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INTRODUCTION

The Latent Print Section will follow the guidelines set forth in the Forensic Science Bureau SOP. Supplemental requirements specific to the Latent Print Section are contained within the Latent Print Standard Operating Procedures (SOP), the Latent Print Technical Manual, and the Latent Print Training Manual. These documents represent guidelines for the Quality System within the Latent Print Section.

CHAPTER 1: THE SCIENCE OF FINGERPRINTS

1.1 BIOLOGY

Papillary ridges are anatomical areas of skin that include the dermal and epidermal layers of skin that cover the areas of the fingers, palms, and the soles of the feet. They are formed during fetal development and remain persistent throughout the life of the individual except through damage by scarring or disease. Friction skin ridges (papillary ridges) are not continuous formations; rather they are made up of biologically unique components, ridge units that form the appearance of linear formations. No two areas of friction skin on the hands or feet of any person, or persons, have been found to be duplicated in their minute detail.

1.2 SCIENTIFIC BASIS

There are two basic principles for the basis for identification:

- **Permanence** - Friction skin permanence is based on Embryological studies that show the friction ridge skin begins forming in the 6th week of estimated gestational age and are fully developed at approximately the 23rd week. These biological developments include the basal layer of skin which is considered the template and generating layer for all friction ridge skin growth. This layer remains unchanged throughout one's lifetime with the exception of natural expansive growth and/or damage to the basal layer that permanently alters that area of friction skin.
- **Uniqueness** - Friction skin is biologically diverse in that there is a genetic influence up until cellular differentiation. Friction ridge growth and placement takes place due to physical influences and volar pad development (epigenetic). The timing of development of the ridges with respect to volar pad regression, in combination with the forces on the skin, ensures that the minute details of the friction ridge skin cannot be duplicated. It is this basic principle, referred to as differential growth, which assures that the formations on the friction skin are biologically random and cannot be replicated.

CHAPTER 2: LATENT PRINT COMPARISON

2.1 METHODOLOGY

Latent print examinations are conducted by applying the methodology of analysis, comparison, evaluation and verification (ACE-V). The process itself is not a linear method in which examiners work from one phase to the next, but allows for the ability to return to any previous phase. Due to the many factors taken into consideration during an examination, examiners must rely on principles gained from their prior training and experience based discretion throughout all phases of ACE-V.

- **Analysis** – The first and most important phase of the ACE-V methodology. An examiner will conduct a thorough analysis to determine the anatomical source, orientation and identify minutiae of an impression. All three levels of detail are observed and utilized in the decision making process. All of this is completed while also assessing reliability factors including tolerance and distortion. Following a thorough analysis, an examiner will use all of the information present to determine the suitability of the latent print.
- **Comparison** – Once a latent print is determined to be suitable, the second phase of the examination process is comparison. This is a side by side comparison of friction ridge detail to identify agreement or disagreement between two impressions. A target group (multiple minutiae in close proximity) can be identified in the latent print and used to compare with the known prints. While conducting a comparison, an examiner should observe features in agreement or disagreement based on ridge flow, minutia and spatial relationship.
- **Evaluation** – All of the information gathered by an examiner in the comparison is used to reach a conclusion in the evaluation phase. A conclusion can be rendered based on the quality and quantity of information present in the comparison.
- **Verification** – The final phase of the methodology is verification. This is an independent examination by an additional examiner to ensure that all conclusions fit within accepted practices. This examination includes all suitability determinations in addition to comparison conclusions.

2.2 FINGERPRINTS DEFINED

A latent print is an unintentional or chance impression, deposited on a surface, which typically requires some sort of processing to be visible. The impression is a reproduction of the friction ridge detail found on the fingers, palms and soles of the feet. It can be deposited on the surface via a transfer of residue or deposition into a malleable material.

Known prints, or exemplars, are fingerprints, palm prints or footprints recorded of a known person in a controlled environment. These prints can be captured electronically via LiveScan or by coating the friction ridge skin with black printer's ink and depositing it on a contrasting white background (fingerprint card).

2.3 LEVELS OF DETAIL

There are three levels of details which are used to describe features found within latent print impressions and are defined as follows:

Level 1 Detail: This refers to the general class characteristics found within a latent print. It encompasses features such as general ridge flow, anatomical source and pattern type. Level one details alone cannot be used to form conclusions.

Level 2 Detail: This describes the individual friction ridge paths or friction ridge events (i.e. ending ridges, bifurcations, short ridges and dots) found within an impression. This not only includes the appearance of such features but also their arrangement within an impression.

Level 3 Detail: This describes the individual characteristics of the ridge and pore structure. This not only includes the appearance (size, shape and path) but also their arrangement within an impression.

Additional features such as creases, scars and incipient ridges may be present in all three levels of details.

2.4 CONCLUSIONS

A comparison of two friction ridge prints will result in the examiner reaching one of the following three conclusions: Identification, Exclusion, or Inconclusive.

- **Identification** is the result of the comparison of two friction ridge impressions containing sufficient quality (clarity) and quantity of friction ridge detail in agreement. Identification occurs when a latent print examiner, trained to competency, determines that two friction ridge impressions originated from the same source.
- **Exclusion** is the determination that two friction ridge prints did not originate from the same source due to sufficient quality and quantity of information in disagreement.
- **Inconclusive** results when a definitive conclusion cannot be reached due to one of the following reasons:
 1. Insufficient agreement exists between the latent print and known print
 2. Inability to locate corresponding detail due to ambiguity
 3. Exemplars not fully recorded in the area needed for comparison

2.5 EXCLUSION GUIDELINES

Examiners should be able to reach a reliable exclusion by meeting the following conditions:

- A. Determine the anatomical source of the latent print beyond a reasonable doubt.
- B. Determine the orientation of the latent print beyond a reasonable doubt.
- C. Identify a clear and reliable target group.
- D. Conduct a thorough search of the latent print ensuring compelling inconsistency with the known prints.

An examiner can reliably exclude an individual in a comparison only when all of the above conditions have been met. If any one of the conditions cannot be met beyond a reasonable doubt, an individual cannot be reliably excluded and therefore inconclusive is a more appropriate conclusion.

2.6 COMPLEX LATENT PRINTS

A latent print is considered complex when distortion, lack of contrast, background interference, or other factors make the visualization of minutiae or the determination of orientation or anatomical source difficult.

Complex latent prints are captured in Photoshop and enhanced as necessary to improve visualization of features prior to comparison.

Examiners will use an enhanced image of the complex print to perform a thorough analysis, marking visible minutiae, tracing ridges, indicating creases, isolating indistinct areas, and other marks, as desired, to show how the latent print was interpreted prior to comparison. The image with all analytical markings will be preserved, in the case record, regardless of the final conclusion.

2.7 CONFLICT RESOLUTION

All conflicts between examiners regarding an analytical aspect of an examination will be documented in the case record. All emails, charts, images, and documented observations will be preserved in the case record.

A consultation between two examiners involving questions about an analysis or comparison, prior to verification, requires no additional documentation. Examples may include discussions concerning the anatomical source, pattern type, orientation, etc...

During the verification process, all conflicts between examiners regarding an analytical aspect of an examination will be documented in the case record. This will be documented by the verifier using the review function in Microsoft Word. The verifier will identify the conclusion on the initial examiner's worksheet and write a brief description, as a comment, of the difference in opinion. The worksheet with comments will be saved by the verifier and attached to the case record in LIMS. In addition, the assignment will be routed for information "I" in LIMS to the initial examiner, with a description of the difference in opinion.

In any instance where an assignment is routed for information "I", the initial examiner will select yes to the drop down box for Conflict Resolution in the Latent Print Request Stats panel. This will populate the following statement in the disposition of the report "One or more conclusions reported involved an initial difference of opinion between examiners, which was documented and resolved according to the conflict resolution policy".

A conflict involves a difference of opinion, during verification, between two examiners regarding a latent print examination. The examiners will work together to resolve the difference by the following method:

1. The two examiners will meet and discuss each other's observations, reviewing charts and images together, in order to come to an agreement.
2. If no agreement can be reached, the examination print(s) will be sent to three additional examiners in order to reach a consensus.

3. The request should be handled blindly, i.e., the additional examiners should be sent unmarked and unenhanced images of the examination prints with no case numbers or laboratory numbers attached.
4. The final decision will be based on the consensus of all involved examiners. If no clear consensus is reached, the original examiner's conclusion will stand, unless it is an unverified identification.
5. When an unverified latent print is the subject of the conflict, the final decision will be by consensus. If no consensus can be reached, the examiner will change the conclusion to 'inconclusive' or 'not suitable', and line out the markings on the lift card or photo and initial them.
6. The examiner requesting the consensus will be responsible for attaching all documentation to the case record in LIMS. This includes adding all necessary documentation to the charts and email responses (Lab number, Item Number and identifying information for known prints in the case of a comparison).

The Technical Leader and Supervisor will be notified when there has been an erroneous identification, erroneous exclusion, or a suitability determination that resulted in a missed identification. If such an error involves casework performed by the Supervisor who is currently serving as the Technical Leader, then the Assistant Laboratory Manager will be notified.

2.8 LATENT PRINT SUITABILITY

A latent print is deemed suitable for comparison through a complete analysis of all visible features within the print, prior to the comparison phase. A latent print will be considered suitable for comparison when there are a minimum of eight discernible minutiae **AND** one or more of the following are present:

- Discernible distal orientation
- At least one focal point (e.g. core, delta, crease, scar)
- At least one region of considerable size

Other significant detail, such as clear incipient detail, scar detail, or small groupings of minutia with high clarity contribute to the determination of suitability for comparison; therefore, latent prints that do not meet the above-listed criteria may be marked as suitable for comparison at the discretion of the case examiner.

2.9 SIMULTANEOUS IMPRESSIONS

A simultaneous impression is defined as "two or more friction ridge impressions from the same hand or foot which were deposited concurrently."

An examiner may treat multiple impressions as simultaneous, when the following conditions are met:

- The examiner has received formal training in identifying simultaneous impressions.
- The examiner has determined that each impression analyzed complies with the Complex Latent Print Policy (Latent Print Tech Manual 2.6) and Suitability Criteria (Latent Print Tech Manual 2.8).

- The examiner, after conducting a thorough analysis, can determine that the impressions are consistent with being deposited concurrently. The examiner must provide documentation in the case record that simultaneity was determined.

Aggregate conclusions may be formed if the above listed criteria are met.

2.10 MARKING LATENT PRINTS

The examiner conducting a latent comparison will write an item number on each photograph, on the front and back of each lift card, and initial each item examined. In addition, all suitable latent prints on each latent-bearing item (lift card or photograph) will be marked with a sequential circled capital letter i.e. A, B, etc... designation marked in blue.

The item number will correspond with the LIMS item number and a sequential number i.e. 14.1, 14.2, etc... and marked in blue.

The examiner will, in the event of identification, write the name and unique identifying number of the person identified on the lift card, photograph, copy or other latent-bearing item. This will be marked in blue.

The finger/palm identifier, initials and employee number of the examiner making an identification will be marked in red.

The following symbols will be added near the identified latent and will be marked in red:



A half circle over the top of the latent, in the event of a finger latent identification.



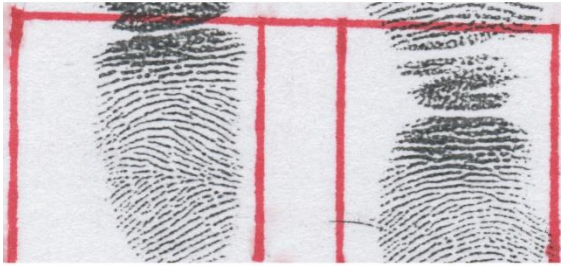
Lines drawn parallel on both sides of the latent, in the event of a phalange (joint) identification.



A vertical line drawn along the hypothenar area and a connecting line drawn along the base, in the event of a palm latent identification.



Interlocking half circles over the top of the fingers, in the event of a simultaneous latent identification.



Connected lines drawn parallel on both sides of the latents, in the event of a simultaneous phalange (joint) identification.



A vertical line drawn along the hypothenar area, a connecting line drawn along the base and interlocking half circles over the fingers, in the event of a simultaneous palm and finger identification.

- If the location of the identified latent print on the card / image is such that drawing the required symbol would mean marking over another suitable latent print, then a small arrow can be used in lieu of the usual symbol.
- The Latent Print Examiner verifying identifications will place their initials along with “√ID” and will be marked in green.
- Once analytical markings are made on a latent lift card or photo by an examiner, it becomes examination documentation and must have the lab number and the examiner’s handwritten initials written on the side containing the markings.

2.11 DOCUMENTING DUPLICATES

'Duplicate' refers to a latent print created by a single touch of a surface, but lifted or photographed more than once.

Each latent print deemed suitable for comparison, whether duplicate or not, must be given a letter designation; however, the latent print examiner will document the results of their comparison of only one instance of each particular latent print. Duplicate latent prints will be documented as a duplicate with references to the original item on the lift card/photograph, in the results block of the worksheet and in the report.

Duplicates will not be subject to verification.

Examiners will determine, based on clarity and completeness, which latent print will be compared, and which ones will be documented as duplicates.

Duplicate latent prints will not count toward the final tally of identified latent prints, but will be counted as an examination in LIMS.

2.12 EXAMINATION ERRORS

The following types of errors, encountered in friction ridge examination, will be tracked by the supervisor or the technical leader.

Erroneous Identifications (Class I Error):

An erroneous identification is the marking of a latent print as having originated from a particular known source when, in fact, the print did not come from that source.

When another examiner, usually the verifying examiner, discovers what is believed to be a true erroneous identification and an administrative error has been ruled out, the technical leader and the section supervisor will be notified immediately.

The technical leader will examine the latent and exemplar and verify that the identification is erroneous. If the erroneous ID involves the technical leader, the section supervisor or a latent print examiner with the lowest employee number will examine the latent and exemplar and verify it is an erroneous ID.

An examiner who verifies an erroneous identification will have also committed a Class I error.

Erroneous Exclusions (Class II Error):

An erroneous exclusion is the incorrect conclusion that two friction ridge impressions did not originate from the same source.

Inconclusive is not considered an erroneous exclusion.

Suitability Determination (Class III Error)

A latent print that is deemed not suitable for comparison by an examiner, but demonstrated to meet the criteria for suitability and subsequently identified is a Class III error. This may be deemed equal to a Class II error if an examiner has repeatedly committed this type of error over the course of a year, or if it is discovered after the report is published.

The technical leader and supervisor will be notified when there has been an erroneous identification, erroneous exclusion, or a suitability determination that resulted in a missed identification. If such an error involves casework performed by the supervisor who is currently serving as the technical leader, then the assistant laboratory manager will be notified

CHAPTER 3: RECEIVING LATENT PRINTS

Latent and CD packets received by the Latent Print Section are entered into LIMS via Prelog as an ADM submission assignment.

Latent envelopes will be initialed by the receiver, verifying the number of lifts or photos match the number appearing on the front of the envelope.

Latent prints will be examined to determine AFIS suitability, placing an "A" in the upper right of the latent envelope. If suitable, it will then be filed in the AFIS drawer awaiting AFIS entry. Once evidence is transferred to the AFIS drawer, an in process storage location, the evidence can remain unsealed for a period not to exceed 24 months.

Latent packets that contain AFIS suitable prints will have the ADM assignment switched to an AFIS assignment and then filed per section guidelines.

Latent packets that do not contain AFIS suitable prints will have the ADM assignment administratively closed in LIMS and then filed as per section guidelines.

All latent and CD packets received will have a proper seal over the envelope flap. The examiner conducting receiving will check the integrity of the seal upon receipt of the new item. The seal will have the date and initials of the submitting individual. Any discrepancies will be documented in LIMS. If a packet is received without an initial seal, the receiving person will seal the envelope with evidence tape, initial, and date it. The original seal will not be broken or disturbed by Latent Print Section personnel.

CHAPTER 4: DIGITAL IMAGING

Latent print personnel can utilize scanning equipment and imaging software in order to capture, enhance, and preserve images of friction ridge prints for analytical purposes.

Whenever a latent print is captured digitally for the purpose of suitability analysis or for preparing a chart, the image will be preserved and placed in the LIMS case file.

Images saved in LIMS will have at the minimum, the unique identifying case number, the employee's initials, the date the image was prepared, and the Item number of the latent print. In the event of a charted comparison, there should be adequate identifying information listed to indicate the source of the known print (e.g. name, APD #, finger/palm).

Current versions of Photoshop are approved for use in capturing and enhancing digital images of latent prints. Examiners can use tools that affect the tonal value of an image, such as **Brightness and Contrast, Levels, Dodging and Burning, or Curves** tools. They can also use software tools within Photoshop that effectively improve contrast for visualization of a latent print, such as **Channel Mixer, Black and White, Invert, etc.**

Additional tools and actions can be used in the digital processing and enhancement of the latent print, such as:

- Rotating the image
- Changing the color mode i.e. RGB to Grayscale
- Enlarging or reducing the size of the image
- Cropping an area of the original image
- Selecting and enhancing a portion of the image

Examiners will not use, or overuse, any process in a way that will cause any loss of relevant detail.

Examiners will not use Artistic or Stylistic filters or processes on a latent print image (Emboss, Smudge stick, etc.).

Examiners will not utilize a filter or process they are not familiar with, the effect of which they cannot explain, or one in which they have not received training.

It is recommended to capture latent prints for analysis/examination at a minimum of 1000 dpi, and use native resolutions of their scanners (1200 dpi) whenever possible.

Examiners can document or be ready to explain the processes they use in capturing and enhancing a latent print image, and be able to duplicate what they have done to a reasonable degree.

CHAPTER 5: COURT TESTIMONY

In legal proceedings the duties of all latent print personnel will include:

- Pre-Trial Conference with prosecutor(s) when requested
- Provide examination documentation to prosecutors when requested
- Meet with defense counsel when Forensic Science Bureau criteria have been met
- Notifying the court liaison or the prosecutor of any expected time off

The court appearance, pre-trial conference, etc. will be documented in the Activity Log of LIMS

In-court examinations of new latent prints are not permitted.

Comparisons of inked prints to inked prints are permitted in order to verify identity (confirmation examinations).

CHAPTER 6: AFIS PROCEDURES

Latent prints not identified during the initial search, which meet the criteria, will be entered into the Unsolved Latent Database (ULDB). The report will indicate that latent prints have been registered in the ULDB.

Latent prints from person's crimes cases will be given priority for AFIS entry.

Each latent print to be searched as an AFIS inquiry will be logged into the stats portion of LIMS.

Finger or palm print records entered into the system solely for training purposes will be clearly marked as TEST material.

Viable Candidate results made from an AFIS inquiry will be documented by attaching the image and candidate information screenshots from AFIS into the case record in LIMS.

AFIS SYSTEMS

CAFIS (Local):

The latent print supervisor is the designated CAFIS operations manager.

AFIS suitable latent prints will first be entered into CAFIS unless otherwise directed.

When a viable candidate is indicated from a TLI (Ten-Print to Latent Inquiry) return, the latent print examiner is responsible for deleting the transaction.

In the event of a TLI from an outside agency, the submitting agency will be notified via email of the viable candidate and that the latent transaction in AFIS was deleted. The candidate information and image screenshots will be attached to the email.

All CAFIS direct entries and associations will be entered in the LIMS AFIS stats panel.

All TLI associations will be updated in the LIMS AFIS stats panel.

Whenever the AFIS technician cannot determine whether the image on the screen is a viable candidate, they can consult with a latent print examiner, making a note in the case record.

The operator will specify one of the following crime types. The standardized listing will be in capital letters and periods will not be used.

BOV is the abbreviation that will be used for burglary of vehicle offenses.

BOR is the abbreviation that will be used burglary of residence offenses.

BNR is the abbreviation that will be used for burglary of non-residence offenses.

AUTO THEFT will be used for any auto theft.

DRUG OFFENSE will be used for any drug related offenses.

WEAPONS will be used for any weapons related offenses.

ROBBERY will be used for any robbery related offenses.

DEATH INV will be used for any death related offense except **murder**.

FORGERY will be used for any forgery or falsified information offenses.

SEXUAL ASSAULT will be used for any sexual assault offense not involving a child.

S ASSAULT CHILD will be used for any sexual assault offense involving a child.

CRIM MIS will be used for any criminal mischief or vandalism offenses.

THEFT will be used for any theft offense other than auto theft.

UC PROP will be used for any property crime that doesn't fit any one of the other categories – add details in comments.

UC PER will be used for any person crime that doesn't fit any of the other categories – add details in the comments.

ARSON will be used for any arson offense.

ASSAULT will be used for any assault offenses.

MURDER will be used for any murder.

AFIS (State)

The State AFIS system will be used to search latent prints at the discretion of the examiner assigned. All State AFIS inquiries, whether direct entry or TLI, will be recorded in the State AFIS Logbook. The State AFIS system will be searched only after the local AFIS system has been searched.

Each examiner is responsible for checking their own TLI's in the State AFIS.

AFIS (Federal)

Latent prints that have previously been searched through the local and state AFIS systems with no viable candidates may then be searched in the Federal System via the Multi-Modal Biometric Information System (MBIS).

Each examiner will manage their own federal inquiries.

Federal inquiries and TLI viable candidates will be entered into the LIMS AFIS Stats.

6.1 SUITABILITY FOR AFIS ENTRY

All latent prints received by the Latent Print Section will be evaluated for AFIS suitability when first received.

AFIS suitability is determined by several factors which can include clarity and quality of the impression; the surface the impression was developed on or lifted from and the amount of minutiae present.

Images lacking clarity and quantity of friction ridge detail would not make a good candidate for an AFIS inquiry.

Latent images from the tip or extreme edge of a finger would not make a good candidate for a State AFIS inquiry.

Interpretation of what is suitable for AFIS inquiry is based on the experience and judgment of the Latent Print Section employee conducting the inquiry.

Latent prints that are not suitable for AFIS entry may be suitable for identification purposes.