LIMERICK GENERATING STATION UNITS 1 & 2

ENVIRONMENTAL REPORT - OPERATING LICENSE STAGE

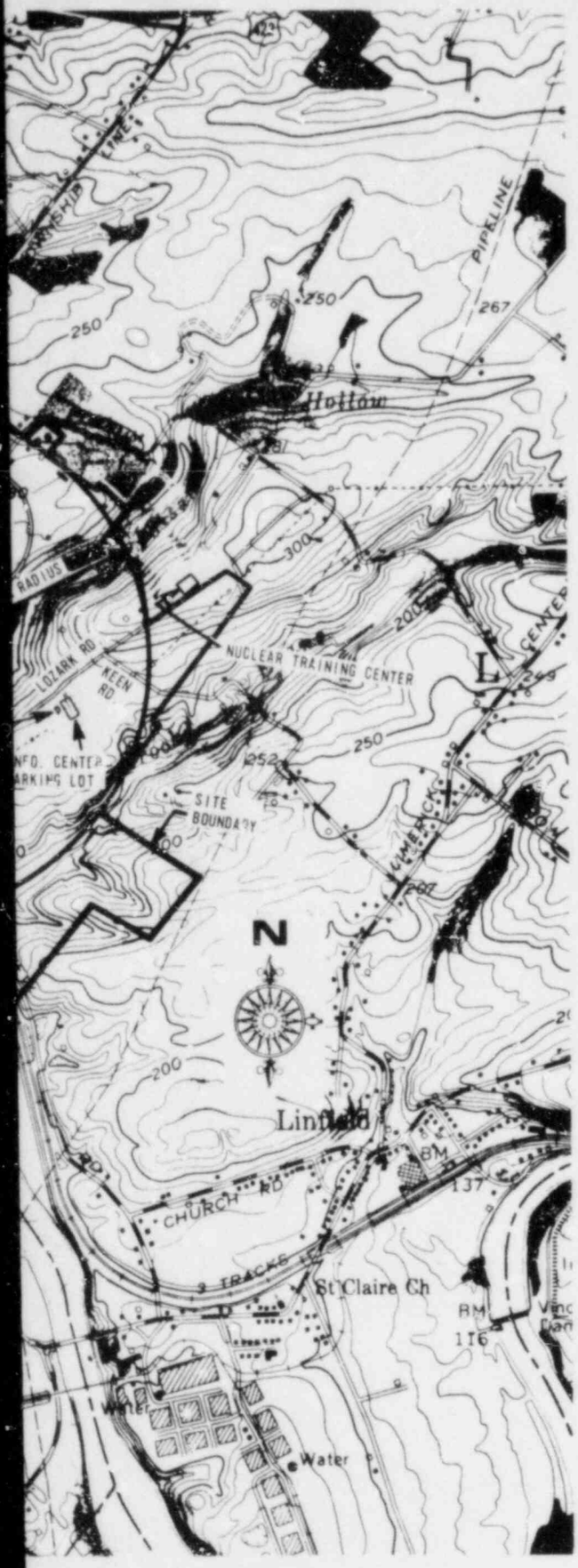
REVISION 10 PAGE CHANGES

The attached pages, tables, and figures are considered part of a controlled copy of the Limerick Generating Station EROL. This material should be incorporated into the EROL by following the instructions below. After the revised pages are inserted, place the page that follows these instructions in the front of Volume 1.

REMOVE	INSERT
VOLUME 1	
Figure 2.1-3	Figure 2.1-3
VOLUME 2	
Tables 3.5-5 & 3.5-6	Tables 3.5-5 & 3.5-6
Table 3.6-2	Table 3.6-2
VOLUME 3	
Pages 4.5-1 & -2	Pages 4.5-1 & -2
Page 5-vii	Page 5-vii
Pages 5.2-15 & -16	Pages 5.2-15 & -16
Table 5.2-1	Table 5.2-1
Table 5.2-13	Table 5.2-13
Table 5.2-15	Table 5.2-15
Tables 5.2-17 & -18	Tables 5.2-17 & -18
Page 5.6-1	Page 5.6-1 & Figure 5.6-1
VOLUME 5	
----	Pages E240.29-1 & -2
Page E290.6-1	Pages E290.6-1 thru -3
----	Pages E290.29-1 thru Figure E290.37-1
----	Pages E290.40-1 & E290.41-1
Page E291.5-1	Page E291.5-1
----	Page E291.8-1
Page E291.12-1 thru Exhibit E291.12-1, pg 9	Pages E291.10-1 thru Exhibit E291.12-1, pg 9
----	Pages E291.18-1 & -2
----	Page E291.22-1
Pages E310.10-1 thru -5	Pages E310.10-1 thru -5

THIS EROL SET HAS BEEN UPDATED TO INCLUDE REVISIONS THROUGH 10
DATED 02/83.


POTTSTOWN
Impounding Basin
EXCLUSION AREA BOUNDARY
CENTRAL ROAD
2500 FT. RADIUS
MONTGOMERY CO
CHESTER CO
Fricks Lock
LIMERICK GENERATING STATION
INFO. CENTER
SCHUYLKILL
FRICKS LOCK RD
SANATOGA RD
Impounding Basin
Consolidated Sch
Brower Cem
Oak Grove Cem
ROAD
Parker



LIMERICK GENERATING STATION
UNITS 1 AND 2
ENVIRONMENTAL REPORT

SITE PLAN

FIGURE 2.1-3 REV. 10, 02/83

TABLE 3.5-5

ASSUMPTIONS AND PARAMETERS USED FOR EVALUATION OF GASEOUS RELEASES

Power	3458 MWt
Capacity Factor	80%
Total Steam Flow	14.863×10^6 lb/hr
Mass of Water in Reactor	3.8×10^5 lb
Cleanup Demineralizer Flow	1.33×10^5 lb/hr
Fraction of Feedwater Through Condenser Demineralizer	1.00
Gland Seal System uses Clean System with no Radioactive Releases	
Reactor Encl Iodine Release Fraction	.3 (2" Carbon Filter)
Particulate Release Fraction	.01 (HEPA Filter)
Turbine Encl Iodine Release Fraction	.01 (8" Deep Bed Charcoal Filter)
Particulate Release Fraction	.01
Radwaste Encl Iodine Release Fraction	1.0
Particulate Release Fraction	.01
Mech Vac Pump Iodine Release Fraction	.01
Particulate Release Fraction	.01

Charcoal Delay System designed with vendor coefficients for 35-day Xenon holdup at 75 scfm. (This corresponds to 58.6 days Xe at 30 scfm condenser inleakage using the NUREG-16, Rev. 0 coefficients).

EXPECTED ANNUAL ACTIV

NUCLIDE	REACTOR ENCL	TURBINE ENCL
Ar-41	5.0 x 10+1	*
Kr-83m	*(2)	*
Kr-85m	12.0	13.6 x 10+1
Kr-85	*	*
Kr-87	12.0	2.6 x 10+2
Kr-88	12.0	4.6 x 10+2
Kr-89	*	*
Xe-131m	*	*
Xe-133m	*	*
Xe-133	2.60 x 10+2	5.0 x 10+2
Xe-135m	18.40 x 10+1	13.0 x 10+2
Xe-135	13.60 x 10+1	12.6 x 10+2
Xe-137	*	*
Xe-138	2.8 x 10+1	2.80 x 10+3
TOTAL NOBLE GASES		
I-131	2.0 x 10-1	3.8 x 10-3
I-133	8.0 x 10-1	15.2 x 10-3
TOTAL HALOGENS(4)		
Tritium Gaseous Release		
Carbon-14	*	*
Cr-51	12.0 x 10-6	2.6 x 10-4
Mn-54	12.0 x 10-5	12.0 x 10-6
Co-58	2.4 x 10-5	12.0 x 10-6
Fe-59	16.0 x 10-6	10.0 x 10-6
Co-60	4.0 x 10-4	4.0 x 10-5
Zn-65	8.0 x 10-5	4.0 x 10-6
Sr-89	3.6 x 10-6	12.0 x 10-5
Sr-90	2.0 x 10-7	4.0 x 10-7
Zr-95	16.0 x 10-6	2.0 x 10-6
Sb-124	8.0 x 10-6	6.0 x 10-6
Cs-134	16.0 x 10-5	6.0 x 10-6
Cs-136	12.0 x 10-6	10.0 x 10-7
Cs-137	2.2 x 10-4	12.0 x 10-6
Ba-140	16.0 x 10-6	2.2 x 10-4
Ce-141	4.0 x 10-6	12.0 x 10-6
TOTAL AIRBORNE PARTICULATE RELEASE		

IGS EROL

TABLE 3.5-6

ITY RELEASED FROM GASEOUS WASTE MANAGEMENT SYSTEMS(1)
(CURIES/YEAR; 2 UNITS)

RADWASTE ENCL	GLAND SEAL	AIR EJECTOR	MECH VAC PUMP	TOTAL
*	*	*	*	5.0 x 10+1
*	*	*	*	*
		12.0		16.0 x 10+1
*		5.6 x 10+2	*	5.6 x 10+2
*	*	*	*	2.8 x 10+2
*	*	*	*	4.8 x 10+2
*	*	*	*	*
*	*	14.0	*	14.0
*	*	*	*	*
2.0 x 10+1	*	11.2 x 10+1	4.6 x 10+3	5.4 x 10+3
*	*	*	*	14.8 x 10+2
9.0 x 10+1	*	*	7.0 x 10+2	2.2 x 10+3
*	*	*	*	*
*	*	*	*	2.8 x 10+3
				13.4 x 10+3
1.0 x 10-1	**(3)	**	6.0 x 10-2	3.6 x 10-1
3.6 x 10-1	**	**	**	1.2
				12.2 x 10-1
				14.4 x 10+1
*	*	19.0	*	19.0
18.0 x 10-5	0.0	0.0	0.0	4.6 x 10-4
6.0 x 10-4	0.0	0.0	0.0	7.4 x 10-4
9.0 x 10-5	0.0	0.0	0.0	12.6 x 10-5
3.0 x 10-4	0.0	0.0	0.0	3.2 x 10-4
18.0 x 10-4	0.0	0.0	0.0	2.2 x 10-3
3.0 x 10-5	0.0	0.0	0.0	11.4 x 10-5
9.0 x 10-6	0.0	0.0	0.0	13.2 x 10-5
6.0 x 10-6	0.0	0.0	0.0	6.6 x 10-6
10.0 x 10-7	0.0	0.0	0.0	19.0 x 10-6
10.0 x 10-7	0.0	0.0	0.0	15.0 x 10-6
9.0 x 10-5	0.0	0.0	6.0 x 10-6	2.6 x 10-4
9.0 x 10-6	0.0	0.0	4.0 x 10-6	2.6 x 10-5
18.0 x 10-5	0.0	0.0	2.0 x 10-5	4.4 x 10-4
2.0 x 10-6	0.0	0.0	2.2 x 10-5	2.6 x 10-4
5.2 x 10-5	0.0	0.0	0.0	6.8 x 10-5
				5.2 x 10-3

(1) Estimated releases based on NUREG 16 Rev.
(2) Less than 1.0 Ci/yr. (*)
(3) Less than 1.0 x 10^{-4} Ci/yr. (**)
(4) Includes both gaseous and particulate rele

TABLE 3.5-6 (cont'd)

0, GALE Code evaluation

ases.

LGS EROL

Table 3.6-2

SIMULATED INTAKE WATER QUALITY FROM LIMERICK GENERATING STATION 1975 THROUGH 1978

PARAMETER	DEC, JAN, FEB			MAR, APR, MAY			JUN, JUL, AUG			SEP, OCT, NOV		
	MIN	MED	MAX	MIN	MED	MAX	MIN	MED	MAX	MIN	MED	MAX
TEMPERATURE (C)	0.5	2.2	6.0	1.0	8.0	24.1	16.5	23.5	29.0	4.0	14.0	22.1
DISSOLVED OXYGEN (mg/l)	9.6	11.7	12.5	6.7	10.0	15.4	5.2	7.0	9.3	7.0	9.2	12.4
BIOCHEMICAL OXYGEN DEMAND (mg/l)	0.7	2.0	4.2	1.1	1.8	4.6	0.8	2.1	5.3	0.2	1.4	5.4
TOTAL ORGANIC CARBON (mg/l)	0.0	1.4	20.7	0.0	8.0	19.5	1.9	8.7	24.1	0.0	2.5	13.0
pH	7.43	7.64	7.90	7.49	7.72	8.32	7.53	7.99	8.37	7.36	7.74	8.69
TOTAL INORGANIC CARBON (mg/l)	41.8	64.7	97.0	29.0	57.4	89.7	21.4	68.8	82.0	40.1	68.4	109.9
TOTAL ALKALINITY (mg/l)	39.1	62.0	94.3	27.9	55.2	87.4	20.4	66.6	80.8	37.9	67.0	103.2
FREE CARBON DIOXIDE (mg/l)	1.1	2.5	5.0	0.6	2.2	3.8	0.1	1.3	5.9	0.6	2.6	6.6
TOTAL HARDNESS (mg/l)	81.8	126.9	212.2	72.5	114.8	179.4	81.6	111.6	144.7	59.3	128.8	230.2
SPECIFIC CONDUCTANCE (µsm/cm)	216	320	472	171	277	451	208	298	361	209	322	505
TURBIDITY (JTU)	3.5	8.0	21.0	3.0	7.0	170.0	2.1	7.2	237.1	0.8	6.5	23.7
TOTAL SUSPENDED SOLIDS (mg/l)	1	10	37	1	9	377	3	13	227	0	7	47
TOTAL DISSOLVED SOLIDS (mg/l)	17	215	299	32	176	311	166	221	264	138	223	334
CHLORIDE (mg/l)	11.30	20.70	37.54	8.11	17.09	39.80	14.89	21.26	44.46	10.30	26.28	39.70
FLUORIDE (mg/l)	0.09	0.15	0.31	0.00	0.14	0.43	0.03	0.24	0.45	0.06	0.24	0.33
SULFATE (mg/l)	38.5	66.8	119.1	36.0	53.2	97.5	36.0	47.8	68.0	32.1	59.1	163.1
SODIUM (mg/l)	7.56	12.40	25.39	6.91	12.09	19.48	8.36	14.73	21.50	7.64	12.62	20.23
POTASSIUM (mg/l)	1.84	2.35	3.38	1.34	2.10	4.62	2.12	3.99	10.14	1.74	4.03	9.42
CALCIUM (mg/l)	21.05	30.24	49.28	20.92	27.80	44.71	20.23	28.04	54.60	18.30	29.78	62.30
MAGNESIUM (mg/l)	7.12	13.26	21.45	7.54	11.37	17.81	7.57	11.13	14.56	7.54	12.48	27.30
AMMONIA-NITROGEN (mg/l	0.14	0.47	1.41	0.00	0.22	1.89	0.00	0.02	0.22	0.00	0.07	0.53
NITRITE NITROGEN (mg/l)	0.02	0.05	0.10	0.02	0.05	0.16	0.01	0.04	0.13	0.02	0.04	0.23
NITRATE NITROGEN (mg/l)	1.79	2.48	3.59	0.93	2.18	3.50	1.12	1.28	2.40	0.00	1.61	3.26
TOTAL PHOSPHATE PHOSPHORUS (mg/l)	0.12	0.18	0.44	0.10	0.14	0.42	0.12	0.20	0.76	0.11	0.18	0.31
ORTHO PHOSPHATE PHOSPHORUS (mg/l)	0.03	0.14	0.37	0.07	0.10	0.22	0.10	0.15	0.22	0.07	0.16	0.27
ARSENIC (mg/l)	0.000	0.000	0.000	0.000	0.000	0.004	0.000	0.000	0.000	0.000	0.000	0.001
BERYLLIUM (mg/l)	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
BORON (mg/l)	0.00	0.14	0.24	0.05	0.14	0.21	0.00	0.10	0.33	0.10	0.15	0.29
CADMIUM (mg/l)	0.000	0.000	0.012	0.000	0.000	0.002	0.000	0.000	0.004	0.000	0.000	0.007
CHROMIUM (mg/l)	0.002	0.005	0.016	0.001	0.004	0.014	0.000	0.003	0.016	0.001	0.003	0.010
COPPER (mg/l)	0.004	0.011	0.046	0.004	0.013	0.027	0.004	0.010	0.093	0.001	0.010	0.017
IRON (mg/l)	0.123	0.297	0.980	0.121	0.420	6.680	0.157	0.419	13.560	0.140	0.254	1.245
LEAD (mg/l)	0.000	0.002	0.007	0.000	0.003	0.027	0.000	0.003	0.111	0.000	0.001	0.012
MANGANESE (mg/l)	0.190	0.339	0.675	0.069	0.282	0.640	0.050	0.077	0.496	0.015	0.114	0.459
NICKEL (mg/l)	0.00	0.00	0.06	0.00	0.00	0.02	0.00	0.00	0.09	0.00	0.00	0.03
SELENIUM (mg/l)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ZINC (mg/l)	0.000	0.038	0.160	0.007	0.043	0.146	0.004	0.019	0.081	0.000	0.018	0.063
MERCURY (µg/l)	0.000	0.000	0.400	0.000	0.000	0.400	0.000	0.546	0.00	0.000	0.000	0.446
COBALT (mg/l)	0.001	0.001	0.006	0.001	0.002	0.005	0.000	0.000	0.013	0.000	0.000	0.000

4.5 CONSTRUCTION IMPACT CONTROL PROGRAM

A construction pollution control program has been established to monitor and correct construction activities that could result in unacceptable environmental effects. The program will be discontinued when construction is completed and permanent measures for environmental impact control are implemented. The program includes written procedures, instructions, work rules, references, and appropriate documentation in the following areas.

4.5.1 EROSION AND SEDIMENTATION CONTROL

An erosion and sedimentation control plan for the site has been implemented to comply with "Chapter 102 - Erosion Control" which was added to the rules and regulations of the Pennsylvania Department of Environmental Resources on September 21, 1972. Inspections are made at least monthly to verify that accelerated erosion is not occurring.

Early installation (January 1972) of the permanent storm drainage system has helped minimize erosion. Later on, the permanent storm drain line was provided with a temporary diversion pipe and valve, which can be closed to divert the runoff into the holding pond if the runoff is suspected to contain deleterious or toxic substances. Most storm runoff is allowed to flow directly (through the open valve) to Possum Hollow because the storm water has not been causing sedimentation of the receiving water and because limitations on pond capacity make batch treating all of the storm runoff impossible during storms. A temporary debris basin receives dewatering flows and some storm runoff from cooling tower and spray pond areas.

4.5.2 CONSTRUCTION DISCHARGE CONTROL

Construction discharges are collected, monitored, and treated as necessary in a 400,000-gallon concrete-lined holding pond which is provided with facilities and chemicals for wastewater treatment. The holding pond receives dewatering flows from excavations, some diverted storm runoff, potential runoff from oil and chemical spills, cleaning wastes from [illegible] and equipment flushing, blowdown from the auxiliary boilers, as well as raw water treatment waste such as clarifier underflow, filter backwash, and demineralizer regenerant. The holding pond is being operated in accordance with NPDES Permit No. PA 0024414 issued by the U.S. Environmental Protection Agency. Water quality of holding pond effluent is shown in Table 4.5-1.

4.5.3 SANITARY WASTEWATER CONTROL

Temporary and permanent sanitary drainage systems have been installed onsite for the collection of sanitary wastewater. The sanitary wastewater is first piped to holding tanks. The wastewater is then pumped to the sewage treatment plant. Portable chemical toilets are also provided and are cleaned and serviced by the vendor on a regular schedule. Monthly inspections are made to verify that sanitary wastewater is being removed from the site.

The permanent sewage treatment plant has been placed in service and is operated by a state-certified operator. Sanitary wastewater will be treated to meet applicable state and federal water quality standards and then discharged to the Schuylkill River. The sewage treatment plant is operated in accordance with Pennsylvania Department of Environmental Resources, Bureau of Water Quality Management, Permit No. 4672437 and NPDES Permit No. PA 0024414 issued by the U.S. Environmental Protection Agency.

4.5.4 SOLID WASTE DISPOSAL

Trash and scrap receptacles are located strategically throughout the site. The containers are emptied as required at a designated trash sorting area. Salvageable items are separated and removed from the site by an outside scrap contractor. Trash and waste materials are transported offsite for disposal. No burning of trash or brush is permitted at the site. Trash removal operations are inspected at least biweekly.

4.5.5 NOISE MONITORING AND CONTROL

Most of the noise generated during construction is attenuated by the surrounding natural stands of trees and shrubs. Surveys are made every six months to verify that noise caused by construction activities does not reach unacceptable levels offsite.

4.5.6 EXTERIOR LIGHTING CONTROL

During the hours of darkness, banks of floodlights are in operation over those areas where work is being performed. The lights are situated to shine downward and are not directed beyond the site boundary. The glow of the lights is similar to that at sports arenas and is visible from some distance. As the construction in outside areas is completed, the lights will be removed. Yard lighting is inspected semiannually or after major lighting arrangement changes to verify that the light is situated to shine downward within the site boundary.

CHAPTER 5

TABLES (Cont'd)

FIGURES

5.2.4.2 Gaseous Pathways

Individual doses through the atmospheric environment from gaseous effluents of LGS were calculated according to the guidelines in USNRC Regulatory Guide 1.109 (Ref 5.2-1). A computer program, GASPAR, which incorporates the computational models described in Regulatory Guide 1.109, was obtained from the NRC staff and used to perform the dose calculations according to the models described in Appendix 5.2B.

Table 5.2-13 lists the annual doses to all organs through each pathway, by age group, at the location where the maximum total dose to any organ exists. The largest dose contribution to any organ resulted from goat-milk-thyroid pathway, at a farm with its goat pasture located about 15,600 feet ESE of the LGS building vents. The organ receiving the largest dose was the infant thyroid, which was calculated to receive a total of 2.33 mrem/year from all real pathways listed in Table 5.2-13. Approximately 98% of this total dose resulted from the goat-milk pathway, 0.6% from inhalation of air particulates and radioiodines, 1.4% from external exposure to noble gases, and less than 0.03% from exposure to activity deposited on the ground.

The location where a real person would receive the largest calculated total body dose resulting from exposure to noble gases released from LGS is a residence located about 3100 feet ESE of the LGS enclosure vents. This dose was calculated to be 0.46 mrem/year to the total body. The location where a person would receive the largest calculated dose to the skin resulting from exposure to noble gases released from LGS is the same residence location. This dose was calculated to be 0.90 mrem/year to the skin.

The maximum calculated annual dose to the total body resulting from exposure to noble gases at a hypothetical residence location was 0.57 mrem/year, and the maximum annual dose to the skin was 1.1 mrem/year. These calculated doses resulted at the nearest site boundary in the ESE sector, about 2500 feet from the LGS enclosure vents, which is near the worst case real residence discussed above.

The maximum calculated gamma dose in air at any location offsite was 0.86 mrad/year. This occurred at the site boundary about 2500 feet ESE of the LGS enclosure vents. The maximum calculated beta dose in air at any location offsite occurred at the same location, and was 0.59 mrad/year.

Calculation of annual doses at hypothetical dairy farm locations, using conservative worst-case assumptions for pasture grazing, showed that there are no sectors in which there are locations that could result in doses greater than 15 mrem/year/reactor through all pathways, if dairy cows were actually located there.

The maximum calculated dose to any organ at the worst-case hypothetical dairy farm was 11.2 mrem/year/reactor to the infant's thyroid resulting from all pathways. This occurred at the nearest site boundary in the ESE sector, about 2500 feet from the LGS structure vents. The total dose of 11.2 mrem/year/reactor at this location is well below the design objective of 15 mrem/year/reactor.

5.2.4.3 Direct Radiation from Facility

Direct radiation doses from the Limerick facility were calculated by the SKYSHINE computer code (Ref 5.2-30) for the 16 site boundary locations, assuming N-16 shine is the only significant source of exposure.

Skyshine dose rates at the nearest residences in each of the 16 cardinal sectors are calculated by applying the following equation to the dose rate at the site boundary for that sector:

$$D_X = D_B \frac{r^2 e^{-\mu d}}{d^2 e^{-\mu r}} \quad \frac{B(\mu,d)-1}{B(\mu,r)-1} \qquad (5.2\text{-}14)$$

where:

D_X = Dose rate at residence x, mrem/yr.

D_B = Dose rate at site boundary for same sector, mrem/yr.

r = Distance from plant to site boundary, cm.

d = Distance from plant to residence, cm.

μ = Linear attenuation coefficient in air for 6.2 MeV gammas, 3.225×10^{-5} cm^{-1}.

$$B(\mu,t) = Ae^{-\alpha_1 \mu t} + (1-A)e^{-\alpha_2 \mu t} \qquad (5.2\text{-}15)$$

(Taylor double exponential empirical expression for a point kernel attenuation buildup factor at distance t through a medium having a linear attenuation coefficient μ.)

For 6.2 MeV gammas in air:

$$\left.\begin{array}{lll} A = & 8.01 & \\ \alpha_1 = & -1.9013 \times 10^{-2} & \\ \alpha_2 = & 4.4573 \times 10^{-2} & \end{array}\right\} \text{ Dimensionless} \qquad (5.2\text{-}16)$$

TABLE 5.2-1

MAXIMUM CALCULATED RADIONUCLIDE CONCENTRATIONS IN THE ENVIRONMENT FROM ROUTINE ATMOSPHERIC RELEASES
LOCATION: ESE SITE BOUNDARY

AVERAGE ANNUAL - CONCENTRATIONS

	AIR (pci/m^3)	VEGETATION (pci/kg)	GROUND (pci/kg)
Ar 41	9.82×10^{-1}		
Kr 85M	3.17		
Kr 85	$1.12 \times 10^{+1}$		
Kr 87	5.46		
Kr 88	9.48		
Xe 131M	2.79×10^{-1}		
Xe 133	$1.08 \times 10^{+2}$		
Xe 135M	$2.64 \times 10^{+1}$		
Xe 135	$4.37 \times 10^{+1}$		
Xe 138	$4.95 \times 10^{+1}$		
I 131	6.60×10^{-3}	7.98	1.25×10^{-1}
I 133	2.20×10^{-2}	4.25	4.51×10^{-2}
Cr 51	7.69×10^{-6}	3.67×10^{-2}	1.10×10^{-3}
Mn 54	1.24×10^{-5}	8.28×10^{-2}	2.00×10^{-2}
Fe 59	5.35×10^{-6}	2.90×10^{-2}	1.23×10^{-3}
Co 58	2.11×10^{-6}	1.24×10^{-2}	7.75×10^{-4}
Co 60	3.68×10^{-5}	2.55×10^{-1}	3.16×10^{-1}
Zn 65	1.91×10^{-6}	1.35×10^{-2}	2.41×10^{-3}
Sr 89	2.21×10^{-6}	1.23×10^{-2}	5.79×10^{-4}
Sr 90	1.10×10^{-7}	7.91×10^{-4}	1.82×10^{-3}
Zr 95	3.18×10^{-7}	1.85×10^{-3}	1.08×10^{-4}
Sb 124	2.51×10^{-7}	1.44×10^{-3}	7.87×10^{-5}
Cs 134	4.35×10^{-6}	2.97×10^{-2}	1.68×10^{-2}
Cs 136	4.35×10^{-7}	1.53×10^{-3}	2.95×10^{-5}
Cs 137	7.36×10^{-6}	5.19×10^{-2}	1.22×10^{-1}
Ba 140	4.35×10^{-6}	1.51×10^{-2}	2.88×10^{-4}
Ce 141	1.14×10^{-6}	5.70×10^{-3}	1.91×10^{-4}
H 3	2.87	$1.36 \times 10^{+2}$	
C 14	3.78×10^{-1}	$2.60 \times 10^{+2}$	

TABLE 5.2-1 (Cont'd)

MAXIMUM CALCULATED RADIONUCLIDE CONCENTRATIONS IN THE ENVIRONMENT FROM ATMOSPHERIC RELEASES
LOCATION: FARM 15,600 FEET ESE OF LGS ENCLOSURE VENTS

AVERAGE ANNUAL CONCENTRATIONS

	GOAT MILK (pci/l)
I 131	4.79×10^{-1}
I 133	6.10×10^{-2}
Cr 51	9.32×10^{-5}
Mn 54	2.86×10^{-5}
Fe 59	4.57×10^{-5}
Co 58	1.57×10^{-5}
Co 60	3.62×10^{-4}
Zn 65	6.88×10^{-4}
Sr 89	2.11×10^{-4}
Sr 90	1.55×10^{-5}
Zr 95	1.17×10^{-8}
Sb 124	2.70×10^{-6}
Cs 134	1.26×10^{-2}
Cs 136	4.90×10^{-4}
Cs 137	2.20×10^{-2}
Ba 140	6.43×10^{-6}
Ce 141	4.01×10^{-6}
H 3	$1.14 \times 10^{+1}$
C 14	$1.30 \times 10^{+1}$

CALCULATED ANNUAL DOSE
DOSE TO ANY ORGAN RESULTI

PATHWAY	T.BODY	GI-TRACT	
PLUME	3.22×10^{-2}	3.22×10^{-2}	3.
GROUND	7.66×10^{-4}	7.66×10^{-4}	7.
VEGETABLE			
ADULT	5.82×10^{-3}	5.84×10^{-3}	2.
TEEN	9.44×10^{-3}	9.47×10^{-3}	4.
CHILD	2.23×10^{-2}	2.22×10^{-2}	1.
INFANT	0.0	0.0	0.
GOATMILK			
ADULT	4.15×10^{-3}	2.97×10^{-3}	1.
TEEN	6.50×10^{-3}	5.11×10^{-3}	2.
CHILD	1.34×10^{-2}	1.1×10^{-2}	5.
INFANT	2.65×10^{-2}	2.32×10^{-2}	1.
INHALE			
ADULT	3.18×10^{-4}	3.18×10^{-4}	2.
TEEN	3.26×10^{-4}	3.23×10^{-4}	4.
CHILD	2.94×10^{-4}	2.77×10^{-4}	5.
INFANT	1.73×10^{-4}	1.57×10^{-4}	4.

LGS EROL

TABLE 5.2-13

S FOR ALL REAL PATHWAYS AT THE LOCATION OF MAXIMUM OFFSITE
NG FROM ATMOSPHERIC RELEASE FROM LGS UNITS 1 AND 2 (mrem/yr)

BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN	
22 x 10^{-2}	3.22 x 10^{-2}	3.22 x 10^{-2}	3.22 x 10^{-2}	3.26 x 10^{-2}	6.42 x 10^{-2}	
66 x 10^{-4}	7.66 x 10^{-4}	7.66 x 10^{-4}	7.66 x 10^{-4}	7.66 x 10^{-4}	9.02 x 10^{-4}	I
58 x 10^{-2}	5.87 x 10^{-3}	5.80 x 10^{-3}	3.13 x 10^{-2}	5.62 x 10^{-3}	5.60 x 10^{-3}	I
86 x 10^{-2}	9.60 x 10^{-3}	6.79 x 10^{-3}	3.09 x 10^{-2}	9.26 x 10^{-3}	9.23 x 10^{-3}	I
06 x 10^{-1}	2.26 x 10^{-2}	5.55 x 10^{-3}	5.54 x 10^{-2}	2.21 x 10^{-2}	2.20 x 10^{-2}	I
0	0.0	0.0	0.0	0.0	0.0	
29 x 10^{-2}	4.91 x 10^{-3}	4.69 x 10^{-3}	2.99 x 10^{-1}	2.80 x 10^{-3}	2.65 x 10^{-3}	I
87 x 10^{-2}	8.66 x 10^{-3}	6.05 x 10^{-3}	4.74 x 10^{-1}	4.99 x 10^{-3}	4.69 x 10^{-3}	I
81 x 10^{-2}	1.79 x 10^{-2}	5.00 x 10^{-3}	9.42 x 10^{-1}	1.16 x 10^{-2}	1.11 x 10^{-2}	I
13 x 10^{-2}	3.73 x 10^{-2}	5.00 x 10^{-3}	2.28	2.36 x 10^{-2}	2.28 x 10^{-2}	I
98 x 10^{-5}	3.44 x 10^{-4}	3.76 x 10^{-4}	1.04 x 10^{-2}	3.18 x 10^{-4}	2.98 x 10^{-4}	I
16 x 10^{-5}	3.63 x 10^{-4}	3.76 x 10^{-4}	1.31 x 10^{-2}	3.29 x 10^{-4}	3.00 x 10^{-4}	I
52 x 10^{-5}	3.27 x 10^{-4}	1.74 x 10^{-4}	1.56 x 10^{-2}	2.89 x 10^{-4}	2.65 x 10^{-4}	I
41 x 10^{-5}	2.10 x 10^{-4}	6.58 x 10^{-5}	1.42 x 10^{-2}	1.68 x 10^{-4}	1.53 x 10^{-4}	I

TABLE 5.2-15

ANNUAL POPULATION EXPOSURE IN CONTIGUOUS U.S. (man-rem)

	GASEOUS PATHWAYS	
	TOTAL BODY (man-rem)	THYROID (man-rem)
Plume	11.9	11
Ground	.10	.10
Inhalation	.38	13.2
Vegetation	14.5	16.6
Cow milk	6.06	21.6
Meat	10.8	11.0
Total	43.7	74.4
	LIQUID PATHWAYS	
Fish ingestion	5.32×10^{-1}	6.53×10^{-3}
Liquid ingestion	3.00	9.12
Shoreline	5.21×10^{-2}	5.21×10^{-2}
Boating	3.37×10^{-5}	3.37×10^{-5}
Total	3.58	9.18

TABLE 5.2-17

50-MILE ANNUAL POPULATION EXPOSURE RESULTING FROM LGS GASEOUS EFFLUENTS
(man-rem)

	TOTAL BODY	THYROID
Plume	11.0	11.0
Ground	.10	.10
Inhalation	.32	13.2
Vegetation	1.28	3.38
Cow milk	1.50	17.1
Meat	0.47	0.69
TOTAL	14.7	45.47

TABLE 5.2-18

COMPARISON OF MAXIMUM INDIVIDUAL DOSES RESULTING FROM LGS UNITS 1 AND 2 WITH 10 CFR 50 APPENDIX I DESIGN OBJECTIVES

	LIMERICK LIQUID DOSE UNITS 1 AND 2	10 CFR 50, APPENDIX I DESIGN OBJ./2 UNITS
Total body	1.02 mrem/year	6 mrem/year
Max. organ	1.78 mrem/year (Bone)	20 mrem/year

	LIMERICK GASEOUS DOSE UNITS 1 AND 2	10 CFR 50, APPENDIX I DESIGN OBJ./2 UNITS	RM-50-2 SITE % OF DESIGN OBJECTIVE(3)
Gamma air dose (mrad/yr)(1)	.86	20	-
Beta air dose (mrad/yr)(1)	.59	40	-
Total body of individual (mrm/yr)(1)	.46	10	5
Skin of individual (mrem/yr)(1)	.90	30	15
Any organ all pathways (mrem/yr)(2)	2.33 (Thyroid)	30	15

(1) Doses from noble gases only

(2) Doses from radioiodines and air particulates with half lives greater than eight days

(3) Annex to Appendix I, 10CFR50; Concluding Statement of Position of the Regulatory Staff, Public Rulemaking Hearing on Numerical Guides for Design Objectives and Limiting Conditions for Operation to meet the criterion "as low as practicable" for Radioactive Material in Light Water Cooled Nuclear Reactors, USAEC Docket No. RM-50-2.

5.6 OTHER EFFECTS

Community noise impact of the Limerick Generating Station will be minimal because of several features incorporated into the design. The main transformers are surrounded on the sides by sound absorption masonry (Figure 5.6-1). Major equipment such as turbines, pumps, compressors, blowers, fans, and emergency diesel generators are located inside of enclosures with concrete sides. The emergency diesel generators have mufflers on the exhausts and will be operated very infrequently. The crossflow natural draft cooling towers will emit some sound from water droplets falling through the fill onto the water in the basin and air flowing through the fill, but these nonmechanical noises are generally not offensive at low levels.

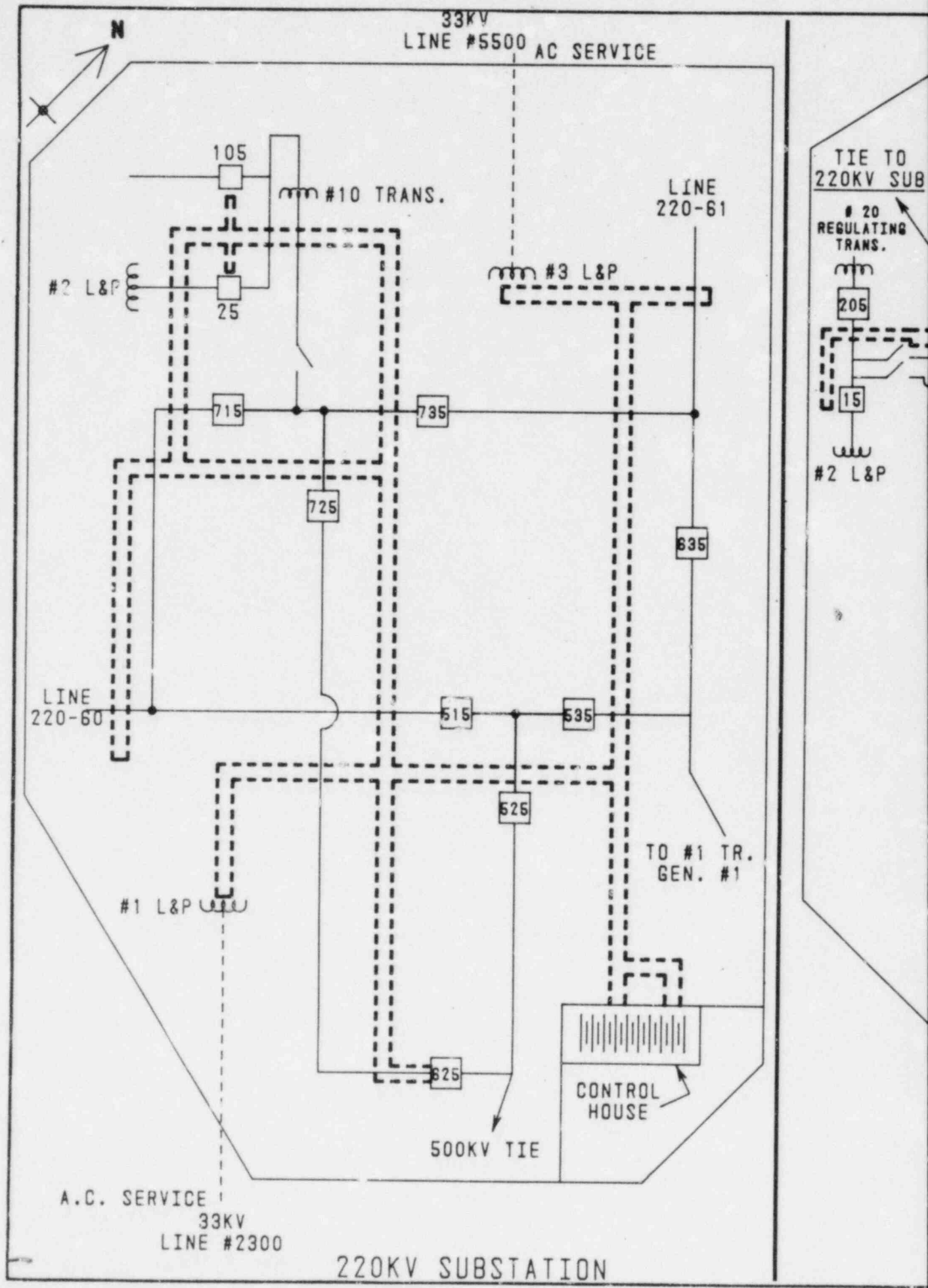
Twenty-four hour equivalent sound levels resulting from station operation are not expected to exceed 62 dBA (re 20 micropascals) at the site boundary, except possibly at the railroad and river corridor boundaries. At the railroad and river corridor boundaries, the 24-hour equivalent sound levels are not expected to exceed 70 dBA. Peak sound levels in the railroad and river corridors are expected to be higher from passing trains than from station operation. Ambient sound levels prior to station construction are given in Section 2.7, and sound levels during station construction are given in Section 4.5.

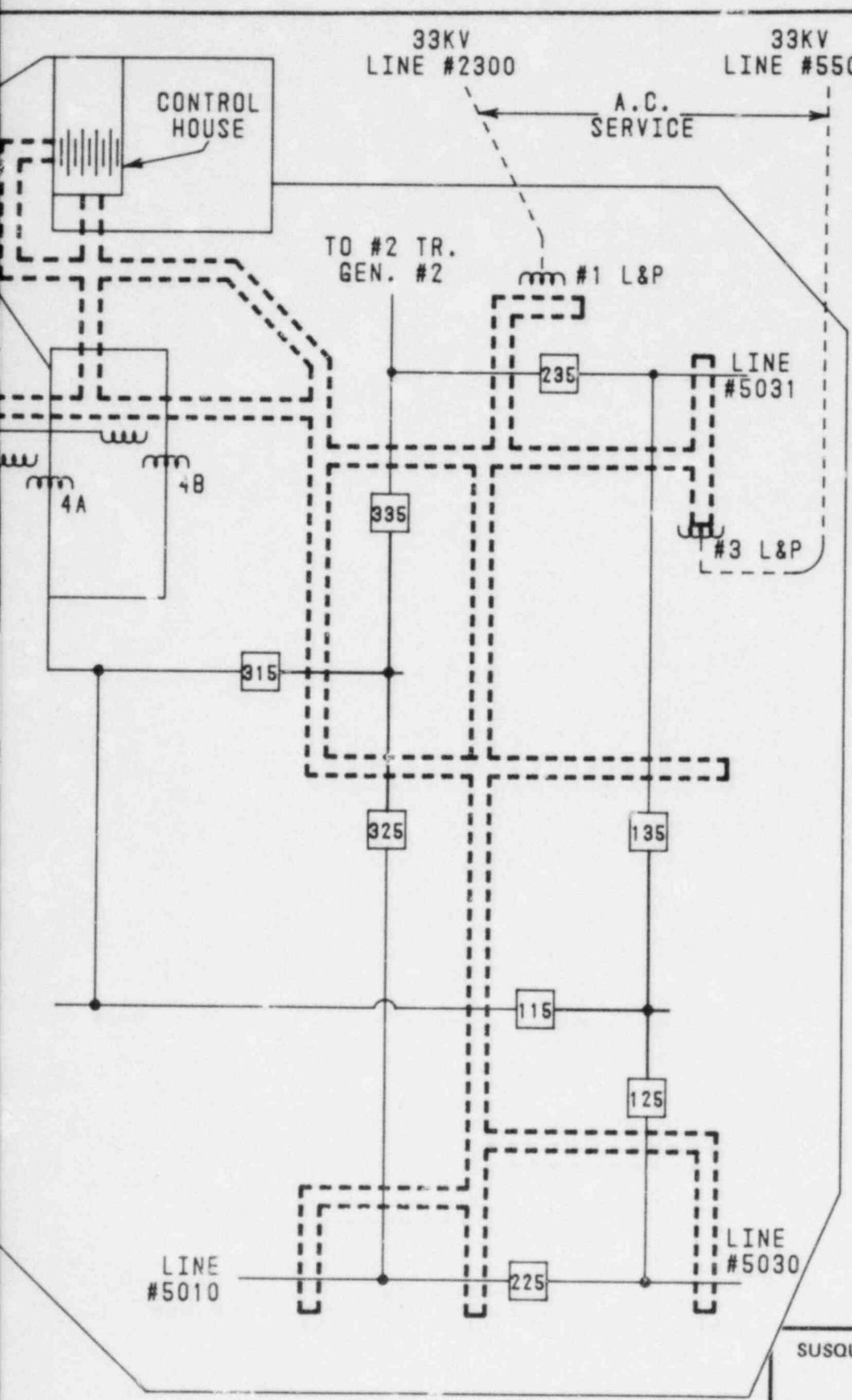
Twenty-four hour equivalent sound levels of less than 62 dBA are within the "normally acceptable" range as used by the U.S. Department of Housing and Urban Development (HUD) in Reference 5.6-1. A yearly average 24-hour equivalent sound level of 70 dBA has been identified by the U.S. Environmental Protection Agency in Reference 5.6-2 as requisite to protect public health (hearing loss) with an adequate margin of safety.

5.6.1 References

5.6-1 USHEW, Noise Abatement and Control, Departmental Policy, Implementation Responsibilities and Standards, Circular 1390.2 Change 1 (September 1971).

5.6.2 USEPA, Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with An Adequate Margin of Safety, 550/9-74-004, (March 1974).


N
33KV
LINE #5500
AC SERVICE
105
#10 TRANS.
LINE
220-61
#2 L&P
25
#3 L&P
715
735
725
835
LINE
220-60
515
535
525
TO #1 TR.
GEN. #1
#1 L&P
825
CONTROL
HOUSE
500KV TIE
A.C. SERVICE
33KV
LINE #2300
220KV SUBSTATION
TIE TO
220KV SUB
20
REGULATING
TRANS.
205
15
#2 L&P



NOTES:

1. A.C. POWER IS SUPPLIED FROM TWO OFF-SITE SOURCES AND ONE SUBSTATION SOURCE. AN AUTOMATIC THROWOVER SCHEME WILL TRANSFER TO THE EMERGENCY SOURCE ON LOSS OF THE NORMAL POWER SUPPLY.
2. D.C. POWER IS SUPPLIED FROM THE 130 VOLT STATION BATTERY IN THE CONTROL HOUSE.

SUSQUEHANNA STEAM ELECTRIC STATION
UNITS 1 & 2
ENVIRONMENTAL REPORT

TRANSMISSION SYSTEM
ARRANGEMENT OF TRANSFORMERS
WITHIN THE SWITCHYARDS

FIGURE 5.6-1

REV. 10, 02/83

QUESTION E240.29 (Section 3.4)

A. The water level in the Delaware River at the Point Pleasant Diversion site is controlled primarily by the Lumberville Wing Dam and to a lesser degree by an apparently inoperative gate in the Delaware and Raritan Canal at Bull's Island, hydraulically adjacent to the Wing Dam. In an inspection of this gate structure it appeared that water was being held back by wooden stop logs which can be expected to further deteriorate over the life of the plant (40 years). Please provide an estimate of the change (if any) in the stage-discharge relationship for the river at Pt. Pleasant if the stop logs should completely fail. If this change is significant please discuss the likelihood of prompt repair of this gate structure and state the names of the responsible authorities that would be involved.

B. The Lumberville Wing Dam also appears to show some signs of deterioration. Please discuss the ability of the Lumberville Wing Dam to survive flood flows which can reasonably be expected to occur during the life of the plant. Also discuss the likelihood of prompt repairs should the dam seriously deteriorate and state the names of the responsible authorities that would be involved.

C. Please provide all significant assumptions, calculations and pertinent data used to arrive at the above requested estimates and conclusions.

RESPONSE

A. Lumberville Dam is a wing dam with an open weir 100 feet wide at midstream. Each wing is about 400 feet long, and the total river width is approximately 900 feet. The Delaware and Raritan Canal, which draws water from upstream of the dam, has a total width of approximately 32 feet. It is controlled by 6 gates, the widest of which is about 8 feet.

It can be assumed that any one of the canal's wooden stoplog gates could fail due to old age, but it is reasonable to assume only one failure at any time. If failure occurs when the river is flowing with a modest depth over the dam's wings, the effect on the water level at Point Pleasant will be insignificant. At a lower flow when the dam is not overtopped (flows below about 3,000 cfs), the failure of a wooden stoplog gate will make a difference in the river stage

at Point Pleasant, but it will be small because the width of the canal is relatively small compared to the open width of the midstream weir.

Although the significance of a failure is small, future maintenance plans were investigated. Contacts were made with the State of New Jersey, owner of the canal, and the responsibility for maintenance and operation was determined to rest with the New Jersey Water Authority, a part of the State's Department of Environmental Protection. Plans are being developed to dredge the canal beginning in July 1983 and completing work by December 1985. The Authority plans to rehabilitate the stoplogs within the next 2 to 5 years.

B. Lumberville Dam was built in the 19th century. Its construction is typical of low head dams of that era and, except for some maintenance including a concrete cap, it remains as built. Dams of this type do fail in localized areas but generally not catastrophically for their entire length. Furthermore, even if a section failed it would probably move downstream only slightly and still effectively be an obstruction to river flow. The river stage at Point Pleasant should not change too greatly following initial failure, and if repairs are made, no long-term effects will result.

The New Jersey Water Authority has responsibility for the dam and when contacted indicated that no maintenance work is presently planned. The Authority views the dam as an important structure because it assures adequate flow in the Delaware and Raritan Canal, and this water is necessary to a sizable portion of the state. The Authority would expect to take quick action in the event of any failure.

C. All assumptions and pertinent data are provided above.

QUESTION E290.6 (Section 2.2.1.1.1)

Provide information on the spatial distribution of plant communities in the site vicinity (i.e. within 1 mi) after construction is completed and all disturbed areas are re-vegetated.

RESPONSE

On site:

Clearing and excavation of the Limerick site was virtually completed when the vegetation studies reported in Section 2.2.1.1.1 were conducted. Therefore, no significant changes in plant communities after construction is completed, other than natural plant succession, are anticipated. The area identified as pioneer herbaceous plant community in Figure 2.2-1 is primarily occupied by buildings and laydown for construction materials. When construction is completed, these areas will be seeded with grasses and mowed to maintain a permanent herbaceous ground cover. Banks and slopes will be hydroseeded to prevent erosion.

Within 1-mile radius of site:

The plant communities and associated vascular plant species occurring within a 1-mile radius of Limerick are typical of the Triassic Lowland section of the Piedmont physiographic province. There should be no loss of unique habitats or species as a result of Limerick Plant construction. The indigenous plant communities should not be threatened or altered.

Vegetation within a 1-mile radius of the Limerick site includes eight plant communities: forest, old-field, grassland, pioneer herbaceous, wetland, cultivated field, orchard, and residential.

Forested areas occur along the Schuylkill River floodplain (Riparian Forest) and Schuylkill Canal; on the steep hillsides, drained by Sanatoga Creek, Brooke Evans Creek, Possum Hollow Run, and AKM Run; and between Sanatoga and Township Line Roads, just north of Possum Hollow Road.

Dominant tree species of the Riparian Forest include Acer rubrum, Acer saccharinum, Betula nigra, Catalpa bignonioides, Platanus occidentalis, and Salix nigra. Common shrubs and vines are Cephalanthus occidentalis, Cornus amomum, Lonicera japonica, Rhus radicans, Sambucus canadensis, Staphylea trifolia, and Vitis raparia. Common herbs are Arisaema triphyllum, Asarum canadense,

Erythronium americanum, Mertensia virginica, Solidago flexicaulis, and Symplocarpus foetidus.

Along the Schuylkill Canal and the perimeter of the impounding basins, Robinia pseudo-acacia predominates. Other species present include Acer negundo, Acer saccharinum, and Ailanthus altissima.

Other forested areas support the regional climax vegetation, the oak-chestnut forest. Chestnut trunks can be found throughout the woods but only occasionally does one find adventitious sprouts.

The elimination of chestnut has resulted in increased importance of tulip poplar. The dominant trees on north-facing slopes include Fagus grandifolia, Liriodendron tulipifera, Quercus rubra, and Tilia americana. Dominants on the south-facing slopes are Pinus virginiana, Quercus velutina, Quercus prinus, and Sassafras albidum. Other woodland species present are Ailanthus altissima, Carya cordiformis, Carya ovata, and Prunus serotina. Understory and shrub species of these upland forests include Cornus florida, Hamamelis virginiana, Lindera benzoin, Lonicera japonica, Parthenocissus quinquefolia, Rhus radicans, Rubus spp., Viburnum acerifolium, and Viburnum dentatum.

Old field communities are scattered throughout the site (e.g., impounding basins, abandoned farmlands, and transmission line right-of-ways). Juniperus virginiana predominates and is indicative of the highly calcareous soils found here. Crateagus spp., Fraxinus americana, Prunus serotina, Prunus virginiana, Robinia pseudo-acacia, Rubus spp., Sassafras albidum, and Viburnum prunifolium occur in the old field, and together these species form hedgerows, thereby dividing the fields. The hedgerows are important ecologically because they create an edge habitat and therefore provide food and shelter for a wide variety of animals. Other common trees of the hedgerow are Celtis occidentalis and Maclura pomifera. Elaeagnus umbellata, Lonicera bella, Lonicera japonica, and Rosa multiflora have become prominent pests in the old field community.

The grassland community is very limited within a 1-mile radius of Limerick. Glyceria striata, Leersia oryzoides, Leersia virginica, Phalaris arundinacea, and Phragmites australis are common in the low, moist areas. Agrostis alba, Andropogon scoparius, Anthoxanthum odoratum, Bromus spp., Dactylis glomerata, Danthonia spicata, Festruca elatior, Panicum spp., Setaria spp., and Triodia flava are common in the higher, drier areas. Eragrostis hypnoides forms extensive mats with the impounding basins.

A large portion of the study area has been stressed by man (e.g., mowing, paving, grading). Therefore, most of the common European weeds can be found in this pioneer herbaceous community. Some of

the more common species are Achillea millefolium, Amaranthus retrofexus, Aster spp., Cirsium arvense, Chenopodium album, Dianthus armeria, Erigeron spp., Linaria vulgaris, Melilotus spp., Denothera biennis, Oxalix spp., Polygonum spp., Potentilla spp., Prunella vulgaris, Rumex spp., Solidago canadensis, Solidago juncea, Solidago nemoralis, Solidago rugosa, and Trifolium spp. Common grasses present include Dactylis glomerata, Digitaria ischaemum, Digitaria sanguinalis, Echinochloa crusgalli, Festuca elatior, Lolium multiflorum, Microstegium vimineum, Panicum capillare, Panicum clandestinum, Panicum dichotomiflorum, Poa annua, Poa pratensis, and Triodia flava.

A wetland community occurs along the Schuylkill River and its tributaries. Vegetation tolerant of these moist conditions includes Asclepias incarnata, Boehmeria cylindrica, Equisetum arvense, Eupatorium fistulosum, Eupatorium perfoliatum, Helenium automnale, Lobelia siphilitica, Lythrum salicaria, Polygonum hydropiper, Polygonum pensylvanicum, and Vernonia noveboracensis, and Xanthium sp.

Corn, wheat, and hay are the common cultivated crops within a 1-mile radius of Limerick. There are several small orchards which produce apples, pears, and peaches. Residential areas are limited within the study area. There are a few homes along both sides of Sanatoga Road, Fricks Lock Road, Green Lane Road, Possum Hollow Road, and Township Line Road. The vegetation here typifies suburban living with the common cultivated trees of the area abounding. Acer platanoides, Acer rubrum, Acer saccharinum, Betula populifolia, Cornus florida, Euonymous alatus, Ilex opaca, Juglans nigra, Picea abies, Picea glauca, Pinus storbus, Quercus rubra, Taxus baccata, Thuja occidentalis, and Tilia americana are representative species.

The most interesting area botanically is not owned by Philadelphia Electric Company. Due north of the Limerick Plant Site, east of Sanatoga Road and north of Possum Hollow Road, is a red oak Virginia pine forest. At the top of the ridge there is a colony of Cypripedium acaule (approximately 150 plants).

QUESTION E290.29

How often will the spray pond be operative once the piant begins generating electrical power?

RESPONSE

The spray pond will be operated to support diesel generator surveillance testing as required by the Technical Specifications. It is anticipated that this will result in maximum spray pond operation of 2 hours per diesel per week.

QUESTION E290.29a (Section 2.1.1.1)

At the Limerick site visit PECo personnel indicated that waterfowl are expected to frequent the spray pond. Describe the waterfowl monitoring program planned to document usage of the spray pond both before and after the plant begins operating.

RESPONSE

Waterfowl are expected to use the spray as they would any pond of a similar size and character. Use of the spray pond is not expected to produce any significant impact on the waterfowl community. However, during trips to the site, in conjunction with the preoperational/postoperational environmental monitoring program, a check will be made of the numbers and species of waterfowl frequenting the pond.

QUESTION E290.30

What is the sound power level (by octave bands) for the cooling towers and each transformer; include directivity effects in answer?

RESPONSE

Sound power level data for the cooling towers were provided by the manufacturer as follows:

frequency	63	125	250	500	1000	2000	4000	8000
dB at 20 feet	62	62	62	63	64	64	66	67

No directivity effects were indicated; the cooling towers are essentially nondirectional.

Sound power levels for the transformers are as follows:

a. Main transformers Unit 1, 3 single-phase, measured levels with all cooling in operation, 71.5 to 73.1 dBA

b. Unit auxiliary transformers, 3-phase, measured sound levels

Unit 1 63.3 dBA-DA, 66.5 dBA-FA, 66.8 dBA-FDA
Unit 2 60.5 dBA-DA, 65.1 dBA-FA, 66.6 dBA-FDA

c. Unit 2 main transformers, 3 single-phase, not yet fabricated but manufacturer guarantees not to exceed 75 dBA

d. Safeguard transformers, measured sound levels

64 dBA-DA, 64 dBA-FA

e. Plant services transformers, measured sound levels

63 dBA-DA, 67 dBA-FA
65 dBA-DA, 68 dBA-FA

f. Perkiomen pumphouse transformers, measured sound levels

62.9 dBA-DA, 66.3 dBA-FA
62.5 dBA-DA, 66.3 dBA-FA

Directivity effects for all transformers are estimated to be broad-band on the fan side. Tones of 120, 240, and 480 Hz are expected in the other directions.

QUESTION E290.31

Provide location data for each of the transformers within the switchyards.

RESPONSE

Figure 5.6-1 has been added to provide the requested information.

QUESTION E290.32

Provide information on the specifications for the sound absorption masonry used to quiet the main transformers. Provide information on expected sound power levels (by octave bands) including directivity effects (if relevant) as result of installing sound absorption masonry.

RESPONSE

Sound absorption masonry is specified to be 8"x8"x16" Type Q SOUNDBLOX, manufactured by the Proudfoot Company. Published sound absorption coefficients are:

Freq (Hz)	125	250	500	1000	2000	4000	NRC
Coefficient	1.07	0.57	0.61	0.32	0.56	0.55	0.50-0.20

See the response to Question 290.30 for information on expected sound power levels and directivity effects for the main transformers. Directivity of the main transformer noise in the northerly direction (fan side) will be unaffected by these blocks because the transformer enclosures are open on this side.

Along the east-west centerline of the main transformers, the sound level will be reduced approximately 3 to 5 dB due to the installation of the SOUNDBLOX walls between the transformers.

QUESTION E290.33

Locate on a scale map houses or clusters of houses within a one mile radius of the cooling towers. Also locate any other potentially sound sensitive areas.

RESPONSE

Figure E290.14-1 is an aerial photograph showing the site within a one-mile radius of the cooling towers.

Table 2.1-37 lists the residences within one mile. There are no other potentially sound-sensitive areas affected by operation of Limerick.

QUESTION E290.34

Provide a copy of the June 1973 data study on ambient noise.

RESPONSE

The June 1973 data study was transmitted to the NRC by letter from E. J. Bradley (PECo) to A. Schwencer, dated January 17, 1983.

QUESTION E290.35

Provide information on any local or other standards on noise for the Limerick site.

RESPONSE

A review of the "Noise Regulation Reporter", published by the Bureau of National Affairs, revealed no local or other standards on noise for the Limerick site.

QUESTION E290.36 (Section 4.5.5)

Provide the... "plans for noise monitoring and update"... (ER pg. 4.5-2) and any existing data from measurements made under that plan.

RESPONSE

Noise monitoring plans were intended for use during the construction period only. Surveys are made every 6 months to verify that noise caused by construction activities do not reach unacceptable levels offsite.

The data from the most recent noise survey is shown in Exhibits E290.36-1 and E290.36-2.

Section 4.5.5 has been changed to provide the correct information.

Inspection No. 25

LIMERICK GENERATING STATION
POLLUTION CONTROL CHECKLIST

TASK: Sound Survey

REQUIREMENTS: Check for objectional noise levels. See Attachment D for location of noise level recording points.

INSPECTION CRITERION: Final Environmental Statement, Section 4.5.1, Item g; Not to exceed 70 dBA during daytime hours or 55 dBA during evening hours.

FREQUENCY: Every 6 mo. and during periods when the noise being generated is higher than normal.

PAGE NO.

DESCRIPTION	INSPECTED BY	DATE / TIME	RESULTS SAT.	RESULTS UNSAT.	UNSATISFACTORY CONDITIONS	NOTIFICATION LETTER NO.
Station 1	K. FULMER R. STOCKHOLM	10/26/82 2:40 PM	54-58			
Station 2		10/26/82 3:23 PM	56-58			
Station 3		10/26/82 3:23 PM	56-58			
Station 4		10/26/82 3:26 PM	48-52			
Station 5		10/26/82 2:46 PM	45-52			
Station 6		10/26/82 3:30 PM	48-50			
Station 7		10/26/82 3:32 PM	48-50			
Station 8		10/26/82 3:40 PM	46-50			
Station 9		10/27/82 10:05 AM	41-48			
Station 10		10/27/82 10:10 AM	43-55			
Station 11		10/27/82 10:15 AM	69-70			
Station 12	↓	10/27/82 10:21 AM	53-56			

NOTE - Record decibel level in "Results Sat." c Results Unsat." column as appropriate

Inspection No. 25

LIMERICK GENERATING STATION
POLLUTION CONTROL CHECKLIST

TASK: Sound Survey

REQUIREMENTS: Continuation Sheet

INSPECTION CRITERION:

FREQUENCY:

PAGE NO.

DESCRIPTION	INSPECTED BY	DATE / TIME	RESULTS SAT.	RESULTS UNSAT.	UNSATISFACTORY CONDITIONS	NOTIFICATION LETTER NO.
Station 13	K. FULMER R. STOCKHOLM	10/26/82 3:15 PM	52-54			
Station 14	↓	10/26/82 3:10 PM	50-53			
Station 15		10/26/82 2:56 PM	56-62			
Station 16		10/26/82 2:53 PM	52-56			
Station 17		10/26/82 2:50 PM	50	HIGH AF	70 DBA DUE TO FARM TRACTOR	

ound Meter Manufacturer

Serial Number

EXHIBIT E290.36-1 Rev. 10, 02/83

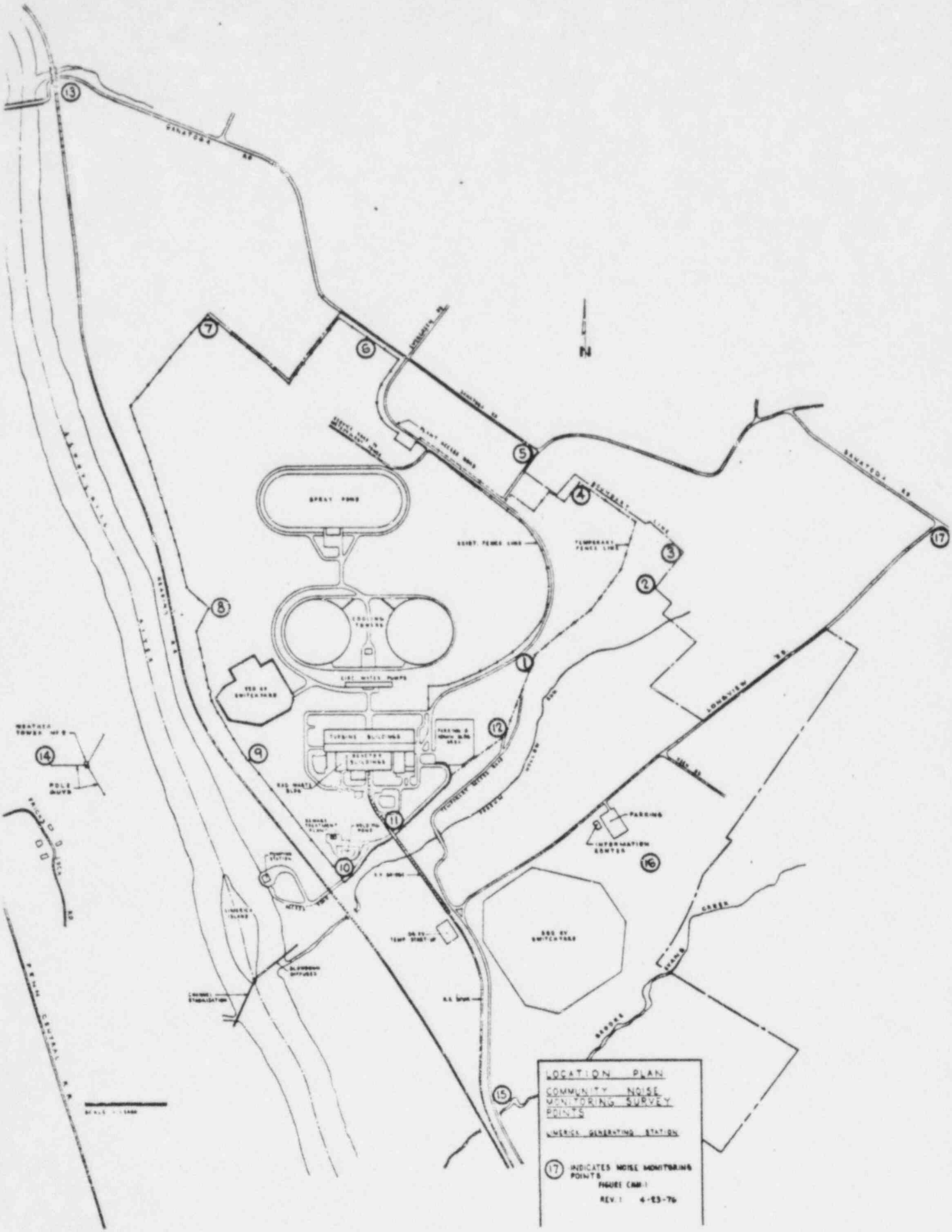


EXHIBIT E290.36-2

QUESTION E290.37

Provide information on flow rate, power rating, location and number of all circulating water pumps. Report pump location (i.e. direction and distance) from the cooling towers.

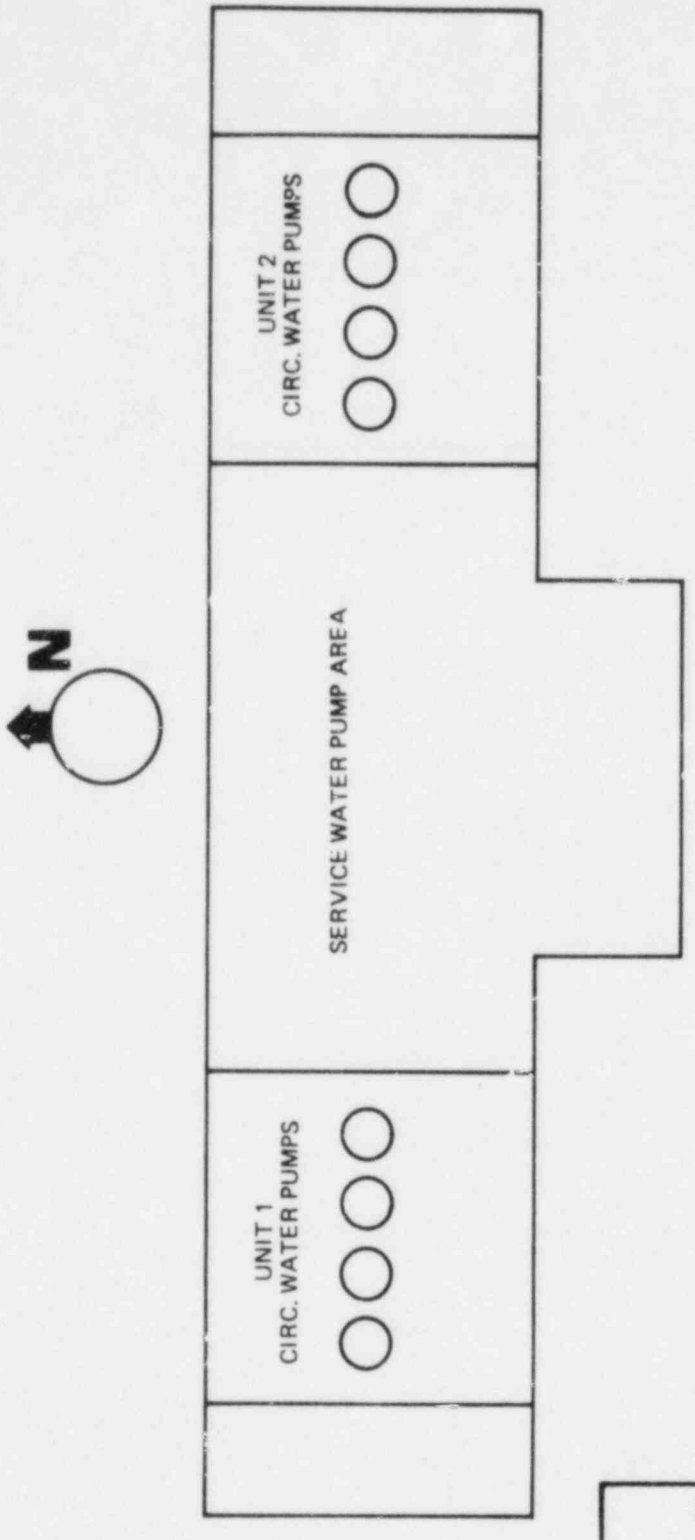
RESPONSE

There are four circulating water pumps per unit. Each pump is capable of delivering 25 percent of the unit's requirements. The pumps are each rated for 113,000 gpm. The pumps are rated at 3450 hp and have 3500 hp motors.

Pumps are located within the circulating water pumphouse (Figure 2.1-4) as shown in Figure E290.37-1. Unit 1 circulating water pumps are southeast of the Unit 1 cooling tower at a distance of approximately 225 feet from the outer wall of the cooling tower basin. They are also approximately 37 feet below the cooling tower basin. Unit 2 circulating water pumps are in a corresponding location southwest of the Unit 2 cooling tower.

The north wall of the pumphouse is 4-ft thick concrete at the pump level and is reduced to 2 ft-3 in. at the crane rail inbeds which are 15 feet above the motors. It is backfilled to approximately El. 253 ft-5 in. The south wall of the pumphouse is made of precast concrete panels 6-1/2 inches thick from El. 217 ft to 253 ft-6 in. The roof slopes downward from north to south and begins 5 feet below the top of the north wall. The east and west outside walls are 2-ft thick concrete.

For Unit 1, an additional 8-in. masonry wall internal to the structure separates the pumps from the outside wall on the west; on the east side, the pump structure is open through the service water pump area. For Unit 2, an internal 8-in. masonry wall separates the pumps from the outside wall on the east and is open to the service water pump area to the west. The roof is 4-ft thick concrete over steel plate.



LIMERICK GENERATING STATION
UNITS 1 AND 2
ENVIRONMENTAL REPORT

CIRCULATING WATER PUMPHOUSE LAYOUT

FIGURE E290.37-1 REV. 10, 02/83

QUESTION E290.40

What sound specifications are planned for each door leading to the outside of the pump house? Of greatest concern is the set of double doors leading outside in the direction of the river.

RESPONSE

There are five doors leading to the outside of the pumphouse. Included in this number is one set of double doors leading outside in the direction of the river. The double-door opening will be 10 feet wide by 16 feet high. The doors will be constructed of 3-inch steel channel frame with 14 gage cold rolled steel face sheet, both sides. The entire door cavity will be filled with expanded polystyrene foam insulation. Field tests have been performed on a similar door 2-1/2 inches thick, and the sound transmission class was found to be 42; therefore the double doors will be sound class 42 or better. The other doors will meet Steel Door Institute Standards for minimum insulation and sound transmission requirements; i.e., sound transmission class 25.

QUESTION E290.41

There is a concern that noise might pass from the pump room back through the air inlet louvers and outside with little attentuation. In addition, the path around the false wall to the outside (facing houses 2 and 3) is short and not tortuous. Describe the method(s) you plan to employ to attenuate noise along these paths.

RESPONSE

The false wall has been closed off at the bottom. Air now will enter at the top of the false wall and come into the pump room through louvers which are located near the bottom of the false wall. In doing this, the path that noise must follow to the outside has been lengthened and made more tortuous. These measures will sufficiently attenuate noise along these paths.

QUESTION E291.5 (Table 3.3-1)

Explain the meaning (e.g., name the sources responsible) of the 1 MGD miscellaneous consumptive losses given in Table 3.3-1. Indicate the fate (i.e., discharge points, treatment, if any, and receiving waters) of these losses.

RESPONSE

One MGD was selected as a conservative estimate for maximum miscellaneous consumptive losses. The only major identifiable miscellaneous consumptive loss is the spray pond seepage and evaporation, which is expected to be no greater than 0.1 MGD.

The major portion of the identifiable miscellaneous consumptive losses is evaporation. Water vapor will be distributed by local air currents.

The seepage losses will enter the natural groundwater underflow below the spray pond. Approximately 77 percent of the natural underflow flows into the Schuylkill River adjacent to the site, and the remaining 23 percent flows toward the north. The spray pond seepage losses will be distributed along the same flow paths in the same proportions as the natural underflow.

QUESTION E291.8 (Section 3.4.4)

Indicate the expected frequency and duration of discharges from spray pond.

RESPONSE

Acceptable spray pond water inventory and quality will be maintained by periodic makeup and blowdown (overflow). Makeup will be controlled by a single high-low level switch. A low level signal will open the spray pond makeup valve, and a high level signal will close the valve. Blowdown will be controlled by a variable timer that overrides the high level signal until it times out. This will permit flushing of the pond after it is full. The pond water quality will be monitored in accordance with the Technical Specifications, and the timer will be adjusted as required to maintain acceptable water quality.

The duration and quantity of blowdown will vary with meteorological conditions. Based on the predicted daily average spray pond evaporation rate and rainfall and runoff contribution shown on Figure 3.3-1, the expected blowdown duration is approximately 1/2 hour per day (12,000 gallons). The worst case evaporative water loss with no rainfall contribution is expected to require approximately 6 hours of blowdown per day (180,000 gallons). Differences in the amount of precipitation, as shown in Table 2.3.1-5, will cause variation in the duration of the makeup and blowdown operation of less than ±1/2 hour per day on an average monthly basis. The duration is also dependent on the amount of cooling tower makeup required during the blowdown operation because the cooling towers and spray pond use the same makeup line. The durations stated above are based on the assumption of no cooling tower makeup during spray pond blowdown.

QUESTION E291.10 (Section 3.6.1)

Provide a more accurate estimate of and bases for the estimate of condenser tube corrosion products in the station blowdown.

RESPONSE

The main condenser has Admiralty brass ASTM B111 tubes. The estimated corrosion product release concentrations are given below:

Average Total Copper Release Concentration	Average Total Zinc Release Concentration
65 ppb	200 ppb

The above estimates were established after a comparison of computerized mathematical models for calculating metal concentrations in recirculating water systems using steady state corrosion product release rates and field copper concentration measurements from operating plants with Admiralty brass tubes in their main condensers. The more conservative data was used.

QUESTION E291.11 (Section 3.6.4)

Indicate, with bases, the maximum expected total residual chlorine (TRC) in the station discharge, the expected duration of measurable (i.e., greater than 0.1 mg/l) TRC presence in the blowdown, the monitoring point and method of measurement.

RESPONSE

The maximum expected total residual chlorine (TRC) in the station discharge when two units (cooling towers) are operating is 0.22 mg/l (Figure E291.11-1). This takes into account the dilution effect of mixing with cooling tower blowdown from the second cooling tower. The chlorination of each tower is set 4 hours apart.

The maximum expected TRC in the station discharge would be expected to double if only one cooling tower is in operation. The maximum concentration would then be 0.43 mg/l (Figure E291.11-2).

When cooling tower blowdown is available from the second cooling tower for dilution, the TRC in the station discharge will be greater than 0.1 mg/l for only 50 minutes (Figure E291.11-1). With one unit operating alone, the TRC in the station discharge will be greater than 0.1 mg/l for only 77 minutes (Figure E291.11-2).

Figures E291.11-1 and E291.11-2 show an estimate of TRC to be expected in the condenser outlet and cooling tower blowdown during and immediately after each chlorination cycle. These curves are based on TRC studies carried out at the John E. Amos Plant at St. Albans, W. Virginia and presented in a technical paper by J. E. Draley of Argonne National Laboratory (ANL/ES-23), entitled, "Chlorination Experiments at the John E. Amos Plant of the Appalachian Power Co." (April 9 - 10, 1973).

The Amos Plant data has been adjusted to reflect the expected water composition chlorination schedule and cooling tower operation at Limerick to produce these figures. The major chemistry parameter in cooling water, which affects the TRC levels required to produce effective chlorination, is the ammonia concentration. These figures were based on the median ammonia concentration as nitrogen from Table 3.6-2. The maximum median ammonia value occurs during the months of December through February and is expected to be about 0.47 mg/l as nitrogen. This concentration was converted to TRC by empirical methods. This value was verified by comparison with data from other operating plants. The expected TRC levels at Limerick, based on the

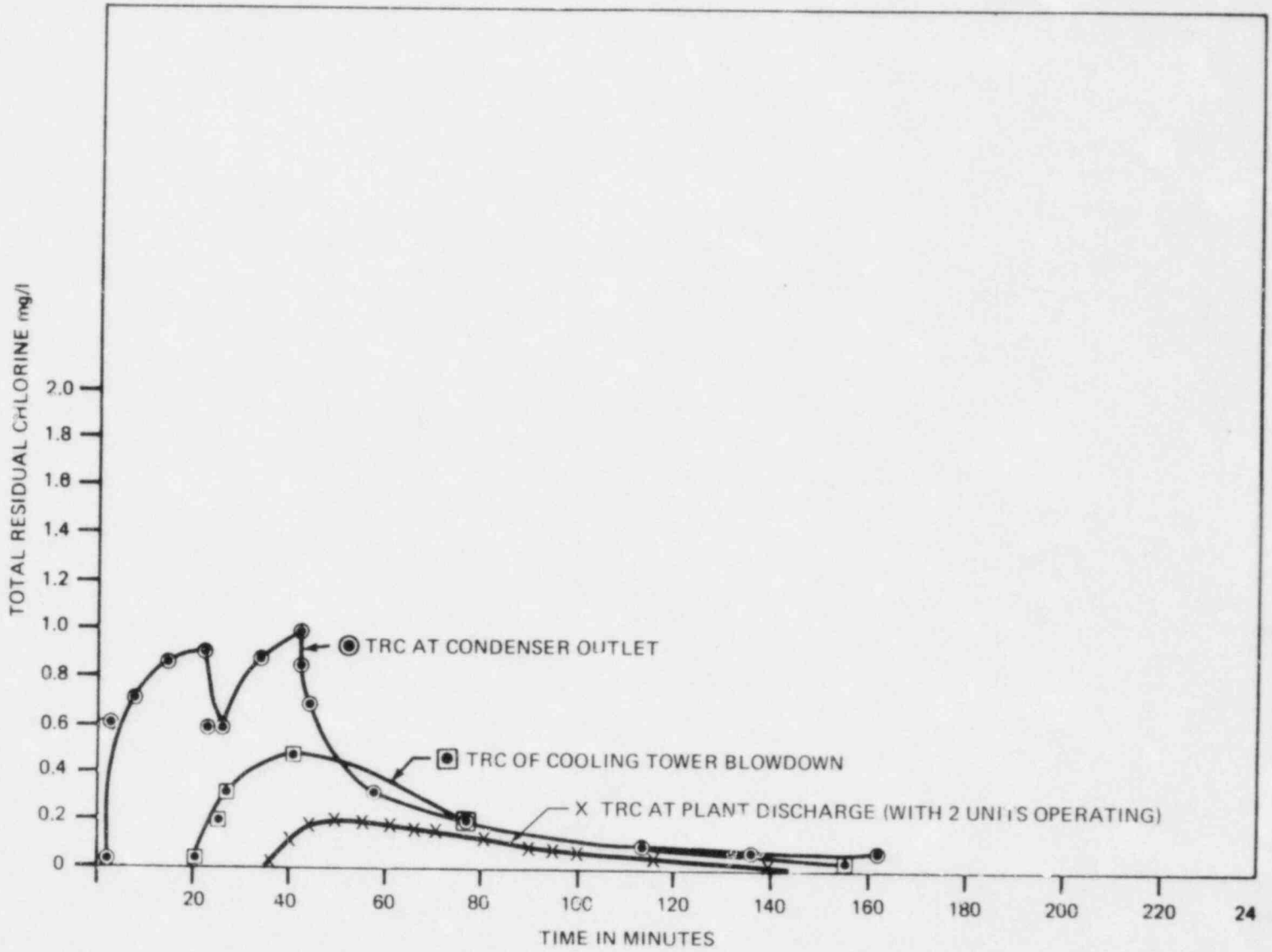
expected ammonia concentration, are about twice the levels found at the John E. Amos Plant. The Limerick cooling towers will be operated in a manner that differs from the operating practice at the Amos Plant. This will compensate for the higher expected TRC levels due to ammonia and have an overall effect of producing lower TRC levels than at the Amos Plant. The operating practices at Limerick that differ from the Amos Plant are:

a. At Limerick only one-half of the condenser will be chlorinated at a time. At the Amos Plant the whole condenser is done at once. When this stream mixes with the unchlorinated condenser stream (the other half not being chlorinated), the average TRC concentration will be halved in the water returning to the cooling tower.

b. The chlorine injection time at Limerick will be about 20 minutes per condenser half (40 minutes total) with a 5 minute flush between injections. The chlorination of the other tower is set 4 hours apart to minimize peak TRC concentration. The Amos Plant has only one cooling tower and chlorinates for 30 minutes. The Limerick TRC peak concentration will be less than at the Amos Plant based on injection time because two 20-minute injection cycles allow the TRC concentration to decrease between injections due to evaporative and blowdown losses. This produces a lower peak TRC concentration than a single long chlorination period. This is shown as a double peak curve on Figures E291.11-1 and E291.11-2.

Calculations show that it will take approximately 14 minutes for the cooling tower blowdown to travel from the cooling tower basin to the diffuser outlet in the Schuylkill River. As the water flows in this pipeline, the TRC in the cooling tower blowdown will react with the organics present in the pipeline and will be eliminated. It is estimated that an additional 10 percent reduction will occur to TRC concentration during this time. The data in Figures E291.11-1 and E291.11-2 have been reduced to account for this reduction. On Figure E291.11-1 (two unit operation), no credit has been taken for the chlorine demand of the blowdown water from the second tower which is not being chlorinated. This stream would consume TRC.

Sample connection is provided on the cooling tower blowdown line to permit grab samples, which can be analyzed for TRC. Also, there is an automatic sampler approximately 975 feet downstream from the plant discharge diffuser where grab samples can be taken for TRC analyses. An amperiometric titrator will be used for analyses.

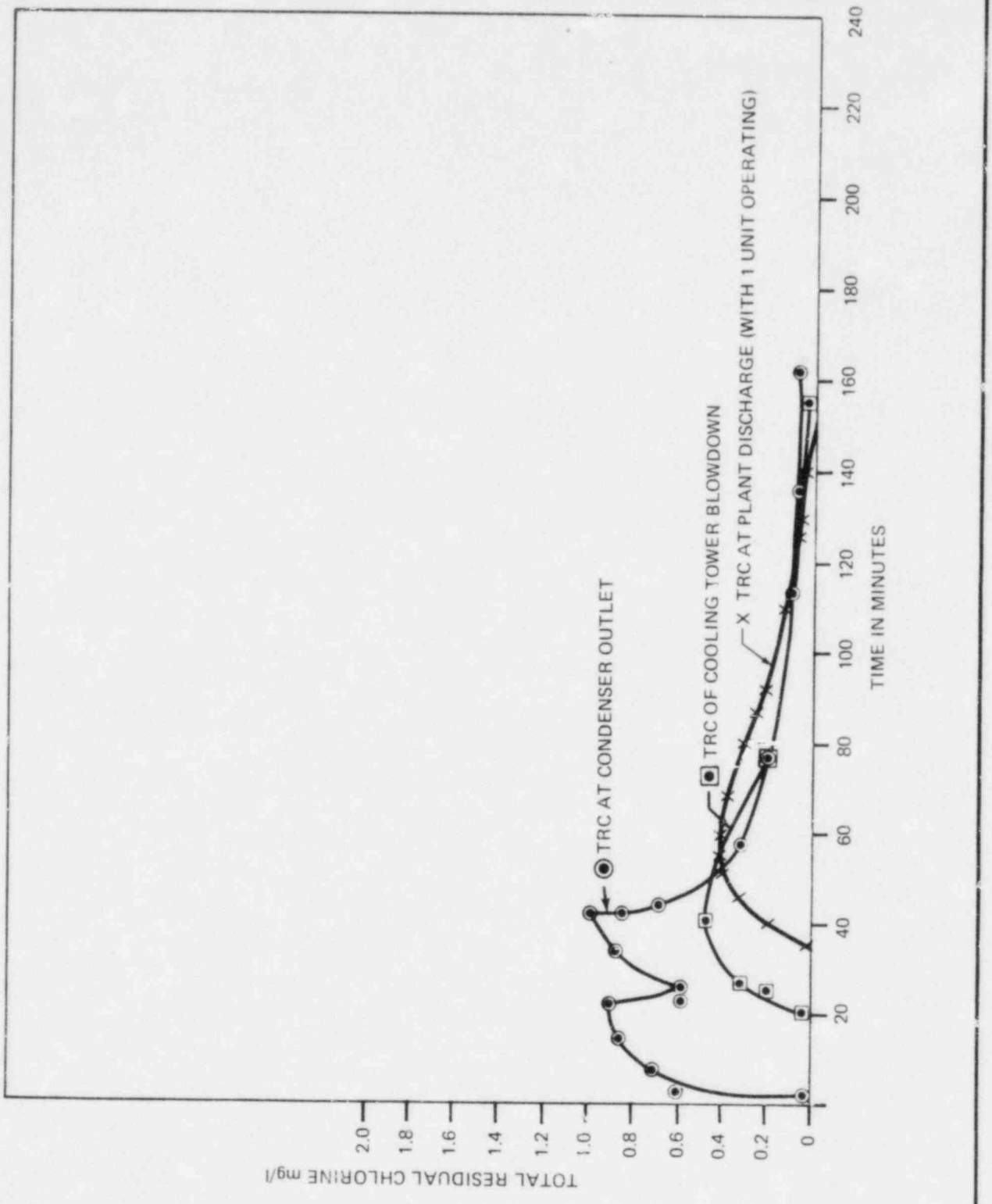


LIMERICK GENERATING STATION
UNITS 1 AND 2
ENVIRONMENTAL REPORT

ESTIMATED TRC FOR CONDENSER OUTLET, COOLING TOWER BLOWDOWN, AND PLANT DISCHARGE (WITH 2 UNITS OPERATING)

FIGURE E291.11-1

REV. 10, 02/83



LIMERICK GENERATING STATION
UNITS 1 AND 2
ENVIRONMENTAL REPORT

ESTIMATED TRC AT CONDENSER OUTLET, COOLING TOWER BLOWDOWN, AND PLANT DISCHARGE (ONE UNIT OPERATING)

FIGURE E291.11-2 REV. 10, 02/83

QUESTION E291.12 (Section 6.3)

Provide a discussion of the expected volume, timing (onset and cessation dates), and duration of pumping water through the Point Pleasant Diversion/Perkiomen Creek system to the Limerick Generating Station for average and worst case years. Discuss the variability of flowrates in the PECo portion of the system for times when water is to be used at LGS and when flow would be maintained only for maintenance of aquatic life in Perkiomen Creek.

RESPONSE

The maximum quantity of water to be withdrawn from the Delaware River and pumped to the East Branch Perkiomen Creek is 46 mgd (71 cfs). Once pumping begins, it must be continued during the entire low flow season at a rate of at least 27 cfs, whether the water is needed at Limerick or not, to protect the aquatic life in the East Branch Perkiomen Creek. For the remainder of the year, a flow of at least 10 cfs must be maintained in the East Branch Perkiomen Creek. During periods of high natural flow in the East Branch Perkiomen Creek, all pumping will be stopped until the flow recedes to normal levels. Water will be withdrawn from the Perkiomen Creek at Graterford at a maximum rate of 42 mgd and pumped to Limerick. The Point Pleasant/Perkiomen Creek system will be used when the flow and temperature in the Schuylkill River prohibit withdrawal in compliance with DRBC Docket D-69-210-CP.

For the average year, pumping from the Delaware River would begin in mid-April and continue at a rate of at least 27 cfs to mid-October. For the remainder of the year, pumping from the Delaware River would be at a rate of 10 cfs. Withdrawals from the Schuylkill River, for the average year, would be prohibited approximately 185 days out of the year.

For the worst year on record, pumping from the Delaware River would begin in January and continue at a rate of at least 27 cfs throughout the whole year. Withdrawals from the Schuylkill River, for the worst year, would be prohibited approximately 283 days out of the year.

As requested in the August 18, 1982 meeting, a copy of the Pennsylvania Department of Environmental Resources Water Quality Management Permit 4671202 is provided in Exhibit E291.12-1.

COMMONWEALTH OF PENNSYLVANIA

V. S. BOYER

JUL 19 1976

DEPARTMENT OF ENVIRONMENTAL RESOURCES
POST OFFICE BOX 2063
HARRISBURG, PENNSYLVANIA 17120

Philadelphia Electric Company
1000 Chestnut Street
Philadelphia, Pennsylvania 19105

Attention: Mr. Vincent Boyer, Vice President

Gentlemen:

Enclosed is a Water Quality Management Permit No. 4671202 for the Limerick Nuclear Steam Electric Generating Station. Please note that the permit has a number of standard conditions and a number of special conditions.

In issuing the attached permit, the Department determined that the facilities proposed in your application, if operated properly, will meet the water quality standards for the Schuylkill River. Although the permit deals primarily with the impact of the discharge on the Schuylkill, the Department is concerned about the availability of water to operate this generating station. The Delaware River Basin Commission also expressed concern over the availability of water for this station and in November, 1975 resolved the problem by conditionally approving your application for the withdrawal of surface water. Therefore, we must qualify this permit to discharge by requiring you to comply with the DRBC approval as specified in Docket D-69-210CP, dated November 5, 1975.

Sincerely yours,

Ernest F. Giovannitti, Chief
Division of Industrial Wastes
and Erosion Regulation

Attachment

EXHIBIT E 291.12-1

DEPARTMENT OF ENVIRONMENTAL RESOURCES
BUREAU OF WATER QUALITY MANAGEMENT

WATER QUALITY MANAGEMENT PERMIT

NO 4671202

A. PERMITTEE (Name and Address)

Philadelphia Electric Company
300 Chestnut Street
Philadelphia, Pennsylvania 19105

B. PROJECT LOCATION

Municipality: Limerick Township
County: Montgomery

C. TYPE OF FACILITY OR ESTABLISHMENT

Nuclear steam-electric generating station

D. NAME OF MINE OPERATION OR AREA SERVED

Limerick Generating Station

E. THIS PERMIT APPROVES

1. Plans For Construction of

- a. ☐ PUMP STATIONS, SEWERS AND APPURTENANCES
- b. ☐ SEWAGE TREATMENT FACILITIES
- c. ☐ MINE DRAINAGE TREATMENT FACILITIES
- d. ☒ INDUSTRIAL WASTE TREATMENT FACILITIES
- e. ☐ OUTFALL & HEADWALL
- f. ☐ STREAM CROSSING

2. The Discharge of:

- a. ☒ TREATED
- ☐ UNTREATED
- b. ☒ INDUSTRIAL WASTE
- ☐ MINE DRAINAGE
- ☐ SEWAGE

3. The Operation of:

- ☐ MINE
  MAXIMUM AREA TO BE DEEP MINED _____
- ☐ DAM

4. An Erosion and Sedimentation Control Plan ☐
PROJECT AREA IS _____ ACRES.

5. Nature of Discharge or Impoundment:

- ☒ DISCHARGE TO SURFACE WATER
- ☐ DISCHARGE TO GROUND WATER
- ☐ IMPOUNDMENT

Schuylkill River
(Name of Stream to which discharge or drainage area on which ground water discharge takes place or impoundment is located).

F. You are hereby authorized to construct, operate or discharge, as indicated above, provided that you comply with the following:

1. All representations regarding operations, construction, maintenance and closing procedures as well as all other matters set forth in your application and its supporting documents (Application No. 4671202 dated March 30, 1971), and amendments dated 9 & 11/24/71, 2/14, 4/10, & 6/13/72. Such application, it's supporting documents and amendments are hereby made a part of this permit.
2. Conditions ~~numbered~~ All of the Industrial Wastes Standard Conditions dated October 1, 1971 which conditions are attached hereto and are made a part of this permit.
3. Special condition(s) designated A, B, C, D, E, F, & G. which are attached hereto and are made a part of this permit.

G. The Authority granted by this permit is subject to the following further qualifications:

1. If there is a conflict between the application or its supporting documents and amendments and the standard or special conditions, the standard or special conditions shall apply.
2. Failure to comply with the Rules and Regulations of the Department or the terms or conditions of this permit shall void the authority given to the permittee by the issuance of the permit.
3. This permit is issued pursuant to the Clean Streams Law, The Act of June 22, 1937, P.L. 1987 as amended and/or the Water Obstruction Act of June 25, 1913, P.L. 555 as amended. Issuance of this permit shall not relieve the permittee of any responsibility under any other law.

PERMIT ISSUED
DATE JUL 16 1976

DEPARTMENT OF ENVIRONMENTAL RESOURCES
BY Ernest F. Giovannitti
Ernest F. Giovannitti, Chief
TITLE Division of Industrial Wastes & Erosion Regulation

INDUSTRIAL WASTES
PERMIT NO. 4671202

This permit is issued subject to all Rules and Regulations now in force, and the following Special Conditions:

A. The effluent discharged to the waters of the Commonwealth shall not be acid, shall have a pH of not less than 6.0 nor greater than 9.0, and shall not contain more than 7.0 mg/l of dissolved iron.

B. Within six months after the herein approved waste treatment works are constructed and placed in operation, the permittee shall submit to the Department evidence of the efficiency and adequacy of such works in treating the waste discharges from this establishment.

C. All bio-degradable wastes shall be given a minimum of secondary treatment or its equivalent for industrial wastes. Secondary treatment is that treatment which shall accomplish the following:

(1) Reduce the organic waste load as measured by the biochemical oxygen demand test by at least 85% during the period May 1 to October 31 and by at least 75% during the remainder of the year based on a five consecutive day average of values.

(2) Remove practically all of the suspended solids.

(3) Provide effective disinfection to control disease producing organisms.

(4) Provide satisfactory disposal of sludge.

(5) Reduce the quantities of oils, greases, acids, alkalis, toxic, taste and odor producing substances, color and other substances inimical to the public interest to levels which shall not pollute the receiving stream.

An equivalent of the treatment prescribed above shall be required for non-biodegradable wastes.

D. The effluent shall also be limited to concentrations of total dissolved solids not more than 570 mg/l, total suspended solids not more than 30 mg/l, copper not more than 0.1 mg/l and chlorine not more than 0.25 mg/l.

E. Waterborne releases of radioactive material to unrestricted areas shall conform to criteria set forth in Title 10 Code of Federal Regulation Part 50 Appendix I - Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion "As Low As Practicable" for Radioactive Material in Light-Water-Cooled Nuclear Power Reactor Effluents, as implemented through the Environmental Technical Specifications.

The intended effect of the standard condition is the reiteration of federal criteria and license conditions. The federal criteria are expressed in Title 10 Code of Federal Regulation Part 50 Appendix I. These criteria are implemented at a particular facility through Environmental Technical Specifications which are developed by the facility operator. These specifications become conditions for operation upon review and eventual approval by the Nuclear Regulatory Commission (NRC). The specifications are a part of the facility operating license from NRC.

F. The facility operator shall provide the Department with copies of reports specifying the quantities of radioactive materials released to unrestricted areas in liquid effluents.

G. The facility operator shall provide the Department with copies of reports of the results of environmental surveillance activities and such other reports as necessary for the estimation of the dose consequential to facility operation.

October 1, 1971

COMMONWEALTH OF PENNSYLVANIA

DEPARTMENT OF ENVIRONMENTAL RESOURCES

STANDARD CONDITIONS RELATING TO INDUSTRIAL WASTES

For use in Water Quality Management Permits

1971

General

1. The plans for which this permit is issued are approved subject to the condition that the waste treatment plant constructed under said plans will produce an effluent satisfactory to the Department. By this approval, neither the Department nor the Commonwealth of Pennsylvania assumes any responsibility for the feasibility of the plans or the operation of the plant to be constructed thereunder.

2. All relevant and non-superseded conditions of any prior water quality management permits, decrees, or orders issued to the herein permittee or his predecessor shall be continued in full force and effect and together with the provisions of this permit shall apply to his successors, lessees, heirs and assigns.

3. The responsibility for the carrying out of the conditions of this permit shall rest upon the owner, lessee, assignee, or other party in responsible managerial charge of the operation producing the wastewaters and of the waste treatment works herein approved, such responsibility passing with each succession in said control. Approval of a discharge or facilities under a permit shall not be effective as to a new owner until a transfer has been executed and filed on forms provided by the Department and the transfer is approved by the Department.

4. The permittee shall secure any necessary permission from the proper federal authority for any outfall or industrial waste treatment structure which discharges into or enters navigable waters and shall obtain approval of any stream crossing, encroachment or change of natural stream conditions coming within the jurisdiction of the Department.

5. In order to avoid obsolescence of the plans of waste treatment works, the approval of the plans herein granted, and the authority granted in the permit, if not specifically extended, shall cease and be null and void two years from the date of this permit unless the works covered by said plans shall have been completed and placed in operation on or before that date.

6. Approval of plans refers to functional design and not structural stability, which is assumed to be sound and in accordance with good structural design. Failure of the works herein approved because of faulty structural design or poor construction will render the permit void.

7. The Department may at a subsequent time modify, suspend or revoke this permit whenever the waters affected by the presently authorized waste discharge have become so improved in character through natural or artificial processes of conservation or reclamation as to render inimical or harmful the effluent from the works herein approved, or whenever the Department increases treatment requirements for wastes generally.

   Therefore, the permittee is hereby notified that when the Department shall have determined that the public interest requires the further treatment of such of the permittee's industrial wastes as are discharged to the waters of the Commonwealth, then upon notice by the Department and within the time specified, the permittee shall submit to the Department for its approval, plans and a report providing for the required degree of treatment, and after approval thereof, shall construct such works in accordance with the requirements of the Department.

8. If at any time the industrial waste treatment works of the permittee, or any part thereof, or the discharge of the effluent therefrom, shall have created a public nuisance, or such discharge is causing or contributing to pollution of the waters of the Commonwealth, the permittee shall forthwith adopt such remedial measures as are acceptable to the Department.

9. Nothing herein contained shall be construed to be an intent on the part of the Department to approve any act made or to be made by the permittee inconsistent with the permittee's lawful powers or with existing laws of the Commonwealth regulating industrial wastes and the practice of professional engineering, nor shall this permit be construed to sanction any act otherwise forbidden by any of the laws of the Commonwealth of Pennsylvania or of the United States.

Construction

10. The works shall be constructed under expert engineering supervision and competent inspection, and in accordance with plans, designs, and other data as herein approved or amended, and with the conditions of this permit.

11. No radical changes shall be made in the works herein approved without approval of the Department. Revisions which do not increase the rate of flow or change the quality of the effluent, the treatment processes or the point of discharge, may be approved by the Regional Sanitary Engineer upon submission of plans. Other revisions must be approved by a permit.

12. The outfall sewer or drain shall be extended to low water mark of the receiving body of water in such a manner as to insure the satisfactory dispersion of its effluent thereinto; insofar as practicable it shall have its outlet submerged; and shall be constructed of cast iron, concrete, or other material approved by the Department; and shall be so protected against the effects of flood water, ice, or other hazards as to reasonably insure its structural stability and freedom from stoppage.

13. When the herein approved industrial waste treatment works is completed and before it is placed in operation, the permittee shall notify the Department so that an inspection of the works may be made by a representative of the Department.

Operation and Maintenance

14. No matter how well designed and carefully constructed a waste treatment works may be, full effectiveness cannot be developed unless it is efficiently operated. In order to secure such efficiency, protect the waters of the Commonwealth, and insure the most effective and economical dosage when chemicals are used, the permittee is required to place the works under the regular charge of a responsible plant official, and its operation under the control of the designer of the works or other qualified person approved by the Department, for at least one year after completion. Moreover, upon written notice from the Department, the permittee shall maintain one or more skilled operators regularly on duty for such daily periods as the Department may direct.

15. The right to discharge the effluent from the herein approved industrial waste treatment works into the waters of the Commonwealth is contingent upon such operation of these works as will at all times produce an effluent of a quality satisfactory to the Department. If, in the opinion of the Department, these works are not so operated or if by reason of change in the character of wastes or increased load upon the works, or changed use or condition of the receiving body of water, or otherwise, the said effluent ceases to be satisfactory for such discharge, then upon notice by the Department the right herein granted to discharge such effluent shall cease and become null and void unless within the time specified by the Department, the permittee shall adopt such remedial measures as will produce an effluent which, in the opinion of the Department, will be satisfactory for discharge into the said receiving body of water.

16. No untreated or ineffectively treated wastewaters shall at any time be discharged into the waters of the Commonwealth, and especial care shall be used to prevent accidental "spills" or similar unusual discharges of all raw, finished and waste materials.

17. No storm water, sewage or other industrial wastes not specifically approved herein, shall be admitted to the works for which this permit is issued, unless with the approval of the Department.

18. The various structures and apparatus of the industrial waste treatment works herein approved shall be maintained in proper condition so that they will individually and collectively perform the functions for which they were designed. In order to insure the efficacy and proper maintenance of the treatment works, the permittee shall make periodic inspections at sufficiently frequent intervals to detect any impairment of the structural stability, adequate capacity, or other requisites of the herein approved works which might impair their effectiveness, and shall take immediate steps to correct any such impairment found to exist.

19. Any screenings, and any settled or floated solids, shall at no time be permitted to accumulate in sedimentation basins to a depth sufficient to interfere with the settling efficiency thereof. Any such material removed shall be handled and disposed of so that a nuisance is not created and so that every reasonable and practical precaution is taken to prevent the said material from reaching the waters of the Commonwealth.

20. The permittee shall keep records of operation and efficiency of the waste treatment works and shall submit to the Department, promptly at the end of each month, such report thereon as may be required by the Department.

21. The discharge of untreated or improperly treated industrial wastes to the waters of the Commonwealth is contrary to the requirements of the Department. If, because of accidental breakdown of the treatment works or plant equipment or for other reason, any such discharge should occur, then the operation of the mill or process producing such discharge shall be discontinued until repairs to the treatment works or other satisfactory measures to prevent water pollution shall have been completed.

DEPARTMENT OF ENVIRONMENTAL RESOURCES
BUREAU OF WATER QUALITY MANAGEMENT
REGIONAL OFFICES

REGIONAL SANITARY ENGINEERS/WATER QUALITY MANAGERS REGIONAL HEADQUARTERS	COUNTIES SUPERVISED	
C. T. Beechwood Regional Sanitary Engineer 1875 New Hope Street Norristown, Pennsylvania 194011 Tel: 215-631-2408	Bucks Chester Delaware Montgomery Philadelphia	
Lawrence Pawlush Regional Water Quality Manager 90 E. Union Street P. O. Box 659 Wilkes-Barre, Pennsylvania 18703 Tel: 717-825-7511, Ext. 474	Bradford Lackawanna Luzerne Monroe Pike	Sullivan Susquehanna Tioga Wayne Wyoming
John P. Durr Regional Sanitary Engineer 16 Angelica Street Reading, Pennsylvania 19611 Tel: 215-378-4358	Berks Carbon Lehigh Northampton Schuylkill	
Terry R. Fabian Regional Water Quality Manager Room 1003, Health & Welfare Building Harrisburg, Pennsylvania 17120 Tel: 717-787-9665 or 9860	Adams Cumberland Dauphin Franklin Lancaster	Lebanon Perry York
Mark A. Roller Regional Sanitary Engineer 736 West Fourth Street Williamsport, Pennsylvania 17701 Tel: 717-326-2681, Ext. 258	Bedford Blair Cambria Centre Clinton Columbia Fulton Huntingdon	Juniata Lycoming Mifflin Montour Northumberland Snyder Somerset Union
Howard G. Luley Regional Sanitary Engineer 600 Kossman Building 100 Forbes Avenue Pittsburgh, Pennsylvania 15222 Tel: 412-565-5091	Allegheny Armstrong Beaver Butler Fayette	Greene Indiana Washington Westmoreland
Homer Fry Regional Sanitary Engineer 1012 Water Street Meadville, Pennsylvania 16335 Tel: 814-724-3700	Cameron Clarion Clearfield Crawford Elk Erie Forest	Jefferson Lawrence McKean Mercer Potter Venango Warren

QUESTION E291.18 (Section 5.1.3)

In Section 5.1.3.1.1.b, the statement is made that entrainment of fish eggs and larvae is not expected to seriously alter species composition or density of important species near the station. No quantitative analysis is provided. Provide additional discussion that supports this conclusion.

RESPONSE

Analysis of impact due to cooling water withdrawal primarily involves consideration of the location, design, and capacity of the particular intake. While location and design aspects of the Schuylkill River intake were discussed under Section 5.1.3.1.1.a, the primary basis for the statement was the relatively small proportion of Schuylkill River flow that will be withdrawn.

Table 5.1-2 depicts the water withdrawals for simulated two-unit generation as a percentage of the 1974-1977 flows measured at the USGS Pottstown gage. These percentage-of-flow-withdrawn figures were upgraded to show simulated (predicted) percentage of fish eggs and larvae withdrawn based on biological monitoring data obtained at the intake site (Section 6.1.1.2.1.6). The resultant predicted entrainment estimates were presented in Table 5.1-4.

As presented in Table 5.1-4, the percent drift entrained for the important species was usually a relatively small percent of those drifting downriver past the intake. In 1975, predicted entrainment of larvae of important species exceeded 5% twice for tessellated darter and for banded killifish. No other important species as defined in Section 2.2 had a percent of drift entrained value over 3.4% in 1975. In 1976, predicted entrainment exceeded 5% in five instances and for only one important species, goldfish. None of these three species are important in the recreational fishery in the site vicinity, and none have been identified as being of critical importance of the structure and function of the Schuylkill River ecosystem.

Entrainment losses of the magnitudes shown in Table 5.1-4 are relatively small compared to other cooling water intakes on the Schuylkill River where fish populations have continued to exist and produce a harvestable surplus for anglers. The ability of fish populations to produce harvestable surpluses is well known among fishery scientists. While some reduction in population size may occur due to harvest by the intake, it is highly

unlikely that such a limited change would have anything but minimal impact on the fish community.

The species composition of the fish community would be upset if the intake entrainment were highly selective for certain species. On the contrary, the intake is expected to entrain all drifting fish eggs and larvae within the influence of the intake plume without regard to species composition. Differential selection of species does occur to a limited extent as a result of species distribution within the river, i.e., the density of eggs and larvae of some species is greater near the Montgomery Country shore (intake location) than outside the zone of intake influence. Thus, some species are entrained in greater numbers and percentages than would be expected if uniform across-river distribution were assumed. Nonetheless, species composition is not expected to be altered due to entrainment because of the small percentage of water removed from the river. In addition, the year-to-year variation (compare 1975 vs. 1976) that occurs in species composition of drift in the near shore area that will be within the intake plume limits the exposure of any particular species to entrainment. The river in the vicinity of Limerick is not critical to the survival of any fish because similar riverine habitats exist in the Schuylkill River and elsewhere. The limited withdrawal of water by Limerick will not endanger the survival of any species due to entrainment of early life stages.

QUESTION E291.22

Provide a discussion of control procedures, and other measures to be taken to prevent the growth of organisms in the spray pond. Organisms of principal concern are fish and Asiatic clams.

RESPONSE

The procedures for controlling algae with slug applications of hypochlorite are discussed in Section 3.6.2.

Philadelphia Electric Co. has been monitoring the Delaware and Schuylkill Rivers near the Limerick intake points, and there has been no evidence of Asiatic clam infestation. However, various control methodologies including heat and low level chlorination combined with screens/traps are currently being employed by other utilities. The water supplies will continue to be monitored to detect the possible appearance of Asiatic clams. If they are detected, the best technology available at the time will be used to prevent their growth in the spray pond. Control of fish in the spray pond can be effected using a fish poison such as rotenone.

QUESTION E310.10 (Section 2.6)

The response to Question E310.10 addresses only the transmission lines; there was no mention of "impacts to cultural resources in the vicinity of the plant property...," nor correspondence supplied addressing that topic as requested.

Please provide lists of properties presently listed or eligible for listing on the National Register of Historic Places within 15 km of the site or within 2 km of the transmission line routes. The ER-OL (2.6) contains no list and refers to the ER-CP listing which needs to be updated.

Please identify any impacts to cultural resources in the vicinity of the Limerick Plant which could potentially result from the operation and maintenance of the facility. Provide copies of any correspondence you have had with the State Historic Preservation Officer (SHPO) on this topic.

Please provide a report on the archeologic survey done on the transmission line corridors.

With regard to the Point Pleasant Pumping Station; have archeologic surveys been conducted on the pump station site, water line transmission corridors, Bradshaw Reservoir, etc.? If so, please provide copies of the reports. Please provide copies of correspondence with the SHPO on this topic.

RESPONSE

There will be little or no impact to cultural resources in the vicinity of the transmission lines resulting from the operation and maintainance of these lines. As noted in the response to Question E290.12, all lines will be built on existing transmission and railroad rights-of-way and will not require new access roads.

An archeological survey was made by John Milner Associates, Inc., 309 North Matlack Street, West Chester, PA 19380. This report was submitted to the Pennsylvania PUC on August 23, 1982 in response to their request. A copy of PECo's letter of notification to Pennsylvania Historical and Museum Commission and a reply from Brenda Barrett, Director of Bureau for Historic Preservation, are provided.

The properties presently listed or eligible for listing on the National Register of Historic Places within 15 km of the site or within 2 km of the transmission routes are listed below:

Coventry Hall, Conventryville, off PA23.

Good News Building (Yellow Springs Spa), North of Chester Springs on Art School Road.

Hall's Bridge, about 3 miles North of Chester Springs at Sheeder Road and Birch Run.

Martin-Little House, South of Phoenixville of PA113 on Church Road.

Prizer's Mill Complex, West of Phoenixville on Seven Stars Road.

Coventryville Historic District, South of Pottstown on PA23.

Simon Meredith House, 0.5 miles West of Pughtown on Pughtown Road.

Townsend House, Southwest of Pughtown off PA100.

River Bend Farm, North of Spring City on Sanatoga Road.

Kuster Mill, In Collegeville vicinity on Skippack Creek at Mill Road and Walter Street Road.

Pottstown Roller Mill, South and Hanover Streets, Pottstown.

Henry Antes House, Northeast of Pottstown on Colonial Road.

Pottsgrove Mansion, West of Pottstown on Benjamin Franklin Highway.

John Englehardt Homestead, West of Schwenksville off PA73 on Keyser Road.

Nathan Michener House, West of Bucktown on Ridge Road.

Birchrunville General Stor , Hollow and Flowing Springs Roads, Birchrunville.

Kimberton Village Historic District, Kimberton, both sides of Hares Hill Road between Kimberton and Cold Stream Road.

Kennedy Bridge, North of Kimberton off PA23 on Seven Stars Road over French Creek.

Rapps Bridge, Mont Clare vicinity off PA724 on Mowere Road.

Charlestown Village Historic District, Southwest of Phoenixville on Charlestown Road.

Deery Family Homestead, West of Phoenixville.

Fagley House, West of Phoenixville on Art School Road.

Hare's Hill Road Bridge, West of Phoenixville on Hare's Hill Road.

George Hartman House, West of Phoenixville on Church Road.

Conrad Grubb Homestead, Northwest of Schwenksville off PA on Perkiomenville Road.

Long Meadow Farm (Plank House and Barn), Northwest of Schwenksville on PA73.

Pennypacker Mansion, 5 Haldeman Road, Schwenksville Vicinity.

Sunrise Mill, 3 miles West of Schwenksville on Neiffer Road.

Augustus Lutheran Church, 7th Avenue E and Main Steet, Trappe.

Old Swede's House, Old Philadephia Pike, Douglasville.

Gabriel's Episcopal Church, US 422, Douglasville.

White Horse Tavern, 509 Old Philadelphia Pike, Douglasville.

Washington's Headquarters, Valley Creek Road near jct. of PA 252 and 23.

Kuster Mill on Skippack Creek at Mill Road and Water Street Road near Collegeville.

Warren Z. Cole House (Kidder - DeHaven House) Skippack Pike and Evansburg Road.

Peter Wentz Homestead, Schultz Road, Worcester.

This list was compiled by reference to site area maps and the Federal Register Annual Listings of Historic Properties dated February 6, 1979, March 18, 1980, February 3, 1981, and February 2, 1982.

Based on the following considerations, it is expected that there will be little or no impact on the historic properties due to the operation and maintenance of the Limerick facility.

a. Cooling tower noise beyond the exclusion zone will not exceed the EPA Guidelines for outdoor noise levels (Section 5.1.4.2.8).

b. The size of the cooling towers (combined with the topography of the site) will eliminate the possibility of the visible or invisible plume from reaching the ground; therefore, there will be no additional fogging, icing, or humidity at any of the cultural resources (Section 5.1.4.2.2).

c. The transmission lines are designed so that under fair conditions audible noise is imperceptible at 230kV and only slightly perceptible at 500kV near the tower locations. During heavy rains, the 500kV design only produces 54 dB at 50 ft from the conductor (Section 3.9.3.3).

A copy of the archeological survey done by John Milner Associates on the transmission line corridors (Limerick-Cromby, Cromby-Plymouth Meeting, Cromby-North Wales, Limerick-Whitpain) and copies of correspondence between PECo and the State Historical Preservation Officer on this topic were provided to the NRC by letter from E. J. Bradley to A. Schwencer dated February 25, 1983.

With regard to the Point Pleasant Pumping Station, an archeological survey was conducted in 1978 by Edward M. Schortman and Patricia A. Urban. Their report entitled, "A Survey of Cultural Resources in the Area of the Proposed Point Pleasant Pumping Facilities, Combined Transmission Main, Bradshaw Reservoir, North Branch Main and Perkiomen Main, Bucks County, Pennsylvania," was provided to the NRC by letter from E. J. Bradley to A. Schwencer dated February 25, 1983. Copies of correspondence between the NWRA and SHPO were requested from the NWRA and will be provided when received.