INSERTION INSTRUCTIONS FOR AMENDMENT 2

Remove old pages and insert Amendment 2 pages as instructed below (amendment pages bear the amendment number and date at the foot of the page).

Vertical bars (change bars) have been placed in the outside margins of revised text pages and tables to show the location of any technical changes originating with this amendment. A few unrevised pages have been reprinted because they fall within a run of closely spaced revised pages. No change bars are used on figures or on new sections, appendices, questions and responses, etc.

Transmittal letters along with these insertion instructions should either be filed or entered in Volume I of Part I, in front of any existing letters, instructions, distribution lists, etc.

LEGEND

Remove/Insert Columns

Entries beginning with "T" or "F" designate table or figure numbers, respectively. All other entries are page numbers:

T2.3-14 = Table 2.3-14   F2.3-14 = Figure 2.3-14

2.1-9 = Page 2.1-9   EP2-1 = Page EP2-1   vii = Page vii

Pages printed back to back are indicated by a "/":

1.2-5/6 = Page 1.2-5 backed by Page 1.2-6

T2.3-14(5 of 5)/15(1 of 3) = Table 2.3-14, sheet 5 of 5, backed by Table 2.3-15, sheet 1 of 3

Location Column

Ch = Chapter, S = Section, Ap = Appendix

Remove	Insert	Location
	VOLUME 1	
EP1-1/Blank	EP1-1/Blank	After Ch. 1 Tab
EP2-1/2	EP2-1/2	After Ch. 2 Tab
EP2-3/4	EP2-3/4	
EP2-5/6	EP2-5/6	

INSERTION INSTRUCTIONS FOR AMENDMENT 2 (Cont)

Remove	Insert	Location
EP2-7/8	EP2-7/8	
	VOLUME 2	
T2.3-30/31	T2.3-30/31	S 2.3
T2.3-32/33	T2.3-32/33	
T2.3-34/35	T2.3-34/35	
T2.3-36/37	T2.3-36/37	
T2.3-38/39	T2.3-38/39	
2.4-13/14	2.4-13/14	S 2.4
2.5-1/2	2.5-1/2	S 2.5
2.7-1/2	2.7-1/2	S 2.7
	F2.7-2	
EP3-1/2	EP3-1/2	After Ch. 3 Tab
3.3-1/2	3.3-1/2	S 3.3
3.4-1/2	3.4-1/2	S 3.4
	3.4-2a	
T3.4-1	T3.4-1	
3.6-3/4	3.6-3/4	S 3.6
EP5-1/2	EP5-1/2	After Ch. 5 Tab
EP5-3/Blank	EP5-3/Blank	
5.2-11/12	5.2-11/12	S 5.2
5.2-13/14	5.2-13/14	
5.3-1/2	5.3-1/2	

INSERTION INSTRUCTIONS FOR AMENDMENT 2 (Cont)

Remove	Insert	Location
	VOLUME 3	
EPF-1/Blank	EPF-1/Blank	After Appendix F Tab
TF-1/2 (1 of 2)	TF-1/2 (1 of 2)	Appendix F
TF-2 (2 of 2)/TF-3	TF-2 (2 of 2)/TF-3	

LIST OF EFFECTIVE PAGES

LIST OF EFFECTIVE PAGES

Page, Table (T), or Figure (F)	Amendment Number
2-i thru 2-xvii	0
2.1-1 thru 2.1-6	0
2.1-7 thru 2.1-8	1
2.1-9 thru 2.1-10	0
2.1-11	1
2.1-12 thru 2.1-30	0
T2.1-1 (1 of 1)	0
T2.1-2 (1 of 1)	0
T2.1-3 (1 of 1)	0
T2.1-4 (1 of 1)	0
T2.1-5 (1 of 1)	0
T2.1-6 (1 of 1)	0
T2.1-7 (1 of 1)	0
T2.1-8 (1 of 1)	0
T2.1-9 (1 of 1)	0
T2.1-10 (1 of 1)	0
T2.1-11 (1 of 1)	0
T2.1-12 (1 of 1)	0
T2.1-13 (1 of 1)	0
T2.1-14 (1 of 1)	0
T2.1-15 (1 of 1)	0
T2.1-16 (1 of 1)	0
T2.1-17 (1 of 1)	0
T2.1-18 (1 of 1)	0
T2.1-19 (1 of 1)	0
T2.1-20 (1 of 1)	0
T2.1-21 (1 thru 2 of 2)	0
T2.1-22 (1 of 1)	0
T2.1-23 (1 of 1)	0
T2.1-24 (1 thru 2 of 2)	0
T2.1-25 (1 thru 3 of 3)	0
T2.1-26 (1 of 1)	0
T2.1-27 (1 thru 3 of 3)	0
T2.1-28 (1 of 1)	0
T2.1-29 (1 of 1)	0
T2.1-30 (1 of 1)	0
T2.1-31 (1 of 1)	0
T2.1-32 (1 thru 3 of 3)	0
T2.1-33 (1 of 1)	0
T2.1-34 (1 thru 3 of 3)	0
T2.1-35 (1 thru 4 of 4)	0
T2.1-36 (1 thru 2 of 2)	0
T2.1-37 (1 of 1)	0
T2.1-38 (1 thru 2 of 2)	0

LIST OF EFFECTIVE PAGES (Cont)

LIST OF EFFECTIVE PAGES (Cont)

LIST OF EFFECTIVE PAGES (Cont)

LIST OF EFFECTIVE PAGES (Cont)

LIST OF EFFECTIVE PAGES (Cont)

Page, Table (T), or Figure (F)	Amendment Number
T2.3-5 (1 of 1)	0
T2.3-6 (1 of 1)	1
T2.3-7 (1 of 1)	0
T2.3-8 (1 of 1)	1
T2.3-9 (1 of 1)	0
T2.3-10 (1 of 1)	0
T2.3-11 (1 of 1)	1
T2.3-12 (1 of 1)	0
T2.3-13 (1 of 1)	0
T2.3-14 (1 thru 13 of 13)	1
T2.3-15 (1 thru 13 of 13)	0
T2.3-16 (1 of 1)	0
T2.3-17 (1 of 1)	0
T2.3-18 (1 of 1)	1
T2.3-19 (1 thru 2 of 2)	1
T2.3-20 (1 of 1)	1
T2.3-21 (1 of 1)	1
T2.3-22 (1 of 1)	1
T2.3-23 (1 thru 8 of 8)	0
T2.3-24 (1 thru 3 of 3)	0
T2.3-25 (1 of 1)	0
T2.3-26 (1 of 1)	0
T2.3-27 (1 of 1)	0
T2.3-28 (1 of 1)	1
T2.3-29 (1 thru 12 of 12)	0
T2.3-30 (1 of 1)	0
T2.3.31 (1 of 1)	2
T2.3-32 (1 of 1)	2
T2.3-33 (1 of 1)	2
T2.3-34 (1 of 1)	2
T2.3-35 (1 of 1)	2
T2.3-36 (1 of 1)	2
T2.3-37 (1 of 1)	2
T2.3-38 (1 of 1)	2
T2.3-39 (1 thru 3 of 3)	1
T2.3-40 (1 of 1)	1
T2.3-41 (1 of 1)	0
T2.3-42 (1 of 1)	1
T2.3-43 (1 of 1)	1
T2.3-44 (1 of 1)	0
T2.3-45 (1 of 1)	0
T2.3-46 (1 of 1)	0
T2.3-47 (1 of 1)	1
T2.3-48 (1 of 1)	1

LIST OF EFFECTIVE PAGES (Cont)

LIST OF EFFECTIVE PAGES (Cont)

Page, Table (T), or Figure (F)	Amendment Number
F2.4-8	0
F2.4-9	0
F2.4-10	0
F2.4-11	0
F2.4-12	0
F2.4-13	0
2.5-1 thru 2.5-2	2
F2.5-1	0
F2.5-2	0
2.6-1 thru 2.6-3	0
T2.6-1 (1 thru 2 of 2)	0
T2.6-2 (1 of 1)	0
Attachment 2.6A (Cover) - 1 page	0
Attachment 2.6A - 1 page	0
Attachment 2.6A (letter) - 3 pages	0
Attachment 2.6A (list) - 15 pages	0
Attachment 2.6B (cover) - 1 page	0
Attachment 2.6B - 1 page	0
Attachment 2.6B (letter) - 2 pages	0
2.7-1	2
2.7-2 thru 2.7-3	0
T2.7-1 (1 of 1)	0
T2.7-2 (1 of 1)	0
T2.7-3 (1 thru 2 of 2)	0
F2.7-1	0
F2.7-2	2

TABLE 2.3-30

SEASONAL AND ANNUAL ATMOSPHERIC MIXING DEPTHS AT MILLSTONE*

Period	Morning** (m)	Afternoon (m)
Winter	910	900
Spring	810	1,250
Summer	600	1,300
Autumn	600	1,300
Annual	760	1,110

NOTES:

* Interpolation between data collected twice daily at New York, N.Y. and Nantucket, Mass. Estimates include both precipitation and non-precipitation cases.

** Morning mixing depths are characteristics of an urban area.

TABLE 2.3-31

MEDIAN (50 PERCENT EQUAL RISK) GROUND LEVEL X/Q VALUES ($x10^{-5}$ sec/m^3) AT THE EXCLUSION AREA 2
BOUNDARY FOR THE 0 TO 720 HOUR PERIOD FOLLOWING AN ACCIDENT 2

(Containment Building)

Downwind Sectors	Distance (meters)	0-2 hr	0-8 hr	8-24 hr	1-4 day	4-30 day
N	782	2.75	2.37	2.21	1.88	1.50
NNE	826	4.65	3.70	3.30	2.58	1.80
NE	548	12.30	9.87	8.85	6.99	4.98
ENE	524	13.10	10.60	9.56	7.59	5.46
E	524*	8.07	6.89	6.36	5.35	4.17
ESE	524*	8.60	7.39	6.85	5.81	4.58
SE	524*	8.60	7.34	6.79	5.72	4.47
SSE	524*	8.02	6.77	6.22	5.18	3.98
S	524*	8.23	7.16	6.68	5.74	4.62
SSW	524*	8.70	7.74	7.30	6.43	5.36
SW	524*	4.48	4.19	4.06	3.77	3.40
WSW	524*	1.65	1.65	1.65	1.65	1.65
W	524*	2.60	2.32	2.19	1.93	1.62
WNW	524*	4.32	3.74	3.48	2.97	2.38
NW	524	3.40	3.18	3.07	2.85	2.57
NNW	532	1.97	1.97	1.97	1.97	1.97

NOTE:

*Overwater Sector

TABLE 2.3-32

MEDIAN (50 PERCENT EQUAL RISK) GROUND-LEVEL X/Q VALUES 2
($x\ 10^{-6}\ sec/m^3$) AT THE LOW POPULATION ZONE FOR THE
0 TO 30 DAY PERIOD FOLLOWING AN ACCIDENT 2
(Containment Building)

Downwind Sector	Distance (m)	0-2 hr	0-8 hr	8-24 hr	1-4 day	4-30 day	
N	3862	2.71	1.92	1.61	1.11	0.644	
NNE	3862	6.50	4.06	3.21	1.93	0.926	
NE	3862	13.20	7.72	5.90	3.30	1.43	
ENE	3862	11.10	6.68	5.19	3.01	1.37	
E	3862	5.12	3.41	2.78	1.79	0.52	
ESE	3862	5.14	3.48	2.86	1.87	1.02	
SE	3862*	4.89	3.31	2.72	1.78	0.970	1
SSE	3862*	4.42	2.97	2.44	1.58	0.853	1
S	3862*	4.78	3.29	2.74	1.83	1.02	1
SSW	3862*	5.01	3.54	2.98	2.04	1.19	1
SW	3862	1.93	1.51	1.33	1.01	0.686	
WSW	3862	0.232	0.232	0.232	0.232	0.232	
W	3862	1.04	0.781	0.676	0.494	0.315	
WNW	3862	2.46	1.69	1.40	0.934	0.521	
NW	3862	1.48	1.15	1.01	0.770	0.520	
NNW	3862	0.289	0.289	0.289	0.289	0.289	

NOTES:

*Overwater sector 1

TABLE 2.3-33

MEDIAN (50 PERCENT EQUAL RISK) GROUND-LEVEL X/Q VALUES ($x10^{-5}$ sec/m^3) AT THE EXCLUSION AREA BOUNDARY FOR THE 0 TO 720 HOUR PERIOD FOLLOWING AN ACCIDENT 2

(Containment Ventilation Vent)

Downwind Sector	Distance (m)	0-2 hr	0-8 hr	8-24 hr	1-4 day	4-30 day
N	722	3.41	2.91	2.69	2.26	1.77
NNE	1383	2.68	1.97	1.69	1.21	0.752
NE	706	10.70	8.18	7.15	5.33	3.50
ENE	600	10.80	8.67	7.77	6.12	4.34
E	600*	7.00	5.87	5.38	4.44	3.38
ESE	600*	7.00	5.98	5.52	4.65	3.64
SE	600*	6.92	5.88	5.42	4.55	3.53
SSE	600*	6.53	5.48	5.02	4.15	3.16
S	600*	6.77	5.84	5.43	4.63	3.68
SSW	600*	7.00	6.20	5.84	5.12	4.24
SW	600*	4.10	3.74	3.57	3.23	2.80
WSW	600*	1.29	1.29	1.29	1.29	1.29
W	600*	2.35	2.05	1.91	1.65	1.33
WNW	600*	4.15	3.47	3.18	2.62	1.98
NW	600	3.13	2.85	2.71	2.45	2.11
NNW	644	1.39	1.39	1.39	1.39	1.39

NOTE:

*Overwater sector

TABLE 2.3-34

MEDIAN (50 PERCENT EQUAL RISK) ELEVATED X/Q VALUES ($x10^{-6}$ sec/m^3) AT THE LOW POPULATION ZONE FOR THE 0 TO 720 HOUR PERIOD FOLLOWING AN ACCIDENT (Containment Ventilation Vent) |2 |2

Downwind Sectors	Distance (meters)	0-2 hr	0-8 hr	8-24 hr	1-4 day	4-30 day
N	3862	2.74	1.93	1.62	1.11	0.646
NNE	3862	6.59	4.11	3.24	1.94	0.936
NE	3862	13.60	7.92	6.04	3.35	1.44
ENE	3862	11.50	6.90	5.35	3.07	1.39
E	3862	5.14	3.42	2.79	1.80	0.953
ESE	3862	5.14	3.48	2.86	1.87	1.02
SE	3862*	4.91	3.32	2.73	1.79	0.971
SSE	3862*	4.42	2.97	2.44	1.58	0.853
S	3862*	4.78	3.29	2.74	1.83	1.02
SSW	3862*	5.11	3.60	3.02	2.06	1.20
SW	3862	1.95	1.52	1.34	1.02	0.688
WSW	3862	0.232	0.232	0.232	0.232	0.232
W	3862	1.05	0.782	0.677	0.494	0.315
WNW	3862	2.48	1.70	1.41	0.939	0.523
NW	3862	1.48	1.15	1.01	0.771	0.521
NNW	3862	0.289	0.289	0.289	0.289	0.289

NOTES: |1

*Overwater sector

TABLE 2.3-35

MEDIAN (50 PERCENT EQUAL RISK) ELEVATED χ/Q VALUES ($x10^{-7}$ sec/m^3) |2
AT THE EXCLUSION AREA BOUNDARY
FOR THE 0 TO 2 HOUR PERIOD FOLLOWING AN ACCIDENT |2
(Millstone 1 Stack)

Downwind Sector	Distance (meters)	0-2 hr
N	1,695	16.30
NNE	813	28.10
NE	496	17.80
ENE*	496	14.50
E*	496	11.60
ESE*	496	8.91
SE*	496	8.02
SSE*	496	6.71
S*	496	4.15
SSW*	496	5.09
SW*	496	6.02
WSW*	496	3.24
W*	496	5.34
WNW	649	4.10
NW	710	3.62
NNW	1,029	0.54

NOTES:

χ/Q values in this table are not used for any dose calculations but are presented for information only. |1

* Overwater sector

TABLE 2.3-36

MEDIAN (50 PERCENT EQUAL RISK) ELEVATED X/Q VALUES ($x10^{-7}$ sec/m^3) |2
AT THE LOW POPULATION ZONE
FOR THE 30 DAY PERIOD FOLLOWING AN ACCIDENT |2
(Millstone 1 Stack) |1

Downwind Sectors	Distance (meters)	0-2 hr	0-8 hr	8-24 hr	1-4 day	4-30 day
N	3862	16.30	9.48	7.23	4.01	1.72
NNE	3862	26.70	15.30	11.60	6.32	2.65
NE	3862	17.80	9.75	7.23	3.77	1.48
ENE	3862	14.10	8.68	6.81	4.03	1.90
E	3862	11.00	6.74	5.28	3.11	1.45
ESE	3862	8.86	5.43	4.25	2.49	1.16
SE	3862*	8.00	5.11	4.08	2.51	1.25
SSE	3862*	6.71	4.16	3.27	1.95	0.92
S	3862*	4.15	2.45	1.88	1.06	0.46
SSW	3862*	5.09	3.07	2.39	1.38	0.63
SW	3862	6.02	3.67	2.87	1.67	0.77
WSW	3862	3.24	1.98	1.55	0.91	0.42
W	3862	5.34	3.20	2.48	1.42	0.64
WNW	3862	4.10	2.82	2.33	1.55	0.86
NW	3862	3.56	2.53	2.13	1.47	0.86
NNW	3862	0.54	0.54	0.54	0.54	0.54

NOTES:

X/Q values in this table are not used for any dose calculations but are presented for information only. |1

*Overwater sector

TABLE 2.3-37

MEDIAN (50 PERCENT EQUAL RISK) FUMIGATION X/Q VALUES ($x10^{-5}$ sec/m^3) | 2
AT THE EXCLUSION AREA BOUNDARY
FOR THE ELEVATED RELEASE DOSE CALCULATION
(Millstone 1 Stack) | 2

Downwind Sector	Distance (meters)	X/Q
N	1,695	0.79
NNE	813	1.32
NE	496	1.97
ENE	496	1.91
E	496	1.91
ESE	496	1.86
WSW	496	1.81
W	496	1.81
WNW	649	1.45
NW	710	1.34
NNW	1,029	1.03

NOTE:

X/Q values in this table are not used for any dose calculations but are presented for information only. | 1

TABLE 2.3-38

MEDIAN (50 PERCENT) FUMIGATION X/Q VALUES (x10^{-6} sec/m^3) 2
AT THE LOW POPULATION ZONE
FOR ELEVATED RELEASE DOSE CALCULATIONS
(Millstone 1 Stack) 2

Downwind Sector	Distance (meters)	X/Q
N	3862	5.25
NNE	3862	5.61
NE	3862	3.77
ENE	3862	3.80
E	3862	3.52
ESE	3862	3.01
SW	3862	2.93
WSW	3862	3.20
W	3862	3.10
WNW	3862	4.94
NW	3862	5.96
NNW	3862	6.47

NOTE:

X/Q values in this table are not used for any dose calculations but are presented for information only. 1

TABLE 2.3-39

RADIOLOGICAL PATHWAY ANALYSES DISTANCES (to 8 km - 5 miles) (a) FOR MILLSTONE 3 VENTILATION VENT AND MILLSTONE 1 114-METER (375-FOOT) STACK (IN PARENTHESES) (g)

	Nearest Milk Cow	Nearest Meat Animal (b)	Nearest Milk Goat km (mile)	Nearest Residence km (mile)	Nearest Vegetable Garden km (mile) (c)	Nearest Site Boundary km (mile) (d,e)	Nearest Land km (mile) (f)
N	-	-	3.2 (2.0)	0.92 (0.58) (NNW-1.19 (0.74))	0.92 (0.58) (NNW-1.19 (0.74))	0.92 (0.58) (NNW-1.19 (0.74))	0.92 (0.58) (NNW-1.19 (0.74))
NNE	-	-	2.4 (1.5)	1.55 (0.97) (N-1.73 (1.08))	1.55 (0.97) (N-1.73 (1.08))	1.55 (0.97) (N-1.73 (1.08))	1.55 (0.97) (N-1.73 (1.08))
NE	-	-	-	0.84 (0.53) (NNE-0.81 (0.51)	0.84 (0.53) (NNE-0.81 (0.51)	0.84 (0.53) (NNE-0.81 (0.51)	0.84 (0.53) (NNE-0.81 (0.51)
ENE	-	-	3.2 (2.0)	0.81 (0.51) (NE-0.78 (0.49))	0.81 (0.51) (NE-0.78 (0.49))	0.60 (0.38) (NE-0.50 (0.31))	0.60 (0.38) (NE-0.50 (0.31))
E	-	-	-	1.30 (0.81) (ENE-1.10 (0.69))	1.30 (0.81) (ENE-1.10 (0.69))	0.60 (0.38) (ENE-0.35 (0.22))	1.30 (0.81) (ENE-1.10 (0.69)
ESE	-	-	-	1.69 (1.06) (E-1.40 (0.88))	1.69 (1.06) (E-1.40 (0.88))	0.60 (0.38) (ESE-0.28 (0.18))	1.69 (1.06) (E-1.40 (0.88))
SE	-	-	-	33.0 (20.6) (SE-33.0 (20.6))	33.0 (20.6) (SE-33.0 (20.6))	0.60 (0.38) (SE-0.28 (0.18))	33.0 (20.6) (SE-33.0 (20.6))
SSE	-	-	-	22.2 (13.9) (SSE-22.2 (13.9))	22.2 (13.9) (SSE-22.2 (13.9))	0.63 (0.39) (SSW-0.44 (0.28)	22.2 (13.9) (SSE-22.2 (13.9))
S	-	-	-	16.1 (10.1) (S-16.1 (10.1))	16.1 (10.1) (S-16.1 (10.1))	0.60 (0.38) (SSW-0.42 (0.26))	16.1 (10.1) (S-16.1 (10.1))
SSW	-	-	-	18.3 (11.4) (SSW-18.3 (11.4))	18.3 (11.4) (SSW-18.3 (11.4))	0.60 (0.38) (SW-0.48 (0.30))	18.3 (11.4) (SSW-18.3 (11.4))
SW	-	-	-	3.38 (2.11) (WSW-3.48 (2.18))	3.38 (2.11) (WSW-3.48 (2.18))	0.60 (0.38) (WSW-0.66 (0.41))	3.38 (2.11) (WSW-3.48 (2.18))
WSW	-	-	-	3.05 (1.91) (W-3.08 (1.93))	3.05 (1.91) (W-3.08 (1.93))	0.60 (0.38) (W-0.77 (0.48))	3.05 (1.91) (W-3.08 (1.93))

No arsenic was detected during the 1974 sampling program. However, the detection limit of the analytical methods used to measure arsenic was above the concentrations reported by previous investigators.

Molybdenum

The detection limit of the analytical methods used to measure molybdenum during the 1974 baseline study was 15 μg/l. The range of molybdenum concentrations recorded is from 150 to 600 μg/l in March and 38 to 56 μg/l in September. Recorded June concentrations are as high as 1 mg/l. No molybdenum was detected in December. A major portion of the molybdenum present in the water column appears to be associated with suspended matter. In June, higher concentrations of molybdenum were detected at the station discharge than at other locations in the area.

Titanium

Concentrations of 0.0 to 17.88 μg/l of titanium in the northeast Atlantic Ocean in sea water suspended matter (Blazhis 1971), and 1 μg/l in the open ocean (Preston et al 1972) have been reported. The detection limit for titanium during the 1974 sampling program was 150 μg/l which is above the concentrations reported by previous authors. No titanium was detected in the water column except in December, when four stations recorded a range of 150 to 320 μg/l. Titanium was not detected at the discharge of Millstone Power Station.

Cadmium

Dehlinger et al (1973) reports cadmium concentrations in eastern Long Island Sound of 0.1 μg/l. He reports that these concentrations agree with those obtained for nearshore waters by other investigators and that large concentrations of cadmium are not associated with the acid leachable material or strong chelating substances. In eastern Long Island Sound, spring of 1972, he reported a range of cadmium concentrations of 0.16 to 2.7 μg/l.

During the 1974 study, soluble cadmium determinations were conducted in September and December, and detectable concentrations (>1 μg/l) were reported in only 9 of 44 samples. The station discharge never contained more than 1 μg/l. |2

Beryllium

Beryllium concentrations of 0.38 and 0.03 μg/l in the Sea of Japan (Chemical Abstracts 1951a) and 0.005 μg/l in the open ocean (Preston et al 1972) have been reported. No beryllium was detected during the 1974 sampling program. The detection limit of the analytical method used was 50 μg/l.

Mercury

Concentrations of 0.013 to 0.018 µg/l of mercury in the northeast Atlantic Ocean (Chemical Abstracts 1951b) and 0.4 to 2 µg/l in the Atlantic Ocean (Chemical Abstracts 1959) have been reported. Dehlinger et al (1973) reports 0.045 to 0.078 µg/l in eastern Long Island Sound in October of 1972. No mercury was detected during the 1974 sampling program. The detection limit for the mercury analysis was 2 µg/l.

Tin

Smith (1971) reports 2.25 µg/l tin in the open ocean. Difficulties in tin analysis resulted in unreliable March determinations during the 1974 study. From June to December, tin was detected in only one sample. The detection limit for tin was 200 µg/l.

Phenol

Alekserva (1972) reports 0.02 to 0.08 mg/l in the open ocean. Phenol was detectable at only four sampling stations throughout 1974. Concentrations do not exceed 9 µg/l. No phenol was detected at the station discharge during the 1974 study period.

2.4.3.4.4. Physical Parameters and Dissolved Gases

Salinity

Clapp Laboratories (NUSCo. 1973) has collected salinity data around Millstone Point. Seasonal maxima occur from September to November, peaking at greater than 31 ppt. Seasonal minima usually occur between March and May, generally at 27 to 28 ppt. Jordan Cove salinities are consistently lower than levels recorded in the rest of the Millstone Point area in the May-July period. Values in the range of 25 to 26 ppt were recorded at these times. Average salinities in the area were in the range of 28 to 30 ppt.

Lowest salinities (26 to 28 ppt) recorded by TRC during the 1974 baseline study were recorded in the March-May spring runoff period on both tidal conditions. Jordan Cove and Niantic River salinities are lower than at other stations around Millstone Point during the March-May period, because these water bodies are sources of freshwater input to Niantic Bay.

Salinities gradually increased after May, peaking at 31 to 32 ppt in late September, and decreasing thereafter to a concentration in December similar to that recorded the previous January. The average salinity was in the range of 28 to 30 ppt.

Salinities reported in 1980 as part of the ongoing monitoring program ranged from 24.9 ppt (Giants Neck) in May to 33.0 ppt (Twotree Island) in September. The lowest salinities for all four sampling locations were recorded in May (27.6 ppt average of all stations).

2.5 GEOLOGY

For more detailed information, see FSAR Section 2.5.

2.5.1 Topography

The site is located on a small peninsula near the mouth of the Niantic River. The most striking topographic feature in the region around the site is the north-south trending ridges and valleys. The region is drained by a number of small brooks and the Thames, Niantic, and Connecticut Rivers. The maximum relief in the site area is approximately 61 meters (200 feet). Glacial till covers much of the bedrock surface on the hills and in smaller valleys.

Figure 2.5-1 shows the topography and surficial geology of the site vicinity. The site area slopes gently upward from Long Island Sound northward to an elevation of approximately 9 meters (30 feet). Wave action has eroded the blanket of till from the promontories of Millstone Point, exposing rock at several places. The reworked material was deposited as beach sand in the protected areas.

Much of the plant area has been graded and backfilled during the construction of the three units at Millstone Point.

2.5.2 Geology

The site is located in a geologically complex region characterized by metamorphosed and folded rocks of Ordovician-Silurian age. The area has been affected by four orogenies: the Avalonian (575 million years ago [m.y.a.]), the Taconian (465-445 m.y.a.), the Acadian (400-370 m.y.a.) and the Alleghenian (230-260 m.y.a.). The surrounding region has also been affected by rifting ranging from Triassic to Jurassic. Since then the region has been stable with the exception of epeirogenic uplift during the Cretaceous and Tertiary times and isostatic rebound resulting from the removal of the weight of ice covering the region during Pleistocene time.

The geology of the eastern portion of Connecticut is made difficult to decipher by the complex folding and faulting of the Late Paleozoic Era. The tectonic features of eastern Connecticut are shown on Figure 2.5-2. As shown on this figure the site lies on the east limb of the recumbent Hunts Brook syncline which mantles the Lyme Dome, just west of the site.

Much of the rock that underlies eastern Connecticut is a series of Early Paleozoic metavolcanic and meta-sedimentary rocks and granitic gneisses (Goldsmith and Dixon 1968). The site is underlain by the Monson Gneiss of pre-Silurian age and the Westerly Granite of Pennsylvanian or younger age. The Monson Gneiss is thinly layered with light feldspathic and dark biotitic and hornblendic layers (Goldsmith 1967). The foliation is well developed in the site area with an average trend of N67W and dips at 48 degrees northeast. The Monson Gneiss has been intruded by granitic and pegmatitic sills related to the Westerly Granite. 2 Q231.1

A number of faults are prominent in Eastern Connecticut (Figure 2.5-2). The Honey Hill - Lake Char fault system lies approximately 24 km (15 miles) north of the Millstone site. The east-west segment of Honey Hill dips at low angles to the north; the Lake Char section dips westward at approximately 10 degrees (Dixon and Lundgren 1968). The system is thought to have been active beginning in Middle or Late Devonian time and continued into the Permian Period (170-225 m.y.a). The latest episode of faulting is related to the Jurassic-Triassic rifting which resulted in the formation of the Jurassic-Triassic basin and a number of other high angle normal faults throughout southern New England. These faults generally trend north-south. | 2 Q231.1

Juro-Triassic rifting is evident at the Millstone site. Eleven fault zones with numerous minor associated faults have been uncovered during excavation, and all but one of these features are normal faults trending approximately north-south. A small thrust fault was found, which was related to, or is older than, the Jurassic activity. | 2 Q231.1 | 2 Q231.1

Samples of the fault gouge found in the fault zones were radiometrically age dated. The results indicate that the last activity associated with the faulting occurred approximately 142 m.y.a. Therefore, the faulting at the site is considered to be incapable. | 2 Q231.1

During the Pleistocene epoch, all of New England was covered with ice. The topography was not greatly altered by glaciation, but the ice scoured the land, leaving scattered deposits (Figure 2.5-1) throughout the area after advancing to and beyond the southern New England coast. The ice began to retreat from the Connecticut coast approximately 15,000 years ago (Flint 1975).

2.5.3 References for Section 2.5

Dixon, H.R. and Lundgren, L., Jr. 1968. Structure of Eastern Connecticut. In: Studies of Appalachian Geology: Northern and Maritime, Zen (Ed.), John Wiley and Sons Inc., New York, p 219-230.

Flint, R.F. 1975. The Surficial Geology of Essex and Old Lyme Quadrangles. State Geological and Natural History Survey of Connecticut, Quadrangle Report No. 31.

Goldsmith, R. 1967. Bedrock Geologic Map of Niantic Quadrangle. U.S. Geological Survey, Quadrangle Map GQ-575.

Goldsmith, R. and Dixon, H.R. 1968. Bedrock Geology of Eastern Connecticut. In: Guidebook for Field Trips in Connecticut, New England Intercollegiate Geologic Conference, 60th Annual Meeting, Yale University New Haven, Conn., F-O, p 1-5.

2.7 NOISE

2.7.1 Site Characteristics

The Millstone station, with two of its units operating and the third under construction, is situated on the tip of a small peninsula extending southward into Long Island Sound. Small residential communities, as well as Route 156, bound the site to the north and northeast. The residential areas are mostly year-round suburban communities, but many of the commercial businesses and other land uses are centered on summer tourism and vacationing. The resulting seasonal effects include slight increases in population and traffic volume during the summer months.

Noise-sensitive areas were determined through the use of United States Geological Survey maps and an inspection of the site environs by the survey personnel. Measurement locations were chosen in the residential communities of Jordan Cove, Pleasure Beach, Millstone Road, and Black Point to ensure that a complete and accurate description of the ambient sound levels could be drawn for all areas in the vicinity of the Millstone site, and that a comparison of sound levels could be made with those obtained from previous noise surveys at similar locations.

In all, eight measurement locations were selected as representative of the different noise-sensitive areas surrounding the station. Two locations were chosen in each of the Jordan Cove and Pleasure Beach areas. These communities have an unobstructed view of the Millstone site, and plant noise is generally audible. Three locations were chosen in the Black Point area and a single location in the Millstone Road community, where the plant was generally not audible. The eight measurement positions described in Table 2.7-1 are shown on Figures 2.7-1 and 2.7-2. | 2 QE291.5

2.7.2 Ambient Sound Levels

The statistical descriptors selected to delineate the ambient sound levels include residual, equivalent, and day-night sound levels. Residual sound levels are represented by the L_{90} percentile level, which is the sound level exceeded 90 percent of the time. This residual level represents the minimum or background sound level. The equivalent sound level (L_{eq}) is the level of steady noise which would have the same total sound energy as the fluctuating noise actually measured in the community. The day-night sound level (L_{dn}) is similar to L_{eq}, but has a 10-dB weighting applied to noise occurring during the night since nighttime noise is considered more annoying than the same noise during the day. The L_{eq} is calculated by combining the daytime hourly L values for the 15-hour period from 0700 to 2200 hours with the 10 dB weighted nighttime hourly L_{eq} values for the 9-hour period from 2200 to 0700 hours. Table 2.7-2 provides a statistical summary of hand-held and automatically monitored measurements at each site. Table 2.7-3 furnishes more detailed information.

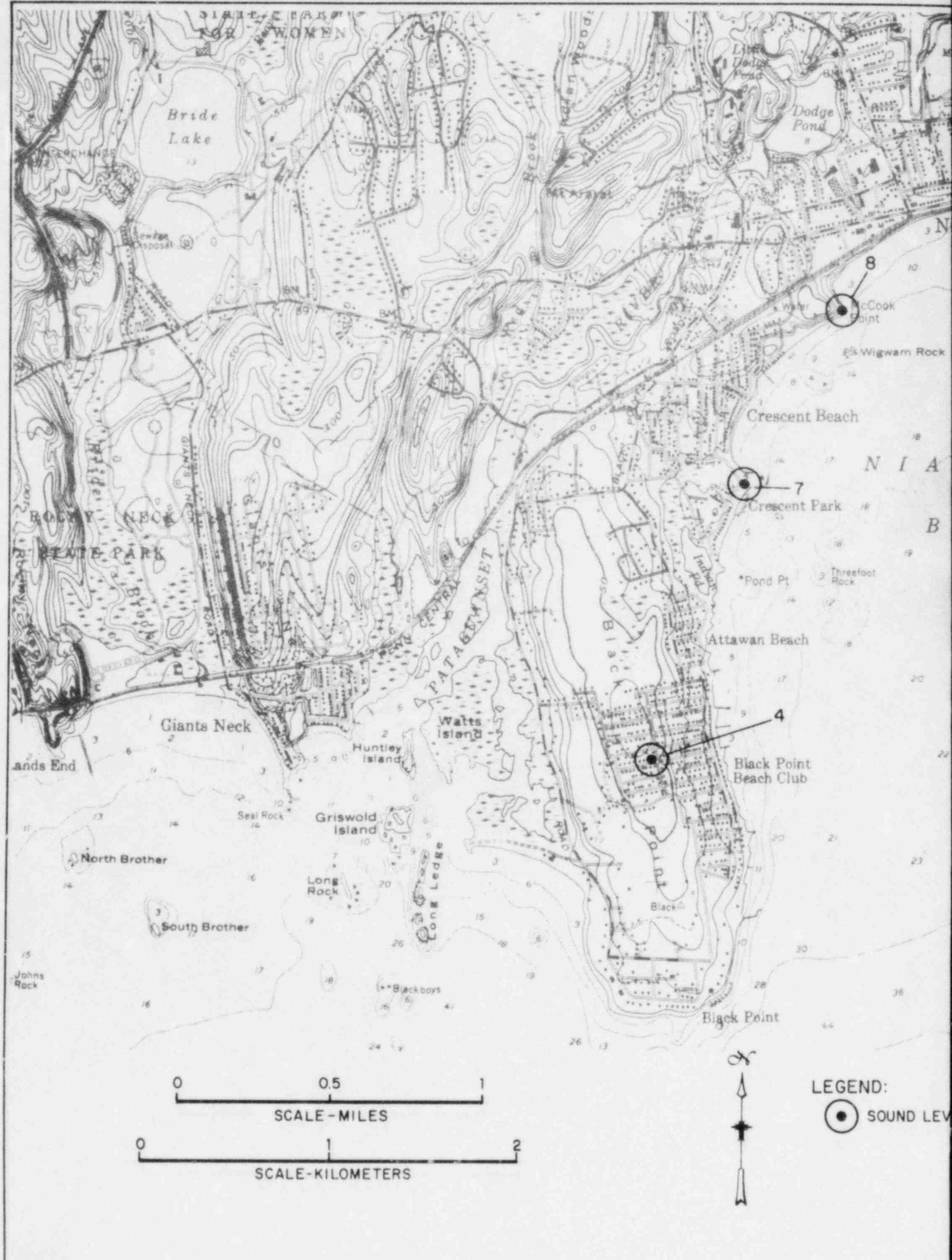
The Jordan Cove area is a year-round residential community located 914 meters to 1,219 meters (3,000 to 4,000 feet) northeast of the plant. Dominating noise sources for the residual and equivalent sound levels were observed to be plant and wind noise, with residual sound levels ranging from 30 to 45 dBA, and equivalent sound levels of 40 to 50 dBA. A slight decrease of approximately 3 or 4 dB occurs from daytime to nighttime for both residual and equivalent sound levels. This reduction of sound level seems to stem from a decline in traffic and decreased construction activity on Millstone 3 during the nighttime hours.

A similar residential community, the Pleasure Beach area, is situated some 1,676 meters to 2,286 meters (5,500 to 7,500 feet) directly east of the plant site. Traffic and cricket-like noise dominate all percentile levels in this area, with residual sound levels in the order of 32 to 42 dBA. The equivalent sound levels, in the small residential community close to the shore, generally range from 35 to 50 dBA, while on the more heavily traveled street further onshore, 30 to 55 dBA. Nighttime residual sound levels are generally 6 dBA lower than daytime levels due to a decline in human activity, decreased construction activity on Millstone 3, and an absence of cricket noise. In the same manner, nighttime equivalent sound levels are reduced 8 to 10 dBA due to the decline in traffic and aircraft flyovers. Plant noise was clearly audible during the nighttime, often accompanied with a no wind or a favorable westerly wind condition.

Measurement Location 3, located 1,372 meters (4,500 feet) north of the plant on Millstone Road, represents another residential community. Traffic noise from Route 156 and cricket-like noise govern the sound levels in this area. Both the residual and equivalent sound levels were approximately 40 to 50 dBA during the daytime, while nighttime residual levels generally ranged from 30 to 40 dBA, and nighttime equivalent levels from 35 to 45 dBA. Differences between day and night residual and day and night equivalent sound levels are again attributed to the decline of human activity, most notably, the variation in traffic volume during plant workers commuting hours, and the intermittent construction activity on nearby Millstone 3.

Measurement locations on Black Point are 2,591 meters to 3,505 meters (8,500 to 11,500 feet) to the west northwest of the Millstone site. The three measurement locations include a town park, a yacht club, and a residential street. A variety of noise sources control the ambient sound levels, including traffic, wave, wind, and cricket-like noise. On only one occasion was the plant audible, when an east wind allowed for sound propagation in the direction of Black Point.

The daytime residual sound levels fell in a range from 30 to 45 dBA at the yacht club and residential area and 40 to 50 dBA in the park due to the heavier traffic volume. The same effect is seen in the equivalent sound level data, with ranges of 40 to 50 dBA at the yacht club and residential area, and 45 to 65 dBA in the town park. Differences in day to nighttime measurements reveal a slight decrease



Bride Lake
Dodge Pond
Little Dodge Pond
Crescent Beach
Crescent Park
McCook Point
Wigwam Rock
Pond Pt
Threefoot Rock
Attawan Beach
Black Point Beach Club
Black Point
ROCKY NECK STATE PARK
Giants Neck
Lands End
PATAGUANSET
Watts Island
Huntley Island
Griswold Island
Seal Rock
North Brother
South Brother
Long Rock
Johns Rock
Blackboys
Sewage Disposal
8
7
4
0 0.5 1
SCALE-MILES
0 1 2
SCALE-KILOMETERS
N
LEGEND:
SOUND LEV

EL MONITORING STATIONS

FIGURE 2.7-2
LOCATIONS OF SOUND LEVEL MEASUREMENTS IN THE MILLSTONE STATION AREA
MILLSTONE NUCLEAR POWER STATION
UNIT 3
ENVIRONMENTAL REPORT
OPERATING LICENSE STAGE

LIST OF EFFECTIVE PAGES

LIST OF EFFECTIVE PAGES (Cont)

3.3 STATION WATER USE

3.3.1 Water Sources

Seawater withdrawn from Long Island Sound supplies the once-through circulating water system and the service water system. Freshwater from the Town of Waterford public water system supplies the unit's domestic water system, fire protection system, and makeup water treating system.

The makeup water treating system supplies deionized water to the primary grade water, auxiliary boiler, condensate storage, and auxiliary feedwater system.

3.3.2 Water Uses

A schematic diagram of station water use is shown on Figure 3.3-1.

Table 3.3-1 shows the maximum, average, and minimum use under normal operating conditions or during temporary shutdown for the various plant water systems. Under normal operating conditions, water use will vary because systems are dependent upon loadings and demands. Temporary shutdown will occur when the reactor is shut down for relatively long periods, such as during maintenance and refueling. Some of the plant systems will be operating at reduced capacities (Table 3.3-1) during a temporary shutdown. | 2 QE291.7

3.3.2.1 Cooling Systems

The circulating water system for Millstone 3 will draw water from the Niantic Bay area of Long Island Sound through the circulating and service water pumphouse (located on the west side of Millstone Point and north of the Millstone 2 intake). The water is pumped through the condenser to condense steam exhausted from the turbine generator. During its passage through the condenser, the circulating water will be heated to approximately 9.4°C (17°F) above its inlet temperature.

Small amounts of radioactive wastes are released after treatment to reduce the radioactivity to a level below the concentrations permitted by Federal Regulations (Section 3.5). Circulating water, after passing through the condenser, will be used to dilute the treated radioactive waste and small quantities of chemical wastes. Sections 3.6 and 3.7 summarize the maximum cumulative chemical releases expected from operations at the site.

The heated circulating water will be discharged into the quarry (which is located on the southeast extremity of Millstone Point) where it will be combined with the heated discharges from Millstone 1 and 2. Section 3.4 gives details of the heat dissipation system.

The service water, in a manner similar to the circulating water, will be used as the coolant for various heat exchangers and will not come in contact with radioactive material or components in the unit. After passing through these heat exchangers, the service water will

be mixed into the circulating water and discharged first to the quarry and ultimately to Long Island Sound. Because of the relatively small service water flow and temperature rise, this discharge will not increase the temperature of the circulating water at the quarry discharge.

3.3.2.2 Domestic Uses

During initial startup of the unit, approximately 3,217 cubic meters (850,000 gallons) of freshwater will be taken into the unit, demineralized, and stored in five tanks for use in various systems. In general, the demineralized water used in the unit will be recycled. Approximately 545 cubic meters (144,000 gallons) per day will be required as makeup for losses from the unit systems due to floor and equipment washdowns, steam generator blowdown, valve stem leakages, and evaporation from open systems and tanks and normal maintenance activities. Details of the unit process of the water treating system and the quality of its waste discharge are discussed in Sections 3.6 and 3.7. In addition, approximately 13.2 cubic meters (3,500 gallons) per day will be required for use in the unit's sanitary waste system.

3.3.2.3 Consumptive Use

Various process water streams used in the plant are recycled within the plant for reuse. Since the unit uses once-through circulating water system, consumptive use due to evaporation of cooling water is minimal.

Major consumptive uses in the plant are those used in the process of radioactive solid waste and sanitary and potable water system. Approximately 29.5 cubic meters (7,800 gallons) per year of water are consumed for radioactive solid waste process, and 13.2 cubic meters (3,500 gallons) per day are consumed for potable and sanitary purposes. Details of the sanitary and potable water systems are discussed in Section 3.7.

3.4 HEAT DISSIPATION SYSTEM

3.4.1 Circulating Water System

The Millstone 3 circulating water system (Figure 3.4-1) pumps salt water from Niantic Bay through a single-pass, triple shell condenser at a rate of approximately 57 cubic meters/sec (2,000 cfs) to condense the steam rejected by the main turbine. The expected temperature range of inlet water is between 0.6°C (33°F) and 24°C (75°F). During its passage through the condenser, the circulating water is heated approximately 9.4°C (17°F) above its inlet temperature. The heated circulating water is then discharged into the quarry, located on the southeast extremity of Millstone Point, where it is combined with the discharge of Millstone 1 and 2. The total combined flow from the circulating water systems of all three Millstone units is approximately 118 cubic meters/sec (4,160 cfs), with a maximum temperature rise at full load of about 11.7°C (21°F). Figure 3.4-2 shows the overall plan for Millstone 3.

The circulating and service water pumphouse (Figure 3.4-3) is divided into six bays which supply water to six circulating water pumps, four service water pumps, and two screenwash pumps. Flow to each bay leaves Niantic Bay and passes through a trash rack and a traveling water screen in each bay. The average velocity within the pumphouse bays during normal operation at low water elevation is about 0.24 meters/sec (0.8 fps).

The trash racks are 4.9 meters (16 feet - 1 inch) wide and consist of 1.3-cm (1/2-inch) thick by 8.9 cm (3-1/2 inch) deep vertical steel bars installed 6.4 cm (2-1/2 inches) apart on centers at a slope of 5 on 1. Two traversing trash rakes remove debris from the six trash racks by means of motor operated cable hoists mounted on a steel superstructure (located at elevation 4.4 meters [14.5 feet] and deposit the debris into trash carts for removal.

The traveling water screens are located upstream of the circulating water pumps and consist of an endless band of screening panels 4.3 meters (14 feet) wide by 0.61 meters (2 feet) high constructed of No. 17 W&M gage 4.76 mm (3/16-inch) mesh copper cloth, which has a 60-percent clear opening. Each bay has an overall 48-percent clear opening based on 100-percent clean screen. The screens are automatically operated according to the differential water level across each screen. Screen wash water is discharged from the screen wash headers through high pressure spray nozzles at 6/sq leg cm (85 psi) to clean debris off the screens into an upper trash trough and through gentle wash spray nozzles at 0.7 kg/sq cm (10 psi) to flush organisms from the fish trays on the screens into a fish trough. The debris is removed from the trash trough by a motorized conveyor system to a trash container for removal. The fish are carried from the fish trough to a fish sluiceway running from the pumphouse back to Niantic Bay.

The circulating water flows from the six circulating water pumps to the condenser through six independent 183-meter (600-foot) long

213-cm (84-inch) diameter pipelines. The pipe is copper nickel clad steel inside the pumphouse, reinforced concrete outside the pumphouse, and concrete encased fiberglass inside the turbine building. The 213-cm (84-inch) diameter pipes transition to 244-cm (96-inch) diameter pipes just upstream of the condenser to improve flow characteristics inside the inlet water boxes. The condenser is a single-pass, 46,758 square meter (503,300 square foot), triple shell condenser with 28.6-mm (1-1/8 inch) diameter titanium tubes. Each condenser shell is served by two circulating water pumps. The circulating water discharges from the condenser outlet water boxes through six independent 4.3- by 4.3-meter (50-foot) long 213-cm (84-inch) diameter pipelines. The pipes are copper nickel clad steel followed by concrete encased fiberglass which combine into one 4.3 by 4.3 meter (14 by 14 foot) reinforced concrete tunnel. An additional flow of approximately 114 cubic meters/min (30,000 gpm) from the service water system enters the tunnel immediately downstream of the condenser. This 503-meter (1,650-foot) long tunnel runs to a seal pit structure at the quarry where the circulating water passes over a weir, into the quarry, and finally through a channel into Long Island Sound. The water discharges from the seal pit structure at an average velocity of about 0.76 meters/sec (2.5 fps).

A 152 cm (60-inch) diameter recirculating tempering line is provided from the upstream end of the discharge tunnel to the circulating and service water pumphouse to prevent ice formation around the intake during the winter.

The circulating water pumps are arranged in pairs such that the three pairs of pumps serve the three condenser shells, as shown on Figure 3.4-1. Each pair of pumps is interconnected at the circulating and service water pumphouse by lateral passageways and at the condenser inlet and outlet water boxes by cross connecting 168-cm (66-inch) diameter motor operated valves. This arrangement provides for recirculation of the discharged water for back flushing of the condenser, and for biofouling control of the intake lines, and the pumphouse. An Amertap tube cleaning system is provided for each condenser flow path to maintain a high level of tube cleanliness. This eliminates the need for a chlorine injection system in the circulating water system. However, in the event that thermal backwashing or tube cleaning proves unsuccessful, provisions for a chlorine injection system have been incorporated into the design of the circulating water system. The existing service water chlorination system (Section 3.4.2) has been designed with the capability to retrofit a chlorination system to provide sequential, intermittent chlorination downstream of the traveling water screens in each circulating water intake bay. This system would back up the 2
Amertap system to provide condenser slime control. Should a more extensive, continuous chlorination program be required to control QE291.8
hard shell fouling in the intake structure, additional chlorination equipment would be necessary. Chlorination frequency, duration, and concentration are indeterminate at this time, since this option is not expected to be added to the circulating water system. However, any chlorination program would be within the EPA Effluent Limitation Guidelines in 40 CFR 423.

Six independent condenser tube cleaning systems, one for each condenser flow path, are installed to provide a mechanical means of cleaning the condenser tubes and thus provide for the control of biofouling in the condenser. Each system consists of elastomeric sponge rubber balls oversized in comparison to the condenser tube diameter, which are injected into the circulating water system upstream of the condenser. The balls are forced through the condenser tubes by the differential pressure between condenser inlet

TABLE 3.4-1

SERVICE WATER FLOW AND HEAT LOAD REQUIREMENTS UNDER ALL OPERATING CONDITIONS

			DBA Coincident with LOP		Loss of Power (LOP)		
	Normal Operating Condition	Normal Unit Cooldown Condition	Minimum Engineered Safety Features	Normal Engineered Safety Features	Hot Shutdown	Cold Shutdown	
Flow (gpm)	27,288	27,426	15,037	29,484	20,898	10,883	2 QE291.6
Flow (lb/hr)	1.516×10^7	1.523×10^7	8.3×10^6	1.62×10^7	1.18×10^7	6.1×10^6	
Heat Load $\left(10^6 \frac{BTU}{hr}\right)$	213.72	235.74	429.71	855.82	160.72	93.68	2 QE291.6
ΔT°C (F)	8.2 (14.8)	9.1 (16.3)	30.0 (54.0)	30.5 (54.9)	8.1 (14.5)	9.1 (16.3)	2 QE291.6

A gaseous chlorine solution is injected into the service water system to control biofouling. Chlorination of the service water occurs three times a day for 30-minute periods, for a total of 1 1/2 hours per day. Chlorination is controlled by grab sample monitoring such that the concentration of free available chlorine at the point where the mixture of service water and circulating water is discharged to the quarry is maintained at 0.1 ppm average or less. After mixing with the quarry water, the concentration of free available chlorine is reduced to a concentration below detectable limits (i.e., less than 0.05 ppm). In addition, the chlorine demand of the circulating water will further reduce the free residual chlorine concentration below that which would occur through dilution alone. It is estimated that approximately 3,720 kg/yr (8,200 lb/yr) of chlorine (as Cl_2) will be used for service water chlorination. |2 QE291.9

3.6.3 Floor and Equipment Drainage

Radioactive and potentially radioactive floor drainage is conveyed to the liquid radwaste treatment system (Section 3.5). Nonradioactive floor and equipment drainage, resulting from pump seal leaks, pump seal and bearing water, floor washing, etc, is discharged to the yard storm sewer. Oil contaminated floor drainage is conveyed to oil/water separators before discharge. The oil removed is collected in drums and hauled offsite for recycle or disposal. The amount of floor drainage discharged to the yard storm sewer on a daily basis is variable. There are three oil/water separators, each having a design capacity of 379 liters/min (100 gpm), for the Millstone 3 plant areas. Oil and grease concentrations in the separate effluent are limited to 10 mg/l, average and 20 mg/l, maximum.

3.6.4 Other Liquid Wastes

3.6.4.1 Steam Generator Blowdown

The design of the steam generator blowdown system provides a means of controlling the suspended solids concentration and the chemical composition of the steam generator shell water. The system is capable of blowing down water from each of the four steam generators at various blowdown rates up to a maximum of 341 liters/min (90 gpm) per steam generator. Blowdown from each steam generator is conveyed to the blowdown flash tank in which pressure is maintained at a point slightly above the normal operating pressure of the fourth point feedwater heater shells. Characteristics of steam generator blowdown are presented in Table 3.6-3.

Steam from the flash tank is conveyed to the feedwater heaters. The remaining liquid in the flash tank drains by pressure differential to the condensate side of the condenser. Contaminants are removed from the liquid in the condensate polishing demineralizers, which are located downstream of the condenser. By using the above system, steam generator blowdown will not be discharged to the environment under normal plant operating conditions. During an extended plant outage, the steam generator shells may be drained through the blowdown lines to the condensate polishing system waste

neutralization sump or, if required, to the low level waste drain tanks in the liquid radwaste system (Section 3.5).

3.6.4.2 Low Level Waste Drain Tank

Approximately 473,000 liters (125,000 gallons) of distillate are discharged, on an annual basis, to the circulating water discharge tunnel from the boron evaporator for tritium control. This waste is initially stored in the 15,000-liter (4,000-gallon) low level waste drain tank prior to discharge to the circulating water. The waste is released from the low level waste drain tank at a rate of 189 liters (50 gpm) on an average of once every 18 days.

The bulk of the discharges occurs during the 6 weeks prior to refueling. Distillate from the boron evaporator is treated using the boron demineralizers, boron demineralizer filter, and the effluent filters. Boron is the only constituent in this waste.

Potentially radioactive floor and equipment drainage is collected and fed into the low level waste drain tanks via the aerated drains system and discharged to the circulating water at a rate of 189 liters (50 gpm) for approximately 4 hours on an average of once every month. Contaminated shower drainage is also collected in the low level waste drain tanks and demineralized and discharged to the circulating water at 189 liters (50 gpm) in a manner similar to the boron recovery evaporator distillate. In both cases, the main contaminants are detergents from showers and floor washes.

Approximately 1,290 liters (340 gallons) of leakage from the reactor coolant system are assumed to occur on an annual basis. This leakage is diluted by washing down for decontamination purposes and further diluted in the low level waste drain tanks by other equipment and floor drainage. Small quantities, less than 1 ppm of lithium hydroxide used for pH control, could be released from this source.

3.6.4.3 Waste Test Tank Discharges

The high level radioactive liquid waste treatment system is described in Section 3.5. Distillate from the waste evaporators is conveyed to the waste test tank and discharged after demineralization to either primary grade water storage or to the circulating water discharge tunnel, depending on the plant water balance.

The waste evaporators are designed assuming that all distillate will be discharged to the circulating water. Whenever steam generator leaks exceeding the maximum allowable leak occur, the steam generator blowdown is processed by the waste evaporator.

The following are the maximum amounts of liquids handled by the waste evaporators annually:

1. Condensate demineralizer - mixed bed system regenerant — 18,200,000 liters/yr (4,800,000 gal/yr)

LIST OF EFFECTIVE PAGES

Page, Table (T), or Figure (F)	Amendment Number
5-i thru 5-vii	0
5.1-1 thru 5.1-79	0
T5.1-1 (1 of 1)	0
T5.1-2 (1 cf 1)	0
T5.1-3 (1 of 1)	0
T5.1-4 (1 thru 2 of 2)	0
T5.1-5 (1 of 1)	0
T5.1-6 (1 thru 3 of 3)	0
T5.1-7 (1 of 1)	0
T5.1-8 (1 of 1)	0
T5.1-9 (1 of 1)	0
T5.1-10 (1 of 1)	0
T5.1-11 (1 of 1)	0
T5.1-12 (1 of 1)	0
T5.1-13 (1 of 1)	0
T5.1-14 (1 of 1)	0
T5.1-15 (1 of 1)	0
T5.1-16 (1 of 1)	0
T5.1-17 (1 of 1)	0
T5.1-18 (1 of 1)	0
T5.1-19 (1 thru 2 of 2)	0
F5.1-1	0
F5.1-2	0
F5.1-3	0
F5.1-4	0
F5.1-5	0
F5.1-6	0
F5.1-7	0
F5.1-8	0
F5.1-9	0
F5.1-10	0
F5.1-11	0
F5.1-12	0
F5.1-13	0
F5.1-14	0
F5.1-15	0
F5.1-16	0
F5.1-17	0
F5.1-18	0
F5.1-19	0
F5.1-20	0
F5.1-21	0
F5.1-22	0
F5.1-23	0
F5.1-24	0
F5.1-25	0

LIST OF EFFECTIVE PAGES (Cont)

LIST OF EFFECTIVE PAGES (Cont)

obtained for any given time by taking the inverse of the concentration value shown on Figure 5.2-3.

5.2.2.1.2 Sediment Uptake Models

Sediment uptake reduces radionuclide concentrations as predicted by the two-dimensional vertically averaged numerical model. However, because only limited information is available on sediment uptake, the effect of this process is conservatively neglected. It should be noted that such uptake could result in additional pathways of radioactivity to man and biota. These pathways and the doses resulting from sediment uptake are considered in Sections 5.2.1 and 5.2.3.

5.2.2.1.3 Water Use Models

The nearest industrial user of Long Island Sound water is the Pfizer Corporation, located 8.8 km (5.5 miles) east-northeast of Millstone Point. Normal or accidental releases from the site are not expected to affect this plant because of its distance from the Millstone site. There are no planned changes in water use or flow regulation in Niantic Bay or Long Island Sound waters that could have an appreciable effect on far-field dilution estimate during the operating life of the station.

5.2.2.2 Groundwater Models

There are no routine discharges of liquid effluents to ground-water; therefore, groundwater models are not used in these analyses.

5.2.3 Dose Rate Estimates for Biota Other than Man

The exposure pathways and parameters are discussed in previous subsections. The doses to terrestrial and aquatic organisms other than man resulting from radionuclide effluents are presented in the following subsections and tables. Calculated internal and external dose rates to biota are based on the model and assumptions presented in Appendix F.

5.2.3.1 Doses through Gaseous Pathways

Table 5.2-6 presents the calculated doses to biota other than man from gaseous pathways. These doses are calculated for a terrestrial animal residing in the vicinity of the plant. The dose rates for these animals are based on methodology used to calculate external dose rates for man.

5.2.3.2 Doses through Liquid Pathways

Table 5.2-6 shows the maximum calculated doses from submersion in water at the edge of the initial mixing zone and exposure to sediments at the closest accessible shoreline from the point of discharge. Table 5.2-7 shows the maximum calculated internal doses due to the bioaccumulation process.

5.2.4 Dose Rate Estimates for Man

Calculated doses to the maximum offsite individual and for the population within the 80-km radius for the year 2010 are based on the gaseous and liquid releases shown in Sections 3.5.2 and 3.5.3. The mathematical models and assumptions used to calculate these doses are given in Appendix F. |2 Q470.2

5.2.4.1 Gaseous Pathways

Tables 5.2-8 through 5.2-19 present the calculated doses to maximum individual from gaseous pathways. These tables present the calculated total body and organ doses for four age groups - adult, teen, child, and infant. The analysis was performed for locations where an existing resident, milk cow, and milk goat were identified. Each analysis considers existing and potential pathways at the specified location. For example, it was assumed that a garden existed at all locations which had milking animals. The maximum individuals residing at those farms were analyzed for inhalation, ground deposition, ingestion of vegetation, and consumption of milk.

Tables 5.2-8 through 5.2-11 present the doses to the maximum individuals living at the estimated maximum resident location (0.81 km east northeast).

Tables 5.2-12 through 5.2-15 present the estimated doses to the maximum individual living at the maximum goat milk animal location (2.4 km north northeast).

Tables 5.2-16 through 5.2-19 present doses to the maximum individuals from consumption of cow milk.

Table 5.2-23 presents the comparison of the maximum individual calculated doses from gaseous effluents to the design objectives of Appendix I limits (U.S. NRC 1976).

Annual calculated gamma air dose and beta air dose values were determined. Table 5.2-23 compares these values to the 10CFR50 design objective limit values. The maximum values occurred at the site boundary in the east northeast direction at a distance of 650 meters from Millstone 3.

5.2.4.2 Liquid Pathways

Tables 5.2-20 through 5.2-22 present the calculated doses to the maximum individual from liquid pathways. The tables present the calculated total body and organ doses for three age groups; adult, teen, and child. It was assumed that an infant would not exceed the doses calculated for a child and, therefore, a separate table was not provided.

Table 5.2-23 presents a comparison of the maximum individual calculated doses from liquid effluents to the design objectives of Appendix I limits (U.S. NRC 1976).

5.2.4.3 Direct Radiation from Facility

The station radiation shield analysis is based on conservative operating parameters, which include a nuclide inventory associated with 1 percent fuel defects. The shield walls are designed to meet the operational dose criteria of 0.25 mRem per hour in the yard areas. The most significant structures which contribute to the yard dose rate are the containment fuel building, waste disposal building, auxiliary building, refueling water storage tank, and the boron recovery tanks.

The calculated dose rate levels in the unrestricted areas are based on full power normal plant operations assuming fuel defects producing expected quantities and concentrations of radioactive nuclides consistent with NUREG 0017.

The annual dose rate at the site boundary is approximately 0.43 mRem per year. The annual dose rates computed as a function of distance from the site boundary are given on Figure 5.2-4.

5.2.4.4 Annual Population Doses

5.2.4.4.1 Eighty-km Radius Population Doses

Population dose commitments are calculated for all individuals living within 80 km of the facility, employing the same models used from individual doses (Regulatory Guide 1.109).

Table 5.2-24 presents the calculated annual total body and thyroid doses from gaseous and liquid pathways to the population projected for the year 2010, residing within an 80-km radius of the site. Due |2
to the long travel times and high dilution factors involved in Q470.3
analyzing population doses from liquid pathways out to the 80-km radius, the dilution factor and travel time to the 16-km radius is conservatively assumed to be representative of the 80-km radius. Thus, population doses from ingestion of aquatic foods, swimming, and boating will be determined using the dilution factor and travel time calculated for the 16-km radius.

5.2.4.4.2 Contiguous U.S. Population Doses

In addition to the 80-km (50-mile) radius population doses, population doses associated with the export of food crops produced within the 80-km (50-mile) region and the atmospheric and hydrospheric transport of the more mobile effluent species, such as noble gases, tritium, and carbon-14, were calculated.

Table 5.2-25 presents the calculated annual total body and thyroid doses to the contiguous U.S. population.

5.2.4.5 Liquid Pathways

For liquid releases, it was assumed that the maximum individual will consume fish and invertebrates caught at the edge of the initial mixing zone (EIMZ). This location was also used in calculating the doses from swimming and boating. Shoreline recreation was analyzed at the closed shore on the Long Island Sound.

The calculated maximum organ dose to the maximum individual from liquid pathways was 5.6E-03 mRem per year to an adult thyroid. This dose was primarily a result of the consumption of fish and invertebrates. It was assumed that the adult consumes 21 kg per year of fish and 5 kg per year of invertebrates, which were caught at the edge of the initial mixing zone.

5.2.4.6 Annual Population Doses

The calculated annual doses for the population residing within an 80-km radius of the site are presented in Table 5.2-24. For the liquid effluents, the calculated whole body and thyroid doses are 1.3E+00 and 6.5E+00 man-Rem per year, respectively.

The calculated doses from gaseous releases are 4.7E+00 man-Rem per year whole body and 7.2E+00 man-Rem per year thyroid. These doses were calculated for a projected population in the year 2010 of 3.3 million people within 80 km of the site.

Annual population doses to the contiguous U.S. from the liquid and gaseous pathways are given in Table 5.2-25. The calculated doses to the U.S. population are 2.3E+01 man-Rem to the whole body and 3.1E+01 man-Rem to the thyroid.

5.2.5 References for Section 5.2

Carslaw, H. S. and Jaeger, J.C. 1973. Conduction of Heat in Solids. Oxford University Press, Oxford.

Environmental Analysts, Inc. 1975. Standard Methodology for Calculating Radiation Dose to Lower Form of Biota. Prepared for the Atomic Industrial Forum and the National Environmental Studies Project AIF/NESP-006, February 1975.

Jirka, G.; Adams, E.; and Stolzenbach, K. 1981. Buoyant Surface Jets, Journal of the Hydraulics Division, ASCE, Volume 107, No. H411.

Liang, H.C. and Tsai, C.E. 1979. Far-field Thermal Plume Prediction for Units 1, 2, and 3; Millstone Nuclear Power Station, Northeast Utilities Service Company (NUSCo.) NERM-49, Stone & Webster Engineering Corporation, Boston, Mass.

Northeast Utilities Service Company (NUSCo.) 1975. Summary Report, Ecological and Hydrographic Studies, May 1966 and December 1974. Millstone Nuclear Power Station, Berlin, Conn.

5.3 EFFECTS OF CHEMICAL AND BIOCIDE WASTE DISCHARGES

5.3.1 Water Quality Standards and Effluent Limitations

Water quality standards and classifications for the State of Connecticut were adopted by the State Department of Environmental Protection (DEP) on September 20, 1977. According to these standards, the waters in the vicinity of the Millstone Nuclear Power Station are classified as Class SB, "...suitable for bathing, other recreational purposes, industrial cooling, and shellfish harvesting for human consumption after depuration; excellent fish and wildlife habitat; good aesthetic value." Water quality standards for Class SB waters are presented in Table 5.3-1.

Effluent limitations for Millstone 1, 2, and 3 are contained in National Pollutant Discharge Elimination System (NPDES) Permit No. CT0003263 (State of Connecticut DEP Order No. 1505 Modified). A summary of the limitations contained in the permit relating to discharges from Millstone 3 are listed in Table 5.3-2.

5.3.2 Impact of Liquid Waste Discharge

The major discharge associated with operation of the plant is approximately 59.4 cubic meters/sec (2,096 cfs or 942,000 gpm) of water used for cooling the main steam condensers and various heat exchangers within the plant. This water is withdrawn from Niantic Bay and is discharged to Long Island Sound, via the quarry cut. The chemical composition of this water is essentially unchanged from that taken in at the intake and passed through the plant. The major liquid waste discharges from the plant are chemical wastes resulting from regeneration of the makeup demineralizers and of the condensate polishing demineralizers.

Table 5.3-3 lists average Long Island Sound water quality based on data collected during the 1974 baseline water quality study (Section 2.4). The data have been tabulated for three areas of the Sound: Niantic Bay in the vicinity of the intake structure (Station 8); Long Island Sound at the discharge from the quarry cut (Station 1); and Long Island Sound at a point between the quarry cut and Twotree Island (Station 2). Figure 2.4-13 shows the location of these stations. Since the data in Table 5.3-3 indicate very little difference in water quality at these three locations, no attempt has been made to predict receiving water quality outside of a defined mixing zone. The impact on Long Island Sound chemical water quality resulting from the discharge of once-through cooling water will be minimal. The impact of the waste heat in this discharge is discussed in Section 5.1.3.

As discussed in Section 3.6, an average of approximately 242,000 liters (64,000 gallons) per week of regeneration wastes from the makeup demineralizer system will be discharged, after neutralization (to pH 6.0 to 9.0), to the circulating water discharge tunnel. The principal constituents of this waste are sodium and sulfate at concentrations of 1,460 mg/l and 3,230 mg/l, respectively. The concentration of sodium in this waste is less than that of the intake water, and, therefore, there

will be no increase in concentration of sodium in the discharge to the quarry. The concentration of sulfate in the regeneration wastes is approximately 786 mg/l greater than in the circulating water; however, assuming that this waste is discharged to the circulating water tunnel at 379 liters/min (100 gpm), the resulting increase in the circulating water discharge concentrations is less than 0.1 mg/l. The discharge impact of neutralized makeup demineralizer regeneration wastes on receiving water quality is minimal.

The discharge of regeneration wastes from the condensate polishing demineralizers to the circulating water will also have a negligible impact on water quality. Under average conditions, approximately 23,000 gallons per day of neutralized condensate polisher regeneration wastes may be discharged to circulating water. These wastes will contain approximately 3,930 mg/l of sodium (Section 3.6).

Biofouling in the main steam condenser is controlled through the use of a mechanical condenser tube cleaning system (Amertap) employing captive sponge rubber balls. The use of chlorine for biofouling control in this system is not anticipated. As described in Section 3.6, the service water system is chlorinated three times a day for 30-minute periods, | 2 totaling 1.5 hours per day. The concentration of free available chlorine in the service water at the point where the service water and circulating water is discharged to the quarry is maintained at or less than 0.1 ppm, average. After mixing with the quarry water, this concentration is reduced through dilution below detectable limits for free available chlorine. The chlorine demand of the circulating and quarry water reduces the chlorine concentration, such that essentially no free residual chlorine will be discharged to Long Island Sound.

5.3.3 Effects of Chemical and Biocide Discharges on Aquatic Biota

The chemical constituents of the discharge of Millstone 3 (Sections 5.3.1 and 5.3.2) are practically indistinguishable from ambient water at the intake (Niantic Bay). Average discharge stream concentrations are within the range of ambient Niantic Bay concentrations for all parameters sampled during water quality surveys. Additional dilution in the discharge plume ensures no adverse chemical effects on plankton, fish, or benthos in the vicinity of Millstone Point.

Chlorination is not used to control biofouling in the circulating water system of Millstone 3 (Section 5.3.2). An Amertap system is employed for condenser cleaning and a thermal backwash system is used in the intake to control the growth of organisms such as mussels. Piping for chlorination of the circulating water system will be installed for Millstone 3; however, its use is not anticipated unless the mechanical tube cleaning system should prove ineffective in controlling fouling of the condenser tubes.

Chlorination for approximately 1.5 hours on a daily basis is used to | 2
control biofouling in the service water system. The level of free available chlorine at the point where the service water and circulating water are discharged into the quarry is approximately 0.1 ppm average. After mixing with the quarry water, concentration of free available

LIST OF EFFECTIVE PAGES

TABLE F-1

DILUTION FACTORS, TRAVEL TIMES FROM THE SITE, AND POPULATION SERVED

Location of Analysis	Approximate Distance from Site (km)	Dilution Factor	Transit Time to Point of Analysis (hr)	Population Served
Edge of initial mixing zone[1]	0	3	0.0 (assumed)	-
Closest accessible shoreline[2]	1.1	7.2	0.0 (assumed)	-
Edge of initial mixing zone[3]	0	3	0.0 (assumed)	3.3E+06[4]

NOTES:

1. Location used to calculate doses to maximum offsite individual from ingestion of aquatic foods and boating

2. Location used to calculate doses to maximum offsite individual from shoreline recreation and swimming

3. Location used to calculate doses to population from ingestion of aquatic foods, boating, swimming, and shoreline recreation. The travel time and dilution factor for the edge of the initial mixing zone radius is conservatively applied to the entire 80-km radius. It is also assumed that the entire 80-km radius population participates in swimming and boating.

4. 3.3E+06 = 3.3×10^6

TABLE F-2

PARAMETERS AND ASSUMPTIONS USED IN
EQUATIONS FOR ESTIMATING DOSES TO HUMANS

All parameters and assumptions used are recommended values to be used, in lieu of site specific data, from Regulatory Guide 1.109, Revision 1.

The following are site specific parameters or parameters for which there is no recommended value:

F = normal circulation flow rate (for 3-unit operation) = 4,160 cu ft/sec

T_p = transit time = see Table F-1

Note: T_p used in calculations was increased, where appropriate, by the distribution or holdup time recommended by Regulatory Guide 1.109, Revision 1.

P = fractional equilibrium ratio of C^{14} = 1 (continuous release); = 0.0073 (intermittent release)

Q_i = annual release rate of radionuclide i, Ci/yr (Tables 3.5-11 and 3.5-14)

f_p = fraction of year animals graze on pasture = 0.67 (8 months)

f_s = fraction of daily feed which is pasture grass when animal is grazing = 1 (100%)

H = absolute humidity of atmosphere at location of analysis 7.10 g/cu m

U_{ap} = usage factor (hr/year of exposure):

Maximum individual	Adult	Teen	Child
Swimming	100	100	56
Boating	52	52	29

80-km radius population:

	Adult	Teen	Child
Swimming	3.5	19	12
Boating	29	29	16.5

V_p = Total commercial U.S. fish harvest = 1.1E+09 kg/yr*

V_p' = Total commercial U.S. shellfish harvest = 5.2E+08 kg/yr

TABLE F-2 (Cont)

V_{dp}	= 80-km commercial fish harvest	= 9.7E+06 kg/yr
V_{dp}'	= 80-km sports fish harvest	= 9.7E+06 kg/yr
V_{dp}''	= 80-km invertebrate harvest**	= 2.8E+06 kg/yr
V_{dp}'''	= 80-km milk production	= 5.6E+08 l/yr
V_{dp}''''	= 80-km meat production	= 1.7E+07 kg/yr
V	= 80-km vegetation production	= 1.8E+08 kg/yr

NOTES:

* 1.1E+09 = 1.1×10^9

**Includes sports and commercial harvest (analysis conservatively assumes 50% sports and 50% commercial) 2 Q470.4

TABLE F-3

METEOROLOGICAL DATA

Radiological Release Points:

1. Millstone 1 stack (continuous release)
2. Ventilation vent (intermediate release)
3. Ventilation vent (continuous release)
4. Turbine building vent (continuous release)

Meteorological Parameters - $\chi/Q = Sec/m^3$; $D/Q = m^{-2}$

Location	Resident		Annual Average	Growing/Grazing Season
810 m ENE	Maximum resident	χ/Q[1]*	4.03E-08**	4.59E-08
		D/Q[1]	2.16E-09	1.70E-09
		χ/Q[2]	1.69E-05	2.06E-05
		D/Q[2]	1.08E-07	1.11E-07
		χ/Q[3]	3.50E-06	3.98E-06
		D/Q[3]	4.15E-08	3.72E-08
		χ/Q[4]	1.22E-05	1.54E-05
		D/Q[4]	7.57E-08	7.86E-08
2,400 m NNE	Maximum goat	χ/Q[1]	6.60E-08	8.00E-08
		D/Q[1]	7.04E-10	7.58E-10
		χ/Q[2]	2.01E-06	2.50E-06
		D/Q[2]	7.67E-09	8.80E-09
		χ/Q[3]	7.96E-09	1.04E-06
		D/Q[3]	3.94E-09	4.87E-09
		χ/Q[4]	9.71E-06	1.28E-06
		D/Q[4]	3.81E-09	4.62E-09
7,200 m WNW	Maximum cow	χ/Q[1]	1.43E-08	1.73E-08
		D/Q[1]	8.74E-11	1.01E-10
		χ/Q[2]	1.80E-07	2.27E-07
		D/Q[2]	5.39E-10	6.28E-10
		χ/Q[3]	4.54E-08	5.62E-08
		D/Q[3]	1.83E-10	2.14E-10
		χ/Q[4]	7.42E-08	1.00E-07
		D/Q[4]	2.11E-10	2.68E-10
650 m ENE	Maximum site boundary	χ/Q[1]	1.27E-08	-
		D/Q[1]	2.34E-09	-
		χ/Q[2]	2.63E-05	-
		D/Q[2]	1.74E-07	-
		χ/Q[3]	4.81E-06	-
		D/Q[3]	6.29E-08	-
		χ/Q[4]	1.90E-05	-
		D/Q[4]	1.22E-07	-

NORTHEAST UTILITIES

THE CONNECTICUT LIGHT AND POWER COMPANY
WESTERN MASSACHUSETTS ELECTRIC COMPANY
HOLYOKE WATER POWER COMPANY
NORTHEAST UTILITIES SERVICE COMPANY
NORTHEAST NUCLEAR ENERGY COMPANY

General Offices • Selden Street, Berlin, Connecticut

P.O. BOX 270
HARTFORD, CONNECTICUT 06141-0270
(203) 666-6911

April 15, 1983

TO: B. Doolittle
U.S. Nuclear Regulatory Comm.
7920 Norfolk Ave.
Bethesda, Maryland 20014
#55-56

SUBJECT:

Millstone Nuclear Power Station, Unit No. 3
Transmittal of Amendment to ER
Docket No. 50-423

Enclosed is 40 copy (copies) of Amendment 2 to Copy No. 55, 56 of the Millstone Nuclear Power Station, Unit No. 3 Environmental Report. Please complete the attached form acknowledging the receipt of the amendment and return it to this office.

The instruction sheets enclosed shall be used to assist you in incorporating the revisions to your ER, and as such these should be retained until the Effective Page Listing is again updated.

If you have any questions, please contact me at (203) 666-6911 ext. 3285.

Sincerely,

Carol J. Shaffer

Carol J. Shaffer

Enclosure

MNPS-3 EROLS

INSERTION INSTRUCTIONS FOR NRC QUESTIONS AND RESPONSES

VOLUME 3

Remove	Insert	Location
	Frontispiece (NRC Questions and Responses) through Q470.4-1	After Page G-1

MILLSTONE NUCLEAR POWER STATION UNIT 3

environmental report

operating license stage

QUESTIONS AND RESPONSES

VOLUME 4

LIST OF EFFECTIVE PAGES

Page, Table (T), or Figure (F)	Amendment Number
EROLS Questions (Index) (1 thru 2 of 2)	0
Q231.1-1	0
Q240.1-1	0
Q240.2-1	0
QE100.2-1	0
QE290.1-1	0
QE291.1-1 thru QE291.1-2	0
QE291.2-1	0
TQE291.2-1 (1 thru 2 of 2)	0
TQE291.2-2 (1 of 1)	0
TQE291.2-3 (1 of 1)	0
TQE291.2-4 (1 of 1)	0
QE291.3-1 thru QE291.3-2	0
QE291.4-1	0
QE291.5-1	0
QE291.6-1	0
QE291.7-1	0
QE291.8-1	0
QE291.9-1	0
QE291.10-1	0
QE291.11-1	0
QE291.12-1	0
FQE291.12-1	0
QE291.13-1	0
QE291.14-1	0
QE291.15-1	0
QE291.16-1	0
QE291.17-1	0
QE291.18-1	0
QE311.5-1	0
TQE311.5-1 (1 of 1)	0
TQE311.5-2 (1 of 1)	0
TQE311.5-3 (1 of 1)	0
TQE311.5-4 (1 of 1)	0
TQE311.5-5 (1 of 1)	0
TQE311.5-6 (1 of 1)	0
TQE311.5-7 (1 of 1)	0
TQE311.5-8 (1 of 1)	0
TQE311.5-9 (1 of 1)	0
TQE311.5-10 (1 of 1)	0
TQE311.5-11 (1 of 1)	0
TQE311.5-12 (1 of 1)	0
TQE311.5-16 (1 of 1)	0
TQE311.5-17 (1 of 1)	0
TQE311.5-13 (1 of 1)	0

LIST OF EFFECTIVE PAGES (Cont)

EROLS QUESTIONS

MILLSTONE NUCLEAR POWER STATION - UNIT 3
DOCKET NO. 50-423

NRC Question	EROLS Section	Keywords
Geosciences Branch (GSB)		
231.1	2.5.2	Site Faulting investigations
Hydrologic Engineering Section (HGEB)		
240.1	2.4	Flood plains
240.2	7.1.9	Postulated core melt accident
Environmental Engineering Branch (EEB)		
E100.2	---	Differences between time of EROLS and ERCPS
E290.1	5.5.6	Copy of McDowell and Haalk 1975
E291.1	2.4	Tables 2.4-2 through 2.4-4
E291.2	2.4	Tables 2.4-2 through 2.4-5
E291.3	2.4	Metals
E291.4	2.4	Water quality program
E291.5	2.7	Noise measurement locations
E291.6	3.3.2	Service water
E291.7	3.3.2	Maximum monthly average
E291.8	3.4.1	Chlorine injection system
E291.9	3.6.2	Residual chlorine in the service water system
E291.10	3.6.2	FAC average concentration
E291.11	5.1	References: NUSCO, 1981b and Stone & Webster, 1976
E291.12	5.3	Service water interface with circulating water
E291.13	5.3	Reference for Section 5.3

EROLS QUESTIONS (Cont)

NRC Question	EROLS Section	Keywords
E291.14	12.0	Discharge outlet change
E291.15	12.0	NPDES permit
E291.16	12.0	Clean Water Act 316(a) thermal variance application
E291.17	12.0	Clean Water Act 316(b) demonstration
E291.18	App C	Effluent toxicity testing program
Siting Analysis Branch (SAB)		
E311.5	2.1.3	Population data in miles
Antitrust and Economic Analysis Branch (AEAB)		
E320.1	---	Production cost analysis
E320.2	---	30 and 40 yr present worth fuel and O&M costs
Radiological Assessment Branch (RAB)		
470.1	2.3.1	Distributional data
470.2	5.2.4	Dose rate estimates for man
470.3	5.2.4.4.1, 5.2.4.6	Dose rates
470.4	---	Invertebrate annual harvest

NRC Letter: January 31, 1983

Question No. Q231.1 (Section 2.5)

Revise the Environmental Report to accurately reflect the results of the site faulting investigations as presented in the FSAR. Page 2.5-2 (second and third paragraphs) of the ER is incorrect (based on the more detailed geologic submittal presented in the FSAR) as far as:

1. The number of faults mapped at the Unit 3 site,

2. The age of most recent faulting, and

3. The type of faulting.

Response:

EROLS Section 2.5 has been revised in Amendment 2 to reflect consistency with the FSAR.

NRC Letter: January 31, 1983

Question No. Q240.1 (Section 2.4)

Description of floodplains, as requested by Executive Order 11988, Floodplain-Management, have not been provided. The definition used in the Executive Order is:

Floodplain: The lowland and relatively flat areas adjoining inland and coastal waters including flood prone areas of offshore islands, including at a minimum that area subject to a one percent or greater chance of flooding in any given year.

a. Provide descriptions of the floodplains adjacent to the site. On a suitable map(s) provide delineations of those areas that will be flooded during the one percent (100-year) flood, both before and after plant construction or operation.

b. Provide details of the methods used to determine the floodplains in response to a. above. Include your assumption of, and basis for, the pertinent parameters used in the computation of the flood flows and water elevations. If studies approved by the Federal Insurance Administration (FIA) are available for the site and other affected areas, the details of the analyis used in the reports need not be supplied. You can instead provide the reports from which you obtained the floodplain information.

c. Identify, locate on a map and describe all plant structures and topographic alternations in the floodplains.

d. Discuss the hydrologic effects of all items identified in response to c. above. Discuss the potential for altered flood flows and levels, offsite. Discuss the effects on offsite areas of debris generated from the site during flood events.

e. Provide the details of your analysis used in response to d. above. The level of detail is similar to that identified in item b. above.

Response:

The response to this question will be submitted in June 1983.

NRC Letter: January 31, 1983

Question No. Q240.2 (Section 7.1.9)

Calculate the radiological consequences of a liquid pathway release from a postulated core melt accident. The analysis should assume, unless otherwise justified, that there has been a penetration of the reactor basemat by the molten core mass, and that a substantial portion of radioactivity contaminated sump water was released to the ground. Doses should be compared to those calculated in the Liquid Pathway Generic Study (NUREG-0440, 1978). Provide a summary of your analysis procedures and the values of parameters used (such as permeabilities, gradients, populations affected, water use). It is suggested that meetings with the staff of the Hydrologic Engineering Section be arranged so that we may share with you the body of information necessary to perform this analysis.

Response:

As stated in Section 7.1.9 of the Millstone 3 EROLS, "The analyses of the probabilities and consequences of accidents beyond the design bases of the Millstone 3 plant will be comprehensively discussed in the relevant portions of the Millstone 3 Probabilistic Safety Study (PSS), which the applicants presently estimate will be completed within 6 months after the docketing of the FSAR" (August 1983).

NRC Letter: January 31, 1983

Question No. QE100.2

In addition to other requested information, provide a summary and brief discussion, in table form, by section, of differences between currently projected environmental effects (including those that would degrade and those that would enhance environmental conditions) and the effects discussed in the environmental report and environmental hearings associated with the construction permit review. On a similar basis, indicate changes in plant or plant component design, location or operation that have been made or planned since the construction permit review.

Response:

A review of the ERCPS and EROLS will be conducted to document substantive informational changes since 1973 (ERCPS). Significant changes in design, new information, and changes in conclusions or impacts will be presented in Tabular (matrix) form in June 1983.

NRC Letter: January 31, 1983

Question No. QE290.1 (Section 5.5.6)

Provide a copy of reference, McDowell and Haalk 1975.

Response:

A copy of the following reference has been provided under separate cover on April 1, 1983.

McDowell and Haalk 1975. Report on Expected Impact on Wildlife and Forest Due to a Proposed Widening of the Current Right-of-way of the Millstone - Manchester 345 kV Line.

NRC Letter: January 31, 1983

Question No. QE291.1 (Section 2.4)

Indicate the bases for the data presented in ER Tables 2.4-2 through 2.4-4. That is, indicate whether the data are averages for all sampling locations; indicate whether the data in these tables and Table 2.4-5 are depth composites or surface or subsurface grab samples.

Response:

Please refer to Figure 2.4-13, WATER QUALITY SAMPLING LOCATIONS.

In Table 2.4-2, data are averages of the sampling results at the following locations (stations) during various tidal phases:

For January 1974

Station No.	Tidal Phase: Ebb	Tidal Phase: Flood
2	S	S
3	S	S
4	S	S
5	S	NS
6	S	S
7	NS	S
8	S	S
9	NS	S

NOTE: S = Sampled, NS = Not Sampled

For February through December 1974

Station No.	Tidal Phase					
	High Slack	Max. Ebb	Ebb	Low Slack	Max. Flood	Flood
1	S	NS	NS	S	NS	NS
2	S	NS	NS	S	NS	NS
3	NS	S	NS	S	NS	NS
4	S	NS	NS	NS	S	NS
5	NS	NS	S	NS	NS	S
6	NS	NS	S	NS	NS	S
7	NS	NS	S	NS	NS	S
8	NS	NS	S	NS	S	NS
9	NS	NS	S	NS	NS	S

NOTES:

S = Sampled, NS = Not sampled.
Samples from Stations 3 and 4 were not analyzed on ammonia-nitrogen, nitrite-nitrogen, nitrate-nitrogen, organic-nitrogen, total phosphate, ortho-phosphate, condensed phosphate, and organic carbon.

In Table 2.4-3, data are averages of the sampling results at the following locations (stations) during various tidal phases:

For January through December 1974

Station No.	Tidal Phase: High Slack	Ebb	Low Slack	Flood
1	S	NS	S	NS
2	S	NS	S	NS
5	NS	S	NS	S
6	NS	S	NS	S
7	NS	S	NS	S
8	NS	S	NS	S
9	NS	S	NS	S

NOTE: S = Sampled, NS = Not Sampled

In Table 2.4-4, data are averages of the sampling results at the following locations (stations) during various tidal phases:

For January 1974

Station No.	Tidal Phase: Ebb	Flood
2	S	S
3	S	S
4	S	S
5	S	NS
6	S	S
7	NS	S
8	S	S
9	NS	S

For February through December 1974

Station No.	Tidal Phase: High Slack	Max. Ebb	Ebb	Low Slack	Max. Flood	Flood
1	S	NS	NS	S	NS	NS
2	S	NS	NS	S	NS	NS
3	NS	S	NS	S	NS	NS
4	S	NS	NS	NS	S	NS
5	NS	NS	S	NS	NS	S
6	NS	NS	S	NS	NS	S
7	NS	NS	S	NS	NS	S
8	NS	NS	S	NS	S	NS
9	NS	NS	S	NS	NS	S

The sample depths for Tables 2.4-2 through 2.4-4 are indicated on Figure 2.4-13.

The samples for Table 2.4-5 were collected from subsurface water (about 10 inches below the surface).

NRC Letter: January 31, 1983

Question No. QE291.2 (Section 2.4)

Indicate or provide a reference for the maximum values and their locations by months for the parameters shown in Tables 2.4-2 through 2.4-5.

Response:

The maximum values and their locations by months for parameters in Tables 2.4-2 through 2.4-5 are presented in the following tables (Table QE291.2-1 to Table QE291.2-4):

TABLE QE291.2-1

MAXIMUM CONCENTRATIONS OF PARAMETERS FOR LONG ISLAND SOUND WATER[6]

Parameter	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Ammonia-Nitrogen	0.12/[1] 2S	0.02[1]	0.08	0.04	0.16/ 2B	0.20/ 6M	0.28/ 5M	0.30/ 6M	0.40/ 2M	0.38/ 2S	0.14/ 9M	0.08 1M
Nitrite-Nitrogen	ND	0.001	0.004	0.002	0.002	0.001	0.001	0.002/ 6M	0.010	0.080	0.018/ 8B	0.003/ 1M
Nitrate-Nitrogen	0.95/ 2B	0.83/ 2S	0.96/ 2B	0.64/ 7M	1.46/ 8M	0.10	0.48/ 8S	0.08/ 6M	0.14/ 8S	0.076/ 8B	0.038/ 5M	0.17/ 6M
Organic-Nitrogen	0.42/ 2M	0.58/ 2S	0.36/ 1M	0.56/ 7M	0.60	0.70/ 1M	0.50	2.0/[5] 2S	1.2/ 9M	0.84/ 1M	0.706/ 8M	0.32
Total Phosphate	0.80/ 5M	0.7	0.4/ 2M	0.4/ 1M	0.1	0.9/ 2M	0.2	0.2	0.4	0.2	0.3/ 1M	0.3/ 8B
Ortho Phosphate	ND	0.3/ 8M	<0.1/ 8B	0.2/ 1M	<0.1	0.1	<0.1	<0.1	0.2/ 2M	0.1/ 8B	<0.1	0.1
Condensed Phosphate	0.18/ 2B	0.5/ 2S	0.1	0.3/ 1M	<0.1	<0.1	<0.1	0.2/ 7M	0.2/ 7M	0.2/ 9M	0.2	0.1
Organic Carbon	61.0/ 2M	111.0/[3] 1M	100.0/ 2B	20.0/ 6M	25.0/ 7M	21.0/ 2B	13.5	19.0/ 2M	41.5/ 8B	30.2/ 2S	9.3/ 9M	32.0
Oil and Grease	89.8/ 2M	29.44/ 3M	18.68/ 9M	22.28/ 8M	15.16/ 8S	29.42/ 1M	8.50/ 4B	14.16/ 6M	12.02/ 9M	7.88/ 4B	6.10/ 2B	8.16/ 3B
Sulfates	2,750/ 7M	2,600	2,800	2,550/ 6M	2,450/ 8B	2,900/ 1M	3,240/ 4S	2,850/ 3M	3,300/ 2B	2,425	2,400	2,525
MBAS	0.396/ 2S	0.60/[4] 2M	0.15/ 2B	0.45/ 6M	0.20/ 2M	0.225/ 1M	0.045	0.077	0.115/ 6M	0.240	0.133	0.224/ 3S
Suspended Solids	184/[2] 2M	54.1/ 3B	87.6/ 6M	45.6/ 3B	33.3/ 3B	45.55/ 6M	43.7/ 2B	53.5/ 3S	50.7/ 3B	38.4/ 3M	41.3/ 2B	38.6/ 7M

NOTES:

1. A/BC, where A - concentration in mg/l
   B - station number (see Figure 2.4-13)
   C - depth (B - bottom water, M - mid-depth water, S - surface water)

   e.g., 0.12/2S means the maximum value of 0.12 mg/l was recorded at Station No. 2, surface water sample.

TABLE QE291.2-1 (Cont)

When the same maximum concentration was recorded in more than one location, only concentration is shown, e.g., the maximum value of 0.02 was recorded at 2M, 8B, and 9M.

2. Unusualy high; the next high is 47.6/3B

3. Unusually high; the next high is 10.0/2B

4. Unusually high; the next high is 0.12

5. Unusually high; the next high is 0.66

6. Based on data collected monthly during 1974 water quality monitoring program by TRC (The Research Corporation of New England)

TABLE QE291.2-2

MAXIMUM CONCENTRATIONS OF QUARTERLY SAMPLES
FOR LONG ISLAND SOUND WATER

Parameter	March	June	September	December
Total alkalinity	276.8/2M[1]	246/2S	248	272/7M
Chloride	19,460/2B	19,375/1M	24,375/2B	18,750
Potassium	650	715/8M	575	675
Calcium	270	269	244	250
Magnesium	825/8S	1,805/8M	1,170/8M	900/1M
Arsenic	ND	ND	ND	ND
Molybdenum	0.60	1.0/1M	0.056/9M	ND
Titanium	ND	ND	ND	0.32/8M
Vanadium	0.40/7M	0.20	0.027/2S	ND
Cadmium	0.05	0.09/8M	0.013	ND
Berylium	ND	ND	ND	ND
Mercury	ND	ND	ND	ND
Total solids	35,750/2B	43,500/2B	41,017/7M	40,800/9M
Volatile solids	7,400/2B	14,950/2B	24,012/5M	12,800/6M
Tin	19.8/2M	ND	ND	ND
Phenol	0.009	ND	0.003	ND

NOTES:

A/BC, where A - concentration in mg/l
B - station number (see Figure 2.4-13)
C - depth (B - bottom water, M - mid-depth water, S - surface water)

When the same maximum concentration was recorded in more than one location, only concentration is shown.

TABLE QE291.2-3

MONTHLY MAXIMUM METAL CONCENTRATION

Month	Tide	Parameter (Unfiltered Samples) Iron	Manganese	Nickel	Zinc	Aluminum
Jan.	Ebb	0.25/3S[1]	0.06/5M	0.20	0.014/3M	2.60/8M
	Flood	0.25/3M	0.05/8S	0.20/6M	0.013/3B	3.20/8M
Feb.	Ebb	0.13/4S	0.035	0.14/8S	0.005/8B	1.3/9M
	Flood	0.40/3B	0.045	0.12/7M	0.007/3B	1.3/8S
Mar.	Ebb	0.70/5M[2]	0.062/8B	0.30	0.030/2B	1.7/8S
	Flood	0.19	0.095/3B	0.30	0.013	2.1/8S
Apr.	Ebb	0.25/3B	0.050	0.18/9M	0.050/3M	5.0/7M
	Flood	0.18/3B	0.050	0.24/8M	0.025/6M	2.7/4B
May	Ebb	0.22/1M	0.04	0.22	0.22/6M	2.85/9M
	Flood	0.18	0.04	0.27	0.205/9M	2.36/8S
June	Ebb	0.14/1M	0.075	0.19/2M	0.013	1.00/6M
	Flood	0.14	0.11/2S	0.16/2S	0.011/4B	1.00/6M
July	Ebb	0.17/4M	0.05	0.10	0.043/1M	10.0/4M
	Flood	0.10	0.03	0.10	0.035/7M	7.5/3S
Aug.	Ebb	0.11	0.05/4S	0.035	0.013/7M	2.8/9M
	Flood	0.11/8M	0.042/1M	0.065/9M	0.010/8B	2.1/3S
Sept.	Ebb	0.28/2S	0.04	0.073/9M	0.010/4B	7.2
	Flood	0.48/6M	0.05/2S	0.073	0.020/3M	2.8/1M
Oct.	Ebb	0.14/5M	0.02	0.28/4M	0.035/6M	ND
	Flood	0.14/3S	0.04/7M	0.10/8S	0.057/9M	ND
Nov.	Ebb	0.02	0.01	0.05/4S	0.025	ND
	Flood	0.02	0.01	0.05	0.055	1.00/2M
Dec.	Ebb	0.09/8S	ND	ND	0.040	0.6/9M
	Flood	0.09	ND	ND	0.050/3M	0.6

NOTES:

(1) A/BC where A - Concentration in mg/l
B - Station number (see Figure 2.4-13)
C - Depth (B - bottom water; M - mid-depth water, S - surface water)

(2) Unusually high; the next high is 0.19

TABLE QE291.2-4

MAXIMUM ANNUAL METAL CONCENTRATIONS IN ppb
(μg/l) IN UNFILTERED SEAWATER SAMPLED FROM SELECTED SITES NEAR
MILLSTONE POINT, CONNECTICUT[1]

Selected Site	1980	1979	1978	1977	1976	1975	1974	1973
				Copper				
Unit 1 Intake	2.4	3.9	3.3/3.6[2]	3.2/7.6	20/4.5	8/<1	15	9
Quarry Cut	3.6	5.0	6.0/3.9	4.8/4.1	10/2.8	12/<1	15	45
Giants Neck	2.8	4.4	4.0/2.4	5.0/13	16/7.9	12/<1	18	10
Twotree	2.2	3.8	3.6/0.7	5.7/4.1	12/3.2	8.9/<1	16	14
				Zinc				
Unit 1 Intake	6.7	9.2	15.4/1.7	6.9/4.7	26/2.7	26/18	14	10
Quarry Cut	5.1	8.4	16.5/1.5	8.4/4.5	20/5.3	15/4	16	15
Giants Neck	8.5	10.4	29/5.3	10.0/24	35/22	28/5.9	15	19
Twotree	5.6	9.6	11.8/1.5	11.0/5.2	39/4.3	24/6.4	9	75
				Iron				
Unit 1 Intake	280	130	3.7/105	1.7/490	2.4/195	1.6/148	173	122
Quarry Cut	333	130	0.9/133	3.2/400	2.4/195	10.5/101	197	721
Giants Neck	465	254	1.3/413	3.1/3,800	3.5/300	1.6/88	223	536
Twotree	257	133	1.7/128	1.1/310	8.9/251	1.7/146	241	348
				Chromium				
Unit 1 Intake	<1	<2	<2/<2	<1/<1	<1/<1	<1/2	6	4
Quarry Cut	<1	<2	<2/<2	<1/<1	2.4/<1	<1/2	3	4
Giants Neck	<1	<2	<2/<2	<1/10.0	<1/<1	<1/2	4	8
Twotree	<1	<2	<2/<2	<1/<1	1.8/<1	<1/2.7	2	5
				Lead				
Unit 1 Intake	1.3	3.7	8/<1	3.6/3.3	1.3/6.7	2/1	4	8
Quarry Cut	2.3	3.1	1.5/11	<1/3.0	14/12	1/1	15	5
Giants Neck	2.3	2.8	1.2/6.7	2.4/1.0	1/8.3	3/6	6	4
Twotree	1.7	2.1	2.0/<1	1.9/4.0	13/21	1/1	4	5

NOTES:

(1) For the years 1975 through 1978 the data are available only for soluble and insoluble constituents separately.

(2) A/B, where A is soluble concentration
B is insoluble concentration

NRC Letter: January 31, 1983

Question No. QE291.3 (Section 2.4)

The information on metals in Section 2.4 doesn't always indicate the location when metals concentration values are discussed. These data are helpful when reviewing this section and should be provided.

Response:

As discussed in EROLS Section 2.4.3.4.3 Trace Metals, an ongoing monitoring program was established by NUSCO to determine potential impacts of the Millstone Nuclear Power Station on trace metal concentrations in Long Island Sound. Samples were collected from four locations in the vicinity of the station: Millstone 1 Intake; Quarry Cut (station discharge); Giants Neck; and Twotree Island.

However, in presenting the 1974 baseline study results, the location of the sampling was not always indicated. It is supplemented by the following. Please refer to Figure 2.4-13 for station number designation.

Iron

Iron concentration between 100 and 200 ppb were record in September 1974 at the following stations:

Ebb Tide: 2M, 4M, 8S, 8B, 7M, 9M(1)

Flood Tide: 1M, 2S, 3B, 4B, 8M, 8B, 7M

The concentration greater than 200 ppb was recorded at the following sampling location:

2S (280 ppb), 3S (280 ppb), 3M (220 ppb), 4S (220 ppb), and 6M (480 ppb)

Lead

Lead concentration greater than 5 ppb were recorded in 5 of 24 samples which were collected from the Quarry Cut and the Millstone 1 Intake between February 1973 and February 1974.

The maximum concentration of 15 ppb was detected in the Quarry Cut sample.

Molybdenum

Molybdenum concentration of 1 mg/l was detected in the Quarry Cut (station discharge) samples in June 1974.

Cadmium

Soluble cadmium concentration of 13 μg/l was reported in 9 of 44 samples collected in September and December 1974.

These samples were collected at the following stations:

Ebb Tide: 5M, 6M, 7M, 8S, 8B

Flood Tide: 5M, 6M, 8B, 8S

Phenol

Phenol concentration of 9 μg/l was detected in the 8S and 8B samples in March 1974.

Phenol concentration of 3 μg/l was detected in the 2S and 8M samples in September 1974.

In all other cases, if the location in Section 2.4 is not specified when concentrations of metals are discussed, the data are applicable to all locations or they are averages of the data collected from each location.

NOTES:

1. B = Bottom water sample
   M = Mid-depth water sample
   S = Surface water sample

2. Refer to Figure 2.4-13 for station numbers

NRC Letter: January 31, 1983

Question No. QE291.4 (Section 2.4)

The information in Section 2.4 and elsewhere in the ER is referenced to the 1974 water quality program. The ER in Section 6 indicates that more recent surveys have been conducted. Indicate whether and to what degree the analyses and conclusions drawn in the ER with regard to site area water quality would be changed by this additional information.

Response:

The comprehensive baseline water quality survey was conducted during 1974 only by The Research Corporation of New England, Inc. (TRC). The objective of more recent surveys is to determine possible contributions by the Millstone Station condenser cooling system to the heavy metal concentrations in adjacent Long Island Sound. The heavy metals selected for analyses in seawater include copper, zinc, iron, chromium, and lead. The results are discussed in Section 2.4.3.4.3 and presented in Table 2.4-5. The analyses and conclusions drawn in the ER with regard to site area water quality are not changed by this additional information (NUSCO 1982).

Reference:

NUSCO 1982. Annual Report 1981. Monitoring the Marine Environment of Long Island Sound at Millstone Nuclear Power Station, Waterford, Conn.

NRC Letter: January 31, 1983

Question No. QE291.5 (Section 2.7)

Indicate the reference points (e.g., site property boundary, reactor building centerlines) for the noise measurement locations.

Response:

Distance to the community noise measurement locations identified in Figure 2.7-1 and described in Table 2.7-1 were measured directly from a USGS map of the area. The USGS map is a 1970 photorevised edition with only the location of the Millstone 1 Nuclear Power Station clearly identified. The reference point for the community measurement locations is clearly identified on Figure 2.7-2 Amendment 2, which is a copy of the USGS map and represents the intersection of the Millstone 1 turbine building and the reactor building which provides the only distinguishable reference point for the Millstone 1 Station.

NRC Letter: January 31, 1983

Question No. QE291.6 (Section 3.4.2)

Indicate the temperature rise of the service water upon passage through the unit under normal operating and under shutdown conditions.

Response:

The temperature rise of the service water under all operating conditions is given in Table 3.4-1 as revised in Amendment 2.

NRC Letter: January 31, 1983

Question No. QE291.7 (Section 3.3.2)

Indicate the reason for using the term "maximum monthly average" when referring to the continuous flow values (in gpm) in Table 3.3-1.

Response:

Please refer to Section 3.3.2 as revised (Amendment 2).

NRC Letter: January 31, 1983

Question No. QE29 8 (Section 3.4.1)

Describe the design and likely operational parameters (e.g., frequency, duration and amount of biocide addition) of the chlorine injection system for the circulating water system.

Response:

In the event that thermal backwashing or tube cleaning proves unsuccessful, provisions for a chlorine injection system have been incorporated into the design of the circulating water system. The existing service water chlorination system (Section 3.4.2) has been designed with the capability to retrofit a chlorination system to provide sequential, intermittent chlorination downstream of the traveling water screens in each circulating water intake bay. This system would back up the Amertap system to provide condenser slime control. Should a more extensive, continuous chlorination program be required to control hardshell fouling in the intake structure, additional chlorination equipment would be necessary. Chlorination frequency, duration, and concentration are indeterminate at this time since this option is not expected to be added to the circulating water system. However, any chlorination program would be within the EPA Effluent Limitation Guidelines in 40CFR423.

NRC Letter: January 31, 1983

Question No. QE291.9 (Section 3.6.2)

Based on operating experience with Units 1 and 2 or on other bases, provide an estimate of the total residual chlorine concentration of the service water system at the point where it discharges into the discharge tunnel.

Response:

A chlorination study was conducted in 1976 and 1977 for Millstone Units 1 and 2[1], to correlate levels of total residual chlorine at the quarry cut with levels of free available chlorine at the condenser outlets (discharge structures) into the quarry. No significant correlation of the total residual levels at the quarry cut and the free available levels at the discharge structure can be demonstrated from the available data. It is estimated that the total residual chlorine concentration of the Millstone 3 service water system at the point where it discharges into the Unit 3 discharge tunnel will be 2.5 ppm (the worst case). The 2.5 ppm concentration is an extremely conservative estimate. The service water chlorination equipment is designed to chlorinate the service water to a concentration of 2.5 ppm. If it is assumed no chemical reaction occurred between the chlorine and marine organisms (i.e., no chlorine is consumed during chlorination process), the concentration will remain the same at the point where the service water discharges into the discharge tunnel. The service water (30,000 gpm) will mix with the circulating water (912,000 gpm) in the discharge tunnel. Even in this worst case, it is calculated that the total residual chlorine will be reduced to 0.08 ppm at the discharge outfall structure into the quarry.

Reference:

1. NUSCO 1978. Annual Environmental Operating Report, January 1, 1977 - December 31, 1977 Part A, Section 4.7.

NRC Letter: January 31, 1983

Question No. QE291.10 (Section 3.6.2)

Indicate the time period that the 0.1 ppm FAC average concentration is based upon. Indicate the anticipated maximum concentration value.

Response:

The average free available chlorine concentration of 0.1 ppm or less is based on chlorination, three times a day for 30 minute periods, for a total of 1 1/2 hours per day.

The anticipated maximum concentration of free available chlorine is 0.25 ppm.

NRC Letter: January 31, 1983

Question No. QE291.11 (Section 5.1)

Provide a copy of the references, NUSCO 1981b and Stone & Webster Engineering Corporation, 1976.

Response:

A copy of the following references has been provided under separate cover on April 1, 1983.

NUSCo. 1981b. Feasibility of Modifying the Millstone Units 1 and 2 Cooling Water Intake Screen Wash System to Improve the Return of Fish to Long Island Sound. Submitted to Connecticut DEP.

Stone & Webster Engineering Corporation (SWEC) 1976. Biological Modeling of the Effect of Entrainment on Four Selected Fish Species at the NEP 1 and 2 Site, Charlestown, R.I.

NRC Letter: January 31, 1983

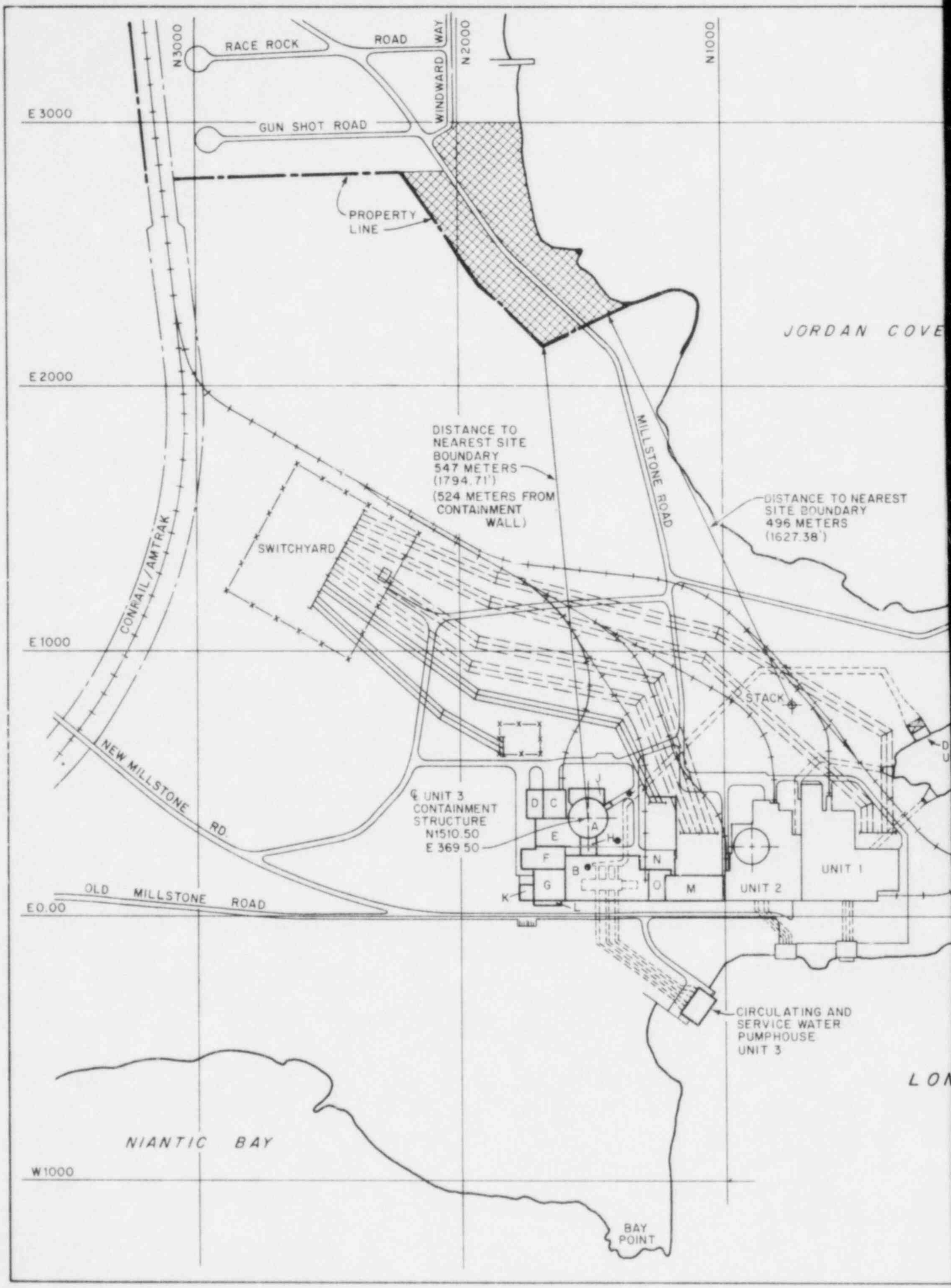
Question No. QE291.12 (Section 5.3)

Indicate the location, physically in relation to the Unit 3 discharge structure, where the service water mixes with the circulating water. Section 3.6 indicates that the biocide control point is to be here, but Section 5.3 indicates that the control point is to be where the mixed waters enter the quarry. Indicate which situation is correct.

Response:

Figure QE291.12-1 shows the physical location, in relation to the Millstone 3 discharge structure, where the service water mixes with the circulating water.

The biocide control point will be at the place where the mixed waters enter the quarry as indicated in Section 5.3


RACE ROCK ROAD
WINDWARD WAY
N3000
N2000
N1000
E 3000
GUN SHOT ROAD
PROPERTY LINE
JORDAN COVE
E 2000
DISTANCE TO NEAREST SITE BOUNDARY 547 METERS (1794.71') (524 METERS FROM CONTAINMENT WALL)
MILLSTONE ROAD
DISTANCE TO NEAREST SITE BOUNDARY 496 METERS (1627.38')
SWITCHYARD
CONRAIL/AMTRAK
E 1000
STACK
NEW MILLSTONE RD.
℄ UNIT 3 CONTAINMENT STRUCTURE N1510.50 E 369.50
UNIT 2
UNIT 1
OLD MILLSTONE ROAD
E 0.00
CIRCULATING AND SERVICE WATER PUMPHOUSE UNIT 3
NIANTIC BAY
W1000
BAY POINT

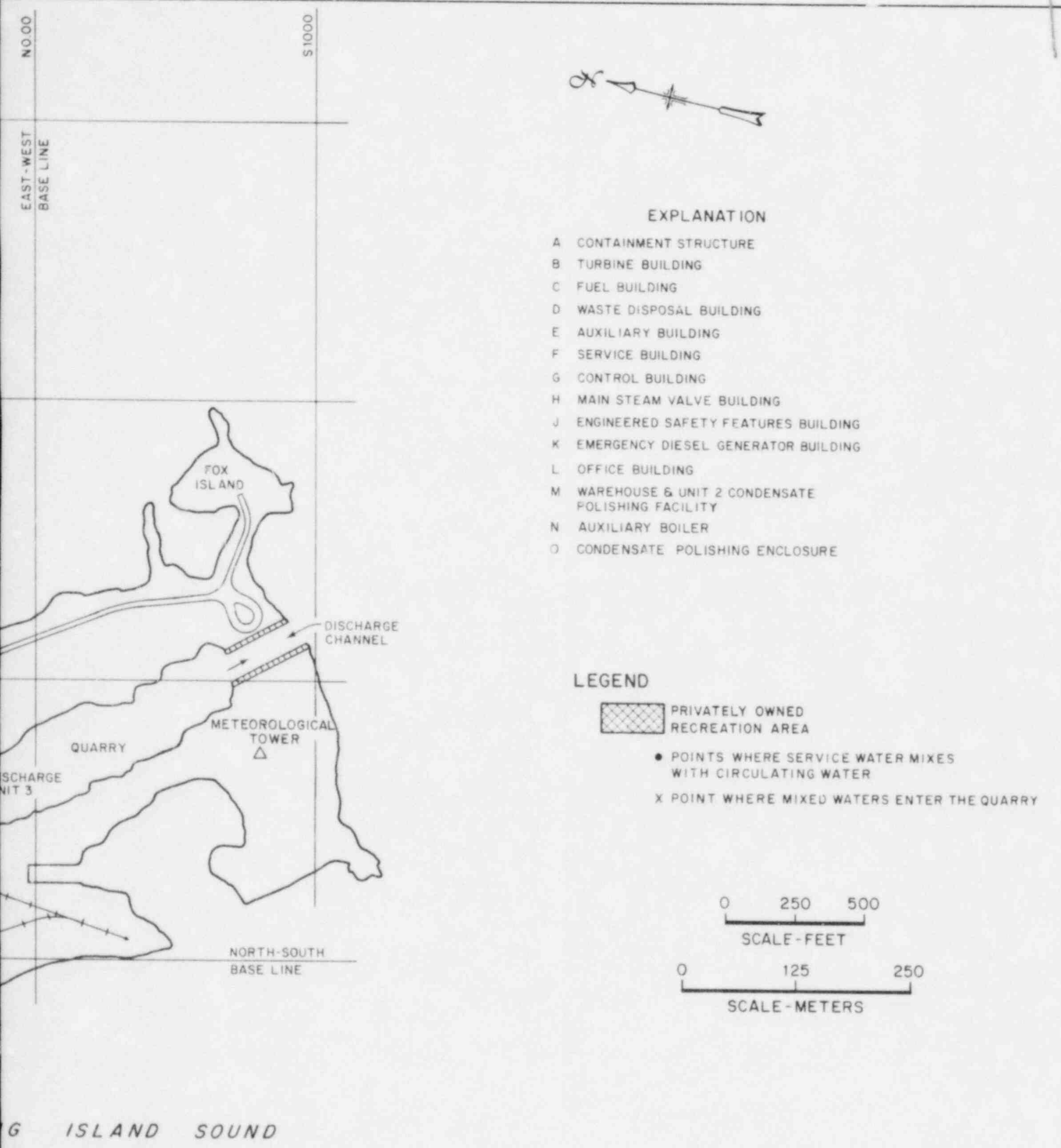


FIGURE QE 291.12-1
SITE PLAN
MILLSTONE NUCLEAR POWER STATION
UNIT 3
ENVIRONMENTAL REPORT
OPERATING LICENSE STAGE

NRC Letter: January 31, 1983

Question No. QE291.13 (Section 5.3)

Provide a copy of the reference used for Section 5.3 (i.e., Waslenchuk, 1980).

Response:

A copy of the following reference has been provided under separate cover on April 1, 1983.

Waslenchuk, D.G., 1980. The Concentration, Reactivity, and Fate of Copper, Nickel, and Zinc in a Coastal Power-Station Cooling-Water Plume.

NRC Letter: January 31, 1983

Question No. QE291.14 (Section 12.0)

Provide a copy of the application to Corps of Engineers for construction of discharge outlet change and copy of Corps of Engineers' approval.

Response:

A copy of the above application and approval has been provided under separate cover on April 1, 1983.

NRC Letter: January 31, 1983

Question No. QE291.15 (Section 12.0)

Provide a copy of the (latest) NPDES permit for Millstone 1, 2, and 3 discharges.

Response:

A copy of the above permit has been provided under separate cover on April 1, 1983.

NRC Letter: January 31, 1983

Question No. QE291.16 (Section 12.0)

Provide a copy of the Clean Water Act 316(a) thermal variance application to Conn DEP and a copy of correspondence from Conn DEP documenting approval.

Response:

A copy of the above application and approval has been provided under separate cover on April 1, 1983.

NRC Letter: January 31, 1983

Question No. QE291.17 (Section 12.0)

Provide a copy of the Clean Water Act 316(b) demonstration to Conn DEP and a copy of correspondence from Conn DEP documenting approval of the intake structure and fish return sluiceway.

Response:

A copy of the above correspondence and approval has been provided under separate cover on April 1, 1983.

NRC Letter: January 31, 1983

Question No. QE291.18 (Section Appendix C)

Provide a copy of all reports available from the effluent toxicity testing program. Indicate which "other suitable organisms indigenous to the Millstone area" will be used in effluent toxicity testing.

Response:

No formal report providing summaries and interpretation of data from the effluent toxicity testing program has been prepared to date. Development of the experimental testing facility was not completed until early 1981 when the first series of tests on sheepshead minnow (Cyprinodon variegatus) were begun. During 1982, the program scope was expanded to include Mysidopsis bahia. Preparation of a report on these results is being planned for later in 1983. Copies will be made available.

Other indigenous species currently being considered are the silverside (Menidia menidia), an abundant local shore-zone forage fish, and winter flounder (Pseudopleuronectes americanus) which would be tested as larvae or juveniles. Because the experimental facility would have to be modified appreciably to accommodate the lower water temperature requirements of flounder, tests using this species will probably be delayed for several years.

NRC Letter: January 31, 1983

Question No. QE311.5 (Section 2.1)

It is noted in Tables 2.1-1 through 2.1-20 that the population data has been given in metric measurement. Please provide this data in the English system of miles to correspond with the distances given in Regulatory Guide 1.70, Section 2.1-3 Population Distribution.

Response:

Population per sector, based on distances in English system miles is provided in attached Tables QE311.5-1 through QE311.5-14. Per NRC agreement, distances do not correspond to those given in Regulatory Guide 1.70 but instead are provided in distances suitable for the Probabilistic Safety Study. Transient population distribution is listed by distance and direction in Tables QE311.5-15 through QE311.5-17.

TABLE QE311.5-1

1980 POPULATION DISTRIBUTION
0-10 miles

	Distance (miles)														
Direction	0.0-0.5	0.5-1.0	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0	4.0-4.5	4.5-5.0	5.0-6.0	6.0-7.0	7.0-8.5	8.5-10.0	Total
N	0	0	116	495	119	357	773	91	17	45	317	359	1,697	1,823	6,209
NNE	0	0	31	325	475	806	614	241	288	1,904	1,850	1,295	1,862	3,623	13,314
NE	23	153	57	439	410	191	1,036	2,595	5,649	6,537	5,717	4,020	3,728	2,643	33,198
ENE	6	68	160	210	111	108	514	4,127	1,182	140	7,223	1,364	4,475	4,387	24,075
E	0	16	528	165	212	250	844	1,871	209	76	751	0	621	2,263	7,806
ESE	0	0	73	89	68	11	0	0	0	0	0	0	219	415	875
SE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0	0	0	0	0	0	147	157	304
SSW	0	0	0	0	0	0	0	0	0	0	0	0	6	112	118
SW	0	0	0	0	29	132	0	0	0	0	0	0	0	0	161
WSW	0	0	0	0	1,302	179	204	112	0	1,009	1,103	1,510	35	18	5,472
W	0	0	0	257	1,019	383	409	694	23	295	435	187	525	765	4,992
WNW	0	0	0	516	723	504	524	23	40	32	157	52	518	421	3,510
NW	0	0	37	580	364	147	645	297	89	319	573	52	513	392	4,008
NNW	0	122	458	198	438	272	246	2[illegible]2	400	155	455	75	1,076	1,268	5,395
TOTAL	29	359	1,460	3,274	5,270	3,340	5,809	10,283	7,897	10,512	18,581	8,914	15,422	18,287	109,437

TABLE QE311.5-2

1985 POPULATION DISTRIBUTION
0-10 miles

	Distance (miles)														
Direction	0.0-0.5	0.5-1.0	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0	4.0-4.5	4.5-5.0	5.0-6.0	6.0-7.0	7.0-8.5	8.5-10.0	Total
N	0	0	119	507	122	365	791	93	17	46	324	368	1,746	1,886	6,384
NNE	0	0	32	333	487	824	628	246	293	1,916	1,860	1,325	1,907	3,775	13,626
NE	23	156	58	449	420	196	1,060	2,508	5,621	6,505	5,728	4,064	3,790	2,753	33,411
ENE	6	70	164	215	114	110	513	4,107	1,176	142	7,336	1,389	4,500	4,455	24,297
E	0	17	541	169	216	256	854	1,862	208	77	762	0	628	2,282	7,872
ESE	0	0	75	92	69	12	0	0	0	0	0	0	246	466	960
SE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0	0	0	0	0	0	165	176	341
SSW	0	0	0	0	0	0	0	0	0	0	0	0	7	126	133
SW	0	0	0	0	30	139	0	0	0	0	0	0	0	0	169
WSW	0	0	0	0	1,367	188	215	118	0	1,082	1,182	1,619	38	18	5,827
W	0	0	0	264	1,062	402	429	729	24	316	466	201	563	791	5,247
WNW	0	0	0	531	748	529	550	24	42	33	166	56	557	453	3,689
NW	0	0	38	597	375	155	677	312	94	342	602	54	542	418	4,206
NNW	0	125	469	203	450	279	253	237	416	165	478	79	1,119	1,320	5,593
TOTAL	29	368	1,496	3,360	5,460	3,455	5,970	10,316	7,891	10,624	18,904	9,155	15,808	18,919	111,755

TABLE QE311.5-3

1990 POPULATION DISTRIBUTION
0-10 miles

Direction	Distance (miles) 0.0-0.5	0.5-1.0	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0	4.0-4.5	4.5-5.0	5.0-6.0	6.0-7.0	7.0-8.5	8.5-10.0	Total
N	0	0	121	515	124	371	804	94	18	47	330	374	1,792	1,956	6,546
NNE	0	0	32	338	494	837	637	249	298	1,948	1,892	1,346	1,943	3,980	13,994
NE	24	159	59	456	427	199	1,075	2,630	5,712	6,610	5,799	4,093	3,835	2,880	33,958
ENE	6	71	166	218	116	112	521	4,173	1,195	142	7,368	1,390	4,558	4,472	24,508
E	0	17	549	172	220	260	869	1,892	211	77	765	0	632	2,297	7,961
ESE	0	0	76	93	70	12	0	0	0	0	0	0	274	518	1,043
SE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0	0	0	0	0	0	184	196	380
SSW	0	0	0	0	0	0	0	0	0	0	0	0	8	140	148
SW	0	0	0	0	31	142	0	0	0	0	0	0	0	0	173
WSW	0	0	0	0	1,395	191	219	120	0	1,173	1,282	1,755	41	18	6,194
W	0	0	0	275	1,092	411	438	744	25	341	505	217	611	814	5,473
WNW	0	0	0	553	775	540	562	25	43	34	170	61	603	488	3,854
NW	0	0	40	621	390	158	691	318	96	371	614	56	560	439	4,354
NNW	0	127	477	209	468	286	257	241	424	176	488	84	1,146	1,358	5,741
TOTAL	30	374	1,520	3,[illegible]50	5,602	3,519	6,073	10,486	8,022	10,919	19,213	9,376	16,187	19,556	114,327

TABLE QE311.5-4

2000 POPULATION DISTRIBUTION
0-10 MILES

Direction	Distance (miles) 0.0-0.5	0.5-1.0	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0	4.0-4.5	4.5-5.0	5.0-6.0	6.0-7.0	7 0-8.5	8.5-10.0	Total
N	0	0	118	505	121	364	788	92	17	46	323	367	1,857	2,125	6,723
NNE	0	0	32	332	485	821	625	245	292	1,909	1,854	1,320	1,928	4,262	14,105
NE	23	156	58	440	419	195	1,055	2,576	5,593	6,473	5,766	4,183	3,948	3,068	33,961
ENE	6	69	163	214	113	110	510	4,086	1,170	146	7,536	1,422	4,661	4,574	24,780
E	0	17	539	169	216	255	852	1,853	207	79	783	0	646	2,349	7,965
ESE	0	0	75	91	69	12	0	0	0	0	0	0	309	584	1,140
SE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0	0	0	0	0	0	207	220	427
SSW	0	0	0	0	0	0	0	0	0	0	0	0	9	158	167
SW	0	0	0	0	32	146	0	0	0	0	0	0	0	0	178
WSW	0	0	0	0	1,436	197	226	124	0	1,320	1,443	1,975	46	18	6,785
W	0	0	0	283	1,124	423	451	766	25	384	568	245	687	849	5,805
WNW	0	0	0	569	798	556	578	25	44	35	178	68	677	546	4,074
NW	0	0	41	640	402	163	712	327	99	417	632	57	589	476	4,555
NNW	0	124	468	208	482	287	253	237	427	193	502	91	1,187	1,437	5,896
TOTAL	29	366	1,494	3,459	5,697	3,529	6,050	10,331	7,874	11,002	19,585	9,728	16,751	20,666	116,561

TABLE QE311.5-5

2010 POPULATION DISTRIBUTION
0-10 miles

	Distance (miles)														
Direction	0.0-0.5	0.5-1.0	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0	4.0-4.5	4.5-5.0	5.0-6.0	6.0-7.0	7.0-8.5	8.5-10.0	Total
N	0	0	115	491	118	353	765	90	17	45	314	356	1,922	2,316	6,902
NNE	0	0	31	322	471	796	605	240	292	2,025	1,970	1,281	1,902	4,876	14,831
NE	22	151	56	435	407	189	1,021	2,858	6,282	7,270	6,136	4,163	3,954	3,379	36,323
ENE	6	67	158	208	110	107	567	4,589	1,314	139	7,200	1,308	4,954	4,359	25,096
E	0	16	523	163	210	247	876	2,081	232	76	748	0	649	2,366	8,187
ESE	0	0	72	88	67	11	0	0	0	0	0	0	359	679	1,276
SE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0	0	0	0	0	0	241	256	407
SSW	0	0	0	0	0	0	0	0	0	0	0	0	11	183	194
SW	0	0	0	0	28	131	0	0	0	0	0	0	0	0	159
WSW	0	0	0	0	1,285	176	202	111	0	1,586	1,733	2,372	55	17	7,537
W	0	0	0	319	1,099	378	404	685	23	456	683	294	825	875	6,041
WNW	0	0	0	641	842	497	517	23	40	31	166	82	809	631	4,279
NW	0	0	46	721	446	149	637	293	88	501	566	51	559	485	4,542
NNW	0	121	454	216	543	294	244	230	395	224	449	103	1,141	1,429	5,343
TOTAL	28	355	1,455	3,604	5,626	3,328	5,838	11,200	8,683	12,353	19,965	10,010	17,381	21,871	121,697

TABLE QE311.5-6

2020 POPULATION DISTRIBUTION
0-10 miles

	Distance (miles)														
Direction	0.0-0.5	0.5-1.0	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0	4.0-4.5	4.5-5.0	5.0-6.0	6.0-7.0	7.0-8.5	8.5-10.0	Total
N	0	0	108	461	111	332	719	84	16	42	295	335	1,976	2,535	7,014
NNE	0	0	29	303	443	745	566	229	286	2,204	2,148	1,203	1,830	5,713	15,699
NE	21	142	53	408	382	177	955	3,307	7,382	8,543	6,702	4,078	3,896	3,746	39,792
ENE	5	63	148	195	104	100	657	5,393	1,545	127	6,568	1,108	5,370	3,961	25,344
E	0	15	490	153	196	232	910	2,445	273	69	682	0	646	2,367	8,478
ESE	0	0	68	83	63	11	0	0	0	0	0	0	411	778	1,414
SE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0	0	0	0	0	0	276	294	570
SSW	0	0	0	0	0	0	0	0	0	0	0	0	12	210	222
SW	0	0	0	0	22	101	0	0	0	0	0	0	0	0	123
WSW	0	0	0	0	997	137	157	86	0	1,916	2,094	2,866	67	13	8,333
W	0	0	0	367	1,024	293	313	531	18	547	825	355	997	892	6,162
WNW	0	0	0	738	887	386	401	18	31	24	143	99	971	728	4,426
NW	0	0	53	830	504	122	494	227	68	606	439	40	488	472	4,343
NNW	0	113	427	224	625	300	226	216	334	262	349	118	1,034	1,365	5,593
TOTAL	26	333	1,376	3,762	5,358	2,936	5,398	12,536	9,953	14,340	20,245	10,202	17,974	23,074	127,513

TABLE QE311.5-7

2030 POPULATION DISTRIBUTION
0-10 miles

Direction	Distance (miles) 0.0-0.5	0.5-1.0	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0	4.0-4.5	4.5-5.0	5.0-6.0	6.0-7.0	7.0-8.5	8.5-10.0	Total
N	0	0	98	418	100	301	652	76	14	38	268	304	2,020	2,781	7,070
NNE	0	0	26	275	401	674	509	214	200	2,458	2,403	1,090	1,722	6,738	16,790
NE	19	129	48	370	347	160	860	3,952	8,961	10,369	7,500	3,926	3,772	4,180	44,593
ENE	5	57	134	176	94	90	785	6,547	1,875	108	5,609	812	5,920	3,357	25,569
E	0	14	443	139	178	211	957	2,968	332	59	583	0	635	2,352	8,871
ESE	0	0	61	75	57	10	0	0	0	0	0	0	467	883	1,553
SE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0	0	0	0	0	0	313	334	647
SSW	0	0	0	0	0	0	0	0	0	0	0	0	14	238	252
SW	0	0	0	0	12	57	0	0	0	0	0	0	0	0	69
WSW	0	0	0	0	563	77	88	49	0	2,320	2,535	3,471	81	9	9,193
W	0	0	0	431	898	166	177	300	10	656	999	430	1,208	899	6,174
WNW	0	0	0	866	937	218	227	10	17	14	104	120	1,168	842	4,523
NW	0	0	62	974	579	80	279	128	39	733	248	22	371	437	3,952
NNW	0	103	387	233	731	307	201	196	242	307	197	136	859	1,238	5,137
TOTAL	24	303	1,259	3,957	4,897	2,351	4,735	14,440	11,770	17,062	20,446	10,311	18,550	24,288	134,393

TABLE QE311.5-8

1980 POPULATION DISTRIBUTION
0-50 Miles

Direction	Distance (miles) 0.0-10.0	10.0-12.5	12.5-15.0	15.0-17.5	17.5-20.0	20.0-25.0	25.0-30.0	30.0-35.0	35.0-40.0	40.0-45.0	45.0-50.0	Total
N	6,209	3,585	3,801	4,215	2,394	3,819	22,992	15,034	16,350	9,419	9,416	97,234
NNE	13,314	3,449	7,323	12,988	13,256	16,095	7,918	10,604	14,725	14,430	15,579	129,681
NE	33,198	3,521	4,375	2,492	1,747	4,426	3,753	9,235	16,357	49,825	108,963	237,892
ENE	24,075	8,129	3,167	4,347	6,244	8,012	6,631	11,430	21,117	44,766	74,863	212,781
E	7,806	613	1,898	2,910	4,632	7,414	1,652	4,908	6,921	1,135	1,592	41,481
ESE	875	125	0	0	0	0	0	615	0	0	0	1,615
SE	0	0	0	0	154	889	0	0	0	0	0	1,043
SSE	0	0	119	125	395	1,676	0	0	0	0	0	2,315
S	304	0	292	226	2,128	6,674	262	0	0	0	0	9,886
SSW	118	721	138	581	1,826	6,602	8,465	8,756	518	0	0	27,725
SW	161	0	472	3,149	1,681	5,897	8,206	13,479	22,557	56,346	82,581	194,529
WSW	5,472	335	0	0	0	0	0	0	310	10,562	45,270	61,949
W	4,992	6,324	5,059	3,739	8,566	10,729	14,997	32,277	120,757	142,931	109,444	459,815
WNW	3,510	2,782	3,485	4,311	2,175	6,066	18,007	39,549	94,929	65,705	138,140	378,659
NW	4,008	673	979	1,287	1,810	6,905	21,332	39,104	118,751	280,731	98,897	574,477
NNW	5,395	1,104	1,089	1,389	2,881	6,688	9,153	16,221	82,445	56,488	46,438	229,291
TOTAL	109,437	31,361	32,197	41,759	49,889	91,892	123,368	201,212	515,737	732,338	731,183	2,660,373

MNPS-3 EROLS

TABLE QE311.5-9

1985 POPULATION DISTRIBUTION
0-50 Miles

Direction	Distance (miles) 0.0-10.0	10.0-12.5	12.5-15.0	15.0-17.5	17.5-20.0	20.0-25.0	25.0-30.0	30.0-35.0	35.0-40.0	40.0-45.0	45.0-50.0	Total
N	6,384	3,709	3,912	4,284	2,455	3,975	23,609	15,179	16,554	10,076	9,761	99,880
NNE	13,626	3,588	7,467	13,148	13,437	16,421	8,508	11,390	15,482	15,051	15,949	134,067
NE	33,411	3,719	4,624	2,596	1,782	4,584	4,114	9,967	17,574	51,922	113,306	247,599
ENE	24,297	8,299	3,323	4,506	6,464	8,543	7,069	12,579	24,369	50,548	84,619	234,616
E	7,872	650	1,960	3,029	4,847	7,741	1,695	5,414	7,094	1,389	1,947	43,638
ESE	960	141	0	0	0	0	0	633	0	0	0	1,734
SE	0	0	0	0	173	998	0	0	0	0	0	1,171
SSE	0	0	134	141	444	1,881	0	0	0	0	0	2,600
S	341	0	328	254	2,388	7,492	294	0	0	0	0	11,097
SSW	133	809	155	652	2,051	7,409	9,502	9,828	582	0	0	31,121
SW	169	0	530	3,534	1,886	6,619	9,210	15,131	25,316	63,246	92,960	218,331
WSW	5,827	343	0	0	0	0	0	0	347	11,855	50,813	69,185
W	5,247	6,469	5,248	3,892	8,923	11,397	15,836	32,973	120,630	143,186	111,192	464,993
WNW	3,689	2,858	3,573	4,490	2,340	6,618	19,025	40,663	96,648	68,167	139,867	387,938
NW	4,206	722	1,034	1,350	1,911	7,399	22,266	41,515	122,277	280,976	101,434	585,090
NNW	5,593	1,191	1,188	1,500	3,103	7,290	10,122	17,299	84,245	50,860	48,278	238,669
TOTAL	111,755	32,498	33,476	43,376	52,204	98,349	131,250	212,571	531,118	755,276	769,856	2,771,729

TABLE QE311.5-10

1990 POPULATION DISTRIBUTION
0-50 Miles

	Distance (miles)											
Direction	0.0-10.0	10.0-12.5	12.5-15.0	15.0-17.5	17.5-20.0	20.0-25.0	25.0-30.0	30.0-35.0	35.0-40.0	40.0-45.0	45.0-50.0	Total
N	6,546	3,845	4,038	4,382	2,508	4,038	24,188	15,349	16,732	10,618	10,086	102,330
NNE	13,994	3,756	7,704	13,492	13,794	16,796	9,080	12,173	16,285	15,654	16,533	139,261
NE	33,958	3,995	4,972	2,701	1,783	4,660	4,432	10,726	18,817	53,874	115,930	255,048
ENE	24,508	8,470	3,404	4,611	6,662	8,984	7,708	13,903	25,912	52,328	85,862	242,352
E	7,961	678	2,036	3,125	5,030	8,086	1,877	5,978	7,758	1,486	2,084	46,099
ESE	1,043	157	0	0	0	0	0	694	0	0	0	1,894
SE	0	0	0	0	192	1,111	0	0	0	0	0	1,304
SSE	0	0	149	157	494	2,093	0	0	0	0	0	2,893
S	380	0	364	283	2,659	8,339	327	0	0	0	0	12,352
SSW	148	901	172	726	2,283	8,245	10,576	10,938	647	0	0	34,636
SW	173	0	590	3,934	2,100	7,367	10,251	16,841	28,181	70,395	103,171	243,003
WSW	6,194	348	0	0	0	0	0	0	387	13,194	56,556	76,769
W	5,473	6,556	5,355	3,992	9,230	11,849	16,307	33,430	121,678	144,531	113,678	472,079
WNW	3,854	2,933	3,649	4,691	2,480	7,057	19,843	41,837	98,320	70,148	141,846	396,653
NW	4,354	767	1,079	1,401	1,995	7,804	23,217	43,848	126,477	285,359	104,083	600,384
NNW	5,741	1,260	1,266	1,583	3,301	7,820	10,959	18,379	86,327	61,444	50,254	248,334
TOTAL	114,327	33,666	34,778	45,078	54,512	104,249	138,765	224,096	547,521	779,031	800,083	2,876,106

TABLE QE311.5-11

2000 POPULATION DISTRIBUTION
0-50 Miles

Direction	Distance (miles) 0.0-10.0	10.0-12.5	12.5-15.0	15.0-17.5	17.5-20.0	20.0-25.0	25.0-30.0	30.0-35.0	35.0-40.0	40.0-45.0	45.0-50.0	Total
N	6,723	4,184	4,312	4,476	2,556	4,177	25,449	16,407	18,056	11,685	10,729	108,754
NNE	14,105	4,075	8,098	14,028	14,355	17,458	9,619	13,057	17,607	16,591	17,446	146,439
NE	33,961	4,355	5,424	2,857	1,807	4,890	4,812	11,529	20,117	56,342	119,918	266,012
ENE	24,780	8,796	3,614	4,849	6,955	9,539	8,541	14,918	28,267	56,030	89,983	256,272
E	7,965	728	2,153	3,301	5,282	8,534	2,072	6,297	8,710	1,556	2,181	48,779
ESE	1,140	176	0	0	0	0	0	694	0	0	0	2,010
SE	0	0	0	0	217	1,251	0	0	0	0	0	1,460
SSE	0	0	168	176	557	2,358	0	0	0	0	0	3,259
S	427	0	411	320	2,995	9,394	369	0	0	0	0	13,916
SSW	167	1,015	194	819	2,571	9,292	11,912	12,324	729	0	0	3,9023
SW	178	0	665	4,431	2,366	8,300	11,550	18,971	31,743	79,298	116,215	273,717
WSW	6,785	352	0	0	0	0	0	0	436	14,864	63,711	86,148
W	5,805	6,644	5,606	4,254	9,787	12,951	17,866	34,599	125,287	148,472	117,327	488,598
WNW	4,074	3,030	3,761	4,971	2,728	7,948	21,572	43,721	101,040	73,366	145,793	412,004
NW	4,555	849	1,175	1,516	2,168	8,606	25,062	48,039	132,619	289,048	107,362	620,999
NNW	5,896	1,441	1,479	1,759	3,516	8,422	12,290	20,245	90,375	66,280	52,843	264,546
TOTAL	116,561	35,645	37,060	47,757	57,860	113,120	151,114	240,801	574,986	813,532	843,508	3,031,944

TABLE QE311.5-12

2010 POPULATION DISTRIBUTION
0-50 Miles

Direction	Distance (miles) 0.0-10.0	10.0-12.5	12.5-15.0	15.0-17.5	17.5-20.0	20.0-25.0	25.0-30.0	30.0-35.0	35.0-40.0	40.0-45.0	45.0-50.0	Total
N	6,902	4,557	4,665	4,774	2,577	4,003	26,468	17,255	18,778	12,147	11,256	113,382
NNE	14,831	4,564	9,030	15,654	15,978	18,456	10,363	14,292	19,329	17,342	17,925	157,764
NE	36,323	5,239	6,538	3,043	1,643	4,635	5,007	12,045	20,753	57,555	122,483	275,264
ENE	25,086	9,143	3,391	4,770	7,216	9,792	9,069	15,515	29,458	57,961	92,581	263,982
E	8,187	745	2,370	3,364	5,488	8,882	2,201	6,493	9,270	1,602	2,247	50,849
ESE	1,276	205	0	0	0	0	0	694	0	0	0	[illegible]
SE	0	0	0	0	253	1,456	0	0	0	0	0	1,709
SSE	0	0	196	205	648	2,744	0	0	0	0	0	3,793
S	497	0	477	372	3,485	10,932	429	0	0	0	0	16,192
SSW	194	1,181	226	951	2,992	10,813	13,863	14,341	848	0	0	45,409
SW	159	0	773	5,156	2,753	9,657	13,441	22,077	36,939	92,276	135,240	318,471
WSW	7,537	341	0	0	0	0	0	0	507	17,296	74,138	99,819
W	6,041	6,458	5,395	4,190	10,097	12,769	17,085	34,344	134,595	157,780	125,673	514,427
WNW	4,279	3,151	3,822	5,442	2,848	8,225	22,179	46,163	103,799	74,321	151,134	425,363
NW	4,542	905	1,218	1,553	2,230	8,938	27,032	52,038	143,630	318,041	112,252	672,379
NNW	5,343	1,493	1,551	1,767	3,700	8,857	13,049	22,278	96,017	72,458	56,864	283,877
TOTAL	121,697	37,982	39,652	51,241	61,908	120,159	160,186	257,535	613,923	878,779	901,793	3,244,855

TABLE QE311.5-13

2020 POPULATION DISTRIBUTION
0-50 MILES

Direction	Distance (Miles) 0.0-10	10.0-12.5	12.5-15.0	15.0-17.5	17.5-20.0	20.0-25.0	25.0-30.0	30.0-35.0	35.0-40.0	40.0-45.0	45.0-50.0	Total
N	7,014	4,983	5,080	5,168	2,555	3,607	27,369	18,277	19,522	12,194	11,703	117,472
NNE	15,699	5,159	10,292	17,946	18,246	19,640	10,980	15,459	21,209	18,000	18,318	170,948
NE	39,792	6,392	7,991	3,223	1,359	4,088	5,102	12,505	21,223	58,461	124,853	284,989
ENE	25,344	9,495	2,900	4,492	465	9,994	9,680	16,036	30,448	59,698	94,562	270,114
E	8,478	737	2,641	3,362	5,693	9,258	2,388	6,665	9,774	1,645	2,307	52,948
ESE	1,414	235	0	0	0	0	0	694	0	0	0	2,345
SE	0	0	0	0	289	1,667	0	0	0	0	0	1,956
SSE	0	0	224	235	741	3,142	0	0	0	0	0	4,342
S	570	1	547	425	3,989	12,513	490	0	0	0	0	18,535
SSW	222	1,352	259	1,089	3,426	12,379	15,870	16,418	971	0	0	51,986
SW	1,230	0	885	5,903	3,153	11,057	15,386	25,274	42,288	105,642	154,826	364,537
WSW	8,333	317	0	0	0	0	0	0	580	19,884	84,877	113,911
W	6,162	6,048	4,891	3,931	10,210	11,812	15,000	33,235	148,397	171,245	136,597	547,528
WNW	4,426	3,262	3,828	5,987	2,870	8,095	22,071	48,774	106,318	73,421	157,403	436,455
NW	4,343	940	1,228	1,546	2,223	8,948	29,062	55,697	156,933	361,845	117,347	740,112
NNW	5,593	1,478	1,551	1,665	3,703	8,978	13,273	24,299	102,680	79,395	61,252	303,947
TOTAL	127,513	40,399	42,317	54,972	66,002	125,178	166,571	273,333	660,343	961,350	964,045	3,482,123

TABLE QE311.5-14

2030 POPULATION DISTRIBUTION
0-50 Miles

	Distance (miles)											
Direction	0.0-10.0	10.0-12.5	12.5-15.0	15.0-17.5	17.5-20.0	20.0-25.0	25.0-30.0	30.0-35.0	35.0-40.0	40.0-45.0	45.0-50.0	Total
N	7,070	5,457	5,560	5,673	2,494	2,977	28,129	19,404	20,179	11,791	12,064	120,798
NNE	16,790	5,867	11,916	20,976	21,229	21,035	11,529	16,632	23,285	18,545	18,513	186,317
NE	44,593	7,855	9,835	3,405	946	3,215	5,069	12,652	21,064	58,371	125,139	292,144
ENE	25,569	9,857	2,112	3,993	7,608	9,742	9,676	16,009	30,476	59,578	96,651	269,271
E	8,871	702	2,972	3,260	5,758	9,358	2,450	6,690	9,831	1,649	2,312	53,853
ESE	1,553	267	0	0	0	0	0	694	0	0	0	2,514
SE	0	0	0	0	329	1,894	0	0	0	0	0	2,223
SSE	0	0	254	267	842	3,569	0	0	0	0	0	4,932
S	647	1	621	483	4,532	14,216	557	0	0	0	0	21,057
SSW	252	1,536	294	1,238	3,890	14,061	18,029	18,652	1,102	0	0	59,054
SW	69	0	1,006	6,706	3,581	12,560	17,480	28,713	48,039	120,011	175,888	414,053
WSW	9,193	281	0	0	0	0	0	0	659	22,495	96,421	129,049
W	6,174	5,405	4,066	3,456	10,126	9,995	11,436	31,179	166,893	189,069	150,460	588,259
WNW	4,523	3,373	3,782	6,626	2,789	7,522	21,182	51,621	108,640	70,611	164,681	445,350
NW	3,952	954	1,201	1,487	2,138	8,612	31,162	59,042	172,953	422,210	122,882	826,593
NNW	5,137	1,385	1,469	1,446	3,776	8,814	12,963	26,333	110,463	87,186	66,181	325,153
TOTAL	134,393	42,940	45,089	59,016	70,038	127,570	169,662	287,621	713,584	1,061,516	1,029,192	3,740,620

TABLE QE311.5-15

TRANSIENT POPULATION - PARK VISITATION

Park Name	Sector Location (miles)	Annual Attendance	Average Daily Attendance
Ocean Beach	3.4 E	500,000	1,370[1]
Fort Griswold	5.5 ENE	47,220	129[2]
Harkness Memorial	2.8 E	146,745	868[2]
Rocky Neck	3.8 W	533,312	1,630[3]
Submarine Memorial	5.6 NE	68,000	186[1]
Waterford Beach	2.8 ESE	53,000	663[4]

NOTES:

[1] Year-round use - average daily attendance based on 365 days/year

[2] Seasonal attendance between April 15 to September 30

[3] Seasonal camping with other year-round use - 53,275 campers from April 15 to September 30. 480,037 other visitors over 365 days.

[4] Based on attendance from mid-June through Labor Day.

Sources: State of Connecticut, Department of Environmental Protection, Parks and Recreation Unit, State Park Attendance, 1978.

American Automobile Association, Campbook, Northeastern Region, 1981 Edition.

Telecon: Ellis, C.S. (SWEC) 1981p to Bugbee, R. (Parks & Recreation Dept.), Waterford, Conn., December 21, 1981.

Ellis, C.S. (SWEC) 1981j to Submarine Memorial Assoc., Groton, Conn, Nov. 20, 1981.

Ellis, C.S. (SWEC) 1981h to Butler, Mrs., Ocean Beach Park, New London, Conn., November 19, 1981.

TABLE QE311.5-16

TRANSIENT POPULATION
EMPLOYMENT 1977

Direction	Distance (Miles) 0.0-1.0	1.0-2.0	2.0-3.0	3.0-4.0	4.0-5.0	Total
N	-	-	-	-	-	-
NNE	-	-	-	-	-	-
NE	-	-	315	-	655	970
ENE	-	-	-	-	2767	2767
E	-	-	-	-	-	-
ESE	-	-	-	-	-	-
SE	-	-	-	-	-	-
SSE	-	-	-	-	-	-
S	-	-	-	-	-	-
SSW	-	-	-	-	-	-
SW	-	-	-	-	-	-
WSW	-	-	-	-	-	-
W	-	-	-	-	-	-
WNW	-	-	-	-	-	-
NW	-	200	-	115	-	315
NNW	-	-	-	-	-	-
Total	-	200	315	115	3422	4052

NOTE:

Firms with 50 or more employees

Source: 1977 Facts Book Southeastern Connecticut Chamber of Commerce, New London, Conn.

TABLE QE311.5-17

TRANSIENT POPULATION
1981-1982 SCHOOL ENROLLMENTS

	0.0-1.0	1.0-2.0	2.0-3.0	3.0-4.0	4.0-5.0	Total
N	0	384	0	271	0	655
NNE	0	0	0	0	369	369
NE	0	0	1073	755	2,790	4,613
ENE	0	293	0	800	0	1,093
E	0	0	0	0	0	0
ESE	0	0	0	0	0	0
SE	0	0	0	0	0	0
SSE	0	0	0	0	0	0
S	0	0	0	0	0	0
SSW	0	0	0	0	0	0
SW	0	0	0	0	0	0
WSW	0	0	0	0	0	0
W	0	0	0	0	0	0
WNW	0	0	381	0	0	381
NW	0	0	785	372	0	1,157
NNW	0	0	0	0	1,716	1,716
Total	0	677	2,239	2,198	4,875	9,989

Source: Connecticut Education Directory, 1981-82. Conn. State Board of Education, Hartford, Conn.

NRC Letter: January 31, 1983

Question No. QE320.1 (Sections 8 and 11)

Provide the following:

A production cost analysis which shows the difference in system production costs associated with the availability vs. unavailability of the proposed nuclear addition. Note, the resulting cost differential should be limited solely to the variable or incremental costs associated with generating electricity from the proposed nuclear addition and the sources of replacement energy. If, in your analysis, other factors influence the cost differential, explain in detail.

a. The analysis should provide results on an annual basis covering the period from initial operation of the first unit through five full years of operation of the last unit.

b. Where more than one utility shares ownership in the proposed nuclear addition or where the proposed facility is centrally dispatched as part of an interconnected pool, the results of the anlaysis may be aggregated for all participating systems.

c. The analysis should assume electrical energy requirements grow at (1) the system's latest official forecasted growth rate, and (2) zero growth from the latest actual annual energy requirement.

d. The analysis should assume two capacity factors for the nuclear facility (1) 50 percent average annual capacity factor and (2) applicant's currently anticipated average annual capacity factor.

e. For each year (and for each growth rate scenario) the following results should be clearly stated: (1) system present worth production costs with the proposed nuclear addition available as scheduled; (2) system present worth production costs without the proposed nuclear addition available; (3) the capacity factor assumed for the nuclear addition (4) the average fuel cost and variable O&M cost for the nuclear addition and the sources of replacement energy (by fuel type)--both expressed in mills per kWh; and (5) the proportion of replacement energy assumed to be provided by coal, oil, gas, etc. for both purchased power and for self-generated power. The base year for all costs should be identified.

Response:

On March 26, 1982, the Nucler Regulatory Commission ammended its rules and regulations to provide that an applicant for a license to operate a nuclear power plant need not include in its Environmental Report - Operating License Stage any discussion of "need for power or alternative

energy sources. . ." 47FR12940 1982. In his letter to W.G. Counsil, dated January 31, 1983, to which the "Requests for Additional Information" were attached, Darrell G. Eisenhut, Director, Divison of Licensing, Office of Nuclear Reactor Regulation, indicated that the Staff will not include need for power and alternative energy sources issues in the licensing review for Millstone 3. Accordingly, because this question is in essence an inquiry into the need for power and alternative energy sources, a response is not necessary.

NRC Letter: January 31, 1983

Question No. QE320.2 (Sections 8 and 11)

Provide 30 and 40 yr present worth fuel and O&M costs (for the nuclear units(s)). Provide values for all variables assumed in calculating these costs (escalation, discount rates, etc).

Response:

See response to QE320.1.

NRC Letter: January 31, 1983

Question No. Q470.1 (Section 2.1)

Provide the following distributional data for each of the 22-1/2 degree radial sectors centered on the sixteen cardinal compass directions for the radial distances of 1.6, 3.2, 4.8, 6.4, 8.0, 16.1, 32.2, 48.3, 64.4, and 80.4 km for the reactor:

1. Present annual meat production (kg/yr)

2. Present annual milk production (l/yr)

3. Present annual vegetable production (kg/yr)

Response:

Estimated production of beef, milk, and vegetables (corn) is listed by distance and direction in Tables Q470.1-1, Q470.1-2, and Q470.1-3. Corn was discussed in lieu of all vegetables because garden vegetables were not given in quantities and corn was uniformly distributed throughout the three states. Since data was only available as state totals in Connecticut and Rhode Island and as county totals in N.Y., distributions, with the exception of those within 8 km, were calculated by assuming that production was evenly distributed over either the state or the county land area. Production within 8 km was distributed by first sector distance (see Table 2.1-22 of the EROLS), and actual survey data of beef, dairy, and vegetable gardens was used.

References:

1. Connecticut Department of Agriculture 1981. Connecticut Agriculture Statistics, 1980. Hartford, Conn. November 1981.

2. Rhode Island Department of Environmental Management, Division of Agriculture. Rhode Island Agriculture 1980. Providence, R.I.

3. State of New York, Department of Agriculture and Markets. New York Agricultural Statistics.

TABLE Q470.1-1

ESTIMATED 1980 BEEF PRODUCTION (10^3 kgs)
WITHIN 80.4 km OF MILLSTONE 3

	Distance (km)									
Direction	0-1.6	1.6-3.2	3.2-4.8	4.8-6.4	6.4-8.0	8.0-16.1	16.1-32.2	32.2-48.3	48.3-64.4	64.4-80.4
N	0	0	0	0	0	36.0	145.0	243.0	334.0	438.0
NNE	0	0	0	0	0	32.0	135.0	239.0	332.0	326.0
NE	0	0	0	0	0	32.0	145.0	221.0	52.0	0
ENE	0	0	0	0	0	35.0	131.0	34.0	0	0
E	0	0	0	0	0	6.0	25.0	0	0	0
ESE	0	0	0	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0	0	0	0
SW	0	0	0	0	0	0	0	0	0	0
WSW	0	0	0	0	0	5.0	2.0	0	0	0
W	0	0	0	0	0	28.0	214.0	174.0	210.0	321.0
WNW	0	0	0	0	0	35.0	131.0	242.0	335.0	439.0
NW	0	0	0	0	0	35.0	141.0	227.0	328.0	434.0
NNW	0	0	0	0	0	36.0	146.0	243.0	335.0	428.0

TABLE Q470.1-2

ESTIMATED 1980
MILK PRODUCTION (10^3 liters) 80.4 km OF MILLSTONE 3

	Distance (km)									
Direction	0-1.6	1.6-3.2	3.2-4.8	4.8-6.4	6.4-8.0	8.0-16.1	16.1-32.2	32.2-48.3	48.3-64.4	64.4-80.4
N	0	0	0	0	0	817.0	3243.0	5445.0	7492.0	9819.0
NNE	0	0	0	0	0	709.0	3049.0	5356.0	7484.0	8212.0
NE	0	0	0	0	0	723.0	3251.0	5707.0	3404.0	3263.0
ENE	0	0	0	0	0	775.0	3035.0	2422.0	2636.0	1895.0
E	0	0	0	0	0	141.0	724.0	554.0	440.0	14.0
ESE	0	0	0	0	0	0	0	0	193.42	0
SE	0	0	0	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0	0	0	0
SW	0	0	0	0	0	0	0	0	0	0
WSW	0	0	0	0	0	109.0	48.0	0	0	0
W	0	0	0	0	0	632.0	2679.0	3911.0	4722.0	7191.0
WNW	0	0	0	0	97.0	785.0	2932.0	5428.0	7516.0	9847.0
NW	0	0	0	0	0	779.0	3151.0	5083.0	7354.0	9728.0
NNW	0	0	0	0	0	818.0	3265.0	5445.0	7514.0	9590.0

TABLE Q470.1-3

ESTIMATED 1980 CORN PRODUCTION (kg)
WITHIN 80.4 km OF MILLSTONE 3

	Distance (km)									
Direction	0-1.6	1.6-3.2	3.2-4.8	4.8-6.4	6.4-8.0	8.0-16.1	16.1-32.2	32.2-48.3	48.3-64.4	64.4-80.4
N	50	2,030	3,700	4,780	6,220	51,680	205,070	344,250	473,620	620,720
NNE	0	1,810	3,320	4,740	6,030	44,820	191,900	338,590	544,660	2,823,980
NE	490	1,790	3,440	4,830	5,630	45,690	205,590	705,470	6,024,190	8,640,230
ENE	210	2,000	3,460	4,830	1,720	48,990	457,500	4,441,010	6,975,080	5,021,020
E	50	2,070	2,660	2,850	310	8,930	491,570	1,465,730	1,163,120	35,810
ESE	0	990	240	0	0	2,900	580	0	511,800	0
SE	0	0	0	0	0	0	0	4,260	0	0
SSE	0	0	0	0	0	0	4,030	7,810	0	0
S	0	0	0	0	0	1,390	11,460	28,320	0	0
SSW	0	0	0	0	0	540	15,970	57,840	18,960	0
SW	0	0	520	0	0	0	9,140	31,770	99,330	117,490
WSW	0	0	2,470	330	920	6,900	3,020	0	510	40,310
W	0	160	3,060	4,690	4,170	39,980	169,340	247,240	298,530	454,620
WNW	0	730	3,420	4,570	6,150	49,650	185,340	343,130	475,180	622,550
NW	140	1,180	3,040	4,670	6,220	49,280	199,210	321,300	464,970	615,120
NNW	330	750	1,580	4,270	6,010	51,700	206,440	344,280	475,040	606,320

NRC Letter: January 31, 1983

Question No. Q470.2 (Section 5.2.4)

Section 5.2.4 entitled, "Dose Rate Estimates for Man," states that calculated doses to the 80 km population are based on the year 2006 population; however, nowhere in the EROLS are population estimates provided for this year. Please provide a table for the year 2006 similar to Tables 2.1-5 and 2.1-12 at the radial distances specified above.

Response:

The year in Section 5.2.4 has been corrected to 2010. Population estimates for the year 2010 are provided in Tables 2.1-6 and 2.1-13.

NRC Letter: January 31, 1983

Question No. Q470.3 (Section 5.2.4)

Explain the difference in the doses discussed in Section 5.2.4.4.1, "Eighty-km Radius Population Dose," and Section 5.2.4.6, "Annual Population Doses." These appear to be the same doses, except that in one case population data for the year 2006 was used, and in the other case population data for the year 2010 was used.

Response:

The year in Section 5.2.4.4.1 has been corrected to 2010.

NRC Letter: January 31, 1983

Question No. Q470.4 (Section Appendix 7)

Table F-2 should be amended to include both the sport and commercial invertebrate annual harvest for the 80 km region.

Response:

The total invertebrate harvest was calculated using seafood consumption rates for an average adult, teen, and child and the 2010 population. For purposes of calculating doses, it was conservatively assumed that 50 percent of the total was sports catch and 50 percent commercial.