**Uncertainty Evaluation Form**

*NOTES: SOP expected to be NIST OWM publications that include published uncertainty budget tables and may include alternative publications that include technically validated uncertainty budget tables. Numbers in parenthesis correspond to ISO/IEC 17025:2017.*

| **Uncertainty Step and Factors from SOP 29** | **Evaluation and Verification Notes**  | **List Reviewed Objective Evidence, Note Action Items** |
| --- | --- | --- |
| Laboratory uncertainty documents | * Excel file includes good document control and records of reviews and changes (authorized changes, evaluations, approvals and dates) (8.3.2)
* Filenames include dates and/or good date references in the files to indicate updates and reviews (“[Electronic File Organization Tips](https://www.nist.gov/system/files/documents/pml/wmd/labmetrology/ElectronicFileOrganizationTips-2016-03.pdf)”)
* GUM and SOP adoptions are current, correct, and complete with titles and dates (7.2.1.2, 7.2.1.3)
* Consistent approaches are used throughout the Scope with good software design and data management concepts, especially regarding document control, linking of date, and use of updated components (7.11)
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| 3.1 Measurement equation (Specify) | * SOP includes equations that can be used in uncertainty evaluations (7.2.2.1) – also for lab developed procedures
* Each component in equation includes evidence of traceability and uncertainty (6.5.1)
* Standards used have certificates and uncertainties are up to date in the Excel file (internal calibrations) (7.6.2)
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| 3.2 Uncertainty components identified(Identify)  | * Identifies and uses appropriate analysis for each component (7.6.1)
* List is complete and calculations include all components based on SOP used (complies with SOP)
* Items considered negligible must be documented and valid
* Components are clearly identified (labeled, not just with variables); longer heading names, list at bottom or comments added below tables to clarify
* Includes up to date repeatability from control charts or repeatability data
* Reproducibility is reflected with check standards or suitable alternative approaches (identify how if no check standards)
* Includes uncertainties for standards that are correct/current and with verifiable certificates
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| 3.3, 3.4 Components quantified correctly (Quantify and Convert) | * Component values represent “1 sigma values” (using correct divisors for distributions where appropriate; distributions are identified in laboratory documents)
* Units are correctly represented (e.g., not inappropriately combining mass and temperature units in an uncertainty calculation)
* Values are all CURRENT – representing latest calibrations and current control chart values
* May use baseline approach, partial derivatives, or Kragten approach to identify individual component contributions
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| 3.5 Calculate the Combined Uncertainty (Combine) | * All values represent the same units and are 1 sigma before combined (e.g., mass for mass, not °C in a mass RSS)
* Calculated correctly as root sum square (unless alternative equations are used for unique measurements that must be identified)
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| 3.6 Expand combined uncertainty with appropriate *k* value (Expand) | * Control chart data or repeatability data includes suitable degrees of freedom (> 25); action items identified for low degrees of freedom (evaluate control charts and note gaps in Excel file for Unc)
* Coverage factor, *k* value is based on degrees of freedom OR
* Includes W-S equation to calculate *effective* *d.f.* and not just d.f. in control charts (evidence)
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| 3.7 Evaluate Uncertainty (Evaluate) | * *Pn* assessments (suitability and compliance with decision rules)
	+ Tolerances used are up to date reference documents
	+ Correct decision rules are used, and calculations are correct
	+ *Pn* failures have associated action items and are not being performed for current calibrations (it’s nonconforming work to do with failures!)
* Represents the realistic uncertainty of measurements for submitted standards (7.5.1 and SOPs use “duplication of the process”)
* Meets customer requirements and expectations (decision rules documented in contract reviews with customers?)
* Values are NOT less than published (NVLAP) or submitted values (OWM) without updating and submitting to Recognition or Accreditation bodies
 |  |
| * 1. Report

 (Report) | * Values of units match measurement results on certificates (7.8.4.1 a))
* Reported values are rounded correctly in Uncertainty files and on certificates (no more than 2 significant digits)
* Certificates include a complete Uncertainty Statement that includes method of combining and identifying which components are included or not included as well as *k* factor(s) and confidence levels reported to approximately 95 %
* Statement includes GUM compliance (SOP 29 compliance)
* *May include decision rule in Uncertainty Statement on how uncertainty was used to determine conformity if not included in conformity statement.*
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| Other Observations |  |  |