Alabama Power Company
40 Inverness Center Parkway
Post Office Box 1295
Birmingham, Alabama 35201
Telephone 205 868-5581

W. G. Hairston, III
Senior Vice President
Nuclear Operations

Alabama Power
the southern electric system

February 23, 1990

Docket Nos. 50-348
50-364

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

Joseph M. Farley Nuclear Plant
Radioactive Effluent Release Report

Gentlemen:

The Joseph M. Farley Nuclear Plant Semiannual Radioactive Effluent Release Report for the period of July 1, 1989 through December 31, 1989 is herewith submitted in accordance with the Unit 1 and Unit 2 Technical Specification Section 6.9.1.8.

If you have any questions, please contact our office.

Sincerely,

W. G. Hairston, III

WGH:DMH/db
Attachment

cc: Mr. S. D. Ebneter
Mr. E. A. Reeves
Mr. G. F. Maxwell

IE48
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ALABAMA POWER COMPANY
FARLEY NUCLEAR PLANT UNIT NO. ONE
LICENSE NO. NPF-2
AND
FARLEY NUCLEAR PLANT UNIT NO. TWO
LICENSE NO. NPF-8

SEMI-ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JULY 1, 1989 THROUGH DECEMBER 31, 1989

CONTENTS

CHAPTER 1

INTRODUCTION

This semi-annual radioactive release report, for the period July 1 through December 31, 1989, is submitted in accordance with Appendix A of License No.'s NPF-2 and NPF-8. Appendix A will hereinafter be referred to as the Technical Specifications or TS.

A single submittal is made for both units which combines those sections that are common. Separate tables of releases and release totals are included where separate processing systems exist.

This report includes an annual summary of hourly meteorological data collected over the past year and an assessment of the radiation doses due to the radioactive liquid and gaseous effluents released from the Farley Nuclear Plant site over the same period. Additionally Section 2.13 with associated dose contributions to sectors comprises an assessment of radiation doses to the likely most exposed member of the public from reactor releases and other nearby uranium fuel cycle sources (including doses from primary effluent pathways and direct radiation). All assessments of radiation doses are performed in accordance with the OFFSITE DOSE CALCULATION MANUAL (ODCM).

CHAPTER 2

SUPPLEMENTAL INFORMATION FOR EFFLUENT AND WASTE DISPOSAL

2.1 REGULATORY LIMITS

2.1.1 Fission And Activation Gases

1) The dose rate from the site at any time due to noble gases shall be less than or equal to 500 mrem/yr to the total body and 3000 mrem/yr to the skin.

2) The air dose from each reactor unit from the site during any calendar quarter due to noble gases shall be less than or equal to 5 mrad for gamma radiation and 10 mrad for beta radiation.

3) The air dose from each reactor unit from the site during any calendar year due to noble gases shall be less than or equal to 10 mrad for gamma radiation and 20 mrad for beta radiation.

2.1.2 Iodines And Particulates

1) The dose rate from the site at any time due to iodines, particulates and radionuclides with half-lives greater than 8 days shall be less than or equal to 1500 mrem/yr to any organ.

2) The dose from each reactor unit from the site during any calendar quarter due to iodines, particulates and radionuclides with half-lives greater than 8 days shall be less than or equal to 7.5 mrem to any organ.

3) The dose from each reactor unit from the site during any calendar year due to iodines, particulates and radionuclides with half-lives greater than 8 days shall be less than or equal to 15 mrem to any organ.

2.1.3 Liquid Effluents

1) The concentration of radioactive materials released in liquid effluents to unrestricted areas from all reactors at the site shall not exceed at any time the values specified in 10CFR Part 20, Appendix B, Table II, Column 2. The concentration of dissolved or entrained noble gases, released in liquid effluents to unrestricted areas from all reactors at the site, shall not exceed at any time 2E-4 uCi/ml in water.

2) The dose or dose commitment due to liquid effluents released from each reactor unit from the site during any calendar quarter shall be less than or equal to 1.5 mrem to the total body and 5 mrem to any organ.

3) The dose or dose commitment due to liquid effluents released from each reactor unit from the site during any calendar year shall be less than or equal to 3 mrem to the total body and 10 mrem to any organ.

2.2 MAXIMUM PERMISSIBLE CONCENTRATIONS

a) Airborne - The maximum permissible concentration of radioactive materials in gaseous effluents is limited by the dose rate restrictions of 10 CFR 20. In this case, the maximum permissible concentrations are actually determined by the dose factors in the ODCM.

b) Liquids - 10 CFR Part 20, Appendix B, Table II, Column 2. Note: The MPC chosen is the most conservative value of either the soluble or insoluble MPC for each isotope.

2.3 AVERAGE ENERGY

Not applicable for Farley's TS.

2.4 MEASUREMENTS AND APPROXIMATIONS OF TOTAL ACTIVITY

The following discussion details the methods used to measure and approximate total activity for the following:

a. Fission and Activation Gases
b. Iodines and Particulates
c. Liquid Effluents

SUPPLEMENTAL INFORMATION FOR EFFLUENT AND WASTE DISPOSAL MEASUREMENTS AND APPROXIMATIONS OF TOTAL ACTIVITY

Tables 5 and 6 give sampling frequencies and minimum detectable concentration requirements for the analysis of gaseous and liquid effluent streams, respectively.

Values in the attached tables given as zero do not mean that the nuclides were not present. A zero indicates that the nuclide was not detected at levels greater than the sensitivity requirements shown in Tables 5 and 6. For some nuclides, lower detection limits than required may be readily achievable; when a nuclide is measured below its stated limit, it is reported.

2.4.1 Fission And Activation Gases

The following noble gases are considered in evaluating gaseous airborne discharge:

Kr-87	Xe-133
Kr-88	Xe-135
Xe-133m	Xe-138

Periodic grab samples from plant effluent streams are analyzed by a computerized pulse height analyzer system utilizing high resolution germanium detectors. (See Table 5 for sampling and analytical requirements). Isotopic values thus obtained are used for release rate calculations as specified in the ODCM. Only those nuclides that are detected are used in this computation. During the period between grab samples, the amount of radioactivity released is based on the effluent monitor readings.

The monitor meter response (cpm/uCi/ml) and the background (cpm) are used to adjust the activity released for variations in monitor readings, as described in the ODCM.

To ensure isotopic distributions do not change significantly during major operational occurrences, the frequency of grab sampling is increased to satisfy the requirements of footnotes (b) and (d) of TS Table 4.11-2, "Radioactive Gaseous Waste Sampling and Analysis Program".

2.4.2 Iodines And Particulates

The radioiodines and radioactive materials in particulate forms to be considered are:

Mn-54	I-131
Fe-59	I-133

Co-58	Cs-134
Co-60	Cs-137
Zn-65	Ce-141
Sr-89	Ce-144
Sr-90	*H-3
Mo-99	

Other nuclides with half-lives greater than 8 days which are identified and measured are also considered. The MDC's will vary and are not required to meet the MDC limits of those isotopes listed specifically.

* Tritium is considered in the gaseous or water vapor form.

Continuous Releases: Continuous sampling is performed on the continuous release points (i.e. the Plant Vent Stack, Containment Purge and the Turbine Building Vent). Particulate material is collected by filtration. Periodically these filters are removed and analyzed on the pulse height analyzer to identify and quantify radioactive materials collected on the filters. Particulate filters are then analyzed for gross alpha and strontium as required. Gross alpha determinations are made using a 2 pi gas flow proportional counter. Sr-89 and 90 values are obtained by chemical separation and subsequent analysis using 2 pi gas flow proportional counters.

Batch Releases: The processing of batch type releases (from Containment or Waste Gas Decay Tanks) is analogous to continuous releases, except that the release is not commenced until samples have been obtained and analyzed.

2.4.3 Liquid Effluents

The radionuclides listed below are considered when evaluating liquid effluents:

Mn-54	I-131
Fe-59	Cs-134
Co-58	Cs-137
Co-60	Ce-141
Zn-65	Ce-144
Sr-89	Mo-99
Sr-90	Fe-55
	H-3

Batch Releases: Representative pre-release grab samples are obtained and analyzed per Table 6. Isotopic analyses are performed using the computerized pulse height analysis system

previously described. Aliquots of each pre-release sample proportional to the waste volume released are composited in accordance with requirements in Table 6. Strontium determinations are made by performing a chemical separation and counting the isotope thus separated using a 2 pi gas flow proportional counter. Gross beta and gross alpha determinations are made using 2 pi gas flow proportional counters. Tritium and Iron 55 determinations are made using liquid scintillation techniques. Dissolved gases are determined employing grab sampling techniques and then counting on the pulse height analyzer.

Continuous Releases: Continuous releases (from the Steam Generator Blowdown) are analogous to that of the batch releases except that they are analyzed on a weekly composite basis per Table 6.

2.5 BATCH RELEASES AND ABNORMAL RELEASES

Batch releases and abnormal (non-routine) releases from units 1 and 2 are shown on the following pages.

SUPPLEMENTAL INFORMATION FOR EFFLUENT AND WASTE DISPOSAL
BATCH RELEASES AND ABNORMAL RELEASES

BATCH RELEASES - UNIT 1

	QUARTER 3	QUARTER 4
LIQUIDS RELEASE(S):	ALL	
Number of batch releases	193.	211.
Total time period for batch releases (min)	16405.	18190.
Maximum time period for a batch release (min)	105.	366.
Average time period for a batch release (min)	85.	86.
Minimum time period for a batch release (min)	61.	65.
Average stream flow during periods of release (cfs)	★ 9.27E+03	★ 1.20E+04
GASES RELEASE(S):	ALL	
Number of batch releases	3.	9.
Total time period for batch releases (min)	1449.	4593.
Maximum time period for a batch release (min)	661.	1013.
Average time period for a batch release (min)	483.	510.
Minimum time period for a batch release (min)	364.	13.

★ Average River Flow Rate, taken at Walter F. George Lock and Dam, located 30.7 miles above Farley Nuclear Plant.

SUPPLEMENTAL INFORMATION FOR EFFLUENT AND WASTE DISPOSAL
BATCH RELEASES AND ABNORMAL RELEASES

ABNORMAL RELEASES - UNIT 1

	QUARTER 3	QUARTER 4
LIQUIDS		
Number of releases	0.	0.
Total activity released	0.00E+00	0.00E+00
GASES		
Number of releases	0.	0.
Total activity released	0.00E+00	0.00E+00

SUPPLEMENTAL INFORMATION FOR EFFLUENT AND WASTE DISPOSAL
BATCH RELEASES AND ABNORMAL RELEASES

BATCH RELEASES - UNIT 2

	QUARTER 3	QUARTER 4
LIQUIDS RELEASE(S):	ALL	
Number of batch releases	61.	84.
Total time period for batch releases (min)	5986.	8129.
Maximum time period for a batch release (min)	220.	130.
Average time period for a batch release (min)	98.	97.
Minimum time period for a batch release (min)	85.	80.
Average stream flow during periods of release (cfs)	★ 9.27E+03	★ 1.20E+04
GASES RELEASE(S):	ALL	
Number of batch releases	0.	0.
Total time period for batch releases (min)	0.	0.
Maximum time period for a batch release (min)	0.	0.
Average time period for a batch release (min)	0.	0.
Minimum time period for a batch release (min)	0.	0.

★ Average River Flow Rate, taken at Walter F. George Lock and Dam, located 30.7 miles above Farley Nuclear Plant.

SUPPLEMENTAL INFORMATION FOR EFFLUENT AND WASTE DISPOSAL
BATCH RELEASES AND ABNORMAL RELEASES

ABNORMAL RELEASES - UNIT 2

	QUARTER 3	QUARTER 4
LIQUIDS		
Number of releases	0.	0.
Total activity released	0.00E+00	0.00E+00
GASES		
Number of releases	0.	0.
Total activity released	0.00E+00	0.00E+00

2.6 ESTIMATE OF TOTAL ERROR

2.6.1 Liquid

1) The maximum error associated with volume and flow measurements, based upon plant calibration practice is estimated to be + or - 10%.

2) The average error associated with counting is estimated to be less than + or - 15%.

2.6.2 Gaseous

1) The maximum errors associated with monitor readings sample flow, vent flow, sample collection, monitor calibration and laboratory procedure are collectively estimated to be:

Fission and Activation Gases	Iodine	Particulates	Tritium
75%	60%	50%	45%

2) The average error associated with counting is estimated to be:

Fission and Activation Gases	Iodine	Particulates	Tritium
19%	28%	20%	8%

2.6.3 Solid Radwaste

The error involved in determining the contents of solid radwaste shipments is estimated to be less than + or - 15%.

SUPPLEMENTAL INFORMATION FOR EFFLUENT AND WASTE DISPOSAL
ESTIMATE OF TOTAL ERROR

UNIT 1
1989

2.7 SOLID WASTE

See Table 3

2.8 RADIOLOGICAL IMPACT ON MAN

The doses from liquid and gaseous releases for units 1 and 2 are shown on the following pages.

SUPPLEMENTAL INFORMATION FOR EFFLUENT AND WASTE DISPOSAL
RADIOLOGICAL IMPACT ON MAN

DOSES FROM LIQUID AND GASEOUS EFFLUENTS - UNIT 1 (mrem) *

	QUARTER 3	QUARTER 4
LIQUIDS RELEASE(S): ALL		
Bone	5.09E-03	4.32E-02
Liver	9.72E-03	6.72E-02
Whole body	7.38E-03	4.72E-02
Thyroid	1.79E-03	7.58E-04
Kidney	4.44E-03	2.30E-02
Lung	2.67E-03	8.16E-03
GI - LLI	1.21E-02	1.18E-01
GASES RELEASE(S): ALL		
NOBLE GASES		
Whole body	2.88E-03	9.11E-04
Skin	1.48E-03	4.81E-04
PARTICULATE AND IODINE		
Bone	1.20E-05	3.36E-05
Liver	2.13E-03	1.09E-03
Whole body	2.12E-03	1.07E-03
Thyroid	6.73E-03	1.39E-02
Kidney	2.13E-03	1.09E-03
Lung	2.12E-03	1.05E-03
GI - LLI	2.12E-03	1.05E-03
Skin	9.15E-08	2.65E-07

* All doses in mrem except noble gas doses which are in mrad.

SUPPLEMENTAL INFORMATION FOR EFFLUENT AND WASTE DISPOSAL
RADIOLOGICAL IMPACT ON MAN

DOSES FROM LIQUID AND GASEOUS EFFLUENTS - UNIT 2 (mrem) ★

	QUARTER 3	QUARTER 4
LIQUIDS	RELEASE(S): ALL	
Bone	7.14E-03	8.34E-04
Liver	1.29E-02	2.07E-03
Whole body	9.68E-03	1.72E-03
Thyroid	5.75E-04	8.31E-04
Kidney	4.68E-03	1.25E-03
Lung	1.94E-03	9.81E-04
GI - LLI	1.03E-02	1.06E-01
GASES	RELEASE(S): ALL	
NOBLE GASES		
Whole body	3.76E-03	2.23E-03
Skin	1.33E-03	7.87E-04
PARTICULATE AND IODINE		
Bone	0.00E+00	0.00E+00
Liver	6.65E-03	2.12E-03
Whole body	6.65E-03	2.12E-03
Thyroid	6.65E-03	2.12E-03
Kidney	6.65E-03	2.12E-03
Lung	6.65E-03	2.12E-03
GI - LLI	6.65E-03	2.12E-03
Skin	0.00E+00	0.00E+00

★ All doses in mrem except noble gas doses which are in mrad.

2.9 METEOROLOGICAL DATA

See Table 4A, "Cumulative Joint Frequency Distribution".

Continuous Release Mode:

3rd Quarter, 1989 : 4A-CQ3
4th Quarter, 1989 : 4A-CQ4

Batch Release Mode (Units 1 and 2):

3rd Quarter, 1989 : 4A-1BQ3 and 4A-2BQ3
4th Quarter, 1989 : 4A-1BQ4 and 4A-2BQ4

2.10 MINIMUM DETECTABLE CONCENTRATION (MDC)

Detectable limits for activity analyses are based upon the technical feasibility and on the potential significance in the environment of the quantities released. However, in practice, when an isotope's a posteriori MDC could not be met due to other nuclides being present in much greater concentrations, the a priori MDC as defined in the TS table 4.11-1 a. is relied upon.

2.11 DEVIATIONS FROM LIQUID WASTE RELEASE PROGRAM

A deviation from the Liquid Waste Release Program occurred on Unit 2 during Quarter 4 in that the Waste Monitor Tank pumps were determined to have flow less than design,resulting in insufficient required recirculation times prior to sampling. A subsequent evaluation revealed that the recirculation obtained was adequate to provide representative samples, therefore there was no significant impact on liquid doses. A correction factor was then used to calculate recirculation times until the pumps could be repaired.

2.12 DEVIATIONS FROM GASEOUS WASTE RELEASE PROGRAM

Two deviations from the Gaseous Waste Release Program occurred on Unit 1 during Quarter 1. A continuous sample was not obtained on the Unit 1 Containment Purge the week of August 9 due to the sample pump having been unplugged. Also the Plant Vent Stack and Containment Purge filters for the week of August 28 were inadvertently disposed of prior to being used for compositing.

2.13 ANNUAL RADIATION DOSE ASSESSMENT (1989)

DOSES FROM LIQUID AND GASEOUS EFFLUENTS (mrem) *

LIQUIDS	RELEASE(S): ALL	
	Bone	6.49E-02
	Liver	1.12E-01
	Whole body	8.18E-02
	Thyroid	1.08E-02
	Kidney	4.44E-02
	Lung	2.22E-02
	GI - LLI	3.08E-01
GASES	RELEASE(S): ALL	
	NOBLE GASES	
	Whole body	1.69E-02
	Skin	1.61E-02
	PARTICULATE AND IODINE	
	Bone	4.62E-05
	Liver	3.63E-02
	Whole body	3.63E-02
	Thyroid	5.39E-02
	Kidney	3.63E-02
	Lung	3.63E-02
	GI - LLI	3.63E-02
	Skin	3.95E-07

* All doses in mrem except noble gas doses which are in mrad.

SUPPLEMENTAL INFORMATION FOR EFFLUENT AND WASTE DISPOSAL
ANNUAL RADIATION DOSE ASSESSMENT (1989)

Maximum Real Exposure

The maximum real exposure is an assessment of radiation doses to the likely most exposed member of the public from reactor releases and other nearby uranium fuel cycle sources including doses from all primary effluent pathways and direct radiation (liquid pathways are limited to the Chattahoochee River) for the previous 12 consecutive months in conformance with 40 CFR 190.

A tabulation of doses to sixteen 22.5 degree sectors around the plant calculated at the site boundary provides the quarterly and yearly dose for each sector. The dose or dose commitment to any member of the public due to releases of radioactivity and radiation from uranium fuel cycle sources are limited to less than or equal to 25 mrem to the total body or an organ (except the thyroid which is limited to less than or equal to 75 mrem) over 4 consecutive quarters. This technical specification is provided to meet the dose limitations of 40 CFR 190.

Since the Farley Nuclear Plant is the only uranium fuel cycle source within a radius of 50 miles, the dose to any member of the public will be less than the dose in the highest sector. The tabulation below includes the quarterly and yearly doses from the highest sector for each of the following:

1. Gaseous iodine / particulate

2. Noble gases

3. Direct Radiation (Direct radiation data are actual field measurements made by thermoluminescent dosimetry as opposed to calculated data based on effluents. It should be noted that the direct radiation values reported herein include background radiation. Based on preoperational data, the reported direct radiation doses are essentially attributable to background radiation.)

SUPPLEMENTAL INFORMATION FOR EFFLUENT AND WASTE DISPOSAL
ANNUAL RADIATION DOSE ASSESSMENT (1989)

MAXIMUM OFF-SITE DOSES

Dose, Millirems ★

Source	Note	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	Year
Liquid effluents	(1)	Organ LIV 1.23E-02	GI 5.34E-02	LIV 2.26E-02	GI 2.24E-01	GI 3.08E-01
Iodines and Particulates	(2)	Organ THY 1.06E-02	THY 1.39E-02	THY 1.34E-02	THY 1.60E-02	THY 5.39E-02
Noble gases	(2)	Organ SKIN 1.12E-02	SKIN 9.30E-04	WB 6.64E-03	WB 3.14E-03	WB 1.69E-02
Direct radiation	(3)	Sector E 2.46E+01	NE 2.52E+01	SE 2.36E+01	E 2.52E+01	NE 8.06E+01

Note:

1. The liquid effluent total body and organ doses are determined by the fish pathway. These are calculated using the bioaccumulation factors, dose conversion factors, and assumptions of Regulatory Guide 1.109 (October 1977).

2. Gaseous effluent doses are calculated using annual average X/Q methodology per NUREG-0133 (October 1978).

3. Direct radiation was assessed using thermoluminescent dosimetry. Two dosimeters containing three LiF TLD chips were placed at selected locations within each of 16 sectors around the plant. These chips were collected and read quarterly and annually.

★ All doses in mrem except noble gas doses which are in mrad.

CHAPTER 3

TABLE 1A-1

GASEOUS EFFLUENTS -- SUMMATION OF RELEASE(S): ALL - UNIT 1

	UNITS	QUARTER 3	QUARTER 4	
A. FISSION AND ACTIVATION GASES				
1. TOTAL RELEASE	Ci	1.90E+01	8.04E+00	
2. AVERAGE RELEASE RATE FOR PERIOD	uCi/SEC	2.39E+00	1.01E+00	
3. PERCENT OF TECHNICAL SPECIFICATION LIMIT	%	4.37E-03	1.38E-03	(T.BODY) *
4. PERCENT OF TECHNICAL SPECIFICATION LIMIT	%	1.13E-03	3.55E-04	(SKIN) **
B. IODINES				
1. TOTAL IODINE-131	Ci	9.53E-06	2.66E-05	
2. AVERAGE RELEASE RATE FOR PERIOD	uCi/SEC	1.20E-06	3.35E-06	
3. PERCENT OF TECHNICAL SPECIFICATION LIMIT	%	2.46E-03	6.89E-03	(ORGAN) ***

* [(Quarterly T. Body Dose x 4)/(250 mrem/yr limit)] x 100
** [(Quarterly Skin Dose x 4)/(1500 mrem/yr limit)] x 100
*** [(Quarterly I-131 Dose x 4)/(750 mrem/yr limit)] x 100

TABLE 1A-1

GASEOUS EFFLUENTS -- SUMMATION OF RELEASE(S): ALL - UNIT 1

	UNITS	QUARTER 3	QUARTER 4	
C. PARTICULATES				
1. PARTICULATES WITH HALF-LIVES >8 DAYS	Ci	0.00E+00	0.00E+00	
2. AVERAGE RELEASE RATE FOR PERIOD	uCi/SEC	0.00E+00	0.00E+00	
3. PERCENT OF TECHNICAL SPECIFICATION LIMIT	%	0.00E+00	0.00E+00	(ORGAN) *
4. GROSS ALPHA RADIOACTIVITY	Ci	3.05E-08	1.29E-07	
D. TRITIUM				
1. TOTAL RELEASE	Ci	1.27E+01	8.44E+00	
2. AVERAGE RELEASE RATE FOR PERIOD	uCi/SEC	1.60E+00	1.06E+00	
3. PERCENT OF TECHNICAL SPECIFICATION LIMIT	%	6.71E-03	3.32E-03	(ORGAN) **

* [(Quarterly Particulate Dose x 4)/(750 mrem/yr limit)] x 100
** [(Quarterly Tritium Dose x 4)/(750 mrem/yr limit)] x 100

CHAPTER 4

TABLE 1A-2

GASEOUS EFFLUENTS -- SUMMATION OF RELEASE(S): ALL - UNIT 2

	UNITS	QUARTER 3	QUARTER 4	
A. FISSION AND ACTIVATION GASES				
1. TOTAL RELEASE	Ci	1.18E+01	7.01E+00	
2. AVERAGE RELEASE RATE FOR PERIOD	uCi/SEC	1.48E+00	8.82E-01	
3. PERCENT OF TECHNICAL SPECIFICATION LIMIT	%	5.71E-03	3.39E-03	(T.BODY) *
4. PERCENT OF TECHNICAL SPECIFICATION LIMIT	%	1.39E-03	8.27E-04	(SKIN) **
B. IODINES				
1. TOTAL IODINE-131	Ci	0.00E+00	0.00E+00	
2. AVERAGE RELEASE RATE FOR PERIOD	uCi/SEC	0.00E+00	0.00E+00	
3. PERCENT OF TECHNICAL SPECIFICATION LIMIT	%	0.00E+00	0.00E+00	(ORGAN) ***

* [(Quarterly T. Body Dose x 4)/(250 mrem/yr limit)] x 100
** [(Quarterly Skin Dose x 4)/(1500 mrem/yr limit)] x 100
*** [(Quarterly I-131 Dose x 4)/(750 mrem/yr limit)] x 100

TABLE 1A-2

GASEOUS EFFLUENTS -- SUMMATION OF RELEASE(S): ALL - UNIT 2

	UNITS	QUARTER 3	QUARTER 4	
C. PARTICULATES				
1. PARTICULATES WITH HALF-LIVES >8 DAYS	Ci	0.00E+00	0.00E+00	
2. AVERAGE RELEASE RATE FOR PERIOD	uCi/SEC	0.00E+00	0.00E+00	
3. PERCENT OF TECHNICAL SPECIFICATION LIMIT	%	0.00E+00	0.00E+00	(ORGAN) *
4. GROSS ALPHA RADIOACTIVITY	Ci	1.18E-08	6.86E-08	
D. TRITIUM				
1. TOTAL RELEASE	Ci	3.76E+01	1.20E+01	
2. AVERAGE RELEASE RATE FOR PERIOD	uCi/SEC	4.74E+00	1.51E+00	
3. PERCENT OF TECHNICAL SPECIFICATION LIMIT	%	2.11E-02	6.73E-03	(ORGAN) **

* [(Quarterly Particulate Dose x 4)/(750 mrem/yr limit)] x 100
** [(Quarterly Tritium Dose x 4)/(750 mrem/yr limit)] x 100

CHAPTER 5

TABLE 1B-1

GASEOUS EFFLUENTS - Elevated Releases RELEASE(S): ALL - UNIT 1

NUCLIDES RELEASED	UNITS	CONTINUOUS MODE QUARTER 3	CONTINUOUS MODE QUARTER 4	BATCH MODE QUARTER 3	BATCH MODE QUARTER 4
1. FISSION AND ACTIVATION GASES					
AR-41	Ci	7.94E+00	2.55E+00	0.00E+00	0.00E+00
KR-85	Ci	0.00E+00	0.00E+00	3.02E-01	2.05E-01
XE-131M	Ci	0.00E+00	0.00E+00	6.34E-03	3.18E-02
XE-133	Ci	6.38E+00	3.32E+00	1.68E-01	1.03E+00
XE-135	Ci	4.22E+00	9.00E-01	0.00E+00	0.00E+00
TOTAL FOR PERIOD (ABOVE)	Ci	1.85E+01	6.77E+00	4.77E-01	1.27E+00

TABLE 1B-1

GASEOUS EFFLUENTS - Elevated Releases RELEASE(S): ALL - UNIT 1

NUCLIDES RELEASED	UNITS	CONTINUOUS MODE QUARTER 3	CONTINUOUS MODE QUARTER 4	BATCH MODE QUARTER 3	BATCH MODE QUARTER 4
2. IODINES					
I-131	Ci	9.53E-06	2.66E-05	0.00E+00	3.38E-09
I-133	Ci	0.00E+00	7.14E-06	0.00E+00	0.00E+00
TOTAL FOR PERIOD (ABOVE)	Ci	9.53E-06	3.37E-05	0.00E+00	3.38E-09

TABLE 1E-1

GASEOUS EFFLUENTS - Elevated Releases RELEASE(S): ALL - UNIT 1

NUCLIDES RELEASED	UNITS	CONTINUOUS MODE QUARTER 3	CONTINUOUS MODE QUARTER 4	BATCH MODE QUARTER 3	BATCH MODE QUARTER 4
3. PARTICULATES					
H-3	Ci	1.27E+01	8.44E+00	0.00E+00	0.00E+00
G.ALPHA	Ci	3.05E-08	1.29E-07	3.59E-14	1.31E-13
TOTAL FOR PERIOD (ABOVE)	Ci	1.27E+01	8.44E+00	3.59E-14	1.31E-13

CHAPTER 6

TABLE 1B-2

GASEOUS EFFLUENTS - Elevated Releases RELEASE(S): ALL - UNIT 2

		CONTINUOUS MODE		BATCH MODE	
NUCLIDES RELEASED	UNITS	QUARTER 3	QUARTER 4	QUARTER 3	QUARTER 4
1. FISSION AND ACTIVATION GASES					
AR-41	Ci	1.18E+01	7.01E+00	0.00E+00	0.00E+00
TOTAL FOR PERIOD (ABOVE)	Ci	1.18E+01	7.01E+00	0.00E+00	0.00E+00

TABLE 1B-2

GASEOUS EFFLUENTS - Elevated Releases RELEASE(S): ALL - UNIT 2

		CONTINUOUS MODE		BATCH MODE	
NUCLIDES RELEASED	UNITS	QUARTER 3	QUARTER 4	QUARTER 3	QUARTER 4
2. IODINES					
TOTAL FOR PERIOD (ABOVE)	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TABLE 1B-2

GASEOUS EFFLUENTS - Elevated Releases RELEASE(S): ALL - UNIT 2

NUCLIDES RELEASED	UNITS	CONTINUOUS MODE QUARTER 3	CONTINUOUS MODE QUARTER 4	BATCH MODE QUARTER 3	BATCH MODE QUARTER 4
3. PARTICULATES					
H-3	Ci	3.76E+01	1.20E+01	0.00E+00	0.00E+00
G.ALPHA	Ci	1.18E-08	6.86E-08	0.00E+00	0.00E+00
TOTAL FOR PERIOD (ABOVE)	Ci	3.76E+01	1.20E+01	0.00E+00	0.00E+00

CHAPTER 7

TABLE 1C-1

GASEOUS EFFLUENTS - Ground Level Releases RELEASE(S): ALL - UNIT 1

NUCLIDES RELEASED	UNITS	CONTINUOUS MODE QUARTER 3	CONTINUOUS MODE QUARTER 4	BATCH MODE QUARTER 3	BATCH MODE QUARTER 4
1. FISSION AND ACTIVATION GASES					
XE-135	Ci	1.79E-06	0.00E+00	0.00E+00	0.00E+00
TOTAL FOR PERIOD (ABOVE)	Ci	1.79E-06	0.00E+00	0.00E+00	0.00E+00

TABLE 1C-1

GASEOUS EFFLUENTS - Ground Level Releases RELEASE(S): ALL - UNIT 1

		CONTINUOUS MODE		BATCH MODE	
NUCLIDES RELEASED	UNITS	QUARTER 3	QUARTER 4	QUARTER 3	QUARTER 4
2. IODINES					
TOTAL FOR PERIOD (ABOVE)	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TABLE 1C-1

GASEOUS EFFLUENTS - Ground Level Releases RELEASE(S): ALL - UNIT 1

NUCLIDES RELEASED	UNITS	CONTINUOUS MODE QUARTER 3	CONTINUOUS MODE QUARTER 4	BATCH MODE QUARTER 3	BATCH MODE QUARTER 4
3. PARTICULATES					
H-3	Ci	3.65E-03	4.50E-04	0.00E+00	0.00E+00
TOTAL FOR PERIOD (ABOVE)	Ci	3.65E-03	4.50E-04	0.00E+00	0.00E+00

CHAPTER 8

TABLE 1C-2

GASEOUS EFFLUENTS - Ground Level Releases RELEASE(S): ALL - UNIT 2

		CONTINUOUS MODE		BATCH MODE	
NUCLIDES RELEASED	UNITS	QUARTER 3	QUARTER 4	QUARTER 3	QUARTER 4
1. FISSION AND ACTIVATION GASES					
XE-133	Ci	8.04E-08	0.00E+00	0.00E+00	0.00E+00
TOTAL FOR PERIOD (ABOVE)	Ci	8.04E-08	0.00E+00	0.00E+00	0.00E+00

TABLE 1C-2

GASEOUS EFFLUENTS - Ground Level Releases RELEASE(S): ALL - UNIT 2

		CONTINUOUS MODE		BATCH MODE	
NUCLIDES RELEASED	UNITS	QUARTER 3	QUARTER 4	QUARTER 3	QUARTER 4
2. IODINES					
TOTAL FOR PERIOD (ABOVE)	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TABLE 1C-2

GASEOUS EFFLUENTS - Ground Level Releases RELEASE(S): ALL - UNIT 2

		CONTINUOUS MODE		BATCH MODE	
NUCLIDES RELEASED	UNITS	QUARTER 3	QUARTER 4	QUARTER 3	QUARTER 4
3. PARTICULATES					
H-3	Ci	2.80E-03	1.65E-03	0.00E+00	0.00E+00
TOTAL FOR PERIOD (ABOVE)	Ci	2.80E-03	1.65E-03	0.00E+00	0.00E+00

CHAPTER 9

TABLE 2A-1

LIQUID EFFLUENTS -- SUMMATION OF RELEASE(S): ALL - UNIT 1

	UNITS	QUARTER 3	QUARTER 4	
A. FISSION AND ACTIVATION PRODUCTS				
1. TOTAL RELEASE (EXCL. TRIT., GASES, ALPHA)	Ci	8.80E-03	4.20E-02	
2. AVERAGE DILUTED CONC. DURING PERIOD	uCi/ml	5.74E-10	3.01E-09	
3. PERCENT OF APPLICABLE LIMIT	%	1.36E-03	4.88E-03	*
B. TRITIUM				
1. TOTAL RELEASE	Ci	2.89E+02	1.11E+02	
2. AVERAGE DILUTED CONC. DURING PERIOD	uCi/ml	1.88E-05	7.94E-06	
3. PERCENT OF APPLICABLE LIMIT	%	6.23E-01	2.63E-01	**

* (Summation of Fission and Activation Products C/MPC) x 100
** (Tritium C/MPC) x 100

TABLE 2A-1

LIQUID EFFLUENTS -- SUMMATION OF RELEASE(S): ALL - UNIT 1

	UNITS	QUARTER 3	QUARTER 4	
C. DISSOLVED AND ENTRAINED GASES				
1. TOTAL RELEASE	Ci	2.14E-02	5.65E-03	
2. AVERAGE DILUTED CONC. DURING PERIOD	uCi/ml	1.40E-09	4.04E-10	
3. PERCENT OF APPLICABLE LIMIT	%	6.95E-04	2.01E-04	*
D. GROSS ALPHA RADIOACTIVITY				
1. TOTAL RELEASE	Ci	5.61E-06	4.52E-06	
E. VOLUME WASTE RELEASED (PRIOR TO DILUTION)	LITERS	1.07E+08	8.36E+07	
F. VOLUME DILUTION WATER USED DURING PERIOD	LITERS	1.53E+10	1.40E+10	

* (Dissolved and Entrained Gases Concentration)/(2.00E-04) x 100

CHAPTER 10

TABLE 2A-2

LIQUID EFFLUENTS -- SUMMATION OF RELEASE(S): ALL - UNIT 2

	UNITS	QUARTER 3	QUARTER 4	
A. FISSION AND ACTIVATION PRODUCTS				
1. TOTAL RELEASE (EXCL. TRIT., GASES, ALPHA)	Ci	7.67E-03	3.49E-02	
2. AVERAGE DILUTED CONC. DURING PERIOD	uCi/ml	4.95E-10	2.33E-09	
3. PERCENT OF APPLICABLE LIMIT	%	9.15E-04	2.15E-03	*
B. TRITIUM				
1. TOTAL RELEASE	Ci	9.00E+01	1.34E+02	
2. AVERAGE DILUTED CONC. DURING PERIOD	uCi/ml	5.82E-06	8.94E-06	
3. PERCENT OF APPLICABLE LIMIT	%	1.92E-01	2.96E-01	**

* (Summation of Fission and Activation Products C/MPC) x 100
** (Tritium C/MPC) x 100

TABLE 2A-2

LIQUID EFFLUENTS -- SUMMATION OF RELEASE(S): ALL - UNIT 2

	UNITS	QUARTER 3	QUARTER 4	
C. DISSOLVED AND ENTRAINED GASES				
1. TOTAL RELEASE	Ci	1.35E-02	9.03E-04	
2. AVERAGE DILUTED CONC. DURING PERIOD	uCi/ml	8.72E-10	6.04E-11	
3. PERCENT OF APPLICABLE LIMIT	%	4.33E-04	3.00E-05	*
D. GROSS ALPHA RADIOACTIVITY				
1. TOTAL RELEASE	Ci	1.39E-06	5.40E-06	
E. VOLUME WASTE RELEASED (PRIOR TO DILUTION)	LITERS	1.14E+08	1.11E+08	
F. VOLUME DILUTION WATER USED DURING PERIOD	LITERS	1.55E+10	1.50E+10	

* (Dissolved and Entrained Gases Concentration)/(2.00E-04) x 100

CHAPTER 11

TABLE 2B-1

LIQUID EFFLUENTS RELEASE(S): ALL - UNIT 1

NUCLIDES RELEASED	UNITS	CONTINUOUS MODE QUARTER 3	CONTINUOUS MODE QUARTER 4	BATCH MODE QUARTER 3	BATCH MODE QUARTER 4
H-3	Ci	2.85E-01	9.61E-02	2.88E+02	1.11E+02
CR-51	Ci	0.00E+00	0.00E+00	1.17E-03	1.25E-02
MN-54	Ci	0.00E+00	0.00E+00	9.46E-05	1.82E-04
FE-55	Ci	0.00E+00	8.97E-04	1.11E-04	2.39E-03
FE-59	Ci	0.00E+00	0.00E+00	1.25E-04	1.20E-04
CO-58	Ci	0.00E+00	0.00E+00	1.71E-03	9.66E-03
CO-60	Ci	0.00E+00	0.00E+00	4.22E-03	5.70E-03
SR-92	Ci	0.00E+00	0.00E+00	0.00E+00	3.36E-06
ZR-95	Ci	0.00E+00	0.00E+00	1.06E-04	1.36E-03
NB-95	Ci	0.00E+00	0.00E+00	2.15E-04	2.65E-03
TC-99M	Ci	0.00E+00	0.00E+00	4.81E-05	2.93E-06
RU-103	Ci	0.00E+00	0.00E+00	4.96E-05	8.47E-04
RU-105	Ci	0.00E+00	0.00E+00	0.00E+00	2.22E-05
RU-106	Ci	0.00E+00	0.00E+00	5.64E-06	2.07E-05
AG-110M	Ci	0.00E+00	0.00E+00	1.21E-04	1.30E-03
TE-132	Ci	0.00E+00	0.00E+00	2.57E-05	9.73E-05
I-132	Ci	0.00E+00	0.00E+00	1.23E-05	7.94E-05
CS-134	Ci	0.00E+00	0.00E+00	1.07E-04	8.28E-04
CS-137	Ci	0.00E+00	0.00E+00	3.90E-04	3.20E-03
LA-140	Ci	0.00E+00	0.00E+00	1.51E-06	4.83E-06
CE-141	Ci	0.00E+00	0.00E+00	0.00E+00	4.31E-06
NP-239	Ci	0.00E+00	0.00E+00	2.16E-05	0.00E+00
G.ALPHA	Ci	0.00E+00	0.00E+00	5.61E-06	4.52E-06

TABLE 2B-1

LIQUID EFFLUENTS — RELEASE(S): ALL - UNIT 1

NUCLIDES RELEASED	UNITS	CONTINUOUS MODE QUARTER 3	CONTINUOUS MODE QUARTER 4	BATCH MODE QUARTER 3	BATCH MODE QUARTER 4
SB-124	Ci	0.00E+00	0.00E+00	0.00E+00	8.47E-06
NB-97	Ci	0.00E+00	0.00E+00	9.53E-05	6.98E-05
SB-125	Ci	0.00E+00	0.00E+00	1.70E-04	9.77E-06
TOTAL FOR PERIOD (ABOVE)	Ci	2.85E-01	9.70E-02	2.88E+02	1.11E+02

TABLE 2B-1

LIQUID EFFLUENTS - DISSOLVED AND ENTRAINED GASES - UNIT 1

RELEASE(S): ALL

NUCLIDES RELEASED	UNITS	CONTINUOUS MODE QUARTER 3	CONTINUOUS MODE QUARTER 4	BATCH MODE QUARTER 3	BATCH MODE QUARTER 4
XE-133M	Ci	0.00E+00	0.00E+00	9.86E-05	3.10E-05
XE-133	Ci	0.00E+00	0.00E+00	2.12E-02	5.61E-03
XE-135	Ci	0.00E+00	0.00E+00	9.52E-05	6.01E-06
TOTAL FOR PERIOD (ABOVE)	Ci	0.00E+00	0.00E+00	2.14E-02	5.65E-03

CHAPTER 12

TABLE 2B-2

LIQUID EFFLUENTS RELEASE(S): ALL - UNIT 2

NUCLIDES RELEASED	UNITS	CONTINUOUS MODE QUARTER 3	CONTINUOUS MODE QUARTER 4	BATCH MODE QUARTER 3	BATCH MODE QUARTER 4
H-3	Ci	1.44E+00	1.88E+00	8.86E+01	1.32E+02
CR-51	Ci	0.00E+00	0.00E+00	2.05E-03	1.41E-02
MN-54	Ci	0.00E+00	0.00E+00	6.95E-05	9.68E-05
FE-55	Ci	0.00E+00	1.71E-03	9.11E-04	2.12E-03
FE-59	Ci	0.00E+00	0.00E+00	8.70E-05	2.00E-04
CO-58	Ci	0.00E+00	0.00E+00	1.49E-03	6.88E-03
CO-60	Ci	0.00E+00	0.00E+00	1.68E-03	3.54E-03
ZN-65	Ci	0.00E+00	0.00E+00	0.00E+00	1.81E-06
SR-92	Ci	0.00E+00	0.00E+00	0.00E+00	2.55E-06
ZR-95	Ci	0.00E+00	0.00E+00	1.24E-04	1.34E-03
NB-95	Ci	0.00E+00	0.00E+00	2.16E-04	2.52E-03
TC-99M	Ci	0.00E+00	0.00E+00	3.05E-05	0.00E+00
RU-103	Ci	0.00E+00	0.00E+00	9.64E-05	9.48E-04
RU-105	Ci	0.00E+00	0.00E+00	0.00E+00	3.70E-05
RU-106	Ci	0.00E+00	0.00E+00	0.00E+00	5.14E-05
AG-110M	Ci	0.00E+00	0.00E+00	1.98E-06	1.06E-03
TE-132	Ci	0.00E+00	0.00E+00	4.51E-05	6.97E-05
I-132	Ci	0.00E+00	0.00E+00	1.00E-05	3.26E-05
CS-134	Ci	2.58E-04	0.00E+00	5.08E-05	1.29E-05
CS-137	Ci	2.83E-04	0.00E+00	1.41E-04	5.51E-05

TABLE 2B-2

LIQUID EFFLUENTS RELEASE(S): ALL - UNIT 2

NUCLIDES RELEASED	UNITS	CONTINUOUS MODE QUARTER 3	CONTINUOUS MODE QUARTER 4	BATCH MODE QUARTER 3	BATCH MODE QUARTER 4
CE-141	Ci	0.00E+00	0.00E+00	0.00E+00	4.20E-05
NP-239	Ci	0.00E+00	0.00E+00	3.76E-05	0.00E+00
G.ALPHA	Ci	0.00E+00	0.00E+00	1.39E-06	5.40E-06
NB-97	Ci	0.00E+00	0.00E+00	1.08E-05	4.68E-05
SB-125	Ci	0.00E+00	0.00E+00	7.98E-05	0.00E+00
TOTAL FOR PERIOD (ABOVE)	Ci	1.44E+00	1.88E+00	8.86E+01	1.32E+02

TABLE 2B-2

LIQUID EFFLUENTS - DISSOLVED AND ENTRAINED GASES - UNIT 2

RELEASE(S): ALL

NUCLIDES RELEASED	UNITS	CONTINUOUS MODE QUARTER 3	CONTINUOUS MODE QUARTER 4	BATCH MODE QUARTER 3	BATCH MODE QUARTER 4
XE-133M	Ci	0.00E+00	0.00E+00	7.57E-05	0.00E+00
XE-133	Ci	0.00E+00	0.00E+00	1.34E-02	9.03E-04
XE-135	Ci	0.00E+00	0.00E+00	2.63E-05	0.00E+00
TOTAL FOR PERIOD (ABOVE)	Ci	0.00E+00	0.00E+00	1.35E-02	9.03E-04

CHAPTER 13

TABLE 3

SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

2nd Half, 1989

SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL

(not irradiated fuel)

1. Type of Waste	UNITS	PERIOD July 1 - Dec. 31
a. Spent resins, filter sludges, evaporator bottoms, etc.	m^3	8.320E 01
	Ci*	1.290E 01
b. Dry compressible waste, contaminated equipment, etc.	m^3	2.220E 02
	Ci*	8.090E 00
c. Irradiated components, control rods, etc.	m^3	NONE
	Ci	NONE
d. Other	m^3	None
	Ci	None

* Measured and/or estimated by correlations in accordance with 10 CFR 61.55.

TABLE 3

2. Estimate of major nuclide composition

	ISOTOPES	%
a.	H-3	20.00
	Mn-54	17.60
	C-14	16.70
	Co-58	14.20
	Ni-63	10.30
	Fe-55	6.95
	Co-60	4.98
	Cs-137	3.08
	Cr-51	1.78
	Nb-95	1.10
b.	Fe-55	46.40
	Co-60	28.90
	Co-58	8.31
	Ni-63	6.45
	Cs-137	1.79
	C-14	1.71
	Nb-95	1.01

TABLE 3

TABLE 3 (con't)

SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

2nd Half, 1989

3.	Solid Waste Disposition	
	a. Number of Shipments	17
	b. Mode of Transportation	Chem-Nuclear Transport (5) Hittman Transport (12)
	c. Destination	Chem-Nuclear Systems, Inc. (16) Barnwell, South Carolina U.S. Ecology Nuclear (1) Richland, Wa.
4.	Type of Containers	
	a. (1a)	Type "A" and "B" Packages, Steel Liners, and High Integrity Containers
	b. (1b)	"Strong and Tight" Metal Boxes and Steel Drums
	c. (1c)	N/A
5.	Solidification Agents	
	a. (1a)	All Resins and Charcoals were shipped Dewatered. Petroset II used for solidification of oil.
	b. (1b)	N/A
B.	IRRADIATED FUEL SHIPMENTS (Disposition)	
	1. Number of Shipments	None
	2. Mode of Transportation	N/A

CHAPTER 14

TABLE 4A-CQ3

The Quarter 3 cumulative joint frequency table for all releases is contained on the following pages.

TABLE 4A-CQ3

FARLEY NUCLEAR PLANT

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-JUL-89 00:00 TO 30-SEP-89 23:59
RELEASE MODE: Ground
STABILITY CLASS: A ALL HOURS IN PERIOD
ELEVATION: 10.0 m.

Wind Direction	Wind Speed (mph) at 10.0 m. level						
	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	0	0	0	0	0	0	0
WSW	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0
WNW	1	0	0	0	0	0	1
NW	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0
VARIABLE	0	0	0	0	0	0	0
Total	1	0	0	0	0	0	1

Periods of calm(hours): 0
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 4A-CQ3

FARLEY NUCLEAR PLANT

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-JUL-89 00:00 TO 30-SEP-89 23:59
RELEASE MODE: Ground
STABILITY CLASS: B ALL HOURS IN PERIOD
ELEVATION: 10.0 m.

Wind Direction	Wind Speed (mph) at 10.0 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	0	0	0	0	0	0	0
WSW	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0
NW	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0
VARIABLE	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0

Periods of calm(hours): 0
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 4A-CQ3

FARLEY NUCLEAR PLANT

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-JUL-89 00:00 TO 30-SEP-89 23:59
RELEASE MODE: Ground
STABILITY CLASS: C ALL HOURS IN PERIOD
ELEVATION: 10.0 m.

Wind Direction	Wind Speed (mph) at 10.0 m. level						
	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	1	0	0	0	0	1
ENE	0	2	4	0	0	0	6
E	0	1	0	0	0	0	1
ESE	0	1	0	0	0	0	1
SE	0	1	0	0	0	0	1
SSE	0	0	0	0	0	0	0
S	0	0	1	0	0	0	1
SSW	0	0	0	0	0	0	0
SW	0	0	0	0	0	0	0
WSW	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0
NW	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0
VARIABLE	0	2	0	0	0	0	2
Total	0	8	5	0	0	0	13

Periods of calm(hours): 0
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 4A-CQ3

FARLEY NUCLEAR PLANT

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-JUL-89 00:00 TO 30-SEP-89 23:59
RELEASE MODE: Ground
STABILITY CLASS: D ALL HOURS IN PERIOD
ELEVATION: 10.0 m.

Wind Direction	Wind Speed (mph) at 10.0 m. level						
	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	1	1	0	0	0	0	2
NNE	3	20	2	0	0	0	25
NE	10	49	24	0	0	0	83
ENE	5	75	33	0	0	0	113
E	8	54	4	0	0	0	66
ESE	0	21	2	0	0	0	23
SE	2	15	4	0	0	0	21
SSE	1	1	3	0	0	0	5
S	2	6	4	0	0	0	12
SSW	1	6	11	1	0	0	19
SW	7	38	23	0	0	0	68
WSW	6	28	4	0	0	0	38
W	4	38	0	0	0	0	42
WNW	9	60	1	0	0	0	70
NW	9	29	4	0	0	0	42
NNW	5	16	0	0	0	0	21
VARIABLE	74	127	5	0	0	0	206
Total	147	584	124	1	0	0	856

Periods of calm(hours): 0
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 4A-CQ3

FARLEY NUCLEAR PLANT

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-JUL-89 00:00 TO 30-SEP-89 23:59
RELEASE MODE: Ground
STABILITY CLASS: E ALL HOURS IN PERIOD
ELEVATION: 10.0 m.

Wind Direction	Wind Speed (mph) at 10.0 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	11	3	0	0	0	0	14
NNE	44	17	0	0	0	0	61
NE	30	39	16	0	0	0	85
ENE	26	41	16	0	0	0	83
E	15	18	0	0	0	0	33
ESE	15	32	0	0	0	0	47
SE	4	27	5	0	0	0	36
SSE	0	9	2	0	0	0	11
S	1	7	3	0	0	0	11
SSW	4	13	24	0	0	0	41
SW	21	48	14	0	0	0	83
WSW	23	17	2	0	0	0	42
W	19	4	0	0	0	0	23
WNW	21	3	0	0	0	0	24
NW	39	9	0	0	0	0	48
NNW	30	26	0	0	0	0	56
VARIABLE	215	50	3	0	0	0	268
Total	518	363	85	0	0	0	966

Periods of calm(hours): 4
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 4A-CQ3

FARLEY NUCLEAR PLANT

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-JUL-89 00:00 TO 30-SEP-89 23:59
RELEASE MODE: Ground
STABILITY CLASS: F ALL HOURS IN PERIOD
ELEVATION: 10.0 m.

Wind Direction	Wind Speed (mph) at 10.0 m. level						
	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	6	0	0	0	0	0	6
NNE	10	0	0	0	0	0	10
NE	9	0	0	0	0	0	9
ENE	7	0	0	0	0	0	7
E	4	0	0	0	0	0	4
ESE	1	4	0	0	0	0	5
SE	1	2	1	0	0	0	4
SSE	1	0	0	0	0	0	1
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	2	5	0	0	0	0	7
WSW	12	5	0	0	0	0	17
W	13	6	0	0	0	0	19
WNW	26	2	0	0	0	0	28
NW	20	0	0	0	0	0	20
NNW	26	2	0	0	0	0	28
VARIABLE	100	2	0	0	0	0	102
Total	238	28	1	0	0	0	267

Periods of calm(hours): 8
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 4A-CQ3

FARLEY NUCLEAR PLANT

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-JUL-89 00:00 TO 30-SEP-89 23:59
RELEASE MODE: Ground
STABILITY CLASS: G ALL HOURS IN PERIOD
ELEVATION: 10.0 m.

Wind Direction	Wind Speed (mph) at 10.0 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	1	0	0	0	0	0	1
NNE	4	0	0	0	0	0	4
NE	3	0	0	0	0	0	3
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	1	0	0	0	0	0	1
SE	0	1	0	0	0	0	1
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	0	0	0	0	0	0	0
WSW	0	0	0	0	0	0	0
W	5	0	0	0	0	0	5
WNW	7	0	0	0	0	0	7
NW	2	0	0	0	0	0	2
NNW	13	0	0	0	0	0	13
VARIABLE	50	0	0	0	0	0	50
Total	86	1	0	0	0	0	87

Periods of calm(hours): 6
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 4A-CQ3

FARLEY NUCLEAR PLANT

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-JUL-89 00:00 TO 30-SEP-89 23:59
RELEASE MODE: Elevated
STABILITY CLASS: A ALL HOURS IN PERIOD
ELEVATION: 60.3 m.

Wind Direction	Wind Speed (mph) at 60.3 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	0	0	0	0	0	0	0
WSW	0	0	0	0	0	0	0
W	0	1	0	0	0	0	1
WNW	0	0	0	0	0	0	0
NW	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0
VARIABLE	0	0	0	0	0	0	0
Total	0	1	0	0	0	0	1

Periods of calm(hours): 0
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 4A-CQ3

FARLEY NUCLEAR PLANT

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-JUL-89 00:00 TO 30-SEP-89 23:59
RELEASE MODE: Elevated
STABILITY CLASS: B ALL HOURS IN PERIOD
ELEVATION: 60.3 m.

Wind Direction	Wind Speed (mph) at 60.3 m. level						
	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	0	0	0	0	0	0	0
WSW	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0
NW	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0
VARIABLE	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0

Periods of calm(hours): 0
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 4A-CQ3

FARLEY NUCLEAR PLANT

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-JUL-89 00:00 TO 30-SEP-89 23:59
RELEASE MODE: Elevated
STABILITY CLASS: C ALL HOURS IN PERIOD
ELEVATION: 60.3 m.

Wind Direction	Wind Speed (mph) at 60.3 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	1	0	0	0	1
NNE	0	1	1	0	0	0	2
NE	0	0	1	0	0	0	1
ENE	0	1	2	0	0	0	3
E	0	1	0	0	0	0	1
ESE	0	0	0	0	0	0	0
SE	0	1	0	0	0	0	1
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	0	0	1	0	0	0	1
SW	0	0	0	0	0	0	0
WSW	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0
NW	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0
VARIABLE	0	0	2	0	0	0	2
Total	0	4	8	0	0	0	12

Periods of calm(hours): 0
Hours of missing data: 1 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 4A-CQ3

FARLEY NUCLEAR PLANT

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-JUL-89 00:00 TO 30-SEP-89 23:59
RELEASE MODE: Elevated
STABILITY CLASS: D ALL HOURS IN PERIOD
ELEVATION: 60.3 m.

Wind Direction	Wind Speed (mph) at 60.3 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	8	29	20	5	0	0	62
NNE	1	22	11	0	0	0	34
NE	2	23	38	6	0	0	69
ENE	2	37	17	13	0	0	69
E	4	62	14	0	0	0	80
ESE	4	28	3	0	0	0	35
SE	3	11	12	1	0	0	27
SSE	1	2	5	1	0	0	9
S	1	2	3	1	0	0	7
SSW	0	6	6	6	0	0	18
SW	0	15	39	6	0	0	60
WSW	4	24	14	0	0	0	42
W	3	29	2	0	0	0	34
WNW	6	43	13	0	0	0	62
NW	3	36	7	1	0	0	47
NNW	3	14	2	0	0	0	19
VARIABLE	38	79	15	0	0	0	132
Total	83	462	221	40	0	0	806

Periods of calm(hours): 0
Hours of missing data: 50 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 4A-CQ3

FARLEY NUCLEAR PLANT

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-JUL-89 00:00 TO 30-SEP-89 23:59
RELEASE MODE: Elevated
STABILITY CLASS: E ALL HOURS IN PERIOD
ELEVATION: 60.3 m.

Wind Direction	Wind Speed (mph) at 60.3 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	11	31	37	2	0	0	81
NNE	5	33	25	0	0	0	63
NE	5	50	28	11	0	0	94
ENE	9	42	29	8	0	0	88
E	4	34	11	0	0	0	49
ESE	2	17	12	0	0	0	31
SE	1	18	29	1	0	0	49
SSE	2	6	22	0	0	0	30
S	0	6	7	2	0	0	15
SSW	1	7	27	10	0	0	45
SW	1	35	46	12	0	0	94
WSW	3	26	17	0	0	0	46
W	2	18	5	1	0	0	26
WNW	4	17	3	0	0	0	24
NW	4	29	4	0	0	0	37
NNW	2	20	9	0	0	0	31
VARIABLE	35	51	22	1	0	0	109
Total	91	440	333	48	0	0	912

Periods of calm(hours): 1
Hours of missing data: 57 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 4A-CQ3

FARLEY NUCLEAR PLANT

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-JUL-89 00:00 TO 30-SEP-89 23:59
RELEASE MODE: Elevated
STABILITY CLASS: F ALL HOURS IN PERIOD
ELEVATION: 60.3 m.

Wind Direction	Wind Speed (mph) at 60.3 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	4	4	0	0	0	8
NNE	0	8	10	0	0	0	18
NE	3	9	6	0	0	0	18
ENE	3	8	3	0	0	0	14
E	0	18	2	0	0	0	20
ESE	0	10	5	0	0	0	15
SE	1	3	4	0	0	0	8
SSE	1	0	3	2	0	0	6
S	0	1	0	0	0	0	1
SSW	0	0	1	0	0	0	1
SW	1	8	5	0	0	0	14
WSW	2	6	9	0	0	0	17
W	4	18	3	0	0	0	25
WNW	4	17	7	0	0	0	28
NW	2	9	8	0	0	0	19
NNW	2	12	7	0	0	0	21
VARIABLE	13	12	3	0	0	0	28
Total	36	143	80	2	0	0	261

Periods of calm(hours): 0
Hours of missing data: 14 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 4A-CQ3

FARLEY NUCLEAR PLANT

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-JUL-89 00:00 TO 30-SEP-89 23:59
RELEASE MODE: Elevated
STABILITY CLASS: G ALL HOURS IN PERIOD
ELEVATION: 60.3 m.

Wind Direction	Wind Speed (mph) at 60.3 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	4	0	0	0	0	4
NNE	0	0	0	0	0	0	0
NE	0	6	0	0	0	0	6
ENE	1	4	0	0	0	0	5
E	2	6	0	0	0	0	8
ESE	1	6	3	0	0	0	10
SE	0	6	1	0	0	0	7
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	1	0	0	0	0	0	1
SW	0	0	0	0	0	0	0
WSW	1	3	1	0	0	0	5
W	0	3	1	0	0	0	4
WNW	0	6	2	0	0	0	8
NW	0	1	0	0	0	0	1
NNW	0	6	1	0	0	0	7
VARIABLE	12	10	0	0	0	0	22
Total	18	61	9	0	0	0	88

Periods of calm(hours): 0
Hours of missing data: 5 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

CHAPTER 15

TABLE 4A-CQ4

The Quarter 4 cumulative joint frequency table for all releases is contained on the following pages.

TABLE 4A-CQ4

FARLEY NUCLEAR PLANT

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-OCT-89 00:00 TO 31-DEC-89 23:59
RELEASE MODE: Ground
STABILITY CLASS: A ALL HOURS IN PERIOD
ELEVATION: 10.0 m.

Wind Direction	Wind Speed (mph) at 10.0 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	0	0	0	0	0	0	0
WSW	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0
NW	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0
VARIABLE	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0

Periods of calm(hours): 0
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 4A-CQ4

FARLEY NUCLEAR PLANT

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-OCT-89 00:00 TO 31-DEC-89 23:59
RELEASE MODE: Ground
STABILITY CLASS: B ALL HOURS IN PERIOD
ELEVATION: 10.0 m.

Wind Direction	Wind Speed (mph) at 10.0 m. level						
	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	0	0	0	0	0	0	0
WSW	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0
NW	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0
VARIABLE	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0

Periods of calm(hours): 0
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 4A-CQ4

FARLEY NUCLEAR PLANT

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-OCT-89 00:00 TO 31-DEC-89 23:59
RELEASE MODE: Ground
STABILITY CLASS: C ALL HOURS IN PERIOD
ELEVATION: 10.0 m.

Wind Direction	Wind Speed (mph) at 10.0 m. level						
	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	0	0	0	0	0	0	0
WSW	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0
NW	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0
VARIABLE	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0

Periods of calm(hours): 0
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 4A-CQ4

FARLEY NUCLEAR PLANT

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-OCT-89 00:00 TO 31-DEC-89 23:59
RELEASE MODE: Ground
STABILITY CLASS: D ALL HOURS IN PERIOD
ELEVATION: 10.0 m.

Wind Direction	Wind Speed (mph) at 10.0 m. level						
	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	10	18	0	0	0	28
NNE	7	20	0	0	0	0	27
NE	10	41	31	0	0	0	82
ENE	7	33	8	0	0	0	48
E	7	21	0	0	0	0	28
ESE	2	9	0	0	0	0	11
SE	2	18	5	0	0	0	25
SSE	2	4	8	0	0	0	14
S	0	2	7	1	0	0	10
SSW	0	1	5	2	0	0	8
SW	4	10	16	3	0	0	33
WSW	1	26	4	0	0	0	31
W	2	18	4	0	0	0	24
WNW	3	35	11	0	0	0	49
NW	9	42	45	3	0	0	99
NNW	7	32	71	5	0	0	115
VARIABLE	40	71	18	0	0	0	129
Total	103	393	251	14	0	0	761

Periods of calm(hours): 1
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 4A-CQ4

FARLEY NUCLEAR PLANT

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-OCT-89 00:00 TO 31-DEC-89 23:59
RELEASE MODE: Ground
STABILITY CLASS: E ALL HOURS IN PERIOD
ELEVATION: 10.0 m.

Wind Direction	Wind Speed (mph) at 10.0 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	10	3	1	0	0	0	14
NNE	20	24	0	0	0	0	44
NE	19	28	0	0	0	0	47
ENE	11	12	2	0	0	0	25
E	10	11	1	0	0	0	22
ESE	8	16	1	0	0	0	25
SE	3	24	14	0	0	0	41
SSE	3	3	6	3	0	0	15
S	0	8	5	2	0	0	15
SSW	1	6	6	2	0	0	15
SW	5	20	20	3	0	0	48
WSW	15	28	3	0	0	0	46
W	22	7	0	0	0	0	29
WNW	15	17	1	1	0	0	34
NW	19	25	20	1	0	0	65
NNW	27	73	27	1	0	0	128
VARIABLE	115	38	5	0	0	0	158
Total	303	343	112	13	0	0	771

Periods of calm(hours): 20
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 4A-CQ4

FARLEY NUCLEAR PLANT

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-OCT-89 00:00 TO 31-DEC-89 23:59
RELEASE MODE: Ground
STABILITY CLASS: F ALL HOURS IN PERIOD
ELEVATION: 10.0 m.

Wind Direction	Wind Speed (mph) at 10.0 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	19	1	0	0	0	0	20
NNE	17	1	0	0	0	0	18
NE	12	0	0	0	0	0	12
ENE	6	1	0	0	0	0	7
E	3	1	0	0	0	0	4
ESE	4	3	0	0	0	0	7
SE	1	9	0	0	0	0	10
SSE	3	2	2	0	0	0	7
S	0	2	0	0	0	0	2
SSW	1	2	3	0	0	0	6
SW	8	11	2	0	0	0	21
WSW	3	7	0	0	0	0	10
W	10	0	0	0	0	0	10
WNW	9	4	0	0	0	0	13
NW	17	4	0	0	0	0	21
NNW	47	13	0	0	0	0	60
VARIABLE	92	12	0	0	0	0	104
Total	252	73	7	0	0	0	332

Periods of calm(hours): 12
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 4A-CQ4

FARLEY NUCLEAR PLANT

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-OCT-89 00:00 TO 31-DEC-89 23:59
RELEASE MODE: Ground
STABILITY CLASS: G ALL HOURS IN PERIOD
ELEVATION: 10.0 m.

Wind Direction	Wind Speed (mph) at 10.0 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	32	11	0	0	0	0	43
NNE	8	0	0	0	0	0	8
NE	6	0	0	0	0	0	6
ENE	3	0	0	0	0	0	3
E	4	1	0	0	0	0	5
ESE	1	2	0	0	0	0	3
SE	1	1	0	0	0	0	2
SSE	1	0	0	0	0	0	1
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	2	0	0	0	0	0	2
WSW	2	0	0	0	0	0	2
W	9	1	0	0	0	0	10
WNW	4	0	0	0	0	0	4
NW	11	0	0	0	0	0	11
NNW	42	9	0	0	0	0	51
VARIABLE	142	4	0	0	0	0	146
Total	268	29	0	0	0	0	297

Periods of calm(hours): 14
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 4A-CQ4

FARLEY NUCLEAR PLANT

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-OCT-89 00:00 TO 31-DEC-89 23:59
RELEASE MODE: Elevated
STABILITY CLASS: A ALL HOURS IN PERIOD
ELEVATION: 60.3 m.

Wind Direction	Wind Speed (mph) at 60.3 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	0	0	0	0	0	0	0
WSW	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0
NW	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0
VARIABLE	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0

Periods of calm(hours): 0
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 4A-CQ4

FARLEY NUCLEAR PLANT

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-OCT-89 00:00 TO 31-DEC-89 23:59
RELEASE MODE: Elevated
STABILITY CLASS: B ALL HOURS IN PERIOD
ELEVATION: 60.3 m.

Wind Direction	Wind Speed (mph) at 60.3 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	0	0	0	0	0	0	0
WSW	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0
NW	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0
VARIABLE	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0

Periods of calm(hours): 0
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 4A-CQ4

FARLEY NUCLEAR PLANT

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-OCT-89 00:00 TO 31-DEC-89 23:59
RELEASE MODE: Elevated
STABILITY CLASS: C ALL HOURS IN PERIOD
ELEVATION: 60.3 m.

Wind Direction	Wind Speed (mph) at 60.3 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	0	0	0	0	0	0	0
WSW	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0
NW	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0
VARIABLE	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0

Periods of calm(hours): 0
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 4A-CQ4

FARLEY NUCLEAR PLANT

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-OCT-89 00:00 TO 31-DEC-89 23:59
RELEASE MODE: Elevated
STABILITY CLASS: D ALL HOURS IN PERIOD
ELEVATION: 60.3 m.

Wind Direction	Wind Speed (mph) at 60.3 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	1	11	31	20	0	0	63
NNE	4	11	18	0	0	0	33
NE	1	26	49	8	0	0	84
ENE	3	25	15	0	0	0	43
E	4	17	4	0	0	0	25
ESE	5	7	0	0	0	0	12
SE	0	14	8	0	0	0	22
SSE	1	6	9	2	0	0	18
S	2	0	7	3	0	0	12
SSW	0	1	5	9	0	0	15
SW	1	9	15	7	0	0	32
WSW	2	16	9	0	0	0	27
W	0	13	12	2	0	0	27
WNW	3	26	21	7	0	0	57
NW	4	20	50	27	4	0	105
NNW	0	19	17	23	1	0	60
VARIABLE	24	51	42	8	0	0	125
Total	55	272	312	116	5	0	760

Periods of calm(hours): 2
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 4A-CQ4

FARLEY NUCLEAR PLANT

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-OCT-89 00:00 TO 31-DEC-89 23:59
RELEASE MODE: Elevated
STABILITY CLASS: E ALL HOURS IN PERIOD
ELEVATION: 60.3 m.

Wind Direction	Wind Speed (mph) at 60.3 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	1	21	39	1	0	0	62
NNE	3	29	40	0	0	0	72
NE	0	20	26	0	0	0	46
ENE	1	23	3	0	0	0	27
E	2	10	6	1	0	0	19
ESE	3	15	5	0	0	0	23
SE	1	16	21	1	0	0	39
SSE	2	9	21	14	0	0	46
S	3	6	3	7	0	0	19
SSW	1	4	15	12	1	0	33
SW	0	6	23	11	2	0	42
WSW	4	17	20	4	0	0	45
W	3	13	14	0	0	0	30
WNW	2	13	28	3	1	0	47
NW	0	8	29	23	0	0	60
NNW	2	18	33	17	0	0	70
VARIABLE	16	50	27	2	0	0	95
Total	44	278	353	96	4	0	775

Periods of calm(hours): 16
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 4A-CQ4

FARLEY NUCLEAR PLANT

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-OCT-89 00:00 TO 31-DEC-89 23:59
RELEASE MODE: Elevated
STABILITY CLASS: F ALL HOURS IN PERIOD
ELEVATION: 60.3 m.

Wind Direction	Wind Speed (mph) at 60.3 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	10	17	0	0	0	27
NNE	3	8	30	0	0	0	41
NE	1	7	22	0	0	0	30
ENE	2	8	4	0	0	0	14
E	3	11	3	0	0	0	17
ESE	2	7	3	0	0	0	12
SE	3	2	9	0	0	0	14
SSE	3	4	15	3	0	0	25
S	5	3	2	0	0	0	10
SSW	1	2	8	2	0	0	13
SW	1	7	12	4	0	0	24
WSW	1	6	7	1	0	0	15
W	1	4	4	0	0	0	9
WNW	2	2	9	0	0	0	13
NW	1	3	10	1	0	0	15
NNW	2	15	13	0	0	0	30
VARIABLE	6	23	6	0	0	0	35
Total	37	122	174	11	0	0	344

Periods of calm(hours): 0
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 4A-CQ4

FARLEY NUCLEAR PLANT

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-OCT-89 00:00 TO 31-DEC-89 23:59
RELEASE MODE: Elevated
STABILITY CLASS: G ALL HOURS IN PERIOD
ELEVATION: 60.3 m.

Wind Direction	Wind Speed (mph) at 60.3 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	1	7	7	0	0	0	15
NNE	2	8	26	0	0	0	36
NE	1	9	28	0	0	0	38
ENE	2	9	15	0	0	0	26
E	1	6	1	0	0	0	8
ESE	3	5	4	0	0	0	12
SE	1	11	4	0	0	0	16
SSE	5	10	5	4	0	0	24
S	2	7	2	0	0	0	11
SSW	1	1	0	0	0	0	2
SW	1	6	1	1	0	0	9
WSW	1	12	1	0	0	0	14
W	0	13	6	0	0	0	19
WNW	5	10	9	0	0	0	24
NW	0	9	8	0	0	0	17
NNW	0	10	4	0	0	0	14
VARIABLE	16	6	3	0	0	0	25
Total	42	139	124	5	0	0	310

Periods of calm(hours): 1
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

CHAPTER 16

TABLE 4A-1BQ3

The Quarter 3 cumulative joint frequency table for Unit 1 batch releases is contained on the following pages.

TABLE 4A-1BQ3

FARLEY NUCLEAR PLANT - UNIT 1

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-JUL-89 00:00 TO 30-SEP-89 23:59
RELEASE MODE: Ground
STABILITY CLASS: A DURING BATCH RELEASES
ELEVATION: 10.0 m.

	Wind Speed (mph) at 10.0 m. level						
Wind Direction	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	0	0	0	0	0	0	0
WSW	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0
NW	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0
VARIABLE	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0

Periods of calm(hours): 0
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 4A-1BQ3

FARLEY NUCLEAR PLANT - UNIT 1

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-JUL-89 00:00 TO 30-SEP-89 23:59
RELEASE MODE: Ground
STABILITY CLASS: B DURING BATCH RELEASES
ELEVATION: 10.0 m.

Wind Direction	Wind Speed (mph) at 10.0 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	0	0	0	0	0	0	0
WSW	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0
NW	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0
VARIABLE	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0

Periods of calm(hours): 0
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 4A-1BQ3

FARLEY NUCLEAR PLANT - UNIT 1

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-JUL-89 00:00 TO 30-SEP-89 23:59
RELEASE MODE: Ground
STABILITY CLASS: C DURING BATCH RELEASES
ELEVATION: 10.0 m.

Wind Direction	Wind Speed (mph) at 10.0 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	0	0	0	0	0	0	0
WSW	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0
NW	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0
VARIABLE	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0

Periods of calm(hours): 0
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 4A-1BQ3

FARLEY NUCLEAR PLANT - UNIT 1

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-JUL-89 00:00 TO 30-SEP-89 23:59
RELEASE MODE: Ground
STABILITY CLASS: D DURING BATCH RELEASES
ELEVATION: 10.0 m.

Wind Direction	Wind Speed (mph) at 10.0 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	1	0	0	0	0	1
ENE	0	2	0	0	0	0	2
E	0	0	0	0	0	0	0
ESE	0	0	1	0	0	0	1
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	0	3	0	0	0	0	3
WSW	0	1	0	0	0	0	1
W	0	0	0	0	0	0	0
WNW	0	2	0	0	0	0	2
NW	0	0	0	0	0	0	0
NNW	0	1	0	0	0	0	1
VARIABLE	0	3	0	0	0	0	3
Total	0	13	1	0	0	0	14

Periods of calm(hours): 0
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 4A-1BQ3

FARLEY NUCLEAR PLANT - UNIT 1

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-JUL-89 00:00 TO 30-SEP-89 23:59
RELEASE MODE: Ground
STABILITY CLASS: E DURING BATCH RELEASES
ELEVATION: 10.0 m.

Wind Direction	Wind Speed (mph) at 10.0 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	3	0	0	0	0	3
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	1	6	0	0	0	0	7
WSW	1	0	0	0	0	0	1
W	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0
NW	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0
VARIABLE	2	0	0	0	0	0	2
Total	4	9	0	0	0	0	13

Periods of calm(hours): 0
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 4A-1BQ3

FARLEY NUCLEAR PLANT - UNIT 1

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-JUL-89 00:00 TO 30-SEP-89 23:59
RELEASE MODE: Ground
STABILITY CLASS: F DURING BATCH RELEASES
ELEVATION: 10.0 m.

Wind Direction	Wind Speed (mph) at 10.0 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	0	0	0	0	0	0	0
WSW	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0
NW	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0
VARIABLE	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0

Periods of calm(hours): 0
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 4A-1BQ3

FARLEY NUCLEAR PLANT - UNIT 1

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-JUL-89 00:00 TO 30-SEP-89 23:59
RELEASE MODE: Ground
STABILITY CLASS: G DURING BATCH RELEASES
ELEVATION: 10.0 m.

Wind Direction	Wind Speed (mph) at 10.0 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	0	0	0	0	0	0	0
WSW	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0
NW	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0
VARIABLE	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0

Periods of calm(hours): 0
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 4A-1BQ3

FARLEY NUCLEAR PLANT - UNIT 1

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-JUL-89 00:00 TO 30-SEP-89 23:59
RELEASE MODE: Elevated
STABILITY CLASS: A DURING BATCH RELEASES
ELEVATION: 60.3 m.

Wind Direction	Wind Speed (mph) at 60.3 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	0	0	0	0	0	0	0
WSW	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0
NW	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0
VARIABLE	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0

Periods of calm(hours): 0
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 4A-1BQ3

FARLEY NUCLEAR PLANT - UNIT 1

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-JUL-89 00:00 TO 30-SEP-89 23:59
RELEASE MODE: Elevated DURING BATCH RELEASES
STABILITY CLASS: B
ELEVATION: 60.3 m.

Wind Direction	Wind Speed (mph) at 60.3 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	0	0	0	0	0	0	0
WSW	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0
NW	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0
VARIABLE	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0

Periods of calm(hours): 0
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 4A-1BQ3

FARLEY NUCLEAR PLANT - UNIT 1

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-JUL-89 00:00 TO 30-SEP-89 23:59
RELEASE MODE: Elevated
STABILITY CLASS: C DURING BATCH RELEASES
ELEVATION: 60.3 m.

Wind Direction	Wind Speed (mph) at 60.3 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	0	0	0	0	0	0	0
WSW	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0
NW	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0
VARIABLE	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0

Periods of calm(hours): 0
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 4A-1BQ3

FARLEY NUCLEAR PLANT - UNIT 1

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-JUL-89 00:00 TO 30-SEP-89 23:59
RELEASE MODE: Elevated
STABILITY CLASS: D DURING BATCH RELEASES
ELEVATION: 60.3 m.

Wind Direction	Wind Speed (mph) at 60.3 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	1	0	0	0	1
ENE	0	0	1	0	0	0	1
E	0	1	0	0	0	0	1
ESE	0	1	1	0	0	0	2
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	0	1	2	0	0	0	3
WSW	0	1	0	0	0	0	1
W	0	0	0	0	0	0	0
WNW	0	2	0	0	0	0	2
NW	0	0	0	0	0	0	0
NNW	0	1	0	0	0	0	1
VARIABLE	0	2	0	0	0	0	2
Total	0	9	5	0	0	0	14

Periods of calm(hours): 0
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 4A-1BQ3

FARLEY NUCLEAR PLANT - UNIT 1

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-JUL-89 00:00 TO 30-SEP-89 23:59
RELEASE MODE: Elevated
STABILITY CLASS: E DURING BATCH RELEASES
ELEVATION: 60.3 m.

Wind Direction	Wind Speed (mph) at 60.3 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	1	0	0	0	0	1
ENE	0	3	1	0	0	0	4
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	0	1	6	0	0	0	7
WSW	0	0	1	0	0	0	1
W	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0
NW	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0
VARIABLE	0	0	0	0	0	0	0
Total	0	5	8	0	0	0	13

Periods of calm(hours): 0
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 4A-1BQ3

FARLEY NUCLEAR PLANT - UNIT 1

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-JUL-89 00:00 TO 30-SEP-89 23:59
RELEASE MODE: Elevated
STABILITY CLASS: F DURING BATCH RELEASES
ELEVATION: 60.3 m.

Wind Direction	Wind Speed (mph) at 60.3 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	0	0	0	0	0	0	0
WSW	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0
NW	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0
VARIABLE	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0

Periods of calm(hours): 0
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 4A-1BQ3

FARLEY NUCLEAR PLANT - UNIT 1

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-JUL-89 00:00 TO 30-SEP-89 23:59
RELEASE MODE: Elevated
STABILITY CLASS: G DURING BATCH RELEASES
ELEVATION: 60.3 m.

Wind Direction	Wind Speed (mph) at 60.3 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	0	0	0	0	0	0	0
WSW	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0
NW	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0
VARIABLE	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0

Periods of calm(hours): 0
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

CHAPTER 17

TABLE 4A-1BQ4

The Quarter 4 cumulative joint frequency table for Unit 1 batch releases is contained on the following pages.

TABLE 4A-1BQ4

FARLEY NUCLEAR PLANT - UNIT 1

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-OCT-89 00:00 TO 31-DEC-89 23:59
RELEASE MODE: Ground
STABILITY CLASS: A DURING BATCH RELEASES
ELEVATION: 10.0 m.

Wind Direction	Wind Speed (mph) at 10.0 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	0	0	0	0	0	0	0
WSW	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0
NW	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0
VARIABLE	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0

Periods of calm(hours): 0
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 4A-1BQ4

FARLEY NUCLEAR PLANT - UNIT 1

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-OCT-89 00:00 TO 31-DEC-89 23:59
RELEASE MODE: Ground
STABILITY CLASS: B DURING BATCH RELEASES
ELEVATION: 10.0 m.

Wind Direction	Wind Speed (mph) at 10.0 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	0	0	0	0	0	0	0
WSW	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0
NW	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0
VARIABLE	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0

Periods of calm(hours): 0
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 4A-1BQ4

FARLEY NUCLEAR PLANT - UNIT 1

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-OCT-89 00:00 TO 31-DEC-89 23:59
RELEASE MODE: Ground
STABILITY CLASS: C DURING BATCH RELEASES
ELEVATION: 10.0 m.

Wind Direction	Wind Speed (mph) at 10.0 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	0	0	0	0	0	0	0
WSW	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0
NW	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0
VARIABLE	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0

Periods of calm(hours): 0
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 4A-1BQ4

FARLEY NUCLEAR PLANT - UNIT 1

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-OCT-89 00:00 TO 31-DEC-89 23:59
RELEASE MODE: Ground
STABILITY CLASS: D DURING BATCH RELEASES
ELEVATION: 10.0 m.

Wind Direction	Wind Speed (mph) at 10.0 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0	0	0	0	0
NNE	2	0	0	0	0	0	2
NE	0	5	1	0	0	0	6
ENE	0	3	0	0	0	0	3
E	0	2	0	0	0	0	2
ESE	1	1	0	0	0	0	2
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	1	0	0	0	0	0	1
WSW	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0
WNW	0	1	0	0	0	0	1
NW	0	3	0	0	0	0	3
NNW	0	0	0	0	0	0	0
VARIABLE	4	0	0	0	0	0	4
Total	8	15	1	0	0	0	24

Periods of calm(hours): 0
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 4A-1BQ4

FARLEY NUCLEAR PLANT - UNIT 1

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-OCT-89 00:00 TO 31-DEC-89 23:59
RELEASE MODE: Ground
STABILITY CLASS: E DURING BATCH RELEASES
ELEVATION: 10.0 m.

Wind Direction	Wind Speed (mph) at 10.0 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	1	1	0	0	0	0	2
ENE	1	1	0	0	0	0	2
E	1	0	0	0	0	0	1
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	0	0	0	0	0	0	0
WSW	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0
NW	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0
VARIABLE	1	0	0	0	0	0	1
Total	4	2	0	0	0	0	6

Periods of calm(hours): 0
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 4A-1BQ4

FARLEY NUCLEAR PLANT - UNIT 1

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-OCT-89 00:00 TO 31-DEC-89 23:59
RELEASE MODE: Ground
STABILITY CLASS: F DURING BATCH RELEASES
ELEVATION: 10.0 m.

Wind Direction	Wind Speed (mph) at 10.0 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	2	0	0	0	0	0	2
NNE	0	0	0	0	0	0	0
NE	2	0	0	0	0	0	2
ENE	1	0	0	0	0	0	1
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	0	0	0	0	0	0	0
WSW	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0
WNW	1	0	0	0	0	0	1
NW	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0
VARIABLE	2	0	0	0	0	0	2
Total	8	0	0	0	0	0	8

Periods of calm(hours): 0
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 4A-1BQ4

FARLEY NUCLEAR PLANT - UNIT 1

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-OCT-89 00:00 TO 31-DEC-89 23:59
RELEASE MODE: Ground
STABILITY CLASS: G DURING BATCH RELEASES
ELEVATION: 10.0 m.

Wind Direction	Wind Speed (mph) at 10.0 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	10	0	0	0	0	0	10
NNE	2	0	0	0	0	0	2
NE	1	0	0	0	0	0	1
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	0	0	0	0	0	0	0
WSW	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0
NW	1	0	0	0	0	0	1
NNW	6	0	0	0	0	0	6
VARIABLE	9	1	0	0	0	0	10
Total	29	1	0	0	0	0	30

Periods of calm(hours): 0
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 4A-1BQ4

FARLEY NUCLEAR PLANT - UNIT 1

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-OCT-89 00:00 TO 31-DEC-89 23:59
RELEASE MODE: Elevated
STABILITY CLASS: A DURING BATCH RELEASES
ELEVATION: 60.3 m.

Wind Direction	Wind Speed (mph) at 60.3 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	0	0	0	0	0	0	0
WSW	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0
NW	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0
VARIABLE	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0

Periods of calm(hours): 0
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 4A-1BQ4

FARLEY NUCLEAR PLANT - UNIT 1

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-OCT-89 00:00 TO 31-DEC-89 23:59
RELEASE MODE: Elevated
STABILITY CLASS: B DURING BATCH RELEASES
ELEVATION: 60.3 m.

Wind Direction	Wind Speed (mph) at 60.3 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	0	0	0	0	0	0	0
WSW	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0
NW	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0
VARIABLE	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0

Periods of calm(hours): 0
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 4A-1BQ4

FARLEY NUCLEAR PLANT - UNIT 1

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-OCT-89 00:00 TO 31-DEC-89 23:59
RELEASE MODE: Elevated
STABILITY CLASS: C DURING BATCH RELEASES
ELEVATION: 60.3 m.

Wind Direction	Wind Speed (mph) at 60.3 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	0	0	0	0	0	0	0
WSW	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0
NW	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0
VARIABLE	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0

Periods of calm(hours): 0
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 4A-1BQ4

FARLEY NUCLEAR PLANT - UNIT 1

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-OCT-89 00:00 TO 31-DEC-89 23:59
RELEASE MODE: Elevated DURING BATCH RELEASES
STABILITY CLASS: D
ELEVATION: 60.3 m.

Wind Direction	Wind Speed (mph) at 60.3 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	2	5	0	0	0	7
ENE	0	1	1	0	0	0	2
E	1	1	0	0	0	0	2
ESE	1	0	0	0	0	0	1
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	1	0	0	0	0	0	1
SSW	0	0	0	0	0	0	0
SW	0	0	0	0	0	0	0
WSW	1	0	0	0	0	0	1
W	0	0	0	0	0	0	0
WNW	0	2	0	0	0	0	2
NW	0	1	1	0	0	0	2
NNW	0	0	0	0	0	0	0
VARIABLE	4	2	0	0	0	0	6
Total	8	9	7	0	0	0	24

Periods of calm(hours): 0
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 4A-1BQ4

FARLEY NUCLEAR PLANT - UNIT 1

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-OCT-89 00:00 TO 31-DEC-89 23:59
RELEASE MODE: Elevated DURING BATCH RELEASES
STABILITY CLASS: E
ELEVATION: 60.3 m.

Wind Direction	Wind Speed (mph) at 60.3 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	1	1	0	0	0	2
ENE	0	2	1	0	0	0	3
E	0	0	0	0	0	0	0
ESE	1	0	0	0	0	0	1
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	0	0	0	0	0	0	0
WSW	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0
NW	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0
VARIABLE	0	0	0	0	0	0	0
Total	1	3	2	0	0	0	6

Periods of calm(hours): 0
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 4A-1BQ4

FARLEY NUCLEAR PLANT - UNIT 1

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-OCT-89 00:00 TO 31-DEC-89 23:59
RELEASE MODE: Elevated
STABILITY CLASS: F DURING BATCH RELEASES
ELEVATION: 60.3 m.

Wind Direction	Wind Speed (mph) at 60.3 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0	0	0	0	0
NNE	0	0	1	0	0	0	1
NE	0	0	2	0	0	0	2
ENE	0	1	1	0	0	0	2
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	0	0	0	0	0	0	0
WSW	1	0	0	0	0	0	1
W	0	0	0	0	0	0	0
WNW	0	0	1	0	0	0	1
NW	0	0	0	0	0	0	0
NNW	1	0	0	0	0	0	1
VARIABLE	0	0	0	0	0	0	0
Total	2	1	5	0	0	0	8

Periods of calm(hours): 0
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 4A-1BQ4

FARLEY NUCLEAR PLANT - UNIT 1

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-OCT-89 00:00 TO 31-DEC-89 23:59
RELEASE MODE: Elevated DURING BATCH RELEASES
STABILITY CLASS: G
ELEVATION: 60.3 m.

Wind Direction	Wind Speed (mph) at 60.3 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	3	0	0	0	0	3
NNE	1	0	2	0	0	0	3
NE	0	0	7	0	0	0	7
ENE	0	0	8	0	0	0	8
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	0	0	0	0	0	0	0
WSW	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0
WNW	1	1	0	0	0	0	2
NW	0	0	2	0	0	0	2
NNW	0	1	0	0	0	0	1
VARIABLE	3	1	0	0	0	0	4
Total	5	6	19	0	0	0	30

Periods of calm(hours): 0
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

CHAPTER 18

TABLE 4A-2BQ3

There were no batch releases on Unit 2 during Quarter 3.

CHAPTER 19

TABLE 4A-2BQ4

There were no batch releases on Unit 2 during Quarter 4.

CHAPTER 20

TABLE 4B

TABLE 4B

CLASSIFICATION OF ATMOSPHERIC STABILITY

Stability Classification	Pasquill Categories	$\sigma\theta$ [a] (degrees)	Temperature channel with height (^{o}F/51m)
Extremely unstable	A	25.0	<-1.74
Moderately unstable	B	20.0	-1.74 to -1.56
Slightly unstable	C	15.0	-1.56 to -1.38
Neutral	D	10.0	-1.38 to -0.46
Slightly stable	E	5.0	-0.46 to 1.38
Moderately stable	F	2.5	1.38 to 3.6
Extremely stable	G	1.7	>3.6

a Standard deviations of horizontal wind direction fluctuation over a period of 15 minutes to 1 hour. The values shown are averages for each stability classification.

CHAPTER 21

TABLE 5

TABLE 5

RADIOACTIVE GASEOUS WASTE SAMPLING AND ANALYSIS PROGRAM
FARLEY NUCLEAR PLANT - UNITS 1 & 2

Gaseous Release Type	Sampling Frequency	Minimum Analysis Frequency	Type of Activity Analysis [a,h]	Minimum Detectable Concentration (MDC) (uCi/ml)
A. Waste Gas Storage Tank	Each Tank Grab Sample [b] P	Each Tank P	Principle Gamma Emitters [g,j]	1E-04
B. Containment Purge	Each Purge Grab Sample [b] P	Each Purge Grab Sample [b] P	Principle Gamma Emitters [g,j]	1E-04
			H-3	1E-06
C. Condenser Steam Jet Air Ejector Plant Vent Stack	M-[b,c,e] Grab Sample	[b] M	Principle Gamma Emitters [g,j]	1E-04
			H-3	1E-06

TABLE 5

TABLE 5 (Continued)

Gaseous Release Type	Sampling Frequency	Minimum Analysis Frequency	Type of Activity Analysis	Minimum Detectable Concentration (MDC) (uCi/ml) [a,h]
D. Plant Vent Stack Containment Purge	Continuous [f] Charcoal	Charcoal Sample [d] W	I-131	1E-12
			I-133	1E-10
	Continuous [f]	Particulate Sample [d] W	Principle Gamma Emitters [g] (I-131, Others)	1E-11
	Continuous [f]	Composite Particulate Sample M [i]	Gross Alpha	1E-11
	Continuous [f]	Composite Particulate Sample Q [i]	Sr-89, Sr-90	1E-11
	Continuous [f]	Noble Gas Monitor	Noble Gases Gross Beta and Gamma	1E-06

TABLE 5

TABLE 5 (Continued)

TABLE NOTATION

a. The MDC is the smallest concentration of radioactive material in a sample that will be detected with 95% probability with 5% probability of falsely concluding that a blank observation represents a "real" signal.

For a particular measurement system (which may include radiochemical separation):

$$MDC = 4.66\, s_b / E * V * 2.22X10^6 * Y * \exp(-\lambda \Delta t)$$

where:

MDC is the "a priori" lower limit of detection as defined above (as microcurie per unit mass or volume),

s_b is the standard deviation of the background counting rate or of the counting rate of a blank sample as appropriate (as counts per minute),

E is the counting efficiency (as counts per transformation),

V is the sample size (in units mass or volume),

$2.22X10^6$ is the number of transformations per minute per microcurie,

Y is the fractional radiochemical yield (when applicable),

λ is the radioactive decay constant for the particular radionuclide, and

Δt is the elapsed time between midpoint of sample collection and time of counting (for plant effluents, not environmental samples).

The value of s_b used in the calculation of the MDC for a detection system shall be based on the actual observed variance of the background counting rate or of the counting rate of the blank samples (as appropriate) rather than on an unverified theoretically predicted variance. Typical values of E, V, Y, and Δt shall be used in the calculation.

TABLE 5 (Continued)

TABLE NOTATION

b. Analyses shall also be performed following shutdown from > or = 15% RATED THERMAL POWER, startup to > or = 15% RATED THERMAL POWER or a THERMAL POWER change exceeding 15% of the RATED THERMAL POWER within a one hour period.

c. Tritium grab samples shall be taken from the plant vent stack at least once per 24 hours when the refueling canal is flooded.

d. Samples shall be changed at least once per 7 days and analyses shall be completed within 48 hours after changing (or after removal from sampler). Sampling shall also be performed at least once per 24 hours for at least 2 days following each shutdown from > or = 15% RATED THERMAL POWER, startup to > or = 15% RATED THERMAL POWER or THERMAL POWER change exceeding 15% of RATED THERMAL POWER in one hour and analyses shall be completed within 48 hours of changing. When samples collected for 24 hours are analyzed, the corresponding MDC may be increased by a factor of 10.

e. Tritium grab samples shall be taken at least once per 7 days from the ventilation exhaust from the spent fuel pool area, whenever spent fuel is in the spent fuel pool.

f. The ratio of the sample flow rate to the sampled stream flow rate shall be known for the time period covered by each dose or dose rate calculation made in accordance with Specifications 3.11.2.1, 3.11.2.2 and 3.11.2.3.

g. The principle gamma emitters for which the MDC specification applies exclusively are the following radionuclides: Mn-54, Fe-59, Co-58, Co-60, Zn-65, Mo-99, Cs-134, Cs-137, Ce-141 and Ce-144 for particulate emissions. This list does not mean that only these nuclides are to be detected and reported. Other which are measurable and identifiable, together with the above nuclides, shall also be identified and reported.

h. Deviations from MDC requirements of Table 4.11-2 shall be reported per Specification 6.9.1.8 in lieu of any other report.

i. A composite particulate sample is one in which the quantity of air sampled is proportional to the quantity of air discharged. Either a specimen which is representative of the air discharged may be accumulated and analyzed or the individual samples may be analyzed and weighted in proportion to their respective volume discharged.

TABLE 5 (Continued)

j. The principle gamma emitters for which the MDC specification applies exclusively are the following radionuclides: Kr-87, Kr-88, Xe-133, Xe-133m, Xe-135, and Xe-138 for gaseous emissions. This does not mean that only these nuclides are to be detected and reported. Other peaks which are measurable and identifiable together with the above nuclides, shall also be identified and reported.

TABLE 5

TABLE 5 (Continued)

TYPICAL GAS MDC'S FOR RCLS
COUNTING SYSTEM

Nuclide	MDC (uCi/ml)	Nuclide	MDC (uCi/ml)
Mn-54	1.46E-14	Ce-144	5.08E-14
Fe-59	4.51E-14	Kr-87	3.44E-08
Co-58	1.55E-14	Kr-88	4.71E-08
Co-60	2.81E-14	Xe-133	6.30E-08
Zn-65	3.04E-14	Xe-133M	1.54E-07
Mo-99	1.02E-13	Xe-135	1.91E-08
Cs-134	4.08E-11	Xe-138	5.04E-08
Cs-137	1.31E-14	I-131	3.20E-14
Ce-141	1.13E-14	I-133	2.87E-14

CHAPTER 22

TABLE 6

TABLE 6

RADIOACTIVE LIQUID WASTE SAMPLING AND ANALYSIS PROGRAM
FARLEY NUCLEAR PLANT - UNITS 1 & 2

Liquid Release Type	Sampling Frequency	Minimum Analysis Frequency	Type of Activity Analysis	Minimum Detectable Concentration (MDC) (uCi/ml) [a,g]
A. Batch Waste Release Tanks [c]	P Each Batch	P Each Batch	Principle Gamma Emitters [e]	5E-07
			I-131	1E-06
	One Batch/M	M	Dissolved & Entrained Gases (Gamma Emitters)	1E-05
	P Each Batch	M Composite [b]	H-3	1E-05
			Gross Alpha	1E-07

TABLE 6

TABLE 6 (Continued)

Liquid Release Type	Sampling Frequency	Minimum Analysis Frequency	Type of Activity Analysis	Minimum Detectable Concentration (MDC) (uCi/ml) [a,g]
	P Each Batch	b Q Composite	Sr-89, Sr-90	5E-08
			Fe-55	1E-06
B. Continuous Releases [d,f]	D Grab Sample	b W Composite	e Principle Gamma Emitters	5E-07
			I-131	1E-06
1. Steam Generator Blowdown	M Grab Sample	M	Dissolved & Entrained Gases (Gamma Emitters)	1E-05
	D Grab Sample	b M Composite	H-3	1E-05
			Gross Alpha	1E-07
	D Grab Sample	b Q Composite	Sr-89, Sr-90	5E-08
			Fe-55	1E-06
2. Turbine Building Sump	P Grab Sample	b W Composite	e Principle Gamma Emitters	5E-07
			H-3	1E-05

TABLE 6 (Continued)

TABLE NOTATION

a. The MDC is the smallest concentration of radioactive material in a sample that will be detected with 95% probability with 5% probability of falsely concluding that a blank observation represents a "real" signal.

For a particular measurement system (which may include radiochemical separation):

$$MDC = \frac{4.66\, s_b}{E * V * 2.22X10^6 * Y * \exp(-\lambda \Delta t)}$$

where:

MDC is the "a priori" lower limit of detection as defined above (as microcurie per unit mass or volume),

s_b is the standard deviation of the background counting rate or of the counting rate of a blank sample as appropriate (as counts per minute),

E is the counting efficiency (as counts per transformation),

V is the sample size (in units mass or volume),

$2.22X10^6$ is the number of transformations per minute per microcurie,

Y is the fractional radiochemical yield (when applicable),

λ is the radioactive decay constant for the particular radionuclide, and

Δt is the elapsed time between midpoint of sample collection and time of counting (for plant effluents, not environmental samples).

The value of s_b used in the calculation of the MDC for a detection system shall be based on the actual observed variance of the background counting rate or of the counting rate of the blank samples (as appropriate) rather than on an unverified theoretically predicted variance. Typical values of E, V, Y, and Δt shall be used in the calculation.

TABLE 6 (Continued)

TABLE NOTATION

b. A composite sample is one in which the quantity of liquid sampled is proportional to the quantity of liquid waste discharged and in which the method of sampling employed results in a specimen which is representative of the liquids released.

c. A batch release is the discharge of liquid wastes of a discrete volume. Prior to sampling for analyses, each batch shall be isolated, and then thoroughly mixed, by a method described in the ODCM, to assure representative sampling.

d. A continuous release is the discharge of liquid wastes of a nondiscrete volume; e.g., from a volume of system that has an input flow during the effluent release.

e. The principle gamma emitters for which the MDC specification applies exclusively are the following radionuclides: Mn-54, Fe-59, Co-58, Co-60, Zn-65, Mo-99, Cs-134, Cs-137,Ce-141, and Ce-144. This list does not mean that only these nuclides are to be detected and reported. Other peaks which are measurable and identifiable, together with the above nuclides, shall also be identified and reported.

f. Sampling will be performed only if the effluent will be discharged to the environment.

g. Deviation from the MDC requirements of Table 4.11-1 of the TS shall be reported per Specification 6.9.1.8 in lieu of any other report.

TABLE 6

TABLE 6 (Continued)

TYPICAL LIQUID MDC'S FOR RCLS
COUNTING SYSTEM

Nuclide	MDC (uCi/ml)	Nuclide	MDC (uCi/ml)
Mn-54	2.88E-08	I-131	2.13E-08
Co-58	2.15E-08	Cs-134	1.75E-08
Fe-59	4.43E-08	Cs-137	2.67E-08
Co-60	3.86E-08	Ce-141	3.40E-08
Zn-65	7.94E-08	Ce-144	1.65E-07
Mo-99	1.88E-07		

CHAPTER 23

TABLE 7

TABLE 7

LIQUID DISCHARGES NOT MEETING SPECIFIED DETECTION LIMITS
Farley Units 1 & 2 - 2nd half, 1989

Batch #	N/A*
Date	N/A
Count Time in Seconds	N/A
Volume Discharged in Gallons	N/A
Dilution Water in Gallons	N/A
Total Isotopic Activity (uCi/ml)	N/A
Isotope of Interest	N/A
MDC Measured	N/A
% of Total Isotopic Activity	N/A
% of Total Dose	N/A

* No liquid discharges made that did not meet specified detection limits.

CHAPTER 24

TABLE 8-CA

The annual cumulative joint frequency table for all releases is contained on the following pages.

TABLE 8-CA

FARLEY NUCLEAR PLANT

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-JAN-89 00:00 TO 31-DEC-89 23:59
RELEASE MODE: Ground
STABILITY CLASS: A ALL HOURS IN PERIOD
ELEVATION: 10.0 m.

Wind Direction	Wind Speed (mph) at 10.0 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	1	0	0	0	0	1
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	0	0	0	0	0	0	0
WSW	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0
WNW	1	0	0	0	0	0	1
NW	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0
VARIABLE	0	2	0	0	0	0	2
Total	1	3	0	0	0	0	4

Periods of calm(hours): 0
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 8-CA

FARLEY NUCLEAR PLANT

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-JAN-89 00:00 TO 31-DEC-89 23:59
RELEASE MODE: Ground
STABILITY CLASS: B ALL HOURS IN PERIOD
ELEVATION: 10.0 m.

Wind Direction	Wind Speed (mph) at 10.0 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	0	1	0	0	0	0	1
WSW	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0
NW	0	0	0	2	0	0	2
NNW	0	0	0	0	0	0	0
VARIABLE	0	0	0	0	0	0	0
Total	0	1	0	2	0	0	3

Periods of calm(hours): 0
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 8-CA

FARLEY NUCLEAR PLANT

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-JAN-89 00:00 TO 31-DEC-89 23:59
RELEASE MODE: Ground
STABILITY CLASS: C ALL HOURS IN PERIOD
ELEVATION: 10.0 m.

Wind Direction	Wind Speed (mph) at 10.0 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0	0	0	0	0
NNE	0	1	0	0	0	0	1
NE	0	2	0	0	0	0	2
ENE	0	2	4	0	0	0	6
E	0	3	1	0	0	0	4
ESE	0	1	0	0	0	0	1
SE	0	2	2	0	0	0	4
SSE	0	0	0	0	0	0	0
S	0	0	1	1	0	0	2
SSW	0	0	3	2	2	0	7
SW	0	0	3	1	0	0	4
WSW	0	1	0	0	0	0	1
W	0	0	0	0	0	0	0
WNW	0	0	0	2	0	0	2
NW	0	0	4	7	0	0	11
NNW	0	0	1	0	0	0	1
VARIABLE	0	3	0	0	0	0	3
Total	0	15	19	13	2	0	49

Periods of calm(hours): 0
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 8-CA

FARLEY NUCLEAR PLANT

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-JAN-89 00:00 TO 31-DEC-89 23:59
RELEASE MODE: Ground
STABILITY CLASS: D ALL HOURS IN PERIOD
ELEVATION: 10.0 m.

Wind Direction	Wind Speed (mph) at 10.0 m. level						
	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	19	58	33	0	0	0	110
NNE	20	129	43	0	0	0	192
NE	29	202	99	0	0	0	330
ENE	24	181	75	3	0	0	283
E	28	113	13	0	0	0	154
ESE	6	75	8	0	0	0	89
SE	9	76	60	0	0	0	145
SSE	4	17	31	3	0	0	55
S	3	15	33	20	0	0	71
SSW	3	33	66	41	2	0	145
SW	20	150	133	20	0	0	323
WSW	22	130	35	5	0	0	192
W	24	114	26	1	0	0	165
WNW	31	178	36	5	0	0	250
NW	30	141	135	23	0	0	329
NNW	26	138	116	7	0	0	287
VARIABLE	188	296	35	0	0	0	519
Total	486	2046	977	128	2	0	3639

Periods of calm(hours): 1
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 8-CA

FARLEY NUCLEAR PLANT

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-JAN-89 00:00 TO 31-DEC-89 23:59
RELEASE MODE: Ground
STABILITY CLASS: E ALL HOURS IN PERIOD
ELEVATION: 10.0 m.

Wind Direction	Wind Speed (mph) at 10.0 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	49	20	2	0	0	0	71
NNE	102	51	0	0	0	0	153
NE	79	81	17	0	0	0	177
ENE	68	75	18	0	0	0	161
E	37	53	1	0	0	0	91
ESE	33	85	2	0	0	0	120
SE	14	80	70	0	0	0	164
SSE	8	32	30	9	0	0	79
S	4	30	32	2	0	0	68
SSW	15	88	118	12	0	0	233
SW	76	257	113	4	0	0	450
WSW	85	83	10	0	0	0	178
W	73	23	1	0	0	0	97
WNW	67	47	4	1	0	0	119
NW	83	93	29	6	0	0	211
NNW	100	148	38	1	0	0	287
VARIABLE	467	130	13	0	0	0	610
Total	1360	1376	498	35	0	0	3269

Periods of calm(hours): 31
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 8-CA

FARLEY NUCLEAR PLANT

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-JAN-89 00:00 TO 31-DEC-89 23:59
RELEASE MODE: Ground
STABILITY CLASS: F ALL HOURS IN PERIOD
ELEVATION: 10.0 m.

Wind Direction	Wind Speed (mph) at 10.0 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	41	1	1	0	0	0	43
NNE	39	1	0	0	0	0	40
NE	34	0	0	0	0	0	34
ENE	21	2	0	0	0	0	23
E	13	2	0	0	0	0	15
ESE	14	19	0	0	0	0	33
SE	5	16	4	0	0	0	25
SSE	5	2	3	0	0	0	10
S	1	2	0	0	0	0	3
SSW	7	3	6	0	0	0	16
SW	21	27	5	0	0	0	53
WSW	25	26	0	0	0	0	51
W	31	8	0	0	0	0	39
WNW	54	14	0	0	0	0	68
NW	67	23	0	0	0	0	90
NNW	117	23	0	0	0	0	140
VARIABLE	270	18	0	0	0	0	288
Total	765	187	19	0	0	0	971

Periods of calm(hours): 30
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 8-CA

FARLEY NUCLEAR PLANT

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-JAN-89 00:00 TO 31-DEC-89 23:59
RELEASE MODE: Ground
STABILITY CLASS: G ALL HOURS IN PERIOD
ELEVATION: 10.0 m.

Wind Direction	Wind Speed (mph) at 10.0 m. level						
	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	81	11	0	0	0	0	92
NNE	26	0	0	0	0	0	26
NE	14	0	1	0	0	0	15
ENE	11	0	1	0	0	0	12
E	5	1	0	0	0	0	6
ESE	3	2	0	0	0	0	5
SE	3	2	0	0	0	0	5
SSE	1	0	0	0	0	0	1
S	0	2	0	0	0	0	2
SSW	1	0	0	0	0	0	1
SW	2	1	1	0	0	0	4
WSW	5	0	0	0	0	0	5
W	17	6	0	0	0	0	23
WNW	23	5	1	0	0	0	29
NW	43	0	1	0	0	0	44
NNW	158	19	0	0	0	0	177
VARIABLE	255	4	0	0	0	0	259
Total	648	53	5	0	0	0	706

Periods of calm(hours): 57
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 8-CA

FARLEY NUCLEAR PLANT

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-JAN-89 00:00 TO 31-DEC-89 23:59
RELEASE MODE: Elevated
STABILITY CLASS: A ALL HOURS IN PERIOD
ELEVATION: 60.3 m.

Wind Direction	Wind Speed (mph) at 60.3 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	1	0	0	0	1
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	0	0	0	0	0	0	0
WSW	0	0	0	1	0	0	1
W	0	1	0	0	0	0	1
WNW	0	0	0	0	0	0	0
NW	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0
VARIABLE	0	1	0	0	0	0	1
Total	0	2	1	1	0	0	4

Periods of calm(hours): 0
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 8-CA

FARLEY NUCLEAR PLANT

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-JAN-89 00:00 TO 31-DEC-89 23:59
RELEASE MODE: Elevated
STABILITY CLASS: B ALL HOURS IN PERIOD
ELEVATION: 60.3 m.

Wind Direction	Wind Speed (mph) at 60.3 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	0	1	0	0	0	0	1
WSW	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0
NW	0	0	0	0	2	0	2
NNW	0	0	0	0	0	0	0
VARIABLE	0	0	0	0	0	0	0
Total	0	1	0	0	2	0	3

Periods of calm(hours): 0
Hours of missing data: 0 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 8-CA

FARLEY NUCLEAR PLANT

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-JAN-89 00:00 TO 31-DEC-89 23:59
RELEASE MODE: Elevated
STABILITY CLASS: C ALL HOURS IN PERIOD
ELEVATION: 60.3 m.

Wind Direction	Wind Speed (mph) at 60.3 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	1	0	0	0	1
NNE	0	1	1	0	0	0	2
NE	0	0	2	0	0	0	2
ENE	0	1	2	0	0	0	3
E	0	1	3	0	0	0	4
ESE	0	0	0	0	0	0	0
SE	0	1	1	0	0	0	2
SSE	0	0	1	1	0	0	2
S	0	0	0	0	0	0	0
SSW	0	0	2	1	1	2	6
SW	0	1	3	1	2	0	7
WSW	0	0	1	1	0	0	2
W	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0
NW	0	0	0	6	4	2	12
NNW	0	0	1	1	0	0	2
VARIABLE	0	0	3	0	0	0	3
Total	0	5	21	11	7	4	48

Periods of calm(hours): 0
Hours of missing data: 1 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 8-CA

FARLEY NUCLEAR PLANT

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-JAN-89 00:00 TO 31-DEC-89 23:59
RELEASE MODE: Elevated
STABILITY CLASS: D ALL HOURS IN PERIOD
ELEVATION: 60.3 m.

Wind Direction	Wind Speed (mph) at 60.3 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	20	98	104	31	0	0	253
NNE	16	60	81	21	1	0	179
NE	5	99	201	32	0	0	337
ENE	11	101	90	29	0	0	231
E	9	101	39	2	0	0	151
ESE	11	64	27	3	0	0	105
SE	6	50	64	2	0	0	122
SSE	5	16	58	12	0	0	91
S	5	12	28	24	2	0	71
SSW	1	17	30	43	10	2	103
SW	3	67	166	57	21	1	315
WSW	13	94	86	8	2	0	203
W	12	84	55	13	4	0	168
WNW	11	130	76	19	3	0	239
NW	11	107	123	85	13	3	342
NNW	10	64	79	45	1	0	199
VARIABLE	116	230	119	14	0	0	479
Total	265	1394	1426	440	57	6	3588

Periods of calm(hours): 2
Hours of missing data: 50 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 8-CA

FARLEY NUCLEAR PLANT

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-JAN-89 00:00 TO 31-DEC-89 23:59
RELEASE MODE: Elevated
STABILITY CLASS: E ALL HOURS IN PERIOD
ELEVATION: 60.3 m.

Wind Direction	Wind Speed (mph) at 60.3 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	19	88	109	4	0	0	220
NNE	11	89	84	1	0	0	185
NE	8	104	64	11	0	0	187
ENE	15	102	37	8	0	0	162
E	8	84	38	1	0	0	131
ESE	9	58	32	0	0	0	99
SE	3	49	90	2	0	0	144
SSE	9	26	90	56	0	0	181
S	4	23	48	18	0	0	93
SSW	5	25	118	85	2	0	235
SW	4	95	242	94	5	0	440
WSW	12	107	107	9	0	0	235
W	6	75	40	4	0	0	125
WNW	9	47	56	3	1	0	116
NW	10	55	79	33	0	0	177
NNW	11	66	88	24	3	0	192
VARIABLE	87	145	66	5	0	0	303
Total	230	1238	1388	358	11	0	3225

Periods of calm(hours): 18
Hours of missing data: 57 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 8-CA

FARLEY NUCLEAR PLANT

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-JAN-89 00:00 TO 31-DEC-89 23:59
RELEASE MODE: Elevated
STABILITY CLASS: F ALL HOURS IN PERIOD
ELEVATION: 60.3 m.

Wind Direction	Wind Speed (mph) at 60.3 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	3	30	44	0	0	0	77
NNE	4	16	54	0	0	0	74
NE	8	22	36	0	0	0	66
ENE	7	22	11	0	0	0	40
E	5	36	12	0	0	0	53
ESE	5	27	13	1	0	0	46
SE	7	15	20	0	0	0	42
SSE	7	9	25	16	0	0	57
S	5	6	4	1	0	0	16
SSW	2	5	11	5	0	0	23
SW	4	29	33	6	0	0	72
WSW	7	25	29	2	0	0	63
W	6	29	14	0	0	0	49
WNW	6	26	25	0	0	0	57
NW	5	24	42	3	0	0	74
NNW	4	40	37	0	0	0	81
VARIABLE	35	50	12	0	0	0	97
Total	120	411	422	34	0	0	987

Periods of calm(hours): 0
Hours of missing data: 14 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

TABLE 8-CA

FARLEY NUCLEAR PLANT

CUMULATIVE JOINT FREQUENCY DISTRIBUTION

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD: 01-JAN-89 00:00 TO 31-DEC-89 23:59
RELEASE MODE: Elevated
STABILITY CLASS: G ALL HOURS IN PERIOD
ELEVATION: 60.3 m.

Wind Direction	Wind Speed (mph) at 60.3 m. level 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	2	31	19	1	0	0	53
NNE	4	19	46	1	0	0	70
NE	5	30	36	0	0	0	71
ENE	6	32	28	0	0	0	66
E	6	21	13	0	0	0	40
ESE	8	21	18	0	0	0	47
SE	1	33	9	0	0	0	43
SSE	6	10	10	4	0	0	30
S	3	9	2	0	0	0	14
SSW	10	2	1	0	0	0	13
SW	5	9	2	1	0	0	17
WSW	5	17	5	0	0	0	27
W	3	27	11	0	0	0	41
WNW	10	26	19	0	0	0	55
NW	2	28	17	0	0	0	47
NNW	0	39	11	0	0	0	50
VARIABLE	37	28	5	0	0	0	70
Total	113	382	252	7	0	0	754

Periods of calm(hours): 4
Hours of missing data: 5 (this stability class)
Hours of missing data: 0 (this time period, all stability classes)

CHAPTER 25

PROCESS CONTROL PROGRAM

Changes to the Process Control Program for the second half of 1989 are attached.

1. Procedure Number FNP-0-M-030 Revision Number 7
Procedure Title Process Control Program

[x] Safety Related [ ] Non-Safety Related
[ ] New Procedure Request
[x] Procedure Revision, New Revision Number 8
[ ] Temporary Procedure Change, Effective until next permanent change, TCN ______
[ ] Temporary Procedure Change, Req'd. by Plant Conditions, TCN ______
[ ] Temporary Procedure Change, One Time Only Use, TCN ______
[ ] Delete procedure
[ ] Delete TCN ______
[ ] The procedure has been reviewed per Section 9 of FNP-0-AP-1.

2. Change Summary
2.1 Procedure Page Numbers Affected by Change Added procedure F424-P-004 and Report F424-R-002

2.2 Description of Changes Incorporated procedure and report on solidification of Class A unstable oil for disposal

2.3 Reason for Change Solidification of contaminated oils for final disposal at a LLW Burial Site

3. Prepared By [signature], Rad Waste Tech, 7-12-89
Signature Title Date

4. Reviewed By [signature], [signature], 7-12-89
Signature Title Date

5. Cross-Disciplinary/PORC Review

Group	Signature	Title	Date
PORC	[signature]	PORC Ch'm	7/18/89

6. Temporary Change Approval (Signature/Date)

[ ] Member Group Staff ______/______
[ ] Shift Foreman ______/______
[ ] Senior Reactor Operator ______/______
[ ] General Manager-Nuclear Plant ______/______

7. Final Approval (Signature/Date, required within 60 days of temporary approval)

[ ] Group Supervisor ______/______
[x] Manager [signature] / 7-18-89
[ ] MSAER ______/______
[ ] Vice President-Nuclear ______/______
[ ] ______ ______/______
[ ] General Manager-Nuclear Plant ______/______

FARLEY NUCLEAR PLANT
NUCLEAR SAFETY EVALUATION CHECK LIST

(1) UNIT 0
(2) CHECK LIST APPLICABLE TO: FNP-0-M-030 Revision 8 TCN
(3) SAFETY EVALUATION - PART A: Does the procedure or procedure change to which this evaluation is applicable represent:

(3.1)	Yes	No X	A change to the plant as described in the FSAR?
(3.2)	Yes	No X	A change to procedures as described in the FSAR?
(3.3)	Yes	No X	A test or experiment not described in the FSAR?
(3.4)	Yes	No X	A change to the Technical Specifications or Operating License?
(3.5)	Yes	No X	A change to the Fire Protection System as described in the FPPR or a conflict with the requirements of 10CFR50, Appendix R?

If the answer to question 3.1, 3.2, or 3.3 is "Yes," complete Item (4), attach a 10CFR50.59 evaluation and obtain PORC review prior to implementation. If the answer to question 3.4 is "Yes," complete a 10CFR50.92 check list, and obtain PORC and NRC approval prior to implementation. If the answer to question 3.5 is "Yes", provide an evaluation of the impact of the procedure or procedure change on the Fire Protection System and 10CFR50, Appendix R requirements and obtain PORC review prior to implementation. If the answer to Items 3.1, 3.2, 3.3 and 3.4 is "No", omit Item (4) and Item (9).

(4) SAFETY EVALUATION - PART B

(4.1)	Yes	No	Will the probability of an accident previously evaluated in the FSAR be increased?
(4.2)	Yes	No	Will the consequences of an accident previously evaluated in the FSAR be increased?
(4.3)	Yes	No	May the possibility of an accident which is different than any already evaluated in the FSAR be created?
(4.4)	Yes	No	Will the probability of a malfunction of equipment important to safety previously evaluated on the FSAR be increased?
(4.5)	Yes	No	Will the consequences of a malfunction of equipment important to safety different than any already evaluated in the FSAR be increased?
(4.6)	Yes	No	May the possibility of a malfunction of equipment important to safety different than any already evaluated in the FSAR be created?
(4.7)	Yes	No	Will the margin of safety as defined in the basis to any Technical Specification be reduced?

If the answer to any of the above questions is "Yes," an unreviewed safety question may be involved.

(5) REMARKS: (Attach additional pages if necessary) This change does not reduce the overall conformance of the solidified waste program to existing Criteria for solid wastes.

(6) PREPARED BY: [signature] DATE 7-12-89

(7) REVIEWED BY: [signature] DATE 7-12-89

(8) PORC REVIEW: [signature] DATE 7/18/89

(9) NORB REVIEW: [signature] DATE

Basis for Safety Evaluation for Rev. 8 TCN _____ to FNP-0-M-030
"Process Control Program (PCP)"

The following lists data/information to show compliance with 10CFR61 in support of Revision to FNP-0-M-030.

61.56(a) (1) Waste must not be packaged for disposal in cardboard or fiberboard boxes:

N/A to this procedure

61.56(a) (2) Liquid waste must be solidified or packaged in sufficient absorbent material to absorb twice the volume of the liquid:

As shown in F424-R-002 Section 4.0, enough absorbent is added to absorb at least twice the volume.

61.56(a) (3) Solid waste containing liquid shall contain as little free standing and noncorrosive liquid as is reasonably achievable, but in no case shall the liquid exceed 1% of the volume:

F424-R-002 Section 5 ensures free standing liquids of final product are <0.5% by volume.

61.56(a) (4) Waste must not be readily capable of detonation or of explosive decomposition or reaction at normal pressures and temperatures, or of explosive reaction with water:

F424-R-002 Section 5, ensures waste is not capable of ~~decontamination~~ detonation explosive decomposition or reaction with water at normal temperatures and pressures.

61.56(a) (5) Waste must not contain, or be capable of generating, quantities of toxic gases, vapors, or fumes harmful to persons transporting, handling, or disposing of the waste. This does not apply to radioactive gaseous waste packaged in accordance with paragraph (a)(7) of this section:

F424-R-002 Section 5 determines that waste will not contain or be capable of generating toxic gases, vapors or fumes.

61.56(a) (6) Waste must not be pyrophoric. Pyrophoric materials contained in waste shall be treated, prepared, and packaged to be nonflammable:

F424-R-002 Section 5 determines that waste will not be pyrophoric.

61.56(a) (7) Waste in a gaseous form must be packaged at a pressure that does not exceed 1.5 atmospheres at 20°C. Total activity must not exceed 100 curies per container:

N/A this procedure

61.56(a) (8) Waste containing hazardous, biological, pathogenic, or infectious material must be treated to reduce to the maximum extent practicable the potential hazard from the non-radiological materials:

F424-R-002 Section 5 determines that waste will not contain hazardous, biological, pathogenic or infectious materials.

61.56(b) (1) Waste must have structural stability. A structurally stable waste form will generally maintain its physical dimensions and its form, under the expected disposal conditions such as weight of overburden and compaction equipment, the presence of moisture, and microbial activity, and internal factors such as radiation effects and chemical changes. Structural stability can be provided by the waste form itself, processing the waste to a stable form, or placing the waste in a disposal container or structure that provides stability after disposal:

Not applicable to Class A, unstable waste.

61.56(b) (2) Notwithstanding the provisions in § 61.56(a) (2) and (3), liquid wastes, or wastes containing liquid, must be converted into a form that contains as little free standing and noncorrosive liquids as is reasonably achievable, but in no case shall the liquid exceed 1% of the volume of the waste when the waste is in a disposal container designed to ensure stability, or 0.5% of the volume of the waste for waste processed to a stable form:

F424-R-002 Section 5 determines that waste will contain <0.5% by volume free standing liquid.

56.56(b) (3) Void spaces within the waste and between the waste and its package must be reduced to the extent practicable:

F424-P-004 Section 6 address void spaces reduced to maximum extent practicable.

Westinghouse RS
The One Source For Radiological Services
Westinghouse Radiological Services, Inc.
1258 North Church Street
Moorestown, NJ 08057
609-722-9700

July 17, 1989

Perry Farnsworth
Alabama Power Co.
Joseph M. Farley Nuclear Plant
Highway 95 South
Columbia, Al 36319

Subject: Oil Solidification

Dear Perry,

To further clarify my letter of July 14, 1989, this is to confirm that Westinghouse Radiological Services, Inc. and Fluid Tech, Inc. certify that; provided the previously referenced documents are used; waste oil solidified with Petroset, meets the requirements of 10CFR61.56. For the purpose of this letter, and the referenced documentation, waste oil is defined as organic oils meeting the non-hazardous requirements of 40 CFR 261.

Sincerely,

Mike McCauley

Mike McCauley
Sr. Project Manager

mc\iw

Westinghouse RS
The One Source For Radiological Services
Westinghouse Radiological Services, Inc.
1258 North Church Street
Moorestown, NJ 08057
609-722-6700

July 14, 1989

Perry Farnsworth
Alabama Power Co.
Joseph M. Farley Nuclear Plant
Highway 95 South
Columbia, Al 36319

Subject: Oil Solidification

Based on the review of the processing procedures and control program published by Fluid Tech, Inc., the on site testing documented by WRS report number F424-R-002, and the use of the WRS Process and Test Solidification Procedure, F424-P-004, Westinghouse Radiological Services is confident that the solidified product produced will meet all necessary transportation and burial requirements.

Sincerely,

Mike McCauley

Mike McCauley
Sr. Project Manager

mc\iw

FLUID TECH, INC.

July 17, 1989

Mr. Greg Boris
Westinghouse HT
1256 North Church Street
Morristown, NJ 08057

Dear Mr. Boris:

This letter is in response to your questions this morning about our Aquaset-Petroset products. These products have been approved and licensed by the State of Washington and the State of Nevada. They meet the requirements of 10 CFR 61.56 when used in accordance with Fluid Tech, Inc. procedures.

If you have any further questions, please call me.

Sincerely,

F. Dean Rowsell
President

FDR/lpb

Solidifying of Radioactive & Hazardous Liquids
4335 West Tropicana • Las Vegas, Nevada 89103 • (702) 871-1884

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TEST REPORT FOR OIL SOLIDIFICATION USING PETROSET II

For

J. M. FARLEY NUCLEAR PLANT

WESTINGHOUSE RADIOLOGICAL SERVICES, INCORPORATED

1256 N. Church Street

Moorestown, NJ 08057

WESTINGHOUSE RADIOLOGICAL SERVICES INCORPORATED	Document Number: F424-R-002
	Title: TEST REPORT FOR OIL SOLIDIFICATION USING PETROSET II

PROPRIETARY

Rev.	Rev. Date	Manager Design & Process Engineering	Project Manager				EWR/ ECN
2	7/5/89						ECN 89-019

TEST REPORT FOR OIL SOLIDIFICATION USING PETROSET II

1.0 PURPOSE

The purpose of this test was to determine if waste oil could be successfully solidified using Petroset II solidification agent at volume ratios ranging from 0.42 (recommended by Fluid Tech, Inc.) to 0.67 Petroset II to oil.

2.0 REFERENCES

2.1 Fluid Tech Manual .002, "Solidification Procedures for Radioactive Liquids." (See Attachment A).

3.0 EQUIPMENT AND MATERIALS

3.1 Mixing vessels, 1 liter, disposable plastic.

3.2 Electric mixing motor equipped with mixing blade.

3.3 Petroset II solidification agent.

3.4 Activator (isopropyl alcohol).

3.5 Graduated beaker.

3.6 Waste oil, samples of unknown composition from four different drums.

4.0 TEST PERFORMANCE

From each drum, one 300 ml sample of oil was placed into a mixing vessel. Using the recipe suggested by Fluid Tech, 125 ml (80 gm) of Petroset II and 15 ml of activator were measured into separate graduated beakers. Use of the recommended amount of Petroset II (or greater amounts) provides enough Petroset II to absorb twice the volume of oil.

The mixing blade was inserted into the mixing vessel containing the first oil sample and the electric mixing motor was started. The Petroset II was added slowly while mixing. Approximately one minute after completion of the Petroset II addition, the activator was added to

the waste slurry while continuing the mixing. This slurry was mixed for another minute, then the mixing was stopped and the mixing blade was removed from the mixing vessel.

At this point the mix looked too fluid, so it was decided to measure out an additional 50 ml of Petroset II and approximately 5 ml of activator to be added to the slurry. The mixing blade was reinserted into the sample and the mixing motor was started. The additional Petroset II and activator were added to the slurry in the same manner described above. This product looked better than the original recipe, but still looked soft. This procedure was repeated for one sample from each of the four drums.

A second sample from two of the drums was solidified as described above but using 200 ml of Petroset II and 22 ml of activator.

All of the samples were loosely covered and allowed to cure for 24 hours.

No water was evident during testing, thus Petroset I and Aquaset II were not used. However, if water is encountered at full-scale, Fluid Tech recommends their usage.

5.0 PRODUCT ACCEPTABILITY AND TEST RESULTS

Criteria for acceptability of the product for shipment and burial at Richland and Beatty include the product being a free standing monolith with less than 1/2% free liquid.

After 24 hours of cure, all of the samples showed no signs of free liquid and appeared to be the consistency of thick grease. Table 1 shows the solidification test data. The samples were turned upside down on the table top and allowed to sit in that position for two hours. The samples mixed with 200 ml of Petroset showed very little sign of slumping. All samples showed no sign of free oil.

Subsequent conversations with Fluid Tech personnel indicated that the "thick grease" consistency is what the product should resemble and is acceptable for burial. Fluid Tech was confident that their suggested recipe used for the first sample was acceptable without additional Petroset and activator (as in samples 3 and 5).

Conversations with the State of Washington indicated that the solidified waste product is acceptable for burial at the Richland burial site (see Attachment B). Fluid Tech has stated that the criteria of 10 CFR 61.56 are met when the waste is solidified as directed by them, and using the recipes outlined in this report. Specifically, the solidified waste form will:

1) contain less than 0.5% of the volume of waste as free-standing, non-corrosive liquid (10CFR 61.56 (a) (3) and (b) (2));

2) not be readily capable of detonation or of explosive decomposition or reduction (10CFR 61.56 (a) (4));

3) not contain or be capable of generating quantities of toxic gases, vapors, or fumes (10CFR 61.56 (a) (5));

4) not be pyrophoric (10CFR 61.56 (a) (6)); and

5) not contain hazardous, biolcgical, pathogenic or infectious material (10CFR 61.56 (a) (8)).

6.0 CONCLUSIONS

Use of the Petroset II results in an acceptable product for burial at Richland or Beatty. In order to add a margin of safety to the Fluid Tech recipe, additional Petroset II and activator should be used (as in Sample 3 and 5). This will result in approximately 40 gallons of oil waste, 140 pounds of Petroset II and 2.5 gallons of activator per drum processed.

TABLE 1

Test Solidification Data for Oil Using Petroset II

Sample Designation	Waste Oil Volume, ml	Sample Drum	Petroset II Volume, ml	Activator Volume, ml	Final Volume, ml	Observations at 24 hours
1	300	1	175	20	400	Soft, thick, no free liquid
2	300	2	175	20	400	Soft, thick, no free liquid
3	300	2	200	22	410	Soft, thicker than sample 2, no free liquid
4	300	3	175	20	400	Soft, thick, no free liquid
5	300	3	200	22	410	Soft, thicker than sample 4, no free liquid
6	300	4	175	20	400	Soft, thick, no free liquid

ATTACHMENT A

Excerpt from Reference 2.1

5.2 Solidification Process

5.2.1 Equipment Required
1. Shipping Containers
2. Mixing Equipment
3. Company Safety Requirements

5.2.2 Transfer the container of liquid waste to be solidified into the processing area, open the container, and inspect the liquid for solid debris.

5.2.3 If miscellaneous solid debris (i.e., rags, cloth, etc.) is in the liquid, remove such material for subsequent packaging as wet trash. Solid debris should not be left in a container of liquid which is to be processed by solidification.

5.2.4 Place the calculated volume of liquid in the shipping container (normally a 55 gallon drum).

5.2.5 Place the stirring mechanism in position to stir the Petroset or Petroset/Petroset II mixtures into the solution as required.

5.2.6 Add the Petroset or Petroset/Petroset II mixtures while stirring until the mixture has reached the desired consistency. Add activator if necessary.

5.2.7 Remove the stirring tool and place a small amount (1/2" to 1") of the solidification agent being used on the top of the mixture and replace the container lid, but do not secure the lid.

5.2.8 In 24 hours, inspect the solidified media for any free liquid. (Free liquid will normally rise to the top).

5.2.8.1 If no free liquid is present, seal for shipment.

5.2.8.2 If free liquid is found, add enough solidification agent while stirring to solidify the liquid and repeat steps 5.2.7 and 5.2.8 above.

6.0 SOLIDIFICATION PROCEDURES FOR LIQUIDS THAT ARE ESSENTIALLY PURE ORGANIC

Revised 4/22/86

Petroset II provides the greatest efficiency with pure organic liquids. In certain instances, for example when solidifying pure oil, addition of an activator in amounts of approximately 5% of the waste volume will be required to effect rapid solidification. If contaminated solvents which need to be disposed are available, the addition of methyl alcohol, or similar non-hazardous solvents may replace the activator and thus improve the results of Petroset II when solidifying pure oils.

6.1 Sample Testing

6.1.1 Equipment Required

1. Calibrated beakers
2. Stirring device - a variable speed 1/4" drill with a paint stirring attachment works well, or a small stainless steel spatula.
3. Company Safety Requirements

6.1.2 In a small beaker containing 300 ml of waste, add 80 gms (about 125 ml) of Petroset II while stirring. This is equivalent to approximately 100 lbs in 45 gallons. If the waste is not adequately solidified at this point, add activator at the rate of about 5% by volume of the waste fluid.

6.1.3 Evaluate the system condition.

6.1.4 If necessary, add additional Petroset II and activator incrementally in the ratio of 0.083 ml activator for each gram of Petroset II until the desired consistency is reached. (This amounts to 1 gallon of activator per 100 pounds of Petroset II).

6.1.5 Record the final total volume of the solidified material, and determine the volume expansion relative to the volume of liquid with which the test was started.

6.1.6 Calculate the volume of liquid that can be solidified in the shipping container so that it will not overfill during the solidification process.

6.2 Solidification Process

6.2.1 Equipment Required

1. Shipping Container
2. Mixing Equipment
3. Company Safety Requirements

6.2.2 Place the calculated volume of liquid in the shipping container (normally a 55 gallon drum).

6.2.3 Place the stirring mechanism in position to stir the Petroset II into the wastes.

6.2.4 Add the required weight of Petroset II (as determined from lab tests and calculations) while stirring.

6.2.5 Add approximately 5% of the waste volume of activator as required to obtain solidification. Mix well.

6.2.6 Evaluate the system condition.

6.2.7 If necessary, add additional Petroset II and special activator incrementally in the ratio of 1 gallon activator to 100 pounds of Petroset II until the desired consistency is reached.

6.2.8 Remove the stirring tool and place a small amount (1/2" to 1") of the solidification agent being used on the top of the mixture and replace the container lid, but do not secure the lid.

6.2.9 In 24 hours, inspect the solidified media for any free liquid. (Free liquid will normally rise to the top.)

6.2.9.1 If no free liquid is present, seal for shipment.

6.2.9.2 If free liquid is found, add Petroset II and activator if necessary while stirring to solidify the liquid, and repeat steps 6.2.8 and 6.2.9.

7.0 SPECIAL SOLIDIFICATION PROCEDURES FOR:*

1) Water solutions very high in soluble metal salts
2) Water soluble/miscible organic compounds
3) Neutralized acids or bases
4) Combinations of any or all the above
5) Mixtures of 1, 2 and/or 3 above and oils, greases or solvents.

Aquaset II, either alone or in combination with Petroset or Petroset II, will efficiently solidify the wastes referenced above. The water soluble/miscible organic compounds include alcohols, glycols, certain ketones and the like. Shear stirring enhances the speed of the solidification process when using Aquaset II and should be used to realize the greatest solidification cost effectiveness. It is important that laboratory bench testing identify the proper proportions of individual solidification agents to be used in the solidification agent mix. Upon request, Fluid Tech, Inc. will provide necessary technical assistance to achieve the required solidification goals. As a general rule of thumb, wastes can be adequately solidified by the following relationships.

7.0.1 Determination of Proper Solidification Agent Proportions in Mixed Wastes

A) In those cases where Group 1, 2 or 3 exist in concentrated form either singly or mixed, use Aquaset II

B) In cases where Group 1, 2 or 3 are present in diluted form either singly or mixed, Petroset may be used in conjunction with Aquaset II to more efficiently produce the required solidification. The relative percentages of Petroset and Aquaset II to be used will be discovered through laboratory bench testing.

C) Groups 1, 2 or 3 either alone or in combination, whether concentrated or dilute when mixed with oils, greases or solvents can be efficiently solidified according to the following relationship:

$$\frac{\text{Volume \% Group 1+2+3}}{\text{Volume \% Oils + Greases + Solvents}} = \frac{\text{Weight \% Aquaset II}}{\text{Weight \% Petroset II}}$$

* Make sure that these procedures comply with company safety rules.

ATTACHMENT B

C. M. SUGARMAN
Secretary

STATE OF WASHINGTON

DEPARTMENT OF SOCIAL AND HEALTH SERVICES

Olympia, Washington 98504-0095

October 6, 1988

Bryon Roy
Hittman Nuclear
1256 N. Church Street
Moorestown, New Jersey 08057

Dear Mr. Roy:

This is in response to your letter dated July 27, 1988, relative to oil, solidified with Petroset at the Joseph M. Farley plant.

Provided that the oil is processed in accordance with Fluid-Tech, Inc.'s process control program, contains no free-standing liquid, and results in a free-standing solid, the waste described in your letter is acceptable at the US Ecology, Inc. low-level radioactive waste disposal site, near Richland, Washington.

All shipments must comply with the rules and regulations of DOT, NRC, state of Washington, as well as US Ecology, Inc.'s license.

If you should have any questions, do not hesitate to contact this office.

Sincerely,

C. E. Ingersoll

C. E. Ingersoll, Head
Waste Management Section

MJE:CEI:jd

Document Number: F424-P-004

Revision Level: 2

PROCESS AND TEST SOLIDIFICATION PROCEDURE FOR INCONTAINER SOLIDIFICATION OF CLASS A UNSTABLE OIL USING PETROSET II

For

J. M. FARLEY NUCLEAR PLANT

WESTINGHOUSE RADIOLOGICAL SERVICES, INCORPORATED

1256 N. Church Street

Moorestown, NJ 08057

P. FARNSWORTH

WESTINGHOUSE RADIOLOGICAL SERVICES INCORPORATED	Document Number: F424-P-004
	Title: PROCESS AND TEST SOLIDIFICATION PROCEDURE FOR INCONTAINER SOLIDIFICATION OF CLASS A UNSTABLE OIL USING PETROSET II

Rev.	Rev. Date	Manager Design & Process Engineering	Project Manager				ECN/ EWR
2	7-5-89	Bry - Roy	M McCaulley				ECN 89-020

FORM-01 (D)

PROCESS AND TEST SOLIDIFICATION PROCEDURE FOR INCONTAINER SOLIDIFICATION OF CLASS A UNSTABLE OIL USING PETROSET II

1.0 SCOPE

This procedure is applicable to the solidification of oil per Condition 36 and Appendix C of the State of Washington Radioactive Materials License, Number WN-I019-2, and classified as Class A unstable waste under the requirements of 10CFR61.55, Waste Classification. The waste oil to be solidified under this procedure is limited to pourable, lubricating oil.

2.0 PURPOSE

2.1 The purpose of the Process and Test Solidification Procedure (PTSP) for incontainer solidification of oil is to provide a program which, when used in conjunction with the plant's Process Control Program, PCP, will ensure a solidified product which meets the requirements of 10CFR61.56, Waste Characteristics.

The procedure consists of four major steps:

(a) Procedure for collecting and analyzing samples;

(b) Procedure for solidifying samples;

(c) Criteria for process parameters for acceptance or rejection as solidified waste;

(d) Calculational methodology for determining quantities of solidifications agents and additives for full scale operations.

2.2. This document describes the methodology for determining the acceptable ratio of waste, solidification agent and additive that will result in an acceptable product for transportation and burial. See test report F424-R-002, "Test Report for Oil Solidification Using Petroset II", for product acceptance according to 10CFR 61.56 criteria.

3.0 COLLECTION AND ANALYSIS OF SAMPLES

3.1 General Requirements

3.1.1 As required by the Radiological Effluent Technical Specifications for PWR's and BWR's the PTSP shall be used to verify the solidification of at least one representative test specimen from every tenth batch of each type of wet radioactive waste.

3.1.2 For the purpose of the PTSP a batch is defined as the appropriate quantity of waste required to fill a disposable container prior to solidification. For the purpose of the PTSP, a type of waste is defined as a mix of specific oil(s) and contaminants that is made homogeneous to ensure that batches of it are of the same makeup.

3.1.3 If any test specimen fails to solidify, the batch under test shall be suspended until such time as additional test specimens can be obtained, alternative solidification parameters can be determined in accordance with the Process and Test Solidification Procedure, and a subsequent test verifies solidification. Solidification of the batch may then be resumed using the alternate solidification parameters determined.

3.1.4 If a mixture of oil and water or glycol is to be solidified, Petroset I or Aquaset II may be required to be used with Petroset II for proper solidification.

3.2 Collection of Samples

3.2.1 Radiological Protection

These procedures must be followed during sampling to minimize personnel exposure and to prevent the spread of contamination.

3.2.1.1 Comply with applicable Radiation Work Permits.

3.2.1.2 Test samples which use actual waste shall be disposed of by placing them in the solidified container.

3.2.1.3 A Test Solidification Data Sheet will be maintained for each test sample solidified. Each data sheet will contain pertinent information on the test sample and the batch numbers of waste solidified based on each test sample.

3.2.2 Test Solidification Data Sheet

The Test Solidification Data Sheet will contain pertinent information on the characteristics of the test sample solidified so as to verify solidification of subsequent batches of similar waste without retesting.

3.2.2.1 The test sample data for oil will include, but not necessarily be limited to, the type of waste solidified, volume of sample, sample number and the quantity of any additive used.

3.2.2.2 The appropriate Test Solidification Data Sheet will include the Solidification Number, Container Number, Waste Volume, and Date Solidified, for each batch solidified.

3.2.3 Collection of Samples

3.2.3.1 Two samples shall be taken for analysis. If the radioactivity levels are too high to permit full size samples to be taken then smaller samples shall be taken with the results corrected accordingly. Sample sizes shall be determined by the plant Health Physics staff.

3.2.3.2 If possible, samples should be drawn at least two days prior to the planned waste solidification procedure to allow adequate time to complete the required testing and verification of solidification, and to allow for retesting if necessary. For Class A Unstable waste, approximately 28 hours are required for testing and verification.

3.2.3.3 If the contents of more than one tank are to be solidified in the same container then representative samples of each tank should be drawn. The samples should be of such size that when mixed together they form samples of standard size as prescribed in Section 3.2.3.1. If the contents of a particular tank represent a certain percent of the total waste quantity to be solidified then the sample from that tank should be of such size to represent that percent of the composite samples.

4.0 TEST SOLIDIFICATION AND ACCEPTANCE CRITERIA

4.1 Test Solidification of Class A Unstable Oil Waste

4.1.1 MEASURE into the mixing vessel 300 ml of oil.

NOTE: Test solidifications should be conducted using a 1000 ml disposable beaker or similar size container.

4.1.2 RECORD the volume of oil on the Class A Unstable Test Solidification Data Sheet (Item 1, Form F424-P-004-01).

4.1.3 MEASURE the pH of the oil.

4.1.4 If the pH is not in the 5 to 9 range, ADD an acid or a base to adjust the pH to this range.

4.1.5 RECORD the initial pH, the pH adjuster used, the amount of adjuster and the final pH on the Class A Unstable Test Solidification Data Sheet (Items 2 through 5, Form F424-P-004-01).

4.1.6 WEIGH out 128 gms (approximately 200 ml) of Petroset II into a separate vessel.

4.1.7 RECORD the weight of Petroset II on the Class A Unstable Test Solidification Data Sheet (Item 6, Form F424-P-004-01).

4.1.8 MEASURE out 20 ml of activator (isopropyl alcohol) into a separate vessel.

4.1.9 RECORD the volume of activator on the Class A Unstable Test Solidification Data Sheet (Item 7, Form F424-P-004-01).

4.1.10 Slowly ADD the Petroset II to the oil while mixing.

NOTE: Mixing may be accomplished by stirring with an electric mixing motor with mixing blade or other suitable method.

4.1.11 Slowly ADD the activator to the slurry while mixing.

4.1.12 MIX for one minute after addition of the Petroset II and activator to obtain a homogeneous mix.

NOTE: If a separation of phases is noticed following addition of the Petroset II (i.e., clear liquid is observed), Petroset I or Aquaset II may be necessary to solidify the waste due to water or glycol being present.

4.1.13 RECORD the final solidified product volume on the Class A Unstable Test Solidification Data Sheet (Item 8, Form F424-P-004-01).

4.1.14 ALLOW the sample to cure for up to 24 hours at room temperature.

NOTE: ENSURE that Section 4.1, Test Solidification of Class A Unstable Oil Waste, is completed and VERIFY this on the Procedure Verification Sheet, Form F424-P-004-03.

4.2 Solidification Acceptability

When used in accordance with Section 4.1, the amount of Petroset II is enough to absorb at least twice the volume of oil. The following criteria define an acceptable solidification process and process parameters.

4.2.1 The sample solidification has no free standing liquid.

4.2.2 If upon visual inspection the waste appears that it would hold its shape if removed from the mixing vessel.

4.2.3 VERIFY the acceptance criteria by signing and dating each item in Section II of the Class A Unstable Test Solidification Data Sheet.

NOTE: ENSURE that Section 4.2, Solidification Acceptability, is completed and VERIFY this on the Procedure Verification Sheet, Form F424-P-004-03.

4.3 Solidification Unacceptability

4.3.1 If the waste fails any of the criteria set forth in Section 4.2, the solidification will be termed unacceptable and a revised test procedure with revised solidification parameters will need to be established under the procedure in Section 4.4.

4.4 Alternate Solidification Parameters

4.4.1 If a test sample fails to provide acceptable solidification of the waste and no phase separation has occurred (i.e., no clear liquid is exhibited), PERFORM the following procedure:

4.4.1.1 ADD additional Petroset II and activator incrementally in the ratio of 0.083 ml activator per additional gram of Petroset II until the desired consistency is obtained or 140 gms of Petroset II is used, whichever occurs first.

4.4.1.2 If the test sample fails to provide acceptable solidification of the waste after completing Step 4.4.1.1, CONTACT Westinghouse.

4.4.2 If a test sample fails to provide acceptable solidification of the waste and phase separation has occurred (a clear liquid such as water or glycol is observed), PERFORM the following procedure:

4.4.2.1 MEASURE the volume of clear liquid that separated during the solidification.

4.4.2.2 DIVIDE the volume in Step 4.4.2.1 by the volume in Step 4.1.1 to determine the volume percent of miscible liquid in the waste.

4.4.2.3 REPLACE a fraction, equal to the fraction calculated in Step 4.4.2.2, of the weight of Petroset II used in the test solidification with the same weight of either Petroset or Aquaset II; REDUCE the volume of activator used to 10% of the volume of Petroset II now used; and REPERFORM the test solidification.

NOTE: For example, if a solidification of 300 ml of waste with 128 gm (200 ml) of Petroset II and 20 ml of activator exhibited 10 ml of free clear liquid, then replace 4 gms (10 ml/300 ml x 128 gm) of Petroset II with Petroset or Aquaset II and reduce the amount of activator used to 19 ml (124 gm/128 gm x 200 ml x 0.10) in the next test solidification.

4.4.2.4 If the test sample fails to provide acceptable solidification of the waste after completing Step 4.4.2.3, CONTACT Westinghouse.

5.0 PARAMETERS FOR FULL SCALE SOLIDIFICATION

5.1 After successful completion of the test solidifications, CALCULATE the amounts of additive and solidification agent necessary per gallon of waste using Section III of the Class A Unstable Test Solidification Data Sheet (Items 9 through 11, Form F424-P-004-01).

5.2 DETERMINE the quantity of oil to be solidified in the drum and the amounts of additive and solidification agent to be added to the drum per instructions on the Class A Unstable Waste Solidification Calculation Sheet (Items 1 through 4, Form F424-P-004-02).

NOTE: ENSURE that Section 5.0, Parameters for Full Scale Solidification, is completed and VERIFY this on the Procedure Verification Sheet, Form F424-P-004-03.

6.0 DRUM SOLIDIFICATION

6.1 ADD the oil waste to the drum.

NOTE: The volume of oil to be solidified should result in enough solidified product to reduce the void space in the drum to the extent practicable as required by 10 CFR 61.56 (b)(3).

6.2 POSITION the mixing mechanism in the drum.

6.3 START the mixing.

6.4 ADD the required quantity of pH adjuster, if any, and MIX until homogeneous.

6.5 ADD the required quantity of Petroset II and MIX until homogeneous.

6.6 ADD the required quantity of activator and MIX until homogeneous.

6.7 STOP the mixing and REMOVE the mixing mechanism from the drum.

6.8 SPREAD additional Petroset II (1/2 to 1 inch layer) on the top of the mixture.

6.9 PLACE the lid on the drum but do not secure the lid.

6.10 INSPECT the mixture after 24 hours.

6.10.1 If no free liquid is present, SEAL the drum for shipment.

6.10.2 If free liquid is found, CONTACT Westinghouse.

Solidification No.:_____
Batch No.:_____
Sample No.:_____
Date:_____

CLASS A UNSTABLE
TEST SOLIDIFICATION DATA SHEET
for Oil with Petroset II

I. Sample Solidification

Oil Volume, ml: _____ (1)

Initial pH: _____ (2)

pH Adjuster Used: _____ (3)

Quantity of pH Adjuster Used, gms: _____ (4)

Final pH: _____ (5)

Weight of Petroset II, gms: _____ (6)

Volume of Activator, ml: _____ (7)

Final Solidified Product Volume, ml: _____ (8)

II. Sample Inspection

Sample cured for 24 hours: ( ) yes ( ) no

_____ _____
Verified By date

Sample contains 'No Free Liquid': ( ) yes ( ) no

_____ _____
Verified By date

Sample is a 'Free Standing Monolith': ( ) yes ( ) no

_____ _____
Verified By date

III. Parameters for Full Scale Solidification

Quantity of pH Adjuster:

[____ (4) x 8.34 ÷ _____]
Density of pH adjuster in lbs. per gallon

+ ____ (1) = _____ gallons of pH adjuster per gallon of oil (9)

Quantity of Petroset II:

[_____ (6) x 8.34] ÷ _____ (1) = _____ lbs. of Petroset II per gallon of oil (10)

Quantity of Activator:

_____ (7) ÷ _____ (1) = _____ gallons of activator per gallon of oil (11)

Additional batches solidified based on this sample solidification:

Drum No.	Waste Vol.	Date	Drum No.	Waste Vol.	Date	Drum No.	Waste Vol.	Date

CLASS A UNSTABLE WASTE SOLIDIFICATION CALCULATION SHEET

Volume of Oil to be Solidified[1]: _____ gallons (1)

Quantity of pH Adjuster:

_____ (1) x _____ = _____ gallons (2)
Item 9, Form F424-P-004-01

Quantity of Petroset II:

_____ (1) x _____ = _____ pounds (3)
Item 10, Form F424-P-004-01

Quantity of Activator:

_____ (1) x _____ = _____ gallons (4)
Item 11, Form F424-P-004-01

Footnote:
[1] The volume of oil to be solidified in a 55-gallon drum cannot exceed 40 gallons.

Form F424-P-004-02
Sheet 1 of 1

Date: _____

Container No.: _____

PROCEDURE VERIFICATION SHEET

	Verified By:
Section 4.1, Test Solidification of Class A Unstable Oil Waste, has been completed.	_____
Section 4.2, Solidification Acceptability, has been completed.	_____
Section 5.0, Parameters for Full Scale Solidification, has been completed.	_____