

---

## Technical Procedure for Impression Evidence Analysis and Processing

**1.0 Purpose** - This procedure shall be followed for the analysis, chemical and physical processing, comparison and documentation of cases submitted for impression evidence examination.

**2.0 Scope** - This procedure applies to all impression evidence cases in Latent Evidence

### 3.0 Definitions

- **Class characteristics** - An intentional or unavoidable characteristic imparted to an outsole/tire during the manufacturing process. These characteristics repeat and are shared by more than one shoe/tire. These characteristics include size, shape, outsole design, tire tread design, pre-determined nail holes, and any mold characteristics that appear in more than one outsole/tire.
- **Individual characteristics** - Cuts, wear, tears, holes, randomly placed nails, and other characteristics that are imparted to an outsole/tire as a result of general wear. These characteristics, also called accidental characteristics, are unique to a particular outsole/tire.
- **General wear characteristics** - Change of an outsole/tire as a result of general wear and tear acquired as an outsole/tire interacts with the walking/driving surface.
- **Identification/Individualization** – The decision by an examiner that there are sufficient features in agreement to conclude that a questioned impression originated from a single source. Identification of an impression to one source is the decision that the likelihood the impression was made by another (different) source is so remote that it is considered a practical impossibility.
- **Elimination/Exclusion** – A determination by a forensic scientist that there is sufficient data and disagreement present within a questioned impression and a known standard to conclude that it was not made by that source.
- **Of Value/Sufficient** – An impression that contains sufficient qualitative and quantitative data to be utilized for comparison purposes.

### 4.0 Equipment, Materials and Reagents

#### 4.1 Equipment and Materials

- Known footwear and/or known footwear standards
- Known tires and/or known tire standards
- Alternate Light Source (ALS) (Crime Scope, Mini-Crime Scope, TracER Laser)
- Latent Evidence Image Processing System (LEIPS)
- Protective Clothing
- Gloves
- Forensic Advantage (FA)
- Scanner
- Photoshop (currently utilized version)
- Photographic Equipment
- Scale(s) (standard and L-scale)
- Shoeprint Image Capture and Retrieval (SICAR) software

#### 4.2 Reagents

- 4.2.1** Reagents utilized to chemically and physically process impression evidence cases are the same as those utilized in friction ridge impression analysis and include porous, non-porous, semi-porous, blood print processing, adhesive processing, and miscellaneous processing methods.

#### **4.2.1.1. Non-Porous Processing Reagents**

- 4.2.1.1.1. Fingerprint Powder(s)** – Any of the commercially prepared fingerprint powders that are maintained within Latent Evidence (ex: black, bi-chromatic, magnetic, etc.).
- 4.2.1.1.2. Cyanoacrylate Ester** – Any of the commercially prepared cyanoacrylate ester products that are maintained with Latent Evidence (ex: vials, HotShot, wand tips).
- 4.2.1.1.3. Fluorescent Dyes** – Any of the approved fluorescent dyes currently utilized in Latent Evidence (ex: Rhodamine 6G, Ardox, etc.).

#### **4.2.1.2. Porous Processing Reagents**

- 4.2.1.2.1.** Any of the approved porous reagents currently utilized in Latent Evidence, to include:
  - 1,2 Indanedione-Zinc
  - Ninhydrin and Ninhydrin-HFE
  - Zinc Chloride and Zinc Chloride-HFE
  - Physical Developer

#### **4.2.1.3. Adhesive Processing Reagents**

- 4.2.1.3.1.** Any of the approved porous reagents currently utilized in Latent Evidence, to include:
  - Crystal Violet
  - Sticky-Side Powder
  - Tape Glo

#### **4.2.1.4. Blood Print Processing**

- 4.2.1.4.1.** Any of the approved blood print processing reagents currently utilized in Latent Evidence, to include:
  - Amido Black
  - Coomassie Blue
  - LCV
  - Merbromin

#### **4.2.1.5. Miscellaneous Processing Reagents**

- 4.2.1.5.1.** In some instances, reagents that are reactive to a specific medium are required. These reagents include, but may not be limited to:
  - Sudan Black (grease print processing)
  - Small Particle Reagent (wet print processing)

## 5.0 Quality Control (Positive Controls/Test Prints)

- 5.1** Test prints, also called control samples or positive controls, shall be performed on all prepared reagents as well as during all chemical processing steps. The test print shall be prepared on a substrate similar to the actual item of evidence and shall be tested and verified at the time a specific reagent is made and contemporaneously with evidence that is to be processed utilizing that reagent. The results of the test print shall be recorded in the case record in the FA System. A positive result is defined as the presence/development of friction ridge detail within the test print.

## 6.0 Evidence Processing Procedure

- 6.1 Physical and Chemical Processing** – Processing for the presence of impression evidence is conducted in the same manner as friction ridge impressions. While chemical and physical processing requests for impression evidence are less common, when the necessity arises the forensic scientist conducting the examination shall rely on their training and experience with friction ridge impression processing to guide them as to the most appropriate method by which to process for impression evidence.

At any step during the course of the examination and/or processing of an item of evidence the Forensic Scientist has the ability to evaluate the sufficiency of any impression evidence detail observed. If the Forensic Scientist deems it appropriate, the impression detail may be documented photographically or via a scanned image prior to proceeding to the next processing step.

An overview of the procedure for processing evidence may be found in the **Digital/Latent Technical Procedure for Friction Ridge Analysis and Processing**.

## 7.0 Impression Evidence Lifting/Casting Procedure

- 7.1** Circumstances may arise where Latent Evidence forensic scientists are required to lift and/or cast footwear and/or tire track impression(s). It is the responsibility of the forensic scientist, based on his or her training and experience, to be proficient in the methods most suited for preserving an individual impression. The proper procedures for lifting and casting impression evidence are detailed in the following documents:

- **Digital/Latent Technical Procedure for Dental Stone**
- **Digital/Latent Technical Procedure for Gelatin Lifters**
- **Digital/Latent Technical Procedure for Pathfinder**
- **Digital/Latent Technical Procedure for Powder Processing**

## 8.0 Foundation for Impression Evidence Comparison

- 8.1** All impression evidence comparisons performed within the impression evidence discipline shall be independent with conclusions based on scientifically sound premises. The laboratory recognizes the following concepts:

**8.1.1** Any time two objects come into physical contact there exists a potential for an impression.

**8.1.2** Impression evidence may be two or three dimensional in nature.

**8.1.2.1.** Two dimensional impressions are those which exhibit a length and a width.

**8.1.2.2.** Three dimensional impressions are those which exhibit a length, width, and depth.

**8.1.3** The interaction between a shoe outsole and/or a tire tread and a receiving surface will cause, over time, a wearing and changing of the outsole/tire. The resulting surface wear and any additional damage (unique identifying characteristics) that occur on the outsole/tire from interaction with the surface and other foreign objects can be subsequently used to compare unknown impressions to a set of known exemplars.

**8.1.4** A positive identification is effected with sufficient qualitative and quantitative agreement between an unknown impression and a known exemplar.

**8.1.5** There is no scientific requirement of a minimum number of unique identifying characteristics in order to effect a positive identification.

## **9.0 Impression Evidence Comparison Procedure – Analytical Approach**

**9.1** Impression evidence comparisons in Latent Evidence are conducted utilizing the Analysis, Comparison, Evaluation, and Verification (ACE-V) methodology. All ACE-V examinations involve the gathering and use of both qualitative and quantitative data present within a questioned impression in order to reach a conclusion. These examinations include comparisons of developed impressions captured photographically or via a scanner, impressions submitted on lifts, impressions submitted in photographs, impressions submitted via digital media (CDs, DVDs, and portable storage devices), and impressions submitted as casts.

**9.2** Forensic scientists in Latent Evidence conduct impression evidence comparisons utilizing a side-by-side comparison, a superimposition comparison, and/or a combination of both techniques.

**9.2.1 Side-by-side** – A questioned impression is placed next to a known standard (actual item or created standard) and a visual comparison is conducted.

**9.2.2 Superimposed** – A questioned impression is compared to a known standard by placing a clear acetate representation of an outsole/tire directly on top of the questioned impression and a visual comparison is conducted.

**9.3** All comparisons are documented in FA in the Impression Evidence tab.

### **9.4 ACE-V**

**9.4.1 Analysis** includes the assessment of each individual questioned impression to determine its suitability/sufficiency for comparison. The assessment includes the visual examination of the qualitative and quantitative information present in a questioned impression to include class characteristics (physical size, model, outsole design, tire tread design), individual characteristics (wear, cuts, nicks, tears, physical changes in the outsole and/or tire tread), and any areas where the receiving surface and or interference and distortion may reduce the clarity of the impression (ex: depth and “flatness” of the impression, movement, excessive surface or transferred substrate). The forensic scientist may document in the Impressions tab of FA any information about a questioned impression that is deemed pertinent to the examination.

During the analysis phase the forensic scientist shall determine and document if the questioned impression is sufficient (of value) for comparison purposes. Latent evidence recognizes three value conclusions for impression evidence: suitable, suitable with limitations, not suitable.

- **Suitable** – The questioned impression is “of value” for an examination that includes outsole design/tire tread design, physical size, and wear.
- **Suitable with Limitations** – The questioned impression is “of value” for a limited examination. The limitations shall be documented in FA in the Impression Evidence comparison log (ex: no scale in the image, image not taken at 90°, outsole/tire tread design elements only).
- **Not Suitable** – The questioned impression does not contain sufficient qualitative and quantitative detail to conduct a meaningful comparison.

The analysis phase is completed prior to entering the comparison phase.

**9.4.2 Comparison** of a questioned impression includes side-by-side and superimposed examinations of a questioned impression with a known standard. Known standards may be submitted by a local/federal agency and/or generated by the forensic scientist. See segment **12.0** for instructions on how to generate known standards.

Forensic scientists shall conduct the comparison in order to determine if the class, individual, and/or general wear characteristics present within a questioned impression correspond with the class, individual, and/or general wear characteristics in a known standard. The questioned impression and known standard are viewed simultaneously.

The comparison of a questioned impression is conducted the following step-wise fashion:

The forensic scientists shall conduct a visual examination using known standard and the questioned impression. One of two conclusions shall be reached:

- **Class Characteristics Do Not Correspond** - If the impression is of a different outsole/tire tread design than the known standard, the questioned impression can be eliminated as the source of the questioned impression and the examination is complete. The accepted result is that the known standard did not make the questioned impression.
- **Class Characteristics Correspond** - If the outsole design/tire tread visible in the questioned impression corresponds with the known standard, the known standard cannot be eliminated as the source of the questioned impression. Correspondence of this class characteristic dictates that the examination continues.

The known standard is then superimposed over the questioned impression (cast, photograph, or lift of a hard surface footwear impression) and visually compared to determine if the physical size, outsole/tire tread design elements, and general wear characteristics correspond to the known standards.

When the questioned impression is submitted as a cast, a gelatin lifter, or an electrostatic dust lift, any photographs of the impressions must be reversed in order to compensate for the lifted orientation of the evidence. The forensic scientist may choose to reverse the known standards for comparison purposes.

If the forensic scientist determines that the class and general wear characteristics correspond, an in-depth examination of the questioned impression is conducted to locate any unique, identifying characteristics that may be present within the impression. The known item and item standard are also examined for the presence of any unique characteristics. The unique characteristics present are then compared.

**Note:** The lack of correspondence of unique identifying characteristics does not immediately eliminate an impression as having been made by a known standard or item. The circumstances surrounding the creation of the impression (presence of substrate, movement, distortion, etc.) and the time frame in which the known item was collected may affect whether or not a characteristic is represented in an impression or remains on an outsole/tire tread. The forensic scientist shall use his or her training and experience to reach a scientifically supported conclusion.

All questioned impressions that are deemed suitable or suitable with limitations shall be compared to all available known standards.

**9.4.3 Evaluation** is when the forensic scientist compiles all data that was observed in the analysis and comparison phases and reaches a conclusion. The conclusions that may be reached are elimination, could have made, and identification. All conclusions shall be documented in the Impressions tab in the impression comparison log.

Forensic Scientist shall determine if the unique identifying characteristics present in both the questioned impression and the known standard are significant and sufficient to effect a positive identification. An identification indicates that the questioned impression was made by a particular shoe and/or tire to the exclusion of all others.

**Note:** A lack of unique identifying characteristics or insufficient characteristic significance does not eliminate the known footwear from having made a questioned footwear impression. A conclusion of *could have made* will then be rendered. The Forensic Scientist shall include the following statement in the report: *due to the lack of detail present within the questioned footwear/tire track impression a more positive association could not be made.*

**9.4.4 Verification** is an independent application of the analysis, comparison, and evaluation phases of ACE-V by another qualified examiner. All impression identifications and eliminations shall be verified. Additionally, in cases involving a death all impression conclusions, including “of value” and “could have made” determinations shall be verified.

A verification review shall be scheduled and completed in FA prior to scheduling any additional reviews. The forensic scientist acting as the verifier shall document the verification by completing the verification review.

Conflicts of opinion between the assigned forensic scientist and the verifying forensic scientist shall be resolved as provided in the lab-wide **Procedure for Reviewing Laboratory Reports**.

## 10.0 Miscellaneous Impression Examinations

**10.1** In some instances it is requested that forensic scientists in Latent Evidence analyze and compare miscellaneous impression evidence (glove impressions, cloth impressions, jewelry impressions, ear impressions, etc.). When this occurs an exam is conducted utilizing the same ACE-V methodology that is utilized in footwear and tire tread examinations.

- 10.2** It is the responsibility of the forensic scientist conducting these examinations to ensure that all conclusions and reports are based on scientifically sound premises. The results of miscellaneous impression results are often limited due to the lack of research on the uniqueness of the evidentiary item. It is at the discretion of the forensic scientist as to what opinion he or she will render.

## **11.0 Impression Search Programs**

- 11.1** The Shoeprint Image Capture and Retrieval (SICAR) system is a commercially available computerized database that is designed for the storage, capture, matching, and recognition of footwear outsole images. SICAR is updated and utilized by the forensic scientists in Latent Evidence; however, the program is maintained by an outside vendor. See the **Digital/Latent Technical Procedure for Footwear Impression Search Programs** for detailed instructions on how to operate SICAR.
- 11.2** In addition to SICAR, forensic scientists may utilize on-line searches, communication with footwear manufacturers, and professional contacts to assist them in identifying a questioned outsole design. All communications shall be documented in FA.

## **12.0 Generating Known Standards**

- 12.1** Multiple methods exist for generating both known footwear standards and known tire standards. While forensic scientists in Latent Evidence generally use an adhesive overlay method for footwear standards and printer's ink on acetate for tire standards, it is permissible to generate an additional form of known standard. It is the responsibility of the forensic scientist, based on his or her training and experience, to be aware of the various methods that may be employed and to utilize them when deemed appropriate.
- 12.2** Known standards for miscellaneous impressions (gloves, fabric, jewelry, ear, etc.) are generated in a fashion that is similar to known footwear standards and may be limited based upon the size, shape, and maneuverability of the object.
- 12.3** All standards, lifts, photographs and casts created during the examination process shall be entered into FA as an item/sub-item of evidence.

### **12.4 Known Footwear Standards – Analytical Approach**

- 12.4.1** The known shoe is placed on the work table with the sole facing upward.
- 12.4.2** Commercial fingerprint powder is applied in a thin layer to the entire outsole of the shoe using a Magna wand or fingerprint brush. Ensure that all areas of the outsole are covered.
- 12.4.3** Tap the shoe lightly on the table to remove excess powder from the outsole.
- 12.4.4** Remove the protective backing from the residue footprint lifter to expose the adhesive side. With the adhesive side facing the outsole, press one end of the lifter onto the outsole of the shoe at either the extreme heel or toe. Slowly press remainder of the lifter onto the outsole in one smooth motion. Forensic Scientists may employ a soft cloth to press/rub the non-adhesive side of the lifter; pressing lightly to ensure that even contact is made with the adhesive surface and the entire outsole.
- 12.4.5** Once the lifter has been satisfactorily pressed onto the outsole, lift one edge and remove from the outsole in a slow continuous motion.

- 12.4.6** Label the footwear standard as provided in the Laboratory Procedure for Evidence Management.

## **12.5 Known Tire Standards – Analytical Approach**

- 12.5.1** Locate an area where you can move a vehicle forward approximately one vehicle length over a hard, flat surface. An indoor garage with a concrete floor will be used if available; however, the impressions can be recorded outside if weather permits.
- 12.5.2** On a clean, dry and smooth surface, roll a 30-foot section of brown paper and tape to surface. This will provide a clean surface in the event the tire runs off of the boards, and will also prevent the inked tire from leaving an unwanted impression on the concrete surface. Pull the vehicle onto one end of the paper. Align the vehicle so that pertinent tire will run through the center of the paper during this process. Dust off any loose dirt or dust from the tire. Excess dust or dirt will contaminate the ink and impression and give false characteristics. Rocks or other objects in the grooves of the tires shall not be removed.
- 12.5.3** Using a flexible tape, measure the approximate circumference of the tire.
- 12.5.4** Measure the distance between the front and rear tires; this distance is normally longer than the circumference of the tire.
- 12.5.5** Cut cardboard to create two sections that combine to be approximately six inches longer than the circumference of the tire, yet still fit between the front and rear tires.
- 12.5.6** Tape the cardboard pieces together from the back. One section will be used as the ink board and one will be used as the board for impressions. Make sure the sections fit between the front and rear tires, but are at least a few inches longer than the circumference of the tire, so a full impression can be obtained.
- 12.5.7** Mark the entire circumference of the tire with chalk or marker in the 12, 3, 6, and 9 o'clock positions (i.e.: 1, 2, 3, 4). When the number rolls across the clear film, mark the corresponding number on the impression.
- 12.5.8** Remove ink from the can or tube and spread with the spatula at various locations over the length of the cardboard section. Spread the ink first slightly with the spatula, and then with the fingerprint roller, until it is thin and even. The final ink coating should NOT be thick, but should cover the entire surface of the cardboard.
- 12.5.9** Using the other section of the cardboard, tape the end of the roll of clear film to one end of the section roll to cover the length of the section. Cut film to fit and tape it securely to the board at each end.
- 12.5.10** Slide the inked cardboard between the tires and align it so when the vehicle rolls across it, the tire will track over the inked cardboard and not run off the side of the inked surface. Push the vehicle forward so that the tire tracks across the inked surface, inking the tread design of the tire. As the tire completes a revolution and tracks off the inked cardboard, insert the other section of the cardboard with the clear film. Do this so the vehicle will continue to track from the inked cardboard onto the film until it reaches the end. Note the starting position on the tire for future reference. Insert a small clean piece of cardboard for the inked tire to come to rest on so the ink does not pick up dirt from the surface or stick to the brown paper. Note the direction



relative to the front of the vehicle, presuming the tire has been mounted on the same side as it was on the suspect vehicle.

**12.5.11** Remove the inked cardboard and the cardboard containing the inked impression. Disconnect the clear film with the impression and hang it over a door (or lay it across a table) and let it dry overnight.

**12.5.12** For each subsequent impression, re-roll the inked cardboard with the roller to remove prior impressions and re-smooth the ink. Adjust the ink amount if necessary.

**12.5.13** Repeat the above procedure to get a second clear film impression, but shift the beginning point by half the circumference of the tire (about 3 feet) to get a full circumference impression that begins and ends differently from the first impression.

**12.5.14** After drying, carefully roll the clear film and place in a cardboard tube.

**Note:** Allow the impressions to dry for 24 hours. For a faster drying time, spray a thin layer of lacquer or polyurethane on the impressions.

## **12.6 Recording of All Analytical Data**

### **12.6.1 Information required in Every Case File:**

**12.6.1.1.** All examination activities.

**12.6.1.2.** Activities include the development techniques applied, control or reagent checks used in development techniques, photography/digital imaging used, Image Processing history logs, any footwear database searches conducted, a copy of any known standards, comparisons conducted, and conclusions reached.

**12.6.1.3.** Examination documentation shall also acknowledge the existence and disposition of any captured impressions which are not analyzed, compared or evaluated. This includes any photographs or scans taken where impressions were later determined to be not "of value."

**12.6.1.4.** When an individualization or identification is made, a comparison quality digital copy of the impression and the known exemplar used shall be retained on the Latent Evidence Image Processing System (LEIPS). The images shall remain on the hard drive until archived by the key operator. If the LEIPS is not in service for an extended period of time, the images shall be retained in the case record object repository.

### **12.6.2 Photographs/digital images and/or legible copies of questioned impressions:**

**12.6.2.1.** All photographs, digital images, or legible copies of all questioned impressions shall be retained in the case record object repository or the LEIPS. The case record includes associated LEIPS entries.

**12.6.2.2.** Legible copies of any annotations made on sub-item evidence, such as impression lifts or photographs/digital images of questioned impressions, shall be retained as examination documentation in the Case Record Object Repository.

**12.6.2.3.** Database materials. Databases which generate lists that are reference materials include the following: SICAR system. If a search results in potential source, a copy of the SICAR report shall be retained in the case record object repository.

**12.6.2.4.** The Case Record Object Repository for impression evidence cases (footwear, tire track, glove impressions) shall include a copy of all evidence submitted and any notes, photographs, copies of the standards, negatives, overlays, contact sheets, etc. used to conduct the examination. Images may be retained on the Image Processing System. The images shall remain on the hard drive until archived by the key operator. If the Image Processing System is not used, the images may be recorded in the Case Record Object Repository. The method used, and date that the footwear images or tire track images were retained, shall be recorded in the case record

**12.6.3** A full case review shall be conducted on all cases involving deaths (see **Digital/Latent Evidence Section Technical Procedure for Conducting Reviews**). The completed Full Case Review form shall be imported into the Case Record Object Repository.

### 13.0 Results Statements

**13.1** Results statements shall include an accurate interpretation of the actual results of the examination; this interpretation may include one or more of the following statements or a variation approved during the technical review process.

**Note:** There are several variations of the results possible in reports concerning impression evidence. The results are based upon the condition of the submitted questioned and known evidence which concerns the outsole design, outsole design elements, tire tread design, tire tread design elements, questioned design elements, physical size of the outsole/tire tread/questioned design elements, and the general wear (or lack of general wear) of the outsole design, outsole design elements, tire tread design, tire tread design elements, and/or questioned design elements.

**13.1.1** There was/were (number/several/overlapping) (questioned impression(s) and/or questioned footwear impression(s) and/or tire tread impression(s)) noted/developed on/in Item (Item number).

**13.1.2** The questioned footwear impression(s) noted/developed on/in Item (Item number) was/were compared to the known (right shoe(s)/left shoe(s)/ pair of shoes) submitted in Item (Item number). The questioned footwear impression(s) noted/developed on/in Item (Item number) was/were made by the known (right shoe(s)/left shoe(s)/pair of shoes submitted in Item (Item number).

**13.1.3** The questioned tire tread impression(s) noted/developed on/in Item (Item number) was/were compared to the known tire(s) submitted in Item (Item number). The questioned tire tread impression(s) noted/developed on /in Item (Item number) was/were made by the known (correct tire) submitted as Item (Item number).

**13.1.4** The questioned glove impression(s) was/were noted/developed on Item (Item number) and was compared to the known glove submitted as Item (Item number). The questioned glove impression(s) noted on Item (Item number) was/were made by the known (right glove/left glove/pair of gloves) submitted as Item (Item number).

- 13.1.5** The questioned footwear impression(s) noted/developed on/in Item (Item number) correspond(s) in (outsole design or outsole design elements/outsole design or outsole design elements and physical size/outsole design or outsole design elements, physical size, and general wear) with the known (right shoe/left shoe/pair of shoes) submitted in Item (Item number) and could have been made by that/those shoe(s) or any other (right shoe/left shoe/pair of shoes) having the same (outsole design or outsole design elements/outsole design or outsole design elements and physical size/outsole design or outsole design elements, physical size, and general wear). Due to the limited detail in the questioned footwear impression, a more positive association could not be made.
- 13.1.6** The questioned tire tread impression(s) noted/developed on/in Item (Item number) was compared to the known tire(s) submitted in Item (Item number). The questioned tire tread impression(s) correspond(s) with the (tire tread design or tire tread design elements/tire tread design or tire tread design elements and physical size of the elements/tire tread design or tire tread design elements, physical size of the elements, and general wear with the known tire(s) (note the correct tire(s)) submitted in Item (Item number) and could have been made by that/those tire(s) or any other tire(s) having the same (tire tread design or tire tread design elements/tire tread design or tire tread design elements and physical size of the elements/tire tread design or tire tread design elements, physical size of the elements, and general wear of that tire tread design. Due to the limited detail in the questioned tire tread impression(s), a more positive association could not be made.
- 13.1.7** The (questioned impression(s) and/or glove impression(s)) noted/developed on/in Item (Item number) was compared to the (known object's impression(s) and/or glove(s) impression(s)) submitted as Item (Item number). The (questioned impression(s) and/or glove impression(s)) correspond(s) in or with the design of the elements on the inner palm area of the glove(s) and/or the "grip side" of the glove(s) and/or the known object submitted as Item (Item number) and could have been made by either the (left glove and/or the right glove and/or an object) with the same design characteristics. Due to the limited detail in the (questioned glove impression(s) and/or the questioned impression(s)), a more positive association could not be made.
- 13.1.8** The (questioned impression(s) and/or questioned footwear impression (s) and/or questioned tire tread impression(s)) noted in the photograph(s) submitted as Item (Item number) correspond(s) in (outsole/tread design or outsole/tread design elements/outsole/tread design or outsole/tread design elements and physical size/outsole/tread design or outsole/tread design elements, physical size, and general wear) with the known (right shoe(s)/left shoe(s)/pair of shoes/left tire(s)/right tire(s)/front tires/rear tires/ all four tire(s)) submitted in Item (Item number). Due to the fact that (there was no scale included in the image(s), the scale was not at the same level as the questioned impression(s), the (questioned impression(s) and/or questioned footwear impression (s) and/or questioned tire tread impression(s)) was/were not photographed at a 90 ° angle), a 1:1 enlargement could not be produced and a more positive association could not be made.
- 13.1.9** The (questioned impression(s) and/or questioned footwear impression (s) and/or questioned tire tread impression(s)) noted/developed on/in Item (Item number) was/were compared to the known shoe(s)/tire(s)/glove(s) submitted in Item (Item number). The (questioned impression(s) and/or questioned footwear impression (s) and/or questioned tire tread impression(s)) noted/developed on/in Item (Item number) was/were of a different (outsole design/tread design/design element); therefore, the impression(s) was/were not made by the known shoe(s)/tire(s)/glove(s) submitted in Item (Item number).

- 13.1.10** The (questioned impression(s) and/or glove impression(s)) noted on/in Item (Item number) was compared to the (known object's impression(s) and/or glove impression(s)) submitted as Item (Item number). The (questioned impression(s) and/or glove impression(s)) contain(s) a (different design element on the inner palm area and/or the "grip side" of the glove and/or the design elements of the known object); therefore, the (questioned impression(s) and/or glove impression(s)) were/was not made by the known object/glove submitted as Item (Item number).
- 13.1.11** The questioned impression(s)/footwear impression(s)/tire tread impression(s) developed/ noted on/in Item (Item number) was/were insufficient for comparison purposes.
- 13.1.12** The questioned footwear impression(s)/tire tread impression(s) was/were searched on the Shoeprint Image Capture and Retrieval (SICAR) system. The pattern of the questioned footwear impression(s)/tire tread impression(s) was similar, but may not be limited, to the outsole design/tire tread design of the (name brand) and could have been made by that (name brand) or any other shoe/tire of the same outsole design/tire tread design.
- 13.1.13** The questioned footwear impression(s)/tire tread impression(s) were/was searched on the Shoeprint Image Capture and Retrieval (SICAR) system. A possible source of the questioned footwear impression(s)/tire tread impression(s) was not located.
- 13.1.14** The questioned tire tread impression(s) were/was searched on the Shoeprint Image Capture and Retrieval (SICAR) and/or the Tread Assistance system(s). A possible source of the questioned tire tread impression(s) was not located.
- 13.1.15** The questioned tire tread impression(s) were/was searched on the Shoeprint Image Capture and Retrieval (SICAR) and/or the Tread Assistance system(s). The pattern of the questioned tire tread impression(s) was similar, but may not be limited, to the tire tread design of the (brand name) tire and could have been made by that brand of tire.

#### **14.0 Records – N/A**

#### **15.0 Attachments – N/A**

#### **16.0 References**

##### **Footwear –**

Adair, T. and M. Dobersen. "Lifting Dusty Shoe Impressions from Human Skin: A Review of Experimental Research from Colorado." *Journal of Forensic Identification*. Vol. 56, 3: 333 – 338 (2006).

Adair, T.W., et al. "The Mount Bierstadt Study: An Experiment in Unique Damage Formation in Footwear." *Journal of Forensic Identification*. Vol. 57, 2: 199 – 205 (2007).

Alexandre, G. "Computerized Classification of the Shoeprints of Burglars' Soles." *Forensic Science International*. (1996): 59-65.

Ashley, W. "What Shoe Was That? The Use of Computerised Image Database to Assist in Identification." *Forensic Science International*. (1996) 7-20.

Belcher, G.L. *Methods of Casting and Latent Print Recovery*. 14-15.

- Black, J.P. "An Interesting Case Involving Footwear Distribution Information." *Journal of Forensic Identification*. Vol. 55, 4: 499 – 501 (2005).
- Bodziak, W. "Use of Leuco Crystal Violet to Enhance Shoe Prints in Blood." *Forensic Science International*. (1996): 45-52.
- Bodziak, W.J. *Footwear Impression Evidence*. CRC Press, New York (1990).
- Bodziak, W.J. *Footwear Impression Evidence*. 2<sup>nd</sup> Edition. CRC Press, New York (2000).
- Bodziak, W.J. *Lifting a Footwear Impression from a Hard Surface*. FBI Laboratory (Apr. 1984).
- Bodziak, W.J. "Manufacturing Processes for Athletic Shoe Outsoles and Their Significance in the Examination of Footwear Impression Evidence." *Journal of Forensic Sciences*. Vol. 31, 1: 153-176 (1986).
- Bodziak, W.J. "Shoe and Tire Impression Evidence." *FBI Law Enforcement Bulletin*. (July 1984): 1-11.
- Bodziak, W.J. *Casting a Footwear or Tire Impression with Dental Stone*. 1-3.
- Bodziak, W.J. and L. Hammer. "An Evaluation of Dental Stone, Traxtone, and Crime-Cast." *Journal of Forensic Identification*. Vol. 56, 5: 769 – 787 (2006).
- Boyd, F.M. *Shoe Box and Side Labeling: A Most Valuable Piece of Evidence When Shoes are Missing*. Broward County Sheriff's Office, 1-4.
- Brundage, D.J. *Physical Developer: A Chemical Enhancement Technique for Footwear Impressions*. Illinois State Police. (1994): 1-7.
- Carlsson, K. and C.A. Maehly. "For Securing Impressions of Shoes and Tyres on Different Surfaces." *International Criminal Police Review*. (June-July 1976): 158-167.
- Cassidy, M.J. *Footwear Identification*. Lightning Powder Company, Oregon (1995).
- Cheskin, M.P. *The Complete Handbook of Athletic Footwear*. Fairchild Publications, New York (1987).
- Davis, R. J. "Electrostatic Lifting." *Fingerprint Whorld*. (April 1984): 113.
- Davis, R. J. "An Intelligence Approach to Footwear Marks and Toolmarks." *Journal of the Forensic Science Society*. Vol. 21: 183-193.
- Davis, R.J. "Current Perspectives in Footwear Identification." *Identification News*. (Oct. 1986): 8 – 11.
- DeHaan, J.D. *Footwear Evidence – An Update*. BATF Forensic Lab.
- Dinkins, L.S. *Development and Enhancement of Footwear Impressions on Non-Porous Surfaces Using Refrigeration and Cyanoacrylate Fuming*. U.S. Army Criminal Investigation Laboratory.
- Doller, D.W. *Interpretations of Shoe and Tire Impressions at the Crime Scene*. Suffolk County Crime Laboratory, 1-16.
- Drexler, S.G. *Test Impressions of Footwear Outsoles Using Biofoam*.

Facey, O.E., et al. "Shoe Wear Patterns and Pressure Distribution Under Feet and Shoes, Determined by Image Analysis." *Journal of the Forensic Science Society*. Vol. 32, 1: 15-24 (1992).

*Footwear Construction: Methods of Identification*. American Footwear Industries Association. 1-12.

Freels, R.H. *Improved Test Impressions and Prints*. Kentucky State Police.

Geller, J. "Casting on Road Surfaces." *Journal of Forensic Identification*. Vol. 40, 5: 279 – 282 (1990).

Geller, J. *Dental Stone Verses Plaster of Paris*. 74<sup>th</sup> Annual Educational Conference, IAI. (June 1989): 1-4.

German, E.R. "A Microscopic Footwear Identification on Cloth." *Fingerprint Whorld*.

Hamm, E. "Chemical Developers in Footwear Prints." *Fingerprint Whorld*. (1984): 117-120.

Hamm, E.D. "Tire Tracks and Footwear Identification." *Identification News*. (January 1975): 3 – 6.

Hamm, E.D. "Track Identification: An Historical Overview." *Journal of Forensic Identification*. Vol. 39, 6: 333 – 338 (1989).

Heafner, H.J. *Demonstrative Evidence Preparation, Use and Effectiveness of Trial Exhibits for Courtroom Presentation*. 1-12.

Hebrard, J., et al. "Experimental and Comparative Study of New Casting Materials." *International Symposium of the Forensic Aspects of Footwear and Tire Impression Evidence*. (1994): 1-3.

Hilderbrand, D.S. "Using Manufacturing Companies to Assist in Footwear Cases." *Journal of Forensic Identification*. Vol. 44, 2: 130-132 (1994).

Hilderbrand, D.S. *Footwear, The Missed Evidence*. Staggs Publishing, California (1999).

Hueske, E.E. "A Superior Method for Obtaining Test Prints from Footwear and Tires." *Journal of Forensic Identification*. Vol. 41, 3: 165-167 (June 1991).

Hueske, E.E. "Photographing and Casting Footwear/Tire Track Impressions in Snow." *Journal of Forensic Identification*. Vol. 41, 2: 92-95 (April 1991).

Ineichen, M. and P.W. Pfefferli. *The Discriminating Power of a Computerized Shoeprint Reference Collection System*. Zurich Canton Police (1994).

"Information Bulletin for Shoeprint/Toolmark Examiners." *Proceedings of the European Meeting for Shoeprint/Toolmark Examiners*. National Bureau of Investigation, Finland. Vol. 6, 1 (2000).

"Information Bulletin for Shoeprint/Toolmark Examiners." *Proceedings of the European Meeting for Shoeprint/Toolmark Examiners*. National Bureau of Investigation, Finland. Vol. 4, 1 (1998).

Kainuma, A. "Manufacturing Variations in a Die-Cut Footwear Model." *Journal of Forensic Identification*. Vol. 55, 4: 503 – 517 (2005).

Keijzer, J. "Identification Value of Imperfections in Shoes with Polyurethane Soles in Comparative Shoe Print Examination." *Journal of Forensic Identification*. Vol. 40, 4: 217 – 223 (1990).

Laskowski, G.E. An Improved Technique for the Visualization of Footprint Impressions in the Insoles of Athletic Shoes. *Journal of Forensic Sciences*. Vol. 32, 4: 1075-1078 (1987).

Laskowski, G.E. and V.L. Kyle. "Barefoot Impressions – A Preliminary Study of Identification Characteristics and Population Frequency of Their Morphological Features." *Journal of Forensic Sciences*. Vol. 33, 2: 378-388 (1988).

Majamaa, H. and E.D. Hamm. "Using the ESDA to Detect Dusty Shoe Prints." *Journal of Forensic Identification*. Vol. 41, 6: 421 – 425 (1991).

Mankevich, A. *The Determination of Shoe Size in Out-of-Scale Photographs*. Maryland State Police, 1-19.

Mikkonen, S., V. Suominen and P. Heinonen. "Use of Footwear Impressions in Crime Scene Investigations Assisted by Computerised Footwear Collection System." *Forensic Science International*. (1996): 67-79.

Miller, J. E. "Enhancing Footwear Casts." *Journal of Forensic Identification*. Vol. 43, 1: 13-19 (1993).

Morgan-Smith, R.K., D.A. Elliot and H. Adam. "Enhancement of Aged Shoeprints in Blood." *Journal of Forensic Identification*. Vol. 59, 1: 45 – 50 (2009).

Natarajan, N. and G.M. Cecil Ranjit. "Computer Assisted Analysis of Footprint Geometry." *Journal of Forensic Identification*. Vol. 55, 4: 489 – 497 (2005).

Navarro, R.L. *The Collection, Preservation, and Examination of Footwear and Tire Track Impressions* (Aug. 1987).

Nayar, P.S. and Das S.K. Gupta. "Personal Identification Based on Footprints Found on Footwear." *International Criminal Police Review*. (March 1979): 83-87.

Olsen, R.D. *Need for Defining Nomenclature of Class and Individual Characteristics*. Kansas Bureau of Investigation. 1-23.

Pasquier, Du E., et al. "Evaluation and Comparison of Casting Materials in Forensic Sciences Applications to Tool Marks and Foot/Shoe Impressions." *Forensic Science International*. (1996): 33-43.

*Plaster Casting*. Northern Illinois Police Crime Laboratory.

*Preservation and Identification of Shoe and Tire Impressions*. North Carolina State Bureau of Investigation. 1-5.

Robbins, L.M. *Footprints: Collection, Analysis, and Interpretation*. Thomas Books, Illinois (1985).

Rousseau, L.J. *Reference File of Tread Designs on Athletic Shoes*. Florida Department of Law Enforcement, (Jan. 1985).

Shane, C.M. "Novel Means of Identifying Footprints Admissible." *The Criminal Law Reporter* (1984).

*Shoe Factory Buyers Guide*. Shoe Trader's Publishing Company. Massachusetts (1984).

*Shoediction*. American Footwear Industries Association. 1-30.

Steigmann, J.P. *An Inexpensive Latent Fingerprint, Footprint, Shoeprint, and Tire Mark Lifter*. 13.

Stone, R.S. *Mathematical Probabilities in Footwear Comparisons*. Albuquerque Police Department. 1-4.

“Tips on Making Casts of Shoe and Tire Prints.” *FBI Law Enforcement Bulletin*. (Oct. 1963): 1-5.

“Tire ‘Footprints’ Help Solve Homicide Cases.” *Law and Order*. (Dec. 1981): 36-39.

Vandiver, J.V., and J.H. Wolcott. “Identification of Suitable Plaster for Crime-Scene Casting.” *Journal of Forensic Sciences*. (1977): 607 – 614.

Vanhoven, H. *A Correlation Between Shoeprint Measurements and Actual Sneaker Size*. Monroe County Public Safety Laboratory. 1-12.

Von Bremen, A. “The Comparison of Brake and Accelerator Pedals with Marks on Shoe Soles.” *Journal of Forensic Sciences*. Vol. 35, 1: 14-24 (1990).

Walker, S.A. *Sneakers*. Scholastic Book Services/Workman Publishing Company, New York (1978).

Wolner, M.F. *Black Powder – Cotton Development of Latent Footwear Impressions*. Michigan State Police Laboratory.

Wyatt, J.M., K. Duncan and M.A. Trimpe. “Aging of Shoes and its Effect on Shoeprint Impressions.” *Journal of Forensic Identification*. Vol. 55, 2: 181 – 188 (2005).

#### **Tire Tracks –**

Belcher, G.L. *Methods of Casting and Latent Print Recovery*.

Bodziak, W.J. “Shoe and Tire Impression Evidence.” *FBI Law Enforcement Bulletin*. (July 1984): 1-11.

Bodziak, W.J. *Casting a Footwear or Tire Impression with Dental Stone*.

Cook, C.W. “Comparative Analysis (Footprint and Tire Track Information.” *Identification News*. (April 1979): 3–5.

Doller, D.W. *Interpretations of Shoe and Tire Impressions at the Crime Scene*. Suffolk County Crime Laboratory.

Freels, R.H. *Improved Test Impressions and Prints*. Kentucky State Police.

Hamm, E.D. “Chemical Developers in Footwear Prints.” *Fingerprint Whorld*. (1984): 17-118.

Heafner, H.J. *Demonstrative Evidence Preparation, Use and Effectiveness of Trial Exhibits for Courtroom Presentation*.

Hebrard, J., et al. “Experimental and Comparative Study of New Casting Materials.” *International Symposium of the Forensic Aspects of Footwear and Tire Impression Evidence*. (1994): 1-3.



McDonald, P. *Tire Imprint Evidence*. CRC Press LLC, Florida (1993).

Nause, L. *Forensic Tire Impression Identification*. Canadian Police Research Centre, Canada (2001).

Navarro, R.L. *The Collection, Preservation, and Examination of Footwear and Tire Track Impressions* (Aug. 1987).

Olsen, R.D. *Need for Defining Nomenclature of Class and Individual Characteristics*. Kansas Bureau of Investigation.

*Preservation and Identification of Shoe and Tire Impressions*. North Carolina State Bureau of Investigation.

Steigmann, J.P. "An Inexpensive Latent Fingerprint, Footprint, Shoeprint, and Tire Mark Lifter. p. 13. Tips on Making Casts of Shoe and Tire Prints." *FBI Law Enforcement Bulletin*. (Oct. 1963): 1-5.

"Tire Forensics: A Presentation of Tire Print Identification with an Emphasis on Tire Design and Tire Manufacturing." Presentation at the International Association for Identification International Educational Conference. Dallas, TX (2004).

#### 17.0 Records - N/A

#### 18.0 Attachments - N/A

Revision History		
Effective Date	Version Number	Reason
07/01/2016	1	Original Document