DISTRIBUTION SHEET

To	From	Page 1 of 1
Distribution	Criticality & Radiological Analyses	Date 9/22/94
Project Title/Work Order		EDT No. 157941
CSER 91-003, Addendum 1, CSER for Postponed Retrieval of Three Container Sequences in the Burial Ground		ECN No. N/A

Name	MSIN	Text With All Attach.	Text Only	Attach./Appendix Only	EDT/ECN Only
SJ Altschuler	R3-01	X			
SL Bhatia	R3-01	X			
DR Bristol (4 copies)	R3-01	X			
T. Chiao	H4-64	X			
J. W. Daughtry	H4-64			X	
T. A. Demitruk	H5-36	X			
K. D. Dobbin	N2-32	X			
D. R. Duncan	H5-33	X			
D. E. Friar	R3-01	X			
J. L. Geiger	R3-01	X			
D. J. Hart	S2-42	X			
A. L. Hess	H4-64	X			
D. A. Himes	H4-64	X			
R. M. Irwin	T4-03	X			
K. M. McDonald	T4-03	X			
D. J. Meyers	T3-01	X			
E. M. Miller	H4-64	X			
D. B. Powell	T4-03	X			
C. A. Rogers	R3-01	X			
Central Files	L8-04	X			
O.S.T.I. (2)	L8-07	X			

DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.

ENGINEERING DATA TRANSMITTAL SEP 30 1994		STA 4 Page 1 of 2 1. EDT 157941	
2. To: (Receiving Organization) Distribution 3. From: (Originating Organization) Criticality & Radiological Analyses		5. Proj./Prog./Dept./Div.: Burial Grounds 6. Cog. Engr.: S. L. Bhatia	
4. Related EDT No.: N/A		7. Purchase Order No.: N/A 9. Equip./Component No.: N/A 10. System/Bldg./Facility: N/A	
11. Receiver Remarks: Transmittal of Addendum 1 to CSER 91-003		12. Major Assm. Dwg. No.: N/A 13. Permit/Permit Application No.: N/A 14. Required Response Date: N/A	
DATA TRANSMITTED			
(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.
1	WMC-SD-SQA-CSA-20377	0	S
CSER 91-003, Addendum 1			
Criticality Safety Evaluation			
Report for Postponed			
Retrieval of Three Container			
Sequences in the Burial			
Ground			
KEY			
Disposition (H) & (I)			
Reason for Transmittal (G)			
1. Approved 2. Approved w/comment 3. Disapproved w/comment 4. Reviewed no/comment 5. Reviewed w/comment 6. Receipt acknowledged			
APPROVAL DESIGNATOR (F)			
E, S, Q, D or N/A (see WMC-CM-3-5, Sec. 12.7)			
SIGNATURE/DISTRIBUTION (See Approval Designator for required signatures)			
Rea-son	Disp.	(J) Name	(K) Signature
1	1	Cog. Eng.	9-27-94 H4-64
1	1	Cog. Mgr.	9-27-94 H4-64
S. L. Bhatia			
9/29/94			
Env.			
Peer Review.			
18.			
19.			
Authorized Representative Date			
Cognizant Manager Date			
20. J. W. Daughtry 9-27-94			
21. DOE APPROVAL (if required) Ctrl. No. Approved Approved w/comments Disapproved w/comments			

RELEASE AUTHORIZATION

Document Number: WHC-SD-SQA-CSA-20377, REV 0

Document Title: CSER 91-003, Addendum 1

Release Date: September 30, 1994

* * * * *

This document was reviewed following the
procedures described in WHC-CM-3-4 and is:

APPROVED FOR PUBLIC RELEASE

* * * * *

WHC Information Release Administration Specialist:

Kara Broz
(Signature)

September 30, 1994
(Date)

JKE 9/30/94

SUPPORTING DOCUMENT		1. Total Pages 11
2. Title CSER 91-003, Addendum 1	3. Number WHC-SD-SQA-CSA-20377	4. Rev No. 0
5. Key Words Waste Retrieval, Burial Grounds, 55 Gallon Drums, Alpha Contamination, Corrosion, Drum Life APPROVED FOR PUBLIC RELEASE <i>Rmb 9/30/94</i>	6. Author Name: S. L. Bhatia <i>S. L. Bhatia</i> Signature Organization/Charge Code 8D150/E32216	
7. Abstract The restricted underground burial time of 20 years for galvanized drums and 18 years for painted drums was selected based on structural integrity analysis and the application of conservative criticality safety principles because there has been no established reliable real life behavior (corrosion) test. This addendum addresses the risks in postponing retrieval of three sequences of drums in the burial grounds. Analysis shows no inherent danger to postponing retrieval.		
8. PURPOSE AND USE OF DOCUMENT - This document was prepared for use within the U.S. Department of Energy and its contractors. It is to be used only to perform, direct, or integrate work under U.S. Department of Energy contracts. This document is not approved for public release until reviewed. PATENT STATUS - This document copy, since it is transmitted in advance of patent clearance, is made available in confidence solely for use in performance of work under contracts with the U.S. Department of Energy. This document is not to be published nor its contents otherwise disseminated or used for purposes other than specified above before patent approval for such release or use has been secured, upon request, from the Patent Counsel, U.S. Department of Energy Field Office, Richland, WA. DISCLAIMER - This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, nor any of their contractors, subcontractors or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or any third party's use or the results of such use of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof or its contractors or subcontractors. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.		10. RELEASE STAMP <div>OFFICIAL RELEASE BY WHC DATE SEP 30 1994 <i>STA 4</i></div>
9. Impact Level S		

ADDENDUM 1 to CSER 91-003

Title: CRITICALITY SAFETY EVALUATION REPORT FOR POSTPONED RETRIEVAL OF THREE
CONTAINER SEQUENCES IN THE BURIAL GROUND

Prepared by: S. L. Bhatia Date: 9/27/94
Engineer, Criticality and Radiological Analysis

Reviewed by: Tang Chiao Date: 9/27/94
Engineer, Criticality and Radiological Analysis

Approved by: J. M. Daugherty Date: 9-27-94
Manager, Criticality and Radiological Analysis

Approved by: C. Meyer for D. J. Hart Date: 9/29/94
Manager, Solid Waste Burial Ground Nuclear Safety

Introduction and Summary

The restricted underground burial time of 20 years for galvanized drums and 18 years for painted drums was selected based on structural integrity analysis and the application of conservative criticality safety principles because there is no established reliable real life behavior (corrosion) test data (References 1 through 4) on such 55 gallon standard drums buried under the environmental conditions at Hanford. Efforts have been made to establish data to support the extension of the design life of these drums (Reference 5). The data so far obtained suggest a drum lifetime of twice the current restricted value, but the body of data (References 6 and 7) is not enough to conclude this amount of time with certainty. This Criticality Safety Evaluation Report (CSER) Addendum establishes the technical basis for extending the underground storage time of only three drum sequences (Reference 4) in the Hanford waste burial grounds which expire soon (Attachment 1). The three drum sequences were originally scheduled for retrieval this year based on conservative assumptions about container lifetime in the burial ground, as described in CSER 91-003, "Criticality Safety Review for 1978-1990 Burial Ground Placements" (Reference 4).

MASTER

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

fr

Evaluation of the recent retrieval data (Reference 6) on physical contents of such containers and a corrosion study of the drums under the environmental conditions at Hanford burial grounds (Reference 6) show that these drums can remain buried without loss of integrity much longer than the restricted storage time without posing any safety concern. Based on this review, it is concluded that a conditional approval of extending the underground storage time by 5 years beyond the expiration date(s) of these three placements is justified. This amendment will permit the Pilot Scale Retrieval operations of the buried drums for integrity inspection, drum material corrosion behavior, and inspection and repackaging of TRU waste currently underway at Hanford to proceed and to be in compliance with the applicable Criticality Prevention Specifications.

System Description

A detailed description of the waste burial trenches is provided in CSER 91-003, section 2. A summary system description is given below, extracted from Reference 4:

There are several physically different storage environments of retrievable stored drums at Hanford, leading to differing expected corrosion rates in each separate environment. The environment of the drum clusters of concern in CSER 91-003 is that of an atmospheric environment. The drums are stacked two-to-four layers high on asphalt or gravel-base pads with plywood sheeting between layers, with a plastic tarp draping from the top of the stack covering the entire stack....

The CSER 91-003 (and its predecessors) assume a "design life" of 20 years (carbon steel) and 22.5 years (galvanized steel) for structural integrity of 55-gallon drums, and base the allowable burial time limit on drums for maintenance of critically safe geometry on those design lives. The drum "design life" was chosen from estimates of corrosion effects on drum integrity (Reference 2). The document recognizes, however, that the burial time limit may be increased as a result of drum integrity examinations (References 2, 5 and 6).

The visual examinations performed in 1981, 1982, 1983, 1988, and 1992 on drums in Burial Ground 4C, Trench 01, Module 1 (Reference 6) and current on going retrieval operations visual examination data (not yet completed) have shown no corrosion that would be expected to challenge the structural integrity of the drums during continued storage. Some exterior corrosion was evident, apparently severe at a few locking ring locations at the tops of drums, but the paint coating was intact over most of the drum surfaces (See Figure 1). The inspection performed by R. L. Morton disclosed only a maximum postulated corrosion rate of 1 mil per year (Reference 7). A summary of all drum corrosion studies up to 1992 (Reference 6) estimated 1 mil per year for general corrosion rates applicable to drums in underground atmospheric storage at Hanford. This rate, applied to a minimum wall thickness of 42 mils for 17H drums,

results in an estimated 40-year life (rounded from 42 for conservatism) for drums in such storage.

As a consequence of this discussion, one could infer much longer underground storage time for the standard drums than the stipulated time given in the applicable Criticality Prevention Specifications (CPSs).

In particular, this addendum considers the extension of underground storage time of three drum sequences so the schedule for retrieval may be implemented without facing nonconformance with the applicable CPS requirements. The three drum sequences in burial ground 04B, trench T07 are:

8 drums from PNL/303C
SWBR #s 770001-77008 (sic; as given in Reference 1, Appendix E)
Container #s 303C-77-1 through 303C-77-8

22 drums from PNL/303C
SWBR #s 770009-770030
Container #s 303C-77-9 through 303C-77-30

82 drums from WHC 234-5Z
SWBR #s 760442-760522
Container #s Z76-9-91 through -166

Special Requirements & Controls

The extension of the underground burial time/retrieval date analyzed in this addendum applies only to the three drum sequences specified. The extension is not applicable to any other sequence without further analysis.

This extension of the retrieval date must not be construed as a justification to delay the retrieval. The purpose of this analysis is to establish current compliance with the demands of safety in operations. The basic requirement for prompt retrieval is not waived.

Other controls related to monitoring and reporting of corrosion data are described below:

Monitoring Vents For Alpha Release -- Since the presence of alpha contamination could be an early indicator of drum deterioration, identify any alpha monitoring currently in use and evaluate its adequacy for monitoring potential of alpha contamination spread in vents, or provide scope of a new one. Frequency of monitoring is tentatively set at once per year.

Corrosion Data -- Compile Corrosion data on drums as the retrieval progresses so a good data base can support the 1 mil/year corrosion rate with certainty.

Periodic reports on the results of these monitoring efforts should be sent to CRA, so that results contrary to the assumptions of this analysis can be promptly evaluated and changes in the limits implemented if necessary.

Method of Analysis and Results

The drum lifetime estimate cited above (about 40 years) is based on a linear model of corrosion through the total wall thickness of the drum. The data so far obtained indicate that one could infer much longer underground burial time for drums at Hanford; however, the data are not sufficiently complete and analyzed to support the model with certainty. There are not yet extensive data to support the linear postulated near 1 mil per year corrosion rate for drums in trenches at Hanford; therefore, a conservative approach is prudent pending the gathering of drum lifetime information based on in situ observation and measurement.

Solid Waste Operations will be retrieving drums as part of a demonstration project. As this project advances, more and more data on drum corrosion under actual storage conditions will become available to affirm or modify the current drum lifetime estimates. It is important to make use of this information promptly so that this CSER addendum can be revised if necessary. Therefore, as a condition for this addendum for postponement of removal of the three drum sequences from trench 4B, the following requirement is imposed:

Interim information about past and current retrieval operations will be reported promptly to CRA to provide a basis for re-analysis of the drum lifetime issue.

This control gives additional assurance that unexpected drum deterioration will be detected in time to allow retrieval before the array could collapse. However, the data on drum integrity will originate from drums in different trenches and conditions in these trenches could differ from the conditions in trench 4B in ways not yet identified or understood. A specific means of detecting drum deterioration in trench 4B has been identified:

Ventilation vents in trench 4B shall be monitored at least once per year for alpha contamination. If alpha contamination is detected, CRA shall be notified promptly.

Contingency Analysis

The contingency analysis reported in CSER 91-003 is not changed by this addendum.

Reviewer Comments

This addendum to CSER 91-003 was reviewed by Tang Chiao and comments were incorporated into the body of the addendum. Additional comments are as follows. It seems that the five year extension of the underground storage time granted by this analysis is adequate because of the support data from References 5 and 7. However, the waste corrosion data available to support the evaluation of the waste drums' integrity are limited and the data were taken before 1982. Therefore, better waste drum corrosion data are needed to support any additional extension of the storage time. I suggest that a

program to collect more corrosion data should be put in place and carried out within a year of the issuing date of this addendum.

References

1. Letter 72360-81-006, G. C. Oberg to D. E. Braden, "Structural Life of Buried Fissile Material Containers," dated January 13, 1981.
2. Letter 65430-81-021, D. E. Braden to G. C. Oberg, "Structural Life of Buried Fissile Material Containers," dated February 18, 1981.
3. CSAR 82-003, "Packing, Storage and/Or Disposal of Solid Wastes (Burial Containers And Uranic Burial," W. A. Blyckert 1982.
4. WHC-SD-SQA-CSA-20346, CSER 91-003, "Criticality Safety Review for 1978-1990 Burial Ground Placements," A. L. Hess, 1994
5. Internal Memo 87320-94-DRD-093, "Transuranic Drum Lifetime for Criticality Analysis," D. R. Duncan, Solid Waste Systems Engineering, August 2, 1994.
6. Report, D. R. Duncan et al., WHC-SA-1450FP, Revision 1, "Application of Service Examinations to Transuranic Waste Container Integrity at the Hanford Site," dated September 1993.
7. Report, L. Morton, RHO-SD-WM-TRP-002, "Inspection of Retrievable Stored Transuranic Waste Containers," dated March 1991.

FY1

Westinghouse
Hanford Company

ATTACHMENT A

Internal
Memo

From: Solid Waste Management Facility Engineering 87250-SWMFE-94-055
Phone: 376-9420 T4-03
Date: July 19, 1994
Subject: CRITICALITY SAFETY EVALUATION FOR RETRIEVABLY STORED 55 GALLON
DRUMS

To: J. W. Daughtry H4-64
cc: D. R. Duncan H5-33
R. J. Giroir T4-05
P. L. Hapke T4-05
A. L. Hess H4-64
R. M. Irwin T4-03
K. M. McDonald T4-03
D. J. Meyers T3-03
DBP:KMM File/LB

A recent Criticality Safety Evaluation Report (CSER), CSER 91-003, identified that a number of 55-gallon drums which are retrievably stored are nearing their design lifetime according to the current criticality prevention specification (CPS-SW-149-00003). The above report also states that the drums may be allowed to exceed their stated lifetime if further evaluation shows that drum integrity is sufficient to warrant such an extension.

We are confident that there is now sufficient evidence that drum lifetime is considerably longer than 20 years. Much of the data to support this has already been presented to A. L. Hess and S. L. Bhatia of your staff. Further information and background data is available from D. R. Duncan, 372-1013.

Solid Waste Management Facility Engineering requests that Criticality and Radiological Analyses evaluate the current information with the intent to extend the lifetime of retrievably stored drums as much as is practical. Please issue this evaluation as an addendum to CSER 91-003. Internal work order E32216 has been issued in the amount of \$5,000 to perform this work.

D. B. Powell
Manager

sag

[213] From: Robert M (Mat) Irwin at -WHC228 8/24/94 12:22PM (3876 bytes: 63 ln)
To: Sunder L Bhatia at -WHC83, Denelle E Friar at -WHC83
cc: Darrel R Duncan at -WHC274, Donald J Meyers at -WHC110, Dean B Jr Powell,
James W Daughtry at -WHC276, Kent M McDonald
Subject: 55-Gallon Drum life extension

----- Message Contents -----

Per our meeting on August 23 concerning extending the drum life of 55-gallon transuranic drums stored for retrieval, I am sending this message to provide the information you requested.

The placements with the highest priority for extension are discussed in WHC-SD-SQA-CSA-20346 (CSER 91-03), and are listed in Appendix E of the document. The table in Appendix E lists those clusters of drums which need to be retrieved per the CPS time limit due to the high fissile concentration of the cluster. The first cluster to reach the current 18 year limit is sequence number 3 which is located in burial ground 218-W-4C, trench 7. The date of burial for this cluster is September 1 to 10 of 1976, so the 18 year limit is reached in September of this year. Obviously this is the highest priority cluster. The next highest priority clusters are located in the same trench with due dates of September 1995 for their 18 year limit. These clusters are identified as sequence 1 and 2 in Appendix E. Since this drum life extension is an ongoing process, it would be best to start with the soonest cluster of concern and then continue with all the possible clusters identified in Appendix E until that time when we are able to redefine the 55-gallon drum life within retrievable storage for all 55-gallon drums. As you can see the deadline for the first cluster is fast approaching so we need to perform the analysis at the fastest possible pace. I will be happy to discuss a specific schedule if that will help.

On the question of provisions for the 5 year extension. One provision discussed is annual monitoring of the riser pipes for the locations in question. What specific monitoring needs to be performed and what action levels need to be established? SWM has the ability to monitor for combustible gases and organic vapors, but how would you like that information to be used in regards to criticality concerns?

The current pilot TRU retrieval project has taken some ultrasonic drum thickness measurements within burial ground 218-W-4C, trench 1 which should support the drum extension. Each drum analyzed has 16 measurements on the sides, 4 on the lid and 4 on the bottom. For the first 14 complete drums and 3 partial drum measurements, the average thicknesses are as follows:

Side average	.053 inches
Minimum	.046 inches
Top average	.061 inches
Minimum	.056 inches
Bottom average	.054 inches
Minimum	.045 inches

These drums were procured with a nominal thickness of .0598 inches and a minimum thickness of .0533 inches. As additional data becomes available I will forward it to you. If you have any additional questions or comments, feel free to let me know.

Thanks,

Mat Irwin 3-5424

[215] From: Robert M (Mat) Irwin at -WHC228 8/25/94 9:52AM (4210 bytes: 74 ln)
To: Sunder L Bhatia at -WHC83, Denelle E Friar at -WHC83, Darrel R Duncan at
-WHC274

Subject: 55-Gallon Drum life extension

----- Message Contents -----

I was notified that I have a couple errors in this original message. The first clusters burial ground location is actually 218-W-4B and not what I indicated in the original message. The correct location is discussed in Appendix E. I wanted to send you another quick message to be sure I did not cause confusion.

Thanks,

Mat Irwin

Per our meeting on August 23 concerning extending the drum life of 55-gallon transuranic drums stored for retrieval, I am sending this message to provide the information you requested.

The placements with the highest priority for extension are discussed in WHC-SD-SQA-CSA-20346 (CSER 91-03), and are listed in Appendix E of the document. The table in Appendix E lists those clusters of drums which need to be retrieved per the CPS time limit due to the high fissile concentration of the cluster. The first cluster to reach the current 18 year limit is sequence number 3 which is located in burial ground 218-W-4C, trench 7. The date of burial for this cluster is September 1 to 10 of 1976, so the 18 year limit is reached in September of this year. Obviously this is the highest priority cluster. The next highest priority clusters are located in the same trench with due dates of September 1995 for their 18 year limit. These clusters are identified as sequence 1 and 2 in Appendix E. Since this drum life extension is an ongoing process, it would be best to start with the soonest cluster of concern and then continue with all the possible clusters identified in Appendix E until that time when we are able to redefine the 55-gallon drum life within retrievable storage for all 55-gallon drums. As you can see the deadline for the first cluster is fast approaching so we need to perform the analysis at the fastest possible pace. I will be happy to discuss a specific schedule if that will help.

On the question of provisions for the 5 year extension. One provision discussed is annual monitoring of the riser pipes for the locations in question. What specific monitoring needs to be performed and what action levels need to be established? SWM has the ability to monitor for combustible gases and organic vapors, but how would you like that information to be used in regards to criticality concerns?

The current pilot TRU retrieval project has taken some ultrasonic drum thickness measurements within burial ground 218-W-4C, trench 1 which should support the drum extension. Each drum analyzed has 16 measurements on the sides, 4 on the lid and 4 on the bottom. For the first 14 complete drums and 3 partial drum measurements, the average

thicknesses are as follows:

Side average	.053 inches
Minimum	.046 inches
Top average	.061 inches
Minimum	.056 inches
Bottom average	.054 inches
Minimum	.045 inches

These drums were procured with a nominal thickness of .0598 inches and a minimum thickness of .0533 inches. As additional data becomes available I will forward it to you. If you have any additional questions or comments, feel free to let me know.

Thanks,

Mat Irwin 3-5424