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Mr. Reese Crenshaw, P.E.
State Water Resources Control Board
Division of Drinking Water (DDW)
364 Knollcrest Dr., Redding CA 96002

Mr. J Stakenburg
California Office of Emergency Services
Water Task Force
3650 Schriever Avenue, Mather, CA 95655-4203

March 24, 2019

Dear Mr. Crenshaw and Mr. Stakenburg:

I am uncertain as to who in California would handle this topic for water systems affected by the Camp Fire, but because of your role on the Task Force you might be able to point me to the right organization. My concern pertains to the condition of Camp Fire area water distribution system materials, building plumbing, and their disposal. Specifically, their condition following sustained exposure to elevated levels of VOCs including benzene, which may render the infrastructure unsafe for water delivery.

I have been looking into how to handle contaminated water infrastructure Camp Fire waste. In particular, I also spoke with a leader in the private sector whose career has involved assisting organizations nationwide determine what is solid waste and what is hazardous waste. Page 2 describes the approach I followed to explore this question. My concern is that some of the infrastructure has become inherently "hazardous" due to VOC loading, and thus some components may now be a Resources Conservation and Recovery Act (RCRA) "hazardous waste." If the materials are now "hazardous" by definition, they would require special removal, disposal actions, not like solid waste. It's unclear if the utilities have received guidance about what their contaminated materials are: hazardous or solid waste. Both have been removing damaged meters from what I have been told.

We know that VOCs prefer to be in plastic components more than water, so an aqueous VOC concentration would likely be less than that the VOC concentration inside the plastic (i.e., pipe, meter, gasket). The common waste characterization test however to determine if a material is toxic (and therefore classified as hazardous waste) has a 0.5 mg/L (500 ppb) benzene regulatory threshold. This is the toxicity characterization leaching procedure or TCLP test which is similar to what's happening in the water systems. The DDW found greater than 2.217 mg/L benzene in a water sample from Lancaster Drive. Hundreds of ppb of benzene have been found in some other drinking water samples. Finally, if the water itself contains greater than 0.5 mg/L of benzene would that prompt the water to be considered a hazardous waste? Liquids can be considered both solid waste and hazardous waste.

Thank you in advance for your feedback. The unprecedented nature and scale of this disaster is raising questions that I do not believe have been encountered previously. Those involved in handling these materials through the response and recovery effort would benefit from clarity on this topic. This would also benefit those who in the future may experience similar disasters.

Sincerely,

Andrew Whelton, Ph.D.
Lyles School of Civil Engineering, Division of Environmental and Ecological Engineering

Proposed Waste Classification Determination of Contaminated Water System Materials

To determine if a material is a solid waste or hazardous waste the following logic may be applicable.

Question 1. Is the VOC contaminated material a solid waste? – Probably.

Question 2. Is the material considered a hazardous waste? – Unclear, must answer additional questions

Question 3. Is the material a RCRA "listed waste"? – Do not think so. A VOC contaminated water pipe, gasket, valve, meter is not found on the F, K, P, or U lists.

Question 4. Does the "mixture rule" apply? – Do not think so. The waste would be currently in the ground not necessarily mixed with anything.

Question 5. Does the waste have "characteristics" that make it a "hazardous waste"?

a. Is it Ignitable? – Do not think so.
b. Is it Corrosive? – Do not think so.
c. Is it Reactive? – Do not think so.
d. Is it Toxic? – Maybe.

Question 6. To determine waste toxicity, consult *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, 1980. Here you could apply the Toxicity Characterization Leaching Procedure (TCLP) to extract heavy metals and toxic organics. Then, TCLP results would be compared against results to determine if it's a D-listed waste. You would compare the TCLP contaminant concentration due to the TCLP to regulatory limits. For example, benzene's regulatory threshold is 0.5 mg/L (500 ppb). If benzene is found greater than 0.5 mg/L, you would classify the material as "hazardous" and treat it as such for waste handling and disposal purposes.

For the water sample collected by DDW in the PID service area, a drinking water measurement was found to be greater than 2,217 ppb (2.217 mg/L). Some other drinking water samples have been found to exceed 100s of ppb of benzene. If that solid exceeded the TCLP test regulatory threshold of 0.5 mg/L, that material would be considered "hazardous waste." Because benzene prefers to be in water rather than water, we could expect a greater concentration in the plastics and under TCLP conditions more of that benzene may come out (because we're trying to get it out to see how much is there). To me, this would seem to possibly indicate that some water distribution system materials may be potentially hazardous waste and possibly the contaminated water itself. The TCLP test for a solid from my understanding would have an 18-hour soak time and other conditions. Above are the references I consulted.