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established in Subsection 2.3.4 of Westinghouse's AP1000 DCD and listed in Table 2-1 of the AP1000 DCD (values reproduced in the table).

The maximum predicted Chi/Q values were determined in accordance with NRC Regulatory Guide 1.194.

Input to the ARCON96 model other than the site-specific meteorological data consisted of the data provided in AP1000 DCD Table 15A-7 and DCD Figure 15A-1 and FSAR Table 2.3.4-207 and FSAR Figure 2.1.1-203. DCD Table 15A-7 provides the release and receptor elevations and the horizontal distance between the release and receptor points. DCD Figure 15A-1 shows the orientation of the AP1000 and the locations of the release and receptor points. Figure 2.1.1-203 shows the plant layout on the site, including the true north direction. Plant north is given as 25 degrees counterclockwise. Table 2.3.4-207 provides the site-specific release/receptor azimuthal angles for input to ARCON96.

2.3.5 LONG-TERM ATMOSPHERIC DISPERSION ESTIMATES FOR ROUTINE RELEASES

2.3.5.1 Objective

HAR COL 2.3-5 Estimates of long-term Chi/Q and relative deposition (D/Q) were estimated using a straight-line Gaussian model, consistent with the requirements of NRC Regulatory Guides 1.109 and 1.111. The objective was to calculate Chi/Q and D/Q values at the following locations in each of the 16 primary directions, including:

- Exclusion area boundary (as described in Section 2.1.2 and Section 2.3.4.2).
- Low population zone (variable distance based on site centerpoint).
- Distance to nearest milk cow.
- Distance to nearest milk goat.
- Distance to nearest garden.
- Distance to nearest meat animal.
- Distance to nearest residence.
- Distances of 0.8, 1.2, 1.6, 2.4, 3.2, 4.0, 4.8, 5.6, 6.4, 7.2, 8.0, 12.0, 16.0, 22.5, 32.0, 40.0, 48.0, 56.0, 64.0, 72.0, and 80.0 km (0.5, 0.75, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 7.5, 10.0, 15.0, 20.0, 25.0, 30.0, 35.0, 40.0, 45.0, and 50.0 mi.) from the HAR site.

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Subsection 2.3.5.2 provides additional information on the calculations and results of long-term Chi/Q estimates for the HAR site.

2.3.5.2 Calculations

The calculations of Chi/Q and D/Q at the locations and distances listed above were made using NRC's XOQDOQ computer program using 5 years of hourly, on-site meteorological data.

Assumptions used in the analysis are summarized below:

- Meteorological Data Source – HNP on-site meteorological tower.
- Period of Record – March 1, 1994 to February 28, 1999.
- Wind Reference Level – 12 m (39 ft.).
- Stability Calculation – Delta-Temperature (12- and 61-m [39- and 200-ft.] tower levels).
- Release Type – Ground level.
- Release Height – 10 m (33 ft.).
- Building Wake Effects – Included.
- For sectors containing nearest milk cow, milk goat, garden, meat animal, and residence, it was assumed that if these did not exist within 8 km (5 mi.) of HNP, 8 km (5 mi.) was assumed as the location of the receptor. Also, some locations represent historical activities (milk cows for the N and NNE sectors) but were retained to be conservative.

Based on the location of HAR 2 and HAR 3 with respect to surrounding topography and the main and auxiliary reservoirs, the atmospheric diffusion parameter, sigma z, is not expected to be significantly influenced by the topographical conditions. Therefore, no modifications were made to this atmospheric dispersion parameter.

The results of the long-term Chi/Q and relative deposition (D/Q) have been summarized in [Tables 2.3.5-201](#), [2.3.5-202](#), [2.3.5-203](#), and [2.3.5-204](#). [Table 2.3.5-201](#) contains the Chi/Q calculations for routine releases, and [Table 2.3.5-202](#) contains D/Q calculations for routine releases that account for deposition effects. [Table 2.3.5-203](#) contains Chi/Q calculations based on radioactive decay with an overall half-life of 2.26 days for short-lived noble gases. [Table 2.3.5-204](#) contains Chi/Q calculations based on radioactive decay with an 8-day half-life for all iodines released to the atmosphere.

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Based on these analyses, the established site characteristic value for the maximum average annual dispersion factor at the EAB is a value of $8.80\text{E-}06 \text{ sec/m}^3$ for any given sector (i.e., SSW sector; refer to [Table 2.3.5-201](#)).

2.3.6 COMBINED LICENSE INFORMATION

2.3.6.1 Regional Climatology

HAR COL 2.3-1 This COL Item is addressed in [Subsection 2.3.1](#).

2.3.6.2 Local Meteorology

HAR COL 2.3-2 This COL Item is addressed in [Subsection 2.3.2](#).

2.3.6.3 On-Site Meteorological

HAR COL 2.3-3 This COL Item is addressed in [Subsection 2.3.3](#).

2.3.6.4 Short-Term Diffusion Estimates

HAR COL 2.3-4 This COL Item is addressed in [Subsection 2.3.4](#).

2.3.6.5 Long-Term Diffusion Estimates

HAR COL 2.3-5 This COL Item is addressed in [Subsection 2.3.5](#).

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HAR COL 2.3-5

**Table 2.3.5-201 (Sheet 1 of 3)
Long-Term Chi/Q (in sec/m³) Calculations for Routine Releases for HAR 2 and HAR 3**

Exclusion Area Boundary		Low Population Zone ^a		Nearest Milk Cow		Nearest Milk Goat		Nearest Garden		Nearest Meat Animal	
Downwind Sector	Distance (m)	Chi/Q	Distance (m)	Chi/Q	Distance (m)	Chi/Q	Distance (m)	Chi/Q	Distance (m)	Chi/Q	Distance (m)
N	1245	2.30E-06	4959	3.10E-07	2973	6.50E-07	7472	1.80E-07	2974	6.50E-07	2974
NNE	1245	2.80E-06	4925	3.90E-07	4297	4.70E-07	7630	2.10E-07	2668	9.30E-07	2668
NE	1245	2.60E-06	4876	3.70E-07	7851	1.90E-07	7851	1.90E-07	7851	1.90E-07	7851
ENE	1245	2.80E-06	4832	4.10E-07	8100	2.00E-07	8100	2.00E-07	8100	2.00E-07	8100
E	1245	2.10E-06	4887	3.10E-07	8338	1.50E-07	8338	1.50E-07	2994	6.10E-07	2994
ESE	1245	2.60E-06	4934	4.00E-07	8530	1.90E-07	8530	1.90E-07	7887	2.10E-07	7887
SE	1245	2.80E-06	4964	4.20E-07	8651	2.00E-07	8651	2.00E-07	7202	2.50E-07	4790
SSE	1245	4.30E-06	4973	6.60E-07	8686	3.20E-07	8686	3.20E-07	7398	3.90E-07	7398
S	1245	8.00E-06	4959	1.30E-06	8631	6.20E-07	8631	6.20E-07	8631	6.20E-07	8631
SSW	1245	8.80E-06	4925	1.40E-06	8492	7.10E-07	8492	7.10E-07	6565	9.80E-07	8492
SW	1245	6.00E-06	4876	9.60E-07	8287	4.90E-07	8287	4.90E-07	4922	9.50E-07	4922
WSW	1245	3.40E-06	4832	5.30E-07	8044	2.70E-07	8044	2.70E-07	7242	3.10E-07	7242
W	1245	2.20E-06	4887	3.40E-07	7798	1.80E-07	7798	1.80E-07	4754	3.50E-07	4754
WNW	1245	1.70E-06	4934	2.50E-07	7588	1.40E-07	7588	1.40E-07	7588	1.40E-07	7588
NW	1245	1.50E-06	4964	2.10E-07	7449	1.20E-07	7449	1.20E-07	7449	1.20E-07	7449
NNW	1245	1.70E-06	4973	2.30E-07	7408	1.30E-07	7408	1.30E-07	2580	5.90E-07	2580

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**Table 2.3.5-201 (Sheet 2 of 3)
Long-Term Chi/Q (in sec/m³) Calculations for Routine Releases for HAR 2 and HAR 3**

Nearest Residence		Downwind Distance (mi.)										
Downwind Sector	Distance (m)	Chi/Q	0.5	0.75	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5
N	2974	6.50E-07	4.47E-06	2.41E-06	1.57E-06	8.74E-07	5.79E-07	4.21E-07	3.25E-07	2.62E-07	2.17E-07	1.84E-07
NNE	2668	9.30E-07	5.45E-06	2.94E-06	1.91E-06	1.07E-06	7.11E-07	5.19E-07	4.02E-07	3.24E-07	2.69E-07	2.29E-07
NE	3534	5.80E-07	5.09E-06	2.72E-06	1.76E-06	9.93E-07	6.62E-07	4.85E-07	3.76E-07	3.04E-07	2.53E-07	2.15E-07
ENE	8100	2.00E-07	5.52E-06	2.90E-06	1.88E-06	1.06E-06	7.11E-07	5.21E-07	4.06E-07	3.28E-07	2.74E-07	2.33E-07
E	2680	7.10E-07	4.21E-06	2.20E-06	1.42E-06	8.18E-07	5.53E-07	4.09E-07	3.20E-07	2.60E-07	2.18E-07	1.86E-07
ESE	4676	4.30E-07	5.35E-06	2.74E-06	1.77E-06	1.03E-06	6.99E-07	5.20E-07	4.08E-07	3.33E-07	2.80E-07	2.40E-07
SE	4790	4.40E-07	5.73E-06	2.92E-06	1.88E-06	1.09E-06	7.40E-07	5.50E-07	4.31E-07	3.52E-07	2.95E-07	2.53E-07
SSE	7398	3.90E-07	8.96E-06	4.55E-06	2.92E-06	1.71E-06	1.17E-06	8.69E-07	6.84E-07	5.60E-07	4.70E-07	4.04E-07
S	8631	6.20E-07	1.68E-05	8.44E-06	5.43E-06	3.20E-06	2.20E-06	1.64E-06	1.30E-06	1.06E-06	8.95E-07	7.70E-07
SSW	6565	9.80E-07	1.86E-05	9.28E-06	5.95E-06	3.53E-06	2.43E-06	1.83E-06	1.45E-06	1.19E-06	1.00E-06	8.63E-07
SW	4922	9.50E-07	1.26E-05	6.32E-06	4.06E-06	2.40E-06	1.65E-06	1.24E-06	9.76E-07	8.01E-07	6.75E-07	5.81E-07
WSW	7242	3.10E-07	6.93E-06	3.54E-06	2.28E-06	1.33E-06	9.05E-07	6.73E-07	5.29E-07	4.32E-07	3.63E-07	3.11E-07
W	4594	3.70E-07	4.50E-06	2.32E-06	1.50E-06	8.67E-07	5.90E-07	4.38E-07	3.44E-07	2.81E-07	2.35E-07	2.02E-07
WNW	3577	3.80E-07	3.33E-06	1.74E-06	1.13E-06	6.47E-07	4.37E-07	3.23E-07	2.53E-07	2.06E-07	1.72E-07	1.47E-07
NW	3268	3.80E-07	3.00E-06	1.59E-06	1.03E-06	5.82E-07	3.90E-07	2.86E-07	2.23E-07	1.80E-07	1.50E-07	1.28E-07
NNW	1936	8.80E-07	3.29E-06	1.77E-06	1.15E-06	6.46E-07	4.30E-07	3.14E-07	2.43E-07	1.96E-07	1.63E-07	1.39E-07

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**Table 2.3.5-201 (Sheet 3 of 3)
Long-Term Chi/Q (in sec/m³) Calculations for Routine Releases for HAR 2 and HAR 3**

Downwind Sector	Downwind Distance (mi.)									
	5.0	7.5	10.0	15.0	20.0	25.0	30.0	35.0	40.0	50.0
N	1.59E-07	9.11E-08	6.16E-08	3.56E-08	2.43E-08	1.81E-08	1.42E-08	1.16E-08	9.77E-09	8.38E-09
NNE	1.98E-07	1.14E-07	7.71E-08	4.49E-08	3.07E-08	2.29E-08	1.80E-08	1.48E-08	1.24E-08	1.07E-08
NE	1.86E-07	1.08E-07	7.31E-08	4.27E-08	2.93E-08	2.19E-08	1.73E-08	1.42E-08	1.20E-08	1.03E-08
ENE	2.02E-07	1.17E-07	8.01E-08	4.71E-08	3.24E-08	2.43E-08	1.93E-08	1.59E-08	1.34E-08	1.15E-08
E	1.62E-07	9.50E-08	6.53E-08	3.88E-08	2.69E-08	2.03E-08	1.61E-08	1.33E-08	1.13E-08	9.72E-09
ESE	2.09E-07	1.24E-07	8.55E-08	5.11E-08	3.56E-08	2.70E-08	2.15E-08	1.78E-08	1.51E-08	1.31E-08
SE	2.20E-07	1.30E-07	9.01E-08	5.39E-08	3.76E-08	2.85E-08	2.27E-08	1.88E-08	1.59E-08	1.38E-08
SSE	3.52E-07	2.10E-07	1.45E-07	8.73E-08	6.10E-08	4.63E-08	3.70E-08	3.06E-08	2.60E-08	2.26E-08
S	6.73E-07	4.02E-07	2.80E-07	1.69E-07	1.18E-07	9.00E-08	7.20E-08	5.97E-08	5.08E-08	4.41E-08
SSW	7.55E-07	4.53E-07	3.17E-07	1.92E-07	1.35E-07	1.03E-07	8.23E-08	6.84E-08	5.82E-08	5.05E-08
SW	5.08E-07	3.04E-07	2.12E-07	1.28E-07	8.99E-08	6.84E-08	5.48E-08	4.55E-08	3.87E-08	3.36E-08
WSW	2.71E-07	1.61E-07	1.11E-07	6.65E-08	4.64E-08	3.51E-08	2.80E-08	2.32E-08	1.97E-08	1.70E-08
W	1.76E-07	1.04E-07	7.18E-08	4.29E-08	2.99E-08	2.26E-08	1.80E-08	1.49E-08	1.26E-08	1.09E-08
WNW	1.28E-07	7.50E-08	5.15E-08	3.06E-08	2.12E-08	1.60E-08	1.27E-08	1.05E-08	8.86E-09	7.65E-09
NW	1.11E-07	6.44E-08	4.40E-08	2.58E-08	1.78E-08	1.33E-08	1.06E-08	8.66E-09	7.31E-09	6.30E-09
NNW	1.20E-07	6.90E-08	4.68E-08	2.72E-08	1.86E-08	1.39E-08	1.10E-08	8.97E-09	7.55E-09	6.49E-09

Notes:

a) The reported distance of the Low Population Zone (LPZ) is measured from the centerpoint of HAR 2 and HAR 3 to the outermost boundary of the LPZ.

Wind Reference Level: 12 m

Stability Type: ΔT (61 – 12 m)

Release Type: Ground Level:12 m

Building Height/Cross Section: 43.9 m/2730 m²

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HAR COL 2.3-5

**Table 2.3.5-202 (Sheet 1 of 3)
Long-Term Average D/Q (in m⁻²) Calculations for Routine Releases for HAR 2 and HAR 3**

Exclusion Area Boundary		Low Population Zone ^a		Nearest Milk Cow		Nearest Milk Goat		Nearest Garden		Nearest Meat Animal		
Downwind Sector	Distance (m)	D/Q	Distance (m)	D/Q	Distance (m)	D/Q	Distance (m)	D/Q	Distance (m)	D/Q	Distance (m)	
N	1245	5.90E-09	4959	5.40E-10	2973	1.30E-09	7472	2.60E-10	2974	1.30E-09	2974	1.30E-09
NNE	1245	6.40E-09	4925	5.90E-10	4297	7.50E-10	7630	2.70E-10	2668	1.70E-09	2668	1.70E-09
NE	1245	6.10E-09	4876	5.70E-10	7851	2.40E-10	7851	2.40E-10	7851	2.40E-10	7851	2.40E-10
ENE	1245	7.40E-09	4832	7.10E-10	8100	2.80E-10	8100	2.80E-10	8100	2.80E-10	8100	2.80E-10
E	1245	3.80E-09	4887	3.60E-10	8338	1.40E-10	8338	1.40E-10	2994	8.50E-10	2994	8.50E-10
ESE	1245	4.60E-09	4934	4.30E-10	8530	1.60E-10	8530	1.60E-10	7887	1.80E-10	7887	1.80E-10
SE	1245	5.70E-09	4964	5.20E-10	8651	1.90E-10	8651	1.90E-10	7202	2.70E-10	4790	5.50E-10
SSE	1245	7.20E-09	4973	6.50E-10	8686	2.40E-10	8686	2.40E-10	7398	3.20E-10	7398	3.20E-10
S	1245	1.10E-08	4959	1.00E-09	8631	3.80E-10	8631	3.80E-10	8631	3.80E-10	8631	3.80E-10
SSW	1245	1.10E-08	4925	1.00E-09	8492	3.90E-10	8492	3.90E-10	6565	6.10E-10	8492	3.90E-10
SW	1245	7.80E-09	4876	7.40E-10	8287	2.80E-10	8287	2.80E-10	4922	7.20E-10	4922	7.20E-10
WSW	1245	5.20E-09	4832	5.00E-10	8044	2.00E-10	8044	2.00E-10	7242	2.40E-10	7242	2.40E-10
W	1245	3.40E-09	4887	3.10E-10	7798	1.40E-10	7798	1.40E-10	4754	3.30E-10	4754	3.30E-10
WNW	1245	2.80E-09	4934	2.60E-10	7588	1.20E-10	7588	1.20E-10	7588	1.20E-10	7588	1.20E-10
NW	1245	3.00E-09	4964	2.70E-10	7449	1.30E-10	7449	1.30E-10	7449	1.30E-10	7449	1.30E-10
NNW	1245	3.90E-09	4973	3.50E-10	7408	1.70E-10	7408	1.70E-10	2580	1.10E-09	2580	1.10E-09

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Table 2.3.5-202 (Sheet 2 of 3)
Long-Term Average D/Q (in m⁻²) Calculations for Routine Releases for HAR 2 and HAR 3

Nearest Residence		Downwind Distance (mi.)										
Downwind Sector	Distance (m)	D/Q	0.5	0.75	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5
N	2974	3.80E-10	1.21E-08	6.22E-09	3.82E-09	1.90E-09	1.16E-09	7.81E-10	5.66E-10	4.30E-10	3.39E-10	2.74E-10
NNE	2668	6.10E-10	1.31E-08	6.74E-09	4.14E-09	2.06E-09	1.25E-09	8.46E-10	6.13E-10	4.66E-10	3.67E-10	2.97E-10
NE	3534	7.20E-10	1.25E-08	6.42E-09	3.94E-09	1.97E-09	1.19E-09	8.06E-10	5.84E-10	4.44E-10	3.50E-10	2.83E-10
ENE	8100	2.40E-10	1.52E-08	7.80E-09	4.79E-09	2.39E-09	1.45E-09	9.79E-10	7.09E-10	5.39E-10	4.25E-10	3.44E-10
E	2680	3.50E-10	7.88E-09	4.05E-09	2.49E-09	1.24E-09	7.51E-10	5.08E-10	3.68E-10	2.80E-10	2.21E-10	1.79E-10
ESE	4676	4.50E-10	9.52E-09	4.89E-09	3.00E-09	1.50E-09	9.07E-10	6.13E-10	4.44E-10	3.38E-10	2.66E-10	2.16E-10
SE	4790	5.70E-10	1.16E-08	5.96E-09	3.66E-09	1.83E-09	1.11E-09	7.48E-10	5.42E-10	4.12E-10	3.25E-10	2.63E-10
SSE	7398	1.80E-09	1.47E-08	7.55E-09	4.64E-09	2.31E-09	1.40E-09	9.48E-10	6.87E-10	5.22E-10	4.12E-10	3.33E-10
S	8631	3.80E-10	2.30E-08	1.18E-08	7.26E-09	3.62E-09	2.20E-09	1.49E-09	1.08E-09	8.18E-10	6.44E-10	5.22E-10
SSW	6565	6.10E-10	2.27E-08	1.17E-08	7.15E-09	3.57E-09	2.16E-09	1.46E-09	1.06E-09	8.06E-10	6.35E-10	5.14E-10
SW	4922	7.20E-10	1.60E-08	8.23E-09	5.05E-09	2.52E-09	1.53E-09	1.03E-09	7.48E-10	5.69E-10	4.48E-10	3.63E-10
WSW	7242	2.40E-10	1.07E-08	5.50E-09	3.37E-09	1.68E-09	1.02E-09	6.90E-10	5.00E-10	3.80E-10	2.99E-10	2.42E-10
W	4594	3.50E-10	6.88E-09	3.53E-09	2.17E-09	1.08E-09	6.56E-10	4.43E-10	3.21E-10	2.44E-10	1.93E-10	1.56E-10
WNW	3577	4.50E-10	5.72E-09	2.94E-09	1.80E-09	9.00E-10	5.46E-10	3.69E-10	2.67E-10	2.03E-10	1.60E-10	1.30E-10
NW	3268	5.70E-10	6.15E-09	3.16E-09	1.94E-09	9.66E-10	5.86E-10	3.96E-10	2.87E-10	2.18E-10	1.72E-10	1.39E-10
NNW	1936	1.80E-09	7.96E-09	4.08E-09	2.51E-09	1.25E-09	7.58E-10	5.13E-10	3.72E-10	2.83E-10	2.23E-10	1.80E-10

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Table 2.3.5-202 (Sheet 3 of 3)
Long-Term Average D/Q (in m⁻²) Calculations for Routine Releases for HAR 2 and HAR 3

Downwind Sector	Downward Distance (mi.)										
	5.0	7.5	10.0	15.0	20.0	25.0	30.0	35.0	40.0	45.0	50.0
N	2.27E-10	1.11E-10	6.98E-11	3.53E-11	2.14E-11	1.43E-11	1.03E-11	7.70E-12	5.99E-12	4.78E-12	3.90E-12
NNE	2.46E-10	1.21E-10	7.56E-11	3.82E-11	2.31E-11	1.55E-11	1.11E-11	8.35E-12	6.49E-12	5.18E-12	4.23E-12
NE	2.34E-10	1.15E-10	7.21E-11	3.64E-11	2.20E-11	1.48E-11	1.06E-11	7.95E-12	6.18E-12	4.94E-12	4.03E-12
ENE	2.85E-10	1.39E-10	8.75E-11	4.42E-11	2.68E-11	1.79E-11	1.29E-11	9.66E-12	7.51E-12	6.00E-12	4.89E-12
E	1.48E-10	7.24E-11	4.54E-11	2.30E-11	1.39E-11	9.31E-12	6.67E-12	5.01E-12	3.90E-12	3.11E-12	2.54E-12
ESE	1.78E-10	8.74E-11	5.48E-11	2.77E-11	1.68E-11	1.12E-11	8.06E-12	6.05E-12	4.70E-12	3.76E-12	3.07E-12
SE	2.18E-10	1.07E-10	6.69E-11	3.38E-11	2.05E-11	1.37E-11	9.83E-12	7.38E-12	5.74E-12	4.59E-12	3.74E-12
SSE	2.76E-10	1.35E-10	8.47E-11	4.28E-11	2.59E-11	1.74E-11	1.25E-11	9.35E-12	7.27E-12	5.81E-12	4.74E-12
S	4.32E-10	2.12E-10	1.33E-10	6.71E-11	4.06E-11	2.72E-11	1.95E-11	1.46E-11	1.14E-11	9.10E-12	7.42E-12
SSW	4.25E-10	2.08E-10	1.31E-10	6.61E-11	4.00E-11	2.68E-11	1.92E-11	1.44E-11	1.12E-11	8.96E-12	7.31E-12
SW	3.00E-10	1.47E-10	9.23E-11	4.67E-11	2.82E-11	1.89E-11	1.36E-11	1.02E-11	7.92E-12	6.33E-12	5.16E-12
WSW	2.01E-10	9.83E-11	6.17E-11	3.12E-11	1.89E-11	1.27E-11	9.06E-12	6.81E-12	5.29E-12	4.23E-12	3.45E-12
W	1.29E-10	6.32E-11	3.96E-11	2.00E-11	1.21E-11	8.13E-12	5.83E-12	4.37E-12	3.40E-12	2.72E-12	2.22E-12
WNW	1.07E-10	5.26E-11	3.30E-11	1.67E-11	1.01E-11	6.76E-12	4.85E-12	3.64E-12	2.83E-12	2.26E-12	1.85E-12
NW	1.15E-10	5.65E-11	3.54E-11	1.79E-11	1.08E-11	7.27E-12	5.21E-12	3.91E-12	3.04E-12	2.43E-12	1.98E-12
NNW	1.49E-10	7.30E-11	4.58E-11	2.32E-11	1.40E-11	9.40E-12	6.74E-12	5.06E-12	3.93E-12	3.14E-12	2.56E-12

Notes:

a) The reported distance of the Low Population Zone (LPZ) is measured from the centerpoint of HAR 2 and HAR 3 to the outermost boundary of the LPZ.

Wind Reference Level: 12 m

Stability Type: ΔT (61 – 12 m)

Release Type: Ground Level: 12 m

Building Height/Cross Section: 43.9 m/2730 m²

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HAR COL 2.3-5

**Table 2.3.5-203 (Sheet 1 of 3)
Long-Term Average Chi/Q (in sec/m³) Calculations (2.26-Day Decay) for Routine Releases for HAR 2 and HAR 3**

Downwind Sector	Exclusion Area Boundary		Low Population Zone ^a		Nearest Milk Cow		Nearest Milk Goat		Nearest Garden		Nearest Meat Animal	
	Distance (m)	Chi/Q	Distance (m)	Chi/Q	Distance (m)	Chi/Q	Distance (m)	Chi/Q	Distance (m)	Chi/Q	Distance (m)	Chi/Q
N	1245	2.30E-06	4959	3.10E-07	2973	6.40E-07	7472	1.70E-07	2974	6.40E-07	2974	6.40E-07
NNE	1245	2.80E-06	4925	3.80E-07	4297	4.60E-07	7630	2.00E-07	2668	9.10E-07	2668	9.10E-07
NE	1245	2.60E-06	4876	3.60E-07	7851	1.80E-07	7851	1.80E-07	7851	1.80E-07	7851	1.80E-07
ENE	1245	2.70E-06	4832	3.90E-07	8100	1.90E-07	8100	1.90E-07	8100	1.90E-07	8100	1.90E-07
E	1245	2.10E-06	4887	3.00E-07	8338	1.50E-07	8338	1.50E-07	2994	6.00E-07	2994	6.00E-07
ESE	1245	2.60E-06	4934	3.80E-07	8530	1.80E-07	8530	1.80E-07	7887	2.00E-07	7887	2.00E-07
SE	1245	2.80E-06	4964	4.00E-07	8651	1.90E-07	8651	1.90E-07	7202	2.40E-07	4790	4.20E-07
SSE	1245	4.30E-06	4973	6.30E-07	8686	3.00E-07	8686	3.00E-07	7398	3.70E-07	7398	3.70E-07
S	1245	8.00E-06	4959	1.20E-06	8631	5.70E-07	8631	5.70E-07	8631	5.70E-07	8631	5.70E-07
SSW	1245	8.70E-06	4925	1.40E-06	8492	6.60E-07	8492	6.60E-07	6565	9.20E-07	8492	6.60E-07
SW	1245	5.90E-06	4876	9.30E-07	8287	4.60E-07	8287	4.60E-07	4922	9.10E-07	4922	9.10E-07
WSW	1245	3.30E-06	4832	5.10E-07	8044	2.50E-07	8044	2.50E-07	7242	2.90E-07	7242	2.90E-07
W	1245	2.20E-06	4887	3.30E-07	7798	1.70E-07	7798	1.70E-07	4754	3.40E-07	4754	3.40E-07
WNW	1245	1.60E-06	4934	2.40E-07	7588	1.30E-07	7588	1.30E-07	7588	1.30E-07	7588	1.30E-07
NW	1245	1.50E-06	4964	2.10E-07	7449	1.20E-07	7449	1.20E-07	7449	1.20E-07	7449	1.20E-07
NNW	1245	1.70E-06	4973	2.30E-07	7408	1.30E-07	7408	1.30E-07	2580	5.80E-07	2580	5.80E-07

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Table 2.3.5-203 (Sheet 2 of 3)
Long-Term Average Chi/Q (in sec/m³) Calculations (2.26-Day Decay) for Routine Releases for HAR 2 and HAR 3

Nearest Residence			Downwind Distance (mi.)									
Downwind Sector	Distance (m)	Chi/Q	0.5	0.75	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5
N	2974	6.40E-07	4.45E-06	2.40E-06	1.56E-06	8.63E-07	5.69E-07	4.12E-07	3.17E-07	2.54E-07	2.10E-07	1.77E-07
NNE	2668	9.10E-07	5.42E-06	2.92E-06	1.89E-06	1.06E-06	6.99E-07	5.08E-07	3.91E-07	3.14E-07	2.60E-07	2.20E-07
NE	3534	5.70E-07	5.07E-06	2.70E-06	1.75E-06	9.79E-07	6.50E-07	4.73E-07	3.65E-07	2.94E-07	2.43E-07	2.06E-07
ENE	8100	1.90E-07	5.50E-06	2.88E-06	1.86E-06	1.05E-06	6.97E-07	5.09E-07	3.94E-07	3.17E-07	2.63E-07	2.23E-07
E	2680	7.00E-07	4.18E-06	2.18E-06	1.41E-06	8.04E-07	5.41E-07	3.97E-07	3.09E-07	2.50E-07	2.08E-07	1.77E-07
ESE	4676	4.10E-07	5.32E-06	2.72E-06	1.75E-06	1.01E-06	6.83E-07	5.04E-07	3.94E-07	3.19E-07	2.66E-07	2.27E-07
SE	4790	4.20E-07	5.70E-06	2.90E-06	1.86E-06	1.07E-06	7.23E-07	5.33E-07	4.16E-07	3.37E-07	2.81E-07	2.40E-07
SSE	7398	3.70E-07	8.90E-06	4.50E-06	2.89E-06	1.68E-06	1.14E-06	8.43E-07	6.59E-07	5.36E-07	4.47E-07	3.82E-07
S	8631	5.70E-07	1.66E-05	8.36E-06	5.36E-06	3.13E-06	2.14E-06	1.59E-06	1.25E-06	1.02E-06	8.49E-07	7.26E-07
SSW	6565	9.20E-07	1.85E-05	9.19E-06	5.87E-06	3.46E-06	2.37E-06	1.77E-06	1.39E-06	1.13E-06	9.48E-07	8.11E-07
SW	4922	9.10E-07	1.25E-05	6.26E-06	4.01E-06	2.35E-06	1.61E-06	1.19E-06	9.38E-07	7.64E-07	6.39E-07	5.46E-07
WSW	7242	2.90E-07	6.89E-06	3.51E-06	2.26E-06	1.30E-06	8.83E-07	6.53E-07	5.10E-07	4.14E-07	3.45E-07	2.94E-07
W	4594	3.50E-07	4.48E-06	2.30E-06	1.48E-06	8.52E-07	5.76E-07	4.25E-07	3.32E-07	2.69E-07	2.24E-07	1.91E-07
WNW	3577	3.70E-07	3.31E-06	1.73E-06	1.12E-06	6.37E-07	4.28E-07	3.14E-07	2.44E-07	1.98E-07	1.64E-07	1.40E-07
NW	3268	3.70E-07	2.98E-06	1.57E-06	1.02E-06	5.74E-07	3.82E-07	2.79E-07	2.16E-07	1.74E-07	1.44E-07	1.22E-07
NNW	1936	8.80E-07	3.28E-06	1.76E-06	1.14E-06	6.38E-07	4.22E-07	3.07E-07	2.37E-07	1.90E-07	1.57E-07	1.33E-07

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Table 2.3.5-203 (Sheet 3 of 3)
Long-Term Average Chi/Q (in sec/m³) Calculations (2.26-Day Decay) for Routine Releases for HAR 2 and HAR 3

Downwind Sector	Downwind Distance (mi.)										
	5.0	7.5	10.0	15.0	20.0	25.0	30.0	35.0	40.0	45.0	50.0
N	1.53E-07	8.54E-08	5.64E-08	3.13E-08	2.05E-08	1.47E-08	1.11E-08	8.74E-09	7.08E-09	5.87E-09	4.95E-09
NNE	1.89E-07	1.06E-07	7.04E-08	3.91E-08	2.56E-08	1.83E-08	1.39E-08	1.09E-08	8.85E-09	7.32E-09	6.17E-09
NE	1.77E-07	1.00E-07	6.63E-08	3.70E-08	2.42E-08	1.74E-08	1.31E-08	1.03E-08	8.37E-09	6.93E-09	5.84E-09
ENE	1.92E-07	1.09E-07	7.24E-08	4.05E-08	2.66E-08	1.91E-08	1.45E-08	1.14E-08	9.27E-09	7.68E-09	6.48E-09
E	1.53E-07	8.72E-08	5.83E-08	3.28E-08	2.16E-08	1.55E-08	1.17E-08	9.22E-09	7.47E-09	6.18E-09	5.20E-09
ESE	1.97E-07	1.13E-07	7.57E-08	4.27E-08	2.82E-08	2.02E-08	1.54E-08	1.21E-08	9.79E-09	8.11E-09	6.83E-09
SE	2.07E-07	1.19E-07	7.98E-08	4.51E-08	2.97E-08	2.13E-08	1.62E-08	1.28E-08	1.03E-08	8.56E-09	7.21E-09
SSE	3.31E-07	1.91E-07	1.28E-07	7.26E-08	4.79E-08	3.45E-08	2.62E-08	2.06E-08	1.67E-08	1.38E-08	1.17E-08
S	6.30E-07	3.64E-07	2.46E-07	1.40E-07	9.22E-08	6.64E-08	5.04E-08	3.97E-08	3.22E-08	2.66E-08	2.24E-08
SSW	7.05E-07	4.09E-07	2.77E-07	1.57E-07	1.04E-07	7.48E-08	5.68E-08	4.47E-08	3.62E-08	3.00E-08	2.52E-08
SW	4.75E-07	2.75E-07	1.86E-07	1.05E-07	6.96E-08	5.01E-08	3.80E-08	2.99E-08	2.42E-08	2.01E-08	1.69E-08
WSW	2.55E-07	1.46E-07	9.82E-08	5.54E-08	3.65E-08	2.62E-08	1.99E-08	1.56E-08	1.27E-08	1.05E-08	8.81E-09
W	1.65E-07	9.47E-08	6.35E-08	3.58E-08	2.36E-08	1.69E-08	1.28E-08	1.01E-08	8.17E-09	6.76E-09	5.68E-09
WNW	1.21E-07	6.88E-08	4.60E-08	2.58E-08	1.70E-08	1.22E-08	9.22E-09	7.25E-09	5.87E-09	4.86E-09	4.09E-09
NW	1.06E-07	5.96E-08	3.97E-08	2.21E-08	1.45E-08	1.04E-08	7.87E-09	6.19E-09	5.01E-09	4.15E-09	3.49E-09
NNW	1.15E-07	6.44E-08	4.27E-08	2.37E-08	1.56E-08	1.11E-08	8.43E-09	6.63E-09	5.37E-09	4.45E-09	3.75E-09

Notes:

a) The reported distance of the Low Population Zone (LPZ) is measured from the centerpoint of HAR 2 and HAR 3 to the outermost boundary of the LPZ.

Wind Reference Level: 12 m

Stability Type: ΔT (61 – 12 m)

Release Type: Ground Level: 12 m

Building Height/Cross Section: 43.9 m/2730 m²

**Shearon Harris Nuclear Power Plant Units 2 and 3
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HAR COL 2.3-5

**Table 2.3.5-204 (Sheet 1 of 3)
Long-Term Average Chi/Q (in sec/m³) Calculations (Depleted and 8-Day Decayed) for Routine Releases
for HAR 2 and HAR 3**

Exclusion Area Boundary		Low Population Zone ^a		Nearest Milk Cow		Nearest Milk Goat		Nearest Garden		Nearest Meat Animal		
Downwind Sector	Distance (m)	Chi/Q	Distance (m)	Chi/Q	Distance (m)	Chi/Q	Distance (m)	Chi/Q	Distance (m)	Chi/Q	Distance (m)	
N	1245	2.00E-06	4959	2.50E-07	2973	5.40E-07	7472	1.30E-07	2974	5.40E-07	2974	5.40E-07
NNE	1245	2.50E-06	4925	3.10E-07	4297	3.80E-07	7630	1.60E-07	2668	7.80E-07	2668	7.80E-07
NE	1245	2.30E-06	4876	2.90E-07	7851	1.40E-07	7851	1.40E-07	7851	1.40E-07	7851	1.40E-07
ENE	1245	2.50E-06	4832	3.20E-07	8100	1.50E-07	8100	1.50E-07	8100	1.50E-07	8100	1.50E-07
E	1245	1.90E-06	4887	2.50E-07	8338	1.10E-07	8338	1.10E-07	2994	5.10E-07	2994	5.10E-07
ESE	1245	2.30E-06	4934	3.10E-07	8530	1.40E-07	8530	1.40E-07	7887	1.60E-07	7887	1.60E-07
SE	1245	2.50E-06	4964	3.30E-07	8651	1.50E-07	8651	1.50E-07	7202	1.90E-07	4790	3.40E-07
SSE	1245	3.80E-06	4973	5.20E-07	8686	2.30E-07	8686	2.30E-07	7398	2.90E-07	7398	2.90E-07
S	1245	7.10E-06	4959	9.80E-07	8631	4.40E-07	8631	4.40E-07	8631	4.40E-07	8631	4.40E-07
SSW	1245	7.80E-06	4925	1.10E-06	8492	5.10E-07	8492	5.10E-07	6565	7.40E-07	8492	5.10E-07
SW	1245	5.30E-06	4876	7.60E-07	8287	3.60E-07	8287	3.60E-07	4922	7.50E-07	4922	7.50E-07
WSW	1245	3.00E-06	4832	4.20E-07	8044	2.00E-07	8044	2.00E-07	7242	2.30E-07	7242	2.30E-07
W	1245	2.00E-06	4887	2.70E-07	7798	1.30E-07	7798	1.30E-07	4754	2.80E-07	4754	2.80E-07
WNW	1245	1.50E-06	4934	1.90E-07	7588	1.00E-07	7588	1.00E-07	7588	1.00E-07	7588	1.00E-07
NW	1245	1.30E-06	4964	1.70E-07	7449	9.20E-08	7449	9.20E-08	7449	9.20E-08	7449	9.20E-08
NNW	1245	1.50E-06	4973	1.80E-07	7408	1.00E-07	7408	1.00E-07	2580	4.90E-07	2580	4.90E-07

**Shearon Harris Nuclear Power Plant Units 2 and 3
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**Table 2.3.5-204 (Sheet 2 of 3)
Long-Term Average Chi/Q (in sec/m³) Calculations (Depleted and 8-Day Decayed) for Routine Releases
for HAR 2 and HAR 3**

Nearest Residence		Downwind Distance (mi.)										
Downwind Sector	Distance (m)	Chi/Q	0.5	0.75	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5
N	2974	5.40E-07	4.08E-06	2.15E-06	1.37E-06	7.39E-07	4.77E-07	3.39E-07	2.57E-07	2.03E-07	1.65E-07	1.38E-07
NNE	2668	7.80E-07	4.97E-06	2.61E-06	1.67E-06	9.05E-07	5.86E-07	4.18E-07	3.17E-07	2.51E-07	2.05E-07	1.71E-07
NE	3534	4.70E-07	4.64E-06	2.42E-06	1.54E-06	8.40E-07	5.45E-07	3.90E-07	2.96E-07	2.35E-07	1.92E-07	1.61E-07
ENE	8100	1.50E-07	5.04E-06	2.58E-06	1.64E-06	8.98E-07	5.85E-07	4.19E-07	3.19E-07	2.54E-07	2.08E-07	1.74E-07
E	2680	5.90E-07	3.83E-06	1.95E-06	1.24E-06	6.91E-07	4.55E-07	3.28E-07	2.52E-07	2.01E-07	1.65E-07	1.39E-07
ESE	4676	3.40E-07	4.88E-06	2.44E-06	1.54E-06	8.68E-07	5.75E-07	4.17E-07	3.21E-07	2.57E-07	2.12E-07	1.78E-07
SE	4790	3.40E-07	5.22E-06	2.60E-06	1.64E-06	9.20E-07	6.09E-07	4.41E-07	3.39E-07	2.71E-07	2.23E-07	1.88E-07
SSE	7398	2.90E-07	8.17E-06	4.04E-06	2.55E-06	1.44E-06	9.59E-07	6.98E-07	5.38E-07	4.31E-07	3.56E-07	3.00E-07
S	8631	4.40E-07	1.53E-05	7.50E-06	4.74E-06	2.70E-06	1.80E-06	1.32E-06	1.02E-06	8.18E-07	6.77E-07	5.72E-07
SSW	6565	7.40E-07	1.70E-05	8.25E-06	5.19E-06	2.98E-06	2.00E-06	1.47E-06	1.14E-06	9.14E-07	7.57E-07	6.41E-07
SW	4922	7.50E-07	1.15E-05	5.62E-06	3.54E-06	2.02E-06	1.36E-06	9.91E-07	7.67E-07	6.16E-07	5.10E-07	4.31E-07
WSW	7242	2.30E-07	6.32E-06	3.15E-06	1.99E-06	1.12E-06	7.44E-07	5.40E-07	4.16E-07	3.33E-07	2.74E-07	2.31E-07
W	4594	2.90E-07	4.11E-06	2.06E-06	1.31E-06	7.33E-07	4.85E-07	3.52E-07	2.70E-07	2.16E-07	1.78E-07	1.50E-07
WNW	3577	3.10E-07	3.04E-06	1.55E-06	9.84E-07	5.47E-07	3.60E-07	2.60E-07	1.99E-07	1.59E-07	1.30E-07	1.10E-07
NW	3268	3.10E-07	2.73E-06	1.41E-06	8.97E-07	4.92E-07	3.21E-07	2.30E-07	1.75E-07	1.39E-07	1.14E-07	9.55E-08
NNW	1936	7.60E-07	3.00E-06	1.58E-06	1.01E-06	5.47E-07	3.54E-07	2.53E-07	1.92E-07	1.52E-07	1.24E-07	1.04E-07

Shearon Harris Nuclear Power Plant Units 2 and 3
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Table 2.3.5-204 (Sheet 3 of 3)
Long-Term Average Chi/Q (in sec/m³) Calculations (Depleted and 8-Day Decayed) for Routine Releases
for HAR 2 and HAR 3

Downwind Sector	Downwind Distance (mi.)										
	5.0	7.5	10.0	15.0	20.0	25.0	30.0	35.0	40.0	45.0	50.0
N	1.17E-07	6.30E-08	4.03E-08	2.13E-08	1.35E-08	9.38E-09	6.95E-09	5.36E-09	4.27E-09	3.49E-09	2.90E-09
NNE	1.46E-07	7.86E-08	5.05E-08	2.68E-08	1.70E-08	1.18E-08	8.77E-09	6.77E-09	5.40E-09	4.41E-09	3.67E-09
NE	1.37E-07	7.42E-08	4.77E-08	2.54E-08	1.62E-08	1.13E-08	8.37E-09	6.48E-09	5.17E-09	4.22E-09	3.51E-09
ENE	1.48E-07	8.09E-08	5.22E-08	2.80E-08	1.78E-08	1.25E-08	9.29E-09	7.20E-09	5.76E-09	4.71E-09	3.92E-09
E	1.19E-07	6.53E-08	4.24E-08	2.29E-08	1.47E-08	1.03E-08	7.69E-09	5.97E-09	4.77E-09	3.91E-09	3.26E-09
ESE	1.53E-07	8.48E-08	5.54E-08	3.01E-08	1.94E-08	1.37E-08	1.02E-08	7.93E-09	6.35E-09	5.21E-09	4.34E-09
SE	1.61E-07	8.95E-08	5.84E-08	3.18E-08	2.04E-08	1.44E-08	1.08E-08	8.36E-09	6.70E-09	5.49E-09	4.58E-09
SSE	2.58E-07	1.44E-07	9.41E-08	5.14E-08	3.31E-08	2.34E-08	1.75E-08	1.36E-08	1.09E-08	8.95E-09	7.47E-09
S	4.92E-07	2.75E-07	1.81E-07	9.91E-08	6.40E-08	4.53E-08	3.39E-08	2.64E-08	2.12E-08	1.74E-08	1.45E-08
SSW	5.52E-07	3.10E-07	2.04E-07	1.12E-07	7.27E-08	5.15E-08	3.86E-08	3.01E-08	2.42E-08	1.98E-08	1.66E-08
SW	3.71E-07	2.08E-07	1.37E-07	7.51E-08	4.86E-08	3.44E-08	2.57E-08	2.01E-08	1.61E-08	1.32E-08	1.10E-08
WSW	1.98E-07	1.10E-07	7.20E-08	3.92E-08	2.52E-08	1.78E-08	1.33E-08	1.03E-08	8.26E-09	6.77E-09	5.65E-09
W	1.29E-07	7.13E-08	4.65E-08	2.53E-08	1.62E-08	1.14E-08	8.53E-09	6.63E-09	5.31E-09	4.35E-09	3.63E-09
WNW	9.37E-08	5.15E-08	3.35E-08	1.81E-08	1.16E-08	8.12E-09	6.05E-09	4.70E-09	3.76E-09	3.08E-09	2.56E-09
NW	8.16E-08	4.44E-08	2.87E-08	1.53E-08	9.76E-09	6.83E-09	5.07E-09	3.93E-09	3.14E-09	2.56E-09	2.13E-09
NNW	8.82E-08	4.77E-08	3.06E-08	1.63E-08	1.03E-08	7.18E-09	5.32E-09	4.12E-09	3.28E-09	2.68E-09	2.23E-09

Notes:

a) The reported distance of the Low Population Zone (LPZ) is measured from the centerpoint of HAR 2 and HAR 3 to the outermost boundary of the LPZ.

Wind Reference Level: 12 m

Stability Type: ΔT (61 – 12 m)

Release Type: Ground Level: 12 m

Building Height/Cross Section: 43.9 m/2730 m²