



## **Comprehensive Weather Report**

**Date:**                    **December 7 – 9, 2006**

**Location:**                **123 Bay Road**  
**Anywhere, NJ 05555**

Prepared For:                    The Law Offices of John Doe  
*Re: Doe vs. Made Up Apartment  
Complex*  
999 Smith Avenue, 2<sup>nd</sup> Floor  
Belmar Park, NJ 08904

Submitted on:                    1/12/2017

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## **INTRODUCTION**

This report was requested by Mr. John Doe of The Law Offices of John Doe in order to establish the weather conditions that existed at 123 Bay Road in Anywhere, NJ on Sunday, December 9, 2006.

It is my understanding that the Plaintiff, Ms. Jane Doe, slipped and fell on a sidewalk walking from her apartment to a friend's apartment in the Made Up Apartment Complex located at 123 Bay Road in Anywhere, NJ at approximately 10:00 am on Sunday, December 9, 2006. The following report is a detailed analysis of the weather conditions that existed at this address from December 7 – 9, 2006. This investigation will set forth and outline the weather conditions that existed on and leading up to the time of the incident.

In order to determine the weather conditions for 123 Bay Road, Anywhere, NJ with a reasonable degree of meteorological and scientific certainty, I analyzed the following data: official NWS surface weather observations, public information statements, sunrise and sunset times, records of climatological observations, Automated Weather Observing System (AWOS) observations, Doppler Radar images and other National Weather Service products. Data was accessed from the National Center for Environmental Information's (NCEI) official web page, the New Jersey Weather & Climate Network, Iowa State University's MESONET archive and the US Naval Observatory Astronomical Applications Department. The NCEI is a unification of the National Oceanic and Atmospheric Administration's (NOAA) three existing data collection centers: the National Climatic Data Center (NCDC), the National Geophysical Data Center (NGDC), and the National Oceanic Data Center (NODC). Geological Data was accessed and analyzed from the United States Geological Survey and distances were accessed and analyzed using Google Maps.

I certify that the following report of the actual weather conditions, as well as my expert opinions and appropriate conclusions are within a reasonable degree of meteorological and scientific certainty. Such opinions and conclusions are based on the aforementioned weather data, information of the case, including the plaintiff's and defendant's answers to interrogatories provided by The Law Offices of John Doe, and over 15 years of professional meteorological experience.

## **WEATHER RECORDS**

### **Surface Weather Observations**

The National Oceanic and Atmospheric Administration (NOAA) Surface Weather Observations are usually taken at airports and other locations with a frequency of at least one observation per hour. These observations generally include current weather, hourly temperature, cloud height and coverage, visibility, air pressure, change in air pressure (past 3 hours), wind speed and direction, precipitation amounts, and type of precipitation. This data is usually recorded in a worldwide code known as METAR and can be interpreted into the weather variables listed above.

In addition to the NOAA Surface Weather Observations, there is also a network of non-NOAA observations available from both publicly and privately owned weather stations. These observations can be utilized and a supplement to the more reliable and comprehensive METAR data to aid in meteorological analysis.

### **Records of Climatological Observations**

The NOAA Cooperative Observer Program (COOP) is a nationwide weather and climate monitoring network consisting of volunteer citizens and institutions observing, reporting, and recording weather data. These observations can include the following: daily maximum and minimum temperatures, temperature at time of observations, precipitation amounts, type of precipitation, and many other variables.

There is also a network of non-NOAA precipitation observations available nationwide from COCORAH.S.org and other non-NOAA organizations. While these observations are not controlled by NOAA, most are integrated into their Meteorological Assimilations Data Ingest System (MADIS), and can often be utilized to supplement the record of climatological records.

### **Location of Data Collection**

Both New Airport (KNEW) and Old Airport (KOLD) were used for data collection in determining the weather for 123 Bay Road. New Airport (elevation 23 ft) is located approximately 5.5 miles north and Old Airport (elevation 157 ft) is located approximately 14.2 miles southeast of 123 Bay Road (elevation 120 ft). Although Old Airport is approximately 9 miles further away from 123 Bay Road, it is more similar in elevation, and is used in data collection and analysis for that reason.

Two additional COCORAHS stations were used to supplement the NOAA AWOS observations. These stations were station NJ-546 (Anyplace, NJ) and station NJ-548 (Any River, NJ). Station NJ-546 (elevation 25 ft) is located approximately 2.43 miles east northeast and station NJ-548 is located about 4.82 miles west of 123 Bay Road. The daily weather report from December 9, 2006 indicating total snowfall amounts are attached in the supplemental data at the end of this report.

The National Weather Services also issues Local Storm Reports during/directly after a significant snow event. These reports are a collection of snowfall totals throughout the forecasting area. An LSR was issued at 9:12 pm on Saturday, December 8, 2006 and two locations were utilized as a supplemental data collection point: New Anywhere (9.36 miles northeast) and Point Anywhere (6.02 miles west).

The following is a list of the surface weather data analyzed from December 7-9, 2006.

- Hourly Temperatures
- Hourly Precipitation Totals
- Precipitation Type
- Hourly Wind Speed
- Hourly Wind Direction
- Air Pressure Tendency
- Hourly Relative Humidity`
- Hourly Sky Conditions
- Daily Snowfall Totals
- National Weather Service Forecasts and Text Products
- NWS published Local Storm Reports

All of the weather data used in preparing this report is attached.

## **DAILY WEATHER SUMMARY**

**December 7, 2006** began an overcast day with light rain and drizzle. This light precipitation continued until about 8:30 am, and soon after by 9:15 am the clouds broke and skies became clear. The clear skies were again overtaken by overcast at around 2:15 pm, when another batch of light precipitation moved into the area. This light rain shower lasted from about 2:30 pm – 5:00 pm. By 6:00 pm, skies were again clear, and they remained that way until days end.

The hourly temperatures remained in the mid 50's for most of the morning and afternoon. Temperatures began at 55<sup>0</sup>F at 12:00 am and reached a high of 58<sup>0</sup>F between 12:00 pm – 2:00 pm. The temperature began to fall consistently during and after the rain shower moved through, finally reaching a daily low of 35<sup>0</sup>F at 11:59 pm.

**December 8, 2006** continued the trend from the day prior, and began with clear skies and falling temperatures. Skies remained clear through the morning until around 1:00 pm, when scattered clouds from the relevant snow storm moved into the area. By 6:15 pm, skies were completely overcast and precipitation began in the form light snow. The precipitation continued to fall as mostly snow until the end of the day, however between 11:00 pm and 11:59 pm, there were a few brief periods of rain mixed with the snow.

Temperatures rose and fell several different times throughout this 24 hour period. Rolling over from February 16, temperatures continued to fall throughout the early morning hours of February 17, reaching a daily low of 27<sup>0</sup>F by 7:00 am. From there, temperatures rose slowly to reach a daily high of 37<sup>0</sup>F by 5:30pm. As the storm approached the region, temperatures began to fall once again. They fell slowly and leveled off at around 32<sup>0</sup>F by 8:00 pm, where they remained until the end of the day.

**December 9, 2006** (*Date of the Incident*) saw the continuation of the remaining precipitation taper off in the early parts of the day: The light rain/snow mix had ended by approximately 12:30 am. Skies remained overcast until around 5:00 am, then still remained partly cloudy until around 6:00 – 8:00 am. After 8:00 am, skies were clear for the remainder of the day.

Temperatures began the day at 32<sup>0</sup>F, and held steady at 32<sup>0</sup>F for most of the morning. The temperature rose to 34<sup>0</sup>F for a brief period between 4:00 am – 4:30 am, but fell back to 32<sup>0</sup>F until around 8:00 am. From there, temperatures rose steadily to reach a daily high of 45<sup>0</sup>F by 3:00 pm, and fell back to reach a daily low of 30<sup>0</sup>F by 11:00 pm.

At 10:00 am (Time of the Incident), the weather conditions were as follows...

- Temperature: 37<sup>0</sup>F
- Dew Point: 29<sup>0</sup>F
- Relative Humidity: 64%
- Wind: West @ 11 mph
- Skies: Clear
- Precipitation: None

## **SUPPORTING WEATHER ANALYSIS**

### **Total Snowfall from December 8-9, 2006 Event**

There were several data collection points analyzed in order to get an accurate measurement of the total snowfall that occurred from the December 8-9, 2006 event. Data was collected at two COCORAHS.org stations, and two Local Storm Report points that were issued in a National Weather Service Text Product.

COCORAHS station NJ-546, which is located approximately 2.43 miles east northeast of 123 Bay Road, recorded a total snow fall of 2.0 inches at 7:00 am on Sunday, December 9, 2006. COCORAHS station NJ-548, which is located approximately 4.82 miles west of 123 Bay Road, recorded a total snow fall of 3.0 inches at 7:00 am on Sunday, December 9, 2006. It is also noted in this stations report that “at night on Saturday, snow measured 3 inches. By morning, it was down to 2.5 inches.”

Two NWS Text Products issued at 9:12 pm on Saturday, December 8, 2006 were relevant in determining the total snowfall at 123 Bay Road from the December 8-9 snow event. One of these observations taken in New Anywhere (approximately 9 miles northeast) measured 2.5 inches of snow on the ground as of 8:46 pm. The other, taken in Point Anywhere (approximately 6 miles west), measured 2.9 inches of snow on the ground as of 8:56 pm. Both of those products are listed below.





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PRELIMINARY LOCAL STORM REPORT

NATIONAL WEATHER SERVICE MOUNT HOLLY NJ

912 PM EST SAT DEC 8 2006

..TIME...	...EVENT...	...CITY LOCATION...	...LAT.LON...
..DATE...	....MAG....	..COUNTY LOCATION..ST..	...SOURCE....
..REMARKS..			

0846 PM	SNOW	NEW ANYWHERE	LAT/LONG
12/08/2006	<b>M2.5 INCH</b>	COUNTY	NJ COCORAHS

0856 PM	SNOW	POINT ANYWHERE	LAT/LONG
12/08/2006	<b>M2.9 INCH</b>	COUNTY	NJ SOCIAL MEDIA

## Hourly Temperatures Trends

The hourly temperature on December 9, 2006 at 123 Bay Road leading up to the incident was near to/exactly at 32<sup>0</sup>F. The hourly temperatures recorded at both main data collection points were not exactly the same, so further analysis was needed.

The temperature at New Airport on December 9, 2006 between 12:30 am – 8:00 am was recorded at 33<sup>0</sup>F for every observation time. This means that the temperature remained at 33<sup>0</sup>F for the entire 7 ½ hour period. The temperature at Old Airport varied slightly, but significantly. From 12:30 am – 4:00 am, the temperature was recorded at 32<sup>0</sup>F for every observation time. Between 4:00 am – 4:30 am, the temperature rose to 34<sup>0</sup>F, but at 4:30 am temperature fell back down to 32<sup>0</sup>F and remained there until 8:00 am.

The temperatures at New Airport, which is closer geographically but has a 97 ft difference in elevation, never fell below 32<sup>0</sup>F between 12:30 am – 8:00 am on February 18, 2018, and therefore would promote only melting at 123 Bay Road. In contrast, the temperatures at Old Airport, which is further geographically but has only about a 35 ft difference in elevation, varied from the data at New Airport. The temperature between 12:30 am – 4:00 am remained at exactly 32<sup>0</sup>F. This suggests that if any melting did occur, it would have been minimal. Between 4:00 am – 4:30 am, the temperature rose to above 32<sup>0</sup>F. This would increase the chance that some melting of snow had occurred. Between 4:30 am – 8:00 am, the temperature fell back to 32<sup>0</sup>F. Any snow melt that had occurred during the brief duration of above freezing temperatures could have refrozen when the temperatures fell back down to 32<sup>0</sup>F between 4:30 am – 8:00 am.

From 8:00 am – 10:00 am, the data was consistent from both locations. The temperature rose above 32<sup>0</sup>F during that time frame to reach 37<sup>0</sup>F by 10:00 am.

In order to determine the temperature between 12:30 am – 8:00 am with exact precision, I had to calculate the difference in elevation and compare it with the dry adiabatic lapse rate<sup>1</sup>. We use the dry adiabatic lapse rate and not the moist adiabatic lapse rate because the air between 12:30 am – 8:00 am was not saturated and relative humidity was always below 100% (RH ranged from 96-64% between 12:30 am – 8:00 am). The dry adiabatic lapse rate is -9.8<sup>0</sup>C/km. This converts to -5.5<sup>0</sup>F/1000ft or 0.0055<sup>0</sup>F/ft. Considering the difference in elevation between New Airport & 123 Bay Road (97 ft), we use the dry adiabatic lapse rate to find the difference in temperature compared to the difference in elevation.

$$0.0055^{\circ}\text{F}/\text{ft} \times 97 \text{ ft} = -0.5335^{\circ}\text{F}$$

There was likely a temperature difference of approximately  $-0.5335^{\circ}\text{F}$  at 123 Bay Road due to the difference in elevation. This would mean if the temperature was recorded as  $33^{\circ}\text{F}$  at New Airport, it's probable that the temperature would be recorded as at least  $32^{\circ}\text{F}$  at 123 Bay Road due to the difference in elevation.

- <sup>1-</sup> Dry Adiabatic Lapse Rate as defined in Climate Change Glossary- The rate at which the temperature of a parcel of dry air decreases as the parcel is lifted in the atmosphere. The dry adiabatic lapse rate is  $5.5^{\circ}\text{F}$  per 1000 feet or  $9.8^{\circ}\text{C}$  per kilometer.

## SUMMARY AND CONCLUSION

I have prepared the following summary based on the data analyzed. The conclusion and opinions are supported by the data and documents examined, and are appropriate for 123 Bay Road, Anywhere, NJ on December 7 – 9, 2006.

- There was a snow event that began around 6:15 pm on December 8, 2006 and ended around 12:30 am on December 9, 2006 in which 2.0-3.0 inches of snow fell.
- There could have been up to approximately 0.5 inches of snow that had melted between the end of the snow event (12:30 am, December 9) until the time of the incident (10:00 am, December 9). This would have still left 1.5 – 2.5 inches of snow on the ground at untreated, undisturbed areas at the time of the incident.
  - o If the exact location of the incident was not exposed to direct sun (i.e. blocked by a building or trees and covered in shade), then the amount of snow melt would be less.
- The temperature at 123 Bay Road was at the freezing mark for approximately 11 ½ of the 14 hours leading up to the incident.
  - Beginning at 8:00 pm, December 8 and ending 10:00 am, December 9, the only times the temperature rose above 32°F was between 4:00 am – 4:30 am and also between 8:00 am – 10:00 am on December 9.
- **All of the snow/ice that had formed on the sidewalk would have had to melt in only those 2 ½ hours when the temperature had risen above 32°F.**



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## **CERTIFICATION**

I certify that the information in this report is true and accurate and that my estimations, interpretations or assumptions that have been made were done so with expert accuracy with a reasonable degree of meteorological and scientific certainty by a professional meteorologist. Additionally, I reserve the right to amend these conclusions made herein upon further discovery of additional meteorological data.

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1/12/2017

Date