National Transportation Safety Board

Office of Aviation Safety

Washington, D.C. 20594-2000

February 14, 2011

WEATHER STUDY

DCA10MM025

A. ACCIDENT

Location: Delaware River, Philadelphia, Pennsylvania
Date: July 7, 2010
Time: 1437 eastern daylight time (1837 UTC[1])
Vessel: allision between the barge *The Resource* being towed by the M/V *Caribbean Sea* and DUKW 34

B. METEOROLOGICAL SPECIALIST

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C. SUMMARY

On Wednesday, July 7, 2010, the empty 250-foot-long sludge barge *The Resource*, being towed alongside the 78.9 –foot-long towing vessel M/V *Caribbean Sea*, allided with the anchored 33-foot amphibious small passenger vessel DUKW 34 in the Delaware River near Philadelphia, Pennsylvania. The *DUKW* 34, operated by Ride The Ducks International. LLC, carried 35 passengers and 2 crewmembers. On board the *Caribbean Sea* were 5 crewmembers. Following the allusion, the *DUKW* 34 sank in about 55 feet of water. Two passengers were fatally injured, and 10 passengers suffered minor injuries. No one on the *Caribbean Sea* was injured.

[1] UTC – is an abbreviation for Coordinated Universal Time.

D. DETAILS OF INVESTIGATION

The National Transportation Safety Board's (NTSB) Senior Meteorologist was not on scene for this investigation and gathered all the weather data for this investigation from the Washington D.C. office from official National Weather Service (NWS) sources including the National Climatic Data Center (NCDC). All times are eastern daylight time (EDT) based upon the 24 hour clock, local time is +4 hours to UTC, and UTC=Z. Directions are referenced to true north and distances in nautical miles. Heights are above mean sea level (MSL) unless otherwise noted. Visibility is in statute miles and fractions of statute miles.

The accident site was located at latitude 39° 57" N and longitude 75°08" W.

1.0 Synoptic Situation

The northeast section of the NWS Surface Analysis Chart for 1400 EDT (1800Z) on July 7, 2010, is provided as figure 1 with the approximate location of the accident site marked by a red cross. The chart depicted a high pressure system with a central pressure of 1020-hectopascals (hPa) centered over West Virginia with several weak low pressure systems of 1013-hPa off the Maryland and North Carolina coasts with a trough of low pressure extending north and south from the low's. The chart depicted a weak pressure gradient over the area which resulted in northwest to northerly wind flow of 10 knots or less over the area. Over the coastal areas east, an easterly onshore wind flow was indicated as a result of a sea-breeze. The station models depicted clear to partly cloudy skies over the area with surface temperatures ranging from 94° to 103° Fahrenheit (F) over Pennsylvania, New Jersey, Maryland, Delaware, and Virginia. Several stations reported visibility restricted in haze.

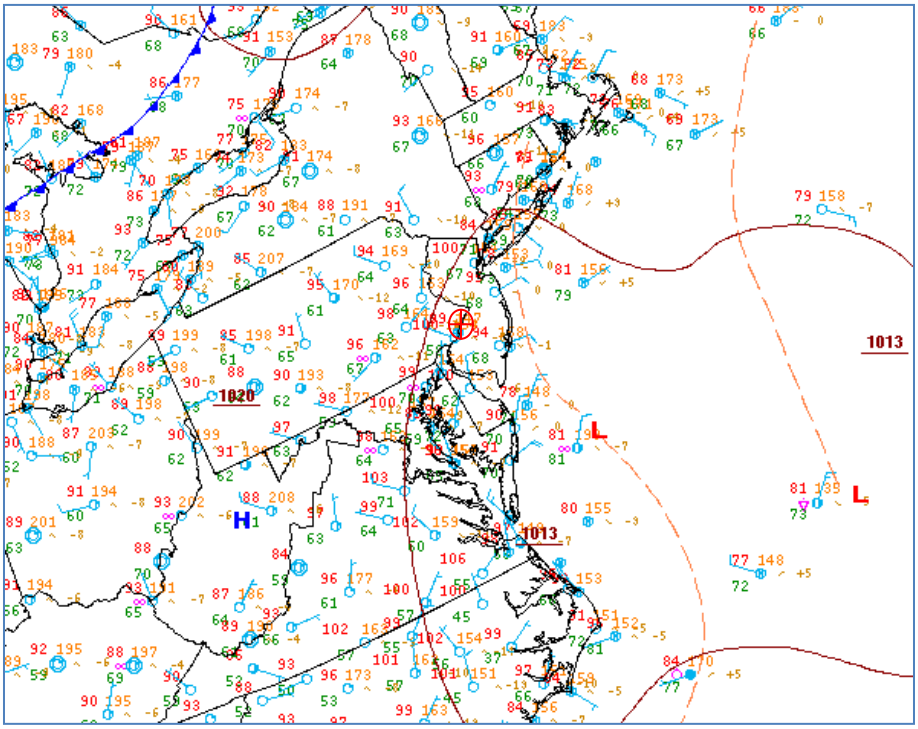

Figure 1 – NWS Surface Analysis Chart for 1400 EDT

The NWS Radar Summary Charts surrounding the period depicted no significant weather echoes in the vicinity of the accident site. Some very light intensity echoes were depicted to the east of the accident site over central New Jersey associated with the sea breeze front, with no defined cumulonimbus clouds were reported surrounding the period.

2.0 Surface Observations

The closest official NWS weather reporting location to the accident site was from Philadelphia International Airport (KPHL), Philadelphia, Pennsylvania, located approximately 6 1/2 miles southwest of the accident site at an elevation of 36 feet msl. The airport had an Automated Surface Observation System (ASOS) and was augmented by a NWS certified weather observer. The following conditions were reported surrounding the time of the accident:

Philadelphia weather at 1412 EDT, wind from 010° at 8 knots gusting to 17 knots, visibility unrestricted at 10 statute miles, a few clouds at 9,000 feet above ground level (agl), temperature 100° F (38° Celsius(C)), dew point temperature 59° F (15° C), altimeter setting 29.98 inches of mercury (Hg).

Philadelphia weather at 1454 EDT, wind from 010° at 8 knots gusting to 19 knots, visibility unrestricted at 10 statute miles, scattered clouds at 9,000 feet above ground level (agl), temperature 101° F (38.3° C), dew point temperature 58° F (14.4° C), altimeter setting 29.98 inches of Hg. Remarks: sea level pressure 1014.9-hPa.

The relative humidity was 26 percent at the time of the accident. No rainfall was reported on July 7, 2010, and the recorded low temperature of the day was 84° F (28.9° C) and the high temperature was 101° F (38.3 C).

3.0 Buoy Observation

The NOAA Philadelphia buoy station PHBP1 located south of the accident site in the Delaware River at latitude 39 56’0” N and longitude 75 8’30” W reported at 1436 a sea level pressure of 1014.5-Hpa, an air temperature of 99° F (37.1° C), and a water temperature of 82° F (27.8° C). A plot of air and water temperature during the period is included as figure 2.

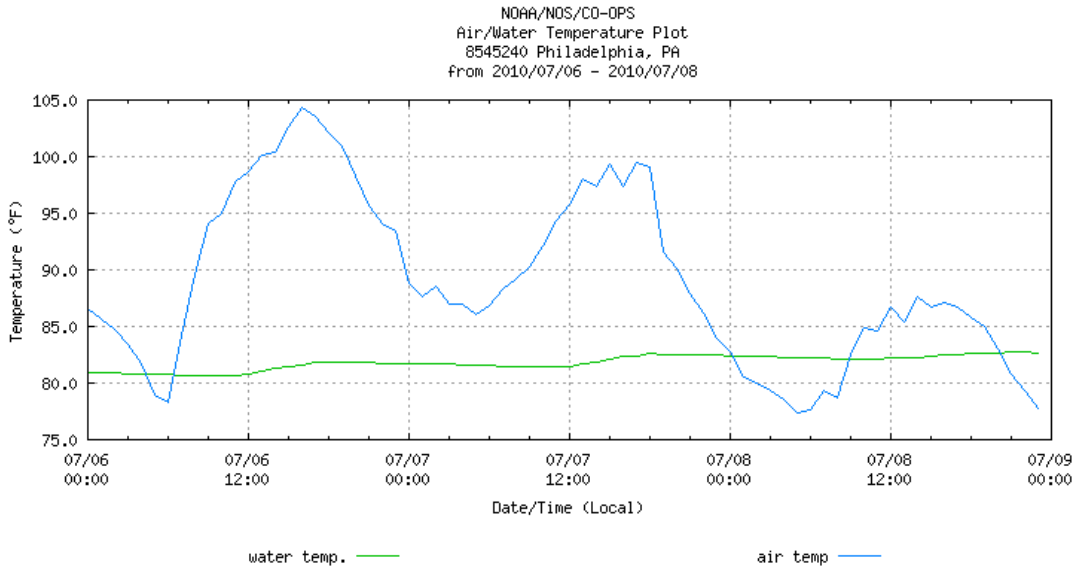

Figure 2 – PHBP1 buoy observation surrounding the period

4.0 NWS Public Forecast

The NWS Weather Service Forecast office (WSFO) located in Mount Holly, New Jersey, responsible for the Philadelphia area had an Excessive Heat Warning in effect until 2000 EDT for the area. An excessive heat warning is issued when the heat index[2] is expected to be over 110° F (43° C) for 3 hours or more during the day for two consecutive days or more, and evening temperatures of 80° F (27° C) or more. The five day forecast was as follows for the area:

PHILADELPHIA-
312 PM EDT WED JUL 7 2010
...EXCESSIVE HEAT WARNING IN EFFECT UNTIL 8 PM EDT THIS EVENING...
...EXCESSIVE HEAT WATCH IN EFFECT FROM THURSDAY MORNING THROUGH THURSDAY AFTERNOON...
.TONIGHT...PARTLY CLOUDY. LOWS IN THE UPPER 70S. EAST WINDS 5 TO 10 MPH.
.THURSDAY...PARTLY SUNNY. A CHANCE OF SHOWERS AND THUNDERSTORMS IN THE AFTERNOON. HOT. HUMID WITH HIGHS IN THE LOWER 90S. EAST WINDS 5 TO 10 MPH. CHANCE OF RAIN 30 PERCENT.
.THURSDAY NIGHT...PARTLY CLOUDY. A CHANCE OF SHOWERS AND THUNDERSTORMS IN THE EVENING. LOWS IN THE LOWER 70S. SOUTHEAST WINDS 5 TO 10 MPH. CHANCE OF RAIN 30 PERCENT.
.FRIDAY...PARTLY SUNNY. HUMID WITH HIGHS AROUND 90. SOUTH WINDS 5 TO 10 MPH.
.FRIDAY NIGHT...PARTLY CLOUDY IN THE EVENING...THEN BECOMING MOSTLY CLOUDY. A CHANCE OF SHOWERS AND THUNDERSTORMS. LOWS IN THE LOWER 70S. SOUTH WINDS 5 TO 10 MPH. CHANCE OF RAIN 40 PERCENT.
.SATURDAY...MOSTLY CLOUDY WITH A CHANCE OF SHOWERS AND THUNDERSTORMS. HIGHS IN THE UPPER 80S. CHANCE OF RAIN 50 PERCENT.

[2] Heat Index (HI) – is an index that combines air temperature and relative humidity in an attempt to determine the human-perceived equivalent temperature. The human body normally cools itself by perspiration, or sweating, which evaporates and carries heat away from the body. However, when the relative humidity is high, the evaporation rate is reduced, so heat is removed from the body at a lower rate causing it to retain more heat than it would in dry air.

.SATURDAY NIGHT...MOSTLY CLOUDY WITH A CHANCE OF SHOWERS AND THUNDERSTORMS IN THE EVENING...THEN PARTLY CLOUDY AFTER MIDNIGHT. LOWS IN THE UPPER 60S. CHANCE OF RAIN 50 PERCENT.
.SUNDAY...MOSTLY SUNNY. HIGHS AROUND 90.
.SUNDAY NIGHT...PARTLY CLOUDY IN THE EVENING...THEN BECOMING MOSTLY CLEAR. LOWS AROUND 70.
.MONDAY...SUNNY. HIGHS IN THE LOWER 90S.
.MONDAY NIGHT...PARTLY CLOUDY. LOWS IN THE LOWER 70S.
.TUESDAY...PARTLY SUNNY. HIGHS IN THE LOWER 90S.
.TUESDAY NIGHT...PARTLY CLOUDY WITH A CHANCE OF SHOWERS AND THUNDERSTORMS. LOWS IN THE LOWER 70S. CHANCE OF RAIN 30 PERCENT.
.WEDNESDAY...PARTLY SUNNY WITH A CHANCE OF SHOWERS AND THUNDERSTORMS. HIGHS IN THE LOWER 90S. CHANCE OF RAIN 30 PERCENT.
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NOAA's National Weather Service

Heat Index

Temperature (°F)

Relative Humidity (%)	80	82	84	86	88	90	92	94	96	98	100	102	104	106	118	110
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
55	81	84	86	89	93	97	101	106	112	117	124	130	137			
60	82	84	88	91	95	100	105	110	116	123	129	137				
65	82	85	89	93	98	103	108	114	121	126	130					
70	83	86	90	95	100	105	112	119	126	134						
75	84	88	92	97	103	109	116	124	132							
80	84	89	94	100	106	113	121	129								
85	85	90	96	102	110	117	126	135								
90	86	91	98	105	113	122	131									
95	86	93	100	108	117	127										
100	87	95	103	112	121	132										

Likelihood of Heat Disorders with Prolonged Exposure or Streuous Activity

Caution Extreme Caution Danger Extreme Danger

5.0 Astronomical Data

The United States naval Observatory astronomical data for Philadelphia indicated the following conditions for July 7, 2010:

Beginning of civil twilight	0506 EDT
Sunrise	0539 EDT
Sun transit	1306 EDT
Accident	1437 EDT
Sunset	2032 EDT
End of civil twilight	2104 EDT

At the time of the accident the Sun was approximately 64° above the horizon at an azimuth of 234°.

Donald E. Eick
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