sonoma county
DEPARTMENT OF HEALTH SERVICES
PUBLIC HEALTH DIVISION

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Sonoma County Complex Fires
Health Screening Level Guidance, Cleanup Goals and Background Data Sets

The following summary tables provide updated health screening level guidance and cleanup goals for the Sonoma County Complex Fires Alternative Program. The USACE and CalRecycle have recently compiled background data sets for the fires that take into consideration the geologic and geographic location of sampling. Where confirmation soil sampling exceeds the health screening levels, a licensed professional (California licensed geologist, civil engineer or petroleum engineer[1]),may in their professional judgement certify that the results are naturally occurring, and additional cleanup will not be required based on the exceedance. This determination must take into consideration site specific data relative to local geology, and the geologic chemical data in the tables provided where results within 20% of the stated background data would be considered passing. Where confirmation sample results exceed data sets contained in the published tables and/or additional clearing with additional testing does not meet health screening criteria or published regional background sets, site specific background samples may be collected to establish that the cleanup has been performed to background levels.

Guidance for Site Specific Background Data Collection and Analyses

The following guidance is provided to assist licensed professionals establish site specific background data:

1) Three locations shall be identified away from the impacted/cleanup area, such that minimal air blown ash or debris may disturb the desired samples. Locations should be staggered to represent the area.
2) In order to assure a “clean” or “native” sample, the first 3 inches of dirt shall be removed from the ground surface.
3) Samples shall be collected from 3 to 9 inches and placed in appropriate containers for transport to an analytical laboratory
4) Samples shall be analyzed for metals under EPA Method 6020 and Mercury by EPA Method 7471A.
5) Analytical results will be reviewed and compiled by the licensed professional, and a determination made if the results are representative of background for the subject site.

Additional Advisory:
In cases where a subject site has been cleaned up to background levels, and health screening levels exceeded, property owners should be advised of the exceedance.

Reporting:
In order to facilitate the expedient review of cleanup documentation, results of testing and analyses should be outlined in tables for each site compared against the identified screening level. Certified analytical reports shall be attached including all QA/QC documentation from the lab. As the results presented will included interpretation, all reports must be signed and stamped by the licensed professional taking responsible charge for the work.

Attachments:
Sonoma Background Table V1 - PDF
Sonoma Background Sampling Locations - PDF

[1] California Code of Regulations Title 16, Division 29§§ 3000-3067 & Business and Professions Code §§ 7800 – 7887

TABLE 1.
CLEANUP GOALS FOR METALS IN SOIL
SONOMA COUNTY, POCKET FIRE INCIDENT
KJFM GEOLOGIC AREA

Metal	Background	US EPA RSL [a]	CalEPA CHHSL [b]	DTSC HERO [c]	Cleanup Goal
Antimony	0.278	31	30	-	**30**
Arsenic	8.006	0.7	0.1	0.07	**8**
Barium	640	15,000	5,200	-	**5,200**
Beryllium	0.818	160	16	15	**15**
Cadmium	0.132	71	1.7	5.2	**1.7**
Chromium	140.4	120,000	100,000	36,000	**36,000**
Cobalt	45.3 [d]	23	660	-	**45.3**
Copper	127.8	3,100	3,000	-	**3,000**
Lead	16.44	400	80	80	**80**
Mercury	0.102	5.1	18	23	**5.1**
Molybdenum	1.215	390	380	-	**380**
Nickel	235.1	1,500	1,600	490	**490**
Selenium	1.171	390	380	-	**380**
Silver	0.063	390	380	390	**380**
Thallium	0.759	0.8	5	-	**5**
Vanadium	106.5	390	530	390	**390**
Zinc	105.9	23,000	23,000	-	**23,000**

Notes:

All results presented in milligrams per kilogram (mg/kg)

Cleanup goal selected using the higher value of background or appropriate health-based screening level

Complete statistical summary information is presented as Attachment 1

NA Statistics not conducted due to minimal detections

-- None listed

a U.S. Environmental Protection Agency, Risk-Based Screening Levels (www.epa.gov/Region9/superfund/prg). May 2016.

b California Environmental Protection Agency, Revised California Human Health Screening Levels for Lead (http://oehha.ca.gov.risk/pdf/LeadCHHSL091709.pdf). September 2010.

c California Department of Toxic Substances Control, Office of Human Health and Ecological Risk Assessment, Note 3 (www.dtsc.ca.gov/AssessingRisk.upload/HHRA-Note-3-2016-01.pdf). January 2016.

d Background levels up to 248 mg/kg of cobalt were detected but not included in the evaluation.

TABLE 1.
CLEANUP GOALS FOR METALS IN SOIL
SONOMA COUNTY, POCKET FIRE INCIDENT
MZV GEOLOGIC AREA

Metal	Background	US EPA RSL [a]	CalEPA CHHSL [b]	DTSC HERO [c]	Cleanup Goal
Antimony	0.212	31	30	-	**30**
Arsenic	9.87	0.7	0.1	0.07	**9.9**
Barium	787.8	15,000	5,200	-	**5,200**
Beryllium	1.92	160	16	15	**15**
Cadmium	0.244	71	1.7	5.2	**1.7**
Chromium	990	120,000	100,000	36,000	**36,000**
Cobalt [d]	54.8	23	660	-	**54.8**
Copper	106	3,100	3,000	-	**3,000**
Lead	11.3	400	80	80	**80**
Mercury	0.144	5.1	18	23	**5.1**
Molybdenum	1.061	390	380	-	**380**
Nickel	3,490	1,500	1,600	490	**490**
Selenium	1.74	390	380	-	**380**
Silver	0.193	390	380	390	**380**
Thallium	N/A	0.8	5	-	**5**
Vanadium	175	390	530	390	**390**
Zinc	110.7	23,000	23,000	-	**23,000**

Notes:

All results presented in milligrams per kilogram (mg/kg)

Cleanup goal selected using the higher value of background or appropriate health-based screening level

Complete statistical summary information is presented as Attachment 1

NA Statistics not conducted due to minimal detections

-- None listed

a U.S. Environmental Protection Agency, Risk-Based Screening Levels (www.epa.gov/Region9/superfund/prg). May 2016.

b California Environmental Protection Agency, Revised California Human Health Screening Levels for Lead (http://oehha.ca.gov.risk/pdf/LeadCHHSL091709.pdf). September 2010.

c California Department of Toxic Substances Control, Office of Human Health and Ecological Risk Assessment, Note 3 (www.dtsc.ca.gov/AssessingRisk.upload/HHRA-Note-3-2016-01.pdf). January 2016.

d Background levels up to 166 mg/kg of cobalt were detected but not included in the evaluation.

TABLE 1.
CLEANUP GOALS FOR METALS IN SOIL
SONOMA COUNTY, TUBBS FIRE INCIDENT
KJFM/QPC GEOLOGIC AREA

Metal	Background	US EPA RSL [(a)]	CalEPA CHHSL [(b)]	DTSC HERO [(c)]	Cleanup Goal
Antimony	0.127	31	30	-	**30**
Arsenic	7.812	0.7	0.1	0.07	**7.8**
Barium	223	15,000	5,200	-	**5,200**
Beryllium	0.97	160	16	15	**15**
Cadmium	0.106	71	1.7	5.2	**1.7**
Chromium	493	120,000	100,000	36,000	**36,000**
Cobalt	66.23	23	660	-	**66.2**
Copper	64.5	3,100	3,000	-	**3,000**
Lead	16.93	400	80	80	**80**
Mercury	0.163	5.1	18	23	**5.1**
Molybdenum	0.609	390	380	-	**380**
Nickel	632	1,500	1,600	490	**490**
Selenium	0.981	390	380	-	**380**
Silver	0.0621	390	380	390	**380**
Thallium	0.216	0.8	5	-	**5**
Vanadium	94.01	390	530	390	**390**
Zinc	93.84	23,000	23,000	-	**23,000**

Notes:

All results presented in milligrams per kilogram (mg/kg)

Cleanup goal selected using the higher value of background or appropriate health-based screening level

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NA Statistics not conducted due to minimal detections

-- None listed

a U.S. Environmental Protection Agency, Risk-Based Screening Levels (www.epa.gov/Region9/superfund/prg). May 2016.

b California Environmental Protection Agency, Revised California Human Health Screening Levels for Lead (http://oehha.ca.gov.risk/pdf/LeadCHHSL091709.pdf). September 2010.

c California Department of Toxic Substances Control, Office of Human Health and Ecological Risk Assessment, Note 3 (www.dtsc.ca.gov/AssessingRisk.upload/HHRA-Note-3-2016-01.pdf). January 2016.

TABLE 1.
CLEANUP GOALS FOR METALS IN SOIL
SONOMA COUNTY, TUBBS FIRE INCIDENT
Q/QPC GEOLOGIC AREA

Metal	Background	US EPA RSL [(a)]	CalEPA CHHSL [(b)]	DTSC HERO [(c)]	Cleanup Goal
Antimony	0.255	31	30	-	**30**
Arsenic	22	0.7	0.1	0.07	**22**
Barium	198.5	15,000	5,200	-	**5,200**
Beryllium	0.704	160	16	15	**15**
Cadmium	0.253	71	1.7	5.2	**1.7**
Chromium	70.56	120,000	100,000	36,000	**36,000**
Cobalt	23.85	23	660	-	**23.9**
Copper	32.09	3,100	3,000	-	**3,000**
Lead	46.1	400	80	80	**80**
Mercury	0.33	5.1	18	23	**5.1**
Molybdenum	0.547	390	380	-	**380**
Nickel	100	1,500	1,600	490	**490**
Selenium	0.98	390	380	-	**380**
Silver	0.075	390	380	390	**380**
Thallium	0.239	0.8	5	-	**5**
Vanadium	77.49	390	530	390	**390**
Zinc	250	23,000	23,000	-	**23,000**

Notes:

All results presented in milligrams per kilogram (mg/kg)

Cleanup goal selected using the higher value of background or appropriate health-based screening level

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-- None listed

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TABLE 1.
CLEANUP GOALS FOR METALS IN SOIL
SONOMA COUNTY, TUBBS FIRE INCIDENT
TV GEOLOGIC AREA

Metal	Background	US EPA RSL [(a)]	CalEPA CHHSL [(b)]	DTSC HERO [(c)]	Cleanup Goal
Antimony	0.252	31	30	-	**30**
Arsenic	22	0.7	0.1	0.07	**22**
Barium	370	15,000	5,200	-	**5,200**
Beryllium	1.65	160	16	15	**15**
Cadmium	0.264	71	1.7	5.2	**1.7**
Chromium	300	120,000	100,000	36,000	**36,000**
Cobalt	65.9	23	660	-	**65.9**
Copper	39.3	3,100	3,000	-	**3,000**
Lead	118	400	80	80	**118**
Mercury	0.755	5.1	18	23	**5.1**
Molybdenum	0.591	390	380	-	**380**
Nickel	93.2	1,500	1,600	490	**490**
Selenium	1.62	390	380	-	**380**
Silver	0.0644	390	380	390	**380**
Thallium	0.629	0.8	5	-	**5**
Vanadium	142	390	530	390	**390**
Zinc	112	23,000	23,000	-	**23,000**

Notes:

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b California Environmental Protection Agency, Revised California Human Health Screening Levels for Lead (http://oehha.ca.gov.risk/pdf/LeadCHHSL091709.pdf). September 2010.

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TABLE 1.
CLEANUP GOALS FOR METALS IN SOIL
SONOMA COUNTY, SONOMA VALLEY NORTH INCIDENT
Q/QOA/QPC GEOLOGIC AREA

Metal	Background	US EPA RSL [(a)]	CalEPA CHHSL [(b)]	DTSC HERO [(c)]	Cleanup Goal
Antimony	0.378	31	30	-	**30**
Arsenic	6.534	0.7	0.1	0.07	**6.5**
Barium	210.3	15,000	5,200	-	**5,200**
Beryllium	2.215	160	16	15	**15**
Cadmium	0.311	71	1.7	5.2	**1.7**
Chromium	242	120,000	100,000	36,000	**36,000**
Cobalt	37.9	23	660	-	**37.9**
Copper	49.9	3,100	3,000	-	**3,000**
Lead	117	400	80	80	**117**
Mercury	4.49	5.1	18	23	**5.1**
Molybdenum	0.98	390	380	-	**380**
Nickel	392	1,500	1,600	490	**490**
Selenium	1.841	390	380	-	**380**
Silver	0.0885	390	380	390	**380**
Thallium	0.307	0.8	5	-	**5**
Vanadium	76.69	390	530	390	**390**
Zinc	141.9	23,000	23,000	-	**23,000**

Notes:

All results presented in milligrams per kilogram (mg/kg)

Cleanup goal selected using the higher value of background or appropriate health-based screening level

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NA Statistics not conducted due to minimal detections

-- None listed

a U.S. Environmental Protection Agency, Risk-Based Screening Levels (www.epa.gov/Region9/superfund/prg). May 2016.

b California Environmental Protection Agency, Revised California Human Health Screening Levels for Lead (http://oehha.ca.gov.risk/pdf/LeadCHHSL091709.pdf). September 2010.

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TABLE 1.
CLEANUP GOALS FOR METALS IN SOIL
SONOMA COUNTY, SONOMA VALLEY NORTH INCIDENT
TV GEOLOGIC AREA

Metal	Background	US EPA RSL [(a)]	CalEPA CHHSL [(b)]	DTSC HERO [(c)]	Cleanup Goal
Antimony	0.26	31	30	-	**30**
Arsenic	6.18	0.7	0.1	0.07	**6.2**
Barium	263.2	15,000	5,200	-	**5,200**
Beryllium	2.079	160	16	15	**15**
Cadmium	0.184	71	1.7	5.2	**1.7**
Chromium	110	120,000	100,000	36,000	**36,000**
Cobalt	29.2	23	660	-	**29.2**
Copper	40.35	3,100	3,000	-	**3,000**
Lead	39.76	400	80	80	**80**
Mercury	3.19	5.1	18	23	**5.1**
Molybdenum	0.759	390	380	-	**380**
Nickel	102.7	1,500	1,600	490	**490**
Selenium	1.208	390	380	-	**380**
Silver	0.0741	390	380	390	**380**
Thallium	0.355	0.8	5	-	**5**
Vanadium	120	390	530	390	**390**
Zinc	74.5	23,000	23,000	-	**23,000**

Notes:

All results presented in milligrams per kilogram (mg/kg)

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-- None listed

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b California Environmental Protection Agency, Revised California Human Health Screening Levels for Lead (http://oehha.ca.gov.risk/pdf/LeadCHHSL091709.pdf). September 2010.

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TABLE 1.
CLEANUP GOALS FOR METALS IN SOIL
SONOMA COUNTY, SONOMA VALLEY NORTH INCIDENT
UM GEOLOGIC AREA

Metal	Background	US EPA RSL [(a)]	CalEPA CHHSL [(b)]	DTSC HERO [(c)]	Cleanup Goal
Antimony	0.13	31	30	-	**30**
Arsenic	11	0.7	0.1	0.07	**11**
Barium	206	15,000	5,200	-	**5,200**
Beryllium	1.369	160	16	15	**15**
Cadmium	0.372	71	1.7	5.2	**1.7**
Chromium	2,198	120,000	100,000	36,000	**36,000**
Cobalt	109.8	23	660	-	**109.8**
Copper	64.86	3,100	3,000	-	**3,000**
Lead	57.17	400	80	80	**80**
Mercury	0.251	5.1	18	23	**5.1**
Molybdenum	0.872	390	380	-	**380**
Nickel	2,913	1,500	1,600	490	**490**
Selenium	1.374	390	380	-	**380**
Silver	0.0393	390	380	390	**380**
Thallium	N/A	0.8	5	-	**5**
Vanadium	124.1	390	530	390	**390**
Zinc	185.7	23,000	23,000	-	**23,000**

Notes:

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-- None listed

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b California Environmental Protection Agency, Revised California Human Health Screening Levels for Lead (http://oehha.ca.gov.risk/pdf/LeadCHHSL091709.pdf). September 2010.

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TABLE 1.
CLEANUP GOALS FOR METALS IN SOIL
SONOMA COUNTY, SONOMA VALLEY SOUTH INCIDENT
QOA GEOLOGIC AREA

Metal	Background	US EPA RSL [(a)]	CalEPA CHHSL [(b)]	DTSC HERO [(c)]	Cleanup Goal
Antimony	0.314	31	30	-	**30**
Arsenic	7.589	0.7	0.1	0.07	**7.6**
Barium	262.1	15,000	5,200	-	**5,200**
Beryllium	1.184	160	16	15	**15**
Cadmium	0.388	71	1.7	5.2	**1.7**
Chromium	40.95	120,000	100,000	36,000	**36,000**
Cobalt	22.38	23	660	-	**22.4**
Copper	30.22	3,100	3,000	-	**3,000**
Lead	132	400	80	80	**132**
Mercury	0.403	5.1	18	23	**5.1**
Molybdenum	0.558	390	380	-	**380**
Nickel	48.7	1,500	1,600	490	**490**
Selenium	1.082	390	380	-	**380**
Silver	0.0737	390	380	390	**380**
Thallium	0.236	0.8	5	-	**5**
Vanadium	49.32	390	530	390	**390**
Zinc	102.3	23,000	23,000	-	**23,000**

Notes:

All results presented in milligrams per kilogram (mg/kg)

Cleanup goal selected using the higher value of background or appropriate health-based screening level

Complete statistical summary information is presented as Attachment 1

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-- None listed

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b California Environmental Protection Agency, Revised California Human Health Screening Levels for Lead (http://oehha.ca.gov.risk/pdf/LeadCHHSL091709.pdf). September 2010.

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TABLE 1.
CLEANUP GOALS FOR METALS IN SOIL
SONOMA COUNTY, SONOMA VALLEY SOUTH INCIDENT
TV GEOLOGIC AREA

Metal	Background	US EPA RSL [(a)]	CalEPA CHHSL [(b)]	DTSC HERO [(c)]	Cleanup Goal
Antimony	0.259	31	30	-	**30**
Arsenic	6.43	0.7	0.1	0.07	**6.4**
Barium	217.3	15,000	5,200	-	**5,200**
Beryllium	1.864	160	16	15	**15**
Cadmium	0.185	71	1.7	5.2	**1.7**
Chromium	47.5	120,000	100,000	36,000	**36,000**
Cobalt	30.2	23	660	-	**30.2**
Copper	36.8	3,100	3,000	-	**3,000**
Lead	32.84	400	80	80	**80**
Mercury	0.0747	5.1	18	23	**5.1**
Molybdenum	0.573	390	380	-	**380**
Nickel	24	1,500	1,600	490	**490**
Selenium	1.732	390	380	-	**380**
Silver	0.0759	390	380	390	**380**
Thallium	0.461	0.8	5	-	**5**
Vanadium	114.3	390	530	390	**390**
Zinc	59.49	23,000	23,000	-	**23,000**

Notes:

All results presented in milligrams per kilogram (mg/kg)

Cleanup goal selected using the higher value of background or appropriate health-based screening level

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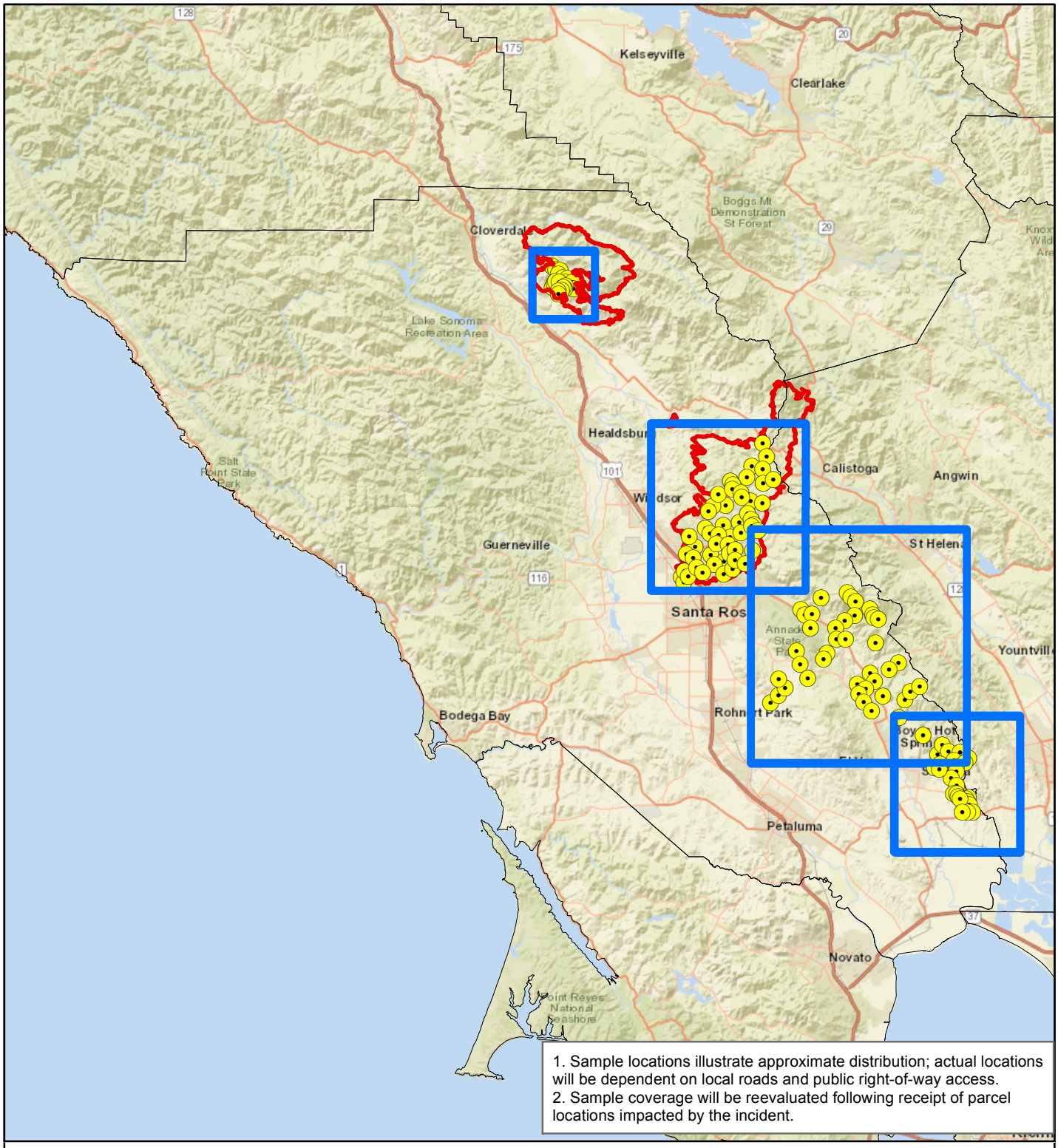
c California Department of Toxic Substances Control, Office of Human Health and Ecological Risk Assessment, Note 3 (www.dtsc.ca.gov/AssessingRisk.upload/HHRA-Note-3-2016-01.pdf). January 2016.



Background Sample Locations

Incident Boundary

Map Extents

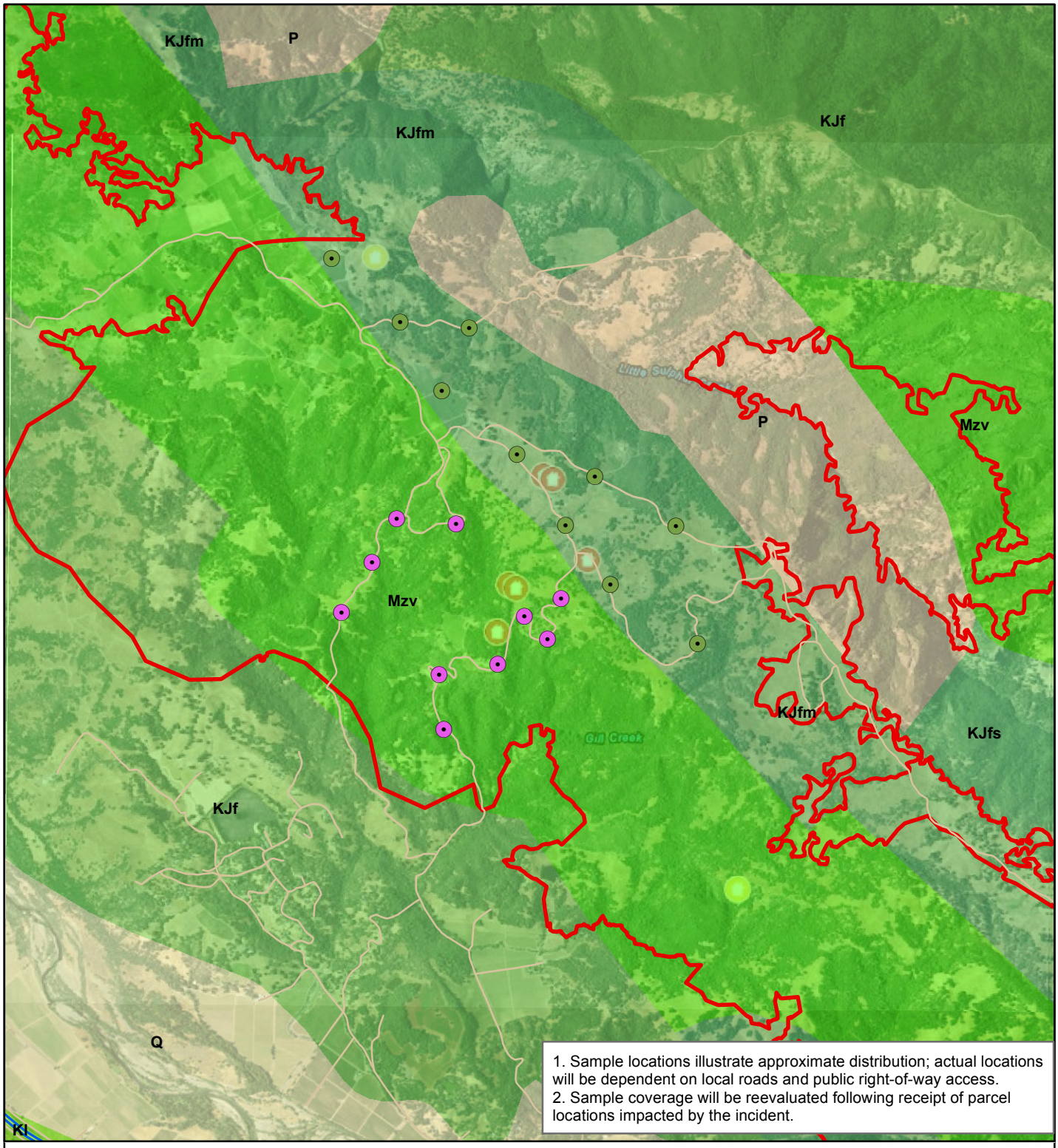
N

0 5 10 Miles

TETRA TECH

Sonoma County Fires
Sonoma County, California

BACKGROUND SAMPLE LOCATIONS



Incident Boundary

Background Sample Locations

- KJfm Formation Sample
- Mzv Formation Sample

N

0 1,500 3,000

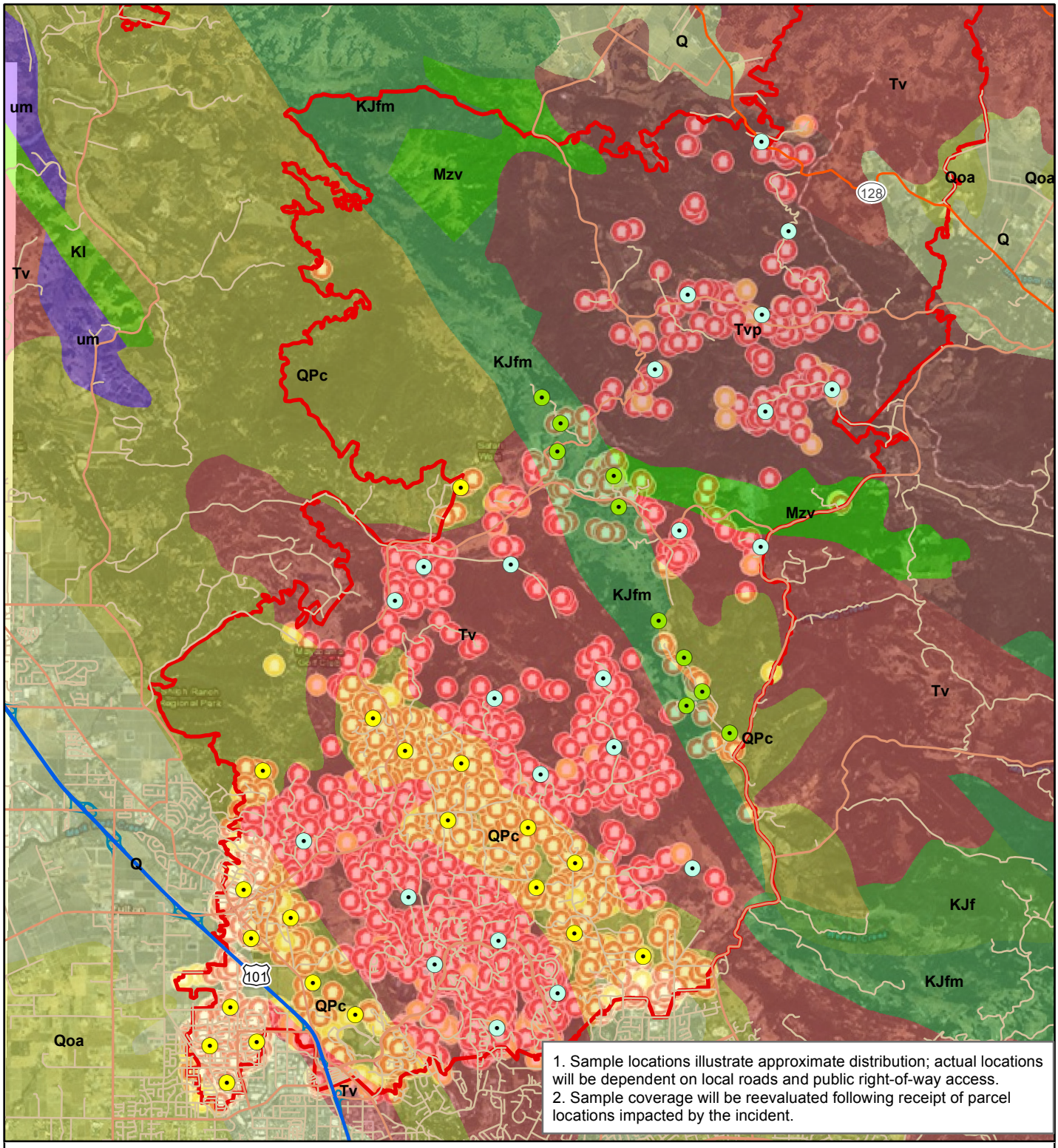
Feet

TETRA TECH

Pocket Fire Incident
Sonoma County, California

BACKGROUND SAMPLE LOCATIONS

11/2/2017 C:\CalRecycle\Pocket Fire\Pocket_BackgroundSamples.mxd TtEMI michelle.handley



1. Sample locations illustrate approximate distribution; actual locations will be dependent on local roads and public right-of-way access.
2. Sample coverage will be reevaluated following receipt of parcel locations impacted by the incident.

Incident Boundary

Background Sample Locations

- KJfm/QPc Formation Sample
- Q/QPc Formation Sample
- Tv Formation Sample

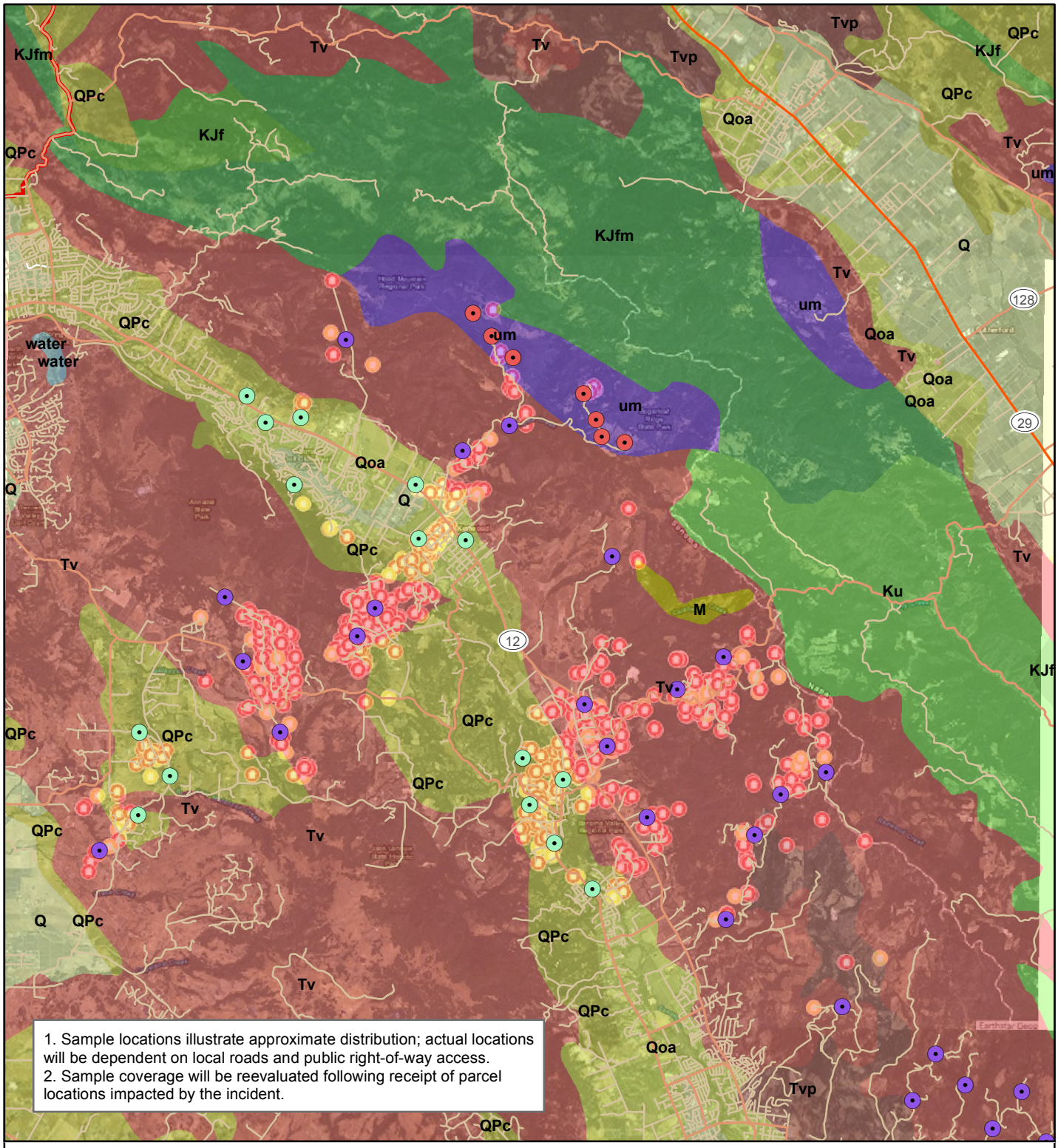
N

0 1 2 Miles

TETRA TECH

Tubbs Fire Incident
Sonoma County, California

BACKGROUND SAMPLE LOCATIONS



Incident Boundary

Background Sample Locations

- Q/Qoa/QPc Formation Sample
- Tv Formation Sample
- um Formation Sample

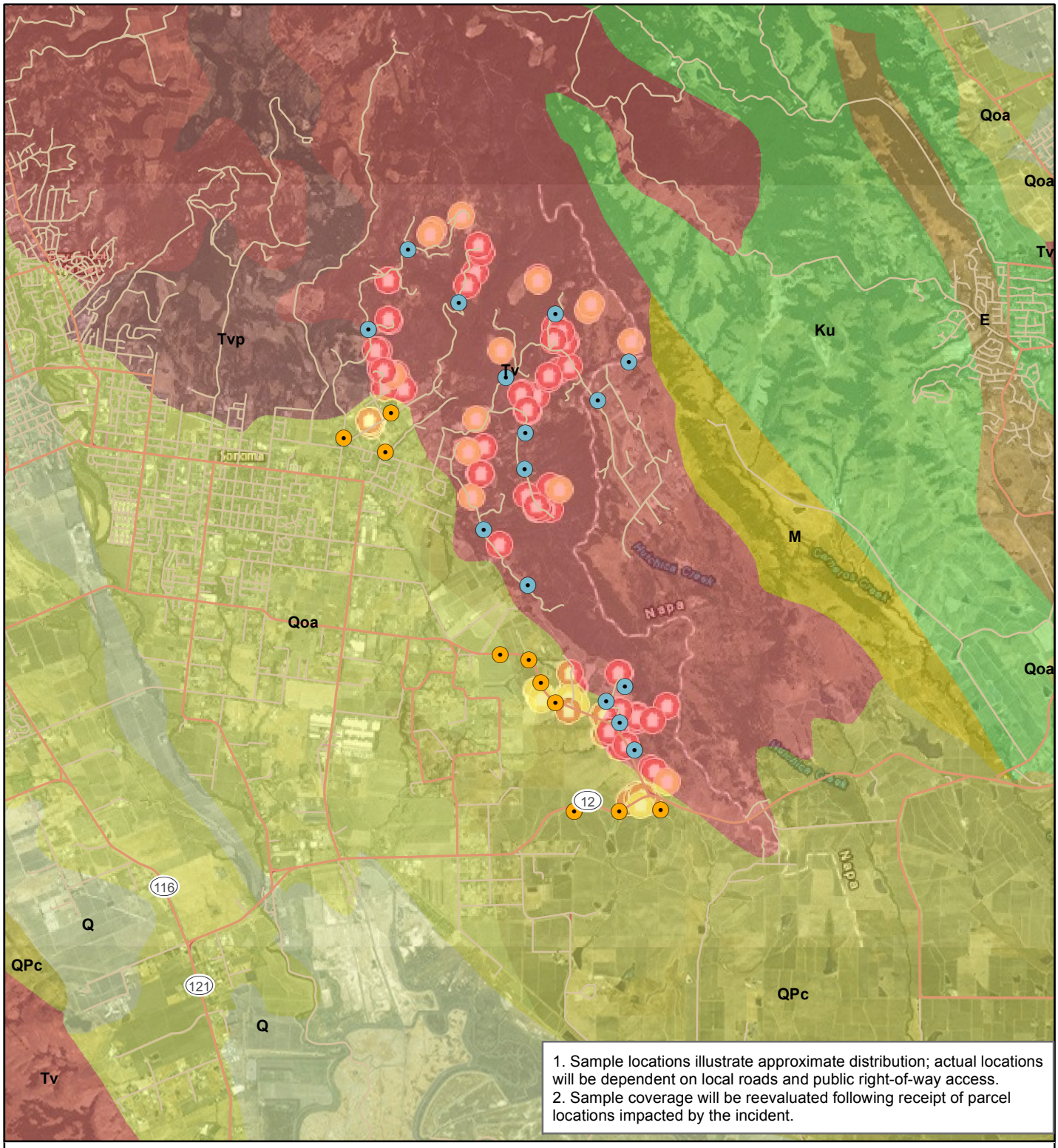
N

0 1 2 Miles

TETRA TECH

Sonoma Valley Fire Incident (North)
Sonoma County, California

BACKGROUND SAMPLE LOCATIONS



Incident Boundary

Background Sample Locations

- Qoa Formation Sample
- Tv Formation Sample

N

0 3,000 6,000

Feet

TETRA TECH

Sonoma Valley Fire Incident (South)
Sonoma County, California

BACKGROUND SAMPLE LOCATIONS

CESPK-ED-EC 23 February 2018

MEMORANDUM FOR SONOMA COUNTY

SUBJECT: US Army Corps of Engineers Revised Sonoma Tv Background Concentrations for Arsenic Using Probability Plot Statistical Evaluation

Acronyms:
DTSC = Department of Toxic Substance Control (CA)

1. Purpose. Revise background value for arsenic based on observed data in the Tv geologic formation. Multiple properties within the Tv geologic unit failed the comparison to the original regional background value derived by a contractor, Tetra Tech, during this Fire Event, suggesting a more localized background condition.

Data

Data from properties along the transition between two different geologic units were used to develop the revised background value. Following the CalOES/CalRecycle methodology, site specific borings were collected from a number of properties, but the results did not provide enough evidence to modify the original regional background. In total, 383 discrete sample values ranging from 1.4 to 410 mg/kg were used for the statistical evaluation discussed in the next section.

Statistical Evaluation

Following California Department of Toxic Substance Control guidance for determining background concentrations (DTSC, 1997), data from properties within the Tv formation along the transition between the Tv and Qpc geologic formations were placed in rank order and graphed on a cumulative probability plot for arsenic (Figure 1). Prior to inclusion, an outlier analysis was conducted and the highest value from the arsenic (Figure 1) data set was dropped from evaluation as a likely outlier.

The inflection point (change in slope) in the plotted data represent different populations of data. Generally the background concentrations are all within a linear curve starting with the lowest detected concentration which extends to the inflection point transition to site-related concentrations. Linear regression trend lines were plotted to show the correlation coefficient (R^2) of the data. A high correlation coefficient shows a stronger relationship within a data set.

Results

Arsenic

Instead of a continuous curve that smoothly transitions through the inflection point, the data indicates three populations of concentrations. The observed inflection points for arsenic occur at 22 mg/kg and 37 mg/kg. On numerous sites in California where arsenical pesticides have been used historically, this type of distribution represents the background concentration and ambient concentration. In this data set, 87% of the

data falls at or below the background value of 22 mg/kg indicated by the probability plot results. Concentrations observed up to 37 mg/kg are likely an ambient condition and not related to fire debris.

The correlation coefficients for the observed populations are 0.88 and 0.98 for background and ambient, respectively.

Further, there is some indication based on an evaluation by contractor and USACE geologists that the volcanic (Tv) and surficial (QPc) formations are related. The surficial Q units are likely derived for one or both of the volcanic Tv and QThg (volcanic QPc), and the adjacent QPc background value is 22 mg/kg arsenic, which is consistent with the observed Tv background value. Many of the properties with arsenic values higher than the original background value are on the border between the Tv and QPc formation (Figure 2).

Recommendations

The proposed background value for arsenic in the Sonoma Tv formation represented by the evaluated properties is:

Arsenic: 22 mg/kg

The US Army Corps of Engineers, as Mission Assigned by the Federal Emergency Management Administration, will implement the proposed background value as the cleanup goal for the Tv geologic unit in the Tubbs Fire and suggests that the County of Sonoma adopt this value for private homeowner debris removal efforts.

References

DTSC, 1997. SELECTING INORGANIC CONSTITUENTS AS CHEMICALS OF POTENTIAL CONCERN AT RISK ASSESSMENTS AT HAZARDOUS WASTE SITES AND PERMITTED FACILITIES, FINAL POLICY. Human and Ecological Risk Division. February.

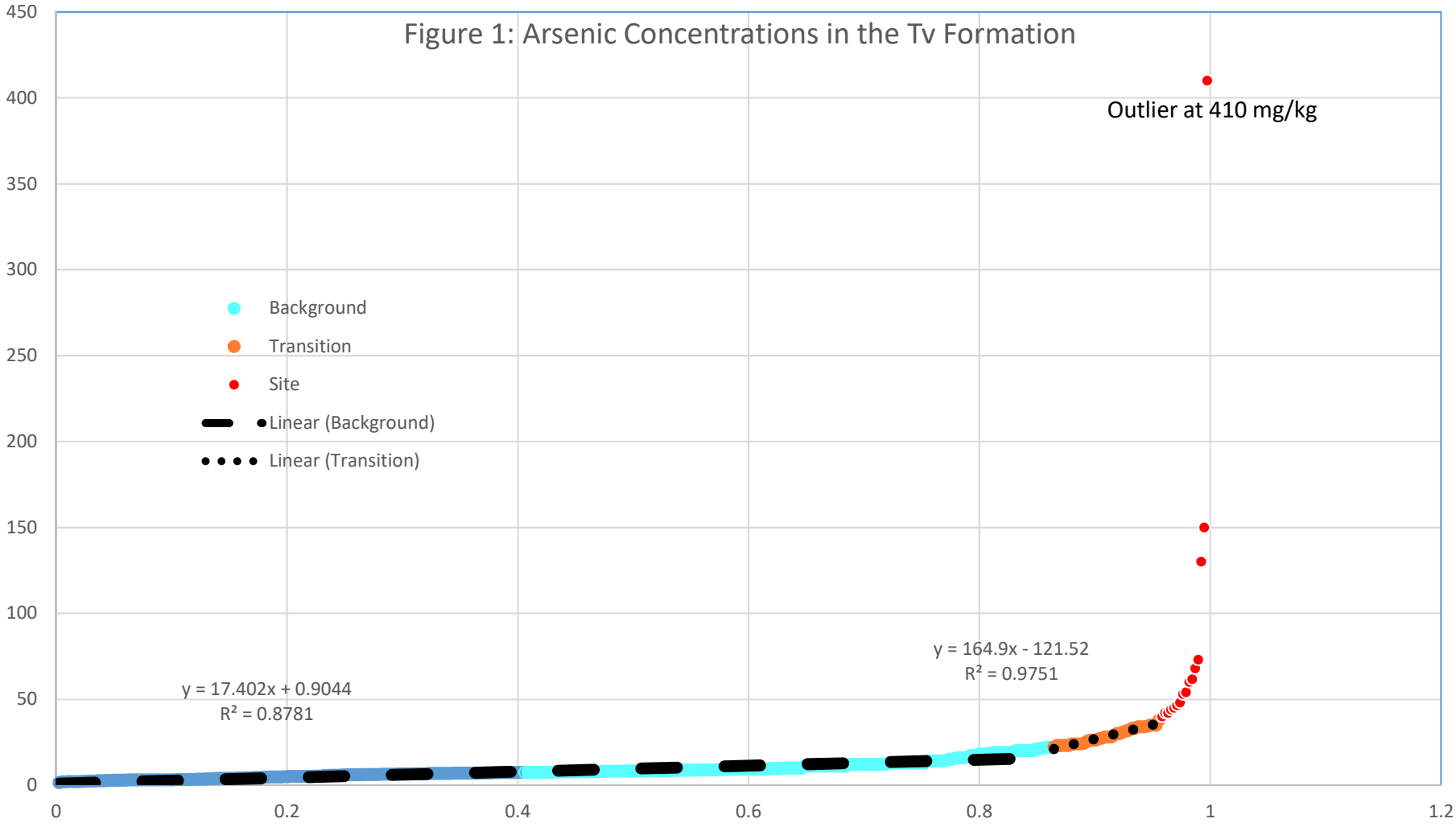
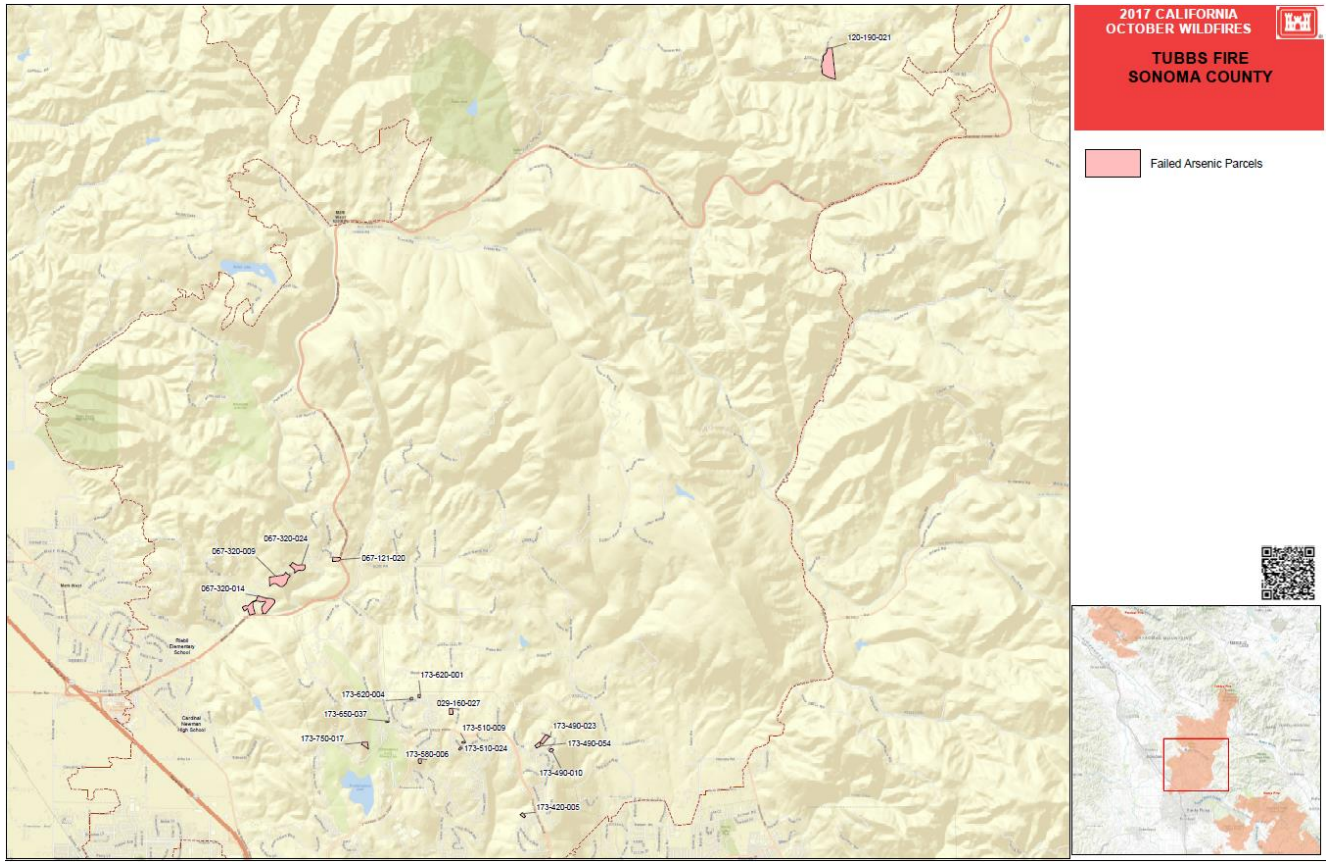


Figure 1: Arsenic Concentrations in the Tv Formation
Outlier at 410 mg/kg
Background
Transition
Site
Linear (Background)
Linear (Transition)
y = 17.402x + 0.9044
R² = 0.8781
y = 164.9x - 121.52
R² = 0.9751
450
400
350
300
250
200
150
100
50
0
0
0.2
0.4
0.6
0.8
1
1.2



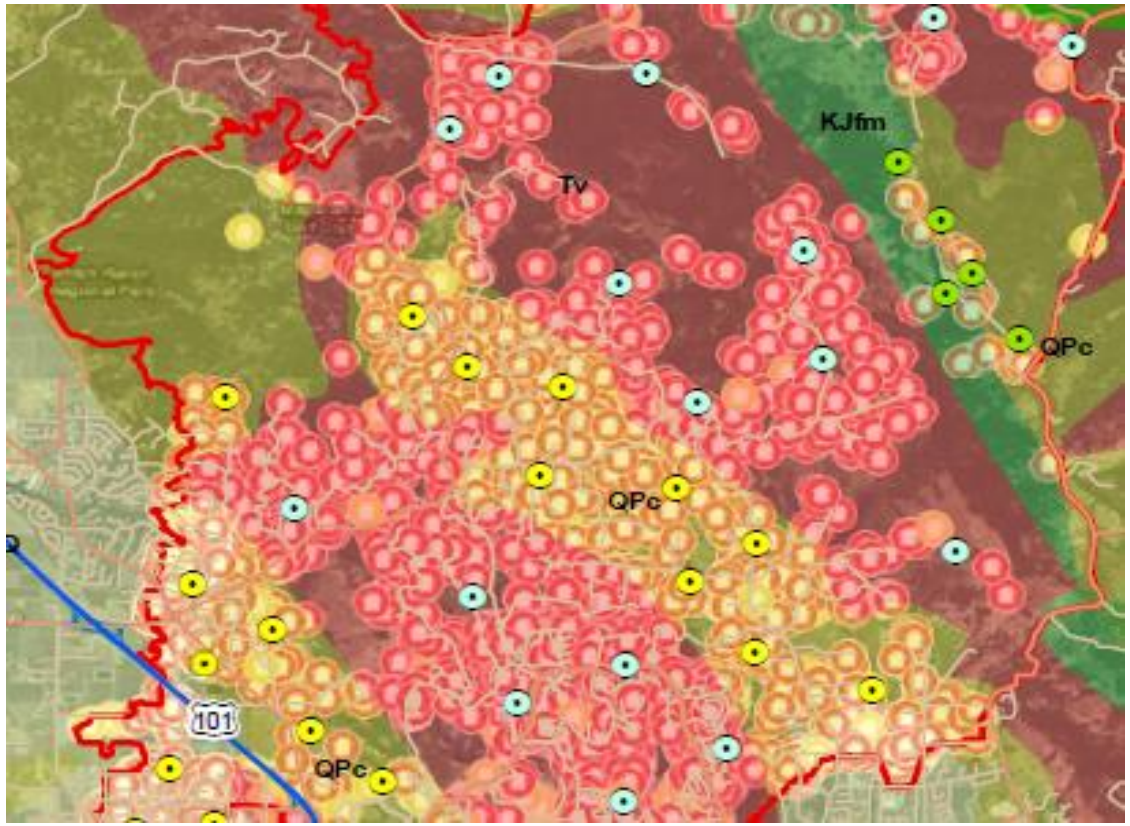


Figure 2: Left are the initial properties that failed when compared to the orignical arsenic background value of 7.2 mg/kg. Right – Geologic map showing impacted properties in the Tubbs Fire area.