



WEST VIRGINIA STATE POLICE  
FORENSIC LABORATORY  
**THE LAB REPORT**  
VOLUME 5 NO. 2 — FALL 2019



**SPECIAL POINTS  
OF INTEREST:**

- Trace Evidence Focus
- The Future of Trace Evidence
- Primer Gunshot Residue, its Limitations, and Victim Kits
- To Mail or Not to Mail?

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## A MESSAGE FROM THE DIRECTOR

Hello!

Training was our focus over the summer as Assistant Laboratory Director Meredith Chambers and I, by invitation from Phillip Morrison and the staff at the WV Prosecuting Attorney’s Institute, participated in the 2019 Law Enforcement and Prosecutor Training Tour. We visited various cities across the state including Fairmont, Charles Town, White Sulphur Springs, Wheeling and Hurricane to provide valuable information and updates regarding the laboratory. We appreciated the opportunity and really enjoyed getting to meet so many law enforcement officers, face to face, to discuss concerns and answer questions. If you did not get to attend one of the training events, but would like to know more about what we presented, please don’t hesitate to contact me. As always, my email, as well as the email addresses of all laboratory staff, is located within this newsletter.

Sincerely,  
Sheri Lemons  
Forensic Laboratory Director



West Virginia State Police  
Forensic Laboratory Director—Sheri Lemons

### Links:

- [WEST VIRGINIA STATE POLICE FORENSIC LABORATORY FIELD MANUAL](#)
- [FORENSIC LABORATORY EVIDENCE SUBMISSION FORM](#)
- [CURRENT JOB POSTINGS](#)
- [FEEDBACK SURVEY](#)

## *EMPLOYEE SPOTLIGHT: Farrah Machado*

**Employee Spotlight:** Farrah Machado

**Hometown:** Winfield, WV

**Education:** Bachelor of Science in Chemistry and Master of Science in Chemistry, both from Marshall University

**Work Experience:** I've been employed by the West Virginia State Police Forensic Laboratory since August 2002, including 12 years in the Drug Identification Section and 5 years in the Trace Evidence Section.

**Role at WVSP Forensic Laboratory:** I work as a Forensic Scientist 6 in the Trace Evidence Section of the laboratory and assist in the Drug Identification Section. In the Trace Evidence Section, I conduct analyses on samples for primer gunshot residue to be identified based on the composition and morphology of particles that are present. I also analyze fire debris samples for the identification of ignitable liquids. Upon completion of my analyses, I issue a report and testify in court, if necessary.

**Favorite Part of the Job:** My favorite part of the job is that I am treated with respect and given daily encouragement.



# *Fire Debris Analysis*

**Farrah Machado**  
**Trace Evidence Section**

Fire Debris Analysis is one of the sub-disciplines included in the Trace Evidence Section. This is the examination of materials from a fire to determine the presence or absence of an ignitable liquid. What is an ignitable liquid? This is any liquid that may be ignited and that will sustain a fire after ignition. Debris should be recovered at the area of the suspected area of origin or along unusual burn (pour) patterns.

The trends in Ignitable Liquids have been fairly consistent over the last several years. Our laboratory sees gasoline as the most common ignitable liquid found in casework. Gasoline is often an accelerant of choice for arsonists because it is readily available, easy to transport, inexpensive, and easy to ignite. We also routinely identify petroleum distillates in the heavy range in many samples. This includes kerosene and diesel fuel.

For fire debris analysis, proper packaging is of the utmost importance. Samples should be submitted to the laboratory in a timely manner. Upon submission of suspected ignitable liquid samples, please make sure to indicate on the case submission form if there is suspected alcohol present or if the sample is soil. Soil samples must be refrigerated to inhibit bacteriological degradation of any ignitable liquids. Collect fire debris samples in an unused metal paint can. Some good sources for ignitable liquid residues include carpet/padding, curtains, clothing, wood flooring, corners,

protected areas, concrete, and soil. Only fill the can 2/3 full to allow room for analysis. When submitting liquid samples, pour the samples directly from the container into a clean, unused metal can or collect the samples using absorbents, such as paper towels, gauze, or commercial powders. If an absorbent is used, please submit a comparison sample to the laboratory. When large items are collected to be submitted, heat-sealed nylon/polyester bags can be used. Do not use boxes, paper bags, tin foil, trash bags, or regular plastic wrap as these will not preserve ignitable liquid residues.

In the future, we hope to expand our fire debris testing capabilities to include vegetable oils. Vegetable oils have the capability to self-heat and spontaneously ignite. These substances are widely available in today's market, in such things as food supplies, paint hardeners, and other chemical products. This detection and analysis of these substances is currently being researched further in our laboratory.

If there are any questions regarding fire debris analysis or collection of fire debris evidence, please feel free to call the Trace Evidence Section at 304-746-2468.

# PRIMER GUNSHOT RESIDUE

## *Its Limitations, and Kits*

### Nicole MacEwan Trace Evidence Section

Primer gunshot residue, also known as pGSR, is generated from the priming compound of the cartridge case and consists typically of lead, barium, and antimony. When the firing pin strikes the primer cap containing this mixture of chemicals, it creates an explosion, which ignites the propellant forcing the projectile out of the gun. The high temperature and pressure created during this explosion cause the primer mixture to vaporize. As the particles cool, they condense and solidify into tiny molten spheres that may contain the lead, barium, and antimony from the primer mixture. These tiny particles may be deposited on the shooter's hands, face, nearby surfaces, or on people or items in close proximity to where the firearm was discharged. The particles are so small that a high powered microscope, a scanning electron microscope, needs to be used to see them. For comparison, a human hair has a diameter of approximately 100 microns while many of the pGSR particles that we analyze go down to 1 micron in size.

Primer gunshot residue is a lot like chalk dust. It is easily removed and easily transferrable, therefore, it is extremely important to collect it as soon as possible. Since it is easily transferred, the quantity and location of the particles can-

not be used to predict the circumstances that occurred during the incident, nor can it give an indication of the distance from which the firearm was discharged. It is also equally important to make sure the appropriate kit is used for collection. Kits that have gauze pads or swabs are not analyzed by our laboratory. You may refer to the West Virginia State Police Forensic Laboratory Field Manual, located on [www.wvsp.gov](http://www.wvsp.gov), for more information on the type of kits we accept and analyze.



The collection device of a GSR kit for the left hand.

ARTICLE CONTINUED ON PAGE 5

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## *CONT: PRIMER GUNSHOT RESIDUE*

One common question we are asked concerning gunshot victim kits is if we can determine if the gunshot was self-inflicted or not. This question cannot be answered using primer gunshot residue. Victims of a gunshot have already been established to have been in the environment of a discharged firearm by the report of the medical examiner or medical treatment facility, therefore, the examination of their kits do not typically provide any more definitive information. Collecting these kits is still important, however, because any gunshot residue particles may be removed during treatment, transport, or autopsy. The kits do not require any specialized storage and can be analyzed long after collection. If you have specific questions concerning the analysis of gunshot victim kits or primer gunshot residue, please don't hesitate to contact the Trace Evidence Section of the laboratory at 304-746-2468.

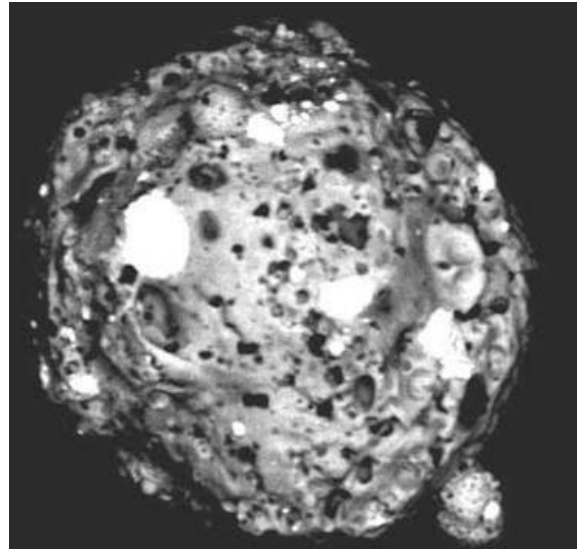


Image of a primer GSR particle using SEM/EDS



An example of the residues expelled from a firearm during the firing process.

# *The FUTURE of Trace Evidence*

**Korri Powers**  
**Supervisor, Trace Evidence Section**

The Trace Evidence Section in each laboratory is very unique. The services offered are dependent on the equipment and instrumentation available, the staffing, and the needs of the community they serve. Based on these factors, our Trace Evidence Section offers primer gunshot residue (pGSR) analysis and fire debris analysis.

Over half of the case work that comes into our Trace Evidence Section is primer gunshot residue. We currently have two scanning electron microscopy/energy dispersive X-Ray spectrometry (SEM/EDS) systems dedicated to pGSR analysis and three analysts qualified to conduct this type of analysis. These instruments run five days a week, 24 hours a day. Although these are very reliable instruments, the continuous use can take its toll. One has been in use since 2001 and the other since 2008. In forensic years, that's old. We have recently been given the thumbs up to purchase a new SEM/EDS system to replace our oldest one. We're currently gathering information on what's available, and getting bids to see what best meets our needs. Once purchased, the new instrument will need to be validated and the analysts trained on the new software before using it for casework.

The majority of ignitable liquids identified in the fire debris cases we receive are gasoline or heavy petroleum distillates, such as kerosene and diesel fuel. We have, however, seen an increase in the requests to determine if a vegetable oil is present in fire debris in recent years and are working to develop testing methods to help determine this. This service should be available in 2020 upon request.

In 2018, the Trace Evidence Section stopped offering paint and glass comparisons. This was a managerial decision, based on the extremely low number of cases requesting these services and the cost associated with keeping them available. As we continue to evaluate the needs of the customer, we may re-offer these services in the future.

As with all forensic sciences, we are not a static service. We are constantly adapting and changing the services we offer based on advancements in technology and methodology. Please let us know what type of services would be most beneficial to you and your agency as we strive to meet the needs of our customers and track the requests of the section. You may contact the Trace Evidence Section of the Laboratory at 304-746-2468.

# *To Mail or Not to Mail?*

## *How to Properly Submit Evidence to the Laboratory*

**Staci Taylor**  
**Supervisor, Central Evidence Receiving Section**

It is recommended that evidence be submitted via personal delivery to the West Virginia State Police Forensic Laboratory. This ensures that the integrity of the evidence is maintained and that it reaches the laboratory in an efficient and timely manner. However, the laboratory does accept evidence submitted via carriers such as the US Postal Service (USPS), FedEx, and UPS. The items being mailed must not violate the carrier's shipping regulations or any federal, state, or local laws.

- Loaded ammunition should not be mailed
  - ◊ Loaded ammunition cannot be mailed via USPS
  - ◊ UPS and FedEx may ship "cartridges, small arms" ammunition if properly packaged and labeled
- Acidic, caustic, corrosive, and flammable/combustible liquids should not be mailed

Evidence submissions via mail are routinely received by the laboratory, but mail can and has gotten lost or delayed. All evidence submitted via mail should have a tracking number associated with the package so that the evidence can be tracked after being placed in the mail. Certified or registered mail is recommended if using the USPS to mail evidence.

Whether submitting in person at the laboratory or through a mail carrier, all evidence must be packaged in a sealed container with initials across the seal and onto the package (see next page). The Case Submission Form (WVSP Form-53) must also be filled out completely and submitted with the evidence. If evidence is submitted through the mail, the Case Submission Form must be placed in a separate envelope and attached to the outside of the mailing container. Evidence is received by evidence custodians in the Central Evidence Receiving Section and they are not authorized to open packages to retrieve the Case Submission Form. If the Case Submission Form is not attached to the outside of the mailing package the evidence may be returned to the sender without being accepted for testing.

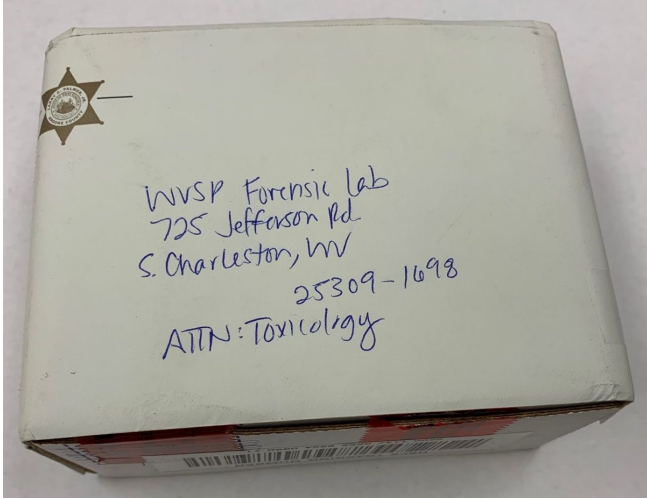
The following is required on all Case Submission Forms:

- The investigating agency name and mailing address
- The investigating officer's name
- The agency case number (this should be a unique identification assigned to only the specific investigation)
- The crime and crime date
- A detailed list of all items contained in the package(s)
- A list of all types of testing required for each item contained in the package(s)
- All known suspects' and victims' information

**ARTICLE CONTINUED ON PAGE 8**

# CONT: To Mail or Not to Mail?

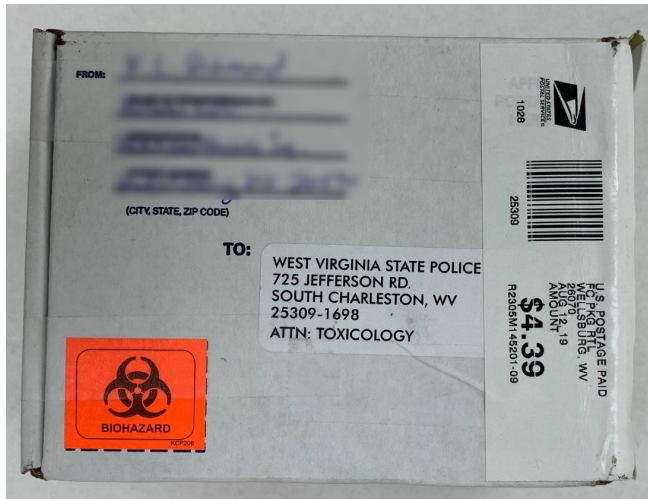
Please reference the below photographs for proper mailing requirements discussed in this article.



A kit with the submission form in a separate envelope and attached to the outside of the mailed kit.



Showing a submitted tox kit with a proper seal. Note the initials go across the tape and the box.



When mailing evidence it is recommended to use a method that will allow tracking of the mailed items.

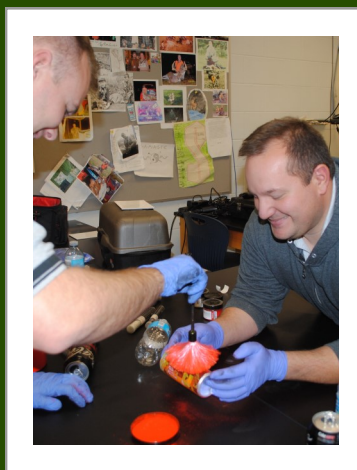


# The Crime Lab Road Show

The West Virginia State Police Forensic Laboratory is providing training opportunities for law enforcement, attorneys, and judges! To help us do this we need volunteer agencies to host a one day training opportunity. If you are an interested party please contact Blake N. Reta. (contact information below)

- One day training opportunity for any law enforcement agencies, attorneys, and judges.
- Maximum of 30 attendees.
- Training may feature 1 to 2 sections of the forensic laboratory for lecture and hands on experience with evidence collection.
- The sections that will be providing training will be agreed upon by the forensic laboratory and the volunteer host.

**Note: Law enforcement officers are eligible to obtain in-service hours for attending this training.**



**The training provided will be free to the attendees!**

**What we are asking of the host agency:**

- Provide an area (local school, department complex, etc) for training to occur
- Provide material needed for the training

**West Virginia State Police Forensic Laboratory**

Blake N. Reta  
 Email: blake.n.reta@wvsp.gov  
 Phone: 304-746-2171

**Sections of the West Virginia State Police Forensic Laboratory that can provide lecture / training include:**

- |                    |                       |                      |
|--------------------|-----------------------|----------------------|
| - Biology DNA      | - Seized Drugs        | - Biology Processing |
| - Firearm/Toolmark | - Footwear/Tire Track | - Latent Prints      |
| - Toxicology       | - Trace Evidence      | - Photography        |

## LABORATORY INFO:

West Virginia State Police  
Forensic Laboratory  
725 Jefferson Road  
South Charleston, WV 25309  
Phone: 304-746-2100

### Section Contacts:

**Biology DNA / Databasing:** [biochemistry@wvsp.gov](mailto:biochemistry@wvsp.gov)

**Biology Processing:** [cep@wvsp.gov](mailto:cep@wvsp.gov)

**Central Evidence Receiving:** [cer@wvsp.gov](mailto:cer@wvsp.gov)

**Seized Drugs:** [drugs@wvsp.gov](mailto:drugs@wvsp.gov)

**Firearms/Toolmarks:** [firearms@wvsp.gov](mailto:firearms@wvsp.gov)

**Latent Prints:** [latent.prints@wvsp.gov](mailto:latent.prints@wvsp.gov)

**Toxicology:** [toxicology@wvsp.gov](mailto:toxicology@wvsp.gov)

**Trace Evidence:** [trace@wvsp.gov](mailto:trace@wvsp.gov)

## FEEDBACK

We always welcome feedback for the upcoming newsletter!

Have comments or suggestion?

Want to know how we do something?

Need to know how we recommend to collect a specific type of evidence?

Feel free to contact the editors and suggest topics and provide us with any comments or feedback.

Your Editors,

Blake N. Reta — [blake.n.reta@wvsp.gov](mailto:blake.n.reta@wvsp.gov)

Stephen C. King — [stephen.c.king@wvsp.gov](mailto:stephen.c.king@wvsp.gov)



## Laboratory Mission and Goal

### Mission:

It is the mission of the West Virginia State Police Forensic Laboratory to provide accurate and impartial scientific support services to all criminal justice agencies operating in the State of West Virginia.

### Goal:

The goal of the West Virginia State Police Forensic Laboratory is to generate accurate, impartial, and timely scientific examinations and opinions for the criminal justice system of the State in the interest of public safety. Establish and maintain a database of convicted felons, sex offenders, case work profiles, and missing persons.

## LABORATORY STAFF:

### Lab Director:

Sheri Lemons—sharon.e.lemons@wvsp.gov

### Quality Assurance Manager:

Meredith Chambers—meredith.a.chambers@wvsp.gov

### Secretaries:

Sharon Allen—sharon.c.allen@wvsp.gov

Tonya Molek—tonya.r.molek@wvsp.gov

### Biology DNA / Databasing:

Melissa Runyan—melissa.n.runyan@wvsp.gov

Angela Gill—angela.k.gill@wvsp.gov

Bailey Hill—bailey.e.hill@wvsp.gov

Joshua Haynes—joshua.t.haynes@wvsp.gov

Nicole Johnson—nicole.l.johnson@wvsp.gov

Hanna Foreman—hannah.e.foreman@wvsp.gov

Nicholas King—nicholas.a.king@wvsp.gov

Megan Lesser—megan.m.lessner@wvsp.gov

Brandi Bentley—brandi.n.bentley@wvsp.gov

Brian Clemons—brian.j.clemons@wvsp.gov

Ian Perry—ian.t.perry@wvsp.gov

### Codis Administrator:

Brent Myers: howard.b.myers@wvsp.gov

### Central Evidence Receiving:

Staci Taylor—staci.l.taylor@wvsp.gov

Ashley Woods—ashley.j.woods@wvsp.gov

Shelli Philpott—shelli.r.philpott@wvsp.gov

Melissa Clevinger—melissa.g.clevinger@wvsp.gov

### Biology Processing:

David Miller—david.w.miller@wvsp.gov

Jennifer Howard—jennifer.a.howard@wvsp.gov

Joel Harvey—joel.b.harvey@wvsp.gov

Aaron Dean—aaron.d.dean@wvsp.gov

Sydney Jenkins—sydney.e.jenkins@wvsp.gov

### Seized Drugs:

Carrie Kirkpatrick—carrie.j.ozalas@wvsp.gov

Jared Vititoe—jared.j.vititoe@wvsp.gov

Rebecca Harrison—rebecca.e.harrison@wvsp.gov

Tara Hayslip—tara.a.hayslip@wvsp.gov

Tiffany Neu—tiffany.a.neu@wvsp.gov

Blake Kinder—blake.a.kinder@wvsp.gov

D’Nisha Hamblin—dnisha.d.hamblin@wvsp.gov

Laura A Lapczynski —laura.a.lapczynski@wvsp.gov

Courtney Miller—courtney.n.miller@wvsp.gov

Danielle Taylor—danielle.r.taylor@wvsp.gov

### Firearm/Toolmark Identification (Footwear/ Tires):

Philip Cochran—philip.k.cochran@wvsp.gov

Calissa Carper—calissa.n.carper@wvsp.gov

Blake Reta—blake.n.reta@wvsp.gov

### Latent Prints:

Stephen King—stephen.c.king@wvsp.gov

Robyn Lewis—robyn.g.lewis@wvsp.gov

LeAnne Simms—allison.l.simms@wvsp.gov

Lara D’agostin—lara.k.dagostin@wvsp.gov

### Toxicology:

Erin Spearen—erin.e.feazell@wvsp.gov

Austi Roush—austi.l.roush@wvsp.gov

Chris Jenkins—chris.d.jenkins@wvsp.gov

Courtney Tackett—courtney.l.tackett@wvsp.gov

### Trace Evidence:

Korri Powers—koren.k.powers@wvsp.gov

Nicole Macewan—nicole.r.macewan@wvsp.gov

Farrah Machado—farrah.s.machado@wvsp.gov