Section 8. High Winds

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Why High Winds Are a Threat

Wind is defined as the motion of air relative to the earth's surface. The horizontal component of the three-dimensional flow and the near-surface wind phenomenon are the most significant aspects of the high wind hazard. Extreme windstorm events are associated with extra-tropical and tropical cyclones, winter cyclones, and severe thunderstorms and accompanying mesoscale offspring such as tornadoes and straight-line winds.

Straight-line winds are often responsible for most of the wind damage associated with a thunderstorm. These winds are often confused with tornadoes because of similar damage and wind speeds. However, the strong and gusty winds associated with straight-line winds blow roughly in a straight line unlike the rotating winds of a tornado.

Downbursts or microbursts are examples of damaging straight-line winds. A downburst is a small area of rapidly descending rain and rain-cooled air beneath a thunderstorm that produces a violent, localized downdraft covering 2.5 miles or less. Wind speeds in some of the stronger downbursts can reach 100 to 150 miles per hour, which is similar to that of a strong tornado. The winds produced from a downburst often occur in one direction, and the worst damage is usually on the forward side of the downburst.

In the mainland United States, the mean annual wind speed is reported to be 8 to 12 mph, with frequent speeds of 50 mph and occasional wind speeds of greater than 70 mph. For coastal areas from Texas to Maine, tropical cyclone (hurricane) winds may exceed 100 mph.

Property damage and loss of life from windstorms are increasing due to a variety of factors. Use of manufactured housing is on an upward trend, and this type of structure provides less resistance to

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wind than conventional construction. Uniform building codes for wind resistant construction are not adopted by all states, and population trends show rapid growth in the highly exposed areas.

Areas experiencing the highest wind speeds are coastal regions from Texas to Maine, under the influence of North Atlantic Ocean and Gulf of Mexico windstorms associated with tropical cyclones (hurricanes) , and the Alaskan coast, under the influence of winter low-pressure-system windstorms in the Gulf of Alaska and North Pacific Ocean.

Hazard Profile

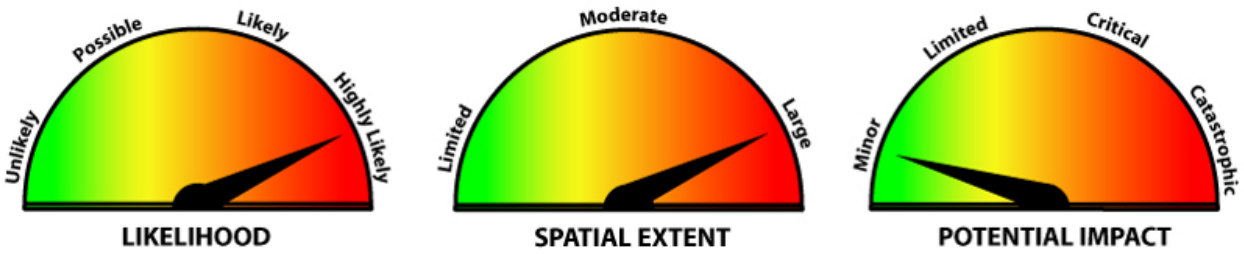

Figure 8-1. High Wind Hazard Profile Summary for the City of Plano

The frequency, or likelihood, of a high winds in the City of Plano is "Highly Likely", with an event probable in the next year. Most thunderstorms and resulting high wind events occur during the spring (March, April, May and June) and, at a lesser intensity, during the fall (September, October, and November). This is because thunderstorms form when warm, moist air collides with cooler, drier air. Often these masses tend to come together during the transition from summer to winter. Warning time for high winds is minimal.

The spatial extent of high winds could cover a large area of the City of Plano, potentially affecting more than 50% of property. The potential impact of high winds is "Minor," involving few, if any, injuries. The potential exists for only minor property damage and minimal disruption to the quality of life. Shutdown of facilities would be temporary.

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Magnitude and Distribution of High Wind Events

Two databases of the National Climatic Data Center (NCDC) record the magnitude and frequency of wind speeds. These are, first, the U.S. Storm Event data and, second, daily peak gust data collected at hourly climatic stations operated by the National Weather Service (NWS) as part of the spotter network. National Weather Service climatic stations in or near the North Central Texas region are shown in Table 8-1and mapped in Figure 8-2.

Table 8-1. Summary of National Weather Service climatic stations in and near Plano with at Least 20 Years of Record for Peak Wind Gusts

COUNTY	STATION_NA	Beginning Year	Ending Year
DALLAS	DALLAS HENSLEY FIELD NAS	1948	1997
TARRANT	DALLAS-FORT WORTH INTL AP	1974	1995
TARRANT	FORT WORTH GREATER SW INT'L A	1953	1974
TARRANT	FORT WORTH NAS	1958	2003
WICHITA	WICHITA FALLS MUNICIPAL ARPT	1951	1993
TAYLOR	ABILENE REGIONAL AP	1973	1996
McLENNON	WACO REGIONAL AP	1972	1993
CADDO	SHREVEPORT REGIONAL ARPT	1952	1995

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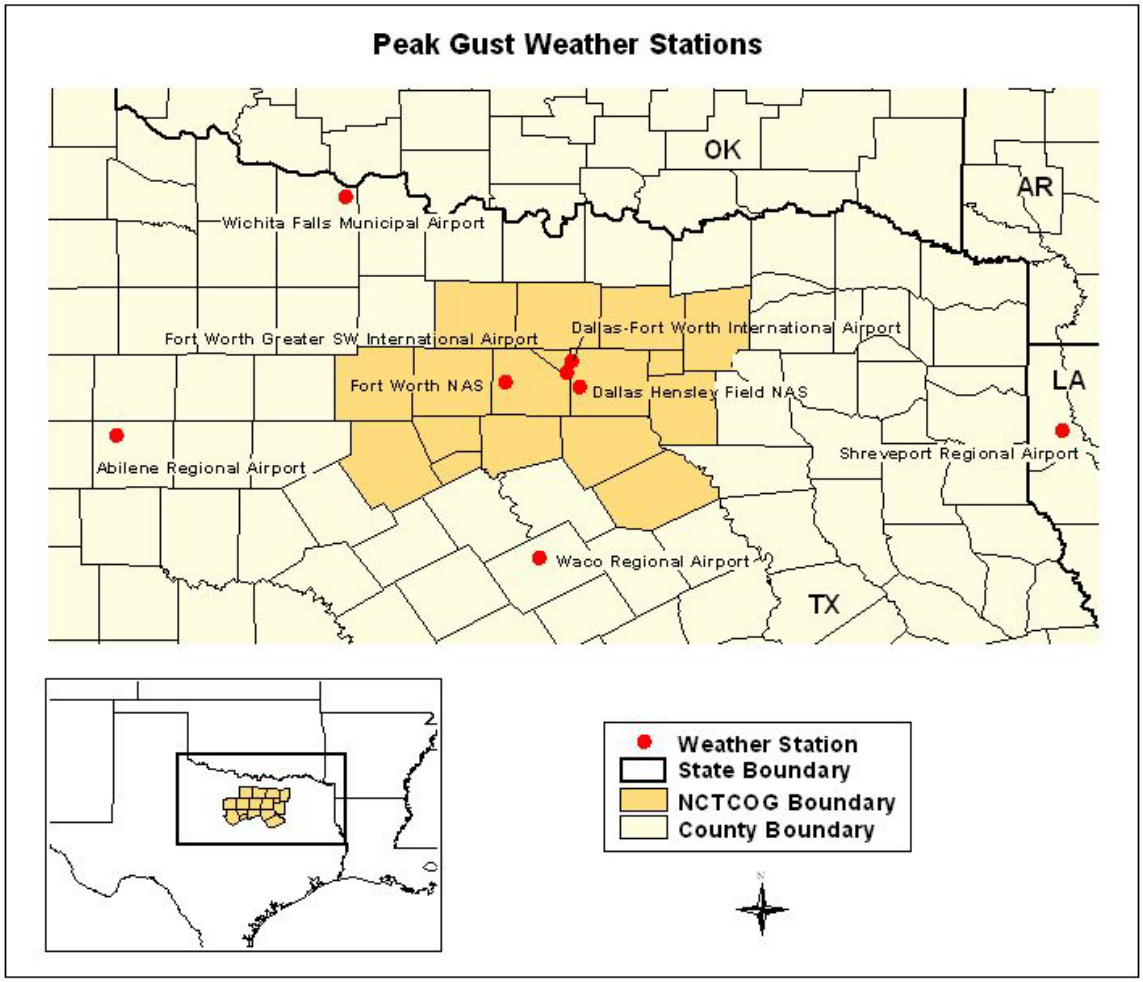

Figure 8-2. Location of the climatic stations in North Central Texas

The wind speeds are characterized by the peak gusts in miles per hour. The 2-, 10-, 50-, and 100-year peak wind gusts and the annual maximum peak gusts were estimated at each site.

Figure 8-3 plots the annual maximum peak wind gusts and recurrence intervals for Dallas Hensley Field in Dallas County. As indicated by Figure 8-3, within a recurrence interval or "window of time" of 80 years, peak wind gusts of about 90 miles per hour are expected. Within a ten-year recurrence interval, peak wind gusts of about 72 miles per hour are expected. Within a one-year recurrence interval, peak wind gusts of about 33 miles per hour are expected.

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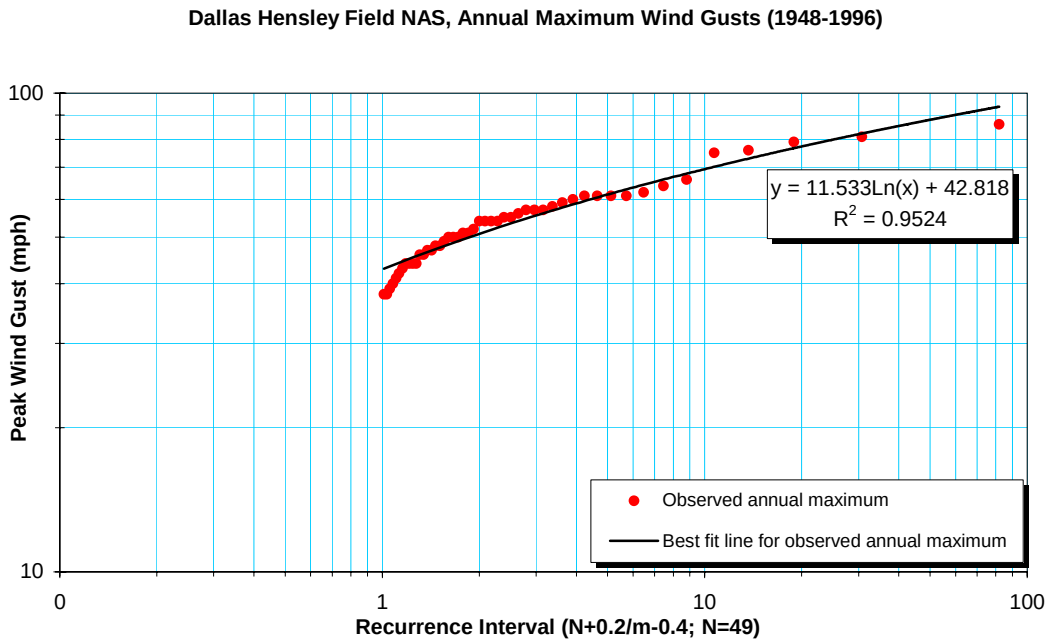

Figure 8-3. Frequency curve based on the Cunnane plotting position of the annual maximum peak gusts for Dallas Hensley Field in Dallas County for the period 1948 to 1996

The 2-, 10-, 50-, and 100-year recurrence interval events for peak gusts above a threshold are summarized in Table 8-2 using the Cunnane plotting method.

Table 8-2. Summary of frequency estimates for the eight stations based on the peak wind gusts above a threshold

Location and Recurrence Interval (Years of Observation)	Peak Wind Gusts
Dallas Hensley Field (49)	
2-year estimate (mph):	60
10-year estimate (mph):	72
50-year estimate (mph):	86
100-year estimate (mph):	93
Dallas-Fort Worth Int'l AP (21)	
2-year estimate (mph):	51
10-year estimate (mph):	61
50-year estimate (mph):	71
100-year estimate (mph):	76
Fort Worth Greater SW Int'l AP (21)	
2-year estimate (mph):	61
10-year estimate (mph):	74
50-year estimate (mph):	89
100-year estimate (mph):	97
Fort Worth NAS (20)	
2-year estimate (mph):	59
10-year estimate (mph):	77
50-year estimate (mph):	100
100-year estimate (mph):	113
Waco Regional AP (21)	
2-year estimate (mph):	51
10-year estimate (mph):	59
50-year estimate (mph):	69
100-year estimate (mph):	74
Shreveport Regional AP (43)	
2-year estimate (mph):	58
10-year estimate (mph):	69
50-year estimate (mph):	81
100-year estimate (mph):	86

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Location and Recurrence Interval (Years of Observation)	Peak Wind Gusts
Abilene Regional AP (23)	
2-year estimate (mph):	53
10-year estimate (mph):	63
50-year estimate (mph):	74
100-year estimate (mph):	80
Wichita Falls Municipal AP (43)	
2-year estimate (mph):	61
10-year estimate (mph):	73
50-year estimate (mph):	87
100-year estimate (mph):	94

The wind hazard does not vary significantly over North Central Texas region, but does change outside the North Central Texas region. As shown in Figure 8-2, the 2-year event at Dallas Hensley Field is 60 miles per hour (mph), the 10-year event is 72 mph, the 50-year event is 86 mph, and the 100-year event is 93 mph for the North Central Texas region. Thus, based on 49 nears of observation at Dallas Hensley Field, during a two-year "window of time," peak wind gusts of 60 miles per hour are expected; during a 10-year "window of time," winds of 72 miles per hour are expected; during a 50-year "window of time," winds of 86 miles per hour are expected; and during a 100-year "window of time, winds of 93 miles per hour are expected.

Location of Hazardous Areas

There is no distinct geographic boundary to high winds. High winds can occur in every area of the City and of the North Central Texas region equally. Figure 8-5 provides a map of reported high wind events in the City of Plano from 1950 to 2003.

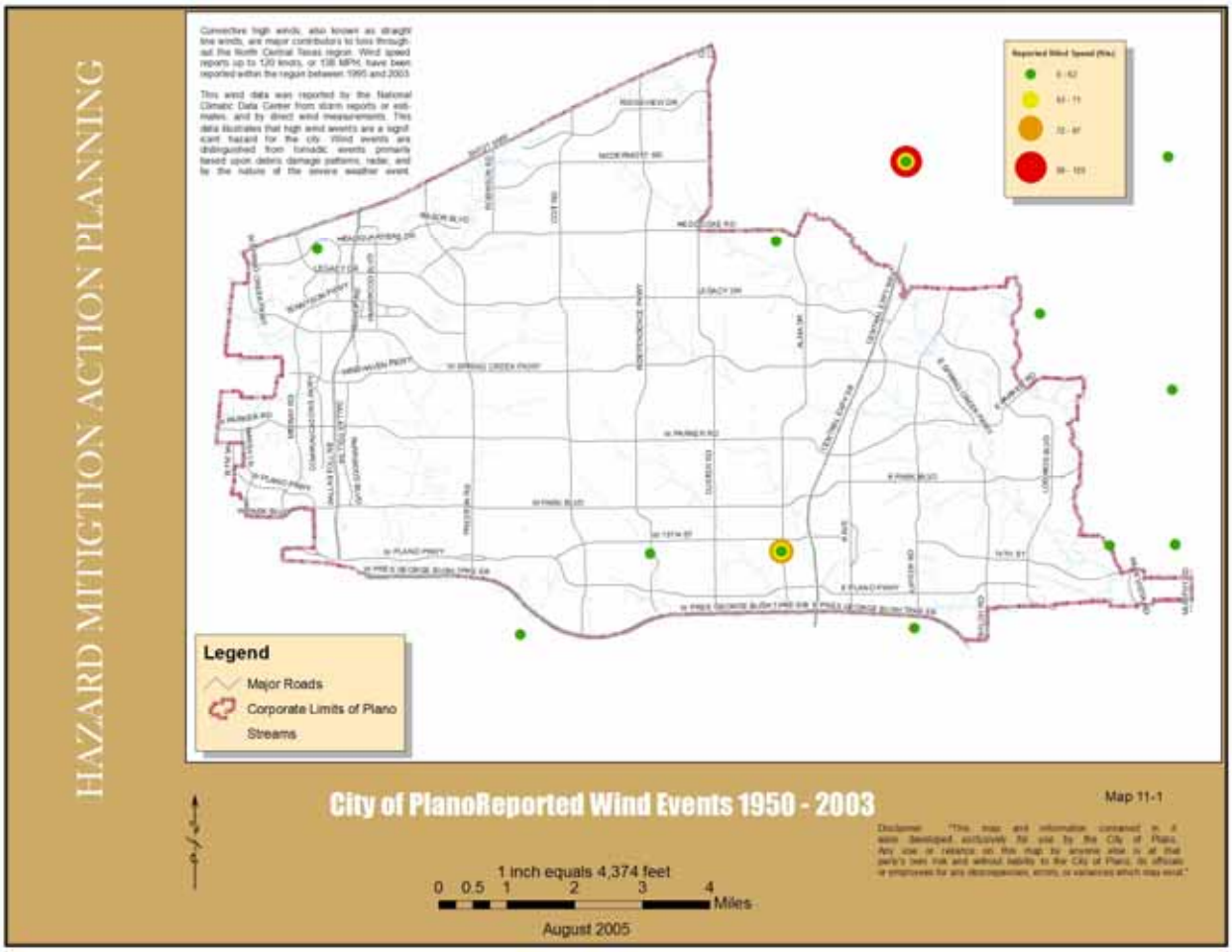

Figure 8-5. City of Plano Reported High Wind Events, 1950 - 2003

History of High Winds

North Central Texas experiences severe windstorms. Since 1955 over 160 windstorms with wind speeds exceeding 70 mph have been recorded in the NCTCOG region. On April 19, 1995 Somervell County experienced a windstorm with wind speeds of 120 mph. Tarrant County was subjected to windstorms with wind speeds of 115 mph on May 4, 1960 and April 19, 1976. A windstorm event on March 2, 1997 in Navarro County resulted in approximately $500,000 in property damage, 4 injuries and 2 fatalities. In the April 23, 2003 thunderstorms that rolled through the NCTCOG region, 100 mph winds were responsible for destroying dozens of mobile homes, injuring seven people, and causing an estimated $4 million in damage in Johnson County. More

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recently in August 2003, high winds wreaked havoc with the construction industry. A construction worker was killed on August 24 when straight-line winds caused a wall to collapse at the construction site of a new Home Depot in Carrollton. Less than two days later, downburst winds estimated at 65-70 mph killed one man and injured four others at a residential construction site in McKinney.

As indicated in Table 8-3, There have been 37 thunderstorm and high wind events (50 knots or 58 miles per hour or over) reported in the City of Plano or in Collin County, Texas between January 1, 1950 and April 30, 2005.

Table 8-3. Reported Thunderstorm and High Wind Events in Collin County and the City of Plano, according to the National Oceanic and Atmospheric Administration, January 1, 1950 to April 30, 2005

Event	Location	Date	Wind Speed (knots)
Collin County			
Thunderstorm Wind	Collin	05/27/1963	62
Thunderstorm Wind	Collin_	05/23/1981	56
Thunderstorm Wind	Collin	05/17/1982	52
Thunderstorm Wind	Collin	05/22/1983	52
Thunderstorm Wind	Collin_	08/12/1983	52
Thunderstorm Wind	Collin_	03/26/1985	61
Thunderstorm Wind	Collin	07/22/1985	56
Thunderstorm Wind	Collin	07/21/1986	52
Thunderstorm Wind	Collin	09/28/1986	52
Thunderstorm Wind	Collin	05/03/1987	51
Thunderstorm Wind	Collin	05/14/1987	55
Thunderstorm Wind	Collin	05/28/1987	61
Thunderstorm Wind	Collin	11/12/1988	52
Thunderstorm Wind	Collin	06/02/1989	56
Thunderstorm Wind	Collin	06/04/1989	52
Thunderstorm Wind	Collin	06/04/1989	52
Thunderstorm Wind	Collin	07/02/1989	61
Thunderstorm Wind	Collin	01/17/1990	60
Thunderstorm Wind	Collin	08/21/1990	62
Thunderstorm Wind	Collin	04/28/1991	52
Thunderstorm Wind	Collin_	04/28/1991	50

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Event	Location	Date	Wind Speed (knots)
Thunderstorm Wind	Collin	06/05/1991	61
Thunderstorm Wind	Collin	07/15/1991	65
Thunderstorm Wind	Collin	09/24/1991	52
Thunderstorm Wind	Collin	05/11/1992	51
Thunderstorm Wind	Collin	05/11/1992	51
Thunderstorm Wind	Collin	06/28/1992	65
Thunderstorm Wind	Collin	09/02/1992	61
High Wind	Collin	02/26/1996	52
High Wind	Collin	04/11/2001	57
Thunderstorm Wind	Collin	06/14/2001	58
City of Plano			
Thunderstorm Wind	Plano	03/29/1997	52
Thunderstorm Wind	Plano	05/19/1997	57
Thunderstorm Wind	Plano	06/16/1997	58
Thunderstorm Wind	Plano	11/09/1998	50
Thunderstorm Wind	Plano	02/25/2000	61
Thunderstorm Wind	Plano	08/22/2003	61
Thunderstorm Wind	Plano	08/22/2003	61

People and Property at Risk

There is no defined geographic boundary for thunderstorm events. High wind events usually impact large geographical areas; thus, all population, buildings, critical facilities, infrastructure and lifelines, and hazardous materials facilities are considered exposed to the hazard and could potentially be impacted. As a result, high wind hazards deserve mitigation consideration by the City of Plano.

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