

Pinellas County

Hazard Identification and Vulnerability Assessment

In order to minimize loss of life, human suffering, damage to public and private property, and economic loss we must have complete knowledge of the types of hazards that affect Pinellas County. This Hazard Identification and Vulnerability Assessment is a vital component in the development of a county wide Local Mitigation Strategy. Through the information gathered, we will be better able to determine and prioritize mitigation initiatives.

The Hazard Identification and Vulnerability Assessment includes types of hazards, location, and population affected. The information was compiled by:

- Pinellas County Emergency Management
- Pinellas County Planning Department
- Pinellas County Emergency Communications
- Pinellas County Economic Development
- Pinellas County Environmental Management
- St. Petersburg Clearwater Airport, Albert Whitted Airport
- Port Authority Tampa
- Federal Aviation Administration
- Clearwater Airpark
- National Weather Service
- State of Florida DOT
- Pinellas County Parks
- U.S. Geological Survey
- National Climatic Data Center
- Local Mitigation Strategy Workgroup

General Description of Pinellas County

Pinellas County is a peninsula located on the west central coast of Florida, bordered on the west by the Gulf of Mexico, and on the east and south, by Tampa Bay. It is the second smallest county in Florida, based on geographic size, with a land area of 280 square miles or 179,314 acres and is the most densely populated. Pinellas County has a total of 587.77 miles of coastline.

NATURAL FEATURES: The elevation of Pinellas County ranges from Mean Sea Level (MSL) to 97 feet. The County is divided into five different topographic features that also correspond to elevation: the ridge, which consists of gently rolling hills, with elevations between 40 and 97 feet; the transition area, with elevations between ten and 40 feet; the flood plain, with elevations between zero and ten feet; the barrier islands, with elevations between zero and ten feet; and the coastal filled areas, that have elevations between zero and five feet. The filling of selected waterfront areas in Pinellas County began in 1920, as a means of providing commercial and residential real estate for construction. Since that time, approximately 4,790 acres of water surrounding the Pinellas Peninsula, have been filled. The most extensive filling was done in Boca Ciega

Bay, where 25% of the Bay, or approximately 2,506 acres were filled. This practice has been discontinued.

RIVERS, CREEKS AND LAKES: Pinellas County has only one river, the Anclote. It exits into the Gulf of Mexico and is located in the extreme northern portion of the County, in the Tarpon Springs vicinity. There are numerous creeks and drainage channels in the county.

Lake Tarpon is the largest lake in the County, covering 2,534 acres. It is fed by groundwater and at the surface by Brooker Creek. Until 1967, the lake was connected hydrologically to Spring Bayou (eventually flowing into the Anclote River) but was subsequently damned off by the US Army Corps Of Engineers in order to control saltwater intrusion into Lake Tarpon. A controlled height canal is an outfall for the lake into Tampa Bay near the City of Safety Harbor and is used to maintain the water level at approximately 3.1 feet above mean sea level. Lake Seminole is 980 acres in surface area and was formerly an estuary at the end of Long Bayou. Only about five feet deep, many outfalls from the western shoreline empty into the lake. Lake Maggiore is 380 acres in size and ten feet deep. Other large lakes in the County include: Salt Lake 220 acres; Lake Del Oro 75 acres; Alligator Lake 77 acres; Lake St. George and Lake Chautaugua each about 50 acres.

ISLANDS: There are a series of barrier islands in close proximity to the mainland coast. These islands extend about 34 miles along the western coastline of the County. With the exception of Caladesi Island and Anclote Key, all barrier islands are connected to the mainland by a series of 14 causeways and bridges. The barrier islands are densely populated and completely built out. Their population consists of single family houses, hotels/motels, condominiums and mobile home parks.

CLIMATE: The climate in Pinellas County is subtropical marine, characterized by long, humid summers and mild winters. Rainfall is abundant, especially during the summer months.

The annual average rainfall is 51.9 inches, mostly occurring during June through September. The driest months of the year are April and November. Snowfall in Pinellas County is rare. The maximum recorded monthly accumulation was two inches in January, 1977.

The average annual temperature is 74.1 degrees Fahrenheit. The average high is 81.7 Fahrenheit and the average low is 60.6. In the winter months, the normal daily fluctuation in temperatures is from the low 50s to the low 70s. In the summer months, the temperatures range from the low 70s to the high 90s.

The number of freezes recorded, at Tampa International Airport, is an average of 3.3 days at 32 degrees Fahrenheit or below per year. Due to Pinellas County's exposure to shoreline, our average number of freezes may be less than those recorded at Tampa International Airport.

Pinellas County has a very active thunderstorm season during the summer. There is an average of 85.1 thunderstorms a year. Most occur during the months of June through September. The hurricane season extends from June 1 through November 30.

POPULATION: Pinellas County has the fifth largest population in Florida, with an estimated 927,438 permanent residents, 42,890 seasonal residents, and 89,166 tourists for a total of 1,059,495 in the year 2000. The current population density is 3,312 persons per square mile. A large percentage of residents live in coastal communities. It is estimated, in the year 2030, the total county population will be 1,146,934.

Permanent Population Estimates

Municipality	1997
Belleair	4,153
Belleair Beach	2,196
Belleair Bluffs	2,096
Belleair Shore	60
Clearwater	103,521
Dunedin	35,440
Gulfport	11,961
Indian Rocks Beach	4,242
Indian Shores	1,489
Kenneth City	4,454
Largo	67,906
Madeira Beach	4,220
North Redington Beach	1,161
Oldsmar	9,666
Pinellas Park	44,736
Redington Beach	1,575
Redington Shores	2,436
Safety Harbor	17,054
St. Petersburg	241,810
St. Pete Beach	9,801
Seminole	9,325
South Pasadena	5,971
Tarpon Springs	19,971
Treasure Island	7,378
Unincorporated	280,848

Population Living in Hurricane Evacuation Levels

An estimated 676,250 residents will have to evacuate for a worst case hurricane scenario. The figures below depict the cumulative numbers of people who would have to evacuate based on the severity or category of the hurricane.

Level A Cat 1	Level B Cat 2	Level C Cat 3	Level D Cat 4	Level E Cat 5
392,010	482,190	581,000	647,190	676,250

Economic Indicators

1997-1998 Annual Average Unemployment Rate was 3.5%

Income County Ranking in State:

#4 Total personal income (\$23.7 billion in 1996)

#7 Total earned income (\$12.9 billion in 1996)

#8 Per capita income (\$27,311 in 1996)

Pinellas County ranks first in the State in total retail sales, food stores, general merchandise stores, automobile dealerships, and building material/hardware establishments.

The Pinellas County School district is the 7th largest school district in Florida.

Tourism was up approximately 3% in 1997 from 1996. Over 4.3 million people visited Pinellas County in 1997, spending an estimated \$2.3 billion.

HOUSING: There are an estimated 500,000 housing units in Pinellas County. There are 368 mobile home parks with 56,305 units. 73,955 Condominiums, and 78,665 Apartments.

TRANSPORTATION: Pinellas County is serviced by five major highways, I-275, US Highway 19, US 19A, US 92, and Highway 60. Other major transportation routes are as follows: Tarpon Avenue/SR582, Tampa Road/752-SR584, Curlew Road/SR586, East Bay/SR686, Ulmerton Road/SR688, Park Boulevard/Gandy Boulevard, CR611, SR580, SR 693 and Gulf Boulevard/SR699.

Airports: There are three airports located in Pinellas County, the St. Petersburg-Clearwater International Airport which houses the largest Coast Guard Air Station in the country, Albert Whitted Municipal Airport, and the Clearwater Airpark. Additionally, in close proximity, in Hillsborough County, are Tampa International Airport and MacDill Air Force Base.

Bus: There are two bus lines operating in Pinellas County. One bus line, the Pinellas Suncoast Transit Authority with a fleet of 143 buses, provides intra-county public transportation. The other bus line, Greyhound, provides inter-state service. Additionally, the Pinellas County School Board operates a fleet of 573 school buses for the movement of students.

Railroad: CSX operates a single line freight rail service through mostly industrial areas in Pinellas County. Most of the railway in Pinellas County has been converted into the Pinellas Trail, a recreational thoroughfare that traverses the county.

Waterways: Pinellas County has two ports, Port of St. Petersburg and Port Tarpon for shallow draft ships. Deep draft ships must use Port Tampa in Hillsborough County or Port Manatee in Manatee County. In 1998, Port Tampa recorded 4,077 operations. The majority shipped fertilizer and phosphates. The total number of barges in Tampa's operations is 1,251 and the total number of vessels and tugs are 1,172. There are several smaller ports and terminals throughout Tampa Bay.

The following are significant historical waterway accidents: 1980 Black Thorn and Capricorn both sunk, 1980 Summit Venture and the Skyway Bridge with major fatalities, and 1993 three vessels collided which caused a significant oil spill. There have been several groundings with no pollution.

SPECIAL FACILITIES/POPULATIONS:

There are 20 hospitals with one in evacuation Level A, one in evacuation Level B, one in evacuation Level C, one in evacuation Level D, and three in evacuation Level E.

There are 324 Assisted Living Facilities. Thirty five are in an evacuation Level A, 28 are in evacuation Level B, 28 are in evacuation Level C, 35 are in evacuation Level D, and 12 are in evacuation Level E.

There are 84 Nursing Homes. Seven are in evacuation Level A, nine are in evacuation Level B, ten evacuation Level C, nine are in evacuation Level D, and two are in evacuation Level E.

The following is an estimated number of patients who would require evacuation for the various levels/categories of hurricanes:

LEVEL	A	B	C	D	E
Hospital	0	260	300	774	1,119
Nursing Home	389	1,317	1,993	3,354	3,991
Total	389	1,577	2,293	4,128	5,110

There are 15 Ambulatory Surgical Centers. Two are in evacuation Level A, four are in evacuation Level B, and one in evacuation Level D.

There are approximately 30,000 people receiving home health care and 1,200 receiving Hospice Care in Pinellas County. To date, we have 1,600 registered in the Special Needs Program meaning they have no means of transportation in the event of a disaster.

Natural Hazards Affecting Pinellas County

Drought

History: Drought occurs every few years even after periods of heavy rain. They can become severe if several months pass without significant precipitation. During such droughts, restrictions have been placed on water usage. As a result, alternative water sources, such as desalination plants, are being studied.

Probability: Based on historical trends, the frequency of drought in Florida is every five to ten years. Fortunately, the geographic location of Florida places it at far less risk for drought than the western states, because Florida remains humid, even with less than average rainfall. Thus, the occurrence of drought is considered to be low.

Vulnerability: Pinellas County does not have much open wildland. That which does exist is located mostly in the northern areas of the County; Safety Harbor, East Lake, and Oldsmar. When such wildland becomes parched, it becomes more susceptible to wildfires.

Pinellas County is surrounded by water, thus at first glance one might think that the area could never suffer from drought. Unfortunately, the water is saltwater and is not currently available for human consumption or daily uses. When considering how densely populated the County has become, and the high demands placed on the water supply daily, the area can be moderately vulnerable to drought.

Maximum Threat: A prolonged drought combined with sunny and warm conditions resulting in very low water levels and the need for water rationing.

Earthquake

The probability of an earthquake is very low, however the impact would be major throughout the county.

Flooding - Coastal

History: Pinellas County is a peninsula with a total of 587.77 miles of coastline, which makes it extremely vulnerable to coastal flooding. The County has experienced a number of damaging coastal floods caused by wind-driven water associated with an astronomical high tide.

June 1972: Hurricane Agnes, although well out in the Gulf of Mexico, caused a wind-driven high tide of 5.6 feet, that struck Pinellas County on June 19, 1972. It caused an estimated 12 million dollars in damages to public and private property.

June 1982: On June 18, 1982, Pinellas County was struck by severe coastal flooding from the “no-name” storm. The highest recorded winds from the storm were 49 mph and rainfall amounts were between four to six inches. The estimated public and private property damage from the “no-name” storm were over 16 million dollars.

March 1993: The “Storm of the Century” was a very powerful winter storm which generated Category 1 “hurricane - like” storm surges. A 7.7 feet above normal reading was taken on Clearwater Beach.

Probability: Serious coastal flooding has occurred in Pinellas County three times in the last 26 years. Statistically, the frequency of occurrence of tidal water elevation, based on a study conducted by the Coastal and Oceanographic Engineering Laboratory is shown below:

Water Level Elevation Above MSL:	Frequency:
3 feet or higher	Once in 3 - 5 years

4 feet or higher	Once in 20 years
5 feet of higher	Once in 25 - 30 years
6 feet or higher	Once in 30 - 50 years
7 feet or higher	Once in 60 - 90 years
8 feet or higher	Once in 90 - 100 years

Statistics indicate a high tide above five feet only once in 25 to 30 years, however, there have been three incidents of coastal flooding in the last 26 years, caused by a high tide of between five and six feet. This indicates that Pinellas County might expect severe coastal flooding once every 8.7 years. The probability of major coastal flooding is considered to be high.

Vulnerability: Based on historical information, Pinellas County remains highly vulnerable to wind blown high tide on the barrier islands and in other low lying areas along the coastline. The risk to both population and property continues to grow with development of vulnerable areas.

Maximum Threat: The maximum threat to Pinellas County is a storm generation gale force wind from the west or southwest, striking the coastline during an astronomical high tide. This would place over 60,000 persons at risk, as well as 30,000 dwelling units. Estimated damages would be between 30 and 40 million dollars.

Flooding - Rainfall

History: Fresh water flooding problems due to rainfall are evident in many sections of Pinellas County. Rapid development during the past twenty years has aggravated this problem, especially in areas of poor drainage. Prolonged periods of rainfall have shown increased potential for causing damage to property and evacuation of residents due to flooding. This problem becomes more severe if the heavy rainfall occurs at the same time as the astronomical high tide, which prevents much of the rainwater from flowing through the drainage system into the Gulf of Mexico or Tampa Bay. Pinellas County has experienced a number of damaging floods during the past twenty years. The most significant are:

June 1974: During the period of June 22 through June 30, 1974, Pinellas County received between 20 and 30 inches of rain. Damage to public and private property totaled more than twenty million dollars.

May 1979: Pinellas County was hit by torrential rains during the period of May 7-8, 1979. Portions of the County received between ten and 18 inches of rainfall during a 12-hour period. The City of Pinellas Park was particularly hard-hit. In several areas of the County, the rainfall surpassed the 100-year level. The amount of damage to Pinellas County resulted in Presidential Disaster Declaration 586.

September 1979: During the months of August and September 1979, Central Florida, including Pinellas County, experienced the most significant period of rainfall in over three decades. In some areas, the two month rainfall totaled more than 40 inches.

September 1988: After a week of light to moderate rains, flooding began to occur county-wide. Areas of Pinellas Park, Clearwater and Dunedin were hardest hit. 13.25

inches of rain were recorded.

Probability: Serious flooding has occurred four times in the past 20 years, with one incident, May 8, 1979, causing a Presidential Disaster Declaration. Although the drainage system has been greatly improved as a result of the past flooding, there is potential for the situation to occur again during periods of higher than normal rainfall. Based on past history, Pinellas County can expect heavy rainfall to cause flooding once every 3.3 years. Therefore, the probability for major flooding is considered to be high during any given year.

Vulnerability: With the high probability of fresh water flooding and the continued development throughout Pinellas County, both on low ground and high ground, the vulnerability of population and property must also be considered as high. Historically, the older sections of Pinellas Park, Dunedin, and Clearwater have shown a vulnerability to fresh water type flooding.

Maximum Threat: The maximum threat to Pinellas County would be a May 8, 1979 type of storm, which deposited almost 18 inches of rainfall in the lower central part of the County during a 12-hour period. The situation would become more critical if the storm was preceded by a long period of rainfall over a one to two month period, or if accompanied by a high tide situation. Although drainage has been improved, it is estimated that homes would still be at risk for potential flooding in the Pinellas Park and North St. Petersburg areas.

Freezes

History: Pinellas County is subject to frost and/or freezing temperatures from November through March each year. Since 1962, there have been 12 freezes that have affected Pinellas County. The month and year are shown below:

December	1962	January	1981	December	1985
November	1970	January	1982	January	1986
January	1977	January	1985	February	1989

Probability: Freezes have occurred in Pinellas County 12 times during the last 36 years. Therefore, the County can expect a freeze once every three years. The probability of a freeze is considered as high.

Vulnerability: Pinellas County is primarily an urban County with only a small amount of acreage devoted to agriculture. However, the population most vulnerable to freeze is the elderly population. Past freezes have caused power outages in several areas. This has required the electrical power companies to institute rolling "brown-outs", and have required the opening of shelters.

Maximum Threat: The maximum threat for Pinellas County would be a sustained period of low temperatures below 30 degrees in December or January. This threat would devastate the small citrus industry in Pinellas County, and due to power outages, selected areas of the population would be at risk.

Hurricane/Tropical Storm

History: Historically, hurricanes are the natural disasters that pose the greatest threat to Florida and Pinellas County. They have caused the greatest amount of property damage and as more people move to Pinellas County, and more development takes place, the potential for hurricane-related deaths and damages, increases each year.

Pinellas County has experienced the effects (wind damage, beach erosion, etc) from a number of hurricanes since 1886. A total of five hurricanes have affected Pinellas County within the last 13 years. They were Hurricane Elena, Hurricane Erin, Hurricane Opal, Hurricane Earl, and Hurricane Georges.

Probability: Based on the history of hurricane affecting the Tampa Bay area, Pinellas County can expect a hurricane to effect us at least once every 2.6 years. It is considered that the occurrence of a hurricane in the Tampa Bay area on an annual basis is high.

Vulnerability: The vulnerability of Pinellas County to potential hazards from hurricanes is analyzed prior to each storm. The population at risk and potential for property/economic damages is based on the specific characteristics of the threatening hurricane.

The principle tool for analyzing the expected hazards from potential hurricanes that may affect the Tampa Bay Region, is the Sea, Lake, Overland Surges from Hurricanes (SLOSH) numerical storm surge model. The SLOSH model predicts the tidal surge heights that result from test data about hypothetical hurricanes with various combinations of pressure, size, forward speed, track and winds.

Hurricane Hazards: The three major hazards produced by a hurricane are the storm surge, high winds and rainfall.

Storm Surge: The storm surge is by far the most dangerous of the three hazards, historically causing nine out of ten hurricane related deaths. This surge, when coupled with the breaking waves, will cause great destruction. The more intense the hurricane, and the closer to perpendicular its track is, in relation to the coastline, the higher the storm surge and resulting destruction will be. Also impacting on the height of storm surge is the depth of the water along a threatened coastline. Because of the high shoaling factor (shallow water and gradual slope of the Gulf bottom) off the central west coast of Florida, Pinellas County will receive higher surges than those indicated in the generalized Saffir/Simpson Hurricane Scale.

High Winds: High winds will also render segments of the population vulnerable to the passing hurricane. Throughout Pinellas County, the approximately 56,000 mobile and manufactured homes will be unable to withstand hurricane force winds. High winds will also have an impact on the timing of the evacuation order, since they arrive at the coastline several hours before the eye of the storm makes landfall. All evacuation activities must be completed prior to the arrival of sustained gale force winds (40 mph with

significantly higher gusts).

Rainfall: Since the structure of every hurricane is unique, there is no way to determine the rate and distribution of the expected six to twelve inches of rainfall generally accompanying the storm. However, it is known that the rainfall has only a minor influence on the storm surge water levels. Rainfall, in itself, will not normally require the emergency evacuation of large numbers of residents during the passage of a hurricane as does the storm surge. However, rain may cause the slowing of traffic, it may sever evacuation routes which could severely reduce the number of hours available for the overall evacuation.

Maximum Threat: The worst case scenario for Pinellas County is a Category 5 Hurricane heading northeast at less than 15 miles per hour that makes landfall at high tide near New Port Richey. A 24 foot storm surge would inundate almost half of the County while the winds would destroy hundreds if not thousands of homes and cause damage to thousands more.

*Currently Pinellas County Emergency Management and the Tampa Bay Regional Planning Council (TBRPC) are engaged in a joint project to do a Hurricane Evacuation Restudy of the County. The purpose of the project is to employ new technology tools to more accurately define the county's vulnerability to hurricane generated storm surge. This is being accomplished through the use of highly accurate digital elevation contours produced from LIDAR (Laser Infrared Detection and Ranging), storm surge height data from the National Hurricane Center's SLOSH (Sea Lake Overland Surge in Hurricanes) computer model, TBRPC's Geographic Information System) computer system and the County's GIS computer system. When completed the project will produce more accurate Hurricane Evacuation zones that cover less area and impact fewer people and more accurately describe the CHHA (Coastal High Hazard Area).

Landslide

Does not affect the county.

Lightning & Thunderstorms

History: The State of Florida has an unusually high incidence of lightning strikes and thunderstorms causing death and injury.

Lightning occurs mostly in the months of May through October. In 1998, lightning caused \$3,000,000+ worth of damage in the State of Florida and 17 deaths.

In 1998, there were a recorded 645 severe thunderstorms in Florida. They caused two deaths, two injuries and \$13,244 million dollars in damages. Pinellas County had an estimated 150 severe thunderstorms from 1959-1998.

Probability: There is a high probability that lightning strikes and thunderstorms will continue to occur in Pinellas County. However, the risk to the population is relatively low concerning injury and death.

Vulnerability: Because of the very frequent occurrences, Pinellas County has a high vulnerability to these incidents. Additionally, with the waters of Tampa Bay and the Gulf of Mexico surrounding Pinellas County, there is an added vulnerability to fisherman, swimmers, and boaters.

Maximum Threat: The maximum threat is the potential for a lightning strike hitting a group of spectators during a large outdoor sporting event, or possibly, a strike into a group of sunbathers. In this situation, a number of individuals could be injured or killed.

Tornado

History: The tornado, potentially the most violent storm produced in nature, is a common occurrence in Florida and Pinellas County. In the past 20 years only two outbreaks of strong tornadoes have occurred, one in May of 1979 and the other in October of 1992. In 1998, there were 118 tornadoes, 42 deaths, 305 injuries and \$461 million dollars in damages in the United States. The last major event occurred in Pinellas County on October 3, 1992.

From 1959 to 1997, Pinellas County recorded 99 tornado incidents, some minor, but all causing varying degrees of property loss, some ranging in the millions. The most severe incident occurred on May 4, 1978, when a tornado struck Highpoint Elementary School during a school day. Three children were killed, 15 hospitalized and another 84 injured, with property damages totaling \$4 million dollars. The last major event occurred October 3, 1992, when tornadoes damaged and destroyed a subdivision of homes and a mobile home park in the City of Pinellas Park. Four were killed, 130 were injured; the property damages totaled 37 million dollars.

Probability: Based on historical trend of the past 13 years, Pinellas County can expect to receive 2.2 tornado touchdowns per year. Thus, the occurrence of a tornado touchdown on an annual basis would be considered high. The expected tornado size would be approximately 100 yards wide, with a two to three mile path moving from the southwest to northeast. Most tornadoes are expected to touchdown for relatively short periods of time in a bounce type pattern.

Vulnerability: Because of the high frequency and unpredictable pattern of tornadoes, all of Pinellas County is vulnerable to tornado induced damages. The damage potential is high because of the population density, and also due to the large number of mobile homes and manufactured housing units throughout the County. Because of their construction, the estimated 56,000 mobile homes and manufactured housing units are especially vulnerable to the high winds of a tornado.

Maximum Threat: A worst case scenario involving a tornado incident in Pinellas County would call for multiple tornadoes numbering at least f4 on the Fujita Tornado Intensity Scale, touching down in the central part of the County, and moving on a southwest to northwest track for about three to four miles. This would be very similar to the series of tornadoes that moved through the central part of the County on May 8, 1979.

Tsunami

The probability is very low, however the impact would be tremendous. Tsunamis offer little or no warning of the pending coastal flooding. Such an unexpected event would cause a large loss of life and property.

Volcano

Does not affect the county.

Wildfire

History: In the last five years, there have been an average of 200 wildfires per year in Pinellas County, despite the fact that the county is almost “built out”. The East Lake area near the power line corridor is the most likely location for wildfires to occur. The County does conduct controlled burning in the entire northeast corner of the County and small burns at county parks and other properties throughout the year. The State also conducts annual controlled burns at state parks located within the county.

Probability: Based on an analysis of recent fire histories, Pinellas County can expect about 200 small wildfires each year. This number will probably decrease as the remaining brush areas are developed.

Vulnerability: Vulnerability is low. The highest risk is found primarily in the wildland/urban interface developments located at various sites throughout the county. Wildfires are usually kept small and extinguished quickly.

Maximum Threat: A worst case scenario would involve damage to or the destruction of two or three adjacent homes, most likely in the wildland/urban interface setting.

Urban Fire

History: Since January 1, 1995; 17,261 structure fires have been dispatched. 1,245 of those alarms were termed working fires, i.e.: fires that caused significant damage to at least the structure of origin.

Probability: The likelihood of urban fire is high and the potential impact major. Because of aggressive fire prevention and suppression efforts, the effects have been minimized. Additionally, quick response and a large number of firefighting resources contribute to mitigate the impact of such an occurrence.

Vulnerability: Vulnerability is high due to the age of the structures in St. Petersburg, Clearwater, and Largo.

Maximum Threat: The maximum threat is most likely to be a fire incident in an older large high-rise building with an elderly population. Many of the older structures are still

without fire suppression sprinkler systems. Most of these buildings are required to be retrofitted in the next few years.

Winter Storm

Does not affect the County.

Sinkholes

History: Sinkholes, a common occurrence in many parts of Florida, have a history of occurring in Pinellas County. A geological survey conducted for the Pinellas County General Plan (1979) indicates that the central and northern portions of the County are more prone to sinkhole development due to the heavy limestone composition of the sub-strate in the area.

Sinkholes in Pinellas County have generally developed rather slowly and are fairly shallow and small in diameter. From January 1988 to February 1998, there have been 57 sinkholes in Pinellas County. However, there is much debate on whether structure damage caused by every reported sinkhole is indeed a sinkhole and not clay shrinkage.

Probability: There is a high probability that sinkholes will develop in the sinkhole-prone areas of the County. However, there is a low probability that these sinkholes will be large enough to cause extensive damage or casualties.

Vulnerability: Based on historical and geological information, Pinellas County is vulnerable to sinkhole occurrences. However, the population-at-risk is moderate, due to the nature of sinkhole development.

Maximum Threat: A sinkhole of unprecedented size, similar to the one that developed in Winter Park, Florida, in 1981, occurring in downtown Clearwater in the vicinity of Gulf-to-Bay Blvd. and North Ft. Harrison Ave., during a working day. With a depth of 100 feet, a sinkhole of this size would cause an enormous amount of property damage and possible fatalities and injuries to the work force in the area.

Technological Hazards Affecting Pinellas County

Airport Incidents

History: St. Petersburg-Clearwater International Airport employs 3,000 people. It's yearly economic impact is \$400 million, and it annually hosts 1.1 million domestic and international air travelers. In 1998, there was a total of 911,195 passenger traffic, 15,295 air carrier cargo tonnage, and 212,714 aircraft operations. From May 1994 to present, there have been eight accidents resulting in three deaths and eight injuries to crew and passengers.

Albert Whitted Municipal Airport is a general aviation and private business with no commercial business airport. They do very little charter business out of this airport.

They average 87,000 aircraft operations annually. In the last year two years, there have been two landings in the water of Tampa Bay with no injuries.

Clearwater Airpark is a general aviation airport with mostly piston airplanes, two corporate airplanes and one helicopter. They do an average of 60,000 operations annually. In 1997, a student pilot ran an airplane into a ditch; there were no injuries. Ten years ago an airplane crashed into the side of a house near the airport; the pilot died.

There have been a total of 25 accidents in Pinellas County since 1996.

Probability: The probability of minor aircraft accidents in Pinellas County is high and of major accidents, low.

Vulnerability: Although the entire County must be considered vulnerable, the areas with the highest vulnerability are along the designated flight paths of the three airports in Pinellas County. A greater vulnerability exists on the flight paths for the St. Petersburg-Clearwater International Airport, simply because it handles large passenger and cargo type aircraft.

Maximum Threat: The crash of a large passenger aircraft into a densely populated area in either St. Petersburg or Pinellas Park, represents the maximum threat in the southern portion of the County. In the north, the same situation exists if a large aircraft would crash in Safety Harbor, or striking the Countryside High School, during a school day. In either case, the crash would threaten 50 to 100 homes and 200-400 people. The crash of a large aircraft into Countryside High School would place over 2,700 staff and students at risk. In this situation, it is expected that fatalities and injuries would be extremely high.

Hazardous Materials (fixed facility)

History: One hundred and forty two sites in the county produce, store, or use hazardous materials. The Pinellas County Hazardous Materials Response Team responds to 250 incidents, on average, each calendar year. The majority of these releases are small, affecting only the building of origin and, in a few instances, immediately adjacent buildings.

Probability: The probability of a release or spill is high. Chlorine is the most abundant extremely hazardous substance stored in Pinellas County.

Vulnerability: Vulnerability to a release or spill is moderate, depending on the amount and type of material, and the location of the release. The Pinellas County Hazardous Materials Response Team has 105 members trained to the technician level, 35 of whom are on duty at any time. The Haz Mat Team's capabilities are instrumental in minimizing the effects of spills and/or releases on the citizens of the County.

Maximum Threat: The largest threat is from HCL Clearwater, a facility that stores approximately 360,000 pounds of chlorine on site. The chlorine is repackaged at the facility into containers of various sizes, contributing to the possibility for a leak or other release to occur. The facility is located in the center of the County. A release of the

worst case would be the failure of one of the largest containers, on a day with high humidity, little to no wind, and during tourist season. This would be a 180,000 (one rail car) release at 1.0 miles per hour wind speed, atmospheric stability class D that would generate a vulnerability zone of at least a 10 mile radius from the site. The potential number of citizens affected by this incident could be well over 500,000 persons, depending on time of day and year.

Hazardous Materials (transportation)

History: Spills or releases from road transport vehicles are common. Maritime accidents have occurred, but are rare. There have been no rail incidents in the last 10 years.

Probability: The probability of a hazardous materials transportation incident is high. The event most likely to occur is a road transport vehicle accident, conceivably a tanker truck.

Vulnerability: Five major roadway corridors service the County from the north, east, and south. Marine delivery routes border the county on the east, south, and west. One main railroad corridor services the county. Thus the county is highly vulnerable to a transportation accident.

Maximum Threat: Rail deliveries of chlorine to Clearwater pose the largest threat. The threat would exactly duplicate the **Hazardous Materials (fixed facility)** scenario above, except that the location would be unknown. This incident could occur at any point along the rail delivery corridor throughout the northern half of the county.

Power Failure

History: Pinellas County receives its power from the Crystal River Power Plant that is located approximately 100 miles north of the County. The power is brought into the County via a single power corridor. To date, the County has never experienced a total loss of power. However, in December 1989, as a result of severely cold temperatures, the demand for power exceeded availability. The power company rationed the power by conducting "rolling brown-outs." This procedure alternated the temporary shutting off of power to the County on an area by area basis.

Probability: There is a low probability that a total power failure will occur in Pinellas County. Although, if it were to happen the impact would be extremely high. Since the County is so densely populated, and there is a high number of elderly who are electrically dependent, an extended period without power would have a significant impact.

Vulnerability: The single power corridor spans approximately 100 miles above ground from the power plant to Pinellas County. This main transmission line that serves the County is vulnerable to being damaged or destroyed by wildfire, tornado, aircraft crash, and extremely hot or cold temperatures.

Maximum Threat: The maximum threat that is likely to threaten Pinellas County's power source is, a large segment of the power corridor being destroyed by tornado(es).

Terrorism

History: There has never been a known terrorist incident in Pinellas County.

Probability: The probability of a terrorism incident in the County is low.

Vulnerability: Vulnerability to an incident of terrorism is moderate. The County recently conducted a large scale multi-jurisdictional terrorism exercise. Joint planning efforts with a number of response agencies are currently under way. It is expected that resultant changes in a number of procedures will ultimately minimize the potential effects of a terrorism based incident, should one occur.

Maximum Threat: Considering the large population concentration in the County, the likelihood of affecting a large number of persons is great. The threat increases with the large influx of tourists during the winter months. In 1998, over 4 million persons visited the County.

Water

History: Most of Pinellas County receives its potable water from a regional water supply system, Tampa Bay Water, which draws from sources in Pinellas, Pasco and Hillsborough Counties. Water is transmitted to the County through 84", 36" and 48" transmission mains. The cities of Dunedin and Belleair, have their own water supply and transmission systems which do not require dependence on sources outside of the County. Clearwater and Tarpon Springs also have their own resources to a lesser extent, although they continue to rely on Pinellas County Utilities to provide potable water. The County and cities have agreements to exchange water on an emergency basis. To date, Pinellas County's water source has never been totally severed. However scheduled and unscheduled repairs have occurred. Normally when repairs are scheduled, interconnections with municipal systems can be used as a backup to minimize the impact on the availability of water and water pressure.

Probability: There is a low probability that total failure in the water system will occur in Pinellas County. Interconnections between municipal and County transmission lines help to maintain the availability of potable water, albeit at a reduced rate. Many prudent actions have been taken to protect the integrity of the system, such as multiple generators being connected to the system to ensure the power source is not interrupted.

Vulnerability: Pinellas County is extremely vulnerable since almost all (96%) current sources are from outside the County's control and the daily demand is extremely high.

Maximum Threat: The maximum threat that is likely to threaten Pinellas County's water source is the intentional contamination of the water supply. However, such an act of terrorism would require great planning and access to tremendous resources.