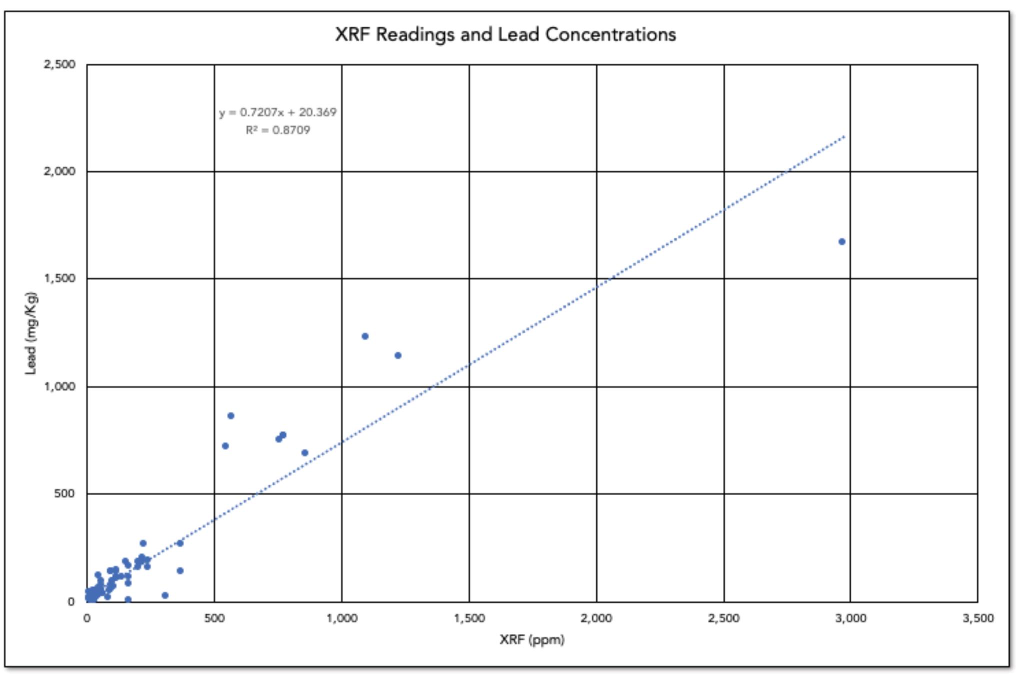
- Benzo(a)anthracene was detected above RLs in 25 of the 48 samples analyzed at concentrations ranging from 0.00212 mg/kg to 8.45 mg/kg. Benzo(a)anthracene concentrations exceeded the soil SL of 1.1 mg/kg in four surface samples and two shallow samples;
- Benzo(a)pyrene was detected above RLs in 28 of the 48 samples analyzed at concentrations ranging from 0.00239 mg/kg to 11.7 mg/kg. Benzo(a)pyrene concentrations exceeded the soil SL of 0.11 mg/kg in seven surface samples and four shallow samples;
- Benzo(b)fluoranthene was detected above RLs in 37 of the 48 samples analyzed at concentrations ranging from 0.00183 mg/kg to 14.8 mg/kg. Benzo(b)fluoranthene concentrations exceeded the soil SL of 1.1 mg/kg in four surface samples and two shallow samples;
- Dibenz(a,h)anthracene was detected above RLs in 16 of the 48 samples analyzed at concentrations ranging from 0.00377 mg/kg to 4.45 mg/kg. Dibenz(a,h)anthracene concentrations exceeded the soil SL of 0.028 mg/kg in seven surface samples and four shallow samples;
- Indeno(1,2,3-c,d)pyrene was detected above RLs in 23 of the 48 samples analyzed at concentrations ranging from 0.00213 mg/kg to 6.25 mg/kg. Indeno(1,2,3-c,d)pyrene concentrations exceeded the soil SL of 1.1 mg/kg in four surface samples and two shallow samples;

- Naphthalene was detected above RLs in 10 of the 48 samples analyzed at concentrations ranging from 0.00491 mg/kg to 4.68 mg/kg. Naphthalene concentrations exceeded the soil SL in one surface sample and was not detected above the soil SL in the shallow samples analyzed; and
- Other PAHs were detected above RLs but did not exceed their respective soil SLs and do not pose a human health risk.

6.3 Findings

The following summarizes the findings of the field activities:

- Field screening results indicate that XRF readings provide a better indicator of lead concentrations than visual observations of shot fragments. Soil samples from 27 boring locations exceeded the soil SL for lead. As summarized on Table 1, shot was observed at two boring locations with lead concentrations below soil SLs at boring WM-DG-11 and exceeding soil SLs at boring WM-DG-13, where shell casings were observed. As shown on the graph below, XRF readings exhibit a favorable correlation with lead concentrations in associated sieved soil samples. The general absence of observed shot fragments and favorable correlation between XRF readings and lead concentrations in sieved soil samples suggest that the shot has dissolved and associated metals have sorbed to soil during the more than 60 years since deposition.



- Soil samples from eight boring locations exceeded one or more soil SL for PAHs. As summarized on Table 2, clay target fragments were observed at four boring locations with PAH concentrations below soil SLs at boring WM-DG-6 and the primary sample from boring WM-DG-11 and exceeding soil SLs at borings WM-C-9A, WM-DG-11 (duplicate), and WM-DG-13.
- Lead exceeded soil SLs in the following areas:
  - West Meadow:
    - Northwest of the proposed building complex (WM-C-1, WM-C-2, WM-DG-1). This area is outside the hypothetical shot fall distribution.
    - Boring WM-DG-13, south of the southern shooting range. A shell casing was observed at this location.
    - North of the seasonal wetland (WM-C-3, WM-C-4, WM-DG-7). This area is within the hypothetical shot fall zone.
    - The 1.5-2.0 foot bgs soil samples analyzed did not exceed soil SLs.
  - North Orchard:
    - Western portion of this area (NO-1, NO-2, NO-3, NO-4, NO-6) within and near the northwestern extent of the hypothetical shot fall zone.
    - The 1.5-2.0 foot bgs soil samples analyzed did not exceed soil SLs.
  - East Meadow:
    - West/South portion of this area along the ravine and extending eastward in the southern portion (EM-1, EM-2, EM-3, EM-4, EM-5, EM-6, EM-7, EM-8, EM-9, EM-10, EM-11, EM-19, EM-20, EM-21, EM-22). This area is within the hypothetical shot fall zone and reported the highest lead concentrations observed.
    - The 1.5-2.0 foot bgs soil samples analyzed reported lower concentrations than overlying samples; however, several of these deeper samples exceeded soil SLs (EM-7, EM-8, EM-9, EM-11).

- Antimony, arsenic, copper and zinc (as well as lead) exceeded soil SLs in the one boring (WM-DG-13) where shell casings were observed. Concentrations of these metals were below soil SLs in the deeper soil sample, indicating attenuation across a vertical interval of 1 foot or less.
- PAH concentrations indicated the following:
  - West Meadow:
    - Benzo(a)pyrene and dibenz(a,h)anthracene, with or without benzo(a)anthracene, benzo(b)fluoranthene, indeno(1,2,3-c,d)pyrene, and naphthalene, exceeded their soil SLs near the historic shooting ranges in the west meadow.
    - The analyzed 1.5-2.0 foot bgs soil samples did not consistently exhibit lower concentrations than overlying samples. For example, at boring WM-C-11, PAHs were not detected above RLs in the surface sample (note that estimated concentrations between the method detection limit and the RL were noted for several constituents) while soil SLs for several PAHs were exceeded in the shallow sample.
  - North Orchard:
    - PAHs were not detected above RLs.
  - East Meadow:
    - Although clay target fragments were observed at east meadow boring EM-10, PAHs were not detected above RLs in the associated sample.

7.0 DATA QUALITY OBJECTIVES

Data quality objectives (DQOs) are qualitative and quantitative statements for establishing criteria for data quality and for preparing data collection designs. The seven-step DQO approach for this project was described in the Work Plan. The purpose of the DQOs for this project was to provide data of known and sufficient quality and quantity to support the evaluation of potential impacts and management of potential associated risks. This section outlines quality assurance and quality control (QA/QC) protocols that were assessed to ensure that the data collected met the DQOs for the project.

QA protocols were conducted for the following components of the analytical laboratory reports: chain of custody and holding times, field and laboratory duplicates, equipment and method blanks, laboratory control samples, surrogates, and method detection limits. As described in the following sections, the analytical results are considered acceptable based on a review of these data quality indicators.

7.1 Precision

Precision is the reproducibility of measurements under a given set of conditions. For large data sets, precision is expressed as the variability of a group of measurements compared to their average value (i.e., standard deviation). For duplicate measurements, precision is expressed as the relative percent difference (RPD) of a data pair and is calculated using the following equation:

$$RPD = \frac{(A-B)}{(A+B)/2} \times 100$$

Where: RPD = Relative Percent Difference

A = First Sample Value (original)

B = Second Sample Value (duplicate)

Field Precision: Field precision was assessed through the collection and analysis of field duplicate samples. Field duplicates were collected for laboratory analysis at a rate of about 5-percent of the primary samples.

Four field duplicate soil samples were collected and analyzed for metals and two field duplicates samples were collected and analyzed for PAHs. Duplicate sample results were compared to primary sample results and an RPD was calculated for each duplicate pair. Field duplicate sample results were evaluated using 50 percent as the acceptance criteria. Eight of the 25 RPDs calculated exceeded the 50 percent acceptance criteria. Each of the eight RPDs exceeding 50 percent were from the surface sample collected at boring WM-DG-11, which is likely attributed to heterogeneity of the soil matrix at this location. RPD values are presented in Table E-1 of Appendix E.

Laboratory Precision: Laboratory precision was assessed using the calculated RPD between the following data:

- Matrix spike/matrix spike duplicate (MS/MSD) sample data; and
- Primary and associated field duplicate sample data.

The RPDs for laboratory matrix spike/matrix spike duplicate (MS/MSD) samples were reviewed using specific RPD acceptance criteria for each analytical method. Several MS/MSD sample recoveries were above or below the acceptance criteria and the following notes were made in the laboratory reports:

- J3 – The associated batch QC was outside the established quality control range for precision; and
- J6 – The sample matrix interfered with the ability to make any accurate determination; spike value is low.

The RPDs for field duplicate samples were discussed above.

7.2 Accuracy

Accuracy is the degree of agreement of a measurement or an average of measurements with an accepted reference or "true" value, and is a measure of bias in the system. The accuracy of a measurement system is affected by errors introduced through the sampling process, field contamination, and sample preservation, handling, matrix, preparation, and analytical techniques.

Accuracy was evaluated using the percent recovery (%R) calculated using the following equation:

$$\%R = \frac{|X_s - X_u|}{K} \times 100\%$$

Where: X_s is the measured value from the spiked sample

X_u is the measured value of the unspiked sample

K is the known amount of the spike in the sample.

The background level (X_u) is set to zero when percent recovery is calculated for the laboratory control sample or other standard reference materials.

Field Accuracy: Although accuracy of the field program cannot be assessed quantitatively, a qualitative bias assessment was conducted by reviewing the sample collection, preservation, handling, and shipping procedures for compliance with the specifications of the Work Plan.

The chain of custody and Laboratory Sample Receipt Checklists were reviewed for accuracy, representativeness, and completeness. The number of samples collected from each sample location were reviewed and are consistent with the sampling and analysis plan presented in the Work Plan, except at borings WM-DG-9 and WM-DG-11, where supplemental samples were collected from adjacent borings to analyze samples from the interval with the highest observed clay target fragment density. Contingency sample analyses were requested upon review of the original analytical results and comparison to applicable screening levels. Sample locations, depths, and corresponding analytical methods were verified. Sample containers and preservation methods were reviewed for appropriateness. The laboratory analyses were conducted within acceptable holding times.

Four field equipment blanks, one per day, were collected during the sampling activities and analyzed for metals and PAHs. No compounds were detected above the RL in the four equipment blanks analyzed. Copper was detected in each of the four equipment blanks at estimated concentrations between method detection limits (MDLs) and the RL, which were qualified with a J-flag. At these levels, any residual copper on field equipment is not expected to significantly impact the results of this investigation.

Laboratory Accuracy: Laboratory accuracy was assessed quantitatively through the analysis of standards (organic analysis only), MS/MSD samples, surrogate spikes (organic analysis only), laboratory control sample (LCS), response factors for calibration standards, internal standard recoveries, and interference check samples (metals only).

Laboratory accuracy through standard MS/MSD samples were discussed in Section 7.1.

Laboratory control samples (LCS) and laboratory control sample duplicates (LCSD) in the analytical results were reviewed for accuracy. Each of the LCS and LCSD values were within acceptable limits.

Surrogate recoveries in the analytical results were reviewed for accuracy. Each of the surrogate recovery values were within acceptable limits.

7.3 Representativeness

Representativeness is a qualitative expression of the degree to which sample data accurately and precisely represent a characteristic of a population, a sampling point, or an environmental condition. Representativeness is maximized by ensuring that, for a given task, the number and location of sampling points and the sample collection and analysis techniques are appropriate for the specific investigation, and that the sampling and analysis program provides information that reflects "true" Site conditions.

Field Duplicate Evaluation: Field duplicate samples were collected and analyzed to evaluate sampling and analytical precision. Because precision is affected by several variables including sample heterogeneity, sample collection procedures, sample preparation and sample analysis, the results of field duplicates were used as additional evidence to support data quality rather than as a basis for accepting or rejecting the data. Field duplicate sample results were discussed in Section 7.1.

Laboratory Data: Laboratory data were evaluated for representativeness by assessing whether the laboratory followed the specified analytical criteria, assessing compliance with holding time criteria and the results of method and instrument blank samples, and field duplicate samples.

As discussed in Section 7.1, the chain of custody and Laboratory Sample Receipt Checklists were reviewed for accuracy, representativeness, and completeness. Field duplicate sample results were discussed in Section 7.1.

Method blanks presented in the analytical reports were reviewed for analyte detections. There were method blank detections in the following laboratory reports:

- L1219079 – 0.534 mg/kg of arsenic (J-flagged);
- L1219490 – 4.42 mg/kg of antimony; and
- L1222033 – 0.587 mg/kg of arsenic (J-flagged).

7.4 Completeness

Completeness is the amount of valid data obtained compared to the amount expected under ideal conditions. The number of valid results divided by the number of possible results, expressed as a percentage, determines the completeness of the data set. The DQO for completeness is to obtain valid results for at least 90 percent of the planned analytical results. The formula for calculation of completeness is presented below:

% Completeness = 100 x (number of valid results)/(number of expected results)

As discussed in Section 7.1, the chain of custody and Laboratory Sample Receipt Checklists were reviewed for accuracy, representativeness, and completeness. Valid results were obtained for 100% of the samples.

7.5 Comparability

Comparability is a qualitative parameter that expresses the confidence with which one data set may be compared to another. Comparability is dependent on similar QA/QC objectives and is achieved through the use of standardized methods for sample collection and analysis, the use of standardized units of measure, and the use of standard and comprehensive reporting formats.

Laboratory data comparability is dependent on the use of similar sampling and analytical methodology and standard units of measure between different tasks at a specific site. Chemical data were collected using standard sampling and analyses procedures. Data comparability were assessed by comparing investigative sample data to QA/QC results discussed in DQOs above.

7.6 Method Detection Limits

The target MDLs and/or RLs were reviewed and compared to the screening levels outlined in the Work Plan. The RLs were below the screening levels applicable to the COPCs.

8.0 HUMAN HEALTH SCREENING EVALUATION

This section describes and presents the results of the HHSE for the COPCs detected in soil at the Site. This HHSE was conducted to further evaluate potential exposures associated with the anticipated future land uses, which include a building complex and agriculture farm and garden (i.e., perennial orchards and row crops), in order to identify the need for any remediation, mitigation, or engineering controls to adequately protect human health. The potential source of soil impacts at the Site is related to the deposition of shot and clay target fragments based on former land use as a shooting range. The methods used in this HHSE are in accordance with the PEA Guidance Manual (DTSC, 2015) and current guidance issued by the DTSC HERO (DTSC, 2020).

8.1 Media of Concern, Receptors, and Exposure Pathways

8.1.1 Media of Concern

This HHSE assesses whether COPCs in surface and shallow soil pose a potential health risk to future Site users, which may be exposed to surface and shallow (less than 2 feet) soil during maintenance, landscaping, farming, or gardening activities.

8.1.2 Potential Receptors

This HHSE focuses on the following long-term receptors exposed to soil:

- Future On-Site Unrestricted Receptor; and
- Future On-Site Commercial Worker Receptor.

Although a future on-Site construction worker may be exposed to soil during construction earthwork (e.g., trenching, grading, etc.), this receptor will be performing activities subject to applicable administrative controls (e.g., SMP, HSP, and BMPs). This receptor is expected to be a short-term outdoor worker (i.e., 2 weeks to 1 year) for a single construction or development project at the Site. The exposures for a construction worker receptor are expected to be limited in comparison to long-term worker receptors, which are described in more detail below.

The hypothetical future on-Site unrestricted receptor is included to evaluate an unrestricted land use scenario. This receptor is a long-term receptor that spends 350 days per year at the Site for a period of 26 years (as both a child [6 years] and an adult [20 years]). The unrestricted land use may include farming and gardening activities for the purpose of cultivating, consuming and/or selling produce.

The hypothetical future on-Site commercial worker receptor is a long-term adult receptor (i.e., greater than 7 years [USEPA, 1989]). This receptor is a full-time employee that is assumed to spend 250 days per year at work for 25 years. This receptor may spend the workday (8 hours per day) both indoors performing light office duties and outdoors performing moderate soil invasive activities in surface or near surface soil (e.g., maintenance or landscaping).

8.1.3 Potentially Complete and Significant Exposure Pathways

COPCs at the Site include metals and PAHs, which tend to adsorb to soil particles and typically do not readily dissolve into water or volatilize into ambient air. Therefore, this PEA focuses on evaluating direct contact exposure to metals and PAHs in on-Site soil. This HHSE assumes the following exposure pathways are complete and significant for the future on-Site receptors:

- Incidental ingestion of soil;
- Dermal contact with soil; and
- Inhalation of fugitive dust.

8.2 Chemicals of Potential Concern and Screening Level Evaluation

Typically, only the most toxic, persistent, and prevalent Site-related chemicals detected are fully evaluated in a HHSE. In this way, the evaluation can focus solely on those chemicals that are expected to account for the majority of the estimated health impacts at the Site. These selected chemicals are known as COPCs. Metals and PAHs were designated as the COPCs to be assessed at the Site based on the historic Site use.

The exposure point concentration (EPC) represents the amount of a chemical to which a hypothetical receptor is assumed exposed. The EPC is a conservative estimate of the average chemical concentration in an environmental medium in an assumed exposure area. Based on the assumption that farming and gardening under an unrestricted land use scenario may be located anywhere on-Site, a sample-by-sample comparison was made between detected concentrations in soil and appropriate screening levels. The sample-by-sample comparison conservatively ensured that compounds were not eliminated based on area-wide averages. Maintenance and landscaping activities under a commercial land use scenario will be located within the proposed building complex area in the west meadow.

As presented herein, soil samples were collected from the following anticipated future farm and garden areas:

- 26 soil borings were located in the west meadow;
- 12 soil borings were located in the north orchard; and
- 33 soil borings were located in the east meadow.

The soil data used in this HHSE for the west meadow, north orchard, and east meadow are presented in Tables 1 and 2.

A chemical was identified as a COPC if the following conditions applied:

- An EPC exceeding relevant background (ambient) concentration for metals only (PAHs are not considered naturally occurring at the Site); and
- An EPC exceeding applicable soil SLs.

These conditions are discussed in more detail in the following sections.

8.2.1 Background Concentrations for Metals

DTSC (2015) recommends that metals detected at background (ambient) levels not be identified as COPCs at a site. In accordance with the Work Plan, a 2009 LBNL study was used to identify acceptable background levels for metals except for arsenic, which used the background level for San Francisco Bay Region (Duvergé, 2011). Table 1 presents background levels for metals detected in soil.

8.2.2 Risk-Based Soil Screening Levels

The risk-based soil SLs include USEPA Regional Screening Levels (RSLs; USEPA, 2020) modified per DTSC Office of Human and Ecological Risk Human Health Risk Assessment (HHRA) Note Number 3 (HHRA Note 3; DTSC, 2020) in accordance with PEA Manual (DTSC, 2015). Soil SLs are included on Tables 1 and 2.

8.2.3 Lead Soil Screening Levels

Unlike other COPCs, blood-lead models are used to develop a soil SLs for lead. Neither USEPA nor CalEPA publishes toxicity values for lead. In the absence of toxicity values, noncarcinogenic risks for lead are evaluated by predicting blood lead concentrations using toxicokinetic modeling. This section describes the blood-lead models used to develop lead soil SLs.

The DTSC LeadSpread 8 model (DTSC, 2011) calculates several blood lead concentrations, including the median, 90th, 95th, 98th, and 99th percentile estimates for the predicted distribution. Additionally, the model calculates the concentration in exterior soil and interior dust that will result in a 90th percentile estimate of blood lead equal to the target increase in children's blood lead level of concern by 1 microgram per deciliter (µg/dL; CalEPA benchmark incremental change criterion for lead). This target concentration is referred to as "PRG-90". Based on this model, DTSC's soil SL for lead is 80 mg/kg (DTSC, 2020). The LeadSpread 8 model worksheet for an unrestricted exposure scenario is provided on Table F1 of Appendix F.

DTSC LeadSpread 8 addresses child exposures only and is recommended by DTSC for evaluating lead exposure under unrestricted land use. In the model, DTSC indicates that non-residential scenarios may involve fewer than seven days per week for exposure frequency. On-Site receptors are anticipated to be primarily adult receptors; however, child receptors may occasionally visit the Site during organized field trips or other visits accompanied by adult visitors or workers. To evaluate a more restricted scenario for a child receptor, the exposure frequency in the DTSC LeadSpread 8 model was reduced from seven days per week to one day per week. Based on this restricted model, the soil SL for lead is 540 mg/kg The LeadSpread 8 model worksheet for a restricted exposure scenario is provided on Table F2 of Appendix F. Based on significantly higher soil SL for the restricted model, the soil SL of 80 mg/kg for unrestricted land use represents a reasonably conservative soil SL to protect future receptors at the Site.

For commercial land use, DTSC recommends a modified version of USEPA's June 21, 2009 adult lead model (ALM; DTSC, 2011). The model calculates the concentration in exterior soil and interior dust that will result in a 90th percentile estimate of blood lead among fetuses of adult workers of 1 µg/dL. Based on this model, DTSC's commercial soil SL for lead is 320 mg/kg (DTSC, 2020). The ALM model worksheet for a commercial worker exposure scenario is provided on Table F3 of Appendix F.

8.2.4 Results of Screening Level Evaluation

Based on the sample by sample comparison with background levels and risk-based soil SLs, the following metals and PAHs were identified as COPCs in each area:

Table C
Summary of Chemicals of Potential Concern (COPCs)

Area	Unrestricted Land Use	Commercial Land Use
West Meadow	• Antimony • Arsenic • Copper • Lead • Zinc • Benz(a)anthracene • Benzo(a)pyrene • Benzo(b)fluoranthene • Dibenz(a,h)anthracene • Indeno(1,2,3-c,d)pyrene • Naphthalene	• Benzo(a)pyrene • Lead • Benzo(b)fluoranthene • Dibenz(a,h)anthracene
North Orchard	• Lead	• Lead
East Meadow	• Lead	• Lead

The HHSE results for the west meadow, north orchard, and east meadow for unrestricted land use and commercial land use are summarized in Tables 1 and 2. Antimony, arsenic, copper, and zinc were only detected at concentrations above soil SLs in soil sample WM-DG-13-1.5'. The soil sample locations with concentrations that exceed soil SLs for unrestricted land use are highlighted on Figure 6. Although the screening level comparison for commercial land use identified COPCs, none of the soil sample locations with concentrations above soil SLs for commercial land use were located within the proposed building complex area in the west meadow.

9.0 CONCLUSIONS AND RECOMMENDATIONS

The conclusions of the Report address the following four questions:

1. *Have current or past practices resulted in a release or threat of a release of hazardous materials at the Site, or are there naturally-occurring hazardous materials at the Site?*

   As presented herein, select metals and PAHs associated with shot and clay target fragments in soil from historic shooting range activities have been identified in the three planned planting areas at the Site.

2. *If a release has occurred, a threatened release exists, or a naturally-occurring hazardous material is present, does it pose a significant threat to public health or the environment in context of the proposed reuse plans, and if not, why not?*

   An HHSE was conducted to further characterize risk and evaluate potential land use scenarios for the three planned planting areas at the Site. The findings of the HHSE are as follows:

   - Unrestricted Land Use (the most protective scenario evaluated):

     West Meadow: Antimony, arsenic, copper, lead, zinc, and PAHs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, indeno(1,2,3-c,d)pyrene, and naphthalene) concentrations exceeded soil SLs and may pose a human health risk for unrestricted receptors. Antimony, arsenic, copper, and zinc concentrations only exceeded soil SLs at boring WM-DG-13, where a shell casing was observed. Lead concentrations exceeded the soil SL of 80 mg/kg in borings near the proposed building complex and at boring WM-DG-13. PAH concentrations exceeded soil SLs at various locations near the historic shooting ranges.

     North Orchard: Lead concentrations exceeded the soil SL of 80 mg/kg in borings along the western portion of this area and may pose a human health risk for unrestricted receptors.

     East Meadow: Lead concentrations exceeded the soil SL of 80 mg/kg in borings in the western and southern portions of this area and may pose a human health risk for unrestricted receptors.

- Commercial Land Use

  West Meadow: Lead and PAH (benzo(a)pyrene, benzo(b)fluoranthene and dibenz(a,h)anthracene) concentrations exceeded soil SLs. Lead concentrations only exceeded the soil SL of 320 mg/kg in boring WM-DG-13. PAH concentrations were above soil SLs at various locations, particularly near the historic shooting ranges. These locations above soil SLs for commercial land use were not located within the proposed building complex area in the west meadow; therefore, these COPCs do not pose a human health risk for commercial receptors.

  North Orchard: Lead concentrations only exceeded the soil SL of 320 mg/kg in boring NO-3. The proposed building complex area is located in the west meadow and no commercial land use is anticipated in the north orchard.

  East Meadow: Lead concentrations exceeded the soil SL of 320 mg/kg in borings along the western and southern portions of this area. The proposed building complex area is located in the west meadow and no commercial land use is anticipated in the east meadow.

Although commercial land is expected to be limited to the proposed building complex area in the west meadow, risk management decisions for other areas of the Site will be consistent with unrestricted land use. As such, risk management decisions for the west meadow, north orchard, and east meadow areas will be protective of both unrestricted and commercial receptors.

Additional scenarios that were not considered to be significant exposure pathways included:

- Farming and gardening activities would be conducted, in part, for the purpose of consuming and/or selling produce. Considering that only a portion of the produce sourced from the Pogonip Farm and Garden may be included in a potential receptors diet, ingestion of Pogonip Farm and Garden produce is not likely a significant exposure pathway.
- A future on-Site construction worker may be exposed to soil during short-term construction earthwork (e.g., trenching, grading, etc.). The exposures for a construction worker receptor are expected to be limited in comparison to long-term worker receptors, which are described above and these activities will be performed subject to applicable administrative controls (e.g., SMP, HSP, and BMPs).

3. *What further specific information and/or removal/remediation actions are necessary in order to better assess or abate threats posed by the Site to human health and the environment and allow the City to either make a decision regarding their reuse planning or to move forward with their redevelopment plans?*

Based on our evaluation of the Site conditions, consideration of the following activities is recommended:

- Preparation of a *Soil Management Plan* to provide guidance for handling potentially impacted soil encountered during Site activities.
- Establishment of a land use covenant to restrict land use in areas where COPCs may pose a human health risk (i.e., areas were COPC concentrations exceed SLs) at the Site.
- Modify the development plan to avoid areas where soil samples exceed SLs to reduce potential exposures. For example, limiting the southward extent of planting in the east meadow avoids the area near borings EM-9, EM-10, EM-11, EM-21 where lead concentrations of more than 750 mg/kg were observed.
- Remediate (e.g., soil excavation and removal) and/or implement engineering controls (e.g., soil amendments, fence and post) in areas where lead and PAH concentrations exceed SLs to reduce potential exposures.

4. *What is the projected cost of response or remediation of the Site?*

The projected cost for preparation of a *Soil Management Plan*, supporting LUC efforts, and one meeting with HGP personnel to review Site data for their consideration of potential development plan modifications is approximately $20,000 to 25,000. This projected cost does not consider implementation of the *Soil Management Plan*, annual inspections to confirm LUC compliance, or modification to development plans.

Alternatively, excavation of the areas exceeding SLs for unrestricted land use depicted on Figure 6 to 2 feet bgs, would result in approximately 15,000 cubic yards (19,000 tons) of soil. Assuming non-hazardous disposal (pending waste characterization), the projected cost for soil excavation and removal is estimated to exceed $1,000,000.

10.0 LIMITATIONS

This document was prepared for the exclusive use of DTSC for the express purpose of complying with a client- or regulatory directive for environmental investigation or restoration. RMD has used professional judgment to present the findings and opinions of a scientific and technical nature. The opinions expressed are based on the conditions of the Site existing at the time of the field investigation, current regulatory requirements, and any specified assumptions. The presented findings and recommendations in this report are intended to be taken in their entirety to assist DTSC personnel in applying their own professional judgment in making decisions related to the property. No warranty or guarantee, whether expressed or implied, is made with respect to the data or the reported findings, observations, conclusions, and recommendations.

11.0 REFERENCES

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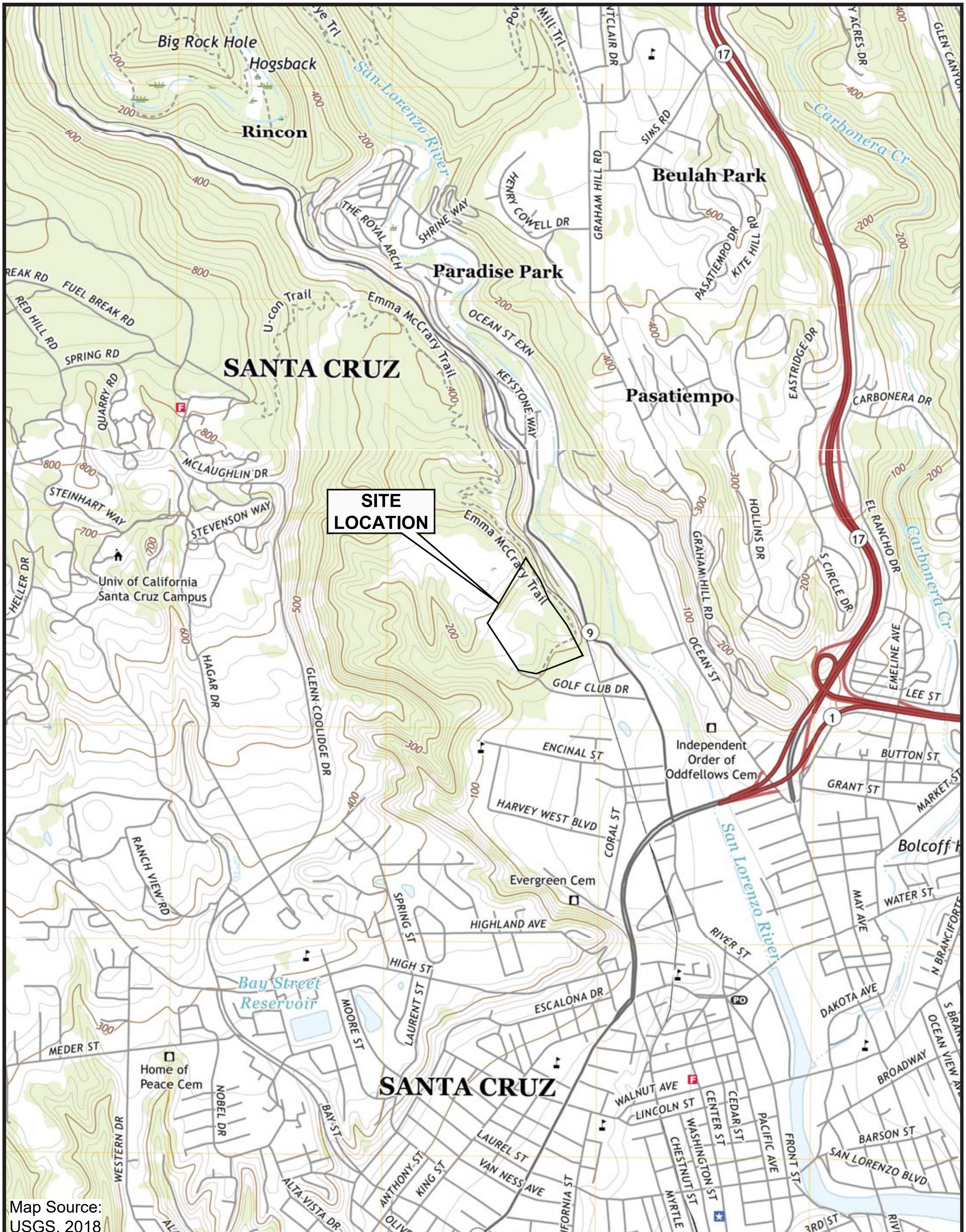
FIGURES



RMD ENVIRONMENTAL SOLUTIONS

333 GOLF CLUB DRIVE
SANTA CRUZ, CALIFORNIA

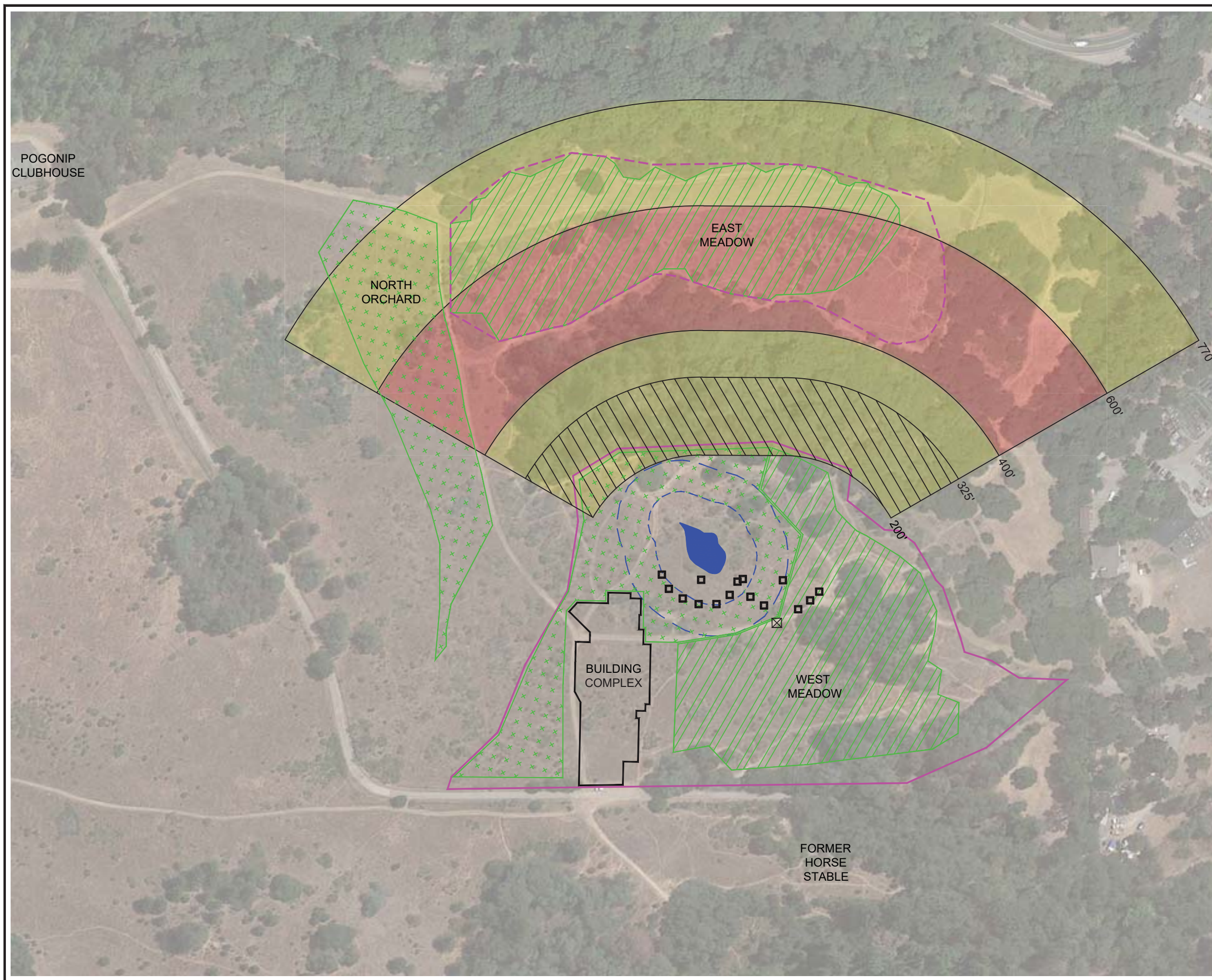
SITE LOCATION MAP

PROJECT NO.	DATE	DR.BY:	APP. BY:
01-DTSC-002	03/05/20	DCB	KR

0 2000 4000
SCALE: 1" = 2000'

N

FIGURE 1



LEGEND

- PROPOSED EAST GARDEN BOUNDARY
- PROPOSED WEST GARDEN BOUNDARY
- 50' WETLAND BUFFER (NO PLANTING)
- 100' WETLAND BUFFER (NATIVE PLANTS)
- APPROXIMATE LOCATION OF SEASONAL WETLAND
- HYPOTHETICAL RANGE OF LEAD SHOT (~200'-770')
- HYPOTHETICAL RANGE OF HIGHEST LEAD SHOT CONCENTRATION (~400'-600')
- HYPOTHETICAL RANGE OF CLAY TARGETS (~200'-325')
- PROPOSED PERENNIAL/ORCHARD LAND
- PROPOSED ROW CROP ANNUAL PRODUCTION
- SHOOTING PAD LOCATION
- UNKNOWN CONCRETE PAD

Notes:
1) Hypothetical Ranges of Lead Shot and Clay Pigeons Are Based On Standard Skeet Shooting Range Shot Fall Zones. (ITRC, 2015)
2) Proposed Garden Boundaries and Building Complex Based on GPS Coordinate Plan (Fall Creek Engineering, Inc, 2018) and Map of Pogonip Farm & Garden (Homeless Garden Project O&M Plan, 2017)

SITE PLAN

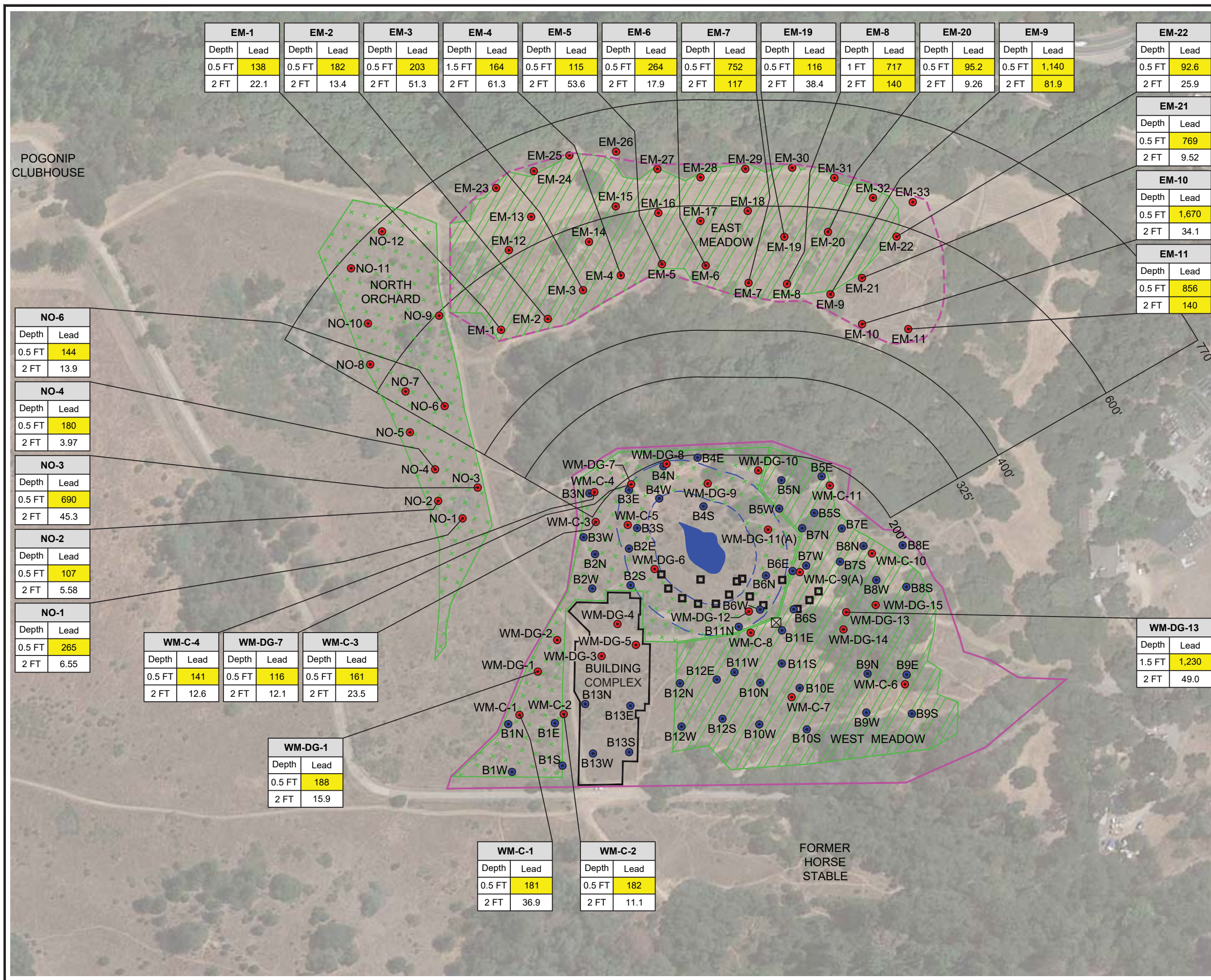
333 GOLF CLUB DRIVE
SANTA CRUZ, CA

PROJECT NO.	DATE	DRAWN BY:	APP. BY:
01-DTSC-002	08/05/20	DCB	KR

0 150 300
SCALE: 1" = 150'

RMD ENVIRONMENTAL SOLUTIONS

FIGURE 2



	Depth	Lead
EM-1	0.5 FT	138
EM-1	2 FT	22.1
EM-2	0.5 FT	182
EM-2	2 FT	13.4
EM-3	0.5 FT	203
EM-3	2 FT	51.3
EM-4	1.5 FT	164
EM-4	2 FT	61.3
EM-5	0.5 FT	115
EM-5	2 FT	53.6
EM-6	0.5 FT	264
EM-6	2 FT	17.9
EM-7	0.5 FT	752
EM-7	2 FT	117
EM-19	0.5 FT	116
EM-19	2 FT	38.4
EM-8	1 FT	717
EM-8	2 FT	140
EM-20	0.5 FT	95.2
EM-20	2 FT	9.26
EM-9	0.5 FT	1,140
EM-9	2 FT	81.9
EM-22	0.5 FT	92.6
EM-22	2 FT	25.9
EM-21	0.5 FT	769
EM-21	2 FT	9.52
EM-10	0.5 FT	1,670
EM-10	2 FT	34.1
EM-11	0.5 FT	856
EM-11	2 FT	140
NO-6	0.5 FT	144
NO-6	2 FT	13.9
NO-4	0.5 FT	180
NO-4	2 FT	3.97
NO-3	0.5 FT	690
NO-3	2 FT	45.3
NO-2	0.5 FT	107
NO-2	2 FT	5.58
NO-1	0.5 FT	265
NO-1	2 FT	6.55
WM-C-4	0.5 FT	141
WM-C-4	2 FT	12.6
WM-DG-7	0.5 FT	116
WM-DG-7	2 FT	12.1
WM-C-3	0.5 FT	161
WM-C-3	2 FT	23.5
WM-DG-1	0.5 FT	188
WM-DG-1	2 FT	15.9
WM-C-1	0.5 FT	181
WM-C-1	2 FT	36.9
WM-C-2	0.5 FT	182
WM-C-2	2 FT	11.1
WM-DG-13	1.5 FT	1,230
WM-DG-13	2 FT	49.0

LEGEND

- PROPOSED EAST GARDEN BOUNDARY
- PROPOSED WEST GARDEN BOUNDARY
- 50' WETLAND BUFFER (NO PLANTING)
- 100' WETLAND BUFFER (NATIVE PLANTS)
- APPROXIMATE LOCATION OF SEASONAL WETLAND
- PROPOSED PERENNIAL/ORCHARD LAND
- PROPOSED ROW CROP ANNUAL PRODUCTION
- SHOOTING PAD LOCATION
- UNKNOWN CONCRETE PAD
- SOIL SAMPLE LOCATION (EIS, 2019)
- SOIL SAMPLE LOCATION (RMD, 2020)
- 0.5 FT — DEPTH IN FEET BELOW GROUND SURFACE
- 22.1 — ANALYTICAL RESULT IN MILLIGRAMS PER KILOGRAM (mg/kg)

Notes:
1) Yellow highlighted values exceed the screening level for unrestricted land use.
2) Data shown only for locations with lead concentration exceeding the unrestricted screening level.
3) Hypothetical Ranges of Lead Shot and Clay Pigeons Are Based On Standard Skeet Shooting Range Shot Fall Zones (ITRC, 2015).
4) Proposed Garden Boundaries and Building Complex Based on GPS Coordinate Plan (Fall Creek Engineering, Inc, 2018) and Map of Pogonip Farm & Garden (Homeless Garden Project O&M Plan, 2017).

LEAD CONCENTRATIONS IN SOIL

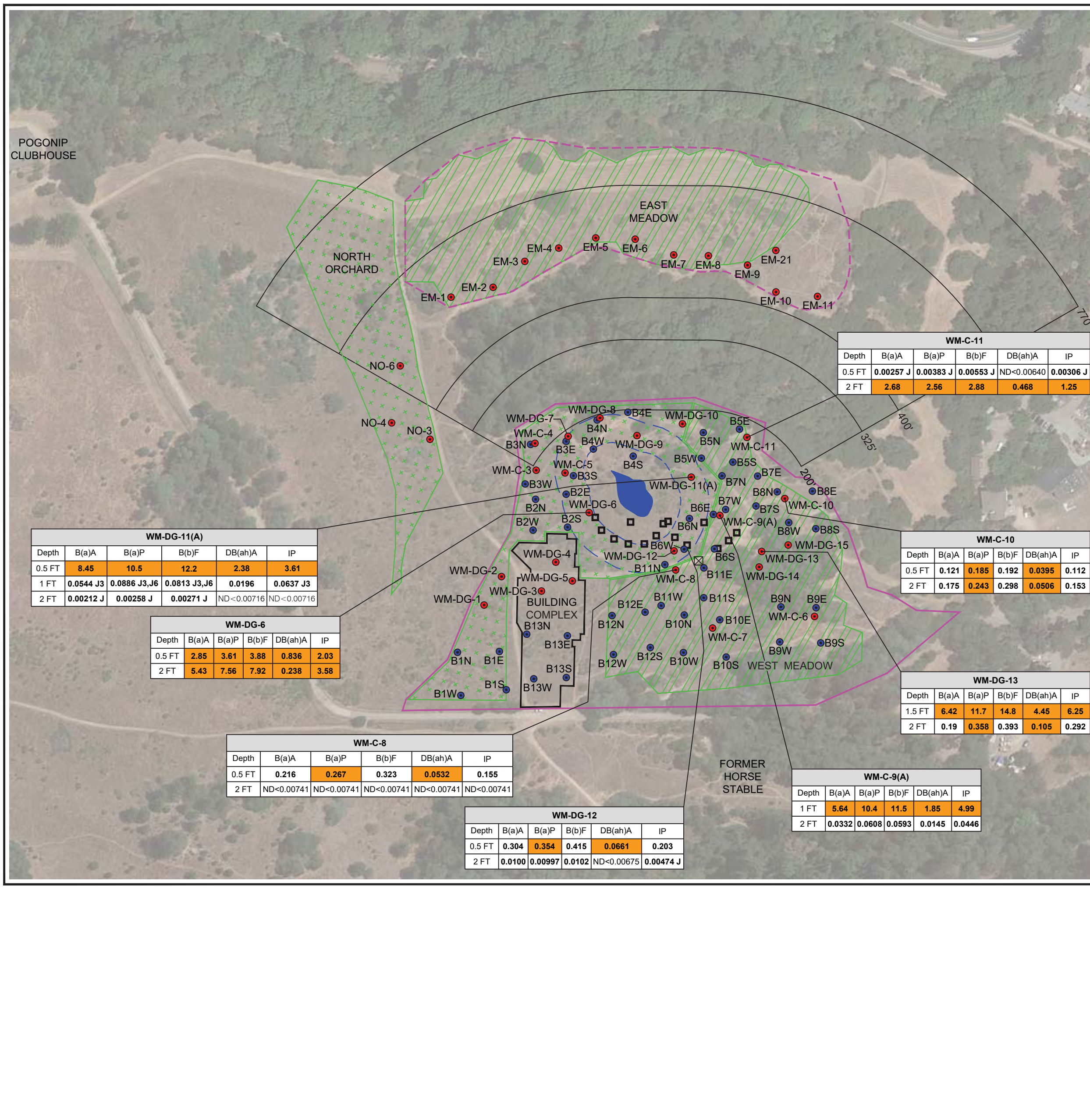
333 GOLF CLUB DRIVE
SANTA CRUZ, CA

PROJECT NO.	DATE	DRAWN BY:	APP. BY:
01-DTSC-002	08/05/20	DCB	KR

0 150 300
SCALE: 1" = 150'

FIGURE 3

RMD ENVIRONMENTAL SOLUTIONS



WM-DG-11(A)					
Depth	B(a)A	B(a)P	B(b)F	DB(ah)A	IP
0.5 FT	8.45	10.5	12.2	2.38	3.61
1 FT	0.0544 J3	0.0886 J3,J6	0.0813 J3,J6	0.0196	0.0637 J3
2 FT	0.00212 J	0.00258 J	0.00271 J	ND<0.00716	ND<0.00716

WM-DG-6					
Depth	B(a)A	B(a)P	B(b)F	DB(ah)A	IP
0.5 FT	2.85	3.61	3.88	0.836	2.03
2 FT	5.43	7.56	7.92	0.238	3.58

WM-C-11					
Depth	B(a)A	B(a)P	B(b)F	DB(ah)A	IP
0.5 FT	0.00257 J	0.00383 J	0.00553 J	ND<0.00640	0.00306 J
2 FT	2.68	2.56	2.88	0.468	1.25

WM-C-10					
Depth	B(a)A	B(a)P	B(b)F	DB(ah)A	IP
0.5 FT	0.121	0.185	0.192	0.0395	0.112
2 FT	0.175	0.243	0.298	0.0506	0.153

WM-DG-13					
Depth	B(a)A	B(a)P	B(b)F	DB(ah)A	IP
1.5 FT	6.42	11.7	14.8	4.45	6.25
2 FT	0.19	0.358	0.393	0.105	0.292

WM-C-8					
Depth	B(a)A	B(a)P	B(b)F	DB(ah)A	IP
0.5 FT	0.216	0.267	0.323	0.0532	0.155
2 FT	ND<0.00741	ND<0.00741	ND<0.00741	ND<0.00741	ND<0.00741

WM-DG-12					
Depth	B(a)A	B(a)P	B(b)F	DB(ah)A	IP
0.5 FT	0.304	0.354	0.415	0.0661	0.203
2 FT	0.0100	0.00997	0.0102	ND<0.00675	0.00474 J

WM-C-9(A)					
Depth	B(a)A	B(a)P	B(b)F	DB(ah)A	IP
1 FT	5.64	10.4	11.5	1.85	4.99
2 FT	0.0332	0.0608	0.0593	0.0145	0.0446

LEGEND

(pink dashed line)	PROPOSED EAST GARDEN BOUNDARY
(pink solid line)	PROPOSED WEST GARDEN BOUNDARY
(blue short-dashed line)	50' WETLAND BUFFER (NO PLANTING)
(blue long-dashed line)	100' WETLAND BUFFER (NATIVE PLANTS)
(blue fill)	APPROXIMATE LOCATION OF SEASONAL WETLAND
(green dotted fill)	PROPOSED PERENNIAL/ORCHARD LAND
(green hatched fill)	PROPOSED ROW CROP ANNUAL PRODUCTION
(square)	SHOOTING PAD LOCATION
(crossed square)	UNKNOWN CONCRETE PAD
(blue dot)	SOIL SAMPLE LOCATION (EIS, 2019)
(red dot)	SOIL SAMPLE LOCATION (RMD, 2020)
B(a)A	BENZO(A) ANTHRACENE
B(a)P	BENZO(A) PYRENE
B(b)F	BENZO(B) FLUORANTHENE
DB(ah)A	DIBENZ(A,H) ANTHRACENE
IP	INDENO(1,2,3-CD) PYRENE
0.5 FT	DEPTH IN FEET BELOW GROUND SURFACE
2.68	ANALYTICAL RESULT IN MILLIGRAMS PER KILOGRAM (mg/kg)
ND<0.00640	ANALYTICAL RESULT NOT DETECTED ABOVE LABORATORY REPORTING LIMIT
J	THE IDENTIFICATION OF THE ANALYTE IS ACCEPTABLE; THE REPORTED VALUE IS AN ESTIMATE
J3	THE ASSOCIATED BATCH QC WAS OUTSIDE THE ESTABLISHED QUALITY CONTROL RANGE FOR PRECISION
J6	THE SAMPLE MATRIX INTERFERED WITH THE ABILITY TO MAKE ANY ACCURATE DETERMINATION; SPIKE VALUE IS LOW

Notes:
1) Orange highlighted values exceed the screening level for unrestricted land use.
2) Data shown only for locations with PAH concentrations exceeding the unrestricted screening level.
3) Where duplicate sample was collected, the highest concentration is shown.
4) Hypothetical Ranges of Lead Shot and Clay Pigeons Are Based On Standard Skeet Shooting Range Shot Fall Zones (ITRC, 2015).
5) Proposed Garden Boundaries and Building Complex Based on GPS Coordinate Plan (Fall Creek Engineering, Inc, 2018) and Map of Pogonip Farm & Garden (Homeless Garden Project O&M Plan, 2017).

POLYCYCLIC AROMATIC HYDROCARBON CONCENTRATIONS IN SOIL

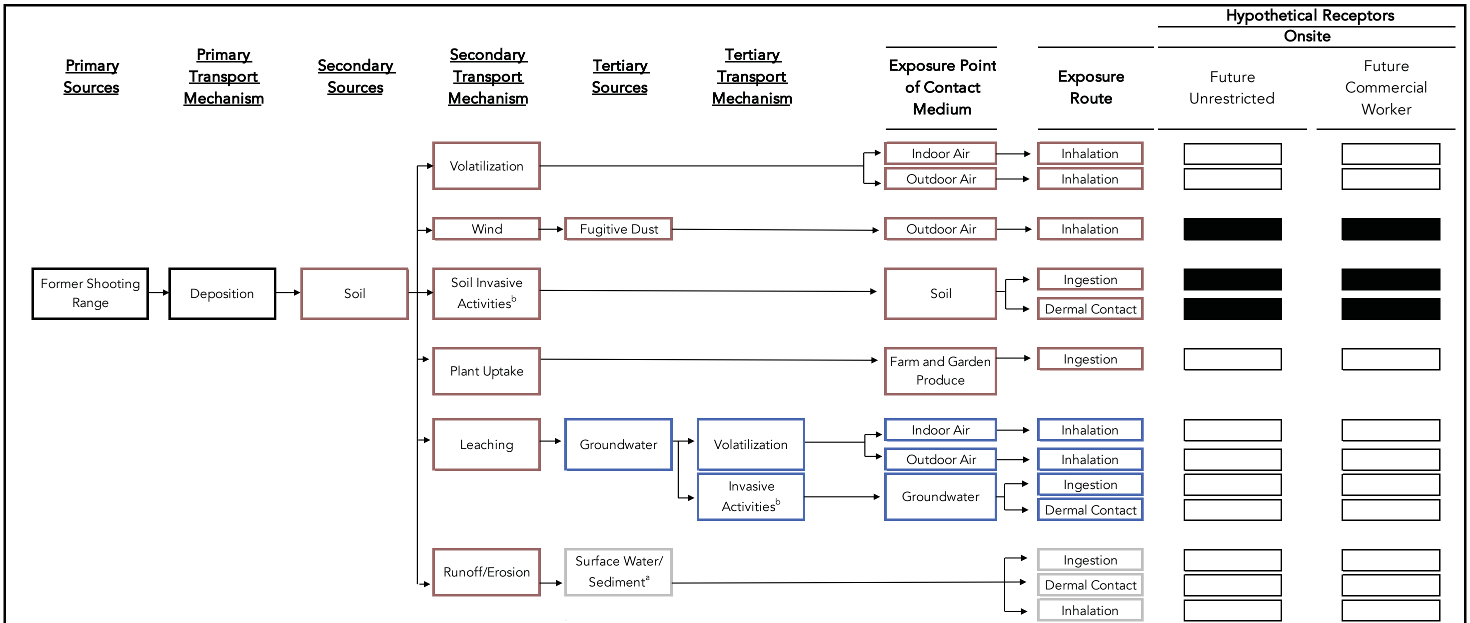
333 GOLF CLUB DRIVE
SANTA CRUZ, CA

PROJECT NO.	DATE	DRAWN BY:	APP. BY:
01-DTSC-002	08/05/20	DCB	KR

0 150 300
SCALE: 1" = 150'

RMD ENVIRONMENTAL SOLUTIONS

FIGURE 4

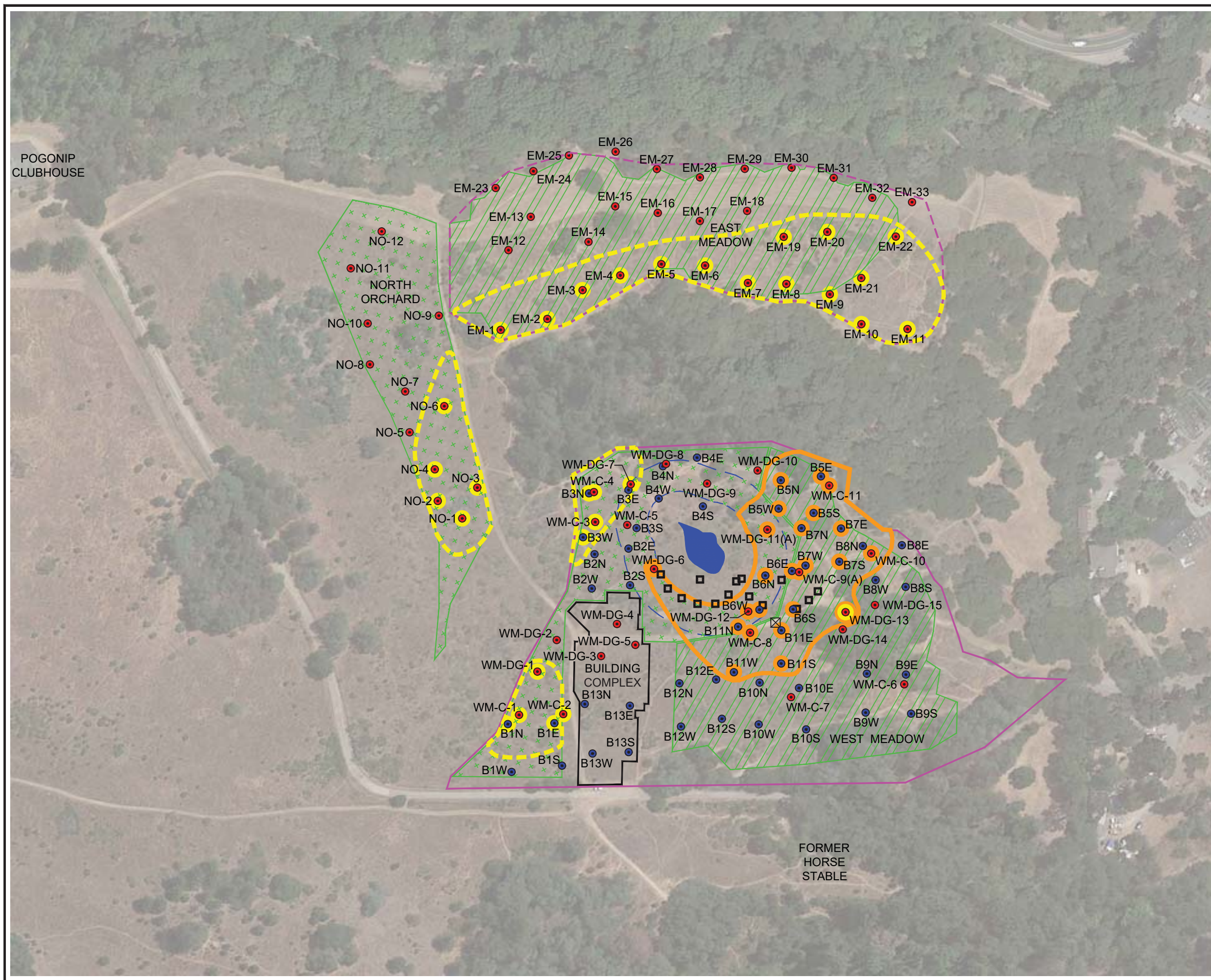


CSM components related to soil.
CSM components related to groundwater.
CSM components related to surface water.

Receptor likely to be exposed via this route, so pathway is considered potentially complete.
Receptor may be exposed via this route, so pathway is considered potentially complete; however, pathway is considered minor.
Pathway is incomplete, no further evaluation required.

[a] With the exception of the seasonal wetland, there are no identified surface water bodies within a one-half mile radius of the site.
[b] Surface invasive activities are not expected to extend beyond 2 feet bgs.
[c] Perched shallow groundwater supports seasonal wetlands and seeps. A 345 foot deep water supply well near the Pogonip clubhouse reported a depth to water of 128 feet below ground surface (bgs) in 1993. Due to depth to groundwater, it is not a media of concern at the site.

POGONIP FARM AND GARDEN SANTA CRUZ, CALIFORNIA				HUMAN HEALTH CONCEPTUAL SITE MODEL	
PROJECT NO.	DATE	DRAWN BY	APP. BY	RMD ENVIRONMENTAL SOLUTIONS	FIGURE 5
01-DTSC-002	08/05/20	II	KR		



LEGEND

- PROPOSED EAST GARDEN BOUNDARY
- PROPOSED WEST GARDEN BOUNDARY
- 50' WETLAND BUFFER (NO PLANTING)
- 100' WETLAND BUFFER (NATIVE PLANTS)
- APPROXIMATE LOCATION OF SEASONAL WETLAND
- PROPOSED PERENNIAL/ORCHARD LAND
- PROPOSED ROW CROP ANNUAL PRODUCTION
- SHOOTING PAD LOCATION
- UNKNOWN CONCRETE PAD
- SOIL SAMPLE LOCATION (EIS, 2019)
- SOIL SAMPLE LOCATION (RMD, 2020)
- APPROXIMATE PROPOSED PLANTING AREA EXCEEDING LEAD SCREENING LEVEL FOR UNRESTRICTED LAND USE
- APPROXIMATE PROPOSED PLANTING AREA EXCEEDING POLYCYCLIC AROMATIC HYDROCARBON SCREENING LEVELS FOR UNRESTRICTED LAND USE

Notes:
1) Yellow highlighted sample locations exceed the lead screening level for unrestricted land use.
2) Orange highlighted sample locations exceed the polycyclic aromatic hydrocarbon screening levels for unrestricted land use.
3) Sample location WM-DG-13 also reports antimony, arsenic, copper, and zinc exceeding screening levels for unrestricted land use.
4) Shot fragments observed at locations WM-DG-11(A) and WM-DG-13.
5) Clay target fragments observed at locations WM-C-9(A), WM-DG-11(A), WM-DG-13, and EM-10.
6) Proposed Garden Boundaries and Building Complex Based on GPS Coordinate Plan (Fall Creek Engineering, Inc, 2018) and Map of Pogonip Farm & Garden (Homeless Garden Project O&M Plan, 2017).

AREAS EXCEEDING SCREENING LEVELS FOR UNRESTRICTED LAND USE

333 GOLF CLUB DRIVE
SANTA CRUZ, CA

PROJECT NO.	DATE	DRAWN BY:	APP. BY:
01-DTSC-002	08/05/20	DCB	KR

0 150 300
SCALE: 1" = 150'

RMD ENVIRONMENTAL SOLUTIONS

FIGURE 6

TABLES

Table 1
Metals in Soil
Pogonip Farm and Garden
Santa Cruz, California

Sample ID	Date	Sample Depth (feet bgs)	Depth Shot Observed (feet bgs)	XRF Reading (ppm)	Notes	Antimony (mg/kg)		Arsenic (mg/kg)		Copper (mg/kg)		Lead (mg/kg)		Zinc (mg/kg)	
					Background Level[1]	6		11		63		43		140	
					Unrestricted (Residential) Screening Level[2]	31		0.11		3,100		80		23,000	
					Commercial Screening Level[2]	470		0.36		47,000		320		350,000	
West Meadow															
WM-C-1-0.5'	5/13/2020	0 - 0.5		222		**1.31**	J	**2.63**		**12.3**		**181**		**23.9**	
WM-C-1-2'	5/13/2020	1.5 - 2		54		-		-		-		**36.9**		-	
WM-C-2-0.5'	5/13/2020	0 - 0.5		202		**0.989**	J	**2.13**	J	**6.91**		**182**		**15.3**	
WM-C-2-0.5' DUP	5/13/2020	0 - 0.5		202	Duplicate	**1.57**	J	**2.45**		**7.54**		**156**		**13.6**	
WM-C-2-2'	5/13/2020	1.5 - 2		26		-		-		-		**11.1**		-	
WM-C-3-0.5'	5/13/2020	0 - 0.5		244		**1.23**	J	**2.14**	J	**8.38**		**161**		**53.6**	
WM-C-3-2'	5/13/2020	1.5 - 2		13		-		-		-		**23.5**		-	
WM-C-4-0.5'	5/13/2020	0 - 0.5		368		**0.683**	J	**1.92**	J	**6.96**		**141**		**15**	
WM-C-4-2'	5/13/2020	1.5 - 2		27		-		-		-		**12.6**		-	
WM-C-5-0.5'	5/13/2020	0 - 0.5		95		**0.568**	J	**1.58**	J	**77.7**	O1	**76.9**	O1	**78.5**	O1
WM-C-6-0.5'	5/14/2020	0 - 0.5		30		**0.897**	J,J6	**2.16**		**4.92**		**10.6**		**19.7**	
WM-C-7-0.5'	5/14/2020	0 - 0.5		13		**0.785**	J	<2.51		**47.3**		**8.57**		**59.1**	
WM-C-8-0.5'	5/14/2020	0 - 0.5		31		**0.879**	J	<2.40		**18.1**		**15.0**		**31.0**	
WM-C-9A-1'	5/15/2020	0.5 - 1		105		**0.727**	J	**1.55**	J	**5.61**		**71.2**		**18.6**	
WM-C-10-0.5'	5/14/2020	0 - 0.5		-		**1.65**	J	**3.81**		**9.09**		**27.0**		**26.6**	
WM-C-11-0.5'	5/13/2020	0 - 0.5		45		**1.47**	J	**10.7**		**7.86**		**29.3**		**24.3**	
WM-DG-1-0.5'	5/13/2020	0 - 0.5		241		**1.41**	J	**2.69**		**8.57**		**188**		**16.4**	
WM-DG-1-2'	5/13/2020	1.5 - 2		9		-		-		-		**15.9**		-	
WM-DG-2-0.5'	5/13/2020	0 - 0.5		168		<2.42		**2.74**		**10.3**		**6.16**		**12.9**	
WM-DG-3-0.5'	5/13/2020	0 - 0.5		90		**0.833**	J	**1.28**	J	**5.66**		**51.1**		**23.0**	
WM-DG-4-0.5'	5/13/2020	0 - 0.5		30		<2.42		**1.76**	J	**16.2**		**19.8**		**28.3**	
WM-DG-5-0.5'	5/13/2020	0 - 0.5		19		<2.44		**1.53**	J	**13.9**		**38.1**		**23.1**	
WM-DG-6-0.5'	5/13/2020	0 - 0.5		311		<2.22		**2.25**		**11.0**		**27.0**		**18.5**	
WM-DG-7-0.5'	5/13/2020	0 - 0.5		120		**0.721**	J	**1.77**	J	**7.01**		**116**		**17.0**	
WM-DG-7-2'	5/13/2020	1.5 - 2		29		-		-		-		**12.1**		-	
WM-DG-8-0.5'	5/13/2020	0 - 0.5		59		**0.637**	J	**1.43**	J	**9.12**		**55.7**		**21.0**	
WM-DG-9-0.5'	5/13/2020	0 - 0.5		28		<2.31		**1.52**	J	**299**		**17.5**		**91.1**	
WM-DG-10-0.5'	5/13/2020	0 - 0.5		46		**0.640**	J	**2.78**		**10.9**		**28.7**		**25.0**	
WM-DG-11-0.5'	5/14/2020	0 - 0.5		59		**2.01**	J	**2.72**	B	**263**		**76.0**		**689**	
WM-DG-11-0.5'-DUP	5/14/2020	0 - 0.5	0.5-2	59	Duplicate	**1.55**	J	**2.13**	B,J	**14.9**		**40.9**		**75.8**	
WM-DG-11A-1'	5/15/2020	0.5 - 1		16		<2.20		**1.77**	J	**9.01**		**11.5**		**15.6**	
WM-DG-12-0.5'	5/14/2020	0 - 0.5		64		**1.58**	J	**1.65**	B,J	**10.8**		**39.1**		**51.6**	
WM-DG-13-1.5'	5/14/2020	1 - 1.5	1-2	1,095		**41.7**	J	**15.9**	B,J	**6,320**		**<u>1,230</u>**		**28,500**	
WM-DG-13-2'	5/14/2020	1.5 - 2		33		**3.33**		**3.61**	B	**214**		**49.0**		**2,770**	
WM-DG-14-0.5'	5/14/2020	0 - 0.5		19		**0.817**	J	**2.82**	B	**8.28**		**13.8**		**40.8**	
WM-DG-15-0.5'	5/14/2020	0 - 0.5		23		**1.80**	J	**2.17**	B,J	**76.9**		**23.8**		**303**	
North Orchard															
NO-1-0.5'	5/14/2020	0 - 0.5		225		**3.54**		**3.05**	B	**6.32**		**265**		**24.0**	
NO-1-2'	5/14/2020	1.5 - 2		25		-		-		-		**6.55**		-	
NO-2-0.5'	5/14/2020	0 - 0.5		119		**1.65**	J	**1.94**	B,J	**8.14**		**107**		**17.6**	
NO-2-2'	5/14/2020	1.5 - 2		28		-		-		-		**5.58**		-	
NO-3-0.5'	5/14/2020	0 - 0.5		863		**6.94**		**4.77**	B	**11.3**		**<u>690</u>**		**21.5**	
NO-3-2'	5/14/2020	1.5 - 2		35		-		-		-		**45.3**		-	
NO-4-0.5'	5/14/2020	0 - 0.5		211		**2.03**	J	**1.60**	B,J	**8.16**		**180**		**15.7**	
NO-4-2'	5/14/2020	1.5 - 2		16		-		-		-		**3.97**		-	
NO-5-0.5'	5/14/2020	0 - 0.5		10		**1.08**	J	**1.57**	B,J	**50.8**		**40.0**		**44.2**	
NO-6-0.5'	5/14/2020	0 - 0.5		118		**1.97**	J	**2.32**	B,J	**23.2**		**144**		**41.8**	
NO-6-2'	5/14/2020	1.5 - 2		14		-		-		-		**13.9**		-	
NO-7-0.5'	5/14/2020	0 - 0.5		43		**0.926**	J	**1.91**	B,J	**8.08**		**29.8**		**24.8**	
NO-8-0.5'	5/15/2020	0 - 0.5		31		**0.928**	J	<2.46		**18.9**		**18.5**		**23.1**	
NO-9-0.5'	5/14/2020	0 - 0.5		39		**1.51**	J	**1.70**	B,J	**14.4**		**20.0**		**26.7**	
NO-10-0.5'	5/15/2020	0 - 0.5		17		<2.33		<2.33		**18.0**		**14.0**		**27.5**	
NO-11-0.5'	5/15/2020	0 - 0.5		18		**1.04**	J	**0.655**	J	**15.0**		**14.5**		**26.8**	
NO-12-0.5'	5/15/2020	0 - 0.5		21		**0.718**	J	<2.42		**17.1**		**10.5**		**49.8**	
East Meadow															
EM-1-0.5'	5/12/2020	0 - 0.5		119		**2.34**		**2.42**		**63.1**		**138**		**69.6**	
EM-1-2'	5/12/2020	1.5 - 2		39		-		-		-		**22.1**		-	
EM-2-0.5'	5/12/2020	0 - 0.5		153		**1.93**	J	**2.42**		**24.6**		**182**		**31.0**	
EM-2-2'	5/12/2020	1.5 - 2		15		-		-		-		**13.4**		-	
EM-3-0.5'	5/12/2020	0 - 0.5		219		**2.87**		**3.23**		**16.6**		**203**		**20.4**	
EM-3-2'	5/12/2020	1.5 - 2		24		-		-		-		**51.3**		-	
EM-4-1.5'	5/12/2020	1 - 1.5		166		**5.15**		**4.58**		**15.8**		**164**		**25.3**	
EM-4-2'	5/12/2020	1.5 - 2		47		-		-		-		**61.3**		-	
EM-5-0.5'	5/12/2020	0 - 0.5		139		**2.51**		**3.21**		**19.1**		**115**		**26.4**	
EM-5-2'	5/12/2020	1.5 - 2		95		-		-		-		**53.6**		-	
EM-6-0.5'	5/12/2020	0 - 0.5		372		**3.46**		**3.91**		**19.9**		**264**		**28.8**	
EM-6-2'	5/12/2020	1.5 - 2		83		-		-		-		**17.9**		-	
EM-7-0.5'	5/12/2020	0 - 0.5		758		**17.0**		**9.58**		**21.1**		**<u>752</u>**		**30.7**	
EM-7-2'	5/12/2020	1.5 - 2		46		-		-		-		**117**		-	
EM-8-1'	5/12/2020	0.5 - 1		549		**11.8**		**8.69**		**14.7**		**<u>717</u>**		**31.1**	
EM-8-2'	5/12/2020	1.5 - 2		94		-		-		-		**140**		-	

Table 1
Metals in Soil
Pogonip Farm and Garden
Santa Cruz, California

Sample ID	Date	Sample Depth	Depth Shot Observed	XRF Reading	Notes	Antimony		Arsenic		Copper		Lead		Zinc	
		(feet bgs)	*(feet bgs)*	*(ppm)*		*(mg/kg)*		*(mg/kg)*		*(mg/kg)*		*(mg/kg)*		*(mg/kg)*	
					Background Level[1]	6		11		63		43		140	
					Unrestricted (Residential) Screening Level[2]	31		0.11		3,100		80		23,000	
					Commercial Screening Level[2]	470		0.36		47,000		320		350,000	
EM-9-0.5'	5/12/2020	0 - 0.5		1,227		**5.46**		**6.71**		**10.7**		**1,140**		**22.1**	
EM-9-2'	5/12/2020	1.5 - 2		168		-		-		-		**81.9**		-	
EM-10-0.5'	5/12/2020	0 - 0.5		2,973		**6.07**		**8.44**		**12.6**		**1,670**		**29.0**	
EM-10-2'	5/12/2020	1.5 - 2		15		-		-		-		**34.1**		-	
EM-11-0.5'	5/12/2020	0 - 0.5		569		**3.78**		**7.16**		**24.4**		**856**		**36.2**	
EM-11-2'	5/12/2020	1.5 - 2		94		-		-		-		**140**		-	
EM-12-0.5'	5/14/2020	0 - 0.5		31		<2.44		**3.04**	B	**38.6**		**9.15**		**98.3**	
EM-13-0.5'	5/15/2020	0 - 0.5		24		**0.815**	J	**0.554**	J	**9.98**		**11.2**		**25.4**	
EM-14-0.5'	5/14/2020	0 - 0.5		38		**1.58**	J	**2.92**	B	**12.5**		**33.0**		**44.5**	
EM-14-0.5'-DUP	5/14/2020	0 - 0.5		38	Duplicate	**2.14**	J	**2.80**	B	**14.0**		**32.5**		**55.3**	
EM-15-0.5'	5/15/2020	0 - 0.5		26		**1.12**	J	**1.72**	J	**13.0**		**16.1**		**33.0**	
EM-16-0.5'	5/15/2020	0 - 0.5		42		**1.00**	J	**1.33**	J	**14.0**		**24.6**		**37.3**	
EM-17-0.5'	5/15/2020	0 - 0.5		47		**1.50**	J	**1.13**	J	**13.8**		**40.3**		**35.0**	
EM-18-0.5'	5/15/2020	0 - 0.5		39		**3.29**		**2.35**		**11.2**		**44.5**		**30.5**	
EM-19-0.5'	5/14/2020	0 - 0.5		167		**3.13**		**3.57**	B	**12.7**		**116**		**46.0**	
EM-19-2'	5/14/2020	1.5 - 2		64		-		-		-		**38.4**		-	
EM-20-0.5'	5/15/2020	0 - 0.5		58		<2.53		**2.07**	J	**20.5**		**95.2**		**33.4**	
EM-20-2'	5/15/2020	1.5 - 2		10		-		-		-		**9.26**		-	
EM-21-0.5'	5/14/2020	0 - 0.5		776		**10.0**		**6.12**		**7.16**		**768**		**28.7**	
EM-21-0.5'-DUP	5/14/2020	0 - 0.5		776	Duplicate	**6.85**		**5.65**	B	**7.33**		**769**		**30.6**	
EM-21-2'	5/14/2020	1.5 - 2		17		-		-		-		**9.52**		-	
EM-22-0.5'	5/15/2020	0 - 0.5		100		<2.28		**2.39**		**12.3**		**92.6**		**22.8**	
EM-22-2'	5/15/2020	1.5 - 2		17		-		-		-		**25.9**		-	
EM-23-0.5'	5/15/2020	0 - 0.5		29		**0.932**	J	**1.24**	J	**12.8**		**10.7**		**26.0**	
EM-24-0.5'	5/15/2020	0 - 0.5		33		**0.886**	J	**0.686**	J	**9.50**		**9.18**		**26.8**	
EM-25-0.5'	5/15/2020	0 - 0.5		30		**0.786**	J	**0.810**	J	**12.2**		**10.3**		**28.7**	
EM-26-0.5'	5/15/2020	0 - 0.5		19		**0.656**	J	**1.02**	J	**11.7**		**10.8**		**25.1**	
EM-27-0.5'	5/15/2020	0 - 0.5		34		**1.02**	J	**0.823**	J	**13.6**		**6.12**		**26.4**	
EM-28-0.5'	5/15/2020	0 - 0.5		29		**0.813**	J	**0.865**	J	**14.4**		**14.3**		**31.9**	
EM-29-0.5'	5/15/2020	0 - 0.5		31		**0.720**	J	**1.02**	J	**10.8**		**17.8**		**36.8**	
EM-30-0.5'	5/15/2020	0 - 0.5		31		<2.25		**2.52**		**21.9**		**18.0**		**24.1**	
EM-31-0.5'	5/15/2020	0 - 0.5		33		<2.30		**2.07**	J	**9.94**		**15.4**		**19.1**	
EM-32-0.5'	5/15/2020	0 - 0.5		18		<2.34		**2.01**	J	**13.8**		**37.4**		**23.0**	
EM-33-0.5'	5/15/2020	0 - 0.5		17		<2.25		**2.23**	J	**8.74**		**12.3**		**19.0**	

Notes:
Soil samples sieved using No. 10 sieve and metals analyzed using USEPA Method 6010B.
Analytes detected above laboratory reporting limit are **emboldened**.
Analytes detected above background level and Unrestricted (Residential) Screening Level are highlighted.
Analytes detected above background level and Commercial Screening Level are underlined.
bgs = Below ground surface.
mg/kg = Milligrams per kilogram.
- = Not analyzed.
B = The same analyte is found in the associated blank.
J = The identification of the analyte is acceptable; the reported value is an estimate.
J6 = The sample matrix interfered with the ability to make any accurate determination; spike value is low.
O1 = The analyte failed the method required serial dilution test and/or subsequent post-spike criteria. These failures indicate matrix interference.
[1] Lawrence Berkeley National Laboratory (LBNL, 2009), was used to establish acceptable upper estimate background concentrations for metals with the exception of arsenic. For arsenic, the background level represents the established background level for San Francisco Bay Region of 11 mg/kg (Duvergé, 2011).
[2] In order of priority, the screening level represents the Department of Toxic Substances Control (DTSC)-modified screening level (DTSC, 2020) followed by U.S. Environmental Protection Agency (USEPA) Regional Screening Level (RSL; USEPA, 2020).

References:

DTSC, 2020. Human Health Risk Assessment (HHRA) Note Number 3. June.
Duvergé, 2011. Establishing Background Arsenic in Soil of the Urbanized San Francisco Bay Region. December.
LBNL, 2009. Analysis of Background Distributions of Metals in Soil at Lawrence Berkeley National Laboratory. Revised April.
USEPA, 2020. Regional Screening Level (RSL) Summary Table (TR=1E-6, HQ=1). May.

Table 2
Polycyclic Aromatic Hydrocarbons in Soil
Pogonip Farm and Garden
Santa Cruz, California

Sample ID	Date	Sample Depth	Depth Clay Target Fragments Observed	Notes	ANTHRACENE	ACENAPHTHENE	BENZO(A) ANTHRACENE	BENZO(A) PYRENE	BENZO(B) FLUORANTHENE	BENZO(G,H,I) PERYLENE	BENZO(K) FLUORANTHENE	CHRYSENE	DIBENZ(A,H) ANTHRACENE	FLUORANTHENE	FLUORENE	INDENO(1,2,3-CD) PYRENE	PHENANTHRENE	PYRENE	NAPHTHALENE	1-METHYL NAPHTHALENE	2-METHYL NAPHTHALENE
		(feet bgs)	(feet bgs)		(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Unrestricted (Residential) Screening Level[1]					17,000	3,300	1.1	0.11	1.1	NE	11	110	0.028	2,400	2,300	1.1	NE	1,800	2.0	9.9	190
Commercial Screening Level[1]					130,000	23,000	12	1.3	13	NE	130	1,300	0.31	18,000	17,000	13	NE	13,000	6.5	30	1,300
West Meadow																					
WM-C-5-0.5'	05/13/2020	0 - 0.5			<0.00645	<0.00645	0.00425 J	0.00642 J	0.00668	0.00606 J	0.00326 J	0.00552 J	<0.00645	0.00445 J	<0.00645	0.00467 J	<0.00645	0.00486 J	<0.0215	<0.0215	<0.0215
WM-C-6-0.5'	05/14/2020	0 - 0.5			<0.00644	<0.00644	<0.00644	<0.00644	0.00244 J	<0.00644	<0.00644	<0.00644	<0.00644	<0.00644	<0.00644	<0.00644	<0.00644	<0.00644	<0.0215	<0.0215	<0.0215
WM-C-7-0.5'	05/14/2020	0 - 0.5			<0.00752	<0.00752	0.00232 J	0.00283 J	0.00352 J	0.00295 J	<0.00752	<0.00752	<0.00752	<0.00752	<0.00752	<0.00752	<0.00752	0.00292 J	<0.0251	<0.0251	<0.0251
WM-C-8-0.5'	05/14/2020	0 - 0.5			0.0273	0.0102	0.216	0.267	0.323	0.176	0.081	0.261	0.0532	0.340	0.00293 J	0.155	0.102	0.309	<0.0240	<0.0240	<0.0240
WM-C-8-2'	05/14/2020	1.5 - 2			<0.00741	<0.00741	<0.00741	<0.00741	<0.00741	<0.00741	<0.00741	<0.00741	<0.00741	<0.00741	<0.00741	<0.00741	<0.00741	<0.00741	<0.0247	<0.0247	<0.0247
WM-C-9A-1'	05/15/2020	0.5 - 1	0.5-1.5		0.231	0.0866	5.64	10.4	11.5	4.88	2.79	6.44	1.85	4.22	0.0319 J	4.99	<0.215	0.828	4.68	<0.215	<0.215
WM-C-9-2'	05/14/2020	1.5 - 2			<0.00717	<0.00717	0.0332	0.0608	0.0593	0.0545	0.0232	0.0412	0.0145	0.0272	<0.00717	0.0446	0.00582 J	0.0319	<0.0239	<0.0239	<0.0239
WM-C-10-0.5'	05/14/2020	0 - 0.5			0.0115	0.00499 J	0.121	0.185	0.192	0.131	0.0803	0.172	0.0395	0.162	<0.00706	0.112	0.0508	0.155	<0.0235	<0.0235	<0.0235
WM-C-10-2'	05/14/2020	1.5 - 2			0.0258	0.00645 J	0.175	0.243	0.298	0.179	0.0819	0.217	0.0506	0.268	0.00249 J	0.153	0.0736	0.229	<0.0217	<0.0217	<0.0217
WM-C-11-0.5'	05/13/2020	0 - 0.5			<0.00640	<0.00640	0.00257 J	0.00383 J	0.00553 J	0.00419 J	<0.00640	0.00307 J	<0.00640	0.00273 J	<0.00640	0.00306 J	<0.00640	0.0028 J	<0.0213	<0.0213	<0.0213
WM-C-11-2'	05/13/2020	1.5 - 2			0.56	0.23	2.68	2.56	2.88	1.42	0.772	3.02	0.468	3.81	0.123	1.25	2.43	4.18	0.0112 J	0.0106 J	0.0215 J
WM-DG-1-0.5'	05/13/2020	0 - 0.5			<0.00687	<0.00687	<0.00687	<0.00687	0.00247 J	<0.00687	<0.00687	<0.00687	<0.00687	<0.00687	<0.00687	<0.00687	<0.00687	<0.00687	<0.0229	<0.0229	<0.0229
WM-DG-2-0.5'	05/13/2020	0 - 0.5			<0.00725	<0.00725	<0.00725	<0.00725	<0.00725	<0.00725	<0.00725	<0.00725	<0.00725	<0.00725	<0.00725	<0.00725	<0.00725	<0.00725	<0.0242	<0.0242	<0.0242
WM-DG-3-0.5'	05/13/2020	0 - 0.5			<0.00676	<0.00676	<0.00676	<0.00676	0.00267 J	0.00215 J	<0.00676	<0.00676	<0.00676	<0.00676	<0.00676	<0.00676	<0.00676	<0.00676	<0.0225	<0.0225	<0.0225
WM-DG-4-0.5'	05/13/2020	0 - 0.5			<0.00726	<0.00726	<0.00726	0.0027 J	0.00347 J	0.00283 J	<0.00726	<0.00726	<0.00726	<0.00726	<0.00726	<0.00726	<0.00726	<0.00726	<0.0242	<0.0242	<0.0242
WM-DG-5-0.5'	05/13/2020	0 - 0.5			<0.00733	<0.00733	<0.00733	0.00239 J	0.00287 J	0.00256 J	<0.00733	<0.00733	<0.00733	<0.00733	<0.00733	<0.00733	<0.00733	<0.00733	<0.0244	<0.0244	<0.0244
WM-DG-6-0.5'	05/13/2020	0 - 0.5			0.131	0.0763	2.85	3.61	3.88	2.27	1.31	3.61	0.836	3.07	0.0173	2.03	0.633	3.23	0.00974 J	0.0111 J	0.0133 J
WM-DG-6-2'	05/13/2020	1.5 - 2			0.185	0.114	5.43	7.56	7.92	4.06	1.85	7.05	0.238	5.06	0.0248	3.58	0.942	6.73	0.0141 J	0.0162 J	0.0194 J
WM-DG-7-0.5'	05/13/2020	0 - 0.5			<0.00639	<0.00639	0.00345 J	0.00558 J	0.00635 J	0.00506 J	<0.00639	0.00452 J	<0.00639	0.00399 J	<0.00639	0.00419 J	<0.00639	0.00411 J	<0.0213	<0.0213	<0.0213
WM-DG-8-0.5'	05/13/2020	0 - 0.5			<0.00730	<0.00730	0.0529	0.107	0.113	0.0893	0.0331	0.0669	0.0252	0.0409	<0.00730	0.0754	0.00898	0.0444	<0.0243	<0.0243	<0.0243
WM-DG-9-0.5'	05/13/2020	0 - 0.5			<0.00694	<0.00694	<0.00694	0.00271 J	0.0034 J	0.00272 J	<0.00694	<0.00694	<0.00694	<0.00694	<0.00694	0.00213 J	<0.00694	<0.00694	<0.0231	<0.0231	<0.0231
WM-DG-10-0.5'	05/13/2020	0 - 0.5			<0.00690	<0.00690	0.00254 J	0.00254 J	0.00298 J	<0.00690	<0.00690	0.00297 J	<0.00690	0.00366 J	<0.00690	<0.00690	<0.00690	0.00373 J	<0.0230	<0.0230	<0.0230
WM-DG-11-0.5'	05/14/2020	0 - 0.5			<0.0242	<0.0242	0.041	0.0608	0.0665	0.0445	0.0224 J	0.0535	0.0115 J	0.0469	<0.0242	0.0371	0.0158 J	0.0477	<0.0804	<0.0804	<0.0804
WM-DG-11-0.5'-DUP	05/14/2020	0 - 0.5	0.5-1	Duplicate	0.986	0.651	8.45	10.5	12.2	3.35	4.00	9.86	2.38	11.1	0.260	3.61	4.14	11.8	0.321	0.0762	0.11
WM-DG-11A-1'	05/15/2020	0.5 - 1			0.00491 J	<0.00659	0.0544 J3	0.0886 J3,J6	0.0813 J3,J6	0.0751 J3	0.0336 J3	0.0709 J3	0.0196	0.0595	<0.00659	0.0637 J3	<0.0220	0.0152	0.061	<0.0220	<0.0220
WM-DG-11-2'	05/14/2020	1.5 - 2			<0.00716	<0.00716	0.00212 J	0.00258 J	0.00271 J	<0.00716	<0.00716	<0.00716	<0.00716	<0.00716	<0.00716	<0.00716	<0.00716	<0.00716	0.00716 J	<0.0239	<0.0239
WM-DG-12-0.5'	05/14/2020	0 - 0.5			0.0278	0.0132	0.304	0.354	0.415	0.243	0.12	0.365	0.0661	0.347	0.00273 J	0.203	0.13	0.498	<0.0222	<0.0222	<0.0222
WM-DG-12-2'	05/14/2020	1.5 - 2			<0.00675	<0.00675	0.0100	0.00997	0.0102	0.00534 J	0.00445 J	0.0126	<0.00675	0.014	<0.00675	0.00474 J	0.00682	0.0159	<0.0225	<0.0225	<0.0225
WM-DG-13-1.5'	05/14/2020	1 - 1.5	0.5-2		0.252	0.113	6.42	11.7	14.8	7.52	4.02	8.75	4.45	5.74	0.0241	6.25	0.901	5.68	0.0462	0.0166 J	0.0201 J
WM-DG-13-2'	05/14/2020	1.5 - 2			0.00609 J	<0.00670	0.19	0.358	0.393	0.365	0.123	0.257	0.105	0.123	<0.00670	0.292	0.0186	0.158	0.00491 J	<0.0223	<0.0223
WM-DG-14-0.5'	05/14/2020	0 - 0.5			<0.00659	<0.00659	0.00997	0.0149	0.0169	0.0138	0.00589 J	0.0122	0.00377 J	0.0108	<0.00659	0.0107	0.00295 J	0.0124	<0.0220	<0.0220	<0.0220
WM-DG-15-0.5'	05/14/2020	0 - 0.5			<0.00686	<0.00686	0.00482 J	0.00658 J	0.00832	0.00645 J	0.00264 J	0.00575 J	<0.00686	0.00552 J	<0.00686	0.00486 J	<0.00686	0.0065 J	<0.0229	<0.0229	<0.0229
North Orchard																					
NO-3-0.5'	05/14/2020	0 - 0.5			<0.00726	<0.00726	<0.00726	<0.00726	0.00191 J	<0.00726	<0.00726	<0.00726	<0.00726	<0.00726	<0.00726	<0.00726	<0.00726	<0.00726	<0.0242	<0.0242	<0.0242
NO-4-0.5'	05/14/2020	0 - 0.5			<0.00700	<0.00700	<0.00700	<0.00700	<0.00700	<0.00700	<0.00700	<0.00700	<0.00700	<0.00700	<0.00700	<0.00700	<0.00700	<0.00700	<0.0233	<0.0233	<0.0233
NO-6-0.5'	05/14/2020	0 - 0.5			<0.00786	<0.00786	<0.00786	<0.00786	<0.00786	<0.00786	<0.00786	<0.00786	<0.00786	<0.00786	<0.00786	<0.00786	<0.00786	<0.00786	<0.0262	<0.0262	<0.0262
East Meadow																					
EM-1-0.5'	05/12/2020	0 - 0.5			<0.00688	<0.00688 J3	<0.00688	<0.00688	0.00228 J	<0.00688	<0.00688 J3	<0.00688	<0.00688	<0.00688	<0.00688	<0.00688	<0.00688	<0.00688	<0.0229 J3	<0.0229 J3	<0.0229 J3
EM-2-0.5'	05/12/2020	0 - 0.5			<0.00693	<0.00693	0.00233 J	0.00267 J	0.00508 J	0.00326 J	<0.00693	0.0028 J	<0.00693	0.00337 J	<0.00693	0.00232 J	<0.00693	0.00292 J	<0.0231	<0.0231	<0.0231
EM-3-0.5'	05/12/2020	0 - 0.5			<0.00690	<0.00690	<0.00690	<0.00690	0.00324 J	0.00258 J	<0.00690	<0.00690	<0.00690	<0.00690	<0.00690	<0.00690	<0.00690	<0.00690	<0.0230	<0.0230	<0.0230
EM-4-1.5'	05/12/2020	1 - 1.5			<0.00656	<0.00656	<0.00656	<0.00656	<0.00656	<0.00656	<0.00656	<0.00656	<0.00656	<0.00656	<0.00656	<0.00656	<0.00656	<0.00656	<0.0219	<0.0219	<0.0219
EM-5-0.5'	05/12/2020	0 - 0.5			<0.00647	<0.00647	<0.00647	<0.00647	<0.00647	<0.00647	<0.00647	<0.00647	<0.00647	<0.00647	<0.00647	<0.00647	<0.00647	<0.00647	<0.0216	<0.0216	<0.0216
EM-6-0.5'	05/12/2020	0 - 0.5			<0.00671	<0.00671	<0.00671	<0.00671	0.00332 J	0.00223 J	<0.00671	<0.00671	<0.00671	<0.00671	<0.00671	<0.00671	<0.00671	<0.00671	<0.0224	<0.0224	<0.0224
EM-7-0.5'	05/12/2020	0 - 0.5			<0.00663	<0.00663	<0.00663	<0.00663	0.00224 J	<0.00663	<0.00663	<0.00663	<0.00663	<0.00663	<0.00663	<0.00663	<0.00663	<0.00663	<0.0221	<0.0221	<0.0221
EM-8-1'	05/12/2020	0.5 - 1			<0.00652	<0.00652	<0.00652	<0.00652	<0.00652	<0.00652	<0.00652	<0.00652	<0.00652	<0.00652	<0.00652	<0.00652	<0.00652	<0.00652	<0.0217	<0.0217	<0.0217
EM-9-0.5'	05/12/2020	0 - 0.5			<0.00641	<0.00641	<0.00641	<0.00641	<0.00641	<0.00641	<0.00641	<0.00641	<0.00641	<0.00641	<0.00641	<0.00641	<0.00641	<0.00641	<0.0214	<0.0214	<0.0214
EM-10-0.5'	05/12/2020	0 - 0.5	0-1.5		<0.00633	<0.00633	<0.00633	<0.00633	<0.00633	<0.00633	<0.00633	<0.00633	<0.00633	<0.00633	<0.00633	<0.00633	<0.00633	<0.00633	<0.0211	<0.0211	<0.0211
EM-11-0.5'	05/12/2020	0 - 0.5			<0.00708	<0.00708	<0.00708	<0.00708	<0.00708	<0.00708	<0.00708	<0.00708	<0.00708	<0.00708	<0.00708	<0.00708	<0.00708	<0.00708	0.0114 J	<0.0236	0.0102 J

Table 2
Polycyclic Aromatic Hydrocarbons in Soil
Pogonip Farm and Garden
Santa Cruz, California

Sample ID	Date	Sample Depth	Depth Clay Target Fragments Observed	Notes	ANTHRACENE	ACENAPHTHENE	BENZO(A) ANTHRACENE	BENZO(A) PYRENE	BENZO(B) FLUORANTHENE	BENZO(G,H,I) PERYLENE	BENZO(K) FLUORANTHENE	CHRYSENE	DIBENZ(A,H) ANTHRACENE	FLUORANTHENE	FLUORENE	INDENO(1,2,3-CD) PYRENE	PHENANTHRENE	PYRENE	NAPHTHALENE	1-METHYL NAPHTHALENE	2-METHYL NAPHTHALENE
		(feet bgs)	*(feet bgs)*		*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*
Unrestricted (Residential) Screening Level[1]					17,000	3,300	1.1	0.11	1.1	NE	11	110	0.028	2,400	2,300	1.1	NE	1,800	2.0	9.9	190
Commercial Screening Level[1]					130,000	23,000	12	1.3	13	NE	130	1,300	0.31	18,000	17,000	13	NE	13,000	6.5	30	1,300
EM-21-0.5'	05/14/2020	0 - 0.5			<0.00646	<0.00646	<0.00646	<0.00646	<0.00646	<0.00646	<0.00646	<0.00646	<0.00646	<0.00646	<0.00646	<0.00646	<0.00646	<0.00646	<0.0215	<0.0215	<0.0215
EM-21-0.5'-DUP	05/14/2020	0 - 0.5		Duplicate	<0.00650	<0.00650	<0.00650	<0.00650	**0.00183** J	<0.00650	<0.00650	<0.00650	<0.00650	<0.00650	<0.00650	<0.00650	<0.00650	<0.00650	<0.0217	<0.0217	<0.0217

Notes:
PAHs analyzed using USEPA Method 8270C-SIM.
Analytes detected above laboratory reporting limit are **emboldened**.
Analytes detected above Unrestricted (Residential) Screening Level are highlighted.
Analytes detected above Commercial Screening Level are underlined.
bgs = Below ground surface.
mg/kg = Milligrams per kilogram.
NE = Not Established.
PAHs = Polycyclic Aromatic Hydrocarbons.
SIM = Selective Ion Mode.
J = The identification of the analyte is acceptable; the reported value is an estimate.
J3 = The associated batch QC was outside the established quality control range for precision.
J6 = The sample matrix interfered with the ability to make any accurate determination; spike value is low.
[1] The screening level represents the Department of Toxic Substances Control (DTSC)-modified screening level (DTSC, 2020).
References:
DTSC, 2020. Human Health Risk Assessment (HHRA) Note Number 3. June.