

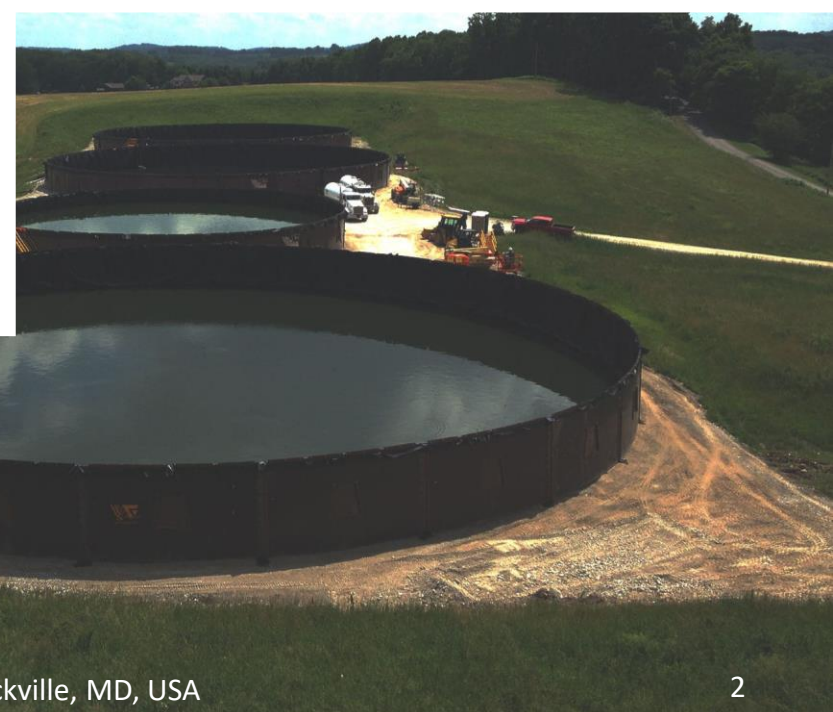
Development of Voluntary Consensus Standards and Measurement Support for NORM / TENORM Applications

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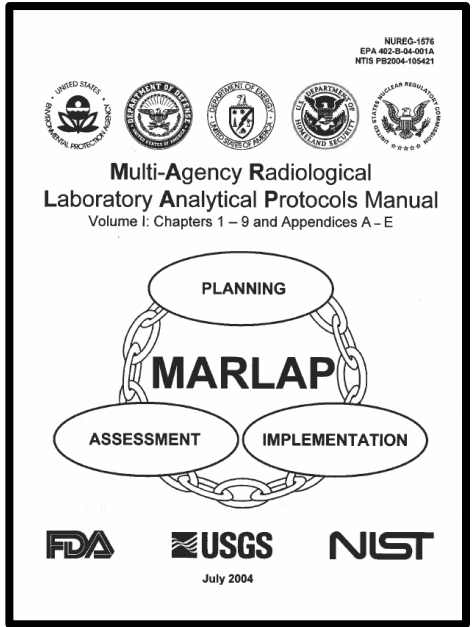
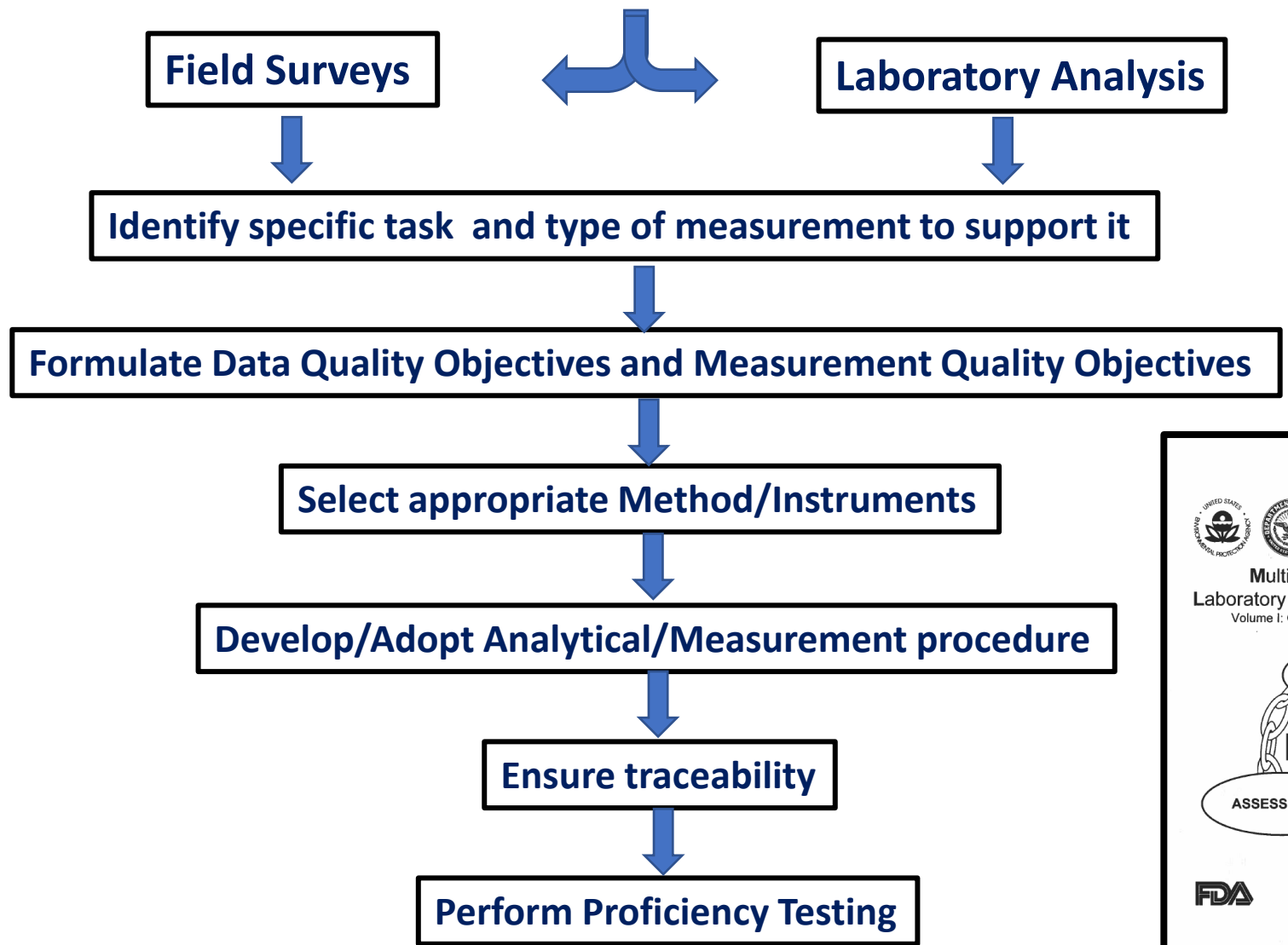
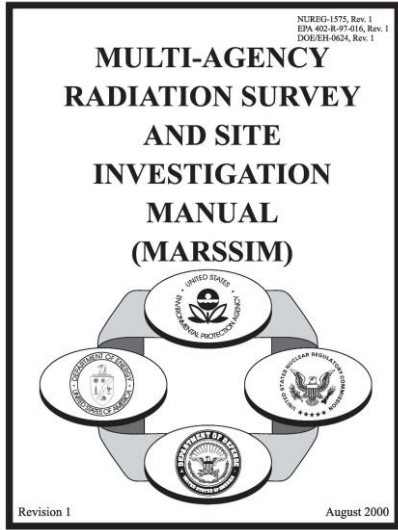
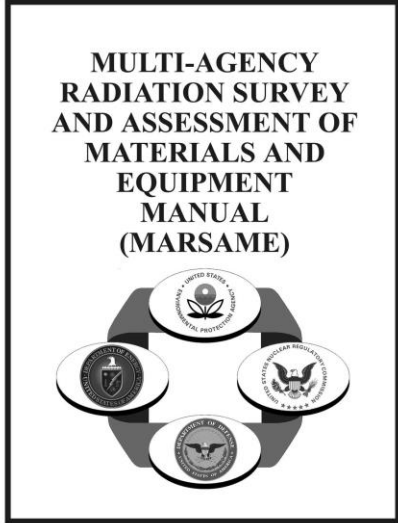
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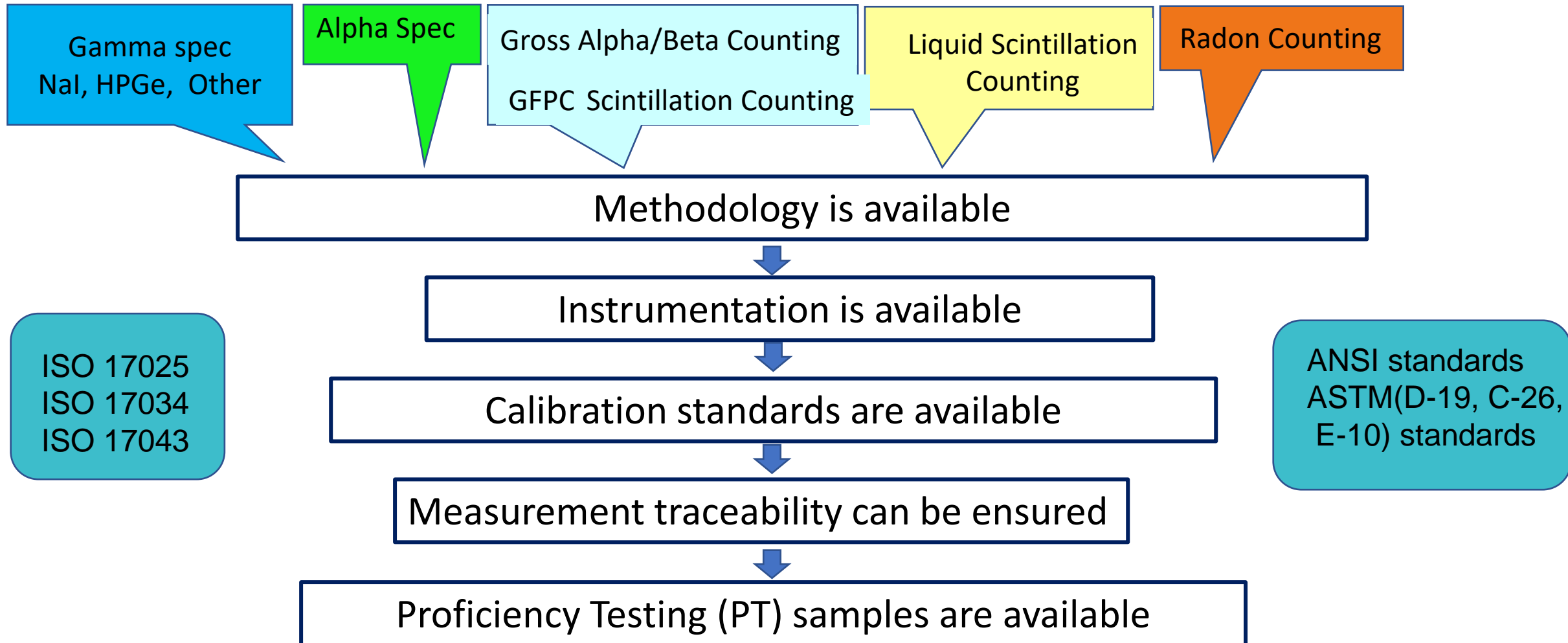


Part of (TE)NORM ANALYSIS – determination of concentration of radionuclides

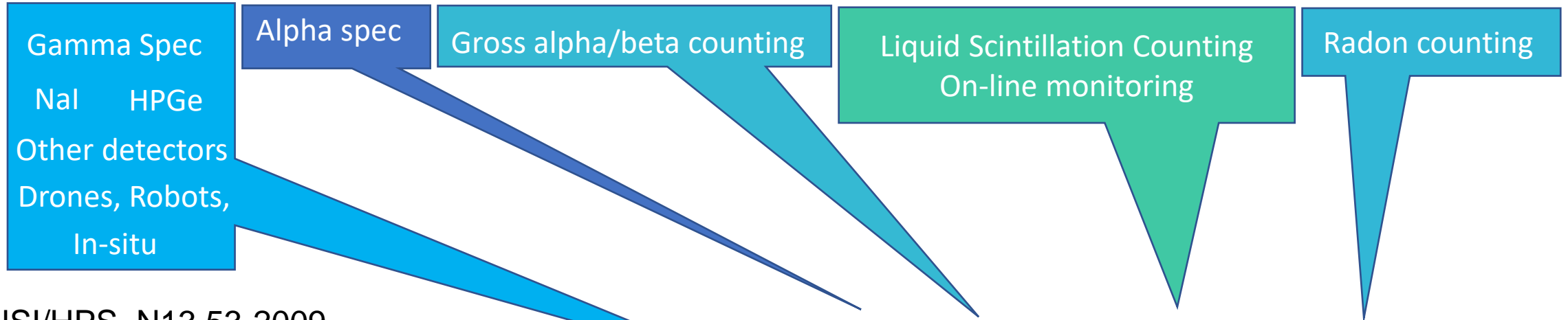


Laboratory Analysis

Can be performed with or without a radiochemical separation



Field Surveys and Analysis



ANSI/HPS N13.53-2009

Control and Release of Technologically Enhanced Naturally Occurring Radioactive Material (TENORM)

Survey: A systematic evaluation and documentation of the radiological characteristics of areas, items, or materials using calibrated instrumentation or laboratory radio-analytical techniques that meet data quality objectives established for the survey. Data quality objectives define the appropriate type of data, specify tolerance levels for decision errors, and establish the quality and quantity of data needed to support the decision process when evaluating results.

Methodology, Instrumentation, Calibration Standards and Proficiency Testing (PT) samples are somewhat available



Implementation of measurement practices is not consistent, measurement traceability and survey results can be questionable and unreliable

What is the role of field survey? Can it be used for obtaining quantitative results and significantly reduce time and cost of analysis?

To answer “yes” several issues need to be addressed and resolved:

- standardized practices and procedures should be adopted or developed for specific applications.
- critical part of each procedure should be the calibration of the instruments. Calibration must be specific for each application and must established relation between the count rate and activity. Some calibration procedures should address state of equilibrium between parent and daughter radionuclides. Procedures for in-situ analysis, including drone and vehicle-based surveys, should include landscape variations. Historical data or laboratory analysis should be used to better simulate the isotopic composition.
- capabilities should be developed to provide Performance Testing samples or the possibility to do the Performance Testing measurements for the specific procedures, allowing verifications and demonstration of competence

Example of “Calibration” certificate, that is no more than functionality check

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6/25/2013

Calibration Certificate

Calibration Certificate for 44-10, Serial # PR194981, Bar Code # , i

Date: 06/25/13 Date Last Cal. Expires: 07/09/13 Technician:
Location: 9999 Reason For Calibration: Due for Calibration

EQUIPMENT USED DURING CALIBRATION

MODEL: 2221	SERIAL #: 262321	CAL DUE: 06/25/14
MODEL:	SERIAL #:	CAL. DUE:

NIST TRACEABLE SOURCES USED

SOURCE	ISOTOPE	ACTIVITY	2 π	ASSAY DATE
99-0292	Cs-137	7.03 uCi		1/30/2012

Efficiency from Last Calibration: 0.70% HV From Last Calibration: 1050 V Calibration Threshold: 10 mV

AS FOUND DATA	1 MINUTE COUNTS (CPM)	AS LEFT DATA after repair of HV adjust
AS FOUND Instrument Condition: SAT		AS LEFT Instrument Condition: SAT
HV: 1050 V		HV: 1050 V
Center: 111537		Center: 111592
Background: 3814		Background: 4082
Probe Efficiency: Cs-137 0.69%		Probe Efficiency: Cs-137 0.69%

"AF" in the AL Efficiency fields means to refer to the AF Efficiencies in the AS FOUND DATA Section

Is the As Found Efficiency Within 20% of the efficiency from the last cal.?
Reproducibility: Isotope: Cs-137 111481 110348 112126 Average: 111318 Are the individual counts within 10% of the average?
* If As Found Efficiency after the repair is within 10% of the specification and uniformity $\pm 1\%$, the technician may skip the "As Found" data and proceed to "Comments". Geometry = N/A
* If As Found Efficiency after the repair is not within 10% of the specification, the technician may skip the "As Found" data and proceed to "Comments". Geometry = N/A

PLATEAU AND SET POINT DATA (CPM)

High Voltage	Source Response	Background	HV	CENTER	Background	Efficiency
N/A			V			Cs-137

Comments: Married as a set with: Model: 2221 Serial #: 262321 Bar Code #:

Does Instrument Meet Final Acceptance Criteria? Calibration Sticker Attached?

Performed by: [redacted] Date is Due For Next Calibration: [redacted] 6/26/13
Printed Name: [redacted] Reviewed by: [redacted]

EZA capabilities to support (TE)NORM analysis and surveys

- All (TE)NORM isotopes are available, including uranium-238 and thorium-232 in equilibrium with their decay products.
- EZA pitchblende material is analyzed at Oak Ridge National Laboratory for uranium content, uranium isotopic abundance and trace element content.
- Manufacturing capabilities for solid and liquid Calibration Standards and PT samples for common and custom geometries and isotope composition.
- Flat source manufacturing up to 1m x 1m for potential use for In-Situ measurements and in-pipe and other simulations.
- Solid matrices for the preparation of calibration standard, reference materials (bulk standards) and PT samples are available in 0.5 – 3.5 g/cm³ density range, including Olivine, low NORM material (Σ NORM isotopes < 12 mBq/g).
- Potential capability for in-house instrument calibration service and Performance Testing for in situ measurements, using realistic simulations.