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FORENSIC WEATHER INVESTIGATION OF THE WEATHER AND GROUND CONDITIONS FOR THE PERIOD AUGUST 31, 2016 THROUGH SEPTEMBER 2, 2016 AT 821 ORLANDO BOULEVARD IN ORLANDO, FLORIDA

January 8, 2021

CASE NAME:	"Jacob Jacobson v. Orlando Boulevard, LLC"
DATE AND TIME OF INCIDENT:	September 2nd, 2016 at 9:00 p.m. EDT
PREPARED FOR:	Mr. Richard Radcliffe, Esq.
COMPANY:	Radcliffe, Mondoya, & Planco, LLP

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ASSIGNMENT:

This case was assigned to me by Radcliffe, Mondoya, & Planco, LLP. I was asked to perform an in-depth weather analysis and forensic weather investigation at 821 Orlando Bouelvard in Orlando, Florida in order to determine what the weather conditions were leading up to and including the day of the incident.

METHODOLOGY:

Forensic Weather Consultants, LLC uses various reliable sources of weather information in order to conduct a reliable weather analysis. In order to accurately determine the weather conditions that existed leading up to and including the time of the incident, a detailed search was performed to find the closest, official weather stations to the incident location. Using the computer program "Google Earth", weather station locations provided by the National Centers for Environmental Information (NCEI) and MesoWest were plotted and are indicated by a yellow pushpin. MesoWest is a cooperative project that was started at the University of Utah in 1996 with a goal of providing access to current and archived weather observations from across the United States through internet-based resources. While not all of the weather data can be certified by the NCEI, it is all housed and maintained on National Weather Service websites including ncei.noaa.gov and raws.wrh.noaa.gov and are the records that meteorologists rely upon during the normal course of business to conduct these investigations.

GENERAL REVIEW OF WEATHER DATA SOURCES

Many different types of weather data are gathered and analyzed as part of our investigations. While some, but not necessarily all, of these weather data sources were utilized for this case, we are providing a list of the different types of stations for general information purposes.

The Automated Surface Observing Systems (ASOS) program is a joint effort of the National Weather Service (NWS), the Federal Aviation Administration (FAA), and the Department of Defense (DOD). The ASOS systems serve as the nation's primary surface weather observing network. The ASOS systems compile various weather observations, often more than once per hour, called Local Climatological Data (**LCD**) that are reviewed, maintained, and stored by NOAA. ASOS computed wind speeds are the 2-minute average wind speed prior to the time of the observation. ASOS computed wind gusts are the greatest 5-second average wind speed that was measured in the 10 minutes prior to the time of the observation. Wind gusts are reported if the greatest gust exceeds 14 knots (16 MPH). ASOS also computes peak wind gusts which are the greatest 5-second average wind speed that occurred since the last generated Meteorological Aerodrome Report (METAR). Peak wind gusts are reported if the greatest peak wind gust exceeds 25 knots (29 MPH).

Through the National Weather Service (NWS) Cooperative Observer Program (**COOP**), more than 10,000 volunteers take daily weather observations at National Parks, seashores, mountaintops, and farms as well as in urban and suburban areas. COOP data usually consists of daily maximum and minimum temperatures, snowfall, and 24-hour precipitation totals ending at a specific time, such as 7:00 a.m. in many locations.

The Remote Automatic Weather Stations (**RAWS**) system is a nationwide network of automated weather stations that are often located in remote areas, particularly in national forests. These stations are often run by the Bureau of Land Management and U.S. Forest Service, and they are also monitored by the National Interagency Fire Center (NIFC), primarily to observe potential wildfire conditions.

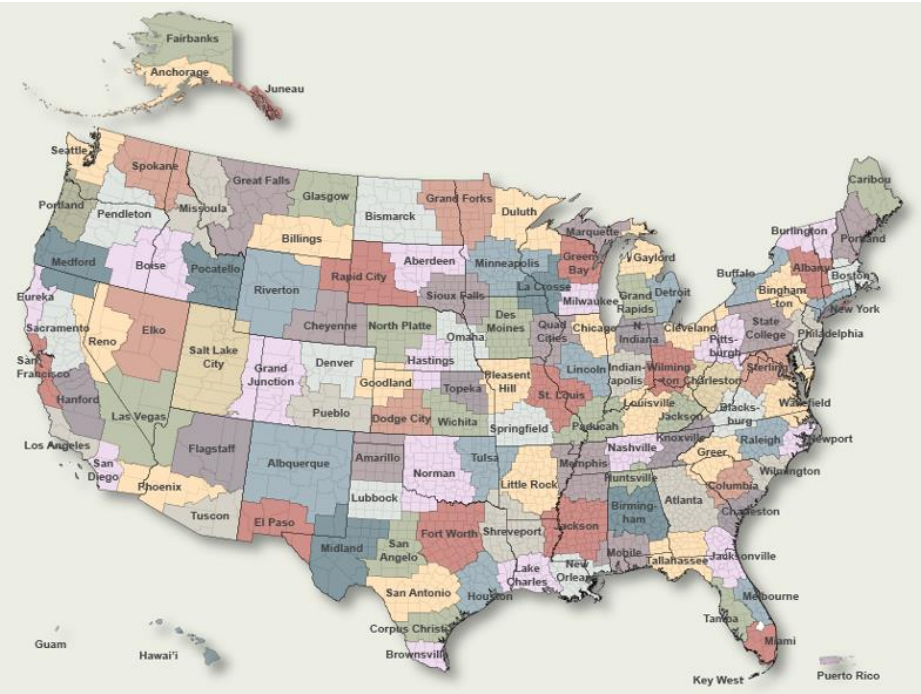
The Community Collaborative Rain, Hail and Snow Network (**CoCoRaHS**) is a network consisting of volunteer weather observers across the United States, Canada, and the Bahamas. These volunteers take daily precipitation measurements and report them to a centralized data store online, where this data is heavily utilized by the NWS, meteorologists, emergency managers and city utilities. CoCoRaHS data is particularly useful in situations where storm systems produce sharp precipitation gradients.

The National Ocean Service (**NOS**) provides data, tools, and services that support coastal economies and their contribution to the national economy. NOS maintains the nation's network of coastal tide and water level sensors to provide real-time data. Among many things, this data supports accurate weather forecasts, coastal storm and flood predictions, and tsunami warnings.

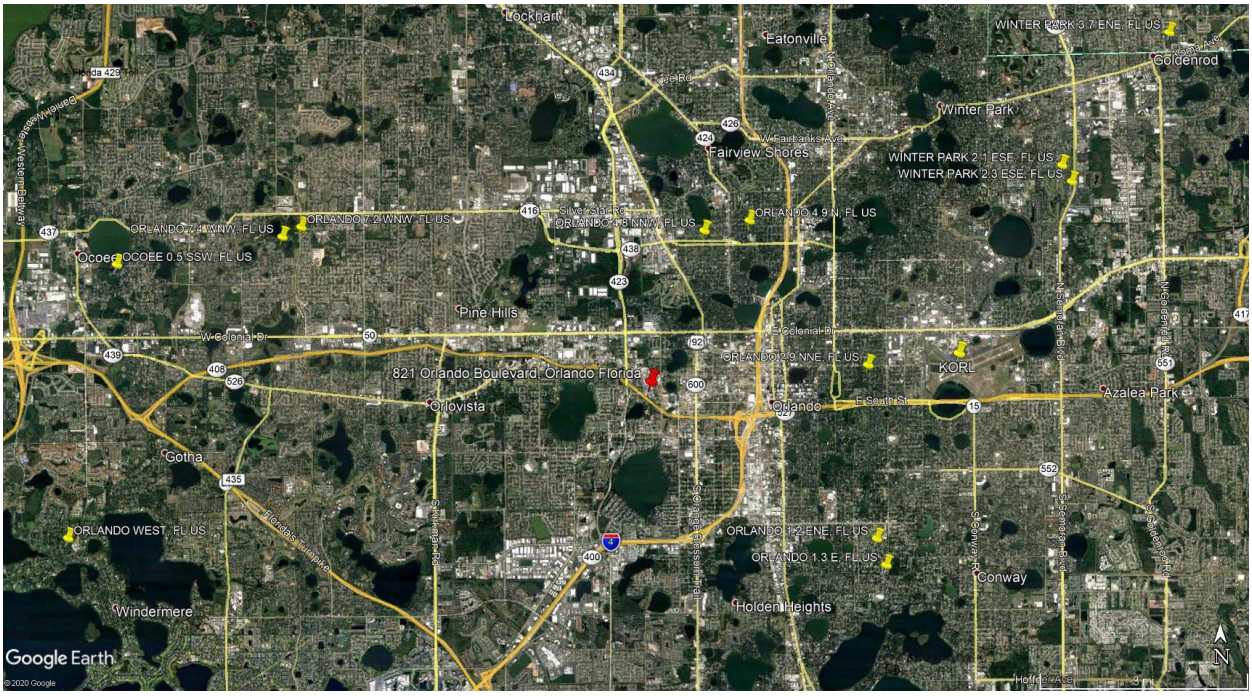
One of the most effective tools to detect precipitation is radar. Radar, which stands for RAdio Detection And Ranging, has been utilized to detect precipitation, and especially thunderstorms, since the 1940's. The radar used by the National Weather Service is called the WSR-88D, which stands for Weather Surveillance Radar - 1988 Doppler (the prototype radar was built in 1988). As its name suggests, the WSR-88D is a **Doppler radar**, meaning it can detect motions toward or away from the radar as well as the location of precipitation areas. There are approximately 155 WSR-88D Doppler radar in the nation, including the U.S. Territory of Guam and the Commonwealth of Puerto Rico, operated by the National Weather Service and the Department of Defense. Doppler radar images and several other types of weather records were used in this study. Doppler radar images are useful for locating precipitation. As the radar unit sends a pulse of energy into the atmosphere and if any precipitation is intercepted by the energy, part of the energy is scattered back to the radar. These return signals, called "radar echoes", are assembled to produce radar images. The location of these radar echoes helps indicate where precipitation may be falling, and the various colors on the color code key on the right side of the radar image indicates intensity. Doppler radar images are processed approximately every 1 to 5 minutes and can determine if precipitation was falling at the incident location and if so, when it started and stopped.

Storm Total Precipitation (S.T.P.) images are also received approximately every 6 minutes and give an estimate as to how much rain has accumulated with the storm. The S.T.P. images are especially useful in determining rainfall amounts where rain measurement equipment is not present. In order to generate the S.T.P Doppler Radar images, the National Oceanic and Atmospheric Administration's (NOAA's) Weather and Climate Toolkit was utilized. It is important to note that within this radar-viewing program, the locations of most airports are indicated by a green pushpin. In addition, the locations of the Automated Surface Observing Systems (ASOS)/Automated Weather Observing Systems (AWOS) are indicated by a blue pushpin. These airports and weather stations are plotted in locations corresponding to the metadata on file with the National Centers for Environmental Information.

The National Weather Service (NWS) offices around the country issue numerous weather alerts, advisories, warnings, statements, bulletins, and storm reports and these are also utilized in our investigations. A map depicting the locations of these NWS offices can be found below.



The incident location was plotted by our office and is indicated by a red pushpin. The map will help give you an approximate location of the weather stations we used in this study and their proximity to the incident location.



<u>In order to perform my analysis of the weather conditions that existed, I obtained and reviewed official copies of the following weather records (the distance from the incident location and each weather station is also provided)</u>:

a. National Weather Service Hourly Surface Weather Observations/ Local Climatological Data (LCD) from the Orlando Executive Airport in Orlando, Florida (approximately xxx miles xxxxx of the incident location).

b. 5-Minute Surface Observations from the Orlando Executive Airport in Orlando, Florida.

c. Community Collaborative Rain, Hail and Snow Network (CoCoRaHS) reports from Orlando 4.8 NNW, Florida (approximately xxx miles xxxxx of the incident location).

d. Community Collaborative Rain, Hail and Snow Network (CoCoRaHS) reports from Orlando 4.9 N, Florida (approximately xxx miles xxxxx of the incident location).

e. Community Collaborative Rain, Hail and Snow Network (CoCoRaHS) reports from Orlando 2.9 NNE, Florida (approximately xxx miles xxxxx of the incident location).

f. Community Collaborative Rain, Hail and Snow Network (CoCoRaHS) reports from Orlando 7.2 WNW, Florida (approximately xxx miles xxxxx of the incident location).

g. Community Collaborative Rain, Hail and Snow Network (CoCoRaHS) reports from Orlando 7.4 WNW, Florida (approximately xxx miles xxxxx of the incident location).

h. Online Community Collaborative Rain, Hail and Snow Network (CoCoRaHS) reports for Orange County in Florida and Seminole County in Florida.

i. The publication entitled "Storm Data" for Florida in August 2016 and September 2016.

j. Super-resolution Reflectivity Doppler Radar images from the Melbourne, Florida radar site that were zoomed in over the incident location.

k. Storm Total Precipitation (S.T.P.) Doppler Radar images from the Melbourne, Florida radar site that were zoomed in over the incident location.

l. Various weather bulletins, advisories and statements that were issued by the National Weather Service in Melbourne, Florida.

m. United States Surface Analysis Images from the Weather Prediction Center (WPC).

n. Storm Events Database from the National Centers for Environmental Information (NCEI) for Orange County in Florida.

The weather data and Climatological records used for this analysis are the official records that Meteorologists rely upon every day during the normal course of business and are either kept in our office or at the National Centers for Environmental Information. The findings in this report utilize the weather records that were available at the time of data retrieval for this case. Any additional weather records and data that become available at a later date may be incorporated into this report in the future.

In addition to the weather records and climatological data listed above, I also reviewed the following information that was provided to me:

- Incident Report dated September 2, 2016

It should be noted that the radar image date and time stamps that are given on the Doppler radar images are given in "GMT", which is Greenwich Mean Time. In order to convert "GMT" to Eastern Daylight Time (EDT), a subtraction of 4 hours is necessary. Additionally, the hourly surface weather observations / Local Climatological Data are given in "Local Standard Time" which requires a one-hour forward time adjustment to obtain "Eastern Daylight Time (EDT)". The only exception to this is that some of the remarks themselves are given in GMT. The findings in this report have incorporated and converted all of these times correctly.

ANALYSIS:

To determine the total rain accumulation for each 24-hour period, Storm Total Precipitation (S.T.P.) Doppler Radar images were used (**Figures 1-4**). S.T.P. values at the incident location and at the Orlando Executive Airport, as well as the actual rainfall totals observed at the Orlando Executive Airport were used to determine the actual total rain accumulation at the incident location itself. It should be noted that these S.T.P. images were cumulative over these 3 days, so the appropriate subtractions of the previous days' rainfall amounts were taken into account. Thus, the rainfall amounts given below are for each 24-calendar day.

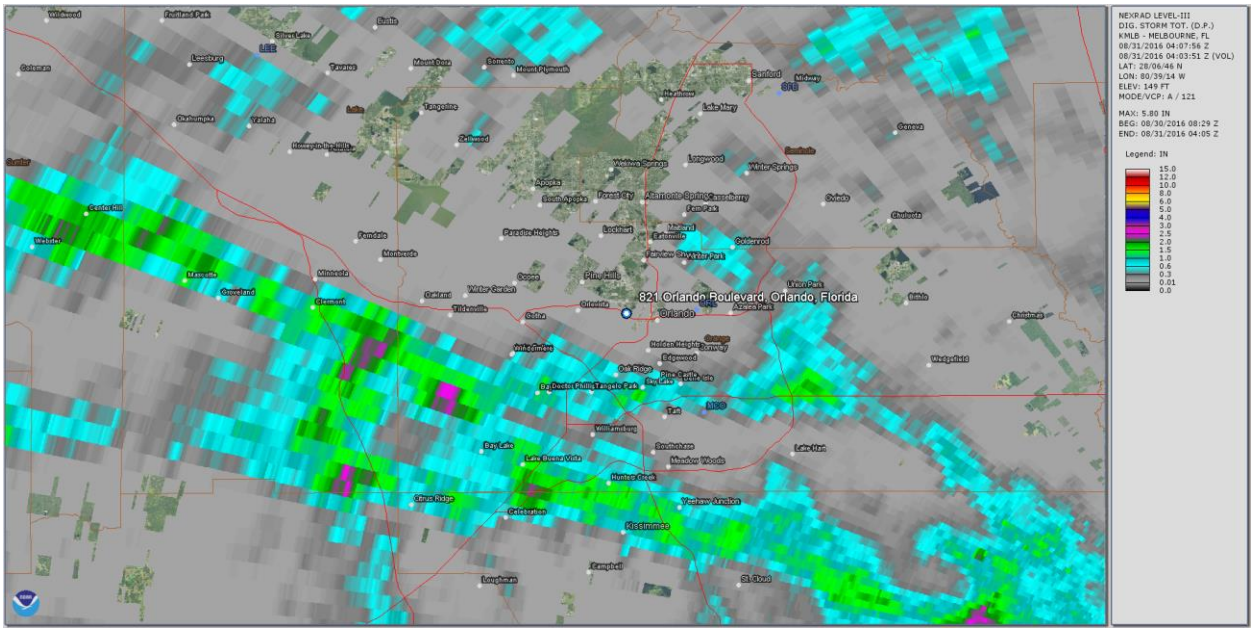


Figure 1: At 12:03 a.m. EDT on August 31st, 2016, the Storm Total Precipitation (S.T.P) Doppler radar image above indicated 0.00" of rain at the incident location and a "Trace" (defined as less than 0.01" and too light to measure) was measured at the Orlando Executive Airport.

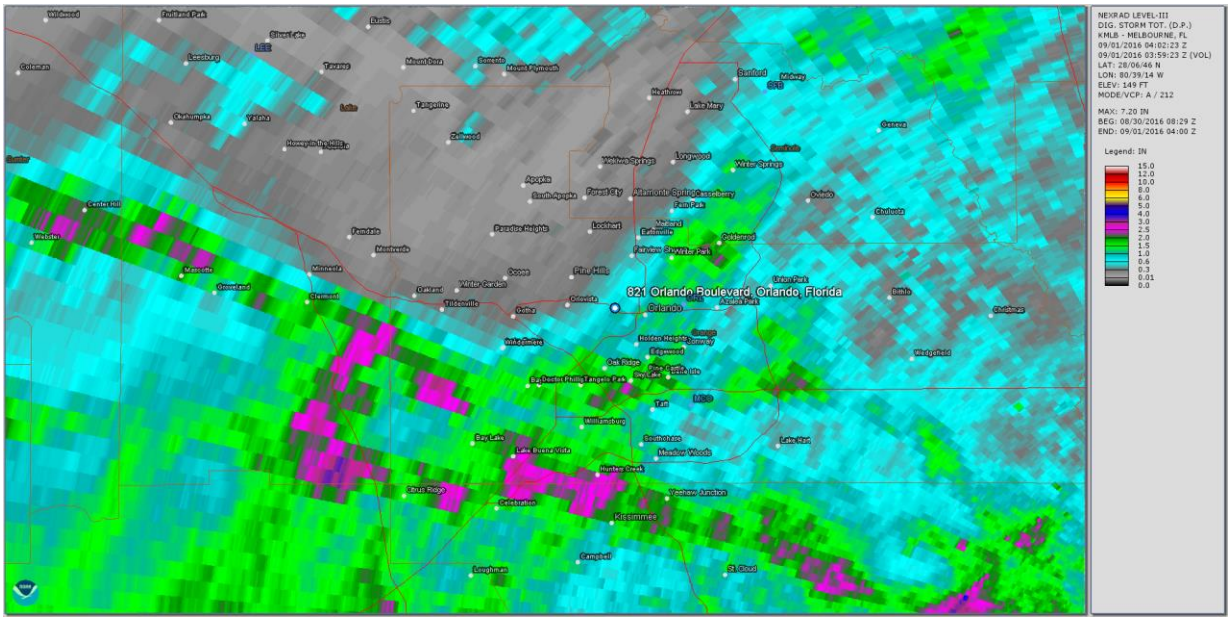


Figure 2: At 11:59 p.m. EDT on August 31st, 2016, the Storm Total Precipitation (S.T.P) Doppler radar image above indicated that approximately 0.60" of rain accumulated at the incident location, and approximately 0.75" of rain accumulated at the Orlando Executive Airport on August 31st, 2016.

The actual amount of rain observed at the Orlando Executive Airport on August 31st, 2016 was 1.82". This means that S.T.P. Doppler Radar images underestimated the amount of precipitation that accumulated on August 31st, 2016 by 1.07". To adjust for this anomaly, 1.07" of rain was added to the incident location S.T.P. value of 0.60" to get a total rainfall amount of 1.67" at the incident location on August 31st, 2016. This method was then used to calculate the total

precipitation on September 1st and 2nd, 2016, as well.

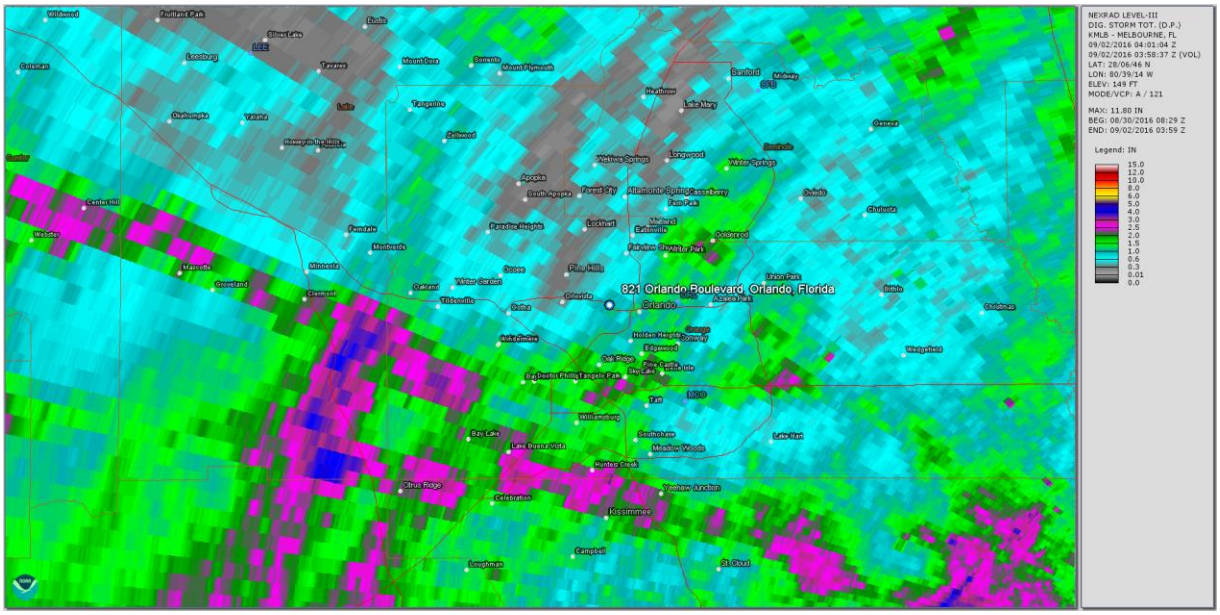


Figure 3: At 11:58 p.m. EDT on September 1st, 2016, the Storm Total Precipitation (S.T.P) Doppler radar image above indicated that approximately 0.20" of rain accumulated at the incident location and 0.20" of rain accumulated at the Orlando Executive Airport on September 1st, 2016.

The actual observed rainfall total for the day was 0.11" at the Orlando Executive Airport. Thus, S.T.P. Doppler Radar overestimated the total daily rainfall on September 1st, 2016 by 0.09". To adjust for this anomaly, 0.09" of rain was subtracted from the incident location S.T.P. value of 0.20" to get a total rainfall amount of 0.11" at the incident location on September 1st, 2016.

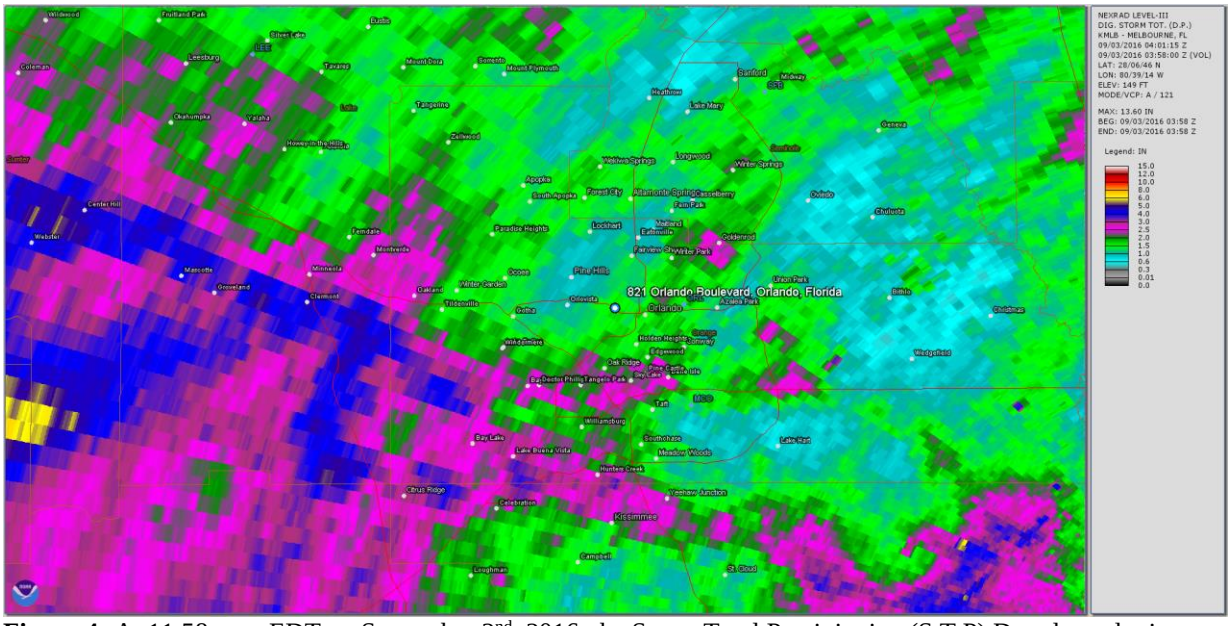


Figure 4: At 11:58 p.m. EDT on September 2nd, 2016, the Storm Total Precipitation (S.T.P) Doppler radar image above indicated that approximately 0.60" of rain accumulated at the incident location and approximately 0.55" of rain accumulated at the Orlando Executive Airport on September 2nd, 2016.

The actual observed rainfall total for the day was 0.59" at the Orlando Executive Airport. Thus, S.T.P. Doppler Radar underestimated the total rainfall on September 2nd, 2016 by 0.04". To adjust for this anomaly, 0.04" of rain was added to the incident location S.T.P. value of 0.60" to get the total rainfall amount at the incident location on September 2nd, 2016 of 0.64".

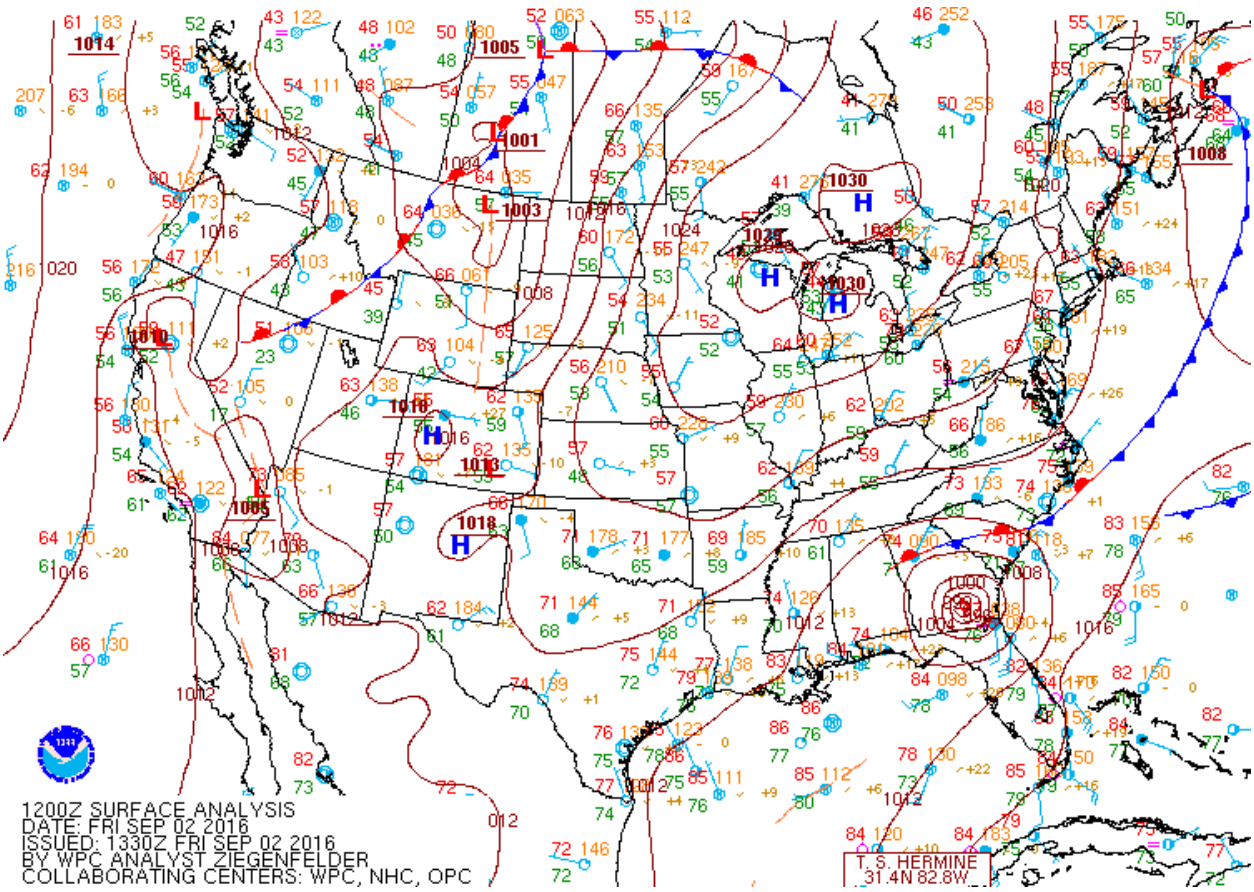
The following table is a summary of the daily weather conditions day by day at the location of the incident. This summary includes the date, the Maximum temperature for the 24-hour period (in Fahrenheit), the Minimum temperature for the 24-hour period (in Fahrenheit), and the total rain accumulation for the 24-hour period (in Inches).

AUGUST 2016 – SEPTEMBER 2016

Date	Maximum Air Temperature	Minimum Air Temperature	Rain
8/31	85	74	1.67"
9/1	87	73	0.11"
9/2	86	74	0.64"

SEPTEMBER 2, 2016 (DAY OF THE INCIDENT)

The following is a surface analysis map of the contiguous United States at 8:00 a.m. EDT on September 2nd, 2016 that was prepared by the Weather Prediction Center (WPC), a division of the National Weather Service. This surface map indicated that Tropical Storm Hermine was located over southern Georgia.



On September 2nd, 2016 (day of the incident), Doppler radar images that were zoomed in over the incident location and nearby surface observations indicated that occasional light rain fell from approximately 2:37 a.m. through 2:54 a.m. After a lull in the precipitation, steady light to moderate and heavy rain (with embedded thunderstorms at times) fell from approximately 4:08 a.m. through 9:42 a.m.

At 6:02 a.m. on September 2nd, 2016, the National Weather Service in Melbourne, Florida issued a "Short Term Forecast" which stated, ***"Some locally heavy rainfall will be possible as showers move northeast across the interstate 4 corridor. Localized amounts may reach 1 to 2 inches by late morning… causing a concern for ponding of water on roadways and minor flooding of poor drainage areas."*** At 10:47 a.m. on September 2nd, 2016, the National Weather Service in Melbourne, Florida issued a "Short Term Forecast" which stated, ***"Some locally heavy rainfall will be possible as showers move northeast across the area into early afternoon."***

No rain fell between 9:42 a.m. and 4:06 p.m. on the day of the incident.

During the late afternoon on September 2nd, 2016, periods of light rain fell from approximately 4:06 p.m. through 4:52 p.m. During the evening, steady light to moderate rain fell again from approximately 6:12 p.m. through 7:00 p.m.

Approximately 0.64" of rain accumulated on September 2nd, 2016 (day of the incident).

At 9:00 p.m. on September 2nd, 2016 (time and date of the incident), the sky was partly cloudy and the air temperature was 69 degrees Fahrenheit. The last time any precipitation fell prior to the time of the incident was at approximately 7:00 p.m. on September 2nd, 2016 (approximately 2 hours prior to the time of the incident).

BASE REFLECTIVITY DOPPLER RADAR ANALYSIS

The following image is a Base Reflectivity Doppler radar images (**Figure 5**) that was processed at 8:49 p.m. EDT on September 2nd, 2016. The incident location is indicated by a white pushpin on the base map. The color code on the right side indicates the intensity of the precipitation.

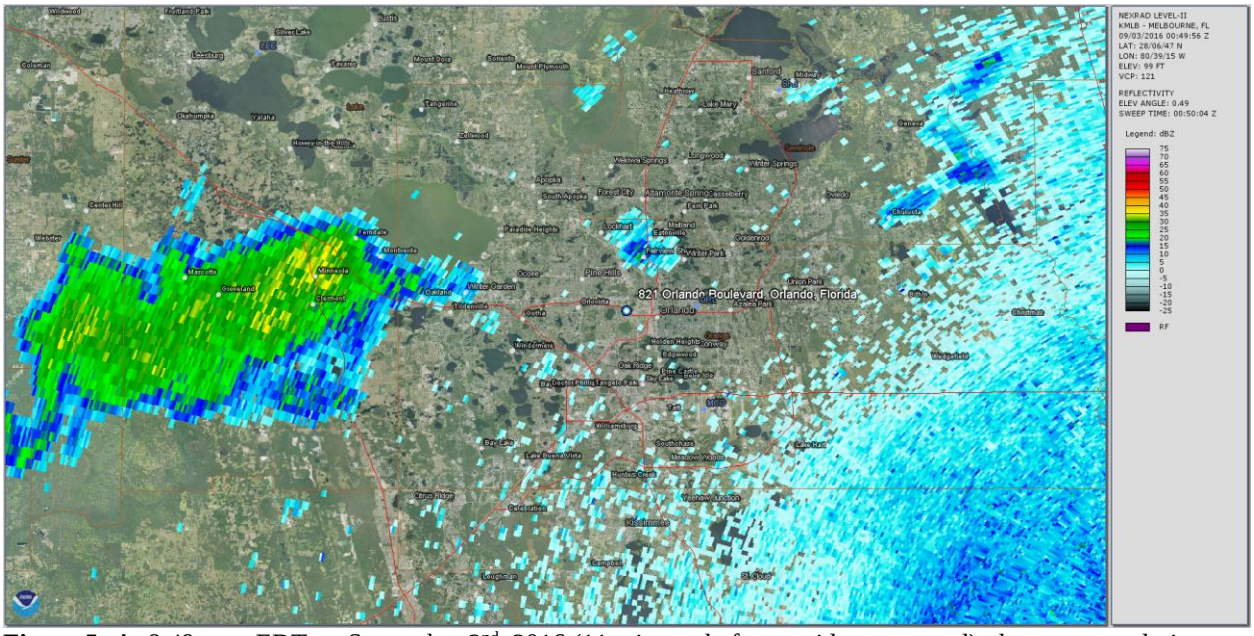


Figure 5: At 8:49 p.m. EDT on September 2nd, 2016 (11 minutes before accident occurred), the super-resolution base reflectivity Doppler radar image above and nearby surface observations indicated that no precipitation was falling at the incident location.

CONCLUSIONS

In conclusion, it is my opinion that:

- Tropical Storm Hermine caused rain and gusty winds to occur at the incident location from the early morning through the evening on September 2nd, 2016.
- Light to occasionally moderate and heavy rain fell at the incident location, with some occasional lulls, from approximately 2:37 a.m. through 7:00 p.m. on September 2nd, 2016 (day of the incident), and approximately 0.64" of rain accumulated.
- At 9:00 p.m. on September 2nd, 2016 (time and date of the incident), the sky was partly cloudy and the air temperature was 69 degrees Fahrenheit.
- The last time any precipitation fell prior to the time of the incident was at approximately 7:00 p.m. on September 2nd, 2016 (approximately 2 hours prior to the time of the

incident).

- As part of our investigation, we also reviewed the incident report that was provided to us by Radcliffe, Mondoya, & Planco, LLP. According to the incident report, Mr. Jacobson stated that he slipped and fell on a wet area of the floor that was located near the elevator of the hotel lobby. Mr. Jacobson stated that it was "not raining outside" when he fell and that there were no other wet surfaces between the entrance of the building and where he slipped and fell. He also stated that no wet floor signs were placed anywhere in the lobby.
- Mr. Jacobson's statement that it was "not raining outside" at the time that he fell is very consistent with our findings and the weather records which indicated that precipitation was not falling at the incident location. In fact, the last time that any precipitation fell at the incident location prior to the time of the incident was at 7:00 p.m. on September 2nd, 2016 (approximately 2 hours before the incident).
- Since the witness testimony stated that no other wet surfaces were presence between the outside door and where the incident occurred, it indicates that wet floor that Mr. Jacobson slipped and fell on was isolated with no evidenced of any water being tracked in from outdoors.

CERTIFICATION

I certify that the above information contained in this report is true and accurate to the best of my ability and that all of my opinions, findings, estimations, and interpolations expressed in this report were made with accuracy as a professional meteorologist within a reasonable degree of meteorological certainty.

By: _____

Certified Consulting Meteorologist

Certified Consulting Meteorologist
Awarded by the American Meteorological Society.