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2.3 METEOROLOGY

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

PTN SUP 2.3-1 The meteorological parameters associated within the approximately 50 mile region surrounding the Units 6 & 7 site and the site itself, as described within this section, are bounded by the site parameters specified in Table 2-1 of the DCD and as compared in Section 2.0 of this FSAR, except as noted.

2.3.1 REGIONAL CLIMATOLOGY

PTN COL 2.3-1 This subsection describes the climate within the approximately 50 mile radius region surrounding the Units 6 & 7 site. Also included in this subsection is a summary of the regional meteorological conditions that provide a basis for the design and operating conditions of Units 6 & 7. A climatological summary of normal and extreme values of relevant meteorological parameters is presented for the first-order National Weather Service (NWS) station (a first order station measures a wide number of meteorological parameters, operates 24 hours-a-day and is maintained by a NWS trained and certified staff) or Automated Surface Observing System stations. Figure 2.3.1-201 shows the locations of these meteorological observation stations with respect to the Units 6 & 7 site.

Subsection 2.3.1.1 identifies data sources used to develop these descriptions. Subsection 2.3.1.2 describes large-scale general climatic features and their relationship to conditions in the region.

Severe weather phenomena considered in the design and operating bases for Units 6 & 7 are described in Subsection 2.3.1.3 and include:

- Subsection 2.3.1.3.1 — Observed and probabilistic extreme wind conditions
- Subsection 2.3.1.3.2 — Tornadoes and related wind and pressure characteristics
- Subsection 2.3.1.3.3 — Tropical cyclones and related effects

- Subsection 2.3.1.3.4 — Observed and probabilistic precipitation extremes
- Subsection 2.3.1.3.5 — Frequency and magnitude of hail, snowstorms, and ice storms
- Subsection 2.3.1.3.6 — Frequency of thunderstorms and lightning
- Subsection 2.3.1.3.7 — Droughts and dust storms

Subsection 2.3.1.4 explains that the ultimate heat sink incorporated in the AP1000 design does not require long-term temperature and atmospheric water vapor characteristics to evaluate that system's performance. Subsection 2.3.1.5 provides design basis dry bulb and wet bulb temperature statistics considered in the design and operating bases of other safety- and nonsafety-related structures, systems, and components.

Subsection 2.3.1.6 characterizes climatological conditions in the region that may affect atmospheric dispersion. Finally, Subsection 2.3.1.7 describes climate changes in the context of the site's design bases (60-year warranted design life of the AP1000) and expected 40-year operating license period by evaluating the record of observations of temperature and rainfall (normals, means, and extremes) as they have varied over the last 70–80 years, and the occurrence of severe weather events in the region.

Climate-related site parameters on which the AP1000 design is based (i.e., wind speed, tornadoes, precipitation, and air temperatures) are identified in DCD Tier 1, Table 5.1-1 and DCD Tier 2, Table 2-1. Site-specific characteristics that correspond to these site parameters are addressed in Subsections 2.3.1.3.1 and 2.3.1.3.3 (for wind speed), 2.3.1.3.3 (for tornadoes), 2.3.1.3.4 (for precipitation), and 2.3.1.3.5 (for air temperatures). Table 2.0-201 compares the applicable site parameters and corresponding site-specific characteristic values.

2.3.1.1 Data Sources

Several sources of data are used to characterize regional climatological conditions pertinent to the Turkey Point site. This includes data acquired by the NWS at its Miami International Airport, Florida first-order station and from 16 other nearby locations in its network of cooperative observer stations, as compiled and summarized by the National Climatic Data Center (NCDC).

These climatological observing stations are located in Broward, Collier, Miami-Dade, and Monroe Counties, Florida. Table 2.3.1-201 identifies the specific stations and lists their approximate distance and direction from the midpoint between the Units 6 & 7 containment buildings at the site. Figure 2.3.1-201 illustrates these station locations relative to the site for Units 6 & 7. Onsite data sources are not used in describing regional climatology. The primary objective of an onsite meteorological monitoring program is to provide meteorological data representative of the project site that will be suitable for use in dispersion modeling assessments of routine as well as hypothetical radiological releases from the facility. In this regard, onsite data sources are used to prepare monthly and annual average joint frequency distributions of wind speed and wind direction by Pasquill stability category.

The objective of selecting nearby, offsite climatological monitoring stations is to demonstrate that the mean and extreme values measured at those locations are reasonably representative of conditions that might be expected to be observed at the Turkey Point site. The 50-mile radius circle shown in Figure 2.3.1-201 provides a relative indication of the distance between the climate observing stations and the Turkey Point site.

The identification of stations to be included was based on the following general considerations:

- Proximity to the site (i.e., within the nominal 50-mile radius indicated above, to the extent practicable).
- Coverage in all directions surrounding the site (to the extent possible).
- Where more than one station exists for a given direction relative to the site, a station was included if it contributed one or more extreme conditions (e.g., rainfall, snowfall, maximum or minimum temperatures) for that general direction or added context for variation of conditions over the site.

Nevertheless, if an overall extreme precipitation or temperature condition was identified for a station located within a reasonable distance beyond the nominal 50 miles and that event was considered to be reasonably representative for the site, such stations were also included, regardless of directional coverage.

Normals (i.e., 30-year averages), means (mean values of meteorological elements that are computed for a myriad of reasons by organizations and individuals), and extremes of temperature, rainfall, and snowfall are based on the following references:

- *2008 Local Climatological Data, Annual Summary with Comparative Data, Miami, Florida* (Reference 201).
- *Climatography of the United States, N. 20, 1971–2000, Monthly Station Climate Summaries* (Reference 202).
- *Climatography of the United States, No. 81, 1971–2000, U.S. Monthly Climate Normals* (Reference 203).
- *Utah Climate Center, Utah State University, Climate Data Base for Florida* (Reference 204).
- *Period of Record General and Monthly Climate Summaries for Cooperative Reporting Stations in the southeastern United States*, Southeast Regional Climate Center (References 205 and 206).

First-order NWS stations also record measurements, typically every hour, of other weather elements, including winds, several indicators of atmospheric moisture content (i.e., relative humidity, dew point, and wet bulb temperatures), and barometric pressure, as well as other conditions when they occur (e.g., fog, thunderstorms). Occasionally the NWS data may be missing or contain human, instrumentation or computer errors; the NCDC compiles, filters and quality-controls NWS observations, making the data "Official." Table 2.3.1-202 presents the long-term characteristics of these parameters, excerpted from the NCDC 2008 local climatological data (LCD) summary for the Miami, Florida, NWS station.

Additional data sources were also used in describing the climatological characteristics of the region, including:

- 2005 ASHRAE Handbook, Chapter 28, Climatic Design Conditions (Reference 207).
- Minimum Design Loads for Buildings and Other Structures (Reference 208).
- Historical Hurricane Tracks Storm Query, 1851 through 2007 (Reference 209).
- The Climate Atlas of the United States (Reference 210).
- Climate of Florida, No. 60 (Reference 211).

- Storm Events for Florida, Hail, Snow and Ice, Drought, Tornado, Hurricane and Tropical Storm, and Dust Storm Event Summaries (References 212, 213, and 214).
- Air Stagnation Climatology for the United States (1948-1998) (Reference 215).
- Ventilation Climate Information System (Reference 216).
- Seasonal Variation of 10-Square-Mile Probable Maximum Precipitation Estimates, United States East of the 105th Meridian, Hydrometeorological Report No. 53, June 1980 (Reference 217).
- Climatography of the United States, No. 85, Divisional Normals and Standard Deviations of Temperature, Precipitation, and Heating and Cooling Degree Days 1971-2000 (and previous normal periods) (Reference 218).

2.3.1.2 General Climate

Units 6 & 7 are on the lower east coast of Florida within the Atlantic Coastal Ridge which is a flat stretch of land that borders the Atlantic Ocean, including the Gulf of Mexico (see Figure 2.3.1-201). The location of Units 6 & 7 is relatively flat with an elevation of approximately 25.5 feet NAVD 88. Elevations within 50 miles of the site range from 2.49 feet below MSL to the north-northeast to 86.12 feet above MSL to the north. Biscayne Bay is located directly east of the site of Units 6 & 7.

The state of Florida is divided into seven climate divisions. A climate division represents a region within a state that is as climatically homogeneous as possible. Division boundaries generally coincide with county boundaries. The Turkey Point site is located within Climate Division 6 (lower east coast), which includes a majority of Miami-Dade, Broward, Palm Beach, and Martin counties. (Reference 219)

The general climate in this division is classified as subtropical maritime (or humid subtropical) and is characterized by long and warm summers, with abundant rainfall, followed by mild, dry winters (Reference 201). The chief factors that govern the climate are latitude, land and water distribution, prevailing winds, storms, pressure systems, and ocean currents. The wet season, which is hot and humid, lasts from May to October. The wet season gives way to the dry season, which features mild temperatures with some invasions of colder air, which is when the little winter rainfall occurs with the passing of a cold front. (Reference 211)

The Azores-Bermuda high-pressure system exerts a powerful influence on the weather during the winter months. Within high-pressure systems air subsides, and as a consequence, precipitation is suppressed. The Azores-Bermuda high remains over the Sahara Desert throughout the year, but extends over Florida during the winter. As the water around the peninsula warms in the spring, the high-pressure system over Florida weakens and the summer rains begin. In some years, the influence of the Azores-Bermuda high-pressure system is greater than others, so even in the Units 6 & 7 area, rain may fall in the winter. (Reference 211) Because of the clockwise circulation around the western extent of the Azores-Bermuda high-pressure system and the nearness of the Atlantic Ocean, maritime tropical air mass characteristics prevail much of the year. Together, these factors govern late spring, summer, and early fall temperature and precipitation patterns. The climate of southern Florida does not favor the conditions that cause air stagnation.

The marine influence of the Atlantic Ocean is evident by the low daily range of temperature and the rapid warming of cold air masses that pass to the east of the state. The regional area is subject to winds from the east and southeast about half of the time, and in several specific respects has a climate whose features differ from farther inland. One of the features is the annual precipitation for the area. During the early morning hours, more rainfall occurs along the beach areas than at Miami International Airport, while during the afternoon, the reverse situation is true. The Miami International Airport is located approximately 9 miles inland (Reference 201)**.** Monthly precipitation exhibits a cyclical pattern, with the predominant maximum occurring in the summer months and the minimum occurring during the winter months (see Table 2.3.1-202).

An even more striking difference appears in the annual number of days with temperatures reaching 90 degrees or higher, with inland stations having four times more annual days than the beach areas. Minimum temperature contrasts are also particularly marked under proper conditions, with the difference between inland locations and the beach areas frequently reaching to 15 degrees or more, especially in the winter. Freezing temperatures occur occasionally in the inland suburban areas and farming districts, but rarely near the ocean (Reference 201).

The region is subject to sea/land breeze circulations, local winds that are driven by the differential heating of the air over the ocean and over the land surface. Sea breezes are stronger than land breezes because the difference in temperature and air density between the land and the sea is greater during the day than at night. In south Florida the existence and intensity of the sea breeze depends strongly on seasonal and latitudinal factors as well as on the time of day. Sea/land breeze circulations influence local temperature, humidity, wind speed and wind direction and precipitation. The most notable sea breeze impacts are a shift in wind to the onshore direction, an increase in wind speed, a decrease in temperature and an increase in humidity.

The El Niño-Southern Oscillation is a physical phenomenon that occurs in the equatorial Pacific Ocean where the water temperature oscillates between being unusually warm (El Niño) and unusually cold (La Niña). El Niño and La Niña are among the strongest drivers of the climate of North America, with impacts that vary across different regions. These oceanic events shift the position of the jet streams across the continent, which act to steer the fronts and weather systems. The southeast United States experiences particularly strong long-term weather shifts, with Florida experiencing the greatest impacts. El Niño typically brings 30 to 40 percent more rainfall and cooler temperatures to Florida in the winter, while La Niña brings a warmer and much drier than normal winter and spring. La Niña is frequently a trigger to periodic drought in Florida (Reference 211). El Niño contributes to fewer Atlantic hurricanes, while La Niña contributes to more Atlantic hurricanes.

Florida is only exceeded by Louisiana as the wettest state in the nation. Most of the rain that falls on Florida is convective. It is in the intensity of its precipitation that Florida differs from states farther north. The Panhandle and southeastern Florida are the wettest parts of the state. Coastal locations, including the Keys, receive less rain than those locations nearby but farther in the interior because coastal locations do not provide as good an environment for convectional heating. A large share of Florida's precipitation falls during periods of torrential rain, which here is defined as three inches or more in a 24-hour period. (Reference 211)

Summer rain is generally in the form of local thunderstorms, or thunderstorms that form in long squall lines created when hot humid air from the Atlantic Ocean converges with equally hot and humid air from the Gulf of Mexico. In southeast Florida, on average, thunderstorms occur most frequently during June and July and the area experiences approximately 69 thunderstorms per year. The state usually leads the nation in lightning deaths because of the large number of people involved in outdoor activities such as swimming, boating, and golfing. The months of June, July, and August have the highest frequency of dangerous lightning events (Reference 201).

Tropical storms in southeast Florida have occurred in the month of February and from May through November. Hurricanes occasionally affect the area with the greatest frequency occurring in September and October.

Florida experiences more tornadoes per 10,000 square miles than any state in the nation. Fortunately, most Florida tornadoes are much lower in intensity than those in the Great Plains and destructive tornadoes are very rare. Funnel clouds are occasionally sighted offshore (waterspouts) during the summer months and a few touch the ground briefly but significant damage is seldom reported (Reference 201). Further information regarding tornadoes and tropical cyclones is presented in Subsections 2.3.1.3.2 and 2.3.1.3.3, respectively.

2.3.1.3 Severe Weather

This subsection addresses severe weather phenomena that affect the Turkey Point region and that are considered in the design and operating bases for the plant. These include:

- Observed and probabilistic extreme wind conditions (Subsection 2.3.1.3.1)
- Tornadoes and related wind and pressure characteristics (Subsection 2.3.1.3.2)
- Tropical cyclones and related effects (Subsection 2.3.1.3.3)
- Observed and probabilistic precipitation extremes (Subsection 2.3.1.3.4)
- The frequencies and magnitude of hail, snowstorms, and ice storms (Subsection 2.3.1.3.5)
- The frequencies of thunderstorms and lightning (Subsection 2.3.1.3.6)
- Droughts and dust (sand) storms (Subsection 2.3.1.3.7)

Included in the information provided in several of these subsections are climate-related site characteristics and their corresponding site parameters in DCD Tier 1, Tables 5.0-1 and Tier 2, Table 2-1; Subsections 2.3.1.3.1, 2.3.1.3.2, 2.3.1.3.3, and 2.3.1.3.4.

2.3.1.3.1 Extreme Winds

From a climatological standpoint, the frequency of peak wind speed gusts can be characterized from information in the *Climate Atlas of the United States* (Reference 210), which is based on observations made over the 30-year period of record from 1961 to 1990. Frequencies of occurrence were developed from values reported as the 5-second peak gust for the day. Mean annual occurrences of peak gusts greater than or equal to 50 mph, 40 mph, and 30 mph in the Units 6 & 7 site range between 0.5 and 1.4 days per year, less than 9.5 days per year, and between 40.5 and 50.4 days per year, respectively (Reference 210).

Estimating the wind loading on plant structures for design and operating bases considers the "basic" wind speed, which is the "3-second gust speed at 33 feet (10 meters) above the ground in Exposure Category C," as defined in Sections 6.2 and 6.3 of the ASCE-SEI design standard, *Minimum Design Loads for Buildings and Other Structures* (Reference 208).

The "basic" wind speed is approximately 150 mph, as estimated from the plot of basic wind speeds in Figure 6-1B of ASCE 7-05 (Reference 208) for that portion of the United States that includes the Turkey Point site. The site is located in a hurricane prone region as defined in Section 6.2 of the ASCE-SEI design standard, that is, along the U.S. Atlantic Ocean and Gulf of Mexico coasts where the basic wind speed is greater than 90 mph (Reference 208).

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From a probabilistic standpoint, 150 mph is associated with a mean recurrence interval of 50 years. This value exceeds the design value wind velocity given in DCD Subsection 3.3.1.1. The higher wind velocity does not adversely affect any safety-related systems, structures, and/or components. Section C6.0 (Table C6-3) of the ASCE-SEI design standard provides conversion factors for estimating 3-second gust wind speeds for other recurrence intervals (Reference 208). Based on this guidance, the 100-year return period value is determined by multiplying the 50-year return period value by a scaling factor of 1.07, which yields a 100-year return period 3-second gust wind speed for the site of approximately 161 mph.

For the period of record (1851–2007), there were two Category 5 hurricanes (the unnamed hurricanes of 1935 and 1947). Both hurricanes had maximum 1-minute wind speeds of 140 knots (161 mph) (Reference 209). Hurricane Andrew occurred in 1992 was classified as Category 4 with a 1-minute average wind speed of 130 knots (150 mph) (Reference 225). However, in a post event reanalysis (References 238 and 239) Hurricane Andrew was upgraded to Category 5. The winds at landfall were assigned a sustained 1-minute wind speed of 145 knots (167 mph). The associated 3-second gust wind speed would be 204 mph using a conversion factor from Figure C6-4 of ASCE/SEI 7-05 (Reference 208). Additionally, using the guidance of RG 1.221 (Reference 240), it was determined that the nominal 3-second gust wind speed that can be expected to occur at the Turkey Point site with a return period of 1.0E07 years is

260 mph. The 3-second gust wind speed was determined by digitizing the contours from Figure 1 of RG 1.221, and overlaying the Turkey Point site location.

Subsection 2.3.1.3.3 addresses rainfall extremes associated with tropical cyclones that have passed within 100 nautical miles of the Turkey Point site. It concludes with a description of observed or estimated sustained wind speeds and wind gusts accompanying several of the more intense hurricanes that have made landfall and tracked through this radial area.

This climate-related site characteristic value (i.e., the 3-second gust wind speed) is one of the wind speed-related site parameters listed in DCD Tier 1, Table 5.1-1 and DCD Tier 2, Table 2-1. Refer to Table 2.0-201 for a comparison of the corresponding site parameter values.

2.3.1.3.2 Tornadoes

The design basis tornado characteristics applicable to structures, systems, and components important to safety include the following parameters as identified in RG 1.76 (Reference 220):

- Maximum wind speed
- Translational speed
- Maximum rotational speed
- Radius of maximum rotational speed
- Pressure drop
- Rate of pressure drop

Based on Figure 1 of RG 1.76 and the coordinates for the midpoint between the Units 6 & 7 containment buildings (see Subsection 2.1.1.2), the Turkey Point site is located within Tornado Intensity Region II. The design basis tornado characteristics for Tornado Intensity Region II (Reference 220) that apply to the Turkey Point site are:

- Maximum wind speed = 200 mph
- Translational speed = 40 mph
- Maximum rotational speed = 160 mph

- Radius of maximum rotational speed = 150 feet
- Pressure drop = 0.9 pounds per square inch (psi)
- Rate of pressure drop = 0.4 psi per second

Revision 1 of RG 1.76 retains the same 1E-07 exceedance probability for tornado wind speeds as the original version of that RG. Revision 2 of NUREG/CR-4461 (Reference 221) describes the relationship between the Original Fujita Scale of wind speed ranges for different tornado intensity classifications and the Enhanced Fujita Scale wind speed ranges. NUREG/CR-4461, Rev. 2 was the basis for most of the technical revisions to RG 1.76. The tornado-related site parameter values listed in DCD Tier 1, Table 5.0-1 and DCD Tier 2, Table 2-1 exceed (are more severe than) the design basis tornado characteristics listed above.

Tornadoes observed in a 2-degree latitude and longitude square, centered on the Turkey Point site, are used to characterize their frequency of occurrence from a climatological standpoint, per RG 1.76. The data was obtained from the NCDC *Storm Events* database of tornado occurrences by location, date, and time, starting and ending coordinates, Fujita Scale wind speed classification (or F-scale), Pearson Scale path length and path-width dimensions (or P-scale), and other storm-related statistics (Reference 213).

The 2-degree square area for this evaluation includes all or portions of six counties in Florida that include Broward, Collier, Hendry, Miami-Dade, Monroe, and Palm Beach Counties. All tornado occurrences in the six counties were queried for tornado occurrences in the 2-degree latitude/longitude square. Through the nearly 59-year period from 1950 through July 2008, the records in the database indicate that 297 tornadoes occurred in the 2-degree latitude/ longitude square (Reference 213).

Tornado F-scale classifications (with corresponding wind speed range based on the Original Fujita Scale of wind speeds) and respective occurrences are as follows:

Tornado F-scale Classification	Corresponding Wind Speed Range in meters per second	Respective Occurrences
F5	≥117 (261 – 318 mph)	0
F4	93 to 116 (207 – 260 mph)	0
F3	70 to 92 (158 – 206 mph)	4
F2	50 to 69 (113 – 157 mph)	17
F1	33 to 49 (73 – 112 mph)	65
F0	18 to 32 (40 – 72 mph)	211

Twelve of the tornadoes are assigned an undefined F-scale magnitude of "F" in the *Storm Events* database, because the begin location and end location are both unknown and most have no description of the incident available. These events are assumed to be comparable to an F0 classification (Reference 213).

Tornadoes have occurred in the site area during every month of the year with a peak frequency occurring in the summer. On a monthly basis, the greatest number of events has been recorded in June followed by the second-highest count during August followed by the third highest count during May. The lowest percent of the tornadoes have occurred during the winter months (Reference 213).

Tornadoes that occur over a body of water are called waterspouts. Waterspouts probably occur more frequently in the Florida Keys than anywhere else in the world (Reference 222). Waterspouts are generally broken into two categories: fair weather waterspouts and tornadic waterspouts. Tornadic waterspouts are simply tornadoes that form over water, or move from land to water. They have the same characteristics as a land tornado. Fair weather waterspouts are usually a less dangerous phenomena, but quite common over south Florida's coastal waters from late spring to early fall. Waterspouts can move onshore and become tornadoes and cause significant damage and injury to people. The maximum rotational wind speed of waterspouts has been estimated to be as high as 219 mph (98 m/s) (Reference 222). However, typically, fair weather waterspouts dissipate rapidly when they make landfall, and rarely penetrate far inland (Reference 223).

It is estimated that the Florida Keys area experiences 50 to 500 waterspouts each year. In terms of waterspouts per unit area, the most active region after the Florida Keys is the entire southeast Florida coast from Stuart, Florida to Homestead, Florida (Reference 222). Conventional data reporting sources for the Florida Keys area likely underestimate the actual yearly waterspout population. The tendency for underreporting in the Florida Keys may be attributed to the fact that much of the population is concentrated in a few areas of much higher density, such as the city of Key West, and the duration of a waterspout is only approximately 14 minutes. This tendency is reflected in the *Storm Events* database compiled by the NCDC for the Florida Keys (Monroe County), which only reports 421 waterspouts for the period of record January 1, 1950 through May 30, 2008 (Reference 213). NCDC data for the same period of record from Miami-Dade, Collier, and Broward counties indicates reports of 112, 38, and 61 waterspouts, respectively. There have been no reports of waterspouts coming on shore in Miami-Dade County and resulting in deaths or property damage (Reference 213).

2.3.1.3.3 Tropical Cyclones

Tropical cyclones include not only hurricanes and tropical storms, but systems classified as tropical depressions, subtropical storms, subtropical depressions, and extratropical storms. This characterization considers “tropical cyclones” (rather than systems classified only as hurricanes and tropical storms) because storm classifications are generally downgraded once landfall occurs and the system weakens, although they may still result in significant rainfall and extreme wind events as they travel through the site region.

Wind speeds (one-minute average) corresponding to each of the Saffir-Simpson hurricane categories are listed below (Reference 209):

Saffir-Simpson Hurricane Categories	
Classification	**Wind Speed (mph)**
Category 1	74–95
Category 2	96–110
Category 3	111–130
Category 4	131–155
Category 5	>155

The National Oceanic and Atmospheric Administration’s (NOAA) Coastal Services Center provides a comprehensive historical database, extending from 1851 through 2007, of tropical cyclone tracks based on information compiled by the National Hurricane Center. This database indicates that 53 tropical cyclone centers or storm tracks (which includes three extratropical storms) have passed within 100 nautical miles of the Turkey Point site during this historical period.

Storm classifications, respective occurrences and frequencies over this 157-year period of record are as follows (Reference 209):

Storm Classification	Occurrences	Frequency (events/yr)
Hurricane – Category 5	3	0.019
Hurricane – Category 4	10	0.064
Hurricane – Category 3	13	0.083
Hurricane – Category 2	8	0.051
Hurricane – Category 1	16	0.102
Extratropical	3	0.019

Tropical cyclones in this 100-nautical-mile radius have occurred as early as February and as late as November, with the greatest occurrence recorded during October, including classifications at and above tropical depression status. Tropical storms have occurred in February and from May to November (Reference 209).

During August through October, hurricane frequency increases. Three Category 5 hurricanes have been tracked within 100 nautical miles of the Turkey Point site. Two were “no named” hurricanes occurring in September of 1935 and September of 1947. Hurricane Andrew, the third Category 5, occurred in August 1992. Of the 10 Category 4 hurricanes that have occurred in this radial distance, one was recorded in August, seven recorded in September, and two were recorded in October. One Category 3 hurricane occurred in July, two in August, three in September, and seven in October. Most major hurricanes in the Turkey Point site area have occurred from late-summer to early fall (Reference 209).

Tropical cyclones are responsible for at least 14 separate rainfall records among the 17 NWS and cooperative observer network stations listed in Table 2.3.1-203, including eight 24-hour (daily) rainfall totals and six monthly rainfall totals. For example, in mid-September 1960, a 24-hour record was set at the Miami 12 SSW cooperative observing station as a result of Hurricane Donna (10.06 inches) (Reference 204). On August 26, 2005, a 24-hour record was set at the Perrine 4 W cooperative observing station as a result of Hurricane Katrina (15.1 inches) (Reference 204).

Additional monthly station records were established due to contributions from the following tropical cyclones (Reference 204):

- Hurricane Donna and Tropical Storm Florence in September 1960 (21.95 inches at Dania 4 WNW, 27.54 inches at Miami 12 SSW, 24.4 inches at Miami International Airport, and 29.5 inches at Perrine 4 W)

As indicated above, significant amounts of recorded rainfall can be associated with a tropical cyclone once the system moves inland. Wind speed intensity, however, noticeably decreases as the system passes over terrain and is subjected to increased frictional forces. Examples of such effects associated with some of the more intense tropical cyclones that have passed within 100 nautical miles of the Turkey Point site are:

- Not Named Hurricane of 1926 (September 1926). The Category 4 hurricane's eye moved directly over Miami Beach and downtown Miami during the morning hours of September 18, 1926. This cyclone produced the highest sustained winds ever recorded in the United States at the time. A storm surge of nearly 15 feet was reported in Coconut Grove. Many casualties resulted as people ventured outdoors during the half-hour lull in the storm as the eye passed overhead. The great hurricane of 1926 ended the economic boom in South Florida and would be a $90 billion disaster had it occurred in recent times. With a highly transient population across southeastern Florida during the 1920s, the death toll is uncertain because more than 800 people were missing in the aftermath of the cyclone. A Red Cross report lists 373 deaths and 6,381 injuries as a result of the hurricane (Reference 224).

- Hurricane Donna (September 1960). Hurricane Donna (Category 4) was one of the most destructive hurricanes to strike Florida and one of the most damaging to affect the United States. It is also believed to have caused hurricane winds over a greater proportion of the United States coastline than any other known hurricane. Donna came ashore on the southwestern coast of Florida with the eye passing over Naples and Fort Myers as the hurricane turned northward, moved inland, and then continued northeastward to reenter the Atlantic just north of Daytona Beach on September 11. As indicated previously, Donna produced record 24-hour rainfall amounts at Miami 12 SSW cooperative observing station located 16 miles from Turkey Point and contributed to record maximum monthly rainfall at several weather observation stations within 50 miles of the Turkey Point site. The last report from the Tavenier observing station estimated the wind speed to be 135 mph. Wind gusts of 97 mph were reported at the Miami Airport Tower (Reference 225).

- Tropical Storm Florence (September 1960). Florence intensified into a tropical storm on September 18, 1960 north of Puerto Rico and moved westward. Wind speeds reached 50 to 55 mph. The storm weakened the next day as it moved westward to the Florida Straits and just north of Cuba, then moved slowly northward over southern Florida on September 23 and 24 with accompanying heavy rains before turning northwestward and then into the Gulf of Mexico (Reference 225). This tropical storm was responsible for the 24-hour maximum rainfall (8.4 inches) at the Miami Beach cooperative observing station.

- Hurricane Andrew (August 1992). Hurricane Andrew (Category 5) caused an estimated $26 billion damage in the United States making it the most expensive natural disaster at that time in the United States. Andrew dropped sufficient rain to cause local floods even though the hurricane was relatively small and generally moved rather fast. Rainfall totals in excess of four to seven inches were recorded in southeast Florida. At landfall in southern Miami-Dade County, Florida, the central pressure was 922 millibars, which was the third lowest this century (after the 1935 Florida Keys Labor Day storm and Hurricane Camille in 1969) for a landfalling hurricane in the U.S. The storm devastated Miami-Dade County then moved northwest across the Gulf of Mexico to make a second landfall in a sparsely populated area of south-central Louisiana as a Category 3 storm on August 26 (Reference 225). Hurricane Andrew is historic because this is the first time that a hurricane significantly affected a commercial nuclear power plant. The eye of the storm passed over the Turkey Point site and caused extensive onsite and offsite damage, however, there was no damage to the safety-related systems except for minor water intrusion and some damage to insulation and paint (Reference 226).

  In a post event reanalysis (References 238 and 239) Hurricane Andrew was upgraded to Category 5. The winds at landfall were assigned a sustained 1-minute wind speed of 145 knots (167 mph). The associated 3-second gust wind speed would be 204 mph using a conversion factor from Figure C6-4 of ASCE/SEI 7-05 (Reference 208).

- Hurricane Katrina, (August 2005). Katrina was one of the strongest storms to impact the coast of the United States during the last 100 years. Hurricane Katrina developed initially as a tropical depression on August 23 and strengthened into a tropical storm the next day. It then moved slowly along a northwesterly then westerly track through the Bahamas, increasing in strength during this time. A few hours before landfall in south Florida on August 25, Katrina strengthened to become a Category 1 hurricane. Landfall occurred between Hallandale Beach and North Miami Beach, Florida, with maximum sustained winds of 81 mph. The storm then moved generally southwest across the tip of the Florida peninsula. Katrina was responsible for the maximum reported 24-hour rainfall (15.1 inches) at the Perrine 4 W cooperative station on August 26, 2005. This observation agrees with an analysis conducted by NOAA's Climate Prediction Center that showed parts of the region received heavy rainfall, more than 15 inches in some locations, which caused localized flooding (Reference 225).

- Hurricane Wilma, (October 2005). Hurricane Wilma was the 25th tropical cyclone and 12th hurricane of the hyperactive 2005 season, and the fifth tropical cyclone in as many months to have a significant impact on the Florida Keys. Hurricane Wilma moved across the extreme southeastern Gulf of Mexico and southern Florida peninsula during the morning hours of October 24, 2005, bringing hurricane-force winds to the Florida Keys and the highest storm surge observed in the Keys since Hurricane Betsy, on September 8, 1965. The core of Category 3 Hurricane Wilma passed just north of the Florida Keys, sparing the Keys island chain from the highest winds and heaviest rain. However, the ocean surrounding the Keys archipelago rose rapidly on the morning of the 24th, inundating many island communities, and causing millions of dollars in property damage (Reference 227).

2.3.1.3.4 Precipitation Extremes

Because precipitation is a localized measurement, assessing the variability of precipitation extremes over the area of the Turkey Point site, in an effort to evaluate whether the available long-term data is representative of conditions at the site, largely depends on station coverage.

Historical precipitation extremes (rainfall and snowfall) are presented in Table 2.3.1-203 for the 17 nearby land-based climatological observing stations listed in Table 2.3.1-201. Based on the maximum 24-hour and monthly precipitation totals recorded among these stations in the area of the Turkey Point site, and, more importantly, the areal distribution of these stations around the site, the data show that these statistics are reasonably representative of the extremes of rainfall and snowfall expected to be observed at the Turkey Point site.

As indicated in Subsection 2.3.1.3.3, almost half of the individual station 24-hour rainfall records (and to a lesser extent the monthly rainfall totals) were established as a result of precipitation associated with tropical cyclones that passed within 100 nautical miles of the Turkey Point site.

Maximum recorded 24-hour rainfall totals range from 7.5 inches at the Tamiami Trail 40 Mile Bend station, 38 miles northwest of the Turkey Point site, to 15.1 inches at the Perrine 4 W observing station approximately 13 miles to the north-northwest. The maximum 24-hour rainfall total on August 26, 2005 at the Perrine 4 W cooperative weather observing station was directly associated with Hurricane Katrina. Maximum monthly rainfall totals range from 17.5 inches at Miami Beach in May 1984, approximately 28 miles to the northeast, to 34.4 inches at the Pompano Beach observing station approximately 57 miles to the north-northeast in October 1965 (References 202, 204, and 205).

Between October 12 and October 15, 1965, a rainstorm of unusually prolonged duration and high intensity struck southern Florida and its surrounding waters. The storm was especially noteworthy for having produced very heavy rainfall in the area between Miami and Palm Beach. The heavy rainfall was associated with a stationary front that brought about lifting of conditionally unstable layers of air to saturation. The adiabatic ascent in this case appeared to constitute a forcing of the convection over a relatively small and prescribed area. The further concentration of heavy rain may have been the result of a local moistening effect on the flow by the Bahama Island chain in combination with a favorable wind regime (Reference 228). The heavy precipitation on October 31 is believed to be attributed to a persistent easterly flow off the ocean that supported convective thunderstorm development over the inland area (Reference 229).

In general, when monthly rainfall records were established at a given observing station, regardless of their cause(s), significant amounts of precipitation were usually measured at most of the other stations in the site area, particularly when associated with the passage of tropical cyclones. This is usually not the case for maximum 24-hour rainfall records because of the occurrence of more local-scale events such as thunderstorms and because of the intense nature of these storms in this coastal area. However, there does not appear to be any clear relationship between the rainfall recorded during such extreme events, whether on a 24-hour or monthly basis, and the distance inland within the area considered around the Turkey Point site (see Figure 2.3.1-201). Therefore, based on the range of the maximum recorded 24-hour and monthly rainfall totals among these stations, the areal distribution of these climatological observing stations around the site, and their proximity to the site, the data shows that rainfall extremes close to the upper limits of the respective maxima can reasonably be expected to occur at the Turkey Point site.

Site characteristic values corresponding to the precipitation (for roof design) site parameters—that is, 1-hour and 5-minute rainfall rates (intensities)—are addressed in Subsection 2.4.2.

Winter storms that produce measurable amounts of frozen precipitation near the Turkey Point site are rare. The only observation of frozen precipitation near the Turkey Point site was a trace (0.05 inch) observed at Homestead, Florida on January 19, 1977 (Reference 204). From a probabilistic standpoint, estimating the design basis snow load on the roofs of safety-related structures considers one or both of these climate-related components:

- The weight of the 100-year return period ground-level snow pack (to be included in the combination of normal live loads).
- The weight of the 48-hour probable maximum winter precipitation (to be included, along with the weight of the 100-year return period ground-level snow pack, in the combination of extreme live loads).

As indicated in Table 2.3.1-203, the 24-hour and monthly maximum snowfall for the climatological stations is zero with the exception of the Homestead Experiment Station. Based on Figure 7-1 of the ASCE-SEI design standard, *Minimum Design Loads for Buildings and Other Structures* (Reference 208), the 50-year return period ground-level snow pack for the Turkey Point site area is 0 pounds per square foot. Section C7.0 of the design standard provides conversion factors for estimating ground-level snow pack values for other recurrence intervals. A 100-year return period value is determined by dividing the 50-year ground-level snow pack by a factor of 0.82. In this case, however, the 50-year and the 100-year return period values would both be 0 pounds per square foot.

Instead of a 100-year return period ground-level snow pack values based on the ASCE-SEI design standard, the weight of the overall maximum snowfall event recorded in the Turkey Point site has been estimated based on the station report. As indicated previously, the highest 24-hour snowfall total (0.05 inches) occurred on January 19, 1977 at the Homestead Experiment Station (Reference 204). It is assumed that the snow remained on the ground for an extended period of time and that a nominal snow density (i.e., the ratio of the volume of melted snow to the volume of snow) of 1:10 applies (Reference 230). This ratio represents a value typically used by the NCDC in estimating liquid precipitation equivalents during snowfall events. Therefore, the liquid equivalent for this maximum snowfall event would be 0.005 inches of water. Based on the relationship of one inch of water being equivalent to 5.2 pounds per square foot, the estimated weight of the maximum recorded snowfall event would be 0.026 pounds per square foot.

The 48-hour probable maximum winter precipitation component (unadjusted) for evaluating extreme live loads (as indicated above) is derived by logarithmic interpolation on the curve defined by plots of the 6-, 24- and 72-hour, 10-square mile area, monthly probable maximum precipitation estimates as presented in NUREG/CR-1486 (Reference 217). The highest winter season (December through February) probable maximum precipitation values for the Turkey Point site occur in December and are approximately 18, 29, and 37 inches, respectively, for these time intervals (Reference 217). The 24- and 72-hour probable maximum precipitation values for January and February are essentially the same as the December values for these two time intervals (Reference 217).

The 48-hour probable maximum precipitation value (unadjusted), estimated by logarithmic interpolation on the curve defined by the 6-, 24-, and 72-hour probable maximum precipitation values for December, is 34.0 inches liquid depth. The weight of the 48-hour probable maximum winter precipitation is reported and applied in Section 3.8, which addresses the design of Seismic Category I structures.

The climate-related site characteristic values (i.e., the 100-year return period ground snow load [or, in this case, the estimated weight of the maximum recorded snowfall event in the site area in lieu of that value], and the 48-hour probable maximum winter precipitation) are two of the precipitation (for roof design)-related site parameters. Refer to Table 2.0-201 in Section 2.0 for a comparison of the corresponding site parameter values.

2.3.1.3.5 Hail, Snowstorms, and Ice Storms

Frozen precipitation in the Turkey Point site typically occurs in the form of hail. The frequency of occurrence and characteristics of this type of weather event is based on the following two references: the latest version of *The Climate Atlas of the United States* (Reference 210), which has been developed from observations made over the 30-year period of record from 1961 to 1990, and the NCDC *Storm Events* database for Florida (Reference 212) based on observations over the period of January 1950 to May 2008.

Though hail can occur at any time of the year in the site area and is associated with well-developed thunderstorms, it has been observed primarily during late spring and the summer months (May through August), reaching a peak during

May, and occurring least often from late fall through the winter months (December, January, and February) (Reference 212).

The *Climate Atlas* (Reference 210) indicates that most of Miami-Dade County can expect, on average, hail with diameters 0.75 inch or greater approximately 1 day per year. The *Climate Atlas* also shows a similar frequency in the eastern portions of the adjacent Broward County. However, a relatively lower frequency of occurrence is indicated for the west portion of Broward County and the extreme western and southern portions of Miami-Dade County (less than 0.5 days per year). Other nearby counties of Collier and Monroe, which are directly adjacent to the Gulf of Mexico, can expect 0.75-inch or greater hail approximately 0.5 days or less per year. The *Climate Atlas* indicates that the occurrence of hail with diameters greater than or equal to 1.0 inch is relatively less frequent over the site area and confined to the northeastern portion of Miami-Dade County and the southeastern portion of Broward County (Reference 210).

NCDC cautions that hailstorm events are point observations and somewhat dependent on population density. This may explain the areal extent of higher frequencies in the northeastern portion of Miami-Dade County and what could be interpreted as generally lower frequencies of occurrence in the southern coastal portion of the county. The slightly higher annual mean frequency of approximately one to two days per year with hail greater than or equal to 0.75 inch in diameter is considered to be a representative indicator for the Turkey Point site.

Hailstorm events in Miami-Dade and surrounding counties have generally reported maximum hailstone diameters ranging between 1.75 and 4.0 inches. Golf ball-size hail (approximately 1.75 inches in diameter) is not a rare occurrence, having been observed numerous times in Miami-Dade and surrounding counties. However, in terms of extreme hailstorm events, the NCDC *Storm Events* database indicates that grapefruit- to softball-size hail (approximately 4.0 to 4.5 inches in diameter, respectively) was observed on only one occasion within 50 miles of the Turkey Point site—March 29, 1963 (4.0 inches), in Miami-Dade County, approximately 27 miles to the north-northeast of the Turkey Point site (Reference 212).

Winters bring no accumulation of snowfall in southeastern Florida. Snow has never been reported at the Miami International Airport. According to the NCDC (Reference 231), a trace of snowfall was observed at the Homestead Experiment Station once during a period of record of 39 years. The Homestead Experiment Station is within 19 kilometers (12 miles) of Units 6 & 7 (Reference 204). The total snowfall was estimated to be only 0.05 inches (References 204 and 231). The notes made by the station observer indicate that the snow melted before reaching the ground (Reference 232). This was during one of the worst of the mid-1970s cold waves and snow fell that day in several parts of Miami-Dade County, Florida, but not at the NWS office at the Miami Airport, which is why the official records do not show the snow. The effects of winter precipitation have been addressed in the preceding subsection from a design basis perspective (Reference 212).

The *Storm Events* database for Florida (Reference 212) indicates that ice storms have not been reported in Broward, Collier, Monroe, or Miami-Dade Counties in the period January 1, 1950 through May 31, 2008. In addition, the *Climate Atlas* (Reference 210) indicates that the mean numbers of days per year with frozen precipitation in counties of southeastern Florida is zero.

2.3.1.3.6 Thunderstorms and Lightning

Thunderstorms can occur in the site area at any time during the year. Based on a 61-year period of record, Miami, Florida, averages approximately 73 thunderstorm-days (i.e., days on which thunder is heard at an observing station) per year. On average, August has the highest monthly frequency of occurrence—approximately 15 days. Annually, almost three-quarters (approximately 74 percent) of thunderstorm-days are recorded between early summer and early fall (i.e., from June through September). From November through March thunderstorms have the lowest monthly frequency of occurrence and might be expected to occur approximately 1 day per month (Reference 201).

The mean frequency of lightning strikes to earth can be estimated using a method attributed to EPRI, as reported by the U.S. Department of Agriculture Rural Utilities Service in the publication titled *Summary of Items of Engineering Interest* (Reference 233). This methodology assumes a relationship between the average number of thunderstorm-days per year ($\boldsymbol{T}$) and the number of lightning strikes to earth per square mile per year ($\boldsymbol{N}$), where:

$$\boldsymbol{N} = 0.31\boldsymbol{T}$$

Based on the average number of thunderstorm-days per year at Miami, Florida (i.e., 73.0; see Table 2.3.1-202), the frequency of lightning strikes to earth per square mile is approximately 23 per year for the area of the Turkey Point site. This frequency is below the mean of the 10-year (1989 to 1999) lightning flash density for the area that includes the Turkey Point site, as reported by the NWS to be 14 to 16 flashes per square kilometer per year or 4.6 to 5.4 flashes/square mile/year (Reference 234).

The Turkey Point power block and the surrounding area are shown on Figure 2.1-205, which is approximately 30 acres, or approximately 0.047 square miles. Given the estimated annual average frequency of lightning strikes to earth in the area of the Turkey Point site, the frequency of lightning strikes in the power block and surrounding area can be estimated as follows:

> (23 lightning strikes/square miles/year) x (0.047 square miles) = 1.1 lightning strikes/year, or approximately once each year.

2.3.1.3.7 Droughts and Dust (Sand) Storms

Droughts are prolonged periods of very dry weather that cause serious water imbalances in the affected area. 27 drought event(s) are reported in Florida between January 1, 1950 and July 31, 2008; however no drought events are reported in Miami-Dade County during the same period (Reference 213). Statewide, the drought events effects range from reduced topsoil moisture and poor pastures, to wildfire breakouts, to various degrees of water usage restrictions (Reference 213). The southeastern coastal region of Florida, where the Turkey Point site is located, experienced a dry spring in 2007 combined with a prolonged period of below normal rainfall going back to early 2006, producing severe to extreme drought conditions. The drought conditions returned to southwestern Florida, primarily Collier County, in August 2007 and continued into May of 2008. Subsection 2.4.11 describes the effect of droughts on the Turkey Point cooling system. Subsection 2.4.11.3 describes historical low water conditions from droughts and their frequencies in the past.

Dust storms predominantly originate in normally arable regions during periods of drought where dust and sand layers are loosened. Dust storms in the southeastern coastal region of Florida are very rare due to the vegetative cover. Severely reduced visibilities due to large-scale dust storms in Florida occur infrequently. The NCDC *Storm Events* database indicates no occurrences of dust storms in 50-nautical miles of the Turkey Point site from January 1950 through May 2008 (Reference 213). Severely reduced visibilities in southeastern Florida primarily occur as a result of wildfires or brushfires.

2.3.1.4 Meteorological Data for Evaluating the Ultimate Heat Sink

The AP1000 design uses a passive containment cooling system (PCS) to provide the safety-related ultimate heat sink for the plant. The PCS uses a high strength steel containment vessel inside a concrete shield building. The steel containment vessel provides the heat transfer surface that removes heat from inside the containment by conduction. Heat from the containment surface is transferred to a water film by convection, and from the water film to the air by convection and the evaporation of the water film. Heat removal from the containment vessel is aided by continuous, natural circulation of air (see DCD Tier 2, Subsection 6.2.2).

The use of the PCS in the AP1000 design is not significantly influenced by local weather conditions. Therefore, the identification of meteorological conditions that are associated with maximum evaporation and drift loss of water, as well as minimum cooling by the ultimate heat sink (i.e., periods of maximum wet bulb temperatures) is not necessary.

2.3.1.5 Design Basis Dry and Wet Bulb Temperatures

These climate-related site characteristic values are among the air temperature-related site parameters listed in DCD Tier 2, Table 2-1 as:

- Maximum safety (0 percent exceedance) dry bulb, coincident and noncoincident wet bulb temperatures
- Minimum safety (0 percent exceedance) dry bulb temperature
- Maximum normal (1 percent seasonal corresponding to the 0.4 percent annual) dry bulb, coincident and noncoincident wet bulb temperatures
- Minimum normal (99 percent seasonal corresponding to the 99.6 percent annual) dry bulb temperature

These temperatures are discussed in the following paragraphs.

Maximum and Minimum Safety Temperatures

The DCD indicates that the 0 percent exceedance site parameter values represent conservative estimates of historical high and low temperatures for potential sites. Based on a 30-year period of record (1976–2005) of sequential hourly data for the NWS station at Homestead AFB (the closest station to the site at which coincident dry and wet bulb temperature measurements are made), the 0 percent exceedance historical maximum dry bulb temperature for the Turkey Point site is 98.0°F with a coincident wet bulb temperature of 75.5°F. Over this same period of record, the 0 percent exceedance historical maximum noncoincident wet bulb temperature is 84.8°F; the 100 percent exceedance historical minimum dry bulb temperature is 28.0°F at this station (Reference 207).

The dry bulb temperature component of the maximum dry bulb and coincident wet bulb temperature site characteristic pair is calculated by the 100-year return period maximum dry bulb value. Maximum dry bulb, minimum dry bulb, and maximum wet bulb temperatures corresponding to a 100-year return period were derived through linear regression using annual maximum and minimum dry bulb temperatures, and annual maximum wet bulb temperatures recorded over the 30-year period from 1976 to 2005 at the Homestead AFB station.

Because this 100-year return period dry bulb value is extrapolated from a regression curve on a single parameter, there is no corresponding mean coincident wet bulb temperature. As a result, the coincident wet bulb temperature component had to be derived based on a characteristic relationship between concurrent dry bulb and wet bulb temperatures, that is, as the dry bulb temperature continues to increase, there is a point at which the concurrent wet bulb temperature reaches a maximum and thereafter changes little or even decreases. This characteristic is not unique to this location or climatological setting.

Based on the linear regression analyses of these data sets for a 100-year return period, the maximum dry bulb temperature is 103.0°F, the minimum dry bulb temperature is 17.9°F, and the maximum noncoincident wet bulb temperature is
PTN DEP 2.0-3 87.4°F. This temperature exceeds the DCD site parameter of 86.1°F. The higher maximum safety wet-bulb (noncoincident) air temperature does not affect any safety-related systems, structures, and/or components.

This relationship is exhibited by the annual percent frequency distribution of wet bulb temperature depression for the Miami, Florida, NWS station, as reported in the International Station Meteorological Climate Summary (Reference 235), over the 47-year period from 1949 through 1995. This type of summary is a bivariate distribution of dry bulb temperatures in 2-degree ranges by wet bulb depression (i.e., the difference between concurrent dry bulb and wet bulb observations), also in 2-degree ranges.The Miami station was used for this analysis since ISMCS data is not available for the Homestead AFB station.

For the Miami NWS station, this threshold dry bulb temperature occurs at about 98°F. A cubic polynomial curve was fit to the concurrent maximum dry bulb and maximum wet bulb temperature pairs extracted from this bivariate distribution at and above this threshold dry bulb value. The equation of the curve is an estimation of the trend where the maximum coincident wet bulb temperature can then be determined as a function of the maximum dry bulb temperature in this upper range of dry bulb values. Based on a 100-year return period maximum dry bulb temperature of 103.0°F, the corresponding wet bulb temperature is estimated to be 75.2°F.

Maximum and Minimum Normal Temperatures

Long-term, engineering-related climatological data summaries, prepared by the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) for the Homestead Air Force Base (AFB) observing station (Reference 207), (except as noted) located approximately 5 miles from the site, are used to characterize maximum and minimum normal dry and wet bulb temperatures for the Turkey Point site.

Based on a 19-year period of record from 1982–2001 at Homestead AFB, the maximum normal dry bulb temperature with a 1.0 percent seasonal (corresponding to 0.4 percent annual) exceedance probability is 91.3°F, with a mean coincident wet bulb temperature of 79.3°F. The maximum normal noncoincident wet bulb temperature with a 1.0 percent seasonal (corresponding
PTN DEP 2.0-2 to 0.4 percent annual) exceedance probability is 81.5°F (Reference 207). This temperature exceeds the DCD site parameter of 80.1°F. The higher maximum normal wet-bulb (noncoincident) air temperature does not affect any safety-related systems, structures, and/or components.

For the same period of record, the minimum dry bulb temperatures with 99.0 percent seasonal (corresponding to 99.6 percent annual) exceedance probability is 46.9°F (Reference 207).

Finally, based on a 19-year period of record from 1982–2001 at Homestead AFB, the maximum dry bulb temperature with a 2.0 percent annual exceedance probability is 89.7°F, with a mean coincident wet bulb temperature of 78.8°F. The same ASHRAE summary for Homestead AFB lists the maximum noncoincident wet bulb temperature with a 2.0 percent annual exceedance probability as 80°F.

Refer to Table 2.0-201 in Section 2.0 of this chapter for a comparison between the applicable site characteristic values and the corresponding air temperature-related site parameter values.

2.3.1.6 Restrictive Dispersion Conditions

Atmospheric dispersion can be described as the horizontal and vertical transport and diffusion of pollutants released into the atmosphere. Horizontal and along-wind dispersion is controlled primarily by wind direction variation, wind speed, and atmospheric stability. Subsection 2.3.2.2.1 addresses wind characteristics for the

Turkey Point site based on measurements from the pre-application phase, onsite meteorological monitoring program. The persistence of those wind conditions is described in Subsection 2.3.2.2.2.

In general, lower wind speeds represent less-turbulent air flow, which is restrictive to both horizontal and vertical dispersion. And, although wind direction tends to be more variable under lower wind speed conditions (which increases horizontal transport), air parcels containing pollutants often recirculate within a limited area, thereby increasing cumulative exposure.

Major air pollution episodes are usually related to the presence of stagnating high-pressure weather systems (or anticyclones) that influence a region with light and variable wind conditions for four consecutive days or more. An updated air stagnation climatology has been published with data for the continental United States based on over 50 years of observations—from 1948 through 1998. In this study, stagnation conditions were defined as four or more consecutive days when meteorological conditions were conductive to poor dispersion. Although interannual frequency varies, the data in Figures 1 and 2 of that report indicate that on average, the Turkey Point site region can expect less than 20 days per year with stagnation conditions, or less than four cases per year, with a mean duration of less than 5 days for each case (Reference 215).

Air stagnation conditions primarily occur during an “extended” summer season (May through October). This is a result of the weaker pressure and temperature gradients, and therefore weaker wind circulations, during this period (as opposed to the winter season). Based on Wang and Angell Figures 17 to 67, the highest incidence of air stagnation is recorded between July and September, typically reaching its peak during August, when the Bermuda high-pressure system has become established (Reference 215). As the LCD summary in Table 2.3.1-202 for Miami International Airport, Florida, indicates, this 3-month period coincides with the lowest monthly mean wind speeds during the year (Reference 201). Air stagnation is at a relative minimum in the extended summer season during May and June (Reference 215).

The dispersion of air pollutants is also a function of the mixing height. The mixing height (or depth) is defined as the height above the surface through which relatively vigorous vertical mixing takes place. Lower mixing heights (and wind speeds), therefore, are a relative indicator of more restrictive dispersion conditions. Holzworth reported mean seasonal and annual morning and afternoon mixing heights and wind speeds for the contiguous United States based on observations over the 5-year period from 1960 to 1964 from a network of 62 NWS stations at which daily surface and upper air sounding measurements were routinely made (Reference 236).

However, an interactive, spatial database developed by the U.S. Department of Agriculture — Forest Service, referred to as the *Ventilation Climate Information System*, is readily available and provides monthly and annual graphical and tabular summaries of relevant dispersion-related characteristics (e.g., morning and afternoon modeled mixing heights, modeled surface wind speeds, and resultant ventilation indices) (Reference 216). The system, although developed primarily for fire management and related air quality purposes, extends the period of record to climatologically representative durations of 30 to 40 years depending on the parameter.

Table 2.3.1-204 summarizes minimum, maximum, and mean morning and afternoon mixing heights, surface wind speeds, and ventilation indices on a monthly, seasonal, and annual basis for the area of the Turkey Point site. As atmospheric sounding measurements are still only made from a relatively small number of observation stations, these statistics represent model-derived values in the interactive data base for a specific location (Reference 237)—in this case, the Turkey Point site. The seasonal and annual values listed in Table 2.3.1-204 were derived as weighted means based on the corresponding monthly values.

From a climatological standpoint, the lowest morning mixing heights occur in the summer and the highest morning mixing heights occur during the spring. As might be expected, the afternoon mixing heights reach a seasonal minimum in the fall and a maximum during the spring due to more intense heating (Reference 216).

The wind speeds listed in Table 2.3.1-204 representing the location of the Units 6 & 7 site are reasonably consistent with the LCD summary for Miami International Airport, Florida, in Table 2.3.1-202, although approximately 0.5 meters per sec (m/sec) lower. Relatively lower daily mean wind speeds (i.e., the average of the morning and afternoon mean values in Table 2.3.1-204) are shown to generally occur during the summer and early fall as in the LCD. (References 201 and 216) This period of minimum wind speeds also coincides with the extended summer season described by Wang and Angell that is characterized by relatively higher air stagnation conditions (Reference 215).

The ventilation index is a measure of the potential of the atmosphere to disperse pollutants and is based on the product of the surface wind speed and the mixing height. Because it uses surface winds instead of higher trajectory winds, the index values represent conservative estimates of ventilation potential. This is more indicative of the dispersion potential near the ground and, therefore, directly relevant to the release heights of the sources evaluated in Subsections 2.3.4 and 2.3.5.

Based on the classification system for ventilation indices (Reference 216), the morning ventilation indices in Table 2.3.1-204 for the area of the Turkey Point area generally indicate marginal ventilation potential on an annual average basis with the exception of spring and fall when the ventilation indices are “fair”; which is consistent with characteristics reported by Wang and Angell.

Ventilation indices markedly improve during the afternoon with conditions rated as “good” on an annual average basis and for every season except the summer which is classified as “fair” (Reference 216). Mean wind speeds do not vary significantly in the site area over the course of the year. As a result, the relatively better ventilation index classifications are attributable to the higher mixing height values, which for the summer season tends to mask the general potential for more restrictive dispersion conditions during the extended summer referred to by Wang and Angell (Reference 215). Nevertheless, the decrease in the ventilation index values between the summer and fall seasons is still evident and consistent with the monthly variations for air stagnation potential described previously.

Ambient air quality conditions in the area of the Turkey Point site are described in Subsection 2.3.2.2.5.

2.3.1.7 Climate Changes

Climatic conditions change over time and these changes are cyclical in nature on various time and spatial scales. The timing, magnitude, relative contributions to, and implications of these changes are generally more speculative, and are even more so for specific areas or locations.

With regard to the expected 40-year operating license period for Units 6 & 7, it is reasonable to evaluate the record of readily available and well-documented climatological observations of temperature and rainfall (normals, means, and extremes) as they have varied over time (the last 70 to 80 years), and the occurrences of severe weather events, in the context of the plant’s design bases.

Trends of temperature and rainfall normals are identified over a 70-year period for successive 30-year intervals, updated every 10 years, beginning in 1931 (i.e., 1931–1960, 1941–1970, etc.) through the most recent normal period (i.e., 1971–2000) in the NCDC publication *Climatography of the United States,* *No. 85* (Reference 218). The publication summarizes these observations for the 344 climate divisions in the 48 contiguous states.

As Subsection 2.3.1.2 indicates, the Turkey Point site is located in climate Division 6 (lower east coast) in the state of Florida (Reference 219). Summaries of successive annual temperature and rainfall normals, as well as the composite 70-year average are provided below for climate Division 6 (Reference 218).

Period	**Temperature (°F)**	**Rainfall (inches)**
1931–2000	74.8	59.79
1931–1960	74.6	59.92
1941–1970	74.5	59.54
1951–1980	74.5	58.28
1961–1990	74.8	57.17
1971–2000	75.4	59.66

This data indicates a slight cooling trend in the climate division of approximately 0.1°F between 1931–1960 and 1951–1980, with an increase of approximately 0.9°F between the 1951–1980 and 1971–2000 normal periods. In general, total annual rainfall increased by 2.49 inches between the 1961–1990 and 1971–2000 normal periods. A decrease of 2.75 inches occurred between the 1931–1960 and 1961–1990 periods. The latest normal period (1971–2000) is slightly less (0.13 inches) in comparison to the 1931–2000 70-year period (Reference 218).

The preceding values represent variations of average temperature and rainfall conditions over time. The occurrence of extreme temperature and precipitation events does not necessarily follow the same trends. However, characteristics about the occurrence of such events over time are indicated by the summaries for observed extremes of temperature, and rainfall and snowfall totals recorded in the Turkey Point area (see Table 2.3.1-203).

Individual station records for maximum temperature have been set between 1934 and 2007 (the overall highest value for the site area having been recorded in 1998), that is, no discernible trend for these extremes exists in the site area. Similarly, record-setting 24-hour rainfall totals were established between 1933 and 2005, with station records for total monthly rainfall being set between 1948 and 1999—again, no clear trend is evident. Cold air outbreaks that result in overall extreme low temperatures occur infrequently; snowfall in the area of the Turkey Point site is even more rare. Nevertheless, station records set for these weather types span a range of 54 years (i.e., 1942 to 1995) for record cold and a trace of snowfall recorded once in 58 years (see Table 2.3.1-203).

The occurrence of tropical cyclones within 100 nautical miles of the Turkey Point site has been somewhat cyclical over the available 157-year period of record when considered on a decadal (10-year basis), having reached a peak of 12 such storms during the period 1900–1910, with secondary peaks of 10 tropical cyclone events in the period 1931–1940, 11 during 1941-1950, and 10 during 1961-1970. In general, the frequency of hurricanes passing within 100 nautical miles of the site has generally decreased since the peak period from 1961–1970. The frequency of tropical storms in recent decades has been less than that during the peak frequency (decades 1900–1910, 1931-1940, 1941-1950 and 1961–1970). On the basis of reported tropical storm wind speeds and barometric pressure, the intensity of tropical storms has been relatively steady since the peak period 1961-1970 (Reference 209). Many of the 24-hour and monthly total rainfall records identified in Table 2.3.1-203 and described in Subsection 2.3.1.3.3 occurred during recent decades. Most of the listed observing stations began operation after the peak tropical cyclone activity; therefore, rainfall records do not reflect data from this period.

In general, the number of recorded tornado events has increased since detailed records were routinely documented beginning around 1950. However, some of this increase is attributable to a growing population, greater public awareness and interest, and technological advances in detection. These changes are superimposed on normal yearly variations.

The regulatory guidance for evaluating the climatological characteristics of a site from a design basis standpoint is not event-specific, but rather is statistically based and for several parameters includes expected return periods of 100 years or more and probable maximum event concepts. These return periods exceed the expected 40-year operating license period of Units 6 & 7. The design basis characteristics determined previously under Subsection 2.3.1.3 are developed consistent with the intent of that guidance and incorporate the readily available, historical data records for locations considered to be representative of the Turkey Point site.

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Table 2.3.1-201
NWS and Cooperative Observing Stations Near the Units 6 & 7 Site

Station	County	Approximate Distance (miles)	Direction Relative to Site	Elevation (feet)
Dania 4 WNW	**Broward**	46	NNE	10
Flamingo Ranger Station	**Monroe**	41	SW	3
Fort Lauderdale	**Broward**	47	NNE	16
Fort Lauderdale Experiment Station	**Broward**	46	N	10
Hialeah	**Miami-Dade**	27	N	12
Homestead Experiment Station	**Miami-Dade**	12	NW	11
Kendall 2 E	**Miami-Dade**	18	NNE	20
Miami Beach	**Miami-Dade**	28	NE	5
Miami 12 SSW[a]	**Miami-Dade**	16	NNE	10
Miami 12 SSW[b]	**Miami-Dade**	16	NNE	10
Miami International Airport[c]	**Miami-Dade**	25	N	29
Oasis Ranger Station	**Collier**	53	NW	8
Perrine 4 W	**Miami-Dade**	13	NNW	10
Pompano Beach	**Broward**	57	NNE	15
Royal Palm Ranger Station	**Miami-Dade**	17	WSW	7
Tamiami Trail 40-Mile Bend	**Miami-Dade**	38	NW	15
Tavernier	**Monroe**	31	SSW	7

(a) Period of record: 1933–1958
(b) Period of record: 1958–1988
(c) National Weather Service First-Order Station

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Table 2.3.1-202
Local Climatological Data Summary for Miami, Florida

NORMALS, MEANS, AND EXTREMES
MIAMI (KMIA)

LATITUDE: 25 ° 49'N | LONGITUDE: -80 ° 17'W | ELEVATION (FT): GRND: 6 BARO: 29 | TIME ZONE: EASTERN (UTC -5) | WBAN: 12839

	ELEMENT	POR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
TEMPERATURE °F	NORMAL DAILY MAXIMUM	30	76.5	77.7	80.7	83.8	87.2	89.5	90.9	90.6	89.0	85.4	81.2	77.5	84.2
	MEAN DAILY MAXIMUM	61	75.7	77.1	79.8	82.7	85.9	88.1	89.6	89.9	88.3	85.0	80.5	77.0	83.3
	HIGHEST DAILY MAXIMUM	66	88	89	93	96	96	98	98	98	97	95	91	87	98
	YEAR OF OCCURRENCE		1987	2008	2003	1971	2008	1985	1998	1990	1987	1980	2002	1989	JUL 1998
	MEAN OF EXTREME MAXS.	61	83.5	85.3	87.7	90.0	91.3	92.8	93.4	93.8	92.3	89.8	86.0	83.7	89.1
	NORMAL DAILY MINIMUM	30	59.6	60.5	64.0	67.6	72.0	75.2	76.5	76.5	75.7	72.2	67.5	62.2	69.1
	MEAN DAILY MINIMUM	61	59.7	61.1	64.4	68.0	72.0	74.9	76.5	76.6	75.9	72.4	66.6	61.9	69.2
	LOWEST DAILY MINIMUM	66	30	32	32	46	53	60	69	68	68	51	39	30	30
	YEAR OF OCCURRENCE		1985	1947	1980	1971	1945	1984	2002	1950	1983	1943	1950	1989	DEC 1989
	MEAN OF EXTREME MINS.	61	42.4	45.8	49.3	56.7	64.2	70.0	72.1	72.3	71.9	63.0	52.6	45.5	58.8
	NORMAL DRY BULB	30	68.1	69.1	72.4	75.7	79.6	82.4	83.7	83.6	82.4	78.8	74.4	69.9	76.7
	MEAN DRY BULB	61	67.7	69.1	72.2	75.4	79.0	81.6	83.0	83.3	82.1	78.7	73.6	69.5	76.3
	MEAN WET BULB	25	62.0	63.3	64.8	66.7	71.1	75.0	76.0	76.4	75.8	72.3	67.9	64.1	69.6
	MEAN DEW POINT	25	59.1	60.3	61.7	63.4	68.3	73.0	73.9	74.4	74.0	70.1	65.5	61.2	67.1
	NORMAL NO. DAYS WITH:														
	MAXIMUM >= 90	30	0.0	0.0	0.3	1.7	4.8	10.8	18.0	16.9	10.8	2.6	0.0	0.0	65.9
	MAXIMUM <= 32	30	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	MINIMUM <= 32	30	0.1	0.0	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2
	MINIMUM <= 0	30	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
H/C	NORMAL HEATING DEG. DAYS	30	52	39	15	1	0	0	0	0	0	0	4	38	149
	NORMAL COOLING DEG. DAYS	30	133	154	236	315	442	510	568	568	517	433	291	194	4361
RH	NORMAL (PERCENT)	30	73	71	70	67	71	76	74	76	78	75	74	73	73
	HOUR 01 LST	30	81	80	78	76	79	83	82	83	84	82	81	80	81
	HOUR 07 LST	30	85	84	82	79	80	83	83	85	87	85	84	84	83
	HOUR 13 LST	30	59	57	56	54	58	65	63	65	66	63	63	60	61
	HOUR 19 LST	30	70	68	66	64	69	74	72	75	77	73	72	71	71
S	PERCENT POSSIBLE SUNSHINE	20	66	68	74	76	72	68	72	71	70	70	67	63	70
W/O	MEAN NO. DAYS WITH:														
	HEAVY FOG(VISBY <= 1/4 MI)	45	0.9	0.6	0.5	0.4	0.2	0.2	0.1	0.1	0.2	0.3	0.5	0.7	4.7
	THUNDERSTORMS	61	0.9	1.1	1.8	2.8	6.3	12.5	14.6	15.4	11.4	4.3	1.0	0.6	72.7
CLOUDNESS	MEAN:														
	SUNRISE-SUNSET (OKTAS)	48	4.3	4.2	4.3	4.2	4.6	5.4	5.1	5.1	5.3	4.6	4.3	4.2	4.6
	MIDNIGHT-MIDNIGHT (OKTAS)	32	3.8	3.8	3.8	3.5	4.1	4.9	4.4	4.4	4.7	4.0	3.8	3.6	4.1
	MEAN NO. DAYS WITH:														
	CLEAR	47	9.2	8.6	8.5	8.4	6.3	3.1	2.6	2.5	2.1	6.6	7.5	8.9	74.3
	PARTLY CLOUDY	47	13.1	12.1	14.1	14.9	15.3	14.3	17.4	17.8	15.5	14.3	14.0	12.9	175.7
	CLOUDY	47	8.7	7.6	8.3	6.7	9.3	12.6	11.0	10.7	12.4	10.1	8.5	9.1	115.0
PR	MEAN STATION PRESSURE(IN)	25	30.10	30.07	30.04	30.00	29.98	30.00	30.04	29.99	29.94	29.96	30.03	30.08	30.02
	MEAN SEA-LEVEL PRES. (IN)	25	30.12	30.09	30.06	30.02	30.00	30.02	30.06	30.01	29.96	29.98	30.05	30.10	30.04
WINDS	MEAN SPEED (MPH)	25	8.9	9.2	10.1	9.8	9.1	7.8	7.6	7.4	7.8	8.9	9.3	8.6	8.7
	PREVAIL.DIR(TENS OF DEGS)	40	35	12	12	11	09	12	12	11	11	06	10	35	12
	MAXIMUM 2-MINUTE:														
	SPEED (MPH)	12	30	55	43	37	43	41	41	60	43	69	36	29	69
	DIR. (TENS OF DEGS)		09	19	26	16	10	14	10	13	10	15	18	22	15
	YEAR OF OCCURRENCE		1998	1998	2003	2008	1999	2007	2005	2005	1998	2005	1998	1997	OCT 2005
	MAXIMUM 3-SECOND														
	SPEED (MPH)	12	40	104	51	52	63	53	55	78	51	92	44	40	104
	DIR. (TENS OF DEGS)		26	19	26	15	33	14	04	12	28	15	31	23	19
	YEAR OF OCCURRENCE		2004	1998	2003	2008	1998	2007	2008	2005	2004	2005	1998	1997	FEB 1998
PRECIPITATION	NORMAL (IN)	30	1.88	2.07	2.56	3.36	5.52	8.54	5.79	8.63	8.38	6.19	3.43	2.18	58.53
	MAXIMUM MONTHLY (IN)	66	6.66	8.07	10.57	17.29	18.54	22.36	13.51	16.88	24.40	21.64	13.84	6.39	24.40
	YEAR OF OCCURRENCE		1969	1983	1986	1979	1968	1968	1947	1943	1960	1991	1992	1958	SEP 1960
	MINIMUM MONTHLY (IN)	66	0.04	0.01	0.02	0.05	0.44	1.81	1.77	1.65	2.63	0.72	0.09	0.12	0.01
	YEAR OF OCCURRENCE		1951	1944	1956	1981	1965	1945	1963	1954	1951	2002	1970	1988	FEB 1944
	MAXIMUM IN 24 HOURS (IN)	66	2.68	5.73	7.07	16.21	11.59	8.20	4.67	6.92	7.58	12.66	8.01	5.26	16.21
	YEAR OF OCCURRENCE		1973	1966	1949	1979	1977	1977	2003	1964	1960	2000	1992	2000	APR 1979
	NORMAL NO. DAYS WITH:														
	PRECIPITATION >= 0.01	30	7.5	6.8	6.2	6.1	10.3	15.6	16.0	18.9	17.4	13.4	9.0	7.3	134.5
	PRECIPITATION >= 1.00	30	0.4	0.5	0.8	0.9	1.4	2.7	1.6	2.5	2.7	1.7	0.9	0.5	16.6
SNOWFALL	NORMAL (IN)	30	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	MAXIMUM MONTHLY (IN)	5	0.0	0.0	0.0	0.0	T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	T
	YEAR OF OCCURRENCE						1998								MAY 1998
	MAXIMUM IN 24 HOURS (IN)	59	0.0	0.0	0.0	0.0	T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	T
	YEAR OF OCCURRENCE'						1998								MAY 1998
	MAXIMUM SNOW DEPTH (IN)	53	0	0	0	0	0	0	0	0	0	0	0	0	0
	YEAR OF OCCURRENCE														
	NORMAL NO. DAYS WITH: SNOWFALL >= 1.0	30	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

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Table 2.3.1-203 (Sheet 1 of 2) Climatological Extremes at Selected NWS and Cooperative Observing Stations in the Area of Units 6 & 7

Station	Maximum Temperature (°F)	Minimum Temperature (°F)	Maximum 24-Hour Rainfall (inches)	Maximum Monthly Rainfall (inches)	Maximum 24-Hour Snowfall (inches)	Maximum Monthly Snowfall (inches)
Dania 4 WNW	96[(a)(b)] (10/03/65)	42[(a)(b)] (11/19/51)	9.5[(a)(b)] (10/30/69)	22.0[(a)(b)] (09/60)	0.0[(a)(b)]	0.0[(a)(b)]
Flamingo Ranger Station	104[(c)] (06/24/98)	25[(c)] (12/25/89)	8.2[(c)] (08/18/81)	24.7[(c)] (05/75)	0.0[(c)]	0.0[(c)]
Fort Lauderdale	99[(c)] (07/13/80)	28[(c)] (01/20/77)	14.6[(c)] (04/25/79)	24.4[(c)] (06/92)	0.0[(c)]	0.0[(c)]
Fort Lauderdale Experiment Station	100[(a)(b)] (06/24/77)	26[(a)(b)] (01/20/77)	11.5[(a)(b)] (04/25/79)	21.3[(a)(b)] (06/66)	0.0[(a)(b)]	0.0[(a)(b)]
Hialeah	100[(c)] (07/10/98)	28[(c)] (01/13/81)	10.0[(c)] (05/05/77)	31.9[(c)] (06/99)	0.0[(c)]	0.0[(c)]
Homestead Experiment Station	100 [(a)(b)(d)] (06/24/44)	26[(a)(b)(e)] (02/16/43)	11.5[(a)(b)] (10/05/33)	27.3[(a)(b)] (08/81)	T[(a)(b)] (01/19/77)	T[(a)(b)] (01/77)
Kendall 2 E	N/A	N/A	9.8[(a)(b)] (05/25/58)	23.2[(a)(b)] (08/73)	0.0[(a)(b)]	0.0[(a)(b)]
Miami Beach	98[(c)] (08/29/99)	32[(c)] (12/24/89)	8.4[(c)] (09/23/60)	17.5[(c)] (05/84)	0.0[(c)]	0.0[(c)]
Miami 12 SSW POR 1933-1958	98[(a)(b)(f)] (06/18/34)	28[(a)(b)(g)] (02/06/47)	7.6[(a)(b)] (09/22/48)	23.8[(a)(b)] (09/48)	0.0[(a)(b)]	0.0[(a)(b)]
Miami 12 SSW POR 1958–1988	97[(a)(b)(h)] (08/10/87)	25[(a)(b)] (01/20/77)	10.1[(a)(b)] (09/10/60)	27.5[(a)(b)] (09/60)	0.0[(a)(b)]	0.0[(a)(b)]
Miami International Airport	98[(i)(j)] (07/03/98)	30[(i)(k)] (12/25/89)	14.9[(i)] (04/25/79)	24.4[k(i)] (09/60)	0.0[(c)]	0.0[(c)]
Oasis Ranger Station	103[(a)(b)] (06/18/81)	26[(a)(b)(l)] (02/16/91)	8.1[(a)(b)] (08/24/95)	24.2[(a)(b)] (06/99)	0.0[(a)(b)]	0.0[(a)(b)]
Perrine 4 W	98[(a)(b)] (07/04/98)	29[(a)(b)] (12/24/89)	15.1[(a)(b)] (08/26/05)	29.5[(a)(b)] (09/60)	0.0[(a)(b)]	0.0[(a)(b)]
Pompano Beach	101[(a)] (07/16/81)	21[(a)] (02/09/95)	12.7[(a)] (10/15/65)	34.4[(a)(b)] (10/65)	0.0[(a)]	0.0[(a)]
Royal Palm Ranger Station	102[(a)(m)] (04/28/07)	24[(a)] (01/20/77)	9.6[(a)] (06/09/97)	25.5[(a)(b)] (06/69)	0.0[(a)]	0.0[(a)]
Tamiami Trail 40-Mile Bend	102[(a)] (06/17/81)	28[(a)(n)] (12/25/89)	7.5[(a)(o)] (10/16/99)	23.5[(a)(b)] (06/69)	0.0[(a)]	0.0[(a)]
Tavernier	98[(a)(p)] (09/03/03)	35[(a)(q)] (12/24/89)	13.8[(a)] (06/02/82)	21.8[(a)(b)] (06/67)	0.0[(a)]	0.0[(a)]

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Table 2.3.1-203 (Sheet 2 of 2)
Climatological Extremes at Selected NWS and Cooperative Observing Stations in the Area of Units 6 & 7

(a) Subsection 2.3.2, Reference 206
(b) Subsection 2.3.2, Reference 204
(c) Subsection 2.3.2, Reference 202
(d) Occurs on multiple dates: 07/21/42; 06/24/44 (most recent date shown in table).
(e) Occurs on multiple dates: 12/13/34; 03/02/41; 02/16/43 (most recent date shown in table)
(f) Occurs on multiple dates: 07/09/32; 06/18/34 (most recent date shown in table)
(g) Occurs on multiple dates: 01/28/40; 02/06/47 (most recent date shown in table)
(h) Occurs on multiple dates: 05/01/71; 06/25/87 (most recent date shown in table)
(i) Subsection 2.3.2, Reference 201
(j) Occurs on multiple dates: 06/04/85; 07/03/98; 08/01/90 (most recent date shown in table)
(k) Occurs on multiple dates: 01/22/85; 12/25/89 (most recent date shown in table)
(l) Occurs on multiple dates: 01/12/89; 12/25/89; 02/16/91 (most recent date shown in table)
(m) Occurs on multiple dates: 07/22/96; 04/28/07 (most recent date shown in table)
(n) Occurs on multiple dates: 01/22/85; 12/25/89 (most recent date shown in table)
(o) Occurs on multiple dates: 09/23/48; 10/16/99 (most recent date shown in table)
(p) Occurs on multiple dates: 08/14/57; 09/03/63 (most recent date shown in table)
(q) Occurs on multiple dates: 01/13/81;12/24/89 (most recent date shown in table)

N/A — Not Available. This parameter is not measured at this station.
T — Trace

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Table 2.3.1-204
Monthly, Seasonal, and Annual Morning and Afternoon Mixing Heights and Wind Speeds for the Area of Units 6 & 7

Period	Statistic[a]	Mixing Height (m, AGL)[b]		Wind Speed – (m/sec)		Ventilation Index (m^2/sec)[c]	
		AM	PM	AM	PM	AM	PM
January	Min	252	858	2.7	2.4	626 (P)	2890 (F)
	Max	863	1400	4.7	4.5	4674 (G)	5724 (G)
	Mean	522	1105	3.5	3.2	2094 (M)	3644 (G)
February	Min	359	910	2.5	2.2	850 (P)	2771 (F)
	Max	1012	1458	4.6	4.4	4510 (G)	5732 (G)
	Mean	599	1239	3.5	3.3	2462 (F)	4129 (G)
March	Min	406	1043	2.8	2.6	1237 (M)	3189 (G)
	Max	1010	1552	4.8	4.6	4872 (G)	6700 (G)
	Mean	681	1311	3.5	3.3	2797 (F)	4394 (G)
April	Min	272	1128	2.5	2.2	946 (P)	3397 (F)
	Max	1056	1689	4.4	4.0	4897 (G)	5894 (G)
	Mean	668	1412	3.3	3.1	2549 (F)	4342 (G)
May	Min	327	881	2.1	2.2	1032 (P)	2566 (F)
	Max	1224	1618	4.6	4.3	5564 (G)	5814 (G)
	Mean	688	1338	3.1	2.9	2573 (F)	3981 (G)
June	Min	327	725	1.8	2.2	945 (P)	1798 (M)
	Max	928	1464	4.1	4.3	4094 (G)	5256 (G)
	Mean	577	1165	3.1	2.9	2019 (M)	3141 (F)
July	Min	240	806	1.8	1.9	451 (P)	1742 (M)
	Max	788	1547	4.6	4.0	2946 (F)	4644 (G)
	Mean	474	1234	2.8	2.7	1597 (M)	3423 (F)
August	Min	254	958	2.1	2.1	824 (P)	2431 (F)
	Max	774	1489	4.4	4.0	3675 (G)	5225 (G)
	Mean	478	1237	2.3	2.8	1705 (M)	3598 (G)
September	Min	234	868	2.5	2.2	721 (P)	1894 (M)
	Max	952	1430	4.8	5.0	4502 (G)	6092 (G)
	Mean	541	1139	3.4	3.2	2107 (M)	3755 (G)
October	Min	376	868	2.4	2.7	1433 (M)	2325 (M)
	Max	1076	1556	4.6	4.6	4883 (G)	6145 (G)
	Mean	607	1184	3.6	3.6	2612 (F)	4371 (G)
November	Min	343	768	2.5	2.7	1296 (M)	2440 (F)
	Max	981	1406	5.0	4.7	5789 (G)	5596 (G)
	Mean	606	1138	3.6	3.4	2598 (F)	3992 (G)
December	Min	292	886	2.2	2.3	769 (P)	2437 (F)
	Max	970	1486	4.7	5.1	4723 (G)	5386 (G)
	Mean	569	1128	3.4	3.4	2376 (F)	3926 (G)
Winter	Mean	563	1157	3.5	3.3	2306 (M)	3892 (G)
Spring	Mean	679	1354	3.3	3.1	2641 (F)	4238 (G)
Summer	Mean	510	1212	2.7	2.7	1771 (M)	3390 (F)
Fall	Mean	585	1154	3.5	3.4	2441 (F)	4043 (G)
Annual	Mean	584	1219	3.5	3.1	2291 (M)	3891 (G)

(a) Monthly minimum, maximum and mean values are based directly on summaries available from USDA - Forest Service Ventilation Climate Information System (VCIS) (Reference 216). Seasonal and annual mean values represent weighted averages based on the number of days in the appropriate months.

(b) AGL = above ground level.

(c) Classifications of ventilation potential from Ventilation Index: P = Poor (0 to 1175 m^2/sec); M = Marginal (1176 to 2350 m^2/sec); F = Fair (2351 to 3525 m^2/sec); G = Good (> 3525 m^2/sec).

Figure 2.3.1-201 Climatological Observing Stations Near Units 6 & 7

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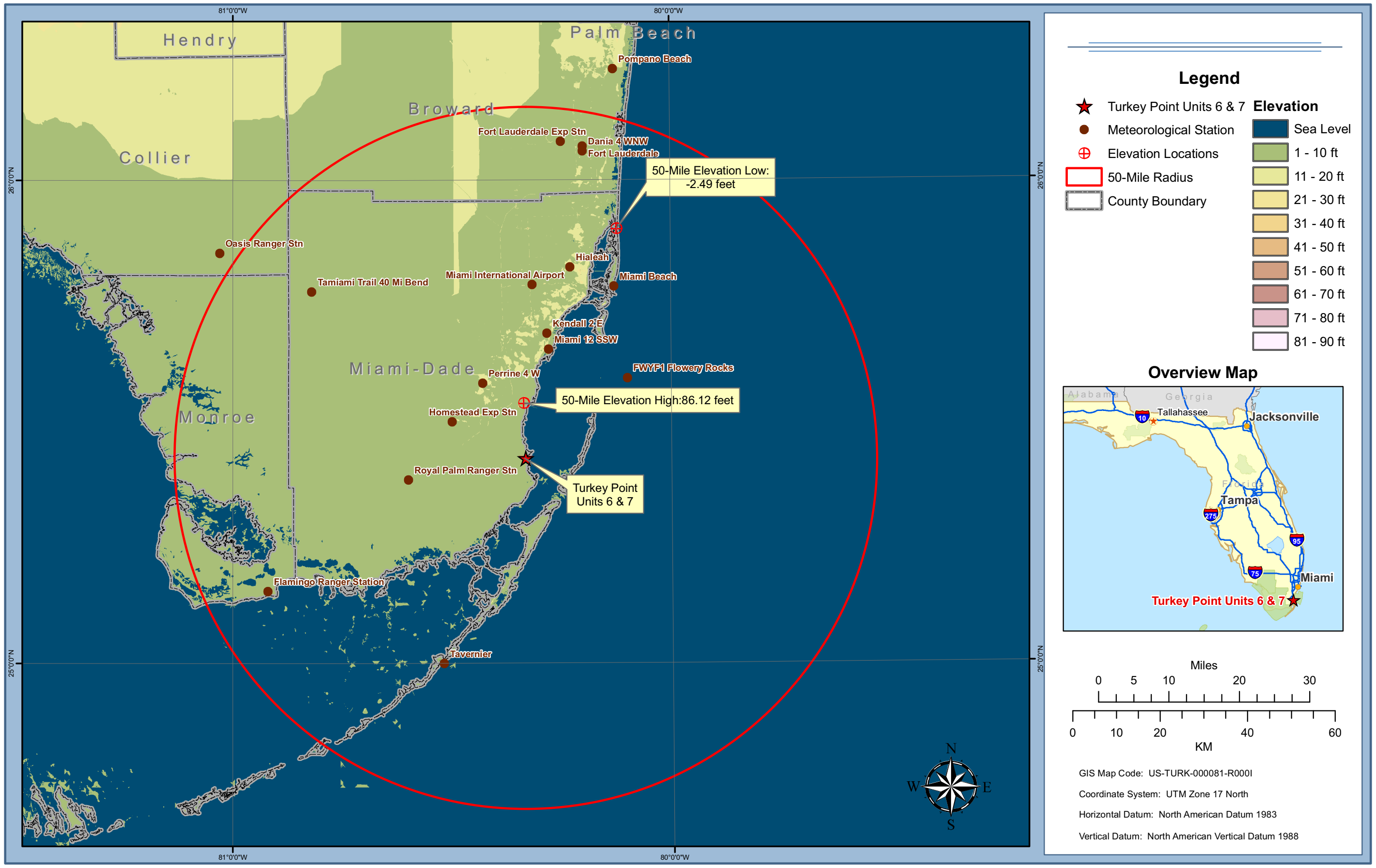

2.3.2 LOCAL METEOROLOGY

PTN COL 2.3-2 This subsection addresses various meteorological and climatological characteristics of the site and vicinity around the Units 6 & 7 site.

Subsection 2.3.2.1 identifies data resources used to develop the climatological descriptions and introduces information about the onsite meteorological monitoring program used to characterize site-specific atmospheric dispersion conditions.

Additionally, information presented in Subsection 2.3.2.1 has site-specific characteristics related to atmospheric transport and diffusion, based on measurements from the onsite meteorological monitoring program operated in support of Units 6 & 7, that are detailed, respectively, in Subsections 2.3.2.1.1 and 2.3.2.1.2 (wind speed and wind direction, and wind direction persistence) and in Subsection 2.3.2.1.3 (atmospheric stability).

Climatological normals, means and extremes (temperature, rainfall, snowfall, and fog), based on long-term records from nearby observing stations, are addressed in Subsections 2.3.2.1.4 through 2.3.2.1.7 and are evaluated to substantiate that observations are representative of conditions that might be expected to occur at the Units 6 & 7 site.

Subsection 2.3.2.2 addresses the potential influence the plant and its related facilities on local meteorology. Included in this description are the effects of changes in local topography, heat dissipation, and a description of current and future air quality conditions based on Units 6 & 7 operation.

Finally, Subsection 2.3.2.3 describes the local meteorological conditions for the design and operating bases of Units 6 & 7.

2.3.2.1 Normal, Mean, and Extreme Values of Meteorological Parameters

The primary sources of data used to characterize local meteorological and climatological conditions representative of the Units 6 & 7 site include long-term summaries from the first-order National Weather Service (NWS) Station at Miami International Airport, Florida, and other nearby cooperative network observing stations. Table 2.3.1-201 identifies the offsite observing stations, including the station at Miami International Airport and others, and provides the approximate distance and direction of each station relative to the Units 6 & 7 site. Station locations are shown in Figure 2.3.1-201.

The NWS and cooperative observing station summaries were used to characterize climatological normals (30-year averages), and period-of-record means and extremes of temperature, rainfall, and snowfall in the vicinity of the site for Units 6 & 7. In addition, first-order NWS stations record hourly measurements (typically) of other weather elements, including winds, relative humidity, dew point, and wet bulb temperatures, as well as other observations (e.g., fog, thunderstorms). This information was based on the following resources:

- *2008 Local Climatological Data, Annual Summary with Comparative Data for Miami, Florida* (Reference 201)
- *Climatography of the United States, No. 20, 1971–2000, Monthly Station Climate Summaries* (Reference 202)
- *Climatography of the United States, No. 81, 1971–2000*, U.S. Monthly Climate Normals (Reference 203)
- *Period of Record General* and *Monthly Climate Summaries* for Cooperative Reporting Stations in the southeastern United States, Southeast Regional Climate Center (Reference 204)
- Utah Climate Center, Utah State University, *Climate Data Base for Florida* (Reference 206)

Measurements from the tower-mounted meteorological monitoring system that currently supports Units 3 & 4—specifically, wind direction, wind speed, and atmospheric stability—are the basis for determining and characterizing atmospheric dispersion conditions in the vicinity of the site. The data from this monitoring program, used to support Units 6 & 7, includes measurements taken over the three-year period of record during 2002, 2005, and 2006.

Refer to Subsection 2.3.3 for a description of relevant details about the tower location; terrain features and elevations at the meteorological tower and in the vicinity of Units 6 & 7; instrumentation and measurement levels; data recording and processing; system operation, maintenance, and calibration activities.

Wind and atmospheric stability characteristics, based on meteorological data obtained from the monitoring program operated in support of Units 6 & 7, are described in Subsections 2.3.2.2.1 through 2.3.2.2.3. This site-specific data also provides input to dispersion modeling analyses of impacts, at onsite and offsite receptor locations, because of accidental and routine radiological releases to the atmosphere (see Subsections 2.3.4 and 2.3.5).

Summaries of normals, and period-of-record means and/or extremes for several standard weather elements—that is, temperature, atmospheric water vapor, precipitation, and fog are provided in Subsections 2.3.2.1.4 through 2.3.2.1.7, respectively.

2.3.2.1.1 Average Wind Direction and Wind Speed Conditions

The distribution of wind direction and wind speed is an important consideration when characterizing the dispersion climatology of a site. Long-term average wind motions at the macro- and synoptic scales (on the order of several thousand down to several hundred kilometers) are influenced by the general circulation patterns of the atmosphere at the macro-scale and by large-scale topographic features (land-water interfaces such as coastal areas). These characteristics are addressed in Subsection 2.3.1.2.

Site-specific or micro-scale (on the order of 2 kilometers or less) wind conditions, while they may reflect these larger-scale circulation effects, are influenced primarily by local and, to a lesser extent (in general), by meso- or regional-scale (up to approximately 200 kilometers), topographic features. Wind measurements at these smaller scales are currently available from the meteorological monitoring program operated in support of Units 3 & 4 and, for comparison, from data recorded at the nearby Miami International Airport, NWS Station.

Subsection 2.3.3 includes a description of the monitoring program that provides the onsite meteorological data used. Wind direction and wind speed measurements were made at 10 meters and at 60 meters on a 60-meter instrumented tower.

Figures 2.3.2-201 through 2.3.2-205 present annual and seasonal wind rose plots for the 10-meter level, i.e., graphical distributions of the direction from which the wind is blowing and wind speeds for each of 16, 22.5-degree compass sectors centered on north, north-northeast, and northeast, etc., for the 10-meter level based on measurements during 2002, 2005, and 2006. Figure 2.3.2-206 (Sheets 1 to 12) presents monthly wind rose plots for the 10-meter level during the same period 2002, 2005, and 2006.

The annual wind direction distribution at the 10-meter level generally follows an easterly orientation on an annual basis (see Figure 2.3.2-201). The prevailing wind (the direction from which the wind blows most often) is from the east: with approximately 41 percent of the winds blowing from the east-northeast through east-southeast sectors. Conversely, winds from the west-southwest through west-northwest sectors occur approximately 7 percent of the time.

Winds from the east direction predominate during the spring, summer and autumn months (see Figures 2.3.2-203, 2.3.2-204, and 2.3.2-205). During the winter, the relative frequency of north-northwest winds during this season is greater (see Figure 2.3.2-202) because of increased cold frontal passages. Winds from the north-northwest quadrant predominate during the winter months (see Figure 2.3.2-202).

Annual and seasonal wind rose plots based on measurements at the 60-meter level are shown in Figures 2.3.2-207 through 2.3.2-211. By comparison, wind direction distributions for the 60-meter level are fairly similar to the 10-meter level wind roses on composite annual and seasonal bases in terms of the predominant directional quadrants and variation over the course of the year. Prevailing winds differ between the two levels by one adjacent direction sector, generally veering (turning clockwise) with height as might be expected. Plots of individual monthly wind roses at the 60-meter measurement level are presented in Figure 2.3.2-212 (Sheets 1 to 12).

Wind information summarized in the local climatological data (LCD) for the Miami International Airport Station (see Table 2.3.1-202) indicates a prevailing east-southeasterly wind direction on an annual basis, as well as seasonal variations (Reference 201), that appear to be similar to the 10-meter level wind flow at the Turkey Point site. Differences between the two wind direction distributions are attributable to many factors: topographic setting; sensor exposure; instrument threshold and accuracy, and length of record.

Table 2.3.2-201 summarizes seasonal and annual mean wind speeds based on measurements from the upper and lower levels of the meteorological tower operated in support of Units 6 & 7 over the 3-year period of record 2002, 2005, and 2006 and from wind instrumentation at the Miami International Airport Station based on a 24-year period of record (Reference 201). The elevation of the wind instruments at the Miami International Airport Station is nominally 33 feet above the ground surface (10 meters), comparable to the lower (10-meter) level measurements at the Turkey Point site.

On an annual basis, mean wind speeds at the 10- and 60-meter levels are 3.8 and 5.6 meters/second, respectively, at the Turkey Point site. The annual mean wind speed at Miami International Airport (3.9 meters/second) is similar to the 10-meter level at the Turkey Point site, differing by only 0.10 meters/second. Seasonal average wind speeds at Miami International Airport are higher throughout the year except during summer when speeds average approximately 0.07 meters/second lower than those at the Turkey Point site. Seasonal mean wind speeds for both locations follow the same pattern described in Subsection 2.3.1.6 in relation to the seasonal variation of relatively higher air stagnation and restrictive dispersion conditions in the site region.

There were few calm winds recorded by the meteorological monitoring system at the 10-meter level and the 60-meter level during the annual periods in 2002, 2005, and 2006. [Note: Wind speeds greater than 0.5 mph (starting threshold of sensor) are considered non-calm winds. However, 42 hours of actual calm conditions occurred over the 2002, 2005, and 2006 periods. These hours, however, were not considered valid and were not used in the meteorological data set.]

2.3.2.1.2 Wind Direction Persistence

Wind direction persistence is a relative indicator of the duration of atmospheric transport from a specific sector-width to a corresponding downwind sector-width that is 180 degrees opposite. Atmospheric dilution is directly proportional to the wind speed (other factors remaining constant). When combined with wind speed, a wind direction persistence/wind speed distribution further indicates the downwind sectors with relatively more or less dilution potential (higher or lower wind speeds, respectively) associated with a given transport wind direction.

Tables 2.3.2-202 and 2.3.2-203 present wind direction persistence/wind speed distributions (in hours) based on measurements from the Units 6 & 7 monitoring program for the 3-year period of record from 2002, 2005, and 2006. The distributions account for durations ranging from 1 to 48 hours for wind directions from 22.5-degree upwind sectors centered on each of the 16 standard compass radials (i.e., north, north-northeast, northeast, etc.) and for wind speed groups greater than or equal to 5, 10, 15, 20, 25, 30, 35, and 40 mph. Distributions are provided for wind measurements made at the lower (10-meter) and the upper (60-meter) tower levels, respectively, identified in the preceding subsection.

At the 10-meter level, the longest persistence period is 36 hours for winds from the east-northeast and southeast sectors (see Table 2.3.2-202). This duration appears only in the lowest two wind speed groups for wind speeds greater than or equal to 5 and 10 mph. Persistence periods lasting for at least 30 hours are indicated for several direction sectors for wind speeds greater than or equal to 5 mph, including winds from the northeast, east-northeast, east, and southeast. For wind speeds greater than or equal to 20 mph, maximum persistence is limited to 12 hours from the southeast.

At the 60-meter level, the longest persistence period is 36 hours and occurs for winds from three different direction sectors which include northeast, east-northeast, and north-northwest (see Table 2.3.2-203) for wind speeds greater than or equal to 5 mph and for wind speeds greater than or equal to 10 mph. Winds occur from one sector (i.e., northeast) for wind speeds greater than or equal to 15 mph and for wind speeds greater than or equal to 20 mph for a 36 hour period. For wind speeds greater than or equal to 25 mph, maximum persistence periods are limited to 12 hours for winds from the northeast and east-southeast sectors.

2.3.2.1.3 Atmospheric Stability

Atmospheric stability is a relative indicator for the potential diffusion of pollutants released into the ambient air. Atmospheric stability, as described in this FSAR, was based on the delta-temperature (ΔT) method defined in Table 1 of RG 1.23.

The approach classifies stability based on the temperature change with height (i.e., the difference in °C per 100 meters). Stability classifications are assigned according to the following criteria:

- Extremely Unstable (Class A) ΔT ≤–1.9°C
- Moderately Unstable (Class B) –1.9°C < ΔT ≤ –1.7°C
- Slightly Unstable (Class C) –1.7°C < ΔT ≤ –1.5°C
- Neutral Stability (Class D) –1.5°C < ΔT ≤ –0.5°C
- Slightly Stable (Class E) –0.5°C < ΔT ≤ +1.5°C
- Moderately Stable (Class F) +1.5°C < ΔT ≤ +4.0°C
- Extremely Stable (Class G) +4.0°C < ΔT

The diffusion capacity is greatest for extremely unstable conditions and decreases progressively through the remaining unstable, neutral, and stable classifications.

For the 3-year period of record from 2002, 2005, and 2006, ∆T was determined from the difference between temperature measurements made at the 60- and 10-meter tower levels. Seasonal and annual frequencies of atmospheric stability class and associated 10-meter level mean wind speeds for this period of record are presented in Table 2.3.2-204.

The data indicates a predominance of neutral stability (Class D) and slightly stable (Class E) conditions throughout the year, 28.5 percent and 36.5 percent of the time for these stability classes, respectively, and 65 percent combined. Extremely unstable conditions (Class A) are more frequent during the spring and occur least often during the summer and autumn months. Such extremely unstable conditions are attributed to relatively lower mean wind speeds and greater insolation in the summer and higher mean wind speeds and lesser insolation in the spring extremely stable conditions (Class G) are most frequent during the winter (approximately 10 percent of the time), owing in part to increased radiational cooling at night, and occur least often during the summer months.

Joint frequency distributions of wind speed and wind direction by atmospheric stability class and for stability classes combined for the 10-meter and 60-meter wind measurement levels are presented in Tables 2.3.2-205 and 2.3.2-206, respectively, based on the 3-year period of record from 2002, 2005, and 2006. The 10-meter level joint frequency distributions are used to evaluate short-term dispersion estimates for accidental atmospheric releases (see Subsection 2.3.4) and long-term diffusion estimates of routine releases to the atmosphere (see Subsection 2.3.5).

2.3.2.1.4 Temperature

Mean monthly normal annual temperatures are based on the average of the mean monthly maximum and minimum temperature values. Annual mean monthly normal temperatures over the site area range from 73.8°F at the Fort Lauderdale Experiment Station (approximately 46 miles north of Units 6 & 7) to 78.4°F at the Hialeah Station (approximately 27 miles to the north) (see Table 2.3.2-207).

Likewise, the mean monthly diurnal (day-to-night) temperature ranges, as indicated by the differences between the mean monthly maximum and minimum temperatures, are fairly comparable, ranging from 9.0°F at Miami Beach (approximately 28 miles to the northeast of the site) to 19.8°F at the Oasis Ranger Station (approximately 53 miles to the northwest) (Reference 205). The breadth of this range reflects each stations' proximity to the Atlantic Ocean. Miami Beach is located directly on the coast (less temperature variability because of maritime influence), while Homestead Experiment Station is located further inland.

On a monthly basis, the 2008 LCD summary for Miami International Airport, Florida, indicates that the daily maximum normal temperature is highest during July (90.9°F) and August (90.6°F) and reaches a minimum in January (76.5°F) (Reference 201).

Extreme maximum temperatures recorded in the vicinity of the site for Units 6 & 7 have ranged from 96°F to 104°F, with the highest reading observed at the Flamingo Ranger Station (approximately 41 miles to the southwest) on June 24, 1998. As Table 2.3.2-208 and the accompanying description show, individual station extreme maximum temperature records were set at Oasis Ranger Station and Tamiami Trail 40-Mile Bend on adjacent dates in June 1981 (References 202 and 204).

Extreme minimum temperatures in the vicinity of the site for Units 6 & 7 have ranged from 21°F to 42°F, with the lowest reading on record observed at the Pompano Beach Station (approximately 57 miles to the north-northeast) on February 9, 1995. More noteworthy, though, Table 2.3.2-208 and the accompanying notes indicate that record low temperatures were also set at Miami Beach, Miami International Airport, Flamingo Ranger Station, Oasis Ranger Station, Perrine 4 W, Tamiami Trail 40-Mile Bend, and Tavernier on December 24–25, 1989 (References 202 and 204).

The extreme maximum and minimum temperature data indicates that synoptic-scale conditions responsible for periods of record-setting excessive heat as well as significant cold air outbreaks tend to affect the overall area at theTurkey Point site. The similarity of the respective extremes and their dates of occurrence suggest that these statistics are reasonably representative of the temperature extremes that might be expected to be observed at the site for Units 6 & 7.

2.3.2.1.5 Atmospheric Water Vapor

Based on a 25-year period of record, the LCD summary for Miami International Airport (see Table 2.3.1-202) indicates that the mean annual wet bulb temperature is 69.6°F, with a seasonal maximum during the summer months June through September, and a seasonal minimum during the winter months December through February. The highest monthly mean wet bulb temperature is 76.4°F in August (only slightly less during July); the lowest monthly mean value (62°F) occurs during January (Reference 201).

The LCD summary shows a mean annual dew point temperature of 67.1°F, also reaching its seasonal maximum and minimum during the summer and winter, respectively. The highest monthly mean dew point temperature is 74.4°F in August. The lowest monthly mean dew point temperature (59.1°F) occurs during January (Reference 201).

The 30-year normal daily relative humidity averages 73 percent on an annual basis, typically reaching its diurnal maximum in the early morning hours (approximately 0700 local standard time) and its diurnal minimum during the early afternoon hours (1300 local standard time). There is less variability in this daily pattern with the passage of weather systems, persistent cloud cover, and precipitation. Nevertheless, this diurnal pattern is evident throughout the year. The LCD summary indicates that average early morning relative humidity levels are greater than or equal to 85 percent during the months of August, September, October, and January (Reference 201).

2.3.2.1.6 Precipitation

Normal annual rainfall totals for the 17 nearby (within approximately 57 miles) observing stations that report rainfall listed in Table 2.3.2-207 vary greatly, ranging from 44.8 inches at Tavernier Station (approximately 31 miles to the south-southwest of Units 6 & 7) to 66 inches at the Hialeah Station (approximately 27 miles to the north) (Reference 203).

The LCD summary of normal rainfall totals for Miami International Airport, Florida indicates two seasonal maximums, the highest (8.63 inches) during late summer (August) with 8.38 inches early autumn (September), and the second (8.54 inches) during early summer (June). Together, these 3 months account for approximately 44 percent of the annual total of 58.53 inches for the Miami International Airport Florida Station. The overall maximum monthly total rainfall occurs during September (24.4 inches) (Reference 201). Maximum monthly rainfall totals range from 17.5 inches at Miami Beach (approximately 28 miles to the northeast of Units 6 & 7), to 34.4 inches at the Pompano Beach observing station (approximately 57 miles to the north-northeast of Units 6 & 7).

Subsection 2.3.1.3.4 addresses historical precipitation extremes (i.e., rainfall and snowfall), as presented in Table 2.3.2-208 for the 17 nearby climatological observing stations listed in Table 2.3.1-201. Based on the maximum 24-hour and monthly precipitation totals recorded among these stations and, more importantly, the aerial distribution of these stations around the site, the data suggests that these statistics are reasonably representative of the extremes of rainfall and snowfall that might be expected to be observed at the Turkey Point site.

2.3.2.1.7 Fog

The closest station to the Turkey Point site at which observations of fog are made and routinely recorded is the Miami International Airport Station, approximately 25 miles to the north. The 2008 LCD summary for this station (Table 2.3.1-202) indicates an average of approximately 4.7 days per year of heavy fog conditions, based on a 45-year period of record. The NWS defines heavy fog as fog that reduces visibility to one-quarter mile or less (Reference 201).

Seasonally, heavy fog conditions occur most often during the winter months. It reaches a peak frequency in December and January, averaging 0.7 and 0.9 days per month, respectively. Heavy fog conditions occur least often from May through September, averaging 0.1 days per month (Reference 201).

The frequency of heavy fog conditions for Units 6 & 7 would be expected to be very similar to the Miami International Airport Station observations because of their proximity to each other (approximately 25 miles). This is consistent with the higher frequency of occurrence reported in *Climate Atlas of the United States* (Reference 207), which indicates an annual average frequency of 5.5 to 10.4 days per year in the area that includes the Turkey Point site and the same annual frequency in the area that includes Miami International Airport Station, Florida. The seasonal variation is very similar to that in the 2008 LCD for the Miami International Airport Station (Reference 201).

2.3.2.2 Potential Influence of the Plant and Related Facilities on Meteorology

The operation of Units 6 & 7 could influence the local micrometeorology in the immediate vicinity of the site. These effects could occur as a result of minor changes to the topography and vegetation resulting from land clearing and the construction of additional buildings and infrastructure, as well as the use of mechanical draft cooling towers for system heat rejection to the atmosphere. However, these alterations to the existing terrain are localized and will not represent a significant change to the flat topographic character of the site vicinity or the surrounding site area (see Figure 2.3.2-213). Neither the mean and extreme climatological characteristics of the site area, nor the meteorological characteristics of the site and vicinity, will be affected as a result of plant operation.

Wind flow will be altered in areas immediately adjacent to and downwind of larger site structures. However, these effects will likely dissipate in 10 structure heights downwind of the intervening structure(s). Similarly, while ambient temperatures immediately above any improved surfaces could increase, these temperature effects will be limited in their vertical profile and horizontal extent to alter local-, area-, or regional-scale mean or extreme ambient temperature patterns.

Detailed topographic features within 5 miles of the site for Units 6 & 7, also based on digital map elevations, are shown in Figure 2.3.2-214. Terrain within this radial distance of the site primarily consists of flat plains with little elevation change, relative to nominal plant grade.

The use of mechanical draft cooling towers for system heat rejection will result in visible moisture plumes from the cooling tower during certain atmospheric conditions. The amount of condensation of evaporated water vapor, and thus the formation of visible plumes from the cooling towers, are expected to be greatest during winter months.

Icing conditions caused by freezing condensed water vapor from cooling tower plumes could occur on vertical surfaces (such as buildings and equipment) and on horizontal surfaces (such as roadways) in the immediate vicinity of the cooling towers. However, given the climate in southern Florida, these types of conditions are expected to occur only on rare occasions and only at onsite locations. Because of the large distances from the locations of the cooling towers to areas of public access (such as roadways), the potential for fogging and icing conditions at offsite locations is unlikely.

2.3.2.2.1 Topographic Description

The Turkey Point plant property is on the southeastern coast of Florida, bordering Biscayne Bay and Card Sound, in unincorporated southeast Miami-Dade County. The Turkey Point plant site is located approximately 8 miles east of Florida City and 9 miles southeast of Homestead. The Turkey Point plant site is adjacent to Biscayne National Park, Palm Drive, Biscayne Bay, the Everglades Mitigation Bank, and the cooling canals. The Turkey Point plant property is approximately 9400 acres. The power block for Units 6 & 7 is an area of approximately 6 acres. The Turkey Point power block and surrounding area are shown on Figure 2.1-205.

Terrain features within 50 miles of the site for Units 6 & 7, based on digital map elevations, are illustrated in Figure 2.3.1-201. Terrain elevation profiles along each of the 16 standard 22.5-degree compass radials out to a distance of 50 miles from the site are shown in Figure 2.3.2-213 (Sheets 1 through 6). Because Units 6 & 7 are relatively close to one another and because of the distance covered by these profiles, the locus of these radial lines is the center point between the Units 6 & 7 reactor buildings.

The finished grade elevation for Units 6 & 7 is 25.5 feet NAVD 88. The Turkey Point plant site and its immediate environs lie on the Floridian Plateau, a partly submerged peninsula of the continental shelf. Terrain within 50 miles of the site for Units 6 & 7 is generally flat and rises very gently from sea level to an elevation of approximately 10 feet NAVD 88 at a point some 8 to 10 miles west of the site. Figure 2.3.1-201 indicates that the highest elevation within 50 miles of the site is approximately 86 feet located north of Turkey Point. Figure 2.3.1-201 also indicates that the lowest elevation within 50 miles of the site, 2.49 feet below MSL, is to the northeast of the Turkey Point site.

2.3.2.2.2 Fogging and Icing Effects Attributable to Cooling Tower Operation

Ground-level fogging and icing impacts attributable to cooling tower operation are not expected to be significant. Although ground-level fogging events could occur in the immediate vicinity of the cooling towers, these events are expected at onsite locations under relatively cold and moist atmospheric conditions and when building wake and downwash effects (i.e., from the cooling tower structures or from nearby plant structures) influence the dispersion of the cooling tower plumes. The vapor plume from the circular mechanical draft circulating water system (CWS) cooling towers (three per unit) could be directed towards the ground under high wind conditions, creating ground-level fogging and icing. However, under high wind conditions the vapor plume would undergo rapid dispersion and result in lower moisture concentration at the ground level. Because of the warm climate in southern Florida, icing at the ground level is expected to be infrequent. For circular mechanical draft cooling towers, fogging and icing usually occur under high wind conditions (wind speed >12 m/s) (Reference 210). Because the CWS cooling towers are located to the south of the plant site, only winds coming from the south-southeast (SSE), south (S), and south-southwest (SSW) sectors would have the potential to create fogging at the switchyard, transformer areas, or transmission lines. Based on the 10-meter level joint frequency distributions (JFDs) provided in Table 2.3.2-205, only 22 hours (about 7 hours per year) have the wind speed greater than 10 m/s coming from SSE, S and SSW sectors. The shortest distance between the transformer areas and the cooling tower is about 1400 feet. Considering this long physical separation and low frequency of the southern winds, the potential fogging impact to the transformer areas, electrical equipment in the switchyard, and transmission lines is minimal.

Extended visible plumes from the cooling towers will likely occur most frequently during periods of high humidity when restricted visibility occurs naturally. Subsection 2.3.2.1.7 describes known and predicted occurrences of natural occurring fog, which served as a prediction of potential time periods when fogging from Units 6 & 7 is expected.

Significant ice formation on structures or at ground level is not expected to occur in the vicinity of the Turkey Point site. Climatological records from the Miami meteorological observing station in Table 2.3.1-202 indicate that the average number of days of below freezing ambient temperatures in the region is less than one day. There are no large safety-related plant structures or other nearby structures adversely affected by icing from the cooling tower plumes under any meteorological conditions that are expected to occur.

2.3.2.2.3 Assessment of Heat Dissipation Effects on the Atmosphere

Mechanical draft cooling towers are used to dissipate heat to the atmosphere from Units 6 & 7. Although the cooling towers do not significantly influence local meteorological conditions, there are some limited periods of time when visible cooling tower plumes may extend short distances from the cooling towers, possibly being visible from selected offsite locations.

Cooling towers evaporate water to dissipate heat to the atmosphere. Evaporation is followed by partial re-condensation, which creates a visible mist or plume. The plume creates the potential for shadowing, fogging, icing, and localized increases in humidity. In addition, small water droplets are blown out of the tops of the cooling towers. These water droplets are referred to as drift and could be deposited, along with any dissolved salts, on vegetation and surfaces surrounding the cooling towers.

The temperature of the exhaust plume from the CWS cooling towers is designed to be 10°F higher than the ambient temperature. With this temperature difference, under low wind conditions, the thermal vapor plume from the cooling tower will be elevated and without direct contact with the transformers, the switchyard equipment, transmission lines, and HVAC air intakes. As discussed in Subsection 2.3.2.2.2, under high wind conditions, the vapor plume would undergo rapid dispersion and result in decreasing moisture in the plume. These factors, together with the low frequency of the southern sector winds, would cause the moisture impact to the transformers, switchyard equipment, and transmission lines from operation of the CWS cooling towers to be minimal. Since the cooling tower plume is only about 2°F higher than the 100-year return dry-bulb temperature, the plume is not hot enough to exceed the HVAC design temperature, as shown in DCD Table 2-1, and would not adversely impact the control room HVAC intakes.

For Units 6 & 7, the USEPA CALPUFF (Reference 208) and USEPA AERMOD (Reference 209) dispersion models were used to evaluate cooling tower plume behavior and to estimate the frequency of occurrence and length of visible cooling tower plumes. Five years (2001 through 2005) of hourly meteorological data (Miami surface and upper air observations) were used. Physical and performance characteristics of the mechanical draft cooling towers are as follows:

Parameter	Value
Number of Towers (Per Unit)	3
Circulating Water flow (Per Tower)	210,367 gpm
Cycle of Concentrations[a]	1.5 to 4
Approximate Height	67 feet
Approximate Base Diameter	246 feet
Number of cells (Per tower)	12
Number of fan per cell	1
Exit air delivery per fan	1,746,500 actual cubic feet per minute
Drift Rate	0.0005% (of the flow rate)
Heat Rejection Rate (million BTU/hr)	7,628
Solids Concentration (ppm)	50,000

(a) Cycle of Concentrations for saltwater is 1.5 (assume a saltwater salinity of approximately 33,000 ppm).

The analysis of cooling tower plume behavior for the 5-year simulation period (2001–2005) concluded that the predicted plumes would remain primarily on site. Visible vapor plumes would occur approximately 1723 hours per year, or approximately 20 percent of the year. Visible vapor plumes would occur during the winter months (718 hours), the spring (387 hours) and fall (388 hours) months. Table 2.3.2-209 summarizes the results for all hours.

Visible vapor plumes from the cooling towers remain close to each of the towers during the daylight when the plumes are the most visible. The results for daylight hours conclude that for the majority of the time, plume heights are less than 400 meters and plume lengths are less than 300 meters. Plume heights greater than 1000 meters are predicted to occur only one hour per year, while plume lengths in excess of 5000 meters would only occur 40 hours per year. Table 2.3.2-210 summarizes the results for all daylight hours.

Fogging from the cooling towers occurs when the visible plume intersects with the ground, appearing like fog to an observer. An analysis of cooling tower fogging and icing, using USEPA's CALPUFF model, concluded that there were no predicted occurrences of ground-level fogging during the summer season and minimal localized occurrence of fogging during the autumn and spring seasons at the plant area. During the winter season, the analysis concluded that fogging would occur for a total maximum of 5 hours during daylight hours for the entire 5-year simulation period at offsite areas on the eastern and southeastern perimeter of the site.

Salt deposition from the CWS cooling towers has the potential to build up on bushings of electrical equipment such as the Units 6 & 7 transformers, switchyard equipment, and transmission lines. A maximum salt deposition rate of 0.25 mg/cm^2/month was predicted to occur at the Unit 7 transformers, and a rate of approximately 0.20 mg/cm^2/month was predicted to occur at the transmission lines and switchyard, during the summer season. At this maximum monthly predicted salt deposition rate, the environment in the Unit 7 transformer area, due to the contribution of salt deposition from the cooling towers, could be classified as a "Heavy Contamination Level" environment. Whereas the environment at the transmission lines and switchyard areas, due to the contribution of maximum monthly summer salt deposition from the cooling towers, could be classified as a "Medium Contamination Level" environment. Typical equivalent salt deposition density levels, defined by the applicable IEEE Standard, "Guide for Application of Power Apparatus Bushings," are 0.08 - 0.25 mg/cm^2 and 0.25 - 0.6 mg/cm^2 for medium and heavy contamination levels, respectively (Reference 211). However, it is not anticipated that the salt deposition from the CWS cooling towers will accumulate to the point where it would have an adverse effect on electrical equipment based on the following:

- The salt deposition model assumed the radial collector wells were operated on a full-time basis. However, the radial collector well system is a back-up system; the primary CWS cooling makeup water system is reclaimed water, with a lower salinity (total dissolved solids concentration). For example, the maximum measured total dissolved solids value reviewed for Biscayne Bay was 34,000 ppm—accounting for approximately 1.5 cycles of concentration, 50,000 ppm was assumed in the model—versus a total dissolved concentration for the reclaimed water source of 960 ppm—accounting for 4 cycles of concentration, the total dissolved solids concentration for the CWS towers for the reclaimed water source may reach approximately 3840 ppm.

- The salt deposition model assumed the salt was transported as liquid droplets and did not account for evaporation of these droplets—essentially traveling the plume further out from the CWS cooling towers. The model also did not account for wet deposition.

- As depicted in FSAR Figure 2.3.2-204, the transformer, switchyard, and transmission lines are located north/northwest of the CWS cooling towers and the summer season prevailing wind direction is from the east.

It is anticipated that existing equipment condition monitoring programs would be able to recognize any degradation resulting from the cooling towers before it adversely affects the equipment.

Icing from the cooling towers would be the result of ground-level fogging when ambient temperatures are below freezing. However, the CALPUFF model predicted that no ground-level icing will occur as a result of cooling tower operation. Therefore, there will be no ground-level icing impacts as a result of cooling tower operation.

The AERMOD model was used to predict salt deposition from the operation of the Units 6 & 7 cooling towers. The simulation was modeled based on the cooling tower operational parameters and the 2001 through 2005 Miami meteorological data for upper air and surface data. Salt deposition up to 105 kg/ha per month is predicted near the makeup water reservoir.

Beyond the makeup water reservoir, the deposition rates are predicted to decrease rapidly. The monthly salt deposition into the industrial wastewater facility ranges from 1 to 70 kg/ha/month. Salt deposition of more than 10 kg/ha per month is generally confined to the plant property, with the exception of areas adjacent to the southeastern portion of the site.

No combined effects of cooling tower plume mixing with plant releases are expected to occur. Any gaseous effluents released from the plant during operation occur intermittently, at different elevations, and at locations other than the cooling towers. Also, any such releases are at or near ambient temperature and no significant plume rise occurs. Therefore, the potential for the mixing of the plumes is expected to be minimal.

2.3.2.2.4 Current and Projected Site Air Quality

This subsection addresses current ambient air quality conditions in the area of the Turkey Point site and region (e.g., the compliance status of various air pollutants) that are relevant to plant design, construction, and operating basis. Subsection 2.3.1.3 characterized conditions (from a climatological standpoint) in the site area and region that may be restrictive to atmospheric dispersion.

2.3.2.2.5 Regional Air Quality Conditions

Units 6 & 7 are located in the Southeast Florida Intrastate Air Quality Control Region, which includes Broward, Miami-Dade, Indian River, Martin, Monroe, Okeechobee, Palm Beach, and St. Lucie counties. Attainment areas are areas where the ambient levels of criteria air pollutants are designated as being better than, unclassifiable/attainment, or cannot be classified or better than the EPA-promulgated National Ambient Air Quality Standards (NAAQS). Criteria pollutants are those for which NAAQS have been established: sulfur dioxide, particulate matter (i.e., PM_{10} and $PM_{2.5}$), carbon monoxide, nitrogen dioxide, ozone, and lead.

The Southeast Florida Intrastate Air Quality Control Region is classified as in attainment (unclassifiable) for each criteria pollutant. Smog caused by ozone is not expected to be a significant problem near Units 6 & 7 because of the attainment classification of Miami-Dade County.

Three pristine areas are located in the state of Florida with Class I Areas designated as *Mandatory Class I Federal Areas Where Visibility is an Important Value.* They include Everglades National Park, Chassahowitzka Wilderness Area, and St. Marks Wilderness Area. The Everglades National Park is the closest of the Class I areas and is located approximately 13 miles west of Units 6 & 7. The Chassahowitzka Wilderness Area and the St. Marks Wilderness Area are both more than 250 miles to the northwest.

2.3.2.2.6 Projected Air Quality Conditions

The Units 6 & 7 nuclear steam supply systems and other related systems are not sources of criteria pollutants or other air toxics. Supporting equipment (e.g., diesel generators, fire pump engines), and other emission-generating sources (e.g., storage tanks and related equipment) operate intermittently and are not significant sources of criteria (common) pollutant emissions. Therefore, these emission sources will not impact ambient air quality levels in the vicinity of Units 6 & 7. Likewise, because of the relatively long distance of separation from Units 6 & 7, visibility at any Class I federal areas will not be impacted.

Emission sources are regulated by the Florida Department of Environmental Protection (FDEP) depending on the source type, source emissions, and permitting requirements for construction and operation.

2.3.2.3 Local Meteorological Conditions for Design and Operating Bases

Design and operating bases, such as tornado parameters, temperature, and precipitation extremes are statistics that, by definition and necessity, are based on long-term regional records. Although data collected by the onsite meteorological monitoring system is representative of site conditions, only 3 years of onsite data has been analyzed. Therefore, the design and operating basis conditions were based on regional meteorological data, as previously described in Subsection 2.3.1.

2.3.2.4 References

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PTN COL 2.3-2

**Table 2.3.2-201
Seasonal and Annual Mean Wind Speeds Units 6 & 7
(2002, 2005, and 2006)**

Primary Tower Elevation	Location	Winter	Spring	Summer	Autumn	Annual
Upper Level (60 m) (m/sec)	Units 6 & 7 Site	6.1	5.9	4.8	5.5	5.6
Lower Level (10 m) (m/sec)	Units 6 & 7 Site	3.7	4.0	3.5	3.7	3.8
Single Level (10 m) (m/sec)	Miami International Airport[(a)]	4.0	4.3	3.4	3.9	3.9

(a) Reference 201

Notes:

Winter December, January, February
Spring March, April, May
Summer June, July, August
Autumn September, October, November

PTN COL 2.3-2

Table 2.3.2-202 (Sheet 1 of 3) Wind Direction Persistence/Wind Speed Distributions for the Units 6 & 7 Site 10-Meter Level

Number of Sectors Included: 16, Width in Degrees: 22.5

Measurement Height, m: 10, Speed Sensor: 1, Direction Sensor: 1

Speed Greater than or Equal to: 5.00 mph

Direction

Hours	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
1	997	395	1465	2359	3979	3009	1836	1323	960	587	397	313	300	306	539	1554
2	527	144	1004	1553	2870	2007	1205	806	554	303	191	135	136	136	251	1008
4	170	27	593	852	1710	1034	642	350	230	104	71	40	42	46	73	519
8	23	0	268	345	722	324	265	72	49	9	11	4	7	6	6	177
12	6	0	129	178	294	101	137	7	13	0	0	0	1	1	0	62
18	0	0	47	79	71	6	44	0	1	0	0	0	0	0	0	20
24	0	0	15	51	17	0	19	0	0	0	0	0	0	0	0	8
30	0	0	3	29	6	0	10	0	0	0	0	0	0	0	0	0
36	0	0	0	15	0	0	4	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Speed Greater than or Equal to: 10.00 mph

Direction

Hours	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
1	202	157	889	1114	1771	1398	861	583	429	312	205	102	76	74	97	379
2	99	73	667	750	1196	933	602	342	233	186	117	39	25	43	42	233
4	33	15	432	402	628	493	351	131	84	59	42	6	4	16	11	105
8	10	0	193	171	201	156	152	27	13	2	4	0	0	1	0	22
12	2	0	87	99	46	52	84	3	1	0	0	0	0	0	0	4
18	0	0	27	57	17	1	29	0	0	0	0	0	0	0	0	0
24	0	0	9	31	6	0	15	0	0	0	0	0	0	0	0	0
30	0	0	3	15	0	0	8	0	0	0	0	0	0	0	0	0
36	0	0	0	7	0	0	2	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Speed Greater than or Equal to: 15.00 mph

Direction

Hours	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
1	16	16	165	115	225	227	203	75	66	74	63	21	4	10	11	58
2	6	9	117	69	132	144	143	38	42	41	31	7	2	5	3	32
4	1	4	69	29	57	75	92	12	18	13	8	0	0	3	0	11
8	0	0	24	3	12	17	38	0	3	0	0	0	0	0	0	0
12	0	0	13	0	3	6	18	0	0	0	0	0	0	0	0	0
18	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

PTN COL 2.3-2

Table 2.3.2-202 (Sheet 2 of 3) Wind Direction Persistence/Wind Speed Distributions for the Units 6 & 7 Site 10-Meter Level

Speed Greater than or Equal to: 20.00 mph																
Direction																
Hours	**N**	**NNE**	**NE**	**ENE**	**E**	**ESE**	**SE**	**SSE**	**S**	**SSW**	**SW**	**WSW**	**W**	**WNW**	**NW**	**NNW**
1	0	1	7	3	15	31	36	16	8	12	6	4	0	1	0	3
2	0	0	5	1	5	19	24	8	5	7	1	1	0	0	0	0
4	0	0	3	0	2	9	16	2	3	2	0	0	0	0	0	0
8	0	0	0	0	0	0	9	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Speed Greater than or Equal to: 25.00 mph																
Direction																
Hours	**N**	**NNE**	**NE**	**ENE**	**E**	**ESE**	**SE**	**SSE**	**S**	**SSW**	**SW**	**WSW**	**W**	**WNW**	**NW**	**NNW**
1	0	0	0	2	5	8	16	9	5	2	1	1	0	0	0	0
2	0	0	0	1	3	3	13	6	4	1	0	0	0	0	0	0
4	0	0	0	0	1	1	7	2	2	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Speed Greater than or Equal to: 30.00 mph																
Direction																
Hours	**N**	**NNE**	**NE**	**ENE**	**E**	**ESE**	**SE**	**SSE**	**S**	**SSW**	**SW**	**WSW**	**W**	**WNW**	**NW**	**NNW**
1	0	0	0	0	2	0	7	8	4	0	0	0	0	0	0	0
2	0	0	0	0	1	0	2	6	3	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

PTN COL 2.3-2

Table 2.3.2-202 (Sheet 3 of 3)
Wind Direction Persistence/Wind Speed Distributions for the Units 6 & 7 Site 10-Meter Level

Speed Greater than or Equal to: 35.00 mph																
	Direction															
Hours	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
1	0	0	0	0	0	0	0	7	2	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	5	1	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Speed Greater than or Equal to: 40.00 mph																
	Direction															
Hours	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
1	0	0	0	0	0	0	0	5	1	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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Table 2.3.2-203 (Sheet 1 of 3) Wind Direction Persistence/Wind Speed Distributions for the Units 6 & 7 Site 60-Meter Level

Number of Sectors Included: 16, Width in Degrees: 22.5																
Measurement Height, m: 60, Speed Sensor: 2, Direction Sensor: 2																
Speed Greater than or Equal to: 5.00 mph																
Direction																
Hours	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
1	1506	594	1762	2539	3822	3326	2123	1537	1109	753	544	383	489	580	711	1527
2	984	208	1208	1697	2683	2268	1396	948	651	424	287	165	249	308	382	1051
4	481	39	703	914	1530	1171	738	421	283	168	115	51	93	112	129	593
8	154	1	320	354	569	375	302	84	72	25	33	6	12	17	18	244
12	48	0	155	199	217	115	147	16	27	1	7	1	4	2	0	114
18	5	0	70	105	37	8	38	0	6	0	0	0	0	0	0	38
24	0	0	36	58	0	0	8	0	0	0	0	0	0	0	0	18
30	0	0	18	28	0	0	0	0	0	0	0	0	0	0	0	8
36	0	0	9	9	0	0	0	0	0	0	0	0	0	0	0	2
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Speed Greater than or Equal to: 10.00 mph																
Direction																
Hours	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
1	1122	371	1403	2023	2965	2346	1476	965	760	513	383	234	290	344	447	1232
2	740	150	1035	1416	2113	1574	1028	603	459	290	221	110	160	188	250	881
4	385	32	640	803	1205	830	600	278	196	110	86	34	65	81	85	514
8	133	1	303	335	454	286	266	63	41	14	24	4	12	15	11	224
12	40	0	152	197	176	94	134	11	10	0	2	0	4	2	0	104
18	5	0	69	105	28	7	36	0	1	0	0	0	0	0	0	35
24	0	0	36	58	0	0	8	0	0	0	0	0	0	0	0	18
30	0	0	18	28	0	0	0	0	0	0	0	0	0	0	0	8
36	0	0	9	9	0	0	0	0	0	0	0	0	0	0	0	2
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Speed Greater than or Equal to: 15.00 mph																
Direction																
Hours	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
1	438	137	923	921	1073	785	609	387	233	226	185	109	92	107	189	591
2	263	62	719	650	726	530	435	243	132	135	104	50	34	55	103	382
4	117	15	482	387	406	282	272	113	51	51	38	14	3	20	28	186
8	38	0	244	185	144	99	123	24	7	2	7	0	0	5	5	50
12	11	0	123	114	49	38	63	2	1	0	1	0	0	1	0	13
18	1	0	52	58	11	4	20	0	0	0	0	0	0	0	0	0
24	0	0	30	22	0	0	6	0	0	0	0	0	0	0	0	0
30	0	0	18	5	0	0	0	0	0	0	0	0	0	0	0	0
36	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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Table 2.3.2-203 (Sheet 2 of 3) Wind Direction Persistence/Wind Speed Distributions for the Units 6 & 7 Site 60-Meter Level

Speed Greater than or Equal to: 20.00 mph																
Direction																
Hours	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
1	55	26	345	209	153	125	151	92	54	57	61	19	13	26	29	104
2	25	9	267	135	89	74	102	48	31	30	30	6	5	15	12	55
4	4	0	179	73	43	30	61	13	13	7	7	0	1	6	2	17
8	0	0	87	28	13	6	32	1	1	0	0	0	0	1	0	1
12	0	0	44	13	4	2	16	0	0	0	0	0	0	0	0	0
18	0	0	28	7	0	0	6	0	0	0	0	0	0	0	0	0
24	0	0	21	1	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0
36	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Speed Greater than or Equal to: 25.00 mph																
Direction																
Hours	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
1	2	1	79	11	14	32	36	30	9	16	9	7	3	10	2	12
2	0	0	55	3	5	22	24	17	5	8	4	3	1	6	0	6
4	0	0	34	0	1	14	13	4	3	1	0	0	0	4	0	0
8	0	0	15	0	0	6	5	0	0	0	0	0	0	0	0	0
12	0	0	4	0	0	2	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Speed Greater than or Equal to: 30.00 mph																
Direction																
Hours	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
1	0	0	1	0	1	9	21	16	7	6	4	3	0	4	0	2
2	0	0	0	0	0	5	15	8	5	3	1	1	0	2	0	0
4	0	0	0	0	0	1	7	2	3	0	0	0	0	0	0	0
8	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

PTN COL 2.3-2

Table 2.3.2-203 (Sheet 3 of 3) Wind Direction Persistence/Wind Speed Distributions for the Units 6 & 7 Site 60-Meter Level

Speed Greater than or Equal to: 35.00 mph																
	Direction															
Hours	**N**	**NNE**	**NE**	**ENE**	**E**	**ESE**	**SE**	**SSE**	**S**	**SSW**	**SW**	**WSW**	**W**	**WNW**	**NW**	**NNW**
1	0	0	0	0	0	2	14	10	5	2	1	1	0	0	0	0
2	0	0	0	0	0	0	9	6	4	1	0	0	0	0	0	0
4	0	0	0	0	0	0	3	2	2	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Speed Greater than or Equal to: 40.00 mph																
	Direction															
Hours	**N**	**NNE**	**NE**	**ENE**	**E**	**ESE**	**SE**	**SSE**	**S**	**SSW**	**SW**	**WSW**	**W**	**WNW**	**NW**	**NNW**
1	0	0	0	0	0	1	8	8	5	1	0	0	0	0	0	0
2	0	0	0	0	0	0	4	6	4	0	0	0	0	0	0	0
4	0	0	0	0	0	0	1	2	2	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

PTN COL 2.3-2

Table 2.3.2-204
Seasonal and Annual Vertical Stability Class and 10-Meter Level Wind Speed Distributions for Units 6 & 7 Site (2002, 2005, and 2006)

	Vertical Stability Categories[a]						
Period	**A**	**B**	**C**	**D**	**E**	**F**	**G**
Winter							
Frequency (%)	5.17	6.08	9.14	26.64	31.01	11.67	10.29
Wind Speed (m/sec)	5.61	5.19	4.93	4.53	3.56	2.04	1.97
Spring							
Frequency (%)	12.52	7.62	7.52	23.72	30.37	9.35	8.90
Wind Speed (m/sec)	5.79	5.18	4.83	4.60	3.66	2.12	1.93
Summer							
Frequency (%)	2.78	4.37	6.52	30.78	42.21	11.61	1.73
Wind Speed (m/sec)	4.77	4.70	4.46	4.16	3.13	1.81	1.71
Autumn							
Frequency (%)	3.33	4.38	6.39	32.61	41.67	8.45	3.17
Wind Speed (m/sec)	4.70	4.64	4.68	4.30	3.32	1.96	2.15
Annual							
Frequency (%)	5.90	5.59	7.36	28.51	36.47	10.26	5.92
Wind Speed (m/sec)	5.47	4.98	4.74	4.37	3.38	1.97	1.96

(a) Vertical stability based on temperature difference (ΔT) between 60-meter and 10-meter temperature measurement levels.

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Table 2.3.2-205 (Sheet 1 of 8) Joint Frequency Distribution of Wind Speed and Wind Direction (10-Meter Level) by Atmospheric Stability Class for Units 6 & 7 Site (2002, 2005, and 2006)

Hours at Each Wind Speed and Direction

Total Period

Period of Record: 3-Year Composite (2002, 2005, 2006)

Elevation: 10M **Speed:** WS10M

Direction: WD10M **Lapse:** DT10M–60M

Stability Class: A Extremely Unstable

Wind Speed (m/s)													
Wind Direction (from)	**0.22–0.50**	**0.51–0.75**	**0.76–1.0**	**1.1–1.5**	**1.6–2.0**	**2.1–3.0**	**3.1–5.0**	**5.1–7.0**	**7.1–10.0**	**10.1–13.0**	**13.1–18.0**	**>18.0**	**Total**
N	0	0	0	0	0	5	40	26	3	0	0	0	74
NNE	0	0	0	0	0	0	20	23	0	0	0	0	43
NE	0	0	0	0	0	1	35	73	12	0	0	0	121
ENE	0	0	0	0	0	0	9	69	10	0	0	0	88
E	0	0	0	0	0	0	15	72	16	0	0	0	103
ESE	0	0	0	0	0	0	39	110	35	0	0	0	184
SE	0	0	0	0	0	0	46	78	23	1	0	0	148
SSE	0	0	0	0	1	14	110	77	13	0	0	0	215
S	0	0	0	0	0	4	58	92	22	0	0	0	176
SSW	0	0	0	0	0	2	11	37	15	0	0	0	65
SW	0	0	0	0	0	0	6	16	6	0	0	0	28
WSW	0	0	0	0	0	0	5	6	2	0	0	0	13
W	0	0	0	0	1	0	8	6	2	0	0	0	17
WNW	0	0	0	1	0	3	8	4	3	0	0	0	19
NW	0	0	1	0	2	1	20	14	0	0	0	0	38
NNW	0	0	0	0	0	4	67	76	21	0	0	0	168
Totals	**0**	**0**	**1**	**1**	**4**	**34**	**497**	**779**	**183**	**1**	**0**	**0**	**1500**

Number of Calm Hours not included above for:	**Total Period**	**0**
Number of Variable Direction Hours for:	**Total Period**	**0**
Number of Invalid Hours for:	**Total Period**	**873**
Number of Valid Hours for:	**Total Period**	**1500**
Total Hours for:	**Total Period**	**26,280**

Note: Stability class based on the vertical temperature difference (ΔT or lapse rate) between the 60-meter and 10-meter measurement levels.

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Table 2.3.2-205 (Sheet 2 of 8) Joint Frequency Distribution of Wind Speed and Wind Direction (10-Meter Level) by Atmospheric Stability Class for Units 6 & 7 Site (2002, 2005, and 2006)

Hours at Each Wind Speed and Direction

Total Period

Period of Record: 3-Year Composite (2002, 2005, 2006)

Elevation: 10M **Speed:** WS10M

Direction: WD10M **Lapse:** DT10M–60M

Stability Class: B Moderately Unstable

Wind Speed (m/s)													
Wind Direction (from)	**0.22–0.50**	**0.51–0.75**	**0.76–1.0**	**1.1–1.5**	**1.6–2.0**	**2.1–3.0**	**3.1–5.0**	**5.1–7.0**	**7.1–10.0**	**10.1–13.0**	**13.1–18.0**	**>18.0**	**Total**
N	0	0	0	0	2	8	46	17	2	0	0	0	75
NNE	0	0	0	0	1	4	21	11	0	0	0	0	37
NE	0	0	0	0	0	0	65	45	5	0	0	0	115
ENE	0	0	0	0	0	2	55	60	4	0	0	0	121
E	0	1	0	0	1	1	47	69	19	0	0	0	138
ESE	0	0	0	0	0	1	94	109	16	0	0	0	220
SE	0	0	0	0	0	11	46	65	22	0	0	0	144
SSE	0	0	0	0	0	22	81	50	5	0	0	0	158
S	0	0	0	0	0	8	72	47	7	0	0	0	134
SSW	0	0	0	0	2	6	22	38	5	0	0	0	73
SW	0	0	0	0	2	3	5	16	14	0	0	0	40
WSW	0	0	0	0	1	2	3	9	0	0	0	0	15
W	0	0	0	0	0	0	8	3	1	0	0	0	12
WNW	0	0	0	0	0	1	8	6	1	0	0	0	16
NW	0	0	1	0	3	2	22	4	0	0	0	0	32
NNW	0	0	0	0	2	8	56	18	5	0	0	0	89
Totals	**0**	**1**	**1**	**0**	**14**	**79**	**651**	**567**	**106**	**0**	**0**	**0**	**1419**

Number of Calm Hours not included above for:	**Total Period**	**0**
Number of Variable Direction Hours for:	**Total Period**	**0**
Number of Invalid Hours for:	**Total Period**	**873**
Number of Valid Hours for:	**Total Period**	**1419**
Total Hours for:	**Total Period**	**26,280**

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Table 2.3.2-205 (Sheet 3 of 8) Joint Frequency Distribution of Wind Speed and Wind Direction (10-Meter Level) by Atmospheric Stability Class for Units 6 & 7 Site (2002, 2005, and 2006)

Hours at Each Wind Speed and Direction

Total Period

Period of Record: 3-Year Composite (2002, 2005, 2006)

Elevation: 10M **Speed:** WS10M

Direction: WD10M **Lapse:** DT10M–60M

Stability Class: C Slightly Unstable

	Wind Speed (m/s)												
Wind Direction (from)	**0.22–0.50**	**0.51–0.75**	**0.76–1.0**	**1.1–1.5**	**1.6–2.0**	**2.1–3.0**	**3.1–5.0**	**5.1–7.0**	**7.1–10.0**	**10.1–13.0**	**13.1–18.0**	**>18.0**	**Total**
N	0	0	0	0	2	16	43	15	3	0	0	0	79
NNE	0	0	0	0	2	5	33	4	1	0	0	0	45
NE	0	0	0	0	1	8	78	60	6	0	0	0	153
ENE	0	0	0	1	0	7	75	90	20	0	0	0	193
E	0	0	0	0	0	7	152	143	14	0	0	0	316
ESE	1	0	0	0	0	15	175	128	19	0	0	0	338
SE	0	0	0	1	2	16	76	72	10	1	0	0	178
SSE	0	0	0	1	4	30	81	34	5	0	0	0	155
S	0	0	0	1	2	14	43	27	5	0	0	0	92
SSW	0	0	0	0	5	9	16	42	6	0	0	0	78
SW	0	0	0	0	0	4	11	13	5	0	0	0	33
WSW	0	0	0	0	0	11	13	7	0	0	0	0	31
W	0	0	1	2	2	3	7	8	0	0	0	0	23
WNW	0	0	0	0	1	3	16	8	2	0	0	0	30
NW	0	0	0	1	2	15	19	7	0	0	0	0	44
NNW	0	0	0	3	2	18	35	18	6	0	0	0	82
Totals	**1**	**0**	**1**	**10**	**25**	**181**	**873**	**676**	**102**	**1**	**0**	**0**	**1870**

Number of Calm Hours not included above for:	**Total Period**	**0**
Number of Variable Direction Hours for:	**Total Period**	**0**
Number of Invalid Hours for:	**Total Period**	**873**
Number of Valid Hours for:	**Total Period**	**1870**
Total Hours for:	**Total Period**	**26,280**

PTN COL 2.3-2

Table 2.3.2-205 (Sheet 4 of 8) Joint Frequency Distribution of Wind Speed and Wind Direction (10-Meter Level) by Atmospheric Stability Class for Units 6 & 7 Site (2002, 2005, and 2006)

Hours at Each Wind Speed and Direction

Total Period

Period of Record: 3-Year Composite (2002, 2005, 2006)

Elevation: 10M **Speed:** WS10M

Direction: WD10M **Lapse:** DT10M–60M

Stability Class: D Neutral

	Wind Speed (m/s)												
Wind Direction (from)	**0.22–0.50**	**0.51–0.75**	**0.76–1.0**	**1.1–1.5**	**1.6–2.0**	**2.1–3.0**	**3.1–5.0**	**5.1–7.0**	**7.1–10.0**	**10.1–13.0**	**13.1–18.0**	**>18.0**	**Total**
N	0	0	5	13	18	75	121	42	4	0	0	0	278
NNE	0	0	1	4	11	35	54	25	4	0	0	0	134
NE	2	0	3	7	14	72	179	239	76	0	0	0	592
ENE	1	1	1	6	14	112	480	336	29	0	0	0	980
E	2	2	0	7	20	105	799	520	61	0	0	0	1516
ESE	1	0	1	7	21	114	644	271	50	0	0	0	1109
SE	0	0	1	10	11	72	270	160	47	6	2	0	579
SSE	0	1	1	12	16	78	191	111	7	1	2	2	422
S	1	0	1	3	11	45	178	59	7	0	1	1	307
SSW	0	1	2	5	16	36	95	62	15	4	0	0	236
SW	0	0	2	4	11	19	73	54	17	1	0	0	181
WSW	1	1	1	5	7	20	56	39	11	0	0	0	141
W	0	0	0	1	16	39	64	21	1	0	0	0	142
WNW	0	0	3	9	15	37	57	14	3	0	0	0	138
NW	0	1	1	14	20	47	55	11	6	0	0	0	155
NNW	1	1	0	18	25	62	155	62	9	0	0	0	333
Totals	**9**	**8**	**23**	**125**	**246**	**968**	**3471**	**2026**	**347**	**12**	**5**	**3**	**7243**

Number of Calm Hours not included above for:	**Total Period**	**0**
Number of Variable Direction Hours for:	**Total Period**	**0**
Number of Invalid Hours for:	**Total Period**	**873**
Number of Valid Hours for:	**Total Period**	**7243**
Total Hours for:	**Total Period**	**26,280**

PTN COL 2.3-2

Table 2.3.2-205 (Sheet 5 of 8) Joint Frequency Distribution of Wind Speed and Wind Direction (10-Meter Level) by Atmospheric Stability Class for Units 6 & 7 Site (2002, 2005, and 2006)

Hours at Each Wind Speed and Direction

Total Period

Period of Record: 3-Year Composite (2002, 2005, 2006)

Elevation: 10M **Speed:** WS10M

Direction: WD10M **Lapse:** DT10M–60M

Stability Class: E Slightly Stable

Wind Speed (m/s)													
Wind Direction (from)	**0.22–0.50**	**0.51–0.75**	**0.76–1.0**	**1.1–1.5**	**1.6–2.0**	**2.1–3.0**	**3.1–5.0**	**5.1–7.0**	**7.1–10.0**	**10.1–13.0**	**13.1–18.0**	**>18.0**	**Total**
N	0	2	11	19	46	151	131	13	0	0	0	0	373
NNE	3	7	9	17	22	44	75	20	6	0	0	0	203
NE	0	2	5	23	22	89	252	140	22	1	0	0	556
ENE	3	3	9	36	75	289	586	132	3	3	0	0	1139
E	4	5	5	69	181	594	1062	232	20	7	2	0	2181
ESE	2	6	12	66	118	349	571	170	31	14	1	0	1340
SE	4	4	10	60	57	227	385	125	24	7	6	0	909
SSE	2	4	8	24	35	119	194	68	12	1	1	3	471
S	1	2	5	23	48	107	127	25	1	1	3	0	343
SSW	0	5	11	31	38	64	66	20	1	1	0	0	237
SW	2	5	7	22	27	44	32	24	5	1	0	0	169
WSW	0	3	4	41	27	32	38	6	0	0	0	0	151
W	1	1	9	36	36	70	34	3	0	0	0	0	190
WNW	2	4	11	40	44	60	27	3	0	0	0	0	191
NW	1	5	7	28	41	96	64	8	1	0	0	0	251
NNW	2	3	19	34	57	164	256	26	1	0	0	0	562
Totals	**27**	**61**	**142**	**569**	**874**	**2499**	**3900**	**1015**	**127**	**36**	**13**	**3**	**9266**

Number of Calm Hours not included above for:	**Total Period**	**0**
Number of Variable Direction Hours for:	**Total Period**	**0**
Number of Invalid Hours for:	**Total Period**	**873**
Number of Valid Hours for:	**Total Period**	**9266**
Total Hours for:	**Total Period**	**26,280**

PTN COL 2.3-2

Table 2.3.2-205 (Sheet 6 of 8) Joint Frequency Distribution of Wind Speed and Wind Direction (10-Meter Level) by Atmospheric Stability Class for Units 6 & 7 Site (2002, 2005, and 2006)

Hours at Each Wind Speed and Direction

Total Period

Period of Record: 3-Year Composite (2002, 2005, 2006)

Elevation: 10M **Speed:** WS10M

Direction: WD10M **Lapse:** DT10M–60M

Stability Class: F Moderately Stable

	Wind Speed (m/s)												
Wind Direction (from)	**0.22–0.50**	**0.51–0.75**	**0.76–1.0**	**1.1–1.5**	**1.6–2.0**	**2.1–3.0**	**3.1–5.0**	**5.1–7.0**	**7.1–10.0**	**10.1–13.0**	**13.1–18.0**	**>18.0**	**Total**
N	1	7	13	49	67	117	27	1	0	0	0	0	282
NNE	1	1	4	21	16	14	6	3	0	0	0	0	66
NE	3	3	5	17	11	13	10	0	0	0	0	0	62
ENE	1	1	2	16	21	30	5	1	0	0	0	0	77
E	3	1	8	25	42	116	15	0	0	0	0	0	210
ESE	4	3	7	23	44	80	20	0	0	0	0	0	181
SE	3	6	7	21	34	63	10	1	0	0	0	0	145
SSE	2	3	6	19	19	25	5	0	0	0	0	0	79
S	1	1	2	17	10	23	7	0	0	0	0	0	61
SSW	1	4	8	21	17	22	5	0	0	1	0	0	79
SW	3	4	4	33	24	26	4	1	0	1	0	0	100
WSW	4	4	8	23	32	48	11	2	0	1	0	0	133
W	8	5	9	40	53	49	1	0	0	0	0	0	165
WNW	11	7	7	49	46	46	7	0	0	0	0	0	173
NW	5	6	17	66	82	85	28	0	0	0	0	0	289
NNW	5	8	21	83	145	180	60	2	0	0	0	0	504
Totals	**56**	**64**	**128**	**523**	**663**	**937**	**221**	**11**	**0**	**3**	**0**	**0**	**2606**

Number of Calm Hours not included above for:	**Total Period**	**0**
Number of Variable Direction Hours for:	**Total Period**	**0**
Number of Invalid Hours for:	**Total Period**	**873**
Number of Valid Hours for:	**Total Period**	**2606**
Total Hours for:	**Total Period**	**26,280**

PTN COL 2.3-2

Table 2.3.2-205 (Sheet 7 of 8) Joint Frequency Distribution of Wind Speed and Wind Direction (10-Meter Level) by Atmospheric Stability Class for Units 6 & 7 Site (2002, 2005, and 2006)

Hours at Each Wind Speed and Direction

Total Period

Period of Record: 3-Year Composite (2002, 2005, 2006)

Elevation: 10M **Speed:** WS10M

Direction: WD10M **Lapse:** DT10M–60M

Stability Class: G Extremely Stable

	Wind Speed (m/s)												
Wind Direction (from)	**0.22–0.50**	**0.51–0.75**	**0.76–1.0**	**1.1–1.5**	**1.6–2.0**	**2.1–3.0**	**3.1–5.0**	**5.1–7.0**	**7.1–10.0**	**10.1–13.0**	**13.1–18.0**	**>18.0**	**Total**
N	3	1	7	29	60	167	11	0	0	0	0	0	278
NNE	0	2	1	10	8	6	0	0	0	0	0	0	27
NE	2	0	1	4	0	2	0	0	0	0	0	0	9
ENE	0	0	0	2	0	0	0	0	0	0	0	0	2
E	1	1	0	1	5	2	0	0	0	0	0	0	10
ESE	0	0	1	0	2	0	0	0	0	0	0	0	3
SE	1	0	3	1	2	5	0	0	0	0	0	0	12
SSE	1	2	3	4	2	2	0	0	0	0	0	0	14
S	1	1	2	3	2	5	0	0	0	0	0	0	14
SSW	2	2	3	6	5	12	1	0	0	0	0	0	31
SW	3	0	3	14	15	21	2	0	0	0	0	0	58
WSW	1	1	2	11	22	20	2	0	0	0	0	0	59
W	1	3	6	21	33	24	0	0	0	0	0	0	88
WNW	3	5	9	39	52	35	0	0	0	0	0	0	143
NW	5	3	5	35	53	102	7	0	0	0	0	0	210
NNW	7	2	11	34	135	327	29	0	0	0	0	0	545
Totals	**31**	**23**	**57**	**214**	**396**	**730**	**52**	**0**	**0**	**0**	**0**	**0**	**1503**

Number of Calm Hours not included above for:	**Total Period**	**0**
Number of Variable Direction Hours for:	**Total Period**	**0**
Number of Invalid Hours for:	**Total Period**	**873**
Number of Valid Hours for:	**Total Period**	**1503**
Total Hours for:	**Total Period**	**26,280**

PTN COL 2.3-2

Table 2.3.2-205 (Sheet 8 of 8) Joint Frequency Distribution of Wind Speed and Wind Direction (10-Meter Level) by Atmospheric Stability Class for Units 6 & 7 Site (2002, 2005, and 2006)

Hours at Each Wind Speed and Direction

Summary of All Stability Classes

Total Period

Period of Record: 3-Year Composite (2002, 2005, 2006)

Elevation: 10M **Speed:** WS10M

Direction: WD10M **Lapse:** DT10M–60M

	Wind Speed (m/s)												
Wind Direction (from)	**0.22–0.50**	**0.51–0.75**	**0.76–1.0**	**1.1–1.5**	**1.6–2.0**	**2.1–3.0**	**3.1–5.0**	**5.1–7.0**	**7.1–10.0**	**10.1–13.0**	**13.1–18.0**	**>18.0**	**Total**
N	4	10	36	110	195	539	419	114	12	0	0	0	1,439
NNE	4	10	15	52	60	108	209	86	11	0	0	0	555
NE	7	5	14	51	48	185	619	557	121	1	0	0	1,608
ENE	5	5	12	61	110	440	1,210	688	66	3	0	0	2,600
E	10	10	13	102	249	825	2,090	1,036	130	7	2	0	4,474
ESE	8	9	21	96	185	559	1,543	788	151	14	1	0	3,375
SE	8	10	21	93	106	394	833	501	126	15	8	0	2,115
SSE	5	10	18	60	77	290	662	340	42	2	3	5	1,514
S	4	4	10	47	73	206	485	250	42	1	4	1	1,127
SSW	3	12	24	63	83	151	216	199	42	6	0	0	799
SW	8	9	16	73	79	117	133	124	47	3	0	0	609
WSW	6	9	15	80	89	133	128	69	13	1	0	0	543
W	10	9	25	100	141	185	122	41	4	0	0	0	637
WNW	16	16	30	138	158	185	123	35	9	0	0	0	710
NW	11	15	32	144	203	348	215	44	7	0	0	0	1,019
NNW	15	14	51	172	366	763	658	202	42	0	0	0	2,283
Totals	**124**	**157**	**353**	**1,442**	**2,222**	**5,428**	**9,665**	**5,074**	**865**	**53**	**18**	**6**	**25,407**

Number of Calm Hours not included above for:	**Total Period**	**0**
Number of Variable Direction Hours for:	**Total Period**	**0**
Number of Invalid Hours for:	**Total Period**	**873**
Number of Valid Hours for:	**Total Period**	**25,407**
Total Hours for:	**Total Period**	**26,280**

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Table 2.3.2-206 (Sheet 1 of 8) Joint Frequency Distribution of Wind Speed and Wind Direction (60-Meter Level) by Atmospheric Stability for Units 6 & 7 Site (2002, 2005, and 2006)

Hours at Each Wind Speed and Direction

Total Period

Period of Record: 3-Year Composite (2002, 2005, 2006)

Elevation: 60M **Speed:** WS60M

Direction: WD60M **Lapse:** DT10M–60M

Stability Class: A Extremely Unstable

	Wind Speed (m/s)												
Wind Direction (from)	**0.22–0.50**	**0.51–0.75**	**0.76–1.0**	**1.1–1.5**	**1.6–2.0**	**2.1–3.0**	**3.1–5.0**	**5.1–7.0**	**7.1–10.0**	**10.1–13.0**	**13.1–18.0**	**>18.0**	**Total**
N	0	0	0	0	0	0	14	36	22	2	0	0	74
NNE	0	0	0	0	0	0	5	21	18	1	0	0	45
NE	0	0	0	0	0	0	1	43	72	7	0	0	123
ENE	0	0	0	0	0	0	0	31	40	5	0	0	76
E	0	0	0	0	0	0	4	45	54	5	0	0	108
ESE	0	0	0	0	0	0	16	89	66	3	0	0	174
SE	0	0	0	0	0	0	34	55	42	8	0	0	139
SSE	0	0	0	0	0	6	71	95	30	1	0	0	203
S	0	0	0	0	0	0	34	89	50	6	0	0	179
SSW	0	0	0	0	0	2	6	23	29	9	0	0	69
SW	0	0	0	0	0	0	1	6	13	4	0	0	24
WSW	0	0	0	0	0	0	5	4	4	0	0	0	13
W	0	0	0	0	1	0	1	6	6	2	0	0	16
WNW	0	0	0	0	0	1	3	9	4	0	3	0	20
NW	0	0	0	0	0	3	5	14	21	0	0	0	43
NNW	0	0	0	0	0	1	14	61	67	10	0	0	153
Totals	**0**	**0**	**0**	**0**	**1**	**13**	**214**	**627**	**538**	**63**	**3**	**0**	**1,459**

Number of Calm Hours not included above for:	**Total Period**	**0**
Number of Variable Direction Hours for:	**Total Period**	**0**
Number of Invalid Hours for:	**Total Period**	**2,337**
Number of Valid Hours for:	**Total Period**	**1,459**
Total Hours for:	**Total Period**	**26,280**

Note: Stability class based on the vertical temperature difference (ΔT or lapse rate) between the 60-meter and 10-meter measurement levels.

PTN COL 2.3-2

Table 2.3.2-206 (Sheet 2 of 8) Joint Frequency Distribution of Wind Speed and Wind Direction (60-Meter Level) by Atmospheric Stability for Units 6 & 7 Site (2002, 2005, and 2006)

Hours at Each Wind Speed and Direction

Total Period

Period of Record: 3-Year Composite (2002, 2005, 2006)

Elevation: 60M **Speed:** WS60M

Direction: WD60M **Lapse:** DT10M–60M

Stability Class: B Moderately Unstable

Wind Speed (m/s)													
Wind Direction (from)	**0.22–0.50**	**0.51–0.75**	**0.76–1.0**	**1.1–1.5**	**1.6–2.0**	**2.1–3.0**	**3.1–5.0**	**5.1–7.0**	**7.1–10.0**	**10.1–13.0**	**13.1–18.0**	**>18.0**	**Total**
N	0	0	0	0	0	4	22	32	11	1	0	0	70
NNE	0	0	0	0	0	1	13	22	7	0	0	0	43
NE	0	0	0	0	0	1	22	68	42	5	0	0	138
ENE	0	0	1	0	1	1	12	56	42	3	0	0	116
E	0	0	0	0	0	1	16	62	43	1	0	0	123
ESE	0	0	0	0	0	1	51	101	42	3	0	0	198
SE	0	0	0	0	1	6	42	44	43	6	0	0	142
SSE	0	0	0	0	0	11	57	48	26	1	0	0	143
S	0	0	0	0	0	3	39	70	21	1	0	0	134
SSW	0	0	0	0	1	3	15	34	16	3	0	0	72
SW	0	0	0	0	2	1	5	3	21	4	0	0	36
WSW	0	0	0	0	0	0	3	6	6	0	0	0	15
W	0	0	0	0	1	0	3	4	3	1	0	0	12
WNW	0	0	0	0	0	1	2	4	10	0	1	0	18
NW	0	0	0	0	2	2	12	11	3	0	0	0	30
NNW	0	0	0	0	0	4	24	35	18	3	0	0	84
Totals	**0**	**0**	**1**	**0**	**8**	**40**	**338**	**600**	**354**	**32**	**1**	**0**	**1374**

Number of Calm Hours not included above for:	**Total Period**	**0**
Number of Variable Direction Hours for:	**Total Period**	**0**
Number of Invalid Hours for:	**Total Period**	**2337**
Number of Valid Hours for:	**Total Period**	**1374**
Total Hours for:	**Total Period**	**26,280**

PTN COL 2.3-2

Table 2.3.2-206 (Sheet 3 of 8) Joint Frequency Distribution of Wind Speed and Wind Direction (60-Meter Level) by Atmospheric Stability for Units 6 & 7 Site (2002, 2005, and 2006)

Hours at Each Wind Speed and Direction

Total Period

Period of Record: 3-Year Composite (2002, 2005, 2006)

Elevation: 60M **Speed:** WS60M

Direction: WD60M **Lapse:** DT10M–60M

Stability Class: C Slightly Unstable

	Wind Speed (m/s)												
Wind Direction (from)	**0.22–0.50**	**0.51–0.75**	**0.76–1.0**	**1.1–1.5**	**1.6–2.0**	**2.1–3.0**	**3.1–5.0**	**5.1–7.0**	**7.1–10.0**	**10.1–13.0**	**13.1–18.0**	**>18.0**	**Total**
N	0	0	0	0	0	7	24	30	17	0	0	0	78
NNE	0	0	0	0	0	3	19	19	4	2	0	0	47
NE	0	0	0	1	0	6	35	62	56	7	0	0	167
ENE	0	0	0	0	1	5	27	77	69	11	0	0	190
E	0	0	0	0	0	2	86	147	64	1	0	0	300
ESE	0	0	0	0	0	2	111	123	60	1	0	0	297
SE	0	0	0	0	1	11	54	68	47	2	1	0	184
SSE	0	0	0	1	4	16	58	49	13	1	0	0	142
S	0	0	0	2	1	13	25	31	11	1	0	0	84
SSW	0	0	0	0	2	5	14	24	24	4	0	0	73
SW	0	0	0	0	1	1	7	16	11	2	1	0	39
WSW	0	0	0	0	0	6	7	6	5	0	0	0	24
W	0	0	0	1	0	8	1	8	5	0	0	0	23
WNW	0	0	0	1	0	2	6	7	10	1	1	0	28
NW	0	0	0	0	3	5	16	10	8	2	0	0	44
NNW	0	0	0	0	0	5	18	26	16	5	0	0	70
Totals	**0**	**0**	**0**	**6**	**13**	**97**	**508**	**703**	**420**	**40**	**3**	**0**	**1790**

Number of Calm Hours not included above for:	**Total Period**	**0**
Number of Variable Direction Hours for:	**Total Period**	**0**
Number of Invalid Hours for:	**Total Period**	**2337**
Number of Valid Hours for:	**Total Period**	**1790**
Total Hours for:	**Total Period**	**26,280**

PTN COL 2.3-2

Table 2.3.2-206 (Sheet 4 of 8) Joint Frequency Distribution of Wind Speed and Wind Direction (60-Meter Level) by Atmospheric Stability for Units 6 & 7 Site (2002, 2005, and 2006)

Hours at Each Wind Speed and Direction

Total Period

Period of Record: 3-Year Composite (2002, 2005, 2006)

Elevation: 60M **Speed:** WS60M

Direction: WD60M **Lapse:** DT10M–60M

Stability Class: D Neutral

	Wind Speed (m/s)												
Wind Direction (from)	**0.22–0.50**	**0.51–0.75**	**0.76–1.0**	**1.1–1.5**	**1.6–2.0**	**2.1–3.0**	**3.1–5.0**	**5.1–7.0**	**7.1–10.0**	**10.1–13.0**	**13.1–18.0**	**>18.0**	**Total**
N	0	0	2	4	13	30	90	83	42	2	0	0	266
NNE	0	0	0	1	8	20	42	24	30	4	0	0	129
NE	0	0	1	2	7	40	117	113	238	102	5	0	625
ENE	0	0	0	1	13	44	226	337	339	28	0	0	988
E	0	3	0	3	7	42	389	514	290	24	0	0	1272
ESE	0	0	1	4	7	64	444	373	146	17	0	0	1056
SE	0	0	1	6	6	40	171	164	150	21	2	2	563
SSE	0	0	1	5	6	37	137	115	91	7	5	4	408
S	0	0	1	5	4	23	98	103	44	3	1	2	284
SSW	0	0	0	2	6	19	55	70	48	8	4	0	212
SW	0	0	0	3	7	12	31	64	52	6	2	0	177
WSW	0	0	0	2	2	16	24	20	31	8	1	0	104
W	0	0	0	4	7	19	26	37	30	3	0	0	126
WNW	0	0	0	4	7	25	36	26	18	6	1	0	123
NW	0	0	0	2	14	16	39	26	17	9	0	0	123
NNW	0	0	1	4	10	25	49	102	91	8	1	0	291
Totals	**0**	**3**	**8**	**52**	**124**	**472**	**1974**	**2171**	**1657**	**256**	**22**	**8**	**6747**

Number of Calm Hours not included above for:	**Total Period**	**0**
Number of Variable Direction Hours for:	**Total Period**	**0**
Number of Invalid Hours for:	**Total Period**	**2337**
Number of Valid Hours for:	**Total Period**	**6747**
Total Hours for:	**Total Period**	**26,280**

PTN COL 2.3-2

Table 2.3.2-206 (Sheet 5 of 8) Joint Frequency Distribution of Wind Speed and Wind Direction (60-Meter Level) by Atmospheric Stability for Units 6 & 7 Site (2002, 2005, and 2006)

Hours at Each Wind Speed and Direction

Total Period

Period of Record: 3-Year Composite (2002, 2005, 2006)

Elevation: 60M **Speed:** WS60M

Direction: WD60M **Lapse:** DT10M–60M

Stability Class: E Slightly Stable

	Wind Speed (m/s)												
Wind Direction (from)	**0.22–0.50**	**0.51–0.75**	**0.76–1.0**	**1.1–1.5**	**1.6–2.0**	**2.1–3.0**	**3.1–5.0**	**5.1–7.0**	**7.1–10.0**	**10.1–13.0**	**13.1–18.0**	**>18.0**	**Total**
N	0	0	0	2	1	20	109	167	56	0	0	0	355
NNE	0	0	0	1	3	13	52	66	36	0	0	0	171
NE	0	0	3	5	11	17	96	169	225	55	0	0	581
ENE	0	0	0	2	8	49	283	476	237	11	0	0	1066
E	0	3	1	5	12	101	553	799	340	18	3	0	1835
ESE	1	0	1	5	14	92	474	505	225	17	10	1	1345
SE	0	0	0	8	20	97	311	339	157	14	11	5	962
SSE	0	2	2	4	13	63	168	143	113	16	4	4	532
S	0	0	5	7	8	55	129	98	40	4	2	2	350
SSW	0	0	1	6	12	29	90	64	32	2	1	0	237
SW	0	0	2	3	6	27	50	42	28	3	1	0	162
WSW	0	0	1	4	4	22	28	34	12	0	0	0	105
W	0	0	0	10	8	30	49	41	5	1	0	0	144
WNW	0	1	3	5	6	22	57	46	17	1	0	0	158
NW	0	0	3	9	9	29	46	45	41	3	0	0	185
NNW	0	0	1	6	7	24	78	173	129	1	0	0	419
Totals	**1**	**6**	**23**	**82**	**142**	**690**	**2573**	**3207**	**1693**	**146**	**32**	**12**	**8607**

Number of Calm Hours not included above for:	**Total Period**	**0**
Number of Variable Direction Hours for:	**Total Period**	**0**
Number of Invalid Hours for:	**Total Period**	**2337**
Number of Valid Hours for:	**Total Period**	**8607**
Total Hours for:	**Total Period**	**26,280**

PTN COL 2.3-2

Table 2.3.2-206 (Sheet 6 of 8)
Joint Frequency Distribution of Wind Speed and Wind Direction (60-Meter Level) by Atmospheric Stability for Units 6 & 7 Site (2002, 2005, and 2006)

Hours at Each Wind Speed and Direction

Total Period

Period of Record: 3-Year Composite (2002, 2005, 2006)

Elevation: 60M **Speed:** WS60M

Direction: WD60M **Lapse:** DT10M–60M

Stability Class: F Moderately Stable

	Wind Speed (m/s)												
Wind Direction (from)	**0.22–0.50**	**0.51–0.75**	**0.76–1.0**	**1.1–1.5**	**1.6–2.0**	**2.1–3.0**	**3.1–5.0**	**5.1–7.0**	**7.1–10.0**	**10.1–13.0**	**13.1–18.0**	**>18.0**	**Total**
N	0	0	2	7	14	28	83	124	51	0	0	0	309
NNE	0	0	0	7	6	19	41	18	4	0	0	0	95
NE	0	0	1	9	6	30	45	8	7	0	0	0	106
ENE	0	0	1	6	9	21	30	13	4	0	0	0	84
E	1	3	1	7	11	29	82	49	4	0	0	0	187
ESE	1	1	2	6	11	29	112	73	7	0	0	0	242
SE	0	2	5	6	11	25	69	55	1	0	0	0	174
SSE	0	0	5	12	8	29	54	27	0	0	0	0	135
S	0	0	1	1	5	17	35	20	0	0	0	0	79
SSW	1	1	3	1	7	14	53	11	3	0	1	0	95
SW	0	1	3	3	7	15	37	19	2	0	1	0	88
WSW	0	0	2	2	9	16	28	23	13	0	1	0	94
W	0	1	7	8	9	23	54	53	7	0	0	0	162
WNW	0	0	1	3	11	31	53	49	10	0	0	0	158
NW	0	1	3	4	9	20	45	45	37	0	0	0	164
NNW	0	0	4	8	10	33	68	102	76	0	0	0	301
Totals	**3**	**10**	**41**	**90**	**143**	**379**	**889**	**689**	**226**	**0**	**3**	**0**	**2473**

Number of Calm Hours not included above for:	**Total Period**	**0**
Number of Variable Direction Hours for:	**Total Period**	**0**
Number of Invalid Hours for:	**Total Period**	**2337**
Number of Valid Hours for:	**Total Period**	**2473**
Total Hours for:	**Total Period**	**26,280**

PTN COL 2.3-2

Table 2.3.2-206 (Sheet 7 of 8) Joint Frequency Distribution of Wind Speed and Wind Direction (60-Meter Level) by Atmospheric Stability for Units 6 & 7 Site (2002, 2005, and 2006)

Hours at Each Wind Speed and Direction

Total Period

Period of Record: 3-Year Composite (2002, 2005, 2006)

Elevation: 60M **Speed:** WS60M

Direction: WD60M **Lapse:** DT10M–60M

Stability Class: G Extremely Stable

Wind Speed (m/s)													
Wind Direction (from)	**0.22–0.50**	**0.51–0.75**	**0.76–1.0**	**1.1–1.5**	**1.6–2.0**	**2.1–3.0**	**3.1–5.0**	**5.1–7.0**	**7.1–10.0**	**10.1–13.0**	**13.1–18.0**	**>18.0**	**Total**
N	0	1	1	5	7	29	65	128	117	3	0	0	356
NNE	0	2	1	4	5	19	45	14	7	0	0	0	97
NE	0	2	0	1	9	23	38	1	0	0	0	0	74
ENE	0	1	2	2	6	23	19	1	0	0	0	0	54
E	0	1	1	7	4	13	23	4	0	0	0	0	53
ESE	0	0	2	8	4	13	11	1	0	0	0	0	39
SE	0	1	3	2	4	6	7	5	0	0	0	0	28
SSE	0	1	0	5	3	7	13	7	0	0	0	0	36
S	0	1	0	0	5	7	6	15	1	0	0	0	35
SSW	0	0	0	4	2	4	14	11	6	0	0	0	41
SW	0	1	0	4	1	9	16	21	10	0	0	0	62
WSW	1	0	1	3	4	7	26	10	11	0	0	0	63
W	0	0	1	2	4	12	34	26	3	0	0	0	82
WNW	0	0	0	2	4	22	47	44	4	0	0	0	123
NW	2	1	1	4	6	23	49	39	20	0	0	0	145
NNW	0	2	0	4	2	21	40	77	59	0	0	0	205
Totals	**3**	**14**	**13**	**57**	**70**	**238**	**453**	**404**	**238**	**3**	**0**	**0**	**1493**

Number of Calm Hours not included above for:	**Total Period**	**0**
Number of Variable Direction Hours for:	**Total Period**	**0**
Number of Invalid Hours for:	**Total Period**	**2337**
Number of Valid Hours for:	**Total Period**	**1493**
Total Hours for:	**Total Period**	**26,280**

PTN COL 2.3-2

Table 2.3.2-206 (Sheet 8 of 8) Joint Frequency Distribution of Wind Speed and Wind Direction (60-Meter Level) by Atmospheric Stability for Units 6 & 7 Site (2002, 2005, and 2006)

Hours at Each Wind Speed and Direction

Summary of All Stability Classes

Total Period

Period of Record: 3-Year Composite (2002, 2005, 2006)

Elevation:	60M	**Speed:**	WS60M
Direction:	WD60M	**Lapse:**	DT10M–60M

	Wind Speed (m/s)												
Wind Direction (from)	**0.22–0.50**	**0.51–0.75**	**0.76–1.0**	**1.1–1.5**	**1.6–2.0**	**2.1–3.0**	**3.1–5.0**	**5.1–7.0**	**7.1–10.0**	**10.1–13.0**	**13.1–18.0**	**>18.0**	**Total**
N	0	1	5	18	35	118	407	600	316	8	0	0	1,508
NNE	0	2	1	13	22	75	217	184	106	7	0	0	627
NE	0	2	5	18	33	117	354	464	640	176	5	0	1,814
ENE	0	1	4	11	38	143	597	991	731	58	0	0	2,574
E	1	10	3	22	34	188	1,153	1,620	795	49	3	0	3,878
ESE	2	1	6	23	36	201	1,219	1,265	546	41	10	1	3,351
SE	0	3	9	22	43	185	688	730	440	51	14	7	2,192
SSE	0	3	8	27	34	169	558	484	273	26	9	8	1,599
S	0	1	7	15	23	118	366	426	167	15	3	4	1,145
SSW	1	1	4	13	30	76	247	237	158	26	6	0	799
SW	0	2	5	13	24	65	147	171	137	19	5	0	588
WSW	1	0	4	11	19	67	121	103	82	8	2	0	418
W	0	1	8	25	30	92	168	175	59	7	0	0	565
WNW	0	1	4	15	28	104	204	185	73	8	6	0	628
NW	2	2	7	19	43	98	212	190	147	14	0	0	734
NNW	0	2	6	22	29	113	291	576	456	27	1	0	1,523
Totals	**7**	**33**	**86**	**287**	**501**	**1,929**	**6,949**	**8,401**	**5,126**	**540**	**64**	**20**	**23,943**

Number of Calm Hours not included above for:	**Total Period**	**0**
Number of Variable Direction Hours for:	**Total Period**	**0**
Number of Invalid Hours for:	**Total Period**	**2,337**
Number of Valid Hours for:	**Total Period**	**23,943**
Total Hours for:	**Total Period**	**26,280**

PTN COL 2.3-2

Table 2.3.2-207
Climatological Normals at Selected NWS and Cooperative Observing Stations in the Area of the Units 6 & 7 Site

Station	Normal Annual Temperatures (°F)				Normal Annual Precipitation	
	Mean Monthly Maximum	Mean Monthly Minimum	Mean Monthly Range	Mean Monthly Mean	Rainfall (inches)	Snowfall (inches)
Dania 4 WNW	N/A	N/A	N/A	N/A	54.7[a]	0.0[a]
Flamingo Ranger Station	84.3[b]	66.1[b]	18.2	75.2[b]	47.5[b]	0.0[a]
Fort Lauderdale	83.4[b]	68.3[b]	15.1	75.9[b]	64.2[b]	0.0[a]
Fort Lauderdale Experiment Station	83.5[a]	64.1[a]	19.4	73.8[a]	60.9[a]	0.0[a]
Hialeah	85.3[b]	71.4[b]	13.9	78.4[b]	66.0[b]	0.0[a]
Homestead Experiment Station	84.1[c]	65.5[c]	18.6	74.8[c]	58.2[c]	0.0[a]
Kendall 2 E	N/A	N/A	N/A	N/A	61.6[a]	0.0[a]
Miami Beach	80.3[b]	71.3[b]	9.0	75.9[b]	46.6[b]	0.0[a]
Miami 12 SSW (POR 1931-1958)	83.4[a]	66.3[a]	17.1	74.9[d]	55.8[a]	0.0[a]
Miami 12 SSW (POR 1958-1988)	82.9[a]	66.3[a]	16.6	74.6[d]	57.2[a]	0.0[a]
Miami International Airport	84.2[b]	69.1[b]	15.1	76.7[b]	58.5[b]	0.0[a]
Oasis Ranger Station	85.7[a]	65.9[a]	19.8	75.8[d]	58.8[c]	0.0[a]
Perrine 4 W	83.2[a]	64.9[a]	18.5	74.1[d]	61.6[c]	0.0[a]
Pompano Beach	84.5[b]	67.5[b]	17.0	76.0[b]	57.3[b]	0.0[a]
Royal Palm Ranger Station	84.9[b]	65.3[b]	19.6	75.1[b]	55.6[b]	0.0[a]
Tamiami Trail 40-Mile Bend	85.6[b]	66.0[b]	19.6	75.8[b]	51.6[b]	0.0[a]
Tavernier	82.4[b]	71.0[b]	11.4	76.7[b]	44.8[b]	0.0[a]

(a) Reference 205
(b) Reference 202
(c) Reference 203
(d) Value calculated as the mean of Mean Annual Maximum and Mean Annual Minimum.
N/A — Not Available

PTN COL 2.3-2

Table 2.3.2-208
Climatological Extremes at Selected NWS and Cooperative Observing Stations in the Area of the Units 6 & 7 Site

Station	Maximum Temperature (°F)	Minimum Temperature (°F)	Maximum 24-Hr Rainfall (inches)	Maximum Monthly Rainfall (inches)	Maximum 24-Hr Snowfall (inches)	Maximum Monthly Snowfall (inches)
Dania 4 WNW	96[(a)(b)] (10/03/65)	42[(a)(b)] (11/19/51)	9.5[(a)(b)] (10/30/69)	22.0[(a)(b)] (09/60)	0.0[(a)(b)]	0.0[(a)(b)]
Flamingo Ranger Station	104[(c)] (06/24/98)	25[(c)] (12/25/89)	8.2[(c)] (08/18/81)	24.7[(a)] (05/75)	0.0[(c)]	0.0[(c)]
Fort Lauderdale	99[(c)] [07/13/80]	28[(c)] (01/20/77)	14.6[(c)] (04/25/79)	24.4[(c)] (06/92)	0.0[(c)]	0.0[(c)]
Fort Lauderdale Experiment Station	100[(a)(b)] (06/24/77)	26[(a)(b)] (01/20/77)	11.5[(a)(b)] (04/25/79)	21.3[(a)(b)] (06/66)	0.0[(a)(b)]	0.0[(a)(b)]
Hialeah	100[(c)] (07/10/98)	28[(c)] (01/13/81)	10.0[(c)] (05/05/77)	31.9[(c)] (06/99)	0.0[(c)]	0.0[(c)]
Homestead Experiment Station	100[(a)(b)(d)] (06/24/44)	26[(a)(b)(e)] (02/16/43)	11.5[(a)(b)] (10/05/33)	27.3[(a)(b)] (08/81)	T[(a)(b)] (01/19/77)	T[(a)(b)] (01/77)
Kendall 2 E	N/A	N/A	9.8[(a)(b)] (05/25/58)	23.2[(a)(b)] (08/73)	0.0[(a)(b)]	0.0[(a)(b)]
Miami Beach	98[(c)] (08/29/99)	32[(c)] (12/24/89)	8.4[(c)] (09/23/60)	17.5[(c)] (05/84)	0.0[(c)]	0.0[(c)]
Miami 12 SSW (POR 1931-1958)	98[(a)(b)(f)] (06/18/34)	28[(a)(b)(g)] (02/06/47)	7.6[(a)(b)] (09/22/48)	23.8[(a)(b)] (09/48)	0.0[(a)(b)]	0.0[(a)(b)]
Miami 12 SSW (POR 1958-1988)	97[(a)(b)(h)] (08/10/87)	25[(a)(b)(i)] (01/20/77)	10.1[(a)(b)] (09/10/60)	27.5[(a)(b)] (09/60)	0.0[(a)(b)]	0.0[(a)(b)]
Miami International Airport	98[(j)(k)(l)] (07/03/98)	30[(k)(m)] (12/25/89)	14.9[(k)] (04/25/79)	24.4[(k)] (09/60)	0.0[(c)]	0.0[(c)]
Oasis Ranger Station	103[(a)(b)] (06/18/81)	26[(a)(b)(n)] (02/16/91)	8.1[(a)(b)] (08/24/95)	24.2[(a)(b)] (06/99)	0.0[(a)(b)]	0.0[(a)(b)]
Perrine 4 W	98[(a)(b)] (07/04/98)	29[(a)(b)] (12/24/89)	15.1[(a)(b)] (08/26/05)	29.5[(a)(b)] (09/60)	0.0[(a)(b)]	0.0[(a)(b)]
Pompano Beach	101[(a)] (07/16/81)	21[(a)] (02/09/95)	12.7[(a)] (10/15/65)	34.4[(a)(b)] (10/65)	0.0[(a)]	0.0[(a)]
Royal Palm Ranger Station	102[(a)(o)] (04/28/07)	24[(a)] (01/20/77)	9.6[(a)] (06/09/97)	25.5[(a)(b)] (06/69)	0.0[(a)]	0.0[(a)]
Tamiami Trail 40-Mile Bend	102[(a)] (06/17/81)	28[(a)(p)] (12/25/89)	7.5[(a)(q)] (10/16/99)	23.5[(a)(b)] (06/69)	0.0[(a)]	0.0[(a)]
Tavernier	98[(a)(r)] (09/03/03)	35[(a)(s)] (12/24/89)	13.8[(a)] (06/02/82)	21.8[(a)(b)] (06/67)	0.0[(a)]	0.0[(a)]

PTN COL 2.3-2

Table 2.3.2-208
Climatological Extremes at Selected NWS and Cooperative Observing Stations in the Area of the Units 6 & 7 Site

(a) Reference 206
(b) Reference 204
(c) Reference 202
(d) Occurs on multiple dates: 07/21/42; 06/24/44 (most recent date shown in table)
(e) Occurs on multiple dates: 12/13/34; 03/02/41; 02/16/43 (most recent date shown in table)
(f) Occurs on multiple dates: 07/09/32; 06/18/34 (most recent date shown in table)
(g) Occurs on multiple dates: 01/28/40; 02/06/47 (most recent date shown in table)
(h) Occurs on multiple dates: 05/01/71; 06/25/87 (most recent date shown in table)
(i) Occurs on multiple dates: 08/06/54; 07/19/81; 06/04/85 (most recent date shown in table)
(j) Occurs on multiple dates: 01/22/85; 12/25/89 (most recent date shown in table)
(k) Reference 201
(l) Occurs on multiple dates: 06/04/85; 07/03/98; 08/01/90 (most recent date shown in table)
(m) Occurs on multiple dates: 01/22/85; 12/25/89 (most recent date shown in table)
(n) Occurs on multiple dates: 01/12/89; 12/25/89; 02/16/91 (most recent date shown in table)
(o) Occurs on multiple dates: 07/22/96; 04/28/07 (most recent date shown in table)
(p) Occurs on multiple dates: 01/22/85; 12/25/89 (most recent date shown in table)
(q) Occurs on multiple dates: 09/23/48; 10/16/99 (most recent date shown in table)
(r) Occurs on multiple dates: 08/14/57; 09/03/63 (most recent date shown in table)
(s) Occurs on multiple dates: 01/13/81;12/24/89 (most recent date shown in table)
N/A — Not Available. This parameter is not measured at this station.
T — Trace

PTN COL 2.3-2

Table 2.3.2-209
CALPUFF Predicted Visible Cooling Tower Vapor Plume Height and Length — All Hours

Conditions		Winter		Spring		Summer		Autumn		Annual[(a)]	
		hours/ year	%	hours/ year	%	hours/ year	%	hours/ year	%	hours/ year	%
Ambient Fog/ Calm Hours Removed		**718**	**41.7**	**387**	**22.5**	**230**	**13.3**	**388**	**22.5**	**1723**	**100.0**
Plume Height (m)											
>0	200	365	50.78	222	57.45	115	50.00	206	53.17	908	52.71
>200	400	328	45.63	153	39.61	106	46.25	168	43.32	755	43.84
>400	600	15	2.14	8	1.96	6	2.53	9	2.37	38	2.21
>600	1000	10	1.34	4	0.98	3	1.13	4	1.13	20	1.18
>1000		1	0.11	0	0.00	0	0.09	0	0.00	1	0.06
Plume Length (m)											
>0	100	166	23.1	111.2	28.75	65.8	28.66	104.4	26.92	447	25.96
>100	300	220	30.6	119.6	30.92	67.4	29.36	104.8	27.02	511	29.69
>300	500	35	4.8	16.2	4.19	9.4	4.09	14.8	3.82	75	4.35
>500	1000	46	6.5	25	6.46	17.4	7.58	38.6	9.95	127	7.40
>1000	3000	84	11.6	43.6	11.27	28.4	12.37	47.6	12.27	203	11.80
>3000	5000	52.4	7.29	22.4	5.79	16.6	7.23	26.2	6.76	118	6.83
>5000		116	16.15	49	12.62	25	10.71	51	13.25	241	13.98

(a) Annual average of the 5-year period from 2001 to 2005.

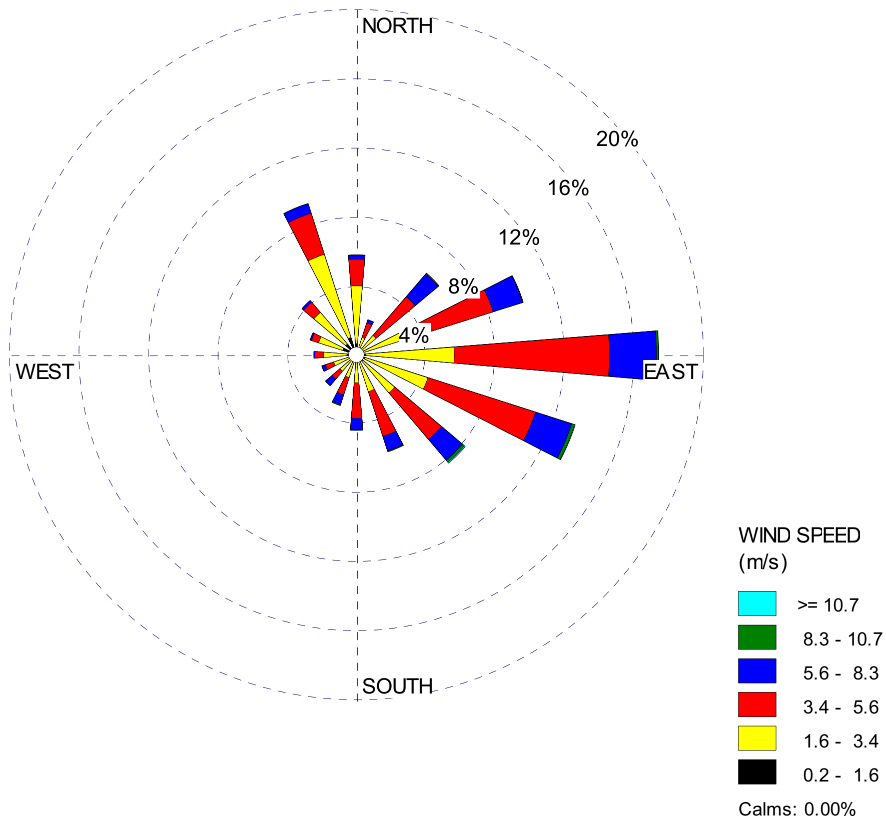
PTN COL 2.3-2

Table 2.3.2-210
CALPUFF Predicted Visible Cooling Tower Vapor Plume Height and Length — Daylight Hours

Conditions		Winter		Spring		Summer		Autumn		Annual[a]	
		hours/ year	%	hours/ year	%	hours/ year	%	hours/ year	%	hours/ year	%
Ambient Fog/ Calm Hours Removed		**213**	**36.5%**	**137**	**23.4**	**99**	**17.0**	**134**	**23.0**	**584**	**100.0**
Plume Height (m)											
>0	200	119	55.87	84	61.40	57	57.75	77	56.99	337	57.75
>200	400	79	36.90	46	33.48	34	34.61	47	35.12	206	35.30
>400	600	9	41.13	5	3.36	6	5.63	7	5.06	26	4.42
>600	1000	6	2.91	2	1.75	2	1.81	4	2.83	14	2.43
>1000		0	0.19	0	0.00	0	0.20	0	0.00	1	0.10
Plume Length (m)											
>0	100	61	28.8	41.4	30.26	30.8	30.99	37.6	27.98	171	29.34
>100	300	77	36.3	55	40.20	42	42.25	46.4	34.52	221	37.83
>300	500	13	5.9	7.8	5.70	5.6	5.63	7.4	5.51	33	5.75
>500	1000	15	7.2	11.6	8.48	9.6	9.66	16	11.90	53	9.01
>1000	3000	19	8.8	9.8	7.16	7.6	7.65	13	9.67	49	8.43
>3000	5000	7.4	3.47	3.6	2.63	1.8	1.81	4	2.98	17	2.88
>5000		20	9.39	8	5.56	2	2.01	10	7.44	40	6.79

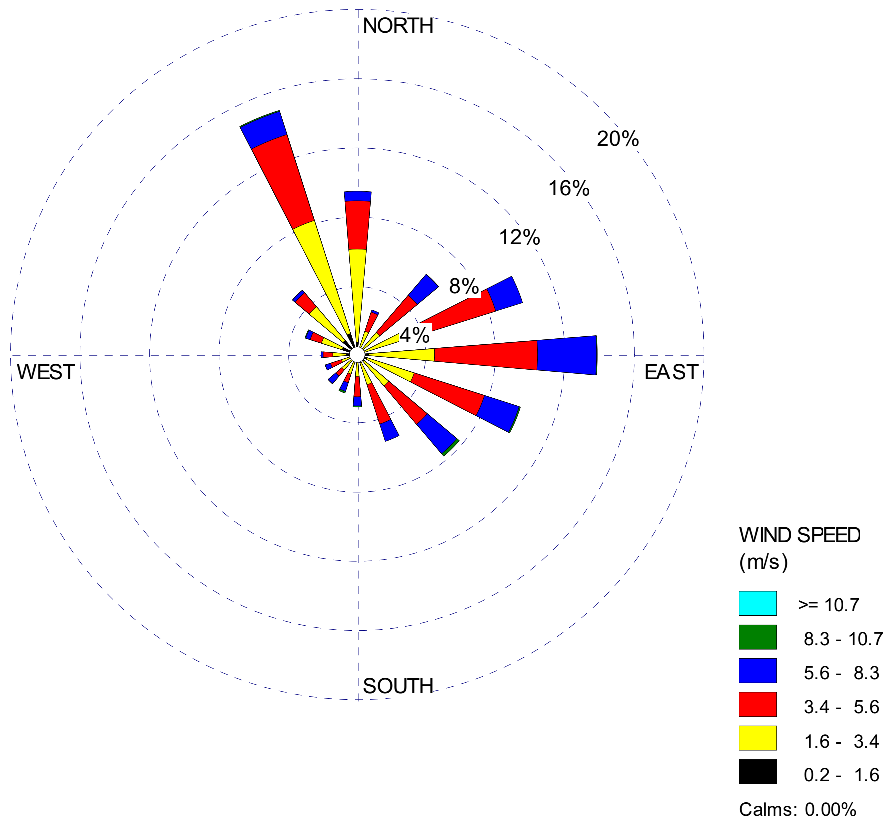
(a) Annual average of the 5-year period from 2001 to 2005.

PTN COL 2.3-2 **Figure 2.3.2-201 10-Meter Level 3-Year Composite Wind Rose — Annual (2002, 2005, and 2006)**

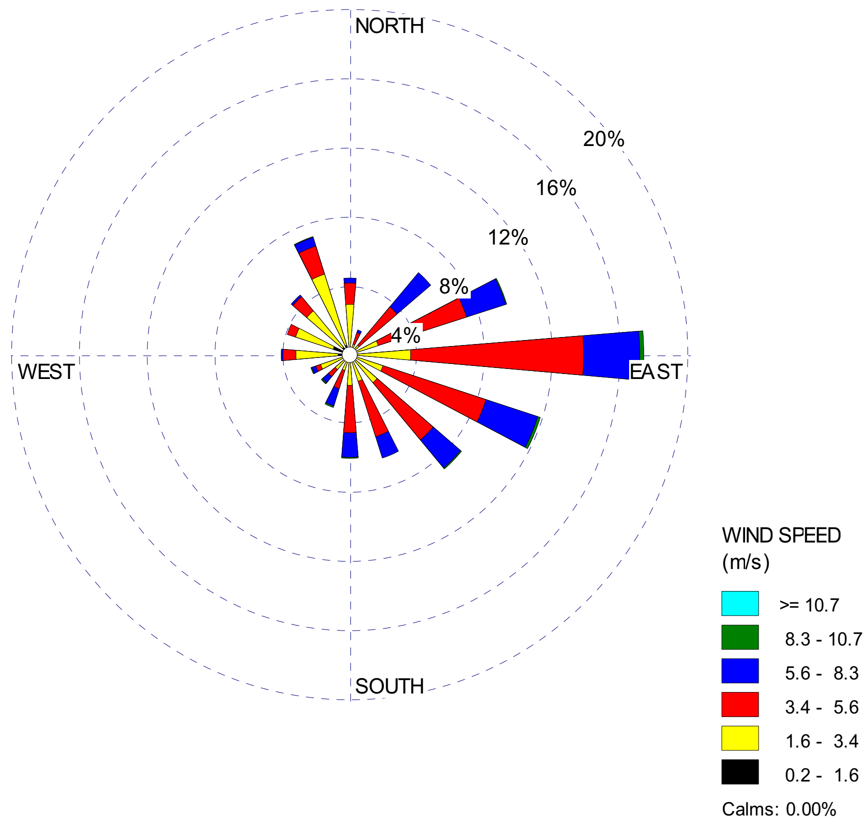


PTN COL 2.3-2

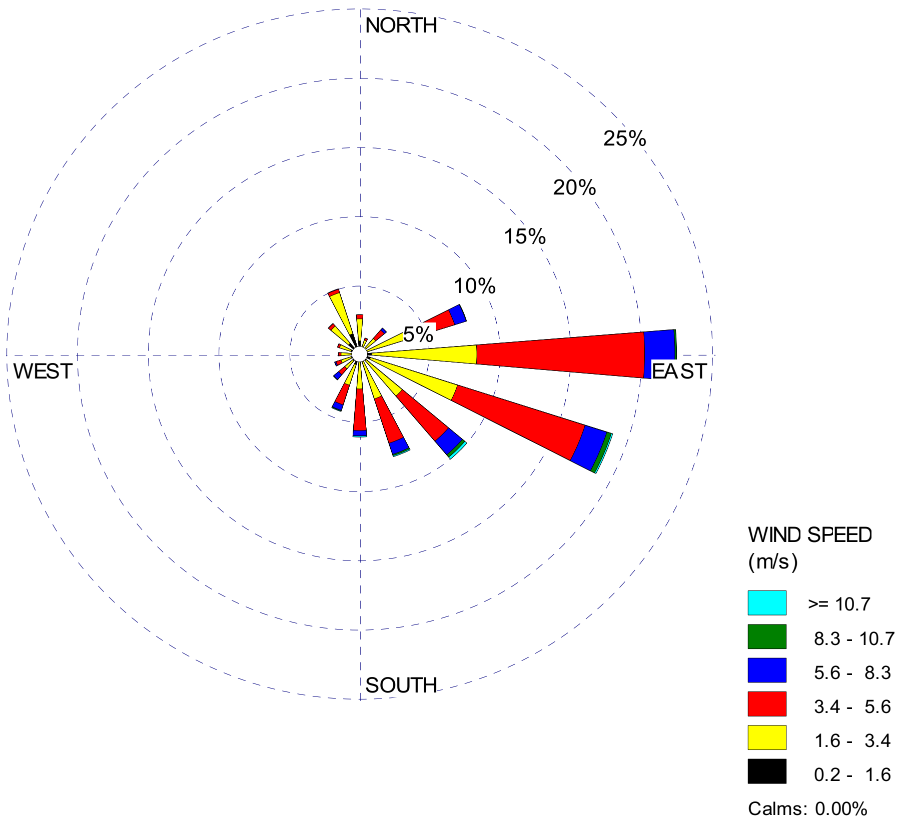
Figure 2.3.2-202 10-Meter Level 3-Year Composite Wind Rose — Winter (2002, 2005, and 2006)



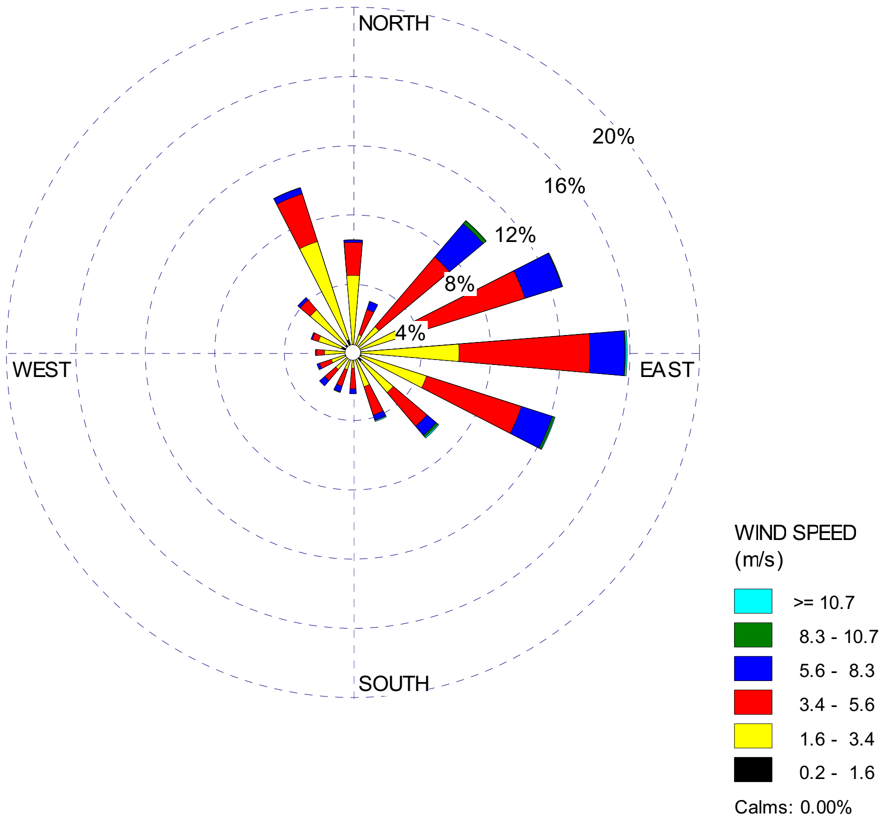
PTN COL 2.3-2 **Figure 2.3.2-203 10-Meter Level 3-Year Composite Wind Rose — Spring (2002, 2005, and 2006)**



PTN COL 2.3-2 **Figure 2.3.2-204 10-Meter Level 3-Year Composite Wind Rose — Summer (2002, 2005, and 2006)**



PTN COL 2.3-2 **Figure 2.3.2-205 10-Meter Level 3-Year Composite Wind Rose — Autumn (2002, 2005, and 2006)**



PTN COL 2.3-2

Figure 2.3.2-206 10-Meter Level 3-Year Composite Wind Rose — January (2002, 2005, and 2006) (Sheet 1 of 12)

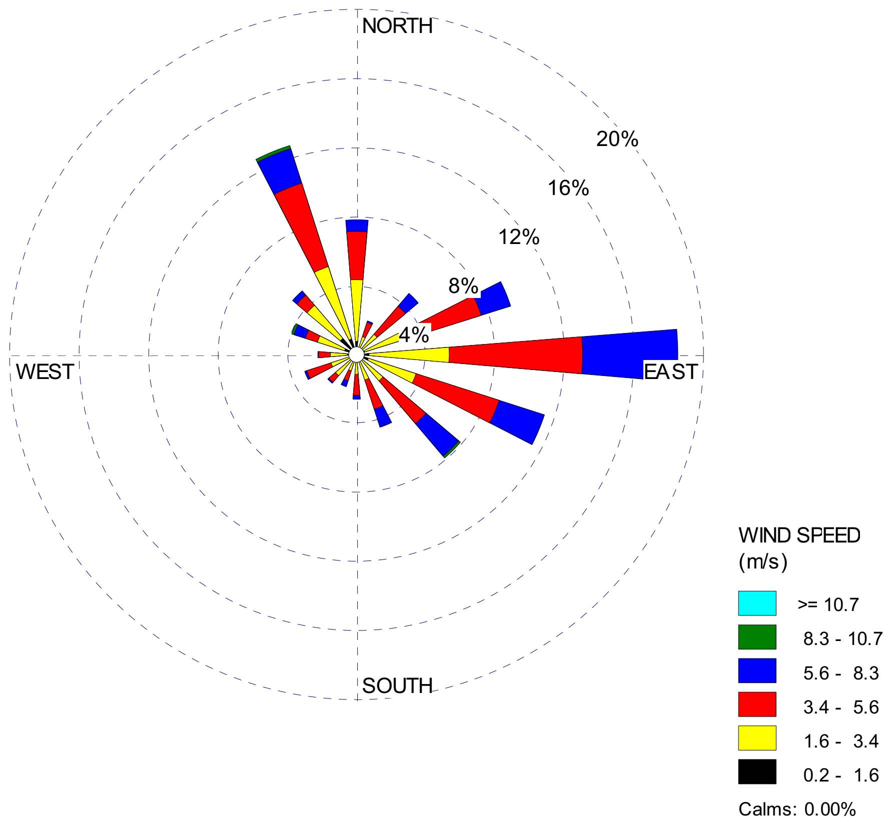


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Figure 2.3.2-206 10-Meter Level 3-Year Composite Wind Rose — February (2002, 2005, and 2006) (Sheet 2 of 12)

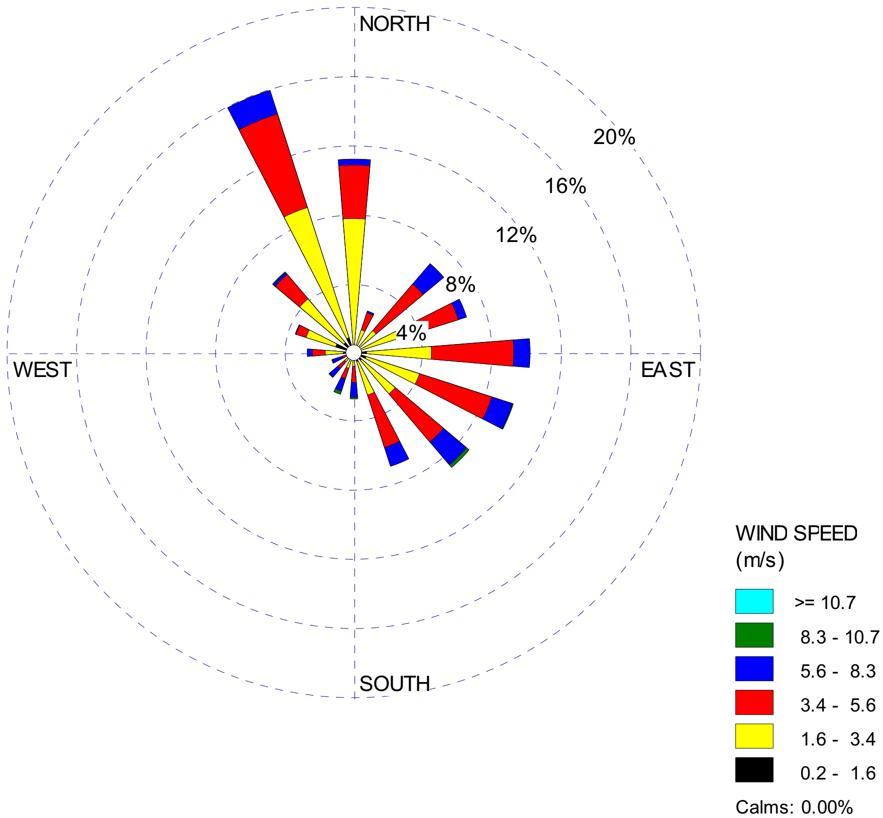

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Figure 2.3.2-206 10-Meter Level 3-Year Composite Wind Rose — March (2002, 2005, and 2006) (Sheet 3 of 12)

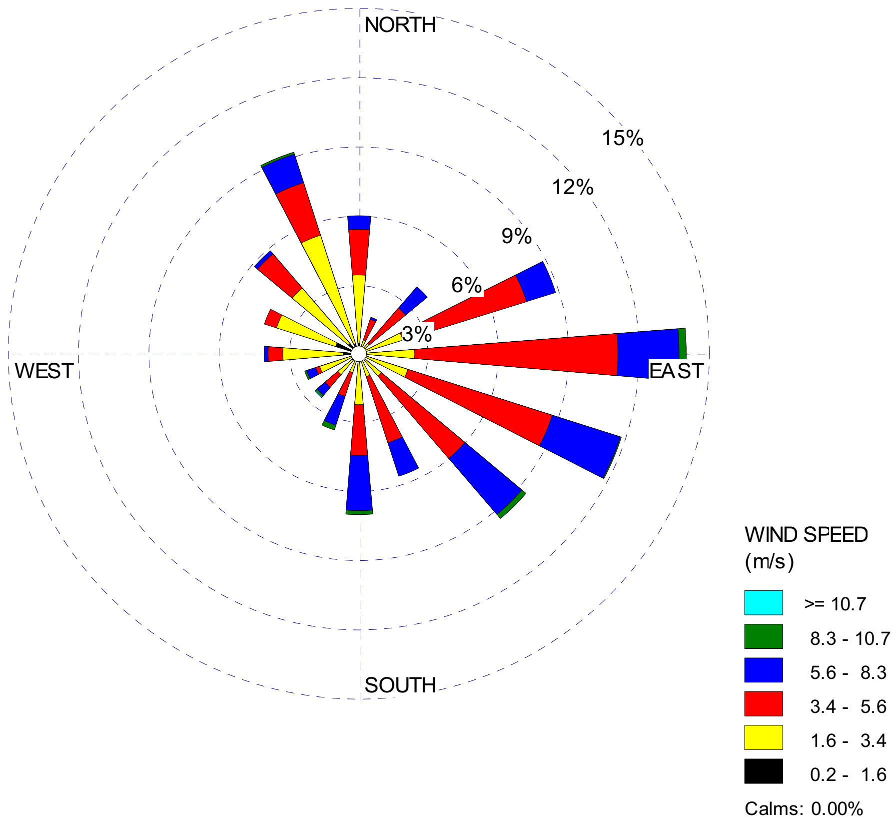

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Figure 2.3.2-206 10-Meter Level 3-Year Composite Wind Rose — April (2002, 2005, and 2006) (Sheet 4 of 12)

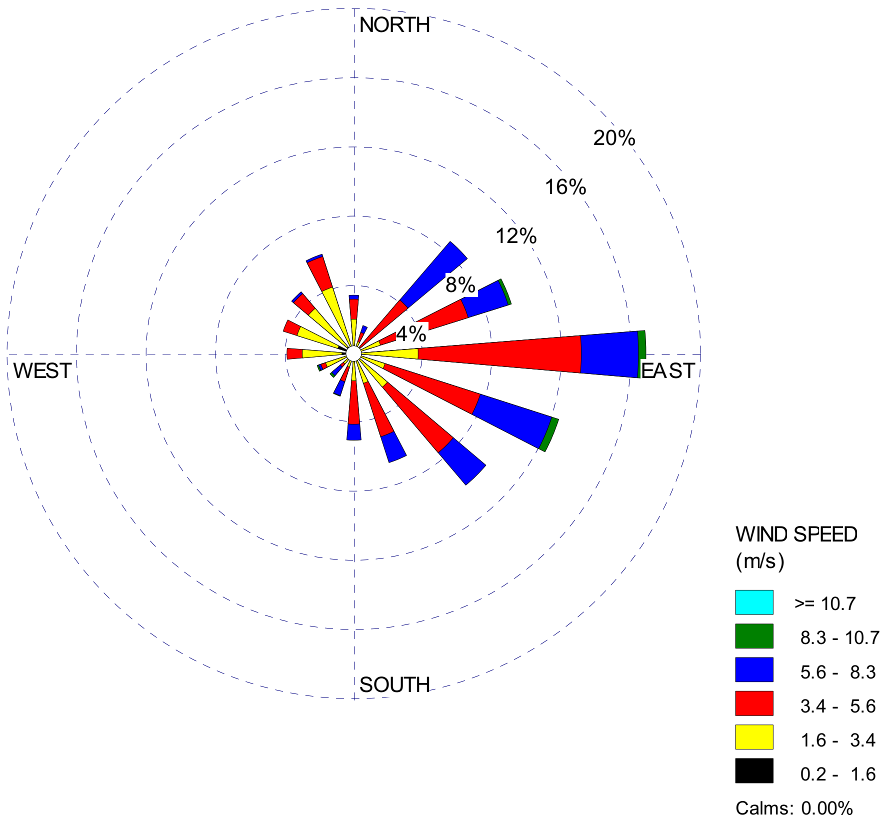

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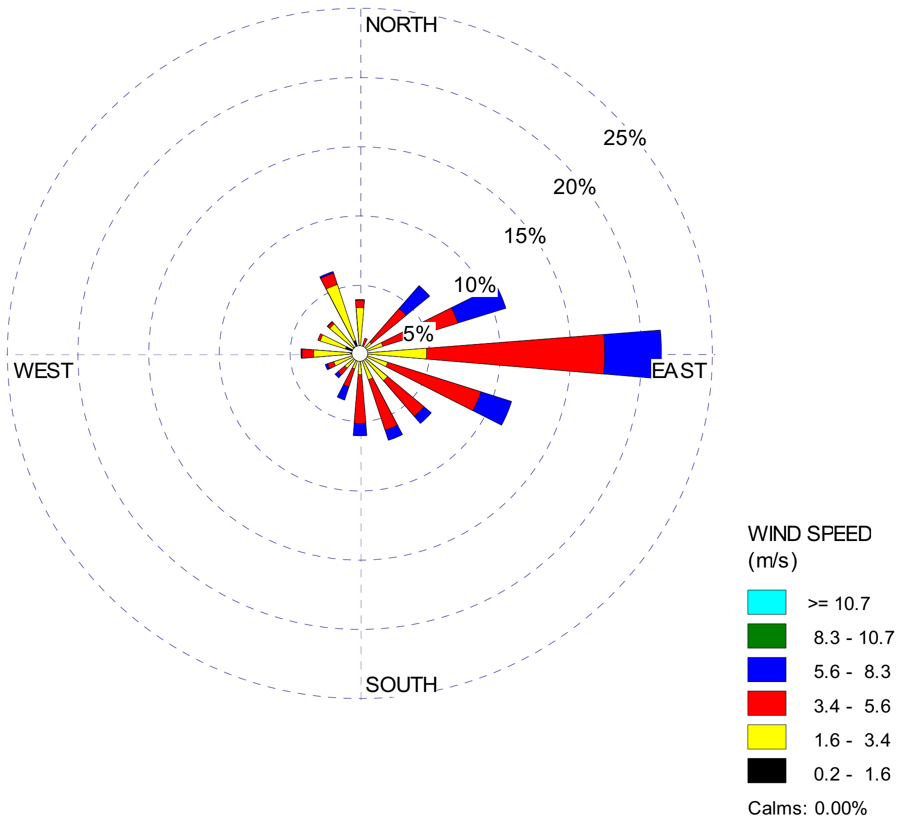
Figure 2.3.2-206 10-Meter Level 3-Year Composite Wind Rose — May (2002, 2005, and 2006) (Sheet 5 of 12)



PTN COL 2.3-2

Figure 2.3.2-206 10-Meter Level 3-Year Composite Wind Rose — June (2002, 2005, and 2006) (Sheet 6 of 12)

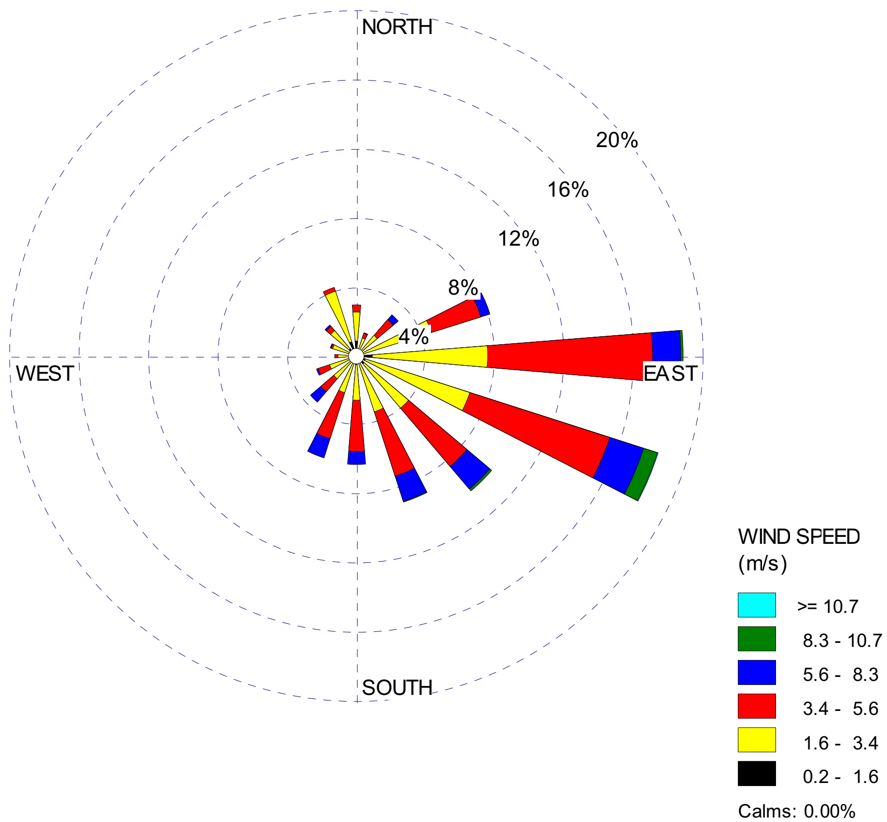


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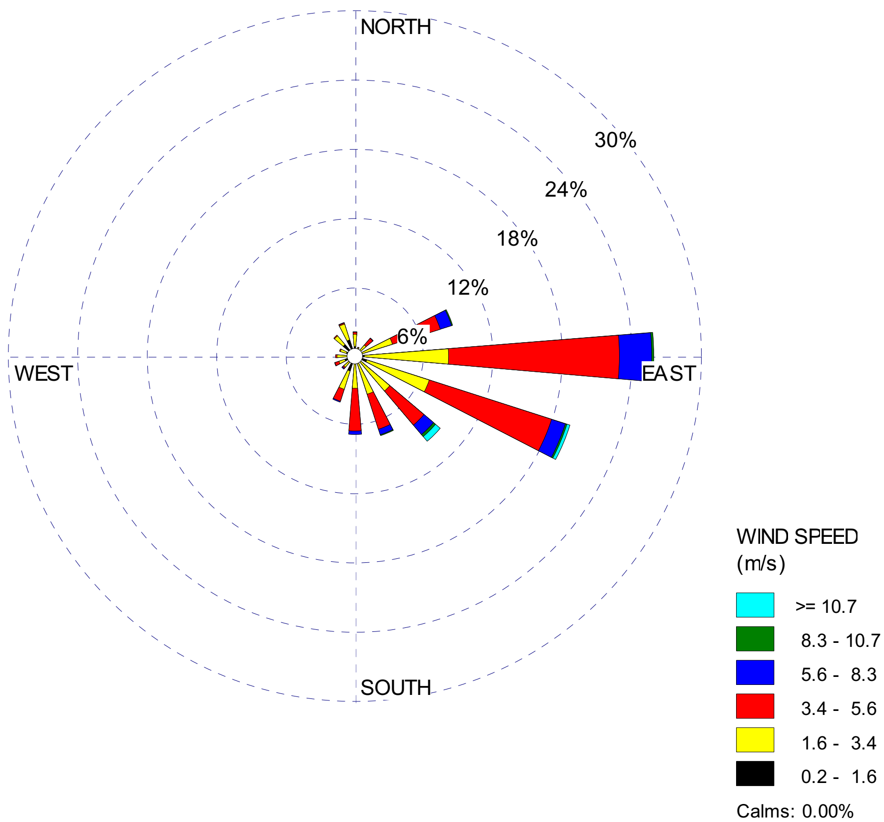
Figure 2.3.2-206 10-Meter Level 3-Year Composite Wind Rose — July (2002, 2005, and 2006) (Sheet 7 of 12)



PTN COL 2.3-2

Figure 2.3.2-206 10-Meter Level 3-Year Composite Wind Rose — August (2002, 2005, and 2006) (Sheet 8 of 12)

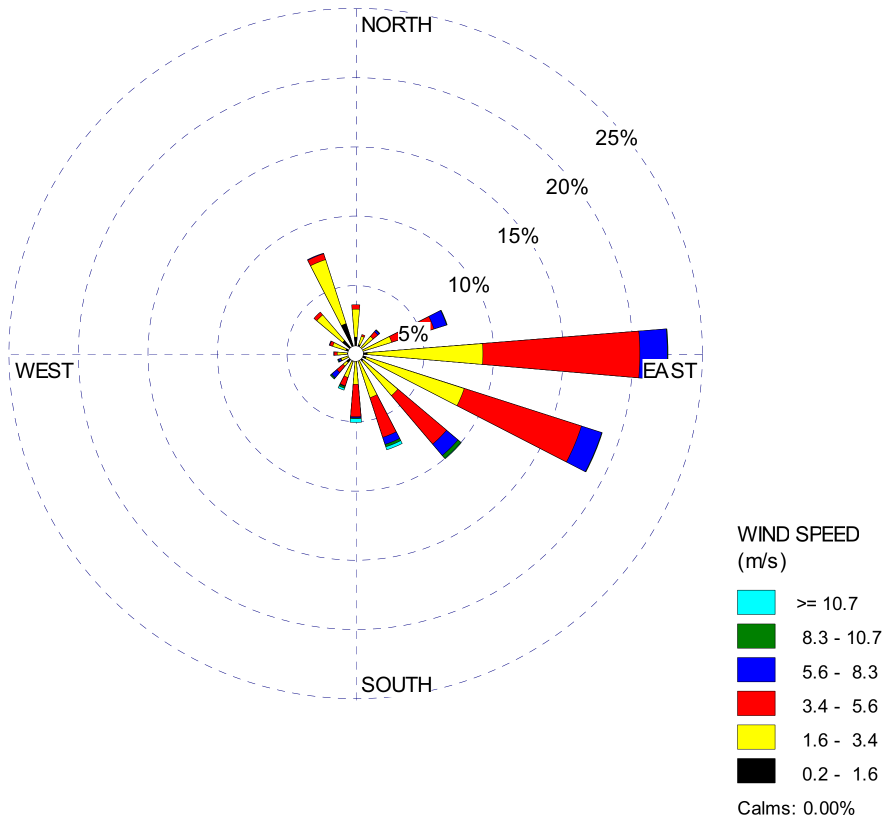


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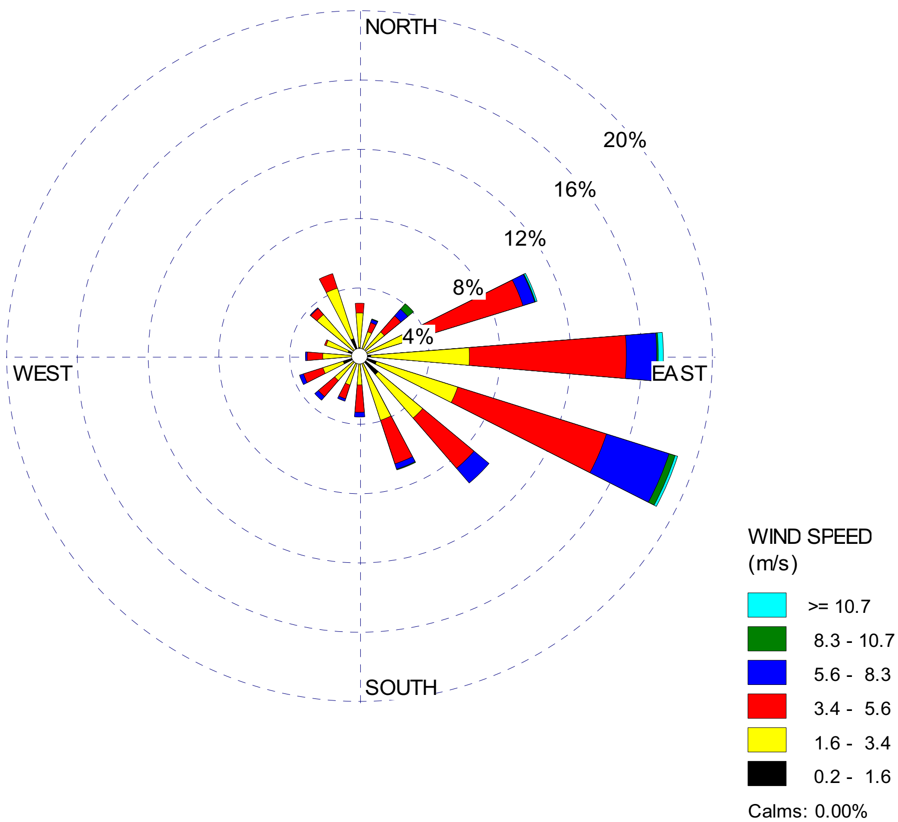
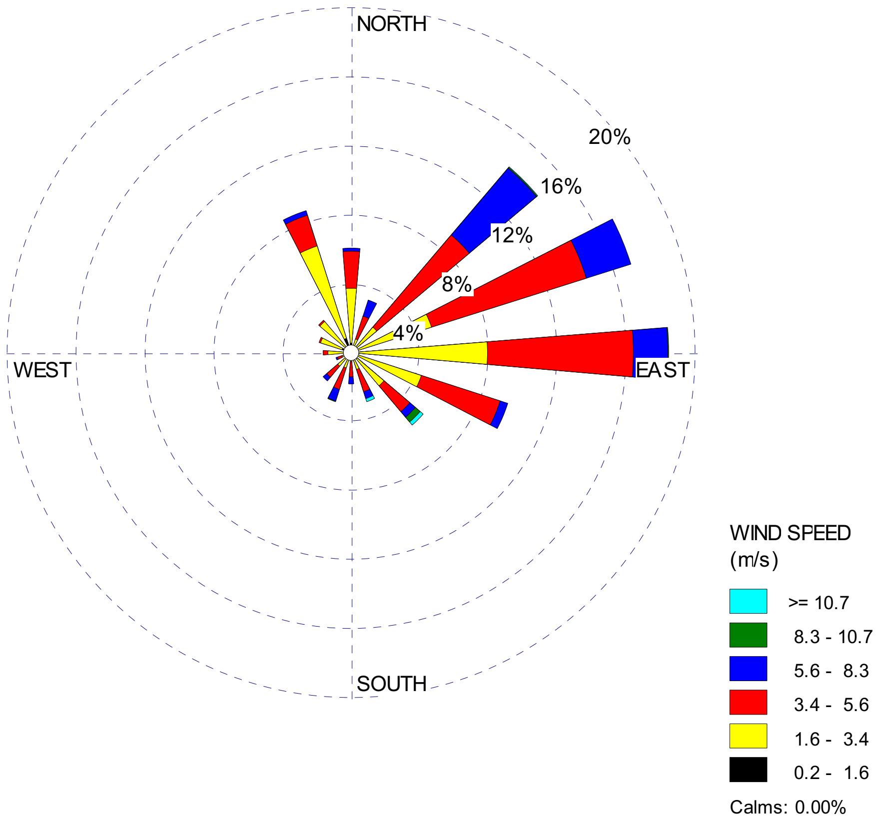
Figure 2.3.2-206 10-Meter Level 3-Year Composite Wind Rose — September (2002, 2005, and 2006) (Sheet 9 of 12)



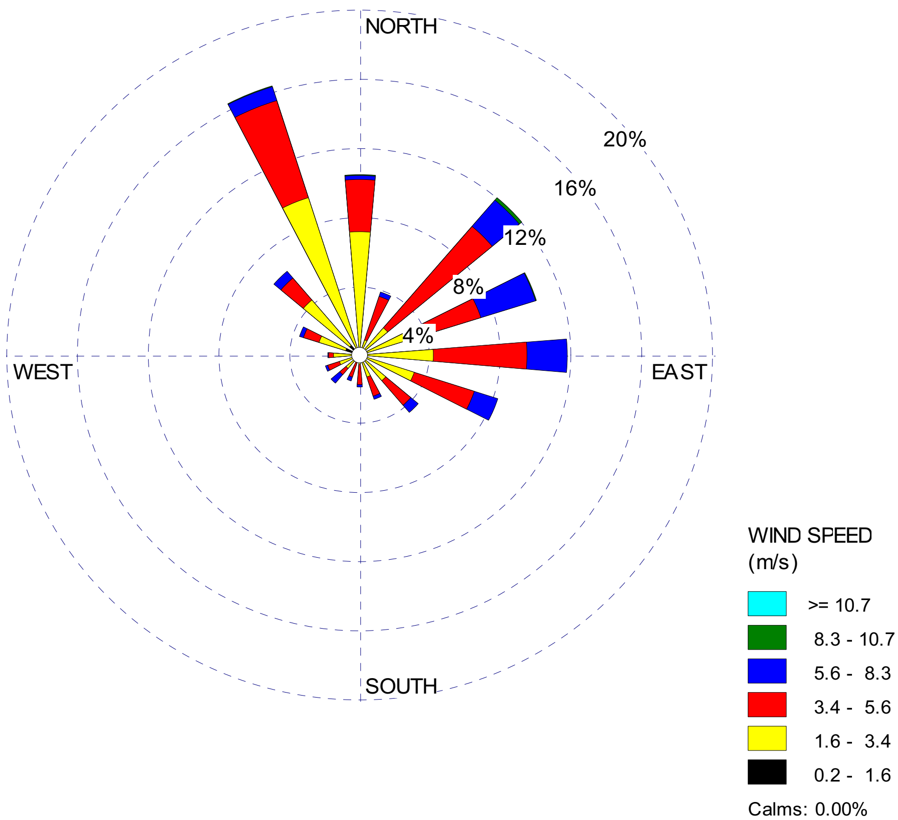
PTN COL 2.3-2

Figure 2.3.2-206 10-Meter Level 3-Year Composite Wind Rose — October (2002, 2005, and 2006) (Sheet 10 of 12)



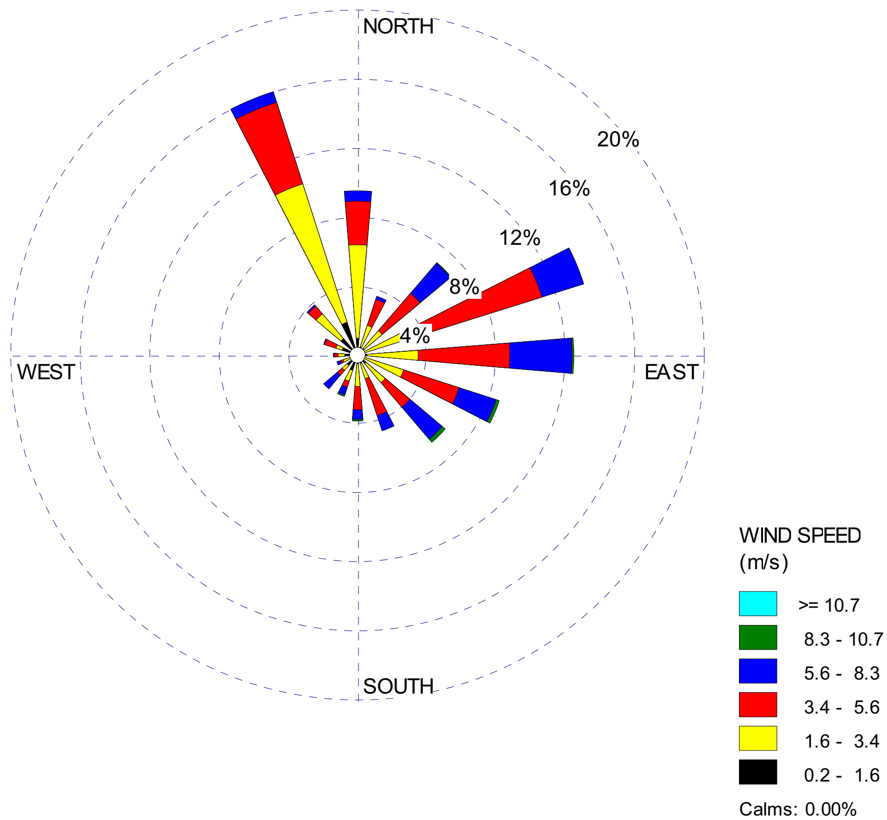
PTN COL 2.3-2

Figure 2.3.2-206 10-Meter Level 3-Year Composite Wind Rose — November (2002, 2005, and 2006) (Sheet 11 of 12)



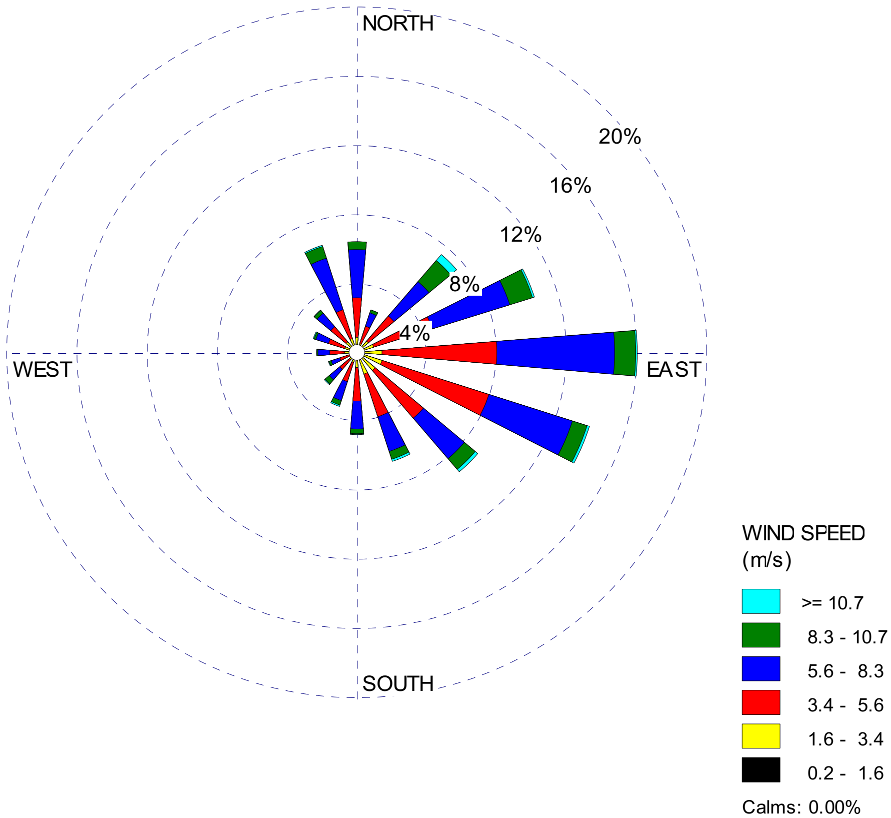
PTN COL 2.3-2

Figure 2.3.2-206 10-Meter Level 3-Year Composite Wind Rose — December (2002, 2005, and 2006) (Sheet 12 of 12)

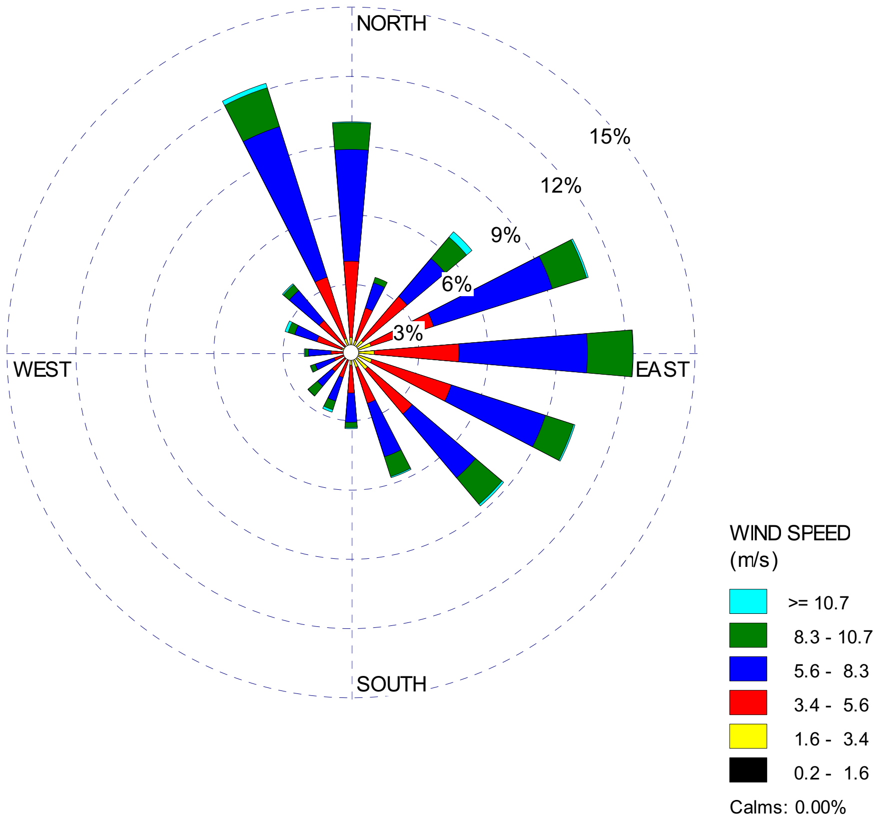


PTN COL 2.3-2

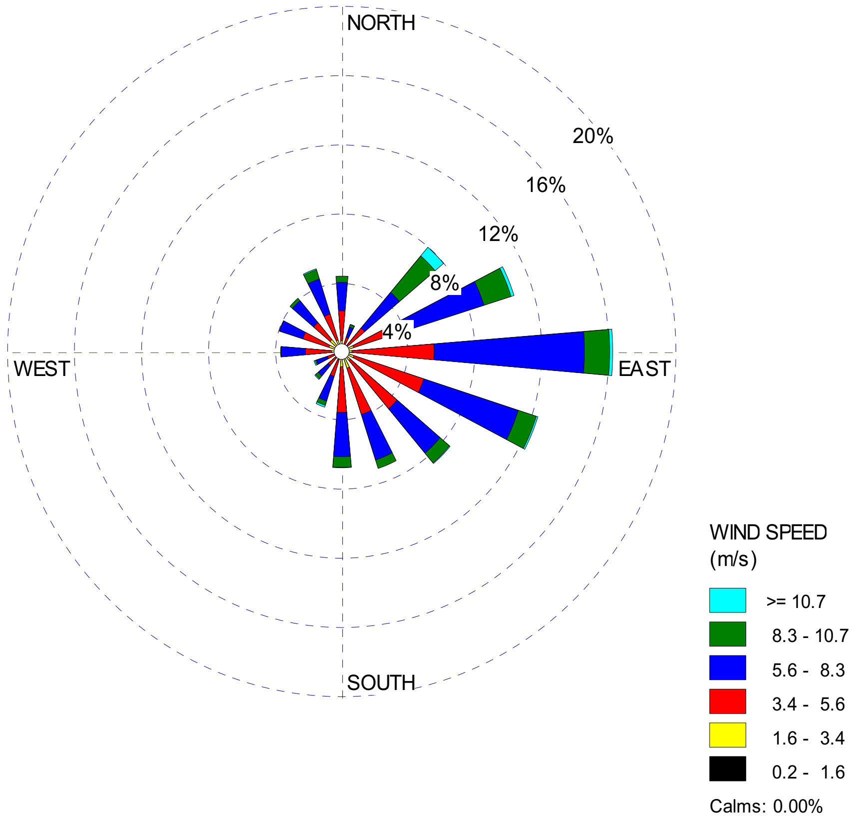
Figure 2.3.2-207 60-Meter Level 3-Year Composite Wind Rose — Annual (2002, 2005, and 2006)



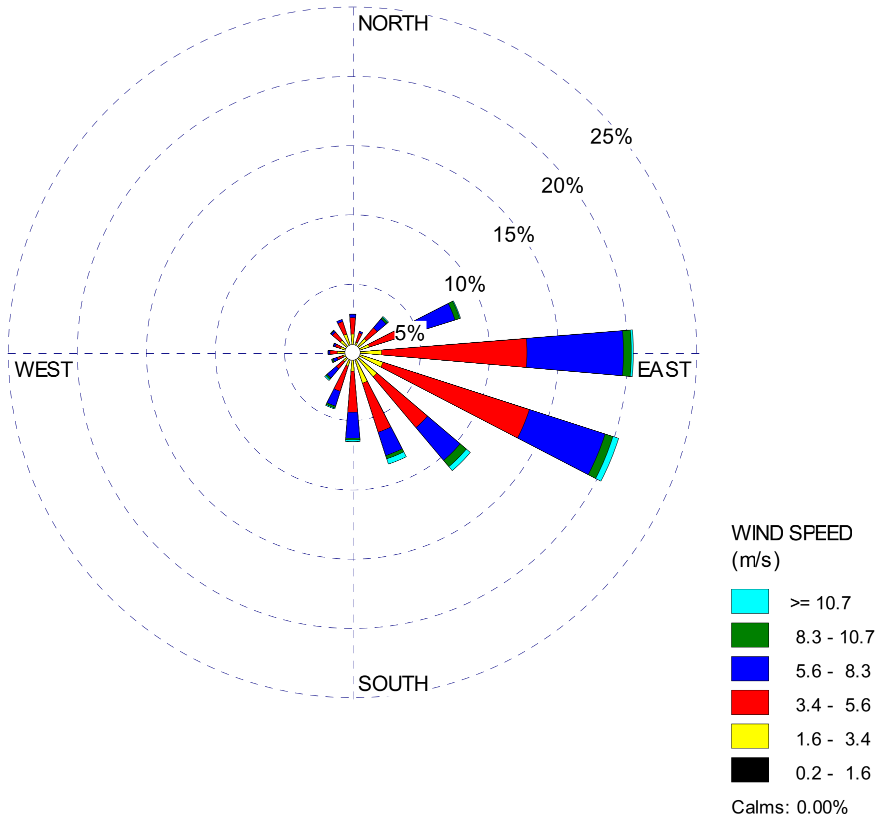
PTN COL 2.3-2 **Figure 2.3.2-208 60-Meter Level 3-Year Composite Wind Rose — Winter (2002, 2005, and 2006)**



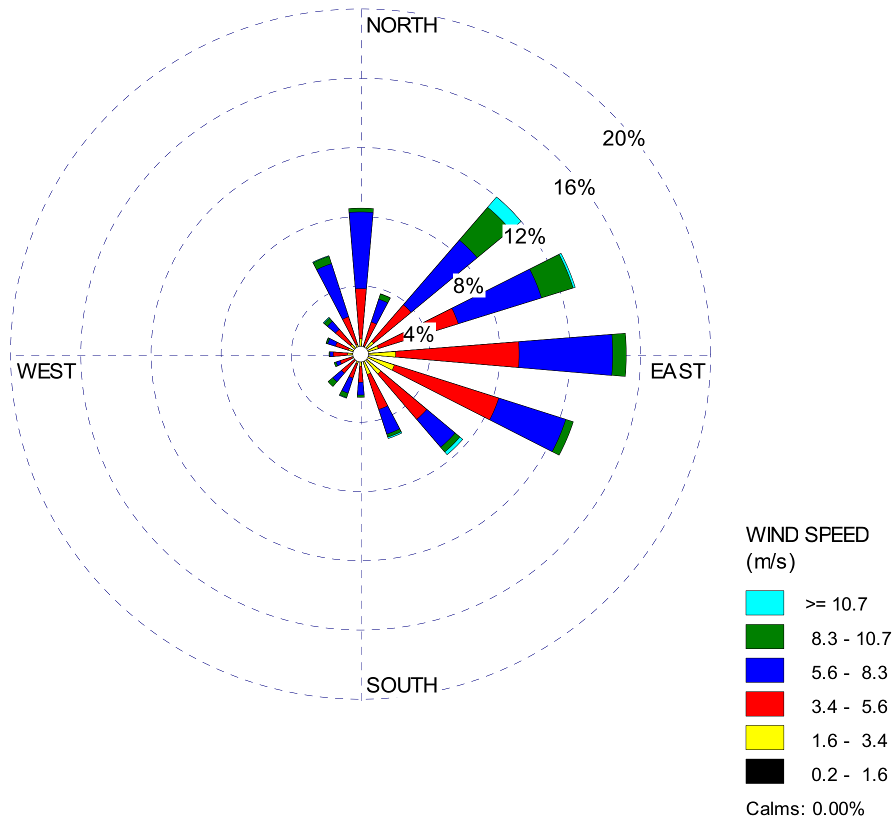
PTN COL 2.3-2 **Figure 2.3.2-209 60-Meter Level 3-Year Composite Wind Rose — Spring (2002, 2005, and 2006)**



PTN COL 2.3-2 **Figure 2.3.2-210 60-Meter Level 3-Year Composite Wind Rose — Summer (2002, 2005, and 2006)**

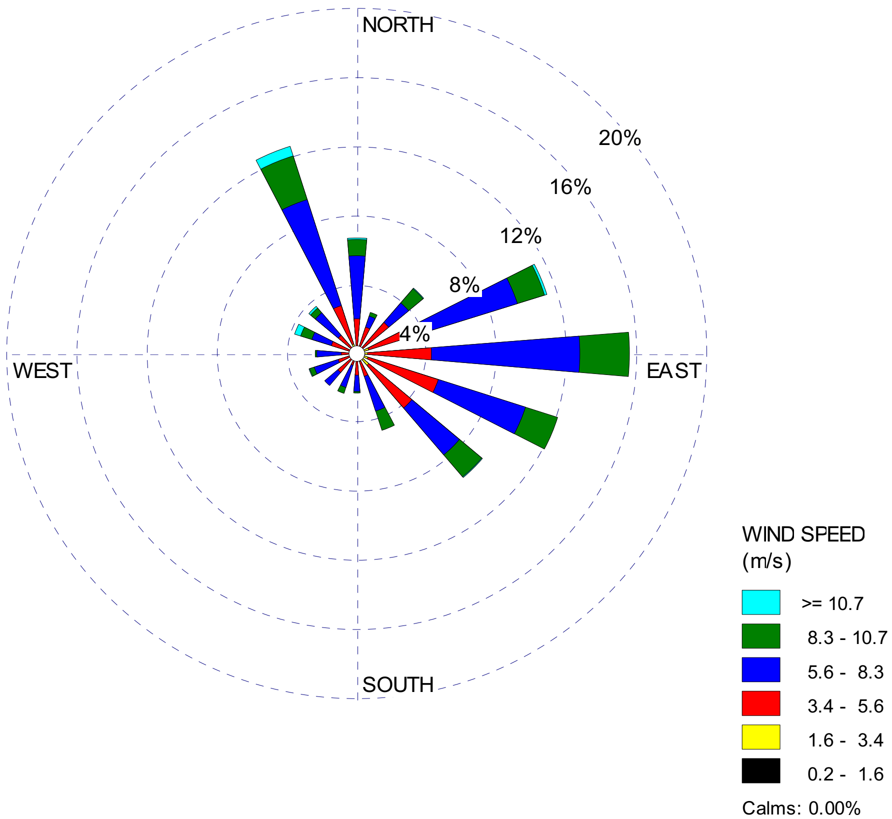


PTN COL 2.3-2 **Figure 2.3.2-211 60-Meter Level 3-Year Composite Wind Rose — Autumn (2002, 2005, and 2006)**



PTN COL 2.3-2

Figure 2.3.2-212 60-Meter Level 3-Year Composite Wind Rose — January (2002, 2005, and 2006) (Sheet 1 of 12)



PTN COL 2.3-2

Figure 2.3.2-212 60-Meter Level 3-Year Composite Wind Rose — February (2002, 2005, and 2006) (Sheet 2 of 12)

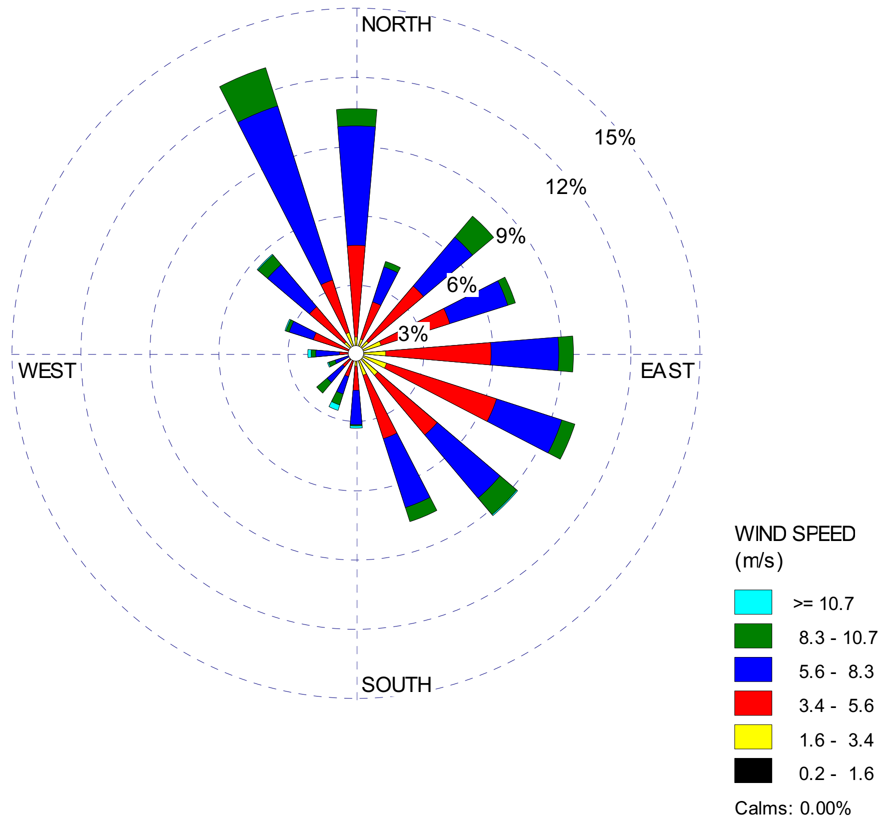


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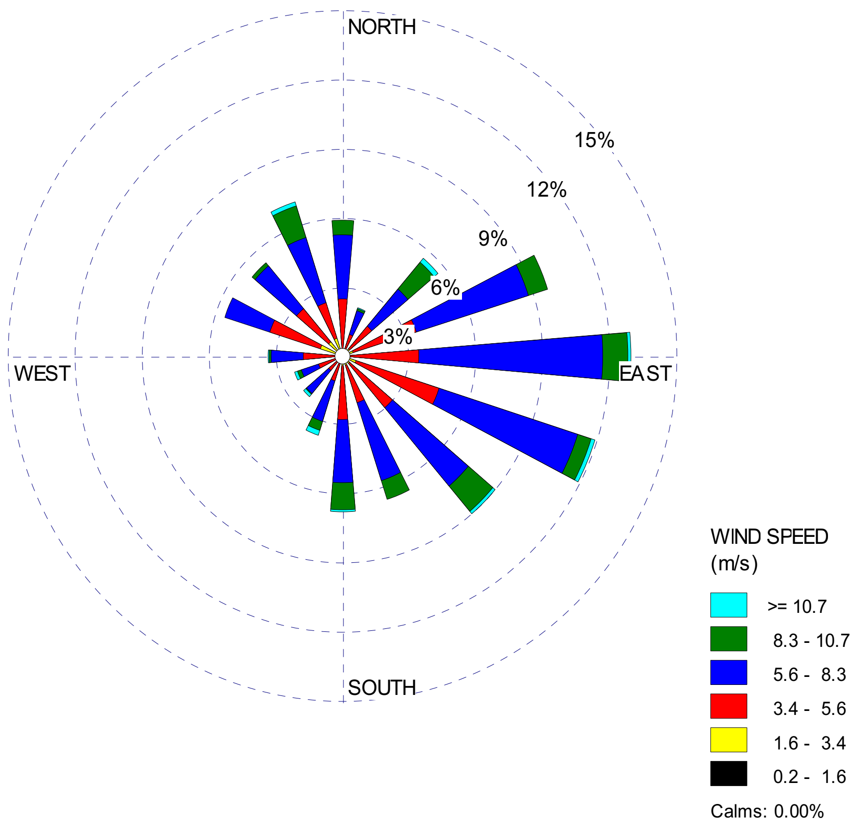
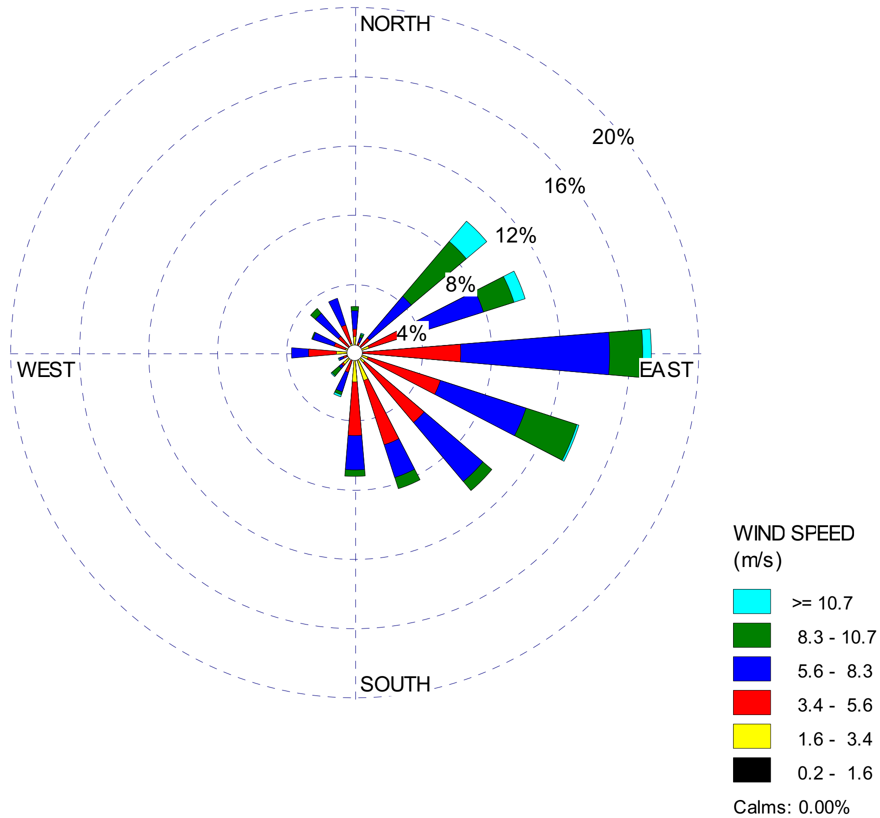
Figure 2.3.2-212 60-Meter Level 3-Year Composite Wind Rose — March (2002, 2005, and 2006) (Sheet 3 of 12)



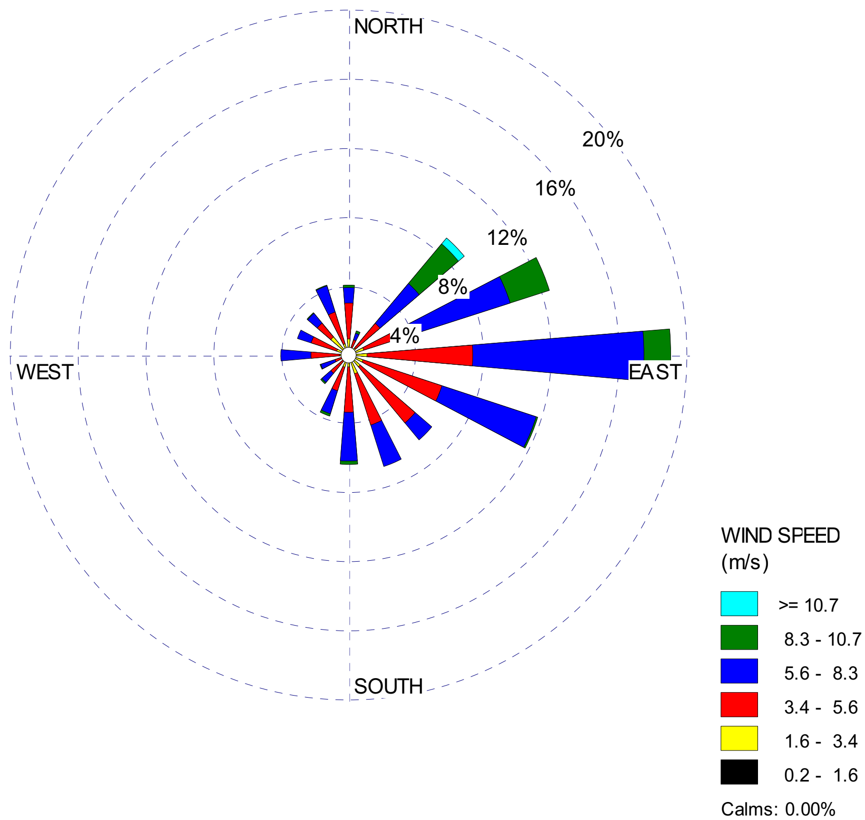
PTN COL 2.3-2

Figure 2.3.2-212 60-Meter Level 3-Year Composite Wind Rose — April (2002, 2005, and 2006) (Sheet 4 of 12)



PTN COL 2.3-2

Figure 2.3.2-212 60-Meter Level 3-Year Composite Wind Rose — May (2002, 2005, and 2006) (Sheet 5 of 12)



PTN COL 2.3-2

Figure 2.3.2-212 60-Meter Level 3-Year Composite Wind Rose — June (2002, 2005, and 2006) (Sheet 6 of 12)

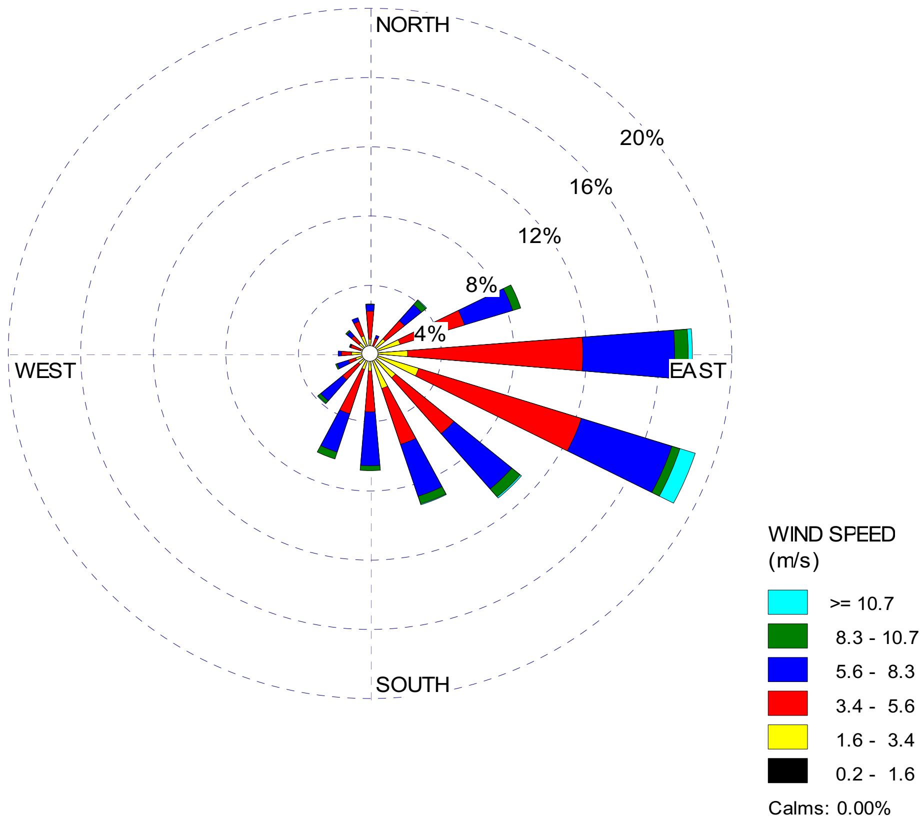


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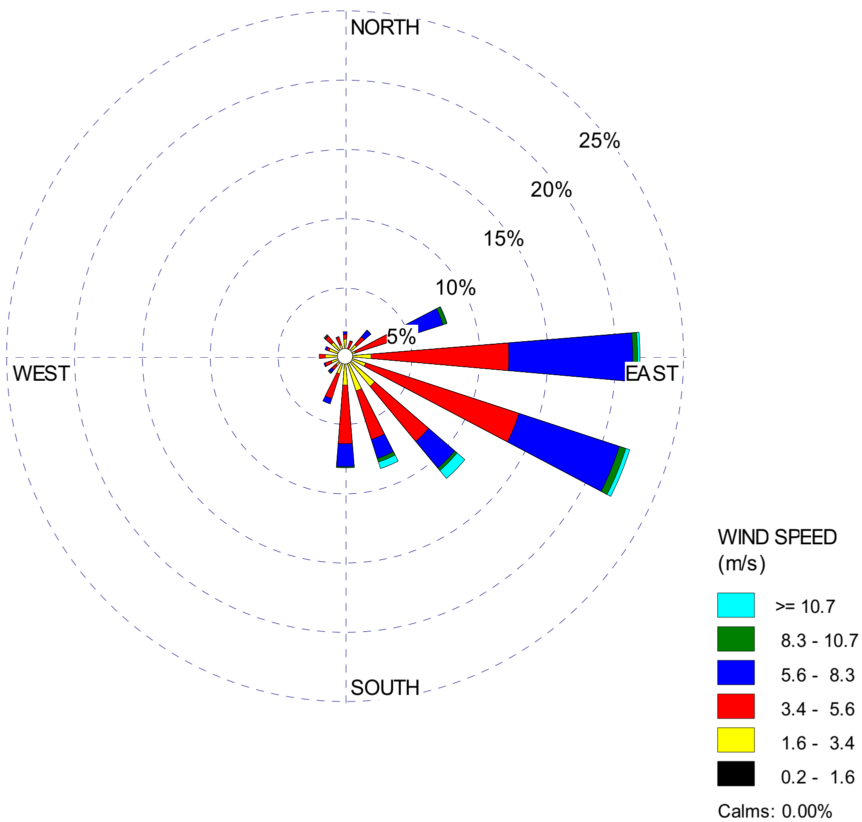
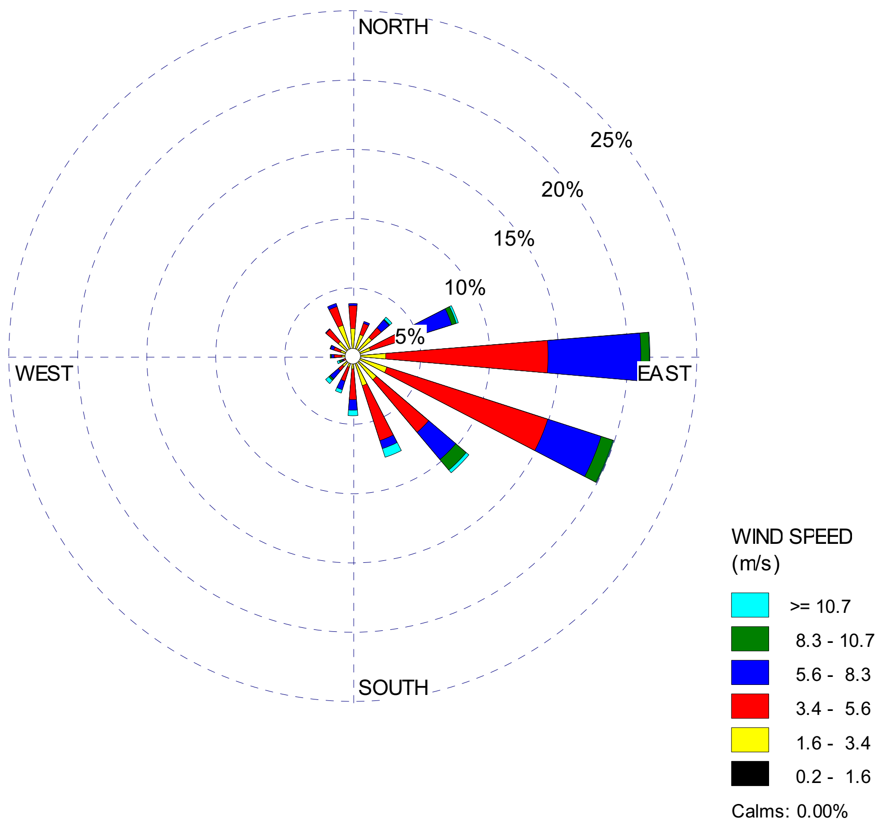
Figure 2.3.2-212 60-Meter Level 3-Year Composite Wind Rose — July (2002, 2005, and 2006) (Sheet 7 of 12)



PTN COL 2.3-2

Figure 2.3.2-212 60-Meter Level 3-Year Composite Wind Rose — August (2002, 2005, and 2006) (Sheet 8 of 12)



PTN COL 2.3-2

Figure 2.3.2-212 60-Meter Level 3-Year Composite Wind Rose — September (2002, 2005, and 2006) (Sheet 9 of 12)

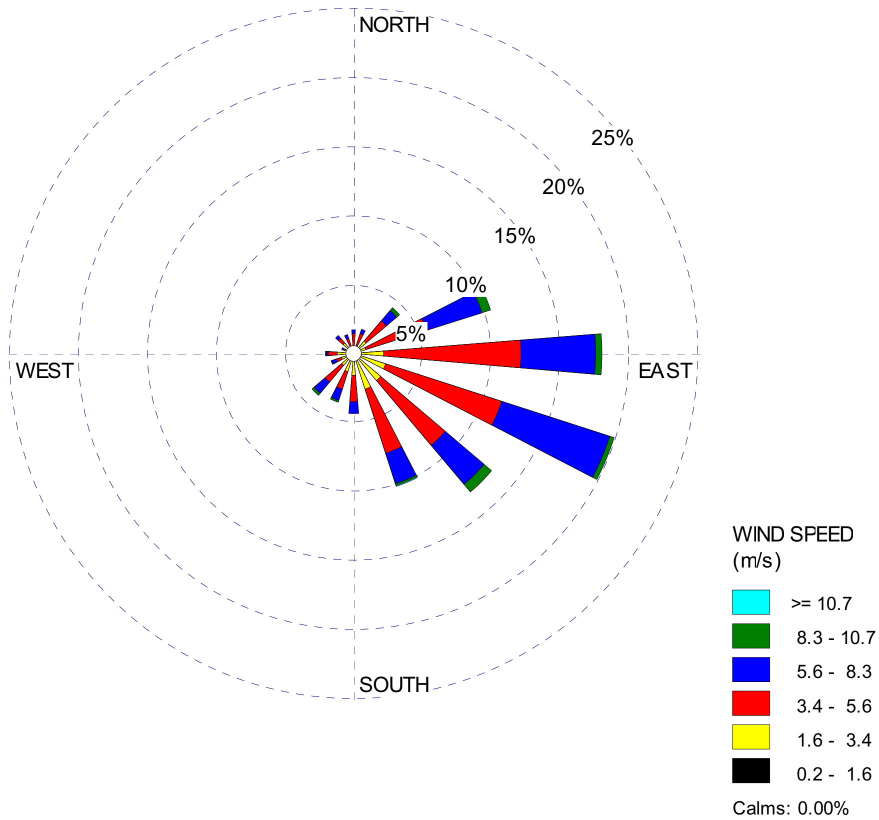


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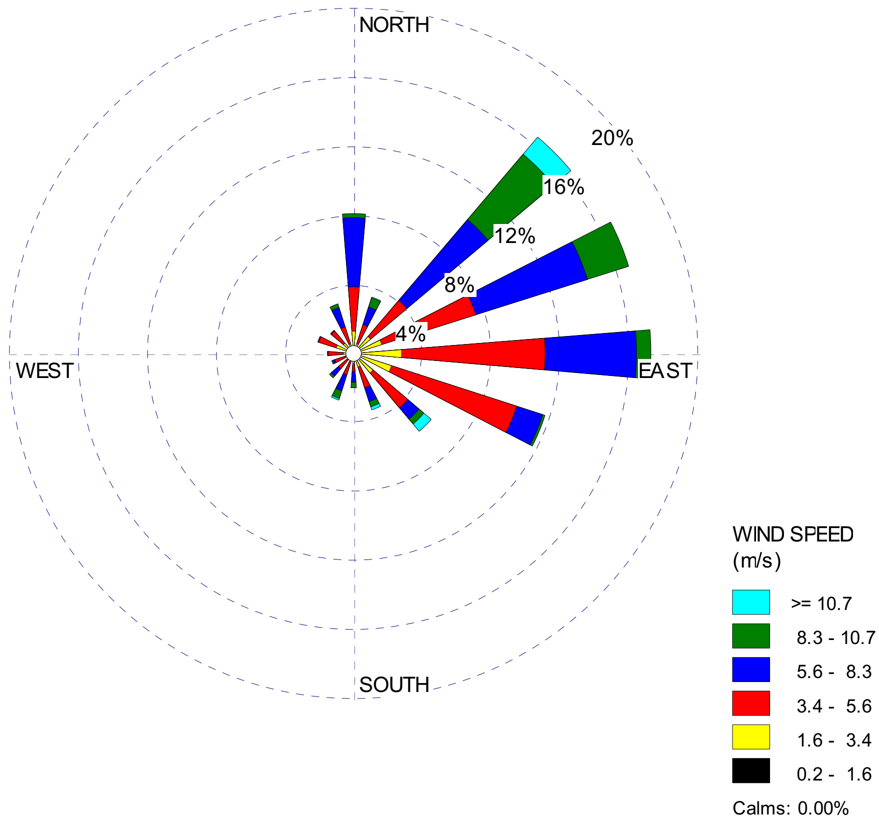
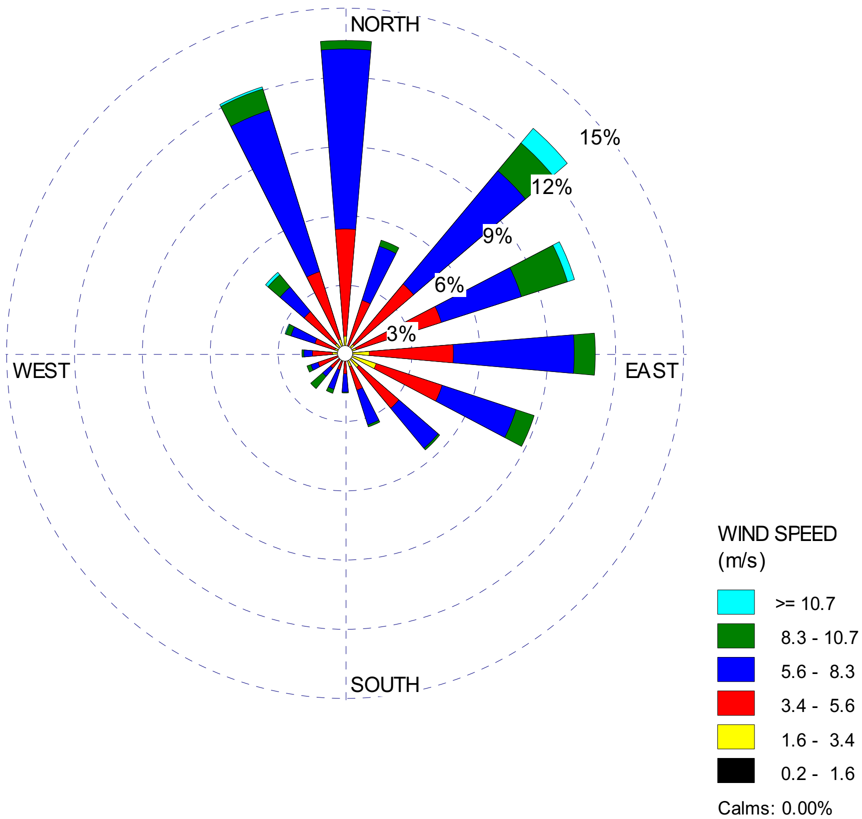
Figure 2.3.2-212 60-Meter Level 3-Year Composite Wind Rose — October (2002, 2005, and 2006) (Sheet 10 of 12)



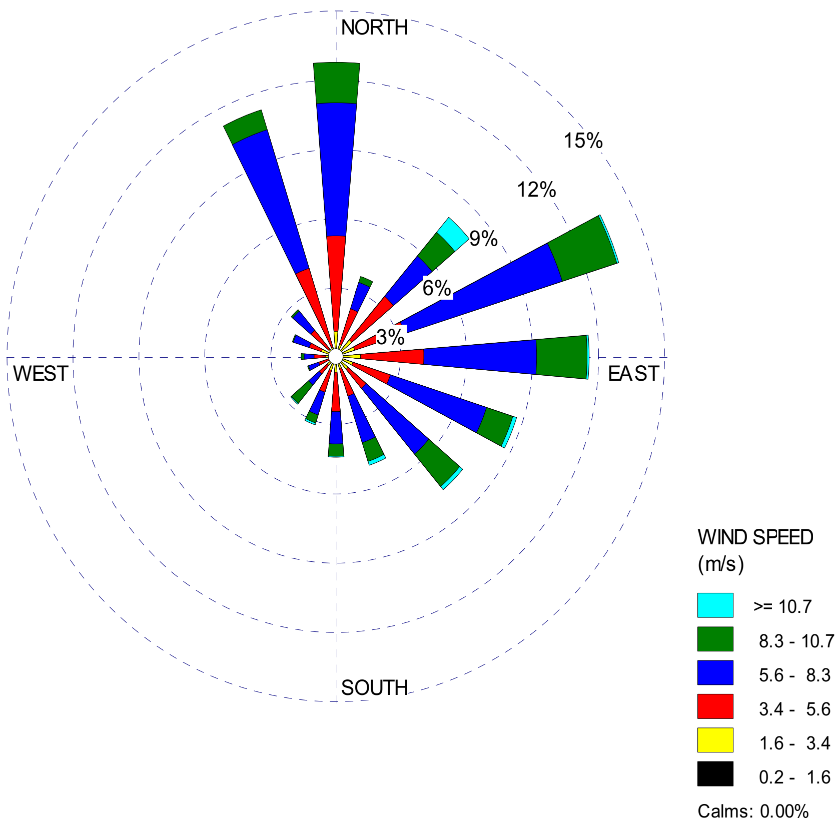
PTN COL 2.3-2

Figure 2.3.2-212 60-Meter Level 3-Year Composite Wind Rose — November (2002, 2005, and 2006) (Sheet 11 of 12)



PTN COL 2.3-2

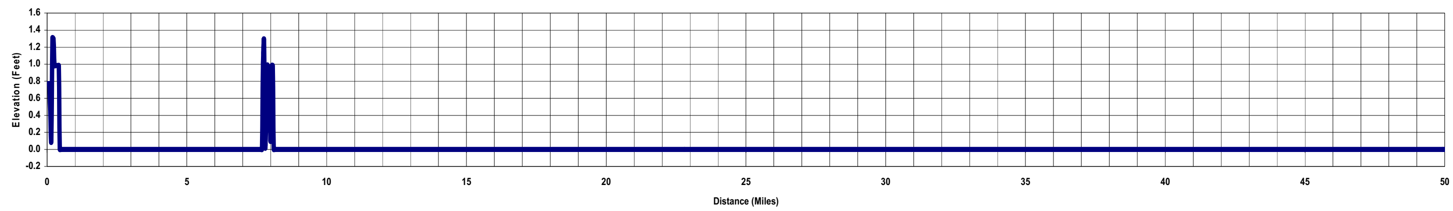
Figure 2.3.2-212 60-Meter Level 3-Year Composite Wind Rose — December (2002, 2005, and 2006) (Sheet 12 of 12)



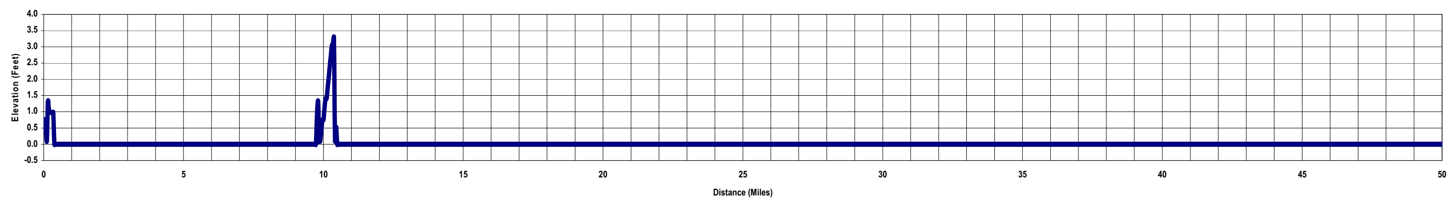
PTN COL 2.3-2

Figure 2.3.2-213 Terrain Elevation Profiles Within 50 Miles of the Units 6 & 7 Site (Sheet 1 of 6)

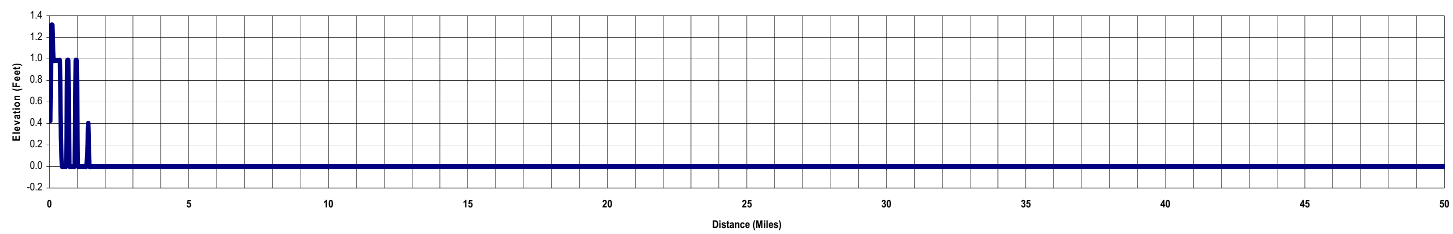
Profile 1: East



Profile 2: East-northeast

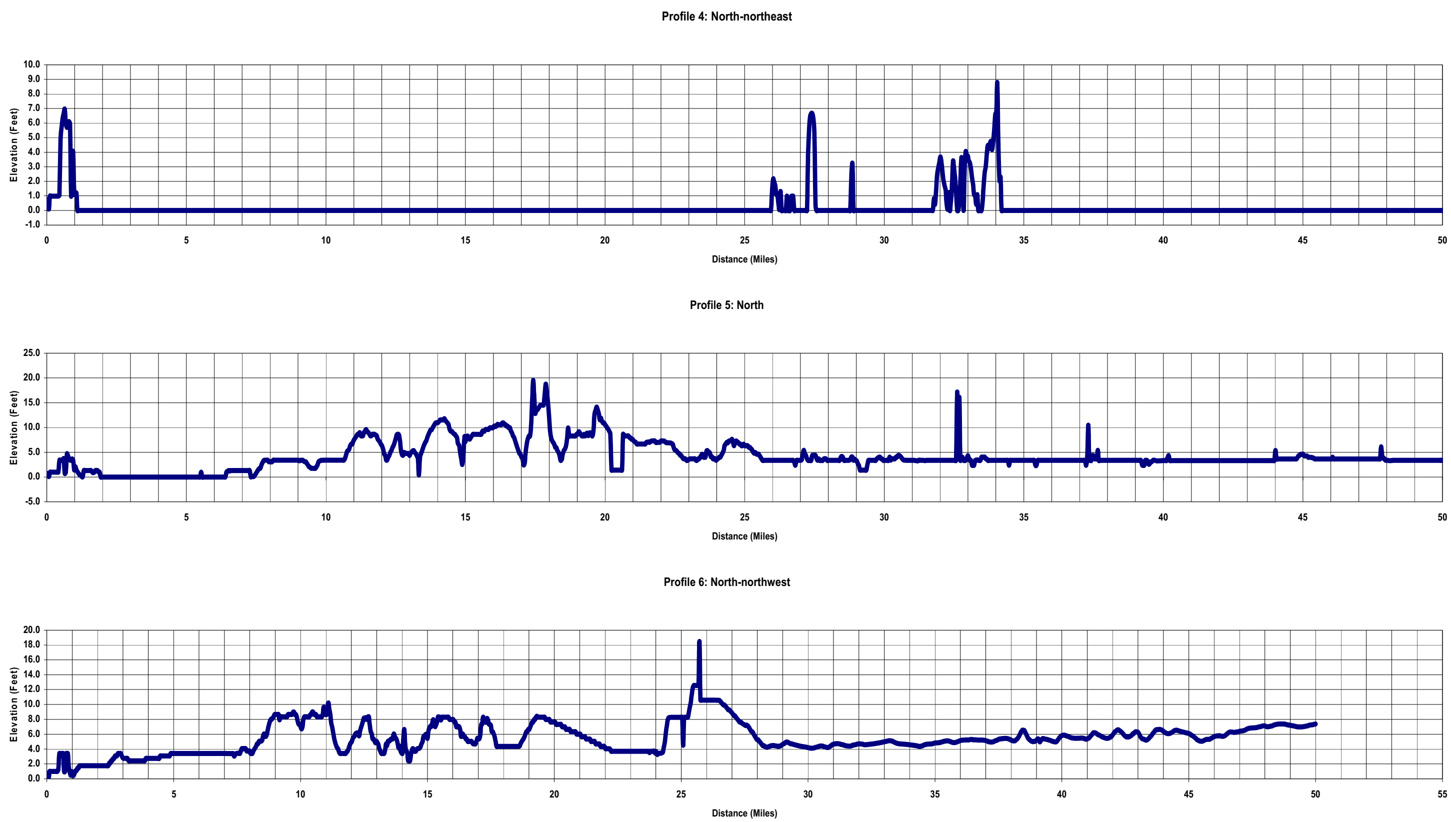


Profile 3: Northeast



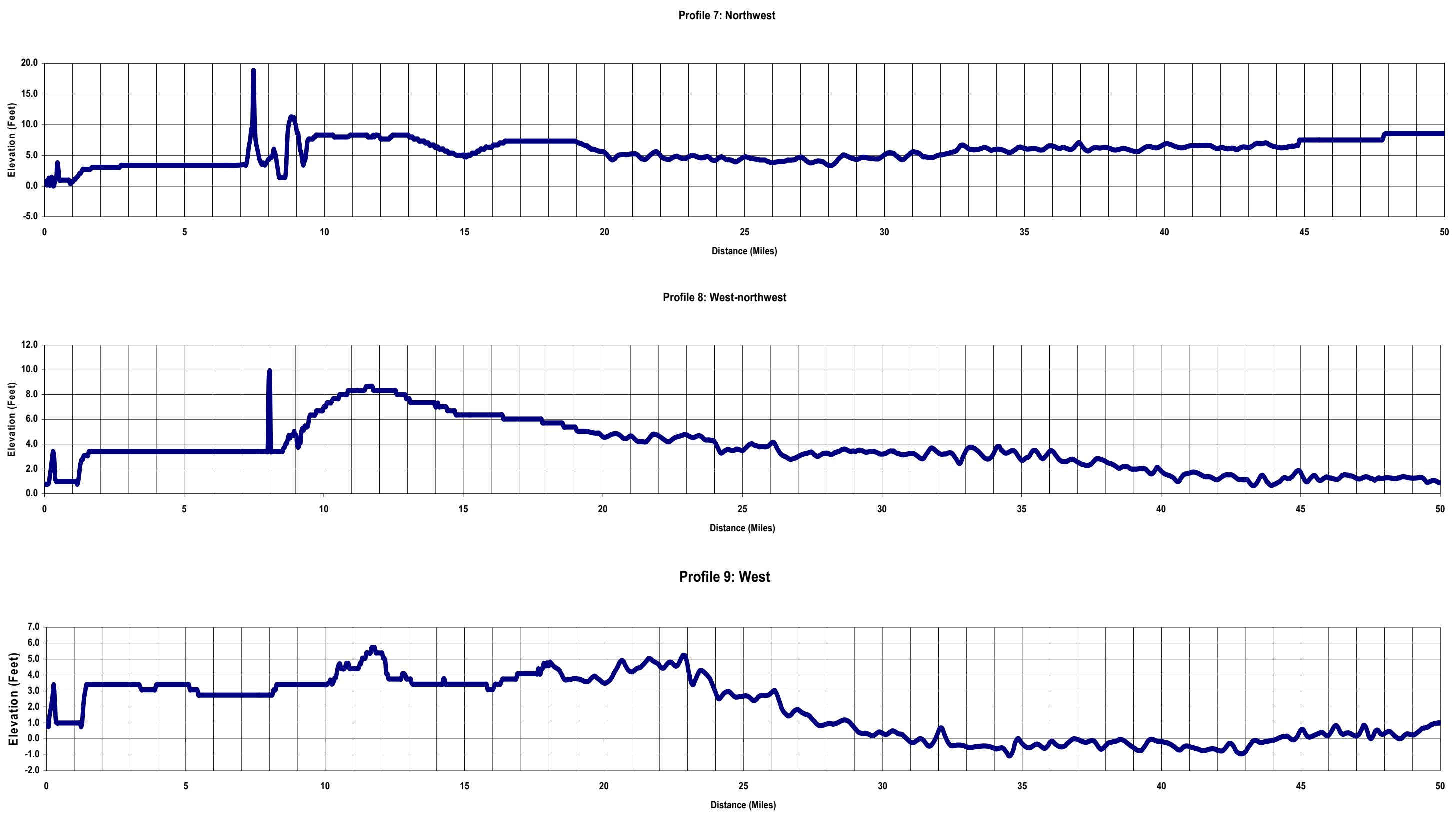
PTN COL 2.3-2

Figure 2.3.2-213 Terrain Elevation Profiles Within 50 Miles of the Units 6 & 7 Site (Sheet 2 of 6)



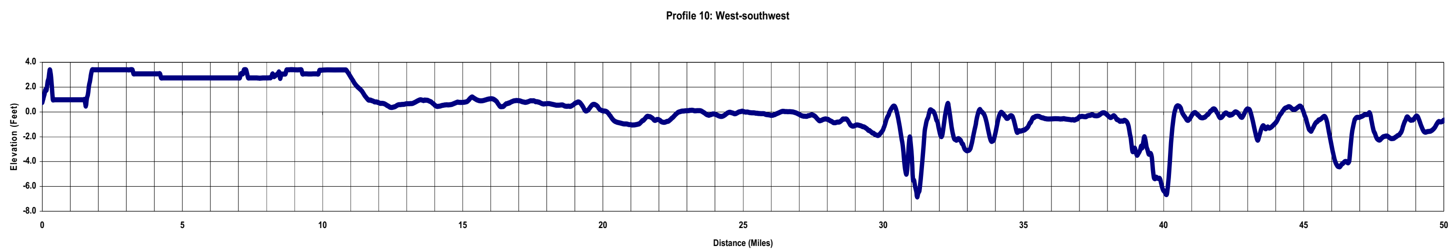
PTN COL 2.3-2

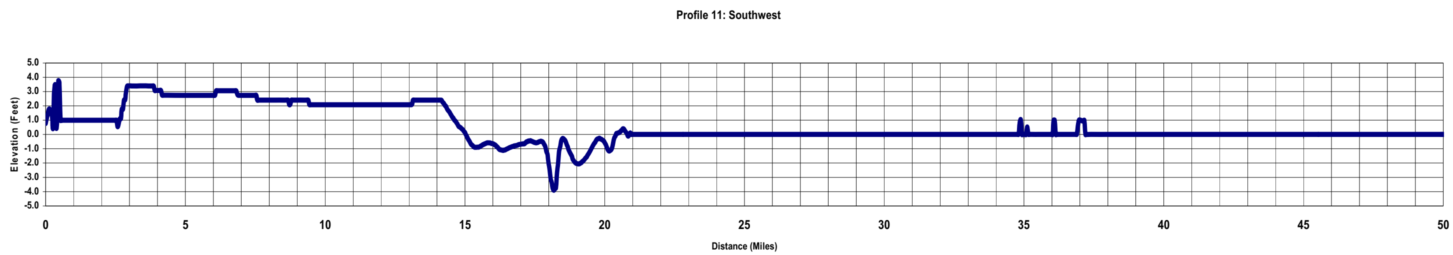
Figure 2.3.2-213 Terrain Elevation Profiles Within 50 Miles of the Units 6 & 7 Site (Sheet 3 of 6)

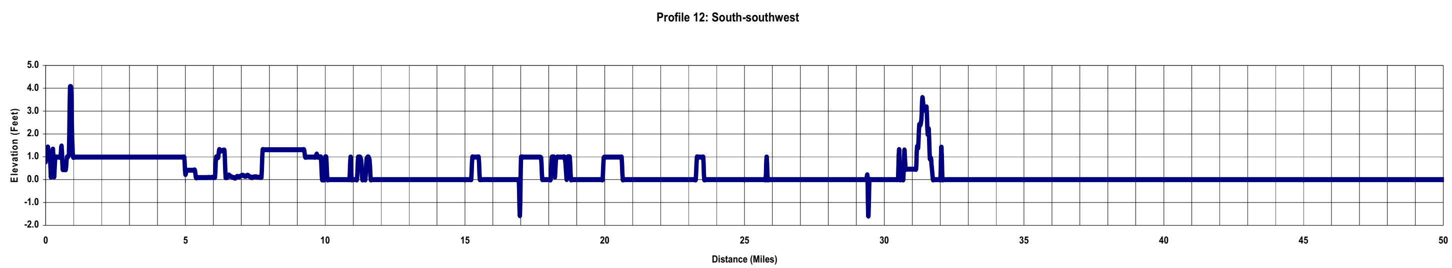


PTN COL 2.3-2

Figure 2.3.2-213 Terrain Elevation Profiles Within 50 Miles of the Units 6 & 7 Site (Sheet 4 of 6)



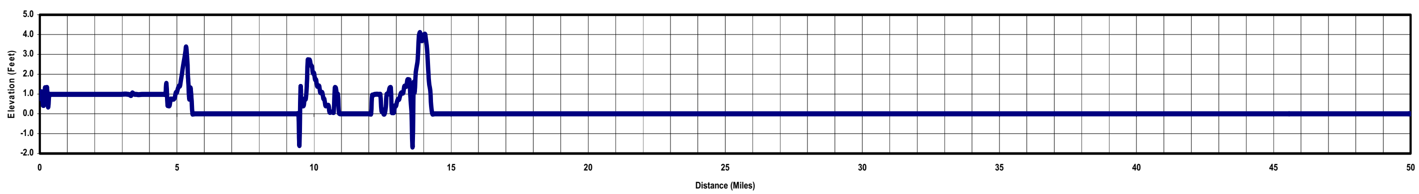




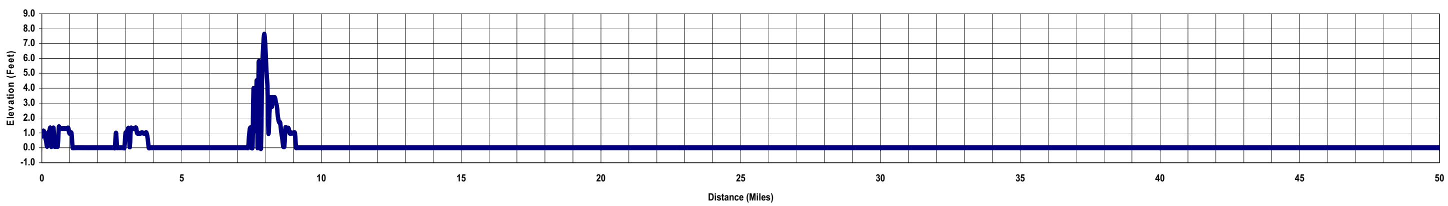
PTN COL 2.3-2

Figure 2.3.2-213 Terrain Elevation Profiles Within 50 Miles of the Units 6 & 7 Site (Sheet 5 of 6)

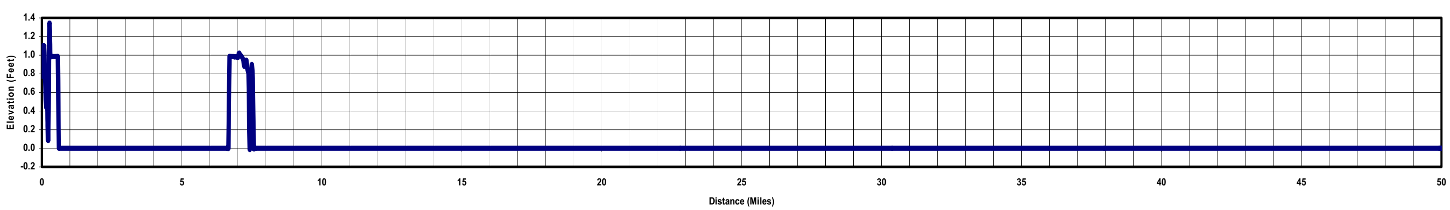
Profile 13: South



Profile 14: South-southeast

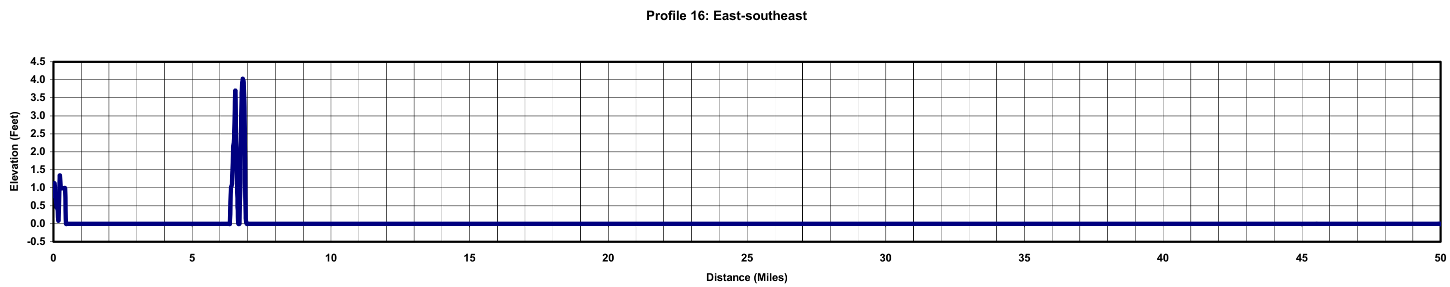


Profile 15: Southeast



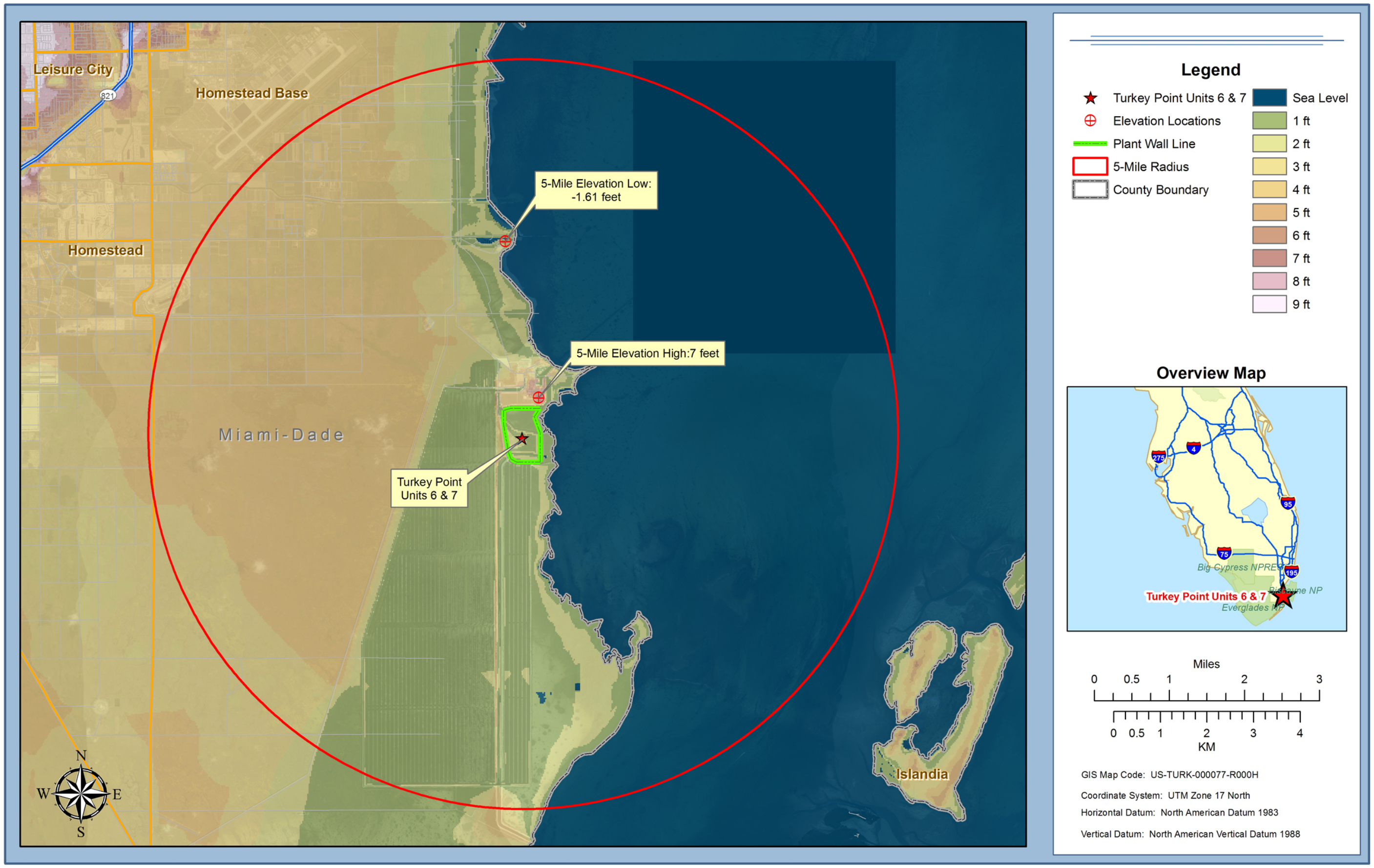
PTN COL 2.3-2

Figure 2.3.2-213 Terrain Elevation Profiles Within 50 Miles of the Units 6 & 7 Site (Sheet 6 of 6)



PTN COL 2.3-2

Figure 2.3.2-214 Topographic Features Within 5 Miles of the Units 6 & 7 Site



2.3.3 ONSITE METEOROLOGICAL MEASUREMENT PROGRAMS

PTN COL 2.3-3 This subsection provides a description of the onsite preoperational and operational meteorological monitoring programs for Units 6 & 7, including a description and site map showing tower locations with respect to man-made structures, topographic features, and other site features that can influence site meteorological measurements. In addition, a description of measurements made including elevations and exposure of instruments; instruments used including instrument performance specifications, calibration and maintenance procedures; data output and recording systems and locations; and data processing, archiving, and analysis procedures is provided by this subsection.

The Units 6 & 7 meteorological monitoring program is comprised of a set of towers and their associated shelters, electronic racks, power systems, and power backup systems. The onsite meteorological monitoring programs for Units 6 & 7 consist of two phases:

- Preoperational Monitoring — As a result of nearby existing Units 3 & 4, data from the Units 3 & 4 meteorological stations during 2002, 2005, and 2006 establish a baseline for identifying and assessing environmental impacts resulting from operation of Units 6 & 7. The preoperational meteorological monitoring program for Units 6 & 7 is conducted in conformance with RG 1.23, Revision 1 for the existing configuration, except as noted in the following description.

- Operational Monitoring — the same preoperational set of existing meteorological stations is used for the operational phase for Units 6 & 7. Because the current meteorological monitoring program for Units 3 & 4 is conducted in accordance with the regulatory guidance criteria (except as noted), the existing system may continue to be used for Units 6 & 7 during plant operation. Although the current system, including meteorological sensors, may be upgraded periodically or replaced before new plant operation, the functional requirements of the operational program for Units 6 & 7 are described based on the current system.

Data from the meteorological monitoring stations is used to:

- Describe local and regional atmospheric transport and diffusion characteristics

- Calculate the dispersion estimates for both postulated accidental and expected routine airborne releases of effluents
- Compare with offsite sources to determine the appropriateness of climatological data used for design considerations
- Evaluate environmental risk from the radiological consequences of a spectrum of postulated accidents
- Provide a meteorological database for evaluation of the effects from plant construction and operation, including radiological and nonradiological impacts and real-time predictions of atmospheric effluent transport and diffusion
- Develop emergency response plans, including provision for real-time meteorological data and plume trajectory dispersion modeling capabilities for dose and exposure predictions

2.3.3.1 Preoperational and Operational Monitoring Programs

This subsection describes the current meteorological monitoring program operated in support of existing Units 3 & 4, focusing primarily on the period of record used to provide meteorological data for the COL Application for Units 6 & 7 (i.e., the years 2002, 2005, and 2006). The same meteorological monitoring program is in use for operational monitoring for proposed Units 6 & 7.

The 2002, 2005 and 2006 period of data taken for Units 3 & 4 is determined to be the best available (using validated data with least data substitution), representative (tower and sensor siting in accordance with RG 1.23, Revision 1), and complete (with annualized composite data recovery of 90 percent), without being older than 10 years. Because RG 1.23, Revision 1 specifies that 3 or more years of data is preferable, 3 years (i.e., 2002, 2005 and 2006) of Units 3 & 4 data is used in support of the preoperational monitoring program for Units 6 & 7. The findings presented below indicate that these 3 years of data are suitable for use in characterizing the atmospheric dispersion conditions for Units 6 & 7.

Two meteorological towers are located onsite; the 60-meter South Dade tower (Figure 2.3.3-201) and the 10-meter land utilization (LU) tower (Figure 2.3.3-202) near the land utilization office. The operational meteorological monitoring program consists of the existing South Dade 60-meter tower and the existing 10-meter LU tower.

The 60-meter South Dade meteorological tower serves as the data collection system and source of onsite meteorological data for the COL Application (10-meter and 60-meter levels) and the 10-meter LU tower serves as a backup to this system. The 10-meter wind speed and wind direction data from the LU tower is primarily used in emergency situations at the site. The data from the South Dade 60-meter tower is used as backup during a plant emergency, if needed. The rationale for designating the LU tower for emergency situations for wind speed and wind direction is that it is physically closer to the plant and can provide a representative reading and allow more reliable dose assessment.

The meteorological instrumentation is located at multiple levels on the 60-meter South Dade guyed tower, and at a single level on the 10-meter LU tower. The meteorological instrumentation on these towers is summarized in Table 2.3.3-201.

The South Dade and LU wind sensors are designed to operate across the range from 0 to 125 mph (56 meters per second). The 60-meter South Dade meteorological tower is located approximately 5.5 miles (8.9 kilometers) southwest of Units 3 & 4. The height of the concrete pad on which the tower rests is approximately 18 inches (45.7 centimeters).

The height of the sensors for wind direction and speed at the 10-meter elevation of the South Dade meteorological tower is 38 feet (11.58 meters) above local grade surface. The height of temperature sensors A and B at the 10-meter elevation of the South Dade meteorological tower is 34 feet [10.36 meters] above local grade surface. The South Dade meteorological tower was rebuilt in 1994, consistent with the relevant regulatory guidance.

The 10-meter LU tower measures wind speed, wind direction, standard deviation of wind direction (used to indicate atmospheric stability), and rainfall.

Subsection 2.3.3.1.1 describes meteorological tower location and siting, while Subsection 2.3.3.1.2 describes meteorological instrumentation and siting.

2.3.3.1.1 Meteorological Tower Location and Siting

The following topics are addressed regarding meteorological tower location and siting:

- Subsection 2.3.3.1.1.1 describes general location
- Subsection 2.3.3.1.1.2 addresses tower location relative to potential obstructions to airflow

- Subsection 2.3.3.1.1.3 describes tower location relative to potential sources of heat and moisture
- Subsection 2.3.3.1.1.4 addresses tower location relative to Biscayne Bay

2.3.3.1.1.1 General Location

Refer to Subsection 2.3.2.2.1 (Topographic Description) for a general description of topographic features up to 50-miles (80-kilometers) from Units 6 & 7. Digital map elevations in this radial area and more detailed topographic features 5 miles (8 kilometers) from the site are shown, including elevation characteristics in the immediate vicinity of Turkey Point.

Figures 2.3.3-201 and 2.3.3-202 show the location of 60-meter South Dade tower and 10-meter LU tower in relation to existing Units 3 & 4, Units 6 & 7, cooling towers, the existing cooling canals, and Biscayne Bay, respectively. The 60-meter South Dade tower is located at 25° 21' 05.74120" north latitude and 80° 22' 45.54962" west longitude, approximately 11.3 kilometers (7 miles) south of the LU building. The 10-meter LU tower is located at 25 25' 35.072" north latitude and 80° 20' 15.536" west longitude, near the LU building.

Section 1.2 describes the final grade elevation of Units 6 & 7, which is approximately 25 feet (7.6 meters) North American Vertical Datum 1988 (NAVD 88). The Units 6 & 7 control room/receptor elevation relative to grade at 0.0 meters for the plant vent release elevation is 183 feet (55.7 meters) and the passive containment cooling system air diffuser elevation relative to grade at 0.0 meters is 229 feet (69.8 meters) (DCD Table 15A-7).

Although the base of the South Dade tower is approximately 25 feet below the elevation of the finished grade of Units 6 & 7, there are minimal terrain variations between the tower and Units 6 & 7. Therefore, it is concluded that the location of the South Dade tower site and Units 6 & 7 have similar meteorological exposures. The tower and instrument siting conformance status in relation to RG 1.23, Revision 1 are summarized in Tables 2.3.3-202 and 2.3.3-203, respectively. The base of the LU tower is approximately 22 feet below the finished grade of Units 6 & 7. Based on the relatively close distance (0.30 miles) of the LU tower to Units 6 & 7, the LU tower requires relocation because of different meteorological exposures.

2.3.3.1.1.2 Tower Location Relative to Potential Obstructions to Airflow

The wind sensors should be located over level, open terrain at a distance of at least 10 times the height of any nearby natural and man-made obstructions (e.g., terrain, trees and buildings), if the height of the obstruction exceeds one-half the height of the wind measurements (in accordance with RG 1.23, Revision 1). Therefore, an assessment is made regarding whether the wind measurements at locations and heights on the towers avoid airflow modifications by obstructions and the findings follow below:

Figure 2.3.3-201 presents the 60-meter South Dade tower in relation to potential obstructions to airflow. The emergency generator shelter mound is located approximately 21.5 feet (6.6 meters) north of the tower and the emergency generator shelter building is located approximately 36.75 feet (11.2 meters) north of the tower. The emergency generator shelter mound is approximately 9.6 feet (2.9 meters) above ground level and the shelter roof is approximately 10.75 feet (3.3 meters) above the base, for a total height of approximately 20.4 feet (6.2 meters).

The emergency generator shelter houses the data acquisition system for tower measurements and is located on a raised mound to protect it from tidal surges during hurricanes. The azimuth angles of each side of the shelter were sighted and measured from the tower base. These form the basis of defining a sector of possible influence. This sector extends from approximately 353 degrees to 28 degrees in the 360 degree tower wind measurement field. A frequency of occurrence analysis of wind direction for 1 year (January–December 2003) of wind data from the 10-meter level at the 60-meter meteorological station show winds from the sector of possible influence occurred 6.8 percent of the time during 2003.

The LU meteorological tower equipment shelter is currently approximately 35 feet (10.7 meters) west of the 10-meter LU tower. With an obstruction height of approximately 20 feet, according to the 10-times-the-height-of-the-obstruction convention, the tower should be 200 feet away. Because tower separation from the obstruction is approximately 35 feet, the site does not meet conventional specifications for the measurement of an obstruction. A utility pole exists northwest of the LU tower. It should be noted, however, that similar to the South Dade tower, the obstructions are not in the path of prevailing east wind direction flow.

Because of the increased traffic during Units 6 & 7 construction and the raised elevation of the finished plant grade and associated structures, the LU tower requires relocation to an appropriate location on the plant property to ensure tower/instrument operation is in conformance with relevant regulations.

At least 3 months prior to the start of Units 6 & 7, construction activities that could potentially impact the location and/or monitoring capabilities of the current 10-meter meteorological LU tower, a replacement 10-meter meteorological tower will be installed and made operational at an appropriate location on the Turkey Point plant property.

There have been no changes to obstructions in relation to the 60-meter South Dade tower for the period 2002, 2005, and 2006. Potential wake effects are not considered to have influenced wind measurements from the 60-meter South Dade tower during the period of record used to support this COL Application.

2.3.3.1.1.3 Tower Location Relative to Potential Sources of Heat and Moisture

The predominant potential source of heat and moisture in the vicinity of the 60-meter South Dade tower site is the 5900-acre (2388 hectare) industrial wastewater facility/cooling canals, of which 4370 acres (1768 hectare) is water surface (Reference 202).

The 60-meter South Dade tower is located approximately 4500 feet (1372 meters) southwest of the cooling canals. Because of the relatively large size of the cooling canals, it is expected that the cooling canals could have certain influence to the meteorological data monitoring especially when the meteorological tower is located downwind from the cooling canals. Wind directions from the NNE to ENE have a straight-line, over-canal, upwind fetch in relation to the 60-meter tower.

Warmer temperatures from the cooling canals could increase the lower level temperature and create thermal instability. Subsequently, more unstable atmospheric stability is expected. However, this effect enhances the dispersion capability for releases occurring near the plant site.

The water temperature from the Units 3 & 4 plant discharge into the cooling canals averages approximately 105°F (41°C), based on 18 years of measurements between 1980 and 1998. The water temperature in the plant intake from the cooling canals averages approximately 91°F (33°C) during the same period. Temperatures in the southern portions of the cooling leg average approximately 93°F (34°C) (Reference 202).

Ocean water temperatures at Miami Beach average 80.1°F (26.7°C) on an annual basis, ranging from a low of 71.9°F (22.2°C) in January to a high of 88.5°F (31.4°C) in August (Reference 202). Water temperatures in the southern portion of the cooling canals are expected to track ocean water temperatures over the course of the year. Air temperatures are not expected to be modified significantly during onshore airflow conditions between the shoreline and the tower site. When the southeasterly winds prevail, the air traveling through the south Atlantic could have some counter effect to the warming of the cooling canals.

The measured data represents the conditions of the parcel of air if a release occurs from Units 6 & 7 and travels over the cooling canals.

The ground surface surrounding the 60-meter South Dade tower is a grainy, light-colored material with patches of low-cut grass or weeds around the base of the tower which is typical of ground cover in the area. Light-colored ground surface is a potential source of reflective heat that might influence lower-level temperature measurements.

The cooling system for Units 6 & 7 includes six mechanical draft cooling towers. The cooling canals in the industrial wastewater facility are approximately 4500 feet northeast of the South Dade tower at their closest point, while the Units 6 & 7 cooling towers are approximately 5.5 miles northeast of the South Dade tower. The location of the South Dade tower is not directly downwind of the cooling canals or the Units 6 & 7 cooling towers under the prevailing downwind wind direction (i.e., easterly). Therefore, there is no influence on the South Dade heat sensors. In addition, the tower temperature sensors are mounted in fan-aspirated radiation shields, which are horizontal to minimize the impact of thermal radiation and precipitation.

The LU tower is located immediately adjacent to the main return canal in the industrial wastewater facility. Temperature is not measured at this location. The LU tower is used for emergency situations only (short-term) and not for normal data collection/reporting. No parameters related to atmospheric moisture are currently measured on the Turkey Point plant property.

Tropical Storm Gordon in November 13–16, 1994 flooded near the base of the 60-meter South Dade tower. There was some less severe flooding in 2005. The 10-meter temperature measurements may have been influenced (e.g., lower than what might otherwise have been observed had the ground surface not been covered with water).

No paved or other improved surfaces were located in the vicinity of the 60-meter tower during 2002, 2005, or 2006.

2.3.3.1.1.4 Tower Location Relative to Biscayne Bay

The 60-meter South Dade tower is located approximately 3 miles (4.8 kilometers) west from Biscayne Bay. Refer to Subsection 2.3.1.1 for a general description of the effects of Biscayne Bay and adjacent waters on the climate of the Turkey Plant site.

Coastal locations are frequently subject to the daytime formation of a temperature discontinuity referred to as the thermal internal boundary layer (TIBL). The TIBL develops at or very near the land-water interface based on the rate of differential heating between the land and water surfaces, wind conditions and other factors. In general, the TIBL increases in height with increasing distance from the coastline (NUREG/CR-0936).

It is important in siting a meteorological tower in a coastal location, which provides data to be used in atmospheric dispersion calculations, to ensure that the different measurement levels on the tower are in the same boundary layer of air. Consequently, such towers are not located directly on the coastline, but rather some distance inland where the TIBL height is usually greater than the instrument levels on the tower (NUREG/CR-0936).

The 60-meter South Dade tower is located approximately three miles (4.8 kilometers) inland. The TIBL horizontal extent penetrates inland from the shoreline, however it is likely to do so at an elevation greater than the instrument levels on the tower.

2.3.3.1.2 Meteorological Instrumentation and Siting

This subsection describes parameters measured, instrument siting, and system accuracies for the 60-meter South Dade tower during 2002, 2005 and 2006.

2.3.3.1.2.1 Parameters Measured

The meteorological parameters measured at the 60-meter South Dade tower during 2002, 2005 and 2006 are wind speed, wind direction, air temperature A and air temperature B at both the 60-meter height and the 10-meter height. Also measured were solar radiation, barometric pressure, and precipitation.

Ambient temperature is monitored both at the 10- and the 60-meter levels. The ΔT is calculated as the difference between the temperatures measured at 10 meters and at 60 meters. Precipitation is measured at 24.5 feet (7.5 meters) southeast from base of the 60-meter South Dade tower at a height of 4.5 feet (1.37 meters) above ground, while the solar radiation is measured at 4 feet (1.2 meters) above ground.

The meteorological monitoring system block diagrams reflecting the operational station monitoring system configuration during 2002, 2005, and 2006 are provided as Figures 2.3.3-203 and 2.3.3-204 for the South Dade and LU towers, respectively.

Instrumentation (ambient temperature, ΔT, wind speed, wind direction, precipitation [rainfall], solar radiation, and time) conforms to Revision 1 of RG 1.23, Revision 1 during the 2002, 2005 and 2006 period of record.

Table 2.3.3-204 lists, by parameter: measurement height; sensor type; manufacturer and model number; operating range; measurement resolution; starting thresholds (wind speed and direction sensors only); for the Units 6 & 7 meteorological data collection system.

Wind speed, wind direction, and wind direction standard deviation (i.e., sigma theta for atmospheric stability class determination) are obtained at the 10-meter level on the LU 10-meter tower. The LU 10-meter tower provides wind speed, wind direction, and standard deviation of wind direction data to the plant. The standard deviation of wind direction is used to indicate atmospheric stability. Either the LU tower or the South Dade tower is required to be operational. The LU tower measures wind using a Climatronics Wind sensor. It also measures rainfall using a Climatronics tipping bucket rain gauge.

No parameters related to atmospheric moisture are measured at the Turkey Point plant property.

Subsection 2.3.3.1.2.3 contains a more detailed description of system accuracies.

2.3.3.1.2.2 Instrument Siting

The 60-meter South Dade tower, rebuilt in 1994, is 197 feet tall, constructed out of steel, with open-lattice shape, and guyed. The meteorological instrumentation is located at multiple levels on the 60-meter guyed tower, with platforms at 10 meters, 60 meters, and an intermediate (non-instrumented) level. The meteorological instrumentation heights are summarized in Table 2.3.3-201.

The wind sensors are mounted on booms into the prevailing southeast wind direction approximately 6 feet (1.8 meters) away from the open-lattice tower. This position on the boom is equal to two tower widths (one tower width is 3 feet [0.9 meters]) away from the tower. The wind speed and wind direction boom is pointed southeast into the prevailing wind direction.

The temperature sensors discharge points north. Temperature sensors are mounted on booms at a distance of approximately 4 feet (1.2 meters) (< 1.5 tower horizontal widths) from the tower so that the sensors are unaffected by thermal radiation from the tower. To further ensure that air temperature measurements avoid air modification by heat and moisture, their sensors are mounted in fan aspirated solar radiation shields.

The barometric pressure sensor is located outside the tower control building on the south wall. Barometric pressure is not reported to the NRC.

The solar radiation sensor is approximately 23 feet (7 meters) southeast from the base of the 60-meter South Dade tower. The sensor (Eppley Black and White Pyranometer Model 8-48) is mounted 4 feet (1.2 meters) above ground.

The rain gauge is located approximately 24.5 feet (7.5 meters) southeast from base of 60-meter South Dade tower. The top edge of the rain gauge is 4.5 feet (1.4 meters) above ground. The ground surface surrounding the base of the rain gauge and the 60-meter South Dade tower is a grainy, light-colored material with patches of low-cut grass or weeds that is typical of ground cover in the area. A wind shield is not installed on the rain gauge. The wind speed and wind direction sensors and rain gauge are not heated.

2.3.3.1.2.3 System Accuracies

The overall station system accuracies include the errors introduced by sensors, cables, signal conditioners, temperature environments for signal conditioning and recording equipment, recorders, processors, data displays, and the data reduction process. The system accuracies of the Units 6 & 7 meteorological station data collection system are compared against the regulatory requirements and the findings are summarized in Table 2.3.3-204. As shown in the table, the system accuracies of the proposed system meet the regulatory guidance in accordance with RG 1.23, Revision 1 and ANSI/ANS 3.11 (Reference 204).

The time clock is not calibrated, but is checked as part of weekly tower inspection visits. Time is recorded as Eastern Standard Time during 2002, 2005, and 2006.

The calibration procedures perform system accuracies from sensor to data logger (sensor to end point). Calibration forms are used for the plant computer and indication in the control room.

2.3.3.1.3 System Operation, Maintenance, and Calibration

This subsection describes system operation and maintenance, and system calibration.

2.3.3.1.3.1 System Operation and Maintenance

Meteorological sensors used on both meteorological towers are designed to operate in the environmental conditions found at the Turkey Point site. Specifically, this instrumentation is capable of withstanding the following environmental conditions:

- Ambient temperature range of –22°F (–30°C) to 122°F (50°C)
- Wind load up to 100 miles per hour (45 meters per second) (the wind sensors blew away during Hurricane Andrew)

The instruments on the towers are off-the-shelf components and are used universally throughout the nuclear industry and others for the purpose of meteorological measurement. Based on operating experience, the only adverse operational effects that have been noted is the susceptibility of the rotating-cup and weather vane instruments to bearing wear and degradation due to the site environmental conditions that required the instruments to be rebuilt or replaced approximately every 6 months. The meteorological tower guy wires are inspected on an annual basis and the tower anchors are inspected once every three years, in accordance with NRC Regulatory Guide 1.23, Revision 1, Section C.5.

2.3.3.1.3.2 System Calibration

Calibration and maintenance of the onsite meteorological monitoring station system are performed in accordance with RG 1.23, Revision 1, Section C.5., Regulatory Position, Instrument Maintenance and Servicing Schedules and ANSI/ANS 3.11, Section 7, System Performance (Reference 204). The existing meteorological monitoring system is calibrated semi-annually at both towers, and channel checks are performed daily in order to achieve maximum data recovery.

Detailed instrument calibration procedures and acceptance criteria are strictly followed during station system calibration. Calibrations verify and, if necessary, re-establish accuracies of sensors, associated signal processing equipment and displays. Routine calibrations include obtaining both “as-found” (prior to maintenance) and “as-left” (final configuration for operation) results. The end-to-end results are compared with expected values. Any observed anomalies which may affect equipment performance or reliability are reported for corrective action. If any acceptance criteria is not met during performance of calibration procedures, timely corrective measures (e.g., adjusting response to conform to desired results by qualified personnel onsite or return the sensor to vendor for calibration) are initiated. Inspection, service, and maintenance, including preventive and/or corrective maintenance on system components for transmitting, manipulating, and/or processing meteorological data for computer display or storage, are performed according to the instrument manuals and plant surveillance program procedures to maintain at least 90 percent data recovery.

The following semiannual calibrations occur in June and December:

- Emergency Response Data Acquisition and Display System calibration data points
- Loop checks from tower (5 points)
- Outage notification and system calibration to maintain the system accuracy of the meteorological system)
- Final Overlap Test:

Repair Calibrations: As needed from any combination of the above.

- Routine site checks are conducted weekly
- Troubleshooting of individual channels on the meteorological parameters system loop.

2.3.3.1.4 Data Acquisition and Recording

Data loggers and communication equipment at the LU and South Dade meteorology tower station shelters include a new CR1000 data logger and new radio communication equipment. The radios are Campbell Scientific model RF310. They are manufactured by Midland (Midlandradio.com) as model SD125V2 VHF. The configuration changes occurred in 2007, as follows:

An older Climatronics analog system was replaced with a new supervisory control and data acquisition/ModBus digital radio system. Data is currently independently polled on frequencies A and B using ModBus commands from the meteorological towers to the Foxboro computers for Units 3 & 4. Somewhat aged data loggers have been replaced with new ones. The data acquisition system for the LU office has been upgraded.

Independent microprocessors are used as the primary data collection system for the meteorological towers, with digital data recorders used as a backup data collection system. The microprocessors sample the meteorological processor modules once per second for each parameter measured except for precipitation. Water collected by the rain gauge is automatically drained and counted each time an internal bucket fills with 0.01 inch of rainfall. The temperature difference (ΔT) is calculated from the difference between 60-meter and 10-meter level ambient temperature measurements.

The station processing equipment is housed in environmentally controlled (air-conditioned) shelters. A direct readout capability from these microprocessors is included. The equipment is located in the station instrument shelter near the base of the South Dade Tower, across the road from the LU tower, in the LU office, and in the Units 3 & 4 control room.

The LU and control room have Omni meteorological antennae and a meteorological data loggers. The South Dade tower uses Yagi antennas. Meteorological communications equipment provides radio-transmitted serial data communications back to the computer room.

Personnel in the LU office monitor the data being reported by the meteorological towers and they are required to submit meteorological reports to the NRC. LoggerNet™ software (computer software for Campbell Scientific dataloggers supporting programming, communications, and data retrieval between Campbell Scientific dataloggers and a PC) has been installed on a personal computer (PC) in the LU office so it can receive data from the meteorological towers using Frequency C. LoggerNet is also able to send data logger programs, check and set the data logger clocks and other normal LoggerNet functions.

Real time monitoring of the met tower data is accomplished by programming the meteorological tower data loggers to send their one minute data shortly after the end of the minute using the “SendData” command. RTMC software is used to build graphs and charts that display the data in the minute of its receipt.

NRC reportable data is required to be in discrete 1-hour intervals. LoggerNet has been set up to “poll” or request the hourly data from the met towers every 2 hours.

2.3.3.1.5 Data Processing and Validation

This subsection describes data reduction and review, data validation, and data reporting and archival.

2.3.3.1.5.1 Data Reduction and Review

Hourly average data is downloaded and formatted monthly for review and editing. Acceptable data editing methods have been established and implemented. Missing or invalid 60-meter tower 10-meter wind speed, wind direction, and ΔT data are deleted or manually replaced with backup tower data.

2.3.3.1.5.2 Data Validation

Processing of monthly, quarterly and annual data files have defined procedures. Validation checks for monthly data may include importing the file into Microsoft Office Excel® and plotting the temperatures—TA10 against TB10 and TA60 against TB60. The point of this exercise is to try to see which one is at fault if one temperature goes too low, which happens when the terminals are corroded and wet. For this reason, plotting the precipitation as well can frequently provide additional information. FPLDiagnose (uncompiled Microsoft Visual Basic®) is used on the file, which flags the problems. The user can then set a status of “valid” or “missing” for each issue, then apply the NRC checks. The FPLDiagnose program writes the following files:

- TPyy.mmm files, with the validations applied
- TPyymmm.err files, which contain the record of the flags and invalidations
- MTPyymmm.csv files, which have the record of sigma thetas set to missing because of wind speeds below 3.5 miles per hour
- DTPyy.mmm files, which are used for input to subsequent programs

The acceptance criteria for the meteorological data are as follows:

1. Wind direction out of range (0–360°)

2. Wind direction absolute difference between the 10- and 60-meter levels too large (wind speed >12 miles per hour for both levels, wind direction difference >= 30°)

3. Wind speed out of range (0–99 miles per hour)

4. Wind speed absolute difference between the 60- and 10-meter levels too large (wind speed difference >=15 miles per hour)

5. Temperatures A and B for each level do not match within 0.5° F

6. The ΔT A and B do not match within 0.5°C per 100 meters

7. The ΔT less than -3.4°C per 100 meters

8. Sigma-Theta unreasonable (WS10 < 3.5 miles per hour)

2.3.3.1.5.3 Data Reporting and Archival

An additional feature of the data acquisition system is the storage of the 15- and 60-minute averaged meteorological data. At a minimum, the latest 12 months of averaged data resides on the system hard-drive. The historical data can be retrieved, archived, displayed, or printed. Running 15-minute-averaged data is stored on local plant computers for trending and reporting purposes in accordance with RG 1.21.

2.3.3.1.6 Data Recovery and Representativeness

The 3 years of data used in the atmospheric dispersion estimates was determined to be (1) the best available, because the data has been validated and required the least data substitution, (2) representative, because the meteorological tower and sensor siting were performed in accordance with RG 1.23, Revision 1, and (3) complete with annualized data recovery of 90 percent as shown in Table 2.3.3-205.

Three years of representative data (i.e., 2002, 2005, and 2006) collected at the existing towers are used in preparing the Units 6 & 7 COL Application. The data set satisfies the guidance provided in RG 1.23, Revision 1. The required joint frequency distributions are presented in Subsection 2.3.2, Tables 2.3.2-205 and 2.3.2-206 in the format described in RG 1.23, Revision 1 for the following: wind speed and wind direction by stability class and by stability classes combined for the 10- and 60-meter levels measurements.

The annualized data recovery rates for 2002, 2005, and 2006 are presented in Table 2.3.3-205 for the individual parameters (e.g., wind speed and wind direction) and the composite parameters. As shown in the table, data recovery rates (with the exception of 60-meter wind direction in 2005 of 89.59 percent) exceed 90 percent as specified in RG 1.23, Revision 1. Although measured, barometric pressure and solar radiation data were not validated and so are not included in this table (or in the NRC-formatted data file).

The recovery rate is greater than 90 percent for each of the 3 years when considering the 10-meter speed and direction combined with the vertical temperature difference. Data recovery for the 60-meter speed and direction combined with the vertical temperature difference also is greater than 90 percent for the 3-year composite, but not for each individual year (2005 being slightly less than 80 percent for this joint recovery) For the AP1000 design only the 10-meter joint frequency distributions are applicable to modeling potential accidental and routine releases, and composite 3-year data recoveries for 60-meter wind speed and wind direction are greater than 90 percent if used in the ARCON96 modeling of control room dispersion estimates.

Refer to Subsections 2.3.2.2.1 through 2.3.2.2.3 for descriptions of the long-term representativeness of atmospheric dispersion-related parameters based on the 2002, 2005 and 2006 period of record (i.e., winds and atmospheric stability).

Refer to Subsections 2.3.1.3.4, 2.3.2.2.4, and 2.3.2.2.6 for descriptions of the long-term representativeness of normal, mean and extreme precipitation (rainfall) and temperature conditions that might be expected to occur at the Turkey Point site.

2.3.3.1.7 Emergency Preparedness Support

The Units 6 & 7 onsite data collection system is used to provide representative meteorological data for use in real-time atmospheric dispersion modeling for dose assessments during and following any accidental atmospheric radiological releases. The data is also used to represent meteorological conditions in the 10-mile Emergency Planning Zone radius in NUREG 0696, NUREG 0737, and NUREG 0654.

Microprocessors sample the meteorological processor modules once per second for each of the following parameters in order to provide near real-time meteorological data for use in atmospheric dispersion modeling: wind speed, wind direction, and ambient temperature for calculations of vertical temperature difference. Dose assessment calculations are performed using the most recent 15-minute average of data in RG 1.97.

In order to identify rapidly changing meteorological conditions for use in performing emergency response dose consequence assessments, 15-minute average values are compiled for real-time display in the Units 6 & 7 control room, technical support center, and emergency operations facility. The meteorological channels required for input to the dose consequence assessment models are available and presented in a format compatible for input to these dose assessment models in RG 1.97.

Currently, provisions are in place to obtain representative regional meteorological data during an emergency if the site meteorological system is unavailable.

2.3.3.1.8 Need of Additional Data Sources for Airflow Trajectories

Topographic features and the dispersion characteristics of the area of the site were examined in Subsections 2.3.2 and 2.3.3.1. The area of the site is generally flat and is considered an open terrain site. The airflow is dominated mostly by large-scale weather patterns and infrequent recirculation of airflow during periods of prolonged atmospheric stagnation.

The NRC-sponsored computational model (XOQDOQ), based on RG 1.111, is a constant mean wind direction model, using meteorological data from a single station to calculate dispersion estimates out to 50 miles of a site of interest. In the model, application of terrain induced airflow-recirculation factor options are provided to account for the effects of airflow recirculation phenomenon occurring in the area of interest, when meteorological data from a single station is used to represent the entire modeling domain. However, application of airflow-recirculation factor for sites located in open terrain is not required. This methodology implies that the meteorological data from an onsite station is reasonably representative of the entire modeling domain and adjustment to the dispersion estimates calculated by the model out to 50 miles of a site located in open terrain is not required.

For coastal sites located in open terrain such as the Turkey Point site, an airflow-recirculation factor provided in the XOQDOQ model is used to account for potential airflow recirculation due to sea breeze and land breeze effects and during the infrequent stagnation conditions that could lead to more restrictive dispersion estimates. With application of the appropriate airflow recirculation factor, this methodology further implies that using data collected from an onsite meteorological monitoring station located in open terrain for making dispersion estimates out to 50 miles of a coastal site is considered to be adequate and acceptable.

Therefore, data collected by the onsite meteorological system is used for the description of atmospheric transport and diffusion characteristics 80 kilometers (50 miles) from Units 6 & 7 and for making dispersion estimates out to 50 miles of the site. No other offsite data collection systems have been considered while determining the dispersion characteristics of the area of the Turkey Point site.

2.3.3.2 References

201. Not Used.

202. Lyerly, R., T*hermal Performance of the Turkey Point Cooling Canal System in 1998*, October 1998.

203. Not Used.

204. American Nuclear Society/American National Standards Institute, American National Standard for Determining Meteorological Information at Nuclear Facilities, ANS/ANSI 3.11-2005, December 2005.

PTN COL 2.3-3

Table 2.3.3-201
Units 6 & 7 System Meteorological Instrumentation

Parameter	South Dade Tower Level (meters)	LU Tower Level (meters)
Wind Speed	10, 60	10
Wind Direction	10, 60	10
Temperature	10, 60	None
Vertical Temperature Difference (ΔT)	(60–10)	None
Sigma Theta	None	10
Precipitation	1.37[(a)]	—
Solar Radiometer	1.2[(b)]	None
Barometric Pressure	[(c)]	None
Humidity	None	None

(a) Located approximately 24.5 feet (7.5 meters) southeast from base of 60-meter tower
(b) Located approximately 23 feet (7 meters) southeast from the base of the 60-meter tower
(c) Located outside the equipment shelter on the south wall

Table 2.3.3-202
Meteorological Tower Siting Conformance Status

RG 1.23, Revision 1 Criteria	Conformance Status	Remarks
Tower Siting		
The meteorological tower sites and the Units 6 & 7 location have similar meteorological exposure.	Yes	The Turkey Point plant property is generally flat land.
The base of the tower is at approximately the same elevation as the finished grade of Units 6 & 7.	No No	The South Dade tower is below the approximately 25.5 feet finished grade. However, due to the similarity of the landscape, there would be minimal effects. The finished grade of Units 6 & 7 and associated buildings would produce different meteorological exposures than at the current LU tower location. The LU tower would need to be relocated.
Location of the tower is not directly downwind of the plant cooling systems (i.e., cooling canals in the industrial wastewater facility and mechanical draft cooling towers) under the prevailing downwind wind direction.	Yes No	The South Dade tower is not located near preexisting or planned cooling systems. The LU tower is located near existing cooling canals on both the east and west sides; however, the majority of the cooling canals are located west of the LU tower, while the path of the prevailing downwind wind direction is from the east. The LU tower would need to be relocated because of construction impacts and operational concerns (i.e., height of the Units 6 & 7 finished grade and structures).
Tower is not located on or near permanent man-made surface.	Yes No	There are no large concrete or asphalt parking lot or temporary land disturbance, such as plowed fields or storage areas nearby the South Dade tower. The closest large concrete or asphalt parking lots are at Units 3 & 4, which is approximately 6.5 miles from the South Dade tower. The LU tower is located near an asphalt roadway and temperature is not measured. Temperature concerns would not be an issue in the siting of the LU tower at a new location.

Table 2.3.3-203 (Sheet 1 of 2)
Meteorological Sensor Siting Conformance Status

RG 1.23, Revision 1 Criteria	Conformance Status	Remarks
Sensor Siting		
Wind sensors should be located away from nearby obstructions to airflow (e.g., plant buildings, other structures, trees, nearby terrain) by a distance of at least 10 times the height of any such obstruction that exceeds one-half the height of the wind measurement level to avoid any modifications to airflow (i.e., turbulent wake effects).	Yes No	The South Dade tower is located near a raised mound/equipment shelter. However, the effects were found to be minimal on the South Dade tower. The LU tower would need to be relocated because of construction impacts and operational concerns (i.e., height of the finished grade and buildings).
Wind sensors are located at heights that avoid airflow modifications by nearby obstructions with heights exceeding one-half of the wind measurement.	Yes	See remark above.
Wind sensors are located extended outward on a boom to reduce airflow modification and turbulence induced by the supporting structure itself. Wind sensors on the side of a tower should be mounted at a distance equal to at least twice the longest horizontal dimension of the tower (e.g., the side of a triangular tower).	Yes	Tower booms (6 feet long) are oriented into the prevailing winds to reduce tower effects on the measurements. The wind sensors are boom-mounted more than approximately 6.5 feet from the tower (more than twice the tower's width of 3 feet).
The sensors should be on the upwind side of the mounting object in areas with a dominant prevailing wind direction.	Yes	The wind speed/direction boom is pointed southeast into the dominant wind direction.
Air temperature and dew point sensors are located in such a way to avoid modification by the existing and proposed heat and moisture sources, such as ventilation systems, water bodies, or the influence of large parking lots or other paved surfaces.	Yes (see remark) No	The South Dade tower is not located near any heat or moisture sources. The LU tower is located near the cooling canals. Dew point is not measured at either the South Dade or LU towers.
Temperature sensors should be mounted in fan-aspirated radiation shields to minimize adverse influences of thermal radiation and precipitation. Aspirated temperature shields should either be pointed downward or laterally towards the north. The shield inlet should be at least 1.5 times the tower horizontal width away from the nearest point on the tower.	Yes	Temperature is measured only on the South Dade Tower. Temperature sensors are mounted in fan-aspirated radiation shields. Aspirated temperature shields are horizontal. The shield inlet is situated approximately 4 feet from the tower (slightly less than 1.5 times the tower's width of 3 feet).

Table 2.3.3-203 (Sheet 2 of 2)
Meteorological Sensor Siting Conformance Status

RG 1.23, Revision 1 Criteria	Conformance Status	Remarks
Precipitation measured at ground level near the base of the tower. Precipitation gauges should be equipped with wind shields to minimize wind-caused loss of precipitation and, where appropriate, equipped with heaters to melt frozen precipitation.	Yes (see remark)	Precipitation is measured at ground level near the base of each of the towers, but the gauge is located away from the tower shelter to prevent any interference in precipitation capture. Neither precipitation gauge is equipped with wind shields to minimize the wind-caused loss of precipitation, but each gauge has a funnel screen.

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Table 2.3.3-204 (Sheet 1 of 2)
Units 6 & 7 Meteorological System — Operational Configuration

Sensed Parameter	Sensor Type	Manufacturer/ Model	Range	System Accuracy	System Accuracy (per RG 1.23, Revision 1)	System Accuracy (per ANSI/ANS-3.11-2005, Reference 204)	Starting Thresholds	Starting Threshold (RG 1.23, Revision 1)	Measurement Resolution	Measurement Resolution (RG 1.23, Revision 1)	Measurement Resolution (per ANSI/ANS-3.11-2005, Reference 204)	Elevation (Relative to Tower)
South Dade Tower Instruments												
Wind Speed	3 Cup Anemometer	Climatronics/ Model Wind Speed F460	0 to 145 mph (0 to 65 m/s)	0.15 mph (±0.07 m/s) or ±1.0% of true air speed (whichever is greater)	±0.45 mph (±0.2 m/s) or 5% of observed wind speed	±0.45 mph (0.2 m/s) or 5% of observed wind speed	0.5 mph (0.22 m/s)	1 mph (<0.45 m/s)	—	0.1 mph (0.1 m/s)	0.1 mph (0.1 m/s)	10 m, 60 m
Wind Direction	Wind Vane	Climatronics/ Model Wind Direction F460	0 to 360 degrees — mechanical	±2 degrees	±5°	5°azimuth	0.5 mph (0.22 m/s)	1 mph (<0.45 m/s)	<1 degree	1.0 degree	1.0° azimuth	10 m, 60 m
Ambient Temperature	Epoxy Coated Thermistor	Climatronics/ P/N 100093	–22.0° to 122.0°F (–30.0° to 50°C)	±0.27°F (±.15 °C)	±0.9°F (±0.5°C)	±0.9°F (0.5°C)	—	—	—	0.1°F (0.1°C)	0.1°F (0.1°C)	10 m
Differential Temperature[(a)]	N/A	N/A	—	—	±0.18°F (±0.1°C)	±0.18°F (0.1°C)	—	—	—	0.1°F (0.1°C)	0.1°F (0.1°C)	60 m–10 m
Precipitation[(b)]	Tipping Bucket	Climatronics/ P/N 100097	—	+/–3% (Rates of 1 to 6 inches per hour)	±10% for a volume equivalent to 0.1 in (2.54 mm) of precipitation at a rate <2 in/h (<50 mm/h)	±10% for a volume equivalent to 0.1 in (2.54 mm) of precipitation at a rate <2 in/h (<50 mm/h)	—	—	—	0.01 in (0.25 mm)	0.01 in (0.25)	Tower base
Solar Radiation	Pyranometer	Eppley Black and White Model 8-48	0.3-3um	±0.008 Langley/min[(c)]	—	—	—	—	—	—	—	Tower base
Barometric Pressure	—	Climatronics barometer	—	—	—	3 hPa	—	—	—	—	0.1 hPa	Instrument Building
Sigma-Theta[(d)]	N/A	N/A	N/A	N/A	—	—	N/A	—	1 degree	—	0.1 degrees azimuth	10 m, 60 m
Humidity	N/A	N/A	N/A	N/A	±4%	N/A	N/A	N/a	N/A	0.1%	N/A	N/A

PTN COL 2.3-3

Table 2.3.3-204 (Sheet 2 of 2)
Units 6 & 7 Meteorological System — Operational Configuration

Sensed Parameter	Sensor Type	Manufacturer/ Model	Range	System Accuracy	System Accuracy (per RG 1.23, Revision 1)	System Accuracy (per ANSI/ANS-3.11-2005, Reference 204)	Starting Thresholds	Starting Threshold (RG 1.23, Revision 1)	Measurement Resolution	Measurement Resolution (RG 1.23, Revision 1)	Measurement Resolution (per ANSI/ANS-3.11-2005, Reference 204)	Elevation (Relative to Tower)
LU Tower Instruments												
Wind Speed	Cup 3 Cup Anemometer	Climatronics/ Model Wind Speed F460	0 to 145 mph (0 to 65 m/s)	0.15 mph (±0.07 m/s) or ±1.0% of true air speed (whichever is greater)	±0.45 mph (±0.2 m/s) or 5% of observed wind speed	±0.45 mph (0.2 m/s) or 5% of observed wind speed	0.5 mph (0.22 m/s)	1 mph (<0.45 m/s)	—	0.1 mph (0.1 m/s)	0.1 mph (0.1 m/s)	10 m
Wind Direction	Wind Vane	Climatronics/ Model Wind Direction F460 sensor	0 to 360 degrees — mechanical	±2°	±5°	5°azimuth	0.5 mph (0.22 m/s)	1 mph (<0.45 m/s)	<1 degree	1.0 degree	1.0 degree azimuth	10 m
Precipitation[b]	Tipping Bucket	Climatronics/ P/N 100097	—	+/-3% (Rates of 1 to 6 inches per hour)	±10% for a volume equivalent to 0.1 in (2.54 mm) of precipitation at a rate <2 in/h (<50 mm/h)	±10% for a volume equivalent to 0.1 in (2.54 mm) of precipitation at a rate <2 in/h (<50 mm/h)	—	—	—	0.01 in (0.25 mm)	0.01 in (0.25 mm)	Tower base
Sigma-Theta[d]	N/A	N/A	N/A	N/A	—	—	N/A	—	1 degree	—	0.1 degrees azimuth	10 m

(a) The Differential Temperature value is a calculated value based on arithmetic differences in the Ambient Temperature measurements at 60-meter and 10-meter locations.
(b) Water is collected and drained each time an internal bucket fills with 0.01 inches (0.25 mm) of water.
(c) As measured at the output of Foxboro (Primary equipment rack).
(d) The Sigma-Theta value is a calculated value based on the Wind Direction variation measurements, and therefore has the same resolution as the Wind Direction measurements.

PTN COL 2.3-3

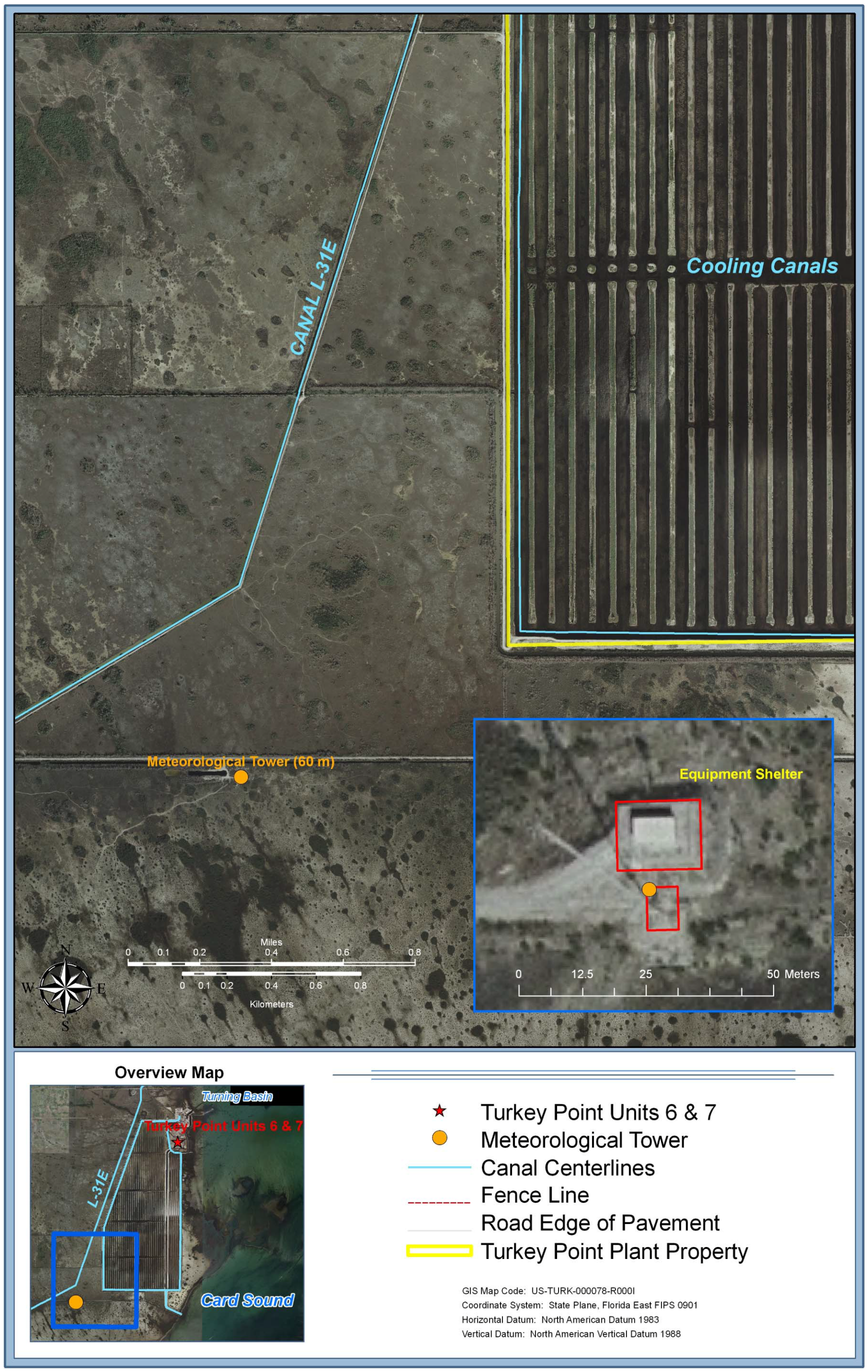
Table 2.3.3-205
Units 6 & 7 Annual Data Recovery Rate (in percent) for Existing Meteorological Monitoring System (2002, 2005, and 2006)

Parameter	2002	2005	2006	3-Year Composite
Wind Speed (10 m)	100.0%	98.9%	99.6%	99.5%
Wind Speed (60 m)	99.9%	90.8%	100.0%	96.9%
Wind Direction (10 m)	99.6%	98.6%	99.6%	99.2%
Wind Direction (60 m)	99.9%	89.6%	100.0%	96.5%
Temperature (60 m–10 m)[(a)]	94.0%	98.9%	99.6%	97.5%
Ambient Temperature (10 m)	95.0%	99.7%	99.9%	98.2%
Ambient Temperature (60 m)	95.9%	99.8%	99.8%	98.5%
Precipitation	100.0%	99.8%	100.0%	99.9%
Composite Parameters				
WS/WD (10m), T (60m-10m)[(a)]	93.6%	97.2%	99.2%	96.7%
WS/WD (60m), T (60m-10m)[(a)]	94.0%	79.7%	99.6%	91.1%
WS/WD (10m)	99.6%	98.2%	99.6%	99.1%
WS/WD (60m)	99.9%	80.6%	100.0%	93.5%

(a) Temperature difference (ΔT) between 60-meter and 10-meter levels.

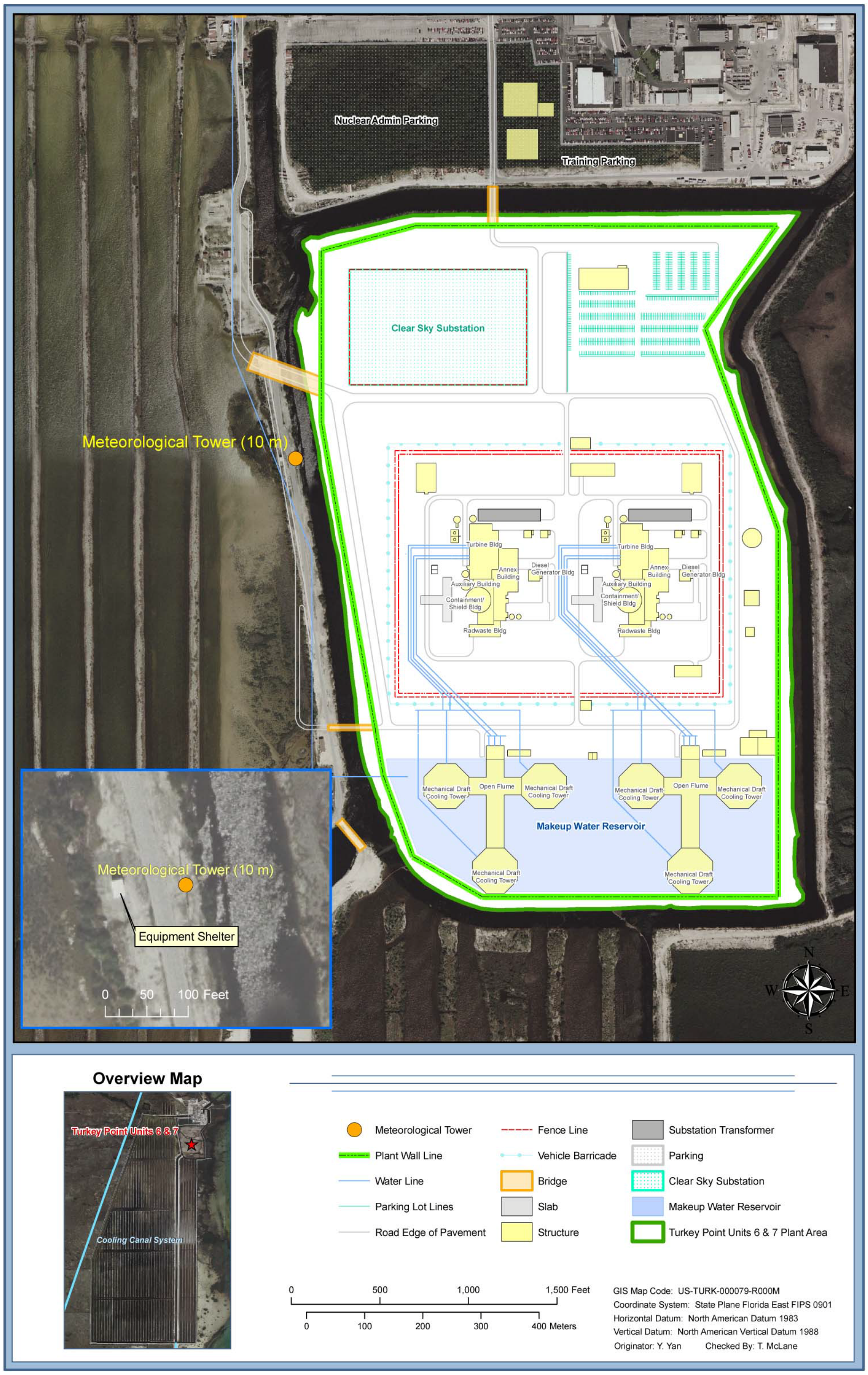
PTN COL 2.3-3

Figure 2.3.3-201 60-meter Meteorological Tower Site Features



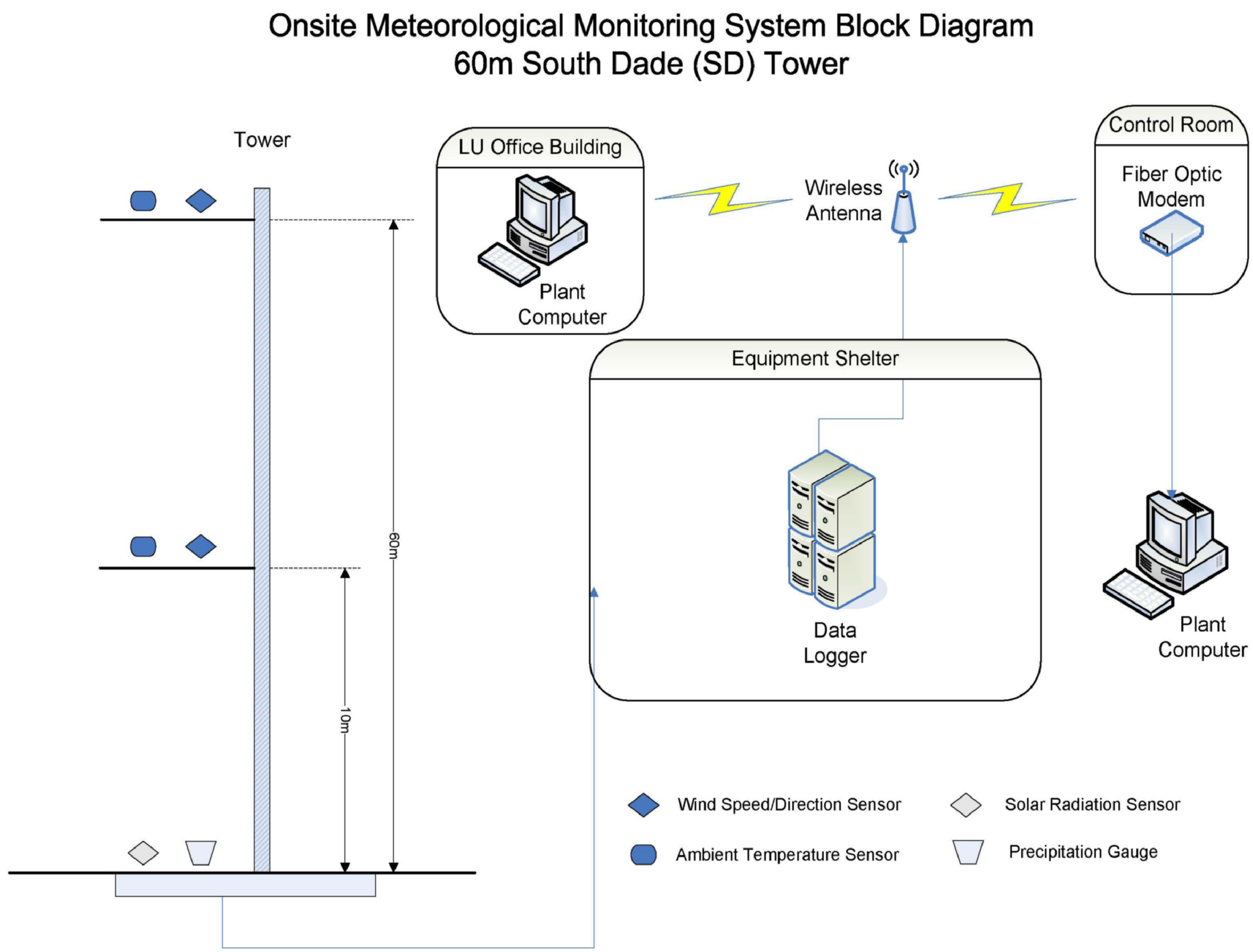
PTN COL 2.3-3

Figure 2.3.3-202 10-meter Meteorological Tower Site Features



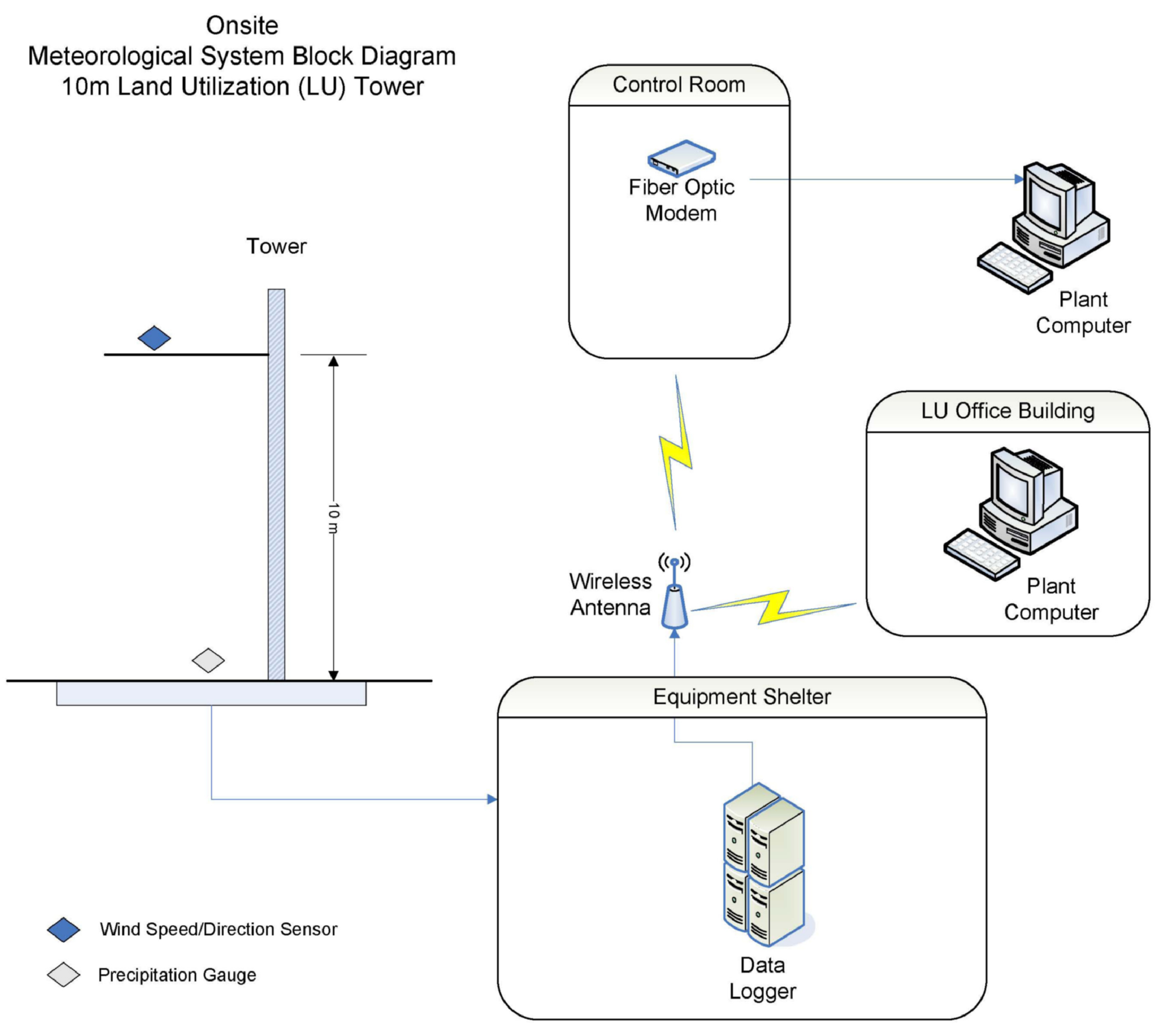
PTN COL 2.3-3

Figure 2.3.3-203 Meteorological System Block Diagram (South Dade Tower — Operational Configuration)



PTN COL 2.3-3

Figure 2.3.3-204 Meteorological System Block Diagram (LU Tower — Operational Configuration)



2.3.4 SHORT-TERM DIFFUSION ESTIMATES

2.3.4.1 Objective

PTN COL 2.3-4 The NRC-sponsored PAVAN computer code (NUREG/CR-2858) is used to estimate relative ground-level atmospheric concentrations (X/Q) at the exclusion area boundary (EAB) and low population zone (LPZ) for potential accidental releases of radioactive material. Control room X/Qs are estimated using the ARCON96 model (NUREG/CR-6331).

According to 10 CFR Part 100, it is necessary to consider the doses for various time periods immediately following the onset of a postulated ground-level release at the EAB and for the duration of exposure at the LPZ. Therefore, the relative X/Qs are estimated for various time periods ranging from 2 hours to 30 days.

According to Subsection B of RG 1.23, the required meteorological data for a combined license that does not reference an early site permit is a consecutive 24-month period of data that is defendable, representative, and complete, but not older than 10 years from the date of application. Site-specific meteorological data covering the 3-year period of record (2002, 2005, and 2006) is used to quantitatively evaluate such a hypothetical accident at the site.

2.3.4.2 PAVAN Modeling Results

Meteorological data is used to determine various postulated accident conditions as specified in RG 1.145**.** Compared to an elevated release, a ground-level release usually results in higher ground level concentrations at downwind receptors because of less dilution from shorter traveling distances. Section 4.4 of the PAVAN code specifies that ground level releases include all release points or areas that are lower than 2.5 times the height of adjacent solid structures. Because the ground level release scenario usually provides a bounding case, and because none of the release heights is higher than 2.5 times the height of the associated reactor shield building, elevated releases are not considered.

According to RG 1.111, the meteorological effects from large bodies of water should be considered in relative dispersion calculations. Therefore, to be conservative, the effects of Biscayne Bay on the dispersion environment were considered in this analysis. The terrain adjustment factors were used for the annual average calculations to account for the airflow recirculation effect generated by the local land-sea breeze circulation. The terrain in the area is characterized as flat, so adjustments for topography are not required.

The PAVAN program implements the guidance provided in RG 1.145. The code computes X/Qs at the EAB and LPZ for each combination of wind speed and atmospheric stability class for each of 16 downwind direction sectors (i.e., north, north-northeast, northeast, etc.). 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 is designated the maximum sector-dependent X/Q value.

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

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) is used to represent the X/Q value for a 0- to 2-hour time period. To determine X/Qs for longer time periods, the program calculates an annual average X/Q value using the procedure described in RG 1.111). The program then uses logarithmic interpolation between the 0–2 hour X/Qs for each sector and the corresponding annual average X/Qs to calculate the values for intermediate time periods (i.e., 0–8 hours, 8–24 hours, 1–4 days, and 4–30 days). As suggested in NUREG/CR-2858, each of the sector-specific 0–2 hour X/Qs provided in the PAVAN output file are examined for “reasonability” by comparing them with the ordered X/Q also presented in the model output.

The PAVAN model has been configured to calculate offsite X/Q values assuming both “wake-credit allowed” and “wake-credit not allowed.” Several sector distances from the power block area to the EAB (NE, ENE, E, SE, ESE) are within the building wake influence zone. Therefore, credit is taken for building wakes in these four zones for the EAB analysis. Since the LPZ is located farther away from the plant site than the EAB, the “wake-credit not allowed” scenario of the PAVAN results is used for the X/Q analyses at the LPZ.

The PAVAN model input data is presented below:

- Meteorological data: 3-year (2002, 2005, and 2006) composite onsite joint frequency distributions of wind speed, wind direction, and atmospheric stability (see Subsection 2.3.2)

- Type of release: Ground level

- Wind sensor height: 33 feet (10 meters)

- Vertical temperature difference: as measured at the 33-foot (10-meter) and 196.9-foot (60-meter) levels of the primary meteorological tower

- Number of wind speed categories: 13

- Minimum reactor building cross-sectional area: 2636 square meters (see Subsection 2.3.5)

- Shield building height: 69.7 meters above grade

- Distances from release points along the source boundary, which encompasses all potential release points, to the EAB for all downwind sectors (see Table 2.3.4-201)

- Distances from release point to LPZ for all downwind sectors (see Table 2.3.4-201)

The PAVAN model uses building cross-sectional areas and shield building height to estimate wake-related X/Q values. Since the EAB (not including NE, ENE, E, SE, ESE sectors) and the LPZ (all sectors) are both located beyond the building wake influence zone, these two input parameters have no effect in calculating the non-wake X/Q values.

PTN DEP 2.0-4

Units 6 & 7 are conservatively treated as one unit in estimating the shortest distance to each boundary receptor in each direction. This is done by using a source boundary that encloses all potential release points for both Units 6 & 7. Using the source boundary approach, the shortest distance from the source boundary to the EAB is presented in Table 2.3.4-201 for each of the 16 direction sectors.

The maximum sector-dependent 0.5 percent X/Q value and the overall 5 percent X/Q value are conservatively estimated using the source boundary concept.

Similar to the above approach, the shortest distances from the source boundary to the LPZ (Figure 2.1-226) is used in the PAVAN modeling run to determine the X/Q values at the LPZ.

Based on the PAVAN modeling results, the maximum 0–2 hour, 0.5 percent, sector-dependent X/Q value is compared with 5 percent overall site 0–2 hour X/Q value at the EAB. The higher of the two is used as the proper X/Q at the EAB for each time period. The same approach is used to determine the proper X/Qs at the LPZ.

Table 2.3.4-202 (EAB without wake credit), Table 2.3.4-203 (EAB with wake credit), and Table 2.3.4-204 (LPZ with no wake credit) present the X/Qs for each of the 16 downwind sectors for the appropriate time period(s). The sector-dependent 0.5 percent X/Q value at either the EAB (with or without wake credit for select sectors) or the LPZ is higher than the overall site 5 percent X/Q value. The maximum X/Qs are summarized below (s/m^3):

Receptor Location	X/Q 0–2 hours	X/Q 0–8 hours	X/Q 8–24 hours	X/Q 1–4 days	X/Q 4–30 days	X/Q Annual Average
EAB	4.19E–04	+	+	+	+	+
DCD Value	5.1E–04	*Not provided*	*Not provided*	*Not provided*	*Not provided*	*Not provided*
LPZ	+	1.87E–5	1.25E–5	5.25E–6	1.51E–6	+
DCD Value	*Not provided*	2.2E–04	1.6E–04	1.0E–04	8.0E–05	*Not provided*

Note: The plus (+) sign indicates the value is not provided because there is no equivalent DCD value.

The results provided in Table 2.3.4-202, Table 2.3.4-203 and Table 2.3.4-204 show that the X/Q values determined by the PAVAN modeling analyses at the EAB and LPZ, respectively, do not exceed the AP1000 standard plant site design parameters as defined in Table 15A-5 of the DCD. The PAVAN-predicted maximum 0–2 hour EAB X/Q value (4.19E–04 s/m^3) is less than the corresponding DCD EAB XQ value (5.1E–04 s/m^3). The PAVAN-predicted maximum 0–8 hour LPZ X/Q value (1.87E–05 s/m^3) is lower than the corresponding DCD LPZ X/Q value (2.2E–04 s/m^3).

2.3.4.3 Atmospheric Dispersion Factors for Onsite Doses

X/Q values are also estimated at the control room HVAC intake and annex building access door for postulated accidental radioactive airborne releases. These two receptors considered for determination of onsite X/Q values are identified in Table 15A-7 of the DCD. The release and receptor locations are identified in Figure 2.1-204.

Control room X/Qs are estimated using the ARCON96 model as described in NUREG/CR-6331 and input data such as receptor height, release height, release type, and building area. A composite 3-year (2002, 2005, and 2006) hourly meteorological data collected onsite was used as part of the input for the ARCON96 program. The above averaged three years of the meteorological data all have data recovery rates equal to or greater than 90 percent and are representative of the site dispersion characteristics as described in Subsection 2.3.2.

According to Figure 15A-1 of the DCD, doses to receptors need to consider eight sources: plant vent, passive containment cooling system air diffuser, fuel building blowout panel, radwaste building truck staging area door, steam vent, power-operated relief valve and safety valves, condenser air removal stack, and containment shell. Figure 15A-1 of the DCD shows that among the potential release sources, the containment shell is considered as a diffuse area source; all other releases are considered as point sources. Release types used in the ARCON96 modeling analyses for Units 6 & 7 follow those specified in the DCD.

RG 1.194 provides guidance on the use of ARCON96 for determining X/Qs to be used in design basis evaluation of control room radiological habitability. Section 3.2.2 of RG 1.194 specifies that a stack release should be more than 2.5 times the height of the adjacent structure. All the release heights and receptor heights information are provided in DCD Table 15A-7. As stated in Section 3.2.3 of RG 1.194, the results from the vent releases mode may not be sufficiently conservative for accident analysis; therefore, the vent release mode should not be used in the design basis evaluation. (The plant vent release and condenser air removal stack are considered ground-level releases.)

Control room intake and annex building access door X/Qs for the 95 percent time averaging (0–2 hours, 2–8 hours, 8–24 hours, 1–4 days, and 4–30 days) periods obtained from the ARCON96 modeling results are summarized in Table 2.3.4-205 and Table 2.3.4-206, respectively.

The results provided in Table 2.3.4-205 and Table 2.3.4-206 show that all of the X/Q values determined by the ARCON96 modeling analyses at the control room air intake and annex building access door for reactor building plant stack releases are bounded by the corresponding DCD X/Q values.

2.3.4.4 Hazardous Material Releases

Pollutant concentrations are also estimated at the Unit 6 & 7 control rooms for postulated accidental releases of toxic chemicals for material stored onsite, offsite, and for toxic or flammable material transported on nearby transportation routes. The concentrations at the control room intake and annex building access door due to accidental hazardous chemical releases (toxic vapor and flammable cloud) are determined using the guidance specified in RG 1.78 and NUREG-0570.

Estimated values of control room concentrations due to hazardous material releases are presented in Table 2.2-215. Detailed description of potential accidents to be considered as design basis events and their impacts are described in Subsections 2.2.3.1 and 2.2.3.2.

PTN COL 2.3-4

Table 2.3.4-201
Distances from the Source Boundary Area

Directional Sector	To EAB (feet)	To EAB (meters)	To LPZ (feet)	To LPZ (meters)
S	2,756	840	22,484	6,853
SSW	2,687	819	22,474	6,850
SW	2,375	724	22,411	6,831
WSW	2,559	780	23,284	7,097
W	2,566	782	25,230	7,690
WNW	2,589	789	25,230	7,690
NW	2,513	766	26,568	8,098
NNW	2,516	767	28,330	8,635
N	2,516	767	29,423	8,968
NNE	2,516	767	29,209	8,903
NE	**1,427**	**435**	27,677	8,436
ENE	**1,503**	**458**	26,371	8,038
E	**1,572**	**479**	24,862	7,578
ESE	**1,932**	**589**	23,655	7,210
SE	**1,923**	**586**	22,805	6,951
SSE	2,782	848	22,523	6,865

Bolded values in table represent sector distances eligible for the building wake credit.

PTN COL 2.3-4

Table 2.3.4-202
Units 6 & 7 Ground Level Release PAVAN Output — X/Q Values (s/m^3) at the Exclusion Area Boundary — Building Wake Credit Not Included

DOWNWIND SECTOR	DISTANCE (METERS)	0–2 HOURS	0–8 HOURS	8–24 HOURS	1–4 DAYS	4–30 DAYS	ANNUAL AVERAGE	HRS PER YR MAX 0–2 HR X/Q EXCEEDED IN SECTOR
S	**840**	**2.51E-04**	**1.60E-04**	**1.28E-04**	**7.87E-05**	**3.91E-05**	**1.67E-05**	**6.2**
SSW	**819**	**1.03E-04**	**6.27E-05**	**4.89E-05**	**2.86E-05**	**1.32E-05**	**5.15E-06**	**1.1**
SW	**724**	**1.25E-04**	**8.25E-05**	**6.69E-05**	**4.25E-05**	**2.21E-05**	**9.95E-06**	**2.8**
WSW	**780**	**1.17E-04**	**8.27E-05**	**6.97E-05**	**4.80E-05**	**2.82E-05**	**1.46E-05**	**0.5**
W	**782**	**1.38E-04**	**1.06E-04**	**9.27E-05**	**6.93E-05**	**4.57E-05**	**2.74E-05**	**2.2**
WNW	**789**	**1.33E-04**	**9.65E-05**	**8.23E-05**	**5.83E-05**	**3.55E-05**	**1.94E-05**	**1.7**
NW	**766**	**1.39E-04**	**9.58E-05**	**7.94E-05**	**5.28E-05**	**2.94E-05**	**1.43E-05**	**2**
NNW	**767**	**1.18E-04**	**7.77E-05**	**6.30E-05**	**4.00E-05**	**2.08E-05**	**9.39E-06**	**2.3**
N	**767**	**1.10E-04**	**7.00E-05**	**5.57E-05**	**3.41E-05**	**1.68E-05**	**7.06E-06**	**1.4**
NNE	**767**	**1.23E-04**	**7.73E-05**	**6.13E-05**	**3.71E-05**	**1.80E-05**	**7.44E-06**	**3**
NE	435	3.78E-04	2.35E-04	1.85E-04	1.11E-04	5.29E-05	2.14E-05	36.1
ENE	458	3.66E-04	2.26E-04	1.78E-04	1.05E-04	4.96E-05	1.98E-05	32.6
E	479	4.01E-04	2.55E-04	2.03E-04	1.24E-04	6.09E-05	2.56E-05	39.5
ESE	589	3.51E-04	2.24E-04	1.78E-04	1.09E-04	5.42E-05	2.29E-05	28.6
SE	586	4.25E-04	2.72E-04	2.18E-04	1.35E-04	6.73E-05	2.89E-05	43.7
SSE	**848**	**3.04E-04**	**2.05E-04**	**1.69E-04**	**1.10E-04**	**5.98E-05**	**2.83E-05**	**12.9**
Max 0–2 hr X/Q		4.25E-04	Total Hours Entire Site Max 0–2 hr X/Q Exceeded					216.7

Bolded values indicate sectors not eligible to receive the building wake credit. See Table 2.3.4-203 for sectors with wake credit applied.

PTN COL 2.3-4

Table 2.3.4-203
Units 6 & 7 Ground Level Release PAVAN Output — X/Q Values (s/m^3) at the Exclusion Area Boundary — Building Wake Credit Included

DOWNWIND SECTOR	DISTANCE (METERS)	0–2 HOURS	0–8 HOURS	8–24 HOURS	1–4 DAYS	4–30 DAYS	ANNUAL AVERAGE	HRS PER YR MAX 0–2 HR X/Q EXCEEDED IN SECTOR
S	840	2.48E-04	1.46E-04	1.12E-04	6.30E-05	2.76E-05	1.00E-05	6.4
SSW	819	9.36E-05	5.35E-05	4.05E-05	2.21E-05	9.26E-06	3.19E-06	1.2
SW	724	1.03E-04	6.48E-05	5.14E-05	3.11E-05	1.51E-05	6.26E-06	2.8
WSW	780	1.10E-04	7.30E-05	5.95E-05	3.83E-05	2.03E-05	9.36E-06	0.5
W	782	1.37E-04	9.74E-05	8.21E-05	5.66E-05	3.32E-05	1.72E-05	2.2
WNW	789	1.30E-04	8.81E-05	7.26E-05	4.76E-05	2.60E-05	1.24E-05	1.7
NW	766	1.35E-04	8.63E-05	6.89E-05	4.23E-05	2.10E-05	8.91E-06	2.1
NNW	767	1.10E-04	6.81E-05	5.35E-05	3.17E-05	1.50E-05	5.98E-06	2.4
N	767	1.01E-04	6.01E-05	4.64E-05	2.66E-05	1.19E-05	4.47E-06	1.5
NNE	767	1.17E-04	6.85E-05	5.24E-05	2.93E-05	1.27E-05	4.58E-06	3.1
NE	**435**	**3.54E-04**	**2.03E-04**	**1.54E-04**	**8.46E-05**	**3.57E-05**	**1.24E-05**	**36**
ENE	**458**	**3.26E-04**	**1.87E-04**	**1.42E-04**	**7.80E-05**	**3.30E-05**	**1.15E-05**	**29.1**
E	**479**	**3.92E-04**	**2.28E-04**	**1.74E-04**	**9.68E-05**	**4.17E-05**	**1.49E-05**	**39.1**
ESE	**589**	**3.51E-04**	**2.05E-04**	**1.56E-04**	**8.69E-05**	**3.74E-05**	**1.34E-05**	**29.5**
SE	**586**	**4.19E-04**	**2.47E-04**	**1.89E-04**	**1.06E-04**	**4.64E-05**	**1.69E-05**	**43.7**
SSE	848	2.98E-04	1.86E-04	1.46E-04	8.75E-05	4.17E-05	1.69E-05	13.1
Max 0–2 hr X/Q		4.19E-04	Total Hours Entire Site Max 0–2 hr X/Q Exceeded					214.3

Bolded values indicate sectors eligible to receive the building wake credit. See Table 2.3.5-202 for sectors without wake credit.

PTN COL 2.3-4

Table 2.3.4-204
Units 6 & 7 Ground Level Release PAVAN Output — X/Q Values (s/m^3) at the Low Population Zone

DOWNWIND SECTOR	DISTANCE (METERS)	0–2 HOURS	0–8 HOURS	8–24 HOURS	1–4 DAYS	4–30 DAYS	ANNUAL AVERAGE	HRS PER YR MAX 0–2 HR X/Q EXCEEDED IN SECTOR
S	6853	3.19E-05	1.37E-05	8.94E-06	3.56E-06	9.50E-07	1.89E-07	21.1
SSW	6850	8.26E-06	3.59E-06	2.37E-06	9.60E-07	2.63E-07	5.38E-08	3.2
SW	6831	7.44E-06	3.52E-06	2.42E-06	1.07E-06	3.34E-07	8.02E-08	3.4
WSW	7097	8.69E-06	4.31E-06	3.04E-06	1.42E-06	4.76E-07	1.25E-07	0.7
W	7690	1.14E-05	5.86E-06	4.20E-06	2.05E-06	7.27E-07	2.05E-07	2.4
WNW	7690	1.05E-05	5.19E-06	3.64E-06	1.69E-06	5.61E-07	1.45E-07	2.3
NW	8098	9.70E-06	4.51E-06	3.08E-06	1.34E-06	4.08E-07	9.49E-08	2.8
NNW	8635	6.86E-06	3.08E-06	2.07E-06	8.70E-07	2.51E-07	5.46E-08	2.8
N	8968	5.29E-06	2.34E-06	1.56E-06	6.46E-07	1.82E-07	3.87E-08	1.6
NNE	8903	7.34E-06	3.13E-06	2.05E-06	8.15E-07	2.17E-07	4.28E-08	3
NE	8436	1.12E-05	4.61E-06	2.95E-06	1.12E-06	2.80E-07	5.12E-08	5.2
ENE	8038	1.23E-05	5.05E-06	3.24E-06	1.23E-06	3.09E-07	5.67E-08	3.7
E	7578	1.85E-05	7.67E-06	4.94E-06	1.90E-06	4.79E-07	8.92E-08	8.7
ESE	7210	2.57E-05	1.07E-05	6.89E-06	2.66E-06	6.77E-07	1.27E-07	15.4
SE	6951	3.00E-05	1.28E-05	8.31E-06	3.28E-06	8.65E-07	1.69E-07	20.4
SSE	6865	4.15E-05	1.87E-05	1.25E-05	5.25E-06	1.51E-06	3.29E-07	43.7
Max 0–2 hr X/Q		4.15E-05	Total Hours Entire Site Max 0–2 hr X/Q Exceeded					140.4

PTN COL 2.3-4

Table 2.3.4-205
ARCON96 X/Q (s/m^3) Values at the Control Room HVAC Intake

Release Point and DCD Values[a]	0–2 hours	2–8 hours	8–24 hours	1–4 days	4–30 days
Plant Vent	1.66E-03	1.05E-03	5.14E-04	3.19E-04	2.02E-04
DCD	**3.00E-03**	**2.50E-03**	**1.00E-03**	**8.00E-04**	**6.00E-04**
PCS Air Diffuser	1.29E-03	7.46E-04	3.44E-04	2.08E-04	1.16E-04
DCD	**3.00E-03**	**2.50E-03**	**1.00E-03**	**8.00E-04**	**6.00E-04**
Fuel Building Blowout Panel	1.44E-03	9.72E-04	4.28E-04	3.14E-04	1.98E-04
DCD	**6.00E-03**	**4.00E-03**	**2.00E-03**	**1.50E-03**	**1.00E-03**
Radwaste Building Truck Staging Area Door	1.21E-03	8.91E-04	3.87E-04	2.87E-04	1.89E-04
DCD	**6.00E-03**	**4.00E-03**	**2.00E-03**	**1.50E-03**	**1.00E-03**
Steam Vent	1.32E-02	7.43E-03	3.33E-03	2.47E-03	1.39E-03
DCD	**2.40E-02**	**2.00E-02**	**7.50E-03**	**5.50E-03**	**5.00E-03**
PORV & Safety Valves	1.19E-02	7.29E-03	3.08E-03	2.26E-03	1.36E-03
DCD	**2.00E-02**	**1.80E-02**	**7.00E-03**	**5.00E-03**	**4.50E-03**
Condenser Air Removal Stack	1.61E-03	1.24E-03	5.15E-04	3.98E-04	3.03E-04
DCD	**6.00E-03**	**4.00E-03**	**2.00E-03**	**1.50E-03**	**1.00E-03**
Containment Shell (As Diffuse Area Source)	1.55E-03	9.55E-04	4.79E-04	3.31E-04	1.96E-04
DCD	**6.00E-03**	**3.60E-03**	**1.40E-03**	**1.80E-03**	**1.50E-03**

(a) Values from DCD Table 15A-6

PTN COL 2.3-4

Table 2.3.4-206
ARCON96 X/Q (s/m^3) Values at the Annex Building Access Door

Release Point and DCD Values[a]	0–2 hours	2–8 hours	8–24 hours	1–4 days	4–30 days
Plant Vent	3.66E-04	2.31E-04	1.13E-04	6.92E-05	4.38E-05
DCD	**1.00E-03**	**7.50E-04**	**3.50E-04**	**2.80E-04**	**2.50E-04**
PCS Air Diffuser	3.56E-04	2.05E-04	9.85E-05	6.03E-05	3.85E-05
DCD	**1.00E-03**	**7.50E-04**	**3.50E-04**	**2.80E-04**	**2.50E-04**
Fuel Building Blowout Panel	3.47E-04	2.22E-04	1.03E-04	6.78E-05	4.14E-05
DCD	**6.00E-03**	**4.00E-03**	**2.00E-03**	**1.50E-03**	**1.00E-03**
Radwaste Building Truck Staging Area Door	3.47E-04	2.33E-04	1.03E-04	7.14E-05	4.37E-05
DCD	**6.00E-03**	**4.00E-03**	**2.00E-03**	**1.50E-03**	**1.00E-03**
Steam Vent	8.05E-04	4.59E-04	2.11E-04	1.20E-04	7.94E-05
DCD	**4.00E-03**	**3.20E-03**	**1.20E-03**	**1.00E-03**	**8.00E-04**
PORV & Safety Valves	8.34E-04	4.73E-04	2.19E-04	1.26E-04	8.23E-05
DCD	**4.00E-03**	**3.20E-03**	**1.20E-03**	**1.00E-03**	**8.00E-04**
Condenser Air Removal Stack	3.01E-03	1.74E-03	8.05E-04	5.33E-04	2.70E-04
DCD	**2.00E-02**	**1.80E-02**	**7.00E-03**	**5.00E-03**	**4.50E-03**
Containment Shell (As Diffuse Area Source)	3.39E-04	1.95E-04	9.67E-05	6.08E-05	3.75E-05
DCD	**1.00E-03**	**7.50E-04**	**3.50E-04**	**2.80E-04**	**2.50E-04**

(a) Values from DCD Table 15A-6

2.3.5 LONG-TERM DIFFUSION ESTIMATES

2.3.5.1 Objective

PTN COL 2.3-5 This section provides estimates of annual average atmospheric dispersion factors (X/Q values) and relative dry deposition factors (D/Q values) to a distance of 50 miles (80 kilometers) from the Units 6 & 7 site for annual average release limit calculations and person-rem estimates.

The NRC-sponsored XOQDOQ computer program was used to estimate X/Q and D/Q values for continuous releases of gaseous effluents to the atmosphere. The XOQDOQ computer code has the primary function of calculating annual average X/Q and D/Q values at receptors of interest (e.g., the exclusion area boundary [EAB], nearest resident, nearest vegetable garden, nearest milk animal, and nearest meat animal). RG 1.206 requires X/Q and D/Q estimates at the above receptor locations. 10 CFR Part 100 requires an “exclusion area” surrounding the reactor in which the reactor licensee has the authority to determine all activities, including exclusion or removal of personnel and property.

The XOQDOQ dispersion model implements the assumptions outlined in RG 1.111. The program assumes that the material released to the atmosphere follows a Gaussian distribution around the plume centerline. In estimating concentrations for longer time periods, the Gaussian distribution is assumed to be evenly distributed within a given directional sector. A straight line trajectory is assumed between the release point and all receptors.

Because the XOQDOQ model is used in the analysis, dispersion coefficients (σ_y and σ_z) as specified in RG 1.145 and implemented by the XOQDOQ code are used in estimating the X/Q and D/Q values. The following input data and assumptions have been used in the XOQDOQ modeling analysis:

- Meteorological Data: 3-year composite (2002, 2005, and 2006) onsite joint frequency distributions of wind speed, wind direction, and atmospheric stability (see Subsection 2.3.2). The determinations for the atmospheric stability classes are based on the vertical ΔT method as specified in RG 1.145.
- Type of release: Ground-level.
- Wind sensor height: 10 meters.

- Vertical temperature difference: (60 meters–10 meters).
- Number of wind speed categories: 13.
- Minimum shield building cross-sectional area: 2636 square meters.
- Shield building height: 69.7 meters above grade.
- Distances from the release point to the nearest residence (including a school), nearest EAB boundaries, milk animals, and vegetable garden (see Table 2.3.5-201).
- No milk cows/goats are identified within 5 miles of the Units 6 & 7 site. It is conservatively assumed that all residents are raising beef cattle for residential consumption.

The AP1000 reactor design is used to calculate the minimum building cross-sectional area as called for in NUREG/CR-2919 for evaluating building downwash effects on dispersion. The containment building features a straight section at the bottom and a tapered-shape structure with a smaller area at the top. The height of the containment building is approximately 228.75 feet (69.7 meters). Because of the shape of the containment building, the midpoint between the high point of the building (69.7 meters) and the point at which the building begins to taper (approximately 170.84 feet or 52.1 meters) was used when determining the building cross-sectional area. This point has a height of 199.8 feet (60.9 meters). The cross-sectional area was determined by multiplying this height by the diameter of the containment building (approximately 142 feet or 43.3 meters). Therefore, based on the cross-sectional area of the reactor structure (2636 square meters) and assuming the entire structure has a rectangular cross section, the equivalent structural height is calculated to be 60.9 meters.

The shortest distances from the Units 6 & 7 power block area (i.e., area encompassing the containment and auxiliary building) to receptors of interest (e.g., nearest resident, meat animal, EAB boundaries, and vegetable garden) are calculated for each directional sector. The results are presented in Table 2.3.5-201. The receptors of interest within 5 miles were evaluated. Directional sectors without a receptor within 5 miles were not modeled. As previously stated, there are no cow/goat receptors within 5 miles of the site.

To account for possible land-water recirculation effects from Biscayne Bay on the local meteorological conditions, default correction factors are implemented in the

XOQDOQ model. These factors are implemented to properly account for possible recirculation due to land-water boundaries, which could raise X/Q values in an open terrain area such as the Units 6 & 7 site.

As addressed in Subsection 2.3.4, site-specific meteorological data covering the 3-year composite period of record is used to quantitatively evaluate diffusion estimates. Therefore, the lower level (10 meter) 3-year composite (2002, 2005, and 2006) joint frequency distributions of wind speed, wind direction, and atmospheric stability are used as input in the XOQDOQ modeling analysis.

2.3.5.2 Calculations

Table 2.3.5-202 summarizes the maximum relative atmospheric dispersion factors (X/Q) and relative dry deposition factors (D/Q values) predicted by the XOQDOQ model for identified sensitive receptors of interest as a result of continuous releases of gaseous effluents. The listed maximum X/Q values reflect several plume depletion scenarios that account for radioactive decay: no decay and the default half-life decay periods of 2.26 and 8 days.

The maximum annual average X/Q values with no decay (along with the direction and distance of the receptor locations relative to the Units 6 & 7 site) is 1.6E–04 sec/m^3 and occurs at Unit 7 as a result of the release from Unit 6. Other X/Q values for receptors of interest are:

- 1.7E–05 s/m^3 for the EAB occurring in the SSE, SE, and W sectors at a distance of 0.53, 0.36, and 0.49 miles, respectively. (Note: this value is bounded by value in Table 2.0-201.)

- 1.4E–07 s/m^3 for the residence and meat animal occurring in the N Sector at a distance of 2.7 miles. (Note the same distance (2.7 miles) is used to estimate the X/Q values for the meat animal)

- 9.6E–08 s/m^3 for the nearest vegetable garden occurring in the NW sector at a distance of 4.8 miles

Tables 2.3.5-203 through 2.3.5-206 summarize the annual average sector X/Q values (for no decay [undepleted], 2.26-day decay [undepleted], and 8-day decay [depleted]), and D/Q values for 22 standard radial distances between 0.25 and 50 miles, and for 10 distance-segment boundaries between 0.5 and 50 miles downwind along each of the 16 standard direction radials separated by 22.5 degrees. Table 2.3.5-207 summarizes the predicted annual X/Q values and D/Q at the sensitive receptors.

2.3.5.3 References

201. *2008 Annual Radiological Environmental Operating Report*, Turkey Point Plant Units 3 & 4, License No. DPR-31 and DPR-41, Docket Nos. 50-250 and 50-251, February 26, 2009.

Table 2.3.5-201
Source to Sensitive Receptor Distances from Units 6 & 7

Sector	Name	Type of Receptor	Latitude	Longitude	Distance From Power Block Area (Miles)
N	Biscayne National Park	Resident	N25.46362	W80.33445	2.7
NNW	Military Canal Residence	Resident/Meat Animal	N25.48945	W80.37138	5.1
NNW	Bananas, plantains, coconuts, lemons	Vegetable Garden	N25.48945	W80.37138	5.1
NW	Satellite School	Resident	N25.44695	W80.35362	1.99
NW	Single-Family Home	Resident/Meat Animal	N25.46278	W80.38112	4.0
NW	Mowry Drive Residence	Vegetable Garden	N25.47028	W80.39112	4.8

Source: Reference 201

Table 2.3.5-202
XOQDOQ Predicted χ/Q and D/Q Values at Receptors of Interest

Type of Location	Sector	Distance (miles)	X/Q (s/m^3) (No Decay, no dry deposition)
EAB	SSE	0.53	1.7E-5
	SE	0.36	1.7E-5
	W	0.49	1.7E-5
Residence/Meat Animal	N	2.7	1.4E-7
	NW	4.0	1.3E-7
	NNW	5.1	5.5E-8
Vegetable Garden	NW	4.8	9.6E-8
	NNW	5.1	5.5E-8
Unit 7	W	0.13	1.6E-4
School	NW	1.99	5.7E-7
Site Boundary	SSE	0.35	3.4E-5
Type of Location	**Sector**	**Distance (miles)**	**X/Q (s/m^3) (2.26-Day Decay, no dry deposition)**
EAB	SSE	0.53	1.7E-5
	SE	0.36	1.7E-5
	W	0.49	1.7E-5
Residence/Meat Animal	N	2.7	1.3E-7
	NW	4.0	1.3E-7
	NNW	5.1	5.4E-8
Vegetable Garden	NW	4.8	9.4E-8
	NNW	5.1	5.4E-8
Unit 7	W	0.13	1.6E-4
School	NW	1.99	5.2E-7
Site Boundary	SSE	0.35	3.4E-5
Type of Location	**Sector**	**Distance (miles)**	**X/Q (s/m^3) (8-Day Decay, dry deposition)**
EAB	SE	0.36	1.6E-5
	W	0.49	1.6E-5
Residence/Meat Animal	N	2.7	1.1E-7
	NW	4.0	1.0E-7
	NNW	5.1	4.1E-8
Vegetable Garden	NW	4.8	7.2E-8
	NNW	5.1	4.1E-8
Unit 7	W	0.13	1.5E-4
School	NW	1.99	4.3E-7
Site Boundary	SSE	0.35	3.2E-5
Type of Location	**Sector**	**Distance (miles)**	**D/Q (1/m^2)**
EAB	W	0.49	1.4E-7
Residence/Meat Animal	N	2.7	7.5E-10
	NW	4.0	5.8E-10
	NNW	5.1	2.4E-10
Vegetable Garden	NW	4.8	3.8E-10
	NNW	5.1	2.4E-10
Unit 7	W	0.13	1.0E-6
School	NW	1.99	2.9E-9
Site Boundary	SSE	0.35	1.2E-7

Table 2.3.5-203 (Sheet 1 of 2)
XOQDOQ-Predicted Annual Average X/Q Value at the Standard Radial Distances and Distance Segment Boundaries — No Decay, Undepleted

RELEASE POINT - GROUND LEVEL - NO INTERMITTENT RELEASES
NO DECAY, UNDEPLETED
CORRECTED USING STANDARD OPEN TERRAIN FACTORS

ANNUAL AVERAGE CHI/Q (SEC/METER CUBED) DISTANCE IN MILES FROM THE SITE

SECTOR	.250	.500	.750	1.000	1.500	2.000	2.500	3.000	3.500	4.000	4.500
S	3.597E-05	1.079E-05	5.472E-06	2.745E-06	1.107E-06	6.119E-07	3.987E-07	2.843E-07	2.155E-07	1.705E-07	1.394E-07
SSW	1.064E-05	3.280E-06	1.745E-06	8.876E-07	3.595E-07	1.968E-07	1.263E-07	8.892E-08	6.668E-08	5.230E-08	4.243E-08
SW	1.673E-05	5.351E-06	2.913E-06	1.481E-06	5.939E-07	3.208E-07	2.029E-07	1.413E-07	1.050E-07	8.168E-08	6.579E-08
WSW	2.761E-05	8.963E-06	5.030E-06	2.577E-06	1.035E-06	5.582E-07	3.520E-07	2.444E-07	1.810E-07	1.405E-07	1.129E-07
W	5.162E-05	1.657E-05	9.278E-06	4.764E-06	1.924E-06	1.042E-06	6.592E-07	4.590E-07	3.409E-07	2.651E-07	2.135E-07
WNW	3.753E-05	1.202E-05	6.649E-06	3.403E-06	1.372E-06	7.415E-07	4.686E-07	3.259E-07	2.419E-07	1.880E-07	1.513E-07
NW	2.636E-05	8.298E-06	4.552E-06	2.332E-06	9.450E-07	5.136E-07	3.263E-07	2.279E-07	1.697E-07	1.323E-07	1.068E-07
NNW	1.776E-05	5.564E-06	2.994E-06	1.519E-06	6.093E-07	3.298E-07	2.092E-07	1.460E-07	1.086E-07	8.467E-08	6.830E-08
N	1.330E-05	4.161E-06	2.250E-06	1.142E-06	4.586E-07	2.484E-07	1.577E-07	1.101E-07	8.201E-08	6.395E-08	5.161E-08
NNE	1.375E-05	4.255E-06	2.256E-06	1.145E-06	4.624E-07	2.526E-07	1.618E-07	1.139E-07	8.532E-08	6.688E-08	5.423E-08
NE	1.429E-05	4.344E-06	2.247E-06	1.138E-06	4.620E-07	2.547E-07	1.649E-07	1.169E-07	8.822E-08	6.955E-08	5.667E-08
ENE	1.447E-05	4.389E-06	2.263E-06	1.149E-06	4.695E-07	2.595E-07	1.681E-07	1.193E-07	9.003E-08	7.099E-08	5.786E-08
E	2.023E-05	6.085E-06	3.110E-06	1.577E-06	6.447E-07	3.574E-07	2.324E-07	1.654E-07	1.252E-07	9.890E-08	8.075E-08
ESE	2.616E-05	7.820E-06	3.961E-06	1.995E-06	8.100E-07	4.494E-07	2.934E-07	2.095E-07	1.589E-07	1.259E-07	1.030E-07
SE	3.274E-05	9.759E-06	4.913E-06	2.473E-06	1.005E-06	5.582E-07	3.646E-07	2.605E-07	1.977E-07	1.566E-07	1.282E-07
SSE	6.209E-05	1.845E-05	9.261E-06	4.638E-06	1.872E-06	1.039E-06	6.799E-07	4.866E-07	3.698E-07	2.933E-07	2.403E-07

DISTANCE IN MILES FROM THE SITE
ANNUAL AVERAGE CHI/Q (SEC/METER CUBED)

SECTOR	5.000	7.500	10.000	15.000	20.000	25.000	30.000	35.000	40.000	45.000	50.000
S	1.169E-07	6.302E-08	4.218E-08	2.527E-08	1.762E-08	1.334E-08	1.064E-08	8.789E-09	7.454E-09	6.448E-09	5.665E-09
SSW	3.534E-08	1.857E-08	1.221E-08	7.143E-09	4.902E-09	3.666E-09	2.894E-09	2.372E-09	1.997E-09	1.717E-09	1.500E-09
SW	5.445E-08	2.796E-08	1.809E-08	1.035E-08	7.000E-09	5.177E-09	4.051E-09	3.295E-09	2.757E-09	2.357E-09	2.049E-09
WSW	9.326E-08	4.744E-08	3.048E-08	1.725E-08	1.157E-08	8.497E-09	6.610E-09	5.349E-09	4.455E-09	3.793E-09	3.285E-09
W	1.766E-07	9.034E-08	5.828E-08	3.317E-08	2.233E-08	1.645E-08	1.282E-08	1.040E-08	8.675E-09	7.396E-09	6.415E-09
WNW	1.251E-07	6.399E-08	4.128E-08	2.350E-08	1.584E-08	1.168E-08	9.113E-09	7.394E-09	6.173E-09	5.267E-09	4.571E-09
NW	8.851E-08	4.568E-08	2.966E-08	1.704E-08	1.155E-08	8.551E-09	6.698E-09	5.451E-09	4.563E-09	3.902E-09	3.394E-09
NNW	5.662E-08	2.927E-08	1.903E-08	1.097E-08	7.462E-09	5.544E-09	4.354E-09	3.552E-09	2.980E-09	2.553E-09	2.225E-09
N	4.280E-08	2.215E-08	1.442E-08	8.318E-09	5.657E-09	4.203E-09	3.300E-09	2.693E-09	2.259E-09	1.935E-09	1.686E-09
NNE	4.514E-08	2.369E-08	1.557E-08	9.096E-09	6.239E-09	4.665E-09	3.683E-09	3.018E-09	2.541E-09	2.184E-09	1.908E-09
NE	4.737E-08	2.525E-08	1.676E-08	9.931E-09	6.871E-09	5.171E-09	4.104E-09	3.378E-09	2.855E-09	2.462E-09	2.157E-09
ENE	4.837E-08	2.578E-08	1.712E-08	1.014E-08	7.013E-09	5.277E-09	4.187E-09	3.445E-09	2.911E-09	2.510E-09	2.199E-09
E	6.762E-08	3.625E-08	2.416E-08	1.438E-08	9.983E-09	7.531E-09	5.987E-09	4.934E-09	4.175E-09	3.605E-09	3.161E-09
ESE	8.640E-08	4.664E-08	3.123E-08	1.872E-08	1.305E-08	9.880E-09	7.877E-09	6.508E-09	5.518E-09	4.772E-09	4.192E-09
SE	1.076E-07	5.813E-08	3.896E-08	2.338E-08	1.631E-08	1.236E-08	9.856E-09	8.146E-09	6.910E-09	5.978E-09	5.253E-09
SSE	2.019E-07	1.095E-07	7.360E-08	4.433E-08	3.102E-08	2.354E-08	1.881E-08	1.557E-08	1.322E-08	1.145E-08	1.007E-08

VENT AND BUILDING PARAMETERS:

RELEASE HEIGHT	(METERS)	.00	REP. WIND HEIGHT	(METERS)	10.0
DIAMETER	(METERS)	.00	BUILDING HEIGHT	(METERS)	69.7
EXIT VELOCITY	(METERS)	.00	BLDG.MIN.CRS.SEC.AREA	(SQ.METERS)	2636.0
			HEAT EMISSION RATE	(CAL/SEC)	.0

Table 2.3.5-203 (Sheet 2 of 2)
XOQDOQ-Predicted Annual Average X/Q Value at the Standard Radial Distances and Distance Segment Boundaries — No Decay, Undepleted

RELEASE POINT - GROUND LEVEL - NO INTERMITTENT RELEASES
NO DECAY, UNDEPLETED
CHI/Q (SEC/METER CUBED) FOR EACH SEGMENT

DIRECTION	SEGMENT BOUNDARIES IN MILES FROM THE SITE									
FROM SITE	.5-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50
S	5.442E-06	1.251E-06	4.098E-07	2.180E-07	1.403E-07	6.573E-08	2.563E-08	1.340E-08	8.809E-09	6.456E-09
SSW	1.705E-06	4.046E-07	1.301E-07	6.756E-08	4.273E-08	1.947E-08	7.274E-09	3.687E-09	2.378E-09	1.720E-09
SW	2.818E-06	6.697E-07	2.097E-07	1.065E-07	6.630E-08	2.946E-08	1.058E-08	5.213E-09	3.306E-09	2.361E-09
WSW	4.814E-06	1.166E-06	3.639E-07	1.837E-07	1.138E-07	5.009E-08	1.767E-08	8.561E-09	5.369E-09	3.801E-09
W	8.893E-06	2.163E-06	6.811E-07	3.457E-07	2.151E-07	9.525E-08	3.393E-08	1.657E-08	1.043E-08	7.412E-09
WNW	6.400E-06	1.543E-06	4.843E-07	2.454E-07	1.525E-07	6.748E-08	2.405E-08	1.176E-08	7.420E-09	5.277E-09
NW	4.398E-06	1.061E-06	3.369E-07	1.721E-07	1.076E-07	4.808E-08	1.740E-08	8.608E-09	5.469E-09	3.910E-09
NNW	2.909E-06	6.871E-07	2.160E-07	1.102E-07	6.882E-08	3.080E-08	1.120E-08	5.579E-09	3.563E-09	2.558E-09
N	2.182E-06	5.171E-07	1.629E-07	8.317E-08	5.200E-08	2.330E-08	8.491E-09	4.230E-09	2.701E-09	1.939E-09
NNE	2.206E-06	5.208E-07	1.669E-07	8.645E-08	5.461E-08	2.485E-08	9.265E-09	4.692E-09	3.026E-09	2.187E-09
NE	2.220E-06	5.201E-07	1.697E-07	8.931E-08	5.704E-08	2.639E-08	1.009E-08	5.198E-09	3.386E-09	2.465E-09
ENE	2.241E-06	5.273E-07	1.730E-07	9.114E-08	5.824E-08	2.695E-08	1.030E-08	5.304E-09	3.453E-09	2.513E-09
E	3.090E-06	7.241E-07	2.390E-07	1.267E-07	8.127E-08	3.785E-08	1.460E-08	7.567E-09	4.946E-09	3.610E-09
ESE	3.945E-06	9.130E-07	3.014E-07	1.608E-07	1.036E-07	4.863E-08	1.898E-08	9.924E-09	6.522E-09	4.778E-09
SE	4.905E-06	1.133E-06	3.746E-07	2.000E-07	1.290E-07	6.059E-08	2.370E-08	1.241E-08	8.164E-09	5.986E-09
SSE	9.247E-06	2.116E-06	6.983E-07	3.740E-07	2.418E-07	1.141E-07	4.492E-08	2.364E-08	1.560E-08	1.146E-08

XOQDOQ - FPL COL (3 YEAR COMPOSITE 2002, 2005, 2006 Met Data)

Table 2.3.5-204 (Sheet 1 of 2)
XOQDOQ-Predicted Annual Average X/Q Value at the Standard Radial Distances and Distance Segment Boundaries — 2.26-Day Decay, Undepleted

RELEASE POINT - GROUND LEVEL - NO INTERMITTENT RELEASES
2.260 DAY DECAY, UNDEPLETED
CORRECTED USING STANDARD OPEN TERRAIN FACTORS

ANNUAL AVERAGE CHI/Q (SEC/METER CUBED) — DISTANCE IN MILES FROM THE SITE

SECTOR	0.250	0.500	0.750	1.000	1.500	2.000	2.500	3.000	3.500	4.000	4.500
S	3.594E-05	1.077E-05	5.457E-06	2.735E-06	1.101E-06	6.075E-07	3.951E-07	2.812E-07	2.127E-07	1.680E-07	1.371E-07
SSW	1.063E-05	3.273E-06	1.739E-06	8.837E-07	3.571E-07	1.950E-07	1.248E-07	8.772E-08	6.563E-08	5.137E-08	4.157E-08
SW	1.671E-05	5.341E-06	2.906E-06	1.476E-06	5.908E-07	3.186E-07	2.012E-07	1.398E-07	1.037E-07	8.051E-08	6.472E-08
WSW	2.759E-05	8.951E-06	5.021E-06	2.571E-06	1.031E-06	5.553E-07	3.497E-07	2.425E-07	1.794E-07	1.390E-07	1.116E-07
W	5.159E-05	1.655E-05	9.260E-06	4.752E-06	1.917E-06	1.036E-06	6.548E-07	4.553E-07	3.377E-07	2.623E-07	2.109E-07
WNW	3.751E-05	1.200E-05	6.635E-06	3.393E-06	1.366E-06	7.372E-07	4.652E-07	3.231E-07	2.394E-07	1.858E-07	1.493E-07
NW	2.633E-05	8.284E-06	4.541E-06	2.324E-06	9.403E-07	5.102E-07	3.235E-07	2.255E-07	1.677E-07	1.305E-07	1.051E-07
NNW	1.775E-05	5.553E-06	2.986E-06	1.513E-06	6.060E-07	3.273E-07	2.072E-07	1.443E-07	1.072E-07	8.339E-08	6.714E-08
N	1.329E-05	4.154E-06	2.244E-06	1.138E-06	4.562E-07	2.467E-07	1.563E-07	1.090E-07	8.099E-08	6.303E-08	5.077E-08
NNE	1.373E-05	4.245E-06	2.248E-06	1.140E-06	4.594E-07	2.504E-07	1.601E-07	1.124E-07	8.399E-08	6.568E-08	5.313E-08
NE	1.427E-05	4.333E-06	2.239E-06	1.132E-06	4.585E-07	2.521E-07	1.628E-07	1.152E-07	8.664E-08	6.812E-08	5.536E-08
ENE	1.445E-05	4.379E-06	2.255E-06	1.144E-06	4.662E-07	2.571E-07	1.661E-07	1.176E-07	8.855E-08	6.966E-08	5.664E-08
E	2.020E-05	6.070E-06	3.098E-06	1.569E-06	6.399E-07	3.539E-07	2.295E-07	1.629E-07	1.230E-07	9.691E-08	7.892E-08
ESE	2.612E-05	7.798E-06	3.945E-06	1.984E-06	8.033E-07	4.444E-07	2.893E-07	2.060E-07	1.558E-07	1.231E-07	1.004E-07
SE	3.270E-05	9.737E-06	4.896E-06	2.462E-06	9.983E-07	5.531E-07	3.604E-07	2.569E-07	1.945E-07	1.538E-07	1.255E-07
SSE	6.203E-05	1.841E-05	9.234E-06	4.620E-06	1.861E-06	1.031E-06	6.733E-07	4.809E-07	3.648E-07	2.888E-07	2.361E-07

DISTANCE IN MILES FROM THE SITE
ANNUAL AVERAGE CHI/Q (SEC/METER CUBED)

SECTOR	5.000	7.500	10.000	15.000	20.000	25.000	30.000	35.000	40.000	45.000	50.000
S	1.148E-07	6.130E-08	4.065E-08	2.391E-08	1.637E-08	1.217E-08	9.530E-09	7.735E-09	6.444E-09	5.477E-09	4.729E-09
SSW	3.454E-08	1.795E-08	1.167E-08	6.672E-09	4.477E-09	3.275E-09	2.529E-09	2.028E-09	1.671E-09	1.406E-09	1.203E-09
SW	5.347E-08	2.719E-08	1.742E-08	9.774E-09	6.484E-09	4.705E-09	3.612E-09	2.883E-09	2.368E-09	1.988E-09	1.697E-09
WSW	9.204E-08	4.651E-08	2.969E-08	1.658E-08	1.097E-08	7.952E-09	6.105E-09	4.877E-09	4.010E-09	3.370E-09	2.882E-09
W	1.742E-07	8.851E-08	5.671E-08	3.183E-08	2.113E-08	1.535E-08	1.181E-08	9.444E-09	7.774E-09	6.540E-09	5.598E-09
WNW	1.233E-07	6.258E-08	4.006E-08	2.247E-08	1.492E-08	1.084E-08	8.332E-09	6.663E-09	5.482E-09	4.610E-09	3.944E-09
NW	8.696E-08	4.448E-08	2.862E-08	1.614E-08	1.074E-08	7.817E-09	6.015E-09	4.811E-09	3.958E-09	3.328E-09	2.845E-09
NNW	5.554E-08	2.843E-08	1.830E-08	1.034E-08	6.892E-09	5.020E-09	3.866E-09	3.093E-09	2.546E-09	2.140E-09	1.830E-09
N	4.202E-08	2.155E-08	1.389E-08	7.863E-09	5.248E-09	3.826E-09	2.950E-09	2.363E-09	1.946E-09	1.638E-09	1.402E-09
NNE	4.412E-08	2.288E-08	1.486E-08	8.478E-09	5.679E-09	4.147E-09	3.198E-09	2.560E-09	2.107E-09	1.770E-09	1.512E-09
NE	4.616E-08	2.428E-08	1.591E-08	9.180E-09	6.190E-09	4.541E-09	3.514E-09	2.821E-09	2.326E-09	1.958E-09	1.675E-09
ENE	4.724E-08	2.488E-08	1.632E-08	9.442E-09	6.381E-09	4.693E-09	3.639E-09	2.928E-09	2.420E-09	2.041E-09	1.750E-09
E	6.592E-08	3.489E-08	2.296E-08	1.333E-08	9.021E-09	6.639E-09	5.151E-09	4.144E-09	3.424E-09	2.887E-09	2.473E-09
ESE	8.401E-08	4.471E-08	2.953E-08	1.722E-08	1.168E-08	8.610E-09	6.685E-09	5.381E-09	4.446E-09	3.749E-09	3.211E-09
SE	1.051E-07	5.614E-08	3.720E-08	2.181E-08	1.488E-08	1.102E-08	8.598E-09	6.952E-09	5.771E-09	4.887E-09	4.204E-09
SSE	1.980E-07	1.064E-07	7.080E-08	4.183E-08	2.872E-08	2.139E-08	1.678E-08	1.363E-08	1.137E-08	9.672E-09	8.357E-09

VENT AND BUILDING PARAMETERS:

RELEASE HEIGHT (METERS)	.00	REP. WIND HEIGHT (METERS)	10.0
DIAMETER (METERS)	.00	BUILDING HEIGHT (METERS)	60.9
EXIT VELOCITY (METERS)	.00	BLDG.MIN.CRS.SEC.AREA (SQ.METERS)	2636.0
		HEAT EMISSION RATE (CAL/SEC)	.0

Table 2.3.5-204 (Sheet 2 of 2)
XOQDOQ-Predicted Annual Average X/Q Value at the Standard Radial Distances and Distance Segment Boundaries — 2.26-Day Decay, Undepleted

RELEASE POINT - GROUND LEVEL - NO INTERMITTENT RELEASES
2.260 DAY DECAY, UNDEPLETED
CHI/Q (SEC/METER CUBED) FOR EACH SEGMENT

DIRECTION	SEGMENT BOUNDARIES IN MILES FROM THE SITE									
FROM SITE	.5-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50
S	5.428E-06	1.245E-06	4.062E-07	2.153E-07	1.380E-07	6.401E-08	2.428E-08	1.223E-08	7.756E-09	5.486E-09
SSW	1.700E-06	4.021E-07	1.287E-07	6.651E-08	4.187E-08	1.885E-08	6.807E-09	3.297E-09	2.035E-09	1.410E-09
SW	2.812E-06	6.666E-07	2.079E-07	1.052E-07	6.523E-08	2.869E-08	1.001E-08	4.742E-09	2.895E-09	1.993E-09
WSW	4.805E-06	1.162E-06	3.616E-07	1.820E-07	1.125E-07	4.915E-08	1.700E-08	8.018E-09	4.897E-09	3.379E-09
W	8.877E-06	2.155E-06	6.767E-07	3.426E-07	2.125E-07	9.341E-08	3.260E-08	1.547E-08	9.483E-09	6.557E-09
WNW	6.387E-06	1.537E-06	4.809E-07	2.429E-07	1.505E-07	6.606E-08	2.302E-08	1.092E-08	6.690E-09	4.622E-09
NW	4.387E-06	1.057E-06	3.341E-07	1.700E-07	1.059E-07	4.687E-08	1.651E-08	7.877E-09	4.830E-09	3.336E-09
NNW	2.902E-06	6.838E-07	2.141E-07	1.087E-07	6.766E-08	2.995E-08	1.057E-08	5.057E-09	3.105E-09	2.145E-09
N	2.177E-06	5.147E-07	1.615E-07	8.214E-08	5.116E-08	2.270E-08	8.040E-09	3.855E-09	2.372E-09	1.642E-09
NNE	2.199E-06	5.177E-07	1.651E-07	8.512E-08	5.351E-08	2.404E-08	8.652E-09	4.176E-09	2.570E-09	1.774E-09
NE	2.212E-06	5.165E-07	1.676E-07	8.773E-08	5.573E-08	2.542E-08	9.346E-09	4.570E-09	2.830E-09	1.962E-09
ENE	2.233E-06	5.239E-07	1.710E-07	8.966E-08	5.701E-08	2.604E-08	9.611E-09	4.722E-09	2.938E-09	2.045E-09
E	3.079E-06	7.192E-07	2.360E-07	1.245E-07	7.944E-08	3.648E-08	1.355E-08	6.679E-09	4.157E-09	2.893E-09
ESE	3.930E-06	9.062E-07	2.974E-07	1.577E-07	1.011E-07	4.670E-08	1.749E-08	8.659E-09	5.397E-09	3.756E-09
SE	4.890E-06	1.126E-06	3.704E-07	1.968E-07	1.263E-07	5.860E-08	2.215E-08	1.108E-08	6.973E-09	4.896E-09
SSE	9.222E-06	2.105E-06	6.917E-07	3.690E-07	2.376E-07	1.109E-07	4.244E-08	2.150E-08	1.367E-08	9.688E-09

XOQDOQ - FPL COL (3 YEAR COMPOSITE 2002, 2005, 2006 Met Data)

Table 2.3.5-205 (Sheet 1 of 2) XOQDOQ-Predicted Annual Average X/Q Value at the Standard Radial Distances and Distance Segment Boundaries — 8-Day Decay, Depleted

RELEASE POINT - GROUND LEVEL - NO INTERMITTENT RELEASES
8.000 DAY DECAY, DEPLETED
CORRECTED USING STANDARD OPEN TERRAIN FACTORS

ANNUAL AVERAGE CHI/Q (SEC/METER CUBED) — DISTANCE IN MILES FROM THE SITE

SECTOR	0.250	0.500	0.750	1.000	1.500	2.000	2.500	3.000	3.500	4.000	4.500
S	3.403E-05	9.849E-06	4.872E-06	2.401E-06	9.386E-07	5.056E-07	3.221E-07	2.252E-07	1.675E-07	1.304E-07	1.049E-07
SSW	1.007E-05	2.993E-06	1.554E-06	7.760E-07	3.048E-07	1.625E-07	1.019E-07	7.036E-08	5.180E-08	3.995E-08	3.190E-08
SW	1.583E-05	4.884E-06	2.594E-06	1.295E-06	5.036E-07	2.651E-07	1.640E-07	1.119E-07	8.163E-08	6.245E-08	4.951E-08
WSW	2.613E-05	8.182E-06	4.480E-06	2.254E-06	8.783E-07	4.616E-07	2.846E-07	1.937E-07	1.409E-07	1.075E-07	8.509E-08
W	4.885E-05	1.513E-05	8.263E-06	4.167E-06	1.632E-06	8.613E-07	5.330E-07	3.637E-07	2.653E-07	2.029E-07	1.608E-07
WNW	3.552E-05	1.097E-05	5.922E-06	2.976E-06	1.163E-06	6.130E-07	3.788E-07	2.583E-07	1.882E-07	1.439E-07	1.140E-07
NW	2.494E-05	7.574E-06	4.054E-06	2.039E-06	8.014E-07	4.245E-07	2.636E-07	1.805E-07	1.320E-07	1.012E-07	8.037E-08
NNW	1.681E-05	5.078E-06	2.666E-06	1.328E-06	5.167E-07	2.725E-07	1.690E-07	1.156E-07	8.445E-08	6.471E-08	5.139E-08
N	1.259E-05	3.798E-06	2.003E-06	9.989E-07	3.889E-07	2.053E-07	1.274E-07	8.721E-08	6.377E-08	4.889E-08	3.884E-08
NNE	1.300E-05	3.883E-06	2.008E-06	1.001E-06	3.920E-07	2.087E-07	1.307E-07	9.011E-08	6.628E-08	5.108E-08	4.076E-08
NE	1.352E-05	3.964E-06	2.001E-06	9.946E-07	3.915E-07	2.103E-07	1.331E-07	9.249E-08	6.849E-08	5.308E-08	4.256E-08
ENE	1.369E-05	4.006E-06	2.015E-06	1.005E-06	3.980E-07	2.143E-07	1.357E-07	9.438E-08	6.992E-08	5.421E-08	4.348E-08
E	1.914E-05	5.553E-06	2.768E-06	1.378E-06	5.464E-07	2.951E-07	1.876E-07	1.308E-07	9.717E-08	7.549E-08	6.066E-08
ESE	2.475E-05	7.135E-06	3.526E-06	1.744E-06	6.863E-07	3.709E-07	2.367E-07	1.656E-07	1.233E-07	9.602E-08	7.731E-08
SE	3.098E-05	8.906E-06	4.374E-06	2.162E-06	8.520E-07	4.610E-07	2.944E-07	2.061E-07	1.535E-07	1.196E-07	9.634E-08
SSE	5.875E-05	1.683E-05	8.246E-06	4.055E-06	1.587E-06	8.583E-07	5.492E-07	3.852E-07	2.874E-07	2.242E-07	1.808E-07

DISTANCE IN MILES FROM THE SITE
ANNUAL AVERAGE CHI/Q (SEC/METER CUBED)

SECTOR	5.000	7.500	10.000	15.000	20.000	25.000	30.000	35.000	40.000	45.000	50.000
S	8.669E-08	4.408E-08	2.804E-08	1.547E-08	1.007E-08	7.189E-09	5.435E-09	4.277E-09	3.465E-09	2.871E-09	2.422E-09
SSW	2.617E-08	1.297E-08	8.099E-09	4.356E-09	2.789E-09	1.964E-09	1.468E-09	1.144E-09	9.195E-10	7.563E-10	6.336E-10
SW	4.038E-08	1.955E-08	1.202E-08	6.330E-09	3.998E-09	2.785E-09	2.065E-09	1.599E-09	1.277E-09	1.045E-09	8.718E-10
WSW	6.926E-08	3.326E-08	2.033E-08	1.061E-08	6.654E-09	4.613E-09	3.407E-09	2.629E-09	2.095E-09	1.711E-09	1.425E-09
W	1.311E-07	6.332E-08	3.885E-08	2.039E-08	1.283E-08	8.921E-09	6.604E-09	5.105E-09	4.074E-09	3.332E-09	2.777E-09
WNW	9.288E-08	4.483E-08	2.750E-08	1.443E-08	9.091E-09	6.323E-09	4.683E-09	3.622E-09	2.892E-09	2.365E-09	1.972E-09
NW	6.565E-08	3.196E-08	1.972E-08	1.043E-08	6.604E-09	4.610E-09	3.423E-09	2.653E-09	2.122E-09	1.738E-09	1.451E-09
NNW	4.198E-08	2.046E-08	1.264E-08	6.706E-09	4.259E-09	2.980E-09	2.218E-09	1.722E-09	1.379E-09	1.132E-09	9.458E-10
N	3.174E-08	1.550E-08	9.585E-09	5.089E-09	3.233E-09	2.263E-09	1.685E-09	1.308E-09	1.048E-09	8.601E-10	7.191E-10
NNE	3.343E-08	1.654E-08	1.032E-08	5.543E-09	3.546E-09	2.495E-09	1.864E-09	1.452E-09	1.166E-09	9.587E-10	8.027E-10
NE	3.505E-08	1.760E-08	1.109E-08	6.037E-09	3.893E-09	2.755E-09	2.068E-09	1.617E-09	1.303E-09	1.074E-09	9.013E-10
ENE	3.581E-08	1.799E-08	1.134E-08	6.177E-09	3.986E-09	2.822E-09	2.120E-09	1.659E-09	1.337E-09	1.103E-09	9.261E-10
E	5.004E-08	2.528E-08	1.600E-08	8.750E-09	5.662E-09	4.018E-09	3.022E-09	2.367E-09	1.910E-09	1.577E-09	1.325E-09
ESE	6.389E-08	3.248E-08	2.065E-08	1.136E-08	7.382E-09	5.253E-09	3.960E-09	3.108E-09	2.511E-09	2.075E-09	1.745E-09
SE	7.965E-08	4.058E-08	2.583E-08	1.425E-08	9.278E-09	6.615E-09	4.996E-09	3.927E-09	3.178E-09	2.631E-09	2.216E-09
SSE	1.496E-07	7.657E-08	4.890E-08	2.711E-08	1.772E-08	1.267E-08	9.597E-09	7.563E-09	6.135E-09	5.089E-09	4.296E-09

VENT AND BUILDING PARAMETERS:

RELEASE HEIGHT (METERS)	.00	REP. WIND HEIGHT (METERS)	10.0
DIAMETER (METERS)	.00	BUILDING HEIGHT (METERS)	60.9
EXIT VELOCITY (METERS)	.00	BLDG.MIN.CRS.SEC.AREA (SQ.METERS)	2636.0
		HEAT EMISSION RATE (CAL/SEC)	.0

Table 2.3.5-205 (Sheet 2 of 2)
XOQDOQ-Predicted Annual Average X/Q Value at the Standard Radial Distances and Distance Segment Boundaries — 8-Day Decay, Depleted

RELEASE POINT - GROUND LEVEL - NO INTERMITTENT RELEASES
8.000 DAY DECAY, DEPLETED
CHI/Q (SEC/METER CUBED) FOR EACH SEGMENT

DIRECTION	SEGMENT BOUNDARIES IN MILES FROM THE SITE									
FROM SITE	.5-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50
S	4.880E-06	1.071E-06	3.323E-07	1.698E-07	1.057E-07	4.642E-08	1.586E-08	7.257E-09	4.299E-09	2.881E-09
SSW	1.528E-06	3.463E-07	1.055E-07	5.259E-08	3.216E-08	1.374E-08	4.491E-09	1.986E-09	1.151E-09	7.592E-10
SW	2.526E-06	5.736E-07	1.701E-07	8.297E-08	4.996E-08	2.083E-08	6.558E-09	2.821E-09	1.610E-09	1.050E-09
WSW	4.314E-06	9.989E-07	2.954E-07	1.433E-07	8.588E-08	3.551E-08	1.101E-08	4.675E-09	2.648E-09	1.719E-09
W	7.969E-06	1.853E-06	5.528E-07	2.696E-07	1.623E-07	6.751E-08	2.113E-08	9.038E-09	5.141E-09	3.346E-09
WNW	5.735E-06	1.322E-06	3.930E-07	1.913E-07	1.150E-07	4.780E-08	1.496E-08	6.405E-09	3.647E-09	2.376E-09
NW	3.941E-06	9.090E-07	2.733E-07	1.341E-07	8.108E-08	3.401E-08	1.079E-08	4.667E-09	2.671E-09	1.746E-09
NNW	2.607E-06	5.884E-07	1.752E-07	8.582E-08	5.185E-08	2.177E-08	6.938E-09	3.016E-09	1.733E-09	1.136E-09
N	1.956E-06	4.429E-07	1.321E-07	6.480E-08	3.919E-08	1.648E-08	5.263E-09	2.290E-09	1.317E-09	8.637E-10
NNE	1.977E-06	4.458E-07	1.352E-07	6.730E-08	4.110E-08	1.753E-08	5.717E-09	2.523E-09	1.461E-09	9.624E-10
NE	1.990E-06	4.450E-07	1.374E-07	6.947E-08	4.290E-08	1.859E-08	6.208E-09	2.784E-09	1.626E-09	1.078E-09
ENE	2.008E-06	4.512E-07	1.401E-07	7.092E-08	4.382E-08	1.900E-08	6.351E-09	2.852E-09	1.668E-09	1.107E-09
E	2.769E-06	6.196E-07	1.936E-07	9.853E-08	6.112E-08	2.665E-08	8.988E-09	4.058E-09	2.380E-09	1.582E-09
ESE	3.536E-06	7.811E-07	2.441E-07	1.250E-07	7.788E-08	3.420E-08	1.166E-08	5.304E-09	3.124E-09	2.082E-09
SE	4.398E-06	9.693E-07	3.035E-07	1.556E-07	9.705E-08	4.271E-08	1.461E-08	6.677E-09	3.947E-09	2.639E-09
SSE	8.292E-06	1.812E-06	5.660E-07	2.913E-07	1.821E-07	8.051E-08	2.778E-08	1.279E-08	7.600E-09	5.105E-09

XOQDOQ - FPL COL (3 YEAR COMPOSITE 2002, 2005, 2006 Met Data)

Table 2.3.5-206 (Sheet 1 of 2)
XOQDOQ-Predicted Annual Average D/Q value at the Standard Radial Distances and Distance Segment Boundaries

RELEASE POINT - GROUND LEVEL - NO INTERMITTENT RELEASES
CORRECTED USING STANDARD OPEN TERRAIN FACTORS

RELATIVE DEPOSITION PER UNIT AREA (M**-2) AT FIXED POINTS BY DOWNWIND SECTORS

DIRECTION	DISTANCES IN MILES										
FROM SITE	.25	.50	.75	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50
S	1.312E-07	4.436E-08	2.278E-08	1.083E-08	3.889E-09	1.929E-09	1.136E-09	7.437E-10	5.233E-10	3.878E-10	2.988E-10
SSW	5.059E-08	1.711E-08	8.784E-09	4.176E-09	1.500E-09	7.439E-10	4.380E-10	2.868E-10	2.018E-10	1.496E-10	1.153E-10
SW	1.466E-07	4.957E-08	2.545E-08	1.210E-08	4.346E-09	2.155E-09	1.269E-09	8.310E-10	5.847E-10	4.333E-10	3.339E-10
WSW	2.370E-07	8.015E-08	4.115E-08	1.956E-08	7.027E-09	3.485E-09	2.052E-09	1.344E-09	9.455E-10	7.007E-10	5.400E-10
W	4.078E-07	1.379E-07	7.081E-08	3.366E-08	1.209E-08	5.997E-09	3.531E-09	2.312E-09	1.627E-09	1.206E-09	9.291E-10
WNW	3.077E-07	1.040E-07	5.342E-08	2.540E-08	9.122E-09	4.524E-09	2.664E-09	1.744E-09	1.227E-09	9.095E-10	7.009E-10
NW	1.928E-07	6.520E-08	3.347E-08	1.591E-08	5.716E-09	2.835E-09	1.669E-09	1.093E-09	7.691E-10	5.700E-10	4.392E-10
NNW	1.380E-07	4.667E-08	2.396E-08	1.139E-08	4.092E-09	2.029E-09	1.195E-09	7.824E-10	5.505E-10	4.080E-10	3.144E-10
N	1.027E-07	3.474E-08	1.784E-08	8.480E-09	3.046E-09	1.511E-09	8.895E-10	5.824E-10	4.098E-10	3.037E-10	2.340E-10
NNE	7.283E-08	2.463E-08	1.265E-08	6.012E-09	2.160E-09	1.071E-09	6.306E-10	4.129E-10	2.905E-10	2.153E-10	1.659E-10
NE	5.551E-08	1.877E-08	9.639E-09	4.582E-09	1.646E-09	8.163E-10	4.806E-10	3.147E-10	2.215E-10	1.641E-10	1.265E-10
ENE	4.950E-08	1.674E-08	8.594E-09	4.086E-09	1.468E-09	7.278E-10	4.286E-10	2.806E-10	1.975E-10	1.463E-10	1.128E-10
E	5.807E-08	1.964E-08	1.008E-08	4.793E-09	1.722E-09	8.538E-10	5.027E-10	3.292E-10	2.316E-10	1.717E-10	1.323E-10
ESE	6.472E-08	2.189E-08	1.124E-08	5.342E-09	1.919E-09	9.517E-10	5.604E-10	3.669E-10	2.582E-10	1.913E-10	1.474E-10
SE	9.289E-08	3.141E-08	1.613E-08	7.667E-09	2.754E-09	1.366E-09	8.042E-10	5.266E-10	3.705E-10	2.746E-10	2.116E-10
SSE	2.081E-07	7.037E-08	3.613E-08	1.718E-08	6.171E-09	3.060E-09	1.802E-09	1.180E-09	8.302E-10	6.152E-10	4.741E-10

DIRECTION	DISTANCES IN MILES										
FROM SITE	5.00	7.50	10.00	15.00	20.00	25.00	30.00	35.00	40.00	45.00	50.00
S	2.374E-10	1.055E-10	6.389E-11	3.229E-11	1.954E-11	1.310E-11	9.390E-12	7.051E-12	5.482E-12	4.379E-12	3.574E-12
SSW	9.157E-11	4.068E-11	2.464E-11	1.245E-11	7.538E-12	5.054E-12	3.622E-12	2.719E-12	2.114E-12	1.689E-12	1.379E-12
SW	2.653E-10	1.179E-10	7.139E-11	3.608E-11	2.184E-11	1.464E-11	1.049E-11	7.879E-12	6.126E-12	4.893E-12	3.994E-12
WSW	4.290E-10	1.906E-10	1.154E-10	5.835E-11	3.531E-11	2.368E-11	1.697E-11	1.274E-11	9.905E-12	7.912E-12	6.458E-12
W	7.381E-10	3.279E-10	1.986E-10	1.004E-10	6.077E-11	4.074E-11	2.919E-11	2.192E-11	1.704E-11	1.362E-11	1.111E-11
WNW	5.568E-10	2.474E-10	1.498E-10	7.574E-11	4.584E-11	3.073E-11	2.202E-11	1.654E-11	1.286E-11	1.027E-11	8.383E-12
NW	3.489E-10	1.550E-10	9.390E-11	4.746E-11	2.873E-11	1.926E-11	1.380E-11	1.036E-11	8.058E-12	6.436E-12	5.254E-12
NNW	2.498E-10	1.110E-10	6.722E-11	3.397E-11	2.056E-11	1.379E-11	9.879E-12	7.418E-12	5.768E-12	4.607E-12	3.761E-12
N	1.859E-10	8.260E-11	5.004E-11	2.529E-11	1.531E-11	1.026E-11	7.354E-12	5.522E-12	4.294E-12	3.430E-12	2.799E-12
NNE	1.318E-10	5.856E-11	3.547E-11	1.793E-11	1.085E-11	7.276E-12	5.214E-12	3.915E-12	3.044E-12	2.432E-12	1.985E-12
NE	1.005E-10	4.464E-11	2.704E-11	1.367E-11	8.272E-12	5.546E-12	3.974E-12	2.984E-12	2.320E-12	1.853E-12	1.513E-12
ENE	8.959E-11	3.980E-11	2.411E-11	1.219E-11	7.375E-12	4.945E-12	3.543E-12	2.661E-12	2.069E-12	1.652E-12	1.349E-12
E	1.051E-10	4.669E-11	2.828E-11	1.429E-11	8.652E-12	5.801E-12	4.157E-12	3.121E-12	2.427E-12	1.939E-12	1.582E-12
ESE	1.171E-10	5.204E-11	3.152E-11	1.593E-11	9.643E-12	6.466E-12	4.633E-12	3.479E-12	2.705E-12	2.161E-12	1.764E-12
SE	1.681E-10	7.468E-11	4.524E-11	2.287E-11	1.384E-11	9.280E-12	6.649E-12	4.993E-12	3.882E-12	3.101E-12	2.531E-12
SSE	3.767E-10	1.673E-10	1.014E-10	5.123E-11	3.101E-11	2.079E-11	1.490E-11	1.119E-11	8.698E-12	6.948E-12	5.671E-12

XOQDOQ - FPL COL (3 YEAR COMPOSITE 2002, 2005, 2006 Met Data)

Table 2.3.5-206 (Sheet 2 of 2)
XOQDOQ-Predicted Annual Average D/Q value at the Standard Radial Distances and Distance Segment Boundaries

RELEASE POINT - GROUND LEVEL - NO INTERMITTENT RELEASES
RELATIVE DEPOSITION PER UNIT AREA (M**-2) BY DOWNWIND SECTORS

DIRECTION FROM SITE	SEGMENT BOUNDARIES IN MILES .5-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50
S	2.226E-08	4.560E-09	1.190E-09	5.346E-10	3.024E-10	1.163E-10	3.365E-11	1.334E-11	7.122E-12	4.408E-12
SSW	8.586E-09	1.759E-09	4.591E-10	2.062E-10	1.166E-10	4.486E-11	1.298E-11	5.143E-12	2.747E-12	1.700E-12
SW	2.488E-08	5.095E-09	1.330E-09	5.974E-10	3.380E-10	1.300E-10	3.760E-11	1.490E-11	7.958E-12	4.926E-12
WSW	4.022E-08	8.239E-09	2.151E-09	9.660E-10	5.465E-10	2.101E-10	6.080E-11	2.410E-11	1.287E-11	7.964E-12
W	6.921E-08	1.418E-08	3.701E-09	1.662E-09	9.403E-10	3.616E-10	1.046E-10	4.146E-11	2.214E-11	1.370E-11
WNW	5.221E-08	1.069E-08	2.792E-09	1.254E-09	7.094E-10	2.728E-10	7.892E-11	3.128E-11	1.670E-11	1.034E-11
NW	3.272E-08	6.702E-09	1.750E-09	7.858E-10	4.445E-10	1.709E-10	4.945E-11	1.960E-11	1.047E-11	6.479E-12
NNW	2.342E-08	4.798E-09	1.252E-09	5.625E-10	3.182E-10	1.224E-10	3.540E-11	1.403E-11	7.493E-12	4.638E-12
N	1.743E-08	3.571E-09	9.323E-10	4.187E-10	2.369E-10	9.109E-11	2.635E-11	1.044E-11	5.577E-12	3.452E-12
NNE	1.236E-08	2.532E-09	6.610E-10	2.969E-10	1.679E-10	6.458E-11	1.868E-11	7.405E-12	3.954E-12	2.447E-12
NE	9.421E-09	1.930E-09	5.038E-10	2.263E-10	1.280E-10	4.922E-11	1.424E-11	5.644E-12	3.014E-12	1.865E-12
ENE	8.400E-09	1.721E-09	4.492E-10	2.017E-10	1.141E-10	4.389E-11	1.270E-11	5.032E-12	2.687E-12	1.663E-12
E	9.854E-09	2.019E-09	5.269E-10	2.367E-10	1.339E-10	5.149E-11	1.489E-11	5.903E-12	3.152E-12	1.951E-12
ESE	1.098E-08	2.250E-09	5.873E-10	2.638E-10	1.492E-10	5.739E-11	1.660E-11	6.580E-12	3.514E-12	2.175E-12
SE	1.576E-08	3.229E-09	8.430E-10	3.786E-10	2.142E-10	8.236E-11	2.383E-11	9.444E-12	5.043E-12	3.121E-12
SSE	3.532E-08	7.234E-09	1.889E-09	8.482E-10	4.798E-10	1.845E-10	5.338E-11	2.116E-11	1.130E-11	6.993E-12

VENT AND BUILDING PARAMETERS:

RELEASE HEIGHT	(METERS)	.00	REP. WIND HEIGHT	(METERS)	10.0
DIAMETER	(METERS)	.00	BUILDING HEIGHT	(METERS)	69.7
EXIT VELOCITY	(METERS)	.00	BLDG.MIN.CRS.SEC.AREA	(SQ.METERS)	2636.0
			HEAT EMISSION RATE	(CAL/SEC)	.0

ALL GROUND LEVEL RELEASES.
XOQDOQ - FPL COL (3 YEAR COMPOSITE 2002, 2005, 2006 Met Data)

Table 2.3.5-207
XOQDOQ-Predicted Annual Average X/Q and D/Q Values at Sensitive Receptors

RELEASE POINT - GROUND LEVEL - NO INTERMITTENT RELEASES
CORRECTED USING STANDARD OPEN TERRAIN FACTORS
SPECIFIC POINTS OF INTEREST

RELEASE ID	TYPE OF LOCATION	DIRECTION FROM SITE	DISTANCE (MILES)	DISTANCE (METERS)	X/Q (SEC/CUB.METER) NO DECAY UNDEPLETED	X/Q (SEC/CUB.METER) 2.260 DAY DECAY UNDEPLETED	X/Q (SEC/CUB.METER) 8.000 DAY DECAY DEPLETED	D/Q (PER SQ.METER)
A	Residential	NW	3.97	6388.	1.3E-07	1.3E-07	1.0E-07	5.8E-10
A	Residential	NNW	5.06	8145.	5.5E-08	5.4E-08	4.1E-08	2.4E-10
A	Residential	N	2.69	4333.	1.4E-07	1.3E-07	1.1E-07	7.5E-10
A	Vegetable	NW	4.78	7692.	9.6E-08	9.4E-08	7.2E-08	3.8E-10
A	Vegetable	NNW	5.06	8145.	5.5E-08	5.4E-08	4.1E-08	2.4E-10
A	UNIT 7	W	.13	215.	1.6E-04	1.6E-04	1.5E-04	1.0E-06
A	School	NW	1.99	3198.	5.2E-07	5.2E-07	4.3E-07	2.9E-09
A	EAB	S	.52	840.	1.0E-05	1.0E-05	9.1E-06	4.1E-08
A	EAB	SSW	.51	819.	3.2E-06	3.2E-06	2.9E-06	1.7E-08
A	EAB	SW	.45	724.	6.3E-06	6.3E-06	5.8E-06	5.9E-08
A	EAB	WSW	.48	780.	9.4E-06	9.3E-06	8.6E-06	8.4E-08
A	EAB	W	.49	782.	1.7E-05	1.7E-05	1.6E-05	1.4E-07
A	EAB	WNW	.49	789.	1.2E-05	1.2E-05	1.1E-05	1.1E-07
A	EAB	NW	.48	766.	8.9E-06	8.9E-06	8.2E-06	7.1E-08
A	EAB	NNW	.48	767.	6.0E-06	6.0E-06	5.5E-06	5.0E-08
A	EAB	N	.48	767.	4.5E-06	4.5E-06	4.1E-06	3.8E-08
A	EAB	NNE	.48	767.	4.6E-06	4.6E-06	4.2E-06	2.7E-08
A	EAB	NE	.27	435.	1.2E-05	1.2E-05	1.2E-05	4.9E-08
A	EAB	ENE	.28	458.	1.1E-05	1.1E-05	1.1E-05	4.1E-08
A	EAB	E	.30	479.	1.5E-05	1.5E-05	1.4E-05	4.5E-08
A	EAB	ESE	.37	589.	1.3E-05	1.3E-05	1.2E-05	3.6E-08
A	EAB	SE	.36	586.	1.7E-05	1.7E-05	1.6E-05	5.2E-08
A	EAB	SSE	.53	848.	1.7E-05	1.7E-05	1.5E-05	6.5E-08
A	Prop Line	S	.36	577.	1.9E-05	1.9E-05	1.8E-05	7.5E-08
A	Prop Line	SSW	2.72	4373.	1.1E-07	1.1E-07	8.6E-08	3.6E-10
A	Prop Line	SW	1.50	2409.	6.0E-07	5.9E-07	5.1E-07	4.4E-09
A	Prop Line	WSW	1.36	2195.	1.3E-06	1.3E-06	1.1E-06	8.9E-09
A	Prop Line	W	1.35	2173.	2.4E-06	2.4E-06	2.1E-06	1.6E-08
A	Prop Line	WNW	1.80	2903.	9.2E-07	9.2E-07	7.7E-07	5.8E-09
A	Prop Line	NW	1.64	2641.	7.8E-07	7.7E-07	6.6E-07	4.6E-09
A	Prop Line	NNW	1.51	2430.	6.0E-07	6.0E-07	5.1E-07	4.0E-09
A	Prop Line	N	1.12	1797.	8.9E-07	8.8E-07	7.7E-07	6.4E-09
A	Prop Line	NNE	1.10	1773.	9.2E-07	9.1E-07	8.0E-07	4.7E-09
A	Prop Line	NE	.39	624.	6.7E-06	6.6E-06	6.2E-06	2.8E-08
A	Prop Line	ENE	.40	647.	6.3E-06	6.3E-06	5.8E-06	2.4E-08
A	Prop Line	E	.39	635.	9.1E-06	9.1E-06	8.4E-06	2.9E-08
A	Prop Line	ESE	.43	688.	1.0E-05	1.0E-05	9.4E-06	2.8E-08
A	Prop Line	SE	.37	595.	1.6E-05	1.6E-05	1.5E-05	5.1E-08
A	Prop Line	SSE	.35	564.	3.4E-05	3.4E-05	3.2E-05	1.2E-07

VENT AND BUILDING PARAMETERS:

RELEASE HEIGHT	(METERS)	.00	REP. WIND HEIGHT	(METERS)	10.0
DIAMETER	(METERS)	.00	BUILDING HEIGHT	(METERS)	60.9
EXIT VELOCITY	(METERS)	.00	BLDG.MIN.CRS.SEC.AREA	(SQ.METERS)	2636.0
			HEAT EMISSION RATE	(CAL/SEC)	.0

Note: “Prop Line” refers to the site boundary.

2.3.6 COMBINED LICENSE INFORMATION

2.3.6.1 Regional Climatology

PTN COL 2.3-1 This COL Item is addressed in Subsection 2.3.1.

2.3.6.2 Local Meteorology

PTN COL 2.3-2 This COL Item is addressed in Subsection 2.3.2.

2.3.6.3 Onsite Meteorological Measurement Programs

PTN COL 2.3-3 This COL Item is addressed in Subsection 2.3.3.

2.3.6.4 Short-Term Diffusion Estimates

PTN COL 2.3-4 This COL Item is addressed in Subsection 2.3.4.

2.3.6.5 Long-Term Diffusion Estimates

PTN COL 2.3-5 This COL Item is addressed in Subsection 2.3.5.

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