



INDIANAPOLIS-MARION COUNTY FORENSIC SERVICES AGENCY

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EVIDENCE SUBMISSION GUIDELINE #15

SOIL SAMPLES FOR FORENSIC ANALYSIS

EVIDENCE SUBMITTAL PROCEDURES

NOTE: The I-MCFSA Laboratory does not process soil as evidence. Requests of this nature should be forwarded to the F.B.I. Laboratory in Quantico, Virginia to the attention of the Mineralogy Unit at the following address:

F.B.I. Laboratory
Attention: Evidence Control Unit
2501 Investigation Parkway
Quantico, VA 22135
TX: 703-632-7692

INTRODUCTION

Naturally occurring soil is a complex and changing mixture of living organisms, decaying organic matter, weathering rocks, minerals, and decomposing plants, air and water. Although there are different types of soils in the state, specific local areas contain relatively few of these varieties. Each type may exist for a few feet or for many square yards with the amount of variation in a single soil sample being quite limited. Hence, it is often not possible to exactly pinpoint the origin of a particular naturally occurring soil sample, but rather to relate it to areas of occurrence.

Soil can generally be considered the natural accumulation of the humus, sand and gravel. The formation of soil represents a dynamic process, influenced by a number of factors, including climate, geologic parent material, relief, biological activity, and time. Soil may develop in place (in situ) or after being deposited by wind, water, animals, or human activity. Soil varies laterally--that is, across the land surface--from place to place. These changes may be abrupt, occurring within a few meters, or gradual, over tens of meters. Soil also varies vertically, as a function of depth. Changes in soil relating to either of these dimensions are sensitive to the influences of nature and human activity. Soil samples may also contain debris from human habitation or industrial operations. The latter type of debris (e.g. paint droplets, brick fragments, roof shingle stones, paint chips, glass, cinders, chemicals, fibers, or other items) if sufficiently varied and unique, can be most valuable in individualizing a specimen. Soil samples containing such unusual features can be excellent physical evidence and may strengthen the association between specimens consequently, all soil samples should be submitted in anticipation that this rare occurrence may actually happen.

Not only does the character and composition of soils vary laterally, but also with depth. Unless a crime is committed which involves the digging of a grave, most samples for soil comparison will be from the top surface. Although the color and texture of soils visually does not appear to vary along the ground, the chemical composition can change sufficiently in a very short distance so that it may be significant in localizing the source of the soil sample. Therefore, sufficient samples should be submitted in order to establish the normal distribution of soil of a particular type in and about a crime scene. Generally two or three crime scene soil samples are sufficient.

IMPRESSIONS - Insure that impressions in soil such as footprints or tire tread patterns are photographed with a scale and a plaster cast made before disturbing the footprint in any manner. Photographs should be taken with the camera perpendicular to the impression to prevent angle distortion of the photograph. If the soil is firmly attached to some object do not remove but AIR DRY and place the object in a paper bag or other appropriate container, seal and label. Loose soil or sand can be swept onto a clean piece of paper which is then folded to enclose the specimen, and when completely dried, sealed in an appropriate container, and labeled as to source.

COLLECTION GUIDELINES

The nature of soil makes it imperative that investigators properly document the exact location from which they collect soil samples. Hand-drawn or detailed commercial maps best illustrate specimen collection sites as well as their spatial relationships.

Questioned samples taken from the ground surface, such as those taken from the tread pattern of a shoe, should be compared to known specimens collected from like places. Further, because time governs the factors that affect soil formation, timeliness in evidence collection is important.

To ensure that examiners possess an adequate representation of soil variability, investigators should collect a sufficient number of known soil specimens at crime scenes and from surrounding areas. Establishing the uniqueness of the soil at a particular location to the exclusion of others greatly strengthens the association between specimens. Of course, the available amount of suitable soil can limit the significance of the comparison. While in most cases, investigators cannot control the amount of questioned soil available for comparison, they do have substantial control over the number of known specimens collected.

In most cases, a 35mm film canister of soil from each location is sufficient for comparison. The nature of the crime scene and the investigation generally dictate the number of samples needed. All samples should be packaged dry, sealed, and properly labeled. Investigators must allow moist soil samples to air dry overnight at room temperature before packaging. Overlooking this step has resulted in the receipt of some rather exotic "terrariums" within samples. Plant nutritional demands can also alter soil characteristics, and consequently, undermine the effort involved and the value of the soil comparison.

In addition, investigators should not overlook the collection of alibi soil samples. They should collect these alibi samples from any area that suspects could claim as the source of the questioned soil. A suspect may contend, for

example, that soil recovered from the shovel used to dig a victim's grave actually came from a garden. If forensic examiners can identify dissimilarities between the soil found on a shovel and that of the suspect's garden or yard, they can eliminate the garden or yard as possible sources.

SUSPECT SAMPLES - A tablespoon of soil may be sufficient quantity for a soil comparison, however, if the questioned soil sample is available in larger quantities (up to one cup) then the crime scene or known soil sample(s) should be provided in equal quantity. Larger quantities of soil samples may provide for more specific soil comparison results.

COMPARISON SAMPLES - Obtain samples consisting of at least three (3) tablespoonfuls of soil from each area where the suspect is now, or is believed to have been at the scene, and especially any "alibi" sites provided. Comparison samples must be representative. If, for example, suspect shoes have been recovered and soil is present on the shoes, recover a soil sample from the area of the footprint that corresponds to the location of the soil on the shoes. If soil on the shoes appears to be from the surface where the footprints are found, collect surface samples (top quarter inch). If the soil may be from an excavation of some type, collect specimens at different depths and mark the depth at which each was recovered.

FORENSIC SOIL EXAMINATION

When soil samples and related items are forwarded to the FBI Laboratory, qualified examiners conduct a forensic soil examination. This examination compares two or more specimens to determine if the soil can be linked by demonstrating a common origin.

Laboratory personnel perform the examination by comparing the color, texture, and composition of the soil samples. Because these characteristics result from locality-dependent factors and are sensitive to a variety of influences, differences in the characteristics tend to disassociate two soil samples. Therefore, proper documentation of an adequate number of samples greatly increases the likelihood of associating soils that share a common origin. This, in turn, can provide crucial forensic evidence to associate--or disassociate--suspects with particular crime scenes.

CONCLUSION

While forensic soil examinations can yield important information concerning crimes, successful results depend on proper evidence collection and handling by case investigators. By understanding the vulnerability of earthen materials to contamination and by following appropriate packaging procedures, investigators can preserve the potential forensic value of soil-related evidence.

Evidence Submission Guideline #15 adapted from Indiana State Police Laboratory Physical Evidence Bulletins.

ESG #15

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