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Summary Report for the Evaluation of Current QA Processes Within the FRMAC, FAL and EPA MERL

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Executive Summary

The Federal Radiological Monitoring and Assessment Center (FRMAC) relies on accurate and defensible analytical laboratory data to support its mission. Therefore, FRMAC must ensure that the environmental analytical laboratories providing analytical services maintain an ongoing capability to provide accurate analytical results to DOE. It is undeniable that the more Quality Assurance (QA) and Quality Control (QC) measures required of the laboratory, the less resources that are available for analysis of response samples. Being that QA and QC measures in general are understood to comprise a major effort related to a laboratory's operations, requirements should only be considered if they are deemed "value-added" for the FRMAC mission.

This report provides observations of areas for improvement and potential interoperability opportunities in the areas of Batch Quality Control Requirements, Written Communications, Data Review Processes, Data Reporting Processes, along with the lessons learned as they apply to items in the early phase of a response that will be critical for developing a more efficient, integrated response for future interactions between the FRMAC and EPA assets.

Acknowledgements

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Background

Nuclear Incident Response Team (NIRT) Laboratory Analysis Program includes assets from both DOE and EPA that are focused on NIRT Program response capabilities and helping advance interoperability between assets and across agency boundaries. These assets include personnel, on-site laboratory equipment and off-site laboratory networks to support the early, intermediate and recovery phases of a major radiological incident in the initial response characterizing the Incident and in the areas of Data Collection, Integration, and Management. The supporting objectives include:

- Develop standardized procedures for laboratory assets across agency boundaries;
- Promote common analytical protocols;
- Act as liaison between data users, sample collection teams, and analytical laboratories to ensure that the coordinating agency objectives are met;
- Standardize data collection and sharing procedures across agencies;
- Establish standardized guidelines for laboratories on data reporting during the event;
- Provide operating guidance for laboratories on and off site during an event;
- Sample control, management and distribution to laboratories;
- Accurate and defensible data;
- Timely review and dissemination of data to make critical public protection decisions.

NIRT Laboratory Analysis Program gaps can be narrowed by the close collaboration between all the NIRT laboratory assets in each of the program categories. Equipment purchases, setup, maintenance, training and regular exercising of equipment, personnel, development of procedures/guidance and the interaction with NIRT Lab Analysis and analytical laboratories will ensure a robust and reliable response framework. Once these processes have been developed, they should be communicated to the broader nuclear emergency response community through expanded training and exercises. Lab-focused exercises aim to evaluate how these new guidance documents, methods, and procedures perform in the context of the whole NIRT laboratory response effort. Through lessons learned from these exercises, NIRT Laboratory assets can then cycle through the process again and make corrections to the processes that incorporate these lessons.

The U.S. Department of Energy (DOE) and the Environmental Protection Agency (EPA) have independently developed mobile laboratory assets for use during a nuclear incident. The DOE Fly Away Laboratory (FAL) is composed of one gamma spectrometer and two alpha/beta counting systems, all of which are portable and can be shipped via commercial airlines or DOE aircraft to the incident site with an adequate number of personnel to operate the equipment. EPA has a Mobile Environmental Radiation Laboratory (MERL) with an accompanying Sample

Preparation Laboratory (SPF) based in Montgomery, AL. The EPA MERL System consists of two towed, self-contained, stand-alone tractor/trailer systems (MERL and a separate Sample Preparation Laboratory). During an emergency response, both EPA and DOE mobile laboratory assets would likely be deployed to the same location, with the FAL most likely arriving before the ground-transported EPA MERL System. As such, coordination between the groups is not only desirable, but essential to a united, efficient response.

It is undeniable that the more Quality Assurance (QA) and Quality Control (QC) measures required of the laboratory, the fewer resources that are available for analysis of response samples. Being that QA and QC measures in general are understood to comprise a major effort related to a laboratory's operations, the FRMAC LA Division needs to consider not adding additional requirements that are not considered value-added but rather considering what is necessary to support the data quality evaluation to commensurate with FRMAC needs.

List of Acronyms

AAL- Analytical Action Level
AIS- Analysis Instruction Sheet
ARF- Analysis Request Form
DER- Duplicate Error Ratio
DEU – Data Exchange Utility
DQO – Data Quality Objective
DOE – Department of Energy
DVF – Data Validation Form
EDD- Electronic Data Deliverable
EPA- Environmental Protection Agency
FAL- Fly Away Laboratory
FRMAC- Federal Radiological Monitoring and Assessment Center
ICLN – Integrated Consortium of Laboratory Networks
Lc- Critical Level
LCS- Laboratory Control Sample
LLNL – Lawrence Livermore National Laboratory
MDA- Minimum Detectable Activity
MERL- Mobile Environmental Radiation Laboratory
NIRT-Nuclear Incident Response Team
NSTec- National Security Technologies, LLC
PAF – Project Acceptance Form
POC- Point of Contact
QC- Quality Control
RAMS- Radiological Assessment and Monitoring System
RSL – Remote Sensing Laboratory
SCF- Sample Control Form
sd – Standard Deviation
SNL – Sandia National Laboratories
SOP- Standard Operating Procedure
SOW – Statement of Work
SPL- Sample Preparation Laboratory

Scope of Evaluation

This evaluation summarily addresses overall QA program elements of the MERL, FAL and FRMAC Laboratory Analysis Division, but it was not within the scope to address or solve identified elements. With regards to the data review processes, regardless of the QA specification, all require, either explicitly or implicitly, that processes be established to ensure that the laboratory produce data of a known quality.

The specific data review processes employed by the EPA MERL, the FRMAC FAL, and the FRMAC Laboratory Analysis Division as well as the lessons learned from multiple exercises conducted over the last three years were evaluated to determine whether opportunities exist for implementing efficiencies leading to the more rapid production of reviewed data. Efficiencies are a consequence of removing duplication and/or automating a process. With respect to processes that might be viewed as redundant or duplicative, some degree of independent review (duplication) is desired to (1) remove the element (or perception) of potential bias within an organization, and (2) provide additional assurances that the product has satisfied the quality specification. This is then the challenge for the FRMAC Laboratory Analysis Division – striking a defensible balance between increased throughput and ensuring quality data are provided.

Although several gaps were identified in this first phase, additional work may be required in the future to more fully resolve gaps in the planning area of the NIRT Laboratory Program.

Quality Assurance Program

FRMAC relies on accurate and defensible analytical laboratory data to support its mission. Furthermore, FRMAC must ensure that the environmental laboratories providing analytical services maintain an ongoing capability to provide accurate results to DOE. Laboratory assets supporting a response are expected to have established Quality Assurance (QA) programs which are required to conduct routine operations. Administering bodies and specifications vary, but generally require similar elements as part of the quality system. The *Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)*, Revision 1, August 2000 (NUREG-1575, Rev.1; EPA 402-R-97-016, Rev. 1; DOE/EH-0624, Rev. 1), Appendix K *Comparison Tables Between Quality Assurance Documents* provides a cross-walk of the various QA requirements documents and elements.

Table 1. Comparison of EPA QA/R-5 and DOE Order 414.1D

[1]EPA QA/R-5 Elements		[2]DOE Order 414.1D Elements	
A1	Title and Approval Sheet		
A2	Table of Contents		
A3	Distribution List		
A4	Project/Task Organization	2	Personnel Training and Qualification
A5	Problem Definition/Background	1	Program
A6	Project/Task Description		
A7	Quality Objectives and Criteria	1	Program
A8	Special Training/Certification	2	Personnel Training and Qualification
A9	Documentation and Records	4	Documents and Records
B1	Sampling Process Design (Experimental Design)	6	Design
B2	Sampling Methods	5	Work Processes
B3	Sample Handling and Custody		
B4	Analytical Methods	5	Work Processes
B5	Quality Control		
B6	Instrument/Equipment Testing, Inspection, and Maintenance	8	Inspection and Acceptance Testing
B7	Instrument/Equipment Calibration and Frequency		
B8	Inspection/Acceptance of Supplies and Consumables	7 8	Procurement Inspection and Acceptance Testing
B9	Non-direct Measurements		
B10	Data Management		
C1	Assessments and Response Actions	10	Independent Assessment
C2	Reports to Management	9	Management Assessment
D1	Data Review, Verification, and Validation		
D2	Verification and Validation Methods		
D3	Reconciliation with User Requirements	3	Quality Improvement

Based on MARSSIM, Appendix K, Table K.3, Revision 1, August 2000, and updated for EPA and DOE document revisions.

[1] MARSSIM, Appendix K, refers to Environmental Protection Agency (EPA). 1994c. *EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations.* EPA QA/R-5, EPA, Draft Interim Final, Quality Assurance Management Staff, Washington, D.C.

Elements updated using;

Environmental Protection Agency (EPA). 2001. *EPA Requirements for Quality Assurance Project Plans.* EPA/240/B-01/003, EPA QA/R-5, EPA, Quality Staff, Washington, D.C.

[2] MARSSIM, Appendix K, refers to Department of Energy (DOE). 1991c. *Quality Assurance.* U.S. DOE Order 5700.6c.

Elements updated using;

Department of Energy (DOE). 2013. *Quality Assurance.* U.S. DOE Order 414.1D Chg 1.

Quality Control Measures

Batch Quality Control Requirements Evaluation

This evaluation focused primarily on data review for laboratory data, which necessarily includes reviewing the laboratory batch quality control data. The following table provides comparison of the batch quality control requirements (volumes and tolerances) provided in the referenced documents.

Table 2. Batch Quality Control Requirements

Organization	Batch QC Samples - # and type required	Blanks	Duplicates/ Replicates	Matrix Spikes	Laboratory Control Samples
[1]FRMAC LA Section 6 Appendix F, F.2.6 NL2016 Analysis Instruction	Analysis of blank and spiked samples with each batch of samples processed at one time. At least 5% of the total number of samples analyzed. Laboratory batch must include only FRMAC samples.	Acceptable without qualification < 3sd	DER < 3	60% ≤ Result ≤ 140%	75% ≤ Result ≤ 125%
[2]FRMAC FAL Section 3	One positive and one negative control 1 set for a batch of 20 samples	No specifics, but direction "If the blank falls outside the appropriate tolerance limits…"	Not mentioned	Concentration >10x the Required Critical Level	Concentration >10x the Required Critical Level Gamma: ± 25%
[3]EPA MERL Section 13	"A preparation batch must consist of 20 or fewer samples of similar matrix types, plus appropriate QC samples. A batch may	"unacceptable high" Unacceptably low = >3sd below 0.	Z_d ± 2 (warning) ± 3 (control)	Not mentioned	>10x the normal expected MDA and comparable to

Organization	Batch QC Samples - # and type required	Blanks	Duplicates/ Replicates	Matrix Spikes	Laboratory Control Samples
	be analyzed by multiple qualified analyst(s) using the same procedure process. Three types of quality control samples (QC samples) are analyzed routinely. The types of QC sample and their frequency are: • Method blank (MB), one per prep batch • Laboratory replicate, one per prep batch • Laboratory control sample (LCS), one per prep batch"				sample activities if expected to be >5x MDA 80 – 120% $Z_d \pm 2$ (warning) ± 3 (control)

[1]FRMAC Laboratory Analysis Manual, SAND2013-10382P
[2]FRMAC Fly Away Laboratory Manual, SAND2013-9560P
[3]NAREL MERL Quality Assurance Manual, QA/QAM-6

Considerations for possible increased efficiencies;

1. Evaluate batch QC sample volumes to determine on a method- and matrix-specific basis whether reduced QC sample #s is justifiable. Consideration should also be given to other existing and available indicators of laboratory system control.
2. Where the EPA MERL and FRMAC FAL have the same or more stringent controls compared to the FRMAC LA Division (e.g.; LCS), and where all agree on QC outliers' consequences (re-prep and re-analysis triggers, impacts to and flagging of FRMAC sample data), the FRMAC LA may accept the lab's review and perform a reduced review of the lab's data deliverables.
3. Given the urgent need for field sample data, there should be discussion on the impact of a QC sample failure where that failure would usually cause the lab to re-prep and/or re-analyze the batch. In most cases, QC sample failure may not directly indicate an impact on sample data, and may not result in qualification of sample data.
4. In advance of a response, document the needs and expectations surrounding QA/QC and data reporting requirements in applicable agency Project Acceptance Forms (PAF), data management plans, and QA plans.

Evaluation of Written Communication to the Laboratories

As a starting point, if analytical direction given to the laboratories isn't clear, additional time will be taken to resolve questions. Therefore, improving direction to the laboratory is one of the first ways we can increase overall throughput. There will necessarily be verbal communications with the laboratories, but we also need to strive to provide the utmost clarity on the written communication as well. The questions posed in the evaluations do not necessarily identify areas where an all-or-nothing response (i.e.; all labs have this problem **or** no labs have this problem) indicates potential for improvement. If provided in a survey context, this information may also be used to identify which laboratories would benefit from additional outreach efforts [e.g.; for Electronic Data Deliverable (EDD) development].

Based on data analysis, we need to continually review what direction (based on FRMAC Assessment DQOs, which are not static) we as an organization provide to the analytical laboratories (inherent in the DQO process).

Laboratory Information Summary or Lab Questionnaire (see Attachment 7)

The current tool for gathering information from the laboratory is the Initial Laboratory Questionnaire. This form asks the lab about capability and capacity at specified DQOs and is used by the FRMAC LA Division in the laboratory selection process. Is the Laboratory Information Summary sheet, also referred to as the Lab Questionnaire, adequate? Does it provide FRMAC with all the necessary information to provide smooth and efficient data flow? Is there more information that could help FRMAC speed up the sample distribution and sample data results return process?

Recommendations for realizing increased efficiencies are:

1. Radioactive Materials License limits and limitations come in a variety of forms, formats, units, etc. The Laboratory Information Summary sheet could be standardized for items such as check boxes for pre-approval required for sample receipt, specific boxes or fields for maximum amount of activity per sample accepted, maximum dose rate per sample accepted, and several others.
2. Knowing analysis laboratory capabilities is beneficial in lessening the time it takes to decide which lab to send samples to (which labs can do the types of samples that have been collected, meet the detection limits and desired turn around times) and how long it takes for the overall process of sending the samples to the lab through getting the results back. The Laboratory Information Summary sheet could be expanded to collect information on detection limits and typical turn around times.

3. Pre-populate the Laboratory Information Summary sheet with the Nuclides of Interest (if known at the time of request) for the event when asking for detection capability.
4. The Laboratory Information Summary sheet should list analytical laboratories' preferences, restrictions, electronic data transfer capabilities and other pertinent information that might benefit, or speed up the transfer of samples and results.
5. Integrate more analysis laboratory information with FRMAC database.
6. The Laboratory Information Summary sheet should be an electronic form that is easily uploaded into FRMAC database.
7. Include a section for the analysis lab to list if they have existing analysis contracts with DOE or EPA or ICLN and their contractors.

Analysis Instruction Sheet (AIS) (see Attachment 1)

The Analysis Instruction Sheet (AIS) is sent with each analytical batch to explain the analysis requirements in-detail to the laboratory. Does the information (either the way it is presented, or the specification) on the AIS cause delays in the laboratory beginning the sample processing? While FRMAC LA should continuously review content, the following are a few items that might be clarified.

Recommendations for realizing increased efficiencies are:

1. The AIS discussion section can be more clearly defined to clear up confusion.
2. The "Volume(s)/Weight(s) listed on the ARF for samples other than air filters or swipes are nominal values. This information should be evaluated for other matrices and determine what the expectation of the laboratory is with regards to calculating activity concentration data.
3. For the Isotope(s) where there are known issues in achieving the critical level (Lc) FRMAC should consider a strategy to address those issues.
4. The process for requiring the laboratories to report a result value for each analyte (whether detected or not detected) should be re-evaluated for the data's intended use.
5. The contents of an expected data package from the laboratories needs to be clearly defined.
6. The capability that samples are dried in the laboratory should be a pre-determined factor for which laboratories could do this work.

Attachment 2 contains additional details of the AIS evaluation.

Analysis Request Form (ARF) (see Attachment 3)

The Analysis Request Form (ARF) is used to communicate what samples are being sent to the laboratory and what analysis is being requested. Multiple internal batching and logging processes are originated from the ARF. While FRMAC LA should continuously review content, the following are a few items that might be clarified.

Recommendations for realizing increased efficiencies are;

1. Examine if the Point of Contact (POC) information provided is beneficial in supporting data turnarounds.
2. Remove items related to the Statement of Work (SOW) on the form to avoid potential confusion.
3. Consider removing instructions that do not pertain to samples on the ARF.
4. The lab should have the flexibility to use any method they see fit as long as the DQOs are met.

Attachment 4 contains additional details of the ARF evaluation.

Evaluation of Reporting Processes

The consequence related to the failure of a quality control items should be agreed to by the FRMAC LA Division, FAL and the EPA MERL. That is, will the item's failure result in negligible, marginal or significant impact to the intended use of the associated field data? In most situations, laboratory quality control tolerances aren't standardized, "failures" are rarely significant, and QC sample results' relationship to sample data quality are not definite.

EPA MERL – the data review and reporting process is described in Section 12 of the NAREL MERL Quality Assurance Manual, QA/QAM-6, Revision 1, and includes two independent reviews of each radiochemical analysis performed. It also describes the level of management required to review, sign and approve the final report for release. In the event of a national emergency, it specifies that the data must be approved by the ORIA Director and ORIA QAM. Concerning data qualifiers, it mentions that they routinely are not applied to sample data based on QC analyses.

Recommendations:

1. If the ORIA Director or ORIA QAM are not expected to be routinely and readily available for review and release of data, determine whether data report release may be authorized by the senior EPA official at the FRMAC, NAREL or the MERL.

FRMAC FAL - the data review and reporting process is described in Section 11 of the FRMAC FAL Manual, SAND2013-9560P, and includes a review against the analysis request form, a technical review, and FAL Manager review and approval. Data qualifiers are not discussed.

Recommendations:

1. Continue interoperability efforts to evolve to a point where FRMAC Hotline sample surveys and decontamination processes and data are acceptable for similar processes currently done during EPA MERL and FRMAC FAL receipt.
2. The FAL should develop a more well-documented sample control and data review process to allow for more standardization.
3. The FAL could minimize hand-entry by developing software to organize results in the EDD format.

FRMAC LA Division – the data review is currently performed when the lab submits their initial data as a hardcopy report and in the FRMAC electronic data deliverable (EDD) format and in the process of loading the EDD to the RAMS database (either by the Web Portal or Sample Result paths).

Recommendations:

1. Identify default Required Critical Levels (0.1AAL) that routinely are not achievable by the labs, and determine with Assessment strategies for resolving (e.g., increase default Required Lc to 0.5AAL [depending on whether the Uncertainty is incorporated]).
2. Current methods to determine AALs are based on one type of analysis, the correlation of a result to a Protective Action Guide (PAG). Consider defining alternative methods for defining the AAL based on the purpose of the sample.
3. Where agreement is reached between EPA MERL, FAL and FRMAC LA Division on batch quality control and data review, reduce Quality Assurance Specialists efforts for additional review.
4. Continue RAMS development to refine data review focus and resolve data processing errors, which reduces QA Specialist efforts.
5. Remove the requirement for labs to report electronic results for their laboratory QC samples. Require only that they report the information in the form of a report file that can be uploaded to the database. With such a system, major simplifications to current data reporting tools could be implemented which significantly reduce the burden on the laboratory during the reporting step.

Evaluation of Data Review Processes

FRMAC Data Validation Form (see Attachment 5)

It should be noted that the FRMAC LA Division data review elements (implemented with the Data Verification Form [DVF]) are meant as a guide to ensure key items are reviewed to defend the data quality. As RAMS has evolved to manage data processing (e.g.; SCF #s contained in the EDD and validated during creation on the Web Portal and loading to RAMS), some DVF items do not need to be reviewed by the QA Specialists. The key questions for evaluating each item are: (1) the importance of the item with respect to sample data quality, (2) how RAMS supports evaluating the item, which would reduce the need for QA Specialist review, and (3) the EPA MERL, FAL and Web Portal processes for ensuring the completeness and correctness of the item. In cases where the lab is expected to ensure the correctness of the item, or data processing tools have been developed, the FRMAC LA Division review is redundant. And in cases where the laboratory has extensive experience with the FRMAC (as is the case with EPA MERL and FRMAC FAL) or data tools are mature, further FRMAC LA Division review may be unnecessary. A consideration is also, besides whether an item should be evaluated, whether the DVF should be printed and filed with other documentation, which leads to the higher-level operational question of formal Records requirements.

Table 3. Data Validation Form (DVF) Evaluation

Data Review Item	Comments	Potential and Consequence	Recommendation
Issues identified prior to analysis that affect the data	Issues identified prior to shipment to a lab are managed through the RAMS Non-Conformance process, and samples determined to be invalid do not proceed for analysis. Issues identified at the laboratory should be communicated with the FRMAC LA and included in the laboratory report if analyses are performed.	Unlikely that an unviable sample would be analyzed. If it was analyzed, the potential data quality consequence would have been accepted at the point the decision was made to send the sample for analysis.	Remove from the DVF

Data Review Item	Comments	Potential and Consequence	Recommendation
Custody records continuous and complete	This concerns custody between FRMAC LA and the lab, as documented on the ARF. FRMAC LA should have a copy prior to data review. While not affecting the technical validity of the data, this has been discussed as causing the data to be legally indefensible.	Unlikely Unknown Significance	Keep on the DVF
Requested radionuclides were reported	The primary challenge for the laboratory is reporting data (Result, Uncertainty, Critical Level, MDA) for a radionuclide that isn't detected. RAMS tracks the % of requested radionuclides reported, which does provide some assistance in determining completeness.	Likely for gammas Significant	Keep on the DVF. Determine a standard solution for how a lab is to report a radionuclide if they don't detect it.
Correct SCF Sample ID numbers	The lab should ensure that the correct SCF Sample IDs are reported. The Web Portal and RAMS EDD processes validate that the EDD SCF Sample ID exists in RAMS and is associated with the ARF.	Unlikely Marginal	Remove from the DVF.
Correct reporting units	The lab should ensure that the correct units are reported. The Web Portal and RAMS EDD uploader validates that units are reported and that they are consistent with allowable units in RAMS. However, the systems do not validate that the reported units match the requested units on the ARF.	Unlikely Significant, if RAMS assumes specified units for subsequent TFRMAC calculations.	If Web Portal or RAMS validates units, remove from the DVF.
Uncertainty reported (1 or 2-sigma indicated)	The lab should ensure that the Uncertainty is reported. RAMS does not allow for data to be loaded without an Uncertainty value.	Unlikely Insignificant	Remove from the DVF.

Data Review Item	Comments	Potential and Consequence	Recommendation
Detection and Quantitation Limits met	The current FRMAC LA strategy; A = Measured Lc < Required Lc < Result A = Required Lc < Measured Lc < Result U = Result < Measured Lc < Required Lc U = Measured Lc < Result < Required Lc J = Result < Required Lc < Measured Lc R = Required Lc < Result < Measured Lc.	Likely Significant	Develop automated RAMS logic for coding Remove from the DVF
Electronic data compare correctly against Hardcopy	This is not intended to be a 100% comparison, but review of key elements such as SCF #s, Results, Measured Lc. The reason for this is the expectation that the lab is more practiced in producing their hardcopy reports than they are with the FRMAC EDD. Consequently, lacking ready access to the lab, discrepancies might be resolved based on the hardcopy. For the EPA MERL and FRMAC FAL, their familiarity and experience with the EDD should result in few discrepancies between the hardcopy and EDD. If discrepancies do exist, the specific data element involved will determine the significance and need to resolve.	Unlikely (for MERL, FAL) Significant	Keep on the DVF
Hardcopy deliverable level is correct (1 or 2) and complete	Reports with the initial data will be prescribed in the Analysis Instructions. The final deliverables will be submitted after the data have been reviewed.	Unlikely Negligible	<u>Add this as a review/check in the previous item</u>

Data Review Item	Comments	Potential and Consequence	Recommendation
QC data meet requirements • LCS +/- 25% • MS +/- 40% • DER < 3 • Blank ≤ 3s	If the labs review against these, then FRMAC LA would not need to perform the same level of review. RAMS correctly evaluates the LCS and Blank, but not the DER. Matrix spikes are not evaluated. We need to determine, with Assessment, which "significant" failures will result in Rejecting associated sample data. These may also be conditions that would cause the lab to re-prep and re-analyze a batch. For failures that do not cause a rejection of the data, rigorous scrutiny is unnecessary.	Likely Marginal	Keep on the DVF, but only those "significant" items (e.g.; Blank contamination > AAL; LCS < 25% recovery)

Lessons Learned related to the FRMAC LA data review process usually mention that it is cumbersome – in evaluating lab reports to the EDD and then multiple actions in RAMS. Much of that has been driven by "learning curve" experiences with new processes and RAMS development.

Recommendations:

1. Focusing on those data review items that, if incorrect, will invalidate lab data for Assessment's use.
2. Leveraging the internal reviews done by the EPA MERL and FRMAC FAL to reduce the QA Specialist workload.
3. Continue refining the RAMS support to the data review process, including evaluating the relationships between the Result, Required Lc, and Measured Lc.

Evaluation of Lessons Learned from Exercises and Drills

In addition to specific QA/QC data reporting processes and documentation of the two organizations, lessons learned were also reviewed for the drills/exercises from 2014-2016. The drills evaluated are listed below.

- CM Capstone: 3/24/14-3/28/14

- SRS drill: 6/9/14-6/13/14
- EPA-LV drill: 6/24/14-6/26/14
- SRS drill: 4/21/15-4/24/15
- Southern Exposure: 7/21/15-7/23/15
- ABQ drill: 6/21/16-6/24/16
- Northern Lights: 10/17/16-10/21/16

The lessons learned were reviewed for gaps not previously mentioned that would decrease the data review time as well as items that would potentially create a more efficient process during the early phase of an event. Below is a list of the recommendations. See Attachment 6 for a complete list of the lessons learned evaluated that applied to the early phase of the event.

1. Create a realistic analytical analysis and data review of results timeline for data users to eliminate false expectations and added pressure
2. Ensure that Rad Responder/Web portal/RAMS is functioning properly and provide training courses and Just-In-Time (JIT) training modules
3. Clearly define the MERL vs NAREL procedures and processes
4. Provide additional FRMAC Lab Analysis supplemental training on the eFRMAC processes
5. EPA should consider creating a blanket project acceptance form for emergency response
6. DOE should consider revising the process to ensure loadout gear is in a ready state for deployment
7. DOE should consider developing a formalized process for laboratory selection
8. DOE should consider purchasing a backup gamma spectroscopy system for the FAL due to heavy usage
9. DOE and EPA should develop an alternate screening process for shipping samples that will not tie up analytical instrumentation deployed with the FAL
10. DOE should consider developing a process to utilize RAP team gamma spectroscopy systems for analyzing samples and/or shipment parcels
11. DOE should develop a CMHT Gamma Spectroscopist position to assist laboratories in the interpretation of complex spectra and to process in-situ field spectra
12. DOE and EPA should formalize the TTL positions
13. DOE should consider moving the maintenance of the FRMAC Web portal to the eFRMAC suite
14. DOE and EPA should develop an action tracker system to ensure priorities are identified and being addressed appropriately
15. Work should continue with the ICLN to encourage data reporting efficiencies and stability of the ICLN Data Exchange Utility (DEU)
16. RAMS should be modified to incorporate ICLN external agency laboratory data

17. DOE should consider adopting EPA data qualifiers- Complete - The FRMAC Laboratory Analysis Division data review process, using the “U”, “J”, and “R” qualifiers, was designed with the expectation that transition to EPA would benefit from using EPA-recognized qualifiers. While not all qualifiers provided in MARLAP, Chapter 8, section 8.3.3 or MARSSIM Chapter 9, section 9.3.2 were used, the ones used in both were.
18. EPA and DOE should consider developing pre-deployment checklists to ensure rapid setup of operations
19. MERL and FAL should consider developing a proficiency testing process to maintain skillsets
20. DOE and EPA should consider developing a standardized waste characterization process for mobile laboratories
21. FAL should standardize QC criteria amongst FAL analytical instrumentation
22. MERL LIMS system should be modified/automated to reduce human interaction (reduce errors and time)
23. FAL and MERL should consider developing iSOCS models for each programs geometries.

References

1) *Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)*, Revision 1, August 2000 (NUREG-1575, Rev.1; EPA 402-R-97-016, Rev. 1; DOE/EH-0624, Rev. 1), Appendix K *Comparison Tables Between Quality Assurance Documents*
2) MARSSIM, Appendix K, refers to Department of Energy (DOE). 1991c. *Quality Assurance*. U.S. DOE Order 5700.6c.
3) Department of Energy (DOE). 2013. *Quality Assurance*. U.S. DOE Order 414.1D Chg 1.
4) FRMAC Laboratory Analysis Manual, SAND2013-10382P
5) FRMAC Fly Away Laboratory Manual, SAND2013-9560P
6) National Analytical Radiation Environmental Laboratory Mobile Environmental Radiation Laboratory (MERL) Quality Assurance Manual, QA/QAM-6
7) National Analytical Radiation Environmental Laboratory Quality Management Plan, QA/QMP-1
8) Quality Systems Manual (QSM) for Environmental Laboratories, Based on ISO/IEC 17025:2005(E) and The NELAC Institute (TNI) Standard, Volume 1, (September 2009), DoD Quality Systems Manual Version 5.1, 2016
9) The Department of Energy Laboratory Accreditation Program for Radiobioassay, DOE-STD-1112-98, December 1998
10) Summary Report for the Environmental Protection Agency MERL/FRMAC/RAP Mission Alignment Exercise held at the Savannah River Site on June 9-13, 2014, SAND Report No. 154768
11) Summary Report for the Environmental Protection Agency MERL/FRMAC Mission Alignment Exercise held at Environmental Protection Agency Facility on June 24-26, 2014, SAND Report No. 154774
12) Environmental Protection Agency (EPA). 2001. *EPA Requirements for Quality Assurance Project Plans.* EPA/240/B-01/003, EPA QA/R-5, EPA, Quality Staff, Washington, D.C.
13) Lessons Learned CM Capstone: 3/24/14-3/28/14
14) Lessons Learned SRS drill: 4/21/15-4/24/15
15) Lessons Learned Southern Exposure: 7/21/15-7/23/15
16) Lessons Learned ABQ drill: 6/21/16-6/24/16
17) Lessons Learned Northern Lights: 10/17/16-10/21/16

Conclusions

This report provides observations of areas for improvement and potential interoperability opportunities in the areas of Batch Quality Control Requirements, Written Communications, Data Review Processes, Data Reporting Processes, along with the lessons learned as they apply to items in the early phase of a response that will be critical for developing a more efficient, integrated response for future interactions between the FRMAC and EPA assets.

The observations of areas for improvement and potential interoperability opportunities for the FAL, FRMAC-LA Division, and EPA MERL are summarized below and combined with the lessons learned items will be critical for developing a more efficient, integrated response for future interactions between the FRMAC and EPA assets.

Batch Quality Control

1. Evaluate batch QC sample volumes to determine on a method- and matrix-specific basis whether reduced QC sample #s is justifiable. Consideration should also be given to other existing and available indicators of laboratory system control.
2. Where the EPA MERL and FRMAC FAL have the same or more stringent controls compared to the FRMAC LA (e.g.; LCS), and where all agree on QC outliers' consequences (re-prep and re-analysis triggers, impacts to and flagging of FRMAC sample data), the FRMAC LA may accept the lab's review and perform a reduced review of the lab's data deliverables.
3. Given the urgent need for field sample data, there should be discussion on the impact of a QC sample failure where that failure would usually cause the lab to re-prep and/or re-analyze the batch. In most cases, QC sample failure may not directly indicate an impact on sample data, and may not result in qualification of sample data.
4. In advance of a response, document the needs and expectations surrounding QA/QC and data reporting requirements in applicable agency Project Acceptance Forms (PAF), data management plans, and QA plans.

Written Communication

<u>Laboratory Information Summary or Lab Questionnaire</u>

1. Radioactive Materials License limits and limitations come in a variety of forms, formats, units, etc. The Laboratory Information Summary sheet could be standardized for items such as check boxes for pre-approval required for sample receipt, specific boxes or fields for maximum amount of activity per sample accepted, maximum dose rate per sample accepted, and several others.
2. Knowing analysis laboratory capabilities is beneficial in lessening the time it takes to decide which lab to send samples to (which labs can do the types of samples that have

been collected, meet the detection limits and desired turn around times) and how long it takes for the overall process of sending the samples to the lab through getting the results back. The Laboratory Information Summary sheet could be expanded to collect information on detection limits and typical turn around times.

3. Pre-populate the Laboratory Information Summary sheet with the Nuclides of Interest (if known at the time of request) for the event when asking for detection capability.
4. The Laboratory Information Summary sheet should list analytical laboratories' preferences, restrictions, electronic data transfer capabilities and other pertinent information that might benefit, or speed up the transfer of samples and results.
5. Integrate more analysis laboratory information with FRMAC database.
6. The Laboratory Information Summary sheet should be an electronic form that is easily uploaded into FRMAC database.
7. Include a section for the analysis lab to list if they have existing analysis contracts with DOE or EPA or ICLN and their contractors.

Analysis Instruction Sheet

1. The AIS discussion section can be more clearly defined to clear up confusion.
2. The "Volume(s)/Weight(s) listed on the ARF for samples other than air filters or swipes are nominal values. This information should be evaluated for other matrices and determine what the expectation of the laboratory is with regards to calculating activity concentration data.
3. For the Isotope(s) where there are known issues in achieving the critical level (Lc) FRMAC should consider a strategy to address those issues.
4. The process for requiring the laboratories to report a result value for each analyte (whether detected or not detected) should be re-evaluated for the data's intended use.
5. The contents of an expected data package from the laboratories needs to be clearly defined.
6. The capability that samples are dried in the laboratory should be a pre-determined factor for which laboratories could do this work.

Analysis Request Form

1. Examine if the Point of Contact (POC) information provided is beneficial in supporting data turnarounds.
2. Remove items related to the Statement of Work (SOW) on the form to avoid potential confusion.
3. Consider removing instructions that do not pertain to samples on the ARF.
4. The lab should have the flexibility to use any method they see fit as long as the DQOs are met.

Data Review Processes

1. If the ORIA Director or ORIA QAM are not expected to be routinely and readily available for review and release of data, determine whether data report release may be authorized by the senior EPA official at the FRMAC, NAREL or the MERL.
2. Continue interoperability efforts to evolve to a point where FRMAC Hotline sample surveys and decontamination processes and data are acceptable for similar processes currently done during EPA MERL and FRMAC FAL receipt.
3. The FAL should develop a more well-documented sample control and data review process to allow for more standardization.
4. The FAL could minimize hand-entry by developing software to organize results in the EDD format.
5. Identify default Required Critical Levels (0.1AAL) that routinely are not achievable by the labs, and determine with Assessment strategies for resolving (e.g., increase default Required Lc to 0.5AAL [depending on whether the Uncertainty is incorporated]).
6. Current methods to determine AALs are based on one type of analysis, the correlation of a result to a Protective Action Guide (PAG). Consider defining alternative methods for defining the AAL based on the purpose of the sample.
7. Where agreement is reached between EPA MERL, FAL and FRMAC LA Division on batch quality control and data review, reduce Quality Assurance Specialists efforts for additional review.
8. Continue RAMS development to refine data review focus and resolve data processing errors, which reduces QA Specialist efforts.
9. Remove the requirement for labs to report electronic results for their laboratory QC samples. Require only that they report the information in the form of a report file that can be uploaded to the database. With such a system, major simplifications to current data reporting tools could be implemented which significantly reduce the burden on the laboratory during the reporting step.

Reporting Processes

1. Focusing on those data review items that, if incorrect, will invalidate lab data for Assessment's use.
2. Leveraging the internal reviews done by the EPA MERL and FRMAC FAL to reduce the QA Specialist workload.
3. Continue refining the RAMS support to the data review process, including evaluating the relationships between the Result, Required Lc, and Measured Lc.

Attachment 1
Example - NL16 Analysis Instruction Sheet_ARF_001

	**Federal Radiological Monitoring and Assessment Center** Laboratory Analysis Instructions for samples submitted during an emergency response
Hazard Identification and Safety Considerations	The laboratory may receive samples containing known, suspected, or unknown amounts of chemical, radioactive, and/or biological hazardous constituents. The laboratory shall be aware of the potential hazards associated with the handling and analysis of these samples. The laboratory shall have a documented health and safety plan that includes procedures consistent with Title 10 Code of Federal Regulations (CFR) Parts 20 and 835, and 29 CFR Part 1910.1450. While the FRMAC will provide available hazards information to the laboratory, it is the laboratory' s responsibility to take all necessary precautions to ensure the safety and health of its employees.
Analytical Request Form	An Analytical Request Form (ARF) has been submitted with a collection of samples to your laboratory. This ARF serves as the official chain-of custody and should reflect a continuity of possession for the group of samples. The ARF contains the most current contact information for FRMAC personnel. Please use this contact information with any questions regarding the submitted samples or the analyses requested. If you are an onsite laboratory, your POC will be the onsite Deputy Laboratory Analysis Manager. The first page of the form includes information that pertains to the samples as a whole. The ARF contains a table of information that constitutes the analysis request. Should you choose to assign an alternate ID to any samples using an internal identification system there must be a key linking the FRMAC Sample I.D. to the laboratory I.D. that is submitted with the results. This documentation shall be included in the electronic and the hardcopy results submission. When applicable, decay correct all results to the Sample Date/Time. Volume(s)/Weight(s) listed on the ARF for samples other than air filters or swipes are nominal values and should not be used as the analytical sample amount. The preservative field will list if and what was used to preserve the sample. If this field is blank, the sample has not been treated in any way. The Contact Dose Rate is the result of a gross ß/? measurement that is specific to the sample alone. The Isotope(s) listed on the ARF represent the analyte(s) of interest that the sample is to be analyzed for using the method listed in the Analysis Method field. The sample must be counted sufficiently so that the measured critical level (measured Lc) achieves the listed required critical level (required Lc), unless otherwise stated in this document. The analyte-specific comments field is used for information pertaining to the individual sample-analyte. A result value is expected for each analyte listed on the table. Nuclides that are not included in the table but are detected above the measured Lc should be reported.
Sample Batching Requirements	Samples submitted under a single ARF may be grouped in multiple analytical batches. Batches should contain only FRMAC samples and any Laboratory quality control samples (Laboratory control sample, Method Blank, Matrix Blank, etc.) that are applicable to the sample preparation and analysis method used.
Reporting Units	Report all results, uncertainties, and measured Lc in the units of the required Lc as printed on the ARF, unless otherwise stated in this document.

Reporting electronic Results	You will be sent a separate set of instructions regarding the electronic reporting of results and the submission of preliminary electronic reports through the internet. Do not have sample results from multiple ARF's on one Electronic Data Deliverable or electronic report. Using the FRMAC "Lab Qualifier" field in electronic data: Analytical results that are found to be below the measured critical level should be flagged with an upper-case "U". Analytical results that are determined by the laboratory to be estimated are to be flagged with an upper-case "J" with the basis provided in the report and in the comments field on the electronic data deliverable (EDD). Analytical results that are determined by the laboratory to be unsupportable (i.e. rejected) are to be flagged with an upper-case "R" with the basis provided in the report and in the comments field on the electronic data deliverable (EDD). If the analytical result does not meet any of the conditions stated above and otherwise pass your laboratory's other QC requirements, the Lab Qualifier field shall be an upper-case "A"
Reporting Hardcopy Results	The FRMAC requests that all sample result records include a legally-defensible level 4 data package. Refer to the description of the Level 4 data package in the model Scope of Work (SOW) section of the most current FRMAC Laboratory Analysis Manual unless otherwise provided. Please send all hardcopy results via the FRMAC Web Portal or to the point of contact listed on the first page of the ARF.
Special Instructions for samples that are dried in the laboratory	It is preferred that all data (results, uncertainty, measurement Lc) for Ground Deposition/Soil samples are reported in uCi/kg using the wet mass of the entire sample as measured by the analytical laboratory. Both the wet and dry sample mass is to be reported as well as which mass was used in determining the activity concentration in uCi/kg.

Attachment 2
Evaluation of FRMAC Analysis Instruction Sheet (AIS)

- **ARF discussion section – some elements that may cause confusion**
    - "When applicable, decay correct all results to the Sample Date/Time."
        - Question (Q): Is it made clear to the lab when this is applicable?
        - Q: Are labs having a problem with this request?
    - "Volume(s)/Weight(s) listed on the ARF for samples other than air filters or swipes are nominal values and should not be used as the analytical sample amount."
        - Q: Does this mean the lab is only to use FRMAC data for air filters and swipes? And if so, should this information for the other matrices be removed from the ARF?
        - Q: Have the labs had challenges incorporating the volume/weight into calculations to provide activity concentration data?
    - "The Isotope(s) listed on the ARF represent the analyte(s) of interest that the sample is to be analyzed for using the method listed in the Analysis Method field."
        - Q: Has prescribing the analysis method required resolution prior to the lab beginning prep and/or analysis?
    - "The sample must be counted sufficiently so that the measured critical level (measured Lc) achieves the listed required critical level (required Lc), unless otherwise stated in this document."
        - Q: Have we identified which radionuclides the labs have had routine issues with meeting the Required Lc? Do we have a strategy to address those issues? Is relaxing the Required Lc = 0.1AAL an option? For example, maybe 0.5AAL is acceptable during the early phase?
    - "A result value is expected for each analyte listed on the table."
        - Q: Is this a challenge for the labs? If so, have we developed a strategy to address it?
    - "Nuclides that are not included in the table but are detected above the measured Lc should be reported."
        - Q: Is this a challenge for the labs?
- **Sample Batching Requirements**
        - Q: does our FRMAC-only sample batching requirement cause problems for the labs?

        - Comment: This may not be a problem for labs dedicated to FRMAC sample analyses, or if FRMAC provides sufficient sample loads to fill a batch. But this would likely cause labs additional effort at the point that there aren't enough FRMAC samples to constitute a complete batch and/or the lab has clients besides FRMAC.
- **Reporting Units**
    - Q: have the labs had issues reporting
        - Results, Uncertainties, and Measured Lc?
        - In the correct units?
- **Reporting electronic Results**
    - Q: specifically, what challenges are the labs having – Excel format, data for fields, qualifiers, other?
- **Reporting Hardcopy Results**
    - We should indicate that a Level 4 will be required at some point, but that initially much less is needed.
- **Special Instructions for samples that are dried in the laboratory**
    - This capability could be a pre-determining factor for which labs could do this work.

Analysis Request # **ARF-001**

Attachment 3

FRMAC Analytical Request Form

Laboratory Information		Report & Turnaround Information	
Event: Laboratory:	Northern Lights 2016	**Send Report To:**	FRMAC
Laboratory POC:	Sandia National Laboratories	**Phone:**	
Phone:		**Fax: Email:**	
Fax: Email:		**Turnaround Date:**	10/17/2016 1:00:00PM

Sample Hazards/Comments/Additional Information:

Samples are associated with a signed S.O.W. ( ) yes (X) no

Analysis entered here agrees with the S.O.W. ( ) yes (X) no

If not, identify the variation:

Special Instructions:

- When calculating MDA values please consider parent/daughter relationships (e.g. if in equilibrium use the parent half-life and abundance).
- Please indicate in the case narrative if you DID or DID NOT performed any cascade summing corrections for any isotopes (e.g. Cs-134).
- Samples were irradiated 22 days prior to collection date/time
- Decay correct all results to the sample collection date/time, NOT the irradiation date
- Report all nuclides detected even if they are not specifically requested on the analysis request form
- Gamma spectroscopy for water and air matrices please count for 100 minutes
- For Sr89/90 analysis for water matrix please count for 60 minutes

*Report sample results in the same units as the required Lc

FRMAC Analytical Request Form

SCF-8001	Collection Date/Time(UTC)	Sample Matrix	Sample Size
	28-Sep-2016 4:00	Soil	100 grams

Contact Dose Rate	Requested Analyte	*Required Lc		Analysis Method	Comments
1.00E+000 mR/hr	Ba-140	8.06E-002	uCi/kg	Gamma Spectroscopy	Soil
1.00E+000 mR/hr	Cs-134	9.68E-002	uCi/kg	Gamma Spectroscopy	Soil
1.00E+000 mR/hr	Cs-137	6.69E-002	uCi/kg	Gamma Spectroscopy	Soil
1.00E+000 mR/hr	I-131	8.29E-001	uCi/kg	Gamma Spectroscopy	Soil
1.00E+000 mR/hr	I-133	4.36E-001	uCi/kg	Gamma Spectroscopy	Soil
1.00E+000 mR/hr	La-140	1.18E-003	uCi/kg	Gamma Spectroscopy	Soil
1.00E+000 mR/hr	Mo-99	1.88E-001	uCi/kg	Gamma Spectroscopy	Soil
1.00E+000 mR/hr	Rb-86	1.31E-003	uCi/kg	Gamma Spectroscopy	Soil
1.00E+000 mR/hr	Ru-106	2.47E-002	uCi/kg	Gamma Spectroscopy	Soil
1.00E+000 mR/hr	Sb-127	8.15E-002	uCi/kg	Gamma Spectroscopy	Soil
1.00E+000 mR/hr	Tc-99m	5.16E-002	uCi/kg	Gamma Spectroscopy	Soil
1.00E+000 mR/hr	Te-127m	1.14E-002	uCi/kg	Gamma Spectroscopy	Soil
1.00E+000 mR/hr	Te-129m	4.68E-002	uCi/kg	Gamma Spectroscopy	Soil
1.00E+000 mR/hr	Te-132	7.36E-001	uCi/kg	Gamma Spectroscopy	Soil
1.00E+000 mR/hr	Y-91	2.93E-006	uCi/kg	Gamma Spectroscopy	Soil

*Report sample results in the same units as the required Lc

FRMAC Analytical Request Form

SCF-8002

Collection Date/Time(UTC)	Sample Matrix	Sample Size
28-Sep-2016 4:00	Soil	100 grams

Contact Dose Rate	Requested Analyte	*Required Lc		Analysis Method	Comments
1.00E+000 mR/hr	Ba-140	8.06E-002	uCi/kg	Gamma Spectroscopy	SOIL
1.00E+000 mR/hr	Cs-134	9.68E-002	uCi/kg	Gamma Spectroscopy	SOIL
1.00E+000 mR/hr	Cs-137	6.69E-002	uCi/kg	Gamma Spectroscopy	SOIL
1.00E+000 mR/hr	I-131	8.29E-001	uCi/kg	Gamma Spectroscopy	SOIL
1.00E+000 mR/hr	I-133	4.36E-001	uCi/kg	Gamma Spectroscopy	SOIL
1.00E+000 mR/hr	La-140	1.18E-003	uCi/kg	Gamma Spectroscopy	SOIL
1.00E+000 mR/hr	Mo-99	1.88E-001	uCi/kg	Gamma Spectroscopy	SOIL
1.00E+000 mR/hr	Rb-86	1.31E-003	uCi/kg	Gamma Spectroscopy	SOIL
1.00E+000 mR/hr	Ru-106	2.47E-002	uCi/kg	Gamma Spectroscopy	SOIL
1.00E+000 mR/hr	Sb-127	8.15E-002	uCi/kg	Gamma Spectroscopy	SOIL
1.00E+000 mR/hr	Tc-99m	5.16E-002	uCi/kg	Gamma Spectroscopy	SOIL
1.00E+000 mR/hr	Te-127m	1.14E-002	uCi/kg	Gamma Spectroscopy	SOIL
1.00E+000 mR/hr	Te-129m	4.68E-002	uCi/kg	Gamma Spectroscopy	SOIL
1.00E+000 mR/hr	Te-132	7.36E-001	uCi/kg	Gamma Spectroscopy	SOIL
1.00E+000 mR/hr	Y-91	2.93E-006	uCi/kg	Gamma Spectroscopy	SOIL

*Report sample results in the same units as the required Lc

FRMAC Analytical Request Form

SCF-8003

Collection Date/Time(UTC)	Sample Matrix	Sample Size
28-Sep-2016 4:00	Soil	100 grams

Contact Dose Rate	Requested Analyte	*Required Lc		Analysis Method	Comments
1.00E+000 mR/hr	Ba-140	8.06E-002	uCi/kg	Gamma Spectroscopy	SOIL
1.00E+000 mR/hr	Cs-134	9.68E-002	uCi/kg	Gamma Spectroscopy	SOIL
1.00E+000 mR/hr	Cs-137	6.69E-002	uCi/kg	Gamma Spectroscopy	SOIL
1.00E+000 mR/hr	I-131	8.29E-001	uCi/kg	Gamma Spectroscopy	SOIL
1.00E+000 mR/hr	I-133	4.36E-001	uCi/kg	Gamma Spectroscopy	SOIL
1.00E+000 mR/hr	La-140	1.18E-003	uCi/kg	Gamma Spectroscopy	SOIL
1.00E+000 mR/hr	Mo-99	1.88E-001	uCi/kg	Gamma Spectroscopy	SOIL
1.00E+000 mR/hr	Rb-86	1.31E-003	uCi/kg	Gamma Spectroscopy	SOIL
1.00E+000 mR/hr	Ru-106	2.47E-002	uCi/kg	Gamma Spectroscopy	SOIL
1.00E+000 mR/hr	Sb-127	8.15E-002	uCi/kg	Gamma Spectroscopy	SOIL
1.00E+000 mR/hr	Tc-99m	5.16E-002	uCi/kg	Gamma Spectroscopy	SOIL
1.00E+000 mR/hr	Te-127m	1.14E-002	uCi/kg	Gamma Spectroscopy	SOIL
1.00E+000 mR/hr	Te-129m	4.68E-002	uCi/kg	Gamma Spectroscopy	SOIL
1.00E+000 mR/hr	Te-132	7.36E-001	uCi/kg	Gamma Spectroscopy	SOIL
1.00E+000 mR/hr	Y-91	2.93E-006	uCi/kg	Gamma Spectroscopy	SOIL

*Report sample results in the same units as the required Lc

FRMAC Analytical Request Form

SCF-8004	Collection Date/Time(UTC)	Sample Matrix	Sample Size
	28-Sep-2016 4:00	Soil	100 grams

Contact Dose Rate	Requested Analyte	*Required Lc		Analysis Method	Comments
1.00E+000 mR/hr	Ba-140	8.06E-002	uCi/kg	Gamma Spectroscopy	SOIL
1.00E+000 mR/hr	Cs-134	9.68E-002	uCi/kg	Gamma Spectroscopy	SOIL
1.00E+000 mR/hr	Cs-137	6.69E-002	uCi/kg	Gamma Spectroscopy	SOIL
1.00E+000 mR/hr	I-131	8.29E-001	uCi/kg	Gamma Spectroscopy	SOIL
1.00E+000 mR/hr	I-133	4.36E-001	uCi/kg	Gamma Spectroscopy	SOIL
1.00E+000 mR/hr	La-140	1.18E-003	uCi/kg	Gamma Spectroscopy	SOIL
1.00E+000 mR/hr	Mo-99	1.88E-001	uCi/kg	Gamma Spectroscopy	SOIL
1.00E+000 mR/hr	Rb-86	1.31E-003	uCi/kg	Gamma Spectroscopy	SOIL
1.00E+000 mR/hr	Ru-106	2.47E-002	uCi/kg	Gamma Spectroscopy	SOIL
1.00E+000 mR/hr	Sb-127	8.15E-002	uCi/kg	Gamma Spectroscopy	SOIL
1.00E+000 mR/hr	Tc-99m	5.16E-002	uCi/kg	Gamma Spectroscopy	SOIL
1.00E+000 mR/hr	Te-127m	1.14E-002	uCi/kg	Gamma Spectroscopy	SOIL
1.00E+000 mR/hr	Te-129m	4.68E-002	uCi/kg	Gamma Spectroscopy	SOIL
1.00E+000 mR/hr	Te-132	7.36E-001	uCi/kg	Gamma Spectroscopy	SOIL
1.00E+000 mR/hr	Y-91	2.93E-006	uCi/kg	Gamma Spectroscopy	SOIL

*Report sample results in the same units as the required Lc

FRMAC Analytical Request Form

SCF-8005

Collection Date/Time(UTC)	Sample Matrix	Sample Size
28-Sep-2016 4:00	Soil	100 grams

Contact Dose Rate	Requested Analyte	*Required Lc		Analysis Method	Comments
5.00E+001 uR/hr	Ba-140	8.06E-002	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	Cs-134	9.68E-002	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	Cs-137	6.69E-002	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	I-131	8.29E-001	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	I-133	4.36E-001	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	La-140	1.18E-003	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	Mo-99	1.88E-001	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	Rb-86	1.31E-003	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	Ru-106	2.47E-002	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	Sb-127	8.15E-002	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	Tc-99m	5.16E-002	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	Te-127m	1.14E-002	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	Te-129m	4.68E-002	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	Te-132	7.36E-001	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	Y-91	2.93E-006	uCi/kg	Gamma Spectroscopy	SOIL

*Report sample results in the same units as the required Lc

FRMAC Analytical Request Form

SCF-8006

Collection Date/Time(UTC)	Sample Matrix	Sample Size
28-Sep-2016 4:00	Soil	100 grams

Contact Dose Rate	Requested Analyte	*Required Lc		Analysis Method	Comments
5.00E+001 uR/hr	Ba-140	8.06E-002	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	Cs-134	9.68E-002	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	Cs-137	6.69E-002	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	I-131	8.29E-001	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	I-133	4.36E-001	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	La-140	1.18E-003	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	Mo-99	1.88E-001	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	Rb-86	1.31E-003	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	Ru-106	2.47E-002	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	Sb-127	8.15E-002	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	Tc-99m	5.16E-002	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	Te-127m	1.14E-002	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	Te-129m	4.68E-002	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	Te-132	7.36E-001	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	Y-91	2.93E-006	uCi/kg	Gamma Spectroscopy	SOIL

*Report sample results in the same units as the required Lc

Report Generated: 9/30/2016

FRMAC Analytical Request Form

SCF-8007	Collection Date/Time(UTC)	Sample Matrix	Sample Size
	28-Sep-2016 4:00	Soil	100 grams

Contact Dose Rate	Requested Analyte	*Required Lc		Analysis Method	Comments
5.00E+001 uR/hr	Ba-140	8.06E-002	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	Cs-134	9.68E-002	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	Cs-137	6.69E-002	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	I-131	8.29E-001	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	I-133	4.36E-001	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	La-140	1.18E-003	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	Mo-99	1.88E-001	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	Rb-86	1.31E-003	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	Ru-106	2.47E-002	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	Sb-127	8.15E-002	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	Tc-99m	5.16E-002	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	Te-127m	1.14E-002	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	Te-129m	4.68E-002	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	Te-132	7.36E-001	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	Y-91	2.93E-006	uCi/kg	Gamma Spectroscopy	SOIL

*Report sample results in the same units as the required Lc

FRMAC Analytical Request Form

SCF-8008	Collection Date/Time(UTC)	Sample Matrix	Sample Size
	28-Sep-2016 4:00	Soil	100 grams

Contact Dose Rate	Requested Analyte	*Required Lc		Analysis Method	Comments
5.00E+001 uR/hr	Ba-140	8.06E-002	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	Cs-134	9.68E-002	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	Cs-137	6.69E-002	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	I-131	8.29E-001	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	I-133	4.36E-001	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	La-140	1.18E-003	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	Mo-99	1.88E-001	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	Rb-86	1.31E-003	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	Ru-106	2.47E-002	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	Sb-127	8.15E-002	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	Tc-99m	5.16E-002	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	Te-127m	1.14E-002	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	Te-129m	4.68E-002	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	Te-132	7.36E-001	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	Y-91	2.93E-006	uCi/kg	Gamma Spectroscopy	SOIL

*Report sample results in the same units as the required Lc

FRMAC Analytical Request Form

SCF-8009

Collection Date/Time(UTC)	Sample Matrix	Sample Size
28-Sep-2016 4:00	Soil	100 grams

Contact Dose Rate	Requested Analyte	*Required Lc		Analysis Method	Comments
5.00E+001 uR/hr	Ba-140	8.06E-002	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	Cs-134	9.68E-002	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	Cs-137	6.69E-002	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	I-131	8.29E-001	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	I-133	4.36E-001	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	La-140	1.18E-003	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	Mo-99	1.88E-001	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	Rb-86	1.31E-003	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	Ru-106	2.47E-002	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	Sb-127	8.15E-002	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	Tc-99m	5.16E-002	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	Te-127m	1.14E-002	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	Te-129m	4.68E-002	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	Te-132	7.36E-001	uCi/kg	Gamma Spectroscopy	SOIL
5.00E+001 uR/hr	Y-91	2.93E-006	uCi/kg	Gamma Spectroscopy	SOIL

*Report sample results in the same units as the required Lc

FRMAC Analytical Request Form

SCF-8010

Collection Date/Time(UTC)	Sample Matrix	Sample Size
28-Sep-2016 4:00	Soil	Not provided

Contact Dose Rate	Requested Analyte	*Required Lc		Analysis Method	Comments
5.00E+001 uR/hr	Ba-140	See Comment	uCi/kg	Gamma Spectroscopy	Count Time: 2 mins SOIL
5.00E+001 uR/hr	Cs-134	See Comment	uCi/kg	Gamma Spectroscopy	Count Time: 2 mins SOIL
5.00E+001 uR/hr	Cs-137	See Comment	uCi/kg	Gamma Spectroscopy	Count Time: 2 mins SOIL
5.00E+001 uR/hr	I-131	See Comment	uCi/kg	Gamma Spectroscopy	Count Time: 2 mins SOIL
5.00E+001 uR/hr	I-133	See Comment	uCi/kg	Gamma Spectroscopy	Count Time: 2 mins SOIL
5.00E+001 uR/hr	La-140	See Comment	uCi/kg	Gamma Spectroscopy	Count Time: 2 mins SOIL
5.00E+001 uR/hr	Mo-99	See Comment	uCi/kg	Gamma Spectroscopy	Count Time: 2 mins SOIL
5.00E+001 uR/hr	Rb-86	See Comment	uCi/kg	Gamma Spectroscopy	Count Time: 2 mins SOIL
5.00E+001 uR/hr	Ru-106	See Comment	uCi/kg	Gamma Spectroscopy	Count Time: 2 mins SOIL
5.00E+001 uR/hr	Sb-127	See Comment	uCi/kg	Gamma Spectroscopy	Count Time: 2 mins SOIL
5.00E+001 uR/hr	Tc-99m	See Comment	uCi/kg	Gamma Spectroscopy	Count Time: 2 mins SOIL
5.00E+001 uR/hr	Te-127m	See Comment	uCi/kg	Gamma Spectroscopy	Count Time: 2 mins SOIL
5.00E+001 uR/hr	Te-129m	See Comment	uCi/kg	Gamma Spectroscopy	Count Time: 2 mins SOIL
5.00E+001 uR/hr	Te-132	See Comment	uCi/kg	Gamma Spectroscopy	Count Time: 2 mins SOIL
5.00E+001 uR/hr	Y-91	See Comment	uCi/kg	Gamma Spectroscopy	Count Time: 2 mins SOIL

*Report sample results in the same units as the required Lc

FRMAC Analytical Request Form

Custody Transfer:

Relinquished By: (print)	Signature	Date/Time	Received By: (print)	Signatures/Time	
Barcode labels:					

Attachment 4
Detailed Evaluation of FRMAC Analysis Request Form (ARF)

- Laboratory and FRMAC LA contact information
  - Q: Are the primary POCs sufficient, or would additional POC information be beneficial in supporting data turnarounds? For example, instead of the FRMAC LA Manager, should the Deputy and/or CMHT be identified, since they will routinely interface with the lab?
- Items related to S.O.W. – suggest these be removed to avoid potential confusion.
- Special Instructions
  - Providing instructions for samples that are not included on the ARF may cause confusion.
- Sample-specific analysis directions
  - Has this format been acceptable

Attachment 5

FRMAC Data Validation Form

DATA VERIFICATION FORM

Event: Northern Lights 2016 **Laboratory:** SRS			**Analysis Request#:**	ARF-001
Item	**RAMS**	**Hardcopy**	**Comments**	
Issues identified prior to analysis that affect the data	N/A	N/A		
Custody records continuous and complete	N/A	Y		
Requested radionuclides were reported	Y	Y	Additional radionuclides reported	
Correct SCF Sample ID numbers	Y	Y		
Correct reporting units	Y	Y		
Uncertainty reported (1 or 2-sigma indicated	Y	Y	1 sigma	
Detection and Quantitation Limits met	Y	Y		
Electronic data compare correctly against Hardcopy	Y	Y		
Hardcopy deliverable level is correct (1 or 2) and complete	N/A	Y		
QC data meet requirements	N	Y	QC data not uploaded. Requirements met per case narrative provided by lab.	
Approved by (sign & date):				

Attachment 6

Detailed Lessons Learned from Drills/Exercises that would affect the Early Phase of the Response

Description (Lessons Learned)	Responsible Agency/Program
Data users have an unrealistic expectation timeline on how long it takes to analyze samples. Develop a standard analysis timeline to provide to analytical data users (LL3)	FRMAC-LA
Develop standard laboratory qualification criteria (LL5)	FRMAC-LA
QA/QC data verification process is cumbersome. Need a purpose driven QA process. Potentially do not need to check LCS acceptance criteria for EPA MERL results, etc. (LL8,90,102&256).	FRMAC-LA
FRMAC must have the flexibility to have ICLN laboratories report directly to FRMAC. (LL9)	ICLN
Samples logged in using Rad Responder did not get into RAMS. (LL10)	Chainbridge
Labs had a hard time meeting required Lc. No clear guidance from stakeholders as to what an acceptable analysis would be in this situation. Work with data users to develop guidance on what to do in those situations (LL12)	FRMAC
Samples were not efficiently analyzed due to batch sizes and matrices. Update FRMAC ARF job aids with guidance on how to batch samples on the ARF for efficient sample analysis at the laboratory (LL16)	FRMAC-LA
Labs had difficulties reporting results for non-detected radionuclides. (LL20)	FRMAC
FRMAC deputy lab manager and QA specialist needs coordination with EPA QA officer (if deployed). (LL23)	FRMAC-LA & EPA
Tendency to rely on SME for RAMS and QA questions; not enough FRMAC staff proficient in RAMS operations. Provide supplemental training to responders (LL28)	FRMAC-LA
Considerable time was spent filling out EPA and DOE paperwork prior to the onset of analysis. EPA and DOE work together to integrate FRMAC Laboratory Questionnaire with the EPA Project Acceptance Form (LL28,267,270)	FRMAC & EPA
Loadout gear is not complete or sometimes not functional upon arrival at scene. Revise process to keep loadout gear in a ready and operational state (LL31)	FRMAC
Need a way to store the FRMAC initial laboratory questionnaire information in RAMS (LL57)	Chainbridge
The iSOLO EDD generator was not usable. Data had to be hand-entered into the spreadsheet which lead to transcription errors and valuable. Develop an automated	DOE FAL

process to develop the EDD for the iSOLO instrumentation time wasted. (LL63)	
Need an additional gamma spectrometry unit to improve turn-around time and serve as a back-up unit as well as support shipping efforts. (LL66,112)	DOE FAL
The ability to quickly scale FAL gamma spec capability by using RAP or field team detectives would be very useful. (LL73)	DOE FAL
On-site laboratory gamma systems were overwhelmed when used for shipping screening. Evaluate using a sodium iodide, LaBr or Inspector detector as a backup gamma spec system for the FAL. LaBr or NaI for shipping characterization. (LL74)	DOE FAL
The FAL received a request to analyze spectra from and ORTEC detective and was unable to do so making sample data unusable. Develop Gamma Spectroscopist Position. (LL84)	FRMAC-LA
EPA personnel have not been trained or are familiar with FRMAC Lab Analysis processes and likewise FRMAC personnel not familiar with EPA processes. Train EPA personnel on FRMAC processes and train FRMAC personnel on EPA processes (LL86)	FRMAC & EPA
Because of training requirements and experience necessary to fulfill some positions, it was not always effective to move staff around amongst other functional roles within Lab Analysis. Evaluate FRMAC training requirements (LL94)	FRMAC-LA
EPA TTL and FRMAC TTL positions were vital to the exercise. EPA and DOE should consider formalizing these positions. (LL95)	FRMAC & EPA
Sample Priorities were unclear which caused analytical delays. Develop an Action Tracker System that is not overly complicated to communicate priorities (LL98)	FRMAC
The Web portal is not currently on a stable platform with regards to immediate bug fixes during a response. Consider moving the Web portal maintenance under the RAMS maintenance umbrella (LL100,186)	FRMAC
All Deputy Lab Managers, Lab Analysis Managers, CMHT personnel and a few others need access to email as well as RAMS. An option is to use 2 computers, one connected to home office computer and the other FRMAC computer connected to RAMS. Another option is to run RAMS and email (VPN or VMware) from my (their) VDI (home office computer). This is often a slower connection to RAMS but is more convenient to have email and RAMS access. (LL132)	FRMAC
The ICLN portal DEU needs to function with all types of browsers and the meeting/conference call setup needs to be	ICLN

more intuitive (LL144)	
The Lab names in RAMS and the Web portal are not matching up which caused confusing communication requests to the analytical laboratories (LL152)	RAMS/Chainbridge
Need a way to print the SCF forms from RAMS again (LL155)	RAMS/Chainbridge
Need more robust error checking on the RAMS uploader (LL158)	RAMS/Chainbridge
Need ability to attach files/spectra to samples and V&V forms to ARF's (LL162,165)	RAMS/Chainbridge
RAMS needs the flexibility to import data from external agencies into the main results table Data from the ICLN DEU cannot go into the RAMS results table (LL167,212)	RAMS
Evaluate the need to upload QC data or propose an alternate method other than the EDD (LL215,216,220)	FRMAC-LA
Many labs did not know what constituted a data package (LL188,199,207,208,272)	FRMAC-LA
FRMAC QA reviewers were not reading entire case narrative before requesting information from lab. Labs had to re-explain issues to several FRMAC staff leading to delays. (LL190)	FRMAC-LA
Many labs were not flexible enough in their SOPs to meet the DQOs required for an NPP response (LL191)	EPA MERL
Many labs face a lack of experience with complicated gamma spectra It would be great to have further training on calculation of decay chain yields with respect to decay equilibria of various fast fission nuclides. (LL193,195,224)	EPA MERL
Need more formalized process on how we screen labs before we send them sample (LL201)	FRMAC-LA
Need to evaluate the benefits of uploading censored data (reporting 0, or <MDA, etc.) (LL217)	FRMAC-LA
Consider obtaining a long background on the gamma detectors and store it to use in a response unless the background is considerably higher in an event. Both FAL and EPA MERL (LL225)	EPA MERL
FRMAC should consider placing a sticker on sample if it is above 1 mR/hr on contact. This will help the EPA MERL (LL227)	FRMAC-LA & EPA MERL
Consider adopting EPA MERL data qualifiers (U, R and J) (LL230,262)	DOE FAL & FRMAC-LA
Procedure setup is somewhat confusing. There are NAREL and MERL procedures but it is not clear when some of the NAREL procedures apply to MERL. (LL236)	EPA MERL

EPA to consider having a pre-deployment checklist (forms, supplies, etc…) or maintain in ready state at home base (LL237)	EPA MERL
Develop a process to allow for immediate changes in sample priority if the sample was already assigned to a work order and batched (LL240)	EPA MERL
Mobile Labs to consider developing a "Priority" lane for initial contamination checks (LL246,267)	EPA MERL & DOE FAL
EPA should consider accepting FRMAC's contamination check and just perform dose rate screen for sample preparation purposes	EPA MERL
Empower MERL QA officer to perform vital time critical decision in the field and not have to reach back to the QA at NAREL (e.g. field activities and non-conformances, etc..) (LL250)	EPA MERL
Batch samples per matrix and method so that they can remain together during the EPA batching process!!!!! Bring gamma samples in groups of minimum of 5 to maximize QC sample requirements Place URGENT samples on their own ARF and provide enough sample to make a duplicate (LL254,255,261,329)	FRMAC-LA
Mobile Laboratories - develop proficiency testing program to keep up skills (LL258,263)	EPA MERL & DOE FAL
Work with EPA to determine process for characterizing laboratory waste and implement (LL266)	EPA MERL & DOE FAL
Configure EPA LIMS to read in the Web portal ARF info file to speed up login (LL277)	EPA MERL
Create an EPA job aid to demonstrate best practices when it comes to batching samples to optimize sample throughput. Train staff using case studies so they know how to react to several common situations. (LL279)	EPA MERL
Integrate analytical balances to the bench sheet using the built-in premium data transfer mechanisms included in LIMS already. Reduce human error by eradicating data entry by keyboard. (LL282)	EPA MERL
XML should never be opened and read by a human for verification, this is a huge time sink. The XML transfer must be thoroughly tested and validated. (LL286,319)	EPA MERL
Consider programming or creating a tool in the EDD exporter (or even stored in LIMS) to auto-flag results lab qualifier ID based on the apostori Lc values. Currently this is done outside of LIMs and done manually which is prone to error. (LL289)	EPA MERL
FAL should evaluate MERL's data management architecture and bin process (LL296)	DOE FAL

EPA should consider building some more ASFs with more flexibility to handle non-routine samples or samples with very complex source terms (LL309)	EPA MERL
FAL should consider aligning their reference with MERL (LL312,314)	DOE FAL
FAL should consider acquiring the LABSOCS models of all the MERL geometries for conversion for use in the FAL for samples repackaged for FAL counting by SPL. All MERL geometries have already been created for cascade summing correction. FAL would simply reprocess them with the appropriate detector. (LL313)	DOE FAL
Give the SPL a list of LCS samples and which situations warrant which LSC. This allows the SPL users to batch the LCS with the other QC samples in the LIMS. This saves a several steps for the Gamma Analyst. The SPL could export the Apex import file as well giving the analyst only Back End LIMS responsibilities. This would make the process more efficient. (LL318)	EPA MERL
Do not use the work order as the overarching batch that must be completed before reporting. Redesign form to make the analytical batch the only batch that must be completed before reporting. This will vastly increase TAT as completed analysis will not withhold data waiting for other analytical batches unrelated to the analysis of the first sample (LL321)	EPA MERL
FAL should adopt frozen user and boundary flags based off similar criteria as EPA MERL. (LL326)	DOE FAL
FRMAC should consider specifying a count time range (i.e. 10-100 minutes) for its detectors in the Fly Away Laboratory Manual, like what EPA prescribes in their Standard Operating Procedures (SOPs) and incorporate into FAL Manual and training. (LL349)	DOE FAL & FRMAC-LA
The FAL should consider adopting some of the EPA's sample receipt procedures. (LL351)	DOE FAL

Attachment 7

Laboratory Information Summary

Laboratory Name: _____

Shipping Address: _____

_____

_____

_____

Contact Name: _____

Contact Phone/Fax Number: _____

Contact Email Address: _____

Alternate Contact: _____

Alternate Phone/Fax Number: _____

Alternate Email Address: _____

Please describe your laboratory sample acceptance limits:

If your laboratory can provide analysis for the matrices, please place a mark in the box. Please leave blank if your lab cannot perform the analysis

	Gamma Spectroscopy	**Alpha Spectroscopy**	**Gross Alpha/Beta (LSC/GPC/iMATIC) Please indicate which**	**Total Strontium**	**Strontium-89 / Strontium-90 Isotopic**	**Tritium**
Soil/Solid						
Air Filter						
Water						
Animal/Game						
Milk						
Food						

- Does your laboratory have sample homogenization capabilities? (Yes / No)