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SUBJECT: DEPARTMENT OF TOXIC SUBSTANCES CONTROL RESPONSE LOCAL GOVERNMENT OFFICIALS REGARDING SOIL CONTAMINATION POST-WILDFIRE IN GREENVILLE, PLUMAS COUNTY, CALIFORNIA

Purpose

The Department of Toxic Substances Control (DTSC) prepared this memo to describe options that Plumas County or property owners may choose to take at parcels affected by the Dixie Fires[1] and emergency declaration of Greenville in Plumas County,

[1] Dixie Fire impacted Butte, Plumas, Tehama and Lassen counties.

California that are released back to local entities with elevated concentrations of metals. While this memo specifically references parcels in downtown Greenville referred to as "Zone X" (Figure 1), the protocols conducted by CalRecycle are applicable to all parcels affected by the Dixie Fire.

Overview

In January 2022, the California Office of Emergency Services (Cal OES) and CalRecycle requested DTSC's assistance related to the 2021 Disaster Debris Removal Operations - Northern Division (DR-4610/4619) in the community of Greenville, Plumas County. DTSC was contacted by CalRecycle because CalRecycle found (1) widespread elevated lead concentrations were identified by CalRecycle outside of the known debris ash footprints within Greenville, (2) concerns regarding Plumas County and the Greenville community responses regarding legacy contamination, and (3) the high likelihood that DTSC would be engaged given the potential for legacy contamination. Sampling results collected by CalRecycle lead them to assert that the elevated lead was not from the Dixie Fire. CalRecycle's findings were based on 120 background samples collected outside of debris footprints that they indicated supported widespread lead contamination not characteristic of debris. CalRecycle's conclusion was also based on confirmation samples collected in Greenville following debris removal which also exhibited elevated lead patterns inconsistent with any other communities affected by the Dixie Fire. DTSC's initial review of the CalRecycle data suggested that a significant data gap existed in a lack of samples at one foot below ground surface (bgs) and deeper, in addition to sampling needs along the Zone X boundaries.

A supplemental sampling plan to assess the data gaps was implemented, with DTSC oversight, by Tetra Tech, Inc., an environmental firm contracted by CalRecycle to establish soil background levels and confirmation sampling for the Northern Division operation during the last week of January 2022 (Figure 1). Soil samples were collected at 23 borings at depths of one-, two-, three-, five-, and ten-feet bgs.

DTSC analyzed the sampling results and found sporadic occurrences of elevated concentrations of metals that exceeded the Cal OES and CalRecycle Cleanup Goals used for disaster debris removal activities. Elevated concentrations of metals, when encountered, were primarily observed in the 1-foot samples. These data do not suggest the presence of widespread or uniform contamination within the 23 borings.

Given these findings, DTSC recommends CalRecycle follow their existing protocols and test for metal concentrations in the underlying soil. DTSC also recommends that these sampling results be compared against the DTSC residential or commercial screening levels.

DTSC's recommendations to Cal OES and CalRecycle are provided in DTSC's memo – *DTSC Response to State Officials Regarding Soil Contamination Post-Wildfire in Greenville, Plumas County, California (March 2022).*

Background

Lead was the primary metal detected above the screening criteria used by Cal OES and CalRecycle during the subject debris removal operations. Arsenic and mercury were detected above screening criteria at a subset of the properties with lead contamination. DTSC's screening level for lead in residential soils is 80 milligrams per kilogram (mg/kg) or parts per million (ppm).[2] For consistency and ease of reading, units will be provided in ppm in this document.

In general, the confirmation sampling conducted by Tetra Tech, in accordance with the executed contract to conduct necessary site assessment and soils analysis for the subject operation, was performed in the footprint of burned structures, where the term "structures" includes buildings, RVs, vehicles, and motorcycles, following the removal of such debris. That is, the sampling efforts performed by Tetra Tech were focused on establishing if residual contamination caused by the fire was still present. Sampling was also conducted to establish area background and site-specific levels outside the burn footprints, which is independent of the confirmation samples.

DTSC's sampling activities were conducted in areas not affected by the burned structures. Figure 1 presents the additional 23 sampling locations. Sampling occurred here because these areas would be expected to provide additional data needed to fill the data gaps.

DTSC Recommended Screening Criteria for Lead

DTSC recommends using the health-based lead screening criterion of 80 ppm when comparing the composite sample results collected in the scrape footprint. The 80 ppm is consistent with the current cleanup level under the CalRecycle program.

The Cal OES/CalRecycle screening criteria for lead of 103 ppm is a calculated upper background limit.[3] The state agencies used this criterion to distinguish metals contamination in Dixie Fire ash and debris from the soil underneath and unrelated to the fire. The area of Greenville, known as "Zone X," is in a geological zone called Unit Q. CALOES/CalRecycle used a statistical measurement known as an "upper tolerance

[2] Human and Ecological Risk Office (HERO) Note 3, DTSC-modified Screening Levels (DTSC, June 2020)
[3] Background Sampling and Cleanup Goals Report, version 2, December 1, 2021, Northern Division Fires, Contract DRR21048, Lassen, Plumas, Siskiyou, Trinity and Tehama counties.

limit" (UTL) and determined that Unit Q has a higher lead background concentration than surrounding areas. This is the basis for the UTL of 103 mg lead/kg of soil as the cleanup goal. Ideally, it is meant to be used with single sample results.

CalRecycle uses cleanup goals that are health-based unless the background concentration of metals present in the soil (e.g.,103 ppm for lead) is greater than the health-based concentrations. The reason is that after removing all ash and debris, the concentration of a particular metal in the underlying soil may never reach the health-based concentration if the naturally occurring background concentration is higher than the health-based goal.

DTSC's health-based cleanup goal for lead is 80 ppm for residential properties and 500 ppm for commercial or industrial properties and then generally compares it against a site-wide average/mean concentration developed for an exposure area, such as a residential parcel (500 mg/kg for a commercial/industrial parcel).

If the concentration of 80 ppm is used as a cleanup goal, the result from each 5-point composite sample can be used for comparison, as can individual samples. Any area represented by the composite that is greater than 80 ppm should be rescraped if 80 ppm mg/kg is used as the cleanup goal, unless there is supporting justification to use a site-specific goal.

Cal OES and CalRecycle can compare their sample results to the 80 ppm lead screening level We have also provided a reference to the United States Environmental Protection Agency's guidance protocols regarding the use of composite sampling at residential sites.[4]

[4] *Superfund Lead-Contaminated Residential Sites Handbook* (USEPA, August 2003)

Table 1 DTSC Screening Criteria for Chemicals of Concern (ppm)			
	Lead	**Arsenic[5]**	**Mercury[6]**
Residential	80 [7]	32	1
Commercial/ Industrial	500 [8]		4.4

Recommendation for the State Consolidated Debris Removal Program

DTSC recommends that the debris removal operations should proceed with standard operating procedures that are implemented by CalRecycle state-wide for all wildfire debris incidents. These procedures are summarized below.

The standard operating procedures used by CalRecycle may include the removal of 3", 6", 9", or up to 12" of contaminated soil from each parcel if it is deemed related to debris, based on state inspector observations and supported by sampling results. CalRecycle's existing practice is to remove 3" to 6" of contaminated soil during the structural debris removal operation. Generally, CalRecycle then conducts confirmation sampling and compare the results against DTSC's residential or commercial screening level provided in Table 1. If confirmation sampling results identify elevated metal levels above the applicable screening level, CalRecycle would remove up to an additional 6" of contaminated soil from the structural footprint ("rescrape") in the parcels where elevated metals are identified. In the event that CalRecycle suspects that the remaining contamination is not related to the current fire incident, it may collect site-specific samples to justify an alternate cleanup goal. This is consistent with current CalRecycle protocols.

As described above, based on its 23 supplemental borings, DTSC did not identify a widespread pre-Dixie Fire source of soil contamination and recommends that CalRecycle proceed according to its established protocols. Their program is designed to remove soil contamination reasonably believed to have been caused by the Dixie Fire.

[5] Per HERO Note 3, risk-based screening-level concentrations of arsenic in soil are often below naturally occurring (background) concentrations
[6] HHRA Note 3, (DTSC, June 2020)
[7] HERO Note 3, DTSC-modified Screening Levels (DTSC, June 2020)
[8] DTSC Management Memo EO-2022-01 MM, *Update to the LeadSpread Model and Revised Lead Preliminary Remediation Goals (PRGs)/Screening Levels for Soil at Residences and Commercial/Industrial Facilities* (DTSC, February 2022)

Should parcels cleaned to site-specific levels with levels of metals above health-based screening levels be returned to local authorities for release to property owners, Plumas County Environmental Health should be notified that the parcel has not met DTSC screening levels.

Options for Local Government or Property Owners

The remainder of this memo describes the actions that local officials or property owners may take to address potential exposures should parcels with elevated concentrations of metals be returned to local entities after debris removal operations.

Potential Response Actions

The following response actions may be conducted on parcels with elevated metal concentrations following scraping:

- No Action
- Institutional Controls
- Capping/Covering
- Treatment in place
- Dig and Haul

The following response actions are discussed in order of increasing level of protectiveness. A response action may be implemented independently of other response actions or in combination with others to increase the level of protection.

Response Actions Evaluation (Pros & Cons)

1. **No Action.** No action means no additional activity is taken at a parcel. If additional samples collected after scraping indicate elevated levels of contaminants, then DTSC would not recommend “no action.” Instead, we would recommend that if elevated concentrations are found, then property-specific concentrations should be evaluated. Additional actions that local representatives or property owners may choose to address potential exposures are described below.

2. **Institutional Controls (ICs).** Institutional controls include administrative actions to minimize the potential for exposure to the elevated metal concentrations in the soil.

The following ICs may be implemented in combination with other response actions to provide added safeguards and minimize the potential exposure to elevated metal concentrations:

a. Education. Local authorities may develop factsheets and hold workshops advising the property owners of steps they may take to reduce their potential exposure to metals. Education can include protective steps that can be taken by property owners should they need to disturb contaminated soil to reduce their exposure.

b. Property restrictions. In general, land use restrictions are applied to Commercial and Industrial properties restricting their use to prevent the property from being used for residential purposes unless residual contaminants are addressed to support unrestricted land use. This will apply if a commercial property owner plans to use DTSC's commercial/industrial screening criteria for lead of 500 ppm. As required by Assembly Bills (AB) 871 and AB 2436, DTSC has developed and posted to its website, Land Use Restricted Sites Lists, to provide the public easy access to information on land-use restrictions and affected sites. This list does not include residential properties.

   Also, in order to place a land-use restriction on a property, the property owner must agree to the restrictions and sign the deed restriction.
   Ordinances. The County or local agency may establish local ordinances aimed at protecting public health and safety. The ordinance would describe the permitted activities and necessary precautions to take to prevent exposure to elevated metal concentrations. The ordinances would include practices that property owners follow for future construction, gardening, and general soil best management practices. The community of Mesa de Oro created an ordinance after the United States Environmental Protection Agency created caps to prevent exposure to elevated levels of arsenic in the community's soil.[9]

In addition, the County or a local agency may adopt Best Management Practices for Soils (Attachment A) to minimize dust during rebuilding and construction. In general, wetting soil to prevent dust will minimize any potential exposures to metal concentrations that may be naturally occurring in the area.

[9] https://dtsc.ca.gov/wp-content/uploads/sites/31/2017/11/MesaDeOro_FS_LandUse_0905.pdf

3. **Capping/Covering.** Capping/covering is the placement of a barrier over the contaminated soil to prevent contact with the elevated concentrations in soil. Different materials may be used on residential or commercial parcels. However, caps/covers need long-term maintenance to prevent exposure to elevated metal concentrations. Caps/covers are often used in combination with ICs to ensure the cap/cover is maintained and not compromised. Table 2 summarizes the materials typically used to cap/cover a site.

   Clean soil should be placed over contaminated soil in the footprint of the scraped area. This creates separation between the contaminated soil and the cap/cover. The thickness of the clean soil layer should be assessed to minimize contact with elevated metal concentrations when performing maintenance and to avoid creating access and drainage issues around structures on the property.

Table 2 Cap/Cover Materials		
Cap/Cover Material	**Residential**	**Commercial**
Liner & Mulch	All areas not covered by clean soil, concrete asphalt or other materials	All areas not covered by clean soil, concrete, asphalt or other materials
Soil (2 feet)	All areas not covered by concrete or asphalt	All areas not covered by concrete or asphalt
Concrete[10]	Footprint of foundations[11], patios and walkways	Footprint of foundations and walkways
Asphalt	Footprint of play areas (e.g., basketball or volleyball court)	Footprint of play areas

   Liner & Mulch Cover. The protectiveness of a liner and mulch cover is dependent on the thickness of the liner, the thickness of the mulch layer, thickness of the clean soil layer (depth to contaminated soil), and the property owner's activities[12].

   The liner and mulch cover will prevent contact with the elevated metals that are below the clean soil layer and the cover and liner; prevent tracking of

[10] Foundations to structures would serve as long term caps with no maintenance requirements.
[11] The structures on properties with suspended first floors will also provide long-term protection from the elevated concentration of metals is soil.
[12] Grass may also provide a non-permanent cover which will prevent exposure to elevated metal soil concentrations. However, in general, grass needs daily and/or weekly maintenance to provide protection.

contaminated soil into the homes, and prevent dust with elevated concentrations of metals from becoming airborne. However, the liner and mulch layer will need maintenance. The liner and mulch must be regularly inspected to ensure it is intact (i.e., inspected for holes from burrowing animals and other activities). Additional mulch should be laid down, and the liner replaced if either becomes degraded. A liner & mulch cover is not as protective as other types of caps/covers because of the amount and frequency of maintenance recommended for this type of action.

Soil cover. A soil cover of clean fill material will protect the residents and community by covering the contaminated soil with clean soil. In general, most homeowner activities do not require digging deeper than two feet. For the average homeowner, a two-foot-thick soil cover may provide adequate protection for activities such as planting most plants or installing irrigation piping. However, if a resident digs past two feet deep, contaminated soil would be exposed and dug up, which could expose the resident or worker to the contaminated soil and any dust that is generated.

Concrete. The foundation of a structure often serves as a long-term cap and will prevent the potential exposure to elevated metal concentrations. Little to no long-term maintenance is typically needed for the first 10 to 50 years. Severe weather conditions or heavy use (e.g., snow removal) could trigger the need for more frequent maintenance.

Asphalt. An asphalt pavement laid down for a driveway, or a basketball court would serve as a long-term cap and will prevent the potential exposure to elevated metal concentrations. Depending on the design and use of the asphalt cap and sun exposure, maintenance may be minimal for the first 10 to 20 years. However, maintenance and/or replacement may be needed if the asphalt has significantly deteriorated after 20 years. Severe weather conditions or heavy use (e.g., snow removal) could trigger the need for more frequent maintenance.

4. **In Situ Treatment.** Treatment of contaminated soil can include mixing a chemical into the soil that can bind to the metals and make them less bio-available if ingested or inhaled. Bioavailability refers to the amount of the chemical that is available to be absorbed by the body.

   Phosphate Treatment. Phosphates fall into one of the broad classes of amendments that can be added to the soil to react with the lead and reduce its bioavailability. Bench testing is required to determine the formula and/or quantity of chemicals that will be used to treat the soil. The recipe may vary from property

to property. Specialized testing for bioavailability is required to assess effectiveness.

Limitations:

- Phosphate treatment is not an effective treatment for mercury or arsenic.
- Phosphate treatment has been found to be ineffective in reducing bioavailability when the lead concentrations exceed 1,000 ppm. There are numerous factors that affect the effectiveness of treatment, such as soil type, organic materials, initial concentration, moist content etc. Testing is needed to determine the effectiveness of phosphate in reducing lead's bioavailability.
- DTSC also recommends testing the soil after treatment to ensure the treatment is effective. In some cases, additional treatment may be necessary.

Dig and Haul. The contaminated soil is dug up and replaced with clean soil. Dig and haul is considered the most protective option because the contaminated soil is removed from the site. Twenty-four (24) inches of clean soil cover is considered to be protective for residential activities. For this reason, if contaminated soil is excavated to 24 inches deep and clean soil is used to fill the excavation (or 24 inches of clean soil is placed on top of the contaminated soil), this will prevent contact with contaminants for most property owners.

ATTACHMENT A
Soil Management Plan Table of Contents
[For consideration in an Ordinance]

Figure 1 - DTSC Sampling Location Map - 01

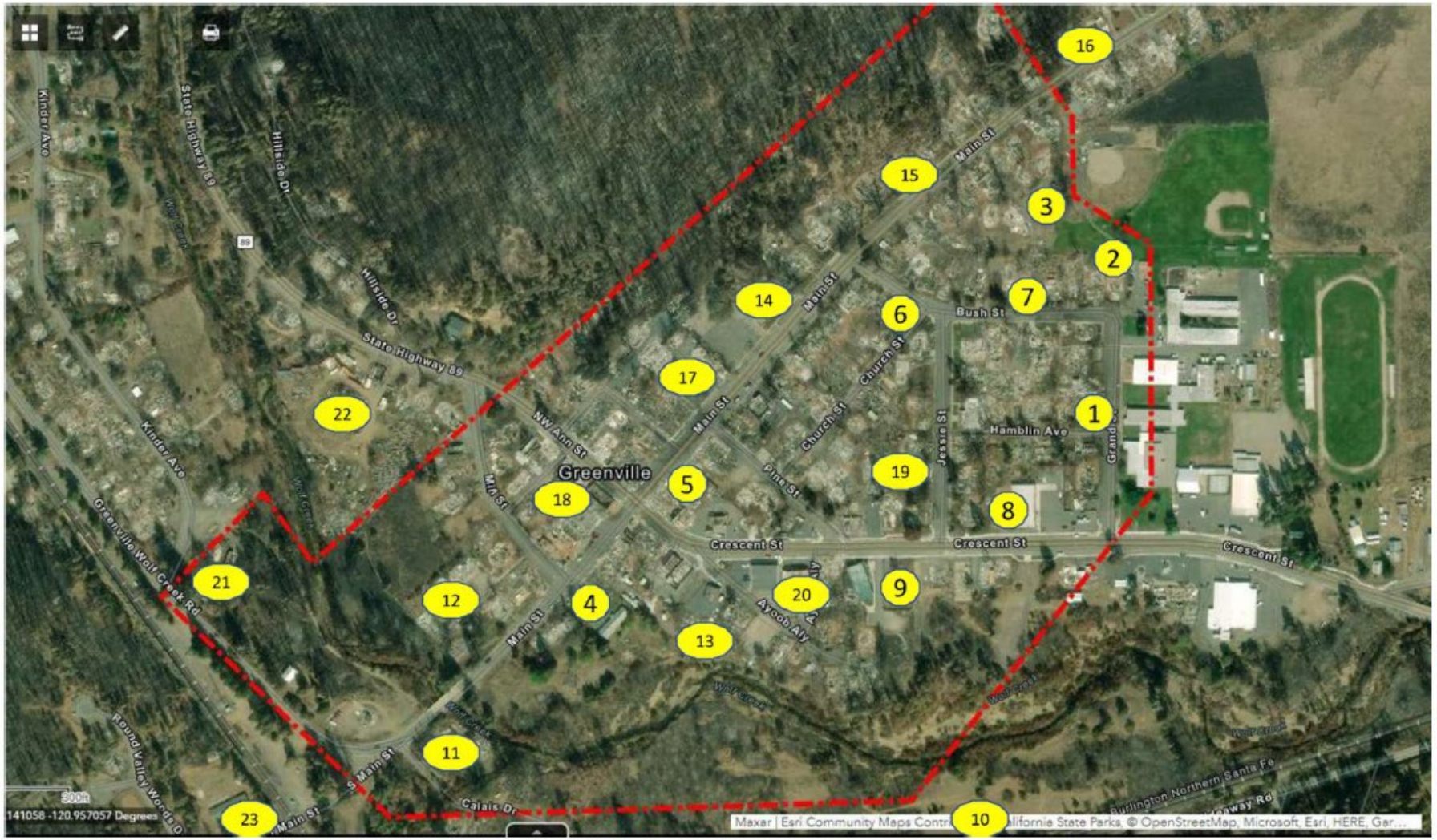

Figure 1.
DTSC Sample Location Map

DTSC Sampling Event, January 2022

Greenville, CA
Zone X

Note: 23 Sample locations are shown. Soil boring samples were collected from January 26 to 28, 2022. Soil boring locations as shown are approximate; surveyed data is not available