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SUBJECT: Review of Analytical Report and Invoice for Papich Properties-Arroyo Grande CA Project  
Sampled 2/5/20 (EAS ID 220048)

DATE: December 7, 2020

On November 27, 2020, I received a chemical survey of soil vapor samples collected by Timothy Nelligan on 2/5/2020 from the property of Marcia Papich to determine if the results could indicate the presence of human remains in the nearby surrounding area.

In order to properly evaluate the results, several assumptions and caveats must be mentioned:

1. No control samples were collected for the current set of samples (SVP-4, SVP-05). This makes interpretation of the data difficult since there is no baseline for comparison.
2. If the assumption is that the human remains in this circumstance are buried either underneath or encased in concrete, there has been no collection/analysis of previous data for this particular scenario.
3. It is assumed that the body has not been moved/relocated.
4. It is assumed that very little plume generation occurred since the only water potentially available for compound migration was from the corpse itself (if covered or encased in concrete); therefore residual VOCs would reflect those more associated with the corpse rather than the plume. This circumstance might reveal that a few early decompositional compounds might be present due to leaching which might otherwise not be present.
5. Any association with concrete did not significantly alter the pH of the decompositional process.

Results:

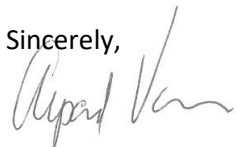
Thirty-two compounds that meet the detection criteria based on age, association, decompositional phase, soil texture/conditions, and environment should have been present. Analysis of the data indicate that 24 (75%) were present. Of the 8 additional compounds that should have been present, 2 are typically associated with the corpse (rather than the plume) as the grave ages. I would consider this a good match.

However, the one very peculiar and unusual finding was the nearly complete lack of aldehydes which are normally an important component of the decompositional process. In the two samples, only the most water soluble aldehydes (acetone and acetaldehyde) were detected. As the carbon chain increases in length, solubility in water decreases. The borderline of solubility occurs at about four carbon atoms per oxygen atom. Small aldehydes and ketones are freely soluble in water, but solubility falls with chain length. The reason for the solubility is that although aldehydes and ketones can't hydrogen bond with themselves, they can hydrogen bond with water molecules.

In this particular scenario (given the above assumptions and caveats), it appears as if the concrete did influence the evolution and liberation of some key compounds of the decompositional process. However, a 75%+ match of expected and detected compounds indicates a relatively high probability of a decompositional event.

Please let me know if you have additional questions.

Sincerely,



Arpad Vass, PhD