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Project Title/Work Order:

Hot Sample Archiving - WHC-SD-W079-ES-001, Rev. 3

EDT No.: | ECN No.: 166046

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ENGINEERING CHANGE NOTICE

1. ECN 166046

Proj. ECN

2. ECN Category (mark one)	3. Originator's Name, Organization, MSIN, and Telephone No.		4. Date
Supplemental [] Direct Revision [X] Change ECN [] Temporary [] Standby [] Supersedure [] Cancel/Void []	C. B. McVey, AS, H4-21, 372-0926		5/26/95
	5. Project Title/No./Work Order No.: Hot Sample Archiving/W-079	6. Bldg./Sys./Fac. No.: 222-S	7. Impact Level: ~~N~~ N/A
	8. Document Numbers Changed by this ECN (includes sheet no. and rev.): WHC-SD-W079-ES-001, Rev 2	9. Related ECN No(s.): N/A	10. Related PO No.: N/A

11a. Modification Work	11b. Work Package No.	11c. Modification Work Complete	11d. Restored to Original Condition (Temp. or Standby ECN only)
[] Yes (fill out Blk. 11b) [X] No (NA Blks. 11b, 11c, 11d)	N/A	N/A Cog. Engineer Signature & Date	N/A Cog. Engineer Signature & Date

12. Description of Change

Change includes removal of PNL's 325 facility as an option due to funding limitations, uses actual data from September of 1994 to calculate a 85% capture rate senario and includes the latest TWRS sample schedule using a 100% capture rate. The entire document was revised to incorporate these items.

13a. Justification (mark one)							
Criteria Change	[X]	Design Improvement	[]	Environmental	[]		
As-Found	[]	Facilitate Const.	[]	Const. Error/Omission	[]	Design Error/Omission	[]

13b. Justification Details

Future sample archiving has been eliminated at PNL's 325 facility due to funding constraints. Utilizing this information new calculations were performed to determine the impact on the 222-S facility if all samples taken were to be archived at the facility. The calculations confirmed that the facility has the capacity to handle the archiving of the TWRS samples.

14. Distribution (include name, MSIN, and no. of copies)

See attached distribution sheet.

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1. ECN (use no. from pg. 1): 166046

15. Design Verification Required	16. Cost Impact				17. Schedule Impact (days)	
	ENGINEERING		CONSTRUCTION			
[] Yes	Additional	[] $ N/A	Additional	[] $	Improvement	[] N/A
[X] No	Savings	[] $	Savings	[] $	Delay	[]

18. Change Impact Review: Indicate the related documents (other than the engineering documents identified on Side 1) that will be affected by the change described in Block 12. Enter the affected document number in Block 19.

SDD/DD	[]	Seismic/Stress Analysis	[]	Tank Calibration Manual	[]
Functional Design Criteria	[]	Stress/Design Report	[]	Health Physics Procedure	[]
Operating Specification	[]	Interface Control Drawing	[]	Spares Multiple Unit Listing	[]
Criticality Specification	[]	Calibration Procedure	[]	Test Procedures/Specification	[]
Conceptual Design Report	[]	Installation Procedure	[] N/A	Component Index	[]
Equipment Spec.	[]	Maintenance Procedure	[]	ASME Coded Item	[]
Const. Spec.	[]	Engineering Procedure	[]	Human Factor Consideration	[]
Procurement Spec.	[]	Operating Instruction	[]	Computer Software	[]
Vendor Information	[]	Operating Procedure	[]	Electric Circuit Schedule	[]
OM Manual	[]	Operational Safety Requirement	[]	ICRS Procedure	[]
FSAR/SAR	[]	IEFD Drawing	[]	Process Control Manual/Plan	[]
Safety Equipment List	[]	Cell Arrangement Drawing	[]	Process Flow Chart	[]
Radiation Work Permit	[]	Essential Material Specification	[]	Purchase Requisition	[]
Environmental Impact Statement	[]	Fac. Proc. Samp. Schedule	[]		[]
Environmental Report	[]	Inspection Plan	[]		[]
Environmental Permit	[]	Inventory Adjustment Request	[]		[]

19. Other Affected Documents: (NOTE: Documents listed below will not be revised by this ECN.) Signatures below indicate that the signing organization has been notified of other affected documents listed below.

Document Number/Revision	Document Number/Revision	Document Number Revision
N/A		

20. Approvals

Signature	Date	Signature	Date
OPERATIONS AND ENGINEERING		ARCHITECT-ENGINEER	
Cog Engineer CB McVey CB McVey	5/23/95	PE	
Cog. Mgr. SM Joyce Steven M Joyce	5/23/95	QA	
QA		Safety	
Safety		Design	
Security		Environ.	
Environ.		Other	
Projects/Programs			
Tank Waste Remediation System			
Facilities Operations		DEPARTMENT OF ENERGY	
Restoration & Remediation		Signature or Letter No.	
Operations & Support Services			
IRM		ADDITIONAL	
Other			

RELEASE AUTHORIZATION

Document Number:	WHC-SD-W079-ES-001, Rev. 3
Document Title:	HOT SAMPLE ARCHIVING
Release Date:	5/25/95

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

APPROVED FOR PUBLIC RELEASE

WHC Information Release Administration Specialist:

Chris Willingham

C. Willingham 5/25/95

SUPPORTING DOCUMENT

1. Total Pages 113 ~~234~~

2. Title	3. Number	4. Rev No.
HOT SAMPLE ARCHIVING	WHC-SD-W079-ES-001	3

5. Key Words

SAMPLE ARCHIVING
222-S
325
TANK WASTE CHARACTERIZATION

6. Author

Name: C. B. McVey

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Signature

Organization/Charge Code 75721/Y117C

7. Abstract

This Engineering Study revision evaluated the alternatives to provide tank waste characterization analytical samples for a time period as recommended by the Tank Waste Remediation Systems Program. The recommendation of storing 40 ml segment samples for a period of approximately 18 months (6 months past the approval date of the Tank Characterization Report) and then composite the core segment material in 125 ml containers for a period of five years. The study considers storage at 222-S facility. It was determined that the critical storage problem was in the hot cell area. The 40 ml sample container has enough material for approximately 3 times the required amount for a complete laboratory re-analysis. The final result is that 222-S can meet the sample archive storage requirements. During the 100% capture rate the capacity is exceeded in the hot cell area, but quick, inexpensive options are available to meet the requirements.

8. RELEASE STAMP

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RECORD OF REVISION	(1) Document Number WHC-SD-W079-ES-001	Page 1

(2) Title
HOT SAMPLE ARCHIVING

CHANGE CONTROL RECORD

(3) Revision	(4) Description of Change - Replace, Add, and Delete Pages	Authorized for Release	
		(5) Cog. Engr.	(6) Cog. Mgr. Date
0	(7) Initial Release 1/29/93		
1	Rev 1 - Replace entire document with new revision per ECN 166025	Signed 12/17/93	Signed 12/17/93
2	Rev 2 - Replace entire document with new revision per ECN 166039	Signed 6/30/94	Signed 7/11/94
3 RS	Rev 3 - Replace entire document with new revision per ECN 166046	C B Mcvey C.B. McVey	SM Joyce 5/23/95 Steven M. Joyce

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EXECUTIVE SUMMARY

Revision 3 updates the needs for sample archiving from revision 2 (11/94). Input from Environmental, Tank Waste Remediation Systems (TWRS), Liquid Effluents, Spent Nuclear Fuels and Solid Waste programs was requested and only Liquid Effluent responded. Information from the latest sample schedule was used for TWRS and the latest input from the other programs was used assuming no change.

The recommendation of this engineering study is that the existing 222-S facility, with modifications, can meet the hot sample archiving requirements. These modifications require minimal time and funding. Solutions may be as simple as not compositing samples into 125 ml containers, providing additional casks or storage boxes, assigning an analytical cell in room 11A for the purpose of short term archiving or placing samples in shielded casks and storing them in room 2E.

Archive samples which have been received since September of 1994 reflects a trend that approximately 15% of the samples taken to date do not have sufficient material for archiving. This is due to less than 100% sample recovery. As of May 15, 1994, 234 samples were planned to be archived from samples received, but only 198 are in archive storage, which is a 15% reduction.

Sample integrity cannot be maintained on tank waste samples stored for an extended period of time. Water and organics are examples of sample constituents which cannot be maintained. The TWRS Data Quality Objectives will establish the requirements (technical basis) for sample storage. The primary usa of stored tank waste samples is anticipated for pretreatment/disposal process development support activities.

These findings are based on a letter report from TWRS (Bratzel 1994). The letter report defines the TWRS requirements, the quantity and schedule of the cores to be received by the laboratories. Other programs have indicated that hot sample archiving space is not required in the anticipated future. Due to the changing requirements of the different programs, this document will be readdressed on a yearly basis.

1.0 OBJECTIVE

1.1 BACKGROUND AND SCOPE

Background:

The Hanford Site contains storage and disposal facilities for varied waste substances generated over its years of operation. These waste facilities include cribs, ponds, ditches, trenches, single shell tanks (SSTs), and double shell tanks (DSTs). Some of these facilities are inactive, meaning that waste material is not being added to or taken from the facilities. Other facilities are active and waste material is being added to, or transferred from these sites. The radioactivity levels range from being undetectable to several hundred Rad/hr, and the majority of the waste contains hazardous constituents as defined in the Washington State Department of Ecology (WDOE) Dangerous Waste Regulations, Chapter 173-303 of the Washington Administrative Code (WAC).

Some of the above sites are being closed or have completed closure and other sites are in the process of having the waste retrieved for volume reduction or stabilization. The retrieval process will eliminate many active storage sites and thus convert these sites to areas that will require closure per Resource Conservation and Recovery Act (RCRA) statutes. The stabilization process may be accomplished by the vitrification which will produce concentrated and stabilized waste forms that are totally contained in a manner to prevent migration to the environment.

A requirement of the closure process and the retrieval operations is the sampling and analysis of the ground water, subsurface soils and waste material to be processed for treatment. The sampling and analysis will provide a basis for determining the effectiveness of the closure process, establishment of background concentrations, characterization of storage sites requiring treatment and supporting the treatment activities. These samples require a holding period until the results of the analysis have been verified and approved. A portion of these samples may require a longer archiving period if determined by the customer for purposes of further testing or for use in future process development testing.

Scope:

This study investigated the requirements and need for storing waste material samples greater than 1 mr/hr as described above. Samples of 1 mr/hr and less will be archived at the Waste Sampling and Characterization Facility Cold Environmental Sample Archive building. Samples greater than 1 mr/hr may be stored at the 222-S prior to analysis and may be held for a period agreed to by the laboratories and their customers. The archiving of selected samples may obviate the need for costly retrieval of specimens in the future if additional analysis is required.

TANK WASTE REMEDIATION SYSTEMS (TWRS)

Waste Tank Safety Programs:

Core samples are tank waste materials retrieved from defense waste storage tanks. They consist of 48.26 centimeters (19 inch) segments obtained either currently by the Push Mode Retrieval System or by the Rotary Mode Retrieval System in the future. Tank waste core composite samples are constructed from homogenized fractions of the tank waste segments. Additionally, stratification layers exist in many tanks and composites can be constructed from the homogenized segments of this material (Bratzel 1994). The archiving of these core samples will allow further analyses at a future date without the need of repeating costly and labor intensive retrieval of tank waste samples. These tank waste samples can be a valuable resource for laboratory-scale process development work (Bratzel 1994). In addition, auger and grab samples will be retrieved and processed as required by the customer.

Pretreatment Technology:

The Pretreatment Technology (PT) program requests that all tank waste samples be saved until the reports of the analyses has been distributed and interested programs have had adequate time to verify that they have their program's required information. A need for large tank waste samples for laboratory process testing on the order of three hundred (300) grams is perceived. Additionally, PT has plans to take fifty (50) liter samples from the tanks for use in processing testing. Storage facilities for this will need to be developed if this perceived need is found justifiable.

Pretreatment has identified requirements for 100 ml composite from segments from selected tanks. These requirements will be identified in the Data Quality Objectives (DQO's). The core sampling schedule will be managed with intentions of having the pretreatment identified tank cores delivered to the 222-S facility. The requirements for the 100 ml composite from segments will be completed as the DQO requests. Once the DQO's have been finalized, this study will readdress the pretreatment requirements for impacts to the sample archive space projections for the 222-S facility.

Vitrification:

Vitrification has identified that access to tank waste core samples would be beneficial. The core sample schedule will have to be revisited yearly until the vitrification process is defined.

ENVIRONMENTAL RESTORATION PROGRAM

Remedial Investigation/Feasibility Samples:

The archiving of samples will not be required by Remedial Investigation/Feasibility Study (RI/FS) Work Plans currently being proposed, or which have been approved by the regulatory agencies.

SOLID WASTE PROGRAM

Projection of archiving requirements for the Solid Waste Program has not been considered for this study. Insufficient information is available at this

time which can be used for projections. The programs requirements will have to be addressed during the next revision to this document.

SPENT FUELS

Projection of archiving requirements for the Spent Fuels Program was not considered for this study. Information was requested, but none was received at this time which could be used. The programs requirements will have to be addressed during the next revision to this document.

LIQUID EFFLUENTS

No sample archiving space is required by the Liquid Effluent Program.

1.2 PURPOSE AND NEED

This study identifies the requirements for archival of samples from the retrieval of waste from single shell and double shell tanks and the environmental monitoring of other facilities, which is a statutory requirement of RCRA and Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) law. This study evaluates the need for a storage and archiving facility for waste samples used to characterize waste tank in-core hot samples. This study does not address waste samples from sites that have been stabilized, RCRA closed or been determined to be CERCLA sites as these samples are generally less than 1 mr/hr and do not require archiving as high level samples.

These waste samples are currently stored in hot cells in the 222-S and 325 Laboratories. This, however, is a very inefficient use of facilities that were constructed to perform waste analysis. Some samples were stored in the pipe tunnels in the basement of the 222-S Laboratory. However, considerable shielding was required to minimize the radiation background level in the laboratory counting rooms. Unsatisfactory shielding endeavors soon led to the abandonment of this location as a hot sample storage location.

Presently hot cell 1E1 in the 222-S Facility is being used for informal sample storage and this unit is full to capacity. To utilize this space for which it is intended, these samples may be placed in "casks" and stored in another room. These solutions do not solve the space problem, but just move it from one area of 222-S facility to another. With the increased demand on sample archiving for single shell tanks, double shell tanks, and other programs, sufficient space must be readily available to store these samples for a number of years.

With the best available information received from the different Programs, estimates were projected for archiving needs for the site. The Tank Waste Remediation System Division (TWRS) provided the most significant information and requirements (Valenzuela 1994). Calculations utilizes the proposed cycles provided by TWRS. Due to the uncertainty of the projected schedule for core sampling, all calculations utilize calendar quarters (Quarter 0...48), to show time frame that cores are received rather than being based on specific calendar dates. Samples have been archived during September 1995 through April 1995, actual values were used for quarter 0 through 3 for the purpose of this study.

The laboratories shall archive segments, core composites and facies as required by the customer. After the six month waiting period if enough core composite material is available (~60 grams), the segments and facie will be disposed of as waste. The archive sample will be the core composite that was prepared initially for the analyses that was performed for the customer. If insufficient sample material is available in the core composite, a sample will be composited into a 100 ml container. Insufficient samples will be considered to be less than 60 grams.

The 40 ml core composite will be saved after the six month waiting period if it has a minimum of 60 grams of material. If this cannot be accomplished, the segments and facie shall be used to prepare a core composite which shall be stored in 100 ml container. The six month waiting period shall begin after the Tank Characterization Report (TCR) has been approved. The core composites for each tank will not be combined or will core composites from several tanks. Only segments from a core shall be composited.

Tank waste core segment samples will be stored segregated for a period of 18 months in 40 ml (~60 grams) per segment, core composite and facie. After the TCR has been approved and a six month waiting period has elapsed with no requests for reanalysis, the samples will be composited into 100 ml containers for storage for a period of five years (Valenzuela 1994). During this five year period the Process Technology, Pretreatment, and Vitrification programs are anticipated to have clearly defined their needs and can utilize the composited tank samples.

Grab samples and auger samples will be taken frequently and will be archived as well. Both the grab and auger samples, after data approval, will be composited into 100 ml containers and stored for a period of six months.

The Department of Energy (DOE) has recognized this archiving space problem in a Memorandum in May of 1991 (transmitted as 91-TFPO-218), which directed Westinghouse Hanford Company (WHC) to develop appropriate long term archiving facilities. Plans to archive samples for a year were considered inadequate.

Further justification for archiving tank waste cores, besides the cost involved for re-sampling, is the radiological safety concerns that accompany tank farm operations. Normal operations for obtaining core samples require installation and removal of the sampling apparatus. This operation requires entering the tank with sampling equipment, which has the potential for exposure to tank waste chemical vapors and radioactive liquids. Containment is renewed once the sampling apparatus is installed and becomes a closed system. The personnel must be aware of the potential safety risks associated with this operation. Archiving samples minimizes waste tank core sampling.

2.0 SUMMARY

2.1 222-S LABORATORY

The 222-S Laboratory provides analytical services to the operating plants and programs at the Hanford site. As required by analytical methods, a portion of the samples are saved until the analytical data is verified and approved as acceptable. This time frame varies from several weeks to several months depending on the type and number of analyses performed on the samples and the data package required for verification. The 222-S facility was not designed to perform the function of sample archiving, but due to current program needs, it has become essential to provide this service to its customers on a limited basis. This is being accomplished by dedication of hot cell space for hot samples and room 2E for storage of low level samples and shielded casks containing high level samples. It is estimated that approximately 34 percent of waste tank characterization samples analyzed in the 222-S facility can be stored in room 2E as low level samples. The remaining 66 percent will require high level storage.

TWRS has provided criteria for storage requirements for sample archiving of the tank waste samples (Valenzuela 1994). TWRS will require storage of these samples in 40 ml containers for a period of 18 months (or six months after TCR approval) for the majority of their samples and then they will be composited into 125 ml containers for a period of five years. An option of an additional 5 years may be requested for certain composites if the Pretreatment and Retrieval process is still undefined at the end of the storage period.

Room 2E is located on the main floor of the 222-S facility on the north side of the building. It is approximately 160 square feet in area and contains shelving. Fifty percent of the shelving has been identified for other programs and will not be available for sample archiving of Waste Tank Characterization samples or vitrfication samples. Low level (less than 100 mR/L) samples will be stored in cans, with five 40 ml samples per can. Samples that are less than 200 mr/hr can also be stored in these containers since the majority of the samples have beta activity and the can offers sufficient shielding to reduce the levels to <100 mr/hr. Nine of these storage cans can be stored on one square foot of shelf space and there are eight shelves in room 2E. This configuration will allow storage for 1,440 low level 40 ml samples or 360 samples of 125 ml size.

Shielded casks are used for samples greater than 100 mR/L and can be stored in room 2E. A proposal to accommodate shielded casks in room 2E will provide space for 30 casks. Each cask can handle 10 containers of 40 ml samples, which will allow storage capability for 300 samples. This space of 300 samples is estimated as total contingency. It is estimated that the total available sample storage space for hot and cold samples, using the 40 ml samples, is 2640 total capacity. Temporary storage containers are being considered for additional storage space which may free up areas within the facility for storage of samples less than 100 mr/hr.

Existing hot cells are used to store high level (greater than 100 mR/L) samples. Currently there is space for 164 samples of 250 ml size in the existing hot cells in sample racks. This space is made up of a rack for fifty-six (56) 250 ml bottles and eight feet of hot cell space with capacity

for forty-eight (48) 250 ml bottles, and 30 shielded casks which can store two 250 ml bottles each.

A 40 ml bottle holds approximately three times the material required for a complete laboratory re-analysis. These samples will be stored for approximately 18 months before being placed in a 125 ml bottle with other samples as determined by TWRS customer.

The 222-S Facility presently is using 120 storage containers with 60 dedicated for archiving needs. A container will hold approximately 30 samples of the 40 ml size and 9 samples of the 125 ml size. The total calculated capacity is 3,600 samples of the 40 ml size or a total of 1,080 of the 100 ml size.

For the 100% capture rate case in quarter 14 through 16 (Figure 1), 1890 samples of the 40 ml size are required. For the 125 ml size, 1298 samples are required in quarter 26. During quarter 16 some of the samples will utilize the contingency space in room 2E for both the 40 ml and the 125 ml samples. From quarter 17 through 35 some 40 ml storage space becomes available for 100 ml storage as the 40 ml sample volume drops. Even with this available storage space, contingency space in room 2E will be required for storage of the excess 125 ml samples. A total space for 167 - 125 ml bottles will be required of the contingency space in room 2E, which will leave approximately 50% remaining contingency space in room 2E.

A capture rate for 85% was calculated using actual archive samples history against what was planned (Figure 2). Samples have been archived since September of 1994 in a hot cell in room 11A at the 222-S laboratory. As of May 15, 1995, 198 samples have been archived and the plan shows that a total of 234 samples should have been placed in archive storage. The difference of 36 samples is due to insufficient sample material available for archiving after the laboratory analysis is complete. This nine month track record shows an approximate 85% capture rate for archiving. For the 85% case, quarter 17 through 36 shows that space becomes critical for the 125 ml samples only, with 564 exceeding the storage capacity for 125 ml samples during quarter 26. This is offset by the 40 ml sample space availablilty during quarter 26 of 1800 spaces. It is assumed that this space for 1800 40 ml sample bottles relates into 600 spaces for 125 ml bottles. This will leave the 125 ml samples with a small reserve contingency.

FIGURE 1

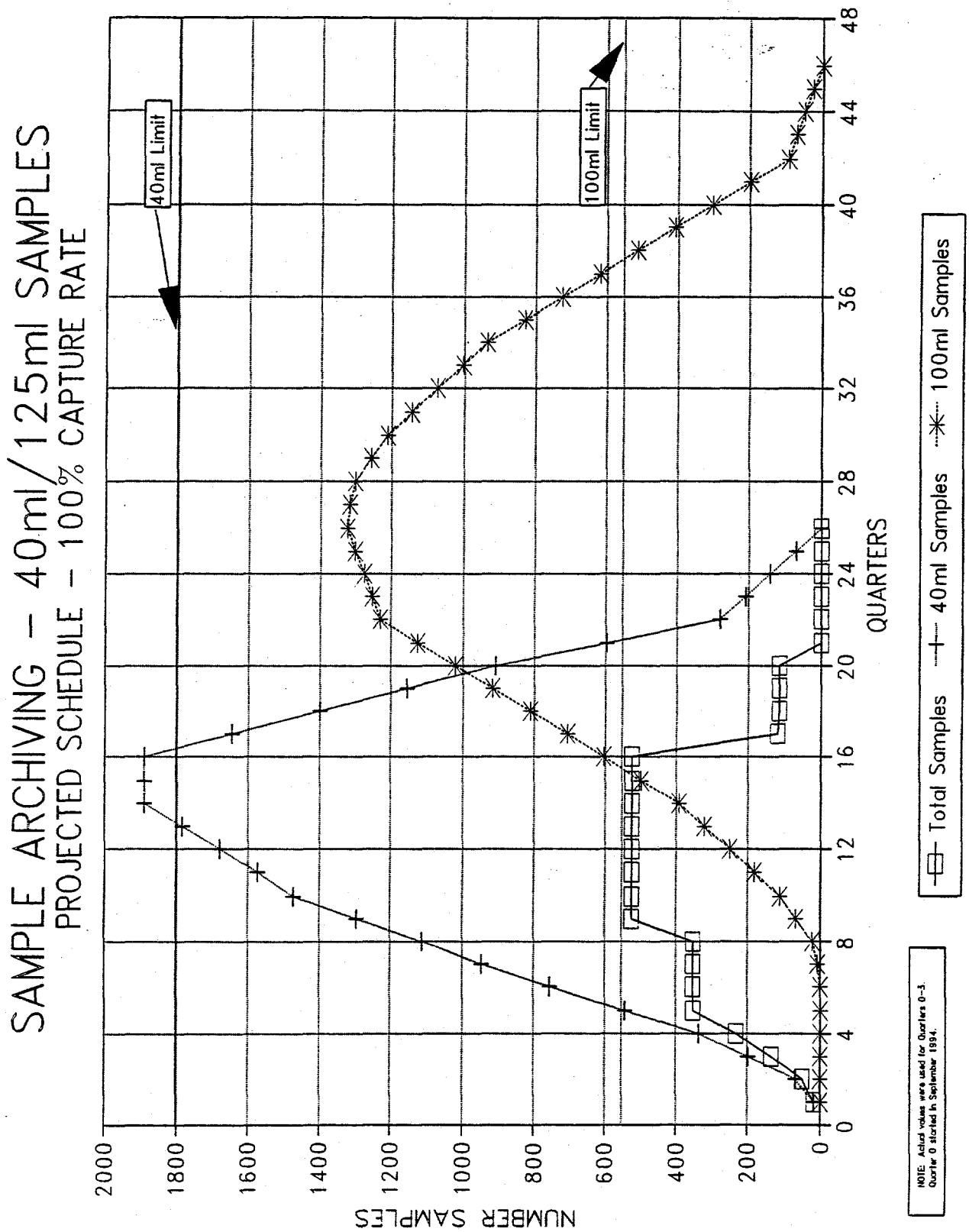
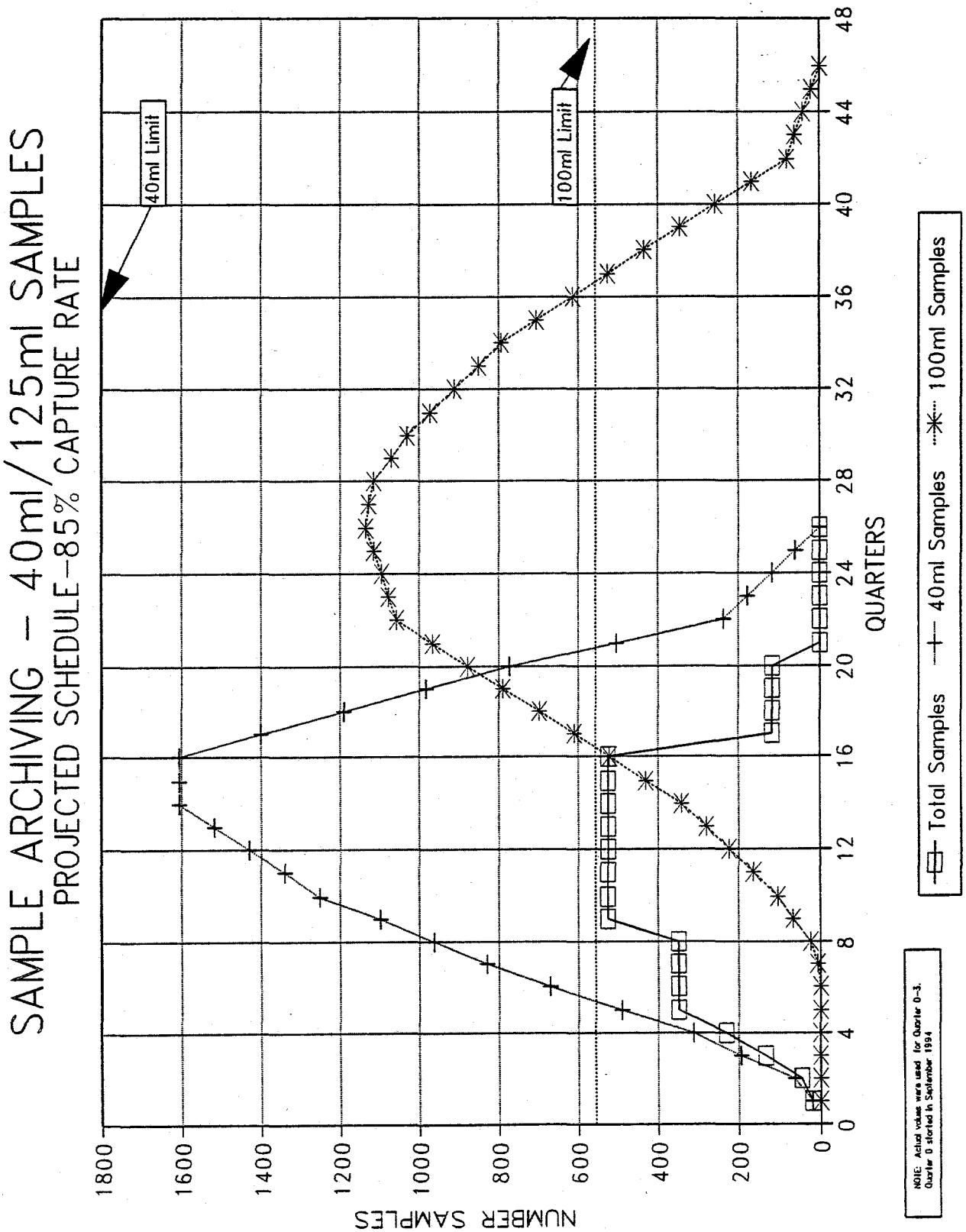

SAMPLE ARCHIVING - 40ml/125ml SAMPLES
PROJECTED SCHEDULE - 100% CAPTURE RATE
40ml Limit
100ml Limit
NUMBER SAMPLES
QUARTERS
Total Samples
40ml Samples
100ml Samples
NOTE: Actual values were used for Quarters 0-3. Quarter 0 started in September 1994.

FIGURE 2


SAMPLE ARCHIVING - 40ml/125ml SAMPLES
PROJECTED SCHEDULE-85% CAPTURE RATE
40ml Limit
100ml Limit
NUMBER SAMPLES
QUARTERS
0
200
400
600
800
1000
1200
1400
1600
1800
0
4
8
12
16
20
24
28
32
36
40
44
48
Total Samples
40ml Samples
100ml Samples
NOTE: Actual values were used for Quarter 0-3.
Quarter 0 started in September 1994

2.2 PACIFIC NORTHWEST LABORATORY

In the past, the Pacific Northwest Laboratory (PNL) has provided laboratory services to a variety of customers at the Hanford Site. Presently the funding for the analytical services provided by PNL is in question and a decision for the long term mission has not been made. PNL may continue as a research and development laboratory, but the services provided for archiving and storage may be suspended. If these services are terminated, then the samples in storage at the 325 facility will have to be sent to 222-S facility for continued storage, returned to the customer, or disposed of as waste. An inventory of legacy radioactive samples at PNL was made in February 1995 and is shown in Appendix B. If the decision is to move all or partial quantity of samples to the 222-S facility, then the archiving capacity at 222-S will need to be readdressed to determine the impacts. The magnitude of the problem is estimated to be approximately 700 additional samples along with larger material containers (drums, cores, etc.).

The High Level Radiation Facility (HLRF), or otherwise known as "A" hot cells, and the Shielded Analytical Laboratory (SAL) or "B" hot cells also provided space for the archive of samples. The HLRF provided process and development work for the HWVP facility Radioactive Process and Products Testing (RPPLT) samples. Storage of these materials, and those contained in the SAL, is necessary and may continue at the 325 facility.

2.3 OTHER FACILITIES

Section 5.3 discusses alternatives that were considered for this study. Alternatives covered such items as "do-nothing", new facility, use of closed facilities, additions and re-sampling vs. archiving. These alternatives were not considered viable for various reasons ranging from As Low As Reasonably Achievable (ALARA) to insufficient timing support for sample archiving loads. The best option selected was to use 222-S with the implementation of TWRS archive requirements and the change from 250-500 ml samples to 40 ml and 125 ml composited samples.

3.0 RECOMMENDATION AND CONCLUSIONS

3.1 RECOMMENDATIONS:

It is the recommendation of this study that Line Item Project funding not be pursued at this time. The cycle for a FY 1999 Line Item is too long to meet the critical storage needs in FY 1998-2004. A facility could be operational in FY 2002; this date does not provide storage capability when it is most needed. With the planned use of sample containers of 40 ml and 125 ml size for archive samples, rather than the larger 250-500 ml containers, the 222-S facility can meet sample archive storage requirements as forecasted with projected contingency as discussed in sections 2.1 and 2.2.

The recommendation from WHC-SD-WM-SD-011, Rev 1, "In-Process Hot Core Sample Storage Justification and Requirements" should be implemented. The storage time for tank waste characterization samples is 18 months for all sample segments, core composites and facies and five years for composites of tank samples. The storage time starts when the laboratory starts the analytical work on a sample. The time for the 125 ml composite samples will start six months after the TCR is approved (~18 months period) for the last 40 ml sample added to the composite. For Radioactive Process and Products Laboratory Testing (RPPLT) samples, a storage time of five years for washed solids, wash water, and supernate is recommended.

A sample archive bar-coding system is recommended to maintain control of the sample as required for chain-of-custody. This type of system will allow identification of the sample, location, radiation level, rotation schedule for the sample to be composited and when the sample has ended its archival life span. It is important to keep track of the schedule for rotation of the samples due to the laboratory's limited space. When a sample is due to be removed from sample archiving and identified as waste, this type of system will be able to notify the system operator that the time for removal has been reached, give location and type of sample. A bar-code system supports the permitting discussion in section 5.2.1. Samples are not considered wastes until after the archive period recommended or has been declared a waste by the customer.

Presently an inventory system is being used successfully, but should be reviewed periodically to determine if continued use will meet the customers and user's requirements for the future.

To successfully determine the length of time that a sample can be maintained as an archive sample and still be viable, will require an evaluation at the time of storage. Once the purpose of the sample is known and what it will be stored for, an evaluation can be given to determine the life expectancy the sample will have during archiving. It is recommended that samples be reviewed for continued retention beyond their normal retention schedule.

TWRS must also identify which samples are to be composited with which samples into 125 ml containers. This plan must be in place within 18 months of receipt of the first sample at the laboratory. It is the recommendation of this study that TWRS establish a plan by as soon as possible which identifies which samples will be composited. The laboratory will be required to notify the user of which samples are nearing the end of their 18 month storage and

are ready to be composited. This must be coordinated closely to ensure that samples are correctly composited and also identify at the end of the samples archive life when it will be designated as a waste. This designation is significant since it starts the 90 day clock for the final disposition of the sample as a waste.

It is recommended that the space requirements of the laboratories be revisited in one year's time (1996). The figures used in the development of this study are under constant change. Any change in the core sampling or vitrification schedule will affect the available storage space for archiving samples. These changes may be helpful or cause potential storage problems in the future. Other factors, such as having core samples shipped off site for analyses, may relieve the storage capability at 222-S laboratory. Also the samples that are stored at PNL's 325 laboratory that may be shipped to the 222-S facility for future archiving will have a major impact on these space requirements. These will have to be factored into the overall capability if they become viable options.

Presently the laboratories are using glass containers for sample storage. This type of container may not meet the customers criteria and may require a change in the type of container. A decision on the type of sample containers that should be used must be made at the earliest possible date to provide proper sample preservation during the sample archive life. This will require agreement with the customer and the laboratory for size and container material that will be compatible with the sample material. If a change in containers is required by the customer, it will be made at the earliest possible date to meet the customers needs.

Funding for operation and upkeep of the hot cells and archived samples will be required. Funding estimates include loading, unloading, compositing, waste costs, sample tracking, surveillance and reports. Funding in the amount of $300,000 per year will be required and shall be placed in the TWRS budget requests for the duration of the sample archiving schedule.

3.2 CONCLUSIONS:

3.2.1 222-S Laboratories

The results of this study supports the funded case for archiving samples >100 mr/hr and <100 mr/hr. However, if the 222-S archiving capacity is exceeded, several simple alternatives are available to overcome a temporary capacity shortage. These include making additional dedicated archiving boxes, storage of samples <100 mr/hr outside the facility in approved storage buildings, leaving samples in 40 ml and not compositing them, or assigning storage space in an analytical cell for a short period.

The current Waste Tank Characterization schedule reflects a peak period for sample archiving in quarters 14 through 16 for 40 ml samples and quarter 26 for 125 ml samples. The sample archive loading will put the greatest strain on the storage of archive samples at the Laboratories. The present capacity is estimated at the 222-S Facility to be approximately 3,600 40 ml samples or 1,080 125 ml samples using all 120 available boxes discussed in Section 2.1. The maximum case projection for 40 ml samples is estimated at 1890 samples and 125 ml samples is 1306 samples (Figure 1). Even with this type of projected

sample archiving loading, the 222-S Laboratories has sufficient capacity for storage of samples based on the requirements of WHC-SD-WM-SD-011, Rev 0, In-Process Hot Core Sample Storage Justification and Requirements (Valenzuela 1994). Additional contingency is available on an as needed basis at the 222-S facility.

4.0 UNCERTAINTIES

The information used to develop the sample schedules for the evaluations of this study are in a continuous development stage and may not be valid in future years. This information is developed with the best knowledge and judgment available at the time and factors such as weather, mechanical problems, work schedules, personnel shortages, lack of funding support and unknown higher priority tasks will affect these schedules.

Future changes and development of Federal and/or State Regulations may increase or decrease the need for sample archiving with respect to quantity and length of time for storage of the sample.

During the development of this study, levels of radiation for the samples were unknown. An assumption was made to support an evaluation of criteria (Appendix C). Any change in this assumption may increase or decrease the cost of alternatives of this study. Levels of radiation of the samples from the Single Shell Tanks and Double Shell Tanks can only be estimated at this time.

Adjustments of the priorities for the other Hanford Site sampling and analytical programs could also result in an acceleration or delay of the waste characterization programs. A larger portion of the 222-S Laboratory resources could be dedicated to the support of these changes and archiving space may be occupied or freed up.

The Hanford Site analytical planning is based on a leave/retrieve decision requiring full regulatory protocol for all waste characterization analyses. A full waste retrieval decision could eliminate the need for a complete characterization of the waste before treatment as required by Federal and Washington State hazardous and mixed waste regulations. This option could reduce the laboratory burden by as much as 25% for Single Shell Tanks alone. Other options, such as blending of the tank waste containing less than 150,000L (40,000 gal) of waste, could affect the quantity of samples required per tank.

Archive samples may not be viable for the analyses required for such characteristics as volatiles, short lived isotopes or other chemical characteristics which change with time. This is a very complex problem which deals with what the sample is to be saved for, how long, how much, what analysis, etc. Volatiles are probably the hardest characteristic to maintain for re-verification of an analysis (essentially impossible to re-duplicate). The next one is water content. Water tends to evaporate in a matter of days, therefore % water content would be very questionable for re-duplication after the initial determination. A new core sample may be needed, depending on the analysis requested, even with the availability of an archive sample. For the purpose of development testing the archive samples will be a valuable asset to eliminate the need for re-sampling.

It has been suggested to store samples in sealed containers. This may not be possible for radioactive samples due to the gas generation of the material unless a routine schedule is set for relief of the gas pressure or purchase of self venting. Problems have been experienced at the 222-S facility with sample having container lids which cannot be opened. This is either due to pressure build up within the container and/or crystallization of

material on the screw cap. These type of samples may require storage in vented containers to prevent gas buildup and over-pressurization of the container during storage. If storage containers need to be vented manually, a procedure will be required to maintain control of these samples. It has been found that storage of samples has resulted in the sample changing to a crystallized state over time. This sometimes renders the sample useless for re-analysis for the purpose of verification or duplication.

Some discussion has evolved recently about the storage container material (i.e. glass, metal, type of metal). Some types of containers cannot be used due to dissolution of container materials into the samples. This decision on the type of container to be utilized is a operational/user decision. It is the recommendation of this study that the decision of the type of container be made at the earliest possible date to insure proper sample protection during its archiving life.

The Interim Safety Basis (ISB) document for the 222-S facility has not been approved as of the release of this document. For the purposes of this study a worst case scenario was considered for the basis of sample archiving to maintain a Safety Class 3 facility. When the ISB is approved, this study will require to be briefly revisited to validate the number of samples that will be allowed within the facility. If the results provide less restriction, the study can be modified at the next scheduled revision.

5.0 DESCRIPTION OF ALTERNATIVES AND SOLUTIONS

5.1 CRITERIA:

The following general criteria have been developed from customer surveys of sample requirements and are used in evaluating the adequacy of the alternatives.

1) The maximum activity of any given sample will be 2R/hr at the surface of the container.

2) The maximum number of samples to be stored at any given time is estimated to be 1890 samples in 40 ml containers and 1306 composited samples in 125 ml containers.

3) The HWVP project will provide its own archival storage facility.

4) Refrigeration will be provided for 500 samples and the facility must have a temperature controlled environment suitable for personnel comfort.

5) The facility (if required) must be located near an analytical laboratory to allow laboratory personnel to retrieve samples from storage without transporting them in a vehicle.

6) The samples will contain hazardous constituents but the facility will not be a RCRA permitted facility per Environmental Protection Agency criteria. (40 CFR 261.4 Exclusions. (d) (1) (vi)).

(7) The Remedial Investigation/Feasibility Study work plans will not require archiving.

5.2 PERMITTING:

A sample archive facility, new or modification to existing facilities, will not be required to be permitted. Samples are what the laboratory uses to make their product. Until samples exceed the time required for them to be archived they are not considered waste. Samples are saved for the purpose of additional and future analyses. Samples which are collected for the sole purpose of testing to determine its characteristics or composition, are not dangerous wastes under chapter 173-303 Washington Administrative Codes (WAC) when handled in accordance with WAC 173-303-071 (3) (l). The sample will then fall under the "Treatability Study Sample" exclusion WAC 173-303 (3) (r) and (s) when it is decided to conduct a treatability study on the sample or set of samples. Permitting is not required if an archiving purpose can be demonstrated.

Once the storage period of the archive sample has ended per the archive plan, the sample then becomes waste and is subject to the 90-day rule. The facility will then be required to designate, label, package, and ship the waste within 90 days to prevent storage permitting from being imposed.

5.3 ALTERNATIVES:

5.3.1 Alternative 1 - Do Nothing

The "do nothing" option does not require any capital or expense funding. This option also does not address the need or requirement for archiving of samples. If a decision was made to return all of the samples to the customer and not archive samples beyond the normal period for verification of analyses and data approvals, no further modifications or new facilities would be required at the 222-S Complex. This decision would place the responsibility onto the customers to provide archiving space or re-sample if further information or characterization is required by other agencies. This option may require more capital and/or expense funding to provide multiple facilities if all customers decided to archive rather than re-sample when required.

This alternative also increases the possibility of exposure to core sampling personnel if re-sampling is required. During the core sampling process, the core sampling personnel are exposed to tank waste chemical vapors, radiation, and liquid residues.

5.3.2 Alternative 2 - New Facility

A "new facility" would require the expenditure of capital and expense funds. A new facility would provide relief of the space crunch at the 222-S facility. It would free hot cell space which could be put to better use and provide an organized sample archive inventory control system which would provide the "chain of custody" required.

A Fiscal Year 1999 Line Item would provide a new facility no earlier than 2002. This does not provide the space when it is needed in 1998-2004. A General Plant Project is not an acceptable solution since it would not provide sufficient space as required in the time frame needed. Therefore the cost of this option was not estimated.

5.3.3 Alternative 3 - Use Existing Facilities

This option would require the expenditure of expense funds to provide modifications to existing rooms or areas in existing facilities. Options that can be implemented are storage of samples in a shielded casks in room 2E, vial racks in hot cells which allows stacking or storage in "box" type containers in 222-S Facility. These options will provide archive storage space for 1,800 samples of the 40 ml size or 540 samples of the 100 ml size in the new hot cell space. This is sufficient to meet the requirements for archiving for the minimum funded case.

Use of hot cells at 324 and 325 buildings were not considered due to funding constraints. The use of the 324 building would have required packaging and transportation of samples. The 324 building does however, have the potential for further storage for an additional 800 samples. The 325 facility is capable of handling approximately 1800 samples of the 40 ml size or 450 samples of the 100 ml size, which is sufficient to meet to requirements of the Waste Tank Characterization and HWVP programs, if funded.

5.3.4 Alternative 4 - Use Closed Facilities

The 202-S (REDOX) facility is conveniently located adjacent to the 222-S Analytical Laboratory. It is currently classified and managed as a retired facility. Use of this facility would require RL Authorization, modification of existing or development of safety documentation, and facility modifications which will require expense and possibly capital funding. Storing archive samples in the new fabricated shielding casks being proposed is anticipated to cost an estimated $5.7M to implement.

The WESF facility has seven hot cells, which are either being used or plans are in place for their future use. Five of the cells are heavily contaminated with one of them currently being used for waste packaging. The other cells are scheduled to house the Truex Pilot Plant and Waste Form Certification.

The FMEF facility has numerous hot cells and archival facilities that have not been completed. Utilization of these premium cells for archival storage versus these other vital programs would be impractical. The FMEF facility Fuel and Assembly Storage Area provides another possible archival area. This area has the capability to store 301 fuel assemblies in seismically qualified storage and would be an ideal archival storage facility with some modifications to storage canisters for retrieval. Modifications to equipment, hot cells and/or storage areas would require capital funding. However, the FMEF facility is listed as a facility for decommissioning and not available for future use.

5.3.5 Alternative 5 - Add On to Existing Facilities

Add on to Existing Facilities - 222-S: This option would require the utilization of expense and capital funds to support a General Plant Project or a Line Item. As discussed in option 5.3.2, a GPP or LI does not sufficiently support the storage requirements in the years needed, therefore this option was not evaluated.

5.3.6 Alternative 6 - Re-sampling vs. Archiving

It is estimated that to re-sample a tank would require approximately $150,000 to $1,000,000 depending on type of sample (Grab vs. tank core samples). To date re-sampling has not been required. As Low As Reasonably Achievable (ALARA) is more of a concern than cost. The process required to re-sample a tank requires breaching containment of the tank for a period of time. This exposes the tank farm crew to tank waste penetrating radiation, chemical vapors, and liquid residues. The use of archive samples may eliminate the requirement of re-sampling if another analysis is required.

6.0 DISCUSSION OF PREFERRED ALTERNATIVE/SOLUTION

The preferred alternative is Alternative 3 which recommends the use of existing facilities. This alternative not only provides the required storage space, but does so for a expenditure of funds. The existing and new hot cells at 222-S have been modified to accept 40 ml and 125 ml bottles, and room 2E can be modified to accept storage canisters which can be stored on hooks on the walls. Space for the samples which do not require hot cell storage shall be identified at these facilities. Purchase of storage racks for the hot cells and shelving for the storage room will be required. Also purchase of new sample containers will be required if a decision is made to change from the present glass container. Procedures for compositing the 40 ml samples into 125 ml will be required prior to June 1995 to assure proper implementation of TWRS recommendations. TWRS will be required to identify which samples are to be composited to make up the 125 ml composite sample.

7.0 NO ACTION ALTERNATIVE

The No Action alternative offers the least expense or capital cost impact, but will not meet the archival storage needs for the various programs at the 222-S Laboratory. Samples will continue to be archived in the available hot cells without using wall space until there is no further storage capacity. This action will prevent the hot cells from being used for their primary function of sample preparation and analysis of samples greater than 100 mr/hr. For samples less than 100 mr/hr, archiving will continue until this space is full to capacity. When either of these areas become full, sample archiving of new samples will be severely impacted and may affect the sample throughput of the Laboratory.

A fiscal year 1997 General Plant Project (GPP) does not provide a solution to the storage problem due to the expected cost exceeding the $1.6M limit. A storage facility would require shielding, ventilation, and heating which are all cost intensive items. A fiscal year 1999 Line Item project would not be available until 2002 at the earliest and the shortage would end in 2003. Therefore a 1997 Line Item or a 1997 GPP is not recommended as a solution to the storage problem.

8.0 REFERENCE

Bratzel, D. R., 1994, *Archiving Requirements*, (internal letter 7E720-94-125 to S. M. Joyce, June 23), Westinghouse Hanford Operations, Richland, Washington

9.0 APPENDIX A

SAMPLE ARCHIVING DATA

SAMPLE PROJECTION CALCULATION METHOD

Several assumptions were made to do the calculations necessary for this study. The TWRS schedule for minimum and maximum cases was utilized for the receipt scheduling of core segments into the facilities. At the 222-S facility, 60 percent of the samples received would require storage in a hot cell. Samples that are less than 100 mr/hr will be stored outside the hot cell.

The results of these calculations were made by quarters with no assignment of dates attempted. This will allow for some changes in the sample schedule due to late starts, delays or outages without affecting the intent of the projections.

The following charts show the results of these calculations for 40 ml, 125 ml the combination of these results. To combine these results the 40 ml sample was calculated to be stored for 18 months at which time it will be composited with like tank material from other 40 ml samples. These composites were calculated to be stored in 125 ml. The 125 ml samples were calculated to be stored for a 5 year time period and then disposed of at the end of this period if not identified for further storage.

All samples were considered to contain their maximum amount of activity elements allowed. The majority of the samples less than 200 mr/hr were estimated to be due to beta and would be less than 100 mr/hr when placed in a container for storage. These can then be stored outside of a hot cell at the 222-S facility.

SAMPLE PROJECTIONS - 100% CAPTURE RATE (Continued)

SAMPLE ARCHIVING - PROJECTED SCHEDULE BY QUARTER - 100% CAPTURE RATE

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
TOTAL SAMPLES RECEIVED	*18*	*46*	*132*	231	350	350	350	350	525	525	525	525	525	525	525	525	117
40 ml SAMPLES >100 MR/HR	*18*	*46*	*132*	139	210	210	210	210	315	315	315	315	315	315	315	315	70
ACCUMLATIVE ARCHIVE TOTAL	*18*	*64*	*196*	335	545	755	947	1111	1294	1470	1575	1680	1785	1890	1890	1890	1645
100 ml SAMPLES >100 MR/HR	*0*	*0*	*0*	0	0	0	6	15	44	46	70	70	70	70	105	105	105
ACCUMLATIVE ARCHIVE TOTAL	*0*	*0*	*0*	0	0	0	6	21	65	112	182	252	322	392	497	602	707

ACTUAL VALUES SHOWN IN ITALICS

5/15/95

SAMPLE ARCHIVING - PROJECTED SCHEDULE BY QUARTER - 100% CAPTURE RATE

SAMPLE PROJECTIONS - 100% CAPTURE RATE (Continued)

18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
116	116	116	0	0	0	0	0	0											
70	70	70	0	0	0	0	0	0											
1400	1154	909	594	279	209	139	70	0											
105	105	105	105	105	23	23	23	23											
812	917	1022	1127	1232	1255	1278	1301	1325	1319	1303	1259	1213	1143	1073	1003	933	828	723	618

SAMPLE PROJECTIONS - 100% CAPTURE RATE (Continued)

SAMPLE ARCHIVING - PROJECTED SCHEDULE BY QUARTER - 100% CAPTURE RATE

38	39	40	41	42	43	44	45	46
513	408	303	198	93	70	46	23	0

5/15/95

SAMPLE PROJECTIONS - 85% CAPTURE RATE (Continued)

SAMPLE ARCHIVING - PROJECTED SCHEDULE BY QUARTER - 85% CAPTURE RATE

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
TOTAL SAMPLES RECEIVED	*18*	*46*	*132*	231	350	350	350	350	525	525	525	525	525	525	525	525	117
40 ml SAMPLES >100 MR/HR	*18*	*46*	*132*	118	179	179	179	179	268	268	268	268	268	268	268	268	60
ACCUMLATIVE ARCHIVE TOTAL	*18*	*64*	*196*	314	492	671	831	964	1100	1250	1339	1428	1517	1607	1607	1607	1398
100 ml SAMPLES >100 MR/HR	*0*	*0*	*0*	0	0	0	6	15	44	39	60	60	60	60	89	89	89
ACCUMLATIVE ARCHIVE TOTAL	*0*	*0*	*0*	0	0	0	6	21	65	105	164	224	283	343	432	521	610

SAMPLE PROJECTIONS - 85% CAPTURE RATE
(Continued)

SAMPLE ARCHIVING - PROJECTED SCHEDULE BY QUARTER - 85% CAPTURE RATE

18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
116	116	116	0	0	0	0	0	0											
59	59	59	0	0	0	0	0	0											
1190	981	773	505	237	177	118	59	0											
89	89	89	89	89	20	20	20	20											
700	789	878	967	1057	1076	1096	1116	1136	1130	1114	1070	1031	972	912	853	793	704	615	525

SAMPLE PROJECTIONS - 85% CAPTURE RATE
(Continued)

SAMPLE ARCHIVING - PROJECTED SCHEDULE BY QUARTER - 85% CAPTURE RATE

38	39	40	41	42	43	44	45	46
436	347	258	168	79	59	39	20	0

5/15/95

APPENDIX B

PACIFIC NORTHWEST LABORATORY
LEGACY SAMPLES

LEGACY RADIOACTIVE SAMPLES AND LABORATORY WASTE IN THE ANALYTICAL CHEMISTRY LABORATORY/325 BUILDING

Legacy Sample Materials:

1. HLRF Hot Cells

(a) 9400 gm of core materials; estimate that this material will be shipped with no more than 100 gm/drum.

2. SAL Hot Cells

(a) 45, 250 ml jars of core materials

(b) 26, 150 ml jars of core materials

(c) 332 smaller samples of core materials

3. Laboratories

(a) 30 operable unit soil samples

(b) 110 core samples that have been put into solution (radchem storage)

(c) 50 core samples in sample vials (organic)

(d) 100 operable unit samples in sample vials (organic)

Legacy Wastes:

1. HLRF Hot Cells

(a) core extruder

(b) two drums of RMW

2. SAL Hot Cells

(a) 12 gal core analysis liquid waste

(b) 19 drums core analysis RMW

(c) miscellaneous solid waste not yet placed in drums

3. Laboratories

(a) 45 gal of operable unit liquid waste

(b) 102 gal core analysis liquid waste

(c) 105 gal core analysis liquid waste-high chloride content, must be overpacked and shiped in drums

Prepared: 2-14-95 by W.C. Weimer
SAM-WAST.LST