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	<i>Document Manager: Cheryl Lozen</i>	<i>Approved By: Ryan Larrison</i>

1.0 Introduction and Report Conclusions

1.1 Trace Evidence

Trace Evidence examination comprises a wide variety of evidence types. This manual contains the most routinely used procedures for the Trace Evidence Unit, within the Michigan State Police Forensic Science Division (FSD). This manual, in combination with the Trace Evidence Training Manual, provides the basis for effective quality management of analyses. The FSD's Quality Manual (QM), Laboratory Operations Manual (LOM) and Health and Safety Manual provide additional guidelines.

The purpose of this manual is to provide a framework of analytical procedures for the Trace Evidence Examiner. Every effort has been made to document the routine procedures used by this unit and to provide appropriate references. Many procedures have been adapted from standard laboratory practices and, therefore, no specific reference may be available.

Every case is unique and must be evaluated by the individual examiner. Not all possible analyses that may be encountered in casework can be appropriately covered in a procedures manual nor can all possible variations to a described procedure be included.

1.1.1 Risk Assessment

The examination of questioned trace materials carries the risk of loss or consumption of the material. To assist in minimizing possible loss or unneeded consumption, it is recommended to determine the availability of known samples before assessing the risk of examining a questioned sample.

1.1.2 Examination of the Questioned Sample Prior to Making Comparisons

Prior to conducting any comparisons, the questioned sample will be examined to identify characteristics that may be suitable for comparison. When possible, characterization of the physical characteristics of the questioned sample shall be documented before comparison to a known sample (e.g. identify the presence, color, and layer structure (if applicable) for paint; presence, color, and physical appearance of fibers; and presence, color and physical appearance of glass).

This requirement is not intended to address the process of assessing and selecting the particular particle/material from a questioned sample that will be the subject of further comparison. In these circumstances, it may be appropriate to perform a preliminary characterization of the known prior to the assessment of the questioned sample.

Note: For Trace Evidence Collection and Documentation procedures - See discipline-specific procedure manuals

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1.2 Report Conclusions

Reports shall contain general examinations conducted, including generic class and type of instrumentation used for examinations or determinations (e.g., elemental analysis by SEM-EDS, polarized light microscopy, and color determination by visual observation).

In addition to the results of examinations, each report should include opinions and conclusions that arise from those results. These opinions and conclusions should include an interpretation of the significance of the results as well as a basis for the opined significance. In reports that include conclusions regarding associative evidence, this interpretation and basis should be assessed for the significance of any associations made. Further, any limitations in conclusions or opinions should be stated.

Characteristics or observations that increase or decrease the significance of an association should be explained. Two-way transfers or multiple transfers are examples of circumstances that may increase significance of the overall findings.

The following association scale is intended to outline the range of conclusions that may be reached in trace evidence examinations and general criteria underlying them.

If an association is made, the following scale shall be placed into the body of the laboratory report sent to the submitting agency:

Association Scale for Trace Evidence

The following descriptions are meant to provide context to the levels of opinions reached in this report. Every level of conclusion may not be applicable in every case nor for every material type.

- Level 1 - Identification: A physical match or fracture match; items physically fit back to one another, indicating that the items were once a single object or from the same source.
- Level 2 - High Degree of Association: Items are consistent in observed and measured physical properties and/or chemical composition and share atypical characteristic(s) that would not be expected to be readily available in the population of this evidence type.
- Level 3 - Association: Items are consistent in observed and measured physical properties and/or chemical composition and, therefore, could have originated from the same source. Because other items have been manufactured that would also be indistinguishable from the submitted evidence, an individual source cannot be determined.
- Level 4 - Limited Association: Items are consistent in observed and measured physical properties and/or chemical composition and, therefore, could have originated from the same source. As compared to a Level 3 association, items categorized within a Level 4 share characteristics that are more common amongst these kinds of manufactured products or are commonly encountered in the environment. Alternatively, an association between items would be categorized as a Level 4 if a limited analysis was performed due to characteristics or size of the specimen(s).
- Level 5 - Inconclusive Association: Items are consistent in some, but not all, physical properties and/or chemical composition. Some minor variation(s) exists between the known and questioned items and could be due to factors such as sample heterogeneity, contamination of the sample(s), or having a sample of insufficient size to adequately assess homogeneity of the entity from which it was derived.

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- Unsuitable for comparison: No conclusion could be reached regarding an association/elimination between the items.
- Elimination (Non-association): The items were dissimilar in physical properties and/or chemical composition, indicating that they did not originate from the same source.
- Inconclusive Non-association: The items appear to exhibit some dissimilarities; however, there are significant limiting factors in the samples (such as lacking in quantity, quality and/or detail) that do not permit an elimination.

1.3 Technical and Administrative Review

The technical review shall include but is not limited to the review of all examination documentation within the case record and the test report to ensure:

- Conformance with proper technical procedures (test methods) and applicable laboratory policies and procedures.
- Accuracy of calculations (if subject to human error)
- Accuracy of data transfers
- Accuracy of test reports and that the data supports the results and/or conclusions in the test report.
- Associations are properly qualified in the test report.
- The test report contains all required information.
- The test conclusions in the report are the same as those written in the case notes.
- Instrumental model and operating parameters are included in the case records.
- Techniques or analyses performed on non-routine evidence that is not specifically mentioned in the procedure manual should be clearly documented with supporting information on the applicability of the performed tests (literature cites, experimentation/verification, etc.)
- Note reagents verified if appropriate per procedure.
- Reference literature/spectra/etc. is labeled with its source information.

At a minimum, an administrative review shall include:

- A review of the test report for spelling and grammatical accuracy;
- A review of all administrative and examination records to ensure that the records are uniquely identified according to laboratory policy and/or procedure;
- A review of the test report to ensure that all key information is included.