TABLE OF CONTENTS

1.0 PURPOSE AND SCOPE .......................................................................................... 2
2.0 IMPLEMENTATION ............................................................................................... 2
3.0 RESPONSIBILITIES .............................................................................................. 2
4.0 PROCEDURE ......................................................................................................... 3
  4.1 General .................................................................................................................. 3
  4.2 Retrieval Evaluation ......................................................................................... 3
5.0 DEFINITIONS ........................................................................................................ 5
6.0 RECORDS ............................................................................................................. 5
7.0 SOURCES ............................................................................................................. 5
  7.1 Requirements ..................................................................................................... 5
  7.2 References ......................................................................................................... 5

TABLE OF FIGURES

Figure 1. Single-Shell Tank Retrieval Evaluation Flowchart ........................................... 6
Figure 2. Single-Shell Tank Retrieval Evaluation Form ................................................... 7

TABLE OF ATTACHMENTS

ATTACHMENT A - GUIDANCE FOR RETRIEVAL PERFORMANCE AND LIMIT OF TECHNOLOGY EVALUATIONS .............................................................................. 8
ATTACHMENT B - RETRIEVAL REPORT OUTLINE .................................................... 11
1.0 PURPOSE AND SCOPE

(7.1.1)

This procedure provides the requirements, responsibilities, and decision-making steps necessary to: 1) ensure that retrieval data is collected and analyzed throughout operations, 2) establish a process and criteria for interim decisions to continue retrieval or make process/configuration changes to get the most out of a technology, and 3) establish a process and criteria for a field-level decision to declare waste retrieval operations meet the limits of technology for a single-shell tank (SST).

This procedure applies to Washington River Protection Solutions LLC (WRPS), personnel that are responsible for providing the required data, documentation, and approvals for retrieval operations.

The initial steps within the scope of this procedure for the retrieval/closure process are as follows:

- Collect, process, and report data to establish retrieval baseline
- Make and document technical retrieval process decisions
- Establish criteria for when the limits of technology are met and make recommendation when to terminate retrieval operations
- Notify management and operations of retrieval status so they can inform DOE and regulators
- Prepare a retrieval report that documents the decision to conclude retrieval and provides the basis for determining the limits of technology have been reached.

The retrieval report and this procedure precede post-retrieval activities defined in the “Hanford Federal Facility Agreement and Consent Order” (Tri-Party Agreement), Appendix I, which requires preparation of the following documents:

- Retrieval data report
- SST closure plan.

2.0 IMPLEMENTATION

This procedure is effective on the date shown in the header.

3.0 RESPONSIBILITIES

Responsibilities are contained within Section 4.0.
4.0 PROCEDURE

4.1 General

Criteria used for declaring single-shell tanks as “retrieved” are as follows (Tri-Party Agreement, M-45-00):

- Retrieval will remove as much waste as technically possible with waste residues not to exceed:
  - 360 ft$^3$ of waste in each 100-series tank
  - 30 ft$^3$ of waste in each 200-series tank.

- Or the limit of waste retrieval technology capability, whichever is less.

See Attachment A for guidance and the approach to determine waste volume and limit of technology.

NOTE: Figure 1 shows the evaluation logic used during retrieval and the process required to declare SST retrieval is complete.

4.2 Retrieval Evaluation

1. Request that the responsible engineering manager assign a responsible engineer and checker prior to the start of retrieval operations to compile and evaluate retrieval performance, prepare retrieval report, coordinate reviews and checking, and obtain approvals.

2. Establish and track retrieval performance (i.e., percent waste retrieved). Chart/trend data and provide weekly status reports to management.

3. Recommend configuration modifications or process/operating changes to enhance performance (document changes against the chart/trend data). Following a configuration modification or process change, identify the reference point in response to any changes and continue to trend data.

4. Notify management and operations after performance efficiency degrades to approximately 10% of the starting retrieval performance (100%) and continue status notifications to management and operations until retrieval operations stop.

(NOTE: Operations will forward status information to DOE and Ecology during this time, brief Ecology on retrieval activity including: residual volume estimates, video images and performance parameters, and invite Ecology to view retrieval activities).
5. Establish when the limits of technology have been reached:
   a. Examine in-tank photos/videos to observe and record the waste surface contours, form, and characteristics (liquid or solids, size of particles).
   
   b. Estimate retrieval performance efficiency and remaining waste volume by one or more of the following methods: qualitative estimate from in-tank photos/videos, mass balance, or displacement measurement. Document calculations per TFC-ENG-DESIGN-C-10.
   
   c. Utilize retrieval performance data trend to demonstrate that a consistent pattern is present indicating that limits of technology have been reached.
   
   d. Evaluate retrieval performance against system limitations (e.g., required suction head, size of intake screen, measurement accuracy, etc.).

6. When the limits of technology have been reached notify management and operations so they can notify DOE and Ecology and consider halting retrieval operations.

7. Prepare and sign the Single-Shell Tank Retrieval Evaluation Form (Figure 2), which is the front page of the retrieval report, and prepare draft/summary retrieval report (Attachment B) and submit to checker.

Evaluation Checker 8. Check and sign the Retrieval Evaluation Form.

Responsible Engineer 9. Finalize retrieval report if the criteria have been met or notify responsible engineering manager if criteria have not been met.

10. Obtain the following approvals for the retrieval report:
    - Responsible Engineer
    - Evaluation Checker
    - Responsible manager
    - SST Retrievals Engineering Level 2 Manager.

SST Retrievals Project Level 2 Manager 11. Prepare cover letter to transmit retrieval report to the Office of River Protection (ORP) according to TFC-BSM-AD-C-03.

12. Submit completion letter and retrieval report to ORP.
Prepare a tank retrieval report file containing copies of basic information such as engineering calculations, in-tank photograph and video reviews, and other observations. These will be included as part of the evaluation package. The package, including all calculations and evaluations, will remain in the tank retrieval report file.

5.0 DEFINITIONS

No terms or phrases unique to this procedure are used.

6.0 RECORDS

No records are generated in the performance of this procedure.

7.0 SOURCES

7.1 Requirements

1. Management Directed.

7.2 References

1. 89-10, Hanford Federal Facility Agreement and Consent Order, M-45-00.
2. TFC-BSM-AD-C-03, “Correspondence Preparation and Control.”
3. TFC-BSM-IRM_DC-C-02, “Records Management.”
4. TFC-ENG-DESIGN-C-10, “Engineering Calculations.”
Figure 1. Single-Shell Tank Retrieval Evaluation Flowchart.

1. Assign responsible engineer for retrieval project

2. Retrieve, collect data, and trend retrieval performance

3. Document changes

4. Notify management and operations at ~10% of original performance rate

5. Establish basis for determining the limits of technology are reached

6. Notify management/operations when reached

7. Prepare tank retrieval evaluation form and draft retrieval report

8. Check report

9, 10. Complete retrieval report and obtain signatures

9. Notify management

11. Prepare transmittal letter and obtain approvals

12. Distribute letter
Figure 2. Single-Shell Tank Retrieval Evaluation Form.

TANK: __________________________________________________________

Description of Photo/Video Key Items:

Tank bottom: ______________________________________________________

_______________________________________________________________

Tank Wall and equipment: __________________________________________

_______________________________________________________________

Date of photo/video ______________________

Evaluation Summary:

Starting Waste Volume ______________ Method ______________ Date ____________

Ending Waste Volume ______________ Method ______________ Date ____________

Net Waste Removed ______________ Method ______________ Date ____________

Final Retrieval Performance Efficiency ______________ Basis ______________

Retrieval Performance Trend (chart, figure or other technical data/information)

Basis for recommending retrieval is completed:

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

Signatures

Responsible Engineer ____________________________ Date ________

Evaluation Checker ____________________________ Date ________

Responsible Manager ____________________________ Date ________

SST Retrievals Engineering Level 2 Manager ____________________________

Date _______________________________
ATTACHMENT A - GUIDANCE FOR RETRIEVAL PERFORMANCE AND LIMIT OF TECHNOLOGY EVALUATIONS

1.0 100-SERIES TANKS RETRIEVED BY MODIFIED SLUICING

Several methods are available to evaluate the retrieval performance technology limit for modified sluicing operations in 100-series tanks. Use one or more of the following methods most appropriate, consistent with tank conditions, regulatory requirements, and the type of waste being retrieved (sludge or saltcake). Methods not identified in this section are also acceptable.

1.1 Material Balance

Material balances require obtaining the necessary data to estimate the increase in the volume of a tank receiving waste and the volume of material added during retrieval operations. The difference between the volume of waste pumped to the receiving tank (as determined by the change in ENRAF\(^1\) reading for the receiving tank and/or a flow totalizer measurement) and the volume of water or other solution added to the tank retrieved provides an estimate of waste removed for each operation which can be used in retrieval performance evaluations.

1.2 Volume Displacement Method

This is an accurate method to estimate residual waste volume. A known volume of water is added to the tank to submerge solids and a liquid-level measurement is made using the ENRAF gage. The volume of waste in the tank is determined by subtracting the liquid volume added from the total volume pumped out. The addition of water or liquids will not be made solely for the purpose of volume measurement.

After the last sluicing operation, the volume of waste left in the tank is estimated by again adding a known volume of water to submerge all of the waste in the tank and provide enough water to enable an ENRAF reading. The addition of water or liquids will not be made solely for the purpose of volume measurement.

NOTE: The ENRAF in a dished-bottom tank is often near the side of the tank and may not contact a liquid pool centered in the tank.

The volume of the water added is again subtracted from the ENRAF reading to determine the waste volume in the tank.

1.3 Photo/Video Visual Assessment

The primary purpose for the photo/video assessment for the modified sluicing method is to estimate the amount of residual waste on the walls and the bottom of the tank. This assessment provides visual confirmation of the residual waste in the tank. This visual assessment relies on the presence of known tank features (e.g., welds along liner plates, location of stiffener rings etc.) or objects of known size (e.g., pump inlet openings) for perspective in assessing residual volume.

\(^{1}\)ENRAF - Nonius Series 854 is a trademark of Enraf-Nonius, N.V. Verenigde Instrumentenfabrieken, Enraf-Nonius Corporation Netherlands, Rontegenweg 1, Delft, Netherlands.
ATTACHMENT A - GUIDANCE FOR RETRIEVAL PERFORMANCE AND LIMIT OF TECHNOLOGY EVALUATIONS (cont.)

1.4 System Operation

Key system indicators that the limit of technology may be reached are:

- The retrieval system performance is less than or equal to ten percent of the initial performance with little or no change for consecutive sluicing cycles or batch (retrieval team judgment).

- Pump is operated until standing liquid has been removed to the limits of the pumping system and loss of suction occurs.

- Alternate system configurations and process modifications have been considered to enhance performance. This does not include a change in the retrieval method approved by regulators and documented in tank waste retrieval work plans. It may include system enhancements, e.g., lengthening lines, changing out motors, etc.

- The system is limited by particle size intake (e.g., a ¼-in. screen may limit removal of larger particles).

2.0 200-SERIES TANKS AND 100-SERIES TANKS RETRIEVED BY VACUUM EXTRACTION OR MOBILE RETRIEVAL SYSTEM

Two methods are currently available for evaluating retrieval performance and limits of technology for Vacuum Retrieval System (VRS) or Mobile Retrieval Systems (MRS). These include the material balance previously described and photo/video volume measurements. In addition, the VRS/MRS uses load cells on the abovegrade vessel to measure the mass of waste retrieved. The displacement method is not utilized because MRS and VRS are used on assumed leaking tanks.

In-tank monitoring during waste retrieval operations includes video surveillance, batch vessel weight measurements, and waste density measurements. The technology limits for the VRS and MRS can be determined through the evaluation of the following combination of numerical limits and best management practices:

- Given the dished bottom of the 200-series tanks, a depth of less than 5 in. (measured from the center of the tank) is less than 30 ft³ at the bottom of the tank. (This does not include waste residuals on the tank walls or equipment.) At that depth an even waste surface would be 13.5 ft in diameter. An equivalent depth can also be determined for the 100-series dish-bottom tanks. This depth will vary with the size of the tank. The ENRAF measuring device may be used for flat bottom A and AX tank farm tanks (for sound tanks only, not leakers or suspected leakers).
ATTACHMENT A - GUIDANCE FOR RETRIEVAL PERFORMANCE AND LIMIT OF TECHNOLOGY EVALUATIONS (cont.)

- Another means of estimating depth is visibility of objects such as hoses on the tank floor. Three of four C-200 series tanks have a 4¾ -in. diameter hose and a 5¾ in. diameter hose stretching across the tank floor. For estimating the size of waste piles, a flat disk 1 ft across and 2 in. high contains 0.131 ft$^3$.

- The retrieval system performance efficiency is less than or equal to ten percent of the initial performance and only a small amount of waste is retrieved in the batch vessel with little or no measurable change after consecutive batches (retrieval team judgment).

- Alternate system configurations and process modifications have been considered to enhance performance. This does not include previously approved changes in the retrieval method documented in tank waste retrieval work plans.

- Standing liquids/solids have been vacuumed to the limits of the Articulate Mast System (AMS).

- Significant deposits of waste have been scarified with the high-pressure jet.
ATTACHMENT B - RETRIEVAL REPORT OUTLINE

(Italics identify general content, except for tank number, the introduction should not be changed. See C-106 completion letter [CH2M-0301487.2] for an example of the types of information to include in this report)

COVER PAGE: Single-Shell Tank Retrieval Evaluation Form

1.0 INTRODUCTION

This Retrieval Report documents the completion of retrieval operations undertaken on the single-shell tank 241-X-XXX. This Retrieval Report provides a summary of technical information upon which the decision to cease tank retrieval operations was based. In addition, this report is the mechanism by which WRPS asserts that the selected retrieval technology has reached its limit of technology and is in compliance with pertinent Hanford Federal Facility Agreement and Consent Order (HFFACO) (Ecology, EPA, and DOE 1997) milestone M-45-00 requirements related to operational retrieval goals. This Retrieval Report is being submitted to the Department of Energy, Office of River Protection as formal notification that tank 241-C-203 retrieval operations are considered complete.

The specific HFFACO retrieval goals are that as much waste as technically possible was retrieved (limits of technology) or that no more that 30 cubic-feet of residual waste was left in the tank, whichever is less. If these retrieval goals cannot be attained, the HFFACO, Appendix H, process can be invoked. The Appendix H establishes a process whereby an exception to the retrieval goals can be obtained.

The scope and contents of this tank 241-X-XXX Retrieval Report are consistent with the Single-Shell Tank Retrieval Completion Evaluation procedure (TFC-ENG-CHEM-P-47, Rev A). This report provides retrieval performance data at a field engineering level of development that demonstrates retrieval goals have been met. This report also provides an overview of pre-retrieval and post-retrieval conditions, references other supporting documents that assisted in the determination that the limit of the technology has been reached, and includes a preliminary estimate of the residual waste volume (based on video observations and engineering judgment).

The Retrieval Report is the first step in a number of actions that will be necessary to obtain formal regulator concurrence that HFFACO goals relative to tank retrieval have been met and that subsequent actions can be initiated for proceeding with tank closure as specified in the respective RCRA closure document (RPP-13774, Single-Shell Tank System Closure Plan). Ultimately, information from this report will be combined with additional information in the Retrieval Data Report. The Retrieval Data Report, or an Appendix H exception report, will include a summary of the retrieval operation completion activities and results (information contained within this Retrieval Report), post-retrieval residual volume measurement and associated calculations, tank characterization of tank residual waste (Format IV sample analysis report), retrieval technology performance documentation, post-retrieval risk assessment, feasibility and viability of other available technologies, Leak Detection Monitoring and Mitigation monitoring and performance results, recommendations for further action and proposed schedules, and any additional data deemed relevant.
ATTACHMENT B - RETRIEVAL REPORT OUTLINE (cont.)

2.0  SYSTEM DESCRIPTION

This section describes the retrieval system at the end of retrieval and the physical limitations of the retrieval system (e.g., intake screen size, suction head, ability to reach walls, etc.). It describes operational methods utilized, configuration modifications and process changes implemented since initiation of retrieval and affect on retrieval performance.

2.1  Pre-Retrieval Condition
2.2  Process Description
2.3  System Improvements
2.4  Campaign Chronology

3.0  POST-RETRIEVAL CONDITION

Estimated ending waste volume, waste type (sludge/salt cake), waste in receiver tank, uncertainty, etc.

4.0  SELECTED RETRIEVAL PERFORMANCE RESULTS

Present data, trends, and analysis.

5.0  RETRIEVAL COMPLETION SUMMARY

Summarize the results and analysis and basis for stopping retrieval. If cost and/or exposure are considerations include discussion of these factors.

6.0  CONCLUSIONS/RECOMMENDATIONS

Does analysis support the conclusion that retrieval is complete or not (volume limit met and limit of technology reached)?

7.0  REFERENCES