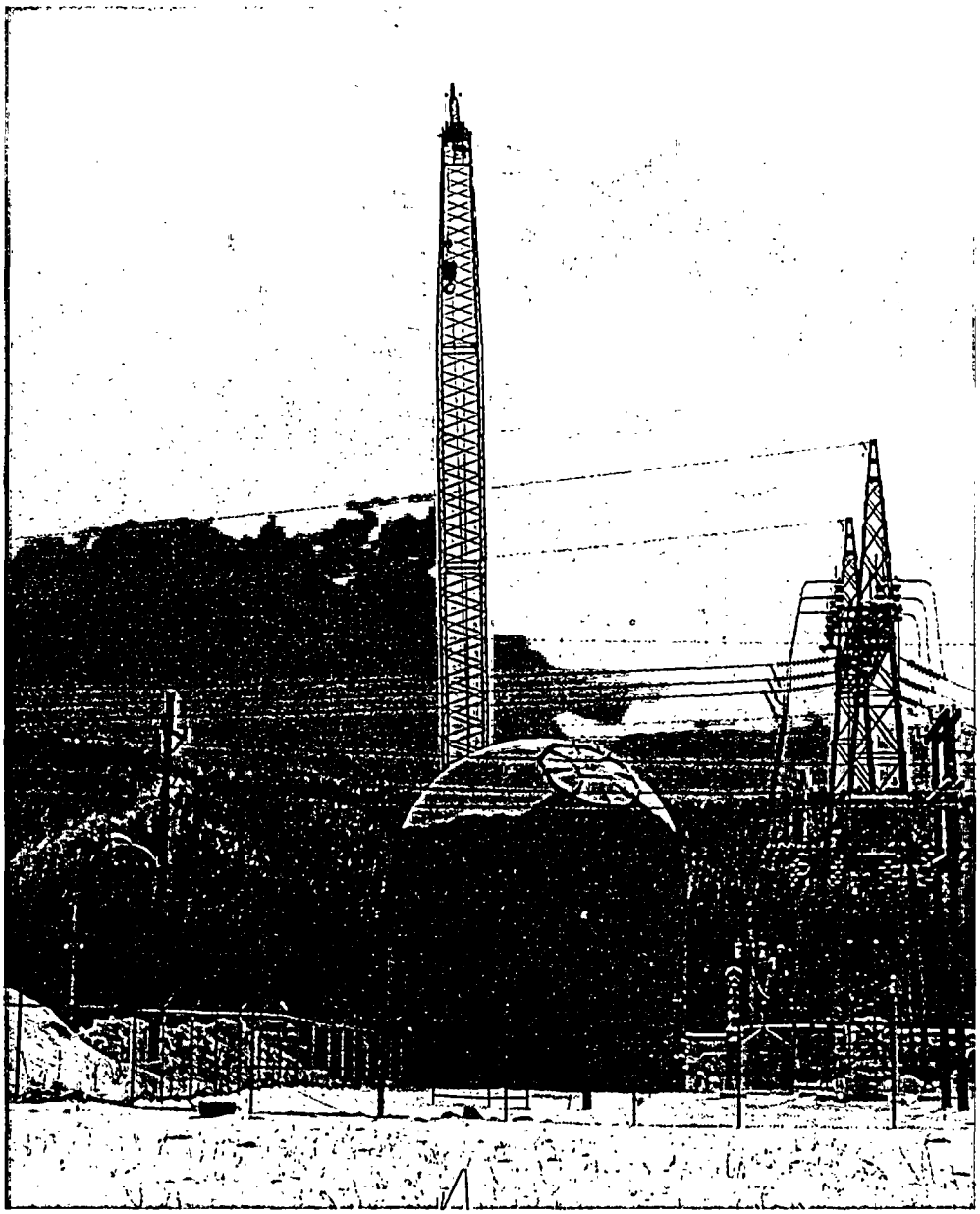
Saxton Nuclear Experimental Corporation Facility

License Termination Plan

Rev. 3



February 2004

Prepared by GPU Nuclear, Inc.

List of Effective Pages

Page No.	Rev. No.	Page No.	Rev No.
TOC			
i	1	ii	1
iii	1	iv	2
v	2	vi	1
vii	2		
CHAPTERS			
1-1	1	1-2	2
1-3	1	1-4	1
2-1	1	2-2	1
2-3	1	2-4	1
2-5	1	2-6	1
2-7	1	2-8	1
2-9	1	2-10	1
2-11	1	2-12	1
2-13	1	2-14	1
2-15	1	2-16	2
2-17	1	2-18	2
2-19	2	2-20	2
2-21	2	2-22	1
2-23	2	2-24	1
2-25	2	2-26	2
2-26a	2		
2-27	1	2-28	1
2-29	1	2-30	1
2-31	1	2-32	1
2-33	2	2-34	2
2-35	1	2-36	2
2-37	2	2-38	1
2-39	2	2-40	2
2-41	2	2-42	2
2-43	2	2-44	2
2-45	2	2-46	2
2-47	2	2-48	1
2-49	2	2-50	1
2-51	2	2-52	1
2-53	1	2-54	1
2-55	1	2-56	1
2-57	1	2-58	1
2-59	1	2-60	1
2-61	1	2-62	1
2-63	1	2-64	1
2-65	3	2-66	1
2-67	1	2-68	1
2-69	1	2-70	1
2-71	2	2-72	1
2-73	1	2-74	1
2-75	1	2-76	1
2-77	1	2-78	1

List Of Effective Pages

Page No.	Rev. No.	Page No.	Rev. No.
2-79	1	2-80	1
2-81	1	2-82	1
2-83	1	2-84	1
2-85	1	2-86	2
2-87	2	2-88	1
2-89	1	2-90	1
2-91	1	2-92	1
2-93	1	2-94	1
2-95	3	2-96	1
2-97	1	2-98	1
2-99	1	2-100	1
2-101	1	2-102	1
2-103	1	2-104	1
2-105	1	2-106	1
2-107	1	2-108	1
2-109	1	2-110	1
2-111	1	2-112	1
2-113	1	2-114	1
2-115	1	2-116	1
2-117	1	2-118	1
2-119a-119i	2		
2-119	1	2-120 (Fig. 2-1)	1
2-121 (Fig. 2-2)	1	2-122 (Fig. 2-3)	1
2-123 (Fig. 2-4)	1	2-124 (Fig. 2-5)	1
2-125 (Fig. 2-6)	1	2-126 (Fig. 2-7)	1
2-127 (Fig. 2-8)	1	2-128 (Fig. 2-9)	1
2-129 (Fig. 2-10)	1	2-130 (Fig. 2-11)	1
2-131 (Fig. 2-12)	1	2-132 (Fig. 2-13)	1
2-133 (Fig. 2-14)	1	2-134 (Fig. 2-15)	1
2-135 (Fig. 2-16)	1	2-136 (Fig. 2-17)	1
2-137 (Fig. 2-18)	1	2-138 (Fig. 2-19)	0
2-139 (Fig. 2-20)	0	2-140 (Fig. 2-21)	0
2-141 (Fig. 2-22)	0	2-142 (Fig. 2-23)	1
2-143 (Fig. 2-24)	1	2-144 (Fig. 2-25)	0
2-145 (Fig. 2-26)	0	2-146 (Fig. 2-27)	0
2-147 (Fig. 2-28)	2	2-148 (Fig. 2-29)	1
2-149 (Fig. 2-30)	1	2-150 (Fig. 2-31)	0
2-151 (Fig. 2-32)	0	2-152 (Fig. 2-33)	1
2-153 (Fig. 2-34)	2	2-154 (Fig. 2-35)	2
3-1	3	3-2	3
3-3	3	3-4	3
3-5	1		
4-1	1	4-2	1
4-3	1	4-4	1
5-1	2	5-2	1
5-3	1	5-4	1
5-5	1	5-6	1
5-7	3	5-8	1

List Of Effective Pages

Page No.	Rev. No.	Page No.	Rev. No.
5-9	1	5-10	2
5-11	3	5-12	3
5-13	3	5-14	3
5-15	3	5-16	2
5-17	1	5-18	1
5-19	1	5-20	1
5-21	1	5-22	1
5-23	2	5-24	2
5-25	1	5-26	3
5-27	1	5-28	1
5-29	1	5-30	1
5-31	1	5-32	1
5-33	1	5-34	1
5-35	1	5-36	1
5-37	1	5-38	2
5-39	1	5-40	1
5-41	1	5-42	1
5-43	1	5-44	1
5-45	1	5-46	2
5-47	1	5-48	1
5-49	1	5-50	1
5-51	2	5-52	1
5-53	1	5-54	2
5-55	2	5-56	1
5-57	1	5-58	1
5-59	1	5-60	3
5-61	2	5-62	1
5-63	3	5-64	1
5-65	1	5-66	2
5-67	1	5-68	2
5-69	3	5-70	1
5-71	1	5-72	2
5-73	1	5-74	1
5-75	2	5-76	1
5-77	1	5-78	1
5-79	1	5-80	1
5-81	1	5-82	1
Figure 5-1	1	Figure 5-4	0
Figure 5-5	0		
6-1	1	6-2	1
6-3	2	6-4	2
6-5	2	6-6	2
6-7	2	6-8	2
6-9	2	6-10	1
6-11	1	6-12	1
6-13	1	6-14	1

List Of Effective Pages

Page No.	Rev. No.	Page No.	Rev. No.
6-15[a]	1		
7-1	2		
8-1	1		

[a] Appendix 6.1 contains information on DandD DCGL Calculations for Building Occupancy Surface Area Model executed on 9/28/99 for Am-241 (3 pages), C-14 (2 pages), Co-60 (2 pages), Cs-137 (2 pages), Eu-152 (2 pages), H-3 (2 pages), Ni-63 (2 pages), Pu-238 (3 pages), Pu-239 (3 pages), Pu-241 (3 pages) and Sr-90 (2 pages)

Table 2-29 (Contd.)
Listing of all "Hard to Detect Nuclide"/Transuranic Analysis

Sample No.	Analysis Date	Location/Description	Sample location See Table 5-2	H-3	Sr-90	Co-60	Cs-137	Am-241	Pu-238	Pu-239	Pu-241	C-14	Ni-63	Eu-152
SX-SL-2655	6/11/02	Annulus Well A-4, 5-10'	OL1 (1)	<1.89	<0.0497			0.0135	<0.03	<0.0123	<2.28	<0.187	<1.94	
SX-SL-2374	6/11/02	SE CV Yard ABH 40, 30-40'	OL1 (1)	<1.87	<0.0268			<0.0585	<0.019	<0.00134	<2.37	<0.186	<1.64	
SX-SL-2484	6/11/02	N CV Yard ABH 22, 50-60'	OL1 (1)	<2	<0.038			<0.0273	<0.0269	<0.0155	<2.45	<0.178	<1.84	
SX-SL-2662	6/11/02	W CV Yard ABH 10, 20-30'	OL1 (1)	<1.98	<0.0338			<0.041	<0.0307	0.0293	<1.96	<0.189	<1.34	
SX-SL-2960	6/11/02	NRC CV Angle Well, Initial Sample	(3)		<0.299			<0.327	<0.276	<0.16	<24.9			
SX-SL-2634	6/11/02	W CV Yard ABH 9, 10-15'	OL1 (1)	<2.06	<0.0287			0.0324	<0.0295	<0.0104	<1.68	<0.191	<2.3	
SX-SL-2649	6/11/02	Annulus Well A-2, 5-10'	OL1 (1)	<2.0	<0.0314			<0.00978	<0.0133	<0.00938	<1.87	<0.183	<1.75	
SX-SL-2664	6/11/02	W CV Yard ABH 10, 40-50'	OL1 (1)	1.99	<0.0303			<0.0216	<0.0105	<0.0256	<2.28	<0.182	<1.84	
SX-SL-2660	6/11/02	Annulus Well A-3, 15-20'	OL1 (1)	<1.9	<0.0268			<0.0372	<0.00949	<0.0134	<1.65	<0.189	<2.0	
SX-SL-2425	6/11/02	E CV Yard ABH 33, 60-90'	OL1 (1)	<1.99	<0.0339			<0.0261	<0.0264	<0.0118	<1.71	<0.188	<1.57	
SX-ST-3077	8/30/02	CV Shell Steel, Internal	CV1			<1.17	<1.17						<8.54	
SX-ST-3087	8/30/02	CV Shell Steel, Internal	CV1			<2.12	<1.45						<36.21	
SX-ST-3069	8/30/02	CV Shell Steel, Internal	CV1			<1.49	2.28						<10.83	
SX-ST-3086	8/30/02	CV Shell Steel, Internal	CV1			<1.22	<1.13						<5.9	
SX-ST-3085	8/30/02	CV Shell Steel, Internal	CV1			<1.48	<1.38						<9.46	
SX-ST-3084	8/30/02	CV Shell Steel, Internal	CV1			<2.29	2.55						<5.11	
SX-ST-3083	8/30/02	CV Shell Steel, Internal	CV1			<1.56	<1.69						<4.33	
SX-ST-3082	8/30/02	CV Shell Steel, Internal	CV1			<1.66	3						<4.02	
SX-ST-3081	8/30/02	CV Shell Steel, Internal	CV1			<1.91	3.44						<4.99	
SX-ST-3067	8/30/02	CV Shell Steel, Internal	CV1			<3.39	16.9						<3.89	
SX-ST-3070	8/30/02	CV Shell Steel, Internal	CV1			2.64	180						<10.96	
SX-ST-3078	8/30/02	CV Shell Steel, Internal	CV1			<1.11	2.3						<4.84	
SX-ST-3076	8/30/02	CV Shell Steel, Internal	CV1			2.78	24.8						<4.46	
SX-ST-3079	8/30/02	CV Shell Steel, Internal	CV1			<2.13	5.08						<20.46	
SX-ST-3080	8/30/02	CV Shell Steel, Internal	CV1			<1.02	1.9						<4.29	
SX-ST-3074	8/30/02	CV Shell Steel, Internal	CV1			<1.96	3.36						<3.8	
SX-ST-3075	8/30/02	CV Shell Steel, Internal	CV1			2.06	1.37						<5.25	
SX-ST-3073	8/30/02	CV Shell Steel, Internal	CV1			<1.79	3.03						<12.8	
SX-ST-3072	8/30/02	CV Shell Steel, Internal	CV1			<0.96	1.12						<27.11	
SX-ST-3071	8/30/02	CV Shell Steel, Internal	CV1			3.43	9.26						20.23	
SX-ST-3068	8/30/02	CV Shell Steel, Internal	CV1			<2.85	59						<30.35	
DA-SX4PC990114	10/25/01	CV Dome Paint Chips (see 110611) (PSO-5)	(2)			< 1.5	< 1.7							

Footnotes: (1) Subsurface Sample (2) Component to be Removed (3) Groundwater (4) Outside Impacted Area

Table 2-30
CV Backfill & Subsurface Sample Results (see Figs. 2-31 & 2-32)

	TYPE	SAMPLE No.	Cs-137	Co-60	H-3	SAMPLE DATE	SAMPLE DESCRIPTIONTION
1	SL	1627	<0.1	<0.12	---	10/30/2001	0-10' N. CV YARD GC HOLE 800' #1 (ELEVATION 800')
2	SL	1628	<0.07	<0.08	---	10/30/2001	10-20' CV YARD GC HOLE #1
3	SL	1631	<0.08	<0.11	---	10/30/2001	30'-40' N. CV YARD G.C. HOLE #1
4	SL	1632	<0.07	<0.09	---	10/30/2001	20'-30' N. CV YARD G.C. HOLE #1
5	SL	1633	<0.1	<0.11	---	10/30/2001	40-50' N. CV YARD G.C. HOLE #1
6	SL	1634	<0.1	<0.12	---	10/30/2001	50-60' N. CV YARD G.C. HOLE #1
7	SL	1635	<0.1	<0.12	---	10/30/2001	60-70' N. CV YARD G.C. HOLE #1
8	SL	1636	<0.09	<0.09	---	10/30/2001	70-75' N. CV YARD G.C. HOLE #1
9	SL	1637	<0.11	<0.13	---	10/30/2001	0-10' N. CV YARD G.C. HOLE #3 800'
10	SL	1638	<0.08	<0.09	---	10/30/2001	10-20' N. CV YARD G.C. HOLE #3
11	SL	1639	<0.09	<0.08	---	10/30/2001	20-30' N. CV YARD G.C. HOLE #3
12	SL	1640	<0.06	<0.07	---	10/30/2001	30-40' N. CV YARD G.C. HOLE #3
13	SL	1641	<0.13	<0.147	---	10/30/2001	40-50' N. CV YARD G.C. HOLE #3
14	SL	1642	<0.09	<0.12	---	10/30/2001	50-60' N. CV YARD G.C. HOLE #3
15	SL	1643	<0.11	<0.13	---	10/30/2001	60-70' N. CV YARD G.C. HOLE #3
16	SL	1648	<0.05	<0.07	---	10/30/2001	70-75' N. CV YARD G.C. HOLE #3
17	SL	1649	<0.07	<0.07	---	10/30/2001	0-10' N. CV YARD G.C. HOLE #5 (ELEVATION 800')
18	SL	1650	<0.07	<0.07	---	10/30/2001	10-20' N. CV YARD G.C. HOLE #5
19	SL	1651	<0.12	<0.13	---	10/30/2001	20-30' N. CV YARD G.C. HOLE #5
20	SL	1652	<0.1	<0.11	---	10/30/2001	30-40' N. CV YARD G.C. HOLE #5
21	SL	1653	<0.12	<0.13	---	10/30/2001	40-50' N. CV YARD G.C. HOLE #5
22	SL	1654	<0.1	<0.11	---	10/30/2001	50-60' N. CV YARD G.C. HOLE #5
23	SL	1655	<0.09	<0.11	---	10/30/2001	60-75' N. CV YARD G.C. HOLE #5
24	SL	1656	<0.09	<0.09	---	10/30/2001	0-10' N. CV YARD G.C. HOLE #7 (ELEVATION 800')
25	SL	1657	<0.12	<0.15	---	10/30/2001	10-20' N. CV YARD G.C. HOLE #7
26	SL	1658	<0.11	<0.13	---	10/30/2001	20-30' N. CV YARD G.C. HOLE #7
27	SL	1659	<0.08	<0.08	---	10/30/2001	30-40' N. CV YARD G.C. HOLE #7
28	SL	1660	<0.13	<0.13	---	10/30/2001	40-50' N. CV YARD G.C. HOLE #7
29	SL	1661	<0.11	<0.12	---	10/30/2001	50-60' N. CV YARD G.C. HOLE #7
30	SL	1662	<0.09	<0.1	---	10/30/2001	60-75' N. CV YARD G.C. HOLE #7
31	SL	1680	<0.12	<0.14	---	10/30/2001	0-10' N. CV YARD G.C. HOLE #9 (ELEVATION 800')
32	SL	1681	<0.11	<0.11	---	10/30/2001	10-20' N. CV YARD G.C. HOLE #9
33	SL	1682	<0.1	<0.11	---	10/30/2001	20-30' N. CV YARD G.C. HOLE #9
34	SL	1683	<0.07	<0.08	---	10/30/2001	30-40' N. CV YARD G.C. HOLE #9
35	SL	1684	<0.11	<0.12	---	10/30/2001	40-50' N. CV YARD G.C. HOLE #9
36	SL	1685	<0.07	<0.05	---	10/30/2001	50-60' N. CV YARD G.C. HOLE #9
37	SL	1686	<0.11	<0.12	---	10/30/2001	60-75' N. CV YARD G.C. HOLE #9
38	SL	1687	<0.11	<0.12	---	10/30/2001	0-10' N. CV YARD G.C. HOLE #11 (ELEVATION 800')
39	SL	1688	<0.12	<0.147	---	10/30/2001	10-20' N. CV YARD G.C. HOLE #11
40	SL	1689	<0.13	<0.13	---	10/30/2001	20-30' N. CV YARD G.C. HOLE #11
41	SL	1690	<0.12	<0.13	---	10/30/2001	30-40' N. CV YARD G.C. HOLE #11
42	SL	1691	<0.11	<0.13	---	10/30/2001	40-50' N. CV YARD G.C. HOLE # 11
43	SL	1692	<0.1	<0.11	---	10/30/2001	50-60' N CV YARD G.C. HOLE #11
44	SL	1693	<0.08	<0.09	---	10/30/2001	60-75' N. CV YARD G.C. HOLE #11
45	SL	1695	<0.07	<0.08	---	10/31/2001	0-10' N. CV YARD G.C. HOLE #13 (ELEVATION 800')

NOTE: All water samples are reported in uCi/ml except for H-3 which is reported in pCi/L. Soil samples are in pCi/g.

3.0 IDENTIFICATION OF REMAINING DISMANTLEMENT ACTIVITIES

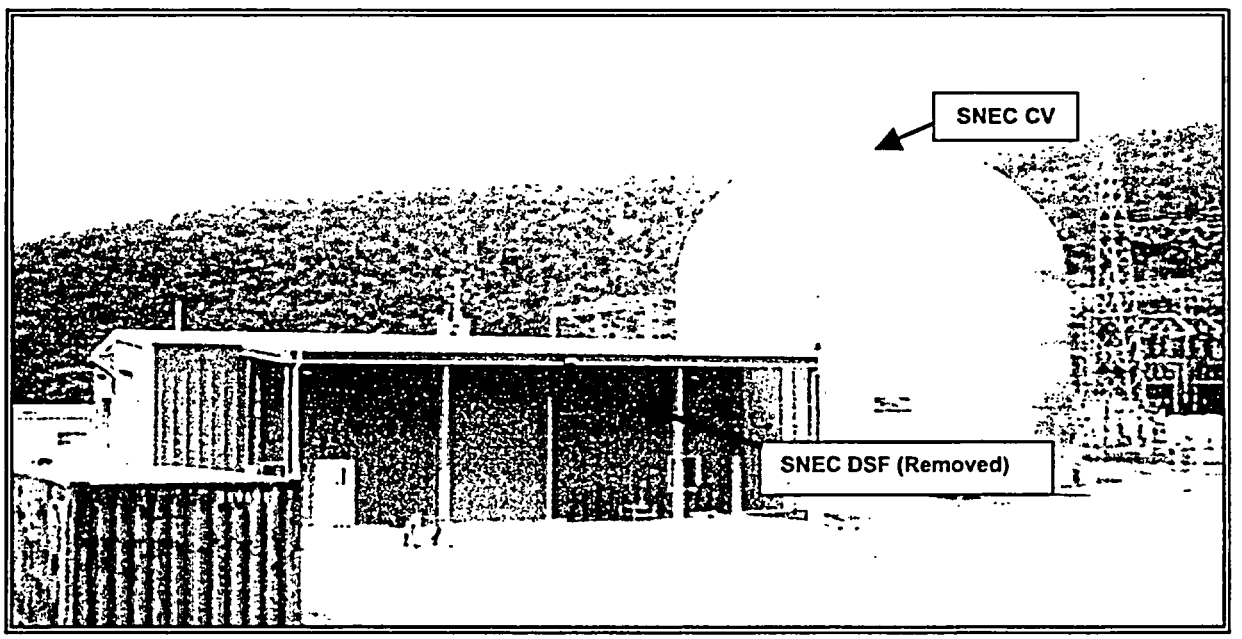
3.1 INTRODUCTION

As discussed previously, this final phase of the SNEC Facility Decommissioning Project commenced in April 1998 following NRC approval of a License Amendment authorizing decommissioning. Since that time, the greater part of 1998 was devoted to removing and shipping the SNEC Facility Large Components (i.e. Reactor Vessel, Pressurizer and Steam Generator). Following removal of the large components, the latter part of 1998 and the beginning of 1999 were devoted to removing the bulk of the remainder of the systems from the SNEC Facility. Following that, concrete decontamination commenced and continued into 2000 when it was determined that complete removal of the concrete from the Containment Vessel (CV) would be required in order to release the site in accordance with NRC Regulations (10 CFR Part 20.1402, Radiological Criteria for Unrestricted Use). Concrete removal was completed in October 2002. The interior of the CV below the ~804 ft. elevation was then decontaminated and a final status survey was performed. The NRC has accepted the results of the survey and the CV has been backfilled to the ~804ft. elevation in preparation of removal of the upper CV shell.

As described in Section 2.2.4 the site is divided into eight areas in describing radiological conditions. These same area designations will be used in describing remaining site dismantlement activities.

FIGURE 3-1

Photograph of SNEC Facility CV & DSF Buildings



3.2 REMAINING TASKS

3.2.1 Area 1 (CV Basement) Remaining Site Dismantlement Activities

Area 1 was completely removed to the steel CV liner.

3.2.2 Area 2 (Primary Compartment) Remaining Site Dismantlement Tasks

Area 2 was completely removed to the steel CV liner.

3.2.3 Area 3 (Auxiliary Compartment) Remaining Site Dismantlement Activities

Area 3 was completely removed to the steel CV liner.

3.2.4 Area 4 (Operating Floor) Remaining Site Dismantlement Activities

Remaining tasks in Area 4 include removal of miscellaneous steel and removal of the polar crane and its girders. The polar crane is the last large component to be removed from the SNEC Facility. It will be removed following removal of the upper dome of the CVThe Containment Vessel is a special case. The SNEC Facility License requires the interior of the Containment Vessel to be maintained as an exclusion area Thus, prior to removal of the upper dome of the Containment Vessel the SNEC Technical Specifications will need to be revised. A change request to the SNEC Facility Technical Specifications (Reference 3-1) has been submitted to permit this activity (Note: this request was approved on 1/9/04). During removal of the upper dome, the backfilled portion of the lower Containment Vessel will be protected concrete cap. This area will be resurveyed after completion of the removal of the upper dome.

3.2.5 Area 5 (Pipe Tunnel) Remaining Site Dismantlement Activities

As described in Section 2.2.2, Area 5 consisted of a concrete tunnel, which extended 235 degrees around the CV. The tunnel has been removed except for the portion under the Material Handling Bay (MHB) section of the Decommissioning Support Facility.

The portion of the tunnel under the MHB will be removed and the area surveyed and remediated as appropriate to meet site release levels.

3.2.6 Area 6 (Reactor Compartment and Storage Well) Remaining Site Dismantlement Activities

Area 6 was completely removed to the steel CV liner.

3.2.7 Area 7 (Exterior of Containment Vessel Dome) Remaining Site Dismantlement Activities

Remaining tasks in Area 7 consist of removing the CV Dome to at least three feet below grade and completing the requisite Final Status Survey and backfilling the remaining below grade portions of the CV. Remediation, if needed, will be performed as appropriate.

3.2.8 Area 8 (SNEC Facility Yard Areas) Remaining Site Dismantlement Activities

As described in Section 2.2.4.1.2, the Decommissioning Support Facility (DSF) building walls and roof have been dismantled and released from the site. Concrete floors for the remaining DSF subdivision areas [i.e. Decommissioning Support Building (DSB), Material Handling Building (MHB) and the Personnel Access Facility PAF)] still remain. Remaining tasks in Area 8, with the exception of the Saxton Steam Generating Station (SSGS) area will consist of some soil removal and removal of utilities located outside the CV.

The SSGS was used by the SNEC Facility to support its operation, generate electricity and to provide dilution flow for radioactive effluent liquid discharges. Surveys in this area indicate there was some residual contamination that needed to be removed. This included water and sediment removal, some concrete decontamination, and extensive embedded piping surveying and removal. These activities were completed..

3.3 ACCESS CONTROL MEASURES

Since all decommissioning activities were not completed prior to the start of final status survey work, measures as described in Section 5.3 have been implemented to protect survey areas from recontamination during and after the final status survey. In all cases, decommissioning activities creating a potential for the spread of contamination will be completed within each survey area prior to starting a final status survey in the area. Additionally, decommissioning activities that create a potential for the spread of contamination to adjacent survey areas will be evaluated and controlled using barriers, covers, or restricting or rescheduling activities.

3.4 10 CFR 50.59 REVIEW

10 CFR 50.59 "Changes, Tests and Experiments" permits licensees to make changes to the facility as described in the Safety Analysis Report (as updated), make changes in procedures as described in the Safety Analysis Report (as updated), and conduct tests or experiments not described in the Safety Analysis Report (as updated) without obtaining a license amendment under certain conditions.

With respect to the SNEC Facility this License Termination Plan serves to support a License Amendment to perform the Final Status Survey and terminate the license. In addition as indicated in Section 3.2.4 above a change request to the SNEC Facility Technical Specifications (Reference 3-1) has been submitted to allow removal of the upper Containment Vessel dome. The remaining tasks described in Section 3.2 are bounded by the Definition for Decommissioning Activities in the SNEC Facility Technical Specifications (Reference 3-3) and are thus permitted by the Technical Specifications. Additionally these tasks have been reviewed against the criteria of 10 CFR 50.59 and are bounded by the SNEC Facility USAR (Reference 3-4).

Thus, although some changes will be made to the facility as described in the SNEC Facility USAR, e.g. Removal of the Polar Crane, these activities were anticipated to be performed. Further, greater than 99% of the curies present at the SNEC Facility at the commencement of decommissioning in 1998 have been safely removed from the site and shipped for proper disposition. Finally, each activity requiring a procedure as defined by the SNEC Facility Technical Specifications is reviewed to ensure it satisfies the criteria of 10 CFR 50.59. Thus,

with the exception of the removal of the Containment Vessel upper dome, none of the remaining tasks identified in Section 3.2 requires prior NRC approval in accordance with 10 CFR 50.59.

3.5 DECOMMISSIONING TASKS REQUIRING COORDINATION WITH OTHER FEDERAL OR STATE REGULATORY AGENCY

Prior to License Termination, tasks requiring coordination with any other Federal or State Regulatory Agency include disposal of the water in Area 8. Additionally, some water treatment will be necessary for water collecting in excavated areas e.g., the yard area North of the CV. Discharge of this water will be controlled radiologically in accordance with the requirements of the ODCM (Reference 3-2). Non-radioactive sampling and analysis will be in accordance with a program accepted by the Commonwealth of Pennsylvania. Additionally, the Army Corps of Engineers gave its consent for locating temporary on-site excavations and infiltration galleries.

3.6 SUMMARY

The tasks remaining for site dismantlement are permitted by the SNEC Facility License Technical Specifications and USAR. Based on current estimates, these tasks will be completed in the second quarter of 2003 for an estimated exposure of approximately 37 person-rem (Table 3.1). Of this total approximately 35 person-rem has been expended to date. Estimated remaining low level radioactive waste generation is provided in Table 3.2.

3.7 REFERENCES

3-1 SNEC Facility Technical Specification Change Request No. 62, April 2002.

3-2 SNEC Procedure E900-PLN-4542.08 "Off-Site Dose Calculation Manual"

3-3 SNEC Facility Technical Specifications

3-4 Updated Safety Analysis Report for Decommissioning the SNEC Facility

To obtain the best approximation of the actual ratio between radionuclides present in any area, a sufficient number of measurements or samples, spatially separated throughout the area must be collected. The number of measurements or samples needed to determine the ratio is based on the chemical, physical, and radiological characteristics of the radionuclides expected to be present in the area. The MARSSIM surrogate method will be applied when similar physical and geological characteristics are present in a survey unit (Reference 5-21). This method will be used to determine the most representative ratio for each positively identified radionuclide present in the data set with the surrogate radionuclide. From the sum of the ratios a mean ratio value for each radionuclide will be calculated and used to determine an effective surrogate DCGLw. In conclusion, selecting a surrogate ratio ensures that potential exposures from individual radionuclides are not underestimated. The surrogate DCGLw for volumes with multiple radionuclides is calculated using the following equation (NUREG-1575, Reference 5-5, Equation I-14):

$$D_{total} = 1/\left[1/D_1 + R_2/D_2 + R_3/D_3 + \ldots + R_n/D_n\right]$$

Where: D_{total} is the $DCGL_W$ for the surrogate radionuclide when the concentration of that radionuclide represents all radionuclides that are present in the survey unit. D_1 is the initial DCGLw for the surrogate radionuclide. D_2, D_3,...D_n are DCGLw values for radionuclides 2, 3,...n.

R_2, R_3...R_n are the respective ratio values between the concentration of the surrogate radionuclide and radionuclide 1, 2, ...n.

Post-remediation sampling may be performed to re-establish surrogate ratios when there is reason to believe that the remediation process may have significantly changed the ratios of the original radionuclide concentration mix. However, the surrogate ratio will usually be established using data collected prior to remediation. Additional sample data may be collected or an evaluation performed when there is reason to believe a surrogate ratio is non-representative of the survey area. In all cases, SNEC will use the best representative data for the survey area. A radionuclide mix justification will be documented in each survey package.

5.2.3.2.4 Gross Activity DCGLs

Where multiple radionuclides are present, a gross activity DCGL may be developed. The gross activity DCGL enables field measurements of gross activity rather than the determination of individual radionuclide activity, for comparison to the radionuclide-specific DCGL. The gross activity DCGL, or $DCGL_{GA}$, for surfaces or volumes with multiple radionuclides is calculated using the following equation (NUREG-1575, Reference 5-5, Equation 4-4):

$$\text{Gross Activity DCGL} = 1/((f_1/DCGL_1) + (f_2/DCGL_2) + \ldots (f_n/DCGL_n))$$

Where:

f_1 = relative fraction of the total activity contributed by radionuclide 1

f_2 = relative fraction of the total activity contributed by radionuclide 2

f_n = relative fraction of the total activity contributed by the nth radionuclide in the mix

In situations where an area has unknown or a highly variable concentration of radionuclides throughout, it is acceptable to select the most conservative mix of radionuclides present when developing a gross DCGL. Remediation efforts at the SNEC Facility will seek to remove contamination from concrete surfaces by removing significant near surface volumes of concrete. On other structural surfaces (e.g., support steel), abrasive decontamination techniques may be used to remove surface deposited contamination. Additionally, by aggressively chasing cracks and other structural anomalies, little (if any) surface deposited radionuclides should remain. Those that do remain will be at a significantly reduced fraction of their previous level. Characterization data and/or post-remediation sampling data will be used to adjust gross DCGL values before performing the FSS. In either case, a radionuclide mix justification will be documented in each survey package.

Gross activity measurements will be performed in both reference areas (background areas) and areas to be surveyed.

Open land areas will be scanned by semi-automated contractor supplied measurement equipment and/or by hand-held NaI detector instrumentation. Samples will also be obtained. When necessary, spectra of the components of a radiation field may be used to differentiate between site related radioactive materials and natural occurring radioactivity.

5.2.3.2.5 Elevated Measurement Comparison (EMC) DCGLs

Elevated Measurement Comparison (EMC) DCGLs are DCGL values that have been modified by reducing the dose model area size in the dose modeling computer code. The effect is to allow higher levels of contamination to exist in smaller well-defined on-site areas. Assuming the residual radioactivity is concentrated in a much smaller area rather than uniformly over the entire survey unit is the basis for developing the $DCGL_{EMC}$. The methodology used to calculate the $DCGL_{EMC}$ is given in Appendix 5-1. Area factors for individual radionuclides have been calculated and are presented in Tables 5-15 and 5-15A.

5.2.3.2.6 Unity Rule

Typically, each radionuclide specific DCGL corresponds to the release criteria (e.g., regulatory limit in terms of dose or risk). However, in the presence of multiple radionuclides, the total of the DCGLs for all radionuclides would exceed the release criteria. In this case, the individual DCGLs need to be adjusted to account for the presence of multiple radionuclides contributing to the total dose. One method for adjusting the DCGLs is to modify the assumptions made during exposure pathway modeling to account for multiple radionuclides. The surrogate measurement method discussed previously, describes one method for adjusting the DCGL to account for multiple radionuclides. Additionally, another method includes the use of the unity rule.

The unity rule, represented in the expression below, is satisfied when radionuclide mixtures yield a combined fractional concentration limit that is less than or equal to one (1) (NUREG-1575, Equation 4-3):

$$(C_1 / DCGL_1) + (C_2 / DCGL_2) + \ldots (C_n / DCGL_n) \leq 1$$

Where:

C = concentration of radionuclide (1, 2, ...,n)

DCGL = guideline value for each individual radionuclide (1, 2, ...,n)

Table 5-2

Initial Classifications of Site Areas

Survey Unit Designations of the SNEC Facility and Surrounding Impacted Areas										
Survey Unit Number [a]	Description	Classification			Survey Unit Area (m^2) [b]				Number of Survey Units [b]	Type of DCGL Applied [c]
		1	2	3	Floor	Walls	Ceiling	Other		
MISCELLANEOUS AREAS & ITEMS										
MA1	Airborne Monitoring Stations		X					<10	1	1
MA2	SSGS Discharge Tunnel Outfall (Land Area)			X				600	1	2
MA3	Weir Outfall		X					25	1	2
MA4	Weir Outfall Buffer			X				200	1	2
MA5	Northeast Dump Site			X				7000	1	2
MA6	Northwest Open Land Area			X				4100	1	2
MA7	Northwest Open Land Area		X					100	1	2
MA8	Miscellaneous Concrete Slabs (Around Site)			X				<100	1 each	1
CONTAINMENT VESSEL (CV) - INTERIOR & EXTERIOR STEEL SHELL										
CV1-1 to 4	Interior Vertical Wall of CV Shell – Plates D to G	X				392			4	1 [e]
CV2-1 to 22	Internal Support Rings – 774' El to 802' El	X						410	22 [d]	1 [e]
CV2-23 to 28	Internal Support Ring Weld Areas – 774' El to 802' El	X				66			22 [d]	1 [e]
CV3-1 to 3	Interior Curved Bottom of CV Shell – Plates A to C	X						256	3	1 [e]
CV4-1	Exterior Wall – 802.6' El up to Cut-off	X				7			1	1 [e]
CV5	Exterior Wall 1 Meter Below Class 1 Area (Down to 797.6' El)		X			16			1	1 [e]
CV6 & CV6-1	External Rock Anchor Support Ring Assembly Area	X				66			1 [d]	1 [e]

NOTES:

(a) "X" designates a sequential number starting with 1, and defines a survey unit within a survey area.

(b) This data was estimated with best available information. No survey unit, regardless of its classification will exceed 10,000 square meters.

(c) NRC Default Surface DCGLs = 1, Site Specific Volumetric DCGLs = 2

(d) Survey units were established as the ring areas became available to field personnel doing the survey work.

(e) Activation of CV steel liner to be addressed when region is accessible.

Table 5-2 (continued)

Initial Classifications of Site Areas

Survey Unit Designations of the SNEC Facility and Surrounding Impacted Areas										
Survey Unit Number [a]	Description	Classification			Survey Unit Area (m^2) [b]				Number of Survey Units [b]	Type of DCGL Applied [c]
		1	2	3	Floor	Walls	Ceiling	Other		
DECOMMISSIONING SUPPORT FACILITY (DSF) - SNEC AREA										
DB1-1 & 2	DSB Floor Slab	X			212				2	1
PF1	PAF Floor Slab	X			36				1	1
DB5	DSB Carport Floor Slab	X			62				1	1
SAXTON STEAM GENERATING STATION (SSGS), INTAKE, DISCHARGE & STEAM TUNNELS										
SS1	Floor of Discharge Tunnel (first ~150')	X			120				1	1
SS2	Floor of Discharge Tunnel (next ~235')		X		175				1	1
SS3	Floor of Discharge Tunnel (last ~315')			X	234				1	1
SS4	Ceiling of Discharge Tunnel (first ~150')	X					120		1	1
SS5	Ceiling of Discharge Tunnel (last ~550')			X			400		1	1
SS6-1 & 2	Walls of Discharge Tunnel (first ~150')	X				290			3	1
SS7-1 & 2	Walls of Discharge Tunnel (last ~550')			X		600			1	1
SS8-X	In DT – Seal Chambers (1, 2, & 3)	X						230	3	1

NOTES:

(a) "X" designates a sequential number starting with 1, and defines a survey unit within a survey area.

(b) This data was estimated with best available information. No survey unit, regardless of its classification will exceed 10,000 square meters.

(c) NRC Default Surface DCGLs = 1, Site Specific Volumetric DCGLs = 2: SNEC plans to use surface area DCGLs as noted in SSGS section. However, if geometry of surface is not appropriate for a surface area measurement then guidance as specified in LTP Chapter 6, Section 6.2.1 may need to be implemented.

Table 5-2 (continued)

Initial Classifications of Site Areas

Survey Unit Designations of the SNEC Facility and Surrounding Impacted Areas										
Survey Unit Number [a]	Description	Classification			Survey Unit Area (m^2) [b]				Number of Survey Units [b]	Type of DCGL Applied [c]
		1	2	3	Floor	Walls	Ceiling	Other		
SAXTON STEAM GENERATING STATION (SSGS), INTAKE, DISCHARGE & STEAM TUNNELS (cont'd)										
SS9	Spray Pump Pit Floor	X			120				1	1
SS10	Spray Pump Pit Walls Below 795' El.		X			20			1	1
SS11	Spray Pump Pit Walls Above 795' El.			X			100		1	1
SS12	SSGS Boiler Pad (811' El.)			X	1800				1	1
SS13-1 & 2	SSGS Firing Aisle (806' El.)			X	560	80			1	1
SS14-1 to 6	SSGS Basement Area Floor (790' El.)	X			420				6	1
SS15	SSGS Basement Walls – East End	X				100			1	1
SS16	SSGS Basement Walls Up to 2 Meters		X			240			1	1
SS17	SSGS Basement Walls > 2 Meters			X		350			1	1
SS18- X	Top of Seal Chambers		X		70				1	1
SS19-X	Section of SSGS Intake Tunnel Floor		X		493				3	1
SS20-X	Section of Intake Tunnel Walls		X			2150			3	1
SS21	Section of Intake Tunnel Ceiling			X			493		3	1
SS22-1 to 4	CV Steam Tunnel Remnants	X			20	45	15	< 30	4	1
SS23	Discharge Tunnel Access Area		X					97	1	1
SS24	Miscellaneous SSGS Area Concrete Slabs			X				< 400	1	1

NOTES:

(a) "X" designates a sequential number starting with 1, and defines a survey unit within a survey area.

(b) This data was estimated with best available information. No survey unit, regardless of its classification will exceed 10,000 square meters.

(c) NRC Default Surface DCGLs = 1, Site Specific Volumetric DCGLs = 2: SNEC plans to use surface area DCGLs as noted in SSGS section. However, if geometry of surface is not appropriate for a surface area measurement then guidance as specified in LTP Chapter 6, Section 6.2.1 may need to be implemented.

Table 5-2 (continued)

Initial Classifications of Site Areas

Survey Unit Designations of the SNEC Facility and Surrounding Impacted Areas										
Survey Unit Number [a]	Description	Classification			Survey Unit Area (m^2) [b]				Number of Survey Units [b]	Type of DCGL Applied [c]
		1	2	3	Floor	Walls	Ceiling	Other		
SAXTON STEAM GENERATING STATION (SSGS) SPRAY POND AREA										
SP1	Open Land Area		X					6600	1	2
SNEC FACILITY SITE OPEN LAND AREA										
OL1-1 to X	SNEC Facility Site & Near Site Area	X						11000	11	2
GPU ENERGY (PENELEC) SITE OPEN LAND AREA										
OL2-X	Westinghouse and Adjacent Areas [d]	X						5700	6	2
OL3	Warehouse Burn Area	X						200	1	2
OL4-X	Buffer Zones		X					5600	1	2
REMAINING IMPACTED OPEN LAND AREA										
OL5-X	Site Road Access Areas		X					20500	9	2
OL6-X	Stack Release Area (NNE)		X					14600	3	2
OL7-X	Stack Release Area (SSW)		X					12700	2	2
OL8-X	Buffer Zones			X				47900	5	2
WAREHOUSE (LARGE GARAGE - SOUTH) - PENELEC AREA										
WA1-X	Floor Slabs		X		450				2	1
WA2	Sump		X					< 10	1	1
WA3	Exterior Foundation Walls			X		374			1	1

NOTES:

(a) "X" designates a sequential number starting with 1, and defines a survey unit within a survey area.

(b) This data was estimated with best available information. No survey unit, regardless of its classification will exceed 10,000 square meters.

(c) NRC Default Surface DCGLs = 1, Site Specific Volumetric DCGLs = 2

(d) Includes substation yard drainage area.

Table 5-2 (continued)

Initial Classifications of Site Areas

Survey Unit Designations of the SNEC Facility and Surrounding Impacted Areas										
Survey Unit Number [a]	Description	Classification			Survey Unit Area (m^2) [b]				Number of Survey Units [b]	Type of DCGL Applied [c]
		1	2	3	Floor	Walls	Ceiling	Other		
GARAGE (SMALL GARAGE - SOUTHWEST) - PENELEC AREA										
GA1	Floor Slab		X		109				1	1
GA2	Sump		X					< 10	1	1
LINE SHACK - PENELEC AREA										
LS1-X	Floors & Walls Up to 2 Meters (Interior)		X		290	177			2	1
LS2-X	Upper Walls & Ceiling (Interior)		X			191	412		1	1
LS3	Exterior Walls			X		343			1	1
LS4	Roof		X				324		1	1
LS5	Roof Drainage System		X					<10	1	1, 2
LS6	Line Shack Attic Area		X					< 50	1	1
PENELEC SWITCHYARD BUILDING & YARD STRUCTURES										
PS1	Interior			X	55	89	55		1	1
PS2	Exterior Walls and Roof			X		151	68		1	1
PS3	Switchyard Units – Base Pads			X	<500				1	1

NOTES:

(a) "X" designates a sequential number starting with 1, and defines a survey unit within a survey area.

(b) This data was estimated with best available information. No survey unit, regardless of its classification will exceed 10,000 square meters.

(c) NRC Default Surface DCGLs = 1, Site Specific Volumetric DCGLs = 2

5.2.4.4 Changes in Classification

Changes in classification are based on survey data and other relevant information that indicates a different area classification is more appropriate. Changes in area classifications which decrease an area classification will be in accordance with License Condition 2.E.(h).

5.2.5 Final Survey Process

In general, FSS activities do not commence in the area to be surveyed until decontamination activities are believed to be complete and radioactive waste materials are removed. The FSS process begins with survey area preparation activities such as gridding and review of final remediation support survey information, as well as survey area walk-downs. Survey design calculations and the issuance of Survey Requests to field survey teams follow this phase. Field survey teams then collect the data and assemble the survey results in an organized and understandable format in accordance with site procedures. Data assessment and documentation concludes this process.

5.2.5.1 Survey Design Overview

Survey design, as described in Section 5.4, identifies relevant components of the FSS process and establishes the assumptions, methods, and performance criteria to be used. Areas ready for FSS are classified as Class 1, Class 2 or Class 3 and are divided into survey units. Systematic scan and static measurements are prescribed according to a pattern and frequency established for each classification. Investigation levels are established which, if exceeded, initiate an investigation of the survey data. A measurement from the survey unit that exceeds an investigation level may indicate a localized area of elevated residual radioactivity. Such locations are marked and investigated to determine the area and the level of the residual radioactivity present. Depending on the results of the investigation, the survey unit may require remediation, and/or re-survey or re-classification.

Quality Control (QC) measurements are prescribed to identify and control measurement error and uncertainty attributable to measurement methods or analytical procedures used in the data collection process. QC measurements provide qualitative and quantitative information to demonstrate that measurement results are sufficiently free of error and accurately represent the radiological condition of the SNEC Facility.

5.2.5.2 Survey Data Collection

As deemed appropriate, a final post-remediation survey is performed using similar instrumentation, quality control and survey techniques to be used in the FSS process. The review of the final post-remediation survey data is then carried out to verify that residual radioactivity levels are acceptable and that no additional remediation will be needed in the survey unit. If an area of elevated residual radioactivity is identified, and remediation is determined to be ALARA, the area is remediated and re-surveyed to ensure meeting FSS requirements. The data collected during the final post-remediation survey (when performed),

2. Planned dismantlement activities affecting or adjacent to the post remediation survey unit are completed, or are evaluated and determined to not have a reasonable potential to introduce radioactive material into the post remediation survey unit.

3. An operational radiation protection survey of the post remediation survey unit is completed and all outstanding items are addressed.

4. Planned physical work in, on, or around a post remediation survey unit, other than routine surveillance or maintenance, is complete.

5. Tools, non-permanent equipment, and material not needed for survey data collection are removed.

6. Housekeeping, clean up, and remediation of the survey unit are completed.

7. Scaffolding, temporary electrical and ventilation equipment and components, and other material or equipment needed for survey data collection is radiologically clean and left in place.

8. Transit paths to/through the post remediation survey unit are eliminated or re-routed.

9. Appropriate measures are instituted to prevent the re-introduction of radioactive material into isolated area from ventilation systems, drain lines, system vents, and other potential airborne and liquid contamination pathways.

10. Measures are instituted to control access and egress and otherwise restrict radioactive material from entering the survey unit.

5.3.3 Transfer of Control

Once a walk-down has been performed and the isolation criteria are met, control of activities within the post remediation survey unit is transferred from the dismantlement organization to the FSS team. The need for localized remediation within the isolated area may be identified after transfer of control. Localized remediation may be performed under the control of the FSS organization. However, if large areas require remediation, the isolated area may be transferred back to the dismantlement organization for further decontamination.

5.3.4 Isolation and Control Measures

Prior to performing the FSS, the post remediation survey unit is isolated and controlled. Routine access, equipment removal, material storage, and worker and material transit through the area without proper controls are no longer allowed. One or more of the following administrative and physical controls will be established to minimize the possibility of introducing radioactive material from ongoing decommissioning activities in adjacent or nearby areas.

1. Personnel training

2. Installation of barriers to control access to the area(s)

3. Installation of postings with access/egress requirements

4. Locking or otherwise securing entrances to the area

5. Installation of tamper-evident seals or labels

Isolation and control measures are implemented through approved facility procedures and remain in place through the FSS data collection process until license termination.

5.4 SURVEY DESIGN

The survey design identifies relevant components of the FSS process, and establishes the assumptions, methods, and performance criteria to be used. The methodology for planning a FSS, including a FSS in the subsurface region is identified in the applicable site procedure. Survey design is summarized in Table 5-5.

The application of survey design criteria to structures and land areas will vary based on the type of survey media and the relative potential for elevated residual radioactivity. For facility systems, many of the survey design criteria applicable to structures and land areas do not apply or are dictated by the physical system layout and the accessibility to the system piping and components. To accommodate these factors, the survey design integrates both non-systematic (random) and judgmental (biased) methods to data collection to achieve the overall objective of the final survey process. Survey design will be performed in accordance with SNEC procedures E900-ADM-4500.59, "Final Site Survey Planning" and E900-ADM-4500.58, "Treatment of Embedded Piping and Components".

Each survey design package will address the following areas of interest:

1. A brief overview describing the final status survey design;

2. A description and map or drawing of impacted areas of the site, area, or building classified by residual radioactivity levels (Class 1, Class 2, or Class 3) and divided into survey units, with an explanation of the basis for division into survey units and the boundaries for each survey unit or area indicated. Maps should have compass headings indicated;

3. A description of the background reference areas and materials, if they will be used, and a justification for their selection;

4. A summary of the statistical tests that will be used to evaluate the survey results, including the elevated measurement comparison, if Class 1 survey units are present, a justification for any test methods not included in MARSSIM, and the values for the decision errors (and) with a justification for values greater than 0.05;

5. A description of scanning instruments, methods, calibration, operational checks, coverage, and sensitivity for each media and radionuclide;

6. For *in-situ* sample measurements made by field instruments, a description of the instruments, calibration, operational checks, sensitivity, and sampling methods, with a demonstration that the instruments, and methods, have adequate sensitivity;

7. A description of the analytical instruments for measuring samples in the laboratory, including the calibration, sensitivity, and methodology for evaluation, with a demonstration that the instruments and methods have adequate sensitivity;

Table 5-12

Initial Survey Results and Conclusions When A Background Reference Area Is Not Used

Survey Result (Class 1 Areas)	Conclusion: Survey unit meets site release dose criteria	
	Yes	No
All measurements less than or equal to $DCGL_W$	✓	
Mean greater than $DCGL_W$		✓
Any measurement greater than DCGL with mean less than or equal to DCGL which passes Sign test	✓	
Any measurement greater than DCGL with mean less than or equal to DCGL which fails Sign test		✓

Table 5-13

Initial Survey Results and Conclusions When a Background Reference Area is Used

Survey Result (Class 1 Areas)	Conclusion: Survey unit meets site release dose criteria	
	Yes	No
Difference between maximum survey unit measurement and minimum background reference area measurement less than or equal to $DCGL_W$	✓	
Difference between survey unit mean and background reference area mean greater than $DCGL_W$		✓
Difference between any survey unit measurement and any background reference area measurement greater than $DCGL_W$, and difference between survey unit mean and background reference area mean less than or equal to $DCGL_W$ which passes WRS test	✓	
Difference between any survey unit measurement and any background reference area measurement greater than DCGL and difference between survey unit mean and background reference area mean less than or equal to $DCGL_W$ which fails WRS test		✓

5.6.4.2 Sign Test

The one-sample Sign statistical test is used if the radionuclide of concern is not present in background and radionuclide-specific measurements are made. The Sign test may also be used for gross activity measurements if one or more radionuclides are present in background at such small fractions of the $DCGL_W$ as to be considered insignificant. In this case, background concentrations of the radionuclides are included with the residual radioactivity (in other words, the entire amount is attributed to facility operations). Thus, the total concentration of the radionuclides is compared to the site release criteria. This option is only used if it is expected that ignoring the background concentration does not affect the outcome of the statistical test. The advantage of ignoring a small background concentration is that no background reference area is necessary.

The Sign test is applied as follows:

1. List the survey unit measurements, X_i, i = 1, 2, 3,. . .,n; where: n = the number of measurements.

2. Subtract X_i from the $DCGL_W$ to obtain the difference ($DCGL_W - X_i$, i=1, 2, 3...n).

3. Discard differences where the value is exactly zero and reduce n by the number of zero measurements.

4. Count the number of positive differences. The result is the test statistic S+. Note that a positive difference corresponds to a measurement below the $DCGL_W$ and contributes evidence that the survey unit meets the site release criteria.

Compare the value of S+ to the critical values in Appendix I, Section I.3 of NUREG-1575 (Reference 5-5). The Table columns equate to the false positive decision error rate, α. The value of α is the probability of passing a survey unit which actually fails to meet the site release criteria, which is obtained from the survey design (the initial value is 0.05 – see Appendix 5-2). If S+ is greater than the critical value for the false positive decision error rate given in the Table, the survey unit meets the site release criteria. If S+ is less than the critical value, the survey unit fails to meet the criterion.

5.6.4.3 Wilcoxon Rank Sum (WRS) Test

The two-sample WRS statistical test is used when the radionuclide of concern appears in background, or when a measurement method is used that is not radionuclide-specific. Because gross activity measurements are not radionuclide-specific, they should be performed for both the survey unit being evaluated by the WRS test and for the corresponding background reference area.

The WRS test is applied as follows:

1. Adjust the background reference area measurements by adding the $DCGL_W$ to each background reference area measurement, X_i (X_i + $DCGL_W$).

2. Sum the number of adjusted background reference area measurements, m, and the number of survey unit measurements, n, to obtain N (N = m + n).

3. Pool and rank the measurements in order of increasing size from 1 to N. If several

5. Survey measurement locations and corresponding survey data
6. Survey unit investigations performed with documented results, as applicable
7. Any survey unit data assessment results
8. Results of any special measurements performed for the survey unit

5.7.2 Final Survey Report

A final survey report (Reference 5-22) will be prepared and submitted to the NRC. The report will provide a summary of any ALARA analysis, survey data results, and overall conclusions, which demonstrate that the SNEC Facility and site meet the radiological criteria for unrestricted use. Information such as the number and type of measurements, basic statistical quantities, and statistical test results will be included in the report.

The following outline illustrates a general format that may be used for the final status survey report. The outline below may be adjusted to provide a clearer presentation of the information. The level of detail will be sufficient to clearly describe the final status survey program and certify the results.

Information to be submitted (Reference 5-4, Section 14.5):

1. A summary of the results of the final status survey.
2. A discussion of any changes that were made in the final status survey from what was proposed in the LTP or other prior submittals.
3. A description of the method by which the number of samples were determined for each survey unit (see Reference 5-5, Section 5.5.2).
4. A summary of the values used to determine the numbers of samples and a justification for these values (see Reference 5-5, Section 5.5.2).
5. Survey results for each survey unit including:
    - Number of samples taken for the survey unit.
    - A map or drawing of the survey unit showing the reference system and random start systematic sample locations for Class 1 and 2 survey units, and random locations shown for Class 3 survey units and reference areas.
    - Measured sample concentrations.
    - Statistical evaluation of the measured concentrations (see Reference 5-5, Section 8.3, 8.4 and 8.5).
    - Judgmental and miscellaneous sample data sets reported separately from those samples collected for performing the statistical evaluation.

- Discussion of anomalous data including any areas of elevated direct radiation detected during scanning that exceeded the investigation level or measurement locations in excess of the DCGLw.

- A statement that a given survey unit satisfied the DCGLw and the elevated measurement comparison if any sample points exceeded the DCGLw.

6. A description of any changes in initial survey unit assumptions relative to the extent of residual radioactivity.

7. When a survey unit failed, a description of the investigation conducted to ascertain the reason for the failure and a discussion of the impact that the failure has on the conclusion that the facility was ready for final radiological surveys.

8. If a survey unit failed, a description of the impact that the reason for the failure has on other survey unit information.

5.7.3 Other Reports

If requested by the NRC, computer-generated and/or summary data reports will be provided in hard copy or electronic form. Survey data include date, instrument, location, type of measurement, and mode of instrument operation. Other data, such as conversion factors, background reference areas, and the MDCs used, are available which will allow independent verification of the results. Measurement results will also be presented graphically. The FSS report will be independently reviewed.

Any independent verification survey performed will be performed by an organization outside the SNEC Facility staff and management organization. Reports generated as a result of any independent verification survey process initiated by the SNEC Facility, will be available upon request.

defined by existing facility physical features, such as a room, intersection of walls, column-and-row layout of a floor elevation, or structural I-beams.

24. Survey Location - In a structural or open land survey area, a survey location is usually represented by a single grid block. In a system survey area, a specified length of piping or a component such as a valve or tank is referred to as a survey location. A survey location can contain one or more survey points. Also referred to as measurement locations.

25. Survey Unit Release Record - A collection of information in a standardized format for controlling and documenting field measurements taken for the Final Status Survey. A survey unit release record is prepared for each survey area. The survey unit release record may include the survey instructions, a control form, grid map(s), survey measurement data sheets and survey maps. It may also be called a survey package.

26. Survey Point - A smaller subdivision within a survey location (grid block, system, component) where local measurements are taken. For structures and systems, a survey point generally refers to an area covered by a detector, or an area of 100 cm2 when a smear is taken. For open land areas, a survey point refers to the area covered by a detector (for paved surfaces), the point at which a dose rate measurement is taken, or the point at which a soil or pavement sample is collected.

27. Survey Unit - A geographical area consisting of structures or land areas of specified size and shape at a remediated site for which a separate decision will be made whether the unit attains the site-specific reference-based cleanup standard for the designated pollution parameter. Survey units are generally formed by grouping contiguous site areas with a similar use history and the same classification of contamination potential. Survey units are established to facilitate the survey process and the statistical analysis of survey data.

28. Total Effective Dose Equivalent (TEDE) - The sum of the deep dose equivalent (for external exposures) and the committed effective dose equivalent (for internal exposures).

29. Unity Rule - Where more than one radionuclide is present, the sum of the ratios of each radionuclide concentration to its respective DCGL should not exceed unity. When this method is used, the effective DCGL is equal to one (1).

5.9 REFERENCES

5-1 Code of Federal Regulations, Title 10, Part 50.82, "Termination of License"

5-2 Regulatory Guide 1.179, "Standard Format and Content of License Termination Plans for Nuclear Power Reactors," January 1999

5-3 Code of Federal Regulations, Title 10, Part 20.1402, "Radiological Criteria for Unrestricted Use"

5-4 NUREG-1727, "NMSS Decommissioning Standard Review Plan", September 2000.

5-5 NUREG-1575, Revision 1, "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)," August 2001

5-6 NUREG-1505, "A Nonparametric Statistical Methodology for the Design and Analysis of Final Status Decommissioning Surveys"

5-7 SNEC Facility Site Characterization Report, May, 1996

5-8 NUREG/CR-5512, "Residual Radioactive Contamination From Decommissioning, Final Report," Volume 1, October 1992

5-9 Draft NUREG-1549, "Using Decision Methods for Dose Assessment to Comply With Radiological Criteria for License Termination," July 1998

5-10 Yu, C. F. et al., Manual for Implementing Residual Radioactivity Materials Guidelines Using RESRAD, Environmental Assessment Division, Argonne National Laboratory

5-11 Yu, C. F. et al., RESRAD-Build, A Computer Model for Analyzing the Radiological Doses Resulting from the Remediation and Occupancy of Buildings Contaminated with Radioactive Material. Environmental Assessment Division, Argonne National Laboratory

5-12 Regulatory Guide 4.15, "Quality Assurance for Radiological Monitoring Programs (Normal Operations) – Effluent Streams and the Environment"

5-13 SNEC Procedure, 1000-PLN-3000.05, "SNEC Facility Decommissioning Quality Assurance Plan"

5-14 SNEC Procedure, E900-PLN-4542.01, "SNEC Radiation Protection Plan"

5-15 SNEC Procedure, E900-ADM-4500.44, "SNEC Facility Calculations"

5-16 SNEC Procedure, E900-ADM-4500.04, "SNEC Records Retention Procedure"

5-17 SNEC Procedure, E900-ADM-4500.12, "Radiological Surveys: Requirements & Documentation Procedure"

5-18 NUREG-1507, "Minimum Detectable Concentrations With Typical Radiation Survey Instruments for Various Contaminants and Field Conditions," June 1998

5-19 SNEC Facility Historical Site Assessment Report, January 2000

5-20 Deleted

5-21 SNEC Procedure, E900-ADM-4500.59, "Final Status Survey Planning and DQA"

5-22 SNEC Procedure, E900-ADM-4500.60, "Final Status Survey Report"

APPENDIX 5-1

ELEVATED MEASUREMENT COMPARISON (EMC)

The EMC, sometimes called a "hot spot test," is a simple comparison of measured values against a limit. There are two applications of this comparison in the final survey process. It is used when the sensitivity of the scanning technique is not sufficient to detect levels of residual radioactivity below the DCGL (i.e., where the MDC_{scan} is greater than the DCGL). In this application, the number of static measurements may need to be adjusted. Appendix 5-2 describes how this is done. The second application in this appendix, is when one or more scan or static measurement data points exceed the DCGL. The use of the EMC for measurements above the DCGL provides assurance that unusually large measurements receive the proper attention and that any area having the potential for significant dose contributions is identified. The EMC is intended to flag potential failures in the remediation process.

Locations, identified by scan or static measurements, with levels of residual radioactivity, which exceed the DCGL, are investigated (see Section 5.4.4). The size of the area where the elevated residual radioactivity exceeds the DCGL and the level of the residual radioactivity within the area are determined. The average level of residual radioactivity is then compared to the $DCGL_{EMC}$. If a background reference area is to be applied to the survey unit, the mean of the background reference area measurements may be added to the DCGL or the $DCGL_{EMC}$ to which the average level of residual radioactivity is compared.

The $DCGL_{EMC}$ is calculated using the following equation (NUREG-1575, Equation 8-1):

$$DCGL_{EMC} = Area\ Factor \times DCGL$$

The area factor is the multiple of the DCGL that is permitted in the area of elevated residual radioactivity without requiring remediation. The area factor is related to the size of the area over which the elevated residual radioactivity is distributed. That area, denoted A_{EMC}, is generally bordered by levels of residual radioactivity below the DCGL, and is determined by the investigation. The area factor is the ratio of dose per unit area or volume for the default surface area for the applicable dose modeling scenario to that generated using the area of elevated residual radioactivity, A_{EMC}. It is calculated based on the methodology given in chapter 8 of NUREG-1505 (Reference 5-6).

If the average level of the elevated residual radioactivity is less than the $DCGL_{EMC}$, there is reasonable assurance the site release criteria is still satisfied and the area does not require remediation. Radioactivity at the $DCGL_{EMC}$ distributed over the area A_{EMC} delivers the same calculated dose as does residual radioactivity at the DCGL distributed over the default surface area. If the $DCGL_{EMC}$ is exceeded, the area is remediated and resurveyed. Area factors for open land areas at the SNEC Facility are provided in Table 5-15. Area factors for surface area DCGLs supplied by the NRC are provided in Table 5-15A.