The Secretary of Energy
Washington, DC 20585

January 21, 1994

The Honorable John T. Conway
Chairman
Defense Nuclear Facilities Safety Board
Suite 700
625 Indiana Avenue, N.W.
Washington, D.C. 20004

Dear Mr. Chairman:

On August 31, 1993, the Department of Energy accepted Defense Nuclear Facilities Safety Board Recommendation 93-5 regarding the waste characterization program for high-level nuclear waste storage tanks at the Hanford Site.

In accordance with section 315 (e) of the Atomic Energy Act of 1954 (42 U.S.C. 2286d(e)), the Implementation Plan for Recommendation 93-5 is enclosed for the Board's review.

The Department recognizes there are uncertainties in the characterization of the high-level nuclear waste storage tanks at the Hanford Site. We appreciate the clarification and support the Board's staff has provided in the development of this Plan. As the Department learns more about the contents of these tanks, we will continue to improve upon the Plan, and we will keep you and your staff apprised of these improvements.

Sincerely,

Hazel R. O'Leary

Enclosure

DOE/RL 94-0001

Recommendation 93-5 Implementation Plan

United States
Department of Energy
Richland, Washington

Approved for Sponsor Release

DOE/RL 94-0001

Recommendation 95-3 Implementation Plan

Date Published
January 1994

United States
Department of Energy
P.O. Box 550
Richland, Washington 99352

Approved for Sponsor Release

RECOMMENDATION 93-5 IMPLEMENTATION PLAN
DOE/RL 94-0001

Document Title: Recommendation 93-5 Implementation Plan

Approved by:
W. T. Alumkal
W. T. Alumkal, Executive Vice President
TWRS, Westinghouse Hanford Company
1/11/94
Date

Approved by:
J. H. Anttonen, Actg. Program
Manager, TWRS, U.S. Department of
Energy, Richland Operations Office
1/11/94
Date

Approved by:
T. M. Anderson, President
Westinghouse Hanford Company
1/12/94
Date

Approved by:
J. D. Wagoner, Manager
U.S. Department of Energy
Richland Operations Office
1/12/94
Date

Concurrence:
J. C. Tseng, Director
Office of Hanford Programs
U.S. Department of Energy,
Headquarters (EM-36)
1/16/94
Date

CONTENTS

LIST OF FIGURES

LIST OF TABLES

EXECUTIVE SUMMARY

On July 19, 1993, the Defense Nuclear Facilities Safety Board (DNFSB) provided to the Secretary of Energy its Recommendation 93-5, which commented on the Hanford Tank Waste Characterization effort. Recommendation 93-5 was subsequently accepted by the Secretary of Energy on September 9, 1993. Recommendation 93-5 highlighted the need to accelerate the characterization of the Hanford Site tank wastes to expedite the resolution of identified tank safety issues, and to provide timely design data in support of activities addressing the disposal of the tank wastes. The Department of Energy (DOE) and its prime contractor, Westinghouse Hanford Company (WHC), are in full agreement with the content of Recommendation 93-5 and have prepared this Implementation Plan to document those actions that have been or will be taken to meet Recommendation 93-5.

The new Characterization Strategy embodied by this Plan acknowledges that waste distribution within a tank is the critical unknown with respect to successfully characterizing the tank for any Tank Waste Remediation Systems (TWRS) programmatic need. Therefore the new strategy is to: (a) complete historical characterization reports on each high-level waste (HLW) tank within a tank farm by using historical knowledge for information on waste layering, distribution, and general composition. These reports will be issued farm-by-farm for all farms in a given 200 Area quadrant; (b) to the extent permitted by operational and safety program needs, sample each tank within a farm for a short list of key safety-related analytes (the safety screening process) and, for those tanks where screening indicates a safety concern does in fact exist, complete additional analyses and possibly additional sampling to provide the data needed to resolve the safety issue; (c) select specific tanks in the near-term to be sampled which are representative of the various Hanford waste distributions and utilize the data which results to enhance and expand the statistical models for determining the number of core samples needed from a tank; (d) revise as necessary the sampling and analytical needs, and capabilities, projections for FY 1995 and 1996 based on the predictive models, completed safety screening, safety resolution and other programmatic Data Quality Objectives (DQOs), and completed risk acceptance criteria; (e) utilize the Hanford Site HLW laboratories for operational, safety screening (45 day), and safety issue resolution analyses, and utilize (generally) offsite laboratories for process development laboratory work to support the TWRS disposal program needs; and, (f) support the disposal program sampling needs by both accumulating unused core sample materials for shipment to the offsite laboratories, and by expanded sampling of specific tanks ("bounding tanks") that the historical records indicate may contain limiting concentrations of key disposal analytes. The new strategy also addresses both the complementary and conflicting aspects of the Vapor and the Flammable gas characterization programs, and the impact of thermocouple tree installations being planned by the Ferrocyanide program.

The new strategy has been incorporated into the seven task initiatives of this Plan. The initiatives will, in their aggregate, substantially improve the Hanford Tank Wastes Characterization Program and will envelope the DNFSB's 93-5 Recommendation. Each task

initiative, along with specific commitments, is discussed in the subsequent sections of this plan. A summary of the task initiatives, as well as the major commitments, are as follows:

1. Strengthen Technical Management.

Strengthening the technical management of the TWRS Characterization Program requires the development of decision making tools and techniques, as well as employing managers who can effectively utilize those tools and techniques in formulating and executing the Characterization Program. This task commits the Hanford Site to establishing a sound technical basis for the Characterization Program. Specifically, commitments for developing statistical tools are provided which will enable TWRS management to make informed decisions on the number of cores required per tank. Other commitments include (1) finalization of the limiting tank contents criteria (what chemicals control the design) for each of the TWRS program elements; (2) finalization of the detailed historical tank contents reviews and completion of the DQO planning processes for all TWRS elements; (3) completion of the statistical analysis of variability due to contents heterogeneity and sampling equipment/location limitations; and (4) completion of TWRS risk acceptance criteria for both tank safety issues and disposal system design issues.

This section clarifies the roles and responsibilities of the Characterization Program within DOE and WHC. Specifically, program scope is defined and includes proactive management of the Data Definition (i.e., DQO process); Data Collection (historical records, sampling, and analysis); Data Dissemination process; and technology development in support of sampling and analysis. Commitments are provided which will streamline the WHC-managed DQO planning processes, as well as align responsibility for the Characterization Program activities with the authority vested in the Characterization Program Manager. Commitments to enhance the staff of WHC and DOE commensurate with the above roles and responsibilities are made. Finally, commitments to explicitly define the roles and responsibilities within WHC of the Characterization Program Manager, the field sampling activities manager, the systems engineering manager, safety program manager, and the analytical laboratories manager are identified.

2. Accelerate Safety Related Characterization.

Even though the primary goal of this plan is to accelerate characterization activities in support of the TWRS mission, a specific near-term task has been initiated to collect necessary characterization data to (1) ensure all tanks with safety issues are properly identified, and (2) resolve specific tank waste safety issues. This task is driven by a growing acceptance that tank waste historical records alone are too uncertain to allow an acceptable determination of whether a specific tank is safe, conditionally safe, or unsafe, and whether it belongs on a Watch List. This task commits TWRS to accomplish a comprehensive hazardous vapors, flammable gas, organic, ferrocyanides, and high heat safety screening sampling and analysis activity on each of the 177 HLW tanks within 3 years of the date of acceptance of the Recommendation 93-5 (October 1996).

A commitment is also made to sample as many of the tanks as practical within a specific tank farm to minimize the time associated with decontaminating the sampling equipment prior to over the road travel to another tank farm. A commitment is also made to optimize the sampling order of tanks within a tank farm to maximize the number of Watch List tanks sampled and screened in the first two years. Even though this accelerated sampling technique may cause some tanks presently on the Watch List not to be safety screened within the two year period suggested by the DNFSB, the technique provides much greater assurance that all 177 tanks will be safety screened within the three year period specified within 93-5. Of the 177 waste tanks, only 128 tanks should need to be core sampled. The reduction in the number of tanks to be sampled is due to tanks which have already been sampled, tanks which are empty or close to empty, and tanks which contain only liquid. The latter two categories will be sampled with alternate sampling means. This reduced number of tanks requiring core sampling will contribute to completion of tank characterization within the time-frame specified in Recommendation 93-5.

This task commits the site to taking 2 or more full depth screening core samples from each tank sampled until the technical basis activity within Task 1 is completed. Finally, this task commits the site to the prompt development via the DQO process of an analytical package for screening core samples that utilize "macro-measures" (such as calorimetry for energetic reactions, Total Organic Carbon (TOC) for fuel content, and gross alpha for fissile material estimation) and minimal mixing of core components in order to determine within 45 days of sampling whether the core sample data indicates that a tank meets the criteria for the safe, conditionally safe, or unsafe category. Additional analytical work per safety-issue specific DQOs is required for tanks determined to be conditionally safe or unsafe.

3. Improve the Quality and Quantity of Sampling.

This task addresses changes necessary to achieve the accelerated schedule and improve recoveries. One push-mode and one rotary-mode sampling truck will begin operation in March 1994. Commitments are made for two more rotary-mode trucks to begin operation in FY 1995 and the addition of enough trained sampling crews to go to multiple shift operation for all four trucks. This schedule will allow an over 2 core/tank (average) sampling of all tanks in the 3-year period. Commitments are made to programs for flammable gas monitoring and vapor sampling that will allow timely access to flammable gas tanks and adequate monitoring for industrial hygiene purposes.

The issue of poor push-mode sample recoveries is addressed. Commitments are made to develop the means to determine core recoveries at the time of sampling and to directly monitor drill bit temperatures. The possibility that the number of cores required from some tanks may exceed the present capability to sample from existing risers is addressed by a commitment to immediately begin assessing the installation of additional risers. Details of an integrated sampling schedule including core sampling, auger sampling and grab sampling are presented.

4. Streamline Tank Access.

This task identifies the initiatives that have been taken and completed with respect to gaining earlier access to waste tank contents for characterization activities. In addition, a commitment to resolve the issue of the timeliness of authorizing an intrusive activity into a tank with an identified safety issue is provided.

5. Improve the Quality and Quantity of Analyses.

This task addresses needed improvements to the planning, performance, and assessment of analytical services supporting the TWRS Characterization Program. Key areas needing to be improved are the quality of analyses, analytical capacity improvements to support projected sampling, and development of new or improved analytical techniques. The "macro-measures" techniques being proposed for the safety screening analysis of each tank core sample should substantially increase laboratory throughput due to the greatly reduced number of analytical determinations that are anticipated, and the simplified data reporting required.

A commitment is made to develop offsite HLW laboratory capability by October, 1994. Specifically, two PAS-1 shipping casks are being procured with amended licenses that will permit some liquid content to be shipped. TWRS has selected two offsite laboratories and are proceeding to fund the labs so that they are ready to receive samples in FY 1994.

In the past, technical staff often questioned the reported results from the laboratories at the Hanford Site and/or found errors in their reports. Commitments are made to improve (1) the quality of the reported results; and (2) the internal and external assessments (enhanced quality assurance program). In addition, specific commitments are made to expand capacities, both by improvements to on site hot cells/equipment and by using off side laboratory facilities.

6. Improve Data Management

Improvements in the previous tasks will be of little value if customers to the Tank Characterization Program cannot access the information they need. The old Characterization Program had not established any controlled, accessible database for data users, nor had it created an atmosphere of sharing key information. Data flow was slow and manual (i.e., not computer generated), lending to input errors. Reports were not user friendly. Commitments are made to identify, develop, and make accessible data in electronic form to support customer needs. In addition, commitments are made to identify and work with customers to develop or improve data accessibility and to automate much of the data accumulation.

A near term commitment to evaluate the 12 existing validated data packages (similar to the recent tank 241-T-111 data package which indicated potential energetics issues) is also provided. The evaluation will determine whether (1) the packages are suitable for a safety screening effort, (2) and if so, is a safety issue indicated by the data, and (3) are the packages of value to the immediate needs of the TWRS disposal programs.

7. Change Control

This section outlines the process for making changes to this document.

In summary, it is expected that the new Characterization Strategy, as implemented through the seven tasks of this Plan, will result in:

- An acceptable determination of the safety issue status of each of the 177 Hanford HLW tanks;
- Sufficient data to allow resolution of any confirmed safety issue that may impact a specific tank
- Operational sampling and analyses that will meet the quality, quantity, and timeliness needs of a *Resource Conservation and Recovery Act* (RCRA) permitted treatment, storage, and disposal (TSD) facility
- Sufficient sample material and/or analytical data to support the design needs of the TWRS disposal programs.

These tasks should all occur within the three (3) year time period included within the DNFSB's Recommendation 93-5.

1.0 INTRODUCTION

Decades of United States defense material production left a legacy of high-level liquid radioactive and chemical wastes at the Hanford Site.

The present contents of the 149 single-shell tanks (SSTs) and the 28 double-shell tanks (DSTs) represent a diverse chemical processing and waste management history. Waste from three primary reprocessing flow sheets, a variety of materials recovery operations, and numerous waste management-oriented operations have led to both chemically and physically heterogeneous waste. This diversity in the stored waste, coupled with an incomplete record of tank waste operations and transfers, creates a complex challenge for waste characterization. Access risers into the tanks are limited, which further restricts available sampling options. The costs and time required to add additional sampling risers are expected to be high, and the technology to permit random access through existing risers maybe too long term (> 3 years) to be responsive to the DNFSB's Recommendation 93-5.

Historical information is limited by the fact that analytes of concern for continued safe storage and ultimate retrieval and disposal of the wastes differ from those collected for past waste management operation controls. The chemical and physical heterogeneity add complexity to the problem.

Characterization provides a key part of the information needed to (1) resolve safety issues; (2) ensure safe interim storage; and (3) meet the Tank Waste Remediation Systems (TWRS) mission objective to dispose of the wastes stored in the Hanford Site SSTs and DSTs. Other information which supports the TWRS mission is the analysis of historical data on waste sources, waste transfer and processing data, and waste tank monitoring and/or ongoing tank surveillance data. Where applicable, information from chemical and physical modeling of tank contents and waste simulant and other studies will be used to provide comprehensive information on the contents and expected behavior of the wastes.

DNFSB Recommendation 93-5 strongly criticized the overall direction and timeliness of the Characterization Program. Consequently, the DNFSB made the following recommendations.

- The Characterization Program should undergo a comprehensive reexamination and restructuring to accelerate schedules, strengthen technical management, and expedite analyses.

- The Characterization Program should be integrated into the TWRS systems engineering effort.

The DNFSB Recommendation 93-5 also addressed simplifying tank access protocols and strengthening the management and conduct of sampling.

1.1 RECOMMENDATIONS OF THE DNFSB

1. Undertake a comprehensive re-examination and restructuring of the characterization effort with the objectives of accelerating sampling schedules, strengthening technical management of the effort, and completing safety-related sampling and analysis of Watch List tanks within a period of two years, and the remainder of the tanks by a year later.

    a. In accordance with the above, give priority in the schedule of tanks to be sampled to the Watch List tanks and others with identified safety problems, and priority to the chemical analyses providing information important to ensuring safety in the near-term during the period of custodial management. Other analyses, required by statutes such as the Resource Conservation and Recovery Act prior to final disposition of the waste, should not be cause for delay of safety-related analyses. In most cases, analyses needed for long-term disposition may be postponed until more pressing safety-related analyses are completed.

    b. Re-examine protocols for gaining access to the tanks for sampling, with the objective of simplifying documentation and approval requirements.

    c. Increase the laboratory capacity and activities dedicated to tank sample analysis, as follows.

        - Expedite efforts to obtain and begin utilizing additional sampling and analytical equipment now being procured, and expedite the training of personnel needed for an enlarged through-put capacity.

        - Explore the availability and utility of laboratory services on site and off site, such as the Hanford Site's Fuel Materials and Examination Facility, the Idaho National Energy Laboratory (INEL) and Los Alamos National Laboratory (LANL) laboratories for accelerating the waste characterization effort.

2. Integrate the characterization effort into the systems engineering effort for the Tank Waste Remediation System.

    a. Schedule tank sampling consistent with engineering and planning for removal, pre-treatment, and vitrification of the wastes.

b. Critically examine the list of chemical analyses done on samples to establish the smallest set needed to satisfy safety requirements.

c. Strengthen the management and conduct of the sampling operations.

1.2 DOE RESPONSE TO THE DNFSB 93-5 RECOMMENDATION

The DOE accepted the DNFSB's Recommendation 93-5 on September 9, 1993. The purpose of this plan is to describe how these recommendations are being implemented by the DOE and its contractors.

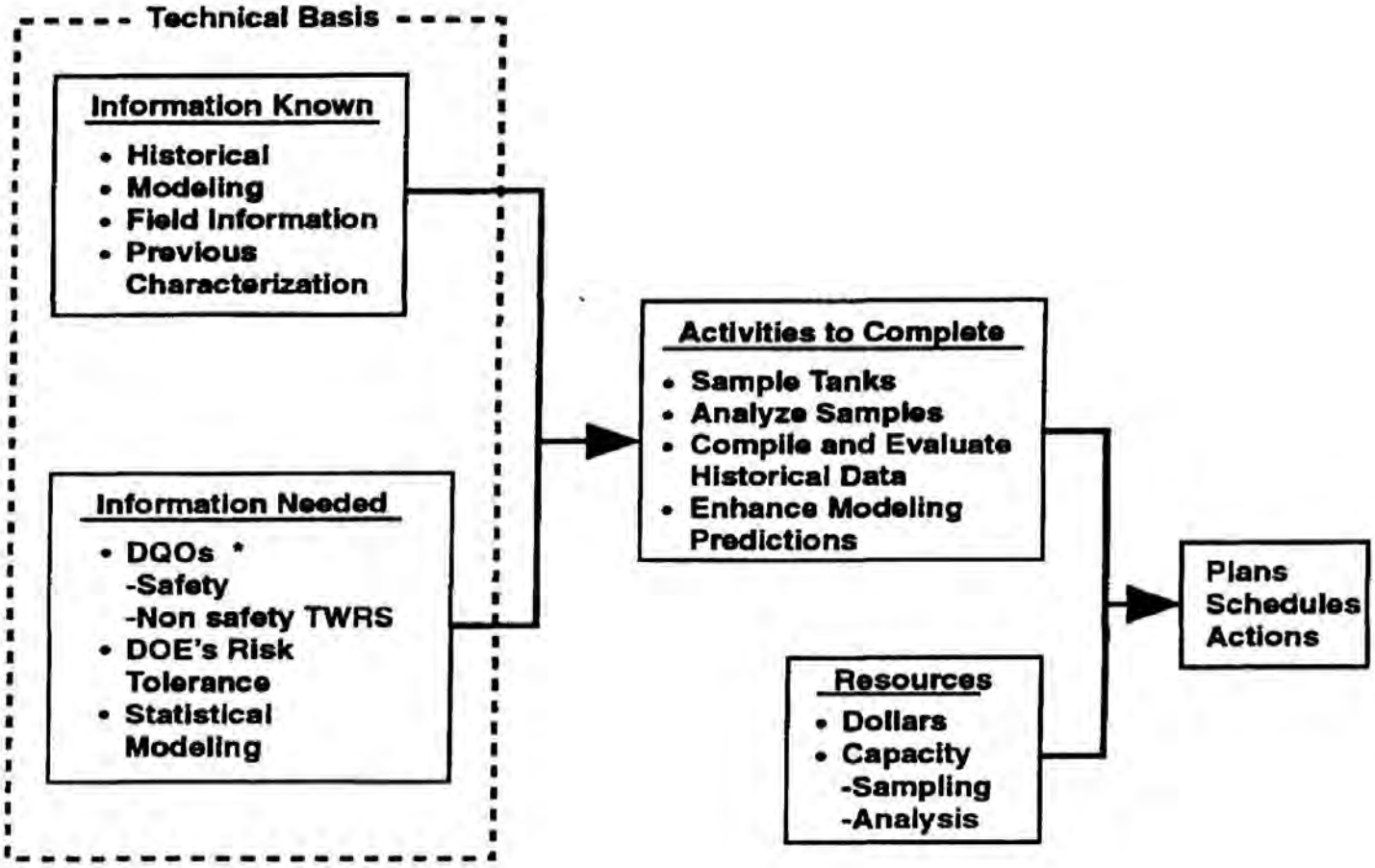
DOE and WHC recognize that some key information to guarantee that the 2- and 3-year schedules can be met is missing. Figure 1 shows the data that is available and needed before there can be a high degree of confidence that these dates can be met. However, DOE and WHC are committed to make necessary changes to the program, and will commit necessary resources to substantially accelerate this program and improve its management so that the milestone is met.

Recognizing the need for dramatic improvement in characterization performance, a strategy to resolve these issues has been developed that includes the following:

- Use systems engineering functions and requirements process to define and integrate TWRS characterization needs.
- Use historical analysis, theoretical modeling, field instrumentation, and in-tank sampling to characterize tank contents (see Figure 2).
- Expedite the resolution of tank safety issues by shortening the time to sample and analyze tanks.

In addition to the DNFSB's finding, there have been several other independent reports that have outlined the need to improve the Characterization Program (GAO/RECD-93-99, Tseng 1993, Wagoner 1993, Arvizu 1993). WHC and DOE management have also spent considerable time in the last several months reviewing and analyzing problems facing the TWRS Characterization Program. Major problem areas include (1) lack of defined technical basis; (2) management issues; (3) sampling issues; and (4) analytical laboratory assay issues. These issues and the plan to address them are presented in future sections. As the improvements are made, and as the necessary data that is presently missing is obtained, then updates to this plan will be developed to accurately assess the schedule status.

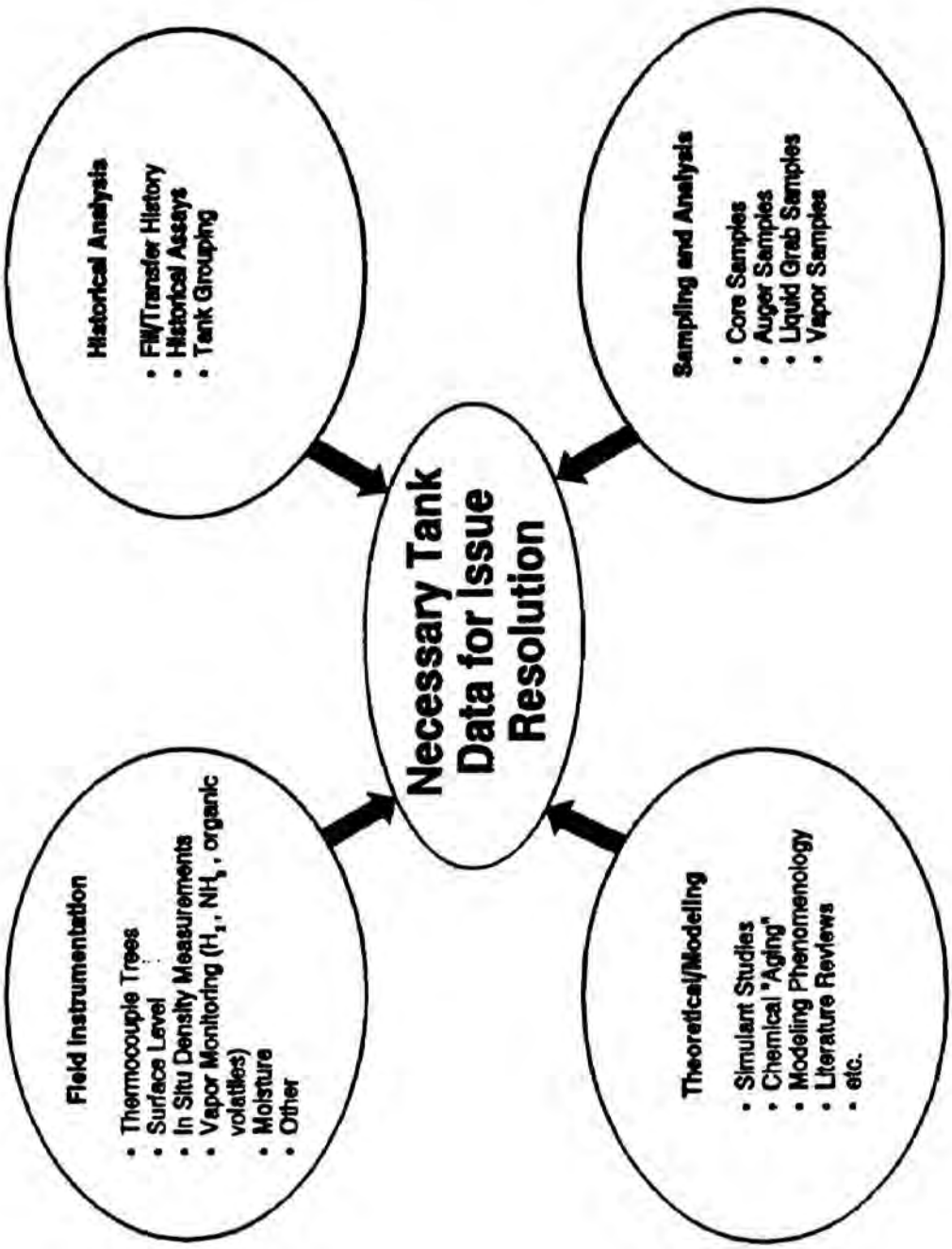
Figure 1. Flowchart for Characterization Program Plans, Schedules, and Activities.



* The DQO process provides a systematic method, using system engineering concepts, to determine what data are needed and the required accuracy and precision to support a decision. Throughout this report the terms DQO and data requirements are used interchangeably; DQOs will be prepared for the various safety issues including safety screening.

29401037.1

Figure 2. Strategy for Tank Characterization.



1.3 ORGANIZATION OF IMPLEMENTATION PLAN

The following Table 1 provides a cross-reference between the DNFSB recommendations and the appropriate sections in the plan.

Table 1. DNFSB Recommendation/Section.

DNFSB recommendation	Implementation plan section
1.a	3.2
1.b	3.4
1.c	3.3, 3.5
2.a	3.1.2
2.b	3.1.3
2.c	3.1

2.0 NEAR-TERM INITIATIVES

An aggressive effort is underway to complete near-term initiatives which will demonstrate the commitment of Characterization Program in implementing this plan. A number of initiatives will be completed in the next 9 months. Most are presently in the planning base. Others will be added shortly via formal change control. They are as follows:

- Initiate construction of second and third rotary-mode core sampling trucks. (Commitment 3.1) November 1993 (initiated).
- Ensure characterization's functions and requirements are included in the detailed functional analysis report, to project functional level. (Commitment 1.13) January 1994.
- Streamline DQO Process. (Commitment 1.7) January 1994.
- Complete the safety screening DQO. (Commitment 2.2) January 1994.
- Review characterization procedures using DOE Conduct of Operations and Institute of Nuclear Power Operations good practices and revise as necessary. (Commitment 3.2) January 1994.
- Issue Approved Broad-Based Environmental Assessment. (Commitment 4.1) January 1994.
- DOE-RL to submit request for delegation of authority. (Commitment 4.2) January 1994.
- Initial online capability for LABCORE-1 System. (Commitment 6.3) January 1994.
- Demonstrate offsite access to the tank characterization database. (Commitment 6.4) January 1994.
- Issue plan to upgrade INEL to ready-to-serve mode for Hanford Site Analytical requirements. (Commitment 5.9) January 1994.
- Revise FY 1994 Sampling Schedule (Commitment 1.22) by February 1994.
- Complete qualification of first push-mode crew. (Commitment 3.3) February 1994.
- Issue TWRS Characterization QA Plan. (Commitment 1.8) February 1994.

- Enhance WHC Characterization Program Management Staff. (Commitment 1.1) February 1994.

- Develop minimum/maximum laboratory capacity strategy. (Commitment 5.11) February 1994.

- Complete training and qualification requirements for sampling cognizant engineers. (Commitment 3.5) February 1994.

- Restore rotary-mode sampling capability at the Hanford Site. (Commitment 3.6) March 1994.

- Issue a letter assessing the operability of the new extruder. (Commitment 5.3) March 1994.

- Issue a report on results of the Sample Exchange Phase II. (Commitment 5.5) March 1994.

- Complete qualification of first rotary-mode crew and vapor/grab/auger crews. (Commitment 3.7) March 1994.

- Reduce number of management layers in WHC TWRS. (Commitment 1.2) March 1994.

- Define responsibilities of key WHC managers associated with Characterization Program. (Commitment 1.6) March 1994.

- Re-deploy push-mode core sampling. (Commitment 3.4) March 1994.

- Obtain Delegation of Authority for DOE-Richland Operations Office (RL) to approve safety and environmental documentation for TWRS. (Commitment 4.3) April 1994.

- Issue plan to upgrade LANL laboratory to ready-to-serve mode for Hanford Site Analytical requirements. (Commitment 5.10) March 1994.

- Develop plan for adding additional field crews. (Commitment 3.9) April 1994.

- Issue quarterly progress reports by the 15th working day after the end of each quarter. (Commitment 1.10) April 1994.

- Improve WHC Technical Staff Competencies. (Commitment 1.4) April 1994.

- Complete DQOs for all six safety issues. (Commitment 2.1) April 1994.
- Prepare customer needs analysis. (Commitment 6.1) April 1994.
- All WHC Characterization Program management staff to have completed systems engineering training. (Commitment 1.12) May 1994.
- Improve RL Oversight. (Commitment 1.3) May 1994.
- Plan for blind samples. (Commitment 1.9) May 1994.
- Issue Data Management Improvement Plan. (Commitment 6.2) May 1994.
- Develop and issue a field schedule for sampling that integrates all sampling activities for FY 1995 through FY 1996. (Commitment 1.11) June 1993.
- Complete characterization portion of the initial Systems Engineering analysis results. (Commitment 1.14) June 1994.
- Review procedures to identify changes to increase push-mode core sample recovery. (Commitment 3.17) June 1994.
- Complete historical tank content estimate reports for the northeast and southwest quadrants of tanks. (Commitment 1.17) June 1994.
- Engineering Evaluation of Alternatives for In Situ Moisture Monitoring. (Commitment 3.15) June 1994.
- Complete qualification of 2 additional field sampling crews. (Commitment 3.10) June 1994.
- Evaluate Laboratory Staff Training. (Commitment 5.6) June 1994.
- Complete Engineering Evaluation of Installing New Risers in SSTs. (Commitment 3.19) August 1994.
- Complete TWRS Risk Assessment Criteria. (Commitment 1.20) August 1994.
- Procure and receive two PAS-1 Transfer Casks. (Commitment 5.8) September 1994.
- Complete Historical Tank Layering Models. (Commitment 1.16) September 1994.

- Complete DQOs for all TWRS program elements that may need data. (Commitment 1.21) September 1994.

- Install Core Scanning System in Hot Cell. (Commitment 5.1) September 1994.

- Additional rotary-mode core sampling systems. (Commitment 3.11) September 1994.

- Cyanide Specification: Complete Technology Transfer from Pacific Northwest Laboratory (PNL) (Commitment 5.4) September 1994.

- Complete data loading on 20 tanks into the tank characterization database. (Commitment 6.5) September 1994.

3.0 TASK INITIATIVES

3.1 TASK 1: STRENGTHEN TECHNICAL MANAGEMENT

PURPOSE

Substantially improve management of the Characterization Program.

DISCUSSION

A large number of specific management issues have been identified. These have been divided into three general areas: (1) improve program management; (2) integrate characterization and system engineering efforts; and (3) provide a sound technical focus.

3.1.1 IMPROVE PROGRAM MANAGEMENT

A key issue affecting management of this program has been determined to be a lack of ownership of the characterization needs by the real owners of the issues. Tank characterization activities were centralized several years ago to improve integration and consistency. As part of this consolidation, funding (as well as responsibility) were moved from other program elements. However, this centralization has caused certain other problems, such as cost insulation, inactive participation, and incomplete review, especially for non-Watch List Tanks. A recent example which shows this problem is the analysis of tank 241-T-111, which was sampled in October 1991. Analysis results were issued in October of 1992 and March of 1993, and no one reviewed the data until November of 1993. No data user asked for the results of that tank, once it had been characterized. The immediate action is requiring users to develop specific DQOs prior to authorizing sampling. As many staff are unfamiliar with the rigor of this process, the Characterization Program is providing the guidance and support (via trained facilitators) to help the customers to develop DQOs. In addition the Characterization Program will provide key technical basis support (see Section 3.1.3).

Other recognized problems in the management area are (1) staff core technical competencies, especially in the chemical processing, chemistry, and program management areas; (2) failure to establish and meet realistic schedules; (3) failure to make better use of offsite expertise, equipment, and facilities; (4) poor packaging and dissemination of characterization data to support the various customer needs (covered in Section 3.6); (5) inadequate quality assurance; and (6) inadequate/ill defined roles and responsibilities.

The TWRS Characterization Program has a full-time dedicated Quality Assurance (QA) representative from the QA oversight organization. The TWRS Characterization Program also has the authority to request QA oversight to perform independent assessments of the laboratory, including, but not limited to, field blanks and blind performance evaluation samples which reflect the TWRS high-level waste. The Characterization Program Management position is key to ensure that the Characterization Program is properly implemented. This is an area that WHC senior management strengthened after receiving the DNFSB recommendation to increase the quality of program management. A description of the Characterization Program and its interfacing organizations is contained in WHC-SD-WM-PLN-047, *Tank Waste Remediation System Tank Waste Characterization Plan.*

Funding and manpower conflicts are identified and resolved during the fiscal year work planning process. Within TWRS, field access conflicts are resolved by the Director of Waste Tank Operations. This has been a problem in the past regarding availability of resources and which work gets supported. WHC has made significant efforts since August 1993 to develop an integrated field activity schedule. A number of meetings were held to set the priority for various work tasks to assure that realistic schedules could be developed and met. Characterization was given a high priority, as it is key to so many activities. To support this, TWRS Tank Farm Operations established a single field organization that is responsible for all sampling activities (core, grab, auger, and vapor). An integrated field work schedule was developed and issued in November of 1993 covering fiscal year 1994. This should alleviate the problem with lack of available key staff (such as operators or health physics technicians) when field activities are set. Integrated schedules for sampling during fiscal years 1995 and 1996 will be developed and released in June 1994. This will allow adequate time to determine the effectiveness of the new process and organization, as well as to incorporate the information from the various DQO documents. All the schedules will be controlled via a formal change control process.

Existing characterization monthly program reviews, held by the Characterization Program Element Manager, will be refocused to concentrate on schedule status and deliverables. This will also include deliverables associated with Recommendation 93-5. WHC will use these reviews to identify schedule problems and other potential problems, and to focus management attention on the solution of these problems. On an as-needed basis, focus groups will meet to solve technical problems.

Action items resulting from this Recommendation 93-5 are being incorporated into the TWRS financial data and scheduling system, and WHC key milestones are being established. These milestones will be statused on a monthly basis. The earned value is calculated based on performance in terms of actions or deliverables that are sequential to meet the end milestones.

A quarterly progress report will be issued to DOE and the DNFSB starting in April 1994. This report will provide information and status on actions associated with the implementation plan. The DNFSB staff will also be provided copies of the monthly reports and schedule statuses that are used by management.

DOE Richland (RL) holds a weekly status meeting with WHC that focuses on Characterization Program issues. RL reviews the overall program status on a monthly basis, with emphasis on program performance.

RESPONSIBILITY:

The manager of the Characterization Program is responsible for ensuring that this work is completed. The RL Office of Characterization Manager is responsible for oversight to ensure that this is completed.

COMMITMENT 1.1: Enhance WHC Characterization Program Management Staff.

A new manager of the Characterization Program was named November 1, 1993. She brings a proven record of program management as well as a strong knowledge of the Waste Tank Safety Program and RCRA/*Comprehensive Environmental Response, Compensation, and Liability Act/Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement). A second manager has been selected to take over technology development activities. He will start January 17, 1994 and brings a strong technical and program management experience, as well as in-depth understanding of the Tri-Party Agreement. A third key management position (laboratory interface) will be filled in January 1994 by an experienced management candidate. The WHC laboratories are making similar changes to improve management control.

Deliverable: Implement new organization. Transmit to DOE the updated organizational charts.

Due Date: February 1994

COMMITMENT 1.2: Reduce number of management layers in WHC TWRS to improve lines of communication.

Within TWRS, a central program office has been formed to increase coordination and integration across all program elements. At the same time, a much stronger TWRS engineering organization has been formed with an emphasis on chemical engineering/process skills as well as the previous mechanical/electrical skill mix. This, along with the newly

formed TWRS strategic planning group which will implement the high-level systems engineering review, will provide needed technical strength to support the Characterization Program.

Deliverable: Implement new organization. Transmit to DOE the updated organizational charts.

Due Date: March 1994

COMMITMENT 1.3: Improve RL Oversight.

RL has developed plans and received approval from DOE-Headquarters (DOE-HQ) to implement changes to strengthen the management and coordination of the Characterization Program within RL. RL has formed the Characterization Office with a higher graded management position to attract senior experience; this office now reports directly to the TWRS Program Director. The RL TWRS Characterization Office is responsible for all TWRS sampling and analysis; historical characterization data compilation; data definition (DQOs) process to ensure thoroughness and adequate stakeholder participation; data dissemination; management and quality; and characterization technology development activities. The RL TWRS Characterization Office is responsible for ensuring that all needed laboratory support is available and that the data meets the DQOs established by the data users. DOE-HQ authorization of additional staff to support this new office has been requested. In the interim, four general services contractor staff are being added to provide the following services:

- Monitor DQO activities and support regulator interface.
- Data management systems specialist.
- Monitor the quality of all TWRS sampling and analysis activities.

Deliverable: Obtain DOE HQ approval for additional full-time equivalents.

Due Date: May 1994

COMMITMENT 1.4: Improve WHC Characterization Program Technical Staff Competencies.

Complete staff requirements analysis, compare to existing staff, and develop a plan (training, use of offsite contracts and/or recruitment) to close gap between present staff and identified needs.

Deliverable: Letter report.

Due Date: April 1994

COMMITMENT 1.5: Complete implementation of WHC Characterization Program plan to improve staff competencies.

Deliverable: Letter report documenting completion.

Due Date: May 1995

COMMITMENT 1.6: Define responsibilities of key WHC managers associated with Characterization Program.

Deliverable: Completed job descriptions and memorandum of understanding between key WHC organizations to assure communication of responsibilities.

Due Date: March 1994

COMMITMENT 1.7: Streamline DQO Process.

Develop and issue guidance document and sample DQOs to customers to use in developing their DQOs. Establish clear expectations and requirements.

Deliverable: Internal letter/document to user organizations.

Due Date: January 1994

COMMITMENT 1.8: Issue TWRS Characterization QA Plan.

Issue QA Plan to cover all aspects of QA needs (sampling, development, equipment fabrication and laboratory).

Deliverable: WHC Document.

Due Date: February 1994

COMMITMENT 1.9: Plan for blind samples.

Develop plan to establish a periodic independent TWRS blind sample QA check of all laboratories supporting tank characterization. Plan will include where to get representative high-level waste blind samples and what to put into the blind samples.

Deliverable: Letter Report.

Due Date: May 1994

COMMITMENT 1.10: Issue quarterly progress reports by the 15th working day after the end of each quarter. Distribution of the quarterly progress reports shall include the DNFSB and DOE.

Deliverable: Letter Report.

Due Date: One month after quarter ends, starting April 1994.

3.1.2 INTEGRATE THE CHARACTERIZATION AND SYSTEM ENGINEERING EFFORT

For the last several years, the Characterization Program had focused on taking two cores per tank, which were then analyzed according to RCRA protocol. This was to collect data to determine if SSTs should be left in place or retrieved. Recently, TWRS underwent a significant rebaselining, with the new baseline planning case being retrieval of all SSTs (see Appendix B). As part of that rebaselining, TWRS is using systems engineering techniques to develop and manage the TWRS Program and to improve integration and basis for activities and schedules. This process started with senior DOE-HQ, RL and WHC TWRS management attending a special orientation training on systems engineering techniques. TWRS is now in the process of training managers and key technical staff in the details of systems engineering, so that all members associated with planning activities will be using similar techniques and terminology. Classes are 2-day orientations (usually for managers)

and 5-day intense workshops (normally for the key technical staff or management responsible for developing key systems engineering documents). Certain RL staff also have attended the 5-day sessions.

In addition to the training, an organization was formed in TWRS to develop the overall TWRS systems engineering base documents. A small core staff, familiar with systems engineering techniques, was assembled. The remaining staff are matrixed from the program elements and are the best technical staff available who have an overall grasp of the particular program element (for example, the Characterization Program has dedicated their best engineer for approximately two months to develop functions and interfaces from which the Characterization Program can ensure that all requirements are identified). These staff will not only bring the best knowledge to the process, but will also be able to bring back to their functions the knowledge gained from the systems engineering process.

The specific product and commitment schedule for systems engineering products for TWRS are presented in the implementation plan for DNFSB 92-4. Systems engineering techniques will be used to develop the sampling requirements and schedules for FY 1995 and FY 1996 with a focus on gathering the right information at the right time.

COMMITMENT 1.11: Develop and issue a field schedule for sampling that integrates all sampling activities (core, vapor, grab, auger, equipment availability, and crew training) for all tank sampling events for FY 1995 through FY 1996.

Deliverable: Approved schedule.

Due Date: June 1994

COMMITMENT 1.12: All WHC Characterization Program management staff will complete systems engineering training.

Deliverable: Letter documenting that training has been completed.

Due Date: May 1994

COMMITMENT 1.13: Ensure that the Characterization Program's functions and requirements are included in the detailed functional analysis report, to project functional level.

Deliverable: Text/table input to Systems Engineering organization.

Due Date: January 1994

COMMITMENT 1.14: Complete characterization portion of the initial systems engineering analysis results.

Deliverable: Text/table input to Systems Engineering organization.

Due Date: June 1994

COMMITMENT 1.15: Integrate the vapor sampling program into the Characterization Program.

Deliverable: Letter to DOE documenting the integration.

Due Date: October 1994

3.1.3 PROVIDE SOUND TECHNICAL BASIS FOR SAMPLING AND ANALYSES

A well-developed technical basis to support all sampling and analysis activities in the Tank Waste Remediation System Program does not exist. The purpose of this section is to describe how the TWRS Program will establish the technical basis upon which the program will make safety related, and other programmatic (retrieval, pretreatment and disposal) decisions. Some TWRS Programs, such as the Tank Safety Program, have a good understanding of what analyses are needed to resolve safety issues, however, the individual TWRS Programs do not have a good understanding of: how much data are actually needed; how accurate the data must be; and how many samples must be collected to establish an acceptable level of risk for decision makers.

The need to establish the technical basis upon which the TWRS Characterization Program will proceed is critical. Without a sound technical basis one cannot determine the number of samples to be collected and analyzed to meet the TWRS Program objectives. Without knowing the number of samples to be collected, one cannot determine the number of sampling trucks and crews, the number of working shifts, the laboratory capacity, and other critical needs. Information which must be determined so that the technical basis can be established include: establishing the risk one is willing to take in making the wrong decision; and the definition of the accuracy, precision and detection limit for each analyte each TWRS program has identified as being important to their decisions. The types of risk vary with the program element. The risk to the disposal program elements, for example, are cost and schedule impacts if the characterization data gathered are inadequate. At the other end, the risk of not knowing that a safety issue exists could be an increased chance of radiological releases.

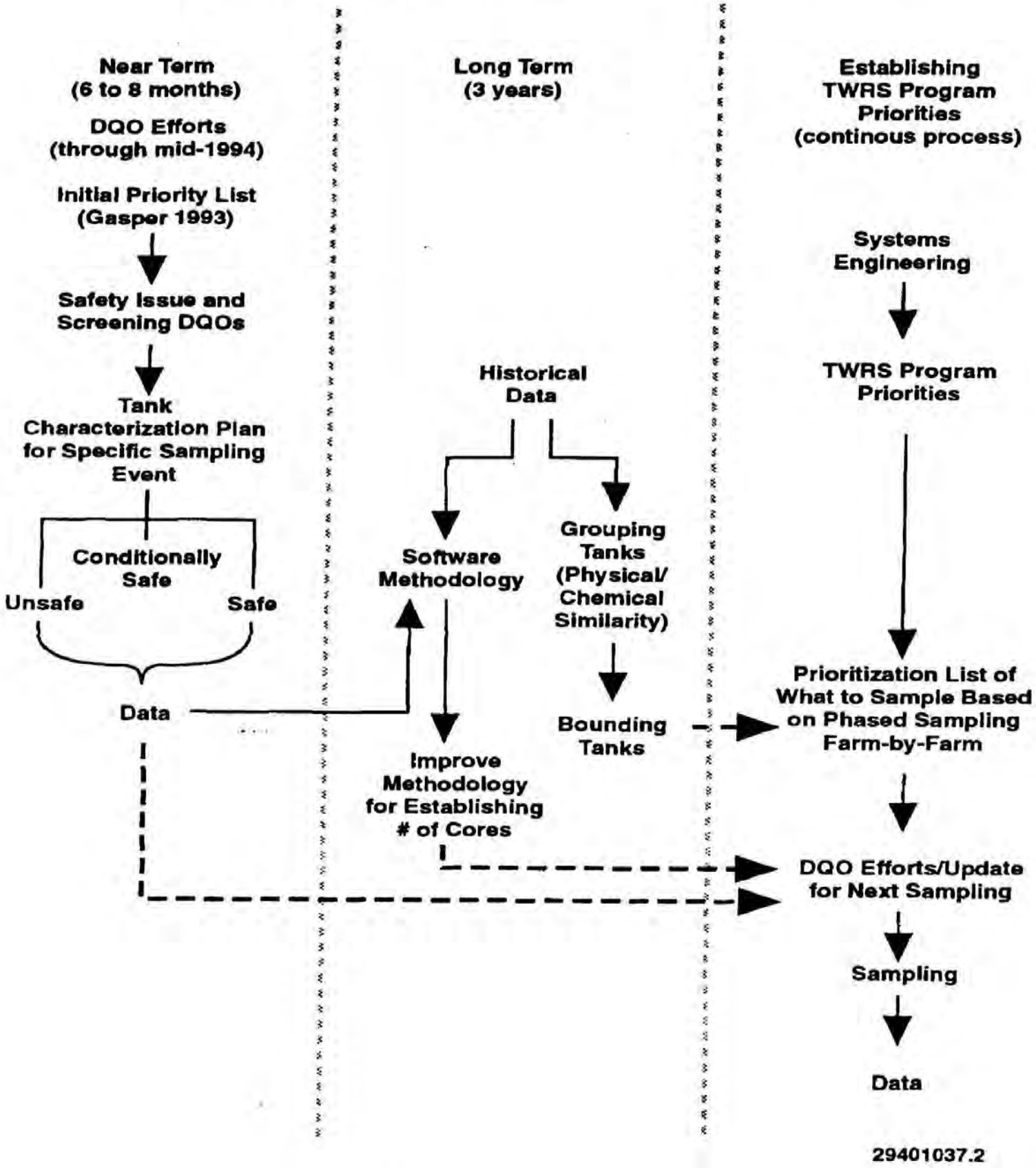
There are various approaches or strategies which could be employed to establish the technical basis for characterization of the high-level nuclear waste tanks in order to resolve safety issues, and meet the needs of other TWRS Programs. Most of these strategies would lead to similar conclusions, albeit with different schedules. The large number of variables and uncertainties associated with a program as complex as TWRS will necessitate revision of the selected strategy as more knowledge is gained. Such is the case with the strategy selected for the DOE 93-5 Implementation Plan.

The 93-5 Implementation Plan strategy involves 3 parallel efforts: (1) a near-term (6 to 8 months); (2) long-term (3 year); and (3) establishing TWRS Program priorities. Figure 3 shows the elements of the 3 parallel efforts.

The near-term effort involves establishing a FY 1994 priority listing of tanks to be core sampled. This priority list is attached at Appendix C (Tank Farm Sampling Schedule). This schedule includes those tanks which will be auger and core sampled. Using the Environmental Protection Agency's DQO process, the Characterization Program is assisting the other TWRS Program elements in identifying critical data requirements including the suite of analyses required, precision, accuracy, detection levels of interest, the acceptable risk, etc. which will be required for each program to make decisions. The near-term effort is focused primarily on (1) resolving safety issues in compliance with the DNFSB's Recommendation 93-5; and (2) screening tanks to validate earlier decisions to put tanks on the Watch List. Based on the results of the screening analyses, further analyses will be conducted on each tank sampled to assess whether the tanks are "safe," "unsafe," or "conditionally safe." Data collected during the near-term effort will form a database which will be used as an input to the DQO during the long-term effort. Figure 4 shows the decision logic for the near-term effort. Two or more core samples will be taken from each tank. The number of cores to be taken will be based on the number of risers which are available and readily accessible. The reason for this approach is that, in the near-term, more samples cannot be taken than there are risers from which to take them; and the installation of additional risers or other alternative sampling techniques will not be available in the near-term. The data from the analyses of cores from each tank will be compared to the DQO to see if the DQO was met, or whether more data will be required to achieve the stated DQO. If additional samples are required to meet the DQO, further sampling of the tanks sampled during this period will be deferred until alternatives become available to allow additional sampling during the long-term effort. In addition, as more information is made available through improved historical data analyses, improved databases and modeling, etc. reassessment of the near-term DQOs will be needed.

The long-term effort involves using additional information as it becomes available to update the DQOs and the Tank Characterization Reports. The DQO process is being used to identify data requirements of each TWRS Program during this effort. Extensive historical data analyses of the tank farms will be performed during the near-term effort. The historical

Figure 3. Three Parallel Paths to Establish a Technical Basis.



data includes process data, transfer records, and previous characterization data. The historical analysis will be used in part to segregate tanks into groups based on chemical and physical similarities. The strategy will be to sample a few tanks within a group. The optimum number of cores needed to describe the vertical and horizontal homogenity will be determined using standard statistical models (e.g., the existing tank 241-B-110 statistical model database and Heasler [1993]) and the most appropriate database developed during the near-term effort. The database selected to predict the number of samples from a specific group of tanks will match the group of tanks to be sampled. The data from the first few tanks sampled within a group will be compared to the DQO. Additional samples will be collected if necessary to meet the DQO. When the DQO has been met, the next tank within this group will then be sampled. The data from the analyses from this tank will be compared statistically to the data from previous tanks to validate the grouping. In addition, the data will be evaluated against the DQO and a determination will be made as to whether additional samples are needed. When the data indicates that the tank matches the grouping and meets the DQO, the next tank in the series will be sampled for the optimal number of samples and the previous steps will be repeated. The iterative process of sampling or resampling a tank, evaluating the aggregate data, comparing results to the DQO, and collecting more samples and data will be repeated until the DQO has been met. The goal is to collect the optimum number of samples to meet the DQO and characterize the tanks to resolve safety issues.

The third parallel effort is to establish TWRS Program priorities. Figure 3 depicts this effort. Sampling priorities have been established by Gasper (1993). But as the methodology for estimating the number of cores to take is improved, and the definition of bounding tanks becomes clearer, the priority listing will be revised. The revised priority list will be available in July 1994. The revised priority list will establish the sampling schedule for all types of samples, and will be input to the continuing and iterative DQO processes for each of the TWRS Programs.

PHASING OF SAMPLING

In evaluating the data requirements of the various TWRS programs, as part of the systems engineering efforts, different TWRS program elements require data at different times. This allows the Characterization Program to focus on certain near-term issues and to defer other issues to more opportune times for sampling and analysis. Data gathering needed to support safety issue resolution is being accelerated (see Section 3.2). The pretreatment program is now likely to be based on a small set of alternative treatments. The data needed to design these pretreatment flow sheets can focus on the average composition of a narrow number of analytes. The near-term issues requiring data now should be bounding conditions for interfering substances in the waste prior to retrieval. All other pretreatment data requirements can wait until the material from several SSTs has been retrieved and blended. Sampling can occur during the transfer steps, which is less complicated than coring.

For waste compatibility/operations, the characterization issues reduce to whether the material in the retrieved tank will be compatible with whatever material is currently in the receiving tank. A procedures document has been used to ensure that only certain contents are mixed. A DQO is being generated for the existing compatibility safety criteria.

For retrieval, based on sluicing methodology, the physical parameter information required for retrieval-system design is quite limited. In most cases, one assumes the worst case scenario and over-designs the retrieval equipment.

This acknowledgement that there is a phasing of when data are required so individual TWRS program managers can make informed decisions in their respective areas leads to the following four phases:

- **Phase I**--Define Present Conditions
- **Phase II**--Assure Interim Safe Storage
- **Phase III**--Characterize Disposal Feed
- **Phase IV**--Final Waste Form Qualification.

Phase I focuses on resolving tank safety issues and performing tank screening on all the tanks. Any data (e.g., bounding tank data) required for retrieval and pretreatment design will also be obtained during this phase.

In Phase II, samples are obtained during transfer from the SST to the receiving DSTs or from well mixed interim storage DSTs. These samples are easily obtained and a small number of samples are representative of the overall material. Thus, Phase II is the optimal time for performing any extensive characterization required to support pretreatment and ultimate disposal.

In Phase III, samples support data requirements for ensuring contents for feed into disposal operations. Samples are obtained during transfers into the feed tanks and while material is in the feed tank.

In Phase IV, the final product will be characterized to establish that the final disposal forms meet regulatory requirements. Sampling here is done in transfer lines to the final disposal waste form (e.g., HLW glass canisters).

This sequencing of sampling to respond to clearly established data needs ensures that only the that data needed for the issues of immediate concern are addressed. Postponing sampling events to later points when the data are needed and where there is an easier and more representative opportunity for sampling is very cost-effective.

DQO PROCESS

The DQO process was developed by the U.S. Environmental Protection Agency as the framework for developing the necessary justifications and to focus the characterization activity prior to sampling. Although this process is being led by the Characterization Program, each individual TWRS program element manager requesting a sampling and analysis event is responsible for the DQO effort. The TWRS program element managers must justify the sampling and analysis event. The Characterization Program is there to ensure that a thoughtful and thorough process is conducted, by providing trained facilitators, and later via guidance letters or documents and facilitators. The Characterization Program also ensures that the right players in the planning process are involved so all key issues are raised and addressed. Washington State representatives will be invited to participate in the DQO process.

The DQO process helps the TWRS program element managers to define precisely the question(s) they must answer. If the question is not precisely formulated, then the data required to answer the question is not focused. Data collection that is not focused results in collecting the wrong data, too little data, or too much data.

An important element in the DQO process is to establish the risk or the uncertainty that the data users are willing to accept in making a wrong decision. If the willingness in making a wrong decision is large, then the need for precise data decreases directly. This balancing of risk/uncertainty takes place after the questions and answers are precisely stated so that there is no confusion as to what data are needed and how the data are to be used.

The TWRS Characterization Program strategy is based on use of the DQO process to develop and define the Characterization Program's analytical needs. These detailed analytical requirements include the following.

- The number and type of samples per unit time and per time period
- The suite of analytes for field samples
- The types of sample matrices
- Analytical performance objectives (e.g., detection limit, accuracy, and precision).

The DQO process is an iterative process. That is, samples are collected and analyzed and then the data are evaluated to determine whether the DQO has been met. The DQO is met if the questions asked by the program elements have been answered. The questions include such factors as sample recovery, accuracy, and precision variability among core samples. In the event the question requires additional data, more samples will be collected and the DQO will be revisited.

TANK GROUPING

As discussed previously, tank grouping may represent an opportunity to simplify tank sampling. However, the primary emphasis will be to collect the optimum number of samples needed to resolve safety issues in accordance with the DQO. The knowledge base for establishing what tanks are important to sample next and how extensively that tank should be sampled is influenced by the extensive historical knowledge that exists. The number of chemical and physical possibilities represent an important opportunity to group like tanks together and possibly reduce the number of individual sampling events required to characterize the waste tanks, particularly with respect to disposal operations. Efforts are underway to use this historical data to group similar tanks based on chemical and physical factors.

Based on this grouping effort, the expectation is that if there are a reasonable number of similar tanks, then significant sampling economies can result. If a few tanks within a group are characterized extensively, the remaining tanks within a group may be characterized using fewer samples as long as the results of these samples confirm the grouping from the historical data and meet the DQO.

SAMPLING PRIORITIZATION

Initially, the FY 1994 prioritization is based on input from the Waste Tank Safety Program (Gasper 1993), in which all tank safety concerns were evaluated and prioritized. The initial sampling schedule follows the Gasper priorities that were adjusted to reflect the difficulties inherent in gaining access to the flammable gas Watch List tanks. Top priority flammable gas generating tanks must undergo head space sampling and monitoring prior to the start of core sampling necessitating the placement of these tanks later in the schedule than their priority would warrant. To ensure the optimal use of field sampling teams, while the core sampling truck is being repositioned, grab samples for operations and auger samples from shallow tanks that required data were interspersed in the prioritized sampling list. As experience is gained in sampling and a better appreciation of the time required to move coring equipment from tank farm to tank farm, the current prioritization list may be modified to incorporate sampling in a different order based on tank location, only if this does not seriously impair the timelines to address important safety concerns. As the longest step in the field is cleaning and releasing the sample truck from one farm to go to the next farm, substantial time savings overall may result by finishing one farm before moving to the next one. A new sampling priority listing based on the foregoing will be available in February, 1994.

COMMITMENT 1.16: Complete Historical Tank Layering Models. This will develop sedimentation and tank layering models using detailed waste transaction analysis. The layering models will estimate the number of layers, volume of each layer, and the waste type of each layer for each tank.

Deliverable: Document.

Due Date: September 1994

COMMITMENT 1.17: Complete historical tank content estimate reports for the northeast and southwest quadrants of tanks (covers 83% of the single-shell watch list tanks). These content estimates will be based on quantitative transactions analysis, layering models, nominal waste type compositions, and historical sample data.

Deliverable: Documents for each quadrant.

Due Date: June 1994

COMMITMENT 1.18: Complete historical tank content estimate reports for remaining two quadrants of tanks (northwest and southeast).

Deliverable: Documents for each quadrant.

Due Date: March 1995

COMMITMENT 1.19: Develop statistical tools necessary to support decisions relative to the amount of samples needed. This activity will start with the model developed for tank 241-B-110. It will provide needed supplementary information to update the DQOs performed in FY 1994, to better focus on how many samples are required for a specific issue. A key aspect will be to analyze the variability based on expected "laydown" (e.g., was the tank sluiced, and are the layers expected to be fairly uniform). This tool will help answer whether additional samples beyond this are needed.

Deliverable: Letter documenting tool developed.

Due Date: December 1994

COMMITMENT 1.20: TWRS Risk Acceptance Criteria.

This will provide an analysis of variables that must be considered and how they affect the outcome of decisions (e.g., does it affect risk of employee exposure or is it a cost/schedule issue, and how sensitive is the resultant decision to the data). DOE will determine its level of acceptable risk within two months of acceptance of the WHC generated document.

Deliverable: Document.

Due Date: August 1994

COMMITMENT 1.21: Complete DQOs for all TWRS program elements that may need data. Ten DQOs are scheduled to be completed in FY 1994, which encompass all the major customers of the Characterization Program. In addition, three of the less defined areas (e.g., pretreatment) will have developed working drafts. Others will be completed, published documents.

Deliverable:

1.	Ferrocyanide Safety Issue DQO Report	December 15, 1993
2.	C-103 Vapor DQO Draft Report	January 31, 1994
3.	C-103 Dip Sample DQO Final Report	December 16, 1994
4.	C-106 High Heat DQO Report	December 20, 1994
5.	Organic Safety Issue DQO Report	January 31, 1994
6.	Safety Screening Module DQO Report	January 31, 1994
7.	Waste Compatibility DQO Report	February 28, 1994
8.	In-tank Generic Vapor DQO Final Draft Report	March 3, 1994
9.	Vapor Rotary Core DQO Final Draft Report	January 20, 1994
10.	Hydrogen Generating DQO Final Draft Report	April 29, 1994
11.	Pretreatment DQO Draft Report	August 22, 1994
12.	HLW Immobilization DQO Draft Report	September 6, 1994
13.	LLW Immobilization DQO Draft Report	September 21, 1994

COMMITMENT 1.22: Update field schedule for FY 1994 to incorporate new technical approach to maximize sampling.

Deliverable: Re-issue signed field schedule.

Due Date: February 1994

COMMITMENT 1.23: Identify "Bounding Tanks" for disposal. This will also include defining limiting tank contents criteria for each area of interest.

Deliverable: Document.

Due Date: November 1994

3.2 TASK 2: ACCELERATE SAFETY RELATED CHARACTERIZATION

PURPOSE

Substantially improve time to obtain safety related characterization data.

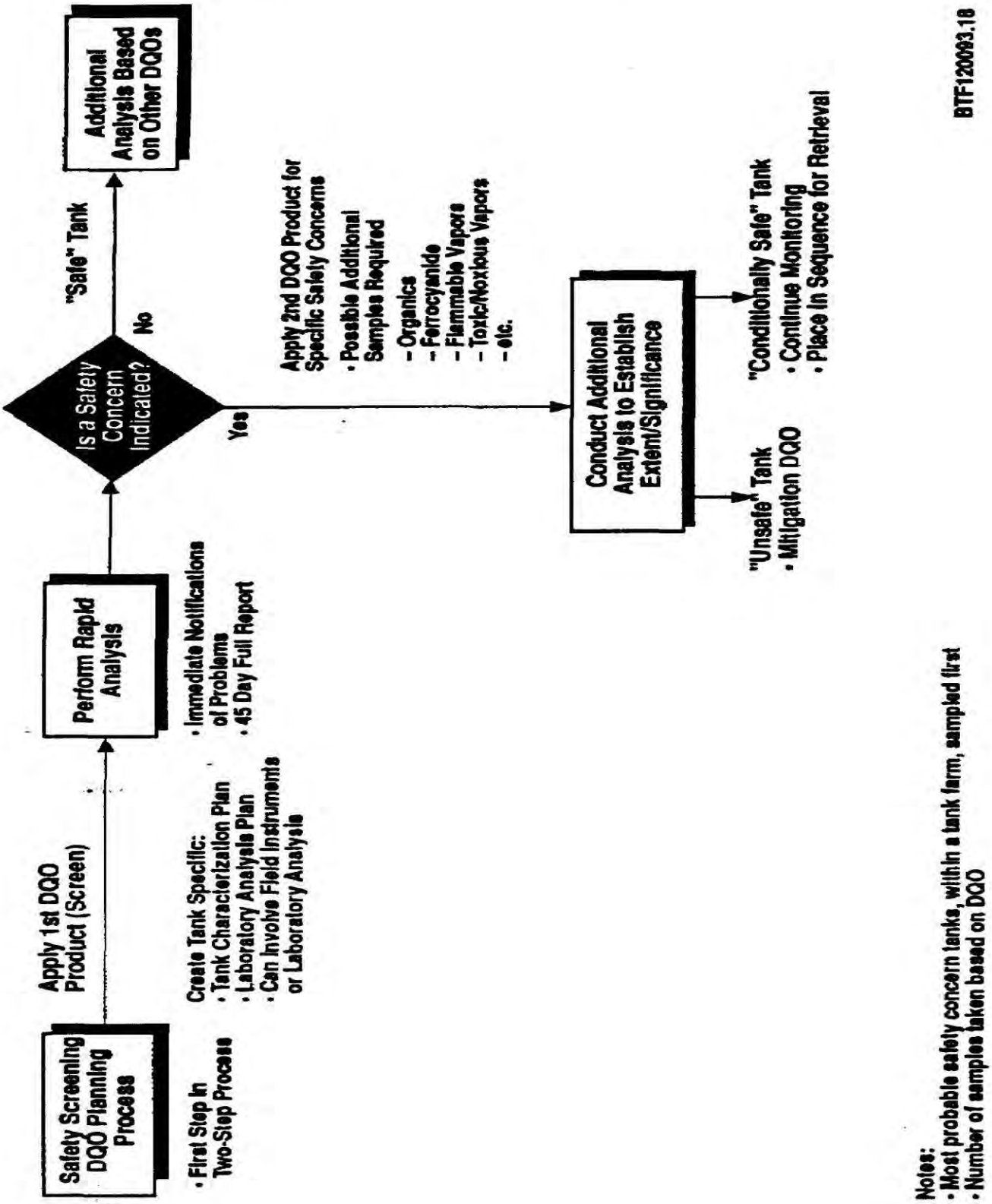
DISCUSSION

There are two major data requirements in the near-term. The first involves confirming which tanks are safe, conditionally safe, and unsafe. Establishing which tanks fall into which group is based on the criteria established in the August 25, 1993 policy statement sent to the DNFSB entitled "Strategy for Safety Issue Resolution." The Watch List tanks have been placed into six groupings. These are (1) high heat; (2) ferrocyanide; (3) organic; (4) tank vapor; (5) flammable gases; and (6) criticality. Efforts are underway with the Tank Safety Program staff to develop specific DQOs to resolve the specific safety issues.

The second major safety data requirement is to screen all the non-watch list tanks to establish which, if any, should be added to, or deleted from the Watch List. Figure 4 shows the logic flow for addressing safety concerns, from a characterization perspective. This screening effort will consist of combining historical process knowledge and limited sampling and analysis. The intent is to confirm that no potential, significant safety issue has been overlooked on any tank. To date, the following parameters have been identified for screening the tanks for safety concerns. They are:

- Moisture
- Energetics
- Total organic carbon
- Heat generation
- Fissile material (total alpha)
- Separable organic phases.

Figure 4. Logic Flow Addressing Safety Concerns.



Of the 177 waste tanks, only 128 tanks (approximate) will have to be core sampled. The reduction in the number of tanks to be sampled is due to tanks which have already been sampled since 1989, tanks which are essentially empty, and tanks which contain only liquid. This reduced number of tanks requiring core sampling will contribute to completion of tank characterization within the timeframe specified in 93-5.

The technical basis for selecting these screening parameters is still under development. A DQO is being prepared and issued addressing tank screening.

The number of samples taken from each tank to establish whether there is or is not a likely safety concern will be defined when the tank sampling and analysis design is finalized for that sampling and analysis event (i.e., DQO). Whether all these parameters or a subset of these parameters will be sampled will be determined by the need for confirmatory data. Factors to consider will be the certainty in the historical information on the tank contents, prior sampling results, information on tanks having similar contents, and available physical measurements.

The Safety Program is furthest along in establishing its technical bases for characterization. The emphasis in the near-term will be on sampling and analysis to support safety issues. However, in between safety sampling events, there will be opportunities to optimize characterization staff productivity. Where there are tanks that can be grab sampled or very shallow tanks that can be angered and where there is a clear need for data, these tank sampling and analysis events will be fit in. See Appendix C for more detail.

COMMITMENT 2.1: Complete DQOs for all six safety issues. Each DQO will be completed in time to support the necessary sampling and analysis scheduled (see Appendix C).

Deliverable: 6 documents.

Due Date: April 1994

COMMITMENT 2.2: Complete the safety screening DQO. This DQO documents what analysis needs to be performed to screen tanks to increase assurance that no safety issue tank has been missed.

Deliverable: Document.

Due Date: January 1994

COMMITMENT 2.3: Complete sampling of all Watch List tanks per the DQOs established in commitments 2.1 and 2.2.

Deliverable: Letter documenting sampling.

Due Date: October 1995

3.3 TASK 3: IMPROVE THE QUALITY AND QUANTITY OF SAMPLING

PURPOSE:

Substantially improve timeliness and completeness of sampling waste tank material.

DISCUSSION

Acceleration of sampling will be achieved by acquiring more sampling equipment; training more crews; cross-training crews to work on push-mode or rotary-mode sampling trucks, auger sampling, grab sampling and vapor sampling; working multiple shifts instead of one; phasing sampling to meet programmatic needs; using bounding tanks so that decisions are based on worst-case assumptions; and conducting sampling activities by tank farm to minimize down-time between sampling events.

The highest near-term needs for the characterization sampling effort are to (1) support the resolution of the tank safety issues including collecting data to close safety issues and to screen tanks to assure all issues are identified; and (2) perform sampling to support routine operations. In conjunction with this effort, other TWRS program element needs will be met if they are defined and needed to support near-term work.

The following sampling uncertainties exist:

- Types of samples needed
- Number of samples per tank
- Appropriate time for sample collection
- Availability of necessary equipment and trained operations crews
- Adequate equipment performance
- Ability to streamline the process for obtaining tank access.

The DQO process is being used to determine (1) the types of samples needed (e.g., core, auger, grab); (2) the number of samples needed per tank; and (3) the appropriate time for sample collection. Until the DQOs have been completed, at least two full-depth sample will be collected from tanks that contain waste. Section 3.1.3 provides further discussion on the

sampling strategy. A planning basis has been assumed for core sampling to ensure adequate sampling capacity is available. The anticipated core sampling rate can be derived by assuming that, allowing for down time, a core truck can take one core per shift per month. Beginning in March 1994, the push-mode trucks will be operated by 1 crew on a day shift, with a third crew dedicated to vapor, auger, and grab sampling. By June 1, 1994, additional crews will be trained to operate both trucks at two shifts per day, 5 days per week. WHC is now developing preliminary plans to provide additional sampling and support personnel to operate under 3 and 4 shift operations, if such a schedule is required to meet the DNFSB's schedule in 93-5. Provisions will be made to train crews during off shifts, to double or triple the number of trainers, and to work with the craft unions to develop expedited procedures to obtain new personnel to support the sampling effort. The plan to acquire and train third and fourth shift operations sampling and support personnel will be completed by April 1994. Under the assumption of round the clock operation, each truck can produce a maximum of 48 cores per year. Allowing for start-up difficulties and staffing ramp-up, and a total of 4 sampling trucks it is estimated that the maximum TWRS core sampling capacity is as presented in Table 2. Auger and grab samples will augment this total. The basis for the sample capacity numbers in Table 2 can be found in Appendix D.

Table 2. TWRS Core Sampling Capacity.

Sampling	FY 1994	FY 1995	FY 1996
Core sampling capacity (cores)	24	192	192

Sampling all Watch List tanks may not be completed in two years since the sampling strategy selected is based on a farm-by-farm approach. However, farms will be selected which present the best opportunity to sample the most safety tanks. The farm by farm strategy has been selected because it represents the best chance to sample all of the tanks within 3 years, and may only delay sampling of the Watch List tanks a few months beyond the 2 year schedule in 93-5. Core sampling (and other sampling as required by the DQOs) will be performed to support resolution of safety issues and to screen all tanks. All tanks will be sampled in accordance with the DQO developed for each tank or tank group. Tanks with 10 inches or less of waste will be auger sampled to complete the sampling of all tanks within the three year period.

Core sampling can be implemented only through risers. A study of alternatives will be accomplished by August 1994, in anticipation of a DQO product or earlier sampling results that indicate that a requirement exists for additional samples not achievable through existing risers. One alternative is adding additional access points in a tank. Other alternatives involve advanced sampling techniques/designs.

The integrated field sampling schedule in Appendix C details the sampling activities (including cores, vapor, liquid grab samples, and augers) and sampling equipment needs for

FY 1994. The schedule was prepared prior to TWRS decisions on safety screening, and farm by farm sampling. The schedule will be revised by February 1994 to reflect these changes. Schedules of integrated sampling for FY 1995 to FY 1996 will be issued by June 30, 1994 (see Section 3.1 for details).

ADEQUATE SAMPLING EQUIPMENT AND STAFF

A new certification and training program for characterization operators was developed in late 1992. This program was developed using job task analysis and a structured process similar to those used in upgrading nuclear industry training programs. The upgraded package for characterization operators requires 18 weeks of classroom training, reviewing practical facts, and examination. This training program is designed to cross-train sampling crews in every sampling procedure needed to support the TWRS program. Each sampling crew shall be trained in sampling procedures to support rotary-mode, push-mode, auger, grab and vapor sampling. This will permit maximum use of sampling crews in that when crew members are unavailable there will be a pool of cross-trained personnel who can step in to fill the vacancy. In addition, when sampling equipment fails, or there is loss time when equipment is being moved, etc., sampling personnel can be used to collect other types of samples required to support the TWRS program. In addition, at least one additional sampling crew will be trained to serve as a backup pool when personnel from regular crews are not available. Initially enough sampling crews will be trained to staff the push-mode sampling system and the new rotary-mode system which will be operational in February, 1994 operating on 1 shift per day for the push-mode truck and the rotary-mode truck and a 3rd crew for vapor/rotary/grab sampling. Two more crews will be added June 1994, allowing 2 shift/day operations of the two trucks. WHC senior management is committed to ensuring that there are adequate personnel available for sampling and supporting specialties. Figures 5-7 present the near-term schedule and projected capacity per year per type of truck. The operators will complete this training before resuming core sampling. Sampling crews will be dedicated to the TWRS Characterization Program. Additional crews for the support of Tank Farm Operations (e.g., installation of thermocouple trees) will be provided so that no conflicts arise in the support of other TWRS programs.

Training for the person in charge of each crew was developed using a similar process. The training lasts approximately 24 weeks and includes fundamentals, tank farm systems, administrative requirements, practical factors, good sampling practices, laboratory interfaces, and examinations. Currently, five people are in training, four people have passed the course, and seven people are planned to start the next session.

In addition to obtaining and training crews, Waste Tank Operations has completed a Plant Implementation Team Performance upgrade approach, as outlined in Figure 8, to improve field work packages.

Figure 5. Staffing/Training/Sampling Plan.

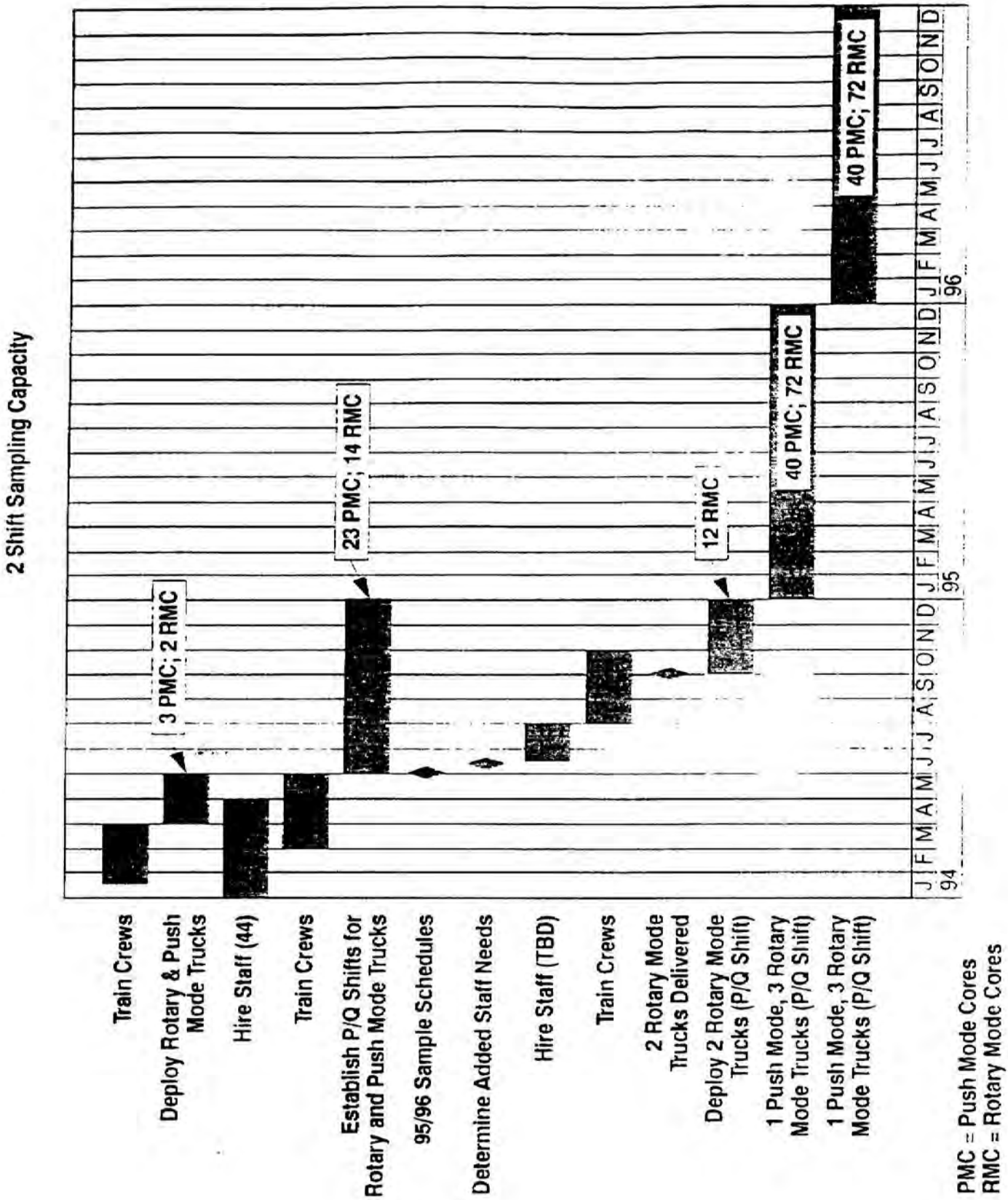


Figure 6. Rotary-Mode Sampling.

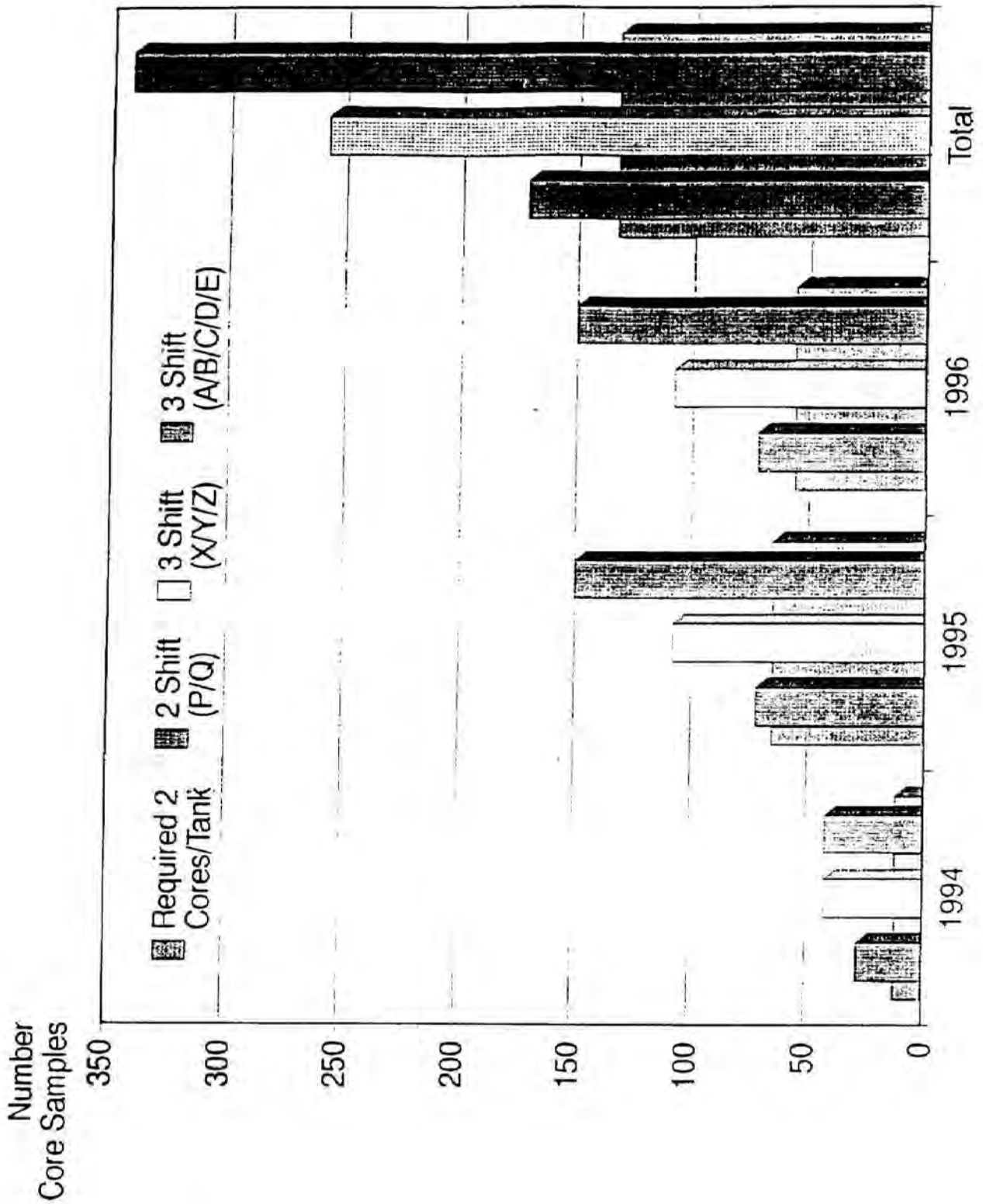


Figure 7. Push-Mode Sampling.

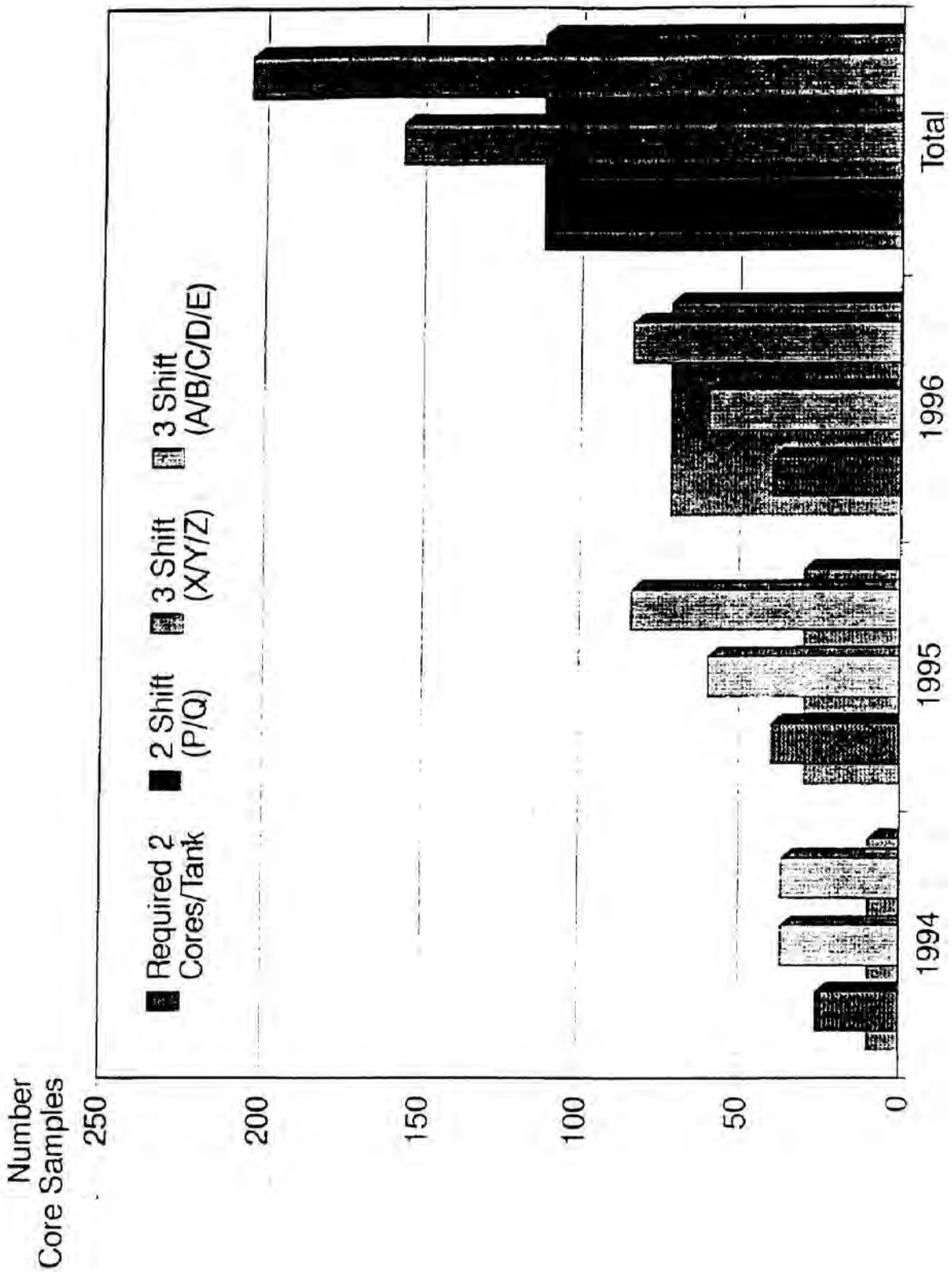
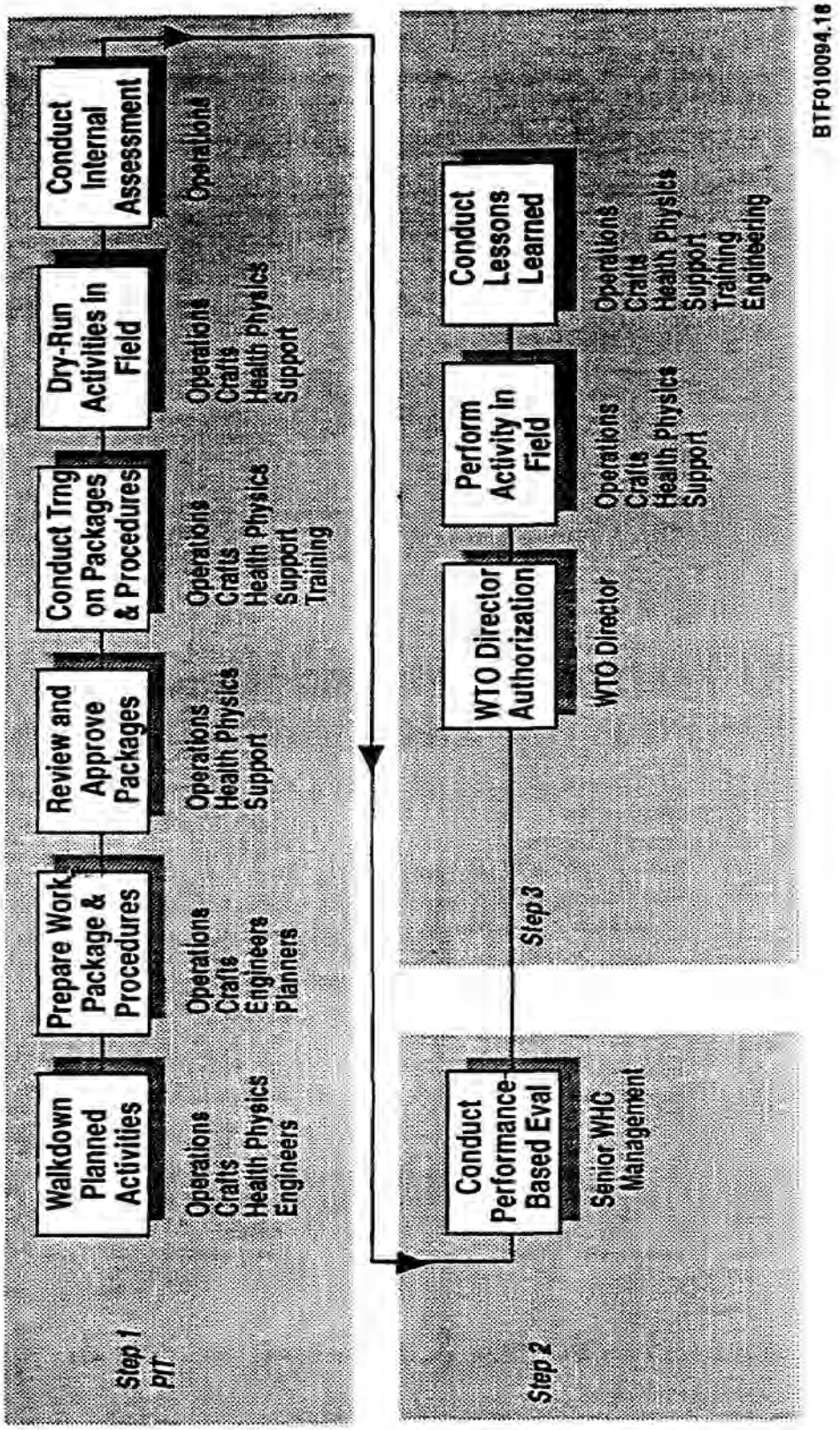


Figure 8. Plant Implementation Team (PIT) Performance Upgrade Approach.



MEETING FLAMMABLE GAS AND VAPOR SAMPLING REQUIREMENTS

Up-to-date information on tank dome space vapors will be required prior to in-tank sampling to check for flammability for all rotary core sampling. Flammable gas meters will be used to show the atmosphere in flammable gas tanks is safe prior to in-tank activities. In addition, vapor samples will be taken before core sampling to ensure that the requirements of the *Clean Air Act* permit are not exceeded during rotary core sampling. For flammable gas Unreviewed Safety Question (USQ) tanks, continuous head space gas monitoring for some period of time is required to determine if a flammability problem exists. Gas monitors will be installed for all Watch List flammable gas tanks by April 1995. As the program develops further, this date will be reassessed to determine whether installation of these monitors at this date will in any way jeopardize completion of Watch List tank characterization within the 2-year period recommended by the DNFSB. In addition, some monitoring equipment will be mounted on a portable skid, which can be moved to different tanks. The time-frame needed for continuous data to support a sampling authorization request will be determined by the requirements of the safety analyses. In addition to this monitoring, the flammable gas tanks will be continuously gas monitored while being core sampled.

Signature type (top side) vapor sample screening for industrial hygiene concerns will be conducted on 39 tanks in FY 1994. These tanks include those associated with ferrocyanide, organics, and those with a history of vapor exposure. Should the screening demonstrate no industrial hygiene safety issues, the tanks will be added to the field sampling schedule for in-tank vapor sampling as a low priority or deleted completely (depending on top side data). Otherwise, in-tank vapor sampling will be added to the field schedule as a priority.

ISSUES AND CONTINGENCY PLANS

Adequate sampling capacity is necessary to achieve the aggressive sampling schedule slated for the next three years. Several issues have the potential for impeding this sampling schedule. They are:

- Push-mode inadequate sample recovery
- Timely deployment of the first rotary-mode sampling truck
- Timely deployment of the second and third rotary-mode trucks
- Hiring, training and qualification of staff
- Transfer of tank access authorization from DOE-HQ to WHC (covered in Section 3.4).
- Unsuitable physical properties data from existing sampling systems.

The status of these issues are addressed below. Contingency plans are also provided for those issues posing on-going threats to the sampling schedule.

PUSH-MODE SAMPLE RECOVERY

The push-mode core sampling system was placed in a stand-down earlier this year as a result of an inadequate sample recovery. Subsequently, engineering studies and the use of an outside panel of drilling, sampling, and characterization experts was assembled to bring industry expertise to the program. To date significant gains in sample recovery have not been achieved, and the selection of an appropriate hydrostatic fluid remains an issue. The push-mode core sampling is scheduled to resume in March 1994 provided the DOE "hold" on the systems use is removed. If poor push-mode recovery should still exist, the Characterization Program will pursue other options. One option is to modify of the push-mode truck safety assessment. If this occurs, tanks which are covered by the current safety assessment will be sampled in lieu of the selected push-mode tanks, and extra sampling shifts will be added to compensate for the lost capability. In addition, WHC has begun to modify the current push-mode safety assessment as a contingency, and will complete the assessment by March 1994. Sampling procedures are also being reviewed with outside drilling experts, as well as contractor staff, to determine whether operational procedures can be modified to improve sampling recovery. This review will be completed by June 1994. If these fail, preliminary indications are that it would be faster to build a new rotary sampling truck than to modify the push-mode truck, due to the fixed contamination on the truck and the age of the equipment. If this becomes necessary all efforts to accelerate acquisitions of a new system will be made.

TIMELY DEPLOYMENT OF FIRST ROTARY-MODE SAMPLING TRUCK

The first rotary-mode core sampling truck is scheduled to be deployed after completion of the operational testing program (January 3, 1994) and the readiness review (March 31, 1994). The primary uncontrollable factor that may impact the schedule is the weather. This can hinder completion of the Operational Testing Program. This activity is being aggressively addressed. However, acceleration potential is limited if staff training on the system has not been completed. Should delays occur, field sampling schedules will be adjusted, additional crews trained, and extra shifts will be added to use all open dates to compensate for the delay.

TIMELY COMPLETION OF SECOND AND THIRD ROTARY MODE SAMPLING TRUCKS

Two additional rotary-mode core sampling systems are scheduled to be deployed by the end of FY 1994. An area in the 337 High-Bay Building has been identified for assembly, and the first truck has been delivered there. Work began to prepare the truck for the new components in December 1993. WHC management is committed to increasing fiscal and personnel resources to meet the stated deliverable as necessary should complications arise in the delivery and assembly of components.

HIRING, TRAINING, AND QUALIFICATION OF STAFF

Current staffing levels support one push-mode crew with one rotary-mode crew in training. TWRS Operations has committed to provide the identified dedicated crews and required support on a priority basis. WHC is prepared to obtain trained resources through subcontracts, or other means, to meet the deliverable. The near-term schedule is shown in Figure 5.

TECHNOLOGY DEVELOPMENT

Current sampling and analytical procedures are not suitable for obtaining some physical property data (e.g., moisture). Therefore, in situ techniques using the cone penetrometer deployment system will be evaluated to improve the reliability of this data. Various moisture monitoring sensors will be evaluated as part of this program.

Direct drill bit temperature monitoring could eliminate the need for forced nitrogen cooling of the "rotary" system and may enhance the sample recovery of the "push" system by removing the safety restriction that prevents the drill bit/drill string from rotating during sampling. A commitment to deploy a field useable prototype that incorporates a bottom of tank sensor in addition to direct temperature monitoring is provided.

SAMPLING SUMMARY

Sampling capacity can be increased over the next 3 years by (1) resolving sample recovery issues and resuming push-mode sampling; (2) implementing rotary-mode core sampling; (3) providing two additional rotary-mode sampling systems; (4) ensuring adequate staff online; (5) streamlining tank access; and (6) providing augers and other equipment for alternate sampling techniques. These actions will increase capacity and provide added capability of other sampling methods and tools.

Responsibility: The Characterization Program Manager.

COMMITMENT 3.1: Initiate construction of second and third rotary-mode core sampling trucks.

Deliverable: Commit funds and identify contractor.

Due Date: November 1993 (met)

COMMITMENT 3.2: Review characterization field procedures using DOE Conduct of Operations and Institute of Nuclear Power Operations good practices and revise as necessary.

Deliverable: Letter report documenting review.

Due Date: January 1994

COMMITMENT 3.3: Complete qualification of first push-mode crew.

Deliverable: Letter documenting numbers of staff and date qualified.

Due Date: February 1994

COMMITMENT 3.4: Re-deploy push-mode core sampling.

Deliverable: A letter will be transmitted to the Characterization Program acknowledging the deployment-ready status of the push-mode core sampling system.

Due Date: March 1994

COMMITMENT 3.5: Complete training and qualification requirements for sampling cognizant engineers.

Deliverable: Letter documenting that cognizant engineers are available for sampling activities.

Due Date: February 1994

COMMITMENT 3.6: Restore rotary-mode sampling capability at the Hanford Site.

The rotary-mode hard salt cake sampler and all required support equipment will be approved and released for characterization sampling operations.

Deliverable: Transmittal of a letter documenting the completion of all actions necessary to implement the safe core sampling of the hard salt cake wastes.

Due Date: March 1994

COMMITMENT 3.7: Complete qualification of first rotary-mode crews and vapor/grab/auger sampling crew.

Deliverable: Letter documenting number of staff and date qualified.

Due Date: March 1994

COMMITMENT 3.9: Develop detailed plans for acquiring and training additional crews for sampling trucks.

Deliverable: Letter report.

Due Date: April 1994

Commitment 3.10: Complete qualification of two additional crews (one each for push and rotary trucks)

Deliverable: Letter documenting number of staff and date qualified.

Due Date: June 1994

COMMITMENT 3.11: Additional rotary-mode core sampling systems.

Fabricate and/or procure new core sampling trucks and support equipment as indicated by Characterization Program needs. Current planning entails developing one complete system, and procuring one additional base drill rig. A design specification document and drawings, based on the design of the rotary-mode core sampling system, will be prepared. Documentation to initiate fabrication of equipment will be issued. Equipment for the rotary-mode core sampling system includes a core sampling truck, nitrogen purge gas trailer, generator, support trailer, cask truck, and other ancillary equipment.

Deliverable: Transmittal of a letter documenting the completion of new rotary-mode core sampling system equipment.

Due Date: September 1994

COMMITMENT 3.12: Hire, train, and qualify four additional rotary-mode crews.

Deliverable: Letter documenting number of staff and date qualified.

Due Date: October 1994

COMMITMENT 3.13: Deploy prototype cone penetrometer.

Technology development activities are being pursued which may result in the ability to provide some requested data outside of laboratory analysis. A cone penetrometer and a foil activation technique are being developed. The cone penetrometer is a deployment tool for commercially available sensors. A foil activation process is being tested to assess moisture and transuranic (TRU). Inaccuracies in the moisture measurements from core samples are incurred due to the use of a nitrogen gas flow in the rotary-mode core sampling system, which cause the drying of sample material (as it is contained in the sample) as well as potential drying of samples in hot cells. The present method provides conservative values (e.g., potentially lower moisture than in tank), and may result in unnecessary safety restrictions.

Deliverable: Letter documenting the deployment-ready status of the prototype core penetration.

Due Date: May 1995

COMMITMENT 3.14: Installation of Flammable Gas Monitors.

Deliverable: Continuous gas monitors will be installed for all Watch List flammable gas tanks.

Due Date: April 1995

COMMITMENT 3.15: Engineering Evaluation of alternatives for In Situ Moisture monitoring. This document will evaluate all alternatives reviewed or in development to date, including the Tank Instrument Advisory Panel input on the alternatives.

Deliverable: Document.

Due Date: June 1994

COMMITMENT 3.16: Direct Drill Bit Temperature Monitoring. This will complete field deployment and testing of a direct drill bit temperature monitoring device. Sandia National Laboratories Albuquerque Office has completed the preliminary design and is developing a full size prototype for field deployment.

Deliverable: Field deployment of devise.

Due Date: January 1995

COMMITMENT 3.17: Review procedures with outside drilling experts, as well as contractor staff to identify changes that may increase core sample recovery in the Push-mode.

Deliverable: Revised procedures.

Due Date: June 1994

COMMITMENT 3.18: Develop means for measuring complete sample recovery. Complete engineering study of alternatives, select method and complete design/fabrication/ testing of technique.

Deliverable: Completed design and testing.

Due Date: January 1995

COMMITMENT 3.19: Complete engineering evaluation of installing new risers in SSTs. complete Engineering evaluation of alternatives for installing new risers in two locations in a SST. The first location is approximately one foot from the inner wall. The second location will be in the central area of the tank. The study will evaluate integrating need of other program elements (Tank upgrades and tank retrieval, for example) in determining optimum size of risers. The study will evaluate all styles of SSTs.

Deliverable: Document.

Due Date: August 1994

3.4 TASK 4: STREAMLINE TANK ACCESS

PURPOSE

Improve access to tanks with USQs.

DISCUSSION

To access USQ tanks for sampling activities, an adequate safety and environmental basis must be developed. Presently, these documents must be reviewed and approved. This process for tank access will be streamlined and shortened without compromising the necessary rigor. An Interim Safety Basis (ISB) document has been developed and approved to better define the safety envelope for most tank farm activities a revised Safety Basis has been developed based on on-going and comprehensive safety and hazard analysis. The ISB consolidates existing hazard analyses, including work that was done since 1991 on Watch List tanks. The ISB also evaluates their adequacy and identifies any further analysis needed. These additional analyses will be completed by July 1994.

The ISB also contains facility descriptions, safety equipment lists, and Interim Operations Safety requirements. The DOE Richland accepted the ISB for use by WHC in November 1993. DOE orders and WHC procedures require that a USQ screen be performed for activities to ensure that they are within the authorization basis. If this screening process determines that the proposed activities are within the authorization basis, no further approval is needed. If these activities fall outside the authorization basis, then additional safety and environmental analysis and DOE authorization is required. Authority had been granted (via approval by DOE-HQ of a justification for continued operation) for the criticality and tank 241-C-103 USQs with respect to sampling. The ferrocyanide USQ is expected to be closed by January 1994, which will substantially reduce access issues for those tanks.

A broad based Environmental Assessment is being prepared to handle those activities anticipated for the SSTs and DSTs over the next several years, including tank sampling. This Environmental Assessment is scheduled to be approved by January 1994. Once the Environmental Assessment is approved, the access authorization time for most activities will be shortened from approximately 10 months to less than 1 month.

RL is in the process of establishing the basis upon which they will request a delegation of authority for approval of safety and environmental documentation needed for TWRS. DOE RL plans to submit a request for delegation of authority to DOE Headquarters in January 1994. This new process will be a tremendous benefit to the Characterization Program because most sampling activities will fall within the safety envelope as defined within the ISB. For these activities, only WHC approvals will be required for tank access.

The integrated schedule status meetings and the monthly reviews will be used to identify potential problem areas so that management can focus their attention on corrective actions.

RESPONSIBILITY: The Waste Tank Safety Program is responsible for developing and submitting the broad-based Environmental Assessment. The RL TWRS Operations Office is responsible for obtaining the delegation of authority.

COMMITMENT 4.1: Issue approved broad-based Environmental Assessment.

Deliverable: Approved (by DOE-HQ) Environmental Assessment.

Due Date: January 1994

COMMITMENT 4.2: DOE-RL to submit a request for delegation of authority to DOE-HQ.

Deliverable: Letter from RL to HQ making the request.

Due Date: January 1994

COMMITMENT 4.3: Obtain delegation of authority for RL to approve safety and environmental documentation for TWRS.

Deliverable: Authorization letter from EM-1, DOE-HQ.

Due Date: April 1994

3.5 TASK 5: IMPROVE THE QUALITY AND QUANTITY OF ANALYSES

This task addresses the planning, performance, and assessment of analytical services to support the TWRS Characterization Program.

PURPOSE

The purpose of this task is to develop and implement the analytical strategies, systems, and controls to ensure that the following Characterization Program objectives are met.

- Analytical data must meet applicable program and regulatory requirements.

- Analytical data must be capable of withstanding critical technical reviews.
- Analytical services must support critical path TWRS schedules.
- The Characterization Program must have access to sufficient analytical capacity to meet actual, and often changing needs.
- Analytical development activities must be intrinsically linked to critical path program schedules.

DISCUSSION

Since the TWRS Program has not yet developed the technical bases upon which sampling and analyses will be conducted, the bases upon which laboratory support is be estimated must be flexible. Initial laboratory capacity estimates are based on the following assumptions:

- The maximum sampling rate is 192 cores per year
- The cores will be analyzed for a reduced set of analyses based on the safety screening module
- The safety screening module, including delivery of the final data package will be completed within 45 days
- Additional laboratory support will be required for vapor samples, auger samples and grab samples
- PNL and WHC laboratories will work multiple shifts as necessary
- Off site laboratories will be used for physical testing and other TWRS program needs
- Off site laboratory capacity will be expanded as much as necessary to meet TWRS needs

By February, 1994, WHC will provide a minimum-maximum strategic assessment using information based on laboratory capacity as determined from Analytical Equivalent Units (AEUs) and capacity modeling using two, three, four, etc. cores per tank to determine the number of laboratories, the number of hot cells, the number of shifts, and a Type A/Type B offsite shipment strategy to meet the scaled minimum-maximum workload. This strategic assessment shall include maximum estimates of other TWRS laboratory support (e.g., vapor, grab and auger sample analyses and other activities related to reporting final data), and other

Hanford Site analytical support. Current schedules for bringing on line offsite facilities, and evaluating transportation options and shipping strategies to obtain further increased capacity shall be completed by February, 1994.

The task of resource planning to satisfy non-safety TWRS analytical needs is more problematic. Analytical needs for other TWRS program elements (e.g., retrieval, pre-treatment) are largely undefined, and subject to considerable change as the program matures. Safety analyses receive first access to available TWRS analytical capacity, therefore the uncertainty in other TWRS analytical needs will not compromise the Safety Program. In addition, the PAS-1 shipping cask being procured can be used to ship disposal program samples to the offsite laboratories for evaluation.

Two techniques are used to assess laboratory capability and capacity; the Analytical Equivalency Unit (AEU), and a laboratory capacity and use analysis technique. The Hanford Site-generated AEU is defined as the analytical work needed to perform a specific suite of analyses on a waste tank core sample. Early use of the AEU technique identified needs for additional hot cells and data management and reporting capacity. However, the AEU analysis does not ensure that adequate capacity will be available for any specific analytical requirement.

To initiate the assessment of capacity for specific analytical requirements, a laboratory capacity and use analysis technique was applied to the preliminary TWRS needs. Some shortfalls in specific areas were projected, and are being addressed. For example, additional equipment for energetics analysis was a limiting factor and additional equipment is being procured to address this shortfall. WHC will continue to assess potential laboratory capacity in this manner, and will expand the capability to meet TWRS programmatic needs.
To provide flexibility in responding to variable analytical needs, and to ensure that the Characterization Program has unrestricted access to adequate analytical capacity, expanding and optimizing the use of available analytical resources will be a continuing priority of the Characterization Program. To date, analytical services for high-level waste samples have been provided exclusively by the Hanford Site's two onsite laboratories with high-level radioactive sample handling capabilities (the 222-S Laboratory at WHC and the 325 Laboratory at PNL). The Characterization Program has accepted responsibility for maintaining in readiness laboratory resources to support their program, regardless of their actual usage. In consideration of the Characterization Program's analytical needs, the present capabilities of candidate high-level laboratory facilities have been evaluated, and operational constraints have been identified. In FY 1993, WHC prepared a study (Bliss 1992) that identified alternate laboratories and recommended a preferred offsite laboratory for TWRS support. Based on start-up requirements, capability, cost projections, and resource availability, the INEL and LANL were identified as preferred alternate sites. Both sites are being actively pursued at this time. WHC has continued to exchange information with both laboratories to define specific facility requirements and availability for

TWRS usage. Both sites are working to resolve issues such as disposal of INEL secondary laboratory mixed waste. Issues which need to be resolved prior to using offsite laboratories include:

Transportation. Functional specifications have been developed for sample shipping containers, and available Type B casks are being identified. Type A containers will be identified for shipping lower activity TWRS samples.

Waste Handling. Receipt and analysis of high-level TWRS samples will result in mixed waste generation, and may require concurrence from the responsible operations office and regulatory authorities.

***National Environmental Policy Act* (NEPA).** Environmental Assessments may be required for transporting and using offsite laboratories. If an Environmental Impact Statement is required, it may not be possible to bring off site labs online in time to support safety screening analyses.

A politically sensitive issue (receiving high-level waste samples outside of the State of Washington) could introduce the possibility that public sentiment could effectively rule out using a given facility. If this is not adequately addressed in existing NEPA documents, additional NEPA documentation addressing this issue may be required.

Successfully resolving these institutional issues is a prerequisite to developing and demonstrating specific capabilities at offsite laboratories. WHC and RL are working with laboratory managers and operations office personnel at the candidate sites to close these issues. Although preparatory work at both INEL and LANL is presently funded, it is the expectation of DOE that both facilities will be able to receive and perform analyses on actual TWRS waste at the start of FY 1995. The focus at LANL will be on analytical process development.

Productivity improvements are also being pursued by the laboratories to enhance quality and capacity. These include improvements in laboratory operations and automated data collection (implementation, evaluation, reporting, and improved usage of analytical resources). See Section 3.6 for details.

A Hanford Site analytical services Quality Assurance Plan is being written to establish a common Quality Assurance/Quality Control basis for both Hanford Site Laboratories and offsite laboratories that provide analytical services to the Hanford Site. The plan will be based on DOE Order 5700.6C, and will be integrated into the TWRS Quality Assurance Project Plan requirements. A draft of this plan will be issued to the Characterization Program Manager in January 1994. It will provide detailed, prescriptive requirements in technical areas. It will also reflect requirements for validation and verification procedures to meet the TWRS DQOs. As an independent assessment, the TWRS program will be

implementing a blind performance sample program which more nearly reflects the nature of the high-level nuclear wastes in the tanks.

RESPONSIBILITY

The Hanford Analytical Services Management organization is responsible for the development and management of analytical resources required with the support of other WHC and DOE programs, i.e., analytical laboratory support.

COMMITMENT 5.1: Install Core Scanning System in Hot Cell.

The hot cell scanner is a WHC project to design and fabricate a multi-axis scanner platform to aid in deployment of various fiber optic excitation and spectroscopic probes (Raman, infrared). The scanner will support hot cell implementation of just-extruded waste tank core samples.

Deliverable: Install core scanning system in hot cell.

Due Date: September 1994

COMMITMENT 5.2: Complete Renovation of the 325 Building A Hot Cell.

Complete cleanout and renovation activities in the A Cell of the 325 Building High Level Radiochemistry Facility. Install hot cell related equipment. Begin installation and room modifications for a shielded inductively coupled plasma (ICP) instrument and glovebox. The setting of the shielded ICP will be completed in FY 1995.

Deliverable: Letter documenting completion of renovation of the A Hot Cell complex to be fully functional for tank waste core characterization work.

Due Date: September 1995

COMMITMENT 5.3: Issue a letter assessing the operability of the new extruder.

Determine the operability of the new sample extruder. Testing will be performed and will include testing in a mock-up facility, bench operations, and hot cell testing.

Deliverable: Letter report.

Due Date: March 1994

COMMITMENT 5.4: Cyanide Speciation - Complete Technology Transfer from PNL.

This activity provides for the development of new analytical methods and/or improvements to existing methods. Technical staff are responsible for investigating, developing, validating, documenting, and training personnel to formal procedures that detail analytical processes. These methods include, but are not limited to: cyanide speciation, hot cell gamma, and thermal conductivity.

Deliverable: Letter documenting completion.

Due Date: September 1994

COMMITMENT 5.5: Issue a report on results of the Sample Exchange Phase II.

Phase II of the Sample Exchange Program will involve the exchange of water leach, fusion preparation, and acid digest samples of SST core material from tanks 241-C-112 and B-201. The tank core material to be used in Phase II will retrieved from the PNL Analytical Chemistry laboratory sample archive. The archived core material will be distributed to both participating laboratories for analysis. Sample preparation (water leach, fusion preparation, acid digest) from each tank will be distributed in quadruplicate to both laboratories.

Deliverable: Letter report.

Due Date: March 1994

COMMITMENT 5.6: Evaluate Laboratory Staff Training.

Perform an evaluation of the training of the laboratory's staff.

Deliverable: Letter.

Due Date: June 1994

COMMITMENT 5.7: Develop and Implement Enhanced Training Plan for laboratory staff.

Deliverable: Issue training schedule.

Due Date: October 1994

COMMITMENT 5.8: Procure and receive two PAS-1 Transfer Casks.

Procure and receive two PAS-1 Transfer Casks onsite. The licensing revision required for use of the cask with core samples is not expected to be approved by the NRC until January 1995. In the interim, WHC will buy or lease additional Type A casks which will allow the shipment of small samples to off site labs beginning in October 1994.

Deliverable: Letter acknowledging receipt of two PAS-1 Transfer Casks.

Due Date: September 1994

COMMITMENT 5.9: Issue plan to upgrade INEL laboratory to ready-to-serve mode for Hanford Site Analytical requirements.

Deliverable: Plan and Schedule.

Due Date: January 1994

COMMITMENT 5.10: Issue plan to upgrade LANL laboratory to ready-to-serve mode for Hanford Site analytical requirements, including any NEPA needs.

Deliverable: Plan and Schedule.

Due Date: March 1994

COMMITMENT 5.11: Develop minimum/maximum laboratory capacity strategy, which includes schedules to bring off-site capacity on board.

Deliverable: Letter report with schedules.

Due Date: February 1994

COMMITMENT 5.12: Upgrade INEL Laboratory to ready-to-serve mode.

Deliverable: Letter from INEL indicating ready-to-serve mode.

Due Date: October 1994

COMMITMENT 5.13: Upgrade LANL Laboratory to ready-to-serve mode. Long lead item is NEPA (started January 1994).

Deliverable: Letter from LANL indicating ready-to-serve mode.

Due Date: February 1995

3.6 TASK 6: IMPROVE DATA MANAGEMENT

PURPOSE

Substantially improve data accessibility to key users.

DISCUSSION

Without access to useable data in a timely manner, other improvements discussed earlier will have little value. Poor data management and slow flow of data is one of the major problems in the existing program.

Key near-term focus areas are:

- All Characterization Program data users (customers) must be identified.
- Customer needs must be determined and supported in a timely manner.
- Controlled, accessible databases must be established.
- Data reports must be readable and user friendly to key customers.

The ultimate goal of the Characterization Program is to provide the necessary analytical information to its data users (e.g., TWRS program elements, DOE, Washington State Department of Ecology). Easy access to this data in a form the users can understand is essential.

To date the Characterization Program has been unsuccessful in satisfying the needs of its customers. Data once generated has been manually entered into various databases. Many of the databases are not controlled, nor are they all maintained by the Characterization Program. The data has been cumbersome for data users (large and bulky) and very difficult to comprehend. Often requests for data have been turned down or data is purposefully not shared. Plans are being developed to improve in these areas.

COMMITMENT 6.1: Prepare a Customer Needs Analysis.

A document will be developed identifying the customers of the Characterization Program and their individual characterization needs. This document will serve as a basis for evaluating the program's ability to meet its customers' needs.

Deliverable: Document.

Date Due: April 1994

COMMITMENT 6.2: Issue a Data Management Improvement Plan.

A plan will be developed identifying implementation plans for improving data accessibility, data control, and data readability. These plans will be the basis for determining work scope in the outyears.

Deliverable: Issue internal WHC document.

Date Due: May 1994

COMMITMENT 6.3: Initial Online Capability for an automated laboratory information management system (LABCORE-1).

The first phases of the anticipated system (LABCORE-1) will be installed and implemented at the 222-S Laboratory to support SST analyses.

This task will result in development and installation of a Laboratory Information System (LIMS) in all site laboratories. MULTI LIMS software will manage the data which pertains to sample analysis tracking and the management aspects of the laboratory operations, work assignments, sample status, final reporting, personnel training and equipment status. With this capability WHC can assign to specific sample data the analysis request, chain-of-custody records, and laboratory analysis raw data (as appropriate) to provide summary laboratory reports.

Deliverable: Initial online capability for LABCORE-1 System.

Due Date: January 1994

COMMITMENT 6.4: Demonstrate offsite access to the Tank Characterization database.

Demonstration of read-only offsite access by regulators to three tanks worth of characterization data in the Tank Characterization database.

Deliverable: Letter documenting completion.

Due Date: January 1994

COMMITMENT 6.5: Complete data loading of 20 tanks of data in to the Tank Characterization database.

Load 20 tanks worth of characterization data in the Tank Characterization database.

Deliverable: Letter documenting completion.

Due Date: September 1994

COMMITMENT 6.6: Evaluate 12 validated data reports for safety significance and determine if acceptable for safety screening and if data will be of use for TWRS disposal activities.

Deliverable: Letter report documenting results of the evaluation.

Due Date: January 1994

3.7 TASK 7: CHANGE CONTROL

The 93-5 Implementation Plan is a complex and long range plan. Flexibility is needed to address changes in commitments, actions, or completion dates where modifications are necessary due to additional information, project refinements, or changes in DOEs baseline assumptions.

PURPOSE

To provide a change control process to handle implementation course corrections or process change.

DISCUSSION

The 93-5 Implementation Plan is based on certain assumptions. These assumptions were used to develop commitment dates. If outyear significant funding, staffing levels, or mission changes occur, the original date for commitments may require modification. Any anticipated significant changes in completion dates and department commitments will be promptly brought to the attention of the DNFSB prior to the passing of the completion date. These changes will be formally discussed in the quarterly progress reports, including appropriate corrective action, and (where appropriate) submitted to the DNFSB as a revision to the Implementation Plan.

RESPONSIBILITY

The Assistant Secretary for Environmental Restoration and Waste Management and the Technical Personnel Program Coordinator at DOE-HQ have the primary responsibility for Task 7.

COMMITMENT 7.1: Substantive changes in a Department commitment or commitment completion date will be formally submitted. The implementation plan will be revised and resubmitted as appropriate.

Deliverable: Revised Implementation Plan.

Due Date: As required

COMMITMENT 7.2: Changes to interim milestones and schedules will be formally addressed and assessed in the quarterly progress reports.

Deliverable: Discussion in quarterly report.

Due Date: As required in conjunction with quarterly report schedule.

4.0 REFERENCES

Bell, K. E., 1993, *Tank Waste Remediation System Tank Waste Characterization Plan*, WHC-SD-WM-PLN-047, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

Bliss, R. J., 1992, *Analytical Services Support for Tank Waste Remediation System (TWRS)*, (external letter 9207398B R3 to J. R. Hunter, December 2), Westinghouse Hanford Company, Richland, Washington.

DOE, 1991, *Quality Assurance*, DOE Order 5700.6C, U.S. Department of Energy, Washington, D.C.

Ecology, EPA, and DOE, 1992, *Hanford Federal Facility Agreement and Consent Order*, 2 vols., as amended, Washington State Department of Ecology, U.S. Environmental Protection agency, and U.S. Department of Energy, Olympia, Washington.

Gasper, K. A., 1993, *Watch List Core Sampling Priority Rationale and Sampling Requirements*, Internal Memo, Westinghouse Hanford Company, Richland, Washington.

Heasler, P. G., 1993, *Generic Tank Characterization Estimates and Sample Size Problems*, Pacific Northwest Laboratory, Richland, Washington.

National Environmental Policy Act of 1969, 42 USC 6901, et seq.

Resource Conservation and Recovery Act of 1976, 42 USC 6901, et seq.

APPENDIX A

LIST OF TERMS/GLOSSARY

APPENDIX A

LIST OF TERMS/GLOSSARY

AEU	Analytical Equivalency Unit
DNFSB	Defense Nuclear Facilities Safety Board
DOE	U.S. Department of Energy
DOE-HQ	U.S. Department of Energy, Headquarters
DQO	Data Quality Objective
DST	Double-shell tanks
Ecology	Washington State Department of Ecology
HLW	High-level waste
ICP	inductively coupled plasma
INEL	Idaho National Energy Laboratory
LANL	Los Alamos National Laboratory
NEPA	*National Environmental Policy Act*
PNL	Pacific Northwest Laboratory
RCRA	*Resource Conservation and Recovery Act*
RL	U.S. Department of Energy-Richland Operations Office
SST	Single-shell tanks
Tri-Party Agreement	*Hanford Federal Facility Agreement and Consent Order*
TRU	Transuranic Wastes or Transuranic Processing Plant
TWRS	Tank Waste Remediation System
TSD	treatment, storage, and disposal
USQ	Unreviewed Safety Question
WHC	Westinghouse Hanford Company

GLOSSARY

Analytical Equivalency Unit (AEU). Laboratory resources are measured by a Hanford Site-generated unit called the Analytical Equivalency Unit (AEU). One AEU is defined as the analytical burden required to perform the full suite of analyses identified in Tables 15-1 and 15-2 of the *Waste Characterization Plan for the Hanford Site Single-Shell Tanks* on each segment and one core composite of a typical five-segment waste tank core sample.

Data Quality Objective (DQO). The DQO process provides a systematic method to determine what data are needed and the required accuracy to support a decision. Throughout this report the terms DQO and data requirements are used interchangeably. DQOs will be prepared for the various safety programs, including safety screening.

Tank Characterization Plan (TCP). The tank characterization plans (TCPs) integrate the various decision-based DQOs into a specific plan for samples obtained and analyses to be performed on tank wastes. A TCP will be developed for each tank to be sampled. Consistent with the DQOs, the plan will identify (1) the sampling methodology, number of samples to be taken, analyses to be performed, and the QA/QC requirements. The Tank (specific) Characterization Plan will be the document which governs the samples collected by field operations and the analyses performed by the laboratories. During the sample analysis the Tank (specific) Characterization Plan will be modified as necessary to accommodate any changes (such as changes in analytical requirements) due to new or modified DQOs or the addition of newly developed analytical procedures.

APPENDIX B

ROLE OF CHARACTERIZATION IN TANK WASTE REMEDIATION MISSION

APPENDIX B

ROLE OF CHARACTERIZATION IN TANK WASTE REMEDIATION MISSION

The TWRS mission is to provide treatment, storage, and disposal of waste forms in a safe, cost-effective, and environmentally sound manner. These waste forms include current and future tank waste, as well as cesium and strontium capsules.

The TWRS mission will be carried out by characterizing the waste, resolving safety issues, restoring the waste tank infrastructure, operating and maintaining waste tank and capsule storage facilities, constructing new waste tank storage facilities, and mitigating the potential for future leaks. The mission also involves the development, construction, and operation of waste immobilization and disposal facilities. These facilities include:

- Retrieval equipment
- Pretreatment (waste separation) facilities
- Waste treatment and disposal facilities
- Interim storage of immobilized waste forms.

The previous Characterization Program was based on taking two samples from each single-shell tank to provide information to support a *National Environmental Policy Act* (NEPA) decision to either leave or retrieve the single-shell tank waste. To provide sufficient data to support retrieval decisions of single-shell tank wastes, RCRA-based analyses on two core samples from each of the 149 single-shell tanks were required by September 1998. Priorities for sampling were driven by the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) (Ecology et al. 1992) Action Plan rather than by a systems needs approach. Recently the DOE has established a planning base for retrieving all single-shell tank waste, given the recent safety concerns that have been identified. DOE has tentatively reached an agreement with the Washington State Department of Ecology (Ecology) and the U.S. Environmental Protection Agency (EPA) on the wording for a revised Tri-Party Agreement Action Plan. The new Action Plan is compatible with the DNFSB's Recommendation 93-5. It requires use of the DQO process to define analytical needs, pre-approved sampling plans, and enhanced electronic access to analytical results and tank characterization reports that utilize all available data, not just core data. Approval of the revised Tri-Party Agreement is scheduled to occur in January 1994.

Fifty-one of the tanks have been placed on a Watch List because of potential safety concerns. Although sampling these tanks is a high priority, obtaining the required approvals to conduct sampling in tanks with unreviewed safety questions (USQs) has been both cumbersome and lengthy. The existing approval cycle had been taking an average of 10 months for new sampling events.

The current baseline program is described in Figure B-1. The attached figure describes the result of the most recent negotiation of the Tri-Party Agreement between DOE, Ecology, and EPA Region 10.

Safety issue resolution, assurance of safe interim storage, and accelerated screening of tanks to identify areas of chemical and physical risk associated with present waste are the highest priority of the TWRS program. This short term focus, to ensure safe interim storage and easy tank access, will be succeeded by the disposal program requirements, as information and resources become available.

Wastes from both the double-shell and single-shell tanks will be retrieved. The solid fraction of the waste will be separated and washed in an enhanced process to reduce the volume of non-radioactive constituents sent to high level immobilization. Radionuclides (cesium and strontium if required) will be removed from the low level liquids to reduce exposure in subsequent process steps. The liquids from these processes will be immobilized in a retrievable waste form, suitable for disposal (current baseline is LLW vitrification).

The solids remaining from the enhanced sludge wash process will be immobilized in a HLW immobilization (vitrification).

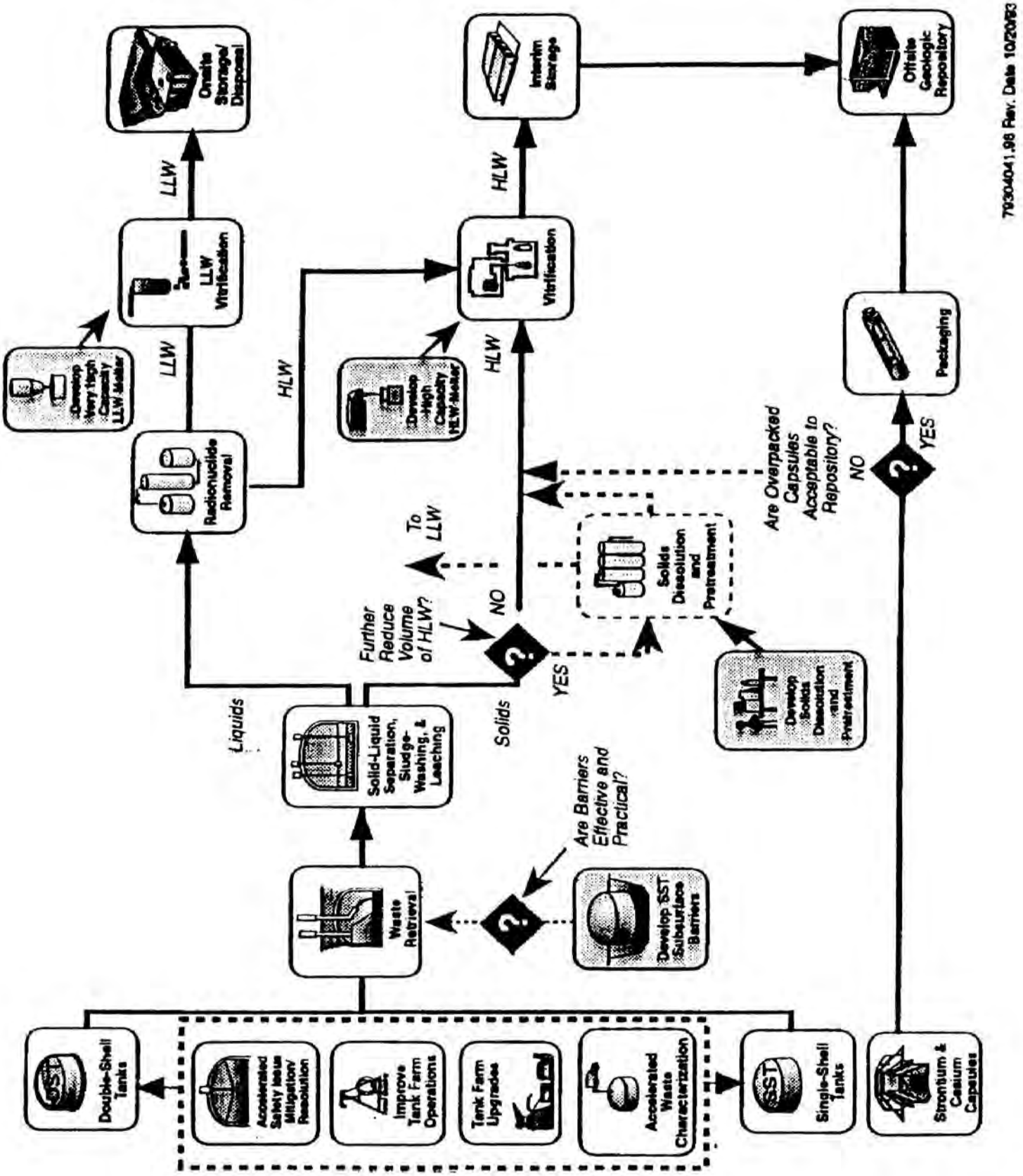
In addition to this baseline approach, technology will be developed and demonstrated for the following contingency areas.

- Develop single-shell tank subsurface barriers.
- Develop solids dissolution and pretreatment processes (if enhanced sludge washing is ineffective).

Major programmatic events are indicated on the time line shown in Figure B-2. As part of this major redirection of the TWRS program, a set of baseline definition products are under development for the program. In its response to DNFSB finding 92-4, DOE committed to implement a systematic management process, with clearly defined roles and responsibility. The TWRS program is being defined using systems engineering processes to define requirements and interfaces of the TWRS program. In addition, baseline scope, schedule, cost estimates, and management systems are under development and will be in place by April 1, 1994.

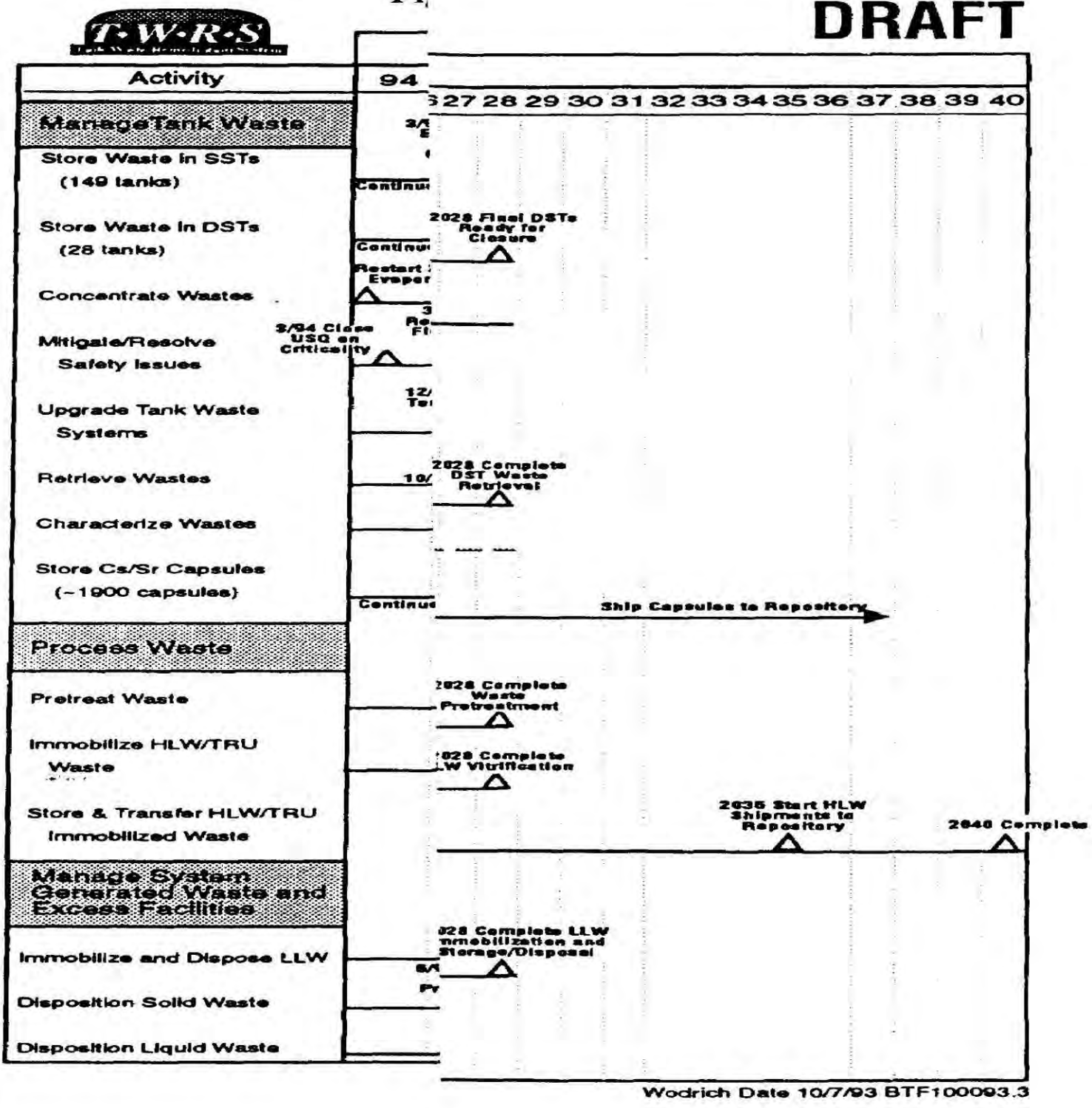
Tank characterization data is used (1) for safety screening; (2) to support safety issue resolution; (3) to support ongoing safe operation of tank storage and transfer systems; and (4) to support waste disposal (retrieval, pretreatment, and waste immobilization). Specification for required data changes as each of the TWRS program elements evolves. Individual programs will specify data needs required from characterization, keyed to programmatic decision points, by using the DQO process described in Section 3.1.

Figure B-1. Proposed Hanford Tank Waste Remediation System.



Fi

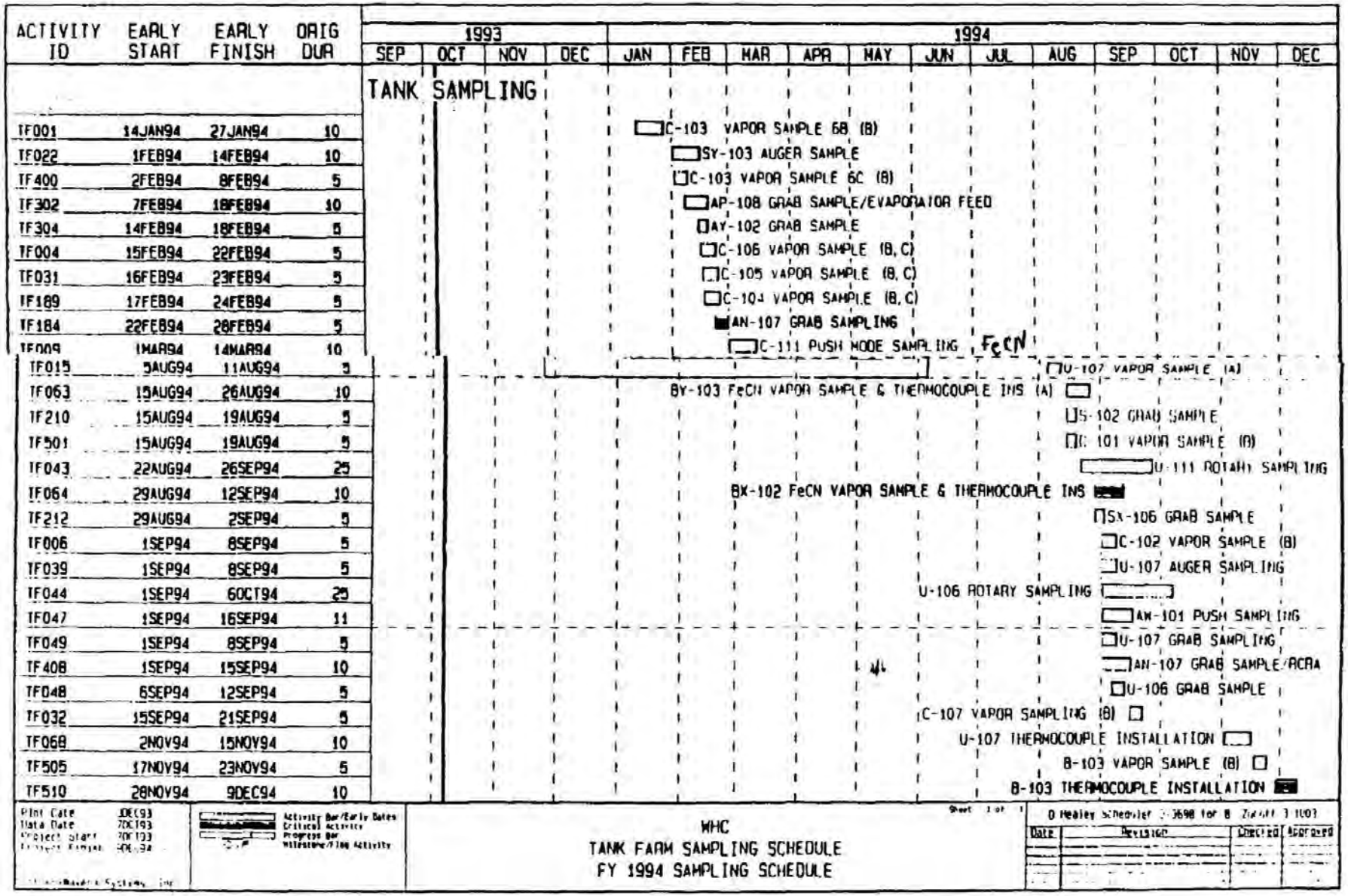
DRAFT


T·W·R·S
Activity
94
27 28 29 30 31 32 33 34 35 36 37 38 39 40
Manage Tank Waste
Store Waste in SSTs
(149 tanks)
Store Waste in DSTs
(28 tanks)
Concentrate Wastes
Mitigate/Resolve
Safety Issues
Upgrade Tank Waste
Systems
Retrieve Wastes
Characterize Wastes
Store Cs/Sr Capsules
(~1900 capsules)
Process Waste
Pretreat Waste
Immobilize HLW/TRU
Waste
Store & Transfer HLW/TRU
Immobilized Waste
Manage System
Generated Waste and
Excess Facilities
Immobilize and Dispose LLW
Disposition Solid Waste
Disposition Liquid Waste
Continu
2028 Final DSTs
Ready for
Closure
Restart
Evaper
3/94 Close
USQ on
Criticality
2028 Complete
DST Waste
Retrieval
Ship Capsules to Repository
2028 Complete
Waste
Pretreatment
2028 Complete
LW Vitrification
2035 Start HLW
Shipments to
Repository
2048 Complete
028 Complete LLW
mmobilization and
Storage/Disposal
Wodrich Date 10/7/93 BTF100093.3

An overlapping phased approach to characterization is being implemented as part of the management of TWRS waste characterization efforts. The purpose of the phased characterization approach is to collect the required quantity and quality of characterization data needed at a specific time in the TWRS Program schedule to support major programmatic initiatives and decisions. For example, in pretreatment, information needs for process selection must proceed, and will be different from, those needed to optimize feed to immobilization.

APPENDIX C

FY 1994 SAMPLING SCHEDULE


ACTIVITY ID
EARLY START
EARLY FINISH
ORIG DUR
1993
1994
SEP OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
TANK SAMPLING
TF001 14JAN94 27JAN94 10
TF022 1FEB94 14FEB94 10
TF400 2FEB94 8FEB94 5
TF302 7FEB94 18FEB94 10
TF304 14FEB94 18FEB94 5
TF004 15FEB94 22FEB94 5
TF031 16FEB94 23FEB94 5
TF189 17FEB94 24FEB94 5
TF184 22FEB94 28FEB94 5
TF009 1MAR94 14MAR94 10
TF015 5AUG94 11AUG94 5
TF063 15AUG94 26AUG94 10
TF210 15AUG94 19AUG94 5
TF501 15AUG94 19AUG94 5
TF043 22AUG94 26SEP94 25
TF064 29AUG94 12SEP94 10
TF212 29AUG94 2SEP94 5
TF006 1SEP94 8SEP94 5
TF039 1SEP94 8SEP94 5
TF044 1SEP94 6OCT94 25
TF047 1SEP94 16SEP94 11
TF049 1SEP94 8SEP94 5
TF408 1SEP94 15SEP94 10
TF048 6SEP94 12SEP94 5
TF032 15SEP94 21SEP94 5
TF068 2NOV94 15NOV94 10
TF505 17NOV94 23NOV94 5
TF510 28NOV94 9DEC94 10
C-103 VAPOR SAMPLE 68 (B)
SY-103 AUGER SAMPLE
C-103 VAPOR SAMPLE 6C (B)
AP-108 GRAB SAMPLE/EVAPORATOR FEED
AY-102 GRAB SAMPLE
C-106 VAPOR SAMPLE (B,C)
C-105 VAPOR SAMPLE (B,C)
C-104 VAPOR SAMPLE (B,C)
AN-107 GRAB SAMPLING
C-111 PUSH MODE SAMPLING FeCN
U-107 VAPOR SAMPLE (A)
BY-103 FeCN VAPOR SAMPLE & THERMOCOUPLE INS (A)
S-102 GRAB SAMPLE
C-101 VAPOR SAMPLE (B)
U-111 ROTARY SAMPLING
BX-102 FeCN VAPOR SAMPLE & THERMOCOUPLE INS
SX-106 GRAB SAMPLE
C-102 VAPOR SAMPLE (B)
U-107 AUGER SAMPLING
U-106 ROTARY SAMPLING
AN-101 PUSH SAMPLING
U-107 GRAB SAMPLING
AN-107 GRAB SAMPLE/ACRA
U-106 GRAB SAMPLE
C-107 VAPOR SAMPLING (B)
U-107 THERMOCOUPLE INSTALLATION
B-103 VAPOR SAMPLE (B)
B-103 THERMOCOUPLE INSTALLATION
Print Date 3DEC93
Data Date 7DEC93
Project Start 7DEC93
Project Finish 9DEC94
Activity Bar/Early Dates
Critical Activity
Progress Bar
Milestone/Float Activity
WHC
TANK FARM SAMPLING SCHEDULE
FY 1994 SAMPLING SCHEDULE
Date
Revision
Checked
Approved

Sampling of Waste Tanks in FY 1994

An analysis of the tanks that require further core sampling was made. There have been 14 DSTs and 15 SSTs that have been sampled since 1989, with enough rigor (2 or more samples, adequate analytes) that additional sampling are not expected to be needed to complete necessary safety screening. Safety screening of the data packages from these tanks will occur in January 1994. In addition, 7 DSTs contain only dilute liquid waste and will only need to be grab sampled. Core sampling will be unnecessary to adequately characterize these tanks, as they contain essentially no solids. There are also 12 SSTs and 1 DST that contain less than 25,000 gal (under 10 in.) of waste. Many of these show substantial bare metal on the bottom in photograph that have been taken. If waste material exists in sufficient amounts underneath available risers, auger sampling will provide a sufficient quantity of material to characterize without requiring core sampling. Auger and grab sampling can be accomplished much more quickly and at a substantially lower cost than core sampling.

A number of options were evaluated in establishing the fiscal year (FY) 1994 waste sampling schedule. There was a strong need to support the safety program, by sampling Watch List tanks, while at the same time maximizing use of the sample trucks to optimize the number of tanks that could be sampled. In FY 1995 and FY 1996, the present plan is to complete sampling in one tank farm before proceeding to the next farm. The reason for this is the time lost in the field decontaminating the trucks and support equipment to move them to the next farm. This is particularly difficult in cold or wet weather as these situations increase the difficulty in rapidly releasing equipment out of a tank farm. For example, often equipment cannot be surveyed out of a farm if there is ice on the equipment. This slowed down transfer of equipment in the winter of 1993, when there was substantial snow and freezing rain. In 1995 and 1996, with four trucks, a number of farms can be sampled simultaneously, thus supporting safety tank resolution in a timely manner. Once in a farm, safety tanks will be sampled first, if possible.

In the summer months, sampling is often delayed into the evening because of excessive temperatures in the day time, which causes concern for heat stress. Presently, crews must be in full protective gear to operate sampling equipment. In addition, substantial preparation work is needed to access a tank. Tank and riser-specific work packages must be developed. Particularly for the SSTs, risers are often not immediately available. Failed equipment or monitoring equipment must often be removed to take samples. If monitoring equipment is involved, this equipment must be carefully removed and then re-installed. If failed equipment is involved, then waste disposal plans must be developed and pre-approved. This includes approval of any disposal containers, if other than standard (e.g., 55 gal drums). In addition to this, many tanks (e.g., ferrocyanide tanks) or sampling processes (rotary-mode drilling) require vapor sampling prior to the core sampling events. This work involves different crews and equipment and therefore, careful pre-planning and sequencing are required to ensure that there are no delays. It is extremely important to the program's success to establish a schedule and then follow it, unless there are extremely compelling

reasons to deviate from the schedule. Changes in the sampling order can significantly affect the efficiency of the plant engineering forces to have necessary preparations done, so that there are no field delays.

Complicating FY 1994, there are only two core sampling trucks. One is only acceptable for push-mode sampling and the second is acceptable for rotary-mode sampling. Only certain tanks may be sampled via the push-mode sampling method. Tanks with hard layers (many of the ferrocyanide tanks, such as the one safety high-heat tank) can only be sampled with the rotary-mode sampler. In FY 1995, with four trucks available, there will be much greater flexibility for sampling. There are certain Watch List tanks that have are very high priority for the Waste Tank Safety Program. One of these is tank 241-C-106, the one high-heat tank on the Watch List. The decision has been made to retrieve this tank on a high priority basis to close the safety concern. Sampling is a critical path item to finalizing retrieval plans, both for tank 241-C-106 and for it's planned DST receiver tank, 241-AY-102. A second high priority tank to sample is tank 241-SY-103. To date, only one of the 24 flammable gas tanks has been sampled. The next two highest priority flammable gas tanks are tanks 241-SY-103 and 241-AW-101. Both are scheduled to have on-tank instrumentation installed to obtain critically needed vapor space data in FY 1994 in time to allow core sampling to occur. The flammable gas tank concern is the number one tank safety concern in the DOE complex. Other key areas to gain information are ferrocyanide tanks, organic tanks, and tank vapor issues. The last issue requires vapor, rather than core, samples. Tank 241-C-106 requires rotary sampling to obtain key information on the bottom layer of waste in the tank. The rest of the tanks in C Farm can be push-mode sampled. Tanks 102-AY, 103-SY, and 101-AW can all be push-mode sampled. Most of the tanks in BY Farm (which contains 10 ferrocyanide tanks) require rotary-mode sampling. There is only one organic tank in C Farm that has not been sampled and no organic tanks in BY Farm, based on existing knowledge. There are a number of organic tanks in U Farm. The tanks with the estimated highest concentration of organics are 241-C-103 and several tanks in U Farm.

Reviews are underway to reassess the order of push-mode sampling, to maximize the number of C Tank Farm samples taken. Specifically under consideration is postponing tank 241-AW-101 into FY 1995 and reordering tank 241-AY-102, so that once in C Farm, the push-mode truck would stay until all tanks are sampled. A revised, integrated schedule is due in February 1994.

FY 1994 is the year that WHC is obtaining additional sampling equipment and hiring and training additional crews. At this time, the estimate is that only 12 tanks can be sampled (2 cores per tank). It is anticipated that the new dedicated crews will have higher productivity. However, the field loaded schedule, including precursor vapor sampling and riser preparation, indicates that 12 tanks are the most realistic case. WHC is starting with rotary sampling tank 241-C-106, as it is a critical path for the safety retrieval initiative. The rotary truck will then be moved to BY Farm to pick up the next 3 highest concentration ferrocyanide tanks not yet sampled (based on historical records of inventories). Given that the remaining tanks in C Farm can be push-mode sampled, it was not warranted to leave the

rotary truck in C Farm. After sampling 3 of the 10 ferrocyanide tanks in BY Farm, the rotary truck will be moved to U Farm to pick up 2 high organic tanks. These organic tanks must also be rotary-mode sampled. An alternative was evaluated in which the rotary truck was left in BY Farm. This would result in an estimated 6 month slip in the organic safety program, with essentially no gain in the ferrocyanide program. The Waste Tank Safety Program did not recommend this strategy, even though it was estimated that an extra tank could have been sampled (e.g., 1 high-heat and 7 ferrocyanide tanks vs. 1 high-heat, 3 ferrocyanide, and 2 organic tanks).

With the push-mode sampling, the highest priority is to sample tank 241-SY-103 (a flammable gas tank). Sampling this tank will complete sampling of the SY Farm (the other two tanks have been sampled earlier). Tank 241-AY-102 is the next priority, even though it is not a Watch List tank. It is the planned receiver tank for tank 241-C-106 waste, and therefore is also critical to the successful and timely closure of the high-heat tank safety issue. The truck will then sample in C Farm (tank 103-C which is a high-organic tank, and 108-C and 111-C, which are both ferrocyanide tanks). With these 3 C Farm tanks, all Watch List tanks in C Farm will be sampled. The plan was then to sample tank 241-AW-101, which is a high-priority flammable gas tank. An option was considered of leaving the truck in C Farm after tanks 103-SY and 102-AY were sampled. There are 4 other tanks in C Farm (besides the 3 scheduled for push-mode sampling) that are left for sampling. As none of these are priority safety tanks, it was considered best to sample the extra flammable gas tank. There has been considerable pressure to sample flammable gas tanks, as they constitute the highest safety concern. However, until this year, only tank 241-SY-101 had the necessary continuous air monitoring equipment, which would allow data to be collected to support safety analyses to determine if core sampling will be safe. The site did not wish to miss the opportunity to maximize sampling of the flammable gas tanks, even if this meant a slightly longer time in sampling the non-Watch List tanks in C Farm.

Other grab and auger samples are also shown on the schedule. These are sampling opportunities that do not affect the number of core samples that can be taken. The core sampling is limited by equipment and trained crews. The auger and grab sampling can be taken while the existing crews are waiting for the equipment to be set up or moved. The grab samples support SST stabilization activities and the RCRA evaporator or DST Part B permit (covered by the approved characterization analysis plan). None of the grab samples add significantly to the laboratory burden (quick/simple analyses) or the field staff burden. The auger samples are to support specific safety issues (for example, flammable gas tanks must be auger sampled to confirm if there is a crust burn issue and if water must be added during core sampling prior to core sampling), or to sample those tanks that have less than 10 inches of waste in them. Tanks with less than 10 inches of waste will not be core sampled. They will be auger sampled (if sufficient waste is visible beneath access risers). WHC wanted to complete sampling the maximum number of tanks that only require auger samples while there was a shortage of core sampling equipment, to minimize the impact on core sampling activities in FY 1995 and 1996.

APPENDIX D

PROJECTED MAXIMUM CORE SAMPLING CAPACITY

DNFSB 93-5 Response - Tank Safety Screening

29-Aug-93 ADS 1130 Tank Waste Characterization Program

Core Sampling Truck	Sampling Method	Crew	Number of Core Samples per Fiscal Year					
			FY 94	FY 95	FY 96	FY 97	FY 98	FY 99
Truck No. 1	Push-Mode	1st Crew	11 @	20 **	20	0 ++	0	0
Truck No. 2	Rotary-Mode	1st Crew	6 *	12 #	12	12	12	12
		2nd Crew	7	12	12	12	12	12
Truck No. 3	Rotary-Mode	1st Crew		12 I	12	12	12	12
		2nd Crew		12	12	12	12	12
Truck No. 4	Rotary-Mode	1st Crew		12 I	6 +			
	Push-Mode	1st Crew			15 +	33 $	33	33
	Rotary-Mode	2nd Crew		12	6 +			
	Push-Mode	2nd Crew			15 +	33 $	33	33
	Push-Mode		11	20	50	66	66	66
	Rotary-Mode		13	72	60	48	48	48
	Total		24	92	110	114	114	114

@ - Assumes a nominal push-mode productivity of 10 cores per truck due to standown

- Assumes a nominal rotary mode productivity of 12 cores per truck per shift per fiscal year.

* - Assumes 12 rotary cores can be obtained in FY 94 because exhauster is not available until spring at beginning of fiscal year

I - Assumes Truck No. 3 & 4 brought on line with 2 crews at beginning of FY 95

+ Assumes Truck No. 4 will split duty between push & rotary mode

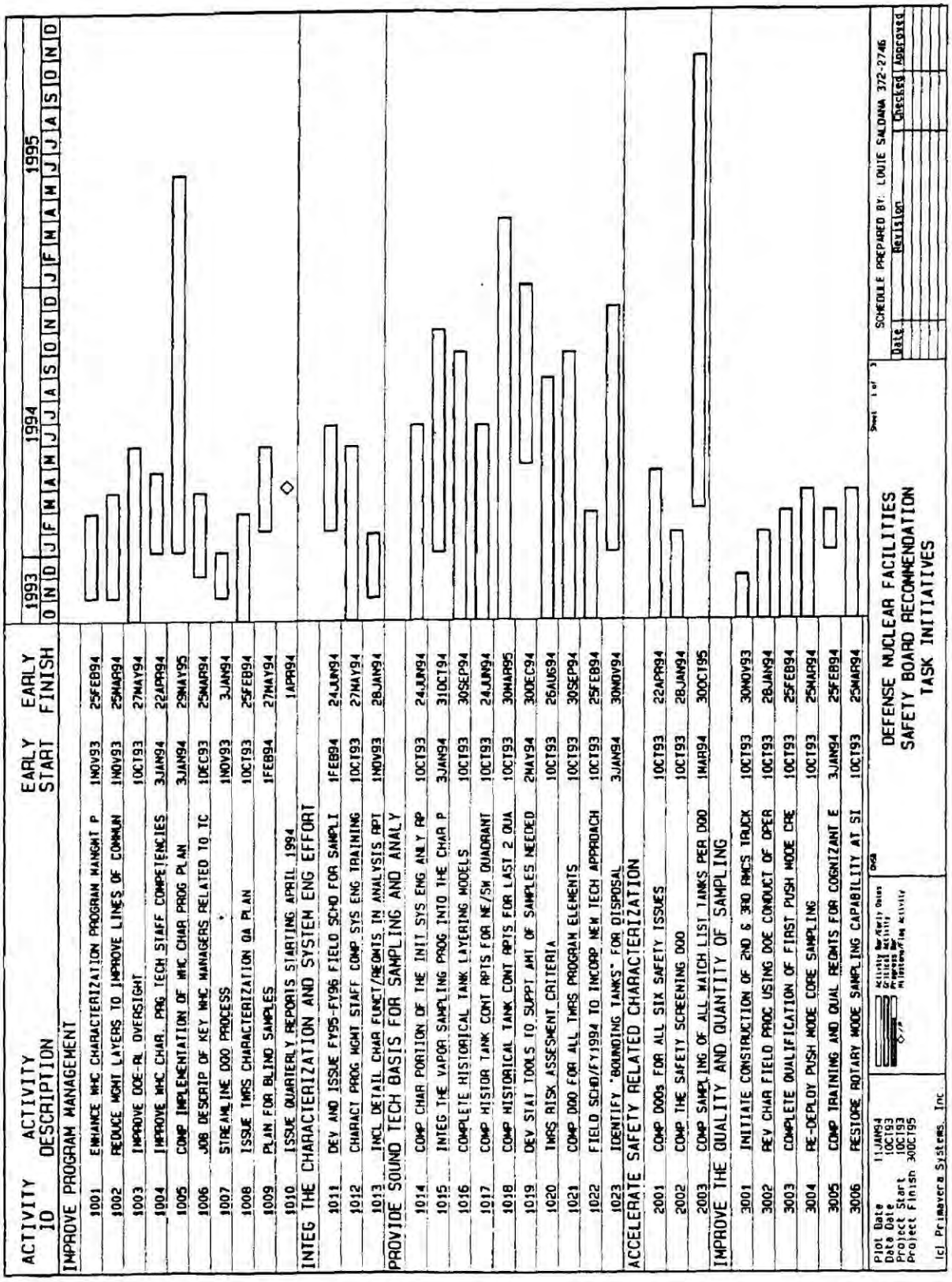
$ - Assumes Nominal rate of 33 cores per shift per year for push-mode because multiple cores per tank are expected in outyears

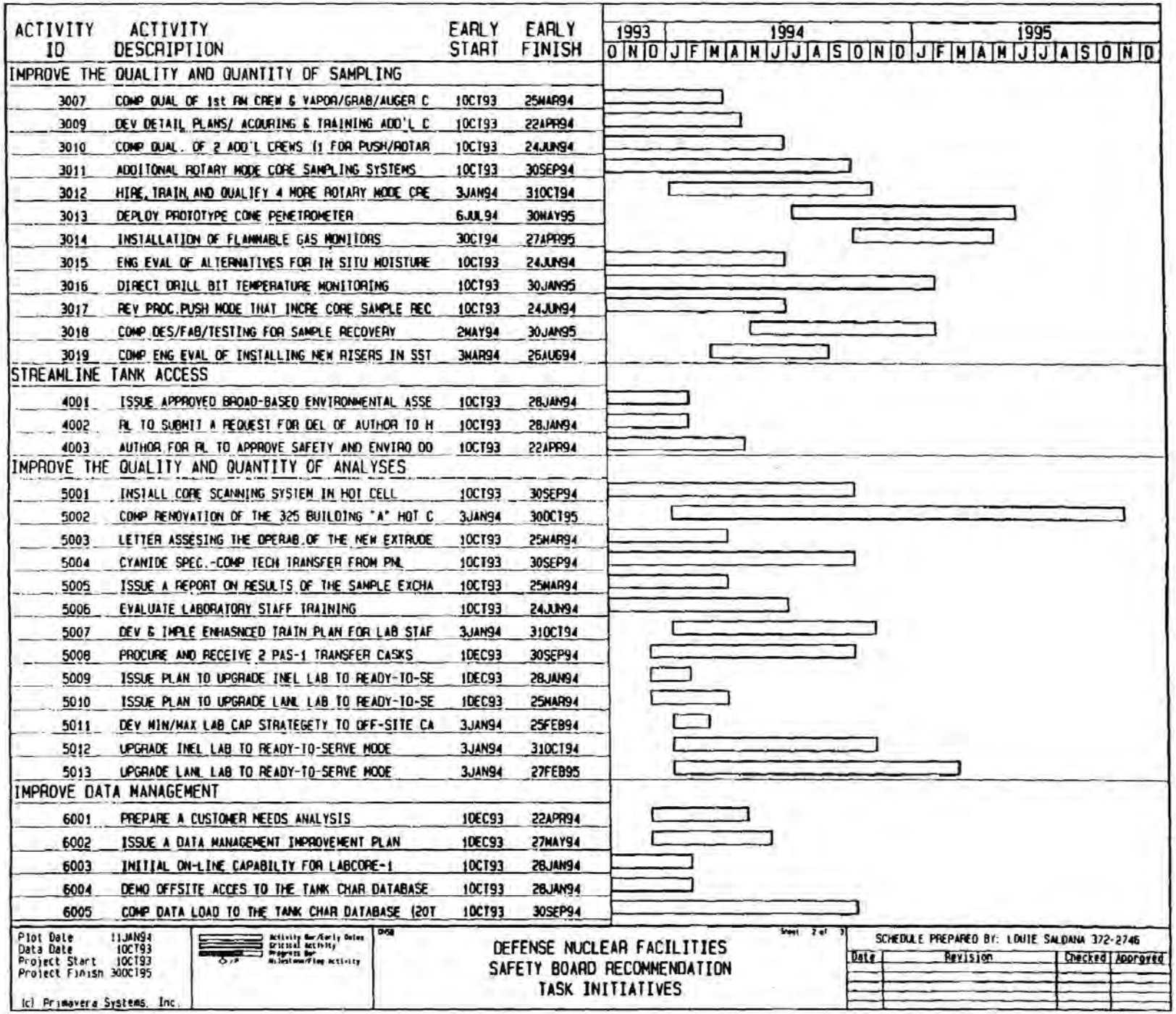
** - Assumes truck No. 1 has a nominal capacity of only 20 cores per year due to age of equipment.

++ - Assumes 1st truck only in standby mode due to age. Crews are pulled off of other trucks during downtime if needed.

APPENDIX E

INTEGRATED SCHEDULE OF COMMITMENTS


ACTIVITY ID
ACTIVITY DESCRIPTION
EARLY START
EARLY FINISH
1993
1994
1995
O N D J F M A M J J A S O N D J F M A M J J A S O N D
IMPROVE PROGRAM MANAGEMENT
1001 ENHANCE WHC CHARACTERIZATION PROGRAM MANGMT P 1NOV93 25FEB94
1002 REDUCE MGMT LAYERS TO IMPROVE LINES OF COMMUN 1NOV93 25MAR94
1003 IMPROVE DOE-RL OVERSIGHT 1OCT93 27MAY94
1004 IMPROVE WHC CHAR. PRG TECH STAFF COMPETENCIES 3JAN94 22APR94
1005 COMP IMPLEMENTATION OF WHC CHAR PROG PLAN 3JAN94 29MAY95
1006 JOB DESCRIP OF KEY WHC MANAGERS RELATED TO TC 1DEC93 25MAR94
1007 STREAMLINE DOO PROCESS 1NOV93 3JAN94
1008 ISSUE TWRS CHARACTERIZATION QA PLAN 1OCT93 25FEB94
1009 PLAN FOR BLIND SAMPLES 1FEB94 27MAY94
1010 ISSUE QUARTERLY REPORTS STARTING APRIL 1994 1APR94
INTEG THE CHARACTERIZATION AND SYSTEM ENG EFFORT
1011 DEV AND ISSUE FY95-FY96 FIELD SCHD FOR SAMPLI 1FEB94 24JUN94
1012 CHARACT PROG MGMT STAFF COMP SYS ENG TRAINING 1OCT93 27MAY94
1013 INCL DETAIL CHAR FUNCT/REQMTS IN ANALYSIS RPT 1NOV93 28JAN94
PROVIDE SOUND TECH BASIS FOR SAMPLING AND ANALY
1014 COMP CHAR PORTION OF THE INIT SYS ENG ANLY RP 1OCT93 24JUN94
1015 INTEG THE VAPOR SAMPLING PROG INTO THE CHAR P 3JAN94 31OCT94
1016 COMPLETE HISTORICAL TANK LAYERING MODELS 1OCT93 30SEP94
1017 COMP HISTOR TANK CONT RPTS FOR NE/SW QUADRANT 1OCT93 24JUN94
1018 COMP HISTORICAL TANK CONT RPTS FOR LAST 2 QUA 1OCT93 30MAR95
1019 DEV STAT TOOLS TO SUPPT AMT OF SAMPLES NEEDED 2MAY94 30DEC94
1020 TWRS RISK ASSESMENT CRITERIA 1OCT93 26AUG94
1021 COMP DOO FOR ALL TWRS PROGRAM ELEMENTS 1OCT93 30SEP94
1022 FIELD SCHD/FY1994 TO INCORP NEW TECH APPROACH 1OCT93 25FEB94
1023 IDENTIFY "BOUNDING TANKS" FOR DISPOSAL 3JAN94 30NOV94
ACCELERATE SAFETY RELATED CHARACTERIZATION
2001 COMP DOOs FOR ALL SIX SAFETY ISSUES 1OCT93 22APR94
2002 COMP THE SAFETY SCREENING DOO 1OCT93 28JAN94
2003 COMP SAMPLING OF ALL WATCH LIST TANKS PER DOO 1MAR94 30OCT95
IMPROVE THE QUALITY AND QUANTITY OF SAMPLING
3001 INITIATE CONSTRUCTION OF 2ND & 3RD RMCS TRUCK 1OCT93 30NOV93
3002 REV CHAR FIELD PROC USING DOE CONDUCT OF OPER 1OCT93 28JAN94
3003 COMPLETE QUALIFICATION OF FIRST PUSH MODE CRE 1OCT93 25FEB94
3004 RE-DEPLOY PUSH MODE CORE SAMPLING 1OCT93 25MAR94
3005 COMP TRAINING AND QUAL REQMTS FOR COGNIZANT E 3JAN94 25FEB94
3006 RESTORE ROTARY MODE SAMPLING CAPABILITY AT SI 1OCT93 25MAR94
Plot Date 11JAN94
Data Date 1OCT93
Project Start 1OCT93
Project Finish 30OCT95
Activity Bar/Early Dates
Critical Activity
Progress
Milestone Activity
DEFENSE NUCLEAR FACILITIES
SAFETY BOARD RECOMMENDATION
TASK INITIATIVES
Sheet 1 of 1
SCHEDULE PREPARED BY: LOUIE SALOMA 372-2745
Date
Revision
Checked
Approved
(c) Primavera Systems, Inc.



ACTIVITY ID	ACTIVITY DESCRIPTION	EARLY START	EARLY FINISH
IMPROVE THE QUALITY AND QUANTITY OF SAMPLING			
3007	COMP QUAL OF 1st RH CREW & VAPOR/GRAB/AUGER C	10CT93	25MAR94
3009	DEV DETAIL PLANS/ ACQUIRING & TRAINING ADD'L C	10CT93	22APR94
3010	COMP QUAL. OF 2 ADD'L CREWS (1 FOR PUSH/ROTAR	10CT93	24JUN94
3011	ADDITONAL ROTARY MODE CORE SAMPLING SYSTEMS	10CT93	30SEP94
3012	HIRE, TRAIN AND QUALIFY 4 MORE ROTARY MODE CRE	3JAN94	31OCT94
3013	DEPLOY PROTOTYPE CONE PENETROMETER	6JUL94	30MAY95
3014	INSTALLATION OF FLAMMABLE GAS MONITORS	30CT94	27APR95
3015	ENG EVAL OF ALTERNATIVES FOR IN SITU MOISTURE	10CT93	24JUN94
3016	DIRECT DRILL BIT TEMPERATURE MONITORING	10CT93	30JAN95
3017	REV PROC.PUSH MODE THAT INCRE CORE SAMPLE REC	10CT93	24JUN94
3018	COMP DES/FAB/TESTING FOR SAMPLE RECOVERY	2MAY94	30JAN95
3019	COMP ENG EVAL OF INSTALLING NEW RISERS IN SST	3MAR94	26AUG94
STREAMLINE TANK ACCESS			
4001	ISSUE APPROVED BROAD-BASED ENVIRONMENTAL ASSE	10CT93	28JAN94
4002	RL TO SUBMIT A REQUEST FOR DEL OF AUTHOR TO H	10CT93	28JAN94
4003	AUTHOR FOR RL TO APPROVE SAFETY AND ENVIRO DO	10CT93	22APR94
IMPROVE THE QUALITY AND QUANTITY OF ANALYSES			
5001	INSTALL CORE SCANNING SYSTEM IN HOT CELL	10CT93	30SEP94
5002	COMP RENOVATION OF THE 325 BUILDING "A" HOT C	3JAN94	30OCT95
5003	LETTER ASSESING THE OPERAB.OF THE NEW EXTRUDE	10CT93	25MAR94
5004	CYANIDE SPEC.-COMP TECH TRANSFER FROM PNL	10CT93	30SEP94
5005	ISSUE A REPORT ON RESULTS OF THE SAMPLE EXCHA	10CT93	25MAR94
5006	EVALUATE LABORATORY STAFF TRAINING	10CT93	24JUN94
5007	DEV & IMPLE ENHASNCED TRAIN PLAN FOR LAB STAF	3JAN94	31OCT94
5008	PROCURE AND RECEIVE 2 PAS-1 TRANSFER CASKS	1DEC93	30SEP94
5009	ISSUE PLAN TO UPGRADE INEL LAB TO READY-TO-SE	1DEC93	28JAN94
5010	ISSUE PLAN TO UPGRADE LANL LAB TO READY-TO-SE	1DEC93	25MAR94
5011	DEV MIN/MAX LAB CAP STRATEGETY TO OFF-SITE CA	3JAN94	25FEB94
5012	UPGRADE INEL LAB TO READY-TO-SERVE MODE	3JAN94	31OCT94
5013	UPGRADE LANL LAB TO READY-TO-SERVE MODE	3JAN94	27FEB95
IMPROVE DATA MANAGEMENT			
6001	PREPARE A CUSTOMER NEEDS ANALYSIS	1DEC93	22APR94
6002	ISSUE A DATA MANAGEMENT IMPROVEMENT PLAN	1DEC93	27MAY94
6003	INITIAL ON-LINE CAPABILITY FOR LABCORE-1	10CT93	28JAN94
6004	DEMO OFFSITE ACCES TO THE TANK CHAR DATABASE	10CT93	28JAN94
6005	COMP DATA LOAD TO THE TANK CHAR DATABASE (20T	10CT93	30SEP94

1993 1994 1995
O N D J F M A M J J A S O N D J F M A M J J A S O N D

Plot Date 11JAN94
Data Date 10CT93
Project Start 10CT93
Project Finish 30OCT95

Activity Bar/Early Dates
Critical Activity
Progress Bar
Milestone/Float Activity

DOE

Sheet 2 of 3

DEFENSE NUCLEAR FACILITIES
SAFETY BOARD RECOMMENDATION
TASK INITIATIVES

SCHEDULE PREPARED BY: LOUIE SALDANA 372-2746

Date	Revision	Checked	Approved

ACTIVITY ID	ACTIVITY DESCRIPTION	EARLY START	EARLY FINISH
IMPROVE DATA MANAGEMENT			
6006	EVAL 12 VALID RPTS AND DETERMINE IF ACCEPTABL	3JAN94	28JAN94

1993: O N D — 1994: J F M A M J J A S O N D — 1995: J F M A M J J A S O N D

Plot Date 11JAN94
Data Date 1OCT93
Project Start 1OCT93
Project Finish 30OCT95

(c) Primavera Systems, Inc

Activity Bar/Early Dates
Critical Activity
Progress Bar
Milestone/Flag Activity

DNSB

DEFENSE NUCLEAR FACILITIES
SAFETY BOARD RECOMMENDATION
TASK INITIATIVES

Sheet 3 of 3

SCHEDULE PREPARED BY: LOUIE SALDANA 372-2746

Date	Revision	Checked	Approved