TVA

Tennessee Valley Authority, Post Office Box 2000, Spring City, Tennessee 37381-2000

May 26, 2011

10 CFR 50.4(b)(6)
10 CFR 50.34(b)

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555-0001

Watts Bar Nuclear Plant, Unit 2
NRC Docket No. 50-391

Subject: **WATTS BAR NUCLEAR PLANT (WBN) UNIT 2 - RESPONSE TO REQUEST FOR INFORMATION FROM PUBLIC MEETING ON MAY 11, 2011**

References: 1. E-mail from Justin C. Poole, U.S. Nuclear Regulatory Commission to William D. Crouch, TVA dated May 11, 2011

2. TVA to NRC letter dated May 20, 2011, "Watts Bar Nuclear Plant (WBN) Unit 2 - Response to Final Safety Analysis Report (FSAR) Chapter 11 and Final Supplemental Environmental Impact Statement (FSEIS) Request for Additional Information

The purpose of this letter is to provide a response to questions received via a handout during a public meeting held on May 11, 2011 in Rockville, Maryland and subsequently via an email received on May 11, 2011 (Reference 1), regarding the review of Unit 2 FSAR, Chapters 11 and12 and the environmental review. This information is being requested as part of the effort to ensure consistency between the FSAR review and environmental review.

Enclosure 1 provides the requested information. Enclosure 2 provides X/Q and D/Q information from the site to a radius of 50 miles. This information will be added to the Unit 2 FSAR in Amendment 104. Enclosure 3 provides the list of commitments. Should you have any questions, please contact Bill Crouch at (423) 365-2004.

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U.S. Nuclear Regulatory Commission
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I declare under penalty of perjury that the foregoing is true and correct. Executed on the 26th day of May, 2011.

Respectfully,

David Stinson
Watts Bar Unit 2 Vice President

Enclosures:

1. Response to NRC Questions Received during May 11, 2011 Public Meeting Request for Additional Information

2. X/Q and D/Q Information from the Site to a Radius of 50 Miles

   Attachments to Enclosure 2:

   1. Average Annual X/Q's and D/Q's Out to 50 Miles

   2. Joint Percentage Frequencies of Wind Direction and Wind Speed for Difference Stability Classes

3. List of Commitments

cc (Enclosures):

U. S. Nuclear Regulatory Commission
Region II
Marquis One Tower
245 Peachtree Center Ave., NE Suite 1200
Atlanta, Georgia 30303-1257

NRC Resident Inspector Unit 2
Watts Bar Nuclear Plant
1260 Nuclear Plant Road
Spring City, Tennessee 37381

Enclosure 1
Response to NRC Questions Received during May 11, 2011 Public Meeting
Request For Additional Information

Information Required for Staff Analysis for Dose from Gaseous Effluents

The staff will be performing dose assessment for dose to the public from gaseous effluents from Watts Bar Nuclear Unit 2 using the NRC developed GASPAR II computer code (Strenge et al. 1986) developed using the approach specified in Regulatory Guide 1.109 (NRC 1977). The following is a list of input values needed to run the computer code. Provide the data, the source of the data and any appropriate assumptions. Refer to RG 1.109 for any questions on the need for the parameter or more detail on what the parameter is.

Please provide answers to the following questions, as well as Tables 1-5.

1. *Confirm that there are no milk goat or meat animals are present in the 5-mi radius.*

   TVA Response

   Based on the 2007 Land Use Survey (LUS), Watts Bar Nuclear Plant does not have any milk goats within the 5 mile radius.

   Beef cattle are assumed to be located at the site boundary for all 16 sectors.

2. *Provide the direction and distance for the nearest residence, nearest garden, and nearest milk cow.*

   TVA Response

   See Attachment A taken from the 2007 LUS.

3. *Confirm that releases are calculated as ground level releases.*

   TVA Response

   All releases from Watts Bar Nuclear Plant are considered to be ground releases for dose calculations.

4. *Provide nearest site boundary distances for the 16 cardinal compass directions*

   TVA Response

   See Attachment B for the nearest site boundary for each sector.

5. *Provide the estimate of direct radiation doses from sources within the site for each of the 22.5-degree radial sectors centered on the 16 cardinal compass directions for radial distances of 2, 4, 6, 8, 10, 20, 40, 60, and 80 km (1.2, 2.5, 3.7, 5, 6.2, 12, 25, 27, and 50 mi) from the reactor.*

TVA Response

See Attachment C taken from the 2007 Environmental Dosimetry Data at distances monitored at WBN. The most distant point routinely monitored is 15 miles from the plant. The data indicates that dose at the monitored locations is essentially the same irrespective of distance and direction. These readings appear to be indicative of offsite doses from direct radiation that are so low as to be indistinguishable from normal background radiation.

6. *Confirm that there are no unusual animals, plants, agricultural practices, game harvests, or food processing operations having the potential to contribute 10 percent or more to either individual or population doses in areas affected by liquid effluents, and food-processing operations involving large quantities of water.*

TVA Response

Based on the 2007 Land Use Survey, Watts Bar does not have any unusual animals, plants, agricultural practices, game harvests that would contribute 10% or more to either the individual or population doses in areas affected by liquid or gaseous pathways and no food processing operations involving large quantities of water.

7. *Identify and provide a reference for direct radiation sources within or onsite out-of-plant as solid waste (e.g., independent fuel storage).*

TVA Response

Outside Radwaste Storage

Operational considerations make it necessary to temporarily store containers of radioactive materials and radioactive wastes in designated areas such as the concrete pad in the east yard outside of the Condensate Demineralizer Waste Evaporator (CDWE). Drums, boxes, and liners of radioactive materials or wastes including Dry Active Waste (DAW) may be stored in outside storage areas after being packaged for shipment or storage. Liners of dewatered resin (that have been processed for imminent shipment offsite) are stored the same as other containers. The outside storage area provides sufficient storage to accommodate one full shipment of DAW or radioactive materials. The concrete pad east of the CDWE will also be used to temporarily store (less than 5 years) DAW. Watts Bar does not have an independent wet or dry fuel storage facility.

Monitoring in the immediate vicinity of this storage shows dose rates that range from 81 to 180 mrem/year. The monitored values vary substantially throughout the year depending on the quantity of material being stored. Other monitored

locations on the site do not appear to vary based on the dose rate from the Radwaste Storage area.

Old Steam Generator Storage Facility (OSGSF)

The OSGSF is a non-safety related, non-seismic reinforced concrete structure that provides interim storage for the Old Steam Generators (OSGs) removed from the Reactor Building as a result of steam generator replacement during the Unit 1 Cycle 7 refueling outage. The OSGSF is located north of the plant, outside the protected area but within the exclusion area and site boundary. The reinforced concrete walls and roof (minimum density of 145 lb/ft3) of the OSGSF and its access vestibule have been designed to ensure that the dose rates outside the facility are below station administrative and 10 CFR 20 and 40 CFR 190 limits. Radiation zones inside the OSGSF were calculated to range from a "radiation area" near the OSGs to "unlimited access" at the vestibule door and "unlimited access" outside the OSGSF. Based on measured radiation levels inside the OSGSF, the interior of the OSGSF is controlled as a radiologically controlled area. The radiation dose assessment was accomplished using the MCNP (Monte Carlo NParticle) computer code. MCNP is a Monte Carlo program that calculates direct and skyshine doses.

In a manner similar to the Radwaste Storage discussed above, this structure is routinely monitored. The dose rate ranges from 61 to 79 mrem/year. Values in this range are typical of very slightly higher than measured at other locations on site.

8. *The following five tables of information were requested:*

Table 1

Item	Parameter	Units	Value	Source	Assumptions
1	Distance (in miles) from the site to the northeast corner of the U.S.	miles	5	NUREG/CR-4653	Any dummy value >0 in order not to abort GASPAR
2	Fraction of the year that leafy vegetables are grown	%	0.33	WBN LUS Survey	4 out 12 months
3	Fraction of the year that milk cows are on pasture	%	0.65	2	Value was used for all three dairy farms
4	Fraction of the maximum individual's vegetable intake that is from his own garden	%	1	WBN ODCM	Conservatively assumed that all food eaten by the average individual is grown within the sector.
5	Fraction of milk-cow feed intake that is from pasture while on pasture.	kg/d	64	2, 6	N/A
6	Average absolute humidity over the growing season	g/m³	9	See Attachment D	See Attachment D
7	Average temperature over the growing season (deg F). T is used only to calculate absolute humidity. If T is supplied, H must be supplied as relative humidity (%). Otherwise set T=0 or blank	N/A	0	N/A	N/A
8	Fraction of the year that goats are on pasture.	N/A	N/A	N/A	No Goats in 5 mile radius of WBN
9	Fraction of goat-feed intake that is from pasture while on pasture	N/A	N/A	N/A	No Goats in 5 mile radius of WBN
10	Fraction of the year that beef cattle are on pasture.	N/A	1	2	N/A
11	Fraction of beef-cattle feed intake that is from pasture while the cattle are on pasture.	kg/d	64	2, 6	N/A

Table 1 (continued)

Item	Parameter	Units	Value	Source	Assumptions
12	Consumption factors for milk, meat, leafy vegetables, and vegetables	Milk (	L/yr)	2	consumption factors for max individual
		Adult	310		
		Teen	400		Population doses are determined by multiplying the average dose for each sector by the population in that sector. The average population dose is then multiplied by the ratio of the average consumptions obtained from RG 1.109 Table E-4 divided by the consumption factors for the max individuals
		Child	330		
		Infant	330		
		Meat	(kg/yr)		
		Adult	110		
		Teen	65		
		Child	41		
		Infant	0		
		Leafy Vegetable	(kg/yr)		
		Adult	64		
		Teen	42		
		Child	26		
		Infant	0		
		Vegetable	(kg/yr)		
		Adult	520		
		Teen	630		
		Child	520		
		Infant	0		

Table 2. **Present Annual Milk Production Sector and Radial Distance Around the WBN2 Site for the Year 2007.**

Sectors	Year	Radii/Distances (mi)										
		0-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50	0-50
North	2007											
North-Northeast	2007											
Northeast	2007											
East-Northeast	2007											
East	2007											
East-Southeast	2007					4.17						
Southeast	2007											
South-Southeast	2007											
South	2007											
South-Southwest	2007		1.42	2.08								
Southwest	2007											
West-Southwest	2007											
West	2007											
West-Northwest	2007											
Northwest	2007											
North-Northwest	2007											
Total			1	1		1						

Table 3. **Present Annual Meat Production Sector and Radial Distance Around The WBN2 Site for the Year 2007.**

Sectors	Year	Radii/Distances (mi)										
		0-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50	0-50
North	2007	0.96										
North-Northeast	2007		1.23									
Northeast	2007	0.98										
East-Northeast	2007	0.85										
East	2007	0.80										
East-Southeast	2007	0.78										
Southeast	2007	0.78										
South-Southeast	2007	0.78										
South	2007	0.83										
South-Southwest	2007	0.96										
Southwest	2007		1.04									
West-Southwest	2007	0.89										
West	2007	0.91										
West-Northwest	2007	0.87										
Northwest	2007	0.87										
North-Northwest	2007	0.91										
Total		14	2									

Table 4.   **Present Annual Vegetable Production Sector and Radial Distance around the WBN2 Site for the Year 2007**

| Sectors | Year | Radii/Distances (mi) | | | | | | | | | | |
		0-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50	0-50
North	2007					4.76						
North-Northeast	2007				3.84							
Northeast	2007			2.08								
East-Northeast	2007				3.06							
East	2007				3.96							
East-Southeast	2007			2.96								
Southeast	2007			2.88								
South-Southeast	2007					4.63						
South	2007		1.40									
South-Southwest	2007		1.23									
Southwest	2007						5.03					
West-Southwest	2007			2.90								
West	2007				3.18							
West-Northwest	2007				3.67							
Northwest	2007		1.97									
North-Northwest	2007			2.86								
Total			3	5	6	2						

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Table 5.   Present Annual Leafy Vegetable production Sector and Radial Distance around the WBN2 Site for the Year 2007.

Sectors	Year	Radii/Distances (mi)
		0-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50	0-50
North	2007					4.76						
North-Northeast	2007				3.84							
Northeast	2007			2.08								
East-Northeast	2007				3.06							
East	2007				3.96							
East-Southeast	2007			2.96								
Southeast	2007			2.88								
South-Southeast	2007					4.63						
South	2007		1.40									
South-Southwest	2007		1.23									
Southwest	2007					5.03						
West-Southwest	2007			2.90								
West	2007				3.18							
West-Northwest	2007				3.67							
Northwest	2007		1.97									
North-Northwest	2007			2.86								
Total		0	3	5	6	2						

Information Required for Staff Analysis for Dose from Liquid Effluents

The staff will be performing dose assessment for dose to the public from liquid effluents from Watts Bar Nuclear Unit 2 using the NRC developed LADTAP II computer code (Strenge et al. 1986) developed using the approach specified in Regulatory Guide 1.109 (NRC 1977). The following is a list of input values needed to run the computer code. Provide the data, the source of the data and any appropriate assumptions. Refer to RG 1.109 for any questions on the need for the parameter or more detail on what the parameter is. Some supplementary information is provided in Regulatory Guide 1.113 (NRC 1977) to which the licensee is referred.

1. *The staff compares their calculations against the applicants. Will TVA be revising the information in the TVA application or will the staff's comparison be against the 2008 application?*

TVA Response

TVA is using the 2007 LUS and clarified both the liquid and gaseous source terms.

2. Projected population by sector and radial distance around the WBN2 site for the year   2040, including totals for each sector and a total population. See Table I below:

Table I. Projected Population by Sector and Radial Distance Around the WBN2 Site for the Year 2040. Population with Projections to the Year 2040

Sectors	Year	Radii/Distances (mi)											
		0-1	1-2	2-3	3-4	4-5	5-10	0-10[a]	10-20	20-30	30-40	40-50	0-50
North	2040	0	18	0	0	135	2465	2619	1885	2778	4798	6172	18222
North-Northeast	2040	0	0	18	411	185	1536	2150	11762	18766	14502	2547	49727
Northeast	2040	0	0	18	308	287	827	1441	3783	16734	29838	78334	130130
East-Northeast	2040	0	0	18	308	287	497	1110	3553	29539	63798	253831	351832
East	2040	0	8	431	308	616	552	1915	11352	18647	30063	44013	105990
East-Southeast	2040	0	0	0	27	41	68	135	6230	20120	5068	3280	34833
Southeast	2040	8	0	0	29	39	135	203	19852	15185	3950	7822	44012
South-Southeast	2040	21	0	0	246	413	103	783	8951	12907	2918	48593	74151
South	2040	16	0	0	0	1983	3824	5823	4586	42883	56430	17985	127707
South-Southwest	2040	0	0	21	0	0	546	567	5725	42517	46281	106392	201482
Southwest	2040	0	0	0	0	0	1051	1051	12978	14499	62307	111795	202630
West-Southwest	2040	0	6	36	59	126	711	938	12791	2837	2840	3372	22778
West	2040	0	14	22	101	90	710	937	3406	5555	2944	5474	18316
West-Northwest	2040	0	0	22	126	79	490	717	2091	4372	5654	20511	33345
Northwest	2040	0	108	332	376	526	2655	3998	2889	18634	10462	15956	51940
North-Northwest	2040	0	0	0	173	123	3116	3413	1536	33843	11609	5890	56290
Total		45	155	919	2471	4930	19287	27799	113368	299818	353432	728968	1523385

Table II.

Item	Parameter	Units	Value	Source	Assumptions
1	Liquid effluent discharge rate	ft^3/s	0.33	FSAR Table 11.2-2	Maximum rate of undiluted radwaste discharge
2	Reconcentration model (see Reg Guide 1.113)	No model / completely mixed model/plug-flow model/partially mixed model	No model or considered a direct release	4	Liquid waste is discharged directly into the cooling tower blowdown line which enters the TN river
3	Effluent discharge rate to receiving body	ft^3/s	44.56 + 0.33 = 44.89	FSAR Section 11.2.4	Minimum rate of cooling tower blowdown dilution flow + radwaste discharge rate
	Total volume of impoundment	ft^3	N/A	N/A	N/A
4	Fraction of population who are adults		0.665	6	N/A
5	Fraction of population who are teens		0.153	6	Fraction of population
6	Fraction of population who are children		0.168	6	Fraction of population
7	Liquid effluent source term by radionuclide	(Ci/yr)	See Attachment E	7	N/A
8					
9	Shore width factor (see Reg Guide 1.109)	none	0.2	2	N/A
	Include items 10-14 or items 15-20				
10	Dilution factor for aquatic food pathways and external exposure while boating		See Attachment F	1, 8	See Attachment F
11	Dilution factor for shoreline and swimming exposure		See Attachment F	1, 8	See Attachment F
12	Dilution factor for drinking water pathway		See Attachment G	1, 8	See Attachment G
13	Transit time from discharge to exposure location for all pathways except drinking water	h	0	N/A	For conservatism 0 was assumed
14	Transit time from discharge to drinking water supply	h	0	N/A	For conservatism 0 was assumed

Table II.

Item	Parameter	Units	Value	Source	Assumptions
	Include Items 15-20 if no value was given for items 10-12. Include one set of items 15-20 for each dilution factor (Items 10-12) not provided above.				
15	Surface water model	-			
16	Average flow velocity	Ft/s	N/A	N/A	N/A
17	Average depth of water body	ft	N/A	N/A	N/A
18	Downshore distance from discharge point to usage location	ft.	N/A	N/A	N/A
19	Offshore, distance to water usage location	ft.	N/A	N/A	N/A
20	Width of river or depth of discharge point in lake	ft.	N/A	N/A	N/A
21	Consumption and usage factors for adults, teens, children, and infants	Shoreline usage (hr/yr) (adult) (teen) (child) (infant) Water usage (L/yr) (adult) (teen) (child) (infant) Fish consumption (kg/yr) (adult) (teen) (child) (infant)	 500 500 500 500 730 510 510 330 21 16 6.9 0.0	 2 2	Max. individual Shoreline conservatism is based on the max individual visits the shoreline for 10 hours per week for 50 weeks per year Population usage are the same as RG 1.109 except shoreline is 5 hr per visits per year at each reach
	For Each Sport Fishing Usage Location				N/A
22	Surface water model	-	N/A	N/A	N/A
23	Average flow velocity	Ft/s	N/A	N/A	N/A
24	Average depth of water body	ft	N/A	N/A	N/A
25	Downshore distance from discharge point to usage location	ft.	N/A	N/A	N/A
26	Offshore, distance to water usage location	ft.	N/A	N/A	N/A
27	Width of river or depth of discharge point in lake	ft.	N/A	N/A	N/A
	Sport Fish harvest – Provide a separate dataset for each location				
28	Identification	mi downstream	18	N/A	Usage location is considered from 528 to

Table II.

Item	Parameter	Units	Value	Source	Assumptions
					510 TRM downstream (4799 acres)
29	Fish Harvest	Kg/yr	662	5	3.04 lb/acre/yr
30	Dilution		See Attachment F	1, 8	See Attachment F
31	Transit time	h	0	N/A	For conservatism 0 was assumed
	Commercial fish harvest – provide a separate dataset for each location				**WBN does not have commercial fishing.**
32	identification		N/A	N/A	N/A
33	Fish Harvest	Kg/yr	N/A	N/A	N/A
34	Dilution		N/A	N/A	N/A
35	Transit time	h	N/A	N/A	N/A
	Sport invertebrate harvest – provide a separate dataset for each location				**WBN ODCM does not consider invertebrates.**
36	identification		N/A	N/A	N/A
37	invertibrate Harvest	Kg/yr	N/A	N/A	N/A
38	Dilution		N/A	N/A	N/A
39	Transit time	h	N/A	N/A	N/A
	Commercial invertebrate harvest – provide a separate dataset for each location				**WBN ODCM does not consider invertebrates.**
40	identification		N/A	N/A	N/A
41	invertibrate Harvest	Kg/yr	N/A	N/A	N/A
42	Dilution		N/A	N/A	N/A
43	Transit time	h	N/A	N/A	N/A
	Population shoreline – provide a separate dataset for each location				
44	Identification	N/A	See Attachment F	N/A	N/A
45	Dilution		See Attachment F	1, 8	See Attachment F
46	Transit time	hr	0		For conservatism 0 was assumed
47	Usage (person-hours)	hr	See Attachment F	WBN ODCM	Population usage for shoreline is 5

Table II.

Item	Parameter	Units	Value	Source	Assumptions
					hr per visits per year at each reach
48	Shorewidth factor		0.2	2	N/A
	Population swimming – provide a separate dataset for each location				**WBN ODCM does not consider swimming.**
49	Identification		N/A	N/A	N/A
50	Total Exposure time for swimming for the current usage location	hr/y	N/A	N/A	N/A
51	Dilution Factor for the current swimming location	-	N/A	N/A	N/A
52	Transit time from the release point to the current usage location	hr	N/A	N/A	N/A
	Population Boating – provide a separate dataset for each location				**WBN ODCM does not consider boating.**
53	Identification		N/A	N/A	N/A
54	Total Exposure time for boating for the current usage location	hr/y	N/A	N/A	N/A
55	Dilution Factor for the current swimming location	-	N/A	N/A	N/A
56	Transit time from the release point to the current usage location	hr	N/A	N/A	N/A
	Population drinking water – provide a separate dataset for each location				
57	Supplier Identification	N/A	Attachment G		
58	Total population supplied by the current drinking water location	N/A	Attachment G		
59	Dilution factor for current usage location intake		See Attachment G	1, 8	See Attachment G
60	Transit time from discharge point (to receiving water body)	hr	0		For conservatism 0 was assumed
61	Supply rate of drinking water for current water plant. (used only if pop = 0)	Gal/d	N/A	N/A	pop not = 0
62	Ave. rate of water usage by individuals for the current water-plant service area (used	Gal/d	N/A	N/A	pop not = 0

Table II.

Item	Parameter	Units	Value	Source	Assumptions
	only if pop = 0)				
63	Surface water model	-	N/A	N/A	N/A
64	Average flow velocity	Ft/s	N/A	N/A	N/A
65	Average depth of water body	Ft	N/A	N/A	N/A
66	Downshore distance from discharge point to usage location	ft.	N/A	N/A	N/A
67	Offshore, distance to water usage location	ft.	N/A	N/A	N/A
68	Width of river or depth of discharge point in lake	ft.	N/A	N/A	N/A
	Irrigated foods: include a separate dataset for each irrigated food. If there are no irrigated foods these items may be omitted				**No irrigation pathway at WBN**
69	Food type	Vegetation/leafy vegetation/milk/ meat	N/A	N/A	N/A
70	Irrigation rate	$L.m^{-2}.mo^{-1}$	N/A	N/A	N/A
71	Fr. of animal feed not produced with contaminated irrigation water		N/A	N/A	N/A
72	Fr. of animal drinking water not obtained from contaminated irrigation water supply.		N/A	N/A	N/A
73	Total production of food product within 50 miles of the site	Kg/y or L/y	N/A	N/A	N/A
74	Growing period for current food product	D	N/A	N/A	N/A
75	Crop yield for current food product	Kg/m^2	N/A	N/A	N/A
76	Rate of consumption by maximally exposed adult	Kg/y	N/A	N/A	N/A
77	Rate of consumption by maximally exposed teen	Kg/y	N/A	N/A	N/A
78	Rate of consumption by maximally exposed child	Kg/y	N/A	N/A	N/A
79	Average rate of consumption by an adult in local population	Kg/y	N/A	N/A	N/A
80	Average rate of consumption by a teen in local population	Kg/y	N/A	N/A	N/A
81	Average rate of consumption by a child in local population	Kg/y	N/A	N/A	N/A
82	Holdup time between harvest and consumption by average	Hr	N/A	N/A	N/A

Table II.

Item	Parameter	Units	Value	Source	Assumptions
	members of population				
83	Holdup time between harvest and consumption by maximally exposed members of population	Hr	N/A	N/A	N/A
84	Dilution Factor for irrigation water usage location for the current food product	-	N/A	N/A	N/A
85	Production rate for the current food product using current irrigation water supply	Kg/y or L/y	N/A	N/A	N/A
86	Transit time from the release point to the current usage location	Hr	N/A	N/A	N/A
	Items 88-93 (only if dilution factors not given above)		N/A	N/A	N/A
88	Surface water model	-	N/A	N/A	N/A
89	Average flow velocity	Ft/s	N/A	N/A	N/A
90	Average depth of water body	Ft	N/A	N/A	N/A
91	Downshore distance from discharge point to usage location	ft.	N/A	N/A	N/A
92	Offshore, distance to water usage location	ft.	N/A	N/A	N/A
93	Width of river or depth of discharge point in lake	ft.	N/A	N/A	N/A
	Biota Exposure Location Data: The following data are for calculation of dose to biota				**WBN does not consider Biota**
94	Location identifier		N/A	N/A	N/A
95	Dilution Factor for current exposure location for biota	-	N/A	N/A	N/A
96	Transit time from the effluent release location to current exposure location	hr	N/A	N/A	N/A
	Include items 97-102 following only if no dilution factor was given for biota				**WBN does not consider Biota**
97	Surface water model	-	N/A	N/A	N/A
98	Average flow velocity	Ft/s	N/A	N/A	N/A
99	Average depth of water body	Ft	N/A	N/A	N/A
100	Downshore distance from discharge point to usage location	ft.	N/A	N/A	N/A
101	Offshore, distance to water usage location	ft.	N/A	N/A	N/A
102	Width of river or depth of discharge point in lake	ft.	N/A	N/A	N/A

Attachment A - 2007 LUS

	Sector	Distance (Meters)	Chi/Q (s/m^3)	D/Q (1/m^2)	Terrain Adjustment Factor	Milk Feeding Factor
Nearest Resident	N	2134	2.84e-06	4.21e-09	1.50	
Nearest Resident	NNE	3600	2.69e-06	4.41e-09	1.80	
Nearest Resident	NE	3353	3.84e-06	3.22e-09	2.20	
Nearest Resident	ENE	2414	6.26e-06	3.83e-09	1.90	
Nearest Resident	E	3268	3.97e-06	2.14e-09	1.70	
Nearest Resident	ESE	4416	2.64e-06	1.46e-09	1.90	
Nearest Resident	SE	1372	9.66e-06	8.16e-09	1.50	
Nearest Resident	SSE	1524	4.18e-06	5.56e-09	1.40	
Nearest Resident	S	1585	3.91e-06	8.42e-09	1.80	
Nearest Resident	SSW	1979	2.76e-06	6.64e-09	1.90	
Nearest Resident	SW	4230	1.15e-06	1.43e-09	2.00	
Nearest Resident	WSW	1829	3.61e-06	4.03e-09	1.70	
Nearest Resident	W	2896	7.30e-07	6.01e-10	1.10	
Nearest Resident	WNW	1646	2.26e-06	2.12e-09	2.90	
Nearest Resident	NW	2061	1.03e-06	9.95e-10	1.50	
Nearest Resident	NNW	4389	3.50e-07	2.97e-10	1.00	
Nearest Garden	N	7664	3.13e-07	3.00e-10	1.00	
Nearest Garden	NNE	6173	1.06e-06	1.42e-09	1.50	
Nearest Garden	NE	3353	3.84e-06	3.22e-09	2.20	
Nearest Garden	ENE	4927	2.01e-06	9.39e-10	1.60	
Nearest Garden	E	6372	1.35e-06	5.42e-10	1.40	
Nearest Garden	ESE	4758	2.26e-06	1.21e-09	1.80	
Nearest Garden	SE	4633	1.58e-06	8.97e-10	1.30	
Nearest Garden	SSE	7454	3.73e-07	2.80e-10	1.10	
Nearest Garden	S	2254	2.50e-06	4.94e-09	1.90	
Nearest Garden	SSW	1979	2.76e-06	6.64e-09	1.90	
Nearest Garden	SW	8100	4.28e-07	4.03e-10	1.80	
Nearest Garden	WSW	4667	8.70e-07	7.11e-10	1.50	
Nearest Garden	W	5120	3.03e-07	2.03e-10	1.00	
Nearest Garden	WNW	5909	1.72e-07	1.05e-10	1.30	
Nearest Garden	NW	3170	4.13e-07	3.50e-10	1.10	
Nearest Garden	NNW	4602	3.28e-07	2.74e-10	1.00	
Milk Cow	ESE	6706	1.35e-06	6.18e-10	1.70	0.65
Milk Cow	SSW	2286	2.24e-06	5.20e-09	1.90	0.65
Milk Cow	SSW	3353	1.36e-06	2.84e-09	2.00	0.65

Attachment B - Nearest Sector for Site Boundary

	Sector	Distance (Meters)	Chi/Q (s/m^3)	D/Q $(1/m^2)$	Terrain Adjustment Factor
Unrestricted Area Boundary	N	1550	5.12e-06	8.13e-09	1.70
Unrestricted Area Boundary	NNE	1980	6.35e-06	1.23e-08	1.80
Unrestricted Area Boundary	NE	1580	1.05e-05	1.10e-08	2.10
Unrestricted Area Boundary	ENE	1370	1.23e-05	8.77e-09	1.70
Unrestricted Area Boundary	E	1280	1.37e-05	9.66e-09	1.60
Unrestricted Area Boundary	ESE	1250	1.43e-05	1.16e-08	1.80
Unrestricted Area Boundary	SE	1250	1.11e-05	9.49e-09	1.50
Unrestricted Area Boundary	SSE	1250	6.04e-06	8.21e-09	1.50
Unrestricted Area Boundary	S	1340	5.33e-06	1.17-e08	1.90
Unrestricted Area Boundary	SSW	1550	4.14e-06	1.05e-08	2.00
Unrestricted Area Boundary	SW	1670	4.46e-06	7.34e-09	2.10
Unrestricted Area Boundary	WSW	1430	5.47e-06	6.37e-09	1.80
Unrestricted Area Boundary	W	1460	2.11e-06	2.07e-09	1.20
Unrestricted Area Boundary	WNW	1400	2.49e-06	2.38e-09	2.50
Unrestricted Area Boundary	NW	1400	2.05e-06	2.13e-09	1.70
Unrestricted Area Boundary	NNW	1460	2.68e-06	3.08e-09	1.60

Attachment C - 2007 Land Use Survey Environmental Dosimetry Data

TLD Station Number	Direction degrees	Approx Distance miles	1st Qtr 2007 mR/year	2nd Qtr 2007 mR/year	3rd Qtr 2007 mR/year	4th Qtr 2007 mR/year	Annual Exposure mR/year
N-1	10	1.2	15.7	16.8	12.1	16.1	60.7
N-2	350	4.7	15.8	12.1	13.5	11.2	52.6
NNE-1	21	1.2	15.7	9.3	14.4	15	54.4
NNE-1A	22	1.9	15	8.8	8.4	10.1	42.3
NNE-2	20	4.1	15.3	11.6	10.2	12.9	50
NNE-3	17	10.4	15.7	12.1	7.9	8.5	44.2
NE-1	39	0.9	15.7	12.6	13.5	12.3	54.1
NE-2	54	2.9	15.3	9.8	13	12.3	50.4
NE-3	47	6.1	15.2	6.9	10.2	9.6	41.9
ENE-1	74	0.7	15.7	9.8	14	11.2	50.7
ENE-2	69	5.8	15.3	11.6	12.1	11.8	50.8
ENE-2A	69	3.5	15.2	7.4	8.4	9.6	40.6
ENE-3	56	7.6	15.5	8.8	12.6	9	45.9
E-1	85	1.3	15.5	14	-1	13.9	57.9
E-2	92	5	15.6	14.9	17.7	14.5	62.7
E-3	90	15	15.4	12.6	17.2	14.5	59.7
ESE-1	109	1.2	14.8	8.3	8.8	8	39.9
ESE-2	106	4.4	15.8	14.9	17.7	14.5	62.9
SE-1A	138	0.9	15.1	10.2	9.8	8.5	43.6
SE-2	128	5.3	15.5	10.2	10.7	11.2	47.6
SE-2A	144	3.1	15.2	12.6	10.2	10.7	48.7
SSE-1	146	0.6	15.1	13.1	8.4	11.2	47.8
SSE-1A	161	0.6	15.6	10.2	12.1	12.3	50.2
SSE-2	156	5.8	15.6	10.7	14.9	15.6	56.8
S-1	182	0.7	15.6	9.3	9.3	8.5	42.7
S-2	185	4.8	15.3	8.8	5.1	9.6	38.8
S-2A	177	2	15.3	12.1	13.5	12.9	53.8
S-3	185	6.2	15.2	10.2	10.7	8.5	44.6
SSW-1	199	0.8	15.6	15.9	16.3	16.7	64.5
SSW-2	200	1.3	15.1	9.3	12.6	11.8	48.8
SSW-3	199	5	15.3	10.2	9.8	9.6	44.9
SW-1	226	0.8	15.6	16.8	12.6	18.8	63.8
SW-2	220	5.3	15.3	10.2	11.2	13.4	50.1
SW-3	225	15	15.2	9.3	10.2	10.1	44.8
WSW-1	255	0.9	15.6	10.2	11.2	15	52
WSW-2	247	4	15.2	13.1	13.5	16.1	57.9
W-1	270	0.9	15.6	13.5	13	8.5	50.6

Attachment C - 2007 Land Use Survey Environmental Dosimetry Data (continued)

TLD Station Number	Direction degrees	Approx Distance miles	1st Qtr 2007 mR/year	2nd Qtr 2007 mR/year	3rd Qtr 2007 mR/year	4th Qtr 2007 mR/year	Annual Exposure mR/year
W-2	277	4.8	15.3	10.2	8.8	9	43.3
W-2A	268	3.2	15.4	10.7	11.2	8	45.3
WNW-1	294	0.9	15.9	19.2	19.6	15	69.7
WNW-2	292	4.9	15.5	16.3	18.2	17.2	67.2
NW-1	320	1.1	15.8	11.6	12.1	13.9	53.4
NW-2	313	4.7	15.5	12.6	15.8	13.4	57.3
NW-2A	321	3	15.7	7.9	11.6	6.3	41.5
NW-3	317	7	15.6	13.1	14.4	15	58.1
NNW-1	340	1	15.6	12.1	9.8	12.3	49.8
NNW-2	333	4.5	15.7	11.2	12.1	10.1	49.1
NNW-3	329	7	15.6	7.9	7.9	7.4	38.8
NNW-4	337	15	15.6	9.8	8.8	8.5	42.7

Attachment D Absolute Humidity

TVA's Offsite Dose Calculation manuals include absolute humidity in the denominators of equations for ingestion dose factors. An estimated value of 9 grams per cubic meter is used based on the calculations performed for Browns Ferry and Sequoyah. The methodology used to determine the absolute humidity is examined in the following study.

Absolute humidity (H) is "the ratio of the mass of water vapor present to the volume occupied by the mixture: that is the density of the water vapor component." (Glossary of Meteorology) Absolute humidity is not directly measured, but must be calculated from those variables which are measured by TVA. TVA measures the temperature (T) and dewpoint (Td) at 10m at each nuclear plant. In the 1970's and early 1980's TVA also measured the barometric pressure.

Attachment E Liquid Effluent Source Term

Nuclide	LRW Ci	SGB Ci	Total Released Ci
Br-84	1.65E-04	5.23E-04	6.88E-04
I-131	2.63E-02	1.14E+00	1.16E+00
I-132	1.32E-02	1.08E-01	1.21E-01
I-133	5.29E-02	8.57E-01	9.10E-01
I-134	6.26E-03	2.65E-02	3.28E-02
I-135	4.75E-02	4.22E-01	4.70E-01
Rb-88	6.89E-03	7.84E-04	7.68E-03
Cs-134	2.93E-02	1.68E-01	1.98E-01
Cs-136	2.55E-03	1.72E-02	1.98E-02
Cs-137	4.03E-02	2.21E-01	2.61E-01
Na-24	1.86E-02	0.00E+00	1.86E-02
Cr-51	7.03E-03	9.27E-02	9.98E-02
Mn-54	4.99E-03	5.10E-02	5.59E-02
Fe-55	8.09E-03	0.00E+00	8.09E-03
Fe-59	2.42E-03	9.05E-03	1.15E-02
Co-58	2.20E-02	1.44E-01	1.66E-01
Co-60	1.44E-02	1.72E-02	3.16E-02
Zn-65	3.82E-04	0.00E+00	3.82E-04
Sr-89	1.92E-04	4.33E-03	4.52E-03
Sr-90	2.20E-05	3.88E-04	4.10E-04
Sr-91	2.84E-04	2.18E-03	2.47E-03
Y-91m	1.68E-04	0.00E+00	1.68E-04
Y-91	9.00E-05	3.00E-04	3.90E-04
Y-93	1.27E-03	0.00E+00	1.27E-03
Zr-95	1.39E-03	1.20E-02	1.34E-02
Nb-95	2.10E-03	8.98E-03	1.11E-02
Mo-99	4.20E-03	9.95E-02	1.04E-01
Tc-99m	3.35E-03	0.00E+00	3.35E-03
Ru-103	5.88E-03	0.00E+00	5.88E-03
Ru-106	7.63E-02	0.00E+00	7.63E-02
Te-129m	1.41E-04	0.00E+00	1.41E-04
Te-129	7.30E-04	0.00E+00	7.30E-04
Te-131m	8.05E-04	0.00E+00	8.05E-04
Te-131	2.03E-04	0.00E+00	2.03E-04
Te-132	1.11E-03	2.93E-02	3.05E-02
Ba-140	1.02E-02	3.48E-01	3.58E-01
La-140	1.62E-02	4.98E-01	5.14E-01
Ce-141	3.41E-04	0.00E+00	3.41E-04
Ce-143	1.53E-03	0.00E+00	1.53E-03
Ce-144	6.84E-03	1.26E-01	1.33E-01
Np-239	1.37E-03	0.00E+00	1.37E-03
H-3	1.25E+03	0.00E+00	1.25E+03
Unplanned	1.60E-01	0.00E+00	1.60E-01

Attachment E Liquid Effluent Source Term

Nuclide	LRW Ci	SGB Ci	Total Released Ci
Totals w/o H-3		4.4020E+00	4.8400E+00
Total w/unplanned			5.0000E+00
Totals w H-3			1.2576E+03
Total w/unplanned			1.2578E+03

Attachment F Shoreline Data

For WBN, the dilution factor (Mp/F) is replaced by the near field dilution factor (D_{NF}) as described below;

D_{NF} = 1/0.1 RF (for receptors upstream of TRM 510.0)

D_{NF} = 1/RF (for receptors downstream of TRM 510.0)

where: RF = 28,000 cfs

0.1 = the fraction of river flow available for dilution in the near field

TRM 510 is the point at which the effluent is considered to be fully mixed with the river flow.

Name	Beginning TRM	Ending TRM	Size (acres)	Estimated 2040 Recreation (visits/year)	Estimated 2040 Recreation (usage person hours)
Chickamauga Reservoir (from WBN to 100 percent mixing point)	528	510	4799	120,986	6.0E5
Chickamauga Reservoir (from 100 percent mixing point to SQN)	510	484	22101	1,297,880	6.5E6
Chickamauga Reservoir (from SQN to Chickamauga Dam)	484	471	9889	7,421,905	3.7E7
Nickajack Reservoir (from Chickamauga Dam to WBN 50-mile radius)	471	460	1799	284,000	1.4E6

Attachment G Public Water Supply Data

For WBN, the dilution factor (Mp/F) is replaced by the near field dilution factor (D_{NF}) as described below;

D_{NF} = 1/0.1 RF (for receptors upstream of TRM 510.0)

D_{NF} = 1/RF (for receptors downstream of TRM 510.0)

where: RF = 28,000 cfs

0.1 = the fraction of river flow available for dilution in the near field

TRM 510 is the point at which the effluent is considered to be fully mixed with the river flow.

Name	TRM	Estimated 2040 Population
Dayton, Tenn.	504	19,170
Soddy-Daisy/Falling Water Utility District	487	11,452
East Side Utility, Tenn.	473	49,700
Chattanooga, Tenn.	465	237,048

Sources

1. NUREG-0133, "Preparation of Radiological Effluent Technical Specifications for Nuclear Power Plants," September 1978.

2. Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I," Revision 1, October 1977.

3. Regulatory Guide 1.111, "Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Light-Water-Cooled Reactors," Revision 1, July 1977.

4. Regulatory Guide 1.113, "Estimating Aquatic Dispersion of Effluents from Accidental and Routine Reactor Releases for the Purpose of Implementing 10 CFR Part 50 Appendix I," Revision 1, April 1977.

5. TVA Memorandum, Edwin M. Scott to Betsy Eiford-Lee, "Fish Harvest Estimates for the Revision of the QWATA Computer Code," December 15, 1987.

6. NUREG/CR-1004, "A Statistical Analysis of Selected Parameters for Predicting Food Chain Transport and Internal Dose of Radionuclides," October 1979.

7. NUREG-0017 R1 "Calculation of Releases of Radioactive Materials in Gaseous and Liquid Effluents from Pressurized Water Reactors."

8. TVA Memorandum, E. E. Driver to R. B. Maxwell, "Watts Bar Nuclear Plant Dispersion," December 3, 1984.

Enclosure 2

X/Q and D/Q Information From the Site to a Radius of 50 Miles.

Attachment 1 provides a table of the X/Q and D/Q data for each of the 16 cardinal compass points out to 50 miles. Attachment 2 provides tables of the joint frequency distributions to be used in conjunction with the Attachment 1 data. The information provided is used for the determination of doses to the public in both the FSAR Chapter 11 routine releases and in the values provided in the Final Supplemental Environmental Impact Statement. The methodology used to develop this information was described in Reference 2.

Average Annual X/Q's and D/Q's Out to 50 Miles

X/Q's

Sector	1305 (m)	2414 (m)	4023 (m)	5633 (m)	7242 (m)	12070 (m)	24140 (m)	40234 (m)	56327 (m)	72420 (m)
N	3.92E-06	1.59E-06	7.65E-07	4.78E-07	3.39E-07	1.68E-07	6.69E-08	3.42E-08	2.22E-08	1.61E-08
NNE	6.54E-06	2.65E-06	1.28E-06	7.99E-07	5.65E-07	2.81E-07	1.12E-07	5.72E-08	3.71E-08	2.69E-08
NE	6.66E-06	2.76E-06	1.36E-06	8.61E-07	6.14E-07	3.10E-07	1.25E-07	6.47E-08	4.22E-08	3.07E-08
ENE	7.79E-06	3.29E-06	1.65E-06	1.05E-06	7.58E-07	3.87E-07	1.58E-07	8.23E-08	5.39E-08	3.94E-08
E	8.32E-06	3.53E-06	1.77E-06	1.13E-06	8.14E-07	4.16E-07	1.70E-07	8.87E-08	5.81E-08	4.28E-08
ESE	7.45E-06	3.15E-06	1.57E-06	1.00E-06	7.19E-07	3.67E-07	1.49E-07	7.79E-08	5.10E-08	3.73E-08
SE	6.94E-06	2.94E-06	1.47E-06	9.38E-07	6.73E-07	3.43E-07	1.40E-07	7.30E-08	4.78E-08	3.50E-08
SSE	3.77E-06	1.57E-06	7.78E-07	4.93E-07	3.52E-07	1.78E-07	7.20E-08	3.73E-08	2.44E-08	1.77E-08
S	2.92E-06	1.19E-06	5.77E-07	3.61E-07	2.56E-07	1.28E-07	5.08E-08	2.60E-08	1.69E-08	1.22E-08
SSW	2.70E-06	1.09E-06	5.26E-07	3.29E-07	2.33E-07	1.16E-07	4.57E-08	2.34E-08	1.51E-08	1.09E-08
SW	3.09E-06	1.26E-06	6.17E-07	3.89E-07	2.77E-07	1.39E-07	5.55E-08	2.86E-08	1.86E-08	1.35E-08
WSW	3.50E-06	1.45E-06	7.12E-07	4.50E-07	3.21E-07	1.62E-07	6.52E-08	3.37E-08	2.20E-08	1.60E-08
W	2.09E-06	8.59E-07	4.22E-07	2.67E-07	1.90E-07	9.56E-08	3.85E-08	1.99E-08	1.29E-08	9.40E-09
WNW	1.11E-06	4.56E-07	2.24E-07	1.41E-07	1.01E-07	5.05E-08	2.03E-08	1.05E-08	6.81E-09	4.95E-09
NW	1.34E-06	5.51E-07	2.70E-07	1.70E-07	1.21E-07	6.10E-08	2.45E-08	1.26E-08	8.20E-09	5.96E-09
NNW	1.99E-06	8.12E-07	3.95E-07	2.48E-07	1.76E-07	8.82E-08	3.52E-08	1.81E-08	1.18E-08	8.52E-09

D/Q's

Sector	1305 (m)	2414 (m)	4023 (m)	5633 (m)	7242 (m)	12070 (m)	24140 (m)	40234 (m)	56327 (m)	72420 (m)
N	6.32E-09	2.28E-09	9.45E-10	5.22E-10	3.32E-10	1.37E-10	4.18E-11	1.71E-11	9.24E-12	5.61E-12
NNE	1.35E-08	4.87E-09	2.02E-09	1.12E-09	7.10E-10	2.92E-10	8.94E-11	3.65E-11	1.98E-11	1.20E-11
NE	7.13E-09	2.57E-09	1.07E-09	5.89E-10	3.74E-10	1.54E-10	4.72E-11	1.92E-11	1.04E-11	6.33E-12
ENE	5.58E-09	2.01E-09	8.35E-10	4.61E-10	2.93E-10	1.21E-10	3.70E-11	1.51E-11	8.17E-12	4.96E-12
E	5.85E-09	2.11E-09	8.76E-10	4.84E-10	3.08E-10	1.27E-10	3.88E-11	1.58E-11	8.57E-12	5.20E-12
ESE	6.02E-09	2.17E-09	9.01E-10	4.98E-10	3.17E-10	1.30E-10	3.99E-11	1.63E-11	8.82E-12	5.35E-12
SE	5.90E-09	2.13E-09	8.82E-10	4.87E-10	3.10E-10	1.28E-10	3.91E-11	1.59E-11	8.63E-12	5.24E-12
SSE	5.11E-09	1.84E-09	7.64E-10	4.22E-10	2.68E-10	1.10E-10	3.38E-11	1.38E-11	7.47E-12	4.54E-12
S	6.41E-09	2.31E-09	9.59E-10	5.29E-10	3.37E-10	1.39E-10	4.24E-11	1.73E-11	9.38E-12	5.69E-12
SSW	6.91E-09	2.49E-09	1.03E-09	5.71E-10	3.63E-10	1.50E-10	4.58E-11	1.87E-11	1.01E-11	6.14E-12
SW	5.21E-09	1.88E-09	7.80E-10	4.31E-10	2.74E-10	1.13E-10	3.45E-11	1.41E-11	7.63E-12	4.63E-12
WSW	4.10E-09	1.48E-09	6.14E-10	3.39E-10	2.16E-10	8.88E-11	2.72E-11	1.11E-11	6.01E-12	3.65E-12
W	2.07E-09	7.45E-10	3.09E-10	1.71E-10	1.09E-11	4.47E-11	1.37E-11	5.58E-12	3.02E-12	1.83E-12
WNW	1.06E-09	3.84E-10	1.59E-10	8.79E-11	5.59E-11	2.30E-11	7.05E-12	2.87E-12	1.56E-12	9.46E-13
NW	1.41E-09	5.07E-10	2.10E-10	1.16E-10	7.39E-11	3.04E-11	9.31E-12	3.87E-12	2.06E-12	1.25E-12
NNW	2.31E-09	8.34E-10	3.46E-10	1.91E-10	1.21E-10	5.00E-11	1.53E-11	6.24E-12	3.38E-12	2.05E-12

Enclosure 2

Attachment 2

Joint Percentage Frequencies of Wind Direction and Wind Speed for Difference Stability Classes

STABILITY CLASS A

(DELTA T<=-1.9 C/100 M)

Watts Bar Nuclear Plant

JAN 1, 1986 - DEC 31, 2005

WIND SPEED (MPH)

WIND DIRECTION	CALM	0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	TOTAL
N	0.000	0.001	0.011	0.052	0.079	0.095	0.005	0.000	0.000	0.244
NNE	0.000	0.001	0.021	0.084	0.124	0.181	0.007	0.000	0.000	0.418
NE	0.000	0.000	0.034	0.100	0.080	0.094	0.000	0.000	0.000	0.308
ENE	0.000	0.000	0.039	0.076	0.045	0.017	0.000	0.000	0.000	0.175
E	0.000	0.000	0.037	0.040	0.010	0.004	0.000	0.000	0.000	0.092
ESE	0.000	0.000	0.017	0.023	0.002	0.001	0.000	0.000	0.000	0.042
SE	0.000	0.001	0.026	0.027	0.005	0.004	0.000	0.000	0.000	0.064
SSE	0.000	0.000	0.049	0.063	0.015	0.011	0.001	0.000	0.000	0.140
S	0.000	0.002	0.070	0.180	0.142	0.121	0.020	0.001	0.000	0.535
SSW	0.000	0.000	0.063	0.371	0.594	0.700	0.049	0.001	0.000	1.778
SW	0.000	0.000	0.029	0.146	0.148	0.065	0.002	0.000	0.000	0.390
WSW	0.000	0.000	0.007	0.020	0.018	0.040	0.006	0.000	0.000	0.091
W	0.000	0.000	0.006	0.007	0.029	0.059	0.007	0.000	0.000	0.108
WNW	0.000	0.000	0.004	0.010	0.011	0.064	0.005	0.000	0.000	0.093
NW	0.000	0.000	0.004	0.007	0.019	0.052	0.005	0.000	0.000	0.087
NNW	0.000	0.000	0.009	0.021	0.038	0.081	0.012	0.000	0.000	0.161
SUBTOTAL	0.001	0.005	0.426	1.226	1.359	1.589	0.119	0.001	0.000	4.725

```
TOTAL HOURS OF VALID STABILITY OBSERVATIONS                                170639
TOTAL HOURS OF STABILITY CLASS A                                             8030
TOTAL HOURS OF VALID WIND DIRECTION-WIND SPEED-STABILITY CLASS A             7945
TOTAL HOURS OF VALID WIND DIRECTION-WIND SPEED-STABILITY OBSERVATIONS      168144
TOTAL HOURS CALM                                                                1
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METEOROLOGICAL FACILITY: Watts Bar Nuclear Plant
STABILITY BASED ON DELTA-T BETWEEN   9.51 AND 45.63 METERS
WIND SPEED AND DIRECTION MEASURED AT   9.72 METER LEVEL

MEAN WIND SPEED = 6.72

NOTE: TOTALS AND SUBTOTALS ARE OBTAINED FROM UNROUNDED NUMBERS

Enclosure 2

Attachment 2

**Joint Percentage Frequencies of Wind Direction
and Wind Speed for Difference Stability Classes**

STABILITY CLASS B

(-1.9< DELTA T<=-1.7 C/100 M)

Watts Bar Nuclear Plant

JAN 1, 1986 - DEC 31, 2005

WIND SPEED (MPH)

WIND DIRECTION	CALM	0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	TOTAL
N	0.000	0.000	0.027	0.092	0.084	0.109	0.005	0.000	0.000	0.318
NNE	0.000	0.001	0.039	0.155	0.147	0.212	0.009	0.000	0.000	0.563
NE	0.000	0.000	0.081	0.147	0.090	0.077	0.001	0.000	0.000	0.396
ENE	0.000	0.001	0.058	0.096	0.043	0.010	0.000	0.000	0.000	0.208
E	0.000	0.001	0.046	0.052	0.004	0.002	0.000	0.000	0.000	0.106
ESE	0.000	0.002	0.026	0.022	0.000	0.000	0.000	0.000	0.000	0.051
SE	0.000	0.000	0.039	0.032	0.005	0.002	0.001	0.000	0.000	0.078
SSE	0.000	0.000	0.057	0.035	0.008	0.004	0.000	0.000	0.000	0.104
S	0.000	0.001	0.077	0.148	0.075	0.039	0.014	0.001	0.000	0.354
SSW	0.000	0.001	0.082	0.322	0.266	0.199	0.020	0.000	0.000	0.890
SW	0.000	0.000	0.036	0.169	0.054	0.014	0.001	0.000	0.000	0.275
WSW	0.000	0.000	0.007	0.037	0.015	0.021	0.001	0.000	0.000	0.081
W	0.000	0.000	0.006	0.011	0.025	0.040	0.009	0.000	0.000	0.091
WNW	0.000	0.001	0.005	0.014	0.031	0.079	0.007	0.000	0.000	0.137
NW	0.000	0.000	0.007	0.015	0.033	0.071	0.008	0.000	0.000	0.135
NNW	0.000	0.000	0.011	0.034	0.040	0.079	0.008	0.000	0.000	0.173
SUBTOTAL	0.000	0.007	0.606	1.383	0.923	0.958	0.083	0.001	0.000	3.960

TOTAL HOURS OF VALID STABILITY OBSERVATIONS   170639
TOTAL HOURS OF STABILITY CLASS B   6722
TOTAL HOURS OF VALID WIND DIRECTION-WIND SPEED-STABILITY CLASS B   6659
TOTAL HOURS OF VALID WIND DIRECTION-WIND SPEED-STABILITY OBSERVATIONS   168144
TOTAL HOURS CALM   0

METEOROLOGICAL FACILITY: Watts Bar Nuclear Plant
STABILITY BASED ON DELTA-T BETWEEN   9.51 AND 45.63 METERS
WIND SPEED AND DIRECTION MEASURED AT   9.72 METER LEVEL

MEAN WIND SPEED = 5.98

NOTE: TOTALS AND SUBTOTALS ARE OBTAINED FROM UNROUNDED NUMBERS

Enclosure 2

Attachment 2

Joint Percentage Frequencies of Wind Direction and Wind Speed for Difference Stability Classes

STABILITY CLASS C

(-1.7< DELTA T<=-1.5 C/100 M)

Watts Bar Nuclear Plant

JAN 1, 1986 - DEC 31, 2005

WIND SPEED (MPH)

WIND DIRECTION	CALM	0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	TOTAL
N	0.000	0.001	0.060	0.141	0.125	0.151	0.007	0.000	0.000	0.485
NNE	0.000	0.001	0.111	0.224	0.209	0.260	0.013	0.000	0.000	0.817
NE	0.000	0.003	0.139	0.221	0.117	0.070	0.001	0.000	0.000	0.552
ENE	0.000	0.001	0.113	0.127	0.030	0.005	0.001	0.000	0.000	0.277
E	0.000	0.005	0.080	0.049	0.005	0.002	0.000	0.000	0.000	0.140
ESE	0.000	0.003	0.054	0.028	0.002	0.001	0.000	0.000	0.000	0.088
SE	0.000	0.002	0.071	0.033	0.002	0.001	0.000	0.000	0.000	0.109
SSE	0.000	0.002	0.080	0.064	0.009	0.004	0.002	0.000	0.000	0.161
S	0.000	0.001	0.128	0.230	0.085	0.048	0.008	0.001	0.000	0.503
SSW	0.000	0.001	0.152	0.423	0.256	0.177	0.019	0.000	0.000	1.028
SW	0.000	0.001	0.080	0.225	0.070	0.011	0.001	0.000	0.000	0.387
WSW	0.000	0.001	0.023	0.049	0.026	0.015	0.001	0.000	0.000	0.117
W	0.000	0.001	0.016	0.027	0.039	0.042	0.004	0.000	0.000	0.130
WNW	0.000	0.000	0.013	0.030	0.049	0.111	0.010	0.000	0.000	0.214
NW	0.000	0.000	0.020	0.036	0.043	0.096	0.011	0.000	0.000	0.206
NNW	0.000	0.000	0.032	0.059	0.064	0.098	0.011	0.000	0.000	0.264
SUBTOTAL	0.000	0.023	1.171	1.968	1.130	1.093	0.089	0.001	0.000	5.476

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TOTAL HOURS OF VALID STABILITY OBSERVATIONS                              170639
TOTAL HOURS OF STABILITY CLASS C                                          9309
TOTAL HOURS OF VALID WIND DIRECTION-WIND SPEED-STABILITY CLASS C          9207
TOTAL HOURS OF VALID WIND DIRECTION-WIND SPEED-STABILITY OBSERVATIONS    168144
TOTAL HOURS CALM                                                             0
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METEOROLOGICAL FACILITY: Watts Bar Nuclear Plant
STABILITY BASED ON DELTA-T BETWEEN   9.51 AND 45.63 METERS
WIND SPEED AND DIRECTION MEASURED AT   9.72 METER LEVEL

MEAN WIND SPEED = 5.57

NOTE: TOTALS AND SUBTOTALS ARE OBTAINED FROM UNROUNDED NUMBERS

Enclosure 2

Attachment 2

Joint Percentage Frequencies of Wind Direction and Wind Speed for Difference Stability Classes

STABILITY CLASS D

(-1.5< DELTA T<=-0.5 C/100 M)

Watts Bar Nuclear Plant

JAN 1, 1986 - DEC 31, 2005

WIND SPEED (MPH)

WIND DIRECTION	CALM	0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	TOTAL
N	0.006	0.050	0.656	0.996	1.063	1.203	0.034	0.000	0.000	4.007
NNE	0.006	0.052	0.697	1.241	1.206	1.182	0.072	0.002	0.000	4.458
NE	0.007	0.064	0.796	1.060	0.477	0.203	0.005	0.000	0.000	2.612
ENE	0.008	0.095	0.840	0.479	0.115	0.038	0.002	0.000	0.000	1.577
E	0.005	0.126	0.478	0.137	0.022	0.005	0.000	0.000	0.000	0.774
ESE	0.003	0.081	0.275	0.057	0.006	0.004	0.000	0.000	0.000	0.426
SE	0.004	0.090	0.369	0.076	0.022	0.014	0.001	0.001	0.000	0.575
SSE	0.006	0.133	0.566	0.160	0.035	0.034	0.014	0.000	0.000	0.949
S	0.011	0.174	1.104	0.699	0.296	0.251	0.076	0.004	0.000	2.615
SSW	0.015	0.145	1.610	1.796	0.927	0.815	0.076	0.002	0.000	5.386
SW	0.010	0.167	1.060	0.790	0.202	0.097	0.004	0.000	0.000	2.329
WSW	0.006	0.109	0.558	0.289	0.123	0.088	0.004	0.000	0.000	1.177
W	0.005	0.121	0.406	0.293	0.258	0.256	0.008	0.000	0.000	1.347
WNW	0.004	0.095	0.353	0.394	0.491	0.520	0.021	0.000	0.000	1.879
NW	0.004	0.071	0.353	0.403	0.532	0.608	0.046	0.001	0.000	2.017
NNW	0.004	0.042	0.445	0.566	0.631	0.795	0.034	0.000	0.000	2.517
SUBTOTAL	0.104	1.615	10.566	9.436	6.405	6.113	0.395	0.010	0.000	34.645

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TOTAL HOURS OF VALID STABILITY OBSERVATIONS                            170639
TOTAL HOURS OF STABILITY CLASS D                                       58946
TOTAL HOURS OF VALID WIND DIRECTION-WIND SPEED-STABILITY CLASS D       58253
TOTAL HOURS OF VALID WIND DIRECTION-WIND SPEED-STABILITY OBSERVATIONS  168144
TOTAL HOURS CALM                                                       175
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METEOROLOGICAL FACILITY: Watts Bar Nuclear Plant
STABILITY BASED ON DELTA-T BETWEEN   9.51 AND 45.63 METERS
WIND SPEED AND DIRECTION MEASURED AT   9.72 METER LEVEL

MEAN WIND SPEED = 4.96

NOTE: TOTALS AND SUBTOTALS ARE OBTAINED FROM UNROUNDED NUMBERS

Enclosure 2

Attachment 2

Joint Percentage Frequencies of Wind Direction and Wind Speed for Difference Stability Classes

STABILITY CLASS E

(-0.5< DELTA T<= 1.5 C/100 M)

Watts Bar Nuclear Plant

JAN 1, 1986 - DEC 31, 2005

WIND SPEED (MPH)

WIND DIRECTION	CALM	0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	TOTAL
N	0.032	0.156	0.484	0.623	0.300	0.062	0.002	0.000	0.000	1.659
NNE	0.029	0.142	0.431	0.322	0.171	0.047	0.003	0.000	0.000	1.144
NE	0.039	0.169	0.606	0.366	0.068	0.012	0.003	0.000	0.000	1.264
ENE	0.053	0.240	0.813	0.196	0.015	0.004	0.001	0.000	0.000	1.321
E	0.029	0.277	0.310	0.040	0.011	0.003	0.000	0.000	0.000	0.671
ESE	0.014	0.167	0.118	0.024	0.006	0.004	0.001	0.000	0.000	0.333
SE	0.018	0.203	0.149	0.048	0.025	0.017	0.002	0.000	0.000	0.462
SSE	0.032	0.324	0.321	0.083	0.051	0.039	0.007	0.000	0.000	0.856
S	0.077	0.519	1.012	0.415	0.197	0.193	0.041	0.001	0.000	2.454
SSW	0.123	0.604	1.864	1.178	0.645	0.516	0.051	0.000	0.000	4.981
SW	0.101	0.731	1.291	0.307	0.121	0.062	0.002	0.000	0.000	2.616
WSW	0.072	0.736	0.711	0.147	0.087	0.037	0.001	0.000	0.000	1.792
W	0.064	0.698	0.591	0.194	0.083	0.034	0.000	0.000	0.000	1.664
WNW	0.059	0.645	0.537	0.263	0.099	0.037	0.001	0.000	0.000	1.642
NW	0.048	0.461	0.507	0.279	0.108	0.047	0.002	0.001	0.000	1.453
NNW	0.036	0.255	0.457	0.375	0.247	0.092	0.005	0.000	0.000	1.465
SUBTOTAL	0.827	6.326	10.201	4.862	2.234	1.206	0.121	0.002	0.000	25.777

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TOTAL HOURS OF VALID STABILITY OBSERVATIONS                              170639
TOTAL HOURS OF STABILITY CLASS E                                         44130
TOTAL HOURS OF VALID WIND DIRECTION-WIND SPEED-STABILITY CLASS E         43343
TOTAL HOURS OF VALID WIND DIRECTION-WIND SPEED-STABILITY OBSERVATIONS    168144
TOTAL HOURS CALM                                                         1390
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METEOROLOGICAL FACILITY: Watts Bar Nuclear Plant
STABILITY BASED ON DELTA-T BETWEEN   9.51 AND 45.63 METERS
WIND SPEED AND DIRECTION MEASURED AT   9.72 METER LEVEL

MEAN WIND SPEED = 3.03

NOTE: TOTALS AND SUBTOTALS ARE OBTAINED FROM UNROUNDED NUMBERS

Enclosure 2

Attachment 2

Joint Percentage Frequencies of Wind Direction and Wind Speed for Difference Stability Classes

STABILITY CLASS F

(1.5< DELTA T<= 4.0 C/100 M)

Watts Bar Nuclear Plant

JAN 1, 1986 - DEC 31, 2005

WIND SPEED (MPH)

WIND DIRECTION	CALM	0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	TOTAL
N	0.046	0.268	0.181	0.018	0.001	0.001	0.000	0.000	0.000	0.515
NNE	0.038	0.199	0.172	0.016	0.002	0.001	0.000	0.000	0.000	0.429
NE	0.050	0.218	0.266	0.029	0.002	0.000	0.000	0.000	0.000	0.565
ENE	0.064	0.275	0.348	0.032	0.002	0.001	0.000	0.000	0.000	0.721
E	0.033	0.197	0.123	0.005	0.001	0.000	0.000	0.000	0.000	0.358
ESE	0.015	0.121	0.027	0.000	0.000	0.000	0.000	0.000	0.000	0.163
SE	0.016	0.119	0.036	0.004	0.001	0.001	0.000	0.000	0.000	0.176
SSE	0.025	0.177	0.066	0.010	0.001	0.002	0.001	0.000	0.000	0.282
S	0.056	0.313	0.236	0.032	0.004	0.002	0.000	0.000	0.000	0.643
SSW	0.103	0.459	0.547	0.156	0.020	0.004	0.000	0.000	0.000	1.290
SW	0.136	0.698	0.627	0.040	0.006	0.001	0.000	0.000	0.000	1.507
WSW	0.167	0.994	0.639	0.023	0.002	0.001	0.000	0.000	0.000	1.827
W	0.183	1.268	0.522	0.021	0.003	0.001	0.000	0.000	0.000	1.999
WNW	0.177	1.279	0.447	0.029	0.001	0.001	0.000	0.000	0.000	1.933
NW	0.171	1.198	0.472	0.034	0.002	0.001	0.000	0.000	0.000	1.878
NNW	0.080	0.525	0.254	0.036	0.002	0.001	0.000	0.000	0.000	0.897
SUBTOTAL	1.360	8.307	4.963	0.486	0.049	0.016	0.001	0.000	0.000	15.181

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TOTAL HOURS OF VALID STABILITY OBSERVATIONS                              170639
  TOTAL HOURS OF STABILITY CLASS F                                        26048
  TOTAL HOURS OF VALID WIND DIRECTION-WIND SPEED-STABILITY CLASS F        25526
  TOTAL HOURS OF VALID WIND DIRECTION-WIND SPEED-STABILITY OBSERVATIONS  168144
  TOTAL HOURS CALM                                                         2286
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METEOROLOGICAL FACILITY: Watts Bar Nuclear Plant
STABILITY BASED ON DELTA-T BETWEEN   9.51 AND 45.63 METERS
WIND SPEED AND DIRECTION MEASURED AT   9.72 METER LEVEL

MEAN WIND SPEED = 1.42

NOTE: TOTALS AND SUBTOTALS ARE OBTAINED FROM UNROUNDED NUMBERS

Enclosure 2

Attachment 2

**Joint Percentage Frequencies of Wind Direction
and Wind Speed for Difference Stability Classes**

STABILITY CLASS G

(DELTA T > 4.0 C/100 M)

Watts Bar Nuclear Plant

JAN 1, 1986 – DEC 31, 2005

WIND SPEED (MPH)

WIND DIRECTION	CALM	0.6-1.4	1.5-3.4	3.5-5.4	5.5-7.4	7.5-12.4	12.5-18.4	18.5-24.4	>=24.5	TOTAL
N	0.035	0.221	0.066	0.001	0.000	0.000	0.000	0.000	0.000	0.323
NNE	0.034	0.199	0.077	0.001	0.000	0.000	0.000	0.000	0.000	0.310
NE	0.048	0.271	0.123	0.002	0.000	0.000	0.000	0.000	0.000	0.444
ENE	0.059	0.300	0.188	0.004	0.001	0.000	0.000	0.000	0.000	0.551
E	0.032	0.202	0.058	0.002	0.000	0.000	0.000	0.000	0.000	0.294
ESE	0.016	0.116	0.018	0.000	0.000	0.000	0.000	0.000	0.000	0.151
SE	0.021	0.145	0.023	0.000	0.000	0.000	0.000	0.000	0.000	0.189
SSE	0.025	0.173	0.032	0.001	0.000	0.000	0.000	0.000	0.000	0.231
S	0.036	0.246	0.051	0.002	0.000	0.000	0.000	0.000	0.000	0.335
SSW	0.060	0.367	0.123	0.005	0.001	0.000	0.000	0.000	0.000	0.556
SW	0.096	0.569	0.222	0.002	0.000	0.000	0.000	0.000	0.000	0.889
WSW	0.162	0.916	0.410	0.007	0.000	0.000	0.000	0.000	0.000	1.495
W	0.169	1.036	0.351	0.002	0.000	0.000	0.000	0.000	0.000	1.559
WNW	0.130	0.825	0.240	0.004	0.000	0.000	0.000	0.000	0.000	1.200
NW	0.127	0.751	0.292	0.002	0.000	0.000	0.000	0.000	0.000	1.173
NNW	0.058	0.356	0.120	0.002	0.000	0.000	0.000	0.000	0.000	0.536
SUBTOTAL	1.109	6.695	2.394	0.037	0.001	0.000	0.000	0.000	0.000	10.236

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TOTAL HOURS OF VALID STABILITY OBSERVATIONS                              170639
 TOTAL HOURS OF STABILITY CLASS G                                         17454
 TOTAL HOURS OF VALID WIND DIRECTION-WIND SPEED-STABILITY CLASS G         17211
 TOTAL HOURS OF VALID WIND DIRECTION-WIND SPEED-STABILITY OBSERVATIONS   168144
 TOTAL HOURS CALM                                                          1864
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METEOROLOGICAL FACILITY: Watts Bar Nuclear Plant
STABILITY BASED ON DELTA-T BETWEEN   9.51 AND 45.63 METERS
WIND SPEED AND DIRECTION MEASURED AT   9.72 METER LEVEL

MEAN WIND SPEED = 1.14

NOTE: TOTALS AND SUBTOTALS ARE OBTAINED FROM UNROUNDED NUMBERS

Enclosure 3

List of Commitments

1. This information will be added to the Unit 2 FSAR in Amendment 104. [Cover Letter]