Environmental Release Prevention and Control Plan

by

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MASTER

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Savannah River Site

Environmental Release Prevention and Control Plan (U)

Final

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Final

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Environmental Release Prevention and Control Plan – Final (U)

Perspective on Liquid Radioactive Releases at SRS

During the history of SRS, continual improvements in facilities, processes, and operations, and changes in the site's mission have reduced the amount of radioactive liquid releases. In the early years of SRS (1958 to 1965), the amount of tritium discharged to the Savannah River averaged approximately 61,000 curies a year. During the mid–1980's (1983 to 1988), liquid releases of tritium averaged 27,000 curies a year. By 1996, liquid releases of tritium are projected to be just 3000 curies for the year. This large projected decrease is the result of the planned shutdown of all reactors and the anticipated significant decline in the amount of tritium migrating from the site seepage basins and the Solid Waste Disposal Facility (SWDF). Table #1 shows the past, present, and projected releases of tritium from SRS for the years 1985 to 1996.

During 1991, the maximum offsite dose to an individual living at the site boundary was estimated to be 0.34 mrem, which is far below the DOE Order 5400.5 "all–pathway" standard of 100 mrem. In addition, less than 10% (0.03 mrem) of this low maximum offsite individual dose came from the planned direct discharge of liquid effluents from SRS facilities. The majority (0.24 mrem, or 70%) of the maximum offsite individual dose is estimated to be from the ingestion of Cs–137 found in Savannah River fish. However, less than 5% of the Cs–137 measured in Savannah River fish (caught at the site boundary during 1991) can be attributed to planned direct discharges. The remainder is assumed to have come from seepage basin migration, desorption from site streambeds, or background sources.

Also, during 1991, the maximum individual dose from drinking water was estimated to be 0.099 mrem at Port Wentworth, GA. This dose is just 2.5% of the DOE and EPA standard of 4 mrem for the drinking water pathway. Nearly 90% of this estimated drinking water dose is attributed to tritium releases from SRS.

Summary of Past and Projected Liquid Tritium Releases (no major actions to limit releases)

	Actual Releases (Ci)				Forecast Releases (Ci)				
Facility	1985	1989	1990	1991	1992	1993	1994	1995	1996
Reactors									
Leaks	3K	<1K	<1K	7K	1K	2K	1K	<1K	<1K
Dis.Bld.	17K	1K	1K	<1K	2K	3K	1K	<1K	<<1K
Perc.	5K	3K	4K	2K	3K	3K	2K	1K	1K
D-Area	2K	1K	1K	1K	1K	1K	1K	<1K	<<1K
Rx Total	27K	6K	6K	4K (10K)	7K	9K	5K	2K	1K
ETF	–	3K	1K	3K	3K	3K	3K	2K	1K
F/H Seep Basins	10K	11K	10K	14K	11K	10K	8K	3K	1K
Other Areas	.1K	.1K	.1K	.1K	.1K	.1K	.1K	.1K	.1K
Site Total	37K	20K	17K	21K (27K)	21K	22K	16K	7K	3K

Table #1

However, only 20% (5600 curies) of the total 27,400 curies of tritium released from SRS was from planned direct discharges. The majority (16,100 curies) was measured to have come from seepage basin and SWDF migration. The unplanned K–Reactor tritium release in December 1991 contributed the remaining 5700 curies to the 1991 site release total.

From these current offsite dose numbers, and from the projected decreases in future releases shown in Table #1, it can be seen that planned direct discharges of radioactive liquid effluents from SRS contribute just a small percentage to already small offsite doses. Therefore, WSRC senior management believe that the main focus of future efforts and monies in this area should be placed on the prevention and control of unplanned radioactive liquid releases. Unplanned releases not only have the potential to greatly impact offsite doses, they also have the greatest impact on the public perception of SRS's Conduct of Operations.

This belief in focusing on unplanned releases became even more apparent during the WSRC senior management review of the recently revised 1992 As Low As Reasonably Achievable (ALARA) Release Guides and of the options and alternatives identified in this report for the elimination of liquid radioactive releases.

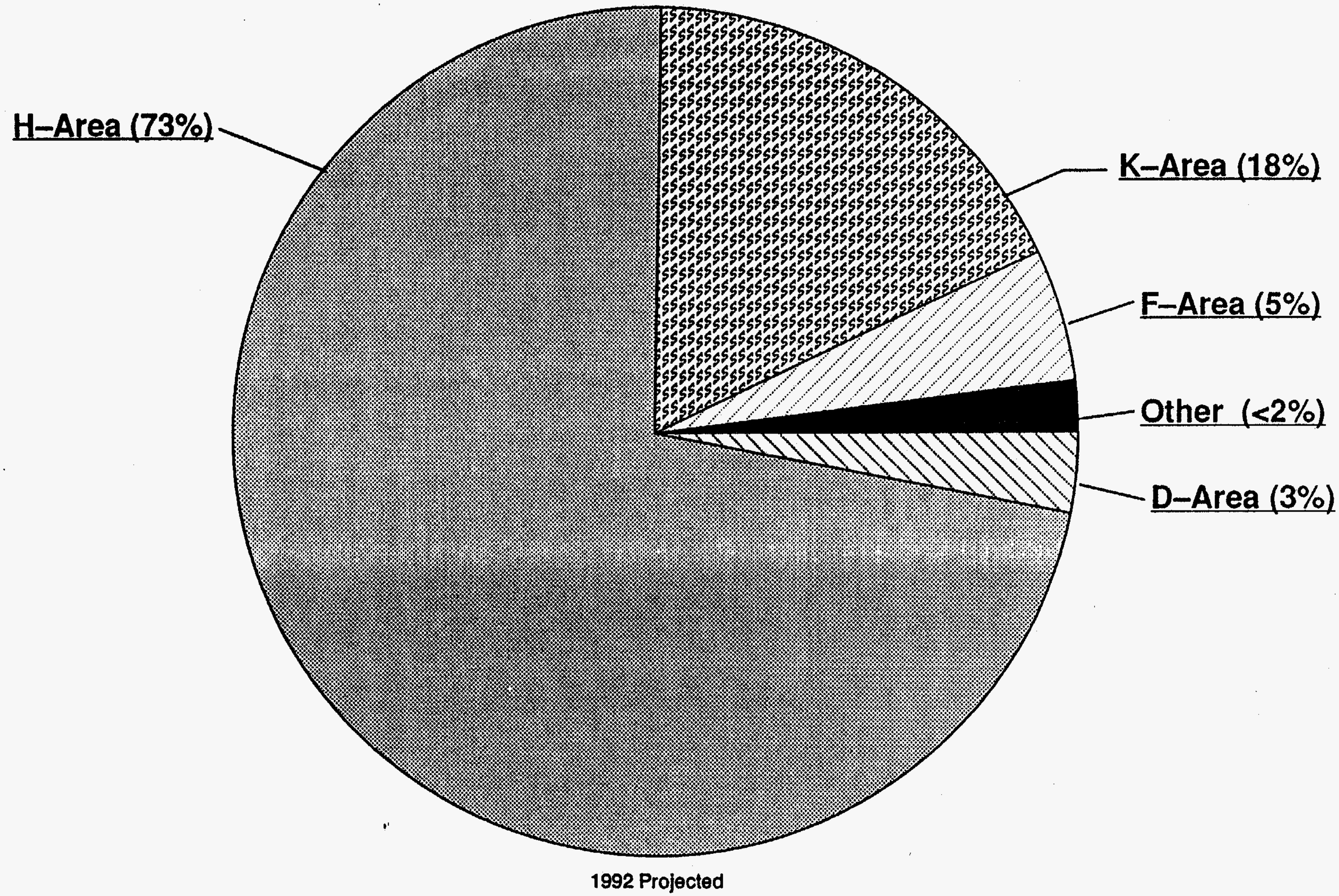
Revised 1992 ALARA Release Guides

The SRS ALARA Release Guides Committee was strengthened by the appointment of the Vice President and General Manager of ESH&QA as the chairman, on February 28, 1992, and by the selection of a steering committee composed of senior managers from each WSRC Division with responsibilities for liquid radioactive releases.

The SRS ALARA Release Guides Committee reconvened in March and reviewed and aggressively reduced both the atmospheric and liquid ALARA Release Guides. The revised 1992 ALARA Release Guides, which were authorized by the Vice President and General Manager of ESH&QA on April 30, 1992, are provided in Attachment 1. The site atmospheric guide was reduced by over 63 percent and the liquid release guide was reduced by over 76 percent. The major process considerations that caused the goals to be set above baseline operational levels were planned increased operations in the Separations areas for the final 6 months of 1992, and K–Reactor operation for 3 months.

As shown in Attachment I, the 1992 ALARA Release Guides for liquid effluents were reduced by over 76%, but again, the offsite doses from direct releases is al-

Projected Area Releases by % of 1992 Site ALARA Goal of 0.063 mrem



Other = A, C, L, P, M, and TNX Areas

Figure #1

ready so small that this reduction will have no significant impact on total offsite doses. In addition, Figure #1, which gives the projected Area releases by percent of the revised 1992 ALARA Goal of 0.063 mrem, shows that several Areas (A, C, L, M, P, and TNX) have already essentially reached ALARA conditions. Each of these Areas, because of either operational shutdowns or use of effluent treatment facilities, are projected to contribute much less than 1/1000 of a mrem/year to offsite doses.

Also included in Attachment I are the baseline release numbers used for establishing the revised ALARA guides, as well as the major reasons for required increases above the baseline releases.

The strengthening of the ALARA Release Guides process, and the subsequent reduction of the 1992 ALARA Release Guides to more realistic and challenging levels, fulfilled the ALARA principle, demonstrated senior management attention, and provided psychological benefit that planned radioactive releases were being adequately trended and controlled, but it provided no real physical reductions in releases.

Options and Alternatives for the Elimination or Minimization of Releases

WSRC senior management has analyzed in detail the alternatives for elimination or minimization of releases from each radioactive liquid effluent outfall. Attachment II presents a summary of that analysis. The basis for evaluating various initiatives for minimizing releases is one of cost benefit. For each release point we have listed the past, present, and projected future releases based on current operating plans and funded projects. The estimated cost of additional initiatives, which in most cases are engineered solutions, is balanced against the reduction in radioactive liquid releases and the time to complete the project. Each of the WSRC recommendations identified will be presented to and discussed with the appropriate DOE–SR Assistant Manager. Upon formal concurrence of these recommendations and the acquisition of required funding, WSRC will manage the implementation of the initiatives.

Procedural Actions to Mitigate Releases

WSRC has also reviewed all operating procedures that are applicable to the control and monitoring of liquid radioactive releases for their appropriateness in addressing the following criteria:

- Authorization level ("permitting system")
- Action Levels and Release Limits
- Monitoring practices
- Sampling Regime
- Training/Conduct of Operations
- Documentation

The results of this review, which includes an analysis of the adequacy of action levels and release limits, and the revisions that have been made, or will be made, to operating procedures are presented in Attachment III.

Physical Actions to Prevent & Control Unplanned Releases

Shortly after the K–Reactor tritium release in December 1991, WSRC senior management formed the Environmental Release Prevention Taskforce (ERPT) to conduct a sitewide review of potentially significant liquid release points and the systems, procedures, and practices in place to prevent and control unplanned releases. The Executive Summary and the Recommendations from the ERPT Final Report are presented in Attachment IV. Also given in Attachment IV is the Interim ERP&CP, which includes the Operating Department's responses to the 56 ERPT recommendations, with an updated (as of June 30, 1992) Action Plan showing the scheduled completion dates for the responses.

Since many of the ERPT recommendations concerned near-term procedural and monitoring improvements, WSRC senior management requested that additional reviews be performed of the following physical actions and long-term projects (engineered solutions) that would prevent and control unplanned releases:

- Control of Source Term
- Hydraulic Barriers
- Saltstone/Concrete Composition
- Tile Fields
- Detritiation Processes
- Remediation of Seepage Basins and SWDF Effluents
- Elimination of Once–through Cooling Water systems

Most of the above actions would also serve to eliminate or minimize planned routine releases due to the fact that source terms would be decreased and/or effluent streams would be directed away from site streams. The results of these reviews, including cost/benefit analyses, are included in Attachment V.

ATTACHMENT I

ALARA Release Guides

REVISED 1992 ALARA RELEASE GUIDES

The section presents the revised 1992 ALARA Release Guides, which were authorized on April 30, 1992 and became effective as of March 1, 1992.

Also included in this section are the baseline release numbers used for establishing the revised guides, as well as the major operational reasons for the required increases above the baseline numbers.

Westinghouse
Savannah River Company

P.O. Box 616
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ESH-920117

May 14, 1992

Mr. T. F. Heenan, Assistant Manager
Environment, Safety, Health and Quality Programs
U. S. Department of Energy
Field Office, Savannah River
P. O. Box A
Aiken, SC 29802

Dear Mr. Heenan:

ALARA RELEASE GUIDES COMMITTEE (U)

Ref: (1) Letter, P. M. Hekman, Jr. to A. L. Schwallie, 1/29/92
(2) Letter, A. L. Schwallie to P. M. Hekman, Jr., 2/12/92

Reference (1) directed WSRC to strengthen the As Low As Reasonably Achievable (ALARA) program for liquid radioactive releases and to review the goal-setting process. The WSRC commitments made in response to this directive were outlined in reference (2) and have been met.

The SRS ALARA Release Guides Committee was strengthened by the appointment of the Vice President and General Manager of ESH&QA as the chairman, on February 28, 1992, and the selection of a steering committee composed of senior managers from each WSRC Division with responsibilities for liquid radioactive releases.

The SRS ALARA Release Guides Committee reconvened in March and reviewed and aggressively reduced both the atmospheric and liquid ALARA Release Guides. The revised 1992 ALARA Release Guides, which were authorized by the Vice President and General Manager of ESH&QA on April 30, 1992, are provided in the attachments. The site atmospheric guide was reduced by over 63 percent, and the liquid release guide was reduced by over 76 percent. The major process considerations that caused the goals to be set above baseline operational levels were planned increased operations in the Separations areas for the final 6 months of 1992, and K-Reactor operation for 3 months.

Improvements made in the goal-setting process include requirements for documentation and qualification of production schedule effects and the identification of operations and altenatives that would reduce, or eliminate, liquid radioactive releases. The options and alternatives that have been identified will be addressed in the final Environmental Release Prevention and Control Plan which is due on June 30, 1992.

The actions reported herein satisfy the April 1, 1992 and May 15, 1992 measurables for Assessment Factor D.1.1.4 of the Special Emphasis Area D, Period 7, Award Fee.

Yours very truly,

for R. R. Campbell
Vice President and General Manager
ESH&QA Division

RRC:gt
Att

CC: A. L. Schwallie, 703-A

Revised 1992 ALARA Goal Assignments

LIQUID EMISSIONS

AREA	EDE (MREM)	% SITE TOTAL
A	4.72E–05	0.07%
C	3.39E–05	0.05%
D	1.79E–03	3.00%
F	2.96E–03	5.00%
H	4.64E–02	73.0%
K	1.11E–02	18.0%
L	3.98E–04	0.60%
M	7.44E–05	0.10%
P	2.27E–04	0.40%
TNX	1.12E–05	0.02%
SITE TOTAL	0.063 mrem	

REVISED 1992 ALARA GOAL ASSIGNMENTS

AIRBORNE EMISSIONS

AREA	EDE (MREM)	% SITE TOTAL
A	8.06E–05	0.05%
C	1.82E–03	1.02%
D	1.69E–04	0.09%
F	1.16E–02	6.52%
H	7.65E–02	43.0%
K	6.06E–02	34.0%
L	1.49E–02	8.30%
M	1.00E–04	0.06%
P	1.45E–02	8.15%
TNX	1.09E–06	0.00%
SITE TOTAL	0.178	

1991 ACTUAL RELEASES

VS

1992 ALARA GOALS

LIQUID EFFLUENTS

(EDE in mrem)

Area	1991 Releases (mrem)	1992 Goals (mrem)	Percentage of 1992 Goal
A	1.40E–05	4.72E–05	30.0%
C	3.71E–05	3.39E–05	109%
D	1.93E–03	1.79E–03	108%
F	9.88E–04	2.96E–03	33.0%
H	2.33E–02	4.64E–02	50.0%
K	2.43E–03	1.11E–02	22.0%
L	3.99E–04	3.98E–04	100%
M	3.64E–05	7.44E–05	49.0%
P	5.80E–04	2.27E–04	255%
TNX	5.14E–06	1.12E–05	46.0%
SITE	**0.030**	**0.063**	**48.0%**

The Revised goals are 76% lower than the existing 1992 goal of 0.262 mrem.

1991 ACTUAL RELEASES

VS

1992 ALARA GOALS

AIRBORNE EMISSIONS

(EDE in mrem)

Area	1991 Releases (mrem)	1992 Goals (mrem)	Percentage of 1992 Goal
A	8.10E–07	8.06E–05	0.99%
C	7.84E–04	1.82E–03	43%
D	1.78E–04	1.69E–04	105%
F	3.90E–03	1.16E–02	34%
H	6.40E–02	7.65E–02	84%
K	5.02E–02	6.06E–02	83%
L	1.40E–02	1.49E–02	94%
M	7.59E–05	1.00E–04	76%
P	1.35E–02	1.45E–02	93%
TNX	———	1.09E–06	———
SITE	0.147	0.178	83%

The Revised goals are 63% lower than the existing 1992 goal of 0.484 mrem.

1992 ALARA Release Goals–Liquid

Area – Increment	1991 Actual Release (mrem)	1992 Revised Goal(mrem)	Goal % of 1991 Actual Release	% of 1992 Site Total
A – Total	1.40 E–05	4.72 E–05	337%	0.07%
C – Total	3.71 E–05	3.39 E–05	91%	0.05%
D – Total	1.93 E–03	1.79 E–03	94%	3%
F – Baseline	–	9.88 E–04	–	–
F – Start–up	–	1.97 E–03	–	–
F – Total	9.88 E–04	2.96 E–03	300% (1)	5%
H – Baseline	–	2.33 E–02	–	–
H – Start–up	–	2.31 E–02	–	–
H – Total	2.33 E–02	4.64 E–02	199% (2)	73%
K – Baseline	–	2.43 E–03	–	–
K – Start–up	–	8.67 E–03	–	–
K – Total	2.43 E–03	1.11 E–02	456% (3)	18%
L – Total	3.99 E–04	3.98 E–04	99%	0.6%
M – Total	3.64 E–05	7.44 E–05	204%	0.1%
P – Total	5.80 E–04	2.27 E–04	39%	0.4%
TNX – Total	5.14 E–06	1.12 E–05	218%	0.02%
Site–Baseline	–	0.030	–	–
Site–Increases	–	0.033	–	–
Site – Total	0.030	0.063	210%	–

Major Increases From Baseline Releases

(1) F–Area Increases to Baseline .... 1.97E–03 mrem

Sources:
1) Separations to run 1.75 times more than in 1991
(7 batches of TRR and 3 batches of Mk–31A)
2) First Cycle
3) A–line
4) 2nd U/Pu cycles

(2) H–Area Increases to Baseline .... 2.31 E–02 mrem

Sources:
1) HB Line to run 3 times 1991 level
2) Separations to run similar to 83/84 level for 6 months
3) 1–H Evaporator start–up

(3) K–Area Increases to Baseline .... 8.67 E–03 mrem

Sources:
1) 25% Reactor Operations
2) 4 Purges for level control
3) 1 Purge for Tritium reduction

Total Increases .... 3.374 E–02 mrem

ATTACHMENT II

Area Outfall Analysis

OPTIONS AND ALTERNATIVES FOR ELIMINATION OR MINIMIZATION OF LIQUID RADIOACTIVE RELEASES

WSRC senior management requested that the operating departments identify and perform an analysis of the options and alternatives available for the elimination or minimization of releases from each of their radioactive liquid discharge points. This section presents the results of these analyses for each outfall, on a divisional basis.

DESCRIPTION OF AREA OUTFALL SHEETS

SECTION (A) – RELEASE POINTS

This section identifies the individual release points and the official liquid effluent outfalls that they discharge through. The listed outfalls are the locations which are monitored on a monthly basis by the Environmental Monitoring Section (EMS) for compliance with the SRS ALARA Release Guides and the DOE DCGs.

SECTION (B) – PAST, PRESENT, AND PROJECTED RELEASES

This sections lists the historical releases (since 1985) from each release point and gives the anticipated releases through 1995. The projected releases are based upon planned current initiatives only.

It must be emphasized that the listed projected releases are for planned routine operations and do not reflect the potential risks of unplanned releases. Due to the large source terms and potential adverse effects involved, the initiatives identified for selected release points, such as the F–Area and H–Area effluents, K–Area Heat Exchanger Cooling Water, and the D–Area Process Sewer, should be given higher priority over the lesser risk release points.

Section (C) – Impact of Operational Considerations

This section describes the impact that currently planned changes in physical plant, operations and site mission may have upon future releases.

Section (D) – Initiatives to Reduce Production of Wastes

This section identifies the operational initiatives that would eliminate, or reduce, the production of radioactive wastes and/or the existing waste source terms. WSRC recommendations are also provided in this section.

Section (E) – Initiatives to Reduce the Size of Releases

This section presents the physical projects and the procedural changes that would reduce the size of releases from each release point. The costs associated with each initiative also are included. However, it must be emphasized that these cost estimates are preliminary estimates only, and do not reflect detailed engineering analysis.

WSRC recommendations also are provided in this section. Each of the recommendations identified will be presented to and discussed with the appropriate DOE–SR Assistant Manager. Upon formal concurrence of these recommendations, and the acquisition of required funding, WSRC will manage the implementation of the initiatives.

The identified division initiatives are described in additional detail in Attachment V inserts.

A–Area

A) Release Points – .... 700 Area Labs, Air Stripper, Process Water and Stormwater

Outfall – .... Tims Branch–2 (TB–2)

B) Past, Present and Projected Releases Based on Current Initiatives –

(Curies)

Nuclide	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
H–3	N/A	N/A	N/A	N/A	N/A	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
U/Pu	<0.0002	<0.0002	<0.0003	<0.0003	<0.0003	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

C) Impact of Operational Considerations –

1. None

D) Initiatives that would reduce production of this waste –

1. Decontaminate all Area roofs and facilities.
2. Move the EMS and HP Internal Dosimetry labs to the F or H Area.

WSRC Recommendations – Continue to operate and decon facilities as per the site mission. Relocation of labs is not justifiable on a cost/benefit basis.

E) Initiatives that would reduce the size of the release – .... Cost

1. Reconfigure all laboratory drains to become Low–Activity Drains at 776–A. This would be against waste minimization. .... Capital ...... $3.3M; Operating $5M/yr
2. Reconfigure all drains within SRTC and build an ETF to treat the waste. Capital $43M

WSRC Recommendations – Continue to operate facilities as planned. The cost/benefit ratio is too high for each initiative, especially when considering the high operating costs of storing and shipping low level waste.

TNX–Area

A) Release Points – .... TNX Process Sewer

Outfall – TNX–1

B) Past, Present and Projected Releases Based on Current Initiatives –

(Curies)

Nuclide	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
H–3	N/A	N/A	N/A	N/A	N/A	<0.1	<0.08	<0.1	<0.1	<0.1	<0.1
U/Pu	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

C) Impact of Operational Considerations –

1. TNX will continue to have a research mission with small associated releases.

D) Initiatives that would reduce production of this waste –

1. Reduce operations at the TNX facility.

WSRC Recommendations – Continue with operations at TNX as per the site mission.

E) Initiatives that would reduce the size of the release – .... Cost

1. Reclose the old TNX Seepage Basin according to RCRA regulations. .... Funded

WSRC Recommendations – Reclose the TNX Seepage Basin per RCRA regulations, as planned.

RRD Outfall Analysis

Note: Refer to the RRD Outfall Analysis Initiative Discussions, which are found in Attachment V, for additional information concerning Section E.

C–Area

A) Release Points – .... Process Sewer

Outfall – .... C–Canal

B) Past, Present and Projected Releases Based on Current Initiatives – (Curies)

Nuclide	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
H–3	57	32	4	11	17	2	13	12	10	5	1

C) Impact of Operational Considerations –

1. C–Area continues to have an equipment maintenance mission, therefore chillers still need to be operated.
2. Tritiated moderator is still stored in the tanks within the Reactor Building.

D) Initiatives that would reduce production of this waste –

1. Stop performing maintenance work in C–Area.
2. Remove all tritiated moderator from area.
3. Route outfall to seepage basin.

WSRC Recommendations – Continue performing maintenance in C–Area and continue storing tritiated moderator in C–Area.

E) Initiatives that would reduce the size of the release – .... Cost

1. All drains in decon facility have been plugged. .... Comp.
2. All sumps have been diverted to the Disassembly Basin .... Comp.

WSRC Recommendations – Continue performing equipment maintenance, as needed, and continue storing tritiated moderator in C–Area.

D–Area

A) Release Points – .... Process Sewer for 420–D, 421–D & 772–D

Outfall – .... Beaver Dam Creek

B) Past, Present and Projected Releases Based on Current Initiatives –

Nuclide	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
H–3	2100	4000	1400	1700	600	400	700	700	700	500	500

Note – These totals include the 772–D Process Sewer, which makes up 7–10% of the releases.

C) Impact of Operational Considerations –

1. D–Area continues to have a heavy water rework and Analytical Lab mission, which will continue regardless of reactor status.
2. The site need for clean moderator drums will continue indefinitely, regardless of reactor status. Clean drums are needed in the 100–Areas for clean–up and decon activities.

D) Initiatives that would reduce production of this waste –

1. Reduce the Rework Unit overhead concentration control point from 0.40 Mol % D20 to a lower value, this would decrease production capability.
2. Discontinue moderator rework activities.

WSRC Recommendations – Reactor Engineering to further study the benefit of reducing the Rework overhead concentration drawoff point from 0.40 Mol % D2O to 0.20 Mol % D2O. Item #2 is not justifiable on a cost basis, it is more economical to clean up and reconcentrate the moderator now, than it is to wait and have to reconcentrate it at a later time.

E) Initiatives that would reduce the size of the release – .... Cost

1. Design and construct a percolation field/seepage basin. $10M
2. Design and construct an evaporator. $20M
3. Reactors and Heavy Water Operations reevaluate the number and volume of samples currently being requested for analysis to see if they can be reduced. .... Funded
4. Collecting and transporting the 772–D effluent to a different site location for processing would only transfer the point of tritium release to the environment. Accordingly, the only initiative that would reduce the size of the release is to drum the effluent and store until tritium removal technology is available on site. To accommodate 3 years storage $2M

WSRC Recommendations – Perform Item #3. Items #1, 2 & 4 are not justifiable on a cost/benefit basis.

K–Area

A) Release Point – .... Process Sewer

Outfall – .... K – Canal

B) Past, Present and Projected Releases Based on Current Initiatives –

(Curies)

Nuclide	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
H–3	400	400	300	300	100	200	100	100	200	100	100
Sr–90	0	0.01	0	0	<<0.01	0.01	<0.01	<0.01	<0.01	<<0.01	0

C) Impact of Operational Considerations –

1. **K–Process Sewer releases do not change (volume wise) with operations, they do change with the H–3 concentration in the moderator.**

D) Initiatives that would reduce production of this waste –

1. **Limited operation of the K–Reactor will reduce the production source of waste.**

WSRC Recommendation – Operate the K–Reactor in accordance with the site mission, as planned, through 1994 and beyond.

E) Initiatives that would reduce the size of the release – .... Cost

1. **Reroute the Process Sewer discharge to the existing percolation field, or construct a field that is designed to handle the Process Sewer flowrate. $15M**
2. **Replace the existing 9 Ci/L moderator with virgin moderator. .... $0.5M (There is not sufficient virgin moderator in stock for complete change–out)**
3. **Replace the existing 9 Ci/L moderator with less concentrated moderator from the site inventory. $1M**
4. **Design and construct an Evaporator that would change the Process Sewer discharge into an airborne effluent. $20M**
5. **Bring the K–Cooling Tower on–line, this will control and reduce the volume of liquid discharges to the environment. .... Funded**
6. **Drain moderator and change out with Light Water after completion of mission in 1994. Perform testing and training operations using the untritiated Light Water. .... Funded**

WSRC Recommendations – Perform Items #5 and #6 as planned. Items #1 through #4 are not justifiable on a cost/benefit or ALARA basis.

K–Area

A) Release Point – .... 107–K HX Cooling Water

Outfall – .... K – Canal

B) Past, Present and Projected Releases Based on Current Initiatives – (Curies)

Nuclide	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
H–3	2300	1800	1400	2500	100	20	800 (a)	1250	2200	800	100

(a) Does not include 5700 Ci Tritium release in December, 1991.

Note: Projected releases do not reflect the substantial potential releases that exist with the HX CW System.

C) Impact of Operational Considerations –

1. The K–Area Heat Exchanger Cooling Water releases are dependent on time at full cooling water flow, the tritium concentration in the moderator, and the integrity of the 12 Heat Exchangers.
2. Revised operating procedures and an additional online monitoring system have reduced the potential for a large moderator loss to the environment.

D) Initiatives that would reduce production of this waste –

1. Limited operation of the K–Reactor will reduce the production source of waste.

WSRC Recommendation – Operate the K–Reactor in accordance with the site mission, as planned, through 1994 and beyond.

E) Initiatives that would reduce the size of the release – .... Cost

1. Bring the K–Cooling Tower on–line, this will control and reduce the volume of liquid discharges to the environment. .... Funded
2. Sample each Heat Exchanger effluent daily, during downtime and sample the 107–K effluent every 2 hours in the non–alarmed state. .... Funded
3. Replace the existing 9 Ci/L moderator with virgin moderator. $0.5M
4. Replace the existing 9 Ci/L moderator with less concentrated moderator from the site inventory. $1M
5. Replace all Heat Exchangers (10 of 12 are planned for replacement) with new design type Heat Exchangers. .... Funded
6. Design and install a moderator de–tritiation facility. $100M

WSRC Recommendations – Perform Initiatives #1, #2 & #5 as planned. Initiatives #3, #4 & #6 are not justified on a cost/benefit or personnel dose ALARA basis.

K–Area

A) Release Point – .... K– Disassembly Basin Purge

Outfall – .... K – Percolation Field

B) Past, Present and Projected Releases Based on Current Initiatives – (Curies)

Nuclide	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
H–3	6700	2100	4200	100	200	10	0	1600	2000	200	100
Sr–90	<<0.01	0	<0.01	<0.01	<<0.01	<<0.01	0	<0.01	<0.01	<0.01	<<0.01
Cs–134	<<0.01	<<0.01	<0.01	<<0.01	<<0.01	0	0	<0.01	<0.01	0	0
Cs–137	0.01	0.01	0.04	0.02	<0.01	<<0.01	0	0.01	0.01	<0.01	<<0.01

C) Impact of Operational Considerations –

1. **K–Disassembly Basin releases are dependent on the number of fuel changes and the H–3 concentration of the Moderator.**
2. **The concentration of tritium in the basin is minimized by flushing the fuel rods.**

D) Initiatives that would reduce production of this waste –

1. **Limited operation of the K–Reactor will reduce the production source of waste.**
2. **Removal of all fuel and target rods would eliminate the leakage of fission and activation products into the basin water.**

WSRC Recommendation – Operate the K–Reactor in accordance with the site mission as planned through 1994 and beyond.

E) Initiatives that would reduce the size of the release – .... Cost

1. **Replace the existing 9 Ci/L moderator with virgin moderator. $0.5M**
2. **Replace the existing 9 Ci/L moderator with less concentrated moderator from the site inventory. $1M**
3. **Cover the basin to avoid required purges for reducing tritium concentrations. .... Funded**

WSRC Recommendation – Continue to discharge to the percolation field on an as required basis, only. Items #1 and #2 are not justified on a cost/benefit or ALARA basis. Implement Item #3, as planned.

L–Area

A) Release Point – .... Process Sewer

Outfall – .... L – 007

B) Past, Present and Projected Releases Based on Current Initiatives –

(Curies)

Nuclide	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
H–3	8	11	20	25	24	27	11	25	10	10	<10
Sr–90	0	0	0	0	0.002	0.003	<0.001	<0.001	<0.001	<<0.001	0

C) Impact of Operational Considerations –

1. Non–operating status of L–Reactor will continue to reduce releases.

D) Initiatives that would reduce production of this waste –

1. As part of the overall lay–up plan, divert all building sumps directly to the Disassembly Basin once all cooling water lines are drained.

WSRC Recommendations – Continue to operate L–Area in accordance with the site mission, as planned.

E) Initiatives that would reduce the size of the release – .... Cost

1. Divert all building sumps to 106 Building and send to 211F for evaporation. $0.30/gal
2. Divert sumps to Disassembly Basin, as per lay–up plan. .... Funded

WSRC Recommendations – Perform Initiative #2 as part of the overall lay–up plan. Initiative #1 is not justifiable due to low levels of contamination.

L–Area

A) Release Point – .... 107–L HX Cooling Water

Outfall – .... L – 007

B) Past, Present and Projected Releases Based on Current Initiatives –

(Curies)

Nuclide	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
H-3	N/A	190	180	140	100	70	110	110	50	25	<10

C) Impact of Operational Considerations –

1. Non–operating status of L–Reactor will continue to reduce releases.

D) Initiatives that would reduce production of this waste –

1. Lay–up of the L–Reactor has eliminated the production source of waste.

WSRC Recommendations – Continue to operate L–Area in accordance with the site mission, as planned.

E) Initiatives that would reduce the size of the release – .... Cost

1. Defuel and drain process water from L–Area systems. .... Funded

WSRC Recommendations – Continue to operate L–Area in accordance with the site mission, as planned.

L–Area

A) Release Point – .... L Disassembly Basin

Outfall – .... L – Seepage Basin

B) Past, Present and Projected Releases Based on Current Initiatives –

(Curies)

Nuclide	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
H–3	2	25	53	65	46	0	14	14	14	0	0

C) Impact of Operational Considerations –

1. Non–operating status of L–Reactor will continue to reduce releases.

D) Initiatives that would reduce production of this waste –

1. Lay–up of the L–Reactor has eliminated the production source of waste.

WSRC Recommendations – Continue to operate L–Area in accordance with the site mission, as planned.

E) Initiatives that would reduce the size of the release – .... Cost

1. No purges for either tritium or level control are anticipated. Should inleakage occur and necessitate a purge, the effluent could be sent to 211–F evaporator. $0.30/gal

WSRC Recommendations – Continue to operate L–Area in accordance with the site mission, as planned. Initiative #1 is not justifiable due to the low levels of contamination.

P–Area

A) Release Point – .... Process Sewer

Outfall – .... P–Canal

B) Past, Present and Projected Releases Based on Current Initiatives –

(Curies)

Nuclide	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
H–3	200	120	160	57	165	67	43	40	20	10	<10
Sr–90	N/A	N/A	N/A	N/A	0.002	0.0006	<0.0005	<0.0001	<0.0001	<0.0001	0

C) Impact of Operational Considerations –

1. Non–operating status of P–Reactor will continue to reduce releases.

D) Initiatives that would reduce production of this waste –

1. As part of the overall lay–up plan, divert all building sumps directly to the Disassembly Basin once all cooling water lines are drained.

WSRC Recommendations – Continue to operate P–Area in accordance with the site mission, as planned.

E) Initiatives that would reduce the size of the release – .... Cost

1. Divert all building sumps to 106 Building and send to 211F for evaporation. $0.30/gal
2. Divert sumps to Disassembly Basin, as per lay–up plan. .... Funded

WSRC Recommendations – Perform Initiative #2 as part of the overall lay–up plan. Initiative #1 is not justifiable due to low levels of contamination.

P–Area

A) Release Point – .... 107–P HX Cooling Water

Outfall – .... P–Canal

B) Past, Present and Projected Releases Based on Current Initiatives –

(Curies)

Nuclide	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
H–3	1120	675	780	335	465	125	88	45	25	15	<10

C) Impact of Operational Considerations –

1. Non–operating status of P–Reactor will continue to reduce releases.

D) Initiatives that would reduce production of this waste –

1. Lay–up of the P–Reactor has eliminated the production source of waste.

WSRC Recommendations – Continue to operate P–Area in accordance with the site mission, as planned.

E) Initiatives that would reduce the size of the release – .... Cost

1. Maintain P–Reactor in lay–up status. .... Funded

WSRC Recommendations – Continue to operate P–Area in accordance with the site mission, as planned.

P–Area

A) Release Point – .... P Disassembly Basin

Outfall – .... P– Seepage Basin

B) Past, Present and Projected Releases Based on Current Initiatives –

(Curies)

Nuclide	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
H–3	5900	4400	1900	203	20	0	48	0	0	0	0
Cs	0.051	0.008	0.028	0.005	0.0005	0	0.0002	0	0	0	0

C) Impact of Operational Considerations –

1. Non–operating status of P–Reactor will continue to reduce releases.

D) Initiatives that would reduce production of this waste –

1. Lay–up of the P–Reactor has eliminated the production source of waste.

WSRC Recommendations – Continue to operate P–Area in accordance with the site mission, as planned.

E) Initiatives that would reduce the size of the release – .... Cost

1. No purges for either tritium or level control are anticipated. Should inleakage occur and necessitate a purge, the effluent could be sent to 211–F evaporator. $0.30/gal

WSRC Recommendations – Continue to operate P–Area in accordance with the site mission, as planned. Initiative #1 is not justifiable due to low levels of contamination.

SRTC Outfall Analysis

Note: Refer to the SRTC Outfall Analysis Initiative Discussions, which are found in Attachment V, for additional information concerning Section E.

NMPD Outfall Analysis

Note: Refer to the NMPD Outfall Analysis Initiative Discussions, which are found in Attachment V, for additional information concerning Section E.

F–Area

A) Release Points – .... F–Area Cooling Water, Stormwater and F–Area Effluents

Outfall – FM–3

B) Past, Present and Projected Releases Based on Current Initiatives – (Curies)

Nuclide	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
H–3	13	14	13	a	8	33	6	5	5	5	5
Sr	0.013	0.011	0.008		0.003	0.004	0.004	0.005	0.005	<0.004	<0.004
Cs	0.019	0.022	N/A	N/A	0.006	0.002	0.002	0.01	0.01	<0.01	<0.01
Pm	N/A	N/A	N/A	N/A	0.015	0.020	0.003	0.02	0.02	<0.01	<0.01

Note: Projected releases do not reflect the substantial potential releases that exist with the Seg. CW System.

C) Impact of Operational Considerations –

1. F–Canyon will process Pu–239 to support inventory stabilization and begin the conversion of assorted material now in inventory to a form suitable for long term storage. During FY92, Separations will begin the transition from a production mode to an inventory stabilization mode (FY92–96) and then clean out (FY97–98). Following completion of clean-out, the potential for an accidental release will be reduced greatly.
2. F–Area Segregated Cooling Water Effluent is the primary consideration for a substantial potential release to the environment in regard to this outfall and the condition of this effluent is dependent upon process leaks (coil leaks), and the presence of residual activity from past leaks.

D) Initiatives that would reduce production of this waste –

1. If current long term operating plans are not revised, the reduction of radioactive material processing and process inventories in F–Canyon will reduce the source for potential accidental NMPD releases.
2. Completion of F–Canyon clean out, which is scheduled for FY97–FY98, will eliminate the primary source of potential radioactive releases. This will also reduce the production of waste from cooling water diversions.
3. Complete installation of new stormwater monitor/source holders in all stormwater monitor systems.
4. Complete program to develop geometry specific calibrations for each stormwater monitor system.
5. Design, fabricate, test and implement a prototype sediment removal system.
6. Continue program to identify, track, reduce, and prevent fixed and transferrable contamination within the F/H Tank Farm Boundaries.

WSRC Recommendations – F–Area processes will be operated in an environmentally sound manner and will be in a position to take on new production initiatives, if assigned. The current strategic plan for operations will reduce and ultimately eliminate the risk associated with new radioactive material processing and process storage. Past contaminations and residual materials will continue to require active management. Continue with all initiatives as planned.

Outfall – FM-3

E) Initiatives that would reduce the size of the release – .... Cost

1. Install additional instrumentation and modify existing cooling water monitoring equipment to enhance reliability, sensitivity and trouble-shooting capability. $1M
2. Consolidate and upgrade UO3 Storage facilities to provide satisfactory storage criteria and satisfy findings by DOE-SR and Tiger Team findings. $20M
3. Provide batch release system to match the H-Area system. This approach would reduce the potential for releases by increasing reaction time. $15M
4. Modify segregated cooling water system to provide closed loop cooling. $40M
5. Improve the sensitivity of the stormwater monitors (Dependent on sediment removal system). .... <$10K
6. Test/Install new Beta/Gamma inline probe assembly $60K
7. Route all diverted stormwater through ETF. .... Capital $2M
   Operating $3M
8. Collect all stormwater runoff from F-Tank Farm. $6.1M

WSRC Recommendations – Implement Items #1 and #2. Items #3 and #4 are not recommended due to the high cost/benefit ratio when related to plans for canyon clean out in FY97–98. Continue with Items #5 and #6 as planned. Items #7 and #8 are not justifiable on a cost/benefit basis.

F–Area

A) Release Points – .... F–Area Storm Sewer

Outfall – U3R–2

B) Past, Present and Projected Releases Based on Current Initiatives – (Curies)

Nuclide	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
H-3	N/A	N/A	N/A	N/A	0.5	0.05	0.08	<0.1	<0.1	<0.1	<0.1
Sr	N/A	N/A	N/A	N/A	0.003	<<0.001	<<0.001	0	0	0	0
Cs	N/A	N/A	N/A	N/A	0.006	<<0.001	<<0.001	0	0	0	0
Pm	N/A	N/A	N/A	N/A	0.015	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

C) Impact of Operational Considerations –

1. F–Canyon FB–Line will process Pu–239 to support inventory stabilization and begin the conversion of assorted material now in inventory to a form suitable for long term storage. During FY92–96, Separations will begin the transition from production to an inventory stabilization mode and then clean out (FY97–98). Upon completion of cleanout, the potential for an accidental release will be greatly reduced.

2. Credible sources of potential contamination at this outfall are due to rainwater pick–up of contamination and equipment failure associated with related processing units. Processing areas include: 221–1F (A–Line), 232–F (Abandoned Tritium), 292–F (F–Area Stack) and Waste Trailer Receiving at 211–F.

3. Depleted uranium is stored in 728–F and 730–F. Building integrity and drum corrosion are major concerns. The material in F–Area represents approximately 12% of the site total. A release of this material from the container could result in contamination reaching the outfall.

D) Initiatives that would reduce production of this waste –

1. If current long term operating plans are not revised, reduction of radioactive material and process storage will reduce the source for potential NMPD releases. Past contaminations will continue to have potential impacts on releases from this outfall. However, this potential will decrease over time.

WSRC Recommendations – F–Area processes will be operated in an environmentally sound manner and will be in a position to take on new production initiatives, if assigned. The current strategic plan for operations will reduce and ultimately eliminate the risk associated with new radioactive material processing and process storage. Past contaminations and residual materials will continue to require active management. Continue with all initiatives as per the site mission.

Outfall – U3R–2

E) Initiatives that would reduce the size of the release – .... Cost

1. Improve confinement, monitoring, and fire protection at the liquid waste unloading facility. $20M
2. Line the B–1 and B–3 basins with stainless steel to seal cracks. $0.4M
3. Ceilcoat Sandfilter ditch up to 4 feet and maintain ditches as a clean area. $0.1M
4. Install Sandfilter roof to eliminate ditch rainwater processing $0.5M
5. Install piping to transfer ditch rainwater to process through GP evaporators. $0.5M
6. Construct a divided basin and administratively control releases by sampling prior to release. Normally clean rainwater can be transferred directly to the outfall thus eliminating processing. $1M
7. Provide monitoring capability at F–002, make slidegate remotely operational, and install piping to 211F. $1M

WSRC Recommendations – Due to environmental risks and long term needs, implement Items #1, #2 & #3. Further studies are needed to refine the cost estimates. Items #4 through #7 are not justifiable based on cost/benefit. Items #4 & #5 were rejected in favor of Item #3.

F–Area

A) Release Points – .... Naval Fuels Effluent

Outfall – U3RF–3

B) Past, Present and Projected Releases Based on Current Initiatives –

(Curies)

Nuclide	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
H–3	N/A	N/A	N/A	N/A	2	0.2	0.2	<0.2	<0.2	<0.2	<0.2
Sr	N/A	N/A	N/A	N/A	0.002	<<0.001	<<0.001	0	0	0	0
U/Pu	N/A	N/A	N/A	N/A	<<0.001	<<0.001	<<0.001	0	0	0	0
Pm	N/A	N/A	N/A	N/A	0.002	<<0.001	<<0.001	<<0.001	<<0.001	<<0.001	<<0.001

C) Impact of Operational Considerations –

1. The 247–F facility has been placed in non–operational stand–by. This placement considered environmental issues and the current condition is considered to be environmentally sound.

D) Initiatives that would reduce production of this waste –

1. Abandon and seal building. Shut down building support functions.
2. Decommission and Decontaminate the facility.

WSRC Recommendations – Maintain current stand–by status per the site mission.

E) Initiatives that would reduce the size of the release – .... Cost

1. Current releases are negligible.

WSRC Recommendations – No new initiatives are believed to be justified. Keep facility in non–operational, stand–by mode, as per the the site mission.

H–Area

A) Release Points – .... H–Area Cooling Water, Stormwater and H–Area Effluents

Outfall – FM–1C

B) Past, Present and Projected Releases Based on Current Initiatives – (Curies)

Nuclide	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
H–3	72	56	205	12	20	18	12	10	10	10	<10
Sr	0.003	0.003	0.002	0.013	0.004	<0.001	0.006	0.005	0.005	<0.005	<0.005
Cs	0.009	0.011	0.008	0.040	0.060	0.02	0.002	0.01	0.01	<0.01	<0.01

Note: Projected releases do not reflect the substantial potential releases that exist with the Seg. CW System.

C) Impact of Operational Considerations –

1. H–Canyon is scheduled for operation through FY98 to process select RBOF inventory and current reactor basin material. H–Canyon waste recovery and HB–line will continue to process and blend Pu–238 oxide for NASA space missions.
2. Potential substantial accidental releases to H–Area Segregated Cooling Water Effluent are dependent upon operation, coil leaks, and the presence of residual activity from past leaks. Upon completion of clean out of H–Canyon, the potential for accidental release and cooling water diversion will greatly decrease.
3. Tritium will continue to unload reservoirs from weapons retirement and will continue to perform normal recycling.

D) Initiatives that would reduce production of this waste –

1. Reduction of radioactive material inventory in H–Canyon vessels will reduce the source of potential releases.
2. Completion of H–Canyon clean out (FY98–99) will eliminate the source of potential radioactive releases.
3. Shutdown of 234–H processes after FY94 will eliminate this source of potential releases.
4. Design completion and installation of drain collection system for Tank Farm H–East and H–West cooling water pumphouses.
5. Reroute stormwater runoff around H–East and H–West pumphouses to the monitored zone.

WSRC Recommendations – Start up the state–of–the–art Replacement Tritium Facility, as planned. Other H–Area operations will be performed in an environmentally sound manner and will be positioned to take on new initiatives, if assigned. The current strategic plan for operations will ultimately eliminate the risk associated with new radioactive material processing. Past contaminations will continue to require active management. Complete Item #4 as planned. Item #5 is not justifiable in light of the low levels of contamination involved.

Outfall – FM–1C

E) Initiatives that would reduce the size of the release – .... Cost

1. Install additional instrumentation and modify existing cooling water monitoring equipment. .... Funded
2. Line the B–3 basin with stainless steel to seal cracks. $0.2M
3. Cellcoat Sandfilter ditch and maintain as a "clean area." $0.1M
4. Continue to monitor outfall per 12 hour shift for tritium concentrations (Tritium). .... Funded
5. Install Sandfilter roof to eliminate ditch rainwater processing and possible contamination of the environment. $0.5M
6. Install piping to transfer ditch rainwater from LAW evaporator to GP evaporator and the ARU. $0.5M
7. Construct a divided basin and administratively control releases by sampling prior to release. Normally clean rainwater can be transferred directly to the outfall, thus eliminating processing. $1M
8. Provide alternate transfer route of spill containment basins and 500 and 600 aprons to ETF. $0.3M

WSRC Recommendations – Implement Items #1, #2, #3 & #4. Items #5 through #8 are not justifiable on a cost/benefit basis. Items #5 and #6 were rejected in favor of Item #3.

H–Area

A) Release Points – .... Tritium Facility Stormwater

Outfall – HP–15

B) Past, Present and Projected Releases Based on Current Initiatives –

(Curies)

Nuclide	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
H–3	N/A	N/A	N/A	N/A	1	4	5	<5	<5	<5	<5
Sr	N/A	N/A	N/A	N/A	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Pm	N/A	N/A	N/A	N/A	0.0002	0.0006	0.001	0.001	0.001	<0.001	<0.001

C) Impact of Operational Considerations –

1. Tritium will continue to unload reservoirs from weapons retirement and will continue to perform normal recycling.
2. Tritium's schedule to extract tritium from reactor targets is dependent upon K–Reactor Operations.
3. 233–H (RTF) startup is scheduled for FY94, which will result in a period of dual operation with the current processing facility (234–H).
4. The 234–H facility will stop processing after FY94.
5. Stormwater runoff will be affected by a tritium release only during an accidental release, or by rainout of tritium to the outfall.

D) Initiatives that would reduce production of this waste –

1. The cessation of processing in the existing 234–H facility after FY94 will reduce the potential for NMPD releases to this outfall.
2. The RTF (233–H) will be less vulnerable to accidental releases. ALso, reduced tritium emissions will reduce the potential for rainout of tritium to the environment.

WSRC Recommendations – Execute the strategic operating plan for start up of the state–of–the–art Replacement Tritium Facility as scheduled.

E) Initiatives that would reduce the size of the release – .... Cost

1. There is no viable option for treating tritium which may migrate to an outfall by stormwater runoff.

WSRC Recommendations – No action recommended.

S–Area

A) Release Points – .... H–Area Runoff and Future S–Area Effluent

Outfall – .... McQueen's Branch at Rd 4

B) Past, Present and Projected Releases Based on Current Initiatives –

(Curies)

Nuclide	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
H–3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	<10	<10	<10	<10
Cs	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	<<0.01	<<0.01	<<0.01

C) Impact of Operational Considerations –

1. **H–Canyon is scheduled for operation through FY98 to process select RBOF inventory and current reactor basin material, after which releases will be reduced in the rainwater runoff through this outfall.**
2. **H–Canyon frames waste recovery and HB–Line will process and blend Pu–238 oxide for NASA's Cassini space mission.**
3. **S–Area is scheduled for start–up in 1994, this will cause a small increase in releases.**

D) Initiatives that would reduce production of this waste –

1. **Reduction of radioactive material inventory will reduce the source of potential releases.**

WSRC Recommendations – Complete operational initiatives as per the site mission.

E) Initiatives that would reduce the size of the release – .... Cost

1. **Install Sandfilter roof to eliminate ditch rainwater processing and potential contamination. $0.5M**
2. **Ceilcoat Sandfilter ditch up to 4 feet and maintain ditches as a "clean area." $0.1M**
3. **Install permanent piping to transfer ditch rainwater to process through the GP evaporators. $0.5M**
4. **Construct a divided basin and administratively control releases by sampling prior to release. Normally clean rainwater can be transferred directly to outfall, thus eliminating processing. $1M**

WSRC Recommendations – Implement Item #2. Items #1, #3 and #4 are not justifiable on a cost/benefit basis. Items #1 and #3 were rejected in favor of Item #2.

M–Area

A) Release Points – .... M–Area ETF, Air Stripper, Cooling Water and Stormwater

Outfall – .... Tims Branch–3 (TB–3)

B) Past, Present and Projected Releases Based on Current Initiatives –

(Curies)

Nuclide	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
U	0.002	0.045	0.006	0.006	0.001	0.002	0.002	0.001	<0.001	<0.001	<0.001

C) Impact of Operational Considerations –

1. **M–Area releases are mainly due to background radioactivity in the groundwater pumped from wells and are, therefore, proportional to the volume of water discharged.**
2. **Uranium in LETF effluent is at the drinking water concentration of 20 ppb and cannot be distinguished from background in the the combined effluent at TB–3.**

D) Initiatives that would reduce production of this waste –

1. **Shutdown of M–Area would reduce the volume of non–contact cooling water by 40%. M–Area is scheduled to process existing stored waste through 1998.**
2. **Shutdown of the M–Area groundwater air stripper would reduce the volume of discharged water by 60%. It is estimated that 30 years may be required to complete remedial action for plume of chlorocarbon contamination.**

WSRC Recommendations – Continue waste treatment until RCRA Facilities are clean and closed.

E) Initiatives that would reduce the size of the release – .... Cost

1. **Tails treatment could be added to the LETF to remove uranium to 2 ppb, but this project could not be completed before most of the stored waste is scheduled to be processed. The reduction in the size of radioactive release would not be measurable at TB–3. .... $10M**

WSRC Recommendations – Continue with present operation per the site mission. Item #1 is not justifiable on a cost/benefit basis.

WM & ER Outfall Analysis

Note: Refer to the WM & ER Outfall Analysis Initiative Discussions, which are found in Attachment V, for additional information concerning Section E.

Outfalls FM–3, FM–1C and McQueens Branch, which include releases points owned by WM & ER, are presented in the NMPD section.

H–Area

A) Release Points – .... ETF

Outfall – U3R–2A

B) Past, Present and Projected Releases Based on Current Initiatives –

(Curies)

Nuclide	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
H–3	N/A	N/A	N/A	100	2100	1200	3100	3000	3000	3000	3000
Sr	N/A	N/A	N/A	0	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cs	N/A	N/A	N/A	0	0.068	<0.001	0.002	0.002	0.002	<0.002	<0.002
Pm	N/A	N/A	N/A	0.0002	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

C) Impact of Operational Considerations –

1. F and H Canyon operation will be reduced with K–Reactor shutdown. Unloading of Reactor trailers at 211–F will be reduced with K–Reactor shutdown.
2. Volume from H–Tank Farm to ETF will increase with operation of the 1H evaporator and the RHLWE.

D) Initiatives that would reduce production of this waste –

1. Reduced operations and clean out of the F and H canyons will reduce waste production.

WSRC Recommendations – Continue with operations as per the site mission.

E) Initiatives that would reduce the size of the release – .... Cost

1. Route 100–Area waste trailers to the tank farm. $2M/yr
2. Route 100–Area waste trailers directly to Z–Area. $2M/yr
3. Segregate high tritium ETF influent and route to Z–Area. $20M/yr
4. Segregate high tritium ETF effluent and route to Z–Area. $20M/yr
5. Route ETF effluent to H–Tank farm for use in ESP/salt mining operation. $1M/yr
6. Route ETF effluent to use as process make–up water. $2M/yr
7. Design and install a de–tritiation facility. $100M
8. Evaporate all ETF effluent to atmosphere. $50M
9. Design and construct a tile field for ETF effluent. $20M

WSRC Recommendations – Initiate feasibility study for Tank farm storage of 100–Area Waste. Other initiatives are not justifiable for either regulatory (Item #2), or cost/benefit reasons (Items #3–#9).

H–Area

A) Release Points – .... H–Area Tank Farm Stormwater

Outfall – HP–52

B) Past, Present and Projected Releases Based on Current Initiatives –

(Curies)

Nuclide	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
H–3	N/A	N/A	N/A	N/A	N/A	5	3	<5	<5	<5	<5
Sr	N/A	N/A	N/A	N/A	N/A	0.0005	0.0009	0.0005	<0.0005	<0.0005	<0.0005
Cs	N/A	N/A	N/A	N/A	N/A	0.003	0.006	0.003	0.001	<0.001	<0.001

C) Impact of Operational Considerations –

1. Increases in operations at H–Tank Farm will increase the risk of stormwater contamination.

D) Initiatives that would reduce production of this waste –

1. Complete installation of new stormwater monitor and source holders in all stormwater monitor manholes.
2. Complete program to develop geometry–specific calibrations for each stormwater monitor.
3. Design, fabricate, test, and implement a prototype sediment removal system in the stormwater monitor manholes.
4. Continue program to identify, track, reduce, and prevent fixed and transferrable surface contamination within the F/H Tank Farm boundaries.
5. Complete design/installation of containment dikes around waste Tanks 13–15.

WSRC Recommendations – Continue with all identified initiatives as planned.

E) Initiatives that would reduce the size of the release – .... Cost

1. Test/Install new Beta/Gamma inline probe assembly in the 907–6H and 907–7H stormwater monitor manholes. $60K
2. Improve the sensitivity of stormwater monitors. (Dependent on sediment removal). .... <$10K
3. Route all collected stormwater through ETF. $3M/yr
4. Collect all stormwater runoff from the H–Area Tank Farm. .... $6.1M+

WSRC Recommendations – Complete Items #1 and #2. Items #3 and #4 are not justifiable in light of the low levels of contamination involved.

F–Area

A) Release Points – .... F– Retention Basin

Outfall – F–12

B) Past, Present and Projected Releases Based on Current Initiatives –

(Curies)

Nuclide	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
H–3	N/A	N/A	N/A	N/A	N/A	N/A	0	<3	<3	<3	<3
Sr	N/A	N/A	N/A	N/A	N/A	N/A	0	<0.01	<0.01	<0.01	<0.01
Cs	N/A	N/A	N/A	N/A	N/A	N/A	0	<0.01	<0.01	<0.01	<0.01

C) Impact of Operational Considerations –

1. Increased operations in F–Tank Farm will increase the risk of stormwater contamination.
2. Reduced F and H Canyon operation will decrease the probability of cooling water diversion.

D) Initiatives that would reduce production of this waste –

1. Improve the stormwater monitors to reduce the amount of clean water diverted to basin.

WSRC Recommendations – Continue with this initiative as planned.

E) Initiatives that would reduce the size of the release – .... Cost

1. Continue with stormwater monitor upgrades. .... Funded
2. Route all collected stormwater through ETF for processing. $3M/yr
3. Modify discharge pump suction to reduce amount of mud in effluent stream. $10K
4. Clean sediment out of basin twice per year. $0.1M/yr
5. Design and install a filtration system for basin effluent. $0.5M
6. Design and construct a settling basin upstream of existing retention basin. $1M
7. Route all basin effluent through portable treatment system. $3M/yr
(Unit currently being procured for treating High Activity water >10 dpm/ml).

WSRC Recommendations – Complete Items #1, #3, & #4. Implement items #2 and/or #7 on an as needed basis only. Items #5 and #6 are not justifiable on a cost benefit basis.

F–Area

A) Release Points – .... F– Seg Cooling Water Basin

Outfall – F–13

B) Past, Present and Projected Releases Based on Current Initiatives –

(Curies)

Nuclide	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
H–3	N/A	N/A	N/A	N/A	N/A	N/A	0	<3	<3	<3	<3
Sr	N/A	N/A	N/A	N/A	N/A	N/A	0	<0.01	<0.01	<0.01	<0.01
Cs	N/A	N/A	N/A	N/A	N/A	N/A	0	<0.01	<0.01	<0.01	<0.01

C) Impact of Operational Considerations –

1. Reduced F Canyon operations will decrease the probability of cooling water diversion.

D) Initiatives that would reduce production of this waste –

1. Shutdown of F Canyon would reduce the the probability of a cooling water diversion.

WSRC Recommendations – Continue with planned reductions in F–Canyon operations, as per the site mission.

E) Initiatives that would reduce the size of the release – .... Cost

1. Route all collected cooling water through ETF for processing. .... Capital ... $2M
   Operating . $0.2M/yr
2. Route all basin effluent through portable treatment system (unit currently being procured). $0.2M/yr
3. Design and install a closed cooling water system (total cost). $40M

WSRC Recommendations – Implement Items #1 and/or #2 on an as–needed basis. Item #3 is not justifiable on a cost/benefit basis.

H–Area

A) Release Points – .... H–Retention Basin

Outfall – H–17

B) Past, Present and Projected Releases Based on Current Initiatives –

(Curies)

Nuclide	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
H–3	N/A	N/A	N/A	N/A	N/A	N/A	0	3	<3	<3	<3
Sr	N/A	N/A	N/A	N/A	N/A	N/A	0.01	<0.01	<0.01	<0.01	<0.01
Cs	N/A	N/A	N/A	N/A	N/A	N/A	0.01	<0.01	<0.01	<0.01	<0.01

C) Impact of Operational Considerations –

1. Increased operations in H–Tank Farm will increase the risk of stormwater contamination.
2. Reduced F and H Canyon operations will decrease the probability of a diversions to basin.

D) Initiatives that would reduce production of this waste –

1. Improve stormwater monitors to reduce amount of clean water diverted to basin.

WSRC Recommendations – Continue with this initiative as planned.

E) Initiatives that would reduce the size of the release – .... Cost

1. Continue with stormwater monitor upgrades. $10K
2. Route all collected stormwater through ETF for processing. $3M/yr
3. Modify discharge pump suction to reduce amount of mud in effluent stream. $10K
4. Clean sediment out of basin periodically. $0.1M/yr
5. Design and install a filtration system for basin effluent. $0.5M
6. Design and construct a settling basin upstream of existing retention basin. $1M
7. Route all basin effluent through portable treatment system. $3M/yr
(Unit currently being procured for treating High Activity water >10 dpm/ml).

WSRC Recommendations – Complete Items #1, #3, and #4. Implement items #2 and/or #7 on an as–needed basis. Items #5 and #6 are not justifiable on a cost/benefit basis.

H–Area

A) Release Points – .... H– Seg Cooling Water Basin

Outfall – H–18

B) Past, Present and Projected Releases Based on Current Initiatives –

(Curies)

Nuclide	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
H–3	N/A	N/A	N/A	N/A	N/A	N/A	0	5	<5	<5	<5
Sr	N/A	N/A	N/A	N/A	N/A	N/A	0	<0.01	<0.01	<0.01	<0.01
Cs	N/A	N/A	N/A	N/A	N/A	N/A	0	<0.01	<0.01	<0.01	<0.01

C) Impact of Operational Considerations –

1. **Reduced H Canyon operations will decrease the probability of cooling water diversion.**

D) Initiatives that would reduce production of this waste –

1. **Shutdown of H Canyon would reduce the the probability of a cooling water diversion.**

WSRC Recommendations – Continue with planned reductions in H–Canyon operations, as per the site mission.

E) Initiatives that would reduce the size of the release – .... Cost

1. **Route all collected cooling water through ETF for processing.** .... **Capital ... $2M**
   Operating . $0.2M/yr
2. **Route all basin effluent through portable treatment system (unit currently being procured).** **$0.2M/yr**
3. **Design and install a closed cooling water system (total cost).** **$40M**

WSRC Recommendations – Implement Items #1 and/or #2 on an as–needed basis. Item #3 is not justifiable on a cost/benefit basis.

ATTACHMENT III

Authorization of Releases

BASES FOR LIQUID RELEASE LIMITS AND ACTION LEVELS

As part of the review of the procedural control and authorization of liquid radioactive releases, action limits for monitoring systems and the release limits for batch effluent discharges have been analyzed for adequacy by the operating departments and WSRC senior management. This section presents the results of these analyses.

TRITIUM RELEASES

Since tritium constitutes over 99% of the total curies of radioactive materials released from SRS, the Environmental ALARA Management Steering Committee requested that the Savannah River Technology Center (SRTC) perform a study to determine the worst case scenario for planned aqueous tritium releases.

The results of this study are provided in the attached IOM #SRT–ETS–920123. Using the then existing release limits for batch releases from K–Area, D–Area and the Effluent Treatment Facility (ETF), the study showed that sequentially staggered releases from the Areas, at the maximally allowed concentration levels, occurring at the lowest River flow rate, could cause a peak tritium concentration of 54 pCi/ml at the Highway 301 bridge. This level is more than $2^1/_2$ times the EPA standard of 20 pCi/ml, and was determined to be an unacceptable situation.

Therefore, the Management Steering Committee lowered the D–Area Rework Distillate Tank tritium release limit to 10 uCi/ml (5 curie limit) and the DW Plant Tank release limit to 1.0 uCi/ml (5 curie limit), which lowered their peak tritium concentration contributions in the River to 2 pCi/ml and 1.25 pCi/ml, respectively. In addition, the ETF is currently procedurally limited to a maximum concentration of 0.1 uCi/ml, which translates to a peak tritium concentration in the River of 8 pCi/ml. Any tritium concentration, in the ETF tanks, above 0.1 pCi/ml requires the explicate authorization of the Vice Presidents of the WM&ER and ESH&QA divisions prior to being released.

As shown in Table III–1, these actions have served to reduce the maximum possible tritium concentration in the River, due to planned batch releases, to less than 12 pCi/ml. This means, that even during the highly unlikely worst case release scenario, the EPA standard of 20 pCi/ml would not be approached without WSRC senior management involvement.

Current tritium release limits and responses are shown in the attached matrix entitled "Authorization for Liquid Radioactive Releases – Batch Releases of Liquid Effluents."

Area	Release Point	Release Limit (uCi/ml)	Total Curies Allowed (Ci)	Release Period (min)	Low Flow Peak (pCi/ml)	Ave. Flow Peak (pCi/ml)
K–Area	Process Sewer	0.01	10	10	0.4	0.2
D–Area	Distillate Tank	10	5	60	2.0	1.0
D–Area	Rework Tank	1.0	5	480	1.25	0.625
H–Area	ETF Tank	0.1	45.5	600	8	4
TOTAL	–	–	65.5	–	11.65	5.825

Table III–1

ACTION LEVELS VS DCGS

For radionuclides other than tritium, action levels and release limits are based upon historical process parameters (in the case of Separations Areas and the SWDF) or upon monitoring detection limits (in the case of Reactors and D–Area).

The 3 dpm/ml (alpha) and 10 dpm/ml (beta/gamma) action levels and release limits used in the Separations Areas and SWDF (refer to matrix in the attached memorandum #ESH–920109) have proven, over time, to be good compromises between leak detection sensitivity and avoidance of spurious alarms with the subsequent costly diversion of process streams.

In order to verify the adequacy of the existing action levels, the Environmental ALARA Management Steering Committee requested that a study be performed in the Separations and Waste Management Areas to compare the 3 dpm/ml and 10 dpm/ml action levels with the DOE Derived Concentration Guides (DCGs) for various potential waste streams.

The results of these studies are provided in the attached IOMs from J.E. Dickenson dated May 27, 1992 and May 29, 1992 and from A.W. Wiggins dated June 24, 1992. As can be seen, most waste streams onsite would be detected below the DCG levels due to the predominance of low dose factor gamma–emitters. However, there are a few potential waste streams that are dominated by alpha–emitters (Am/Cm and Pu), which the action levels would allow to be discharged in excess of the DCGs.

This situation is unavoidable due to the low level of the DCGs for most alpha–emitters (equivalent to 0.07 dpm/ml), and because of the "real time" detection limits of in–field monitors (1 dpm/ml). However, the SRS ALARA Release Guides, which are over 1000 times less than the 100 mrem DCG standard, and the DCGs themselves, for each outfall, are monitored and trended on a monthly basis by the Environmental Monitoring Section. These low-level monthly monitoring programs will detect any long term incipient leaks, which may occur below the established action levels, prior to there being a concern with offsite exposure levels.

CONCLUSION

WSRC Senior Staff believes that the revised tritium release limits shown in Table 3–1, and the existing action levels and release limits for radionuclides other than tritium are adequate to protect the public from exposures in excess of the DOE and EPA standards for the following reasons:

1. The DOE DCGs for some alpha–emitting radionuclides are at levels below the detection limit of "real time" monitoring capabilities. Therefore, the DCGs cannot be universally used as a basis for action levels and release limits.
2. Redundant low–level monitoring and trending of releases is performed on a monthly basis to ensure compliance with SRS ALARA Release Guides and the DOE–DCGs.
3. Continuous access by the public to liquid effluent waste streams (which is the bases of the DCGs) is not possible until the Savannah River, where, even at low River flow, the dilution factor is at least 1 to 10,000.
4. Planned liquid radioactive releases from the site have remained far below all DOE and EPA release standards throughout the history of the site. The action levels based upon historical process parameter have, therefore, proven a posteriori to be adequately sensitive to leaks.

PROCEDURAL CONTROL OF LIQUID RADIOACTIVE RELEASES

The final two sections of this Attachment present the initiatives that were undertaken concerning the procedural authorization of liquid releases. This includes the attributes that WSRC senior management required of each liquid release procedure.

Also, an updated matrix is provided for batch and continuous release procedures, for each radioactive release point. The batch release procedures have been revised or are in the process of being revised per the mandated attributes. A detailed status is provided in the matrix. All continuous release procedures are scheduled to be revised by July 31, 1992.

WESTINGHOUSE SAVANNAH RIVER COMPANY

INTER-OFFICE MEMORANDUM

SRT-ETS-920123

June 6, 1992

TO: T. JANNIK, 735-11A

FROM: D. W. HAYES, 773-A

DWH

PREDICTED PEAK TRITIUM CONCENTRATIONS AT HIGHWAY 301 FOR PLANNED AQUEOUS RELEASES FROM SRS FACILITIES

Summary:

SRS facilities routinely make planned releases of tritium to SRS streams which discharge into the Savannah River. To understand the impact these releases have on peak tritium concentrations at Highway 301, the SRS stream/river emergency response model was used to predict the highest peak concentrations that could occur at Highway 301 and to estimate release timing to reduce peak concentrations. Based on allowable release limits, the highest peak concentration (worst possible case) of 54 pCi/ml at a low flow of 5000 ft3/sec would occur if all of the peaks arrived at Highway 301 simultaneously. The tritium concentration would be lower, about 27 pCi/ml, for an average river flow of 10,000 ft3/sec. The amount of time the concentration would remain above a present guideline level, for example 20 pCi/ml, is not very long, about 10 hours for a low flow of 5000 ft3/sec. By scheduling the beginning and ending time for the releases, the peak concentration could be kept at or below 20 pCi/ml at Highway 301.

Introduction:

The Health Protection Department requested the Environmental Technology Section provide a worst case scenario for planned aqueous tritium releases from SRS facilities which, when compounded, would result in the highest concentrations at Highway 301 for a constant river flow. An estimate of what the tritium concentration would be at Highway 301 if each area released tritium at their highest allowable limit (action level) during the worst case scenario was also requested.

SRS facilities routinely make planned aqueous releases of tritium to SRS streams. These planned releases are made when the tritium concentration in the waste water from SRS facilities is so low recovery is impractical and it can be released without environmental consequences and violating current discharge regulations. The releases are from holding tanks in the 100 Areas, 400 Area and the ETF facility in H Area. Prior to release, the tritium concentration is measured and must be below the allowable limit (action level) before approval can be obtained from the appropriate area authority for release to SRS streams (Table 1). Planned releases are usually less than 100 Curies.

From tracer studies and dilution concepts, it has been determined that the major factors controlling the peak tritium concentration at Highway 301 for releases from SRS facilities are the timing of the release from each of the facilities, river flow rate and stream/river dispersion. For releases longer than 1/2 day in length, dispersion (mixing) processes are not effective in reducing the peak concentration and, therefore, steady state assumptions on dilution in the Savannah River are used. Peak arrival times are relative to the release duration and a shift occurs to longer travel times as release duration lengthens (leading edge travel times remain the same). This is true of releases from ETF and D Area to Upper Three Runs and beaver Dam Creeks. The large amount of mixing that occurs in Four Mile Creek and Pen Branch obscures some of the peak travel time detail. Releases from L and P Areas enter into L Lake and PAR Pond and are extremely slow in moving to the river and undergo large amounts of dilution and are not readily modeled.

Savannah River flow is important in determining the tritium concentration at Highway 301. Differences between a low flow (5000 ft3/sec) and an average flow (10,000 ft3/sec) in the Savannah River can change the tritium concentration by a factor of 2.

Planned Area Releases:

The tritium concentration at Highway 301 was predicted for each area holding tank release using the SRS stream/river emergency response code. The SRS stream/river emergency response code includes the transport characteristics for each stream: stream/river velocities for each site stream and the Savannah River (velocities range from a few feet/min to over a 100ft/min), flow distances from SRS facilities to the river over a range of 4 to 12 miles, and dispersion coefficients (mixing) from 50 to 1000 ft2/sec. Stream studies to update the transport coefficients are in progress and when they are completed some minor changes may occur in the model.

As input to the model for planned releases, the maximum amount of tritium in a holding tank and its release period was estimated. The amount of tritium was calculated from the holding tank volume and the action level concentration, which is the highest anticipated release concentration (Table 1 & 2). The holding tank release period was estimated from the tank volume and expected flow rate.

The results from the planned release simulation (all releases occurring at the same time) show that the highest concentrations are for releases from D and the ETF facility (Table 3 & Figure 3) and that the peaks are close together in time. If the releases did occur at the same time then the tritium concentration at Highway 301 would be the sum of the curves in Figure 2 and the peak tritium concentration could approach 30 pCi/ml for a low river flow of 5000 ft3/sec (Figure 3). Although this is an unlikely event, D-Area Drum Wash and D-Area Distillate Tank releases should be staggered by a few hours between the ending of one release and the start of the other to prevent the possibility of this occurrence.

Worst Case Scenario:

A worst case scenario would be for the area releases to be timed in such a manner as the peaks arrive at the same time at Highway 301. The worst case would be for K Reactor to release first, followed in 2.2 days by ETF, then in 2.5 days by D-Drum Wash, and finally in 2.7 days by D-Distillate. This staggering could result in a summed tritium peak concentration of 54 pCi/ml for a low flow of 5000 ft3/sec and 27 pCi/ml for an average flow of 10,000 ft3/sec at Highway 301 (Figure 4) for these releases. The release peak tritium concentration would be slightly higher if the current background of 3 pCi/ml at Highway 301 is added to these peak concentrations. The amount of time the concentration remained above a guideline level, such as 20 pCi/ml, is not very long, about 10 hours for a low flow of 5000 ft3/sec and 5 hours at an average flow 10,000 ft3/sec (Figure 3). At no time would the 4 mrem EPA drinking water dose limit be violated.

The chances of peaks arriving at the same time at Highway 301 from SRS planned releases and concentration summing can be reduced by release timing. Release timing for holding tank releases can be estimated from the arrival and ending times for planned releases at Highway 301. To reduce summing between releases, an overlap of 0.2 pCi/ml between the ending of a release and the beginning of another release at Highway 301 was used. This will assure that summing between releases would be limited to about 0.5 pCi/ml with little chance for the peaks to overlap. Since K Area planned releases contribute less than 1% to the peak concentration it was not included in this analysis.

The period between the beginning of one facility release to another varied from 26 to 2 hours (Table 3). A delay of 26 hours would be required from the start of an ETF release until a release from D-Distillate Tank could begin (Table 3). The delay times in Table 3 could serve as a guideline for controlling releases to mitigate peak concentrations downriver of SRS. These stagger times are based on the release volumes and periods given in Table 1 and 2 and may not be valid for other release volumes and periods. Stream studies to update the transport coefficients in the stream/river model are in progress and when they are completed some minor changes in timing estimates may be needed.

ALB:jpr

Attachments

cc: L. M. Papouchado, 773-A
A. L. Boni, 773-A
J. D. Heffner, 735-A
R. P. Addis,773-A
W. H. Carlton, 773-A
R. W. Taylor, 735-A
A. W. Wiggins, ETF

Table 1

Batch Releases of Liquid Effluent with High Potential for Tritium Content

Area	Release Point	Outfall	Action Level uCi/ml	Volume gallons	Amount Curies
100K	Process Sewer	Pen Branch	0.01	NR	10.
D	Distillate Tanks	Beaver Dam Creek	100.	125.	47.
D	Drum Wash Tanks	Beaver Dam Creek	1.	19000.	72.
H	ETF Treated Water	Upper Three Runs	0.2	120000.	91.

NR- Not Recorded

Table 2

Predicted River Tritium Concentrations for Area Releases with Highest Allowable Tritium Release Limits

Area	Release Point	Amount	Release Period	Peak Concentration at HWY 301 at river flow 5000 ft3/sec	10000 ft3/sec	Travel Time
		Curies	Minutes	pCi/ml	pCi/ml	Days
100K	Process Sewer	10.	10.	0.4	0.2	4.1
D	Distillate Tanks	47.	60.	20.	10.	1.4 (2.7)
D	Drum Wash Tanks	72.	480.	18.	9.	1.6 (2.5)
H	ETF Treated Water	91.	600.	16.	8.	1.9 (2.2)
Total Peak Concentration at Highway 301, if all peaks arrive at the same time.				54.4 pCi/ml	27.2 pCi/ml	

( ) Stagger Time - Days

Table 3

Release Times to Minimize Peak Concentration Impact at Highway 301 for Area Releases

From Start of Release Facility	To Start of Other Release Facility	Delay Needed Hours
ETF (10 Hours)	D-Drum Wash	25
ETF (10 Hours)	D-Distillate Tank	26
D-Drum Wash (1 Hour)	ETF	7
D-Distillate Tank (8 Hours)	ETF	2
D-Drum Wash (8 Hours)	D-Distillate Tank	16
D-Distillate Tank (1 Hour)	D-Drum Wash	9

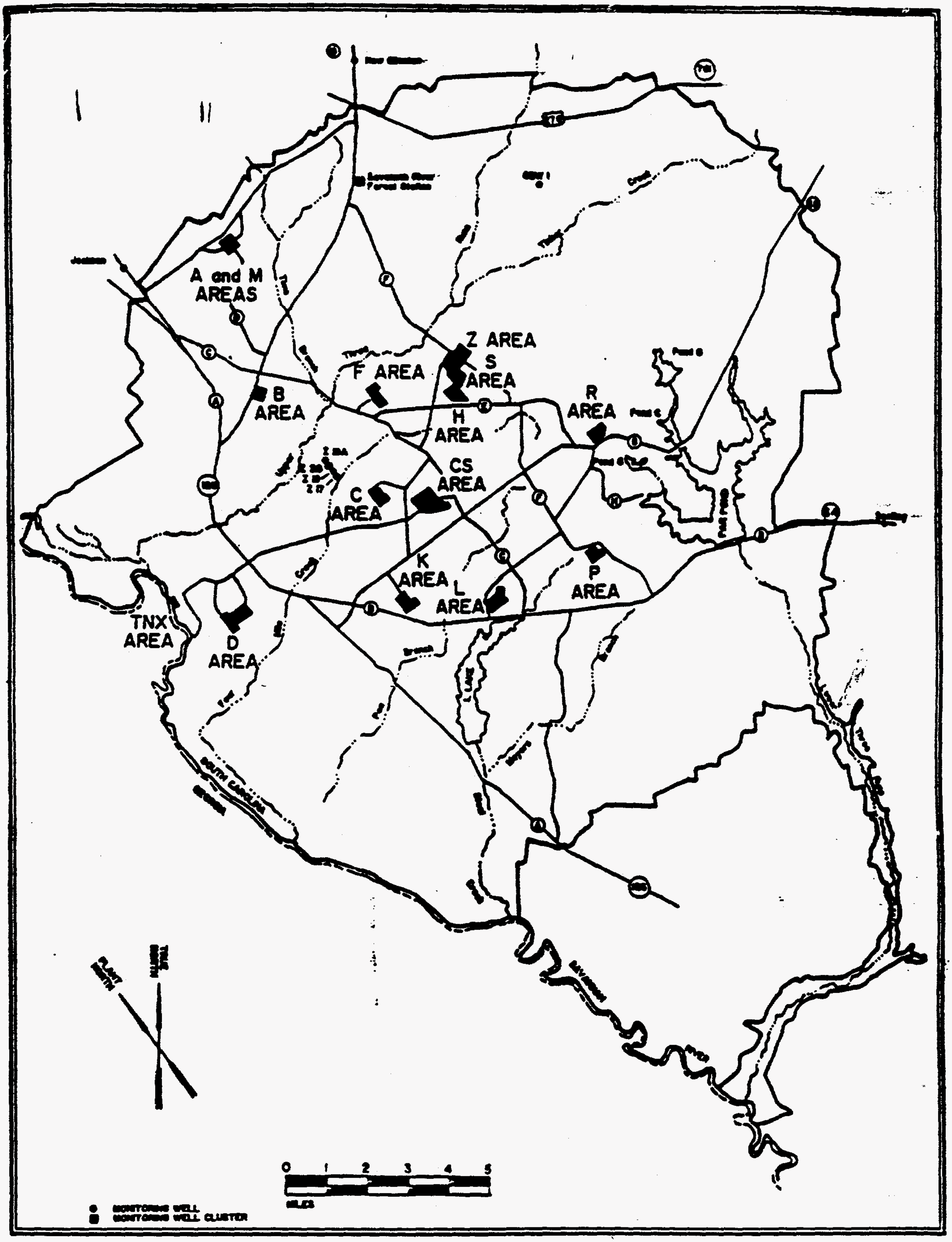
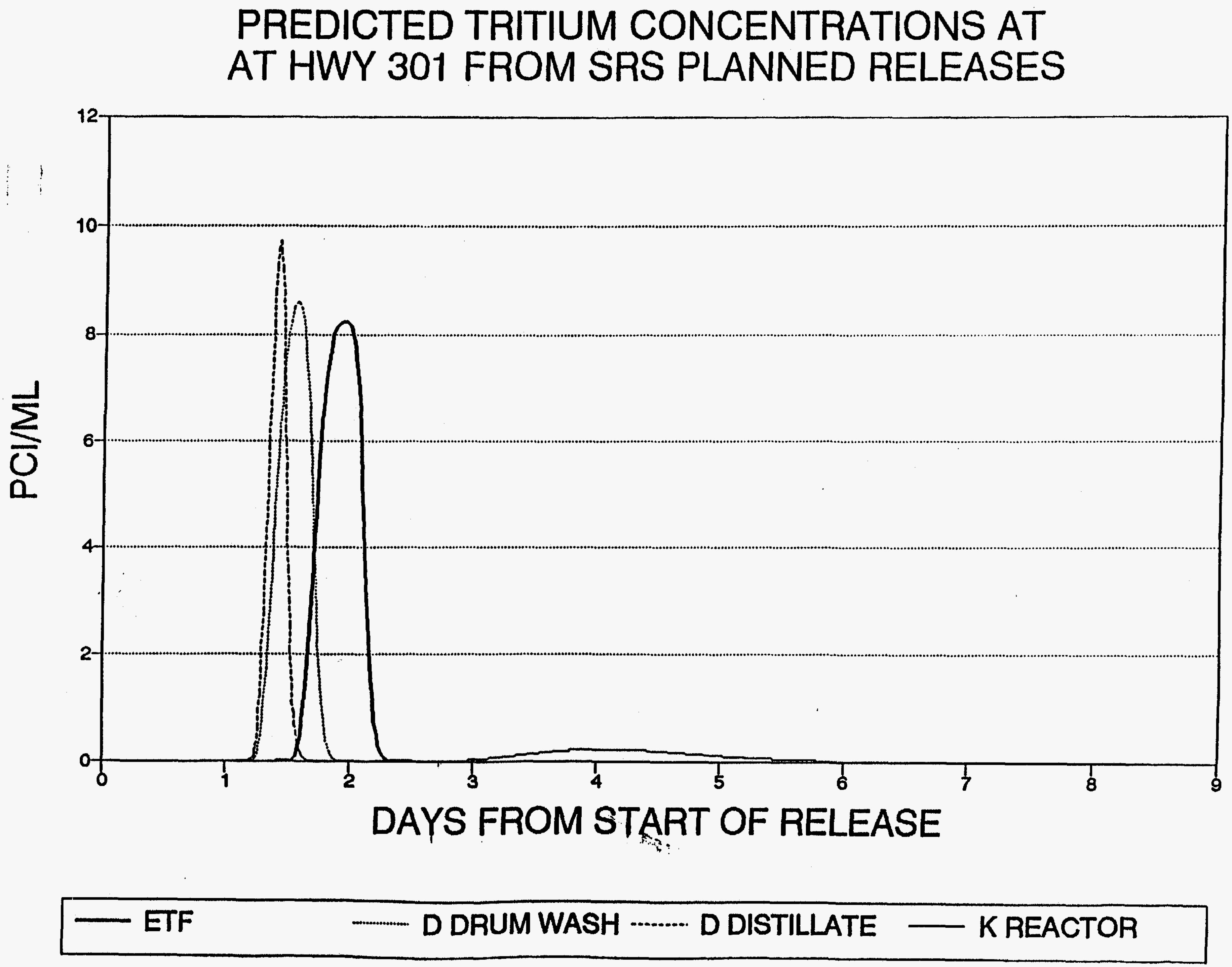


Figure 1 The Savannah River Site

Figure 2



PREDICTED TRITIUM CONCENTRATIONS AT
AT HWY 301 FROM SRS PLANNED RELEASES
PCI/ML
12
10
8
6
4
2
0
0
1
2
3
4
5
6
7
8
9
DAYS FROM START OF RELEASE
ETF
D DRUM WASH
D DISTILLATE
K REACTOR

Figure 3

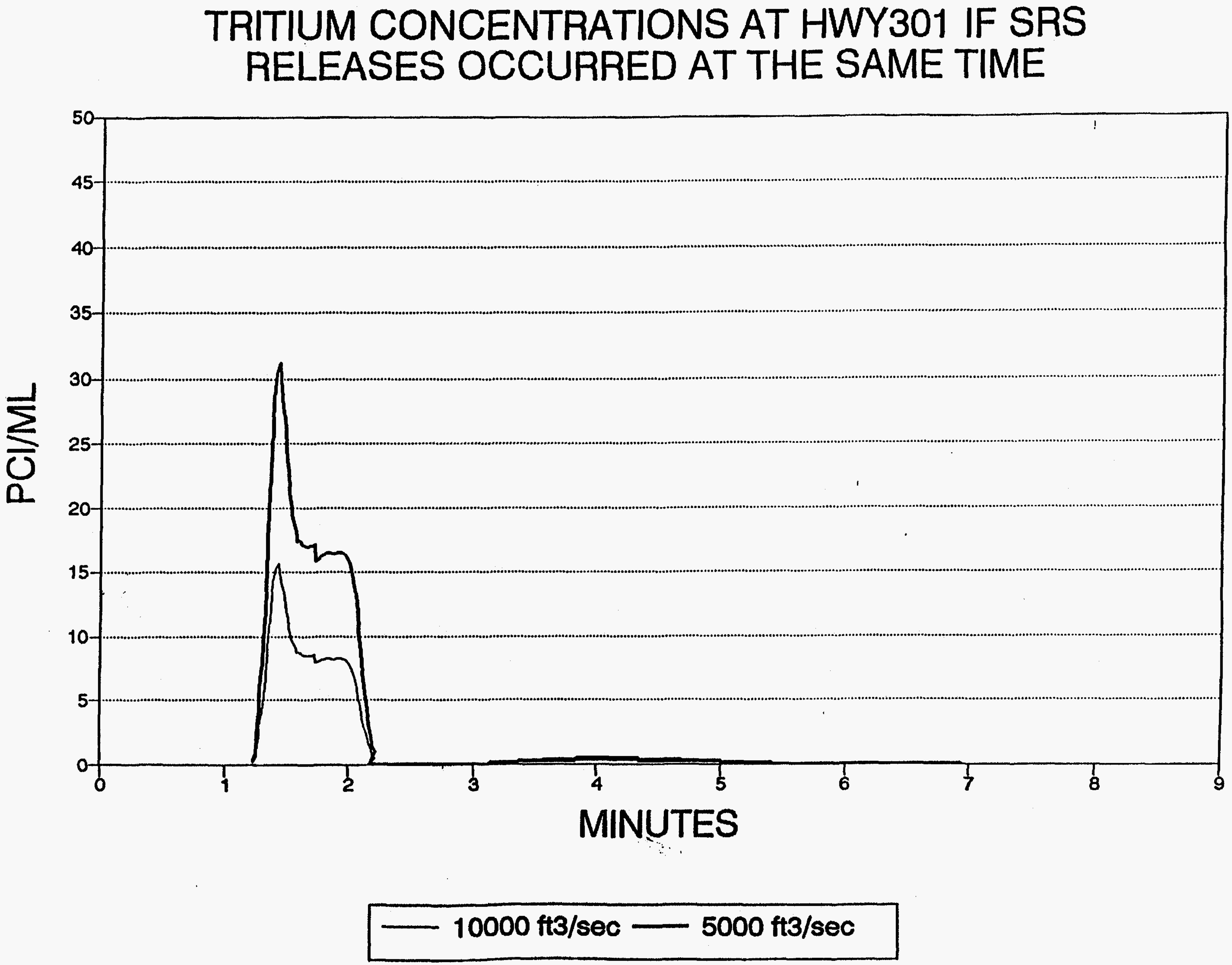
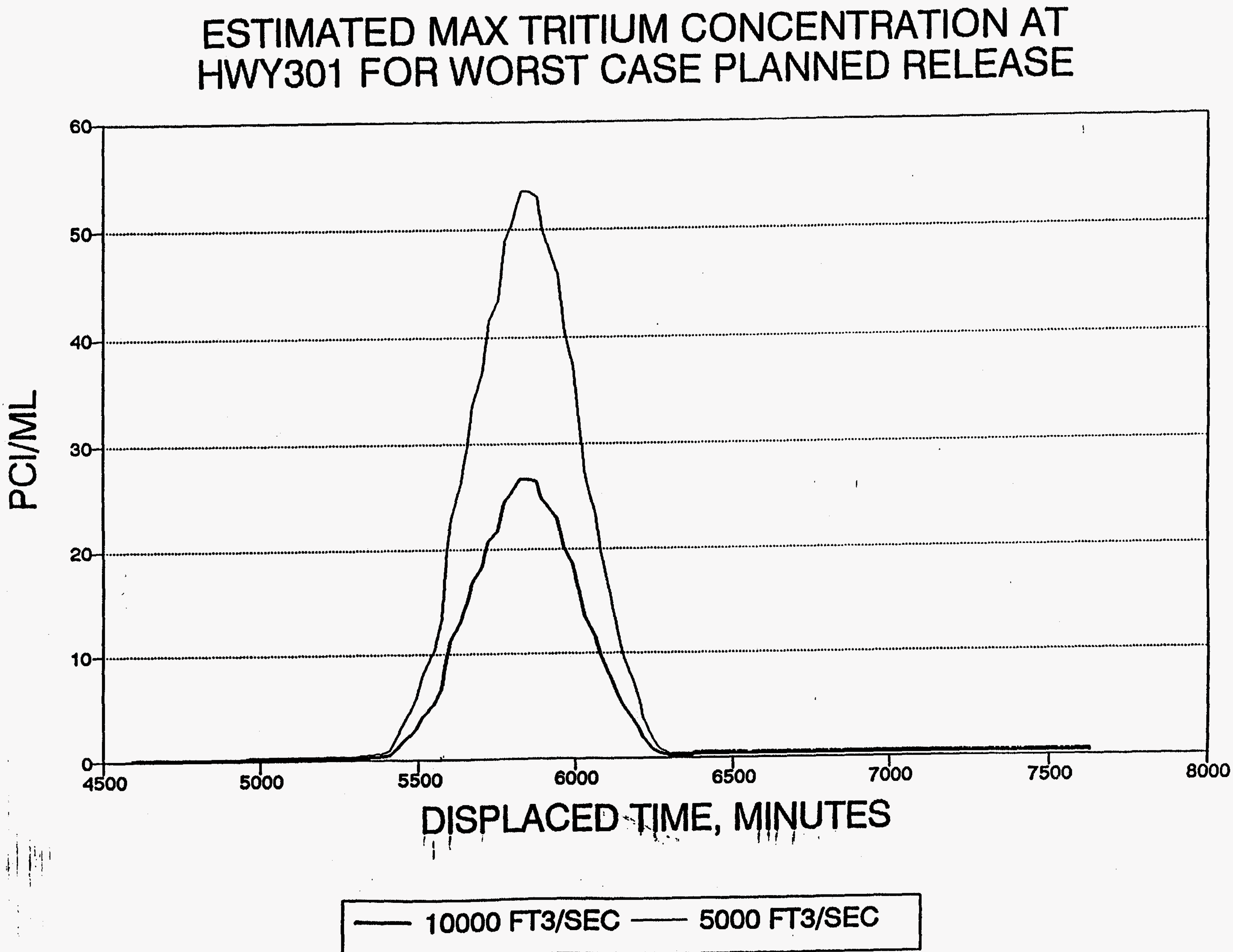

TRITIUM CONCENTRATIONS AT HWY301 IF SRS RELEASES OCCURRED AT THE SAME TIME
PCI/ML
50
45
40
35
30
25
20
15
10
5
0
0
1
2
3
4
5
6
7
8
9
MINUTES
10000 ft3/sec
5000 ft3/sec

Figure 4


ESTIMATED MAX TRITIUM CONCENTRATION AT
HWY301 FOR WORST CASE PLANNED RELEASE
PCI/ML
60
50
40
30
20
10
0
4500
5000
5500
6000
6500
7000
7500
8000
DISPLACED TIME, MINUTES
10000 FT3/SEC
5000 FT3/SEC

INTER-OFFICE MEMORANDUM
Savannah River Site

Date: 27-May-1992 03:28pm EDT
From: John E. Dickenson
DICKENSON-JE-04988
Dept: Separations
Tel No: 24123

TO: R. Maher (MAHER-R-01351 @A1@SLSRP1)

Subject: RADIOACTIVE LIQUID DISCHARGE ACTION LEVELS VS. DCG'S

Using the attached data, I have concluded that the only potential leak to F and H Area segregated water systems that would result in concentration of a radionuclide exceeding its Derived Concentration Guide that would NOT be detected by the in-line monitors (set at 3 d/m/ml alpha and 10 d/m/ml gamma) is a coil leak in F Canyon tank 17.1 which contains Am-Cm solution. This tank 17.1 solution is unusual in that the concentrations of alpha activity and gamma activity are approximately equal. In all other cases for F Canyon and H Canyon solutions, the concentration of gamma activity is at least 1000 times that of alpha activity. This predominance of gamma activity is important because the DCGs of certain Pu and Np isotopes are as low as 0.07 d/m/ml, which would not be detected by monitors set to alarm at 3 d/m/ml alpha. However, since gamma activity is also present (at least 1000 times greater concentration than alpha) in all other cases, the gamma activity will always exceed 10 d/m/ml when the alpha emitters are at their DCG value. The attached tables give the expected isotopic breakdown of radioactive leaks to the segregated cooling water systems from the various process locations in F and H Canyons (taken from the F and H Canyon SARs).

In the case of F Canyon tank 17.1 (Am-Cm solution), the total alpha activity is 1.77E11 d/m/ml and the total gamma activity is 4.16E10 d/m/ml. A leak of this solution which eventually made it to the segregated cooling water system and alarmed the monitor at 3 d/m/ml alpha would contain Am-243 at approximately 40 times its DCG value of 0.07 d/m/ml.

Assuming average flows of 0.45 CFS (200 gal/min) for F Area segregated cooling water, 10 CFS for Four Mile Creek, and 10,000 CFS for the Savannah River, 3 d/m/ml Am-243 at the F Area segregated cooling water discharge point would yield approximately 0.14 d/m/ml Am-243 (2 times the DCG) in Four Mile Creek and 0.00014 d/m/ml Am-243 (0.002 times the DCG) in the Savannah River.

INTER-OFFICE MEMORANDUM
Savannah River Site

Date: 27-May-1992 10:12am EDT
From: John E. Dickenson
DICKENSON-JE-04988
Dept: Separations
Tel No: 24123

Subject: DCGs FOR 200 AREAS ISOTOPES

	DCG (uCi/ml)	DCG (d/m/ml)
H-3	2.0E-3	4400
Sr-89	2.0E-5	44
Sr-90	1.0E-6	2.2
Y-90	1.0E-5	22
Y-91	2.0E-5	44
Zr-95	4.0E-5	88
Nb-95	6.0E-5	132
Ru-103	5.0E-5	110
Ru-106	6.0E-6	13
Rh-106	2.0E-4	444
Ag-110	1.0E-5	22
Sn-123	2.0E-5	44
Sb-125	5.0E-5	110
Te-127	2.0E-5	44
Te-129	1.0E-5	22
Cs-134	2.0E-6	4.4
Cs-137	3.0E-6	6.6
Ce-141	5.0E-5	110
Ce-144	7.0E-6	15
Pr-144	1.0E-3	2200
Pm-147	1.0E-4	220
Pm-148	1.0E-5	22
Eu-154	2.0E-5	44
U-234	5.0E-7	1.1
U-235	6.0E-7	1.3
U-236	5.0E-7	1.1
U-238	6.0E-7	1.3
Np-237	3.0E-8	0.07
Pu-238	4.0E-8	0.09
Pu-239	3.0E-8	0.07
Pu-240	3.0E-8	0.07
Pu-241	2.0E-6	4.4
Pu-242	3.0E-8	0.07
Am-243	3.0E-8	0.07
Cm-244	6.0E-8	0.13

NUCLIDES RELEASED TO FOUR MILE CREEK DUE TO F CANYON COIL FAILURES

% OF TOTAL ACTIVITY BY ISOTOPE

	Diss/HE/ 1st Cycle	HAW	LAW	2nd Pu Cycle	2nd U Cycle	Decon
Sr-89	7.80	7.70	7.80	7.80	7.80	6.30
Sr-90	0.70	0.70	0.70	0.70	0.70	0.60
Y-90	0.70	0.70	0.70	0.70	0.70	0.00
Y-91	12.00	12.00	12.00	12.00	12.00	11.00
Zr-95	12.00	11.90	11.90	12.00	12.00	17.00
Nb-95	3.20	3.20	3.20	3.20	3.20	31.00
Ru-103	5.90	5.90	5.90	5.90	5.90	5.70
Ru-106	6.00	6.00	6.00	6.00	6.00	7.30
Rh-106	6.00	6.00	6.00	6.00	6.00	0.00
Ag-110	0.08	0.08	0.08	0.08	0.08	0.00
Sn-123	0.10	0.10	0.10	0.10	0.10	0.00
Sb-125	0.13	0.15	0.12	0.13	0.13	0.00
Te-127	0.20	0.19	0.19	0.20	0.19	0.00
Te-129	0.12	0.12	0.12	0.12	0.12	0.00
Cs-134	0.13	1.29	1.30	0.13	0.13	0.36
Cs-137	1.00	0.90	0.90	1.00	1.00	1.00
Ce-141	3.90	3.80	3.80	3.80	3.80	0.00
Ce-144	18.00	17.90	18.00	18.00	18.00	17.00
Pr-144	18.00	17.90	18.00	18.00	18.00	0.00
Pm-147	3.20	3.20	3.20	3.20	3.20	2.80
Pm-148	0.04	0.04	0.04	0.04	0.04	0.00
Eu-154	0.06	0.06	0.06	0.06	0.06	0.00
U-234	0.00	0.00	0.00	0.00	0.00	0.00
U-235	0.00	0.00	0.00	0.00	0.00	0.00
U-236	0.00	0.00	0.00	0.00	0.00	0.00
U-238	0.00	0.00	0.00	0.00	0.00	0.00
Np-237	0.00	0.00	0.00	0.00	0.00	0.00
Pu-238	0.00	0.00	0.00	0.00	0.00	0.00
Pu-239	0.05	0.00	0.00	0.05	0.05	0.00
Pu-240	0.01	0.00	0.00	0.01	0.01	0.00
Pu-241	0.68	0.00	0.00	0.68	0.68	0.00
Pu-242	0.00	0.00	0.00	0.00	0.00	0.00
	99.99	99.82	100.11	99.89	99.89	100.06

NUCLIDES RELEASED TO FOUR MILE CREEK DUE TO H CANYON COIL FAILURES

% OF TOTAL ACTIVITY BY ISOTOPE

	Diss/HE	1st Cycle/ HAW	LAW	2nd U Cycle	2nd Np Cycle	Decon
Sr-89	7.00	7.19	7.20	7.20	7.20	11.00
Sr-90	0.50	0.50	0.50	0.50	0.50	2.30
Y-90	0.50	0.50	0.50	0.50	0.50	0.00
Y-91	10.90	11.28	11.30	11.30	11.20	20.00
Zr-95	9.90	10.41	10.40	10.40	10.40	2.70
Nb-95	2.90	0.29	0.30	0.29	0.30	5.10
Ru-103	2.40	1.56	1.50	1.60	1.60	3.90
Ru-106	1.80	1.21	1.20	1.20	1.20	2.90
Rh-106	1.80	1.82	1.80	1.80	1.80	0.00
Ag-110	0.04	0.04	0.04	0.04	0.04	0.00
Sn-123	0.04	0.05	0.05	0.05	0.04	0.00
Sb-125	0.06	0.06	0.06	0.06	0.06	0.00
Te-127	0.03	0.07	0.07	0.07	0.07	0.00
Te-129	0.04	0.05	0.05	0.05	0.04	0.00
Cs-134	1.10	1.13	1.10	1.10	1.10	3.20
Cs-137	2.00	1.56	1.50	1.60	1.60	2.50
Ce-141	2.00	2.26	2.30	2.30	2.30	0.00
Ce-144	25.70	26.02	26.00	26.10	25.90	42.00
Pr-144	25.70	26.02	26.00	26.10	25.90	0.00
Pm-147	2.80	2.86	2.80	2.90	2.80	4.10
Pm-148	2.90	5.03	5.00	5.00	5.00	0.00
Eu-154	0.05	0.05	0.05	0.05	0.05	0.00
U-234	0.00	0.00	0.00	0.00	0.00	0.00
U-235	0.00	0.00	0.00	0.00	0.00	0.00
U-236	0.00	0.00	0.00	0.00	0.00	0.00
U-238	0.00	0.00	0.00	0.00	0.00	0.00
Np-237	0.00	0.00	0.00	0.00	0.00	0.00
Pu-238	0.03	0.03	0.03	0.03	0.03	0.08
Pu-239	0.00	0.00	0.00	0.00	0.00	0.00
Pu-240	0.00	0.00	0.00	0.00	0.00	0.00
Pu-241	0.08	0.08	0.08	0.08	0.08	0.00
Pu-242	0.00	0.00	0.00	0.00	0.00	0.00
	100.27	100.07	99.82	100.31	99.71	99.78

TABLE C-11. Curies of Specific Nuclides Released to Four Mile Creek due to Coil and Tube Failures (F-Canyon)

Nuclide	Decon-tamination	Dissolver	Head End	First Cycle	2nd U Cycle	2nd Pu Cycle	HAN Evaporator	LAN Evaporator	Ion Exchange	High Heat Waste
89Sr	1.26E-02	1.32E+00	1.32E+00	1.32E+00	1.07E-10	6.87E-06	1.33E+00	4.53E-08	1.33E+00	1.33E+00
90Sr	1.28E-03	1.26E-01	1.26E-01	1.26E-01	1.02E-11	6.55E-07	1.28E-01	4.35E-09	1.28E-01	1.28E-01
90Y	0.00E+00	1.26E-01	1.26E-01	1.26E-01	1.02E-11	6.55E-07	1.28E-01	4.35E-09	1.28E-01	1.28E-01
91Y	2.20E-02	2.02E+00	2.02E+00	2.02E+00	1.64E-10	1.05E-05	2.06E+00	6.99E-08	2.06E+00	2.06E+00
95Zr	3.40E-02	2.02E+00	2.02E+00	2.02E+00	1.64E-10	1.05E-05	2.04E+00	6.94E-08	2.04E+00	2.04E+00
95Nb	6.20E-02	5.42E-01	5.42E-01	5.42E-01	4.39E-11	2.82E-06	5.47E-01	1.86E-08	5.47E-01	5.47E-01
103Ru	1.14E-02	9.96E-01	9.96E-01	9.96E-01	8.07E-11	5.18E-06	1.01E+00	3.42E-08	1.01E+00	1.01E+00
106Ru	1.46E-02	1.02E+00	1.02E+00	1.02E+00	8.26E-11	5.30E-06	1.03E+00	3.50E-08	1.03E+00	1.03E+00
106Rh	0.00E+00	1.02E+00	1.02E+00	1.02E+00	8.26E-11	5.30E-06	1.03E+00	3.50E-08	1.03E+00	1.03E+00
110Ag	0.00E+00	1.30E-02	1.30E-02	1.30E-02	1.05E-12	6.76E-08	1.30E-02	4.42E-10	1.30E-02	1.30E-02
123Sn	0.00E+00	1.70E-02	1.70E-02	1.70E-02	1.38E-12	8.84E-08	1.75E-02	5.95E-10	1.75E-02	1.75E-02
125Sb	0.00E+00	2.20E-02	2.20E-02	2.20E-02	1.78E-12	1.14E-07	2.10E-02	7.14E-10	2.10E-02	2.10E-02
127Te	0.00E+00	3.30E-02	3.30E-02	3.30E-02	2.67E-12	1.72E-07	3.30E-02	1.12E-09	3.30E-02	3.30E-02
129Te	0.00E+00	2.10E-02	2.10E-02	2.10E-02	1.70E-12	1.09E-07	2.10E-02	7.14E-10	2.10E-02	2.10E-02
134Cs	7.20E-04	2.20E-02	2.20E-02	2.20E-02	1.78E-12	1.14E-07	2.22E-01	7.55E-09	2.22E-01	2.22E-01
137Cs	1.98E-03	1.69E-01	1.69E-01	1.69E-01	1.37E-11	8.79E-07	1.70E-01	5.78E-09	1.70E-01	1.70E-01
141Ce	0.00E+00	6.55E-01	6.55E-01	6.55E-01	5.31E-11	3.41E-06	6.60E-01	2.24E-08	6.60E-01	6.60E-01
144Ce	3.40E-02	3.04E+00	3.04E+00	3.04E+00	2.46E-10	1.58E-05	3.08E+00	1.05E-07	3.08E+00	3.08E+00
144Pr	0.00E+00	3.04E+00	3.04E+00	3.04E+00	2.46E-10	1.58E-05	3.08E+00	1.05E-07	3.08E+00	3.08E+00
147Pm	5.60E-03	5.46E-01	5.46E-01	5.46E-01	4.42E-11	2.84E-06	5.51E-01	1.87E-08	5.51E-01	5.51E-01
148Pm	0.00E+00	6.36E-03	6.36E-03	6.36E-03	5.15E-13	3.31E-08	6.43E-03	2.19E-10	6.43E-03	6.43E-03
155Eu	0.00E+00	9.57E-03	9.57E-03	9.57E-03	7.75E-13	4.98E-08	9.66E-03	3.28E-10	9.66E-03	9.66E-03
234U	0.00E+00	2.52E-08	2.52E-08	2.52E-08	2.04E-18	1.31E-13	2.40E-12	8.16E-20	2.40E-12	2.40E-12
235U	6.00E-13	4.03E-07	4.03E-07	4.03E-07	3.26E-17	2.10E-12	4.00E-11	1.36E-18	4.00E-11	4.00E-11
236U	4.00E-13	3.64E-07	3.64E-07	3.64E-07	2.95E-17	1.89E-12	4.00E-11	1.36E-18	4.00E-11	4.00E-11
238U	5.80E-11	3.72E-05	3.72E-05	3.72E-05	3.01E-15	1.93E-10	4.00E-09	1.36E-16	4.00E-09	4.00E-09
237Np	0.00E+00	5.36E-08	5.36E-08	5.36E-08	4.34E-18	2.79E-13	1.09E-09	3.71E-17	5.41E-08	1.09E-09
238Pu	2.80E-08	2.53E-05	2.53E-05	2.53E-05	2.05E-15	1.32E-10	1.60E-09	5.44E-17	7.06E-08	1.60E-09
239Pu	3.00E-07	7.62E-03	7.62E-03	7.62E-03	6.17E-13	3.96E-08	4.60E-07	1.56E-14	2.31E-06	4.60E-07
240Pu	1.35E-06	1.73E-03	1.73E-03	1.73E-03	1.40E-13	9.00E-09	1.05E-06	3.57E-14	5.24E-06	1.05E-06
241Pu	2.60E-06	1.15E-01	1.15E-01	1.15E-01	9.32E-12	5.98E-07	7.00E-06	2.38E-13	3.50E-04	7.00E-06
242Pu	0.00E+00	1.68E-07	1.68E-07	1.68E-07	1.36E-17	8.74E-13	1.02E-11	3.47E-19	5.10E-05	1.02E-11
Total	2.00E-01	1.69E+01	1.69E+01	1.69E+01	1.37E-09	8.60E-05	1.72E+01	5.84E-07	1.72E+01	1.72E+01
Frequency, /hr	6.00E-08	2.68E-07	3.36E-07	2.13E-07	2.13E-07	2.13E-07	1.56E-06	1.56E-06	9.60E-08	3.36E-07

TABLE C-11. Curies of Specific Nuclides Released to Four Mile Creek due to Coil Failures (H-Canyon)

Nuclide	Decon-tamination	Dissolver	Head End	First Cycle	2nd U Cycle	2nd Np Cycle	HAW Evaporator	LAW Evaporator	High Heat Waste
89Sr	2.20E-02	1.21E+00	1.21E+00	1.41E+00	4.94E-10	9.03E-07	1.41E+00	5.93E-08	1.41E+00
90Sr	4.60E-03	8.30E-02	8.30E-02	9.86E-02	3.45E-11	6.31E-08	9.86E-02	4.14E-09	9.86E-02
90Y	0.00E+00	8.30E-02	8.30E-02	9.86E-02	3.45E-11	6.31E-08	9.86E-02	4.14E-09	9.86E-02
91Y	4.00E-02	1.87E+00	1.87E+00	2.21E+00	7.74E-10	1.41E-06	2.21E+00	9.28E-08	2.21E+00
95Zr	5.40E-03	1.70E+00	1.70E+00	2.04E+00	7.14E-10	1.31E-06	2.04E+00	8.57E-08	2.04E+00
95Nb	1.02E-02	4.93E-01	4.93E-01	5.78E-02	2.02E-11	3.70E-08	5.78E-02	2.43E-09	5.78E-02
103Ru	7.80E-03	4.08E-01	4.08E-01	3.06E-01	1.07E-10	1.96E-07	3.06E-01	1.29E-08	3.06E-01
106Ru	5.80E-03	3.06E-01	3.06E-01	2.38E-01	8.33E-11	1.52E-07	2.38E-01	1.00E-08	2.38E-01
106Rh	0.00E+00	3.06E-01	3.06E-01	3.57E-01	1.25E-10	2.28E-07	3.57E-01	1.50E-08	3.57E-01
110Ag	0.00E+00	7.31E-03	7.31E-03	8.67E-03	3.03E-12	5.55E-09	8.67E-03	3.64E-10	8.67E-03
123Sn	0.00E+00	7.48E-03	7.48E-03	8.84E-03	3.09E-12	5.66E-09	8.84E-03	3.71E-10	8.84E-03
125Sb	0.00E+00	9.52E-03	9.52E-03	1.11E-02	3.87E-12	7.07E-09	1.11E-02	4.64E-10	1.11E-02
127Te	0.00E+00	4.76E-03	4.76E-03	1.34E-02	4.69E-12	8.58E-09	1.34E-02	5.63E-10	1.34E-02
129Te	0.00E+00	7.48E-03	7.48E-03	8.84E-03	3.09E-12	5.66E-09	8.84E-03	3.71E-10	8.84E-03
134Cs	6.40E-03	1.87E-01	1.87E-01	2.21E-01	7.74E-11	1.41E-07	2.21E-01	9.28E-09	2.21E-01
137Cs	5.00E-03	3.40E-01	3.40E-01	3.06E-01	1.07E-10	1.96E-07	3.06E-01	1.29E-08	3.06E-01
141Ce	0.00E+00	3.74E-01	3.74E-01	4.42E-01	1.55E-10	2.83E-07	4.42E-01	1.86E-08	4.42E-01
144Ce	8.40E-02	4.42E+00	4.42E+00	5.10E+00	1.79E-09	3.26E-06	5.10E+00	2.14E-07	5.10E+00
144Pr	0.00E+00	4.42E+00	4.42E+00	5.10E+00	1.79E-09	3.26E-06	5.10E+00	2.14E-07	5.10E+00
147Pm	8.20E-03	4.76E-01	4.76E-01	5.61E-01	1.96E-10	3.59E-07	5.61E-01	2.36E-08	5.61E-01
148Pm	0.00E+00	4.93E-01	4.93E-01	9.86E-01	3.45E-10	6.31E-07	9.86E-01	4.14E-08	9.86E-01
154Eu	0.00E+00	7.82E-03	7.82E-03	9.18E-03	3.21E-12	5.88E-09	9.18E-03	3.86E-10	9.18E-03
234U	6.00E-11	2.04E-06	2.04E-06	2.21E-05	7.74E-15	1.41E-11	2.04E-09	8.57E-17	2.04E-09
235U	6.00E-13	2.72E-07	2.72E-07	3.06E-07	1.07E-16	1.96E-13	3.40E-11	1.43E-18	3.40E-11
236U	8.00E-12	2.38E-06	2.38E-06	2.89E-06	1.01E-15	1.85E-12	2.72E-10	1.14E-17	2.72E-10
238U	2.00E-14	6.80E-09	6.80E-09	7.99E-09	2.80E-18	5.11E-15	6.80E-13	2.86E-20	6.80E-13
237Np	0.00E+00	1.24E-06	1.24E-06	1.46E-06	5.11E-16	9.34E-13	1.36E-09	5.71E-17	1.36E-09
238Pu	1.62E-04	4.59E-03	4.59E-03	5.27E-03	1.84E-12	3.37E-09	5.27E-03	2.21E-10	5.27E-03
239Pu	1.74E-06	3.91E-05	3.91E-05	4.59E-05	1.61E-14	2.94E-11	4.59E-05	1.93E-12	4.59E-05
240Pu	1.40E-06	2.89E-05	2.89E-05	3.40E-05	1.19E-14	2.18E-11	3.40E-05	1.43E-12	3.40E-05
241Pu	3.20E-07	1.31E-02	1.31E-02	1.55E-02	5.43E-12	9.92E-09	1.55E-02	6.51E-10	1.55E-02
242Pu	0.00E+00	5.78E-08	5.78E-08	6.80E-08	2.38E-17	4.35E-14	6.80E-08	2.86E-15	6.80E-08
Total	2.00E-01	1.72E+01	1.72E+01	1.96E+01	6.86E-09	1.26E-05	1.96E+01	8.24E-07	1.96E+01
Frequency, /hr	6.00E-08	1.04E-06	6.40E-07	9.60E-08	9.60E-08	9.60E-08	1.36E-06	1.36E-06	9.60E 08

INTER-OFFICE MEMORANDUM
Savannah River Site

Date: 18-May-1992 02:20pm EDT
From: John E. Dickenson
DICKENSON-JE-04988
Dept: Separations
Tel No: 24123

TO: R. Maher (MAHER-R-01351 @A1@SLSRP1)

Subject: 1985 F & H AREA RELEASES

1985 is the most recent "high production" year for F and H Area Separations Facilities. The following estimated concentrations in site streams and tributaries were calculated using data presented in WSRC-RP-91-684, Radioactive Releases at the Savannah River Site 1954 - 1989. Concentrations were calculated by dividing total curies of each radionuclide released by the associated volume of water released. For isotopes reported as released to seepage basins, the calculated concentrations were divided by the 200 Area ETF decontamination factor for that isotope. Note that the only release exceeding the associated DCG is the H Area tritium release.

F & H AREA LIQUID WASTE DISCHARGES

Estimated Concentrations in Site Streams and Tributaries

1985

	F Area Ave. Conc. (uCi/ml)	H Area Ave. Conc. (uCi/ml)	DCG (uCi/ml)
H-3	2.5E-4	2.6E-3	2.0E-3
Sr-90	1.0E-8	5.7E-10	1.0E-6
Nb-95	1.4E-7	1.8E-9	6.0E-5
Zr-95	1.0E-8	1.1E-9	4.0E-5
Ru-103	1.3E-8	4.8E-11	5.0E-5
Ru-106	3.8E-8	6.8E-8	6.0E-6
I-131	2.7E-11		3.0E-6
Cs-134		2.5E-10	2.0E-6
Cs-137	1.9E-8	1.6E-8	3.0E-6
Ce-144	2.8E-9	2.0E-10	7.0E-6
Pm-147	2.5E-9	3.3E-9	1.0E-4
Pu-238	3.0E-10	1.0E-10	4.0E-8
Pu-239	3.2E-10		3.0E-8
Am-241	9.3E-9	4.3E-9	3.0E-8
Cm-244	1.6E-8	1.9E-9	6.0E-8

INTER-OFFICE MEMORANDUM
Savannah River Site

Date: 29-May-1992 09:55am EDT
From: John E. Dickenson
DICKENSON-JE-04988
Dept: Separations
Tel No: 24123

TO: See Below

Subject: ACTION LEVEL VS. DCG FOR H CANYON Pu-238 SOLUTION

Per your request, I have examined the impact of a leak of H-Canyon Pu-238 solution to the segregated cooling water. In the case of H Canyon tank 7.3-1 (Pu-238 product solution hold tank), the total alpha activity is 7.52E10 d/m/ml (predominately Pu-238 activity) and the total gamma activity is 2.27 E5. As you suspected, there is not sufficient gamma activity to activate the segregated cooling water monitor alarm in the case of a leak where the Pu-238 content is equal to its DCG value of 0.09 d/m/ml. A leak of this solution which eventually made it to the segregated cooling water system and alarmed the monitor at 3 d/m/ml alpha would contain Pu-238 at approximately 30 times its DCG value. As you know, in H Area the segregated cooling water is collected, sampled, then discharged as a batch if sample results are below 1 d/m/ml alpha and 8 d/m/ml gamma. Therefore, water containing between 1 and 3 d/m/ml alpha would be detected by sample analysis and would not be released to Four Mile Creek. Water with activity below the sample detection limit of 1 d/m/ml alpha could contain Pu-238 at approximately 10 times its DCG value.

Assuming average flows of 0.45 CFS (200 gal/min) for H Area segregated cooling water, 10 CFS for Four Mile Creek, and 10,000 CFS for the Savannah River, 1 d/m/ml Pu-238 at the H Area segregated cooling water discharge point would yield approximately 0.045 d/m/ml Pu-238 (0.5 times the DCG) in Four Mile Creek and 0.000045 d/m/ml Pu-238 (0.0005 times the DCG) in the Savannah River.

Note: Attached is the information presented to the ALARA Release Steering Committee on 5/28/92.

Distribution:

TO:	R. Maher	(MAHER-R-01351 @A1@SLSRP1)
CC:	William H. Britton	(BRITTON-WH-L3656 @A1@SLSRP1)
CC:	Robert R. Campbell	(CAMPBELL-RR-B7731 @A1@SLSRP1)
CC:	J. David Woodward	(WOODWARD-JD-L1502 @A1@SLSRP1)
CC:	Charles L. Peckinpaugh	(PECKINPAUGH-CL-Z9086 @A1@SRXSS2)
CC:	BRENT RANKIN	(RANKIN-DB-04241 @A1@SRXSS2)
CC:	C G HARDIN	(HARDIN-CG-05564 @A1@SLSRP1)
CC:	G. Timothy Jannik, 735-11A	(JANNIK-GT-09913)
CC:	JOHN G. McKIBBIN	(MCKIBBIN-JG-04177)
CC:	R.L. McQuinn	(MCQUINN-RL-04929)
CC:	Paul W. Dickson Jr.	(DICKSON-PW-Y5105 @A1@SLSRP1)
CC:	ONELIO M. EBRA-LIMA	(EBRALIMA-OM-T5452 @A1@SLSRP1)

WESTINGHOUSE SAVANNAH RIVER COMPANY WER-WME-92-0912

INTER-OFFICE MEMORANDUM

June 29, 1992

TO: C. L. Peckinpaugh, 703-A

FROM: A. W. Wiggins, 241-84H AWW

WASTE MANAGEMENT RADIOACTIVE LIQUID RELEASES VS. DCG'S (Rev 1) (U)

References:

1) J. E. Dickenson to R. Maher, "Radioactive Liquid Release Discharge Action Levels vs. DCG's", May 27, 1992.
2) J. E. Dickenson to R. Maher, "Action Level vs. DCG for H Canyon Pu-238 Solution", May 29, 1992.

In the above referenced memoranda, Separations examined the various sources of liquid contamination and evaluated the potential for a release occurring that might exceed the Derived Concentration Guides (DCG's) found in DOE Order 5400.5 (Attachment 1) but not be detected by the present monitoring systems. A similar analysis is appropriate for the Waste Management facilities and is the scope of this memorandum. Examination of the radioactive source terms to the various Waste Management outfalls reveals situations similar to those described in the Separations memos. Areas of particular concern include Sr-90 from H-Tank Farm storm zones 6H & 7H, alpha contaminants from the two canyon tanks mentioned in John Dickenson's memos, and especially alpha contaminants from the various release points in the Solid Waste Disposal Facility.

In all cases in the F and H area Tank Farms and most of the situations at the F/H Effluent Treatment Facility (and associated basins), the concentration of gamma activity is at least 100 times that of alpha activity in the solutions being released. In fact, in most cases, the ratio exceeds 1000X. The limiting case is that of the routine influent to the ETF (Attachment 2) where the alpha radionuclides, assumed as Pu-239, are shown to average 8.10E-09 Ci/gal versus a total average activity of 8.28E-07 Ci/gal, giving a beta-gamma to alpha ratio of approximately 100:1. Although the DCG for certain alpha radionuclides can be far below the 1 d/m/ml detection limit of the HP radiation counters (0.07 d/m/ml for Pu-239 for instance), the corresponding beta-gamma activity would serve as a tracer for the alpha. As long as the beta-gamma activity is kept sufficiently low (<7 d/m/ml), the alpha activity would remain below the DCG level. To date, there has been no detectable alpha activity in any of the ETF or tank farm outfalls.

For nonroutine water releases, such as stormwater or cooling water, attached tables (Attachments 3-7) show the typical isotopic breakdowns of these streams. The tables are from various 200-area Safety Analysis Reports and Dickenson's first memo. Attachment 3 shows the typical tank farm stormwater isotopic breakdown while attachments 4-7 show what the breakdown would be for a cooling water diversion. In two stormwater zones in H Tank Farm (907-6H & 907-7H), there exists a potential for exceeding the DCG for strontium (Sr-89/90). Under typical conditions in the tank farms, the gamma activity (typically Cs-137) is much higher than the beta activity (typically Sr-90), at a ratio of approximately 25:1 in H-area supernate, for example (Attachment 3). However, during sludge washing, the Cs:Sr ratio is reduced. Therefore, any runoff after a process leak could be much higher in Sr-90 and could exceed the Sr-90 DCG of 2.2 d/m/ml without triggering the existing stormwater monitors that divert the water to the retention basin (281-8H). This is the reason why beta-gamma on-line monitors will be installed in these two stormwater zones before extended sludge processing (ESP) start-up. If the monitor is not operational before ESP start-up, the 7H storm zone will be manually diverted to the 8H retention basin until the beta monitor is operational. The sensitivity of the new monitors and the specific requirements for diverting water with beta activity to the basin are still being evaluated. The current plan is to divert at 10 d/m/ml total beta-gamma activity above background (vs the current 10 d/m/ml total gamma activity for the existing monitors).

The only cases for the liquid waste facilities where beta-gamma activity would not be a good indication of alpha activity are the two cases shown in Dickenson's memos for F Canyon tank 17.1 and H Canyon tank 7.3-1. Using the F Canyon tank as an example, the alpha activity (Am-243 solution) <u>exceeds</u> the gamma activity by a factor of >4X. If a cooling coil leak did occur and the F Canyon water monitor did alarm, this water would be diverted to the 241-97F Cooling Water basin. The collected water would then be sampled by ETF Operations and analyzed by HP for beta-gamma and alpha activity levels. If the alpha level was found to be below 3 d/m/ml (~40X the Am-243 DCG), the water would be discharged to Four Mile Creek per procedure. No isotopic breakdown would be determined until the routine basin outfall sample (F-013) was analyzed by the Environmental Monitoring Section for their monthly radioactive releases report. Therefore, the AM-243 DCG could be exceeded by up to 40X for that single discharge. However, since the DCG is a 12-month running average and not a discharge limit, the effect of one such discharge would be reduced by other discharges that do not contain Am-243 (or Pu-238). Therefore, although the potential for exceeding a DCG for a single discharge or a small period of time does exist, the risk of this occurring is very low. The ALARA guides for the F/H areas would not be unduly affected since 2 million gallons of cooling water with Am-243 or Pu-238 at 3 d/m/ml would result in a release of 0.01 curies and an maximum offsite dose of less than 0.004 mrem/yr for Am-243 or 0.002 mrem/yr for Pu-238, both well below the yearly ALARA release goals for the 200-areas.

If a DCG is exceeded, the DOE order calls for an analysis of the best available treatment (BAT) options for the stream to reduce the radionuclide levels to below the DCG. The only DCG that Waste Management exceeds is that for tritium at ETF outfall U3R-2A. The DCG for tritium is 4400 d/m/ml while the tritium level in ETF effluent averages 10X this level at about 50,000 d/m/ml. For 1992, the latest monthly release report (April) shows the tritium level running at about 25X DCG. This is due to a high level of tritium released in January. The tritium came from a 100-K waste trailer processed through the 211-F General Purpose Evaporators. Tritium levels since that period have been much lower and are currently running near the DCG level. The DOE order includes a disclaimer for tritium, in that there is no economical treatment option available. The order calls for keeping the releases "as low as reasonably achievable", the ALARA principle which has been implemented at the ETF through the use of "flag" levels with corresponding actions for various tritium concentrations in the effluent. The flags on the ETF treated water effluent do nothing to lower the total amount of tritium released per year, they reduce the maximum concentration in the stream and river by limiting the amount discharged per day to less than 100 curies. Other flags for 100-area trailers unloaded at 211-F also help reduce the ETF effluent concentration but the tritium is still released to the outfall. Only disposal in Z-area saltstone or some other permanent disposal system would prevent discharge of the tritium.

The situation for the Solid Waste Disposal Facility is not as clear. Rainwater collected in the various sumps is screened for alpha and beta-gamma activity and discharged if the activity is below the standard 3 d/m/ml alpha and 10 d/m/ml beta-gamma. There are some areas, such as Above Ground Equipment Storage and Suspect Soil piles, where unmonitored runoff occurs. Most of this water is routed to the area drainage system which runs to two settling basins. These basins are for sediment/erosion control only and are not for retention of suspect contaminated water. The outlets of the basins are not sampled nor are the basin contents at this time. A basin sampling special procedure is currently routing for review and approval. Environmental Monitoring Section of ESH&QA has samplers in Four Mile Creek and Upper Three Runs Creek downstream of the basin outlets that will detect increased activity after a release. This group also pulls a weekly sample from the north main drainage ditch. None of this is in compliance with DOE orders 5400.1 and 5400.5, which call for undiluted sampling along with characterization/quantification of contaminants to determine the DCG's.

Some of the SWDF waste, such as TRU waste drums on outdoor pads, contains nearly pure alpha waste. However, the waste is stored in metal containers (burial boxes or lined/unlined drums) and is also further contained in plastic bags (sometimes double or triple bagged) inside the metal container. Therefore, the probability of release to the water column is small, but the highly variable nature of solid waste calls for more in-depth radioactive sampling and screening to establish baselines and verify DCG compliance for the various release locations. These actions are being investigated as part of the followup of the Waste Management Radiological Liquid Effluent Release Prevention Taskforce, which is now being chaired by the Waste Management Regulatory Compliance group. This effort has just begun with the kickoff meeting taking place on June 16, 1992.

AWW:aww

CC: G. T. Wright, 703-H
J. V. Cioffi, 724-7E
R. W. Harral, 703-H
S. S. Cathey, 703-H
R. M. Satterfield, 719-4A
I. K. Sullivan, 241-84H
R. W. Wilson, 703-H
V. G. Dickert, 703-F
L. C. Thomas, 724-7E
C. G. Lampley, 241-120H
T. D. Phillips, 703-H
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WM File 220.0, WM file room, 703-H

ATTACHMENT 1

INTER-OFFICE MEMORANDUM
Savannah River Site

Date: 27-May-1992 10:12am EDT
From: John E. Dickenson
DICKENSON-JE-04988
Dept: Separations
Tel No: 24123

Subject: DCGs FOR 200 AREAS ISOTOPES

	DCG (uCi/ml)	DCG (d/m/ml)
H-3	2.0E-3	4400
Sr-89	2.0E-5	44
Sr-90	1.0E-6	2.2
Y-90	1.0E-5	22
Y-91	2.0E-5	44
Zr-95	4.0E-5	88
Nb-95	6.0E-5	132
Ru-103	5.0E-5	110
Ru-106	6.0E-6	13
Rh-106	2.0E-4	444
Ag-110	1.0E-5	22
Sn-123	2.0E-5	44
Sb-125	5.0E-5	110
Te-127	2.0E-5	44
Te-129	1.0E-5	22
Cs-134	2.0E-6	4.4
Cs-137	3.0E-6	6.6
Ce-141	5.0E-5	110
Ce-144	7.0E-6	15
Pr-144	1.0E-3	2200
Pm-147	1.0E-4	220
Pm-148	1.0E-5	22
Eu-154	2.0E-5	44
U-234	5.0E-7	1.1
U-235	6.0E-7	1.3
U-236	5.0E-7	1.1
U-238	6.0E-7	1.3
Np-237	3.0E-8	0.07
Pu-238	4.0E-8	0.09
Pu-239	3.0E-8	0.07
Pu-240	3.0E-8	0.07
Pu-241	2.0E-6	4.4
Pu-242	3.0E-8	0.07
Am-243	3.0E-8	0.07
Cm-244	6.0E-8	0.13

TABLE 3-1. Nuclide Distribution and Dose Potential for Normal 200-Area Effluents (Nuclide Other Than Tritium) (1)

Nuclide	Ci Content, Ci/gal (2)	Ci Airborne from Release of 1 gal	Inhalation Dose Commitment Factor, arem/pCi (3)	Dose Due to Intake of Ci Content of 1 gal, rem	Ratio to Total, %	Ci Content for Major Contributors, Ci/gal (4)	Dose Due to Major Contributors, rem	Baseline Normal Process Solution Ci Fraction
51Cr	5.80E-08	5.80E-12	1.25E-08	7.25E-11	1.08E-04			
58Co	1.10E-08	1.10E-12	2.59E-07	2.85E-10	4.23E-04			
60Co	1.10E-08	1.10E-12	1.85E-06	2.04E-09	3.02E-03			
65Zn	9.20E-09	9.20E-13	5.82E-06	5.35E-09	7.94E-03			
89Sr	5.80E-09	5.80E-13	1.09E-06	6.32E-10	9.38E-04			
90Sr	1.60E-08	1.60E-12	7.21E-05	1.15E-07	1.71E-01	1.60E-08	1.15E-07	2.93E-02
95Zr	5.80E-08	5.80E-12	2.91E-06	1.69E-08	2.50E-02			
95Nb	6.40E-08	6.40E-12	5.26E-07	3.37E-09	4.99E-03			
103Ru	4.00E-08	4.00E-10	8.23E-08	3.29E-08	4.88E-02			
106Ru	3.10E-07	3.10E-09	1.09E-06	3.38E-06	5.01E+00	3.10E-07	3.38E-06	5.68E-01
125Sb	2.30E-09	2.30E-13	1.58E-06	3.63E-10	5.39E-04			
134Cs	2.10E-08	2.10E-12	9.10E-05	1.91E-07	2.83E-01	2.10E-08	1.91E-07	3.85E-02
137Cs	1.50E-07	1.50E-11	5.35E-05	8.03E-07	1.19E+00	1.50E-07	8.03E-07	2.75E-01
141Ce	5.80E-09	5.80E-13	1.91E-07	1.11E-10	1.64E-04			
144Ce	4.10E-08	4.10E-12	2.30E-05	9.43E-08	1.40E-01	4.10E-08	9.43E-08	7.51E-02
147Pm	1.70E-08	1.70E-12	3.19E-06	5.42E-09	8.04E-03			
239Pu	8.10E-09	8.10E-13	7.75E-02	6.28E-05	9.31E+01	8.10E-09	6.28E-05	1.48E-02
Total (5)	8.28E-07	3.55E-09		6.74E-05	1.00E+02	5.46E-07	6.74E-05	1.00E+00

(1) Tritium is present at a uniform concentration of 3.5e-4 Ci/gal throughout the process. Tritium is included in source term, dose, and risk calculations as a separate line item.
(2) Reference 8; Pu-239 was assumed for alpha-emitting nuclides.
(3) Reference 27.
(4) Major contributor - greater than 0.1% contribution to total dose.
(5) Does not include 131I (1.4E-8 Ci/gal). See Section 3.2.1.1.

Radionuclide Content of Combined Supernate in High Heat Waste Receiver Tanks, curies/gallon

High Heat Supernate (HHS)

Radionuclide	F-Area Tanks Composite	H-Area Tanks Composite
^{3}H	-------5.0EE-03-------	
^{89}Sr	1.4EE-02	1.0EE-02
^{90}Sr	6.1EE-02	3.2EE-01
^{90}Y	6.1EE-02	3.2EE-01
^{91}Y	2.4EE-02	1.9EE-02
^{95}Zr	3.8EE-01	3.1EE-01
^{95}Nb	8.1EE-01	6.7EE-01
^{106}Ru	1.5EE-01	3.7EE-01
^{106}Rh	1.5EE-01	3.7EE-01
^{137}Cs	4.8	8.4
^{137}Ba	4.4	7.7
^{144}Ce	5.4EE-01	1.2
^{144}Pr	5.4EE-01	1.2
^{147}Pm	2.7EE-01	9.2EE-01
^{235}U	1.9EE-09	5.5EE-10
^{238}U	9.5EE-08	3.9EE-10
^{238}Pu	6.0EE-07	7.0EE-03
^{239}Pu	1.1EE-05	5.3EE-05
^{240}Pu	2.6EE-06	0
^{241}Pu	-------2.7EE-03-------	
^{241}Am	-------1.6EE-05-------	
^{244}Cm	-------5.1EE-07-------	

Reference. DPSTSA-200-10, SUP-18, "Safety Analyses-200 Areas, Savannah River Plant, Liquid Radioactive Waste Handling Facilities", pp 4-32.

NUCLIDES RELEASED TO FOUR MILE CREEK DUE TO F CANYON COIL FAILURES

% OF TOTAL ACTIVITY BY ISOTOPE

	Diss/HE/ 1st Cycle	HAW	LAW	2nd Pu Cycle	2nd U Cycle	Decon
Sr-89	7.80	7.70	7.80	7.80	7.80	6.30
Sr-90	0.70	0.70	0.70	0.70	0.70	0.60
Y-90	0.70	0.70	0.70	0.70	0.70	0.00
Y-91	12.00	12.00	12.00	12.00	12.00	11.00
Zr-95	12.00	11.90	11.90	12.00	12.00	17.00
Nb-95	3.20	3.20	3.20	3.20	3.20	31.00
Ru-103	5.90	5.90	5.90	5.90	5.90	5.70
Ru-106	6.00	6.00	6.00	6.00	6.00	7.30
Rh-106	6.00	6.00	6.00	6.00	6.00	0.00
Ag-110	0.08	0.08	0.08	0.08	0.08	0.00
Sn-123	0.10	0.10	0.10	0.10	0.10	0.00
Sb-125	0.13	0.15	0.12	0.13	0.13	0.00
Te-127	0.20	0.19	0.19	0.20	0.19	0.00
Te-129	0.12	0.12	0.12	0.12	0.12	0.00
Cs-134	0.13	1.29	1.30	0.13	0.13	0.36
Cs-137	1.00	0.90	0.90	1.00	1.00	1.00
Ce-141	3.90	3.80	3.80	3.80	3.80	0.00
Ce-144	18.00	17.90	18.00	18.00	18.00	17.00
Pr-144	18.00	17.90	18.00	18.00	18.00	0.00
Pm-147	3.20	3.20	3.20	3.20	3.20	2.80
Pm-148	0.04	0.04	0.04	0.04	0.04	0.00
Eu-154	0.06	0.06	0.06	0.06	0.06	0.00
U-234	0.00	0.00	0.00	0.00	0.00	0.00
U-235	0.00	0.00	0.00	0.00	0.00	0.00
U-236	0.00	0.00	0.00	0.00	0.00	0.00
U-238	0.00	0.00	0.00	0.00	0.00	0.00
Np-237	0.00	0.00	0.00	0.00	0.00	0.00
Pu-238	0.00	0.00	0.00	0.00	0.00	0.00
Pu-239	0.05	0.00	0.00	0.05	0.05	0.00
Pu-240	0.01	0.00	0.00	0.01	0.01	0.00
Pu-241	0.68	0.00	0.00	0.68	0.68	0.00
Pu-242	0.00	0.00	0.00	0.00	0.00	0.00
	99.99	99.82	100.11	99.89	99.89	100.06

NUCLIDES RELEASED TO FOUR MILE CREEK DUE TO H CANYON COIL FAILURES

% OF TOTAL ACTIVITY BY ISOTOPE

	Diss/HE	1st Cycle/ HAW	LAW	2nd U Cycle	2nd Np Cycle	Decon
Sr-89	7.00	7.19	7.20	7.20	7.20	11.00
Sr-90	0.50	0.50	0.50	0.50	0.50	2.30
Y-90	0.50	0.50	0.50	0.50	0.50	0.00
Y-91	10.90	11.28	11.30	11.30	11.20	20.00
Zr-95	9.90	10.41	10.40	10.40	10.40	2.70
Nb-95	2.90	0.29	0.30	0.29	0.30	5.10
Ru-103	2.40	1.56	1.50	1.60	1.60	3.90
Ru-106	1.80	1.21	1.20	1.20	1.20	2.90
Rh-106	1.80	1.82	1.80	1.80	1.80	0.00
Ag-110	0.04	0.04	0.04	0.04	0.04	0.00
Sn-123	0.04	0.05	0.05	0.05	0.04	0.00
Sb-125	0.06	0.06	0.06	0.06	0.06	0.00
Te-127	0.03	0.07	0.07	0.07	0.07	0.00
Te-129	0.04	0.05	0.05	0.05	0.04	0.00
Cs-134	1.10	1.13	1.10	1.10	1.10	3.20
Cs-137	2.00	1.56	1.50	1.60	1.60	2.50
Ce-141	2.00	2.26	2.30	2.30	2.30	0.00
Ce-144	25.70	26.02	26.00	26.10	25.90	42.00
Pr-144	25.70	26.02	26.00	26.10	25.90	0.00
Pm-147	2.80	2.86	2.80	2.90	2.80	4.10
Pm-148	2.90	5.03	5.00	5.00	5.00	0.00
Eu-154	0.05	0.05	0.05	0.05	0.05	0.00
U-234	0.00	0.00	0.00	0.00	0.00	0.00
U-235	0.00	0.00	0.00	0.00	0.00	0.00
U-236	0.00	0.00	0.00	0.00	0.00	0.00
U-238	0.00	0.00	0.00	0.00	0.00	0.00
Np-237	0.00	0.00	0.00	0.00	0.00	0.00
Pu-238	0.03	0.03	0.03	0.03	0.03	0.08
Pu-239	0.00	0.00	0.00	0.00	0.00	0.00
Pu-240	0.00	0.00	0.00	0.00	0.00	0.00
Pu-241	0.08	0.08	0.08	0.08	0.08	0.00
Pu-242	0.00	0.00	0.00	0.00	0.00	0.00
	100.27	100.07	99.82	100.31	99.71	99.78

TABLE C-11 Curies of Specific Nuclides Released to Four Mile Creek due to Coil and Tube Failure, (?) Canyon

Nuclide	Decon-tamination	Dissolver	Head End	First Cycle	2nd U Cycle	2nd Pu Cycle	HAW Evaporator	LAW Evaporator	Ion Exchange	High Heat Waste
89Sr	1.26E-02	1.32E+00	1.32E+00	1.32E+00	1.07E-10	4.87E-06	1.33E+00	4.51E-08	1.33E+00	1.33E+00
90Sr	1.28E-03	1.26E-01	1.26E-01	1.26E-01	1.02E-11	6.55E-07	1.28E-01	4.35E-09	1.28E-01	1.28E-01
90Y	0.00E+00	1.26E-01	1.26E-01	1.26E-01	1.02E-11	6.55E-07	1.28E-01	4.35E-09	1.28E-01	1.28E-01
91Y	2.20E-02	2.02E+00	2.02E+00	2.02E+00	1.64E-10	1.05E-05	2.06E+00	6.99E-08	2.06E+00	2.06E+00
95Zr	3.40E-02	2.02E+00	2.02E+00	2.02E+00	1.64E-10	1.05E-05	2.04E+00	6.94E-08	2.04E+00	2.04E+00
95Nb	6.20E-02	5.42E-01	5.42E-01	5.42E-01	4.39E-11	2.82E-06	5.47E-01	1.86E-08	5.47E-01	5.47E-01
103Ru	1.14E-02	9.96E-01	9.96E-01	9.96E-01	8.07E-11	5.18E-06	1.01E+00	3.42E-08	1.01E+00	1.01E+00
106Ru	1.46E-02	1.02E+00	1.02E+00	1.02E+00	8.26E-11	5.30E-06	1.03E+00	3.50E-08	1.03E+00	1.03E+00
106Rh	0.00E+00	1.02E+00	1.02E+00	1.02E+00	8.26E-11	5.30E-06	1.03E+00	3.50E-08	1.03E+00	1.03E+00
110Ag	0.00E+00	1.30E-02	1.30E-02	1.30E-02	1.05E-12	6.76E-08	1.30E-02	4.42E-10	1.30E-02	1.30E-02
123Sn	0.00E+00	1.70E-02	1.70E-02	1.70E-02	1.38E-12	8.84E-08	1.75E-02	5.95E-10	1.75E-02	1.75E-02
125Sb	0.00E+00	2.20E-02	2.20E-02	2.20E-02	1.78E-12	1.14E-07	2.10E-02	7.14E-10	2.10E-02	2.10E-02
127Te	0.00E+00	3.30E-02	3.30E-02	3.30E-02	2.67E-12	1.72E-07	3.30E-02	1.12E-09	3.30E-02	3.30E-02
129Te	0.00E+00	2.10E-02	2.10E-02	2.10E-02	1.70E-12	1.09E-07	2.10E-02	7.14E-10	2.10E-02	2.10E-02
134Cs	7.20E-04	2.20E-02	2.20E-02	2.20E-02	1.78E-12	1.14E-07	2.22E-01	7.55E-09	2.22E-01	2.22E-01
137Cs	1.98E-03	1.69E-01	1.69E-01	1.69E-01	1.37E-11	8.79E-07	1.70E-01	5.78E-09	1.70E-01	1.70E-01
141Ce	0.00E+00	6.55E-01	6.55E-01	6.55E-01	5.31E-11	3.41E-06	6.60E-01	2.24E-08	6.60E-01	6.60E-01
144Ce	3.40E-02	3.04E+00	3.04E+00	3.04E+00	2.46E-10	1.58E-05	3.08E+00	1.05E-07	3.08E+00	3.08E+00
144Pr	0.00E+00	3.04E+00	3.04E+00	3.04E+00	2.46E-10	1.58E-05	3.08E+00	1.05E-07	3.08E+00	3.08E+00
147Pm	5.60E-03	5.46E-01	5.46E-01	5.46E-01	4.42E-11	2.84E-06	5.51E-01	1.87E-08	5.51E-01	5.51E-01
148Pm	0.00E+00	6.36E-03	6.36E-03	6.36E-03	5.15E-13	3.31E-08	6.43E-03	2.19E-10	6.43E-03	6.43E-03
155Eu	0.00E+00	9.57E-03	9.57E-03	9.57E-03	7.75E-13	4.98E-08	9.66E-03	3.28E-10	9.66E-03	9.66E-03
234U	0.00E+00	2.52E-08	2.52E-08	2.52E-08	2.04E-18	1.31E-13	2.40E-12	8.16E-20	2.40E-12	2.40E-12
235U	6.06E-13	4.03E-07	4.03E-07	4.03E-07	3.26E-17	2.10E-12	4.00E-11	1.36E-18	4.00E-11	4.00E-11
236U	4.00E-13	3.64E-07	3.64E-07	3.64E-07	2.95E-17	1.89E-12	4.00E-11	1.36E-18	4.00E-11	4.00E-11
238U	5.80E-11	3.72E-05	3.72E-05	3.72E-05	3.01E-15	1.93E-10	4.00E-09	1.36E-16	4.00E-09	4.00E-09
237Np	0.00E+00	5.36E-08	5.36E-08	5.36E-08	4.34E-18	2.79E-13	1.09E-05	3.71E-17	5.41E-08	1.09E-05
238Pu	2.80E-08	2.53E-05	2.53E-05	2.53E-05	2.05E-15	1.32E-10	1.60E-09	5.44E-17	7.06E-08	1.60E-09
239Pu	3.00E-07	7.62E-03	7.62E-03	7.62E-03	6.17E-13	3.96E-08	4.60E-07	1.56E-14	2.11E-06	4.60E-07
240Pu	1.35E-06	1.73E-03	1.73E-03	1.73E-03	1.40E-13	9.00E-09	1.65E-06	5.57E-14	5.24E-06	1.65E-06
241Pu	2.60E-06	1.15E-01	1.15E-01	1.15E-01	9.32E-12	5.98E-07	[illegible]	2.10E-13	3.50E-04	7.00E-06
242Pu	0.00E+00	1.68E-07	1.68E-07	1.68E-07	1.36E-17	8.74E-13	1.02E-11	3.47E-19	5.10E-05	1.02E-11
Total	2.00E-01	1.69E+01	1.69E+01	1.69E+01	1.37E-09	8.60E-05	1.72E+01	5.84E-07	1.72E+01	1.72E+01
Frequency, /hr	6.00E-06	2.66E-07	1.36E-07	2.11E-07	2.11E-07	2.11E-07	1.56E-06	1.56E-06	[illegible]	[illegible]

TABLE C-11. Curies of Specific Nuclides Released to Four Mile Creek due to Coil Failures (H Canyon)

Nuclide	Decon-tamination	Dissolver	Head End	First Cycle	2nd U Cycle	2nd Np Cycle	HAN Evaporator	LAN Evaporator	High Heat Waste
89Sr	2.20E-02	1.21E+00	1.21E+00	1.41E+00	4.96E-10	9.03E-07	1.41E+00	5.93E-08	1.41E+00
90Sr	4.60E-03	8.30E-02	8.30E-02	9.86E-02	3.45E-11	6.31E-08	9.86E-02	4.14E-09	9.86E-02
90Y	0.00E+00	8.30E-02	8.30E-02	9.86E-02	3.45E-11	6.31E-08	9.86E-02	4.14E-09	9.86E-02
91Y	4.00E-02	1.87E+00	1.87E+00	2.21E+00	7.74E-10	1.41E-06	2.21E+00	9.28E-08	2.21E+00
95Zr	5.40E-03	1.70E+00	1.70E+00	2.04E+00	7.14E-10	1.31E-06	2.04E+00	8.57E-08	2.04E+00
95Nb	1.02E-02	4.93E-01	4.93E-01	5.78E-02	2.02E-11	3.70E-08	5.78E-02	2.43E-09	5.78E-02
103Ru	7.00E-03	4.00E-01	4.00E-01	3.06E-01	1.07E-10	1.96E-07	3.06E-01	1.29E-08	3.06E-01
106Ru	5.00E-03	3.06E-01	3.06E-01	2.38E-01	8.33E-11	1.52E-07	2.38E-01	1.00E-08	2.38E-01
106Rh	0.00E+00	3.06E-01	3.06E-01	3.57E-01	1.25E-10	2.28E-07	3.57E-01	1.50E-08	3.57E-01
110Ag	0.00E+00	7.31E-03	7.31E-03	8.67E-03	3.03E-12	5.55E-09	8.67E-03	3.64E-10	8.67E-03
123Sn	0.00E+00	7.40E-03	7.40E-03	8.84E-03	3.09E-12	5.66E-09	8.84E-03	3.71E-10	8.84E-03
125Sb	0.00E+00	9.52E-03	9.52E-03	1.11E-02	3.87E-12	7.07E-09	1.11E-02	4.64E-10	1.11E-02
127Te	0.00E+00	4.76E-03	4.76E-03	1.34E-02	4.69E-12	8.58E-09	1.34E-02	5.63E-10	1.34E-02
129Te	0.00E+00	7.40E-03	7.40E-03	8.84E-03	3.09E-12	5.66E-09	8.84E-03	3.71E-10	8.84E-03
134Cs	6.40E-03	1.07E-01	1.07E-01	2.21E-01	7.74E-11	1.41E-07	2.21E-01	9.28E-09	2.21E-01
137Cs	5.00E-03	3.40E-01	3.40E-01	3.06E-01	1.07E-10	1.96E-07	3.06E-01	1.29E-08	3.06E-01
141Ce	0.00E+00	3.74E-01	3.74E-01	4.42E-01	1.55E-10	2.83E-07	4.42E-01	1.86E-08	4.42E-01
144Ce	8.40E-02	4.42E+00	4.42E+00	5.10E+00	1.79E-09	3.26E-06	5.10E+00	2.14E-07	5.10E+00
144Pr	0.00E+00	4.42E+00	4.42E+00	5.10E+00	1.79E-09	3.26E-06	5.10E+00	2.14E-07	5.10E+00
147Pm	8.20E-03	4.76E-01	4.76E-01	5.61E-01	1.96E-10	3.59E-07	5.61E-01	2.36E-08	5.61E-01
148Pm	0.00E+00	4.93E-01	4.93E-01	9.86E-01	3.45E-10	6.31E-07	9.86E-01	4.14E-08	9.86E-01
154Eu	0.00E+00	7.82E-03	7.82E-03	9.18E-03	3.21E-12	5.84E-09	9.18E-03	3.86E-10	9.18E-03
234U	6.00E-11	2.04E-06	2.04E-06	2.21E-05	7.74E-15	1.41E-11	2.04E-09	8.57E-17	2.04E-09
235U	6.00E-13	2.72E-07	2.72E-07	3.06E-07	1.07E-16	1.96E-13	3.40E-11	1.43E-18	3.40E-11
236U	8.00E-12	2.38E-06	2.38E-06	2.89E-06	1.01E-15	1.85E-12	2.72E-10	1.14E-17	2.72E-10
238U	2.00E-14	6.80E-09	6.80E-09	7.99E-09	2.80E-18	5.11E-15	6.80E-13	2.86E-20	6.80E-13
237Np	0.00E+00	1.24E-06	1.24E-06	1.46E-06	5.11E-16	9.34E-13	1.36E-09	5.71E-17	1.36E-09
238Pu	1.62E-06	4.59E-03	4.59E-03	5.27E-03	1.84E-12	3.37E-09	5.27E-03	2.21E-10	5.27E-03
239Pu	1.74E-06	3.91E-05	3.91E-05	4.59E-05	1.61E-14	2.94E-11	4.59E-05	1.93E-12	4.59E-05
240Pu	1.40E-06	2.89E-05	2.89E-05	3.40E-05	1.19E-14	2.18E-11	3.40E-05	1.43E-12	3.40E-05
241Pu	3.20E-07	1.31E-02	1.31E-02	1.55E-02	5.43E-12	9.92E-09	1.55E-02	6.51E-10	1.55E-02
242Pu	0.00E+00	5.78E-08	5.78E-08	6.80E-08	2.38E-17	4.35E-14	6.80E-08	2.86E-15	6.80E-08
Total	2.00E-01	1.72E+01	1.72E+01	1.96E+01	6.86E-09	1.26E-05	1.96E+01	8.24E-07	1.96E+01
Frequency, /hr	6.00E-08	1.04E-06	6.40E-07	9.60E-08	9.60E-08	9.60E-08	1.36E-06	1.36E-06	9.60E-08

Westinghouse
Savannah River Company

P.O. Box 616
Aiken, SC 29802

ESH-920109

May 15, 1992

Mr. T. F. Heenan, Assistant Manager
Environment, Safety, Health and Quality Programs
U. S. Department of Energy
Field Office, Savannah River
P. O. Box A
Aiken, SC 29802

Dear Mr. Heenan:

AUTHORIZATION FOR LIQUID RADIOACTIVE RELEASES (U)

Ref: (1) Letter, P. M. Hekman, Jr. to A. L. Schwallie, 1/29/92
(2) Letter, P. M. Hekman, Jr. to A. L. Schwallie, 3/02/92
(3) Letter, R. R. Campbell to T. F. Heenan, 3/31/92

One of the elements of controlling radioactive liquid releases to the environment is the procedural control and authorization of releases. References (1) and (2) specifically directed WSRC to provide a system for controlling discharges and authorities for all releases. We have devoted a considerable amount of time and effort at a senior management level analyzing this issue. Following is a report of our progress on the authorization of liquid releases to the environment.

The basis for our analysis is the Environmental Release Prevention Taskforce (ERPT) Report which you received via reference (3). The ERPT identified all site release points and then reviewed the existing monitoring and/or sampling programs for each effluent stream. Procedures for the evaluation of monitoring and sampling results as well as the response to out-of-limit sample results and alarms were reviewed at the same time. The procedures were also reviewed to determine if responsibility for authorization of releases was controlled by procedure.

For purposes of clarity, we have separated releases into planned and unplanned (accidental) categories. Actions to prevent unplanned releases are the subject of the Environmental Release Prevention and Control Plan (ERP&CP). Since by definition unplanned releases are not authorized, our authorization process address only planned releases.

Planned releases are further subdivided into batch and continuous releases. Batch releases are those releases which result from pumping tanks, sumps or basins after first sampling the effluent and comparing the sample results to a pre-approved limit for release. Batch releases are the easiest to control by administrative means.

Continuous releases are trace releases of radionuclides from undetected heat exchanger leakage into cooling water systems or rain water run off from contaminated outside facilities. Activity in these streams is normally at or near background levels, but the potential for release is present in cooling water systems for reactor heat exchangers and separations segregated cooling water. The cooling water in these systems is only once removed from high activity moderator or separations process liquids. Continuous releases are controlled by in-line monitors, backup samples and proceduralized actions based on pre-approved action limits.

All of the SRS release points with any significant potential for the presence of radioactive nuclides in the effluent streams are monitored and/ or sampled. The procedures which ensure positive control of releases from these effluent streams are summarized in the attached matrix (Attachment 1). All of the entries in the matrix represent current operating practices, including many of the recommendations made by the ERPT.

We are currently conducting a consistency determination for the authorization of releases. As a first step, the action limits for monitoring systems and the release limits for batch effluent discharges in each area were analyzed for adequacy. Current action levels and release limits (shown in Attachment 1) are based on historical process parameters or monitoring detection limits. Except for tritium, the levels are (coincidentally) approximately equivalent to the DOE Order 5400.5, Derived Concentration Guides (DCG's) for the major radionuclides of interest at SRS. However, in several cases, the release limit for a specific isotope is higher than the corresponding DCG. Our environmental monitoring program demonstrates that the calculated site boundary dose for 1991 was 0.34 mrem which is far below the 100 mrem/yr limit (the basis for the DCG). However, further analysis of action levels and release limits is needed based on DCG's, dilution factors and the best available technology for monitoring and sampling. In addition, the worst case release scenario for tritium is being investigated to determine the effects this would have on river concentrations downstream of SRS. Based on this study, a determination will be made if additional internal control of batch tritium releases is required.

The consistency determination also includes an analysis of procedures to determine their adequacy for controlling releases, and an evaluation of the process for authorizing releases. Attachment 1 correctly reflects that the procedures contain the essential requirements, and the process for authorization of releases is in place, but the procedures lack consistency and in some cases, several documents are required to satisfy the procedural requirements.

Attachment (2), Attributes of Procedures for Release of Potentially Radioactive Liquid Effluents, has been provided to the operating division as a guide for upgrading their current procedures. These guidelines will be used to modify existing procedures in an effort to achieve more consistent content and better documentation.

The actions reported herein will be incorporated in the final ERP&CP which is due on June 30, 1992. This report satisfies the May 15, 1992 measurable for Assessment Factor D.1.1.3 of the Special Emphasis Area D, Period 7, Award Fee.

Yours very truly,

J D Woodward

for R. R. Campbell
Vice President and General Manager
ESH&QA Division

JDW:gt
Att

CC: A. L. Schwallie, 703-A

Attachment 2

ATTRIBUTES OF PROCEDURES FOR RELEASE OF POTENTIALLY RADIOACTIVE LIQUID EFFLUENTS

Procedures for Batch Releases:

1. The procedure must be category 1.

2. The procedure must describe the point at which the batch is sampled to determine its radioactive content.

3. The procedure must describe the type of analysis to be performed (i.e. alpha, beta-gamma, tritium, etc.)

4. The procedure must state who is responsible for performing the analysis. Signature of this individual is required to confirm analytical results.

5. The procedure must state who is responsible for communication of sample results to operations and to whom in operations the sample results are communicated.

6. The responsibilities of Analytical Labs and Health Protection must be clearly defined.

7. The procedure must state the authorized release limit(s).

8. The procedure must state who is responsible for comparing the sample results against the release limits. Signature of this individual is required to confirm this comparison.

9. The procedure must state the required response to radioactivity levels below limits (i.e. release of the batch) and above limits and who is required to authorize the release. Management authorization is required for all releases and the responsibility for approval of the release must be consistent with the risk associated with the amount of the release. Signature of this individual is required to confirm authorization of the release.

Procedures for Continuous Releases:

1. The procedure must be category 1.

2. The procedure must describe the point at which the stream is monitored and/or sampled to determine whether radioactivity is present.

3. The procedure must describe the type of analysis to be performed (i.e. alpha, beta-gamma, tritium, etc.) and whether by on-line monitoring or sampling.

4. The procedure must describe how calibration and reliability of monitoring instrumentation is ensured (i.e. through the M&TE Control program or other required surveillance).

5. The procedure must state who is responsible for performing the analysis. Signature of this individual is required to confirm analytical results.

6. The procedure must state who is responsible for communication of sample results to operations and to whom in operations the sample results are communicated.

7. The procedure must state the required frequency of sampling.

8. The procedure must state the required turnaround time for sample analysis and reporting of results.

9. The responsibilities of Analytical Labs and Health Protection must be clearly defined.

10. The procedure must define action levels, state the required actions for each level, and state who is responsible for each action. Responsibility for action must be consistent with the risk associated with the potential amount of the release. Signature of this individual is required to confirm completion of required actions.

Attachment 1

AUTHORIZATION FOR LIQUID RADIOACTIVE RELEASES

BATCH RELEASES OF LIQUID EFFLUENT

Area	Release Point	Outfall	Analysis	Analyzed By	Req'd	Release Limit	Response	Authority for Release
100	Process sewer	Canal	alpha beta-gamma tritium	HP Anal. lab	prior to release	1 d/m/ml 2 c/m/ml 0.001 μCi/ml (1 Ci Total)	< , release > , report	RRD Shift Mgr, Purification Supv, & HPO Shift Mgr
			alpha beta-gamma tritium	HP Anal. lab	prior to release	3 d/m/ml 10 c/m/ml 0.01 μCi/ml (10 Ci Total)	< , release > , retain	RRD Area Mgr, RRD Environ. Coord., & HPO Area Mgr
KLP	Basin purge	Seepage	Per procedure	105-3729C				RRD Shift Mgr, Area Environ. Coord., & HPO Rep. & Notify DOE
D	Rework Distillate Tanks	Beaver Dam Creek	tritium	Anal. lab	prior to release	100 μCi/ml	< ; release > , retain	HW Operator Lab Analyst
D	DW Plant Distillate Tanks	Beaver Dam Creek	tritium	Anal. lab	prior to release	15 μCi/ml	< , release > , retain	HW Operator Lab Analyst
D	Drum Wash Tanks	Beaver Dam Creek	tritium	Anal. lab	prior to release	monthly guide	< , release > , timed release	HWO Manager HPO Manager
H	ETF Treated water	U3R-2A	alpha beta-gamma tritium	HP	prior to release	3 d/m/ml 10 d/m/ml 0.1 μCi/ml	< , release > , report	WMO Supv, "A" Wastewater Oper., & HPO Supv
			alpha beta-gamma tritium	HP	prior to release	3 d/m/ml 10 d/m/ml 0.2 μCi/ml	< , timed release > , retain	WMO Supv, "A" Wastewater Oper., HPO Supv, & ETF Facility Mgr & Notify WM&ER & ESH&QA VPs

AUTHORIZATION FOR LIQUID RADIOACTIVE RELEASES

BATCH RELEASES OF LIQUID EFFLUENT
(Continued)

Area	Release Point	Outfall	Analysis	Analyzed By	Req'd	Release Limit	Response	Authority for Release
F/H	ETF Basins	F-012/013 H-017/018	alpha beta-gamma	HP	prior to release & hourly	3 d/m/ml 10 d/m/ml	< , release > , treat	WM Operations Mgr. WM Technology Mgr. & HP Manager
H	OF RCA slab	FM-1C	alpha beta-gamma	HP	prior to release	3 d/m/ml 10 d/m/ml	< , release > , retain	Sep Operator HPO Supervisor
E	Solvent tanks sumps	4M-2B & U3R-3	alpha beta-gamma	HP	prior to release	3 d/m/ml 10 d/m/ml	< , release > , retain	WMO Operator HPO Supervisor
E	643-29G sump	4M-2B & U3R-3	alpha beta-gamma tritium	HP	prior to release	1 c/m/ml 1 d/m/ml 50 μCi/ml	< , release > , retain	WMO Operator HPO Supervisor
E	709-2G sump	4M-2B & U3R-3	alpha beta-gamma	HP	prior to release	3 d/m/ml 10 d/m/ml	< , release > , retain	WMO Supervisor HPO Supervisor
E	ELLT #4 sump	4M-2B & U3R-3	alpha beta-gamma	HP	prior to release	3 d/m/ml 10 d/m/ml	< , release > , retain	WMO Operator HPO Supervisor
E	TRU pad sumps	4M-2B & U3R-3	alpha beta-gamma	HP	prior to release	3 d/m/ml 10 d/m/ml	< , release > , retain	WMO Operator HPO Supervisor
M	LETF Treated water	TB-3	uranium	320-M lab	prior to release	1.0 mg/l/day 0.5 mg/l/day (monthly avg)	< , release > , retain	RMP Supervisor RMET Supervisor "B" Wastewater Oper.
A	735-A LLW Tank dike	TB-2	alpha beta-gamma tritium	SRTC	prior to release	3 d/m/ml 10 d/m/ml 0.00005 μCi/ml	< , release > , retain	SRTC Supervisor HPO Supervisor

AUTHORIZATION FOR LIQUID RADIOACTIVE RELEASES

CONTINUOUS RELEASES OF LIQUID EFFLUENT

Area	Release Point	Outfall	Analysis	Analyzed By	Freq.	Turn. Time	Action Level	Response	Responsibility For Action
K	Cooling water	Canal	tritium	monitor	continuous	immed.	0.00005 μCi/ml	<AL, none >AL, isolate source	RRD Shift Mgr & CCR Operator
KLP	CW& process sewer	Canal	alpha beta-gamma tritium	HP Anal. lab	12 hrs	4 hrs	1 d/m/ml 8 d/m/ml 0.00005 μCi/ml	<AL, none >AL, isolate source	Purif. Supv & Area HPO Supv
C	Process sewer	Canal	alpha beta-gamma tritium	HP Anal. lab	24 hrs (M-F)	4 hrs	1 d/m/ml 8 d/m/ml 0.00005 μCi/ml	<AL, none >AL, isolate source	Purif. Supv & Area HPO Supv
C	Cooling water	Canal	alpha beta-gamma tritium	HP Anal. lab	weekly	4 hrs	1 d/m/ml 8 d/m/ml 0.00005 μCi/ml	<AL, none >AL, isolate source	Purif. Supv & Area HPO Supv
D	Process sewer	Beaver Dam Creek	tritium	Anal. lab	8 hrs	1 hr	0.00005 μCi/ml	<AL, none >AL, isolate source	CCR Operator Lab Analyst
			alpha beta-gamma	HP	12 hrs	1 hr	1 d/m/ml 8 d/m/ml	<AL, none >AL, isolate source	RRD Shift Mgr HPO Supervisor
F	OF Runoff	U3R-2	beta-gamma	HP	24 hrs	immed.	> bkgd	<AL, none >AL, report	CCR Supv HPO Supv
			alpha beta-gamma	HP	24 hrs	2 hrs	3 d/m/ml 10 d/m/ml	<AL, none >AL, isolate source	CCR Supv HPO Supv

AUTHORIZATION FOR LIQUID RADIOACTIVE RELEASES

CONTINUOUS RELEASES OF LIQUID EFFLUENT
(Continued)

Area	Release Point	Outfall	Analysis	Analyzed By	Freq.	Turn. Time	Action Level	Response	Responsibility For Action
F	Seg. CW	FM-3	beta-gamma	HP	8 hrs	immed.	> bkgd	<AL, none >AL, report	CCR Supv HPO Supv
			alpha beta-gamma	HP	8 hrs	2 hrs	3 d/m/ml 10 d/m/ml	<AL, none >AL, divert	CCR Supv HPO Supv
H	Seg. CW	FM-1C	beta-gamma	HP	prior to release	immed.	> bkgd	<AL, none >AL, report	CCR Supv HPO Supv
			alpha beta-gamma	HP	prior to release	2 hrs	3 d/m/ml 10 d/m/ml	<AL, release >AL, divert	Sep Operator HPO Supv
F/H	Tankfarm runoff	HP-52	gamma	monitor	continuous	immed.	10 d/m/ml	<AL, none >AL, divert	CCR Operator
H	Tritium Facilities	HP-15 & HP-50	tritium	Anal. Lab	12 hrs	3 hrs	20 pCi/ml	<AL, none >AL, isolate source	CCR Operator AL Technician

AUTHORIZATION FOR LIQUID RADIOACTIVE RELEASES

BATCH RELEASES OF LIQUID EFFLUENTS

AREA (Footnote ref.)	RELEASE POINT	OUTFALL	ANALYSIS	ANALYZED BY	REQUIRED	RELEASE LIMIT	RESPONSE	AUTHORITY OF RELEASE	APPLICABLE PROCEDURE
100 (See Note #1)	Process Sewer	Canal	alpha beta/gamma tritium alpha beta/gamma tritium	HP Anal. Lab HP Anal Lab	Prior to Release Prior to Release	1 d/m/ml 2 c/m/ml 0.001 uCi/ml (1 Ci Total) 3 d/m/ml 10 c/m/ml 0.01 uCi/ml (10 Ci Total)	< Release > Report < Release > Retain	RRD Shift Mgr., Purif. Supv., & HPO Shift Mgr. RRD Area Mgr., RRD Env. Coord., HPO Mgr.	105-2308
KLP (See Note #1)	Basin Purge	Seepage Basin	Per procedure 105-3729C	Analytical LAb	Prior to Release	Per procedure 105-3729C	Per procedure 105-3729C	RRD Shift Mgr., Area Env. Coord., HPO Rep., & Notify DOE	105-3729C 5Q1.2-302U
D (See Note #1)	Rework Distillate Tanks	Beaver Dam Creek	Tritium	Analytical Lab	Prior to Release	10 uCi/ml (5 Curie Total)	< Release > Retain	HWO Mgr. Lab Analyst	DPSOL 420-227 OSR-7-320
D (See Note #1)	DW Plant Distillate Tanks	Beaver Dam Creek	Tritium	Analytical Lab	Prior to Release	1 uCi/ml (5 Curie Total)	< Release > Retain	HWO Mgr. Lab Analyst	DPSOL 420-67C OSR-7-320A
D (See Note #1)	Drum Wash Tanks	Beaver Dam Creek	Tritium	Analytical Lab	Prior to Release	Monthly Guide	< Release > Timed Release	HWO Mgr. HPO Mgr.	DPSOL 421-2D-166 OSR-7-687
H (See Note #2)	ETF Treated Water	U3R-2A	alpha beta/gamma tritium alpha beta/gamma tritium	HP HP	Prior to Release Prior to Release	3 d/m/ml 10 d/m/ml 0.1 uCi.ml 3 d/m/ml 10 d/m/ml 0.2 uCi.ml	< Release > Report < Timed Release > Retain	WMO Supv. "A" WW Opr. HPO Supv. WMO Supv. "A" WW Opr. HPO Supv. ETF Fac. Mgr. WMER and ESH&QA VP	241-FH-ETF-903A 241-H-ETF-199B 5Q1.2-302U

AUTHORIZATION FOR LIQUID RADIOACTIVE RELEASES

BATCH RELEASES OF LIQUID EFFLUENTS (continued)

AREA (Footnote ref.)	RELEASE POINT	OUTFALL	ANALYSIS	ANALYZED BY	REQUIRED	RELEASE LIMIT	RESPONSE	AUTHORITY OF RELEASE	APPLICABLE PROCEDURE
F/H (See Note #2)	ETF Basins	F-012/013 and H-017/018	alpha beta/gamma	HP	Prior to Release	3 d/m/ml 10 d/m/ml	< Release > Treat	WM OPs Mgr. WM Tech Mgr HP Mgr.	241-F-ETF-201A, -208,-208A. 241-H-ETF-201A, -208,-208A. 241-F-ETF-202A, -202B. 241-H-ETF-202A, -202B.
H (See Note #1)	OF RCA slab	FM-1C	alpha beta/gamma	HP	Prior to Release	3 d/m/ml 10 d/m/ml	< Release > Retain	Sep Oper. HPO Supv.	SOP-211-H-1445
E (See Note #3)	Solvent Tanks sumps	4M-2B and U3R-3	alpha beta/gamma	HP	Prior to Release	3 d/m/ml 10 d/m/ml	< Release > Retain	WMO Oper. HPO Supv.	643-E-2005 643-G-2005A
E (See Note #3)	643-29G sump	4M-2B and U3R-3	alpha beta/gamma tritium	HP	Prior to Release	1 c/m/ml 1 d/m/ml 50 uCi/ml	< Release > Retain	WMO Oper. HPO Supv.	643-29G-2
E (See Note #4)	709-2G sump	4M-2B and U3R-3	alpha beta/gamma	HP	Prior to Release	3 d/m/ml 10 d/m/ml	< Release > Retain	WMO Oper. HPO Supv.	709-G-9
E (See Note #3)	ELLT #4 sump	4M-2B and U3R-3	alpha beta/gamma	HP	Prior to Release	3 d/m/ml 10 d/m/ml	< Release > Retain	WMO Oper. HPO Supv.	643-E-2058
E (See Note #3)	TRU pad sumps	4M-2B and U3R-3	alpha beta/gamma	HP	Prior to Release	3 d/m/ml 10 d/m/ml	< Release > Retain	WMO Oper. HPO Supv.	643-E-2024 643-G-2024A
M (See Note #1)	LETF Treated water	TB-3	Uranium	320-M	Prior to Release	1.0 mg/l/day 0.5 mg/l/day (monthly avg.)	< Release > Retain	RMP Supv. RMET Supv. "B WW Oper.	SOP-341-502
A (See Note #1)	735-A LLW Tank dike	TB-2	alpha beta/gamma tritium	SRTC	Prior to Release	3 d/m/ml 10 d/m/ml .00005 uCi/ml	< Release > Retain	SRTC Supv. HPO Supv.	DPSTOM-32-18

AUTHORIZATION FOR LIQUID RADIOACTIVE RELEASES
BATCH RELEASES OF LIQUID EFFLUENTS (continued)

Footnotes for Status of Procedures, as of June 30, 1992

Footnote #1. Procedure has been revised, approved and issued.

Footnote #2. Procedures meet the mandated criteria, however, they will be revised into a single procedure by July 31, 1992.

Footnote #3. Procedure is being revised and is due to be issued on July 1, 1992.

Footnote #4. Procedure will not be used for discharges of liquid effluents until it is revised on July 31, 1992

AUTHORIZATION FOR LIQUID RADIOACTIVE RELEASES

CONTINUOUS RELEASES OF LIQUID EFFLUENTS

AREA	RELEASE POINT	OUTFALL	ANALYSIS	ANALYZED BY	REQUIRED FREQUENCY AND TURN-AROUND TIME	RELEASE LEVEL	RESPONSE	RESPONSI-BILITY FOR RELEASE	APPLICABLE PROCEDURE
K	Heat Exchanger Cooling Water	Canal	tritium	on–line monitor	Continuous / Immediate action	0.00005 uCi/ml	< None > Isolate Source	RRD Shift Mgr., and CCR Operator	RP 2.3001 5Q1.2 302U
KLP	HX Cooling Water and Process Sewer	Canal	alpha beta/gamma tritium	HP Analytical Labs	12 hours / 4 hours turnaround	1 d/m/ml 8 d/m/ml 0.00005 uCi/ml	< None > Isolate Source	Purification Supervisor & Area HPO Supervisor	RP 2.3001 5Q1.2 302U
C	Process Sewer	Canal	alpha beta/gamma tritium	HP Analytical Lab	Daily (M–F) / 4 hours turnaround	1 d/m/ml 8 d/m/ml 0.00005 uCi/ml	< None > Isolate Source	Purification Supervisor & Area HPO Supervisor	RP 2.3001 5Q1.2 302U
C	Cooling Water	Canal	alpha beta/gamma tritium	HP Analytical Lab	Weekly / 4 hours turnaround	1 d/m/ml 8 d/m/ml 0.00005 uCi/ml	< None > Isolate Source	Purification Supervisor & Area HPO Supervisor	RP 2.3001 5Q1.2 302U
D	Process Sewer	Beaver Dam Creek	tritium alpha beta/gamma	Analytical Lab HP	8 hours / 1 hour turnaround 12 hours / 1 hour turnaround	0.00005 uCi/ml 1 d/m/ml 8 d/m/ml	< None > Isolate Source < None > Isolate Source	CCR Operator and Lab Analyst RRD Shift Mgr. and HPO Supv.	RP 2.3001 5Q1.2 302U

AUTHORIZATION FOR LIQUID RADIOACTIVE RELEASES

CONTINUOUS RELEASES OF LIQUID EFFLUENTS (continued)

AREA	RELEASE POINT	OUTFALL	ANALYSIS	ANALYZED BY	REQUIRED FREQUENCY AND TURN-AROUND TIME	RELEASE LEVEL	RESPONSE	RESPONSIBILITY FOR RELEASE	APPLICABLE PROCEDURE
F	Outside facility Runoff	U3R–2	beta/gamma	HP	Daily / Immediate	> background	< None > Report	CCR Supv. HPO Supv.	5Q1.4 303
			alpha beta/gamma	HP	Daily / 2 hour turn-around	3 d/m/ml 10 d/m/ml	< None > Isolate Source	CCR Supv. HPO Supv.	
F	Segregated Cooling Water	FM–3	beta/gamma	HP	8 hours / Immediate	> Background	< None > Report	CCR Supv. HPO Supv.	SOP 221–F–OF–F90111 5Q1.2 312
			alpha beta/gamma	HP	8 hours / 2 hour turn-around	3 d/m/ml 10 d/m/ml	< None > Divert Flow	CCR Supv. HPO Supv.	
H	Segregated Cooling Water	FM–1C	beta/gamma	HP	Prior to Release / Immediate	> Background	< None > Report	CCR Supv. HPO Supv.	SOP 221–H–9406 5Q1.2 312
			alpha beta/gamma	HP	Prior to Release / 2 hour turnaround	3 d/m/ml 10 d/m/ml	< None > Divert Flow	Sep. Oper. HPO Supv.	
F/H	Tankfarm Runoff	HP–52	gamma	in–field monitor	Continuous	10 d/m/ml	< None > Divert Flow	CCR Operator	241 FH–740AQ
H	Tritium Facilities	HP–15 and HP–50	tritium	Analytical Lab	12 hours / 3 hour turn-around	20 pCi/ml	< Release > Retain	CCR Operator AL Technician	Special Procedure

HUMAN RESOURCES
INTERIM ENVIRONMENTAL RELEASE PREVENTION AND CONTROL PLAN

ACTION ITEM	RESPONSIBILITY	BASIS	IMPACT ON RELEASE	SCHEDULED COMPLETION	STATUS
WSRC Video Services Group will produce "SRS Outreach" -- this video will give basic information concerning radiation, federal guidelines for releases, and how SRS performed within those guidelines. Designed for Site employees -- 8 to 12 minutes in length.	Video Services: Ron Grant Environmental Protection: Tim Jannik	Heighten employee awareness of radioactive release impacts.	1) Site-Recommendation 2) Self-evaluation 3) Best Management Practices	5/29/92 Rev - 7/1/92 Rev. 2 - 7/31/92	In Production
WSRC Video Services Group will produce a segment of "Update" in June featuring the SRS ALARA Program. This segment will let employees know that while the program does focus on the individual worker, its scope also extends to reducing the normal routine releases, and preventing unplanned releases. Designed for Site employees -- 3 to 4 minutes in length.	Video Services: Ron Grant Environmental Protection: Tim Jannik	Heighten employee awareness of radioactive release impacts.	1) Site-Recommendation 2) Self-evaluation 3) Best Management Practices	6/30/92	Complete
WSRC Employee Communications Department will publish monthly articles in the *SRS News* concerning release prevention and employee participation in the ALARA programs. These feature stories will be designed to heighten awareness relative to the Site's two ALARA programs by educating employees about their role in the release prevention process. Designed for Site employees.	Employee Communications: Morgan Kearse Environmental Protection: Tim Jannik	Heighten employee awareness of radioactive release impacts.	1) Site-Recommendation 2) Self-evaluation 3) Best Management Practices	This will be an on going effort beginning June 1992	In Production
WSRC Employee Communications Department will publish the latest ALARA Site goals explaining their impact on the Site's overall release program. Designed for Site employees.	Employee Communications: Morgan Kearse Ann Mary Carley Environmental Protection: Tim Jannik	Heighten employee awareness of radioactive release impacts.	1) Site-Recommendation 2) Self-evaluation 3) Best Management Practices	5/29/92 Rev - 7/1/92 Rev. 2 - 7/31/92	In Process
WSRC Employee Communications Department will prepare messages concerning the Site's latest ALARA standings and send this information to employees Sitewide over the ALL-IN-1 network. This means of communications will allow employees to receive ALARA information within hours of its release.	Employee Communications: Ann Mary Carley Kim Maxwell Environmental Protection: Tim Jannik	Heighten employee awareness of radioactive release impacts.	1) Site-Recommendation 2) Self-evaluation 3) Best Management Practices	5/29/92 Rev - 7/1/92 Rev. 2 - 7/31/92	In Process

HUMAN RESOURCES
INTERIM ENVIRONMENTAL RELEASE PREVENTION AND CONTROL PLAN

ACTION ITEM	RESPONSIBILITY	BASIS	IMPACT ON RELEASE	SCHEDULED COMPLETION	STATUS
WSRC Employee Communications Department will serve as the central communications point for sending out Sitewide ALARA and release prevention messages that require all employee notification. this will be accomplished through the use of the ALL-IN-1 network.	Employee Communications: Ann Mary Carley Kim Maxwell Environmental Protection: Tim Jannik	Heighten employee awareness of radioactive release impacts.	1) Site-Recommendation 2) Self-evaluation 3) Best Management Practices	This will be an on going effort.	In Process

WASTE MANAGEMENT
INTERIM ENVIRONMENTAL RELEASE PREVENTION AND CONTROL PLAN

ACTION ITEM	RESPONSIBILITY	BASIS	IMPACT ON RELEASE	SCHEDULED COMPLETION	STATUS
Complete 1st draft of Action Plan/Schedule for improvements to downstream radioactive sampling and responses for all IWM facilities	K. S. Wierzbicki (WMPT)	ERPT Recommendation 1 (WM self-evaluation)	Potential reduction in releases.	6/30/92	On Schedule
Reset all Storm Water Monitor (SWM) alarm/diversion setpoints to 10 d/m/ml gamma above background using individual rather than generic background readings.	R. W. Wilson (WMO) V. G. Dickert (WMO)	self-evaluation	Sensitivity increased. Releases are minimized.	3/13/92	Complete
Revise control room roundsheets to add daily operator surveillance readings for all SWM's, including appropriate response to out-of-limit or unusual conditions.	M. A. Ceravolo (WMT) D. L. Rosbach (WMO)	self-evaluation	Alarm response formalized. Releases are minimized.	6/30/92	Revisions initiated, still in approval cyscle.
Develop periodic WMO tickler (or put in WMS as PM item) to reverify SWM background levels and reset alarm points to take into account changing conditions.	M. A. Ceravolo (WMT) D. L. Rosbach (WMO)	self-evaluation	Sensitivity increased. Releases are minimized.	6/30/92	Revisions initiated, still in approval cyscle.
Revise procedures for SWM operation to ensure that the background level is checked and hi alarm point changed (if needed) whenever sediment is removed from the SWM manhole.	M. A. Ceravolo (WMT) D. L. Rosbach (WMO)	self-evaluation	Sensitivity increased. Releases are minimized.	6/30/92	Revisions initiated, still in approval cyscle.
Complete shop mockup testing of new Beta-Gamma monitor assembly using Sr-90 solution to demonstrate unit's sensitivity to Beta radiation.	T. D. Phillips (WMWE)	ERPT Recommendation 49 (WM self-evaluation)	Potential increased sensitivity. Reduced releases.		Complete
Install B-G monitor system in the 902-6M SWM manhole, with readout and alarms in the 241-28H control room. (Existing Gamma monitor will also remain in place)	C. G. Kelly (WMWE)	ERPT Recommendation 49 (WM self-evaluation)	Potential increased sensitivity. Reduced releases.	6/30/92	Complete
Complete technical evaluation report of prototype B-G monitor design and operation	T. D. Phillips (WMWE)	ERPT Recommendation 49 (WM self-evaluation)	Potential increased sensitivity. Reduced releases.	7/31/92	Complete

WASTE MANAGEMENT
INTERIM ENVIRONMENTAL RELEASE PREVENTION AND CONTROL PLAN

ACTION ITEM	RESPONSIBILITY	BASIS	IMPACT ON RELEASE	SCHEDULED COMPLETION	STATUS
Since the 6M B-G monitor is successfully in operation revise procedures/sketches to address operation, daily surveillance and response to alarms.	R. W. Wilson (WMO)	ERPT Recommendation 49 (WM self-evaluation)	Potential increased sensitivity. Reduced releases.	8/31/92	On schedule
Install B-G probe system in the 907-7H SWM manhole before ESP startup.	C. G. Kelly (WMWE)	ERPT Recommendation 49 (WM self-evaluation)	Potential increased sensitivity. Reduced releases.	10/31/92	On Schedule Depends on 6M B-G monitor results
Complete Installation of prototype gamma detector/source holder in the 907-6H SWM manhole	T.K. Phi (WME)	ERPT Recommendation 50 (WM self-evaluation)	Increased calibration consistency; Reduced releases.	4/92	Complete
Develop methods/procedures for calibration and verification of new SWM gamma detector arrangement (using liquid and solid sources) that meets all applicable standards/requirements.	T. K. Phi (WME)	ERPT Recommendation 50 (WM self-evaluation)	Increased calibration consistency; Reduced releases.	6/30/92 Rev. - 7/10/92	In Progress
Complete testing of new SWM calibration methods using the 907-6H SWM and/or shop mockup.	T. K. Phi (WME)	ERPT Recommendation 50 (WM self-evaluation)	Increased calibration consistency; Reduced releases.	7/31/92	On Schedule
Revise SWM operating procedure/sketches to address new configuration of 907-6H SWM.	M. A. Ceravolo (WMT)	ERPT Recommendation 50 (WM self-evaluation)	Increased calibration consistency; Reduced releases.	8/31/92	On Schedule
If prototype work is successful, initiate similar changes to all other SWM systems.	R. W. Wilson (WMO) V. G. Dickert (WMO)	ERPT Recommendation 50 (WM self-evaluation)	Increased calibration consistency; Reduced releases.	9/30/92	On Schedule (depends on 6M results)
Complete construction of the prototype sediment removal system and mount it at one of the H-SWM manholes.	C. G. Kelly (WMWE)	ERPT Recommendation 51 (WM self-evaluation)	None; Reduction in false alarms.	9/30/92	On Schedule

WASTE MANAGEMENT
INTERIM ENVIRONMENTAL RELEASE PREVENTION AND CONTROL PLAN

ACTION ITEM	RESPONSIBILITY	BASIS	IMPACT ON RELEASE	SCHEDULED COMPLETION	STATUS
Develop procedures for operation of the debris removal equipment	R. W. Wilson (WMO)	ERPT Recommendation 51 (WM self-evaluation)	None; Reduction in false alarms.	10/30/92	Schedule under development
Revise operating procedures as appropriate to address concerns specified in reports. QA surveillance Report 92-SUR-22-0016 and 0017.	R. W. Wilson V. G. Dickert L. C. Thomas	ERPT Recommendation 54	Enhanced detection	6/30/92	Revisions initiated, still in approval cycle.
Complete design and installation of a drain collection system for the Tank Farm H-East and H-West cooling water (CW) pumphouses.	M.A. Ceravolo (WME)	WM self-evaluation	Reduced release potential	Project Authorization 12/31/92	On Schedule. Date is for project authorization, only.
Complete design and installation of containment dikes around waste tanks 13-15 in order to reduce the probability of releasing contamination to 4H SWM zone (having to divert this runoff to the ETF).	M.A. Ceravolol (WME)	WM self-evaluation	Reduced release potential	Project Authorization 6/30/92	In conceptual design phase. Date is for project authorization, only.
Complete calibration and checkout of the 241-8F/H retention basin <u>outlet</u> radiation monitors (already installed).	I. K. Sullivan (WMO)	ERPT Recommendation 52 (WM self-evaluation)	Reduced release potential	5/92	Complete
Revise operating procedures to address inlet new monitors and startup monitors.	I. K. Sullivan (WMO)	ERPT Recommendation 52 (WM self-evaluation)	Reduced release potential	6/30/92	Complete
Complete installation and checkout of inlet monitors.	I. K. Sullivan (WMO)	WM self evaluation	Reduce potential	12/31/92	On Schedule.
Design, procure and install 241-8F/H retention basin inlet radiation monitors.	I. K. Sullivan (WMO)	ERPT Recommendation 52 (WM self-evaluation)	Reduced release potential	Project Authorized 10/93	On Schedule. Maybe delayed due to FY93 funding
Develop procedures and startup monitors.	I. K. Sullivan (WMO)	ERPT Recommendation 52 (WM self-evaluation)	Reduced release potential	1/31/95	On Schedule

WASTE MANAGEMENT
INTERIM ENVIRONMENTAL RELEASE PREVENTION AND CONTROL PLAN

ACTION ITEM	RESPONSIBILITY	BASIS	IMPACT ON RELEASE	SCHEDULED COMPLETION	STATUS
Complete the establishment of "action levels" and appropriate responses for ETF tritium releases such that the impact to site/offsite streams is minimized.	I. K. Sullivan (WMO)	WM self-evaluation	Potential reduction of 50% in the rate of tritium release to the Savannah River	3/13/92	Complete
Develop plan for upstream controls to limit amount of tritium introduced through ETF.	I. K. Sullivan (WMO)	WM self-evaluation	Reduced releases	5/92	Complete
Initiate periodic sampling of the SWDF stormwater runoff north and south settling basins, and develop/revise procedure(s) for response to detection of high radioactivity.	L. C. Thomas (WMO)	ERPT Recommendation 53 (WM self-evaluation)	Early identification of releases	4/92	Complete
Establish response limits for settling basins radioactivity so that facility notifications can be made.	L. C. Thomas (WMO)	ERPT Recommendation 53 (WM self-evaluation)	Notification only	4/92	Complete
Develop facility procedure(s) to address response to high basin sample activities, and investigate the need for (and feasibility of) improved release mitigation capabilities.	L. C. Thomas (WMO)	ERPT Recommendation 53 (WM self-evaluation)	Unknown	TBD	Schedule under development

TRITIUM FACILITIES
INTERIM ENVIRONMENTAL RELEASE PREVENTION AND CONTROL PLAN

ACTION ITEM	RESPONSIBILITY	BASIS	IMPACT ON RELEASE	SCHEDULED COMPLETION	STATUS
Evaluation of the feasibility and practicality of developing and installing continuous, in-line tritium monitoring capability upstream of outfalls H-002 and H-012. 1) Change to monitoring system 2) Change to sampling program 3) Change to procedure affecting limits, controls, or authorization	Tritium PMT (Tritium Tech.) SRL (AD-Ray Sigg)	1) ERPT Recommendation 26 2) ALARA Release Guiudes 3) Tiger Team BMP	Expected reduction in release activity. Will allow for fast response to high tritium levels in liquid effluents (Segregate process cooling water especially). Allows for faster equipment identification and shutdown.	12/31/92	On Schedule
Concerns documented in QA Surveillance Report 92-SUR-14T-014. 1) Change to procedure affecting limits, control, or authorization.	Tritium PMT (TOD, TT&E, TWE, QA)	1) Permit Requirements-SPCC/NPDES 2) ERPT Recommendation 27 3) ALARA Release Guides	Reduce release activity from accidental spills	12/31/92	On Schedule
Daily sampling of the cooling water effluents from H-Area Tritium Facility to outfalls H-002 and H-012 including procedure upgrades and response actions. 1) Change to sampling program 2) Change to procedure affecting limits, controls, or authorization.	Tritium PMT (TOD, TT&E)	1) ERPT Recommendation 25 2) Self-evaluation 3) ALARA Release Guides 4) Process	More timely detection of unplanned releases	2/92	Completed

SEPARATIONS
INTERIM ENVIRONMENTAL RELEASE PREVENTION AND CONTROL PLAN

ACTION ITEM	RESPONSIBILITY	BASIS	IMPACT ON RELEASE	SCHEDULED COMPLETION	STATUS
More representative sampling of FH segregated cooling water	HPO D. J. Ratchford	ERPT Recommendation 10A	Improved detection of transient releases	3/31/92	Complete
Improved sensitivity of weekly FH segregated cooling water analyses	HOP D. J. Ratchford	ERPT Recommendation 10B	Improved estimate of release at the source	3/31/92	Complete
Isotopic analysis of FH segregated cooling water composite samples	HOP D. J. Ratchford	ERPT Recommendation 10C	Improved source characterization of facility ownership	3/31/92	Complete
Document technical basis for FH cooling water monitor design	HPO/SRTC D. J. Ratchford	ERPT Recommendation 10D	Continued surety of equipment operation	9/30/92	On schedule
Implementation in-area gamma spectroscopy for FH effluent water samples	HPO E. B. Andersen	ERPT Recommendation 10E	Timely isotopic analysis of source locations	10/31/92	On schedule
Increase EMS sampling frequency at F-001 outfall to weekly	SPEG W. M. Wierzbicki	ERPT Recommendation 11	More timely detection of unplanned releases	6/1/92 Rev - 6/30/92 Rev 2 - 7/31/92	In Process Awaiting Flow Meter
Complete installation of diversion capability from outfall F-002 to 211-F	SPEG/F-Canyon W. M. Wierzbicki	ERPT Recommendation 12	Containment capability for detected unplanned releases	FY93	Clarify permit implications by 6/30/92
Make additional and redundant F-Area cooling water monitors fully operational	F-Canyon T. C. Robinson	ERPT Recommendation 13	Improved reliability for detecting unplanned releases	4/30/92 Rev - 7/31/92 6/30/92 Rev - 12/31/92 FY 93	281-4F & 6F Additional 4 Remaining 3 In Process
Verify all 221-F First Level floor drains are sealed from Sanitary Sewer	SPEG/F-Canyon W. M. Wierzbicki	ERPT Recommendation 14	Prevent unrestricted release of potentially radioactive liquid	4/30/92 Rev - 6/30/92 Rev 2 - 7/31/92	In Process

SEPARATIONS
INTERIM ENVIRONMENTAL RELEASE PREVENTION AND CONTROL PLAN

ACTION ITEM	RESPONSIBILITY	BASIS	IMPACT ON RELEASE	SCHEDULED COMPLETION	STATUS
Evaluate and address concerns in QA Surveillance Report 92-SUR-02-0012	F-Canyon J. A. Britt	ERPT Recommendation 15	Enhanced surety of release prevention/ control activities	3/3/92	Complete
Reroute 211-H GP evaporator preheater steam trap condensate from H-004 outfall to 700 apron sump	H-Canyon M. J. Green	ERPT Recommendation 16	Provide containment for potentially radioactive condensate	5/15/92 Rev - 7/15/92 Rev 2 - 9/15/92	In Process
Provide alternate transfer route from 211-H 500 and 600 aprons and B1, B2, & B4 basin sumps to 200 Area ETF	H-Canyon M. J. Green	ERPT Recommendation 17	Enhanced surety of containment of potentially radioactive water during periods of heavy rainfall	4/30/92 Rev - 9/1/92 Rev 2 - 9/30/92	ETF cannot accept waste. Reassessing problem.
Apply waterproof sealant to areas of potential leak through of 211-H RCA storage slab	H-Canyon M. J. Green	ERPT Recommendation 18	Enhanced surety of containment of potentially radioactive water	6/30/92 Rev - 7/31/92	On schedule
Disposition Si-81-1-7 open action item concerning telephones in 211-H RCAs	H-Canyon M. J. Green	ERPT Recommendation 19	Application of lessons learned to avoid repeat occurrence	6/30/92 Rev. - 8/31/92	On schedule
Correct path for potential overflow from 211-H F1-6 sump to Uranyl Trailer loadout sump to outfall H-006	H-Canyon M. J. Green	ERPT Recommendation 20	Eliminate path for potential uncontrolled release	6/30/92 Rev. - 7/31/92	On schedule
Verify all 221-H First Level floor drains are sealed from Sanitary Sewer	H-Canyon/SPEG M. J. Green	ERPT Recommendation 21	Prevent unrestricted release of potentially radioactive liquid	5/15/92 Rev - 6/30/92 Rev. 2 - 12/31/92	In Process
Make additional and redundant H-Area cooling water monitors fully operational	H-Canyon M. J Green	ERPT Recommendation 22	Improved reliability for unplanned releases	6 months after F-Area	In Process (See item 13)

SEPARATIONS
INTERIM ENVIRONMENTAL RELEASE PREVENTION AND CONTROL PLAN

ACTION ITEM	RESPONSIBILITY	BASIS	IMPACT ON RELEASE	SCHEDULED COMPLETION	STATUS
Evaluate and address concerns in QA Surveillance Report 92-SUR-03-0013	H-Canyon M .J. Green	ERPT Recommendation 23	Enhanced surety of release prevention/ control activities	3/24/92	Complete
Resume (and possibly accelerate) relocation of depleted uranium oxide from Central Shops, B-Area, & R-Area to F-Area	F-Canyon T. C .Robinson	ERPT Recommendation 24	Improved containment of radioactive material	FY 95	Plan & schedule by 6/30/92

REACTOR DIVISION
INTERIM ENVIRONMENTAL RELEASE PREVENTION AND CONTROL PLAN

ACTION ITEM	RESPONSIBILITY	BASIS	IMPACT ON RELEASE	SCHEDULED COMPLETION	STATUS
Perform tritium analysis in K-Reactor Laboratory	Reactor Operations (ROD) Analytical Laboratory (AL)	Self Evaluation Recommendation 2b	1) Minimize releases 2) Decrease detection time by ~ 500%	1/15/92	Complete
Develop flow chart identifying sampling, pickup/delivery, analysis and notification	ROD AL Reactor Environmental Support (RES)	Self Evaluation Procedural requirements Recommendation 2b	Reduces release time thus, minimizing activity released	1/15/92	Complete
Identify effluent stream sample points	ROD RES	NPDES Technical Specifications Recommendation 2b	Identifies release paths	1/15/92	Complete
Determine sample frequency, both routine and non-routine	ROD AL RES	Self Evaluation NPDES Procedural requirements Recommendation 1b	Releases minimized	1/15/92	Complete
Determine type of analysis required for each sample	ROD AL RES	NPDES DOE Order 5400.5 Recommendation 1b	Releases identified and minimized	1/15/92	Complete
Install in-line Tritium Monitor (TEWM) in K-011 outfall	ROD SRL	Site requirement Recommendation 1b	Provides on-line leak detection within 20 minutes	1/15/92	Complete
Identify minimum crew & revise Conduct of Operations Manual to include requirement	ROD Reactor Training and Procedures (RTAP) AL	Self Evaluation Recommendation 1d	Prevent delays in analysis, thus minimizing releases	1/15/92	Complete
Establish Sample Truck priority at PA entrance	ROD WSI	Self Evaluation Recommendation 2b	Prevent delays in analysis, thus minimizing releases	1/15/92	Complete
Generate procedures for K-Reactor sample program	ROD AL RTAP	RD-1 Best Management Practices Recommendation 2b	Provides guidance to operators	1/29/92	Complete

REACTOR DIVISION
INTERIM ENVIRONMENTAL RELEASE PREVENTION AND CONTROL PLAN

ACTION ITEM	RESPONSIBILITY	BASIS	IMPACT ON RELEASE	SCHEDULED COMPLETION	STATUS
Provide backup analytical equipment	AL ROD	Best Management Practices Recommendation 1c	Prevent delays in analysis, thus minimizing releases	1/15/92	Complete
Remove excess equipment from Inhibitor Room hood	ROD	Best Management Practices and Site housekeeping practices	Prevent delays in analysis, thus minimizing releases	1/15/92	Complete
AL to maintain minimum crew in K-Reactor and 772-D Laboratory	AL	Safety Requirements, Best Management Practices Recommendation 2b	Prevent delays in analysis, thus minimizing releases	1/15/92	Complete
Review data and maps to identify effluent streams	RES	Self Evaluation Recommendation 1a	Identify release paths	1/12/92	Complete
Walkdown each effluent stream (all reactor facilities) and contributing source	RES	Self Evaluation NPDES DOE Order Recommendation 1a	Identify release paths. Minimizes time to locate leak source.	1/12/92	Complete
Generate color coded maps for each waste stream	RES	Self Evaluation	Minimizes time to locate leak source	1/12/92	Complete
Provide diking for all areas with potential for exceeding the RQ	ROD	Self Evaluation Best Management Practices Recommendation 2a	Prevents releases to ground and waters of the State	2/14/92 Temporary diking (Permanent diking TBD)	Complete RREA #92-0028
Inspect Disassembly Basin Deionizers every 2 hrs. during operation	ROD	Self Evaluation Procedureal Requirement Recommendation 2c	Early detection of release path	4/1/92	Complete
Provide Emergency Action Levels (EAL) for off-site notifications	ROD	Self Evaluation 40 CFR § 302 Recommendation 3a	Faster agency notification	4/1/92	Complete
Train shift personnel in the EAL	RTAP ROD	RD-1 Recommendation 3b	Faster response to leaks, thus minimizing releases	4/4/92	Complete

REACTOR DIVISION
INTERIM ENVIRONMENTAL RELEASE PREVENTION AND CONTROL PLAN

ACTION ITEM	RESPONSIBILITY	BASIS	IMPACT ON RELEASE	SCHEDULED COMPLETION	STATUS
Reactor Quality Verification Support to verify programs	RQA&A	Best Management Practices. Recommendation 3c	Verifies adequacy of responses	1/29/92	Complete
Develop calibration and surveillance program to verify operability of in-line tritium monitor at the Heavy Water facility	ROD/HWD RTAP	Best Management Practices RES/ERPT Recommendation 4	Early detectgion of releases	5/1/92 Rev - 6/30/92 Rev. 2 - 9/30/92	In progress
Evaluate sampling practices of outfall D-001	ROD/HWD	RES/ERPT Recommendation 5	Reduce potential for release	5/1/92 Rev - 6/30/92 Rev. 2 - 10/30/92	Evaluation on-going Prototype monitor in development
Address concerns in memo ESH-ALT-92-0028	ROD/HWD	ERPT Recommendation 6	Reduce potential for release	6/30/92	Complete (5Q1.2-90-3)
Review past spill and release events	RQA&A	Chemistry Task Team Recommendation 7	Identify adequacy of corrective actions	2/14/92	Complete
Evaluate need for permanent containment structure for the heat exchanger facility	ROD RES	RES Recommendation 8	Prevent releases as a result of adverse weather	6/30/92 Rev. - 7/31/92	In Progress
Move B-25 boxes containing sandblast grit from 728-N to WM	ROD-RWM	ERPT Recommendation 9	Removes potential release path	6/5/92 Rev - 6/30/92	Complete
Revising ALARA Guidelines	RES	RES Recommendation.	Lowers releases to the enviornment	4/15/92	Complete
Perform tightness testing of UST	ROD RES	40 CFR § 280 SCDHEC R.61-79 § 280	Early detection of leaks	8/31/92	Scheduled for August 1992
Review Procedures that release liquids to the environment	ROD RES	Site Recommendation	Limit releases	Prior to next purge	Complete
Heighten awareness of personnel	ROD RTAP	Site recommendation	Personnel more aware of results of a release	Continuous	Complete

ENVIRONMENTAL RESTORATION
INTERIM ENVIRONMENTAL RELEASE PREVENTION AND CONTROL PLAN

ACTION ITEM	RESPONSIBILITY	BASIS	IMPACT ON RELEASE	SCHEDULED COMPLETION	STATUS
Complete first draft of Action Plan/Schedule for improvements to downstream radioactive sampling and releases for all ER facilities	J. W. Immel (ERD)	ERPT Recommendation 1 (WM self-evaluation)	Unknown (no continuous release involved)	6/92 Rev. - 8/31/92	In Progress
Develop a program for obtaining monitoring data for the Four Mile Branch Outcrop and track the data quarterly.	R. Lorenz (EMS)	ERPT Recommendation 55	None, this action only monitors releases	6/30/92 Rev - 8/1/92	In Process See EPD item #44
Institute weekly tritium monitoring and analysis program to quantify A-1 Air Stripper releases.	R. E. Reece (EMS) C. D. Rogers (EMS) J. W. Immel (ERD)	ERPT Recommendation 56	No releases to date: Maximum release expected is 6 Ci/yr	3/23/92	Completed

SITE SERVICES DIVISION
INTERIM ENVIRONMENTAL RELEASE PREVENTION AND CONTROL PLAN

ACTION ITEM	RESPONSIBILITY	BASIS	IMPACT ON RELEASE	SCHEDULED COMPLETION	STATUS
Perform Risk Assessment of contributing sources to the system	SSD/Waste Mgmt./ Separations	Based on preliminary assessment by Poer Engr., this risk is small; the discharge is monitored indirectly. A more detailed risk assessment is necessary to define any further appropriate actions. Recommendation 46	None	9/30/92	Discussions with WM and Separations wil be initiated in early April, 1992 to develop study scope
Recommend design changes/ change to monitoring system based on risk assessment	SSD/Waste Mgmt./ Separtions	Review of system design and ERPT recommendations. Recommendation 46	Improved detection capability will decrease potential for release from sources which contribute rad constituents to cooling tower	12/1/92	Actions taken to be determined by outcome of Risk Assessment
Request DOE to transfer responsibility to SREL	SSD	SREL has custodial responsibilities for the pond in question Recommendation 47	Based on discussions with SREL mgmt., potential for release is very low.	4/1/92	Complete

ENVIRONMENTAL PROTECTION DEPARTMENT
INTERIM ENVIRONMENTAL RELEASE PREVENTION AND CONTROL PLAN

ACTION ITEM	RESPONSIBILITY	BASIS	IMPACT ON RELEASE	SCHEDULED COMPLETION	STATUS
Change to Sampling and controls	EPD/ER&GP J.W. Cook	Self evaluation/ERPT Recommendation 43	Expected reduction in releases is less than 1 Ci/yr. (Tritium, the main radionuclide of interested in groundwater, cannot be removed. However, it will be monitored).	7/1/92 For approval of the Purge Water Management Plan (PWMP) - WSRC-RP-90-208 Rev. - 5/1/93	Awaiting EPA and DHEC approval. The PWMP was submitted to EPA and SCDHEC for approval on 6/91. The plan has been reviewed by EPD/ER&GP to ensure that all radiological releases will be monitored, controlled and minimized.
Change to Monitoring Program	EPD/EMS R.Lorenz	ERPT Recommendation 44	N/A - This action would provide a more timely response to non-routine releases	8/1/92	In process - EPD/EMS will issue a procedure that establishes action levels and a formal notification process for stream water samples.
Change to Monitoring Program EMS to issue Monthly Radiological Releases Report within 3 weeks of the end of the month. This is to be accomplished by reporting gross alpha/beta results, instead of individual radionuclides	EPD/EMS	Self evaluation/ERPT Recommendation 45	N/A - This action would provide a more timely response to non-routine releases	N/A	VOID: This action item was presented to the ALARA Release Guides Committee on 3/19/92. The committee decided that individual radionuclide analyses was of more value than a more timely report. Typically, due to the length of time certain analyses take, the best EMS can do is issue the report within 45 days.

SAVANNAH RIVER LABORATORY
INTERIM ENVIRONMENTAL RELEASE PREVENTION AND CONTROL PLAN

ACTION ITEM	RESPONSIBILITY	BASIS	IMPACT ON RELEASE	SCHEDULED COMPLETION	STATUS
Issue L1 manual procedure 6.01.	SRL/LSS/TAS/ETSG	ERPT Recommendation 28 Self-Evaluation	Reduce potential for unplanned release.	4/30/92 Rev - 7/1/92	Complete
Procedure for checking 735-A tank dike for rainwater & analyzing water in dike for radioactivity.	SRL/LSS/TAS/ASO	ERPT Recommendation 29	Reduces potential for unplanned release. Wastewater with measurable radioactivity would not be released.	Completed	ASO has determined that a procedure does exist. ASO has reviewed with the appropriate personnel the need to follow the procedure.
Conduct nondestructive integrity test on Building 735-A outside tank.	SRL/LSS/TAS/ETSG	ERPT Recommendation 30	Reduces potential for unplanned release.	Review with EES:4/30/92 Complete testing: 7/1/92 Rev. 2 - 7/31/92	Preliminary contact has been made with EES to confirm their testing capabilities. The testing of the tank will take place in July 1992.
Store the low activity trailer in Building 776-6A.	SRL/LSS/TAS/ASO	ERPT Recommendation 31	Reduces potential for unplanned release.	Procedure modification: 8/1/92	The procedure for loading the trailer at 735-A will be modified to state that the 735-A tank may be unloaded into the trailer only if the trailer is empty. The maximum volume of waste that could be spilled, therefore, would be equal to the maximum volume in the tank, and the secondary containment could capture all of it in the event of a spill or leak. This response meets the intent of the recommendation.

SAVANNAH RIVER LABORATORY
INTERIM ENVIRONMENTAL RELEASE PREVENTION AND CONTROL PLAN

ACTION ITEM	RESPONSIBILITY	BASIS	IMPACT ON RELEASE	SCHEDULED COMPLETION	STATUS
Procedures controlling use of source/tracer materials in non-RCA labs.	SRL/ETS/HPT/EMS	ERPT Recommendation 32	Reduces potential for unplanned release.	9/30/92	ETS: Samples with radioactivity above background levels are being disposed of to the low activity drains. This current practice will be incorporated into existing procedures by 9/30/92. HPT: Per procedures, all aqueous wastes containing radioactive tracers are discarded to the satellite area. Waste from the satellite area is discharged in the 607-17A neutralization facility, which will be sampled for radioactivity (See Action Item 33). EMS: Written instructions have been issued. Formal procedures are being drafted.
Analyze 607-17A tanks for radioactivity before discharging.	SRL/LSS/TAS/ASO	ERPT Recommendation 33	Wastewater with measurable radioactivity will not be released.	Procedure modification: 8/1/92	Will begin to implement the recommendation immediately. The additional analyses does not violate the existing procedure. The existing procedure will be modified to incorporate the recommendation.
Investigate the need for 774-A heat exchanger and remove it if not needed.	SRL/DWPT	ERPT Recommendation 34	Reduces potential for unplanned release.	Determine if heat exchanger needed: TBD	Heat Exchanger may be needed in the future. LSS will pursue disconnecting Heat Exchanger in the nearterm.

SAVANNAH RIVER LABORATORY
INTERIM ENVIRONMENTAL RELEASE PREVENTION AND CONTROL PLAN

ACTION ITEM	RESPONSIBILITY	BASIS	IMPACT ON RELEASE	SCHEDULED COMPLETION	STATUS
Provide impervious secondary containment for L Tank.	SRL/LSS/TAS/ETSG& ASO	ERPT Recommendation 35	Reduces potential for unplanned release.	TBD	L Tank is currently empty and is not being used. Previous plans called for the future use of the tank to store low activity waste from the 779-A metallography lab. LSS has designed 2 options for 779-A waste to bypass L tank. L tank will not be used until it has impervious secondary containment. LSS is investigating methods to retrofit the tank with such secondary containment. When more data is available, LSS will determine whether the secondary containment will be upgraded so that the tank can be used, or wether the tank will be placed in stand-by status without upgrades.
Determine whether building sumps should be monitored before being discharged.	SRL/LSS/TAS/ASO	ERPT Recommendation 36	Reduces potential for unplanned release.	773-A review: 7/1/92 735-A: Issue ESR 4/30/92, dike completion date TBD	Sumps will be reviewed by LSS AS&O and ETSG personnel and recommendations will be made by 7/1/92. An ESR has been issued on 4/30/92 for design and installation of a dike around the low activity tank in the service floor of 735-A.
Initiate sampling and analysis of outfall A-025.	EMS	Appraisal finding, ERPT Recommendation 37	May reduce severity. Provides detection capability.	6/1/92 Rev - 8/1/92	Continuous sampler cannot be installed due to intermittent flow. Investigating reroute of stream to A-001 outfall.
Develop a contingency plan.	SRL/LSS/TAS/ETSG	ERPT Recommendation 38	Mitigates severity.	6/1/92 Rev - 8/1/92	In Process
Clarify air stripper communications.	SRL/LSS/TAS/ETSG	ERPT Recommendation 39	Mitigates severity	4/15/92 Rev - 8/1/92	Information exists on various memos. Information will be consolidated and issued to all appropriate personnel. Information will be incorporated into the contingency plan (See Action Item 38) if appropriate.

SAVANNAH RIVER LABORATORY
INTERIM ENVIRONMENTAL RELEASE PREVENTION AND CONTROL PLAN

ACTION ITEM	RESPONSIBILITY	BASIS	IMPACT ON RELEASE	SCHEDULED COMPLETION	STATUS
Investigate the need for a WWTF for non-rad discharges.	SRL/LSS/TAS/ETSG	ERPT Recommendation 40	Wastewater with radioactivity greater than an established authorized level would not be released.	TBD	Previous toxicity testing at the A-001 outfall indicate that the wastewater leaving the SRL Technical Area is toxic. SRL Management has agreed to allow EPD to conduct more detailed toxicity studies on the A-001 outfall. Results from this study will provide information on the type of treatment needed.
Request that EMS analyze samples from TNX-1 outfall for gamma emitters.	SRL/LSS/TAS/ETSG, EMS	Self-evaluation ERPT Recommendation 41	May reduce severity. Provides detection capability.	3/1/92	Complete. EMS began the additional analysis on the TNX-1 outfall samples, effective 3/1/92.
Evaluate and address concerns documented in QA surveillance report 92-SUR-11-008	SRL/LSS/TAS/ETSG	QA Surveillance Recommendation 42	Improve or maintain accuracy of sampling and related activities.	Ongoing	Surveillances of air emissions and outfall sampling/monitoring will be scheduled annually.

DEFENSE WASTE PROCESSING FACILITY
INTERIM ENVIRONMENTAL RELEASE PREVENTION AND CONTROL PLAN

ACTION ITEM	RESPONSIBILITY	BASIS	IMPACT ON RELEASE	SCHEDULED COMPLETION	STATUS
Issue DCF for Sanitary Sewer removal from 221-S prior to radioactive operations	H. M. Walker (DWPF Operations) R. M. Sprague (Facility Manager)	ERPT Recommendation 48 (DWPF self-evaluation)	Will prevent a future accidental release	6/92	Complete

ATTACHMENT V

Physical Actions to Prevent and Control Liquid Releases

GENERIC ENGINEERED SOLUTIONS TO LIQUID RELEASES

This section presents the Final Version of the White Paper prepared by the SRTC Ad Hoc Task Group on Aqueous Tritium Releases. This Task Group addressed generic engineered solutions concerning the elimination or minimization of aqueous tritium releases.

Also included in this section is the Separations Area report on Engineered Solutions for Potential Separations Effluent Release Points.

OUTFALL ANALYSIS INITIATIVE DISCUSSIONS

This Attachment also includes the detailed discussions, by each division, of the outfall initiatives for reducing releases, which were presented in Attachment II.

OSR 3-4A-W(REV 1-89)

WESTINGHOUSE SAVANNAH RIVER COMPANY

INTER-OFFICE MEMORANDUM

SRT-EMP-92-0156

June 30, 1992

TO: C. L. Peckinpaugh, 719-4A

FROM: C. M. King, 773-42A CMK
A. W. Wiggins, Jr., ETF AWW

FINAL REPORT: TASK GROUP ON CONTROL OF AQUEOUS TRITIUM RELEASES (U)

Please find attached the final report of the "Task Group on Control of Aqueous Tritium Releases." This was requested by your Department in response to the needs of the Westinghouse ALARA Release Committee. Input for this analysis was provided by senior staff members of the Savannah River Technology Center as well as Waste Management and Environmental Restoration and Environment, Safety, Health and Quality Assurance Divisions of the WSRC.

Any questions regarding this report should be directed to C. M. King (5-5206) and A. W. Wiggins, Jr. (7-8058).

CMK/sm

Attachment

SRTC Task Group on Control of Aqueous Tritium Releases

DISTRIBUTION: SRTC Ad HOC Task Group

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SRTC Ad Hoc Task Group on Aqueous Tritium Releases

Outline of Report on Tritium Releases

SRTC Ad Hoc Task Group on Control of Aqueous Tritium Releases

MISSION OF THE TASK GROUP

In a letter from Peter M. Hekman, Jr. (DOE-SR) to Ambrose L. Schwallie (WSRC), dated January 29, 1992 and entitled "Control of Radioactive Liquid Releases to the Environment (U)", the Department of Energy/Savannah River Operations Office mandated the Westinghouse Savannah River Company to enhance their "sensitivity at all levels to the perceived impact of liquid releases involving radionuclides". This was in response to the adverse publicity and concern associated with the tritiated water release to the Savannah River on 12/25/91. This tritium release was due to the K-Reactor heat exchanger leak of tritiated heavy water moderator to the secondary cooling system, which discharged to an on-site stream and impacted down-stream water supplies and industry near Savannah, GA.

The Westinghouse Savannah River Company was directed to "identify all site release points and releases of radionuclides to site streams" and to "identify physical or operating changes that are needed to minimize and control releases".

The SRTC Ad Hoc Task Group on Aqueous Tritium Releases was formed to assist the Westinghouse ALARA Release Committee (Mr. R. R. Campbell, Chairman) to respond to the DOE-SR request. Our primary mission is to identify and evaluate those physical actions which should be considered for control, mitigation or potential elimination of aqueous tritium releases. Only aqueous releases are considered herein, in light of their significance to nearby drinking water supplies and industry. Our technical analyses are in cooperation with SRS operating departments who have been chartered to identify all SRS site release points of tritium as potential source terms. The Task Group charter also includes Capital Cost analysis of Tritium Control options and Cost/Benefit analysis. This has been pursued <u>only</u> when adequate information existed from prior analyses. Due to our timing, more detail is required in this area to sufficiently evaluate cost/benefit of each, so called, technology for tritium control.

INTRODUCTION: Environmental Impact of Aqueous Tritium Releases

A large percentage of the radioactivity released to the environment as a result of SRS operations is due to tritium, the radioactive isotope of hydrogen. Tritium is generated as a product or byproduct of specific identified SRS processes. Over the years, tritium has accumulated in various wastes/products, or has entered the environment as an atmospheric release or as a liquid release through outfalls or wastewater treatment facilities. The releases have been carefully measured and documented. In 1990, tritium was the greatest contributor (94.4%) to the total dose for downstream Savannah River water users. Importantly, the maximum 1990 dose commitment for the maximum water consumption at Beaufort–Jasper SC and Port Wentworth GA was 0.07 mrem, only 1.8% of the EPA standard for drinking water (4 mrem/yr.).

In the past, several studies have been completed and programs implemented to address tritium releases. DOE, supported by its technical staff and operating contractor, has concluded that further reductions of tritium releases would be costly and are probably not justified on the basis of the very small dose and relatively small incremental reductions realized by most of the actions. Nonetheless, DOE has a commitment to periodically document the status of tritium handling and releases at SRS and to reevaluate the technical and process options of tritium reduction and effluent detritiation.

The evaluation of aqueous tritium releases will be performed in steps. First, we will clearly identify all of the tritium producing processes at SRS, and by extension the facilities in which the largest tritium inventories are housed and handled. Second, we shall identify the aqueous waste streams from these primary facilities entering the environment or passing to a secondary facility (e.g. an effluent treatment plant). Third, based on an estimate of the future missions and activities of SRS, tritium releases have been projected to the future. All of these items are then combined with a list of possible process or operational changes to determine if a substantial reduction in aqueous tritium release is achievable and to estimate, where possible, the capital cost. Finally, the tritium currently in the environment (e.g., in the groundwater) is addressed. Such an approach is consistent with DOE policy to reduce doses to levels that are as low as reasonably achievable (ALARA).

Background on Aqueous Tritium Source Terms

Tritium, the radioactive form of hydrogen (half-life: 12.3 years), is present in the form of tritiated light water (HTO) in the effluent from several Savannah River Site (SRS) waste management and production facilities. Tritiated water constitutes the major offsite aqueous release of radioactivity to SRS surface streams and the Savannah River – a major drinking water supply downgradient of the SRS. SRS environmental facilities which deal with tritium contaminated light water include the low level waste burial grounds, a 200 acre site having received fission byproduct and tritium production solid state residues for the past 35 years, liquid seepage basins in the chemical separations areas (F and H Areas), which until 1988 received and managed low activity liquid discharges; and liquid seepage basins (percolation fields) in each of the nuclear reactor areas which manage tritium contamination resulting from discharged reactor fuel assemblies (stored in the Reactor Disassembly Basins) due to tritium present in the heavy water (D_2O) moderator (~9 Ci/L tritium). In 1988, an Effluent Treatment Facility (ETF) began operation at SRS to replace the F and H Area Seepage Basins and to process F and H Area evaporator liquid discharges and generate "clean" light water essentially free of contamination – except for tritium as HTO at ~10,000 pCi/mL. ETF effluent is discharged directly to the Upper Three Runs Creek at Road C on SRS. The discharged water is ~500-1000 fold greater than the EPA Drinking Water Guideline for tritium in light water.

Tritium is produced at SRS by three methods which produce a variety of tritiated water source terms:

1. Neutron irradiation of fissile materials (i.e., Uranium–235 as Driver Fuel) produces tritium as a ternary fission byproduct. Chemical processing of the nuclear fuel tubes in the F&H Areas places tritium into aqueous process streams as tritiated water (HTO) in the F&H Canyon operations. Continued chemical processing results in tritium discharges as low level radioactive liquid and solid waste.

   Currently, liquid tritiated waste is sent to the Effluent Treatment Facility (ETF), a waste water treatment facility designed to remove toxic and radioactive metals (as cations in solution). Tritiated water is not separated or partitioned during ETF processing. ETF effluent is discharged to SRS onsite streams containing HTO at a current rate of ~3,000 Ci/year with no reactors in operation and F&H Area liquid processing at a minimal rate.

Prior to 1989, F&H Area Canyon discharges were sent to the F&H Area Seepage Basins – which are now closed and capped. However, a residual source term in soil and groundwater continues to seep and migrate to onsite streams. The current estimate is ~11,000 Ci/year, decreasing to 1,000 Ci/yr by 1996, based upon SRTC modeling calculations of a diminishing F&H Area source term, radioactive decay, and continuing migration to SRS onsite streams.

Finally, low level solid waste containing tritiated water is sent to the Solid Waste Disposal Facility (Burial Ground) and constitutes a minor (~1,000 Ci/Yr) aqueous tritium source term migrating to the water table, and outcropping to SRS surface streams. However, the estimated buried tritium source terms is >1,000,000 Ci over 200 acres – mostly in metal crucibles from H–Area tritium production, hence, discharge monitoring is continuous.

2. Activation of the deuterium content of the reactor heavy water (D_2O) moderator (HWM) produces tritium by neutron capture. As of May 1992, moderator water contains tritium at 9 Ci/Liter (~1ppm), the most concentrated aqueous tritiated water source term at SRS. Flow of HWM through the primary reactor coolant (heat exchanger) system can result in non–routine releases of tritium into onsite streams and the Savannah River as exemplified by the Dec. 25, 1991 and May 15, 1992 releases. HWM must be upgraded to 99.9 mole % D_2O by distillation of light water (H_2O) impurities in process equipment in the 400–D Area. This is a source of some small atmospheric and liquid releases of tritiated water. HWM is not decontaminated of tritium in the 400–D Area distillation equipment because the columns are not designed to separate 1 ppm tritiated water from bulk heavy water.

3. For production purposes, neutron irradiation of Lithium – 6 targets in the nuclear reactors results in synthesis (production) of tritium. Chemical processing of lithium targets in the H Area facilities and refining of tritium gas streams by cryogenic distillation, results in tritiated water releases as both liquid and vapor (atmospheric releases).

Table I provides a summary of actual and projected aqueous tritium source terms based upon:

a. Process/Production Facilities

b. Environmental Facilities

with input provided by WSRC environmental, waste management, and production departments. The summary assumes no major actions to limit releases of tritiated water.

Table I

Process and Environmental Source Terms Summary of Past and Projected Tritium Releases – Liquid*

Process Facility:	Actual Releases (Ci) 1985	1989	1990	1991	Forecast Releases (Ci) 1992	1993	1994	1995	1996
Reactors									
Leaks	3K	<1K	<1K	7K	1K	2K	1K	<1K	<1K
DBD	17K	1K	1K	<1K	2K	3K	1K	<1K	<<1K
PFP	5K	3K	4K	2K	3K	3K	2K	1K	1K
D-Area	2K	1K	1K	1K	1K	1K	1K	<1K	<<1K
Rx Total	27K	6K	6K	11K	7K	9K	5K	2K	1K
Tritium	**	**	**	**	**	**	**	**	**
ETF	-	3K	1K	3K	3K	3K	3K	2K	1K
Environ-mental:									
F/H Seep Basins	10K	11K	10K	14K	11K	10K	8K	3K	1K
SWDF	1K	1K	1K	1K	1K	1K	1K	1K	1K
Other Areas	<1K	<1K	<1K	<1K	<1K	<1K	<1K	<1K	<1K
Site Total	39K	22K	19K	30K	23K	24K	18K	9K	5K

*K = 1000 Curies (Ci);
Assumes no Major Actions to Limit Releases
** Less than 100 Ci/Yr Aqueous/Mostly Atmospheric Releases

DBP: Disassembly Basin Purge
PFP: Purcolation Field (Reactor Seepage Basin) Purge
ETF: Effluent Treatment Facility
SWDF: Solid Waste Disposal Facility (Burial Ground)
Other Areas: Site Release Point Data

Note: Environmental Release Projections by Model Calculation of the Rate of Migration of Tritiated Water

Prior Studies on Aqueous Tritium Releases

Process Facility releases are byproducts of reactor operations with the tritium appearing in large volumes of water and air. Previous studies concluded "there is no current economically feasible means to recover this dilute form of tritium, and consequently, most of it is released to the environment." While there has been significant technical progress in aqueous detritiation methods (see WSRC–MS–91–027), the benefits realized from treatment of the tritium in dilute form may not justify the potentially high treatment costs.

The tritium produced by ternary fission is partly released during fuel processing in the chemical separations areas. The tritium produced by activation of heavy water is lost to the atmosphere or disassembly basins of the reactor. The final tritium production method, neutron capture in lithium, produces tritium in concentrated form which is extracted for use. Any releases of this tritium occur during extraction and packaging operations in the tritium facilities. Thus, the primary sources of tritium are the reactor areas and separations areas, with secondary facilities receiving wastes including the effluent treatment facilities and radioactive waste burial grounds.

The primary form of tritium released to surface water in the vicinity of SRS is tritiated water (e.g., HTO). This molecule behaves almost identically, but not exactly identically, to water (H_2O). The small differences in the behaviors of these molecules are the basis for the aqueous detritiation technologies that have been and continue to be studied in more depth.

An illustration of the magnitude of the engineering challenge associated with control of tritium releases is illustrated by the analysis of the principle SRS tritium sources based upon average HTO concentration (in pCi/mL), along with conversion of the tritium concentrations to a weight basis. Deuterium at natural abundance in light water is about 130 ppm, significantly more concentrated than tritium in effluents from SRS process and waste management facilities. Reactor moderator water is the most concentrated source of tritium at 9 Ci/L – but still only corresponds to 1 ppm of DTO in D_2O! The Reactor Disassembly Basins will potentially discharge 2.5 MM gallons of water per year at 10^5 pCi/mL. On a weight basis, this only corresponds to HTO at 10 parts per trillion (ppt). The EPA Drinking Water Guideline for tritium is 20 p Ci/mL, a value consistent with receiving an annual dose of 4 mrem/yr from drinking two liters of contaminated water each day of the year. On a weight basis, this corresponds to 1 part of HTO in a quadrillion (10^{15}) parts of light water. This value is, surprisingly, comparable to the EPA Dioxin drinking water standard, which as received so much recent attention for application to effluents from the paper industry.

Hence, Reactor Moderator Water detritiation to the EPA tritium water guideline corresponds to a Decontamination Factor (DF) of 10^9 – a major technical and engineering challenge. Decontamination of ETF effluent to the EPA standard would require a process with a DF of 500–1000. This analysis permits a suitable estimate of the magnitude of decontamination to a goal concentration which corresponds to the EPA guideline and permits engineering flowsheets and analyses of H/D/T Separation to be pursued.

Summary of Current SRS Operational Assumptions

1. K Reactor will operate through Fiscal Year 93 and then be placed in a warm standby mode such that it can be restarted in five years.

2. 300-M Area will complete fabrication of all components necessary for the K-15 cycle and then be placed in a standby mode that would support a five-year reactor restart plan.

3. H Canyon will process spent fuel from the SRS reactors and all Al–based fuel in the Receiving Basin for Offsite Fuel (RBOF). The facility will then be cleaned out and prepared for decontamination and decommission (D&D). Estimates are that this can occur around FY 98.

4. HB Line will process Pu-238 to meet Cassini mission requirements and process Np-237 to a storable form before shutdown.

5. F Canyon and FB-Line will be operated to process existing plutonium scrap and residues from SRS. It will then be cleaned out and prepared for D&D. Estimates are that this can begin around FY 96.

6. The potential exists that F or H Area facilities may be used to assist in the cleanup of other sites (e.g., RF, ICPP). If this occurs, the projected shutdown dates may be extended.

7. All enriched uranium, including Uranium Solidification Facility (USF) product, will be returned to Oak Ridge.

8. Building 234-H will be placed in standby after Building 233-H achieves war reserve production.

9. Environmental Restoration and Waste Management activities are relatively unaffected by these assumptions.

Impact on Forecast Tritium Releases

Table I provides a summary of past and projected tritium releases as a function of SRS operations. This table was compiled from Site Release Point data provided to the Westinghouse ALARA Release Committee by the SRS operational departments and reflects the operational assumptions cited above. The major impact on tritium releases would involve:

1. Continued H-Area Canyon processing of spent fuel from the reactor and RBOF locations. Ternary fission product tritium would be released into the H-Canyon aqueous streams and constitute a feed to the ETF, and resulting effluent discharge from ETF to on-site streams.
2. K-Reactor start-up and '93 operation will carry the risk of tritiated heavy water moderator leakage, similar to the December 1991 and May 1992 incidents.
3. Solid waste disposal of sealed crucibles to the SWDF from H Area will occur with, most likely, very little HTO release.

The reader should note, however, that the forecast tritium releases will continue to decrease due to greatly reduced production operations. In addition, the major source term of tritium leaking, via transport, from the closed F & H Area Seepage Basins will subside as this inventory continues to decay – as well as leach. Its impact has been calculated to be rather small in the future. This is also true of tritiated water transport from the SWDF, again by model calculation.

Summary and Recommendations of the SRTC Task Group

1. Several alternatives for control of aqueous tritium releases have been identified – most of which require more detailed analysis of feasibility from the viewpoint of cost/benefit analysis. It is recommended that the SRS Planning Department continue a more detailed cost/benefit analysis with 1990's economics, with engineering input provided by the Bechtel Engineering Services Department and Westinghouse Projects Dept.

2. The Westinghouse Savannah River Company should recommend the continual re-examination of the forecast use of the SRS production facilities. Current forecasts imply the rapid diminishing of tritium source terms – as a result of major cutbacks in use of the SRS Reactor and Separations Areas. In addition, environmental source terms such as the F & H Area Seepage Basins and the Solid Waste Disposal Facility tritiated water plumes will continue to decline due to depletion of tritiated waste and no new source terms. It is recommended that environmental monitoring be used to validate the estimated forecast of tritium releases.

3. Tritium migration from the F & H Area Seepage Basin and Solid Waste Disposal Facility Aquifiers is forecast to greatly diminish. This is based upon computer modeling of tritium transport. It is recommended that dose monitoring of aqueous tritium seepage continue to confirm the predictions of the mathematical models used by the Environmental Sciences Section of SRTC and the Environmental Restoration Department of WM&ER.

4. The SRTC program on "Tritium Removal from Aqueous Waste Streams", funded by DOE Office of Technology Development should be continued with emphasis placed on a cost/benefit analysis for the three options now under consideration.

5. The SRS program for tritium monitoring and evaluation of geohydrologic technologies for control of tritium releases needs to continue and should evaluate and finalize cost/benefit analyses of the several hydrological control strategies.

6. The "Do Nothing" philosophy which surfaced during this recent period of evaluation based upon declining aqueous tritium source term forecasts is not beneficial to the SRS image and is counter (reverse) to all recent discussions with environmental advocates from the State of South Carolina. This philosophy should be discouraged.

DISCUSSION

Physical Actions to Mitigate Tritium Releases

Tritium constitutes the major release of radioactive material to liquid effluents and is the radionuclide having the highest offsite concentration. Although tritium accounts for only 0.08 mrem or 9% of the total dose from SRS liquid releases at the site boundary, it is the greatest contributor to total dose (94.4%) for actual downstream consumers of water. Radiocesium and other isotopes which dominate the liquid dose via the aquatic food chain at the site boundary are deposited in sediments of the river or are removed by conventional water treatment practices prior to reaching actual consumers. The maximum 1990 individual dose commitment for maximum water consumption at Beaufort-Jasper SC and Port Wentworth GA was 0.07 mrem. When compared with the EPA standard for public water supplies of 4 mrem, this dose commitment is 1.8% of the EPA standard. Clearly, the actual doses from tritium to downstream consumers of water from the Savannah River are very low.

In the past, several studies have been done and programs implemented to address tritium releases. DOE-SR and the prime contractor have recognized that further reductions in tritium releases would be costly and probably not justified on the basis of the very small dose commitments currently in effect and of the small incremental reductions realized.

Described below are the major tritium bearing waste streams directed to the plant streams along with possible and/or technically feasible mitigation programs. Where possible, high spot estimates have been provided when recent studies were available. Further engineering definition and the necessary commitment of resources would be required to provide project quality estimates.

The following mitigation programs have been identified as technically feasible, at some capital cost, for control of tritium releases:

- Control of Tritiated Water Source Terms to the ETF
- Hydraulic Barriers to Groundwater Outcropping of Tritiated Water from F&H Areas Seepage Basins
- Physical Separation of Tritiated Water from Dilute Waste and Distribution to Saltstone
- Solidification of Tritiated Water in Concrete and/or Clay Compositions or Other Matrices
- Tile Fields for Tritiated Water Transport Retardation
- Solid Waste Disposal Facility (SWDF) Remediation of the Tritiated Water Effluent
- Detritiation Processes to Actually Separate Tritium from Light Water (H_2O)

Tables II A and B provide a synopsis of the pros and cons of the physical options for tritium control. Table III provides a synopsis of the advantages and disadvantages for concepts on detritiation (tritium removal) of aqueous process and environmental streams.

Control of Tritiated Water Source Terms to the ETF:

Tritium comes into the Separations plants in two major streams. One stream is wastewater contaminated with tritium primarily from reactor moderator. This wastewater is transported to 211-F Outside Facility where it is unloaded from trailers and processed through the General Purpose Evaporators (GPE's) or the Lab Waste Evaporator. During the mid 1980's, in a three reactor production mode, the tritium content of the reactor wastewater amounted to a release of 6000 to 11000 Curies per year to the then operational F-Area Seepage Basins. The overheads from both of these evaporators systems is now sent to the F/H Effluent Treatment Facility (ETF). During 1990 and 1991, the tritium from this source accounted for 64% and 78% of the tritium released to Upper Three Runs Creek from the ETF.

The tritium source term for this wastewater stream is mainly the reactor moderator water contained in the reactor vessels, piping, and in various other containers in the 100-areas. Since this tritium is in a very mobile form until it is somehow isolated, it remains a potential source for large amounts of tritium reaching the ETF. During the past two years, the amount of 100 area wastewater and its commitment of tritium has declined dramatically as the moderator inventories in the non-operational reactors have been drained to the storage tanks in the basements of the 105 Buildings. However, it is important to note that, during and immediately after the 12-24-91 heat exchanger failure and leak, considerable wastewater from K-Area, along with its tritium contamination, was collected and transferred to the high level waste tank farm to prevent its direct or eventual discharge to the plant streams and the Savannah River. The actual failure and leak resulted in about 6000 Curies of tritium in about 150 gallons of reactor moderator being discharged directly to the river in greatly diluted form. Subsequently, another 6000 Curies of tritium in over 150,000 gallons of light water was sent to the tank farms to be transferred to Saltstone. Since Saltstone is a SCDHEC permitted waste water treatment unit, permission of the state was necessary to transfer this large volume of water. It is also clear that SCDHEC also wished to minimize additional release of tritium to the river. For planning purposes, it should be assumed that a heat exchanger failure in a reactor that is operational or is undergoing flow testing etc. with the moderator present in the reactor, could result in as much as 12,000 Curies of tritium contained in 1 to 3 hundred thousand gallons of light water. (See Table IV for 100/400-Areas Tritium Source Terms.) Since the wastewater must be transported to 211-F and is sampled for tritium prior to transport, this source can easily be controlled. The most practical way to control this stream is to set limits at 211-F above which the water will be sent to the tank farms. Such limits are already in place but the option of where to send that high tritium water is left for Separations and Waste Management Level 3 managers to decide.

The other major stream is ternary fission product tritium that is created in the enriched uranium fuel and depleted uranium targets while they are in the nuclear reactors. The fuels and targets are processed in the solvent extraction systems in the 221-F/H Canyons and the tritium exists the process in most waste and product streams. The quantities of tritium contained in the fuel and targets is a direct function of the reactor power level and exposure. SRTC has estimated that 13.2 to 13.8 curies of ternary fission product tritium are produced per thousand megawatt days of exposure in the enriched uranium fuels. The depleted uranium targets have averaged about 2.65 curies of tritium per metric ton in the recent past.

The ternary fission product tritium is extracted by the aqueous flowsheet of the canyons and will, in essence, follow the water balance for these facilities minus some fraction that goes out the canyon stacks. Some of the tritium will go with the high level waste directly to the 241-F tank farms. Experience has shown that between 65% and 75% of the tritium contained in the fuel and targets will be present in the F/H Acid Recovery Unit (ARU), the GPE's, and the F/H tank farm evaporator overheads that are discarded as wastewater to the ETF. Recent analyses of tritium in high level waste tanks show tritium concentrations below 40 uCi/mL. This would result in less than 500 Ci/year sent to the ETF based on 3,000,000 gallons/year of tank farm overheads.

This tritium source term can be controlled by diverting the High Activity Waste (HAW) stream in the canyons directly to the Tank farms without evaporation. However, this would use a large amount of the tank farm volume and the tritium would still reach the ETF from tank farm evaporator overheads. This source term will be reduced in the next few years as operations in F and H Areas are curtailed and fuel and target irradiations are discontinued as forecast. The source term from the waste tank farms and the GP evaporators will also decrease as production activities are curtailed.

Hydraulic Barriers to Groundwater Outcropping of Tritiated Water from F&H Area Seepage Basins

Measures to mitigate the rate of tritiated groundwater outcropping involve putting slurry walls of relatively impermeable materials such as bentonite around the closed basins in F and H Areas. One study conducted in 1985/6 concluded that an expenditure of $15MM would be necessary to reduce the rate of tritiated water outcropping. The rates of tritium outcropping from the closure are estimated to initially be around 9,000 to 10,000 curies per year and will decline to around 1,500 to 2,000 curies per year 15 to 20 years after closure. Installing hydraulic barriers would reduce the initial outcropping to around 2,000 curies per year and reduce the rate to around 1,000 curies per year in 15 to 20 years after installation. However, one should also note that most of this decline would occur between 5 and 10 years after F&H Area Seepage Basin Closure (1988). Building a cutoff wall would take several years to organize and complete. This potentially would generate a very large impact to the environment from road cutting, grout mixing, heavy equipment operations, etc.

ER is in the process of developing a scheme for hydraulic control of groundwater tritium plumes at F and H Area seepage basins. Various methods of hydraulic control of groundwater (i.e., extraction of water via trenches or wells, reinjection of tritiated groundwater via wells or infiltration galleries, some combination of slurry walls and water recycling) are being investigated in terms of effectiveness and cost. Complications posed by the potential environmental impacts (effects on wetlands, streams, change of flow directions in aquifers) of implementing a hydraulic control system to mitigate tritium releases to surface water are under study.

A 1989 cost estimate for construction of a slurry wall for hydraulic control at the F and H Area Seepage Basins was $1.1 – $1.4 billion (C.T. Main report, "Preliminary Ground Water Remediation Technology Evaluation, November 30, 1989").

This extremely high capital cost reflects the engineering scope of a 5 mile by 100 foot hydraulic barrier. This presumably reflects the distance of the tritiated water flowpath. This should be interpreted in all rational circles as an example of an "unjustifiable capital expenditure".

Physical Separation of Tritiated Water from Dilute Waste and Distribution to Saltstone

In order to address the ternary fission product tritium present in the fuels and targets that are processed in the F/H Canyons, it is necessary to go back to the initial processing steps and intercept the tritium bearing stream prior to dilution. An expenditure of about $10MM was estimated in 1989 to isolate and concentrate the tritium bearing stream at the optimal point in the Canyon process, the High Activity Waste (HAW stage II) Evaporator overheads. Once this tritium is isolated and physically separated, the following disposal option had been scoped. The tritium bearing stream could be piped to the high level waste tank farms in each 200 area and be used as process water and eventually be incorporated into the saltstone in Z-Area. Incorporation into saltstone, which will be in vaults, would effectively isolate the tritium from the atmosphere and groundwater until radioactive decay consumes the tritium. Estimated total capital cost was $25MM in 1989.

Tritium migrates from Saltstone (concrete) similar to leach patterns for nitrate ion and it has been estimated (by calculation) that holdup times would be sufficient for tritium decay.

Solidification of Tritiated Water in Concrete and/or Clay Compositions or Other Matrices

The possibility of solidifying one million gallons of tritiated water per month with a Ci content of 10 x 10^6 pCi/l is dependent on classification of this material as deminimus (below radioactive waste limits) or low–level radioactive liquid waste. There are relatively few problems with solidifying this liquid with cement or adsorbing it on clay if it meets deminimus requirements. Otherwise it must be solidified in a permitted low–level waste treatment facility (environmental impact statement, permit etc.). Disposal will require the same. Both cement (hydrated hydraulic ceramic) and clay are suitable for solidifying water. However, the water in these materials is not bound tightly and a large percent of it can evaporate. Tritium in the water can also exchange with hydrogen relatively easily. One disadvantage of these types of wasteforms is that they result in about a 1.5X volume increase. It may be more reasonable to manage the tritium source to first reduce the volume and concentration of tritium in the wastewater. Effort should be put into investigating the possibility of using the most concentrated sources as makeup water for reconstituting salt cake in the DWPF process or as wash water in other tank farm processes. Since the disposal site for this water will be the Saltstone facility or S–Area stack, additional studies on the feasibility with respect to permits and environmental contamination are necessary.

Concrete typically contains 30–35 gallons of water per cubic yard of material. This volume increase of about 6.7X is very large. The volume increase of 1.5 for typical cement wasteforms is possible by optimizing the formulation for high water loading.

No capital costs for this alternative have been evaluated to date.

Tile Fields for Tritiated Water Transport Retardation

Another alternative would be to dispose of the tritiated stream in a optimally sited tile field, so that the tritium would not outcrop into plant streams for at least fifty years. In that time frame, 94% of the tritium would decay in route to the stream. This option would require a very pure tritiated water stream to prevent degradation of the groundwater by residual chemicals. A conceptual process of tritium decontamination of HAW evaporator overheads, 100 Area waste water, etc., depends on isotopic separation of HTO by vacuum distillation. This process will reduce tritium in feed solutions by a factor of 20 and store the recovered tritiated water in about 0.4% of the feed volume (5000-6000 gal/day feed rate into stripping column). 1990 estimated equipment and operating costs were $20MM and $10MM/year respectively. The highly purified stream could then be directed to a tile field at a project level cost of over $20MM (1990). Funding would be required to further define either option. Some uncertainties associated with this alternative from a hydrogeologic viewpoint include alteration of groundwater chemistry and aquifer performance during groundwater infiltration and would mandate additional study.

Solid Waste Disposal Facility (SWDF) Remediation of the Tritiated Water Effluent

A large inventory of tritiated water exists underneath the F/H Seepage Basins and is slowly outcropping into Four Mile and Upper Three Runs creeks which discharge to the Savannah River. These outcroppings, along with a groundwater plume originating in the 643-G Burial Ground (SWDF) from tritium bearing solid wastes, have amounted to around 12,000 to 15,000 curies per year from 1984 to 1987. Even though discharge of additional tritium bearing waste waters to the basins has ceased, the existing tritiated groundwater will continue to outcrop to the plant streams and the Savannah River for many years. The amount of tritium reaching the plant streams and river will decline slowly as decay reduces the concentration of tritium (Table 1).

The primary tritiated solid wastes in the SWDF are the waste crucibles from the tritium extraction process, other process vessels, and job control waste containing tritium. The waste crucibles are steel cylinders, containing lithium/aluminum alloy and residual tritium, both of which were disposed of in the low level burial ground where they became one of the main sources of tritium contamination of groundwater at this facility. Control efforts in effect since 1987 include sealing of the open end of the crucible with an epoxy type plug to prevent reaction with and extraction by soil moisture after trench burial. Further improvements to this disposal have been made such as "greater confinement disposal" to reduce or eliminate contact with ground water. This concept is applicable to tritiated solid wastes in addition to crucibles. To provide for greater confinement of the wide range of tritiated solid wastes, above grade concrete vaults are being constructed in the SWDF in which natural radio-decay of tritium may occur without contamination of ground waters. This concept is based on decoupling the migration pathway for tritium to ground water. Vault storage provides a barrier and decay time constraints to eliminate this source of release. See DPST-88-235 for basic data on the project (vault storage of tritiated solid waste in the burial ground). The project has been funded and will be operational in the early 1990's. Estimated capital cost for vault storage is $2.1 MM in 1992. This represents two cells in the intermediate level vault, the first for tritium–containing crucibles and the second for highly contaminated, tritium – containing waste, both from H–Area.

Detritiation Processes to Actually Separate Tritium from Light Water (H_2O)

Table III provides a summary of tritium removal alternation now under study. Current technology to recover tritiated water from contaminated waste water having concentrations less than 1 ppm has been reviewed in WSRC-MS-91-027 "Concepts for Detritiation of Waste Liquids" by C. M. King et. al. The primary technology utilized in practice has been the Sulzer Brothers, Ltd. (Switzerland) vapor phase hydrogen-steam catalytic isotopic exchange, process, combined with electrolysis to generate the tritium depleted hydrogen vapor stream, and to concentrate tritium in the liquid oxide (HTO) form. Cryogenic distillation of the gaseous isotopic mixture has also been used to recycle the elemental gas for catalytic exchange as well as purification (i.e., T_2 or HT). Both electrolysis and cryogenic distillation are energy and capital intensive. The Sulzer process is run at large scale in Europe and Canada, and has many years of substantial operating experience.

Atomic Energy of Canada (AECL) has developed a lower temperature liquid phase H_2/HTO catalytic exchange (LPCE) process, along with the water-stable catalysts uniquely developed by AECL for this lower cost process variation. Since 1979, the AECL process has been used in the United States by EG&G Mound Applied Technologies for cleanup of light water (HTO), with successful operating experience and basic data.

Dual-temperature catalytic exchange is receiving renewed interest due to the potential for higher decontamination factors and volume reduction. All of the established catalytic exchange technologies are elemental hydrogen (H_2) based. Hydrogen gas is flywheeled and used as a tritium Tripping reagent driven by the greater stability of the HT Chemical Bond. This appears to be a major disadvantage since technology is required to generate and/or recycle the elemental gaseous hydrogen isotopic mixture. An exception is the Girdler-Sulfide noncatalyzed H_2S/HDO exchange process, which had dominated worldwide heavy water production, and is one concept with a direct liquid water (HDO) feed.

New concepts based upon a direct liquid water (HTO) feed stream as the primary reactant in the $10^6 - 10^9$ abundance of light water (H_2O) are being studied in active DOE sponsored programs at the Savannah River Technology Center. Two unique and patentable processes have evolved for direct HTO exchange and separation:

1. A Liquid-Liquid Extraction process using aluminum trichloride catalyzed tritium transfer from HTO to toluene. The tritiated toluene is then sorbed into a clay matrix for disposal as a low level solid waste composition. The method is unreported in the technical literature for tritium removal from environmental liquids and appears unique.

2. The tritium "CEAS" process ("Catalyzed Exchange/Alumina Sorption") developed by the SRTC scientific and engineering staff, utilizes direct HTO exchange with formic acid followed by catalyzed detritiation of formic acid to CO_2 and HT (gas). HT is then preferentially sorbed onto alumina. The tritium is, therefore, in a solid inorganic low level waste form for disposal. Unique highly active homogeneous catalyts for the key formic acid dehydrogenation step have been discovered. Analysis and experimental demonstration of an environmentally applicable flowsheet are currently in progress.

Both new SRTC processes look quite promising and, hence, capital costs are now being estimated. Both new concepts will be tested in laboratory scale equipment with tritiated water. Both approaches avoid the large flywheel of hydrogen (H_2) gas used for tritium stripping in the Sulzer and AECL processes and require no capital investment for tritium recovery. Current capital cost estimates will consider a feed stream of 1 ppt (10^7 pCi/L) of tritium, similar to ETF effluent. Equipment will be sized for a 1 MM gallon/month throughput with the goal of the EPA guideline of 1 part per quadrillon (10^{15}) (20,000 pCi/L) for detritiated water product.

Table II A

Control of Tritium Releases/Physical Methods

Method	Probability of Success	Advantages	Disadvantages
Concrete Waste Form (Solidification)	Very High (Established)	EG&G Mound Demonstrations Practiced at Chem Nuclear, Barnwell, SC	2/1 concrete to water Low % water of Crystallization High void volume subject to evaporation Tritium exchange possible with water
Bentonite/ Attapulgite Waste Form (Solidification)	High	SRS SWDF (getter for water) Minimal Processing (Water/Dirt Mix) >10 to 1 water to clay	Evaporation of HTO Tritium exchangeable with water
Hydraulic Barriers to Lesson Migration	High	Demonstrated Technology	Potentially very high capital cost High environmental upset

Table II B

Control of Tritium Releases/Physical Methods

Control of Tritiated Water Source Terms to the ETF

Method	Probability of Success	Advantages	Disadvantages
Tank Farm Storage/ Saltstone	Very High (Established)	Uses existing facilities/ technology Source easily controlled	Tank farm storage volume limited Concrete waste form disadvantages (see Concrete Waste Form section – Table IIA)
HAW diversion to tank farm	Low	Uses existing facilities	High volumes limited tank farm space Tritium will still reach ETF thru Tank Farm evaporators

Table III

Control of Tritium Releases/Competitive Detritiation Technologies

Method	Probability of Success	Advantages	Disadvantages
Combined Electrolysis Catalytic Exchange	Very High (Established)	EG&G Mound Demonstration Piloted by Atomic Energy of Canada	Indirect HTO Catalyst Availability 100% Electrolysis Re-quired-High Energy High Capital Cost
Dual Temp Catalytic Exchange	High	More Efficient Japan Demonstration High Throughput Less Energy Intensive Large Volume Reduction	Large H2 Recycle Catalyst Availability Indirect HTO
Liquid Extraction Toluene Sequestering	Very High (New Concept)	Direct HTO treatment Low Temp Concept No gas Recycle	Needs to be Scaled Organic Liquid Disposal
Catalytic Exchange Alumina Sorption (CEAS)	High (New Concept)	Direct HTO treatment No gas Recyle Low Temperature Concept Mineral Disposal	Needs to be Scaled Catalyst Utility
Distillation of HTO from H_2O	Low	Established for Heavy Water Production Know Engineering Unit Operation	Extremely Large Columns May not be conceivable for tritium at < 1 ppm

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Table IV

100/400-Areas Tritium Source Terms

Building	Gallons of Heavy Water Moderator	Tritium Conc (Ci/L)	Total Tritium Inventory (Ci)
105-K	55000	8.8	1831940
105-L	55000	2.9	603707
105-C	41000	11.0	1707035
105-P	55000	10.6	2206655
122-R	67230	6.0	1526793
105-13K	24732	6.0	561663
105-13P	30726	.0	0
Other	9396	.0	0
Total Reactor Inventory	338,084		8,437,794
421-D	66150	4.0	1001511
421-2D	27756	3.5	367697
421-4D	50220	5.5	1045454
Receiving Area	19386	6.0	440256
DW Plant	17135	0.0	0
Rework Facility	16331	6.0	370877
D-PUR Facility	228	6.0	5177
Total 400-Area Inventory	197,206		3,230,974

Table V

100–Area Trailers/Tritium Source Terms to the ETF

Year	Reactor Area	# of Trailers	Total Tritium to 211- F(Ci)
1990	P	7	642
	K	28	114
	L	3	14
	C		
	Total		770
1991	P	11	347
	K	19	1998
	L	15	25
	C	1	11
	Total		2381
1992 (Thru 3/2)	P		
	K	3	227
	L		
	C		
	Total		227

OSR 3-4A-W (Rev 1-89)

WESTINGHOUSE SAVANNAH RIVER COMPANY

INTER-OFFICE MEMORANDUM

NMP-SPA-920175
Retention:
Lifetime

May 4, 1992

TO: J. E. Dickenson, 703-F

FROM: J. P. Duane, 704-F JPD

SP 92070
ENGINEERED SOLUTIONS FOR POTENTIAL
SEPARATIONS EFFLUENT RELEASE POINTS

Attached are the data presented to the Environmental Release Prevention Taskforce on April 14, 1992.

JPD:dn
5.4.92

CC: R. L. Geddes, 704-16F
R. M. Bigler, 225-7H
W. G. Smith, 225-7H
D. L. Spiker, 225-7H
M. Flanders, Jr., 225-5H

INFORMATION ONLY

200 AREA

EFFLUENT RELEASE STUDY

SP92070

TABLE OF CONTENTS

INTRODUCTION

The Environmental Release Prevention Taskforce (ERPT) conducted a site-wide review of potentially significant environmental releases and the systems, procedures, and practices in place to prevent and/or mitigate their severity. The ERPT members determined that the most appropriate area of attention is potentially significant radioactive releases to site streams via surface water, outfalls and groundwater outcrops. They developed an action plan to systematically review these areas across the site and issued a report summarizing the information collected and generated.

Separations Program Control and Integration (PC&I) reviewed fifteen items in the ERPT report pertaining to Separations. Of the fifteen items, eight required engineering "fixes" relating to project work. Three additional items were added to the list:

* 294 Sandfilter ditches,
* Outside Facility B-Basin liners
* Liquid Waste Unloading in F-Area.

The PC&I review covers a summary, environmental impact of potential releases, cost, schedule, and discussion of each item. The items are listed in decreasing order of serious environmental impact.

I. COOLING WATER SYSTEMS

Summary

Recent review of the F&H Cooling Water System verified that accurate monitoring and timely water stream diversion is vital to prevent the inadvertent release of hazardous effluent to an outfall. We concur with recommendations as proposed by the Environmental Release Prevention Task force (ERPT) that sampling equipment and sampling routines be improved or modified to provide greater sensitivity to potential releases and to enable items used by field personnel to be calibrated to standard sources and traceable standards.

Environmental Impact of Potential Release

The median release of activity to the cooling water has been about 0.1 to 0.2 curies per event. The two largest releases were one of 40 curies and one of 300 curies. The probability of a release of over 40 curies has been estimated to be about 3 events per 100 years.[1]

Discussion

The primary monitoring houses 281-4 and 281-6 (see Figure 1) are essential to provide early warning of contamination, allowing water to be diverted to the retention basin. Currently, measurements obtained from these monitors along with a HP grab sample, form the basis for release of the effluent to 4 Mile Creek. The circulated water monitor (281-4) and the segregated cooling water monitor (281-6), sample continuously and alarm if contamination is detected in the cooling water systems. If contamination is confirmed by HP analysis of the grab samples, the water is diverted to the 281-8 retention basin.

Though the present operation has these precautions to prevent contaminated effluent discharge, additional monitoring improvements were provided to reduce the risk even further:

- 6 additional monitor systems with datalogger and assessment capability were installed in both F&H Areas on Projects S-2551 & S-3982.
- To date, the equipment installed has not provided the reliable monitoring and data management intended.
- Upgrade and improvement items for the additional monitors are recommended.

I. COOLING WATER SYSTEMS (Contd)

Discussion (Contd)

The improvements and upgrade, when complete and operational will give earlier warning of potential problem areas and aid in locating the source of the leaks, subsequently permitting quicker containment of the source of the contamination. (ERPT recommended that emphasis be concentrated on the two primary monitoring houses in both F&H areas to provide fully operational monitoring systems with the datalogger capabilities intended and that this work be accomplished in an efficient timely manner.)

Cost and Schedule

The high spot cost to provide the upgrades required for the cooling water monitoring is estimated at $1M with a schedule forecast of 24 months after authorization of funds to complete the work.

II. LIQUID WASTE UNLOADING

Summary

SRL, Reactors, and Burial Ground ship liquid radioactive wastes to 211-F for entry into the site's liquid waste disposal systems via the Unloading Facility. There are plans to ship low level radioactive liquid waste from planned new facilities (i.e. New Production Reactor, Heavy Water Processing Facility near C-Area, Health Protection & Environmental Laboratory in B-Area, Plant Wide Fire Protection Water Collection Sumps in RCA Zones). The present unloading facility has two unloading bays, one for LLW and one for HLW. The east side of each bay is open to atmosphere, therefore no ventilation of the building or containment and filtration of building potential emissions is possible under the present system.

Environmental Impact of Potential Release

The greatest potential for contamination of the environment is the unloading of the HLW, received from the Savannah River Laboratory. The wastes are shipped in tanker trailers. When in position, plastic is draped over the trailer to prevent contamination of the trailer in the event of a spill. There are no features provided to contain a spill within the facility. Natural drainage in the area would migrate any spilled material to the outfall F-2. The maximum calculated dose to an individual at the site boundary is 25 mrem compared to a permissible guideline value of 500 mrem.[2]

II. LIQUID WASTE UNLOADING (contd)

Discussion

Separations has requested funding for an improved unloading facility since the late 1980's. A Conceptual Design Report (CDR) was prepared for FY92 Project 92-SR-094 Fiscal Year 1992, but was not funded.

The upgrade proposed by this project will provide a facility which can be operated in an environmentally responsible manner and would include means of containing, controlling, mitigating and monitoring radioactive releases and thereby:

* Reducing the potential for and consequences of an accidental radioactive release.
* Minimizing the potential impact of a release to other site operations.
* Improving facility operability and maintainability.
* Providing greater flexibility in SRS waste handling capabilities.

The proposed facility would be a significant step toward fulfillment of the SRS commitments to EPA regarding NESHAP compliance and would satisfy guidelines mandated by the Environmental Restoration and Waste Management Five Year Plan.

DOE is requesting in-situ treatment to eliminate liquid shipments. The cost of in-place treatment is forecast to be $200M and will require 10+ years to complete. This is the technically preferred solution but not practical in short term. An improved Liquid Waste Unloading Facility is essential as an interim measure.

Cost and Schedule

Total Estimated Cost (TEC) is currently forecast at approximately $20 million and would require approximately 4 years to complete after authorization.

III. 294 SANDFILTER RAIN DITCH

Summary

F and H areas have a stormwater rain ditch adjacent to the old sandfilters. The ditches were installed in 1969 to repair the sandfilters and due to structural constraints, cannot be eliminated. Each sandfilter ditch is approximately 250' by 40' and 25' deep and is located directly north of the sandfilter.

III. 294 SANDFILTER RAIN DITCH (Contd)

Summary (Contd)

The south wall of the sandfilter ditch is the north exterior wall of the old sandfilter and the remaining sides are constructed of concrete and gunite. The ditch contains two sumps with float switch mechanisms to automatically pump rainwater to storm sewers. In H-Area, the water is discharged to the H-6 outfall and in F-Area to the F-5 outfall. Contamination from the sandfilter has migrated into the ditch in the past, increasing the potential to contaminate the environment.

Environmental Impact of Potential Release

In an incident in H-Area in 1969, the total radioactive release was 2.06 mCi Ru 106 and 1.83 mCi SR-89,90. This is well below the prorated monthly release guide of 52.08 mCi Ru106 and 6.25 mCi SR-89,90.[3] However, there was potential for exceeding the prorated monthly radiation release guide.

Discussion

In 1989 the H-6 outfall and McQueens Branch were contaminated by 294-H Sandfilter ditch transfers. Vegetation in the ditch interfered with the operation of the pump float switch mechanism and resulted in the accumulation of excessive rainwater. The rainwater entered the adjacent sandfilter air tunnel. When the pumps were reset and the ditch was pumped out, contaminated water drained back to the ditch via a leaking expansion joint. The contaminated water was subsequently transferred to H-6 outfall.

Since the incident, H-Area has routed all ditch rainwater to H-Canyon for processing through Low Activity Waste Evaporators. 294-H Sandfilter Ditch repairs and upgrades have also been ongoing. F-Area continues to pump to F-5 outfall using the automatic pump system. H-Area plans to return rainwater to H-6 when upgrades are complete. H-Area will batch and sample water for contamination prior to each transfer. It is recommended F-Area adopt the batch and sample method also. This batch and sample method is preferred short-term.

Cost and Schedule

Long-term, piping should be installed to process the rainwater through both the Acid Recovery Unit and the General Purpose Evaporator. It is estimated this project would cost $0.5M for both areas with a schedule of about 12 months after authorization.

IV. F-2 OUTFALL & DRAINAGE NE 221-F

Summary

The primary effluents in this outfall are nonprocess cooling water, cooling tower blowdown, and storm water. A current leak in the Segregated Cooling Water valve is being diverted to this outfall. The discharge flows to Upper Three Runs Creek and on to the Savannah River. Storm sewers along the north and east sides of 221-F flow out north of the area via the 247-F access gate. At this point, the storm drainage discharges into a wide, basin-like area prior to flowing on to the F-2 outfall. The development of this area as a retention area should resume. Permitting to enable continued efforts to install monitoring equipment, a slide gate, pumps and piping to return any contaminated water to 211-F for processing should be pursued.

Environmental Impact of Potential Release

Potential release of contaminated water to the F-2 outfall is possible.

Discussion

Presently, process cooling water leaking in the segregation valve pit is routed to F-2 via a storm sewer. This cooling water supplies Building 221-F and 211-F Outside Facilities.

F-Area plans to re-route the leaking water to 281-1F Cooling Water Basin via the 281-4F Monitor House until repair or replacement of the Segregation Valve can be scheduled. Work orders and Engineering Work Requests have been issued to address this problem and should be expedited.

Other areas of 211-F drain to the storm drainage ditch going to F-2 outfall as mentioned in Section II., Liquid Waste Unloading.

Cost and Schedule

The cost of developing the retention area is forecast to be $.5M to $.7M with a schedule of approximately 24 months after authorization. This schedule is dependent on various environmental permits which would be required to develop this area.

The cost of re-routing leaking water from the Seg Valve is approximately $100,000 with a schedule of 6 months. The Seg Valve repair cost is approximately $35,000 with a six week schedule. Replacement of the Seg Valve would be approximately $100,000 in about 12 months.

V. 500 & 600 APRONS

Summary

Spill and rainwater collected in the 211-H 500 and 600 aprons, located within a RCA, is currently collected and routed to the General Purpose (GP) Evaporator feed tanks via waste header #1 for processing through the GP Evaporator. Waste Header #1 receives effluent from A-line and other spill containment basins. Piping is installed (but blanked) to transfer the aprons to ETF via waste header #1. Nuclear Safety Blank #111 is installed in this header to prevent transfer of possible uranium solutions (from A-Line sumps) to ETF. During periods of heavy rainfall, the volume of water required to be processed through the GP Evaporator can overwhelm processing capacity, allowing potentially contaminated water to overflow from these areas directly to outfall H-004. An alternate transfer route to ETF is recommended.

Environmental Impact of Potential Release

Spill containment basins and aprons are designed for 6 inches rain and the largest single tank failure. Delays in immediate processing of the rainwater could result in overflow of the aprons to the environment. There is potential for exceeding radioactive release guides in this situation.

Cost and Schedule

The cost to provide an alternate route from the 500/600 aprons to ETF is approximately $300,000 with a six month schedule after authorization.

VI. DEPLETED URANIUM STORAGE

Summary

Uranium-238 is the feed material for production of weapons-grade plutonium-239. The plutonium-239 and uranium were separately extracted in both PUREX process facilities (221-F and 221-H Canyons) prior to 1970 and only in 221-F Canyon after 1970. Resultant uranyl nitrate solutions were converted to depleted uranium oxide (UO_3) and loaded into steel drums lined with plastic bags.

The existing SRS UO_3 storage areas are inadequate to allow the storage of drums in a manner that will permit visual inspection of the containers for corrosion damage, permit the counting of drums for nuclear material inventory purposes, and permit the visual inspection of the tamper indicating seals.

VI. DEPLETED URANIUM STORAGE (Contd)

Environmental Impact of Potential Release

For uranium wastes, chemical toxicity, as well as radiological dose effects, is an important consideration. For depleted uranium, the drinking water limit for chemical toxicity is slightly more restrictive than the radiological dose limit for drinking water. The proposed EPA natural uranium chemical toxicity drinking water limit of 60ug/l equates to 20 pCi/l for depleted uranium. While the proposed EPA radiological drinking water limit of 4 mrem/yr is equivalent to 24 pCi/l. Therefore, the EPA drinking water radiation dose limit (4mrem/yr) is not sufficient to protect against chemical toxicity effects as specified by the EPA. Although depleted uranium is not classified as a hazardous waste under RCRA guidelines, good management practices should provide adequate storage which would comply with both radiological and chemical toxicity requirements.

Discussion

At present, there are 35,792 drums of depleted UO_3 stored in eight warehouse at various locations across SRS. Several of the buildings are old and deteriorating from the weather. Six warehouses are 38 years old.[4] (See Table 1 &

2) Drum integrity and drum corrosion are major concerns.

Table 1: Savannah River Site DU Inventory and Storage Location

(as of 3/1/90)

BUILDING NO.	DATE CONSTRUCTED	NO. OF DRUMS
728-F	Sep-54	2,096
730-F	Jun-54	2,129
704-R	Dec-53	4,755
105-R	Dec-53	4,016
714-7G	Jan-52	8,244
772-7G	Jul-53	2,070
221-12F	Nov-86	5,406
221-22F	Nov-87	7,076

TOTAL NO. DRUMS	35,792.
URANIUM, kg	19,410,854.
U-235, kg	34,507.
Percent U-235	0.18

VI. DEPLETED URANIUM STORAGE (contd)

Cost and Schedule

SRS proposed an FY 93 Improved Uranium Containment capital line item to provide a centrally located, secure, and environmentally sound facility to store these drums of low-level radioactive UO3 for 50 years. This project did not make the FY 93 Capital budget and will be reconsidered during the FY 94 capital budget cycle.

Storage of SRS depleted UO3 is preferred because of its potential log-term value for the breeder reactor program. In addition, the cost of storage is about one third that of disposal for this material.

Depleted uranium needs to be stored for at least 30 to 70 years to provide time for the future nuclear power configuration to clearly materialize. The proposed project, "Improve Uranium Containment" is recommended to provide adequate storage. The project is estimated at $24.4 million and would require approximately 36 months to complete after authorization.

VII. 211 BASIN LINERS

Summary

Three spill containment basins in the outside facilities area which contain tanks that receive product or water with radioactive materials present are made of concrete that have cracks that normally occur in concrete with age and have not been lined with steel plate as has been done with other similar basins. The occasional overflow of a tank to these basins potentially could leak contamination thru the cracks to the near-by surface where it eventually may enter the unmonitored storm water drainage.

Environmental Impact of Potential Release

The potential to discharge contaminated water from these locations in the described manner is minimal

Cost and Schedule

The high spot cost to provide the liner required is estimated to cost approximately $100,000 and could be completed over a period of approximately 3 months after authorization of funds for the work.

VIII. CONDENSATE AND VENT LINES TO STORM DRAINAGE

Summary

A survey of the outside facilities area noted that several vent and condensate lines from vessels which handle contaminated liquids are drained to near-by storm ditches. Though these lines are normally clean and/or used infrequently they could become contaminated if failure of an equipment heater tube or coil went undetected. The few lines involved can easily be eliminated or directed to a spill containment pad or sump where the effluent will be monitored or processed before discharge, thus eliminating the potential contamination problem.

Environmental Impact of Potential Release

The potential to discharge contaminated water from these locations is minimal

Cost and Schedule

The high spot cost to provide the upgrades required is estimated at $100,000 and could be completed over a period of approximately 3 months after authorization of funds for the work.

IX. UNH LOADOUT SUMP, 211-H

Summary

Current design of the drainline from the 211-H Uranyl Nitrate (UN) Trailer loadout sump to the F1-6 sump (both located within RCAs) may allow potentially contaminated solution collected in the F1-6 sump to back up into the loadout sump and over flow directly to outfall H-006. Since shipments of UNH solution are not presently planned, the loadout sump drainline should be plugged and the sump basin backfilled and covered in a semi-permanent manner.

Environmental Impact of Potential Release

Overflow of the loadout sump could potentially contaminate the environment.

Cost and Schedule

The cost of covering the sump is forecast at $75,000. Completion would take approximately 1 month after authorization.

REFERENCES

1. DPSPU-82-272-9, Evaluation of Contaminated Cooling Water Problems, January 25, 1982.

2. Chaudhry, H. S., to Dickson, J. E./Britt, J. A., Waste Handling Facility, 211-F, June 4, 1991.

3. Evans, J. S. to Richardson, W. A., Separations Incident (SI) - SI-89-10-60, "Contamination of 294-H Sandfilter Ditch and Outfall H-6," October 26, 1989.

4. Krist, G. A. to Mason, C. C., Depleted Uranium Disposition Report (U), NMP-92-1-TL, March 12, 1992.

RRD Outfall Analysis Initiative Discussions

INTER-OFFICE MEMORANDUM
Savannah River Site

Date: 27-Jun-1992 01:16pm EDT
From: Barry L. Myers
MYERS-BL-05102 AT A1 AT SRXSS2
Dept: RE/TBP
Tel No: 79195

TO: G. Timothy Jannik, 735-11A (JANNIK-GT-09913 @A1@SASRS2)

CC: Ronald W. Garner (GARNER-RW-Y6284 AT A1 AT SRXSS2)

Subject: Release point initiative explanations

C, P, and L Areas:

E. Initiatives for these areas are similar, in that, continued operations as the Reactor mission now stands, requires that the sumps be diverted to the respective disassembly basins to reduce possible releases to the environment. D2O will continue to be stored in these areas and steps--such as diking, plugging of drains, etc.-- have been, and will continue to be taken, to ensure that releases to the environment will be reduced. D2O in these reactors has been drained from all systems in order to allow for mimimum maintenance within the current mission guidelines.

D Area:

E. 1. Design and construct a perculation field/seepage basin.

This option is not considered justifiable on a cost/benifit basis. Also, our customer has instructed WSRC to phase out soil columns as a means of waste disposal.

2. Design and construct an evaporator.

This option is not considered justifiable on a cost/benifit basis. Also, from an ALARA viewpoint, transfering releases from one media another is questionable, although this would spread the release to a population far greater than those presently exposed via the waters of the Savannah River, and possibly reduce the actual Site EDE, the release to the environment would remain the same.

3. Reevaluate numbers of samples.

Reactor Division continually reviews its policies on numbers and volume of samples for analysis, but current sampling plans have been arrived at in order to maintain the most vigilant perspective to prevent environmental releases due to process leakage. Some reduction in the number of samples to D Area has been achieved by the addition of a branch Analydical Lab in K Area. This activity is funded.

4. Transfer of 772-D waste to other site locations.

Collecting and transporting the 772-D effluent to a different site location for processing would only transfer the point of release to the environment. The only initative to store the waste on site until tritium reduction technology is available is not justifiable.

To accommodate the 772-D waste alone is estimated at $2 Million for just 3 years, and this represents only 10% of the total D Area waste. This undeveloped technology is not expected to be effective on waste in the low concentrations existing in Reactors and D Area.

K Area--Process Sewer

E. 1. Reroute the Process Sewer discharge to the existing percolation field, or construct a new one.

The existing percolation field is not permitted for operations other than Disassembly purges. The construction of a new field for this purpose is not considered justified on a cost/benifit or ALARA basis. Our customer has instructed WSRC to phase out soil columns as a method of waste disposal.

2. Replace the existion moderator with virgin moderator.

There is insufficient virgin (Dana) moderator on hand to accomplish this change out. The moderator could be used to dilute the existing moderator to a lower level, but this is the only Tritium-free moderator in existance, and as such, is designated for research only.

3. Replace the existing moderator with lower Tritium concentation moderator from site inventory.

This operation is not justified on a cost/benifit basis. From an ALARA viewpoint, studies made by Reactor Engineering estimate that the transfer exposure to the operators involved would be in excess of 600 mrem.

4. Design and construct an evaporator.

See D Area, above.

5. Bring K-Cooling Tower on-line.

Funded and scheduled for Fall, 1992.

6. Drain and replace moderator with light water upon completion of the existing mission.

Once the "demonstration run", K Area personnel and equipment will require testing and operation to ensure the ability for restart should the mission change. To reduce the severity and probability of any environmental insult, the moderator is planned to be removed and replaced with light water. This will reduce possible emissions and still allow for equipment operation and operator training. It will also reduce the numbers and volume of samples necessary to be tested by Analytical Labs.

K Area--107-K HX Cooling Water

1. See K Area Process Sewer, above.

2. See K Area Process Sewer, above.

3. See K Area Process Sewer, above.

4. See K Area Process Sewer, above.

5. Replace all Process Water heat exchangers.

   This activity is funded and will be completed in the upcoming outage.

6. Design and construct a moderator de-tritiation facility.

   This option is not justifiable at this time.

K Area--Disassembly Basin Purge

1. See K Area Process Sewer, above.

2. See K Area Process Sewer, above.

3. Cover basin to avoid required purges for tritium reduction.

   A research project to develop a polymer film cover for the disassembly basin, is ongoing at Georgia Tech. It is planned for demonstration in early 1993 and is funded.

SRTC Outfall Analysis Initiative Discussions

Outfall – Tims Branch–2 (TB–2)

E) Initiatives that would reduce the size of the release.

1. Reconfigure all laboratory drains to tie into the facility low activity drain system. There are other types of liquid drain systems within the laboratory buildings in the Technical Area, i.e. clear water drains. These type of effluents have minimal potential for becoming contaminated. Capturing these effluents would minimize the potential for a release. The benefit obtained from this project would be to lower the off–site dose from 1E–06 to 5E–07 mrem, or a ratio of 1.3E12 dollars/rem in the first year of operation.

2. Reconfigure all drains within SRTC and build an effluent treatment facility to package the waste. This option involves capturing the effluents from the trade waste and storm sewer drain systems and delivering the effluent to an ETF that would handle the non–radioactive portions. This option still relies on the 211–F facility processing the high and low activity liquids as currently processed. These secondary streams have very low probability of becoming contaminated. The cost/benefit ratio would be high, but is indeterminate due to the uncertainty concerning the operating costs of capturing the rainwater in the area. It is anticipated that a further reduction in off–site dose would be achieved; however, this option would only lower the dose to approximately 1E–07.

NMPD Outfall Analysis Initiative Discussions

RADIOLOGICAL RELEASE POINT FM-3

D. Initiatives that would reduce the production of this waste.

3) Complete installation of new stormwater monitor detector/source holders in all stormwater monitors. This will ensure consistent positioning of all detectors and reduce the effect of contaminated positioning of all detectors and reduce the effect of contaminated debris in the detector reading (the probe will be suspended in the water instead of laying on the manhole floor). Contaminated debris causes "false" alarms that divert clean water to the retention basins. This action will also allow implementation of quantitative radioactive source response testing providing a means to consistently position a source next to the detector when needed. This action is currently underway (ref: Boyter to Sjostrom memo).

4) Once the above detector/source holders are installed, complete program to develop geometry specific calibrations for each of the stormwater monitors. This will consist of determining the response of each stormwater monitor detector to a liquid source and revising current stormwater monitor maintenance procedures to do a periodic quantitative source check to verify the calibration has not changed. This action is currently underway (ref: Boyter to Sjostrom memo).

5) Design, fabricate, test, and implement a prototype sediment removal system for periodically reducing buildup of mud and/or sand in the F/H Area Tank Farm stormwater monitor manholes. This debris is often slightly contaminated and causes "false" alarms resulting in unnecessary diversion of clean water. Plans are to complete construction of the prototype Stormwater Monitor (SWM) Manhole Sediment Removal System and mount it at one of the H-SWM manholes by 9/92 (ref: Boyter to Sjostrom memos).

6) Contamination within Tank Farm stormwater runoff is generated from activities resulting from normal operations (eg: movement of contaminated equipment in and out of tanks). This contamination accumulates on exterior surfaces of equipment, asphalt, etc. and is consequently washed into the storm sewer during a rainfall event. A program has been

established to survey the Tank Farms for contamination and reduce/eliminate it before it is washed into the stormwater system. Surveys are performed on at random locations and at locations where work is conducted which could potentially release contamination.

E. Initiatives that would reduce the size of the release.

1) Install additional instrumentation and modify existing cooling water monitoring equipment to enhance reliability, sensitivity, and troubleshooting capability.

This effort would improve monitoring equipment reliability on the F-Canyon Segregated Cooling Water System and provide greater sensitivity to potential releases. This effort would also install redundant monitoring capabilities that will provide backup to the existing system in the event of equipment outage. A recent failure of the monitoring equipment did occur in this system and it was necessary to take compensatory actions. When complete and operational, the improvements will give earlier warning of potential problem areas and aid in locating the source of the contamination. The completion of this effort is important for detecting and preventing potentially significant releases to the stream during an accident scenario.

2) Consolidate and upgrade UO3 storage facilities per DOE-EH and Tiger Team surveys.

This effort would supply the facilities to consolidate and upgrade UO3 storage. At present, there are 35,792 drums of depleted UO3 stored in eight warehouses at various locations across SRS. Majors concerns (as determined by previous surveys) include drum integrity, poor storage practices (because of space constraints), and building integrity due to age. The new storage facilities would allow the storage of drums in a manner that will permit visual inspection of the containers for corrosion damage, permit the counting of drums for nuclear material inventory purposes, and permit the visual inspection of the tamper indicating seals. The facilities would be constructed to meet all RCRA equivalent standards.

3) Provide batch release system to match the H-Area system. This approach would reduce the potential for releases by increasing reaction time.

   This effort would involve constructing a batch delaying basin system for the F-Area segregated cooling water similar to the batch system for the H-Area segregated cooling water. The current F-Area system is a continuous flow through basin which allows for a maximum three hour retention prior to diversion at the outlet upon detection of radioactivity at the inlet of the basin. The H-Area system is a divided basin capable of independent filling and discharge. After sample results are received and are within limits, discharge of the basin is allowed. Historical experience shows that there is not a significant increase in risk of a release from the F-Area basin as compared to the H-Area basin. The high cost of this effort is not justified based on this past experience and limited future processing plans of the facilities.

4) Modify segregated cooling water system to provide closed loop cooling

   This effort would be a major project effort to modify the segregated cooling water to become a closed loop system rather than the once through system that presently exists. Major piping, tanking, and basin systems are required. This effort would further reduce the possibility of an accidental cooling water release but would have minimal impact on routine releases. The high cost of this effort is not justified based on the limited future processing plans of the facilities.

5) Improve the sensitivity of the stormwater monitors so that water at lower contamination levels may be diverted and sent to treatment. This would reduce the cumulative effect of releasing many batches of water at just below the sensitivity of the monitors. This action would be dependent upon completion of sediment removal initiatives. If the sensitivity of the monitors were lowered and radioactive sediment caused a diversion of stormwater, waste would be created unnecessarily.

6) Test and install the new Beta-Gamma in line probe assembly in the 907-6H and 907-7H storm water monitor manholes to provide improved sensitivity in detecting liquid releases from the three sludge washing (ESP) tanks that are (or will be) low in Cs-137, but high in Sr-90 (a beta emitter). The monitors currently installed only read gamma activity. Plans include installing Beta monitors in F-Tank Farm as well for improved sensitivity (ref: Boyter to Sjostrom memo).

7) Route all diverted stormwater through the ETF for processing (currently not able to process at design rates). Part of the mission of the ETF is to decontaminate stormwater from the H-Area retention basin. In order to meet "zero release" levels, the water could be processed through the ETF prior to discharge. This would eliminate the need for the F-012 outfall. However, the ETF is currently not able to process this water due to the high level of biota in the water which severely fouls the Norton ceramic microfilters. Upgrades to the ETF required before routine treatment of this stream would total capital cost of $2 million. These projects are already planned and are in the Waste Management project list for FY93 and 94. Once the system is capable of handling this water, the system would remove virtually all the radioactivity (>100X) and would cost approximately $4-6 million/year (based on 40-60 million gallons to be treated from the two basins at $0.10/gallon). The estimated annual release values given in Section A for Cs and Sr would result in a cost/curie removed of approximately $200-300 million/curie; clearly not a cost effective option.

8) Currently, stormwater monitor alarm/diversion set-points are at 10 d/m/ml gamma above background. However, all stormwater activity below this set-point is released to the creek. In order to become accountable as well as reduce radiological releases, all Tank Farm stormwater should be collected. This action would call for an additional retention basin to be built in both H and F-Area.

It is a well known fact that the majority of the activity found in stormwater is absorbed in the sediment which accumulates in the stormwater system. If all stormwater were collected, the new basin would serve as a settling pond for the sediment and the majority of the radioactivity would be contained. The water would be pumped from the surface to a monitoring checkpoint. If the water is determined to be "clean" (below an established threshold) it could then be sent to the creek. If activity is found, the pump would shut off and the stormwater remaining in the basin would be sampled and sent to treatment if necessary.

In the event that the new basin becomes contaminated or must undergo routine maintenance activities (removal of sediment for SWDF disposal) the existing basin may be used for incoming flow. The cost of constructing one additional basin was estimated at $6.1M (ref: WSRC-TR-92-14, "WSRC Alternatives Study, H-Area Waste Tanks 9-12 Stormwater Drainage System").

RADIOLOGICAL RELEASE POINT U3R-2

E. Initiatives that would reduce the size of the release.

1) Improve confinement, monitoring, and fire protection at the liquid waste unloading facility.

   This effort would include the approval of the proposed project to upgrade the 211-F liquid waste unloading facility. This project will provide the facility with a means of containing, controlling, mitigating and monitoring radioactive releases that could occur during an incident. This facility is located very near a storm drainage system leading directly to an outfall. Although there have been no past occurrences that have led to a release to the outfall, there is a potential for such an occurrence. The installation and operation of an improved unloading facility will reduce the potential for and consequences of an accidental radioactive release, minimize the potential impact of a release to other site operations, improve facility operability and maintainability, and provide greater flexibility in SRS waste handling capabilities.

2) Line the B-1 and B-3 basins with stainless steel to seal cracks.

   A stainless steel liner will eliminate the potential for a contamination leak from an occasional inadvertent overflow of a tank to these basins. Migration through the cracks might eventually enter unmonitored stormwater to an outfall. This effort should be pursued to eliminate a potential pathway of a release to the environment.

3) Ceilcoat sandfilter ditch and maintain as clean area.

   This effort involves repairing the sandfilter ditch to prevent any leakage from expansion joints. After repairs are complete, the ditch will be coated and maintained as a clean area so that stormwater that collects can be discharged directly to an outfall as clean water. The effort is currently funded and is underway.

4) Install Sandfilter roof

The sandfilter ditch currently receives stormwater that is pumped automatically to a storm sewer prior to being monitored at the outfall sampling point. Should contamination migrate through an expansion joint in the sandfilter to the adjacent stormwater, contamination could be released and not detected until it reaches the outfall. This effort would install a roof over the ditch to prevent rainwater from collecting in the ditch. The low potential for a release and the small amount of any potential release from the sandfilter ditch does not justify the high cost of this effort. The preferred option for handling this situation is by pursuing item 3 above.

5) Install piping to transfer ditch rainwater to process through GP evaporators.

Piping could be installed to process sandfilter ditch rainwater through the Acid Recovery Unit and the General Purpose Evaporator. The piping installation will prevent the inadvertent transfer of any contamination, that migrates to the ditch from the sandfilter, to an outfall. The low potential for a release from the sandfilter ditch does not justify the high cost of this effort. The preferred option for handling this situation is by pursuing item 3 above

6) Administratively control releases by sampling prior to release.

Construct a divided basin capable of independent filling and discharge. After a section of the basin is filled, sample the water in the section. If analyses are within limits, that section can be discharged to an outfall. If contamination is detected, the water flow can be diverted to a treatment facility for processing. This initiative is not recommended because of the low potential for release and the cost of the effort.

7) Provide monitoring capability at F-002, make slidegate remotely operational, and install piping to 211-F.

This effort would develop a basin-like area where the stormwater drainage from northeast 221-F flows into a retention basin. Efforts would be required to obtain a permit which will enable installation of monitoring equipment, a slide gate, pumps and piping to return any contaminated water to 211-F for processing. This initiative is not recommended because the cost of the initiative is not justified based on the changing missions of the Separations facilities.

RADIOLOGICAL RELEASE POINT U3RF-3

E. Initiatives that would reduce the size of the release.

1) Current releases are negligible because this facility is in non-operational, standby mode. No effort is necessary since there there is only residual contamination in the facility that could be discharged to the environment.

RADIOLOGICAL RELEASE POINT FM-1C

D. Initiatives that would reduce the production of this waste.

4) Complete the design and installation of a drain collection system for the Tank Farm H-East and H-West cooling water pumphouses. This will reduce the possibility of release of chromated cooling water to the environment (which is potentially hazardous and contains small amounts of radioactivity) due to equipment failures in the pumphouses (all other cooling water pumphouses already have this system). Releases from the pumphouses are not routine so the reduction effect of this action is not known. This initiative is currently in the conceptual phase (ref: Boyter to Sjostrom memo). Cost; $0.5M

5) Reroute the currently unmonitored stormwater runoff around the H-East and H-West Pumphouses to a monitored zone. This would allow contaminated stormwater to be diverted to a retention basin and treated if necessary before discharge. Cost; Undetermined.

E. Initiatives that would reduce the size of the release.

1) Install additional instrumentation and modify existing cooling water monitoring equipment to enhance reliability, sensitivity, and troubleshooting capability.

This effort would improve monitoring equipment reliability on the H-Canyon Segregated Cooling Water System and provide greater sensitivity to potential releases. This effort would also install redundant monitoring capabilities that will provide backup to the existing system in the event of equipment outage. When complete and operational, the improvements will give earlier warning of potential problem areas and aid in locating the source of the contamination. The completion of this effort is important to detecting and preventing potential significant releases during an accident scenario from the system.

2) Line the B-3 basin with stainless steel to seal cracks.

A stainless steel liner will eliminate the potential for a contamination leak from an occasional inadvertent overflow of a tank to this basin. Migration through the cracks might eventually enter unmonitored stormwater to an outfall. This effort should be pursued to eliminate a potential pathway of a release to the environment.

3) Ceilcoat sandfilter ditch and maintain as clean area.

This effort involves repairing the sandfilter ditch to prevent any leakage from expansion joints. After repairs are complete, the ditch will be coated and maintained as a clean area so that stormwater that collects can be discharged directly to an outfall as clean water. The effort is currently funded and is underway.

4) Continue to monitor outfall per 12 hour shift for tritium concentration.

This effort is currently underway. It provides an earlier detection of contamination to warn of potential problem. It may ultimately be necessary to establish diversion capabilities for the streams.

5) Install Sandfilter roof

The sandfilter ditch currently receives stormwater that is pumped automatically to a storm sewer prior to being monitored at the outfall sampling point. Should contamination migrate through an expansion joint in the sandfilter to the adjacent stormwater, contamination could be released and not detected until it reaches the outfall. This effort would install a roof over the ditch to prevent rainwater from collecting in the ditch. The low potential for a release and the small amount of any potential release from the sandfilter ditch does not justify the high cost of this effort. The preferred option for handling this situation is by pursuing item 3 above.

6) Install piping to transfer ditch rainwater to process through GP evaporators.

Piping could be installed to process sandfilter ditch rainwater through the Acid Recovery Unit and the General Purpose Evaporator. The piping installation will prevent the inadvertent transfer of any contamination, that migrates to the ditch from the sandfilter, to an outfall. The low potential for a release from the sandfilter ditch does not justify the high cost of this effort. The preferred option for handling this situation is by pursuing item 3 above.

7) Administratively control releases by sampling prior to release.

Construct a divided basin capable of independent filling and discharge. After a section of the basin is filled, sample the water in the section. If analyses are within limits, that section can be discharged to an outfall. If contamination is detected, the water flow can be diverted to a treatment facility for processing. This initiative is not recommended because of the low potential for release and the cost of the effort.

8) Provide alternate transfer route of spill containment basins and 500/600 aprons to ETF.

During periods of heavy rainfall, the volume of water required to be processed through the GP Evaporator can exceed processing capacity, allowing potentially contaminated water to overflow from these areas directly to outfall H-006. An alternate transfer route will lessen the potential for the aprons to overflow to the environment; thus, eliminating the potential release of contamination to outfall H-006. Based on the unlikely event of this magnitude of rainfall and on the future processing plans in Separations, the cost of this effort is not justified.

RADIOLOGICAL RELEASE POINT HP-15

E. Initiatives that would reduce the size of the release.

There is no viable option for treating tritium that might accidentally be discharged to the outfall. If tritium was detected, this stream could be diverted and collected if facilities were made available. The water could be sent to Saltstone or a detritiation facility if necessary. The potential volume of water, the cost associated with the risk and the inability to treat and remove tritium leads to the conclusion that no action is appropriate. Internal operational procedures and monitoring are in place and are the best solution to preventing a release in the stormwater.

RADIOLOGICAL RELEASE POINT MCQUEEN'S BRANCH AT RD 4

E. Initiatives that would reduce the size of the release.

1) Install Sandfilter roof

The sandfilter ditch currently receives stormwater that is pumped automatically to a stormsewer prior to being monitored at the outfall sampling point. Should contamination migrate through an expansion joint in the sandfilter to the adjacent stormwater, contamination could be released and not detected until it reaches the outfall. This effort would install a roof over the ditch to prevent rainwater from collecting in the ditch. The low potential for a release and the small amount of any potential release from the sandfilter ditch does not justify the high cost of this effort. The preferred option for handling this situation is by pursuing item 2.

2) Ceilcoat sandfilter ditch and maintain as clean area.

This effort involves repairing the sandfilter ditch to prevent any leakage from expansion joints. After repairs are complete, the ditch will be coated and maintained as a clean area so that stormwater that collects can be discharged directly to an outfall as clean water. The effort is currently funded and is underway.

3) Install piping to transfer ditch rainwater to process through GP evaporators.

Piping could be installed to process sandfilter ditch rainwater through the Acid Recovery Unit and the General Purpose Evaporator. The piping installation will prevent the inadvertent transfer of any contamination, that migrates to the ditch from the sandfilter, to an outfall. The low potential for a release from the sandfilter ditch does not justify the high cost of this effort. The preferred option for handling this situation is by pursuing item 2 above.

4) Administratively control releases by sampling prior to release.

Construct a divided basin capable of independent filling and discharge. After a section of the basin is filled, sample the water in the section. If analyses are within limits, that section can be discharged to an outfall. This initiative is not recommended because of the low potential for release and the cost of the effort.

Radiological Release Point TB-3

E. Initiatives that would reduce the size of the release

1) Tails treatment could be added to the LETF to remove uranium to 2 ppb.

   This effort could not be completed before most of the stored waste is scheduled to be processed through the LETF. The tails treatment could reduce the uranium effluent from 20 ppb to 2 ppb, but this reduction in radioactive release would not be measured at TB-3 since the uranium concentration cannot be distinguished from background readings.

WM & ER Outfall Analysis Initiative Discussions

OUTFALL FM-3

D. Initiatives that would reduce production of this waste.

#3. Complete installation of new stormwater monitor detector/source holders in all stormwater monitors.

This will ensure consistent positioning of all detectors and reduce the effect of contaminated debris in the detector reading (the probe will be suspended in the water instead of laying on the manhole floor). Contaminated debris causes "false" alarms that divert clean water to the retention basins. This action will also allow implementation of quantitative radioactive source response testing providing a means to consistently position a source next to the detector when needed. This action is currently underway (ref: Boyter to Sjostrom memo).

#4. Complete program to develop geometry specific calibrations for each of the stormwater monitors.

Once the above detector/source holders are installed, this will consist of determining the response of each stormwater monitor detector to a liquid source and revising current stormwater monitor maintenance procedures to do a periodic quantitative source check to verify the calibration has not changed. This action is currently underway (ref: Boyter to Sjostrom memo).

#5. Design, fabricate, test, and implement a prototype sediment removal system for periodically reducing buildup of mud and/or sand in the F/H Area Tank Farm stormwater monitor manholes.

This debris is often slightly contaminated and causes "false" alarms resulting in unnecessary diversion of clean water. Plans are to complete construction of the prototype Stormwater Monitor (SWM) Manhole Sediment Removal System and mount it at one of the H-SWM manholes by 9/92 (ref: Boyter to Sjostrom memos).

#6. Continue program to identify, track, reduce, and prevent fixed and transferable contamination within the F/H Tank Farm boundaries.

Contamination within Tank Farm stormwater runoff is potentially generated from activities during normal operations (eg: movement of contaminated equipment in and out of tanks). This contamination could deposit on exterior surfaces of equipment, asphalt, etc. and (if transferrable) is consequently washed into the storm sewer during a rainfall event. A program has previously been established to survey the Tank Farms for contamination and reduce/eliminate it before it is washed into the stormwater system system. Surveys are performed either systematically or at random locations, and at locations where work is conducted that could potentially release contamination as mentioned above.

E Initiative that would reduce the size of the release.

#1. Install additional instrumentation and modify existing cooling water monitoring equipment to enhance reliability, sensitivity and troubleshooting capability.

This effort would improve monitoring equipment reliability on the F-Canyon Segregated Cooling Water System and provide greater sensitivity to potential releases. This effort would also install redundant monitoring capabilities that will provide backup to the existing system in the event of equipment outage. A recent failure of the monitoring equipment did occur in this system and it was necessary to take compensatory actions. When complete and operational, the improvements will give earlier warning of potential problem areas and aid in locating the source of the contamination. The completion of this effort is important for detecting and preventing potential significant releases during an accident scenario.

#2. Consolidate and upgrade UO3 storage facilities per DOE-EH and Tiger Team surveys.

This effort would supply the facilities to consolidate and upgrade UO3 storage. At present, there are 35,792 drums of depleted UO3 stored in eight warehouses at various locations across SRS. Majors concerns (as determined by previous surveys) include drum integrity, poor storage practices (because of space constraints), and building integrity due to age. The new storage facilities would allow the storage of drums in a manner that will permit the counting of drums for nuclear material inventory purposes, and permit the visual inspection of the tamper indicating seals. The facilities would be constructed to meet all RCRA equivalent standards.

#3. Provide batch release system to match the H-Area system. This approach would reduce the potential for releases by increasing reaction time.

This effort would involve constructing a batch delaying basin system for the F-Area segregated cooling water similar to the batch system for the H-Area segregated cooling water. The current F-Area system is a continuous flow through basin which allows for a maximum three hour retention prior to diversion at the outlet upon detection of radioactivity at the inlet of the basin. The H-Area system is a divided basin capable of independent filling and discharge. After sample results are received and are within limits, discharge of the basin is allowed. Historical experience shows that there is not a significant increase in risk of a release from the F-Area basin as compared to the H-Area basin. The high cost of this effort is not justified based on this past experience and limited future processing plans of the facilities.

#4. Modify segregated cooling water system to provide closed loop cooling

This effort would be a major project effort to modify the segregated cooling water to become a closed loop system rather than the once through system that presently exists. Major piping, tanking, and basin systems are required. This effort would further reduce the possibility of an accidental cooling water release but would have minimal impact on routine releases. The high cost of this effort is not justified based on the limited future processing plans of the facilities.

Improve the sensitivity of the stormwater monitors so that water at lower contamination levels may be diverted and sent to treatment. This would reduce the cumulative effect of releasing many batches of water at just below the sensitivity of the monitors. This action would be dependent upon completion of sediment removal initiatives. If the sensitivity of the monitors were lowered and radioactive sediment caused a diversion of stormwater, waste would be created unnecessarily.

#5. Improve the sensitivity of the stormwater monitors so that water at lower contamination levels may be diverted and sent to treatment.

This would reduce the cumulative effect of releasing many batches of water at just below the sensitivity of the monitors. This action would be dependent upon completion of sediment removal initiatives. If the sensitivity of the monitors were lowered and radioactive sediment caused a diversion of stormwater, waste would be created unnecessary.

#6. Test and install the new Beta-Gamma in line probe assembly in the 907-6H and 907-7H storm water monitor manholes.

This effort will provide improved sensitivity in detecting liquid releases from the three sludge washing (ESP) tanks that are (or will be) low in Cs-

137, but high in Sr-90 (a beta emitter). The monitors currently installed only read gamma activity. Plans include installing Beta monitors in F-Tank Farm as well for improved sensitivity (ref: Boyter to Sjostrom memo).

#7. Route all diverted stormwater through the ETF for processing (*currently not able to process at design rates*).

Part of the mission of the ETF is to decontaminate stormwater from the H-Area retention basin. In order to meet "zero release" levels, the water could be processed through the ETF prior to discharge. This would eliminate the need for the F-012 and H-017 outfalls. However, the ETF is currently not able to process this water due to the high level of biota in the water which severely fouls the Norton ceramic microfilters. Upgrades to the ETF for routine treatment of this stream would require total outlays of $2 million. These projects are already planned and are in the Waste Management project list for FY93 and 94. Once the system is capable of handling this water, the system would remove virtually all the radioactivity (>100X) and would cost approximately $4-6 million/year (based on 40-60 million gallons to be treated from these two basins at an estimated cost of $0.10/gallon) in operating funds. The estimated annual release values given in Section A for Cs and Sr would result in a cost/curie removed of approximately $200-300 million/curie; clearly not a cost effective option.

#8. Collect all stormwater runoff from F-Tank Farm.

Currently, stormwater monitor alarm/diversion set-points are at 10 d/m/ml gamma above background. However, all stormwater activity below this set-point is released to the creek. In order to to improve tracking as well as reduce possible radiological releases, all Tank Farm stormwater should be collected. This action would call for an additional retention basin to be built in both H and F-Area.

It is a well known fact that the majority of the activity found in stormwater is absorbed in the sediment which accumulates in the stormwater system. If all stormwater were collected, the new basin would serve as a settling pond for the sediment and the majority of the radioactivity would be contained. The water would be pumped from the surface to a monitoring checkpoint. If the water is determined to be "clean" (below an established threshold) it could then be sent to the creek. If activity is found, the pump would shut off and the stormwater remaining in the basin would be sampled and sent to treatment if necessary.

In the event that the new basin becomes contaminated or must undergo routine maintenance activities (removal of sediment for SWDF disposal), the existing stormwater retention basin may be used for incoming flow. The cost of constructing one additional basin was roughly estimated at $6.1M (ref: WSRC-TR-92-14, "WSRC Alternatives Study, H-Area Waste Tanks 9-12 Stormwater Drainage System"), but it is expected that more detailed estimating will show the cost to be higher.

OUTFALL F-12

E. Initiative that would reduce the size of the release :

#1. Continue with stormwater monitor upgrades.

See initiatives E. 5 and 6 of Outfall FM-3.

#2. Route all diverted stormwater through the ETF for processing (currently not able to process at design rates).

Part of the mission of the ETF is to decontaminate stormwater from the H-Area retention basin. In order to meet "zero release" levels, the water could be processed through the ETF prior to discharge. This would eliminate the need for the F-012 and H-017 outfalls. However, the ETF is currently not able to process this water due to the high level of biota in the water which severely fouls the Norton ceramic microfilters. Upgrades to the ETF for routine treatment of this stream would require total outlays of $2 million. These projects are already planned and are in the Waste Management project list for FY93 and 94. Once the system is capable of handling this water, the system would remove virtually all the radioactivity (>100X) and would cost approximately $4-6 million/year (based on 40-60 million gallons to be treated from these two basins at an estimated cost of $0.10/gallon) in operating funds. The estimated annual release values given in Section A for Cs and Sr would result in a cost/curie removed of approximately $200-300 million/curie; clearly not a cost effective option.

#3. Modify the discharge pump suction to reduce the amount of mud entrained in the effluent stream. The mud in the bottom of the basin is >1000X more contaminated than the basin water. This is due to the ion exchange properties of clay for cesium and other radionuclides. The discharge pump suction line is at the lowest point in the basin and therefore entrains some mud during discharge. To decrease the amount of mud (and hence radionuclides) discharged, the pump suction could be raised 1 - 2 feet from the bottom of the basin. This should reduce the amount released by at least 10X. The cost is negligible (<$10,000 capital cost and no operating costs). The basin would still have to be cleaned out periodically to remove the mud (see option 6). This option is one of the least expensive but still has a cost/curie value of $500,000/curie.

#4. Clean sediment out of basin periodically.

Since mud adsorbs cesium and other radionuclides, the basin must be periodically drained and the mud removed. This currently takes place once a year. Clean-out of the mud helps to keep the basin contamination levels lower and therefore keeps the amount released lower as well. Each clean-out requires a great deal of overtime and burial boxes - the total cost probably exceeding $100K/clean-out. The reduction in the amount of cesium released would be difficult to estimate but may be as much as 100X. The cost per curie removed should be based on the amount of radioactive material removed with the mud and could be as low as $1000/curie. Clean-out more frequently than once per year is not practical due to slow accumulation of the sediment in the basin and the difficulty in removal (shoveled out by hand and manually loaded into B-12 burial boxes).

#5. Design and install a filtration system for basin effluent.

Since a majority of the contamination is contained on solids, such as mud, a filter system could be employed to clean up the water during discharge. Based on Chem Nuclear's experience, a decontamination factor of >10X could be achieved, dependent on the particle size and filter pore size. The filter system could cost as much as $500K per basin (see Case 9). The cost per curie would therefore be $10 million/Ci, once again not a very cost effective method.

#6. Design and construct a settling basin upstream of the existing retention basin.

Another way to remove the mud and debris is to allow it to settle in a new basin upstream of the existing one. Mud, containing cesium and other contaminants, would settle in the basin and be periodically cleaned out. The water entering the retention basin would be about 10X cleaner. Note that this basin would be different than the one in Item 4. This basin is simply a "wide spot" in the sewer line to allow solids to settle out before entering the retention basins. The cost of the basin would depend on its size and design but would probably be less than $1 million. Cost/curie would be $50 million/Ci.

#7. Route all basin effluent through a portable treatment system.

This option is the one used in 1989 when the 281-8H basin was contaminated by an incident in the H tank farm. Chem Nuclear used a portable deionization/filtration system to decontaminated the water to below the discharge limits of 10 d/m/ml beta-gamma. Such a trailer system is currently being procured for use at these retention basins and the corresponding cooling water basins (see outfalls F-013/H-018) for treatment of highly contaminated water (activity >10 d/m/ml) at an estimated capital cost of $950K. Additional modifications to the basin area are required at an estimated capital cost of $1.5 million. Cost of treating the water would be about $0.10/gallon or about $2-3 million/year per basin, based on experience with the Chem-Nuclear system. Therefore, the operating cost per curie for this option would be $100 - 150 million/Ci. However, only one treatment trailer is being purchased. Other units would be required, possibly one per basin, if this option were to be implemented at more than one basin at a time.

OUTFALL F-13

This outfall corresponds to the cooling water basins in F and H areas which collect potentially contaminated cooling water from the Separations segregated and circulated water systems. The basins do not routinely discharge contaminated water only after a cooling water diversion. There have been no cooling water diversions in the three years since ETF has been on line. Release are from rainfall into the basins.

E. Initiative that would reduce the size of the release:

#1.Route all collected cooling water through the ETF for processing

Part of the mission of the ETF is to decontaminate cooling water from the F-Area cooling water system. In order to meet "zero release" levels, the water could be processed through the ETF prior to discharge. This would eliminate the need fro the F-013/F-018 outfalls. However, the ETF is currently not able to process this water due to the high level of biota in the water which severely fouls the North ceramic microfilters. Upgrades to the ETF for routine treatment of this stream would required total capital outlays of $2 million. These projects are already planned and are in the Waste Management project list for FY 93 and 94. Once the system is capable of handling this water, the system would remove virtually all the radioactivity (>100X) and would cost approximately $400,000/year (based on 4 million gallons to be treated from the two areas per year at an estimated cost of $0.10/gallon) in operational funds. For the estimated annual release values given in Section A, this would result in a cost/curie removed of approximately $20 million/curie, clearly not a cost effective option.

#2.Route all basin effluent through a portable treatment system

This option is the one used in 1989 when the 241-84H basin was contaminated by an incident in the H tank farm. Chem Nuclear used a portable deionization/filtration system to decontaminate the water to below the discharge limits of 10 d/m/ml beta-gamma. Such a trailer system is currently being procured for use at these retention basins and the corresponding cooling water basins (see stormwater section, Item 9) for treatment of high contaminated water (activity >10 d/m/ml at an estimated cost of $950K. Additional modifications to the basin area are required at a cost of $1.5 million. Cost of treating the water would be ~$0.10/gallon or about $200,000/year per basin. Therefore, the operating cost per curie for this option would be $20 million/Ci. However, only one treatment trailer is being purchased. Other units would be required, possible one per basin, if this option were to be implemented at more than one basin at a time.

#3. Modify segregated cooling water system to provide closed loop cooling

This effort would be a major project effort to modify the segregated cooling water to become a closed loop system rather than the once through system that presently exists. Major piping, tanking, and basin systems are required. This effort would further reduce the possibility of an accidental cooling water release but would have minimal impact on routine releases. The high cost of this effort is not justified based on the limited future processing plans of the facilities.

Improve the sensitivity of the stormwater monitors so that water at lower contamination levels may be diverted and sent to treatment. This would reduce the cumulative effect of releasing many batches of water at just below the sensitivity of the monitors. This action would be dependent upon completion of sediment removal initiatives. If the sensitivity of the monitors were lowered and radioactive sediment caused a diversion of stormwater, waste would be created unnecessarily.

OUTFALL HP-52

D. Initiative that would reduce the production of the release:

#1. Complete installation of new stormwater monitor detector/source holders in all stormwater monitors.

This effort will ensure consistent positioning of all detectors and reduce the effect of contaminated debris in the detector reading (the probe will be suspended in the water instead of laying on the manhole floor). Contaminated debris causes "false" alarms that divert clean water to the retention basins. This action will also allow implementation of quantitative radioactive source response testing providing a means to consistently position a source next to the detector when needed. This action is currently underway (ref: Boyter to Sjostrom memo).

#2. Complete program to develop geometry specific calibrations for each of the stormwater monitors.

This will consist of determining the response of each stormwater monitor detector to a liquid source and revising current stormwater monitor maintenance procedures to do a periodic quantitative source check to verify the calibration has not changed. This action is currently underway (ref: Boyter to Sjostrom memo).

#3. Design, fabricate, test, and implement a prototype sediment removal system for periodically reducing buildup of mud and/or sand in the F/H Area Tank Farm stormwater monitor manholes.

This debris is often slightly contaminated and causes "false" alarms resulting in unnecessary diversion of clean water. Plans are to complete construction of the prototype Stormwater Monitor (SWM) Manhole Sediment Removal System and mount it at one of the H-SWM manholes by 9.92 (ref: Boyter to Sjostrom memos).

#4. Continue a program to identify, track, reduce and prevent fixed and transferrable surface contamination with the F/H Tank Farm boundaries.

Contamination within Tank Farm stormwater runoff is potentially generated from activities during normal operations (eg: movement of contaminated equipment in and out of tanks). This contamination could deposit on exterior surfaces of equipment, asphalt, etc. and (if transferrable) is consequently washed into the storm sewer during a rainfall event. A program has previously been established to survey the Tank Farms for contamination and reduce/eliminate it before it is washed into the stormwater system system. Surveys are performed either systematically or at random locations, and at locations where work is conducted that could potentially release contamination as mentioned above.

#5. Complete design and installation of containment dikes around waste tanks 13-15 in order to reduce the probability of releasing contamination to the 907-4H Stormwater Monitoring Zone. This will reduce the likelihood of diverting this runoff to the ETF retention basins for processing (ref: Boyter to Sjostrom memo).

E. Initiatives that would reduce the size of the release

#1. Test and install the new Beta-Gamma in line probe assembly in the 907-6H and 907-7H storm water monitor manholes.

This effort will provide improved sensitivity in detecting liquid releases from the three sludge washing (ESP) tanks that are (or will be) low in Cs-137, but high in Sr-90 (a beta emitter). The monitors currently installed only read gamma activity. Plans include installing Beta monitors in F-Tank Farm as well for improved sensitivity (ref: Boyter to Sjostrom memo).

#2. Improve the sensitivity of the stormwater monitors so that water at lower contamination levels may be diverted and sent to treatment.

This would reduce the cumulative effect of releasing many batches of water at just below the sensitivity of the monitors. This action would be dependent upon completion of sediment removal initiatives. If the sensitivity of the monitors were lowered and radioactive sediment caused a diversion of stormwater, waste would be created unnecessary.

#3. Route all diverted stormwater through the ETF for processing (currently not able to process at design rates).

Part of the mission of the ETF is to decontaminate stormwater from the H-Area retention basin. In order to meet "zero release" levels, the water could be processed through the ETF prior to discharge. This would eliminate the need for the F-012 and H-017 outfalls. However, the ETF is currently not able to process this water due to the high level of biota in the water which severely fouls the Norton ceramic microfilters. Upgrades to the ETF for routine treatment of this stream would require total outlays of $2 million. These projects are already planned and are in the Waste Management project list for FY93 and 94. Once the system is capable of handling this water, the system would remove virtually all the radioactivity (>100X) and would cost approximately $4-6 million/year (based on 40-60 million gallons to be treated from these two basins at an estimated cost of $0.10/gallon) in operating funds. The estimated annual release values given in Section A for Cs and Sr would result in a cost/curie removed of approximately $200-300 million/curie; clearly not a cost effective option.

#4. Collect all stormwater runoff from H-Area Tank Farm.

Currently, stormwater monitor alarm/diversion set-points are at 10 d/m/ml gamma above background. However, all stormwater activity below this set-point is released to the creek. In order to to improve tracking as well as reduce possible radiological releases, all Tank Farm stormwater should be collected. This action would call for an additional retention basin to be built in both H and F-Area.

It is a well known fact that the majority of the activity found in stormwater is absorbed in the sediment which accumulates in the stormwater system. If all stormwater were collected, the new basin would serve as a settling pond for the sediment and the majority of the radioactivity would be contained. The water would be pumped from the surface to a monitoring checkpoint. If the water is determined to be "clean" (below an established threshold) it could then be sent to the creek. If activity is found, the pump would shut off and the stormwater remaining in the basin would be sampled and sent to treatment if necessary.

In the event that the new basin becomes contaminated or must undergo routine maintenance activities (removal of sediment for SWDF disposal), the existing stormwater retention basin may be used for incoming flow. The cost of constructing one additional basin was roughly estimated at $6.1M (ref: WSRC-TR-92-14, "WSRC Alternatives Study, H-Area Waste Tanks 9-12 Stormwater Drainage System"), but it is expected that more detailed estimating will show the cost to be <u>higher</u>.

OUTFALL FM-1C

D. Initiative that would reduce the production of the release:

#4. Design completion and installation of drain collection system for Tank Farm H-East and H-West cooling water pumphouses.

This will reduce the possibility of release of chromated cooling water to the environment (which is potentially hazardous and contains small amounts of radioactivity) due to equipment failures in the pumphouses (all other cooling water pumphouses already have this system). Releases from the pumphouses are not routine so the reduction effect of this action is not known. This initiative is currently in the conceptual phase (ref: Boyter to Sjostrom memo). Cost: $0.5M

#5. Reroute the currently unmonitored stormwater runoff around the H-East and H-West Pumphouses to a monitored zone.

This would allow contaminated stormwater to be diverted to a retention basin and treated if necessary before discharge. Cost: Undetermined.

E. Initiatives that would reduce the size of the release.

#1. Install additional instrumentation and modify existing cooling water monitoring equipment to enhance reliability, sensitivity, and troubleshooting capability.

This effort would improve monitoring equipment reliability on the H-Canyon Segregated Cooling Water System and provide greater sensitivity to potential releases. This effort would also install redundant monitoring capabilities that will provide backup to the existing system in the event of equipment outage. When complete and operational, the improvements will give earlier warning of potential problem areas and aid in locating the source of the contamination. The completion of this effort is important to detecting and preventing potential significant releases during an accident scenario from the system.

#2. Line the B-3 basin with stainless steel to seal cracks.

A stainless steel liner will eliminate the potential for a contamination leak from an occasional inadvertent overflow of a tank to this basin. Migration through the cracks might eventually enter unmonitored stormwater to an outfall. This effort should be pursued to eliminate a potential pathway of a release to the environment.

#3. Ceilcoat sandfilter ditch and maintain as clean area.

This effort involves repairing the sandfilter ditch to prevent any leakage from expansion joints. After repairs are complete, the ditch will be coated and maintained as a clean area so that stormwater that collects can be discharged directly to an outfall as clean water. The effort is currently funded and is underway.

#4. Continue to monitor outfall per 12 hour shift for tritium concentration.

This effort is currently underway. It provides an earlier detection of contamination to warn of potential problem. It may ultimately be necessary to establish diversion capabilities for the streams.

#5. Install Sandfilter roof

The sandfilter ditch currently receives stormwater that is pumped automatically to a storm sewer prior to being monitored at the outfall sampling point. Should contamination migrate through an expansion joint in the sandfilter to the adjacent stormwater, contamination could be released and not detected until it reaches the outfall. This effort would install a roof over the ditch to prevent rainwater from collecting in the ditch. The low potential for a release and the small amount of any potential release from the sandfilter ditch does not justify the high cost of this effort. The preferred option for handling this situation is by pursuing item 12 above.

#6. Install piping to transfer ditch rainwater to process through GP evaporators.

Piping could be installed to process sandfilter ditch rainwater through the Acid Recovery Unit and the General Purpose Evaporator. The piping installation will prevent the inadvertent transfer of any contamination, that migrates to the ditch from the sandfilter, to an outfall. The low potential for a release from the sandfilter does not justify the high cost of this effort. The preferred option for handling this situation is by pursuing item 12 above.

#7. Administratively control releases by sampling prior to release.

Construct a divided basin capable of independent filling and discharge. After a section of the basin is filled, sample the water in the section. If analyses are within limits, that section can be discharged to an outfall. If contamination is detected, the water flow can be diverted to a treatment facility for processing. This initiative is not recommended because of the low potential for release and the cost of the effort.

#8. Provide alternate transfer route of spill containment basins and 500/600 aprons to ETF.

During periods of heavy rainfall, the volume of water required to be processed through the GP Evaporator can exceed processing capacity, allowing potentially contaminated water to overflow from these areas directly to outfall H-006. An alternate transfer route will lessen the potential for the aprons to overflow to the environment; thus, eliminating the potential release of contamination to outfall H-006. Based on the unlikely event of this magnitude of rainfall and on the future processing plans in Separations, the cost of this effort is not justified.

OUTFALL H-17

E Initiative that would reduce the size of the release :

#1. Continue with stormwater monitor upgrades.

See initiatives E. 1 and 2 of Outfall HP-52

#2. Route all diverted stormwater through the ETF for processing (currently not able to process at design rates).

Part of the mission of the ETF is to decontaminate stormwater from the H-Area retention basin. In order to meet "zero release" levels, the water could be processed through the ETF prior to discharge. This would eliminate the need for the F-012 and H-017 outfalls. However, the ETF is currently not able to process this water due to the high level of biota in the water which severely fouls the Norton ceramic microfilters. Upgrades to the ETF for routine treatment of this stream would require total outlays of $2 million. These projects are already planned and are in the Waste Management project list for FY93 and 94. Once the system is capable of handling this water, the system would remove virtually all the radioactivity (>100X) and would cost approximately $4-6 million/year (based on 40-60 million gallons to be treated from these two basins at an estimated cost of $0.10/gallon) in operating funds. The estimated annual release values given in Section A for Cs and Sr would result in a cost/curie removed of approximately $200-300 million/curie; clearly not a cost effective option.

#3. *Modify the discharge pump suction to reduce the amount of mud entrained* in the effluent stream.

The mud in the bottom of the basin is >1000X more contaminated than the basin water. This is due to the ion exchange properties of clay for cesium and other radionuclides. The discharge pump suction line is at the lowest point in the basin and therefore entrains some mud during discharge. To decrease the amount of mud (and hence radionuclides) discharged, the pump suction could be raised 1 - 2 feet from the bottom of the basin. This should reduce the amount released by at least 10X. The cost is negligible (<$10,000 capital cost and no operating costs). The basin would still have to be cleaned out periodically to remove the mud (see option 6). This option is one of the least expensive but still has a *cost/curie* value of $500,000/curie.

#4. Clean sediment out of basin periodically.

Since mud adsorbs cesium and other radionuclides, the basin must be periodically drained and the mud removed. This currently takes place once a year. Clean-out of the mud helps to keep the basin contamination levels lower and therefore keeps the amount released lower as well. Each clean-out requires a great deal of overtime and burial boxes - the total cost probably exceeding $100K/clean-out. The reduction in the amount of cesium released would be difficult to estimate but may be as much as 100X. The cost per curie removed should be based on the amount of radioactive material removed with the mud and could be as low as $1000/curie. Clean-out more frequently than once per year is not practical due to slow accumulation of the sediment in the basin and the difficulty in removal (shoveled out by hand and manually loaded into B-12 burial boxes).

#5. Design and install a filtration system for basin effluent.

Since a majority of the contamination is contained on solids, such as mud, a filter system could be employed to clean up the water during discharge. Based on Chem Nuclear's experience, a decontamination factor of >10X could be achieved, dependent on the particle size and filter pore size. The filter system could cost as much as $500K per basin (see Case 9). The cost per curie would therefore be $10 million/Ci, once again not a very cost effective method.

#6. Design and construct a settling basin upstream of the existing retention basin.

Another way to remove the mud and debris is to allow it to settle in a new basin upstream of the existing one. Mud, containing cesium and other contaminants, would settle in the basin and be periodically cleaned out. The water entering the retention basin would be about 10X cleaner. Note that this basin would be different than the one in Item 4. This basin is simply a "wide spot" in the sewer line to allow solids to settle out before entering the retention basins. The cost of the basin would depend on its size and design but would probably be less than $1 million. Cost/curie would be $50 million/Ci.

#7. Route all basin effluent through a portable treatment system.

This option is the one used in 1989 when the 281-8H basin was contaminated by an incident in the H tank farm. Chem Nuclear used a portable deionization/filtration system to decontaminated the water to below the discharge limits of 10 d/m/ml beta-gamma. Such a trailer system is currently being procured for use at these retention basins and the corresponding cooling water basins (see outfalls F-013/H-018) for treatment of highly contaminated water (activity >10 d/m/ml) at an estimated capital cost of $950K. Additional modifications to the basin area are required at an estimated capital cost of $1.5 million. Cost of treating the water would be about $0.10/gallon or about $2-3 million/year per basin, based on experience with the Chem-Nuclear system. Therefore, the operating cost per curie for this option would be $100 - 150 million/Ci. However, only one treatment trailer is being purchased. Other units would be required, possibly one per basin, if this option were to be implemented at more than one basin at a time.

OUTFALL H-18

This outfall corresponds to the cooling water basins in F and H areas which collect potentially contaminated cooling water from the Separations segregated and circulated water systems. The basins do not routinely discharge contaminated water only after a cooling water diversion. There have been no cooling water diversions in the three years since ETF has been on line. Release are from rainfall into the basins.

E. Initiative that would reduce the size of the release:

1. Route all collected cooling water through the ETF for processing

   Part of the mission of the ETF is to decontaminate cooling water from the F-Area cooling water system. In order to meet "zero release" levels, the water could be processed through the ETF prior to discharge. This would eliminate the need fro the F-013/F-018 outfalls. However, the ETF is currently not able to process this water due to the high level of biota in the water which severely fouls the North ceramic microfilters. Upgrades to the ETF for routine treatment of this stream would required total capital outlays of $2 million. These projects are already planned and are in the Waste Management project list for FY 93 and 94. Once the system is capable of handling this water, the system would remove virtually all the radioactivity (>100X) and would cost approximately $400,000/year (based on 4 million gallons to be treated from the two areas per year at an estimated cost of $0.10/gallon) in operational funds. For the estimated annual release values given in Section A, this would result in a cost/curie removed of approximately $20 million/curie, clearly not a cost effective option.

2. Route all basin effluent through a portable treatment system

   This option is the one used in 1989 when the 241-84H basin was contaminated by an incident in the H tank farm. Chem Nuclear used a portable deionization/filtration system to decontaminate the water to below the discharge limits of 10 d/m/ml beta-gamma. Such a trailer system is currently being procured for use at these retention basins and the corresponding cooling water basins (see stormwater section, Item 9) for treatment of high contaminated water (activity >10 d/m/ml at an estimated cost of $950K. Additional modifications to the basin area are required at a cost of $1.5 million. Cost of treating the water would be ~$0.10/gallon or about $200,000/year per basin. Therefore, the operating cost per curie for this option would be $20 million/Ci. However, only one treatment trailer is being purchased. Other units would be required, possible one per basin, if this option were to be implemented at more than one basin at a time.

3. Design and install a closed cooling water system

This effort would be a major project effort to modify the segregated cooling water to become a closed loop system rather than the once through system that presently exists. Major piping, tanking, and basin systems are required. This effort would further reduce the possibility of an accidental cooling water release but would have minimal impact on routine releases. The high cost of this effort is not justified based on the limited future processing plans of the facilities.

Improve the sensitivity of the stormwater monitors so that water at lower contamination levels may be diverted and sent to treatment. This would reduce the cumulative effect of releasing many batches of water at just below the sensitivity of the monitors. This action would be dependent upon completion of sediment removal initiatives. If the sensitivity of the monitors were lowered and radioactive sediment caused a diversion of stormwater, waste would be created unnecessarily.

Outfall U3R-2A

This is the Effluent Treatment Facility outfall.

E. Initiatives that would reduce the size of the release:

1. Route 100-area waste trailers to the tank farm
   a. Hold water for use in ESP/salt mining operations
   b. Route water to Tank 50 for disposal in Z-area

   These two options are similar in that tritium containing water from 100-area trailers will not come to the ETF but be held in the tank farms for use or storage before disposal in Z-area saltstone. This will cut the tritium releases from the ETF by 65% (based on data from 1990-1992) to less than 1000 Ci/year. Cost will depend on the amount of water to be disposed - estimate $1 - 2 million/year. However, the feasibility of long-term tank farm storage and Saltstone disposal would have to be examined more closely to determine if any risks may be associated with this activity. The cost/curie removed would be $10,000/Ci of H-3.

2. Route 100 area trailers directly to _-area

   A slight variation of the first option. Once again a major source of tritium to the ETF would be disposed of in saltstone. The same tritium reduction numbers and cost estimates apply as in option 1. This is not a viable option at this time since the SCDHEC permit for Z-area does not allow direct trailer unloading into the process.

3. Segregate high tritium ETF influent and route to Z-area via ETF waste concentrate

   This option is not practical since it relies on prior knowledge of the tritium content of the ETF influent in order to achieve effective segregation. Therefore, high tritium influent would be diluted with water containing less tritium, thereby increasing the amount of water requiring disposal. Disposal of the water would result in extreme operational difficulties since only about 10,000 gallons per day can be disposed of in this manner. Also, the processing of this stream cannot occur at the same time as normal processing. The amount of tritium released may be reduced slightly (depending on the disposal criteria used) but the cost would increase (proportionally to the amount of water) to $10 - 20 million/year. Cost/curie = $100K/Ci.

4. Segregate high tritium ETF effluent and route to Z-area via ETF waste concentrate

Outfall U3R-2A Cont'd

This option is more practical than Case 3 since the ETF treated water is a batch release which is already being tested for tritium. If the tritium level exceeds a pre-determined value, it could be recycled to the wastewater collection tank and routed to tank 50 and saltstone. Once again, disposal of the water would result in extreme operational difficulties since only about 10,000 gallons per day may be disposed of in this manner. Also, the processing of this stream cannot occur at the same time as normal processing. The reduction in the amount of tritium released and the cost would depend heavily on the amount of water sent to Z-area. The cost could still be in the range of $10 - 20 million/year. Cost/curie = $100K/Ci.

5. Route ETF effluent to H-tank farm for use in ESP/salt mining operations

   Similar to Case 1a, the stream could be routed through the New Waste Transfer Facility (HDB-8) once it becomes operational. As with Case 4, the amount of water and the reduction in tritium released would depend on the criteria used. The cost is negligible since water will be required in H tank farm in the future for these activities anyway. A major question is whether the tank farm can accept as much water as the ETF can produce. The same operational difficulties as stated in Items 3 and 4 make this a poor option.

6. Route ETF effluent to use as process make-up water

   This option is similar to Case 5 and is based on the idea of reusing the water rather than discharging it to the river. The amount of water used would depend on the area needs for process water. The process water system would have to the examined to make sure that the use of ETF effluent would not increase the potential for personnel contamination or the contamination of the domestic water system. Cost would be approximately $1 - 2 million for tanks and pumps, but the reduction in the amount of tritium discharged would depend on the amount of water that can be reused. Once again, as in option #5, it is doubtful that all of the ETF effluent could be disposed of in this manner.

7. Design and install a detritiation facility

   This is the subject of a research effort between SRTC and numerous universities. The removal of tritium from an aqueous stream at levels as low as those in ETF effluent (up to 250,000 pCi/ml) is possible but is still under development. Theoretically, nearly all of the tritium could be removed from the effluent prior to discharge but the estimated cost of the facility is in excess of $100 million, plus operating costs exceeding $15 million/year, making this one of the most expensive options listed.

8. Evaporate all ETF effluent to the atmosphere

   Rather than discharge to the river, the ETF effluent stream could be evaporated to the atmosphere (as the Naval Fuels wastewater evaporator system did). The tritium would be dispersed in the atmosphere. However, this is still an environmental release and is contrary to the "zero release" philosophy. The tritium would still condense and reach the river but would be much more widely dispersed and less concentrated. The cost of such an evaporator system would be in excess of $50 million, plus annual operating costs in excess of $10 million.

9. Design and construct a tile field

   A tile field would allow for residence time to allow the tritium to decay before reaching a surface stream or a drinking water supply. The actual reduction in tritium released would depend on this residence time, given that tritium has a half life of 12.3 years. The costs of the tile field has been estimated at $20 million to construct and $10 million/year to operate if implemented for tritium source terms (100 Area trailers or HAW streams) only.

   The only option that holds promise for reducing the amount of tritium released from the ETF is Option 1. More study as to the effects of tritium storage on the Tank Farm and ultimate disposal in Saltstone is needed before this option could be implemented.

OUTFALL McQUEEN'S BRANCH AT RD 4

E. Initiatives that would reduce production of this waste.

#1. Install Sandfilter roof

The sandfilter ditch currently receives stormwater that is pumped automatically to a storm sewer prior to being monitored at the outfall sampling point. Should contamination migrate through an expansion joint in the sandfilter to the adjacent stormwater, contamination could be released and not detected until it reaches the outfall. This effort would install a roof over the ditch to prevent rainwater from collecting in the ditch. The low potential for a release and the small amount of any potential release from the sandfilter ditch does not justify the high cost of this effort. The preferred option for handling this situation is by pursuing item 12 above.

#2. Ceilcoat sandfilter ditch and maintain as clean area.

This effort involves repairing the sandfilter ditch to prevent any leakage from expansion joints. After repairs are complete, the ditch will be coated and maintained as a clean area so that stormwater that collects can be discharged directly to an outfall as clean water. The effort is currently funded and is underway.

#3. Install piping to transfer ditch rainwater to process through GP evaporators.

Piping could be installed to process sandfilter ditch rainwater through the Acid Recovery Unit and the General Purpose Evaporator. The piping installation will prevent the inadvertent transfer of any contamination, that migrates to the ditch from the sandfilter, to an outfall. The low potential for a release from the sandfilter does not justify the high cost of this effort. The preferred option for handling this situation is by pursuing item 12 above.

#4. Administratively control releases by sampling prior to release.

Construct a divided basin capable of independent filling and discharge. After a section of the basin is filled, sample the water in the section. If analyses are within limits, that section can be discharged to an outfall. If contamination is detected, the water flow can be diverted to a treatment facility for processing. This initiative is not recommended because of the low potential for release and the cost of the effort.

Index of Liquid Effluent Streams & Associated Outfalls for WM Facilities.

RELEASE POINT	EFFLUENT STREAMS	RADIOACTIVE RELEASE POTENTIAL	RAD SAMPLE POINT
E-001	643/643-7E (SWDF) Stormwater (South Side)	Yes	4M-2B
E-002	643/643-7E (SWDF) Stormwater (North Side)	Yes	U3R-3
F-008	241-F Tank Farm Stormwater		
	Zone 2F	Yes	4M-3
	Zone 3F	Yes	4M-3
	Zone 4F	Yes	4M-3
	241-13F/17F CW Pumphouse Stormwater & CT Blowdowns	Yes	4M-3
	241-64F A/C Blowdown & Stormwater	No	
	643-E (SWDF) Stormwater (SW Corner)	Yes	4M-3A
	241-97F Stormwater (around basin)	Yes	4M-3
	[Also Receives Discharge from Upstream Outfalls F-012 & F-013]		
F-009 (281-8F Basin Inlet)	241-F Tank Farm Stormwater		
	Zone 2F	Yes	281-8F
	Zone 3F	Yes	281-8F
	Zone 4F	Yes	281-8F
F-010	281-8F Stormwater (around basin)	Yes	4M-A7
F-012	281-8F Retention Basin Clean Discharge	Yes	4M-3
F-013	241-97F CW Basin Clean Discharge	Yes	4M-3
F-UN	200-F Stormwater (general office area)	No	
H-004	299-H (WMMF) & 230-H (BGI) Stormwater (North & West sides)	Yes	Crouch Branch
	299-H Cooling Tower Blowdown		Crouch Branch

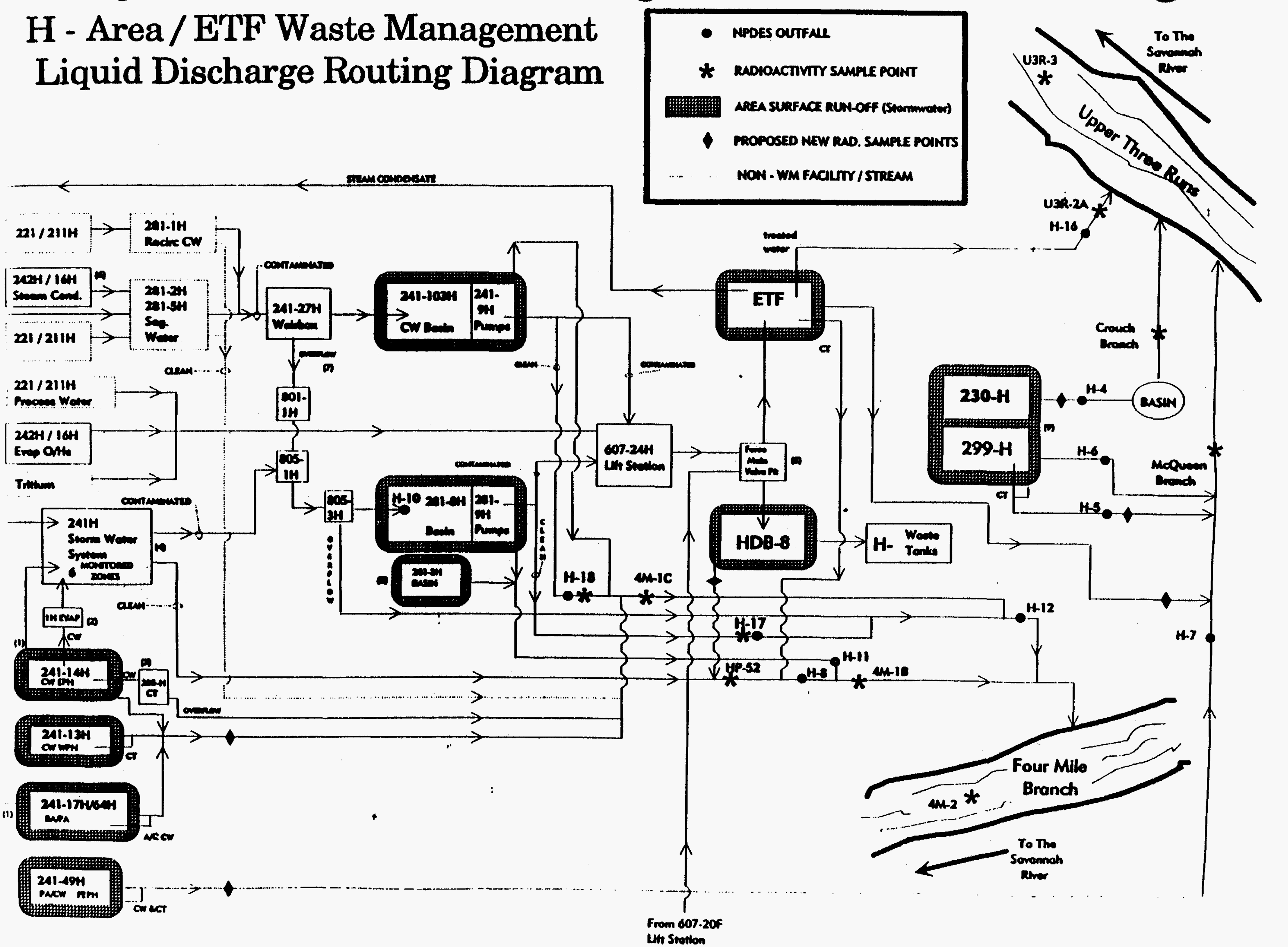
RELEASE POINT	EFFLUENT STREAMS	RADIOACTIVE RELEASE POTENTIAL	RAD SAMPLE POINT
H-005	299-H & 230-H Stormwater (East Side)	Yes	McQueen Branch
H-006	299-H (WMMF) Stormwater (South Side)	Yes	McQueen Branch
H-007	241-32H (ITP Cold Feed/N_2 Storage Area) Stormwater	No	
	241-49H A/C CW Discharge	No	
	241-49H CW Pump House Stormwater & CT Blowdown	Yes	McQueen Branch
H-008	241-H Tank Farm Stormwater		
	Zone 2H	Yes	HP-52
	Zone 3H	Yes	HP-52
	Zone 4H	Yes	HP-52
	Zone 5H	Yes	HP-52
	Zone 6H	Yes	HP-52
	Zone 7H	Yes	HP-52
	NWTF (HDB-8) Stormwater	Yes	HP-52
	241-81H (ETF) CT Blowdown & WWCT Rad Monitor Coolant	Yes	HP-52
H-010 (281-8H Basin Inlet)	241-H (TF) Stormwater		
	Zone 2H	Yes	281-8H
	Zone 3H	Yes	281-8H
	Zone 4H	Yes	281-8H
	Zone 5H	Yes	281-8H
	Zone 6H	Yes	281-8H
	Zone 7H	Yes	281-8H
H-011	281-8H & 281-3H Stormwater (around basins)	Yes	4M-1B
H-012	241-13H/14H CW Pumphouse Stormwater & CT Blowdown	Yes	4M-1C HP-52
	241-17H/64H Stormwater & A/C CW Discharge	No	
	241-103H Stormwater (around basin)	Yes	4M-1C
	[Also Receives Discharge from Upstream Outfalls H-017 & H-018]		

RELEASE POINT	EFFLUENT STREAMS	RADIOACTIVE RELEASE POTENTIAL	RAD SAMPLE POINT
H-016	241-81H (ETF) Treated Water Discharge	Yes	U3R-2A
H-017	281-8H Retention Basin Discharge	Yes	4M-2
H-018	241-103H CW Basin Discharge	Yes	4M-1C
*(a)	241-81H (ETF) Stormwater	Yes	McQueen Branch
*(b)	241-81H (ETF) WWCT Dike	Yes	McQueen Branch
	ETF Transfer Line Overflows:		
*(c)	- Treated water effuent pipline manholes	Yes	**
*(d)	- Force Main manholes & valvepit	Yes	**
*(e)	- Waste concentrate valvepit	Yes	McQueen Branch
*(f)	- Gravity process sewer manholes	Yes	**

* - No NPDES outfalls associated with these streams.

** - Various sample points could pick up activity depending on the location of overflow; refer to effluent stream reports for more details.

H - Area / ETF Waste Management Liquid Discharge Routing Diagram



F - Area / BG Waste Management Liquid Discharge Routing Diagram