ENVIRONMENTAL LABORATORY SECTOR

Technical Training Course Curricula for Environmental Laboratory Assessors

TNI Guidance Document

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P.O. Box 2439
Weatherford, TX 76086
817-598-1624
www.nelac-institute.org

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Introduction

Volume 2 of the TNI Environmental Laboratory Sector Standard requires that all accreditation body assessors take and pass a course in each technical discipline that the assessor will be evaluating during on-site assessments. This is a guidance that gives recommended course outlines and an examination design.

It is assumed that the assessors will already have bench level experience or familiarity with both the analytical techniques and methods involved with the particular discipline. Therefore, the outlines include prerequisites that reflect this assumption. The course outlines are not designed to make analysts out of assessors but assessors out of technical experts. The course duration recommended in the outlines are based on the amount of time the Committee felt would be necessary to sufficiently cover all the portions of the outline. The Committee acknowledges that not all assessors attending the course will have the assumed experience or prerequisites. This is an opportunity for training providers to determine the needs of their clients and add the necessary material and training days to the curricula to ensure assessor proficiency.

Part of the purpose of the TNI standards is to ensure consistency of the on-site assessment. The spirit of TNI fosters the sharing of expertise. So while the Committee acknowledges that many assessors are already experts in their respective fields, all assessors still need to fulfill the training requirements. Additionally, the course outlines are flexible enough to allow a training provider to promote their course as an advanced or continuing education course where the more fundamental parts of the outline are covered quickly allowing more time to cover other topics and exercises in greater depth. The portions of the outline that the Committee felt should be emphasized with more time dedicated to covering them are highlighted in blue. Some specific topics may be covered by homework assignments and/or handouts supplemented by discussion as needed to fit the material into the time allotted.

This is a living document and as all stakeholders participate in the training process the Committee hopes to receive feedback on the content and effectiveness of the guidance.

TABLE OF CONTENTS

OUTLINE FOR ASBESTOS TECHNICAL COURSE

I. **Technical Discipline**

Polarized Light Microscopy (PLM), Phase Contrast Microscopy (PCM), Transmission Electron Microscopy (TEM)

II. **Length of course**

The training should be a minimum of three days for PLM and PCM to allow adequate time for TEM issues.

III. **Course Prerequisites**

1. Basic Assessor Training
2. Familiarity with approved and applicable methods (i.e. *NIOSH 7400, EPA/600/M4-82-020, EPA/600/R-93/116, 40 CFR Part 763 (AHERA), NIOSH 7402, EPA/600/R-94/134 (100.2), EPA/600/4-83-043 (100.1)*)
3. Quality Systems Lab module V1M2
4. Basic knowledge of analytical technology, applications and principles.
5. Experience performing PCM, PLM, TEM

IV. **Specific Analytical and Preparation Technologies**

1. Phase Contrast Microscopy
2. Polarized Light Microscopy
   a. Friable
   b. Non-friable Organically Bound (NOB)
3. Transmission Electron Microscopy
   a. AHERA
   b. EPA Method 100.2
   c. EPA Method 100.1
   d. NOB

V. **Relevant Accreditation Procedures and Criteria**

1. V2M3 - Accreditation Body Onsite Assessment
2. V1M2 - Quality Systems general, management and technical requirements
3. V1M3 – Asbestos Testing

VI. **Program Specific Criteria**

1. Friable building materials, air (PCM & TEM), Non-friable Organically Bound building materials (PLM & TEM), drinking water, waste water.
2. Cover what the applicable and acceptable methods are for each program for each technology.
3. Discuss soil, vermiculite, and dust testing.

VII. **Understanding and Assessing the Test** (This section should include problems associated with each aspect of the test and how to detect improper practices)

1. Principle
2. Application of method/technology

3. Sample preservation and holding time (water)
4. Analyst: include how the "analyst is the instrument"; discuss bias
5. Equipment: include how maintenance affects test
6. Method validation (special requests)
7. Standard reference materials (NIST)
8. Calibration and calibration verification procedures and frequency
9. Data acquisition and processing
10. Data and quality control reporting
11. SOP
12. Traceability of Measurements
13. Corrective actions when data does not meet acceptability requirements (i.e. blanks, false positives, etc.)
14. Computer and software
15. PT results

VIII. Assessment Methods and Techniques

(Note: This section should include exercises so participants can practice and instructor can evaluate assessor's competence)

1. Ensuring consistency and systematic approach (planning to closing)
2. Assuring the lab's quality assurance manual complies with and incorporates the applicable TNI standards and key elements of analytical methods (could be incorporated by reference to Technical Manuals and SOPs).
3. Assessing Technical Competence
    a. Conducting staff interviews (include exercise of writing technique associated questions and doing an interview)
    b. Observing the lab perform the tests
        i. Preparation
        ii. Analysis and analyst's competency (Extremely important – the analyst is the instrument. Are they fumbling? Are the necessary charts and graphs easily available?)
    c. Reviewing records of the testing including the final report
        i. Include exercise of reviewing a report and its raw data down to the bench-sheet level. Demonstrate how full analysis (esp. for PCM) is required. Demonstrate what to look for to determine if "short cuts" are being taken in analysis. Include review of any statistics.
        ii. Devise interview questions specific to data issues found in report and conduct interview
        iii. Write report of findings
4. Inappropriate Practices – include common issues such as inappropriate field counts (esp. PCM); excessive workload; improper use of solvents, oils, acid, etc. (PLM); "standardized" Refractive Indices; improper recording of fiber characteristics (RI, morphology, etc.); lack of full calibration (PLM, PCM, & TEM) and eucentricity adjustment (TEM); appropriate EDX and SAED determination of asbestos type (TEM); and inadequate QC prior to release of results. Also include inappropriate preparation issues such as lack of rotating

stage in carbon evaporator, close proximity of air sample prep areas to bulk handling/prep areas.

IX. **Question and Answer Session**

X. **Examination** Guidance on the type of questions is provided in another section

OUTLINE FOR INORGANIC NON-METALS AND MISCELLANEOUS TECHNIQUES TECHNICAL COURSE

I. **Technical Discipline**

Inorganic Chemistry non-metals and miscellaneous techniques

II. **Length of course**

The training should be a minimum of three days

III. **Course Prerequisites**

1. Basic Assessor Training
2. Familiarity with applicable methods (i.e. EPA, ASTM Standards, Standard Methods)
3. Quality Systems Lab module V1M2
4. Basis knowledge of analytical technology, applications and principles

IV. **Specific Analytical Technologies**

1. Spectrophotometry
2. Colorimetry (Color)
3. Infrared Spectrometry (IR)
4. Titrimetry (TITR)
5. Ion Chromatography (IC)
6. Gravimetric Methods (GRAV)
7. Potentiometry (POT)
8. Total Organic Carbon and Total Organic Halides (TOC/TOX)
9. Chemical Oxygen Demand/Biochemical Oxygen Demand (COD/BOD)

V. **Relevant Accreditation Procedures and Criteria**

1. V2M3 - Accreditation Body Onsite Assessment
2. V1M2 - Quality Systems general, management and technical requirements
3. V1M4 – Applicable sections of chemical testing

VI. **Program Specific Criteria**

1. Drinking water, wastewater, solid and hazardous waste, Superfund, RCRA etc.
2. Cover what the applicable and acceptable methods are for each program for each technology (i.e. standard methods, EPA Method series 100, 300, 400, vs. 9000 series, ASTM, USGS etc.)
3. Cover which methods allow modifications and what modifications are allowed (Include 40 CRF part 136.6)
4. Cover Standard Methods Quality Assurance and Quality Control, Part 1000, 2020,4020 and 5020

VII. **Understanding and Assessing the Test**

(This section should include problems associated with each aspect of the test and how to detect improper practices.)

1. Principle and summary of each analytical technology
2. Scope and application of method/technology
3. Sample preparation
4. Equipment
5. Method validation: assess adequacy of records
6. Standard/reference materials
7. Calibration and calibration verification procedures and frequency
8. Data acquisition and processing (cover integration for ion chromatography)
9. Data and quality control reporting
10. SOPs
11. Traceability of Measurements: Assessing technical validity of reference standards
12. Corrective actions when data does not meet acceptability requirements
13. Computer and software
14. PT results
15. Uncertainty measurement

VIII. **Assessment Methods and Techniques**

(Note: this section should include exercises so participants can practice and instructor can evaluate assessor's competence)

1. Ensuring consistency and systematic approach (planning to closing)
2. Assuring the lab's quality assurance manual complies with and incorporates the applicable TNI standards and key elements of analytical methods (could be incorporated by reference to Technical Manuals and SOPs).
3. Assessing Technical Competence
    a. Conducting staff interviews (include exercise of writing technique associated questions and doing an interview)
    b. Observing the lab perform the test (include QC checklist for that technique/method)
    c. Reviewing records of the testing including the final report
        i. Include exercise of reviewing a report and its raw data including statistical analysis performed by lab
        ii. Devise interview questions specific to data issues found in report and conduct interview
        iii. Write report of findings

IX. **Question and Answer Session**

X. **Examination**

Guidance on the type of questions is provided in another section

OUTLINE FOR METALS TECHNICAL COURSE

I. **Technical Discipline**

Inorganic Chemistry - Metals

II. **Length of course**

The training should be a minimum of three days

III. **Course Prerequisites**

1. Basic Assessor Training
2. Familiarity with applicable methods (i.e. EPA, ASTM, Standard Methods)
3. Quality Systems Lab module V1M2
4. Basic knowledge of analytical technology, applications and principles

IV. **Specific Analytical Technologies**

1. Atomic Absorption – Cold Vapor Spectrometry (CVAAS)
2. Atomic Fluorescence – Cold Vapor Spectrometry (CVAFS)
3. Atomic Emission – Direct Current Plasma Spectrometry (DCP-AES)
4. Differential Pulse Polarography (DPP)
5. Atomic Absorption – Flame Spectrometry (FAAS)
6. Atomic Emission – Flame Spectrometry (FAES)
7. Atomic Absorption – Graphite Furnace Spectrometry (GFAAS)
8. Atomic Emission – Inductively Coupled Plasma Spectrometry (ICP-AES)
9. Mass spectrometry – Inductively Coupled Plasma Spectrometry (ICP-MS)
10. X-Ray Fluorescence Spectrometry (XRF)
11. X-Ray Transmission Spectrometry (XRT)

V. **Relevant Accreditation Procedures and Criteria**

1. V2M3 - Accreditation Body Onsite Assessment
2. V1M2 - Quality Systems general, management and technical requirements
3. V1M4 – Applicable sections of chemical testing

VI. **Program Specific Criteria**

1. Drinking water, wastewater, biosolids, solid and hazardous waste
2. Cover what the applicable and acceptable methods are for each program for each technology (i.e. *Standard Methods*, EPA 200 vs. 7000 series) Include quality assurance and master methods applicable to the program (i.e. Standard Methods section 1000, 3020 and 3030)
3. Cover which methods allow modifications and what modifications are allowed (i.e. recent changes to 40 CFR Part 136.6)

VII. **Understanding and Assessing the Test** (this section should include problems associated with each aspect of the test and how to detect improper practices)

1. Principle
2. Application of method/technology
3. Sample preparation
    a. Microwave digestion
    b. Hydrides
    c. TCLPs
    d. Hot plate/block digestion
    e. QC samples
4. Equipment (cover maintenance, gases)
    a. Maintenance
    b. Gases
5. Method validation
    a. Method required IDC vs. requirement of TNI standard
    b. IDLs
    c. MDLs
    d. Spectral interferences
    e. MQL
6. Standard/reference materials
7. Calibration and calibration verification procedures and frequency
8. Assessing instrument responses
    a. for blanks (both positive and negative responses)
    b. interference indicators (i.e. negative responses)
9. Data acquisition and processing
10. Data and quality control reporting
    a. effect of dilutions on reporting limits
    b. data qualifiers
11. SOP
12. Traceability of Measurements
13. Corrective actions when data does not meet acceptability requirements
14. Computer and software
15. PT results
16. Uncertainty measurement

VIII. **Assessment Methods and Techniques**

(Note: This section should include exercises so participants can practice and instructor can evaluate assessor's competence)

1. Ensuring consistency and systematic approach (planning to closing)
2. Assuring the lab's quality assurance manual complies with and incorporates the applicable TNI standards and key elements of analytical methods (could be incorporated by reference to Technical Manuals and SOPs).
3. Assessing Technical Competence

a. Conducting staff interviews (include exercise of writing technique associated questions and doing an interview)
b. Observing the lab perform the test (include QC checklist for that technique/method)
c. Reviewing records of the testing including the final report
    i. Include exercise of reviewing a report and its raw data including any statistical analysis performed by lab
    ii. Devise interview questions specific to data issues found in report and conduct interview
    iii. Write report of findings

IX. **Question and Answer Session**

X. **Examination**

Guidance on the type of questions is provided in another section

OUTLINE FOR MICROBIOLOGY TECHNICAL COURSE

I. **Technical Discipline**

Microbiology - coliform bacteria, *E. coli*, enterococci, *Salmonella*, coliphage, viruses, protozoa

II. **Length of Course**

The training should be a minimum of three days. Four days is strongly recommended with the fourth day used for final examination and discussion of the exercise report

III. **Course Prerequisites**

1. Basic knowledge of microbiology and microbiology methods
2. Basic assessor training
3. Quality Systems Lab Module V1M2

IV. **Specific Analytical Technologies Discussion**

1. Quantitative vs. qualitative
2. Identification by definition
3. Fermentation vs. filtration
4. Future – molecular techniques, rapid methods, flow cytometery
5. Coliform Bacteria
6. *E. coli*
7. *Salmonella*
8. Enterococci
9. Coliphage
10. Viruses
11. Protozoa

V. **Relevant Accreditation Procedures & Criteria**

1. V2M3 – Accreditation Body Onsite Assessment
2. V1M2 – Quality Systems general, management and technical requirements
3. V1M5 – Microbiological Testing

VI. **Program Specific Criteria**

1. Drinking water, ground water, wastewater, sewage sludge, biosolids, ambient water, and marine waters
2. Applicable methods, sample preservation and holding times for each matrix
3. Notification of positive results and poor samples
4. Method modifications allowed and process for alternate test methods
5. Legal requirements of the various programs

VII. **Understanding and Assessing the Test**

(Note: This section should include problems associated with each aspect of the test and how to detect improper practices)

1. Sampling

2. Sample handling including holding time
3. Laboratory facility
4. Equipment/instruments
5. Calibration & maintenance
6. Supplies, including media
7. Cleaning
8. Reagent water & sterility testing
9. Media preparation including sterilization and sterility testing
10. Reference materials for QC and positive and negative culture controls
11 Validation for new or non-standard methods
12. Method verification
13. Reading and recording analytical results
14. Data qualification, recording and corrective action
15. Record retention
16. SOPs
17. PT results
18. Health & safety issues, biosafety levels
19. Calculations

VIII. **Assessment Methods and Techniques**

(Note: This section should include exercises so participants can practice and instructor can evaluate assessor's competence)

1. Ensuring consistency and systematic approach (planning to closing)
2. Assuring the lab's quality assurance manual complies with and incorporates the applicable TNI standards and key elements of analytical methods (could be incorporated by reference to Technical Manuals and SOPs).
3. Assessing Technical Competence
    a. Conducting staff interviews (include exercise of writing technique associated questions and doing an interview)
    b. Observing the lab perform the test (include QC checklist for that technique/method)
    c. Reviewing records of the testing including the final report
        i. Include exercise of reviewing a report and its raw data including any statistical analysis performed by the lab
        ii. Include a real plate sample as an example
        iii. Devise interview questions specific to data issues found in report and conduct interview
        iv. Write report of findings

IX. **Questions and Answers Session**

X. **Examination**

Guidance on the type of questions is provided in another section

OUTLINE FOR ORGANIC CHEMISTRY COMPOUNDS

I. **Technical Discipline**

Volatile and Semi-volatile Organic compounds including pesticides, PCBs, herbicides, explosives, petroleum hydrocarbons and Dioxins

II. **Length of course**

The training should be a minimum of three days to allow adequate time for the exercises

III. **Course Prerequisites**

1. Basic Assessor Training
2. Familiarity with applicable methods (i.e. EPA, ASTM, Standard Methods)
3. Quality Systems Lab module V1M2
4. Basic knowledge of analytical technology, applications and principles

IV. **Specific Analytical and Preparation Technologies**

1. Gas chromatography (GC)
2. High Performance Liquid Chromatography (HPLC)
3. Ultraviolet (UV)
4. Fluorescence (FL)
5. Electrochemical (ELEC)
6. Mass Spectrometry (MS)
7. High Resolution Mass Spectrometry (HRMS)
8. Flame Ionization Detection (FID)
9. Photo-ionization Detector (PID)
10. Electron Capture Detection (ECD) and Electrolytic Conductivity Detectors (ELCD)
11. Fourier Transform Infrared (FTIR)
12. Nitrogen Phosphorus Detection (NPD)
13. Flame-photometric detector (FPD)
14. Purge and trap
15. Extraction
16. Derivatization
17. Waste Dilution
18. Solid Phase Extraction (SPE)
19. Biological Tissue

V. **Relevant Accreditation Procedures and Criteria**

1. V2M3 - Accreditation Body Onsite Assessment
2. V1M2 - Quality Systems general, management and technical requirements
3. V1M4 – Applicable sections of chemical testing

VI. **Program Specific Criteria**

1. Drinking water, wastewater, solid and hazardous waste, Superfund, RCRA, biological tissue, etc.
2. Cover what the applicable and acceptable methods are for each program for each technology. Include drinking water 500 series methods, wastewater 600 series methods, and solid and hazardous waste SW-846 3000 series and TCLP sample preparation and 8000 series analytical methods.
3. Cover which methods allow modifications and what modifications are allowed
4. Specifically cover SW-846 chapters one and four (QC and Organics respectively) as well as Method 8000. Cover Applicable portions of the *EPA Manual for the certification of Laboratories Analyzing Drinking Water: Criteria and Procedures Quality Assurance.* Also cover applicable air methods and some of the major departures such as the averaging done for calibration curves.

VII. **Understanding and Assessing the Test** (this section should include problems associated with each aspect of the test and how to detect improper practices)

1. Principle
2. Application of method/technology
3. Sample preservation and holding time
4. Sample preparation
5. Equipment and instrumentation: include how maintenance affects test
6. Method validation
7. Standard/reference materials
8. Pre-calibration checks: chromatography and MS tuning
9. Calibration and calibration verification procedures and frequency
10. Data acquisition and processing (cover chromatography, integration and qualitative interpretation, confirmation i.e. second column)
11. Data and quality control reporting
12. SOP
13. Traceability of Measurements
14. Corrective actions when data does not meet acceptability requirements (i.e. method blanks and calibration verifications)
15. Computer and software
16. PT results
17. Uncertainty measurement

VIII. **Assessment Methods and Techniques**

(Note: this section should include exercises so participants can practice and instructor can evaluate assessor's competence)

1. Ensuring consistency and systematic approach (planning to closing)
2. Assuring the lab's quality assurance manual complies with and incorporates the applicable TNI standards and key elements of analytical methods (could be incorporated by reference to Technical Manuals and SOPs).

3. Assessing Technical Competence
    a. Conducting staff interviews (include exercise of writing technique associated questions and doing an interview)
    b. Observing the lab perform the test (include QC checklist for at least one MS method and one other detector)
    c. Reviewing records of the testing including the final report
        i. Include exercise of reviewing a report and its raw data down to the electronic level. Demonstrate how to review integration. Demonstrate how re-calculating a result from raw data to report can reveal problems. Include statistical analyses performed by lab.
        ii. Devise interview questions specific to data issues found in report and conduct interview
        iii. Write report of findings
4. Inappropriate Practices – include common issues such as mis-integration, time travel, file swapping, multiple calibrations, dropping points from the middle of the curve, extrapolating above or below the curve, and hiding blank contamination. Include inappropriate preparation issues such as a) extracting soil samples in water prior to analysis by purge and trap, b) using non-water miscible solvents in spiking solutions, c) spiking surrogate and QC samples after extraction. Be sure to cover headspace and vial limitation issues for volatile compound analyses. Also cover limitations to software.

IX. **Question and Answer Session**

X. **Examination**

Guidance on the type of questions is provided in another section

RADIOCHEMISTRY TECHNICAL COURSE OUTLINE

I. **Technical Discipline**

Radiochemical Testing

II. **Length of course**

The training should be a minimum of three days

III. **Course Prerequisites**

1. Basic Assessor Training
2. Familiarity with applicable methods (i.e. EPA, ASTM, Standard Methods)
3. Quality Systems Lab module V1M2
4. Basic knowledge of analytical technology, applications and principles

IV. **Specific Analytical Technologies**

1. Alpha Spectrometry (AS)
2. Alpha Scintillation Cell Counter (ASC)
3 Fluorometer (FLUO)
4. Alpha/Beta Gas-Flow Internal Proportional Counter (GPC)
5. Gamma Spectrometry-Low/High Resolution (GS)
6. Laser Phosphorimetry (LP)
7. Liquid Scintillation Counter (LSC)

V. **Relevant Accreditation Procedures and Criteria**

1. V2M3 - Accreditation Body Onsite Assessment
2. V1M2 - Quality Systems General, Management and Technical Requirements
3. V1M6 – Radiochemical Testing

VI. **Program Specific Criteria**

1. Drinking water, wastewater, hazardous waste etc.
2. Cover what applicable and acceptable methods are for each program for each technology (EPA, SM, ASTM, USGS, DOE, other)
3. Cover changes or adoption of applicable regulations, TNI Standards, Methods (i.e. recent changes to 40CFR 136, EPA Manual for the Certification of Laboratories Analyzing Drinking Water, etc.)

VII. **Understanding and Assessing the Test** (this section should include problems associated with each aspect of the test and how to detect improper practices when applicable)

1. Principle and Summary of each method/technology
2. Scope and Application of method/technology (include discussion of interference)
3. Sample preparation
    a. Sample preservation

b. pH verification
c. Lab sample preparation protocol – the course should emphasize the importance of strict adherence to the preparation methods and techniques.
d. Role of carriers and tracers in the preparation and analytical process

4. Radiation counting instrumentation and preventative maintenance
    a. Gas- Flow proportional counting system
    b. Alpha and beta scintillation counting system
    c. Gamma spectrometer systems
    d. Scintillation cell system
    e. Liquid scintillation counting system
    f. Fluorometer
    g. Alpha spectrometry systems
5. Method validation
    a. Method required IDC vs. IDC requirement of standard
    b. Ongoing Demonstration of Capability
    c. MDA vs. Required Method/Regulatory Method Detection Limit (example MDA vs SDWA detection limit in 40 CFR 141.25 (c))
    d. The course should emphasis that the detection limit determination is a function of the background of the laboratory as opposed to the sample. If the laboratory does not properly measure the background, all results will be biased.
6. Standard/reference materials, sources and lab radioactive materials license, and radioactivity decay review and application of half-life data in calculating concentration of standards
7. Calibration and calibration verification procedures (Performance/Efficiency checks) and frequency
    a. The course should discuss the difference between radiochemistry calibration inorganic/organic calibration with regard to frequency, verification, management and storage of standards, and corrective actions for calibration failures.
8. Background checks measurements
9. Data acquisition and processing and data calculations including counting error if applicable
10. Data and quality control reporting
    a. Data validation
    b. Data acceptance and rejection criteria
    c. Data flags
11. SOPs - written vs. actual practice vs. method reference
12. Traceability of Measurements
13. Measurement of Uncertainty
    a. Emphasis should be placed on the calculation(s) for the measurement of uncertainty and the control exercised over the calculation technique
        i. Are spreadsheets controlled to prevent changes to equations and propagation of errors?

ii. Are calculations verified and documented prior to implementation?
iii. Is internally developed software used for calculations properly verified and documented, including version control?

14. Control Charts
15. Corrective actions when data does not meet acceptability requirements
16. Computer and software
17. Radiological Control Program- Prevention of cross contamination and background activity or contamination monitoring
18. Radiation safety program - Assessors should be trained regarding the basics of a sound radiation safety program. The program should protect the health of all employees as well as serve to deter the cross-contamination of radioactivity within the radiochemistry laboratory and from the radiochemistry laboratory to the general laboratory and non-laboratory areas. Frisking, standards storage and maintenance, personnel monitoring, etc. are all topics to consider.
19. PT results

VIII. **Assessment Methods and Techniques** (Note: This section should include exercises so participants can practice and instructor can evaluate assessor's competence)

1. Ensuring consistency and systematic approach (planning to closing)
2. Assuring the lab's quality assurance manual complies with and incorporates the applicable TNI standards and key elements of analytical methods (could be incorporated by reference to Technical Manuals and SOPs).
3. Assessing Technical Competence
    a. Special attention should be paid to assessing the credentials of the radiochemistry department supervisor and the technical manager. These personnel must be technically competent for the radiochemistry laboratory to produce valid data.
    b. Conducting staff interviews (include exercise of writing technique associated questions and doing an interview)
    c. Observing the lab performs the test (include QC checklist for that technique/method)
    d. Reviewing test records and final report
        i. Include exercise of reviewing a report and its raw data including any statistical analysis performed by the lab
        ii. Devise interview questions specific to data issues found in report and conduct interview
        iii. Write report of findings

IX. **Question and Answer Session**

X. **Examination**

Guidance on the type of questions is provided in another section

OUTLINE FOR ENVIRONMENTAL TOXICITY TECHNICAL COURSE

I. **Technical Discipline**

Whole Effluent Toxicity (WET), Sediment and Soils Toxicity

II. **Length of course**

The training should be a minimum of three days, and it is recommended that one day of instruction be in an operating facility.

III. **Course Prerequisites**

1. Basic Assessor Training
2. Familiarity with applicable methods (i.e. EPA, ASTM, Standard Methods)
3. Quality Systems Lab module V1M2 & V1M7
4. Basic knowledge of WET technology, applications and principles

IV. **Specific Analytical Technologies**

1. Fresh Water Chronic Testing (EPA/821-R-02-013)
2. Salt Water Chronic Testing (EPA/821-R-02-014)
3. Fresh and Salt Water Acute Testing (EPA/821-R-02-012)
4. Sediment Toxicity Testing (various in ASTM, Standard Methods, EPA)
5. Soils Toxicity Testing (various in ASTM, Standard Methods and EPA)

V. **Relevant Accreditation Procedures and Criteria**

1. V2M3 - Accreditation Body Onsite Assessment
2. V1M2 - Quality Systems general, management and technical requirements
3. V1M7 – Toxicity Testing

VI. **Program Specific Criteria**

1. Wastewater, Dredged Materials Disposal (USACE), Solid Waste
2. Cover what the applicable and acceptable methods are for each program for each technology (i.e. *Standard Methods*, *ASTM*, *EPA*)
3. Cover which methods allow modifications and what modifications are allowed (i.e. Recent changes to 40 CFR 122/136)

VII. **Understanding and Assessing the Test**

(Note: This section should include problems associated with each aspect of the test and how to detect improper practices)

1. Principle of Toxicity Testing
2. Application of method/technology
3. Test set-up, maintenance, and take down (including consistent environmental conditions)
4. Equipment
5. Method validation
    a. Test Acceptability Criterion

b.Positive and Negative Controls
c. Percent Minimum Significant Difference (PMSD's)

6. Calibration and calibration verification procedures and frequency for support equipment
7. Organism Culture Procedures, including taxonomic verification
8. Data acquisition and processing
9. Data and quality control reporting
10. SOP
11. Traceability of Measurements
12. Corrective actions
13. Computer and software
14. PT results

VIII. **Assessment Methods and Techniques** (Note: this section should include exercises so participants can practice and instructor can evaluate assessor's competence)

1. Ensuring consistency and systematic approach (planning to closing)
2. Assuring the lab's quality assurance manual complies with and incorporates the applicable TNI standards and key elements of methods (could be incorporated by reference to Technical Manuals and SOPs).
3. Assessing Technical Competence
    a. Conducting staff interviews (include exercise of writing technique associated questions and doing an interview)
    b. Observing the lab perform the test (include QC checklist for that technique/method)
    c. Reviewing records of the testing including the final report
        i. Include exercise of reviewing a report and its raw data including any statistical analysis performed by the lab
        ii. Devise interview questions specific to data issues found in report and conduct interview
        iii. Write report of findings

IX. **Question and Answer Session**

X. **Examination**

Guidance on the type of questions is provided in another section

Technical Course Examination Guidance

The purpose of the technical course examination is to determine that an assessor has the technical knowledge, assessment skill in a given discipline, adequate knowledge of the applicable TNI technical module and actively participated in the course. To that end, it is strongly recommended that the following guidance is used in the preparation and administering of the exam.

Exam Characteristics

The exam should have 40-60 questions. The questions can be multiple choice, true/false and/or fill in the blank. No more than 20% of the questions should be true/false. At least 10% of the questions should be fill-in-the blank. However, the questions should be objective. The exam should include questions on calculations and improper practices.

Assessors should be encouraged to refer to the standard and methods in their capacity as assessors, therefore the exam should be an open book exam. Students should be allowed two hours to complete the exam.

While the class exercises are not part of the final score, the instructor should include on the exam questions derived from the exercises that show an understanding and capability of determining what is deficient in an analysis. Include questions that require the interpretation of documents common to the discipline being taught.

A score of 70% is considered passing. A participant will be allowed one retest upon failure of the exam. The retest must be significantly different from the original test.

The following topics should have a question included on the respective exams.

Asbestos
Required equipment
Calibration frequency and criteria
Quality control measures
Analysis sequence for bulk
Sub sampling for bulk
Record keeping and bench sheet recording requirements
Fraud indicators
Determination of refractive indices of samples and RI oils
Definition of Fibers in Air
Regulatory issues
TEM data interpretation
Improper practices
Calculations

Inorganic non-metals
Proper integration for ion chromatography
MDL and DOC
Record keeping and bench documentation
Calculations
Calibration and verification
Preparation
Critical method techniques
Routine maintenance
Improper practices

Metals
Frequency and evaluation of QC checks
Digestion methods and required and/or permitted uses
Calibration procedures and options
Routine maintenance
Problems associated with Mercury analyzers
Causes of drift and correction
Common software problems in automated analysis
Sub-sampling of soil samples
Problems with in-house preparation of mixed standards
Common interferences
Regulatory reporting requirements
Improper practices
Calculations

Microbiology
Frequency and evaluation of QC checks
Handling and use of reference cultures
Production and testing of lab water
Verification requirements
Reporting requirements
Matrix or program required method options
Media handling, preparation and storage
Glassware cleaning and testing
Sample shipping and holding time requirements
Incubator temperature and time requirements
Equipment and instrumentation calibration and maintenance
Colors and characteristics of positive samples
Handling non typical sample reactions by rejection and re-sampling
Calculations
Invalidation of sample results
Improper practices

Organic
Initial calibration and calibration check criteria and frequency

Tuning
Extraction sample cleanup
Proper integration
Peak identification
Corrective action for failed QC
Calculations
Improper practices

Radiochemistry
Calibration Frequencies
Counting time
Background checks
Facility requirements and environmental control
Detection limits
Method QC
Calculations and measurement uncertainty
Improper practices and method modifications

Toxicity
Sample receipt requirements
Test initiation, maintenance and take-down
Standard toxicant (positive control) interpretation
Unusual data interpretation
PMSD
Species identification
Environmental controls
Care and feeding of organisms
Calculations
Improper practices

ACRONYMS

AHERA – Asbestos Hazard Emergency Response Act
ASTM – American Society for Testing and Materials
CFR- Code of Federal Regulations
DOE – Department of Energy
IDL – Instrument Detection Limit
M – Module
MDL – Method Detection Limit
MQL – Method Quantitation Limit
NIOSH – National Institute for Occupational Safety and Health
NIST – National Institute of Science and Technology
PE or PT – Performance Evaluation or Proficiency Test
PMSD – Percent Minimum Significant Difference
QC – Quality Control
RCRA – Resource Conservation and Recovery Act
SDWA – Safe Drinking Water Act
SOP – Standard Operating Procedure
TEM - transmission Electron Microscopy
TNI – The NELAC Institute
USGS – United States Geological Survey
V- Volume