

Alaska Scientific Crime Detection Laboratory

Footwear Processing Work Instructions

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Introduction

This document provides work instructions for Footwear processing and Footwear database use. Any abbreviations used in this manual and their meanings are listed in the Footwear Discipline Manual.

Instructions for preparing chemicals made at the laboratory are found in the Chemical Inventory file on the laboratory network.

Accurate measurements and proportions when preparing these chemical solutions are desirable for consistent quality, but successful results in developing impressions are not dependent upon unequivocal accuracy.

For footwear evidence processing, chemicals are deposited into "day use" containers. These "day use" containers are emptied at the end of each day.

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Recovery of Impressions

Recovery may be achieved through the physical transfer of the impression from one surface to another, such as electrostatic lifting, gelatin lifting, and adhesive lifting. An impression is transferred from its original surface to a surface that will provide better contrast. A lift is a reverse image of the impression that it represents. A lift can be compared directly with the sole of the footwear or the photo may be reversed to compare with test impressions.

Electrostatic Lifting uses a high-voltage source to create a static charge on the lifting film, causing the dust or residue particles composing the footwear impression to transfer to the underside or black layer of the lifting film. Works best on dry dust or dry residue footwear impressions that are either latent or barely visible (either where the footwear has left a dust residue on a cleaner surface (positive impression) or where the footwear has come into contact with a dusty surface and during contact has removed some of the dust (negative impression). Identify the area of the impression, cut a portion of the lifting film to fit the area and place the film (black side down) on the impression. Place the small grounding plate next to but not touching the film. Place the electrostatic lifting apparatus (ESLA) with two points on the grounding plate and one point on the film. Switch on and slowly increase the voltage up to the maximum if necessary. The film should start to flatten out over the impression and may crackle with the build-up of charge. Use a plastic/wood/rubber roller to gently roll out any air bubbles make sure not to touch any part of the film with your hand or arm. Turn the ESLA off and gently peel back the film from one corner. Photograph immediately. This technique can be used to "clean" an excessively dusty/dirty impression prior to gel lifting.

Electrostatic Detection Apparatus (ESDA) can be used to recover slightly indented impressions (barely visible or latent) on paper or cardboard. Place the paper containing the impression face up on the vacuum bed. Turn on the pump which sucks the paper completely flat. Extend the clear film across the paper avoiding any folds or wrinkles in the film. A high voltage charge is then applied to the impression using the corona bar at a distance ~1cm, repeat several times. At places where an indented impression is present a difference in voltage will occur. Holding brush parallel to surface brush the toner powder lightly over the film with a camel hair brush. The powder will be attracted to the area of the impression. Place an adhesive cover sheet over the film and photograph.

Gelatin and Adhesive Lifting. Black gel lifts offer excellent contrast with light dust and dry residue, wet origin impressions once powdered and some chemically enhanced blood impressions in combination with alternate light sources/filters. Adhesive lifts, tape

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lifts, and white gel lifts are used mainly in lifting impressions from nonporous surfaces after treatment with black fingerprint powder but generally do not give as good results as black gel lifts. Black fingerprint powder can also be successfully utilized with black gel lifts and oblique lighting photography. Before using gel lifts ensure the lifter is at room temperature, performance and adhesion is affected by excessive cold and excessive heat can destroy the gel lifter. To recover an impression using a gel lift, slowly peel back clear acetate cover sheet, allow gel to settle from any stretching that may occur during cover removal (one minute). In very dusty conditions protect the uncovered gel lift during the resting period. Once the cover is removed handle the gel lift minimally picking up the corner, from one direction lie the gel lift over the impression and gently roll out any air bubbles. Leave the gel lift on the impression for 30 seconds-1 minute then slowly peel back from one end. Photograph immediately.

Casts. A cast represents an actual life-size molding of an impression. Casts and photographs supplement one another and together can provide the maximum information about an impression. Clean casts if needed, taking care not to disturb any imbedded debris or particulates that could leave voids in the cast and photograph with a scale and oblique light. Casting materials may include but are not limited to: dental stone, sulfur/sulfur cement, Mikrosil or Snowstone. All footwear impressions that are to be cast should be first photographed as described in section 3.2. Casts should always be submitted and examined along with the corresponding photographs of that impression. The cast or photograph alone often don't provide high quality impressions but together they complement each other and allow the analyst to see more detail.

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EVIDENCE VISUAL EXAM - PHOTOGRAPHY

Description of Process

Evidence items should be examined to determine if there is sufficient detail and clarity to establish if a possible footwear impression is present.

It is best to photograph impressions in their original condition before any enhancements are attempted. An L shaped scale must be placed alongside the impression as close to the impression and in the same plane as the impression as possible. The camera must be directly over top and sufficiently close to the impression to capture the maximum amount of detail, using a copy stand or tripod to maintain the perpendicularity of the image. Actual size photographs for comparison purposes can be produced in-house or by an approved photography laboratory. Specialized lighting techniques (UV light, IR light, alternate light sources, filters, high-contrast photography, oblique light) may be utilized to enhance footwear impressions. The photographer should set the camera to record images in RAW format and should attempt to fill the frame to ensure maximum detail is recorded.

After any subsequent recovery technique or chemical enhancement it is necessary to re-photograph the impression. All footwear items submitted to the laboratory for analysis will undergo photography.

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POWDERS - PLAIN

Description of Process

Black powder is one of the oldest and most basic methods of developing wet origin or greasy footwear impressions on non-porous surfaces. Powder can be used to develop positive and/or negative footwear impressions. Powder is applied to a surface by lightly dusting over the surface with a soft bristle type brush or duster. Once impressions are developed they should be preserved for later comparison by either photography and/or lifted with gel or adhesive lifters. Black powder is not the only color available; however, it is the most commonly used type of powder (even on dark colored surfaces). In addition, there are fluorescent powders that may be used, which require the use of an alternate light source and appropriate filters.

Sequence

Powder Processing can be used at the Forensic Scientist or Technician's discretion. It should not be used on porous items such as checks, cardboard, paper socks, etc. A chemical process would be best suited for these types of evidence; however, if the paper or cardboard has a shiny or slick surface (such as magazine covers or matchbook covers) it could be used.

Safety

Powder can easily be inhaled. Wear a face mask to filter out loose powder in the air or dust in a fume hood. Wearing gloves will prevent you from getting your hands dirty.

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POWDERS – PLAIN **Process for Use**

All powder is purchased and not prepared in the laboratory.

1. Prior to applying the powder to the surface that is to be processed, view the item for impressions that are visible to the eye; such as prints in blood, grease, or any foreign residue. If there are visible latent, patent, or plastic impressions:
 - a) *Do not handle the evidence excessively since the item has not yet been processed.*
 - b) *Consider alternative processing techniques for prints in blood, grease, or any foreign residue.*
2. Take the jar of powder and tap the jar several times to break up clogs of powder and loosen the powder that has settled.
3. Pour a small amount of powder (two to three tablespoons) into a container.
4. Choose a type of brush to apply powder.
 - a) *Fiberglass or nylon – to be used on small or large objects.*
 - b) *Feather duster – for larger objects.*
 - c) *Short bristle brush – for small objects and also used for cleaning up latents by lightly brushing in the direction of ridge flow.*
5. Hold fiberglass brush, nylon brush, or feather duster between palms of your hands, rub hands back and forth several times to loosen and fluff out bristles or feathers.
 - a) *Dip the brush into the container of powder lightly to pick the powder up.*
 - b) *Tap the brush several times with your index finger over container to release excess powder.*
6. Apply the powder to the surface by lightly dusting over the surface (only the tips of bristles or feathers should touch the surface).
 - a) *Twirling motion – fiberglass brush*
 - b) *Back and forth motion – fiberglass, feather duster, or short bristle brush*
 - c) *Figure eight type motion – feather duster*
 - d) *Once a latent impression is visible, view the impression and then apply a few more strokes of powder. If the impression starts to lighten up or starts looking spotty – stop processing. The impression is at its maximum contrast. Additional processing may destroy or deteriorate the impression.*
7. Remove the excess powder from the processed item.
 - a) *Tap item lightly on counter.*
 - b) *Use short bristle brush (brushing with the flow of ridges).*
 - c) *Make multiple lifts of the same impression if necessary.*

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8. Preserve the impression for later comparison by either digital imaging/photography or a lifting technique appropriate to the evidence.

POWDERS – MAGNETIC

Description of Process

With magnetic powder, there is no brush with fibers or bristles to hold the powder. The powder is actually made up of finely ground metal shavings with colored powder. The powder is applied with a metal rod or wand that has a magnet inside that attracts the powder-like whiskers. This method was developed in the early 1960's. It is not used for every piece of evidence; it is just another tool available in the footwear processing field.

Sequence

Magnetic Powder can be used at the Forensic Scientist or Technician's discretion. Magnetic Powder Processing is not suited for processing metal objects or porous items such as checks, raw cardboard, or paper sacks; however, it can be used on shiny slick surfaces such as magazine covers, match book covers, etc.

Process for Use

All powder is purchased and not prepared in the laboratory.

1. Prior to applying the powder to the surface that is to be processed, view the item for impressions that are visible to the eye; such as prints in blood, grease, or any foreign residue. If there are visible latent, patent, or plastic impressions:
 - a) *Do not handle the evidence excessively since the item has not yet been processed.*
 - b) *Consider alternative processing techniques for prints in blood, grease, or any foreign residue.*
2. Take the jar of powder and tap several times to break up clogs of powder and loosen powder that has settled.
3. Stick large bulb end of wand into the jar to pick up metal shavings. Pull the rod out of the wand to release metal shavings.
4. Go over the surface using a back and forth motion with only the metal shavings coming in to contact with the surface. CAUTION: If the metal bulb end comes in to contact with the surface, it could scratch or destroy the impression.
5. Remove excess powder from the item processed.
 - a) *Tap the item lightly on the counter.*
 - b) *Use a short bristle brush (brushing with the flow of ridges).*
 - c) *Make multiple lifts of the same print as necessary.*
6. Preserve the footwear impression for later comparison by either photography or a lifting technique appropriate to the evidence.

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Safety

There are no known safety hazards. Magnetic Powder Processing is not as messy as Powder Processing. Any overspill can be picked up with the wand and released back into the container.

RHODAMINE 6G FLUORESCENT DYE PROCESSING

Description of Process

Rhodamine 6G is to be used only on non-porous items and after the item has been treated with cyanoacrylate fuming. Rhodamine 6G is a fluorescent dye used to make cyanoacrylate developed footwear impressions more visible on various colored surfaces. Lasers or alternate light sources are used in conjunction with this process. Rhodamine 6G enhanced latent impressions will have to be photographed under a light source. Different carriers for the working solution can be utilized to decrease processing times, preserve inked markings on evidence, or for use on special surfaces.

Sequence

Rhodamine 6G is to be applied only after a non-porous item has been exposed to cyanoacrylate fuming. Powder application may be utilized before or after use of Rhodamine 6G.

Process for Use

Rhodamine 6G crystals or powder is purchased and working and stock solutions are prepared in the laboratory.

1. After the evidence has been processed by cyanoacrylate ester fuming, apply the appropriate Rhodamine 6G working solution by either dipping, or using a spray device or squirt bottle.
2. Place the evidence under a fume hood to dry.
3. Examine the evidence under the laser and view using an orange filter. The power setting (beam intensity) may be adjusted as needed.
4. If the dye appears to be in excess, it may be rinsed with an application of distilled water or methanol over the evidence to reduce its thickness. A second application of dye stain may be necessary after the rinse.
5. Examine the item for footwear impressions and indicate the impression with suitable markings as appropriate to be preserved by photography.

Control Testing

Reactionary substance: cyanoacrylate print on glass slide or clear plastic

Positive results – fluorescence (orange due to filters)

Negative results – no fluorescence

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Safety

Rhodamine 6G working solution and stock solutions are extremely flammable and caution should be used. This reagent should be mixed and applied to evidence under a fume hood so it is not inhaled. Gloves, a lab coat, and eye protection should be used.

CHEMICAL PROCESSING – RESIDUE IMPRESSIONS

Using chemical techniques and procedures it is possible to develop footwear impressions by way of chemical reactions with specific components of the impression residue. The list of chemical processing techniques which may or may not be used includes, but is not limited to the following:

Potassium and Ammonium Thiocyanate

Description of Process

This technique utilizes a color reaction that takes place when potassium or ammonium thiocyanate comes into contact with iron from soil/mud/residue impressions. If iron is present it reacts with the thiocyanate ions in the acid solution to produce reddish-brown color. This process works for wet residue and muddy impressions on all surfaces.

Sequence

Potassium or Ammonium Thiocyanate is typically utilized instead of other processes.

PROCESS FOR USE

Potassium or ammonium thiocyanate is typically prepared in the laboratory and not purchased as a working solution. Shelf life is approximately three months for the working solution.

1. Preserve any suitable visible impressions present on evidence prior to applying thiocyanate solution.
2. Lightly spray a fine mist of the working solution over the impression. Control the amount to get the maximum reaction without causing the impression to run or bleed.
3. Let dry.
4. Photograph either as is or using a green filter.

Note: Developed impressions on some dark-colored surfaces may be viewed with a light source for increased contrast.

Safety

Chemicals used in this process are toxic and are irritants. Mixing and staining must be performed in a vent hood wearing lab coat, gloves, and eye protection.

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DFO (1, 8 – DIAZAFLUOREN – 9 – ONE)

Description of Process

The treatment of wet or muddy footwear impressions on paper with 1,8-diazafluoren-9-one (DFO) after the impressions are lifted and activated with a gel lifter can result in considerable enhancement. DFO applied directly to a wet or muddy impression has little or no success in enhancing the impression.

Sequence

Gel lift and photograph impression first then utilize DFO if necessary instead of other processes.

Process for Use

DFO crystals are purchased and the DFO Stock solution and DFO Working Solution are prepared in the laboratory.

1. Allow impression to air dry and lift the muddy, dirty impression using a black gel lifter.
2. Photograph the impression on the gel under oblique light.
3. Treat with *original impression* on paper with DFO immediately after lifting. 15 min at 95 C with some humidity.

Photograph the fluorescing DFO treated impression, using 535nm light from an ALS with a filter (600nm) on the camera.

DFO (1, 8 – DIAZAFLUOREN – 9 – ONE)

Control Testing

Reactionary substance: synthetic blood (Sirchie catalog No. SYN8) on porous white paper

Positive results – (visual; optional) pinkish-orange, pink, orange; (ALS/Lasers) fluorescence (orange, red-orange due to filters)

Negative results – (visual) no color change; (ALS/Lasers) no fluorescence

Safety

Reagent is flammable. It is a sensitizer and causes staining of the skin. Mixing must be performed in a vent hood wearing lab coat, gloves, and eye protection. DFO is mixed with carriers that are highly flammable and irritant. Wear gloves, a lab coat, safety eyewear and use in a lab fume hood. Must be disposed of like any other flammable chemical.

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CYANOACRYLATE

Description of Process

The super glue process was first used for latent print development by the Japanese police in the late 1970s but this technique also works for wet origin footwear impressions. A glue containing cyanoacrylate is placed in an airtight chamber with the evidence. As the glue dries, the fumes from the drying glue circulate throughout the chamber adhering to the footwear impression residue left on the evidence. The process will develop fresh as well as old prints. Works especially well on wet origin (water) impressions that have dried on non-porous surfaces.

Sequence

Cyanoacrylate Ester Fuming is typically utilized after a visual examination and before the utilization and application of other processes (ex: Powder Processing and/or Fluorescent Dye Staining). Cyanoacrylate Ester Fuming may interfere with DNA analysis and blood enhancement techniques (such as Amido Black, LCV processing).

Process for Use

Cyanoacrylate is purchased as a working solution. Shelf life is indefinite for this purchased product.

1. Place aluminum dish on a heating device and pour approximately one (1) teaspoon of glue in the dish. May use more or less glue depending on evidence being processed.
2. May add accelerator (ex: water), if required. Manufacturer recommends optimum humidity of 30-60%.
3. Place evidence into fuming chamber either by suspending or standing so all areas are exposed.
4. Seal fuming chamber.
5. Turn on heating device. Manufacturer recommends operation at 60°-85° F (16°-29° C) and not to heat above 250° F (120° C).
6. After footwear impressions are developed (usually 8 to 30 minutes), turn the heater off and exhaust the fumes from chamber before opening. May process item longer with superglue, as needed, for adequate clarity of results.
7. Vent chamber (usually 10 or more minutes).
8. Remove evidence and view for developed footwear impressions. Oblique and/or intense light may be utilized to better visualize developed impressions.
9. If suitable impressions are developed, the examiner may indicate the impression(s) with suitable markings as appropriate to be preserved by digital imaging/photography.
10. Depending on type of evidence, additional processing techniques for development of footwear impressions may be used (ex: Powder Processing and/or Fluorescent Dye Staining).

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CYANOACRYLATE

Control Testing

Reactionary substance: latent print on glass slide or clear plastic

Positive results – white/off-white film

Negative results – lack white/off-white film

Safety

Precautions should be taken as to not get the glue on your skin. Wear eye protection and latex gloves. If you do get glue on your skin and get attached to something, do not try to pull apart. Use water or acetone and then rub apart to release. Use in a vent hood or use an exhaust system to remove fumes from the chamber prior to opening the fuming chamber and removing the evidence. Cyanoacrylate ester fuming may be a respiratory and eye irritant.

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CHEMICAL PROCESSING – BLOOD IMPRESSIONS

Using chemical techniques and procedures it is possible to develop footwear impressions in blood by way of chemical reactions with specific components of the bloody impression. Some chemicals require the prior use of a fixing agent to ensure they are not washed away or dissolved during the enhancement. The fixative is sometimes incorporated into the stain, other stains require a fixative such as 5-sulfosalicylic acid to be applied first. The list of chemical processing techniques which may or may not be used includes, but is not limited to the following:

NINHYDRIN

Description of Process

Ninhydrin is a chemical method for developing footwear impressions on porous surfaces and absorbent materials such as paper, cardboard, and smooth raw wood. This method is based on the reaction of Ninhydrin and amino acids that are present in bloody footwear impressions. Although other enhancements are now more common. The reaction produces a color called Ruhemann's Purple.

Ninhydrin can be mixed using two carriers: acetone or petroleum ether.

Sequence

Evidence that may have potential DNA evidentiary value may be processed for latent prints with Ninhydrin previous to DNA sample collection. No fixative is required.

Ninhydrin can be utilized by itself or in conjunction with other processes if used in the following order:

1. IND; 2. DFO; 3. Ninhydrin;

Process for Use

Ninhydrin crystals are purchased, but a working solution is typically prepared in the laboratory. Shelf life is approximately six months for a working solution.

1. Select the appropriate Ninhydrin base solution dependent upon the other substances on the surface. Acetone will cause certain inks to dissolve. Therefore, handwriting analysis should be performed before processing for latent prints begins.
2. Apply Ninhydrin solution to an item by spraying, dipping, or brushing. Spray a second time if necessary.
3. After the Ninhydrin has dried, place the processed item in humidity chamber or steam the item with an iron to accelerate the development process.
4. Examine the item for footwear impressions and indicate the impression with suitable markings as appropriate to be preserved by digital imaging/photography or scanning.

Note: Developed footwear impressions on some dark-colored surfaces may be viewed with a light source for increased contrast. Development of footwear impressions may vary with exposure time to Ninhydrin.

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Ninhydrin

Control Testing

Reactionary substance: synthetic blood (Sirchie catalog No. SYN8) on porous white paper

Positive results – purple, pink, black color change

Negative results – no color change

Safety

Ninhydrin should be used in a laboratory fume hood, a well-ventilated area, or outside. Gloves, lab coat, and safety eyewear must be worn when using. Ninhydrin is mixed with a carrier such as methanol, acetone, or petroleum ether (which is highly flammable). Excess is disposed of as any flammable liquid.

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AMIDO BLACK

Description of Process

Amido Black stains the proteins in the blood turning the impression a dark blue or black color.

Amido Black may destroy blood for biological screening/DNA testing. Have evidentiary blood samples chemically tested and preserved by appropriate personnel prior to processing.. The background of a porous item may also stain, causing weak bloody impressions to not be detected on these surfaces.

Cyanoacrylate ester fuming may be detrimental to this process.

Sequence

Amido Black is typically utilized instead of other processes. . The fixative (5-sulfosalicylic acid) is usually incorporated into the working solution.

Process for Use

Amido Black is typically prepared in the laboratory and not purchased as a working solution. Shelf life is indefinite for Amido Black and Rinse Solution.

1. Preserve any suitable visible impressions present on evidence prior to applying Amido Black solutions.
2. Apply the Amido Black base solution by dipping, spraying, or using a squirt bottle to dried impressions in apparent blood. Apply until the entire impression has turned from a reddish-brown color to a blue-black color. Background staining may occur.
3. If necessary, the base solution can be re-applied before the final rinse to achieve sufficient clarity.
4. Rinse off excess base solution with the rinse solution (use additional rinses as necessary to achieve sufficient clarity).
5. Let dry.
6. Examine the item for footwear impressions and indicate the impression with suitable markings as appropriate to be preserved by digital imaging/photography.

Note: Developed footwear impressions on some dark-colored surfaces may be viewed with a light source for increased contrast.

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AMIDO BLACK

Control Testing

Reactionary substance: synthetic blood (Sirchie catalog No. SYN8) on glass slide

Positive results – purple, blue, black color change

Negative results – no color change

Safety

Mix only in a vent hood. When mixing or using, must wear gloves and eye protection. Chemicals are flammable and skin irritant. Caution should always be exercised around a bloody crime scene or handling items which contain blood. Excess is disposed of as any flammable liquid. Protective lab coats, footwear, eyewear, and latex gloves should be worn. Since Amido Black is mixed with methanol, which is highly flammable extreme caution should be taken when used at a crime scene.

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LEUCO CRYSTAL VIOLET (LCV)

Description of Process

LCV stains the proteins in the blood turning the impression a dark violet color. LCV works with extremely faint traces of blood.

LCV may destroy blood for biological screening/DNA testing. Have evidentiary blood samples chemically tested and preserved by appropriate personnel prior to processing. Suitable for both porous and non-porous surfaces.

Sequence

LCV is typically utilized instead of other processes although faint impressions can be further enhanced with Amido Black after treatment with LCV to increase contrast. The fixative (5-sulfosalicylic acid) is usually incorporated into the working solution.

Process for Use

LCV is typically prepared in the laboratory and not purchased as a working solution. Shelf life is 30 days or 3 months if refrigerated.

1. Preserve any suitable visible impressions present on evidence prior to applying LCV solution.
2. Apply the LCV solution by lightly spraying/misting dried impressions in apparent blood. Background staining may develop over time.
3. Let dry.
4. Examine the item for footwear impressions and indicate the impression with suitable markings as appropriate to be preserved by digital imaging/photography as soon as possible due to background development

Note: Developed footwear impressions on some dark-colored surfaces may be viewed with a light source for increased contrast.

Control Testing

Reactionary substance: synthetic blood (Sirchie catalog No. SYN8) on glass slide

Positive results – violet color change

Negative results – no color change

Safety

When dealing with biological samples and chemical reagents suitable protective clothing, gloves and eyewear should always be worn. Avoid contact with skin and eyes.

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DAB (3,3'-Diaminobenzidine tetrahydrochloride)

Description of Process

DAB is converted to a dark brown insoluble product in the presence of hydrogen peroxide as a result of the hemoglobin derivatives in blood. DAB cannot be mixed with a fixative so prior fixing with 5-sulfosalicyclic acid is necessary. DAB is particularly good on bloody impressions on porous surfaces.

DAB may destroy blood for biological screening/DNA testing. Have evidentiary blood samples chemically tested and preserved by appropriate personnel prior to processing.

Sequence

DAB is typically utilized instead of other processes although faint impressions although can be used in tandem with ninhydrin.

Process for Use

DAB is typically prepared in the laboratory and not purchased as a working solution. Shelf life is 6 months if frozen. The fixative (5-salicyclic acid in buffer) can be stored indefinitely in a dark bottle.

1. Preserve any suitable visible impressions present on evidence prior to applying fixative solution.
2. Immerse impression in fixative for approximately 4 minutes.
3. Remove and rinse well with distilled water.
4. Immerse in working solution of DAB for approximately 4 minutes or until the impression is fully developed.
5. Remove and rinse with distilled water.

Note: Developed footwear impressions on some dark-colored surfaces may be viewed with a light source for increased contrast.

Control Testing

Reactionary substance: synthetic blood (Sirchie catalog No. SYN8) on glass slide

Positive results – dark brown color change

Negative results – no color change

Safety

Chemicals used in preparation and process are flammable and irritant. Avoid contact with skin and eyes.

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Wear proper protective equipment when preparing and processing items: lab coat, gloves, and safety glasses (goggles). Avoid breathing aerosols of the fixative

IND (1,2-INDANEDIONE)

Description of Process

1,2-Indanedione is a fluorescent amino acid reagent applied for developing footwear impressions on porous surfaces such as paper and cardboard. There is no discoloration or background staining evident on the 1,2-Indanedione processed samples that consistently appears when processing with DFO. 1,2-Indanedione may be used in place of DFO.

Sequence

If other processes are to be used on the same piece of evidence, IND should be used prior to DFO, Ninhydrin and Physical Developer.

Process for Use

IND crystals are purchased and a working solution is prepared in the laboratory.

1. Apply the IND solution to an item by spraying, dipping or brushing.
2. Allow to dry for approximately three minutes.
3. After the IND has dried, place the processed item in a humidity chamber to accelerate the development process.
4. 10 minutes at 100 C and 60% relative humidity.
5. The best results obtained for the thermal paper samples were achieved by not accelerating the development and allowing them to develop naturally in the laboratory environment from 4 to 12 hours.
6. Developed impressions are observed through an orange/amber viewing filter using a light source.
7. Examine the item for footwear impressions and indicate the impression with suitable markings as appropriate to be preserved by photography.
8. The results can also be seen on some samples with white light and develop as a light pale pink color.

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IND (1,2-INDANEDIONE)

Control Testing

Reactionary substance: synthetic blood (Sirchie catalog No. SYN8) on porous white paper

Positive results – (visual; optional) light/pale pink color; (ALS/lasers) fluorescence (orange due to filters)

Negative results – (visual) no color change; (ALS/Lasers) no fluorescence

Safety

Chemicals used in preparation and process are flammable and irritant. Avoid contact with skin and eyes. Wear proper protective equipment when preparing and processing items: lab coat, gloves, and safety glasses (goggles). Wear amber protective eye wear when viewing results under laser light.

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Acid Yellow 7

Description of Process

Acid Yellow 7 is a dye solution that is used for staining bloody impressions, that are turned yellow after treatment. They then fluoresce under blue/blue-green light. This enhancement only works on non-porous surfaces.

Acid Yellow 7 may destroy blood for biological screening/DNA testing. Have evidentiary blood samples chemically tested and preserved by appropriate personnel prior to processing.

Sequence

Acid Yellow 7 is typically utilized instead of other processes although the resultant impression can be gel lifted and photographed in the blue/blue-green light range. The fixative (5-sulfosalicylic acid) is usually applied to the impression before staining with Acid Yellow 7.

Process for Use

Acid Yellow 7 is typically prepared in the laboratory and not purchased as a working solution. Once made the solution should be stored in light sensitive vessel and used within 1 day. The fixative (5-sulfosalicylic acid in buffer) can be stored indefinitely in a dark bottle.

1. Preserve any suitable visible impressions present on evidence prior to applying fixative solution.
2. Immerse impression in fixative for 3-5 minutes.
3. Remove and rinse well with distilled water.
4. Immerse or spray mist in working solution of Acid Yellow 7 for 1-3 minutes or until the impression is fully developed.
5. Remove and rinse with the distilled water
6. Allow to dry completely.
7. Stained impressions can be lifted with a black gel lifter. Leave gel on impression for around 1 minute. Remove and visualize under blue/blue-green light (400-490nm) using orange/yellow eye protection. Photograph using orange/yellow filter as soon as possible as dye will begin to diffuse into the gel.

Control Testing

Reactionary substance: synthetic blood (Sirchie catalog No. SYN8) on glass slide

Positive results – yellow color change

Negative results – no color change

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Safety

When dealing with biological samples and chemical reagents suitable protective clothing and gloves should always be worn. Avoid breathing aerosols of the fixative and dye solution, when using aerosols use fume cabinet. Wash hands thoroughly after each session. Wear amber protective eye wear when viewing results under laser light

Fuschin Acid/Hungarian Red

Description of Process

Fuschin Acid stains the bloody impressions a deep magenta color.

Fuschin Acid may destroy blood for biological screening/DNA testing. Have evidentiary blood samples chemically tested and preserved by appropriate personnel prior to processing. Suitable for both porous and non-porous surfaces.

Sequence

Fuschin Acid is typically utilized instead of other processes but the resultant impression can be gel lifted and photographed in the ultraviolet light range. The fixative (5-sulfosalicylic acid) is usually incorporated into the working solution.

Process for Use

Fuschin Acid is typically prepared in the laboratory and not purchased as a working solution. Shelf life is 30 days or 3 months if refrigerated.

1. Preserve any suitable visible impressions present on evidence prior to applying Fuschin Acid solution.
2. Apply the Fuschin Acid solution by lightly spraying/misting dried impressions in apparent blood, leave for 1-3 minutes.
3. Rinse the excess dye away using distilled water.
4. Examine the item for footwear impressions and indicate the impression with suitable markings as appropriate to be preserved by digital imaging/photography as soon as possible due to background development.
5. To further increase contrast lift the stained impression using a white gel lifter (allow to sit on impression for at least 15mins). This impression will fluoresce under ultraviolet light and can be photographed with the appropriate filter. Photography should occur soon after lifting as the impression will diffuse into the gelatin over time.

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Control Testing

Reactionary substance: synthetic blood (Sirchie catalog No. SYN8) on glass slide

Positive results – magenta color change

Negative results – no color change

Safety

When dealing with biological samples and chemical reagents suitable protective clothing and gloves should always be worn. Avoid contact with skin and eyes. Wear protective eye wear when viewing results under ultraviolet light.

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EXAMINATION OF KNOWN FOOTWEAR

Actual footwear items are the preferred known samples for comparison. Just photos or impressions of known footwear limit the conclusions that can be made from comparisons. The laboratory analyst will create the appropriate test impression from the known footwear in the laboratory. Any items of footwear or impressions that are obtained or recovered during the investigation (including elimination samples) should be submitted along with the questioned impression(s) for comparison.

Visual Exam

The general condition of the upper and sole, brand, and label/size information (if discernable) of known footwear should be noted. Evidence for other exams (eg. trace, micro-screening) should be collected prior to any processing of known footwear.

Documentation of Footwear

Photos of known footwear should be taken to document overall appearance and outsole design. It is recommended that a notation be made as to the date on which known footwear was seized. A description of the outsole design should be recorded in the notes (eg. four sided blocks across heel, circles and curved bars apparent on many soles).

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PROCESSING TECHNIQUES FOR KNOWN FOOTWEAR

In footwear comparison examinations, it is common practice to prepare known footwear impressions from submitted footwear as a comparison tool. Multiple test impressions using different methods or on different substrates are often prepared to ensure the repeatability of any characteristics seen. A variety of two-dimensional and three-dimensional test impression methods may be appropriate and can be prepared at the examiner's discretion. The list includes but is not limited to the following.

Preparation of Test Impression(s)

Black Powder—The footwear is worn (by an analyst who is within 2 sizes of the known footwear) and is used to step on a treated surface (such as foam carpet underlay sprayed with WD40 or other such lubricant), the known footwear then steps dynamically across a sheet of white paper placed on a surface that reflects the substrate of the questioned impression. Paper is then powdered lightly using black fingerprint powder. The resulting print has a scale attached and is photocopied to a sheet of over head projector acetate. Scales are checked to ensure photocopy has maintained size.

Biofoam— a 3-dimensional test impression method. The footwear is worn and gently pressed onto the impression foam, engineered for producing orthotic impressions. The foam indented impression should then be photographed and can be cast if necessary.

Adhesive Lifts— a 2-dimensional test impression method that may be useful for recording fine detail on the border or arch areas of footwear. The outsole is dusted with black fingerprint or aluminum powder. A clear adhesive acetate lifter is placed (sticky side up) on the edge of a desk/bench/table or other hard surface. The footwear is then placed against the sticky side of the adhesive lift. Gradually pull the adhesive lift and footwear towards you with one hand using the other to smooth the lift across the outsole of the footwear. Once the outsole has been completely covered by the lift turn footwear over and use a soft fabric towel to smooth the edges of the adhesive lifter out and make sure it has made contact with all areas of the outsole. Slowly remove the adhesive lift. A clear cover or white backer is applied to preserve the lift and rolled out to avoid any air bubbles. Label immediately to ensure you visualize the correct side during comparison.

Inkless test impression – a quick 2-dimensional test impression method used to record general design detail. Step with the footwear onto the chemical coater, making certain the sole is completely covered with the colorless chemical. Then step on the chemically sensitized paper. A high contrast print will develop within seconds but may be lacking in fine detail.

Other— 3-D test impression methods using various substrates/products (e.g. Polyvinyl siloxane, Zetalabor, clay, sand, snow, Mikrotrack or similar materials)

Once the test impression is done information – case number, item number, left or right shoe, size, country of manufacture and label details and recorded.

An additional 2D test impression of each pair of shoes should be taken, do not record the case or item number. These test impressions will form the basis of a hard copy of a footwear reference collection that can be consulted during the comparison process to aid the analyst in forming their conclusions. This

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outsole pattern should be searched against the Alaska Reference Collection database, described below, if it already exists on there no further action required, unless the impression the analyst has just taken is either significantly clearer than the existing database impression or shows details that are not visible in the existing database impression.

If the impression is not already on the Alaska Reference Collection and the left and right items of footwear are mirror images of one another, as most are, then one impression should be uploaded to the database for consideration for inclusion under the module links> suggestion queue tab of the Alaska Reference Collection.

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COMPARISONS

Visual (side-by-side, overlay methods)

A preliminary side-by-side examination should be made between the known footwear and the evidence impression to determine if there are visual similarities in outsole design.

If the outsole designs are different, additional comparisons are not required.

If the outsole designs are similar, test impressions of the known footwear may be prepared and further evaluations conducted. Side-by-side comparisons are usually only done when a test or 3D impression is the only submitted questioned impression. In cases where 2D impressions or scaled photographs are submitted for comparison the overlay method (superimposition) will nearly always be of more practical use.

Test impressions are used to compare and evaluate specific outsole designs, physical size, position and degree of wear, mold characteristics, and any individual identifying characteristics to determine correspondence between the known footwear and the evidence impression. The use of magnification or special lighting may be appropriate. Although the comparison is conducted primarily through the medium of the test impression the actual item of footwear must be examined to confirm the location and validity of the characteristics observed.

The analyst may want to examine other styles of this or other styles, sizes and molds to confirm the appearance of a random acquired characteristic or design features. They may consult a reference collection or local/online store or manufacturer for this purpose.

The design features of an impression can be traced onto a clear sheet. This tracing can be used as a comparison tool.

The analyst should photocopy the test impression and mark the copy with the location of the matching characteristics. This can be done digitally or manually.

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FOOTWEAR DATABASES – INTELLIGENCE SEARCHES

In some instances it may be helpful to provide investigative information or intelligence regarding the manufacturer or style of footwear and an example of the outsole design relating to a questioned footwear impression.

The Laboratory has purchased a number of licenses to a web based footwear reference collection hosted on a server in the United Kingdom; the Bluestar/Corvus database called the Alaskan Reference Collection (ARC). As well as searching the reference collection the lab has the facility to upload new outsole patterns that have previously not been encountered to this database.

Officers or crime scene attendants can submit images to the laboratory for a footwear intelligence search. Photographs should be emailed to footwear.intelligence@alaska.gov along with some basic case information (agency case number, offense date, offense type, location) where a trained examiner will mark the email as actioned using a flag.

When a questioned impression is submitted to the laboratory for an intelligence search it is firstly coded by the footwear analyst. The search is conducted under the module links > collection search tab. Coding is breaking down the outsole into its constituent patterns (eg zig zag, circles, three sided shapes). These codes are then inputted into the ARC Database which returns a pictorial list of the outsole designs which exhibit those same outsole components. These searches can be made more accurate by specifying the type of footwear (boot, sneaker etc), whether you want to search the whole database or just the ARC. Text or parts of text visible in the questioned impression can be inputted or the analyst can conduct a logo search.

If the analyst encounters an outsole design that corresponds to the questioned impression they produce an intelligence output which has a copy of the outsole design and any manufacturer and model information. These reports must be clearly marked with words to the effect of:

The information in this document is intended for intelligence purposes only. This is not a report, result or conclusion. The above footwear was identified using the Alaskan Reference Collection (ARC) online reference database. Please be aware that other manufacturers may produce the same or similar patterns and that other styles and colors may be available.

If footwear is recovered and a comparison and evidential report are required please submit any impressions, footwear and a request for laboratory services to the Alaska Scientific Crime Detection Laboratory Evidence Department.

If the analyst cannot find the outsole design on the ARC they may choose to do a manufacturer search either online (on the manufacturer or shopping websites eg nike.com, zappos.com etc) or by visiting the stores in the vicinity; taking photos and impressions necessary with the store owner/manager's consent.

The analyst can also upload a copy of the questioned impression to an online footwear practitioner's forum (hosted by enfsi.eu or swgthread.org) and appeal for information this way.

Manufacturing, production, distribution, and sizing information may also be determined with assistance from the specific manufacturers and/or research.

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Images submitted for footwear intelligence searches are uploaded into the Digital Workplace with an agency case number and any footwear codes inputted in a searchable field. The footwear intelligence outputs are emailed back to the submitting officer.

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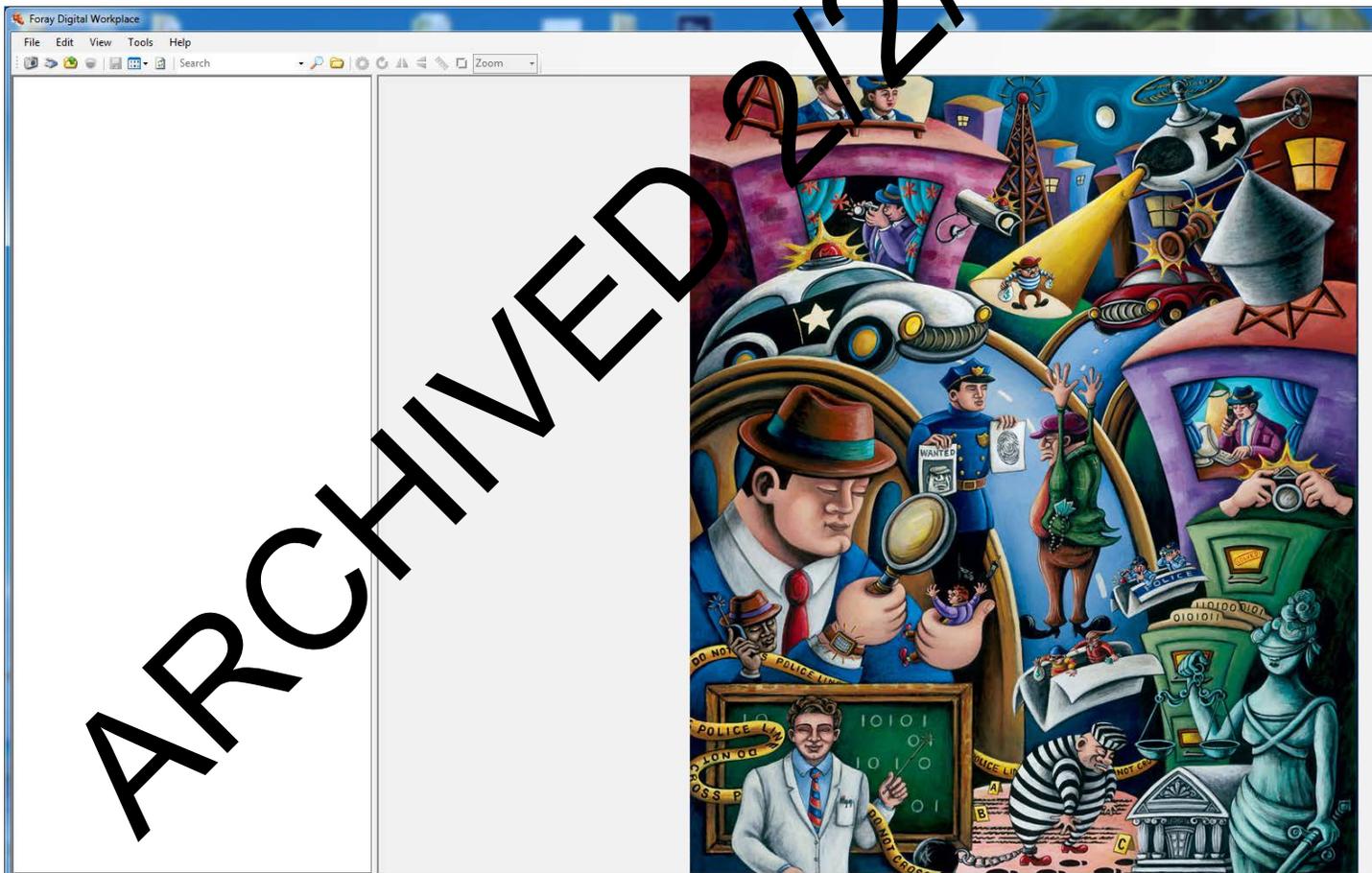
DIGITAL WORKPLACE

ASSET ACQUISITION

Open the Digital Workplace



Digital Workplace - Home Page



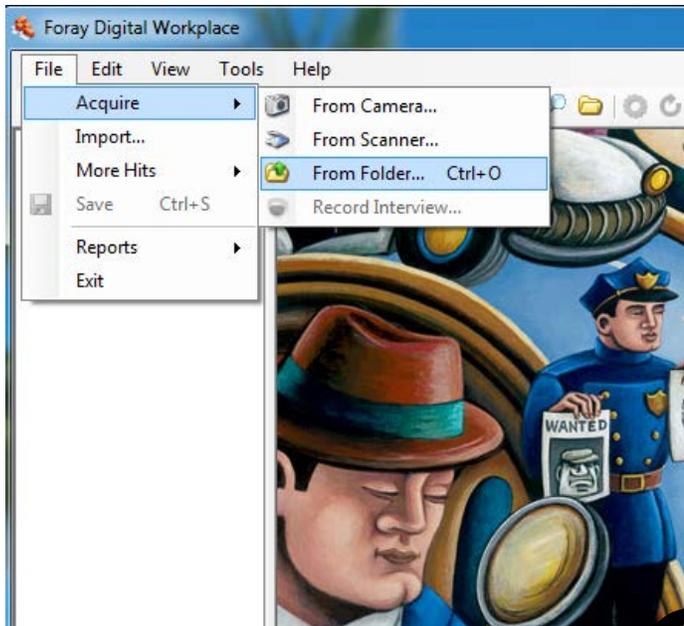
Alaska Scientific Crime Detection Laboratory

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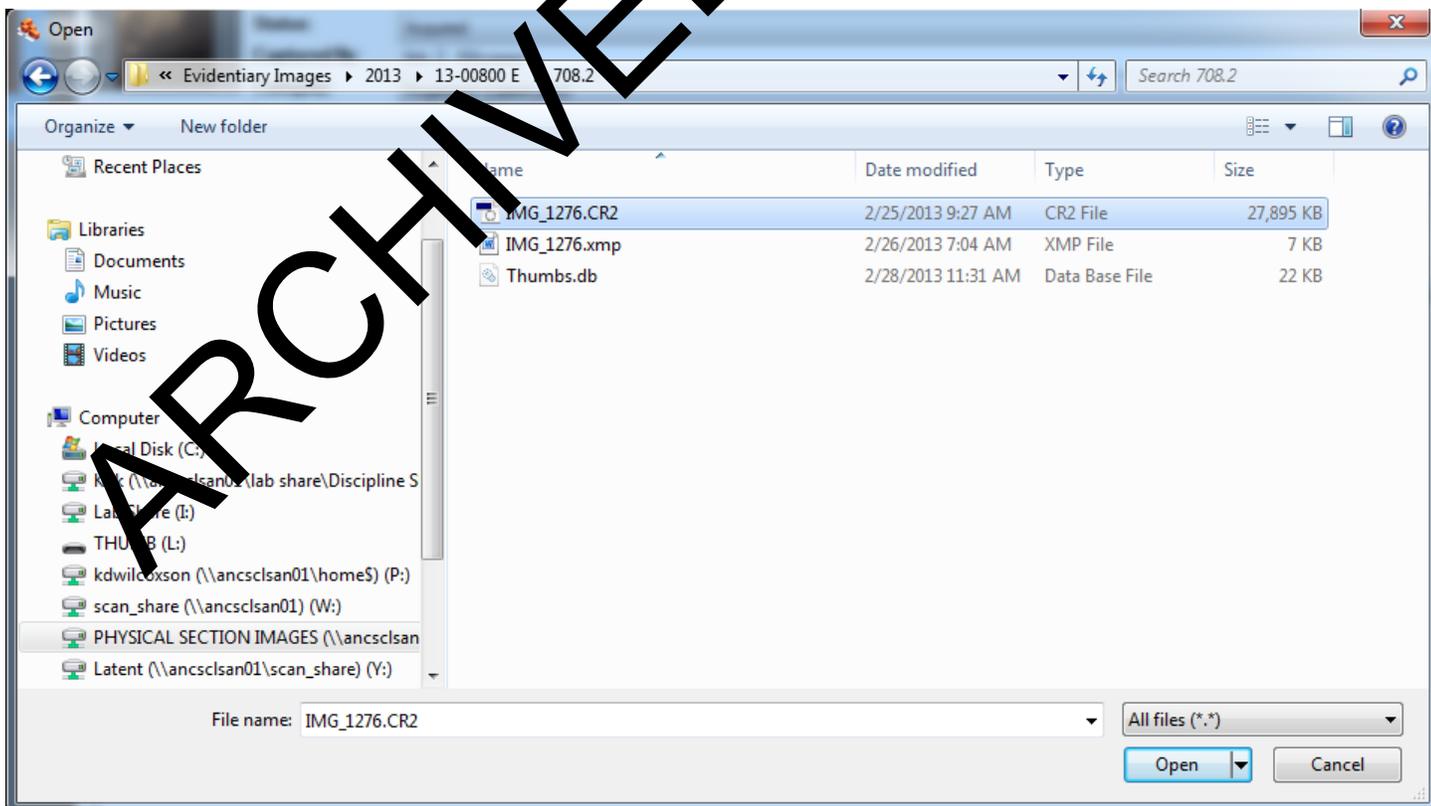
Issued: 3/2/2015
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Image Acquisition – Choose the source of the image(s).



Choose the Assets original location (Note: multiple assets from the same case can be selected.)



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Fill out Asset Information (information entered will be applied to all images acquired in this set)

Acquisition Info

Please enter the information associated with the evidence being acquired.

Case: 12-00001

Contributing Agency ID: Alaska Scientific Crime Detection Lab

Acquired By: Kirk D. Wilcoxson

Captured By: Kirk D. Wilcoxson

Crime: Dangerous Drugs

Date of Crime: [calendar icon]

Captured On: Wednesday, May 01, 2013

Category: Fingerprint (Latent print)

Location: Item 1

Description: Item 1 - Bottle of R&R Whiskey

Delete source assets after acquisition

OK Cancel

Provide as much of the following as possible;

- Lab Case Number
- Acquired by
- Crime Type
- Date of Crime (optional)
- Category of Image
- Location (Item # or physical location)
- Description

Asset View after Acquisition:

Add the latent designation here so that the asset name displays the following format:

Asset Name: IMG_1547.CR2

Captured On: 5/ 1/2013

Status: Acquired

Captured By: Kirk D. Wilcoxson

Category: Other

Location: P12011090

Description: 90a.1 (ziploc bag)

Notes Camera Data Processing File Info Chain of Custody State Changes

This information can be entered previously during acquisition or entered during this

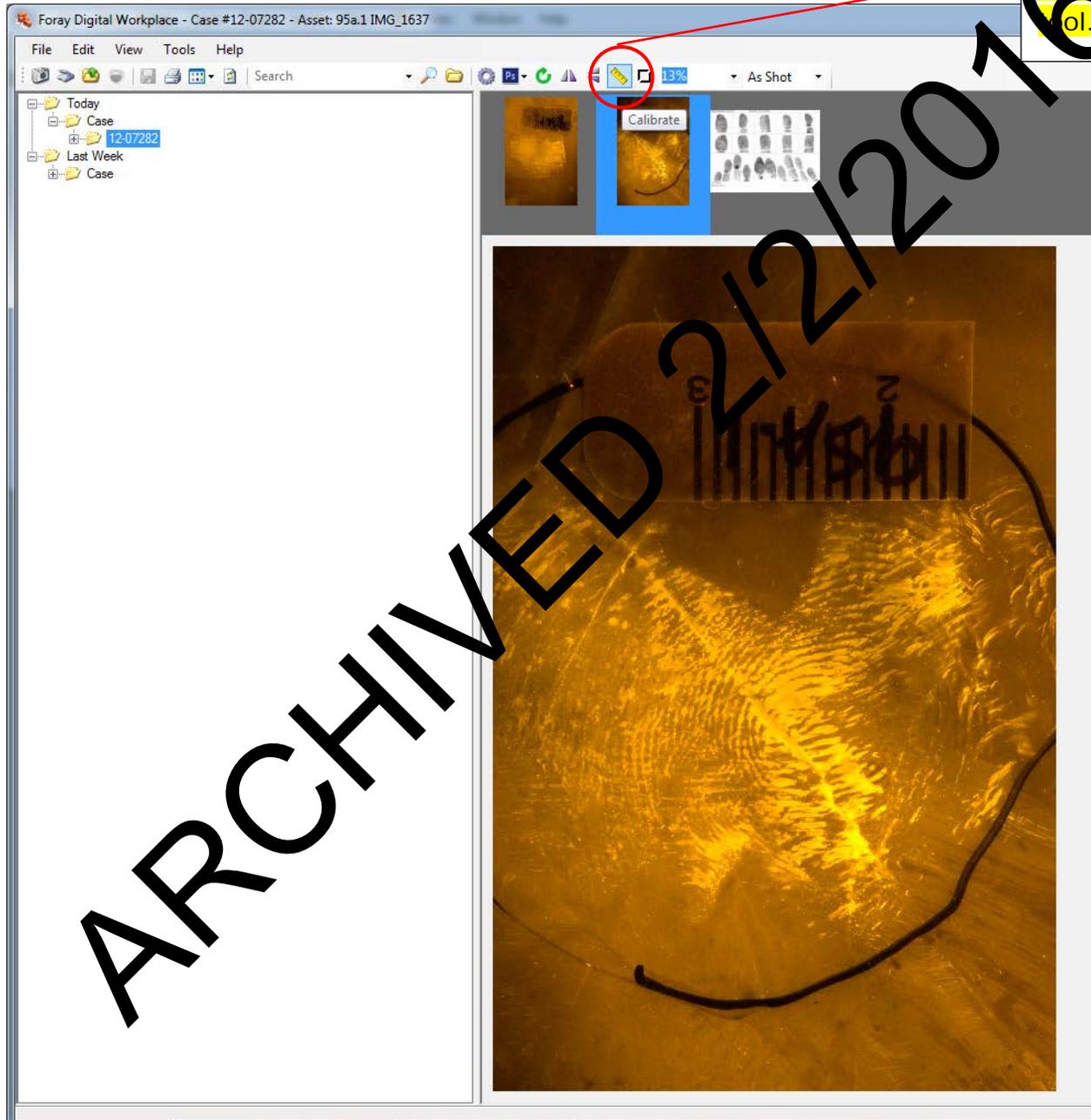
Issued: 3/2/2015
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Archive: Active

ASSET CALIBRATION

Double click on the image you wish to calibrate (this will switch the image to FULL View)

Select the Ruler Icon to launch the calibration tool.

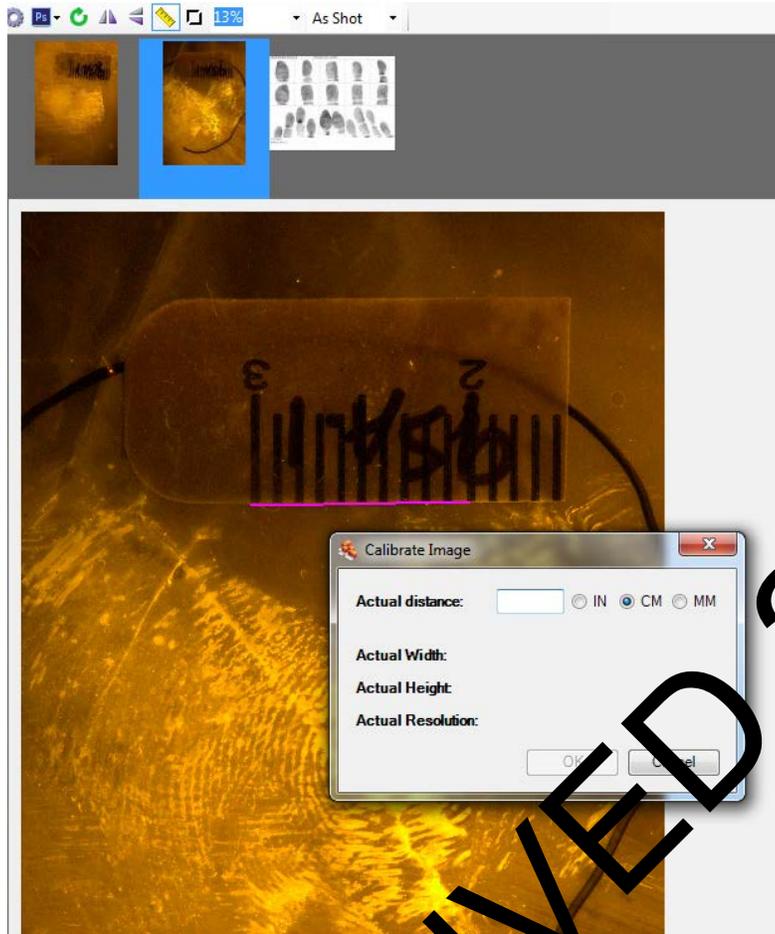


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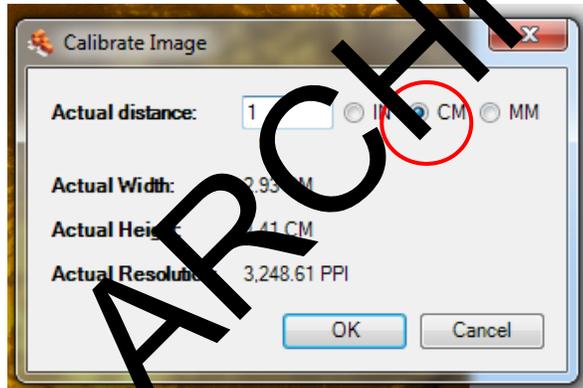
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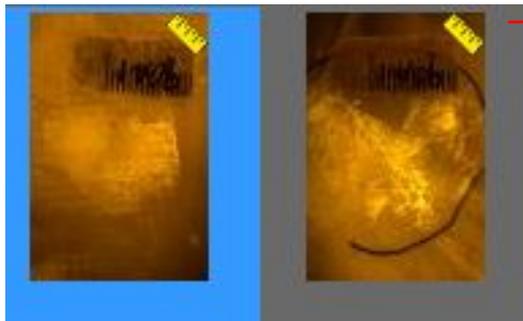
Using the cursor draw a line measuring one unit of measurement on the scale in the image. Enter the value and unit of measurement.



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Calibrated Assets
will have a ruler
icon in the upper

Enhancing the Image with Photoshop

Once Calibrated an asset may be processed (enhanced) with Photoshop by selecting the Photoshop icon and choosing either;

“Process as TIF” for images TIF Format (usually scanned image assets)

“Process as RAW” for Raw format (images from Camera captured assets)

Note: If original asset is JPG format, “process as TIF” must be used.

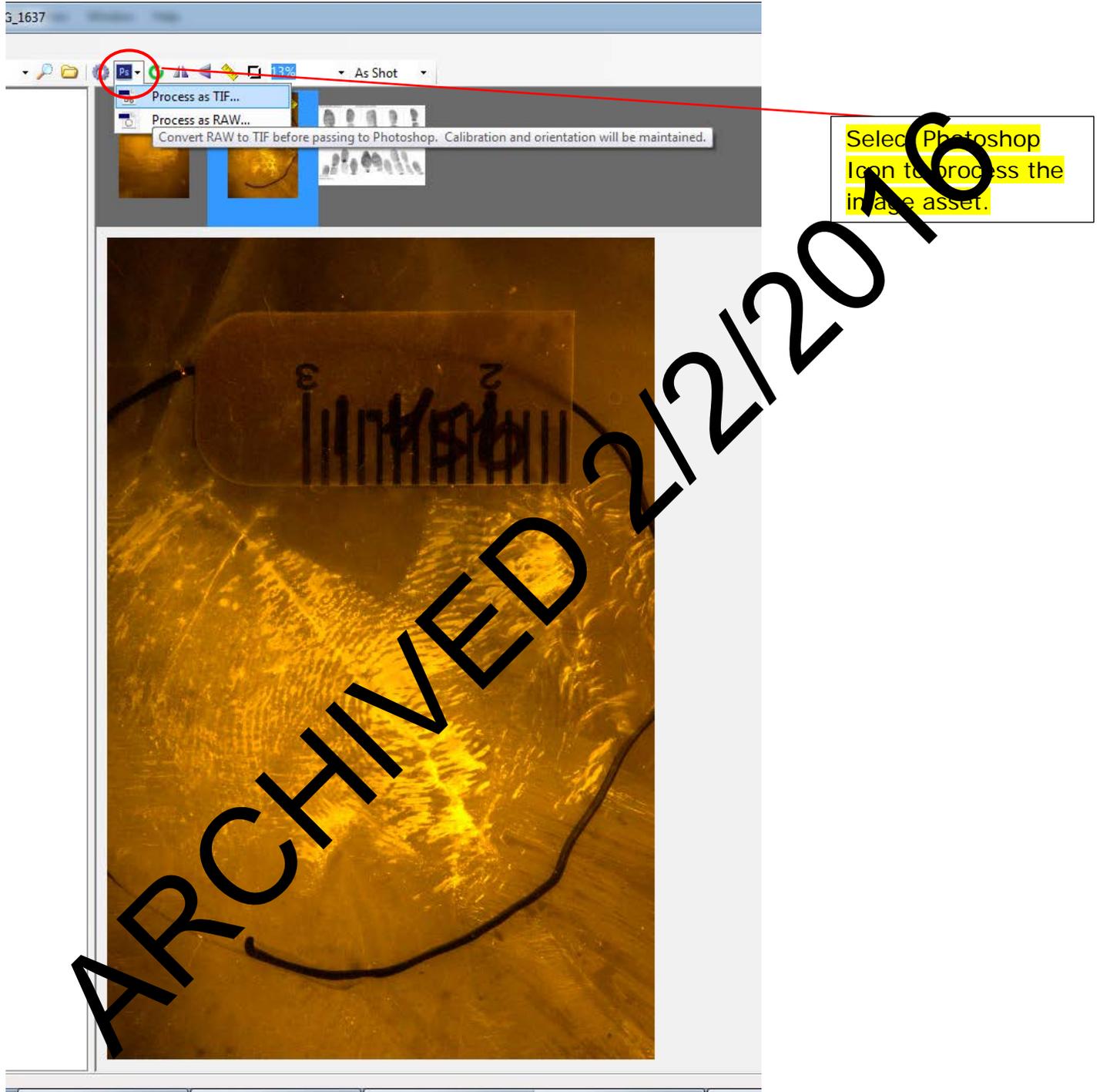
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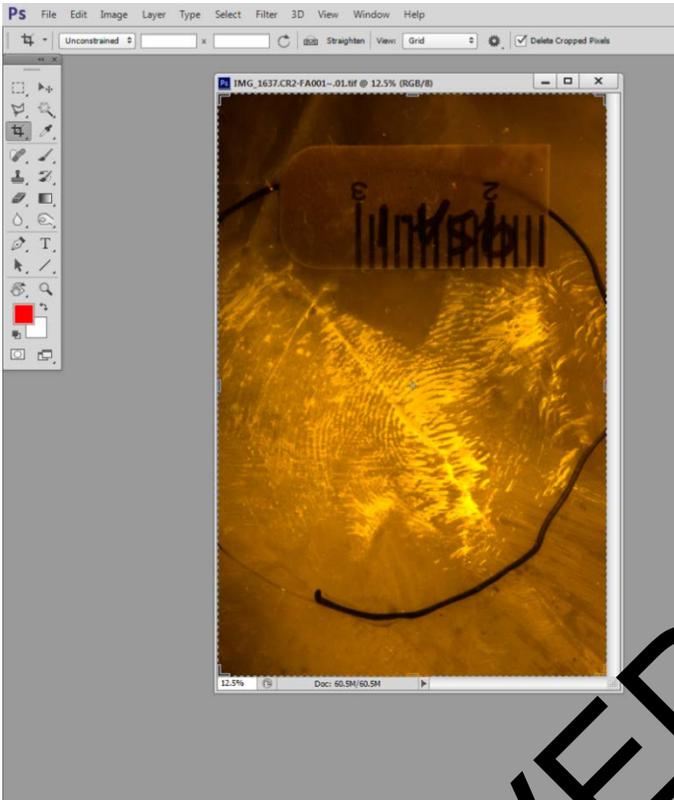
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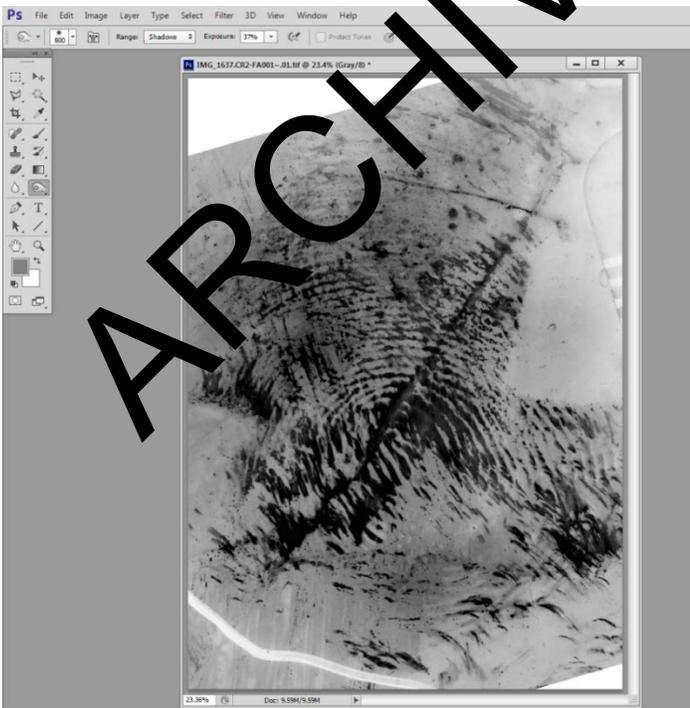
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Original Asset



Process and enhance the image in Photoshop using standard and approved methods to achieve high contrast ridge detail or to determined suitability for identification purposes.

Asset after Photoshop processing techniques applied



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Click the X to close the image when you are finished processing.

When finished processing the image in Photoshop and after the close "X" has been clicked the dialogue box asking if you wish to save your work will appear.

Select "YES" to save the enhancements.

Select "NO" to discard the processing.

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If working with TIFF images, the image asset will close. If working with RAW files additional steps are required to complete the acquisition of the processed image back into Digital Workplace.

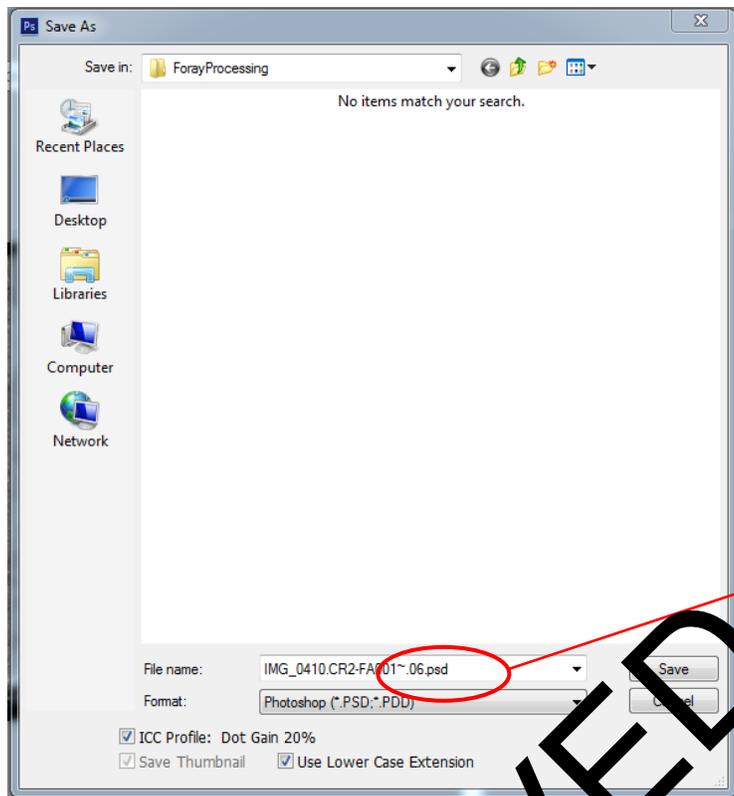
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RAW IMAGES – Extra “Save As” Step

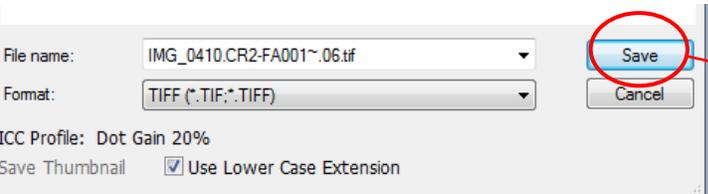
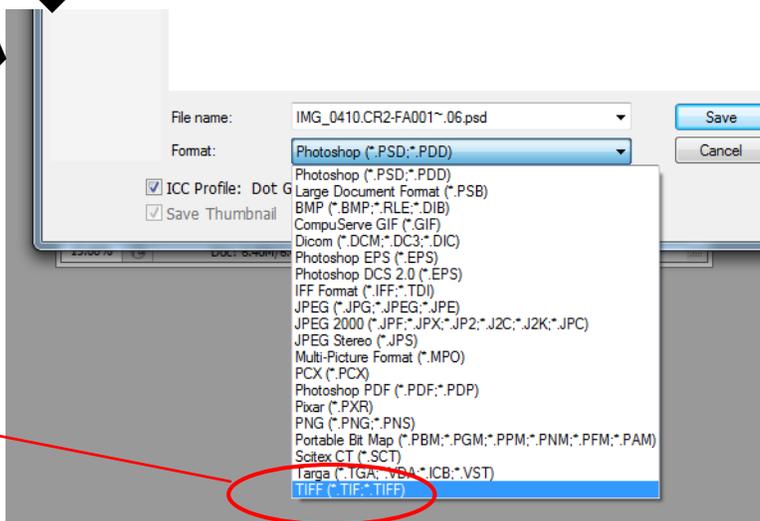


If working with RAW images, Photoshop will prompt you to save the asset. Change the **FORMAT** from PSD (default) to **TIFF**.

IMPORTANT:

Do not change the ASSET name.

Select TIFF from the Drop down menu next



Select Save and the image will close.
Return to Digital Workplace

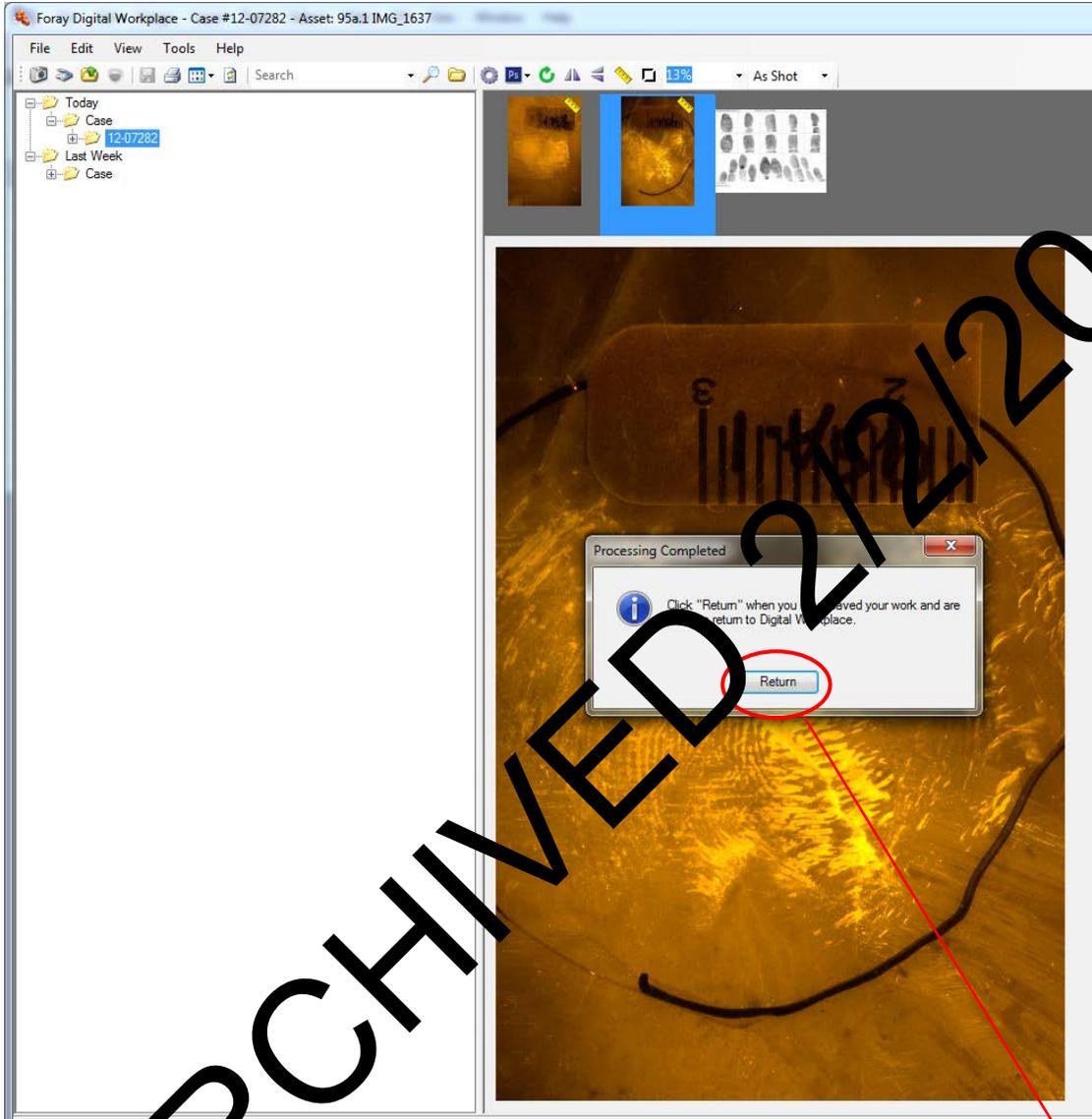
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After the dialogue box is finished you will return to Digital Workplace

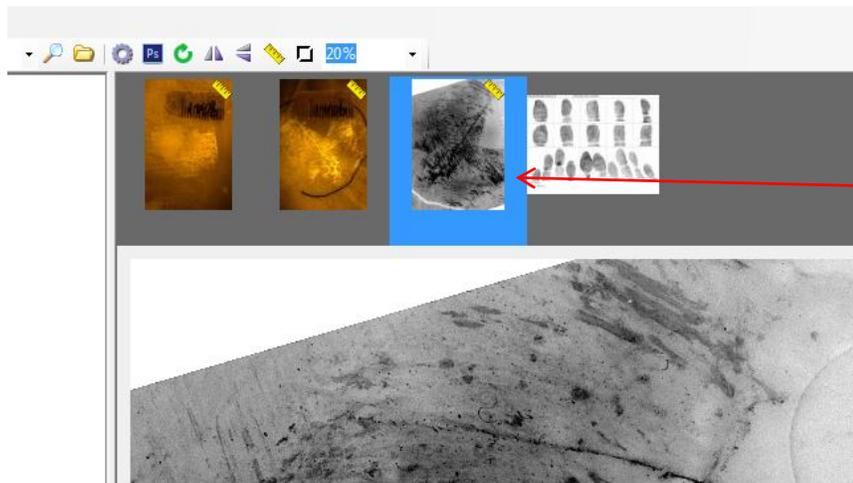


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In Workplace click return to Save the digital processing of the asset. A new Enhanced version of the Asset with the same name will appear next to it in the Asset View.

Working with Latent print Composites, Identifications and Verification Assets

Digital side by side latent print and known print composite images are created by the Case Examiner for purposes of Comparison, Identification and Verification mark up.

The following format is preferred; ten inch wide by eight inch high with a resolution of 300 Pixels per inch. Information should include case number, created by and date, Latent Print Composite as the title, latent print identifier and known print finger number, roll or flat impression, person identifiers (name and identification number), card number (TCN or Item number). The composite should also be initialed by the Case Examiner.

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Example of a Latent print COMPOSITE

Lab Number: 11-09999
Created by: T. Wortman
Date: 11-02-2011

Tw

LATENT PRINT COMPOSITE



Latent Print #1.1



APSIN #AK06806592
Thomas WORTMAN
Finger #7/Left Index (rolled)
Card A

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Latent print composites in DIGITAL WORKPLACE

Latent print composites should be named in the following manner:

“Latent Print Designation” LP COMP.tif - for comparison composites .

For Example “30A.1 LP COMP.tif”

“Latent Print Designation” LP ID “Identifying Examiners Initials”.tif - for Identification composites.

For Example “30A.1 LP ID KDW.tif”

“Latent Print Designation” LP VER “Verifying Examiners Initials”.tif - for Identification composites.

For Example “30A.1 LP VER TMW.tif”

As shown in Digital WorkPlace

The screenshot displays the Digital Workplace interface. On the left, a file browser shows a folder named 'IMG_0252.CR2' containing several files, including '30A.1 LP COMP.tif', '30A.1 LP ID KDW.tif', and '30A.1 LP VER - TMW.tif'. The main area shows the details for '30A.1 LP COMP.tif'. The metadata includes:

- Asset Name: 30A.1 LP COMP.tif
- Captured On: 7/ 2/2013
- Status: Acquired
- Captured By: Kirk D. Wilcoxson
- Category: LP Composite
- Location: Not Set

Below the metadata, there are tabs for 'Notes', 'History', 'Camera Data', 'Processing', 'File Info', 'Chain of Custody', and 'State Changes'. The 'File Info' tab is active, showing a table of properties:

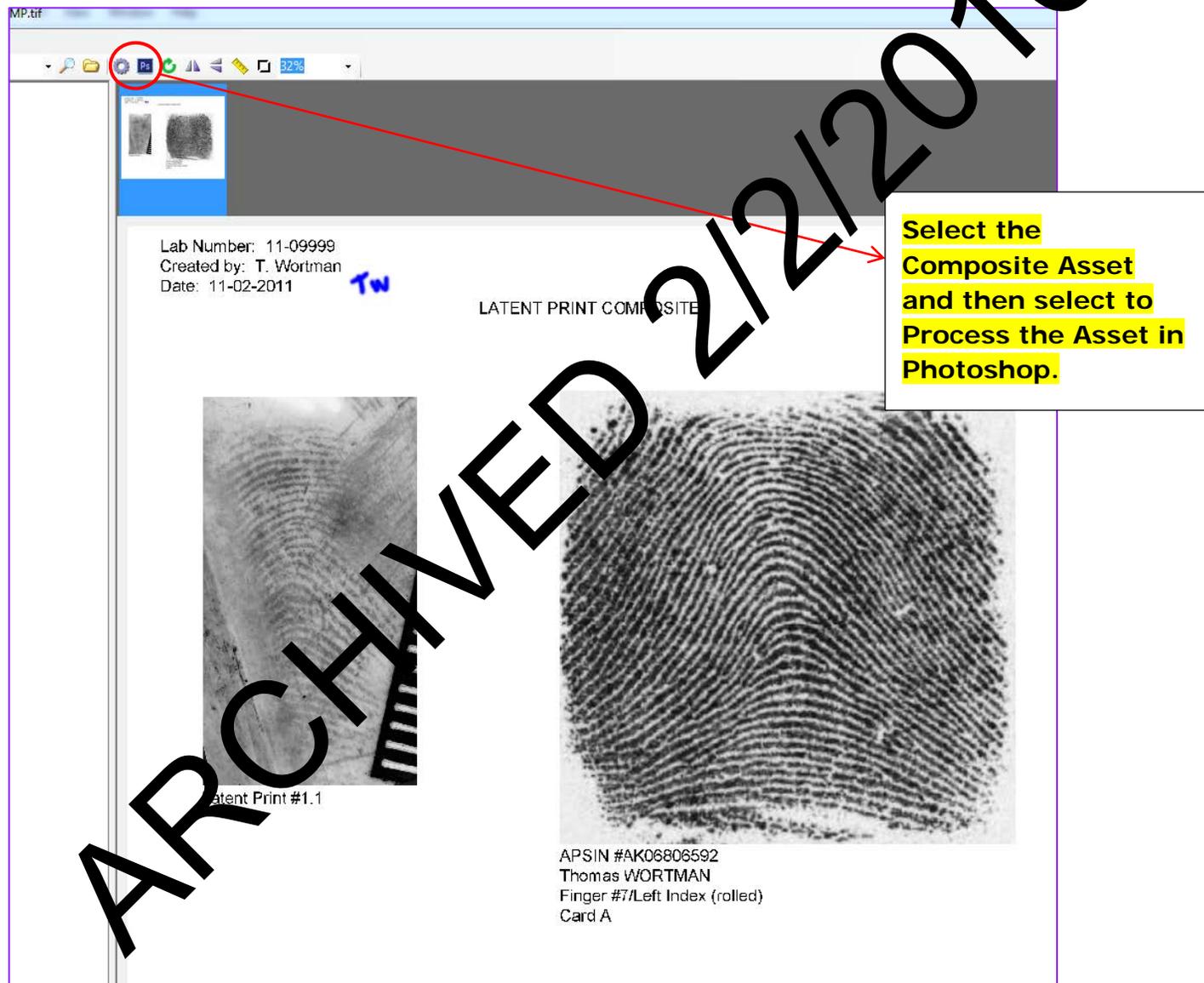
Item	Value
Acquired By	Kirk D. Wilcoxson (kdwilcoxson)
Asset Type	Image
Exhibit Name	
File Name	30A.1 LP COMP.tif
Image Size (W x H)	10.00 x 8.00 Inches
Pixel Dimensions (W x ...)	3000 x 2400 Pixels
Resolution	300 ppi
Set	5
Size	29 MB
Unique ID	KZAU-V2M9-GZFK

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Creating identification and Verification Composites

Latent print Comparison Composites should be created in Photoshop and acquired by the Case Examiner. Latent Print Identifications and Verifications Composites can be created from the Comparison Composite in the following manner;



By selecting the original comparison composite and selecting the Photoshop processing button the Composite will open in Photoshop automatically.

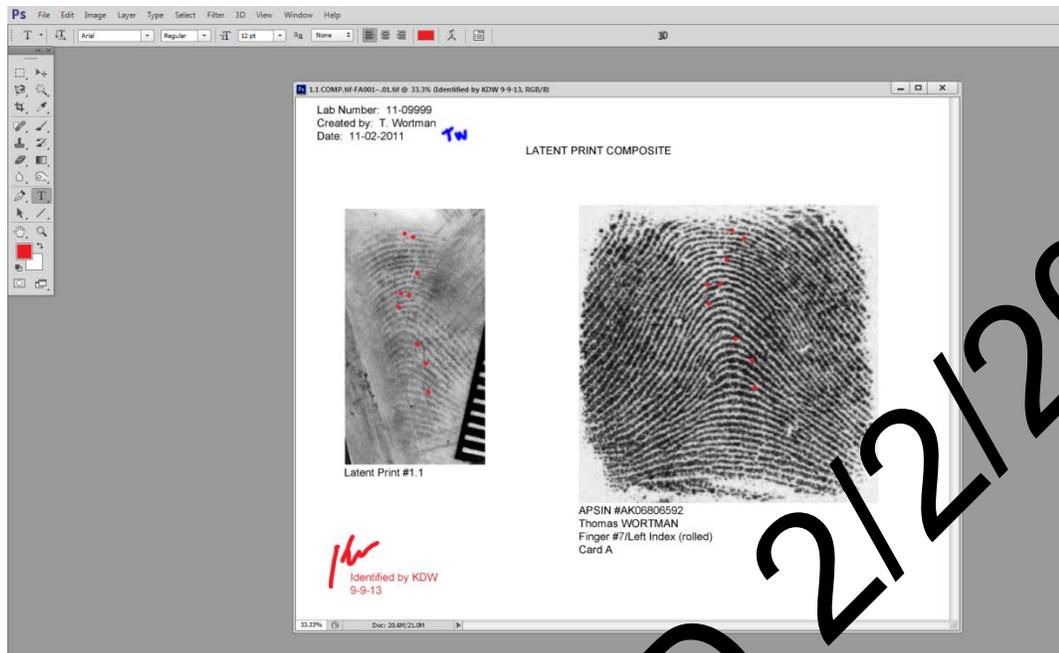
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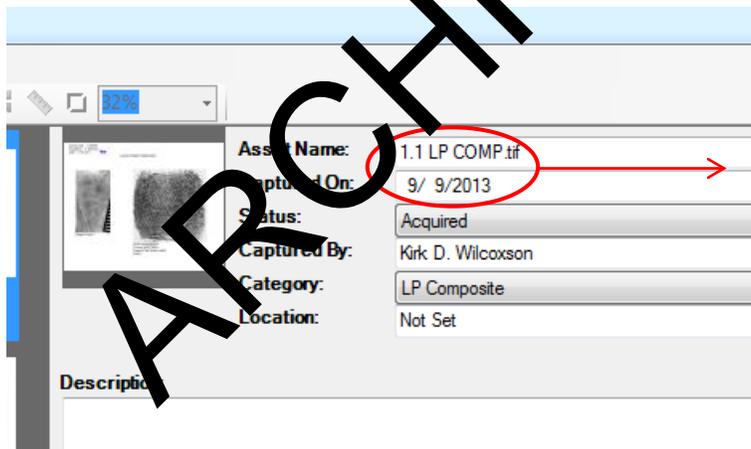
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For Identifications or Verifications the original composite can be marked up and initialed by an examiner.



When completed simply close the window and select to save the changes and the newly marked asset will be save and returned to Digital WorkPlace.

The name of the new assets will need to be changed to reflect the purpose of the markings (identification or verification) and the examiners initials.

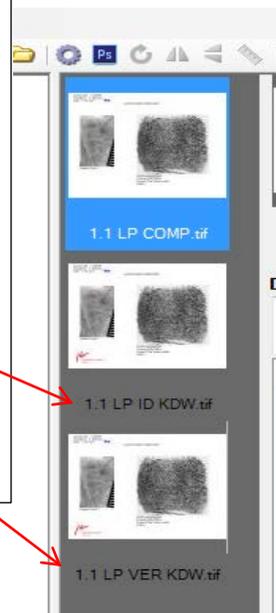


Change Asset Display Name for Identifications and Verifications

1.1 LP ID KDW

or

1.1 LP VER KDW



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DFO

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IND

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