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DOCUMENT CATEGORY: Administrative	LEVEL OF USE: Information Level
Check all that apply: Commitment Stamps ☒ WCO ☒ Shared Site ☐	
FUNCTIONAL AREA: Sample Management Office SUBJECT MATTER AREA: Sample Management Office	SUBJECT MATTER EXPERT: Jaime Morrow, Sample Management Office Manager
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REVISION/CHANGE LOG

Revision/ Change Letter	Description of Changes	Pages Affected	Date of Revision/ Change	Approved By (signature on file)
FR0	Bluesheet	ALL	10/20/2017	Documentation on File
FR1	Non-intent to incorporate bluesheet.	ALL	1/8/2018	
FR2	Resolution for AI-0004565 associated with CA-002859. General Revision with the addition of step 6.5.8 and re-aligned flow charts in appendices to flow with addition of step 6.5.8. Changes included addition of verbiage "trend charts" under Data Assessment on page 1 of Instructions form CP3-ES-5003-F01. Completion of periodic review.	ALL	4/13/2021	
FR2A	Non-intent change to delete acronym FDPD and replace with FRNP and to incorporate 2 additional Data Assessment Comment form pages to CP-ES-5003-F01.	11,13,15, 31-36	5/25/2021	
FR3	Resolution for #AI-0005792 and #AI-0005909 associated with CAPAs CA-003656 and CA-003655 respectively. General Revision of procedure with the addition of NOTEs in Section 6.3 and 6.7 addressing CAPAs. NOTEs include verbiage explaining situations in which data will be given to project before undergoing verification and assessment and that data being used in support of NCS purposes will include uncertainty and will be verified against laboratory data package before loaded into OREIS. Form CP3-ES-5003-F02 *Paducah Data Release to External Agencies* revised (deleted Site DC and Site TIO)	All	8/9/2022	

REVISION/CHANGE LOG				
Revision/ Change Letter	**Description of Changes**	**Pages Affected**	**Date of Revision/ Change**	**Approved By (signature on file)**
FR3A	Periodic Review has been completed with no changes identified in procedure technical content. Nonintent change to FA, SME, Approver and dates has been incorporated per CP3-NS-2001. Date for review cycle has been reset.	All	10/4/2022	Documentation on File
FR3B	Intent change deleting verbiage " and the final data package" in Note above step 6.7.3. Deleted Environmental Monitoring Manager and revised to Sample Management Office Manager and update Subject Matter Expert and Approved By.	4-6, 8, 12	4/26/2023	
FR4	General Revision to address AI-0008141 (CAPA CA-005077) and addition of CP3-ES-5003-F04, *PARRCS PARAMETERS*	All	7/31/2024	
FR4A	Resolution for #AI-0008524 and #AI-0008627 associated with CAPAs CA-005356 and CA-005369 respectively. Intent change-Deletion of CP3-ES-5003-F03 in CP3-ES-5003. Addition of CP3-ES-5003-F05 with title "Data Verification/Validation Checklist." Revise checklist to capture if all reported analytes in LCS, MS and MSD are spiked. Update CP3-ES-5003 to reflect change of CP3-ES-5003-F03 to CP3-ES-5003-F05.	9,13,38,39	3/31/2025	
FR5	General revisions to address AI-0008622 associated with CAPA# CA-005369 and AI-0008660 associated with CAPA# CA-005409.	All	6/25/2025	
FR5A	Non-intent change to revise CP3-ES-5003-F01 (deleted N/A boxes under questions that N/A does not apply along with CP3-ES-5003-F04 and Appendix E definitions for completeness.	28, 30-35	8/20/2025	
FR6	General revision to address #Al-0009187 associated with CAPA CA-005846; deleted Notebox after step 6.9.2 and included actions that were in Notebox in steps 5.2 and 6.9.4. Deletion of forms CP3-ES-5003-F01, CP3-ES-5003-F02, CP3-ES-5003-F04, and CP3-ES-5003-F05 from Appendices in procedure.	All	3/10/2026	Jaime Morrow

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1.0 PURPOSE AND SCOPE

1.1 Purpose

This procedure describes the process, including data collection and data review, to ensure consistent and quality assured data. This process ensures that all data released for decision making and/or external use have received adequate data assessment and quality assurance reviews.

- Consistency is provided by the use of common resources and services such as the Sample Management Office (SMO), a centralized data system, and common definitions for data quality.
- Quality assured data is obtained through appropriate planning, adequate sampling and laboratory quality controls, and documented data assessment review.

1.2 Scope

The requirements of this procedure apply to work performed by the Paducah Gaseous Diffusion Plant Deactivation and Remediation (PGDP D&R) personnel and subcontractors.

This procedure applies to screening and definitive data that is collected by all PGDP D&R projects at Paducah. The procedure allows for flexibility in implementation for programs and projects based on data collection needs and final use of the data.

This procedure does **NOT** apply to any of the following:

- Historical data
- Data collected by the Safety and Health program
- Personnel and financial data
- Data generated through external agency operations, such as Kentucky Department for Environmental Protection
- Nondestructive assay (NDA) measurements
- Process technology data
- Environmental dosimetry data
- Geotechnical data

2.0 REFERENCES

2.1 Use References

- CP2-ER-1000, *Data Management Implementation Plan for the Paducah Plumes Operations Paducah Gaseous Diffusion Plant, Paducah, Kentucky*
- CP2-ES-0006, *Environmental Monitoring Plan, Paducah Gaseous Diffusion Plant, Paducah, Kentucky*
- CP2-ES-0026, *Wet Chemistry and Miscellaneous Analyses Data Verification and Validation for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*
- CP2-ES-0063, *Environmental Monitoring Data Management Implementation Plan at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*

- CP2-ES-0811*, Pesticide and PCB Analyses Data Verification and Validation for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*
- CP2-ES-2000, *Per- and Polyfluoroalkyl Substances Analyses Data Verification and Validation for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*
- CP2-ES-5102, *Radiochemical Analysis Data Verification and Validation for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*
- CP2-ES-5103, *Polychlorinated Dibenzodioxins/Polychlorinated Dibenzofurans Analyses Data Verification and Validation Paducah Gaseous Diffusion Plant, Paducah, Kentucky*
- CP2-ES-5105, *Volatile and Semivolatile Analyses Data Verification and Validation for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*
- CP2-ES-5107, *Inorganic Analyses Data Verification and Validation for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*
- CP2-QA-1000, *Quality Assurance Program Description for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*
- CP2-WM-0001, *Four Rivers Nuclear Partnership, LLC, Paducah Deactivation and Remediation Project Waste Management Plan*
- CP3-ES-1034, *Nuclear Criticality Safety Requirements for Sample Labeling, Handling, and Assay Smears*
- CP3-ES-5007, *Data Management Coordination*
- CP3-QA-3001, *Issues Management*
- DOE/LX/07-2498&D1, *Paducah Gaseous Diffusion Plant Data Management Plan*
- EPA QA/G-4, *Guidance on Systematic Planning Using the Data Quality Objectives Process*
- Project-specific Quality Assurance Project Plan *(*QAPP)

2.2 Source References

- DOE/LX/07-2502&D1*, Paducah Gaseous Diffusion Plant Programmatic Quality Assurance Project Plan*

3.0 COMMITMENTS

- NCSE GEN-01, *Nuclear Criticality Safety Evaluation for General Limits Used at the Paducah Gaseous Diffusion Plant*
- NCSE 111, *Characterization of Independent Samples in the C-709 and C-710 Laboratory Facilities*
- NCSR-FRNP-17-001, *Addressing Common Mode Failures of Independent Samples Sent Offsite for Analysis*

4.0 RESPONSIBILITIES

4.1 SMO

4.1.1 Populates project-specific laboratory statements of work (SOWs), chain-of-custody (COC) forms, sample data forms, and sample labels in Paducah Project Environmental Measurements System (PEMS).

4.1.2 Performs loading of laboratory Electronic Data Deliverables (EDDs) to PEMS.

4.1.3 Performs electronic verification of data using queries in PEMS.

4.1.4 Performs data verification steps including contractual screen.

4.1.5 Prepares a project data assessment package (DAP).

4.1.6 Tracks data assessment review process.

4.1.7 Coordinates data validation services when requested by the project team.

4.1.8 Ensures that data validation deliverables meet the requirements specified in the data validation SOW.

4.1.9 Performs loading of data into Paducah Oak Ridge Environmental Information System (OREIS).

4.2 SMO Manager

4.2.1 Serves as the primary contact for all matters relating to analytical laboratories.

4.2.2 Ensures long-term electronic storage of data.

4.2.3 Ensures compliance with DOE/LX/07-2498&D1, *Paducah Gaseous Diffusion Plant Data Management Plan*.

4.3 Project Team

4.3.1 Defines project Data Quality Objectives (DQOs).

4.3.2 Submits request to SMO for collection of samples.

4.3.3 Coordinates sample collection and analysis with the SMO.

4.3.4 Assigns Project Reviewer to participate in data assessment review process.

4.4 Data Reviewer

4.4.1 Reviews project DAP and laboratory data packages.

4.4.2 Performs data assessment.

4.4.3 Communicates any observations to SMO Manager allowing manager to make a decision to initiate a corrective action in the Issues Management system according to CP3-QA-3001, *Issues Management*.

4.5 Project Reviewer

4.5.1 Reviews project DAP.

4.5.2 Performs data usability assessment.

4.5.3 Determines if quality assured data is generated **and** determines if data is acceptable for decision making.

4.5.4 Communicates any observations to SMO Manager allowing manager to make a decision to initiate a corrective action in the Issues Management system according to CP3-QA-3001.

NOTE:

In this procedure, Quality Assurance (QA) Reviewer does **NOT** pertain to QA personnel.

4.6 QA Reviewer

4.6.1 Reviews project DAP.

4.6.2 Performs QA review.

4.6.3 Verifies completion of data assessment review process.

4.6.4 Communicates any observations to SMO Manager allowing manager to make a decision to initiate a corrective action in the Issues Management system according to CP3-QA-3001.

5.0 GENERAL INFORMATION

5.1 The collection, review, and management of data and information **NOT** addressed under this procedure are maintained according to CP2-QA-1000, *Quality Assurance Program Description for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky.*

NCSE GEN-01
NCSE 111
NCSR-FRNP-17-001

5.2 Verbal relay of analytical results taken for NCS purposes is prohibited.

6.0 INSTRUCTIONS

NOTE:

Steps are performed sequentially unless otherwise noted.

6.1 Initiation of Data Collection

NOTES:

The DQO process used for data in support of making Nuclear Criticality Safety (NCS) decisions may deviate from Appendix B, *Options to Implementing and Documenting the DQO Process for Paducah Projects*, depending on NCS requirements.

The DQO process used for data in support of making ambient air data evaluation decisions may deviate from Appendix B depending on the ambient air data evaluation plan requirements.

Project Team

6.1.1 Determine need for data to support the activity or program/project.

6.1.2 Choose the DQO process option for the program or project outlined in Appendix B.

6.1.3 Follow steps associated with the DQO process.

6.1.4 Select QA/Quality Control (QC) requirements to incorporate into project plans.

6.1.5 Identify if data will be validated **and** determine stage and frequency of the validation.

6.1.6 Ensure the following applicable plans are in place **and** provided to the SMO:

- Project-specific Sampling Analysis Plan (SAP)
- Project-specific Sampling Analysis and Event Plan (SAEP)
- CP2-QA-1000, *Quality Assurance Program Description for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*
- CP2-ES-0006, *Environmental Monitoring Plan, Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (EMP)
- CP2-WM-0001, *Four Rivers Nuclear Partnership LLC Paducah Deactivation and Remediation Project Waste Management Plan* (WMP)
- CP2-ES-0063, *Environmental Monitoring Data Management Implementation Plan at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*
- CP2-ER-1000, *Data Management Implementation Plan for the Paducah Plumes Operations Paducah Gaseous Diffusion Plant, Paducah, Kentucky*
- Project-specific Data Management Implementation Plan (DMIP)
- Project-specific QAPP

6.1.7 Contact the SMO to develop the laboratory SOW for new activities **or** notify the SMO when additional sampling is requested for existing laboratory SOWs.

SMO

6.1.8 Create project identification code (i.e., ProjectID) in PEMS.

6.1.9 Develop project-specific laboratory SOW in PEMS.

6.1.10 Ensure the laboratory SOW specifies the analytes requested, analytical methods, reporting limits, and any special deliverable requirements.

6.1.11 Populate sample information in PEMS.

6.1.12 Generate COC forms, sample data forms, and sample labels in PEMS.

NOTE:

Samples requesting polychlorinated biphenyl (PCB) analysis (other than KPDES samples) require the lab to comply with the Toxic Substance Control Act (TSCA) and the Federal Facilities Compliance Act (FFCA). The laboratory basic ordering agreement (BOA) includes the signed agreement that is in place between U.S. Department of Energy (DOE) and the United States Environmental Protection Agency (EPA).

6.2 Sample Collection & Receipt Review

6.2.1 Ensure collection, shipment, and delivery of samples to the laboratory.

6.2.2 Complete the required fields and questions in the Sample Collection & Receipt Review section on CP3-ES-5003-F01, *Data Assessment Review Checklist and Comment Form.*

6.3 Process Laboratory Analytical Data

6.3.1 Import and load laboratory EDDs into PEMS.

6.3.2 Resolve any issues identified during loading of data to PEMS.

6.3.3 Create a project-specific PEMS loading notes file as described in CP3-ES-5007, *Data Management Coordination*.

6.4 Data Verification

NOTES:

Situations may arise that require preliminary data to be provided to the project team prior to undergoing data verification, data validation (if applicable), data assessment, and data usability assessment due to projects having to make real-time decisions in the field. This requires approval of the SMO Manager.

UF_6 safety sample data will be provided to operations personnel prior to undergoing data verification, data validation (if applicable), data assessment, and data usability assessment due to projects having to make real-time decisions in the field.

6.4.1 Using PEMS, run electronic data verification queries to verify project data.

6.4.2 Add outputs from electronic data verification queries to Electronic Data Verification section of the PEMS loading notes file.

6.4.3 Using PEMS, conduct contractual screen:

1. Review contractual screen verification queries and reports.

2. Resolve any issues identified during contractual screen with the laboratory.

3. Document any exceptions to the laboratory SOW.

6.4.4 Complete the required fields and questions in the Data Verification/Contractual Screen section on CP3-ES-5003-F01.

6.5 Data Validation

NOTES:

Data verification steps including contractual screen **must** be complete before data validation is performed.

CP3-ES-5003-F05, *Data Verification/Validation Checklist* **must** be completed when Stage 2B, Stage 3, or Stage 4 data validation is required.

6.5.1 **If** data validation is **NOT** required, **then** proceed to Section **6.6**.

6.5.2 Initiate data validation as defined in the applicable plans listed in Step **6.1.6**.

6.5.3 Develop a validation SOW for the data validation activity.

6.5.4 Using PEMS, prepare a data validation qualification (DVQ) EDD file.

6.5.5 Submit the following to the validator selected:

1. laboratory data packages
2. DVQ EDD file
3. validation SOW
4. CP3-ES-5003-F05
5. project-specific QAPP, if applicable

6.5.6 Upon receipt of the data validation deliverables, review the data validation report, completed DVQ EDD file, and completed CP3-ES-5003-F05 form.

6.5.7 **If** data validation report, completed DVQ EDD file, or completed CP3-ES-5003-F05 form are **NOT** acceptable, **then** resolve discrepancies with validator until acceptable.

6.5.8 Download data validation codes from completed DVQ EDD file into PEMS.

6.5.9 **If** validation codes are entered in PEMS manually, **then** ensure a QC check is performed as required by CP3-ES-5007.

6.6 Data Assessment & Data Usability Assessment

NOTES:

Data validation **must** be accompanied by data assessment **and** can be performed concurrent with data assessment.

Precision, Accuracy, Representativeness, Completeness, Comparability, Sensitivity (PARCCS) parameter values are recorded on CP3-ES-5003-F04, *PARCCS Parameters* for projects if requested by project team.

6.6.1 Using PEMS, create the project DAP by compiling the following documents:

- data assessment queries (e.g., verify sampling completeness, verify qualifiers, etc.)
- data assessment reports (e.g., laboratory data, laboratory sample analysis comments, etc.)
- additional data assessment information (e.g., PEMS loading notes, laboratory case narratives, CP3-ES-5003-F04 form, etc.)
- laboratory footnote and qualifier definitions
- PEMS and OREIS code definitions

6.6.2 Complete the required fields and questions in the DAP Creation section on CP3-ES-5003-F01.

6.6.3 Provide the Data Reviewer with the project DAP, laboratory data packages, CP3-ES-5003-F01 form, and project-specific QAPP (if applicable).

Data Reviewer

6.6.4 Review the analytical data provided in the project DAP and laboratory data packages.

6.6.5 Review the project-specific QAPP (if applicable).

6.6.6 Complete the required fields and questions in the Data Validation & Data Assessment section on CP3-ES-5003-F01.

6.6.7 **If** questions for the laboratory arise during data assessment review, **then** notify SMO to contact laboratory for resolution.

6.6.8 Evaluate data quality using the following data validation plans as guidance:

- CP2-ES-0026, *Wet Chemistry and Miscellaneous Analyses Data Verification and Validation for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*
- CP2-ES-0811, *Pesticide and PCB Analyses Data Verification and Validation for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*
- CP2-ES-2000, *Per- and Polyfluoroalkyl Substances Analyses Data Verification and Validation for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*
- CP2-ES-5102*, Radiochemical Analysis Data Verification and Validation for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*
- CP2-ES-5103, *Polychlorinated Dibenzodioxins-Polychlorinated Dibenzofurans Analyses Data Verification and Validation Paducah Gaseous Diffusion Plant, Paducah, Kentucky*
- CP2-ES-5105, *Volatile and Semivolatile Analyses Data Verification and Validation for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*
- CP2-ES-5107, *Inorganic Analyses Data Verification and Validation for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*

6.6.9 **If** data has quality deficiencies and requires qualification, **then** note issues in the comments field **and** add notes to the action field on page 3 of CP3-ES-5003-F01.

6.6.10 Sign the CP3-ES-5003-F01 form as Data Reviewer **and** submit completed form to the SMO.

SMO

6.6.11 **If** Data Reviewer added data assessment codes to the data, **then** add data assessment codes in PEMS **and**:

1. Record entry of data assessment codes to PEMS in the resolution field of CP3-ES-5003-F01.

2. Reprint project data reports from PEMS and replace reports in project DAP so that data assessment codes are displayed.

6.6.12 Provide the Project Reviewer with the project DAP, CP3-ES-5003-F01, and CP3-ES-5003-F02, *Paducah Data Release Form*.

Project Reviewer

6.6.13 Review project DAP and CP3-ES-5003-F01 form provided by the SMO.

6.6.14 Review project-specific QAPP (if applicable).

6.6.15 **If** reviewing data for the Environmental Monitoring (EM) program, **then** review for trends using EM data trending charts located within the following directory: S:\Env Services\EM Data Trending Charts.

6.6.16 Complete the required fields and questions in the Data Usability Assessment section on CP3-ES-5003-F01.

6.6.17 **If** data requires additional qualification, **then** note issues in the comments field **and** add notes to the action field on page 3 of CP3-ES-5003-F01.

6.6.18 Sign the CP3-ES-5003-F01 form as Project Reviewer.

6.6.19 Complete the CP3-ES-5003-F02 form:

- Add Project Reviewer name in designated field.
- Check appropriate Data Quality Level (i.e., Data of Known Quality or Information Only Data).
- Choose appropriate Data Release options from dropdown list (i.e., OREIS, PEGASIS, etc.).
- Sign the CP3-ES-5003-F02 form as Project Reviewer.

6.6.20 Notify SMO when data usability assessment is complete **and** submit completed CP3-ES-5003-F01 and CP3-ES-5003-F02 forms to the SMO.

SMO

6.6.21 **If** Project Reviewer added data assessment codes to the data, **then** add data assessment codes in PEMS **and**:

1. Record entry of data assessment codes to PEMS in the resolution field of CP3-ES-5003-F01.
2. Reprint project data reports from PEMS **and** replace reports in project DAP so that data assessment codes are displayed.

6.6.22 Provide the project DAP, CP3-ES-5003-F01 form, and CP3-ES-5003-F02 form to the QA Reviewer.

6.7 QA Review

QA Reviewer

6.7.1 Review the project DAP, CP3-ES-5003-F01 form, and CP3-ES-5003-F02 form.

6.7.2 Complete the required fields and questions in the QA Review section on CP3-ES-5003-F01.

6.7.3 Document any notes or comments on page 3 of CP3-ES-5003-F01.

6.7.4 Ensure all applicable emails have been added to the project DAP.

6.7.5 Verify completion of data assessment review process.

6.7.6 Sign the CP3-ES-5003-F01 form as QA Reviewer.

6.7.7 Review CP3-ES-5003-F02 form to verify completion.

6.7.8 Notify SMO when QA review is complete.

SMO

6.8 Data Classification Review

NOTE:

A Derivative Classifier (DC) review is requested to ensure that the data or document does **NOT** contain any classified information. The DC review is only required for data related to non-environmental matrices.

6.8.1 **If** data is of environmental matrices (i.e., sediment, soil, groundwater, surface water), **then** proceed to Section **6.9**.

6.8.2 **If** data is of non-environmental matrices (i.e., waste projects, characterization projects), **then** complete Requester portion of form PGDP-SS-FO-001, *Paducah Site Derivative Classifier Review Request Form.*

6.8.3 Submit PGDP-SS-FO-001 form and project DAP for DC review.

6.8.4 Once PGDP-SS-FO-001 has been completed, ensure all necessary signatures are present.

6.8.5 Add PGDP-SS-FO-001 to the project DAP.

6.9 Loading Data to OREIS

6.9.1 Format data for loading to OREIS by creating a Ready-to-Load (RTL) file.

6.9.2 Ensure data that is approved for release to PEGASIS on CP3-ES-5003-F02 form is appropriately flagged in OREIS.

6.9.3 Load data (RTL file) to OREIS.

NCSE GEN-01
NCSE 111
NCSR-FRNP-17-001

6.9.4 **If** data loaded to OREIS was collected in support of making NCS decisions, **then** verify OREIS data against the laboratory data package to ensure data was loaded correctly.

NOTES:

The OREIS data report which includes uncertainty will be provided to the project for data collected in support of making NCS decisions.

The OREIS data report will be provided to the Characterization organization **when** sampling is requested by the Characterization organization.

6.9.5 Send OREIS report and Excel file of analytical data to Project Team.

6.9.6 **If** project data contains component identification numbers assigned by Characterization and Criticality Incredible Database (CCID), **then** send OREIS report, Excel file of analytical data, and a completed project DAP to the CCID group.

Project Team

6.9.7 Make project decisions based on data.

6.9.8 **If** additional data needs to be collected, **then** return to Step **6.1.2**.

6.10 Records Management

NOTE:

SMO submits project DAP and laboratory data packages to Records Management.

6.10.1 Ensure all project records associated with the data collection activity, including all forms generated from this procedure, are transmitted to Records Management for submittal to Document Control for final disposition.

7.0 RECORDS

7.1 Records Generated

The following records may be generated by this procedure:

- CP3-ES-5003-F01, *Data Assessment Review Checklist and Comment Form*
- CP3-ES-5003-F02, *Paducah Data Release Form*
- CP3-ES-5003-F04, *PARCCS PARAMETERS*
- CP3-ES-5003-F05, *Data Verification/Validation Checklist*
- Project DAP
- Laboratory Data Packages
- DQOs (e-mails, meeting minutes, SAP, SAEP, answers to Appendix D questions, if applicable).

Forms are to be completed according to CP3-OP-0024, *Forms Control*.

7.2 Records Disposition

The records are to be maintained according to CP3-RD-0010, *Records Management Process*.

Appendix A – Acronyms/Definitions

ACRONYMS

BOA – Basic Ordering Agreement

COC – Chain of Custody

DAP – Data Assessment Package

DC – Derivative Classifier

DMIP – Data Management Implementation Plan

DOE – U.S. Department of Energy

DQO – Data Quality Objective

DUP – Laboratory Duplicate

DVQ – Data Validation Qualification

EDD – Electronic Data Deliverables

EMP – Environmental Monitoring Plan

EPA – United States Environmental Protection Agency

FFCA – Federal Facilities Compliance Act

FRNP – Four Rivers Nuclear Partnership

KPDES – Kentucky Pollutant Discharge Elimination System

LCS – Laboratory Control Sample

LCSD – Laboratory Control Sample Duplicate

MS – Matrix Spike

MSD – Matrix Spike Duplicate

NCS – Nuclear Criticality Safety

OREIS – Paducah Oak Ridge Environmental Information System

PARCCS – Precision, Accuracy, Representativeness, Completeness, Comparability, Sensitivity

PCB – polychlorinated biphenyl

PEGASIS – PPPO Environmental Geographic Analytical Spatial Information System

PEMS – Paducah Project Environmental Measurements System

Appendix A – Acronyms/Definitions (Continued)

PGDP D&R – Paducah Gaseous Diffusion Plant Deactivation and Remediation

QA – Quality Assurance

QAPP – Quality Assurance Project Plan

QC – Quality Control

RTL – Ready-to-Load

SAEP – Sampling Analysis and Event Plan

SAP – Sampling and Analysis Plan

SMO – Sample Management Office

SOW – Statement of Work

TSCA – Toxic Substance Control Act

WMP – Waste Management Plan

DEFINITIONS

Basic Ordering Agreement (BOA) – The contractual agreement between PDGP D&R contractor and the laboratory. The BOA covers programmatic contractual elements such as QA/QC requirements and laboratory deliverable requirements.

Contractual Screen – A process of evaluating a set of data against the requirements specified in the laboratory SOW to ensure that all requested information is received. The contractual screen includes, but is **NOT** limited to, the review of COC information, analytes requested, method used, units, holding times, and reporting limits achieved.

Data Assessment – A process of evaluating a set of data and its associated laboratory QC data to determine if any quality deficiencies are present. Data Assessment is performed by the Data Reviewer. Data assessment follows Data Verification. It can be performed in parallel with Data Validation, however data assessment cannot be completed until data validation report is reviewed.

Data Assessment Package (DAP) – A package that includes data reports from the integrated data system (i.e., PEMS), CP3-ES-5003-F04, (if applicable), laboratory and sample management comments, CP3-ES-5003-F01, CP3-ES-5003-F02, and routine queries generated to aid in the review of the data. After the review is complete, any questions or comments by the Data Reviewer, Project Reviewer, SMO, or QA Reviewer are added to the project DAP. The project DAP is submitted as a record to Records Management.

Data of Known Quality – Data, along with appropriate laboratory qualifiers, verification codes, validation codes, and data assessment codes, that can be used for decision making purposes and was collected and managed according to this procedure.

Appendix A – Acronyms/Definitions (Continued)

Data Quality Objectives (DQOs) – A set of criteria established for the collection of data. The DQO process is a planning tool based on the scientific method that clearly identifies an environmental problem; the remedial decisions to address the problem; and the type, quantity, and quality of data needed to support the decision. This process is based on the DQO process developed by the EPA. The DQO process may be applied in modified form to any data collection activity. The DQO process balances risk with cost in selecting the most appropriate data collection plan.

Data Reviewer – Performs independent review of data presented in project DAP. Data Reviewer can be personnel from SMO or Characterization organizations who are appropriately trained. Data Reviewer and QA Reviewer cannot be the same individual.

Data Usability Assessment – A process for assuring that the type, quality, and quantity of data are appropriate for their intended use. It allows for the determination that the decision can be made with the desired level of confidence, given the quality of the data set. Data Usability Assessment follows Data Verification and Data Validation & Data Assessment in the data assessment review process. Data Usability Assessment is performed by the Project Reviewer. Data Usability Assessment must be performed to ensure data is useable.

Data Validation – A process performed for a data set by a qualified individual independent from sampling, laboratory, project management, or other decision making personnel for the project. Data validation evaluates the laboratory adherence to analytical method requirements.

Data Verification – A process for comparing a data set against a set standard or contractual requirement. Data verification may be performed electronically, manually, or by a combination of both. Data verification includes contractual screen and can include other data quality checks established by the project team.

Definitive Data – Analytical measurements for which the presence, and corresponding concentration, of the target analyte(s) can be determined with a known degree of certainty. The measurements are supported with appropriate physical evidence documenting the acquisition and analysis. Definitive data in electronic form must be supported with retrievable, but **NOT** necessarily retrieved, physical evidence in the laboratory. This evidence can include analytical results, QA/QC results, COC, analytical logbooks, standards information, etc.

Electronic Data Deliverables (EDD) – Data that is received in electronic format from a laboratory through a direct communication between computerized data management systems. EDD contents must meet defined completeness, consistency, and format requirements. These criteria are defined in the laboratory BOA.

External Agency – Any organization external to PGDP D&R personnel, its subcontractors, and DOE.

Information Only Data – Data for which quality is **NOT** assured and may or may **NOT** contain the appropriate qualifiers; however, data can be used for informational purposes or may be used for decision making with relevant documentation.

PARCCS Parameters – Precision, Accuracy, Representativeness, Completeness, Comparability, Sensitivity, as explained in Appendix E and recorded on CP3-ES-5003-F04.

Project Reviewer – Performs independent review of data presented in project DAP. Project Reviewer is assigned by the project team and can be personnel from project team who are appropriately trained. The Project Reviewer bears the ultimate responsibility for determining the usability of a data set for decision making purposes. Project Reviewer and QA Reviewer cannot be the same individual.

Appendix A – Acronyms/Definitions (Continued)

Project Team – The project team consists of project personnel responsible for initiating a data collection activity (i.e., sampling event). The project team defines the project DQOs and submits request to the SMO for collection of samples. The project team coordinates sample collection and analysis with the SMO to ensure project requirements are met. The project team assigns a representative of the project to serve as the Project Reviewer.

Quality Assured Data – Data that has undergone a documented review, as specified by this procedure, to provide confidence that the data conforms to established technical requirements and is sufficient for the intended use.

QA Reviewer –Performs independent review of project DAP and verifies completion of data assessment. QA Reviewer is a member of the SMO who is appropriately trained. QA Reviewer and Data Reviewer cannot be the same individual.

Screening Data – Measurements generated through the use of field or fixed laboratory methods in which the level of certainty in the data cannot be determined given physical evidence documenting the acquisition and analysis of the sample. Analytical methods producing field measurements or screening quality data include those that indicate the presence or absence of an analyte or class of analytes, or provide a semi-quantitative result. Field measurement and other screening quality data include, but are **NOT** limited to, Draeger tube; soil gas surveys; radiation and contamination monitoring; and measurements for pH, conductivity, temperature, dissolved oxygen, and turbidity. Screening data results may be confirmed by collecting a specified percentage of definitive data.

Statement of Work (SOW) – The contractual agreement between the requesting organization and the service provider. The SOW defines the scope of work including analytes requested, reporting limits to be achieved, sample quantities, and sampling schedules. Any project-specific QA/QC requirements that are not standard to laboratory BOA requirements should be defined in laboratory SOW.

Appendix B – OPTIONS TO IMPLEMENTING AND DOCUMENTING THE DQO PROCESS FOR PADUCAH PROJECTS INTRODUCTION

INTRODUCTION

The DQO process is a scientific and legally-defensible data collection and planning process to help users decide what type, quality, and quantity of data will be sufficient for decision making. This attachment is based on a series of planning steps designed to assure that data collected is adequate for the intended purpose.

PURPOSE

The purpose of this appendix is to provide options for implementing and documenting the DQO process.

DQO OPTIONS AND APPLICABILITY

Option 1

For Environmental Remediation projects, the detailed approach as found in the EPA *Guidance on Systematic Planning Using the Data Quality Objectives Process* (EPA QA/G-4) is appropriate. For long-term environmental monitoring sampling programs and extensive waste sampling activities, this detailed and structured approach can be useful. However, full implementation of the process may not always be appropriate.

Option 2 (Minimum Requirements)

The following models are provided for guidance in documenting a simplified version of the DQO process. Use the applicable model for your project.

Model B.1 – ENVIRONMENTAL MONITORING PROJECTS – DQO PROCESS
Model B.2 – ENVIRONMENTAL RESTORATION PROJECTS – DQO PROCESS
Model B.3 – SITE CHARACTERIZATION PROJECTS – DQO PROCESS
Model B.4 – WASTE CHARACTERIZATION PROJECTS – DQO PROCESS

Option 3

A user-defined DQO process that includes the minimum requirements from Option 2 and any additional actions needed.

APPLICABILITY EXCLUSIONS

This attachment is **NOT** applicable to PCB spills, asbestos events, and environmental spills due to the quick response time and the well-defined actions to be taken in the event of the occurrence.

DOCUMENTATION

Documentation of the DQO process is required and will do the following:

- Provide a source of historic data and process knowledge for related sampling,
- Provide a tool for conducting data assessment,
- Facilitate efficient project management transfers, or
- Allow decisions to be recalled and defended.

Appendix B – OPTIONS TO IMPLEMENTING AND DOCUMENTING THE DQO PROCESS FOR PADUCAH PROJECTS (Continued)

The documentation may be presented in various ways and will include:

- An outline or text form following the format shown in this attachment. Include responses to the questions as separate, brief accounts of the information gathered, its sources, and the rationale for decisions made.
- References to various other documents, such as SAPs, SAEPs, QAPPs, EMPs, WMPs, DMIPs, etc., as necessary.
- An e-mail and CP3-ES-1034-F01, *Sample Request Form,* are routinely provided for special sampling requests and serve as the DQO documentation.

Appendix B – OPTIONS TO IMPLEMENTING AND DOCUMENTING THE DQO PROCESS FOR PADUCAH PROJECTS (Continued)

Model B.1 – ENVIRONMENTAL MONITORING PROJECTS – DQO PROCESS

1. **The Problem and the Decision**--The drivers for data collection activities.
   - What is the description of the area of concern?
     - Where is the current location?
   - What are the contaminants or analytes of interest?
     - What is the media of concern?
     - What are the suspected contaminants?
     - How were they selected?
     - What are the known or potential routes of migration?
     - What are the known or potential human and environmental receptors?
     - What are the exposure pathways?
   - What decision needs to be made regarding the area (i.e., disposition of waste, etc.)?

2. **Inputs to the Decision**--The sources of data and information used to make the decision.
   - What historical data exists? Is it adequate for use?
   - What process knowledge exists? Is it adequate for use?
   - What additional data must be collected?
     - What are the analytes and analytical methods?
     - What reporting limits are needed?

3. **Physical Boundaries to be Considered**--Physical characteristics that affect the sampling design.
   - What is the location of the potential contamination?
     - What are the depth and boundaries/geometry of the potential contamination area?
   - What considerations affect the sample location choices?
     - Is the intention to characterize the average of the environmental media?
     - What are the site conditions that affect sampling (power lines, trees, concrete pad, etc.)?
     - Is it homogenous?
     - Is the contamination level expected to be a continuous range?
   - Are there other sampling constraints, such as temporal, schedule, seasonal concerns, regulatory requirements, etc.?

4. **Decision Statement and Uncertainty**
   - What are the steps to be taken after the analytical results are received?
     - Is this preliminary sampling?
   - What results will trigger further testing, verification, or action?
     - What additional steps will be taken?
     - If I find ...., then what will I do? Consider the potential impact for making an incorrect decision based on the data.

5. **Develop the Data Sampling Design**
   - State the type of data to be obtained.
     - Will it be screening, definitive, or a combination?
   - State the approach to sample selection.
     - Will it be grab or composite, judgmental (selective) or random?
     - Will it be a statistically-based selection?
   - Optimize the design and approach for efficiency and effectiveness.
     - What confidence intervals are needed?
     - What QA/QC will be required by sample method or this procedure?
     - What additional QA/QC is requested?

Appendix B – OPTIONS TO IMPLEMENTING AND DOCUMENTING THE DQO PROCESS FOR PADUCAH PROJECTS (Continued)

Model B.2 – ENVIRONMENTAL RESTORATION PROJECTS – DQO PROCESS

1. **The Problem and the Decision**--The drivers for data collection activities.
   - What is the description of the area of concern?
     - Where is the current location?
   - What are the contaminants or analytes of interest?
     - What is the media of concern?
     - What are the suspected contaminants?
     - How were they selected?
     - What are the known or potential routes of migration?
     - What are the known or potential human and environmental receptors?
     - What are the exposure pathways?
   - What are potential corrective actions for this problem?
   - What decision needs to be made regarding the area (e.g., disposition of waste, etc.)?

2. **Inputs to the Decision**--The sources of data and information used to make the decision.
   - What historical data exists? Is it adequate for use?
   - What process knowledge exists? Is it adequate for use?
   - What additional data must be collected?
     - What are the analytes and analytical methods?

3. **Physical Boundaries to be Considered**--Physical characteristics that affect the sampling design.
   - What is the location of the potential contamination?
     - What are the depth and boundaries/geometry of the potential contamination area?
   - What considerations affect the sample location choices?
     - Is the intention to characterize the average of the environmental media or do you need to know the "hot spots"?
     - What are the site conditions that affect sampling (power lines, trees, concrete pad, etc.)?
     - Is it homogenous?
     - Is the contamination level expected to be a continuous range?
   - Are there other sampling constraints, such as temporal, schedule, seasonal concerns, NCS controls, regulatory requirements, etc.?

4. **Decision Statement and Uncertainty**
   - What are the steps to be taken after the analytical results are received?
     - Is this preliminary sampling?
   - What results will trigger further testing, verification, or action?
     - What additional steps will be taken?
     - If I find ...., then what will I do? Consider the potential impact for making an incorrect decision based on the data.

5. **Develop the Data Sampling Design**
   - State the type of data to be obtained.
     - Will it be screening, definitive, or a combination?
   - State the approach to sample selection.
     - Will it be grab or composite, judgmental (selective) or random?
     - Will it be a statistically-based selection?
   - Optimize the design and approach for efficiency and effectiveness.
     - What confidence intervals are needed?
     - What QA/QC will be required by sample method or this procedure?
     - What additional QA/QC is requested?

Appendix B – OPTIONS TO IMPLEMENTING AND DOCUMENTING THE DQO PROCESS FOR PADUCAH PROJECTS (Continued)

Model B.3 – SITE CHARACTERIZATION PROJECTS – DQO PROCESS

1. **The Problem and the Decision**--The drivers for data collection activities.
   - What is the description of the area of concern?
     - Where is the location?
   - What are the boundaries of the area that will be characterized?
   - What are the contaminants or analytes of interest?
     - What is the media of concern?
     - What are the suspected contaminants?
     - How were they selected?

2. **Inputs to the Decision**--The sources of data and information used to make the decision.
   - What historical data exists? Is it adequate for use?
   - What process knowledge exists? Is it adequate for use?
   - Are there any NCS hazards?
   - What additional data must be collected?
     - What are the analytes and analytical methods?

3. **Physical Boundaries to be Considered**--Physical characteristics that affect the sampling design.
   - What is the location of the potential contamination?
     - What are the depth and boundaries/geometry of the potential contamination area?
   - What considerations affect the sample location choices?
     - Is the intention to characterize the average of the environmental media?
     - What are the site conditions that affect sampling (power lines, trees, concrete pad, etc.)?
     - Is it homogenous?
     - Is the contamination level expected to be a continuous range?
   - Are there other sampling constraints, such as temporal, schedule, seasonal concerns, NCS concerns, regulatory requirements, etc.?

4. **Decision Statement and Uncertainty**
   - What are the steps to be taken after the analytical results are received?
     - Is this preliminary sampling?
     - For what event?
   - What results will trigger further testing, verification, or action?
     - What additional steps will be taken?
     - If I find ...., then what will I do? Consider the potential impact for making an incorrect decision based on the data.

5. **Develop the Data Sampling Design**
   - State the type of data to be obtained.
     - Will it be screening, definitive, or a combination?
   - State the approach to sample selection.
     - Will it be grab or composite, judgmental (selective) or random?
     - Will it be a statistically-based selection?
   - Optimize the design and approach for efficiency and effectiveness.
     - What confidence intervals are needed?
     - What QA/QC will be required by sample method or this procedure?
     - What additional QA/QC is requested?

Appendix B – OPTIONS TO IMPLEMENTING AND DOCUMENTING THE DQO PROCESS FOR PADUCAH PROJECTS (Continued)

Model B.4 – WASTE CHARACTERIZATION PROJECTS – DQO PROCESS

1. **The Problem and the Decision**--The drivers for data collection activities.
   - What is the description of the waste?
     - Where and when was it generated?
     - What is the media and the volume?
     - Where is it now?
   - Who needs information about the waste? Why do they need the information?
     - Waste Management for characterization purposes?
     - Waste Management to determine TSDF options?
     - Waste Management to meet a specific vendor's WAC?
   - What are the contaminants or analytes of interest?
     - What are the suspected contaminants?
     - How were they selected?
   - What decision needs to be made regarding the area (e.g., disposition of waste, NCS hazards, etc.)?

2. **Inputs to the Decision**--The sources of data and information used to make the decision.
   - What historical data exists? Is it adequate for use?
   - What process knowledge exists? Is it adequate for use?
   - What additional data must be collected?
     - What are the analytes and analytical methods?

3. **Physical Boundaries to be Considered**--Physical characteristics of waste that affect sampling design.
   - What is the location of the potential contamination?
     - Surface contamination or volumetric?
   - What considerations affect the sample location choices?
     - Is the intention to characterize the average of the waste stream or do you need to know the "hot spots"?
   - How is the waste containerized?
   - Are there sampling problems?
     - What is the geometry of the waste?
     - Is it homogenous?
     - Is the contamination level expected to be a continuous range?
   - Are there other sampling constraints, such as temporal, schedule, seasonal concerns, NCS concerns, regulatory requirements, etc.?

4. **Decision Statement and Uncertainty**
   - What are the steps to be taken after the analytical results are received?
     - Is this preliminary sampling?
   - What results will trigger further testing, verification, or action?
     - What additional steps will be taken?
     - If I find ...., then what will I do? Consider the potential impact for making an incorrect decision based on the data.

5. **Develop the Data Sampling Design**
   - State the type of data to be obtained.
     - Will it be screening, definitive, or a combination?
   - State the approach to sample selection.
     - Will it be grab or composite, judgmental (selective) or random?
     - Will it be a statistically-based selection?
   - Optimize the design and approach for efficiency and effectiveness.
     - What confidence intervals are needed?
     - What QA/QC will be required by sample method or this procedure?
     - What additional QA/QC is requested?

Appendix C – DATA TYPES AND STAGES OF VALIDATION

INTRODUCTION

The following information is an aid to the project team or requester to understand the types of data and choose appropriate stage of validation (if required).

SCREENING AND DEFINITIVE DATA

There are two types of data generated using this procedure. Screening data is defined in Appendix A and generally refers to qualitative data. In order to increase confidence, screening data results should be confirmed by collecting a specified percentage of definitive data. The recommended percentage of definitive data for confirming screening data is 10 percent. This, in turn, makes the data more usable for decision making. Definitive data also is defined in Appendix A and describes data usually generated from a fixed-based laboratory following appropriate quality control requirements for various analytical methods.

STAGES OF VALIDATION

- **Stage 1 Validation**: A verification and validation based only on completeness and compliance of sample receipt condition checks. Client sample IDs and target analytes are verified against the COCs for completeness; sample conditions upon arrival at laboratory noted; sample preservation was appropriate and verified by the laboratory; holding times were met; concentrations and units were appropriate; trip blanks, field blanks, and equipment rinsate blanks, and field duplicates met project requirements for frequency and field quality control.

- **Stage 2A Validation**: A verification and validation based on completeness and compliance checks of sample receipt conditions and **ONLY** sample-related QC results. Method blanks, laboratory control samples (LCS), matrix spikes (MS), laboratory duplicates (LCSD, MSD, DUP), surrogates (organics), serial dilutions, post-digestion spikes (as appropriate to the method) and any preparatory batch cleanup QC to assure project requirements for analyte spike list, frequency, and quality control limits are met.

- **Stage 2B Validation**: A verification and validation based on completeness and compliance checks of sample receipt conditions and **BOTH** sample-related and instrument-related QC results.

- **Stage 3 Validation**: A verification and validation based on completeness and compliance checks of sample receipt conditions, both sample-related and instrument-related QC results, **AND** recalculation checks.

- **Stage 4 Validation**: A verification and validation based on completeness and compliance of sample receipt conditions, both sample–related and instrument-related QC, recalculation checks **AND** the review of actual instrument outputs.

The stage of validation required is generally defined at the program/project level. Validation parameters to be reviewed depending on stage of validation can include instrument calibrations, calibration verification checks, quality control sample results, analytical yields, holding times, and sample preservation. It is not the role of data validation to determine if project goals are met or to provide the decisions to be made. Data validation provides the overall appraisal of a data set and the project team should use this appraisal along with their own judgment to make their own decisions.

Appendix D – DATA ASSESSMENT REVIEW PROCESS

INTRODUCTION

To ensure the process for data quality continues, data assessment review process must be performed for results received from a data collection activity. The four elements of the data assessment review process outlined in this procedure are data verification, data validation, data assessment, and data usability assessment.

PURPOSE

The purpose of this appendix is to provide overview of the data assessment review process. The documentation checklist to be used for assessment of a data collection activity is also provided in this appendix.

DATA VERIFICATION

Data verification is the first step of the data assessment review process. The preferred method for performing verification is electronic. Verification criteria are documented using CP2-ES-5003-F01 and CP3-ES-5003-F05 (if Stage 2B, Stage 3, or Stage 4 data validation is required). Data verification is performed on 100 percent of data.

DATA VALIDATION

Data validation follows data verification in the data assessment review process when requested by the project team. Stage 3 and Stage 4 validations **must** be performed by a third party. Third party data validation is defined as validation performed by persons independent from sampling, laboratory, and decision making for the project (i.e., not the Project Reviewer, etc.). Data validation is documented in a formal deliverable from the data validator. The stage and frequency chosen for validation is based on project requirements and the following considerations:

- Regulatory drivers/requirements
- End-user of data
- Future applicability of the data (other users such as regulatory agencies, risk assessment personnel, internal users, etc.)
- Legal ramifications and defensibility of data
- Confidence in laboratory (DOECAP approved laboratory)

Project team determines if data set requires validation. Project team also determines stage and frequency of data validation. See Appendix C, *Data Types and Stages of Validation* for more information.

DATA ASSESSMENT

Data assessment follows data verification and data validation (if requested) in the data assessment review process. Data assessment is performed by data reviewers who have been trained to evaluate laboratory QA/QC requirements. Data assessment is performed on 100 percent of data.

DATA USABILITY ASSESSMENT

Data usability assessment is the last review step of the data assessment review process prior to release of the data from the project team. It is an integration of all information collected about a result. Data verification and validation can ensure analyses are correct; however, data usability assessment **must** be performed to evaluate data usability. This includes a review of the data itself, the results of all previous reviews of the data, checking data for trends, and evaluation against the intended purpose for data collected. Data usability assessment **must** be performed for all data collection activities and documented using CP3-ES-5003-F01. Data usability assessment is required prior to use of the data, or data release into the final data repository (i.e., OREIS). Data usability assessment is performed on 100 percent of data.

Appendix E – PARCCS PARAMETERS

PARCCS PARAMETERS

Data are only useable if the precision and accuracy is known. Data is only useable for decision making if it is also precise, accurate, representative of the whole, comparable to expectations, complete as planned, and sensitive as needed. These requirements are known as the PARCCS parameters and are explained in detail below. The calculations performed in PEMS for PARCCS parameters are recorded on CP3-ES-5003-F04, during the creation of the project DAP when requested by the project team.

Precision – Precision measures the agreement among a set of replicate measurements. Field precision is assessed through the collection and analysis of field duplicates. Analytical precision is estimated by evaluation of results from duplicate/replicate analyses on laboratory control samples, spiked samples and/or field samples. The most commonly used estimate of precision is relative percent difference (RPD). In PEMS, the analytical precision result is evaluated in the laboratory case narratives when laboratory duplicates, laboratory control sample duplicates, matrix spike duplicates, and/or post-digestion spike duplicates are discussed. Data not meeting laboratory acceptance criteria are qualified by the laboratory using PGDP D&R laboratory qualifiers (*, L1, N1, W1, and Y2).

Accuracy – Accuracy is a quantitative measurement of the bias of the data. It represents the closeness of a measured result to an accepted reference value (true value). Sampling accuracy can be assessed by evaluating results from field blanks, equipment rinsate blanks, and trip blanks (if applicable). Analytical accuracy is measured by evaluating percent recoveries associated with internal standards, laboratory control samples, surrogates, tracers, matrix spikes, and post-digestion spikes. It also includes evaluating results from analysis of preparation blanks and method blanks. In PEMS, the accuracy result is evaluated in the laboratory case narratives when blanks, tracers, surrogates, lab control samples, matrix spikes, and/or post-digestion spikes are discussed. Data not meeting laboratory acceptance criteria are qualified by the laboratory using PGDP D&R laboratory qualifiers (B, L, M, N, S, T, W, and Y1).

Representativeness – Representativeness is a qualitative term that expresses the degree to which the sample data accurately and precisely represent the characteristics of a population, parameter variations at a sampling point, a process condition, or an environmental condition. Representativeness is dependent on the proper design of the sampling program and will be satisfied by ensuring the approved procedures and plans were followed during sampling and analysis. Sampling strategy (location, method, and frequency) is critical to assure that the samples statistically represent the population. Precision, accuracy, and completeness all affect representativeness. Analytical precision and accuracy reflect how representative the data is of the sample as a qualitative measurement.

Completeness – Completeness is a quantitative measurement of the percentage of acceptable data as compared to the number planned. Measurements are considered to be valid if they are not qualified as rejected or unusable during data assessment and/or data validation. Both field and analytical completeness can be measured. Field completeness is a measure of the number samples collected versus the number of samples planned (excluding field QC blanks). Analytical completeness is a measure of the number of valid analytical results received versus the number of analytical results requested from samples submitted to the laboratory.

Comparability – Comparability is a qualitative term that expresses the confidence with which a data set can be compared with another. Strict adherence to standard sample collection procedures, analytical detection limits, and analytical methods assures that data from like samples and sample conditions are comparable. Utilizing such procedures and methods enables the current data to be comparable with previous data sets generated with similar methods. This comparability is independent of laboratory personnel, data reviewers, or sampling personnel.

Appendix E – PARCCS PARAMETERS (Continued)

Sensitivity – Sensitivity is related to the ability to compare analytical results with project-specific levels of interest, such as project action levels. The sensitivity of an analysis (or the detection limit) is determined by the analytical method and the laboratory analyst and instrumentation. In PEMS, sensitivity is evaluated by reviewing the detection limit received compared to what was requested in the laboratory SOW.