**Tennessee Valley Authority**
**Regulatory Submittal for Kingston Fossil Plant**

**Documents submitted:**
**Data Management Plan for the Tennessee Valley Authority Kingston Ash Recovery Project**

**Date submitted**
**9/18/2009**

**Submitted to whom**
**Leo Francendese, EPA**

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September 18, 2009

Mr. Leo Francendese
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Dear Mr. Francendese:

Please find enclosed the Data Management Plan for the Tennessee Valley Authority Kingston Ash Recovery Project. The enclosed plan fulfills the requirements of Section IX, paragraph 28, item h. of the Administrative Order and Agreement on Consent.

Please contact me if you have any questions.

Sincerely,

Anda A. Ray

Anda A. Ray

Enclosures

# DATA MANAGEMENT PLAN
# FOR THE TENNESSEE VALLEY AUTHORITY
# KINGSTON ASH RECOVERY PROJECT

TVA-KIF-DMP-001

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Revised November 9, 2009 (Based on EPA review and comments)
Revised September 11, 2009 (Based on internal TVA review and comments)
Revised August 10, 2009 (Based on EPA Data Team review and comments)
Issued May 29, 2009

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## ABBREVIATIONS

| | |
|---|---|
| COC | Chain-of-Custody |
| DMP | Data Management Plan |
| EDD | Electronic Data Deliverable |
| EDP | Electronic Data Processor |
| EQDMS | EQuIS Quality and Data Management System |
| KIF | Kingston Fossil Plant |
| MAG | Method/Analyte Group |
| QA | Quality Assurance |
| QAPP | Quality Assurance Program Plan |
| QC | Quality Control |
| SDG | Sample Delivery Group |
| SPM | Sample Planning Module |
| TVA | Tennessee Valley Authority |

# 1.0 INTRODUCTION

This site-wide Data Management Plan (DMP) has been prepared to address the challenges of managing technical data from a wide array of technical data analysis processes. This DMP is intended to provide a basis for supporting a full technical data management business cycle from pre-planning of sampling events to reporting and analysis with a particular emphasis on ensuring completeness, data usability, and most importantly defensibility of the data.

## 1.1 Background Information

On Monday, December 22, 2008, just before 1:00 a.m., a coal fly ash release occurred at Tennessee Valley Authority's (TVA's) Kingston Fossil Plant (KIF) site, allowing a large amount of fly ash to escape into the adjacent waters of the Emory River. Ash, a by-product of a coal-fired power plant, is stored in containment areas. Failure of the dredge cell dike caused about 60 acres of ash in the 84-acre containment area to be displaced. At the time of the slide, the area contained about 9.4 million cubic yards of ash. The dike failure released about 5.4 million cubic yards of coal ash over an area of about 275 acres and affected about 40 area homes. In addition, a section of the Emory River channel was blocked by ash causing the river to divert around the blockage.

In response to the ash release, TVA initiated the TVA KIF Ash Recovery Project. TVA's objectives for the recovery effort are to:

- Maintain the health and safety of the public and response personnel;
- Involve the public, affected property owners, and other agencies in the formulation of response activities;
- Restore impacted natural and public resources expeditiously; and
- Return the area to the condition it was before the ash release.

An extensive sampling and monitoring program is required to support the objectives of the recovery effort. To ensure that project objectives are met, a comprehensive Quality Assurance (QA) program has been developed. The primary goals of the QA program is to generate high-quality, reliable, analytical data to characterize the extent of the fly ash deposition, to monitor the spill containment and remediation operations, and to assess the potential short-term and long-term health hazards and biological impact. The TVA KIF Ash Recovery Project includes sampling and monitoring of the following sample matrices.

- Aqueous Sampling (including, but not limited to, river surface water and groundwater)
- Solid Sampling (including, but not limited to, released ash, sediment, and residential soil)

- Air Sampling and Monitoring
- Toxicological Monitoring (including, but not limited to, whole sediment elutriate evaluation, elutriate toxicity evaluation, plume toxicity evaluation, and polymer toxicity evaluation)
- Biological Tissue Sampling (including, but not limited to, fish tissue, bird eggs, amphibians, reptiles, and mammals)

QA for managed analytical data associated with the TVA KIF Ash Recovery Project is described in the site-wide *Quality Assurance Program Plan, TVA Kingston Fossil Plant Ash Recovery Project* (TVA-KIF-QAPP). The TVA-KIF-QAPP provides an overall framework for QA and data management activities associated with the TVA KIF Ash Recovery Project. The TVA-KIF-QAPP is applicable to all current and future sampling and monitoring programs associated with the Site. Nomenclature and controls on data relative to analytical methods and target analyte lists are defined in this and subsequent related documents.

The sampling design and execution for monitoring activities associated with the TVA KIF Ash Recovery Project are described in various program-specific Work Plans and the site-wide *Quality Assurance Program Plan* (TVA-KIF-QAPP). Chain-of-Custody (COC) documentation and sample identification strings are defined in this document and individual standard operation procedures (SOPs).

## 1.2 Historical and Recent Data

Environmental data associated with surface water, groundwater, sediment, soil, air, and biological samples have been collected by TVA during previous operational periods. For the purpose of this data management plan, "Historical" data on this project is defined as data collected by TVA prior to the onsite ash release event of December 22, 2008. These data sets are typically limited to sample and results only (no quality control [QC] data) and are anticipated to be included in TVA's project database. Since the ash release, TVA has conducted considerable environmental sampling at the Site resulting in the generation of a significant amount of environmental data. This data is referred to as "Recent" data

Environmental data from activities from dredge operations have been incorporated into TVA's current database as electronic data. Additional environmental data are anticipated to be generated as a result of specific remedial investigations and activities to characterize the nature and extent of contamination and to assess potential human health and ecological risks. Specific Work Plans will reference this DMP and describe any deviations to this DMP.

### 1.3 Existing Project Database

Beginning in late December 2008, data generated at the Site were stored in the US Environmental Protection Agency (EPA) provided Microsoft Access database known as SCRIBE (a basic desktop database). In January 2009, it became obvious that the Microsoft Access platform was not adequate for the anticipated volume of data that would be generated during the lifetime of the project or for the level of user access needed by the Project Team. TVA decided to move to a more robust multi-user platform, and a commercial software suite, EarthSoft's EQuIS Enterprise, was selected and implemented. Existing project data were migrated into the EQuIS Quality and Data Management System (EQDMS) to centralize data management for the KIF Site.

### 1.4 Objectives

The major objectives for the DMP program at the KIF Site are to:

- Maintain data control, consistency, reliability, and reproducibility throughout the life of the project;
- Establish the framework for consistent documentation of the quality and validity of field and laboratory data compiled during all investigations;
- Describe in detail the data management procedures for all site-related data including groundwater, surface water, soil, sediment, air, biological, toxicological, and any other site-specific data collected;
- Describe how these new data will be integrated and comprehensively managed with previously collected and historical data;
- Include procedures and timelines for sharing data with stakeholders as well as procedures for providing both electronic and hardcopies to specified recipients of each type of data; and
- Enable the use of project data in a consistent and easily shared format among appropriate internal and external parties (such as TVA, Consultants, EPA, and Tennessee Department of Environmental Compliance [TDEC]).

## 2.0 DATA MANAGEMENT PROCESS

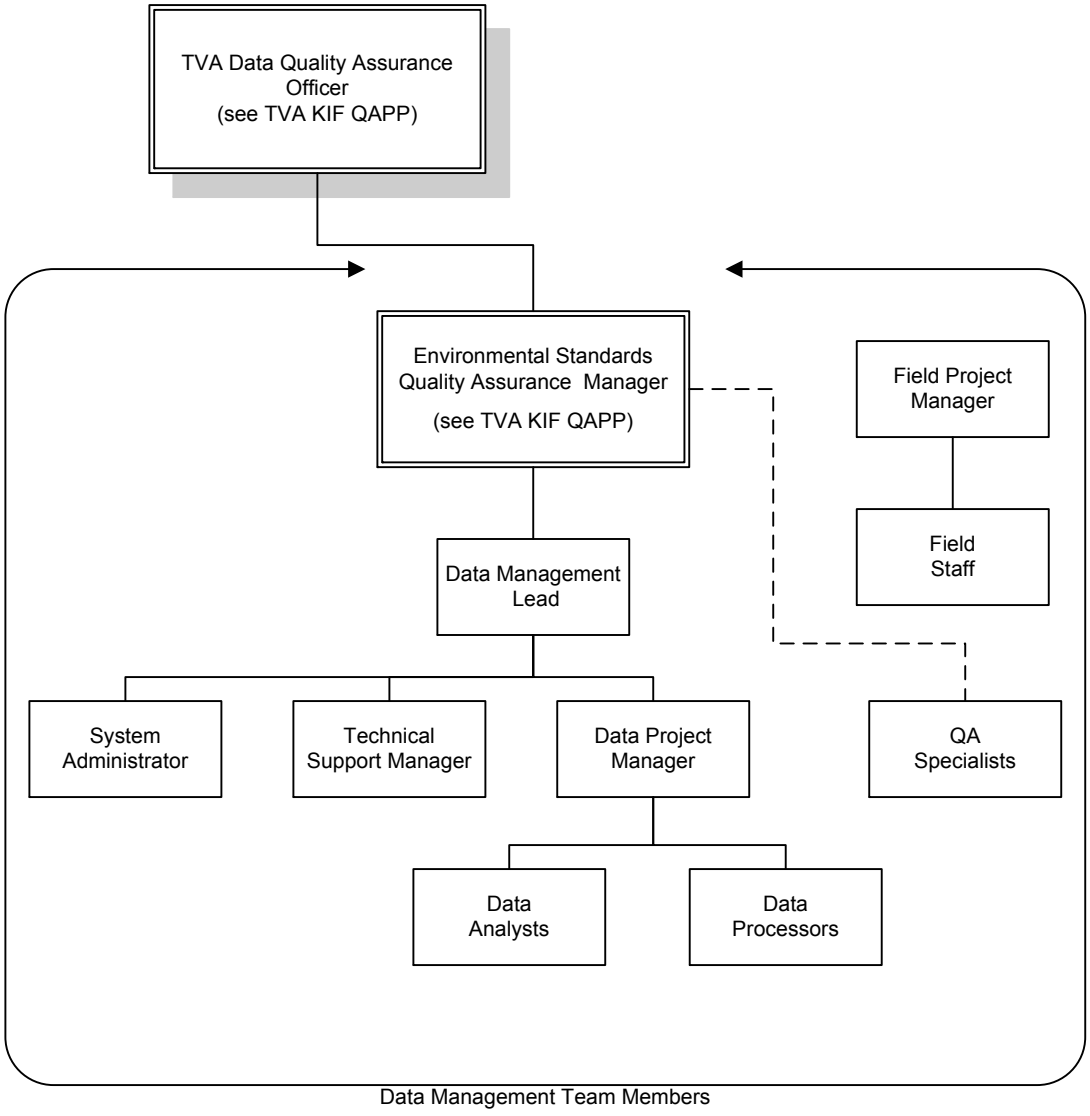
This section describes the data management team and process for managing new and historical data.

### 2.1 Data Management Team

Users of the EDMS will primarily consist of technical and project staff that is assumed to have a general understanding of the environmental data and the Site. Certain users are also required to have an advanced understanding of the EQDMS and relational database architecture. The data management team consists of the following positions.

- Data Management Lead
- Field Project Managers and Field Staff
- Data Project Manager
- QA Specialists
- Data Analysts, Data Processors, and other Data Users
- Technical Support Manager
- System Administrator

The team is organized as depicted in the chart below.




A description of each team member's roles and responsibilities is provided below.

### 2.1.1 Data Management Lead

The Data Management Lead acts as the single point of contact for TVA for data management at the Site. The Data Management Lead is responsible for updating and implementing the DMP, ensuring that adequate data management team members are available and properly trained, and ensuring that adequate software and hardware are available. The Data Management Lead performs periodic audits on components of the data management system including access and security controls, system documentation, and data backup procedures.

### 2.1.2 Field Project Managers

Field Project Managers, who are responsible for identifying data acquisition needs and designing individual sampling plans, are involved in the early stages of sample and data collection activities and determine what should be collected, where to sample, and what types of analyses to perform. Project Managers are responsible for preparing project-specific Work Plans that describe data management requirements and activities to be conducted. Project Managers will be able to use the EQDMS to review current and historical data to identify what data should be collected next. Project Managers (or their designees) are responsible for overall coordination between field activities and the data management process. Field Project Managers understand the data management process and interactions between field and data management staff and are proficient with computers and office productivity tools (such as e-mail, word processing, and spreadsheets).

### 2.1.3 Field Staff

Field staff members are responsible for implementing individual sampling plan activities including collecting samples, recording measurements from field equipment, and documenting the field effort. The field staff members work with the Data Project Manager to print out COC forms and sample labels from the EQDMS, update sampling information recorded in the field, and input field measurements collected. Field staff members should be competent with field monitoring equipment and familiar with computers and office productivity tools (such as e-mail, word processing, and spreadsheets).

### 2.1.4 Data Project Manager

The Data Project Manager is typically the most knowledgeable and active user of the EQDMS and will perform or direct the majority of the data updates or changes. The Data Project Manager uses the EQDMS to enter field measurements and load data received from the laboratory. The Data Project Manager works directly with the Project Managers and field staff members to perform checks that ensure the data are complete and accurate.

In addition, the Data Project Manager works directly with the QA Specialists to apply flags and updates to the data based on verification and validation activities. The Data Project Manager works directly with Project Managers, data analysts, and other data users to provide queries, tables, graphs, and data exports from EQDMS for data analysis or to include in reports. The Data Project Manager has an intimate knowledge of the data management process, relational database concepts, and the architecture of the EQDMS.

### 2.1.5 QA Specialists

QA Specialists will use the EQDMS to review, verify, and validate analytical data loaded by the Data Project Manager. Data verification and validation procedures are described in detail in the TVA-KIF-QAPP. Updates to the data such as the addition of quality control flags resulting from the data verification/validation process are entered by or at the direction of the Data Project Manager.

### 2.1.6 Data Processors

Data Processors will log in and load all data delivered to the system. Data Processors will be responsible for first-level activities and will report any exceptions encountered in a standard process to the Data Project Manager for review and action. Data Processors have access to status tracking functionality, data loading functionality, and data QC functionality; can run all standard reports in EQDMS; and have the ability to create customized reports. Data Processors will update or modify data in the database at the direction of the Data Project Manager in support of QA activities.

### 2.1.7 Data Analysts

Data Analysts will use the EQDMS to evaluate data that have passed the verification/ validation process. Data Analysts can run standard reports in EQDMS and have the ability to create customized reports. Data Analysts will not update or modify data in the database. Data Analysts will use a variety of tools for various types of analyses.

### 2.1.8 Data Users

Other data users may include individuals both internal and external to the TVA team who need to query the investigation results. Data users will typically generate standard reports or work with data analysts to generate customized reports. Data users will not modify data in the database and will be familiar with computers and tools such as e-mail, word processing, and spreadsheets.

### 2.1.9 Technical Support Manager

The Technical Support Manager will be responsible for any programming or database schema change required to support the operation of the EQDMS for this project. The Technical Support Manager will typically be involved in the planning and

implementation phases of the project and, once the system is operational, act primarily as a technical advisor to the team for any contemplated change in functionality. The Technical Support Manager will set user authentication and control access to the data, maintain data tables necessary for the EQDMS to run, and generally manage EQDMS usage. The Technical Support Manager has a strong background in information systems and relational database hardware, software design and programming, detailed understanding of the EQDMS architecture, and familiarity with the data management business process.

#### 2.1.10 System Administrator

The System Administrator will be responsible for the operation and maintenance of the EQDMS. The System Administrator will back up the data and ensure that the system is available for users. The System Administrator has a strong background in network support, information systems, and hardware and software maintenance.

## 2.2 Management of New Data

Optimal control of data is enforced by rigorous pre-planning of all sampling activities and related analytical analysis requirements. The EQDMS provides the functionality to support the creation of COC forms and bottle labels, auto loading of laboratory-generated analytical chemistry data, automated correctness checking, highly detailed completeness checking, data verification, support for data validation report and editing, and technical data reporting and presentation. This functionality exists to ensure that the stages of data management are efficient and performed as accurately as possible. Refer to Appendix A for a cross functional flow diagram of this process.

### 2.2.1 Planning

The data management process starts with Project Managers creating a project-specific work plan or individual sampling plan. This planning phase will give consideration for appropriate levels of documentation specific to the individual data collection process and will detail any appropriate field measurements and / or other event related data. Based on the field planning document, the Data Project Manager will configure the EQDMS for the investigation to support the generation of the required COC forms. The EQDMS supports printing information on the COC form, including the laboratory, shipping information, sample identifications (IDs), type and quantity of containers, preservatives, analytical tests, sample date, and sampler. At the time of sample collection, the field staff members fill out the remaining information including sampler's initials, sample collection time, and shipping information. Bottle labels for each COC form are generated with bar-coded sample IDs for use in accurately and uniquely identifying the sample and ensuring that the sample IDs on the COC form are accurately recorded by analytical laboratories.

### 2.2.2 Field Measurements and Sample Collection

The process continues with field staff members collecting environmental samples and field measurements and documenting field activities. Original hardcopy field documents and notes will be photocopied and stored as PDFs in accordance with project requirements on the KIF server. Field information will be provided to the Data Project Manager to enter technical data into the EQDMS and could possibly include sampling event information, coordinate data, water level measurements, lithologic descriptions, well completion data, and field measurements. The details for the specific data to be collected during sampling or other activities are detailed in individual work plans, field sampling plans, and related standard operating procedures. Long term strategies for project data records, documents, and archive management designed to meet the Federal record keeping guidelines are defined in the project QAPP.

### 2.2.3 Sample Tracking

Sample tracking by the Data Project Manager begins when the COC form is created. Events tracked in the EQDMS include laboratory sample receipt, level one data package receipt, electronic data deliverable (EDD) receipt, level four data package receipt, and any rejection or resubmission dates as needed based on failures in any EDD deliverable for correctness or completeness.

The Data Project Manager updates the sample tracking records in EQDMS upon receiving a deliverable. The laboratory receives the samples and evaluates the samples for proper COC procedures and sample handling. The laboratory assigns unique laboratory sample IDs and a Sample Delivery Group (SDG) number. To ensure that samples were received and that the correct analyses will be performed, the laboratory then provides the Data Project Manager with a sample log-in confirmation that specifies the following.

- Sample receipt quantities and condition of containers (such as broken/leaking, temperature, hold time, custody maintained)
- Sample preparation (such as compositing, filtration) and analyses to be conducted
- Date that analyses will be completed
- Laboratory sample IDs and SDG number

The Data Project Manager updates the database with the sample log-in information and continues to track sample/data reporting progress until the data are delivered.

### 2.2.4 Laboratory Analysis and Reporting

The laboratory personnel analyze the samples as specified on the COC form and according to the published method and project-specific requirements stipulated in the site-wide QAPP (TVA-KIF-QAPP). Once the samples are analyzed at the laboratory,

hardcopy and electronic deliverables are produced and forwarded to the data management group for testing against EDD and project and hardcopy specifications.

### 2.2.5 Data Loading and Review

Data are assigned status values based on how deep within the data loading and review process a given EDD is at a point in time. There currently are three status levels for data that have been received. These status levels are "DRAFT", "VERIFIED", and "VALIDATED". EDDs are assigned a state of "DRAFT" upon initial receipt. After an automated chemistry data verification and 2nd level review, an EDD is assigned a state of "VERIFIED". Upon completion of data validation inclusive of senior reviews, EDDs are assigned a state of "VALIDATION". The sections below will detail the activities of each stage, probable time frames, and potential areas of concern.

#### *2.2.5.1 DRAFT Status*

EDDs are received in an electronic mailbox established specifically for the project. EDDs are automatically loaded where possible and assigned a status of "DRAFT". The first test of the EDD is for correctness against the project specifications. Correctness testing is a review of the EDD format from a structural and nomenclature perspective. This test will determine if data are delivered using the correct file layout, data types, and adherence to project specific values for elements such as methods and analyte names. The full list of requirements can be found in the EDD specification in Appendix B. When an error is identified during automated testing for correctness, an e-mail containing a report of the deficiency is created and reviewed by a data management team member and then sent to the laboratory requesting resubmission, with a copy to the Data Project Manager. The status of DRAFT is automatically assigned upon the loading of the EDD. Typical problems found in this review are missing or incorrect valid values such as sample types, incorrect formatted data such as lab sample codes exceeding the appropriate field length, duplicate rows, and missing Parent/Child sample relationships. The noted issues typically require a resubmission of the EDD by the analytical laboratory.

After successfully passing the correctness testing, EDD completeness is checked by comparing the planned sampling data associated with the COC form to the actual sample and result level data delivered by the laboratory. Checks on the data include confirmation of receipt of each requested sample, appropriate requested analytical methods, and correct requested target analytes for each analytical method. If data are not complete i.e. a sample or data related to a method is missing, a review of the issue is performed by the Data Project Manager to determine if the issue is correctable. Once data have passed correctness and completeness processing, the EDD is ready for data verification processing. Typical problems found in this review are requested tests or

methods not matching reported data, requested target analyte lists not matching reported data, and requested laboratory QC information missing from reported data. The noted issues typically require a resubmission of the EDD by the analytical laboratory. Data are loaded and processed for correctness and completeness in one business day.

*2.2.5.2 VERIFIED Status*

Automated electronic data verification is performed on all correct/complete EDDs. A verification report is produced for review by the QA Specialist. Data verification activities are conducted according to the site-wide QAPP (TVA-KIF-QAPP). The data are reviewed from a usability perspective using screening software. Electronic data are also reviewed against the hard copy data package to ensure that the electronic data matches. After review and approval of the data verification report and related results by the Project QA Specialist, the data are assigned a status of "VERIFIED." Typical problems found in this review are hold-time exceedances; blank contamination, matrix interference and field duplicate precision excursions. Data are typically processed, reviewed, and approved as "VERIFED" in one business day.

*2.2.5.2 VALIDATED Status*

At any time in the data management process, analytical data may be validated. This activity will typically occur after automated verification has been completed. The decision to perform data validation on any given data set will be determined based upon the data quality objectives for that data set. Data validation is supported by reporting and edit functionalities in the EQDMS. Data tables are provided to the QA Specialist who will manually annotate those tables with validation edits. Data management staff will make any needed edits and produce final validation tables for review and inclusion in reports. This stage also reveals and resolves any EDD to hardcopy data discrepancies. After review and approval of the final data validation tables by the QA Specialist, the data are assigned a status of "VALIDATED." Typical problems found in data validation are similar to those found in verification and include correctness / completeness of the analytical laboratory hardcopy data package to identify issues such as missing raw data and/or summary forms, differences between the data reported on the hardcopy and data reported in the EDD, and instrument level interferences. Many of these issues require a resubmission of the hardcopy and / or the EDD by the analytical laboratory.

Upon completion of this activity, data status is set to "VALIDATED". A portion of the project data has a goal of validation, senior review, and approval for project use in ten business days. The QAPP and / or its appendices will detail the sample program specific goals for the timeline of activities such as validation.

It is anticipated that errors will occur with low frequency and that the data management process is designed to ensure that all errors are detected. If there are recurring problems

with EDD submittals and continuous improvement is not apparent by a particular data generator, the Data Project Manager will involve other members of the Project Team, particularly, the TVA QA Officer (identified in TVA-KIF-QAPP), to address issues at a higher level.

### 2.2.6 Data Reporting and Delivery

The EQDMS is used to produce queries, tables, and graphs for reports and to create electronic files for data delivery to internal and external data users. Example reports available to the project team are as follows:

- Analytical Results: Analytical Results is the core function for reporting analytical data in EQuIS. This report allows users to query analytical data based on a wide range of user selected limits and returns a standard dataset that can be used to build graphs, tables, and maps.
- Action Level Exceedance: The **Action Level Exceedance** report compares values from a saved **Analytical Results** report against one or more action levels (e.g., regulatory limits).
- Sample Planning Module (SPM) COC: The SPM COC report outputs a formatted COC based on user selections for use in sampling activities.
- SPM Bottle Labels: The SPM Bottle Labels report outputs a formatted Bottle Label list based on user selections for use in sampling activities.
- TVA COC Status: The TVA COC Status report provides data on a COC-by-COC basis to help the user understand what status a particular COC has. This report is also the basis for summary level views of analytical data status.

## 2.3 Management of Historical Data

As indicated in Section 1.2, there have been prior sampling events at KIF that generated historical data. Managing historical data from these investigations is complicated by the fact that the agencies and contractors performing the investigations used different methods for sampling and analysis. In addition, the historical data may not have complete laboratory reports that allow proper verification/validation of the data. To manage historical data in a manner that addresses the variety of types, sources, and formats, as well as concerns regarding data validation, the following procedures will be implemented.

Electronic data received from other consultants will be migrated to EQDMS. The migration steps include matching up the historical fields with the fields in EQDMS, appending the historical data into the previously determined EQDMS fields, and running error checks on the newly appended data. If questions arise, the previous consultants will be contacted for data clarifications. The data migration steps, such as field matching and

changes made, are documented for future reference. Once data have been loaded, it is assigned a status of "Historical."

If only hardcopy files exist for desired results, these files will be used to perform manual entry of data into EQDMS. Any data requiring manual entry will be checked by a second person for correctness of the entry.

Depending on the source and reliability of the historical data, data will be marked reportable or non-reportable. For historical data to be reportable, it must have associated laboratory reports and must pass the data verification and or data validation process specified in the site-wide QAPP (TVA-KIF-QAPP). After passing the verification or validation process, the data are marked appropriately within the EQDMS. Non-reportable results will remain in EQDMS and can be queried, but will not be included in standard reports. Custom reports can be created for non-reportable historical data, but users will be cautioned about the undetermined reliability of the data.

## 2.4 Monitoring Data

River water and air are examples of monitored matrices and data are gathered using several techniques and matrix specific processes. These processes are sufficiently complex that separate management plans are developed for each monitoring process. Existing plans can be located in the appendix.

# 3.0 DATA MANAGEMENT SYSTEM

This section provides an overview of the EQDMS and its components. This section also describes the specification for laboratory data submission and valid values.

## 3.1 EQDMS Overview

The EQDMS is composed of a commercially available environmental data management software suite, EQuIS (produced by EarthSoft), and QA modules purpose-built by Environmental Standards to work with the EQuIS software. The EQDMS has been configured by Environmental Standards to support project-specific requirements. The EQuIS software suite, which has been in use and continuously improved since 1994, is used on many environmental projects by industrial clients, consultants, and regulatory agencies at the state and federal levels. Functionality is provided on the Web for casual users and on the desktop for power users.

Software modules used on this project are described below.

### 3.1.1 EQuIS Enterprise Database

Data are stored and hosted in a Microsoft SQL database using the EarthSoft's EQuIS Enterprise SQL server data schema. All functionality connects to and accesses data using

industry standard methodology. Security of the data is maintained using SQL server roles and assigning users appropriately.

### 3.1.2 EQuIS Sample Planning Module

The sample planning module functionality enables the planning of sampling events and generation of bottleware requests for analytical laboratories, as well as printing of COC forms and bar-coded bottle labels. The data generated in the sample planning process are used to test analytical laboratory data for completeness and support status reports.

### 3.1.3 EQuIS Enterprise Electronic Data Processor

The Enterprise electronic data processor (EDP) functionally enables auto-loading of EDDs, testing against project specifications, and reporting the results of the testing to users. The basic process is that data generators send a zipped file containing the EDD file(s) and an identifying certificate via e-mail. EDP retrieves the zipped files, verifies that the certificate is valid, and processes the associated EDD against project specifications for correctness of format, valid values, and data integrity rules.

### 3.1.4 Environmental Standards' Completeness Processor

The Completeness Processor will assess EDDs that have successfully passed the correctness test for the existence of project specified data such as target analyte lists. Each EDD should represent a set of samples based on a COC form, each sample represents a set of analytical methods, and each analytical method represents a particular list of target analytes. Methods and target analyte lists are specified using a concept known as Method/Analyte Group (MAG). The MAG is a code that refers to a pre-defined finite list of methods and target analytes.

### 3.1.5 Environmental Standards' Data Verification Module

The Data Verification Module will quantitatively assess loaded, correct, and complete data against project-specific QC limits for accuracy, precision, blank contamination, holding times, total versus dissolved comparisons, and exceedances against project-defined limit lists. This functionality is based on National Functional Guidelines and supports the project goals by automating a significant amount of manual effort in the quantitative assessment of analytical data.

### 3.1.6 EQuIS Enterprise EzView/Information Agent

Enterprise EZView is a web-based portal for generating pre-defined reports on demand. This function is ideally suited for casual users with a need to access project data in a simplified way and build simple reports. Users may run reports with defined parameters selected and save those settings for future uses as a "Pick Report." Pick Reports can be scheduled for automated processing based on pre-defined triggers, the arrival of an EDD,

or on a schedule such as a day of the week. Output from this reporting function can be a spreadsheet, a PDF, or a complex formatted deliverable such as an Excel file that auto-formats based on selections.

#### 3.1.7 EQuIS Professional

EQuIS Professional is a desktop application that is designed for power users. It has the capability to perform the same reporting functions as seen in Enterprise, but can additionally design, build, and publish Enterprise reports. This application enhances decision support by enabling links to analysis and visualization functions that can create crosstab tables, graphs, and statistical output. EQuIS Professional can also interface with third-party tools such as gINT, Rockworks, EVS, Visual Modflow, and Excel.

### 3.2 Electronic Data Deliverable Specification

The EQDMS can import EDDs in a wide variety of formats; however, an EDD specification was created for the Site to standardize laboratory data submissions. The standard specification was additionally designed to ensure that the appropriate sample information is provided by the laboratory to allow for data verification and validation per the site-wide TVA-KIF-QAPP. Currently, laboratories are required to submit EDDs in accordance with the specification provided in Appendix B. Note that as project requirements evolve, the EDD specification is subject to change. If changes are made to the EDD specification, all laboratories involved with investigations at the Site will be notified.

## 4.0 SYSTEM MANAGEMENT AND ADMINISTRATION

This section describes how the EQDMS will be managed and administrated. Database Administration will include:

- Adding, altering, and deleting users, roles, and privileges; and
- Providing for routine backup of the database.

### 4.1 Access and Security

The EQDMS uses application-level and database-level security to limit access to system functionality. All users are required to log onto the system in order to gain entry into the application. The Data Management Team has defined privileges based on roles while other users, such as data analysts and other data users have read-only privileges to the project data and read/write privileges to their personal report and query configuration data as previously indicated in Section 2.1. All user accounts and privileges are maintained by the Technical Support Manager and approved by the Data Management Lead.

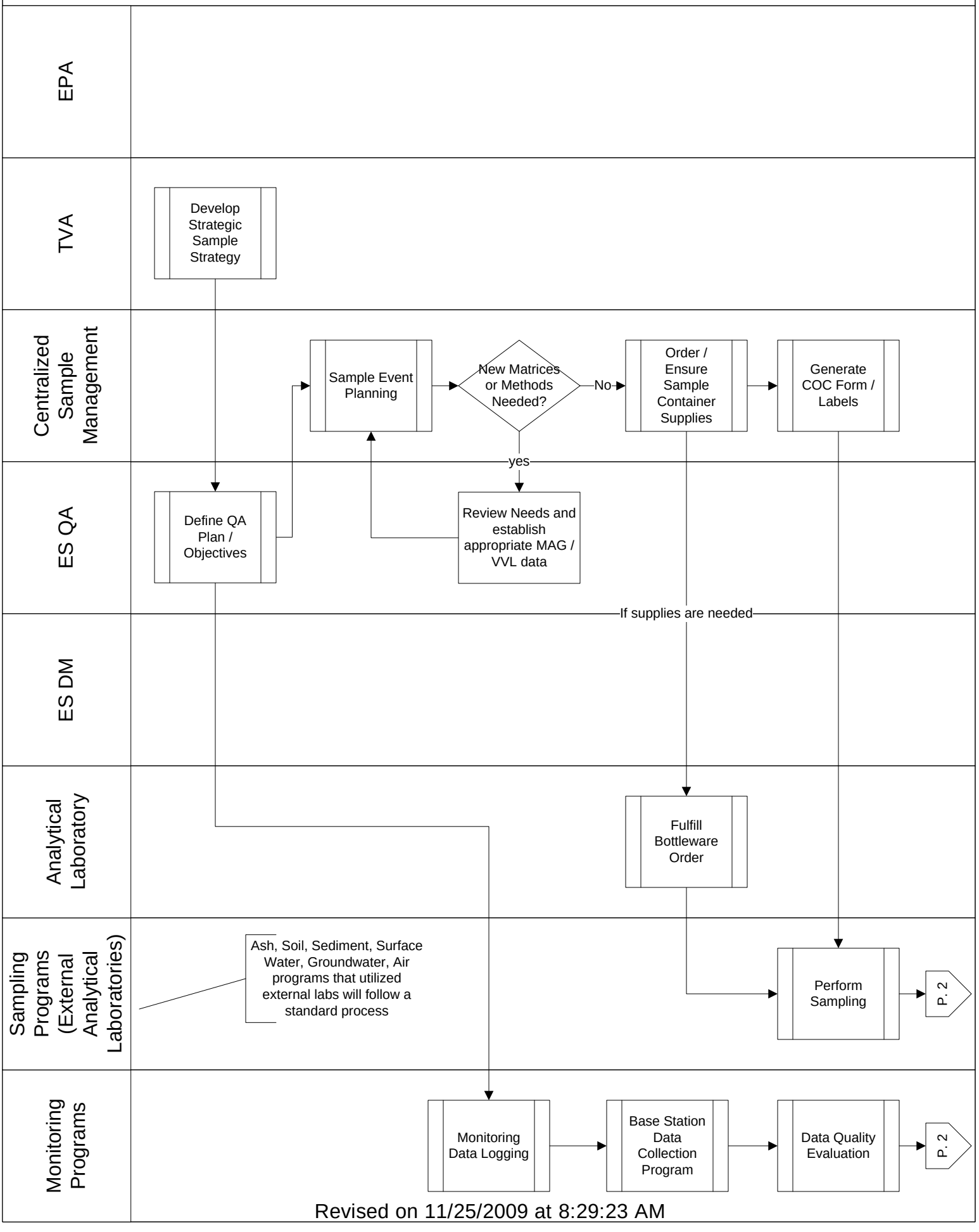
## 4.2 Data Backup

Automated full backups of the EQDMS are performed every four hours; automated incremental backups of transactions are performed every two hours to ensure that any potential data loss is limited to two business hours. A full daily backup is archived every night and retained for 30 days. A full weekly backup is archived and retained for two months. Monthly full backups are archived and retained for 40 years. All backups are written to digital tapes and are stored the next business day in an off-site environmentally controlled storage facility.

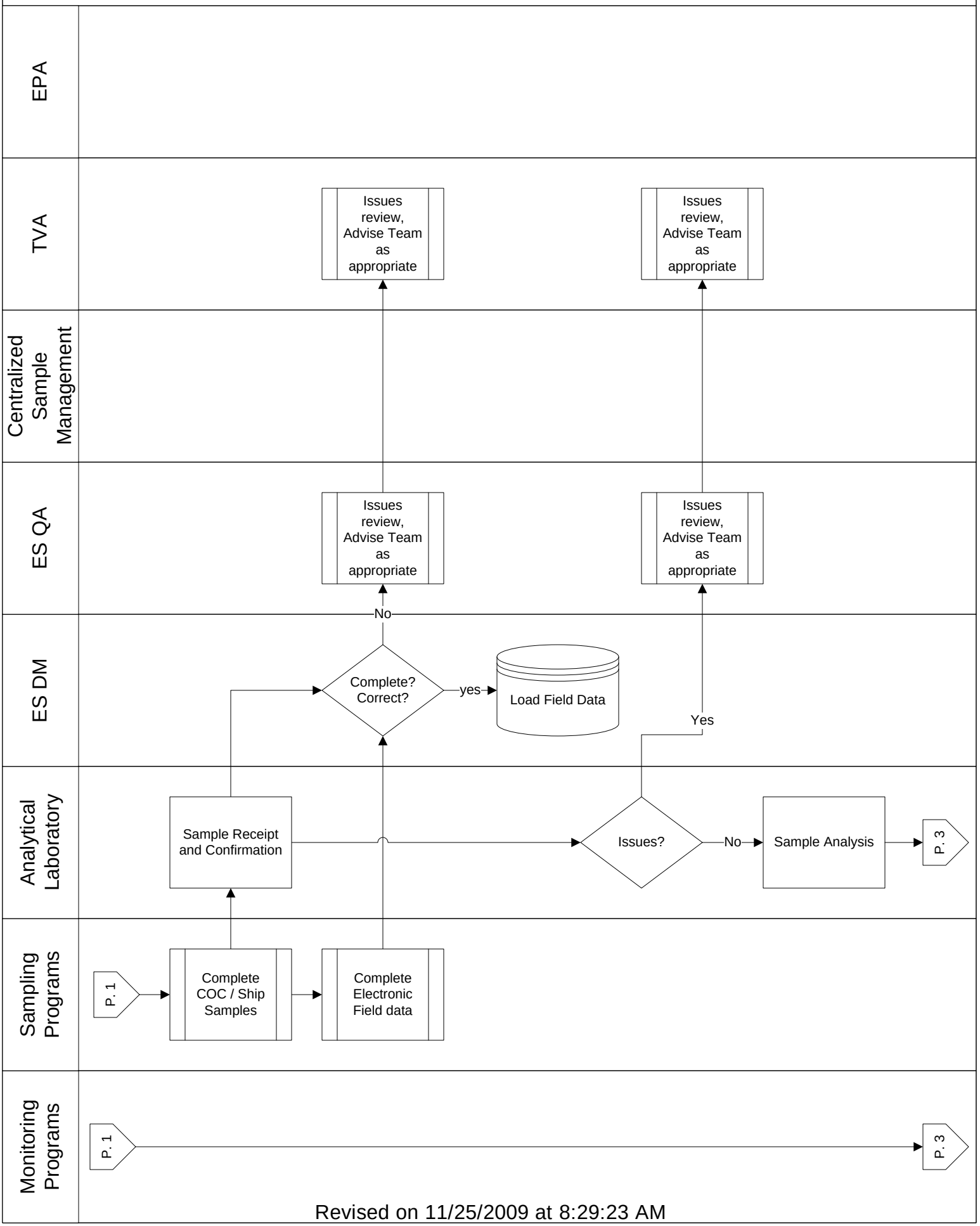
## 5.0 REFERENCES

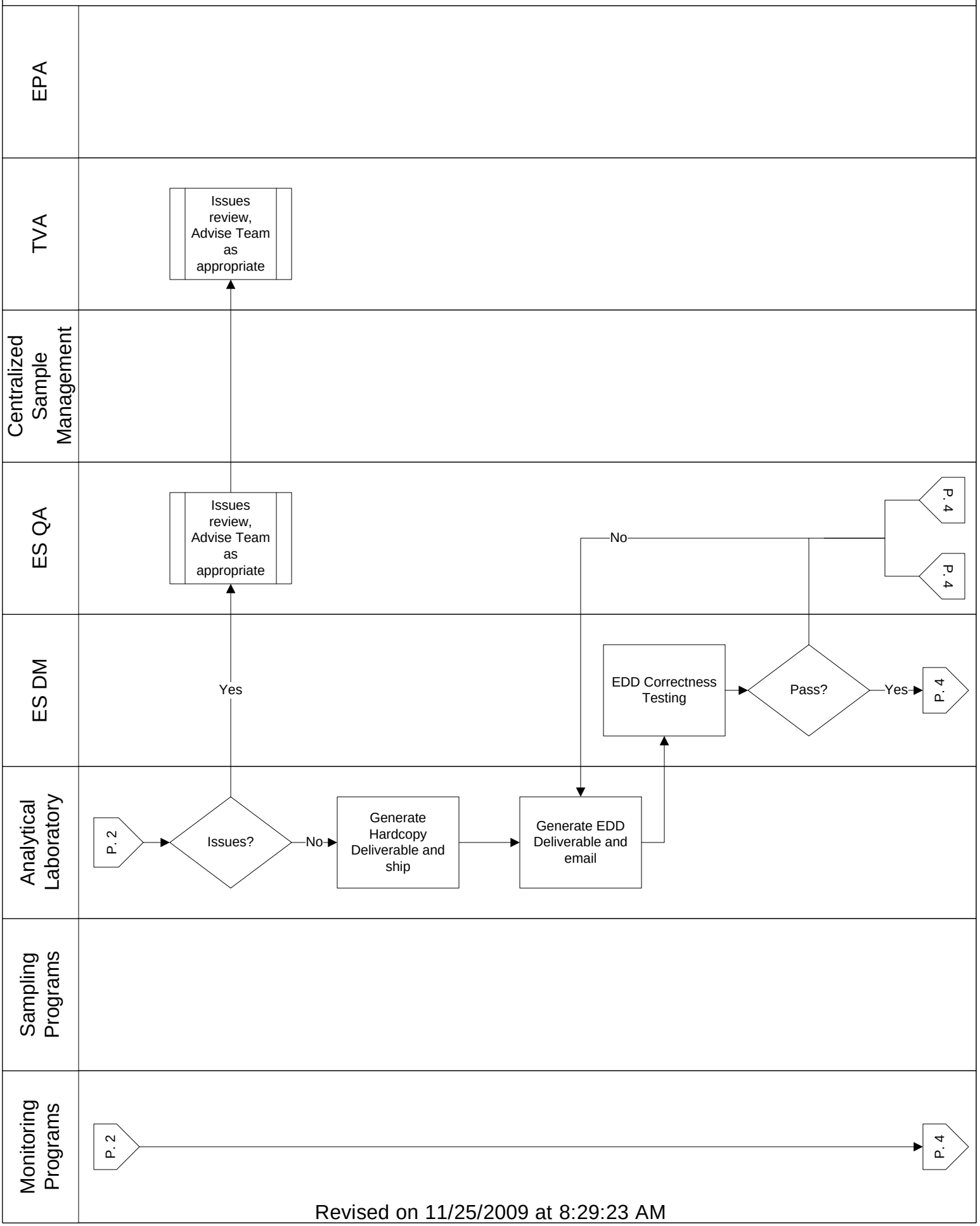
- TVA. *Quality Assurance Program Plan, TVA Kingston Fossil Plant Ash Recovery Project* (TVA-KIF-QAPP), latest *revision.*

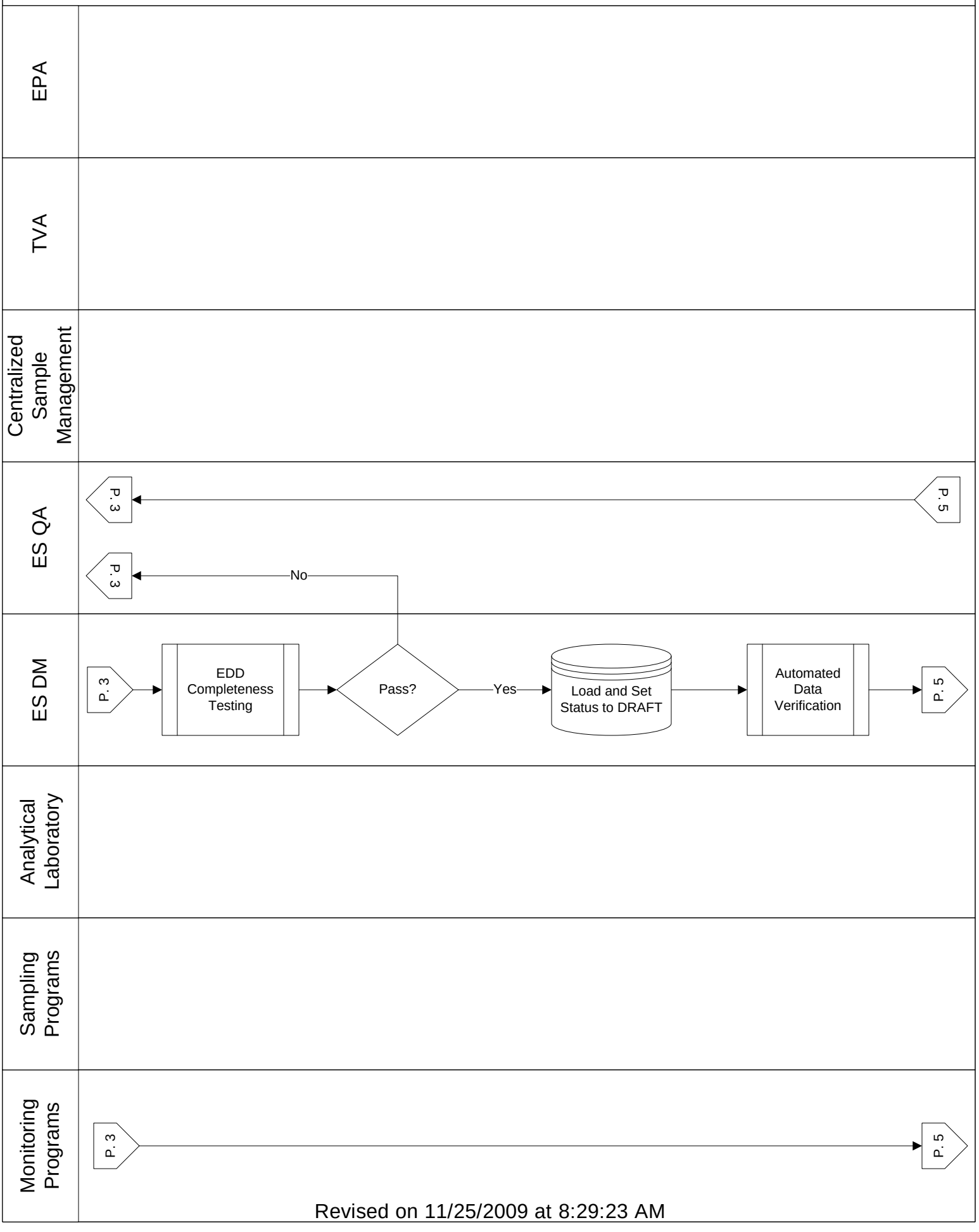
# APPENDIX A
## Cross Function Diagram




Revised on 11/25/2009 at 8:29:23 AM


EPA
TVA
Centralized Sample Management
ES QA
ES DM
Analytical Laboratory
Sampling Programs
Monitoring Programs
Issues review, Advise Team as appropriate
Issues review, Advise Team as appropriate
Issues review, Advise Team as appropriate
Issues review, Advise Team as appropriate
No
Complete? Correct?
yes
Load Field Data
Yes
Sample Receipt and Confirmation
Issues?
No
Sample Analysis
P. 3
P. 1
Complete COC / Ship Samples
Complete Electronic Field data
P. 1
P. 3


EPA
TVA
Issues review, Advise Team as appropriate
Centralized Sample Management
ES QA
Issues review, Advise Team as appropriate
P. 4
P. 4
No
ES DM
Yes
EDD Correctness Testing
Pass?
Yes
P. 4
Analytical Laboratory
P. 2
Issues?
No
Generate Hardcopy Deliverable and ship
Generate EDD Deliverable and email
Sampling Programs
Monitoring Programs
P. 2
P. 4

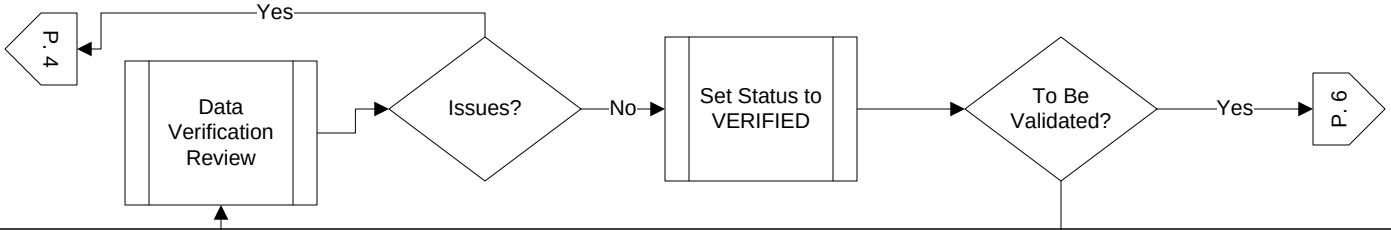

EPA
TVA
Centralized Sample Management
ES QA
P. 3
P. 5
P. 3
No
ES DM
P. 3
EDD Completeness Testing
Pass?
Yes
Load and Set Status to DRAFT
Automated Data Verification
P. 5
Analytical Laboratory
Sampling Programs
Monitoring Programs
P. 3
P. 5

EPA

TVA

Centralized Sample Management

ES QA




ES DM


Analytical Laboratory

Sampling Programs

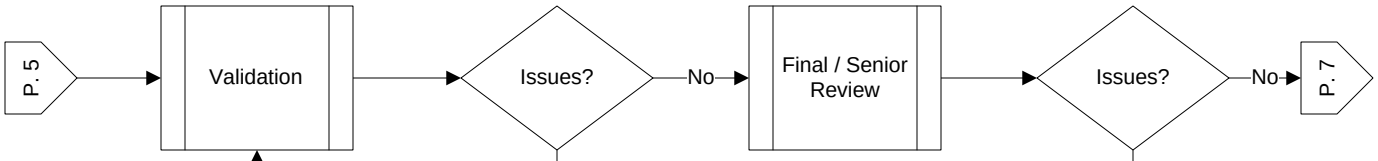
Monitoring Programs

EPA

TVA

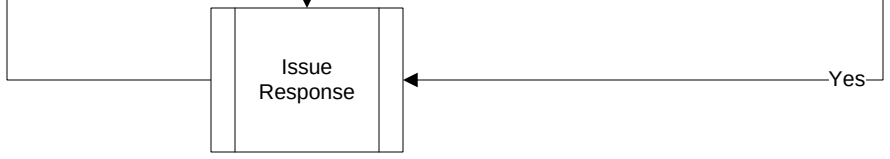
Centralized Sample Management

ES QA



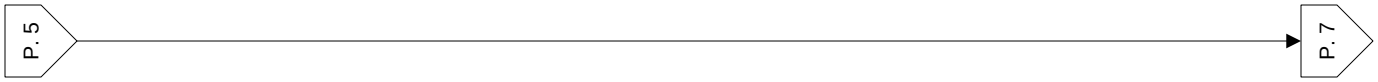

ES DM

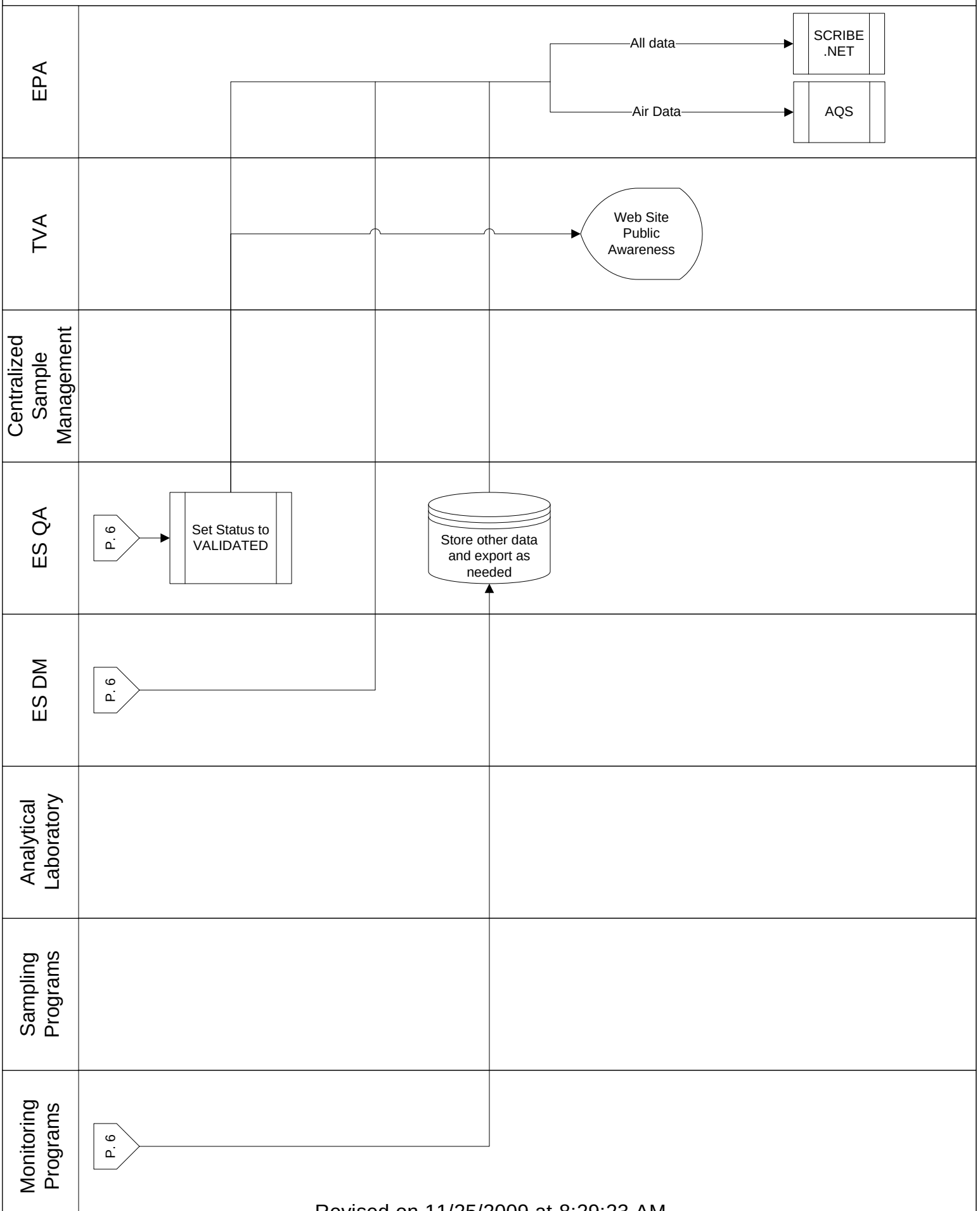

Analytical Laboratory




Sampling Programs

Monitoring Programs




EPA
All data
SCRIBE .NET
Air Data
AQS
TVA
Web Site Public Awareness
Centralized Sample Management
ES QA
P. 6
Set Status to VALIDATED
Store other data and export as needed
ES DM
P. 6
Analytical Laboratory
Sampling Programs
Monitoring Programs
P. 6

# APPENDIX B
# EDD Specification

# KINGSTON FLY ASH RECOVERY PROJECT

## ESI Complex EDD Specifications
## 5 File

**ENVIRONMENTAL STANDARDS, INC**
**INFORMATION TECHNOLOGY GROUP**
**02/05/2009**
**Updated 05/27/2009**

**PREPARED BY**

Steven M. Sampson

## Acknowledgements

This document was prepared for the Tennessee Valley Authority (TVA) by Steven M. Sampson of Environmental Standards.

## Revision History

May 27, 2009:  Chart 2 – Result Level Required Fields, qc_original_conc was marked required for Blank Spike Samples (BS)

# TABLE OF CONTENTS

# 2.0 Electronic Data Deliverable Requirements

The purpose of this document is to describe the specifications of the Environmental Standards, Inc. 5-file Electronic Data Deliverable (EDD) for use within the EarthSoft EQuIS system

## 2.1 File Format

All data from the database must be stored in an ASCII file using a tab-delimited standard format. Maximum length of text fields is indicated in the parentheses. If the information is less than the maximum length, do not pad the record with spaces.

Each record must be terminated with a carriage return/line feed (i.e., standard DOS text file). The file can be produced using any software with the capability to create ASCII files. Date is reported as MM/DD/YY (month/day/year) and time as HH:MM (hour: minute). Time uses a 24-hour clock, thus 3:30 p.m. will be reported as 15:30.

Each record in an import file must have one or more fields with values that make the row unique. These fields are indicated in the **Req.** column, along with fields that are required for other reasons. In the **Req.** column a **Y** indicates that the field is required. If a field is to be considered part of the primary key of a table, it is indicated below by the presence of "PK" in the *PK* column.

## 2.2 File Naming Convention

Five files are required: field sample, lab sample, lab tests, lab results, and lab batches. The filename extensions are used to indicate the file type as follows:

| **Type of Rows** | | **File Name** |
|---|---|---|
| Sample level data | Field | COC.ESI_EFW2FSample_v2.txt |
| | Lab | SDG.ESI_EFW2LabSMP_v2.txt |
| Lab test level data | | SDG.ESI_EFW2LabTST_v2.txt |
| Analyte result level data | | SDG.ESI_EFW2LabRES_v2.txt |
| Lab batch level data | | SDG.ESI_EFW2LabBCH_v2.txt |

Where SDG is the Sample Delivery Group and COC is the Chain of Custody number.

The character portion of the filenames must be the same for each group of five files. Filename conventions may be defined however the laboratory and EQuIS Chemistry project manager determine. For example, the date, sample delivery group, or project name may be encoded in the filename if desired. Although we anticipate that all five files will be prepared and loaded into EQuIS Chemistry together in one group, this is not necessary. Each file can be loaded separately if desired.

For the TVA project, all five files are required to be generated by analytical laboratories.

### 2.3 File Delivery

The file must be "zipped" together using a compression program such as WinZip. The file naming convention for the zip file is as follows:

> **SDG.Site.ESI_v3.zip**, where SDG is the Sample Delivery Group and Site is the value from the "Site ID #" block on the Chain of Custody. Example: 080209123.KIF.ESI_v3.zip

The zipped file must contain a valid EQuIS certificate obtained from Environmental Standards. Laboratories will need to request an EQuIS certificate from Environmental Standards by sending an email to ssampson@envstd.com indicating the email address for which the certificate should be linked. This email address will receive all notifications regarding the status of the EDD receipt.

The zipped file should be emailed to TVAEDD@envstd.com. Once EQuIS receives and checks the EDD, a notification will be sent to the email address supplied by the laboratory. EDD load failure notifications will be accompanied with a detailed error report outlining the errors found in the EDD. Laboratories are responsible for correcting any errors and resubmitting the EDD. The corrected EDD file name must be different from the initial file. However, laboratories need only to add a letter to the SDG to create a unique deliverable. If the resubmitted file has the same name as the initial file, it will be rejected as a duplicate submittal.

### 2.4 EQuIS EDP Format ESI_v3

EDDs should be tested prior to submission. The ESI_v3 EDP Format package can be obtained by contacting Environmental Standards. However, laboratories will be responsible for obtaining the appropriate EarthSoft EDP user license.

ESI_v3 EDP Format Package contains four files are follows:

- Esi_v3.xsd
- ESI_v3.vb
- ESI_v3-enum.xsd
- ESI_v3.rvf

All files are necessary for testing EDDs and must be stored in the same folder. You will receive the four files in a zipped file from Environmental Standards along with project details.

### 2.5

The ESI_v3.rvf contains all the reference values for this project. All EDDs for this project must comply with the reference values in this file. A new "RVF" will be sent each time the reference

values are update. Laboratories can request these reference values in a spreadsheet from Environmental Standards.

### 2.6 Null Format

Many fields are optional, and the list of valid values may be defined in a project or lab specific manner as determined by the laboratory and project manager. When a field is not listed as required, this means that a null or blank may be appropriate. However, tabs must still surround the blank value. In other words, the number of fields is always the same, whether or not the fields include data is optional.

## 3.0 EDD Specifications

EDD formats for the five individual required EDD files are described on the following tables. These files are the Field Sample file, the Sample file, the Test file, the Result file, and the Batch file.

### 3.1 Field Sample Import Format - ESI_EFW2FSample_v2

*Only field samples should be included in this file

| Pos # | Field Name | Data Type | PK | Required ? | VVL | Field Definition |
|---|---|---|---|---|---|---|
| 1 | sys_sample_code | Text (40) | PK | Y | | Unique sample identifier as shown on Chain of Custody. |
| 2 | sample_name | Text (30) | | Y | | Same as sys_sample_code. |
| 3 | sample_matrix_code | Text (10) | | Y | Table 2 | Code that distinguishes between different types of sample matrices. |
| 4 | sample_type_code | Text (20) | | Y | Table 1 | Code that distinguishes between different types of samples. |
| 5 | sample_source | Text (10) | | Y | | This field identifies where the sample came from. Should be **Field** for all samples in this file. |
| 6 | parent_sample_code | Text (40) | | See Chart 1 | | The value of "sys_sample_code" that uniquely identifies the sample that was the source of this sample. |

| Pos # | Field Name | Data Type | PK | Required ? | VVL | Field Definition |
|---|---|---|---|---|---|---|
| 7 | sample_date | Date | | Y | | Date of sample collection (MM/DD/YY). |
| 8 | sample_time | Time | | Y | | Time of sample collection (HH:MM). |
| 9 | sys_loc_code | Text(20) | | Y | | Sample collection location as shown on chain of custody |
| 10 | start_depth | Double | | N | | Beginning depth (top) of sample. |
| 11 | end_depth | Double | | N | | Ending depth (bottom) of sample. |
| 12 | depth_unit | Text (15) | | N | Table 3 | Unit of measurement for the sample begin and end depths. |
| 13 | chain_of_custody | Text (15) | | Y | | Chain of custody identifier. A single sample may be assigned to only one chain of custody. |
| 14 | sent_to_lab_date | Date | | N | | Date sample was sent to lab (MM/DD/YY) |
| 15 | sampler | Text (30) | | N | | Name or initials of sampler. |
| 16 | sampling_company_ code | Text (10) | | N | | Name or initials of sampling company |
| 17 | sampling_reason | Text (30) | | N | | Reason for sampling. |
| 18 | sampling_technique | Text (40) | | N | | Sampling technique. |

| Pos # | Field Name | Data Type | PK | Required ? | VVL | Field Definition |
|---|---|---|---|---|---|---|
| 19 | method_analyte_group | Text (40) | | Y | Y | Field Method Analyte Group Name |
| 20 | task_code | Text (10) | | N | | Same as chain of custody number from chain of custody. |
| 21 | collection_quarter | Text (5) | | N | | Quarter of the year sample was collected (e.g., "1Q96") |
| 22 | composite_yn | Text (1) | | Where applicable | | Y/N field used to indicate whether a sample is a composite sample |
| 23 | composite_desc | Text (255) | | Where applicable | | Description of composite sample |
| 24 | sample_class | Text (10) | | N | | Navy sample class code. |
| 25 | comment | Text(255 ) | | N | | Sample comments as necessary. |
| 26 | tat_start_date | Date | | Y | | Date sample was shipped to lab (MM/DD/YY) |
| 27 | TAT | Text(2) | | Y | | Turn around time. <=48 hours should be reported in hours, >48 hours should be reported in days |
| 28 | matrix_spike_yn | Text(1) | | Y | | Y/N field used to indicate whether a matrix spike is required. |
| 29 | matrix_spike_dup_yn | Text(1) | | Y | | Y/N field used to indicate whether a matrix spike duplicate is required. |

### 3.2 Sample Import Format -ESI_EFW2LabSMP_v2

*Both field and laboratory samples should be included in this file

| Pos # | Field Name | Data Type | PK | Required? | VVL? | Field Definition |
|---|---|---|---|---|---|---|
| 1 | chain_of_custody | Text(15) | | Y | | Chain of custody identifier. A single sample may be assigned to only one chain of custody. Chain of custody identifier can be found on the chain of custody |
| 2 | sys_sample_code | Text(40) | PK | Y | | Unique sample identifier. Sample Id from chain of custody.<br>Lab sample's sys_sample_code should have the SDG appended to its value to insure uniqueness throughout the life of the EQuIS database. |
| 3 | sample_type_code | Text(20) | | Y | Table 1 | Code that distinguishes between different types of samples. |
| 4 | sample_matrix_code | Text(10) | | Y | Table 2 | Code that distinguishes between different types of sample matrices |
| 5 | sample_source | Text(10) | | Y | | Must be either **Field** for field samples or **Lab** for internally generated laboratory QC samples. |
| 6 | parent_sample_code | Text(40) | | See Chart 1 | | The value of "sys_sample_code" that uniquely identifies the sample that was the source of this sample. |
| 7 | comment | Text(255) | | N | | Sample comments. |

| Pos # | Field Name | Data Type | PK | Required? | VVL? | Field Definition |
|---|---|---|---|---|---|---|
| 8 | sample_date | Date | | See Chart 1 | | Date of sample collection (MM/DD/YY). |
| 9 | sample_time | Text(5) | | See Chart 1 | | Time of sample collection (HH:MM). |
| 10 | sample_receipt_date | Date | | See Chart 1 | | Date of sample receipt by laboratory (MM/DD/YY). |
| 11 | sample_delivery_group | Text(10) | | Y | | Sample delivery group as by defined laboratory |
| 12 | standard_solution_ source | Text(20) | | N | | Relevant only for laboratory-generated samples. Textual description of the source of standard solutions as needed for certain laboratory samples |
| 13 | sample_receipt_time | Text (5) | | See Chart 1 | | Time of sample receipt by laboratory (HH:MM). |

### 3.3 Test Import Format - ESI_EFW2LabTST_v2

| Pos # | Field Name | Data Type | PK | Required ? | VVL? | Field Definition |
|---|---|---|---|---|---|---|
| 1 | sys_sample_code | Text(40) | PK | Y | | Unique sample identifier. Sample Id from chain of custody.<br>Lab sample's sys_sample_code should have the SDG appended to its value to insure uniqueness throughout the life of the EQuIS database.. |
| 2 | lab_anl_method_ name | Text(35) | PK | Y | Y | Laboratory analytic method name or description. |
| 3 | analysis_date | Date | PK | Y | | Date of sample analysis (MM/DD/YY). |
| 4 | analysis_time | Text(5) | PK | Y | | Time of sample collection (HH:MM). |
| 5 | total_or_dissolved | Text(1) | PK | Y | | "T" for total [metal] concentration, "D" for dissolved or filtered [metal] concentration, "C" for TCLP, or "N" for organic (or other) constituents for which neither "total" nor "dissolved" is applicable. |
| 6 | column_number | Text(2) | PK | Y | | "1C" for first column analyses, "2C" for second column analyses, or "NA" for analyses for which neither "1C" nor "2C" is applicable. |
| 7 | test_type | Text(10) | PK | Y | | Type of test. Valid values include |

| Pos # | Field Name | Data Type | PK | Required ? | VVL? | Field Definition |
|---|---|---|---|---|---|---|
| | | | | | | "initial", "reextract", and "reanalysis". |
| 8 | lab_matrix_code | Text(10) | | Y | Table 2 | Code that distinguishes between different types of sample matrices |
| 9 | analysis_location | Text(2) | | Y | | Must be either "FI" for field instrument or probe, "FL" for mobile field laboratory analysis, or "LB" for fixed-based laboratory analysis. |
| 10 | basis | Text(10) | | Y | | Must be either "Wet" for wet-weight basis reporting, "Dry" for dry-weight basis reporting, or "NA" for tests for which this distinction is not applicable. |
| 11 | container_id | Text(30) | | Where applicable | | Sample container identifier. |
| 12 | dilution_factor | Single | | Y | | Effective test dilution factor. |
| 13 | prep_method | Text(35) | | Where applicable | | Laboratory sample preparation method name or description. |
| 14 | prep_date | Date | | Where applicable | | Date of sample preparation (MM/DD/YY). |
| 15 | prep_time | Text(5) | | Where applicable | | Time of sample preparation (HH:MM). |
| 16 | leachate_method | Text(15) | | Where applicable | | Laboratory leachate generation method name or description. |

| Pos # | Field Name | Data Type | PK | Required ? | VVL? | Field Definition |
|---|---|---|---|---|---|---|
| 17 | leachate_date | Date | | Where applicable | | Date of sample leachate (MM/DD/YY). |
| 18 | leachate_time | Text(5) | | Where applicable | | Time of sample leachate (HH:MM). |
| 19 | lab_name_code | Text(10) | | Y | Table 4 | Unique identifier of the laboratory |
| 20 | qc_level | Text(10) | | N | | Data validation QC level. |
| 21 | lab_sample_id | Text(20) | | Y | | Laboratory sample identifier. |
| 22 | percent_moisture | Text(5) | | Y | | Percent moisture of the sample portion used in this test; this value may vary from test to test for any sample. Numeric format is "NN.MM", i.e., 70.1% could be reported as "70.1" but not as "70.1%". |
| 23 | subsample_amount | Text(14) | | See Chart 1 | | Amount of sample used for test. |
| 24 | subsample_amount_ unit | Text(15) | | See Chart 1 | Table 3 | Unit of measurement for subsample amount. |
| 25 | analyst_name | Text(30) | | N | | Name or initials of laboratory analyst |
| 26 | instrument_id | Text(50) | | N | | Instrument identifier. |
| 27 | comment | Text(255) | | N | | Comments about the test. |
| 28 | preservative | Text(50) | | N | | Sample preservative used. |

| Pos # | Field Name | Data Type | PK | Required? | VVL? | Field Definition |
|---|---|---|---|---|---|---|
| 29 | final_volume | Text(15) | | See Chart 1 | | The final amount of the sample after sample preparation. |
| 30 | final_volume_unit | Text(15) | | See Chart 1 | Table 3 | The unit of measure that corresponds to the final_volume |

### 3.4 Result Import Format - ESI_EFW2LabRES_v2

| Pos # | FIELD NAME | Data Type | PK | Required? | VVL? | Field Definition |
|---|---|---|---|---|---|---|
| 1 | sys_sample_code | Text(40) | PK | Y | | Unique sample identifier. Sample Id from chain of custody.<br>Lab sample's sys_sample_code should have the SDG appended to its value to insure uniqueness throughout the life of the EQuIS database. |
| 2 | lab_anl_method_name | Text(35) | PK | Y | Y | Laboratory analytic method name or description. |
| 3 | analysis_date | Date | PK | Y | | Date of sample analysis (MM/DD/YY). |
| 4 | analysis_time | Text(5) | PK | Y | | Time of sample analysis (HH:MM). |
| 5 | total_or_dissolved | Text(1) | PK | Y | | "T" for total [metal] concentration, "D" for dissolved or filtered [metal] concentration, or "N" for organic (or other) constituents for which neither "total" nor "dissolved" is applicable. |
| 6 | column_number | Text(2 | PK | Y | | "1C" for first column analyses, "2C" for second column analyses, or "NA" for analyses for which neither "1C" nor "2C" is applicable. |

| Pos # | FIELD NAME | Data Type | PK | Required? | VVL? | Field Definition |
|---|---|---|---|---|---|---|
| 7 | test_type | Text(10) | PK | Y | | Type of test. Valid values include "initial", "reextract", and "reanalysis". |
| 8 | cas_rn | Text(15) | PK | Y | Y | Chemical Abstracts Registry Number for the parameter. |
| 9 | chemical_name | Text(60) | | Y | | Chemical name |
| 10 | result_value | Text(20) | | Where Applicable | | Analytic result reported at an appropriate number of significant digits. Must be null for non-detects. |
| 11 | result_error_delta | Text(20) | | N | | Error range applicable to the result value; typically used only for radiochemistry results. |
| 12 | result_type_code | Text(10) | | Y | | Must be either "TRG" for a target or regular result, "TIC" for tentatively identified compounds, "SUR" for surrogates, "IS" for internal standards, or "SC" for spiked compounds. |
| 13 | reportable_result | Text(10) | | Y | | Y/N field used to indicate whether a result is reportable. |
| 14 | detect_flag | Text(2) | | Y | | Y/N field used to indicate whether a result is detected |
| 15 | lab_qualifiers | Text(7) | | N | | Qualifier flags assigned by the laboratory. |

| Pos # | FIELD NAME | Data Type | PK | Required? | VVL? | Field Definition |
|---|---|---|---|---|---|---|
| 16 | organic_yn | Text(1) | | Y | | Y/N field used to indicate whether a result is organic. |
| 17 | method_detection_limit | Text(20) | | Y | | Method detection limit. |
| 18 | reporting_detection_limit | Text(20) | | Y | | Detection limit that reflects conditions such as dilution factors and moisture content. |
| 19 | quantitation_limit | Text(20) | | Y | | Concentration level above which results can be quantified with confidence. It must reflect conditions such as dilution factors and moisture content. |
| 20 | result_unit | Text(15) | | Y | Table 3 | Units of measurement for the result. |
| 21 | detection_limit_unit | Text(15) | | Y | Table 3 | Units of measurement for the reporting limit(s). |
| 22 | tic_retention_time | Text(8) | | N | | Retention time in seconds for tentatively identified compounds. |
| 23 | result_comment | Text(255) | | N | | Result specific comments. |
| 24 | qc_original_conc | Text(14) | | See Chart 2 | | The concentration of the analyte in the original (unspiked) sample. |
| 25 | qc_spike_added | Text(14) | | See Chart 2 | | The concentration of the analyte added to the original sample. |

| Pos # | FIELD NAME | Data Type | PK | Required? | VVL? | Field Definition |
|---|---|---|---|---|---|---|
| 26 | qc_spike_measured | Text(14) | | See Chart 2 | | The measured concentration of the analyte. Use zero for spiked compounds that were not detected in the sample. |
| 27 | qc_spike_recovery | Text(14) | | See Chart 2 | | The percent recovery calculated. |
| 28 | qc_dup_original_conc | Text(14) | | See Chart 2 | | The concentration of the analyte in the original (unspiked) sample. |
| 29 | qc_dup_spike_added | Text(14) | | See Chart 2 | | The concentration of the analyte added to the original sample. Use zero for spiked compounds that were not detected in the sample. |
| 30 | qc_dup_spike_measured | Text(14) | | See Chart 2 | | The measured concentration of the analyte in the duplicate. Use zero for spiked compounds that were not detected in the sample. |
| 31 | qc_dup_spike_recovery | Text(14) | | See Chart 2 | | The duplicate percent recovery calculated. |
| 32 | qc_rpd | Text(8) | | See Chart 2 | | The relative percent difference calculated. |
| 33 | qc_spike_lcl | Text(8) | | See Chart 2 | | Lower control limit for spike recovery. |
| 34 | qc_spike_ucl | Text(8) | | See Chart 2 | | Upper control limit for spike recovery. |
| 35 | qc_rpd_cl | Text(8) | | See Chart 2 | | Relative percent difference control |

| Pos # | FIELD NAME | Data Type | PK | Required? | VVL? | Field Definition |
|---|---|---|---|---|---|---|
| | | | | | | limit. |
| 36 | qc_spike_status | Text(10) | | See Chart 2 | | Used to indicate whether the spike recovery was within control limits. Use the "*" character to indicate failure, otherwise leave blank. |
| 37 | qc_dup_spike_status | Text(10) | | See Chart 2 | | Used to indicate whether the duplicate spike recovery was within control limits. Use the "*" character to indicate failure, otherwise leave blank. |
| 38 | qc_rpd_status | Text(10) | | See Chart 2 | | Used to indicate whether the relative percent difference was within control limits. Use the "*" character to indicate failure, otherwise leave blank. |

### 3.5 Batch Import Format - ESI_EFW2LabBCH_v2

| Pos # | Field Name | Data Type | PK | Required? | VVL? | Field Definition |
|---|---|---|---|---|---|---|
| 1 | sys_sample_code | Text (40) | PK | Y | | Unique sample identifier. Sample Id from chain of custody.<br>Lab sample's sys_sample_code should have the SDG appended to its value to insure uniqueness throughout the life of the EQuIS database. |
| 2 | lab_anl_method_name | Text (35) | PK | Y | Y | Laboratory analytic method name or description. |
| 3 | analysis_date | Date | PK | Y | | Date of sample analysis (MM/DD/YY). |
| 4 | analysis_time | Text(5) | PK | Y | | Time of sample analysis (HH:MM). |
| 5 | total_or_dissolved | Text(1) | PK | Y | | "T" for total [metal] concentration, "D" for dissolved or filtered [metal] concentration, or "N" for organic (or other) constituents for which neither "total" nor "dissolved" is applicable. |
| 6 | column_number | Text(2) | PK | Y | | "1C" for first column analyses, "2C" for second column analyses, or "NA" for analyses for which neither "1C" nor "2C" is applicable. |

| Pos # | Field Name | Data Type | PK | Required? | VVL? | Field Definition |
|---|---|---|---|---|---|---|
| 7 | test_type | Text(10) | PK | Y | | Type of test. Valid values include "initial", "reextract", and "reanalysis". |
| 8 | test_batch_type | Text(10) | PK | Y | | Lab batch type. Valid values include "Prep", "Analysis", and "Leach". |
| 9 | test_batch_id | Text(20) | | Y | | Unique identifier for all lab batches. For example, the same identifier cannot be used for a prep batch and an analysis batch. |

# 4.0 EQuIS VALID VALUES

## 4.1 Table 1 - Sample Types

| Sample_type_code | Sample_type_desc |
|---|---|
| AB | Ambient Conditions Blank |
| BD | Blank Spike Duplicate |
| BS | Blank Spike |
| EB | Equipment Blank |
| FD | Field Duplicate |
| FR | Field Replicate |
| LB | Lab Blank |
| LR | Lab Replicate |
| MB | Method Blank |
| MS | Lab Matrix Spike |
| N | Normal Environmental Sample |
| RB | Material Rinse Blank |
| SD | Lab Matrix Spike Duplicate |
| TB | Trip Blank |

## 4.2 Table 2 - Matrix Codes

| Matrix_code | Matrix_desc |
|---|---|
| A | Aqueous |
| AIR | Air |
| S | Solid |
| W | Wipe |

**5.0**

### 5.1 Table 3 - Unit of Measure

| Reported_unit | Unit_desc | Reported_unit | Unit_desc |
|---|---|---|---|
| %v/v | percent by volume | g/kg | grams per kilogram |
| 1/s | per second | g/l | grams per liter |
| acre ft | acre feet | g/m2/yr | grams per square meter per year |
| acres | acres | g/ml | grams per milliliter |
| admi color | admi (american dye manufacturers institute) color units | gal | gallons |
| bars | bars | gal/min | gallons per minute |
| cfs | cubic feet per second | gpd | gallons per day |
| cfu/100ml | colony forming units per 100 milliliters | gpd/ft | gallons per day per foot |
| cfu/g | colony forming units per gram | gpd/ft2 | gallons per day per foot squared |
| cfu/ml | colony forming units per milliliters | gpm/ft | gallons per minute per foot |
| cm | centimeters | gpy | gallons per year |
| cm/hr | centimeters per hour | hrs | hours |
| cm/sec | centimeters per second | hrs/day | hours per day |
| cm/yr | centimeters per year | in | inches |
| cm2/sec | square centimeters per second | in(hg) | inches of mercury |
| colf/100ml | coliform bacteria per 100 milliliters | in/day | inches per day |
| colf/g | coliform bacteria per gram | in/ft | inches per foot |
| color unit | color unit | in/hr | inches per hour |
| day | days | in/in | inches per inch |
| deg c | degrees Celsius | in/wk | inches per week |
| deg c/hr | degrees Celsius per hour | in2/ft | square inches per foot |
| deg f | degrees Fahrenheit | jcu | jackson candle units |
| digits | number of digits to the right of the decimal point | jtu | jackson turbidity units |
| dollars | dollars | kg/1000gal | kilograms per 1000 gallons |
| dpy | drums per year | kg/batch | kilograms per batch |
| dynes/cm | dynes per centimeter | kg/day | kilograms per day |
| fibers/l | fibers per liter | kg/m3 | kilogram per meter cubed |
| ft | feet | kg/m3/s | kilogram per meter cubed per second |
| ft candles | foot candles | kg/s | kilogram per second |
| ft msl | feet above mean sea level | km2 | square kilometers |

| | | | |
|---|---|---|---|
| ft/day | feet per day | knots | knots |
| ft/in | feet per inch | lb/1000lb | pounds per thousand pounds |
| ft/min | feet per minute | lb/barrel | pound per barrel |
| ft/sec | feet per second | lb/in2 | pounds per square inch |
| ft2 | square feet | lb/ton | pounds per ton |
| ft2/day | square feet per day (cubic feet/day-foot) | lbs | pounds |
| ft2/min | feet squared per minute (for units of transmissivity) | lbs/day | pounds per day |
| ft3 | cubic feet | lbs/mon | pounds per month |
| ft3/yr | cubic feet per year | lbs/yr | pounds per year |
| g/cc | grams per cubic centimeter | m | meter |
| g/g | grams per gram | m/day | meters per day |
| m/s | meter per second | pci/g | picocuries per gram |
| m2 | meter squared | pci/l | picocuries per liter |
| m2/s | meter squared per second | pci/ml | picocuries per milliliters |
| m3 x 10(6) | meter cubed (in millions) | per loss | percent loss |
| m3/kg | meter cubed per kilogram | percent | percent |
| m3/s | meter cubed per second | pg/g | picogram per gram |
| meq/100g | milliequivalents per 100 grams | pg/kg | picograms per kilogram |
| mg/100cm2 | Milligrams per 100 square centimeters | pg/l | picogram per liter |
| mg/flt | Milligrams per filter | pg/m3 | picograms per cubic meter |
| mg/g | Milligrams per gram | pg/ul | picograms per microliter |
| mg/kg | milligrams per kilogram | ph units | ph units |
| mg/l | milligrams per liter | ppb | parts per billion |
| mg/m2 | milligrams per square meter | ppbv | parts per billion by volume |
| mg/m2/day | milligrams per meter squared per day | ppm | parts per million |
| mg/m3 | milligrams per cubic meter (ppbv) | ppmv | parts per million by volume |
| mg/ml | milligrams per milliliter | pptv | parts per trillion by volume |
| mgal | million gallons | psf | pounds per square foot |
| mgd | millions of gallons per day | psi | pounds per square inch |
| mgdo/l | milligrams dissolved oxygen per liter | s | second |
| mgm | millions of gallons per month | t.o.n. | threshold order number |
| mgy | millions of gallons per year | tons/acre | tons per acre |
| mile2 | square miles | tons/day | tons per day |
| miles | miles | ug/100cm2 | micrograms per 100 square centimeters |

| | | | |
|---|---|---|---|
| mill ft3 | million feet cubed | ug/cm2 | microgram per square centimeters |
| millivolts | millivolts | ug/g | micrograms per gram |
| min | minutes | ug/kg | micrograms per kilogram |
| ml | milliliter | ug/l | micrograms/liter |
| ml/l | milliliter per liter | ug/m3 | micrograms per cubic meter |
| mm | millimeter | ug/yr | micrograms per year |
| mm/m2/hr | millimeter per meter squared per hour | um/sec | micrometer per second |
| mm/yr | millimeter per year | umhos/cm | umhos per centimeter |
| mmhos/cm | milliohms (mmhos) per centimeter | upy | units per year |
| mol % | mole percent | | |
| mon | month | | |
| mph | miles per hour | | |
| mpn/100ml | most probable number per 100 ml | | |
| ms/cm | microsiemens per centimeter | | |
| naut.mile | nautical mile | | |
| ng/100cm2 | nanograms per 100 square centimeters | | |
| ng/g | nanograms per gram | | |
| ng/kg | nanogram per kilogram | | |
| ng/l | nanogram per liter | | |
| ng/m3 | nanogram per cubic meter | | |
| ng/ml | nanograms per milliliter | | |
| none | no unit of measure | | |
| ntu | nephelometric turbidity units | | |
| pcf | pounds per cubic foot | | |

6.0

### 6.1 Table 4 – Laboratory Name

| Lab Code | Lab name |
|---|---|
| ESC | ESC Lab Sciences |
| MB-KNOX | Microbac - Knoxville Division |
| TA | TEST AMERICA |
| TAA | TEST AMERICA - ANCHORAGE |
| TAK | Test America Knoxville |
| TAN | Test America Nashville |
| TAP | TEST AMERICA PORTLAND |
| TAPitt | Test America Pittsburgh |

**6.2**

**6.3**

### 6.4 Chart 1 – Sample Level Required Fields

**6.5**

**6.6**

| | AB | BD | BS | EB | FD | FR | LB | LR | MB | MS | N | RB | SD | TB |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| parent_sample_code | | X | X | | | | | X | | X | | | X | |
| sample_date | X | | | X | X | X | | | | | X | X | | X |
| sample_time | X | | | X | X | X | | | | | X | X | | X |
| sample_receipt_date | X | | | X | X | X | | | | | X | X | | X |
| sample_receipt_time | X | | | X | X | X | | | | | X | X | | X |
| subsample_amount | X | | | X | X | X | X | | X | X | X | X | X | X |
| subsample_amount_unit | X | | | X | X | X | X | | X | X | X | X | X | X |
| final_volume | X | | | X | X | X | X | | X | X | X | X | X | X |
| final_volume_unit | X | | | X | X | X | X | | X | X | X | X | X | X |

### 6.7 Chart 2 – Result Level Required Fields

| | TRG | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | AB | BD | BS | EB | FD | FR | LB | LR | MS | N | RB | SD | TB |
| qc_original_conc | | | X | | X | X | | X | X | | | | |
| qc_spike_added | | | X | | | | | | X | | | | |
| qc_spike_measured | | | X | | | | | | X | | | | |
| qc_spike_recovery | | | X | | | | | | X | | | | |
| qc_dup_original_conc | | X | | | | | | | | | | X | |
| qc_dup_spike_added | | X | | | | | | | | | | X | |
| qc_dup_spike_measured | | X | | | | | | | | | | X | |
| qc_dup_spike_recovery | | X | | | | | | | | | | X | |
| qc_rpd | | X | | | | | | X | | | | X | |
| qc_rpd_cl | | X | | | | | | X | | | | X | |
| qc_spike_lcl | | X | X | | | | | | X | | | X | |
| qc_spike_ucl | | X | X | | | | | | X | | | X | |
| qc_spike_status | | | X | | | | | | X | | | | |

| | SUR | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | AB | BD | BS | EB | FD | FR | LB | LR | MS | N | RB | SD | TB |
| qc_original_conc | | | | | | | | | | | | | |
| qc_spike_added | X | | X | X | X | X | X | X | X | X | X | | X |
| qc_spike_measured | X | | X | X | X | X | X | X | X | X | X | | X |
| qc_spike_recovery | X | | X | X | X | X | X | X | X | X | X | | X |
| qc_spike_recovery | | | | | | | | | | | | | |
| qc_dup_spike_added | | X | | | | | | | | | | X | |
| qc_dup_spike_measured | | X | | | | | | | | | | X | |
| qc_dup_spike_recovery | | X | | | | | | | | | | X | |
| qc_rpd | | | | | | | | | | | | | |
| qc_rpd_cl | | | | | | | | | | | | | |
| qc_spike_lcl | X | X | X | X | X | X | X | X | X | X | X | X | X |
| qc_spike_ucl | X | X | X | X | X | X | X | X | X | X | X | X | X |
| qc_spike_status | X | | X | X | X | X | X | X | X | X | X | | X |
| qc_dup_spike_status | | X | | | | | | | | | | X | |
| qc_rpd_status | | | | | | | | | | | | | |

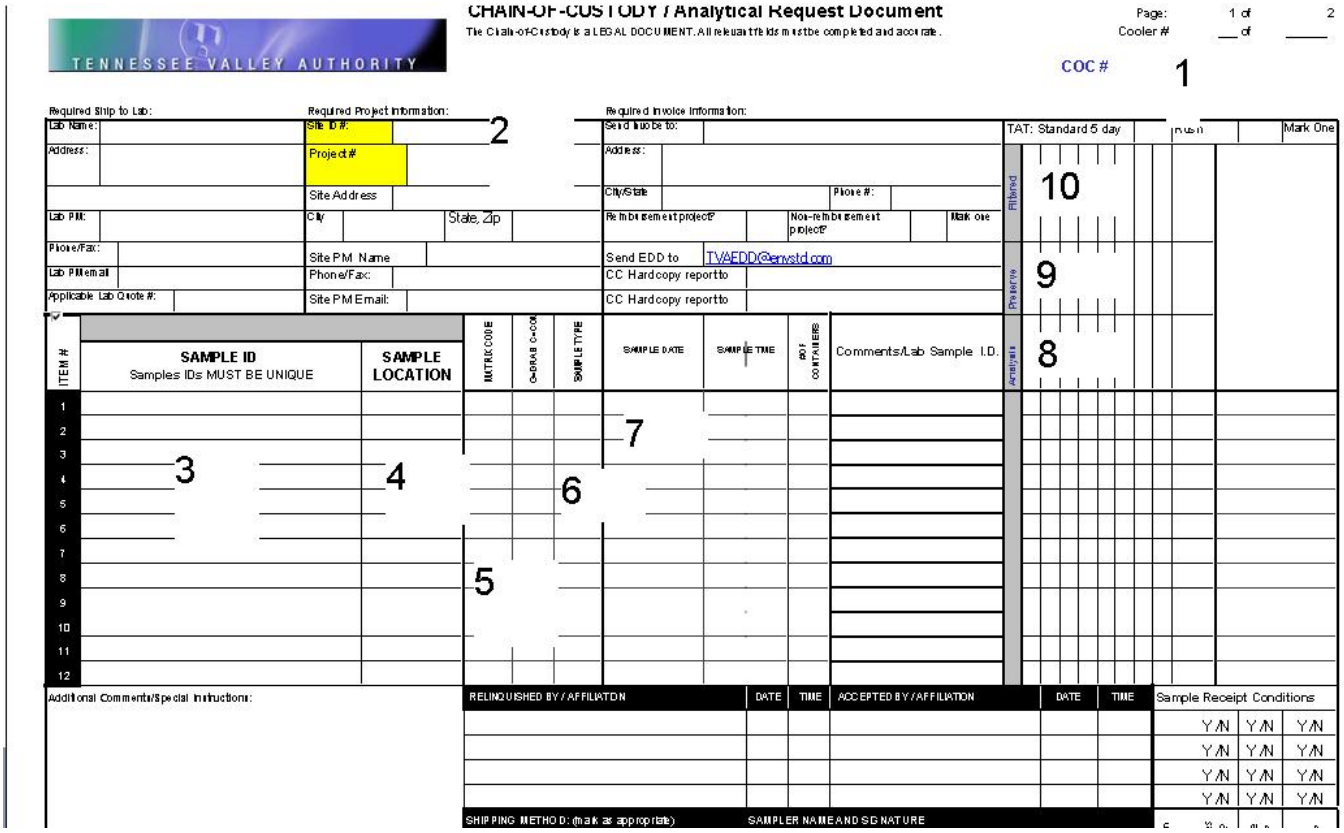



Figure 1: Chain of Custody

Chain of Custody/EDD Match

| Chain of Custody Field | EDD Format File | EDD Column |
|---|---|---|
| 1. Chain of Custody | - ESI_EFW2FSample_v2 | Chain_of_custody |
| | | Task_code |
| | - ESI_EFW2LabSMP | Chain_of_custody |
| 2. Site # | EDD Zip File Deliverable | Site Name |
| 3. Sample ID | ALL EDD Format Files | Sys_sample_code |
| | - ESI_EFW2FSample_v2 | Sample_name |
| 4. Sample Location | - ESI_EFW2FSample_v2 | Sys_loc_code |
| 5. Matrix Code | - ESI_EFW2FSample_v2<br>- ESI_EFW2LabSMP | Sample_matrix_code |
| 6. Sample Type | - ESI_EFW2FSample_v2<br>- ESI_EFW2LabSMP | Sample_type_Code |
| 7. Sample Date & Time | ALL EDD Format Files | Sample Date, Sample Time |
| Chain of Custody Field | EDD Format File | EDD Column |
| 8. Analysis | - ESI_EFW2FSample_v2 | Method_analyte_group |