

EXHIBIT C

Andrew George
Baker Botts LLC
The Warner
1299 Pennsylvania Ave., NW
Washington, DC 20004
USA

January 3, 2020

RE: 2nd Report on the case of Jason Lively

Dear Mr. George,

I am writing to provide a follow-up report to the original report I submitted to you in May of this year. This report is organized in three sections: 1) Analysis of the new fire debris samples collected from the fire scene in September 2019, 2) Contextual analysis of the original fire debris samples collected in 2005, and 3) Comments on the trial transcripts.

Section 1 provides additional evidence to support the conclusion that there are no ignitable liquid residues in the fire debris. This section also indicates that toluene is not likely to be present as background in the unburned flooring material of the upstairs bedroom but is more likely to have originated from pyrolysis. Section 2 demonstrates that the dominant toluene peak identified in sample #12 or the original casework is consistent with pyrolysis of wooden flooring. Section 3 indicates how an expert witness for the state and the prosecuting attorney provided misleading statements to the jury. These findings indicate that the jury may have been provided with inaccurate and misleading information in the trial.

Section 1. Analysis of debris samples collected in September 2019.

In September, you met at the scene of the property fire in the Lively case in Iaeger, WV with several representatives of the office of the WV State Fire Marshal. One representative from the WV State Fire Marshal's Office was George Harms, who assisted with the collection of three additional samples that you sent me to analyze. The three new samples included: 1) charred flooring near the hole of the second-floor bedroom (2019 sample 1); 2) unburned flooring of the far side of the same bedroom (a control sample) (2019 control); and 3) mattress material from what remains of the burned bed (2019 mattress). To form my opinions, I applied ASTM-E1618 (Standard Test Method for Ignitable Liquid Residues in Extracts from Fire Debris Samples by Gas Chromatography-Mass Spectrometry) to conduct passive headspace analysis of the three samples collected by George Harms. My analyses included internal standards and the analysis of additional paint cans that contained positive and negative controls to provide adequate quality assurance. In summary, headspace analysis of the three new samples revealed that none of three samples contained any detectable levels of ignitable liquids.

Figure 1 shows that 2019 sample 1 contains a preponderance of pyrolysis products, including a dominant α -pinene peak at 3 minutes. **Figure 2** shows examples of extracted ion chromatograms for aromatics (m/z 91 & 105), n-alkanes (m/z 57) and branched- or cyclic-alkanes (m/z 55). The distribution of ion profiles in **Figure 2** does not resemble any typical patterns for common ignitable liquids. For reference, under the GC-MS conditions in my laboratory, toluene is expected to appear at 1.5 minutes with major peaks at m/z 91 and 92.

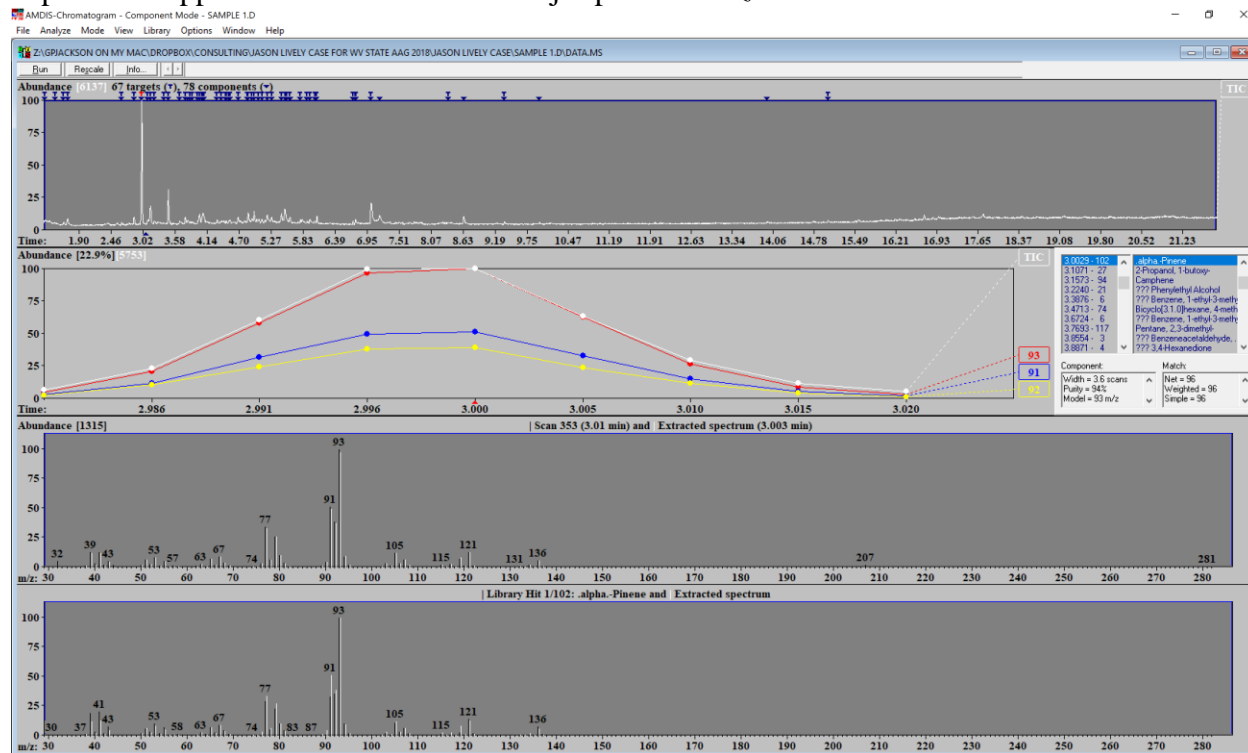


Figure 1. GC-MS results for the headspace analysis of 2019 sample 1, including: total ion chromatogram (TIC) (top panel); selected abundant ions for the peak at 3 minutes (2nd panel); extracted spectrum for the peak at 3 minutes (3rd panel); and NIST reference spectrum for α -pinene (bottom panel).

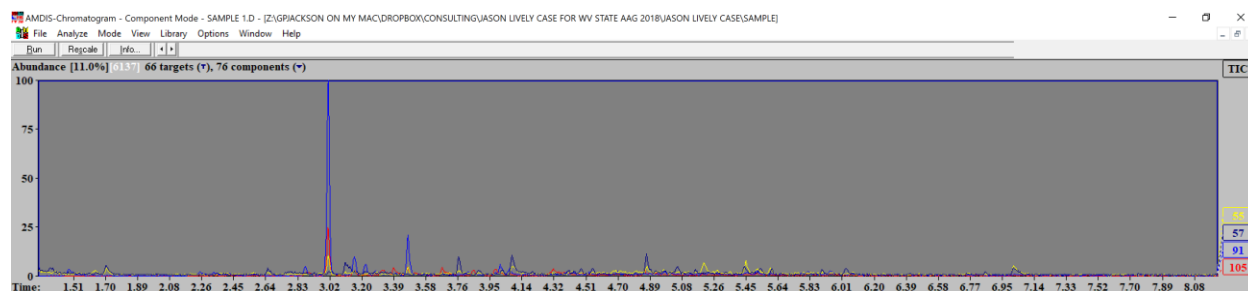


Figure 2. Selected extracted ion profiles for GC-MS of 2019 sample 1.

Figure 3 shows that the 2019 mattress sample contains a preponderance of oxygenated pyrolysis products, including an array of alcohols, ketones and carboxylic acids. **Figure 4** shows examples of extracted ion chromatograms for aromatics (m/z 91 & 105), n-alkanes (m/z 57) and branched- or cyclic-alkanes (m/z 55). The distribution of ion profiles in **Figure 4** does not resemble any typical patterns for common ignitable liquids.

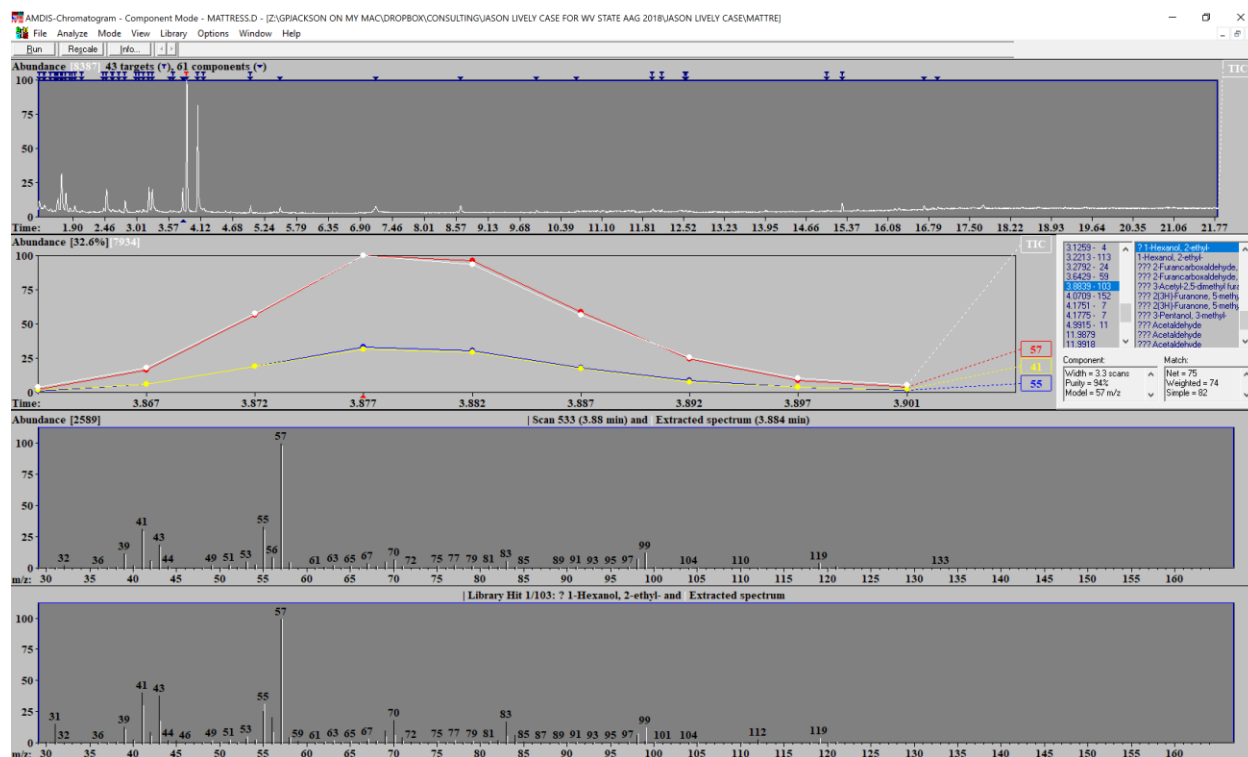


Figure 3. GC-MS results for the headspace analysis of 2019 mattress remains, including: total ion chromatogram (TIC) (top panel); selected abundant ions for the peak at 3.8 minutes (2nd panel); extracted spectrum for the peak at 3.8 minutes (3rd panel); and NIST reference spectrum for 2-ethylhexanol (bottom panel).

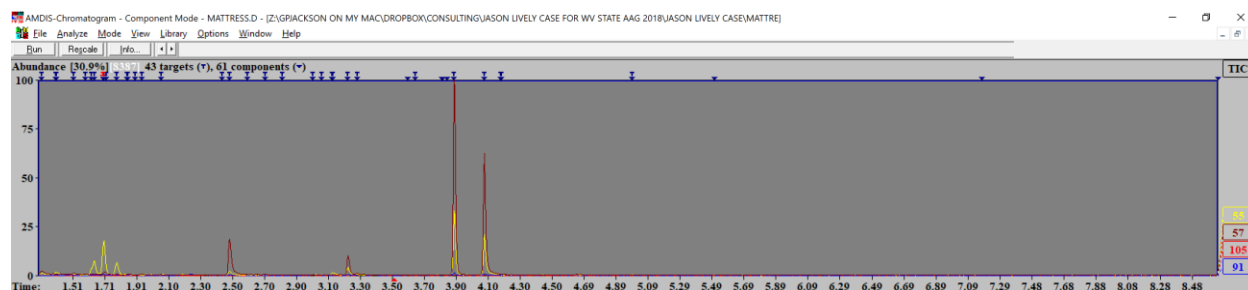


Figure 4. Selected extracted ion profiles for GC-MS of 2019 mattress remains.

Figure 5 shows that the 2019 control sample of bedroom flooring contains common background organics, including α -pinene and camphene, but no toluene or other petroleum distillates. **Figure 6** shows examples of extracted ion chromatograms for aromatics (m/z 91 & 105), n-alkanes (m/z 57) and branched- or cyclic-alkanes (m/z 55). The distribution of ion profiles in **Figure 6** does not resemble any typical patterns for common ignitable liquids.

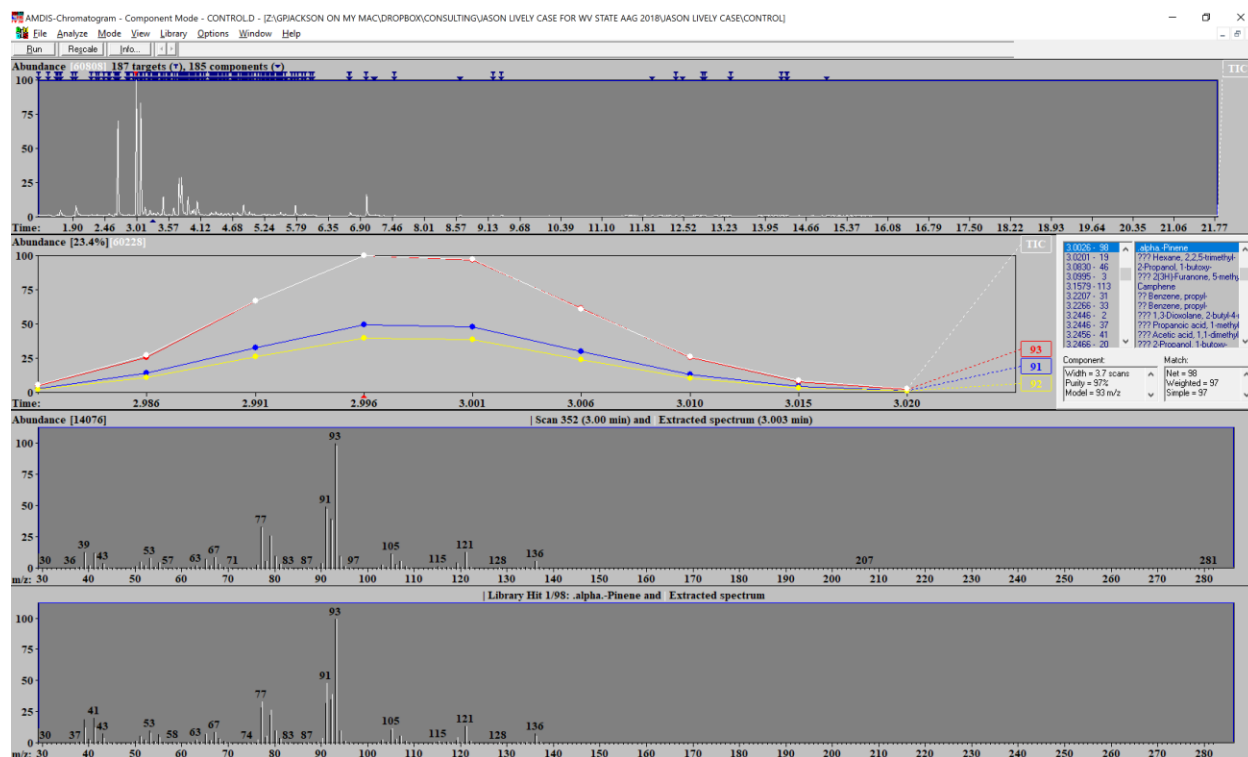


Figure 5. GC-MS results for the headspace analysis of the 2019 control bedroom floor sample, including: total ion chromatogram (TIC) (top panel); selected abundant ions for the peak at 3 minutes (2nd panel); extracted spectrum for the peak at 3 minutes (3rd panel); and NIST reference spectrum for α -pinene (bottom panel).

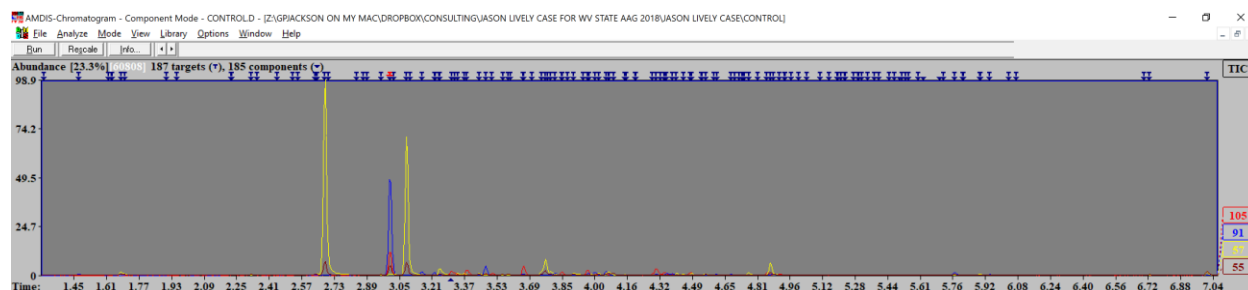


Figure 6. Selected extracted ion profiles for GC-MS of 2019 control bedroom floor.

None of the three samples contained any significant levels of toluene, especially relative to the pyrolysis/background components in the original casework. Had toluene liquid been administered to the flooring comprising 2019 sample 1, one would still expect to identify toluene residues—albeit at reduced levels—even after more than a decade. The ability of charred and uncharred remains to entrap volatiles for more than a decade is the same reason that α -pinene is also readily detectable in the 2019 sample 1 and a variety of volatile oxygenated pyrolysates are detectable in the 2019 mattress sample.

The absence of toluene in 2019 sample 1 supports the hypothesis that liquid toluene was not administered on this sample. The absence of toluene in 2019 sample 1 does not exclude the possibility that toluene liquid was used in the original fire, but it does lower the probability of

reaching that conclusion. Without detailed schematics regarding the locations of 2019 sample 1 and the original sample #12 (collected in 2005), it is difficult to make any additional comments about the expected similarities and differences between the two samples.

One precautionary note about pyrolysis is that the products formed during pyrolysis are highly idiosyncratic and sensitive to temperature, substrate material and oxygen supply. Therefore, samples containing the same substrate but exposed to different temperatures or oxygen supplies can provide different distributions of pyrolysis products. This is to say that the presence of toluene, α -pinene or 2-ethylhexanol as a pyrolysis product in one sample does not guarantee that the same compounds will be detected in the same abundance in a 'replicate' pyrolyzed sample in the same structure fire.

One modest update to my previous report involves the insignificant levels of toluene in the 2019 control sample of flooring. The minimal levels in the 2019 control sample indicate that the toluene identified in the floor samples of the original case (sample # 12) are unlikely to have originated from naturally occurring background levels in the flooring material. However, as I will describe in section 2 below, the toluene in sample #12 is still more likely to have originated from pyrolysis than from liquid toluene, so my underlying conclusions in my first report remain unchanged.

Section 2. Contextual analysis of the original fire debris samples collected in 2005.

As I described in my previous report, it is unreasonable to use the presence of one abundant peak (e.g. toluene) in a chromatogram to justify the conclusion that a liquid form of that compound was present, as was done for toluene in sample #12. Samples from other areas of the house showed peaks for other pyrolysis products in greater quantities than the toluene found in Sample 12, and some of these chromatograms (e.g. sample #2, see **Figure 7**) are as dominated by a single component as is the toluene peak in the chromatogram in sample #12 (**Figure 8**).

WEST VIRGINIA STATE POLICE FORENSIC LABORATORY
725 JEFFERSON ROAD, SO. CHAS., WV 25309-1698
(304) 746-2186

FILE NAME : C:\MSDCHEM\1\DATA\031905B\0401006.D
SAMPLE ID : C05-63-1 #2 **KKP**
ANALYST :
INSTRUMENT : HEWLETT PACKARD 6890 GC - 5973N MSD

VIAL NUMBER : 4
ACQUISITION METHOD: IG_LQ_MS
DATE OF ANALYSIS: 19 Mar 2005 14:21

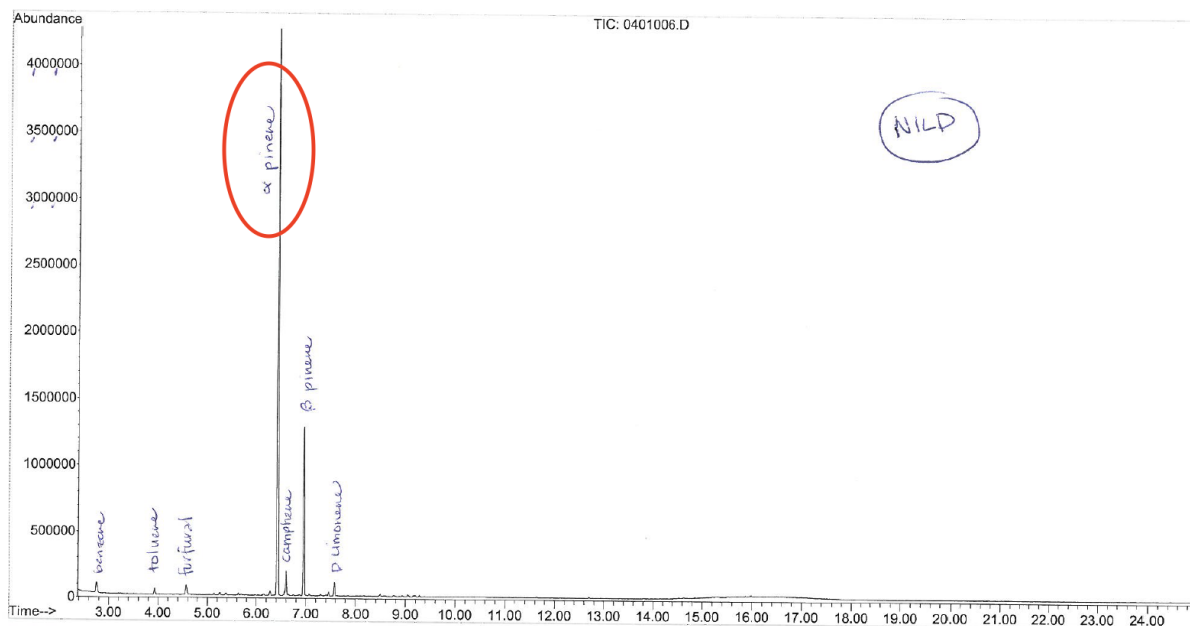


Figure 7. Chromatogram from the State Fire Marshal's report showing one dominant pyrolysis product (α -pinene) at an elevated level in sample #2. In the original report, no ignitable liquids were identified in this sample.

FILE NAME : C:\MSDCHEM\1\DATA\031905B\1401026.D
SAMPLE ID : C05-63-1 #12 *K14P*
ANALYST :
INSTRUMENT : HEWLETT PACKARD 6890 GC - 5973N MSD

VIAL NUMBER : 14
ACQUISITION METHOD: IG_LQ_MS
DATE OF ANALYSIS: 20 Mar 2005 1:32

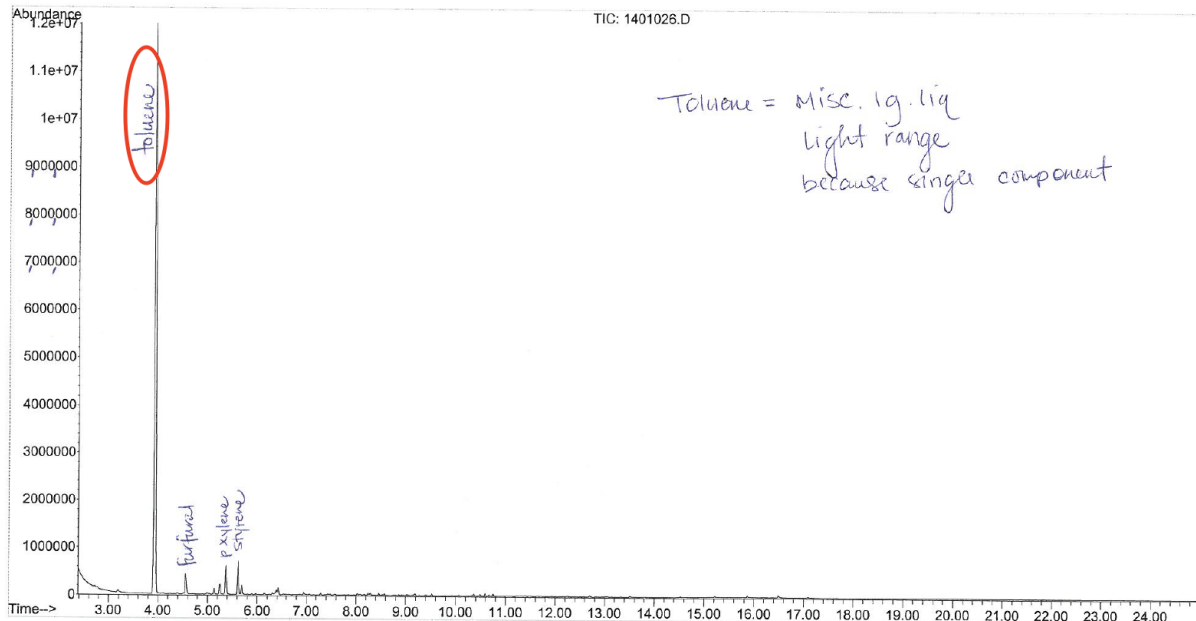


Figure 8. Chromatogram from the State Fire Marshal's report showing one dominant pyrolysis product (toluene) at an elevated level in sample #12. In the original report "miscellaneous ignitable liquid, light range" was identified in this sample.

If the State's forensic laboratory had applied consistent logic to each sample as it did for sample #12, the State should have asserted that liquid pinene was used as an accelerant in sample #2 and that liquid benzene was used as an accelerant in sample #8 (see **Figure 9**). However, there was no allegation that such compounds were used as ignitable liquids, nor that the fire originated at these additional locations. Simple logic tells us that it would be highly improbable for the fire to have been started with three different specialty liquids in three different locations in the same structure fire. For the same reason that α -pinene and benzene were not identified as ignitable liquids in samples #2 and #8, respectively, it is illogical to single out the toluene peak in sample #12 as evidence that liquid toluene was present in sample #12.

One could claim that the abundance of toluene in sample #12 is significantly greater than samples #8 and 12. Whereas the counts on the y-axis are indeed greater in sample #12 than samples #2 and #8, these abundances are only semi-quantitative and have not been corrected for the effect of sample size. For example, sample #12 may have had ten times the quantity of debris than samples #2 and #8, and the difference in sample sizes could easily explain the difference in abundance. If all the paint cans contained roughly the same quantity of debris, the result in sample #12 is still not alarming. The reason, as shown in **Figure 10**, is that sample #10 contains the pyrolysis product styrene at 1.6×10^7 counts, which exceeds the counts for toluene in sample

#12. However, the analyst quite rightly did not claim that liquid styrene must have caused the elevated level in sample #10.

In summary, if one applies equal logic to all the chromatograms in the case, one cannot justify the conclusion that sample #12 is the only sample to contain an ignitable liquid and that sample #12 contains liquid toluene.

WEST VIRGINIA STATE POLICE FORENSIC LABORATORY
725 JEFFERSON ROAD, SO. CHAS., WV 25309-1698
(304) 746-2186

FILE NAME : C:\MSDCHEM\1\DATA\031905B\1001018.D
SAMPLE ID : C05-63-#8 KKP
ANALYST :
INSTRUMENT : HEWLETT PACKARD 6890 GC - 5973N MSD

VIAL NUMBER : 10
ACQUISITION METHOD: IG_LQ_MS
DATE OF ANALYSIS: 19 Mar 2005 21:04

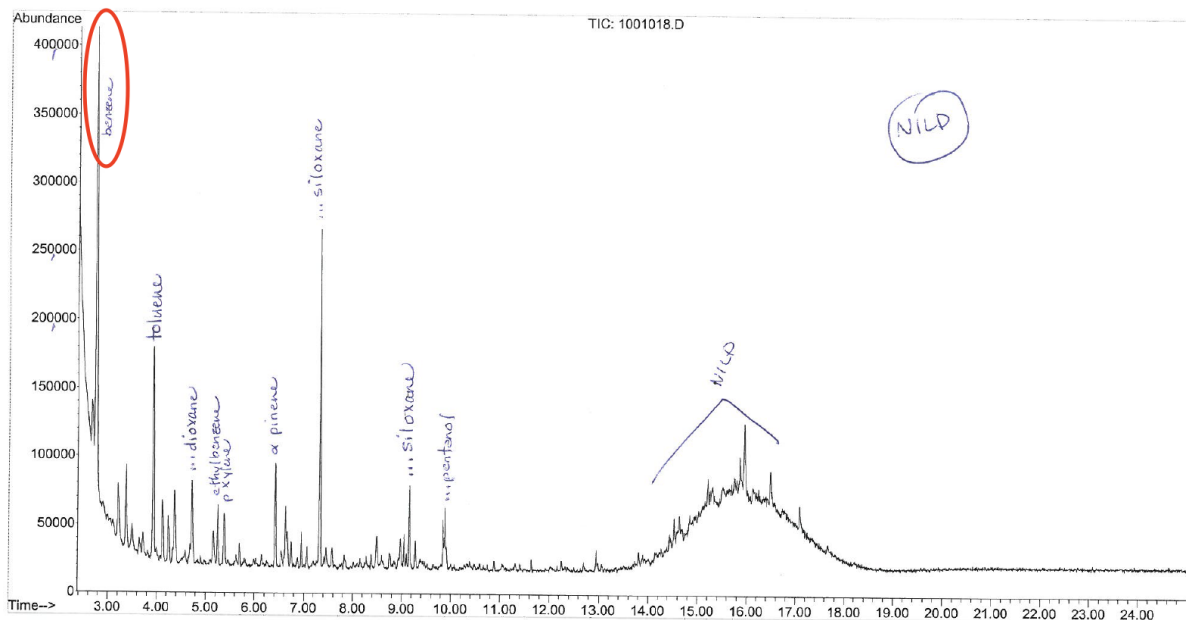


Figure 9. Chromatogram from the State Fire Marshal's report showing one dominant pyrolysis product (benzene) at an elevated level in sample #8. In the original report, no ignitable liquids were identified in this sample.

FILE NAME : C:\MSDCHEM\1\DATA\031905B\1201022.D
SAMPLE ID : C05-63-1 #10 KKP
ANALYST :
INSTRUMENT : HEWLETT PACKARD 6890 GC - 5973N MSD

VIAL NUMBER : 12
ACQUISITION METHOD: IG_LQ_MS
DATE OF ANALYSIS: 19 Mar 2005 23:18

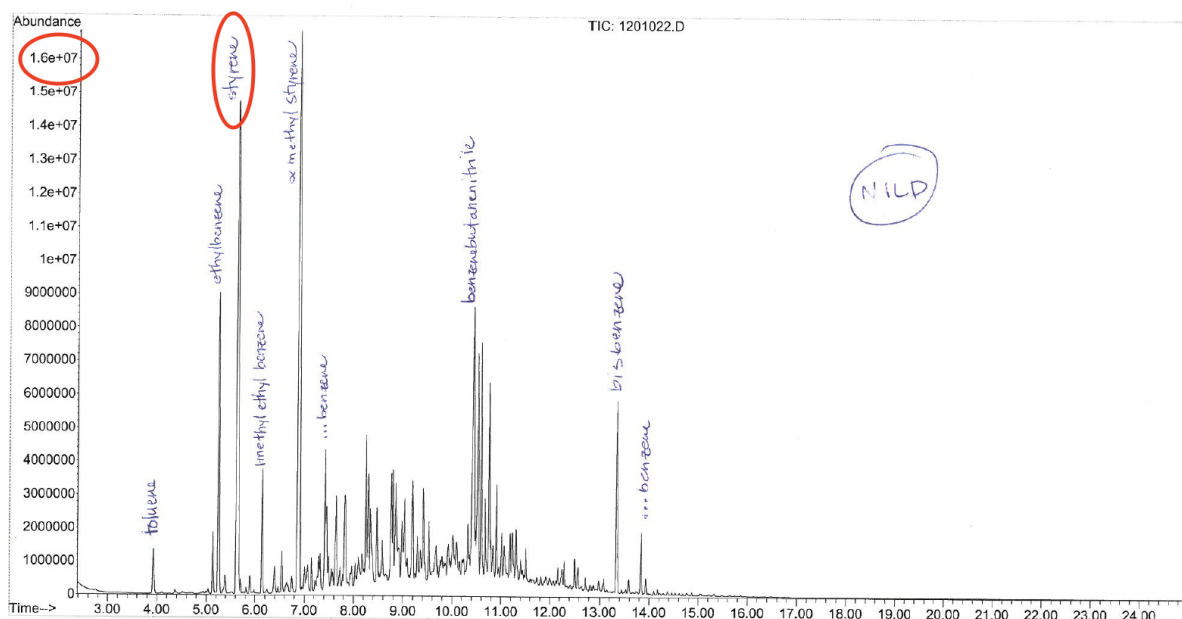
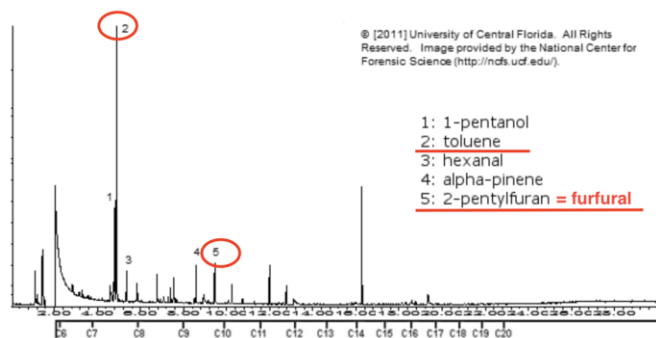


Figure 10. Chromatogram from the State Fire Marshal's report showing pyrolysis product (e.g. styrene) at abundances of 1.6×10^7 in sample #10, which is greater than the toluene peak in sample #12. In the original report, no ignitable liquids were identified in this sample.

To support the hypothesis that Sample #12 is consistent with the pyrolysis of wooden flooring, **Figure 11** shows a headspace GC/MS chromatogram of wooden laminate flooring (MRN 0179) that has been pyrolyzed for two minutes using a modified destructive distillation method (MDDM) (see <http://ilrc.ucf.edu/substrate/criteria.php> for details). This data file is publicly available on the NCFS substrate database (accessed at <http://ilrc.ucf.edu/substrate/index.php>).¹ The chromatogram of pyrolyzed wooden flooring in **Figure 11** shows a very dominant toluene peak, which is similar to the profile in sample #12. *Liquid toluene was not added, in any form, to the wooden flooring in MRN 0179 before pyrolysis, yet toluene is much more abundant than the other pyrolysis products.*

The chromatogram of the pyrolyzed wooden flooring material in MRN 0179 in **Figure 11** provides compelling evidence that wooden flooring of a slightly different nature, heated to a different temperature for a different time, could provide a profile that is consistent with sample #12 in the original casework.

¹ Since the early 2000s, the National Institute of Justice (NIJ) has funded the NCFS at UCF to provide two publicly available databases. One contains a collection of ignitable liquids at various extents of weathering (evaporation) (<http://ilrc.ucf.edu/search.php>), and the other contains substrates in their native states and with different treatments (<http://ilrc.ucf.edu/substrate/index.php>). The substrate treatments include the addition of ignitable liquids and different methods and durations of pyrolysis.



MRN	0179
HC Range	C 7-C 15
Material use class	Flooring -
Material use sub-class	Laminate
Product Name/Description	Pecan Laminate
Ignitable Liquid Residue Present	None
Method	MDDM = burned
	MDDM - 2 min.
Major Peaks	1-pentanol toluene hexanal a-pinene 2-pentylfuran
Predominat Profile	Aromatics
Material Composition	Wood
Committee Reviewed	Yes
Sample detail & download section	
Related Records	

Figure 11. Chromatogram from the NCFS’s substrate database showing one dominant pyrolysis product (toluene) at an elevated level relative to the other pyrolysis products. Note that this burned wooden laminate flooring also contains the common pyrolysis products furfural—like sample #12—and α -pinene.

Section 3: Trial transcripts

On December 5th, 2019, you also provided me with two files that included: 1) Karen Powers’ testimony (pages 1056-1069) about her tests and results; and 2) Page 1504 of Sid Bell’s closing remarks.

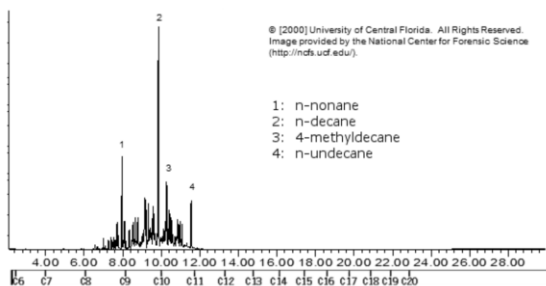
Karen Powers

Regarding these transcripts, I find one area of Ms. Powers’ testimony to be misleading. On line 19 of page 1066, Ms. Powers states that “Toluene is a component in many ignitable liquids that we find. It's a component of gasoline. It's found *by itself* in some charcoal starters, some paint thinners, or some floor strippers, things like that. It's a relatively common product.” (italics added). This statement is misleading for several reasons:

- 1) Toluene is not found “by itself” in charcoal starter fluids. In fact, I cannot find any evidence that toluene is ever present in charcoal starters. My reference data includes numerous books, the National Center for Forensic Science (NCFS) ignitable liquid reference collection and dozens of peer-reviewed articles in the last 40 years². In all the sources I can find, charcoal starters almost exclusively contain saturated hydrocarbons in the form of straight, branched or cyclic alkanes. In fact, charcoal lighters tend to be dearomatized (see ASTM E1618 and the NCFS database), which means they contain a lower abundance of aromatics (like toluene) relative to unaltered petroleum distillates. For illustration, **Figure 12** provides an example of a typical charcoal lighter fuel.

² The NCFS database shows that there are indeed some specialty solvents that contain toluene as a major component. For example, a search of “classification = miscellaneous, major peaks = toluene” shows a list of sample chromatograms with the major peaks labeled. Large toluene peaks can be seen in specialty solvents including samples 0093, 0058, 0144 and 0216. However, the charcoal lighter fluids contain a dominant distribution of branched and cyclic alkanes and are devoid of toluene. The addition of “keyword = charcoal, fluid, starter or lighter” to the search of miscellaneous liquids containing toluene as a major peak provides zero hits.

Given that sample #12 was practically devoid of the characteristic distributions of naphthenic, paraffinic or isoparaffinic compounds found in charcoal starter fuels, charcoal starter fuel can actually be ruled out as a potential source of toluene. In fairness to Ms. Powers, the NCFS database, which is searchable in matter of seconds using any internet browser, was not publicly available in 2005. However, forensic laboratories are required to have their own internal reference databases of ignitable liquids, and Ms. Powers should/would have had access to her lab's reference database.

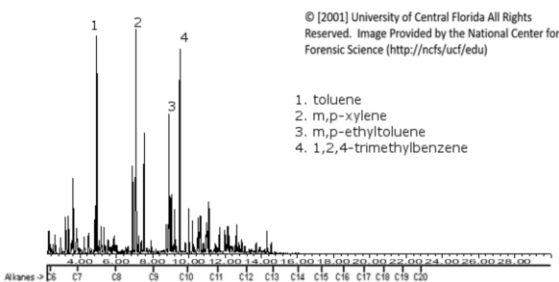


SRN	0024
Brand Name	Kingsford Odorless Charcoal Lighter (plastic bottle)
HC Range	C 8-C 11
Predominant ion profile	Alkanes
Classification	Medium petroleum distillate (MPD)
Major Peaks	4-methyldecane n-decane n-nonane n-undecane

Sample detail & download section

Figure 12. Chromatogram from the NCFS's ignitable liquid reference database showing a typical distribution of alkanes in a charcoal lighter fluid. Charcoal lighter fluids are dearomatized, which means compounds like toluene have been deliberately removed.

- 2) Whereas toluene is certainly a component of gasoline, the absence of any other components of gasoline in sample #12 dictate that gasoline can be categorically eliminated as a possible source of the toluene. **Figure 13** is an example of 50% weathered gasoline from the NCFS database. Although toluene is present, it is accompanied by a dominant series of aromatics, including xylenes, ethylbenzene, trimethyl benzenes etc. It is therefore misleading to suggest that gasoline can be a source of toluene when, in this particular case, gasoline can be easily eliminated as a possible source of the toluene.



SRN	0097
Brand Name	BP Regular Unleaded Gasoline; 50% weathered
HC Range	C 6-C 14
Predominant ion profile	Aromatics
Classification	Gasoline
Major Peaks	1,2,4-trimethylbenzene m,p-ethyltoluene m,p-xylene toluene

Related Records

Sample detail & download section

Figure 13. Chromatogram from the NCFS's ignitable liquid reference database showing a typical distribution of aromatics accompanying toluene in weathered gasoline. Such a pattern is absent in sample #12 (Figure 8), so weathered gasoline can be categorically eliminated as a possibility for the source of toluene.

Sid Bell

Lines 14-20 of page 1066 of Sid Bell's closing remarks contain the following quote: "The forensic scientist who testified identified that substance as an ignitable. And she mentioned charcoal starter fluid as one of the products that that's in. Charcoal starter fluid is one of the things you find toluene in. That sample was found on the second floor of the bedroom."

As I described in comment #1 above, the statement that charcoal starter fluids contain toluene is very misleading because most/all charcoal lighter fluids are practically devoid of aromatics like toluene. The closing remarks could easily have misled the jury to believe that a commonly occurring domestic product was used to initiate the fire. In truth, charcoal starter fluids also can be ruled out as a possible source of toluene because there is no evidence that they contain an abundance of toluene.

Disclaimer: The opinions expressed herein are based on my education, training and experience in the chemical analysis of ignitable liquids and familiarity with the fire scene literature. A summary of my education and experience is obtained in my CV (previously attached). I reserve the right to modify my opinions in light of any new evidence.

Please feel free to contact me if you have any additional questions or concerns.

Sincerely,

A handwritten signature in black ink that reads "Glen P. Jackson". The signature is written in a cursive, flowing style.

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