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From: Douglas Olson, Isabel Chavez, Micheal Hicks, and Val Miller
NIST Office of Weights and Measures

To: Students Completing Fundamentals of Metrology Laboratory Auditing Program (LAP) problems

Subject: Updated Laboratory Auditing Program Problems for Participants of Fundamentals of Metrology Seminar

Problem Assignment and Approved Signatory Status

These Laboratory *Auditing* Program (LAP) problems have been developed to provide new metrologists in the NIST Office of Weights and Measures (OWM) State Laboratory Program a mechanism for recognition of Approved Signatory status, once they have completed both the Mass and Volume seminars. These problems MAY be completed and submitted prior to attending the Mass and Volume seminars (they are not *required* prior to attendance).

Successful completion of these LAP problems requires that a Mass and a Volume PTs are successfully completed with all analyses that are described on the next page. A detailed summary must be generated for each Mass and Volume segment that covers all the required analyses (template included here). The problem summary should include a statement of the purpose of the problem, an explanation of what data was evaluated and from what source it came, what analyses were performed, what action items were identified, how action items were integrated into the normal laboratory operations, and any conclusions the participant has developed about their laboratory measurement system based on the data and analyses.

Note: As these are AUDITING problems, the observations, findings, recommended improvement and corrective actions need to flow into the laboratory internal audit and management reviews. It also needs to include the plans/results of corrective action, preventive action, or improvement action that resulted from the problems – as used as an AUDIT. If you don't have the authority to assign and complete action items in your laboratory, you will need to coordinate with your laboratory management to accomplish these goals.

1. Step 1: Complete the Proficiency Tests (PTs)

Complete a Mass and a Volume PTs (through your regularly scheduled Regional Measurement Assurance Program PT Plan is preferred; you may contact Micheal Hicks or Isabel Chavez if one is not available within the required time period.) Completion of a PT means performing the measurements, submitting a calibration certificate, and getting feedback on the results. When coordinated through the RMAPs, you may need to work with the coordinator, who will also work with OWM staff, to provide interim results to OWM (Mike or Isabel) for review and to provide you with interim feedback.

2. Step 2: Complete the Internal Audit Assessments

Complete all of the additional assessments and PT follow up forms as described on the list. These items can be completed in parallel and do not need to wait until the PT results are final.

3. Step 3: Write the LAP Problem Summary

Write your Summary of the Process and Results, including status of Action Items and how they have been handled and expected due dates on completion of the action items.

4. Step 4: Submission

Submit the problems to NIST OWM as a single submission (do not send them as pieces) in some form of electronic media (not paper). USB sticks are preferred. Media will not be returned. If a Google Drive is needed, contact Isabel Chavez for uploading/login instructions. Be sure to put your name and a title on all media!!! ISO/IEC 17025 and NIST HB 143 require that all Laboratory documentation be complete and this will become part of your laboratory documentation: internal audit, action items, management review. INCLUDE OBJECTIVE EVIDENCE FOR EVERYTHING!!!

For questions please contact Isabel Chavez, Micheal Hicks or Val Miller at NIST OWM.

Submit all PT results to Micheal Hicks or Val Miller for initial feedback. These can be sent via email. If you do not get a response/follow-up evaluation within a few days – keep at it!

Submit all final summaries and data via mail to Isabel Chavez as ONE complete package for review:

NIST Office of Weights and Measures
Attn.: Isabel Chavez
100 Bureau Drive, MS 2600
Gaithersburg, MD 20899

Training Requirements (and Options)

1. Internal on-the-job training (OJT) on your laboratory Quality Management System (including administrative procedures).
2. Fundamentals of Metrology – do not *start* the problems until you have successfully completed this class.
3. Mass: 2 hour to 4 hour OJT (if approved by OWM), NIST on-site training, or NIST SOP 7/8 webinar, or Mass Seminar.
4. Volume: 2 hour to 4 hour OJT (if approved by OWM), NIST on-site training, or NIST SOP 18/19 webinar, or Volume Seminar.

The problems are due within one year of completing the Fundamentals of Metrology seminar. If you are not able to complete the Mass and/or Volume training requirements or options within that one-year period, you can request an extension of the due date from OWM.

Potential for Conditional Recognition

Successful completion of these problems *may* also enable Conditional NIST OWM Recognition of a laboratory prior to participating in a Mass and Volume Seminar if there are no other approved signatory staff available in the laboratory. By completing the LAP problems, the associated [SOP 8](#) and [SOP 18](#) preliminary training, and successfully completing the prescribed proficiency tests, a laboratory may be granted Conditional Recognition to support State weights and measures activities, pending participation in the next Mass and Volume Seminars.

LAP Problem Assessments

1. Perform a Proficiency Test (PT).

Complete a PT on artifact(s) provided by NIST or another RMAP PT as instructed and submit a formal/signed Calibration Certificate for each (mass and volume). Objective Evidence: laboratory data and observations, any hand calculations, computer print-out or file used in the process, and the certificates. Submit an interim report for evaluation; submit a final or amended report with the full set of LAP problems if needed. Be sure to record this as an action item and follow your laboratory administrative procedure if/when amending certificates!!! Include a copy of the PT report that shows your results. If the PT has failures, there will be additional action items!

2. Conduct a “certificate review” of the Calibration Certificate(s) in item 1.

During the certificate review, identify any corrective actions that are needed. Use the job aid with SOP 1 and the Manuscript evaluation included with SP 811: <http://www.nist.gov/pml/wmd/labmetrology/sops.cfm> and <https://www.nist.gov/pml/special-publication-811/nist-guide-si-check-list-reviewing-manuscripts>. Submit amended reports as required (follow the lab procedure; best practice: make sure your lab procedure for amending certificates complies with 17025 while you’re at it!). Objective evidence will include a certificate that is marked up and scanned to PDF. Be sure to identify and document action items!

3. Conduct a “traceability assessment”.

Conduct traceability assessments of the measurement processes for the standards used in your PTs for item 1. Use the job aid Traceability Assessment Form in GMP 13, Appendix C: <https://www.nist.gov/pml/weights-and-measures/laboratory-metrology/good-measurement-practices>. Be sure to identify and document action items!

The objective evidence will include the completed GMP 13, Appendix C form as well as items listed below:

- a. Submit copies of all *relevant* calibration certificates for the standards used within your laboratory that were used for the PT and that demonstrate/establish metrological traceability.
- b. Submit copies of the *relevant* traceability hierarchies that support item 1 (see Appendix A in GMP 13 for examples).

4. Conduct a “measurement assurance” assessment.

Evaluate the control charts, range charts, or standard deviation charts and associated analyses used to obtain standard deviations of the measurement process that are included in the uncertainty analysis for these PTs. If you don't have a control chart for the process at this time, you will need to perform at least 7 measurements to create control charts (following SOP 9, 17/20) – and remember you need 25 to 30 for valid uncertainties. There are TWO assessments for this. Be sure to identify and document action items!

- a. Use Appendix A included in SOP 9 to evaluate the charts themselves.
- b. Use the job aid for measurement assurance assessments that is posted with SOP 30 (Measurement Assurance System Assessment (Latest Date)) to assess the measurement assurance system in your laboratory. You will also need to review the SOP used for the PTs to make sure that it is followed in your laboratory!

5. Provide a documented “uncertainty analysis” to support the calibrations in item 1.

This uncertainty assessment should be your analysis, not a “laboratory documented solution”. Use the job aid SOP 29 Worksheet (DOC) or the Uncertainty Budget Template (Excel) posted with SOP 29. Once you have completed this assessment, evaluate it against the SOP used for the PT to make sure it is complete. Then evaluate your assessment against the Uncertainty Budgets submitted for Laboratory Recognition (latest update) and identify and recommend resolution for any differences. Be sure to identify and document action items! See: <http://www.nist.gov/pml/wmd/labmetrology/sops.cfm>

6. Complete the PT Follow Up Form.

Finally, conduct the PT follow-up assessment and complete the PT Follow-up Form for each PT. Note that even if everything passes and was wonderful, there are follow up action to complete in your laboratory! Submit the completed PT Follow Up Form along with any evidence of corrective actions. Use the PT Follow Up Form: <http://www.nist.gov/pml/wmd/labmetrology/lab-resources.cfm>

Be sure to include the Summary Assessments and Action Items per the instructions or the problem status will be INCOMPLETE. Each item will include objective evidence. PLEASE consider how you have named files and the “Electronic File Organization Tips” that are posted here. Use descriptive but SHORT FILE names and include the revision dates in the file names. <https://www.nist.gov/pml/weights-and-measures/laboratory-metrology/state-lab-program-resources> Conduct a final quality check on the files before sending them to NIST OWM!

Assessments and Reviews

OWM will review the problems that are submitted to identify any missing pieces and provide initial feedback as soon as possible. It is standard practice for OWM to identify “something” during the review to ask participants to clarify and answer questions. Action Items that are identified in your assessments do not necessarily need to be completed prior to submitting the problems, but significant gaps may impact laboratory recognition status and significant concerns will need to be immediately resolved. Action items are expected to be resolved by the laboratory (it may involve more OJT training about how your quality management system operates).

The problems are intended to be completed INDEPENDENTLY by each person. However, the summary action items will need to be reviewed with laboratory management and follow the documentation process used in your laboratory for action items (corrective, preventive, improvement, etc.), internal audits, and management reviews.

Example Outline for the Summary Report

This should be about 2 to 3 pages for Mass and 2 to 3 pages for Volume. Include references to attachments (and their file names) that are included as objective evidence.

Purpose of the PT

- 1. Provide a high-level overview of the PT and Observations**
- 2. Summary of Certificate Review and Findings**
- 3. Summary of Traceability Assessment and Findings**
- 4. Summary of Measurement Assurance Assessments and Findings**
- 5. Summary of Uncertainty Assessment and Findings**
- 6. Summary of PT Follow Up**

Conclusions

Action Plan Form

(If you don't have your own.)

Table 1. Action Plan Form.

Action Type ^a		Criteria		Priority	
Finding					
Root Cause					
Proposed Action					
Due Date		Task Assigned To			
Completion Date		Task Verified By			
Final Action					
Action Effectiveness					
Evaluation Date		Task Verified By			

^aAction Types: Corrective Actions (CA), Preventive Actions (PA), Improvement Actions (IA), Complaint (C), Internal Audit (A), LAP Problems (LAP).

Action Plan Log

It may be useful or helpful to insert this table into each section and then to summarize all actions in one final table in the Conclusions. If your laboratory has an Action Item Log – use that!

Table 2. Action Plan Log.

Action #	Title	Description	Proposed Action	Assigned To	Goal Completion Date	Actual Completion Date