CONF-960212--8

LA-UR- 95-4245

Title:

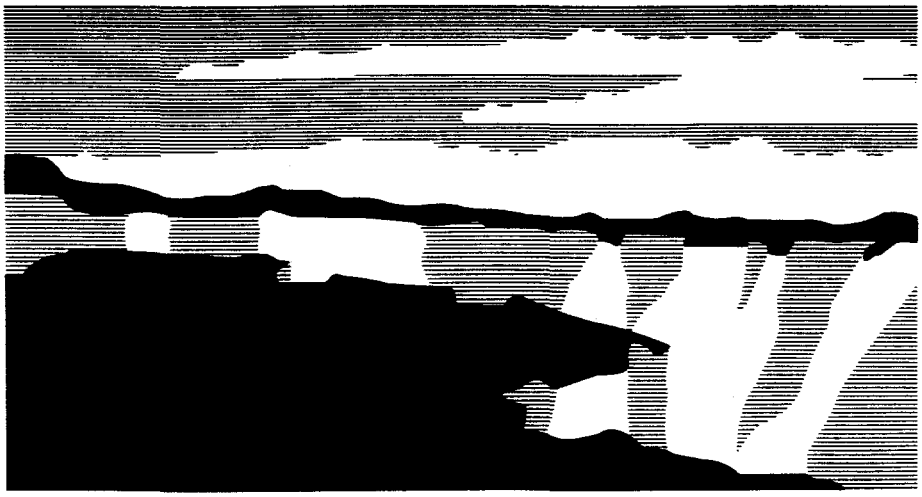
Characterization of Mixed Waste for Shipment to TSD Facilities Program

Author(s):

Kapil K. Goyal, CST-5
K. Chandler, Benchmark Environmental Corporation

Submitted to:

Waste Management '96 Conference
Tucson, AZ
February 25-29, 1996



Los Alamos
NATIONAL LABORATORY

Form No. 836 R5
ST 2629 10/91

CHARACTERIZATION OF MIXED WASTE FOR SHIPMENT TO TSD FACILITIES PROGRAM

K. Chandler
Benchmark Environmental Corporation

K. Goyal
Los Alamos National Laboratory

ABSTRACT

In compliance with the Federal Facilities Compliance Agreement, Los Alamos National Laboratory (LANL) is striving to ship its low-level mixed waste (LLMW) off-site for treatment and disposal. In order to ship LLMW off site to a commercial facility, LANL must request exemption from the DOE Order 5820.2A, *Radioactive Waste Management*, requirement that LLMW be shipped only to Department of Energy facilities. Because the process of obtaining the required information and approvals for a mixed waste shipment campaign can be very expensive, time consuming, and frustrating, a well-planned program is necessary to ensure that the elements for the exemption request package are completed successfully the first time. LANL has developed such a program, which is cost-effective, quality-driven, and compliance-based. This program, described in LANL's *Low-Level Mixed Waste Off-Site Treatment and Disposal Management Plan*, encompasses selecting a qualified analytical laboratory, developing a quality project-specific sampling plan, properly sampling liquid and solid wastes, validating analytical data, documenting the waste characterization and decision processes, and maintaining quality records. The products of the program are containers of waste that meet the off-site facility's waste acceptance criteria, a quality exemption request package, documentation supporting waste characterization, and overall quality assurance for the process.

The program consists of elements that are developed once for all shipment campaigns, can be developed from boiler plates, and must be developed for each individual shipment. Therefore, the majority of the effort is accomplished with the first off-site shipment. This program provides guidance for achieving a successful shipment campaign and is flexible to allow for customization to each waste stream and revision based on lessons learned with each campaign.

The primary goal of the program is to provide an avenue for documenting decisions, procedures, and data pertinent to characterizing waste and preparing it for off-site treatment or disposal. Each shipment may require certain elements of the program be revised, but the overall quality and consistency of each shipment will be assured.

INTRODUCTION

Until recently, treatment technologies and disposal capacities for low-level mixed waste (LLMW) generated at a Department of Energy (DOE) facility did not exist, requiring that all LLMW generated at Los Alamos National Laboratory (LANL) be placed into storage. Because of the recent developments in treatment technologies and disposal capacities, LLMW can now be shipped off site from LANL for treatment and disposal. Each off-site treatment, storage, and disposal facility (TSDF) has its own requirements, or waste acceptance criteria (WAC), that must be met before the waste is shipped. To ship LLMW to any off-site TSDF, LANL must ensure that the waste meets these criteria. This requires obtaining accurate characterization information for the waste and certifying that the waste meets the waste management requirements of DOE Order 5820.2A, *Radioactive Waste Management*. To ship to a commercial facility, LANL must obtain an exemption from the DOE Order 5820.2A requirement that LLMW be shipped only to DOE facilities.

The most accurate characterization information for a waste stream is usually provided by sampling the waste and obtaining analytical data for specified analytes. Sampling operations require strict compliance with quality assurance (QA) criteria to ensure the following: each collected sample is representative of the original waste stream, the analytical data provides a high level of confidence regarding the precision and accuracy of an accurate portrayal of the waste stream constituents, and data quality objectives (DQOs) are met. The *Low-Level Mixed Waste Off-Site Treatment and Disposal Management Plan* (LLMW Management Plan) developed by LANL is quality-driven and compliance-based and provides procedures that ensure a quality program for sampling, characterizing, and shipping LLMW off site.

The program encompasses selecting a qualified analytical laboratory; developing a quality project-specific sampling plan; properly sampling liquid and solid wastes; validating analytical data; and maintaining quality records. Implementation of the LLMW Management Plan provides documentation of decision processes, sampling strategies and procedures, deviations from established protocols, and data pertinent to the quality of the program. The goal of the LLMW Management Plan is to provide the waste certification official (WCO), who is responsible for LLMW off-site treatment and disposal, with a complete project package that demonstrates a quality program and manifests a high confidence level for waste characterization data required to meet DOE requirements and the TSDF's WAC.

ELEMENTS OF THE PROGRAM

This program consists of the following elements:

- The DOE facility's waste management database
- A project database for the data being compiled
- A project-specific sampling plan
- A TSDF WAC checklist
- An analytical laboratory evaluation form
- An analytical data validation form
- A checklist based on DOE Order 5820.2A requirements
- DOE *Exemption Request Package* (ERP)

The majority of these elements can be developed at the outset of the program and used each time a shipment of waste is being prepared. For those elements that are specific to each different shipment, boiler plates can be developed initially and customized to the current shipment.

One-Time Elements

The following elements of the program can be developed at the outset and used for each LLMW shipment:

- Waste management database
- Project database
- A checklist of the TSDF WAC
- An analytical laboratory evaluation form
- A form to document the validation of analytical data
- A checklist based on DOE Order 5820.2A

The waste management database is the database used by the DOE facility to track its waste. To support this program, this database should have the ability to generate reports based on a key word search, the key word being the waste stream identifier. The generated report should provide container numbers and characterization information for the waste identified for off-site shipment.

The project database provides the quality record for the entire program, including the rationale for decisions made. Therefore, this database consists of fields for the following data:

- Unique record number identifying the shipment (each shipment of waste constitutes its own database record)
- Name, address, and telephone number of the TSDF to which the waste is being shipped
- Waste stream identifier (the basis for the waste selected for shipment)
- Project-specific sampling plan document number
- Analytical laboratory selected
- Container numbers, with access to the following subfields
  - Rationale for eliminating containers
  - Containers selected for sampling/analysis
  - Analytical results
- Characterization information for each container
- Compliance of each container with TSDF WAC, with access to a subfield for any details or explanations
- Comments pertaining to the program process

Once this database has been formatted, data entry throughout each shipment is all that is required.

When identifying a TSDF available for the waste stream selected, it is important to obtain its most current WAC document applicable to the specified waste stream. The WAC is developed into a checklist, which is used to determine if each container of waste meets the WAC. Each checklist for different TSDFs can be formatted into the project database as a subroutine that is called up as applicable. Once the WAC checklists are developed, they are used for each shipment of waste to the specified TSDF. Revisions to the checklists are necessary only as the TSDF revises its WAC.

Selecting an analytical laboratory for sample analysis requires an evaluation of the available laboratories to determine which one is best suited for and capable of performing the necessary analyses. An evaluation form is developed using the criteria established in 10 CFR §830.120, "Quality Assurance Requirements," the Environmental Protection Agency's (EPA's) *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (SW-846), and the *Handbook for Analytical Quality Control in Radioanalytical Laboratories*. The TSDF may also mandate its own requirements for the analytical laboratory, which must be taken into account when developing the evaluation criteria. These requirements can be developed as an attachment to the template created from the regulatory criteria. Once an analytical laboratory has been evaluated and approved, the evaluation process need not be repeated for the specified waste types and analytical parameters.

To ensure that analytical data is of acceptable quality, it must be validated against established acceptance criteria. A data evaluation form is developed once for all analytical data. Specific sections of the form that do not apply to the data being validated can be marked "not applicable;" thereby eliminating the need to create new forms for each type of data. The criteria for data validation are based on the analytical method used, the analyte of interest, acceptable ranges for quality control (QC) sample results, and established data quality objectives. Specific validation criteria are obtained from EPA's SW-846.

Finally, to facilitate the preparation of a DOE ERP, a checklist based on DOE Order 5820.2A requirements is developed. A brief review of DOE Order 5820.2A indicates that the checklist would contain the following elements:

- Waste characterization program description
- Waste certification program description
- Waste moratorium implementation program description
- A site three-year forecast of mixed waste shipment campaigns
- Description of waste types
- Justification for small quantity limitation
- Detailed waste characterization of the waste to be shipped
- A description of the physical characteristics and contents of the waste
- EPA hazardous waste codes applicable to the waste
- Radiological constituents and characteristics of the waste
- Method(s) used to characterize the waste
- Procedures supporting the characterization of the waste
- TSDF type, location, and owner
- Agency with the authority to license the TSDF to manage radioactive materials and the license information for the TSDF
- Agency with the authority to permit the TSDF to manage hazardous wastes and the permit information for the TSDF
- Any notice of violations issued against the TSDF
- Comparison of DOE Order 5820.2A requirements with the criteria used by the agencies regulating the TSDF
- Certification that the waste meets the TSDF's WAC
- Procedures used to package the waste for shipment
- Certification of waste inspection before shipment
- Procedures used to prepare waste for shipment, indicating compliance with Department of Transportation regulations
- Options considered and cost estimates for these options, indicating that off-site treatment or disposal is optimal
- Advantages and disadvantages for off-site treatment or disposal
- Analysis of environmental concerns, and environmental assessment if necessary
- Safety analysis for shipping the waste and certification that operations comply with established procedures
- Procurement vehicle for securing the TSDF's services
- Assessment of TSDF against permits and licenses
- Written notification of TSDF's regulatory status to DOE area office 90 days before shipment
- Written notification of specific shipment information to DOE area office 5 days before shipment
- DOE ERP submitted to appropriate agencies
- Records maintained in compliance with an auditable records management program

Although much of the required information is specific to the waste being shipped, certain elements can be developed from boiler plate information. This checklist can be developed by one DOE facility and shared with others.

Boiler Plate Elements

Boiler plates can be developed for the following elements:

- Project-specific sampling plan
- Certain DOE ERP information

Developing a boiler plate involves generating an outline of the information required, providing the common information, and providing guidelines for developing the waste-specific information. Developing and using a boiler plate eliminates recreating information common to all shipments of LLMW and researching requirements for information specific to each shipment.

A project-specific sampling plan documents the specific sampling operations involved with obtaining representative samples for analysis from the selected waste containers. An outline for a sampling plan consists of the following elements:

- Sampling strategy and method used to ensure that the samples collected represent the originating waste stream
- Specific sampling protocol
- QA/QC requirements specific to sampling operations
- Sample container and volume requirements
- Sample preservation methods
- Sample packaging and shipping requirements (if applicable)
- DQOs

Most of these elements can be taken from boiler plate information and customized to the specific sampling operation based on the waste stream. For example, sampling strategies and preservation techniques are provided in SW-846, generic sampling procedures can be developed to encompass most types of waste, and QA/QC requirements and DQOs should be consistent for all sampling operations. However, each of these elements, especially the sampling strategy, must be adapted to the characteristics of the waste being sampled. The sample container and volume requirements are based on the analytes of interest and the TSDF WAC; therefore, these need to be developed specifically for each sampling plan.

Certain information required in a DOE ERP can be developed once and inserted into each ERP. For example, a description of the DOE facility's waste characterization program and waste certification program would change little over time. Therefore, these descriptions can be prepared at the outset of the first DOE ERP and copied into each one after that. The information describing the TSDF and its licenses, permits, and operating record can also be developed once and inserted into other DOE ERPs for waste being shipped to that particular TSDF. The DOE ERP checklist discussed above provides the outline of the elements required in the package.

PROCESS OF THE PROGRAM

A simplified flow diagram illustrating the program is provided in Figure 1, which demonstrates that documentation occurs at each step within the program. This figure illustrates the skeleton of the program, with the details being provided in this report and customized as necessary for each DOE facility.

An activity that parallels the preparation of the actual waste for off-site shipment is the development of

the DOE ERP. Much of the DOE ERP, such as descriptions of the DOE facility's waste characterization and certification programs and a forecast of mixed waste shipment campaigns can be developed from boiler plate information. Other information required for the ERP, such as the characterization of the specific waste being shipped, is obtained through implementation of the LLMW Management Plan. The checklist of DOE Order 5820.2A requirements facilitates preparing the ERP in parallel with characterizing the waste.

The program involves the following steps. These steps assume that the one-time elements and boiler plates have been developed before beginning the process. The DOE ERP is prepared parallel to this process.

1. Select the category of waste stream for off-site treatment or disposal and enter it into the project database.
2. Identify key words describing the waste stream selected (e.g., chemical names, regulatory classifications, and chemical categories) that can be used to search the waste management database.
3. Query the waste management database to identify the containers of waste applicable to the chosen waste stream.
4. Enter the selected container numbers into the project database.
5. If, at any time throughout this process, containers of waste are withdrawn from consideration, document the rationale in the project database.
6. Review all available characterization information (hard copy and electronic) for the selected containers.
7. Enter the characterization information into the project database for each container.
8. Using the information available, complete the applicable WAC checklist for each container. Enter the information into the project database.
9. Identify the containers that cannot conform to the TSDF's WAC and enter the reason in the project database subfield. Remove these containers from consideration for shipment.
10. Identify the analytical parameters required by the TSDF's WAC and enter them into the project database.
11. Based on the project-specific sampling plan and TSDF requirements, and following a documented sampling protocol, collect samples of waste from the containers. Enter the sampling plan and sampling protocol document numbers and the containers selected for sampling in the project database.
12. Maintain chain of custody for the samples by complying with a documented chain-of-custody procedure.
13. Maintain all records and logbooks for the sampling activity in the project files according to a documented records management procedure.
14. Define the analytical parameters and analytes of interest for each sample for the analytical laboratory.
15. Validate the analytical results received, completing the validation documentation and entering the results in the project database.
16. Complete the TSDF WAC checklist based on the validated analytical results. Enter the results in the project database.
17. Complete the DOE ERP.
18. Ensure that the waste is packaged according to TSDF requirements.
19. Upon obtaining the TSDF's and DOE's approval, ship the waste to the TSDF.
20. Review the project file to ensure that it is complete.

IMPLEMENTATION OF THE PROGRAM

LANL successfully shipped 15 55-gallon drums of liquid scintillation fluid off site to Diversified Scientific Services, Incorporated, for disposal. Preparation of this shipment provided guidance and insight in developing the program described in this paper. For example, requiring background or historical research into the characterization of a waste stream resulted from data being lost when the scintillation vials were crushed and the liquid was repackaged. The original radiological data for the liquids was found in the characterization paperwork for the original waste stream of uncrushed scintillation vials. This reinforced the importance of ensuring that the current characterization information is consistent with the original existing information or knowledge.

LANL is currently preparing LLMW streams containing isopropyl alcohols, oils, and organic solvents for off-site shipment, using this program as a guide to the thought process. As lessons are learned from different waste streams, the program is adapted. Throughout the process, LANL is gaining a better understanding as to how to solve problems that arise with each shipment. The resolutions to these problems are incorporated into the program. Finally, this program allows each person responsible for preparing a waste stream for off-site shipment to understand the process and ensure consistency between each shipment.

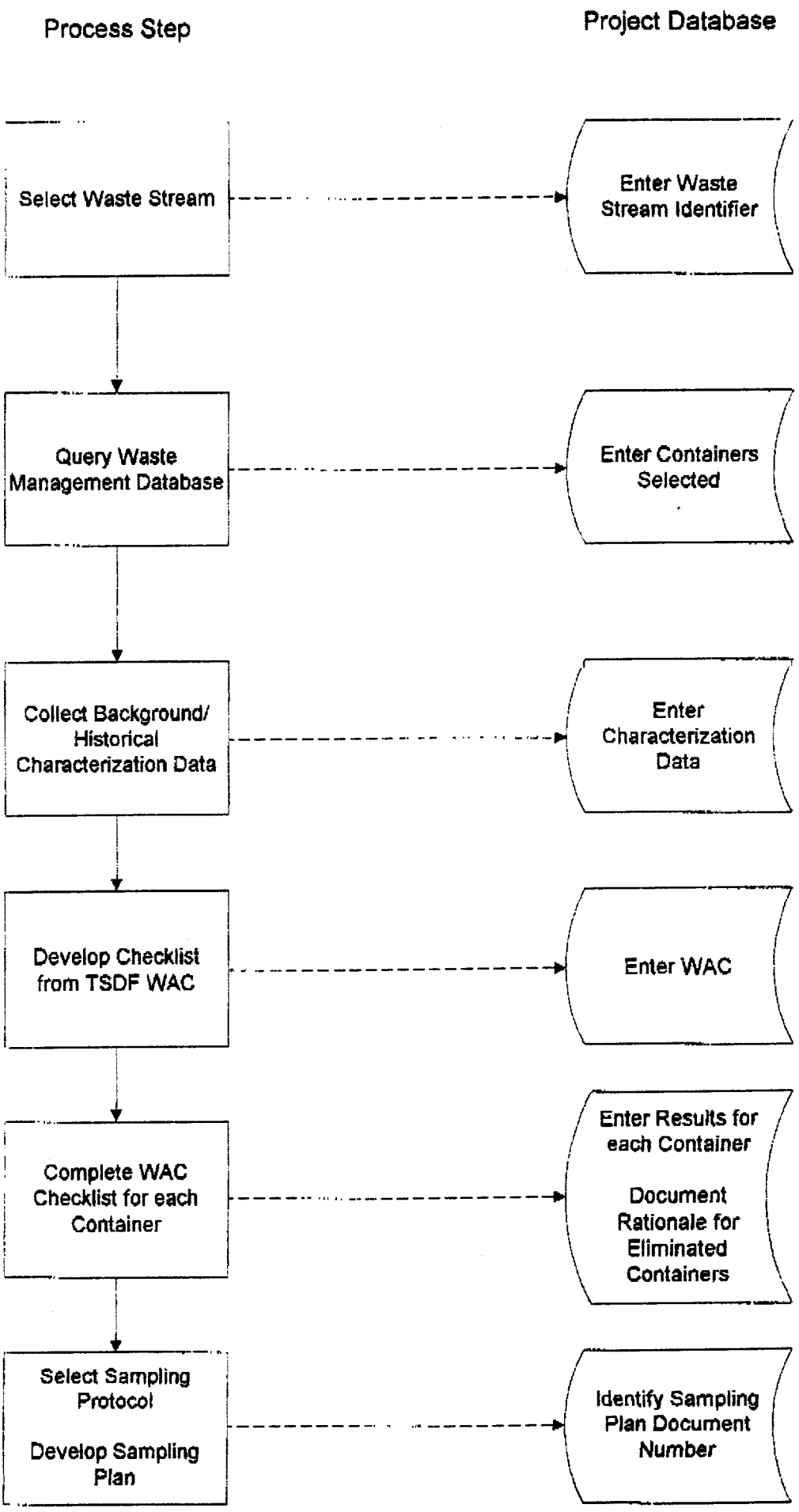

Process Step
Project Database
Select Waste Stream
Enter Waste Stream Identifier
Query Waste Management Database
Enter Containers Selected
Collect Background/ Historical Characterization Data
Enter Characterization Data
Develop Checklist from TSDF WAC
Enter WAC
Complete WAC Checklist for each Container
Enter Results for each Container
Document Rationale for Eliminated Containers
Select Sampling Protocol
Develop Sampling Plan
Identify Sampling Plan Document Number

FIGURE 1

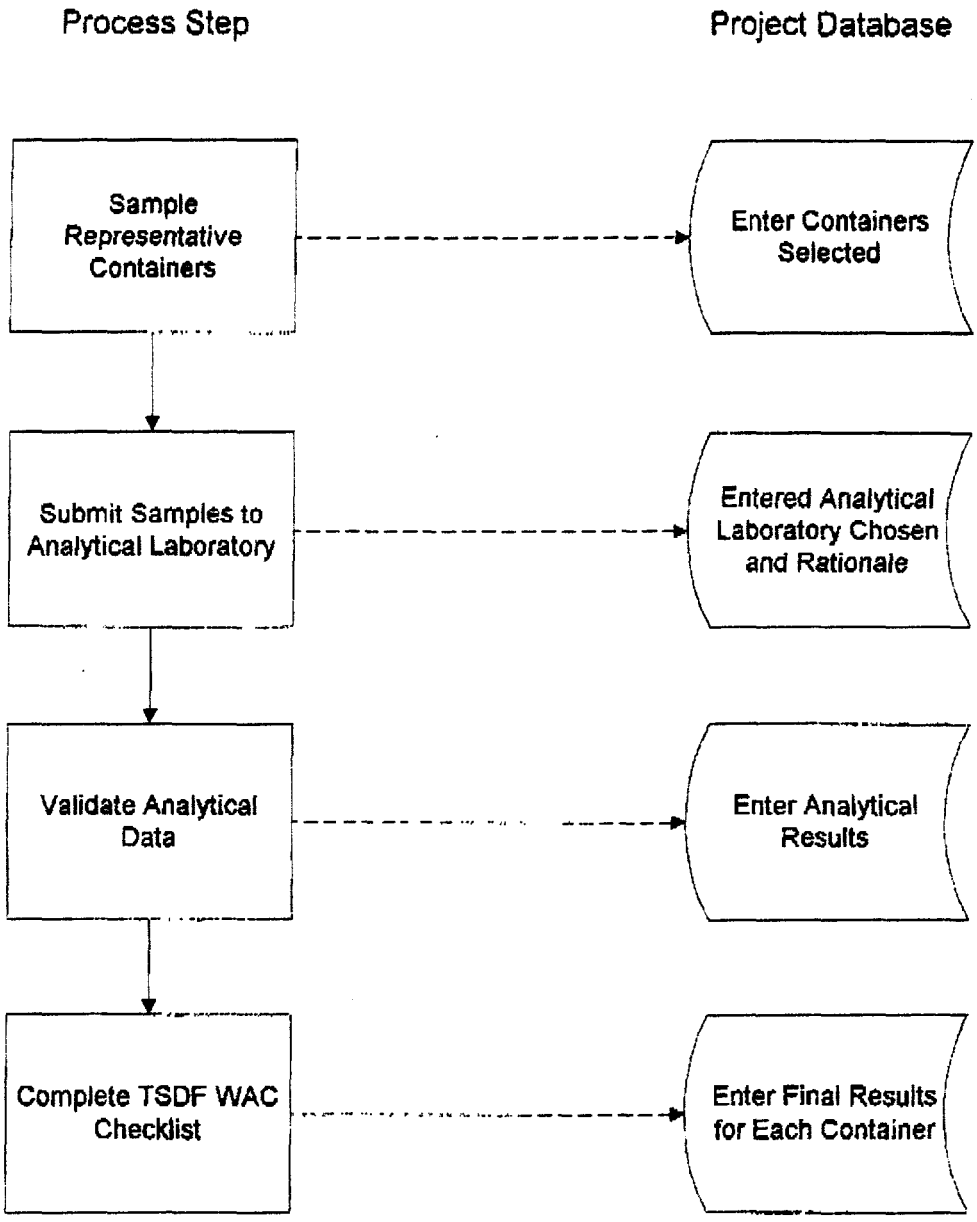


FIGURE 1 (CONT'D)