



ADDITIONAL SOIL SAMPLING WORK PLAN

Santa Fe Trackbed to Park
Berkeley, California

Prepared for:

City of Berkeley

Department of Parks, Recreation, and Waterfront
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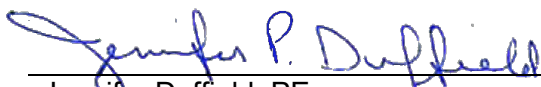
ADDITIONAL SOIL SAMPLING WORK PLAN

Santa Fe Trackbed to Park Berkeley, California

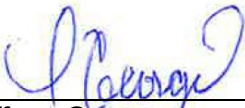
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Santa Fe Trackbed to Park
Berkeley, California

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ADDITIONAL SOIL SAMPLING WORK PLAN

Santa Fe Trackbed to Park

Berkeley, California

1.0 INTRODUCTION

GSI Environmental Inc. (GSI) has prepared this Additional Soil Sampling Work Plan (Work Plan) on behalf of the City of Berkeley Department of Parks, Recreation, and Waterfront (the City) to describe the scope and methods to conduct additional environmental investigation at the Santa Fe Trackbed to Park Conversion project site (the Site) in Berkeley, California. The purpose of the work is to further characterize the extent of arsenic, lead, mercury, and polycyclic aromatic hydrocarbons (PAHs) in soil to support the City's plans to redevelop the Site into a community asset, which will include a community garden, dog park, children's play area, and teaching garden. Figure 1 shows the Site location.

This Work Plan describes the Site background, the proposed scope of work, methodologies for the additional soil investigation, data evaluation, and reporting.

A previous version of this Work Plan dated October 11, 2023, was submitted to California Department of Substances Control (DTSC). DTSC provided comments in a letter dated November 6, 2023. DTSC's comments have been incorporated into this version of the Work Plan.

2.0 BACKGROUND

The Site extends north-to-south between Blake Street and Ward Street and east-to-west between Sacramento Street and Mabel Street and includes four parcels, as shown on Figure 2.

- Parcel 1 – located between Blake and Parker Streets
- Parcel 2 – located between Parker and Carleton Streets
- Parcel 3 – located between Carleton and Derby Streets
- Parcel 4 – located between Derby and Ward Streets

Collectively, the area of these parcels is approximately 1.32 acres. The Site is currently undeveloped land that was historically a railroad right-of-way (ROW).

GSI performed an initial soil investigation in July 2022 (GSI, 2022). Arsenic was detected at concentrations exceeding background in samples collected from 1.0 foot and 2.5 feet below ground surface (bgs) at various locations across the site with no discernable source area. Arsenic was also detected in samples collected at 4.0 feet bgs at two locations (P2-1 at Parcel 2 and P3-4 at Parcel 3); soil samples were not collected deeper than 4.0 feet bgs during the 2022 investigation. Lead, mercury, and various individual PAHs were detected at concentrations exceeding the human health screening criteria in samples collected at 1.0 foot bgs at a limited number of boring locations. Carcinogenic benzo(a)pyrene-like PAHs were further evaluated with a comparison to regional ambient levels, which were published by DTSC using the benzo(a)pyrene equivalency (BaPe). Specifically, the BaPe values were calculated using equivalency factors recommended by DTSC (2015),¹ and compared to the regional ambient level

¹ DTSC, 2015, Preliminary Endangerment Assessment Guidance Manual, October.

of 0.9 mg/kg established by DTSC.² BaPe exceeded background at one location on Parcel 4 (P4-4 at 1.0 foot bgs). Due to an existing neighbor encroachment, no samples were collected on the southernmost portion of Parcel 1 at that time. Results of the previous investigation are included in Tables 1 through 4 and Figures 3a through 3b.

The City has entered into a voluntary cleanup agreement with the California Department of Toxic Substances (DTSC) to oversee environmental characterization and remediation of the Site. The City, GSI, and DTSC met via video conference on April 6, 2023, to discuss the results of the investigation and next steps.

DTSC has requested that the City conduct additional soil characterization to characterize potential impacts to soil on the southern portion of Parcel 1 that has not been investigated due to the neighbor encroachment, delineate the vertical extent of arsenic impacted soil at Parcels 2 and 3 and delineate the elevated concentrations of PAHs detected at a previous boring in Parcel 4.

Since the investigation, the remediation approach has changed and additional sampling is proposed at all four parcels. The initial remediation approach was to mitigate where possible to reduce remediation costs. However, the City has since learned remediation costs will be higher than anticipated and currently does not have enough funding to remediate and fully construct all four parcels as originally intended. As such, the City would like to prioritize remediation to alleviate barriers for future development. The City is currently applying for additional funding to bridge their funding gap. If the City cannot secure additional funding, the City will remediate to unrestricted use and develop the parcels as much as possible. Gridded soil sampling is proposed at each of these parcels to delineate the extent of soil removal that would be required to remediate the entire area of Parcels 1 through 4 for unrestricted use.

This Work Plan incorporates the requests for further investigation from the DTSC, as well as a gridded sampling strategy to delineate remediation for unrestricted use at Parcels 1 through 4.

3.0 CONCEPTUAL SITE MODEL

In this section, the conceptual Site model regarding the source, nature and extent of constituents of potential concern (COPCs) in soil, and potential for human receptors to contact COPCs in soil is discussed.

- Historical Operations and Source of COPCs
 - The Site is a former Santa Fe Railroad ROW within a residential neighborhood. No buildings are present at the Site and the Site surfaces consist of mostly uncovered soils.
 - Typical environmental impacts on railroad corridors include deposition of petroleum-related constituents, metals, and weed control chemicals to shallow soil. Soil sampling has identified arsenic, lead, mercury, and PAHs as COPCs.
- Nature and Extent of COPCs in Soil
 - These COPCs are not mobile in soil, and the impacts are typically limited to surficial soils.

² California Department of Toxic Substances Control (DTSC), 2009, Use of the Northern and Southern California Polynuclear Aromatic Hydrocarbon (PAH) Studies in the Manufactured Gas Plant Site Cleanup Process, July 1.

- Previous soil assessments have demonstrated that COPC impacts are primarily limited to depths up to 2.5 feet bgs.
- Conceptual Site Exposure Model
 - Under current conditions, access to the Site is restricted with chain link fencing and limited to workers involved in environmental characterization of the Site or construction work. Soil removal actions will be completed under a Removal Action Workplan and under regulatory oversight of DTSC.
 - The planned future use of the Site is a community garden, dog park, children's play area, , and teaching garden. Potential human receptors at the Site that may come into contact with COPCs in soil include a future child or adult recreational user and future maintenance worker. These receptors may contact soil via the direct contact pathways (i.e., incidental ingestion, inhalation of particulates and volatile compounds, and dermal absorption).

The Conceptual Site Exposure Model is shown in Figure 4.

4.0 PROPOSED SCOPE OF WORK

The proposed Scope of Work (SOW) is presented below and incorporates requests from the DTSC and the City to collect soil samples at a previously inaccessible location on Parcel 1, delineate the extent of arsenic at depth in Parcels 2 & 3, delineate the extent of PAHs in Parcel 4, and to collect gridded soil samples on Parcels 1 through 4.

The SOW is detailed below. The Sampling and Analysis Plan (SAP) for this SOW is included as Table 5. Proposed boring locations are shown on Figures 3a through 3d. A Site-Specific Quality Assurance Project Plan (QAPP) is included in Appendix A.

4.1 Gridded Soil Sampling

Due to budgetary constraints, the City will remediate Parcels 1 through 4 to unrestricted use and redevelop them to the extent feasible. Gridded soil sampling will be completed to pre-characterize the extent of remediation that may be required. To accomplish this, a 30-foot by 30-foot grid will be overlain on Parcel 1 through Parcel 4 (Figures 3a through 3d). A soil boring will be advanced to approximately 4 feet bgs within each 30-foot by 30-foot cell. Soil samples will be collected from approximately 2.0, 3.0, and 4.0 feet bgs from each boring. Based on findings of the 2022 investigation, soil samples from Parcel 1 will be analyzed for arsenic and soil samples from Parcels 2 through 4 will be analyzed for arsenic, lead, and mercury. Additionally, analysis for PAHs will be performed in some grid locations at Parcel 4 for delineation purposes, as described in Section 3.2. The data will be used to determine the depth of excavation within each cell of the grid such that confirmation samples after excavation should not be required.

The DTSC's request for sampling within the encroachment area in Parcel 1 will be accomplished as part of this gridded sampling program. Soil samples collected from two locations (grid cells A7 and A8; Figure 3a) will be analyzed for an expanded analytical suite that includes Title 22 metals, organochlorine pesticides (OCPs), total petroleum hydrocarbons quantified as diesel (TPHd) and motor oil (TPHmo), and PAHs. An additional sample will be collected from these two borings at a depth of 5.5 feet bgs and placed on hold.

4.2 Vertical and Horizontal Delineation

Additional sampling at Parcels 2 and 3 will be conducted to address the remaining data gaps related to the vertical extent of arsenic in soil. During the initial soil investigation, arsenic was detected at concentrations exceeding background at a depth of 4 feet bgs (the total depth drilled) at two previous boring locations (boring P2-1 at Parcel 2 and boring P3-4 at Parcel 3; GSI, 2022). This scope of work includes additional sampling at previous investigation locations P2-1 and P3-4 to delineate the vertical extent of arsenic in soil (Figures 3b and 3c). Soil samples will be collected from approximately 5.0, 6.0, and 7.0 feet bgs from each boring and soil boring identifiers will be P2-1d and P3-4d, with the “d” denoting deeper soil samples collected at the previous investigation location.

Additionally, soil samples from three grid cells in Parcel 4 (P4-A9, P4-B9, and P4-B10) will be analyzed for polycyclic aromatic hydrocarbons (PAHs) to delineate elevated concentrations of PAHs detected at previous boring location P4-4.

5.0 SOIL SAMPLING METHODOLOGY

Soil sampling activities will be conducted in accordance with the QAPP (Appendix A). Prior to the sampling activities, GSI will perform the following tasks:

- Prepare a Site-Specific Health and Safety Plan (HASP) in accordance with the requirements of the State of California General Industry Safety Order 5192 and Title 29 of the Code of Federal Regulations, Section 1910.120. The HASP will be kept on-Site during field activities and will outline the work to be performed, safety precautions, emergency response procedures, nearest hospital information, and on-Site personnel responsible for managing emergency situations. The HASP is included in Appendix B.
- Mark boring locations and contact Underground Service Alert North (USA) at least 2 days in advance of field activities, as required by law.
- Obtain a Subsurface Drilling Permit from the City of Berkeley.

The City of Berkeley conducted a utility survey of the Site. Results have been provided to GSI for review prior to conducting field activities.

GSI will subcontract with a C-57-licensed drilling company to advance soil borings using a hand auger to the specified depths. Borings will be advanced to depths of approximately 4.0 to 7.0 feet bgs, as specified in Table 5.

The drilling subcontractor will advance the borings under GSI’s oversight, and GSI’s field personnel will collect the soil samples for subsequent laboratory analysis. Prior to collecting and packaging the soil samples, recovered soil will be screened for organic vapors using a portable photoionization detector (PID). Soil samples will then be collected from the hand auger by hand using new, clean, nitrile gloves, and placed directly into clean, unused, laboratory-supplied glass sample jars. All sample containers will be labeled, sealed in plastic zip-closure bags, and stored on ice in a cooler pending delivery to the analytical laboratory under standard chain-of-custody procedures. Sample labels will include the specific sample ID, the date and time the sample was collected, and the analytical test method(s) for which it will be analyzed. Table 5 includes anticipated soil boring and soil sample designations, sample depths, and the sample analytical plan. Figures 3a to 3d show the approximate soil sample locations.

Re-usable equipment utilized during the sampling program will be decontaminated by steam cleaning, or using a cleaner, such as Alconox, followed by double rinsing with potable water.

After sampling, the soil borings will be backfilled with potting soil and the surface finish will be completed to match the existing surface (i.e., bare soil or concrete). Soil cuttings generated during drilling and decontamination water will be placed into Department of Transportation-approved 55-gallon steel drums and transported to a secure area pending disposal. Following laboratory analysis and profiling, the investigation-derived waste will be transported to an off-Site facility for disposal in accordance with state and federal regulations.

Select soil samples will be analyzed by a California-certified analytical laboratory according to Table 5 for one or more of the following:

- Arsenic using USEPA Method 6010B
- Lead using USEPA Method 6010B
- Mercury using USEPA Method 7471A
- Title 22 metals using USEPA Method 6010B/7471A;
- TPHd and TPHmo using USEPA Method 8015;
- OCPs using USEPA Method 8081A; and
- PAHs using USEPA Method 8270C with selective ion monitoring (SIM)

6.0 DATA EVALUATION AND REPORTING

Data evaluation will be conducted in accordance with the QAPP (Appendix A). The field sampling and analytical data will be reviewed to determine the data usability in accordance with guidelines published by USEPA:

- National Functional Guidelines for Inorganic Superfund Methods Data Review (USEPA, 2020a)
- National Functional Guidelines for Organic Superfund Methods Data Review (USEPA, 2020b)

The data usability evaluation will include a review of surrogate recovery results, laboratory blank sample results, matrix spike (MS) and matrix spike duplicate (MSD) results, laboratory control sample results and laboratory calibration standards.

Soil analytical data will be presented with Regional Screening Levels (RSLs) published by the USEPA for residential and commercial/industrial soil (USEPA, 2022), as endorsed or modified by the DTSC (DTSC-SLs; 2022), except as noted below:

- Arsenic typically exceeds its conservative risk-based screening criterion at naturally occurring, “background” concentrations. Therefore, the detected concentrations of arsenic will be compared to regional background values. For arsenic, a background value of 11 milligrams per kilogram (mg/kg) was established in an evaluation of background concentrations in urbanized flatland soils within the San Francisco Bay Area, completed at San Francisco State University in coordination with staff of the San Francisco Bay Regional Water Quality Control Board (Duverge 2011).
- PAHs will be evaluated by initially comparing individual PAHs to DTSC-SLs. If additional evaluation is needed based on the results of this comparison, carcinogenic benzo(a)pyrene-like PAHs may also be evaluated by calculating the benzo(a)pyrene equivalency (BaPe)³ for comparison to the regional ambient level of 0.9 mg/kg established

³ For BaPe, calculations, non-detect values will be represented as the detection limit.

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by DTSC (2009). For risk assessment purposes, cancer risks and hazards will be presented with and without the contribution of chemicals at concentrations consistent with ambient conditions.

- DTSC screening levels are not published for TPHd or TPHmo. As such, analytical results for TPHd, and TPHmo will be evaluated by comparison to residential Environmental Screening Levels (ESLs) published by the Water Board (2019).

A report documenting the results of the investigation will be submitted to the DTSC. The report will include, but not be limited to, site background, a description of field and analytical methodology, tabulated data, figures showing boring locations, a discussion of sampling and analysis results, QA/QC documentation, conclusions, and recommendations.

7.0 REFERENCES

- California Department of Toxic Substances Control (DTSC), 2009, Use of the Northern and Southern California Polynuclear Aromatic Hydrocarbon (PAH) Studies in the Manufactured Gas Plant Site Cleanup Process, July 1.
- DTSC, 2015, Preliminary Endangerment Assessment Guidance Manual, October.
- DTSC, 2022, Human Health Risk Assessment Note 3 – DTSC-Modified Screening Levels (DTSC SLs), May.
- California Regional Water Quality Control Board, 2019, San Francisco Bay Region, Environmental Screening Levels, January.
- Duverge, Dylan Jacques, 2011, Establishing background Arsenic in soil for the Urbanized San Francisco Bay Region, December.
- GSI, 2022. Santa Fe Right-of-Way Phase II Environmental Site Assessment – Report of Findings. Historic Santa Fe Right-of-Way, Berkeley, California. November 22.
- USEPA, 2020a, National Functional Guidelines for Inorganic Superfund Methods Data Review (EPA 542-R-20-006), November.
- USEPA, 2020b, National Functional Guidelines for Organic Superfund Methods Data Review (EPA 540-R-20-005), November.
- USEPA, 2023, Regional Screening Levels, May.

TABLES

Table 1. Metals in Soil

Table 2. Polycyclic Aromatic Hydrocarbons in Soil

Table 3. Pesticides in Soil

Table 4. Total Petroleum Hydrocarbons in Soil

Table 5. Sampling and Analysis Plan

TABLE 1. METALS IN SOIL¹
HISTORIC SANTA FE RIGHT-OF- WAY
BERKELEY, CALIFORNIA

Parcel	Boring	Sample Name	Date Collected	Sample Depth feet bgs	Title 22 Metals																	
					Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium (total)	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	
					mg/kg																	
1	P1-1	P1-1-1.0	7/13/2022	1.0	0.91	9.3	180	0.56	<0.50	62	15	37	34	0.30	0.78	57	1.2	<0.50	<0.50	72	100	
		P1-1-2.5	7/13/2022	2.5	<0.5	8.4	200	0.65	<0.5	69	17	33	9.0	<0.050	0.9	67	1.3	<0.5	<0.5	74	72	
		P1-1-4.0	7/13/2022	4.0	<0.5	6.1	180	0.63	<0.5	70	12	29	6.8	<0.050	<0.5	58	1.2	<0.5	<0.5	71	59	
	P1-2	P1-2-1.0	7/13/2022	1.0	--	62	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		P1-2-2.5	7/13/2022	2.5	1.3	12	300	0.73	<0.5	37	16	28	13	0.079	1.3	53	1.3	<0.5	<0.5	40	66	
		P1-2-4.0	7/13/2022	4.0	--	5.7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	P1-3	P1-3-1.0	7/13/2022	1.0	2.7	83	190	0.5	<0.5	33	19	32	34	0.23	1	48	1.1	<0.5	<0.5	42	74	
		P1-3-2.5	7/13/2022	2.5	--	35	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		P1-3-4.0	7/13/2022	4.0	--	10	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2	P2-1	P2-1-1.0	7/13/2022	1.0	--	28	--	--	--	--	--	--	210	--	--	--	--	--	--	--	--	
		P2-1-2.5	7/13/2022	2.5	1.4	26	150	<0.5	<0.5	46	12	29	63	0.65	<0.5	37	0.93	<0.5	<0.5	55	180	
		P2-1-4.0	7/13/2022	4.0	--	24	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	P2-2	P2-2-1.0	7/13/2022	1.0	1.8	37	170	<0.5	<0.5	34	12	42	200	0.43	<0.5	38	1.6	<0.5	<0.5	73	150	
		P2-2-2.5	7/13/2022	2.5	--	41	--	--	--	--	--	--	10	--	--	--	--	--	--	--	--	--
		P2-2-4.0	7/13/2022	4.0	--	3.4	--	--	--	--	--	--	6.9	--	--	--	--	--	--	--	--	--
	P2-3	P2-3-1.0	7/13/2022	1.0	1.5	32	180	<0.5	<0.5	59	14	81	140	0.48	0.72	61	1.1	<0.5	<0.5	53	190	
		P2-3-2.5	7/13/2022	2.5	<0.5	6.7	190	0.73	<0.5	73	13	32	7.6	<0.050	<0.5	55	1.2	<0.5	<0.5	71	61	
	P2-4	P2-4-1.0	7/13/2022	1.0	3.6	220	280	0.57	<0.5	46	9.8	60	56	2.1	<0.5	83	0.91	<0.5	<0.5	34	62	
		P2-4-2.5	7/13/2022	2.5	--	8.9	--	--	--	--	--	--	12	<0.16 R	--	--	--	--	--	--	--	--
		P2-4-4.0	7/13/2022	4.0	--	4.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	3	P3-1	P3-1-1.0	7/14/2022	1.0	--	63	--	--	--	--	--	15	<0.15 R	--	--	--	--	--	--	--	--
P3-1-2.5			7/14/2022	2.5	<2.7	6.5	190	0.56	0.59	46	10	26	11	<0.17	<0.91	45	<2.7	<0.45	<2.7	43	56	
P3-2		P3-2-1.0	7/14/2022	1.0	<2.8	120	66	<0.47	0.65	35	7.3	42	66	1.7	<0.94	41	<2.8	<0.47	<2.8	35	96	
		P3-2-2.5	7/14/2022	2.5	<2.7 R	67	130	<0.45	0.57	56	13	60	22	0.96	<0.89	65	<2.7	<0.45	<2.7	39	110	
P3-3		P3-3-1.0	7/14/2022	1.0	<2.7	12	180	<0.44	0.72	41	9.5	32	84	0.21	<0.88	39	<2.7	<0.44	<2.7	41	150	
		P3-3-2.5	7/14/2022	2.5	<3.0 UJ	7.8	160	<0.50	0.69	37	12	30	68	0.20	<0.99	40	<3.0	0.56	<3.0	36	140	
		P3-3-4.0	7/14/2022	4.0	--	6.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
P3-4		P3-4-1.0	7/14/2022	1.0	<2.8	13	130	<0.47	0.57	45	15	34	43	<0.15	<0.94	45	<2.8	<0.47	<2.8	50	73	
	P3-4-2.5	7/14/2022	2.5	--	47	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
	P3-4-4.0	7/14/2022	4.0	--	52	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
4	P4-1	P4-1-1.0	7/14/2022	1.0	<3.0	140	190	<0.5	1.9	75	14	81	280	2.1	<1.0	120	<3.0	<0.50	<3.0	37	440	
		P4-1-2.5	7/14/2022	2.5	<2.8	88	160	<0.47	0.47	26	17	28	21	0.25	<0.93	47	<2.8	<0.47	<2.8	24	60	
		P4-1-4.0	7/14/2022	4.0	--	4.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	P4-2	P4-2-1.0	7/14/2022	1.0	<2.8	23	100	<0.46	<0.46	19	9.6	23	13	<0.16	<0.92	31	<2.8	<0.46	<2.8	23	44	
		P4-2-2.5	7/14/2022	2.5	<3.1	4.2	200	<0.52	0.55	44	14	27	11	<0.16	<1.0	21	<3.1	<0.52	<3.1	42	44	
	P4-3	P4-3-1.0	7/14/2022	1.0	--	29	--	--	--	--	--	--	22	<0.16 R	--	--	--	--	--	--	--	--
		P4-3-2.5	7/14/2022	2.5	<2.7	8.2	180	<0.45	<0.45	25	9.8	21	12	<0.14	<0.91	34	<2.7	<0.45	<2.7	26	62	
	P4-4	P4-4-1.0	7/14/2022	1.0	<2.7	51	85	<0.45	<0.45	16	5.3	36	42	0.81	<0.89	20	<2.7	<0.45	<2.7	24	190	
		P4-4-2.5	7/14/2022	2.5	--	12	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		P4-4-4.0	7/14/2022	4.0	--	5.4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Screening Criteria																						
Residential DTSC-SLs ²					31	11 ³	15000	16	71	None	23	3100	80	1	390	820	390	390	0.78	390	23000	
Commercial/Industrial DTSC-SLs ²					470	11 ³	220000	230	780	None	350	47000	320	4.4	5800	11000	5800	5800	12	5800	350000	
Total Threshold Limit Concentration ⁴					500	500	10000	75	100	2500	8000	2500	1000	20	3500	2000	100	500	700	2400	5000	
10 x Soluble Threshold Leaching Criteria ⁵					150	50	1000	7.5	10	50	800	250	50	2	3500	200	10	50	70	240	2500	
20x Toxicity Criteria ⁶					None	100	2000	None	20	100	None	None	100	4	None	None	20	100	None	None	None	

Notes:

- Soil samples collected by GSI Environmental Inc. and analyzed by Enthalpy Analytical using United States Environmental Protection Agency (USEPA) Methods 6010B and 7471A (for mercury). Select samples were analyzed by McCampbell Analytical for metals using USEPA Method 6020.
- Regional screening levels for residential and commercial/industrial soil published by the USEPA (2022) and approved or modified by the California Department of Toxic Substances Control (2022).
- Analytical results for arsenic in soil are compared to the 99th percentile of background arsenic concentrations as presented by Duvergé (2011).
- Total Threshold Limit Concentration, as presented in the California Code of Regulations (CCR), Title 22, Division 4.5, Chapter 11, Article 3, Section 66261.24.
- Ten times the Soluble Threshold Limit Concentration, as presented in CCR, Title 22, Division 4.5, Chapter 11, Article 3, Section 66261.24.
- Twenty times the Toxicity Criteria, as presented in the Code of Federal Regulations (CFR), Title 40, Part 261, Subpart C, Section 261.24.

Abbreviations:

- < = analyte not detected above the reporting limit shown
- = not analyzed
- bold** = analyte detected above the reporting limit
- Shaded concentrations exceed residential screening criteria
- bgs = below ground surface
- mg/kg = milligrams per kilogram
- UJ = The non-detected data is estimated because the Matrix Spike (MS)/Matrix Spike Duplicate (MSD) results are outside specifications
- R = The data are rejected because the MS/MSD results are outside specifications or the holding time was exceeded

References:

- DTSC, 2022, Human and Ecological Risk (HERO), HHRA Note Number 3, May.
- Duverge, Dylan Jacques, 2011, Establishing background Arsenic in soil for the Urbanized San Francisco Bay Region, December.
- USEPA, 2022, Regional Screening Levels, May.

TABLE 2: POLYCYCLIC AROMATIC HYDROCARBONS IN SOIL¹
HISTORICAL SANTA FE RIGHT-OF-WAY
BERKELEY, CALIFORNIA

Parcel	Boring	Sample Name	Date Collected	Sample Depth feet bgs	Polycyclic Aromatic Hydrocarbons																			
					Acenaph- thene	Acenaph- thylene	Anthrac- ene	Benzo(a) anthrac- ene	Benzo(a) pyrene	Benzo(b) fluoranth- ene	Benzo(g,h ,i) perylene	Benzo(k) fluoranth- ene	Chrysene	Dibenz(a, h) anthrac- ene	Fluoranth- ene	Fluorene	Indeno (1,2,3-cd) pyrene	1- Methylna phthalene	2- Methylna phthalene	Naphthal- ene	Phenanth- rene	Pyrene	BaPe ²	
					mg/kg																			
1	P1-1	P1-1-1.0	7/13/2022	1.0	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	NA		
		P1-1-2.5	7/13/2022	2.5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	
		P1-1-4.0	7/13/2022	4.0	<0.0099	<0.0099	<0.0099	<0.0099	<0.0099	<0.0099	<0.0099	<0.0099	<0.0099	<0.0099	<0.0099	<0.0099	<0.0099	<0.0099	<0.0099	<0.0099	<0.0099	<0.0099	NA	
	P1-2	P1-2-2.5	7/13/2022	2.5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	
	P1-3	P1-3-1.0	7/13/2022	1.0	0.015	<0.0099	0.029	0.14	0.19	0.15	0.11	0.15	0.17	0.027	0.15	<0.0099	0.15	0.022	0.032	0.05	0.071	0.19	0.26	
2	P2-1	P2-1-2.5	7/13/2022	2.5	<0.01	<0.01	<0.01	0.018	0.028	0.024	0.025	0.02	0.022	<0.01	0.036	<0.01	0.028	<0.01	<0.01	<0.01	0.024	0.041	0.045	
		P2-2	P2-2-1.0	7/13/2022	1.0	<0.04	<0.04	<0.04	0.13	0.24	0.18	0.21	0.18	0.14	<0.04	0.12	<0.04	0.25	<0.04	<0.04	<0.04	<0.04	0.16	0.34
	P2-3	P2-3-1.0	7/13/2022	1.0	<0.04	<0.04	<0.04	0.047	0.064	0.063	0.059	0.044	0.059	<0.04	0.061	<0.04	0.058	<0.04	<0.04	<0.04	0.051	0.068	0.12	
		P2-3-2.5	7/13/2022	2.5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA
	P2-4	P2-4-1.0	7/13/2022	1.0	<0.01	<0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA
3	P3-1	P3-1-2.5	7/13/2022	2.5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA	
		P3-2	P3-2-1.0	7/13/2022	1.0	<0.1	<0.1	<0.1	0.16	0.28	0.28	0.22	0.24	0.22	<0.1	0.16	<0.1	0.27	<0.1	<0.1	<0.1	<0.1	0.19	0.45
	P3-2	P3-2-2.5	7/13/2022	2.5	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	NA
		P3-3	P3-3-1.0	7/13/2022	1.0	<0.099	<0.099	<0.099	<0.099	<0.099	<0.099	<0.099	<0.099	<0.099	<0.099	<0.099	<0.099	<0.099	<0.099	<0.099	<0.099	<0.099	<0.099	NA
	P3-4	P3-3-2.5	7/13/2022	2.5	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	NA
4	P4-1	P4-1-1.0	7/13/2022	1.0	<0.25	<0.25	<0.25	<0.25	0.31	0.29	0.25	0.27	0.26	<0.25	<0.25	<0.25	0.29	<0.25	<0.25	<0.25	<0.25	<0.25	0.26	0.65
		P4-1-2.5	7/13/2022	2.5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA
	P4-2	P4-2-1.0	7/13/2022	1.0	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA
		P4-2-2.5	7/13/2022	2.5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NA
	P4-3	P4-3-1.0	7/13/2022	1.0	<0.01 R	<0.01 R	0.014 J	0.036 J	0.066 J	0.042 J	0.036 J	0.047 J	0.045 J	<0.01 R	0.04 J	<0.01 R	0.039 J	<0.01 R	<0.01 R	<0.01 R	0.019 J	0.048 J	0.088	
		P4-3-2.5	7/13/2022	2.5	0.012	<0.01	0.048	0.079	0.066	0.049	0.033	0.049	0.064	<0.01	0.17	0.021	0.042	<0.01	<0.01	<0.01	0.21	0.16	0.094	
	P4-4	P4-4-1.0	7/13/2022	1.0	<0.2	<0.2	<0.2	1.7	3.5	2.4	2.3	2.4	1.8	0.54	1.1	<0.2	3.1	<0.2	<0.2	<0.2	0.26	1.5	4.8	
P4-4-2.5		7/13/2022	2.5	<0.01 R	<0.01 R	0.013 J	0.2 J	0.39 J	0.26 J	0.25 J	0.27 J	0.19 J	0.079 J	0.14 J	<0.01 R	0.35 J	<0.01 R	<0.01 R	<0.01 R	0.046 J	0.18 J	0.55		
	P4-4-4.0	7/13/2022	4.0	<0.0099 R	<0.0099 R	<0.0099 R	<0.0099 R	<0.0099 R	<0.0099 R	<0.0099 R	<0.0099 R	<0.0099 R	<0.0099 R	<0.0099 R	<0.0099 R	<0.0099 R	<0.0099 R	<0.0099 R	<0.0099 R	<0.0099 R	<0.0099 R	<0.0099 R	NA	
Screening Criteria²																								
Residential Risk-Based Screening Levels ³					3300	None	17000	1.1	0.11	1.1	None	11	110	0.028	2400	2300	1.1	9.9	None	2	None	1800	0.9 ⁴	
Commercial/Industrial Risk-Based Screening Levels ³					23000	None	130000	12	1.3	13	None	130	1300	0.31	18000	17000	13	30	None	6.5	None	13000	0.9 ⁴	
Total Threshold Limit Concentration ⁵					None	None	None	None	None	None	None	None	None	None	None	None	None	None	None	None	None	None	None	None
10x Soluble Threshold Limit Concentration ⁶					None	None	None	None	None	None	None	None	None	None	None	None	None	None	None	None	None	None	None	None
20x Toxicity Criteria ⁷					None	None	None	None	None	None	None	None	None	None	None	None	None	None	None	None	None	None	None	None

Notes:

- Soil samples collected by GSI Environmental Inc. and analyzed by Enthalpy Analytical for polycyclic aromatic hydrocarbons (PAHs) using United States Environmental Protection Agency (USEPA) Method 8270C with selective ion monitoring (SIM).
- BaPe is calculated using potency equivalency factors for seven PAHs considered carcinogenic by the State of California. These PAHs, with their corresponding equivalency factors, are: benzo(a)anthracene (0.1), benzo(a)pyrene (1), benzo(b)fluoranthene (0.1), benzo(k)fluoranthene (0.1), chrysene (0.01), dibenzo(a,h)anthracene (0.34), and indeno(1,2,3-cd)pyrene (0.1). Note that while naphthalene is the eighth carcinogenic PAH, it is not included in the BaPe because this PAH is evaluated separately from the other PAHs.
- Regional screening levels for residential and commercial/industrial soil published by the USEPA (2022) and approved or modified by the California Department of Toxic Substances Control (2022).
- BaPe are compared to the regional ambient level of 0.9 mg/kg established by DTSC (2009).
- Total Threshold Limit Concentration, as presented in the California Code of Regulations (CCR), Title 22, Division 4.5, Chapter 11, Article 3, Section 66261.24.
- Ten times the Soluble Threshold Limit Concentration, as presented in CCR, Title 22, Division 4.5, Chapter 11, Article 3, Section 66261.24.
- Twenty times the Toxicity Criteria, as presented in the Code of Federal Regulations (CFR), Title 40, Part 261, Subpart C, Section 261.24.

Abbreviations:

bgs = below ground surface
 BaPe = benzo(a)pyrene equivalent value
 mg/kg = milligrams per kilogram
 NA = not applicable; PAHs were not detected; therefore, a BaPe was not calculated

bold = analyte detected above the reporting limit
 < = analyte not detected above the reporting limit shown
 J = The detected result is estimated because the holding time was exceeded.
 R = The non-detected result is rejected because the holding time was exceeded.

References:

- California Department of Toxic Substances Control (DTSC), 2009, Use of the Northern and Southern California Polynuclear Aromatic Hydrocarbon (PAH) Studies in the Manufactured Gas Plant Site Cleanup Process, July 1.
 DTSC, 2015, Preliminary Endangerment Assessment Guidance Manual, October.
 DTSC, 2020, Human and Ecological Risk (HERO), HHRA Note Number 3, June.
 United States Environmental Protection Agency, 2020, Regional Screening Levels, November.

TABLE 3: PESTICIDES IN SOIL¹
HISTORIC SANTA FE RIGHT-OF-WAY
BERKELEY, CALIFORNIA

Parcel	Boring	Sample Name	Date Collected	Sample Depth feet bgs	Organochlorine Pesticides																				
					Aldrin	alpha-BHC	beta-BHC	delta-BHC	gamma-BHC	Chlordane	4,4'-DDD	4,4'-DDE	4,4'-DDT	Dieldrin	Endosulfan I	Endosulfan II	Endosulfan sulfate	Endrin	Endrin aldehyde	Endrin ketone	Heptachlor	Heptachlor epoxide	Methoxychlor	Toxaphene	
					mg/kg																				
1	P1-1	P1-1-1.0	7/13/2022	1.0	<0.0099	<0.0099	<0.0099	<0.0099	<0.0099	<0.099	<0.0099	<0.0099	<0.0099	<0.0099	<0.0099	<0.0099	<0.0099	<0.0099	<0.0099	<0.0099	<0.0099	<0.02	<0.2		
		P1-1-2.5	7/13/2022	2.5	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.01	<0.1	
		P1-1-4.0	7/13/2022	4.0	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.01	<0.1	
	P1-2	P1-2-2.5	7/13/2022	2.5	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0098	<0.098	
2	P2-1	P2-1-1.0	7/13/2022	1.0	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.1	
		P2-1-2.5	7/13/2022	2.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.0099	<0.099	
	P2-2	P2-2-1.0	7/13/2022	1.0	<0.01	<0.01	<0.01	<0.01	<0.01	<0.1	<0.01	<0.01	0.012 C J	0.015	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.2
		P2-2-1.0	7/13/2022	1.0	<0.0099	<0.0099	<0.0099	<0.0099	<0.0099	<0.099	<0.0099	0.025	0.024	<0.0099	<0.0099	<0.0099	<0.0099	<0.0099	<0.0099	<0.0099	<0.0099	<0.0099	<0.0099	<0.02	<0.2
	P2-3	P2-3-1.0	7/13/2022	1.0	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.0099	<0.099
		P2-3-2.5	7/13/2022	2.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.0099	<0.099
P2-4	P2-4-1.0	7/13/2022	1.0	<0.01	<0.01	<0.01	<0.01	<0.01	<0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.2	
	P2-4-1.0	7/13/2022	1.0	<0.01	<0.01	<0.01	<0.01	<0.01	<0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.2	
3	P3-1	P3-1-2.5	7/13/2022	2.5	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.01	<0.1	
		P3-1-2.5	7/13/2022	2.5	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.01	<0.1	
	P3-2	P3-2-1.0	7/13/2022	1.0	<0.0098	<0.0098	<0.0098	<0.0098	<0.0098	<0.098	<0.0098	0.011 C	0.04	<0.0098	<0.0098	<0.0098	<0.0098	<0.0098	<0.0098	<0.0098	<0.0098	<0.0098	<0.0098	<0.02	<0.2
		P3-2-2.5	7/13/2022	2.5	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.01	<0.1
	P3-3	P3-3-1.0	7/13/2022	1.0	<0.0099	<0.0099	<0.0099	<0.0099	<0.0099	<0.099	<0.0099	<0.0099	<0.0099	0.01	<0.0099	<0.0099	<0.0099	<0.0099	<0.0099	<0.0099	<0.0099	<0.0099	<0.0099	<0.02	<0.2
P3-3-2.5		7/13/2022	2.5	<0.025	<0.025	<0.025	<0.025	<0.025	<0.25	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.049	<0.49	
P3-4	P3-4-1.0	7/13/2022	1.0	<0.025	<0.025	<0.025	<0.025	<0.025	<0.25	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.05	<0.5	
	P3-4-1.0	7/13/2022	1.0	<0.025	<0.025	<0.025	<0.025	<0.025	<0.25	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.05	<0.5	
4	P4-1	P4-1-1.0	7/13/2022	1.0	<0.025	<0.025	<0.025	<0.025	<0.025	<0.25	<0.025	0.037	0.14	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.05	<0.5
		P4-1-2.5	7/13/2022	2.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.0099	<0.099
	P4-2	P4-2-1.0	7/13/2022	1.0	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.01	<0.1
		P4-2-2.5	7/13/2022	2.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.05	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.1
P4-3	P4-3-2.5	7/13/2022	2.5	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.01	<0.1	
	P4-3-2.5	7/13/2022	2.5	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.01	<0.1	
P4-4	P4-4-1.0	7/13/2022	1.0	<0.01	<0.01	<0.01	<0.01	<0.01	<0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.2	
	P4-4-1.0	7/13/2022	1.0	<0.01	<0.01	<0.01	<0.01	<0.01	<0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.2	
Screening Criteria																									
Residential Risk-Based Screening Levels ²					0.039	0.086	0.3	0.3	0.57	1.7	2.3	2	1.9	0.034	470	470	380	19	19	19	0.13	0.07	320	0.45	
Commercial/Industrial Risk-Based Screening Levels ²					0.18	0.36	1.3	1.3	2.5	6.1	6.2	9.3	7.1	0.093	7000	7000	4900	250	250	250	0.63	0.33	4100	1.2	
Total Threshold Limit Concentration ³					1.4	None	None	None	None	2.5	1.0	1.0	1.0	8	None	None	None	0.2	None	None	4.7	None	100	5	
10x Soluble Threshold Limit Concentration ⁴					1.4	None	None	None	None	2.5	1.0	1.0	1.0	8	None	None	None	0.2	None	None	4.7	None	100	5	
20x Toxicity Criteria ⁵					None	None	None	None	8	0.6	None	None	None	None	None	None	None	0.4	None	None	0.16	None	200	10	

- Notes:**
- Soil samples collected by GSI Environmental Inc. and analyzed by Enthalpy Analytical for organochlorine pesticides using United States Environmental Protection Agency (USEPA) Method 8081A.
 - Regional screening levels for residential and commercial/industrial soil published by the USEPA (2022) and approved or modified by the California Department of Toxic Substances Control (2022).
 - Total Threshold Limit Concentration, as presented in the California Code of Regulations (CCR), Title 22, Division 4.5, Chapter 11, Article 3, Section 66261.24.
 - Ten times the Soluble Threshold Limit Concentration, as presented in CCR, Title 22, Division 4.5, Chapter 11, Article 3, Section 66261.24.
 - Twenty times the Toxicity Criteria, as presented in the Code of Federal Regulations (CFR), Title 40, Part 261, Subpart C, Section 261.24.

Abbreviations:

< = analyte not detected above the reporting limit shown
bold = analyte detected above the reporting limit
bgs = below ground surface
mg/kg = milligrams per kilogram
C = Presence confirmed, but the Relative Percent Difference (RPD) between columns exceeds 40%
J = The detected result is an estimate

References:

DTSC, 2020, Human and Ecological Risk (HERO), HHRA Note Number 3, June.
United States Environmental Protection Agency, 2020, Regional Screening Levels, November.

TABLE 4: TOTAL PETROLEUM HYDROCARBONS IN SOIL¹
HISTORIC SANTA FE RIGHT-OF-WAY
BERKELEY, CALIFORNIA

Parcel	Boring	Sample Name	Date Collected	Sample Depth	Total Petroleum Hydrocarbons	
					TPH-d	TPH-mo
				feet bgs	mg/kg	
1	P1-1	P1-1-1.0	7/13/2022	1.0	<10	<20
		P1-1-2.5	7/13/2022	2.5	<10	<20
		P1-1-4.0	7/13/2022	4.0	<10	<20
	P1-2	P1-2-2.5	7/13/2022	2.5	<10	<20
	P1-3	P1-3-1.0	7/13/2022	1.0	14	22
2	P2-1	P2-1-2.5	7/13/2022	2.5	<10	<20
	P2-2	P2-2-1.0	7/13/2022	1.0	20	51
	P2-3	P2-3-1.0	7/13/2022	1.0	25	61
		P2-3-2.5	7/13/2022	2.5	<10	<20
	P2-4	P2-4-1.0	7/13/2022	1.0	47	89
3	P3-1	P3-1-2.5	7/13/2022	2.5	<10	<20
	P3-2	P3-2-1.0	7/13/2022	1.0	<50	<100
		P3-2-2.5	7/13/2022	2.5	<10	<20
	P3-3	P3-3-1.0	7/13/2022	1.0	120	87
		P3-3-2.5	7/13/2022	2.5	160	490
P3-4	P3-4-1.0	7/13/2022	1.0	65	210	
4	P4-1	P4-1-1.0	7/13/2022	1.0	<50	<100
		P4-1-2.5	7/13/2022	2.5	<10	<20
	P4-2	P4-2-1.0	7/13/2022	1.0	<10	<20
		P4-2-2.5	7/13/2022	2.5	<10	<20
	P4-3	P4-3-2.5	7/13/2022	2.5	<10	<20
	P4-4	P4-4-1.0	7/13/2022	1.0	45	76
Screening Criteria						
Residential Risk-Based Screening Levels ²					260	12,000
Commercial/Industrial Risk-Based Screening Levels ²					1,200	180,000
Total Threshold Limit Concentration ³					None	None
10x Soluble Threshold Limit Concentration ⁴					None	None
20x Toxicity Criteria ⁵					None	None

Notes:

- Soil samples collected by GSI Environmental Inc. and analyzed by Enthalpy Analytical for TPH using United States Environmental Protection Agency (USEPA) Method 8015M.
- Direct exposure environmental screening levels for human health published by the San Francisco Bay Regional Water Quality Control Board (Water Board, 2019).
- Total Threshold Limit Concentration, as presented in the California Code of Regulations (CCR), Title 22, Division 4.5, Chapter 11, Article 3, Section 66261.24.
- Ten times the Soluble Threshold Limit Concentration, as presented in CCR, Title 22, Division 4.5, Chapter 11, Article 3, Section 66261.24.
- Twenty times the Toxicity Criteria, as presented in the Code of Federal Regulations (CFR), Title 40, Part 261, Subpart C, Section 261.24.

Abbreviations:

< = analyte not detected above the reporting limit shown
bold = analyte detected above the reporting limit
 bgs = below ground surface
 mg/kg = milligrams per kilogram
 TPH = total petroleum hydrocarbons
 TPHd = TPH quantified as diesel (diesel range organics [DRO] C10-C28)
 TPHmo = TPH quantified as motor oil (oil range organics [ORO] C28-C44)

References:

San Francisco Bay Regional Water Quality Control Board (Water Board), 2019, Environmental Screening Levels, Summary Tables, January (Rev. 2).

TABLE 5: ADDITIONAL SOIL SAMPLING AND ANALYSIS PLAN
Sante Fe Trackbed to Park
Berkeley, California

Parcel	Sample ID	Description	Sample Depth (feet bgs)	Analytes and Analytical Methods							
				Arsenic	Lead	Mercury	Title 22 Metals	OCPs	TPHd/TPHmo	PAHs	
				EPA 6010B	EPA 6010B	EPA 7471A	EPA 6010B/7471A	EPA 8081A	EPA 8015M	EPA 8270C SIM	
1	P1-A2	Grid Cell A2	1.5-2.0	X	--	--	--	--	--	--	--
			2.5-3.0	X	--	--	--	--	--	--	--
			3.5-4.0	Hold	--	--	--	--	--	--	--
1	P1-A3	Grid Cell A3	1.5-2.0	X	--	--	--	--	--	--	--
			2.5-3.0	X	--	--	--	--	--	--	--
			3.5-4.0	Hold	--	--	--	--	--	--	--
1	P1-A4	Grid Cell A4	1.5-2.0	X	--	--	--	--	--	--	--
			2.5-3.0	X	--	--	--	--	--	--	--
			3.5-4.0	Hold	--	--	--	--	--	--	--
1	P1-A5	Grid Cell A5	1.5-2.0	X	--	--	--	--	--	--	--
			2.5-3.0	X	--	--	--	--	--	--	--
			3.5-4.0	Hold	--	--	--	--	--	--	--
1	P1-A6	Grid Cell A6	1.5-2.0	X	--	--	--	--	--	--	--
			2.5-3.0	X	--	--	--	--	--	--	--
			3.5-4.0	Hold	--	--	--	--	--	--	--
1	P1-A7	Grid Cell A7 & Encroachment Area Sampling	0.5-1.0	--	--	--	X	X	X	X	X
			2.0-2.5	--	--	--	X	X	X	X	X
			3.5-4.0	--	--	--	Hold	Hold	Hold	Hold	Hold
			5.0-5.5	--	--	--	Hold	Hold	Hold	Hold	Hold
1	P1-A8	Grid Cell A8 & Encroachment Area Sampling	0.5-1.0	--	--	--	X	X	X	X	X
			2.0-2.5	--	--	--	X	X	X	X	X
			3.5-4.0	--	--	--	Hold	Hold	Hold	Hold	Hold
			5.0-5.5	--	--	--	Hold	Hold	Hold	Hold	Hold
1	P1-A9	Grid Cell A9	1.5-2.0	X	--	--	--	--	--	--	--
			2.5-3.0	X	--	--	--	--	--	--	--
			3.5-4.0	Hold	--	--	--	--	--	--	--
1	P1-A10	Grid Cell A10	1.5-2.0	X	--	--	--	--	--	--	--
			2.5-3.0	X	--	--	--	--	--	--	--
			3.5-4.0	Hold	--	--	--	--	--	--	--
1	P1-B2	Grid Cell B2	1.5-2.0	X	--	--	--	--	--	--	--
			2.5-3.0	X	--	--	--	--	--	--	--
			3.5-4.0	Hold	--	--	--	--	--	--	--
1	P1-B3	Grid Cell B3	1.5-2.0	X	--	--	--	--	--	--	--
			2.5-3.0	X	--	--	--	--	--	--	--
			3.5-4.0	Hold	--	--	--	--	--	--	--
1	P1-B4	Grid Cell B4	1.5-2.0	X	--	--	--	--	--	--	--
			2.5-3.0	X	--	--	--	--	--	--	--
			3.5-4.0	Hold	--	--	--	--	--	--	--
1	P1-B5	Grid Cell B5	1.5-2.0	X	--	--	--	--	--	--	--
			2.5-3.0	X	--	--	--	--	--	--	--
			3.5-4.0	Hold	--	--	--	--	--	--	--
1	P1-B6	Grid Cell B6	1.5-2.0	X	--	--	--	--	--	--	--
			2.5-3.0	X	--	--	--	--	--	--	--
			3.5-4.0	Hold	--	--	--	--	--	--	--
1	P1-B7	Grid Cell B7	1.5-2.0	X	--	--	--	--	--	--	--
			2.5-3.0	X	--	--	--	--	--	--	--
			3.5-4.0	Hold	--	--	--	--	--	--	--
2	P2-A4	Grid Cell A4	1.5-2.0	X	X	X	--	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--	--
2	P2-A5	Grid Cell A5	1.5-2.0	X	X	X	--	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--	--
2	P2-A6	Grid Cell A6	1.5-2.0	X	X	X	--	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--	--
2	P2-A7	Grid Cell A7	1.5-2.0	X	X	X	--	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--	--
2	P2-A8	Grid Cell A8	1.5-2.0	X	X	X	--	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--	--
2	P2-A9	Grid Cell A9	1.5-2.0	X	X	X	--	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--	--
2	P2-A10	Grid Cell A10	1.5-2.0	X	X	X	--	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--	--
2	P2-B1	Grid Cell B1	1.5-2.0	X	X	X	--	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--	--
2	P2-1d	Vertical Delineation (deeper sample depth at P2-1)	4.5-5.0	X	--	--	--	--	--	--	--
			5.5-6.0	X	--	--	--	--	--	--	--
			6.5-7.0	Hold	--	--	--	--	--	--	--
2	P2-B3	Grid Cell B3	1.5-2.0	X	X	X	--	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--	--

TABLE 5: ADDITIONAL SOIL SAMPLING AND ANALYSIS PLAN
Sante Fe Trackbed to Park
 Berkeley, California

Parcel	Sample ID	Description	Sample Depth (feet bgs)	Analytes and Analytical Methods							
				Arsenic	Lead	Mercury	Title 22 Metals	OCPs	TPHd/TPHmo	PAHs	
				EPA 6010B	EPA 6010B	EPA 7471A	EPA 6010B/7471A	EPA 8081A	EPA 8015M	EPA 8270C SIM	
2	P2-B4	Grid Cell B4	1.5-2.0	X	X	X	--	--	--	--	
			2.5-3.0	X	X	X	--	--	--	--	
			3.5-4.0	Hold	Hold	Hold	--	--	--	--	
2	P2-B5	Grid Cell B5	1.5-2.0	X	X	X	--	--	--	--	
			2.5-3.0	X	X	X	--	--	--	--	
			3.5-4.0	Hold	Hold	Hold	--	--	--	--	
2	P2-B6	Grid Cell B6	1.5-2.0	X	X	X	--	--	--	--	
			2.5-3.0	X	X	X	--	--	--	--	
			3.5-4.0	Hold	Hold	Hold	--	--	--	--	
2	P2-B7	Grid Cell B7	1.5-2.0	X	X	X	--	--	--	--	
			2.5-3.0	X	X	X	--	--	--	--	
			3.5-4.0	Hold	Hold	Hold	--	--	--	--	
2	P2-B8	Grid Cell B8	1.5-2.0	X	X	X	--	--	--	--	
			2.5-3.0	X	X	X	--	--	--	--	
			3.5-4.0	Hold	Hold	Hold	--	--	--	--	
2	P2-B9	Grid Cell B9	1.5-2.0	X	X	X	--	--	--	--	
			2.5-3.0	X	X	X	--	--	--	--	
			3.5-4.0	Hold	Hold	Hold	--	--	--	--	
2	P2-B10	Grid Cell B10	1.5-2.0	X	X	X	--	--	--	--	
			2.5-3.0	X	X	X	--	--	--	--	
			3.5-4.0	Hold	Hold	Hold	--	--	--	--	
3	P3-A1	Grid Cell A1	1.5-2.0	X	X	X	--	--	--	--	
			2.5-3.0	X	X	X	--	--	--	--	
			3.5-4.0	Hold	Hold	Hold	--	--	--	--	
3	P3-A2	Grid Cell A2	1.5-2.0	X	X	X	--	--	--	--	
			2.5-3.0	X	X	X	--	--	--	--	
			3.5-4.0	Hold	Hold	Hold	--	--	--	--	
3	P3-A3	Grid Cell A3	1.5-2.0	X	X	X	--	--	--	--	
			2.5-3.0	X	X	X	--	--	--	--	
			3.5-4.0	Hold	Hold	Hold	--	--	--	--	
3	P3-A4	Grid Cell A4	1.5-2.0	X	X	X	--	--	--	--	
			2.5-3.0	X	X	X	--	--	--	--	
			3.5-4.0	Hold	Hold	Hold	--	--	--	--	
3	P3-A5	Grid Cell A5	1.5-2.0	X	X	X	--	--	--	--	
			2.5-3.0	X	X	X	--	--	--	--	
			3.5-4.0	Hold	Hold	Hold	--	--	--	--	
3	P3-A6	Grid Cell A6	1.5-2.0	X	X	X	--	--	--	--	
			2.5-3.0	X	X	X	--	--	--	--	
			3.5-4.0	Hold	Hold	Hold	--	--	--	--	
3	P3-A7	Grid Cell A7	1.5-2.0	X	X	X	--	--	--	--	
			2.5-3.0	X	X	X	--	--	--	--	
			3.5-4.0	Hold	Hold	Hold	--	--	--	--	
3	P3-A8	Grid Cell A8	1.5-2.0	X	X	X	--	--	--	--	
			2.5-3.0	X	X	X	--	--	--	--	
			3.5-4.0	Hold	Hold	Hold	--	--	--	--	
3	P3-A9	Grid Cell A9	1.5-2.0	X	X	X	--	--	--	--	
			2.5-3.0	X	X	X	--	--	--	--	
			3.5-4.0	Hold	Hold	Hold	--	--	--	--	
3	P3-A10	Grid Cell A10	1.5-2.0	X	X	X	--	--	--	--	
			2.5-3.0	X	X	X	--	--	--	--	
			3.5-4.0	Hold	Hold	Hold	--	--	--	--	
3	P3-B1	Grid Cell B1	1.5-2.0	X	X	X	--	--	--	--	
			2.5-3.0	X	X	X	--	--	--	--	
			3.5-4.0	Hold	Hold	Hold	--	--	--	--	
3	P3-B2	Grid Cell B2	1.5-2.0	X	X	X	--	--	--	--	
			2.5-3.0	X	X	X	--	--	--	--	
			3.5-4.0	Hold	Hold	Hold	--	--	--	--	
3	P3-B3	Grid Cell B3	1.5-2.0	X	X	X	--	--	--	--	
			2.5-3.0	X	X	X	--	--	--	--	
			3.5-4.0	Hold	Hold	Hold	--	--	--	--	
3	P3-B4	Grid Cell B4	1.5-2.0	X	X	X	--	--	--	--	
			2.5-3.0	X	X	X	--	--	--	--	
			3.5-4.0	Hold	Hold	Hold	--	--	--	--	
3	P3-B5	Grid Cell B5	1.5-2.0	X	X	X	--	--	--	--	
			2.5-3.0	X	X	X	--	--	--	--	
			3.5-4.0	Hold	Hold	Hold	--	--	--	--	
3	P3-B6	Grid Cell B6	1.5-2.0	X	X	X	--	--	--	--	
			2.5-3.0	X	X	X	--	--	--	--	
			3.5-4.0	Hold	Hold	Hold	--	--	--	--	
3	P3-B7	Grid Cell B7	1.5-2.0	X	X	X	--	--	--	--	
			2.5-3.0	X	X	X	--	--	--	--	
			3.5-4.0	Hold	Hold	Hold	--	--	--	--	
3	P3-B8	Grid Cell B8	1.5-2.0	X	X	X	--	--	--	--	
			2.5-3.0	X	X	X	--	--	--	--	
			3.5-4.0	Hold	Hold	Hold	--	--	--	--	
3	P3-4d	Vertical Delineation (deeper sample depth at P3-4)	4.5-5.0	X	--	--	--	--	--	--	
			5.5-6.0	X	--	--	--	--	--	--	--
			6.5-7.0	Hold	--	--	--	--	--	--	--

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Sante Fe Trackbed to Park
 Berkeley, California

Parcel	Sample ID	Description	Sample Depth (feet bgs)	Analytes and Analytical Methods						
				Arsenic	Lead	Mercury	Title 22 Metals	OCPs	TPHd/TPHmo	PAHs
				EPA 6010B	EPA 6010B	EPA 7471A	EPA 6010B/7471A	EPA 8081A	EPA 8015M	EPA 8270C SIM
3	P3-B10	Grid Cell B10	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
4	P4-A1	Grid Cell A1	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
4	P4-A2	Grid Cell A2	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
4	P4-A3	Grid Cell A3	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
4	P4-A4	Grid Cell A4	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
4	P4-A5	Grid Cell A5	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
4	P4-A6	Grid Cell A6	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
4	P4-A7	Grid Cell A7	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
4	P4-A8	Grid Cell A8	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
4	P4-A9	Grid Cell A9; PAH Step-out sampling	1.5-2.0	X	X	X	--	--	--	X
			2.5-3.0	X	X	X	--	--	--	X
			3.5-4.0	Hold	Hold	Hold	--	--	--	Hold
4	P4-B2	Grid Cell B2	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
4	P4-B3	Grid Cell B3	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
4	P4-B4	Grid Cell B4	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
4	P4-B5	Grid Cell B5	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
4	P4-B6	Grid Cell B6	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
4	P4-B7	Grid Cell B7	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
4	P4-B8	Grid Cell B8	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
4	P4-B9	Grid Cell B9; PAH Step-out sampling	1.5-2.0	X	X	X	--	--	--	X
			2.5-3.0	X	X	X	--	--	--	X
			3.5-4.0	Hold	Hold	Hold	--	--	--	Hold
4	P4-B10	Grid Cell A10; PAH Step-out sampling	1.5-2.0	X	X	X	--	--	--	X
			2.5-3.0	X	X	X	--	--	--	X
			3.5-4.0	Hold	Hold	Hold	--	--	--	Hold

Abbreviations:

- bgs = below ground surface
- Hold = sample will be placed on hold pending the results of initial analyses
- OCPs = organochlorine pesticides
- PAHs = polynuclear aromatic hydrocarbons
- SIM = selective ion monitoring
- TPHd = total petroleum hydrocarbons quantified as diesel
- TPHmo = total petroleum hydrocarbons quantified as motor oil

FIGURES

Figure 1. Site Location Map

Figure 2. Site Overview

Figure 3a. Proposed Soil Sampling Locations – Parcel 1

Figure 3b. Proposed Soil Sampling Locations – Parcel 2

Figure 3c. Proposed Soil Sampling Locations – Parcel 3

Figure 3d. Proposed Soil Sampling Locations – Parcel 4

Figure 4. Conceptual Site Exposure Model



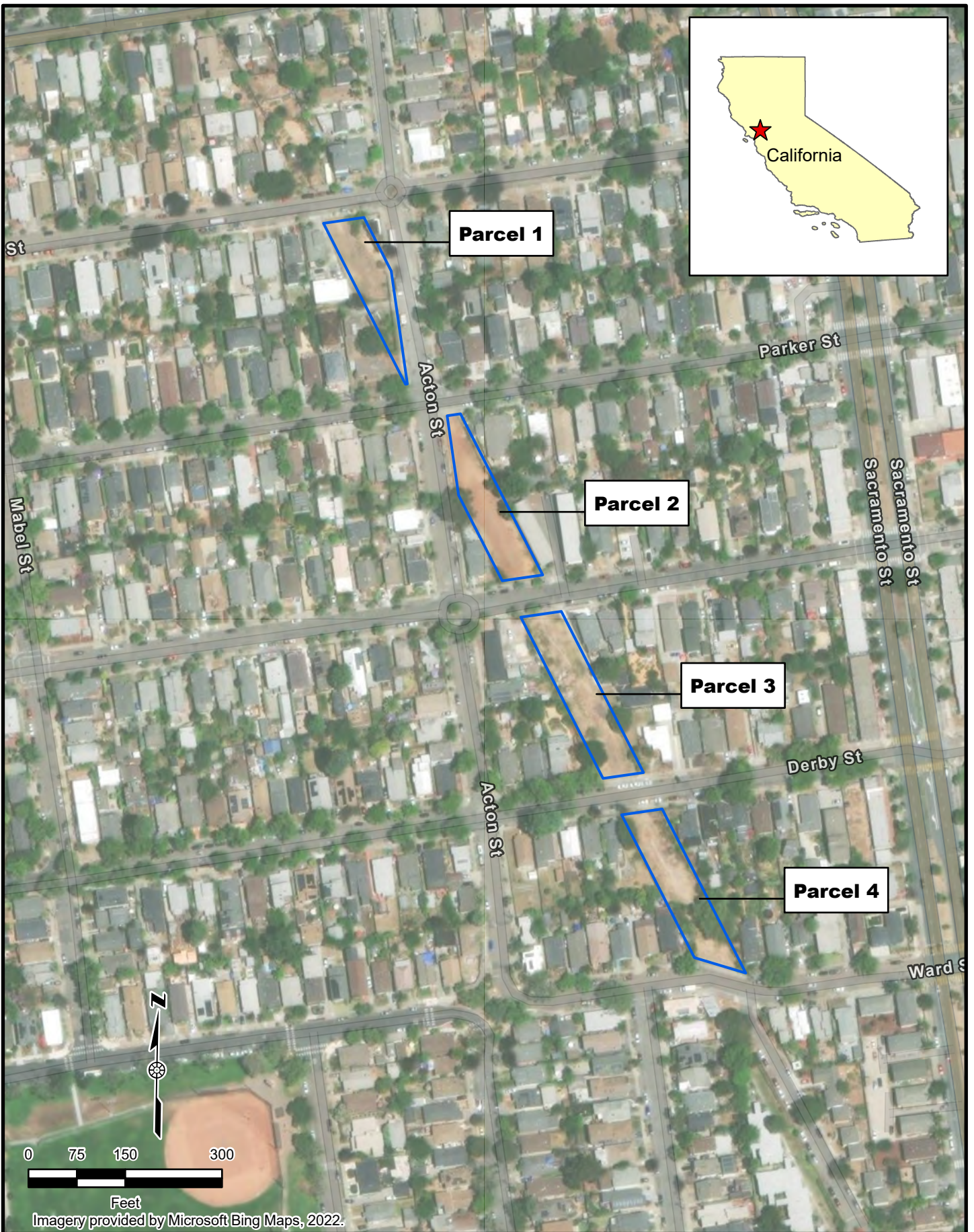
Imagery provided by Microsoft Bing Maps, 2022.



GSI job No.	6272	Drawn By:	AV
Issued:	5-Oct-2023	Chk'd By:	TRK
		App'v'd By:	JPD
Map ID:	SFROW_SiteLocMap	FIGURE 1	

SITE LOCATION MAP

Santa Fe Tracked to Park
Berkeley, California



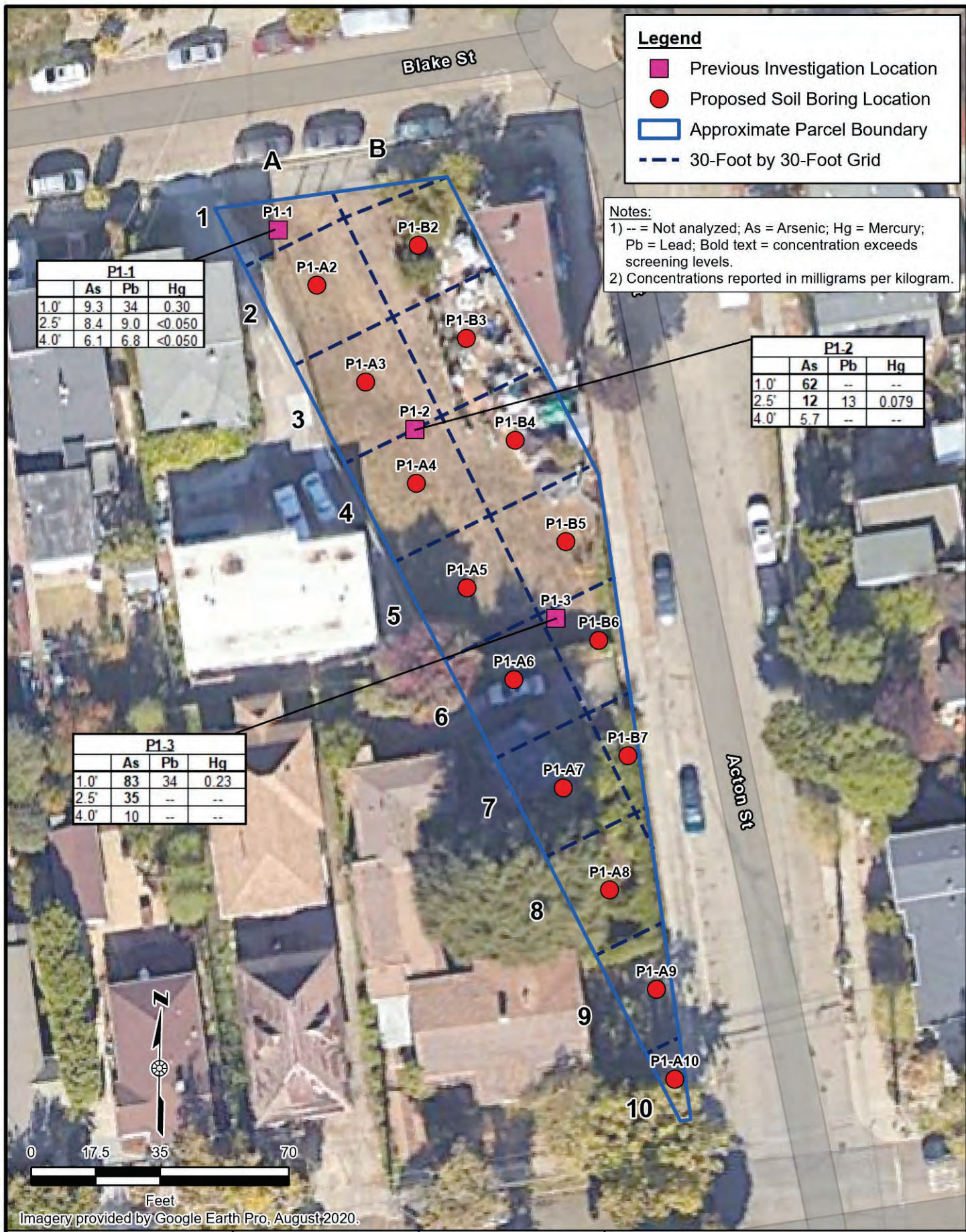
Imagery provided by Microsoft Bing Maps, 2022.



GSI job No.	6272	Drawn By:	AV
Issued:	5-Oct-2023	Chk'd By:	TRK
		App'v'd By:	JPD
Map ID:	SFROW_SiteOverview		FIGURE 2

SITE OVERVIEW

Santa Fe Trackbed to Park
Berkeley, California



Imagery provided by Google Earth Pro, August 2020.



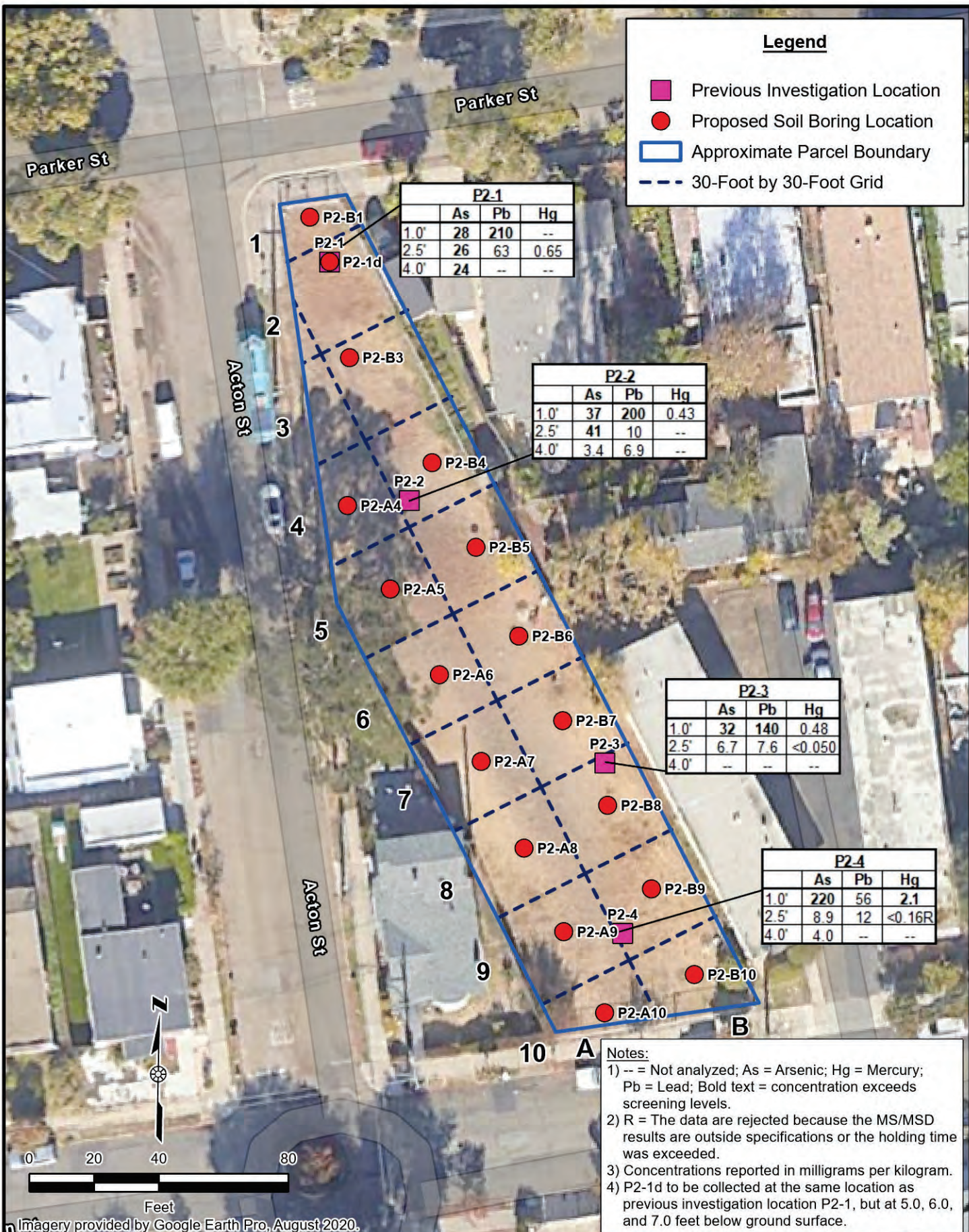
GSI job No.	6272	Drawn By:	AV
Issued:	17-Nov-2023	Chk'd By:	LMS
		Appv'd By:	JPD
Map ID:	SFR0W_Parcel1_PrpsOGrid		FIGURE 3A

PROPOSED SOIL SAMPLING LOCATIONS - PARCEL 1

Santa Fe Tracked to Park
Berkeley, California

Legend

- Previous Investigation Location
- Proposed Soil Boring Location
- Approximate Parcel Boundary
- 30-Foot by 30-Foot Grid



P2-1			
	As	Pb	Hg
1.0'	28	210	--
2.5'	26	63	0.65
4.0'	24	--	--

P2-2			
	As	Pb	Hg
1.0'	37	200	0.43
2.5'	41	10	--
4.0'	3.4	6.9	--

P2-3			
	As	Pb	Hg
1.0'	32	140	0.48
2.5'	6.7	7.6	<0.050
4.0'	--	--	--

P2-4			
	As	Pb	Hg
1.0'	220	56	2.1
2.5'	8.9	12	<0.16R
4.0'	4.0	--	--

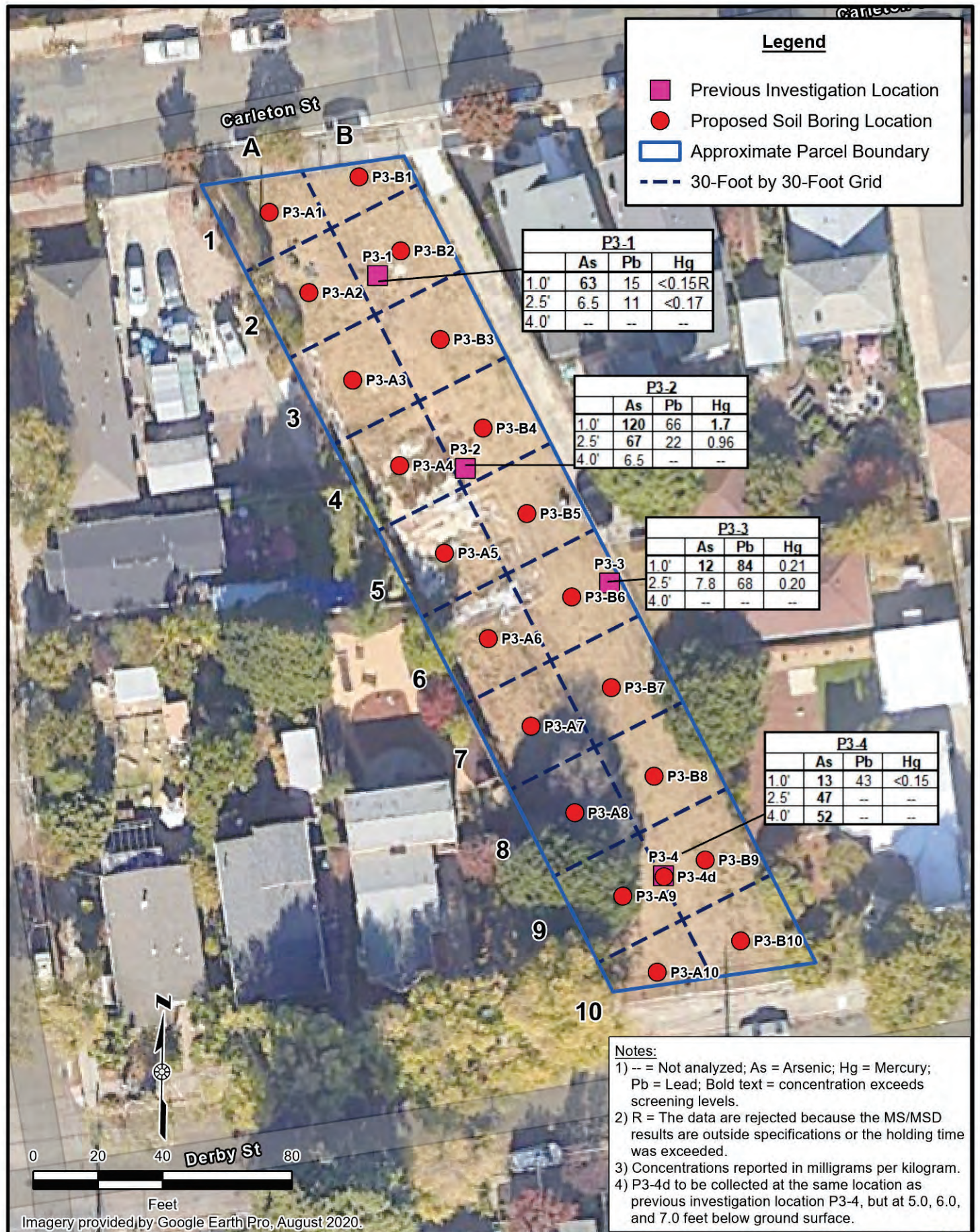
- Notes:**
- 1) -- = Not analyzed; As = Arsenic; Hg = Mercury; Pb = Lead; Bold text = concentration exceeds screening levels.
 - 2) R = The data are rejected because the MS/MSD results are outside specifications or the holding time was exceeded.
 - 3) Concentrations reported in milligrams per kilogram.
 - 4) P2-1d to be collected at the same location as previous investigation location P2-1, but at 5.0, 6.0, and 7.0 feet below ground surface.



GSI job No.	6272	Drawn By:	AV
Issued:	17-Nov-2023	Chk'd By:	LMS
		Appv'd By:	JPD
Map ID:	SFR0W_Parcel2_PrpSOGrid		FIGURE 3B

PROPOSED SOIL SAMPLING LOCATIONS - PARCEL 2

Santa Fe Tracked to Park
Berkeley, California



Notes:

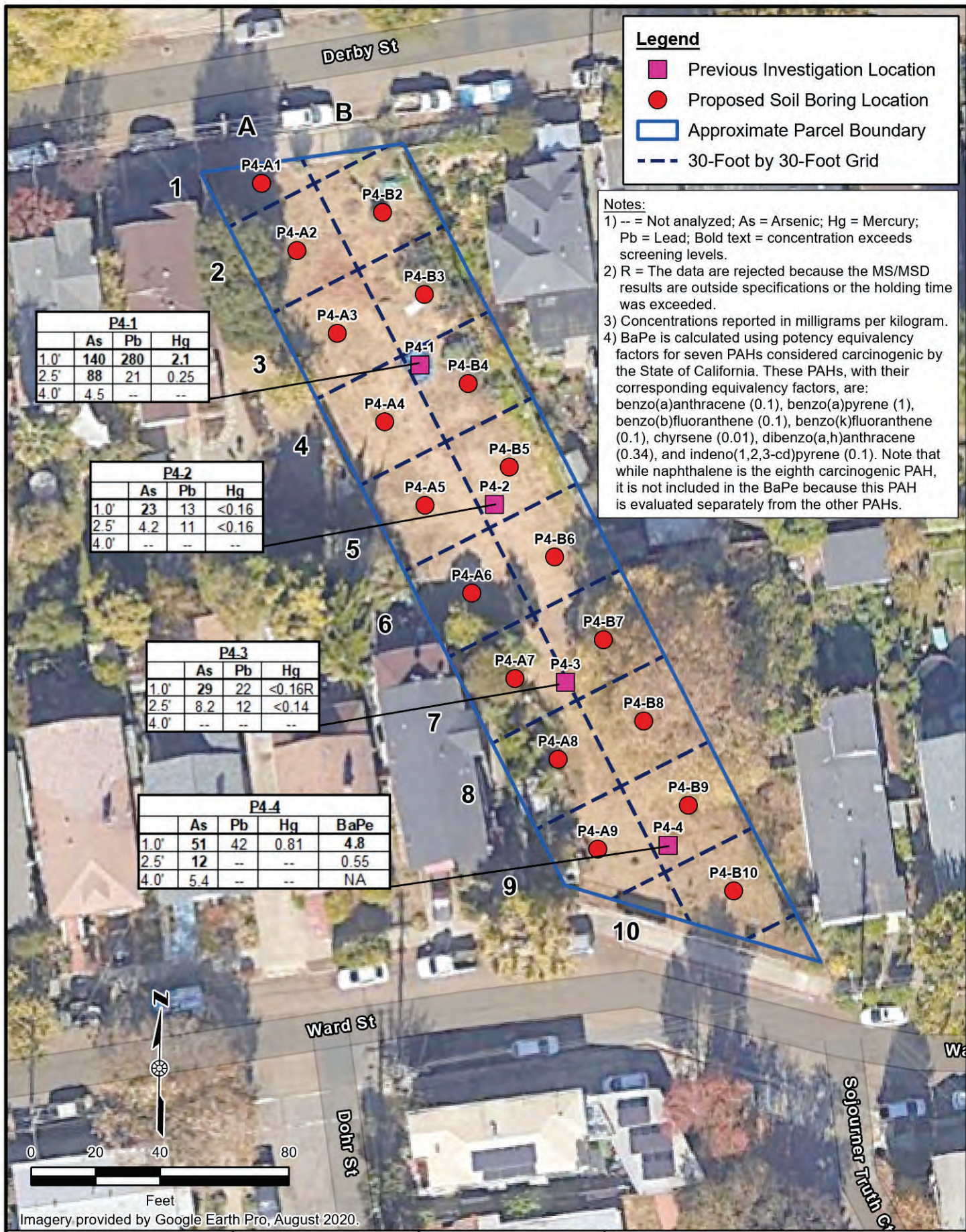
- = Not analyzed; As = Arsenic; Hg = Mercury; Pb = Lead; Bold text = concentration exceeds screening levels.
- R = The data are rejected because the MS/MSD results are outside specifications or the holding time was exceeded.
- Concentrations reported in milligrams per kilogram.
- P3-4d to be collected at the same location as previous investigation location P3-4, but at 5.0, 6.0, and 7.0 feet below ground surface.



GSI job No.	6272	Drawn By:	AV
Issued:	17-Nov-2023	Chk'd By:	LMS
		Appv'd By:	JPD
Map ID:	SFR0W_Parcel3_PrpSOGrid		FIGURE 3C

PROPOSED SOIL SAMPLING LOCATIONS - PARCEL 3

Santa Fe Tracked to Park
Berkeley, California



Legend

- Previous Investigation Location
- Proposed Soil Boring Location
- Approximate Parcel Boundary
- 30-Foot by 30-Foot Grid

Notes:

- 1) -- = Not analyzed; As = Arsenic; Hg = Mercury; Pb = Lead; Bold text = concentration exceeds screening levels.
- 2) R = The data are rejected because the MS/MSD results are outside specifications or the holding time was exceeded.
- 3) Concentrations reported in milligrams per kilogram.
- 4) BaPe is calculated using potency equivalency factors for seven PAHs considered carcinogenic by the State of California. These PAHs, with their corresponding equivalency factors, are: benzo(a)anthracene (0.1), benzo(a)pyrene (1), benzo(b)fluoranthene (0.1), benzo(k)fluoranthene (0.1), chrysene (0.01), dibenzo(a,h)anthracene (0.34), and indeno(1,2,3-cd)pyrene (0.1). Note that while naphthalene is the eighth carcinogenic PAH, it is not included in the BaPe because this PAH is evaluated separately from the other PAHs.

P4-1			
	As	Pb	Hg
1.0'	140	280	2.1
2.5'	88	21	0.25
4.0'	4.5	--	--

P4-2			
	As	Pb	Hg
1.0'	23	13	<0.16
2.5'	4.2	11	<0.16
4.0'	--	--	--

P4-3			
	As	Pb	Hg
1.0'	29	22	<0.16R
2.5'	8.2	12	<0.14
4.0'	--	--	--

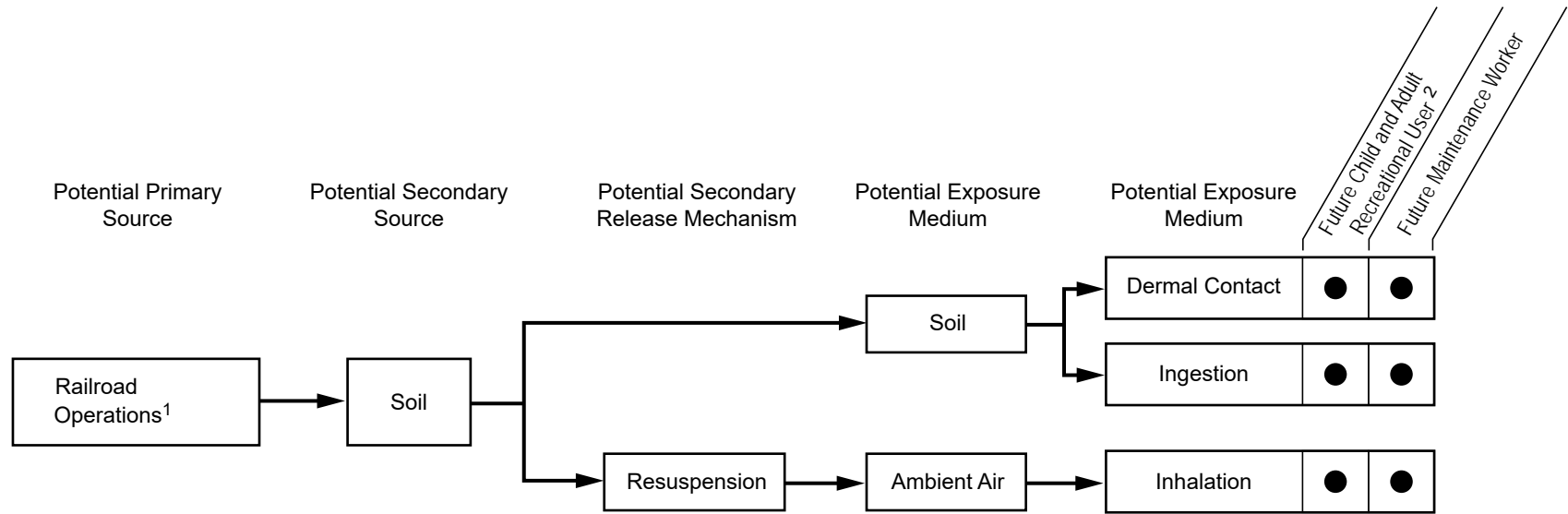
P4-4				
	As	Pb	Hg	BaPe
1.0'	51	42	0.81	4.8
2.5'	12	--	--	0.55
4.0'	5.4	--	--	NA



GSI job No.	6272	Drawn By:	AV
Issued:	17-Nov-2023	Chk'd By:	TRK
		Appv'd By:	JPD
Map ID:	SPROW_Parcel4_PrpsOGrid		FIGURE 3D

PROPOSED SOIL SAMPLING LOCATIONS - PARCEL 4

Santa Fe Tracked to Park
Berkeley, California



Notes:

1) All parcels were formerly part of the Santa Fe Railroad Right-of-Way and contained railroad tracks. Typical environmental impacts on railroad corridors include deposition of petroleum-related constituents, metals, and weed control chemicals to shallow soil.

2) Direct contact exposures by a future child and adult recreational user may be eliminated by the placement of hardscape, paver-type surfaces, and/or landscaping (following soil removal activities).

EXPLANATION

- Incomplete pathway if blank
- Complete exposure pathway; included in HHRA



GSI Job No.	6272	Drawn By:	JC
Issued:	11/17/2023	Chk'd By:	PJS
	Figure 4	Aprv'd By:	PJS
Scale:	Not to scale		

CONCEPTUAL SITE EXPOSURE MODEL

Santa Fe Trackbed to Park
Berkeley, California

APPENDICES

Appendix A. Site-Specific Quality Assurance Project Plan

Appendix B. Site-Specific Health and Safety Plan

APPENDIX A

Site-Specific Quality Assurance Project Plan



SITE-SPECIFIC QUALITY ASSURANCE PROJECT PLAN

Santa Fe Trackbed to Park
Berkeley, California

Prepared for:
City of Berkeley
Department of Parks, Recreation, and Waterfront
1947 Center Street, 5th Floor
Berkeley, California 94704

Prepared by:
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Issued: November 21, 2023
GSI Job No: 6272

SITE-SPECIFIC QUALITY ASSURANCE PROJECT PLAN

Santa Fe Trackbed to Park Berkeley, CA

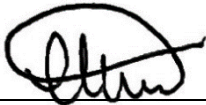
This Site-Specific Quality Assurance Project Plan was prepared by the staff of GSI Environmental Inc., under the supervision of the environmental professionals whose signatures appear hereon.

The findings, recommendations, specifications, or professional opinions were prepared in accordance with generally accepted professional engineering and/or geologic practice. No warranty is expressed or implied.

Issued: November 21, 2023



Jennifer P. Duffield, PE
Senior Associate Engineer



Tiffany George
Senior Scientist

SITE- SPECIFIC QUALITY ASSURANCE PROJECT PLAN
Santa Fe Trackbed to Park
Berkeley, California

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APPENDICES

Appendix A-1. Sample: Chain-of-Custody Forms
Appendix A-2. Sample: Daily Field Activity Log

SITE- SPECIFIC QUALITY ASSURANCE PROJECT PLAN

Santa Fe Trackbed to Park

Berkeley, California

1.0 INTRODUCTION

This Site-Specific Quality Assurance Project Plan (QAPP) has been prepared by GSI Environmental Inc. (GSI) on behalf the City of Berkeley Department of Parks, Recreation, and Waterfront (the City) to describe sampling activities, quality assurance /quality control (QA/QC) procedures, and data acceptance criteria for the characterization and sampling of soil along the Santa Fe Trackbed to Park Conversion Site in Berkeley, California (the Site; Figure 1). The Site extends north-to-south between Blake Street and Ward Street and east-to-west between Sacramento Street and Mabel Street and includes four parcels, as shown on Figure 2.

- Parcel 1 – located between Blake and Parker Streets
- Parcel 2 – located between Parker and Carleton Streets
- Parcel 3 – located between Carleton and Derby Streets
- Parcel 4 – located between Derby and Ward Streets

Details of the scope of work are included in GSI’s October 6, 2023 Additional Soil Sampling Work Plan (Work Plan; GSI, 2023).

1.1 Purpose

The purpose of this QAPP is to describe procedures and objectives so that the data collected and analyzed for this project may be used to delineate the vertical extent of metals-impacted soils in Parcels 2 and 3, as well as assess the extent of soil removal that may be required to fully remediate Parcels 1 through 4. As described by U.S. Environmental Protection (USEPA) guidance, a QAPP is a planning document that provides a clear and concise plan for the data operation and its quality objectives and identifies key project personnel. QAPPs vary in their content and level of complexity based on the nature of the work being performed (USEPA, 2002). This QAPP is focused on primary elements, including project personnel, data acquisition quality control, and evaluation.

This QAPP is to be made available to all persons involved in the field program, including field staff, subcontractors, and laboratories so that project requirements are known and understood.

1.2 Purpose Objectives and Scope

The proposed Scope of Work (SOW) incorporates requests from the DTSC and the City to delineate the vertical extent of arsenic at Parcels 2 and 3, characterize soil at a previously inaccessible location on Parcel 1, and to collect gridded soil samples on Parcels 1 through 4.

Specifically, the objectives of the soil sampling is to:

- a. Investigate the chemical quality of soil in Parcels 1 through 4 to delineate the extent of soil removal required for unrestricted use.
- b. Characterize potential impacts to soil on the southern portion of Parcel 1, which was not previously investigated due to a neighbor encroachment.
- c. Delineate the vertical extent of arsenic at previous sampling locations P2-1 and P3-4 at Parcels 2 and 3, respectively.

1.3 Project Team

The persons and entities involved with the sampling program are listed below.

Project Role	Organization/Company Name	Contact Information
Owner	City of Berkeley Department of Parks, Recreation, and Waterfront	Stacey Rutherford srutherford@berkeleyca.gov (510) 981-6738
Environmental Consultant	GSI Environmental Inc.	Jennifer Duffield jduffield@gsi-net.com (510) 858-0702
Drilling Subcontractor	PeneCore Drilling	Xavier Green xavier@PeneCore.com (916) 753-5127
Analytical Laboratory	Enthalpy Analytical	Sophia Baughman Sophia.baughman@enthalpy.com (510) 204-2227

2.0 FIELD SAMPLING METHODS

As described in Section 1.0, sampling will be performed to characterize soil conditions within Parcels 1 through 4. The sampling methodologies to be employed for this work are described below, including QA/QC measures that are to be included as part of the field program to secure the integrity of the collected samples.

2.1 Soil Sampling Methodology

GSI will subcontract with a C-57-licensed drilling company to advance soil borings using a hand auger. Details of the specific soil sampling scope of work are included in the Work Plan (GSI, 2023).

The drilling subcontractor will advance the borings under GSI's oversight, and GSI's field personnel will collect the soil samples for subsequent laboratory analysis. Prior to collecting and packaging the soil samples, recovered soil will be screened for organic vapors using a portable photoionization detector (PID). Soil samples will then be collected from the hand auger by hand using new, clean, nitrile gloves, and placed directly into clean, unused, laboratory-supplied glass sample jars. All sample containers will be labeled, sealed in plastic zip-closure bags, and stored on ice in a cooler pending delivery to the analytical laboratory under standard chain-of-custody

procedures. All sample labels will include the specific sample ID, the date and time the sample was collected, and the analytical test method(s) for which it will be analyzed. Table 1 includes anticipated soil boring and soil sample designations, sample depths, and the sample analytical plan. Figures 3a through 3d show the approximate soil sample locations.

Duplicate soil samples will be collected at a frequency of one duplicate per 20 primary samples (5%) in accordance with the DTSC Preliminary Endangerment Assessment Guidance Manual (DTSC, 2015).

Re-usable equipment utilized during the sampling program will be decontaminated by steam cleaning, or using a cleaner, such as Alconox, followed by double rinsing with potable water.

2.2 Sample Handling and Chain-of-Custody Procedures

Chain-of-custody (CoC) procedures document the transfer of custody of samples from the field to the laboratory. All soil will be maintained under CoC procedures until final delivery to the analytical laboratories. Each sample sent to the laboratory for analysis will be recorded on a CoC form, which will include instructions to the laboratory for analytical services.

Blank spaces on the CoC record will be crossed out between the last sample listed and the signatures at the bottom of the sheet. The field sampler will sign the CoC record and will record the time and date at the time of transfer to the laboratory or to an intermediate person. A set of signatures is required for each relinquished/reserved transfer, including transfer within the company, a courier, and the receiving analytical laboratory. The original CoC record will accompany the sample containers and a duplicate copy will be placed in the project file. Examples of CoC forms for soil samples are provided in Appendix A-1.

2.3 Analytical Test Methods

Details of the specific scope of work for the soil sampling program are included in the Work Plan (GSI, 2023). In addition, Table 1 of this QAPP presents a summary of the anticipated sampling plan and analytical test methods for the soil samples. The sample container types, preservation, and holding time requirements are presented in Table 2.

A summary of the analytical test methods for the soil samples and the required laboratory accreditations is presented below.

2.3.1 Soil Sample Analytical Test Methods and Laboratory Accreditations

Select soil samples will be analyzed according to Table 1 for one or more of the following:

- Arsenic by USEPA Method 6010B
- Lead by USEPA Method 6010B
- Mercury by USEPA Method 7471A
- Title 22 metals by USEPA Method 6010B/7471A
- Total petroleum hydrocarbons quantified as diesel (TPHd) and as motor oil (TPHmo) by USEPA Method 8015
- Organochlorine pesticides (OCPs) by USEPA Method 8081A

- Polycyclic Aromatic Hydrocarbons (PAHs) by USEPA Method 8270C with selective ion monitoring (SIM)

All soil samples will be submitted to an analytical laboratory accredited by the California Environmental Laboratory Accreditation Program (CA ELAP) and National Environmental Laboratory Accreditation Program (NELAP) for the methods of analysis listed above.

2.4 Field Documentation

Field activities at the Site will be documented through field notes and photographs. Field personnel will be responsible for maintaining Daily Field Activity Logs (DFALs) and other task-specific field records, as appropriate. A description of the DFAL requirements is described in the following section.

2.4.1 Daily Field Activity Logs

A DFAL will be recorded for each day of fieldwork. An example DFAL form is presented in Appendix A-2. Information recorded in the DFAL will include the following, as applicable:

- Date
- Site location and GSI project number
- Names of sampling personnel and subcontractors
- General weather conditions which could potentially affect sampling operations or sample condition (e.g., extreme heat or freezing temperatures)
- Description of field activities and sampling procedures
- Dates and times of field measurements and sample collection
- Results of field measurements or field tests
- Conditions or circumstances that could adversely impact the achievement of project goals
- Safety-related issues discussed or observed (e.g., tailgate safety meeting time/attendance, safety issues raised by on-site personnel) and all injuries. Note that safety issues and all injuries shall be immediately reported to the on-site safety officer and GSI's Health and Safety Coordinator, who is identified in GSI's Health and Safety Plan (HASP) specific to the project.

Entries on the DFAL will be made in indelible ink. If changes to entries are necessary, the person making the change will cross out the item to be changed with a single line and initial and date the change. All original copies of DFALs and task-specific field records will be digitally scanned and saved to the project electronic files.

3.0 DATA EVALUATION

3.1 Screening Levels

Data generated during the sampling program will be evaluated relative to criteria that is applicable to the media sampled and the disposition of the various media. Analytical reporting limits are established to be at or below the designated criteria, as possible within the limitations of the

analytical method employed. Data evaluation criteria are described in Section 3.3 below. The numerical values associated with the screening level criteria and the laboratory reporting limits for each analyte are presented in Table 3.

3.2 Soil Sample Data Evaluation

Soil sample data will be compared to Regional Screening Levels (RSLs) published by the USEPA for residential and commercial/industrial soil (USEPA, 2022), as endorsed or modified by the DTSC (2022), except as noted below:

- Because arsenic can exceed conservative risk-based screening criteria at naturally-occurring, “background” concentrations, this analyte will be compared to a regional background value. For arsenic, a background value of 11 milligrams per kilogram (mg/kg) was established in an evaluation of background concentrations in urbanized flatland soils within the San Francisco Bay Area, completed at San Francisco State University in coordination with Water Board staff (Duvergé, 2011).
- PAHs will be evaluated by initially comparing individual PAHs to DTSC-SLs. If additional evaluation is needed based on the results of this comparison, carcinogenic benzo(a)pyrene-like PAHs may also be evaluated by calculating the benzo(a)pyrene equivalency (BaPe)¹ for comparison to the regional ambient level of 0.9 mg/kg established by DTSC (2009). For risk assessment purposes, cancer risks and hazards will be presented with and without the contribution of chemicals at concentrations consistent with ambient conditions.
- DTSC screening levels are not published for TPHd or TPHmo. As such, analytical results for TPHd, and TPHmo will be evaluated by comparison to residential Environmental Screening Levels (ESLs) published by the Water Board (2019).

3.3 Data Validation and Acceptance

Analytical results for soil samples will be reviewed to evaluate data usability. The data usability review will include a review of the following elements:

- Sample analyses conducted per CoC request
- Sample I.D.s and sample times recorded in laboratory report match the CoC
- Preservation and holding times
- Project-specific reporting limits
- Laboratory Method Blank analysis
- Surrogate recovery analysis
- Laboratory Control Spike (LCS) analysis
- Matrix Spike/Matrix Spike Duplicate (MS/MSD) analysis

¹ For BaPe, calculations, non-detect values will be represented as the detection limit.

In addition, analytical results for soil samples will be reviewed to evaluate data usability in accordance with guidance from the following federal documents:

- USEPA, 2020, National Functional Guidelines for Inorganic Data Review (EPA 542-R-20-006), November.
- USEPA, 2020, National Functional Guidelines for Organic Data Review (EPA 540-R-20-005), November.

3.3.1 Data Accuracy and Precision Metrics

Laboratory data quality review procedures are used to evaluate method accuracy and precision and include analysis of laboratory method blanks, surrogates, LCS samples, MS/MSD samples, and equipment blanks.

Accuracy of the data will be assessed through the analysis and evaluation of LCS samples, MS samples, and surrogate recoveries.

Data precision will be assessed through the analysis and evaluation of laboratory duplicate samples (i.e., MS/MSD samples) and field replicate samples. Field replicates and laboratory duplicates are evaluated to assess the analytical precision based on sample collection, preparation, and analysis.

For field replicate pair results exceeding the reporting limit (RL), data will be evaluated by calculating the relative percent differences (RPDs), using the following equation:

$$RPD = \frac{|x_1 - x_2|}{\bar{x}} \times 100$$

Where:

- | | | |
|-----------|---|---|
| x_1 | = | analyte concentration (or RL if not detected) in primary sample |
| x_2 | = | analyte concentration (or RL if not detected) in duplicate sample |
| \bar{x} | = | average of x_1 and x_2 |

The results of this RPD evaluation will assist with the overall soil data evaluation. It is anticipated that metals and PAHs will exhibit variability in replicate soil samples given the nature of these constituents and the media.

The analytical data generated for the project will be reviewed, as described above, to evaluate the overall data usability for meeting the project objectives outlined in Section 1.2. The overall data quality objective will be that if no more than 30% of the sample data generated is qualified, then the dataset will be considered usable for the purpose of meeting the project objectives.

4.0 REFERENCES

California Department of Toxic Substances Control (DTSC), 2009, Use of the Northern and Southern California Polynuclear Aromatic Hydrocarbon (PAH) Studies in the Manufactured Gas Plant Site Cleanup Process, July 1.

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SITE-SPECIFIC QUALITY ASSURANCE PROJECT PLAN
Additional Soil Sampling
Santa Fe Trackbed to Park
Berkeley, California

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Table 2. Analytical Methods, Containers, Preservation, and Holding Time Requirements

Table 3. Screening Levels and Analytical Reporting Limits

TABLE 1: ADDITIONAL SOIL SAMPLING AND ANALYSIS PLAN
Sante Fe Trackbed to Park
Berkeley, California

Parcel	Sample ID	Description	Sample Depth (feet bgs)	Analytes and Analytical Methods						
				Arsenic	Lead	Mercury	Title 22 Metals	OCPs	TPHd/TPHmo	PAHs
				EPA 6010B	EPA 6010B	EPA 7471A	EPA 6010B/7471A	EPA 8081A	EPA 8015M	EPA 8270C SIM
1	P1-A2	Grid Cell A2	1.5-2.0	X	--	--	--	--	--	--
			2.5-3.0	X	--	--	--	--	--	--
			3.5-4.0	Hold	--	--	--	--	--	--
1	P1-A3	Grid Cell A3	1.5-2.0	X	--	--	--	--	--	--
			2.5-3.0	X	--	--	--	--	--	--
			3.5-4.0	Hold	--	--	--	--	--	--
1	P1-A4	Grid Cell A4	1.5-2.0	X	--	--	--	--	--	--
			2.5-3.0	X	--	--	--	--	--	--
			3.5-4.0	Hold	--	--	--	--	--	--
1	P1-A5	Grid Cell A5	1.5-2.0	X	--	--	--	--	--	--
			2.5-3.0	X	--	--	--	--	--	--
			3.5-4.0	Hold	--	--	--	--	--	--
1	P1-A6	Grid Cell A6	1.5-2.0	X	--	--	--	--	--	--
			2.5-3.0	X	--	--	--	--	--	--
			3.5-4.0	Hold	--	--	--	--	--	--
1	P1-A7	Grid Cell A7 & Encroachment Area Sampling	0.5-1.0	--	--	--	X	X	X	X
			2.0-2.5	--	--	--	X	X	X	X
			3.5-4.0	--	--	--	Hold	Hold	Hold	Hold
			5.0-5.5	--	--	--	Hold	Hold	Hold	Hold
1	P1-A8	Grid Cell A8 & Encroachment Area Sampling	0.5-1.0	--	--	--	X	X	X	X
			2.0-2.5	--	--	--	X	X	X	X
			3.5-4.0	--	--	--	Hold	Hold	Hold	Hold
			5.0-5.5	--	--	--	Hold	Hold	Hold	Hold
1	P1-A9	Grid Cell A9	1.5-2.0	X	--	--	--	--	--	--
			2.5-3.0	X	--	--	--	--	--	--
			3.5-4.0	Hold	--	--	--	--	--	--
1	P1-A10	Grid Cell A10	1.5-2.0	X	--	--	--	--	--	--
			2.5-3.0	X	--	--	--	--	--	--
			3.5-4.0	Hold	--	--	--	--	--	--
1	P1-B2	Grid Cell B2	1.5-2.0	X	--	--	--	--	--	--
			2.5-3.0	X	--	--	--	--	--	--
			3.5-4.0	Hold	--	--	--	--	--	--
1	P1-B3	Grid Cell B3	1.5-2.0	X	--	--	--	--	--	--
			2.5-3.0	X	--	--	--	--	--	--
			3.5-4.0	Hold	--	--	--	--	--	--
1	P1-B4	Grid Cell B4	1.5-2.0	X	--	--	--	--	--	--
			2.5-3.0	X	--	--	--	--	--	--
			3.5-4.0	Hold	--	--	--	--	--	--
1	P1-B5	Grid Cell B5	1.5-2.0	X	--	--	--	--	--	--
			2.5-3.0	X	--	--	--	--	--	--
			3.5-4.0	Hold	--	--	--	--	--	--
1	P1-B6	Grid Cell B6	1.5-2.0	X	--	--	--	--	--	--
			2.5-3.0	X	--	--	--	--	--	--
			3.5-4.0	Hold	--	--	--	--	--	--
1	P1-B7	Grid Cell B7	1.5-2.0	X	--	--	--	--	--	--
			2.5-3.0	X	--	--	--	--	--	--
			3.5-4.0	Hold	--	--	--	--	--	--
2	P2-A4	Grid Cell A4	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
2	P2-A5	Grid Cell A5	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--

TABLE 1: ADDITIONAL SOIL SAMPLING AND ANALYSIS PLAN
Sante Fe Trackbed to Park
Berkeley, California

Parcel	Sample ID	Description	Sample Depth (feet bgs)	Analytes and Analytical Methods						
				Arsenic	Lead	Mercury	Title 22 Metals	OCPs	TPHd/TPHmo	PAHs
				EPA 6010B	EPA 6010B	EPA 7471A	EPA 6010B/7471A	EPA 8081A	EPA 8015M	EPA 8270C SIM
2	P2-A6	Grid Cell A6	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
2	P2-A7	Grid Cell A7	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
2	P2-A8	Grid Cell A8	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
2	P2-A9	Grid Cell A9	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
2	P2-A10	Grid Cell A10	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
2	P2-B1	Grid Cell B1	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
2	P2-1d	Vertical Delineation (deeper sample depth at P2-1)	4.5-5.0	X	--	--	--	--	--	--
			5.5-6.0	X	--	--	--	--	--	--
			6.5-7.0	Hold	--	--	--	--	--	--
2	P2-B3	Grid Cell B3	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
2	P2-B4	Grid Cell B4	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
2	P2-B5	Grid Cell B5	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
2	P2-B6	Grid Cell B6	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
2	P2-B7	Grid Cell B7	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
2	P2-B8	Grid Cell B8	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
2	P2-B9	Grid Cell B9	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
2	P2-B10	Grid Cell B10	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
3	P3-A1	Grid Cell A1	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
3	P3-A2	Grid Cell A2	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
3	P3-A3	Grid Cell A3	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
3	P3-A4	Grid Cell A4	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
3	P3-A5	Grid Cell A5	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--

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				Arsenic	Lead	Mercury	Title 22 Metals	OCPs	TPHd/TPHmo	PAHs
				EPA 6010B	EPA 6010B	EPA 7471A	EPA 6010B/7471A	EPA 8081A	EPA 8015M	EPA 8270C SIM
3	P3-A6	Grid Cell A6	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
3	P3-A7	Grid Cell A7	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
3	P3-A8	Grid Cell A8	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
3	P3-A9	Grid Cell A9	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
3	P3-A10	Grid Cell A10	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
3	P3-B1	Grid Cell B1	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
3	P3-B2	Grid Cell B2	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
3	P3-B3	Grid Cell B3	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
3	P3-B4	Grid Cell B4	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
3	P3-B5	Grid Cell B5	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
3	P3-B6	Grid Cell B6	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
3	P3-B7	Grid Cell B7	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
3	P3-B8	Grid Cell B8	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
3	P3-4d	Vertical Delineation (deeper sample depth at P3-4)	4.5-5.0	X	--	--	--	--	--	--
			5.5-6.0	X	--	--	--	--	--	--
			6.5-7.0	Hold	--	--	--	--	--	--
3	P3-B10	Grid Cell B10	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
4	P4-A1	Grid Cell A1	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
4	P4-A2	Grid Cell A2	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
4	P4-A3	Grid Cell A3	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
4	P4-A4	Grid Cell A4	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
4	P4-A5	Grid Cell A5	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--

TABLE 1: ADDITIONAL SOIL SAMPLING AND ANALYSIS PLAN
Sante Fe Trackbed to Park
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				Arsenic	Lead	Mercury	Title 22 Metals	OCPs	TPHd/TPHmo	PAHs
				EPA 6010B	EPA 6010B	EPA 7471A	EPA 6010B/7471A	EPA 8081A	EPA 8015M	EPA 8270C SIM
4	P4-A6	Grid Cell A6	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
4	P4-A7	Grid Cell A7	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
4	P4-A8	Grid Cell A8	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
4	P4-A9	Grid Cell A9; PAH Step-out sampling	1.5-2.0	X	X	X	--	--	--	X
			2.5-3.0	X	X	X	--	--	--	X
			3.5-4.0	Hold	Hold	Hold	--	--	--	Hold
4	P4-B2	Grid Cell B2	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
4	P4-B3	Grid Cell B3	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
4	P4-B4	Grid Cell B4	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
4	P4-B5	Grid Cell B5	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
4	P4-B6	Grid Cell B6	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
4	P4-B7	Grid Cell B7	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
4	P4-B8	Grid Cell B8	1.5-2.0	X	X	X	--	--	--	--
			2.5-3.0	X	X	X	--	--	--	--
			3.5-4.0	Hold	Hold	Hold	--	--	--	--
4	P4-B9	Grid Cell B9; PAH Step-out sampling	1.5-2.0	X	X	X	--	--	--	X
			2.5-3.0	X	X	X	--	--	--	X
			3.5-4.0	Hold	Hold	Hold	--	--	--	Hold
4	P4-B10	Grid Cell A10; PAH Step-out sampling	1.5-2.0	X	X	X	--	--	--	X
			2.5-3.0	X	X	X	--	--	--	X
			3.5-4.0	Hold	Hold	Hold	--	--	--	Hold

Abbreviations:

- bgs = below ground surface
- Hold = sample will be placed on hold pending the results of initial analyses
- OCPs = organochlorine pesticides
- PAHs = polynuclear aromatic hydrocarbons
- SIM = selective ion monitoring
- TPHd = total petroleum hydrocarbons quantified as diesel
- TPHmo = total petroleum hydrocarbons quantified as motor oil

TABLE 2: ANALYTICAL METHODS, CONTAINERS, PRESERVATION, AND HOLDING TIME REQUIREMENTS

Sante Fe Trackbed to Park

Berkeley, California

Parameter	USEPA Analytical Method ¹	Container Type	Required Preservative	Holding Time
Metals, excluding mercury	6010B	glass jar	4° C	180 days
Mercury	7471A	glass jar	4° C	28 days
PAHs	8270C SIM	glass jar	4° C	14 days ²
TPHd/TPHmo	8015M	glass jar	4° C	14 days ²
OCPs	8081A	glass jar	4° C	14 days ²

Notes:

1. Methods shown are U.S. Environmental Protection Agency (EPA) methods.
2. Days for extraction; 40 days after extraction for analysis.

Abbreviations:

OCPs = organochlorine pesticides
PAHs = polycyclic aromatic hydrocarbons
SIM = selective ion monitoring
TPHd = total petroleum hydrocarbons quantified as diesel
TPHmo = total petroleum hydrocarbons quantified as motor oil

TABLE 3: SCREENING LEVELS AND ANALYTICAL REPORTING LIMITS**Santa Fe Tracked to Park**

Berkeley, California

Analyte	Residential Human Health Screening Levels ¹	Laboratory Reporting Limits ²	
		Reporting Limit	Detection Limit
<i>Concentrations in milligrams per kilogram (mg/kg)</i>			
Metals			
Antimony	31	3.00	0.55
Arsenic ³	11	1.00	0.25
Barium	15,000	1.00	0.081
Beryllium	16	0.5	0.34
Cadmium	71	0.5	0.067
Chromium (total)	none	1	0.074
Cobalt	23	0.5	0.14
Copper	3,100	1	0.26
Lead	80	1	0.43
Mercury	1.0	0.14	0.0230
Molybdenum	390	1	0.37
Nickel	820	1	0.27
Selenium	390	3	0.49
Silver	390	0.5	0.25
Thallium	0.78	3	0.57
Vanadium	390	1	0.32
Zinc	23,000	5	0.28
TPH⁴			
TPHd	260	10.00	5.00
TPHmo	12,000	20.00	5.00
OCPs			
Aldrin	0.039	0.0050	0.0014
alpha-BHC	0.086	0.0050	0.0012
beta-BHC	0.3	0.0050	0.0017
delta-BHC	None	0.0050	0.0014
gamma-BHC (Lindane)	0.57	0.0050	0.001
Chlordane ⁵	1.7	0.05	0.011
4,4'-DDD	1.9	0.0050	0.0011
4,4'-DDE	2	0.0050	0.0015
4,4'-DDT	1.9	0.0050	0.0017
Dieldrin	0.034	0.0050	0.0015
Endosulfan I	450	0.0050	0.0014
Endosulfan II	450	0.0050	0.0017
Endolufan sulfate	380	0.0050	0.0021
Endrin	19	0.0050	0.0017
Heptachlor	0.13	0.0050	0.0017
Heptachlor epoxide	0.07	0.0050	0.0018
Methoxychlor	320	0.01	0.0051
Toxaphene	0.45	0.1	0.031

TABLE 3: SCREENING LEVELS AND ANALYTICAL REPORTING LIMITS

Santa Fe Tracked to Park

Berkeley, California

Analyte	Residential Human Health Screening Levels ¹	Laboratory Reporting Limits ²	
		Reporting Limit	Detection Limit
<i>Concentrations in milligrams per kilogram (mg/kg)</i>			
PAHs			
Acenaphthene	3,300	0.01	0.0027
Acenaphthylene	None	0.01	0.0028
Anthracene	17,000	0.01	0.0037
Benzo(a)anthracene	1.1	0.01	0.0035
Benzo(a)pyrene	0.11	0.01	0.0036
Benzo(b)fluoranthene	1.1	0.01	0.0046
Benzo(g,h,i)perylene	None	0.01	0.0026
Benzo(k)fluoranthene	11	0.01	0.0042
Chrysene	110	0.01	0.004
Dibenz(a,h)anthracene	0.028	0.01	0.0023
Fluoranthene	2,400	0.01	0.0033
Fluorene	2,300	0.01	0.0026
Indeno(1,2,3-cd)pyrene	1.1	0.01	0.0062
1-Methylnaphthalene	9.9	0.01	0.0065
2-Methylnaphthalene	None	0.01	0.0049
Naphthalene	2	0.01	0.0066
Phenanthrene	None	0.01	0.003
Pyrene	1,800	0.01	0.0032
BaPe ⁶	0.9	--	--

Notes:

- Human health screening levels for residential soil published by the USEPA (2023) and approved or modified by the California Department of Toxic Substances Control (2022).
- Reporting limits and Method Detection Limits provided by Enthaply Analytical of Berkeley, California on June 5, 2023.
- Arsenic concentration is the background concentration for the San Francisco Bay Region (Duvergé, D.J., 2011).
- Total petroleum hydrocarbons (TPH) quantified as total petroleum hydrocarbons (TPH) as diesel (TPHd) and motor oil (TPHmo). Direct exposure environmental screening levels for human health published by the San Francisco Bay Regional Water Quality Control Board (Water Board, 2019).
- Screening levels are for Chlordane (Technical). Technical chlordane (CAS No. 12789-03-6) is composed of 60% octachloro-4,7-methanotetrahydroindane (the cis and trans isomers) and 40% related compounds (USEPA, 1997)
- BaPe is calculated using potency equivalency factors for seven PAHs considered carcinogenic by the State of California. These PAHs, with their corresponding equivalency factors, are: benzo(a)anthracene (0.1), benzo(a)pyrene (1), benzo(b)fluoranthene (0.1), benzo(k)fluoranthene (0.1), chrysene (0.01), dibenzo(a,h)anthracene (0.34), and indeno(1,2,3-cd)pyrene (0.1). Note that while naphthalene is the eighth carcinogenic PAH, it is not included in the BaPe because this PAH is evaluated separately from the other PAHs. BaPe are compared to the regional ambient level of 0.9 mg/kg established by DTSC (2009).

TABLE 3: SCREENING LEVELS AND ANALYTICAL REPORTING LIMITS

Santa Fe Trackbed to Park

Berkeley, California

Abbreviations:

alpha-BHC = alpha-HCH = alpha-hexachlorocyclohexane
beta-BHC = beta-HCH = beta-hexachlorocyclohexane
BaPe = benzo(a)pyrene equivalent value
DDD = dichlorodiphenyldichloroethane
DDE = dichlorodiphenyldichloroethylene
DDT = dichlorodiphenyltrichloroethane
gamma-BHC = gamma-HCH = gamma-hexachlorocyclohexane = lindane
OCPs = organochlorine pesticides
PAHs = Polycyclic aromatic hydrocarbons
TPH = total petroleum hydrocarbons
TPHd = TPH quantified as diesel (diesel range organics [DRO] C10-C28)
TPHmo = TPH quantified as motor oil (oil range organics [ORO] C28-C44)

References:

California Department of Toxic Substances Control (DTSC), 2009, Use of the Northern and Southern California Polynuclear Aromatic Hydrocarbon (PAH) Studies in the Manufactured Gas Plant Site Cleanup Process, July 1.
DTSC, 2015, Preliminary Endangerment Assessment Guidance Manual, October.
DTSC, 2022, Human and Ecological Risk (HERO), HHRA Note Number 3, May.
Duverge, Dylan Jacques, 2011, Establishing background Arsenic in soil for the Urbanized San Francisco Bay Region, December.
United States Environmental Protection Agency (USEPA), 1997. Toxicological Review of Chlordane (Technical). December.
USEPA, 2023, Regional Screening Levels, May.
San Francisco Bay Regional Water Quality Control Board (Water Board), 2019, Environmental Screening Levels, Summary Tables, January.

SITE-SPECIFIC QUALITY ASSURANCE PROJECT PLAN
Additional Soil Sampling
Santa Fe Trackbed to Park
Berkeley, California

FIGURES

Figure 1. Site Location Map

Figure 2. Site Overview

Figure 3a. Proposed Soil Sampling Locations – Parcel 1

Figure 3b: Proposed Soil Sampling Locations – Parcel 2

Figure 3c: Proposed Soil Sampling Locations – Parcel 3

Figure 3d: Proposed Soil Sampling Locations – Parcel 4



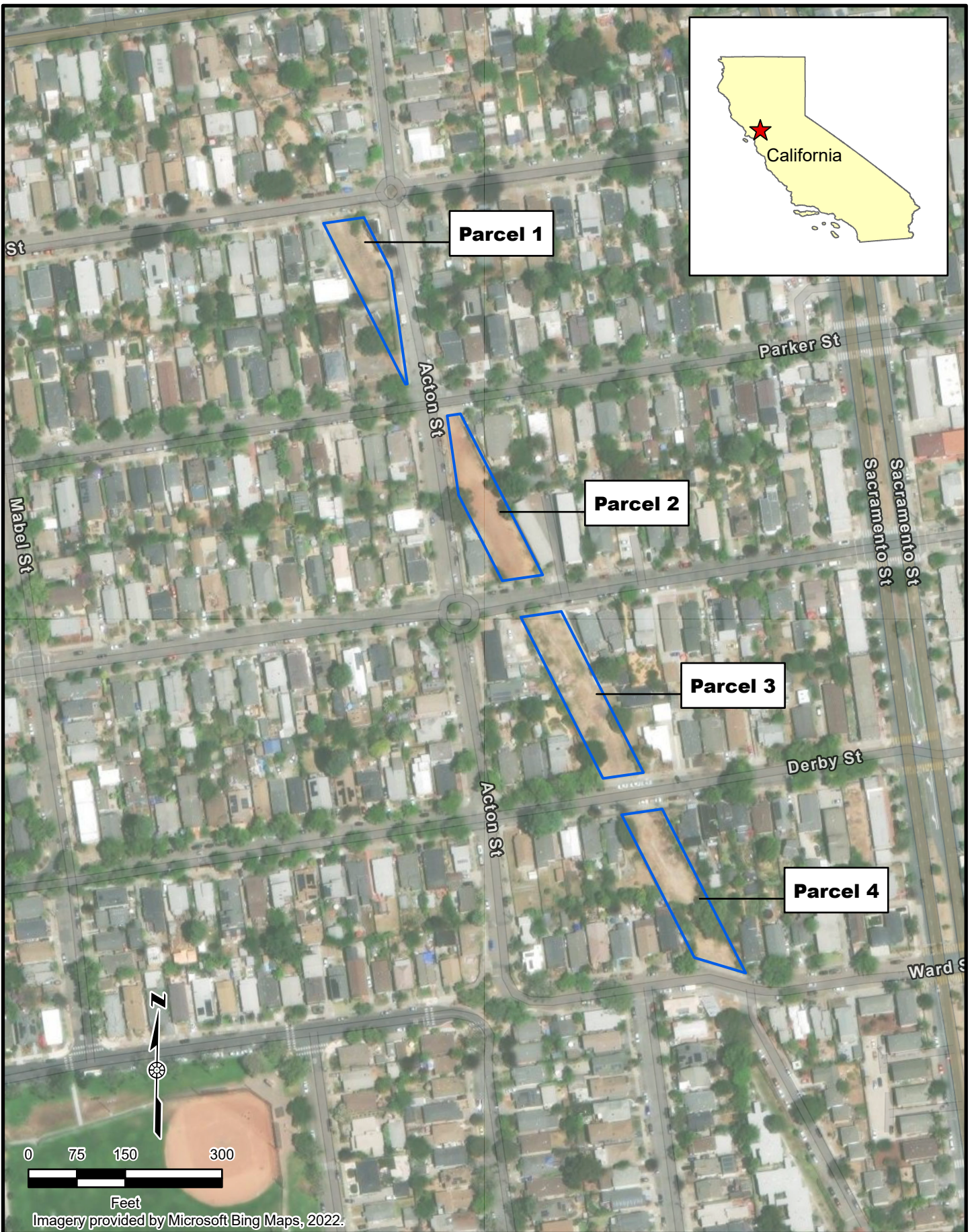
Imagery provided by Microsoft Bing Maps, 2022.



GSI job No.	6272	Drawn By:	AV
Issued:	5-Oct-2023	Chk'd By:	TRK
		App'v'd By:	JPD
Map ID:	SFROW_SiteLocMap	FIGURE 1	

SITE LOCATION MAP

Santa Fe Tracked to Park
Berkeley, California



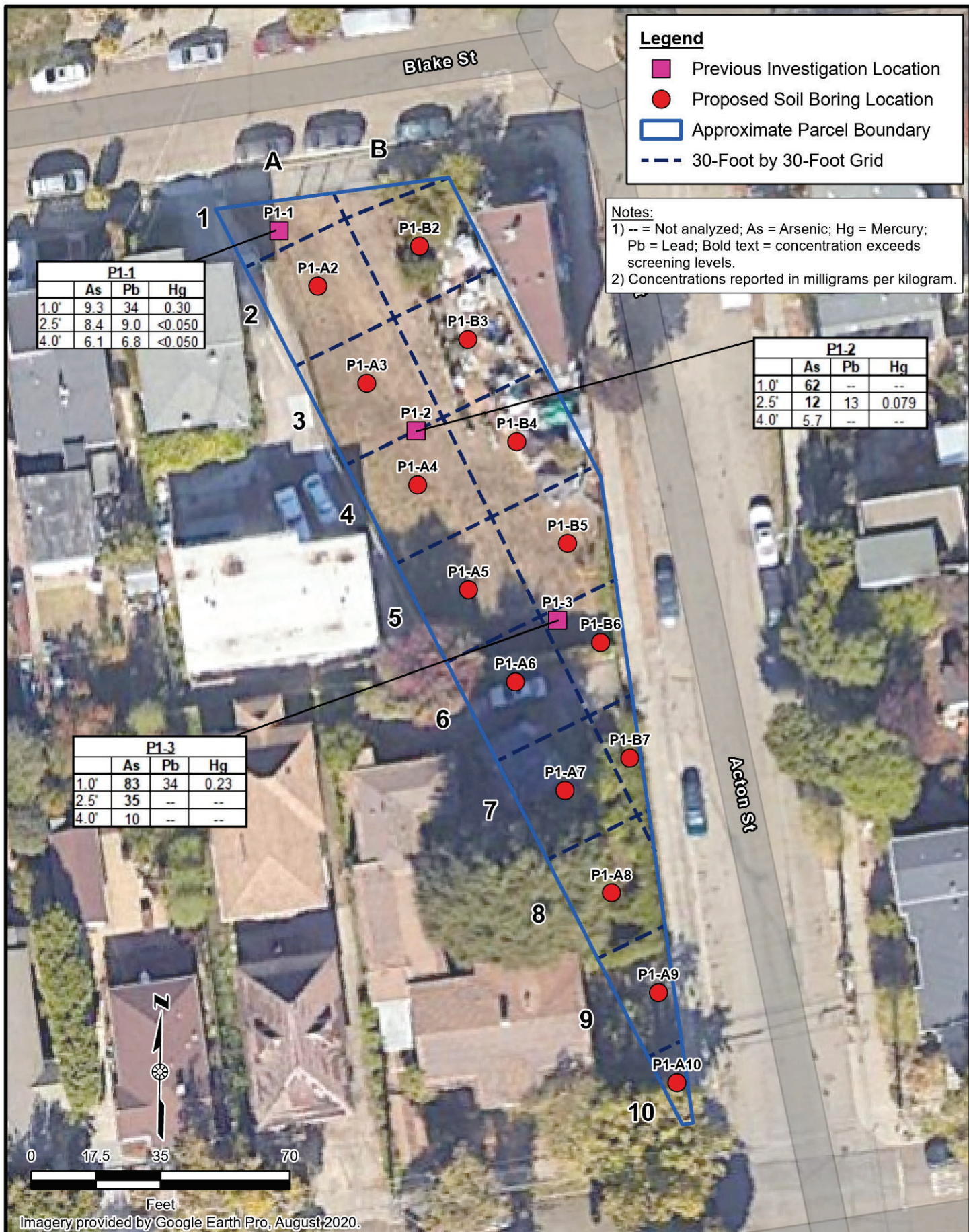
Imagery provided by Microsoft Bing Maps, 2022.



GSI job No.	6272	Drawn By:	AV
Issued:	5-Oct-2023	Chk'd By:	TRK
		App'd By:	JPD
Map ID:	SFROW_SiteOverview		FIGURE 2

SITE OVERVIEW

Santa Fe Trackbed to Park
Berkeley, California



Imagery provided by Google Earth Pro, August 2020.

	GSI job No.	6272	Drawn By:	AV
	Issued:	17-Nov-2023	Chk'd By:	LMS
			Appv'd By:	JPD
	Map ID:	SFROW_Parcel1_PrpsOGrid		

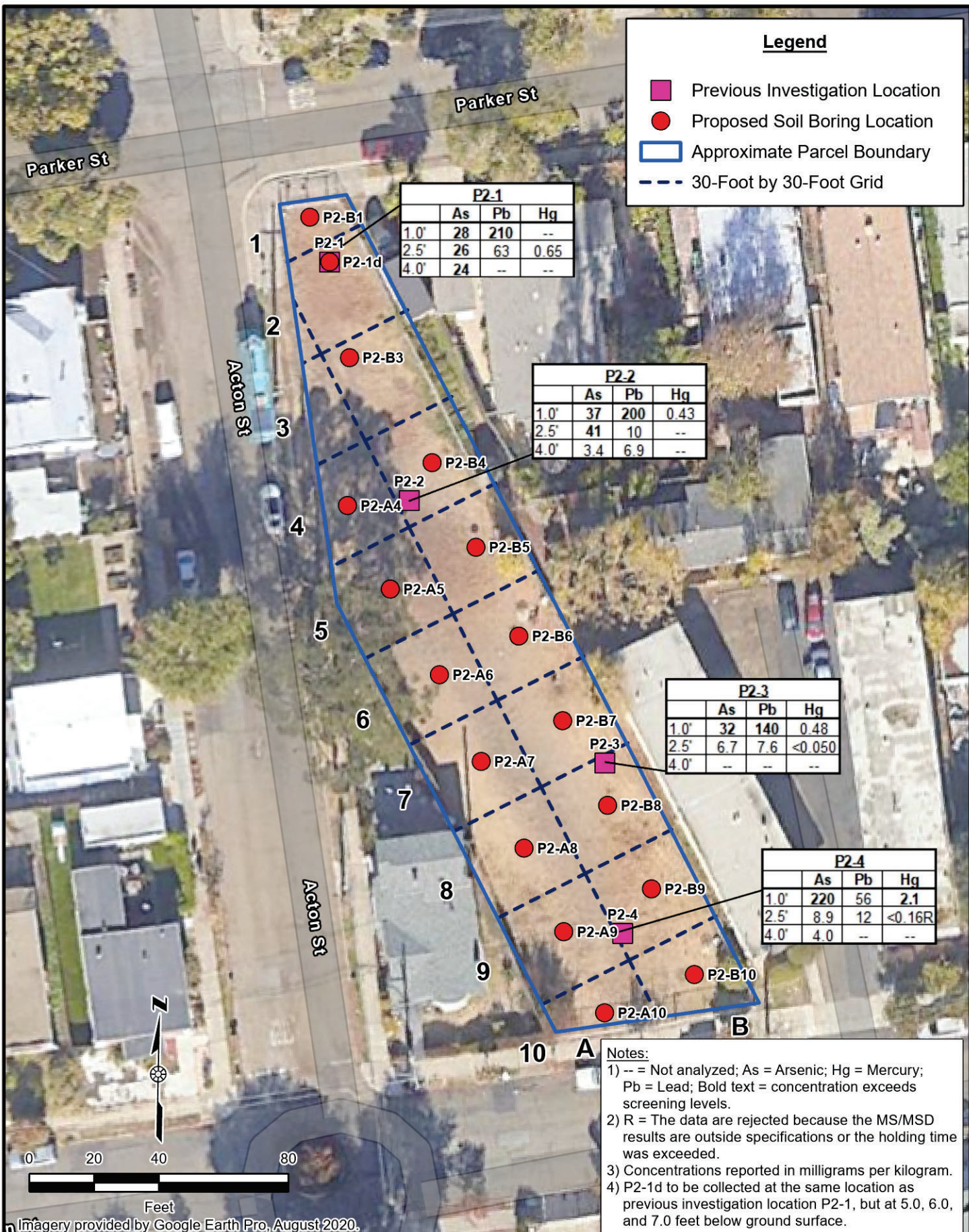
PROPOSED SOIL SAMPLING LOCATIONS - PARCEL 1

Santa Fe Tracked to Park
Berkeley, California

FIGURE 3A

Legend

- Previous Investigation Location
- Proposed Soil Boring Location
- Approximate Parcel Boundary
- 30-Foot by 30-Foot Grid



P2-1			
	As	Pb	Hg
1.0'	28	210	--
2.5'	26	63	0.65
4.0'	24	--	--

P2-2			
	As	Pb	Hg
1.0'	37	200	0.43
2.5'	41	10	--
4.0'	3.4	6.9	--

P2-3			
	As	Pb	Hg
1.0'	32	140	0.48
2.5'	6.7	7.6	<0.050
4.0'	--	--	--

P2-4			
	As	Pb	Hg
1.0'	220	56	2.1
2.5'	8.9	12	<0.16R
4.0'	4.0	--	--

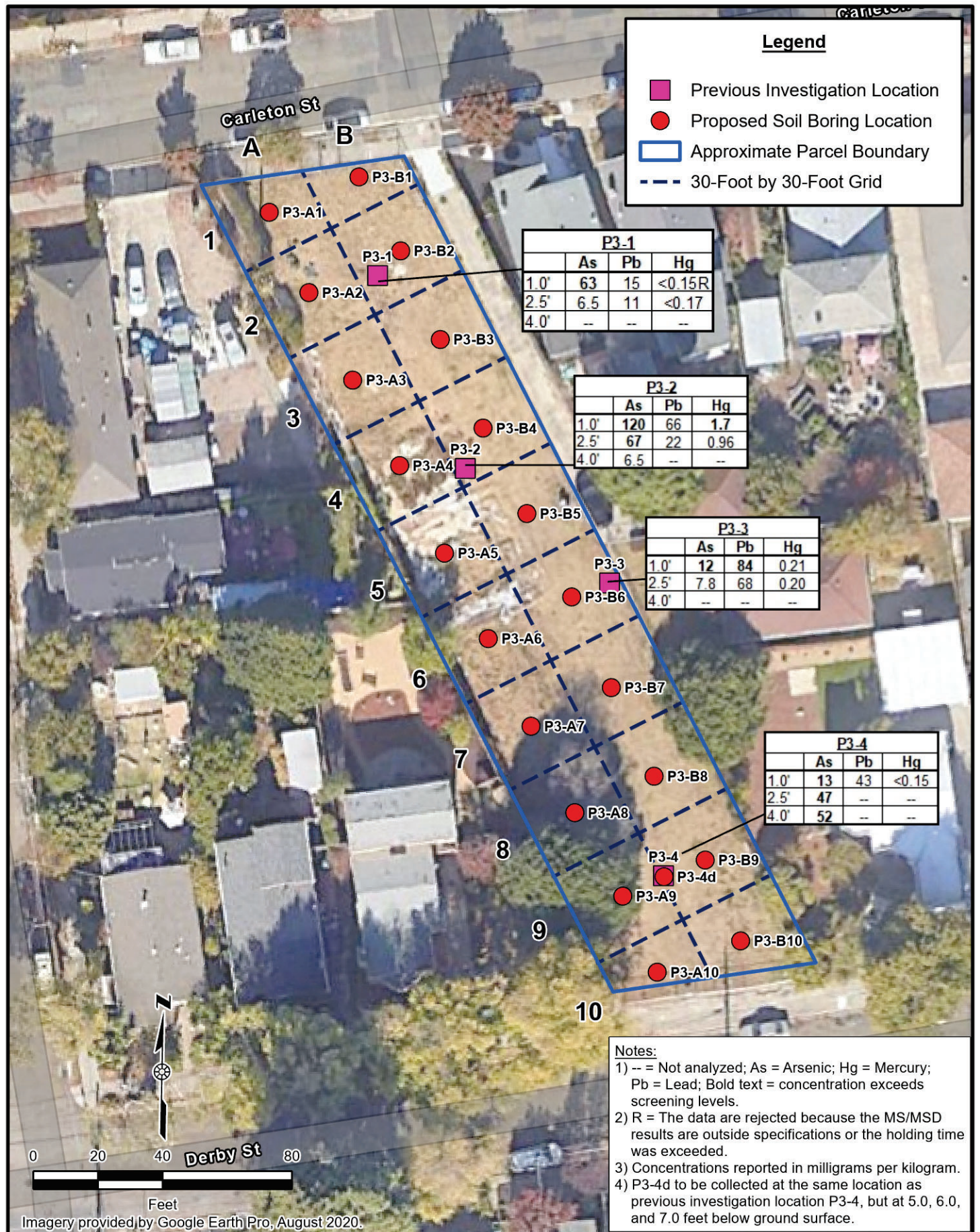
- Notes:**
- 1) -- = Not analyzed; As = Arsenic; Hg = Mercury; Pb = Lead; Bold text = concentration exceeds screening levels.
 - 2) R = The data are rejected because the MS/MSD results are outside specifications or the holding time was exceeded.
 - 3) Concentrations reported in milligrams per kilogram.
 - 4) P2-1d to be collected at the same location as previous investigation location P2-1, but at 5.0, 6.0, and 7.0 feet below ground surface.



GSI job No.	6272	Drawn By:	AV
Issued:	17-Nov-2023	Chk'd By:	LMS
		Appv'd By:	JPD
Map ID:	SPROW_Parcel2_PrpSOGrid		FIGURE 3B

PROPOSED SOIL SAMPLING LOCATIONS - PARCEL 2

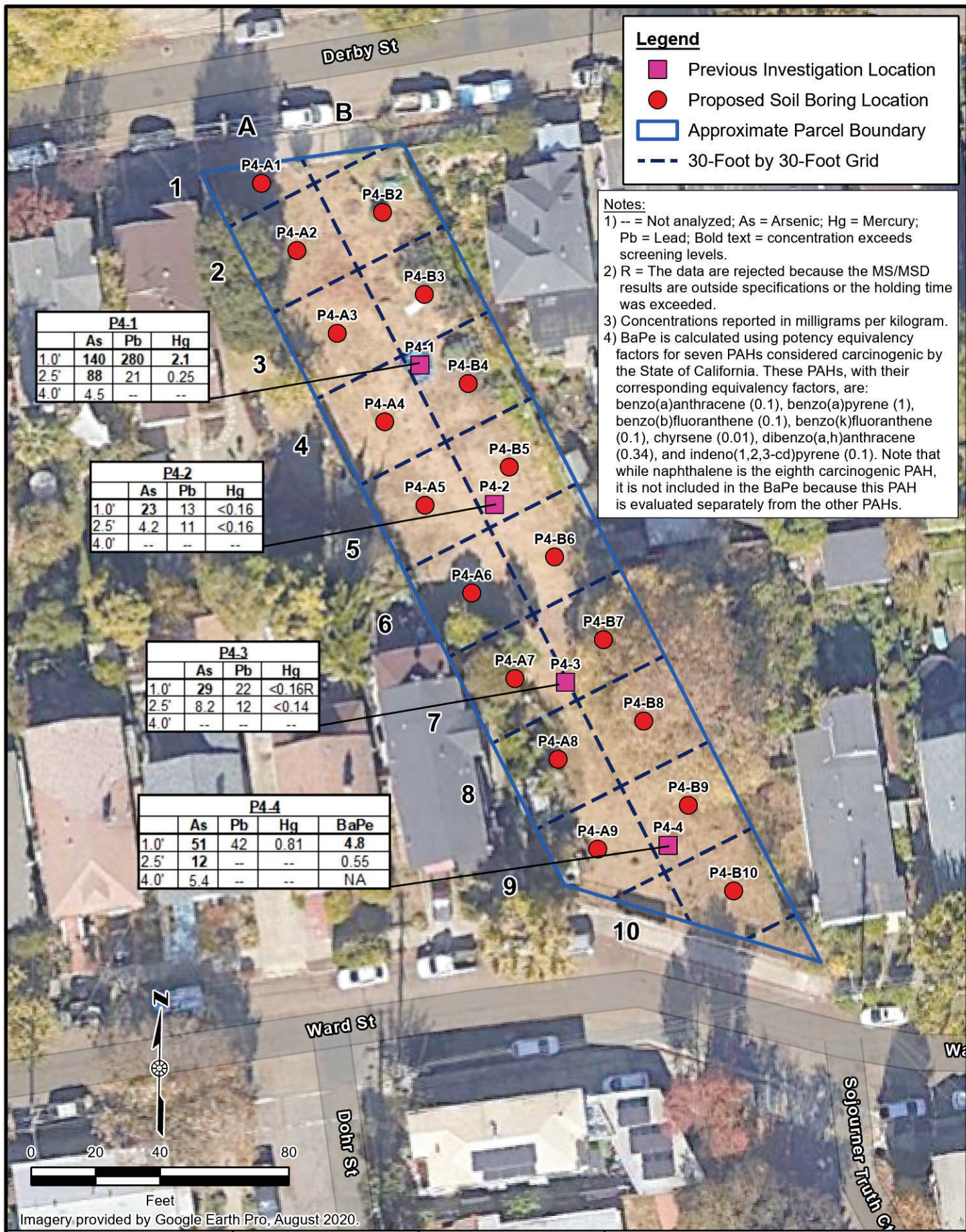
Santa Fe Tracked to Park
Berkeley, California



GSI job No.	6272	Drawn By:	AV
Issued:	17-Nov-2023	Chk'd By:	LMS
		Appv'd By:	JPD
Map ID:	SFR0W_Parcel3_PrpSOGrid	FIGURE 3C	

PROPOSED SOIL SAMPLING LOCATIONS - PARCEL 3

Santa Fe Tracked to Park
Berkeley, California



Legend

- Previous Investigation Location
- Proposed Soil Boring Location
- Approximate Parcel Boundary
- 30-Foot by 30-Foot Grid

Notes:

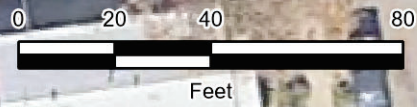
- 1) -- = Not analyzed; As = Arsenic; Hg = Mercury; Pb = Lead; Bold text = concentration exceeds screening levels.
- 2) R = The data are rejected because the MS/MSD results are outside specifications or the holding time was exceeded.
- 3) Concentrations reported in milligrams per kilogram.
- 4) BaPe is calculated using potency equivalency factors for seven PAHs considered carcinogenic by the State of California. These PAHs, with their corresponding equivalency factors, are: benzo(a)anthracene (0.1), benzo(a)pyrene (1), benzo(b)fluoranthene (0.1), benzo(k)fluoranthene (0.1), chrysene (0.01), dibenzo(a,h)anthracene (0.34), and indeno(1,2,3-cd)pyrene (0.1). Note that while naphthalene is the eighth carcinogenic PAH, it is not included in the BaPe because this PAH is evaluated separately from the other PAHs.

P4-1			
	As	Pb	Hg
1.0'	140	280	2.1
2.5'	88	21	0.25
4.0'	4.5	--	--

P4-2			
	As	Pb	Hg
1.0'	23	13	<0.16
2.5'	4.2	11	<0.16
4.0'	--	--	--

P4-3			
	As	Pb	Hg
1.0'	29	22	<0.16R
2.5'	8.2	12	<0.14
4.0'	--	--	--

P4-4				
	As	Pb	Hg	BaPe
1.0'	51	42	0.81	4.8
2.5'	12	--	--	0.55
4.0'	5.4	--	--	NA



Imagery provided by Google Earth Pro, August 2020.



GSI job No.	6272	Drawn By:	AV
Issued:	17-Nov-2023	Chk'd By:	TRK
		Appv'd By:	JPD
Map ID:	SPROW_Parcel4_PrpsOGrid		FIGURE 3D

PROPOSED SOIL SAMPLING LOCATIONS - PARCEL 4

Santa Fe Trackbed to Park
Berkeley, California

SITE-SPECIFIC QUALITY ASSURANCE PROJECT PLAN
Additional Soil Sampling
Santa Fe Trackbed to Park
Berkeley, California

APPENDIX A-1

Sample: Chain-of-Custody Forms

SITE-SPECIFIC QUALITY ASSURANCE PROJECT PLAN
Additional Soil Sampling
Santa Fe Trackbed to Park
Berkeley, California

APPENDIX A-2

Sample: Daily Field Activity Log

APPENDIX B

Site-Specific Health and Safety Plan



SITE SPECIFIC HEALTH AND SAFETY PLAN

**Additional Soil Sampling
Santa Fe Trackbed to Park
Berkeley, California**

Prepared for:

City of Berkeley

Department of Parks, Recreation, and Waterfront
1947 Center Street, 5th Floor
Berkeley, California 94704

Prepared by:

GSI Environmental Inc.

2000 Powell Street, Suite 820
Emeryville, California 94608
Phone: 510.463.8484
www.gsienv.com

Issued: October 9, 2023

GSI Job No: 6272

SITE-SPECIFIC HEALTH AND SAFETY PLAN
Additional Soil Sampling
Santa Fe Trackbed to Park
 Berkeley, California

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SITE-SPECIFIC HEALTH AND SAFETY PLAN
Additional Soil Sampling
Santa Fe Trackbed to Park
Berkeley, California

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- Attachment 1 Daily Tailgate Safety Meeting Form
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**SITE-SPECIFIC HEALTH AND SAFETY PLAN for
Additional Soil Sampling
Santa Fe Trackbed to Park
Berkeley, California**

1.0 SCOPE AND APPLICATION

This Site-Specific Health and Safety Plan (HASP) has been prepared in accordance with 29 CFR §1910.120, 8 CCR 5192, and is a site-specific supplement to the GSI company Environmental, Health and Safety (EHS) Program Manual for Field Operations (the “EHS Program Manual”), which specifies GSI’s general health and safety policies and procedures, including a description of GSI’s medical surveillance program. This HASP is to be provided to all site workers under the direction of GSI for their review. In addition to this HASP, the GSI EHS Program Manual, and applicable client safety guidelines will remain on-site at all times during the project and will be available to all project personnel upon request from the GSI Site Safety Officer (SSO) or other designated representative.

This HASP specifies minimum health and safety protocols to be followed during implementation of project work by all site personnel under the direction of GSI, including employees, contractors, and subcontractors. In the event of conflicting standards between this plan or the GSI EHS Program Manual and client health and safety requirements, the more protective standard shall apply. All personnel are required to comply with this HASP and to indicate their agreement to do so by signing the cover page.

As stated above, the protocols outlined in this HASP are considered minimum requirements and shall not be strictly relied upon. Instead, it is the responsibility of each subcontractor performing work at the Site to prepare its own HASP relative to the tasks its personnel will be conducting. Each subcontractor is responsible for the health and safety of those persons under its oversight, including its personnel and subcontractors.

GSI performed an initial soil investigation at the Santa Fe Trackbed to Park Site in July 2022 (GSI, 2022) and detected concentrations of arsenic, lead, mercury, and polycyclic aromatic hydrocarbons (PAHs) that exceeded the human health screening criteria. The City of Berkeley Department of Parks, Recreation, and Waterfront (the City) entered into a voluntary cleanup agreement with the California Department of Toxic Substances (DTSC) to oversee environmental characterization and remediation of the Site. DTSC requested that the City conduct additional soil investigation to delineate the vertical extent of arsenic-affected soil at two locations and to and characterize potential impacts at a portion of the Site that was not previously investigated due to neighbor encroachment. In addition, further investigation on two parcels of the site is proposed to assess the extent of removal that would be required to remediate specific areas for unrestricted use. GSI has prepared this site-specific HASP to complete the additional investigation activities at the Site.

All applicable federal, state, and local regulations and codes relating to health and safety shall be adhered to by GSI and its subcontractors. GSI and subcontractors shall adhere to all sections of California Occupational Safety and Health Administration regulations contained in Title 8 of the California Code of Regulations (8 CCR) as they apply to the Site activities. Applicable requirements may include but are not limited to the following:

- Injury and Illness Prevention Program (8 CCR 1509 and 8 CCR 3203).
- Hazardous Waste Operations and Emergency Response (8 CCR 5192).
- Hazard Communication (8 CCR 5194).
- Personal Protective Equipment (8 CCR Article 10).
- Respiratory Protective Equipment (8 CCR 5144).
- Control of Noise Exposure (8 CCR 5095-5100).
- Excavations (8 CCR 1503 and 8 CCR 1539- 1547).
- Fire Prevention and Suppression Procedures (8 CCR 4848).
- Portable Fire Extinguishers (8 CCR 6151).
- Cleaning, Repairing, Servicing, and Adjusting Prime Movers, Machinery, and Equipment Lockout/Tagout (8 CCR 3314).
- Medical Services and First Aid (8 CCR 3400).

2.0 PROJECT DESCRIPTION

2.1 General Information

Client	City of Berkeley
Site Owner	City of Berkeley
Project Name and General Description	Additional Soil Sampling Historic Santa Fe Right-of-Way
Project Locations (Physical Address)	Santa Fe Trackbed to Park (the Site), Berkeley, California
Detailed Location Information	Four parcels that together extend north-to-south from Blake Street to Ward Street, and east-to-west between Sacramento Street and Mabel Street.
Start Date/Duration/ Other Schedule Info.	The start date is to be determined and the work is estimated to take 10 days to complete. Note: all work will be completed during daylight hours.

2.2 Site Description

The Site (see attached Figure 1) is currently undeveloped land that was historically a railroad in Berkeley, California. It extends north-to-south between Blake Street and Ward Street and east-to-west between Sacramento and Mabel Streets. The Site is approximately 1.32 acres and consists of four parcels.

- Parcel 1 – located between Blake and Parker Streets
- Parcel 2 – located between Parker and Carleton Streets
- Parcel 3 – located between Carleton and Derby Streets
- Parcel 4 – located between Derby and Ward Streets

GSI performed an initial soil investigation in July 2022 (GSI 2022). Arsenic was detected in samples collected from 1.0 foot and 2.5 feet below ground surface (bgs) at various locations across the site with no discernable source area. Arsenic was also detected in samples collected at 4.0 feet bgs at two locations (Parcel 3). Lead, mercury, and PAHs were detected at concentrations exceeding the human health screening criteria in samples collected at 1.0 foot bgs at a limited number of boring locations. Due to an existing neighbor encroachment, no samples were collected on a portion of Parcel 1 at that time.

2.3 Project Tasks

Work to be conducted includes hand augering and collecting soil samples at varying depths throughout the Site. The project tasks will include the following:

Hand Augering and Soil Sampling

- Obtain a subsurface drilling permit from the City of Berkeley;
- Mark boring locations and notify USA North, as required by law;
- Advance 70 soil borings to an anticipated total depth of approximately 4 to 7 ft bgs using a hand auger. Detailed boring depth and sampling intervals are presented in Exhibit 1;
- Collect three to four soil samples at each boring at various depths based on the sampling plan below in Exhibit 1 or field observations.

Exhibit 1. Summary of Proposed Soil Investigation

Parcel	Number of Borings	Boring Depth (feet bgs)	Rationale	Sample Depths (feet bgs) ¹	Analysis ²
Parcel 1	14	4.0	Grid sampling to pre-characterize extent of remediation across entire parcel	2.0, 3.0, 4.0 (H)	Arsenic
	2	5.5	Grid sampling to pre-characterize extent of remediation across entire parcel and investigate encroachment area	1.0, 2.5, 4.0 (H), 5.5 (H)	Metals OCPs TPHd/TPHmo PAHs
Parcel 2	16	4.0	Grid sampling to pre-characterize extent of remediation across entire parcel	2.0, 3.0, 4.0 (H)	Arsenic, lead, mercury
	1	7.0	Delineate vertical extent of arsenic at P2-1	5.0, 6.0 (H), 7.0 (H)	Arsenic
Parcel 3	19	4.0	Grid sampling to pre-characterize extent of remediation across entire parcel	2.0, 3.0, 4.0 (H)	Arsenic, lead, mercury
	1	7.0	Delineate vertical extent of arsenic at P3-4	5.0, 6.0 (H), 7.0 (H)	Arsenic
Parcel 4	18	4.0	Grid sampling to pre-characterize extent of remediation across entire parcel	2.0, 3.0, 4.0 (H)	Arsenic, lead, mercury, PAHs (3 borings) ³

Notes:

1. H = indicates sample will be held pending analysis of shallower samples.
2. Metals = Title 22 Metals, OCPs – organochlorine pesticides, TPHd/TPHmo = total petroleum hydrocarbons quantified as diesel and motor oil, PAHs = polycyclic aromatic hydrocarbons
3. During the previous investigation, PAHs exceeded screening levels in one sample at the south end of the property. Soil samples collected from up to three borings in the vicinity of the previous detection will be analyzed for PAHs.

Information pertaining to potential hazards that may be encountered during Site activities, and general control measures are discussed in Section 5.0.

3.0 EMERGENCY RESPONSE PROCEDURES

In an emergency call **911**.

Report all accidents immediately to:

Tiffany George (GSI): 510-858-0102 or 831-227-5144
 Danny Kingham (GSI): 713-775-0481 or 713-522-6300

NOTE: Specific emergency contact information and applicable directions to the nearest medical facility are contained in Figures 2 and 3. Secure the safety of yourself and those working under your direction and then contact appropriate Site and GSI representatives that are referenced above.

Non-Emergency Contacts:

Berkeley Police Department: 510-981-5900
Berkeley Fire Department: 510-981-3473

3.1 Emergency Actions

Location of emergency assembly area(s) and evacuation route:

In case of the need to evacuate the Site, all personnel should assemble at the emergency muster points described below and shown on Figure 1:

- If on the parcel between Blake Street and Parker Street, assemble at the southwestern corner of the intersection of Blake Street and Acton Street.
- If on the parcel between Parker and Carleton Streets, assemble at the southwestern corner of the intersection of Acton and Parker Streets or the northeastern corner of the intersection of Acton and Carleton Streets.
- If on the parcel between Carleton and Derby Streets, assemble on the north side of Carleton Street or south side of Derby Street.
- If on the parcel between Derby Street and Ward Street, assemble at the north side of Derby Street or the southwestern corner of the intersection of Ward Street and Sojourner Truth Court.

Other applicable emergency response measures to be taken (decontamination and/or medical treatment):

Should ocular chemical exposure occur, the eyes should be flushed immediately and constantly with water or saline solution. The victim should be immediately transported to the nearest emergency facility or urgent care facility depending on the severity of exposure (see below).

Location and phone number of nearest urgent care facility (see Figure 2)

Concentra Urgent Care
2850 Seventh Street, Suite 100
Berkeley, CA 94710
510-845-5170

Location and phone number of nearest hospital with emergency room (see Figure 3)

Sutter Health Alta Bates Summit Medical Center
2450 Ashby Avenue
Berkeley, CA 94705
510-204-1303

4.0 PROJECT ORGANIZATION, KEY PERSONNEL, & TRAINING REQUIREMENTS

4.1 Key Personnel and Responsibilities

Key project personnel are listed in the table below

Position	Name	Phone (Cell Phone)
GSI Project Manager	Jennifer Duffield	510-821-8925
GSI Site Manager	Tiffany George	831-227-5144
GSI Site-Safety Officer (SSO)	Tiffany George	831-227-5144
GSI Health & Safety Coordinator	Danny Kingham	713-775-0481
Client Project Manager	Stacey Rutherford	510-981-6738
Owner Representative	Stacey Rutherford	510-981-6738

4.1.1 GSI Project Manager

The Project Manager has the overall responsibility for the success of the project, including implementation of this HASP. The Project Manager will have the authority to reallocate resources and personnel, as needed, to address health and safety components of the project and safely complete the fieldwork. The Project Manager will i) direct personnel involved in the field work, ii) make the site safety officer (SSO) aware of all project plans and work scope, iii) make available the resources necessary to maintain a safe working environment, iv) maintain communications with the client, and v) verify that all personnel have received the required training, are aware of potential hazards, and have received and reviewed the HASP.

4.1.3 GSI Site Manager

The Site Manager is responsible for daily direction of Site operations during field work, including management of subcontractors. The Site Manager/Superintendent will i) conduct daily tailgate meetings and other safety briefings, as needed, ii) implement the HASP and report any observed differences from anticipated Site conditions to the Project Manager and SSO, iii) observe subcontractor's procedures with respect to health and safety and suspend work if an imminent health hazard is observed, iv) ensure that required personal protective equipment (PPE), monitoring, and emergency equipment is provided and maintained in effective working condition, v) report observed accidents/incidents or unsafe work practiced to the Project Manager and SSO.

4.1.4 GSI Site Safety Officer

The SSO must be a qualified person, with knowledge, experience, and training commensurate with the responsibilities for the particular site and project.

The SSO is responsible for i) communicating project health and safety requirements to project personnel, including subcontractors; ii) conducting project safety meetings; iii) when appropriate, verifying the safety training credentials [e.g., Occupational Safety and Health Administration (OSHA) training certificates] and protocols (e.g., standard operating procedures, SOPs) of subcontract personnel; iv) ensuring compliance with the HASP by project personnel on-site, including but not limited to proper use of PPE; v) conducting inspection of the work-site each day to identify hazards and mitigation measures before work commences and as work is on-going, vi) completing the Daily Site Safety Record (Attachment 1) and related documentation; and vii) communicating safety-related concerns to the client's designated safety representative and to the Project Manager, as appropriate.

4.2 Training Requirements

GSI and subcontractor personnel shall be trained and certified in environmental health and safety procedures pursuant to OSHA 29 CFR 1910.20, Hazardous Waste Operations and Emergency Response (HAZWOPER) training requirements. Such personnel are required to complete an initial 40-hour training course on safety and health for HAZWOPER, and an annual 8-hour refresher course, as required by 29 CFR 1910.120 (“the OSHA standard”).

Following 40-hour training, field workers shall receive a minimum of 24 hours (three days) of on-the-job field training under the direct supervision of an experienced, qualified supervisor, as required by OSHA regulation (29 CFR 1910.120(e)(3)(i)). Additional training and/or on-site supervision shall be provided, as needed, to achieve demonstrated competence for the scope of work to be performed.

Additionally, all employees who perform fieldwork and may need to use PPE, possibly including respirators, participate in the medical monitoring program as required by 8 CCR 5192(f) and 29 CFR 1910.120. Details of the GSI Medical Monitoring Program are available in the EHS Program Manual. Employees in the medical surveillance program undergo pre-assignment and annual physical examinations by a physician or licensed health care provider to ensure fitness to use PPE and a respirator.

4.3 Requirements for Respirator Use

Respirator use and air quality monitoring is not required for the specified tasks because the chemicals of concern (COCs) are not volatile, and the project tasks are not dust-generating. If visible dust is generated during the execution of project tasks, the soil will be wetted before continuing.

4.4 Personnel Documents

If applicable, field project personnel, including subcontractors, are to maintain training and medical records at their respective offices and provide them to GSI, if requested. OSHA 40-hour HAZWOPER training with 8-hour refresher courses is required of all field personnel performing work subject to the OSHA standard.

5.0 POTENTIAL HAZARDS & HAZARD CONTROL MEASURES

5.1 General Site Access Control

Field activities will be performed between 7:30 AM and 5:00 PM (daylight hours). Access to each parcel in the Site is provided through chain-link gates and will be coordinated with the Client Project Manager. While on-site each gate should remain closed, though not necessarily locked unless deemed necessary by the SSO. Cones will be placed in front of the gates while work is being conducted. The general public will not have access to the Site.

5.2 Work Zones

If work is conducted in areas with the potentially affected soil, the work area will be divided into three zones: the exclusion zone, the contamination reduction zone (CRZ), and the support zone. The zones are characterized by the activities being performed and the possible presence of biological and chemical hazards.

5.2.1 Exclusion Zone

The exclusion zone constitutes the area where potentially hazardous contaminants and physical hazards may be found. Only authorized personnel will be permitted in the exclusion zone and no smoking, eating, or drinking is allowed. Egress from the exclusion zone is through the CRZ, unless other means of egress is warranted due to an imminent hazard or emergency.

5.2.2 Contaminant Reduction Zone

Equipment and personnel decontamination will be conducted in the CRZ, adjacent to the exclusion zone. PPE will be removed in this area, prior to entering the support zone.

5.2.3 Support Zone

The support zone is the clean area outside of the CRZ. There should be no contamination in the support zone.

5.3 Project Personnel Access Control

All personnel visiting the Site, including subcontractors and regulatory personnel, will be required to sign in and review the HASP.

5.4 Traffic Control

Traffic controls are not required to complete the investigation tasks at the Site. Work will be performed within fenced-in parcels and support vehicles will be parked on city streets. Support vehicles will not be driven on the Site and sidewalks will never be blocked for pedestrian access. The City will post no-parking signs in the areas of work 72 hours in advance. Support vehicles will be parked on City streets. When exposed to public vehicular traffic (e.g., while loading/unloading equipment from support vehicles), Personnel shall wear a high-visibility vest or other suitable garments marked with or made of reflectorized or high-visibility material per 8 CCR 1541(d) and Section 7.2.

5.5 Underground Utilities Clearance

Utility clearance will include at least a 2-day notification to Underground Service Alert (USA) of California, the state underground utility notification authority.

Below are the color designations typically used by the underground utilities' surveyors in California (note other states may differ):

WHITE – PROPOSED EXCAVATION

PINK – TEMPORARY SURVEY MARKINGS

RED – ELECTRIC POWER LINES, CABLES, CONDUIT AND LIGHTING CABLES

YELLOW – GAS, OIL, STEAM, PETROLEUM OR GASEOUS MATERIALS

ORANGE – COMMUNICATION, ALARM OR SIGNAL LINES, CABLES OR CONDUIT

BLUE – POTABLE WATER

PURPLE – RECLAIMED WATER, IRRIGATION AND SLURRY LINES

GREEN – SEWERS AND DRAIN LINES

5.6 General Work Hazards and Avoidance

General work hazards include slip, trip, and fall hazards, head or foot injuries from falling or dropped objects, strains from over-exertion or incorrect lifting, electrical shocks, etc. These hazards can be controlled by good housekeeping measures and safe work practices, as outlined below.

Housekeeping Measures:

- Excess brush or high vegetation should be cleared from the work area to the extent practical prior to start of the job.
- The job site must be kept clean and free of trash and debris. Trash will be placed in bags or other suitable containers when generated. Disposable PPE must be disposed of in designated containers upon removal.
- Materials, such as lumber, will be neatly stored in a designated area.
- Tools and equipment must be returned to the toolbox or designated area when no longer in use.

General Safe Work Practices:

- Use a buddy system.
- Stay alert at all times to activities in your surroundings. Watch for on-coming vehicles, other workers, and overhead hazards.
- Work at a deliberate pace; do not rush a job.
- Avoid heavy lifting and lift with knees bent.
- Use tools only for their intended use, and make sure tools are in good condition. Inspect power tools and extension cords prior to use.
- Maintain safe distance (at least 10 feet and an additional 4 inches for every 10 kilovolts (kV) over 50 kV) between overhead equipment and overhead lines.
- Avoid unauthorized entry to restricted areas including confined space areas.
- Proper PPE (specified below) must be worn at all times. PPE must be inspected regularly and properly maintained.
- Remove gloves and wash hands before handling food or tobacco products.

5.7 Fire and Explosion Hazard Mitigation

- All excavation locations must be properly cleared for the presence of underground utilities prior to digging. Utility clearance procedures are specified in Section 5.5.
- Gasoline and other fuels must be stored in steel safety cans with mesh flame arresters and spring-mounted relief vent mechanisms. Flammable and combustible materials including paints and solvents must be properly stored away from sources of ignition.
- Fire extinguishers must be present on all vehicles and in all areas where spark producing equipment is in use.
- Smoking permitted only in designated areas.

5.8 Heat-Related Disorders

The major varieties of heat-related disorders, their related symptoms and appropriate treatment are listed below in order of increasing severity.

Condition & Related Symptoms	Heat Stress	Heat Exhaustion or Heat Syncope	Heat Stroke
Cramping	May be present	May be present	Absent
Mental State	Faint, dizzy, fatigue	May be disoriented	Stupor or coma
Skin & Complexion	Cool, moist, flush; rash may be present	Cool, pale, moist	Red, hot, dry
Temperature	Normal	Normal to low	Very high (>105° F)
Pulse	Rapid (>110 beat /min)	Rapid, weak	Rapid, bounding
Blood Pressure	May be low	May be low	May be high in early stages
Treatment	Give water & electrolytes, loosen or remove clothing, move to shade	Give water & electrolytes, loosen or remove clothing, move to shade	Provide rapid cooling by immersion; cover in wet cloth and transport to emergency room

Prevention Measures: All heat disorders are caused by loss of fluids and the body's inability to cool itself. The GSI EHS Program Manual describes guidance and measures that shall be enacted while work is conducted on-Site to prevent heat illness. Measures include procedures related to acclimatization, training, and emergency responses. Additional preventative requirements include, but are not limited to the following measures:

- Pre-hydrate before going into the field: water or water-electrolyte drinks are preferable to caffeinated beverages or soft drinks. Refrain from alcohol the night before field work.
- In the field drink frequently. Numerous small drinks at a tepid temperature are better than rapid, large volume intakes of iced drinks.
- Water will be provided in sufficient quantity at the beginning of the work shift to provide one quart per employee per hour for drinking for the entire shift. If, during the day, quantities have been reduced to unacceptable levels, one employee should be tasked with going for more water at GSI's expense. An inadequate supply of drinking water may require temporary suspension of work until water can be obtained [CalOSHA 8 CCR 3395(d)].
- Rest at least a few minutes every hour or two.
- Observe co-workers for signs of heat stress.
- Shade shall be present on the worksite when the temperature exceeds 80 degrees Fahrenheit. Below 80 degrees Fahrenheit, if shade is not already present on site, shade must be provided when requested by an employee. "Shade" means blockage of direct sunlight that can accommodate at least 25 percent of the employees on the shift at any time [CalOSHA 8 CCR 3395(d)].

OSHA identifies the following Risk Levels for given values of the heat index and recommends increasing Protective Measures to be implemented at each level.

Heat Index	Risk Level	Protective Measures
< 91° F	Lower (Caution)	Basic heat safety and planning
91° to 103° F	Moderate	Implement precautions and heighten awareness
103° to 115° F	High	Additional precautions to protect workers
> 115° F	Very High to Extreme	Aggressive measures (e.g., reschedule non-essential work)

5.9 Heavy Equipment Operations

The use of heavy equipment is not anticipated for this scope of work. However, if used any equipment must be in good condition. Particular attention should be paid to the condition of cables and hoisting equipment. The equipment must be equipped with a back-up beeper. Barricades or caution tape should be used as needed to exclude unauthorized personnel from the work area.

All heavy equipment must employ the warning methods while the vehicle is backing up, as described in 8 CCR 1592, including:

- Automatic back-up alarm;
- Automatic braking device;
- A spotter directing the vehicle;
- Inspection of the entire perimeter of the vehicle prior to backing up; and/or
- Prohibiting foot traffic in the work area.

Equipment should be positioned to allow for adequate work room and the area kept free of trip and slip hazards. Care must be taken to avoid the catching of loose clothing in moving parts, and to keep hands free of pinch points. Proper PPE including hard hat, safety glasses, gloves, hearing protection, and safety shoes must be worn.

All vehicles or mechanical equipment that may have all or parts of its structure near energized overhead lines should maintain an operating distance as stipulated by CalOSHA requirements (8 CCR 2946). For boom-type lifting or hoisting equipment (i.e., drill rigs) required clearance distances are provided below:

Nominal Voltage		Minimum Required Clearance (feet)
From	To	
600	50,000	10
Over 50,000	75,000	11
Over 75,000	125,000	13
Over 125,000	175,000	15
Over 175,000	250,000	17
Over 250,000	370,000	21
Over 370,000	550,000	27
Over 550,000	1,000,000	42

5.10 Potential Chemical Exposure Hazards

Primary constituents of concern, relevant exposure levels, and the maximum expected concentrations in soil and/or soil vapor, to the extent known, are presented below. Safety Data Sheets (SDSs) are included in Attachment 2.

Constituents of Concern (COCs)	Exposure Limits ¹			I.P. ³	Max. Expected Concentration or Free-Phase (FP)		Health Hazard Target Organ Route of Entry
	Chemical Name/ CAS No.	PEL/ TLV (mg/m ³)	STEL (mg/m ³)		IDLH ² (mg/m ³)	(eV)	
Arsenic 7440-38-2	0.01	NPV	5	NA	338	NE	Ca = Carcinogen Abs = Skin Absorption Con = Skin or Eye Contact Inh = Inhalation Ing = Ingestion Ca, Abs, Con, Inh, Ing
Lead 7439-92-1	0.05	NPV	100	NA	294	NE	Con, Inh, Ing
Mercury 7439-97-6	0.025	NPV	10	NA	2.1	NE	Con, Abs, Inh, Ing
Benzo(a)pyrene (as Coal Pitch Tar volatiles) 65996-93-2	0.2	NPV	80	NA	3.5	NE	Ca, Con, Inh

1 Unless otherwise noted, Permissible Exposure Limits (PEL) and Threshold Limit Values (TLVs) are permissible time-weighted average exposure limits (ppm in air), which must not be exceeded for an 8-hour work-day/40-hour work week. Short-Term Exposure Limits (STELs) must not be exceeded over a 15-minute period. Some exposure limits are expressed in milligrams per cubic meter (mg/m³).

2 IDLH = Immediately Dangerous to Life or Health; must not be exceeded at any time.

3 I.P. = Ionization Potential. A photoionization detector specified in Section 6.0 should have a lamp with an IP (i.e., 10.6 eV or 11.7 eV) that is greater than the largest IP of COCs from this table that may reasonably be expected to occur as volatiles.

- 4 NPV = No published value
- 5 Exposure limits, ionization potentials, and associated health hazards can be found in the NIOSH Pocket Guide to Chemical Hazards and the ACGIH Guide to TLVs and BEIs and Cal-OSHA 8 CCR 5155 Table AC-1.
- 6 NE = Not Established
- 7 NA = Not Applicable

Other metals PAHs, and organochlorine pesticides may also be present in Site soil. One of the objectives of this investigation is to determine their presence. However, since their presence has not yet been established or previous detections were below residential screening levels, none are volatile, and project tasks are not dust-generating activities, these compounds are not included in the table above.

To minimize potential chemical exposure, the following measures will be taken:

- SDS must be provided for any chemical brought on-site for project use.
- Workers should remain upwind of contaminated materials to the extent practical.
- PPE specified below will be worn to prevent skin or eye contact with constituents.
- Air quality monitoring will be conducted, as described below.
- Eating, drinking, smoking, gum chewing and oral tobacco use are not permitted in areas where chemical exposure could occur.
- Workers must remove gloves in the work area and drink from a water source outside the immediate work zone.
- PPE must be removed, and hands thoroughly washed prior to breaking for meals.

5.11 Other Potential Hazards

Other potential hazards associated with the site and/or specific tasks and applicable hazard mitigation methods are described below.

If applicable, exercise extreme caution when working near or around heavy machinery. Make sure the equipment operator can see where you are, especially when the equipment is being moved from one location to the next.

6.0 AIR QUALITY MONITORING

Air quality monitoring is not necessary at the Site because the potential chemicals are not volatile and project tasks are not dust-generating activities. Soil will be wetted if visible dust is generated during the execution of project tasks.

7.0 PERSONAL PROTECTIVE EQUIPMENT (PPE)

7.1 Level D PPE

A minimum of Level D PPE is required for all site personnel at all times, upgraded as necessary depending on task and conditions. Basic Level D PPE shall include the following elements: **1) Hard Hat**; **2) Safety Glasses** (w/side shields); **3) Safety Shoes** (w/steel toes); **4) Body Covering** (long pants, shirt w/ sleeves, collar). Basic Level D equipment will be supplemented as follows:

7.2 Supplemental Level D PPE

	<u>Item</u>	<u>When/Where to be Used</u>
	Flame Retardant Clothing (FRC)	
X	Hearing Protection	As needed, during noise generating activities
X	Work gloves	As needed
	Latex or vinyl surgical gloves	
		As needed, during contact with potentially affected soil
X	Neoprene or Nitrile gloves	As needed, when exposed to public vehicular traffic
X	High-Visibility Vest	
	Tyvek Coveralls	
	Polycoat Tyvek Coveralls	
	Chemical-resistant boots	
	Face Shield	

7.3 Level C PPE

No Level C PPE (use of Air-Purifying Respirator) will be performed on this job.

7.4 Level B PPE

No Level B work will be performed on this job.

8.0 DECONTAMINATION PROTOCOL

Investigation-derived waste, such as soil cuttings and decontamination water shall be collected and contained on Site in sealed steel drums. Soil and decontamination water will be characterized prior to off-Site disposal. All downhole equipment will be decontaminated using a steam cleaner or a solution of Alconox and distilled water and rinsed with distilled water.

All investigation derived waste (e.g., PPE, tubing, paper towels, gloves) will be placed in trash bags, and disposed of off-Site as municipal waste. Personnel should wash their hands and/or shower prior to engaging in non-work area activities, such as eating.

9.0 SPILL CONTAINMENT

In the event of a release of chemicals, a sorbent material, such as bentonite, will be applied to contain the spill. The GSI project manager, client project manager, and a facility representative will be immediately notified.

10.0 ILLUMINATION

All planned field activities are located outside and will be conducted during daylight hours; therefore, artificial illumination will not be required.

11.0 SANITATION

The nearest public restroom is located at San Pablo Park (see Figure 1). Bottled drinking water will be brought on Site by field personnel and stored in the field truck.

12.0 DAILY SITE SAFETY MEETINGS

The SSO will conduct a Site Safety Meeting before the start of work each day. As a means of tracking attendance, all on-Site personnel are expected to review and sign the HASP. If deemed necessary by the SSO, additional site safety meetings may be conducted to refresh all field personnel on the safety issues associated with the project tasks.

13.0 REFERENCES

- GSI, 2022. Santa Fe Right-of-Way Phase II Environmental Site Assessment – Report of Findings. Historic Santa Fe Right-of-Way, Berkeley, California. November 22.
- GSI, 2023. Additional Soil Sampling Work Plan, Santa Fe Trackbed to Park, Berkeley, California. September XX, 2023.

SITE-SPECIFIC HEALTH AND SAFETY PLAN
Additional Soil Sampling
Santa Fe Trackbed to Park
Berkeley, California

FIGURES

Figure 1. Site Overview

Figure 2. Urgent Care Location Map

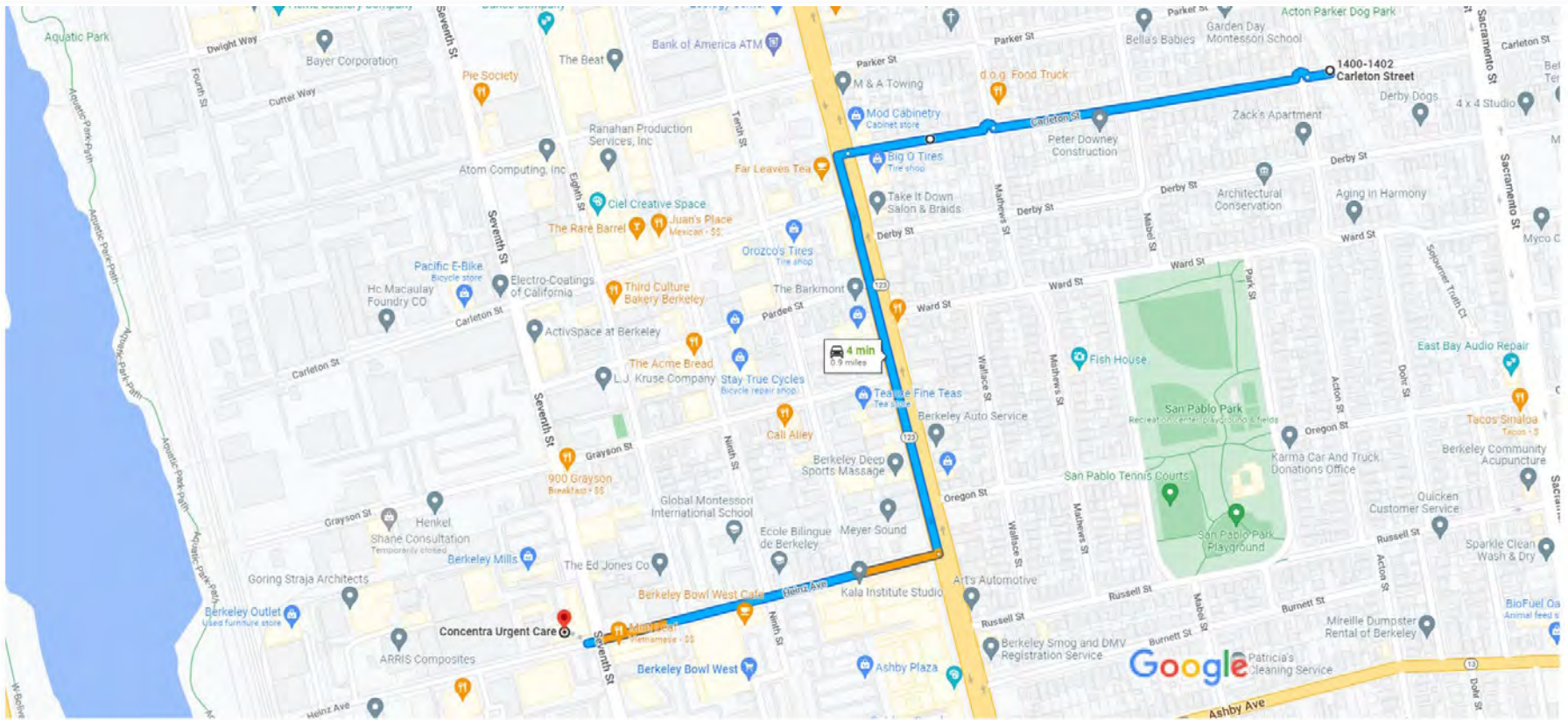
Figure 3. Hospital Location Map



GSI job No.	6272	Drawn By:	AV
Issued:	8-Jun-2023	Chk'd By:	TRK
		App'v'd By:	JPD
Map ID:	SFROW_SiteOverviewZmo		FIGURE 1

SITE OVERVIEW

Santa Fe Tracked to Park
Berkeley, California



Collected Via Google Maps:

1400-1402 Carleton St

Berkeley, CA 94702

- ↑ 1. Head west on Carleton St
89 ft
- ↻ 2. At the traffic circle, continue straight to stay on Carleton St
0.2 mi
- ↻ 3. At the traffic circle, continue straight to stay on Carleton St
0.1 mi
- ← 4. Turn left onto San Pablo Ave
0.3 mi
- ↻ 5. Turn right onto Heinz Ave
0.3 mi

Concentra Urgent Care
2850 Seventh St Suite 100, Berkeley, CA 94710
(510) 845-5170


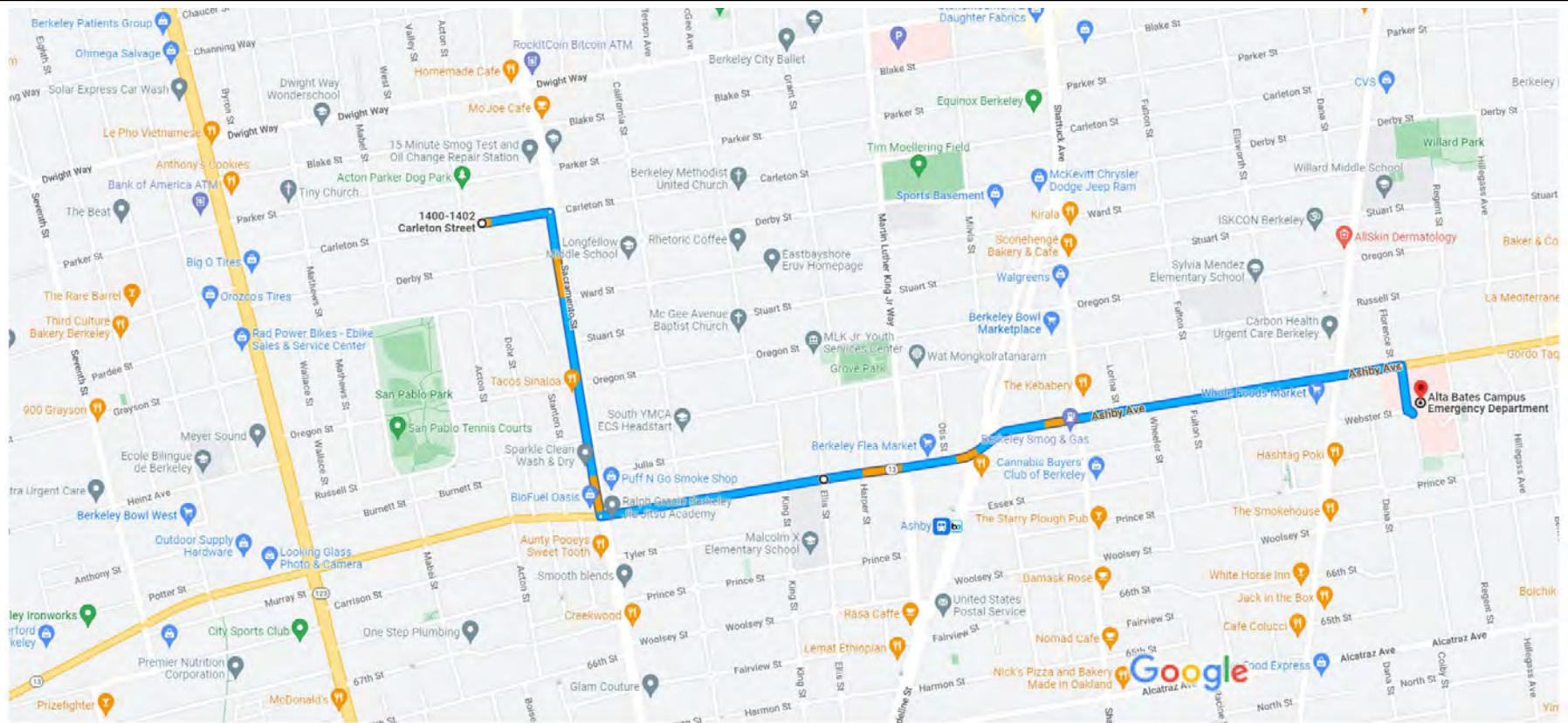
	GSI Job No. 6272	Drawn By: AV
	Issued: 8-Jun-23	Chk'd By:
	Revised:	Apr'd By: JPD
	Scale:	

FIGURE 2: URGENT CARE LOCATION MAP

Santa Fe Trackbed to Park
Berkeley, California



Collected Via Google Maps:

1400-1402 Carleton St
Berkeley, CA 94702

- ↑ 1. Head east on Carleton St toward Sacramento St 0.1 mi
 - ↪ 2. Turn right at the 1st cross street onto Sacramento St 0.4 mi
 - ↶ 3. Turn left onto Ashby Ave 1.2 mi
 - ↪ 4. Turn right onto Colby St 400 ft
- 📍 Destination will be on the left

Alta Bates Campus Emergency Department
2450 Ashby Ave, Berkeley, CA 94705
(510) 204-1303

	GSI Job No.	6272	Drawn By:	AV
	Issued:	8-Jun-23	Chk'd By:	
	Revised:		Apr'd By:	JPD
	Scale:			

FIGURE 3: HOSPITAL LOCATION MAP

Santa Fe Tracked to Park
Berkeley, California

SITE-SPECIFIC HEALTH AND SAFETY PLAN
Additional Soil Sampling
Santa Fe Trackbed to Park
Berkeley, California

ATTACHMENT 1

Daily Tailgate Safety Meeting Form

GSI ENVIRONMENTAL INC.
GSI PERSONNEL ONLY
DAILY TAILGATE SAFETY MEETING



Project/Location: _____

GSI Job No. _____

Site Safety Officer: _____

Date: _____

Meeting Conducted By: _____

Meeting Attended By:

NAME	SIGNATURE	TIME ONSITE-OFFSITE

_____ **Non-GSI** Personnel Present (Use Attachment A).

Task	Hazard(s)*	PPE

*Hazard	Hazard Description	How to Mitigate
Mechanical (M)		
Weather (W)		
Chemical (C)		
Biological (B)		
Other (O)		

Air Quality Monitoring: _____ Required (See record on Attachment B.) _____ Not Required

Site Safety Officer: _____ *"I have reviewed project tasks/hazards with the field team and have visually inspected the work area for proper housekeeping and other potential hazards (e.g., slip, trip, pinch points)."*

Signature: _____ Date: _____

HEAVY EQUIPMENT USE (IF APPLICABLE – USE ATTACHMENT A)

Type of Equipment & Model: _____ Company: _____

ACCIDENTS/INJURIES/INCIDENTS

(Description of incident and actions taken. Attach additional sheets as needed.)

GSI Job No. _____

Date: _____



GSI ENVIRONMENTAL INC.
NON-GSI PERSONNEL ONLY
DAILY TAILGATE SAFETY MEETING – ATTACHMENT A

I, the undersigned, attended the daily site safety meeting conducted by GSI Environmental Inc. (GSI) and have had the opportunity to ask questions about health and safety issues relating to this project. I understand that by signing this Daily Site Safety Record (DSSR), GSI is not my supervisor or controlling contractor; and therefore, is not responsible for my health and safety, as my employer is solely responsible for my health and safety.

NAME	COMPANY	SIGNATURE	TIME ON-SITE - OFF-SITE

Note: Non-GSI personnel include, but not limited to, GSI-subcontractors, 3rd party subcontractors, clients, site representatives, and/or regulatory representatives.

HEAVY EQUIPMENT USE (IF APPLICABLE)

Type of Equipment & Model: _____ Owned: _____ Rented: _____

Certification: *“I have been properly trained on the use of this equipment. I have inspected this equipment and confirmed it to be in good working condition.”*

Signature: _____ Date: _____

SITE-SPECIFIC HEALTH AND SAFETY PLAN
Additional Soil Sampling
Santa Fe Trackbed to Park
Berkeley, California

ATTACHMENT 2

Chemical Safety Data Sheets

SAFETY DATA SHEET

Revision Date 20-Feb-2020

Revision Number 2

1. Identification

Product Name Arsenic powder

Cat No. : 10101

CAS-No 7440-38-2
Synonyms No information available

Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use.
Details of the supplier of the safety data sheet

Company

Alfa Aesar
Thermo Fisher Scientific Chemicals, Inc.
30 Bond Street
Ward Hill, MA 01835-8099
Tel: 800-343-0660
Fax: 800-322-4757
Email: tech@alfa.com
www.alfa.com

Emergency Telephone Number

During normal business hours (Monday-Friday, 8am-7pm EST), call (800) 343-0660.
After normal business hours, call Carechem 24 at (866) 928-0789.

2. Hazard(s) identification

Classification

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Acute oral toxicity	Category 3
Acute Inhalation Toxicity - Dusts and Mists	Category 3
Carcinogenicity	Category 1A

Label Elements

Signal Word

Danger

Hazard Statements

May cause cancer
Toxic if swallowed or if inhaled

**Precautionary Statements****Prevention**

Obtain special instructions before use
 Do not handle until all safety precautions have been read and understood
 Use personal protective equipment as required
 Wash face, hands and any exposed skin thoroughly after handling
 Do not eat, drink or smoke when using this product
 Avoid breathing dust/fume/gas/mist/vapors/spray
 Use only outdoors or in a well-ventilated area

Response

IF exposed or concerned: Get medical attention/advice

Inhalation

IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
 Call a POISON CENTER or doctor/physician

Ingestion

IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
 Rinse mouth

Storage

Store locked up
 Store in a well-ventilated place. Keep container tightly closed

Disposal

Dispose of contents/container to an approved waste disposal plant

Hazards not otherwise classified (HNOC)

Very toxic to aquatic life with long lasting effects
 WARNING. Cancer - <https://www.p65warnings.ca.gov/>.

3. Composition/Information on Ingredients

Component	CAS-No	Weight %
Arsenic	7440-38-2	<=100

4. First-aid measures

General Advice

Show this safety data sheet to the doctor in attendance. Immediate medical attention is required.

Eye Contact

In the case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.

Skin Contact

Wash off immediately with plenty of water for at least 15 minutes. Immediate medical attention is required.

Inhalation

Remove to fresh air. If not breathing, give artificial respiration. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Immediate medical attention is required.

Ingestion

Do NOT induce vomiting. Call a physician or poison control center immediately.

Most important symptoms and effects	None reasonably foreseeable.
Notes to Physician	Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media	approved class D extinguishers. Do not use water or foam.
Unsuitable Extinguishing Media	No information available
Flash Point	No information available
Method -	No information available
Autoignition Temperature	No information available
Explosion Limits	
Upper	No data available
Lower	No data available
Sensitivity to Mechanical Impact	No information available
Sensitivity to Static Discharge	No information available

Specific Hazards Arising from the Chemical

Do not allow run-off from fire-fighting to enter drains or water courses.

Hazardous Combustion Products

arsenic oxides.

Protective Equipment and Precautions for Firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. Thermal decomposition can lead to release of irritating gases and vapors.

NFPA

Health
3

Flammability
0

Instability
0

Physical hazards
-

6. Accidental release measures

Personal Precautions	Ensure adequate ventilation. Use personal protective equipment as required. Avoid dust formation. Keep people away from and upwind of spill/leak. Evacuate personnel to safe areas.
Environmental Precautions	Do not flush into surface water or sanitary sewer system. Do not allow material to contaminate ground water system. Prevent product from entering drains. Local authorities should be advised if significant spillages cannot be contained. Should not be released into the environment.

Methods for Containment and Clean Up Sweep up and shovel into suitable containers for disposal. Avoid dust formation.

7. Handling and storage

Handling	Wear personal protective equipment/face protection. Do not get in eyes, on skin, or on clothing. Avoid dust formation. Use only under a chemical fume hood. Do not breathe (dust, vapor, mist, gas). Do not ingest. If swallowed then seek immediate medical assistance.
Storage	Keep containers tightly closed in a dry, cool and well-ventilated place.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Arsenic	TWA: 0.01 mg/m ³	(Vacated) TWA: 0.5 mg/m ³	IDLH: 5 mg/m ³ Ceiling: 0.002 mg/m ³	TWA: 0.01 mg/m ³

Legend

ACGIH - American Conference of Governmental Industrial Hygienists

OSHA - Occupational Safety and Health Administration

NIOSH IDLH: NIOSH - National Institute for Occupational Safety and Health

Engineering Measures Ensure adequate ventilation, especially in confined areas.

Personal Protective Equipment

Eye/face Protection Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Solid
Appearance	No information available
Odor	Odorless
Odor Threshold	No information available
pH	No information available
Melting Point/Range	817 °C / 1502.6 °F
Boiling Point/Range	614 °C / 1137.2 °F
Flash Point	No information available
Evaporation Rate	Not applicable
Flammability (solid,gas)	No information available
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	0.01 hPa @ 267 °C
Vapor Density	Not applicable
Specific Gravity	5.778 g/cm ³
Solubility	No information available
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	No information available
Viscosity	Not applicable
Molecular Formula	As
Molecular Weight	74.92

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid Incompatible products.

Incompatible Materials Oxidizing agent

Hazardous Decomposition Products arsenic oxides

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information
Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Arsenic	LD50 = 15 mg/kg (Rat) LD50 = 763 mg/kg (Rat)	Not listed	Not listed

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation No information available

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Arsenic	7440-38-2	Group 1	Known	A1	X	A1

<p><i>IARC (International Agency for Research on Cancer)</i></p> <p><i>NTP: (National Toxicity Program)</i></p> <p><i>ACGIH: (American Conference of Governmental Industrial Hygienists)</i></p> <p><i>Mexico - Occupational Exposure Limits - Carcinogens</i></p>	<p><i>IARC (International Agency for Research on Cancer)</i> <i>Group 1 - Carcinogenic to Humans</i> <i>Group 2A - Probably Carcinogenic to Humans</i> <i>Group 2B - Possibly Carcinogenic to Humans</i> <i>NTP: (National Toxicity Program)</i> <i>Known - Known Carcinogen</i> <i>Reasonably Anticipated - Reasonably Anticipated to be a Human Carcinogen</i> <i>ACGIH: (American Conference of Governmental Industrial Hygienists)</i> <i>A1 - Known Human Carcinogen</i> <i>A2 - Suspected Human Carcinogen</i> <i>A3 - Animal Carcinogen</i> <i>Mexico - Occupational Exposure Limits - Carcinogens</i> <i>A1 - Confirmed Human Carcinogen</i> <i>A2 - Suspected Human Carcinogen</i> <i>A3 - Confirmed Animal Carcinogen</i> <i>A4 - Not Classifiable as a Human Carcinogen</i> <i>A5 - Not Suspected as a Human Carcinogen</i></p>
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Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure None known

STOT - repeated exposure None known

Aspiration hazard No information available

Symptoms / effects,both acute and delayed No information available

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. The product contains following substances which are hazardous for the environment. May cause long-term adverse effects in the environment. Do not allow material to contaminate ground water system.

Persistence and Degradability Insoluble in water May persist

Bioaccumulation/ Accumulation No information available.

Mobility Is not likely mobile in the environment due its low water solubility.

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. Transport information

DOT

UN-No UN1558
 Proper Shipping Name ARSENIC
 Hazard Class 6.1
 Packing Group II

TDG

UN-No UN1558
 Proper Shipping Name ARSENIC
 Hazard Class 6.1
 Packing Group II

IATA

UN-No UN1558
 Proper Shipping Name ARSENIC
 Hazard Class 6.1
 Packing Group II

IMDG/IMO

UN-No UN1558
 Proper Shipping Name ARSENIC
 Hazard Class 6.1
 Packing Group II

15. Regulatory information

United States of America Inventory

Component	CAS-No	TSCA	TSCA Inventory notification - Active/Inactive	TSCA - EPA Regulatory Flags
Arsenic	7440-38-2	X	ACTIVE	-

Legend:

TSCA - Toxic Substances Control Act, (40 CFR Part 710)

X - Listed

'-' - Not Listed

TSCA 12(b) - Notices of Export Not applicable

International Inventories

Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Australia (AICS), China (IECSC), Korea (ECL).

Component	CAS-No	DSL	NDSL	EINECS	PICCS	ENCS	AICS	IECSC	KECL
Arsenic	7440-38-2	X	-	231-148-6	X	X	X	X	KE-01933

U.S. Federal Regulations**SARA 313**

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Arsenic	7440-38-2	<=100	0.1

SARA 311/312 Hazard Categories See section 2 for more information**CWA (Clean Water Act)**

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Arsenic	-	-	X	X

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
Arsenic	X		-

OSHA - Occupational Safety and Health Administration Not applicable

Component	Specifically Regulated Chemicals	Highly Hazardous Chemicals
Arsenic	10 µg/m ³ TWA 5 µg/m ³ Action Level	-

CERCLA Not applicable

Component	Hazardous Substances RQs	CERCLA EHS RQs
Arsenic	1 lb	-

California Proposition 65 This product contains the following Proposition 65 chemicals.

Component	CAS-No	California Prop. 65	Prop 65 NSRL	Category
Arsenic	7440-38-2	Carcinogen	0.06 µg/day 10 µg/day	Carcinogen

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Arsenic	X	X	X	X	X

U.S. Department of TransportationReportable Quantity (RQ): N
DOT Marine Pollutant N
DOT Severe Marine Pollutant N**U.S. Department of Homeland Security** This product does not contain any DHS chemicals.**Other International Regulations****Mexico - Grade** No information available**16. Other information**

Prepared By Health, Safety and Environmental Department
Email: tech@alfa.com
www.alfa.com

Revision Date 20-Feb-2020
Print Date 20-Feb-2020
Revision Summary SDS authoring systems update, replaces ChemGes SDS No. 7440-38-2/1.

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS

Lead

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Date of issue: 12/15/2014 Revision date: 12/15/2014 Version: 1.1

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Product form : Substance
CAS No : 7439-92-1
Formula : Pb
Synonyms : C.I. 77575, in massive state / elemental lead, in massive state / glover, in massive state
BIG no : 10073

1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/mixture : Solder
Battery: component
Construction
Electrodes

1.3. Details of the supplier of the safety data sheet

GSC International, Inc.
1747 N. Deffer Drive
Nixa,
MO 65714
United States of America

Tel: 417-374-7431
Fax: 417-374-7442
Email: info@gsccinternationalinc.com

1.4. Emergency telephone number

Country	Organization/Company	Address	Emergency number
MEXICO	Servicio de Informacion Toxicologica Sintox	Tintoreto #32 Edif. a Desp. Col. Nochebuena Mixcoac México, D.F.	1 800 009 2800 +52 55 5611 2634 /+52 55 5598 9095
UNITED STATES OF AMERICA	American Association of Poison Control Centers		1-800-222-1222

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Classification (GHS-US)

Acute Tox. 4 (Oral) H302
Acute Tox. 4 (Inhalation) H332
Carc. 1B H350
Repr. 1A H360
STOT RE 2 H373
Aquatic Acute 1 H400
Aquatic Chronic 1 H410

Full text of H-phrases: see section 16

2.2. Label elements

GHS-US labeling

Hazard pictograms (GHS-US) :



GHS07

GHS08

GHS09

Signal word (GHS-US) :

Danger

Hazard statements (GHS-US) :

H302+H332 - Harmful if swallowed or if inhaled
H350 - May cause cancer
H360 - May damage fertility or the unborn child
H373 - May cause damage to organs through prolonged or repeated exposure

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H400 - Very toxic to aquatic life
H410 - Very toxic to aquatic life with long lasting effects

Precautionary statements (GHS-US) :

- P201 - Obtain special instructions before use
- P202 - Do not handle until all safety precautions have been read and understood
- P260 - Do not breathe dust, fume
- P264 - Wash hands thoroughly after handling
- P270 - Do not eat, drink or smoke when using this product
- P273 - Avoid release to the environment
- P304+P340 - If inhaled: Remove person to fresh air and keep comfortable for breathing
- P308+P313 - If exposed or concerned: Get medical advice/attention
- P314 - Get medical advice/attention if you feel unwell
- P501 - Dispose of contents/container to a licensed hazardous-waste disposal contractor or collection site except for empty clean containers which can be disposed of as non-hazardous waste

2.3. Other hazards

No additional information available

2.4. Unknown acute toxicity (GHS-US)

Not applicable

SECTION 3: Composition/information on ingredients

3.1. Substance

Name	Product identifier	%	Classification (GHS-US)
Lead (Main constituent)	(CAS No) 7439-92-1	> 99,9	Acute Tox. 4 (Oral), H302 Acute Tox. 4 (Inhalation), H332 Carc. 1B, H350 Repr. 1A, H360 STOT RE 2, H373 Aquatic Acute 1, H400 Aquatic Chronic 1, H410

Full text of H-phrases: see section 16

3.2. Mixture

Not applicable

4.1. Description of first aid measures

First-aid measures general : If you feel unwell, seek medical advice. IF exposed or concerned: Get medical advice/attention. Call a poison center/doctor/physician if you feel unwell.

First-aid measures after inhalation : Remove person to fresh air and keep comfortable for breathing. Not applicable. Call a poison center/doctor/physician if you feel unwell.

First-aid measures after skin contact : Not applicable. Wash skin with plenty of water.

First-aid measures after eye contact : Not applicable. Rinse eyes with water as a precaution.

First-aid measures after ingestion : Not applicable. Rinse mouth. Call a poison center/doctor/physician if you feel unwell.

4.2. Most important symptoms and effects, both acute and delayed

Symptoms/injuries after inhalation : No effects known.

Symptoms/injuries after skin contact : No effects known.

Symptoms/injuries after eye contact : No effects known.

Symptoms/injuries after ingestion : No effects known.

Chronic symptoms : No effects known.

4.3. Indication of any immediate medical attention and special treatment needed

Treat symptomatically.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : Adapt extinguishing media to the environment.

Unsuitable extinguishing media : No unsuitable extinguishing media known.

5.2. Special hazards arising from the substance or mixture

Fire hazard : DIRECT FIRE HAZARD. Non combustible.

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- Explosion hazard : DIRECT EXPLOSION HAZARD. No data available on direct explosion hazard. INDIRECT EXPLOSION HAZARD. No data available on indirect explosion hazard.
- Reactivity : On burning: formation of metallic fumes. Oxidizes on exposure to air.

5.3. Advice for firefighters

- Precautionary measures fire : Exposure to fire/heat: keep upwind. Exposure to fire/heat: consider evacuation. Exposure to heat: have neighborhood close doors and windows.
- Firefighting instructions : Dilute toxic gases with water spray. Take account of toxic fire-fighting water. Use water moderately and if possible collect or contain it.
- Protection during firefighting : Heat/fire exposure: compressed air/oxygen apparatus. Do not attempt to take action without suitable protective equipment. Self-contained breathing apparatus. Complete protective clothing.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

6.1.1. For non-emergency personnel

- Protective equipment : Gloves. Protective clothing. See "Material-Handling" to select protective clothing.
- Emergency procedures : Mark the danger area. No naked flames.

6.1.2. For emergency responders

- Protective equipment : Do not attempt to take action without suitable protective equipment. For further information refer to section 8: "Exposure controls/personal protection".

6.2. Environmental precautions

Avoid release to the environment. Prevent soil and water pollution. Prevent spreading in sewers. Notify authorities if product enters sewers or public waters.

6.3. Methods and material for containment and cleaning up

- For containment : Not applicable. Collect spillage.
- Methods for cleaning up : Recover mechanically the product. Pick-up the material. Take collected spill to manufacturer/competent authority. Notify authorities if product enters sewers or public waters.
- Other information : Dispose of materials or solid residues at an authorized site.

6.4. Reference to other sections

For further information refer to section 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

- Precautions for safe handling : Meet the legal requirements. Do not discharge the waste into the drain. Handle unclean empty containers as full ones. Observe strict hygiene. Measure the concentration in the atmosphere. Carry out operations in the open/under local exhaust/ventilation or with respiratory protection. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Do not breathe dust, fume. Use only outdoors or in a well-ventilated area. Take all necessary technical measures to avoid or minimize the release of the product on the workplace. Limit quantities of product at the minimum necessary for handling and limit the number of exposed workers. Provide local exhaust or general room ventilation. Wear personal protective equipment. Floors, walls and other surfaces in the hazard area must be cleaned regularly.
- Hygiene measures : Separate working clothes from town clothes. Launder separately. Do not eat, drink or smoke when using this product. Always wash hands after handling the product.

7.2. Conditions for safe storage, including any incompatibilities

- Technical measures : Does not require any specific or particular technical measures. Comply with applicable regulations.
- Storage conditions : Store locked up. Store in a well-ventilated place. Keep cool.
- Incompatible materials : Strong acids, strong bases and oxidation agents.
- Heat-ignition : KEEP SUBSTANCE AWAY FROM: heat sources.
- Prohibitions on mixed storage : KEEP SUBSTANCE AWAY FROM: oxidizing agents. Strong acids. Strong bases.
- Storage area : Meet the legal requirements.
- Special rules on packaging : SPECIAL REQUIREMENTS: closing. correctly labeled. meet the legal requirements. Secure fragile packaging in solid containers.

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7.3. Specific end use(s)

No additional information available

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Lead (7439-92-1)		
ACGIH	ACGIH TWA (mg/m ³)	0,05 mg/m ³
ACGIH	Remark (ACGIH)	CNS & PNS impair
OSHA	Not applicable	

8.2. Exposure controls

Appropriate engineering controls : Provide adequate general and local exhaust ventilation. Ensure good ventilation of the work station.

Personal protective equipment : Protective goggles. Gloves.



Materials for protective clothing : GIVE EXCELLENT RESISTANCE: No data available. GIVE GOOD RESISTANCE: butyl rubber. PVC. GIVE LESS RESISTANCE: No data available. GIVE POOR RESISTANCE: No data available.

Hand protection : protective gloves.

Eye protection : Safety glasses.

Skin and body protection : Not required for normal conditions of use.

Respiratory protection : Wear respiratory protection.

Environmental exposure controls : Avoid release to the environment.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	: Solid
Appearance	: Metal.
Molecular mass	: 207,20 g/mol
Color	: White to blue-grey
Odor	: Odorless
Odor threshold	: No data available
pH	: No data available
Relative evaporation rate (butyl acetate=1)	: No data available
Melting point	: 327 °C
Freezing point	: No data available
Boiling point	: 1740 °C
Flash point	: Not applicable
Auto-ignition temperature	: No data available
Decomposition temperature	: No data available
Flammability (solid, gas)	: No data available
Vapor pressure	: < 0,1 hPa
Relative vapor density at 20 °C	: No data available
Relative density	: 11,3
Specific gravity / density	: 11340 kg/m ³
Solubility	: insoluble in water. Substance sinks in water. Soluble in nitric acid. Insoluble in organic solvents. Water: < 0,1 g/100ml
Log Pow	: 0,73 (Estimated value)
Log Kow	: No data available

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Viscosity, kinematic	: Not applicable
Viscosity, dynamic	: No data available
Explosive properties	: No data available
Oxidizing properties	: No data available
Explosive limits	: No data available

9.2. Other information

VOC content	: Not applicable (inorganic)
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SECTION 10: Stability and reactivity

10.1. Reactivity

On burning: formation of metallic fumes. Oxidizes on exposure to air.

10.2. Chemical stability

Unstable on exposure to air.

10.3. Possibility of hazardous reactions

No additional information available

10.4. Conditions to avoid

No additional information available

10.5. Incompatible materials

Acids. Bases.

10.6. Hazardous decomposition products

Thermal decomposition generates : fume.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity : Oral: Harmful if swallowed. Inhalation: Harmful if inhaled.

Lead (Pb) 7439-92-1	
LD50 oral rat	> 2000 mg/kg body weight (Rat; Weight of evidence)
LD50 dermal rat	> 2000 mg/kg body weight (Rat; Experimental value; OECD 402: Acute Dermal Toxicity)
ATE US (oral)	500,000 mg/kg body weight
ATE US (gases)	4500,000 ppmV/4h
ATE US (vapors)	11,000 mg/l/4h
ATE US (dust, mist)	1,500 mg/l/4h
Additional information	Lead massive metal is not considered to be acutely toxic. It is not easily inhaled or ingested, and if it is accidentally ingested normally passes through the gastrointestinal system without significant absorption into the body. Lead is not easily absorbed through the skin.

Skin corrosion/irritation	: Not classified (Based on available data, the classification criteria are not met)
Serious eye damage/irritation	: Not classified (Based on available data, the classification criteria are not met)
Respiratory or skin sensitization	: Not classified (Based on available data, the classification criteria are not met)
Germ cell mutagenicity	: Not classified (Based on available data, the classification criteria are not met)
Carcinogenicity	: May cause cancer.

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Lead (7439-92-1)	
Additional information	There is some evidence that inorganic lead compounds may have a carcinogenic effect, and they have been classified by IARC as probably carcinogenic to humans. However, it is considered that this classification does not apply to lead in articles, given the very low bioavailability of metallic lead. Carcinogenicity studies of lead metal powder have been negative. Epidemiology studies of workers exposed to inorganic lead compounds have found a limited association with stomach cancer. IARC has concluded that lead metal is possibly carcinogenic to humans (Group aB).
IARC group	2B - Possibly carcinogenic to humans
National Toxicology Program (NTP) Status	3 - Reasonably anticipated to be Human Carcinogen

Reproductive toxicity	: May damage fertility or the unborn child.
Specific target organ toxicity (single exposure)	: Not classified (Based on available data, the classification criteria are not met)
Specific target organ toxicity (repeated exposure)	: May cause damage to organs through prolonged or repeated exposure.

Lead (7439-92-1)	
Additional information	Lead is a cumulative poison and may be absorbed into the body through ingestion or inhalation. Although inhalation and ingestion of lead in massive form are unlikely, poor hygiene practises may result in hand to mouth transfer which maybe significant over a prolonged period of time. Inorganic lead compounds have been documented in observational human studies to produce toxicity in multiple organ systems and body function including the haemotopoetic (blood) system, kidney function, reproductive function and the central nervous system.

Aspiration hazard	: Not classified (Based on available data, the classification criteria are not met)
Symptoms/injuries after inhalation	: No effects known.
Symptoms/injuries after skin contact	: No effects known.
Symptoms/injuries after eye contact	: No effects known.
Symptoms/injuries after ingestion	: No effects known.
Chronic symptoms	: No effects known.

SECTION 12: Ecological information

12.1. Toxicity

Ecology - general	: Dangerous for the environment. Very toxic to aquatic life with long lasting effects.
Ecology - air	: Not dangerous for the ozone layer (Regulation (EC) No 1005/2009). Not included in the list of fluorinated greenhouse gases (Regulation (EC) No 842/2006). TA-Luft Klasse 5.2.2/II.
Ecology - water	: No water pollutant (surface water). Maximum concentration in drinking water: 0.010 mg/l (lead) (Directive 98/83/EC). Highly toxic to aquatic organisms.

Lead (7439-92-1)	
LC50 fish 1	2,8 (0,44 - 542) mg/l (96h) Coughlan, D.J., S.P. Gloss, and J. Kubota 1986. Acute and Sub-Chronic Toxicity of Lead to the Early Life Stages of Small mouth Bass (<i>Micropterus dolomieu</i>). <i>Water Air Soil Pollut.</i> 28(3/4):265-275
EC50 Daphnia 1	4,46 (0,53 - 5,1) mg/l (48h) Govindarajan, S., C.P. Valsaraj, R. Mohan, V. Hariprasad, and R. Ramasubramanian 1993. Toxicity of Heavy Metals in Aquaculture Organisms: <i>Penaeus indicus</i> , <i>Perna viridis</i> , <i>Artemia salina</i> and <i>Skeletonema costatum</i> . <i>Pollut.Res.</i> 12(3):187-189

12.2. Persistence and degradability

Lead (7439-92-1)	
Persistence and degradability	Biodegradability: Not applicable. No (test)data available on mobility of the substance.
ThOD	Not applicable (inorganic)

12.3. Bioaccumulative potential

Lead (7439-92-1)	
Log Pow	0,73 (Estimated value)
Bioaccumulative potential	Low bioaccumulation potential (Log Kow < 4).

12.4. Mobility in soil

No additional information available

Lead

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12.5. Other adverse effects

Effect on ozone layer :

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste disposal recommendations : Dispose in a safe manner in accordance with local/national regulations. Hazardous waste shall not be mixed together with other waste. Different types of hazardous waste shall not be mixed together if this may entail a risk of pollution or create problems for the further management of the waste. Hazardous waste shall be managed responsibly. All entities that store, transport or handle hazardous waste shall take the necessary measures to prevent risks of pollution or damage to people or animals. Reuse or recycle following decontamination. Remove to an authorized dump (Class I). Do not discharge into surface water (2000/60/EC, Council decision 2455/2001/EC, O.J. L331 of 15/12/2001).

Additional information : LWCA (the Netherlands): KGA category 05. Hazardous waste according to Directive 2008/98/EC.

SECTION 14: Transport information

In accordance with DOT

Transport document description : UN3077 Environmentally hazardous substances, solid, n.o.s. Lead(7439-92-1), 9, III

UN-No.(DOT) : UN3077

Proper Shipping Name (DOT) : Environmentally hazardous substances, solid, n.o.s.
Lead(7439-92-1)

Department of Transportation (DOT) Hazard Classes : 9 - Class 9 - Miscellaneous hazardous material 49 CFR 173.140

Hazard labels (DOT) : 9 - Class 9 (Miscellaneous dangerous materials)



DOT Symbols : G - Identifies PSN requiring a technical name

Packing group (DOT) : III - Minor Danger

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DOT Special Provisions (49 CFR 172.102)	: 8 - A hazardous substance that is not a hazardous waste may be shipped under the shipping description "Other regulated substances, liquid or solid, n.o.s.", as appropriate. In addition, for solid materials, special provision B54 applies. 146 - This description may be used for a material that poses a hazard to the environment but does not meet the definition for a hazardous waste or a hazardous substance, as defined in 171.8 of this subchapter, or any hazard class as defined in Part 173 of this subchapter, if it is designated as environmentally hazardous by the Competent Authority of the country of origin, transit or destination. 335 - Mixtures of solids that are not subject to this subchapter and environmentally hazardous liquids or solids may be classified as "Environmentally hazardous substances, solid, n.o.s.," UN3077 and may be transported under this entry, provided there is no free liquid visible at the time the material is loaded or at the time the packaging or transport unit is closed. Each transport unit must be leak-proof when used as bulk packaging. A112 - Notwithstanding the quantity limits shown in Column (9A) and (9B) for this entry, the following IBCs are authorized for transportation aboard passenger and cargo-only aircraft. Each IBC may not exceed a maximum net quantity of 1,000 kg: a. Metal: 11A, 11B, 11N, 21A, 21B and 21N b. Rigid plastics: 11H1, 11H2, 21H1 and 21H2 c. Composite with plastic inner receptacle: 11HZ1, 11HZ2, 21HZ1 and 21HZ2 d. Fiberboard: 11G e. Wooden: 11C, 11D and 11F (with inner liners) f. Flexible: 13H2, 13H3, 13H4, 13H5, 13L2, 13L3, 13L4, 13M1 and 13M2 (flexible IBCs must be sift-proof and water resistant or must be fitted with a sift-proof and water resistant liner). B54 - Open-top, sift-proof rail cars are also authorized. IB8 - Authorized IBCs: Metal (11A, 11B, 11N, 21A, 21B, 21N, 31A, 31B and 31N); Rigid plastics (11H1, 11H2, 21H1, 21H2, 31H1 and 31H2); Composite (11HZ1, 11HZ2, 21HZ1, 21HZ2, 31HZ1 and 31HZ2); Fiberboard (11G); Wooden (11C, 11D and 11F); Flexible (13H1, 13H2, 13H3, 13H4, 13H5, 13L1, 13L2, 13L3, 13L4, 13M1 or 13M2). IP3 - Flexible IBCs must be sift-proof and water-resistant or must be fitted with a sift-proof and water-resistant liner. N20 - A 5M1 multi-wall paper bag is authorized if transported in a closed transport vehicle. T1 - 1.5 178.274(d)(2) Normal..... 178.275(d)(2) TP33 - The portable tank instruction assigned for this substance applies for granular and powdered solids and for solids which are filled and discharged at temperatures above their melting point which are cooled and transported as a solid mass. Solid substances transported or offered for transport above their melting point are authorized for transportation in portable tanks conforming to the provisions of portable tank instruction T4 for solid substances of packing group III or T7 for solid substances of packing group II, unless a tank with more stringent requirements for minimum shell thickness, maximum allowable working pressure, pressure-relief devices or bottom outlets are assigned in which case the more stringent tank instruction and special provisions shall apply. Filling limits must be in accordance with portable tank special provision TP3. Solids meeting the definition of an elevated temperature material must be transported in accordance with the applicable requirements of this subchapter.
DOT Packaging Exceptions (49 CFR 173.xxx)	: 155
DOT Packaging Non Bulk (49 CFR 173.xxx)	: 213
DOT Packaging Bulk (49 CFR 173.xxx)	: 240
DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27)	: No limit
DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75)	: No limit
DOT Vessel Stowage Location	: A - The material may be stowed "on deck" or "under deck" on a cargo vessel and on a passenger vessel.

Additional information

Other information : No supplementary information available.

ADR

No additional information available

Transport by sea

UN-No. (IMDG)	: 3077
Proper Shipping Name (IMDG)	: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.
Class (IMDG)	: 9 - Miscellaneous dangerous compounds
Packing group (IMDG)	: III - substances presenting low danger

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Air transport

UN-No.(IATA) : 3077
Proper Shipping Name (IATA) : Environmentally hazardous substance, solid, n.o.s.
Class (IATA) : 9 - Miscellaneous Dangerous Goods
Packing group (IATA) : III - Minor Danger

SECTION 15: Regulatory information

15.1. US Federal regulations

Lead (7439-92-1)

Listed on the United States TSCA (Toxic Substances Control Act) inventory
Listed on United States SARA Section 313
Not listed on the United States SARA Section 313

RQ (Reportable quantity, section 304 of EPA's List of Lists)	10 lb
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15.2. International regulations

CANADA

No additional information available

EU-Regulations

No additional information available

Classification according to Regulation (EC) No. 1272/2008 [CLP]

Repr. 1A H360Df

Acute Tox. 4 (Inhalation) H332

Acute Tox. 4 (Oral) H302

STOT RE 2 H373

Aquatic Acute 1 H400

Aquatic Chronic 1 H410

Full text of H-phrases: see section 16

Classification according to Directive 67/548/EEC [DSD] or 1999/45/EC [DPD]

Repr.Cat.1; R61

Repr.Cat.3; R62

Xn; R20/22

R33

N; R50/53

Full text of R-phrases: see section 16

15.2.2. National regulations

Lead (7439-92-1)

Listed on IARC (International Agency for Research on Cancer)

Listed as carcinogen on NTP (National Toxicology Program)

15.3. US State regulations

No additional information available

SECTION 16: Other information

Revision date : 12/15/2014

Lead

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Full text of H-phrases:

Acute Tox. 4 (Inhalation)	Acute toxicity (inhalation) Category 4
Acute Tox. 4 (Oral)	Acute toxicity (oral) Category 4
Aquatic Acute 1	Hazardous to the aquatic environment - Acute Hazard Category 1
Aquatic Chronic 1	Hazardous to the aquatic environment - Chronic Hazard Category 1
Carc. 1B	Carcinogenicity Category 1B
Repr. 1A	Reproductive toxicity Category 1A
STOT RE 2	Specific target organ toxicity (repeated exposure) Category 2
H302	Harmful if swallowed
H332	Harmful if inhaled
H350	May cause cancer
H360	May damage fertility or the unborn child
H373	May cause damage to organs through prolonged or repeated exposure
H400	Very toxic to aquatic life
H410	Very toxic to aquatic life with long lasting effects

NFPA health hazard

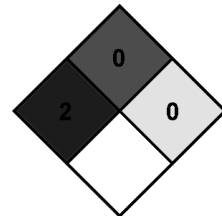
: 2 - Intense or continued exposure could cause temporary incapacitation or possible residual injury unless prompt medical attention is given.

NFPA fire hazard

: 0 - Materials that will not burn.

NFPA reactivity

: 0 - Normally stable, even under fire exposure conditions, and are not reactive with water.



HMIS III Rating

Health : * Chronic Hazard - Chronic (long-term) health effects may result from repeated overexposure

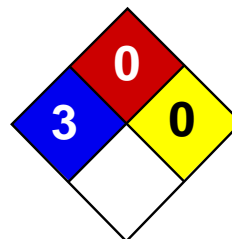
Flammability : 0 Minimal Hazard

Physical : 0 Minimal Hazard

Personal Protection : B

SDS US (GHS HazCom 2012)

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product



Health	3
Fire	0
Reactivity	0
Personal Protection	

Material Safety Data Sheet Mercury MSDS

Section 1: Chemical Product and Company Identification

Product Name: Mercury

Catalog Codes: SLM3505, SLM1363

CAS#: 7439-97-6

RTECS: OV4550000

TSCA: TSCA 8(b) inventory: Mercury

CI#: Not applicable.

Synonym: Quick Silver; Colloidal Mercury; Metallic Mercury; Liquid Silver; Hydragryum

Chemical Name: Mercury

Chemical Formula: Hg

Contact Information:

Sciencelab.com, Inc.

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:

1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Mercury	7439-97-6	100

Toxicological Data on Ingredients: Mercury LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:

Very hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Hazardous in case of skin contact (corrosive, permeator). Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:

Hazardous in case of skin contact (permeator). **CARCINOGENIC EFFECTS:** Classified A5 (Not suspected for human.) by ACGIH. 3 (Not classifiable for human.) by IARC. **MUTAGENIC EFFECTS:** Not available. **TERATOGENIC EFFECTS:** Not available. **DEVELOPMENTAL TOXICITY:** Not available. The substance may be toxic to blood, kidneys, liver, brain, peripheral nervous system, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation.

Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. WARM water MUST be used. Get medical attention immediately.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. **WARNING:** It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:

When thrown into mercury vapor, boron phosphodiiodide ignites at once. Flame forms with chlorine jet over mercury surface at 200 deg to 300 deg C. Mercury undergoes hazardous reactions in the presence of heat and sparks or ignition.

Special Remarks on Explosion Hazards:

A violent exothermic reaction or possible explosion occurs when mercury comes in contact with lithium and rubidium. CHLORINE DIOXIDE & LIQUID HG, WHEN MIXED, EXPLODE VIOLENTLY. Mercury and Ammonia can produce an

explosive compound. A mixture of the dry carbonyl and oxygen will explode on vigorous shaking with mercury. Methyl azide in the presence of mercury was shown to be potentially explosive.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:

Corrosive liquid. Poisonous liquid. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:

Keep locked up.. Keep container dry. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, metals.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above 25°C (77°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:

Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

TWA: 0.025 from ACGIH (TLV) [United States] SKIN TWA: 0.05 CEIL: 0.1 (mg/m³) from OSHA (PEL) [United States] Inhalation TWA: 0.025 (mg/m³) [United Kingdom (UK)] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid. (Heavy liquid)

Odor: Odorless.

Taste: Not available.

Molecular Weight: 200.59 g/mole

Color: Silver-white

pH (1% soln/water): Not available.

Boiling Point: 356.73°C (674.1°F)

Melting Point: -38.87°C (-38°F)

Critical Temperature: 1462°C (2663.6°F)

Specific Gravity: 13.55 (Water = 1)

Vapor Pressure: Not available.

Vapor Density: 6.93 (Air = 1)

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Very slightly soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents, metals.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:

Ground mixtures of sodium carbide and mercury, aluminum, lead, or iron can react vigorously. A violent exothermic reaction or possible explosion occurs when mercury comes in contact with lithium and rubidium. Incompatible with boron diiodophosphide; ethylene oxide; metal oxides, metals(aluminum, potassium, lithium, sodium, rubidium); methyl azide; methylsilane, oxygen; oxidants(bromine, peroxyformic acid, chlorine dioxide, nitric acid, tetracarbonylnickel, nitromethane, silver perchlorate, chlorates, sulfuric acid, nitrates,); tetracarbonylnickel, oxygen, acetylinic compounds, ammonia, ethylene oxide, methylsilane, calcium,

Special Remarks on Corrosivity:

The high mobility and tendency to dispersion exhibited by mercury, and the ease with which it forms alloys (amalgam) with many laboratory and electrical contact metals, can cause severe corrosion problems in laboratories. Special precautions: Mercury can attack copper and copper alloy materials.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:

LD50: Not available. LC50: Not available.

Chronic Effects on Humans:

CARCINOGENIC EFFECTS: Classified A5 (Not suspected for human.) by ACGIH. 3 (Not classifiable for human.) by IARC. May cause damage to the following organs: blood, kidneys, liver, brain, peripheral nervous system, central nervous system (CNS).

Other Toxic Effects on Humans:

Very hazardous in case of skin contact (irritant), of ingestion, of inhalation. Hazardous in case of skin contact (corrosive, permeator).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:

May affect genetic material. May cause cancer based on animal data. Passes through the placental barrier in animal. May cause adverse reproductive effects(paternal effects- spermatogenesis; effects on fertility - fetotoxicity, post-implantation mortality), and birth defects.

Special Remarks on other Toxic Effects on Humans:

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Mercury UNNA: 2809 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Mercury California prop. 65: This product contains the following ingredients for which the State of California has found to cause birth defects which would require a warning under the statute: Mercury Connecticut hazardous material survey.: Mercury Illinois toxic substances disclosure to employee act: Mercury Illinois chemical safety act: Mercury New York acutely hazardous substances: Mercury Rhode Island RTK hazardous substances: Mercury Pennsylvania RTK: Mercury Minnesota: Mercury Massachusetts RTK: Mercury New Jersey: Mercury New Jersey spill list: Mercury Louisiana spill reporting: Mercury California Director's List of Hazardous Substances.: Mercury TSCA 8(b) inventory: Mercury SARA 313 toxic chemical notification and release reporting: Mercury CERCLA: Hazardous substances.: Mercury: 1 lbs. (0.4536 kg)

Other Regulations:

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):

CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC). CLASS E: Corrosive liquid.

DSCL (EEC):

R23- Toxic by inhalation. R33- Danger of cumulative effects. R38- Irritating to skin. R41- Risk of serious damage to eyes. R50/53- Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. S2- Keep out of the

reach of children. S7- Keep container tightly closed. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S39- Wear eye/face protection. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). S46- If swallowed, seek medical advice immediately and show this container or label. S60- This material and its container must be disposed of as hazardous waste. S61- Avoid release to the environment. Refer to special instructions/Safety data sheets.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 0

Personal Protection:

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:

Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:22 PM

Last Updated: 05/21/2013 12:00 PM

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SAFETY DATA SHEET

Revision Date 14-Feb-2020

Revision Number 2

1. Identification

Product Name Benzo[a]pyrene

Cat No. : 15856

CAS-No 50-32-8
Synonyms Benzo[def]chrysene.; 3,4-Benzopyrene; 3,4-Benzpyrene

Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use.
Details of the supplier of the safety data sheet

Company

Alfa Aesar
Thermo Fisher Scientific Chemicals, Inc.
30 Bond Street
Ward Hill, MA 01835-8099
Tel: 800-343-0660
Fax: 800-322-4757
Email: tech@alfa.com
www.alfa.com

Emergency Telephone Number

During normal business hours (Monday-Friday, 8am-7pm EST), call (800) 343-0660.
After normal business hours, call Carechem 24 at (866) 928-0789.

2. Hazard(s) identification

Classification

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Skin Sensitization	Category 1
Germ Cell Mutagenicity	Category 1B
Carcinogenicity	Category 1A
Reproductive Toxicity	Category 1B

Label Elements

Signal Word

Danger

Hazard Statements

May cause an allergic skin reaction
May cause genetic defects
May cause cancer
May damage fertility. May damage the unborn child



Precautionary Statements

Prevention

Obtain special instructions before use
 Do not handle until all safety precautions have been read and understood
 Use personal protective equipment as required
 Avoid breathing dust/fume/gas/mist/vapors/spray
 Contaminated work clothing should not be allowed out of the workplace
 Wear protective gloves

Response

IF exposed or concerned: Get medical attention/advice

Skin

IF ON SKIN: Wash with plenty of soap and water
 If skin irritation or rash occurs: Get medical advice/attention
 Wash contaminated clothing before reuse

Storage

Store locked up

Disposal

Dispose of contents/container to an approved waste disposal plant

Hazards not otherwise classified (HNOC)

Very toxic to aquatic life with long lasting effects
 WARNING. Cancer - <https://www.p65warnings.ca.gov/>.

3. Composition/Information on Ingredients

Component	CAS-No	Weight %
Benzo[a]pyrene	50-32-8	> 96

4. First-aid measures

General Advice	If symptoms persist, call a physician.
Eye Contact	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Get medical attention.
Skin Contact	Wash off immediately with plenty of water for at least 15 minutes. If skin irritation persists, call a physician.
Inhalation	Remove to fresh air. If not breathing, give artificial respiration. Get medical attention if symptoms occur.
Ingestion	Clean mouth with water and drink afterwards plenty of water. Get medical attention if symptoms occur.
Most important symptoms and effects	None reasonably foreseeable. . May cause allergic skin reaction. Symptoms of allergic reaction may include rash, itching, swelling, trouble breathing, tingling of the hands and feet, dizziness, lightheadedness, chest pain, muscle pain or flushing
Notes to Physician	Treat symptomatically

5. Fire-fighting measures

Unsuitable Extinguishing Media	No information available
Flash Point	No information available
Method -	No information available
Autoignition Temperature	Not applicable
Explosion Limits	
Upper	No data available
Lower	No data available
Sensitivity to Mechanical Impact	No information available
Sensitivity to Static Discharge	No information available

Specific Hazards Arising from the Chemical

Do not allow run-off from fire-fighting to enter drains or water courses.

Hazardous Combustion Products

Carbon monoxide (CO). Carbon dioxide (CO₂).

Protective Equipment and Precautions for Firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health
2

Flammability
1

Instability
0

Physical hazards
N/A

6. Accidental release measures

Personal Precautions	Ensure adequate ventilation. Use personal protective equipment as required. Avoid dust formation.
Environmental Precautions	Do not flush into surface water or sanitary sewer system. Do not allow material to contaminate ground water system. Prevent product from entering drains. Local authorities should be advised if significant spillages cannot be contained.
Methods for Containment and Clean Up	Sweep up and shovel into suitable containers for disposal. Keep in suitable, closed containers for disposal.

7. Handling and storage

Handling	Wear personal protective equipment/face protection. Ensure adequate ventilation. Do not get in eyes, on skin, or on clothing. Avoid ingestion and inhalation. Avoid dust formation.
Storage	Keep containers tightly closed in a dry, cool and well-ventilated place.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Benzo[a]pyrene		TWA: 0.2 mg/m ³		

Legend

OSHA - Occupational Safety and Health Administration

Engineering Measures Ensure adequate ventilation, especially in confined areas.

Personal Protective Equipment

Eye/face Protection Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard

EN166.

Skin and body protection	Wear appropriate protective gloves and clothing to prevent skin exposure.
Respiratory Protection	Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.
Hygiene Measures	Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Powder Solid
Appearance	Dark yellow
Odor	aromatic
Odor Threshold	No information available
pH	Not applicable
Melting Point/Range	175 - 179 °C / 347 - 354.2 °F
Boiling Point/Range	495 °C / 923 °F @ 760 mmHg
Flash Point	No information available
Evaporation Rate	Not applicable
Flammability (solid,gas)	No information available
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	No information available
Vapor Density	Not applicable
Specific Gravity	No information available
Solubility	Insoluble in water
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	Not applicable
Decomposition Temperature	No information available
Viscosity	Not applicable
Molecular Formula	C ₂₀ H ₁₂
Molecular Weight	252.31

10. Stability and reactivity

Reactive Hazard	None known, based on information available
Stability	Stable under normal conditions.
Conditions to Avoid	Incompatible products.
Incompatible Materials	Oxidizing agent
Hazardous Decomposition Products	Carbon monoxide (CO), Carbon dioxide (CO ₂)
Hazardous Polymerization	Hazardous polymerization does not occur.
Hazardous Reactions	None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Component Information

Toxicologically Synergistic No information available

Products

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation	No information available
Sensitization	May cause sensitization by skin contact
Carcinogenicity	The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Benzo[a]pyrene	50-32-8	Group 1	Reasonably Anticipated	A2	X	A2

IARC (International Agency for Research on Cancer)

IARC (International Agency for Research on Cancer)

Group 1 - Carcinogenic to Humans

Group 2A - Probably Carcinogenic to Humans

Group 2B - Possibly Carcinogenic to Humans

NTP: (National Toxicity Program)

Known - Known Carcinogen

Reasonably Anticipated - Reasonably Anticipated to be a Human Carcinogen

A1 - Known Human Carcinogen

A2 - Suspected Human Carcinogen

A3 - Animal Carcinogen

ACGIH: (American Conference of Governmental Industrial Hygienists)

NTP: (National Toxicity Program)

ACGIH: (American Conference of Governmental Industrial Hygienists)

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure None known

STOT - repeated exposure None known

Aspiration hazard No information available

Symptoms / effects, both acute and delayed Symptoms of allergic reaction may include rash, itching, swelling, trouble breathing, tingling of the hands and feet, dizziness, lightheadedness, chest pain, muscle pain or flushing

Endocrine Disruptor Information

Component	EU - Endocrine Disruptors Candidate List	EU - Endocrine Disruptors - Evaluated Substances	Japan - Endocrine Disruptor Information
Benzo[a]pyrene	Group III Chemical	Not applicable	Not applicable

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. The product contains following substances which are hazardous for the environment.

Persistence and Degradability May persist

Bioaccumulation/ Accumulation No information available.

Mobility Is not likely mobile in the environment due its low water solubility.

Component	log Pow
Benzo[a]pyrene	6.06

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a

hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

Component	RCRA - U Series Wastes	RCRA - P Series Wastes
Benzo[a]pyrene - 50-32-8	U022	-

14. Transport information

DOT

UN-No	UN3077
Proper Shipping Name	Environmentally hazardous substances, solid, n.o.s.
Technical Name	Benzo[a]pyrene
Hazard Class	9
Packing Group	III

TDG

UN-No	UN3077
Proper Shipping Name	Environmentally hazardous substances, solid, n.o.s.
Hazard Class	9
Packing Group	III

IATA

UN-No	UN3077
Proper Shipping Name	Environmentally hazardous substances, solid, n.o.s.
Hazard Class	9
Packing Group	III

IMDG/IMO

UN-No	UN3077
Proper Shipping Name	Environmentally hazardous substances, solid, n.o.s.
Hazard Class	9
Packing Group	III

15. Regulatory information

United States of America Inventory

Component	CAS-No	TSCA	TSCA Inventory notification - Active/Inactive	TSCA - EPA Regulatory Flags
Benzo[a]pyrene	50-32-8	X	ACTIVE	-

Legend:

TSCA - Toxic Substances Control Act, (40 CFR Part 710)

X - Listed

'-' - Not Listed

TSCA 12(b) - Notices of Export Not applicable

International Inventories

Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Australia (AICS), China (IECSC), Korea (ECL).

Component	CAS-No	DSL	NDSL	EINECS	PICCS	ENCS	AICS	IECSC	KECL
Benzo[a]pyrene	50-32-8	X	-	200-028-5	X	-	-	X	KE-05-0184

U.S. Federal Regulations

SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Benzo[a]pyrene	50-32-8	> 96	0.1

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Benzo[a]pyrene	-	-	X	X

Clean Air Act Not applicable

OSHA - Occupational Safety and Health Administration Not applicable

CERCLA Not applicable

Component	Hazardous Substances RQs	CERCLA EHS RQs
Benzo[a]pyrene	1 lb	-

California Proposition 65 This product contains the following Proposition 65 chemicals.

Component	CAS-No	California Prop. 65	Prop 65 NSRL	Category
Benzo[a]pyrene	50-32-8	Carcinogen	0.06 µg/day	Carcinogen

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Benzo[a]pyrene	X	X	X	X	X

U.S. Department of Transportation

Reportable Quantity (RQ): N
 DOT Marine Pollutant N
 DOT Severe Marine Pollutant N

U.S. Department of Homeland Security This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

16. Other information

Prepared By Health, Safety and Environmental Department
 Email: tech@alfa.com
 www.alfa.com

Revision Date 14-Feb-2020
Print Date 14-Feb-2020
Revision Summary SDS authoring systems update, replaces ChemGes SDS No. 50-32-8/1.

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS