

INSTRUCTIONS FOR UPDATING YOUR ER

To update your copy of the Braidwood Station Environmental Report - Operating License Stage, please remove and destroy the following pages and insert the Amendment 4 pages as indicated.

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BRAIDWOOD NUCLEAR GENERATING STATION - UNITS 1 & 2

ENVIRONMENTAL REPORT - OPERATING LICENSE STAGE

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TABLE 2.1-14
NEAREST RESIDENCE AND GARDEN
WITHIN 5 MILES OF THE BRAIDWOOD STATION

<u>DIRECTION</u>	<u>NEAREST RESIDENCE, APPROXIMATE DISTANCE (miles)</u>	<u>NEAREST GARDEN APPROXIMATE DISTANCE (miles)</u>	
N	0.5	0.5	
NNE	0.7	0.7	
NE	0.5	0.5	2 1/4
ENE	1.1	1.1 ^a	
E	0.7	0.8	
ESE	2.2	2.3 ^a	2
SE	2.8	2.8	
SSE	3.2	3.4	
S	3.9	3.9	
SSW	0.9	0.9	
SW	0.7	0.7	
WSW	0.4	0.4	
W	0.3	0.3	
WNW	0.4	0.4	
NW	0.3	0.3	
NNW	0.4	0.4	

Source: Ruff (1977b).

^aRevised June 23, 1983. New survey conducted
by A. Lewis on June 23, 1983.

TABLE 2.1-15

OIL PIPELINES WITHIN 5 MILES OF THE BRAIDWOOD STATION

PIPELINE COMPANY	DISTANCE AND DIRECTION FROM SITE (closest approach)	SIZE (in.)	AGE (years)	BURIAL DEPTH (ft)	MAXIMUM OPERATING PRESSURE (psi)	LOCATION AND TYPE OF ISOLATION VALVES	PRODUCTS
Arco Pipeline Company ^a	3.3 miles NW	8	25 to 74	3	450	Manual block valves location depends upon terrain.	Refined products ^b
Midwestern Gas Trans- mission Line Company ^c	4.5 miles E	30	18	2.5 or more	700-800	^d	Natural gas
Natural Gas Pipeline Company of America ^e	4.1 miles E	36	24	3.5	Designed for 850 maximum. Nor- mally does not operate at maximum.	Automatic valves located every 10 miles.	Natural gas
Northern Illinois Gas Company ^f	4.2 miles S	4	13	3	60	Manual valve located at least every 10 miles.	Natural gas
	2.4 miles W	6	6 to 9	3	Designed for 230. Operating at 150.	Manual valve located at least every 10 miles.	Natural gas
	2.8 miles NW	12	^d	3	60	Manual valve located at least every 10 miles.	Natural gas
	2.8 miles NW	36 ^g	12	3	750	Manual valve located at least every 10 miles.	Natural gas
Texaco-Cities Service Pipeline Company ^h	2.8 miles SE	12	48	2 to 3	720	Manual valves located at pump stations and major streams.	Crude Oil
	2.8 miles SE	12	40	2 to 3	750	Manual valves located at pump stations and major streams.	Crude Oil
	4.8 miles ESE	18	28	2 to 3	850	Manual valves located at pump stations and major streams.	Crude Oil

^aSource: Morel (1977).^bRefined products include gasoline, kerosene, LPG, and ammonia.^cSource: Howard (1977).^dAsterisk (*) indicates information is not available.^eSource: Harbach (1977).^fSource: Morel (1977).^gSource: Weirich (1977).^hSource: Miller (1977).

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TABLE 6.1-9

DESCRIPTION OF BRAIDWOOD SUMMER BASELINE TERRESTRIAL SURVEY TRANSECTS 1972-1973

TRAN- SECT NUMBER	AREA DESCRIPTION	SAMPLE DESCRIPTION	LENGTH (ft)
1	Fallow Field	Veg.-point intercept	450
		Mam.-10 stations, 2 nights	500
		Birds-qualitative	450
		Insects and Herpetofauna-qual.	450
2	Recently Strip-mined	Veg.-point intercept	1000
		Mam.-10 stations, 2 nights	500
		Birds-qualitative	1000
		Insects and Herpetofauna-qual.	1000
3	Strip-mined in 1940's	Veg.-point intercept, fixed radius plot	735
		Mam.-10 stations, 2 nights	500
		Birds-qualitative	735
		Insects and Herpetofauna-qual.	735
4	Uncultivated Woodlands and Soybean Fields	Veg.-point intercept, fixed radius plot	1000
		Mam.-10 stations, 2 nights	500
		Birds-qualitative	1000
		Insects and Herpetofauna-qual.	1000
5	Strip-mined in 1950's (offsite area)	Veg.-point intercept	1230
		Mam.-10 stations, 2 nights	500
		Birds-qualitative	1230
		Insects and Herpetofauna-qual.	1230
6	7- to 10-year- old Strip- mined area	Veg.-point intercept	973
		Mam.-10 stations, 2 nights	500
		Birds-qualitative	973
		Insects and Herpetofauna-qual.	973
7	Cultivated Corn and Bean Fields	Veg.-qualitative	500
		Mam.-10 stations, 2 nights	500
		Birds-qualitative	500
		Insects and Herpetofauna-qual.	500
8	Uncultivated Woodlands	Veg.-point intercept, fixed radius plot	945
		Mam.-10 stations, 2 nights	500
		Birds-qualitative	945
		Insects and Herpetofauna-qual.	945
9	Strip-mined in 1940's	Veg.-point intercept, fixed radius plot	1000
		Mam.-10 stations, 2 nights	500
		Birds-qualitative	1000
		Insects and Herpetofauna-qual.	1000
10	Marshland (offsite area)	Veg.-point intercept	850
		Mam.-10 stations, 2 nights	500
		Birds-qualitative	850
		Insects and Herpetofauna-qual.	850

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TABLE 6.1-10

PREOPERATIONAL RADIOLOGICAL SAMPLING PROGRAM

SAMPLE MEDIA	COLLECTION SITES	TYPE AND FREQUENCY OF ANALYSIS ^{a,b}	FREQUENCY OF COLLECTION
Airborne Particulate Filter	Braidwood, Ouster Park, County Line Road, Essex, Gardner, and Godley	Gross Beta - W Sr-89, Sr-90 - Q Comp. Gamma Spec. - Q Comp.	Weekly
Charcoal Cartridge	Same as for Airborne Particulate Filter Sites	I-131	Every 2 weeks beginning 3 months before fuel loading
Direct Radiation	a. Same as for Airborne Particulate Filter Sites b. Inner ring, 16 sectors, site boundary ^(d) c. Outer ring, 16 sectors, 6-8 km range ^(d)	TLD	Quarterly
Surface Water ^c	Downstream at sampling Station 5	Sr-89, Sr-90 - Q Comp. Gamma Spec. - M Comp. Gross Beta - W Tritium - Q Comp.	Weekly
Intake/Discharge Pipes ^c	I/D Pipes if pumping; if not pumping, at Sampling Stations 3 and 4	Gross Beta - W Sr-89, Sr-90 - M Comp. Tritium - M Comp. Gamma Spec. - M Comp.	Weekly
Precipitation	Two nearby Dairies	Gamma Spec. - Q Comp. Sr-89, Sr-90 - Q Comp. Gross Beta - M Tritium - Q Comp.	Monthly
Well Water (offsite)	Nearest Well	Gamma Spec. Sr-89, Sr-90 Gross Beta Tritium	Quarterly
Vegetables	Farms within 10 miles	Gross Beta Sr-89, Sr-90 Gamma Spec. I-131 (leafy vegetable)	As available at harvest time
Cattle Feed and Grass	Two nearby Dairies	Gross Beta Sr-89, Sr-90 Gamma Spec.	Quarterly Grass: May-October Feed: November, December
Milk	Two nearby Dairies	Gamma Spec. Sr-89, Sr-90 - M I-131 (pasture season)	Monthly
Sediment Aquatic Plants ^c	Downstream at Sampling Station 5, Upstream at Sampling Station 1	Gross Beta Gamma Spec.	3 times a year if available
Fish ^c	Sampling Station 5	Gross Beta Gamma Spec. Sr-89, Sr-90	3 times a year

^aIf frequency of analysis is not given, it is the same as frequency of collection.

^bFrequency of analysis key: W = Weekly; M = Monthly; Q = Quarterly; Comp. = Composite.

^cSee Figure 6.1-2 for sampling locations.

^dThis monitoring will start in 1984.

TABLE 6.1-11

DETECTION CAPABILITIES FOR ENVIRONMENTAL SAMPLE ANALYSIS⁽¹⁾LOWER LIMIT OF DETECTION (LLD)⁽²⁾⁽³⁾

ANALYSIS	WATER (pCi/l)	AIRBORNE PARTICULATE OR GAS (pCi/m ³)	FISH (pCi/kg, wet)	MILK (pCi/l)	FOOD PRODUCTS (pCi/kg, wet)	SEDIMENT (pCi/kg, dry)
Gross Beta	4	0.01				
II-3	2000*					
Mn-54	15		130			
Fe-59	30		260			
Co-58,60	15		130			
Zn-65	30		260			
Zr-Nb-95	15					
I-131	1 ⁽⁴⁾	0.07		1	60	
Cs-134	15	0.05	130	15	60	150
Cs-137	18	0.06	150	18	80	180
Ba-La-140	15			15		

*If no drinking water pathway exists, a value of 3000 pCi/l may be used.

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TABLE 6.1-11 (Continued)TABLE NOTATIONS

- (1) This list does not mean that only these nuclides are to be considered. Other peaks that are identifiable, together with those of the above nuclides, shall also be analyzed and reported in the Annual Radiological Environmental Operating Report pursuant to Specification 6.7.1.6.
- (2) Required detection capabilities for thermoluminescent dosimeters used for environmental measurements are given in Regulatory Guide 4.13.
- (3) The LLD is defined, for purposes of these specifications, as the smallest concentration of radioactive material in a sample that will yield a net count, above system background, that will be detected with 95% probability with only 5% probability of falsely concluding that a blank observation represents a "real" signal.

For a particular measurement system, which may include radiochemical separation:

$$LLD = \frac{4.66 s_b}{E \cdot V \cdot 2.22 \cdot Y \cdot \exp(-\lambda \Delta t)}$$

Where:

LLD = the "a priori" lower limit of detection (picoCuries per unit mass or volume),

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

E = the counting efficiency (counts per disintegration),

V = the sample size (units of mass or volume),
2.22 = the number of disintegrations per minute per picoCurie,

Y = the fractional radiochemical yield, when applicable,

TABLE 6.1-11 (Continued)TABLE NOTATIONS (Continued)

λ = the radioactive decay constant for the particular radionuclide, (sec⁻¹), and

Δt = the elapsed time between sample collection, or end of the sample collection period, and time of counting (sec).

Typical values of E, V, Y, and Δt should be used in the calculation.

It should be recognized that the LLD is defined as an a priori (before the fact) limit representing the capability of a measurement system and not as an a posteriori (after the fact) limit for a particular measurement. Analyses shall be performed in such a manner that the stated LLDs will be achieved under routine conditions. Occasionally background fluctuations, unavoidable small sample sizes, the presence of interfering nuclides, or other uncontrollable circumstances may render these LLDs unachievable. In such cases, the contributing factors shall be identified and described in the Annual Radiological Environmental Operating Report pursuant to Specification 6.7.1.6.

- (4) LLD for drinking water samples. If no drinking water pathway exists, the LLD of gamma isotopic analysis may be used.

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TABLE 6.1-12
EXPECTED BRAIDWOOD BACKGROUND RADIATION
LEVELS BASED ON DRESDEN DATA

<u>MEDIUM</u>	<u>ANALYSIS</u>	<u>EXPECTED LEVEL^a</u> <u>(Dresden Station data)</u>
External Gamma Radiation	TLD	≈60 mrem/year
Airborne Particulate Samples	"Gross Beta"	0.05 to 0.5 pCi/m ³
	Gamma Spectrum	<u>Be-7</u>
Milk	Gamma Spectrum	Cs-137, <u>K-40</u>
	Radiostrontium	≈5 pCi/liter
	Radiocesium	<5 pCi/liter
Water (surface and wells)	"Gross Beta"	5 to 35 pCi/liter
	Tritium	200-400 pCi/liter
Benthic Organisms, Fish, and Shellfish	"Gross Beta"	10-60 pCi/g (dry)
Sediments	"Gross Beta"	10 to 20 pCi/g (dry)
	Gamma Spectrum	K-40, Uranium Series, Thorium Series
Grass and Food Crops	"Gross Beta"	20 to 50 pCi/g (dry)
	Gamma Spectrum	<u>K-40</u> , occasionally Cs-137, Be-7, Nb-95

Source: Commonwealth Edison Company (1976a, 1976b).

^aUnderlined activities will dominate the spectrum. Others will be near the limits of detectability.

TABLE 6.2-2
STANDARD RADIOLOGICAL MONITORING PROGRAM

SAMPLE MEDIA	COLLECTION SITES	TYPE OF ANALYSIS	FREQUENCY OF COLLECTION
Air Monitoring	Near Field Godley Braidwood Custer Park	Filter - Gross Beta Charcoal - I-131 Sampling Train - Test and Maintenance	Weekly Weekly Weekly
	Far Field Gardner Essex County Line Road	Filter Exchange Charcoal Exchange Sampling Train - Test and Maintenance	Weekly Bi-Weekly Weekly
TLD	Same as Air Monitoring Sites. Inner ring, 16 sectors. Outer ring, 16 sectors.	Gamma Radiation	Quarterly
Land Use Census			
Dairy Animals	To 2-mile radius by door-to-door count	To revise Environmental Dose Models, if necessary	Annually during Grazing Season - May to October
	To 5-mile radius by using referenced source		
Milk	3 nearby Dairy Farms (within 5 miles)	I-131 Gamma isotopic	Semi-monthly during Grazing Season - May to October.
	1 distant Dairy Farm		Monthly - November to April
Surface Water	Downstream of discharge Upstream of discharge	Gamma isotopic Tritium	Monthly composite analysis of Weekly samples
Ground Water	One nearby well	Gamma isotopic Tritium	Quarterly composite analysis of Weekly samples
Cooling Water Sample	Inlet Discharge	Gross Beta Tritium	Weekly Quarterly Composite
Fish	Wilmington Pool of Kankakee River: upstream and downstream of discharge	Gamma isotopic	Spr. 83, summer, fall
Sediment	Downstream of discharge, along shoreline	Gamma isotopic	Semi-annually
Food Products	Representative sampling within 10 miles	Gamma isotopic	at time of harvest
Vegetation (if milk sampling is not performed)	Two nearby sites One distant site	Gamma isotopic I-131	Monthly, when available

QUESTION ER470.3

The applicant should update Section 6.2.3 of the Environmental Report to include tables equivalent to tables presented in USNRC Branch Technical Position, "An Acceptable Radiological Environmental Monitoring Program, Revision 1," November 1979 (attached). The licensee should also indicate when the pre-operational radiological monitoring program will begin.

RESPONSE

Section 6.1.5, Radiological Monitoring, contains a description of the program from its start, Summer of 1983, continuing through the first two years after commercial operation of the plant begins.

Tables 6.1-10 and 6.1-11, "Preoperational Radiological Sampling Program" and "Detection Capabilities for Environmental Sample Analysis," respectively, have been amended to incorporate some of the features of the NRC Branch Technical Position (BTP) referred to in the question. Table 6.1-11 is the equivalent of Table 2 in the BTP.

Table 6.2-2, "Standard Radiological Monitoring Program" has been amended to reflect the features of the BTP. Tables QER470.3-1 and QER470.3-2 are equivalent to Tables 1 and 4 of the BTP. The equivalent to Table 3 of the BTP, "Environmental Radiological Monitoring Program Annual Summary," will be developed at a later date.

TABLE QER470.3-1

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

<u>EXPOSURE PATHWAY AND/OR SAMPLE</u>	<u>NUMBER OF REPRESENTATIVE SAMPLES AND SAMPLE LOCATIONS⁽¹⁾</u>	<u>SAMPLING AND COLLECTION FREQUENCY</u>	<u>TYPE AND FREQUENCY OF ANALYSIS</u>
1. Direct Radiation ⁽²⁾	<p>Forty routine monitoring stations either with two or more dosimeters or with one instrument for measuring and recording dose rate continuously, placed as follows:</p> <p>An inner ring of stations, one in each meteorological sector in the general area of the SITE BOUNDARY;</p> <p>An outer ring of stations, one in each meteorological sector in the 6- to 8-km range from the site; and</p> <p>The balance of the stations to be placed in special interest areas such as population centers, at the air sampling sites.</p>	Quarterly.	Gamma dose quarterly.
2. Airborne			
Radioiodine and Particulates	<p>Samples from five locations:</p> <p>Three samples from close to the three SITE BOUNDARY locations, in different sectors, of the</p>	Continuous sampler operation with sample collection weekly, or more frequently if required by dust loading.	<p><u>Radioiodine Cannister:</u> I-131 analysis weekly.</p> <p><u>Particulate Sampler:</u> Gross beta radioactivity</p>

QER470.3-2

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TABLE QER470.3-1 (Continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

<u>EXPOSURE PATHWAY AND/OR SAMPLE</u>	<u>NUMBER OF REPRESENTATIVE SAMPLES AND SAMPLE LOCATIONS⁽¹⁾</u>	<u>SAMPLING AND COLLECTION FREQUENCY</u>	<u>TYPE AND FREQUENCY OF ANALYSIS</u>
Radioiodine and Particulates (continued)	<p>highest calculated annual average ground level D/Q;</p> <p>One sample from the vicinity of a community having the highest calculated annual average ground-level D/Q; and</p> <p>One sample from a control location, as for example 10-30 km distant and in the least prevalent wind direction.</p>		analysis following filter change ⁽³⁾ ; Gamma isotopic analysis ⁽⁴⁾ of composite (by location) quarterly.
3. Waterborne			
a. Surface ⁽⁵⁾	<p>One sample upstream.</p> <p>One sample downstream.</p>	Weekly collection, composited monthly.	Gamma isotopic analysis ⁽⁴⁾ monthly. Composite for tritium analysis quarterly.
b. Ground	Samples from one off-site source.	Quarterly.	Gamma isotopic ⁽⁴⁾ and tritium analysis quarterly.
c. Sediment from shoreline	One sample from downstream area with existing or potential recreational value.	Semiannually.	Gamma isotopic analysis ⁽⁴⁾ semiannually.

QER470.3-3

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TABLE QER470.3-1 (Continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

<u>EXPOSURE PATHWAY AND/OR SAMPLE</u>	<u>NUMBER OF REPRESENTATIVE SAMPLES AND SAMPLE LOCATIONS⁽¹⁾</u>	<u>SAMPLING AND COLLECTION FREQUENCY</u>	<u>TYPE AND FREQUENCY OF ANALYSIS</u>
4. Ingestion			
a. Milk	Samples from three dairies within 8 km, the nearest ones to the plant, if possible.	Semimonthly when animals are on pasture, monthly at other times.	Gamma isotopic ⁽⁴⁾ and I-131 analysis semimonthly when animals are on pasture; monthly at other times.
	One sample from milking animals at a control location, 15-30 km distant and in the least prevalent wind direction.		
b. Fish and Invertebrates	Representative samples of commercially and recreationally important species in vicinity of plant discharge area.	Three times per year (spring, summer and fall).	Gamma isotopic analysis ⁽⁴⁾ on edible portions.
	Representative samples of commercially and recreationally important species in areas not influenced by plant discharge.		
c. Food Products	Representative samples of the principal classes of food products from any area within 10 miles of the plant.	At time of harvest ⁽⁶⁾ .	Gamma isotopic analysis ⁽⁴⁾ on edible portion.

QER470.3-4

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TABLE QER470.3-1 (Continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

EXPOSURE PATHWAY AND/OR SAMPLE	NUMBER OF REPRESENTATIVE SAMPLES AND SAMPLE LOCATIONS ⁽¹⁾	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSIS
c. Food Products (continued)	Samples of three different kinds of broad leaf vegetation grown nearest each of two different offsite locations of highest predicted annual average ground-level D/Q if milk sampling is not performed.	Monthly when available.	Gamma isotopic ⁽⁴⁾ and I-131 analysis.
	One sample of each of the similar broad leaf vegetation grown 15-30 km distant in the least prevalent wind direction if milk sampling is not performed.	Monthly when available.	Gamma isotopic ⁽⁴⁾ and I-131 analysis.

QER470.3-5

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TABLE QER470.3-1 (Continued)

TABLE NOTATION:

- (1) Specific parameters of distance and direction sector from the centerline of one unit, and additional description where pertinent, shall be provided for each and every sample location in Table QER470.3-1 in a table and figure(s) in the Offsite Dose Calculation Manual (ODCM).

Deviations are permitted from the required sampling schedule if specimens are unobtainable due to hazardous conditions, seasonal unavailability, malfunction of automatic sampling equipment and other legitimate reasons. If specimens are unobtainable due to sampling equipment malfunction, every effort shall be made to complete corrective action prior to the end of the next sampling period. All deviations from the sampling schedule shall be documented in the Annual Radiological Environmental Operating Report pursuant to Specification 6.7.1.6. It is recognized that, at times, it may not be possible or practicable to continue to obtain samples of the media of choice at the most desired location or time. In these instances suitable alternative media and locations may be chosen for the particular pathway in question and appropriate substitutions made within 30 days in the radiological environmental monitoring program. In lieu of any Licensee Event Report required by Specification 6.7.1 and pursuant to Specification 6.7.1.12, identify the cause of the unavailability of samples for that pathway and identify the new location(s) for obtaining replacement samples in a Special Report to the Commission within 30 days and also include in the report a revised figure(s) and table for the ODCM reflecting the new location(s).

2. One or more instruments, such as a pressurized ion chamber, for measuring and recording dose rate continuously may be used in place of, or in addition, to integrating dosimeters. For the purposes of this table, a thermoluminescent dosimeter (TLD) is considered to be one phosphor; two or more phosphors this table, a thermoluminescent dosimeter (TLD) is considered to be one phosphor; two or more phosphors in a packet are considered as two or more dosimeters. Film badges shall not be used as dosimeters for measuring direct radiation. The forty stations is not an absolute number. The number of direct radiation monitoring stations may be reduced according to geographical limitations; e.g., at an ocean site, some sectors will be over water so that the number of dosimeters may be reduced accordingly. The frequency of analysis or readout for TLD systems will depend upon the characteristics of the specific system used and should be selected to obtain optimum dose information with minimal fading.

TABLE QER470.3-1 (Continued)

TABLE NOTATIONS (Continued)

- (3) Airborne particulate sample filters shall be analyzed for gross beta radioactivity 24 hours or more after sampling to allow for radon and thoron daughter decay. If gross beta activity in air particulate samples is greater than ten times the yearly mean of control samples, gamma isotopic analysis shall be performed on the individual samples.
- (4) Gamma isotopic analysis means the identification and quantification of gamma-emitting radionuclides that may be attributable to the effluents from the facility.
- (5) The "upstream sample" shall be taken at a distance beyond significant influence of the discharge. The "downstream" sample shall be taken in an area beyond but near the mixing zone.
- (6) If harvest occurs more than once a year, sampling shall be performed during each discrete harvest. If harvest occurs continuously, sampling shall be monthly. Attention shall be paid to including samples of tuborous and root food products.

QER470.3-7

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TABLE QER 470.3-2

REPORTING LEVELS FOR RADIOACTIVITY CONCENTRATIONS IN ENVIRONMENTAL SAMPLES

REPORTING LEVELS

ANALYSIS	WATER (pCi/l)	AIRBORNE PARTICULATE OR GASES (pCi/m ³)	FISH (pCi/kg, wet)	MILK (pCi/l)	FOOD PRODUCTS (pCi/kg, wet)
II-3	20,000*				
Mn-54	1,000		30,000		
Fe-59	400		10,000		
Co-58	1,000		30,000		
Co-60	300		10,000		
Zn-65	300		20,000		
Zr-Nb-95	400				
I-131	2	0.9		3	100
Cs-134	30	10	1,000	60	1,000
Cs-137	50	20	2,000	70	2,000
Ba-La-140	200			300	

*For drinking water samples. This is 40 CFR Part 141 value. If no drinking water pathway exists, a value of 30,000 pCi/l may be used.

QER470.3-8

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This section contains the NRC request for additional information based on B. J. Youngblood's letters of September 7 and 14, 1983, followed by the response to the question. In some cases the response includes a reference to the appropriate updated sections of the text.

QUESTION E290.9

Provide construction layout drawings for the area around the transformers. These drawings should provide the details of the locations and dimensions of the main and auxiliary transformers and their firewalls.

RESPONSE

The construction layout drawings for the area around the main power, unit auxiliary and system auxiliary transformers have been furnished. These drawings show the locations of the transformers, adjacent building walls and firewalls. The firewalls are made of concrete and are one foot thick. The transformers have all three phases in one tank with the following dimensions:

<u>Transformer</u>		<u>Dimensions - Inches</u>		
		<u>Length</u>	<u>Width</u>	<u>Height</u>
Main Power	625 MVA	240	120	219
Unit Auxiliary	60 MVA	144	120	144
System Auxiliary	60 MVA	220	120	152

QUESTION E290.10

Provide a scaled map or scaled aerial photograph of the site locating the nearest noise sensitive areas (including residences) to the station proceeding clockwise from the west-southwest sector to the east-southeast sector. Only those noise sensitive areas closest to the station transformers in these sectors need be identified.

RESPONSE

Aerial photographs have been provided that indicate the nearest noise sensitive areas in the sectors requested. Also provided was a portion of a topographical map that shows the plant area and environs.

QUESTION E290.11

For the transformers:

- a) Provide the names of the manufacturers, the equivalent two-winding ratings, the NEMA ratings and the breakdown insulation levels (BIL).
- b) Indicate the type of cooling system.
- c) If there is a three-phase transformer system, indicate whether each phase is in a separate tank.
- d) Provide the core tone sound power levels, if available, from the manufacturer. If not known, provide the sound power level octave sound spectrum used in your noise analysis.

RESPONSE

Transformer Data:

<u>Use</u>	<u>Manufacturer</u>	<u>Two-Winding Rating-MVA</u>	<u>Basic Impulse Level - KV</u>	<u>Operating Voltage KV</u>
Power	Westinghouse	625/700	1050	23.7- 345Y/199
Unit Auxiliary	McGraw- Edison	36/48/60	150	23.7-6.9Y/3.98 -4.16Y/2.4
System Auxiliary	ASEA Industries	36/48/60	1050	345Y/199- 6.9Y/3.98- 4.16

Each transformer is three phase, mounted in a single oil filled tank with radiators, and have fans to increase the transformer thermal rating.

The following NEMA sound values were used for the transformer noise predictions: main power 90dBA; unit auxiliary 74dBA; and system auxiliary 79dBA. Since sound from the auxiliary transformers were estimated to be more than 10dBA less than the main transformers and partially baffled by the firewalls, their contribution to offsite noise levels was not considered.

The noise prediction was, therefore based on the power transformer with 90dBA NEMA sound value:

Octave Band Sound Pressure Levels at Six Feet

$\frac{63 \text{ Hz}}{89}$	$\frac{125}{97}$	$\frac{250}{92}$	$\frac{500}{89}$	$\frac{1000}{82}$	$\frac{2000}{77}$	$\frac{4000}{75}$	$\frac{8000}{68}$
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QUESTION E290.12

For the pumphouse pumps, indicate the number, type, number of stages (if multi-stage) and HP and RPM of the pumps. Provide the noise specifications on the vertical motors that drive the pumps. Indicate the frequency of the tonal component, if any, of the pump motor noise.

RESPONSE

Located within the river screenhouse (pumphouse) are three 885 RPM/24,000 GPM circulating water make-up pumps manufactured by Peerless Pump, Type TDH-FT210, Model 36HXP. These pumps are driven by three E.M. (Electric Machinery Manufacturing Company) heavy duty squirrel cage induction motors rated 2250 HP 4000 volts, 3 phase continuous duty, 892 RPM full load, with a 5728-V frame and an E locked rotor KVA code. The frequency of tonal components of the pump motor noise are 1594 Hz and 1714 Hz as measured across the river.

Also within the river screenhouse are two Worthington D-Line booster pumps, Model D 1011, size 4 x 3 x 6 with a design pressure of 275 PSIG. The pumps are driven by Reliance Duty Master AC motors rated 25 HP at 3515 RPM, frame size 284-TS, design B and code E. Tonal measurements of these pumps were not made.

QUESTION E290.13

For the pumphouse transformer:

- a) Provide the name of the manufacturer, the equivalent two winding rating, NEMA rating, and breakdown insulation level (BIL).
- b) Indicate the type of cooling system.
- c) If there is a three-phase transformer system, indicate whether each phase is in a separate tank.
- d) Provide the core tone sound power levels if available from the manufacturer. If not known, provide the sound power level octave band spectrum used in any noise analysis carried out.

RESPONSE

The river screenhouse (pumphouse) transformer is a Heavy Duty Electric transformer rated 34,400 D 4160Y/2400 volt; 7500 KVA (self-cooled); 9375 KVA (fan cooled). Basic insulation level of 200 KV high side, and 75 KV low side. This is a three phase transformer in one tank and is not equipped with fans.

The following noise prediction was based on an estimated 68 NEMA sound value:

Octave Band Sound Pressure Levels at Six Feet

$\frac{63 \text{ Hz}}{67}$	$\frac{125}{75}$	$\frac{250}{70}$	$\frac{500}{67}$	$\frac{1000}{60}$	$\frac{2000}{55}$	$\frac{4000}{53}$	$\frac{8000}{46}$
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QUESTION E290.14

Provide general arrangement and structural drawings along with locations of the mechanical service system (HVAC System) in the pumphouse showing all openings to the outside and items relating to noise.

RESPONSE

The general arrangement and structural drawings have been furnished.

QUESTION E290.15

Concerning the compressor(s) at the pumphouse:

- a) Indicate their number, type, HP, and RPM rating.
- b; Indicate how these compressors are driven (diesel, electric motor, turbines) and the specifications on their drive engines (frame type, HP, RPM).

RESPONSE

Located within the river screenhouse (pumphouse) is an Ingersoll Rand Model 10 T 3NL air compressor and an air receiver. The compressor is driven by a Baldor Industrial Electric Motor rated 20 HP, 1760 RPM, Class B, Code G with a 256 T frame.

QUESTION E290.16

Provide a scale map of vicinity of pumphouse showing elevations, location of nearest residences on same side and opposite side of river.

RESPONSE

Aerial photographs have been furnished that show the location of the nearest residences. Figure QE240.1-2, which is a cross section of the Kankakee River at the river screenhouse gives a representation of the topography near the river. The general topography can be determined from the topographical map referred to in the response to QE290.11.

QUESTION E290.17

Identify any local standards relating to noise in the region of the pumphouse.

RESPONSE

There are no local standards relating to noise for the region containing the pumphouse. In Section 5.6.4, the Illinois and United States Environmental Protection Agencies' and Department of Housing and Urban Development's regulations, criteria and requisite levels are discussed.

QUESTION E290.18

Describe the noise control features used to minimize noise emanating from the pumphouse. Provide the dimensions of the pumphouse (length, width, and height) and indicate the materials from which the walls, ceiling, and floor are built. Indicate the location of open louvers and their open-wall dimensions.

RESPONSE

Noise control features used to minimize noise emanating from the river screenhouse (pumphouse) include: locating the transformer in back of the building; installing corrugated metal wall in front of the trash racks for visual and noise screen; and moving the exhaust louvers from the front of the building (river side) to the sides of the building.

The building is 116 feet long, 69 feet wide, and 34 feet high. The walls are precast concrete panels, 5-1/2 inches thick including a core of 1-1/2 inch thick polystyrene insulation. The roof consists of built-up roofing on 2 inch rigid insulation over 3-1/2 inch concrete channel roof slab. The floor is generally 18 inches thick, steel reinforced, concrete.

Drawings have been furnished that show the elevations of the river screenhouse including the location of the intake and exhaust louvers and wall and roof construction.

The wall openings for the exhaust louvers on the north and south sides are 15'-8" wide by 13'-3" high. The wall opening for the air intake louvers on the west side are 31'-4" wide by 13'-3" high.

QUESTION E290.19

Provide a copy of the ambient and operational noise measurement studies carried out by the Applicant and done for the region near the pumphouse.

RESPONSE

The ambient and operational noise studies are discussed in Section 5.6. Attached is a copy of the report with more detail that was prepared for the operational mode for the river screenhouse with the pumps in operation.

December 2, 1981

Mr. R. G. Monzingo

Subject: Noise effects - Braidwood River Screen House.

At the request of the Environmental Affairs Department, System OAD personnel took sound level measurements of the noise emitted by make up water pumps operating at the Braidwood river screen house. Daytime measurements were taken on 3/9/81 while nighttime levels were taken on 3/23/81.

In order to assess the maximum off site noise while both pumps were in operation, the measurements were taken at the [REDACTED] residence located across the Kankakee river. In turn, the results of our data was compared to applicable federal and state noise standards.

Maximum allowable noise levels are established by the State of Illinois Noise Pollution Control Regulations. Noise emitted by the Braidwood river screen house (land use class C) to residential areas (land use class A) is limited by Rule 202 (Sound emitted to class A-land during daytime hours, 7:00 am to 10:00 pm.) and Rule 203 (Sound emitted to class A land during nighttime hours, 10:00 pm to 7:00 am.). Maximum allowable octave band sound pressure levels of each of the rules appear on the attached graph along with the actual levels measured during our survey. As can be seen by looking at the graphs the pumps are well below the regulation during daytime hours and are at or below the criteria during the nighttime. Note: Typically it takes a 3dB change in sound pressure level before a normal person can audibly distinguish a difference in the noise level.

The U.S. EPA has identified that undue interference with activity and annoyance will not occur if outdoor levels in residential areas are maintained at $Ldn \leq 55$ dB., $Ldn = 10 \log 1/24 [15(10 Ld/10) + 9(10 Ln + 10/10)]$. Ldn represents the sound energy averaged over a 24 hour period with a 10 db nighttime penalty incorporated into the previous mathematical formula. Our tape recorded data was analyzed to yield daytime (Ld) and nighttime (Ln) Equivalent A-weighted sound levels.

Results of our analysis yielded the following:

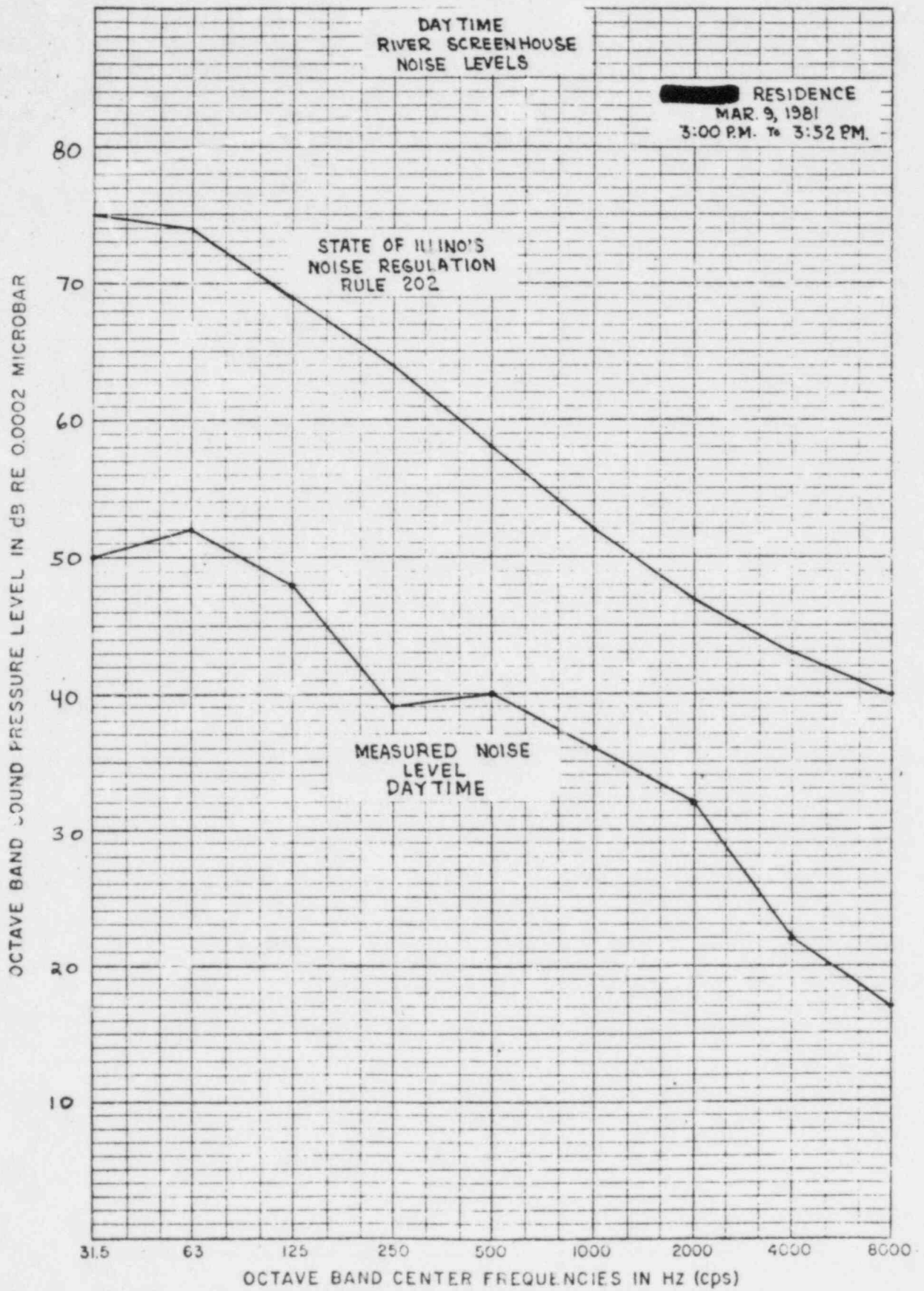
Daytime noise level	$Ld = 45.4$ dB
Nighttime noise level	$Ln = 44.9$ dB
Day-Night noise level	$Ldn = 51.4$ dB

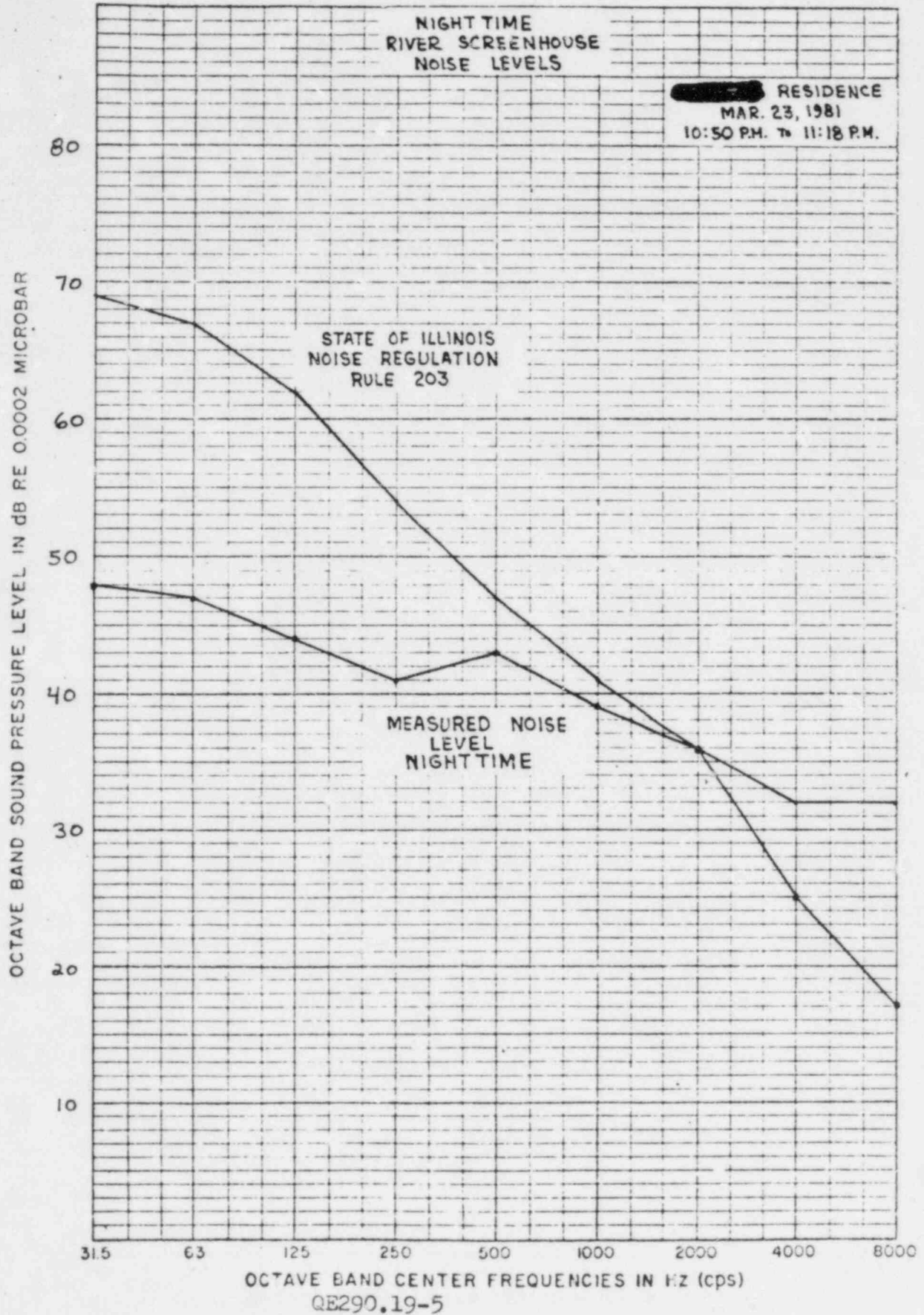
The Department of Housing and Urban Development has published criteria which state that noise levels for residential developments are normally acceptable if they do not exceed an Ldn of 65dB. Therefore our calculated Ldn of 51.4dB is well below allowable noise levels of both the U.S. Environmental Protection Agency and the U.S. Department of Housing and Urban Development.

Daniel J. Fedor

Daniel J. Fedor
System Operational Analysis Dept.

cc. J.F. Bouska
J.R. Petro





AMENDMENT 4
OCTOBER 1983



CONCORD MA 01742 USA

1995 X-Y RECORDER PAPER
REORDER NUMBER 1995-9650

DESCRIPTION DAY TIME BRAIDWOOD RIVER SCREENHOUSE

MEASUREMENTS TAKEN ACROSS THE RIVER AT THE
RESIDENCE 3:00 PM - 3:50 PM

TWO MAKE-UP WATER PUMPS IN OPERATION

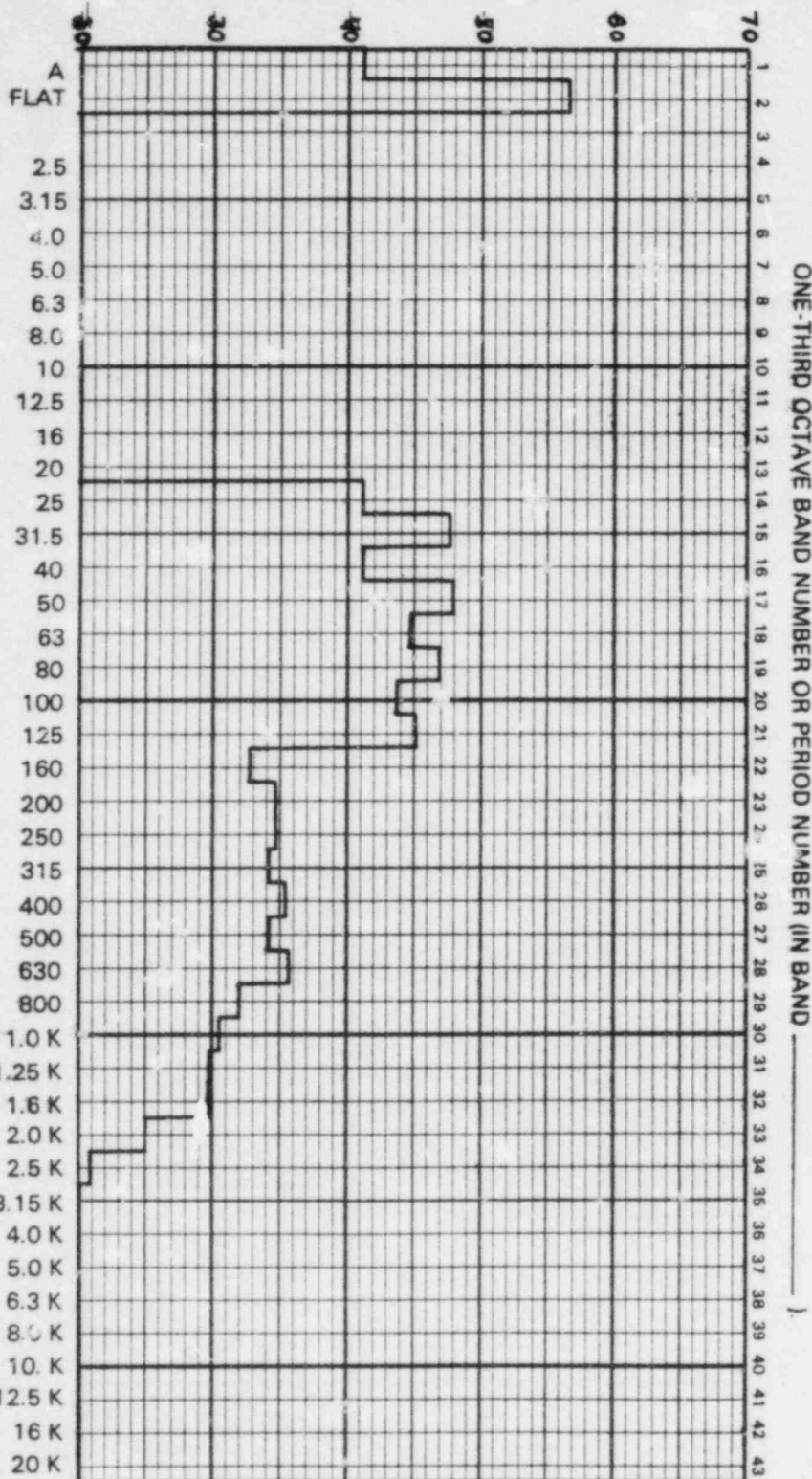
ID NO. _____

DATE MARCH 9, 1981

BY DJF

Braidwood ER-OLS

LEVEL IN dB re FULL SCALE



FULL SCALE LEVEL, dB

MODE/SPECTRUM WEIGHTING

INTEGRATION TIME

AND MODE

LEVEL/	EXP.
FREQ.	SEC.
FLAT	MIN
A WT	1
LEVEL/	2
TIME	4
FLAT	8
A WT	9
10	16
24	SEL
MIN	HR
MIN	HR

QE290.19-6

ONE-THIRD OCTAVE CENTER FREQUENCY HZ

AMENDMENT 4
OCTOBER 1983

 **GenRad**
CONCORD MA 01742 USA

1995 X-Y RECORDER PAPER
REORDER NUMBER 1995-9650

DESCRIPTION NIGHT TIME BRAIDWOOD RIVER SCREENHOUSE

MEASUREMENTS TAKEN ACROSS THE RIVER AT THE
RESIDENCE 10:50 PM - 11:18 PM

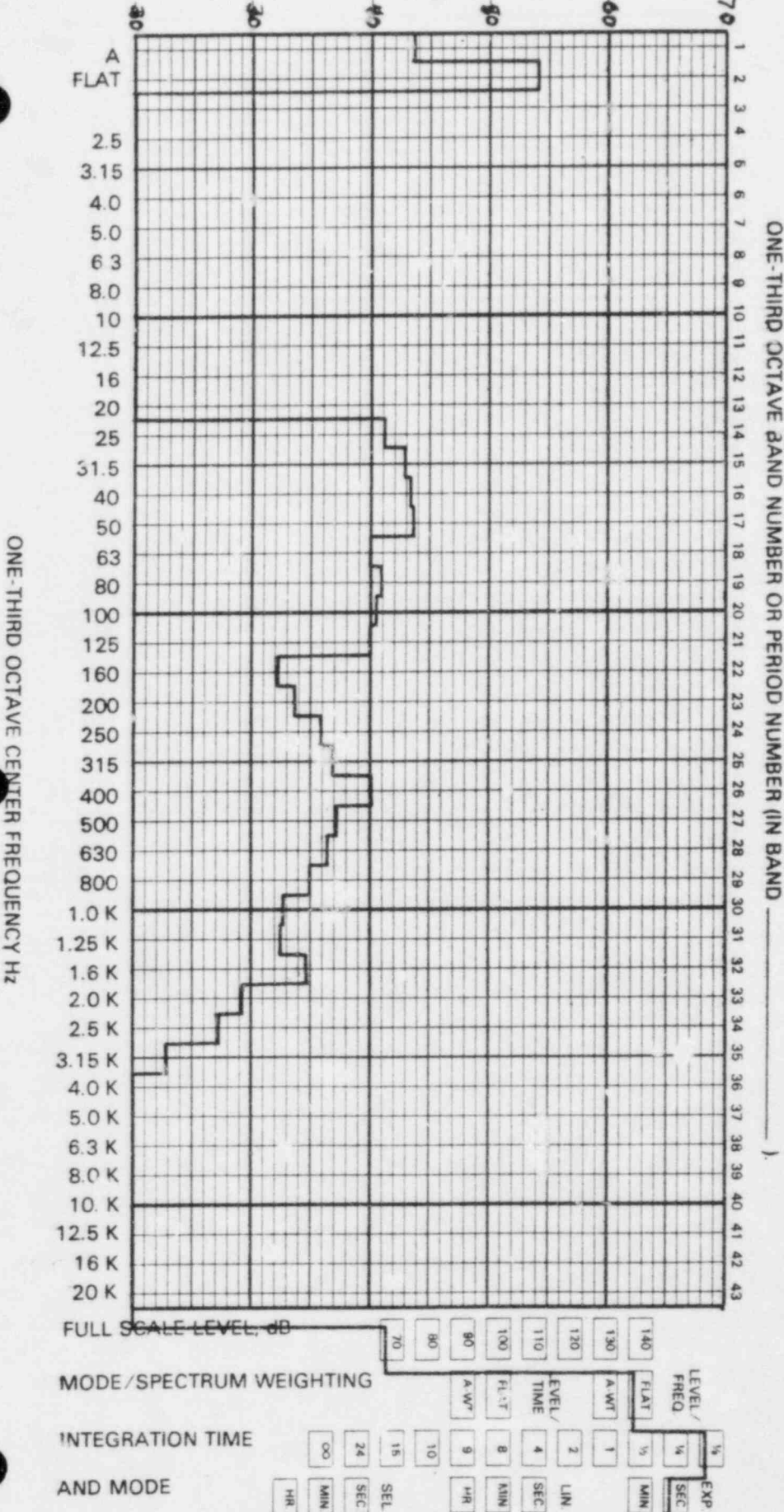
TWO MAKE-UP WATER PUMPS IN OPERATION

ID NO. _____

DATE MARCH 23, 1981

BY BJT

LEVEL IN dB re FULL SCALE Braidwood ER-OLS



QUESTION E290.20

Provide the overall sound power level, the octave band sound power levels for those sources (transformers, compressors, pumps, pump motors), if known, from manufacturer's specifications.

RESPONSE

These data were not furnished by the manufacturers with the specifications for the individual pieces of equipment.

Using the EEI "Environmental Noise Guide," the following sound power levels were calculated:

SOUND POWER LEVELS
OCTAVE BAND CENTER FREQUENCY

<u>Source</u>	<u>Overall</u>	<u>31 Hz</u>	<u>63</u>	<u>125</u>	<u>250</u>	<u>500</u>	<u>1000</u>	<u>2000</u>	<u>4000</u>	<u>8000 Hz</u>
Transformers- Main Power 89dBA NEMA	118	106	112	114	109	109	103	98	93	86
Unit Aux 76dBA NEMA	102	90	96	98	93	93	87	82	77	70
System Aux 76dBA NEMA	103	91	97	99	94	94	88	83	78	71
Pumphouse 66dBA	89	77	83	85	80	80	74	69	64	57
Make-up Pump and Motor	102	88	90	92	93	93	96	96	88	81
Booster Pump and Motor	94	82	84	86	86	86	86	86	83	76
Air Compressor	102	91	87	92	91	89	92	97	94	87

QUESTION E290.21

From the operational measurements made at the pumphouse site, indicate the decibel level in the 1/3-octave band containing the pump motor tone.

RESPONSE

The decibel level in the 1/3 octave band containing the pump motor tone from the operational measurements across the river with two make-up water pumps operating were:

	1600 Hz
	<u>Thiru Octave</u>
Daytime measurements	30dB
Nighttime measurements	35dB