CHAPTER 10

Quality assurance (QA) consists of planned and systematic activities that give confidence in effluent monitoring and environmental surveillance programs results (NCRP 2012). Environmental surveillance programs should provide data of known quality for assessments and decision making. QA and quality control (QC) programs were maintained by Idaho National Laboratory (INL) contractors and laboratories performing environmental analyses.

GEL and Southwest Research Institute laboratories were rigorously assessed and audited in 2022 by the U.S. Department of Energy Consolidated Audit Program-Accreditation Program (DOECAP-AP), an approved third-party accrediting body. ALS-Fort Collins decided not to continue with the DOECAP-AP audit for 2022. Idaho State University's Environmental Assessment Laboratory and the Prime Laboratory are listed in their respective environmental program's approved vendor lists.

In 2022, GEL, Southwest Research Institute, ALS, and Idaho State University's Environmental Assessment Laboratory (ISU-EAL) participated in the Mixed Analyte Performance Evaluation Program (MAPEP) (performance test [PT] samples). Results are presented in Section 10.3.1.

In 2022, the environmental surveillance programs sent QC samples to the laboratories for the purpose of demonstrating that a laboratory can successfully analyze samples within performance criteria, as specified in respective contractor quality project plans. Results are summarized in Section 10.3.2. Data quality reviews were performed by the laboratories and any unusual conditions were addressed, identified, and, when necessary, corrective actions were prepared to improve processes.

The multifaceted approach to QA and QC used by the INL contractors provide confidence that all laboratory data reported for 2022 are reliable and of acceptable quality.

10. QUALITY ASSURANCE OF ENVIRONMENTAL SURVEILLANCE PROGRAMS

This chapter describes specific measures taken to ensure adequate data quality and summarizes performance.

10.1 Quality Assurance Policy and Requirements

The primary policy, requirements, and responsibilities for ensuring QA in U.S. Department of Energy (DOE) activities are provided in the following resources:

- DOE O 414.1D, Chg 2 (LtdChg), "Quality Assurance"
- 10 CFR 830, Subpart A, "Quality Assurance Requirements"
- U.S. Environmental Protection Agency (EPA) QA/G-4, *Guidance on Systematic Planning Using the Data Quality Objective (DQO) Process*
- EPA Intergovernmental Data Quality Task Force, *Uniform Federal Policy for Implementing Quality Systems: Evaluating, Assessing, and Documenting Environmental Data Collection/Use and Technology Programs* (EPA 2005)

- American Society of Mechanical Engineers NQA-1-2012, *Quality Assurance Requirement for Nuclear Facility Applications*.

These regulations specify 10 criteria of a quality program (presented in the gray text box). Additional QA program requirements in 40 CFR 61, Appendix B, Method 114, must be met for all new point sources of radiological air emissions, as required by 40 CFR 61, Subpart H.

Each INL Site contractor incorporates appropriate QA requirements to ensure that environmental samples are representative and complete and that data are reliable and defensible.

Required Criteria of a Quality Program

- Quality assurance program
- Personnel training and qualification
- Quality improvement process
- Documents and records
- Established work processes
- Established standards for design and verification
- Established procurement requirements
- Inspection and acceptance testing
- Management assessment
- Independent assessment

10.2 Program Elements and Supporting QA Process

According to the National Council on Radiation Protection and Measurements (NCRP 2012), QA is an integral part of every aspect of an environmental surveillance program, from the reliability of sample collection through sample transport, storage, processing, and measurement, to calculating results and formulating the report. Uncertainties in the environmental surveillance process can lead to the misinterpretation of data and errors in decisions based on the data. Every step in radiological effluent monitoring and environmental surveillance should be evaluated for integrity, and actions should be taken to evaluate and manage data uncertainty.

Meeting requirements of state regulations, EPA, and DOE orders are an important part of developing a successful and defensible environmental sampling surveillance program. Gathering quantitative and qualitative environmental surveillance data is unique to each surveillance program. All data from planning, sample collection and handling, sample analysis, data review and evaluation, and reporting is accurate, precise, complete, and representative to ensure defensibility. Approved, detailed procedures are maintained, adequate training is given, and documents are controlled by the INL contractors and analytical laboratories to ensure that data are of acceptable precision and accuracy.

The main elements of environmental surveillance programs implemented at the INL Site as well as the QA processes/activities that support them are shown in Figure 10-1 and discussed below.

10.2.1 Planning

Environmental surveillance activities are conducted by the following:

- INL contractor
- Idaho Cleanup Project (ICP) contractor
- U.S. Geological Survey (USGS).

Each INL Site contractor determines sampling requirements using the EPA DQO process (EPA 2006) or its equivalent. During this process, the project manager determines the type, amount, and quality of data needed to meet regulatory requirements, support decision making, and address stakeholder concerns.

Sitewide Monitoring Plans. The *Idaho National Laboratory Site Environmental Monitoring Plan* (DOE-ID 2014) and *Idaho National Laboratory Groundwater Monitoring and Contingency Plan Update* (DOE-ID 2021) summarize the various monitoring programs at the INL Site, including surveillance monitoring for air, water (surface, drinking, and ground), soil, biota, agricultural products, external radiation, ecological, and meteorological monitoring on and near the INL Site; and surveillance/compliance monitoring for effluent on the INL Site. The plans include the rationale for monitoring, the types of media monitored, where the monitoring is conducted, and information regarding access to analytical results.

QA Project Plan. Implementation of QA elements for sample collection and data assessment activities are documented by each INL Site contractor using EPA's recommended approach. The EPA policy on QA plans is based on the national consensus standard ANSI/ASQC E4-1994, *Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs*. DQOs are project-dependent and are determined based on the needs of the data users' and the purpose for which data are generated. DQOs, sampling and analysis plans, and

Technical Basis for Environmental Monitoring and Surveillance at the INL Site (DOE/ID-11485) are integrated into the INL Site contractors QA project plans. Quality elements applicable to environmental surveillance and decision making are specifically addressed in *EPA Requirements for Quality Assurance Project Plans* (EPA 2001).

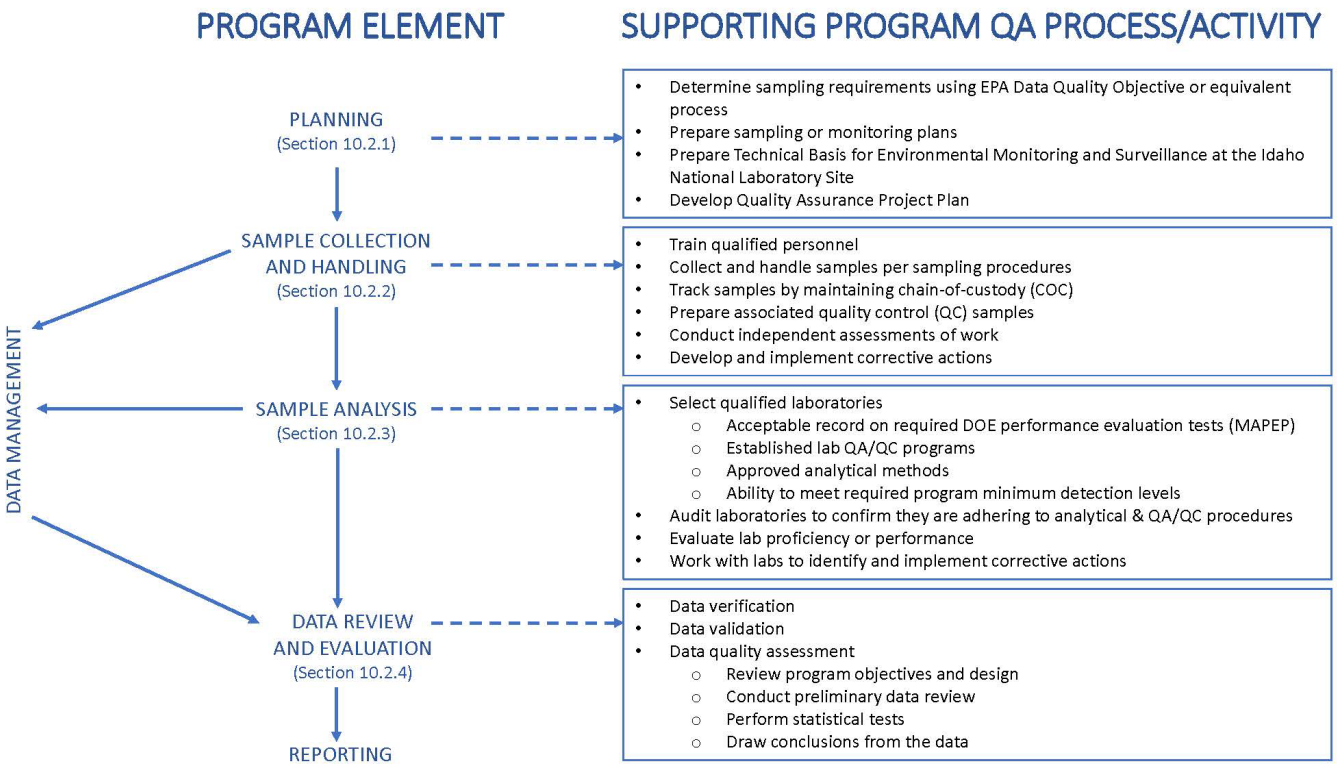

Figure 10-1. Flow of environmental surveillance program elements and associated QA processes and activities.

A QA project plan serves to ensure that all data collected are of known and defensible quality and meet the requirements of all applicable federal and state regulations and DOE orders. These plans include the following:

- INL contractor
  - *Environmental Monitoring Services Quality Assurance Project Plan* (PLN-6690)
  - *Quality Assurance Program Description* (PDD-13000)
- ICP contractor
  - *Quality Assurance Project Plan* (PLN-5199)
- USGS
  - *Field Methods, Quality Assurance, and Data Management Plan for Water-Quality Activities and Water-Level Measurements, INL, Idaho* (DOE/ID-22253).

10.2.2 Sample Collection and Handling

Defensible laboratory data is a critical component of any environmental program. Field sample collection and handling coupled with a chain-of-custody that shows unique sample identification, weight, sample preservation, volume, holding time, approved procedures, and request of laboratory analysis are important steps of good defensible quality data.

Strict adherence to program procedures is an implicit foundation of QA. In 2022, samples were collected and handled by trained personnel according to documented program procedures. Sample integrity was maintained through a system of sample custody records. Work execution assessments were routinely conducted by personnel independent of the work activity. Deficiencies were addressed by follow-up and corrective actions. Quality assessments are tracked in contractor-maintained systems.

What is the difference between Quality Assurance and Quality Control in an environmental program?

- Quality assurance (QA) is an integrated system of management activities designed to ensure quality in the processes used to produce environmental data. The goal of QA is to improve processes so that results are within acceptable ranges.
- Quality control (QC) is a set of activities that provide program oversight (i.e., a means to review and control the performance of various aspects of the QA program). QC provides assurance that the results are what is expected.

QC sampling elements, as shown in Figure 10-2, are used by the contractor to validate the collection process and verify the quality of laboratory preparation and analysis. These included the collection of trip blanks, field blanks, equipment blanks, split samples, sample duplicates, and PE samples.

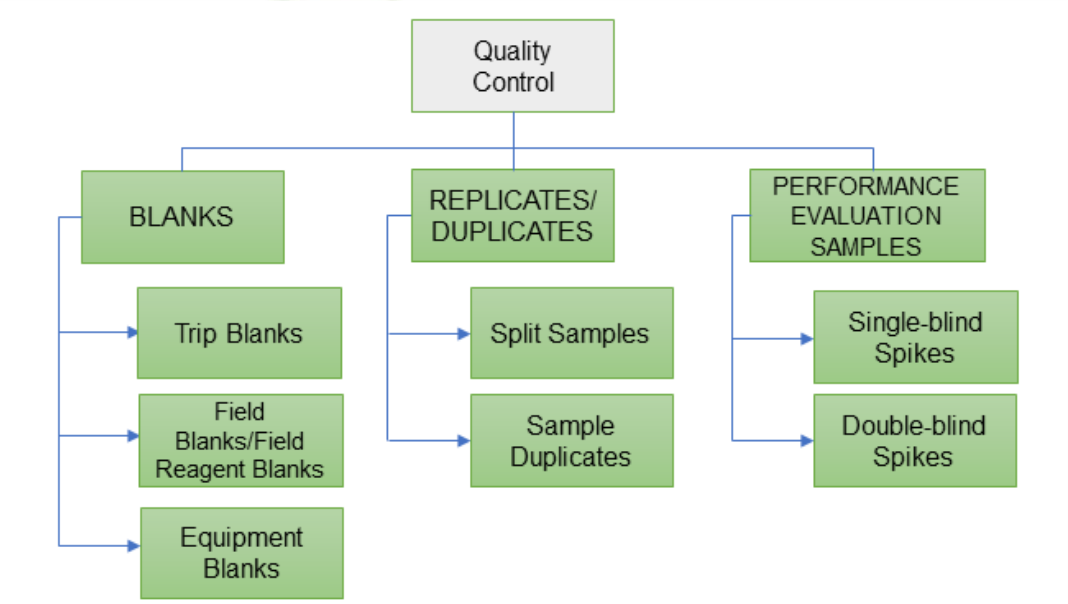

Figure 10-2. QC sampling elements.

10.2.3 Sample Analysis

Laboratories used for routine analyses of radionuclides in environmental media were selected by INL contractors based on each laboratory's capabilities to meet program objectives, such as the ability to meet required detection levels, and past results in PT programs. Programs exist to help contract holders conduct and assess a laboratory's ongoing performance. Requirements for participation in specific programs are at the discretion of the contract holder. One program, the DOECAP-AP, accredits laboratories in meeting the requirements outlined in the Quality System Manual (QSM 2021). No major findings were identified by DOECAP-AP for GEL Laboratory and Southwest Research Institute (SwRI) Laboratory that would influence the defensibility or quality of laboratory data in 2022. ALS Laboratory closed in 2022 and will not be participating in the DOECAP-AP.

For more information on DOECAP-AP, visit the DOE Analytical Services Program webpage at www.energy.gov/ehss/analytical-services-program.

Laboratory data quality is continually verified by QC samples, as observed in Figure 10-3, and includes calibration verifications, blanks, replicates/duplicates, intra-laboratory, and PT samples.

The analytical laboratory may use several of the laboratory QC measurement elements identified in Figure 10-3. Results of the laboratory QC are presented to the INL Site contractors as a data package and provide assurance that the reported data are usable and defensible.

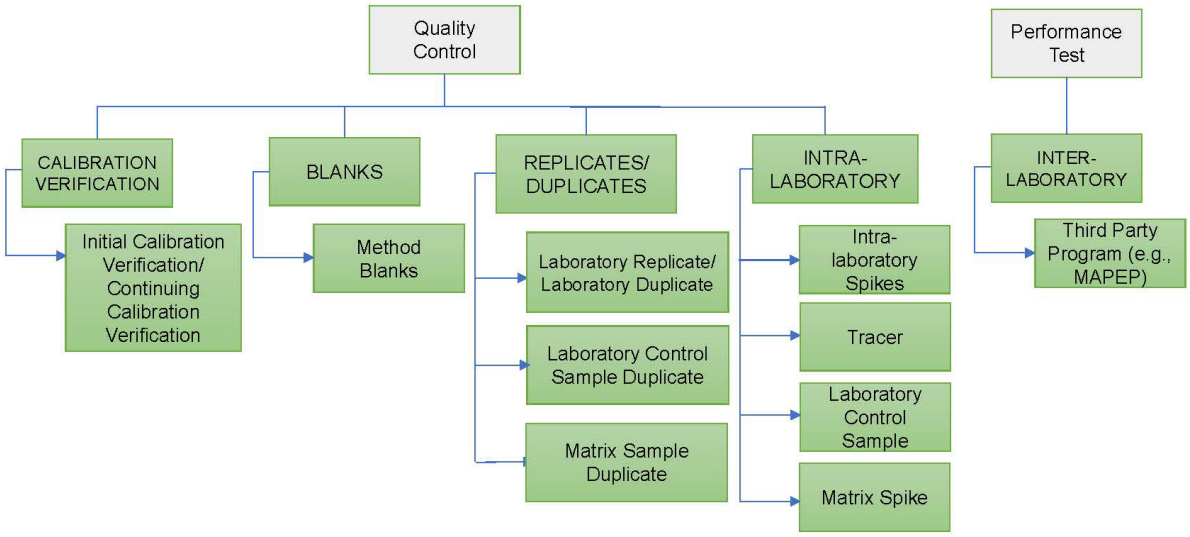

Figure 10-3. Laboratory measurement elements.

10.2.4 Data Review and Evaluation

Data INL Site contractors generate are routinely evaluated to understand and sustain the data quality. This enables the program to determine whether the DQO's established in the planning phase were achieved and whether the laboratory is performing within its QA/QC requirements.

An essential component of data evaluation is the availability of reliable, accurate, and defensible records for all phases of the program, including sampling, analysis, and data management.

Environmental data are subject to data verification, data validation, and data quality assessment.

The INL Site contractors send media-specific QC samples to the laboratories for the purpose of testing the laboratories' ability to successfully analyze samples within performance criteria as specified in each respective contractor quality project plans. These are compared with PT results and can provide valuable indicators that further QC testing may be required.

10.2.4.1 QC Review

Figure 10-4 shows a visual decision tree of the process used for reviewing QC sample results along with sample data from the elements listed in Figure 10-2. When QC sample results fall within the acceptable range for the INL Site contractors, review of the remaining data continues. If no issues are identified, the data package is approved. If the QC result is identified as a nonagreement, the INL Site contractor reviews all available QC data to determine the course of action needed.

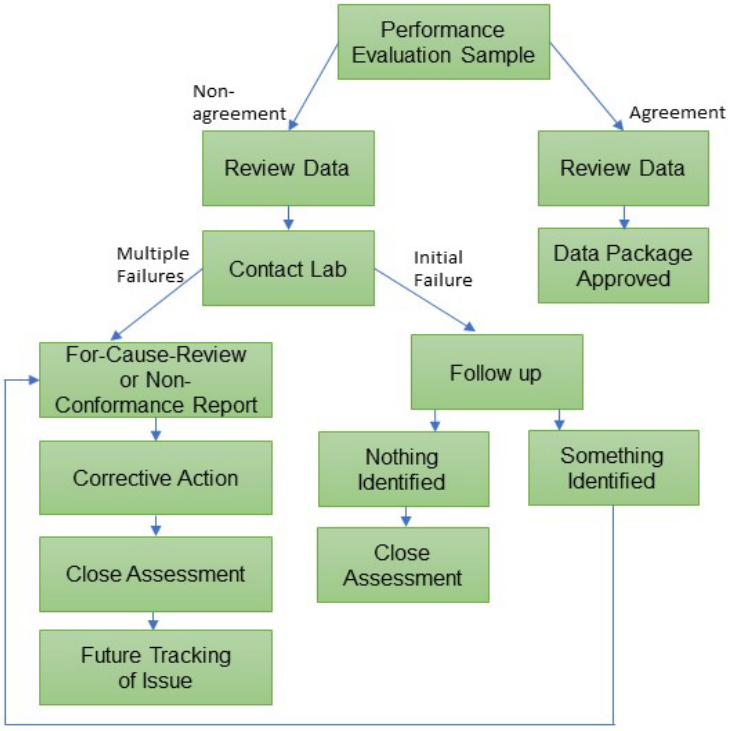

Figure 10-4. Environmental surveillance field sampling data QA review process.

A variety of items that may be considered for review include (but is not limited to) the following questions:

- Did the PE sample provider prepare the sample (single-blind or double-blind) within the range specified by their customer? If yes, begin looking into the other QC data reported by the laboratory. If not, the PE sample may not be an accurate representation of the project-specific field conditions or field results. If the equipment is calibrated for the field concentration range, and the PE sample is not within that range, then the accuracy and representativeness of the PE sample may be called into question.
- Did the laboratory perform all the required program- and method-specific QC analyses? Are these QC results within acceptable parameters?
- What does a review of the long-term project results indicate? Are all project-specific and analytic-method-specific QC results within specification? If not, does the laboratory have a history of out-of-specification QC results for a specific analyte or is the new result a one-time anomaly?

Upon review of the entire body of QC evidence, using both objective and subjective professional judgement, the INL Site contractor will determine if the nonagreement result is a one-time anomaly or if the laboratory needs to implement any "Follow up" or "Corrective Actions."

A "For-Cause-Review" or "Non-Conformance Report" is requested when multiple blind QC sample issues occur consecutively (e.g., a nonagreement evaluation for the same radionuclide in the same matrix) or as a result of a "Follow up" action. The "For-Cause-Review" would review laboratory data to investigate anything that may have been misreported (e.g., sample units, weights, calculations), whereas a "Non-Conformance Report" would generate a more rigorous laboratory review. Both the "For-Cause-Review" and "Non-Conformance Report" could result in a "Corrective Action" being issued, which will resolve the problem and prevent future issues from occurring. Upon acceptance of the "Corrective Action," the assessment would be closed, and the issues discussed in the "Corrective Action" will be monitored in future data packages.

A "Follow up" action occurs after a single failure and may result in the laboratory not identifying any issues leading to the nonagreement result. At this point, the data package is good defensible data if the laboratory passed all their qualifying criteria for the data package and if the following are within the laboratory quality criteria, as applicable: initial calibration

verification, continuing calibration verification, method blank, laboratory control sample, matrix spike, laboratory replicate, radioactive tracer recovery, and field blank(s). If a laboratory qualifying criterion is not met, the laboratory will re-prepare and re-analyze the samples. However, if enough of a sample is not available, the laboratory may flag their data if their radioactive tracer, laboratory control sample, laboratory replicate, or matrix spike are not within their criteria. When the "Follow up" action identifies issue(s), either a "For-Cause-Review" or "Non-Conformance Report" may be requested.

If a laboratory were to have two consecutive sets of PE samples that were not within the acceptable criteria, the specific environmental laboratory project manager would be asked to demonstrate whether the issue in question was investigated, corrective measures were implemented, and additional PE samples were analyzed with results within the acceptable criteria. If the laboratory cannot identify any issues, the INL Site contractor will work with the laboratory to assist in the investigative process. For example, whether additional PE samples may be provided to the analytical laboratory to determine if any problems arise from sample preparation, data calculations, data entry into a database, etc. As a result, the laboratory will provide an acceptable "Corrective Action" to the INL Site contractor. The issue will be monitored for future PE samples. Depending on the severity, the contractor may hold onto samples until the issue is resolved and then may send a letter-of-concern to the laboratory. Based on the outcome of the investigation, the INL Site contractors may terminate the contract and seek another laboratory.

10.2.4.2 Performance Testing

The programs include results of individual program QC data as well as the MAPEP PT. Individual QC programs include the use of several elements, as shown in Figure 10-2 and Figure 10-3, respectively, to evaluate the performance of a laboratory. Not all QC measurement elements are required unless specifically called out in each INL Site contractor program's contract with the laboratory, or as required by the specific analytical method.

The MAPEP is an inter-laboratory program that uses PT evaluations to test the ability of the laboratories to correctly analyze radiological, non-radiological, stable organic, and stable inorganic constituents' representative of those at DOE sites.

The following section presents results and discussions for each environmental surveillance program's quality program.

10.3 QC and PT Sample Results

Laboratories used for routine analyses of radionuclides in environmental media were selected by each INL Site contractor based on each laboratory's capabilities to meet program objectives (such as the ability to meet required detection limits) and past results in PT programs. Laboratories are audited for their adherence to QA/QC procedures and specific requirements outlined in their contract agreements. Programs exist to help contract holders conduct and assess a laboratory's ongoing performance. Requirements for participation in specific programs are at the discretion of the contract holder. Table 10-1 lists the analytical laboratories used by the INL Site contractors to analyze surveillance media in 2022.

Table 10-1. 2022 analytical laboratories used to analyze surveillance media.

ANALYTICAL LABORATORY	MEDIA					
	AIR	WATER	AGRICULTURAL PRODUCTS	BIOTA	ECOLOGICAL	SOIL
ALS Laboratory[a]	X[b]					
GEL Laboratories, LLC	X[b]	X[c]	X	X	X	X
ISU - EAL	X[b]	X[c]	X	X	X	X
Prime Laboratory		X				
RESL Laboratory		X				
SwRI	X					

a. ALS closed their Fort Collins location in the summer of 2022.
b. Includes atmospheric moisture.
c. Includes precipitation.

10.3.1 2022 MAPEP PT Results

In 2022, ALS, GEL Laboratories, ISU-EAL, and SwRI participated in the MAPEP PT (Series 46 and 47) program. ALS only participated in Series 46 due to their laboratory closure. Analyte nonagreement results were evaluated by the INL Site contractors based on their respective media and analyte tested. Following a similar process as identified in Figure 10-4, INL Site contractors requested reviews to be conducted by the laboratory to determine why the nonagreement occurred. MAPEP analyte results that were within criteria for the participating laboratories are presented in Figure 10-5. Two or more consecutive nonagreement MAPEP evaluations for the same radionuclide in the same matrix requiring additional review/discovery from the laboratory are indicated in footnotes in Figure 10-5, with a numbered list detailing the review/discovery below the figure. The results were then compared with the INL contractors' internal QC results. PT results for the water, air filter, and produce were acceptable; therefore, future MAPEP results will continue to be monitored and evaluated.

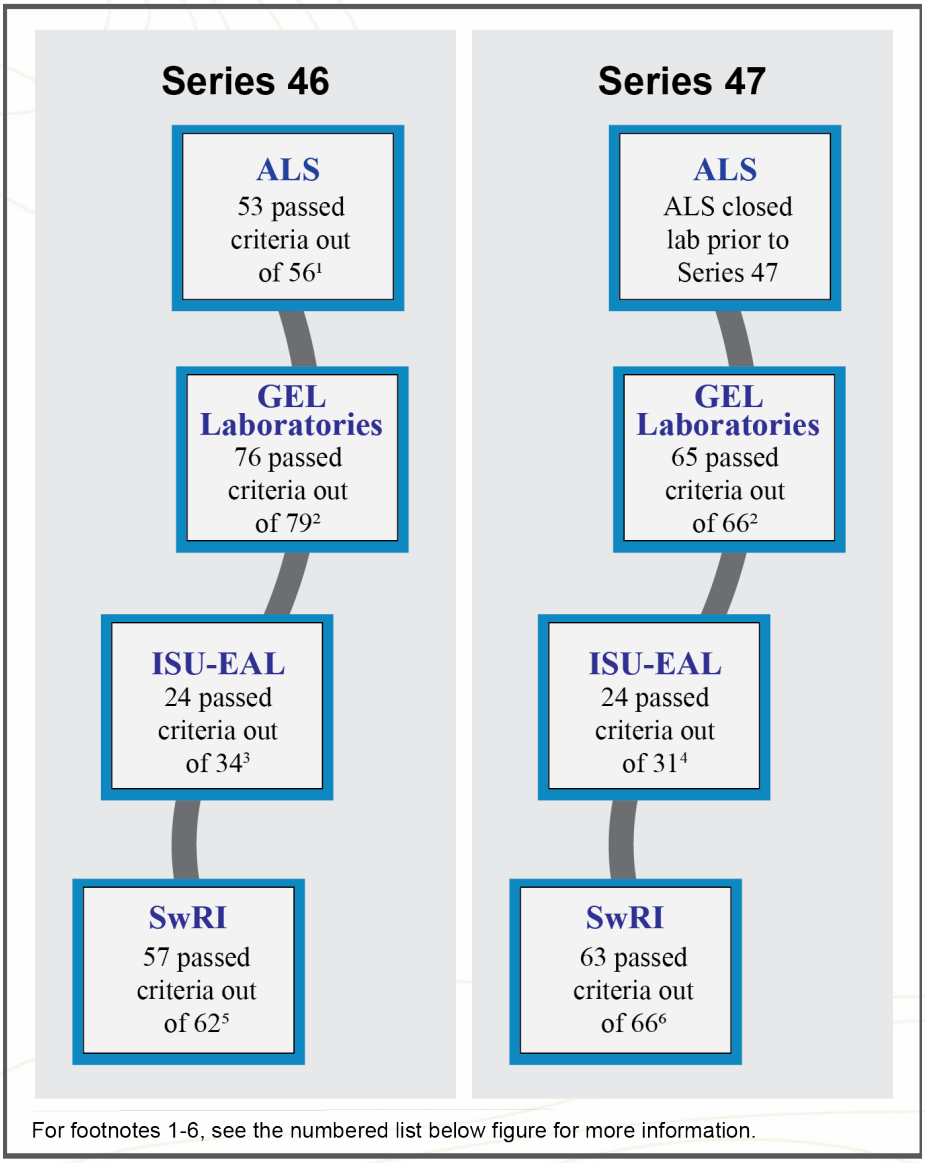

Figure 10-5. 2022 MAPEP PT analyte performance.

1. ALS received nonagreement evaluations for several matrices and radioanalytes that were a single event and does not require additional review/discovery.
2. GEL received nonagreement evaluations for several matrices and radioanalytes that were a single event and does not require additional review/discovery.
3. ISU-EAL received nonagreement evaluations for several matrices and radioanalytes of interest in the MAPEP Series 46. The matrices and respective radioanalytes include air filter (^{57}Co), soil (^{57}Co), water (^{57}Co, ^{54}Mn, ^{3}H, and ^{40}K), and vegetation (^{60}Co).

   ISU-EAL identified a few issues in the MAPEP Series 46: (1) a reporting issue with false negatives, (2) incorrect entry of the reference date, and (3) miscalculation of uncertainty values. The "Corrective Action" was to provide laboratory additional training with respect to calculating, analyzing, and reporting results to the MAPEP Program. ISU-EAL performance will be monitored for future MAPEP PT program samples to identify consecutive nonagreement evaluations.
4. ISU-EAL received nonagreement evaluations for several matrices and radioanalytes of interest in the MAPEP Series 47. The matrices and respective radioanalytes include air filter (^{65}Zn), soil (^{60}Co, ^{65}Zn), water (tritium), and vegetation (^{137}Cs, ^{57}Co, ^{60}Co).

   A review of the evaluation results for Series 47 identified potential trends with a few matrices/analytes not meeting the acceptable criteria. As a result, a request was submitted to ISU-EAL to perform a “For-Cause-Review.” The ISU-EAL addressed the “For-Cause-Review” and identified a few issues in the MAPEP Series 47: (1) reporting issue with false negatives, (2) selection of incorrect sample geometry, and (3) not following protocol for reporting results to MAPEP. The “Corrective Actions” included: posting a copy of the analysis protocol with a follow up discussion of the importance of following the protocol, and a visit to the laboratory from the MAPEP program personnel to provide additional training on the MAPEP process. ISU-EAL performance will be monitored for future trends.
5. SwRI received nonagreement evaluations for several matrices and radioanalytes of interest in the MAPEP Series 46. The matrices and respective radioanalytes include air filter (gross alpha, ^{90}Sr), soil (^{65}Zn), water (^{226}Ra), and vegetation (^{234}U). Sample matrices and analytes will be followed for future trending.
6. SwRI received nonagreement evaluations for several matrices and radioanalytes of interest in the MAPEP Series 47. The matrices and respective radioanalytes include soil (^{241}Am, and ^{63}Ni), and water (^{90}Sr). Sample matrices and analytes will be followed for future trending.

10.3.2 2022 Field QC Elements

Field QC samples are sent to the laboratories along with routine environmental samples to be analyzed in tandem. The samples are prepared in a way that the QC samples are analogous to the field samples. The laboratory is not aware of which samples are blanks, duplicates or PE samples. PE samples can be either a single-blind or a double-blind sample. A PE sample activity known by the INL contractor but not the analytical laboratory is called a single-blind PE sample; whereas a PE sample where the activity is unknown to both the INL contractor and the analytical laboratory is a double-blind PE sample. The laboratory is being evaluated on these samples to determine laboratory capabilities. Discussions of results and any unexpected results are discussed in the following sections.

10.3.2.1 INL Contractor QC Results

In 2022, the INL contractor used ALS, GEL, and ISU-EAL laboratories to provide analytical results for air (air filters, quarterly composites, and charcoal cartridges), atmospheric moisture, precipitation, drinking water, surface water, effluents, groundwater, milk, produce (i.e., alfalfa, lettuce, potato, wheat), big game, soil, and bats. Figure 10-6 presents the results for the laboratories with corresponding numbered list (below the figure) to provide additional information regarding items of concern to the INL contractor. Criteria for these results are identified in quality assurance project plans. The process identified in Figure 10-4 was followed, issues of concern were evaluated, and assessments were conducted on data usability. The 2022 QC results for the INL contractor indicate that the data is reliable and of acceptable quality.

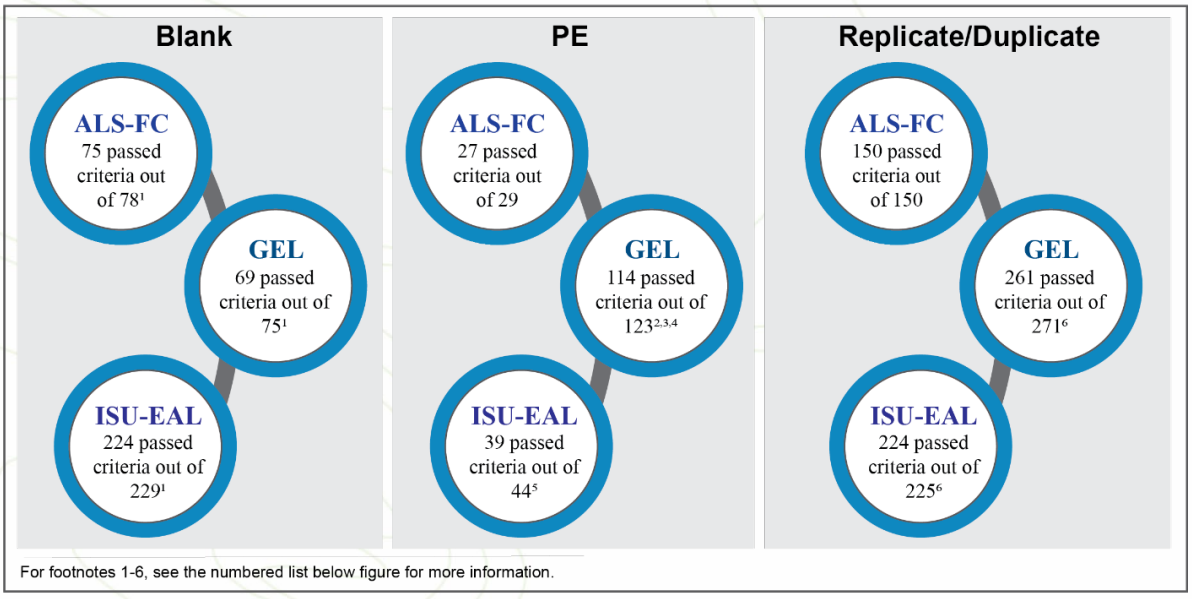

Figure 10-6. INL contractor 2022 QC analyte results.

1. The objective of the INL contractor sending blanks to the laboratories was to show acceptable laboratory precision. The QA program establishes that sample results should agree within 3σ of zero for 98% of samples submitted. ALS and ISU-EAL met this criterion in 2022. GEL did not meet this 2022 criterion, mainly caused by gross beta analysis of blanks. Some possible causes for this could be long laboratory count time and/or blank correction. GEL will be monitored to meet future expectations for blank sample criteria.

2. A total of 36 analytes for various media were analyzed by GEL Laboratories in 2022. GEL received a nonagreement for ^{90}Sr in lettuce and ^{57}Co and ^{54}Mn in soil. GEL was informed of the nonagreement and performed additional review/discovery.

   The laboratory determined that a fraction of the lettuce sample was used for analysis instead of the entire sample. Since the distribution of ^{90}Sr was not homogenous in the sample, a note was included on the chain of custody to use the entire sample. The fraction of sample used for analysis did not contain any of the ^{90}Sr resulting in a statistically zero value. GEL added additional comments for the project to prevent a similar incident from happening in the future.

   The two nonagreements for ^{57}Co and ^{54}Mn in soil were reviewed and the lab determined the issue was due to the relatively short half-lives of the radionuclides, and the amount of time elapsed between the sample collection date and the known activity reference date. Reviews were conducted for the previous soil PE samples and the two MAPEP series for 2022. GEL received agreement evaluations for the two analytes. Since two or more consecutive nonagreement evaluations were not identified, the INL contractor will continue to monitor GEL's performance on these analytes in the future.

3. In 2022, the INL contractor requested an internal evaluation to be performed due to GEL Laboratories, LLC receiving nonagreement for ^{90}Sr analysis of air filter composite samples for consecutive PE samples. As part of the evaluation, the INL contractor requested an internal evaluation be performed and then shipped two filter sets with known activities. Results of the filter sets were within the agreement criteria. No findings were reported by GEL Laboratories, LLC; however, the laboratory concluded that an undetermined error occurred during the preparation process of the sample submitted in 2021. The INL contractor will continue to monitor GEL's performance for ^{90}Sr analysis of air filter composite samples.

4. A total of 83 effluent and groundwater PE analytes were analyzed by GEL in 2022. GEL received a nonagreement for six gamma spectrometry results, including two ^{241}Am and four ^{226}Ra. All six received a nonagreement from the

PE provider for being reported by GEL as non-detected results. Americium-241 and ^{226}Ra are primarily alpha radiation emitters. Gamma spectrometry results for ^{241}Am and ^{226}Ra are used as a screening tool for these specific projects where these analytes are not expected. Additional analysis of field samples for ^{241}Am and ^{226}Ra, using analyte-specific methods, can be performed if the program determines the gamma spectrometry screening results exceed certain thresholds. The thresholds were not exceeded in the associated field samples. Review of the ^{241}Am and ^{226}Ra PE results indicate the PE sample provider prepared all six PE nonagreement analytes at levels less than the contractual minimum detection limits of the laboratory; therefore, the PE provider's nonagreement conclusion (due to the lab reporting the results as non-detects) is considered correct. The 2022 PE provider's nonagreement results were submitted to GEL for evaluation. No findings or gamma spectroscopy QC deficiencies requiring corrective actions have been reported by GEL. Based on review and evaluation of all the quality data presented, the projects have determined the nonagreement conclusions for the six PE sample analytes did not affect the accuracy or defensibility of the field sample results.

5. A total of 43 analytes for various matrices were analyzed by ISU-EAL. ISU-EAL received a nonagreement for five gamma spectroscopy results. Four of the nonagreements were: ^{57}Co, ^{134}Cs, ^{54}Mn, and ^{65}Zn in milk; and one nonagreement was for ^{134}Cs in wheat.

   All four analytes in milk received a nonagreement for not reporting the results. A request to perform a "For-Cause-Review" was submitted to ISU-EAL and determined there was a breakdown in the internal communication of the positive results. The "Corrective Action" was an update to the gamma analysis procedure with an emphasis on reviewing data and communication of positive results.

   Regarding the nonagreement for ^{134}Cs in wheat, ISU-EAL determined that sample positioning on the detector for one of the analyses led to the nonagreement. ISU-EAL rejected the results from the analysis and recalculated the average value for the analyte. The updated average, when compared to the known value, met the criteria of ± 30%. The INL contractor will continue to monitor these analytes in the future.

6. The objective of the INL contractor sending replicate/duplicate samples to the laboratories was to have data close enough to conclude that there was minor sampling bias between the samplers and acceptable laboratory precision. The QA program establishes that duplicate sample results should agree within 3σ for 98% of submitted samples. In 2022 all laboratories met this criterion. The INL contractor wastewater effluent and groundwater program require 90% of duplicate pairs meet a relative percent difference of less than 35%, GEL met this criterion in 2022.

10.3.2.2 ICP Contractor QC Results

In 2022, the ICP contractor used ALS, GEL, and SwRI laboratories to provide analytical results for air and water. Figure 10-7 presents the results for the laboratories with a corresponding numbered list (below the figure) to provide additional information regarding items of concern to the ICP contractor. Criteria for these results are identified in quality assurance project plans. The process identified in Figure 10-4 was followed by ICP, issues of concern were evaluated, and assessments were conducted on data usability. The 2022 results indicate that there were no problems identified with sample collection or laboratory analysis techniques.

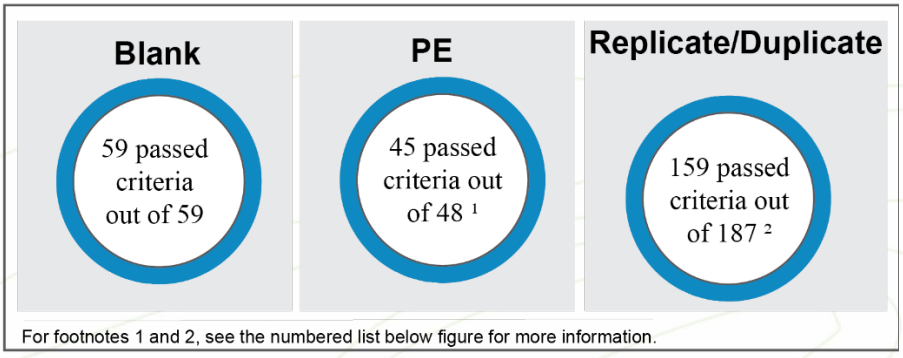

Figure 10-7. ICP contractor 2022 QC analyte results.

1. A total of 48 analytes were analyzed in 2022 for GEL Laboratories. GEL Laboratories received a nonagreement for ^{90}Sr, ^{238}Pu, and Pu for water samples in 2022. At ICP, when a laboratory has a nonagreement assigned, the Sample and Analysis Management Office informs the project managers and participating laboratories of the results and requests the laboratory to investigate. For the discrepancies in agreement for 2022, GEL investigated the results and reported back that there were no errors in GEL's processes found. When it was possible, GEL repeated the analysis during the investigation. GEL reported that for the ^{90}Sr nonagreements, one case of cross contamination was suspected due to significantly high beta activity in the analyzed batch, and in the other case, the laboratory concluded that "an indeterminate error occurred during the preparation process." In the case of ^{238}Pu and ^{239}Pu, the error was either due to an insufficient number of counts or an initial dilution or final platting issue. GEL did pass the MAPEP Series, which was conducted before and after the time these PE results were analyzed. It was concluded that methods are under control, but that GEL and the ICP contractor will continue to monitor these analytes in future evaluations.
2. In 2022, the ICP contractor requested the analysis of 134 field duplicate pairs for the environmental surveillance air program, of which 109 were determined to be acceptable. Accordingly, total precision for air samples across all projects was 81.3%, which, while lower than the previous year, is likely the result of mechanical issues that have been corrected with the air sampler at location SDA 4.3B/4.

10.3.2.3 USGS QC Results

In 2022, the USGS used RESL and Prime laboratories to provide analytical results for groundwater monitoring wells. Figure 10-8 summarizes the QC program results. A footnote is included in Figure 10-8. The 2022 results indicate that there were no problems identified with sample collection or laboratory analysis techniques.

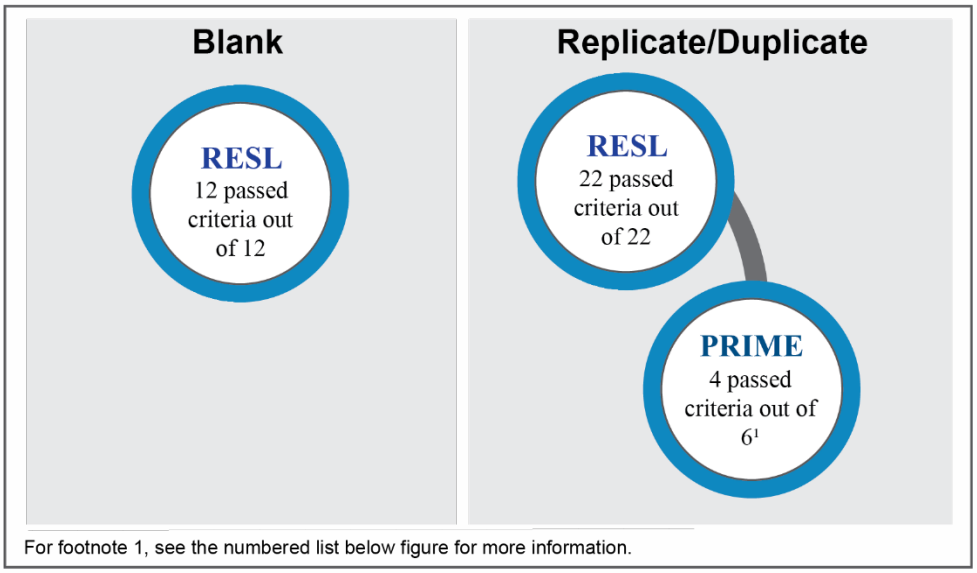

Figure 10-8. USGS 2022 QC analyte results.

1. Utilizing the process as identified in Figure 10-4, PRIME was questioned regarding results above 3σ for duplicate samples and were calculated to have a normalized absolute difference <1.96.

10.4 Conclusions

The quality elements presented in Figure 10-1 were implemented in 2022. Field sampling elements (as provided in Figure 10-2), laboratory measurements (as outlined in Figure 10-3), and QC samples were reviewed and evaluated for each INL Site contractor and are summarized in Section 10.3. It has been determined that all laboratory data presented in this report are reliable and of applicable quality.

10.5 References

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