Docket No. SA-543

Exhibit No. 7-A

NATIONAL TRANSPORTATION SAFETY BOARD

Washington, D.C.

Meteorology Group Chairman
Factual Report

(9 Pages)

National Transportation Safety Board
Office of Aviation Safety
Washington, D.C. 20594-2000
January 12, 2011

METEOROLOGICAL FACTUAL REPORT

DCA10MP008

A. Accident

Location: San Bruno, California
Date: September 9, 2010
Time: approximately 1811 Pacific daylight time (0111 UTC[1] on September 10, 2010)

B. Meteorological Specialist

Mike Richards
Meteorologist
National Transportation Safety Board
Operational Factors Division, AS-30
Washington, DC 20594-2000

C. Summary

On September 9, 2010, at approximately 6:11 p.m. Pacific Daylight Time, a 30-inch diameter section of a multi-diameter intra-state natural gas transmission pipeline (Line 132) owned and operated by Pacific Gas & Electric Company (PG&E) ruptured in a residential area in San Bruno, California. The rupture occurred at approximately mile point (MP) 39.28, at the intersection of Earl Avenue and Glenview Drive in the city of San Bruno. PG&E estimated that 47.6 million standard cubic feet (MMSCF) of natural gas were released as a result of the rupture. The rupture created a crater approximately 72 feet long by 26 feet wide. A pipe segment approximately 28 feet long was found about 100 feet south of the crater. The released natural gas was ignited sometime after the rupture; the resulting fire destroyed 38 homes and damaged 63. Eight people were killed, numerous individuals were injured, and many more were evacuated from the area. On September 10, the NTSB launched a team to California to investigate this tragedy.

[1] UTC – abbreviation for Coordinated Universal Time

Line 132 is regulated by the California Public Utilities Commission (CPUC). According to the PG&E survey sheets, the ruptured pipe (part of Segment 180 that is approximately 1,742-feet long) was constructed from 30-inch diameter seamless steel pipe (API 5LX) Grade X42 with 0.375-inch thick wall. The pipeline was coated with hot applied asphalt, and was cathodically protected. The ruptured pipeline segment was installed circa 1956. The specified maximum operating pressure (MOP) for the ruptured pipeline was 375 pounds per square inch gauge (psig). According to PG&E, the maximum allowable operating pressure (MAOP) for the line was 400 psig. Just before the accident, PG&E was working on their uninterruptable power supply (UPS) system at Milpitas Terminal, which is located about 39.28 miles southeast of the accident site.

D. Details of Investigation

The National Transportation Safety Board's (NTSB) meteorological specialist was not on scene and gathered weather data for this investigation from the NTSB's Washington D.C. office from official National Oceanic and Atmospheric Administration (NOAA) National Weather Service (NWS) sources, except where noted. All times are reported in Pacific daylight time (PDT) for September 9, 2010, based upon the 24-hour clock. Local time is -7 hours from UTC, and UTC=Z. Directions are referenced to true north unless otherwise noted and distances are in nautical miles. Heights are above mean sea level (msl) unless otherwise noted. Distances along surface of the earth are calculated using the "Great Circle" formula.

Coordinates used for the accident location: 37.622499° North latitude, 122.441961° West longitude; elevation 360 feet.

1.0 In-Situ Observations

San Francisco International Airport (KSFO) in San Francisco, California, was located about 3 miles to the east of the accident site at an elevation of 13 feet, and was equipped with an Automated Surface Observing Systems (ASOS). These reports were issued while an official weather observer was logged into the ASOS system.

KSFO-measured wind directions and magnitudes were relatively consistent throughout the period following the accident time. At 1756 PDT, the wind was from 270° at 18 knots. Following this observation, measured wind directions remained between 270° and 290°, and wind magnitudes were above 15 knots through 2156 PDT, after which they decreased to 8 knots at 2356 PDT. Air temperatures during the period were between 15° and 18° Celsius (C) and dewpoint temperatures remained between 10° and 11°C. Observations from KSFO between 1912 and 2356 PDT noted smoke ("FU") to the west at altitudes between 200 and 700 feet above ground level.

METAR KSFO 100056Z 27018KT 10SM FEW010 SCT030 18/10 A2996 RMK AO2 SLP147 T01830100

METAR KSFO 100156Z 28018KT 10SM FEW012 17/10 A2997 RMK AO2 SLP147 T01670100

SPECI KSFO 100212Z 27019KT 10SM FEW005 SCT012 17/10 A2997 RMK AO2 FU FEW005 W

METAR KSFO 100256Z 28018KT 10SM FEW004 SCT012 16/11 A2997 RMK AO2 PK WND 27026/0215 SLP149 FU FEW004 W T01610106 55001

METAR KSFO 100356Z 27015KT 10SM FEW002 SCT012 16/11 A2998 RMK AO2 SLP152 FU FEW002 W T01560106

METAR KSFO 100456Z 28015KT 10SM FEW003 SCT008 16/11 A2998 RMK AO2 SLP152 FU FEW003 W T01560111

METAR KSFO 100556Z 29012KT 10SM FEW007 15/11 A2998 RMK AO2 SLP153 FU FEW007 W T01500111 10200 20150 51004

METAR KSFO 100656Z 29008KT 10SM FEW007 15/11 A2999 RMK AO2 SLP155 FU FEW007 W T01500106

A Citizen Weather Observers Program (APRSWXNET) station at Daly City, California (ID: AS072), was located about 5 miles to the north of the accident site at an elevation of 581 feet. Data from this station is presented in table 1. Wind directions during the period following the accident were measured as northerly and northeasterly, with wind gusts to near 12 knots. From 1802 to 2354 PDT, the relative humidity increased from 55% to 89%.

Time(PDT)	Temp(°C)	Dewpoint(°C)	R Hum(%)	W Dir.	W Speed(kts)	W Gust(kts)
1802	13.9	5.0	55	36°	7.8	7.8
1813	13.3	6.0	61	27°	7.8	11.7
1824	13.3	6.9	65	25°	5.8	9.7
1835	12.8	7.0	68	30°	3.9	9.7
1846	12.8	7.2	69	28°	5.8	9.7
1857	12.8	7.5	70	37°	5.8	9.7
1908	12.2	6.9	70	337°	5.8	11.7
1919	12.2	7.3	72	37°	3.9	11.7
1930	12.2	7.5	73	42°	3.9	11.7
1941	12.2	7.7	74	37°	5.8	11.7
1952	12.2	7.9	75	25°	5.8	9.7
2003	12.2	8.3	77	49°	5.8	7.8
2014	12.2	8.7	79	38°	5.8	9.7
2025	12.2	8.9	80	24°	5.8	7.8
2036	11.7	8.7	82	38°	3.9	7.8
2047	12.2	9.2	82	30°	5.8	7.8
2058	12.2	9.2	82	24°	1.9	7.8
2109	12.2	9.2	82	35°	3.9	7.8
2120	12.2	9.2	82	15°	3.9	7.8
2131	12.2	9.2	82	24°	7.8	7.8
2142	12.2	9.4	83	346°	9.7	9.7
2153	11.7	9.1	84	18°	9.7	11.7
2215	11.7	9.2	85	333°	7.8	11.7
2226	11.7	9.2	85	10°	7.8	11.7
2237	11.7	9.4	86	343°	7.8	11.7
2248	11.7	9.6	87	345°	7.8	11.7
2259	11.7	9.8	88	19°	11.7	11.7

2310	11.7	9.9	89	20°	7.8	11.7
2321	11.7	9.9	89	18°	5.8	11.7
2332	11.7	9.9	89	13°	7.8	11.7
2343	11.7	9.9	89	357°	7.8	9.7
2354	11.7	9.9	89	29°	5.8	9.7

Table 1 – Data collected from APRSWXNET station AS072 on September 9, 2010. R_Hum = relative humidity; W_Dir = wind direction; W_Speed = wind speed; W_Gust = wind gust.

A California Air Resources Board (CARB) station at Fort Funston in San Francisco, California (ID: CQ143), was located about 6 miles to the north-northwest of the accident site at an elevation of 57 feet. Data from this station is presented in table 2. Wind directions during the period following the accident were measured between 225° and 269°, with wind magnitudes not above 8 knots.

Time(PDT)	Temp(°C)	W Dir.	W Speed(kts)
1800	12.2	225°	7.8
1900	13.2	239°	7.8
2000	12.8	252°	5.8
2100	12.7	269°	5.8
2200	12.7	252°	5.8
2300	12.6	243°	7.8
0000*	12.6	231°	7.8

Table 2 – Data collected from CARB/LAD station CQ143 on September 9, 2010. W_Dir = wind direction; W_Speed = wind speed. *data from 0000 PDT September 10, 2010.

Meteorological data from AMDAR[2] reporting aircraft arriving/departing to/from San Francisco International Airport (KSFO) near the time and altitude of the accident is presented in table 3, where "pressure altitudes" in feet (Pft) are determined by conversion from ambient pressure using the International Standard Atmosphere. Wind and temperature retrievals made between approximately 300 and 500 Pft indicated wind directions between 261° and 275°, with magnitudes between 18 and 22 knots. Temperatures were measured at near 13°C.

Aircraft#	Time(PDT)	Latitude	Longitude	Altitude(Pft.)	W Dir.	W Speed(kts)	Temp(°C)
1	1840	37.631	-122.358	480	274°	22	12.7
2	1906	37.631	-122.378	370	268°	22	12.2
3	1922	37.620	-122.358	290	272°	22	13.2
4	1952	37.600	-122.328	510	275°	18	12.6
5	2028	37.631	-122.369	310	261°	21	12.6

Table 3 – Data collected from AMDAR reporting aircraft on September 9, 2010. W_Dir = wind direction; W_Speed = wind speed.

[2] *AMDAR* is the generally-accepted worldwide term for automated weather reports from commercial aircraft.

Atmospheric data was retrieved from a rawinsonde launch (table 4) at 1700 PDT from Oakland International Airport (KOAK) in Oakland, California, which was located approximately 13 miles east-northeast of the accident site at an elevation of about 10 feet. These data indicated that at 423 feet, the wind was from 290° at a magnitude of 14 knots, with an air temperature of 19°C and a relative humidity of 64%.

Pres(hPa)	Alt(ft.)	Temp(°C)	Dewpoint(°C)	R Hum(%)	MixR(g/kg)	W Dir.	W Speed(kts)
1015	10	21.2	13.2	60	9.48	300°	10
1000	**423**	**19.0**	**12.0**	**64**	**8.88**	**290°**	**14**
981	961	16.2	9.2	63	7.49	309°	11
979	1001	16.2	9.1	63	7.47	310°	11

Table 4 – Data collected from the KOAK rawinsonde launch at 1700 PDT. Pres = atmospheric pressure in hectopascals; Alt = altitude in feet; MixR = mixing ratio.

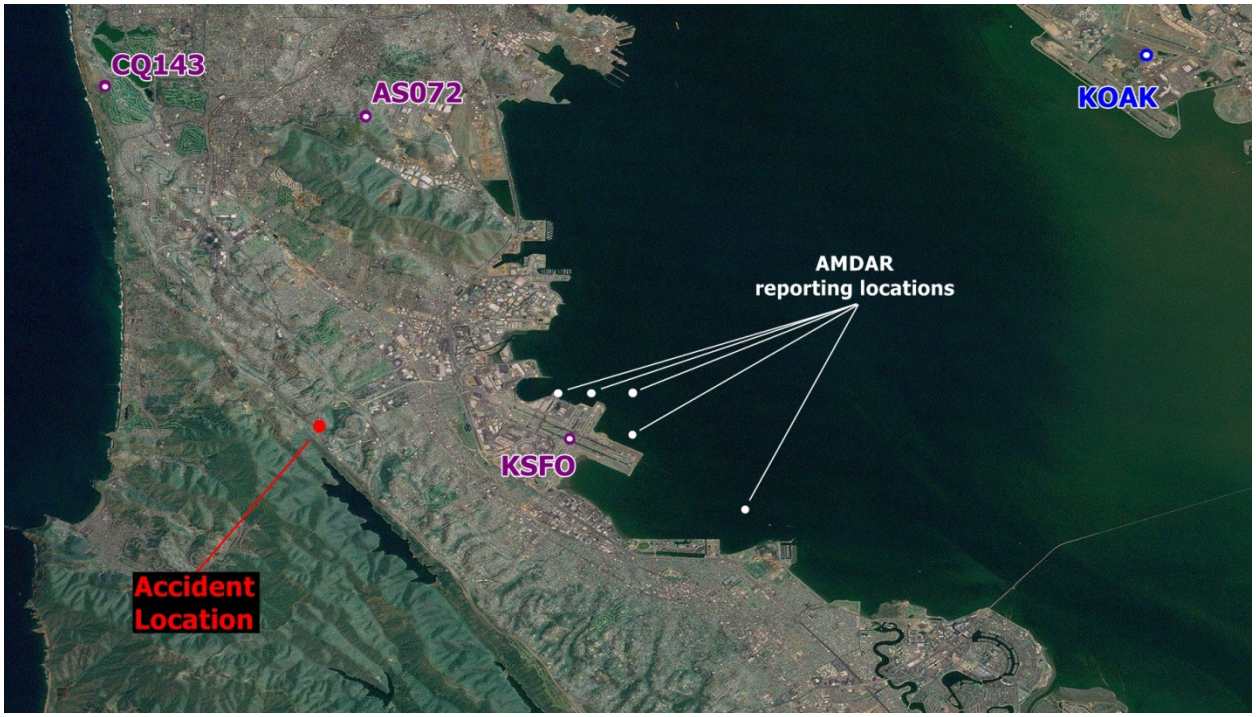

Figure 1 – Locations of data sources presented in Section 1.0

2.0 Model Data[3]

Graphical output from the Bay Area Wind Flow Model for 1700, 1800 and 1900 PDT on September 9, 2010 (figures 2-4), are presented here. Wind vectors are valid for 10 meters above the surface and the magnitude is in knots. The model data indicated that the area near the accident location (red circle) was experiencing westerly winds between 10 and 15 knots during the time period. The area immediately to the southeast of the accident site was experiencing slightly higher wind magnitudes (values approaching 20 knots).

[3] Model data was provided courtesy of Mr. Jan Null, meteorologist with Golden Gate Weather Services.

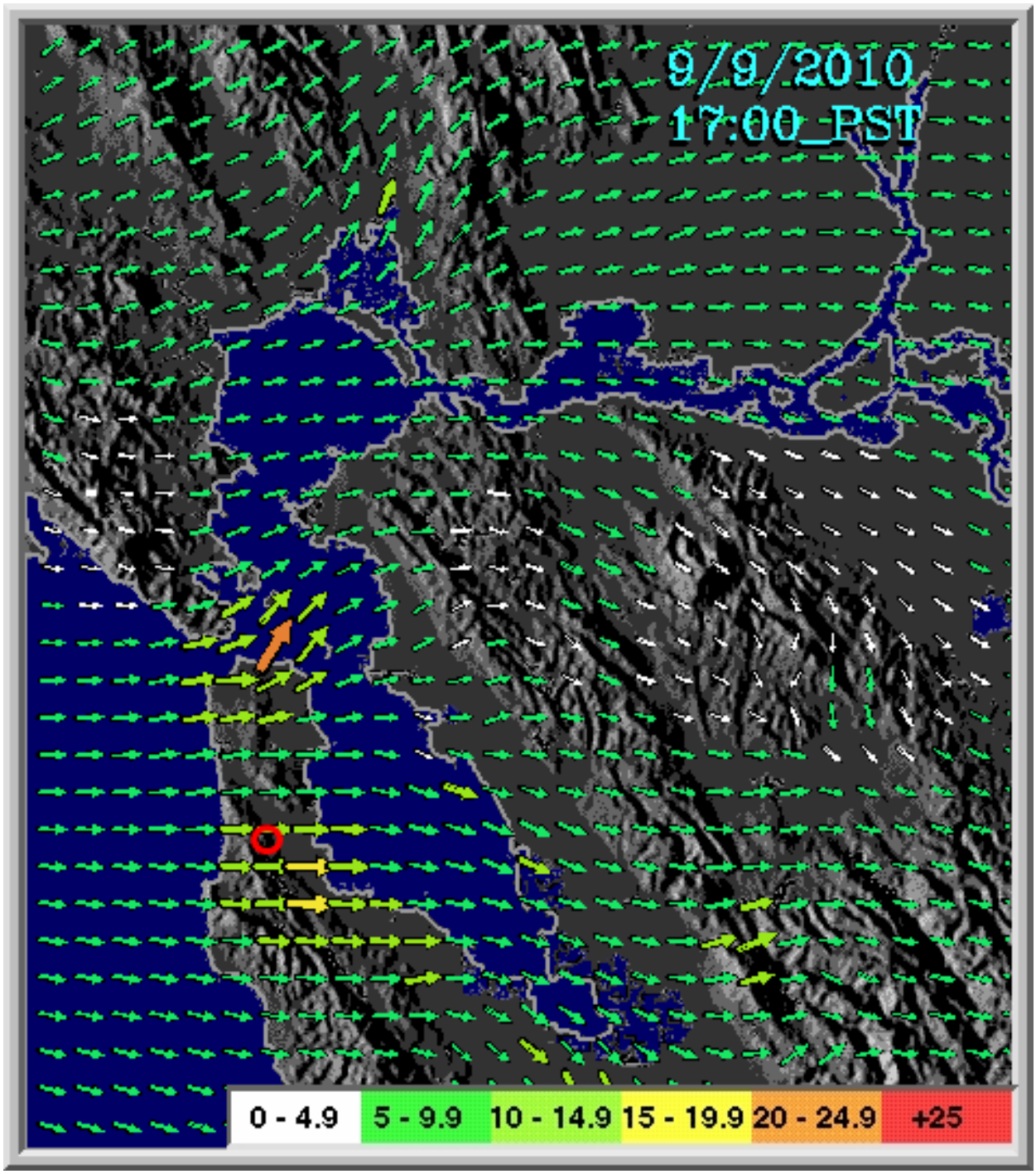

Figure 2 – Bay Area Wind Flow Model output for 1700 PDT. Wind magnitude in knots. Vectors valid for 10 meters above the surface. Red circle indicates accident location.

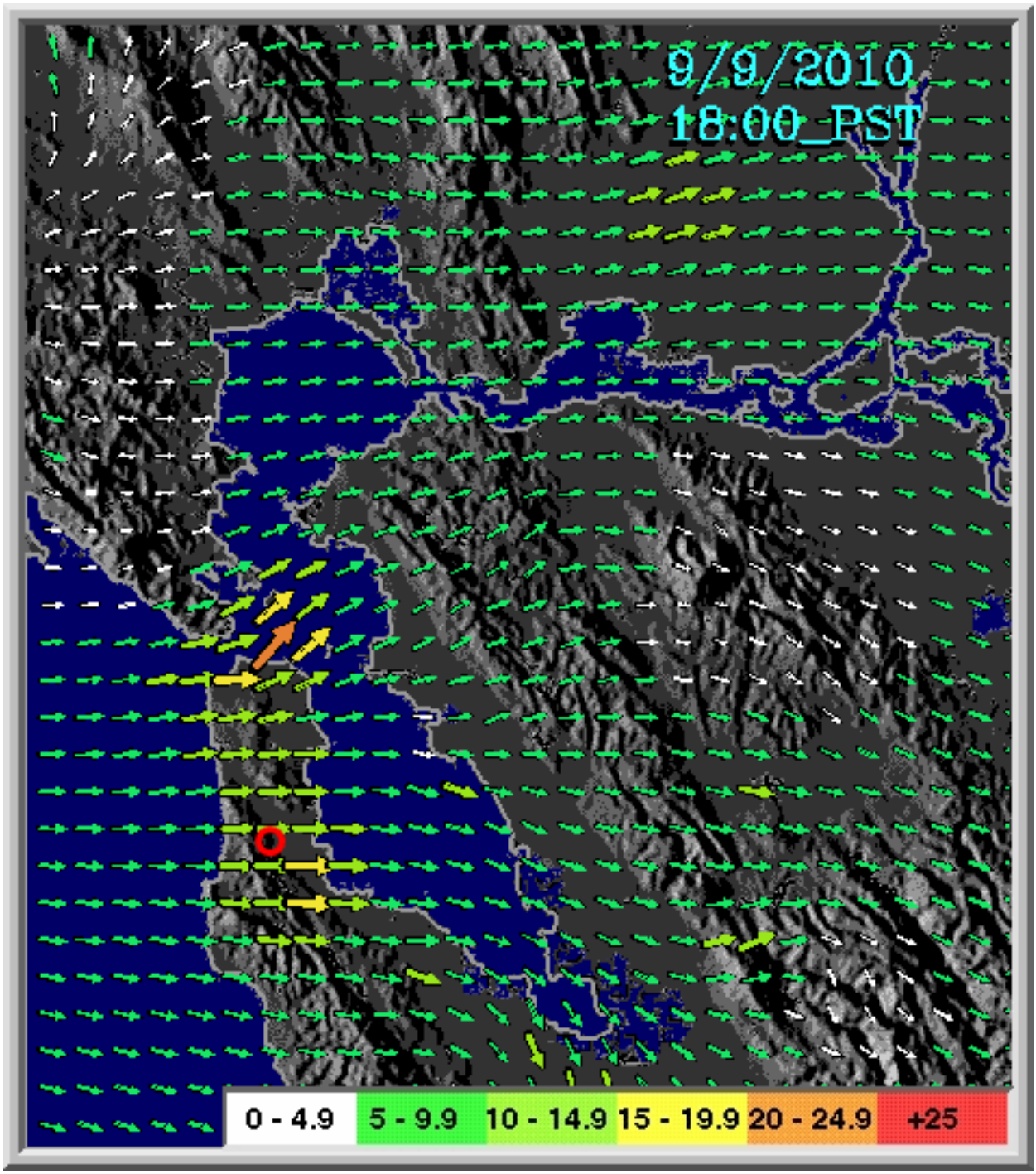

Figure 3 – Bay Area Wind Flow Model output for 1800 PDT. Wind magnitude in knots. Vectors valid for 10 meters above the surface. Red circle indicates accident location.

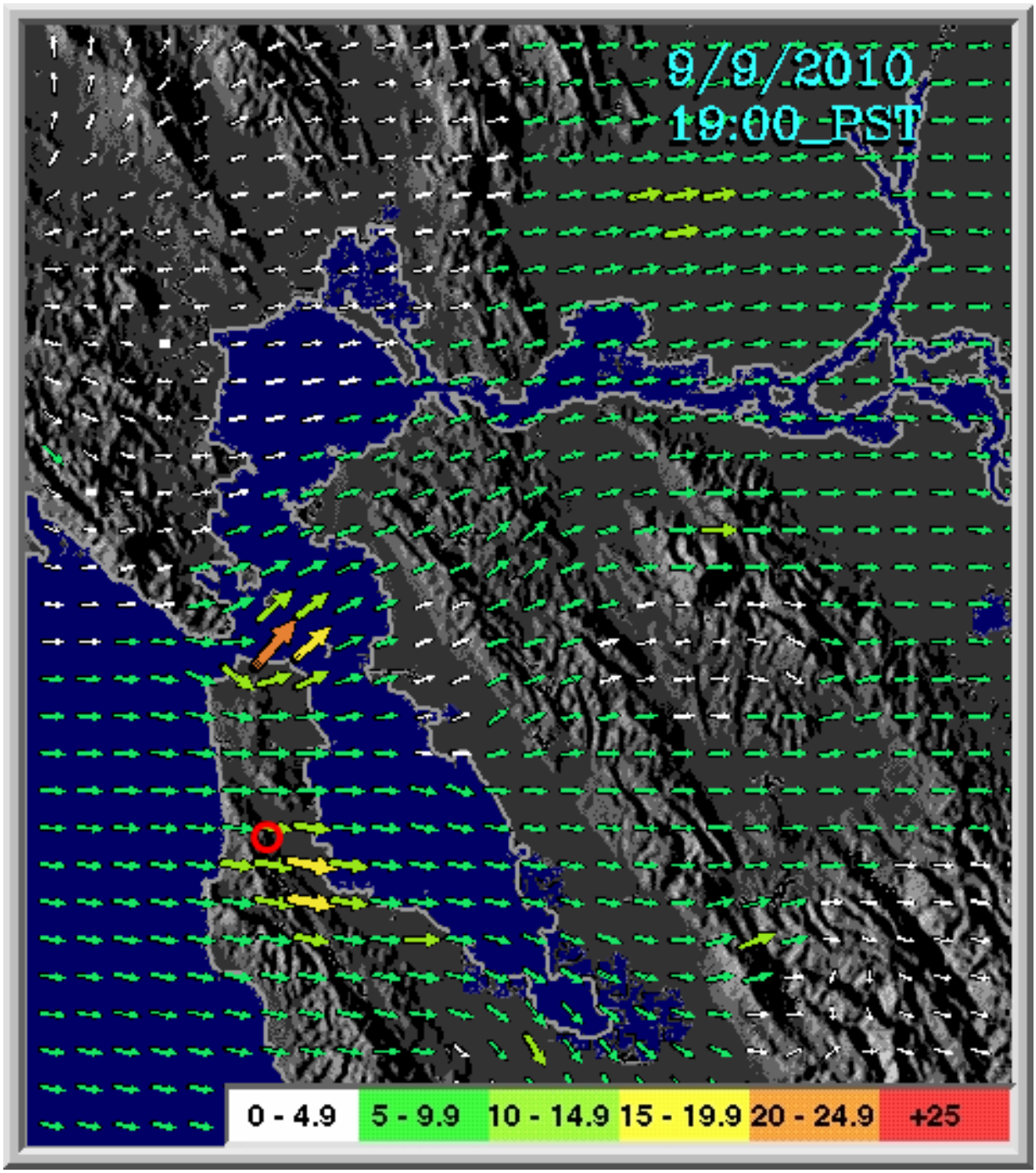

Figure 4 – Bay Area Wind Flow Model output for 1900 PDT. Wind magnitude in knots. Vectors valid for 10 meters above the surface. Red circle indicates accident location.

3.0 Local Expertise

An analysis of local wind conditions during the period surrounding the accident was performed by Mr. Jan Null, a certified Consulting Meteorologist with Golden Gate Weather Services. Mr. Null assessed that the wind flow toward the accident neighborhood would have been northwesterly, arriving down "Skyline Boulevard." Slightly northwest of the accident location, a branching of the northwesterly wind would have brought a weaker flow across the accident neighborhood from the west-northwest (figure 5), with eddying also occurring. Mr. Null estimated that wind speeds between 1800 and 2100 PDT would have been in the "15 to 20 mile per hour range."

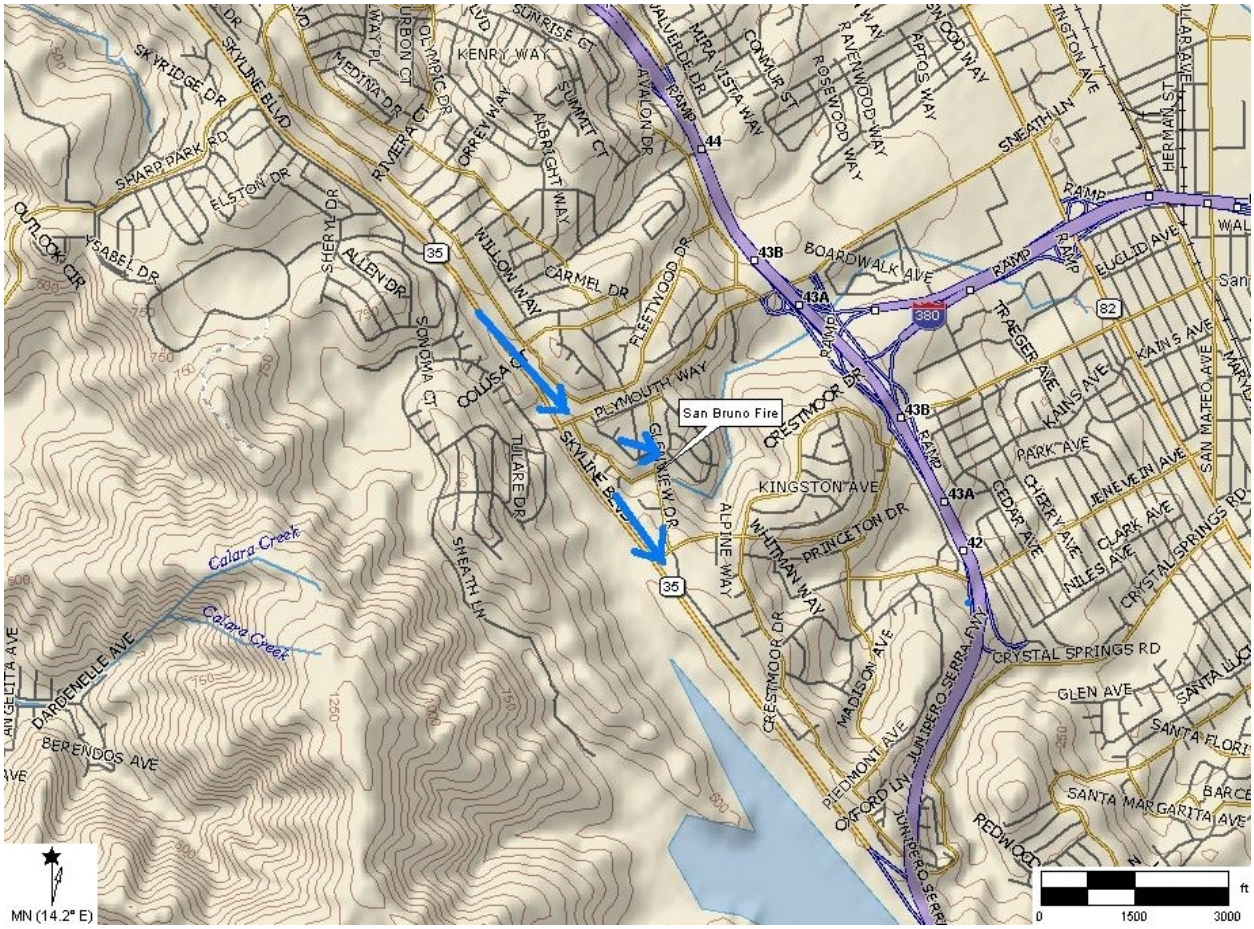

Figure 5 – Mr. Null's assessment of the branching of the local wind flow across the accident neighborhood.

Mike Richards
NTSB Meteorologist