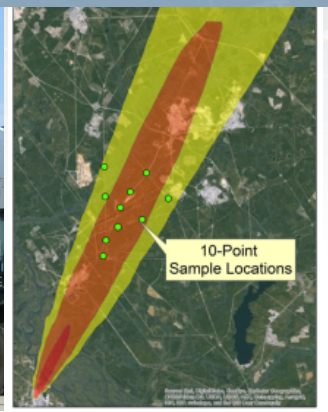
SAND2022-14936C

U.S. DEPARTMENT OF ENERGY

National Nuclear Security Administration

Federal Radiological Monitoring and Assessment Center (FRMAC) Laboratory Analysis Workshop



Radiobioassay and Radiochemical Measurements Conference (RRMC)

October 31, 2022 – November 4, 2022

Sandia National Laboratories

Lawrence Livermore National Laboratory

NEVADA NATIONAL NNSS SECURITY SITE

Managed and operated by Mission Support and Test Services

Sandia National Laboratories is a multimission laboratory managed and operated by National Technology & Engineering Solutions of Sandia, LLC, a wholly owned subsidiary of Honeywell International Inc., for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-NA0003525.

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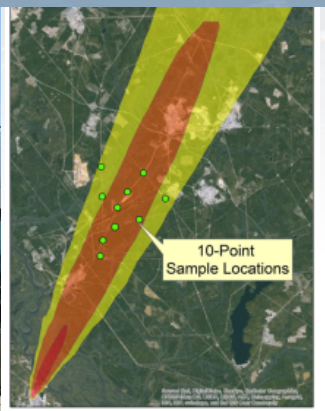
Speaker Introductions

- Mark Allen – Sandia National Laboratories
- Sean Fournier – Sandia National Laboratories
- Lynn Jaussi – Nevada National Security Site
- Phil Torretto – Sandia National Laboratories

Agenda

- A Federal Response to a Nuclear Emergency
- Federal Radiological Monitoring and Assessment Center (FRMAC)
- FRMAC Laboratory Analysis Operations and What Laboratories Can Expect
- Best Practices for Sample Control during the Nuclear Incident Response
- Integrated Consortium of Laboratory Networks (ICLN)
- Cobalt Magnet (CM22) Exercise

A Federal Response to a Nuclear Emergency



U.S. DEPARTMENT OF ENERGY

National Nuclear Security Administration

RESPONSE
RECOVERY
READINESS
TRIBAL
STATE
LOCAL
FRMAC
FEDERAL RADIOLOGICAL MONITORING AND ASSESSMENT CENTER

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A Federal Response to a Nuclear Emergency

- Nuclear Weapon
- Radiological Dispersal Device
- Nuclear Power Plant Release (large scale)
- **Any** release or potential release of radiological material that activates the Consequence Management Program at NNSA

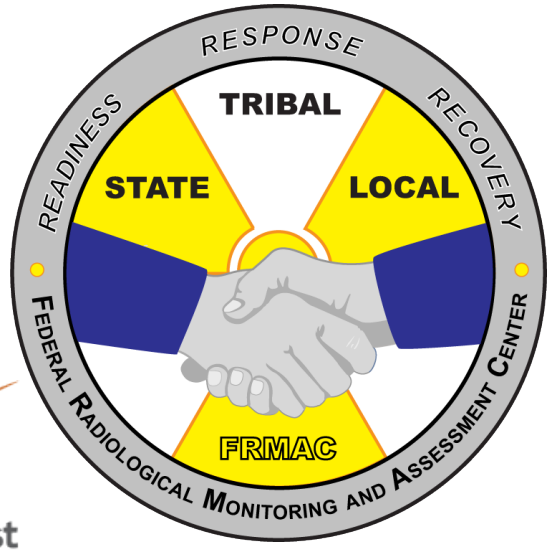
Consequence Management Mission

The mission of the National Nuclear Security Administration's Consequence Management Program is to reduce casualties and protect lives, property, and the environment in response to a nuclear or radiological incident.

Federal Radiological Monitoring and Assessment Center (FRMAC)

Multi-Agency response effort

- Partners include: DOE, DoD, EPA, FDA, CDC, USDA
- Consequence Management Advanced Command (CMAC)
- Consequence Management Response Team (CMRT)
- Consequence Management Home Team (CMHT)
- Off-location assets at the national laboratories



MISSION: Assist Federal, State, Tribal, and Local authorities by providing timely, high-quality predictions, measurements, analyses and assessments to promote efficient and effective emergency response for protection of the public and the environment from the consequences of nuclear or radiological incidents.

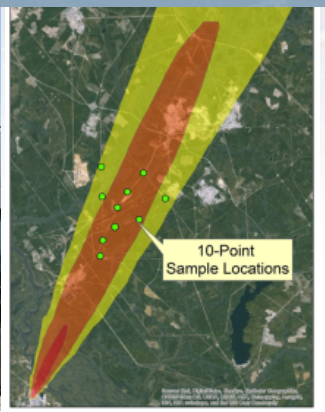
Federal Radiological Monitoring and Assessment Center (FRMAC)

Divisions of FRMAC

- Sampling and Monitoring
- Assessment
- Health & Safety
- Support
- Liaison
- Laboratory Analysis

FRMAC in Action
Southern Exposure 2015 – Full Scale Nuclear Power Plant Exercise

FRMAC Laboratory Analysis Operations and What Laboratories can Expect



U.S. DEPARTMENT OF ENERGY

National Nuclear Security Administration

RESPONSE RECOVERY READINESS
TRIBAL STATE LOCAL FRMAC
FEDERAL RADIOLOGICAL MONITORING AND ASSESSMENT CENTER

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Outline

- FRMAC Laboratory Analysis Process
- Typical FRMAC Samples
- Factors in Selecting a Responding Laboratory
- Scenario Based Walk Thru of What the Laboratory Can Expect
- Key Take-Away(s)

FRMAC Laboratory Analysis Process

Mobile Labs

Fixed Labs

Local Resources

Reachback

Analysis Needs, DQO's and Sampling Plans Established

Lab Assets Notified

Samples Received and Logged at Hotline/Sample Control; COC established

Analysis Request Completed and Samples Shipped to Labs

Labs complete analysis and report results

Receive, review and validate laboratory results

Data Deliverables

Data available for Assessment

COSMOS Workflow Tracking

Timeline = Days to Weeks

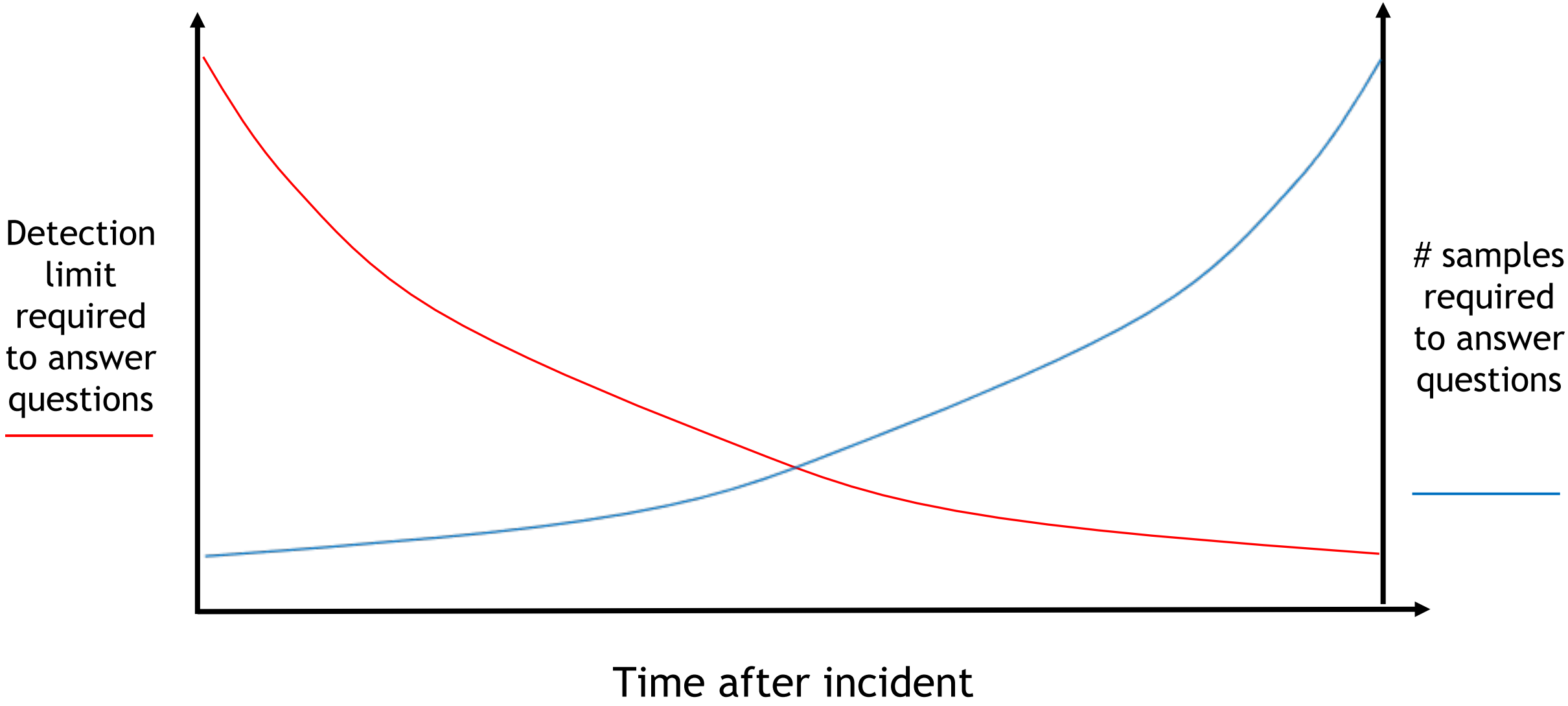
Sample Receipt Hotline – Cobalt Magnet 2019 – Cocoa Beach, FL

Sample Receipt of Soils from Fukushima (Lab Analysis and RAP-3) @ Savanah River Site

FAL/EPA MERL Interoperability drill – 2015, Las Vegas, NV

Lab Analysis management at FRMAC – Northern Lights 2016 - Minnesota

The Laboratory Analysis Challenge



Typical Samples Collected by the FRMAC

- Swipes & Smears – health and safety, general deposition assessment
- Air Filters – health and safety, resuspension analysis
  a) 2 in diameter low-volume
  b) 4 in diameter high-volume
  c) Cartridges for Iodine capture

- Environmental – Soil, water, vegetation
- Commercial – Food, Agricultural Products, Feed/Forage
- **Ground Deposition** – Evaluation of deposited radioactivity in a given area

The Ground Deposition Sample

- Collected to estimate radionuclide concentration deposited on the ground surface
- Similar to soil samples, with key differences:
  - Objective to report sample activity/area
  - No separation of non-soil components (rocks, vegetation, organic materials)
  - Labs are asked to report radioactivity for <u>the whole sample</u>

EPA has developed a standardized rapid screening method for gamma spectroscopy and gross alpha/beta of the Ground Deposition samples

Factors in Selecting a Responding Laboratory

- FRMAC experience
- FRMAC Laboratory Analysis Working Group member lab or contractor
- Member of ICLN Laboratory Network?
- Proficiency test performance
- Permits, accreditations, certifications
- Matrix/method capabilities
- Ability to meet Data Quality Objectives (DQO) and Turn-Around-Times (TAT)
- Sample capacity

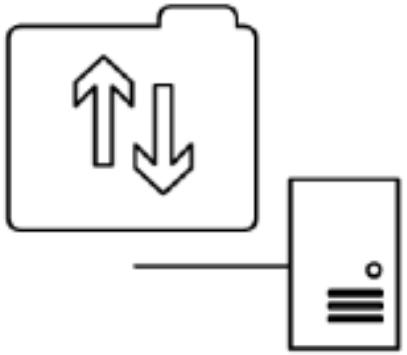
Scenario – 0-6 hours (EXERCISE)

- A local marathon has been attacked by an explosive
- First responders identified elevated radiation levels in the affected area, the local Radiological Assistance Program (RAP) has been activated
- A specialist with Fire & Rescue equipped with a radioisotope identification device (RID) has observed Cs-137 and Co-60 and possibly Am-241
- There is no reliable intelligence as to what might have been in the RID
- Initial health physics and dosimetry calculations and atmospheric modeling **MUST** have an estimate of the source term to yield accurate results

Scenario (continued) 6-12 hours (EXERCISE)

- An initial guess at the source term was made of 6:1 activity ration Cs-137 to Co-60 based on initial spectra sent to DOE Triage
- It is still unknown if Am-241 is present and at what ratio, this has **huge** implications to the modeling and impact assessments
- Higher resolution/more accurate field spectroscopy measurements and samples are needed to confirm the source term
- Smears and ground deposition samples have been taken by the Radiological Assistance Program (RAP) close up to ground zero to determine the source term
- These samples were collected in CBRNResponder and CMHT has created an Analysis Request Form (ARF) that will be going to your lab for analysis

Laboratory Process Review



Initial Laboratory Contact → Analysis Request Form via Lab Portal → Lab receives samples, performs analysis → Lab posts data to Lab Portal → FRMAC makes QA assessment, gives feedback to lab, imports verified results to RR database

Initial Laboratory Questionnaire

- Laboratory point of contact, physical address, and shipping address
- Radioactivity thresholds
- Analysis capabilities, standard geometries, and standard count times/detection limits

Laboratory Information Summary

Laboratory Name:	Sandia National Laboratories	Contact Name:	Sean D. Fournier
	RPSD	Contact Phone/Fax Number:	505.844.7838
Shipping Address:	1515 Eubank Blvd. SE	Contact Email Address:	sdfourn@sandia.gov
	Albuquerque, NM 87123	Alternate Contact:	Sonoya Sh...
	Bldg 1090 MS 1103	Alternate Phone/Fax Number:	505.844.7764
		Alternate Email Address:	tshank...@sandia.gov

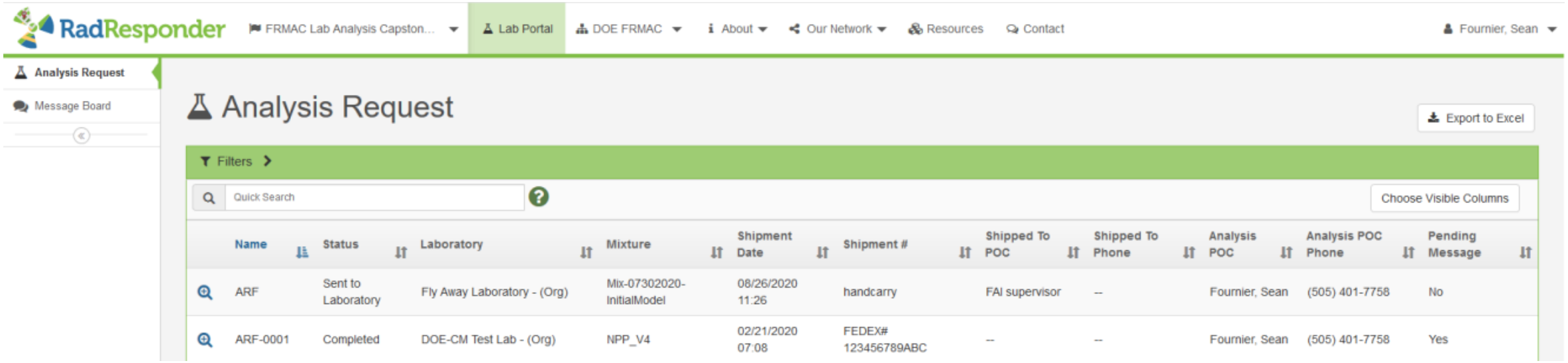
Please specify the maximum activity levels your laboratory can accept.

	CPM	uCi	mR	Other
Per Sample	5000		(on contact)	
Total	5000		5 (on contact)	

Please specify typical Lc for a 10 minute count.

		Counting Geometry	Am-241	Cs-137	Gross Alpha	Gross Beta	Units	Samples / Day	Expected TAT for first sample
Gamma Spectroscopy	Soil	25...mL Jar	...02	1e-4			µCi/Sample	84	6 hrs
	Air	2/4...	.0005	1e-4			µCi/Sample	84	6 hrs
	Swipes	2"	.0005	1e-4			µCi/Sample	84	6 hrs
	Water	500 mL	.004	1e-4			µCi/L	84	6 hrs
	...egati...	250 mL Jar	.001	1e-4			µCi/Sample	84	6 hrs
Proportional Co...ng	So...	N/A					µCi/Sample		
	Air	2"			2.3e-6	6e-6	µCi/Sample		6hrs
	Swipes	2"			2.3e-6	6e-6	µCi/Sample		6hrs
	Water	N/A					µCi/L		
Radon-compensating Alpha/Beta Counter	Air	2"			2.3e-6	6e-6	µCi/Sample		6hrs
	Swipes	2"			2.3e-6	6e-6	µCi/Sample		6hrs
Liquid Scintillation	Water	15/5 UGXR			2.3e-6	6e-6	µCi/L	2400	6hrs
	Air	18/0 UGXR			2.3e-6	6e-6	µCi/Sample	2400	6hrs
	Swipes	18/0 UGXR			2.3e-6	6e-6	µCi/Sample	2400	6hrs

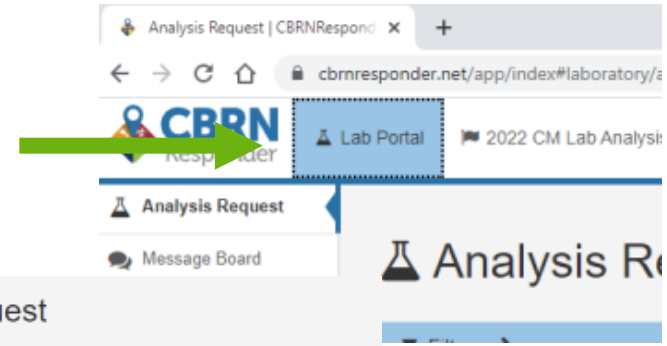
How Labs report data to FRMAC



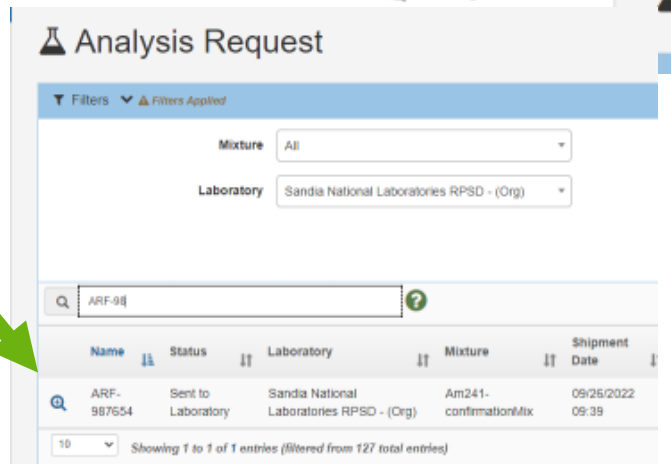
- RadResponder.net Lab Access Portal
- Only see analysis request information sent to their lab
- Post files to website, FRMAC reviews the files and imports the data to the RadResponder database
- Access Electronic Data Deliverable (EDD) file format

Review ARFs sent to your lab before the shipment arrives

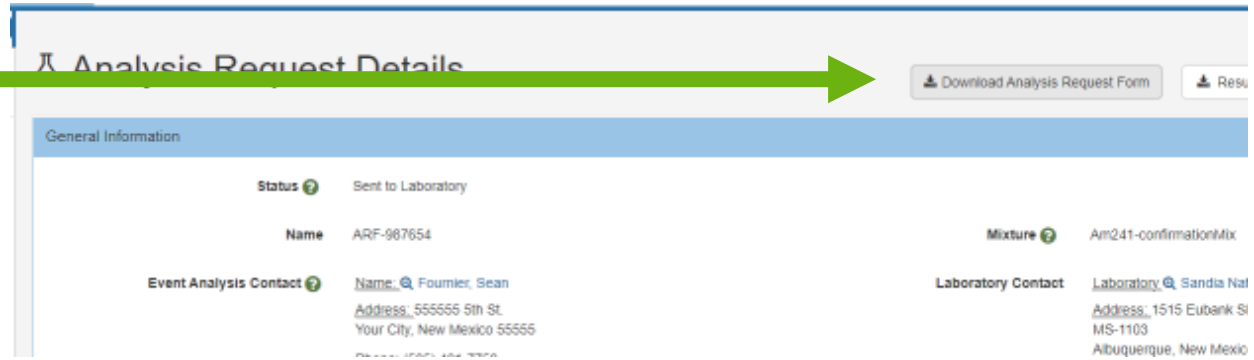
- Log into CBRNResponder and access the lab portal. Note: If your laboratory does not have an organization set up, contact: support@cbrnresponder.net



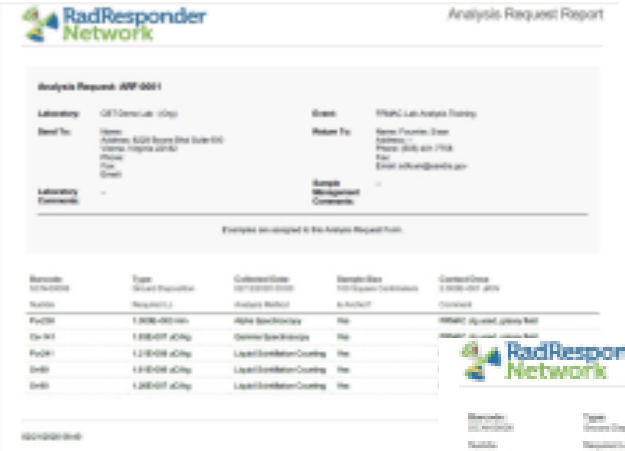
- Select the ARF you wish to view



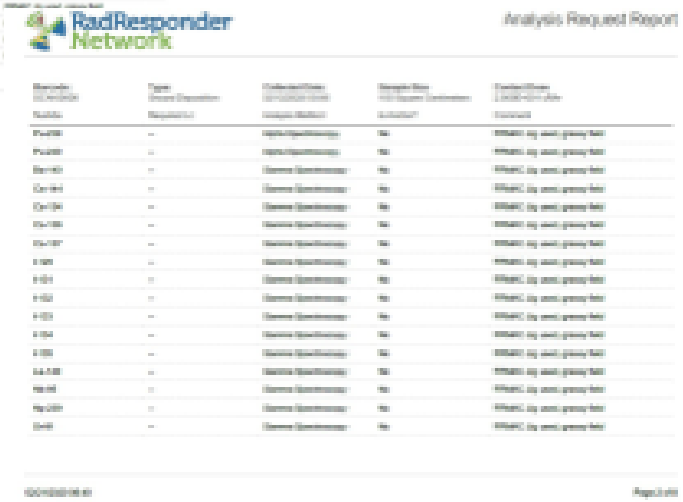
- Download the ARF pdf



Analysis Request Form



Page 1 Cover Page



Page 2 - ?? Sample/Analyte List

Last Page: Chain of Custody

ARF Page One (1)

Analysis Request ID number: This must be reported back on the electronic results

RadResponder Network

Analysis Request Report

Analysis Request: ARF-987654

Laboratory: Sandia National Laboratories RPSD - (Org)

Event: 2022 CM Lab Analysis Training Event

Send To: Name: Mark Allen
Address: 1515 Eubank SE
Albuquerque, New Mexico 87185
Phone: (555) 555-5555
Fax:
Email: mballen@sandia.gov

Return To: Name: Fournier, Sean
Address: 555555 5th St.
Your City, New Mexico 55555
Phone: (505) 401-7758
Fax:
Email: sdfourn@sandia.gov

Laboratory Comments:
Please count samples for at least 10 minutes and achieve an Lc less than the Am-241 Lc indicated below

Sample Management Comments:
Samples are known to contain radioactive materials, handle with caution

2 samples are assigned to this Analysis Request Form.

Barcode:	Type:	Collected Date:	Sample Size	Contact Dose
SCF-987656	Swipe	09/26/2022 09:31	100 Square Centimeters	1.000E-001 mR/hr

Nuclide	Analysis Requirement	Analysis Method	Is Anchor?	Comment
Am-241	5.00E-002 uCi	Gamma Spectroscopy	Yes	--
Co-60	--	Gamma Spectroscopy	No	--
Cs-137	--	Gamma Spectroscopy	No	--

ARF Page One (1)

Your Laboratory name in CBRNResponder: This must also be reported back on the electronic results

RadResponder Network

Analysis Request Report

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Laboratory: Sandia National Laboratories RPSD - (Org)

Event: 2022 CM Lab Analysis Training Event

Send To: Name: Mark Allen
Address: 1515 Eubank SE
Albuquerque, New Mexico 87185
Phone: (555) 555-5555
Fax:
Email: mballen@sandia.gov

Return To: Name: Fournier, Sean
Address: 555555 5th St.
Your City, New Mexico 55555
Phone: (505) 401-7758
Fax:
Email: sdfourn@sandia.gov

Laboratory Comments:
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Cs-137	--	Gamma Spectroscopy	No	--

ARF Page One (1)

Your labs shipment address

RadResponder Network

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Address: 1515 Eubank SE
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Return To: Name: Fournier, Sean
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Cs-137	--	Gamma Spectroscopy	No	--

ARF Page One (1)

The shipment address for unused sample portions: Only send samples back if specifically requested to do so by FRMAC

RadResponder Network

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Send To: Name: Mark Allen
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Phone: (555) 555-5555
Fax:
Email: mballen@sandia.gov

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Fax:
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ARF Page One (1)

Special analysis instructions: Please read carefully and ask questions to FRMAC if needed

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Cs-137	--	Gamma Spectroscopy	No	--

ARF Page One (1)

Special sample handling instructions: Please read carefully and ask questions to FRMAC if needed. This is where we inform you of any out of the ordinary sample conditions (repackaging, contamination, etc.)

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ARF Page One (1)

Total number of individual samples on ARF: Upon receipt, carefully count samples and confirm this is correct.

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Cs-137	--	Gamma Spectroscopy	No	--

ARF Page One (1)

Beginning of sample information section: There will be a block of data for each individual sample. First confirm all samples are present and that IDs, sample types are correct

RadResponder Network

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Am-241	5.00E-002 uCi	Gamma Spectroscopy	Yes	--
Co-60	--	Gamma Spectroscopy	No	--
Cs-137	--	Gamma Spectroscopy	No	--

ARF Sample Information Section

Sample ID: This is a unique identifier for the sample, each sample package will be labeled with a marker or with a barcode sticker

RadResponder Network

Analysis Request Report

Barcode: SCF-987657	**Type:** Ground Deposition	**Collected Date:** 09/26/2022 09:32	**Sample Size** 0.3 kilograms 100 Square Centimeters	**Contact Dose** 1.250E+002 uR/hr
Nuclide	Analysis Requirement	Analysis Method	Is Anchor?	Comment
Am-241	1.50E-001 uCi/kg	Gamma Spectroscopy	Yes	--
Co-60	--	Gamma Spectroscopy	No	--
Cs-137	--	Gamma Spectroscopy	No	--

ARF Sample Information Section

Sample Type: This is the sample type. Ensure it matches the physical media presenting for each sample. Any questions should be directed to FRMAC. Remember a Ground Deposition may look like a soil but results must be reported **for the whole sample.**

RadResponder Network

Analysis Request Report

Barcode:	**Type:**	**Collected Date:**	**Sample Size**	**Contact Dose**
SCF-987657	Ground Deposition	09/26/2022 09:32	0.3 kilograms 100 Square Centimeters	1.250E+002 uR/hr

Nuclide	Analysis Requirement	Analysis Method	Is Anchor?	Comment
Am-241	1.50E-001 uCi/kg	Gamma Spectroscopy	Yes	--
Co-60	--	Gamma Spectroscopy	No	--
Cs-137	--	Gamma Spectroscopy	No	--

ARF Sample Information Section

Sample Collection Date: This is the date/time the sample was collected and is also considered the **result reference date/time.** Analysis results must be decay corrected to this date/time. The reference date/time will be reported with the electronic results Note: this date/time is in the time zone of the event which will be communicated to you.

RadResponder Network

Analysis Request Report

Barcode:	Type:	Collected Date:	Sample Size	Contact Dose
SCF-987657	Ground Deposition	09/26/2022 09:32	0.3 kilograms 100 Square Centimeters	1.250E+002 uR/hr

Nuclide	Analysis Requirement	Analysis Method	Is Anchor?	Comment
Am-241	1.50E-001 uCi/kg	Gamma Spectroscopy	Yes	--
Co-60	--	Gamma Spectroscopy	No	--
Cs-137	--	Gamma Spectroscopy	No	--

ARF Sample Information Section

Sample Size: The *estimated* sample size is here for bulk samples like ground deposition and water. The *actual* sample size for air samples is here. Labs should measure and report back the true sample size as analyzed in the results. For air samples, labs should use this value as the sample size and report air concentration.

RadResponder Network

Analysis Request Report

Barcode:	Type:	Collected Date:	Sample Size	Contact Dose
SCF-987657	Ground Deposition	09/26/2022 09:32	0.3 kilograms 100 Square Centimeters	1.250E+002 uR/hr

Nuclide	Analysis Requirement	Analysis Method	Is Anchor?	Comment
Am-241	1.50E-001 uCi/kg	Gamma Spectroscopy	Yes	--
Co-60	--	Gamma Spectroscopy	No	--
Cs-137	--	Gamma Spectroscopy	No	--

ARF Sample Information Section

Contact Dose: This is the contact dose rate measured for the individual sample. Labs should use this as a general guideline for the amount of radioactivity in the sample and are encouraged to measure it themselves. Due to differences in background and decay, labs should not expect these to be exactly the same.

RadResponder Network

Analysis Request Report

Barcode:	Type:	Collected Date:	Sample Size	Contact Dose
SCF-987657	Ground Deposition	09/26/2022 09:32	0.3 kilograms 100 Square Centimeters	1.250E+002 uR/hr

Nuclide	Analysis Requirement	Analysis Method	Is Anchor?	Comment
Am-241	1.50E-001 uCi/kg	Gamma Spectroscopy	Yes	--
Co-60	--	Gamma Spectroscopy	No	--
Cs-137	--	Gamma Spectroscopy	No	--

ARF Sample Information Section

Nuclide: This column lists all the radionuclides (analytes) for which the lab is requested to analyze and provide a quantitative result, uncertainty, and detection limit.

RadResponder Network

Analysis Request Report

Barcode:	**Type:**	**Collected Date:**	**Sample Size**	**Contact Dose**
SCF-987657	Ground Deposition	09/26/2022 09:32	0.3 kilograms 100 Square Centimeters	1.250E+002 uR/hr

Nuclide	Analysis Requirement	Analysis Method	Is Anchor?	Comment
Am-241	1.50E-001 uCi/kg	Gamma Spectroscopy	Yes	--
Co-60	--	Gamma Spectroscopy	No	--
Cs-137	--	Gamma Spectroscopy	No	--

ARF Sample Information Section

Analysis Requirement: This column indicates the required detection critical level (Lc) OR the sample count time for the given analyte. Labs are instructed to analyze the sample with a sufficient method and count time such that the measured critical level (Lc) is less than this value. When a count time is indicated, labs are asked to count for at least this long. When there are multiple analysis requirements the lab is asked to make an attempt at meeting **All** of the critical level requirements. When a single critical level is provided, labs are asked to meet that critical level for that analyte but report on all listed analytes.

RadResp Network

equest Report

Barcode: SCF-987657	**Type:** Ground Deposition	**Collected Date:** 09/26/2022 09:32	**Sample Size** 0.3 kilograms 100 Square Centimeters	**Contact Dose** 1.250E+002 uR/hr
Nuclide	Analysis Requirement	Analysis Method	Is Anchor?	Comment
Am-241	1.50E-001 uCi/kg	Gamma Spectroscopy	Yes	--
Co-60	--	Gamma Spectroscopy	No	--
Cs-137	--	Gamma Spectroscopy	No	--

ARF Sample Information Section

Analysis Method: This is the name of the generic analysis method being requested (i.e. Gamma Spectroscopy, Gross alpha/beta by gas proportional counting, Alpha Spectroscopy, etc.)

RadResponder Network

Analysis Request Report

Barcode:	**Type:**	**Collected Date:**	**Sample Size**	**Contact Dose**
SCF-987657	Ground Deposition	09/26/2022 09:32	0.3 kilograms 100 Square Centimeters	1.250E+002 uR/hr

Nuclide	Analysis Requirement	Analysis Method	Is Anchor?	Comment
Am-241	1.50E-001 uCi/kg	Gamma Spectroscopy	Yes	--
Co-60	--	Gamma Spectroscopy	No	--
Cs-137	--	Gamma Spectroscopy	No	--

ARF Sample Information Section

Is Anchor?: This indicates if an analyte is driving the analysis requirement or not. Labs should strive to meet the analysis requirement for all anchor analytes. Typically, there will only be one anchor analyte per analysis method.

RadResponder Network

Analysis Request Report

Barcode:	**Type:**	**Collected Date:**	**Sample Size**	**Contact Dose**
SCF-987657	Ground Deposition	09/26/2022 09:32	0.3 kilograms 100 Square Centimeters	1.250E+002 uR/hr

Nuclide	Analysis Requirement	Analysis Method	Is Anchor?	Comment
Am-241	1.50E-001 uCi/kg	Gamma Spectroscopy	Yes	--
Co-60	--	Gamma Spectroscopy	No	--
Cs-137	--	Gamma Spectroscopy	No	--

ARF Sample Information Section

Comment: This will relay any special instructions or information relevant to the analyte itself.

RadResponder Network

Analysis Request Report

Barcode:	Type:	Collected Date:	Sample Size	Contact Dose
SCF-987657	Ground Deposition	09/26/2022 09:32	0.3 kilograms 100 Square Centimeters	1.250E+002 uR/hr

Nuclide	Analysis Requirement	Analysis Method	Is Anchor?	Comment
Am-241	1.50E-001 uCi/kg	Gamma Spectroscopy	Yes	--
Co-60	--	Gamma Spectroscopy	No	--
Cs-137	--	Gamma Spectroscopy	No	--

ARF Chain of Custody page

This last page on the ARF displays the chain of custody for the entire batch of samples. Electronic copies will not have signatures. There will be a hardcopy of the ARF in the package of samples with signatures on it. Labs are asked to sign the custody paperwork indicated all samples arrived and were labeled correctly and report this back as part of the data package.

RadResponder Network

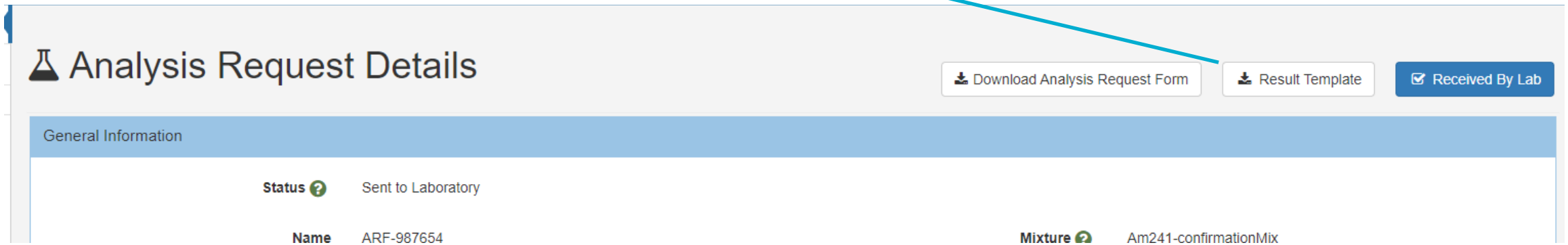
Analysis Request Report

Custody Transfer:

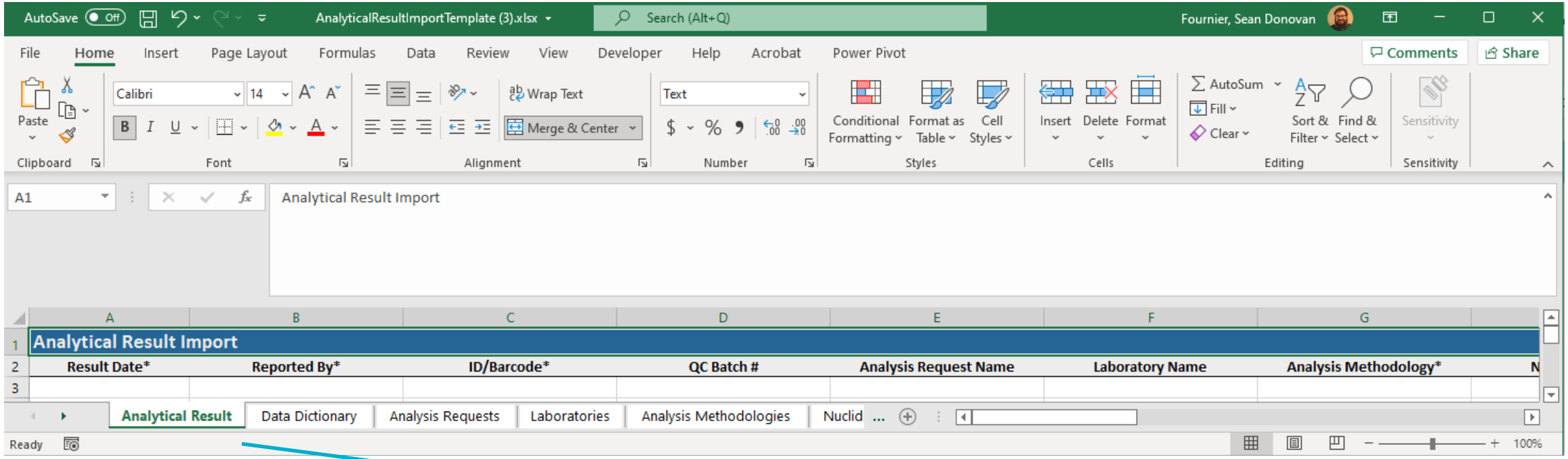
	Name (print):	Signature:	Date:
Received By:			
Relinquished By:			
Received By:			
Relinquished By:			

Download the Electronic Data Deliverable (EDD) template

The result template is an Excel file that is used to report your electronic result data. Download the template here.



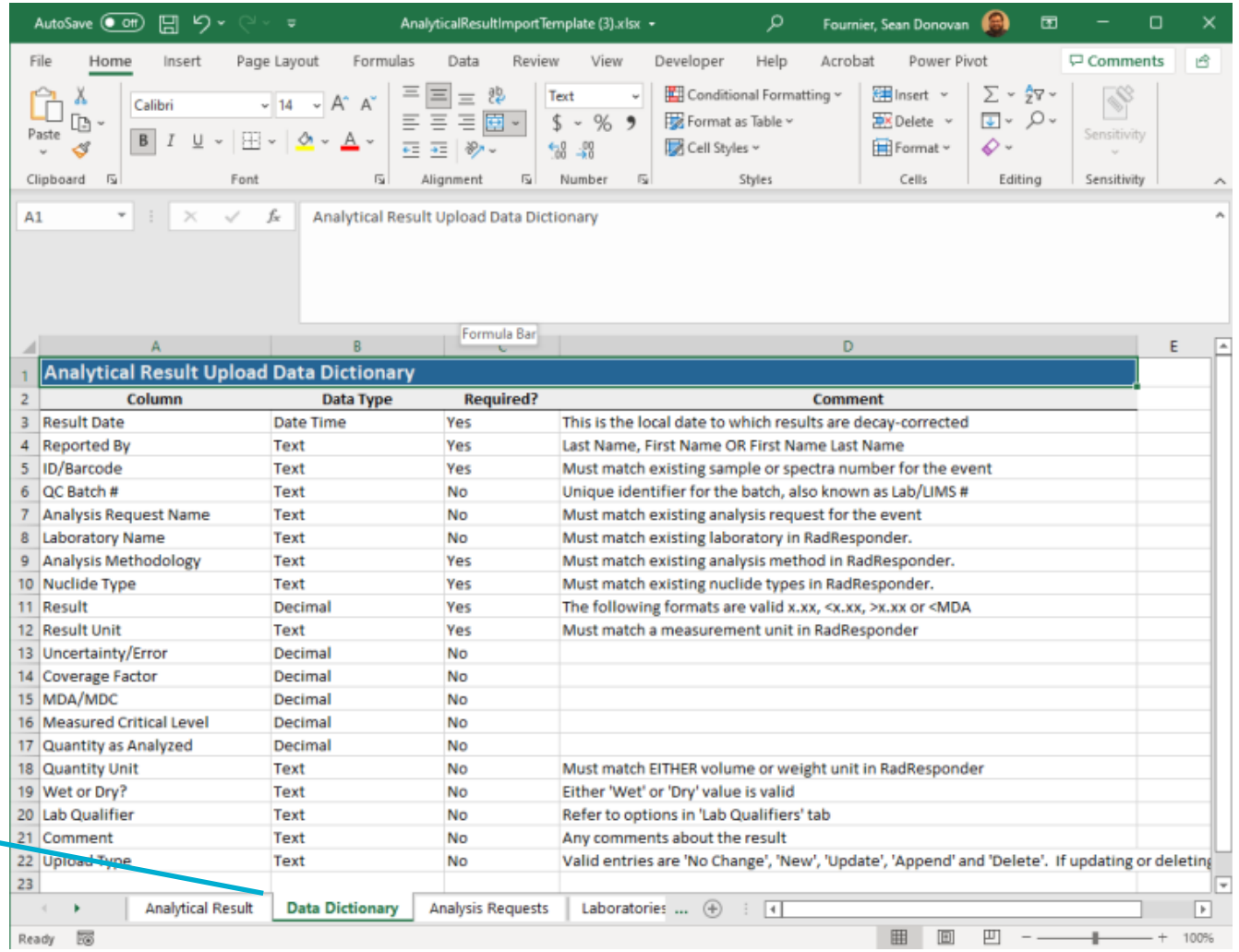
The CBRNResponder Electronic Data Deliverable (EDD) file



The result template has many tabs, the most important is the **Analytical Result** tab, this is where you will put your reported results. We recommend your lab gets a copy of this file now and configures your LIMS to provide data in a convenient format to paste into this file. The more practice you get with this step of data reporting, the more smoothly the first ARFs will go.

The CBRNResponder EDD file

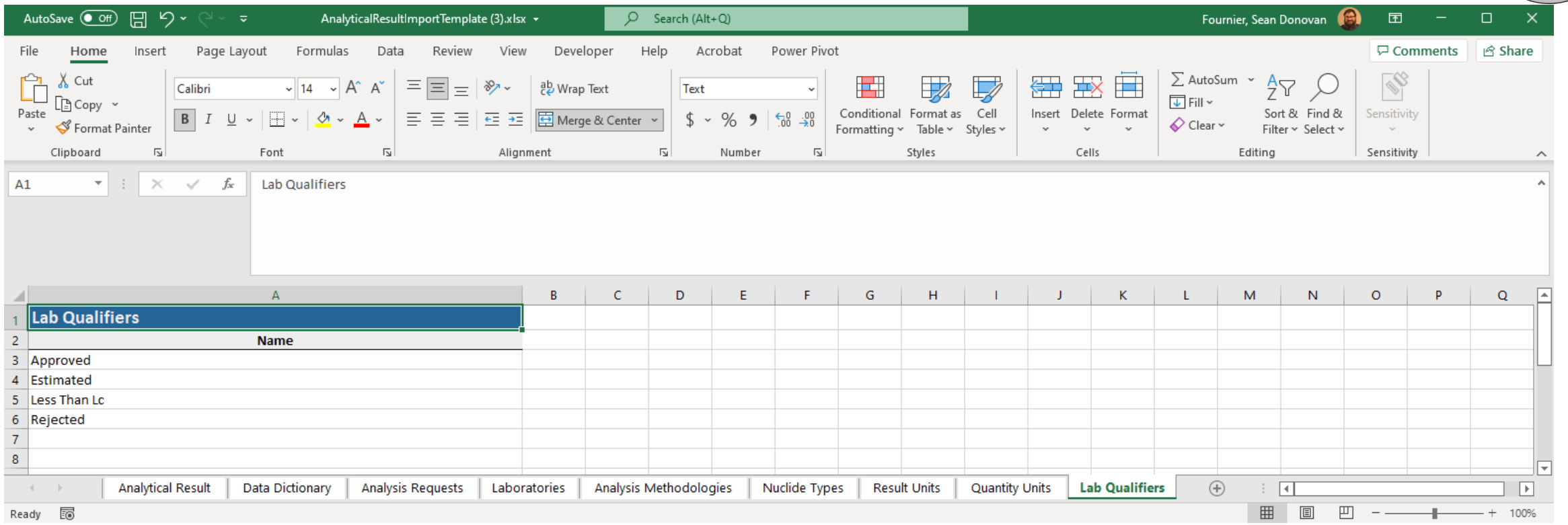
The **Data Dictionary** tab provides the syntax for each field in the EDD



Analytical Result Upload Data Dictionary

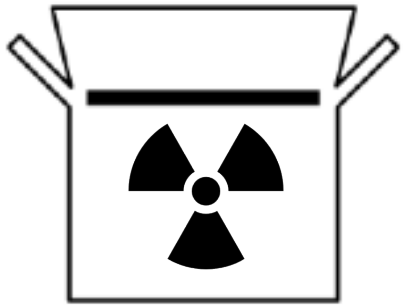
Column	Data Type	Required?	Comment
Result Date	Date Time	Yes	This is the local date to which results are decay-corrected
Reported By	Text	Yes	Last Name, First Name OR First Name Last Name
ID/Barcode	Text	Yes	Must match existing sample or spectra number for the event
QC Batch #	Text	No	Unique identifier for the batch, also known as Lab/LIMS #
Analysis Request Name	Text	No	Must match existing analysis request for the event
Laboratory Name	Text	No	Must match existing laboratory in RadResponder.
Analysis Methodology	Text	Yes	Must match existing analysis method in RadResponder.
Nuclide Type	Text	Yes	Must match existing nuclide types in RadResponder.
Result	Decimal	Yes	The following formats are valid x.xx, <x.xx, >x.xx or <MDA
Result Unit	Text	Yes	Must match a measurement unit in RadResponder
Uncertainty/Error	Decimal	No	
Coverage Factor	Decimal	No	
MDA/MDC	Decimal	No	
Measured Critical Level	Decimal	No	
Quantity as Analyzed	Decimal	No	
Quantity Unit	Text	No	Must match EITHER volume or weight unit in RadResponder
Wet or Dry?	Text	No	Either 'Wet' or 'Dry' value is valid
Lab Qualifier	Text	No	Refer to options in 'Lab Qualifiers' tab
Comment	Text	No	Any comments about the result
Upload Type	Text	No	Valid entries are 'No Change', 'New', 'Update', 'Append' and 'Delete'. If updating or deleting

The CBRNResponder EDD file



Acceptable entries for various fields are noted in the remaining tabs.

Receipt of samples



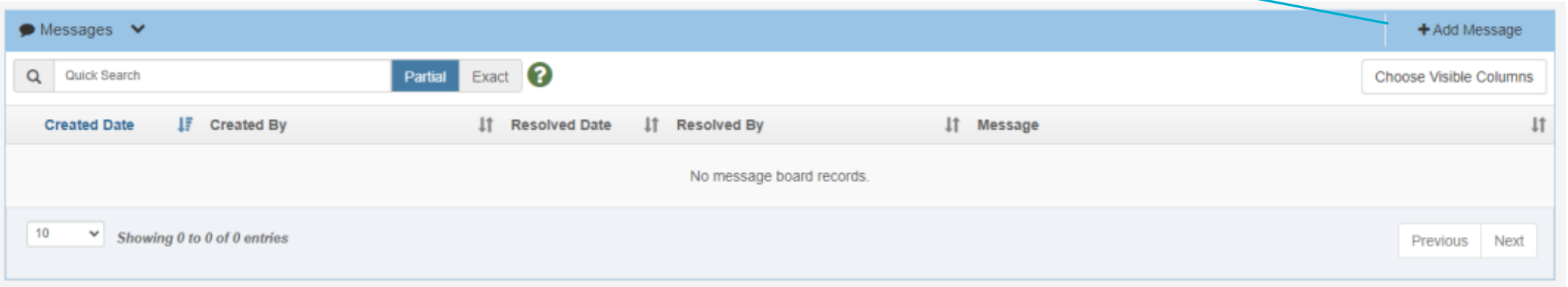
- Samples will typically arrive by a FRMAC courier (local labs) or FedEx (laboratories outside the locality)
- Samples should be unpackaged per your lab's sample receipt procedure

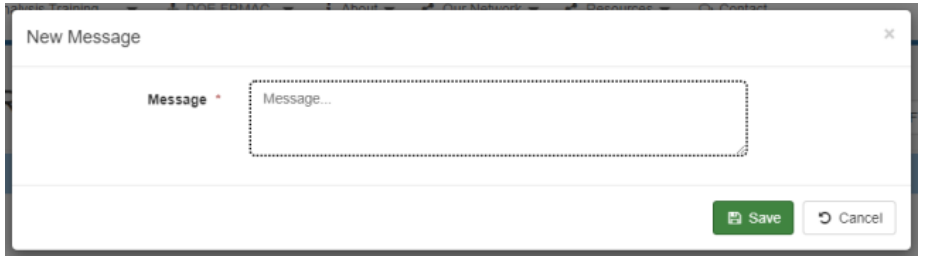
***Note**: FRMAC takes care to properly package samples but you may come across a compromised or leaking sample. Notify FRMAC immediately if there is evidence of a compromised sample container.*

- Paperwork should be reviewed and compared to what was found on the Lab Portal, if there are any discrepancies, notify FRMAC
- Process the samples in accordance to your analytical procedures to meet the analysis requirements laid out on the ARF

How to message the FRMAC about your ARF

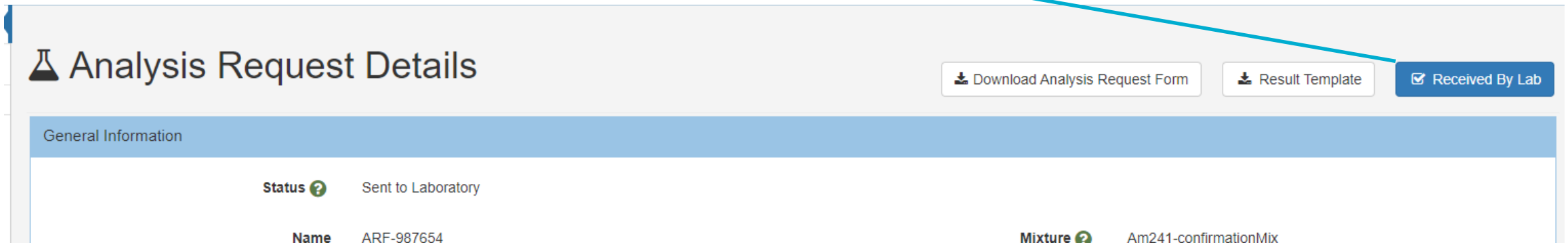
To message the FRMAC, you may use the message board by clicking “Add Message”. Type your message in the box provided. FRMAC will respond by using the message board. Some things may require a phone call but it is best to document messages here that may be useful for data reviewers.





Notify FRMAC samples have arrived

When samples arrive and have been accounted for, mark the ARF received by lab here.



Sample Analysis

- Analyze samples per the instructions on the Analysis Request Form and any applicable procedures your lab has established.

- Some adaptations may be necessary to meet the instructions on the Analysis Request, this is OK but should be documented in the data package (Case Narrative).

- Any deviations from standard operating procedures (SOPs) that affect the accuracy or quality of the results should be noted and communicated with FRMAC. If your lab feels they will be significant, notify FRMAC immediately. In some rare cases, significant biases or inaccuracy in results may warrant sending the samples back. FRMAC will do their best to iron out these details prior to sending your lab samples to avoid delays.

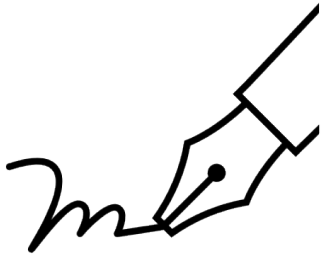
- When analysis is complete, assemble the data package for upload to the portal.

Data Packages

At minimum, what documents should you upload?

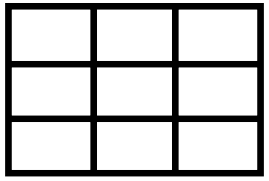
Case Narrative

- Describes what was done to the samples
- Summarizes the QC results for the batch
- Explains any flags or issues encountered with the results



Signed analytical report

- Shows who did the analysis and what settings were applied to the instrument



Electronic Data Deliverable file used

- This way, FRMAC can re-upload data if necessary

Electronic Data Deliverable Fields

- **Result Date** – this is the date/time the results are decay corrected to. On the ARF, the sample collection date/time should match this.

  ***Note**: Be aware that the date/time on the ARF is in the timezone of the event and conversions may need to be made at the lab to correct them. Contact FRMAC with questions.*

- **Reported By** – This is the name of the person reporting the results on the Lab Portal and serves as the point of contact for questions related to the analysis

- **ID/Barcode -** This is the sample control number that FRMAC put on the samples, this is **NOT** the lab-generated sample ID that may have been created.

Analytical Result Import			
Result Date*	Reported By*	ID/Barcode*	QC Batch #
9/26/22 9:31 AM	Reese, Robert	SCF-987656	GAMMA-29633
9/26/22 9:31 AM	Reese, Robert	SCF-987656	GAMMA-29633
9/26/22 9:31 AM	Reese, Robert	SCF-987656	GAMMA-29633
9/26/22 9:32 AM	Reese, Robert	SCF-987657	GAMMA-29634
9/26/22 9:32 AM	Reese, Robert	SCF-987657	GAMMA-29634
9/26/22 9:32 AM	Reese, Robert	SCF-987657	GAMMA-29634
9/26/22 9:32 AM	Reese, Robert	SCF-987657	GAMMA-29634

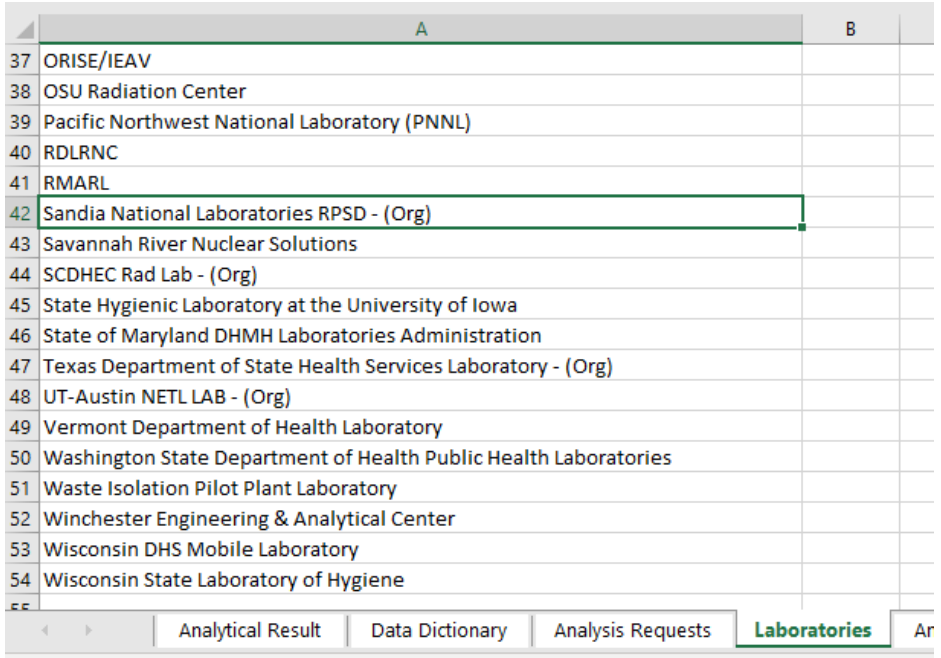
Electronic Data Deliverable Fields

- **QC Batch ID** – This is the lab-generated identifier that shows which samples were batched together at the lab. Every lab will have a different system for identifying batches. This helps the data reviewers find the right portions of the data package.

QC Batch #	Analysis Request Name	Laboratory Name
GAMMA-29633	ARF-987654	Sandia National Laboratories RPSD - (Org)
GAMMA-29633	ARF-987654	Sandia National Laboratories RPSD - (Org)
GAMMA-29633	ARF-987654	Sandia National Laboratories RPSD - (Org)
GAMMA-29634	ARF-987654	Sandia National Laboratories RPSD - (Org)
GAMMA-29634	ARF-987654	Sandia National Laboratories RPSD - (Org)
GAMMA-29634	ARF-987654	Sandia National Laboratories RPSD - (Org)
GAMMA-29634	ARF-987654	Sandia National Laboratories RPSD - (Org)

- **Analysis Request Name** – This is the ARF ID on the analysis request, this ties the result data to the ARF and sample in the system

- **Laboratory Name** – this is the name of your laboratory in CBRNResponder. Copy/paste the lab name from the list located in the reference tab called “Laboratories”



Electronic Data Deliverable Fields

- **Analysis Methodology** – This is the analysis method from the ARF paperwork pertaining to the analysis.

- **Nuclide Type** – This is the name of the analyte for the result, be sure to match the syntax in the Nuclide Types tab on the EDD template

- **Result** – This is the numerical result for the analyte. Report a numerical result weather positive, negative, or zero. If the result is below the critical level, report that numeric result. **Do not** use qualifying statements like "<Lc" or "Not Detected"

- **Result Unit** – This is the radioactivity concentration unit for the numerical result, be sure to match the requested units indicated on the Analysis Requirement section on the ARF. It is usually safe to default to uCi as the unit.

Analysis Methodology*	Nuclide Type*	Result*	Result Unit*
Gamma Spectroscopy	Am-241	0.261351351	uCi
Gamma Spectroscopy	Co-60	0.000804324	uCi
Gamma Spectroscopy	Cs-137	0.013781081	uCi
Gamma Spectroscopy	Am-241	1.129313929	uCi/kg
Gamma Spectroscopy	Co-60	0.012266112	uCi/kg
Gamma Spectroscopy	Cs-137	0.20024948	uCi/kg
Gamma Spectroscopy	K-40	0.007808732	uCi/kg

Electronic Data Deliverable Fields

- **Uncertainty/Error**- This is the **total propagated uncertainty (TPU)** for the analytical result

- **Coverage Factor**- This is the quoted sigma level (i.e. 1σ or 2σ) for the result (do not include a sigma character and decimals are accepted)

- **MDA/MDC** - This is the minimum detectable activity or concentration of the measurement determined by the Currie method with a 5% false positive/negative rate (95% confidence interval). If your lab uses a different approach, note this in the comment field and the case narrative.

Uncertainty/Error	Coverage Factor	MDA/MDC
0.052302703	2.00E+00	0.001310811
9.61081E-05	2.00E+00	2.00811E-05
0.001669189	2.00E+00	5.75676E-05
0.226029106	2.00E+00	0.009480249
0.001187027	2.00E+00	0.000177963
0.024133056	2.00E+00	0.000691892
0.001716424	2.00E+00	0.000568815

Electronic Data Deliverable Fields

- **Measured Critical Level** – This is the measurement critical level, in the same units as the result as determined by the Currie method with a 5% false positive/negative rate (95% confidence interval). If your lab uses a different approach, note this in the comment field and the case narrative.

- **Quantity as Analyzed** – This is the sample size, measured by the lab, used in the determination of the activity concentration.

- **Quantity Unit** – This is the unit for the numeric quantity field

Measured Critical Level	Quantity as Analyzed	Quantity Unit
0.000654054	1	
7.91892E-06	1	
2.75676E-05	1	
0.004731809	0.325	kilograms
7.70062E-05	0.325	kilograms
0.000338462	0.325	kilograms
0.000175468	0.325	kilograms

Electronic Data Deliverable Fields

- **Wet or Dry?**- This indicates if the sample was dried in an oven prior to analysis. In some cases FRMAC may request that samples be analyzed before drying and after drying.

- **Lab Qualifier**- This field relates to the QA status of the results, refer to the Lab Qualifiers reference tab for a list of options.

- **Comment**- This is an open text field for the lab to use to make a comment on the result. Be sure to explain any reasoning behind choosing Estimated or Rejected as the Lab Qualifier.

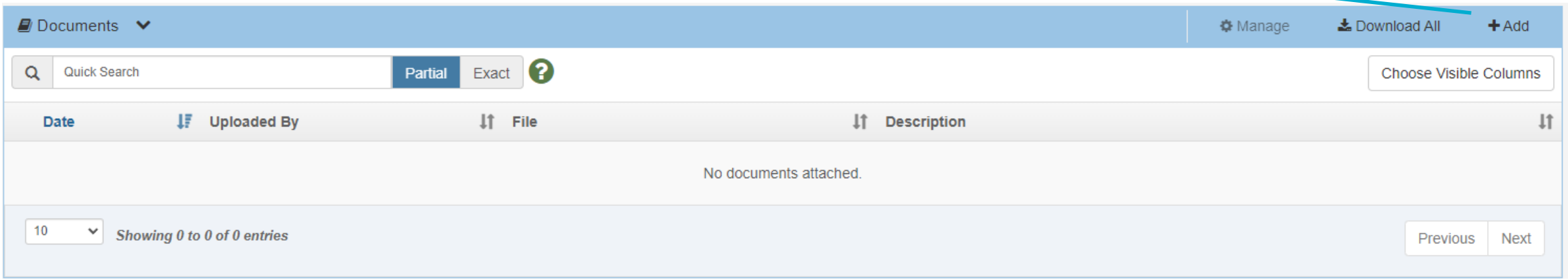
- **Upload Type** - This field is used by FRMAC to make corrections to data already imported to the database, do not use.

Wet or Dry?	Lab Qualifier	Comment	Upload Type
	Approved		
	Approved		
	Approved		
Wet	Approved		
Wet	Approved		
Wet	Approved		
Wet	Approved		

Lab Qualifiers	
Approved	Result is approved by the lab and has a numeric result above the measured critical level
Estimated	Result is approved by the lab but has issues that may cause inaccuracies or biases in the result
Less Than Lc	Result is approved by the lab but the numeric result is below the measured critical level
Rejected	Result is rejected by the lab and the reason is noted in the comment field

Upload your data package to the lab portal

Data files submitted to the FRMAC should be uploaded to the portal in the Documents section. Be sure to upload all the requested documentation for the analysis you are performing. Files may be added or removed as necessary. There is no limit to how many files can be uploaded but keep sizes below 30 MB if possible. Be sure to provide a descriptive file name and description with each file so data reviewers have an easy time using them



Back to the Scenario! (EXERCISE)

- The Smear (SCF-987656) and Ground Deposition (SCF-987657) sample were placed on ARF-987654 and hand carried to the local laboratory: “Sandia National Laboratories RPSD – (org)”

- The lab received the samples per their procedure and prepared the samples for counting

- The smear was placed on the detector in the calibrated geometry and counted for 10 min per the instruction. The lab was confident that this minimum count time would reach the detection limit requirement for Am-241

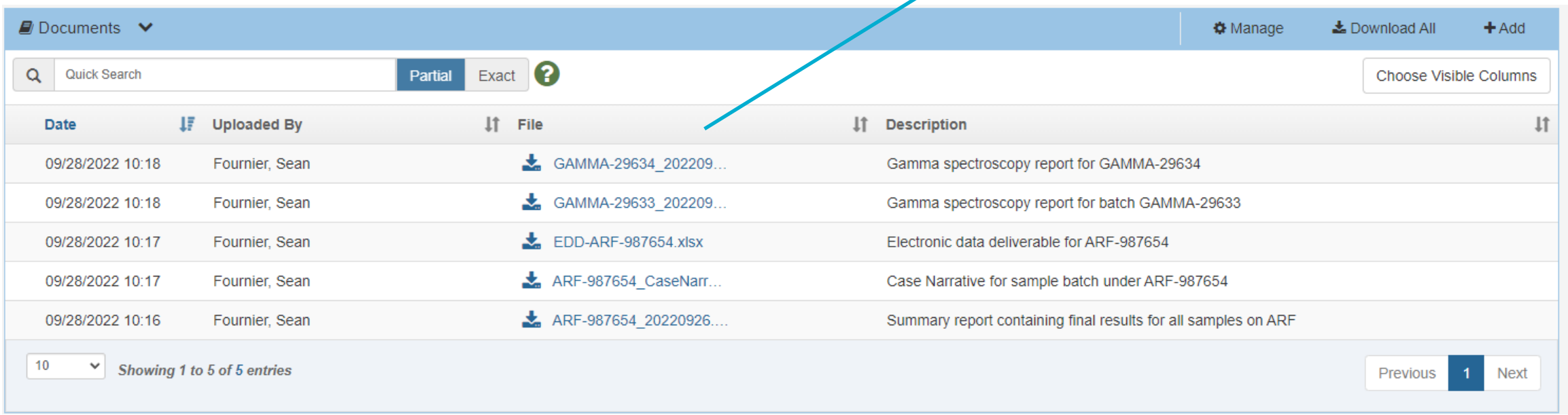
- The Ground Deposition sample was placed in a paint can and shaken in a machine for several minutes and transferred to a standard counting geometry and weighed per the lab’s procedure. The sample was counted for 10 min per the instruction as they were confident this would also meet the detection limit requirement for Am-241 noted on the ARF.

- How did we know this? Ans: The lab composed a case narrative describing their process

- The results were processed through the lab and reported in an EDD, signed analytical reports, and a case narrative.

Reported lab data

These are the files that the FRMAC will first review and then upload to the CBRNResponder database. If any questions or concerns arise, the QA Specialist will reach out to the lab through the message board or phone call. These files are stored under the ARF for future reference.



Mapping Laboratory Report Data to the EDD

Sandia National Laboratories

Radiation Protection Sample Diagnostics Program
1515 Eubank Ave, MS 1103
Albuquerque, NM 87185-1103
(505) 844- 4069

Results For: ARF-987654

Report Date: 9/26/2022
Report Time: 4:09:51PM

Customer Garcia,Nicole Therese **Org:** 00618 , Radiation Protection
Email: ntgarci@sandia.gov **Mail Stop:** 1103
Phone: 505/284-6653

Customer Samples Within This Report

Number of Batches: 2 Validated Samples: 2 of 2

Batch ID: GAMMA-29633 Validated Analyses: 1 of 1

Sample No	Customer Sample ID	Analysis Code	Sample Validation	Analysis Validation	Login Batch	Drop off Location
AD54711	SCF-987656	$GAMMA	09/26/2022	09/26/2022	220926010	RPSD TA2 Lab

Batch ID: GAMMA-29634 Validated Analyses: 1 of 1

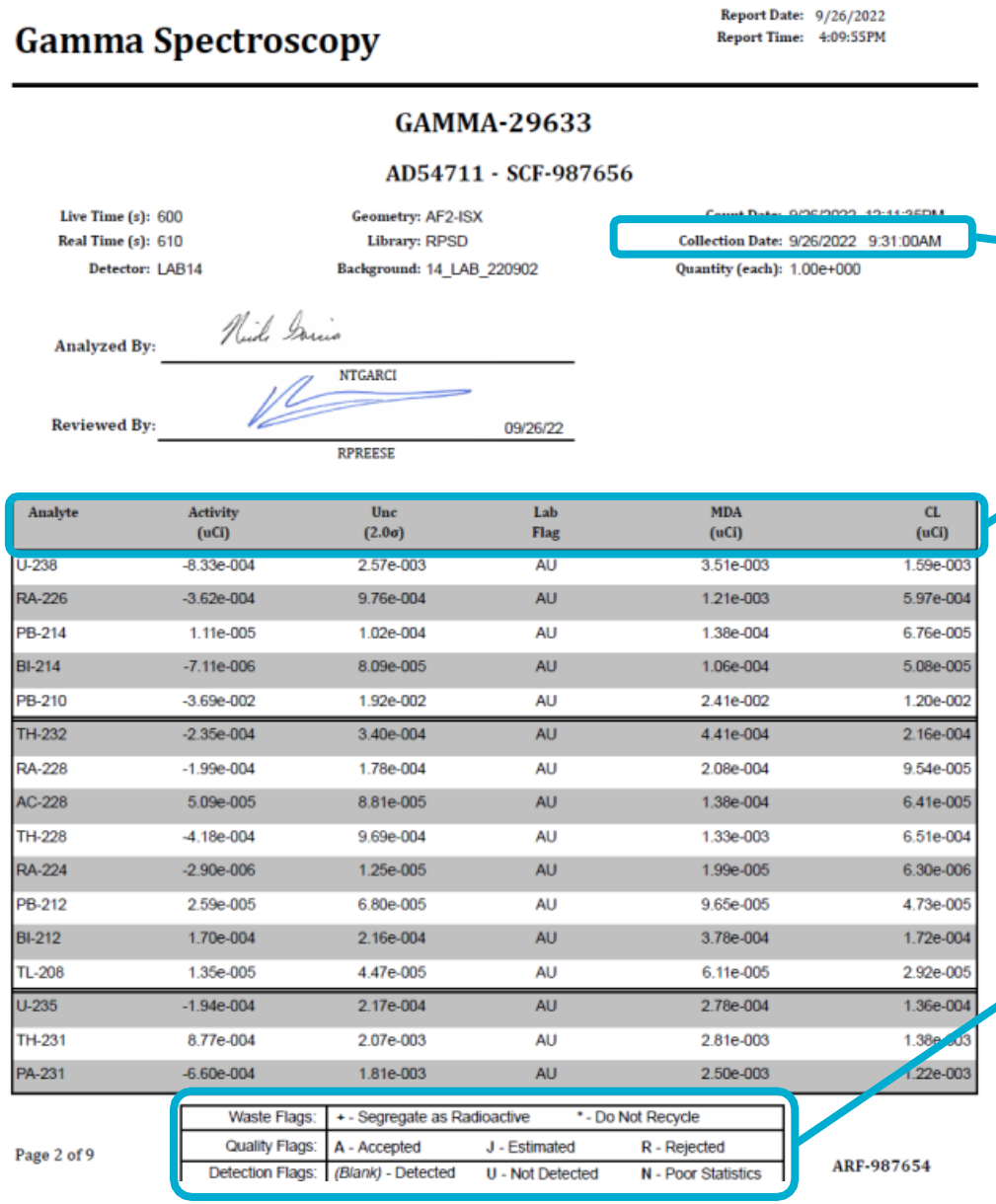
Sample No	Customer Sample ID	Analysis Code	Sample Validation	Analysis Validation	Login Batch	Drop off Location
AD54712	SCF-987657	$GAMMA	09/26/2022	09/26/2022	220926010	RPSD TA2 Lab

Quality Samples Within This Report

Batch ID	Sample No	Sample Type	Validation Date	Analysis Code	Analysis Name
GAMMA-29633	AD54713	Quality	09/26/2022	$L_GAMMA	Lab Control Sample Gamma Spectroscopy
GAMMA-29634	AD54714	Quality	09/26/2022	$L_GAMMA	Lab Control Sample Gamma Spectroscopy

- This is the lab's result summary report
- FRMAC needs this type of report to ensure data entry to the EDD was done correctly
- The report shows how FRMAC sample IDs map to the internal lab tracking numbers for samples and batches
- This report also shows any QC samples that were run with the sample that the lab chose to run

Mapping Laboratory Report Data to the EDD



Gamma Spectroscopy

Report Date: 9/26/2022
Report Time: 4:09:55PM

GAMMA-29633

AD54711 - SCF-987656

Live Time (s): 600
Real Time (s): 610
Detector: LAB14
Geometry: AF2-ISX
Library: RPSD
Background: 14_LAB_220902
Collection Date: 9/26/2022 9:31:00AM
Quantity (each): 1.00e+000

Analyzed By: NTGARCI

Reviewed By: RPREESE 09/26/22

Analyte	Activity (uCi)	Unc (2.0σ)	Lab Flag	MDA (uCi)	CL (uCi)
U-238	-8.33e-004	2.57e-003	AU	3.51e-003	1.59e-003
RA-226	-3.62e-004	9.76e-004	AU	1.21e-003	5.97e-004
PB-214	1.11e-005	1.02e-004	AU	1.38e-004	6.76e-005
BI-214	-7.11e-006	8.09e-005	AU	1.06e-004	5.08e-005
PB-210	-3.69e-002	1.92e-002	AU	2.41e-002	1.20e-002
TH-232	-2.35e-004	3.40e-004	AU	4.41e-004	2.16e-004
RA-228	-1.99e-004	1.78e-004	AU	2.08e-004	9.54e-005
AC-228	5.09e-005	8.81e-005	AU	1.38e-004	6.41e-005
TH-228	-4.18e-004	9.69e-004	AU	1.33e-003	6.51e-004
RA-224	-2.90e-006	1.25e-005	AU	1.99e-005	6.30e-006
PB-212	2.59e-005	6.80e-005	AU	9.65e-005	4.73e-005
BI-212	1.70e-004	2.16e-004	AU	3.78e-004	1.72e-004
TL-208	1.35e-005	4.47e-005	AU	6.11e-005	2.92e-005
U-235	-1.94e-004	2.17e-004	AU	2.78e-004	1.36e-004
TH-231	8.77e-004	2.07e-003	AU	2.81e-003	1.38e-003
PA-231	-6.60e-004	1.81e-003	AU	2.50e-003	1.22e-003

Waste Flags:	+ - Segregate as Radioactive	* - Do Not Recycle	
Quality Flags:	A - Accepted	J - Estimated	R - Rejected
Detection Flags:	*(Blank)* - Detected	U - Not Detected	N - Poor Statistics

Page 2 of 9

ARF-987654

- This is an example of a gamma spectroscopy results summary report
- This report shows the majority of the fields reported on the EDD
- At a minimum, this type of report should show the reference time, analyte, result, uncertainty, unit, detection limit/MDA, and any qualifying flags. Note that it is OK if this data spans multiple report sections but it should be in the report somewhere
- Note that this lab is set up to report a result (even if it is not detected) for every radionuclide in the analysis library
- Detected nuclides will show up with a blank detection flag since this lab uses U and N for not detected or bad statistics respectively
- FRMAC asks that results for requested analytes AND any other DETECTED radionuclides get reported

Mapping Laboratory Report Data to the EDD

AD54711

Analyte	Activity (uCi)	Unc (2.0σ)	Lab Flag	MDA (uCi)	CL (uCi)
TH-227	7.16e-006	2.54e-004	AU	3.24e-004	1.58e-004
RA-223	1.87e-005	1.02e-004	AU	1.37e-004	6.70e-005
RN-219	4.62e-004	6.34e-004	AU	8.81e-004	4.30e-004
PB-211	-4.15e-004	1.15e-003	AU	1.51e-003	7.41e-004
TL-207	-1.34e-003	9.54e-003	AU	1.33e-002	6.16e-003
AM-241	**2.61e-001**	**5.23e-002**	**A**	**1.31e-003**	**6.54e-004**
PU-239	1.80e-003	3.65e-001	AU	4.86e-001	2.38e-001
NP-237	2.01e-003	7.14e-003	AU	9.62e-003	4.70e-003
PA-233	9.44e-006	8.31e-005	AU	1.17e-004	5.73e-005
TH-229	-5.44e-005	3.23e-004	AU	4.27e-004	2.09e-004
AG-108m	-7.64e-006	2.57e-005	AU	3.68e-005	1.65e-005
AG-110m	-3.21e-005	3.61e-005	AU	3.95e-004	1.96e-004
BA-133	9.76e-006	6.59e-005	AU	8.95e-005	4.35e-005
BE-7	2.61e-004	4.80e-004	AU	6.62e-004	3.24e-004
CD-115	-9.66e-005	9.54e-005	AU	1.22e-004	5.95e-005
CE-139	-4.80e-006	3.62e-005	AU	4.57e-005	2.24e-005
CE-141	2.56e-005	4.72e-005	AU	6.43e-005	3.16e-005
CE-144	8.28e-005	2.06e-004	AU	2.78e-004	1.36e-004
CO-56	-1.83e-005	2.45e-005	AU	3.03e-005	1.36e-005
CO-57	-2.97e-005	2.79e-005	AU	3.46e-005	1.70e-005
CO-58	1.38e-005	1.80e-005	AU	3.03e-005	1.39e-005
CO-60	**8.04e-004**	**9.61e-005**	**A**	**2.01e-005**	**7.92e-006**
CR-51	6.77e-005	3.28e-004	AU	4.65e-004	2.27e-004
CS-134	-1.45e-005	4.10e-005	AU	5.24e-005	2.49e-005
CS-137	**1.38e-002**	**1.67e-003**	**A**	**5.76e-005**	**2.76e-005**
EU-152	-6.25e-005	1.02e-004	AU	1.31e-004	6.41e-005

- Here are the results for Am-241, Co-60, and Cs -137
- Note that the Lab Flag is “A” meaning that the result is accepted and that the analyte has been positively identified by the gamma spectroscopy software
- FRMAC QA specialists may want to also see the detailed instrument reports for analyses like gamma spectroscopy or alpha spectroscopy which contain information that would not normally be seen on these summary reports

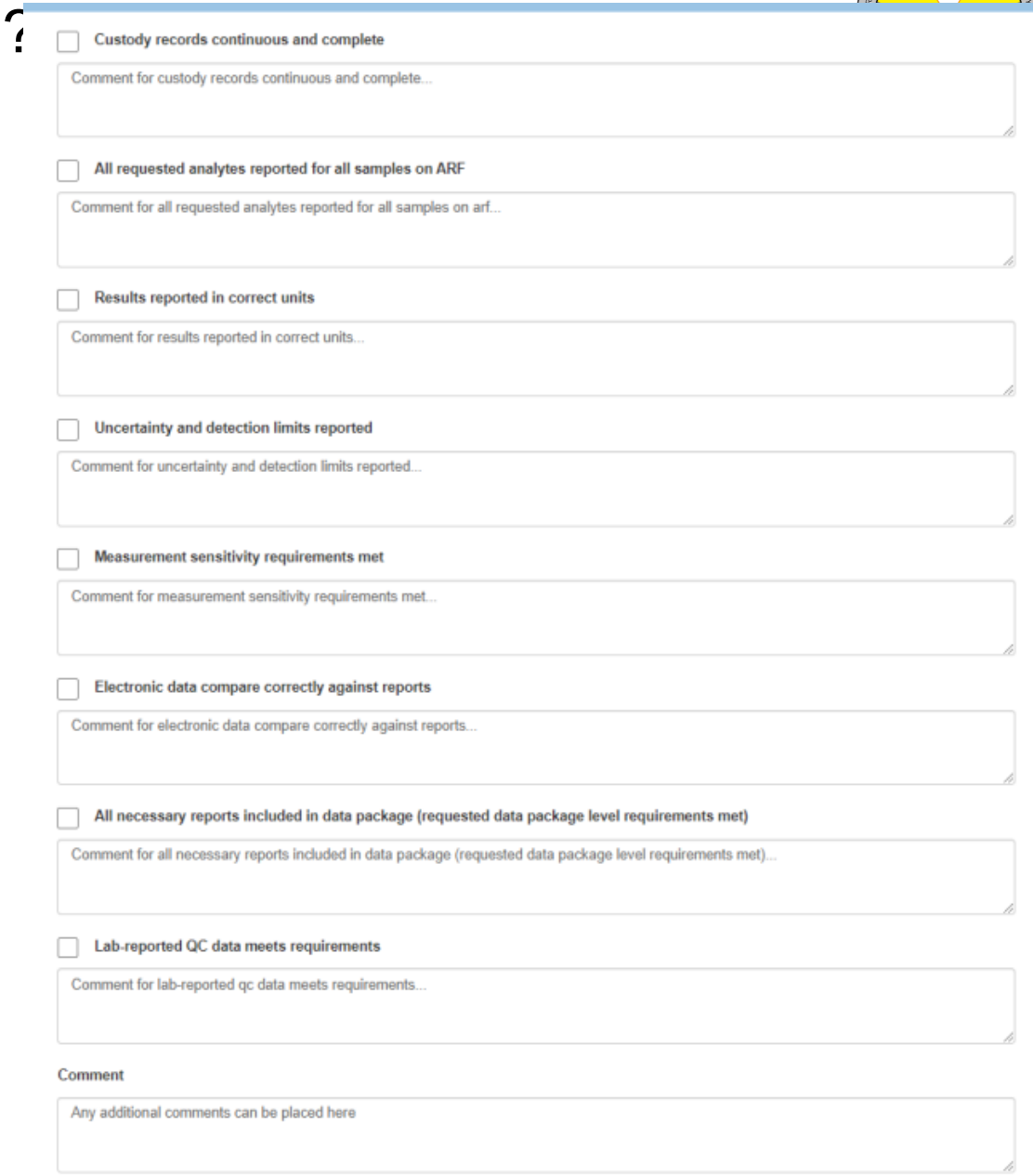
Detailed Gamma Spectroscopy Report

```
*                    Sandia National Laboratories
*          Radiation Protection Sample Diagnostics Program
*                       9/26/22  12:22:18 PM
*Analyzed by:                    Reviewed by:

Sample Identifier          : AD54711
Analysis Code              : $GAMMA
Sample Geometry            : AF2-ISX
Geometry Accuracy          : Regular
Sample Date/Time           : 9/26/22    9:31:00 AM
Nuclide Library            : RPSD
Background File            : 14_LAB_220902

Analyst                    : NTGARCI
Acquire Start Date         : 9/26/22   12:11:35 PM
Detname                    : LAB14
Elapsed Live Time          :    600 seconds
Elapsed Real Time          :    610 seconds
Dead Time                  :   1.68 %

Peak Search Algorithm      : 2nd Diff v2.1
Peak Search Range (channels) :  50 -  8192
Peak Search Sensitivity    :   2.75

Peak Area Algorithm        : NLSQ Fit v2.7
Continuum Channels (FWHM)  :   1.00
Continuum Model            : LINEAR
Singlet Spacing (FWHM)     :   5.00
Left Peak Boundry (FWHM)   :   2.00
Right Peak Boundry (FWHM)  :   2.00

Nuclide ID Algorithm       : NID+Interf v2.6
NID Energy Tolerance (FWHM) :   1.00
Confidence Index threshold :   0.30
Activity Analysis          : Weighted

MDA Algorithm              : Std MDA v2.4
MDA Confidence Level       :   5.00%
MDA Variable ROI Width     :   2.00

Comments:
Activity Report / Sample ID = AD54711                                Page  5

*****************************************************************************
*                        Nuclide Activity Report
*****************************************************************************

 Nuc.   Id      T-1/2     Energy    Yield     Eff          Activity          Coin
 Name   Conf     (d)      (keV)      (%)      (%)     (Bq /ea )     Unc      Cor
------  ----  ---------  --------  ------  ---------  ---------  ---------  ----
CO-60   0.99  1.925E+03  1173.23     99.85  3.897E+00  3.169E+01  3.669E+00  0.8
                         1332.49*    99.98  3.524E+00  2.976E+01  3.555E+00  0.8
                         2505.69      0.00  1.792E+00
CS-137  1.00  1.102E+04   661.66*    84.70  6.028E+00  5.099E+02  6.175E+01  mis
AM-241  1.00  1.579E+05    59.54*    35.90  7.060E+00  9.670E+03  1.935E+03  fre

       * = Nuclide primary energy line
       @ = Energy line not used for Weighted Mean Activity
       Energy Tolerance =    1.000 keV
       Nuclide confidence index threshold =   0.30
       Errors quoted at  2.000 sigma

       Coincidence correction performed.
       ISOCS Geom. C:\GENIE2K\isocs\data\GEOMETRY\14_LAB_AF2-ISX.GEO
       free = No coincidence correction required.
       miss = Nuclide energy was not found in the coincidence library.
       err  = Error in coincidence correction calculation.
```

- The detailed gamma spectroscopy report will contain important information about the software settings used in the analysis
- For complex spectra, the FRMAC Gamma Spectroscopist may need to see this report to confirm results and ensure the appropriate corrections (efficiency, true coincidence summing, decay, etc.) are being applied
- Furthermore, this report may reveal unidentified peaks for analytes that were not quantified in the analysis library that should be reported

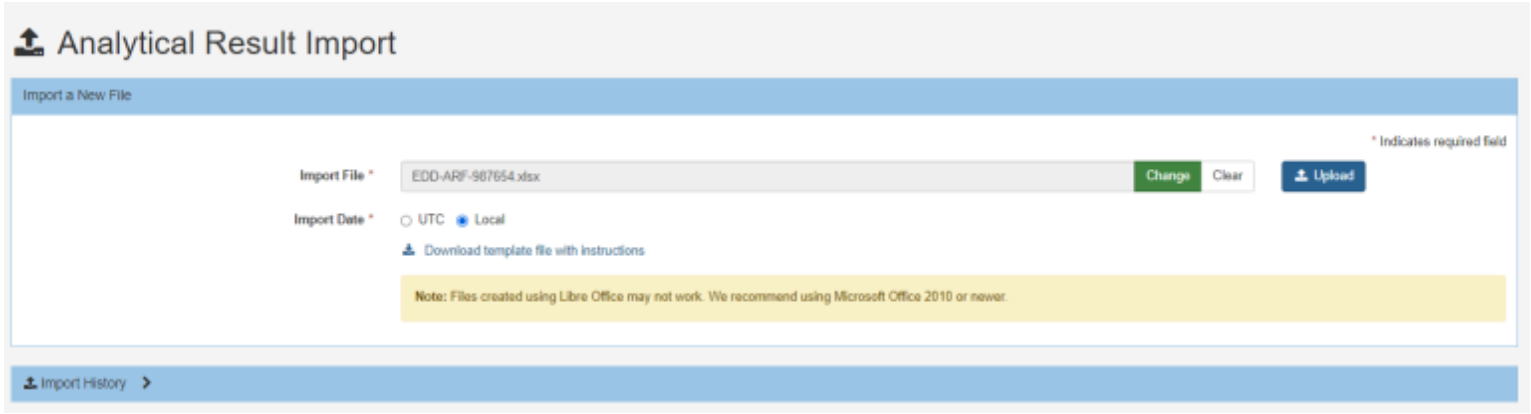
What does the FRMAC QA Specialist do?

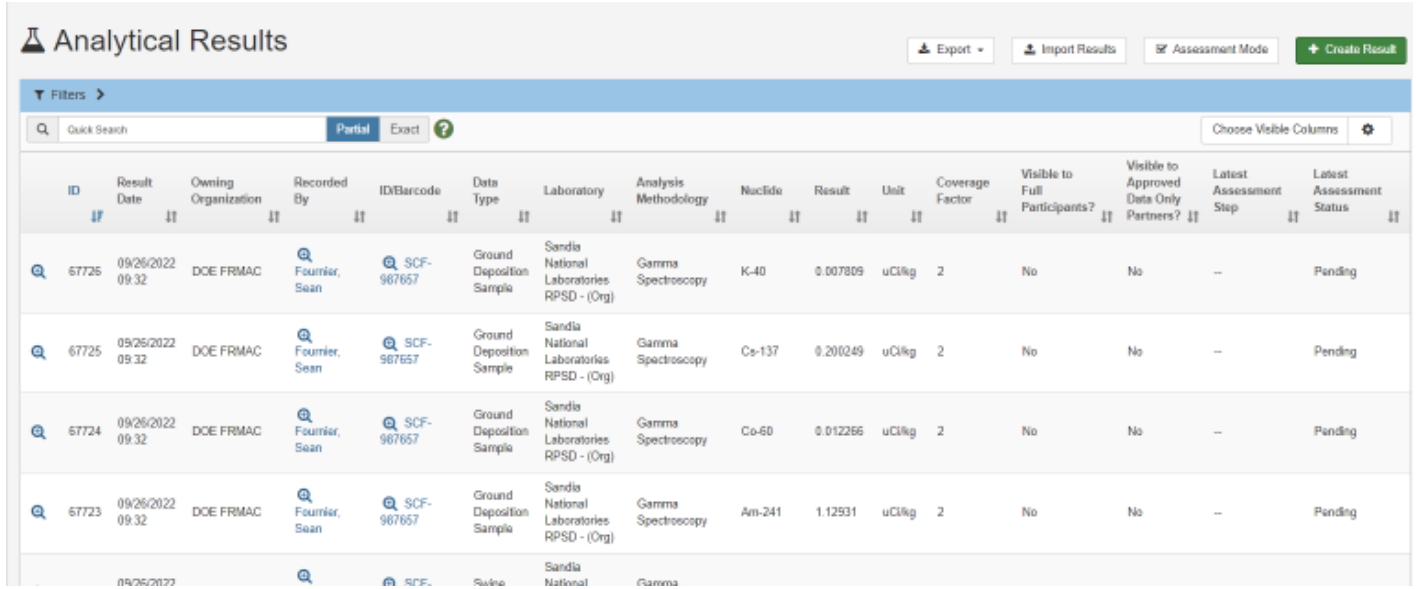
- Check that COC records are complete
- Check that all samples have been analyzed to the specifications on the ARF
- Check that the count time and/or Lc requirements were met
- Check that the data package is complete
- Check QA/QC samples run by the lab passed specifications (that the lab normally uses)
- Provides any notes/comments on this Data Verification Form



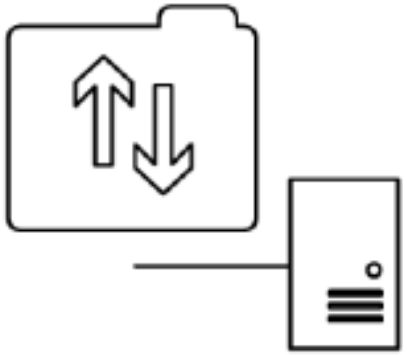
Import of EDD to CBRNResponder Analytical Results database

- EDD files are carefully reviewed and imported to the database that does further syntax checking
- Minor issues in syntax may be corrected by the QA specialist who will repost the file to the ARF documents page
- Major issues may require communication with your laboratory to resolve
- Once in the system, FRMAC scientists use the data to respond to important requests for information (RFIs)





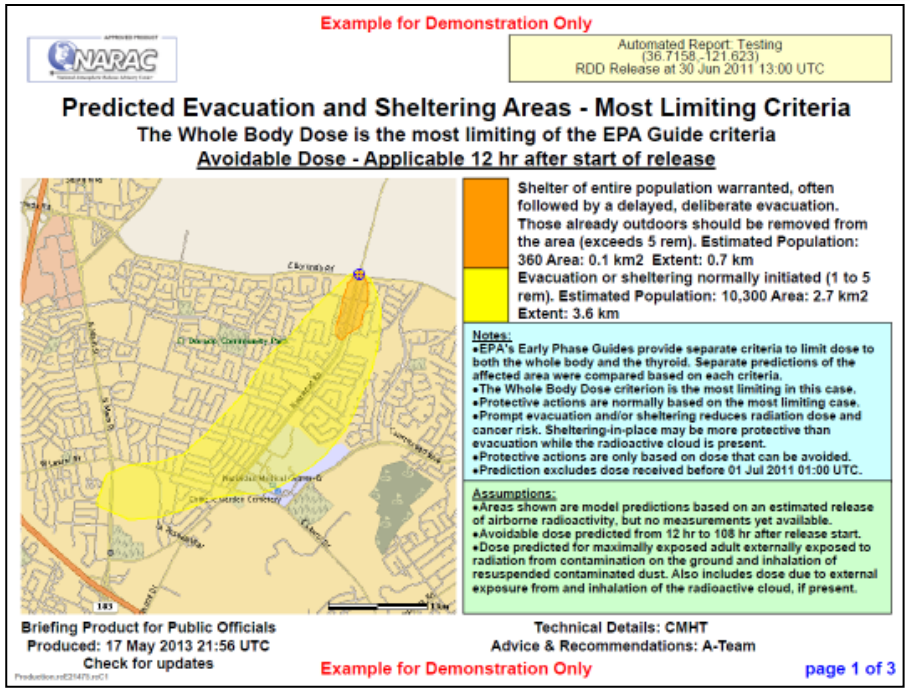
Laboratory Process Review



Initial Laboratory Contact → Analysis Request Form via Lab Portal → Lab receives samples, performs analysis → Lab posts data to Lab Portal → FRMAC makes QA assessment, gives feedback to lab, imports verified results to RR database

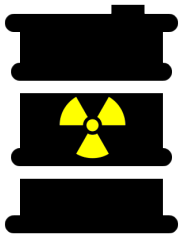
Why is Lab Data Important? (EXERCISE)

- These analytical results clearly showed Am-241 was present in the attack
- Field instruments were unable to clearly ID the nuclide in the presence of the other, higher energy gamma emitters
- This fact had a huge effect on how responders protected themselves when operating in the contaminated zone, as a result of this knowledge responders wore more adequate Personal Protective Equipment (PPE) and operated in an alpha-contaminated environment more effectively.
- The presence of Am-241 significantly changed the dose implications for the response and recovery effort which drove much more sampling and analysis

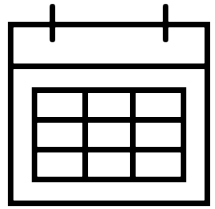


Plan ahead to respond to an emergency – what your Laboratory can do <u>today</u> to prepare

Create emergency response standard operating procedures (SOPs) that allow more flexibility than routine operations. Document standard matrices, geometries, count times and their detection limits.



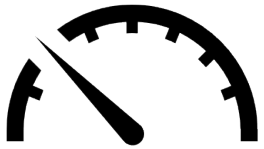
Create a radioactive and mixed waste handling process, a waste addition log, and identify potential waste storage areas in and around your lab. Retaining leftover sample fractions will likely be required.



Work with staff to determine who may be available to work flexible schedules for 24 hour lab operations.

"*A good plan today is better than a perfect plan tomorrow*"
– General George S. Patton

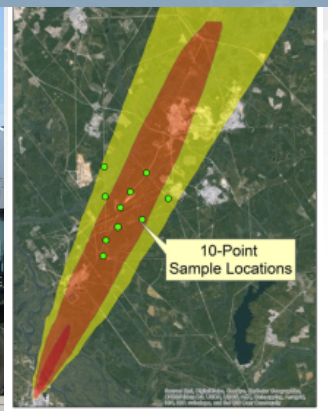
Implement modern rapid radiochemical methods to support emergency response and plan to generate data in the RadResponder EDD format.



Create a plan for more stringent contamination monitoring during emergency response operations. Samples will likely have more radioactivity than normal environmental samples.

Obtain USDA Permits to receive domestic and foreign soil samples.

Best Practices for Sample Control during the Nuclear Incident Response



U.S. DEPARTMENT OF ENERGY

National Nuclear Security Administration

RESPONSE RECOVERY READINESS
TRIBAL STATE LOCAL FRMAC
FEDERAL RADIOLOGICAL MONITORING AND ASSESSMENT CENTER

Sandia National Laboratories

Lawrence Livermore National Laboratory

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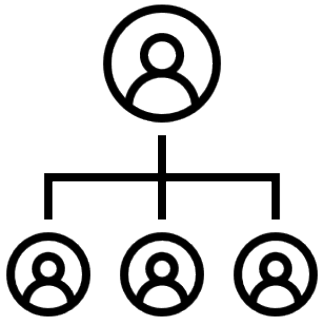
Outline

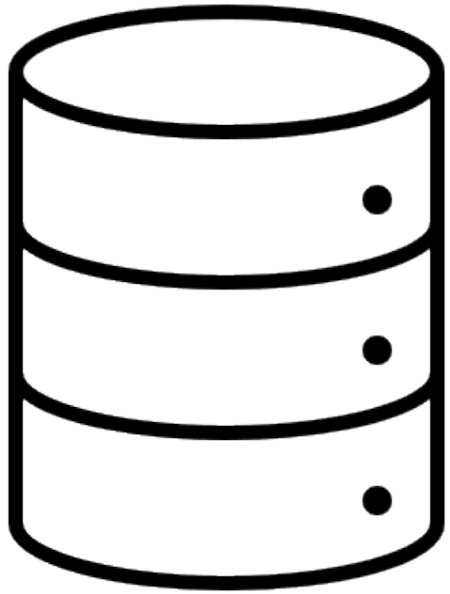
- Elements of an Effective Sample Control Process
- Issues that can Arise
- Benefits of Having all the Elements (Best Practices) in Place
- Plan Ahead to Respond to an Emergency
- Bottom Line

Elements of an effective sample control process: Pre-planning



Integration with Incident Command

Pre-built database for sample control and results



Elements of an effective sample control process: Hotline and sample storage

Hotline Setup

- Organization of space
- Efficiency in process
- Data entry system

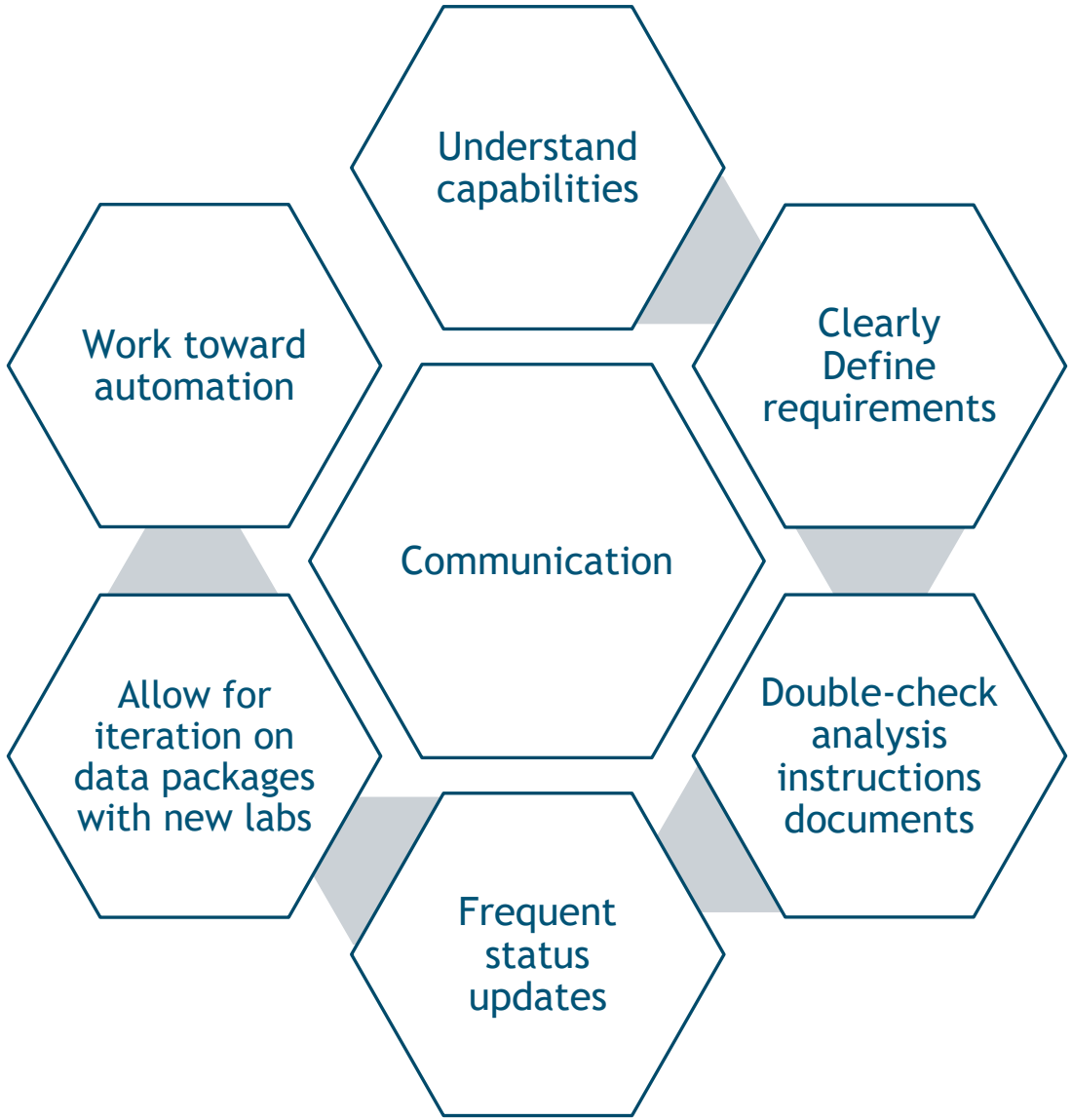
Hotline Operations

- Daily "tailgate" with field teams
- Contamination Control
- Buddy System

Sample Storage

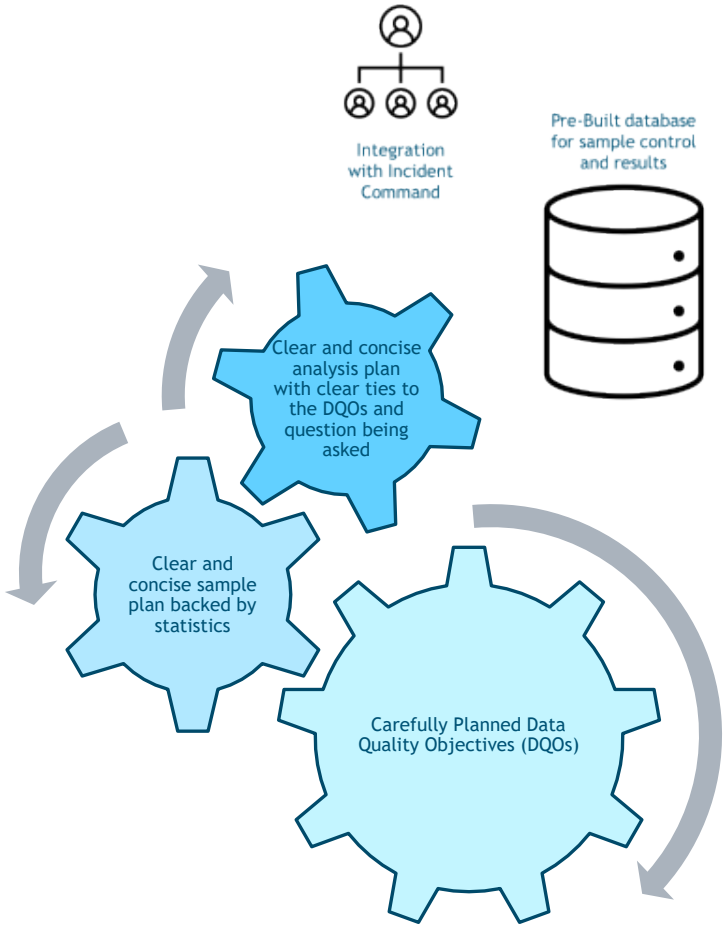
- Plan for expansion
- Practice ALARA

Elements of a rock-solid sample control process: Interactions with the laboratory



All elements work in concert and lead to a smooth, efficient response

Pre Planning



Sample Control Hotline

Hotline Setup

- Ergonomics
- Efficiency
- Data entry automation

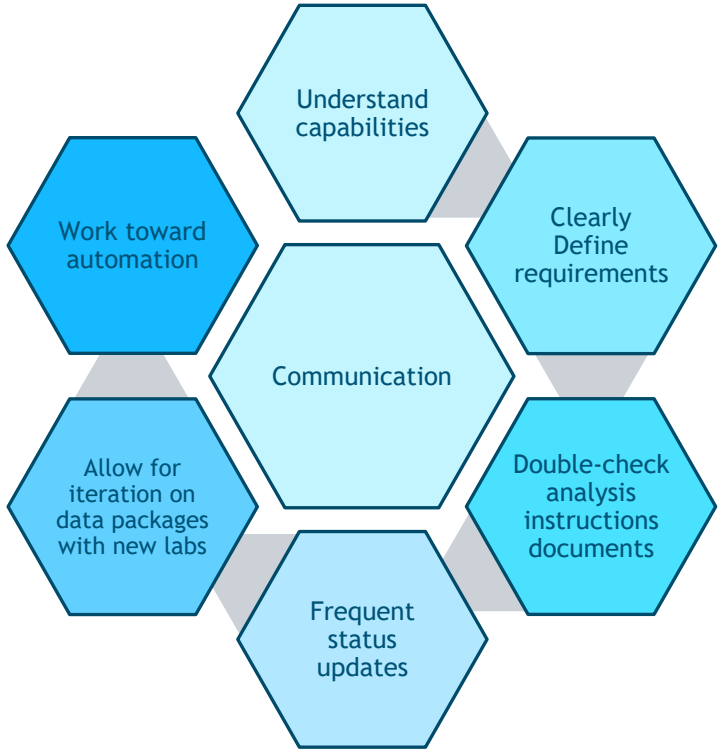
Hotline Operations

- Pre Job Brief
- Contamination Control
- Buddy System

Sample Storage

- Plan for expansion
- Practice ALARA

Laboratory Interactions



Benefits of having all the elements (Best Practices) in place

Pre-Planning

- Clear data quality objectives, negotiated with stakeholders, leads to robust and easy to follow sampling plans

Hotline setup and sample control

- Sample control in the field with sample collectors allows for effective and efficient sample flow through the process. Regular briefings keep personnel informed and up to date.

Interactions with the Analysis Laboratory

- Clear instructions, established detection limits, agreed upon result data reporting requirements and a standardized format, ensures data results will be delivered in a timely manner, easily transferred to event database/data entry system.

Overall Process

- Samples collected will have a purpose. Few wasted efforts. Fewer results generated that serve no real purpose. Data available to Decision Makers sooner.

Issues that can arise when Pre Planning elements are missing

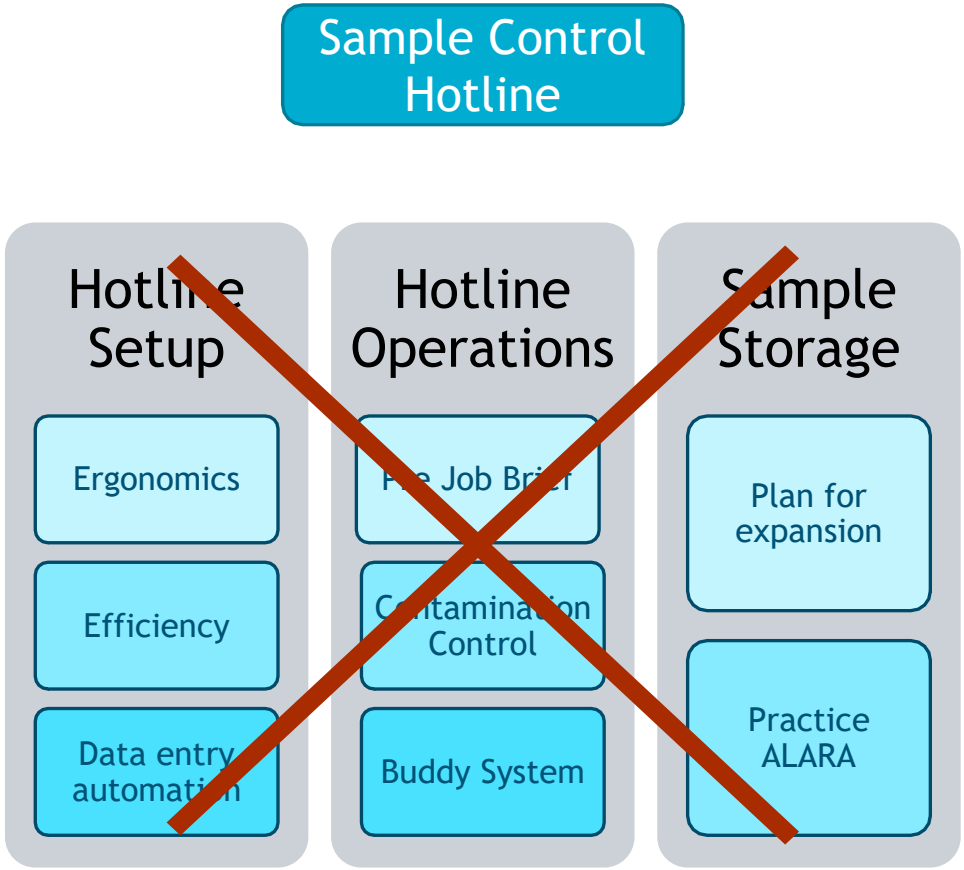
Unclear/Confusing/Inconsistent/ Non-existent Chain of Command

- Difficult to effectively coordinate efforts with stakeholders and decision-makers
- Difficult to understand what priorities are, what requirements are, and what assets are needed
- Ineffective and inefficient laboratory support without stakeholder communication to define sample data quality objectives
- Elevated confusion level for all Responders slowing the entire process

Issues that can arise when critical sample control process elements are missing

No standardized sample control processes

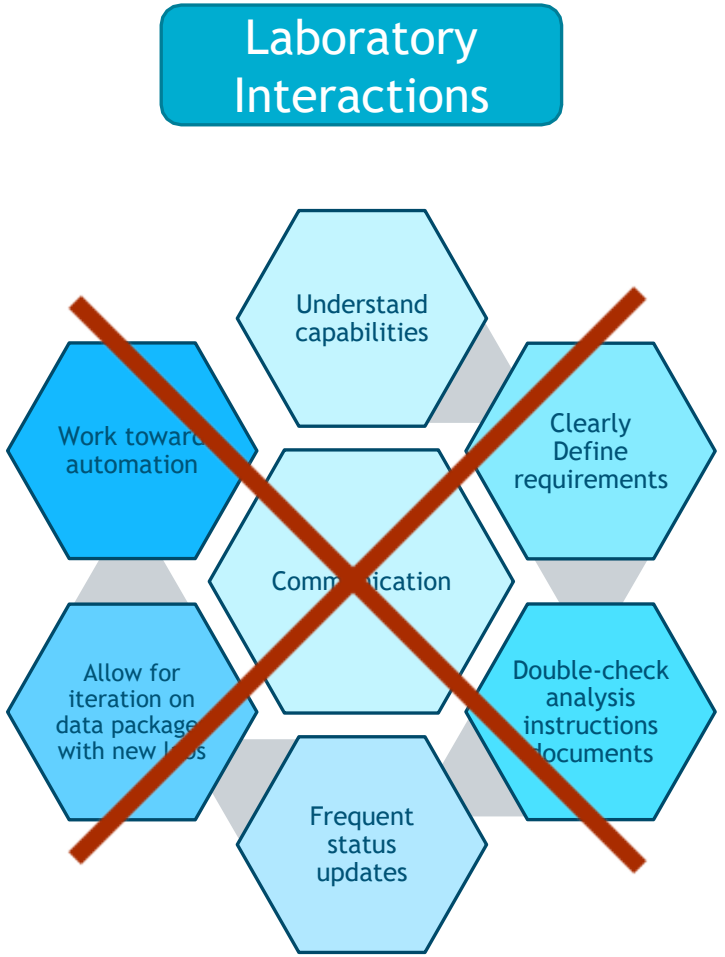
- Chain-of-Custody could become inconsistent,
- Inappropriate sample packaging may occur,
- Samples could become damaged and unusable without standardized collection and delivery process
- Inadequate sample control methods
- Resolving issues takes considerable time and consumes a considerable amount of personnel resources
- Samples and results dropped through the cracks, difficulty in tracking samples and results, difficulty in prioritizing sample analysis, etc.



Issues that can arise when laboratory interaction elements are missing

No structured process or tools for tracking sample status and lab results

- Difficult to tie sample analysis results to sample collection locations and times
- Difficult to verify if sample results meet their intended purpose (i.e. original question being asked)
- Difficult to share results in a readily usable form with Assessment personnel and decision makers without a structured format (adequately constructed database, specific data and result formats)
- Data quality review becomes difficult
- Data storage and retrievability becomes difficult
- Results will not get to the data Assessors, or the Decision Makers fast enough
- Inefficiencies will abound



Importance of Drills and Exercises

Drills and Exercises:

- Help train personnel and condition them to react in a specified, directed, organized, consistent and efficient manner.
- Familiarizes and prepares Responders with probable and potential real world events.

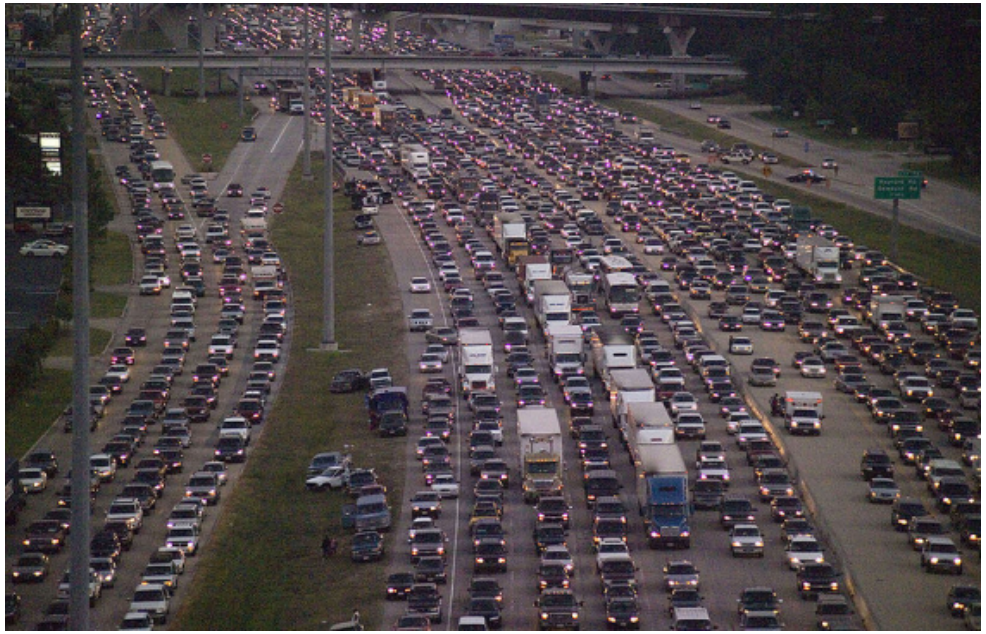
Bottom Line

If Sample Control has a well established process that is effective, then the Data Assessors, and Decision Makers can be effective.

Ineffective decision-making

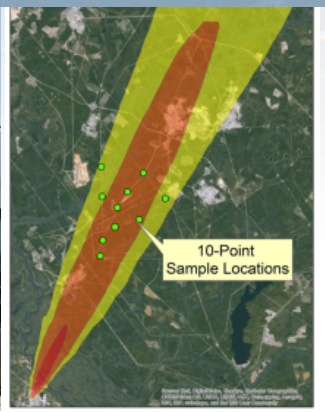
Standard lanes of traffic open

Effective decision-making



All lanes of traffic open for evacuation

Integrated Consortium of Laboratory Networks (ICLN)



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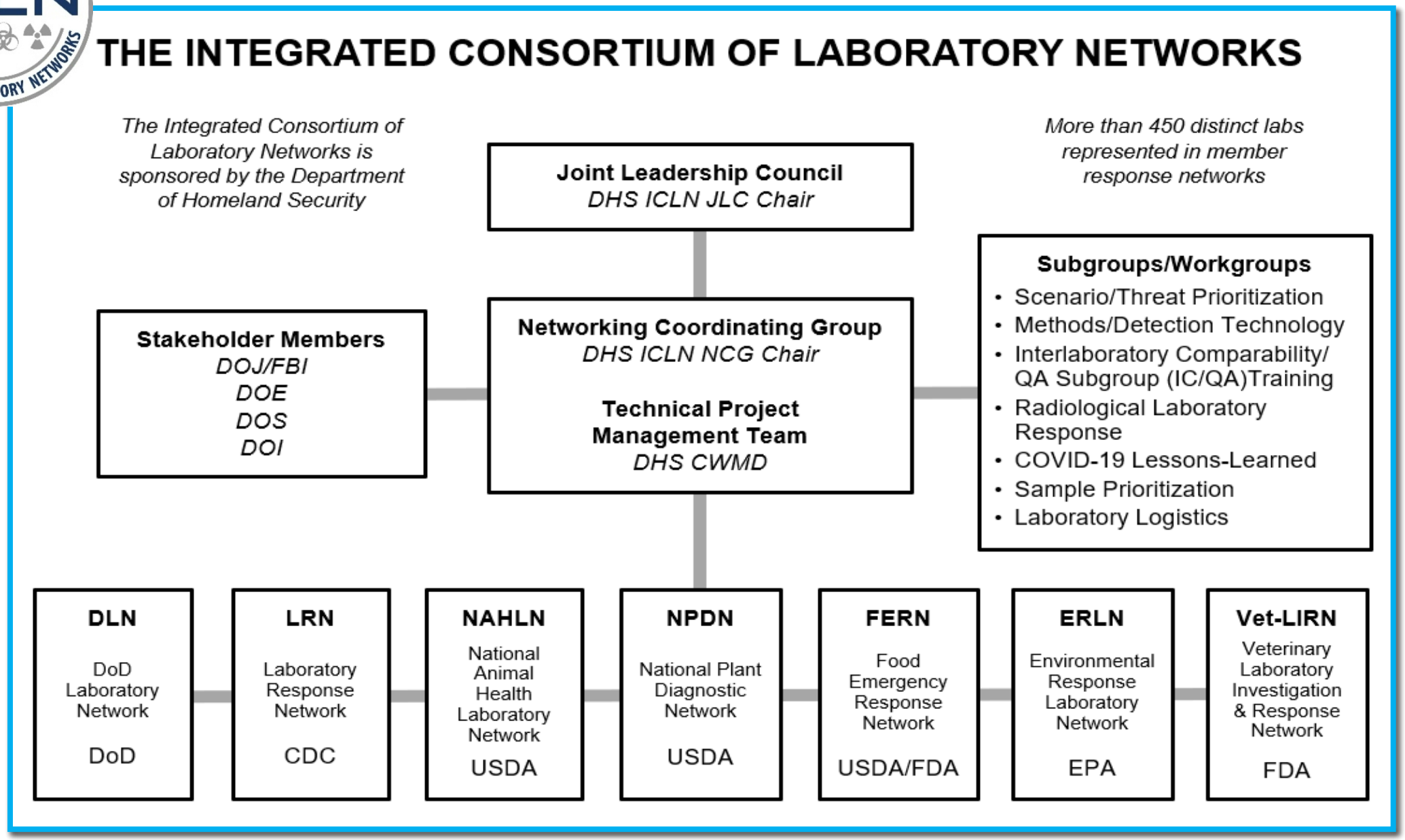
ICLN Organizational Structure



Addressing the Unique Resources of Radiological Laboratories for Emergency Response

Why is this important?
This allows for more strategic preplanning for laboratories to identify and address potential shortages.

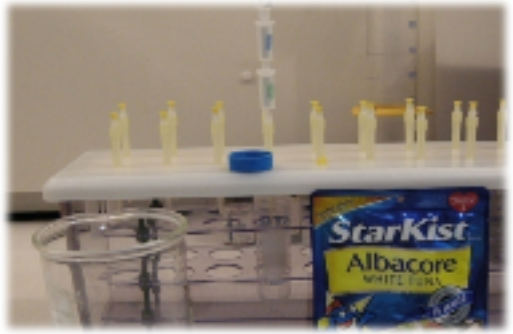
- Limited availability;
- Available only from a single or limited number of vendors; and
- Long lead times for acquisition.

Technology

- Instrumentation (purchase/repurpose)

Supplies

- Standards
- Resins
- Reagents



General Preparation

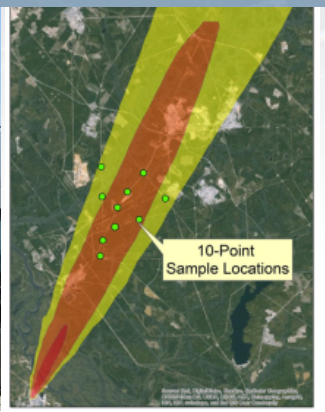
- Permits, licensing
- Advance packaging, shipping, and delivery protocols with overnight carriers
- Staffing plan and WP&C documentation to address 24/7 operations
- Cross-training of staff
- Install IT infrastructure
- Establish formal and informal agreements and accelerated procurement processes
- Plan for acquisition of temporary secure storage space
- Increase instrumentation automation and data-processing steps where possible
- Adopt rapid methods for use during an emergency response
- Develop a plan and **EXERCISE** for long-term operations

- For Information on other ICLN Documents you can visit

https://www.icln.org/subgroups.cfm#radiological-laboratory-response

"Radiological Laboratory Response – Limiting Issues" (May 2009)
"The Tenuous Future of Radiological Laboratories" (Oct 2018)
"Radiological Laboratories – Executive Summary for Senior Executives/Administrators" (Sept 2020)

Cobalt Magnet (CM22) Exercise



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References

- FRMAC Manuals and References
  https://www.nnss.gov/pages/programs/FRMAC/FRMAC_DocumentsManuals.html
- EPA PAG Manual – Protective Action Guides for nuclear incidents
  https://www.epa.gov/radiation/pag-manuals-and-resources
- EPA Incident Guides – Decision path for sampling and analysis following a nuclear incident
  https://www.epa.gov/radiation/incident-guides
- EPA Rapid Methods – Methods labs can adopt to better support emergency response efforts
  https://www.epa.gov/radiation/rapid-radiochemical-methods-selected-radionuclides
- High-level information on the Incident Command System
  https://www.fema.gov/incident-command-system-resources

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Questions?