

# SOUTH CAROLINA LAW ENFORCEMENT DIVISION

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## Forensic Services Laboratory NOTICE TO CUSTOMERS

As the SLED Forensic Services Laboratory is continuing progress towards accreditation under the new ASCLD/LAB-*International* and ISO 17025 Standards, customers will begin to notice certain changes in the reporting of results. Under these new standards, it is required that the laboratory report the Measurement Uncertainty for quantitative measurements when the value is applied to a specified limit. For South Carolina, based on the statutory limits that are present in the Code of Law, this directly impacts several types of measurements to include: drug quantities from drug seizures, barrel length from shot gun cases, and legal blood alcohol levels. This new report format is being incorporated into the SLED Forensic Services Laboratory Report where required.

Examples of reporting:

### DRUG ANALYSIS:

**Item 1.1**

Heat Sealed bag containing ten glassine packets containing powder substance.

**RESULTS:**

Heroin (C-I) found in the sample tested; 7 tested. Total net weight: 0.145 +/- 0.003 grams (2.237 +/- 0.046 grains). Confidence level for the weight is 99.7%.

The maximum attainable statutory threshold has been met for this substance. The remaining untested sample (3 packets) has a net weight (excluding all packaging) of 0.078 grams.

### BARREL LENGTH ANALYSIS:

**Item: 1**

One Winchester Model 12 Pump shotgun, 20 Gauge 2 3/4 inch chamber, serial number #####, with sawed-off barrel and stock.

**RESULTS:**

Item 1 was examined, test fired and found to be in working order. The barrel length of Item 1 was 16 9/16 inches +/- 1/16 inches at a coverage probability of 95.45%. The overall length of Item 1 was 25 inches +/- 1/16 inches at a coverage probability of 95.45%.



An Accredited Law Enforcement Agency

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**BLOOD ETHANOL ANALYSIS:**

ITEMS OF EVIDENCE			
<b>Item: 1                    Sample Type: Blood (Toxicology) – labeled “Doe, John”</b>			
Analysis by Headspace Gas Chromatography (GC) and/or Headspace Gas Chromatography/Mass Spectrometry (GC/MS)			
Analyte	Result	Units	Threshold
Ethanol	0.232 ±0.021	% (g/dL)	0.010
The above range is calculated at 99.7% confidence.			

**EXPLANATION:**

What is Measurement Uncertainty?	Any time a quantitative measurement is made, there is a degree of variability associated with that measurement. This variability can be minimized by selecting instruments and techniques that provide a high degree of accuracy and precision and by reducing external contributions to the measurement. Measurement Uncertainty is calculated by considering all of these contributors of variability and through reproducibility data from the process.
How is Measurement Uncertainty Calculated?	The Measurement Uncertainty calculations reported on the SLED laboratory reports have been calculated using expanded uncertainty. This calculation considers contributions from the process as well as a large population of repeated measurements. Statistically, the measurements are considered to follow a normal or Gaussian distribution as depicted below. Once the standard uncertainty for the process is determined, this has been expanded to cover the range of measurements that fall into the defined confidence level or coverage probability. For reported measurements on SLED laboratory reports, this will be expanded to either 95.45% or 99.73% confidence levels.
What is Confidence Level/Coverage Probability?	

Confidence Level Explained	Based on the chart above, the confidence level is demonstrated as basically a “guard band” that is expanded around the average where $\mu$ is the average value, $\sigma$ is the standard deviation and k is the confidence level coverage factor. At a particular confidence level, it is probable that the measurement falls within the specified range. It is MOST probable that the actual value is near the average value; however, to have the utmost confidence in the measurement, these bands are expanded and should be reported to at least 95.4% or 99.7% confidence. This can be seen on the chart above as the confidence level around the measurement is extended.
How is this range interpreted?	The analyst can say with the associated confidence that the measurement falls into the specified range. For most cases, this would not have a significant impact on the measurement interpretation but it can become significant if the measurement is very close to a statutory threshold.
Drug Analysis Example:	For the Drug Analysis example above, the total net weight of the Heroin was 0.145 +/- 0.003 g at 99.7% confidence. This means that with 99.7% confidence, the weight falls between 0.142 - 0.148 g.

It is important to note the measurement processes at the SLED Forensic Services Laboratory have not changed. Having a knowledge of the variability/uncertainty of a measurement is an important step to having increased confidence in the measurement. In addition, the forensic community and our accrediting body in particular consider it important that this information be provided so that a complete analysis of the significance of a measurement can be made.

The SLED Forensic Services Laboratory is prepared to assist you with interpretation of reports and the impact on case investigations. Please feel free to contact the SLED Forensic Laboratory for additional questions or clarification at (803) 896-7300.