SMUD
SACRAMENTO MUNICIPAL UTILITY DISTRICT ☐ 6201 S Street, P.O. Box 15830, Sacramento CA 95852-1830, (916) 452-3211
AN ELECTRIC SYSTEM SERVING THE HEART OF CALIFORNIA

AGM/NUC 89-086

AUGUST 31, 1989

U. S. Nuclear Regulatory Commission
Attn: J. B. Martin, Regional Administrator
Region V
1450 Maria Lane, Suite 210
Walnut Creek, CA 94596

Docket No. 50-312
Rancho Seco Nuclear Generating Station
License No. DPR-54
SEMIANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT JANUARY-JUNE 1989

Dear Mr. Martin:

The Sacramento Municipal Utility District hereby transmits two copies of the Semiannual Radioactive Effluent Release Report for the period January 1 through June 30, 1989, in compliance with Technical Specification 6.9.2.3.

Members of your staff with questions requiring additional information or clarification may contact Mr. Peter Murphy at (209) 333-2935, extension 4467.

Sincerely,

D. R. Keuter for

Dan R. Keuter
Assistant General Manager
Nuclear

Attachment

cc w/atch: A. D'Angelo, NRC, Rancho Seco
~~Document Control Desk~~, Washington DC

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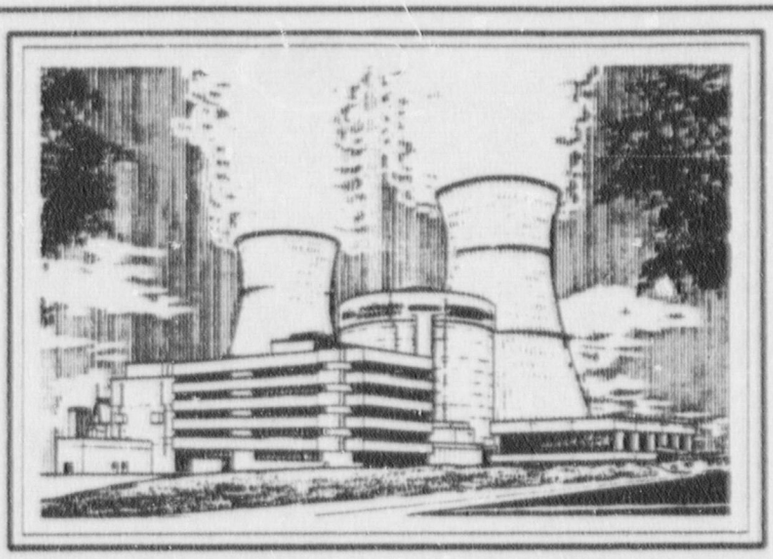
1/1



RANCHO SECO
Nuclear Generating Station

LICENSE NUMBER DPR-54

SEMIANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

JANUARY - JUNE 1989

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INTRODUCTION

Rancho Seco Nuclear Generating Station (RSNGS) Unit No. 1 is located in Sacramento County, California approximately 25 miles southeast of Sacramento and 26 miles north-northeast of Stockton. Rancho Seco Unit No. 1 began commercial operation on April 17, 1975. The single unit on the Rancho Seco site is a pressurized water reactor supplied by Babcock and Wilcox. The rated capacity is 963 gross megawatts electrical.

This Semiannual Radioactive Effluent Release Report (SRERR) provides a summary of gaseous and liquid effluent releases made from Rancho Seco during the period January 1 through June 30, 1989. Also presented in this report is the projected radiological impact from these releases and a summary of solid radwaste shipments.

This report has been prepared by the Sacramento Municipal Utility District to meet the requirements of Rancho Seco Technical Specification 6.9.2.3. It is presented in accordance with the format of USNRC Regulatory Guide 1.21. The radiation doses reported in this SRERR are calculated for a hypothetical individual who receives the maximum possible exposure at or beyond the Site Boundary.

Releases of radioactivity in gaseous and liquid effluents during this report period did not exceed the limits of 10 CFR 20 or the numerical guidelines of 10 CFR 50, Appendix I. A 40 CFR 190 dose evaluation is not required because radioactive effluent releases did not exceed twice the numerical guidelines of 10 CFR 50, Appendix I.

I. SUPPLEMENTAL INFORMATION

A. REGULATORY LIMITS & GUIDELINES FOR EFFLUENT RELEASES

1. Gaseous Effluents

a. Noble Gas dose rate limit at or beyond the Exclusion Area Boundary (Technical Specification 3.18.1):

500 mrem/year to the total body
3000 mrem/year to the skin

b. Noble Gas air dose limit at or beyond the Site Boundary (Technical Specification 3.18.2, numerical guidelines of 10 CFR 50, Appendix I):

5 mrad per calendar quarter for gamma radiation
10 mrad per calendar quarter for beta radiation
10 mrad per calendar year for gamma radiation
20 mrad per calendar year for beta radiation

c. Dose rate limit at or beyond the Exclusion Area Boundary for Iodine-131, Iodine-133, Tritium, and radioactive material in particulate form with half-lives greater than 8 days (Technical Specification 3.18.1):

1500 mrem/year to any organ

d. Dose commitment to a member of the public at or beyond the Site Boundary from Iodine-131, Iodine-133, Tritium, and radioactive material in particulate form with half-lives greater than 8 days (Technical Specification 3.18.3, numerical guidelines of 10 CFR 50, Appendix I):

7.5 mrem per calendar quarter to any organ
15 mrem per calendar year to any organ

2. Liquid Effluents

a. The concentration of radioactive material in liquid effluents released beyond the Site Boundary shall not exceed the limits of 10 CFR 20, Appendix B, Table II, Column 2. This applies to all radionuclides except dissolved or entrained noble gases (Technical Specification 3.17.1).

b. The total concentration of dissolved or entrained noble gases shall not exceed 2.0E-04 µCi/ml (Technical Specification 3.17.1).

c. Dose commitment to a member of the public at or beyond the Site Boundary from radioactive materials in liquid effluents shall be limited to (Technical Specification 3.17.2, numerical guidelines of 10 CFR 50, Appendix I):

1.5 mrem per calendar quarter to the total body
5 mrem per calendar quarter to any organ
3 mrem per calendar year to the total body
10 mrem per calendar year to any organ

B. MAXIMUM PERMISSIBLE CONCENTRATIONS

1. Gaseous Effluents

The concentrations listed in 10 CFR 20, Appendix B, Table II, Column 1 (air) are not directly used in calculations for determining permissible gaseous effluent release rates. The annual dose limits of 10 CFR 20 for unrestricted areas are the doses associated with the concentrations of 10 CFR 20, Appendix B, Table II, Column 1. Technical Specification dose rate limits (mrem/yr) for gaseous effluents are provided to ensure that the dose rate from gaseous effluents at any time at the Exclusion Area Boundary will be within the annual dose limits of 10 CFR 20 for unrestricted areas. These dose rate limits (listed above in part A) are used for determining permissible gaseous effluent release rates.

2. Liquid Effluents

The concentration values listed in 10 CFR 20, Appendix B, Table II, Column 2 are used in calculations to determine permissible liquid discharge flow rates. The most conservative MPC value for each radionuclide detected in the liquid effluent sample (excluding dissolved or entrained noble gases) is used in the calculations.

For dissolved or entrained noble gases, the total allowable concentration in the liquid at the point of offsite discharge is limited to 2.0E-04 µCi/ml.

C. MEASUREMENT METHODS FOR TOTAL RADIOACTIVITY

1. Fission and Activation Gases

Gamma Spectroscopy (HPGe)
Liquid Scintillation (H-3)

2. Iodines

Gamma Spectroscopy (HPGe)

3. Particulates

Gamma Spectroscopy (HPGe)
Beta Proportional (Sr-89, Sr-90, gross beta)
Alpha Proportional (gross alpha)

4. Liquid Effluents

Gamma Spectroscopy (HPGe)
Liquid Scintillation (H-3)
Beta Proportional (Sr-89, Sr-90, gross beta)
Alpha Proportional (gross alpha)

NOTE: HPGe refers to Hyper-Pure Germanium

D. **BATCH RELEASES (via monitored pathways)**

		Quarter 1	Quarter 2
1.	**Gaseous (Rx Bldg Purge, Rx Bldg Equalization, Hydrogen Blower, WGDT)**		
	a. Number of batch releases	10	7
	b. Total time period for batch releases (hours)	878	874
	c. Maximum time period for a batch release (hours)	185	240
	d. Average time period for a batch release (hours)	88	125
	e. Minimum time period for a batch release (hours)	5	10
2.	**Liquid (RHUT Releases)**		
	a. Number of batch releases	31	29
	b. Total time period for batch releases (hours)	166	293
	c. Maximum time period for a batch release (hours)	16	29
	d. Average time period for a batch release (hours)	5	10
	e. Minimum time period for a batch release (hours)	2	4
3.	**Liquid (Retention Basin Discharges)**		
	a. Number of batch releases	18	18
	b. Total time period for batch releases (hours)	221	227
	c. Maximum time period for a batch release (hours)	32	28
	d. Average time period for a batch release (hours)	12	13
	e. Minimum time period for a batch release (hours)	5	4
	f. Average stream flow during periods of release of effluent into a flowing stream (cfs)	25.5	20.1

NOTE: The Regenerant Holdup Tanks (RHUTs) are released to the Retention Basins. The Retention Basins are discharged offsite. All 10 CFR 50, Appendix I dose calculations are based on the RHUT releases. All 10 CFR 20 calculations are based on the Retention Basin discharges.

E. UNPLANNED RELEASES

This section describes unplanned releases of radioactivity in liquid and gaseous effluent. Normally, expected plant evolutions described in the Updated Safety Analysis Report (USAR) which may happen without notice such as Main Steam Safety Relief lifts following a plant trip are considered "planned" and will not be discussed.

Gaseous

1. On April 3, during the release of the B Waste Gas Decay Tank (WGDT), the isolation valve on the A WGDT failed allowing approximately 434 cubic feet of gas (standard conditions) to be released. The tank vents into the Auxiliary Building Stack (ABS) which is a monitored pathway. Grab samples of the tank indicate that the activity released was:

Xe-133	1.35E+00 Ci
Xe-133m	9.05E-03 Ci
Xe-131m	2.19E-02 Ci
Kr-85	1.41E-01 Ci
H-3	8.94E-06 Ci
I-131	3.46E-08 Ci

The resulting gamma air dose at the site boundary was 3.2E-04 mrem or 0.0032 percent of the appropriate annual limit given in Technical Specifications. The beta air dose was 1.15E-03 mrem (0.0058 percent of Technical Specifications). The worst case organ dose was 3.49E-05 mrem to the infant thyroid; this dose is 0.00023 percent of the annual Technical Specification limit. The action to prevent reoccurrence was to repair the valve.

2. In a number of instances during the first half of 1989, ventilation samples from the Interim Onsite Storage facility (IOS) contained radioiodine. These and other samples taken at the Barrel Farm resulted from the segregation of contaminated trash. The total activity released was 7.72E-05 Curies. The resulting organ dose to the critical receptor (infant thyroid) was 5.07E-02 mrem or 0.3 percent of the applicable annual limit. Action to prevent reoccurrence will be to evaluate the IOS as a routine discharge pathway as part of the design and modification effort to improve the IOS gaseous effluent radiation monitoring system.

Liquid

On January 3, an in-line pH sample probe located on the B RHUT leaked following maintenance on that instrument. Approximately 20 gallons of the RHUT contents went to a storm drain leading directly to the plant effluent. The amount of activity released was conservatively estimated as:

H-3	2.04E-05 Ci
Cs-134	3.92E-10 Ci
Cs-137	1.48E-09 Ci

The resulting exposure to the most restrictive offsite receptor (adult whole body) was calculated to be 6.8E-07 mrem or approximately 0.000023 percent of the annual limit provided in Technical Specifications. The cause of the event was personnel error in replacing the retaining ring inside the probe, and programmatic action to prevent reoccurrence was not appropriate.

F. RADIOACTIVE EFFLUENT MONITORING INSTRUMENTATION INOPERABLE FOR GREATER THAN 30 DAYS

During the reporting period, there were no effluent radiation monitors out of service for longer than 30 days. However, pursuant to Licensee Event Report 89-07, the following discussion on a related monitor problem is provided.

On April 26, while performing a monthly surveillance of the Auxiliary Building Stack (ABS) radiation monitor , an I&C technician had placed the monitor in purge mode. In the purge mode, service air is blown through the detector instead of the normal process flow. In an attempt to shorten the time required to perform the surveillance, the technician used an untested method to try to terminate the purge. The technician assumed that the method was successful; however, the monitor remained in the purge mode until May 18. The oversight was not discovered earlier because of the combination of very low concentrations normally observed in that vent and the unusually high background reading on the monitor due to electronic noise. No known plant evolutions performed during that time would have caused higher than average stack concentrations. A conservative estimate of the activity released was made based on worst case samples taken before the monitor was compromised. Those results are included in this report.

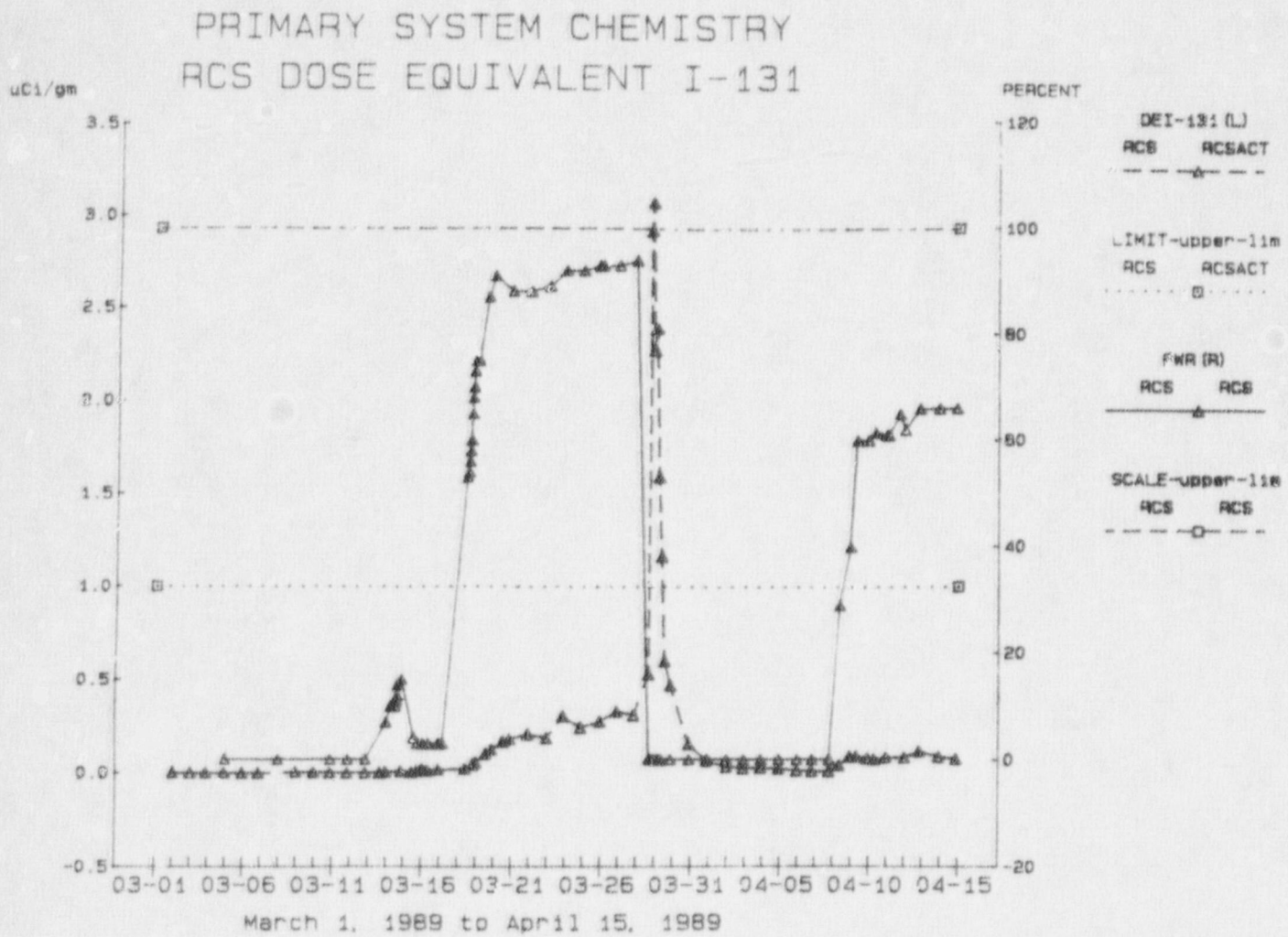
G. RCS DOSE EQUIVALENT IODINE SPECIAL REPORT

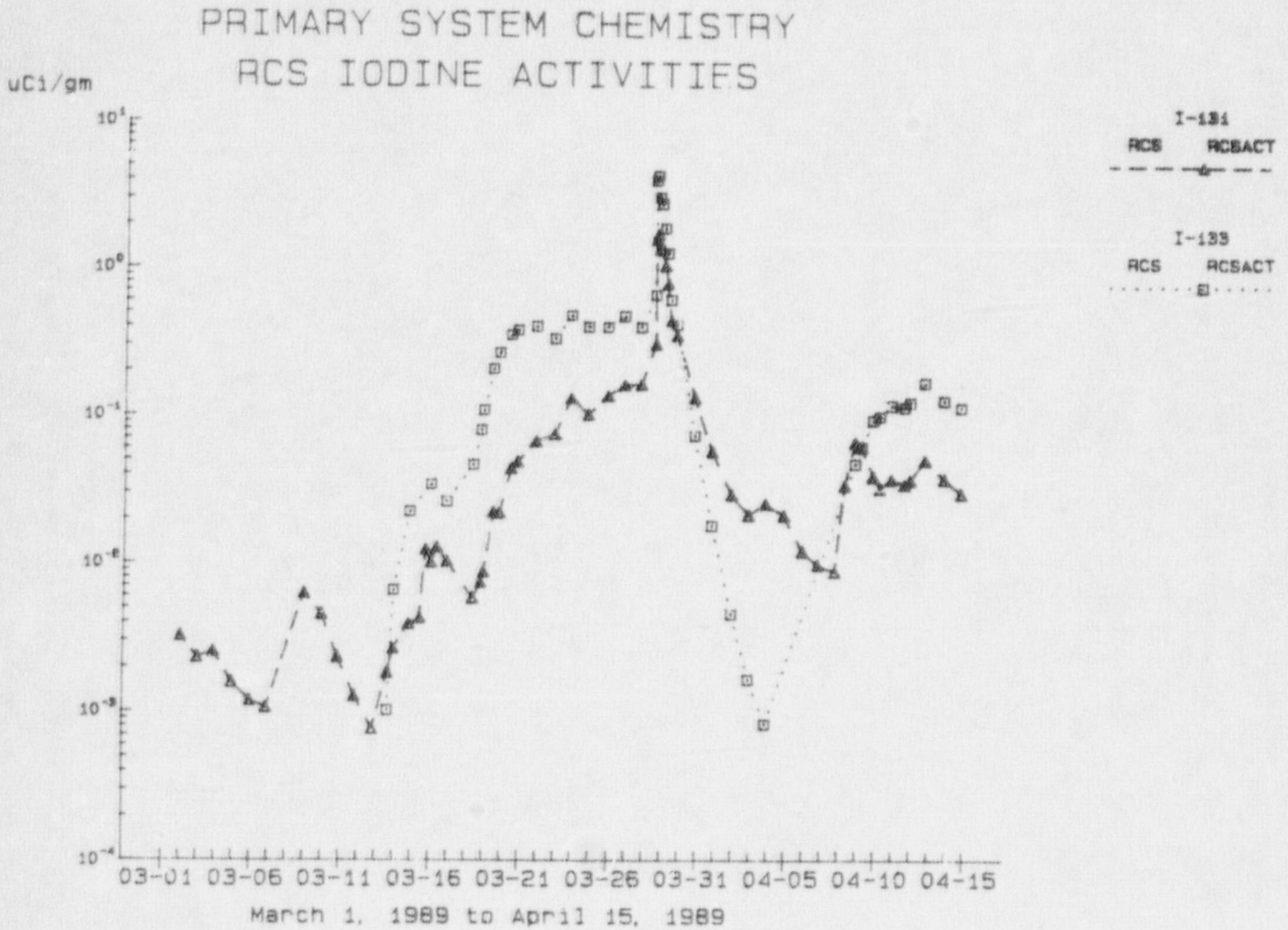
Following a reactor trip on March 28, the concentration of Dose Equivalent Iodine-131 (DEI) in the Reactor Coolant System (RCS) exceeded 1.0 μCi/gm. Pursuant to a SMUD commitment to NRC made in February of this year in response to Generic Letter 85-19, the following discussion of the event is submitted.

On March 13, the plant left a cold shutdown and began power ascension. Reactor power reached 91 percent on March 19 and remained at steady state for 9 days. On March 28, the reactor tripped due to a feedwater transient. The letdown flow during steady state operation varied between 55 and 75 gpm. It was 67 gpm the four days prior to the trip.

The first graph (RCS Dose Equivalent I-131) provided gives the reactor power history and the DEI concentration from the beginning of March to mid April. The plot shows that the DEI concentration increased from a shutdown value of less than 0.1 μCi/gm to 0.53 μCi/gm on March 28. Steady state operation had not lasted long enough for the DEI concentration to reach equilibrium. With the reactor trip, DEI peaked at 3.07 μCi/gm and returned to shutdown levels within three days. The coolant was over the 1.0 μCi/gm value for approximately 18 hours.

The second graph (RCS Iodine Activities) shows the RCS concentrations of I-131 and I-133 on the same time scale. Because of its shorter half-life, I-133 had reached equilibrium while I-131 had not. As expected, the concentration of all iodine isotopes increased following the trip due to rapid reduction in RCS pressure and cessation of neutron flux. In subsequent operation, the DEI concentration remained far below 1.0 μCi/ml, and there was no evidence of any additional fuel damage caused by the trip.


PRIMARY SYSTEM CHEMISTRY
RCS DOSE EQUIVALENT I-131
uCi/gm
PERCENT
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
120
100
80
60
40
20
0
-20
DEI-131 (L)
RCS
RCSACT
LIMIT-upper-lim
RCS
RCSACT
FWR (R)
RCS
RCS
SCALE-upper-lim
RCS
RCS
03-01 03-06 03-11 03-16 03-21 03-26 03-31 04-05 04-10 04-15
March 1, 1989 to April 15, 1989


PRIMARY SYSTEM CHEMISTRY
RCS IODINE ACTIVITIES
uCi/gm
I-131
RCS
RCSACT
I-133
RCS
RCSACT
03-01 03-06 03-11 03-16 03-21 03-26 03-31 04-05 04-10 04-15
March 1, 1989 to April 15, 1989

II. CHANGES TO THE PCP, ODCM, REMP MANUAL, AND RADWASTE TREATMENT SYSTEMS

A. PROCESS CONTROL PROGRAM (PCP) CHANGES

In response to NRC Information Notice 89-27, which stated that Envirostone no longer qualified as an encapsulation medium for Class B and C wastes, in March the station began using High Integrity Containers (HICs) for shipping and disposal of filter cartridges.

B. OFFSITE DOSE CALCULATION MANUAL (ODCM) CHANGES

There were no changes to the ODCM during this report period.

C. RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM (REMP) MANUAL CHANGES

There were no changes to the REMP Manual during this report period.

D. MAJOR CHANGES TO THE RADWASTE TREATMENT SYSTEM

In accordance with Technical Specification 6.17, Rancho Seco reports the following major changes to radwaste systems:

1. In March, a number of structural changes were made to the compaction room to permit more kinds of processing for solid low-level radioactive trash. Specifically, the Stock Equipment Co. compactor was relocated and upgraded by increasing the ram force from 15 to 30 tons. The Consolidated Baling Machine compactor, the Cynaloc Tank, and ancillary equipment were removed.

2. In February, as part of a larger project to construct a solidification pad enclosure, the old solidification pad was demolished. Also, the site discontinued using the urea formaldehyde process for solidification.

3. In March, the facility used for dewatering condensate polishing demineralizer resin (disposable) was upgraded with the addition of filters and a demineralizer for the sluice water. Filtration and ion exchange of the sluice water prior to its entry to the wastewater disposal system is expected to significantly reduce the activity in the liquid effluent.

4. In April, following the intrusion of ion exchange resin into the North Retention Basin, three modifications to the wastewater disposal system were made to preclude similar events: 1) drop strainers were added to the inlets of both RHUTs, 2) the cages containing sock strainers at the Retention Basin inlets were lined with 60 mesh screen, and 3) the pipe on the Basin outlet was modified so that an additional "startup" strainer could be bolted in place if necessary.

III. ESTIMATION OF ERROR

The methods for establishing error estimates included review of applicable station procedures, inspection of sampling equipment, engineering estimates, statistical applications, review of calibration setpoint data, and communication with plant personnel. The various sources of error (σ) in reported values of gaseous effluents, liquid effluents, and solid waste are assumed to be independent, and thus the total error is calculated according to the formula:

$$\text{Total Error} = \sqrt{\sigma_1^2 + \sigma_2^2 + \sigma_3^2 \ldots + \sigma_i^2}$$

where: σ_i = relative error associated with component i

Sources of error for gaseous effluents include WGDT pressure, fan error (flow), grab sampling, collection, filter efficiency, counting, and calibration.

Sources of error for liquid effluents include RHUT volume, dilution water flow rate, grab sampling, counting, and calibration.

Sources of error for solid waste include offsite lab smear analysis, dose rate meter calibration, dose rate meter reading, Wastetrak dose-to-curie calculation, sample volume measurement, gamma spec counting, gamma spec calibration, and waste volume determination.

IV. GASEOUS EFFLUENTS

Table IV-A, Gaseous Effluents - Summation of All Releases, provides a detailed summary of gaseous effluent releases per quarter. This table summarizes releases of fission and activation gases, iodine-131, particulates with half-lives greater than 8 days, and tritium. The methodology used to calculate the Percent of Technical Specification limit is as follows:

$$\% \text{ Tech Spec Limit} = \frac{\sum_{i=1}^{n} (F_i)(\text{Avg Release Rate})(X/Q)(\text{Dose Factor})}{(\text{Dose Rate Limit})} * 100\%$$

where:

F_i = The fraction of the total number of Curies of nuclide i out of the total curies in that category for that quarter (unitless).

NOTE: F_i always equals 1.0 for H-3 because it is the only nuclide in the category.

Avg Rel Rate = $\frac{\text{(Total Curies per category per quarter)(1E+06 } \mu\text{Ci/Ci)}}{\text{(\# seconds in the quarter)}}$

X/Q = The higher [illegible] average atmospheric dispersion factor at the Exclusion [illegible] Boundary for each respective quarter (sec/m^3).

Dose Factor = The values derived for each nuclide i from NRC Regulatory Guide 1.109 (K_i, L_i+1.1M_i, or R_{ai}): [Units in (mrem/yr)/(μCi/m^3)]

Dose Rate Limit = The Technical Specification (i.e., Regulatory) limits for dose rate listed in Section I of this report (mrem/yr).

NOTE: Particulates with half-lives less than 8 days are not included in this calculation.

The methodology used to calculate the Estimated Total Error (%) in Table IV-A is presented in Section III of this report.

Table IV-B, Gaseous Effluents - Ground Level Releases, provides a complete quarterly summary of the amount of radioactivity (Ci) released per radionuclide in each quarter. Data from both continuous and batch release modes is provided for fission gases, iodines, particulates, and tritium.

Table IV-C, Gaseous Effluents - Typical Lower Limits of Detection, provides a listing of the typical lower limit of detection (LLD) concentrations in μCi/ml for various radionuclides.

Table IV-D, Radiological Impact on Man Due to Gaseous Effluent Releases, provides a summary of calculated radiation doses delivered to a maximum exposed hypothetical individual at the Site Boundary for gaseous effluents (annual doses will be assessed in the 1989 Annual REMP Report). The maximum calculated organ dose, gamma air dose, and beta air dose are listed for quarter 1 and quarter 2. The dose due to direct radiation based on Thermoluminescent Dosimeter (TLD) results is also listed. Presented in this table for each category is a comparison versus Technical Specification dose limits with the exception of direct radiation measurements.

TABLE IV-A

GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES

	Unit	Quarter 1	Quarter 2	Est. Total Error, %
A. Fission & Activation Gases (i.e., Noble Gases)				
1. Total Release	Ci	1.20 E+03	7.92 E+02	2.5 E+01
2. Average Release Rate for period	µCi/sec	1.54 E+02	1.01 E+02	
3. Percent of Tech Spec limit	%	3.23 E-01	1.33 E-01	
B. Iodines				
1. Total Iodine-131	Ci	1.87 E-04	7.40 E-05	2.5 E+01
2. Total Iodines	Ci	2.14 E-04	1.80 E-04	2.5 E+01
3. Average Release Rate for period	µCi/sec	2.75 E-05	2.29 E-05	
4. Percent of Tech Spec limit	%	7.57 E-04	2.46 E-04	
C. Particulates				
1. Particulates with half-lives>8 days	Ci	1.00 E-05	0.00 E+00	2.5 E+01
2. Average Release Rate for period	µCi/sec	1.29 E-06	0.00 E+00	
3. Percent of Tech Spec limit	%	2.18 E-06	0.00 E+00	
4. Gross Alpha radioactivity	Ci	2.10 E-07	7.08 E-08	
D. Tritium				
1. Total Release	Ci	6.59 E+00	1.06 E+01	2.5 E+01
2. Average Release Rate for period	µCi/sec	8.47 E-01	1.35 E-00	
3. Percent of Tech Spec limit	%	1.79 E-03	1.83 E-03	

TABLE IV-B

GASEOUS EFFLUENTS - GROUND LEVEL RELEASES

		CONTINUOUS MODE		BATCH MODE	
Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter 1	Quarter 2
1. Fission Gases (i.e., Noble Gases)					
Kr-85	Ci	0.00 E+00	0.00 E+00	9.96 E-01	1.14 E+00
Kr-85m	Ci	2.30 E+00	5.68 E-01	9.13 E-06	0.00 E+00
Kr-88	Ci	3.90 E+00	1.82 E+00	0.00 E+00	0.00 E+00
Xe-131m	Ci	0.00 E+00	0.00 E+00	7.02 E+00	1.75 E+00
Xe-133	Ci	2.86 E+02	4.98 E+02	8.66 E+02	2.61 E+02
Xe-133m	Ci	2.65 E+00	7.65 E+00	5.33 E+00	1.15 E-01
Xe-135	Ci	2.63 E+01	2.04 E+01	1.25 E-01	9.40 E-05
Xe-135m	Ci	0.00 E+00	0.00 E+00	6.21 E-06	0.00 E+00
unidentified	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Total for Period	Ci	3.21 E+02	5.28 E+02	8.79 E+02	2.65 E+02
2. Iodines					
I-131	Ci	1.24 E-04	2.57 E-05	6.34 E-05	4.83 E-05
I-133	Ci	2.69 E-05	1.06 E-04	0.00 E+00	0.00 E+00
Total for Period	Ci	1.51 E-04	1.32 E-04	6.34 E-05	4.83 E-05
3. Particulates					
Cs-137	Ci	0.00 E+00	0.00 E+00	1.00 E-05	0.00 E+00
unidentified	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Total for Period	Ci	0.00 E+00	0.00 E+00	1.00 E-05	0.00 E+00
4. Tritium					
H-3	Ci	5.86 E+00	9.36 E+00	7.27 E-01	1.26 E+00

TABLE IV-C

GASEOUS EFFLUENTS - TYPICAL LOWER LIMITS OF DETECTION

	RADIONUCLIDES	CONTINUOUS AND BATCH LLD (μCi/cc)
1.	Tritium (H-3)	2.27 E-10
2.	Fission & Activation Gases:	
	Argon-41	2.28 E-07
	Krypton-85	8.51 E-06
	Krypton-85m	2.92 E-08
	Krypton-87	2.10 E-07
	Krypton-88	1.06 E-07
	Xenon-131m	8.58 E-07
	Xenon-133	5.58 E-08
	Xenon-133m	1.79 E-07
	Xenon-135	2.55 E-08
	Xenon-135m	3.28 E-05
	Xenon-138	9.72 E-05
3.	Iodines:	
	Iodine-131	8.30 E-13
	Iodine-133	4.15 E-12
	Iodine-135	4.39 E-10
4.	Particulates:	
	Barium-140	2.14 E-12
	Cobalt-58	4.88 E-13
	Cobalt-60	1.55 E-12
	Cerium-141	5.08 E-13
	Cerium-144	1.88 E-12
	Cesium-134	7.50 E-13
	Cesium-137	1.35 E-12
	Iron-59	1.21 E-12
	Lanthanum-140	8.59 E-13
	Manganese-54	7.22 E-13
	Molybdenum-99	8.12 E-12
	Niobium-95	8.27 E-13
	Strontium-89	2.00 E-15
	Strontium-90	5.00 E-15
	Technetium-99m	6.40 E-11
	Zirconium-95	1.02 E-12

TABLE IV-D

RADIOLOGICAL IMPACT ON MAN DUE TO GASEOUS EFFLUENT RELEASES

CALCULATED RADIATION DOSES AT THE SITE BOUNDARY FOR GASEOUS EFFLUENTS:

	UNIT	Quarter 1	Quarter 2
A. Tritium, Iodine, Particulate			
1. Maximum Organ dose	mrem	1.30 E-01 (a)	1.17 E-01 (a)
Percent Tech Spec Limit	%	1.73 E+00	1.56 E+00
B. Noble Gas			
1. Gamma air dose	mrad	3.48 E-01	2.25 E-01
Percent Tech Spec Limit	%	6.96 E+00	4.50 E+00
2. Beta air dose	mrad	8.73 E-01	5.79 E-01
Percent Tech Spec Limit	%	8.73 E+00	5.79 E+00
C. Direct Radiation			
1. Dose (TLD results)	mrem	0.00 E+00	0.00 E+00
Percent Tech Spec Limit	%	N/A	N/A

(a) Infant - Thyroid

NOTE: The quarterly doses listed above were calculated using dose factors from GASPAR and concurrent meteorological data for each quarter.

V. LIQUID EFFLUENTS

Table V-A, Liquid Effluents - Summation of All Releases, provides a detailed summary of liquid effluent releases per quarter. This table summarizes releases of fission and activation products, tritium, dissolved and entrained gases, and gross alpha radioactivity. Also listed is the volume of waste released prior to dilution and the volume of dilution water used during each quarter.

The following methodology is used to calculate the Average Diluted Concentration and the Percent of Technical Specification Limit in Table V-A:

$$\%\ \text{Avg Diluted Conc} = \frac{\text{Total Curies Released in Each Category per Quarter in Ci}}{\text{Total Volume Released (Part F in Table V-A) Converted to mls}}$$

$$\%\ \text{Tech Spec Limit} = \sum_{i=1}^{n} \frac{C_i}{MPC_i}$$

where: n = The total number of radionuclides identified
C_i = The average diluted concentration
MPC_i = The MPC of the ith radionuclide, from 10 CFR 20, Appendix B, Table II, Column 2

The methodology used to calculate the estimated total error in Table V-A is presented in Section III of this report.

Table V-B, Liquid Effluents, provides a complete quarterly summary of the amount of radioactivity (Ci) released per radionuclide in each quarter. Data is provided for fission and activation products, and for dissolved and entrained gases. Tritium and gross alpha are not included in this table (they are listed in Table V-A). Since no continuous releases of liquid radioactive effluent are made from RSNGS, data is provided only for batch releases.

Table V-C, Liquid Effluents - Typical Lower Limits of Detection, provides a listing of the typical lower limit of detection (LLD) concentrations in µCi/ml for various radionuclides.

Table V-D, Radiological Impact on Man Due To Liquid Effluent Releases, provides a summary of calculated radiation doses delivered to a maximum exposed hypothetical individual at the Site Boundary for liquid effluents (actual doses will be assessed in the 1989 Annual REMP Report). The maximum calculated total body dose and organ dose for quarter 1 and quarter 2 are listed. A comparison versus Technical Specification dose limits is also presented.

TABLE V-A

LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES

	Unit	Quarter 1	Quarter 2	Est. Total Error, %
A. Fission & Activation Products				
1. Total Release (not including tritium, gases, alpha)	Ci	1.09 E-03	3.01 E-04	2.3 E+01
2. Average diluted concentration during period	µCi/ml	1.94 E-10	6.73 E-11	
3. Percent of applicable limit	%	1.63 E-02	4.18 E-03	
B. Tritium				
1. Total Release	Ci	1.62 E+01	5.67 E+01	2.3 E+01
2. Average diluted concentration during period	µCi/ml	2.88 E-06	1.27 E-05	
3. Percent of applicable limit	%	9.61 E-02	4.22 E-01	
C. Dissolved and Entrained Gases (i.e., Noble Gases)				
1. Total Release	Ci	3.12 E-06	0.00 E+00	2.3 E+01
2. Average diluted concentration during period	µCi/ml	5.55 E-13	0.00 E+00	
3. Percent of applicable limit	%	2.78 E-07	0.00 E+00	
D. Gross Alpha radioactivity				
1. Total Release	Ci	0.00 E+00	0.00 E+00	N/A
E. Volume of waste released (prior to dilution)	Liters	1.25 E+07	1.37 E+07	5.0 E+00
F. Volume of dilution water used during period	Liters	5.62 E+09	4.48 E+09	1.0 E+01

TABLE V-B

LIQUID EFFLUENTS

Nuclides Released		Batch Mode	
Fission and activation products (excluding tritium, gases, alpha)	Unit	Quarter 1	Quarter 2
Cobalt-58	Ci	1.53 E-05	5.18 E-06
Cobalt-60	Ci	2.78 E-05	2.83 E-05
Cesium-134	Ci	1.02 E-04	4.32 E-05
Cesium-137	Ci	6.57 E-04	1.73 E-04
Iodine-131	Ci	2.50 E-04	5.18 E-05
Iodine-133	Ci	3.86 E-05	0.00 E+00
Manganese-54	Ci	5.29 E-07	0.00 E+00
Total for period (above)	Ci	1.09 E-03	3.01 E-04
Dissolved and entrained gases			
Xenon-135	Ci	3.12 E-06	0.00 E+00

NOTE: No continuous releases of liquid radioactive effluent are made from Rancho Seco Nuclear Generating Station.

TABLE V-C
LIQUID EFFLUENTS - TYPICAL LOWER LIMITS OF DETECTION

RADIONUCLIDES	BATCH MODE: LLD (μCi/ml)
1. Tritium (H-3)	2.60 E-06
2. Particulates & Iodines:	
Sodium-24	2.74 E-09
Chromium-51	1.82 E-08
Manganese-54	2.24 E-09
Iron-59	4.04 E-09
Cobalt-57	2.30 E-09
Cobalt-58	2.37 E-09
Cobalt-60	2.78 E-09
Zinc-65	5.02 E-09
Strontium-89	1.00 E-09
Strontium-90	5.00 E-10
Niobium-95	2.37 E-09
Zirconium-95	3.85 E-09
Zirconium-97	3.26 E-09
Molybdenum-99	1.89 E-08
Technetium-99m	1.18 E-09
Ruthenium-103	2.25 E-09
Silver-110m	1.96 E-09
Antimony-124	2.02 E-09
Antimony-125	6.52 E-09
Cesium-134	2.14 E-09
Cesium-136	3.22 E-09
Cesium-137	2.44 E-09
Barium-140	8.21 E-09
Lanthanum-140	2.74 E-09
Cerium-141	4.13 E-09
Cerium-144	1.81 E-08
Iodine-131	2.41 E-09
Iodine-133	3.06 E-09
3. Dissolved and Entrained Gases:	
Krypton-85	2.10 E-06
Krypton-85m	3.11 E-08
Krypton-87	1.51 E-07
Krypton-88	1.17 E-07
Xenon-131m	5.33 E-07
Xenon-133	4.48 E-08
Xenon-133m	1.11 E-07
Xenon-135	1.54 E-08

TABLE V-D

RADIOLOGICAL IMPACT ON MAN DUE TO LIQUID EFFLUENT RELEASES

CALCULATED RADIATION DOSES AT THE SITE BOUNDARY FOR LIQUID EFFLUENTS:

		UNIT	Quarter 1	Quarter 2
A.	1. Maximum Total Body dose	mrem	2.43 E-01 (a)	6.00 E-01 (b)
	2. Percent Tech Spec Limit	%	1.62 E+01	4.00 E+01
B.	1. Maximum Organ dose	mrem	4.53 E-01 (c)	6.97 E-01 (c)
	2. Percent Tech Spec Limit	%	9.06 E+00	1.39 E+01

(a) Adult
(b) Child
(c) Child - Liver

NOTE: The quarterly doses listed above were calculated using dose factors from the LADTAP and the average dilution flow (cfs) for each respective quarter.

VI. SOLID WASTE AND IRRADIATED FUEL SHIPMENT

A. SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL (Not Irradiated fuel)

1. Type of Waste		Unit	6-Month Period	Est. Total Error, %
a.	Spent resins, filter sludges, evaporator bottoms, etc.	m^3	9.64 E+00	
		Ci	2.76 E+02	2.5 E+01
b.	Dry compressible waste, contaminated equip, etc.	m^3	6.23 E+00	
		Ci	4.39 E+01	3.6 E+01
c.	Irradiated components, control rods, etc.	m^3	0.00 E+00	
		Ci	0.00 E+00	N/A
d.	Other:	m^3	0.00 E+00	
		Ci	0.00 E+00	N/A

2. Estimate of major nuclide composition (by type of waste)

a.	Cs-137	%	5.33 E+01
	Fe-55	%	1.43 E+01
	Cs-134	%	1.29 E+01
	Ni-63	%	1.24 E+01
	Co-60	%	6.20 E+00
	C-14	%	3.66 E-01
	Mn-54	%	3.34 E-01
	Sr-90	%	1.33 E-01
b.	Co-58	%	2.46 E+01
	Cs-137	%	2.39 E+01
	Fe-55	%	1.81 E+01
	Ni-63	%	1.43 E+01
	Co-60	%	6.38 E+00
	Cs-134	%	6.13 E+00
	Nb-95	%	1.52 E+00
	Ag-110m	%	1.11 E+00
	Ce-144	%	8.91 E-01
	Zr-95	%	7.68 E-01
	H-3	%	7.29 E-01
	Sb-125	%	5.26 E-01
	C-14	%	3.42 E-01
	Cr-51	%	2.73 E-01
	Ce-141	%	1.58 E-01
	Mn-54	%	1.26 E-01
	Te-125m	%	1.16 E-01

c. Not Applicable

NOTE: An irradiated component having a volume of approximately 4.1 ccs was consolidated into one of the containers included in this waste category. The volume of this component was insignificant and was not broken out into the irradiated components category.

d. Not Applicable

3. Solid Waste Disposition

Number of Shipments	Mode of Transportation	Destination
4	Truck (sole use vehicle)	Richland, Washington

4. Type of Container

a. Two (2) Type B and Two (2) LSA Greater Than Type A Packages

5. Solidification Agent

a. Envirostone used for all containers, four (4) containers shipped during period.

B. IRRADIATED FUEL SHIPMENTS (Disposition)

Number of Shipments

None

VII. METEOROLOGICAL DATA

The meteorological data for Rancho Seco Nuclear Generating Station for Quarter 1 and Quarter 2 of 1989 is presented in this section. A joint frequency distribution (JFD) table indicates the number of hours in a quarter at each combination of wind speed and direction for a given atmospheric stability class. Included are JFD tables for each separate stability class as well as a composite to summarize all classes.

The data is divided further to account for the mode of release. Continuous release data takes into account all hourly averages in the entire quarter. Batch release meteorology takes into account only those hours during which batch releases occurred. Batch release meteorology includes monitored gaseous batch release hours and abnormal gaseous release hours. This explains the discrepancy between the total hours of batch releases in this section versus the value recorded in the "Batch Releases" summary table (Section I, part D).

The following meteorological data was determined in accordance with USNRC Regulatory Guide 1.111, Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Light Water Cooled Reactors. Meteorological information from the site meteorological tower was used to complete the data for the JFDs. The meteorological data acquisitions system recovered 93.75% of the data for Quarter 1 and 95.51% of the data for Quarter 2 of 1989. Measurements from the meteorological tower have been made in accordance with USNRC Regulatory Guide 1.23, Onsite Meteorological Programs.

CONTINUOUS RELEASE METEOROLOGY

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD = 1989 Quarter 1
STABILITY CLASS: A DT/DZ
ELEVATION: 33 SPEED: WSA10 DIRECTION: WDA10 LAPSE: DTA

WIND DIRECTION	WIND SPEED(MPH) 1-3	4-7	8-12	13-18	19-24	>24	TOTAL	WIND DIRECTION	WIND SPEED(MPH) 0-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0	0	0	0	0	S	0	0	1	0	0	01	
NNE	0	0	0	0	0	0	0	SSW	0	0	0	2	0	0	2
NE	0	0	0	0	0	0	0	SW	0	0	0	2	0	0	2
ENE	0	0	0	0	0	0	0	WSW	0	3	1	1	2	0	7
E	0	0	0	0	0	0	0	W	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0	WNW	0	0	0	0	0	0	0
SE	0	0	0	0	0	1	1	NW	0	0	1	0	2	0	3
SSE	0	0	0	0	0	0	0	NNW	0	0	0	0	0	0	0
TOTAL	0	3	3	5	4	1	16								

PERIODS OF CALM(HOURS): 16
VARIABLE DIRECTION 0
HOURS OF MISSING DATA: 135

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD =1989 Quarter 1
STABILITY CLASS: B DT/DZ
ELEVATION: 33 SPEED: WSA10 DIRECTION: WDA10 LAPSE: DTA

WIND DIRECTION	WIND SPEED(MPH) 1-3	4-7	8-12	13-18	19-24	>24	TOTAL	WIND DIRECTION	WIND SPEED(MPH) 0-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0	0	0	0	0	S	0	4	3	0	0	0	7
NNE	0	0	0	0	0	0	0	SSW	0	4	2	1	0	0	7
NE	0	0	0	0	0	0	0	SW	0	4	0	3	0	0	7
ENE	0	0	0	0	0	0	0	WSW	0	5	3	0	0	0	8
E	0	0	0	0	0	0	0	W	0	2	1	0	0	0	3
ESE	0	0	0	0	0	0	0	WNW	0	1	5	0	0	0	6
SE	0	0	0	0	0	1	1	NW	0	0	9	2	0	0	11
SSE	0	0	0	0	0	0	0	NNW	0	0	3	1	0	0	4
TOTAL	0	20	26	7	0	1	54								

PERIODS OF CALM(HOURS): 16
VARIABLE DIRECTION 0
HOURS OF MISSING DATA: 135

CONTINUOUS RELEASE METEOROLOGY

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD = 1989 Quarter 1
STABILITY CLASS: C DT/DZ
ELEVATION: 33 SPEED: WSA10 DIRECTION: WDA10 LAPSE: DTA

WIND DIRECTION	WIND SPEED(MPH) 1-3	4-7	8-12	13-18	19-24	>24	TOTAL	WIND DIRECTION	WIND SPEED(MPH) 0-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	1	0	0	0	0	0	1	S	0	12	4	1	0	0	17
NNE	0	0	1	0	0	0	1	SSW	1	12	5	1	0	0	19
NE	0	0	0	0	0	0	0	SW	1	3	4	3	0	0	11
ENE	0	0	0	0	0	0	0	WSW	0	12	4	1	0	0	17
E	0	0	0	0	0	0	0	W	0	7	5	0	0	0	12
ESE	0	0	0	0	0	0	0	WNW	0	5	4	0	0	0	9
SE	0	2	0	0	0	0	2	NW	0	9	7	2	1	1	20
SSE	0	2	0	2	0	0	4	NNW	0	6	3	3	0	0	12
TOTAL	3	70	37	13	1	1	125								

PERIODS OF CALM(HOURS):16
VARIABLE DIRECTION 0
HOURS OF MISSING DATA: 135

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD =1989 Quarter 1
STABILITY CLASS: D DT/DZ
ELEVATION: 33 SPEED: WSA10 DIRECTION: WDA10 LAPSE: DTA

WIND DIRECTION	WIND SPEED(MPH) 1-3	4-7	8-12	13-18	19-24	>24	TOTAL	WIND DIRECTION	WIND SPEED(MPH) 0-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	6	10	7	0	0	0	23	S	11	32	11	4	1	0	59
NNE	6	9	1	0	0	0	16	SSW	9	20	9	3	1	0	42
NE	5	7	0	0	0	0	12	SW	10	21	6	9	2	1	49
ENE	5	5	0	0	0	0	10	WSW	10	25	8	1	0	0	44
E	8	2	2	0	0	0	12	W	3	15	4	0	0	0	22
ESE	6	8	9	1	0	0	24	WNW	3	37	8	0	0	0	48
SE	4	16	13	7	9	3	52	NW	4	36	15	1	1	1	58
SSE	5	27	14	9	7	3	65	NNW	6	31	13	3	2	1	56
TOTAL	101	301	120	38	23	9	592								

PERIODS OF CALM(HOURS): 16
VARIABLE DIRECTION 0
HOURS OF MISSING DATA: 135

CONTINUOUS RELEASE METEOROLOGY

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD = 1989 Quarter 1
STABILITY CLASS: E DT/DZ
ELEVATION: 33 SPEED: WSA10 DIRECTION: WDA10 LAPSE: DTA

WIND DIRECTION	WIND SPEED(MPH) 1-3	4-7	8-12	13-18	19-24	>24	TOTAL	WIND DIRECTION	WIND SPEED(MPH) 0-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	6	20	1	1	0	0	28	S	7	23	9	2	0	0	43
NNE	9	8	0	0	0	0	18	SSW	11	19	7	1	0	1	39
NE	11	12	1	0	0	0	24	SW	9	22	9	6	2	0	49
ENE	8	9	2	0	0	0	19	WSW	5	23	2	3	0	0	33
E	8	12	3	0	0	0	25	W	2	7	4	1	0	0	14
ESE	4	19	10	4	0	0	37	WNW	4	15	6	0	0	0	25
SE	9	49	28	23	1	3	113	NW	5	16	2	0	0	0	23
SSE	13	29	20	11	3	2	78	NNW	5	16	10	1	0	2	34
TOTAL	116	299	114	53	6	8	602								

PERIODS OF CALM(HOURS): 16
VARIABLE DIRECTION 0
HOURS OF MISSING DATA: 135

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD = 1989 Quarter 1
STABILITY CLASS: F DT/DZ
ELEVATION: 33 SPEED: WSA10 DIRECTION: WDA10 LAPSE: DTA

WIND DIRECTION	WIND SPEED(MPH) 1-3	4-7	8-12	13-18	19-24	>24	TOTAL	WIND DIRECTION	WIND SPEED(MPH) 0-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	4	11	2	0	0	0	18	S	3	15	2	0	0	0	20
NNE	9	12	1	1	0	0	23	SSW	1	10	0	0	0	0	11
NE	7	18	0	0	0	0	25	SW	4	5	1	0	0	0	10
ENE	4	9	1	0	0	0	14	WSW	3	12	2	0	0	0	17
E	2	19	8	2	0	0	31	W	4	2	1	0	0	0	7
ESE	2	30	16	1	0	0	49	WNW	6	6	3	0	0	0	15
SE	3	23	22	1	0	0	51	NW	5	6	1	1	0	0	14
SSE	5	23	13	0	0	0	41	NNW	4	7	5	0	1	0	17
TOTAL	66	208	78	6	1	0	363								

PERIODS OF CALM(HOURS): 15
VARIABLE DIRECTION 0
HOURS OF MISSING DATA: 135

CONTINUOUS RELEASE METEOROLOGY

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD = 1989 Quarter 1
STABILITY CLASS: G DT/DZ
ELEVATION: 33 SPEED: WSA10 DIRECTION: WDA10 LAPSE: DTA

WIND DIRECTION	WIND SPEED(MPH) 1-3	4-7	8-12	13-18	19-24	>24	TOTAL	WIND DIRECTION	WIND SPEED(MPH) 0-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	2	7	1	0	0	0	10	S	3	8	0	0	0	0	11
NNE	7	12	0	0	0	0	21	SSW	4	6	0	0	0	0	10
NE	15	7	0	0	0	0	53	SW	2	0	0	0	0	0	2
ENE	7	22	0	0	0	0	30	WSW	3	3	1	0	0	0	4
E	9	27	5	0	0	0	42	W	1	1	0	0	0	0	7
ESE	3	20	21	0	0	0	45	WNW	2	2	0	0	0	0	4
SE	3	5	7	0	0	0	15	NW	6	1	3	0	0	0	10
SSE	3	3	0	0	0	0	6	NNW	2	3	0	0	0	0	5
TOTAL	72	157	38	0	0	0	273								

PERIODS OF CALM(HOURS): 16
VARIABLE DIRECTION 0
HOURS OF MISSING DATA: 135

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD = 1989 Quarter 1
STABILITY CLASS: ALL DT/DZ
ELEVATION: 33 SPEED: WSA10 DIRECTION: WDA10 LAPSE: DTA

WIND DIRECTION	WIND SPEED(MPH) 1-3	4-7	8-12	13-18	19-24	>24	TOTAL	WIND DIRECTION	WIND SPEED(MPH) 0-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	19	48	11	1	0	0	80	S	24	94	30	7	1	0	156
NNE	31	41	3	1	0	0	79	SSW	26	71	23	8	1	1	130
NE	36	74	1	0	0	0	114	SW	26	55	20	23	4	1	130
ENE	24	45	3	0	0	0	73	WSW	21	83	21	6	2	0	133
E	27	60	18	2	0	0	110	W	10	34	15	1	0	0	60
ESE	15	77	56	6	0	0	155	WNW	15	66	26	0	0	0	107
SE	19	95	70	31	10	8	235	NW	20	68	38	6	4	2	139
SSE	26	84	47	22	10	5	194	NNW	17	63	34	8	3	3	128
TOTAL	358	1058	416	122	35	20	2025								

PERIODS OF CALM(HOURS): 16
VARIABLE DIRECTION 0
HOURS OF MISSING DATA: 135

BATCH RELEASE METEOROLOGY

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD = 1989 Quarter 1
STABILITY CLASS: A DT/DZ
ELEVATION: 33 SPEED: WSA10 DIRECTION: WDA10 LAPSE: DTA

WIND DIRECTION	WIND SPEED(MPH) 1-3	4-7	8-12	13-18	19-24	>24	TOTAL	WIND DIRECTION	WIND SPEED(MPH) 0-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0	0	0	0	0	S	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0	SSW	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0	SW	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0	WSW	0	0	1	1	2	0	4
E	0	0	0	0	0	0	0	W	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0	WNW	0	0	0	0	0	0	0
SE	0	0	0	0	0	1	1	NW	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0	NNW	0	0	0	0	0	0	0
TOTAL	0	0	1	1	2	1	5								

PERIODS OF CALM(HOURS): 3
VARIABLE DIRECTION 0
HOURS OF MISSING DATA: 49

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD = 1989 Quarter 1
STABILITY CLASS: B DT/DZ
ELEVATION: 33 SPEED: WSA10 DIRECTION: WDA10 LAPSE: DTA

WIND DIRECTION	WIND SPEED(MPH) 1-3	4-7	8-12	13-18	19-24	>24	TOTAL	WIND DIRECTION	WIND SPEED(MPH) 0-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0	0	0	0	0	S	0	2	1	0	0	0	3
NNE	0	0	0	0	0	0	0	SSW	0	1	0	0	0	0	1
NE	0	0	0	0	0	0	0	SW	0	1	0	0	0	0	1
ENE	0	0	0	0	0	0	0	WSW	0	2	2	0	0	0	4
E	0	0	0	0	0	0	0	W	0	2	1	0	0	0	3
ESE	0	0	0	0	0	0	0	WNW	0	1	0	0	0	0	1
SE	0	0	0	0	0	1	1	NW	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0	NNW	0	0	0	0	0	0	0
TOTAL	0	9	4	0	0	1	14								

PERIODS OF CALM(HOURS): 3
VARIABLE DIRECTION 0
HOURS OF MISSING DATA: 49

BATCH RELEASE METEOROLOGY

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD = 1989 Quarter 1
STABILITY CLASS: C DT/DZ
ELEVATION: 33 SPEED: WSA10 DIRECTION: WDA10 LAPSE: DTA

WIND DIRECTION	WIND SPEED(MPH) 1-3	4-7	8-12	13-18	19-24	>24	TOTAL	WIND DIRECTION	WIND SPEED(MPH) 0-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	1	0	0	0	0	0	1	S	0	4	0	0	0	0	4
NNE	0	0	1	0	0	0	1	SSW	1	3	2	0	0	0	6
NE	0	0	0	0	0	0	0	SW	0	0	0	1	0	0	1
ENE	0	0	0	0	0	0	0	WSW	0	2	2	0	0	0	4
E	0	0	0	0	0	0	0	W	0	5	1	0	0	0	6
ESE	0	0	0	0	0	0	0	WNW	0	3	2	0	0	0	5
SE	0	0	0	0	0	0	0	NW	0	9	2	0	0	0	11
SSE	0	1	0	2	0	0	3	NNW	0	4	0	0	0	0	4
TOTAL	2	31	10	3	0	0	46								

PERIODS OF CALM(HOURS): 3
VARIABLE DIRECTION 0
HOURS OF MISSING DATA: 49

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD = 1989 Quarter 1
STABILITY CLASS: D DT/DZ
ELEVATION: 33 SPEED: WSA10 DIRECTION: WDA10 LAPSE: DTA

WIND DIRECTION	WIND SPEED(MPH) 1-3	4-7	8-12	13-18	19-24	>24	TOTAL	WIND DIRECTION	WIND SPEED(MPH) 0-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	3	9	2	0	0	0	14	S	2	18	5	1	0	0	26
NNE	3	5	1	0	0	0	9	SSW	5	6	2	0	0	0	13
NE	4	5	0	0	0	0	9	SW	5	10	1	2	1	0	19
ENE	2	3	0	0	0	0	5	WSW	5	12	5	0	0	0	22
E	4	1	1	0	0	0	6	W	2	5	3	0	0	0	10
ESE	3	2	3	1	0	0	9	WNW	2	25	4	0	0	0	31
SE	2	9	6	6	9	2	34	NW	0	22	4	0	0	0	26
SSE	2	13	6	5	1	0	27	NNW	4	21	1	0	0	0	26
TOTAL	48	166	44	15	11	2	286								

PERIODS OF CALM(HOURS): 3
VARIABLE DIRECTION 0
HOURS OF MISSING DATA: 49

BATCH RELEASE METEOROLOGY

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD = 1989 Quarter 1
STABILITY CLASS: E DT/DZ
ELEVATION: 33 SPEED: WSA10 DIRECTION: WDA10 LAPSE: DTA

WIND DIRECTION	WIND SPEED(MPH) 1-3	4-7	8-12	13-18	19-24	>24	TOTAL	WIND DIRECTION	WIND SPEED(MPH) 0-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	4	12	1	0	0	0	17	S	3	10	3	1	0	0	17
NNE	7	4	0	0	0	0	11	SSW	8	4	0	0	0	0	12
NE	8	4	1	0	0	0	13	SW	6	10	3	1	0	0	20
ENE	5	6	1	0	0	0	12	WSW	3	9	1	2	0	0	15
E	5	3	1	0	0	0	9	W	2	3	2	1	0	0	8
ESE	2	7	4	4	0	0	17	WNW	3	9	3	0	0	0	15
SE	5	15	10	11	1	0	42	NW	5	6	0	0	0	0	11
SSE	10	5	3	2	1	1	22	NNW	4	10	1	0	0	0	15
TOTAL	80	117	34	22	2	1	256								

PERIODS OF CALM(HOURS): 3
VARIABLE DIRECTION 0
HOURS OF MISSING DATA: 49

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD = 1989 Quarter 1
STABILITY CLASS: F DT/DZ
ELEVATION: 33 SPEED: WSA10 DIRECTION: WDA10 LAPSE: DTA

WIND DIRECTION	WIND SPEED(MPH) 1-3	4-7	8-12	13-18	19-24	>24	TOTAL	WIND DIRECTION	WIND SPEED(MPH) 0-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	2	0	0	0	0	3	S	2	4	2	0	0	0	8
NNE	5	9	0	1	0	0	15	SSW	1	4	0	0	0	0	5
NE	4	13	0	0	0	0	17	SW	1	2	1	0	0	0	4
ENE	3	7	1	0	0	0	11	WSW	3	5	1	0	0	0	9
E	1	7	3	2	0	0	13	W	1	0	0	0	0	0	1
ESE	0	14	3	1	0	0	18	WNW	2	3	0	0	0	0	5
SE	0	9	9	1	0	0	20	NW	3	2	1	0	0	0	7
SSE	4	9	6	0	0	0	19	NNW	2	0	1	0	0	0	3
TOTAL	32	90	28	5	0	0	158								

PERIODS OF CALM(HOURS): 3
VARIABLE DIRECTION 0
HOURS OF MISSING DATA: 49

BATCH RELEASE METEOROLOGY

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD = 1989 Quarter 1
STABILITY CLASS: G DT/DZ
ELEVATION: 33 SPEED: WSA10 DIRECTION: WDA10 LAPSE: DTA

WIND DIRECTION	WIND SPEED(MPH) 1-3	4-7	8-12	13-18	19-24	>24	TOTAL	WIND DIRECTION	WIND SPEED(MPH) 0-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	1	3	1	0	0	0	5	S	1	2	0	0	0	0	3
NNE	3	2	0	0	0	0	5	SSW	0	1	0	0	0	0	1
NE	1	10	0	0	0	0	11	SW	0	0	0	0	0	0	0
ENE	0	7	0	0	0	0	7	WSW	2	1	0	0	0	0	3
E	1	6	1	0	0	0	8	W	1	0	0	0	0	0	1
ESE	1	4	7	0	0	0	12	WNW	0	1	0	0	0	0	1
SE	0	1	1	0	0	0	2	NW	5	0	1	0	0	0	6
SSE	1	1	0	0	0	0	3	NNW	1	3	0	0	0	0	4
TOTAL	18	42	11	0	0	0	71								

PERIODS OF CALM(HOURS): 3
VARIABLE DIRECTION 0
HOURS OF MISSING DATA: 49

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD = 1989 Quarter 1
STABILITY CLASS: ALL DT/DZ
ELEVATION: 33 SPEED: WSA10 DIRECTION: WDA10 LAPSE: DTA

WIND DIRECTION	WIND SPEED(MPH) 1-3	4-7	8-12	13-18	19-24	>24	TOTAL	WIND DIRECTION	WIND SPEED(MPH) 0-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	9	26	4	0	0	0	40	S	8	40	11	2	0	0	61
NNE	16	20	2	1	0	0	41	SSW	15	19	4	0	0	0	38
NE	17	32	1	0	0	0	50	SW	12	23	5	4	1	0	45
ENE	10	23	2	0	0	0	35	WSW	13	31	12	3	2	0	61
E	11	17	6	2	0	0	36	W	6	15	7	1	0	0	29
ESE	6	27	17	6	0	0	56	WNW	7	42	9	0	0	0	58
SE	7	34	26	18	10	4	100	NW	13	39	8	0	0	0	61
SSE	17	29	15	9	2	1	73	NNW	11	38	3	0	0	0	52
TOTAL	180	455	132	46	15	5	836								

PERIODS OF CALM(HOURS): 3
VARIABLE DIRECTION 0
HOURS OF MISSING DATA: 49

CONTINUOUS RELEASE METEOROLOGY

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD = 1989 Quarter 2
STABILITY CLASS: A DT/DZ
ELEVATION: 33 SPEED: WSA10 DIRECTION: WDA10 LAPSE: DTA

WIND DIRECTION	WIND SPEED(MPH) 1-3	4-7	8-12	13-18	19-24	>24	TOTAL	WIND DIRECTION	WIND SPEED(MPH) 0-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0	0	0	0	0	S	0	6	11	0	0	0	17
NNE	0	0	0	0	0	0	0	SSW	0	9	14	4	0	0	27
NE	0	0	0	0	0	0	0	SW	0	13	32	11	0	0	56
ENE	0	0	0	0	0	0	0	WSW	0	37	104	41	2	0	184
E	0	0	0	0	0	0	0	W	0	24	69	13	0	0	106
ESE	0	1	0	0	0	0	1	WNW	0	7	33	3	0	0	43
SE	0	1	0	0	0	0	1	NW	0	10	52	9	0	0	71
SSE	0	2	2	4	0	0	8	NNW	0	3	6	0	0	0	9
TOTAL	0	113	323	85	2	0	523								

PERIODS OF CALM(HOURS): 0
VARIABLE DIRECTION 0
HOURS OF MISSING DATA: 97

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD = 1989 Quarter 2
STABILITY CLASS: B DT/DZ
ELEVATION: 33 SPEED: WSA10 DIRECTION: WDA10 LAPSE: DTA

WIND DIRECTION	WIND SPEED(MPH) 1-3	4-7	8-12	13-18	19-24	>24	TOTAL	WIND DIRECTION	WIND SPEED(MPH) 0-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0	0	0	0	0	S	2	3	1	0	0	0	6
NNE	0	0	0	0	0	0	0	SSW	3	6	3	1	0	0	13
NE	0	1	0	0	0	0	1	SW	1	11	4	2	0	0	18
ENE	0	0	0	0	0	0	0	WSW	2	21	17	8	0	0	48
E	0	0	0	0	0	0	0	W	1	10	7	0	0	0	18
ESE	0	1	0	0	0	0	1	WNW	0	8	6	0	0	0	14
SE	0	0	1	0	0	0	1	NW	0	15	4	3	0	0	22
SSE	0	2	4	1	0	0	7	NNW	0	1	3	0	0	0	4
TOTAL	9	79	50	15	0	0	153								

PERIODS OF CALM(HOURS): 0
VARIABLE DIRECTION 0
HOURS OF MISSING DATA: 97

CONTINUOUS RELEASE METEOROLOGY

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD = 1989 Quarter 2
STABILITY CLASS: C DT/DZ
ELEVATION: 33 SPEED: WSA10 DIRECTION: WDA10 LAPSE: DTA

WIND DIRECTION	WIND SPEED(MPH) 1-3	4-7	8-12	13-18	19-24	>24	TOTAL	WIND DIRECTION	WIND SPEED(MPH) 0-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	4	0	0	0	0	4	S	0	9	2	0	0	0	11
NNE	0	1	0	0	0	0	1	SSW	3	9	4	0	0	0	16
NE	0	0	0	0	0	0	0	SW	2	7	2	2	0	0	13
ENE	0	0	0	0	0	0	0	WSW	2	10	13	3	1	0	29
E	0	0	0	0	0	0	0	W	0	10	4	3	0	0	17
ESE	0	0	1	0	0	0	1	WNW	0	5	2	0	0	0	7
SE	0	3	1	0	0	0	4	NW	3	12	4	1	0	0	20
SSE	0	4	1	1	0	0	6	NNW	1	9	2	1	0	0	13
TOTAL	11	83	36	[illegible]	1	0	142								

PERIODS OF CALM(HOURS): 0
VARIABLE DIRECTION 0
HOURS OF MISSING DATA: 97

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD = 1989 Quarter 2
STABILITY CLASS: D DT/DZ
ELEVATION: 33 SPEED: WSA10 DIRECTION: WDA10 LAPSE: DTA

WIND DIRECTION	WIND SPEED(MPH) 1-3	4-7	8-12	13-18	19-24	>24	TOTAL	WIND DIRECTION	WIND SPEED(MPH) 0-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	2	2	0	0	0	0	4	S	10	13	13	2	0	0	38
NNE	1	2	0	0	0	0	3	SSW	12	13	9	1	0	0	36
NE	5	2	0	0	0	0	7	SW	4	24	21	3	0	0	52
ENE	4	2	0	0	0	0	6	WSW	6	33	42	13	0	0	94
E	4	1	1	0	0	0	6	W	8	11	16	1	0	0	36
ESE	2	6	4	0	0	0	12	WNW	4	4	4	2	0	0	14
SE	5	15	3	2	0	0	25	NW	4	30	4	0	0	0	38
SSE	6	17	12	1	0	0	36	NNW	3	15	1	0	0	0	19
TOTAL	81	190	130	25	0	0	426								

PERIODS OF CALM(HOURS): 0
VARIABLE DIRECTION 0
HOURS OF MISSING DATA: 97

CONTINUOUS RELEASE METEOROLOGY

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD = 1989 Quarter 2
STABILITY CLASS: E DT/DZ
ELEVATION: 33 SPEED: WSA10 DIRECTION: WDA10 LAPSE: DTA

WIND DIRECTION	WIND SPEED(MPH) 1-3	4-7	8-12	13-18	19-24	>24	TOTAL	WIND DIRECTION	WIND SPEED(MPH) 0-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	11	4	0	0	0	0	15	S	13	42	7	0	0	0	62
NNE	11	8	0	0	0	0	19	SSW	9	22	6	0	0	0	37
NE	7	4	1	0	0	0	12	SW	5	39	14	0	0	0	58
ENE	9	4	1	0	0	0	14	WSW	2	25	23	2	0	0	52
E	7	16	3	0	0	0	26	W	3	9	3	0	0	0	15
ESE	4	19	2	0	0	0	25	WNW	5	5	5	0	0	0	15
SE	5	41	18	1	0	0	65	NW	1	11	3	0	0	0	15
SSE	9	39	11	1	0	0	60	NNW	4	10	3	0	0	0	17
TOTAL	105	298	100	4	0	0	507								

PERIODS OF CALM(HOURS): 0
VARIABLE DIRECTION 0
HOURS OF MISSING DATA: 97

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD = 1989 Quarter 2
STABILITY CLASS: F DT/DZ
ELEVATION: 33 SPEED: WSA10 DIRECTION: WDA10 LAPSE: DTA

WIND DIRECTION	WIND SPEED(MPH) 1-3	4-7	8-12	13-18	19-24	>24	TOTAL	WIND DIRECTION	WIND SPEED(MPH) 0-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	1	3	0	0	0	0	4	S	3	12	6	0	0	0	21
NNE	2	4	0	0	0	0	6	SSW	2	8	1	0	0	0	11
NE	9	7	0	0	0	0	16	SW	1	7	4	0	0	0	12
ENE	1	3	0	0	0	0	4	WSW	2	14	12	0	0	0	28
E	1	9	0	0	0	0	10	W	2	7	0	0	0	0	9
ESE	4	13	2	0	0	0	19	WNW	2	1	4	0	0	0	7
SE	1	15	13	0	0	0	29	NW	2	1	0	0	0	0	3
SSE	3	17	9	0	0	0	29	NNW	4	6	3	0	0	0	13
TOTAL	40	127	54	0	0	0	221								

PERIODS OF CALM(HOURS): 0
VARIABLE DIRECTION 0
HOURS OF MISSING DATA: 97

CONTINUOUS RELEASE METEOROLOGY

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD = 1989 Quarter 2
STABILITY CLASS: G DT/DZ
ELEVATION: 33 SPEED: WSA10 DIRECTION: WDA10 LAPSE: DTA

WIND DIRECTION	WIND SPEED(MPH) 1-3	4-7	8-12	13-18	19-24	>24	TOTAL	WIND DIRECTION	WIND SPEED(MPH) 0-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	4	1	0	0	0	0	5	S	1	1	1	1	0	0	3
NNE	1	7	0	0	0	0	8	SSW	1	1	0	0	0	0	2
NE	7	15	0	0	0	0	22	SW	3	1	0	0	0	0	4
ENE	1	12	0	0	0	0	13	WSW	0	0	0	0	0	0	0
E	1	7	2	0	0	0	10	W	2	1	0	0	0	0	3
ESE	1	7	4	0	0	0	12	WNW	0	3	1	0	0	0	4
SE	2	5	4	0	0	0	11	NW	3	2	2	0	0	0	7
SSE	1	0	0	0	0	0	1	NNW	2	6	2	0	0	0	10
TOTAL	30	69	16	0	0	0	115								

PERIODS OF CALM(HOURS): 0
VARIABLE DIRECTION 0
HOURS OF MISSING DATA: 97

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD = 1989 Quarter 2
STABILITY CLASS: ALL DT/DZ
ELEVATION: 33 SPEED: WSA10 DIRECTION: WDA10 LAPSE: DTA

WIND DIRECTION	WIND SPEED(MPH) 1-3	4-7	8-12	13-18	19-24	>24	TOTAL	WIND DIRECTION	WIND SPEED(MPH) 0-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	18	14	0	0	0	0	32	S	29	86	41	2	0	0	158
NNE	15	22	0	0	0	0	37	SSW	31	68	37	6	0	0	142
NE	28	29	1	0	0	0	58	SW	16	102	77	18	0	0	213
ENE	15	21	1	0	0	0	37	WSW	14	140	211	67	3	0	435
E	13	33	6	0	0	0	52	W	16	72	99	17	0	0	204
ESE	11	47	13	0	0	0	71	WNW	11	33	55	5	0	0	104
SE	13	80	40	3	0	0	136	NW	13	81	69	13	0	0	176
SSE	19	81	39	8	0	0	147	NNW	14	50	20	1	0	0	85
TOTAL	276	959	709	140	3	0	2087								

PERIODS OF CALM(HOURS): 0
VARIABLE DIRECTION 0
HOURS OF MISSING DATA: 97

BATCH RELEASE METEOROLOGY

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD = 1989 Quarter 2
STABILITY CLASS: A DT/DZ
ELEVATION: 33 SPEED: WSA10 DIRECTION: WDA10 LAPSE: DTA

WIND DIRECTION	WIND SPEED(MPH) 1-3	4-7	8-12	13-18	19-24	>24	TOTAL	WIND DIRECTION	WIND SPEED(MPH) 0-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0	0	0	0	0	S	0	2	0	0	0	0	2
NNE	0	0	0	0	0	0	0	SSW	0	2	2	0	0	0	4
NE	0	0	0	0	0	0	0	SW	0	3	14	8	0	0	25
ENE	0	0	0	0	0	0	0	WSW	0	10	32	18	0	0	60
E	0	0	0	0	0	0	0	W	0	10	26	6	0	0	42
ESE	0	1	0	0	0	0	1	WNW	0	0	2	1	0	0	3
SE	0	1	0	0	0	0	1	NW	0	0	6	1	0	0	7
SSE	0	1	0	0	0	0	1	NNW	0	0	1	0	0	0	1
TOTAL	0	30	83	34	0	0	147								

PERIODS OF CALM(HOURS): 0
VARIABLE DIRECTION 0
HOURS OF MISSING DATA: 52

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD = 1989 Quarter 2
STABILITY CLASS: B DT/DZ
ELEVATION: 33 SPEED: WSA10 DIRECTION: WDA10 LAPSE: DTA

WIND DIRECTION	WIND SPEED(MPH) 1-3	4-7	8-12	13-18	19-24	>24	TOTAL	WIND DIRECTION	WIND SPEED(MPH) 0-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0	0	0	0	0	S	1	3	0	0	0	0	4
NNE	0	0	0	0	0	0	0	SSW	1	2	0	0	0	0	3
NE	0	1	0	0	0	0	1	SW	0	3	2	0	0	0	5
ENE	0	0	0	0	0	0	0	WSW	0	6	7	1	0	0	14
E	0	0	0	0	0	0	0	W	0	2	2	0	0	0	4
ESE	0	1	0	0	0	0	1	WNW	0	2	0	0	0	0	2
SE	0	0	0	0	0	0	0	NW	0	3	1	3	0	0	7
SSE	0	2	2	0	0	0	4	NNW	0	0	2	0	0	0	2
TOTAL	2	25	16	4	0	0	47								

PERIODS OF CALM(HOURS): 0
VARIABLE DIRECTION 0
HOURS OF MISSING DATA: 52

BATCH RELEASE METEOROLOGY

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD = 1989 Quarter 2
STABILITY CLASS: C DT/DZ
ELEVATION: 33 SPEED: WSA10 DIRECTION: WDA10 LAPSE: DTA

WIND DIRECTION	WIND SPEED(MPH) 1-3	4-7	8-12	13-18	19-24	>24	TOTAL	WIND DIRECTION	WIND SPEED(MPH) 0-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0	0	0	0	0	S	0	3	1	0	0	0	4
NNE	0	0	0	0	0	0	0	SSW	1	6	1	0	0	0	8
NE	0	0	0	0	0	0	0	SW	1	2	1	0	0	0	4
ENE	0	0	0	0	0	0	0	WSW	1	1	3	0	0	0	5
E	0	0	0	0	0	0	0	W	0	1	1	0	0	0	2
ESE	0	0	0	0	0	0	0	WNW	0	3	0	0	0	0	3
SE	0	1	0	0	0	0	1	NW	1	7	0	0	0	0	8
SSE	0	1	0	0	0	0	1	NNW	0	7	1	1	0	0	9
TOTAL	4	32	8	1	0	0	45								

PERIODS OF CALM(HOURS): 0
VARIABLE DIRECTION 0
HOURS OF MISSING DATA: 52

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD = 1989 Quarter 2
STABILITY CLASS: D DT/DZ
ELEVATION: 33 SPEED: WSA10 DIRECTION: WDA10 LAPSE: DTA

WIND DIRECTION	WIND SPEED(MPH) 1-3	4-7	8-12	13-18	19-24	>24	TOTAL	WIND DIRECTION	WIND SPEED(MPH) 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0	0	0	0	0	S	3	5	4	0	0	0	12
NNE	1	0	0	0	0	0	1	SSW	3	7	3	0	0	0	13
NE	3	0	0	0	0	0	3	SW	1	12	9	1	0	0	23
ENE	0	1	0	0	0	0	1	WSW	4	18	7	1	0	0	30
E	1	0	0	0	0	0	1	W	2	2	8	1	0	0	13
ESE	0	3	0	0	0	0	3	WNW	0	1	1	1	0	0	3
SE	0	7	1	0	0	0	8	NW	3	23	2	0	0	0	28
SSE	2	10	4	0	0	0	16	NNW	2	8	1	0	0	0	11
TOTAL	25	97	40	4	0	0	166								

PERIODS OF CALM(HOURS): 0
VARIABLE DIRECTION 0
HOURS OF MISSING DATA: 52

BATCH RELEASE METEOROLOGY

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD = 1989 Quarter 2
STABILITY CLASS: E DT/DZ
ELEVATION: 33 SPEED: WSA10 DIRECTION: WDA10 LAPSE: DTA

WIND DIRECTION	WIND SPEED(MPH) 1-3	4-7	8-12	13-18	19-24	>24	TOTAL	WIND DIRECTION	WIND SPEED(MPH) 0-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	1	1	0	0	0	0	2	S	8	10	3	0	0	0	21
NNE	3	1	0	0	0	0	4	SSW	1	5	1	0	0	0	7
NE	4	0	0	0	0	0	4	SW	2	11	7	0	0	0	20
ENE	2	2	0	0	0	0	4	WSW	1	8	2	0	0	0	11
E	1	7	0	0	0	0	8	W	1	3	1	0	0	0	5
ESE	1	8	0	0	0	0	9	WNW	0	1	1	0	0	0	2
SE	2	7	1	0	0	0	10	NW	0	1	1	0	0	0	2
SSE	4	14	6	0	0	0	24	NNW	1	4	1	0	0	0	6
TOTAL	32	83	24	0	0	0	139								

PERIODS OF CALM(HOURS): 0
VARIABLE DIRECTION 0
HOURS OF MISSING DATA: 52

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD = 1989 Quarter 2
STABILITY CLASS: F DT/DZ
ELEVATION: 33 SPEED: WSA10 DIRECTION: WDA10 LAPSE: DTA

WIND DIRECTION	WIND SPEED(MPH) 1-3	4-7	8-12	13-18	19-24	>24	TOTAL	WIND DIRECTION	WIND SPEED(MPH) 0-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	3	0	0	0	0	3	S	1	2	1	0	0	0	4
NNE	0	2	0	0	0	0	2	SSW	0	3	1	0	0	0	4
NE	4	1	0	0	0	0	5	SW	1	2	1	0	0	0	4
ENE	1	0	0	0	0	0	1	WSW	0	3	2	0	0	0	5
E	0	2	0	0	0	0	2	W	0	1	0	0	0	0	1
ESE	0	5	1	0	0	0	6	WNW	0	0	2	0	0	0	2
SE	0	7	4	0	0	0	11	NW	1	1	0	0	0	0	2
SSE	1	6	2	0	0	0	9	NNW	1	3	2	0	0	0	6
TOTAL	10	41	10	0	0	0	67								

PERIODS OF CALM(HOURS): 0
VARIABLE DIRECTION 0
HOURS OF MISSING DATA: 52

BATCH RELEASE METEOROLOGY

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD = 1989 Quarter 2
STABILITY CLASS: G DT/DZ
ELEVATION: 33 SPEED: WSA10 DIRECTION: WDA10 LAPSE: DTA

WIND DIRECTION	WIND SPEED(MPH) 1-3	4-7	8-12	13-18	19-24	>24	TOTAL	WIND DIRECTION	WIND SPEED(MPH) 0-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	2	1	0	0	0	0	3	S	1	1	1	0	0	0	3
NNE	1	5	0	0	0	0	6	SSW	0	1	0	0	0	0	1
NE	5	11	0	0	0	0	16	SW	1	0	0	0	0	0	1
ENE	0	5	0	0	0	0	5	WSW	0	0	0	0	0	0	0
E	1	3	1	0	0	0	5	W	0	0	0	0	0	0	0
ESE	0	2	4	0	0	0	6	WNW	0	2	1	0	0	0	3
SE	2	5	3	0	0	0	10	NW	0	0	2	0	0	0	2
SSE	1	0	0	0	0	0	1	NNW	1	4	0	0	0	0	5
TOTAL	15	40	12	0	0	0	67								

PERIODS OF CALM(HOURS): 0
VARIABLE DIRECTION 0
HOURS OF MISSING DATA: 52

HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD = 1989 Quarter 2
STABILITY CLASS: ALL DT/DZ
ELEVATION: 33 SPEED: WSA10 DIRECTION: WDA10 LAPSE: DTA

WIND DIRECTION	WIND SPEED(MPH) 1-3	4-7	8-12	13-18	19-24	>24	TOTAL	WIND DIRECTION	WIND SPEED(MPH) 0-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	3	5	0	0	0	0	8	S	14	26	10	0	0	0	50
NNE	5	8	0	0	0	0	13	SSW	6	26	8	0	0	0	40
NE	16	13	0	0	0	0	29	SW	6	33	34	9	0	0	82
ENE	3	8	0	0	0	0	11	WSW	6	46	53	20	0	0	125
E	3	12	1	0	0	0	16	W	3	19	38	7	0	0	67
ESE	1	20	5	0	0	0	26	WNW	0	9	7	2	0	0	18
SE	4	28	9	0	0	0	41	NW	5	35	12	4	0	0	56
SSE	8	34	14	0	0	0	56	NNW	5	26	8	1	0	0	40
TOTAL	88	348	199	43	0	0	678								

PERIODS OF CALM(HOURS): 0
VARIABLE DIRECTION 0
HOURS OF MISSING DATA: 52