

**PHASE II ENVIRONMENTAL SITE ASSESSMENT REPORT
FOR THE
UPPER ARROW MILL PROPERTY**

Vicinity of Camp Drive, Near Weitchpec, California
(APN: 534-091-018)

October 3, 2017

Prepared for:
Yurok Tribe Environmental Program
190 Klamath Boulevard
Klamath, California 95548

Prepared by:
Stan Thiesen and Orrin Plocher

of



Freshwater Environmental Services

78 Sunny Brae Center
Arcata, California 95521
Phone (707) 839-0091

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**HUMBOLDT COUNTY, CALIFORNIA
APN: 534-091-018**

Prepared for:
Suzanne Fluharty, Ph.D.,
Yurok Tribe Environmental Program
190 Klamath Boulevard
Klamath, California 95548

September 30, 2017

Prepared by:
Stan Thiesen and Orrin Plocher

of

Freshwater Environmental Services
78 Sunny Brae Center
Arcata, California 95521
Phone (707) 839-0091



Stan Thiesen
PG No. 7990

Orrin Plocher
Geologist

DISTRIBUTION LIST

Suzanne Fluharty, Ph.D.
Environmental Specialist/Project Manager
Yurok Tribe Environmental Program
190 Klamath Boulevard
Klamath, California 95548

Louisa McCovey
Director
Yurok Tribe Environmental Program
190 Klamath Boulevard
Klamath, California 95548

Eric Byous
Tribal 128(a) Grant Lead
USEPA Region 9
75 Hawthorne Street
San Francisco, CA 94105

Eugenia E. McNaughton, Ph.D.
QA Office Manager
USEPA Region 9
75 Hawthorne Street
San Francisco, CA 94105

Orrin Plocher
Freshwater Environmental Services
78 Sunny Brae Center
Arcata, California 95521

Stan Thiesen
Freshwater Environmental Services
78 Sunny Brae Center
Arcata, California 95521

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DISTRIBUTION LIST

Suzanne Fluharty, Ph.D.
Environmental Specialist/Project Manager
Yurok Tribe Environmental Program
190 Klamath Boulevard
Klamath, California 95548

Louisa McCovey
Director
Yurok Tribe Environmental Program
190 Klamath Boulevard
Klamath, California 95548

Eric Byous
Tribal 128(a) Grant Lead
USEPA Region 9
75 Hawthorne Street
San Francisco, CA 94105

Eugenia E. McNaughton, Ph.D.
QA Office Manager
USEPA Region 9
75 Hawthorne Street
San Francisco, CA 94105

Orrin Plocher
Freshwater Environmental Services
78 Sunny Brae Center
Arcata, California 95521

Stan Thiesen
Freshwater Environmental Services
78 Sunny Brae Center
Arcata, California 95521

ACRONYMS AND ABBREVIATIONS

AST	Above-Ground Storage Tank
ASTM	ASTM International (formerly American Society for Testing and Materials)
bgs	below ground surface
BTEX	Benzene, Toluene, Ethylbenzene, and Xylenes
CERCLA	Comprehensive Environmental Response, Cleanup, and Liability Act
CFR	Code of Federal Regulations
CHHSLs	California Human Health Screening Levels
CLP	Contract Laboratory Program
COCs	Chemicals of Concern
CWA	Clean Water Act
DQA	Data Quality Assessment
DQI	Data Quality Indicators
DQO	Data Quality Objectives
DRO	Diesel Range Organics
EDL	Estimated Detection Limit (Dioxin)
EPA	U.S. Environmental Protection Agency
ESA	Environmental Site Assessment
ESLs	Environmental Screening Levels
FEMA	Federal Emergency Management Agency
FES	Freshwater Environmental Services
FSP	Field Sampling Plan
GPS	Global Positioning System
GIS	Geographic Information System
GC/MS	Gas Chromatography and Mass Spectrometry
GRO	Gasoline Range Organics
IDW	Investigation-Derived Waste
IRIS	Integrated Risk Information System (USEPA)
LCS/LCSD	Laboratory Control Sample and Laboratory Control Sample Duplicates
MDL	Method Detection Limit
MPC	Measurement Performance Criteria
MQO	Measurement Quality Objective
MRO	Motor Oil Range Organics
MS/MSD	Matrix Spike and Matrix Spike Duplicate
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
NRCS	Natural Resource Conservation Service
PARCCS	Precision, Accuracy, Representativeness, Completeness, Comparability, and Sensitivity
PCP	Pentachlorophenol
PE	Performance Evaluation
pg/g	picograms per gram
PRG	Preliminary Remediation Goal
PRQL	Project-Required Quantitation Limit
QA	Quality Assurance

QA/QC	Quality Assurance/Quality Control
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QC	Quality Control
QL	Quantitation Limit
RCRA	Resource Conservation and Recovery Act
RPD	Relative Percent Difference
RSLs	Residential Screening Levels
%R	Percent Recovery
SAP	Sampling and Analysis Plan (an integrated FSP and QAPP)
SOP	Standard Operating Procedures
SOW	Statement of Work
SVOC	Semi-Volatile Organic Compound
TCP	Tetrachlorophenol
TPH-G	Total Petroleum Hydrocarbons as Gasoline
TPH-D	Total Petroleum Hydrocarbons as Diesel
TPH-MO	Total Petroleum Hydrocarbons as Motor Oil
TriCP	Trichlorophenol
µg/L	micrograms per Liter
USCS	Unified Soil Classification System
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
VOC	Volatile Organic Compound
YIR	Yurok Indian Reservation
YTEP	Yurok Tribe Environmental Program

1.0 INTRODUCTION

Freshwater Environmental Services (FES) has prepared this report of findings for the Phase II Environmental Site Assessment (ESA) at the Upper Arrow Mill Property (the Subject Property); APN: 534-091-018. The Phase II ESA was conducted in accordance with the Sampling and Analysis Plan (SAP) for the Upper Arrow Mill Property dated March 29, 2017 (FES, 2017). The SAP was approved by the EPA in April 2017.

This report conforms to the process and principles recommended in the *Standard Practice for Environmental Site Assessments: Phase II Environmental Site Assessment Process*, E-1903-11, (ASTM, 2011). This report documents the soil sampling activities performed at the Subject Property. The location of the Subject Property is shown on Figure 1, Figure 2, and Figure 3.

A Phase I ESA was conducted at the Subject Property by Suzanne Fluharty, PhD of the Yurok Tribe Environmental Program (YTEP). The primary objectives of this Phase II ESA were to assess and evaluate the recognized environmental conditions identified in the Phase I ESA conducted by the Yurok Tribe Environmental Program (YTEP, 2016), and to provide sufficient information regarding the presence or absence of contamination at the Site (ASTM, 2011). The scope of work developed by FES for this assessment was based on the conclusions of the Phase I ESA and by discussions with Dr. Fluharty regarding other potential contaminants associated with former lumber mill sites.

Section 9.0 of the Phase I ESA (YTEP, 2016) listed the following as Recognized Environmental Conditions (quoted directly from the report).

- *A conical burner utilized to burn mill wastes with a deep layer of ash remains on the historic site of the Upper Arrow Mill. Associated contaminants of these historic burners commonly include various heavy metals, dioxins, and furans.*

The principal questions to be answered by the investigation are listed below (quoted directly from the SAP).

- Does soil contamination exist inside the conical burner from petroleum use to initiate and maintain the burning of sawmill waste materials?
- Does soil contamination exist inside the conical burner from metals resulting from the burning of sawmill waste materials?
- Does soil contamination exist inside the conical burner from dioxins/furans resulting from the burning of sawmill waste materials?
- Does soil contamination exist in the former log pond area from dioxins/furans resulting from the deposition of ash from the conical burner?

- Does soil contamination exist from the possible use of wood-treatment chemicals to prevent staining?

The alternative actions that could result from resolution of the principal study questions are listed below (quoted directly from the SAP).

- If contamination is not identified over allowable levels on the Subject Property the Yurok Tribe can proceed with redevelopment of the Subject Property; and
- If contamination is identified over allowable levels, additional assessment and/or cleanup may be necessary prior to redevelopment and use of the Subject Property.

This Phase II ESA is a Tribal Response Program project being funded by a CERCLA Section 128(a), Tribal Response Program grant that includes hazardous substances and petroleum products.

1.1 Purpose

The purpose for performing this Phase II ESA on the Subject Property was to ensure the presence or likely presence of any hazardous substance, contamination, or petroleum products does not threaten the health of the public, resources, and the environment during the use, rehabilitation and/or redevelopment of the Site. The Yurok Tribe, user of this report, does not have any direct interests in the site valuation, and their sole intent is to determine whether there exists any contamination from activities emanating from the Subject Property.

1.2 Subject Property Name

The Subject Property is referred to as the Upper Arrow Mill Property. Assessor's Parcel Number (APN) 534-091-018 contains the Subject Property.

1.3 Subject Property Location

The Subject Property is approximately 12.5 miles northwest of Weitchpec and approximately 2,400 feet east-southeast of the intersection of State Highway 169 and Camp Drive. The location of the Subject Property is shown on Figures 1 through 3. The Subject Property is located in the southwest 1/4 of Section 16, Township 13 North, Range 1 East of the Humboldt Base and Meridian. The Subject Property is located within the boundaries of the southwestern portion of APN 534-091-018.

2.0 BACKGROUND

The Subject Property is currently vacant forest land approximately 2,600 feet east of the Klamath River. The parcel which includes the Subject Property (APN 534-091-018) occupies an area of approximately 474 acres. Based on information in the Phase I ESA (YTEP, 2016) the Subject Property was conveyed to the Yurok Tribe in 2011 from the Western Rivers Conservancy.

Section 9.0 of the Phase I ESA (YTEP, 2016) listed the following conclusion (quoted directly from the report).

"A conical burner utilized to burn mill wastes with a deep layer of ash remains on the historic site of the Upper Arrow Mill. Associated contaminants of these historic burners commonly include various heavy metals, dioxins, and furans."

2.1 Sampling Area Description

The relatively flat area that was cleared for the mill site as shown on Figure 6 (1965 aerial photo) is approximately 4.7 acres. Most of this area has become vegetated with trees and brush as shown on Figure 4 (2015 aerial photo).

The Phase I ESA, (YTEP, 2016) indicated that the oldest historic documentation is a 1945 Historical Topographic Map that does not show any development on the Subject Property.

2.2 Operational History

The following text from an interview with former Council Representative for the area, Mr. Richard Myers was excerpted from Section 6.3 of the Phase I ESA, (YTEP, 2016):

"Mr Myers reported that the mill was in operation at the end of the 1950s, early 60s but that they had closed by 1964-65."

"Mr. Myers' grandfather had worked in the mill and he thought that they were mostly a 'dry' mill but that they did use some sort of chemical. He didn't know what chemical, however he reported that after the mill closed that barrels were left lying around "everywhere" up at the millsite. He didn't directly know of any surface water impacts but thought runoff from the site might flow down Camp Road. "

2.3 Previous Investigations/Regulatory Involvement

The only known investigation of the Subject Property is a Phase I ESA, (YTEP 2016) performed for the Yurok Tribe and the United States Environmental Protection Agency (US EPA) Region 9 Brownfields Program with funding through CERCLA 128(a) Tribal Response Grant. The Yurok Tribe Environmental Program is not aware of any previous sampling efforts at the Subject Property.

2.4 Scoping Meeting

The initial scoping meeting was held at FES's Arcata office. Dr. Fluharty of the Yurok Tribe Environmental Program and Stan Thiesen of Freshwater Environmental Services were present and discussed the project including the number of samples and their locations.

3.0 SITE GEOLOGY AND HYDROLOGY

The Subject Property is approximately 720 feet above mean sea level based on the United States Geological Survey (USGS) 7.5 minute Johnsons Quadrangle. The topography of most of the Subject Property is relatively flat with a slight slope towards the west. The nearest surface water is Knulthkarn Creek which is approximately 600 feet south of the Subject Property. The Klamath River is approximately 3,000 feet west of the Subject Property.

Based on data obtained from the Natural Resource Conservation Service (NRCS), the average annual precipitation at the Subject Property is approximately 79 inches.

The Subject Property is shown on the “Geologic Map of the Weed Quadrangle, California” (Wagner and Saucedo, 1987) as being underlain by Franciscan Complex sandstone. This geologic unit also includes shale and conglomerate and is within the California Coast Ranges Geomorphic Province (CGS, 2002). The nearest fault zoned as active (within the last 11,000 years) under the Alquist-Priolo Earthquake Fault Zoning Act, is approximately 25 miles to the southwest of the Subject Property.

The Cascadia Subduction Zone which is capable of producing a 9 or greater magnitude earthquake is approximately 63 miles to the west of the Subject Property and extends beneath the Subject Property at a depth of approximately 11.5 miles beneath the surface. The most recent major earthquake on the Cascadia Subduction Zone was January 26, 1700 based on data recorded in Japan from a tsunami generated by the earthquake. Based on recent research (USGS, 2012) the estimated recurrence interval for earthquakes greater than magnitude 8 at the southern end of the Cascadia Subduction Zone is approximately 240 years.

The following information on soils at the Subject Property is based on NRCS maps and data obtained from the NRCS Web Soil Survey. The soils in the vicinity of the Subject Property are shown as the Burroin-Bagaul-Redtop complex. The NRCS soil description is shown below:

4.0 SAMPLING DESIGN AND RATIONALE

The sampling locations and analytes for this project were based on the following assumptions:

- The presence of a conical burner at the Subject Property. Ash from conical burners is often associated with elevated concentrations of dioxin/furans and metals. Petroleum products were often used to initiate burning.
- The Phase I ESA (YTEP, 2016) contained an interview with an individual who worked at the Subject Property who stated that "they did use some sort of chemical".

Based on these assumptions FES and YTEP discussed the proposed sample locations and analytes. The proposed sample locations included inside the conical burner, the vicinity of the conical burner, the vicinity of the green chain, and a reference sample location. The analytes included dioxins/furans, metals, petroleum products, and wood-treatment chemicals.

4.1 Field Methods

The Yurok Tribe Environmental Program was responsible for determining whether subsurface utilities were present at the Subject Property in the areas where the proposed soil sampling would take place. No utilities were known to exist at the Subject Property. YTEP obtained a Cultural Resources Management Permit for work at the Subject Property.

Soils samples were collected on May 17, 2017 and a single water sample from the ponded water in the vicinity of the former green chain was collected on May 24, 2017. One reference soil sample (B-7-(0.0'-0.5')) was collected from the surface approximately 150 feet northeast of the mill foundations as shown on Figure 7.

The soil samples were collected using a 4-oz soil jar to scoop material into a clean glass bowl. The material in the glass bowl was homogenized by hand using new nitrile gloves and a 4-oz glass jar was filled from the material in the mixing bowl.

The surface water sample was collected by YTEP on May 24, 2017 from the ponded water to the northeast of the mill foundations.

4.2 Soil Sampling – May 17, 2017

The sample locations are shown on Figure 7. Soil samples from B-1 (Photos 3 and 4) were collected inside the conical burner. An additional soil sample B-6-(Fused-Sand) was collected inside the conical burner from a distinct mound of granular material just below a layer of fused sand (Photos 6 through 9). The proposed samples in the vicinity of the flat area which may have been used as a log pond were not collected because this area was approximately 50 feet higher in elevation than the base of the conical burner and it seemed unlikely that ash would have been deposited there. The reference sample (B-7-(0.0'-0.5')) was collected to the east beyond the flat area. FES and YTEP agreed that the soil samples to be analyzed for dioxin should be collected closer to the conical burner and at a similar elevation. The sample locations for B-2, B-3 (co-located with the shallow sample from B-2) and B-4 (Photos 10 through 13) were moved to the locations shown on Figure 7.

FES attempted to find two locations for soil samples in the green chain area. Concrete and very compacted materials were present in many areas of the green chain. FES and YTEP agreed that soil samples should be collected from the area of ponded water where surface water was most likely to have concentrated any releases of wood-treatment chemicals from the green chain area. A shallow and deeper soil sample were collected at location B-5 which was covered with several inches of water at the time of sampling as shown on Figure 7 and Photos 14 through 18. Proposed soil sample B-6 was not collected in the green chain area because FES and YTEP agreed that a surface water sample would be better to determine if wood-treatment chemicals were present in surface water.

4.3 Surface Water Sampling – May 24, 2017

Surface water samples were not proposed for the Subject Property. FES collected surface water samples at location B-5 into 4-oz glass jars. The laboratory indicated that there was insufficient volume for the analysis of SVOCs. On May 24, 2017 YTEP collected a surface water sample in the vicinity of B-5. The sample was collected in two 1 liter amber glass containers.

4.4 Chemical Analysis Methods

The soil samples were analyzed by TestAmerica Laboratories, Inc. (TestAmerica) based in West Sacramento, CA. TestAmerica is certified by the California Department of Public Health for the requested analyses.

The surface water samples were also analyzed by TestAmerica for a limited list of SVOCs. TestAmerica is certified by the California Department of Public Health for the requested analyses.

4.5 Modifications to the Approved Sampling and Analysis Plan

Because of conditions in the field there were some modifications to the Sampling and Analysis Plan. These modifications included:

- Soil samples B-2, B-3 (co-located with B-2), and B-4 were collected near the conical burner instead of their proposed location on the flat area which is at a higher elevation than the base of the conical burner.
- Soil sample B-6 was collected inside the conical burner instead of from the green chain area. FES and YTEP agreed that it would be better to collect a surface water sample from the ponded water in the green chain area than to collect another soil sample.
- Soil samples were homogenized in the field but not by the lab.
- After the results of the sampling were obtained arsenic and nickel were analyzed in an additional 5 soil samples.

5.0 CHEMICAL ANALYTICAL RESULTS

5.1 Soil Analytical Results

The laboratory analytical reports are included in Appendix A through D. Some of the reporting limits and method detection limits exceeded the screening levels as shown in Table 1. Detections of analytes that exceeded reporting limits/method detection limits are shown in the table below. The Yurok Tribe has adopted the San Francisco Bay Regional Water Quality Control Boards (SFBRWQCB) ESLs (environmental screening levels) for soils. The ESLs shown in the table below are from the most recent version of the Tier 1 ESLs (February 2016, Rev. 3).

SUMMARY OF CHEMICAL CONCENTRATIONS DETECTED IN SOIL SAMPLES FROM THE MAY 17, 2017 SAMPLING EVENT

Sample ID	Date	DRO With Silica Gel (mg/kg)	MRO With Silica Gel (mg/kg)	Arsenic (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)	Dioxin TEQ (WHO, 2005) (pg/g)
	ESL	100	5,100	0.067	12,500	3,100	80	86	23,000	4.9
B-1-(0.0'-0.5')	5/17/17	1.6	<6.2	5.9	230	100	9.8	150	130	0.31
B-1-(0.5'-0.7')	5/17/17	1.6	5.7	6.4	540	59	7.2	420	73	0.26
B-2-(0.0'-0.5')	5/17/17	--	--	5.8	--	--	--	300	--	0.18
B-2-(0.5'-1.0')	5/17/17	--	--	5.2	--	--	--	360	--	0.28
B-3-(0.0'-0.5') co-located with B-2-(0.0'-0.5')	5/17/17	--	--	5.7	--	--	--	300	--	0.39
B-4-(0.0'-0.5')	5/17/17	--	--	6.7	--	--	--	310	--	2.5
B-4-(0.5'-1.0')	5/17/17	--	--	6.6	--	--	--	320	--	1.6
B-6-(Fused-Sand)	5/17/17	--	--	--	--	--	--	--	--	0.11
B-7-(0.0'-0.5')	5/17/17	--	--	3.6	300	32	7.1	280	59	0.22

NOTES:

5.9 Analytes detected at or above the screening level shown in red bold.

-- Not analyzed.

B-3-(0.0'-0.5') is co-located with B-2-(0.0'-0.5').

DRO Diesel Range Organics (with silica gel)

MRO Motor Oil Range Organics (with silica gel)

mg/kg milligrams per kilogram

pg/g picograms per gram

ESL SFBRWQCB Tier 1 Environmental Screening Level

-- Not analyzed.

5.2 Surface Water Analytical Results

The laboratory analytical reports are included in Appendix C. There were no detections of any analytes in the surface water sample. Some of the method detection limits exceeded the screening levels as shown in Table 3.

6.0 REVIEW OF LABORATORY REPORTS

All of the samples for this project were analyzed by TestAmerica located in West Sacramento, CA. The laboratory reports were reviewed by FES to determine the usability of the results based on reporting limits, method detection limits, and the laboratory QA/QC results included in the reports.

Laboratory reporting limits indicate the minimum concentration of an analyte that the laboratory can detect and quantify. Laboratory method detection limits indicate the minimum concentration of an analyte that the laboratory can detect and estimate the concentration. It is always preferable that the laboratory be able to detect and quantify analytes at concentrations below the screening levels. The screening levels are used for the initial determination of whether the concentrations present at a site require additional assessment and/or cleanup. The primary issues with data quality for this project were reporting limits and method detection limits that exceeded screening levels. If the reporting limits and method detection limits are greater than the screening levels it makes it difficult to answer the study questions regarding the presence of contamination above allowable levels.

**SUMMARY OF LABORATORY QUALITY CONTROL SAMPLES FROM THE
MAY 17, 2017 SAMPLING EVENT**

Sample ID	Date	Method Blank (analytes detected?)	Surrogate Recovery (within acceptable range?)	Arsenic (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)	Dioxin TEQ (WHO, 2005) (pg/g)
DRO	5/17/17	No	No	5.9	230	100	9.8	150	130	0.31
MRO	5/17/17	No	No	6.4	540	59	7.2	420	73	0.26
GRO	5/17/17	No	No	5.8	--	--	--	300	--	0.18
Benzene	5/17/17	No	No	5.2	--	--	--	360	--	0.28
Ethylbenzene	5/17/17	No	No	5.7	--	--	--	300	--	0.39
Toluene	5/17/17	No	No	6.7	--	--	--	310	--	2.5
Xylenes (Total)	5/17/17	No	No	6.6	--	--	--	320	--	1.6
Arsenic	5/17/17	No	No	5.9	230	100	9.8	150	130	0.31
Chromium	5/17/17	No	No	6.4	540	59	7.2	420	73	0.26
Copper	5/17/17	No	No	5.8	--	--	--	300	--	0.18
Lead	5/17/17	No	No	5.2	--	--	--	360	--	0.28
Nickel	5/17/17	No	No	5.7	--	--	--	300	--	0.39
Zinc	5/17/17	No	No	6.7	--	--	--	310	--	2.5
Xylenes (Total)	5/17/17	No	No	6.6	--	--	--	320	--	1.6
B-6-(Fused-Sand)	5/17/17	No	No	--	--	--	--	--	--	0.11
B-7-(0.0'-0.5')	5/17/17	No	No	3.6	300	32	7.1	280	59	0.22

NOTES:

5.9 Analytes detected at or above the screening level shown in red bold.

-- Not analyzed.

B-3-(0.0'-0.5') is co-located with B-2-(0.0'-0.5').

DRO Diesel Range Organics (with silica gel)

MRO Motor Oil Range Organics (with silica gel)

mg/kg milligrams per kilogram

pg/g picograms per gram

ESL SFBRWQCB Tier 1 Environmental Screening Level

-- Not analyzed.

6.1 Review of Reporting Limits for Soil Samples

The SAP included tables listing the laboratory reporting limits (RLs) and method detection limits (MDLs) provided by TestAmerica for all analytes. The RLs for all of the analytes were less than the screening levels except for arsenic, pentachlorophenol, 2,4,5-Trichlorophenol, and 2,4,6-Trichlorophenol. The MDLs provided by TestAmerica for the SAP were all less than the screening levels except for arsenic.

The RLs and MDLs for the actual soil samples were greater than those provided by TestAmerica for the SAP. The higher RLs and MDLs are usually attributed to matrix interference resulting from the composition of the actual samples which may include chemicals which interfere with the instruments used to detect and quantify the specific chemical of concern.

Method detection limits were between 2 and 3 times the screening levels for 2,4,5-Trichlorophenol and 2,4,6-Trichlorophenol. The reporting limit and method detection limit for arsenic were considerably greater than the screening level. All of the soil samples analyzed for arsenic contained concentrations greater than the reporting limit.

**LIST OF ANALYTES WHICH WERE NOT DETECTED IN THE SOIL SAMPLES
BUT FOR WHICH THE REPORTING LIMIT EXCEEDED THE
SCREENING LEVEL**

Analyte	Units	Screening Level (SFBRWQCB) (February 2016)	Reporting Limit (TestAmerica)	Method Detection Limit (TestAmerica)	Number of Samples for which the Reporting Limit Exceeds the Screening Level
pentachlorophenol	mg/kg	1.0	6.4 - 8.9	0.200 - 0.280	2
2,4,5-Trichlorophenol	mg/kg	0.18	1.3 - 1.8	0.330 - 0.460	2
2,4,6-Trichlorophenol	mg/kg	0.21	1.3 - 1.8	0.340 - 0.470	2

NOTES:
 mg/kg milligrams per kilogram
6.4 Red bold indicates a reporting limit or method detection limit that exceeds the screening
 SFBRWQCB San Francisco Bay Regional Water Quality Control Board

6.2 Review of Reporting Limits for Surface Water Samples

The SAP for this project did not propose the collection of water samples except for the equipment blank. During sampling at the Subject Property FES and YTEP discussed sampling an area of ponded water northeast of the mill foundations. FES and YTEP agreed that a surface water sample of the ponded water would be substituted for proposed soil sample B-6. The surface water sample was collected by YTEP on May 24, 2017. As shown in the table below the MDL for pentachlorophenol was twice the screening level. The MDL for 2,4,6-Trichlorophenol was between 3 and 4 times the screening level.

**LIST OF ANALYTES WHICH WERE NOT DETECTED IN THE SURFACE WATER
SAMPLE BUT FOR WHICH THE REPORTING LIMIT EXCEEDED THE
SCREENING LEVEL**

Analyte	Units	Screening Level (SFBRWQCB) (February 2016)	Reporting Limit (TestAmerica)	Method Detection Limit (TestAmerica)	Number of Samples for which the Reporting Limit Equals or Exceeds the Screening Level
pentachlorophenol	µg/L	1.0	50	2.0	1
2,4,6-Trichlorophenol	µg/L	0.63	9.9	2.0	1

NOTES:
 µg/L micrograms per Liter
50 Red bold indicates a reporting limit or method detection limit that exceeds the screening
 SFBRWQCB San Francisco Bay Regional Water Quality Control Board

6.3 Review of Laboratory Reports for Soil Samples

The laboratory analytical reports are included in Appendices A through D. All of the analyses were conducted by TestAmerica. FES reviewed the laboratory analytical reports to determine if there were any data quality issues. The acceptable ranges of percent recovery for QA/QC samples of an analyte are specified by the laboratory for each analyte and are specific to soil samples. The discussions below are based on the review of the QA/QC results.

Dioxins and Furans EPA Method 1613B (Soil)

There were detections of 8 of the 17 dioxin congeners in the method blank. Detections in the method blank indicate that the sample results may be biased high. All of the sample TEQs were less than the screening level of 4.9 picograms/gram (pg/g) even with a potential high bias.

Surrogate recoveries were all within laboratory-specified acceptable limits. Recoveries and relative percent differences for the lab control sample/lab control sample duplicate (LCS/LCSD) and matrix spike/matrix spike duplicate (MS/MSD) were within laboratory-specified acceptable limits.

The laboratory results for dioxin/furan analysis were accepted with the recognition that they may be biased high because all of the dioxin/furan concentrations in the soil samples were less than the screening level of 4.9 pg/g.

Gasoline Range Organics and BTEX 8260B (Soil)

There were no detections of GRO or BTEX in the method blank. Surrogate recoveries were all within laboratory-specified acceptable limits.

Recoveries and relative percent differences (RPDs) for the LCS/LCSD were within acceptable limits. Recoveries and RPDs for the MS/MSD were within laboratory-specified acceptable limits except for toluene which had a recovery percentage (79%) slightly less than the laboratory-specified acceptable minimum (80%).

The laboratory results for GRO and BTEX analysis were accepted because there were no detections of any analytes and the laboratory quality control issues were relatively insignificant.

Diesel and Motor Oil Range Organics 8260B (Soil)

There were no detections of DRO or MRO in the method blank. Surrogate recoveries were all within laboratory-specified acceptable limits. Recoveries and RPDs for the LCS and MS/MSD were within laboratory-specified acceptable limits. The laboratory results for DRO and MRO analysis were accepted because there were no quality control issues.

Metals 6020 (Soil)

Low concentrations of chromium, nickel, and zinc (0.301 mg/kg, 0.162 mg/kg, and 1.03 mg/kg respectively) were detected in the method blank for the batch that included B-1-(0.0'-0.5'), B-1-(0.5'-0.7'), and B-7-(0.0'-0.5'). Recoveries for the LCS were within laboratory-specified acceptable limits. The recovery of arsenic in the MSD was 75% which is less than the laboratory-specified acceptable minimum of 80%. The recovery of lead in the MS/MSD was within the laboratory-specified acceptable limit. The laboratory-specified RPDs were acceptable for lead and arsenic. The laboratory results for arsenic and lead were accepted.

The detections of chromium, nickel, and zinc in the method blank were not a significant issue because they were much less than the concentrations detected in the soil samples. The recoveries for the LCS were within laboratory-specified acceptable limits for all of the metals analyzed. There was significant variation in the concentrations between the MS and MSD. The laboratory was contacted and they suggested that the variation may be the result of heterogeneity in the aliquots used for the MS and MSD analysis. The laboratory also indicated that it was unlikely that the results would be improved by reanalyzing the samples.

The recovery of chromium in the MS was much higher than the laboratory-specified acceptable limits while the recovery of chromium in the MSD was less than the acceptable limits and the RPD for chromium was 38% which is outside of the laboratory-specified acceptable upper limit of 20%.

SUMMARY OF PERCENT RECOVERY AND RELATIVE PERCENT DIFFERENCE (LAB CALCULATED) FOR ARSENIC, CHROMIUM, COPPER, LEAD, NICKEL, AND ZINC IN THE MATRIX SPIKE AND MATRX SPIKE DUPLICATE

	Arsenic	Chromium	Copper	Lead	Nickel	Zinc
Concentration detected in the Matrix Spike	26.8	321	121	35.6	234	164
Concentration detected in the Matrix Spike Duplicate	25.5	219	92.3	32.3	152	112
Acceptable Percent Recovery Range	80-120%	80-120%	80-120%	80-120%	80-120%	80-120%
Matrix Spike Percent Recovery (Lab Calculated)	83%	369%	65%	102%	315%	151%
Matrix Spike Duplicate Recover (Lab Calculated)	75%	-31%	-48%	86%	-8%	-52%
Acceptable Relative Percent Difference	20%	20%	20%	20%	20%	20%
Relative Percent Difference (Lab Calculated)	5	38	27	10	42	37

The laboratory results for chromium were accepted because the highest concentration detected (540 mg/kg) was approximately 4% of the screening level of 12,500 mg/kg.

The recovery of copper in the MS and MSD were less than the acceptable limits and the RPD for copper was 27% which is outside of the laboratory-specific acceptable upper limit of 20%. The laboratory results for copper were accepted because the highest concentration detected (100 mg/kg) was approximately 3% of the screening level of 3,100 mg/kg.

The recovery of zinc in the MS was higher than the acceptable limits while the recovery of zinc in the MSD was less than the acceptable limits and the RPD for zinc was 37% which is outside of the laboratory-specific acceptable upper limit of 20%. The laboratory results for zinc were accepted because the highest concentration detected (130 mg/kg) was approximately 0.6% of the screening level of 23,000 mg/kg.

The recovery of nickel in the MS was much higher than the acceptable limits while the recovery of nickel in the MSD was much less than the acceptable limits and the RPD for nickel was 42% which is outside of the laboratory-specific acceptable upper limit of 20%. The laboratory results for nickel are considered variable and may be biased high or low. The laboratory results for nickel are considered usable because the lowest concentration (150 mg/kg) was approximately 1.7 times the screening level of 86 mg/kg.

After FES obtained the initial soil sample results with arsenic and nickel detected above the screening level inside the conical burner we decided to have the other samples near the conical burner analyzed for arsenic and nickel. This resulted in 5 additional soil samples analyzed for arsenic and nickel. There were no detections in the method blank and the LCS was within acceptable limits. No MS or MSD was conducted for the additional analyses.

SVOCs 8270C (Soil)

There were no detections of SVOCs in the method blank. Surrogate recoveries were all within acceptable limits. Recoveries and relative percent differences for the LCS and MS/MSD were within acceptable limits except for higher than acceptable recovery of pentachlorophenol in the MS/MSD. The MDLs for 2,4,5-Trichlorophenol and 2,4,6-Trichlorophenol were several times greater than the screening levels. The laboratory results for SVOC analysis were considered acceptable for pentachlorophenol, 2,3,4,6-Tetrachlorophenol, and 2,3,5,6-Tetrachlorophenol and usable for 2,4,5-Trichlorophenol and 2,4,6-Trichlorophenol because the MDLs were less than 3 times the screening levels.

6.4 Review of Laboratory Reports for Surface Water Samples

SVOCs 8270C (Water)

There were no detections of SVOCs in the method blank. Some of the surrogate recoveries were slightly higher than acceptable limits. Recoveries and RPDs for the LCS/LCSD were within acceptable limits. The MDL for pentachlorophenol (2.0 µg/L) was higher than the screening level of 1.0 µg/L. The MDL for 2,4,6-Trichlorophenol (2.0 µg/L) was higher than the screening level of 0.63 µg/L. The laboratory results for SVOC analysis were considered acceptable for 2,3,4,6-Tetrachlorophenol, 2,3,5,6-Tetrachlorophenol, and 2,4,5-Trichlorophenol and the results for pentachlorophenol and 2,4,6-Trichlorophenol were considered usable because the MDLs were within approximately 3 times the screening levels.

6.5 Assessment of Field Variability of Co-Located Soil Samples

One co-located soil sample was collected at the Subject Property. The co-located sample was created by placing soil from the same location and depth in a clean glass mixing bowl and homogenizing the sample with gloved hands. Soil from the homogenized sample was placed into the various containers and the co-located sample was submitted "blind" to the laboratory. One co-located soil sample (B-3-(0.0'-0.5')) was collected at location B-2. The samples were analyzed for dioxins/furans, arsenic, and nickel.

The equation for calculating the RPD is:

$$RPD = \frac{|X1 - X2|}{[(X1 + X2)/2]} \times 100$$

RPD = Relative Percent Difference (as %)

X1 - X2 = Absolute value (always positive) of X1 – X2

X1 = Original sample concentration

X2 = Duplicate sample concentration

A RPD of 35% or less is generally considered acceptable for soil samples. The RPDs for the co-located samples are shown in the following table. The RPD for dioxin TEQ was 73.7% which is greater than the 35% generally considered acceptable. The high RPD may indicate that the sample was not sufficiently homogenized in the field or that the laboratory is not running consistently. The RPDs for arsenic and nickel were 1.7% and 0% respectively.

SUMMARY OF RELATIVE PERCENT DIFFERENCES FOR DIOXIN TEQ, ARSENIC, AND NICKEL IN THE CO-LOCATED SOIL SAMPLES

Sample ID	Date	Dioxin TEQ (WHO, 2005) (picograms/gram)	Arsenic (micrograms/Liter)	Nickel (micrograms/Liter)
B-2-(0.0'-0.5')	5/17/17	0.18	5.8	300
B-3-(0.0'-0.5') (co-located with B-2-(0.0'-0.5'))	5/17/17	0.39	5.7	300
Relative Percent Difference (RPD)		73.7%	1.7%	0%

6.6 Equipment Blanks

One equipment blank was collected from the shovel used to collect the soil samples. The shovel was decontaminated and distilled water was poured over it and collected in a plastic container that was preserved with nitric acid. The equipment blank was analyzed for arsenic, chromium, copper, lead, nickel, and zinc. The only detection was copper at an estimated concentration of 1.0 µg/L. The highest copper detection in soil samples collected from the Subject Property was 100 mg/kg which is much less than the screening level of 3,100 mg/kg. Even if the copper concentrations are biased high they are still much less than the screening level.

6.7 Investigation Derived Wastes

There were no investigation derived wastes generated for this project as there were no indications of contamination in the samples.

7.0 MEASUREMENT QUALITY OBJECTIVES (MQOs)

Data assessment criteria are used to evaluate the quality of the field sampling and laboratory performance for the sampling event, and are expressed in terms of analytical precision, accuracy, representativeness, completeness, and comparability, which are described below.

7.1 Precision

Precision is the degree of mutual agreement between or among independent measurements of a similar property usually reported as relative percent difference (RPD). This indicator relates to the analysis of duplicate laboratory samples, duplicate matrix spikes, and field duplicates (co-located samples). An RPD of <20% for water and <35% for soil, depending upon the chemical being analyzed is generally considered acceptable. TestAmerica used RPDs that were specific to each analyte.

The RPD for the co-located soil samples analyzed for dioxin/furans was 73.7%. This was higher than the generally acceptable limit of 35% and may indicate insufficient field homogenization. The RPDs for arsenic and nickel were 1.7% and 0% respectively.

All of the LCS/LCSD results were within laboratory specified acceptable ranges and RPDs. The MS/MSD results for chromium, copper, nickel, and zinc and toluene were outside of laboratory specified acceptable ranges. Precision was expressed in terms of RPD between the values resulting from duplicate analysis. The QC results are results are described detail in Sections 6.3 and 6.4.

7.2 Accuracy/Bias

Accuracy is the degree of agreement of a measurement with a known or true value. To determine accuracy, a laboratory value was compared to a known or true concentration. Accuracy for this project was determined by laboratory control samples and laboratory control sample duplicates and matrix spikes and matrix spike duplicates. Accuracy is expressed as a bias (high or low) and is determined by calculating percent recovery (%R) from MSs/MSDs and LCSs/LCSDs.

LCS %R indicates accuracy relevant to an analytical batch lot and is a measure of analytical accuracy conditions independent of samples and matrices. MS/MSD and surrogate spike %Rs indicate accuracy relevant to a unique sample matrix. The %R of an analyte, and the resulting degree of accuracy expected for the analysis of spiked samples, are dependent upon the sample matrix, method of analysis, and the compound or element being measured. The concentration of the analyte relative to the detection limit of the method also is a significant factor in determining the accuracy of the measurement.

QC samples that were used in this investigation to measure accuracy/bias were within acceptable ranges for almost all of the LCS/LCSD and MS/MSD except for chromium, copper, nickel, and zinc, and include the following:

- Laboratory Spikes and Laboratory Spike Duplicates- To monitor sample preparation/analysis methodology, as well as, to represent the actual sample matrix itself; and
- Matrix Spikes Matrix Spike Duplicates - To monitor sample preparation/analysis methodology, as well as, to represent the actual sample matrix itself; and
- Standard reference materials and/or laboratory control samples to monitor sample preparation/analysis methodology and often of a similar media (such as water, soil, sediment) as the field samples.

7.3 Representativeness

Representativeness is the expression of the degree to which data accurately and precisely represent a characteristic of an environmental condition or a population. It relates both to the area of interest and to the method of taking the individual sample. The principal study question for this project was whether the Subject Property contains contaminated soils above concentrations regarded as safe for reuse of the Subject Property.

This project collected judgmental samples in locations where FES and YTEP agreed that the chemicals of concern (COCs) were most likely to be present. One of the samples, B-7-(0.0'-).5') was collected from an area that did not seem likely to contain contamination from former activities at the Subject Property. The reference metals sample was collected upslope and beyond the area considered most likely to have been contaminated.

Factors that affect representativeness include:

- Use of appropriate sampling procedures, including equipment and equipment decontamination and sample holding temperatures;
- Use of appropriate analytical methods for the required parameters and project reporting limits; and
- Analysis of samples within the required holding times.

The portion of each collected sample that was chosen for analysis also affects sample representativeness. The soil samples were homogenized in the field to ensure that the reported results were representative of the sample received.

This investigation used sampling and analytical methods for ensuring the data collected reflects the environmental conditions in the areas sampled. To further ensure the representativeness of the data collected, chain-of-custody procedures, sample preservation, and maximum sample holding times were followed.

QC samples that were used in this investigation to quantitatively measure representativeness included the use of temperature blanks. The temperatures were recorded upon receipt of the samples by the laboratories to serve as a QC check for temperature-related sample preservation. All samples were received at temperatures slightly less (1.7°C and 1.9°C) than the acceptance criteria for samples requiring preservation at 4°C +/- 2°C.

A qualitative measure of representativeness included verification that documented sample collection and analytical methods (including sample handling, chain-of-custody procedures, sample preservation, and sample holding times protocols) were followed to ensure that the data reflects the environmental conditions.

7.4 Comparability

Comparability expresses the confidence with which one dataset can be compared to another. The use of methods from EPA or “Standard Methods” or from some other recognized sources allows the data to be compared facilitating evaluation of trends or changes at a site. Comparability also refers to the reporting of data in comparable units so direct comparisons are simplified. Comparability during analysis is dependent upon analytical methods, detection limits, laboratories, units of measure, and sample preparation procedures. Comparability is determined on a qualitative rather than quantitative basis. For this project, comparability of all data collected was ensured by adherence to standard sample collection procedures, standard field measurement procedures, and standard lab methods, analysis and reporting methods, including consistent units.

7.5 Completeness

Completeness is expressed as percent of valid usable data actually obtained compared to the amount that was expected.

A total of 11 soil samples were collected from the Subject Property. One of the samples was collected from an area not expected to have been impacted by activities at the Subject Property to determine reference metals and dioxin/furan concentrations. The SAP called for the collection of 12 soil samples. There were two proposed soil samples near the green chain that were not collected because it was determined in the field that a surface water sample would be more appropriate. One soil sample that was not proposed (B-6-(Fused-Sand) was collected from inside the conical burner. The percent completeness is approximately 92% based on the number of soil samples proposed in the SAP.

7.6 Sensitivity

Laboratory methods utilized in the assessment were sensitive enough to be able to quantify the parameters of concern at or below the screening levels except for the analytes described in

Section 6.1. Tables listing analytes for which the reporting limits were higher than the screening levels is provided in Sections 6.1 and 6.2.

8.0 DISCUSSION

8.1 Conical Burner and Vicinity

Seven samples (excluding the co-located sample) from four locations were collected from the conical burner and vicinity including three samples from inside the conical burner. The samples were collected from various intervals with a maximum depth of 1.0 feet bgs.

The following samples were collected from inside the conical burner:

- B-1-(0.0'-0.5') (approximately halfway between the center of the burner and the access door);
- B-1-(0.5'-0.7') (approximately halfway between the center of the burner and the access door); and
- B-6-(Fused-Sand) (from the mound of granular material just below the fused material in the approximate center of the burner).

The following samples were collected from areas within approximately 35 feet of the edge of the conical burner:

- B-2-(0.0'-0.5') (approximately 35 feet northwest of the burner);
- B-2-(0.5'-1.0') (approximately 35 feet northwest of the burner);
- B-3-(0.0'-0.5') (co-located with B-2-(0.0'-0.5'));
- B-4-(0.5'-1.0') (approximately 35 feet southwest of the burner); and
- B-4-(0.5'-1.0') (approximately 35 feet southwest of the burner).

There were only two COCs that exceeded their screening levels. The arsenic concentrations of 5.9 mg/kg (B-1-(0.0'-0.5')) and 6.4 mg/kg (B-1-(0.5'-0.7')) from soil samples collected inside the conical burner exceeded the screening level of 0.067 mg/kg. The arsenic concentrations in the soil samples collected in the vicinity of the conical burner ranged from 5.2 mg/kg to 6.7 mg/kg exceeding the screening level of 0.067 mg/kg. The reference sample contained 3.6 mg/kg which is close to the background arsenic concentration of approximately 3.3 to 3.8 mg/kg based on the map in USGS Professional Paper 1648 (USGS, 2001). All of the arsenic concentrations are within the range of reference samples (3.64 to 6.9 mg/kg) collected in other areas of the Yurok Indian Reservation. The ash created by the burning of wood can concentrate the metals naturally occurring in wood.

The nickel concentrations of 150 mg/kg (B-1-(0.0'-0.5')) and 420 mg/kg (B-1-(0.5'-0.7')) from soil samples collected inside the conical burner exceeded the screening level of 86 mg/kg. The nickel concentrations in the soil samples collected in the vicinity of the conical burner ranged from 300 mg/kg to 360 mg/kg exceeding the screening level of 86 mg/kg. The reference sample contained 280 mg/kg which is significantly greater than the background nickel concentration of approximately 41.8 to 46.9 mg/kg based on the USGS, 2001 map. The USGS 2001 map from Professional Paper 1648 shows that only 2 or 3 soil samples were collected in all of Humboldt

County. There are likely wide variations in metals concentrations across Humboldt County due to the diverse lithology. It is our opinion that the reference samples collected within the boundaries likely are more representative of background metals concentrations.

All of the nickel concentrations except one (150 mg/kg) are greater than the range of reference samples (23.7 to 154 mg/kg) collected in other areas of the Yurok Indian Reservation. The ash created by the burning of wood can concentrate the metals naturally occurring in wood. The concentrations of nickel in the samples collected from the Subject Property ranged from 150 to 420 mg/kg and are likely elevated by historical activities.

8.2 Green Chain

The following samples were collected from an area considered to be adjacent to the former green chain:

- B-5-(0.0'-0.33') (adjacent to the mill foundations);
- B-5-(0.5'-0.67') (adjacent to the mill foundations); and
- B-5-Surface-Water (adjacent to the mill foundations).

There were no detections of the SVOCs analyzed in the soil and water samples at location B-5. The specific analytes included:

- Pentachlorophenol;
- 2,3,4,6-Tetrachlorophenol;
- 2,3,5,6-Tetrachlorophenol;
- 2,4,5-Trichlorophenol; and
- 2,4,6-Trichlorophenol.

The MDLs for soil samples for 2,4,5-Trichlorophenol and 2,4,6-Trichlorophenol exceeded the screening levels. The MDLs for the surface water sample for Pentachlorophenol, 2,4,5-Trichlorophenol and 2,4,6-Trichlorophenol exceeded the screening levels.

8.3 Reference Sample

The following sample was collected from an area considered unlikely to have been affected by potential contamination from activities at the former mill:

- B-7-(0.0'-0.5') (collected from a location approximately 150 feet northeast of the mill foundations to provide reference metals and dioxin/furan concentrations).

The arsenic concentration (3.6 mg/kg) of the reference sample (B-7-(0.0'-0.5')) is close to the background arsenic concentration of approximately 3.3 to 3.8 mg/kg based on the USGS 2001 map. The nickel concentration (280 mg/kg) of the reference sample (B-7-(0.0'-0.5')) is significantly greater than the background nickel concentration of approximately 41.8 to 46.9 mg/kg based on the USGS, 2001 map.

The dioxin TEQ (0.22 pg/g) of the reference sample (B-7-(0.0'-0.5')) is significantly less than the screening level of 4.9 pg/g and less than all of the other samples except for one sample collected inside the conical burner (B-6-(Fused-Sand)) which contained 0.11 pg/g. The dioxin concentrations contained in soil samples from the Subject Property are all less than the screening level therefore dioxin is not a contaminant of concern for reuse of the Subject Property.

8.4 Human and Ecological Risk

Human Risk

The concentrations of arsenic and nickel are considered a potential human risk. The screening level for arsenic (0.067 mg/kg) is much less than the concentrations in soil samples from the Subject Property which ranged from 3.6 mg/kg to 6.7 mg/kg. The screening level for nickel (86 mg/kg) is less than the concentrations in soil samples from the Subject Property which ranged from 150 mg/kg to 420 mg/kg. The table below lists arsenic and nickel concentrations collected to assess naturally occurring metals within the Yurok Indian Reservation.

ARSENIC AND NICKEL CONCENTRATIONS FROM SOIL SAMPLES COLLECTED ON THE YUROK INDIAN RESERVATION

Subject Property	Arsenic in the Reference Soil Sample (mg/kg)	Nickel in the Reference Soil Sample (mg/kg)	Sample ID	Date
Upper Arrow Mill Property	3.6	280	B-7-(0.0'-0.5')	17-May-17
Tire Fire Property	4.33	52.8	Tire-Fire-Background-Metal -0.0'-0.1'0	09-Apr-13
Tully Site	6.9	124	Background-001	10-Oct-08
Tully Site	6.0	154	Background-002	10-Oct-08
Jet Boat Property	3.64	23.7	Jet-Boat-Metals-(0.75)	05-Jun-14

The table below lists background arsenic and nickel concentrations from two sources and a map interpolation (USGS, 2001) of one of the sources (USGS, 1984) and the average concentrations of arsenic and nickel at the Subject Property. The arsenic concentrations at the Subject Property are much greater than any of the screening levels but are relatively close to other larger scale soil sampling. The nickel concentrations at the Subject Property are approximately 5 to 20 times the background concentrations shown in the table below.

**ARSENIC AND NICKEL BACKGROUND CONCENTRATIONS
IN CALIFORNIA AND THE WESTERN UNITED STATES**

Document	Arsenic Average Concentration (mg/kg)	Nickel Average Concentration (mg/kg)
Background Concentrations of Trace and Major Elements in California Soils - Kearney Foundation of Soil Science Division of Agriculture and Natural Resources University of California (March 1996)	3.5	57
Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States - USGS Professional Paper 1270 (1984) Concentrations are for the Western United States	5.5	15
Geochemical Landscapes of the Conterminous United States — New Map Presentations for 22 Elements - USGS Professional Paper 1648 (November 2001)	~3.3 to ~3.8	~41.8 to ~46.9
Average concentrations for all soil samples collected from the Upper Arrow Mill Property	5.7	305
Average concentrations for all soil samples collected from the Tire Fire Property	7.7	63.5
Average concentrations for all soil samples collected from the Jet Boat Property	4.8	97.6
Average concentrations for all soil samples collected from the Kinney Assignment	9.0	116
Average concentrations for all soil samples collected by FES and analyzed by CalScience from the Tully Site	7.1	93.1

The screening levels used for this project were from the San Francisco Bay Regional Water Quality Control Board (SFBRWQCB) Environmental Screening Levels, February 2016 (Rev. 3). There are other screening levels available as shown in the table below.

REMEDIAL GOALS AND SCREENING LEVELS FOR SOIL

Screening Level	Arsenic (mg/kg)	Nickel (mg/kg)
SFBRWQCB, Tier 1 ESLs, February, 2016 (Rev 3.).	0.067	86
SFBRWQCB, Summary of Soil ESLs, Direct Exposure Human Health Risk Levels (Table S-1), Residential Shallow Exposure, February, 2016 (Rev 3.).	0.067	820
California Human Health Screening Levels (CHHSLs), Residential Land Use, January 2005.	0.07	1,600
USEPA, Regional Screening Level (RSL) Resident Soil Table Carcinogenic SL (TR=1E-06, HQ=0.1) June 2017.	0.68	86

The arsenic concentrations at the Subject Property are significantly greater than any of the screening levels but are relatively close to published background arsenic concentrations. Concentrations of arsenic at the Upper Arrow Mill Property are within the range of average concentrations from other locations within the Yurok Indian Reservation.

The nickel concentrations at the Subject Property are less than two of the screening levels shown in the table above. The nickel concentrations at the Subject Property are all greater than the SFBRWQCB screening level (86 mg/kg) in all of the soil samples analyzed for nickel. The reference sample (B-7-(0.0'-0.5')) contained 280 mg/kg nickel. The rest of the samples ranged from 150 mg/kg to 420 mg/kg. The nickel concentrations in soil samples collected at the Subject Property are all greater than published background nickel concentrations shown in this report and greater than the average nickel concentrations from other locations within the Yurok Indian Reservation.

Ecological Risk

The concentrations of arsenic and nickel at the Subject Property are considered a potential ecological risk. The table on the following page lists potential receptors that are listed as endangered, threatened, or candidate species by the National Marine Fisheries Service (NMFS) and the United States Fish and Wildlife Service (US FWS) on all eight of the USGS 7.5 minute quadrangle maps that contain portions of the Yurok Reservation.

Type	Common Name	Scientific Name	Category	Critical Habitat
Invertebrates				
NMFS	black abalone	Haliotis cracherodii	E	N
Fish				
NMFS	green sturgeon	Acipenser medirostris	T	Y
US FWS	tidewater goby	Eucyclogobius newberryi	E	Y
NMFS	S. OR/N. CA coho salmon	Oncorhynchus kisutch	T	Y
NMFS	CA coastal chinook salmon	Oncorhynchus tshawytscha	T	Y
NMFS	Southern eulachon DPS	Thaleichthys pacificus	T	Y
US FWS	Northern California steelhead	Oncorhynchus mykiss	T	Y
Reptiles				
NMFS	loggerhead turtle	Caretta caretta	T	N
NMFS	green turtle	Chelonia mydas (incl. agassizi)	T	N
NMFS	leatherback turtle	Dermochelys coriacea	E	Y
NMFS	olive (=Pacific) ridley sea turtle	Lepidochelys olivacea	T	N
Birds				
US FWS	marbled murrelet	Brachyramphus marmoratus	T	Y
US FWS	western snowy plover	Charadrius alexandrinus nivosus	T	Y
US FWS	Western yellow-billed cuckoo	Coccyzus americanus	PT	N
US FWS	short-tailed albatross	Phoebastria albatrus	E	N
US FWS	northern spotted owl	Strix occidentalis caurina	T	Y
US FWS	Xantus's murrelet	Synthliboramphus hypoleucus	C	N
Mammals				
NMFS	sei whale	Balaenoptera borealis	E	N
NMFS	blue whale	Balaenoptera musculus	E	N
NMFS	fin whale	Balaenoptera physalus	E	N
NMFS	Steller (=northern) sea-lion	Eumetopias jubatus	T	Y
US FWS	fisher, West Coast DPS	Martes pennanti	C	N
NMFS	humpback whale	Megaptera novaengliae	E	N
NMFS	killer whale, S. resident	Orcinus orca	E	Y
NMFS	sperm whale	Physeter macrocephalus	E	N

NOTES:

- US FWS United States Fish and Wildlife Service
- NMFS National Marine Fisheries Service
- C Candidate species
- DPS Distinct Population Segment
- E Endangered species
- PE Proposed Threatened species
- T Threatened species

8.5 Reporting Limits Exceeding Screening Levels for some SVOCs and Metals

As listed in the tables in Section 6.1 and 6.2 and shown in the table below there were two analytes where the method detection limit exceeded the screening levels by more than 3 times for SVOCs and arsenic. For this project method detection limits that were less than 3 times the screening level were considered usable because the results can still be used to determine if there are higher concentrations present. The following tables shows the number of analytes with method detection limits that exceeded the screening levels by more than 3 times.

PERCENT OF USABLE DATA FOR SOIL SAMPLES

Contaminant of Concern	Total Number of Analytes	Number of Analytes with ESLs	Number of Analytes with Method Detection Limits that exceed the Screening Levels by more than 3x	Usable Data
SVOCs	5	4	0	100%
GRO and BTEX	5	5	0	100%
DRO and MRO	2	2	0	100%
Metals	6	6	1	83%
Dioxins/Furans	17	1	0	100%
Overall Totals	35	18	1	97%

As shown in the table above 97% of the soil sample results were considered usable with a total of 5 analytes with method detection limits that exceeded the screening level by more than 3 times the screening level.

PERCENT OF USABLE DATA FOR SURFACE WATER SAMPLE

Contaminant of Concern	Total Number of Analytes	Number of Analytes with ESLs	Number of Analytes with Method Detection Limits that exceed the Screening Levels by more than 3x	Usable Data
SVOCs	5	3	1	80%
Overall Totals	5	3	1	80%

As shown in the table above 80% of the surface water sample results were considered usable with a total of 1 analyte with a method detection limit that exceeded the screening level by more than 3 times the screening level.

9.0 CONCLUSIONS AND RECOMMENDATION

We have performed a Phase II Environmental Site Assessment of the Subject Property known as the Upper Arrow Mill Property (APN: 534-091-018) approximately 12.5 miles north of Weitchpec in conformance with the scope and limitations of ASTM Practice E 1903-11 and for the following objectives developed pursuant to section 5.1 of ASTM Practice E 1903-11:

- Assess and evaluate the recognized environmental conditions identified in the Phase I ESA (YTEP, 2016); and
- Assess the potential for contamination from wood-treatment chemicals in the vicinity of the green chain.

Conclusions

The primary objectives of this Phase II ESA were to determine whether contamination resulting from the previous use as a lumber mill with a conical burner was present. The scope of work developed by FES for this assessment was based on the Phase I ESA (YTEP, 2016) and discussions with Dr. Fluharty. The laboratory analyses indicate that arsenic and nickel in soil are the only COCs present at the Subject Property in the areas where the samples were collected.

Recommendations

The concentrations of arsenic and nickel in shallow soils at the Subject Property exceed the SFBRWQCB screening levels. There are several strategies for addressing the concentrations of arsenic and nickel at the Subject Property if it is proposed for residential use.

Soil samples could be collected from the first 2 feet below the ground surface (bgs) in the area proposed for residential use. If the concentrations of arsenic and nickel in the soil samples significantly exceed the screening levels we recommend that a Human Health Risk Assessment (HHRA) be conducted to determine the potential risks from arsenic and nickel concentrations at the Subject Property. If the additional soil samples collected from the first 2 feet bgs exceed the screening levels we also recommend that deeper soil samples be collected at the Subject Property and analyzed for arsenic and nickel to determine if the higher concentrations are only present in the first 2 feet bgs.

Additionally we recommend that groundwater and surface water at the Subject Property be sampled and analyzed for arsenic and nickel to determine if the concentrations exceed drinking water screening levels and would be unsafe for human consumption and to determine if arsenic and nickel could migrate offsite in groundwater or surface water and potentially reach the Klamath River or its tributaries. Arsenic and nickel have USEPA recommended water quality criteria for water and fish consumption that could be compared to surface water concentrations. These metals could also impact endangered and threatened aquatic species listed in Section 8.4.

Remedial Options

If the HHRA concludes that the risk from arsenic and nickel at the Subject Property is significantly greater than if arsenic and nickel were less than or equal to the screening levels there are options to excavate soil and/or import fill.

If additional soil samples including deeper samples are collected at the Subject Property and if it is determined that the concentrations exceed the screening levels and the HHRA concludes that they create an unacceptable risk soil could be excavated in the areas proposed for residential use. If the concentrations of arsenic and nickel exceeding the screening levels continue beyond 2 feet bgs the soils could be isolated from human contact using imported clean fill with a minimum thickness of at least 2 feet.

10.0 REFERENCES

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