



U.S. DEPARTMENT OF
ENERGY

Nuclear Energy

U.S. Department of Energy Radiological and Environmental Sciences Laboratory

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U.S. Department of Energy

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Report Documentation Page

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TODAY'S TOPICS

- Overview of the Radiological & Environmental Sciences Laboratory (RESL)
- Programs at RESL
- Core capabilities at RESL
- What RESL can offer the DOD Environmental Laboratory Accreditation Program (ELAP)



MISSION: A Reference Laboratory for the U.S. Department of Energy

- Provide federal agencies & programs confidence in laboratory results supporting protection of workers, the public and the environment
 - Assurance of quality of Measurement
 - Traceability
 - Independence
- RESL adds a defensible decision making component to the management and oversight of federal operations
- Performance based evaluation of laboratories with real world samples and matrices



RESL's Core Mission Capabilities

- Expertise in analytical measurements for radiological, inorganic and organic analyses
- Radiation measurements and calibrations
- Applied programmatic R&D
 - Development of new PE materials
 - Development of new analytical methods
 - Technical assistance
- Development of DOE and National Standards



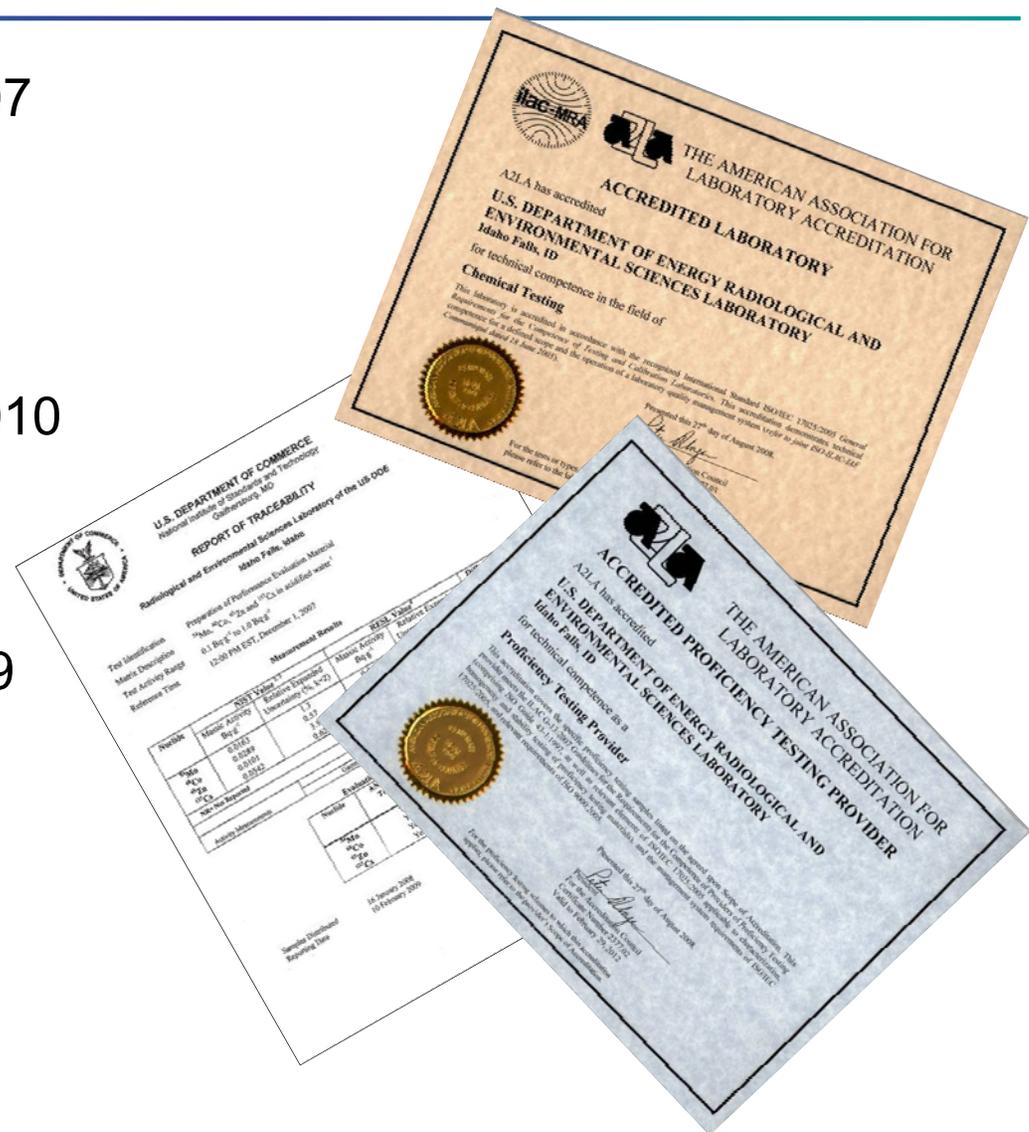
RESL – Established Quality Systems

Accredited to ISO/IEC-7025:2007
ISO Quality Standard for
Laboratory Operations &
External Dosimetry

Accredited to ISO/IEC-17043:2010
General Requirements for
Proficiency Testing

Accredited to ISO/IEC-G34:2009
General Requirements for
Certified Reference Material
Provider

NIST/RESL Radiological
Traceability Program





RESL Programs

Program Secretarial Office – Nuclear Energy

- [RTP](#): NIST Radiological Traceability Program
- [DOELAP](#): DOE Laboratory Accreditation Program
- [RMAP](#): Radiological Measurement Assurance Program
- [MAPEP](#): Mixed Analyte Performance Evaluation Program
- [SSPEP](#): Site-Specific Performance Evaluation Program and Other Specialized Programs

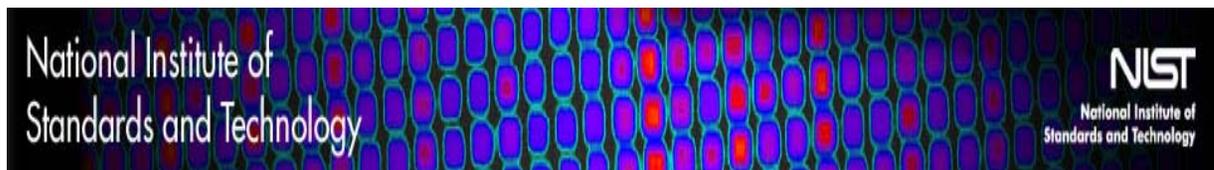


Radiological Traceability Program (RTP)

Direct Traceability to NIST

- ✓ RESL prepares PE Materials for confirmatory measurements by NIST
- ✓ RESL analyzes PE Materials prepared by NIST
- ✓ All Matrices are addressed

No other Federal Agency or Commercial Facility maintains this type of direct traceability to NIST





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Evaluates ability of DOE sites to accurately
measure radiation dose to workers

RESL designed, developed and has administered
the DOELAP performance testing program for
over 25 years



DOELAP Features

External Dosimetry – TLD badges

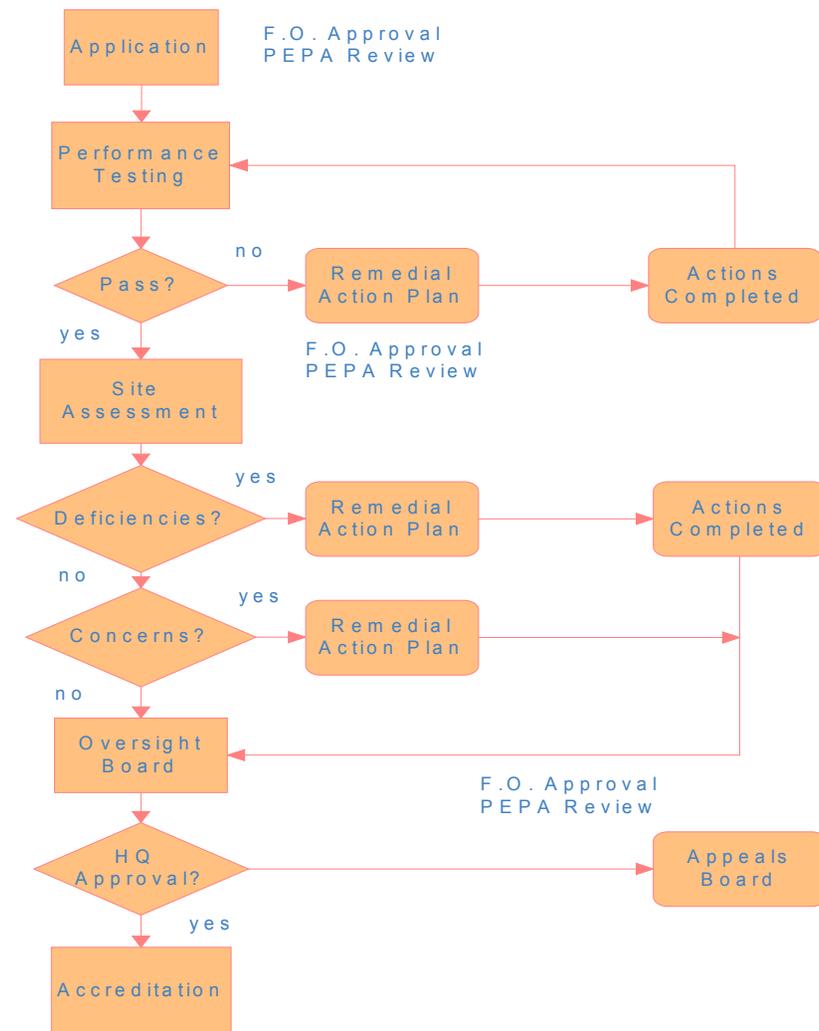
Internal Dosimetry – Radiobioassay

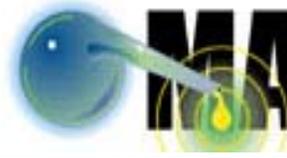
- Wholebody / Lung / Thyroid Phantoms &
- Urine / Fecal Samples
 - Actinide, fission, & activation products
 - Unique isotopic activities for each sample matrix
 - Chemical and radiochemical interferences are chosen to mimic real world samples
 - Reference values are directly traceable to NIST



U.S. Department of Energy Laboratory Accreditation Process

- Application
- Performance Testing
- Assessment
- Corrective Action
- Oversight Board
- Accreditation





Evaluates laboratories performing radiological and non-radiological environmental testing

- Mixed analytes in real world matrices traceable to NIST
- Acceptance criteria based on NIST-traceable reference value
 - Organics acceptance criteria uses NELAC criteria
- Performance based evaluation of laboratories

Not a consensus based PE program

Semiannual Performance Testing In Natural Matrices:

- Water (Groundwater, surface, etc.)
- Soil
- Air Filters
- Vegetation

Containing Mixed Analytes:

- Radiological Analytes (Alpha, Beta, Gamma)
- Inorganic Analytes (Priority Pollutant RCRA & UTS)
- Organic Analytes (Semi-volatile, pesticides)





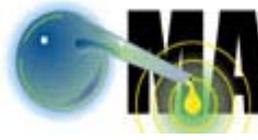
Over 130 national & international participating laboratories

- Results reported over secure web site
- Over 15,000 results are evaluated each year

The screenshot shows the MAPEP web application interface. The main content area displays a 'Laboratory Analyte Summary' table. The table has columns for #, Study, Lab Code, Result, Ref Value, Flag, Units, Bias (%), Unc Value, and Unc Flag. The data rows show various laboratory results with flags indicating performance status (e.g., H, L, A, B).

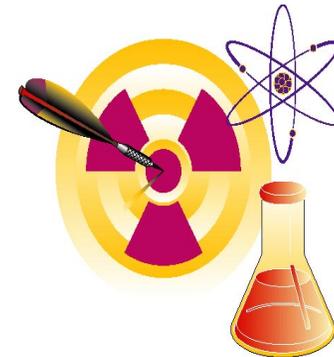
#	Study	Lab Code	Result	Ref Value	Flag	Units	Bias (%)	Unc Value	Unc Flag
1	MAPEP-11-VIAPES	AVY501	5.5	9.5	A		-42.1	1.4	H (Bq/L)
2	MAPEP-11-VIAPES	AY1201	22.9	9.5	A		46.3	2.9	H (Bq/L)
3	MAPEP-11-VIAPES	CDH501	9.70	9.5	A		2.1	0.48	(Bq/L)
4	MAPEP-11-VIAPES	DEH501	-6.7	9.5	A		-70.5	7.5	L (Bq/L)
5	MAPEP-11-VIAPES	DMH501	0.05E+00	9.5	A		3.7	0.26E+00	H (Bq/L)
6	MAPEP-11-VIAPES	ERL501	7.18	9.5	A		-24.4	0.21	L (Bq/L)
7	MAPEP-11-VIAPES	ETT501	11.9	9.5	A		25.3	4.5	H (Bq/L)
8	MAPEP-11-VIAPES	EVL001	4.095	9.5	A		-56.9	.424	(Bq/L)
9	MAPEP-11-VIAPES	FTH501	11.967	9.5	A		22.8	0.904	(Bq/L)
10	MAPEP-11-VIAPES	FOH501	11.020	9.5	A		24.8	3.46	H (Bq/L)
11	MAPEP-11-VIAPES	ISCH501	0.723	9.5	A		-8.2	0.231	L (Bq/L)
12	MAPEP-11-VIAPES	LAW501	28.9	9.5	A		203.2	3.6	(Bq/L)
13	MAPEP-11-VIAPES	NARL01	6.18	9.5	A		-3.4	0.58	(Bq/L)
14	MAPEP-11-VIAPES	NARL02	7.7	9.5	A		-28.9	0.23	(Bq/L)
15	MAPEP-11-VIAPES	NE501	2.74	9.5	A		-71.2	0.72	H (Bq/L)
16	MAPEP-11-VIAPES	ORIS01	8.87	9.5	A		-6.6	0.40	(Bq/L)
17	MAPEP-11-VIAPES	OTL01	10.8	9.5	A		13.7	8.7	H (Bq/L)
18	MAPEP-11-VIAPES	QUAM01	5.88	9.5	A		-39.1	0.231	(Bq/L)
19	MAPEP-11-VIAPES	QUAM02	6.52	9.5	A		-31.4	0.338	(Bq/L)
20	MAPEP-11-VIAPES	SAVA01	0.00E+00	9.5	A		-20.5	3.65E-01	(Bq/L)

RESL designed, developed and has administered MAPEP performance testing for over 18 years



Specialized tests simulate real world samples - challenging laboratories' analytical performance

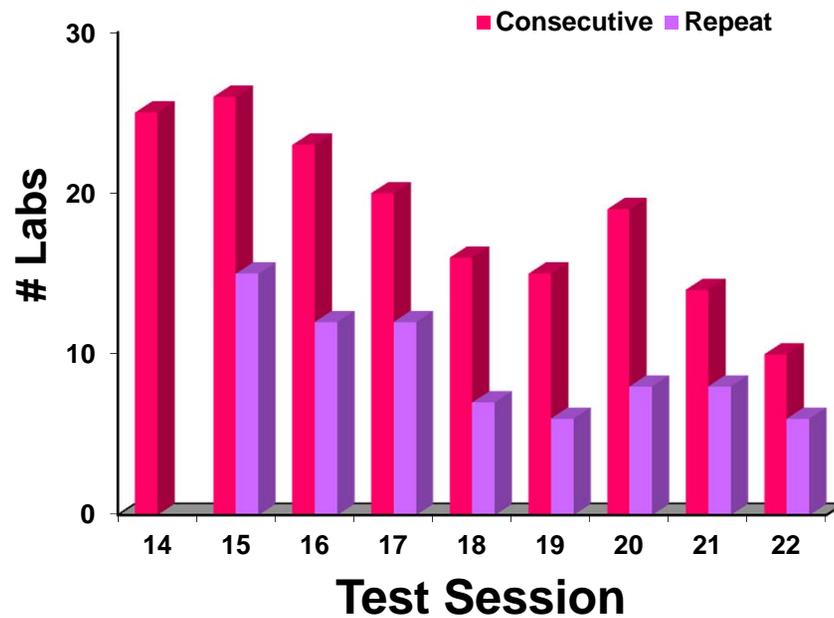
- False Positive Testing
- Sensitivity/False Negative Testing
- Unique isotopic ratios
- Varying sample matrices and concentrations
- Chemical interferences





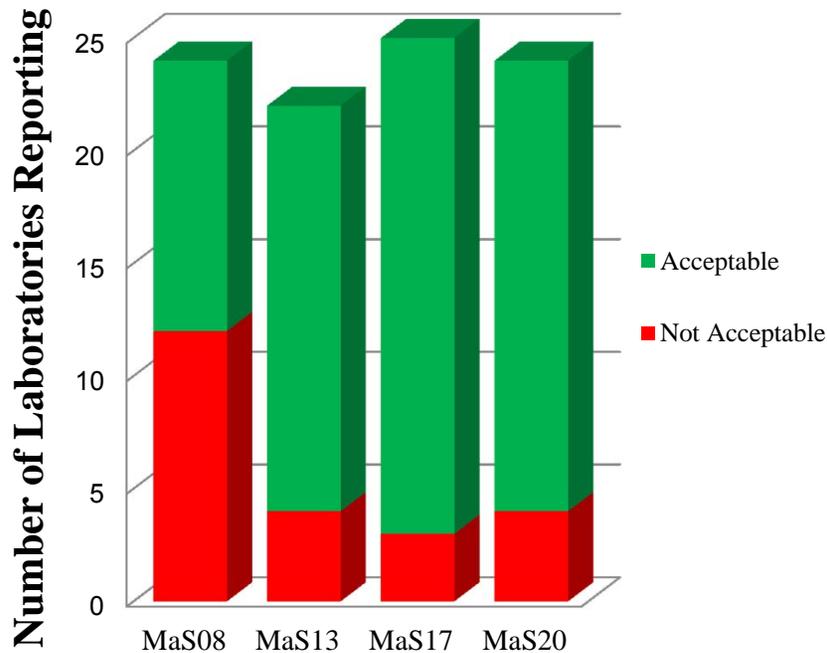
Participation
improves
laboratories
performance

Reduced Failures by Laboratories





Selenium in Soil - False Positive Testing Historical Performance



MAPEP Soils Detection Limit 1.0 mg/kg

Web accessible site

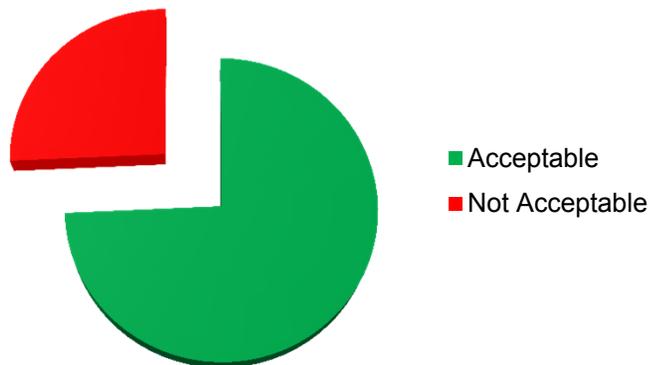
- Participating laboratories report results
- Generate various reports
- Flexible queries of database
- Historical trending of participants

MAPEP Uses Specialized Tests

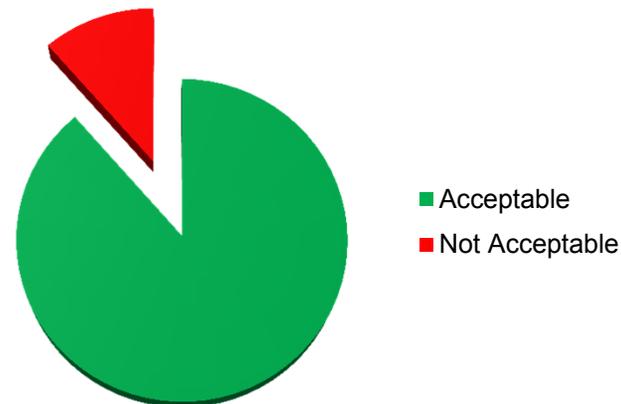
DOE identified refractory plutonium isotopes testing in soil important for laboratories' analytical performance

RESL created MAPEP soil with both refractory and non-refractory Pu in the same soil

Pu-239/240 (Refractory)



Pu-238 (Not Refractory)





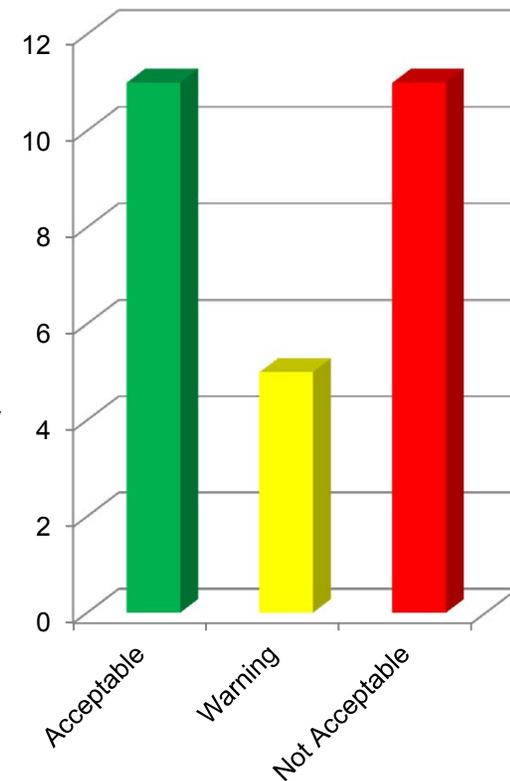
Flexibility to Include Specialized Tests

DOE identified Iodine-129 testing in waters important for laboratories' analytical performance

- ✓ Important long lived isotope to monitor
- ✓ Highly mobile in groundwater
- ✓ Health hazard – concentrates in thyroid
- ✓ No other PT program includes testing for I-129

MAPEP responds by including I-129 in test session 26 showing laboratories relatively poor performance

**Iodine-129 in
MAPEP Water**





Radiological Measurement Assurance Program (RMAP)

RESL evaluates the analytical capability of NRC's contract laboratory

- Performance Evaluation Samples
 - Soil
 - Water
 - Air filters
 - Vegetation
 - Other matrices as requested
- On-site quality assessment



RESL has been NRC's Radiological Reference
Laboratory for over 35 years



Site Specific Performance Evaluation Program (SSPEP)

- RESL prepares proficiency testing standards based on customer requirements for their contracted laboratories
- Performance Evaluation (PE) Samples
 - Soil
 - Water
 - Air filters
 - Fecal
 - Urine
 - Milk
 - Other matrices as requested
- RESL evaluates final results of the PE samples and sends final report to customer





Examples of RESL Program Specific PEPs

- Produced Air Filters for the IAEA for the Proficiency Test on the Determination of Gamma Emitting Radionuclides in Air Filters IAEA-CU-2006-11
- Ultra Low Level Uranium and Plutonium in excreta samples
- Air Filters for the EMPIRE 2009 and April 2010 radiological exercise
- Air Filters for the IAEA Intercomparisons IAEA-CU-2006 and IAEA-CU-2008
- US ARMY ultra low level depleted uranium in urine
- Collaboration with USDA and FERN

DOE and DoD Working Together

Currently merging Laboratory Quality Systems Documents

- Opportunity to participate in MAPEP
- Or create a Non-Rad PE program similar to MAPEP

Specifically Address:

- Priority Pollutant Inorganic Analytes
- Semi-Volatile & Pesticide Organic Analytes
- Concentrations similar to real DoD samples
- Incorporate specialized tests and more.....



New RESL Facility



- Construction began Spring 2010
- Completed July 2011

- Official Opening August 2011





New RESL Facility

Lab Area



Office Area





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Renovations Complete

- Ready for occupation

