2.3 Meteorology and Air Quality

This section describes the general climate of the Fermi site and the surrounding regional meteorological and air quality conditions. This section also documents the range of meteorological conditions that would likely exist during the construction and operation of Fermi 3. Data presented includes a climatological summary of normal and extreme values of several meteorological parameters recorded by National Weather Service (NWS) meteorological instruments located in Detroit (Detroit Metropolitan Airport) and Flint, Michigan, Toledo, Ohio and the Fermi onsite meteorological station. Supplemental meteorological data from four NWS Cooperative Observation Program (COOP) stations with data sets dating back 30 years or more were also added to the analysis of the region surrounding the Fermi site. Air quality data obtained from the Michigan Department of Environmental Quality (MDEQ) monitors was also used to discuss the regional air quality surrounding Fermi 3. The regional climate and air quality conditions that surround the Fermi site are described in Subsection 2.3.1 and Subsection 2.3.1.3.8, respectively. Details regarding severe weather conditions that are observed in the Fermi region are provided in Subsection 2.3.1.3.1, while the description of the local meteorology and topographic description for the Fermi site is located in Subsection 2.3.2 and Subsection 2.3.2.2, respectively. Subsection 2.3.3 provides a description of the Fermi onsite meteorological monitoring program that collected the meteorological data used to describe the onsite meteorological conditions. Short- and long-term diffusion estimates of radiation, as they relate to dose concentrations to the public and surrounding area are presented in Subsection 2.3.4 and Subsection 2.3.5.

EF3 COL 2.0-7-A

2.3.1 General Regional Climate

The following climatology for Fermi 3 uses data from the NWS first-order stations at Detroit Metropolitan Airport, Toledo, and Flint, as well as four NWS COOP stations located within 80.5 km (50 mi) of the Fermi site. The above stations have long return periods of meteorological parameters that provide the regional climatology representative of the Fermi region. The meteorological data obtained for this climatology were collected and processed by the National Oceanic and Atmospheric Administration's (NOAA) Midwestern Regional Climate Center (MRCC) and National Climatic Data Center (NCDC).

Table 2.3-201 contains the distances and directions of the meteorological observing stations relative to the Fermi site as shown in Figure 2.3-201. Detroit Metropolitan Airport is the closest first-order station to the site with a long-term history of recording hourly wind speed and direction, temperature, precipitation, atmospheric moisture content (i.e., dew-point temperature, relative humidity, and wet-bulb temperature), barometric pressure, and the occurrence of weather phenomenon such as thunderstorms and fog (Reference 2.3-201). Flint and Toledo are additional NWS first-order stations with long-term climatological periods of record (Reference 2.3-202, Reference 2.3-203). Table 2.3-202 through Table 2.3-204 display the various meteorological parameters in the annual Local Climatological Data Summaries (LCD) for Detroit Metropolitan Airport, Flint, and Toledo, respectively. The four COOP meteorological stations used in this climatology have complete or nearly complete data sets that extend back 30 years or greater (Reference 2.3-204 through Reference 2.3-207).

2.3.1.1 General Climate

The Fermi site is located along the western Lake Erie shoreline and south of the Detroit metropolitan area. The general climate of the Fermi site and the surrounding region can be described as humid continental, experiencing both warm and humid summers and severe winters. Lake Erie largely influences the overall temperature, wind, and precipitation characteristics of the site and surrounding region. The higher thermal capacity of the lake moderates the daily temperature extremes that are found further inland, especially during the spring, summer, and fall seasons. Annually, the region experiences approximately six days below -17.8°C (0°F) and only 12 days above 32.2°C (90°F) (Reference 2.3-201). The temperature contrast of the coastal boundary also produces lake and land breezes that are most prominent during the late spring through mid-summer, and sometimes into the early fall in the Fermi region. During the late spring through early fall seasons, the lake breezes generally form by late morning and bring cooler air from above the lake to locations along the shoreline, effectively lowering the daily maximum temperature. During the mid and late fall, land breezes continue the moderation effect by bringing cooler air located further inland to the shoreline areas. At night during the spring, summer, and fall, the lake, with its greater heat capacity, moderates low temperatures along the shoreline. During late December, ice typically forms over the lake and decreases its influence on the coastal areas (Reference 2.3-208). The ice cover during most years thaws by the middle of March, which prolongs cooler temperatures through parts of the spring season for the Fermi region.

The meteorological conditions in the Fermi region are also influenced by the high frequency of surface low pressure systems and cloudiness during the late fall and winter, as well as early spring (Reference 2.3-209). During the later half of spring and summer, the mean track of surface low pressure systems shifts north of the region and the Fermi region experiences an increase in sunshine and warmer monthly temperatures.

Overall precipitation amounts vary slightly from month to month throughout the year (Reference 2.3-201). During the winter, the mean track of surface low pressure is positioned over or just south of the Fermi region and increases the frequency of precipitation (Reference 2.3-209). Surface low pressure systems come from the west, northwest and southwest during the winter and bring the possibility of rain, freezing rain, sleet, and snow. Heavy snows are possible throughout the winter and can result in significant accumulations. During the summer, the mean track of surface low pressure systems shifts north of the region, however monthly rainfall values are higher than any other season. The number of days per month with thunderstorms is approximately 6 days during June, July, and August, which is higher than any other months (Reference 2.3-201). Thunderstorms during the summer bring the potential of heavy rainfall and severe weather.

2.3.1.2 Normal, Mean, and Extreme Climatological Conditions

This section discusses 30-year normals, as well as long-term means and historical extremes for temperature, water vapor, precipitation, and wind that characterize the meteorological conditions in the region surrounding the Fermi site.

Table 2.3-202 contains long-term normals, means and extremes for Detroit Metropolitan Airport in Detroit, located approximately 27.4 km (17 mi) north-northwest of the Fermi site. Table 2.3-203 and Table 2.3-204 exhibit long-term meteorological information for Flint and Toledo. Flint and Toledo are located 119.1 km (74 mi) to the north-northwest and 61.2 km (38 mi) southwest of the Fermi site, respectively.

The purpose of this section is to demonstrate that the long-term data reported at the three NWS first-order meteorological stations, as well as the four COOP stations are representative of the short- and long-term climate characteristics of the region surrounding the Fermi site. Subsection 2.3.1.2.1 through Subsection 2.3.1.2.4 provide more detailed discussions of specific meteorological parameters of interest.

2.3.1.2.1 **Wind Conditions**

Based upon 39 years of wind data at Detroit Metropolitan Airport, the annual prevailing wind direction is 240 degrees or southwest (Reference 2.3-201). Monthly prevailing winds in Detroit are generally southwest during all months except during the spring when they are northwest. At Flint and Toledo the annual prevailing wind direction is also southwest (Reference 2.3-202, Reference 2.3-203), but both stations have different monthly variations when compared to Detroit. Monthly winds for Toledo, like Detroit, are southwest during all but the spring season when they become east-northeast. Monthly wind directions for Flint are also southwest during the majority of the year, however winds become westerly during February and March, east-northeasterly during April, and more southerly during May. The differences in the late winter and spring prevailing wind directions between Detroit and the Flint and Toledo stations can be attributed to the transition of the mean track of surface low pressure systems to the north. During this transition the path of surface low pressure systems greatly varies, and wind patterns across the region can be different. The variation in the path of the surface low pressure systems, as well as the general weakening of the jet stream, can explain the complexity of wind directions at the three first-order stations during the late winter and spring months.

During the most recent 23-year period, the annual mean wind speed for Detroit Metropolitan Airport is 15.9 km/hr (9.9 mph) (Reference 2.3-201). In comparison, Flint and Toledo have slightly lower annual mean wind speeds, 15 km/hr (9.3 mph) and 14.6 km/hr (9.1 mph), respectively (Reference 2.3-202, Reference 2.3-203). Seasonally, the highest seasonal mean wind for all three stations is during the winter and spring months as shown in Table 2.3-202 through Table 2.3-204. The lowest seasonal mean wind speed occurs during the summer months for Detroit (13 km/hr [8.4 mph]), Flint (12.4 km/hr [7.7 mph]), and Toledo (11.6 km/hr [7.2 mph]). The highest monthly mean wind speed for Detroit occurs in January with a value of 18.7 km/hr (11.6 mph). Flint and Toledo also have their highest monthly mean wind speed during January; however, their values are slightly lower (17.4 km/hr [10.8 mph]). During January the mean track of surface low pressure systems is positioned near the Fermi region, which increases the frequency of surface low pressure systems, and therefore wind speeds. The lowest monthly mean wind speed for the three first-order stations is during August when the mean track of surface low pressure systems migrates well north of the region. The overall variation of monthly wind speeds is consistent for the three first-order stations, and therefore these values represent values characteristic of locations in the Fermi region.

Extreme winds for design basis purposes are discussed in Subsection 2.3.1.3.1.2. Wind data summaries for the Fermi onsite meteorological station are discussed in Subsection 2.3.2.1.5 and Subsection 2.3.2.1.6.

2.3.1.2.2 Temperature

Table 2.3-205 presents normal annual temperatures for the three NWS first-order and four COOP stations in the Fermi region during the period 1971-2000. The daily normal temperature for the stations are generally uniform with only minor differences apparent between the two COOP stations closer to the shoreline of Lake Erie and the other stations located further inland or stationed near metropolitan cities. The slight difference in the daily normal temperatures across the Fermi region can be explained by looking at the daily maximum and minimum temperatures. Stations that are closer to the shoreline, specifically Monroe and Windsor, have a slightly higher minimum temperature due to the heat content of Lake Erie. While the other NWS first-order and COOP stations are also influenced by the effects of Lake Erie, Monroe and Windsor are closer to the shoreline and further from metropolitan areas, as a result have slightly higher mean daily minimum temperatures and lower daily maximum temperatures. The observation stations at Detroit Metropolitan Airport are also influenced by the heat island effect that is created by large metropolitan areas. The heat island effect likely explains how the daily minimum temperature for Detroit Metropolitan Airport is warmer than the Monroe and Windsor stations.

During the summer months of June, July, and August, daily mean maximum and minimum temperatures at Detroit Metropolitan Airport average 27.2°C (81°F) and 15.5°C (60°F), respectively

(Reference 2.3-201). In comparison, at Flint and Toledo summer mean daily maximum temperatures are 26.6°C (80°F) and 27.7°C (82°F), respectively, while mean daily minimum temperatures are 13.3°C (56°F) and 15°C (59°F), respectively (Reference 2.3-202, Reference 2.3-203). Table 2.3-206 contains climatological extreme maximum and minimum temperatures for the NWS first-order and COOP stations (Reference 2.3-202, Reference 2.3-203, Reference 2.3-205, Reference 2.3-210 through Reference 2.3-214). The highest daily maximum temperature recorded at Detroit Metropolitan Airport was 40°C (104°F) in June of 1988; however, a temperature of 40.5°C (105°F) was recorded in July of 1934 at the nearby Detroit City Airport (Reference 2.3-201, Reference 2.3-211). The highest temperature recorded at Toledo and Flint is 40.5°C (105°F) and 38.3°C (101°F), respectively, occurring in July of 1936 and 1995, respectively (Reference 2.3-202, Reference 2.3-213). The highest temperature recorded at the NWS COOP sites is 42.2°C (108°F), occurring at the Adrian 2 NNE observation station during July of 1934 (Reference 2.3-210).

During the winter months, the variation of the mean daily minimum temperature is higher between the stations, while the mean daily maximum temperature remains nearly uniform across the region. Mean daily maximum temperatures during the winter at Detroit Metropolitan Airport and Toledo are 1.1°C (34°F), while Flint, which is further north, averages a temperature of -1.1°C (30°F) (Reference 2.3-201 through Reference 2.3-203). The mean daily minimum temperatures for Detroit Metropolitan Airport and Toledo are -6.7°C (20°F) and -7.2°C (19°F), respectively. Flint, which is further inland and influenced less by the Great Lakes, has a mean daily minimum temperature of -8.9°C (16°F) during the winter season. The major track of surface low pressure systems during wintertime is over the Fermi region, which allows frequent episodes of arctic air (Reference 2.3-209). During a normal winter, there are 45.6 days where the maximum temperature fails to rise above freezing (Reference 2.3-201). However, the Canadian air masses that usher in arctic air to the Fermi region pass over Lake Michigan, which adds heat and moisture to the air mass. The lake effect produced by the Great Lakes produces an excess of cloudiness during the winter and a moderation of the extreme arctic temperatures. Table 2.3-206 summarizes the extreme minimum temperatures recorded at the NWS first-order and COOP station around the Fermi region. The coldest temperature recorded was -32.2°C (-26°F) at the Adrian 2 NNE station during January of 1892 (Reference 2.3-210). The extreme low values of minimum temperature confirm that the region is exposed to arctic air masses. Furthermore, the stations that are closest to the Lake Erie shoreline have slightly warmer values than those stations further inland, indicating the effect of Lake Erie on extreme temperatures in the Fermi region.

2.3.1.2.3 **Atmospheric Moisture**

Atmospheric moisture in the region surrounding the Fermi site is influenced by Lake Erie and the other surrounding Great Lakes. The content of moisture in the atmosphere is measured through several parameters (relative humidity, dew-point temperature, and wet-bulb temperature) and can be evaluated by looking at the long-term history of the daily, monthly and annual means for the stations in the Fermi region.

<u>Relative Humidity</u>

As shown in Table 2.3-202 through Table 2.3-204, mean annual relative humidity values at Detroit, Flint and Toledo average 71-73 percent (Reference 2.3-201, Reference 2.3-203). Nighttime relative humidity is highest in the late summer and early fall and lowest during the spring months. Daytime humidity readings are highest during the late fall and winter seasons. Daily relative humidity values are typically highest around 0700 EST, while lowest relative humidity values occur during early and mid afternoon.

<u>Wet-Bulb Temperature</u>

The mean annual wet-bulb temperature at Detroit Metropolitan Airport is 7.2ºC (45.0ºF) based upon 23 years of record (Reference 2.3-201). July has the highest mean monthly wet-bulb temperature with a value of 18.8ºC (65.9ºF). The lowest monthly mean wet-bulb temperature is -4.6ºC (23.7ºF), which occurs in January. Toledo and Flint have mean annual wet-bulb temperatures of 7.5ºC (45.5ºF) and 6.4ºC (43.6ºF), maximum mean monthly wet-bulbs of 19.2ºC (66.5ºF) and 18.1ºC (64.6ºF), and minimum mean monthly wet-bulbs of -4.3ºC (24.2ºF) and -5.5ºC (22.1ºF), respectively (Reference 2.3-202, Reference 2.3-203). Detroit and Toledo have slightly higher mean annual wet-bulb temperatures than Flint due to their closer proximity to Lake Erie. While Flint is surrounded by the Great Lakes and is approximately 69.2 km (43 mi) from Saginaw Bay, it is located further inland than the other first-order stations and can experience lower minimum temperatures.

Dew-point Temperature

Table 2.3-202 provides mean monthly and annual dew-point temperatures for Detroit Metropolitan Airport, indicating a mean annual dew-point of 4.6ºC (40.3ºF). In comparison, Table 2.3-203 and Table 2.3-204 show that the mean annual dew-point temperature for Flint and Toledo are 4.1ºC (39.4ºF) and 5.1ºC (41.1ºF), respectively. While the differences in mean annual dew-point are small between the stations, it is apparent that stations that are further south and closer to Lake Erie have slightly higher moisture content. Mean dew-point temperatures for every month at Detroit Metropolitan Airport are lower than the mean dew-point for Toledo, but are higher than the values for Flint. According to Table 2.3-202, Table 2.3-203, and Table 2.3-204 the maximum mean monthly dew-point temperature occurs in July for all first-order stations. The minimum mean monthly dew-point temperature occurs in January, when the mean monthly temperature is the lowest. During the late winter and spring, the difference in mean monthly dew-point between the first-order stations is greatest, while the differences are smallest during the fall and early winter seasons. It is apparent that the content of atmospheric moisture can be directly correlated to the latitude of the station and, to a smaller extent, the distance from Lake Erie in the region of the Fermi site.

2.3.1.2.4 Precipitation

Annual Precipitation

Annual precipitation in the region ranges from just under 76.2 centimeters (30 inches) in northeastern Michigan to near 101.6 cm (40 inches) for the remainder of the state (Reference 2.3-215). Table 2.3-205 presents normal annual rainfall totals for the four COOP and three first-order stations surrounding the Fermi site. Overall, annual rainfall is uniform across the region with the Windsor, Ann Arbor and Adrian stations having the highest annual amounts. The consistent annual rainfall totals for the stations within 80.5 km (50 mi) of the Fermi site demonstrates the regional nature of precipitation events.

Mean Monthly Precipitation

Table 2.3-202 displays normal monthly precipitation amounts at Detroit Metropolitan Airport, showing precipitation is fairly consistent throughout the year. Normal monthly precipitation amounts for Flint and Toledo are displayed in Table 2.3-203 and Table 2.3-204 and confirm the uniform nature of precipitation year round. The highest monthly precipitation for Detroit (9.0 cm [3.55 inches]) and Toledo (9.7 cm [3.80 inches]) occurs during June, while it is during September for Flint (9.6 cm [3.76 inches]). The lowest monthly precipitation occurs in February for the three first-order stations when monthly amounts between 3.4 and 4.8 cm (1.35 and 1.88 inches) are common.

Maximum 24-hour and Monthly Precipitation

Table 2.3-206 displays the maximum 24-hour precipitation amounts recorded for the NWS first-order and COOP stations in the region of the Fermi site. Excessive amounts of precipitation have fallen at all of the observation stations in a 24-hour period. The highest amount of precipitation in a 24-hour period is 15.3 cm (6.04 inches), occurring at Flint during September of 1950 (Reference 2.3-202). For all meteorological stations the 24-hour precipitation amounts occurred between the months of May through September. Table 2.3-206 also contains the maximum monthly precipitation amounts for the meteorological stations surrounding the Fermi site. All maximum amounts of precipitation for the NWS stations occurred between the months of June through August. The highest extreme monthly rainfall occurred at Flint during August of 1975 when 28.0 cm (11.04 inches) was reported (Reference 2.3-202). Earlier it was mentioned that the mean track of surface low pressure systems during the summer months retreats well north of southeast Michigan. While the frequency of surface low pressure systems decreases during the summer season, the intensity of precipitation from thunderstorms contributes to the higher precipitation amounts during the summer months in the Fermi region.

Snow and Ice

Surface low pressure systems during the wintertime can bring a combination of rain, freezing rain, sleet and snow. During a typical year frozen precipitation is possible starting in October and ending in May. Table 2.3-205 presents normal annual snowfall amounts for the meteorological stations surrounding the Fermi site. Normal annual snowfall distributions for the three first-order stations indicate that annual snowfall increases for stations located farther north.

The threat of heavy snowfall is present throughout the wintertime for the Fermi region. Maximum 24-hour snowfall amounts are listed in Table 2.3-206 for each meteorological station. The highest snowfall amount in a 24-hour period is 62.2 cm (24.5 inches), occurring near the Detroit City Airport in April 1886 (Reference 2.3-211). For all meteorological stations listed in Table 2.3-206, the maximum 24-hour snowfall amounts occurred between the months of November through April. Table 2.3-206 also displays the maximum monthly snowfall amounts for the NWS first-order and COOP stations. The maximum amount of snowfall that was reported for a monthly period is 148.59 cm (58.5 inches), occurring at the Ann Arbor station during February of 1923 (Reference 2.3-210). The remainder of the meteorological stations in Table 2.3-206 has maximum monthly snowfall amounts that range between 73.7 and 97.5 cm (29.0 and 38.4 inches). While there is much variability among the maximum 24-hour and monthly snowfall amounts, the region surrounding the Fermi site can experience significant snowfalls anytime during the winter season.

2.3.1.3 Regional Meteorological Conditions for Design and Operating Bases

2.3.1.3.1 Severe Weather Phenomena

2.3.1.3.1.1 Thunderstorms and Lightning

Table 2.3-202 indicates that Detroit Metropolitan Airport averages nearly 33 days per year where thunder is at least heard (Reference 2.3-201). The highest seasonal rate of occurrence for thunderstorms is during the summertime (June-August) when around 54 percent of all thunderstorm days occur. July specifically has the highest occurrence of thunderstorms with on average 6.3 days reported. The mean number of thunderstorm days per month is lowest during the late fall and winter seasons, reaching a minimum of 0.2 days per month in January.

The frequency of lightning strikes to earth can be estimated using a method from the Electric Power Research Institute (EPRI). The method is presented by the U.S. Department of Agriculture Rural Utilities Service in a publication titled *Summary of Items of Engineering Interest*. The formula assumes a relationship between the number of thunderstorm days per year (T) and the number of lightning strikes to hit earth per square mile (N) (Reference 2.3-216):

$$N = 0.31T \qquad \text{[Eq. 1]}$$

Using the above formula and the previously given average of 33 days of thunderstorms per year, the average number of lightning strikes is then calculated as 10 strikes per square mile per year or nearly four strikes per square kilometer per year for the Fermi region. This calculation compared well with the 1996-2000 flash density map created by Vaisala which indicates that the Fermi site is located in the region that averages around 1-4 strikes per square kilometer per year (Reference 2.3-217).

For a more detailed look at the average number of strikes to occur near the reactor (i.e., within a 1,000 ft radius or 0.113 mi^2), the following ratio was applied:

$$10 \text{ strikes/mi}^2 \text{ per year x } 0.113 \text{ mi}^2 = 1.13 \text{ strikes/year}$$

that may strike near Fermi 3 (within 1000 ft).

2.3.1.3.1.2 Extreme Winds and High Wind Events

Extreme Winds

Wind loading on plant structures is estimated using a 3-second wind gust at 10-m (33—ft) above ground level to create a basic wind speed for regions across the United States. The American Society of Civil Engineers (ASCE) and Structural Engineering Institute (SEI) classify the Fermi region into Exposure Category C (Reference 2.3-218). From the Engineering Weather Data, Version 1.0 CD-ROM, the maximum basic wind speed with a 50—year recurrence interval is 144.8 km/hr (90 mph) for Detroit City Airport (Reference 2.3-219). Applying a 50-year to 100-year wind multiplier of 1.07 supplied by the ASCE and SEI in Table C6-7 of SEI/ASCE 7-05 the maximum basic wind speed for the Fermi site increases to 155.0 km/hr (96.3 mph) (Reference 2.3-218).

Local and regional records of maximum wind speeds occurring from thunderstorms and other high wind events present values higher than the above maximum basic wind speed. According to the NCDC online storm database the highest wind speed recorded for Monroe County is 153.7 km/hr (95.5 mph) on May 21, 2004 (Reference 2.3-220). Using the same NCDC online storm database, the highest wind speed recorded in the surrounding counties is 166.7 km/hr (103.6 mph), occurring in Wayne and Lucas Counties on July 22, 1960 and July 4, 1969, respectively. For comparison, a maximum 2-minute wind speed of 98.2 km/hr (61 mph) along with a corresponding 125.5 km/hr (78 mph) 5-second wind gust was recorded at Detroit Metropolitan Airport in May of 2004

(Reference 2.3-201). Wind data records from the LCD for Detroit Metropolitan Airport span back only 11 years. The observed wind speeds from the NCDC database indicate that thunderstorms can produce wind speeds in excess of 160.9 km/hr (100 mph) at the Fermi site.

High Wind Events

This section provides the frequency of occurrence of winds greater than 50 knots, in accordance with the Nuclear Regulatory Commission (NRC) Regulatory Guide 4.2. Storm reports that include wind speeds of 50 knots (91.7 km/hr [57 mph]) or greater occur with many types of weather phenomenon such as thunderstorms and tornadoes. Wind reports for thunderstorms and tornadoes were obtained from the NCDC online storm database for the following five-county area surrounding the Fermi site: Lenawee, Monroe, Washtenaw, Wayne and the Ohio County of Lucas. While not all five counties may have been actively reporting high wind events in the early years of the time period, the 1955-1959 period featured 1.6 high wind events per year. The subsequent 10-year periods of 1960-1969, 1970-1979, and 1980-1989 averaged 2.9, 2.4, and 4.2 high wind events per year respectively. An analysis of the high wind events on a decade by decade basis over the five-county area does not show a significant statistical trend over the first four decades. In fact, the variability in the average number of high wind events per decade over the first four decades may be explained by natural variability as they each reported similar numbers of high wind events.

Furthermore, some of the reported high wind events likely occurred simultaneously in several of the five counties. High wind events can be caused by individual thunderstorms that have a cellular structure or by thunderstorms that have become linear along a squall line or cold front. A line of thunderstorms can cause wind damage along an elongated path, while the wind damage caused by cellular type thunderstorms is typically isolated in nature.

Between January 1, 1955 and December 31, 2007 there have been 816 reports of wind events that were 50 knots or greater in the five-county area (Reference 2.3-220). The highest wind speed reported was 90 knots (166.7 km/hr [103.6 mph]) in Wayne and Lucas Counties on July 22, 1960 and July 4, 1969. Many of the reports for high winds contained in the NCDC online storm database do not specify wind speeds and therefore may underestimate the count of wind events 50 knots or greater in the region of the Fermi site.

Between January 1, 1955 and December 31, 2007, 92 tornadoes were reported in the five-county area (Reference 2.3-220). All tornadoes are categorized as F0 or stronger on the Enhanced Fujita (EF) scale, thereby containing wind speeds greater than 50 knots (Reference 2.3-221). Additional discussion of tornadoes in the region surrounding the Fermi site is given in Subsection 2.3.1.3.1.3.

2.3.1.3.1.3 **Tornadoes and Waterspouts**

Waterspouts

Waterspouts are considered to be the counterpart of tornadoes, but over large bodies of water. Waterspouts are also much smaller than an average tornado and contain wind speeds that are typically less than 43 knots (80.5 km/hr [50 mph]). In the Fermi region, conditions favorable for waterspout formation are when a cool air mass passes over the warmer air above the waters of Lake Erie. The resulting instability can support the formation of waterspouts, most frequently during the late summer and fall season. A search for reported waterspouts in the NCDC online storm database resulted in eight occurrences off the shoreline of Lucas and Monroe counties since 1993 (Reference 2.3-220). The closest occurance to the Fermi site was a report of several waterspouts off the shoreline of Stony Point in Monroe County on the morning of July 26th, 1998 (Reference 2.3-222). Therefore, waterspouts can occur near and at the Fermi site, but are not considered to be of frequent occurrence.

Tornadoes

“Design-Basis Tornado (DBT) and Tornado Missiles for Nuclear Power Plants” (Regulatory Guide 1.76) published in March 2007, was used to determine the design parameters that should be considered in the event that the most severe tornado strikes the Fermi site. In addition, DBT wind speeds for the Fermi site, utilizing information from the “Tornado Climatology of the United States” (NUREG/CR-4461 Rev. 2) published in February of 2007 are presented here. NUREG/CR-4461 Rev. 2 is an update to Rev. 1 that recalculated the tornado climatology using the EF scale for the time period of 1950 through August 2003. The relationship of the damage intensity to the tornado maximum wind speed in the new EF scale is as follows (Reference 2.3-221):

EF0	65-85 mph	105-137 km/h
EF1	86-110 mph	138-177 km/h
EF2	111-135 mph	178-217 km/h
EF3	136-165 mph	218-265 km/h
EF4	166-200 mph	266-322 km/h
EF5	201+ mph	323 + km/h

The EF scale uses the fastest 3-second wind speeds as opposed to the fastest quarter mile wind speeds used in the original Fujita Scale. The result of this new methodology is lower DBT maximum wind speeds as shown in Table 1 of Regulatory Guide 1.76. NUREG/CR-4461 Rev. 2 also introduces a term to account for the finite dimensions of structures as well as the variation of wind speed along and across the tornado footprint. The seven DBT values deemed critical by Regulatory Guide 1.76 when designing nuclear facilities are as follows:

- Tornado Strike Probability
- Maximum Wind Speed
- Translational Speed
- Maximum Rotational Speed
- Radius of Maximum Rotational Speed
- Pressure Drop
- Rate of Pressure Drop

<u>Tornado Strike Probability</u>

NUREG/CR-4461 Rev. 2 divides the United States into 2—degree latitude/longitude boxes containing the number of tornado events reported from 1950 through August 2003. Figure 5-7 of NUREG/CR-4461 Rev. 2 shows that the Fermi site is located near the center of the 2-degree box bound between the 82 degree and 84 degree West longitudes and the 41 degree and 43 degree North latitudes. Adjacent 2-degree boxes to the west and southwest contain significantly higher numbers of tornado events. However, the 2-degree box that contains the Fermi site includes Lake Saint Clair and western parts of Lake Erie, which may explain the decreased number of tornado events. In order to calculate the strike probability specifically for the Fermi site, a 2-degree latitude/longitude box centered on the location of the Fermi site was chosen to mirror the 2-degree box presented in NUREG/CR-4461 Rev. 2. A 2-degree box centered on the Fermi 3 reactor provides a conservative basis for calculating the probability of a tornado striking the Fermi site. Guidelines for calculating strike probability are presented in NUREG/CR-4461 Rev 2. Following the NUREG/CR-4461 Rev. 2 methodology, the strike probability for a point structure in any given year is given by:

$$Pp = At / NAr \qquad \text{[Eq. 2]}$$

where:

Pp = Tornado strike probability for a point structure per year, regardless of wind speed
At = Total area impacted by tornadoes within a region of interest in N years
N = Number of years of tornado record
Ar = Area of the region of interest

The 2 degree latitude/longitude box is based on the centerline of the Fermi 3 reactor vessel. The 2-degree box encompasses 13 counties in Michigan, 17 counties in Ohio, and 3 counties in the Canadian Province of Ontario that are either fully or partially inside the box. The number of tornadoes occurring in the 2-degree box was obtained from the NCDC online storm database and Environment Canada database for the 54-year period of January 1, 1950 through December 31, 2003. As shown below, the number of tornadoes for each EF scale class is displayed. On average 7.81 tornadoes per year occurred in the 2-degree box based on the 422 tornadoes that were reported during the 54-year period (Reference 2.3-220, Reference 2.3-223). The total area impacted by tornadoes in the 2—degree box, shown below, can be found by multiplying the number of tornadoes in each EF scale class by the expected values for tornado segment statistics in the central United States found in Table 2-10 of NUREG/CR-4461 Rev. 2.

	F0	**F1**	**F2**	**F3**	**F4**	**F5**	**Total**
Number of Tornadoes	135	153	93	23	17	1	422

Expected Value of Tornado Area (mi^2) [1]	0.0341	0.3374	1.1784	3.0857	4.7263	6.0152	
A t = Total Tornado Area (mi^2)	4.60	51.62	109.59	70.97	80.35	6.02	323.15

1. From Table 2-10 NUREG/CR-4461 Rev. 2

The total area of the 2-degree box is calculated by summing the areas of Michigan, Ohio, and Canadian counties inside the 2-degree box. County areas provided from the U.S. Census Bureau and Canada's National Statistical Agency estimates a total area of 18,583.87 mi^2 (Reference 2.3-224, Reference 2.3-225). Using a total tornado area of 323.15 mi^2 (At), a 2-degree box area of 18,583.87 mi^2 (Ar), and a time period of 54 years (N), the calculated strike probability (Pp) for the Fermi site becomes 3.22 X 10-4 or a recurrence interval of once every 3105 years.

In comparison, Table 5-1 in NUREG/CR-4461 Rev. 2 shows the calculated probability of a tornado striking any point in the central United States as 3.58 X 10-4 or a recurrence interval of once every 2793 years. The results demonstrate that the statistics for the 2-degree box centered on the Fermi site provides an accurate estimate of the probability of a tornado striking the Fermi site rather than utilizing the generalized value for the central United States, which incorporates regions that experience tornadoes more frequently.

Regulatory Guide 1.76 defines DBT characteristics for nuclear power plants that have a tornado strike probability greater than 1.0 X10-7. The calculated Fermi site tornado strike probability of 3.22 X10-4 exceeds the above probability threshold which requires Fermi 3 to meet the design requirements of Regulatory Guide 1.76. Table 1 from Regulatory Guide 1.76 presents the remaining six DBT characteristics for new reactors located in the United States whose tornado strike probabilities exceed the 1.0 X 10-7 threshold. According to Table 1, since the Fermi site is located in Region I, the DBT characteristics are as follows:

DBT Characteristics	**Fermi site [1]**	**ESBWR DCD [2]**
Maximum wind speed (mph)	230	330
Translational speed (mph)	46	70
Maximum rotational speed (mph)	184	260

Radius of maximum rotational speed (ft)	150	150
Pressure drop (psi)	1.2	2.4
Rate of pressure drop (psi/sec)	0.5	1.7

1. From Table 1 of Regulatory Guide 1.76
2. From DCD Table 2.0-1, Revision 4

The DBT characteristics for the Fermi site are bounded by the values cited in DCD Table 2.0-1 and are listed in the table above. In addition, the ESBWR DCD values are applied to the full building height of structures at the Fermi site for the spectrum of tornado-generated missiles specified in Table 2 of Regulatory Guide 1.76.

2.3.1.3.1.4 Hail

A study authored by Joseph T. Schaefer estimates that the 1 x 1 degree box surrounding the Fermi site averages 16.5 reports of severe hail (hail diameter ≥ 1.9 cm [0.75 inches]) per year (Reference 2.3-226). Schaefer's study examined hail reports from the period 1955-2002. In order to include the most recent five years, hail reports were obtained from the NCDC online storm database for the Michigan Counties of Lenawee, Monroe, Washtenaw, Wayne, and the Ohio County of Lucas. The five-county area surrounding the Fermi site reported 576 severe hail events over a 53-year period of January 1, 1955 through December 31, 2007 producing an average of 10.9 occurrences of severe hail per year, which is somewhat lower than the findings by Schaefer (Reference 2.3-220). However, the total area of the five-counties is less than that of the 1 x 1 degree box used by Schaefer, and thereby explains the difference among the two estimates.

Out of the 576 severe hail reports, 87 were reported as large hail (hail diameter ≥ 4.4 cm [1.75 inches]) (Reference 2.3-220). The largest hail report was 10.2 cm (4.00 inches), occurring in Wayne County on November 13, 1955 and Monroe County on March 27, 1991. Figure 2.3-202 shows the distribution of severe hail events for each month. The majority of hail events in the five-county area occur during the months of May, June, and July. During the 53-year period there were no reports of hail during the winter months of December and January. Figure 2.3-203 provides the distribution of severe hail events across each of the five counties. The counties surrounding Monroe County and the location of Fermi 3 contain higher occurrences of severe hail events. While not all five counties were actively reporting severe hail events between 1955 and 1959, there was an average of 2.0 severe hail events reported per year in the five-county area during this period. By comparison between 1960 and 1979, a period when all five counties were included in the reporting of severe hail events, an average of 1.9 severe hail events per year were reported over the same five-county area for the period between 1960 and 1969 and an average of 2.2 severe hail events per year were reported over the same five-county area for the period between 1970 and 1979. The overall frequency of hail reports has steadily increased during the last few decades. It is reasonable to assume the increase may be explained by the improved technology of Doppler radars, cell phones, and the increased public awareness of reporting hail events (Reference 2.3-226).

2.3.1.3.1.5 **Drought**

Monthly values of precipitation are nearly consistent throughout the year in the region surrounding the Fermi site; however, droughts do happen from time to time. A good way to analyze periods where droughts may have occurred is to analyze the extreme dry stretches over a period of time. In order to find the extreme dry periods, hourly precipitation data was analyzed for Detroit Metropolitan Airport during the period 1961-2007. During a stretch from June 17 through July 13, 1963 (644 hours or 26.8 days), the Detroit Metropolitan Airport recorded no measurable precipitation (Reference 2.3-227 through Reference 2.3-229). This was the longest dry stretch that occurred during the 1961-2007 time period. A useful tool that assesses the severity of drought conditions is the Palmer Drought Index (PDI) (Reference 2.3-230). According to an analysis performed by the NCDC, 10 extreme droughts (PDI values of less than -4.0) have occurred in Michigan between 1900 and February 2008 (Reference 2.3-231). One of the episodes of extreme drought corresponds with the longest dry stretch observed at Detroit Metropolitan Airport during June of 1963. Overall, the frequency of extreme droughts has decreased since 1940.

2.3.1.3.2 **Probable Maximum Annual Frequency of Occurrence and Duration of Dust (Sand) Storms**

The Fermi site is located in a region where prolonged dry periods are infrequent and the occurrence of dust, blowing dust, blowing sand, and dust storms are rare. Typically the occurrence of dust in southeast

Michigan are when the southern Plain states of Oklahoma, Texas and New Mexico or upper Midwest states of Illinois, Iowa, and Indiana are suffering from extreme drought conditions and a synoptic scale system transports the dust northeastward. Hourly observations were obtained from Detroit Metropolitan Airport to provide an estimate of the occurrence of dust at the Fermi site (Reference 2.3-227, Reference 2.3-228). As previously discussed Detroit Metropolitan Airport is located approximately 27.4 km (17 mi) north-northwest of the Fermi site and reports the occurrence of dust, blowing dust, blowing sand, and dust storms. Table 2.3-207 presents the annual number of hours that dust was reported for each year during the period 1961-1995. Noticeable are the low number of years that reported hours with dust. The years with the greatest number of hours reporting dust occurred during 1976 and 1984.

Table 2.3-207 also displays the annual frequency of occurrence of dust for each year during the period 1961-1995. One method to determine the probable maximum annual frequency of occurrence is to find the 99.9 percent percentile rank from the data set of annual hours with dust reported at Detroit Metropolitan Airport during the 35-year period. However, the variance and standard deviation of the data values are large and therefore would not provide for an accurate depiction of the probable maximum frequency of occurrence. A more conservative method is to consider the probable maximum annual frequency of occurrence as 0.09 percent of hours annually (8 hours), corresponding with the year that contained the highest number of hours with dust reported.

Table 2.3-208 displays the distribution for duration of discrete dust events that occurred at Detroit Metropolitan Airport. Discrete events are defined as at least one hour of consecutive observations with dust, blowing dust, blowing sand, or a dust storm occurring. The majority of dust events lasted four hours or less. During 1976 there was one stretch of 7 consecutive hours where dust was reported. The probable maximum duration for dust events at the Fermi site can be estimated through numerous statistical methods. However, the variability and standard deviation of the data set for discrete dust events is large and such statistical calculations would underestimate the probable maximum duration of dust events at the Fermi site. For this reason, it can be conservatively stated that the probable maximum duration of dust events at the Fermi site is 7 hours, the longest duration of discrete events occurring during the 1961-1995 time period.

2.3.1.3.3 Probable Maximum Annual Frequency of Occurrence and Duration of Freezing Rain

Freezing rain is defined as an accretion of ice resulting from liquid precipitation striking a frozen surface (e.g., tree branches or power lines) and freezing. Typically the liquid droplets are supercooled droplets falling through an air layer of sub-freezing temperatures, during their descent to the ground. The weight of the ice accretion on surface objects can become sufficient to cause damage to trees and power lines, as well as slow down or even halt transportation on ice covered roads and bridges. The surface air temperature during freezing rain events typically ranges between -3.9ºC (25ºF) and 0ºC (32ºF) (Reference 2.3-232). Ice pellets are also a common occurrence at the Fermi site during wintertime storms. Ice pellets are created when a snowflake melts during its descent to the ground, but then refreezes as it falls through a sub-freezing air layer near the surface.

Frequency of Occurrence

Cortinas et al. analyzed freezing rain and ice pellets events for the Fermi region during the period 1976-1990. In particular, freezing rain and ice pellet events are most common from December to March, although a few events have occurred in November and April. The Fermi site averages approximately 4-5 days per year when an observation of freezing rain has occurred, while ice pellets are reported four days per year (Reference 2.3-233).

Ice storm reports were obtained from the NCDC storm database in order to estimate the frequency of occurrence and duration of freezing rain events at the Fermi site. A total of 24 freezing rain events were reported in the five-county area surrounding the Fermi site during the period 1993-2007 (Reference 2.3-220). Table 2.3-209 displays the dates of the freezing rain events and the reported accumulations. In some cases amounts of freezing rain amounted to only a trace or were not available from the storm data records. From the data the frequency of freezing rain events during the 15-year period is 1.6 events per year (24 events/15 years). The high number of freezing rain events during the last 15 years provides an assessment of how frequent they are in the Fermi region.

Probable Maximum Annual Duration

In order to determine the duration of each freezing rain event that occurred in the five-county region surrounding the Fermi site, hourly temperature and precipitation data was obtained from Detroit Metropolitan Airport. To provide a conservative estimate of the duration for each event, only hours that reported measurable precipitation were counted. In addition, the precipitation type was ignored such that hours with rain are included. Table 2.3-209 provides the duration of each freezing rain event during the 1993-2007 time period. The freezing rain event with the longest duration occurred from January 30 into the afternoon of February 1, 2002 when 62 consecutive hours of precipitation was reported.

Using the method of moments as suggested by Wilks with the durations of freezing rain events listed in Table 2.3-209, the Gumbel probability distribution estimates a probable maximum annual duration of 72 hours for ice events in the Fermi region (Reference 2.3-234). This provides a conservative estimate of the maximum duration for freezing rain events at Fermi 3.

2.3.1.3.4 Roof Loads of Winter Precipitation Events on Fermi Structures

It is important to determine the potential maximum weight of frozen and liquid precipitation on structures at the Fermi site for safety reasons. The following subsections provide estimates for the resulting ground-level weights and roof loads from the 100-year return period snowpack, historical maximum snowpack, 100-year return period snowfall, historical maximum snowfall, and 48-hour probable maximum winter precipitation (PMWP) in the Fermi region. In accordance with the Interim Staff Guidance (ISG) DC/COL-ISG-07, “Interim Staff Guidance on Assessment of Normal and Extreme Winter Precipitation Loads on the Roofs of Seismic Category I Structures,” winter precipitation roof loads to be considered in the design of Fermi 3 structures should be based on the weight of the maximum Normal Winter Precipitation (NWP) event plus the weight of the maximum Extreme Winter Precipitation (EWP) event. This estimate will provide a conservative and realistic maximum roof load of frozen and liquid precipitation on structures for design purposes at Fermi 3.

2.3.1.3.4.1 Maximum Ground-Level Weight of the Normal Winter Precipitation Event

The NWP event in the Fermi 3 region can be described by the highest ground-level weight among the 100-year return period snowpack, historical maximum snowpack, 100-year return period snowfall, or historical maximum snowfall. The remainder of this subsection provides the basis for each ground-level weight.

<u>100-Year Return Period Snowpack</u>

During the late fall, winter, and early spring the frequency of surface low pressure systems tracking across southeast Michigan is at a maximum. Each surface low pressure system that passes through the region has the potential to produce heavy snowfall at the Fermi site. SEI/ASCE 7-05, “Minimum Design Loads for Buildings and Other Structures,” identifies that the Fermi site is located in a ground snow load zone of 24 lb_f/ft^2 based on a 50-year return period (Reference 2.3-218). In order to convert to a 100-year return period snowpack Table C7-3 of SEI/ASCE 7-05 cites a conversion factor of 1.22 (1/0.82). Using this conversion factor the ground-level weight of the 100-year return period snowpack for the Fermi site becomes 29.3 lb_f/ft^2 (24 lb_f/ft^2 x 1.22).

<u>Historical Maximum Snowpack Event</u>

Snowpack is defined as the amount of measured snow on the ground reported in inches. The NWS measures snowpack on a daily basis at first-order and most COOP stations, reporting it as snow depth. Maximum snow depth measurements were obtained for stations surrounding the Fermi site in order to determine the historical maximum snowpack event. The maximum snowpack recorded is 60.96 cm (24 inches), occurring at the Detroit Metropolitan Airport in January 1999 (Reference 2.3-201). For the Fermi site, using Equation 1 presented in ISG DC/COL-ISG-07, the ground-level weight of the historical snowpack for the Fermi site becomes 21.0 lb_f/ft^2 (0.279 lb_f/ft^2/inch x $24^{1.36}$ inches).

<u>100-year Return Period Snowfall</u>

The 100-year return period snowfall value is intended to provide an estimate of the maximum snowfall event for meteorological observing stations with an insufficient time interval to capture cyclical extremes. 100-year return period snowfall values are extrapolated from a dataset of maximum snowfall events for the time period of the observing station.

100-year return period snowfall amounts for 2-day periods were obtained from NCDC's Snow Climatology web site for first order and COOP stations in the Fermi region. Utilizing values over a 2-day period ensures that snow events that occur for more than a 1-day recording period are captured. The maximum 100-year return period snowfall for the Fermi region is 46.48 cm (18.3 inches) as obtained from the Flint observing station records (Reference 2.3-237). Determining the ground-level weight of the 100-year return period snowfall is not exact, as snow can vary in density with different air temperatures. A more useful method to determine the ground-level weight of snowfall is to calculate the water equivalent of the falling snow. The snow to water equivalent ratio varies anywhere from 0.2 to 0.4 cm (0.07 to 0.15 inches) for 2.54 cm (1 inch) of snow (Reference 2.3-238). Using 0.15 as a conservative snow to water equivalent ratio and the weight of one inch of water, the weight of the 100-year return period snowfall for the Fermi region is given by:

$$18.3 \text{ in} \times 0.15 \times 5.2 \text{ lb}_f/\text{in ft}^2 = 14.3 \text{ lb}_f/\text{ft}^2$$

Historical Maximum Snowfall Event

In order to determine the historical maximum snowfall event, maximum 24-hour snowfall amounts were obtained for stations surrounding the Fermi site. Subsection 2.3.1.2.4 discussed the maximum 24-hour snowfall values in the Fermi region. The highest 24-hour snowfall amounts for the NWS first order and COOP sites around the Fermi site are displayed in Table 2.3-206. The highest 24-hour snowfall of 63.2 cm (24.5 inches) occurred during April of 1886 and is attributed to the Detroit City Airport in the database. Using 63.2 cm (24.5 inches) as the historical maximum snowfall event, 0.15 as the snow to water equivalent ratio, and the weight of one inch of water, the ground-level weight becomes 19.1 lb_f/ft^2 (24.5 inches x 0.15 x 5.2 lb_f/ft^2).

Based on the discussion above, the 100-year return period snowpack (29.3 lb_f/ft^2) , provides the maximum ground-level weight of the NWP event. This estimate is bounded by the ESBWR standard plant site parameter valuse (50 lb_f/ft^2) as shown in Table 2.0-201.

2.3.1.3.4.2 Maximum Ground-Level Weight of the Extreme Winter Precipitation Event

As indicated in ISG DC/COL-ISG-07, the EWP event is considered to be the highest groundlevel weight resulting from either the extreme frozen winter precipitation event or the extreme liquid winter precipitation event.

The extreme frozen winter precipitation event is considered to be the higher ground-level weight between the 100-year return period snowfall event and the historical maximum snowfall event, which for the Fermi region is 19.1 lb_f/ft^2.

The extreme liquid winter precipitation event is defined as the theoretical greatest depth of precipitation during a 48-hour period for a 25.9-square-kilometer (10-square-mile) area during the months having the historically greatest snowpack. Hydrometeorological Report No. 53 (HMR 53) provides a method to determine the 48-hour PMWP for the Fermi site based on long-term climatological normals. The winter precipitation amounts provided in HMR 53 are liquid equivalent amounts and incorporate all winter precipitation in the 10 square mile area that surrounds the Fermi site (Reference 2.3-235). Section 5 of HMR 53 recommends interpolation with a smooth depth-duration curve of the 24-hour and 72-hour PMWP amounts through the point of origin (0,0) to estimate the 48-hour PMWP. In the Fermi region, the greatest snowpack historically has occurred between the months of November through April; therefore, these months have been examined to develop the highest 48-hour PMWP. From Figures 24, 34, and 44 in Reference 2.3-235, the 6-, 24-, and 72-hour PMWP are determined to be 27.9, 40.6, and 52.1 cm (11, 16 and 20.5 inches), respectively, occurring in November. Using the method recommended by HMR 53 yields a 48-hour PMWP of 49 cm (19.3 inches) for the Fermi site. The parapets on the roof of the ESBWR are designed to allow water accumulation of no more than 60.96 cm (24 inches) during the extreme winter precipitation event when the roof scuppers and drains are assumed to be clogged. The weight of 60.96 cm (24 inches) of water is calculated to be 124.8 lb_f/ft^2 (24 inches of water x 5.2 $lb_f/in\ ft^2$).

Therefore, the weight of the 48-hour PMWP (124.8 lb_f/ft^2) is considered a conservative estimate for the EWP event at the Fermi site.

Table 2.0-201 shows the standard plant site parameter for the maximum ground snow load for the EWP event. The maximum ground snow load for the EWP event includes the contribution from the NWP event. The combined ground-level weight from the NWP and EWP event at the Fermi site is 154.1 lb_f/ft^2 (124.8 lb_f/ft^2 + 29.3 lb_f/ft^2). This estimate is bounded by the ESBWR standard plant site parameters of 162 lb_f/ft^2 given in Table 2.0-201.

2.3.1.3.4.3 **Maximum Roof Load**

As described in Subsection 2.3.1.2.4, the Fermi region can be characterized as experiencing liquid and frozen precipitation extremes during the late fall, winter, and early spring seasons. A method for determining the maximum roof load from the ground-level weights of the maximum normal and extreme winter precipitation events is described in ISG DC/COL-ISG- 07. The maximum roof load for the Fermi site can theoretically occur during one of the following scenarios: historical maximum snowfall on top of 100-year return period snowpack, 48-hour PMWP on top of 100-year return period ice accretion, or 48-hour PMWP on top of 100-year return period snowpack. The scenario that results in the maximum roof load can be considered a conservative estimate of the maximum roof load for Seismic I Structures at the Fermi site.

Historical Maximum Snowfall Event on the 100-Year Return Period Snowpack

Subsection 2.3.1.3.4.1 indicates that maximum ground-level weight of the NWP event for the Fermi region is 29.3 lb_f/ft^2, which is the value for the 100-year return period snowpack. The maximum ground-level weight of the extreme frozen winter precipitation event for the Fermi region is 19.1 lb_f/ft^2, resulting from the historical maximum snowfall. In the event that the historical maximum snowfall event occurs while the Fermi site is experiencing a 100-year return period snowpack, the resulting ground-level weight is 48.4 lb_f/ft^2 (19.1 lb_f/ft^2 + 29.3 lb_f/ft^2). SEI/ASCE 7-05 provides a method to convert ground-level weights of snow to roof snow loads by using the following formula for flat roofs:

$p_f = 0.7 \times C_e \times C_t \times I \times p_g$

where:

p_f = Snow load on flat roofs, in lb_f/ft^2

C_e = Exposure factor for sheltered roofs as listed in Table 7-2 of SEI/ASCE 7-05

C_t = Thermal factor as determined from Table 7-3 of SEI/ASCE 7-05

I = Importance factor as determines from Table 7-4 of SEI/ASCE 7-05

p_g = Ground-level snow load, in lb_f/ft^2

Using an exposure factor (C_e) of 1.1, a thermal factor (C_t) of 1, an importance factor (I) of 1, and a ground-level snow load (p_g) of

48.4 lb_f/ft^2, the roof load (p_f) for the historical maximum snowfall on top of the 100-year return period snowpack becomes 37.3 lb_f/ft^2.

48-Hour PMWP on the 100-Year Return Period Ice Accretion Event

The propensity of the Fermi site to experience significant ice accretion events presents an additional scenario in which the 48-hour PMWP falls on top of the 100-year return period ice accretion. Table 2.3-209 provides ice accretion values for the 24 freezing rain events that occurred in the five-counties surrounding the Fermi site during the 1993-2007 period. The ice accretion values were estimated from liquid precipitation amounts obtained from hourly observations at Detroit Metropolitan Airport. To provide a conservative estimate of the ice accretion for each event, all hourly precipitation was considered to fall as freezing rain. A conversion factor (1.09) for the expansion of water to ice as it freezes was applied to the liquid equivalent amounts for each event. The highest ice accumulation displayed in Table 2.3-209 occurred on March 13, 1997 when a major ice storm struck southeastern Michigan and deposited ice accumulations of 3.8-6.4 cm (1.5-2.5 inches) from Detroit to Ann Arbor and south to the Ohio-Michigan state line. A general search for ice storms in the southeast Michigan and northwestern Ohio region prior to 1993 resulted in an ice storm producing a higher amount. On January 26-27, 1967 a storm produced freezing rain and sleet that lasted nearly 24 hours and produced ice accumulations of up to 7.6 cm (3 inches) across northwestern Ohio and parts of southern Michigan (Reference 2.3-236).

In order to determine the 100-year return period ice accretion for the Fermi site, Gumbel distributions were calculated from the method of moments as described by Wilks (Reference 2.3-234). Using this method, the 100-year return period ice accretion becomes 8.4 cm (3.31 inches). The significant accumulations of ice that have occurred in the Fermi region confirm that 8.4 cm (3.31 inches) represents the 100-year return period ice accretion event.

It is reasonable to use the weight of 8.4 cm (3.31 inches) of ice and the 60.96 cm (24 inches) of water to estimate the maximum roof load for the 48-hour PMWP falling on top of the 100- year return period ice accretion event. The weight of 60.96 cm (24 inches) of water is calculated to be 124.8 lb_f/ft^2 (24 inches of water x 5.2 $lb_f/in\ ft^2$). The weight of 8.4 cm (3.31 inches) of ice (equivalent to 7.7 cm [3.04 inches of water]) is calculated to be 15.8 lb_f/ft^2 (3.04 inches of water x 5.2 $lb_f/in\ ft^2$). The summation of these two roof loads yields 140.6 lb_f/ft^2 as the maximum roof load for the 48-hour PMWP on the 100-year return period ice accretion event scenario.

48-Hour PMWP on the 100-Year Return Period Snowpack

As previously mentioned, the maximum roof load for 60.96 cm (24 inches) of water resulting from the 48-hour PMWP is 124.8 lb_f/ft^2. The ground-level weight of the 100-year return period snowpack on safety-related structures at the Fermi site is 29.3 lb_f/ft^2. Using equation 7-1 from SEI/ASCE 7-05, the roof load of the 100-year return period snowpack becomes 22.6 lb_f/ft^2 (0.7 x 1.1 x 1 x 1 x 29.3 lb_f/ft^2). SEI/ASCE 7-05 also mentions for rain on snow loads a surcharge of 5 lb_f/ft^2 must be added to account for heavy rain events where rain will flow through the snowpack and then drain away. This is reasonable since thunderstorms are possible at the Fermi site during the wintertime. Therefore, the roof load of the 48-hour PMWP on the 100-year return period snowpack for design purposes at the Fermi site is determined as:

$124.8\ lb_f/ft^2 + 22.6\ lb_f/ft^2 + 5\ lb_f/ft^2 = 152.4\ lb_f/ft^2$

Based upon the discussions above, the roof load scenario of the 48-hour PMWP on the 100-year return period snowpack provides a conservative estimate of the maximum roof load resulting from the normal and extreme winter precipitation events for the roofs of safety-related structures at the Fermi site. This estimate is bounded by the ESBWR site design parameters shown in Table 3G.1-2 of the ESBWR DCD that provides the maximum roof load resulting from the normal and extreme winter precipitation event determinded as:

$38.5\ lb_f/ft^2 + 125\ lb_f/ft^2 = 163.5\ lb_f/ft^2$

2.3.1.3.5 Design Basis Ambient Temperature and Humidity Statistics

The design of structures at power generating facilities, such as the plant heat sink and plant heating, ventilation, and air conditioning systems, is based upon long-term climatological data such as that produced in the 2005 ASHRAE Handbook (Reference 2.3-239). ASHRAE for design purposes provides 2.0 percent and 1.0 percent maximum ambient threshold values (annual exceedance probabilities) for the dry-bulb (DB) temperature and the mean coincident wet-bulb (MCWB) temperature, as well as the non-coincident wet-bulb (WB) temperatures. The 99.0 percent and 99.6 percent annual exceedance probabilities are also provided for minimum ambient thresholds. Detroit Metropolitan Airport is the closest location to the Fermi site for which the 2005 ASHRAE provides design values. Based upon a 30-year period of record from 1972 through 2001, Table 2.3-210 shows that the maximum 2.0 percent annual DB cooling exceedance temperature is 29.3ºC (84.7ºF) with a corresponding MCWB of 21.6°C (70.8°F). The maximum 1.0 percent annual DB cooling exceedance temperature is 30.7ºC (87.3ºF) with a corresponding MCWB of 22.3ºC (72.2ºF).The maximum 2.0 percent and 1.0 percent annual WB cooling exceedance temperatures are 22.8°C (73.1°F) and 23.8°C (74.8°F), respectively. The minimum 99.0 percent and 99.6 percent annual DB heating exceedance temperatures are -14.8ºC (5.3ºF) and -17.7ºC (0.2ºF), respectively.

<u>Historic Extreme Values</u>

Historic extreme values represent the maximum or minimum value that is observed over a long period of time, usually 30-years or greater. Extreme maximum and minimum DB temperatures for meteorological stations in the region surrounding the Fermi site were discussed in Subsection 2.3.1.2.2 and summarized in Table 2.3-206. The highest DB temperature of 42.2ºC (108ºF) occurred at the Adrian 2 NNE COOP weather station on July of 1934 (Reference 2.3-210). The lowest DB temperature recorded was -32.2ºC (-26ºF) during January of 1892, also occurring at Adrian 2 NNE. In comparison, Detroit Metropolitan maximum and minimum DB temperatures over a 48-year period are 40ºC (104ºF) and -29.4°C (-21.0ºF), respectively, occurring during June 1988 and January 1984, respectively (Reference 2.3-201). For the Fermi site temperature data from Detroit Metropolitan Airport is considered more representative due to its proximity. The Adrian 2 NNE COOP weather station is located further inland and historically experiences temperatures that may not be representative of maximum temperature extremes experienced at the Fermi site, which is along the shoreline of Lake Erie.

In order to determine the historic extreme wet-bulb temperature (non-coincident) and the MCWB associated with the maximum DB temperature, hourly data was obtained from the Detroit Metropolitan Airport for the period 1961-2007 (47 years) (Reference 2.3-227, Reference 2.3-228, Reference 2.3-229). The Detroit Metropolitan Airport is the closest station that measures hourly dry-bulb temperature, dewpoint temperature, and station pressure necessary to calculate wet-bulb temperatures. The extreme maximum value of wet-bulb temperature (non-coincident) estimated from the data from Detroit Metropolitan Airport is 29.4ºC (85.0ºF). The MCWB temperature observed with the historic maximum DB temperature observed at the Detroit Metropolitan Airport is 24.8°C (76.6°F).

<u>100-year Return Period Values</u>

Values of 100-year return period maximum and minimum DB and 100-year return period maximum WB (non-coincident) are estimated from hourly data obtained from Detroit Metropolitan Airport during a 47-year period (1961-2007) (Reference 2.3-227, Reference 2.3-228, Reference 2.3-229, Reference 2.3-240). As mentioned in Subsection 2.3.1.2.2, long-term temperatures for stations across the Fermi site are influenced by latitude and proximity to Lake Erie. Detroit Metropolitan Airport is located approximately 27.4 km (17 mi) north-northwest of the Fermi site and is considered to have similar temperature extremes. Maximum and minimum DB and WB values were determined for each year of the 47-year period. Using the method of moments as suggested by Wilks with the annual minimum DB values, the Gumbel distribution estimates the 100-year return period minimum DB to be -34.9ºC (-30.8ºF) (Reference 2.3-234). Using this same method the 100-year return period maximum DB temperature is calculated to be 40.1ºC (104.1ºF), while the 100-year return period maximum WB (non-coincident) temperature is estimated to be 30ºC (86.0ºF). The 100-year return period MCWB temperature associated with the 100-year return period maximum DB temperature cannot be determined using the Gumbel distribution. ASHRAE's Weather Data Viewer Version 4.0 provides a method to estimate the 100-year return period MCWB temperature by linear extrapolation of historical observations of maximum DB and MCWB temperatures from Detroit Metropolitan Airport during the period 1982-2006 (Reference 2.3-264). A linear trend through the six highest DB temperatures in the joint frequency matrix extrapolated out to a DB temperature of 40.1ºC (104.1ºF) projects a 100-year return period MCWB temperature of 23.3ºC (73.9ºF).

<u>0 percent Exceedance Values</u>

The 0 percent Exceedance Values representing the ambient design temperature site characteristics should be based on the more extreme of either historic or 100-year return period values. Therefore, the 100-year return period DB temperature is considered the 0 percent exceedance value for maximum DB temperature. The 100-year return period minimum DB temperatures and 100-year return period maximum WB temperature (non-coincident) are considered the 0 percent exceedance values for the Fermi site. Table 2.3-210 displays the 0 percent exceedance values that are considered representative of the Fermi site for design purposes. In addition, the Fermi 3 specific design ambient temperature and humidity values are bounded by the values in DCD Table 2.0-1.

2.3.1.3.6 **Potential Changes in Climate**

Natural climate variation is cyclical phenomenon that deviates on both a time and spatial scale. Prediction of these events over any length of time on a global scale is often speculative at best. The uncertainty is especially compounded when referring to specific areas or locations.

A large resource of historical climatic data allows for the evaluation of climate conditions and thus climate changes over the expected life span of Fermi 3. Long-term historical temperature, precipitation and storm data including both normal and extreme conditions that may affect plant operation and design are readily available for the region.

The National Climatic Data Center (NCDC) publishes "Climatography of the United States, No. 85". The publication summarizes 344 climate divisions in the lower 48 contiguous states. Trends of temperature as well as precipitation and their appropriate standard deviations have been collected over five 30-year periods and the 70-year period between 1931-2000 for each climate division in a state. Climate divisions, which typically follow county lines, are designed to represent regions within a state that have similar climates. The Fermi 3 facility is located within the Michigan-10 Climate Division.

In general the temperature data in "Climatography of the United States, No. 85" shows little in the way of change or variability over the 70-year period, with both the beginning period of 1931-1960 and the latest time period of 1971-2000 showing an average annual temperature of 9.0°C (48.3°F). Precipitation on the other hand, did show some increase during the 70-year period, especially when compared with the latest 30-year interval. The average precipitation increased from 78.0 cm (30.72 in) per year for the 1931-1960 time period to 83.5 cm (32.86 in) per year over the 1971-2000 time period.

Temperature and precipitation data for Detroit Metropolitan Airport is available in 20-year increments prior to 2000 and individually for the years 2000 - 2009 through the Detroit Office of the NWS. Climatological data for Detroit starting in 1920 was examined. A comparison of 1980-2000 Detroit temperature data with 1971-2000 "Climatography of the United States, No. 85" data shows a warm bias of 0.1C° (1.3F°) for the Detroit area. Much of the temperature bias between Detroit and the rest of its climatic region can likely be attributed to an urban heat island effect inside the Detroit Metropolitan area. The precipitation data for the same 1980-2000 period for Detroit is also slightly higher when compared to 1971-2000 "Climatography of the United States, No. 85" data.

The statistics found on the Detroit National Weather Service website for the Detroit Metropolitan Airport were not indicative of any type of trend in the annual average temperature between the 1920-1940 period and the 1980-2000 period. Average annual temperatures did, however show an increase of slightly less than 0.5C° (1F°) for the 2000-2009 period when compared with the 1980-2000 period for the Detroit Metropolitan Airport. Precipitation however, much like with the "Climatography of the United States, No. 85" data, did show an increase when comparing the 1920-1940 period with the 1980-2000 period: the average annual precipitation increased from an average of 77.2 cm (30.4 in) to 86.1 cm (33.9 in), respectively. The upward trend in average annual precipitation continues in the 2000-2009 period, which has averaged 86.6 cm (34.1 in) of precipitation per year.

Besides the use of average statistics, extreme temperatures as well as extreme precipitation events will also show trends when it comes to climate change. Table 2.3-206 shows individual station records and dates for several First Order NWS stations as well as COOP stations in the Fermi 3 region. Detroit, Ann Arbor and Adrian have data sets that go back over 100 years, while the data sets for Windsor, Monroe, Toledo and Flint all go back more than 50 years. The dates for extreme maximum and minimum temperatures do not show any discernable trend, if in fact; most of the extreme high and low temperatures occurred more than 30 years ago. Like the temperatures, many of the extreme precipitation events including maximum 24-hour and monthly precipitation, minimum monthly precipitation, as well as maximum 24-hour and monthly snowfall totals also occurred more than 30 years ago, therefore not indicating any type of extreme precipitation trend.

Another possible indication of climate change would be statistics for the number of severe weather events occurring in a particular region. Subsection 2.3.1.3.1 contains subsections for thunderstorms, tornadoes, high winds and hail that present statistical trends for these severe weather phenomena. These subsections come to the general conclusion that no discernable trends are seen in the severe weather events that cannot be primarily explained by a simple increase in communication techniques in the more recent years.

An evaluation of historical data identified no discernable trends in extreme temperatures, precipitation or severe weather. Since no discernable trends in extreme weather data representing site conditions were identified, the data presented here and in other FSAR Sections appropriately characterizes the climate of the region. As such, the derivation of the probable maximum events covering the period of operation of the proposed new unit and beyond are considered to be substantiated and to remain bounded by the design values as this type of return period goes beyond the design life of the proposed new unit.

2.3.1.3.7 Ultimate Heat Sink

The Ultimate Heat Sink (UHS) for the Fermi 3 ESBWR does not require an external source of safety-related cooling water. The UHS function is provided by safety systems integral and interior to the reactor plant. These systems have no cooling towers, basins, or cooling water intake/discharge structures external to the reactor plant. The Fermi 3 ambient temperature values for the reactor building that were provided in Subsection 2.3.1.3.5 are bounded by the maximum and minimum dry-bulb temperature, as well as the maximum wet-bulb temperatures that are cited in DCD Table 2.0-1. A detailed description of the location and operation of the UHS is provided in Subsection 9.2.5.

2.3.1.3.8 Regional Air Quality

2.3.1.3.8.1 Background Air Quality

The Fermi site is located in the northeastern tip of Monroe County and along the western shoreline of Lake Erie. Air quality at the Fermi site is heavily influenced by the Detroit and Toledo Metropolitan areas and surrounding emission sources. The MDEQ evaluates the air quality in the Detroit Metropolitan area with a network of monitors mostly located in Wayne County, north of the Fermi site. The MDEQ routinely monitors the

U.S. Environmental Protection Agency (EPA) criteria pollutants of NO2, SO2, CO, PM2.5, PM10, and Ozone. While Monroe County is a member of the Metropolitan Interstate Toledo Air Quality Control Region (AQCR), it is also included in the Detroit-Ann Arbor air quality designation area. The Detroit-Ann Arbor air quality designation area is currently classified as a PM2.5 non-attainment area for violations of the 1997 annual standard and the 2006 24-hour standard (Reference 2.3-241). The county is also currently classified as a maintenance area for the 8-hour ozone standard after being reclassified to attainment on June 29, 2009 by the EPA (Reference 2.3-241). Monroe County is in attainment for all other criteria pollutants (Reference 2.3-241). The EPA as of March 12, 2008 strengthened the definition of ozone non-attainment areas as those that record a 3-year average of the fourth-highest daily maximum 8-hour average ozone concentration of 0.075 parts per million (ppm) or higher (Reference 2.3-242). For PM2.5 the EPA considers areas in violation of the annual standard when the 3-year average of the weighted annual mean PM2.5 concentration is equal to or exceeds 15 $\mu g/m^3$ and in violation of the 2006 24-hour standard when the 3-year average of the 98th percentile of the 24-hour concentration is equal to or exceeds 35 $\mu g/m^3$.

Maximum concentrations for the annual average of PM2.5 and 8-hour ozone pollutants were obtained from monitors in Monroe and Wayne County. The highest annual PM2.5 concentration reported between 1999 and 2006 is 20.1 $\mu g/m^3$, occurring at the Dearborn monitor located west of downtown Detroit and the highest 24-hour PM2.5 concentration over this same period is 58 $\mu g/m^3$ (98th percentile) occurring at the Allen Park monitor located southwest of downtown Detroit in Wayne County (Reference 2.3-243). Between 2003 and 2007, the highest 8-hour ozone concentration recorded was 104 ppb (0.104 ppm), measured at the East Seven Mile monitor located in northeastern Wayne County (Reference 2.3-244). The next closest non-attainment area for a EPA criteria pollutant is Lorain County, Ohio which is part of the Cleveland Metropolitan air shed (also non-attainment for ozone and PM2.5), located approximately 96.6 km (60 mi) east-southeast of the Fermi site (Reference 2.3-241). There are no Class I Areas that are located within 300 km (186.5 mi) of the Fermi site (Reference 2.3-245). Given the minor nature of air emissions associated with operations of Fermi 3 (discussed below), this distance is sufficiently far as to not warrant a concern.

2.3.1.3.8.2 Projected Air Quality

Air emissions of criteria pollutants will be minor given the nature of a nuclear facility and its lack of significant gaseous exhausts of effluents to the air. Sources of air emissions for Fermi 3 include two standby diesel generators, two ancillary diesel generators, an auxiliary boiler, and two diesel fire pumps, as well as a natural draft cooling tower (NDCT) and two multi-cell mechanical draft cooling towers (MDCT). The combustion sources mentioned above will be designed for efficiency and operated with good combustion practices on a limited basis throughout the year (often only for testing). Given their small magnitude of size and infrequent operation, these emissions will not only have little effect on the nearby ozone and PM2.5 non-attainment areas, but will have minimal impact on the local and regional air quality as well. The air emissions from the listed equipment are regulated by the MDEQ.

Construction of Fermi 3 will lead to an increase of vehicular traffic surrounding the Fermi site prior to operations. Furthermore, increased traffic and construction activities will lead to further release of particulates prior to operation of Fermi 3. However, any increase in particulate emissions from vehicles is expected to be minor and remain local to the Fermi site.

The Fermi 3 cooling towers will not be a source of the typical combustion-related criteria pollutants or other toxic emissions. They will, however, emit small amounts of particulate matter as drift. The towers will be equipped with drift eliminators designed to limit drift to 0.001 percent or less of total water flow. Additionally, the primary normal power heat sink (NPHS) for Fermi 3 is a NDCT. The height of the tower will allow for good dispersion of the drift and not allow localized concentrations of particulate matter to be realized. The minor nature of the effects of the new cooling towers on visibility and air quality, including potential for increases in ambient temperature and moisture, icing, fogging, and salt deposition, are discussed in further detail in Subsection 2.3.2.2.

2.3.1.3.8.3 Air Stagnation

The main components of air stagnation are light winds and weak vertical mixing. Light winds can also be associated with weak or poor horizontal mixing of the atmosphere which has the general effect of leading to restrictive horizontal and vertical dispersion and thus air stagnation (Reference 2.3-246). Along with wind speed, wind direction plays a key roll in horizontal mixing as winds with non-persistent directions can also lead to poor dispersion, especially under light wind speeds when the air may re-circulate. Finally, temperature inversions are also associated with little to no vertical mixing of the atmosphere and, therefore, air stagnation. Analyses of inversions are discussed in Subsection 2.3.2.1.8 while the persistence of wind speeds and directions are covered in Subsection 2.3.2.1.6.

Air stagnation episodes typically occur when high pressure systems (anti-cyclones) have a strong influence on the regional weather for four days or more. These systems often lead to generally light winds and little vertical mixing due to a general sinking of the air in their vicinity. The region surrounding the Fermi site can expect approximately 10 days per year of air stagnation, or two episodes per year (Reference 2.3-246). The mean duration of each air stagnation episode typically is three to four days.

Air stagnation conditions primarily occur during the second half of the summer and early fall seasons that runs from July through September. This is a result of the migration of the mean track of surface low pressure systems to areas well north of the Fermi site, which creates weaker pressure and temperature gradients, and therefore weaker wind circulations during this period. Wang & Angell confirm that air stagnation episodes in the region surrounding the Fermi site begin to occur in June and July (Reference 2.3-246). The number of air stagnation episodes reaches a maximum during August before decreasing in magnitude during September and October. During the fall season the mean track of surface low pressure systems moves south and positions itself over southeastern Michigan and increases the frequency of surface low pressure systems and monthly wind speeds, therefore decreasing the possibility of air stagnation (Reference 2.3-209).

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2.3.2 Local Meteorology

Measurements from the Fermi onsite meteorological tower, located approximately one-quarter mile from the Fermi 3 reactor building, will be used in this section to characterize the local meteorology conditions at the Fermi site. The onsite meteorological tower (the details of which are contained in Subsection 2.3.3) collects wind speed, wind direction, dew-point temperature, precipitation, and the ambient temperature at the 10-m (33-ft) and 60—m (197-ft) levels. The meteorological monitoring system uses the vertical temperature difference (ΔT) between the 10- and 60-m levels to compute the atmospheric stability. The hourly averages of wind speed and direction, as well as the estimated atmospheric stability collected from the onsite tower are archived in a digital format that meets the format described in Appendix A of Regulatory Guide 1.23. Hourly data from the most recent five years (2003 through 2007) was obtained in order to perform the analysis of the local meteorology of the Fermi site. Data recovery rates for all meteorological parameters collected at the Fermi onsite meteorological station are greater than 94 percent. Wet-bulb temperature, relative humidity, and the occurrence of fog and visibility are not collected at the Fermi onsite meteorological station; however, data from the nearby Detroit Metropolitan Airport has been used to supplement Fermi site data. Extreme values of temperature, rainfall, and snowfall have also been obtained for several COOP stations within a 80.5-km (50-mile) radius of the Fermi site since those parameters are better representative from a regional perspective.

2.3.2.1 Normal, Mean, and Extreme Values

Regional normal, mean, and extreme values of temperature, wind, moisture and precipitation were discussed in Subsection 2.3.1.1. In order to demonstrate that the long-term data reported at the NWS first-order meteorological stations are representative of the Fermi site, this section provides a more comprehensive analysis of these parameters in comparison with the conditions at the Fermi site.

2.3.2.1.1 Temperature

Table 2.3-211 presents mean monthly and annual temperature for the 10- and 60-m levels at the Fermi site, as well as the 10-m level at Detroit Metropolitan Airport. In order to show the comparison of temperature at Detroit Metropolitan Airport and the Fermi site, temperature data is analyzed for a 5-year period during 2003 through 2007. From Table 2.3-211, it is apparent that while mean annual temperatures are comparable, the mean monthly values can be considerably different at the Fermi site. The reason they are different can be explained by comparing the locations of the two stations. The Fermi site is located along the shoreline of Lake Erie and experiences moderating effects resulting from the onshore and offshore lake breezes, the higher heat capacity of the lake, and the wintertime lake ice cover. During the wintertime, Lake Erie generally becomes ice covered by the middle of December (Reference 2.3-208). During this period, the ice over Lake Erie shuts off the moderating effects of the water's higher heat content. As a result, the air over the lake fluctuates in temperature as land does and mean monthly temperatures for December, January, and February between the two stations are nearly identical. During the spring, the lake ice melts by the middle of March, but the water temperatures remain cold (Reference 2.3-208). This results in cooler temperatures at the Fermi site when compared to the farther inland Detroit Metropolitan Airport. As the lake water warms up during the late spring, the lake produces a moderating effect on temperatures due to its higher heat capacity, and temperature differences along the shoreline produce onshore and offshore lake breezes. As a result, monthly temperatures remain slightly cooler at the Fermi site in comparison with the Detroit Metropolitan Airport. Lake temperatures remain warm through the fall season and the heat capacity effect helps keep monthly temperatures warmer at the Fermi site. The mean monthly and annual temperatures for the Fermi site are slightly different than those for Detroit Metropolitan Airport due to the effects of being on the Lake Erie shoreline. However, these effects are small when comparing the overall closeness of the mean annual temperatures for the Fermi site and Detroit Metropolitan Airport. Therefore, the mean annual temperatures of the Detroit Metropolitan Airport are characteristic of the temperature conditions for the Fermi site for longer climatological periods.

Long-term climatological values of temperature for Detroit Metropolitan Airport are presented in Subsection 2.3.1.2.2 and summarized in Table 2.3-202 and Table 2.3-205. As shown in Table 2.3-202, the mean daily temperature for the 48-year period is 9.6ºC (49.2ºF). Mean daily maximum temperatures are highest in July (28.5ºC (83.3ºF)) and lowest in January (-0.6ºC (31.0ºF)). Mean daily minimum temperatures are highest in July (16.7ºC (62.1ºF)) and lowest in January (-8.4ºC (16.9ºF)). To illustrate the extreme maximum and minimum values of temperature, which are characteristic of the Fermi site, hourly temperature data was analyzed for the first-order and COOP stations. Table 2.3-206 presents extreme values of temperature in the region surrounding the Fermi site. The table shows that temperatures have risen as high as 42.2ºC (108ºF) and dropped as low as -32.2ºC (-26ºF) in the region surrounding the Fermi site. In general, the Fermi site is vulnerable to both extreme heat in the summer and arctic cold temperatures during the winter months.

2.3.2.1.2 Atmospheric Moisture

Subsection 2.3.1.2.3 discussed the long-term monthly and annual characteristics of dew-point, relative humidity, and wet-bulb temperature in the Fermi region. It also was discovered that the magnitude of atmospheric moisture content for stations in the Fermi region is directly related to the latitude of the station and, to a smaller extent, the distance from the Lake Erie shoreline. This relationship indicates that moisture parameters at Detroit Metropolitan Airport, only 27.4 km (17 mi) north-northwest from the Fermi site, are representative of the conditions at the Fermi site.

Atmospheric moisture content at the Fermi site is influenced by Lake Erie and the other Great Lakes. Table 2.3-202 provides annual and monthly values of relative humidity and wet-bulb temperature for Detroit Metropolitan Airport. The values in Table 2.3-202 can be used to describe the long-term characteristics of relative humidity and wet-bulb temperature at the Fermi site.

Table 2.3-212 contains annual and monthly summaries of dew-point temperature calculated from data obtained from the Fermi onsite meteorological tower for the time period 2003-2007. During the 5-year period the mean annual dew-point temperature for the Fermi site is 3.1ºC (37.6ºF). As would be expected, the mean monthly dew-point temperature values are highest during July and August (14.5ºC (58.1°F)) and lowest in February (-9.1ºC (15.7°F)). Extreme values of dew-point temperature are also displayed in Table 2.3-212. The highest dew-point temperature measured at the Fermi site is 23.7ºC (74.7ºF) corresponding with the summer season, while the lowest dew-point temperature of -29.9ºC (-21.8ºF) occurred during the winter season. The last column in Table 2.3-212 shows that mean monthly diurnal variations in dew-point vary the least during the summer and early fall when mean dew-point temperatures are the highest.

2.3.2.1.3 Precipitation

The Fermi onsite meteorological station measures rainfall and the liquid equivalent of snowfall on a daily basis. During the process of analyzing the Fermi site precipitation data, it was discovered that the precipitation sensor malfunctioned several times during the 2003-2007 period, resulting in much higher annual precipitation amounts than observed at surrounding observation stations. For this reason, precipitation records for Detroit Metropolitan Airport will be used in this section to describe the precipitation characteristics of the Fermi site. Detroit Metropolitan Airport is the nearest first-order station that has a long period-of-record for reporting precipitation. Normal annual and monthly rainfall values were discussed in Subsection 2.3.1.2.4 and summarized in Table 2.3-202 and Table 2.3-205. These tables indicate that the Fermi region is annually characterized as having consistent precipitation amounts during the year and routine wintertime snowfall. These values are reasonably uniform over the region as to indicate that these stations are representative of precipitation averages that would be observed at the site.

Maximum 24-Hour and Monthly Precipitation

Maximum 24-hour and monthly precipitation totals for the region are discussed in Subsection 2.3.1.2.4 and summarized in Table 2.3-206 for the NWS first-order and COOP stations presented in the Fermi region. The highest 24-hour precipitation amount is 15.3 cm (6.04 inches), occurring during September 1950 at Flint (Reference 2.3-202). The highest monthly precipitation was also observed at Flint with an amount of 28.0 cm (11.04 inches) during August 1975. The maximum precipitation values are reasonably uniform across the area given that precipitation can be highly influenced by individual thunderstorms which can be local in nature hitting one station and not another. It is therefore considered that the precipitation data are representative of precipitation extremes that might be observed at the site.

Total Hours of Precipitation and 1-Hour Precipitation Rate Distribution

Hourly precipitation data for Detroit Metropolitan Airport was obtained from the NCDC for the most recent 5-year time period (2003-2007) to identify the precipitation intensity frequencies in the region surrounding the Fermi site (Reference 2.3-247). Detroit Metropolitan Airport is the closest NWS first-order station that has reliable precipitation records and as discussed above is representative of the precipitation trends at the Fermi site. Table 2.3-213 presents the distribution of hourly precipitation amounts in various intensity categories for each month during the 2003-2007 timeframe. Precipitation was recorded approximately 15.95 percent of the time during the 5-year period. January has the highest occurrence of hourly precipitation while September has the lowest. This corresponds with the location of the mean track of surface low pressure systems, which is over the southeast Michigan during the winter and well north of the region during the summer and early fall seasons. Additionally, as expected, precipitation is most frequent in lighter intensity categories with the majority of hourly precipitation having accumulations less than 0.25 cm (0.10 inches).

Maximum Precipitation Rate Distributions for 1-Hour Up To 24-Hours

In an effort to characterize possible heavy rainfall events at the Fermi site, probable maximum precipitation amounts for various durations and recurrence intervals were analyzed and are presented in Table 2.3-214. Maximum rainfall amounts were obtained from Reference 2.3-248 for recurrence intervals of 2 to 100 years and for durations of 1 to 24 hours. Estimates from U.S. Weather Bureau Technical Paper 40 (TP 40) were also obtained for this analysis, since updated literature does not provide amounts for 1-year recurrence intervals and durations of 1 to 24 hours (Reference 2.3-249).

For comparison, maximum observed precipitation amounts were obtained for Detroit City Airport from Reference 2.3-250 for the time period 1889-1961 and calculated for Detroit Metropolitan Airport during the time period 1962-2007 from Reference 2.3-247. These amounts are displayed in Table 2.3-215. The table shows that for all durations, higher maximum precipitation amounts were found during the older 1889-1961 period when compared to the more recent 1962-2007 period. In addition, observed amounts for all durations during the 1889-1961 time period are equal to or greater than the 100-year recurrence interval values in Table 2.3-214.

Precipitation Wind Roses

Monthly and annual precipitation roses for Detroit Metropolitan Airport were created to correlate hourly precipitation with wind direction for the Fermi region during the 2003-2007 timeframe and are presented in Figure 2.3-204 through Figure 2.3-216. A randomization scheme using EPA's computer program PCRAMMET was applied to the hourly wind direction data used to create the precipitation roses to eliminate the typical concentration toward the four cardinal directions (i.e., N, E, S, and W). As shown in Figure 2.3-204, annually the majority of hourly precipitation events, regardless of intensity, occur when winds are from the east and east-northeast with secondary maximum occurring equally from the north and south directions. As can be seen in both Table 2.3-213 and Figure 2.3-204, a significant amount of the hourly precipitation events were less than 0.25 cm (0.10 inches). In addition, it appears from the annual precipitation rose that winds from the southwest and south-southwest yield the highest percentage of hourly rainfall events with intensities greater than 1.27 cm (0.50 inches).

Snowfall

Mean annual snowfall, as well as 24-hour snowfall and maximum monthly values were discussed in Subsection 2.3.1.2.4. Table 2.3-205 and Table 2.3-206 present climatological normal and extreme values of snowfall, respectively, for the first-order and COOP stations in the region of the Fermi site. As indicated in these tables, annual amounts of snow vary greatly amongst the stations, and the region is characterized by heavy snow events. The highest 24-hour snowfall is 62.2 cm (24.5 inches) at the Detroit City Airport located north-northeast of the Fermi site, occurring during April 1886 (Reference 2.3-211). Maximum 2- and 3-day snowfall totals were also obtained for the Fermi region from the NCDC United States Snow Climatology online database. The highest 2- and 3-day snowfall reported from the database is 56.6 cm (22.3 inches) occurring at Flint (Reference 2.3-237). The Snow Climatology online database does not include snow records that would capture the maximum 24-hour snowfall that occurred in 1886. Since the maximum 2- and 3-day snowfall, obtained from Snow Climatology online database, is less than the maximum 24-hour snowfall, it is appropriate that the maximum 24-hour snowfall also be the maximum 2-and 3- day snowfall for the Fermi site. The maximum monthly snowfall is 148.6 cm (58.5 inches) which occurred at Ann Arbor during February 1923 (Reference 2.3-210).

2.3.2.1.4 **Fog and Smog**

Fog

Fog is reported at NWS first-order stations when the horizontal visibility is less than or equal to 9.7 km (6 mi) and the difference between the temperature and dew-point is 5°F or less. Detroit Metropolitan Airport is the nearest NWS station that routinely observes visibility and fog. Detroit Metropolitan Airport is located 27.4 km (17 mi) north-northwest of the Fermi site and has a similar elevation and relative proximity to Lake Erie. Table 2.3-216 displays the mean annual, mean monthly, and frequency of hours that reported fog during the period 1961-1995 (Reference 2.3-227, Reference 2.3-228). On an annual basis, fog occurs 12.7 percent of the hours during a calendar year (1112 hours). The highest monthly averages occur during November and December when 14.8 percent (107 hours) and 17.4 percent (130 hours) of total monthly hours, respectively, report fog. Fog is least frequent during June and July when fog only occurs 65 and 69 hours per month, respectively.

Heavy Fog

Mean annual and monthly values of hours with heavy fog, as well as frequency of hours of heavy fog are presented in Table 2.3-216. Heavy fog is defined as a horizontal visibility less than or equal to 0.4 km (0.25 mi). Annually Detroit Metropolitan Airport averages 60.2 hours per year where heavy fog is reported. Heavy fog most frequently occurs December through March when 8 to 11 hours per month report heavy fog. During April through July, heavy fog is least likely to occur since only 1 to 2 hours each month report heavy fog.

Smog

Smog is simply defined as the combination of fog and smoke that collects in a region of weak vertical dispersion and reduces horizontal visibility. Haze is also caused by any atmospheric pollutant that obscures the horizontal visibility. The region surrounding the Fermi site contains many industrial facilities and contains many sources that emit various pollutants that lead to the creation of smog and haze. Smog and haze is most likely to occur in the Fermi region during the summer and early fall seasons when air above the surface is warmer and winds are lighter, preventing the pollutants from dispersing horizontally and vertically. Detroit Metropolitan Airport reports the occurrence of smoke and haze in its hourly observations. Table 2.3-216 indicates that the months June through September have the highest number of hours where smoke and/or haze are reported. This corresponds with the months when horizontal and vertical dispersion is weakest (Reference 2.3-201).

2.3.2.1.5 Wind Direction and Wind Speeds

Wind direction and speed are two of the main components that define the dispersion characteristics of a site. Wind speed and direction can be classified on macro, synoptic, meso, or micro spatial scales. Macro and synoptic scales typically cover areas of 100 km^2 to 10,000 km^2. The influences on these two scales include features such as oceans and other large bodies of water, continents, and mountain ranges.

Meso and micro scale features better represent the general wind characteristics of the Fermi site and surrounding region. Meso-scale features typically cover areas of 1 km^2 to 100 km^2 and are influenced by such things as local vegetation and river valleys. Micro-scale features are spatially one km^2 or less and include the proximity of the Fermi onsite meteorological tower to the Fermi 3 cooling tower, Lake Erie, and general site specific land use characteristics of the immediate location.

The influence of these smaller scale features may be seen by evaluating local wind data both at the Fermi site and the nearby Detroit Metropolitan Airport. Table 2.3-217 presents the mean monthly and annual wind speeds at the Fermi site and Detroit Metropolitan Airport. The mean annual wind speed for the 10- and 60-m level at the Fermi site is 10.6 km/hr (6.56 mph) and 20.5 km/hr (12.74 mph), respectively. The mean annual wind speed at Detroit Metropolitan Airport is 14.1 km/hr (8.75 mph) at the 10-m level (Reference 2.3-229). The difference in the wind speeds between Detroit Metropolitan Airport and the 10-m level at the Fermi site can be explained by the macro and micro-scale features such as the land use characteristics of the site. Detroit Metropolitan Airport lies in a suburban area of Detroit that is relatively flat and provides a broad sample of prevailing wind direction and speed of the region. The Fermi site is located along the western shoreline of Lake Erie and is affected by onshore and offshore lake breezes, which can have the effect of increasing wind speeds at the Fermi site when inland stations are reporting very light wind speeds. Furthermore, the averaging schemes used to calculate the mean annual wind speeds are different between the Fermi site and the Detroit Metropolitan Airport. The Fermi site wind speeds are reported as hourly averages, while wind speeds from the Detroit Metropolitan Airport represent two-minute averages. This difference in averaging schemes explains the small difference between the two stations at the 10-m level. Wind speeds at the 60-m level are considerably higher than wind speeds at the 10-m level for the Fermi site and Detroit Metropolitan Airport. This can be attributed to the higher exposure height of the instrument which measures wind speeds that are less reduced by the frictional effect of the earth's surface.

Wind Roses-Detroit Metropolitan Airport

Figure 2.3-217 through Figure 2.3-229 contain the 10-m annual and monthly wind roses presenting the distribution of wind speed at 22.5 degree intervals for Detroit Metropolitan Airport during the 5-year period of 2003-2007 (Reference 2.3-229). A randomization scheme using EPA's computer program PCRAMMET was applied to the hourly wind direction data used to create the wind roses to eliminate the typical concentration toward the four cardinal directions (i.e., N, E, S, and W).

The annual wind rose plot in Figure 2.3-217 shows that winds at Detroit Metropolitan Airport predominantly blow from southwesterly directions. According to the annual 2006 LCD, the prevailing wind direction for Detroit Metropolitan Airport is from 240 degrees (west-southwesterly) (Reference 2.3-201). Monthly wind roses for Detroit Metropolitan Airport are presented in Figure 2.3-218 to Figure 2.3-229. The transition is apparent from dominant northwesterly and northerly winds during the spring months to southwesterly wind directions during the summer through fall months as the Bermuda High develops over the southeast United States and the mean track of surface low pressure shifts north of the Fermi region. During May through September, the number of calm hours increase and the wind directions often become light and variable as the synoptic scale pressure gradient weakens, corresponding with the months having the highest number of air stagnation episodes (Reference 2.3-246). Detroit Metropolitan Airport considers calm hours as those with wind speeds less than three knots. As the mean track of surface low pressure systems begins to move south and closer to southeastern Michigan during late the fall and winter, northwesterly and westerly wind directions become more frequent.

Wind Roses-Fermi 10-m Level

Annual and monthly wind roses for the 10-m level at the Fermi site are depicted in Figure 2.3-230 through Figure 2.3-242. These figures show wind speeds and directions at 22.5 degree intervals by direction at the Fermi site for the 2003 through 2007 time period.

Figure 2.3-230 indicates that annually winds are southwesterly most often, occurring approximately 10 percent of the time. Winds with a northwesterly component are the second most common direction for the 10-m level at the Fermi site. Apparent is the increase of easterly and southeasterly winds annually at the Fermi site when compared to Detroit Metropolitan Airport at the same level. During the late spring, summer, and early fall, onshore lake breezes occur frequently at the Fermi site. The breezes form as air temperatures over land heat up faster than the air above the waters of Lake Erie. By afternoon a sharp temperature difference forms along the shoreline and a wind circulation develops that produces easterly through southeasterly winds at the Fermi site. Onshore lake breezes can also increase wind speeds along the shoreline, while inland stations are experiencing lighter winds. Also noticeable on the annual wind rose for the Fermi 10-m level are the high occurrence of winds less than four knots. Calm hours are counted when wind speeds are less than one knot at the Fermi site, explaining the large drop in percentage when compared to annual calm hours at Detroit Metropolitan Airport. Figure 2.3-230 through Figure 2.3-242 present the monthly wind roses for the 10-m level at the Fermi site. In general, the dominant wind patterns for each month at the Fermi site are very similar to those for the Detroit Metropolitan Airport. However, the figures for March through September at the Fermi site 10-m level show the increase in easterly through southeasterly wind directions that are a result of onshore lake breezes.

Wind Roses-Fermi 60-m Level

Figure 2.3-243 presents the annual wind rose at the 60-m level for the Fermi site. Apparent is the similarity of the Fermi site 60-m annual wind rose for the Detroit Metropolitan Airport 10-m level. East through southeast winds remain higher at the Fermi site in comparison to Detroit Metropolitan Airport due to the occurrence of the onshore lake breeze. The wind speeds, as expected, are somewhat higher at all directions as compared to the lower 10-m tower since the higher level can capture wind speeds that are less affected by the frictional effects of the earth's surface. Monthly wind roses for the 60-m level are represented by Figure 2.3-244 through Figure 2.3-255. As expected, wind speeds become somewhat lighter during from May to September, as the Bermuda High over the southeast United States influences the region and the synoptic scale pressure gradient weakens. During the late spring through early fall months, the onshore lake breezes produce the easterly through southeasterly winds. As the normal daytime temperatures begin to become cooler during September and October, the waters of Lake Erie remain relatively warm, creating a strong temperature gradient along the coastline. As explained earlier, a wind circulation develops; however, since the air above Lake Erie is warmer, winds blow from the land towards the water. The monthly wind roses for September and October indicate the presence of the offshore winds with a higher frequency of west and west-northwest winds. By mid-December the temperatures of the lake reach freezing temperatures and ice forms, ending the possibility of lake-induced offshore winds. The minor differences of the wind direction and speed due to the land and lake breezes shown in the 10- and 60-m wind roses and the similarity of the dominant wind directions across the region indicate that the wind conditions described in this section accurately depict the diffusion conditions for the Fermi site.

2.3.2.1.6 **Wind Persistence**

Persistence of wind direction is a measurement of the duration of the transport of air from a specific direction to locations downwind. It reflects the possible amount of time that radioactive contamination or any other type of pollution may travel in the same or a similar direction. The dilution potential of the pollutant as it moves downstream of its source is directly proportional to wind speed. Higher wind speeds lead to increased dilution while lower wind speeds create less dilution.

Table 2.3-218 through Table 2.3-241 show the persistence of wind direction and speed at both the 10-m and 60-m tower levels, respectively, for 22.5 degree (single) and 67.5 degree (three adjoining) wind sector widths for various wind speeds at the Fermi site during the 5-year period of 2003 through 2007. The longest recorded single sector persistence was from the south-southwest (39 hours) for the 10-m level and from the west-southwest direction (41 hours) for the 60-m level. For three adjoining sectors, the 10-m level and 60-m level recorded the longest persistence from the west-southwest (158 hours). Tables containing summaries of wind persistence for all wind speeds and at both the 10- and 60-m levels indicate that winds are most likely to be persistent from the southwest direction for single sector widths and from the west-southwest for three adjoining sector widths. In addition, the final row in the tables displays the average persistent hours for each wind direction and provides a method for determining which direction winds are most likely to persist longer. For the 10-m level, the wind is most likely to persist longer from the south-southwest and southwest directions for single and three adjoining sector widths, respectively. A persistent wind is most likely to last longer at the 60-m level for west-southwest and southwest wind directions for single sector and three adjoining sector widths, respectively.

Table 2.3-242 through Table 2.3-253 present the persistence of wind direction and speed at the 10-m level for the single sector and three adjoining sectors for various wind speeds at Detroit Metropolitan Airport during the 2003 through 2007 time period (Reference 2.3-229). At the 10-m level (the only level at Detroit Metropolitan Airport), the longest persistent wind blew from the north-northwest and lasted 24 hours for a single sector. For three adjoining sectors the longest persistent wind lasted 67 hours from the southwest. Table 2.3-242 and Table 2.3-248 present wind persistence summaries for all wind speeds for the single sector and three adjoining sector widths, respectively. The most likely direction for a wind to be persistent for both single and three adjoining sector widths is south. Wind is most likely to persist longer when blowing from the north and north-northeast for single and three adjoining sector widths, respectively. Previously in Subsection 2.3.2.1.5 the noticeable increase of east through southeast winds at the Fermi site was discussed and attributed to the onshore lake breeze that develops during the late spring and lasts through the early fall seasons. The wind persistence summaries indicate that for those directions the Fermi site experiences a higher percentage of persistent wind occurrences than the Detroit Metropolitan Airport. Furthermore, when winds are persistent from the east through southeast directions they continue for longer hours at the Fermi site.

2.3.2.1.7 **Mean Monthly Mixing Heights**

The mixing height (or depth) is the height above the surface in which air can freely mix vertically without the help of additional atmospheric forcing mechanisms. George C. Holzworth presented monthly mixing heights for the continental United States based on upper-air data from the period 1960-1964 (Reference 2.3-251). Seasonal morning and afternoon mixing heights for the region surrounding the Fermi site were interpolated from Holzworth's analysis. In general, morning mixing heights are lowest in the summer and fall seasons and highest in the winter season. Afternoon mixing heights are the highest in the summer and lowest in the winter.

Annual and monthly mean mixing heights for White Lake, Michigan, located 83.7 km (52 mi) north-northwest of the Fermi site, were calculated using daily morning and afternoon mixing height data obtained from the NCDC (Reference 2.3-252). The NCDC calculated the mixing heights from data recorded during the morning and afternoon release of weather balloons at the White Lake National Weather Service office that measures the vertical temperature and wind information of the atmosphere. Surface wind data from Detroit Metropolitan Airport were used by the NCDC in conjunction with the weather balloon data to create daily mixing heights for the region. The calculated mean monthly and annual mixing heights for White Lake during 2003-2007 are presented in Table 2.3-254. The values shown in the table follow the same trends found by Holzworth (Reference 2.3-251).

2.3.2.1.8 **Inversions**

The frequency and persistence of temperature inversions may also indicate periods where air stagnation is highest. Frequency and persistence of inversions were calculated annually and monthly utilizing the difference in temperature (ΔT) between the 10- and 60-m levels obtained from the Fermi onsite meteorological tower data during the period 2003 through 2007. The presence of an inversion was defined as anytime $\Delta T>0$ for the hour. A summary of the frequency and persistence of inversion conditions is presented in Table 2.3-255 which shows for 43,824 hours analyzed during the 5-year period an inversion was present a total of 13,107 hours, equivalent of 29.9 percent of the total hours. Many of the inversions were short-lived as 48.5 percent of all inversions that occurred lasted six hours or less. Almost all the inversions lasted less then 24 hours with only 1.3 percent of all the inversions lasting longer then 24 hours. In the five years of data used, the longest inversion lasted 76 hours. Table 2.3-256 through Table 2.3-267 present the persistence of inversions tallied for each month. These tables show that the inversions are more common during March through October, however, are most prominent during the summer months of June, July, and August. This corresponds well with the findings by Wang & Angell that the number of days with air stagnation is highest during July through September (Reference 2.3-246). The increase in the number of inversions and air stagnation is a result of the jet stream retreating to the north of the Fermi site during the summer months, which in return creates the warmest temperatures and lowest wind speeds (Reference 2.3-209).

2.3.2.1.9 **Atmospheric Stability**

Atmospheric diffusion, independent of the effects of wind speed, is proportional to the stability of the atmosphere and has a large impact on potential vertical and horizontal dispersion of radioactive contamination or any other type of pollutant in the ambient air. Atmospheric stability can generally be classified as unstable, neutral, and stable. During stable conditions, diffusion is at its lowest levels while under unstable conditions diffusion is at its highest levels. Pasquill-Gifford developed seven categories measuring atmospheric stability that are accepted and used by the NRC. The various categories can be determined by the ΔT between two temperature measurement levels normalized to 100 m. As defined in Regulatory Guide 1.23, the following categories of atmospheric stability reflect the ΔT in degrees Celsius per 100 m.

Class A	Extremely Unstable	$\Delta T/\Delta Z \leq -1.9$
Class B	Moderately Unstable	$-1.9 < \Delta T/\Delta Z \leq -1.7$
Class C	Slightly Unstable	$-1.7 < \Delta T/\Delta Z \leq -1.5$
Class D	Neutral Stability	$-1.5 < \Delta T/\Delta Z \leq -0.5$
Class E	Slightly Stable	$-0.5 < \Delta T/\Delta Z \leq +1.5$
Class F	Moderately Stable	$+1.5 < \Delta T/\Delta Z \leq +4.0$
Class G	Extremely Stable	$+4.0 < \Delta T/\Delta Z$

Table 2.3-268 presents mean annual and monthly wind speeds for the 60-m level at the Fermi site for each of the Pasquill-Gifford stability categories. Annually the mean wind speeds are highest when the stability at the Fermi site is neutral, while mean wind speeds are the lowest under extremely stable conditions, characteristic of high pressure systems. Table 2.3-268 also contains the annual and monthly distribution of stability summaries. The Fermi site experienced neutral and slightly stable conditions 55.6 percent of the total number of hours during the 5-year period. Unstable conditions (Classes A, B, and C combined) occurred 30 percent of the total hours.

Table 2.3-269 through Table 2.3-284 present the annual Joint Frequency Distributions (JFD) of wind speed and direction by stability category at the 10- and 60-m levels of the Fermi onsite meteorological tower for the 2003 through 2007 time period. It is noticeable from the JFD for the 10-m level that for stable conditions (Classes E, F, and G) the observations with wind speeds less than 6.4 km/hr (4 mph) occur most frequently, implying that stable conditions generally are associated with light winds. Tables for the 60-m level suggest that for stable conditions wind speeds are most frequently 12.9-20.9 km/hr (8-13 mph), which can be explained by the fact that the 60-m level wind speeds are less affected by the friction of the earth’s surface. For unstable conditions (Classes A, B, and C), there is more variance in the wind speeds categories at both the 10- and 60-m levels, inferring that unstable conditions are associated with many wind speeds. Therefore, the stability summaries for the 10- and 60-m levels indicate the air dispersion conditions that can be expected at the Fermi site during accidental and routine radiational releases for different stability scenarios.

2.3.2.2 **Influence of Fermi 3 and Its Facilities on Local Meteorology**

The impact of the construction and operation of Fermi 3 on the local climatology is expected to be minor. These impacts will be limited to the construction and operation of a NDCT and two multi-cell MDCT, as well as the reactor building and other plant structures. This section will discuss the regional topography and the estimated extent of the impacts of construction and operation of Fermi 3 on the meteorological variables reviewed in Subsection 2.3.2.1.

<u>Regional Topography</u>

The Fermi site is located in the northeastern part of Monroe County and along the western shoreline of Lake Erie. Figure 2.3-256 and Figure 2.3-257 show topographic features within 8.0 and 80.5 km (5 and 50 mi), respectively, of the Fermi site. The terrain in the region of the Fermi site is mainly flat plains that gently slope to higher elevation west and northwest of the Fermi site. Approximately 48.3 km (30 mi) west and northwest of the Fermi site are the Irish Hills which contain elevations as high as 349.3 m (1146 ft) above mean sea level. The Fermi site is relatively flat and has a general elevation of approximately 177.7 m (583 ft). Figure 2.3-258 shows the terrain elevation profiles for each of the sixteen 22.5 degree compass directions to a distance of 8.0 km (5 mi) from the site. The waters of Lake Erie are approximately 465 m (1526 ft) east of the Fermi 3 reactor building. Figure 2.3-259 presents similar terrain profiles out to 80.5 km (50 mi) from the Fermi site.

<u>Estimated Impacts of Facility Construction</u>

Construction activities for Fermi 3 are not expected to impact the local climate of the site significantly. Fermi 3 will be located southwest of the Fermi 2 reactor building. Fermi 3 will be located in the southwest portion of the Fermi site that is already cleared of trees and may only require minor additional grading. Any influence of the grading on the micro-scale climate will be minimal during construction and will be limited to the Fermi site and the immediate surrounding area. This will lead to minimal change in the overall topography in the area around the Fermi site, and thus will not represent a significant alteration to the flat and gently sloping topographic character of the Fermi region. Additionally, construction of new roads to accommodate the construction traffic for the new facility and the addition of buildings, parking areas and other structures should have little to no effect on the local meteorology of the site.

Estimated Impacts of New Structures

The addition of a NDCT, two multi-cell MDCTs, and reactor building will add additional effects to the airflow trajectories downwind of the new structures. Regulatory Guide 1.23 estimates that a meteorological tower located at least a distance of 10-building-heights horizontal distance downwind from the nearest structure will not have adverse wake effects exerted by the structure. The NDCT for Fermi 3 will be built in the approximate location of the current onsite meteorological tower. Thus, a new meteorological tower will be erected in the southeast corner of the Fermi site prior to construction of Fermi 3. Figure 2.1-204 of Section 2.1 provides the location of the NDCT, two multi-cell MDCTs, and reactor building in relation to the new onsite meteorological tower. The Fermi site according to Figure 2.3-258 is located at an elevation approximately 177.7 m (583 ft.) above mean sea level. The plant area where the structures will be located is relatively flat with only minor differences in plant grade. The two multi-cell MDCTs are located approximately 1235.5 m (4054 ft.) north of the new onsite meteorological tower and at a distance that will not affect wind measurements at the new meteorological tower. The reactor building is located approximately 1341.1 m (4400 ft.) north-northwest of the new onsite meteorological tower. The height of the reactor building is approximately 48.2 m (158 ft.) above plant grade. Using the method suggested by Regulatory Guide 1.23 the zone of turbulent flow created by the reactor building will be limited to approximately 481.6 m (1580 ft.). Since the new meteorological tower will be at a distance of approximately 1341.1 m (4400 ft.), the reactor building will not produce adverse wake effects on the wind direction and speed measurements at the new meteorological tower when winds blow from the north through north-northwest directions.

The NDCT for Fermi 3 will be constructed in the location of the current onsite meteorological tower and will be built to a height of 182.3 m (600 ft) above plant grade, the tallest structure at the Fermi site. The NDCT is hyperbolically shaped and has a maximum width at the base of the tower, which has an outer diameter of 140.2 m (460 ft.). The downwind wake zone for hyperbolically shaped and sloping structures is expected to be smaller than for structures that are square or rectangular and have sharp edges. 40 CFR 51.100(ii)(3) defines good engineering practices (GEP) stack height as that which ensures that emissions from a stack do not result in excessive concentrations of any air pollutant as a result of atmospheric downwash, wakes, or eddy effects created by the source itself, nearby structures, or nearby terrain features. "Nearby structures" is defined in 40 CFR 51.100(jj)(1) as that distance up to five times the lesser of the height or width dimension of a structure. Furthermore, the wake zone area becomes increasingly smaller as the height to width ratio of a structure increases (Reference 2.3-253). For the NDCT the lesser dimension is the width, which is the base width. Therefore, a conservative method to calculate the outermost boundary of influence exerted by the NDCT is to multiply the maximum width by five. Using this method, with a maximum width of 140.2 m (460 ft.) at the base of the tower, the downwind wake effect is estimated to extend 701.1 m (2300 ft.) from the base of the NDCT. The NDCT is located approximately 1268 m (4160 ft.) northwest of the new meteorological tower. Thus, the new meteorological tower is at a distance that will not be affected by the wake zone of the NDCT.

Other Estimated Impacts

Operation of large power generation units can have two distinct effects on the local climate, 1) additional generation of particulates (particulate matter and fog) and 2) effects by cooling tower plumes. Air emissions of particulate matter will be minor given the nature of a nuclear facility and its lack of significant gaseous exhausts of effluents to the air. Sources of air emissions for the proposed facility include two standby diesel generators, an auxiliary boiler, a diesel fire pump, and increased automobile traffic. The combustion sources mentioned above will be designed for efficiency and operated with good combustion practices on a limited basis throughout the year (often only for testing). Given the small magnitude of size and infrequent operation, these emissions will only have a minimal impact on the local and regional air quality, and furthermore the local climate. These emissions will be regulated by the State of Michigan, Department of Environmental Quality.

Plumes emitted from cooling towers can also affect the local climate. Fermi 3 will include a NDCT as the main cooling method and two multi-cell MDCTs as the auxiliary cooling method. The predominant wind direction at the Fermi site is southwesterly at the 10- and 60-m levels. This indicates that the cooling tower plumes will most frequently extend over the Fermi site and towards Lake Erie. A more detailed explanation of the effects of the cooling tower plumes on the local meteorology is provided in the following sub-section.

2.3.2.2.1 Cooling Tower Plumes

Cooling systems depend on evaporation of water to dissipate heat created from the energy production process. In this cooling process the cooling towers often create visible plumes that can produce effects on the local environment. The visible plumes can produce shadows on surfaces such as trees, vegetation and nearby buildings. Cooling tower plumes can also create or enhance ground level fogging or icing, as well as increase salt deposition. An assessment of cooling tower plumes emitted during the operation of a new power production facility at the Fermi site on the local environment and atmosphere was performed. The investigation was performed using the Electric Power Research Institute's Seasonal/Annual Cooling Tower Impact Prediction Code (SACTI), a model endorsed by Section 5.3.3.1 of NUREG-1555 (Reference 2.3-254). The model used meteorological data from the current onsite meteorological tower for the available five-year period of 2003 through 2007 compiled into the CD-144 format. The onsite data contains wind direction, wind speed, dew-point temperature, and dry-bulb temperature measurements at 10- and 60-m heights. Since the current onsite meteorological tower does not record atmospheric pressure, ceiling height, or cloud cover, data commensurate with the onsite data, was taken from Detroit Metropolitan Airport. Using the dry-bulb and dew-point temperature from the Fermi site, as well as the station pressure from Detroit Metropolitan Airport, the required wet-bulb temperature and relative humidity values were calculated (Reference 2.3-240). When CD-144 format is used as the meteorological input to SACTI, the model determines stability class based on measured wind speed, ceiling height, cloud cover, solar elevation angle, and time of day. Mean monthly mixing height values calculated in Subsection 2.3.2.1.7 were also used as inputs for the SACTI cooling tower model analysis.

To assess the potential plume impacts, the NDCT was evaluated for Fermi 3. The cooling tower was modeled as if the power generation process was producing the maximum heat load. Tower-specific data used in the SACTI cooling tower model analysis, such as projected cooling tower dimensions, top exit diameter, and total heat rejection rates, are provided in Table 2.3-285. Since the auxiliary Heat Sink (AHS) will use the two multi-cell MDCTs to dissipate heat from the Plant Service Water System mainly during plant shutdown/cool down, the operation of the two multi-cell MDCTs is expected to be minimal. For this reason, the environmental impact associated with the operation of the two multi-cell MDCTs is bounded by the impacts associated with the NDCT. The remainder of this section will provide the potential plume impacts that result from the operation of the NDCT.

Estimated Plume Lengths

Table 2.3-286 displays the average plume lengths by season and direction during NDCT operation, as predicted by the SACTI cooling tower model analysis. Average plume lengths are longest for the NDCT during winter when average monthly temperatures are coldest (Reference 2.3-201). Table 2.3-287 presents annual plume length frequency for the NDCT. The data shown in this table does not account for the height of the plume as it travels from the cooling tower and is likely an overestimate of the number of times a plume reaches the ground at any location onsite on an annual basis. In addition, plumes from the NDCT are emitted at a height of 182.9 m (600 ft.) and after additional plume rise will have negligible effects on the new onsite meteorological tower and other locations within the Fermi property boundary.

Estimated Salt Deposition Impacts

Using the inputs provided in FSAR Table 2.3-285, the SACTI model predicted average annual and seasonal monthly salt deposition rates for the Natural Draft Cooling Tower (NCDT). Due to the high initial plume of the NDCT, no salt is predicted to be deposited within 4,100 meters (13,451 ft) of the NDCT. Given this large distance, no salt deposition is predicted at the existing Fermi 2 switchyard, the planned location of the new Fermi 3 switchyard, or the planned Fermi 3 main transformer area as these areas lie within 4,100 meters of the NDCT.

The maximum SACTI-predicted annual salt deposition rate is 0.01 $kg/km^2/mo$ and occurs between 4,200 and 9,400 meters (13,779 and

30,840 ft) east-northeast of the NDCT. The maximum seasonal impact occurs during the winter with 0.02 kg/km^2/mo predicted to occur between 4,400 and 9,400 meters (14,436 and 30,840 ft) east-northeast of the NDCT. The only other electrical equipment associated with the operation of Fermi 3 existing beyond 4,100 meters are the transmission lines that run offsite and traverse the surrounding area. The Transformers Committee of the IEEE Power Engineering Society sponsored an "IEEE Guide for Application of Power Apparatus Bushings" which provides ranges of salt deposition density levels for various types of contaminated environments ranging from light contamination environments to extra heavy contamination environments. The maximum predicted impact values given above are well below the lowest bound equivalent salt deposit density level associated with even the lightest contaminated environments which is given in the reference as 300 kg/km^2 (0.03 mg/cm^2) (Reference 2.3-263). This indicates that the operation of the NDCT for Fermi 3 will not produce a contaminated environment on power apparatus bushings which are incorporated as part of transformers, power circuit breakers, and isolatedphases bus. It is also reasonable to assume that cumulative salt deposition buildup would not cause a contaminated environment as the maximum monthly deposition rates are orders of magnitude below the light contamination level and natural precipitation events would wash off and reduce salt deposition long before any significant buildup could occur.

Estimated Water Vapor Impacts

The operation of the NDCT's impacts upon atmospheric water vapor (humidity), precipitation, and dew formation are discussed in detail in FSAR Subsection 2.3.2.2.2. As discussed in that subsection, the NDCT is not expected to significantly alter the natural occurrences of these meteorological phenomena. The electrical equipment mentioned above are designed to operate during naturally occurring events such as precipitation and fog and since the NDCT will not significantly alter the natural occurrences of these meteorological phenomena in the existing environment, the operation of the NDCT is not expected to adversely impact the electrical transmission lines and other electrical equipment (including transformers and switchyards).

2.3.2.2.2 Cooling Tower Plume Effects on Ground Level Meteorological Variables

As was discussed previously, the plume effects on the new onsite meteorological tower are negligible. However, cooling tower plumes will influence some of the ground level meteorological variables very near the base of the cooling tower. This section investigates these influences and their impact at the Fermi site.

Wind

There are two effects of the NDCT on the local wind field. During the operation of the cooling tower air is drawn in at the base of the tower. The air is then heated by evaporation as it passes over the heated water located on the fill, collects moisture, and naturally rises. As the air rises it begins to cool and eventually saturates, forming a plume that exits at the top of the cooling tower. This process is continuous and causes the local wind field to converge toward the base of the cooling towers. The effect of airflow toward the cooling tower is localized and will likely remain within the Fermi property boundary. Hyperbolic shaped cooling towers also have an effect of affecting the wind measurements downwind of the wind direction to a distance of five times the maximum width at the base of the tower. As was mentioned previously in Subsection 2.3.2.2, turbulent wind flow downwind of the base of the NDCT is expected to extend to a maximum distance of 701.1 m (2,300 ft.).

Temperature

The plume that is released from the cooling towers is typically warmer than the ambient air and is mostly dissipated into the atmosphere above the tower height. However, some of the heat is transported downward to the ground downwind of the wind direction. Air temperature at the surface, thereby, is expected to be only slightly warmer within a few hundred feet of the tower. Large plumes may also block the heat from the sun and have the effect of cooling the ambient air at the surface during the day and warming it at night. Once again the effect of the plume on the surface ambient temperature is minimal and cannot be measured beyond a few hundred feet from the tower or plume.

Atmospheric Water Vapor

The vapor plumes increase the absolute and relative humidity values immediately above cooling towers, as indicated by the high frequency of visible plume occurrence. At the surface the absolute humidity only increases slightly as some of the moisture from the plume is transported downward downwind from the cooling tower. During colder temperatures the increase of relative humidity near the cooling tower may be greater due to the relatively lower moisture-bearing capacities of cold air. Overall, the ground level humidity increases from the operation of cooling towers is expected to be very small.

Precipitation

As presented by Huff, drizzle and light snow have been observed within a few hundred feet downwind of cooling towers (Reference 2.3-255). The occurrence of such precipitation events is rare and much localized. From this it can be concluded that the occurrence of freezing drizzle associated with operation of the NDCT would be an even rarer event as the surface temperatures would have to be at or below freezing. Huff compared the fluxes of water vapor from NDCT and MDCT cooling towers to those natural water vapor fluxes ingested into cloud bases of showers and thunderstorms. His results indicate that some enhancement of small rain showers might be expected, as tower fluxes are within an order of magnitude of the shower fluxes. Thunderstorms, with their much greater flux values, should not be significantly affected, except that the cooling tower plume may act as a triggering mechanism. In addition, discharge of cooling tower moisture has been shown to augment natural precipitation as much as 1.0 cm (0.4 inches) annually for a 2,200-MWe station (Reference 2.3-255). The maximum SACTI model predicted water deposition rate for the Fermi 3 NDCT is approximately 0.00001 mm per month. By comparison, this precipitation rate is less than 0.0001 percent of the mean monthly rainfall of the driest month at Detroit Metropolitan Airport (Reference 2.3-201). Further, when considering freezing conditions and associated precipitation events, potential drizzle ice accumulation from operation of the NDCT is immeasurable as evidenced by taking the maximum 0.0001 percent fraction of the highest monthly average precipitation value (of any month having recorded an icing event) of 3.05 inches (April) which results in 0.000003 hundredths of an inch accumulation assuming it is cold enough to result in freezing drizzle conditions (Reference 2.3-201). Thus, impacts due to water deposition (additional precipitation) are expected to be small at the Fermi site.

Light snowfall has also been observed at distances downwind from cooling towers. However, induced snowfall events have resulted only in light, fluffy snow accumulations of less than 2.5 cm (1 inch)

(Reference 2.3-256). Most induced snowfall observed preceded or occurred during natural snowfall events, occurring when temperatures were very cold and diffusion conditions at plume height were relatively stable. While the Fermi site experiences these conditions, literature indicates that snow amounts are light (less than 2.5 cm [1 inch]) and would be only a small fraction of the typical snowfall the area receives. Therefore, the operation of a NDCT or MDCT cooling tower is not expected to increase average snowfall at the Fermi site.

Fogging and Icing

Ground level fogging and icing occurs when the visible plume from a cooling tower reaches the ground. Studies conducted by Broehl, Zeller, Kramer and Hosler indicated that icing and fogging from a NDCT does not present a significant problem (Reference 2.3-257 through Reference 2.3-260). Zeller in a two year study observed one occurrence where the plume from a NDCT reached the ground.

The SACTI cooling tower model was run to assess the potential for fogging and icing for Fermi 3 as a result of operation of a NDCT. The model assumed that the occurrence of fogging from the NDCT is unlikely and thus does not predict estimates of fogging for the NDCT (Reference 2.3-254). Based upon the above SACTI model predictions, ground level fogging or icing at the Fermi site from operation of the NDCT is not expected to be significant.

MDCT cooling towers emit plumes at a lower level and have a tendency to reach the ground more frequently. Icing may be possible from the operation of the two multi-cell MDCTs that are part of the AHS, but given that they will be operated infrequently their impacts are expected to be minimal and be contained onsite.

Stability

Theoretically, the increased flux of moisture and heat into the atmosphere above a NDCT would create slightly more stable conditions during the day and slightly more unstable conditions at night. There has been no quantitative analysis performed that can be referenced to evaluate what would occur at the Fermi site. However, it can be reasonably stated that any effect on stability from the effluents of a NDCT will be minimal and local to the Fermi site.

Dew

Dew typically forms during the night and before sunrise when radiational loss from the ground to the atmosphere is greatest. The ground becomes cooler than the surrounding ambient air and air that is nearly saturated will condense on objects, such as grass, that are slightly cooler. Dew is most likely to occur when skies are clear and winds are light. Tate studied the formation of dew, amongst other variables, at the Bowen plant in Cartersville, Georgia (Reference 2.3-261). From the data Tate collected there was no indication that the plumes emitted from the NDCT had any effect on dew formation surrounding the power plant site. However, from a theoretical perspective the plume may act as a cloud and decrease the amount of radiational loss of the ground. Therefore, areas downwind of the plume may see a decrease of dew occurrences, especially on clear and cool nights when the wind is light.

Dispersion of Radioactive Effluents

The exact effect of the dispersion of radioactive effluents beneath the tower is difficult to provide quantitatively. Radioactive effluents that are entrained at ground level into the NDCT will be dispersed aloft with the plume. Subsection 2.3.4 and Subsection 2.3.5 will provide a discussion of the short and long-term effects of radioactive effluents emitted from the NDCT.

The discussion above concerning the effects of the cooling towers on local meteorology variables indicates that operation of a NDCT and two multi-cell MDCTs will have very minor effects at the plant site and negligible effects to the local areas outside the Fermi boundary.

2.3.2.3 Local Meteorological Conditions for Design and Operating Bases

Subsection 2.3.2 provides a discussion of the onsite meteorological conditions in comparison to the regional conditions. The conclusion is that nearby meteorological stations such as Detroit Metropolitan Airport experience climatic conditions that are representative of meteorological conditions at the Fermi site. Wind speed and direction conditions that determine the air dispersion of the region are unique at the Fermi site due to the lake and land breezes that form along the Lake Erie shore. For these reasons the onsite meteorological data would be used for design and operating bases of Fermi 3; however, these data may be supplemented with data from Detroit Metropolitan Airport.

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2.3.3 Meteorological Monitoring

The current Fermi onsite meteorological monitoring program has been in place since it was implemented for Fermi 2 pre-operational meteorological assessment beginning in June 1975. Starting in June 1975, the onsite meteorological monitoring program has met the requirements of the proposed Revision 1 to Regulatory Guide 1.23 (September 1980) (Reference 2.3-262). Since June 1975, some of the meteorological monitoring program components have been upgraded. Subsection 2.3.3.1 describes the current state of the onsite meteorological measurement program. The Fermi 2 meteorological monitoring program provides the basis for the Fermi 3 preapplication meteorological monitoring program. In addition, data from the onsite meteorological tower is used as the sole input for models that describe the shortand long-term atmospheric transport and diffusion characteristics of the site, as provided for in NRC Regulatory Guides 1.145 and 1.111, respectively. A description of the model used to analyze the short- and long-term atmospheric transport and diffusion conditions of the site is described in Subsection 2.3.4 and Subsection 2.3.5.

The NDCT for Fermi 3 will be built in the approximate location of the current onsite meteorological tower. Thus, a new meteorological tower will be erected in the southeast corner of the Fermi site as displayed in Figure 2.1-204. Subsection 2.3.3.2 describes the site preparation and construction, pre-operational, and operational meteorological monitoring program proposed for Fermi 3.

The purpose of this section is to identify that the onsite meteorological measurements program and other data-collection programs used by Fermi 3 are adequate to: (1) describe local and regional atmospheric transport and diffusion characteristics within 50 mi (80 km) of the plant, (2) ensure environmental protection, and (3) provide an adequate meteorological database for evaluation of the effects of plant operation. This discussion includes an analysis of the following meteorological monitoring system elements:

- The location of the meteorological tower and instrument siting
- Meteorological parameters measured
- Meteorological sensors
- Instrument surveillance

- System accuracy
- Data recording and transmission
- Data acquisition and reduction
- Data validation and screening
- Data display and archiving
- Data recovery rate and annual and joint frequency distribution of data

2.3.3.1 Fermi 3 Preapplication Meteorological Monitoring Program

2.3.3.1.1 Tower and Instrument Siting

Figures showing the location of the onsite meteorological tower in respect to offsite meteorological stations and surrounding topography are provided in Figure 2.3-201 of Subsection 2.3.1 and Figure 2.3-256 through Figure 2.3-259 of Subsection 2.3.5, respectively. Figure 2.1-204 of Section 2.1 provides the location of the Fermi site structures in relation to the current onsite meteorological tower. The existing onsite meteorological open-latticed tower is located approximately 339.2 m (1113 ft) west-southwest of the proposed Fermi 3 reactor containment building and has a height of 60.0 m (197 ft) above plant grade. This location is within a distance that is less than 10 times the height of the Fermi 3 reactor building, and therefore does not fully meet the siting criteria of Regulatory Guide 1.23. Accordingly, a new meteorological tower will be built prior to construction of Fermi 3. Subsection 2.3.3.2.1 describes the location of the new meteorological tower. The meteorological parameters specified in Regulatory Guide 1.23 are measured by instrumentation mounted at two levels (10-m (33-ft) and 60-m (197-ft)) of the tower. The 10- and 60-m elevations were selected to approximate the heights of release of activity emanating from ground level and the plant’s heat dissipation system, respectively. The meteorological sensors are mounted on booms, which are greater than one tower width away from the tower and are oriented normal to the prevailing wind direction. The meteorological sensor types, heights, and location in reference to structures are in conformance with Regulatory Guide 1.23.

The influence of terrain near the base of the tower on temperature measurements is minimal. The tower is situated in a relatively flat area. A small climate controlled instrument shelter is located at the base of the onsite meteorological tower. The tower is situated in an area east of a grove of trees that is located less than ten times the obstruction height recommended in Regulatory Guide 1.23. However, based on analysis of historic wind data collected from the meteorological tower it has been determined that the trees do not impact the wind measurements. The tower is located sufficiently close to the shoreline of Lake Erie such that it can measure the dynamic onshore flow conditions that could affect gaseous effluent releases. This effect on the dispersion conditions is representative of the site since the facility itself is located along the western shoreline of Lake Erie.

2.3.3.1.2 Instrumentation and Their Accuracies and Thresholds

Meteorological Sensors

The instrumentation on the meteorological tower consists of the following: wind speed and wind direction sensors at the 10- and 60-m levels, a 10-m air temperature sensor, a 10- to 60-m vertical air temperature difference system (ΔT), and a dewpoint temperature sensor at the 10-m level. In addition, a heated tipping bucket rain gauge monitors precipitation at ground level at the base of the meteorological tower. Table 2.3-288 provides a listing of the meteorological parameters monitored on the Fermi onsite meteorological tower, the sampling height(s), as well as the sensing technique for the primary and secondary systems.

To minimize data loss due to ice storms, external heaters are installed on the primary wind sensors. The heaters are thermostatically controlled and are of the slip-on/slip-off design for easy attachment. The wind sensor specifications are not affected by these heaters. A windscreen is mounted around the precipitation gage to minimize the amount of windblown snow and debris deposited in the gage.

The accuracies and thresholds for the meteorological sensors located on the meteorological tower are presented in Table 2.3-289. The accuracies and thresholds for each sensor are within the limitations specified in the proposed Revision 1 to Regulatory Guide 1.23 (September 1980).

Data Recording Equipment

After the data are collected by the sensors the output is routed through signal conditioning equipment and then directed to digital data recorders. The signal conditioning equipment and digital recorders are located at the base of the 60-m meteorological tower in an environmentally controlled instrument shelter. An analog backup recorder also records the output from the sensors in the event that the primary digital recorder fails. A computer that is connected to the digital recorder, located in the instrument shelter, collects the data from the recorders and sends it to the control room computer system for analysis and archiving. The computer also has the ability to provide an instantaneous readout from the digital recorders so that it can be compared to sensor readings.

The accuracies for the primary and secondary recording devices are presented in Table 2.3-289.

Electrical power is supplied to the primary and secondary systems by independent power supplies. One source of power is Fermi 2; the other is an offsite source. If one supply fails, the other automatically supplies the necessary power for both systems. Two precautions are taken to minimize lightning damage to the system. Two of the three legs of the tower are grounded and the signal cables are routed through a lightning protection panel. Each signal line is protected by transient protection diodes specifically designed to stay below the individual line voltage breakdown point.

2.3.3.1.3 Instrument Calibration

The sensors, electronics, and recording equipment are calibrated on a six month basis. More frequent onsite calibrations are performed if the past operating history of the sensor indicates it is necessary. Any necessary adjustments are made onsite and the equipment that malfunctioned is either corrected onsite or replaced with similar spare equipment. After any adjustments or repairs, the calibration is repeated. Electronic calibrations are performed by simulating the output of each of the sensors with precision test equipment and monitoring the recorded values for each parameter. The resistance response to specified temperatures for the temperature thermistors is performed in the laboratory using calibrated measurement equipment. The calibrated temperature thermistor is then used to replace the existing sensor installed on the meteorological tower. The response of the calibrated temperature thermistor is then compared to an ambient temperature measurement taken at the sensor with a calibrated thermometer.

The dew point sensor is calibrated by comparing the result reported by the dew point sensor against the dew point measured by a calibrated, portable dew point hygrometer at the aspirator inlet.

The precipitation sensor is calibrated by comparing the result reported by the precipitation sensor to a known volume of liquid.

The calibration of the wind speed sensors is performed in a wind tunnel by an outside vendor using calibrated measurement equipment and a NIST Traceable Wind Tunnel Anemometer. In the wind tunnel the wind velocity is calibrated at specific points and the starting threshold is determined. The calibrated wind speed sensor is then used to replace the existing sensor installed on the meteorological tower.

The calibration of the wind direction sensor is performed by an outside vendor using calibrated measurement equipment. The calibration does not include a specific test of the starting threshold for wind direction. The starting threshold of the calibrated wind direction sensor is assessed at the time of installation by rotating the wind direction sensor body with the shaft in the horizontal plane and observing that the vane remains stationary. A new bearing is installed in the wind direction sensor if required. After installation of the new wind direction sensor, the directional alignment of the wind direction sensor is checked by sighting a known alignment point and comparing the result reported by the wind direction sensor to a known response. The records documenting results of calibrations, drift from calibrations, and corrective action taken for the digital instrumentation are kept and filed onsite.

2.3.3.1.4 **Instrument Service and Maintenance**

Visits are made twice a week to the 60-m tower to make a visual inspection of the sensors, as well as the data output and recording equipment in the instrument shelter, to see if they are damaged and need maintenance. In the event the sensors or monitoring equipment is found damaged or malfunctioning, the equipment is replaced or corrected in a timely fashion. A stock of spare parts and equipment is maintained to minimize and shorten the periods of outages. Using the same precision test equipment used for calibration, the instrumentation is checked to ensure reliable operation. Records documenting results of major causes of instrument sensor outages and other malfunctions of the meteorological monitoring system are kept and filed onsite. A similar inspection and maintenance program is in place for the computers and equipment located in the control room.

2.3.3.1.5 Data Reduction and Transmission

The pre-operational meteorological monitoring program is composed of two independent meteorological trains of instrumentation – a primary train and a secondary train – mounted on the 60-m tower. Both trains feed the data acquisition equipment of the Integrated Plant Computer System (IPCS) located in the Fermi 2 control room. The IPCS has the capability to share the meteorological data with other plant computers, display the data on IPCS terminals at various plant locations, and perform plume dispersion analysis in support of emergency response activities. Users can simultaneously access the meteorological data through two available dial-up lines located at the meteorological instrument building. The Nuclear Regulatory Commission (NRC) can also receive selected meteorological data through the Emergency Response Data System (ERDS) interface on IPCS. The operational meteorological monitoring system is described in further detail in the following subsections and is illustrated in Figure 2.3-260.

Signal Conditioning and Data Reduction

Inside the environmentally controlled instrument shelter, sensor signals are conditioned. Each sensor signal requires a single printed-circuit board to perform the necessary conversion, amplification, and scaling to provide a pair of analog outputs for each parameter. Zero and full-scale test switches are front-panel mounted on each printed-circuit board to facilitate parameter testing.

After conditioning through their respective printed-circuit boards, the 10-m horizontal wind direction and vertical wind speed signals pass into the Climatronics Standard Deviation Computer boards to compute the 15-minute average sigma theta and sigma phi.

The primary and secondary signal conditioner and standard deviation computer boards are independent of each other.

Data Transmission

The outputs of the instrument signal conditioning equipment are transmitted to the Control Room via two independent transmission lines. The one line incorporates a phone line between the shelter and the Nuclear Operations Center, where information is microwaved to the

Office Service Building. From the Office Service Building, the signals are transmitted to the Control Room. The second line uses a separate phone line from the shelter to the Nuclear Operations Center, where the data are transmitted to the Office Service Building via a phone line. From the Office Service Building, the signals are transmitted to the Control Room. The two signals are electrically separated from one another from the 60-m tower to the control room. The instrumentation at the 60-m tower is electrically isolated from the equipment in the computer room of the Control Room.

2.3.3.1.6 Data Acquisition and Processing

The dual IPCS data acquisition multiplexers accept two trains of data from the meteorological system primary and secondary data acquisition equipment. These data are provided to the IPCS computers to screen data for data validity and quality, perform meteorological calculations, update the data archive, display the information on the man-machine interface, and output the data to communication devices. The IPCS provides redundant computers that provide a main (Master) and backup (Slave) capability. The redundant computers in conjunction with the two trains of data acquisition provide two independent paths of data. The IPCS system monitors available error signals to determine equipment status. If an instrument input malfunctions, if data are suspect, or an instrument input is manually removed from service, the IPCS will substitute the reading from the next level of redundancy as listed in Table 2.3-290 and indicate the substitution on the IPCS computers. In the event that a data path to IPCS is unavailable, a digital recorder is available on each train of instrumentation at the meteorological instrument building to archive the raw data. Meteorological data are generally reviewed each day by personnel to identify possible data problems. The meteorological data are also validated to ensure that the amount of data retained in the master record meets the regulatory requirements for minimum recovery rates as outlined in Regulatory Guide 1.23. During the validation process the following steps are followed:

- Utilize software to review raw data
- Identify and edit questionable or invalid data
- Recover data from backup sources
- Adjust data to reflect calibration sources

After the validation process is completed, the processed data are archived and permanently stored electronically.

The objective for the meteorological monitoring program is to maintain annual data recovery rates of at least 90 percent on an annual basis for all meteorological parameters in order to assess the relative concentrations and doses resulting from accidental or routine releases. Table 2.3-291 provides recovery rates for the meteorological parameters monitored on the onsite meteorological tower. The recovery rates for each parameter, including the joint data recovery of wind speed, wind direction, and ΔT, exceed the 90 percent guidance criteria in accordance with Regulatory Guide 1.23. In addition, the onsite meteorological data are considered adequate to represent onsite meteorological conditions as required by 10 CFR 100.10 and 10 CFR 100.20, as well as to make estimates of atmospheric dispersion for design basis accident and routine releases from the reactor.

Meteorological data are available in five different formats: instantaneous values, 1-minute blocked averages, 15-minute rolling averages, 15-minute blocked averages, and 1-hour blocked averages. Routine data summaries are generated for each day, calendar month, and calendar year and then archived on the IPCS computers. In addition, joint frequency distributions of wind speed and wind direction for each Pasquill stability category are created from the 1-hour blocked averages. The format of the annual onsite meteorological data summaries and joint frequency distribution tables conforms to the recommended format found in Regulatory Guide 1.23.

2.3.3.2 Fermi 3 Site Preparation and Construction, Pre-Operational, and Operational Onsite Meteorological Monitoring Program

As described in Section 2.3.3 of NUREG-0800, the current meteorological program establishes a baseline for identifying and assessing the environmental impacts during preapplication meteorological monitoring. The NDCT for Fermi 3 will be built in the approximate location of the current onsite meteorological tower. A new meteorological tower will be erected in the southeast corner of the Fermi site. **[START COM FSAR-2.3-003]**.The new meteorological tower will be operational for at least one year prior to the decommissioning of the existing onsite meteorological tower. The meteorological data recorded concurrently from the current and new onsite meteorological towers will undergo a detailed analysis to ensure the meteorological parameters measured at the new meteorological tower are representative of the atmospheric conditions at the Fermi site **[END COM FSAR-2.3-003]**. Actual and perceived data biases between the current and new meteorological towers will be documented and evaluated. The site preparation and construction, pre-operational, and operational onsite meteorological monitoring program is described in greater detail in the following subsections.

2.3.3.2.1 **Tower and Instrument Siting**

The location of the new onsite meteorological tower in respect to the current onsite meteorological tower and Fermi 3 site layout is provided in Figure 2.1-204. The new meteorological tower will be a guyed open-latticed tower built to ANSI/TIA/EIA-222-G standards, located approximately 1341.1 m (4400 ft.) south-southeast of the Fermi 3 reactor containment building and will have a height of 60 m (197 ft.). This location of the new meteorological tower is at a distance that is greater than 10 times the height of the Fermi 3 reactor building, and therefore meets the siting criteria of NRC Regulatory Guide 1.23.

Structures near the location of the new meteorological tower include a water tower with a height of 44.2 m (144.9 ft.) and a maximum width of approximately 16.2 m (53.3 ft.) at the equator of the tank head. The NRC Regulatory Guide 1.23 suggests that a 10- building-height distance of separation is typically applied to square and rectangular structures having sharp edges. The tank head of the water tower structure is spherical and has a sloping surface, and thus can be expected to produce a smaller wake zone. 40 CFR 51.100(ii)(3) defines good engineering practices (GEP) stack height as that which ensures that emissions from a stack do not result in excessive concentrations of any air pollutant as a result of atmospheric downwash, wakes, or eddy effects created by the source itself, nearby structures, or nearby terrain features. "Nearby structures" is defined in 40 CFR 51.100(jj)(1) as that distance up to five times the lesser of the height or width dimension of a structure. Thus, for the water tower with a maximum width of 16.2 m (53.3 ft.), the outermost boundary of influence exerted by the water tower is conservatively estimated to be 81 m (265.8 ft.). The water tower is located approximately 210.9 m (692 ft.) southeast of the new meteorological tower. Thus, the new meteorological tower is at a distance that will not be affected by the wake zone of the water tower.

Natural obstructions that can influence wind measurements near the new meteorological tower include trees that are taller than 5 m (16 ft.). The location of the new meteorological tower is wooded and contains trees that would influence wind measurements if left at their current height. However, prior to installing the new meteorological tower the trees will be trimmed to a height less than 5 m (16 ft.) in height outwards to a distance that satisfies the 10-building-height distance of separation stated in Regulatory Guide 1.23.

NRC Regulatory Guide 1.23 indicates that delta T should be measured at 10 and 60 m, and if necessary at 10 m and a higher level that is representative of diffusion conditions from release points higher than 85-m (278.9 ft.). The atmospheric release heights above plant grade for Fermi 3 are 52.6 m (172.6 ft.) for the reactor building/fuel building stack, 71.3 m (233.9 ft.) for the turbine building stack, and 18 m (59.1 ft.) for the radwaste building stack. All release heights for Fermi 3 are below 85 m (278.9 ft.); therefore, the new meteorological tower will have meteorological sensors located at 10 m and 60 m elevations to estimate dispersion conditions for ground-level and the plant's heat dissipation system. The meteorological sensors will be mounted on booms, which will be greater than one tower width away from the tower and will be oriented normal to the prevailing wind direction.

The influence of terrain near the base of the new meteorological tower on temperature measurements is expected to be minimal. The area surrounding the new meteorological tower will not be paved or contain temporary land disturbances, such as plowed fields or rock piles. In addition, the tower will be situated in a relatively flat area that will be at a similar elevation as the plant structures. A climate-controlled instrument shelter will be installed on a concrete slab at the base of the tower; however, materials that minimize influence on the measurements will be used to construct the shelter. The new tower will be built close to the shoreline of Lake Erie such that it can measure the dynamic onshore and offshore flow conditions within the thermal internal boundary layer. Fermi 2 and Fermi 3 are located at similar distances to the western shoreline of Lake Erie, such that measurements made at the new meteorological tower will be representative of atmospheric dispersion conditions that could affect gaseous effluent releases.

2.3.3.2.2 **Instrumentation**

Meteorological Sensors

The instrumentation on the new meteorological tower will consist of the following: wind speed and wind direction sensors at the 10 m and 60 m levels, a 10 m air temperature sensor, a 10 m to 60 m delta T, and a 10 m dewpoint temperature sensor. To minimize data loss due to ice storms, external heaters will be installed on the primary wind sensors. The heaters will be thermostatically controlled and of the slip-on/slip-off design for easy attachment. The wind sensor specifications are not affected by these heaters. In addition, a heated tipping bucket rain gauge will be mounted at ground level on a concrete slab at the base of the meteorological tower away from any potential obstructions. A windscreen will be mounted around the precipitation gage to minimize the amount of windblown snow and debris deposited in the gage.

Redundant, secondary sensors at the 10 m and 60 m levels will also be installed on the new meteorological tower for air temperature, vertical wind speed, horizontal wind speed, and wind direction measurements. Table 2.3-288 provides a listing of the meteorological parameters that will be monitored on the new meteorological tower, the sampling height(s), as well as the sensing technique for the primary and secondary systems.

For the new meteorological tower Fermi 3 intends to use meteorological instrumentation that matches the manufacturer and model numbers in use on the current meteorological tower. The accuracies and thresholds for each meteorological sensor located on the current onsite meteorological tower are presented in Table 2.3-289. The accuracies and thresholds for each sensor on the new meteorological tower will be within the values specified in NRC Regulatory Guide 1.23.

Data Recording Equipment

The data recording process planned for the new meteorological monitoring program will mirror the data recording process for the preapplication monitoring as described in Subsection 2.3.3.1. The manufacturer and model numbers for the data recording equipment that is listed in Table 2.3-289 will be used for the new meteorological monitoring program. One exception is that the signal conditioning equipment used for the current meteorological monitoring program is no longer available from the manufacturer. Therefore, the signal conditioning equipment for the new meteorological monitoring program will be replaced with signal conditioning equipment that has accuracies that are equal to or better than the accuracies listed for the current signal conditioning equipment.

Electrical power for the new meteorological monitoring program will continue to be supplied to the primary and secondary systems by independent power supplies. If one supply fails, the other automatically supplies the necessary power for both systems. The new meteorological tower will be built with two precautions to minimize lightning damage to the system. Two of the three legs of the tower will be grounded and the signal cables will be routed through a lightning protection panel. Each signal line will be protected by transient protection diodes specifically designed to stay below the individual line voltage breakdown point.

2.3.3.2.3 Instrument Calibration, Service, and Maintenance

The instrument calibration, service, and maintenance procedures in place for the current meteorological monitoring program will continue for the new meteorological program. Subsection 2.3.3.1.3 provides a description of the instrument calibrations program, while Subsection 2.3.3.1.4 provides a description of the instrument service and maintenance program. System components that collect, transmit, process, record, and display the meteorological data will be inspected, calibrated, serviced, and maintained such that at least 90% data recovery is achieved for the new meteorological monitoring system.

2.3.3.2.4 Data Reduction, Transmission, Acquisition, and Processing

The method of data reduction, transmission, acquisition, and processing that is described in Subsection 2.3.3.1.5 and Subsection 2.3.3.1.6 for the pre-application monitoring program will be used for the site preparation and construction, pre-operational, and operational monitoring programs.

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2.3.4 Short-Term (Accident) Diffusion Estimates

The consequence of a design basis accident in terms of personnel exposure is a function of the atmospheric dispersion conditions at the site of the potential release. Atmospheric diffusion conditions are represented by relative air concentration (χ/Q) values. This section describes the development of the short-term diffusion estimates for the exclusion area and low population zone boundaries and the control room.

2.3.4.1 Calculation Methodology

The efficiency of diffusion is primarily dependent on winds (speed and direction) and atmospheric stability characteristics.

Relative concentrations of released gases, X/Q values, as a function of direction for various time periods at the EAB and the outer boundary of the LPZ, were determined by the use of the computer program PAVAN, NUREG/CR-2858. This program implements the guidance provided in Regulatory Guide 1.145. The X/Q calculations are based on the theory that material released to the atmosphere are normally distributed (Gaussian) about the plume centerline. A straight-line trajectory is assumed between the point of release and the distances for which X/Q values are calculated in accordance with NUREG/CR-2858 and Regulatory Guide 1.145.

Using joint frequency distributions of wind direction and wind speed by atmospheric stability, PAVAN provides the X/Q values as functions of direction for various time periods at the EAB and the LPZ. The meteorological data needed for this calculation included wind speed, wind direction, and atmospheric stability. The meteorological data used for this analysis was collected from the onsite monitoring equipment from 2002 through 2007. The data was combined and is reported in Table 2.3-292 through Table 2.3-299.

Other plant specific data includes tower height at which wind speed was measured (10 m [32.8 ft]) and distances to the EAB and LPZ. The EAB for Fermi 3 is shown in Figure 2.1-203, which is a circle centered at the Reactor Building with a radius of 892 m (2928 ft). The LPZ for Fermi 3 is a 4828-m (3-mile) radius circle centered at the Reactor Building. For the purposes of determining X/Q values, an effective EAB and LPZ are determined. These are referred to as the Dose Calculation EAB and the Dose Calculation LPZ. A circle is drawn from the center of the Reactor Building that encompasses the postulated design basis accident release locations. The Dose Calculation EAB and LPZ are defined as the distance between this circle and the EAB and LPZ, respectively. The distance for the Dose Calculation EAB is 740 meters. The distance for Dose Calculation LPZ is 4670 meters.

Regulatory Guide 1.145 divides release configurations into two modes, ground-level release and stack release. Compared to a stack release, a ground-level release usually results in higher ground-level concentrations at downwind receptors due to less dilution from shorter traveling distances. Because the ground-level release scenario provides a bounding case, stack releases were not evaluated.

The PAVAN program computes X/Q values at the Dose Calculation EAB and Dose Calculation LPZ for each combination of wind speed and atmospheric stability class for each of 16 downwind direction sectors. The X/Q values calculated for each direction sector are then ranked in descending order, and an associated cumulative frequency distribution is derived based on the frequency distribution of wind speeds and stabilities for the complementary upwind direction sector. The X/Q value that is equaled or exceeded 0.5 percent of the total time becomes the maximum sector-dependent X/Q value.

The calculated X/Q values are also ranked independently of wind direction into a cumulative frequency distribution for the entire site. The PAVAN program then selects the X/Qs that are equaled or exceeded 5 percent of the total time.

In accordance with Regulatory Guide 1.145, the larger of the two values (i.e., the maximum sector-dependent 0.5 percent X/Q or the overall site 5 percent X/Q value) is used to represent the X/Q value for a 0-2 hour time period. To determine X/Q values for longer time periods, the program calculates an annual average X/Q value using the procedure described in Regulatory Guide 1.111. The program then uses logarithmic interpolation between the 0-2 hour X/Q values for each sector and the corresponding annual average X/Q values to calculate the values for intermediate time periods (i.e., 0-8 hours, 8-24 hours, 1-4 days, and 4-30 days).

2.3.4.2 Calculations and Results

PAVAN requires the meteorological data in the form of joint frequency distributions of wind direction and wind speed by atmospheric stability class. These analyses were completed using data from the Fermi site meteorological instrumentation collected between 2002 and 2007.

The stability classes were based on the classification system given in Table 2 of Regulatory Guide 1.23. Joint frequency distribution tables were developed from the meteorological data.

Building area is defined as the smallest vertical-plane cross-sectional area of the Reactor Building, in square meters. The area used in the PAVAN input was zero, thereby conservatively neglecting the building wake credit. The building height entered was also zero to conservatively neglect the building wake credit.

The tower height is the height at which the wind speed was measured. Based on the lower measurement location, the tower height used was 10 m.

As described in Regulatory Guide 1.145, a ground-level release includes all release points that are effectively lower than two and one-half times the height of adjacent solid structures. Therefore, as stated above, a ground-level release was assumed.

Table 2.3-300 provides the offsite atmospheric dispersion factors. The PAVAN modeling results for the maximum sector X/Q values at the Dose Calculation EAB and the Dose Calculation LPZ relative to the 0-2-hour time period, the annual average time period, and other intermediate time intervals evaluated by the PAVAN model are presented as follows:

Fermi 3 Maximum X/Q Values (sec/m^3)

	0-2 hours	**0-8 hours**	**8-24 hours**	**1-4 days**	**4-30 days**
Dose Calculation EAB	3.66E-04				
Dose Calculation LPZ	N/A	3.23E-05	2.23E-05	9.95E-06	3.13E-06

2.3.4.3 Atmospheric Dispersion Factors for On-Site Doses

Onsite X/Q values for use in evaluating potential doses from Fermi 3 postulated release locations (sources) to on-site receptor locations are based on the Fermi 3 layout shown in DCD Figure 2A-1. The values were determined based on hourly meteorological data from the years 2001 through 2007. The X/Q values for the control room and technical support center were calculated using the ARCON96 computer code in accodance with guidance as documented in RG 1.194. The source and receptor combinations are shown in Table 2.3-303. DCD Figure 2A-1 shows the locations of postulated accidental releases from Fermi 3 and the Fermi 3 receptor locations. Results from the ARCON96 computer code for each of the source and receoptor combinations are provided in Table 2.3-303.

The dose consequences to operators at other units must be determined in addition to the unit with the accident. The intent is to ensure that an accident in the adjacent unit will not prevent the safe shutdown of the "other" unit. As such, dispersion factors are required so that these doses may be calculated. The cross-unit X/Q values are conservatively based on a simple point source model. A distance of 350 m (1150 ft) between

Fermi 2 and Fermi 3 was conservatively assumed (actual distance is approximately 421 m [1381 ft]). The release height and receptor height were both assumed to be 10m (32.8 ft). The methodology uses a “safety factor” of 1.5 to account for any variations in release locations.

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2.3.5 Long-Term (Routine) Diffusion Estimates

For a routine release, the concentration of radioactive material in the surrounding region depends on the amount of effluent released, the height of the release, the momentum and buoyancy of the emitted plume, the wind speed, atmospheric stability, airflow patterns of the site, and various effluent removal mechanisms. Annual average relative concentration, X/Q, and annual average relative deposition, D/Q, for gaseous effluent routine releases were, therefore, calculated.

2.3.5.1 Calculation Methodology and Assumptions

The XOQDOQ computer program, NUREG/CR-2919, which implements the assumptions outlined in Regulatory Guide 1.111, was used to generate the annual average relative concentration, X/Q, and annual average relative deposition, D/Q. Values of X/Q and D/Q were determined at the site boundary, at points of maximum individual exposure, and at points within a radial grid of sixteen 22.5 degree sectors and extending to a distance of 80 km (50 mi). Radioactive decay and dry deposition were considered. Long term X/Q models are conservatively determined to apply broadly within compass sector and radial ring regions; thus, the very local impacts of over-water wind trajectory changes will not have a significant impact on the X/Q values. The only potential impact of the trajectories over Lake Erie is to the collective dose for the population within 50 miles of the site, and based on the small percentage of the population that is potentially impacted by this trajectory, no specific modeling conditions are included for this trajectory condition.

Meteorological data from 2002 through 2007 was used in the analysis. Receptor locations were based on the site boundary in each of the 16 directions as well as the nearest residences, gardens, sheep, goat, meat cow, and milk cow receptor locations in each of the 16 directions based on 2005 through 2007 Land Use Census. Meteorological data in joint frequency distributions format consistent with the Fermi 3 short-term (accident) diffusion X/Q calculation discussed above was utilized.

For this analysis, both ground-level and mixed-mode releases were considered. A ground-level release was considered for releases from the Radwaste Building, while mixed-mode releases were considered for releases from the Reactor Building/Fuel Building Stack and the Turbine Building Stack based on the criteria set forth in Regulatory Guide 1.111. At ground-level locations beyond several miles from the plant, the annual average concentration of effluents are essentially independent of release mode; however, for ground-level concentrations within a few miles, the release mode is important. Gaseous effluents released from tall stacks generally produce peak ground-level air concentrations near or beyond the site boundary. Near ground-level releases usually produce concentrations that decrease from the release point to locations downwind. Guidance for selection of the release mode is provided in Regulatory Guide 1.111.

The following input data and assumptions are used in the analysis:

- Meteorological data: 6-year (2002-2007) composite onsite joint frequency distributions of wind speed, wind direction, and atmospheric stability
- Type of release: Ground-level (Radwaste Building Stack); mixed-mode (Reactor Building/Fuel Building and Turbine Building Stacks)
- Wind sensor height: 10 m
- Vertical temperature difference: between 10 m to 60 m
- Number of wind speed categories: 9
- Release height: 10 m (default height) for ground-level release; 52.62 m for Reactor Building/Fuel Building Stack (mixed-mode); 71.30 m for Turbine Building Stack (mixed-mode)
- Building area: 350 m^2 for ground-level release, conservatively set to zero to neglect the building wake credit for the mixed-mode releases
- Adjacent building height: N/A for ground-level release; 48.05 m for Reactor Building/Fuel Building Stack (mixed-mode); 52.0 m for Turbine Building Stack (mixed-mode)
- Average Vent Velocity: N/A for ground-level release; 17.78 m/s for Reactor Building/Fuel Building Stack (mixed-mode); 17.78 m/s for Turbine Building Stack (mixed-mode)

- Inside Vent Diameter: N/A for ground-level release; 2.40 m for Reactor Building/Fuel Building Stack (mixed-mode); 1.95 m for Turbine Building Stack (mixed-mode)
- Distances from release point to site boundary, nearest residence, nearest garden, neatest sheep, nearest goat, nearest meat cow, and nearest milk cow for all downwind sectors. The distances are determined from the centerline of the Reactor Building.
- Dry deposition is considered for all releases
- Continuous release is assumed
- Site and regional topography are included

Consistent with Regulatory Guide 1.111 guidance regarding radiological impact evaluations, radioactive decay and deposition were considered. Terrain recirculation was considered consistent with Regulatory Guide 1.111 by employing the default terrain correction option.

2.3.5.2 Results

Receptor locations for Fermi were evaluated. Values of χ/Q and D/Q were determined at the site boundary, at points of maximum individual exposure, and at points within a radial grid of sixteen 22.5 degree sectors (centered on true north, north-northeast, northeast, etc.) and extending to a distance of 80 km (50 mi) from the station. Receptor locations included in the evaluation are given in Table 2.3-305 and Table 2.3-306. A set of data points were located within each sector at increments of 402 m (0.25 mi). to a distance of 1609 m (1 mile) from the plant, at increments of 805 m (0.5 mile) from a distance of 1609 m to 8000 m (1 mile to 5 mi), at increments of 4023 m (2.5 mi) from a distance of 8 km to 16 km (5 mile to 10 mile), and at increments of 16 km (5 mi) thereafter to a distance of 80 km (50 mi). Table 2.3-328 through Table 2.3-339 summarize annual average χ/Q values (no decay and undepleted; 2.26 day decayed and undepleted; 8 day decayed and depleted) and D/Q values at each of these grid points. The results of the analysis, based on meteorological data collected onsite from 2002 through 2007, are presented in Table 2.3-307 through Table 2.3-327.

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Table 2.3-201 National Weather Service First–Order and Cooperative Observing Stations Surrounding the Fermi Site [EF3 COL 2.0-7-A]

Station (1)	State	County	Approximate Distance from Fermi Site (mi) (2)	Relative Direction to Fermi Site	Elevation (ft)
Monroe	MI	Monroe	8	WSW	590
Detroit (Detroit Metropolitan Airport)	MI	Wayne	17	NNW	631
Windsor	ON	Essex	27	NNE	622
Ann Arbor (University of Michigan)	MI	Washtenaw	33	NW	900
Toledo	OH	Lucas	38	SW	674
Adrian 2 NNE	MI	Lenawee	39	W	760
Flint	MI	Genesee	74	NNW	770

Notes:

1. Numeric and letter designators following a station name (Adrian 2 NNE) indicate the station's distance in miles and direction relative to the place name.
2. The Corpscon 6.0.1 conversion program was used to convert Lat/Long (NAD 83) to UTM (NAD 83) for each site location. Distances above are from the current Fermi Site facility to the listed location.

Source: Reference 2.3-201 through Reference 2.3-207

Table 2.3-202 Local Climatological Data Summary for Detroit, Michigan (Sheet 1 of 2) [EF3 COL 2.0-7-A]

NORMALS, MEANS, AND EXTREMES
DETROIT (KDTW)

LATITUDE: 42° 12'N	LONGITUDE: -83° 20'W	ELEVATION (FT): GRND: 631 BARO: 631	TIME ZONE: EASTERN (UTC-5)	WBAN: 94847

	ELEMENT	POR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
TEMPERATURE °F	NORMAL DAILY MAXIMUM	30	31.1	34.4	45.2	57.8	70.2	79.0	83.4	81.4	73.7	61.2	47.8	35.9	58.4
	MEAN DAILY MAXIMUM	48	31.0	34.3	44.5	58.2	69.7	78.9	83.3	81.3	74.1	61.6	48.2	35.7	58.4
	HIGHEST DAILY MAXIMUM	48	62	70	81	89	93	104	102	100	98	91	77	69	104
	YEAR OF OCCURRENCE		1995	1999	1998	1977	1988	1988	1988	1988	1976	1963	1968	1998	JUN 1988
	MEAN OF EXTREME MAXS.	48	50.1	52.9	68.9	79.5	85.9	91.8	93.7	91.7	88.6	79.8	67.5	54.9	75.4
	NORMAL DAILY MINIMUM	30	17.8	20.0	28.5	38.4	49.4	58.9	63.6	62.2	54.1	42.5	33.5	23.4	41.0
	MEAN DAILY MINIMUM	48	16.9	19.0	27.1	37.7	47.9	57.3	62.1	60.8	53.3	41.8	32.8	22.6	39.9
	LOWEST DAILY MINIMUM	48	-21	-15	-4	10	25	36	41	38	29	17	9	-10	-21
	YEAR OF OCCURRENCE		1984	1985	2003	1982	1966	1972	1965	1982	1974	1974	1969	1983	JAN 1984
	MEAN OF EXTREME MINS.	48	-2.5	0.6	9.8	23.5	34.3	44.2	50.5	49.2	37.9	27.3	18.1	3.2	24.7
	NORMAL DRY BULB	30	24.5	27.2	36.9	48.1	59.8	69.0	73.5	71.8	63.9	51.9	40.7	29.6	49.7
	MEAN DRY BULB	48	24.0	26.7	35.9	47.9	58.8	68.3	72.7	71.1	63.7	51.7	40.5	29.3	49.2
	MEAN WET BULB	23	23.7	25.7	32.3	42.6	52.7	61.7	65.9	65.0	58.1	47.0	37.5	28.0	45.0
	MEAN DEW POINT	23	19.2	20.8	26.4	36.0	47.0	57.0	61.8	61.5	54.1	42.5	32.9	23.9	40.3
	NORMAL NO. DAYS WITH:														
	MAXIMUM >= 90	30	0.0	0.0	0.0	0.0	0.5	2.8	5.0	2.9	0.8	0.0	0.0	0.0	12.0
	MAXIMUM <= 32	30	16.7	12.9	4.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	1.4	10.3	45.6
	MINIMUM <= 32	30	28.5	24.7	21.7	8.7	0.5	0.0	0.0	0.0	0.1	4.0	15.8	25.8	129.8
	MINIMUM <= 0	30	3.1	2.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	6.4
H/C	NORMAL HEATING DEG. DAYS	30	1270	1074	886	527	219	41	5	12	121	426	742	1099	6422
	NORMAL COOLING DEG. DAYS	30	0	0	0	6	42	145	254	208	75	6	0	0	736
RH	NORMAL (PERCENT)	30	76	73	69	65	65	67	69	72	73	72	74	77	71
	HOUR 01 LST	30	79	78	75	73	75	79	81	84	84	80	79	80	79
	HOUR 07 LST	30	81	80	79	77	77	79	83	86	87	84	82	81	81
	HOUR 13 LST	30	70	65	60	53	53	55	55	57	57	58	65	70	60
	HOUR 19 LST	30	74	71	65	57	56	58	59	63	66	67	72	76	65
S	PERCENT POSSIBLE SUNSHINE	31	40	46	52	53	60	65	68	67	61	51	35	31	52
W/O	MEAN NO. DAYS WITH:														
	HEAVY FOG (VISBY <= 1/4 MI)	43	2.3	2.3	2.0	0.9	0.8	0.5	0.5	1.0	1.5	1.6	1.4	2.9	17.7
	THUNDERSTORMS	48	0.2	0.4	1.5	3.0	4.0	6.1	6.3	5.4	3.9	1.2	0.7	0.3	33.0
CLOUDNESS	MEAN:														
	SUNRISE-SUNSET (OKTAS)														
	MIDNIGHT-MIDNIGHT (OKTAS)														
	MEAN NO. DAYS WITH:														
	CLEAR														
	PARTY CLOUDY														
	CLOUDY														
PR	MEAN STATION PRESSURE (IN)	23	29.33	29.38	29.32	29.26	29.26	29.26	29.28	29.33	29.34	29.35	29.33	29.35	29.32
	MEAN SEA-LEVEL PRES. (IN)	23	30.07	30.11	30.04	29.98	29.97	29.97	29.98	30.03	30.05	30.06	30.06	30.08	30.03

Table 2.3-202 Local Climatological Data Summary for Detroit, Michigan (Sheet 2 of 2) [EF3 COL 2.0-7-A]

NORMALS, MEANS, AND EXTREMES
DETROIT (KDTW)

LATITUDE: 42° 12'N	LONGITUDE: -83° 20'W	ELEVATION (FT): GRND: 631 BARO: 631	TIME ZONE: EASTERN (UTC-5)	WBAN: 94847

	ELEMENT	POR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
WINDS	MEAN SPEED (MPH)	23	11.6	10.9	11.0	10.8	9.8	8.9	8.4	7.8	8.3	9.6	11.0	11.0	9.9
	PREVAIL DIR (TENS OF DEGS)	39	24	24	30	30	30	24	23	23	24	24	24	24	24
	MAXIMUM 2-MINUTE:														
	SPEED (MPH)	11	44	51	46	47	61	45	53	44	35	47	47	49	61
	DIR. (TENS OF DEGS)		22	22	23	22	22	30	28	24	27	22	27	29	22
	YEAR OF OCCURRENCE		1996	1997	2004	2001	2004	2005	1998	2003	2001	2004	2003	1998	MAY 2004
	MAXIMUM 5-SECOND														
	SPEED (MPH)	11	53	60	59	57	78	55	67	53	45	56	58	60	78
	DIR. (TENS OF DEGS)		24	24	24	24	22	31	28	23	28	24	25	31	22
	YEAR OF OCCURRENCE		1996	2001	2004	1997	2004	2005	1998	2003	1997	2004	1998	1998	MAY 2004
PRECIPITATION	NORMAL (IN)	30	1.91	1.88	2.52	3.05	3.05	3.55	3.16	3.10	3.27	2.23	2.66	2.51	32.89
	MAXIMUM MONTHLY (IN)	48	3.92	5.02	4.48	5.40	8.46	7.04	6.02	7.83	7.52	6.76	5.68	6.00	8.46
	YEAR OF OCCURRENCE		1993	1990	1973	1961	2004	1987	1969	1975	1986	2001	1982	1965	MAY 2004
	MINIMUM MONTHLY (IN)	48	0.27	0.15	0.74	0.69	0.87	0.97	0.59	0.43	0.43	0.13	0.79	0.46	0.13
	YEAR OF OCCURRENCE		1961	1969	2005	2004	1988	1988	1974	1996	1960	2005	1976	1960	OCT 2005
	MAXIMUM IN 24 HOURS (IN)	48	1.72	2.41	1.82	3.58	2.87	2.84	4.34	3.21	4.08	2.57	2.30	3.71	4.34
	YEAR OF OCCURRENCE		1967	1998	1997	2000	1968	1983	1998	1964	2000	1985	2005	1965	JUL 1998
	NORMAL NO. DAYS WITH:														
	PRECIPITATION >= 0.01	30	13.4	11.3	12.7	12.6	11.6	10.1	9.6	9.5	9.9	9.8	12.3	13.9	136.7
	PRECIPITATION >= 1.00	30	0.1	0.2	0.2	0.4	0.6	0.9	0.8	0.7	0.6	0.3	0.3	0.2	5.3
SNOWFALL	NORMAL (IN)	30	11.9	9.3	7.0	1.7	0.*	0.0	0.0	0.0	0.0	0.3	2.7	11.1	44.0
	MAXIMUM MONTHLY (IN)	47	29.6	20.8	16.1	9.0	0.1	T	0.0	0.0	T	2.9	11.8	34.9	34.9
	YEAR OF OCCURRENCE		1978	1986	1965	1982	2005	2006			1994	1980	1966	1974	DEC 1974
	MAXIMUM IN 24 HOURS (IN)	47	12.2	10.3	9.2	7.4	0.1	T	0.0	0.0	T	2.9	5.6	19.2	19.2
	YEAR OF OCCURRENCE		2005	1965	1973	1982	2005	2006			1994	1980	1977	1974	DEC 1974
	MAXIMUM SNOW DEPTH (IN)	46	24	18	9	6	0	0	0	0	0	1	6	19	24
	YEAR OF OCCURRENCE		1999	1982	1982	1982						1980	1966	1974	JAN 1999
	NORMAL NO. DAYS WITH:														
	SNOWFALL >= 1.0	30	3.6	2.9	2.1	0.5	0.0	0.0	0.0	0.0	0.0	0.1	0.9	3.5	13.6

Source: Reference 2.3-202

Table 2.3-203 Local Climatological Data Summary for Flint, Michigan (Sheet 1 of 2) [EF3 COL 2.0-7-A]

NORMALS, MEANS, AND EXTREMES
FLINT (KFNT)

LATITUDE: 42° 58'N **LONGITUDE:** -83° 44'W **ELEVATION (FT):** GRND: 770 BARO: 783 **TIME ZONE:** EASTERN (UTC-5) **WBAN: 14826**

	ELEMENT	POR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
TEMPERATURE °F	NORMAL DAILY MAXIMUM	30	29.2	32.3	43.1	56.2	69.0	77.7	82.0	79.5	71.9	59.7	46.3	34.2	56.8
	MEAN DAILY MAXIMUM	114	29.1	29.7	41.9	55.5	68.4	76.9	81.5	80.4	71.0	60.7	45.2	32.3	56.1
	HIGHEST DAILY MAXIMUM	50	61	68	80	87	93	101	101	98	94	89	76	70	101
	YEAR OF OCCURRENCE		1997	1999	2000	2004	1988	1988	1995	2001	2002	2002	1978	2001	JUL 1995
	MEAN OF EXTREME MAXS.	114	48.4	50.6	66.1	77.9	84.1	90.4	92.1	90.9	86.7	78.7	66.3	53.9	73.8
	NORMAL DAILY MINIMUM	30	13.3	15.3	24.3	34.6	45.2	54.6	59.1	57.4	49.4	38.6	29.8	19.1	36.7
	MEAN DAILY MINIMUM	114	15.2	14.0	24.2	34.6	45.3	54.0	57.6	57.0	49.6	40.1	29.8	19.8	36.8
	LOWEST DAILY MINIMUM	50	-25	-22	-12	6	22	33	40	37	26	19	6	-13	-25
	YEAR OF OCCURRENCE		1976	1967	1978	1982	1966	1998	2001	1982	1991	1974	1976	2000	JAN 1976
	MEAN OF EXTREME MINS.	114	-6.0	-4.0	4.9	21.1	31.1	40.3	46.4	44.4	34.2	25.1	15.2	0.1	21.1
	NORMAL DRY BULB	30	21.3	23.8	33.7	45.4	57.1	66.2	70.6	68.5	60.7	49.2	38.1	26.7	46.8
	MEAN DRY BULB	114	22.2	21.9	33.0	45.1	56.9	65.5	69.5	68.7	60.3	50.4	37.6	26.1	46.4
	MEAN WET BULB	23	22.1	23.9	30.7	41.3	51.5	60.6	64.6	63.7	56.6	45.8	36.1	26.8	43.6
	MEAN DEW POINT	23	18.4	19.6	25.5	35.1	46.0	56.3	60.8	60.6	53.1	41.8	32.2	23.4	39.4
	NORMAL NO. DAYS WITH:														
	MAXIMUM >= 90	30	0.0	0.0	0.0	0.0	0.3	1.7.	3.2	1.5	0.6	0.0	0.0	0.0	7.3
	MAXIMUM <= 32	30	18.5	14.4	5.3	0.4	0.0	0.0	0.0	0.0	0.0	0.0	2.2	12.0	52.8
	MINIMUM <= 32	30	29.0	25.3	23.0	11.1	1.6	0.0	0.0	0.0	0.4	5.8	17.1	27.2	140.5
	MINIMUM <= 0	30	4.6	3.6	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.8	10.5
H/C	NORMAL HEATING DEG. DAYS	30	1341	1147	957	577	267	66	13	28	168	478	791	1172	7005
	NORMAL COOLING DEG. DAYS	30	0	0	1	5	33	110	199	151	52	4	0	0	555
RH	NORMAL (PERCENT)	30	77	75	71	66	66	69	71	75	76	74	76	79	73
	HOUR 01 LST	30	81	79	77	75	76	80	84	87	87	82	81	82	81
	HOUR 07 LST	30	82	81	81	79	78	81	85	90	90	85	83	83	83
	HOUR 13 LST	30	72	69	62	55	54	56	55	59	59	60	68	74	62
	HOUR 19 LST	30	76	72	66	59	56	58	59	65	69	71	75	79	67
S	PERCENT POSSIBLE SUNSHINE														
W/O	MEAN NO. DAYS WITH:														
	HEAVY FOG (VISBY <= 1/4 MI)	43	1.6	1.6	2.3	0.8	1.2	0.8	1.1	1.6	2.0	1.8	1.1	2.2	18.1
	THUNDERSTORMS	58	0.2	0.2	1.2	2.9	4.2	5.8	6.4	5.7	3.6	1.5	0.8	0.3	32.8
CLOUDNESS	MEAN:														
	SUNRISE-SUNSET (OKTAS)							6.4							
	MIDNIGHT-MIDNIGHT (OKTAS)							7.2							
	MEAN NO. DAYS WITH:														
	CLEAR			2.0	3.0		3.0	6.0							
	PARTY CLOUDY	1	2.0	3.0	5.0		9.0	2.0							
	CLOUDY	1	4.0	6.0	9.0		6.0	13.0							

NORMALS, MEANS, AND EXTREMES
FLINT (KFNT)

	LATITUDE: 42° 58'N	LONGITUDE: -83° 44'W	ELEVATION (FT): GRND: 770 BARO: 783	TIME ZONE: EASTERN (UTC-5)	WBAN: 14826

	ELEMENT	POR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
PR	MEAN STATION PRESSURE (IN)	23	29.21	29.23	29.21	29.15	29.15	29.15	29.18	29.22	29.23	29.23	29.21	29.22	29.20
PR	MEAN SEA-LEVEL PRES. (IN)	23	30.06	30.08	30.05	29.98	29.97	29.97	29.99	30.03	30.05	30.06	30.05	30.07	30.03
WINDS	MEAN SPEED (MPH)	23	10.8	10.4	10.6	10.4	9.5	8.2	7.6	7.2	7.9	9.1	10.2	10.1	9.3
WINDS	PREVAIL DIR (TENS OF DEGS)	35	24	28	28	08	19	21	24	21	20	21	24	24	24
WINDS	MAXIMUM 2-MINUTE:														
WINDS	SPEED (MPH)	11	37	41	40	41	40	36	40	35	38	41	41	38	41
WINDS	DIR. (TENS OF DEGS)		25	30	25	30	26	28	33	24	30	31	28	27	31
WINDS	YEAR OF OCCURRENCE		1996	2006	2002	2002	2004	2000	1998	2003	2005	2006	2003	2003	OCT 2006
WINDS	MAXIMUM 5-SECOND														
WINDS	SPEED (MPH)	11	52	53	51	52	49	46	51	46	48	53	55	49	55
WINDS	DIR. (TENS OF DEGS)		18	32	27	26	27	29	25	27	29	31	22	27	22
WINDS	YEAR OF OCCURRENCE		1996	2006	2002	2003	2000	2000	2003	1996	2005	2006	1998	2003	NOV 1998
PRECIPITATION	NORMAL (IN)	30	1.57	1.35	2.22	3.13	2.74	3.07	3.17	3.43	3.76	234	2.65	2.18	31.61
PRECIPITATION	MAXIMUM MONTHLY (IN)	65	4.02	5.28	4.33	5.90	8.19	6.52	9.35	11.04	10.86	6.59	5.66	4.66	11.04
PRECIPITATION	YEAR OF OCCURRENCE		2006	1954	1948	1947	2004	1994	1992	1975	1986	2001	2003	1971	AUG 1975
PRECIPITATION	MINIMUM MONTHLY (IN)	65	0.07	0.17	0.25	0.62	0.34	0.63	0.73	0.45	0.29	0.33	0.66	0.44	0.07
PRECIPITATION	YEAR OF OCCURRENCE		1945	1969	1958	1942	1988	1988	1978	1969	2002	1944	1980	1969	JAN 1945
PRECIPITATION	MAXIMUM IN 24 HOURS (IN)	65	1.81	2.85	2.33	2.89	2.25	3.55	3.72	4.45	6.04	3.19	2.30	1.77	6.04
PRECIPITATION	YEAR OF OCCURRENCE		1967	1954	1948	1976	1974	1943	1957	1968	1950	1981	1995	1971	SEP 1950
PRECIPITATION	NORMAL NO. DAYS WITH:														
PRECIPITATION	PRECIPITATION >= 0.01	30	13.8	10.9	12.2	12.9	10.7	10.5	9.7	10.1	10.5	10.1	12.6	13.8	137.8
PRECIPITATION	PRECIPITATION >= 1.00	30	0.1	0.1	0.3	0.5	0.4	0.6	0.8	0.5	1.0	0.3	0.4	0.2	5.2
SNOWFALL	NORMAL (IN)	30	13.2	9.4	7.7	2.6	0.*	0.0	0.0	0.0	0.0	0.3	3.5	11.6	48.3
SNOWFALL	MAXIMUM MONTHLY (IN)	65	28.5	20.8	19.4	17.3	0.6	T	T	T	T	4.4	16.2	35.3	35.3
SNOWFALL	YEAR OF OCCURRENCE		1976	1990	1965	1975	1961	2006	1992	1998	1975	1989	1951	2000	DEC 2000
SNOWFALL	MAXIMUM IN 24 HOURS (IN)	65	19.8	11.3	12.6	16.7	0.5	T	T	T	T	3.5	13.4	10.8	19.8
SNOWFALL	YEAR OF OCCURRENCE		1967	1965	1973	1975	1961	1992	1992	1998	1975	1989	1951	2000	JAN 1967
SNOWFALL	MAXIMUM SNOW DEPTH (IN)	57	23	23	13	17	0	0	0	0	0	2	8	20	23
SNOWFALL	YEAR OF OCCURRENCE		1967	1967	1973	1975						1997	1975	2000	FEB 1967
SNOWFALL	NORMAL NO. DAYS WITH:														
SNOWFALL	SNOWFALL >= 1.0	30	4.0	3.1	2.5	0.5	0.0	0.0	0.0	0.0	0.0	0.1	1.2	3.9	15.3

Source: Reference 2.3-202

Table 2.3-204 Local Climatological Data Summary for Toledo, Ohio (Sheet 1 of 2) [EF3 COL 2.0-7-A]

NORMALS, MEANS, AND EXTREMES
TOLEDO (KTOL)

LATITUDE: 41° 35'N **LONGITUDE:** -83° 48'W **ELEVATION (FT):** GRND: 674 BARO: 693 **TIME ZONE:** EASTERN (UTC-5) **WBAN: 94830**

	ELEMENT	POR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
TEMPERATURE °F	NORMAL DAILY MAXIMUM	30	31.4	35.1	46.5	58.9	70.7	79.5	83.4	81.0	74.0	62.1	48.3	36.0	58.9
	MEAN DAILY MAXIMUM	52	31.1	34.8	45.4	59.4	70.6	79.8	83.9	81.9	74.9	62.8	48.7	36.0	59.1
	HIGHEST DAILY MAXIMUM	51	65	71	81	88	95	104	104	99	98	91	80	70	104
	YEAR OF OCCURRENCE		1995	2000	1998	2002	1962	1988	1995	1993	1978	1963	2003	2001	JUL 1995
	MEAN OF EXTREME MAXS.	52	51.4	55.9	70.4	80.9	87.2	92.8	94.3	91.8	89.4	80.7	68.6	56.9	76.7
	NORMAL DAILY MINIMUM	30	16.4	18.9	27.9	37.7	48.6	58.2	62.6	60.7	52.9	41.6	32.6	23.3	40.0
	MEAN DAILY MINIMUM	52	16.4	18.9	27.0	37.5	47.4	56.7	61.3	59.6	51.9	40.8	32.0	21.8	39.3
	LOWEST DAILY MINIMUM	51	-20	-14	-6	8	25	32	40	34	26	15	2	-19	-20
	YEAR OF OCCURRENCE		1984	1982	1984	1982	2005	1972	1988	1982	1974	1976	1958	1989	JAN 1984
	MEAN OF EXTREME MINS.	52	-4.4	-0.7	9.0	21.6	32.4	42.7	48.9	46.8	35.5	25.1	16.1	1.1	22.8
	NORMAL DRY BULB	30	23.9	27.0	37.2	48.3	59.6	68.8	73.0	70.8	63.5	51.8	40.5	29.2	49.5
	MEAN DRY BULB	52	23.8	26.9	36.3	48.4	59.0	68.4	72.6	70.7	63.4	51.8	40.3	28.9	49.2
	MEAN WET BULB	23	24.2	26.4	33.2	43.4	53.4	62.2	66.5	65.3	58.1	47.3	37.9	28.1	45.5
	MEAN DEW POINT	23	20.1	22.1	27.6	37.0	48.0	57.8	62.6	62.2	54.4	42.9	33.6	24.6	41.1
	NORMAL NO. DAYS WITH:														
	MAXIMUM >= 90	30	0.0	0.0	0.0	0.0	0.9	3.4	5.9	3.2	1.2	0.0	0.0	0.0	14.6
	MAXIMUM <= 32	30	16.7	12.6	4.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	1.7	10.6	45.8
	MINIMUM <= 32	30	28.5	24.6	21.5	9.6	1.0	*	0.0	0.0	0.4	6.1	16.8	26.0	134.5
	MINIMUM <= 0	30	4.3	3.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	8.9
H/C	NORMAL HEATING DEG. DAYS	30	1281	1079	878	517	224	45	6	18	129	431	745	1107	6460
	NORMAL COOLING DEG. DAYS	30	0	0	1	7	42	148	248	190	73	6	0	0	715
RH	NORMAL (PERCENT)	30	77	75	70	66	67	69	71	76	76	74	76	79	73
	HOUR 01 LST	30	80	79	77	75	79	83	85	89	88	83	80	82	82
	HOUR 07 LST	30	81	81	81	79	80	82	86	91	92	87	83	83	84
	HOUR 13 LST	30	71	67	60	53	53	55	56	59	58	58	66	73	61
	HOUR 19 LST	30	76	72	65	58	57	59	61	68	71	71	74	78	68
S	PERCENT POSSIBLE SUNSHINE	40	41	46	50	52	60	64	65	63	61	54	37	33	52
W/O	MEAN NO. DAYS WITH:														
	HEAVY FOG (VISBY <= 1/4 MI)	43	1.8	1.6	1.8	0.7	0.7	1.0	0.8	1.6	1.7	1.8	1.4	2.3	17.2
	THUNDERSTORMS	52	0.2	0.5	1.6	3.3	4.5	6.1	6.2	5.2	3.0	1.1	0.8	0.2	32.7
CLOUDNESS	MEAN:														
	SUNRISE-SUNSET (OKTAS)														
	MIDNIGHT-MIDNIGHT (OKTAS)														
	MEAN NO. DAYS WITH:														
	CLEAR				2.0		2.0								
	PARTY CLOUDY				1.0										
	CLOUDY	1	1.0	1.0	2.0										

Table 2.3-204 Local Climatological Data Summary for Toledo, Ohio (Sheet 2 of 2) [EF3 COL 2.0-7-A]

NORMALS, MEANS, AND EXTREMES
TOLEDO (KTOL)

LATITUDE: 41° 35’N **LONGITUDE:** -83° 48’W **ELEVATION (FT):** GRND: 674 BARO: 693 **TIME ZONE:** EASTERN (UTC-5) **WBAN:** 94830

	ELEMENT	POR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
PR	MEAN STATION PRESSURE (IN)	23	29.32	29.32	29.29	29.23	29.24	29.24	29.26	29.30	29.32	29.32	29.32	29.33	29.29
PR	MEAN SEA-LEVEL PRES. (IN)	23	30.09	30.10	30.05	29.98	29.98	29.97	29.99	30.03	30.05	30.07	30.07	30.10	30.04
WINDS	MEAN SPEED (MPH)	23	10.8	10.3	10.6	10.6	9.2	7.9	7.2	6.6	7.2	8.5	10.1	10.0	9.1
WINDS	PREVAIL DIR (TENS OF DEGS)	32	25	25	07	07	24	24	24	25	25	24	25	25	25
WINDS	MAXIMUM 2-MINUTE:														
WINDS	SPEED (MPH)	11	43	46	46	48	46	44	40	43	38	45	51	48	51
WINDS	DIR. (TENS OF DEGS)		24	26	24	25	25	28	26	26	24	24	21	30	21
WINDS	YEAR OF OCCURRENCE		1996	2001	2002	1997	2000	2005	2003	1998	2001	1996	2005	1998	NOV 2005
WINDS	MAXIMUM 5-SECOND														
WINDS	SPEED (MPH)	11	56	56	69	61	68	53	52	54	47	59	66	56	69
WINDS	DIR. (TENS OF DEGS)		25	26	23	27	27	28	29	26	23	25	24	31	23
WINDS	YEAR OF OCCURRENCE		1996	2001	2002	2003	1999	2005	2005	1998	2001	1996	1998	1998	MAR 2002
PRECIPITATION	NORMAL (IN)	30	1.93	1.88	2.62	3.24	3.14	3.80	2.80	3.19	2.84	2.35	2.78	2.64	33.21
PRECIPITATION	MAXIMUM MONTHLY (IN)	51	4.61	5.39	5.70	6.10	6.80	8.48	9.19	8.47	8.10	6.26	6.86	6.81	9.19
PRECIPITATION	YEAR OF OCCURRENCE		1965	1990	1985	1977	2000	1981	2006	1965	1972	2001	1982	1967	JUL 2006
PRECIPITATION	MINIMUM MONTHLY (IN)	51	0.27	0.27	0.58	0.88	0.96	0.27	0.34	0.40	0.58	0.27	0.55	0.54	0.27
PRECIPITATION	YEAR OF OCCURRENCE		1961	1969	1958	1962	1964	1988	1995	1976	1963	2005	1976	1958	OCT 2005
PRECIPITATION	MAXIMUM IN 24 HOURS (IN)	51	1.78	2.59	2.60	3.43	2.34	3.21	4.39	2.42	3.97	3.21	3.17	3.53	4.39
PRECIPITATION	YEAR OF OCCURRENCE		1959	1990	1985	1977	1991	1978	1969	1972	1972	1988	1982	1967	JUL 1969
PRECIPITATION	NORMAL NO. DAYS WITH:														
PRECIPITATION	PRECIPITATION >= 0.01	30	13.6	10.6	12.5	12.7	11.9	10.6	9.4	9.6	9.9	9.9	12.0	13.6	136.3
PRECIPITATION	PRECIPITATION >= 1.00	30	0.1	0.2	0.2	0.3	0.6	0.7	0.6	0.6	0.6	0.3	0.4	0.3	4.9
SNOWFALL	NORMAL (IN)	30	10.8	8.5	5.6	1.3	0.1	0.0	0.0	0.0	0.0	0.2	2.6	8.3	37.4
SNOWFALL	MAXIMUM MONTHLY (IN)	45	30.8	16.6	17.7	12.0	1.3	T	T	T	T	2.0	17.9	24.2	30.8
SNOWFALL	YEAR OF OCCURRENCE		1978	1994	1993	1957	1989	1995	1992	1994	1993	1989	1966	1977	JAN 1978
SNOWFALL	MAXIMUM IN 24 HOURS (IN)	45	12.0	7.7	9.7	9.8	1.3	T	T	T	T	1.8	8.3	13.9	13.9
SNOWFALL	YEAR OF OCCURRENCE		2005	1981	1993	1957	1989	1995	1992	1994	1993	1989	1966	1974	DEC 1974
SNOWFALL	MAXIMUM SNOW DEPTH (IN)	43	17	19	8	10	1	0	0	0	0	1	8	16	19
SNOWFALL	YEAR OF OCCURRENCE		1978	1978	2002	1957	1989					1989	1966	1977	FEB 1978
SNOWFALL	NORMAL NO. DAYS WITH:														
SNOWFALL	SNOWFALL >= 1.0	30	3.3	2.8	1.7	0.4	0.0	0.0	0.0	0.0	0.0	0.1	1.0	2.5	11.8

Source: Reference 2.3-203

Table 2.3-205 Climatological Normals for National Weather Service First-Order and Cooperative Observation Stations in the Region Surrounding the Fermi Site [EF3 COL 2.0-7-A]

	Normal Annual Temperatures (ºF)			Normal Annual Precipitation	
Station	Daily Maximum	Daily Minimum	Daily Normal	Precipitation (inches)	Snowfall (inches)
Monroe	57.4 [(A)]	40.4 [(A)]	49.0 [(A)]	33.4 [(A)]	25.3 [(A)]
Detroit (Detroit Metropolitan Airport)	58.4 [(B)]	41.0 [(B)]	49.7 [(B)]	32.9 [(B)]	44.0 [(B)]
Windsor, ON	57.2 [(C)]	40.8 [(C)]	48.9 [(C)]	36.2 [(C)]	49.8 [(C)]
Ann Arbor (Univ. of Michigan)	58.1 [(D)]	39.9 [(D)]	49.0 [(D)]	35.4 [(D)]	52.1 [(D)]
Toledo, OH	58.9 [(E)]	40.0 [(E)]	49.5 [(E)]	33.2 [(E)]	37.4 [(E)]
Adrian 2 NNE	59.1 [(F)]	37.3 [(F)]	48.3 [(F)]	35.2 [(F)]	29.2 [(F)]
Flint	56.8 [(G)]	36.7 [(G)]	46.8 [(G)]	31.6 [(G)]	48.3 [(G)]

Source A: Reference 2.3-204
Source B: Reference 2.3-201
Source C: Reference 2.3-205
Source D: Reference 2.3-206
Source E: Reference 2.3-203
Source F: Reference 2.3-207
Source G: Reference 2.3-202

Table 2.3-206 Climatological Extremes for National Weather Service First-Order and Cooperative Observation Stations Surrounding the Fermi Site [EF3 COL 2.0-7-A]

Parameter	Monroe	Detroit [1]	Windsor, ON	Ann Arbor (Univ. of Michigan)	Toledo, OH	Adrian [2] NNE	Flint
Maximum Temperature	106 (A) (1934) (1988)	105 (B) (1934)	104 (D) (1988)	105 (A) (1934)	104 (E) (1995)	108 (A) (1934) (1936)	101 (G) (1995)
Minimum Temperature	-21 (A) (1918)	-24 (B) (1872)	-20 (D) (1994)	-23 (A) (1885)	-20 (F) (1984)	-26 (A) (1892)	-25 (G) (1976)
Max 24-hr Precipitation (inches)[2]	4.22 (A) (1931)	4.78 (C) (1947)	3.72 (D) (2000)	4.54 (A) (1998)	4.39 (E) (1969)	4.74 (A) (1981)	6.04 (G) (1950)
Max Monthly Precipitation (inches)	9.03 (A) (2007)	8.76 (B) (2004)	N/A --	10.78 (A) (2002)	9.19 (F) (2006)	11.17 (A) (1943)	11.04 (G) (1975)
Min Monthly Prwcipitation (inches)	0.03 (A) (1987)	0.13 (B) (2005)	N/A --	00.0 (A) (1894)	0.27 (F) (2005)	0.00 (A) (2004)	0.07 (G) (1945)
Max 24-hr Snowfall (inches)	20.0 (A) (1974)	24.5 (B) (1886)	14.5 (D) (1965)	20.0 (A) (1894)	13.9 (E) (1974)	15.0 (A) (2000)	19.8 (G) (1967)
Max Monthly Snowfall (inches)	29.0 (A) (1978)	38.4 (B) (2008)	N/A --	58.5 (A) (1923)	30.8 (F) (1978)	34.5 (A) (1978)	35.3 (G) (2000)

1. Extreme values for Detroit were observed in the vicinity of the meteorological stations at Detroit City Airport and Willow Run Airport.
2. The highest reported 24-hour precipitation amount for COOP stations was reported at Grosse Pointe Farms in July 1976 with a value of 5.13 inches.(H)

Source A: Reference 2.3-210
Source B: Reference 2.3-211
Source C: Reference 2.3-212
Source D: Reference 2.3-205
Source E: Reference 2.3-203
Source F: Reference 2.3-213
Source G: Reference 2.3-202
Source H: Reference 2.3-214

Table 2.3-207 Annual Summaries of Hours with Dust Reported for Detroit Metropolitan Airport During the Period 1961-1995 [EF3 COL 2.0-7-A]

Year	Annual Hours of Dust	Annual Frequency of Occurrence(2)
1961	0	--
1962	0	--
1963	1	0.01%
1964(1)	4	0.05%
1965	0	--
1966	2	0.02%
1967	0	--
1968	0	--
1969	0	--
1970	0	--
1971	0	--
1972	0	--
1973	0	--
1974	1	0.01%
1975	0	--
1976(1)	8	0.09%
1977	0	--
1978	0	--
1979	0	--
1980	0	--
1981	0	--
1982	0	--
1983	0	--
1984	7	0.08%
1985	4	0.05%
1986	0	--
1987	0	--
1988	0	--
1989	0	--
1990	0	--
1991	0	--
1992	0	--
1993	1	0.01%
1994	0	--
1995	0	--

Notes:

1. Calculations for leap years add an additional day to the calendar year.
2. Refers to percentage of total hours for the year.

Source: Reference 2.3-227, Reference 2.3-228

Table 2.3-208 Distribution for Duration of Discrete Dust Events at Detroit Metropolitan Airport (1961-1995) [EF3 COL 2.0-7-A]

Month	1	2	3	4	5	6	7	10+	Annual Total of Occurrences
	Duration of Discrete Events (Hours)								
1963	1								1
1964		2							2
1966		1							1
1974	1								1
1976	1						1(1)		2
1984	1	1		1					3
1985				1					1
1993	1								1
Total Occurrences by Duration	5	4	0	2	0	0	1	0	12

Notes:

1. The longest stretch of consecutive hours with dust at Detroit Metropolitan Airport during the 1961-1995 time period is 7 hours, occurring in May of 1976.

Source: Reference 2.3-227, Reference 2.3-228

Table 2.3-209 Summaries for Freezing Rain Events Occurring in the Five-County Area Surrounding the Fermi Site (1993-2007) [EF3 COL 2.0-7-A]

Event Date	Reported Accumulations (in.)	Duration (Hours)	Calculated Maximum Ice Accretion (in.)[2]
1/21/1993	0.40	36	0.96
3/4/1993 [1]	--	18	1.09
1/27/1994	0.25	25	1.68
2/27/1995	0.25	14	0.33
3/6/1995	0.25	27	1.09
4/10/1995	Trace	3	0.26
12/13/1995	0.25	9	0.44
3/13/1997	1.5-2.5	19	1.96
1/13/1998 [1]	--	7	0.12
1/2/1999 [1]	--	15	0.77
3/11/2000	Trace	7	0.15
12/11/2000	0.25	15	0.71
12/13/2000	Trace	12	0.36
1/29/2001	0.20	9	0.36
2/24/2001	0.25	25	1.08
1/30/2002	0.50	62	2.50
3/24/2002	Trace	13	0.27
3/26/2002	0.50	27	1.05
1/4/2004	Trace	24	0.27
1/26/2004	0.13	23	0.27
1/5/2005	0.75	33	0.47
1/14/2007	0.50	24	1.11
2/25/2007	0.50	18	0.31
3/1/2007	0.20	22	1.48

Notes:

1. Ice accumulations were not available for selected dates from the NCDC Storm Database.
2. 3 inches of ice accumulation occurred during the freezing rain event of January 26-27, 1967 across northern Ohio.

Source: Reference 2.3-220, Reference 2.3-247

Table 2.3-210 Ambient Temperature and Humidity Statistics for Detroit Metropolitan Airport [EF3 COL 2.0-7-A]

Minimum Annual Dry-Bulb Heating Exceedance	99.0%	5.3°F
	99.6%	0.2°F
	0.0%	-30.8°F
Maximum Annual Dry-Bulb/Wet-Bulb (Coincident) Cooling Exceedance	2.0%	84.7°F / 70.8°F
	1.0%	87.3°F / 72.2°F
	0.0%	104.1°F / 73.9°F
Maximum Annual Wet-Bulb (Non-Coincident) Cooling Exceedance	2.0%	73.1°F
	1.0%	74.8°F
	0.0%	86.0°F

Notes:
Data for the 2% and 1% maximum and minimum annual dry-bulb and wet-bulb temperatures are taken from the 2005 ASHRAE handbook.

Source: Reference 2.3-201, Reference 2.3-227, Reference 2.3-228, Reference 2.3-234, Reference 2.3-239

Table 2.3-211 Monthly and Annual Temperature Data (ºF) for Detroit Metropolitan Airport and Fermi Site (2003 - 2007) [EF3 COL 2.0-8-A]

Period		Upper Level – 60-m Fermi Site	Lower Level – 10-m Fermi Site	Single Level – 10-m Detroit Metropolitan Airport [(A)]
January	Mean	25.7	26.2	26.2
	Maximum	57.8	55.6	58.0
	Minimum	-0.6	-3.8	-4.0
February	Mean	25.2	25.8	25.9
	Maximum	53.5	53.3	57.0
	Minimum	-4.1	-3.5	-3.0
March	Mean	35.8	35.9	37.2
	Maximum	76.9	78.5	81.0
	Minimum	-2.9	-2.9	-2.0
April	Mean	47.9	48.4	49.7
	Maximum	86.9	85.5	86.0
	Minimum	19.8	20.5	21.0
May	Mean	57.9	58.4	59.3
	Maximum	85.0	88.0	91.0
	Minimum	34.3	33.6	32.0
June	Mean	68.7	69.2	69.7
	Maximum	91.8	94.2	95.0
	Minimum	44.5	42.3	40.0
July	Mean	72.5	73.1	73.5
	Maximum	91.9	94.3	95.0
	Minimum	52.3	52.2	50.0
August	Mean	71.8	72.2	72.5
	Maximum	92.0	93.7	97.0
	Minimum	51.9	51.7	52.0
September	Mean	65.4	65.6	65.3
	Maximum	83.7	85.8	90.0
	Minimum	37.2	39.1	39.0
October	Mean	53.8	53.9	53.4
	Maximum	85.7	87.4	90.0
	Minimum	31.8	32.0	31.0
November	Mean	42.3	42.6	42.5
	Maximum	72.4	72.1	75.0
	Minimum	12.4	13.5	13.0
December	Mean	30.6	31.0	31.1
	Maximum	56.8	57.5	59.0
	Minimum	-2.0	-2.4	-2.0
Annual	Mean	50.0	50.3	50.7
	Maximum	92.0	94.3	97.0
	Minimum	-4.1	-3.8	-4.0

Source A: Reference 2.3-229

Table 2.3-212 Monthly and Annual Dew-point Temperature (°F) Summaries for the Fermi Site (2003 - 2007) [EF3 COL 2.0-8-A]

	Mean Dew-point	Measured Dew-point Extremes		Mean Dew-point Diurnal Range
		Maximum	Minimum	
January	16.6	50.2	-14.7	11.3
February	15.7	45.4	-14.5	10.8
March	24.5	57.2	-14.8	10.7
April	33.3	56.1	8.9	9.7
May	45.1	69.0	18.0	10.4
June	54.7	71.1	35.8	9.0
July	58.1	72.4	38.8	8.1
August	58.1	74.7	36.7	7.7
September	51.3	68.1	28.4	8.8
October	40.6	66.0	-5.4	9.5
November	31.7	58.8	-6.4	10.8
December	21.7	50.2	-21.8	9.4
Annual	37.6	74.7	-21.8	9.7

Table 2.3-213 Hours with Precipitation and Hourly Precipitation Rate Distribution for Detroit Metropolitan Airport at Detroit, Michigan (2003-2007) [EF3 COL 2.0-8-A]

Month	Trace	0.01-0.09 in	0.10-0.24 in	0.25-0.49 in	0.50-0.99 in	≥1.00 in	Hours with Precipitation	Number of Observations
January	684	287	21	1	0	0	993	3720
February	524	199	11	0	1	0	735	3384
March	463	213	28	1	1	0	706	3720
April	339	176	26	1	0	0	542	3600
May	295	230	45	15	4	0	589	3720
June	176	131	17	6	5	1	336	3600
July	162	142	33	10	4	0	351	3720
August	182	140	27	17	7	0	373	3720
September	145	138	27	5	0	0	315	3600
October	241	210	23	1	0	0	475	3720
November	332	279	41	3	1	0	656	3600
December	576	315	25	3	0	0	919	3720
Annual	4119	2460	324	63	23	1	6990	43824
Percent of Total Hours	9.40%	5.61%	0.74%	0.14%	0.05%	0.002%	15.95%	

Source: Reference 2.3-247

Table 2.3-214 Estimated Maximum Precipitation Amounts (Inches) for Durations 1 Hour to 24 Hours and Recurrence Intervals 1 year to 100 years for DTE [EF3 COL 2.0-8-A]

	Recurrence Interval (Years)						
Duration (Hours)	**1**	**2**	**5**	**10**	**25**	**50**	**100**
1	1.10(A)	1.09(B)	1.35(B)	1.55(B)	1.78(B)	2.00(B)	2.30(B)
2	1.20(A)	1.35(B)	1.65(B)	1.90(B)	2.20(B)	2.40(B)	2.80(B)
3	1.32(A)	1.55(B)	1.85(B)	2.10(B)	2.45(B)	2.75(B)	3.25(B)
6	1.55(A)	1.75(B)	2.15(B)	2.40(B)	2.90(B)	3.40(B)	3.70(B)
12	1.80(A)	1.95(B)	2.45(B)	2.88(B)	3.30(B)	3.80(B)	4.50(B)
24	2.20(A)	2.30(B)	2.88(B)	3.30(B)	3.80(B)	4.40(B)	4.75(B)

Source A: Reference 2.3-248
Source B: Reference 2.3-249

Table 2.3-215 Observed Maximum Precipitation Events at Detroit Metro Airport for Durations from 1 Hour to 24 Hours [EF3 COL 2.0-8-A]

	Observed Maximum Precipitation Amounts (Inches)			
Duration (Hours)	Amount(1)	Date	Amount(2)	Date
1	3.09	9/1/1961	2.54	7/7/1998
2	3.86	7/21/1951	3.60	7/7/1998
3	4.12	7/21/1951	3.67	7/7/1998
6	4.51	7/21/1951	3.72	7/8/1998
12	4.56	7/21/1951	3.74	7/8/1998
24	4.75	8/29/1947	3.79	7/8/1998

Notes:

1. Data period of 1889-1961 at Detroit City Airport
2. Data period of 1962-2007 at Detroit Metropolitan Airport

Source A: Reference 2.3-250
Source B: Reference 2.3-227, Reference 2.3-228, Reference 2.3-247

Table 2.3-216 Mean Monthly and Annual Summaries (Hours) of Fog and Heavy Fog for Detroit, Michigan (1961-1995) [EF3 COL 2.0-8-A]

	Mean Number of Hours and Frequency of Hours					
Month	**Fog**		**Heavy Fog**		**Smoke and/or Haze**	
January	99.4	13.4%	7.9	1.1%	94	12.7%
February	93.9	13.9%	8.6	1.3%	91	13.5%
March	107.4	14.4%	9.0	1.2%	97	13.1%
April	73.6	10.2%	2.3	0.3%	61	8.5%
May	73.2	9.8%	1.6	0.2%	84	11.3%
June	64.9	9.0%	1.6	0.2%	106	14.7%
July	69.1	9.3%	1.3	0.2%	131	17.7%
August	96.7	13.0%	3.2	0.4%	158	21.3%
September	97.7	13.6%	3.9	0.5%	115	15.9%
October	99.8	13.4%	4.9	0.7%	86	11.6%
November	106.8	14.8%	5.1	0.7%	86	12.0%
December	129.6	17.4%	10.8	1.5%	76	10.3%
Annual	1112.0	12.7%	60.2	0.7%	1187	13.5%

Source: Reference 2.3-227, Reference 2.3-228

Table 2.3-217 Monthly and Annual Mean Wind Speeds (mph) for Detroit Metropolitan Airport and Fermi Site (2003 - 2007) [EF3 COL 2.0-8-A]

Period	Upper Level – 60-m Fermi Site	Lower Level – 10-m Fermi Site	Single Level – 10-m Detroit Metropolitan Airport (A)
January	14.33	7.45	10.30
February	13.61	7.23	9.83
March	14.13	7.46	9.66
April	14.65	8.21	10.25
May	12.36	6.68	8.19
June	10.85	5.57	7.50
July	10.38	5.12	7.56
August	10.10	5.01	6.83
September	11.38	5.68	7.02
October	13.03	6.06	8.49
November	13.86	7.02	9.36
December	14.37	7.28	10.12
Annual	12.74	6.56	8.75

Source A: Reference 2.3-229

Table 2.3-218 Wind Direction Persistence Summaries - Fermi Site 10-m Level [EF3 COL 2.0-8-A]

Number of Occurrences for Winds Blowing from the Same 22.5° Direction

2003-2007

All Wind Speeds

HOURS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	% of PERSISTENT WINDS
2	189	148	130	148	156	174	167	179	195	236	268	263	254	253	234	183	44.80%
3	82	54	60	77	59	84	93	87	98	128	135	134	110	119	106	82	21.26%
4	43	34	37	36	41	57	58	36	39	87	71	73	63	63	70	40	11.96%
5	20	19	18	19	21	35	36	27	38	42	54	35	27	48	27	32	7.02%
6	7	11	23	10	10	23	23	12	14	27	23	33	18	36	18	12	4.23%
7	5	7	11	7	7	19	20	9	13	27	23	23	13	19	11	10	3.16%
8	7	3	8	5	13	10	9	10	4	24	18	11	7	12	5	7	2.16%
9	3	4	4	4	6	5	5	4	3	14	15	6	4	4	6	11	1.38%
10	5	2	5	2	2	1	4	1	2	11	13	6	3	5	1	4	0.94%
11	0	0	2	2	2	5	1	2	2	12	5	0	5	6	2	5	0.72%
12	2	0	3	1	3	3	2	0	1	5	10	2	0	3	2	1	0.54%
13	2	0	0	0	4	6	1	0	0	2	2	3	1	2	0	1	0.34%
14	0	0	1	0	1	0	0	0	2	3	2	2	2	2	0	2	0.24%
15	1	0	2	2	1	0	0	0	0	6	6	0	1	1	1	1	0.31%
16	0	1	0	0	3	1	0	0	0	4	0	1	1	1	0	0	0.17%
17	0	0	0	0	1	1	0	0	0	4	2	1	1	0	0	2	0.17%
18	0	0	1	0	0	0	0	0	0	1	1	1	1	0	0	1	0.08%
19	0	0	1	0	0	0	0	0	0	0	4	2	0	0	0	0	0.10%
20	0	0	0	1	1	0	0	0	0	1	2	3	0	0	1	0	0.13%
21	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0.04%
22	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0.01%
23	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0.03%
24	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0.01%
25	1	0	0	0	0	0	0	0	0	2	1	1	0	0	0	0	0.07%
26	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0.03%
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
30	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0.04%
31	1	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0.04%
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
39	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0.01%
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
% of PERSISTENT DIRECTION	5.20%	3.99%	4.31%	4.43%	4.67%	5.98%	5.91%	5.17%	5.80%	9.04%	9.33%	8.46%	7.21%	8.11%	6.84%	5.56%	
AVE PERSISTENT HOURS	3.40	3.18	3.86	3.36	3.83	3.80	3.60	3.22	3.27	4.54	4.38	3.70	3.34	3.64	3.28	3.66	

* THE LONGEST PERSISTENT WIND WAS FROM THE SOUTH BY SOUTHWEST AND LASTED 39 HOURS

Table 2.3-219 Wind Direction Persistence Summaries - Fermi Site 10-m Level [EF3 COL 2.0-8-A]

Number of Occurrences for Winds Blowing from the Same 22.5° Direction

2003-2007

0-5 MPH

HOURS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	% of PERSISTENT WINDS
2	93	87	29	20	35	61	50	86	99	116	171	231	212	219	198	145	62.55%
3	28	31	8	7	7	14	19	16	27	40	63	92	73	94	77	41	21.51%
4	9	7	3	0	2	8	3	1	14	16	23	42	29	39	29	17	8.17%
5	5	4	0	1	1	1	5	3	4	6	15	16	5	31	13	8	3.99%
6	1	1	0	0	0	0	1	0	3	4	5	11	2	11	3	1	1.45%
7	2	0	0	0	0	2	0	0	1	3	2	9	1	8	4	5	1.25%
8	1	0	0	0	0	0	0	0	0	1	1	3	2	3	1	1	0.44%
9	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0.14%
10	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0.10%
11	0	0	0	0	0	1	0	0	0	1	0	0	0	3	0	0	0.17%
12	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0.03%
13	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0.10%
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
18	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.03%
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
20	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.03%
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
39	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0.03%
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
% of PERSISTENT DIRECTION	4.80%	4.39%	1.38%	0.98%	1.52%	2.94%	2.63%	3.58%	5.00%	6.35%	9.52%	13.71%	10.98%	13.85%	10.98%	7.40%	

Table 2.3-220 Wind Direction Persistence Summaries - Fermi Site 10-m Level [EF3 COL 2.0-8-A]

Number of Occurrences for Winds Blowing from the Same 22.5° Direction

2003-2007

5-10 MPH

HOURS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	% of PERSISTENT WINDS
2	92	86	103	132	120	168	167	171	159	208	215	150	102	113	120	121	47.09%
3	49	39	58	64	45	73	71	73	68	113	102	70	61	60	51	50	22.14%
4	20	14	38	26	28	35	57	36	35	67	44	41	39	31	32	32	12.16%
5	20	9	17	16	9	30	31	19	24	44	19	24	19	27	15	26	7.38%
6	6	2	18	5	5	14	23	9	9	16	14	15	8	12	14	13	3.87%
7	6	2	6	0	3	10	12	9	11	27	11	12	5	6	3	6	2.73%
8	4	0	8	2	5	7	3	4	0	21	8	6	4	5	6	6	1.88%
9	1	0	4	1	0	3	5	1	2	6	6	3	3	1	4	3	0.91%
10	1	1	3	1	2	0	1	1	1	4	5	3	2	3	1	2	0.66%
11	0	0	3	1	0	1	1	0	1	3	4	2	1	0	0	0	0.36%
12	0	0	2	0	0	3	2	0	0	2	0	0	1	2	1	0	0.27%
13	0	0	0	0	1	3	1	0	0	1	0	2	2	0	0	0	0.21%
14	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0.04%
15	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0.06%
16	1	0	0	0	0	0	0	0	0	1	0	2	0	0	0	0	0.08%
17	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0.06%
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
19	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0.04%
20	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0.02%
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.02%
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
% of PERSISTENT DIRECTION	4.23%	3.24%	5.50%	5.24%	4.61%	7.36%	7.91%	6.83%	6.58%	10.93%	9.07%	7.06%	5.22%	5.50%	5.24%	5.48%	

Table 2.3-221 Wind Direction Persistence Summaries - Fermi Site 10-m Level [EF3 COL 2.0-8-A]

Number of Occurrences for Winds Blowing from the Same 22.5° Direction

2003-2007

10-15 MPH

HOURS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	% of PERSISTENT WINDS
2	27	24	25	43	55	38	14	21	24	66	75	28	14	22	14	16	43.32%
3	11	9	7	19	36	24	8	5	11	40	42	8	8	8	7	12	21.83%
4	11	10	5	7	12	17	2	2	8	20	19	5	3	11	6	6	12.33%
5	6	3	6	4	11	2	2	3	1	21	13	8	3	5	5	6	8.48%
6	2	3	4	2	3	5	3	1	0	11	8	1	1	4	1	2	4.37%
7	0	3	1	2	6	2	0	0	1	7	8	0	1	0	1	1	2.83%
8	1	0	0	4	1	0	0	0	1	2	7	2	3	1	0	2	2.05%
9	0	1	0	3	2	0	0	0	1	4	4	0	0	2	0	0	1.46%
10	2	0	0	1	0	0	0	0	0	4	1	1	2	1	0	0	1.03%
11	0	0	1	0	1	0	0	0	0	3	2	0	0	1	0	0	0.68%
12	1	0	0	0	1	1	0	0	1	0	0	0	1	0	1	0	0.51%
13	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0.17%
14	0	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0.26%
15	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0.17%
16	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.17%
17	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0.17%
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
19	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0.17%
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
% of PERSISTENT DIRECTION	5.31%	4.54%	4.37%	7.45%	11.04%	7.62%	2.48%	2.74%	4.20%	15.33%	15.67%	4.54%	3.08%	4.71%	3.08%	3.85%	

Table 2.3-222 Wind Direction Persistence Summaries - Fermi Site 10-m Level [EF3 COL 2.0-8-A]

Number of Occurrences for Winds Blowing from the Same 22.5° Direction

2003-2007

15-20 MPH

HOURS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	% of PERSISTENT WINDS
2	4	3	1	9	17	3	0	3	1	11	15	2	2	1	1	3	49.03%
3	3	0	0	2	10	1	0	0	0	7	10	1	0	1	1	2	24.52%
4	1	2	0	1	6	1	1	0	0	0	6	0	0	0	0	1	12.26%
5	2	2	0	0	1	1	0	0	0	0	3	0	0	0	0	0	5.81%
6	0	0	0	0	1	0	0	0	0	1	6	0	0	0	0	0	5.16%
7	0	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1.94%
8	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.65%
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
12	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.65%
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
% of PERSISTENT DIRECTION	6.45%	5.81%	0.65%	8.39%	22.58%	3.87%	0.65%	1.94%	0.65%	12.90%	26.45%	1.94%	1.29%	1.29%	1.29%	3.87%	

Table 2.3-223 Wind Direction Persistence Summaries - Fermi Site 10-m Level [EF3 COL 2.0-8-A]

Number of Occurrences for Winds Blowing from the Same 22.5° Direction

2003-2007

>20 MPH

HOURS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	% of PERSISTENT WINDS
2	0	0	0	1	2	0	0	0	0	0	3	0	0	0	0	0	60.00%
3	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	20.00%
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
5	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	10.00%
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
9	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	10.00%
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
% of PERSISTENT DIRECTION	0.00%	0.00%	0.00%	10.00%	30.00%	0.00%	0.00%	0.00%	0.00%	0.00%	60.00%	0.00%	0.00%	0.00%	0.00%	0.00%	

Table 2.3-224 Wind Direction Persistence Summaries - Fermi Site 10-m Level [EF3 COL 2.0-8-A]

Number of Occurrences for Winds Blowing from the Same 67.5° Direction

2003-2007

All Wind Speeds

HOURS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	% of PERSISTENT WINDS
2	123	98	81	117	101	96	84	113	144	151	139	183	187	153	139	131	20.86%
3	87	57	65	81	83	80	80	92	108	107	100	110	113	119	88	88	14.91%
4	54	39	44	50	40	52	84	79	69	73	76	89	95	97	84	70	11.20%
5	46	35	30	35	31	53	56	58	48	52	55	61	62	66	51	49	8.06%
6	31	33	32	20	24	37	44	65	45	47	46	57	47	50	39	36	6.68%
7	27	18	23	26	19	43	31	34	39	39	40	27	35	41	38	30	5.21%
8	21	25	20	25	21	20	38	31	26	28	30	28	29	46	35	24	4.57%
9	18	15	11	9	15	21	35	29	13	26	32	32	35	32	24	19	3.74%
10	13	17	11	11	15	24	22	17	21	26	21	29	19	19	21	21	3.14%
11	18	9	14	9	10	13	23	17	26	20	22	26	22	26	14	8	2.83%
12	11	10	17	9	14	20	18	19	19	21	16	11	16	22	21	9	2.59%
13	4	6	7	6	8	16	13	15	16	20	9	19	15	14	13	16	2.01%
14	6	9	4	7	12	14	16	10	15	12	7	14	9	16	12	7	1.74%
15	9	7	9	5	4	15	11	4	6	9	27	12	11	10	10	7	1.59%
16	4	6	7	10	6	9	11	3	8	11	9	4	10	10	7	16	1.34%
17	1	5	4	4	6	10	7	5	8	11	14	8	5	7	9	5	1.11%
18	2	5	3	3	5	5	1	1	11	16	8	5	12	6	10	4	0.99%
19	2	3	5	3	1	6	4	2	10	8	7	4	8	4	4	5	0.78%
20	4	5	4	6	2	2	2	6	2	8	5	3	6	6	3	7	0.73%
21	4	4	4	1	2	1	1	0	3	8	3	8	7	3	4	8	0.62%
22	3	0	0	5	7	1	0	1	5	8	2	3	0	5	3	3	0.47%
23	5	2	0	1	3	0	1	1	2	8	5	6	1	3	5	1	0.45%
24	0	2	5	3	1	1	1	1	3	5	9	2	1	1	4	1	0.41%
25	0	1	2	3	3	1	3	0	1	7	4	5	1	1	4	2	0.39%
26	0	1	0	2	1	3	0	0	4	7	8	5	3	2	3	3	0.43%
27	1	0	1	1	2	1	1	0	3	5	7	5	6	1	3	5	0.43%
28	1	2	0	1	4	0	0	0	1	3	5	3	5	1	4	2	0.33%
29	0	1	0	2	0	0	0	0	0	3	7	4	4	3	2	5	0.32%
30	1	1	3	0	0	1	1	0	2	4	1	5	0	3	4	0	0.27%
31	0	0	0	1	0	2	1	0	1	1	7	1	0	2	1	1	0.18%
32	1	0	0	0	0	2	0	0	1	2	4	4	2	1	1	1	0.19%
33	0	0	2	1	2	0	0	0	0	2	7	2	0	2	2	0	0.20%
34	0	0	3	0	0	1	0	0	2	1	4	1	0	2	2	0	0.16%
35	0	1	0	1	1	1	0	0	1	1	1	0	0	1	2	0	0.10%
36	0	0	1	2	0	1	0	0	0	3	1	3	2	2	0	0	0.15%
37	0	0	0	0	1	0	1	0	0	2	0	4	1	3	1	0	0.13%
38	0	1	2	1	1	1	1	0	1	0	0	0	0	0	0	0	0.08%
39	0	0	0	2	2	0	0	0	0	0	3	2	0	0	2	0	0.11%
40	0	0	1	1	1	0	0	0	0	1	3	0	2	1	0	0	0.10%
41	0	2	0	1	0	0	0	0	0	0	2	0	1	0	0	0	0.06%
42	0	0	0	0	1	0	0	0	0	1	2	1	1	0	1	0	0.07%
43	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0.03%
44	0	0	1	0	0	0	0	0	0	0	2	1	1	0	0	0	0.05%
45	1	0	0	0	0	0	0	0	0	0	2	2	1	2	0	0	0.08%
46	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0.02%
47	1	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0.03%
48	0	0	0	1	1	0	0	0	0	1	0	1	0	0	0	0	0.04%
% of PERSISTENT DIRECTION	5.10%	4.29%	4.25%	4.76%	4.61%	5.65%	6.04%	6.17%	6.79%	7.78%	7.71%	8.09%	7.92%	8.01%	6.85%	5.97%	
AVE PERSISTENT HOURS	6.21	7.10	7.67	7.18	7.63	7.38	6.95	5.98	7.10	8.61	9.31	7.81	7.05	7.22	7.68	7.04	

THE LONGEST PERSISTENT WIND WAS FROM THE WEST BY SOUTHWEST AND LASTED 158 HOURS

Table 2.3-225 Wind Direction Persistence Summaries - Fermi Site 10-m Level [EF3 COL 2.0-8-A]

Number of Occurrences for Winds Blowing from the Same 67.5° Direction

2003-2007

0-5 MPH

HOURS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	% of PERSISTENT WINDS
2	105	120	55	36	49	72	75	98	131	145	182	208	197	174	183	152	39.34%
3	53	48	32	17	21	29	25	40	57	67	95	119	126	131	97	88	20.74%
4	35	27	18	5	3	15	26	25	40	38	59	88	76	84	71	47	13.04%
5	19	23	8	3	4	9	6	14	13	18	47	60	49	54	59	36	8.38%
6	12	14	3	0	3	5	8	8	12	18	29	26	43	38	29	24	5.40%
7	12	6	0	1	3	0	3	2	9	10	16	23	22	26	25	13	3.39%
8	6	4	2	2	3	1	4	1	1	7	11	24	14	32	18	4	2.66%
9	1	0	0	1	1	4	2	1	2	3	13	19	18	26	13	6	2.18%
10	4	2	2	0	0	0	3	1	2	4	7	6	7	12	10	4	1.27%
11	2	0	1	2	0	1	0	0	2	1	4	12	6	16	7	2	1.11%
12	1	0	0	0	1	0	0	1	1	3	4	6	10	8	10	1	0.91%
13	0	0	0	0	0	0	0	0	0	0	1	5	7	7	3	0	0.46%
14	2	0	0	0	0	0	1	0	0	0	1	4	5	2	2	0	0.34%
15	0	1	0	0	0	1	0	0	0	0	2	2	3	3	0	1	0.26%
16	0	0	0	0	0	0	0	0	0	0	0	2	2	1	1	1	0.14%
17	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	0	0.08%
18	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0.06%
19	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0.04%
20	0	0	0	1	0	1	0	0	0	1	0	0	0	3	0	0	0.12%
21	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0.04%
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.02%
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
39	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0.02%
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
% of PERSISTENT DIRECTION	5.02%	4.86%	2.40%	1.35%	1.75%	2.74%	3.04%	3.79%	5.36%	6.27%	9.37%	11.99%	11.71%	12.27%	10.54%	7.54%	

Table 2.3-226 Wind Direction Persistence Summaries - Fermi Site 10-m Level [EF3 COL 2.0-8-A]

Number of Occurrences for Winds Blowing from the Same 67.5° Direction

2003-2007

5-10 MPH

HOURS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	% of PERSISTENT WINDS
2	80	64	78	116	103	120	102	119	103	152	127	88	67	65	62	88	25.36%
3	61	47	54	65	89	70	96	76	82	95	87	59	62	53	44	61	18.20%
4	35	24	47	38	48	53	84	58	64	72	75	60	43	51	37	46	13.80%
5	22	12	32	26	23	56	46	55	41	54	54	38	36	42	28	30	9.84%
6	19	22	19	32	27	25	34	44	27	34	36	27	20	24	25	20	7.19%
7	12	9	26	21	17	23	28	26	24	37	34	19	28	27	21	21	6.17%
8	12	9	14	10	13	17	26	24	11	30	20	16	13	18	16	18	4.41%
9	5	6	8	5	11	7	25	9	19	17	19	17	17	8	14	10	3.26%
10	3	6	7	7	5	16	9	6	4	14	20	11	5	6	13	7	2.30%
11	5	5	10	5	4	7	16	11	5	17	11	13	7	6	9	8	2.30%
12	3	3	8	5	5	8	9	2	8	11	6	9	1	7	4	6	1.57%
13	3	0	4	6	1	6	5	6	8	9	4	5	5	2	3	3	1.16%
14	0	2	4	3	2	6	3	0	7	5	5	5	0	0	3	3	0.79%
15	0	1	3	2	0	6	3	0	2	2	4	3	1	2	1	0	0.50%
16	1	1	3	2	0	2	4	1	2	4	4	3	2	2	2	1	0.56%
17	0	1	2	1	3	4	1	1	3	3	2	1	4	3	2	0	0.51%
18	0	1	1	2	2	3	0	1	3	3	4	1	1	2	0	1	0.41%
19	0	0	1	1	0	0	1	0	2	3	1	0	2	0	0	1	0.20%
20	0	0	1	0	0	1	0	2	0	0	2	3	0	0	1	0	0.17%
21	1	0	2	0	0	0	0	0	3	0	1	1	1	1	1	1	0.20%
22	0	0	1	1	0	0	0	0	1	3	1	0	2	0	0	0	0.15%
23	0	0	1	0	0	0	0	0	1	0	0	1	1	0	1	0	0.08%
24	0	0	0	0	0	0	2	0	0	0	0	1	0	0	0	0	0.05%
25	0	0	1	0	0	1	1	0	1	0	1	1	0	0	0	1	0.12%
26	0	0	0	0	0	0	0	0	1	0	0	2	2	1	0	0	0.10%
27	0	0	0	0	0	0	0	0	0	2	1	0	1	0	0	0	0.07%
28	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	0	0.05%
29	0	1	0	0	0	1	0	0	0	0	0	0	0	1	1	0	0.07%
30	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.02%
31	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0.03%
32	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.02%
33	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0.03%
34	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0.03%
35	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.02%
36	0	1	0	0	1	0	1	0	0	0	0	0	1	0	0	0	0.07%
37	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.02%
38	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.02%
39	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.02%
40	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.02%
41	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0.03%
42	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.02%
43	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.02%
44	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.02%
45	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.02%
46	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.02%
47	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.02%
48	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.02%
% of PERSISTENT DIRECTION	4.33%	3.85%	5.41%	5.75%	5.85%	7.14%	8.20%	7.29%	6.98%	9.39%	8.60%	6.41%	5.32%	5.31%	4.78%	5.39%	

Table 2.3-227 Wind Direction Persistence Summaries - Fermi Site 10-m Level [EF3 COL 2.0-8-A]

Number of Occurrences for Winds Blowing from the Same 67.5° Direction

2003-2007

10-15 MPH

HOURS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	% of PERSISTENT WINDS
2	19	14	16	26	38	39	20	21	10	51	48	22	14	18	12	17	27.94%
3	14	12	13	17	31	26	6	8	17	45	43	16	9	12	8	12	20.97%
4	8	7	5	12	27	20	5	3	16	20	28	8	6	8	7	6	13.50%
5	5	8	6	9	17	10	3	5	5	29	17	7	8	5	5	7	10.60%
6	5	7	1	3	9	9	1	3	5	12	17	6	2	6	3	2	6.60%
7	2	2	0	4	10	6	2	1	4	10	12	3	1	1	3	3	4.64%
8	2	1	1	9	2	0	1	0	2	5	7	4	1	2	1	2	2.90%
9	0	2	2	1	3	2	0	0	1	6	10	3	1	4	1	1	2.69%
10	4	1	0	1	2	3	0	0	1	7	4	1	4	2	0	0	2.18%
11	1	1	0	4	2	0	0	0	1	4	0	2	2	0	0	0	1.23%
12	1	3	3	3	2	0	0	0	2	2	5	0	1	2	1	0	1.81%
13	1	2	3	2	2	0	0	0	0	2	0	0	2	0	0	1	1.09%
14	1	2	3	1	2	0	0	0	0	3	2	0	0	1	1	0	1.16%
15	0	0	1	2	1	1	0	0	0	0	1	1	0	0	0	0	0.51%
16	1	1	0	0	1	0	0	0	1	3	0	0	0	0	0	0	0.51%
17	1	0	2	2	0	1	0	0	1	1	1	1	0	0	1	0	0.80%
18	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0.15%
19	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.07%
20	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0.15%
21	0	0	1	0	0	0	1	0	0	1	2	0	0	0	0	0	0.36%
22	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0.07%
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
25	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0.07%
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
% of PERSISTENT DIRECTION	4.72%	4.57%	4.21%	7.11%	10.81%	8.49%	2.83%	2.98%	4.79%	14.66%	14.30%	5.37%	3.85%	4.50%	3.12%	3.70%	

Table 2.3-228 Wind Direction Persistence Summaries - Fermi Site 10-m Level [EF3 COL 2.0-8-A]

Number of Occurrences for Winds Blowing from the Same 67.5° Direction

2003-2007

15-20 MPH

HOURS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	% of PERSISTENT WINDS
2	4	3	1	7	17	7	0	2	2	10	12	2	2	3	1	3	40.21%
3	2	0	0	2	12	3	0	1	0	5	11	2	1	1	1	2	22.75%
4	1	0	0	1	6	1	1	0	0	6	8	0	0	0	0	2	13.76%
5	3	4	1	3	2	0	0	0	0	1	3	1	0	0	0	0	9.52%
6	0	1	0	0	2	1	0	0	0	1	6	0	0	0	0	0	5.82%
7	0	2	0	1	0	0	0	0	0	3	1	0	0	0	0	0	3.70%
8	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	1.06%
9	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1.06%
10	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0.53%
11	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.53%
12	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	1.06%
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
% of PERSISTENT DIRECTION	5.29%	5.82%	1.06%	8.47%	21.16%	6.35%	0.53%	1.59%	1.06%	14.29%	23.28%	2.65%	1.59%	2.12%	1.06%	3.70%	

Table 2.3-229 Wind Direction Persistence Summaries - Fermi Site 10-m Level [EF3 COL 2.0-8-A]

Number of Occurrences for Winds Blowing from the Same 67.5° Direction

2003-2007

>20 MPH

HOURS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	% of PERSISTENT WINDS
2	0	0	0	1	2	0	0	0	0	1	3	0	1	0	0	0	61.54%
3	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	15.38%
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
5	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	7.69%
6	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	7.69%
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
9	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	7.69%
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
% of PERSISTENT DIRECTION	0.00%	0.00%	0.00%	7.69%	23.08%	0.00%	0.00%	0.00%	0.00%	15.38%	46.15%	0.00%	7.69%	0.00%	0.00%	0.00%	

Table 2.3-230 Wind Direction Persistence Summaries - Fermi Site 60-m Level [EF3 COL 2.0-8-A]

Number of Occurrences for Winds Blowing from the Same 22.5° Direction

2003-2007

All Wind Speeds

HOURS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	% of PERSISTENT WINDS
2	138	158	174	202	209	201	192	217	242	267	320	264	290	283	212	163	40.29%
3	70	84	108	96	105	104	116	121	126	145	176	165	162	127	128	82	21.85%
4	38	38	60	59	44	59	41	62	86	107	87	88	112	87	54	48	12.21%
5	29	27	37	35	29	49	32	38	51	75	62	60	53	60	56	36	8.32%
6	6	13	21	22	25	36	22	14	19	46	46	38	32	38	24	21	4.83%
7	10	18	18	15	23	21	20	12	21	19	33	30	28	33	17	13	3.78%
8	8	12	10	11	16	13	8	5	11	23	29	29	18	18	15	12	2.72%
9	3	4	7	9	4	13	6	4	6	18	13	12	12	8	9	8	1.55%
10	3	1	8	4	6	5	2	6	4	17	12	14	4	12	4	2	1.19%
11	1	1	5	3	3	0	4	2	4	6	9	11	9	4	3	2	0.76%
12	4	0	2	6	4	2	2	0	2	9	4	6	2	4	2	6	0.63%
13	2	0	1	4	2	1	0	1	0	2	3	4	6	5	1	2	0.39%
14	0	0	2	1	1	4	1	0	2	4	2	1	3	2	1	2	0.30%
15	0	2	2	1	1	0	0	0	4	3	2	1	3	1	2	1	0.26%
16	0	0	2	1	0	0	0	0	1	1	2	4	2	1	1	2	0.19%
17	0	0	0	0	1	0	0	0	2	2	3	3	0	3	0	2	0.18%
18	0	0	1	0	1	1	0	0	0	2	2	1	0	0	0	0	0.09%
19	0	1	2	1	1	0	0	0	1	1	2	4	1	0	2	0	0.18%
20	0	0	0	0	0	0	0	0	0	1	0	2	1	0	0	0	0.05%
21	0	0	0	2	1	0	0	0	0	0	1	1	0	1	0	0	0.07%
22	0	0	0	0	0	0	0	0	1	0	2	1	0	0	0	0	0.05%
23	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.01%
24	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0.02%
25	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0.02%
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
28	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.01%
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
31	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0.02%
32	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0.01%
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
34	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0.01%
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
36	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0.01%
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
41	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0.01%
42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
% of PERSISTENT DIRECTION	3.56%	4.10%	5.26%	5.38%	5.44%	5.81%	5.09%	5.50%	6.65%	8.54%	9.27%	8.46%	8.43%	7.86%	6.06%	4.59%	
AVE PERSISTENT HOURS	3.51	3.51	3.98	3.84	3.84	3.81	3.47	3.27	3.69	4.20	4.13	4.41	3.85	3.96	3.72	3.93	

THE LONGEST PERSISTENT WIND WAS FROM THE WEST BY SOUTHWEST AND LASTED 41 HOURS

Table 2.3-231 Wind Direction Persistence Summaries - Fermi Site 60-m Level [EF3 COL 2.0-8-A]

Number of Occurrences for Winds Blowing from the Same 22.5° Direction

2003-2007

0-5 MPH

HOURS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	% of PERSISTENT WINDS
2	10	22	20	13	12	15	10	18	16	10	15	12	5	21	5	16	81.48%
3	2	1	3	3	2	3	1	6	2	1	1	1	0	1	4	3	12.59%
4	0	0	1	0	1	0	0	0	0	1	0	0	0	1	0	1	1.85%
5	1	0	2	0	0	0	0	0	1	1	0	0	0	1	0	0	2.22%
6	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	1.11%
7	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.37%
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
10	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.37%
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
% of PERSISTENT DIRECTION	4.81%	8.52%	10.37%	6.67%	5.56%	7.04%	4.07%	8.89%	7.04%	4.81%	5.93%	4.81%	1.85%	8.89%	3.33%	7.41%	

Table 2.3-232 Wind Direction Persistence Summaries - Fermi Site 60-m Level [EF3 COL 2.0-8-A]

Number of Occurrences for Winds Blowing from the Same 22.5° Direction

2003-2007

5-10 MPH

HOURS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	% of PERSISTENT WINDS
2	61	54	110	89	87	104	135	118	108	105	97	83	107	102	94	106	62.42%
3	13	24	52	31	21	39	48	55	50	27	30	29	40	36	27	39	22.45%
4	5	9	20	14	4	21	18	22	21	17	12	10	6	18	11	9	8.68%
5	4	6	11	8	5	11	13	12	5	3	4	2	5	0	5	6	4.00%
6	1	0	5	1	0	2	8	3	1	2	1	2	0	0	1	2	1.16%
7	0	0	0	0	0	4	2	1	1	2	1	0	1	0	2	1	0.60%
8	0	0	2	0	0	0	0	0	0	0	0	0	0	1	0	0	0.12%
9	1	0	0	1	0	1	0	0	0	1	0	1	0	1	1	1	0.32%
10	0	1	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0.12%
11	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0.08%
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
13	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0.04%
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
% of PERSISTENT DIRECTION	3.40%	3.76%	8.00%	5.76%	4.68%	7.28%	9.00%	8.48%	7.48%	6.28%	5.80%	5.12%	6.36%	6.32%	5.64%	6.60%	

Table 2.3-233 Wind Direction Persistence Summaries - Fermi Site 60-m Level [EF3 COL 2.0-8-A]

Number of Occurrences for Winds Blowing from the Same 22.5° Direction

2003-2007

10-15 MPH

HOURS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	% of PERSISTENT WINDS
2	75	58	93	92	95	99	98	77	104	159	172	185	160	180	142	117	52.02%
3	33	32	40	34	36	41	30	32	35	69	92	104	82	67	66	61	23.31%
4	18	9	22	21	13	14	22	12	19	37	32	52	45	34	34	22	11.08%
5	6	7	15	13	7	6	6	9	10	20	28	20	20	31	18	24	6.55%
6	2	1	10	7	2	8	6	3	11	11	8	14	13	7	5	5	3.08%
7	2	2	3	1	2	7	3	2	0	7	4	9	5	3	6	5	1.66%
8	2	2	6	2	1	1	1	1	0	7	4	5	1	5	3	6	1.28%
9	0	0	1	0	0	0	0	0	1	1	2	1	2	1	2	0	0.30%
10	0	0	0	1	0	0	0	1	0	1	3	1	2	0	1	1	0.30%
11	0	0	1	0	0	0	0	0	0	0	1	2	1	1	0	0	0.16%
12	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0.08%
13	0	0	1	0	0	0	0	0	0	1	0	0	0	1	0	0	0.08%
14	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0.03%
15	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0.05%
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
% of PERSISTENT DIRECTION	3.77%	3.03%	5.24%	4.67%	4.26%	4.80%	4.53%	3.74%	4.91%	8.54%	9.44%	10.78%	9.06%	9.03%	7.59%	6.60%	

Table 2.3-234 Wind Direction Persistence Summaries - Fermi Site 60-m Level [EF3 COL 2.0-8-A]

Number of Occurrences for Winds Blowing from the Same 22.5° Direction

2003-2007

15-20 MPH

HOURS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	% of PERSISTENT WINDS
2	33	30	31	44	67	55	36	31	45	117	116	95	81	70	61	32	49.61%
3	11	18	17	18	26	26	15	17	29	53	53	63	44	39	24	5	24.07%
4	5	7	10	15	14	14	5	2	9	29	18	30	22	15	10	8	11.19%
5	1	6	8	1	9	9	4	2	7	18	16	22	9	18	5	4	7.30%
6	1	1	2	0	3	4	1	2	4	5	5	8	11	3	5	4	3.10%
7	2	0	3	2	3	2	0	0	1	6	6	8	1	2	2	1	2.05%
8	1	1	1	1	0	1	0	1	0	4	1	3	1	2	1	1	1.00%
9	0	0	0	0	0	0	0	0	0	2	1	1	3	4	0	2	0.68%
10	0	0	1	0	3	0	0	0	0	2	0	2	1	0	0	0	0.47%
11	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0.11%
12	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0.05%
13	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0.05%
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
15	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0.11%
16	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0.16%
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
41	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0.05%
42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
% of PERSISTENT DIRECTION	2.84%	3.31%	3.84%	4.26%	6.57%	5.83%	3.21%	2.89%	4.99%	12.45%	11.40%	12.51%	9.20%	8.04%	5.68%	3.00%	

Table 2.3-235 Wind Direction Persistence Summaries - Fermi Site 60-m Level [EF3 COL 2.0-8-A]

Number of Occurrences for Winds Blowing from the Same 22.5° Direction

2003-2007

>20 MPH

HOURS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	% of PERSISTENT WINDS
2	7	7	9	14	37	20	9	9	16	47	48	36	34	33	14	10	49.86%
3	5	3	1	9	14	10	3	3	8	27	17	26	13	23	8	5	24.93%
4	2	2	2	2	9	1	3	0	6	12	11	5	10	3	6	5	11.25%
5	2	1	0	5	6	1	0	0	1	3	7	7	5	4	3	0	6.41%
6	1	0	0	0	3	1	0	0	0	3	5	2	1	0	2	1	2.71%
7	0	0	0	1	0	1	0	0	0	2	1	2	0	0	0	1	1.14%
8	0	0	0	1	1	0	0	0	0	3	2	2	0	3	1	1	1.99%
9	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0.28%
10	0	0	0	0	0	0	0	0	0	0	2	0	0	1	1	0	0.57%
11	0	0	1	0	0	0	0	0	0	0	0	2	0	0	0	0	0.43%
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
14	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0.28%
15	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0.14%
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
% of PERSISTENT DIRECTION	2.42%	1.85%	1.85%	4.56%	9.97%	4.84%	2.14%	1.71%	4.56%	13.82%	13.53%	11.97%	8.97%	9.54%	4.99%	3.28%	

Table 2.3-236 Wind Direction Persistence Summaries - Fermi Site 60-m Level [EF3 COL 2.0-8-A]

Number of Occurrences for Winds Blowing from the Same 67.5° Direction

2003-2007

All Wind Speeds

HOURS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	% of PERSISTENT WINDS
2	83	85	76	96	104	114	99	108	103	134	99	113	127	102	74	97	17.84%
3	58	54	59	83	73	75	86	89	94	90	77	106	82	68	73	70	13.67%
4	34	24	31	64	45	45	61	80	83	72	71	70	65	62	58	52	10.14%
5	40	39	40	42	33	43	47	57	59	67	59	60	50	65	40	38	8.61%
6	33	23	38	27	18	27	34	48	44	62	44	41	42	40	45	34	6.63%
7	23	25	23	26	27	30	26	33	37	37	43	40	41	29	38	30	5.62%
8	12	16	19	24	18	28	26	24	30	34	34	35	29	31	35	16	4.54%
9	13	16	24	14	25	34	24	32	21	22	22	23	26	29	25	19	4.08%
10	11	14	12	13	12	23	25	19	18	28	28	31	14	17	23	14	3.34%
11	21	12	20	18	17	10	18	16	21	19	20	17	25	18	15	9	3.05%
12	14	8	11	7	8	19	11	21	15	25	18	21	15	22	18	3	2.61%
13	10	6	13	12	13	11	11	11	19	16	12	26	17	16	11	15	2.42%
14	3	13	10	5	15	12	21	12	12	14	12	19	17	13	7	12	2.18%
15	4	4	3	6	8	7	13	9	8	11	16	11	9	13	11	12	1.60%
16	0	6	10	8	4	13	9	6	9	11	11	11	6	9	5	12	1.44%
17	3	9	5	9	8	10	5	6	5	13	6	10	12	14	11	3	1.43%
18	5	6	8	4	3	6	5	4	12	9	10	10	14	9	10	6	1.34%
19	0	5	3	8	3	4	3	2	9	7	6	4	8	9	6	11	0.97%
20	1	3	4	7	3	2	6	2	3	3	7	8	10	7	5	7	0.86%
21	1	3	2	1	6	2	3	2	3	8	8	9	10	1	4	5	0.75%
22	1	3	3	3	10	2	0	2	4	6	10	6	3	8	5	1	0.74%
23	0	2	0	2	4	1	1	2	5	11	4	6	7	3	4	5	0.63%
24	2	1	4	1	4	2	2	1	5	5	8	3	1	5	3	1	0.53%
25	0	0	2	2	1	1	1	1	2	3	6	3	9	2	4	3	0.44%
26	3	1	2	2	2	1	0	2	5	6	4	8	5	5	7	3	0.62%
27	0	1	2	1	3	1	0	1	0	1	6	5	7	4	7	3	0.46%
28	0	1	2	1	3	4	3	1	1	4	2	5	6	3	3	1	0.44%
29	0	2	3	2	2	1	0	0	1	1	2	2	1	4	2	2	0.28%
30	2	1	2	0	1	1	0	0	0	0	3	5	4	2	4	1	0.29%
31	1	0	1	3	3	0	0	1	0	2	5	2	3	3	2	1	0.30%
32	1	1	2	1	1	1	0	0	2	2	6	1	7	5	1	0	0.34%
33	0	0	0	1	1	1	0	0	1	3	3	4	2	6	2	0	0.27%
34	0	1	1	0	0	0	0	0	2	3	6	3	1	2	1	0	0.22%
35	0	0	0	0	0	1	0	0	1	1	0	0	1	2	0	0	0.07%
36	0	0	1	1	1	0	0	0	1	0	2	2	1	2	3	1	0.17%
37	0	0	0	1	0	2	0	0	1	1	0	3	2	2	0	0	0.13%
38	0	0	1	1	2	2	0	0	1	2	2	0	0	0	0	1	0.13%
39	0	0	0	3	0	0	0	0	0	1	2	3	1	2	1	1	0.15%
40	1	1	1	0	1	2	0	0	0	0	2	3	1	1	0	0	0.14%
41	0	1	1	2	0	0	0	0	0	1	2	0	0	1	0	0	0.09%
42	0	0	0	0	1	0	0	0	0	0	1	1	3	0	0	1	0.08%
43	0	0	1	1	1	0	0	0	0	0	1	4	0	0	0	0	0.09%
44	0	0	0	0	0	1	0	0	1	1	1	0	0	0	0	0	0.04%
45	0	0	0	1	0	0	0	0	0	0	2	3	1	0	1	0	0.09%
46	0	0	1	0	0	0	0	0	0	0	0	0	0	3	0	0	0.04%
47	0	0	0	1	1	0	0	0	0	1	0	0	1	0	0	0	0.04%
48	1	0	0	1	0	0	0	0	0	0	0	1	1	0	0	0	0.04%
% of PERSISTENT DIRECTION	4.21%	4.28%	4.88%	5.58%	5.36%	5.96%	5.97%	6.54%	7.05%	8.15%	7.55%	8.16%	7.59%	7.06%	6.23%	5.42%	
AVE PERSISTENT HOURS	6.64	7.55	8.39	7.85	8.28	7.64	6.84	6.45	7.60	8.26	9.64	9.29	9.22	9.34	8.86	7.83	

THE LONGEST PERSISTENT WIND WAS FROM THE WEST BY SOUTHWEST AND LASTED 158 HOURS

Table 2.3-237 Wind Direction Persistence Summaries - Fermi Site 60-m Level [EF3 COL 2.0-8-A]

Number of Occurrences for Winds Blowing from the Same 67.5° Direction

2003-2007

0-5 MPH

HOURS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	% of PERSISTENT WINDS
2	20	26	25	23	20	23	18	28	24	14	21	25	20	25	15	25	65.31%
3	7	12	12	5	3	6	6	7	9	5	7	4	4	5	10	10	20.78%
4	2	2	2	0	2	0	6	3	1	1	2	1	0	2	1	4	5.38%
5	1	2	3	2	0	1	1	1	1	2	2	1	2	3	2	0	4.45%
6	0	0	2	3	0	2	2	1	0	1	0	0	0	0	1	0	2.23%
7	0	0	2	1	1	1	0	0	0	0	0	0	0	0	1	0	1.11%
8	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.19%
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
10	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.37%
11	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.19%
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
% of PERSISTENT DIRECTION	5.57%	8.16%	8.72%	6.31%	4.82%	6.12%	6.12%	7.42%	6.49%	4.27%	5.94%	5.75%	4.82%	6.68%	5.57%	7.24%	

Table 2.3-238 Wind Direction Persistence Summaries - Fermi Site 60-m Level [EF3 COL 2.0-8-A]

Number of Occurrences for Winds Blowing from the Same 67.5° Direction

2003-2007

5-10 MPH

HOURS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	% of PERSISTENT WINDS
2	61	89	94	101	98	111	112	123	99	136	99	107	127	107	110	101	43.84%
3	37	45	72	51	51	53	80	65	77	55	68	49	55	57	49	65	24.31%
4	19	23	32	30	21	41	31	49	54	29	23	29	23	23	33	23	12.64%
5	9	13	30	16	23	21	21	23	18	19	18	23	14	14	18	14	7.69%
6	7	8	15	6	5	12	29	20	4	5	10	10	5	11	7	9	4.27%
7	0	1	6	6	2	12	10	10	10	5	4	3	7	9	5	6	2.51%
8	1	4	5	6	3	3	7	7	5	2	4	2	4	4	3	3	1.65%
9	2	1	3	2	0	5	5	4	1	1	1	2	2	1	3	2	0.92%
10	1	0	1	6	1	3	4	6	1	2	0	0	2	3	2	2	0.89%
11	0	1	3	0	1	2	3	0	1	0	0	1	1	1	1	3	0.47%
12	0	1	2	0	0	2	5	2	2	0	0	0	2	0	0	0	0.42%
13	0	0	0	0	0	1	1	0	1	0	0	0	0	2	1	0	0.16%
14	0	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0.08%
15	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0.03%
16	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0.05%
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
18	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0.05%
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
21	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.03%
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
% of PERSISTENT DIRECTION	3.59%	4.89%	6.94%	5.86%	5.37%	6.96%	8.09%	8.11%	7.17%	6.67%	5.94%	5.94%	6.36%	6.07%	6.07%	5.97%	

Table 2.3-239 Wind Direction Persistence Summaries - Fermi Site 60-m Level [EF3 COL 2.0-8-A]

Number of Occurrences for Winds Blowing from the Same 67.5° Direction

2003-2007

10-15 MPH

HOURS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	% of PERSISTENT WINDS
2	44	51	80	92	90	91	79	78	99	146	150	154	147	140	112	99	35.81%
3	34	33	50	48	54	70	44	48	44	81	92	115	87	73	67	52	21.50%
4	22	22	31	34	29	24	33	25	45	47	63	67	56	63	41	33	13.77%
5	17	15	22	21	11	15	19	20	17	32	42	45	43	52	40	33	9.62%
6	10	6	13	8	8	10	11	11	17	25	22	25	30	28	32	16	5.90%
7	5	5	14	5	5	7	6	5	7	10	13	26	19	18	19	11	3.79%
8	7	2	6	6	3	5	6	5	7	15	15	17	10	16	10	12	3.08%
9	3	7	2	3	2	3	1	1	2	9	2	10	9	7	9	9	1.71%
10	0	0	4	3	1	2	2	2	5	6	18	9	11	11	4	6	1.82%
11	2	1	5	2	2	1	0	2	1	5	3	2	7	6	2	0	0.89%
12	0	1	0	0	0	3	1	1	3	3	1	3	4	2	2	5	0.63%
13	1	0	2	1	0	0	0	0	0	3	3	1	2	3	3	2	0.46%
14	1	0	0	1	0	0	0	0	1	1	0	1	0	0	1	2	0.17%
15	0	0	0	0	1	0	0	0	0	0	3	2	1	0	0	0	0.15%
16	0	0	0	0	0	0	0	0	1	1	2	0	1	0	1	0	0.13%
17	0	0	1	1	0	0	0	0	2	0	1	2	0	1	1	0	0.20%
18	0	1	0	0	0	0	0	0	0	0	0	2	0	0	1	0	0.09%
19	0	0	1	0	0	0	0	0	0	0	1	0	1	0	1	0	0.09%
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.02%
21	0	0	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0.07%
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
24	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2	0.07%
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
31	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0.02%
32	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0.02%
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
% of PERSISTENT DIRECTION	3.16%	3.12%	5.03%	4.88%	4.47%	5.01%	4.38%	4.29%	5.46%	8.35%	9.39%	10.45%	9.28%	9.10%	7.52%	6.11%	

Table 2.3-240 Wind Direction Persistence Summaries - Fermi Site 60-m Level [EF3 COL 2.0-8-A]

Number of Occurrences for Winds Blowing from the Same 67.5° Direction

2003-2007

15-20 MPH

HOURS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	% of PERSISTENT WINDS
2	23	27	37	34	69	53	31	31	51	106	100	95	80	67	53	33	39.10%
3	15	16	20	32	30	28	21	22	26	62	53	57	49	42	27	9	22.36%
4	7	6	10	16	22	21	13	6	18	36	32	40	27	24	18	14	13.62%
5	3	7	9	5	14	14	7	4	12	26	26	19	16	19	9	9	8.74%
6	3	9	4	4	6	7	2	4	6	16	13	16	11	10	7	6	5.45%
7	3	2	3	6	4	5	0	0	5	11	11	12	10	2	6	0	3.51%
8	1	3	2	1	2	2	1	2	1	5	7	6	6	4	3	2	2.11%
9	5	0	0	0	2	1	0	0	4	1	2	3	4	4	1	2	1.27%
10	1	0	2	0	4	0	1	0	2	5	3	5	4	2	0	0	1.27%
11	0	1	0	0	0	1	0	0	1	3	1	4	1	2	1	0	0.66%
12	1	0	0	0	0	0	0	1	1	1	3	1	2	1	0	0	0.48%
13	0	0	0	0	0	0	0	0	1	0	3	1	0	0	0	0	0.22%
14	0	0	1	0	1	0	0	0	0	1	1	2	1	0	0	0	0.31%
15	0	0	0	1	0	0	0	0	0	1	1	3	0	0	0	1	0.31%
16	1	0	0	0	0	0	0	0	0	1	0	1	2	0	0	0	0.22%
17	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0.13%
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
20	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0.09%
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
22	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0.04%
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
42	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0.04%
43	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0.04%
44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
% of PERSISTENT DIRECTION	2.77%	3.16%	3.87%	4.35%	6.77%	5.80%	3.34%	3.08%	5.62%	12.13%	11.29%	11.82%	9.40%	7.78%	5.49%	3.34%	

Table 2.3-241 Wind Direction Persistence Summaries - Fermi Site 60-m Level [EF3 COL 2.0-8-A]

Number of Occurrences for Winds Blowing from the Same 67.5° Direction

2003-2007

>20 MPH

HOURS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	% of PERSISTENT WINDS
2	5	8	8	15	34	20	7	10	21	48	43	34	36	33	18	8	41.28%
3	5	3	2	9	17	16	3	3	8	32	28	29	25	27	8	5	26.10%
4	2	2	2	4	17	4	6	1	3	15	13	10	15	4	7	4	12.93%
5	3	1	0	5	8	2	0	2	3	6	16	6	5	5	3	3	8.07%
6	1	1	1	2	3	1	0	0	4	5	4	7	3	0	2	1	4.15%
7	1	0	0	1	2	0	0	1	1	1	3	4	0	1	1	2	2.14%
8	0	0	0	1	1	0	1	0	1	4	2	3	0	1	2	2	2.14%
9	0	0	0	0	0	0	0	0	0	0	2	2	1	0	0	0	0.59%
10	0	0	0	0	0	0	0	0	1	1	2	0	0	1	1	0	0.71%
11	0	0	1	0	0	0	0	0	0	1	0	2	0	0	0	0	0.47%
12	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	1	0.47%
13	0	0	0	0	0	1	0	0	1	0	1	0	0	0	0	0	0.36%
14	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0.24%
15	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0.12%
16	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0.12%
17	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0.12%
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
% of PERSISTENT DIRECTION	2.02%	1.78%	1.66%	4.39%	9.73%	5.22%	2.02%	2.02%	5.22%	13.64%	13.64%	11.63%	10.20%	8.78%	4.98%	3.08%	

Table 2.3-242 Wind Direction Persistence Summaries - Detroit Metropolitan Airport 10 m Level [EF3 COL 2.0-8-A]

Number of Occurrences for Winds Blowing from the Same 22.5° Direction

2003-2007

All Wind Speeds (A)

HOURS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	% of PERSISTENT WINDS
2	275	210	169	162	254	105	155	190	372	360	353	329	331	352	241	235	51.26%
3	146	111	55	75	93	26	44	93	206	138	154	139	179	129	117	94	22.53%
4	81	61	23	20	56	13	29	48	107	66	89	61	107	74	31	32	11.25%
5	30	39	21	18	37	5	10	18	59	34	31	52	43	19	21	27	5.81%
6	26	16	6	8	27	0	6	4	27	26	24	15	35	19	10	5	3.18%
7	15	12	5	4	15	0	1	1	25	14	19	9	12	14	8	4	1.98%
8	9	7	2	2	10	0	0	2	4	13	7	7	14	11	2	1	1.14%
9	13	6	1	0	4	0	0	0	8	10	14	5	5	2	0	4	0.90%
10	4	1	3	1	1	2	2	0	0	3	3	2	9	0	1	4	0.45%
11	5	2	0	1	1	2	0	0	6	2	3	1	5	1	2	0	0.39%
12	6	2	1	0	0	0	0	0	5	0	5	4	4	3	0	0	0.38%
13	1	0	1	0	3	0	0	0	1	3	1	1	3	0	1	0	0.19%
14	2	4	1	0	2	0	0	0	2	0	0	0	2	0	0	0	0.16%
15	2	0	0	0	2	0	0	0	1	0	1	0	1	0	0	2	0.11%
16	0	0	0	0	2	0	0	0	2	0	0	1	0	0	2	0	0.09%
17	1	2	0	0	1	0	0	0	3	0	0	0	0	0	0	0	0.09%
18	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.03%
19	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.03%
20	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.01%
21	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.03%
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
24	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.01%
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
% of PERSISTENT DIRECTION	7.79%	5.95%	3.61%	3.64%	6.36%	1.92%	3.09%	4.46%	10.37%	8.38%	8.82%	7.84%	9.39%	7.81%	5.46%	5.11%	
AVE PERSISTENT HOURS	3.67	3.52	3.00	2.86	3.44	2.66	2.72	2.78	3.37	3.15	3.25	3.10	3.42	2.96	2.92	2.91	

* THE LONGEST PERSISTENT WIND WAS FROM THE SOUTH BY SOUTHWEST AND LASTED 24 HOURS

(A) Hourly wind speeds of 3 knots or less (3.45) are reported as calm hours.

Source: Reference 2.3-229

Table 2.3-243 Wind Direction Persistence Summaries - Detroit Metropolitan Airport 10 m Level [EF3 COL 2.0-8-A]

Number of Occurrences for Winds Blowing from the Same 22.5° Direction

2003-2007

0-5 MPH [(A)]

HOURS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	% of PERSISTENT WINDS
2	51	45	24	36	87	22	25	39	104	33	3	10	33	31	19	26	78.82%
3	24	16	2	7	13	4	2	3	29	4	2	0	5	3	3	2	15.95%
4	0	2	0	1	7	0	3	1	7	2	0	0	0	1	0	2	3.49%
5	0	3	0	1	2	0	0	0	2	1	0	1	0	0	0	0	1.34%
6	0	0	0	0	1	0	0	0	2	0	0	0	0	0	0	0	0.40%
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
% of PERSISTENT DIRECTION	10.05%	8.85%	3.49%	6.03%	14.75%	3.49%	4.02%	5.76%	19.30%	5.36%	0.67%	1.47%	5.09%	4.69%	2.95%	4.02%	

[(A)] Hourly wind speeds of 3 knots or less (3.45) are reported as calm hours.
Source: Reference 2.3-229

Table 2.3-244 Wind Direction Persistence Summaries - Detroit Metropolitan Airport 10 m Level [EF3 COL 2.0-8-A]

Number of Occurrences for Winds Blowing from the Same 22.5° Direction

2003-2007

5-10 MPH

HOURS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	% of PERSISTENT WINDS
2	175	138	87	75	179	46	78	118	230	153	83	103	160	139	99	121	66.27%
3	74	42	31	25	53	9	22	31	77	46	26	24	65	35	30	25	20.54%
4	19	27	4	6	23	3	11	16	34	21	4	12	16	11	3	6	7.21%
5	9	8	4	3	17	5	3	2	10	5	3	5	11	3	0	4	3.07%
6	7	6	2	2	4	0	2	1	8	3	0	2	2	3	2	0	1.47%
7	4	6	1	0	3	0	0	0	1	1	0	0	0	0	0	0	0.53%
8	2	1	0	1	2	0	0	0	1	0	0	0	0	1	0	0	0.27%
9	1	1	0	0	0	0	0	0	5	0	0	1	0	0	0	0	0.27%
10	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.03%
11	2	1	0	0	1	0	0	0	0	0	0	0	0	3	0	0	0.23%
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
13	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0.03%
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
15	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.03%
16	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.03%
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
% of PERSISTENT DIRECTION	9.79%	7.75%	4.31%	3.74%	9.45%	2.10%	3.87%	5.61%	12.22%	7.68%	3.87%	4.91%	8.48%	6.51%	4.48%	5.21%	

Source: Reference 2.3-229

Table 2.3-245 Wind Direction Persistence Summaries - Detroit Metropolitan Airport 10 m Level [EF3 COL 2.0-8-A]

Number of Occurrences for Winds Blowing from the Same 22.5° Direction

2003-2007

10-15 MPH

HOURS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	% of PERSISTENT WINDS
2	88	56	48	43	33	8	26	47	121	127	174	137	134	132	103	80	60.99%
3	29	27	19	15	23	4	6	11	52	45	60	36	55	42	24	24	21.21%
4	20	13	2	7	7	4	2	8	20	30	21	20	26	11	9	11	9.48%
5	8	8	5	6	10	0	2	0	6	8	15	14	6	5	8	7	4.85%
6	4	1	1	0	2	0	0	0	5	7	7	2	7	1	2	1	1.80%
7	0	4	2	0	0	2	0	0	1	0	1	1	1	2	0	0	0.63%
8	1	0	2	0	0	0	0	0	1	1	1	2	2	0	0	0	0.45%
9	2	2	1	0	0	0	0	0	0	2	0	0	0	0	0	0	0.31%
10	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.04%
11	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0.04%
12	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.09%
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
15	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.09%
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
% of PERSISTENT DIRECTION	7.06%	4.99%	3.60%	3.19%	3.42%	0.81%	1.62%	2.97%	9.26%	9.89%	12.54%	9.53%	10.38%	8.67%	6.56%	5.53%	

Source: Reference 2.3-229

Table 2.3-246 Wind Direction Persistence Summaries - Detroit Metropolitan Airport 10 m Level [EF3 COL 2.0-8-A]

Number of Occurrences for Winds Blowing from the Same 22.5° Direction

2003-2007

15-20 MPH

HOURS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	% of PERSISTENT WINDS
2	16	18	2	6	3	0	5	3	24	41	82	55	65	44	29	20	65.97%
3	12	5	1	0	0	0	0	0	11	3	25	13	31	7	5	7	19.17%
4	7	1	1	0	0	0	0	0	4	9	17	9	3	0	5	1	9.11%
5	1	0	0	0	0	0	0	0	2	2	8	5	4	1	1	4	4.47%
6	0	0	0	0	0	0	0	0	2	0	0	2	1	0	0	0	0.80%
7	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0.32%
8	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0.16%
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
% of PERSISTENT DIRECTION	5.75%	3.83%	0.64%	0.96%	0.48%	0.00%	0.80%	0.48%	6.87%	8.79%	21.41%	13.58%	16.61%	8.31%	6.39%	5.11%	

Source: Reference 2.3-229

Table 2.3-247 Wind Direction Persistence Summaries - Detroit Metropolitan Airport 10 m Level [EF3 COL 2.0-8-A]

Number of Occurrences for Winds Blowing from the Same 22.5° Direction

2003-2007

>20 MPH

HOURS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	% of PERSISTENT WINDS
2	6	2	0	0	0	0	0	0	4	10	25	9	26	9	9	7	69.48%
3	1	0	0	0	0	0	0	0	6	1	10	9	3	2	3	0	22.73%
4	0	0	0	0	0	0	0	0	0	3	4	2	1	0	0	0	6.49%
5	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0.65%
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
7	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0.65%
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
% of PERSISTENT DIRECTION	4.55%	1.30%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	6.49%	9.09%	26.62%	12.99%	19.48%	7.14%	7.79%	4.55%	

Source: Reference 2.3-229)

Table 2.3-248 Wind Direction Persistence Summaries - Detroit Metropolitan Airport 10 m Level [EF3 COL 2.0-8-A]

Number of Occurrences for Winds Blowing from the Same 67.5° Direction

2003-2007

All Wind Speeds [(A)]

HOURS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	% of PERSISTENT WINDS
2	156	107	110	86	166	107	160	164	240	175	133	161	204	136	145	126	24.23%
3	99	75	79	104	103	44	78	91	197	128	125	119	111	94	106	78	16.63%
4	61	43	41	49	43	41	54	89	125	84	58	75	96	66	65	49	10.59%
5	42	40	44	45	50	26	33	66	90	51	57	81	77	62	60	41	8.82%
6	49	19	28	31	25	18	35	57	54	48	46	59	58	54	24	38	6.56%
7	32	24	22	24	15	16	13	30	64	38	44	46	37	51	47	27	5.40%
8	33	22	14	13	30	16	12	40	40	36	40	35	36	46	29	21	4.72%
9	27	13	16	14	16	12	8	21	38	26	38	25	30	22	22	25	3.60%
10	29	13	14	12	7	9	8	13	19	26	24	31	23	33	23	18	3.08%
11	14	16	7	6	14	4	8	10	26	24	18	12	24	19	15	5	2.26%
12	7	13	11	6	8	1	5	12	17	17	9	15	22	13	13	23	1.96%
13	12	3	11	7	8	1	3	12	11	16	20	5	20	6	19	3	1.60%
14	12	22	4	1	3	4	0	3	7	13	6	16	16	12	4	4	1.29%
15	6	10	4	2	3	6	2	6	14	7	13	11	16	6	6	6	1.20%
16	8	8	2	7	7	4	3	4	9	7	12	10	15	10	5	3	1.16%
17	2	4	4	3	3	1	0	2	11	7	3	5	12	9	1	5	0.73%
18	9	14	5	1	4	0	1	2	5	12	14	4	6	5	5	8	0.97%
19	6	2	2	5	3	1	2	2	4	10	3	3	5	8	1	1	0.59%
20	5	8	3	4	3	0	0	3	5	4	3	8	8	9	1	2	0.67%
21	3	4	1	0	3	0	0	3	4	10	8	4	0	2	1	2	0.46%
22	3	2	1	1	2	0	0	1	2	2	2	3	2	1	3	6	0.32%
23	4	2	1	4	2	0	0	2	0	4	6	1	3	2	4	2	0.38%
24	2	1	3	2	4	1	0	0	3	5	4	5	0	1	2	3	0.37%
25	0	3	0	3	1	0	0	0	1	3	4	3	3	2	2	3	0.29%
26	3	0	2	1	1	1	0	0	0	2	1	3	1	0	1	2	0.18%
27	0	5	0	0	1	0	0	0	0	0	2	0	0	2	0	1	0.11%
28	6	4	1	0	0	0	0	0	1	1	4	3	2	4	0	1	0.28%
29	1	1	0	3	0	0	0	0	3	2	5	0	1	2	2	0	0.20%
30	1	0	0	1	0	0	0	0	1	2	2	0	2	2	0	0	0.11%
31	0	0	0	1	1	0	0	0	0	2	2	1	1	2	1	0	0.11%
32	0	0	1	0	1	0	0	0	1	0	0	0	3	0	0	0	0.06%
33	0	4	0	0	0	0	0	0	0	2	0	4	0	2	0	2	0.14%
34	3	3	1	0	1	0	0	0	0	1	0	1	0	1	0	1	0.12%
35	0	2	2	0	0	0	0	1	0	1	4	0	0	0	1	0	0.11%
36	0	1	0	0	0	0	0	1	2	2	0	0	0	1	0	1	0.08%
37	1	1	1	0	1	0	0	0	0	2	0	3	0	0	2	0	0.11%
38	0	0	0	0	0	0	0	0	0	2	0	2	1	1	0	1	0.07%
39	0	1	0	0	0	0	0	0	0	1	0	3	0	0	0	1	0.06%
40	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0.02%
41	0	0	0	1	0	0	0	0	0	0	1	0	2	0	0	0	0.04%
42	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0.02%
43	0	0	0	1	0	0	0	0	0	0	0	2	0	0	0	0	0.03%
44	0	0	0	0	0	2	0	0	0	0	0	0	1	0	0	0	0.03%
45	0	2	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0.05%
46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
48	2	2	0	0	0	0	0	0	0	3	4	0	1	3	1	0	0.16%
% of PERSISTENT DIRECTION	6.50%	5.04%	4.44%	4.48%	5.39%	3.21%	4.33%	6.47%	10.14%	7.93%	7.31%	7.74%	8.55%	7.04%	6.23%	5.19%	
AVE PERSISTENT HOURS	6.86	8.38	6.22	6.32	5.72	5.20	4.25	5.44	5.73	7.41	7.77	6.97	6.75	7.29	6.20	6.71	

* THE LONGEST PERSISTENT WIND WAS FROM THE SOUTHWEST AND LASTED 67 HOURS

(A)Hourly wind speeds of 3 knots or less (3.45) are reported as calm hours.

Source: Reference 2.3-229

Table 2.3-249 Wind Direction Persistence Summaries - Detroit Metropolitan Airport 10 m Level [EF3 COL 2.0-8-A]

Number of Occurrences for Winds Blowing from the Same 67.5° Direction

2003-2007

0-5 MPH [(A)]

HOURS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	% of PERSISTENT WINDS
2	84	64	42	58	122	50	53	83	147	60	14	22	49	59	41	47	63.05%
3	34	32	23	33	43	15	19	22	61	22	4	6	15	17	14	18	23.95%
4	15	8	3	6	15	6	7	9	26	7	1	2	11	3	1	9	8.17%
5	5	2	2	6	6	2	2	5	4	3	0	2	1	3	0	0	2.72%
6	0	3	3	2	2	3	2	0	2	1	0	0	1	1	0	1	1.33%
7	1	1	1	2	2	1	0	0	0	1	0	0	0	0	0	0	0.57%
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0.13%
9	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0.06%
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
% of PERSISTENT DIRECTION	8.81%	6.97%	4.69%	6.78%	12.04%	4.88%	5.26%	7.54%	15.27%	5.96%	1.20%	2.03%	4.88%	5.26%	3.55%	4.88%	

(A) Hourly wind speeds of 3 knots or less (3.45) are reported as calm hours.

Source: Reference 2.3-229

Table 2.3-250 Wind Direction Persistence Summaries - Detroit Metropolitan Airport 10 m Level [EF3 COL 2.0-8-A]

Number of Occurrences for Winds Blowing from the Same 67.5° Direction

2003-2007

5-10 MPH

HOURS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	% of PERSISTENT WINDS
2	161	127	116	98	164	75	126	148	263	168	128	150	207	155	122	133	45.77%
3	100	73	52	53	88	24	48	95	130	94	60	80	86	90	58	52	23.13%
4	42	59	22	28	34	26	27	45	64	52	28	37	45	52	34	46	12.53%
5	28	22	11	16	28	15	15	27	32	25	11	25	30	31	18	15	6.82%
6	27	15	7	13	5	7	11	15	27	23	14	12	28	19	10	8	4.71%
7	16	16	10	9	9	4	3	8	17	8	6	3	11	4	12	10	2.85%
8	4	10	8	7	5	2	2	6	6	8	2	3	2	6	3	4	1.52%
9	2	5	2	3	1	3	2	4	6	4	1	0	2	3	0	1	0.76%
10	4	9	1	0	6	0	0	1	4	0	0	1	2	3	0	2	0.65%
11	4	2	3	0	2	0	0	0	5	1	1	1	0	3	0	0	0.43%
12	3	2	4	0	2	2	0	0	3	1	0	0	0	0	1	0	0.35%
13	0	0	0	1	3	0	0	0	0	1	0	0	1	0	0	0	0.12%
14	0	1	0	0	1	0	2	0	0	0	0	0	0	0	0	1	0.10%
15	0	0	0	0	2	0	0	0	0	2	0	0	0	1	0	0	0.10%
16	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0.06%
17	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.02%
18	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0.04%
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
21	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.04%
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
% of PERSISTENT DIRECTION	7.68%	6.73%	4.61%	4.50%	6.84%	3.09%	4.61%	6.82%	10.89%	7.59%	4.91%	6.10%	8.09%	7.17%	5.04%	5.32%	

Source: Reference 2.3-229

Table 2.3-251 Wind Direction Persistence Summaries - Detroit Metropolitan Airport 10 m Level [EF3 COL 2.0-8-A]

Number of Occurrences for Winds Blowing from the Same 67.5° Direction

2003-2007

10-15 MPH

HOURS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	% of PERSISTENT WINDS
2	109	69	58	35	38	12	29	67	115	147	139	154	152	130	123	93	40.82%
3	51	32	38	28	33	4	6	28	86	84	91	81	73	79	63	53	23.05%
4	28	30	11	17	13	3	8	20	35	51	70	49	59	52	39	25	14.16%
5	13	21	9	14	16	5	6	3	16	27	39	33	25	30	29	22	8.55%
6	16	12	4	8	6	1	4	3	14	21	22	16	16	10	14	7	4.83%
7	8	6	4	3	2	0	0	3	10	9	15	14	17	9	6	5	3.08%
8	4	3	5	0	0	0	0	2	5	15	10	11	9	6	3	0	2.03%
9	6	2	1	0	0	0	0	1	2	9	11	0	2	4	1	3	1.17%
10	2	2	0	2	0	2	0	0	2	2	1	5	0	1	2	0	0.58%
11	0	0	3	0	3	0	0	0	2	0	4	2	1	3	1	1	0.56%
12	2	0	2	0	0	0	0	0	1	2	3	1	1	1	0	0	0.36%
13	0	4	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0.17%
14	0	0	1	0	0	0	0	0	0	0	0	4	1	0	1	0	0.19%
15	2	0	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0.14%
16	0	2	0	2	0	0	0	0	0	0	3	0	1	0	0	0	0.22%
17	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.03%
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0.06%
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
% of PERSISTENT DIRECTION	6.72%	5.08%	3.83%	3.05%	3.08%	0.75%	1.47%	3.53%	8.00%	10.19%	11.36%	10.27%	9.91%	9.03%	7.83%	5.89%	

Source: Reference 2.3-229

Table 2.3-252 Wind Direction Persistence Summaries - Detroit Metropolitan Airport 10 m Level [EF3 COL 2.0-8-A]

Number of Occurrences for Winds Blowing from the Same 67.5° Direction

2003-2007

15-20 MPH

HOURS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	% of PERSISTENT WINDS
2	18	22	6	4	4	0	4	3	26	58	79	68	69	47	33	27	49.32%
3	16	9	0	2	0	1	0	1	10	18	53	29	42	26	29	8	25.71%
4	5	1	3	0	0	0	1	1	10	15	26	14	20	10	8	3	12.33%
5	5	2	0	0	0	0	0	1	4	4	13	7	5	7	1	4	5.58%
6	2	0	1	1	0	0	0	2	2	3	2	8	10	2	1	4	4.00%
7	0	0	0	0	0	0	0	0	0	0	6	3	0	2	2	2	1.58%
8	0	0	0	0	0	0	0	0	0	0	3	1	3	0	1	0	0.84%
9	0	0	0	0	0	0	0	0	0	0	3	1	0	0	0	0	0.42%
10	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0.11%
11	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0.11%
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
% of PERSISTENT DIRECTION	4.85%	3.58%	1.05%	0.74%	0.42%	0.11%	0.53%	0.84%	5.48%	10.43%	19.49%	13.91%	15.70%	9.91%	7.90%	5.06%	

Source: Reference 2.3-229

Table 2.3-253 Wind Direction Persistence Summaries - Detroit Metropolitan Airport 10 m Level [EF3 COL 2.0-8-A]

Number of Occurrences for Winds Blowing from the Same 67.5° Direction

2003-2007

>20 MPH

HOURS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	% of PERSISTENT WINDS
2	5	4	0	0	0	0	0	0	4	9	29	24	30	13	14	10	62.01%
3	3	0	0	0	0	0	0	0	8	3	12	9	9	6	5	1	24.45%
4	0	0	0	0	0	0	0	0	1	4	6	4	3	0	0	0	7.86%
5	0	0	0	0	0	0	0	0	0	3	3	1	0	0	2	0	3.93%
6	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0.87%
7	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0.44%
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
10	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0.44%
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
% of PERSISTENT DIRECTION	3.49%	1.75%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	5.68%	8.73%	22.27%	17.03%	18.78%	8.30%	9.17%	4.80%	

Source: Reference 2.3-229

Table 2.3-254 Mean Monthly and Annual Mixing Heights (m) at White Lake, Michigan (2003 - 2007) [EF3 COL 2.0-8-A]

Month	Morning	Afternoon
January	887	796
February	833	913
March	834	1176
April	694	1482
May	670	1561
June	588	1748
July	663	1739
August	662	1530
September	542	1376
October	805	1248
November	809	943
December	853	718
Annual	737	1274

Source: Reference 2.3-252

Table 2.3-255 Temperature Inversion Frequency and Persistence at the Fermi Site (2003 - 2007) [EF3 COL 2.0-8-A]

	Annual	
Duration (Hours)	**Number of Observations**	**Probability of Occurrence (%)**
1	222	13.2
2	161	9.6
3	138	8.2
4	100	6.0
5	103	6.1
6	90	5.4
7	65	3.9
8	65	3.9
9	75	4.5
10	89	5.3
11	102	6.1
12	113	6.7
13	91	5.4
14	73	4.4
15	51	3.0
16	35	2.1
17	18	1.1
18	14	0.8
19	10	0.6
20	5	0.3
21	3	0.2
22	5	0.3
23	3	0.2
24	4	0.2
25+	21	1.3

Notes:

1. The longest inversion lasted 76 hours.
2. An inversion was present a total of 13,107 hours of a possible 43,824 hours during the 5-year period.
3. Probability of occurrence represents that, if an inversion occurs, the probability of its duration will be equal to the number of hours specified.

Table 2.3-256 Monthly Temperature Inversion Frequency and Persistence at the Fermi Site (2003 - 2007) [EF3 COL 2.0-8-A]

January

Duration (Hours)	Number of Observations	Probability of Occurrence (%)
1	10	10.1
2	6	6.1
3	11	11.1
4	4	4.0
5	11	11.1
6	7	7.1
7	6	6.1
8	3	3.0
9	4	4.0
10	6	6.1
11	2	2.0
12	2	2.0
13	3	3.0
14	0	0.0
15	5	5.1
16	2	2.0
17	0	0.0
18	1	1.0
19	1	1.0
20	1	1.0
21	0	0.0
22	0	0.0
23	0	0.0
24	2	2.0
25+	6	6.1

Notes:

1. The longest inversion lasted 74 hours.
2. Probability of occurrence represents that, if an inversion occurs, the probability of its duration will be equal to the number of hours specified.

Table 2.3-257 Monthly Temperature Inversion Frequency and Persistence at the Fermi Site (2003 - 2007) [EF3 COL 2.0-8-A]

February

Duration (Hours)	Number of Observations	Probability of Occurrence (%)
1	13	13.5
2	9	9.4
3	8	8.3
4	7	7.3
5	5	5.2
6	7	7.3
7	6	6.3
8	4	4.2
9	5	5.2
10	6	6.3
11	4	4.2
12	4	4.2
13	2	2.1
14	3	3.1
15	4	4.2
16	1	1.0
17	2	2.1
18	1	1.0
19	1	1.0
20	0	0.0
21	0	0.0
22	0	0.0
23	0	0.0
24	0	0.0
25+	2	2.1

Notes:

1. The longest inversion lasted 76 hours.
2. Probability of occurrence represents that, if an inversion occurs, the probability of its duration will be equal to the number of hours specified.

Table 2.3-258 Monthly Temperature Inversion Frequency and Persistence at the Fermi Site (2003 - 2007) [EF3 COL 2.0-8-A]

March

Duration (Hours)	Number of Observations	Probability of Occurrence (%)
1	23	15.2
2	14	9.3
3	15	9.9
4	6	4.0
5	5	3.3
6	12	7.9
7	7	4.6
8	5	3.3
9	5	3.3
10	3	2.0
11	6	4.0
12	3	2.0
13	7	4.6
14	9	6.0
15	6	4.0
16	5	3.3
17	2	1.3
18	3	2.0
19	2	1.3
20	1	0.7
21	0	0.0
22	1	0.7
23	3	2.0
24	0	0.0
25+	4	2.6

Notes:

1. The longest inversion lasted 51 hours.
2. Probability of occurrence represents that, if an inversion occurs, the probability of its duration will be equal to the number of hours specified.

Table 2.3-259 Monthly Temperature Inversion Frequency and Persistence at the Fermi Site (2003 - 2007) [EF3 COL 2.0-8-A]

April

Duration (Hours)	Number of Observations	Probability of Occurrence (%)
1	13	9.8
2	19	14.3
3	12	9.0
4	8	6.0
5	8	6.0
6	6	4.5
7	4	3.0
8	5	3.8
9	1	0.8
10	6	4.5
11	5	3.8
12	13	9.8
13	7	5.3
14	3	2.3
15	0	0.0
16	2	1.5
17	1	0.8
18	2	1.5
19	2	1.5
20	3	2.3
21	1	0.8
22	1	0.8
23	0	0.0
24	1	0.8
25+	5	3.8

Notes:

1. The longest inversion lasted 67 hours.
2. Probability of occurrence represents that, if an inversion occurs, the probability of its duration will be equal to the number of hours specified.

Table 2.3-260 Monthly Temperature Inversion Frequency and Persistence at the Fermi Site (2003 - 2007) [EF3 COL 2.0-8-A]

May

Duration (Hours)	Number of Observations	Probability of Occurrence (%)
1	27	17.5
2	15	9.7
3	8	5.2
4	13	8.4
5	10	6.5
6	9	5.8
7	9	5.8
8	10	6.5
9	6	3.9
10	9	5.8
11	12	7.8
12	14	9.1
13	7	4.5
14	1	0.6
15	1	0.6
16	1	0.6
17	1	0.6
18	0	0.0
19	0	0.0
20	0	0.0
21	0	0.0
22	0	0.0
23	0	0.0
24	1	0.6
25+	0	0.0

Notes:

1. The longest inversion lasted 24 hours.
2. Probability of occurrence represents that, if an inversion occurs, the probability of its duration will be equal to the number of hours specified.

Table 2.3-261 Monthly Temperature Inversion Frequency and Persistence at the Fermi Site (2003 - 2007) [EF3 COL 2.0-8-A]

June

Duration (Hours)	Number of Observations	Probability of Occurrence (%)
1	21	12.2
2	21	12.2
3	14	8.1
4	10	5.8
5	9	5.2
6	9	5.2
7	10	5.8
8	8	4.7
9	8	4.7
10	14	8.1
11	24	14.0
12	13	7.6
13	4	2.3
14	4	2.3
15	1	0.6
16	1	0.6
17	1	0.6
18	0	0.0
19	0	0.0
20	0	0.0
21	0	0.0
22	0	0.0
23	0	0.0
24	0	0.0
25+	0	0.0

Notes:

1. The longest inversion lasted 17 hours.
2. Probability of occurrence represents that, if an inversion occurs, the probability of its duration will be equal to the number of hours specified.

Table 2.3-262 Monthly Temperature Inversion Frequency and Persistence at the Fermi Site (2003 - 2007) [EF3 COL 2.0-8-A]

July

Duration (Hours)	Number of Observations	Probability of Occurrence (%)
1	26	15.1
2	16	9.3
3	16	9.3
4	7	4.1
5	20	11.6
6	11	6.4
7	2	1.2
8	5	2.9
9	10	5.8
10	15	8.7
11	17	9.9
12	19	11.0
13	8	4.7
14	0	0.0
15	0	0.0
16	0	0.0
17	0	0.0
18	0	0.0
19	0	0.0
20	0	0.0
21	0	0.0
22	0	0.0
23	0	0.0
24	0	0.0
25+	0	0.0

Notes:

1. The longest inversion lasted 13 hours.
2. Probability of occurrence represents that, if an inversion occurs, the probability of its duration will be equal to the number of hours specified.

Table 2.3-263 Monthly Temperature Inversion Frequency and Persistence at the Fermi Site (2003 - 2007) [EF3 COL 2.0-8-A]

August

Duration (Hours)	Number of Observations	Probability of Occurrence (%)
1	31	17.2
2	16	8.9
3	14	7.8
4	12	6.7
5	6	3.3
6	7	3.9
7	3	1.7
8	6	3.3
9	9	5.0
10	9	5.0
11	19	10.6
12	18	10.6
13	23	12.8
14	7	3.9
15	0	0.0
16	0	0.0
17	0	0.0
18	0	0.0
19	0	0.0
20	0	0.0
21	0	0.0
22	0	0.0
23	0	0.0
24	0	0.0
25+	0	0.0

Notes:

1. The longest inversion lasted 14 hours.
2. Probability of occurrence represents that, if an inversion occurs, the probability of its duration will be equal to the number of hours specified.

Table 2.3-264 Monthly Temperature Inversion Frequency and Persistence at the Fermi Site (2003 - 2007) [EF3 COL 2.0-8-A]

September

Duration (Hours)	Number of Observations	Probability of Occurrence (%)
1	8	5.6
2	9	6.3
3	9	6.3
4	7	4.9
5	10	7.0
6	8	5.6
7	2	1.4
8	5	3.5
9	7	4.9
10	5	3.5
11	5	3.5
12	17	11.9
13	18	12.6
14	25	17.5
15	7	4.9
16	1	0.7
17	0	0.0
18	0	0.0
19	0	0.0
20	0	0.0
21	0	0.0
22	0	0.0
23	0	0.0
24	0	0.0
25+	0	0.0

Notes:

1. The longest inversion lasted 16 hours.
2. Probability of occurrence represents that, if an inversion occurs, the probability of its duration will be equal to the number of hours specified.

Table 2.3-265 Monthly Temperature Inversion Frequency and Persistence at the Fermi Site (2003 - 2007) [EF3 COL 2.0-8-A]

October

Duration (Hours)	Number of Observations	Probability of Occurrence (%)
1	19	12.3
2	14	9.0
3	11	7.1
4	12	7.7
5	5	3.2
6	5	3.2
7	8	5.2
8	6	3.9
9	8	5.2
10	4	2.6
11	5	3.2
12	3	1.9
13	8	5.2
14	14	9.0
15	18	11.6
16	9	5.8
17	2	1.3
18	2	1.3
19	1	0.6
20	0	0.0
21	0	0.0
22	1	0.6
23	0	0.0
24	0	0.0
25+	0	0.0

Notes:

1. The longest inversion lasted 22 hours.
2. Probability of occurrence represents that, if an inversion occurs, the probability of its duration will be equal to the number of hours specified.

Table 2.3-266 Monthly Temperature Inversion Frequency and Persistence at the Fermi Site (2003 - 2007) [EF3 COL 2.0-8-A]

November

Duration (Hours)	Number of Observations	Probability of Occurrence (%)
1	19	16.0
2	8	6.7
3	6	5.0
4	9	7.6
5	11	9.2
6	3	2.5
7	3	2.5
8	6	5.0
9	10	8.4
10	7	5.9
11	3	2.5
12	5	4.2
13	1	0.8
14	3	2.5
15	5	4.2
16	6	5.0
17	5	4.2
18	3	2.5
19	2	1.7
20	0	0.0
21	2	1.7
22	0	0.0
23	0	0.0
24	0	0.0
25+	1	0.8

Notes:

1. The longest inversion lasted 48 hours.
2. Probability of occurrence represents that, if an inversion occurs, the probability of its duration will be equal to the number of hours specified.

Table 2.3-267 Monthly Temperature Inversion Frequency and Persistence at the Fermi Site (2003 - 2007) [EF3 COL 2.0-8-A]

December

Duration (Hours)	Number of Observations	Probability of Occurrence (%)
1	12	11.7
2	14	13.6
3	14	13.6
4	5	4.9
5	3	2.9
6	6	5.8
7	5	4.9
8	2	1.9
9	2	1.9
10	5	4.9
11	0	0.0
12	2	1.9
13	3	2.9
14	4	3.9
15	4	3.9
16	7	6.8
17	4	3.9
18	2	1.9
19	1	1.0
20	0	0.0
21	0	0.0
22	2	1.9
23	0	0.0
24	0	0.0
25+	3	2.9

Notes:

1. The longest inversion lasted 47 hours.
2. Probability of occurrence represents that, if an inversion occurs, the probability of its duration will be equal to the number of hours specified.

Table 2.3-268 Monthly and Annual Vertical Stability Class and Mean 60-m Wind Speed Distributions for Fermi Site (2003 - 2007) (Sheet 1 of 2) [EF3 COL 2.0-8-A]

	Vertical Stability Categories						
Period	**A**	**B**	**C**	**D**	**E**	**F**	**G**
January							
Wind Speed (knots)	13.62	14.28	14.64	15.23	13.28	13.22	11.75
Frequency (%)	10.33	5.35	6.48	46.11	23.74	6.10	1.88
February							
Wind Speed (knots)	13.09	14.44	14.61	14.80	12.45	10.84	10.37
Frequency (%)	17.23	5.53	5.35	41.90	21.07	6.26	2.66
March							
Wind Speed (knots)	12.43	13.10	13.20	15.50	13.47	14.53	14.66
Frequency (%)	16.95	5.32	3.70	34.04	23.68	10.31	5.99
April							
Wind Speed (knots)	13.67	14.92	16.37	16.55	14.49	13.18	12.61
Frequency (%)	25.11	4.58	4.67	24.39	24.73	10.98	5.53
May							
Wind Speed (knots)	12.41	12.53	12.62	13.65	11.65	10.88	9.90
Frequency (%)	23.10	6.53	6.26	28.65	22.12	8.71	4.65
June							
Wind Speed (knots)	9.98	10.80	11.16	11.99	11.36	10.28	8.43
Frequency (%)	26.90	5.86	4.46	23.23	24.77	10.06	4.74
July							
Wind Speed (knots)	10.03	10.43	10.80	12.04	10.70	8.59	8.05
Frequency (%)	30.68	5.44	4.14	19.88	23.96	9.72	6.17
August							
Wind Speed (knots)	9.56	9.57	9.60	11.12	10.75	9.37	8.91
Frequency (%)	26.53	5.78	4.79	19.16	25.27	12.33	6.14
September							
Wind Speed (knots)	10.06	11.90	11.75	13.21	12.29	10.37	8.37
Frequency (%)	25.28	4.64	3.77	21.12	26.84	10.56	7.79
October							
Wind Speed (knots)	11.69	12.81	14.65	14.55	13.03	12.70	9.93
Frequency (%)	17.60	4.38	3.39	28.09	28.41	11.75	6.37
November							
Wind Speed (knots)	13.18	14.69	15.81	14.86	12.89	12.17	12.10
Frequency (%)	11.32	4.01	4.66	41.91	25.55	9.25	3.30

Table 2.3-268 Monthly and Annual Vertical Stability Class and Mean 60-m Wind Speed Distributions for Fermi Site (2003 - 2007) (Sheet 2 of 2) [EF3 COL 2.0-8-A]

	Vertical Stability Categories						
Period	**A**	**B**	**C**	**D**	**E**	**F**	**G**
December							
Wind Speed (knots)	12.45	14.39	16.21	15.12	13.69	12.86	12.80
Frequency (%)	8.90	5.05	5.56	48.55	22.26	8.12	1.56
Annual							
Wind Speed (knots)	11.47	12.70	13.53	14.37	12.49	11.52	10.32
Frequency (%)	20.00	5.22	4.78	31.42	24.35	9.51	4.73

Table 2.3-269 Annual JFD of Wind Direction, Wind Speed, and Stability Class [EF3 COL 2.0-8-A]

Fermi Site

2003-2007

10-m Level

All Pasquill Stability Classes

	Wind Speed (Miles/Hour)										
Direction	**<0.75**	**0.75-3.36**	**3.361-4.5**	**4.51-6.5**	**6.51-8.5**	**8.51-11.5**	**11.51-14.5**	**14.51-18.5**	**18.51-23.5**	**>23.51**	**Total**
N	4	338	319	483	323	351	130	56	5	0	2009
NNE	1	252	327	433	225	240	127	41	10	0	1656
NE	9	144	157	538	554	415	116	4	2	0	1939
ENE	9	107	103	362	480	523	193	66	9	0	1852
E	10	70	129	375	436	515	322	146	33	4	2040
ESE	7	115	222	641	697	529	171	54	1	0	2437
SE	18	111	226	773	767	337	55	13	0	0	2300
SSE	11	166	224	657	587	293	48	6	3	0	1995
S	11	291	301	688	597	362	89	11	0	0	2350
SSW	21	397	371	997	1045	1035	366	120	7	0	4359
SW	19	631	552	826	782	878	459	205	41	1	4394
WSW	17	1015	652	867	648	462	90	27	2	0	3780
W	17	981	481	669	483	321	92	11	3	0	3058
WNW	8	1321	502	683	469	332	136	20	2	0	3473
NW	8	836	542	639	455	291	61	15	0	0	2847
NNW	5	478	453	734	455	277	99	28	0	0	2529
TOTAL	175	7253	5561	10365	9003	7161	2554	823	118	5	43018

Notes:
Data from 10 meter level
Data from 2003-2007
Calm is defined as a wind speed less than 0.75 mph

Table 2.3-270 Annual JFD of Wind Direction, Wind Speed, and Stability Class [EF3 COL 2.0-8-A]

Fermi Site

2003-2007

10-m Level

Class A Pasquill Stability Class

	Wind Speed (Miles/Hour)										
Direction	**<0.75**	**0.75-3.36**	**3.361-4.5**	**4.51-6.5**	**6.51-8.5**	**8.51-11.5**	**11.51-14.5**	**14.51-18.5**	**18.51-23.5**	**>23.51**	**Total**
N	0	10	19	47	62	62	5	9	0	0	214
NNE	0	7	27	56	31	42	11	7	0	0	181
NE	5	20	30	86	96	80	15	1	0	0	333
ENE	3	36	24	96	113	108	33	10	0	0	423
E	5	8	36	99	118	159	97	28	2	1	553
ESE	1	12	41	233	276	188	49	8	0	0	808
SE	9	7	49	313	377	107	5	0	0	0	867
SSE	6	18	44	222	283	96	7	1	0	0	677
S	6	11	48	202	188	58	6	1	0	0	520
SSW	4	16	57	181	282	226	54	8	3	0	831
SW	4	14	42	111	138	148	53	9	0	0	519
WSW	2	24	57	136	165	122	13	1	0	0	520
W	3	31	68	159	138	98	27	0	0	0	524
WNW	0	40	73	198	189	111	23	5	0	0	639
NW	0	30	73	176	175	101	24	4	0	0	583
NNW	0	15	34	128	135	93	29	6	0	0	440
TOTAL	48	299	722	2443	2766	1799	451	98	5	1	8632

Notes:
Data from 10 meter level
Data from 2003-2007
Calm is defined as a wind speed less than 0.75 mph

Table 2.3-271 Annual JFD of Wind Direction, Wind Speed, and Stability Class [EF3 COL 2.0-8-A]

Fermi Site

2003-2007

10-m Level

Class B Pasquill Stability Class

	Wind Speed (Miles/Hour)										
Direction	**<0.75**	**0.75-3.36**	**3.361-4.5**	**4.51-6.5**	**6.51-8.5**	**8.51-11.5**	**11.51-14.5**	**14.51-18.5**	**18.51-23.5**	**>23.51**	**Total**
N	0	12	17	32	28	19	7	6	0	0	121
NNE	0	6	14	20	13	21	9	1	0	0	84
NE	0	1	9	24	16	11	4	0	0	0	65
ENE	1	5	10	15	19	26	13	2	0	0	91
E	0	1	5	15	22	33	16	5	0	0	97
ESE	1	4	10	29	30	20	13	1	0	0	108
SE	0	4	23	58	43	17	4	0	0	0	149
SSE	0	8	9	44	20	8	2	0	0	0	91
S	0	6	17	37	20	14	2	0	0	0	96
SSW	1	7	11	39	71	57	29	10	0	0	225
SW	0	10	16	42	45	67	44	23	4	1	252
WSW	0	10	21	47	68	28	12	2	0	0	188
W	0	15	23	70	48	31	6	0	0	0	193
WNW	0	19	24	58	38	20	13	1	0	0	173
NW	0	17	19	45	40	23	6	2	0	0	152
NNW	0	8	22	51	36	30	9	0	0	0	156
TOTAL	3	133	250	626	557	425	189	53	4	1	2241

Notes:
Data from 10 meter level
Data from 2003-2007
Calm is defined as a wind speed less than 0.75 mph

Table 2.3-272 Annual JFD of Wind Direction, Wind Speed, and Stability Class [EF3 COL 2.0-8-A]

Fermi Site

2003-2007

10-m Level

Class C Pasquill Stability Class

	Wind Speed (Miles/Hour)										
Direction	**<0.75**	**0.75-3.36**	**3.361-4.5**	**4.51-6.5**	**6.51-8.5**	**8.51-11.5**	**11.51-14.5**	**14.51-18.5**	**18.51-23.5**	**>23.51**	**Total**
N	0	9	16	41	19	19	9	6	0	0	119
NNE	0	3	15	27	16	16	18	0	0	0	95
NE	0	8	6	23	23	25	6	0	0	0	91
ENE	0	5	3	8	21	42	15	6	2	0	102
E	0	3	2	17	12	22	12	9	1	0	78
ESE	1	2	9	29	20	27	9	2	0	0	99
SE	0	3	9	32	26	12	3	1	0	0	86
SSE	0	3	11	25	22	4	6	1	0	0	72
S	1	11	10	28	19	19	4	0	0	0	92
SSW	2	10	16	35	45	45	23	7	0	0	183
SW	1	15	21	35	58	56	31	38	6	0	261
WSW	0	15	22	50	37	46	15	6	0	0	191
W	0	19	29	41	39	22	15	0	0	0	165
WNW	0	22	26	46	19	21	18	2	0	0	154
NW	0	18	18	37	26	18	9	4	0	0	130
NNW	0	14	12	49	31	15	7	2	0	0	130
TOTAL	5	160	225	523	433	409	200	84	9	0	2048

Notes:

Data from 10 meter level

Data from 2003-2007

Calm is defined as a wind speed less than 0.75 mph

Table 2.3-273 Annual JFD of Wind Direction, Wind Speed, and Stability Class [EF3 COL 2.0-8-A]

Fermi Site

2003-2007

10-m Level

Class D Pasquill Stability Class

	Wind Speed (Miles/Hour)										
Direction	**<0.75**	**0.75-3.36**	**3.361-4.5**	**4.51-6.5**	**6.51-8.5**	**8.51-11.5**	**11.51-14.5**	**14.51-18.5**	**18.51-23.5**	**>23.51**	**Total**
N	1	73	66	120	121	196	95	30	4	0	706
NNE	0	68	96	153	115	127	83	32	10	0	684
NE	1	32	60	219	328	268	83	3	2	0	996
ENE	1	21	30	119	210	271	120	46	4	0	822
E	1	11	29	85	155	200	137	72	20	1	711
ESE	2	27	47	132	167	190	60	29	1	0	655
SE	6	26	35	145	136	88	23	9	0	0	468
SSE	1	22	42	89	83	65	15	2	2	0	321
S	2	36	50	118	134	111	32	4	0	0	487
SSW	6	41	54	171	226	288	146	70	1	0	1003
SW	7	70	106	305	394	499	297	125	28	0	1831
WSW	4	130	209	410	327	234	47	13	0	0	1374
W	4	129	171	252	202	157	40	8	0	0	963
WNW	3	146	114	234	165	143	75	11	0	0	891
NW	0	92	127	240	160	112	16	4	0	0	751
NNW	0	87	118	253	193	115	46	17	0	0	829
TOTAL	39	1011	1354	3045	3116	3064	1315	475	72	1	13492

Notes:
Data from 10 meter level
Data from 2003-2007
Calm is defined as a wind speed less than 0.75 mph

Table 2.3-274 Annual JFD of Wind Direction, Wind Speed, and Stability Class [EF3 COL 2.0-8-A]

Fermi Site

2003-2007

10-m Level

Class E Pasquill Stability Class

	Wind Speed (Miles/Hour)										
Direction	**<0.75**	**0.75-3.36**	**3.361-4.5**	**4.51-6.5**	**6.51-8.5**	**8.51-11.5**	**11.51-14.5**	**14.51-18.5**	**18.51-23.5**	**>23.51**	**Total**
N	2	105	89	143	80	47	13	5	1	0	485
NNE	0	95	135	138	41	31	6	1	0	0	447
NE	2	48	42	174	86	31	8	0	0	0	391
ENE	3	21	28	113	103	68	10	2	3	0	351
E	4	27	39	117	102	78	50	24	9	2	452
ESE	0	36	63	152	156	78	34	13	0	0	532
SE	2	35	52	135	130	75	10	2	0	0	441
SSE	1	52	66	165	108	81	10	0	1	0	484
S	1	106	116	230	187	118	30	4	0	0	792
SSW	7	124	136	420	325	343	102	21	2	0	1480
SW	3	239	249	294	130	94	31	10	3	0	1053
WSW	5	380	252	216	46	22	1	0	0	0	922
W	5	294	140	138	47	12	4	2	1	0	643
WNW	3	332	165	129	55	31	6	1	2	0	724
NW	4	261	228	125	47	35	6	1	0	0	707
NNW	2	121	158	187	55	18	8	3	0	0	552
TOTAL	44	2276	1958	2876	1698	1162	329	89	22	2	10456

Notes:
Data from 10 meter level
Data from 2003-2007
Calm is defined as a wind speed less than 0.75 mph

Table 2.3-275 Annual JFD of Wind Direction, Wind Speed, and Stability Class [EF3 COL 2.0-8-A]

Fermi Site

2003-2007

10-m Level

Class F Pasquill Stability Class

	Wind Speed (Miles/Hour)										
Direction	**<0.75**	**0.75-3.36**	**3.361-4.5**	**4.51-6.5**	**6.51-8.5**	**8.51-11.5**	**11.51-14.5**	**14.51-18.5**	**18.51-23.5**	**>23.51**	**Total**
N	1	88	84	85	11	8	1	0	0	0	278
NNE	1	55	35	29	9	3	0	0	0	0	132
NE	1	25	10	10	5	0	0	0	0	0	51
ENE	1	17	6	9	12	8	2	0	0	0	55
E	0	16	11	32	17	15	8	8	0	0	107
ESE	2	20	32	42	31	16	5	0	0	0	148
SE	1	17	32	55	34	18	7	1	0	0	165
SSE	2	49	39	82	47	26	6	2	0	0	253
S	1	97	51	55	41	37	15	2	0	0	299
SSW	1	150	73	124	82	63	11	4	1	0	509
SW	3	212	101	26	13	7	2	0	0	0	364
WSW	5	291	69	6	5	5	1	5	2	0	389
W	3	266	42	7	9	1	0	1	2	0	331
WNW	2	350	72	15	2	6	1	0	0	0	448
NW	2	218	65	15	6	2	0	0	0	0	308
NNW	3	135	69	47	5	6	0	0	0	0	265
TOTAL	29	2006	791	639	329	221	59	23	5	0	4102

Notes:
Data from 10 meter level
Data from 2003-2007
Calm is defined as a wind speed less than 0.75 mph

Table 2.3-276 Annual JFD of Wind Direction, Wind Speed, and Stability Class [EF3 COL 2.0-8-A]

Fermi Site

2003-2007

10-m Level

Class G Pasquill Stability Class

	Wind Speed (Miles/Hour)										
Direction	**<0.75**	**0.75-3.36**	**3.361-4.5**	**4.51-6.5**	**6.51-8.5**	**8.51-11.5**	**11.51-14.5**	**14.51-18.5**	**18.51-23.5**	**>23.51**	**Total**
N	0	41	28	15	2	0	0	0	0	0	86
NNE	0	18	5	10	0	0	0	0	0	0	33
NE	0	10	0	2	0	0	0	0	0	0	12
ENE	0	2	2	2	2	0	0	0	0	0	8
E	0	4	7	10	10	8	2	0	1	0	42
ESE	0	14	20	24	17	10	1	1	0	0	87
SE	0	19	26	35	21	20	3	0	0	0	124
SSE	1	14	13	30	24	13	2	0	0	0	97
S	0	24	9	18	8	5	0	0	0	0	64
SSW	0	49	24	27	14	13	1	0	0	0	128
SW	1	71	17	13	4	7	1	0	0	0	114
WSW	1	165	22	2	0	5	1	0	0	0	196
W	2	227	8	2	0	0	0	0	0	0	239
WNW	0	412	28	3	1	0	0	0	0	0	444
NW	2	200	12	1	1	0	0	0	0	0	216
NNW	0	98	40	19	0	0	0	0	0	0	157
TOTAL	7	1368	261	213	104	81	11	1	1	0	2047

Notes:
Data from 10 meter level
Data from 2003-2007
Calm is defined as a wind speed less than 0.75 mph

Table 2.3-277 Annual JFD of Wind Direction, Wind Speed, and Stability Class [EF3 COL 2.0-8-A]

Fermi Site

2003-2007

60-m Level

All Pasquill Stability Classes

	Wind Speed (Miles/Hour)										
Direction	**<0.75**	**0.75-3.36**	**3.361-4.5**	**4.51-6.5**	**6.51-8.5**	**8.51-11.5**	**11.51-14.5**	**14.51-18.5**	**18.51-23.5**	**>23.51**	**Total**
N	0	48	84	161	183	371	350	231	91	26	1545
NNE	0	45	80	195	222	335	298	247	111	38	1571
NE	0	60	84	236	350	656	485	320	121	8	2320
ENE	2	56	64	185	282	519	485	342	199	61	2195
E	2	37	60	156	272	389	389	475	370	200	2350
ESE	2	40	70	237	383	510	431	432	216	65	2386
SE	2	39	57	264	430	570	359	255	84	44	2104
SSE	3	48	77	251	420	543	328	236	88	24	2018
S	0	43	58	245	337	607	470	385	197	81	2423
SSW	1	37	62	198	331	746	813	853	562	189	3792
SW	3	41	52	175	298	714	885	834	579	306	3887
WSW	1	61	51	169	258	789	1027	1092	533	254	4235
W	0	56	47	168	314	757	927	712	420	203	3604
WNW	0	65	83	162	268	721	869	695	369	257	3489
NW	1	57	54	180	254	702	681	419	253	115	2716
NNW	1	52	89	195	300	602	604	299	138	41	2321
TOTAL	18	785	1072	3177	4902	9531	9401	7827	4331	1912	42956

Notes:
Data from 60 meter level
Data from 2003-2007
Calm is defined as a wind speed less than 0.75 mph

Table 2.3-278 Annual JFD of Wind Direction, Wind Speed, and Stability Class [EF3 COL 2.0-8-A]

Fermi Site

2003-2007

60-m Level

Class A Pasquill Stability Class

	Wind Speed (Miles/Hour)										
Direction	**<0.75**	**0.75-3.36**	**3.361-4.5**	**4.51-6.5**	**6.51-8.5**	**8.51-11.5**	**11.51-14.5**	**14.51-18.5**	**18.51-23.5**	**>23.51**	**Total**
N	0	4	8	25	29	41	33	12	4	4	160
NNE	0	4	8	23	26	38	31	22	10	4	166
NE	0	16	12	41	47	94	94	40	15	0	359
ENE	1	24	20	46	78	113	86	42	27	5	442
E	1	7	11	62	113	113	122	93	95	20	637
ESE	1	8	18	110	197	221	118	82	33	2	790
SE	1	7	18	108	237	222	65	12	3	0	673
SSE	0	6	16	91	212	217	61	11	5	0	619
S	0	9	8	85	146	225	73	35	6	0	587
SSW	0	6	14	61	98	228	183	121	42	8	761
SW	2	7	9	47	53	106	101	85	33	12	455
WSW	0	10	3	31	45	93	122	169	69	19	561
W	0	5	6	43	75	135	119	146	114	45	688
WNW	0	5	12	42	77	160	145	184	111	50	786
NW	0	6	9	34	68	138	128	117	70	28	598
NNW	0	6	6	32	44	86	79	32	21	4	310
TOTAL	6	130	178	881	1545	2230	1560	1203	658	201	8592

Notes:
Data from 60 meter level
Data from 2003-2007
Calm is defined as a wind speed less than 0.75 mph

Table 2.3-279 Annual JFD of Wind Direction, Wind Speed, and Stability Class [EF3 COL 2.0-8-A]

Fermi Site

2003-2007

60-m Level

Class B Pasquill Stability Class

	Wind Speed (Miles/Hour)										
Direction	**<0.75**	**0.75-3.36**	**3.361-4.5**	**4.51-6.5**	**6.51-8.5**	**8.51-11.5**	**11.51-14.5**	**14.51-18.5**	**18.51-23.5**	**>23.51**	**Total**
N	0	2	9	14	11	15	12	4	4	3	74
NNE	0	2	3	14	8	8	15	14	6	0	70
NE	0	1	6	2	11	23	16	9	4	1	73
ENE	0	3	5	8	6	19	14	17	9	4	85
E	0	1	5	9	13	20	13	25	20	4	110
ESE	0	1	7	16	14	20	19	17	14	1	109
SE	0	3	4	22	25	22	17	6	1	1	101
SSE	0	4	6	21	27	23	14	3	1	0	99
S	0	3	3	14	24	34	16	10	4	0	108
SSW	0	1	6	22	23	35	41	43	23	7	201
SW	0	0	5	10	22	36	37	48	34	23	215
WSW	0	4	1	11	15	38	39	65	29	30	232
W	0	3	3	7	24	51	45	59	41	15	248
WNW	0	6	9	7	14	41	31	39	30	16	193
NW	0	6	4	9	14	43	34	23	36	6	175
NNW	0	3	5	18	26	42	24	18	12	1	149
TOTAL	0	43	81	204	277	470	387	400	268	112	2242

Notes:
Data from 60 meter level
Data from 2003-2007
Calm is defined as a wind speed less than 0.75 mph

Table 2.3-280 Annual JFD of Wind Direction, Wind Speed, and Stability Class [EF3 COL 2.0-8-A]

Fermi Site

2003-2007

60-m Level

Class C Pasquill Stability Class

	Wind Speed (Miles/Hour)										
Direction	**<0.75**	**0.75-3.36**	**3.361-4.5**	**4.51-6.5**	**6.51-8.5**	**8.51-11.5**	**11.51-14.5**	**14.51-18.5**	**18.51-23.5**	**>23.51**	**Total**
N	0	3	6	15	14	20	12	14	7	5	96
NNE	0	2	5	8	13	18	14	13	7	0	80
NE	0	1	2	9	13	24	24	14	8	0	95
ENE	0	2	4	5	7	19	32	28	11	7	115
E	0	2	2	6	9	10	8	23	14	11	85
ESE	0	1	4	7	12	17	14	22	9	0	86
SE	0	0	1	15	17	16	14	7	3	0	73
SSE	0	2	6	14	17	15	12	6	7	1	80
S	0	1	4	15	17	18	21	14	3	0	93
SSW	0	2	5	4	10	42	31	36	21	4	155
SW	0	4	4	15	15	27	34	35	30	35	199
WSW	0	1	3	9	18	33	41	60	42	43	250
W	0	6	2	10	21	33	41	41	31	21	206
WNW	0	5	3	9	13	34	33	33	24	29	183
NW	0	4	2	10	15	30	23	16	15	13	128
NNW	0	3	7	10	15	36	31	15	11	1	129
TOTAL	0	39	60	161	226	392	385	377	243	170	2053

Notes:
Data from 60 meter level
Data from 2003-2007
Calm is defined as a wind speed less than 0.75 mph

Table 2.3-281 Annual JFD of Wind Direction, Wind Speed, and Stability Class [EF3 COL 2.0-8-A]

Fermi Site

2003-2007

60-m Level

Class D Pasquill Stability Class

	Wind Speed (Miles/Hour)										
Direction	**<0.75**	**0.75-3.36**	**3.361-4.5**	**4.51-6.5**	**6.51-8.5**	**8.51-11.5**	**11.51-14.5**	**14.51-18.5**	**18.51-23.5**	**>23.51**	**Total**
N	0	13	24	44	53	88	107	128	59	12	528
NNE	0	15	23	74	81	113	101	133	83	34	657
NE	0	12	12	59	79	280	261	226	84	6	1019
ENE	1	3	7	38	56	177	239	213	124	43	901
E	0	10	16	24	47	98	127	186	168	105	781
ESE	1	7	18	32	67	133	138	155	72	19	642
SE	0	6	8	41	50	114	100	69	19	6	413
SSE	0	8	14	40	55	79	59	47	12	2	316
S	0	7	13	37	41	89	103	103	46	13	452
SSW	0	10	5	31	45	133	194	206	166	63	853
SW	0	7	9	19	63	155	273	387	349	185	1447
WSW	0	23	9	39	83	277	351	516	346	154	1798
W	0	16	10	35	60	219	271	250	187	103	1151
WNW	0	22	20	33	55	149	211	215	138	135	978
NW	0	13	15	35	57	171	182	155	94	45	767
NNW	0	8	23	40	85	181	196	148	81	30	792
TOTAL	2	180	226	621	977	2456	2913	3137	2028	955	13495

Notes:

Data from 60 meter level

Data from 2003-2007

Calm is defined as a wind speed less than 0.75 mph

Table 2.3-282 Annual JFD of Wind Direction, Wind Speed, and Stability Class [EF3 COL 2.0-8-A]

Fermi Site

2003-2007

60-m Level

Class E Pasquill Stability Class

	Wind Speed (Miles/Hour)										
Direction	**<0.75**	**0.75-3.36**	**3.361-4.5**	**4.51-6.5**	**6.51-8.5**	**8.51-11.5**	**11.51-14.5**	**14.51-18.5**	**18.51-23.5**	**>23.51**	**Total**
N	0	13	21	34	39	125	108	50	16	2	408
NNE	0	9	18	41	59	111	83	53	4	0	378
NE	0	10	20	70	115	180	67	27	10	1	500
ENE	0	10	13	40	67	148	101	35	25	2	441
E	0	7	9	29	65	124	93	126	62	42	557
ESE	0	7	10	27	72	98	117	99	52	24	506
SE	0	8	15	37	65	151	119	92	20	7	514
SSE	1	20	14	56	59	127	114	92	20	4	507
S	0	6	13	44	54	151	163	151	80	37	699
SSW	0	10	11	26	66	195	276	334	210	74	1202
SW	1	9	14	37	73	214	301	217	102	50	1018
WSW	0	11	12	38	56	234	341	240	36	6	974
W	0	9	12	34	76	199	279	155	40	11	815
WNW	0	10	17	37	59	187	205	152	62	24	753
NW	0	12	14	38	51	193	185	77	38	21	629
NNW	0	15	22	48	67	154	175	58	13	5	557
TOTAL	2	166	235	636	1043	2591	2727	1958	790	310	10458

Notes:

Data from 60 meter level

Data from 2003-2007

Calm is defined as a wind speed less than 0.75 mph

Table 2.3-283 Annual JFD of Wind Direction, Wind Speed, and Stability Class [EF3 COL 2.0-8-A]

Fermi Site

2003-2007

60-m Level

Class F Pasquill Stability Class

	Wind Speed (Miles/Hour)										
Direction	**<0.75**	**0.75-3.36**	**3.361-4.5**	**4.51-6.5**	**6.51-8.5**	**8.51-11.5**	**11.51-14.5**	**14.51-18.5**	**18.51-23.5**	**>23.51**	**Total**
N	0	8	10	11	21	59	55	16	0	0	180
NNE	0	5	7	21	20	36	41	8	0	0	138
NE	0	6	16	35	66	43	19	3	0	0	188
ENE	0	6	9	32	51	31	10	6	3	0	148
E	1	6	11	15	17	17	17	19	8	13	124
ESE	0	7	8	28	18	16	22	43	16	13	171
SE	0	11	7	25	32	32	25	45	21	11	209
SSE	0	5	9	19	43	68	54	48	21	12	279
S	0	12	6	29	39	64	63	51	39	25	328
SSW	1	3	4	23	54	79	63	90	86	28	431
SW	0	4	4	24	47	137	93	46	18	0	373
WSW	0	9	11	20	25	70	100	35	5	0	275
W	0	11	6	17	26	74	117	48	7	8	314
WNW	0	7	12	19	31	102	182	58	4	3	418
NW	1	8	5	32	30	76	88	23	0	2	265
NNW	1	10	10	28	40	61	71	22	0	0	243
TOTAL	4	118	135	378	560	965	1020	561	228	115	4084

Notes:
Data from 60 meter level
Data from 2003-2007
Calm is defined as a wind speed less than 0.75 mph

Table 2.3-284 Annual JFD of Wind Direction, Wind Speed, and Stability Class [EF3 COL 2.0-8-A]

Fermi Site

2003-2007

60-m Level

Class G Pasquill Stability Class

	Wind Speed (Miles/Hour)										
Direction	**<0.75**	**0.75-3.36**	**3.361-4.5**	**4.51-6.5**	**6.51-8.5**	**8.51-11.5**	**11.51-14.5**	**14.51-18.5**	**18.51-23.5**	**>23.51**	**Total**
N	0	5	6	18	16	23	23	7	1	0	99
NNE	0	8	16	14	15	11	13	4	1	0	82
NE	0	14	16	20	19	12	4	1	0	0	86
ENE	0	8	6	16	17	12	3	1	0	0	63
E	0	4	6	11	8	7	9	3	3	5	56
ESE	0	9	5	17	3	5	3	14	20	6	82
SE	1	4	4	16	4	13	19	24	17	19	121
SSE	2	3	12	10	7	14	14	29	22	5	118
S	0	5	11	21	16	26	31	21	19	6	156
SSW	0	5	17	31	35	34	25	23	14	5	189
SW	0	10	7	23	25	39	46	16	13	1	180
WSW	1	3	12	21	16	44	33	7	6	2	145
W	0	6	8	22	32	46	55	13	0	0	182
WNW	0	10	10	15	19	48	62	14	0	0	178
NW	0	8	5	22	19	51	41	8	0	0	154
NNW	0	7	16	19	23	42	28	6	0	0	141
TOTAL	4	109	157	296	274	427	409	191	116	49	2032

Notes:
Data from 60 meter level
Data from 2003-2007
Calm is defined as a wind speed less than 0.75 mph

Table 2.3-285 SACTI Input Parameters [EF3 COL 2.0-8-A]

Parameter	Natural Draft Tower	
Number of Towers	1	
Number of Cells/Fans per Tower	N/A	
Tower Height (1)	600 ft (2)	
Total Circulating Water Flow Rate	720,000 gpm (3)	
Total Drift Loss Rate	3,603 lb/hr (454 grams/sec) - based on 0.001% of total water flow as drift	
Total Exit Air Flow Rate	229,211,402 lb/hr (28,880 kilograms/sec) - highest expected operation	
Total Heat Rejection Rate	3,142 MW (highest expected operation)	
Top Exit Diameter	292 ft	
Drift Droplet Spectrum	Drop Size (µm)	Mass Fraction
	10	0.12
	15	0.08
	35	0.20
	65	0.20
	115	0.20
	170	0.10
	230	0.05
	375	0.04
	525	0.008

Notes:

1. Base elevation of tower is approximately 583 ft (presented in Figure 2.3-258).
2. Section 1.2 addresses the need for Federal Aviation Administration (FAA) approval prior to erecting the natural draft cooling tower.
3. Revision 6 of the DCD changed this value to 724,000 gpm. 720,000 gpm is a representative flow rate given the decreased heat load, as discussed in ER Section 3.4.1.6.

Table 2.3-286 Average Plume Lengths During NDCT Operation [EF3 COL 2.0-8-A]

	Winter		Spring		Summer		Fall		Annual	
Direction	**Mi**	**km**	**Mi**	**km**	**Mi**	**km**	**Mi**	**km**	**Mi**	**km**
S	1.72	2.77	0.78	1.25	0.29	0.47	1.19	1.92	1.22	1.97
SSW	1.68	2.70	0.64	1.03	0.26	0.42	1.38	2.22	1.19	1.91
SW	1.72	2.76	0.55	0.89	0.27	0.44	1.22	1.96	1.21	1.95
WSW	1.66	2.66	0.65	1.04	0.34	0.56	1.10	1.78	1.24	1.99
W	1.57	2.53	0.96	1.55	0.20	0.32	1.24	2.00	1.27	2.04
WNW	1.41	2.28	0.92	1.48	0.19	0.31	0.98	1.58	1.04	1.68
NW	1.15	1.86	0.61	0.98	0.18	0.29	0.99	1.59	0.85	1.37
NNW	1.27	2.05	0.75	1.21	0.18	0.29	0.75	1.21	0.86	1.38
N	1.21	1.95	0.38	0.61	0.19	0.30	0.72	1.16	0.84	1.35
NNE	1.22	1.97	0.38	0.61	0.19	0.31	0.79	1.27	0.89	1.43
NE	1.42	2.29	0.39	0.62	0.19	0.30	1.15	1.84	1.17	1.89
ENE	1.66	2.67	0.50	0.81	0.21	0.34	1.27	2.04	1.42	2.28
E	1.40	2.26	0.75	1.21	0.23	0.37	1.03	1.67	1.16	1.86
ESE	1.35	2.17	0.85	1.37	0.32	0.52	0.97	1.56	1.10	1.77
SE	1.35	2.17	0.87	1.39	0.27	0.43	1.12	1.81	1.15	1.86
SSE	1.48	2.38	0.79	1.28	0.30	0.48	1.13	1.81	1.17	1.89
All	1.47	2.37	0.73	1.18	0.24	0.39	1.07	1.73	1.15	1.85

Notes:
Plume moving in the indicated direction.

Table 2.3-287 Annual Plume Length Frequency During NDCT Operations [EF3 COL 2.0-8-A]

Values in %

Distance from Tower (m)	S	SSW	SW	WSW	W	WNW	NW	NNW	N	NNE	NE	ENE	E	ESE	SE	SSE	SUM
100.	4.24	3.25	4.79	4.63	7.19	4.82	4.39	4.15	7.94	8.17	8.10	9.25	11.27	7.08	5.66	5.07	100.00
200.	4.24	3.25	4.79	4.63	7.19	4.82	4.39	4.15	7.94	8.17	8.10	9.25	11.27	7.08	5.66	5.07	100.00
300.	4.24	3.25	4.79	4.63	7.19	4.82	4.39	4.15	7.94	8.17	8.10	9.25	11.27	7.08	5.66	5.07	100.00
400.	4.11	3.18	4.73	4.49	7.00	4.63	4.12	3.69	7.24	7.76	7.66	8.89	10.72	6.76	5.45	4.89	95.34
500.	3.73	2.94	4.28	3.83	6.12	3.79	3.01	2.76	5.61	5.82	5.96	7.52	9.13	5.89	4.90	4.46	79.77
600.	3.35	2.60	3.68	3.41	5.52	3.15	2.42	2.18	4.71	4.89	5.27	6.96	8.45	5.46	4.49	4.09	70.62
700.	2.90	2.17	3.10	3.04	4.95	2.65	2.02	1.81	4.01	4.18	4.72	6.48	7.81	4.94	4.05	3.61	62.43
800.	2.55	1.83	2.73	2.70	4.47	2.35	1.77	1.53	3.56	3.60	4.34	6.10	7.33	4.57	3.73	3.32	56.46
900.	2.38	1.72	2.54	2.52	4.23	2.21	1.63	1.43	3.36	3.40	4.12	5.89	7.03	4.35	3.55	3.15	53.51
1000.	2.18	1.61	2.36	2.37	4.04	2.06	1.53	1.33	3.13	3.17	3.95	5.71	6.77	4.14	3.41	2.97	50.71
1100.	1.83	1.37	2.04	2.11	3.63	1.79	1.30	1.13	2.59	2.73	3.53	5.35	6.22	3.74	3.11	2.65	45.11
1200.	1.83	1.37	2.04	2.11	3.63	1.79	1.30	1.13	2.59	2.73	3.53	5.35	6.22	3.74	3.11	2.65	45.11
1300.	1.68	1.26	1.84	1.99	3.37	1.65	1.18	1.05	2.28	2.49	3.31	5.12	5.84	3.48	2.93	2.48	41.93
1400.	1.55	1.17	1.70	1.88	3.11	1.50	1.09	0.96	2.04	2.27	3.06	4.92	5.47	3.31	2.77	2.31	39.10
1500.	1.55	1.17	1.70	1.88	3.11	1.50	1.09	0.96	2.04	2.27	3.06	4.92	5.47	3.31	2.77	2.31	39.10
1600.	1.41	1.06	1.58	1.76	2.90	1.35	0.99	0.85	1.81	2.07	2.88	4.67	5.02	3.11	2.62	2.18	36.27
1700.	1.41	1.06	1.58	1.76	2.90	1.35	0.99	0.85	1.81	2.07	2.88	4.67	5.02	3.11	2.62	2.18	36.27
1800.	1.41	1.06	1.58	1.76	2.90	1.35	0.99	0.85	1.81	2.07	2.88	4.67	5.02	3.11	2.62	2.18	36.27
1900.	1.29	0.95	1.46	1.66	2.76	1.22	0.89	0.75	1.61	1.84	2.63	4.42	4.64	2.94	2.45	2.04	33.56
2000.	1.03	0.78	1.17	1.39	2.39	0.99	0.67	0.52	1.20	1.42	2.23	3.90	3.76	2.49	2.01	1.75	27.70
2100.	0.90	0.66	1.06	1.27	2.21	0.85	0.56	0.40	1.02	1.21	2.03	3.68	3.42	2.19	1.81	1.58	24.84
2200.	0.90	0.66	1.06	1.27	2.21	0.85	0.56	0.40	1.02	1.21	2.03	3.68	3.42	2.19	1.81	1.58	24.84
2300.	0.78	0.61	0.95	1.14	2.03	0.72	0.47	0.33	0.85	1.02	1.81	3.36	3.06	1.93	1.62	1.39	22.06
2400.	0.78	0.61	0.95	1.14	2.03	0.72	0.47	0.33	0.85	1.02	1.81	3.36	3.06	1.93	1.62	1.39	22.06
2500.	0.68	0.55	0.83	1.01	1.82	0.62	0.41	0.29	0.70	0.88	1.55	2.99	2.65	1.65	1.43	1.17	19.22
2600.	0.68	0.55	0.83	1.01	1.82	0.62	0.41	0.29	0.70	0.88	1.55	2.99	2.65	1.65	1.43	1.17	19.22
2700.	0.68	0.55	0.83	1.01	1.82	0.62	0.41	0.29	0.70	0.88	1.55	2.99	2.65	1.65	1.43	1.17	19.22
2800.	0.60	0.45	0.68	0.86	1.62	0.50	0.33	0.23	0.57	0.72	1.29	2.67	2.26	1.35	1.21	0.97	16.32
2900.	0.60	0.45	0.68	0.86	1.62	0.50	0.33	0.23	0.57	0.72	1.29	2.67	2.26	1.35	1.21	0.97	16.32
3000.	0.60	0.45	0.68	0.86	1.62	0.50	0.33	0.23	0.57	0.72	1.29	2.67	2.26	1.35	1.21	0.97	16.32
3100.	0.60	0.45	0.68	0.86	1.62	0.50	0.33	0.23	0.57	0.72	1.29	2.67	2.26	1.35	1.21	0.97	16.32
3200.	0.60	0.45	0.68	0.86	1.62	0.50	0.33	0.23	0.57	0.72	1.29	2.67	2.26	1.35	1.21	0.97	16.32
3300.	0.60	0.45	0.68	0.86	1.62	0.50	0.33	0.23	0.57	0.72	1.29	2.67	2.26	1.35	1.21	0.97	16.32
3400.	0.50	0.39	0.59	0.67	1.30	0.40	0.27	0.20	0.47	0.56	1.03	2.21	1.78	1.05	1.00	0.78	13.20
3500.	0.50	0.39	0.59	0.67	1.30	0.40	0.27	0.20	0.47	0.56	1.03	2.21	1.78	1.05	1.00	0.78	13.20
3600.	0.50	0.39	0.59	0.67	1.30	0.40	0.27	0.20	0.47	0.56	1.03	2.21	1.78	1.05	1.00	0.78	13.20
3700.	0.50	0.39	0.59	0.67	1.30	0.40	0.27	0.20	0.47	0.56	1.03	2.21	1.78	1.05	1.00	0.78	13.20
3800.	0.50	0.39	0.59	0.67	1.30	0.40	0.27	0.20	0.47	0.56	1.03	2.21	1.78	1.05	1.00	0.78	13.20
3900.	0.50	0.39	0.59	0.67	1.30	0.40	0.27	0.20	0.47	0.56	1.03	2.21	1.78	1.05	1.00	0.78	13.20
4000.	0.50	0.39	0.59	0.67	1.30	0.40	0.27	0.20	0.47	0.56	1.03	2.21	1.78	1.05	1.00	0.78	13.20
4100.	0.50	0.39	0.59	0.67	1.30	0.40	0.27	0.20	0.47	0.56	1.03	2.21	1.78	1.05	1.00	0.78	13.20
4200.	0.50	0.39	0.59	0.67	1.30	0.40	0.27	0.20	0.47	0.56	1.03	2.21	1.78	1.05	1.00	0.78	13.20
4300.	0.50	0.39	0.59	0.67	1.30	0.40	0.27	0.20	0.47	0.56	1.03	2.21	1.78	1.05	1.00	0.78	13.20
4400.	0.41	0.31	0.49	0.51	1.03	0.29	0.17	0.16	0.32	0.37	0.82	1.74	1.34	0.80	0.73	0.59	10.09
4500.	0.41	0.31	0.49	0.51	1.03	0.29	0.17	0.16	0.32	0.37	0.82	1.74	1.34	0.80	0.73	0.59	10.09
4600.	0.41	0.31	0.49	0.51	1.03	0.29	0.17	0.16	0.32	0.37	0.82	1.74	1.34	0.80	0.73	0.59	10.09
4700.	0.41	0.31	0.49	0.51	1.03	0.29	0.17	0.16	0.32	0.37	0.82	1.74	1.34	0.80	0.73	0.59	10.09
4800.	0.41	0.31	0.49	0.51	1.03	0.29	0.17	0.16	0.32	0.37	0.82	1.74	1.34	0.80	0.73	0.59	10.09
4900.	0.41	0.31	0.49	0.51	1.03	0.29	0.17	0.16	0.32	0.37	0.82	1.74	1.34	0.80	0.73	0.59	10.09
5000.	0.41	0.31	0.49	0.51	1.03	0.29	0.17	0.16	0.32	0.37	0.82	1.74	1.34	0.80	0.73	0.59	10.09

Notes:
Plume moving in the indicated direction

Table 2.3-288 Meteorological Parameters Monitored at the Fermi Site [EF3 COL 2.0-9-A]

Parameter	Sampling Height (m)	Sensing Technique
Primary Monitoring System		
Wind Speed	10 and 60	Cups/light chopper
Wind Direction	10 and 60	Vane/potentiometer
Vertical Wind Speed	10	Propeller
Differential Temperature	10 to 60	Matched thermistors
Ambient Temperature	10	Thermistor
Dewpoint	10	Lithium Chloride Type
Precipitation	1.5	Tipping bucket
Secondary Monitoring System		
Wind Speed	10 and 60	Cups/light chopper
Wind Direction	10 and 60	Vane/potentiometer
Vertical Wind Speed	10	Propeller/light chopper
Differential Temperature	10 to 60	Matched thermistors
Ambient Temperature	10	Thermistor

Source: Reference 2.3-262

Table 2.3-289 Accuracies and Thresholds for the Fermi Onsite Meteorological Monitoring Program Instruments [EF3 COL 2.0-9-A]

Equipment	Manufacturer and Model	Range	System Accuracy	Starting Threshold	Measurement Resolution
Wind Speed	Climatronics Model F460-100075	0 to 125 mph	0.15 mph	1.0 mph	0.1 mph
Wind Direction	Climatronics Model F460-100076	0° to 540°	±3.2 degree	1.0 mph	1.0 degree
Temperature	Omega OL-703 Linear Thermistor Probe	-22°F to 212°F	0.4°F	N/A	0.1°C
Dewpoint Temperature	Climatronics Model 101197	-22°F to 122°F	±2.7°F	N/A	0.1°C
Differential Temperature	N/A	N/A	0.15°C	N/A	0.01°C
Precipitation	Fisher & Porter Company Model 35-1559 EA10	0 to 19.5 inches	±0.1 in	N/A	0.01 in
Recorder	Thermo Westronics Model SV180	N/A	±0.05% of programmed range	N/A	0.006% of full scale

Table 2.3-290 Method for Substituting Redundant Parameters of the Critical Meteorological Measurements [EF3 COL 2.0-9-A]

Level of Redundancy	10-m Level Indicator	10-m Level Wind Speed	Stability Wind Direction
0	Primary WS10	Primary WD10	Primary Delta T
1	Secondary WS10	Secondary WD10	Secondary Delta T Primary Sigma theta
3			Secondary Sigma theta

Source: Reference 2.3-262

Table 2.3-291 Data Recovery Percentages for the Fermi Onsite Meteorological Monitoring Instruments During the 2003-2007 Time Period [EF3 COL 2.0-9-A]

Recorded Parameter	Recovery Percentages
Wind Speed	
10-m	99.98%
60-m	99.98%
Wind Direction	
10-m	99.98%
60-m	99.98%
Temperature	
10-m	99.99%
10-m to 60-m Difference (ΔT)	99.98%
Dewpoint	
10-m	99.96%
Precipitation	
Ground Level	94.59%

Table 2.3-292 Joint Frequency Distribution in Hours of Wind Speed and Direction by Atmospheric Stability Class – Stability Class A [EF3 COL 2.0-10-A]

	Wind Speed (miles/hr)									
DIR	**<0.75**	**0.751-2.5**	**2.51-4.5**	**4.51-6.5**	**6.51-8.5**	**8.51-11.5**	**11.51-14.5**	**14.51-18.5**	**18.51-23.5**	**TOTAL**
N	0	6	29	53	72	72	12	12	0	256
NNE	0	3	35	63	44	48	14	7	0	214
NE	5	10	46	108	131	79	15	1	0	395
ENE	3	24	42	102	145	129	39	7	0	491
E	5	3	42	106	141	181	116	37	2	633
ESE	1	4	56	279	326	211	57	9	0	943
SE	10	4	63	363	422	124	7	0	0	993
SSE	6	8	59	243	320	123	10	1	0	770
S	8	5	62	222	203	79	9	1	0	589
SSW	7	7	68	199	300	256	68	11	2	918
SW	5	10	58	137	174	200	79	18	1	682
WSW	2	10	100	158	199	163	20	5	0	657
W	3	22	97	188	146	122	42	3	0	623
WNW	0	17	133	221	208	127	33	5	0	744
NW	0	12	117	202	198	108	30	4	0	671
NNW	0	4	53	137	149	115	37	8	0	503
TOTAL	55	149	1060	2781	3178	2137	588	129	5	10082

Notes:
Data from 10 m Sensor
Data from 2002-2007
Calms already distributed into data

Table 2.3-293 Joint Frequency Distribution in Hours of Wind Speed and Direction by Atmospheric Stability Class – Stability Class B

[EF3 COL 2.0-10-A]

Wind Speed (miles/hr)

DIR	<0.75	0.751-2.5	2.51-4.5	4.51-6.5	6.51-8.5	8.51-11.5	11.51-14.5	14.51-18.5	18.51-23.5	TOTAL
N	0	3	30	35	34	20	7	6	0	135
NNE	0	2	23	23	20	19	12	1	0	100
NE	0	2	12	30	19	15	3	2	0	83
ENE	1	1	18	19	28	28	12	4	0	111
E	0	0	7	18	25	35	17	7	0	109
ESE	1	1	17	40	37	22	13	1	0	132
SE	1	1	32	75	51	21	4	0	0	185
SSE	0	4	14	61	39	12	2	0	0	132
S	0	4	19	46	24	18	2	0	0	113
SSW	2	3	25	50	82	70	30	10	0	272
SW	0	5	28	57	58	84	43	25	4	304
WSW	0	4	38	58	71	28	13	2	0	214
W	0	15	38	78	51	36	11	1	0	230
WNW	0	9	45	70	43	25	14	2	0	208
NW	0	6	43	55	43	22	6	2	0	177
NNW	0	1	36	61	42	32	9	0	0	181
TOTAL	5	61	425	776	667	487	198	63	4	2686

Notes:

Data from 10 m Sensor

Data from 2002-2007

Calms already distributed into data

Table 2.3-294 Joint Frequency Distribution in Hours of Wind Speed and Direction by Atmospheric Stability Class – Stability Class C

[EF3 COL 2.0-10-A]

Wind Speed (miles/hr)

DIR	<0.75	0.751-2.5	2.51-4.5	4.51-6.5	6.51-8.5	8.51-11.5	11.51-14.5	14.51-18.5	18.51-23.5	TOTAL
N	0	2	27	42	29	30	10	6	0	146
NNE	0	5	24	30	23	21	22	0	0	125
NE	0	4	12	28	36	27	6	1	0	114
ENE	0	4	6	11	29	42	14	10	2	118
E	0	1	5	20	19	28	18	10	1	102
ESE	1	0	15	37	28	30	12	2	0	125
SE	0	1	14	46	34	14	5	1	0	115
SSE	0	0	15	39	32	6	7	1	0	100
S	1	5	22	39	27	20	5	0	0	119
SSW	2	7	29	50	56	74	35	8	0	261
SW	1	4	37	51	77	77	48	45	6	346
WSW	0	12	48	57	36	44	16	6	0	219
W	0	14	48	52	48	26	16	0	0	204
WNW	0	10	57	48	39	27	20	3	0	204
NW	0	6	44	36	31	22	9	5	0	153
NNW	0	12	27	60	41	13	8	2	0	163
TOTAL	5	87	430	646	585	501	251	100	9	2614

Notes:

Data from 10 m Sensor

Data from 2002-2007

Calms already distributed into data

Table 2.3-295 Joint Frequency Distribution in Hours of Wind Speed and Direction by Atmospheric Stability Class – Stability Class D [EF3 COL 2.0-10-A]

	Wind Speed (miles/hr)									
DIR	**<0.75**	**0.751-2.5**	**2.51-4.5**	**4.51-6.5**	**6.51-8.5**	**8.51-11.5**	**11.51-14.5**	**14.51-18.5**	**18.51-23.5**	**TOTAL**
N	1	48	122	144	133	222	99	31	4	804
NNE	0	29	169	180	131	133	105	34	10	791
NE	1	26	90	251	380	330	84	4	2	1168
ENE	1	12	51	131	240	324	123	43	4	929
E	1	6	47	93	179	240	163	79	26	834
ESE	2	11	73	158	194	195	64	30	1	728
SE	6	11	55	162	173	102	23	9	1	542
SSE	2	8	60	93	103	92	18	2	2	380
S	3	11	77	133	161	126	36	3	0	550
SSW	8	31	74	194	256	392	171	76	1	1203
SW	7	36	186	391	483	585	346	125	28	2187
WSW	4	56	330	431	333	237	55	21	4	1471
W	4	77	260	290	216	160	38	6	0	1051
WNW	3	71	216	256	180	152	77	11	0	966
NW	0	55	213	271	178	115	20	2	0	854
NNW	0	42	189	290	223	128	48	15	0	935
TOTAL	43	530	2212	3468	3563	3533	1470	491	83	15393

Notes:
Data from 10 m Sensor
Data from 2002-2007
Calms already distributed into data

Table 2.3-296 Joint Frequency Distribution in Hours of Wind Speed and Direction by Atmospheric Stability Class – Stability Class E

[EF3 COL 2.0-10-A]

Wind Speed (miles/hr)

DIR	<0.75	0.751-2.5	2.51-4.5	4.51-6.5	6.51-8.5	8.51-11.5	11.51-14.5	14.51-18.5	18.51-23.5	TOTAL
N	2	65	167	166	92	56	13	7	1	569
NNE	0	45	225	159	60	39	6	2	0	536
NE	3	32	74	210	117	35	9	0	0	480
ENE	3	17	48	132	126	67	13	3	3	412
E	4	20	54	131	123	91	55	26	10	514
ESE	0	18	98	185	182	82	35	14	0	614
SE	2	21	83	164	150	87	11	2	0	520
SSE	1	31	114	197	142	94	14	0	2	595
S	8	71	202	267	231	153	34	7	1	974
SSW	9	77	239	507	452	423	121	21	3	1852
SW	4	128	464	340	158	113	42	10	3	1262
WSW	6	212	525	228	57	23	2	0	0	1053
W	5	193	306	142	47	13	3	2	1	712
WNW	3	193	352	139	58	29	6	1	2	783
NW	4	140	408	131	47	36	6	1	0	773
NNW	2	74	258	211	59	23	8	3	0	638
TOTAL	56	1337	3617	3309	2101	1364	378	99	26	12287

Notes:

Data from 10 m Sensor

Data from 2002-2007

Calms already distributed into data

Table 2.3-297 Joint Frequency Distribution in Hours of Wind Speed and Direction by Atmospheric Stability Class – Stability Class F [EF3 COL 2.0-10-A]

	Wind Speed (miles/hr)									
DIR	**<0.75**	**0.751-2.5**	**2.51-4.5**	**4.51-6.5**	**6.51-8.5**	**8.51-11.5**	**11.51-14.5**	**14.51-18.5**	**18.51-23.5**	**TOTAL**
N	2	48	149	98	13	8	1	0	0	319
NNE	1	32	66	35	9	3	0	0	0	146
NE	1	15	24	11	5	0	0	0	0	56
ENE	1	10	14	10	12	8	2	0	0	57
E	0	12	18	32	20	16	8	8	0	114
ESE	2	13	42	47	36	16	5	0	0	161
SE	2	13	42	66	37	22	7	1	0	190
SSE	3	40	72	93	57	32	7	3	0	307
S	3	68	106	67	47	41	15	2	0	349
SSW	2	99	177	141	98	81	14	4	1	617
SW	3	134	221	26	14	9	2	0	0	409
WSW	5	203	215	6	5	5	1	5	2	447
W	4	221	122	7	9	1	0	1	2	367
WNW	3	265	212	14	2	6	1	0	0	503
NW	3	162	160	15	6	2	0	0	0	348
NNW	5	93	144	47	5	6	0	0	0	300
TOTAL	40	1428	1784	715	375	256	63	24	5	4690

Notes:
Data from 10 m Sensor
Data from 2002-2007
Calms already distributed into data

Table 2.3-298 Joint Frequency Distribution in Hours of Wind Speed and Direction by Atmospheric Stability Class – Stability Class G

[EF3 COL 2.0-10-A]

Wind Speed (miles/hr)

DIR	<0.75	0.751-2.5	2.51-4.5	4.51-6.5	6.51-8.5	8.51-11.5	11.51-14.5	14.51-18.5	18.51-23.5	TOTAL
N	0	23	63	20	4	1	0	0	0	111
NNE	0	14	12	10	0	0	0	0	0	36
NE	0	5	5	2	0	0	0	0	0	12
ENE	0	1	4	2	2	0	0	0	0	9
E	0	1	10	10	10	8	2	0	1	42
ESE	0	7	27	27	18	13	1	1	0	94
SE	0	9	37	37	22	20	3	0	0	128
SSE	1	7	21	31	24	18	5	0	0	107
S	0	21	17	18	9	5	0	0	0	70
SSW	0	23	60	29	15	16	0	0	0	143
SW	1	49	49	11	5	7	1	0	0	123
WSW	2	128	81	2	0	5	1	0	0	219
W	2	223	49	2	0	0	0	0	0	276
WNW	0	333	184	3	1	0	0	0	0	521
NW	2	151	87	1	1	0	0	0	0	242
NNW	0	77	91	19	0	0	0	0	0	187
TOTAL	8	1072	797	224	111	93	13	1	1	2320

Notes:

Data from 10 m Sensor

Data from 2002-2007

Calms already distributed into data

Table 2.3-299 Joint Frequency Distribution in Hours of Wind Speed and Direction by Atmospheric Stability Class – All Stability Classes

[EF3 COL 2.0-10-A]

	Wind Speed (miles/hr)									
DIR	**<0.75**	**0.751-2.5**	**2.51-4.5**	**4.51-6.5**	**6.51-8.5**	**8.51-11.5**	**11.51-14.5**	**14.51-18.5**	**18.51-23.5**	**TOTAL**
N	5	195	587	558	377	409	142	62	5	2340
NNE	1	130	554	500	287	263	159	44	10	1948
NE	10	94	263	640	688	486	117	8	2	2308
ENE	9	69	183	407	582	598	203	67	9	2127
E	10	43	183	410	517	599	379	167	40	2348
ESE	7	54	328	773	821	569	187	57	1	2797
SE	21	60	326	913	889	390	60	13	1	2673
SSE	13	98	355	757	717	377	63	7	4	2391
S	23	185	505	792	702	442	101	13	1	2764
SSW	30	247	672	1170	1259	1312	439	130	7	5266
SW	21	366	1043	1013	969	1075	561	223	42	5313
WSW	19	625	1337	940	701	505	108	39	6	4280
W	18	765	920	759	517	358	110	13	3	3463
WNW	9	898	1199	751	531	366	151	22	2	3929
NW	9	532	1072	711	504	305	71	14	0	3218
NNW	7	303	798	825	519	317	110	28	0	2907
TOTAL	212	4664	10325	11919	10580	8371	2961	907	133	50072

Notes:

Data from 10 m Sensor

Data from 2002-2007

Calms already distributed into data

Table 2.3-300 Fermi 3 Offsite Short-Term Atmospheric Dispersion Factors [EF3 COL 2.0-10-A]

Exclusion Area Boundary X/Q (sec/m^3)

	Direction Dependent X/Q		Direction Independent X/Q
Time Period	**0.5% Max Sector X/Q**	**Sector/Distance**	**5% Overall Site Limit**
0-2 hrs	3.66E-04	ESE	2.54E-04

Low Population Zone X/Q (sec/m^3)

	Direction Dependent X/Q		Direction Independent X/Q
Time Period	**0.5% Max Sector X/Q**	**Sector/Distance**	**5% Overall Site Limit**
0-8 hrs	3.23E-05	ESE	2.20E-05
8-24 hrs	2.23E-05	ESE	1.57E-05
1-4 days	9.95E-06	ESE	7.64E-06
4-30 days	3.13E-06	ESE	2.70E-06

Table 2.3-303 Onsite X/Q Factors from ARCON96 Runs[1] (Sheet 1 of 4)

[EF3 COL 2.0-10-A]

Release Location (Type)	Receptor Locations	0-2 hr X/Q (sec/m^3)	2-8 hr X/Q (sec/m^3)	8-24 hr X/Q (sec/m^3)	1-4 days X/Q (sec/m^3)	4-30 days X/Q (sec/m^3)
Reactor Building	Control Building Louvers	1.69E-03	1.19E-03	4.56E-04	3.57E-04	2.70E-04
Reactor Building	Emergency Intake North	1.14E-03	8.63E-04	3.34E-04	2.75E-04	2.20E-04
Reactor Building	Emergency Intake South	1.12E-03	8.28E-04	3.21E-04	2.41E-04	1.83E-04
Reactor Building	Normal Air Intake	1.22E-03	8.93E-04	3.46E-04	2.56E-04	1.92E-04
Reactor Building	TSC Intake East	2.44E-04	2.00E-04	8.44E-05	7.37E-05	6.19E-05
Reactor Building	TSC Intake West	2.73E-04	2.28E-04	9.48E-05	8.06E-05	6.78E-05
PCCS	Control Building Louvers	1.83E-03	1.29E-03	4.48E-04	3.11E-04	2.68E-04
PCCS	Emergency Intake North	1.45E-03	1.14E-03	4.06E-04	3.11E-04	2.94E-04
PCCS	Emergency Intake South	1.17E-03	8.67E-04	2.95E-04	2.14E-04	1.86E-04
PCCS	Normal Air Intake	1.18E-03	8.59E-04	2.95E-04	2.08E-04	1.78E-04
PCCS	TSC Intake East	3.68E-04	2.97E-04	1.13E-04	1.02E-04	8.55E-05
PCCS	TSC Intake West	4.65E-04	3.58E-04	1.40E-04	1.19E-04	1.00E-04
Turbine Building	Control Building Louvers	5.99E-04	3.27E-04	1.35E-04	9.62E-05	8.34E-05
Turbine Building	Emergency Intake North	7.43E-04	4.05E-04	1.65E-04	1.18E-04	9.87E-05
Turbine Building	Emergency Intake South	5.67E-04	3.23E-04	1.34E-04	9.06E-05	7.70E-05
Turbine Building	Normal Air Intake	5.28E-04	2.95E-04	1.23E-04	8.35E-05	7.16E-05

Table 2.3-303 Onsite X/Q Factors from ARCON96 Runs(1) (Sheet 2 of 4) [EF3 COL 2.0-10-A]

Release Location (Type)	Receptor Locations	0-2 hr X/Q (sec/m^3)	2-8 hr X/Q (sec/m^3)	8-24 hr X/Q (sec/m^3)	1-4 days X/Q (sec/m^3)	4-30 days X/Q (sec/m^3)
Turbine Building	TSC Intake East	8.81E-04	6.28E-04	2.45E-04	2.11E-04	1.75E-04
Turbine Building	TSC Intake West	1.65E-03	1.09E-03	4.35E-04	3.84E-04	3.10E-04
TB-TD	Control Building Louvers	2.45E-04	1.68E-04	6.03E-05	4.11E-05	3.26E-05
TB-TD	Emergency Intake North	2.39E-04	1.71E-04	6.11E-05	3.96E-05	3.14E-05
TB-TD	TSC Intake West	1.16E-03	9.63E-04	3.96E-04	2.83E-04	2.45E-04
Fuel Building	Control Building Louvers	2.70E-03	2.28E-03	9.11E-04	8.20E-04	7.18E-04
Fuel Building	Emergency Intake North	1.28E-03	1.11E-03	4.59E-04	4.11E-04	3.59E-04
Fuel Building	Emergency Intake South	1.79E-03	1.51E-03	6.31E-04	5.25E-04	4.59E-04
Fuel Building	Normal Air Intake	2.23E-03	1.88E-03	7.48E-04	6.22E-04	5.59E-04
Radwaste Building	Normal Air Intake	4.64E-04	3.79E-04	1.44E-04	9.66E-05	7.75E-05
Reactor Building Vent Stack	Control Building Louvers	9.88E-04	7.73E-04	2.87E-04	2.44E-04	2.40E-04
Reactor Building Vent Stack	Emergency Intake South	7.34E-04	5.64E-04	2.00E-04	1.72E-04	1.70E-04
Reactor Building Vent Stack	Normal Air Intake	8.02E-04	6.15E-04	2.17E-04	1.87E-04	1.83E-04
Turbine Building Vent Stack	Control Building Louvers	3.01E-04	1.70E-04	7.26E-05	5.05E-05	3.91E-05
Turbine Building Vent Stack	Emergency Intake North	3.35E-04	1.98E-04	7.17E-05	4.98E-05	3.75E-05

Table 2.3-303 Onsite X/Q Factors from ARCON96 Runs[1] (Sheet 3 of 4)

[EF3 COL 2.0-10-A]

Release Location (Type)	Receptor Locations	0-2 hr X/Q (sec/m^3)	2-8 hr X/Q (sec/m^3)	8-24 hr X/Q (sec/m^3)	1-4 days X/Q (sec/m^3)	4-30 days X/Q (sec/m^3)
Turbine Building Vent Stack	Normal Air Intake	2.55E-04	1.47E-04	5.58E-05	3.99E-05	2.97E-05
Radwaste Building Vent Stack	Control Building Louvers	6.30E-04	5.23E-04	1.93E-04	1.33E-04	1.13E-04
Radwaste Building Vent Stack	Emergency Intake North	4.89E-04	4.16E-04	1.57E-04	1.15E-04	9.66E-05
Radwaste Building Vent Stack	Normal Air Intake	4.32E-04	3.48E-04	1.29E-04	8.79E-05	7.45E-05
North Reactor Building Blowout Panel	Control Building Louvers	2.18E-03	1.47E-03	5.06E-04	3.29E-04	2.70E-04
North Reactor Building Blowout Panel	Emergency Intake North	2.05E-03	1.57E-03	5.61E-04	4.33E-04	4.16E-04
North Reactor Building Blowout Panel	Emergency Intake South	1.62E-03	1.16E-03	3.99E-04	2.85E-04	2.44E-04
North Reactor Building Blowout Panel	Normal Air Intake	1.52E-03	1.06E-03	3.64E-04	2.45E-04	2.08E-04
South Reactor Building Blowout Panel	Control Building Louvers	2.37E-03	1.89E-03	7.13E-04	6.54E-04	5.67E-04
South Reactor Building Blowout Panel	Emergency Intake North	1.70E-03	1.32E-03	4.88E-04	4.45E-04	4.08E-04

Table 2.3-303 Onsite X/Q Factors from ARCON96 Runs[1] (Sheet 4 of 4) [EF3 COL 2.0-10-A]

Release Location (Type)	Receptor Locations	0-2 hr X/Q (sec/m^3)	2-8 hr X/Q (sec/m^3)	8-24 hr X/Q (sec/m^3)	1-4 days X/Q (sec/m^3)	4-30 days X/Q (sec/m^3)
South Reactor Building Blowout Panel	Emergency Intake South	2.04E-03	1.58E-03	5.67E-04	4.97E-04	4.99E-04
South Reactor Building Blowout Panel	Normal Air Intake	2.27E-03	1.77E-03	6.30E-04	5.47E-04	5.48E-04
Fermi 3	Fermi 2	6.53E-05	4.39E-05	1.80E-05	1.39E-05	1.03E-05
Fermi 2	Fermi 3	8.18E-05	7.19E-05	3.35E-05	2.73E-05	2.36E-05

1. **[START COM 2.3-204]** The atmospheric dispersion factors (X/Qs) calculated for the Control Room and Technical Support Center using ARCON96 are currently under revision as part of the effort described in Detroit Edison letter NRC3-10-003, dated February 8, 2010. Detroit Edison will provide the COLA revision to reflect the new atmospheric dispersion factors (X/Qs) calculated for the Control Room and Technical Support Center under separate correspondence to the NRC by March 25, 2010. **[END COM 2.3-204]**

Table 2.3-304 Cross-Unit χ/Q Factors[1] [EF3 COL 2.0-10-A]

Release-Receptor Combination	Time Period	χ/Q with Safety Factor = 1.5(sec/m^3)
Fermi 3 to Fermi 2	0-2 hours	9.80E-05
	2-8 hours	6.59E-05
	8-24 hours	2.70E-05
	1-4 days	2.09E-05
	4-30 days	1.55E-05
Fermi 2 to Fermi 3	0-2 hours	1.23E-04
	2-8 hours	1.08E-04
	8-24 hours	5.03E-05
	1-4 days	4.10E-05
	4-30 days	3.54E-05

1. **[START COM 2.3-204]** The atmospheric dispersion factors (χ/Qs) calculated for the Control Room and Technical Support Center using ARCON96 are currently under revision as part of the effort described in Detroit Edison letter NRC3-10-003, dated February 8, 2010. Detroit Edison will provide the COLA revision to reflect the new atmospheric dispersion factors (χ/Qs) calculated for the Control Room and Technical Support Center under separate correspondence to the NRC by March 25, 2010. **[END COM 2.3-204]**

Table 2.3-305 Distances to Site Boundary, Nearest Residences, and Nearest Gardens [EF3 COL 2.0-11-A]

Downwind Sector	Distance to Site Boundary (m)	Distance to Nearest Residence (m)	Distance to Nearest Garden (m)
N	1059	N/A	3716
NNE	1531	2109	3477
NE	2054	2182	3602
ENE	N/A	N/A	N/A
E	N/A	N/A	N/A
ESE	N/A	N/A	N/A
SE	N/A	N/A	N/A
SSE	1131	1478	N/A
S	1131	N/A	2067
SSW	1156	1442	N/A
SW	1447	1606	N/A
WSW	1281	1821	3445
W	943	1571	2422
WNW	919	N/A	N/A
NW	919	1107	1110
NNW	919	1920	1757

Note: There are no site boundary distances listed for the ENE, E, ESE, and SE sectors since they are directly towards Lake Erie.

Table 2.3-306 Distances to Nearest Sheep, Goat, Meat Cow, and Milk Cow Receptors [EF3 COL 2.0-11-A]

Downwind Sector	Distance to Nearest Sheep Receptor (m)	Distance to Nearest Goat Receptor (m)	Distance to Nearest Meat Cow Receptor (m)	Distance to Nearest Milk Cow Receptor (m)
NNE	7238	N/A	7239	N/A
WNW	N/A	3704	N/A	3513
NW	N/A	N/A	N/A	5869
NNW	7173	4961	4904	N/A

Table 2.3-307 Site Boundary Χ/Q and D/Q Factors for Ground-Level Release [EF3 COL 2.0-11-A]

Sector	Distance (miles)	No Decay, Undepleted Χ/Q (sec/m^3)	2.26 Day Decay, Undepleted Χ/Q (sec/m^3)	8.0 Day Decay, Depleted Χ/Q (sec/m^3)	D/Q (m^{-2})
N	0.66	7.9E-06	7.9E-06	7.1E-06	2.8E-08
NNE	0.95	5.6E-06	5.6E-06	4.9E-06	2.3E-08
NE	1.28	3.0E-06	3.0E-06	2.6E-06	1.1E-08
SSE	0.70	9.3E-06	9.3E-06	8.3E-06	2.6E-08
S	0.70	6.7E-06	6.7E-06	6.0E-06	2.1E-08
SSW	0.72	4.6E-06	4.6E-06	4.1E-06	1.7E-08
SW	0.90	2.2E-06	2.2E-06	1.9E-06	1.2E-08
WSW	0.80	2.2E-06	2.2E-06	2.0E-06	1.5E-08
W	0.59	4.3E-06	4.3E-06	3.9E-06	2.8E-08
WNW	0.57	6.2E-06	6.2E-06	5.6E-06	3.5E-08
NW	0.57	6.5E-06	6.5E-06	5.9E-06	3.4E-08
NNW	0.57	7.2E-06	7.2E-06	6.5E-06	3.0E-08

Note: There are no values listed for the ENE, E, ESE and SE sectors because these sectors are directly towards Lake Erie.

Table 2.3-308 Site Boundary X/Q and D/Q Factors for Mixed-Mode Release from the Reactor Building/Fuel Building Stack [EF3 COL 2.0-11-A]

Sector	Distance (miles)	No Decay, Undepleted X/Q (sec/m^3)	2.26 Day Decay, Undepleted X/Q (sec/m^3)	8.0 Day Decay, Depleted X/Q (sec/m^3)	D/Q (m^{-2})
N	0.66	4.3E-07	4.3E-07	3.9E-07	8.6E-09
NNE	0.95	4.9E-07	4.9E-07	4.5E-07	8.6E-09
NE	1.28	2.8E-07	2.8E-07	2.6E-07	4.8E-09
SSE	0.70	2.9E-07	2.9E-07	2.8E-07	7.7E-09
S	0.70	3.0E-07	3.0E-07	2.8E-07	6.2E-09
SSW	0.72	2.3E-07	2.3E-07	2.1E-07	5.0E-09
SW	0.90	2.4E-07	2.4E-07	2.3E-07	4.9E-09
WSW	0.80	2.7E-07	2.7E-07	2.5E-07	6.7E-09
W	0.59	4.6E-07	4.6E-07	4.3E-07	1.2E-08
WNW	0.57	5.0E-07	5.0E-07	4.7E-07	1.4E-08
NW	0.57	4.9E-07	4.9E-07	4.6E-07	1.4E-08
NNW	0.57	4.5E-07	4.5E-07	4.2E-07	1.1E-08

Note: There are no values listed for the ENE, E, ESE and SE sectors because these sectors are directly towards Lake Erie.

Table 2.3-309 Site Boundary χ/Q and D/Q Factors for Mixed-Mode Release from the Turbine Building Stack [EF3 COL 2.0-11-A]

Sector	Distance (miles)	No Decay, Undepleted χ/Q (sec/m^3)	2.26 Day Decay, Undepleted χ/Q (sec/m^3)	8.0 Day Decay, Depleted χ/Q (sec/m^3)	D/Q (m^{-2})
N	0.66	4.9E-07	4.9E-07	4.5E-07	8.2E-09
NNE	0.95	5.1E-07	5.1E-07	4.6E-07	8.2E-09
NE	1.28	2.6E-07	2.6E-07	2.3E-07	4.1E-09
SSE	0.70	3.6E-07	3.6E-07	3.3E-07	7.0E-09
S	0.70	3.5E-07	3.5E-07	3.2E-07	5.5E-09
SSW	0.72	2.6E-07	2.5E-07	2.3E-07	4.4E-09
SW	0.90	2.1E-07	2.1E-07	2.0E-07	4.0E-09
WSW	0.80	2.5E-07	2.5E-07	2.3E-07	5.8E-09
W	0.59	4.8E-07	4.8E-07	4.4E-07	1.1E-08
WNW	0.57	5.5E-07	5.5E-07	5.1E-07	1.3E-08
NW	0.57	5.4E-07	5.4E-07	5.0E-07	1.2E-08
NNW	0.57	5.2E-07	5.2E-07	4.8E-07	1.0E-08

Note: There are no values listed for the ENE, E, ESE and SE sectors because these sectors are directly towards Lake Erie.

Table 2.3-310 Nearest Residence X/Q and D/Q Factors for Ground-Level Release [EF3 COL 2.0-11-A]

Sector	Distance (miles)	No Decay, Undepleted X/Q (sec/m^3)	2.26 Day Decay, Undepleted X/Q (sec/m^3)	8.0 Day Decay, Depleted X/Q (sec/m^3)	D/Q (m^{-2})
NNE	1.31	2.5E-06	2.5E-06	2.2E-06	1.0E-08
NE	1.36	2.6E-06	2.6E-06	2.2E-06	9.4E-09
SSE	0.92	4.9E-06	4.9E-06	4.3E-06	1.4E-08
SSW	0.90	2.7E-06	2.7E-06	2.4E-06	9.9E-09
SW	1.00	1.7E-06	1.7E-06	1.5E-06	8.9E-09
WSW	1.13	9.0E-07	8.9E-07	7.8E-07	5.9E-09
W	0.98	1.4E-06	1.4E-06	1.2E-06	9.5E-09
NW	0.69	4.6E-06	4.6E-06	4.2E-06	2.5E-08
NNW	1.19	1.4E-06	1.4E-06	1.2E-06	5.8E-09

Table 2.3-311 Nearest Residence X/Q and D/Q Factors for Mixed-Mode Release from the Reactor Building/Fuel Building Stack [EF3 COL 2.0-11-A]

Sector	Distance (miles)	No Decay, Undepleted X/Q (sec/m^3)	2.26 Day Decay, Undepleted X/Q (sec/m^3)	8.0 Day Decay, Depleted X/Q (sec/m^3)	D/Q (m^{-2})
NNE	1.32	2.8E-07	2.8E-07	2.6E-07	4.0E-09
NE	1.36	2.6E-07	2.6E-07	2.4E-07	4.2E-09
SSE	0.92	2.0E-07	2.0E-07	1.9E-07	4.7E-09
SSW	0.90	1.7E-07	1.7E-07	1.6E-07	3.3E-09
SW	1.00	2.1E-07	2.1E-07	2.0E-07	3.9E-09
WSW	1.13	1.6E-07	1.6E-07	1.5E-07	3.1E-09
W	0.98	2.3E-07	2.2E-07	2.1E-07	4.8E-09
NW	0.69	3.8E-07	3.8E-07	3.6E-07	1.1E-08
NNW	1.19	1.4E-07	1.4E-07	1.3E-07	2.5E-09

Table 2.3-312 Nearest Residence X/Q and D/Q Factors for Mixed-Mode Release from the Turbine Building Stack [EF3 COL 2.0-11-A]

Sector	Distance (miles)	No Decay, Undepleted X/Q (sec/m^3)	2.26 Day Decay, Undepleted X/Q (sec/m^3)	8.0 Day Decay, Depleted X/Q (sec/m^3)	D/Q (m^{-2})
NNE	1.32	2.7E-07	2.7E-07	2.4E-07	3.7E-09
NE	1.36	2.3E-07	2.3E-07	2.1E-07	3.6E-09
SSE	0.92	2.2E-07	2.2E-07	2.0E-07	4.3E-09
SSW	0.90	1.7E-07	1.7E-07	1.6E-07	3.0E-09
SW	1.00	1.8E-07	1.8E-07	1.7E-07	3.3E-09
WSW	1.13	1.3E-07	1.3E-07	1.2E-07	2.7E-09
W	0.98	2.1E-07	2.1E-07	1.9E-07	4.8E-09
NW	0.69	4.0E-07	4.0E-07	3.7E-07	9.9E-09
NNW	1.19	1.4E-07	1.4E-07	1.2E-07	2.4E-09

Table 2.3-313 Nearest Garden X/Q and D/Q Factors for Ground-Level Release [EF3 COL 2.0-11-A]

Sector	Distance (miles)	No Decay, Undepleted X/Q (sec/m^3)	2.26 Day Decay, Undepleted X/Q (sec/m^3)	8.0 Day Decay, Depleted X/Q (sec/m^3)	D/Q (m^{-2})
N	2.31	4.4E-07	4.3E-07	3.5E-07	1.3E-09
NNE	2.16	8.2E-07	8.1E-07	6.7E-07	3.0E-09
NE	2.24	8.4E-07	8.3E-07	6.8E-07	2.8E-09
S	1.28	1.5E-06	1.5E-06	1.3E-06	4.7E-09
WSW	2.14	2.0E-07	2.0E-07	1.7E-07	1.2E-09
W	1.50	4.9E-07	4.9E-07	4.2E-07	3.2E-09
NW	0.69	4.6E-06	4.6E-06	4.1E-06	2.5E-08
NNW	1.09	1.7E-06	1.7E-06	1.5E-06	7.3E-09

Table 2.3-314 Nearest Garden X/Q and D/Q Factors for Mixed-Mode Release from the Reactor Building/Fuel Building Stack [EF3 COL 2.0-11-A]

Sector	Distance (miles)	No Decay, Undepleted X/Q (sec/m^3)	2.26 Day Decay, Undepleted X/Q (sec/m^3)	8.0 Day Decay, Depleted X/Q (sec/m^3)	D/Q (m^{-2})
N	2.31	6.9E-08	6.9E-08	6.4E-08	5.5E-10
NNE	2.16	1.3E-07	1.3E-07	1.2E-07	1.3E-09
NE	2.24	1.3E-07	1.3E-07	1.2E-07	1.4E-09
S	1.28	1.2E-07	1.2E-07	1.1E-07	1.8E-09
WSW	2.14	5.7E-08	5.6E-08	5.2E-08	7.4E-10
W	1.50	1.1E-07	1.1E-07	1.0E-07	1.8E-09
NW	0.69	3.8E-07	3.8E-07	3.6E-07	1.1E-08
NNW	1.09	1.6E-07	1.6E-07	1.5E-07	3.1E-09

Table 2.3-315 Nearest Garden Χ/Q and D/Q Factors for Mixed-Mode Release from the Turbine Building Stack [EF3 COL 2.0-11-A]

Sector	Distance (miles)	No Decay, Undepleted Χ/Q (sec/m^3)	2.26 Day Decay, Undepleted Χ/Q (sec/m^3)	8.0 Day Decay, Depleted Χ/Q (sec/m^3)	D/Q (m^{-2})
N	2.31	5.9E-08	5.9E-08	5.3E-08	5.4E-10
NNE	2.16	1.2E-07	1.2E-07	1.1E-07	1.3E-09
NE	2.24	1.1E-07	1.1E-07	1.0E-07	1.3E-09
S	1.28	1.2E-07	1.2E-07	1.1E-07	1.6E-09
WSW	2.14	4.8E-08	4.8E-08	4.4E-08	6.7E-10
W	1.50	9.7E-08	9.7E-08	8.7E-08	1.8E-09
NW	0.69	4.0E-07	4.0E-07	3.7E-07	9.8E-09
NNW	1.09	1.6E-07	1.6E-07	1.4E-07	3.0E-09

Table 2.3-316 Nearest Sheep X/Q and D/Q Factors for Ground-Level Release [EF3 COL 2.0-11-A]

Sector	Distance (miles)	No Decay, Undepleted X/Q (sec/m^3)	2.26 Day Decay, Undepleted X/Q (sec/m^3)	8.0 Day Decay, Depleted X/Q (sec/m^3)	D/Q (m^{-2})
NNE	4.50	1.9E-07	1.9E-07	1.4E-07	5.6E-10
NNW	4.46	8.5E-08	8.3E-08	6.4E-08	2.6E-10

Table 2.3-317 Nearest Sheep X/Q and D/Q Factors for Mixed-Mode Release from the Reactor Building/Fuel Building Stack [EF3 COL 2.0-11-A]

Sector	Distance (miles)	No Decay, Undepleted X/Q (sec/m^3)	2.26 Day Decay, Undepleted X/Q (sec/m^3)	8.0 Day Decay, Depleted X/Q (sec/m^3)	D/Q (m^{-2})
NNE	4.50	4.8E-08	4.7E-08	4.3E-08	2.7E-10
NNW	4.46	2.0E-08	2.0E-08	1.8E-08	1.3E-10

Table 2.3-318 Nearest Sheep χ/Q and D/Q Factors for Mixed-Mode Release from the Turbine Building Stack [EF3 COL 2.0-11-A]

Sector	Distance (miles)	No Decay, Undepleted χ/Q (sec/m^3)	2.26 Day Decay, Undepleted χ/Q (sec/m^3)	8.0 Day Decay, Depleted χ/Q (sec/m^3)	D/Q (m^{-2})
NNE	4.50	4.1E-08	4.1E-08	3.6E-08	2.7E-10
NNW	4.46	1.7E-08	1.7E-08	1.5E-08	1.4E-10

Table 2.3-319 Nearest Goat X/Q and D/Q Factors for Ground-Level Release

[EF3 COL 2.0-11-A]

Sector	Distance (miles)	No Decay, Undepleted X/Q (sec/m^3)	2.26 Day Decay, Undepleted X/Q (sec/m^3)	8.0 Day Decay, Depleted X/Q (sec/m^3)	D/Q (m^{-2})
WNW	2.30	2.6E-07	2.6E-07	2.2E-07	1.4E-09
NNW	3.08	1.7E-07	1.7E-07	1.3E-07	5.9E-10

Table 2.3-320 Nearest Goat X/Q and D/Q Factors for Mixed-Mode Release from the Reactor Building/Fuel Building Stack [EF3 COL 2.0-11-A]

Sector	Distance (miles)	No Decay, Undepleted X/Q (sec/m^3)	2.26 Day Decay, Undepleted X/Q (sec/m^3)	8.0 Day Decay, Depleted X/Q (sec/m^3)	D/Q (m^{-2})
WNW	2.30	6.1E-08	6.1E-08	5.6E-08	7.7E-10
NNW	3.08	3.4E-08	3.3E-08	3.1E-08	2.9E-10

Table 2.3-321 Nearest Goat χ/Q and D/Q Factors for Mixed-Mode Release from the Turbine Building Stack [EF3 COL 2.0-11-A]

Sector	Distance (miles)	No Decay, Undepleted χ/Q (sec/m^3)	2.26 Day Decay, Undepleted χ/Q (sec/m^3)	8.0 Day Decay, Depleted χ/Q (sec/m^3)	D/Q (m^{-2})
WNW	2.30	5.4E-08	5.3E-08	4.8E-08	7.4E-10
NNW	3.08	2.9E-08	2.9E-08	2.6E-08	2.9E-10

Table 2.3-322 Nearest Meat Cow χ/Q and D/Q Factors for Ground-Level Release [EF3 COL 2.0-11-A]

Sector	Distance (miles)	No Decay, Undepleted χ/Q (sec/m^3)	2.26 Day Decay, Undepleted χ/Q (sec/m^3)	8.0 Day Decay, Depleted χ/Q (sec/m^3)	D/Q (m^{-2})
NNE	4.50	1.9E-07	1.9E-07	1.4E-07	5.6E-10
NNW	3.05	1.7E-07	1.7E-07	1.4E-07	6.0E-10

Table 2.3-323 Nearest Meat Cow X/Q and D/Q Factors for Mixed-Mode Release from the Reactor Building/Fuel Building Stack [EF3 COL 2.0-11-A]

Sector	Distance (miles)	No Decay, Undepleted X/Q (sec/m^3)	2.26 Day Decay, Undepleted X/Q (sec/m^3)	8.0 Day Decay, Depleted X/Q (sec/m^3)	D/Q (m^{-2})
NNE	4.50	4.80E-08	4.70E-08	4.30E-08	2.70E-10
NNW	3.05	3.40E-08	3.40E-08	3.10E-08	3.00E-10

Table 2.3-324 Nearest Meat Cow X/Q and D/Q Factors for Mixed-Mode Release from the Turbine Building Stack [EF3 COL 2.0-11-A]

Sector	Distance (miles)	No Decay, Undepleted X/Q (sec/m^3)	2.26 Day Decay, Undepleted X/Q (sec/m^3)	8.0 Day Decay, Depleted X/Q (sec/m^3)	D/Q (m^{-2})
NNE	4.50	4.10E-08	4.10E-08	3.60E-08	2.70E-10
NNW	3.05	3.00E-08	2.90E-08	2.60E-08	2.90E-10

Table 2.3-325 Nearest Milk Cow X/Q and D/Q Factors for Ground-Level Release [EF3 COL 2.0-11-A]

Sector	Distance (miles)	No Decay, Undepleted X/Q (sec/m^3)	2.26 Day Decay, Undepleted X/Q (sec/m^3)	8.0 Day Decay, Depleted X/Q (sec/m^3)	D/Q (m^{-2})
WNW	2.18	3.0E-07	2.9E-07	2.4E-07	1.5E-09
NW	3.65	1.1E-07	1.1E-07	8.5E-08	4.5E-10

Table 2.3-326 Nearest Milk Cow Χ/Q and D/Q Factors for Mixed-Mode Release from the Reactor Building/Fuel Building Stack [EF3 COL 2.0-11-A]

Sector	Distance (miles)	No Decay, Undepleted Χ/Q (sec/m^3)	2.26 Day Decay, Undepleted Χ/Q (sec/m^3)	8.0 Day Decay, Depleted Χ/Q (sec/m^3)	D/Q (m^{-2})
WNW	2.18	6.70E-08	6.60E-08	6.10E-08	8.70E-10
NW	3.65	2.70E-08	2.70E-08	2.40E-08	2.70E-10

Table 2.3-327 Nearest Milk Cow χ/Q and D/Q Factors for Mixed-Mode Release from the Turbine Building Stack [EF3 COL 2.0-11-A]

Sector	Distance (miles)	No Decay, Undepleted χ/Q (sec/m^3)	2.26 Day Decay, Undepleted χ/Q (sec/m^3)	8.0 Day Decay, Depleted χ/Q (sec/m^3)	D/Q (m^{-2})
WNW	2.18	5.80E-08	5.80E-08	5.30E-08	8.30E-10
NW	3.65	2.40E-08	2.30E-08	2.10E-08	2.60E-10

Table 2.3-328 Annual Average X/Q Values (No Decay, Undepleted) for Ground Level Release (Sheet 1 of 3) [EF3 COL 2.0-11-A]

Annual Average X/Q (sec/m^3)

	Distance in Miles from the Site										
Sector	**0.25**	**0.5**	**0.75**	**1.0**	**1.5**	**2.0**	**2.5**	**3.0**	**3.5**	**4.0**	**4.5**
N	4.464E-05	1.291E-05	6.302E-06	3.000E-06	1.130E-06	5.929E-07	3.689E-07	2.544E-07	1.879E-07	1.456E-07	1.170E-07
NNE	7.320E-05	2.121E-05	1.036E-05	4.931E-06	1.854E-06	9.724E-07	6.046E-07	4.166E-07	3.074E-07	2.381E-07	1.912E-07
NE	8.036E-05	2.333E-05	1.140E-05	5.430E-06	2.038E-06	1.067E-06	6.621E-07	4.555E-07	3.356E-07	2.596E-07	2.082E-07
ENE	9.779E-05	2.840E-05	1.384E-05	6.605E-06	2.491E-06	1.309E-06	8.159E-07	5.633E-07	4.164E-07	3.230E-07	2.597E-07
E	9.458E-05	2.735E-05	1.326E-05	6.333E-06	2.396E-06	1.264E-06	7.898E-07	5.468E-07	4.051E-07	3.150E-07	2.538E-07
ESE	1.214E-04	3.511E-05	1.698E-05	8.117E-06	3.083E-06	1.632E-06	1.024E-06	7.107E-07	5.279E-07	4.113E-07	3.321E-07
SE	7.993E-05	2.313E-05	1.123E-05	5.359E-06	2.028E-06	1.069E-06	6.683E-07	4.627E-07	3.428E-07	2.665E-07	2.147E-07
SSE	5.915E-05	1.711E-05	8.318E-06	3.968E-06	1.497E-06	7.872E-07	4.908E-07	3.391E-07	2.507E-07	1.946E-07	1.566E-07
S	4.212E-05	1.224E-05	5.968E-06	2.845E-06	1.070E-06	5.615E-07	3.493E-07	2.408E-07	1.777E-07	1.377E-07	1.106E-07
SSW	2.990E-05	8.693E-06	4.257E-06	2.027E-06	7.586E-07	3.959E-07	2.451E-07	1.682E-07	1.237E-07	9.553E-08	7.650E-08
SW	2.490E-05	7.149E-06	3.497E-06	1.661E-06	6.193E-07	3.216E-07	1.982E-07	1.355E-07	9.926E-08	7.638E-08	6.096E-08
WSW	1.860E-05	5.285E-06	2.573E-06	1.220E-06	4.547E-07	2.362E-07	1.456E-07	9.955E-08	7.295E-08	5.616E-08	4.484E-08
W	2.015E-05	5.745E-06	2.796E-06	1.328E-06	4.974E-07	2.597E-07	1.608E-07	1.104E-07	8.116E-08	6.266E-08	5.018E-08
WNW	2.792E-05	7.916E-06	3.832E-06	1.820E-06	6.839E-07	3.582E-07	2.225E-07	1.532E-07	1.130E-07	8.746E-08	7.020E-08
NW	2.942E-05	8.268E-06	3.981E-06	1.889E-06	7.115E-07	3.736E-07	2.326E-07	1.605E-07	1.185E-07	9.191E-08	7.388E-08
NNW	3.201E-05	9.137E-06	4.425E-06	2.105E-06	7.945E-07	4.181E-07	2.607E-07	1.802E-07	1.333E-07	1.035E-07	8.324E-08

Table 2.3-328 Annual Average χ/Q Values (No Decay, Undepleted) for Ground Level Release (Sheet 2 of 3) [EF3 COL 2.0-11-A]

Annual Average χ/Q (sec/m^3)

	Distance in Miles from the Site										
Sector	**5.0**	**7.5**	**10**	**15**	**20**	**25**	**30**	**35**	**40**	**45**	**50**
N	9.663E-08	4.948E-08	3.206E-08	1.844E-08	1.252E-08	9.303E-09	7.307E-09	5.964E-09	5.006E-09	4.292E-09	3.741E-09
NNE	1.579E-07	8.075E-08	5.228E-08	3.002E-08	2.038E-08	1.513E-08	1.188E-08	9.690E-09	8.130E-09	6.968E-09	6.072E-09
NE	1.718E-07	8.745E-08	5.643E-08	3.226E-08	2.183E-08	1.617E-08	1.267E-08	1.032E-08	8.649E-09	7.404E-09	6.446E-09
ENE	2.147E-07	1.103E-07	7.165E-08	4.135E-08	2.817E-08	2.097E-08	1.650E-08	1.349E-08	1.134E-08	9.734E-09	8.496E-09
E	2.102E-07	1.088E-07	7.111E-08	4.140E-08	2.838E-08	2.123E-08	1.678E-08	1.376E-08	1.161E-08	9.990E-09	8.740E-09
ESE	2.756E-07	1.437E-07	9.437E-08	5.533E-08	3.811E-08	2.862E-08	2.269E-08	1.866E-08	1.577E-08	1.360E-08	1.192E-08
SE	1.778E-07	9.200E-08	6.009E-08	3.495E-08	2.394E-08	1.790E-08	1.414E-08	1.159E-08	9.770E-09	8.407E-09	7.352E-09
SSE	1.295E-07	6.668E-08	4.340E-08	2.512E-08	1.715E-08	1.279E-08	1.008E-08	8.257E-09	6.949E-09	5.972E-09	5.218E-09
S	9.136E-08	4.677E-08	3.031E-08	1.743E-08	1.184E-08	8.802E-09	6.917E-09	5.648E-09	4.742E-09	4.067E-09	3.546E-09
SSW	6.301E-08	3.189E-08	2.049E-08	1.164E-08	7.844E-09	5.790E-09	4.525E-09	3.677E-09	3.075E-09	2.627E-09	2.284E-09
SW	5.007E-08	2.505E-08	1.595E-08	8.949E-09	5.975E-09	4.379E-09	3.403E-09	2.752E-09	2.292E-09	1.951E-09	1.691E-09
WSW	3.685E-08	1.849E-08	1.180E-08	6.646E-09	4.452E-09	3.271E-09	2.547E-09	2.064E-09	1.722E-09	1.468E-09	1.274E-09
W	4.134E-08	2.093E-08	1.345E-08	7.650E-09	5.158E-09	3.809E-09	2.979E-09	2.422E-09	2.027E-09	1.733E-09	1.507E-09
WNW	5.795E-08	2.962E-08	1.917E-08	1.102E-08	7.488E-09	5.565E-09	4.375E-09	3.574E-09	3.002E-09	2.575E-09	2.247E-09
NW	6.109E-08	3.143E-08	2.045E-08	1.183E-08	8.083E-09	6.032E-09	4.757E-09	3.897E-09	3.281E-09	2.822E-09	2.466E-09
NNW	6.888E-08	3.550E-08	2.312E-08	1.339E-08	9.147E-09	6.824E-09	5.380E-09	4.405E-09	3.707E-09	3.186E-09	2.784E-09

Table 2.3-328 Annual Average X/Q Values (No Decay, Undepleted) for Ground Level Release (Sheet 3 of 3) [EF3 COL 2.0-11-A]

X/Q (sec/m³) for Each Segment

	Segment Boundaries in Miles from the Site								
Sector	**0.5-1**	**1-2**	**2-3**	**3-4**	**4-5**	**5-10**	**10-20**	**20-30**	**30-40**	**40-50**
N	6.304E-06	1.307E-06	3.828E-07	1.908E-07	1.179E-07	5.221E-08	1.884E-08	9.364E-09	5.983E-09	4.299E-09
NNE	1.036E-05	2.146E-06	6.275E-07	3.122E-07	1.928E-07	8.524E-08	3.068E-08	1.523E-08	9.720E-09	6.980E-09
NE	1.140E-05	2.360E-06	6.874E-07	3.409E-07	2.100E-07	9.240E-08	3.300E-08	1.628E-08	1.036E-08	7.418E-09
ENE	1.386E-05	2.880E-06	8.465E-07	4.228E-07	2.618E-07	1.163E-07	4.223E-08	2.110E-08	1.353E-08	9.751E-09
E	1.331E-05	2.767E-06	8.189E-07	4.112E-07	2.558E-07	1.146E-07	4.221E-08	2.135E-08	1.380E-08	1.001E-08
ESE	1.707E-05	3.557E-06	1.061E-06	5.357E-07	3.347E-07	1.511E-07	5.635E-08	2.878E-08	1.871E-08	1.362E-08
SE	1.126E-05	2.342E-06	6.930E-07	3.480E-07	2.164E-07	9.689E-08	3.564E-08	1.800E-08	1.162E-08	8.420E-09
SSE	5.973E-06	1.239E-06	3.625E-07	1.805E-07	1.115E-07	4.936E-08	1.781E-08	8.859E-09	5.665E-09	4.074E-09
S	5.973E-06	1.239E-06	3.625E-07	1.805E-07	1.115E-07	4.936E-08	1.781E-08	8.859E-09	5.665E-09	4.074E-09
SSW	4.251E-06	8.791E-07	2.546E-07	1.257E-07	7.714E-08	3.374E-08	1.192E-08	5.832E-09	3.690E-09	2.633E-09
SW	3.493E-06	7.185E-07	2.060E-07	1.009E-07	6.150E-08	2.657E-08	9.183E-09	4.414E-09	2.763E-09	1.956E-09
WSW	2.574E-06	5.276E-07	1.513E-07	7.415E-08	4.523E-08	1.960E-08	6.817E-09	3.296E-09	2.072E-09	1.471E-09
W	2.799E-06	5.763E-07	1.670E-07	8.246E-08	5.060E-08	2.214E-08	7.832E-09	3.837E-09	2.431E-09	1.736E-09
WNW	3.845E-06	7.916E-07	2.310E-07	1.148E-07	7.078E-08	3.127E-08	1.126E-08	5.602E-09	3.585E-09	2.580E-09
NW	4.004E-06	8.230E-07	2.413E-07	1.204E-07	7.448E-08	3.314E-08	1.208E-08	6.069E-09	3.908E-09	2.826E-09
NNW	4.441E-06	9.184E-07	2.705E-07	1.353E-07	8.391E-08	3.741E-08	1.367E-08	6.866E-09	4.418E-09	3.192E-09

Table 2.3-329 Annual Average X/Q Values (2.26 Day Decay, Undepleted) for Ground Level Release (Sheet 1 of 3)

[EF3 COL 2.0-11-A]

Annual Average X/Q (sec/m^3)

	Distance in Miles from the Site										
Sector	**0.25**	**0.5**	**0.75**	**1.0**	**1.5**	**2.0**	**2.5**	**3.0**	**3.5**	**4.0**	**4.5**
N	4.457E-05	1.287E-05	6.271E-06	2.981E-06	1.119E-06	5.852E-07	3.630E-07	2.495E-07	1.836E-07	1.419E-07	1.136E-07
NNE	7.310E-05	2.116E-05	1.032E-05	4.904E-06	1.839E-06	9.618E-07	5.964E-07	4.099E-07	3.017E-07	2.330E-07	1.866E-07
NE	8.025E-05	2.326E-05	1.135E-05	5.399E-06	2.021E-06	1.054E-06	6.525E-07	4.476E-07	3.289E-07	2.536E-07	2.028E-07
ENE	9.763E-05	2.830E-05	1.377E-05	6.560E-06	2.465E-06	1.291E-06	8.019E-07	5.518E-07	4.064E-07	3.142E-07	2.517E-07
E	9.441E-05	2.725E-05	1.319E-05	6.285E-06	2.369E-06	1.245E-06	7.750E-07	5.345E-07	3.945E-07	3.056E-07	2.453E-07
ESE	1.212E-04	3.499E-05	1.689E-05	8.063E-06	3.052E-06	1.610E-06	1.006E-06	6.964E-07	5.156E-07	4.004E-07	3.222E-07
SE	7.980E-05	2.305E-05	1.117E-05	5.323E-06	2.007E-06	1.055E-06	6.570E-07	4.532E-07	3.346E-07	2.592E-07	2.081E-07
SSE	5.906E-05	1.706E-05	8.280E-06	3.944E-06	1.483E-06	7.777E-07	4.834E-07	3.329E-07	2.454E-07	1.899E-07	1.523E-07
S	4.206E-05	1.220E-05	5.945E-06	2.830E-06	1.062E-06	5.556E-07	3.447E-07	2.370E-07	1.745E-07	1.348E-07	1.080E-07
SSW	2.987E-05	8.673E-06	4.243E-06	2.017E-06	7.534E-07	3.923E-07	2.423E-07	1.659E-07	1.217E-07	9.378E-08	7.492E-08
SW	2.487E-05	7.132E-06	3.484E-06	1.653E-06	6.147E-07	3.184E-07	1.957E-07	1.335E-07	9.752E-08	7.485E-08	5.960E-08
WSW	1.858E-05	5.271E-06	2.563E-06	1.214E-06	4.512E-07	2.338E-07	1.437E-07	9.803E-08	7.165E-08	5.501E-08	4.382E-08
W	2.013E-05	5.732E-06	2.786E-06	1.322E-06	4.940E-07	2.573E-07	1.589E-07	1.088E-07	7.986E-08	6.152E-08	4.915E-08
WNW	2.789E-05	7.899E-06	3.820E-06	1.812E-06	6.794E-07	3.551E-07	2.201E-07	1.512E-07	1.113E-07	8.595E-08	6.884E-08
NW	2.938E-05	8.244E-06	3.964E-06	1.878E-06	7.055E-07	3.694E-07	2.293E-07	1.578E-07	1.162E-07	8.989E-08	7.206E-08
NNW	3.196E-05	9.110E-06	4.406E-06	2.093E-06	7.877E-07	4.133E-07	2.570E-07	1.771E-07	1.306E-07	1.011E-07	8.111E-08

Table 2.3-329 Annual Average χ/Q Values (2.26 Day Decay, Undepleted) for Ground Level Release (Sheet 2 of 3)

[EF3 COL 2.0-11-A]

Annual Average χ/Q (sec/m^3)

	Distance in Miles from the Site										
Sector	**5.0**	**7.5**	**10**	**15**	**20**	**25**	**30**	**35**	**40**	**45**	**50**
N	9.356E-08	4.717E-08	3.010E-08	1.681E-08	1.110E-08	8.020E-09	6.136E-09	4.882E-09	3.997E-09	3.345E-09	2.848E-09
NNE	1.537E-07	7.761E-08	4.961E-08	2.780E-08	1.843E-08	1.337E-08	1.027E-08	8.200E-09	6.737E-09	5.656E-09	4.831E-09
NE	1.668E-07	8.371E-08	5.325E-08	2.959E-08	1.948E-08	1.404E-08	1.071E-08	8.502E-09	6.944E-09	5.797E-09	4.923E-09
ENE	2.074E-07	1.047E-07	6.687E-08	3.731E-08	2.459E-08	1.772E-08	1.351E-08	1.070E-08	8.720E-09	7.261E-09	6.149E-09
E	2.024E-07	1.028E-07	6.595E-08	3.700E-08	2.446E-08	1.765E-08	1.346E-08	1.067E-08	8.689E-09	7.228E-09	6.113E-09
ESE	2.665E-07	1.366E-07	8.822E-08	5.002E-08	3.333E-08	2.422E-08	1.859E-08	1.480E-08	1.211E-08	1.012E-08	8.587E-09
SE	1.718E-07	8.736E-08	5.609E-08	3.154E-08	2.089E-08	1.511E-08	1.156E-08	9.180E-09	7.496E-09	6.252E-09	5.302E-09
SSE	1.256E-07	6.368E-08	4.082E-08	2.293E-08	1.521E-08	1.102E-08	8.444E-09	6.723E-09	5.505E-09	4.604E-09	3.916E-09
S	8.898E-08	4.496E-08	2.876E-08	1.613E-08	1.069E-08	7.754E-09	5.949E-09	4.745E-09	3.893E-09	3.264E-09	2.783E-09
SSW	6.157E-08	3.080E-08	1.956E-08	1.085E-08	7.146E-09	5.154E-09	3.937E-09	3.128E-09	2.558E-09	2.138E-09	1.818E-09
SW	4.882E-08	2.411E-08	1.517E-08	8.300E-09	5.411E-09	3.875E-09	2.944E-09	2.330E-09	1.899E-09	1.583E-09	1.344E-09
WSW	3.592E-08	1.779E-08	1.122E-08	6.165E-09	4.034E-09	2.899E-09	2.210E-09	1.755E-09	1.435E-09	1.201E-09	1.023E-09
W	4.040E-08	2.023E-08	1.286E-08	7.160E-09	4.731E-09	3.427E-09	2.631E-09	2.101E-09	1.728E-09	1.453E-09	1.243E-09
WNW	5.671E-08	2.868E-08	1.837E-08	1.035E-08	6.897E-09	5.030E-09	3.882E-09	3.115E-09	2.571E-09	2.168E-09	1.860E-09
NW	5.943E-08	3.018E-08	1.939E-08	1.095E-08	7.312E-09	5.339E-09	4.123E-09	3.311E-09	2.734E-09	2.307E-09	1.980E-09
NNW	6.692E-08	3.401E-08	2.185E-08	1.232E-08	8.207E-09	5.976E-09	4.602E-09	3.685E-09	3.034E-09	2.553E-09	2.186E-09

Table 2.3-329 Annual Average X/Q Values (2.26 Day Decay, Undepleted) for Ground Level Release (Sheet 3 of 3)

[EF3 COL 2.0-11-A]

X/Q (sec/m^3) for Each Segment

	Segment Boundaries in Miles from the Site									
Sector	**0.5-1**	**1-2**	**2-3**	**3-4**	**4-5**	**5-10**	**10-20**	**20-30**	**30-40**	**40-50**
N	6.276E-06	1.295E-06	3.769E-07	1.865E-07	1.146E-07	4.989E-08	1.722E-08	8.087E-09	4.903E-09	3.354E-09
NNE	1.032E-05	2.130E-06	6.193E-07	3.065E-07	1.882E-07	8.208E-08	2.848E-08	1.348E-08	8.234E-09	5.671E-09
NE	1.135E-05	2.342E-06	6.778E-07	3.341E-07	2.046E-07	8.864E-08	3.035E-08	1.416E-08	8.540E-09	5.813E-09
ENE	1.380E-05	2.853E-06	8.324E-07	4.128E-07	2.538E-07	1.107E-07	3.823E-08	1.786E-08	1.075E-08	7.281E-09
E	1.325E-05	2.740E-06	8.041E-07	4.006E-07	2.473E-07	1.086E-07	3.786E-08	1.779E-08	1.071E-08	7.248E-09
ESE	1.699E-05	3.525E-06	1.043E-06	5.234E-07	3.247E-07	1.440E-07	5.109E-08	2.440E-08	1.486E-08	1.014E-08
SE	1.121E-05	2.321E-06	6.816E-07	3.398E-07	2.098E-07	9.222E-08	3.226E-08	1.523E-08	9.218E-09	6.269E-09
SSE	8.305E-06	1.716E-06	5.017E-07	2.493E-07	1.535E-07	6.728E-08	2.347E-08	1.111E-08	6.751E-09	4.616E-09
S	5.951E-06	1.230E-06	3.579E-07	1.772E-07	1.089E-07	4.754E-08	1.652E-08	7.815E-09	4.765E-09	3.272E-09
SSW	4.238E-06	8.738E-07	2.517E-07	1.237E-07	7.556E-08	3.264E-08	1.114E-08	5.199E-09	3.142E-09	2.144E-09
SW	3.481E-06	7.138E-07	2.036E-07	9.916E-08	6.013E-08	2.563E-08	8.542E-09	3.912E-09	2.341E-09	1.588E-09
WSW	2.565E-06	5.240E-07	1.495E-07	7.285E-08	4.421E-08	1.890E-08	6.340E-09	2.926E-09	1.763E-09	1.204E-09
W	2.790E-06	5.727E-07	1.651E-07	8.115E-08	4.957E-08	2.143E-08	7.347E-09	3.456E-09	2.110E-09	1.457E-09
WNW	3.834E-06	7.869E-07	2.286E-07	1.130E-07	6.942E-08	3.033E-08	1.060E-08	5.069E-09	3.127E-09	2.174E-09
NW	3.988E-06	8.167E-07	2.381E-07	1.181E-07	7.267E-08	3.188E-08	1.121E-08	5.379E-09	3.323E-09	2.313E-09
NNW	4.424E-06	9.113E-07	2.667E-07	1.326E-07	8.178E-08	3.592E-08	1.261E-08	6.021E-09	3.699E-09	2.560E-09

Table 2.3-330 Annual Average X/Q Values (8.0 Day Decay, Depleted) for Ground Level Release (Sheet 1 of 3)

[EF3 COL 2.0-11-A]

Annual Average X/Q (sec/m^3)

	Distance in Miles from the Site										
Sector	**0.25**	**0.5**	**0.75**	**1.0**	**1.5**	**2.0**	**2.5**	**3.0**	**3.5**	**4.0**	**4.5**
N	4.223E-05	1.178E-05	5.608E-06	2.621E-06	9.566E-07	4.891E-07	2.975E-07	2.010E-07	1.456E-07	1.109E-07	8.769E-08
NNE	6.925E-05	1.936E-05	9.220E-06	4.310E-06	1.571E-06	8.027E-07	4.878E-07	3.294E-07	2.386E-07	1.817E-07	1.436E-07
NE	7.602E-05	2.128E-05	1.015E-05	4.745E-06	1.727E-06	8.804E-07	5.341E-07	3.600E-07	2.604E-07	1.980E-07	1.563E-07
ENE	9.251E-05	2.591E-05	1.232E-05	5.770E-06	2.109E-06	1.080E-06	6.577E-07	4.448E-07	3.227E-07	2.460E-07	1.946E-07
E	8.947E-05	2.495E-05	1.180E-05	5.532E-06	2.028E-06	1.042E-06	6.363E-07	4.315E-07	3.137E-07	2.397E-07	1.900E-07
ESE	1.149E-04	3.203E-05	1.511E-05	7.092E-06	2.611E-06	1.346E-06	8.251E-07	5.612E-07	4.092E-07	3.134E-07	2.490E-07
SE	7.561E-05	2.110E-05	9.990E-06	4.682E-06	1.717E-06	8.820E-07	5.387E-07	3.653E-07	2.656E-07	2.029E-07	1.609E-07
SSE	5.596E-05	1.562E-05	7.403E-06	3.467E-06	1.268E-06	6.496E-07	3.959E-07	2.679E-07	1.945E-07	1.483E-07	1.174E-07
S	3.985E-05	1.116E-05	5.313E-06	2.487E-06	9.071E-07	4.636E-07	2.819E-07	1.904E-07	1.379E-07	1.051E-07	8.306E-08
SSW	2.829E-05	7.933E-06	3.790E-06	1.772E-06	6.430E-07	3.270E-07	1.979E-07	1.331E-07	9.610E-08	7.295E-08	5.750E-08
SW	2.355E-05	6.524E-06	3.113E-06	1.452E-06	5.249E-07	2.656E-07	1.600E-07	1.072E-07	7.706E-08	5.829E-08	4.579E-08
WSW	1.760E-05	4.822E-06	2.290E-06	1.066E-06	3.853E-07	1.950E-07	1.175E-07	7.873E-08	5.663E-08	4.285E-08	3.368E-08
W	1.907E-05	5.243E-06	2.489E-06	1.161E-06	4.216E-07	2.144E-07	1.298E-07	8.732E-08	6.303E-08	4.785E-08	3.771E-08
WNW	2.641E-05	7.225E-06	3.412E-06	1.591E-06	5.798E-07	2.959E-07	1.797E-07	1.213E-07	8.778E-08	6.681E-08	5.278E-08
NW	2.783E-05	7.544E-06	3.543E-06	1.651E-06	6.028E-07	3.084E-07	1.876E-07	1.268E-07	9.197E-08	7.010E-08	5.546E-08
NNW	3.028E-05	8.337E-06	3.939E-06	1.840E-06	6.731E-07	3.450E-07	2.103E-07	1.424E-07	1.034E-07	7.889E-08	6.247E-08

Table 2.3-330 Annual Average χ/Q Values (8.0 Day Decay, Depleted) for Ground Level Release (Sheet 2 of 3)

[EF3 COL 2.0-11-A]

Annual Average χ/Q (sec/m^3)

	Distance in Miles from the Site										
Sector	5.0	7.5	10	15	20	25	30	35	40	45	50
N	7.136E-08	3.440E-08	2.115E-08	1.115E-08	7.052E-09	4.919E-09	3.651E-09	2.828E-09	2.261E-09	1.851E-09	1.544E-09
NNE	1.168E-07	5.627E-08	3.459E-08	1.825E-08	1.155E-08	8.064E-09	5.991E-09	4.646E-09	3.718E-09	3.047E-09	2.545E-09
NE	1.270E-07	6.088E-08	3.728E-08	1.956E-08	1.233E-08	8.578E-09	6.354E-09	4.914E-09	3.922E-09	3.207E-09	2.672E-09
ENE	1.585E-07	7.661E-08	4.719E-08	2.496E-08	1.581E-08	1.104E-08	8.199E-09	6.354E-09	5.080E-09	4.159E-09	3.469E-09
E	1.550E-07	7.549E-08	4.675E-08	2.492E-08	1.587E-08	1.113E-08	8.294E-09	6.445E-09	5.164E-09	4.236E-09	3.539E-09
ESE	2.035E-07	9.985E-08	6.219E-08	3.343E-08	2.142E-08	1.510E-08	1.130E-08	8.812E-09	7.084E-09	5.828E-09	4.883E-09
SE	1.312E-07	6.390E-08	3.958E-08	2.110E-08	1.344E-08	9.425E-09	7.026E-09	5.462E-09	4.378E-09	3.593E-09	3.003E-09
SSE	9.570E-08	4.639E-08	2.865E-08	1.521E-08	9.670E-09	6.774E-09	5.046E-09	3.921E-09	3.142E-09	2.578E-09	2.155E-09
S	6.759E-08	3.260E-08	2.006E-08	1.060E-08	6.713E-09	4.692E-09	3.488E-09	2.707E-09	2.167E-09	1.777E-09	1.485E-09
SSW	4.666E-08	2.226E-08	1.358E-08	7.095E-09	4.459E-09	3.097E-09	2.292E-09	1.771E-09	1.412E-09	1.154E-09	9.618E-10
SW	3.705E-08	1.746E-08	1.056E-08	5.442E-09	3.387E-09	2.334E-09	1.716E-09	1.319E-09	1.047E-09	8.522E-10	7.074E-10
WSW	2.727E-08	1.289E-08	7.811E-09	4.040E-09	2.522E-09	1.743E-09	1.284E-09	9.890E-10	7.866E-10	6.414E-10	5.332E-10
W	3.061E-08	1.461E-08	8.919E-09	4.664E-09	2.934E-09	2.040E-09	1.511E-09	1.169E-09	9.337E-10	7.642E-10	6.375E-10
WNW	4.293E-08	2.069E-08	1.272E-08	6.726E-09	4.267E-09	2.987E-09	2.225E-09	1.730E-09	1.387E-09	1.140E-09	9.539E-10
NW	4.518E-08	2.190E-08	1.352E-08	7.190E-09	4.578E-09	3.214E-09	2.399E-09	1.868E-09	1.500E-09	1.234E-09	1.034E-09
NNW	5.092E-08	2.472E-08	1.528E-08	8.123E-09	5.169E-09	3.624E-09	2.702E-09	2.102E-09	1.686E-09	1.385E-09	1.159E-09

Table 2.3-330 Annual Average X/Q Values (8.0 Day Decay, Depleted) for Ground Level Release (Sheet 3 of 3)

[EF3 COL 2.0-11-A]

X/Q (sec/m^3) for Each Segment

	Segment Boundaries in Miles from the Site									
Sector	**0.5-1**	**1-2**	**2-3**	**3-4**	**4-5**	**5-10**	**10-20**	**20-30**	**30-40**	**40-50**
N	5.653E-06	1.119E-06	3.100E-07	1.482E-07	8.853E-08	3.672E-08	1.155E-08	4.981E-09	2.847E-09	1.859E-09
NNE	9.290E-06	1.838E-06	5.084E-07	2.428E-07	1.449E-07	6.009E-08	1.890E-08	8.164E-09	4.677E-09	3.060E-09
NE	1.022E-05	2.021E-06	5.568E-07	2.651E-07	1.578E-07	6.508E-08	2.028E-08	8.688E-09	4.948E-09	3.221E-09
ENE	1.243E-05	2.465E-06	6.852E-07	3.284E-07	1.965E-07	8.173E-08	2.583E-08	1.117E-08	6.396E-09	4.176E-09
E	1.194E-05	2.368E-06	6.625E-07	3.192E-07	1.918E-07	8.039E-08	2.575E-08	1.126E-08	6.485E-09	4.253E-09
ESE	1.531E-05	3.045E-06	8.586E-07	4.161E-07	2.512E-07	1.061E-07	3.448E-08	1.526E-08	8.864E-09	5.850E-09
SE	1.010E-05	2.005E-06	5.609E-07	2.702E-07	1.624E-07	6.806E-08	2.180E-08	9.535E-09	5.496E-09	3.607E-09
SSE	7.479E-06	1.482E-06	4.124E-07	1.979E-07	1.185E-07	4.946E-08	1.573E-08	6.855E-09	3.946E-09	2.589E-09
S	5.357E-06	1.061E-06	2.937E-07	1.404E-07	8.385E-08	3.480E-08	1.097E-08	4.749E-09	2.725E-09	1.784E-09
SSW	3.814E-06	7.533E-07	2.064E-07	9.786E-08	5.806E-08	2.383E-08	7.366E-09	3.138E-09	1.783E-09	1.160E-09
SW	3.133E-06	6.157E-07	1.670E-07	7.851E-08	4.626E-08	1.875E-08	5.666E-09	2.368E-09	1.329E-09	8.563E-10
WSW	2.309E-06	4.520E-07	1.226E-07	5.770E-08	3.402E-08	1.383E-08	4.204E-09	1.767E-09	9.963E-10	6.443E-10
W	2.511E-06	4.938E-07	1.354E-07	6.419E-08	3.809E-08	1.564E-08	4.841E-09	2.067E-09	1.177E-09	7.675E-10
WNW	3.450E-06	6.783E-07	1.873E-07	8.935E-08	5.329E-08	2.209E-08	6.965E-09	3.023E-09	1.741E-09	1.144E-09
NW	3.591E-06	7.048E-07	1.955E-07	9.360E-08	5.599E-08	2.335E-08	7.437E-09	3.252E-09	1.880E-09	1.239E-09
NNW	3.983E-06	7.865E-07	2.191E-07	1.052E-07	6.306E-08	2.634E-08	8.400E-09	3.667E-09	2.115E-09	1.390E-09

Table 2.3-331 Annual Average D/Q Values for Ground Level Release (Sheet 1 of 3) [EF3 COL 2.0-11-A]

Relative Deposition per Unit Area (m^{-2}) at Fixed Points by Downwind Sectors

	Distance in Miles from the Site										
Sector	**0.25**	**0.5**	**0.75**	**1.0**	**1.5**	**2.0**	**2.5**	**3.0**	**3.5**	**4.0**	**4.5**
N	1.278E-07	4.323E-08	2.220E-08	1.055E-08	3.791E-09	1.880E-09	1.107E-09	7.248E-10	5.100E-10	3.780E-10	2.913E-10
NNE	2.436E-07	8.237E-08	4.229E-08	2.011E-08	7.222E-09	3.582E-09	2.109E-09	1.381E-09	9.716E-10	7.201E-10	5.549E-10
NE	2.457E-07	8.310E-08	4.267E-08	2.029E-08	7.286E-09	3.614E-09	2.128E-09	1.393E-09	9.803E-10	7.265E-10	5.599E-10
ENE	1.980E-07	6.694E-08	3.437E-08	1.634E-08	5.870E-09	2.911E-09	1.714E-09	1.122E-09	7.897E-10	5.853E-10	4.510E-10
E	1.602E-07	5.417E-08	2.781E-08	1.322E-08	4.749E-09	2.355E-09	1.387E-09	9.081E-10	6.390E-10	4.735E-10	3.649E-10
ESE	1.817E-07	6.145E-08	3.155E-08	1.500E-08	5.388E-09	2.672E-09	1.573E-09	1.030E-09	7.250E-10	5.373E-10	4.140E-10
SE	1.488E-07	5.033E-08	2.584E-08	1.229E-08	4.413E-09	2.189E-09	1.289E-09	8.438E-10	5.938E-10	4.400E-10	3.391E-10
SSE	1.345E-07	4.547E-08	2.335E-08	1.110E-08	3.987E-09	1.977E-09	1.164E-09	7.623E-10	5.364E-10	3.975E-10	3.063E-10
S	1.082E-07	3.660E-08	1.879E-08	8.934E-09	3.209E-09	1.591E-09	9.371E-10	6.136E-10	4.318E-10	3.200E-10	2.466E-10
SSW	9.010E-08	3.047E-08	1.564E-08	7.437E-09	2.672E-09	1.325E-09	7.801E-10	5.108E-10	3.594E-10	2.664E-10	2.053E-10
SW	1.068E-07	3.610E-08	1.854E-08	8.812E-09	3.165E-09	1.570E-09	9.243E-10	6.052E-10	4.259E-10	3.156E-10	2.432E-10
WSW	9.838E-08	3.327E-08	1.708E-08	8.121E-09	2.917E-09	1.447E-09	8.518E-10	5.578E-10	3.925E-10	2.909E-10	2.241E-10
W	1.086E-07	3.673E-08	1.886E-08	8.965E-09	3.220E-09	1.597E-09	9.403E-10	6.157E-10	4.332E-10	3.211E-10	2.474E-10
WNW	1.294E-07	4.375E-08	2.246E-08	1.068E-08	3.836E-09	1.902E-09	1.120E-09	7.334E-10	5.161E-10	3.825E-10	2.947E-10
NW	1.236E-07	4.181E-08	2.147E-08	1.021E-08	3.666E-09	1.818E-09	1.070E-09	7.009E-10	4.932E-10	3.655E-10	2.817E-10
NNW	1.106E-07	3.740E-08	1.920E-08	9.129E-09	3.279E-09	1.626E-09	9.575E-10	6.270E-10	4.412E-10	3.269E-10	2.520E-10

Relative Deposition per Unit Area (m^{-2}) at Fixed Points by Downwind Sectors

	Distance in Miles from the Site										
Sector	**5.0**	**7.5**	**10**	**15**	**20**	**25**	**30**	**35**	**40**	**45**	**50**
N	2.314E-10	1.028E-10	6.227E-11	3.147E-11	1.905E-11	1.277E-11	9.152E-12	6.872E-12	5.343E-12	4.268E-12	3.484E-12
NNE	4.408E-10	1.958E-10	1.186E-10	5.996E-11	3.629E-11	2.433E-11	1.744E-11	1.309E-11	1.018E-11	8.132E-12	6.637E-12
NE	4.448E-10	1.976E-10	1.197E-10	6.050E-11	3.662E-11	2.455E-11	1.759E-11	1.321E-11	1.027E-11	8.204E-12	6.696E-12
ENE	3.583E-10	1.592E-10	9.642E-11	4.873E-11	2.950E-11	1.978E-11	1.417E-11	1.064E-11	8.274E-12	6.609E-12	5.394E-12
E	2.899E-10	1.288E-10	7.801E-11	3.943E-11	2.387E-11	1.600E-11	1.147E-11	8.610E-12	6.694E-12	5.347E-12	4.365E-12
ESE	3.289E-10	1.461E-10	8.851E-11	4.474E-11	2.708E-11	1.815E-11	1.301E-11	9.768E-12	7.595E-12	6.067E-12	4.952E-12
SE	2.694E-10	1.197E-10	7.249E-11	3.664E-11	2.218E-11	1.487E-11	1.065E-11	8.001E-12	6.221E-12	4.969E-12	4.056E-12
SSE	2.434E-10	1.081E-10	6.549E-11	3.310E-11	2.003E-11	1.343E-11	9.625E-12	7.227E-12	5.619E-12	4.489E-12	3.664E-12
S	1.959E-10	8.702E-11	5.271E-11	2.664E-11	1.613E-11	1.081E-11	7.748E-12	5.818E-12	4.523E-12	3.613E-12	2.949E-12
SSW	1.631E-10	7.244E-11	4.388E-11	2.218E-11	1.343E-11	9.001E-12	6.450E-12	4.843E-12	3.766E-12	3.008E-12	2.455E-12
SW	1.932E-10	8.583E-11	5.199E-11	2.628E-11	1.591E-11	1.066E-11	7.642E-12	5.738E-12	4.462E-12	3.564E-12	2.909E-12
WSW	1.781E-10	7.910E-11	4.792E-11	2.422E-11	1.466E-11	9.828E-12	7.042E-12	5.288E-12	4.112E-12	3.284E-12	2.681E-12
W	1.966E-10	8.732E-11	5.289E-11	2.674E-11	1.618E-11	1.085E-11	7.774E-12	5.838E-12	4.539E-12	3.626E-12	2.959E-12
WNW	2.342E-10	1.040E-10	6.301E-11	3.185E-11	1.928E-11	1.292E-11	9.261E-12	6.954E-12	5.407E-12	4.319E-12	3.525E-12
NW	2.238E-10	9.941E-11	6.022E-11	3.044E-11	1.842E-11	1.235E-11	8.850E-12	6.646E-12	5.167E-12	4.128E-12	3.369E-12
NNW	2.002E-10	8.892E-11	5.386E-11	2.723E-11	1.648E-11	1.105E-11	7.917E-12	5.944E-12	4.622E-12	3.692E-12	3.014E-12

Table 2.3-331 Annual Average D/Q Values for Ground Level Release (Sheet 3 of 3) [EF3 COL 2.0-11-A]

Relative Deposition per Unit Area (m^{-2}) at Fixed Points by Downwind Sectors

	Segment Boundaries in Miles from the Site									
Sector	**0.5-1**	**1-2**	**2-3**	**3-4**	**4-5**	**5-10**	**10-20**	**20-30**	**30-40**	**40-50**
N	2.170E-08	4.444E-09	1.160E-09	5.211E-10	2.948E-10	1.134E-10	3.279E-11	1.300E-11	6.941E-12	4.296E-12
NNE	4.134E-08	8.467E-09	2.210E-09	9.927E-10	5.616E-10	2.160E-10	6.248E-11	2.476E-11	1.322E-11	8.185E-12
NE	4.171E-08	8.543E-09	2.230E-09	1.002E-09	5.666E-10	2.179E-10	6.304E-11	2.498E-11	1.334E-11	8.258E-12
ENE	3.360E-08	6.882E-09	1.797E-09	8.069E-10	4.564E-10	1.755E-10	5.078E-11	2.013E-11	1.075E-11	6.652E-12
E	2.718E-08	5.568E-09	1.454E-09	6.528E-10	3.693E-10	1.420E-10	4.109E-11	1.628E-11	8.696E-12	5.382E-12
ESE	3.084E-08	6.317E-09	1.649E-09	7.407E-10	4.190E-10	1.611E-10	4.662E-11	1.848E-11	9.866E-12	6.107E-12
SE	2.526E-08	5.174E-09	1.351E-09	6.067E-10	3.432E-10	1.320E-10	3.818E-11	1.513E-11	8.081E-12	5.002E-12
SSE	2.282E-08	4.674E-09	1.220E-09	5.480E-10	3.100E-10	1.192E-10	3.449E-11	1.367E-11	7.300E-12	4.518E-12
S	1.837E-08	3.762E-09	9.822E-10	4.411E-10	2.496E-10	9.597E-11	2.776E-11	1.100E-11	5.876E-12	3.637E-12
SSW	1.529E-08	3.132E-09	8.177E-10	3.672E-10	2.077E-10	7.989E-11	2.311E-11	9.160E-12	4.892E-12	3.028E-12
SW	1.812E-08	3.711E-09	9.688E-10	4.351E-10	2.461E-10	9.466E-11	2.738E-11	1.085E-11	5.796E-12	3.587E-12
WSW	1.670E-08	3.420E-09	8.928E-10	4.010E-10	2.268E-10	8.723E-11	2.524E-11	1.000E-11	5.341E-12	3.306E-12
W	1.843E-08	3.775E-09	9.856E-10	4.426E-10	2.504E-10	9.630E-11	2.786E-11	1.104E-11	5.896E-12	3.649E-12
WNW	2.196E-08	4.497E-09	1.174E-09	5.273E-10	2.983E-10	1.147E-10	3.319E-11	1.315E-11	7.024E-12	4.347E-12
NW	2.098E-08	4.298E-09	1.122E-09	5.039E-10	2.851E-10	1.096E-10	3.171E-11	1.257E-11	6.712E-12	4.155E-12
NNW	1.877E-08	3.844E-09	1.004E-09	4.507E-10	2.550E-10	9.806E-11	2.837E-11	1.124E-11	6.004E-12	3.716E-12

Table 2.3-332 Annual Average X/Q Values (No Decay, Undepleted) for Mixed-Mode Release from the Reactor Building/Fuel Building Stack (Sheet 1 of 3)

[EF3 COL 2.0-11-A]

Annual Average X/Q (sec/m^3)

	Distance in Miles from the Site										
Sector	**0.25**	**0.5**	**0.75**	**1**	**1.5**	**2**	**2.5**	**3**	**3.5**	**4**	**4.5**
N	1.751E-06	6.179E-07	3.761E-07	2.313E-07	1.278E-07	8.509E-08	6.201E-08	4.785E-08	3.843E-08	3.180E-08	2.711E-08
NNE	3.590E-06	1.280E-06	7.693E-07	4.495E-07	2.328E-07	1.499E-07	1.071E-07	8.168E-08	6.684E-08	5.634E-08	4.769E-08
NE	2.374E-06	9.402E-07	6.270E-07	3.986E-07	2.256E-07	1.507E-07	1.096E-07	8.423E-08	6.739E-08	5.555E-08	4.688E-08
ENE	1.358E-06	5.324E-07	3.603E-07	2.487E-07	1.630E-07	1.185E-07	9.085E-08	7.241E-08	5.948E-08	5.004E-08	4.292E-08
E	1.061E-06	4.341E-07	2.860E-07	1.909E-07	1.219E-07	8.829E-08	6.794E-08	5.446E-08	4.501E-08	3.809E-08	3.285E-08
ESE	1.198E-06	4.623E-07	2.929E-07	1.918E-07	1.215E-07	8.832E-08	6.843E-08	5.527E-08	4.601E-08	3.921E-08	3.403E-08
SE	1.041E-06	3.935E-07	2.490E-07	1.666E-07	1.086E-07	7.944E-08	6.137E-08	4.927E-08	4.074E-08	3.447E-08	2.972E-08
SSE	1.131E-06	4.349E-07	2.828E-07	1.840E-07	1.110E-07	7.726E-08	5.778E-08	4.534E-08	3.685E-08	3.077E-08	2.625E-08
S	1.125E-06	4.382E-07	2.844E-07	1.768E-07	9.884E-08	6.658E-08	4.903E-08	3.816E-08	3.086E-08	2.568E-08	2.185E-08
SSW	8.151E-07	3.275E-07	2.251E-07	1.505E-07	9.004E-08	6.174E-08	4.547E-08	3.517E-08	2.821E-08	2.328E-08	1.964E-08
SW	1.150E-06	4.523E-07	3.164E-07	2.102E-07	1.178E-07	7.642E-08	5.404E-08	4.055E-08	3.177E-08	2.573E-08	2.137E-08
WSW	1.211E-06	4.644E-07	3.042E-07	1.915E-07	1.008E-07	6.333E-08	4.395E-08	3.258E-08	2.531E-08	2.037E-08	1.704E-08
W	1.611E-06	5.708E-07	3.582E-07	2.179E-07	1.104E-07	6.829E-08	4.710E-08	3.483E-08	2.704E-08	2.177E-08	1.802E-08
WNW	1.858E-06	6.257E-07	3.782E-07	2.329E-07	1.219E-07	7.696E-08	5.378E-08	4.016E-08	3.143E-08	2.547E-08	2.120E-08
NW	1.820E-06	6.145E-07	3.538E-07	2.100E-07	1.090E-07	6.904E-08	4.851E-08	3.643E-08	2.866E-08	2.334E-08	1.962E-08
NNW	1.706E-06	5.681E-07	3.227E-07	1.889E-07	9.915E-08	6.416E-08	4.598E-08	3.511E-08	2.801E-08	2.307E-08	1.973E-08

Table 2.3-332 Annual Average χ/Q Values (No Decay, Undepleted) for Mixed-Mode Release from the Reactor Building/Fuel Building Stack (Sheet 2 of 3)

[EF3 COL 2.0-11-A]

Annual Average χ/Q (sec/m^3)

	Distance in Miles from the Site										
Sector	5	7.5	10	15	20	25	30	35	40	45	50
N	2.354E-08	1.489E-08	1.100E-08	7.457E-09	5.597E-09	4.399E-09	3.534E-09	2.895E-09	2.433E-09	2.087E-09	1.820E-09
NNE	4.117E-08	2.404E-08	1.678E-08	1.053E-08	7.545E-09	5.821E-09	4.707E-09	3.934E-09	3.368E-09	2.938E-09	2.600E-09
NE	4.033E-08	2.375E-08	1.663E-08	1.047E-08	7.522E-09	5.817E-09	4.716E-09	3.951E-09	3.392E-09	2.966E-09	2.632E-09
ENE	3.742E-08	2.309E-08	1.664E-08	1.086E-08	8.000E-09	6.308E-09	5.200E-09	4.420E-09	3.844E-09	3.402E-09	3.052E-09
E	2.879E-08	1.789E-08	1.293E-08	8.455E-09	6.210E-09	4.869E-09	3.984E-09	3.359E-09	2.896E-09	2.539E-09	2.257E-09
ESE	3.001E-08	1.924E-08	1.426E-08	9.683E-09	7.321E-09	5.880E-09	4.912E-09	4.219E-09	3.698E-09	3.293E-09	2.970E-09
SE	2.604E-08	1.630E-08	1.186E-08	7.845E-09	5.827E-09	4.622E-09	3.827E-09	3.264E-09	2.847E-09	2.525E-09	2.270E-09
SSE	2.279E-08	1.437E-08	1.062E-08	7.307E-09	5.661E-09	4.666E-09	3.987E-09	3.480E-09	3.074E-09	2.733E-09	2.438E-09
S	1.893E-08	1.162E-08	8.383E-09	5.506E-09	4.086E-09	3.244E-09	2.690E-09	2.297E-09	2.003E-09	1.774E-09	1.589E-09
SSW	1.688E-08	9.925E-09	6.920E-09	4.318E-09	3.080E-09	2.368E-09	1.911E-09	1.594E-09	1.363E-09	1.188E-09	1.050E-09
SW	1.813E-08	1.012E-08	6.827E-09	4.078E-09	2.823E-09	2.121E-09	1.679E-09	1.378E-09	1.162E-09	9.993E-10	8.736E-10
WSW	1.456E-08	8.083E-09	5.453E-09	3.268E-09	2.271E-09	1.711E-09	1.357E-09	1.114E-09	9.383E-10	8.054E-10	7.015E-10
W	1.525E-08	8.841E-09	6.167E-09	3.874E-09	2.754E-09	2.073E-09	1.625E-09	1.322E-09	1.106E-09	9.460E-10	8.228E-10
WNW	1.803E-08	1.092E-08	7.906E-09	5.267E-09	3.845E-09	2.897E-09	2.281E-09	1.865E-09	1.567E-09	1.345E-09	1.174E-09
NW	1.685E-08	1.020E-08	7.395E-09	4.977E-09	3.757E-09	2.976E-09	2.408E-09	1.984E-09	1.676E-09	1.444E-09	1.264E-09
NNW	1.720E-08	1.103E-08	8.292E-09	5.771E-09	4.349E-09	3.360E-09	2.666E-09	2.186E-09	1.842E-09	1.585E-09	1.385E-09

Table 2.3-332 Annual Average X/Q Values (No Decay, Undepleted) for Mixed-Mode Release from the Reactor Building/Fuel Building Stack (Sheet 3 of 3)

[EF3 COL 2.0-11-A]

X/Q (sec/m^3) for Each Segment

Segment Boundaries in Miles from the Site										
Sector	**0.5-1**	**1-2**	**2-3**	**3-4**	**4-5**	**5-10**	**10-20**	**20-30**	**30-40**	**40-50**
N	3.655E-07	1.318E-07	6.250E-08	3.859E-08	2.718E-08	1.508E-08	7.417E-09	4.373E-09	2.902E-09	2.091E-09
NNE	7.406E-07	2.441E-07	1.083E-07	6.708E-08	4.784E-08	2.462E-08	1.059E-08	5.835E-09	3.939E-09	2.940E-09
NE	5.951E-07	2.307E-07	1.104E-07	6.769E-08	4.702E-08	2.427E-08	1.053E-08	5.831E-09	3.957E-09	2.969E-09
ENE	3.489E-07	1.623E-07	9.085E-08	5.958E-08	4.299E-08	2.340E-08	1.087E-08	6.316E-09	4.423E-09	3.403E-09
E	2.766E-07	1.223E-07	6.797E-08	4.507E-08	3.290E-08	1.811E-08	8.453E-09	4.873E-09	3.361E-09	2.540E-09
ESE	2.856E-07	1.224E-07	6.847E-08	4.606E-08	3.408E-08	1.942E-08	9.650E-09	5.877E-09	4.219E-09	3.293E-09
SE	2.445E-07	1.085E-07	6.135E-08	4.079E-08	2.976E-08	1.649E-08	7.840E-09	4.626E-09	3.266E-09	2.526E-09
SSE	2.727E-07	1.122E-07	5.800E-08	3.696E-08	2.631E-08	1.457E-08	7.311E-09	4.660E-09	3.470E-09	2.725E-09
S	2.707E-07	1.018E-07	4.936E-08	3.097E-08	2.190E-08	1.181E-08	5.514E-09	3.247E-09	2.298E-09	1.773E-09
SSW	2.147E-07	9.090E-08	4.569E-08	2.832E-08	1.970E-08	1.014E-08	4.346E-09	2.375E-09	1.597E-09	1.189E-09
SW	2.994E-07	1.200E-07	5.461E-08	3.198E-08	2.146E-08	1.044E-08	4.131E-09	2.131E-09	1.381E-09	1.001E-09
WSW	2.897E-07	1.043E-07	4.457E-08	2.550E-08	1.711E-08	8.353E-09	3.311E-09	1.719E-09	1.117E-09	8.063E-10
W	3.431E-07	1.156E-07	4.784E-08	2.726E-08	1.810E-08	9.076E-09	3.886E-09	2.075E-09	1.326E-09	9.479E-10
WNW	3.686E-07	1.266E-07	5.451E-08	3.165E-08	2.129E-08	1.116E-08	5.221E-09	2.904E-09	1.871E-09	1.348E-09
NW	3.478E-07	1.137E-07	4.915E-08	2.886E-08	1.969E-08	1.043E-08	4.972E-09	2.957E-09	1.988E-09	1.446E-09
NNW	3.178E-07	1.035E-07	4.648E-08	2.816E-08	1.978E-08	1.119E-08	5.699E-09	3.346E-09	2.192E-09	1.587E-09

Table 2.3-333 Annual Average X/Q Values (2.26 Day Decay, Undepleted) for Mixed-Mode Release from the Reactor Building/Fuel Building Stack (Sheet 1 of 3)

[EF3 COL 2.0-11-A]

	Annual Average X/Q (sec/m^3)									
	Distance in Miles from the Site									
Sector	**0.25**	**0.5**	**0.75**	**1**	**1.5**	**2**	**2.5**	**3**	**3.5**	**4**	**4.5**
N	1.750E-06	6.173E-07	3.755E-07	2.308E-07	1.275E-07	8.476E-08	6.170E-08	4.755E-08	3.814E-08	3.152E-08	2.684E-08
NNE	3.589E-06	1.279E-06	7.684E-07	4.488E-07	2.323E-07	1.494E-07	1.067E-07	8.125E-08	6.642E-08	5.593E-08	4.729E-08
NE	2.373E-06	9.395E-07	6.263E-07	3.980E-07	2.250E-07	1.502E-07	1.091E-07	8.379E-08	6.697E-08	5.515E-08	4.649E-08
ENE	1.357E-06	5.319E-07	3.599E-07	2.482E-07	1.625E-07	1.180E-07	9.038E-08	7.195E-08	5.903E-08	4.959E-08	4.248E-08
E	1.061E-06	4.337E-07	2.855E-07	1.906E-07	1.215E-07	8.791E-08	6.756E-08	5.408E-08	4.463E-08	3.771E-08	3.248E-08
ESE	1.197E-06	4.619E-07	2.925E-07	1.915E-07	1.211E-07	8.797E-08	6.807E-08	5.490E-08	4.565E-08	3.884E-08	3.367E-08
SE	1.040E-06	3.931E-07	2.487E-07	1.663E-07	1.083E-07	7.912E-08	6.105E-08	4.895E-08	4.042E-08	3.416E-08	2.941E-08
SSE	1.130E-06	4.345E-07	2.825E-07	1.837E-07	1.107E-07	7.698E-08	5.751E-08	4.507E-08	3.659E-08	3.052E-08	2.600E-08
S	1.125E-06	4.379E-07	2.840E-07	1.765E-07	9.860E-08	6.635E-08	4.881E-08	3.795E-08	3.065E-08	2.548E-08	2.165E-08
SSW	8.148E-07	3.272E-07	2.248E-07	1.503E-07	8.982E-08	6.153E-08	4.527E-08	3.498E-08	2.803E-08	2.311E-08	1.948E-08
SW	1.150E-06	4.518E-07	3.159E-07	2.099E-07	1.175E-07	7.616E-08	5.381E-08	4.034E-08	3.157E-08	2.554E-08	2.119E-08
WSW	1.210E-06	4.640E-07	3.038E-07	1.912E-07	1.006E-07	6.314E-08	4.377E-08	3.241E-08	2.516E-08	2.022E-08	1.690E-08
W	1.610E-06	5.704E-07	3.578E-07	2.176E-07	1.101E-07	6.809E-08	4.691E-08	3.466E-08	2.688E-08	2.162E-08	1.787E-08
WNW	1.857E-06	6.252E-07	3.778E-07	2.325E-07	1.216E-07	7.672E-08	5.357E-08	3.997E-08	3.126E-08	2.531E-08	2.104E-08
NW	1.819E-06	6.139E-07	3.533E-07	2.096E-07	1.087E-07	6.878E-08	4.828E-08	3.622E-08	2.847E-08	2.316E-08	1.944E-08
NNW	1.705E-06	5.676E-07	3.222E-07	1.885E-07	9.889E-08	6.393E-08	4.577E-08	3.492E-08	2.783E-08	2.290E-08	1.956E-08

Table 2.3-333 Annual Average Χ/Q Values (2.26 Day Decay, Undepleted) for Mixed-Mode Release from the Reactor Building/Fuel Building Stack (Sheet 2 of 3)

[EF3 COL 2.0-11-A]

Annual Average Χ/Q (sec/m^3)

	Distance in Miles from the Site										
Sector	**5**	**7.5**	**10**	**15**	**20**	**25**	**30**	**35**	**40**	**45**	**50**
N	1.874E-08	1.144E-08	8.203E-09	5.324E-09	3.904E-09	3.064E-09	2.511E-09	2.119E-09	1.827E-09	1.599E-09	1.416E-09
NNE	1.672E-08	9.781E-09	6.784E-09	4.188E-09	2.955E-09	2.247E-09	1.793E-09	1.480E-09	1.252E-09	1.078E-09	9.428E-10
NE	1.796E-08	9.967E-09	6.686E-09	3.947E-09	2.700E-09	2.004E-09	1.567E-09	1.271E-09	1.059E-09	9.000E-10	7.775E-10
ENE	1.442E-08	7.964E-09	5.342E-09	3.164E-09	2.173E-09	1.617E-09	1.267E-09	1.028E-09	8.554E-10	7.257E-10	6.249E-10
E	1.511E-08	8.716E-09	6.047E-09	3.759E-09	2.644E-09	1.969E-09	1.527E-09	1.230E-09	1.019E-09	8.631E-10	7.435E-10
ESE	1.789E-08	1.078E-08	7.767E-09	5.121E-09	3.699E-09	2.758E-09	2.150E-09	1.740E-09	1.448E-09	1.231E-09	1.064E-09
SE	1.668E-08	1.004E-08	7.238E-09	4.814E-09	3.589E-09	2.809E-09	2.244E-09	1.827E-09	1.524E-09	1.298E-09	1.124E-09
SSE	1.703E-08	1.087E-08	8.116E-09	5.577E-09	4.146E-09	3.157E-09	2.471E-09	2.002E-09	1.666E-09	1.416E-09	1.224E-09
S	2.328E-08	1.462E-08	1.072E-08	7.169E-09	5.304E-09	4.110E-09	3.255E-09	2.630E-09	2.180E-09	1.846E-09	1.589E-09
SSW	4.078E-08	2.368E-08	1.644E-08	1.020E-08	7.226E-09	5.510E-09	4.406E-09	3.641E-09	3.083E-09	2.659E-09	2.328E-09
SW	3.995E-08	2.340E-08	1.629E-08	1.013E-08	7.193E-09	5.494E-09	4.399E-09	3.640E-09	3.086E-09	2.665E-09	2.335E-09
WSW	3.699E-08	2.267E-08	1.622E-08	1.044E-08	7.581E-09	5.892E-09	4.786E-09	4.009E-09	3.436E-09	2.997E-09	2.650E-09
W	2.843E-08	1.753E-08	1.258E-08	8.097E-09	5.855E-09	4.520E-09	3.641E-09	3.022E-09	2.565E-09	2.215E-09	1.939E-09
WNW	2.965E-08	1.887E-08	1.389E-08	9.299E-09	6.930E-09	5.486E-09	4.517E-09	3.824E-09	3.304E-09	2.901E-09	2.578E-09
NW	2.573E-08	1.600E-08	1.156E-08	7.541E-09	5.523E-09	4.320E-09	3.526E-09	2.965E-09	2.549E-09	2.229E-09	1.976E-09
NNW	2.255E-08	1.413E-08	1.037E-08	7.039E-09	5.378E-09	4.372E-09	3.684E-09	3.171E-09	2.763E-09	2.424E-09	2.133E-09

Table 2.3-333 Annual Average X/Q Values (2.26 Day Decay, Undepleted) for Mixed-Mode Release from the Reactor Building/Fuel Building Stack (Sheet 3 of 3)

[EF3 COL 2.0-11-A]

X/Q (sec/m^3) for Each Segment

	Segment Boundaries in Miles from the Site									
Sector	0.5-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50
N	3.650E-07	1.315E-07	6.219E-08	3.831E-08	2.691E-08	1.481E-08	7.130E-09	4.086E-09	2.637E-09	1.850E-09
NNE	7.397E-07	2.435E-07	1.079E-07	6.666E-08	4.744E-08	2.426E-08	1.026E-08	5.526E-09	3.647E-09	2.662E-09
NE	5.944E-07	2.302E-07	1.099E-07	6.727E-08	4.663E-08	2.392E-08	1.020E-08	5.509E-09	3.646E-09	2.668E-09
ENE	3.485E-07	1.618E-07	9.038E-08	5.913E-08	4.256E-08	2.298E-08	1.045E-08	5.900E-09	4.013E-09	2.998E-09
E	2.763E-07	1.219E-07	6.759E-08	4.469E-08	3.253E-08	1.775E-08	8.096E-09	4.524E-09	3.025E-09	2.216E-09
ESE	2.852E-07	1.220E-07	6.811E-08	4.570E-08	3.372E-08	1.905E-08	9.266E-09	5.483E-09	3.824E-09	2.901E-09
SE	2.442E-07	1.082E-07	6.103E-08	4.047E-08	2.946E-08	1.619E-08	7.538E-09	4.323E-09	2.967E-09	2.230E-09
SSE	2.724E-07	1.119E-07	5.773E-08	3.670E-08	2.606E-08	1.433E-08	7.041E-09	4.365E-09	3.163E-09	2.417E-09
S	2.704E-07	1.016E-07	4.914E-08	3.077E-08	2.171E-08	1.162E-08	5.333E-09	3.067E-09	2.120E-09	1.599E-09
SSW	2.144E-07	9.068E-08	4.549E-08	2.814E-08	1.953E-08	9.992E-09	4.217E-09	2.255E-09	1.483E-09	1.080E-09
SW	2.990E-07	1.197E-07	5.438E-08	3.178E-08	2.128E-08	1.028E-08	4.001E-09	2.015E-09	1.275E-09	9.016E-10
WSW	2.894E-07	1.041E-07	4.439E-08	2.535E-08	1.697E-08	8.234E-09	3.207E-09	1.625E-09	1.030E-09	7.268E-10
W	3.428E-07	1.153E-07	4.766E-08	2.710E-08	1.796E-08	8.952E-09	3.772E-09	1.972E-09	1.235E-09	8.651E-10
WNW	3.682E-07	1.263E-07	5.431E-08	3.148E-08	2.114E-08	1.102E-08	5.077E-09	2.766E-09	1.746E-09	1.234E-09
NW	3.473E-07	1.134E-07	4.893E-08	2.866E-08	1.952E-08	1.027E-08	4.808E-09	2.791E-09	1.831E-09	1.301E-09
NNW	3.173E-07	1.033E-07	4.627E-08	2.798E-08	1.961E-08	1.101E-08	5.505E-09	3.146E-09	2.008E-09	1.419E-09

Table 2.3-334 Annual Average χ/Q Values (8.0 Day Decay, Depleted) for Mixed-Mode Release from the Reactor Building/Fuel Building Stack (Sheet 1 of 3)

[EF3 COL 2.0-11-A]

Annual Average χ/Q (sec/m^3)

	Distance in Miles from the Site										
Sector	0.25	0.5	0.75	1	1.5	2	2.5	3	3.5	4	4.5
N	1.678E-06	5.768E-07	3.469E-07	2.137E-07	1.186E-07	7.905E-08	5.757E-08	4.436E-08	3.557E-08	2.937E-08	2.501E-08
NNE	3.426E-06	1.188E-06	7.048E-07	4.110E-07	2.130E-07	1.370E-07	9.783E-08	7.443E-08	6.091E-08	5.134E-08	4.338E-08
NE	2.268E-06	8.786E-07	5.833E-07	3.719E-07	2.111E-07	1.408E-07	1.021E-07	7.830E-08	6.246E-08	5.134E-08	4.320E-08
ENE	1.308E-06	5.028E-07	3.390E-07	2.354E-07	1.554E-07	1.130E-07	8.652E-08	6.882E-08	5.639E-08	4.733E-08	4.050E-08
E	1.026E-06	4.133E-07	2.704E-07	1.811E-07	1.162E-07	8.420E-08	6.471E-08	5.177E-08	4.269E-08	3.604E-08	3.101E-08
ESE	1.160E-06	4.399E-07	2.764E-07	1.815E-07	1.156E-07	8.416E-08	6.518E-08	5.258E-08	4.371E-08	3.719E-08	3.223E-08
SE	1.009E-06	3.745E-07	2.351E-07	1.580E-07	1.036E-07	7.589E-08	5.857E-08	4.694E-08	3.874E-08	3.271E-08	2.814E-08
SSE	1.087E-06	4.098E-07	2.648E-07	1.729E-07	1.048E-07	7.293E-08	5.444E-08	4.261E-08	3.454E-08	2.876E-08	2.446E-08
S	1.074E-06	4.091E-07	2.636E-07	1.641E-07	9.204E-08	6.201E-08	4.561E-08	3.542E-08	2.858E-08	2.373E-08	2.014E-08
SSW	7.794E-07	3.066E-07	2.101E-07	1.413E-07	8.495E-08	5.823E-08	4.278E-08	3.298E-08	2.637E-08	2.169E-08	1.824E-08
SW	1.102E-06	4.235E-07	2.957E-07	1.975E-07	1.106E-07	7.142E-08	5.022E-08	3.747E-08	2.919E-08	2.351E-08	1.943E-08
WSW	1.161E-06	4.354E-07	2.837E-07	1.789E-07	9.393E-08	5.867E-08	4.046E-08	2.980E-08	2.301E-08	1.841E-08	1.534E-08
W	1.542E-06	5.323E-07	3.314E-07	2.015E-07	1.016E-07	6.250E-08	4.283E-08	3.148E-08	2.431E-08	1.946E-08	1.602E-08
WNW	1.788E-06	5.871E-07	3.514E-07	2.164E-07	1.130E-07	7.097E-08	4.933E-08	3.665E-08	2.854E-08	2.301E-08	1.907E-08
NW	1.756E-06	5.797E-07	3.296E-07	1.950E-07	1.009E-07	6.357E-08	4.444E-08	3.321E-08	2.601E-08	2.108E-08	1.765E-08
NNW	1.640E-06	5.327E-07	2.981E-07	1.742E-07	9.145E-08	5.909E-08	4.226E-08	3.219E-08	2.561E-08	2.104E-08	1.797E-08

Table 2.3-334 Annual Average X/Q Values (8.0 Day Decay, Depleted) for Mixed-Mode Release from the Reactor Building/Fuel Building Stack (Sheet 2 of 3)

[EF3 COL 2.0-11-A]

Annual Average X/Q (sec/m^3)

	Distance in Miles from the Site										
Sector	**5**	**7.5**	**10**	**15**	**20**	**25**	**30**	**35**	**40**	**45**	**50**
N	2.168E-08	1.367E-08	1.005E-08	6.681E-09	4.726E-09	3.514E-09	2.711E-09	2.146E-09	1.747E-09	1.456E-09	1.235E-09
NNE	3.738E-08	2.163E-08	1.497E-08	9.258E-09	6.555E-09	5.003E-09	4.008E-09	3.317E-09	2.803E-09	2.415E-09	2.107E-09
NE	3.706E-08	2.159E-08	1.499E-08	9.305E-09	6.609E-09	5.062E-09	4.069E-09	3.381E-09	2.868E-09	2.481E-09	2.175E-09
ENE	3.523E-08	2.154E-08	1.541E-08	9.949E-09	7.261E-09	5.681E-09	4.651E-09	3.927E-09	3.378E-09	2.961E-09	2.626E-09
E	2.713E-08	1.670E-08	1.198E-08	7.732E-09	5.617E-09	4.361E-09	3.537E-09	2.956E-09	2.521E-09	2.190E-09	1.926E-09
ESE	2.838E-08	1.808E-08	1.333E-08	8.974E-09	6.734E-09	5.373E-09	4.461E-09	3.808E-09	3.303E-09	2.914E-09	2.599E-09
SE	2.461E-08	1.527E-08	1.104E-08	7.223E-09	5.317E-09	4.185E-09	3.441E-09	2.915E-09	2.514E-09	2.209E-09	1.964E-09
SSE	2.119E-08	1.325E-08	9.737E-09	6.651E-09	5.127E-09	4.193E-09	3.487E-09	2.933E-09	2.502E-09	2.153E-09	1.870E-09
S	1.741E-08	1.060E-08	7.594E-09	4.936E-09	3.634E-09	2.868E-09	2.364E-09	1.995E-09	1.699E-09	1.464E-09	1.275E-09
SSW	1.563E-08	9.073E-09	6.262E-09	3.845E-09	2.709E-09	2.061E-09	1.648E-09	1.362E-09	1.148E-09	9.813E-10	8.470E-10
SW	1.640E-08	8.970E-09	5.952E-09	3.461E-09	2.344E-09	1.729E-09	1.346E-09	1.086E-09	8.965E-10	7.530E-10	6.417E-10
WSW	1.305E-08	7.096E-09	4.705E-09	2.742E-09	1.852E-09	1.345E-09	1.025E-09	8.099E-10	6.576E-10	5.461E-10	4.616E-10
W	1.350E-08	7.715E-09	5.314E-09	3.204E-09	2.145E-09	1.543E-09	1.163E-09	9.132E-10	7.399E-10	6.138E-10	5.188E-10
WNW	1.615E-08	9.683E-09	6.950E-09	4.420E-09	3.040E-09	2.196E-09	1.665E-09	1.316E-09	1.071E-09	8.930E-10	7.580E-10
NW	1.511E-08	9.051E-09	6.505E-09	4.248E-09	3.022E-09	2.268E-09	1.763E-09	1.402E-09	1.145E-09	9.572E-10	8.142E-10
NNW	1.564E-08	1.001E-08	7.488E-09	5.010E-09	3.532E-09	2.606E-09	1.991E-09	1.577E-09	1.287E-09	1.074E-09	9.133E-10

Table 2.3-334 Annual Average X/Q Values (8.0 Day Decay, Depleted) for Mixed-Mode Release from the Reactor Building/Fuel Building Stack (Sheet 3 of 3)

[EF3 COL 2.0-11-A]

X/Q (sec/m^3) for Each Segment

Segment Boundaries in Miles from the Site										
Sector	**0.5-1**	**1-2**	**2-3**	**3-4**	**4-5**	**5-10**	**10-20**	**20-30**	**30-40**	**40-50**
N	3.388E-07	1.222E-07	5.801E-08	3.572E-08	2.507E-08	1.384E-08	6.561E-09	3.516E-09	2.156E-09	1.460E-09
NNE	6.816E-07	2.232E-07	9.893E-08	6.113E-08	4.352E-08	2.217E-08	9.326E-09	5.019E-09	3.319E-09	2.416E-09
NE	5.550E-07	2.156E-07	1.029E-07	6.275E-08	4.334E-08	2.210E-08	9.370E-09	5.077E-09	3.382E-09	2.482E-09
ENE	3.294E-07	1.543E-07	8.651E-08	5.649E-08	4.057E-08	2.186E-08	9.968E-09	5.690E-09	3.924E-09	2.960E-09
E	2.625E-07	1.164E-07	6.473E-08	4.275E-08	3.106E-08	1.692E-08	7.736E-09	4.366E-09	2.957E-09	2.191E-09
ESE	2.706E-07	1.163E-07	6.520E-08	4.376E-08	3.228E-08	1.826E-08	8.946E-09	5.371E-09	3.802E-09	2.912E-09
SE	2.318E-07	1.034E-07	5.854E-08	3.879E-08	2.819E-08	1.547E-08	7.224E-09	4.190E-09	2.913E-09	2.209E-09
SSE	2.562E-07	1.058E-07	5.464E-08	3.464E-08	2.452E-08	1.345E-08	6.660E-09	4.160E-09	2.927E-09	2.151E-09
S	2.517E-07	9.471E-08	4.591E-08	2.869E-08	2.019E-08	1.078E-08	4.948E-09	2.871E-09	1.987E-09	1.463E-09
SSW	2.009E-07	8.559E-08	4.298E-08	2.648E-08	1.829E-08	9.280E-09	3.877E-09	2.069E-09	1.362E-09	9.810E-10
SW	2.804E-07	1.125E-07	5.077E-08	2.939E-08	1.952E-08	9.279E-09	3.518E-09	1.740E-09	1.088E-09	7.543E-10
WSW	2.708E-07	9.714E-08	4.105E-08	2.320E-08	1.540E-08	7.356E-09	2.783E-09	1.352E-09	8.134E-10	5.478E-10
W	3.183E-07	1.064E-07	4.354E-08	2.451E-08	1.611E-08	7.933E-09	3.202E-09	1.551E-09	9.184E-10	6.160E-10
WNW	3.438E-07	1.173E-07	5.003E-08	2.875E-08	1.916E-08	9.906E-09	4.369E-09	2.209E-09	1.322E-09	8.958E-10
NW	3.254E-07	1.052E-07	4.505E-08	2.619E-08	1.773E-08	9.265E-09	4.205E-09	2.267E-09	1.407E-09	9.600E-10
NNW	2.952E-07	9.547E-08	4.272E-08	2.575E-08	1.802E-08	1.014E-08	4.904E-09	2.607E-09	1.585E-09	1.078E-09

Table 2.3-335 Annual Average D/Q Values for Mixed-Mode Release from the Reactor Building/Fuel Building Stack (Sheet 1 of 3)

[EF3 COL 2.0-11-A]

Relative Deposition per Unit Area (m^{-2}) at Fixed Points by Downwind Sectors

	Distances in Miles										
Sector	**0.25**	**0.50**	**0.75**	**1**	**1.5**	**2**	**2.5**	**3**	**3.5**	**4**	**4.5**
N	2.409E-08	1.210E-08	7.197E-09	3.737E-09	1.441E-09	7.557E-10	4.630E-10	3.129E-10	2.258E-10	1.709E-10	1.340E-10
NNE	5.377E-08	2.552E-08	1.482E-08	7.640E-09	2.974E-09	1.553E-09	9.467E-10	6.371E-10	4.583E-10	3.458E-10	2.704E-10
NE	4.735E-08	2.442E-08	1.519E-08	8.230E-09	3.373E-09	1.800E-09	1.112E-09	7.543E-10	5.453E-10	4.126E-10	3.231E-10
ENE	2.780E-08	1.523E-08	9.593E-09	5.275E-09	2.177E-09	1.186E-09	7.448E-10	5.113E-10	3.726E-10	2.834E-10	2.227E-10
E	2.355E-08	1.315E-08	8.209E-09	4.450E-09	1.795E-09	9.714E-10	6.079E-10	4.167E-10	3.036E-10	2.310E-10	1.817E-10
ESE	2.561E-08	1.419E-08	8.748E-09	4.679E-09	1.858E-09	9.967E-10	6.202E-10	4.237E-10	3.080E-10	2.341E-10	1.841E-10
SE	2.179E-08	1.208E-08	7.441E-09	3.994E-09	1.593E-09	8.591E-10	5.366E-10	3.675E-10	2.676E-10	2.036E-10	1.601E-10
SSE	2.134E-08	1.151E-08	7.121E-09	3.854E-09	1.562E-09	8.443E-10	5.275E-10	3.611E-10	2.627E-10	1.997E-10	1.569E-10
S	1.787E-08	9.225E-09	5.746E-09	3.117E-09	1.271E-09	6.818E-10	4.230E-10	2.880E-10	2.087E-10	1.582E-10	1.240E-10
SSW	1.393E-08	7.387E-09	4.722E-09	2.618E-09	1.089E-09	5.924E-10	3.711E-10	2.542E-10	1.849E-10	1.405E-10	1.103E-10
SW	1.964E-08	1.080E-08	7.021E-09	3.896E-09	1.623E-09	8.739E-10	5.427E-10	3.696E-10	2.679E-10	2.030E-10	1.592E-10
WSW	2.364E-08	1.231E-08	7.566E-09	4.042E-09	1.629E-09	8.609E-10	5.284E-10	3.572E-10	2.576E-10	1.947E-10	1.525E-10
W	3.098E-08	1.498E-08	8.799E-09	4.683E-09	1.849E-09	9.621E-10	5.842E-10	3.919E-10	2.812E-10	2.117E-10	1.654E-10
WNW	3.293E-08	1.672E-08	9.777E-09	5.230E-09	2.037E-09	1.059E-09	6.436E-10	4.323E-10	3.106E-10	2.343E-10	1.833E-10
NW	3.046E-08	1.598E-08	9.347E-09	4.979E-09	1.912E-09	9.908E-10	6.017E-10	4.041E-10	2.904E-10	2.192E-10	1.716E-10
NNW	2.560E-08	1.298E-08	7.482E-09	3.797E-09	1.431E-09	7.439E-10	4.535E-10	3.056E-10	2.203E-10	1.667E-10	1.307E-10

Table 2.3-335 Annual Average D/Q Values for Mixed-Mode Release from the Reactor Building/Fuel Building Stack (Sheet 2 of 3)

[EF3 COL 2.0-11-A]

Relative Deposition per Unit Area (m^{-2}) at Fixed Points by Downwind Sectors

	Distances in Miles										
Sector	**5**	**7.5**	**10**	**15**	**20**	**25**	**30**	**35**	**40**	**45**	**50**
N	1.080E-10	5.087E-11	3.168E-11	4.047E-11	2.870E-11	1.750E-11	1.220E-11	9.193E-12	7.159E-12	5.723E-12	4.674E-12
NNE	2.175E-10	1.000E-10	6.065E-11	3.193E-11	2.045E-11	1.475E-11	1.146E-11	9.780E-12	8.213E-12	8.668E-12	7.393E-12
NE	2.600E-10	1.193E-10	7.167E-11	3.706E-11	2.353E-11	1.672E-11	1.279E-11	1.024E-11	8.629E-12	7.311E-12	6.637E-12
ENE	1.796E-10	8.362E-11	5.082E-11	2.672E-11	1.715E-11	1.235E-11	9.565E-12	7.756E-12	6.536E-12	5.603E-12	4.987E-12
E	1.466E-10	6.865E-11	4.195E-11	2.226E-11	1.428E-11	1.045E-11	8.117E-12	6.557E-12	5.463E-12	4.634E-12	4.008E-12
ESE	1.486E-10	6.960E-11	4.259E-11	2.268E-11	1.461E-11	1.079E-11	8.478E-12	7.001E-12	5.945E-12	5.134E-12	4.500E-12
SE	1.293E-10	6.064E-11	3.715E-11	1.981E-11	1.277E-11	9.415E-12	7.310E-12	5.972E-12	5.055E-12	4.351E-12	3.823E-12
SSE	1.265E-10	5.898E-11	3.645E-11	1.906E-11	1.267E-11	1.530E-11	1.482E-11	1.163E-11	9.017E-12	6.784E-12	5.275E-12
S	9.983E-11	4.609E-11	2.784E-11	1.455E-11	9.251E-12	6.712E-12	6.386E-12	7.975E-12	7.180E-12	6.172E-12	5.025E-12
SSW	8.879E-11	4.112E-11	2.486E-11	1.298E-11	8.222E-12	5.903E-12	4.814E-12	4.275E-12	4.384E-12	4.705E-12	3.992E-12
SW	1.281E-10	5.895E-11	3.579E-11	1.828E-11	1.153E-11	8.209E-12	6.467E-12	5.765E-12	5.760E-12	4.971E-12	4.160E-12
WSW	1.249E-10	5.693E-11	3.408E-11	1.919E-11	1.434E-11	1.209E-11	9.094E-12	6.965E-12	5.401E-12	4.384E-12	3.593E-12
W	1.329E-10	6.063E-11	4.049E-11	3.015E-11	1.944E-11	1.339E-11	9.759E-12	7.364E-12	5.728E-12	4.577E-12	3.737E-12
WNW	1.475E-10	6.847E-11	5.289E-11	3.789E-11	2.357E-11	1.625E-11	1.176E-11	8.835E-12	6.872E-12	5.496E-12	4.487E-12
NW	1.382E-10	6.369E-11	4.251E-11	3.621E-11	2.435E-11	1.598E-11	1.125E-11	8.486E-12	6.588E-12	5.266E-12	4.300E-12
NNW	1.079E-10	4.972E-11	3.510E-11	3.585E-11	2.210E-11	1.425E-11	1.024E-11	7.738E-12	6.021E-12	4.813E-12	3.926E-12

Table 2.3-335 Annual Average D/Q Values for Mixed-Mode Release from the Reactor Building/Fuel Building Stack (Sheet 3 of 3)

[EF3 COL 2.0-11-A]

Relative Deposition per Unit Area (m^{-2}) at Fixed Points by Downwind Sectors

	Segment Boundaries in Miles									
Sector	0.5-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50
N	6.749E-09	1.647E-09	4.810E-10	2.297E-10	1.353E-10	5.504E-11	3.329E-11	1.837E-11	9.276E-12	5.760E-12
NNE	1.401E-08	3.379E-09	9.844E-10	4.665E-10	2.732E-10	1.086E-10	3.321E-11	1.495E-11	9.662E-12	8.061E-12
NE	1.415E-08	3.753E-09	1.152E-09	5.545E-10	3.262E-10	1.294E-10	3.874E-11	1.696E-11	1.035E-11	7.452E-12
ENE	8.927E-09	2.425E-09	7.691E-10	3.782E-10	2.247E-10	9.036E-11	2.782E-11	1.251E-11	7.808E-12	5.651E-12
E	7.637E-09	2.019E-09	6.284E-10	3.082E-10	1.833E-10	7.411E-11	2.309E-11	1.054E-11	6.586E-12	4.648E-12
ESE	8.150E-09	2.102E-09	6.420E-10	3.129E-10	1.857E-10	7.515E-11	2.352E-11	1.088E-11	7.021E-12	5.140E-12
SE	6.940E-09	1.800E-09	5.550E-10	2.717E-10	1.616E-10	6.545E-11	2.053E-11	9.466E-12	6.005E-12	4.364E-12
SSE	6.644E-09	1.752E-09	5.454E-10	2.668E-10	1.583E-10	6.397E-11	2.008E-11	1.440E-11	1.155E-11	6.887E-12
S	5.350E-09	1.419E-09	4.380E-10	2.121E-10	1.252E-10	4.992E-11	1.515E-11	7.259E-12	7.218E-12	6.046E-12
SSW	4.379E-09	1.208E-09	3.833E-10	1.878E-10	1.113E-10	4.449E-11	1.351E-11	6.086E-12	4.470E-12	4.346E-12
SW	6.472E-09	1.795E-09	5.618E-10	2.723E-10	1.607E-10	6.403E-11	1.917E-11	8.397E-12	5.964E-12	4.904E-12
WSW	7.053E-09	1.824E-09	5.486E-10	2.621E-10	1.548E-10	6.188E-11	2.034E-11	1.149E-11	6.977E-12	4.392E-12
W	8.344E-09	2.085E-09	6.081E-10	2.863E-10	1.671E-10	6.774E-11	2.769E-11	1.355E-11	7.425E-12	4.607E-12
WNW	9.300E-09	2.312E-09	6.698E-10	3.163E-10	1.851E-10	7.911E-11	3.486E-11	1.641E-11	8.924E-12	5.530E-12
NW	8.880E-09	2.184E-09	6.264E-10	2.957E-10	1.733E-10	7.084E-11	3.234E-11	1.632E-11	8.554E-12	5.300E-12
NNW	7.066E-09	1.652E-09	4.718E-10	2.242E-10	1.329E-10	5.614E-11	2.957E-11	1.474E-11	7.800E-12	4.843E-12

Table 2.3-336 Annual Average χ/Q Values (No Decay, Undepleted) for Mixed-Mode Release from the Turbine Building Stack (Sheet 1 of 3)

[EF3 COL 2.0-11-A]

Annual Average χ/Q (sec/m^3)

	Distance in Miles from the Site										
Sector	**0.25**	**0.5**	**0.75**	**1**	**1.5**	**2**	**2.5**	**3**	**3.5**	**4**	**4.5**
N	2.181E-06	7.420E-07	4.171E-07	2.323E-07	1.151E-07	7.346E-08	5.261E-08	4.028E-08	3.224E-08	2.664E-08	2.267E-08
NNE	4.422E-06	1.508E-06	8.504E-07	4.635E-07	2.193E-07	1.357E-07	9.519E-08	7.183E-08	5.804E-08	4.850E-08	4.096E-08
NE	3.110E-06	1.134E-06	6.726E-07	3.879E-07	2.001E-07	1.299E-07	9.351E-08	7.161E-08	5.720E-08	4.714E-08	3.978E-08
ENE	2.042E-06	7.337E-07	4.306E-07	2.553E-07	1.436E-07	9.960E-08	7.510E-08	5.947E-08	4.872E-08	4.094E-08	3.510E-08
E	1.442E-06	5.426E-07	3.192E-07	1.880E-07	1.052E-07	7.297E-08	5.525E-08	4.397E-08	3.620E-08	3.057E-08	2.633E-08
ESE	1.870E-06	6.580E-07	3.707E-07	2.113E-07	1.132E-07	7.711E-08	5.792E-08	4.597E-08	3.785E-08	3.200E-08	2.762E-08
SE	1.564E-06	5.521E-07	3.121E-07	1.797E-07	9.864E-08	6.803E-08	5.134E-08	4.077E-08	3.352E-08	2.827E-08	2.432E-08
SSE	1.629E-06	5.764E-07	3.336E-07	1.928E-07	1.024E-07	6.829E-08	5.016E-08	3.900E-08	3.153E-08	2.623E-08	2.232E-08
S	1.573E-06	5.571E-07	3.247E-07	1.841E-07	9.270E-08	5.992E-08	4.328E-08	3.333E-08	2.679E-08	2.220E-08	1.884E-08
SSW	1.104E-06	4.051E-07	2.451E-07	1.456E-07	7.866E-08	5.255E-08	3.847E-08	2.975E-08	2.390E-08	1.976E-08	1.670E-08
SW	1.318E-06	4.872E-07	2.977E-07	1.813E-07	9.805E-08	6.392E-08	4.564E-08	3.455E-08	2.726E-08	2.220E-08	1.853E-08
WSW	1.323E-06	4.817E-07	2.832E-07	1.662E-07	8.516E-08	5.372E-08	3.757E-08	2.805E-08	2.193E-08	1.773E-08	1.488E-08
W	1.817E-06	6.197E-07	3.540E-07	2.008E-07	9.768E-08	6.007E-08	4.147E-08	3.074E-08	2.394E-08	1.932E-08	1.602E-08
WNW	2.105E-06	6.935E-07	3.838E-07	2.173E-07	1.078E-07	6.733E-08	4.700E-08	3.514E-08	2.754E-08	2.235E-08	1.863E-08
NW	2.048E-06	6.823E-07	3.660E-07	2.013E-07	9.813E-08	6.110E-08	4.269E-08	3.199E-08	2.515E-08	2.048E-08	1.719E-08
NNW	2.002E-06	6.562E-07	3.513E-07	1.905E-07	9.135E-08	5.698E-08	4.013E-08	3.036E-08	2.409E-08	1.978E-08	1.683E-08

Table 2.3-336 Annual Average χ/Q Values (No Decay, Undepleted) for Mixed-Mode Release from the Turbine Building Stack (Sheet 2 of 3) [EF3 COL 2.0-11-A]

Annual Average χ/Q (sec/m^3)											
	Distance in Miles from the Site										
Sector	**5**	**7.5**	**10**	**15**	**20**	**25**	**30**	**35**	**40**	**45**	**50**
N	1.968E-08	1.239E-08	9.153E-09	6.258E-09	4.770E-09	3.832E-09	3.156E-09	2.628E-09	2.212E-09	1.898E-09	1.655E-09
NNE	3.531E-08	2.063E-08	1.444E-08	9.098E-09	6.541E-09	5.057E-09	4.096E-09	3.428E-09	2.938E-09	2.565E-09	2.272E-09
NE	3.424E-08	2.018E-08	1.416E-08	8.933E-09	6.428E-09	4.974E-09	4.034E-09	3.381E-09	2.904E-09	2.540E-09	2.255E-09
ENE	3.061E-08	1.888E-08	1.360E-08	8.877E-09	6.532E-09	5.146E-09	4.238E-09	3.601E-09	3.131E-09	2.771E-09	2.488E-09
E	2.306E-08	1.429E-08	1.031E-08	6.730E-09	4.938E-09	3.869E-09	3.164E-09	2.667E-09	2.298E-09	2.015E-09	1.791E-09
ESE	2.425E-08	1.530E-08	1.123E-08	7.539E-09	5.662E-09	4.529E-09	3.772E-09	3.234E-09	2.831E-09	2.519E-09	2.270E-09
SE	2.128E-08	1.325E-08	9.606E-09	6.321E-09	4.678E-09	3.700E-09	3.056E-09	2.603E-09	2.267E-09	2.010E-09	1.806E-09
SSE	1.934E-08	1.201E-08	8.768E-09	5.931E-09	4.552E-09	3.746E-09	3.216E-09	2.836E-09	2.542E-09	2.300E-09	2.092E-09
S	1.629E-08	9.906E-09	7.108E-09	4.640E-09	3.432E-09	2.722E-09	2.257E-09	1.931E-09	1.689E-09	1.503E-09	1.353E-09
SSW	1.438E-08	8.497E-09	5.942E-09	3.718E-09	2.657E-09	2.045E-09	1.651E-09	1.379E-09	1.181E-09	1.031E-09	9.131E-10
SW	1.578E-08	8.905E-09	6.043E-09	3.631E-09	2.521E-09	1.897E-09	1.504E-09	1.236E-09	1.043E-09	8.979E-10	7.857E-10
WSW	1.275E-08	7.155E-09	4.855E-09	2.930E-09	2.045E-09	1.546E-09	1.230E-09	1.013E-09	8.561E-10	7.374E-10	6.445E-10
W	1.359E-08	7.876E-09	5.494E-09	3.468E-09	2.497E-09	1.916E-09	1.518E-09	1.236E-09	1.034E-09	8.845E-10	7.692E-10
WNW	1.586E-08	9.499E-09	6.827E-09	4.563E-09	3.426E-09	2.668E-09	2.110E-09	1.725E-09	1.450E-09	1.244E-09	1.086E-09
NW	1.475E-08	8.826E-09	6.345E-09	4.247E-09	3.235E-09	2.617E-09	2.175E-09	1.827E-09	1.548E-09	1.334E-09	1.167E-09
NNW	1.462E-08	9.238E-09	6.909E-09	4.854E-09	3.763E-09	3.016E-09	2.434E-09	2.000E-09	1.685E-09	1.450E-09	1.268E-09

Table 2.3-336 Annual Average X/Q Values (No Decay, Undepleted) for Mixed-Mode Release from the Turbine Building Stack (Sheet 3 of 3)

[EF3 COL 2.0-11-A]

X/Q (sec/m^3) for Each Segment

Sector	Segment Boundaries in Miles from the Site									
	0.5-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50
N	4.072E-07	1.226E-07	5.324E-08	3.240E-08	2.274E-08	1.257E-08	6.240E-09	3.812E-09	2.620E-09	1.901E-09
NNE	8.247E-07	2.364E-07	9.665E-08	5.835E-08	4.110E-08	2.114E-08	9.148E-09	5.069E-09	3.432E-09	2.567E-09
NE	6.486E-07	2.106E-07	9.445E-08	5.748E-08	3.991E-08	2.063E-08	8.981E-09	4.986E-09	3.386E-09	2.542E-09
ENE	4.200E-07	1.488E-07	7.538E-08	4.883E-08	3.517E-08	1.914E-08	8.885E-09	5.153E-09	3.604E-09	2.773E-09
E	3.105E-07	1.093E-07	5.547E-08	3.628E-08	2.637E-08	1.447E-08	6.730E-09	3.872E-09	2.668E-09	2.016E-09
ESE	3.637E-07	1.190E-07	5.826E-08	3.794E-08	2.767E-08	1.548E-08	7.525E-09	4.528E-09	3.234E-09	2.519E-09
SE	3.066E-07	1.030E-07	5.156E-08	3.359E-08	2.436E-08	1.341E-08	6.320E-09	3.703E-09	2.605E-09	2.011E-09
SSE	3.250E-07	1.073E-07	5.053E-08	3.164E-08	2.238E-08	1.220E-08	5.948E-09	3.749E-09	2.833E-09	2.295E-09
S	3.139E-07	9.845E-08	4.374E-08	2.691E-08	1.889E-08	1.008E-08	4.652E-09	2.725E-09	1.932E-09	1.503E-09
SSW	2.364E-07	8.194E-08	3.873E-08	2.399E-08	1.675E-08	8.669E-09	3.740E-09	2.051E-09	1.382E-09	1.032E-09
SW	2.881E-07	1.014E-07	4.608E-08	2.742E-08	1.860E-08	9.159E-09	3.674E-09	1.906E-09	1.239E-09	8.993E-10
WSW	2.753E-07	8.920E-08	3.807E-08	2.208E-08	1.494E-08	7.376E-09	2.965E-09	1.553E-09	1.015E-09	7.382E-10
W	3.450E-07	1.039E-07	4.214E-08	2.412E-08	1.610E-08	8.087E-09	3.487E-09	1.912E-09	1.240E-09	8.862E-10
WNW	3.787E-07	1.141E-07	4.768E-08	2.774E-08	1.871E-08	9.725E-09	4.561E-09	2.647E-09	1.730E-09	1.247E-09
NW	3.631E-07	1.046E-07	4.332E-08	2.533E-08	1.726E-08	9.039E-09	4.264E-09	2.605E-09	1.820E-09	1.335E-09
NNW	3.476E-07	9.810E-08	4.071E-08	2.424E-08	1.689E-08	9.400E-09	4.826E-09	2.982E-09	2.004E-09	1.452E-09

Table 2.3-337 Annual Average X/Q Values (2.26 Day Decay, Undepleted) for Mixed-Mode Release from the Turbine Building Stack (Sheet 1 of 3)

[EF3 COL 2.0-11-A]

Annual Average X/Q (sec/m^3)

	Distance in Miles from the Site										
Sector	**0.25**	**0.5**	**0.75**	**1**	**1.5**	**2**	**2.5**	**3**	**3.5**	**4**	**4.5**
N	2.180E-06	7.412E-07	4.165E-07	2.319E-07	1.147E-07	7.318E-08	5.235E-08	4.003E-08	3.201E-08	2.642E-08	2.246E-08
NNE	4.420E-06	1.507E-06	8.493E-07	4.627E-07	2.187E-07	1.352E-07	9.477E-08	7.145E-08	5.768E-08	4.816E-08	4.062E-08
NE	3.108E-06	1.133E-06	6.716E-07	3.872E-07	1.996E-07	1.295E-07	9.311E-08	7.124E-08	5.685E-08	4.680E-08	3.946E-08
ENE	2.041E-06	7.328E-07	4.299E-07	2.547E-07	1.431E-07	9.919E-08	7.472E-08	5.910E-08	4.836E-08	4.059E-08	3.477E-08
E	1.442E-06	5.419E-07	3.186E-07	1.876E-07	1.048E-07	7.266E-08	5.495E-08	4.368E-08	3.592E-08	3.029E-08	2.605E-08
ESE	1.869E-06	6.572E-07	3.701E-07	2.109E-07	1.129E-07	7.678E-08	5.761E-08	4.567E-08	3.756E-08	3.172E-08	2.734E-08
SE	1.563E-06	5.514E-07	3.116E-07	1.793E-07	9.833E-08	6.774E-08	5.107E-08	4.051E-08	3.327E-08	2.802E-08	2.408E-08
SSE	1.628E-06	5.758E-07	3.331E-07	1.924E-07	1.021E-07	6.803E-08	4.991E-08	3.877E-08	3.131E-08	2.602E-08	2.211E-08
S	1.572E-06	5.565E-07	3.242E-07	1.838E-07	9.244E-08	5.970E-08	4.307E-08	3.314E-08	2.661E-08	2.203E-08	1.867E-08
SSW	1.104E-06	4.047E-07	2.447E-07	1.454E-07	7.844E-08	5.236E-08	3.829E-08	2.958E-08	2.375E-08	1.961E-08	1.656E-08
SW	1.317E-06	4.867E-07	2.973E-07	1.810E-07	9.780E-08	6.371E-08	4.545E-08	3.437E-08	2.710E-08	2.204E-08	1.838E-08
WSW	1.323E-06	4.813E-07	2.828E-07	1.659E-07	8.496E-08	5.355E-08	3.742E-08	2.792E-08	2.180E-08	1.761E-08	1.477E-08
W	1.817E-06	6.192E-07	3.536E-07	2.005E-07	9.746E-08	5.989E-08	4.131E-08	3.060E-08	2.380E-08	1.919E-08	1.590E-08
WNW	2.104E-06	6.929E-07	3.834E-07	2.170E-07	1.075E-07	6.711E-08	4.681E-08	3.497E-08	2.739E-08	2.221E-08	1.849E-08
NW	2.047E-06	6.816E-07	3.654E-07	2.009E-07	9.785E-08	6.087E-08	4.249E-08	3.181E-08	2.498E-08	2.032E-08	1.704E-08
NNW	2.001E-06	6.555E-07	3.508E-07	1.901E-07	9.109E-08	5.677E-08	3.994E-08	3.019E-08	2.393E-08	1.964E-08	1.669E-08

Table 2.3-337 Annual Average X/Q Values (2.26 Day Decay, Undepleted) for Mixed-Mode Release from the Turbine Building Stack (Sheet 2 of 3)

[EF3 COL 2.0-11-A]

Annual Average X/Q (sec/m^3)

	Distance in Miles from the Site										
Sector	**5**	**7.5**	**10**	**15**	**20**	**25**	**30**	**35**	**40**	**45**	**50**
N	1.947E-08	1.218E-08	8.947E-09	6.039E-09	4.544E-09	3.603E-09	2.930E-09	2.409E-09	2.003E-09	1.698E-09	1.463E-09
NNE	3.498E-08	2.034E-08	1.416E-08	8.828E-09	6.279E-09	4.802E-09	3.848E-09	3.186E-09	2.703E-09	2.335E-09	2.048E-09
NE	3.393E-08	1.990E-08	1.389E-08	8.667E-09	6.167E-09	4.718E-09	3.784E-09	3.135E-09	2.662E-09	2.303E-09	2.022E-09
ENE	3.028E-08	1.857E-08	1.330E-08	8.566E-09	6.224E-09	4.840E-09	3.935E-09	3.300E-09	2.833E-09	2.475E-09	2.193E-09
E	2.279E-08	1.403E-08	1.006E-08	6.474E-09	4.684E-09	3.619E-09	2.919E-09	2.427E-09	2.063E-09	1.784E-09	1.564E-09
ESE	2.397E-08	1.503E-08	1.096E-08	7.267E-09	5.388E-09	4.254E-09	3.498E-09	2.961E-09	2.559E-09	2.248E-09	2.001E-09
SE	2.104E-08	1.302E-08	9.385E-09	6.100E-09	4.458E-09	3.483E-09	2.841E-09	2.390E-09	2.056E-09	1.800E-09	1.597E-09
SSE	1.915E-08	1.182E-08	8.580E-09	5.734E-09	4.348E-09	3.534E-09	2.997E-09	2.611E-09	2.312E-09	2.067E-09	1.857E-09
S	1.613E-08	9.755E-09	6.962E-09	4.496E-09	3.289E-09	2.580E-09	2.117E-09	1.792E-09	1.551E-09	1.365E-09	1.217E-09
SSW	1.425E-08	8.379E-09	5.831E-09	3.613E-09	2.556E-09	1.948E-09	1.558E-09	1.288E-09	1.092E-09	9.437E-10	8.275E-10
SW	1.563E-08	8.780E-09	5.927E-09	3.523E-09	2.420E-09	1.801E-09	1.412E-09	1.147E-09	9.574E-10	8.155E-10	7.060E-10
WSW	1.264E-08	7.058E-09	4.765E-09	2.845E-09	1.964E-09	1.468E-09	1.155E-09	9.411E-10	7.866E-10	6.702E-10	5.797E-10
W	1.347E-08	7.774E-09	5.396E-09	3.372E-09	2.405E-09	1.827E-09	1.434E-09	1.156E-09	9.589E-10	8.125E-10	7.003E-10
WNW	1.573E-08	9.382E-09	6.713E-09	4.444E-09	3.305E-09	2.548E-09	1.996E-09	1.617E-09	1.346E-09	1.145E-09	9.903E-10
NW	1.460E-08	8.693E-09	6.214E-09	4.111E-09	3.095E-09	2.475E-09	2.033E-09	1.689E-09	1.414E-09	1.205E-09	1.044E-09
NNW	1.449E-08	9.105E-09	6.773E-09	4.705E-09	3.604E-09	2.852E-09	2.272E-09	1.845E-09	1.538E-09	1.308E-09	1.132E-09

Table 2.3-337 Annual Average X/Q Values (2.26 Day Decay, Undepleted) for Mixed-Mode Release from the Turbine Building Stack (Sheet 3 of 3)

[EF3 COL 2.0-11-A]

X/Q (sec/m^3) for Each Segment

	Segment Boundaries in Miles from the Site									
Sector	**0.5-1**	**1-2**	**2-3**	**3-4**	**4-5**	**5-10**	**10-20**	**20-30**	**30-40**	**40-50**
N	4.066E-07	1.223E-07	5.298E-08	3.217E-08	2.253E-08	1.236E-08	6.021E-09	3.585E-09	2.403E-09	1.701E-09
NNE	8.236E-07	2.358E-07	9.623E-08	5.799E-08	4.077E-08	2.085E-08	8.879E-09	4.814E-09	3.191E-09	2.338E-09
NE	6.477E-07	2.101E-07	9.405E-08	5.713E-08	3.959E-08	2.035E-08	8.716E-09	4.731E-09	3.140E-09	2.305E-09
ENE	4.193E-07	1.484E-07	7.500E-08	4.847E-08	3.483E-08	1.883E-08	8.576E-09	4.847E-09	3.303E-09	2.477E-09
E	3.100E-07	1.089E-07	5.517E-08	3.599E-08	2.610E-08	1.421E-08	6.475E-09	3.623E-09	2.429E-09	1.785E-09
ESE	3.631E-07	1.186E-07	5.795E-08	3.765E-08	2.739E-08	1.521E-08	7.254E-09	4.254E-09	2.961E-09	2.249E-09
SE	3.061E-07	1.027E-07	5.129E-08	3.334E-08	2.412E-08	1.319E-08	6.100E-09	3.486E-09	2.391E-09	1.800E-09
SSE	3.245E-07	1.070E-07	5.028E-08	3.142E-08	2.217E-08	1.201E-08	5.750E-09	3.536E-09	2.607E-09	2.062E-09
S	3.134E-07	9.818E-08	4.353E-08	2.673E-08	1.872E-08	9.930E-09	4.507E-09	2.584E-09	1.793E-09	1.366E-09
SSW	2.361E-07	8.172E-08	3.856E-08	2.384E-08	1.661E-08	8.551E-09	3.636E-09	1.954E-09	1.291E-09	9.447E-10
SW	2.877E-07	1.011E-07	4.589E-08	2.725E-08	1.845E-08	9.035E-09	3.567E-09	1.810E-09	1.150E-09	8.170E-10
WSW	2.750E-07	8.900E-08	3.792E-08	2.195E-08	1.482E-08	7.280E-09	2.880E-09	1.475E-09	9.434E-10	6.712E-10
W	3.446E-07	1.037E-07	4.198E-08	2.399E-08	1.598E-08	7.984E-09	3.392E-09	1.824E-09	1.160E-09	8.143E-10
WNW	3.782E-07	1.139E-07	4.749E-08	2.758E-08	1.857E-08	9.607E-09	4.442E-09	2.529E-09	1.622E-09	1.147E-09
NW	3.626E-07	1.043E-07	4.312E-08	2.516E-08	1.711E-08	8.905E-09	4.127E-09	2.464E-09	1.683E-09	1.207E-09
NNW	3.471E-07	9.783E-08	4.053E-08	2.408E-08	1.675E-08	9.265E-09	4.675E-09	2.820E-09	1.850E-09	1.311E-09

Table 2.3-338 Annual Average X/Q Values (8.0 Day Decay, Depleted) for Mixed-Mode Release from the Turbine Building Stack (Sheet 1 of 3)

[EF3 COL 2.0-11-A]

Annual Average X/Q (sec/m^3)

	Distance in Miles from the Site										
Sector	**0.25**	**0.5**	**0.75**	**1**	**1.5**	**2**	**2.5**	**3**	**3.5**	**4**	**4.5**
N	2.081E-06	6.882E-07	3.794E-07	2.099E-07	1.037E-07	6.613E-08	4.729E-08	3.614E-08	2.886E-08	2.379E-08	2.021E-08
NNE	4.208E-06	1.393E-06	7.701E-07	4.161E-07	1.955E-07	1.206E-07	8.430E-08	6.342E-08	5.120E-08	4.275E-08	3.601E-08
NE	2.961E-06	1.050E-06	6.141E-07	3.535E-07	1.828E-07	1.186E-07	8.521E-08	6.506E-08	5.180E-08	4.254E-08	3.578E-08
ENE	1.952E-06	6.836E-07	3.953E-07	2.343E-07	1.327E-07	9.230E-08	6.959E-08	5.501E-08	4.497E-08	3.770E-08	3.224E-08
E	1.383E-06	5.096E-07	2.955E-07	1.738E-07	9.762E-08	6.789E-08	5.138E-08	4.083E-08	3.354E-08	2.825E-08	2.427E-08
ESE	1.792E-06	6.158E-07	3.413E-07	1.938E-07	1.041E-07	7.101E-08	5.334E-08	4.230E-08	3.477E-08	2.934E-08	2.528E-08
SE	1.499E-06	5.170E-07	2.874E-07	1.649E-07	9.094E-08	6.288E-08	4.747E-08	3.765E-08	3.090E-08	2.600E-08	2.232E-08
SSE	1.555E-06	5.367E-07	3.059E-07	1.763E-07	9.388E-08	6.263E-08	4.593E-08	3.561E-08	2.870E-08	2.380E-08	2.018E-08
S	1.495E-06	5.155E-07	2.958E-07	1.670E-07	8.398E-08	5.425E-08	3.911E-08	3.004E-08	2.407E-08	1.989E-08	1.682E-08
SSW	1.052E-06	3.756E-07	2.242E-07	1.332E-07	7.228E-08	4.835E-08	3.534E-08	2.725E-08	2.182E-08	1.797E-08	1.514E-08
SW	1.258E-06	4.527E-07	2.733E-07	1.670E-07	9.064E-08	5.901E-08	4.196E-08	3.160E-08	2.480E-08	2.009E-08	1.667E-08
WSW	1.266E-06	4.487E-07	2.600E-07	1.526E-07	7.816E-08	4.913E-08	3.419E-08	2.538E-08	1.972E-08	1.586E-08	1.325E-08
W	1.735E-06	5.743E-07	3.226E-07	1.822E-07	8.814E-08	5.389E-08	3.696E-08	2.723E-08	2.107E-08	1.690E-08	1.394E-08
WNW	2.017E-06	6.464E-07	3.512E-07	1.980E-07	9.781E-08	6.083E-08	4.223E-08	3.139E-08	2.447E-08	1.975E-08	1.637E-08
NW	1.966E-06	6.393E-07	3.364E-07	1.837E-07	8.905E-08	5.515E-08	3.831E-08	2.855E-08	2.232E-08	1.808E-08	1.510E-08
NNW	1.916E-06	6.115E-07	3.206E-07	1.723E-07	8.208E-08	5.098E-08	3.576E-08	2.695E-08	2.131E-08	1.743E-08	1.480E-08

Table 2.3-338 Annual Average X/Q Values (8.0 Day Decay, Depleted) for Mixed-Mode Release from the Turbine Building Stack (Sheet 2 of 3)

[EF3 COL 2.0-11-A]

	Annual Average X/Q (sec/m^3)										
	Distance in Miles from the Site										
Sector	5	7.5	10	15	20	25	30	35	40	45	50
N	1.751E-08	1.098E-08	8.087E-09	5.494E-09	4.127E-09	3.175E-09	2.501E-09	2.012E-09	1.643E-09	1.371E-09	1.164E-09
NNE	3.096E-08	1.788E-08	1.238E-08	7.661E-09	5.426E-09	4.141E-09	3.316E-09	2.745E-09	2.320E-09	2.001E-09	1.749E-09
NE	3.069E-08	1.787E-08	1.240E-08	7.686E-09	5.453E-09	4.170E-09	3.348E-09	2.780E-09	2.359E-09	2.041E-09	1.791E-09
ENE	2.804E-08	1.712E-08	1.223E-08	7.874E-09	5.732E-09	4.475E-09	3.657E-09	3.085E-09	2.656E-09	2.330E-09	2.070E-09
E	2.120E-08	1.300E-08	9.298E-09	5.974E-09	4.327E-09	3.352E-09	2.714E-09	2.266E-09	1.935E-09	1.683E-09	1.483E-09
ESE	2.214E-08	1.386E-08	1.011E-08	6.709E-09	4.993E-09	3.962E-09	3.277E-09	2.791E-09	2.429E-09	2.150E-09	1.926E-09
SE	1.948E-08	1.202E-08	8.643E-09	5.612E-09	4.109E-09	3.221E-09	2.640E-09	2.232E-09	1.930E-09	1.699E-09	1.513E-09
SSE	1.744E-08	1.072E-08	7.765E-09	5.200E-09	3.969E-09	3.257E-09	2.792E-09	2.448E-09	2.147E-09	1.892E-09	1.675E-09
S	1.450E-08	8.725E-09	6.203E-09	3.995E-09	2.925E-09	2.302E-09	1.898E-09	1.615E-09	1.401E-09	1.236E-09	1.100E-09
SSW	1.299E-08	7.566E-09	5.227E-09	3.209E-09	2.259E-09	1.718E-09	1.373E-09	1.136E-09	9.613E-10	8.305E-10	7.271E-10
SW	1.412E-08	7.805E-09	5.201E-09	3.034E-09	2.056E-09	1.516E-09	1.181E-09	9.538E-10	7.905E-10	6.696E-10	5.761E-10
WSW	1.130E-08	6.202E-09	4.130E-09	2.418E-09	1.648E-09	1.220E-09	9.501E-10	7.608E-10	6.228E-10	5.200E-10	4.410E-10
W	1.175E-08	6.700E-09	4.608E-09	2.844E-09	1.966E-09	1.439E-09	1.097E-09	8.621E-10	6.987E-10	5.798E-10	4.903E-10
WNW	1.387E-08	8.200E-09	5.833E-09	3.826E-09	2.731E-09	2.032E-09	1.549E-09	1.224E-09	9.966E-10	8.307E-10	7.053E-10
NW	1.290E-08	7.611E-09	5.406E-09	3.563E-09	2.660E-09	2.064E-09	1.644E-09	1.334E-09	1.094E-09	9.154E-10	7.793E-10
NNW	1.283E-08	8.071E-09	6.013E-09	4.195E-09	3.115E-09	2.373E-09	1.844E-09	1.465E-09	1.196E-09	9.996E-10	8.503E-10

Table 2.3-338 Annual Average Χ/Q Values (8.0 Day Decay, Depleted) for Mixed-Mode Release from the Turbine Building Stack (Sheet 3 of 3)

[EF3 COL 2.0-11-A]

Χ/Q (sec/m^3) for Each Segment

	Segment Boundaries in Miles from the Site									
Sector	**0.5-1**	**1-2**	**2-3**	**3-4**	**4-5**	**5-10**	**10-20**	**20-30**	**30-40**	**40-50**
N	3.727E-07	1.106E-07	4.785E-08	2.901E-08	2.027E-08	1.115E-08	5.463E-09	3.159E-09	2.011E-09	1.375E-09
NNE	7.513E-07	2.112E-07	8.562E-08	5.147E-08	3.614E-08	1.834E-08	7.716E-09	4.154E-09	2.746E-09	2.002E-09
NE	5.953E-07	1.922E-07	8.606E-08	5.206E-08	3.590E-08	1.828E-08	7.740E-09	4.183E-09	2.782E-09	2.043E-09
ENE	3.878E-07	1.373E-07	6.981E-08	4.507E-08	3.230E-08	1.738E-08	7.891E-09	4.483E-09	3.085E-09	2.330E-09
E	2.890E-07	1.013E-07	5.156E-08	3.361E-08	2.431E-08	1.318E-08	5.981E-09	3.357E-09	2.268E-09	1.684E-09
ESE	3.367E-07	1.093E-07	5.364E-08	3.485E-08	2.532E-08	1.403E-08	6.702E-09	3.963E-09	2.792E-09	2.149E-09
SE	2.840E-07	9.491E-08	4.765E-08	3.096E-08	2.236E-08	1.218E-08	5.617E-09	3.225E-09	2.233E-09	1.699E-09
SSE	2.996E-07	9.830E-08	4.626E-08	2.881E-08	2.024E-08	1.090E-08	5.223E-09	3.261E-09	2.432E-09	1.887E-09
S	2.874E-07	8.922E-08	3.952E-08	2.418E-08	1.687E-08	8.888E-09	4.010E-09	2.307E-09	1.614E-09	1.234E-09
SSW	2.174E-07	7.519E-08	3.557E-08	2.190E-08	1.518E-08	7.731E-09	3.235E-09	1.724E-09	1.137E-09	8.310E-10
SW	2.659E-07	9.354E-08	4.236E-08	2.495E-08	1.674E-08	8.051E-09	3.081E-09	1.526E-09	9.565E-10	6.708E-10
WSW	2.542E-07	8.179E-08	3.465E-08	1.987E-08	1.330E-08	6.413E-09	2.456E-09	1.226E-09	7.623E-10	5.212E-10
W	3.161E-07	9.381E-08	3.758E-08	2.124E-08	1.401E-08	6.893E-09	2.846E-09	1.443E-09	8.668E-10	5.819E-10
WNW	3.487E-07	1.036E-07	4.286E-08	2.465E-08	1.645E-08	8.408E-09	3.785E-09	2.025E-09	1.230E-09	8.334E-10
NW	3.359E-07	9.502E-08	3.890E-08	2.248E-08	1.517E-08	7.806E-09	3.571E-09	2.055E-09	1.331E-09	9.180E-10
NNW	3.193E-07	8.831E-08	3.630E-08	2.144E-08	1.485E-08	8.213E-09	4.119E-09	2.359E-09	1.471E-09	1.003E-09

Table 2.3-339 Annual Average D/Q Values for Mixed-Mode Release from the Turbine Building Stack (Sheet 1 of 3)

[EF3 COL 2.0-11-A]

Relative Deposition per Unit Area (m^{-2}) at Fixed Points by Downwind Sectors

	Distances in Miles										
Sector	**0.25**	**0.50**	**0.75**	**1**	**1.5**	**2**	**2.5**	**3**	**3.5**	**4**	**4.5**
N	2.314E-08	1.122E-08	6.940E-09	3.651E-09	1.387E-09	7.372E-10	4.570E-10	3.115E-10	2.262E-10	1.718E-10	1.350E-10
NNE	5.031E-08	2.298E-08	1.382E-08	7.254E-09	2.776E-09	1.477E-09	9.164E-10	6.246E-10	4.532E-10	3.478E-10	2.728E-10
NE	4.297E-08	2.033E-08	1.279E-08	7.090E-09	2.899E-09	1.607E-09	1.023E-09	7.090E-10	5.196E-10	3.964E-10	3.118E-10
ENE	2.496E-08	1.315E-08	8.603E-09	4.843E-09	1.982E-09	1.107E-09	7.092E-10	4.936E-10	3.629E-10	2.777E-10	2.189E-10
E	2.071E-08	1.147E-08	7.499E-09	4.157E-09	1.658E-09	9.153E-10	5.820E-10	4.034E-10	2.961E-10	2.264E-10	1.786E-10
ESE	2.303E-08	1.263E-08	8.144E-09	4.444E-09	1.741E-09	9.499E-10	5.995E-10	4.137E-10	3.029E-10	2.313E-10	1.824E-10
SE	1.963E-08	1.083E-08	7.004E-09	3.836E-09	1.508E-09	8.253E-10	5.220E-10	3.606E-10	2.642E-10	2.018E-10	1.592E-10
SSE	1.920E-08	1.009E-08	6.506E-09	3.598E-09	1.442E-09	7.957E-10	5.058E-10	3.504E-10	2.570E-10	1.964E-10	1.548E-10
S	1.686E-08	8.051E-09	5.067E-09	2.798E-09	1.135E-09	6.278E-10	3.993E-10	2.765E-10	2.026E-10	1.546E-10	1.216E-10
SSW	1.316E-08	6.443E-09	4.160E-09	2.351E-09	9.760E-10	5.470E-10	3.508E-10	2.442E-10	1.795E-10	1.372E-10	1.080E-10
SW	1.725E-08	8.478E-09	5.696E-09	3.248E-09	1.363E-09	7.667E-10	4.927E-10	3.434E-10	2.525E-10	1.931E-10	1.521E-10
WSW	2.019E-08	1.033E-08	6.498E-09	3.546E-09	1.422E-09	7.750E-10	4.880E-10	3.358E-10	2.451E-10	1.867E-10	1.522E-10
W	2.785E-08	1.366E-08	8.194E-09	4.562E-09	1.782E-09	9.363E-10	5.739E-10	3.876E-10	2.795E-10	2.111E-10	1.652E-10
WNW	2.835E-08	1.480E-08	9.606E-09	5.006E-09	1.911E-09	1.006E-09	6.187E-10	4.194E-10	3.034E-10	2.300E-10	1.805E-10
NW	2.615E-08	1.417E-08	8.852E-09	4.744E-09	1.772E-09	9.294E-10	5.710E-10	3.872E-10	2.805E-10	2.129E-10	1.675E-10
NNW	2.258E-08	1.175E-08	7.219E-09	3.748E-09	1.385E-09	7.254E-10	4.455E-10	3.021E-10	2.189E-10	1.662E-10	1.326E-10

Table 2.3-339 Annual Average D/Q Values for Mixed-Mode Release from the Turbine Building Stack (Sheet 2 of 3)

[EF3 COL 2.0-11-A]

Relative Deposition per Unit Area (m^{-2}) at Fixed Points by Downwind Sectors

	Distances in Miles										
Sector	**5**	**7.5**	**10**	**15**	**20**	**25**	**30**	**35**	**40**	**45**	**50**
N	1.090E-10	5.266E-11	3.239E-11	1.737E-11	2.427E-11	2.053E-11	1.351E-11	9.541E-12	7.426E-12	5.936E-12	4.848E-12
NNE	2.197E-10	1.043E-10	6.361E-11	3.345E-11	2.139E-11	1.544E-11	1.194E-11	9.687E-12	8.120E-12	6.958E-12	6.095E-12
NE	2.513E-10	1.183E-10	7.318E-11	3.841E-11	2.434E-11	1.740E-11	1.324E-11	1.059E-11	8.756E-12	7.407E-12	6.401E-12
ENE	1.767E-10	8.391E-11	5.184E-11	2.753E-11	1.755E-11	1.274E-11	9.794E-12	7.956E-12	6.641E-12	5.700E-12	4.981E-12
E	1.443E-10	6.879E-11	4.256E-11	2.277E-11	1.453E-11	1.068E-11	8.220E-12	6.528E-12	5.310E-12	4.401E-12	3.703E-12
ESE	1.474E-10	7.026E-11	4.351E-11	2.334E-11	1.493E-11	1.101E-11	8.497E-12	6.767E-12	5.521E-12	4.572E-12	3.865E-12
SE	1.287E-10	6.135E-11	3.799E-11	2.039E-11	1.303E-11	9.594E-12	7.417E-12	5.989E-12	4.905E-12	4.284E-12	3.776E-12
SSE	1.250E-10	5.954E-11	3.689E-11	1.966E-11	1.264E-11	9.098E-12	7.207E-12	9.109E-12	9.610E-12	7.686E-12	6.242E-12
S	9.806E-11	4.663E-11	2.858E-11	1.510E-11	9.602E-12	6.883E-12	5.292E-12	4.267E-12	3.824E-12	3.584E-12	4.441E-12
SSW	8.711E-11	4.152E-11	2.560E-11	1.337E-11	8.481E-12	6.055E-12	4.632E-12	3.713E-12	3.089E-12	2.615E-12	2.369E-12
SW	1.226E-10	5.914E-11	3.592E-11	1.882E-11	1.185E-11	8.397E-12	6.361E-12	5.037E-12	4.136E-12	3.465E-12	3.046E-12
WSW	1.226E-10	5.785E-11	3.480E-11	1.810E-11	1.148E-11	8.187E-12	7.718E-12	7.168E-12	5.796E-12	4.697E-12	3.813E-12
W	1.329E-10	6.210E-11	3.764E-11	2.490E-11	2.010E-11	1.404E-11	9.906E-12	7.475E-12	5.814E-12	4.646E-12	3.794E-12
WNW	1.457E-10	6.989E-11	4.237E-11	3.565E-11	2.512E-11	1.624E-11	1.193E-11	8.965E-12	6.972E-12	5.577E-12	4.552E-12
NW	1.354E-10	6.496E-11	4.018E-11	2.164E-11	2.339E-11	1.767E-11	1.257E-11	8.770E-12	6.840E-12	5.439E-12	4.442E-12
NNW	1.071E-10	5.107E-11	3.151E-11	2.377E-11	2.411E-11	1.482E-11	1.045E-11	7.888E-12	6.138E-12	4.906E-12	4.002E-12

Table 2.3-339 Annual Average D/Q Values for Mixed-Mode Release from the Turbine Building Stack (Sheet 3 of 3)

[EF3 COL 2.0-11-A]

Relative Deposition per Unit Area (m^{-2}) at Fixed Points by Downwind Sectors

	Segment Boundaries in Miles									
Sector	**0.5-1**	**1-2**	**2-3**	**3-4**	**4-5**	**5-10**	**10-20**	**20-30**	**30-40**	**40-50**
N	6.429E-09	1.602E-09	4.735E-10	2.299E-10	1.363E-10	5.617E-11	2.378E-11	1.872E-11	9.870E-12	5.975E-12
NNE	1.294E-08	3.194E-09	9.492E-10	4.621E-10	2.754E-10	1.119E-10	3.479E-11	1.563E-11	9.734E-12	6.983E-12
NE	1.193E-08	3.256E-09	1.053E-09	5.268E-10	3.145E-10	1.278E-10	3.988E-11	1.759E-11	1.065E-11	7.434E-12
ENE	7.943E-09	2.229E-09	7.291E-10	3.678E-10	2.207E-10	9.029E-11	2.850E-11	1.284E-11	7.980E-12	5.713E-12
E	6.896E-09	1.883E-09	5.994E-10	3.002E-10	1.801E-10	7.392E-11	2.350E-11	1.072E-11	6.547E-12	4.412E-12
ESE	7.497E-09	1.990E-09	6.186E-10	3.073E-10	1.839E-10	7.552E-11	2.408E-11	1.105E-11	6.787E-12	4.591E-12
SE	6.445E-09	1.722E-09	5.383E-10	2.680E-10	1.605E-10	6.594E-11	2.103E-11	9.641E-12	5.984E-12	4.280E-12
SSE	6.009E-09	1.634E-09	5.210E-10	2.606E-10	1.561E-10	6.402E-11	2.037E-11	9.287E-12	8.756E-12	7.721E-12
S	4.722E-09	1.279E-09	4.111E-10	2.054E-10	1.227E-10	5.003E-11	1.565E-11	6.972E-12	4.391E-12	3.972E-12
SSW	3.863E-09	1.091E-09	3.605E-10	1.819E-10	1.089E-10	4.457E-11	1.392E-11	6.133E-12	3.738E-12	2.664E-12
SW	5.226E-09	1.517E-09	5.060E-10	2.558E-10	1.533E-10	6.292E-11	1.952E-11	8.504E-12	5.072E-12	3.508E-12
WSW	6.039E-09	1.606E-09	5.037E-10	2.488E-10	1.515E-10	6.200E-11	1.887E-11	8.876E-12	6.802E-12	4.695E-12
W	7.794E-09	2.024E-09	5.960E-10	2.843E-10	1.669E-10	6.697E-11	2.560E-11	1.400E-11	7.537E-12	4.676E-12
WNW	8.717E-09	2.197E-09	6.423E-10	3.086E-10	1.823E-10	7.450E-11	3.246E-11	1.689E-11	9.054E-12	5.611E-12
NW	8.208E-09	2.058E-09	5.930E-10	2.852E-10	1.691E-10	6.960E-11	2.654E-11	1.716E-11	9.122E-12	5.485E-12
NNW	6.683E-09	1.617E-09	4.628E-10	2.226E-10	1.331E-10	5.483E-11	2.564E-11	1.555E-11	7.954E-12	4.936E-12

Figure 2.3-201 Climatological Observing Stations near the Fermi Site [EF3 COL 2.0-7-A]

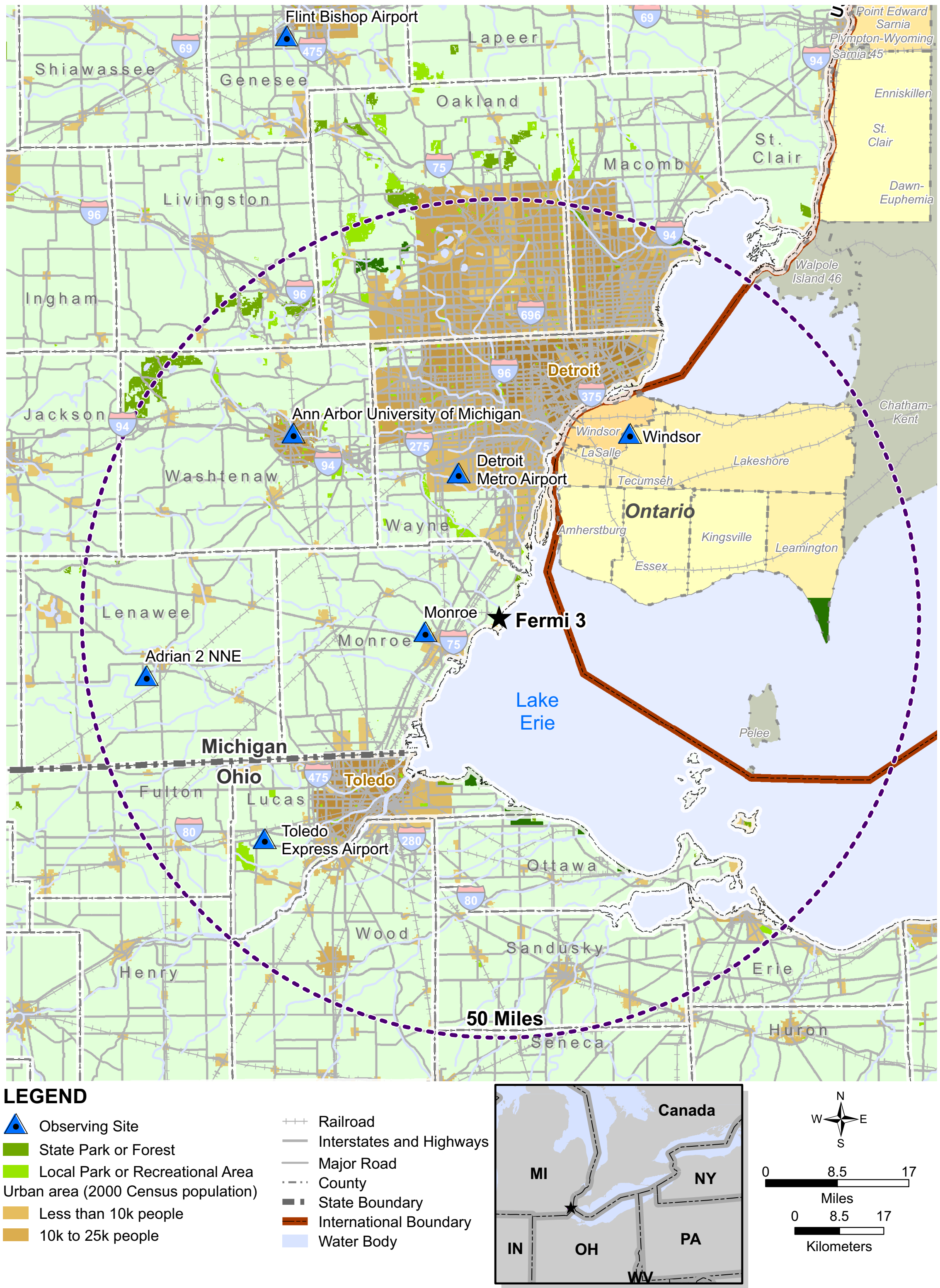
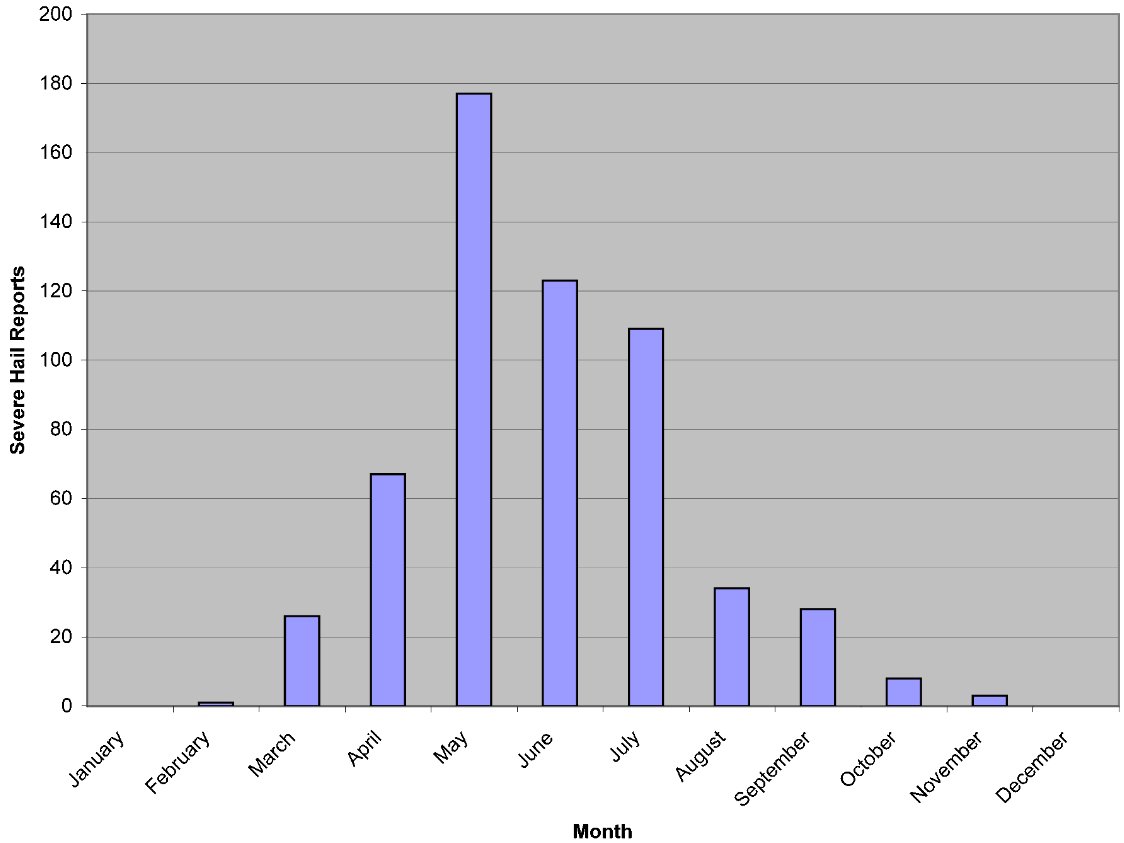
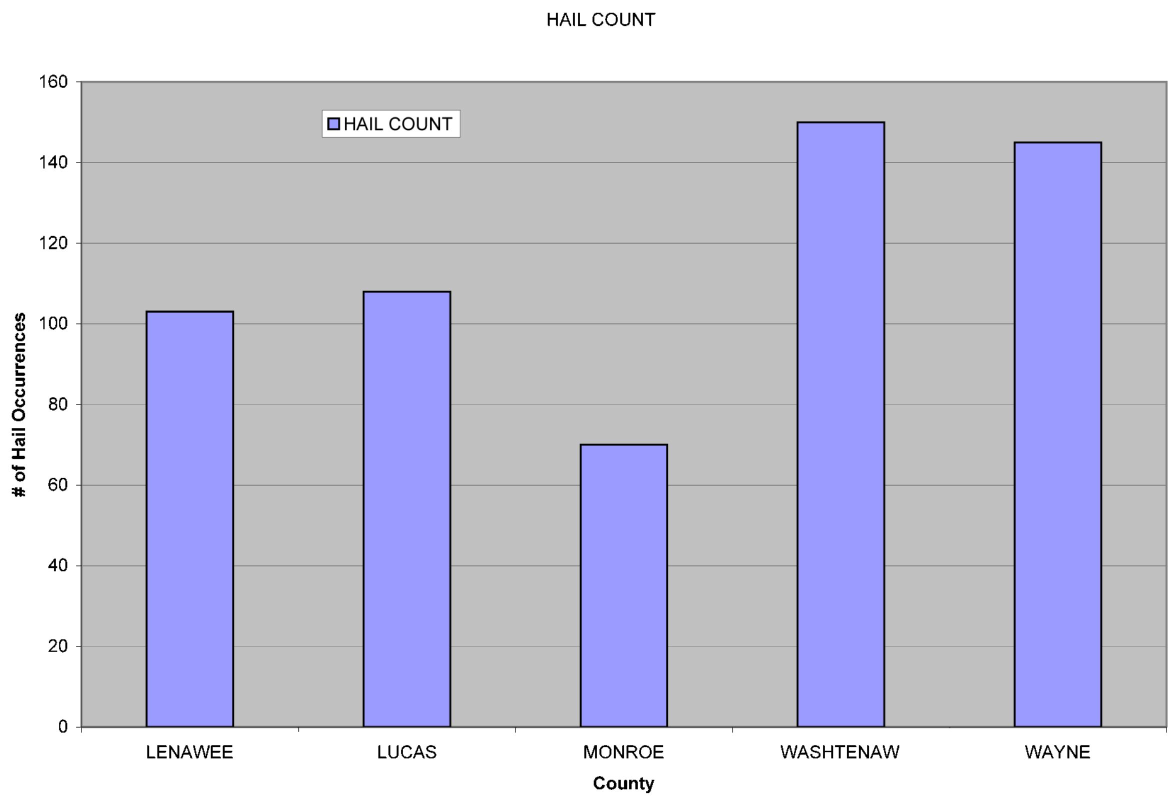


Figure 2.3-202 Total Reports of Severe Hail for the Five-County Area (1955-2007) [EF3 COL 2.0-7-A]



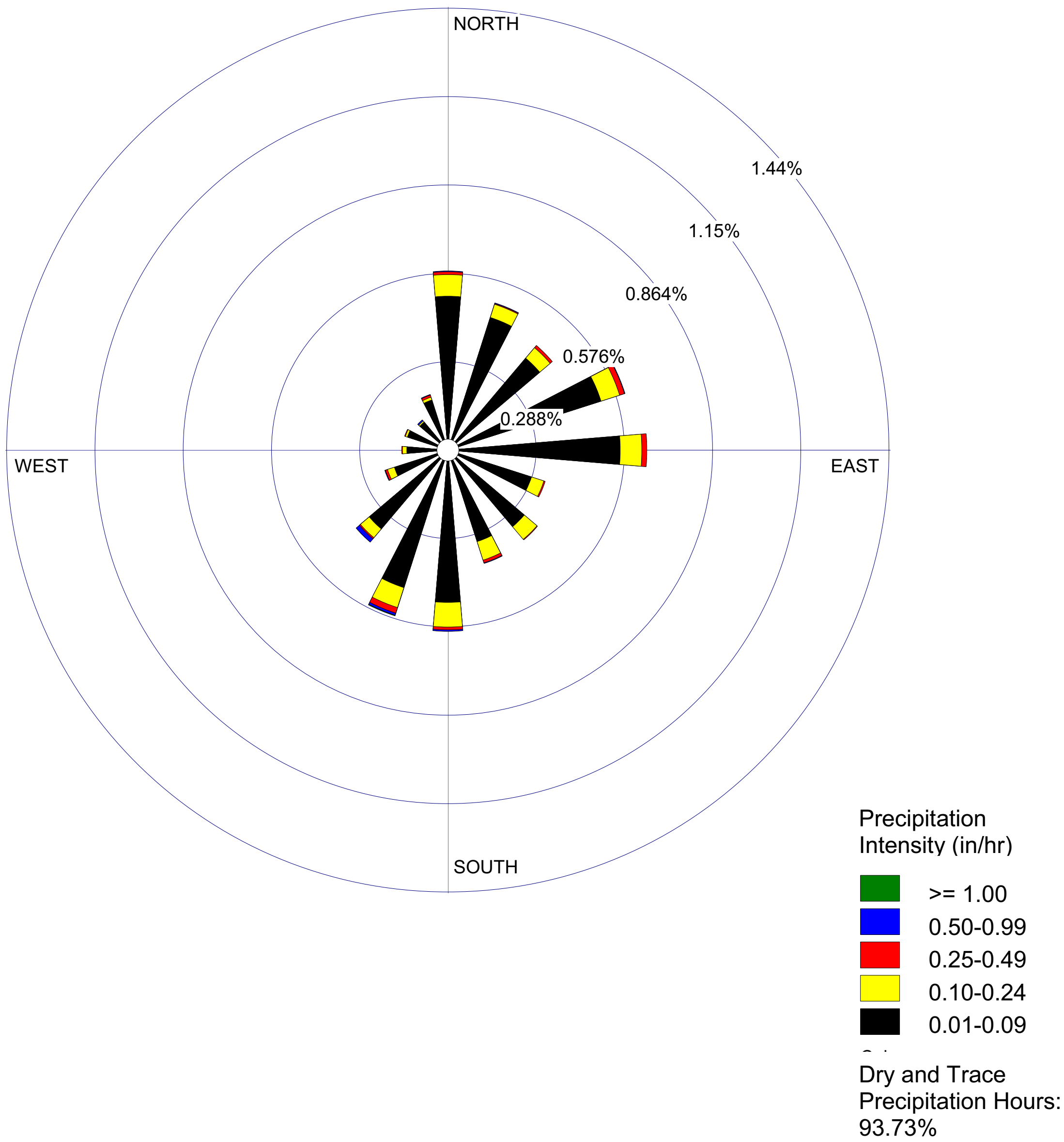
Source: Reference 2.3-220

Figure 2.3-203 Total Hail Reports for the Five-County Area (1955-2007) [EF3 COL 2.0-7-A]



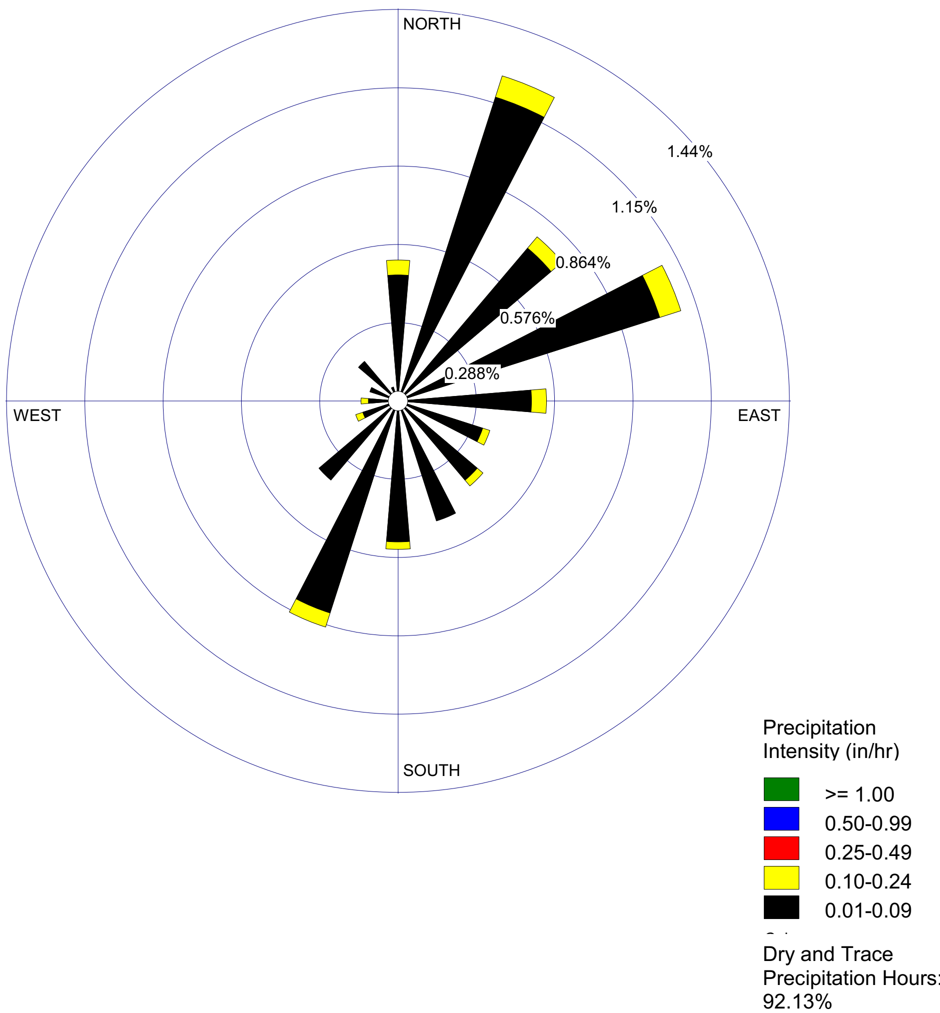
Source: Reference 2.3-220, Reference 2.3-224

Figure 2.3-204 Detroit Metropolitan Airport Annual Precipitation Rose (2003-2007) [EF3 COL 2.0-8-A]



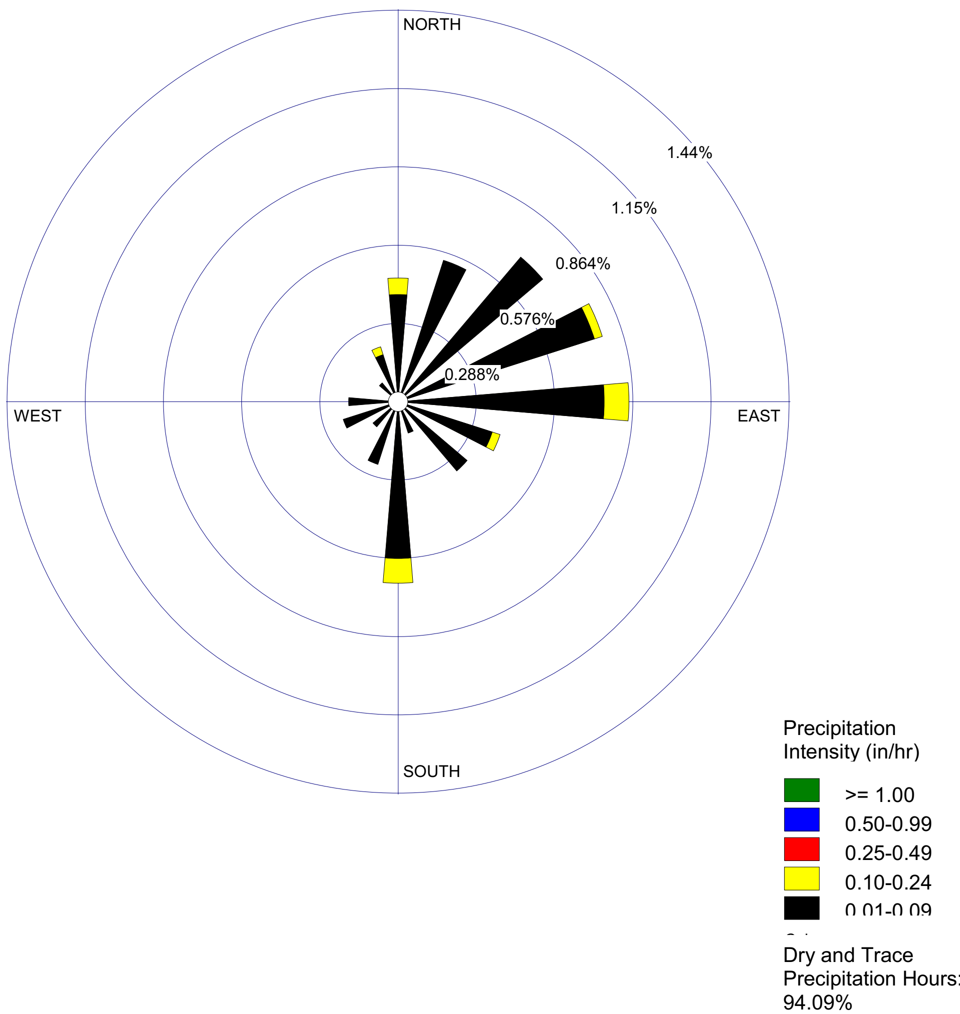
Source: Reference 2.3-229, Reference 2.3-247

Figure 2.3-205 Detroit Metropolitan Airport January Precipitation Rose (2003-2007) [EF3 COL 2.0-8-A]



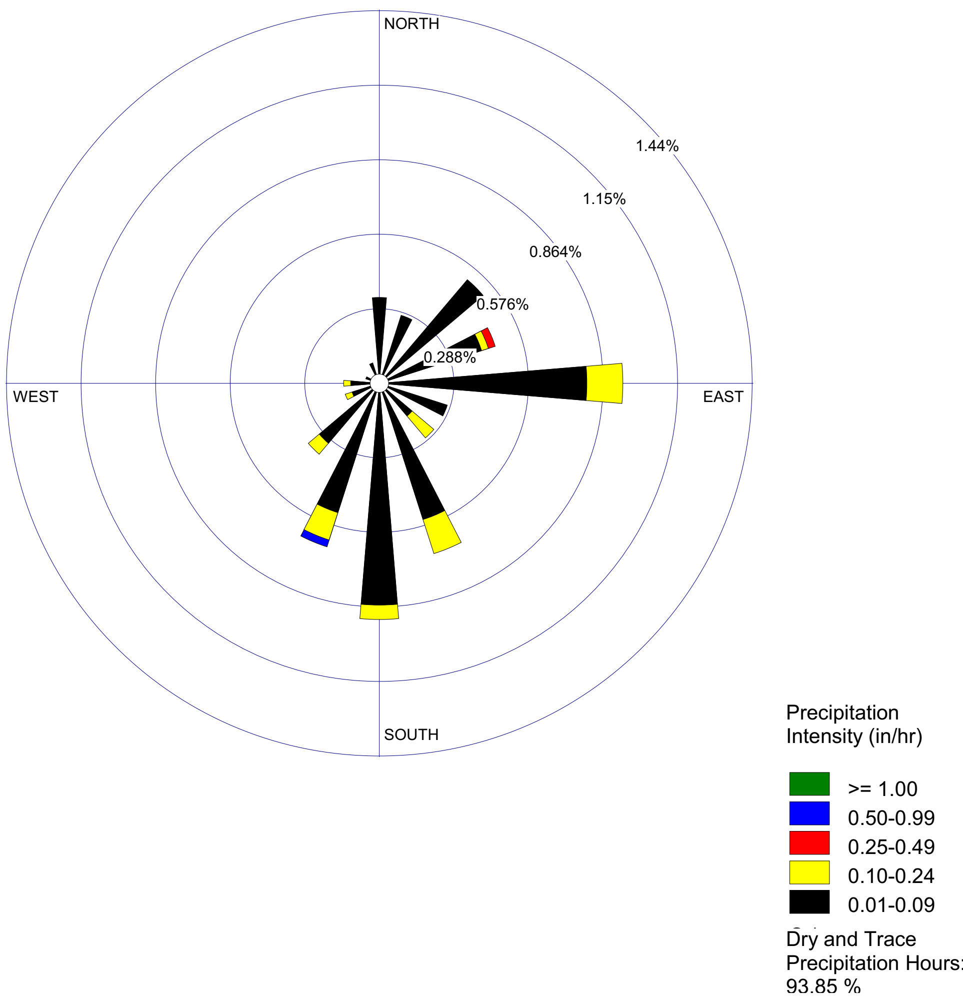
Source: Reference 2.3-229, Reference 2.3-247

Figure 2.3-206 Detroit Metropolitan Airport February Precipitation Rose (2003-2007) [EF3 COL 2.0-8-A]



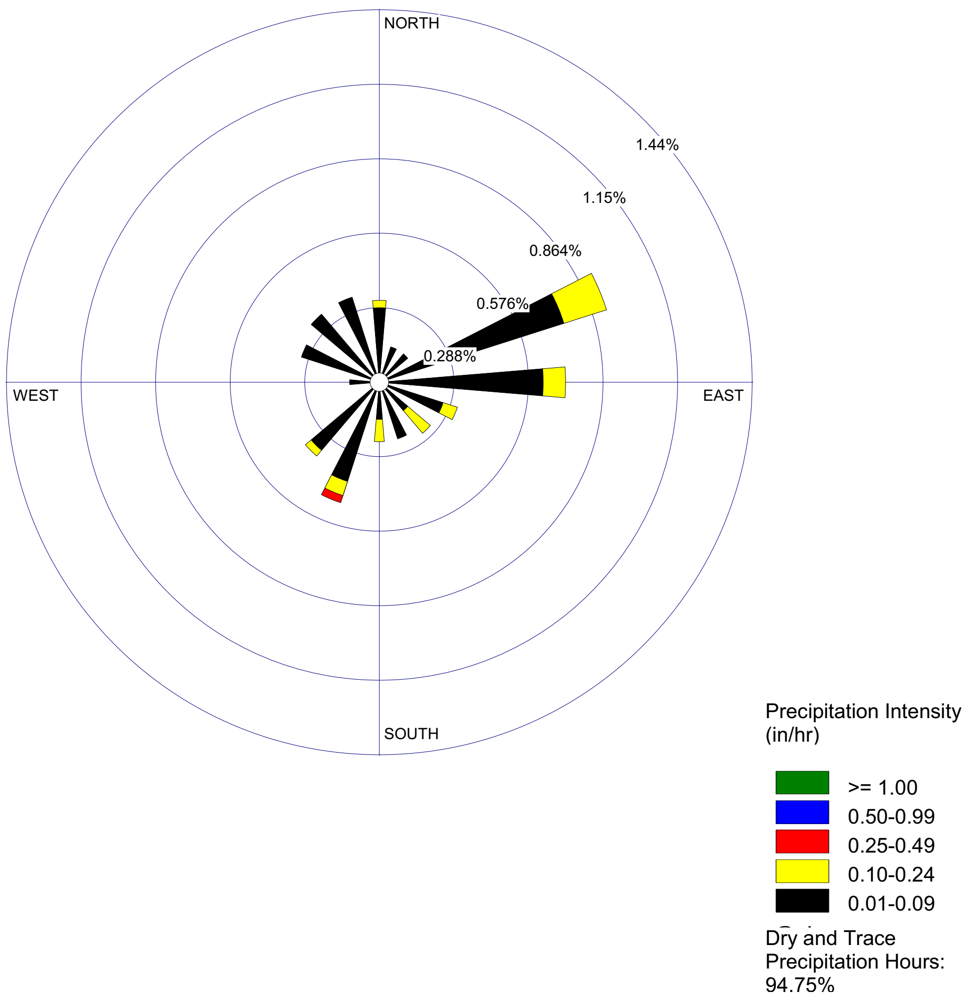
Source: Reference 2.3-229, Reference 2.3-247

Figure 2.3-207 Detroit Metropolitan Airport March Precipitation Rose (2003-2007) [EF3 COL 2.0-8-A]



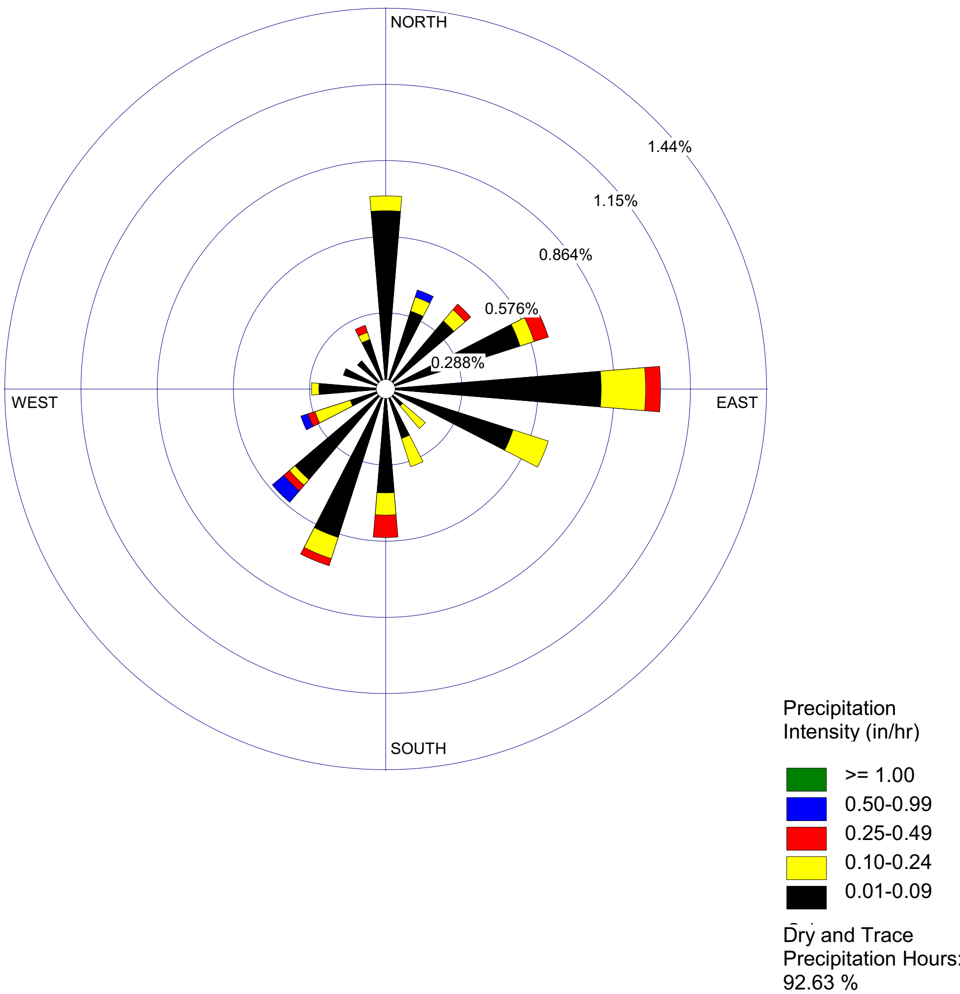
Source: Reference 2.3-229, Reference 2.3-247

Figure 2.3-208 Detroit Metropolitan Airport April Precipitation Rose (2003-2007) [EF3 COL 2.0-8-A]



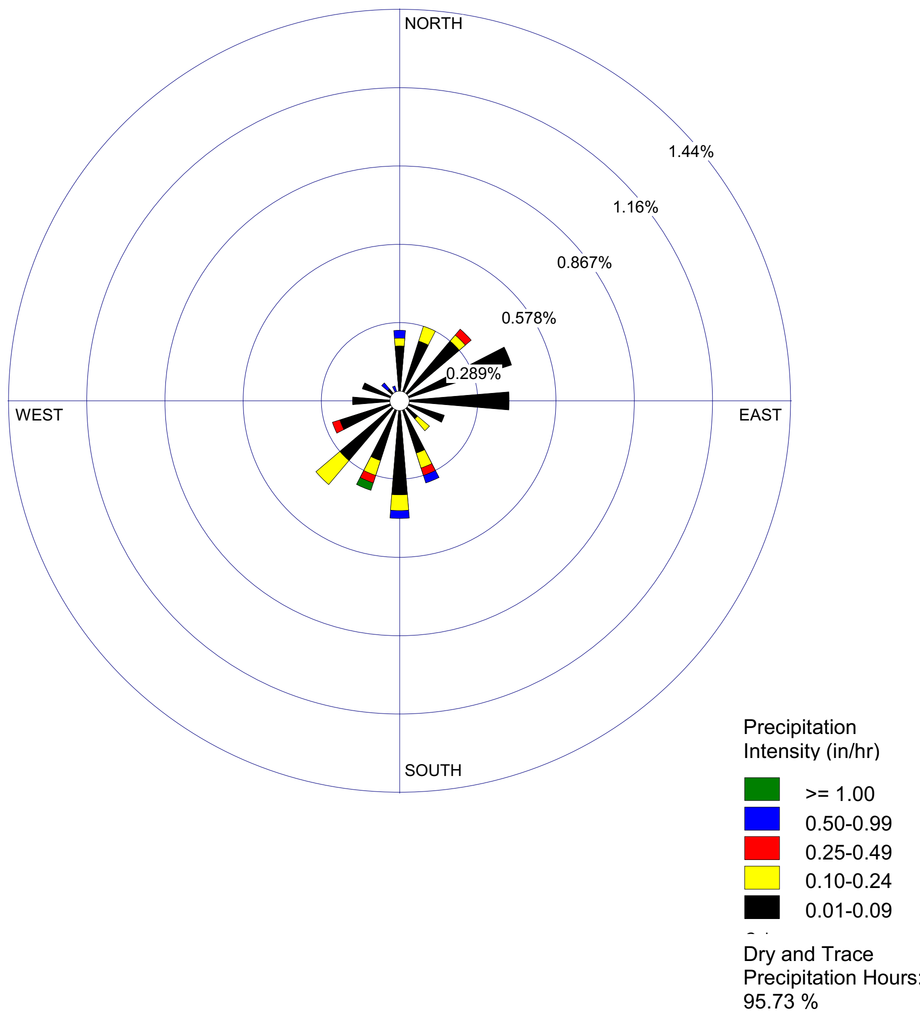
Source: Reference 2.3-229, Reference 2.3-247

Figure 2.3-209 Detroit Metropolitan Airport May Precipitation Rose (2003-2007) [EF3 COL 2.0-8-A]



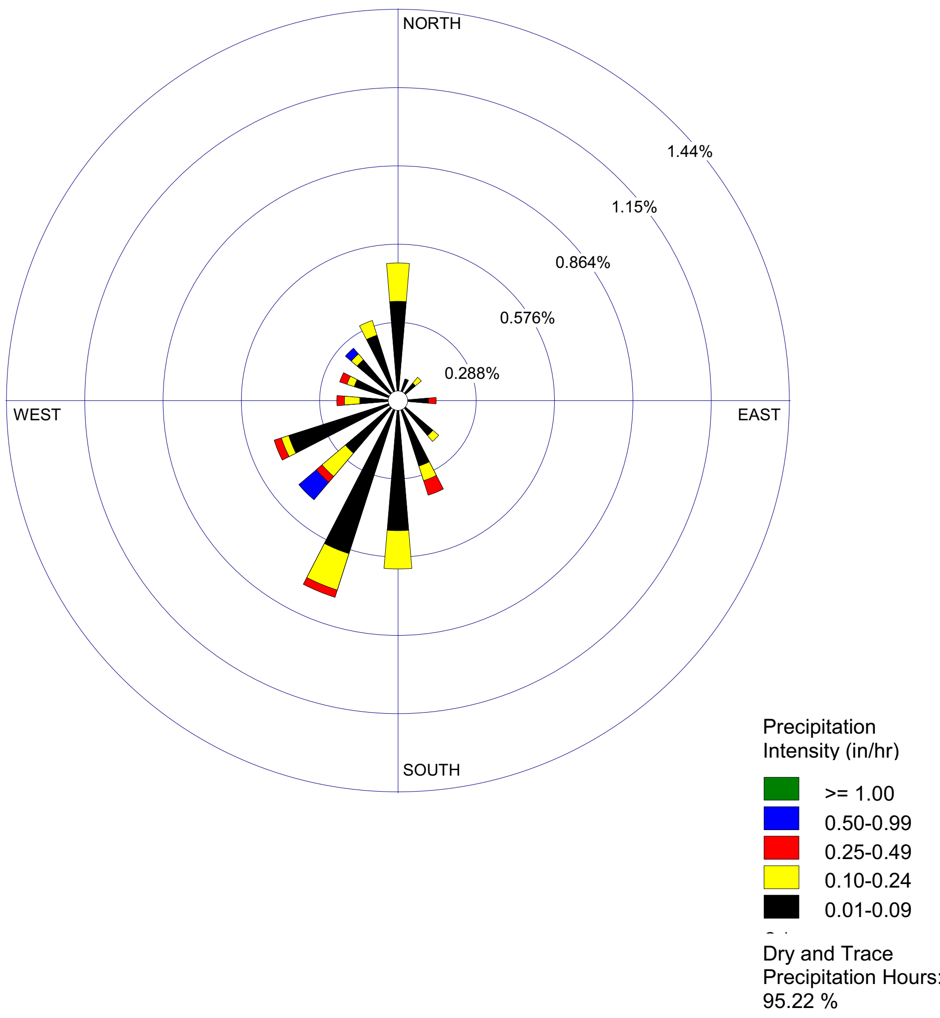
Source: Reference 2.3-229, Reference 2.3-247

Figure 2.3-210 Detroit Metropolitan Airport June Precipitation Rose (2003-2007) [EF3 COL 2.0-8-A]



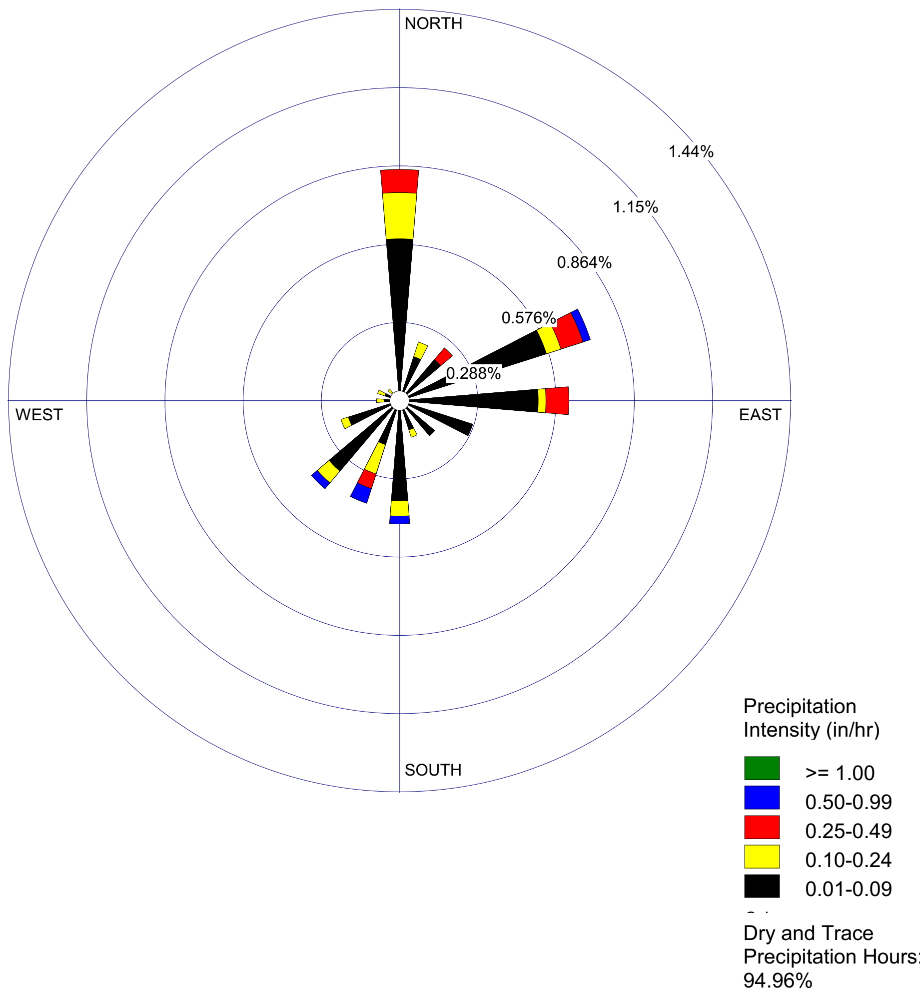
Source: Reference 2.3-229, Reference 2.3-247

Figure 2.3-211 Detroit Metropolitan Airport July Precipitation Rose (2003-2007) [EF3 COL 2.0-8-A]



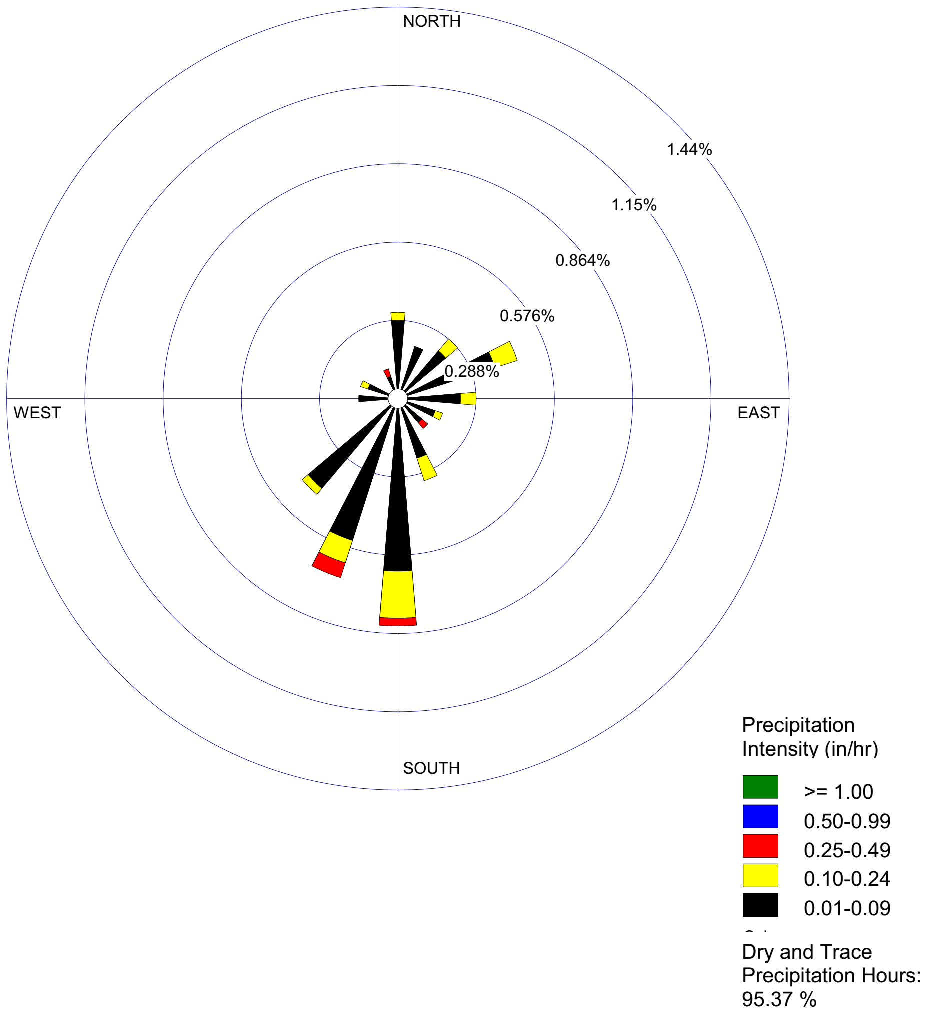
Source: Reference 2.3-229, Reference 2.3-247

Figure 2.3-212 Detroit Metropolitan Airport August Precipitation Rose (2003-2007) [EF3 COL 2.0-8-A]



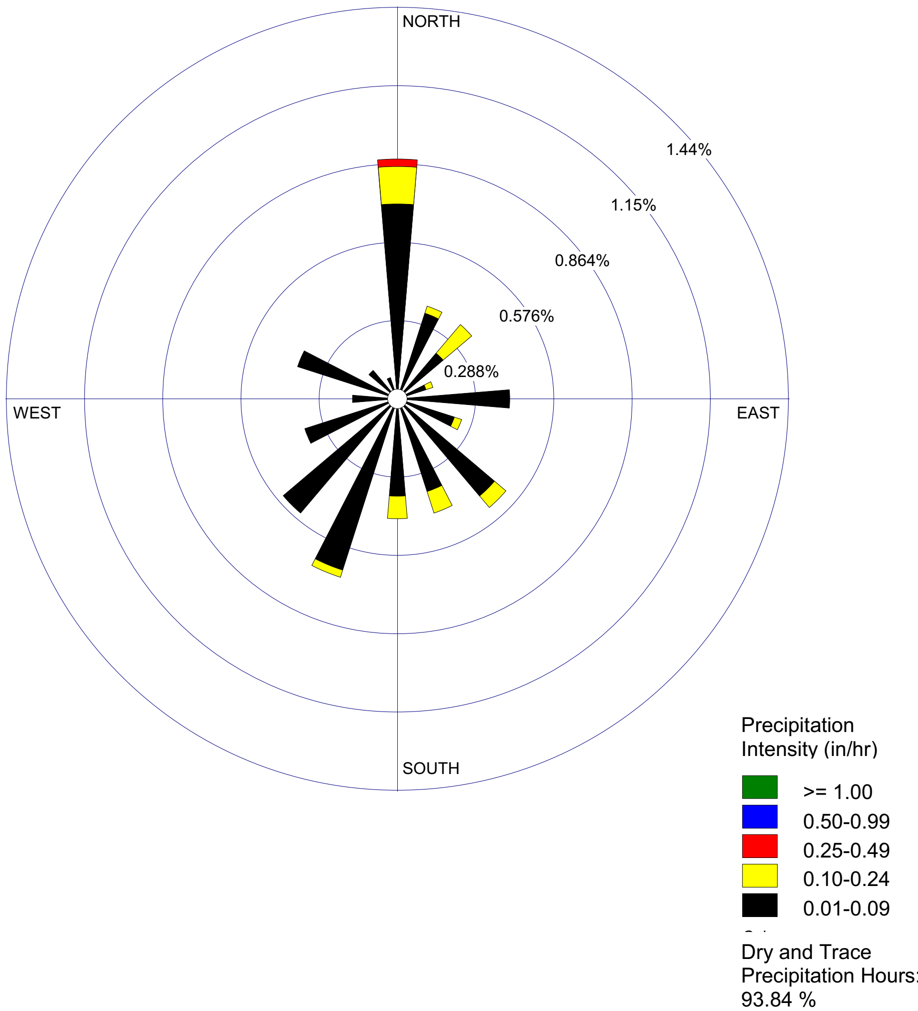
Source: Reference 2.3-229, Reference 2.3-247

Figure 2.3-213 **Detroit Metropolitan Airport September Precipitation Rose (2003-2007)** [EF3 COL 2.0-8-A]



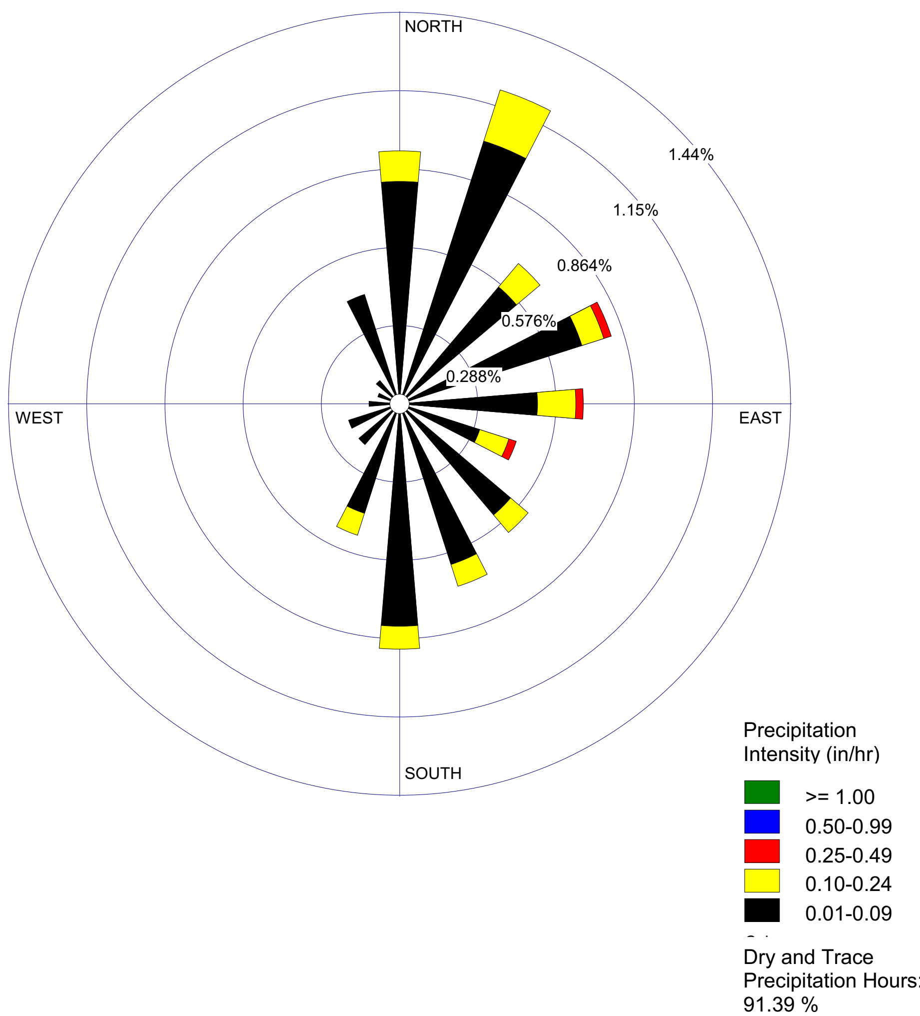
Source: Reference 2.3-229, Reference 2.3-247

Figure 2.3-214 Detroit Metropolitan Airport October Precipitation Rose (2003-2007) [EF3 COL 2.0-8-A]



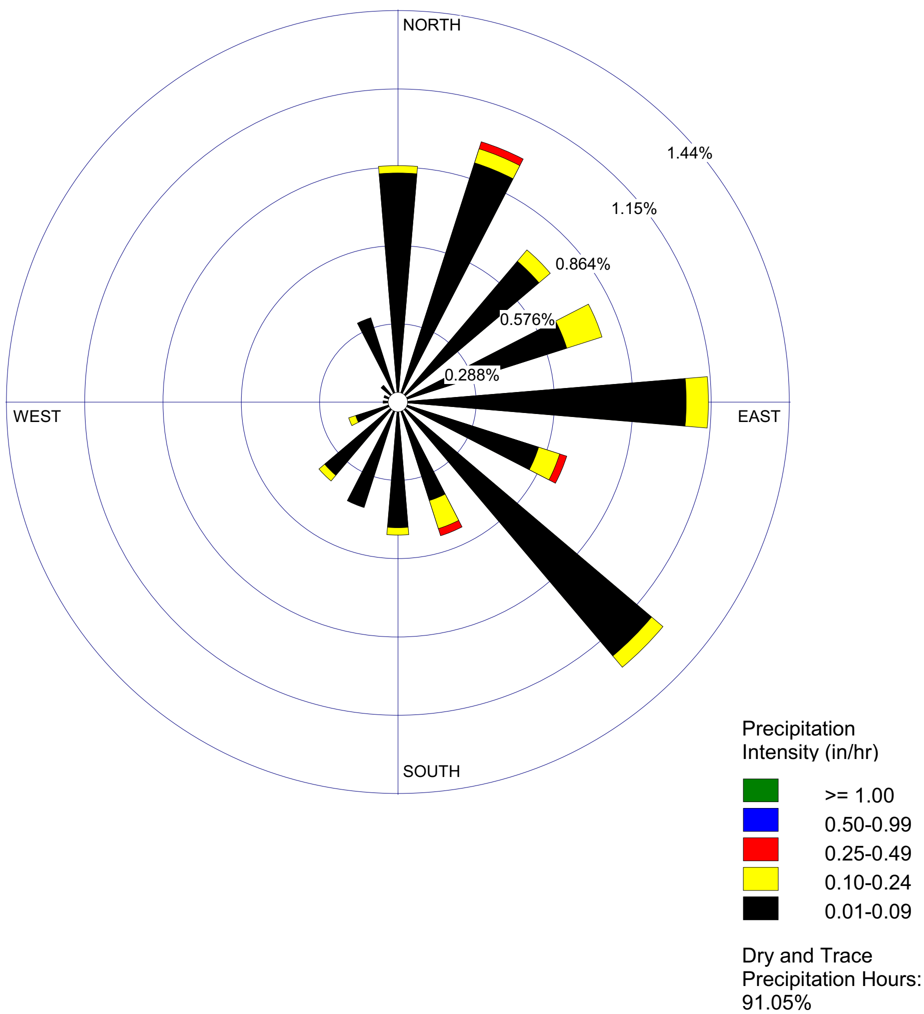
Source: Reference 2.3-229, Reference 2.3-247

Figure 2.3-215 Detroit Metropolitan Airport November Precipitation Rose (2003-2007) [EF3 COL 2.0-8-A]



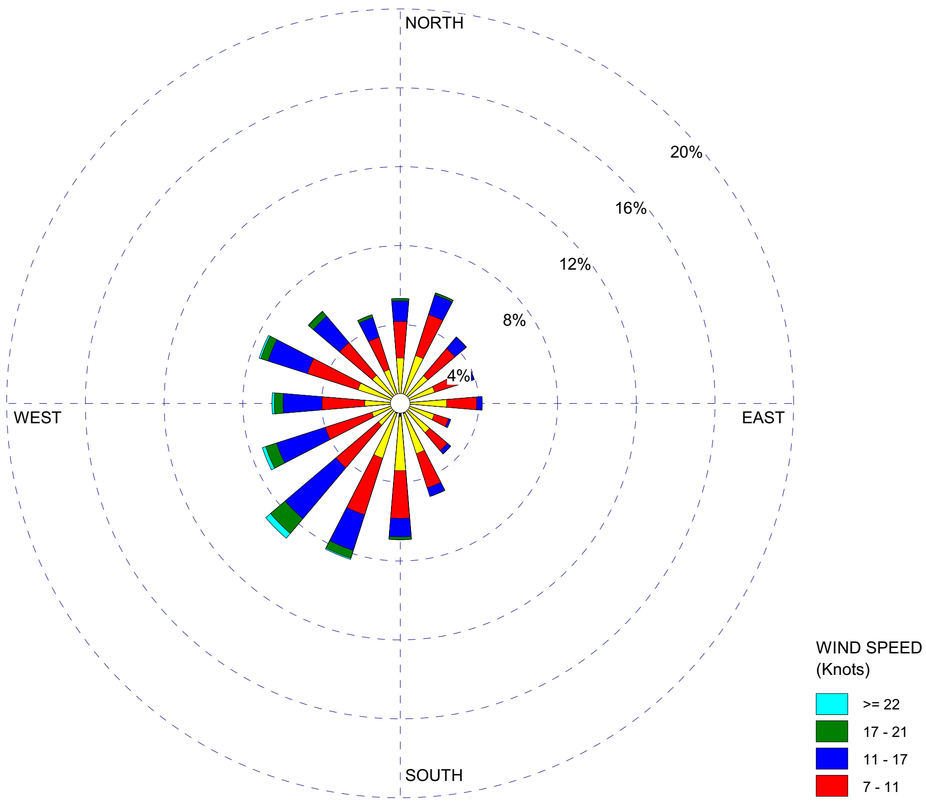
Source: Reference 2.3-229, Reference 2.3-247

Figure 2.3-216 Detroit Metropolitan Airport December Precipitation Rose (2003-2007) [EF3 COL 2.0-8-A]



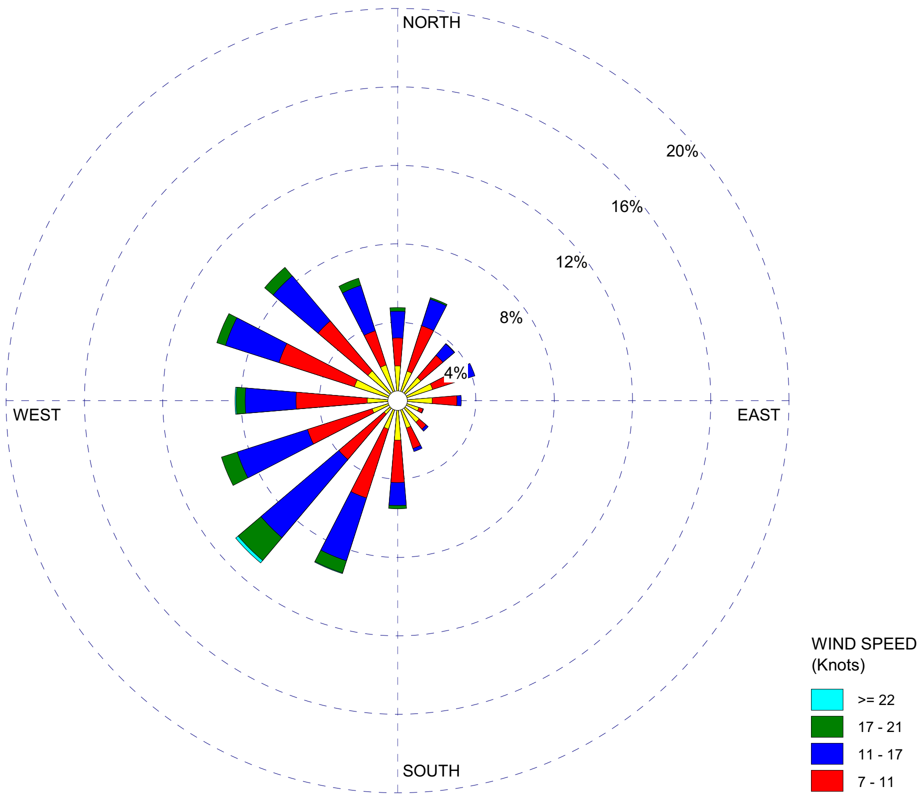
Source: Reference 2.3-229, Reference 2.3-247

Figure 2.3-217 Detroit Metropolitan Airport Annual Wind Rose (2003-2007) [EF3 COL 2.0-8-A]



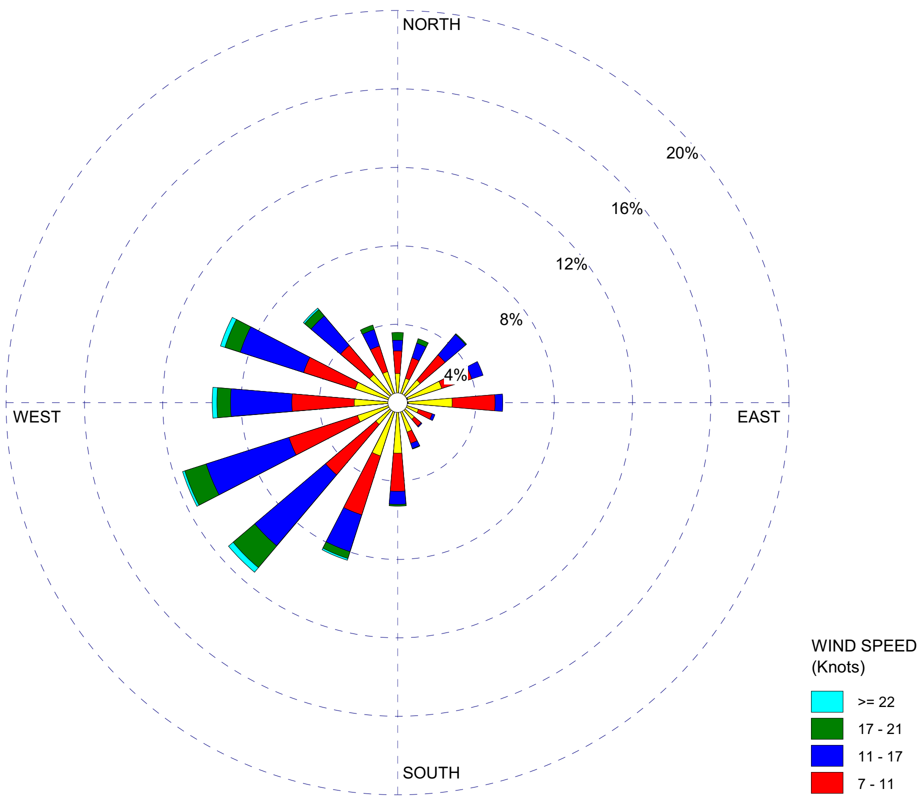
Source: Reference 2.3-229

Figure 2.3-218 Detroit Metropolitan Airport January Wind Rose (2003-2007) [EF3 COL 2.0-8-A]



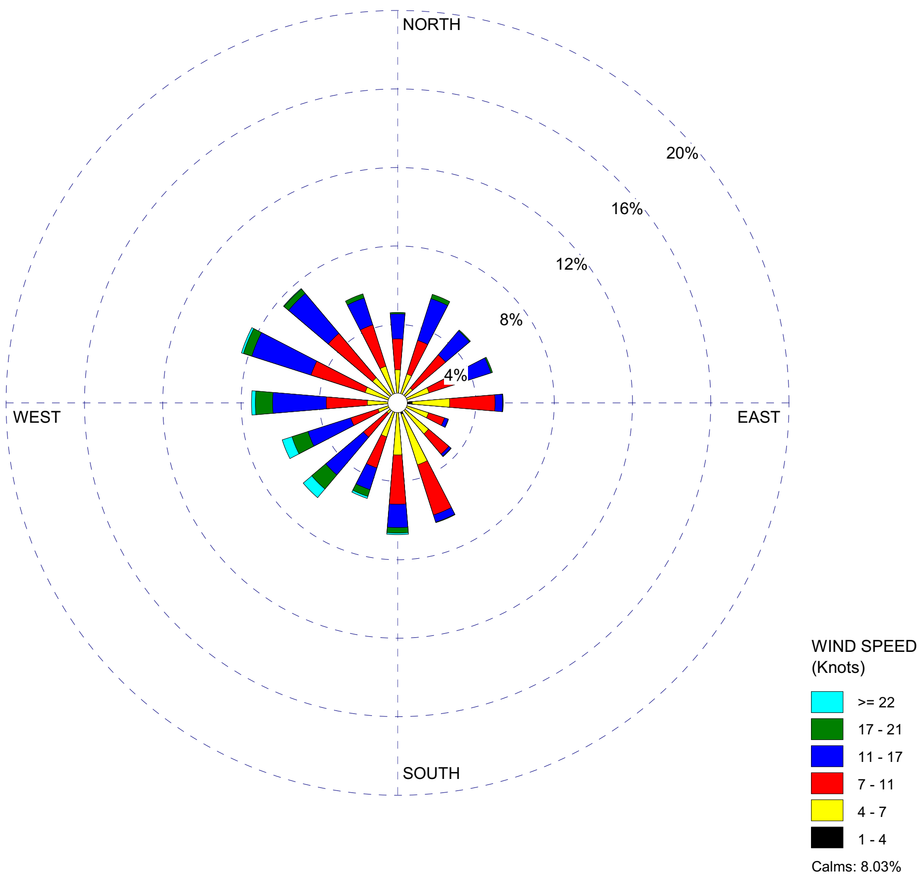
Source: Reference 2.3-229

Figure 2.3-219 Detroit Metropolitan Airport February Wind Rose (2003-2007) [EF3 COL 2.0-8-A]



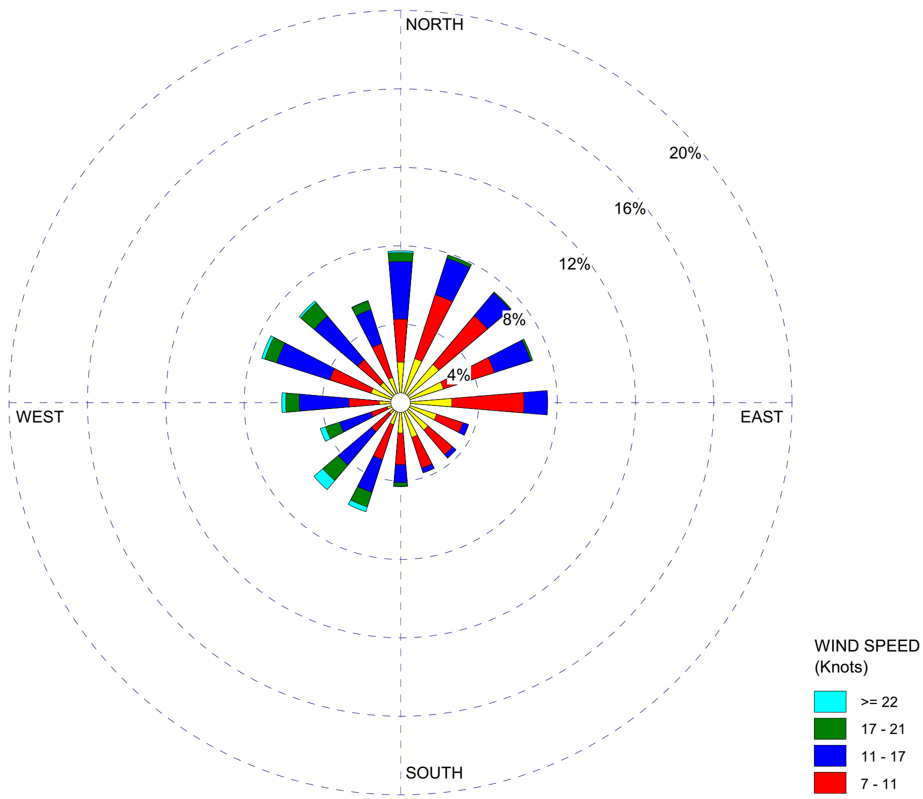
Source: Reference 2.3-229

Figure 2.3-220 **Detroit Metropolitan Airport March Wind Rose (2003-2007)** [EF3 COL 2.0-8-A]



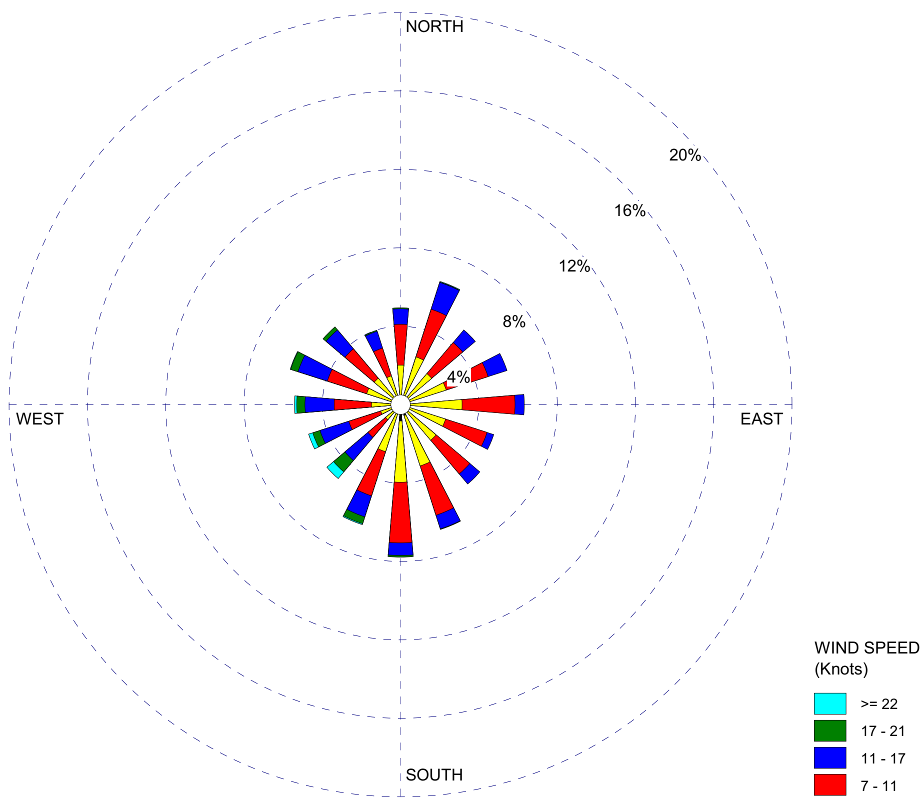
Source: Reference 2.3-229

Figure 2.3-221 Detroit Metropolitan Airport April Wind Rose (2003-2007) [EF3 COL 2.0-8-A]



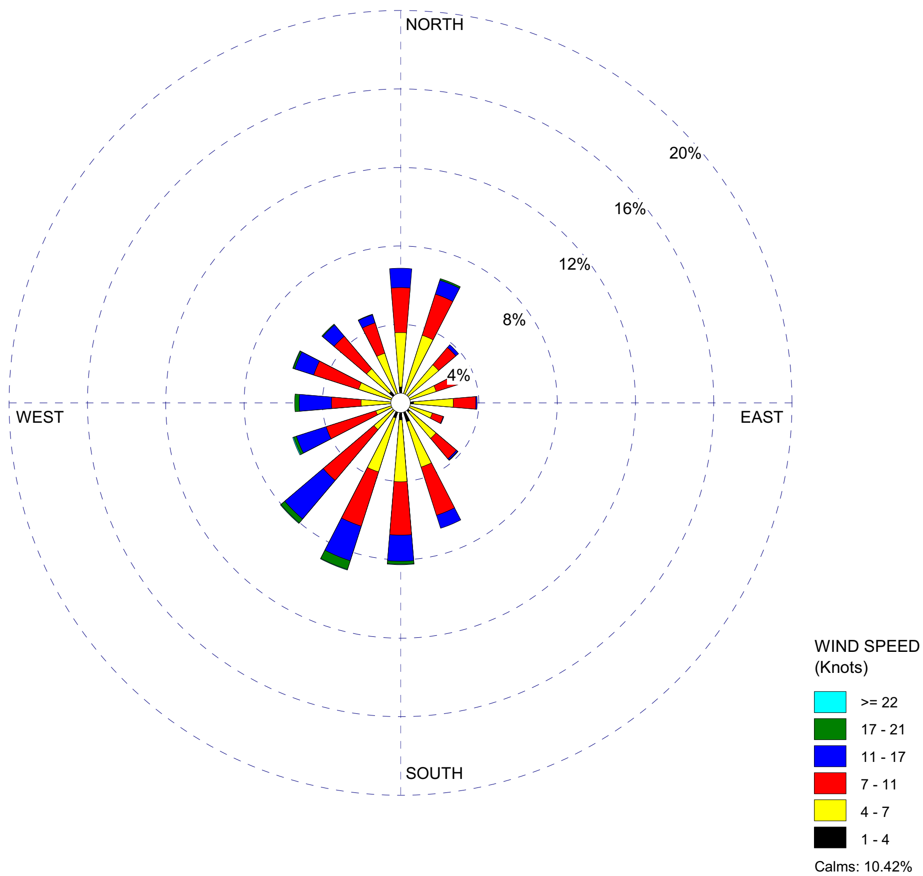
Source: Reference 2.3-229

Figure 2.3-222 Detroit Metropolitan Airport May Wind Rose (2003-2007) [EF3 COL 2.0-8-A]



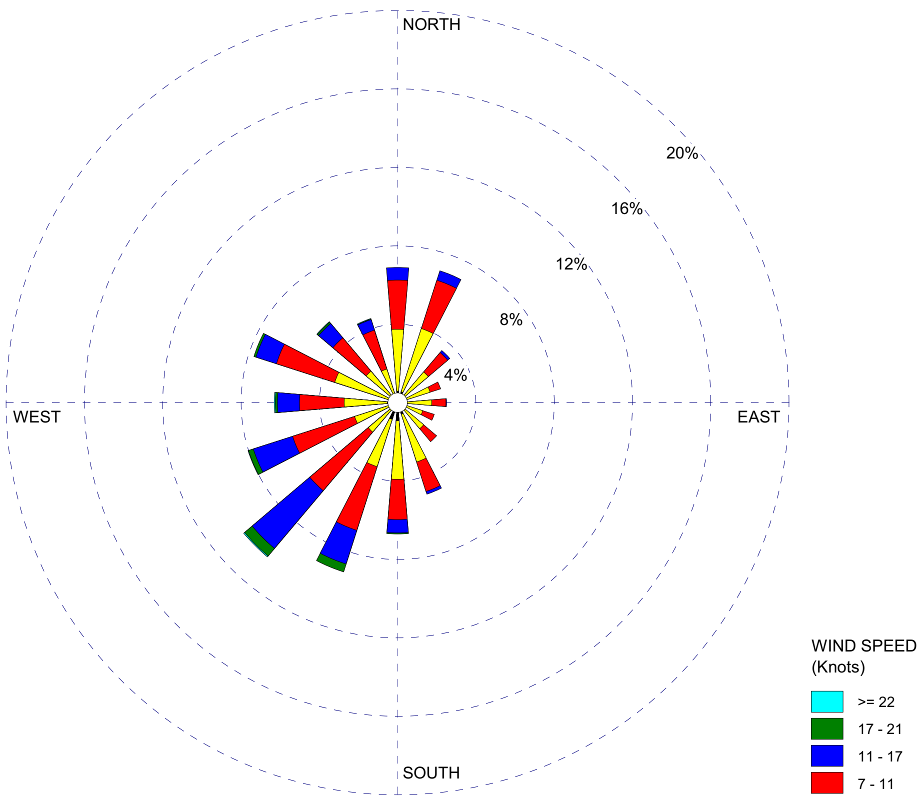
Source: Reference 2.3-229

Figure 2.3-223 **Detroit Metropolitan Airport June Wind Rose (2003-2007)** [EF3 COL 2.0-8-A]



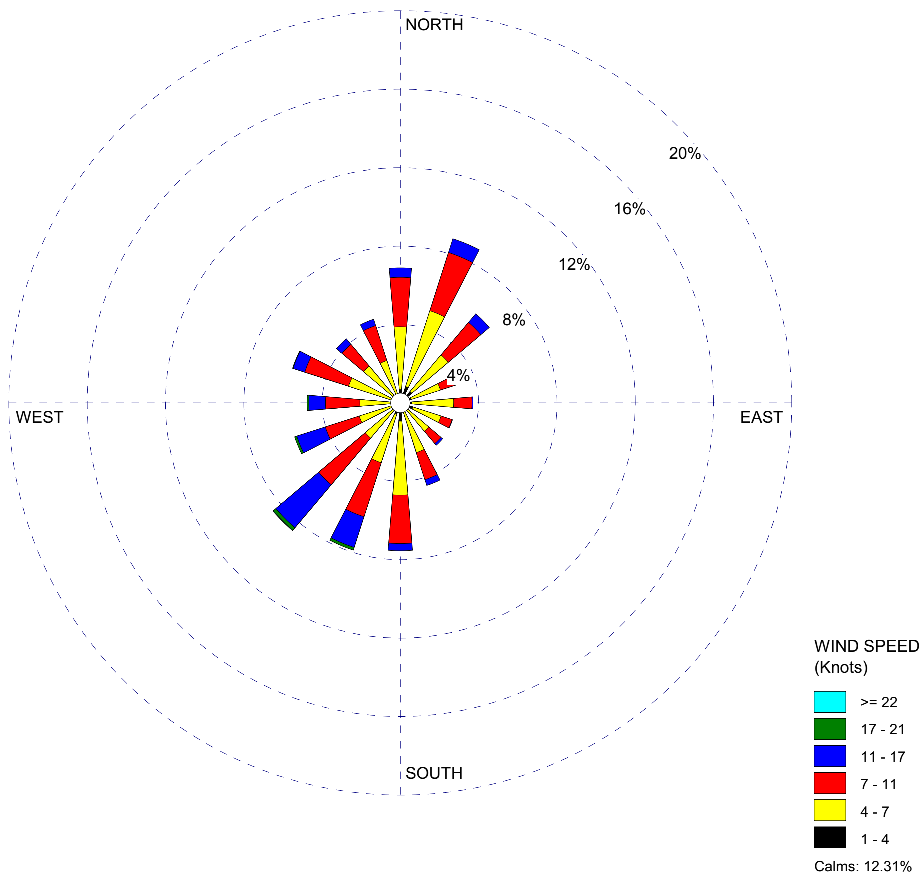
Source: Reference 2.3-229

Figure 2.3-224 **Detroit Metropolitan Airport July Wind Rose (2003-2007)** [EF3 COL 2.0-8-A]



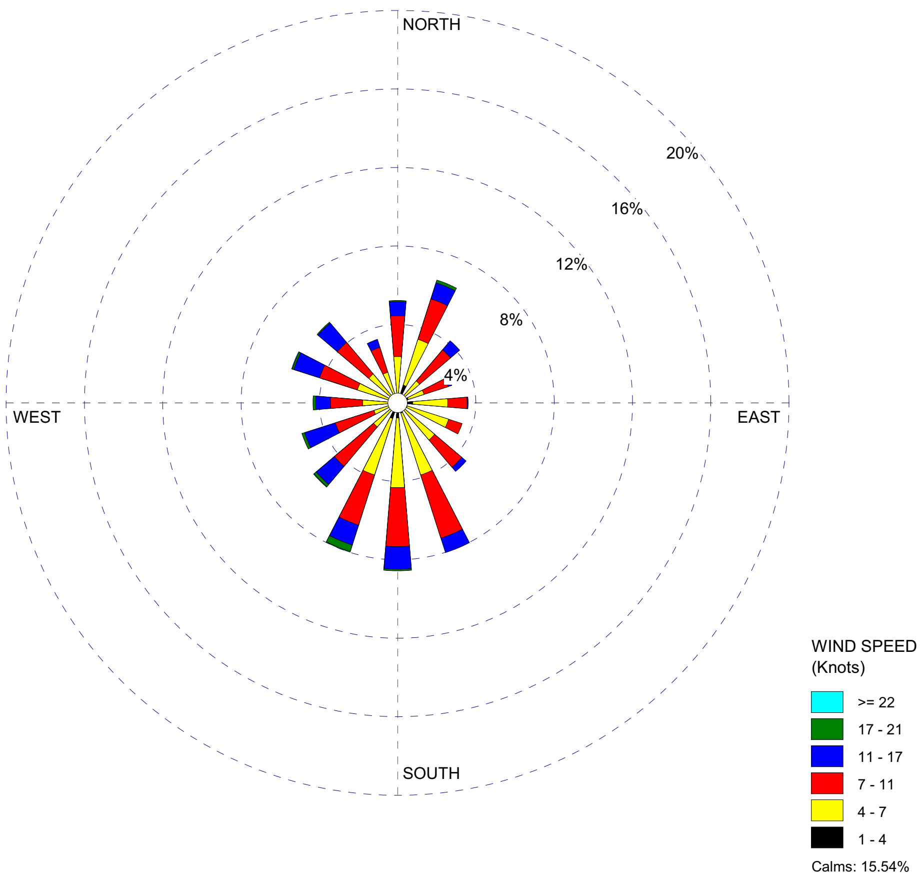
Source: Reference 2.3-229

Figure 2.3-225 **Detroit Metropolitan Airport August Wind Rose (2003-2007)** [EF3 COL 2.0-8-A]



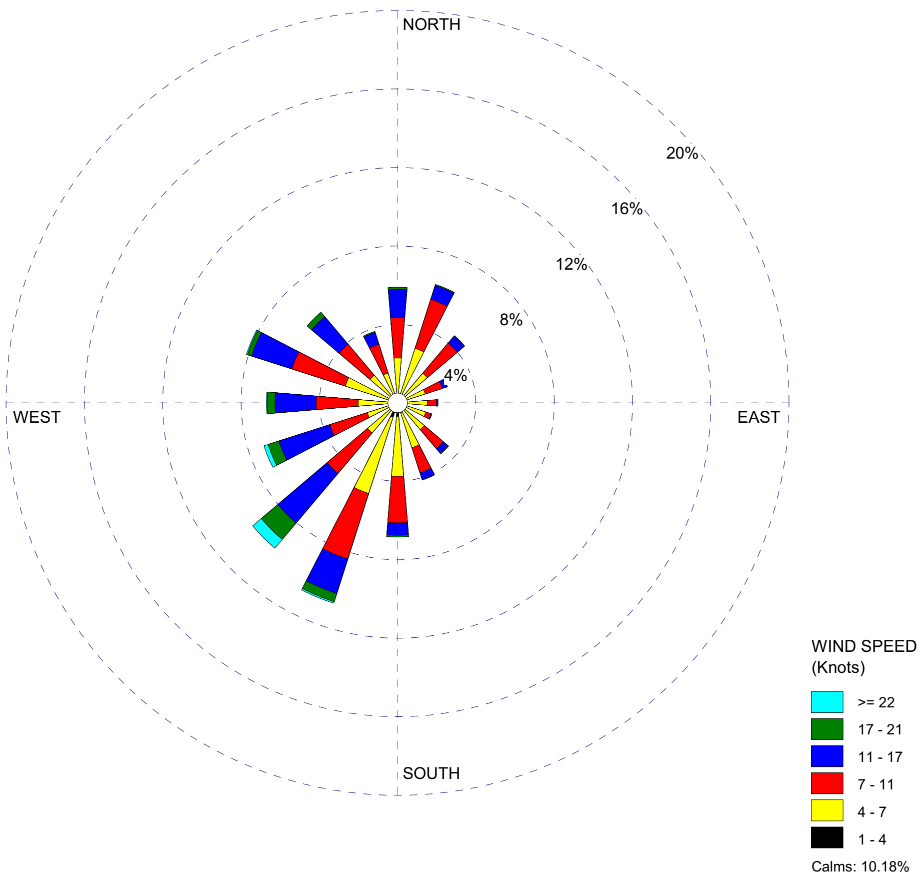
Source: Reference 2.3-229

Figure 2.3-226 Detroit Metropolitan Airport September Wind Rose (2003-2007) [EF3 COL 2.0-8-A]



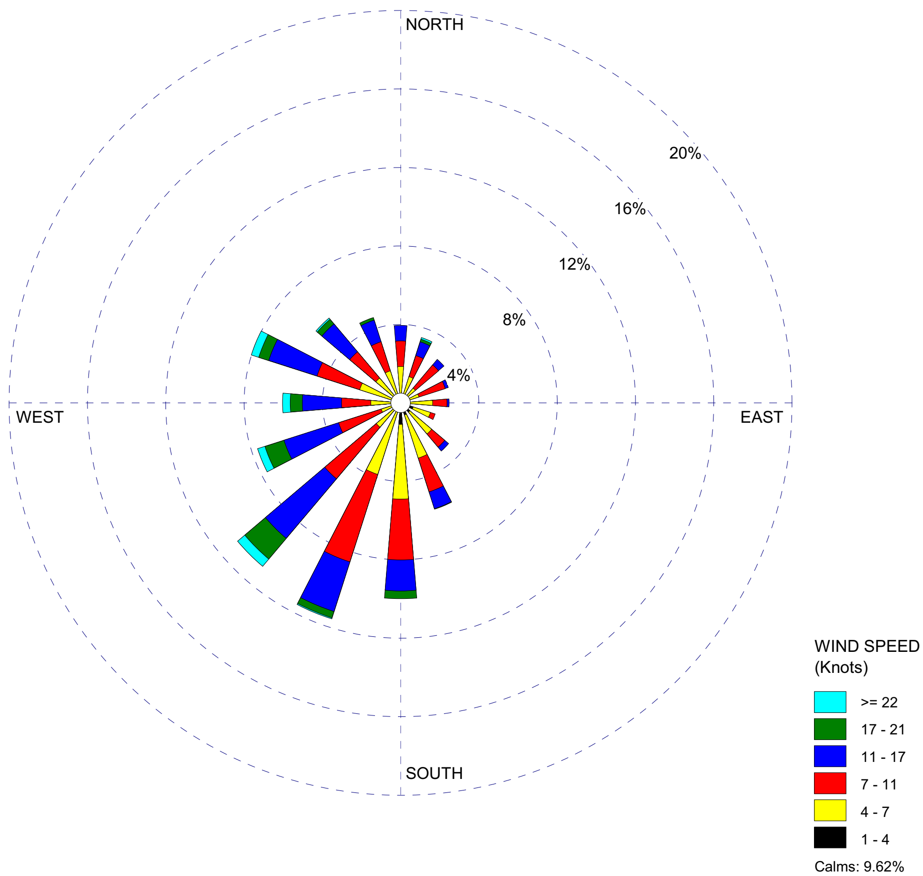
Source: Reference 2.3-229

Figure 2.3-227 **Detroit Metropolitan Airport October Wind Rose (2003-2007)** [EF3 COL 2.0-8-A]



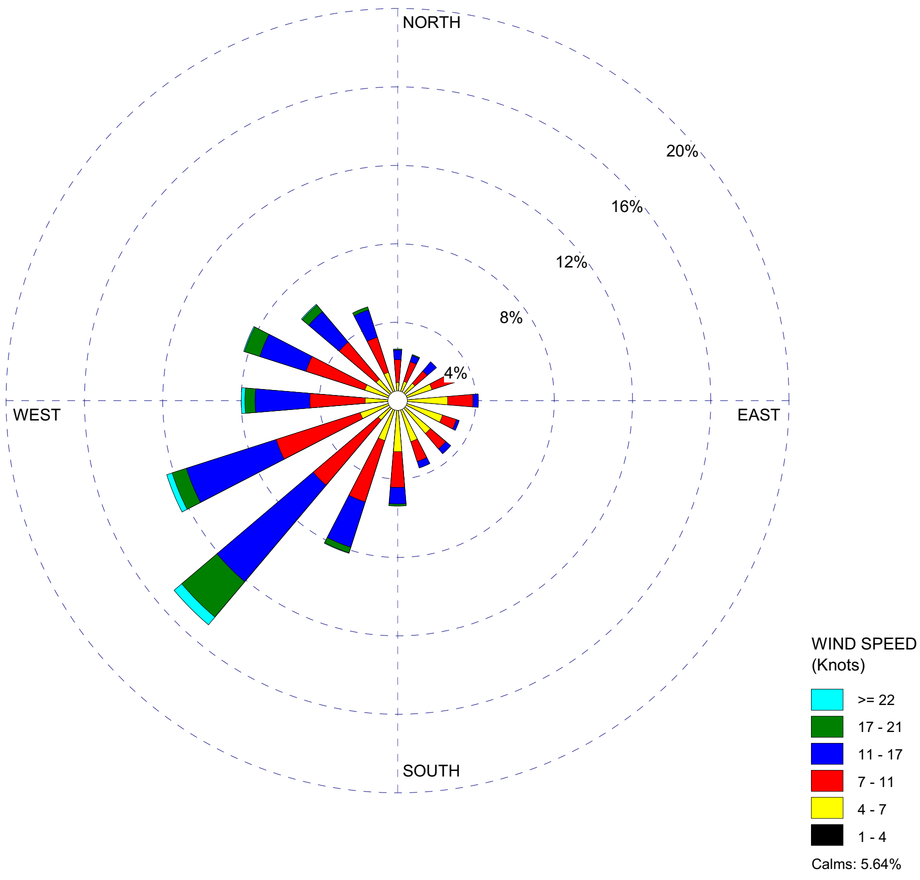
Source: Reference 2.3-229

Figure 2.3-228 Detroit Metropolitan Airport November Wind Rose (2003-2007) [EF3 COL 2.0-8-A]



Source: Reference 2.3-229

Figure 2.3-229 Detroit Metropolitan Airport December Wind Rose (2003-2007) [EF3 COL 2.0-8-A]



Source: Reference 2.3-229

Figure 2.3-230 Fermi Site 10-m Annual Wind Rose (2003-2007) [EF3 COL 2.0-8-A]

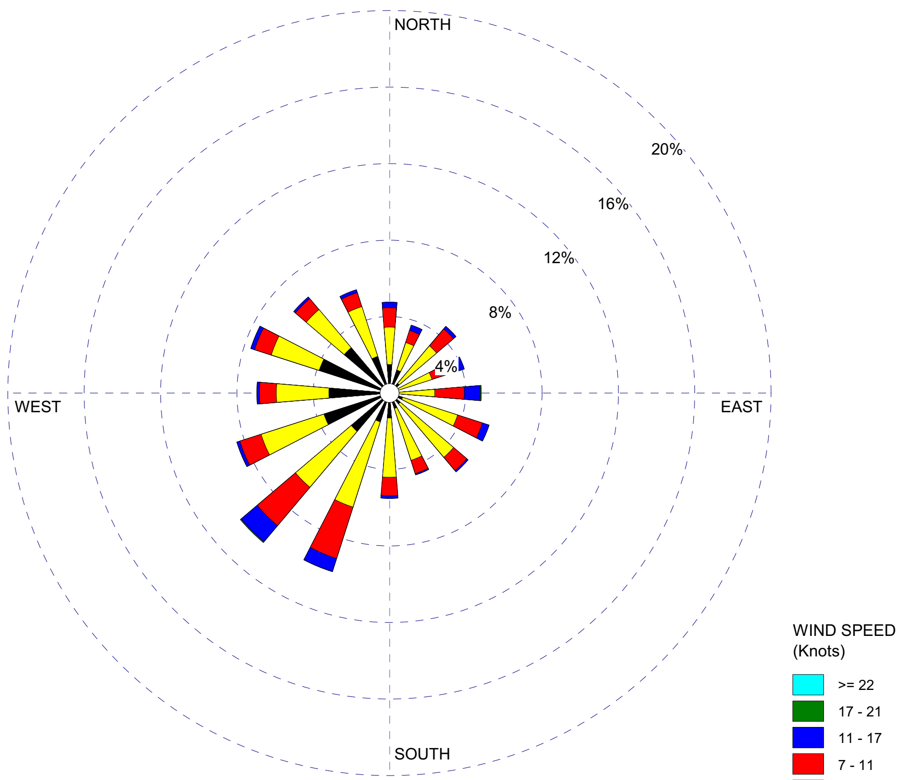


Figure 2.3-231 **Fermi Site 10-m January Wind Rose (2003-2007)**[EF3 COL 2.0-8-A]

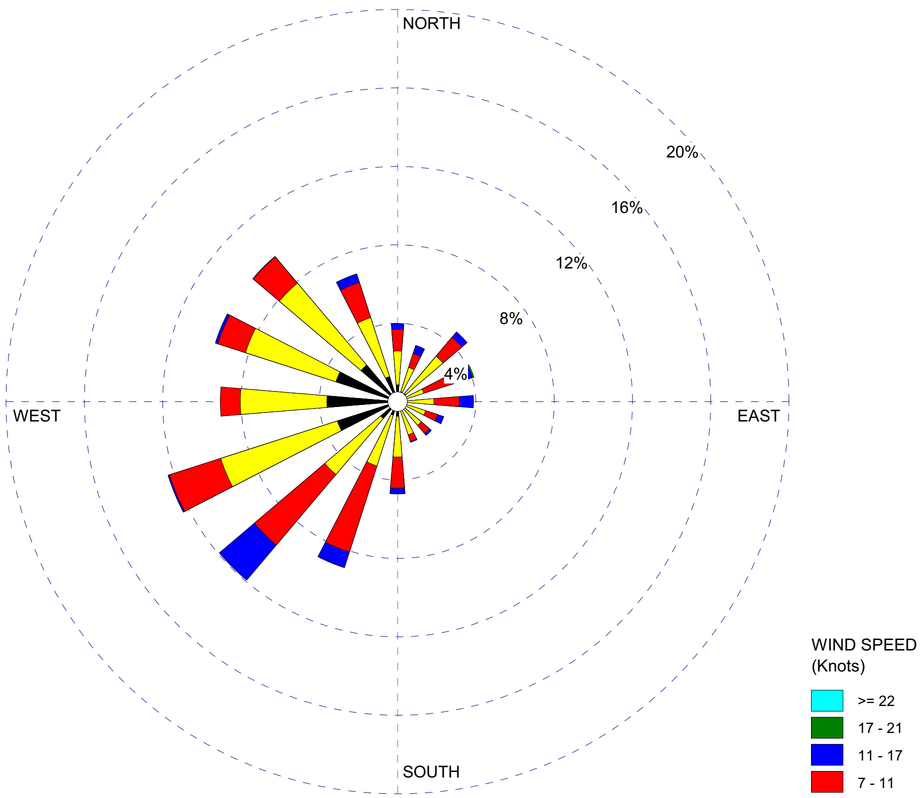


Figure 2.3-232 Fermi Site 10-m February Wind Rose (2003-2007) [EF3 COL 2.0-8-A]

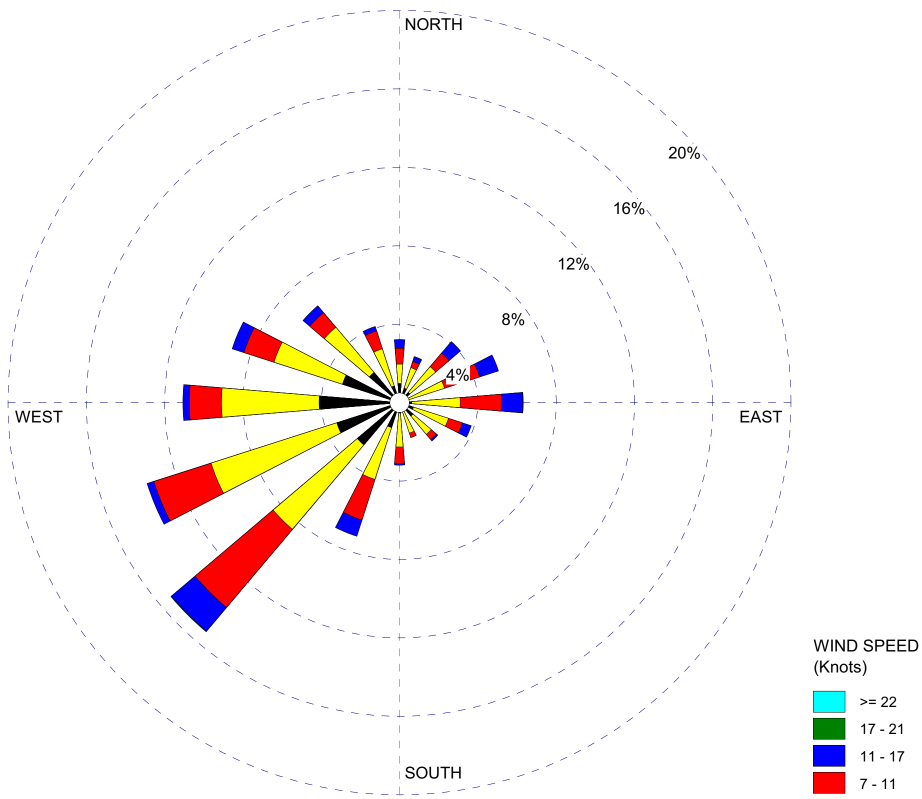


Figure 2.3-233 Fermi Site 10-m March Wind Rose (2003-2007) [EF3 COL 2.0-8-A]

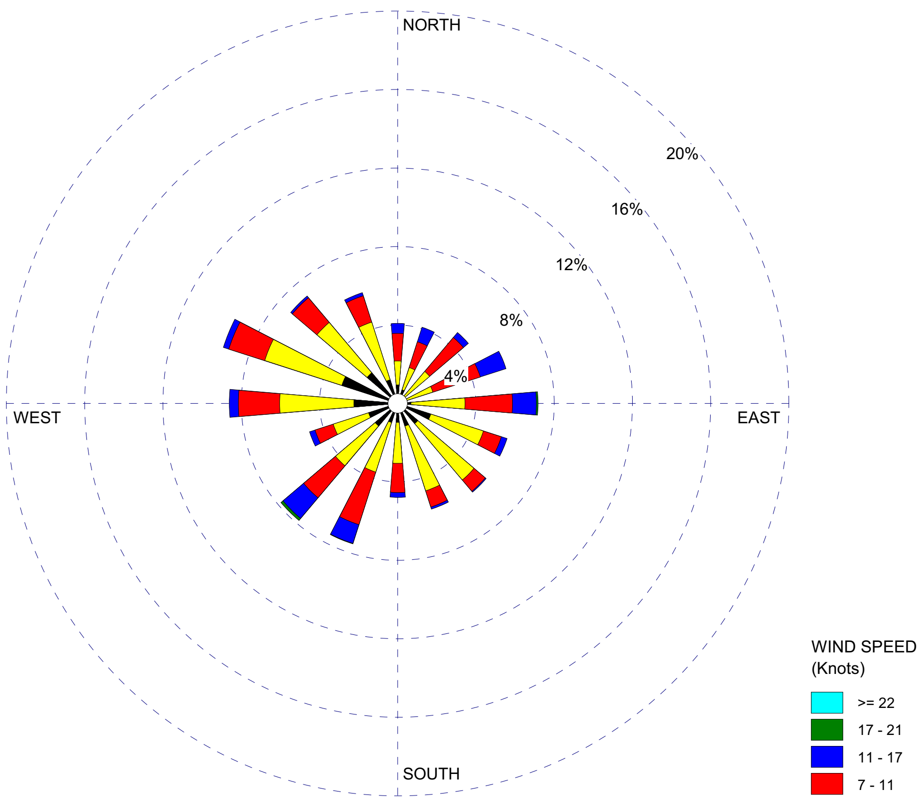


Figure 2.3-234 Fermi Site 10-m April Wind Rose (2003-2007) [EF3 COL 2.0-8-A]

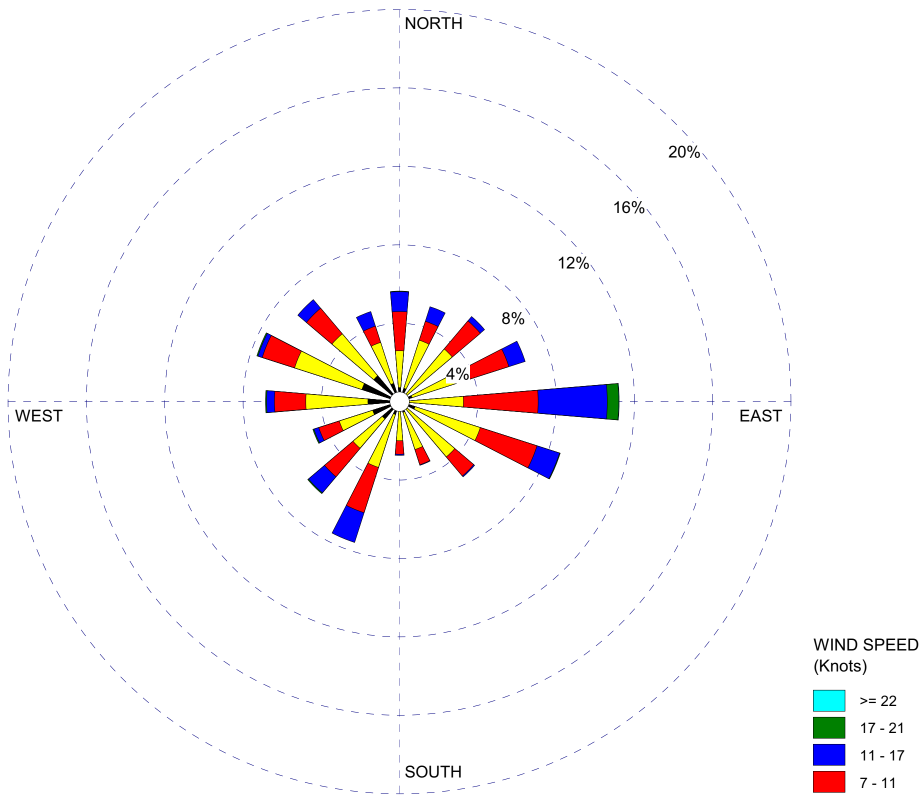


Figure 2.3-235 Fermi Site 10-m May Wind Rose (2003-2007) [EF3 COL 2.0-8-A]

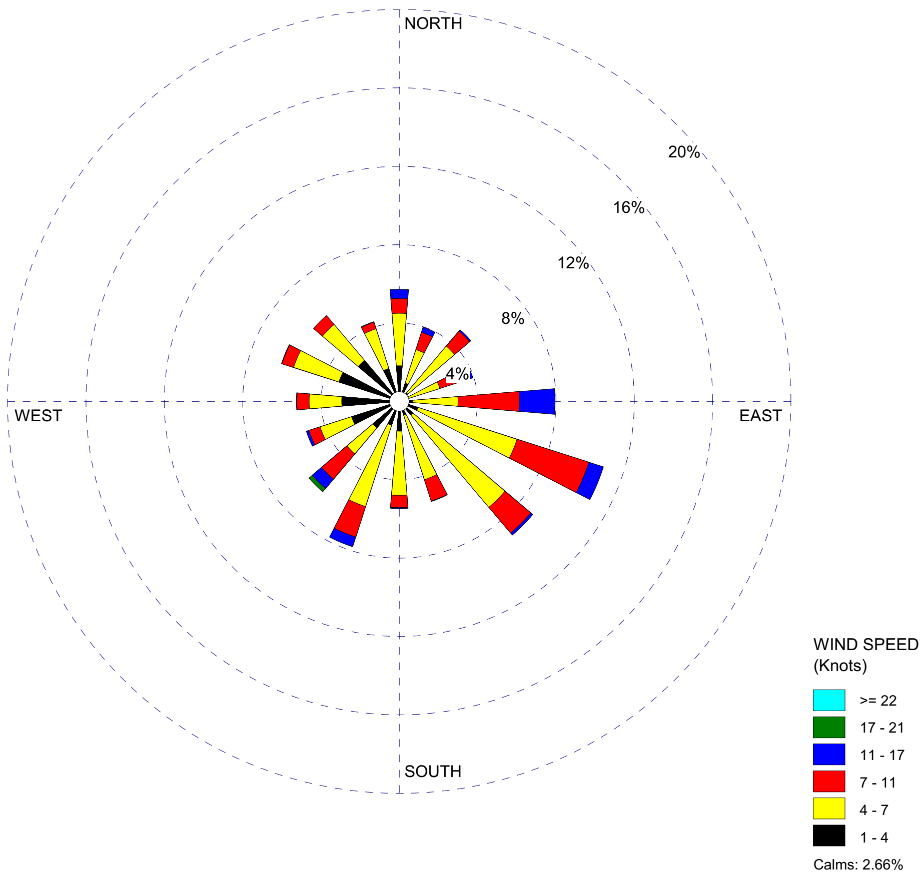


Figure 2.3-236 **Fermi Site 10-m June Wind Rose (2003-2007)** [EF3 COL 2.0-8-A]

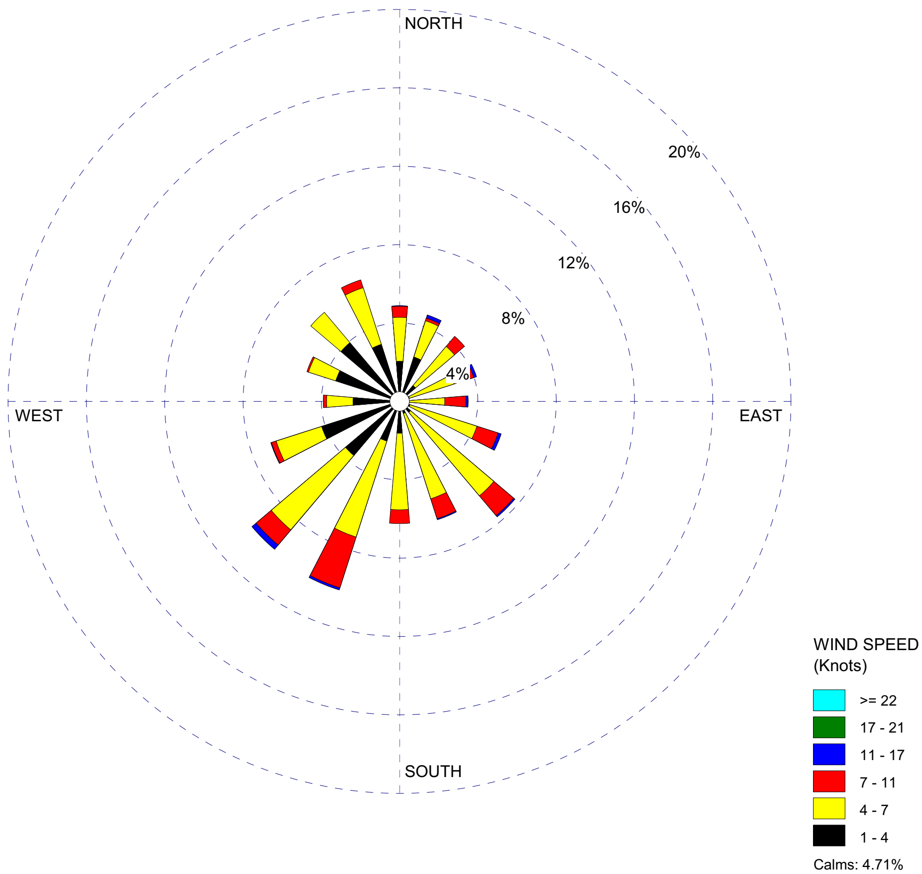


Figure 2.3-237 Fermi Site 10-m July Wind Rose (2003-2007) [EF3 COL 2.0-8-A]

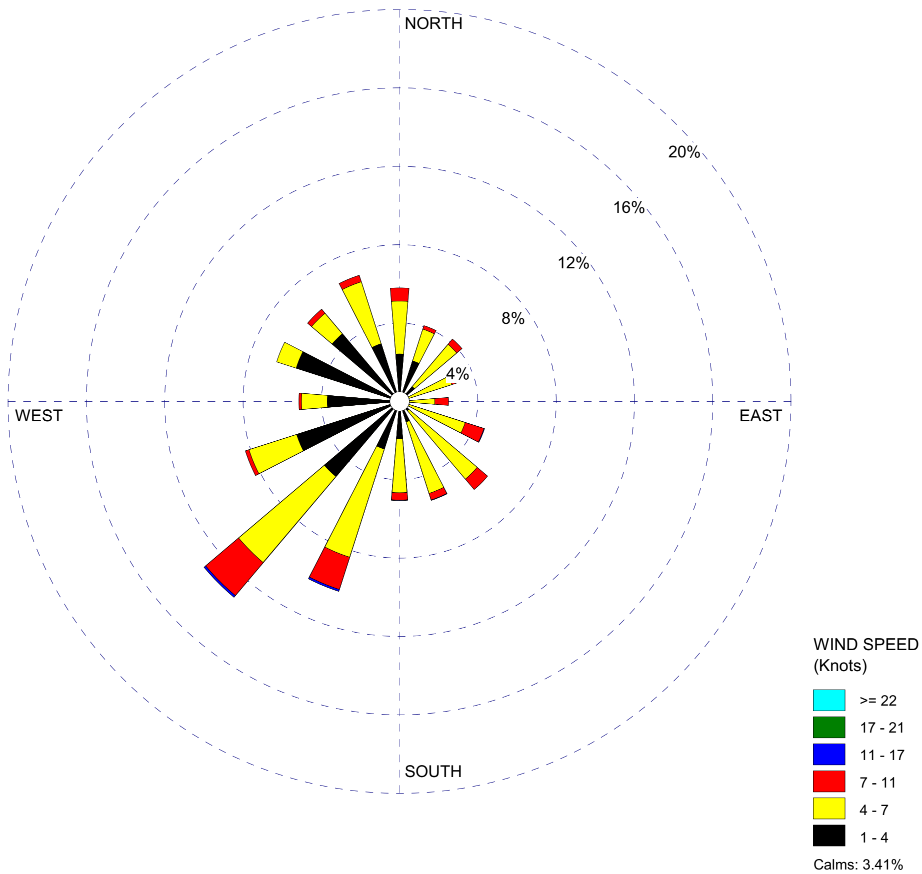


Figure 2.3-238 Fermi Site 10-m August Wind Rose (2003-2007) [EF3 COL 2.0-8-A]

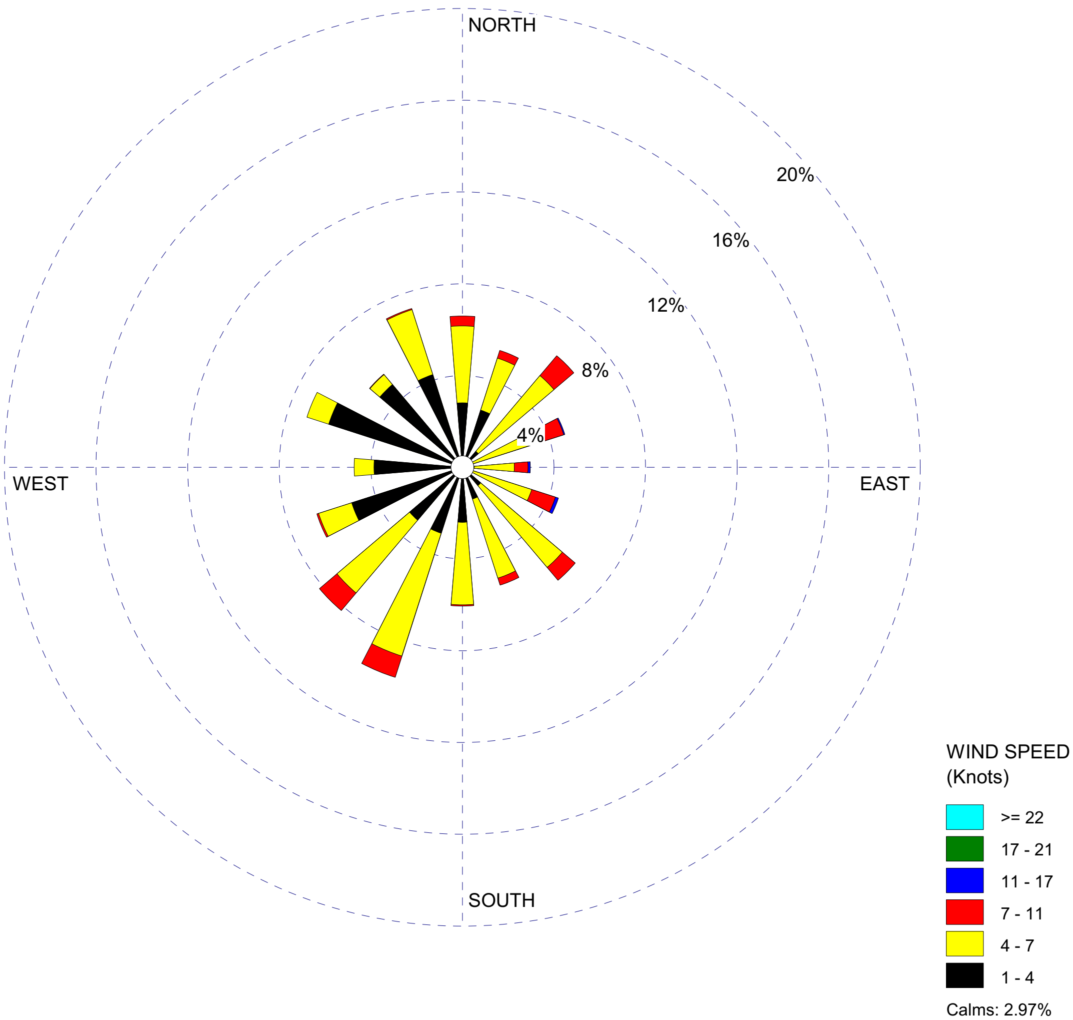


Figure 2.3-239 Fermi Site 10-m September Wind Rose (2003-2007) [EF3 COL 2.0-8-A]

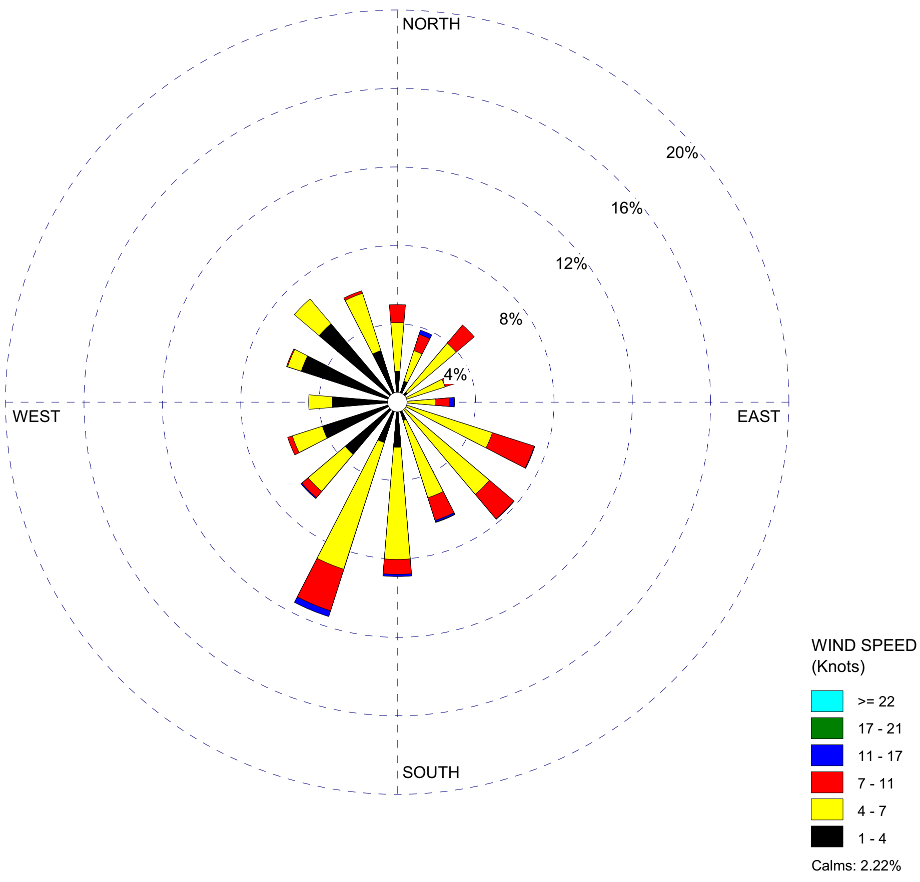


Figure 2.3-240 Fermi Site 10-m October Wind Rose (2003-2007)[EF3 COL 2.0-8-A]

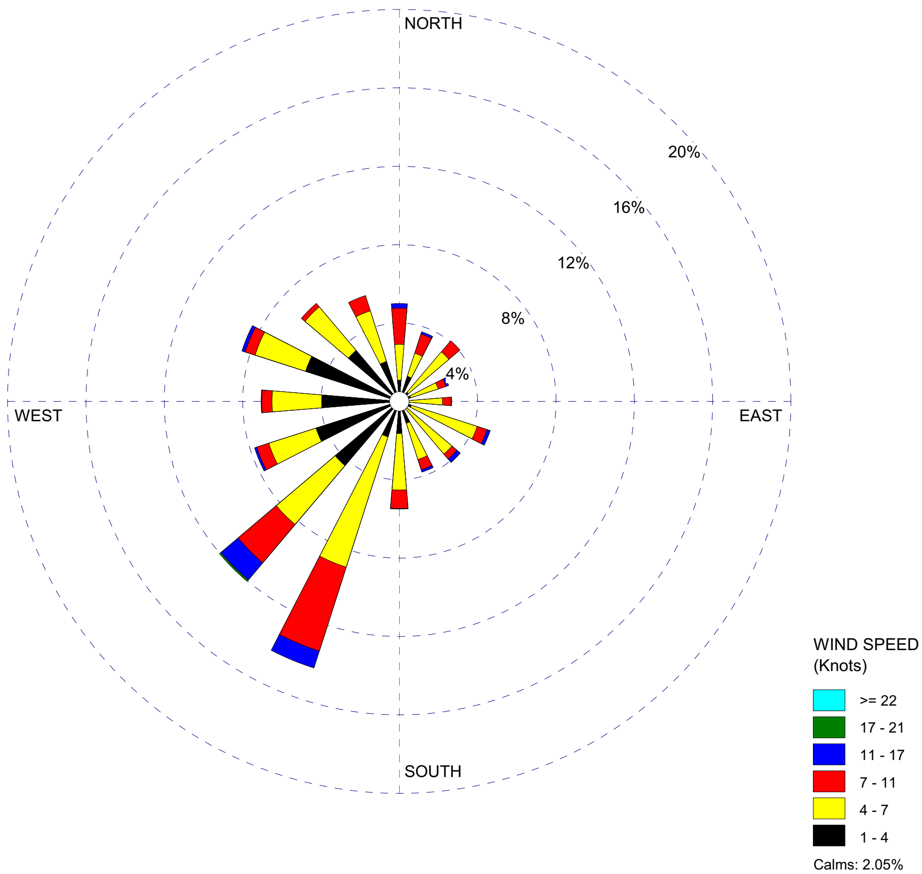


Figure 2.3-241 Fermi Site 10-m November Wind Rose (2003-2007) [EF3 COL 2.0-8-A]

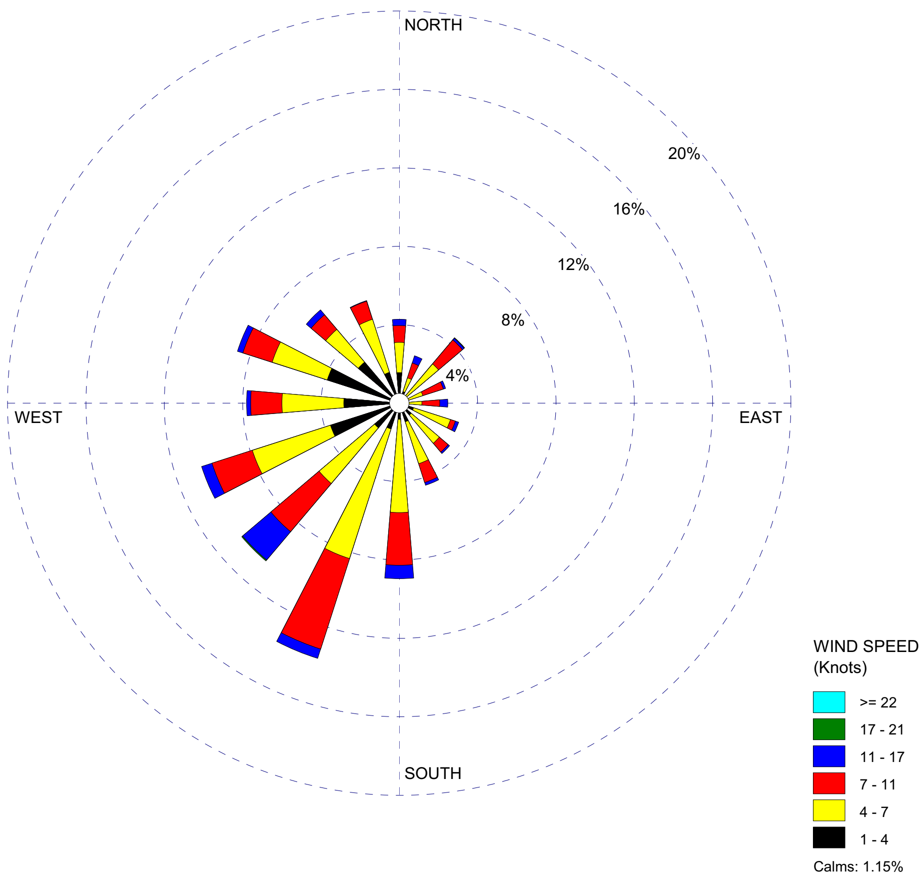


Figure 2.3-242 Fermi Site 10-m December Wind Rose (2003-2007) [EF3 COL 2.0-8-A]

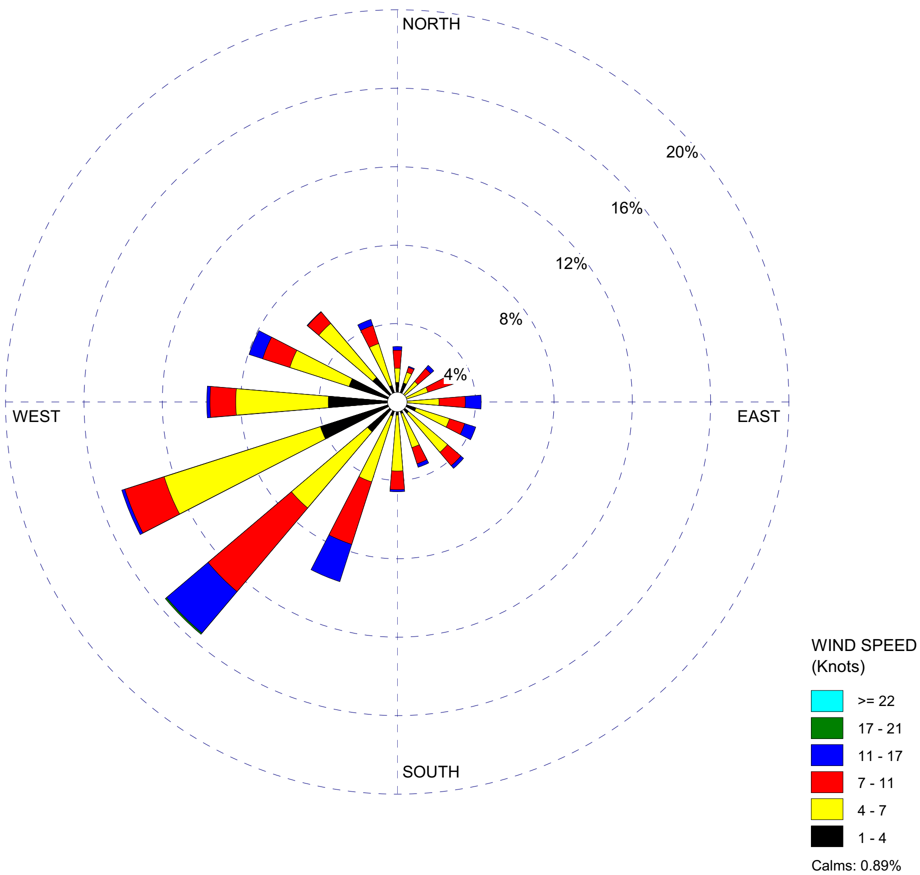


Figure 2.3-243 Fermi Site 60-m Annual Wind Rose (2003-2007) [EF3 COL 2.0-8-A]

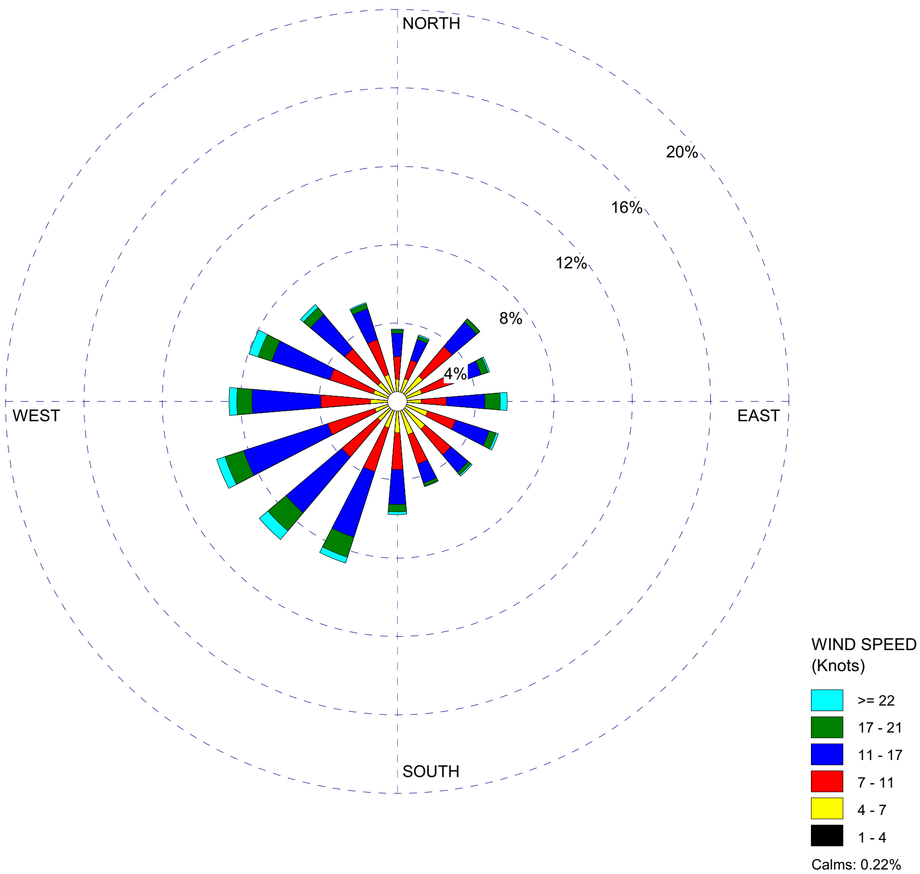


Figure 2.3-244 Fermi Site 60-m January Wind Rose (2003-2007)[EF3 COL 2.0-8-A]

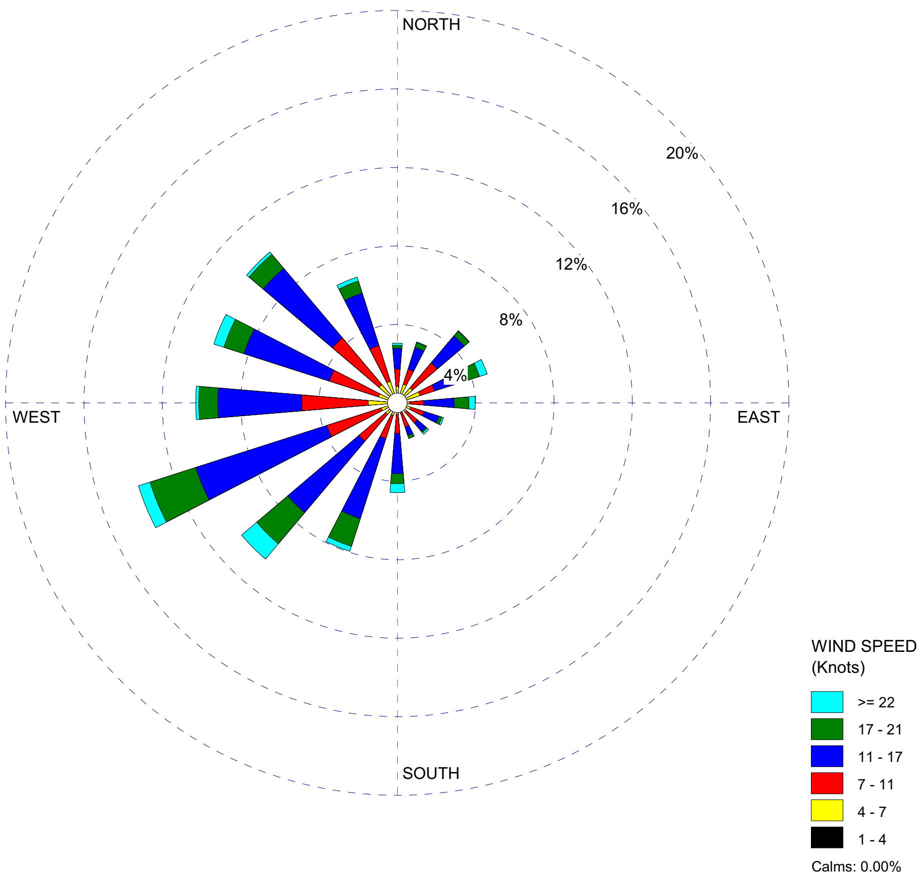


Figure 2.3-245 Fermi Site 60-m February Wind Rose (2003-2007) [EF3 COL 2.0-8-A]

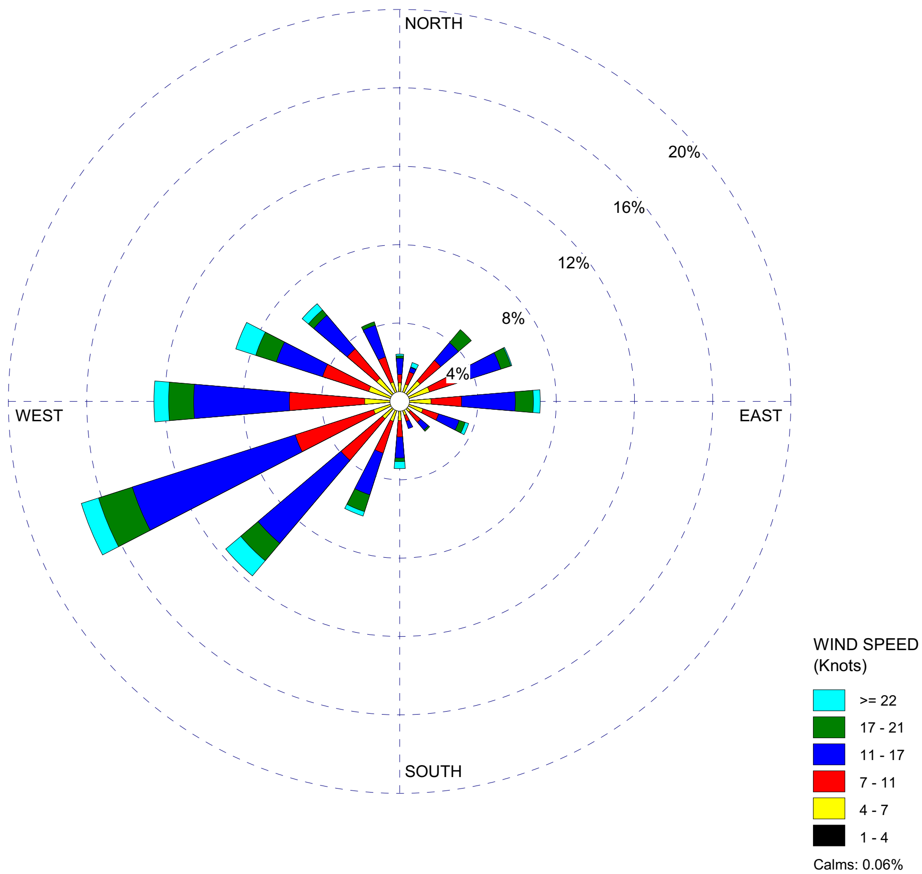


Figure 2.3-246 Fermi Site 60-m March Wind Rose (2003-2007) [EF3 COL 2.0-8-A]

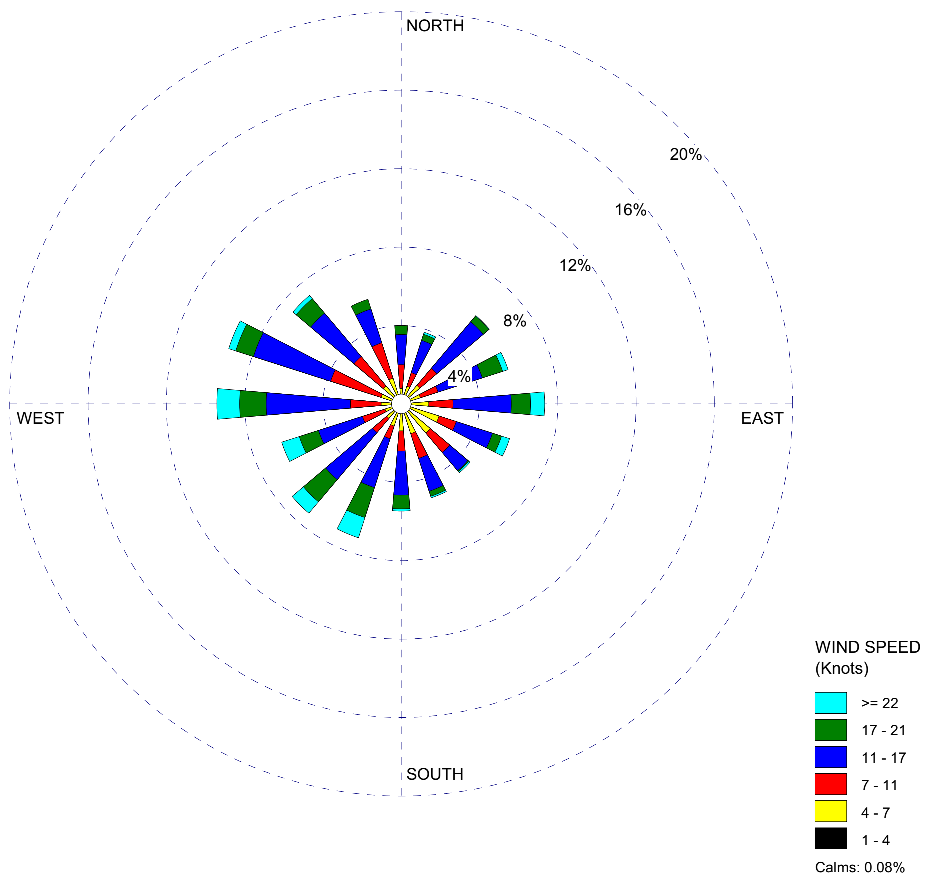


Figure 2.3-247 **Fermi Site 60-m April Wind Rose (2003-2007)** [EF3 COL 2.0-8-A]

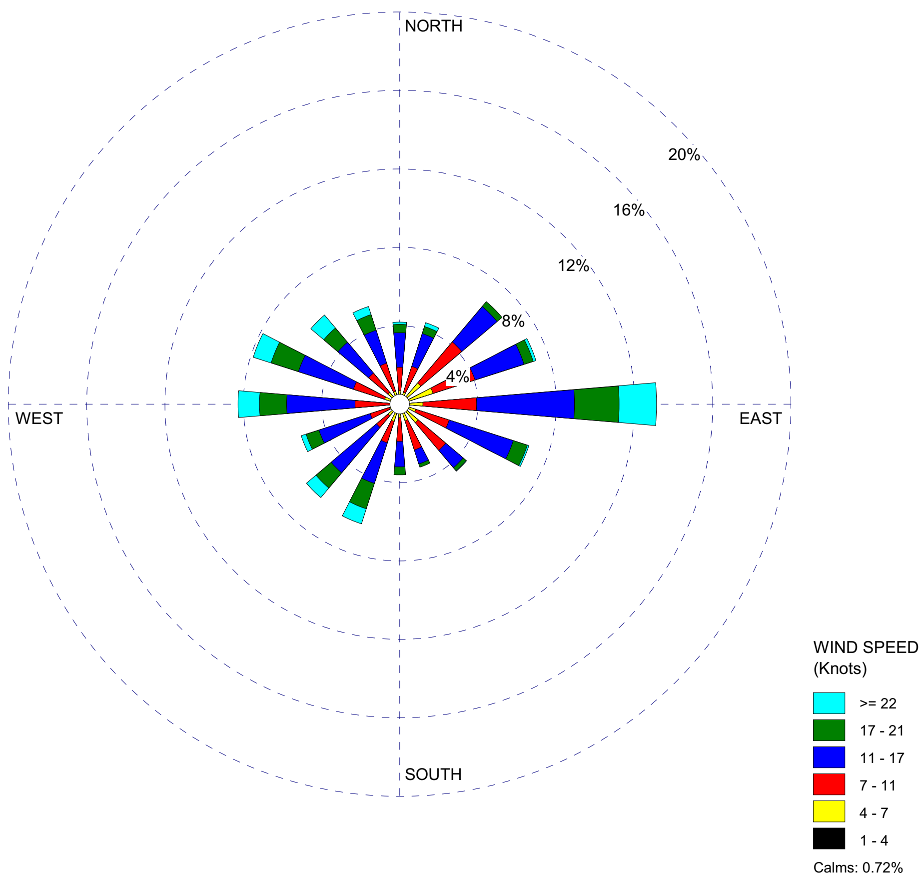


Figure 2.3-248 **Fermi Site 60-m May Wind Rose (2003-2007)** [EF3 COL 2.0-8-A]

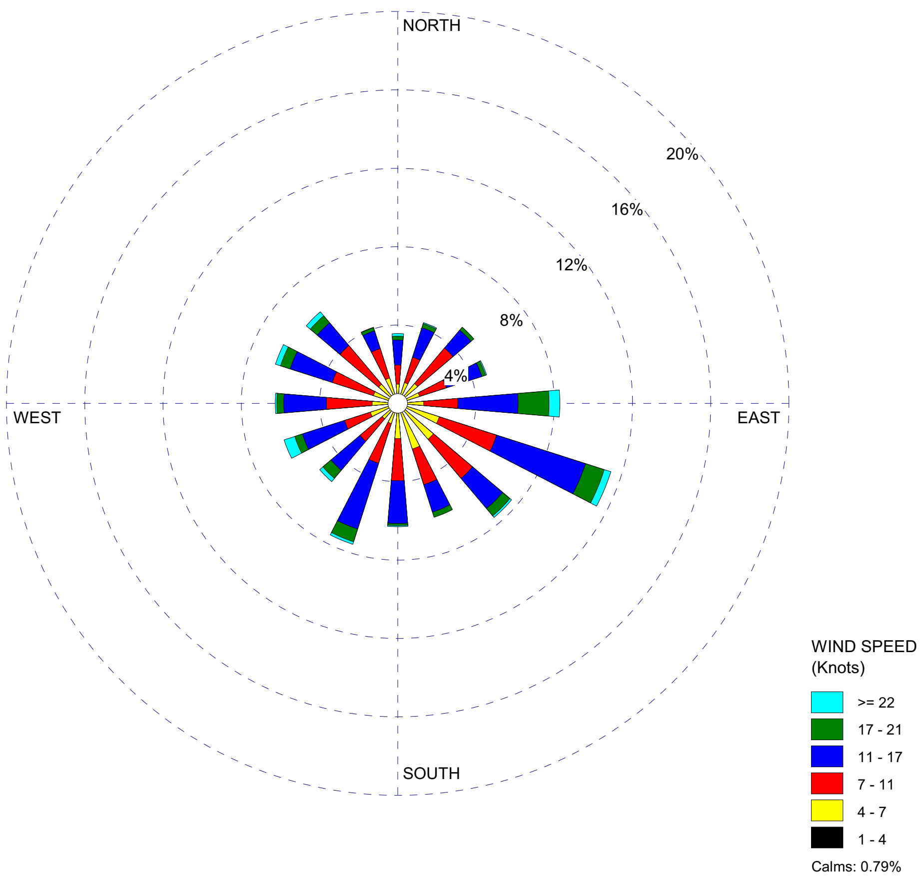


Figure 2.3-249 Fermi Site 60-m June Wind Rose (2003-2007) [EF3 COL 2.0-8-A]

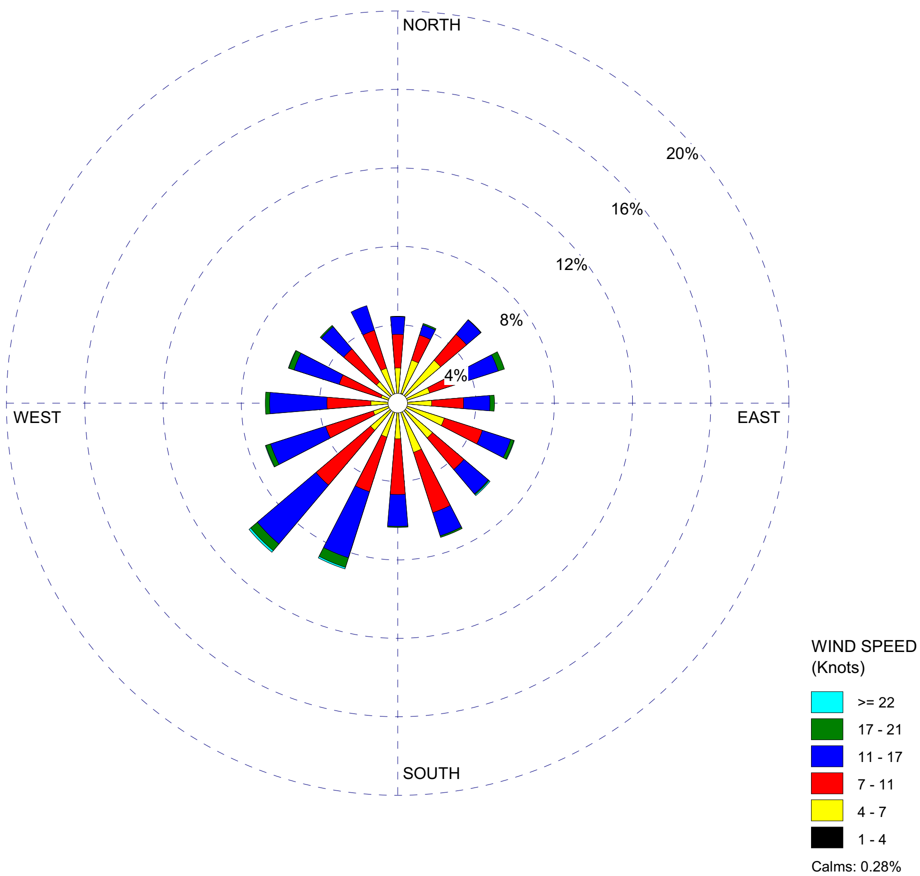


Figure 2.3-250 Fermi Site 60-m July Wind Rose (2003-2007) [EF3 COL 2.0-8-A]

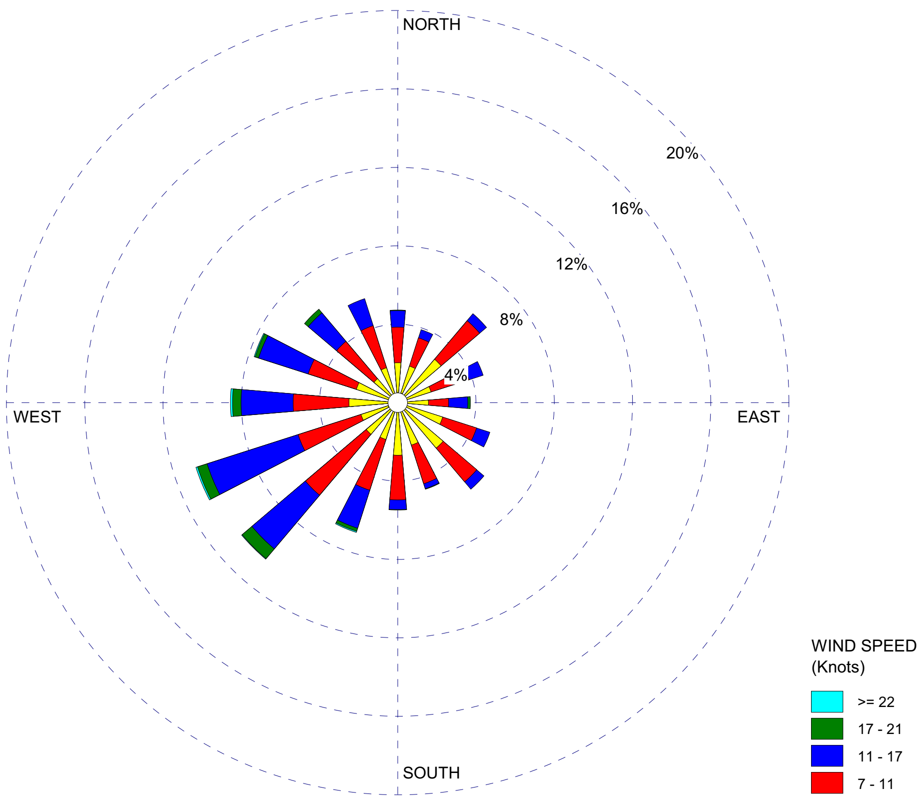


Figure 2.3-251 Fermi Site 60-m August Wind Rose (2003-2007) [EF3 COL 2.0-8-A]

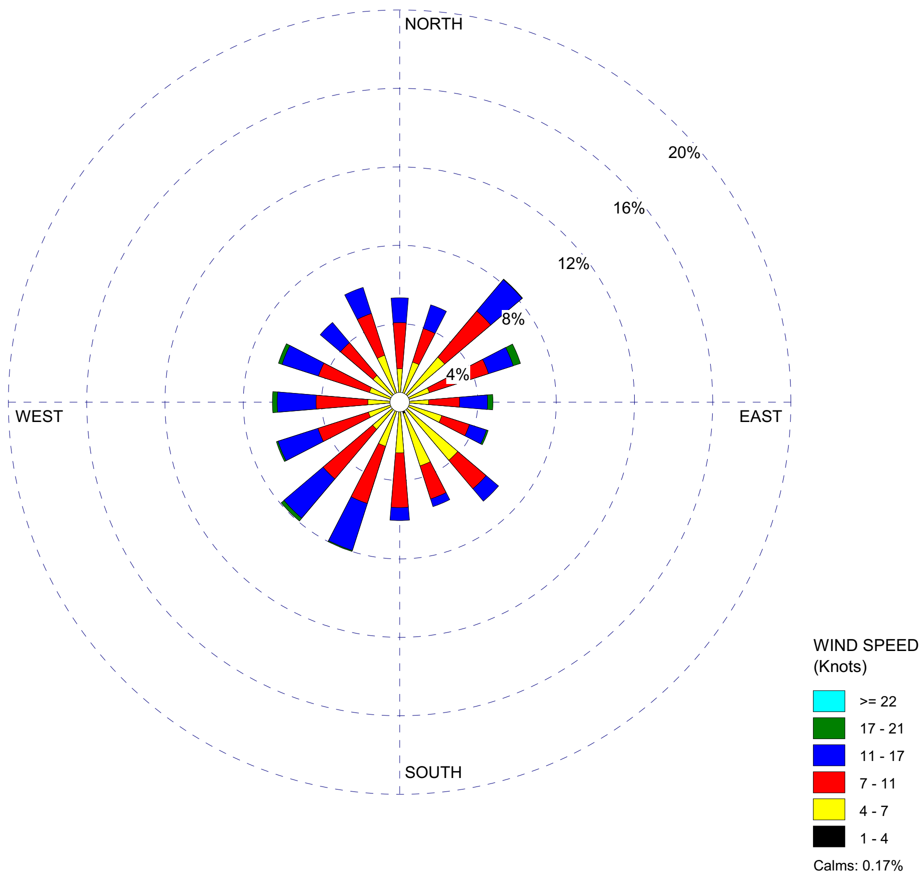


Figure 2.3-252 Fermi Site 60-m September Wind Rose (2003-2007) [EF3 COL 2.0-8-A]

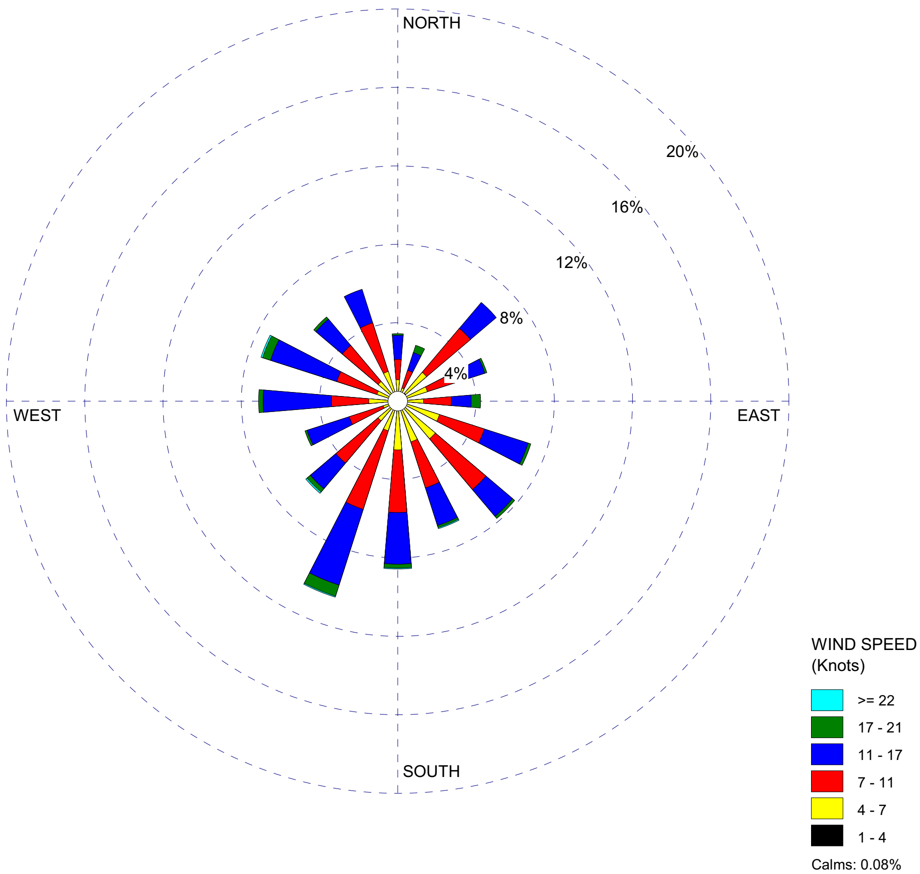


Figure 2.3-253 **Fermi Site 60-m October Wind Rose (2003-2007)**[EF3 COL 2.0-8-A]

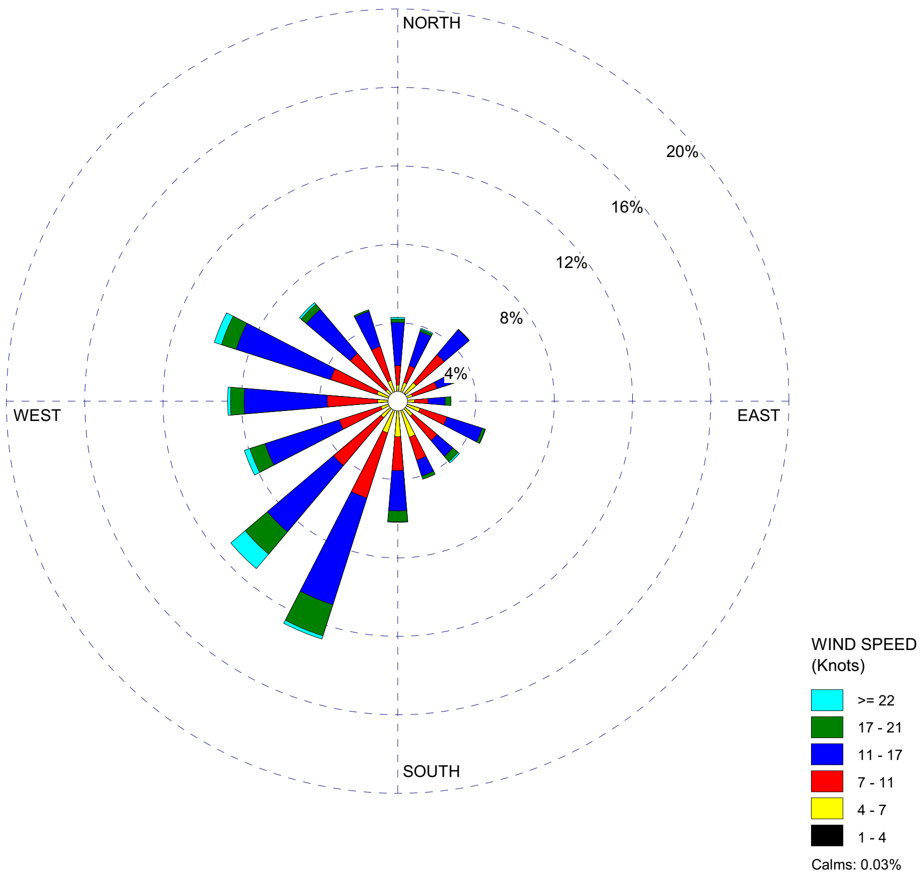


Figure 2.3-254 Fermi Site 60-m November Wind Rose (2003-2007) [EF3 COL 2.0-8-A]

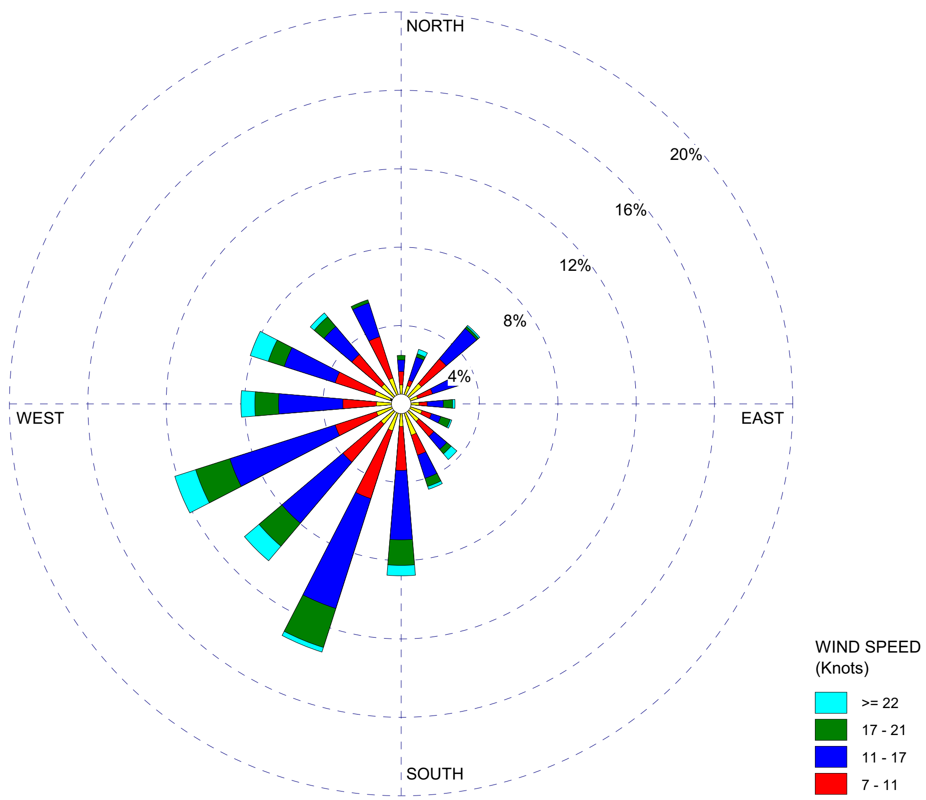


Figure 2.3-255 Fermi Site 60-m December Wind Rose (2003-2007) [EF3 COL 2.0-8-A]

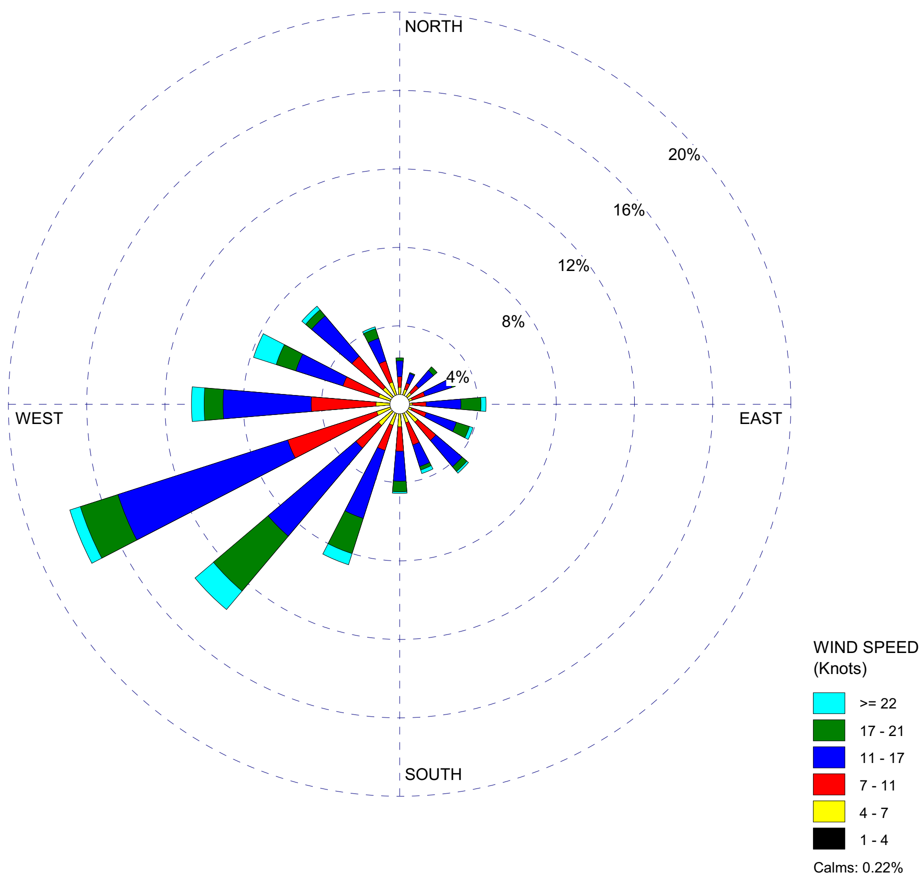


Figure 2.3-256 Topographic Features within 5 Miles of the Fermi Site [EF3 COL 2.0-8-A]

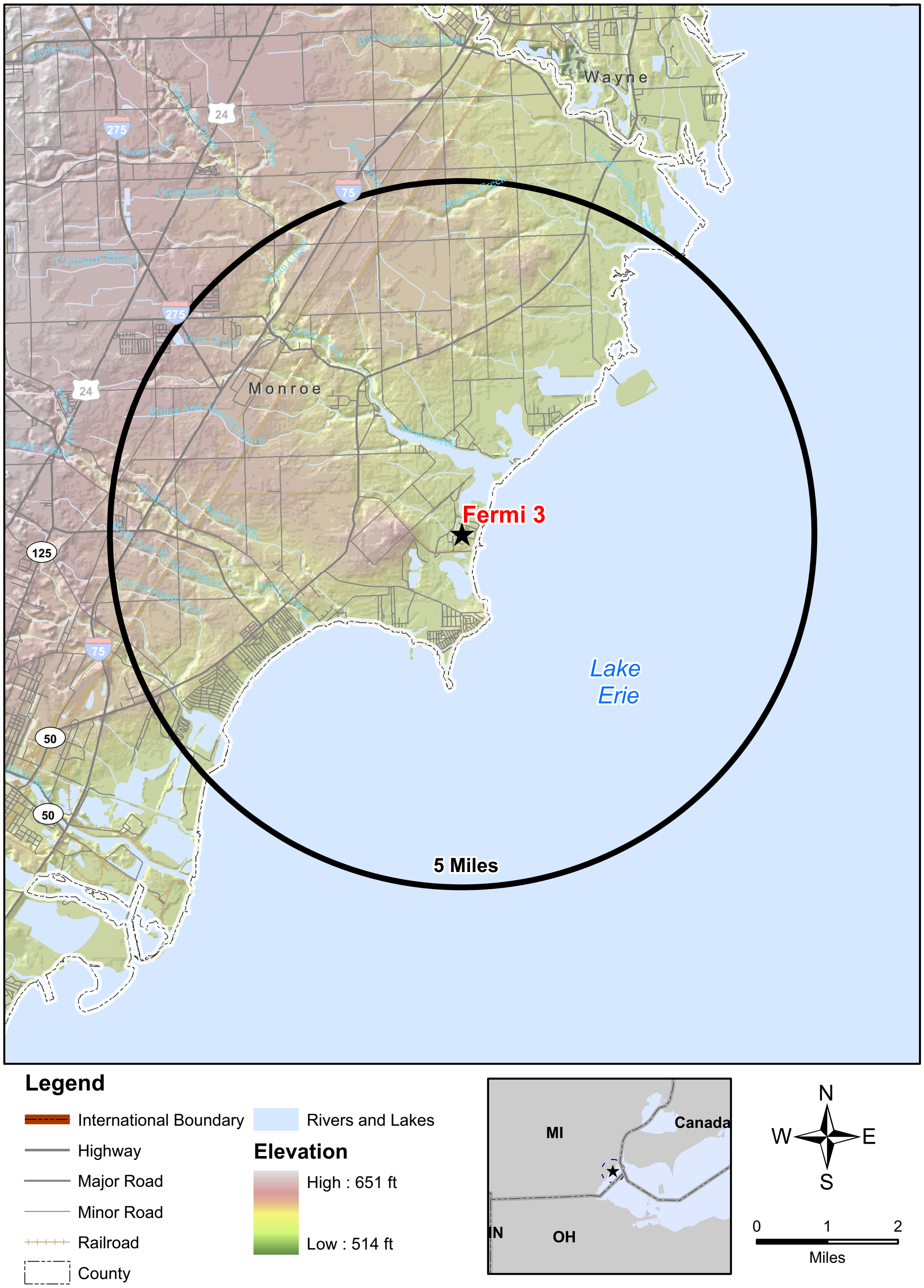
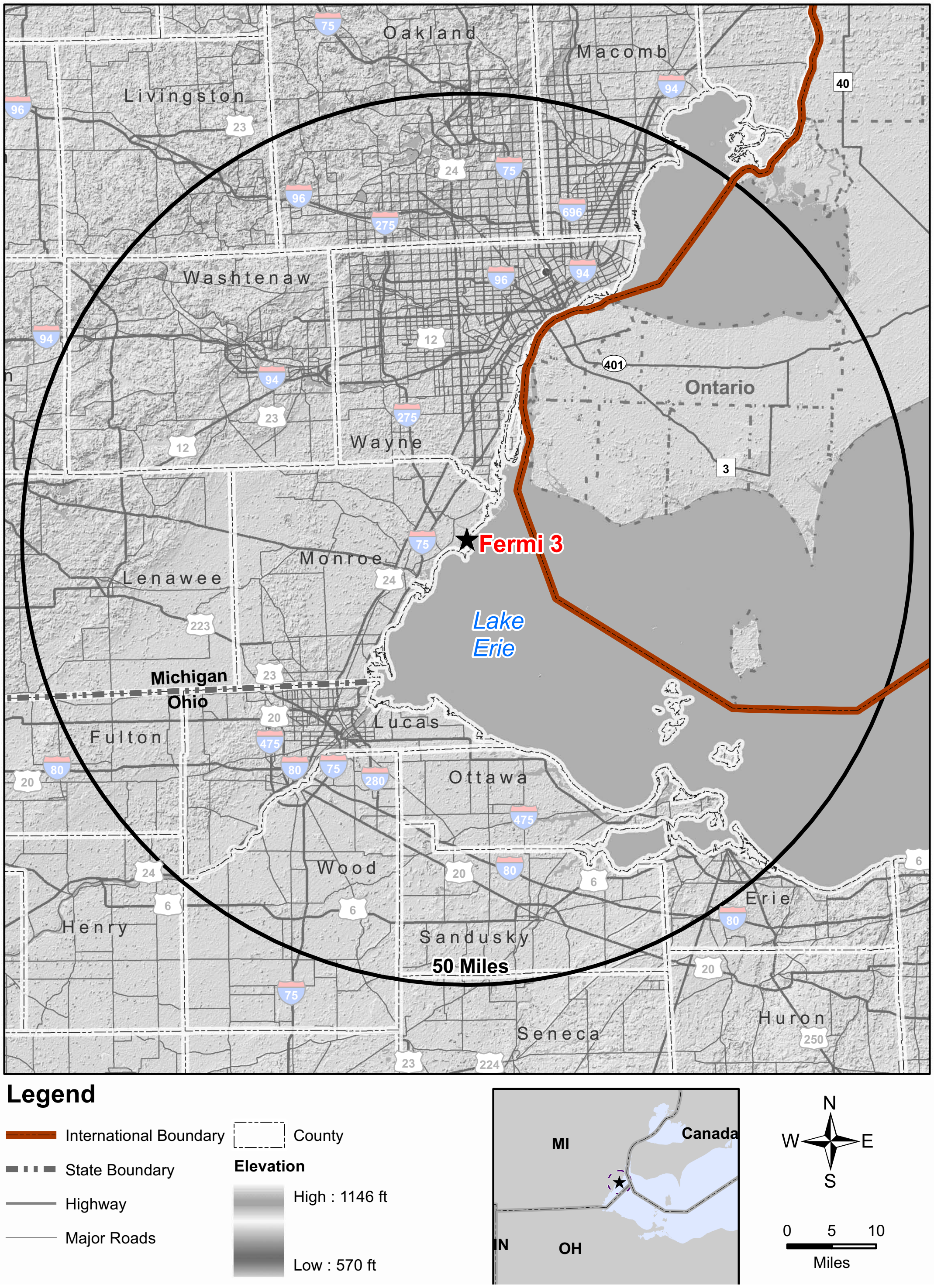
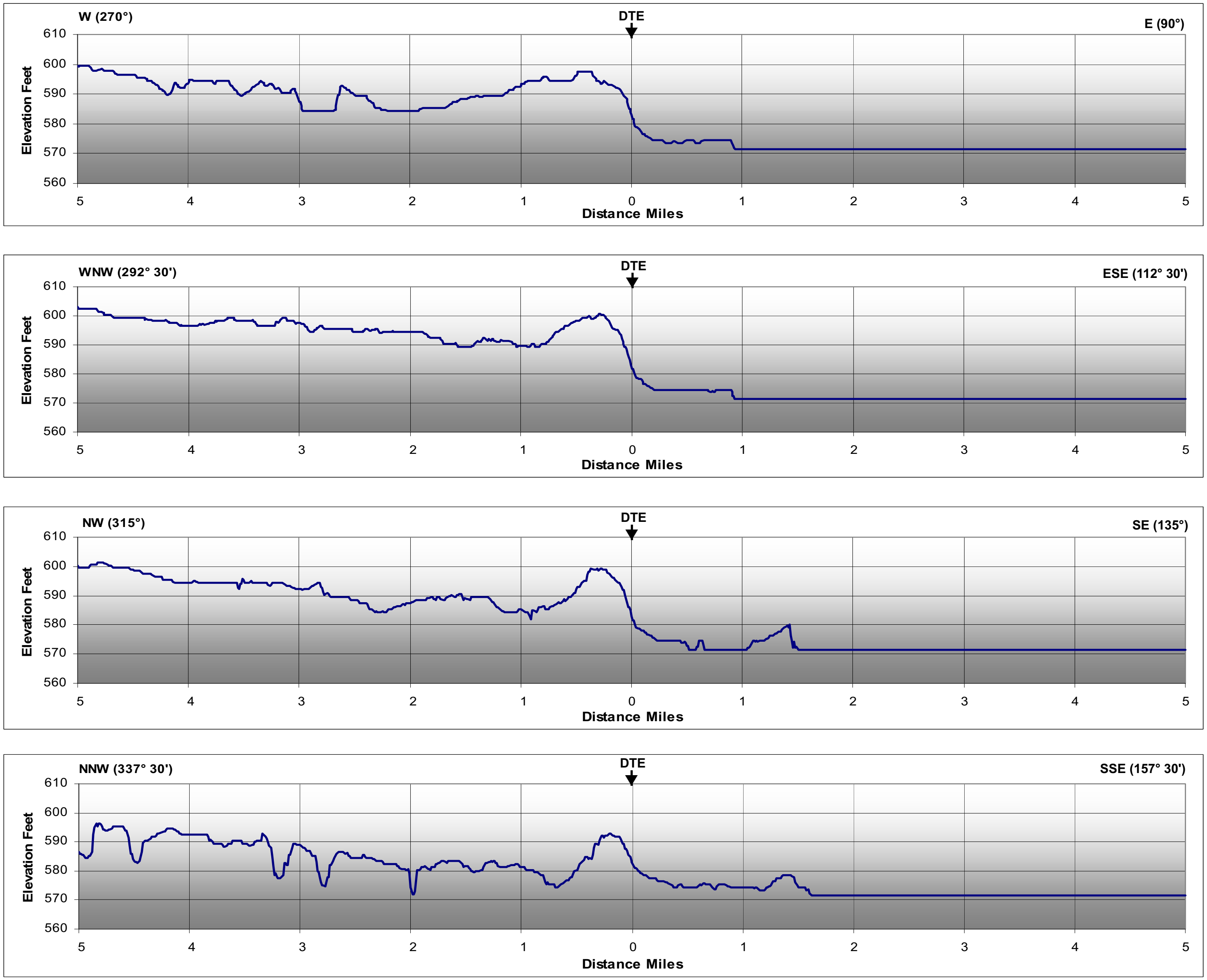


Figure 2.3-257 Topographic Features within 50 Miles of the Fermi Site [EF3 COL 2.0-8-A]




W (270°)
DTE
E (90°)
Elevation Feet
610
600
590
580
570
560
5 4 3 2 1 0 1 2 3 4 5
Distance Miles
WNW (292° 30')
DTE
ESE (112° 30')
Elevation Feet
610
600
590
580
570
560
5 4 3 2 1 0 1 2 3 4 5
Distance Miles
NW (315°)
DTE
SE (135°)
Elevation Feet
610
600
590
580
570
560
5 4 3 2 1 0 1 2 3 4 5
Distance Miles
NNW (337° 30')
DTE
SSE (157° 30')
Elevation Feet
610
600
590
580
570
560
5 4 3 2 1 0 1 2 3 4 5
Distance Miles

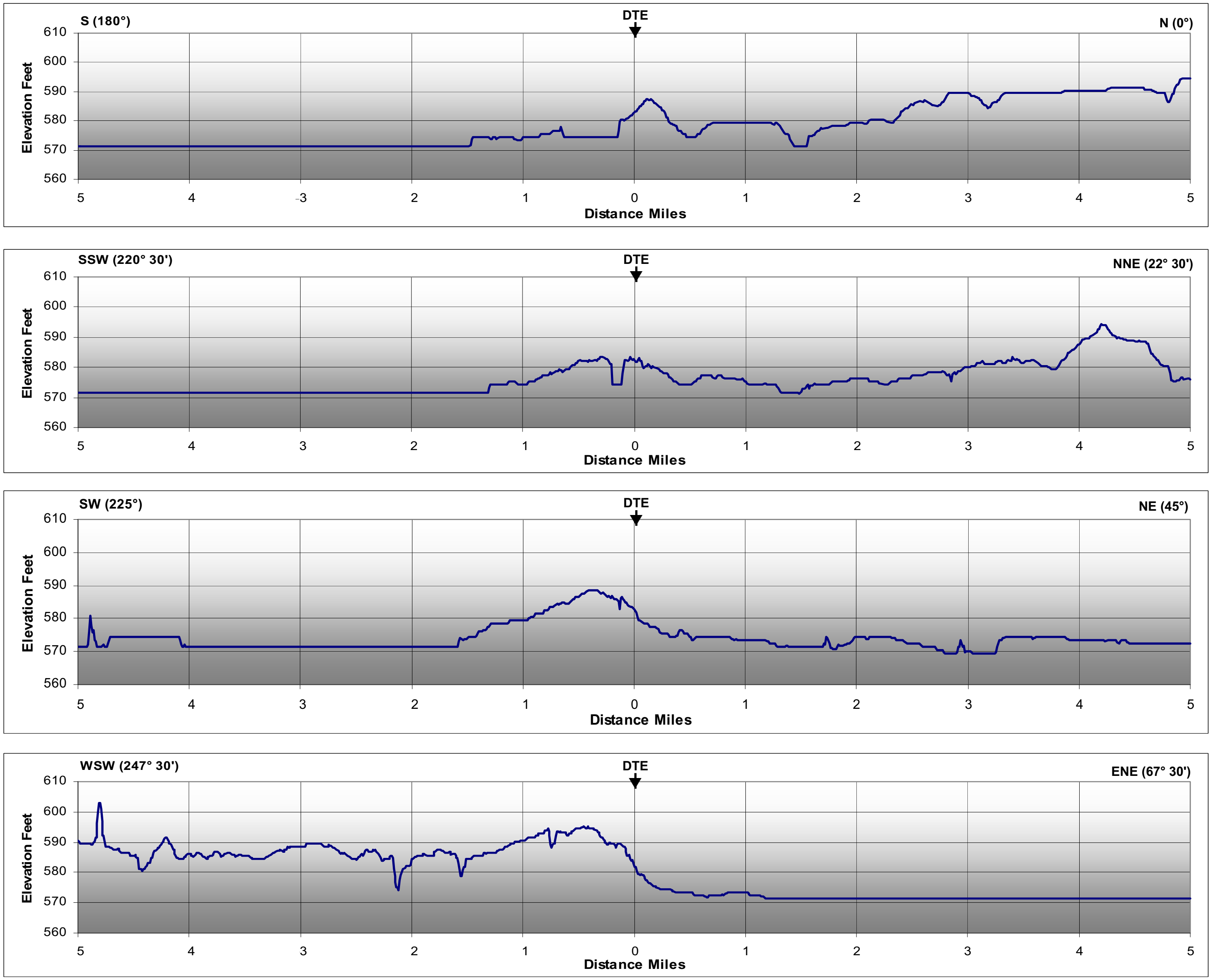

S (180°)
DTE
N (0°)
SSW (220° 30')
NNE (22° 30')
SW (225°)
NE (45°)
WSW (247° 30')
ENE (67° 30')
Elevation Feet
610
600
590
580
570
560
5
4
3
2
1
0
Distance Miles

Figure 2.3-259 Terrain Elevation Profiles Within 50 Miles of the Fermi Site (Sheet 1 of 2) [EF3 COL 2.0-8-A]

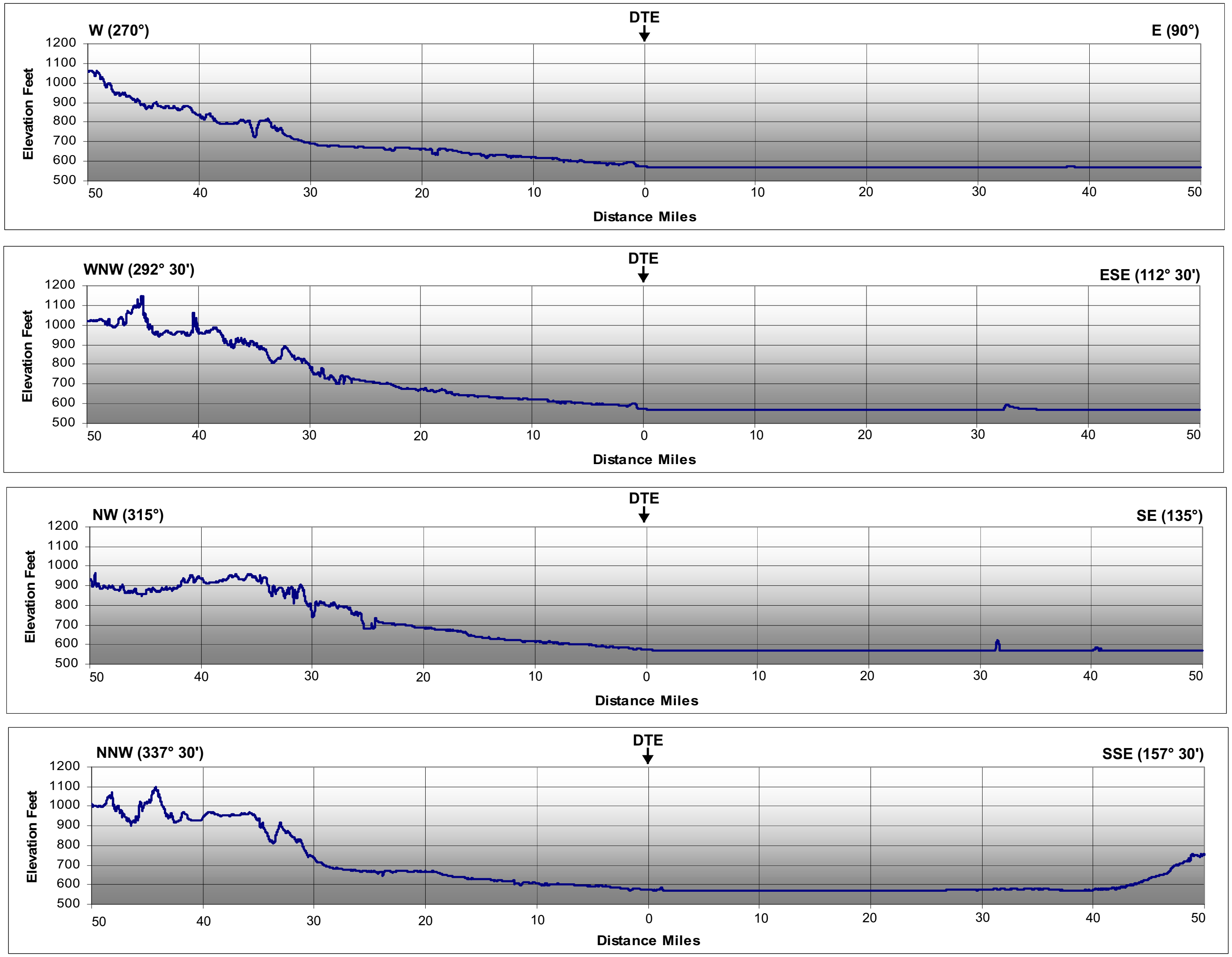
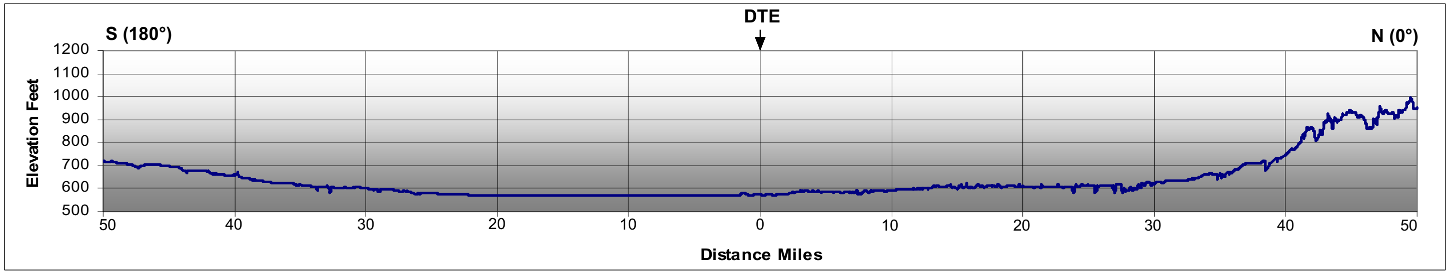
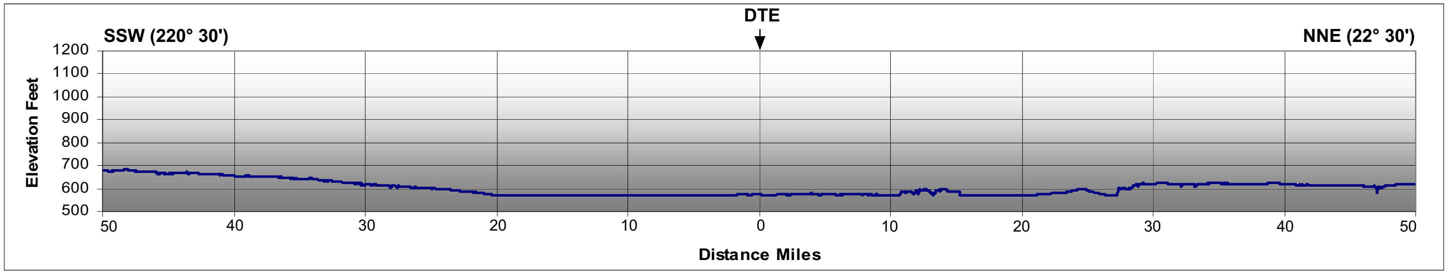
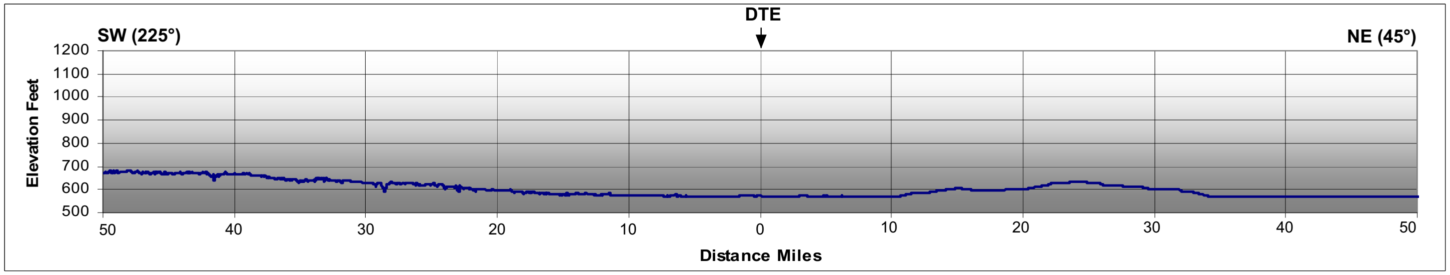


Figure 2.3-259 Terrain Elevation Profiles Within 50 Miles of the Fermi Site (Sheet 2 of 2) [EF3 COL 2.0-8-A]







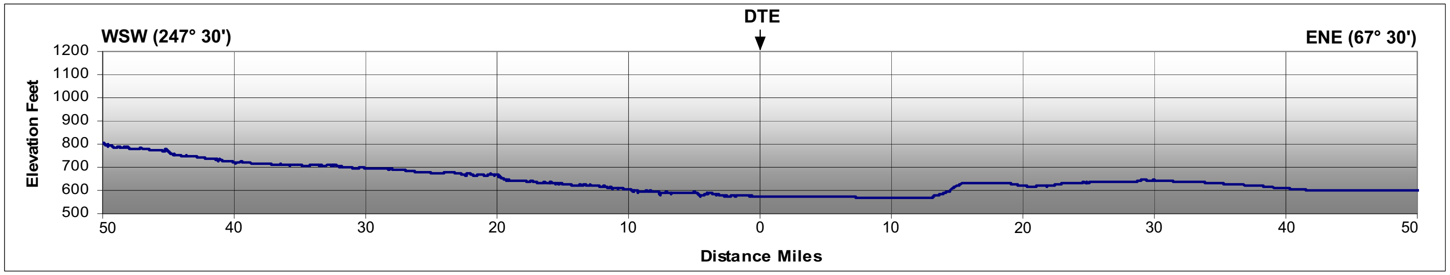


Figure 2.3-260 Process Flow Diagram of the Fermi Onsite Meteorological Monitoring Program [EF3 COL 2.0-9-A]