



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

November 7, 2019

Factual Report

METEOROLOGY

DCA19MM047

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A. ACCIDENT

Location: 21.5 nautical miles south-southwest of Santa Barbara, California
Date: September 2, 2019
Time: 0314 Pacific daylight time
1014 Coordinated Universal Time (UTC)
Vehicles: Commercial Dive Vessel *Conception*

B. METEOROLOGIST

Paul Suffern
Senior Meteorologist
Operational Factors Division (AS-30)
National Transportation Safety Board

C. DETAILS OF THE INVESTIGATION

The National Transportation Safety Board's (NTSB) Meteorologist did not travel for this investigation and gathered the weather data for this investigation from the NTSB's Washington D.C. office and from official National Oceanic and Atmospheric Administration (NOAA) National Weather Service (NWS) sources including the National Centers for Environmental Information (NCEI). All times are Pacific daylight time (PDT) on September 2, 2019, and are based upon the 24-hour clock, where local time is -7 hours from UTC, and UTC=Z (unless otherwise noted). 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. NWS airport and station identifiers use the standard International Civil Aviation Organization 4-letter station identifiers versus the International Air Transport Association 3-letter identifiers, which deletes the initial country code designator "K" for U.S. airports.

The accident site coordinates used were latitude 34.049° N, longitude 119.735° W.

D. FACTUAL INFORMATION

1.0 Synoptic Situation

The synoptic or large scale migratory weather systems influencing the area were documented using standard NWS charts issued by the National Center for Environmental Prediction, the Ocean Prediction Center, and the Weather Prediction Center, located in College Park, Maryland. These are the base products used in describing synoptic weather features and in the creation of forecasts and warnings for the NWS. Reference to these charts can be found at NCEI.¹

¹ Chart information is found at: <https://nomads.ncdc.noaa.gov/ncep/NCEP>

1.1 Surface Analysis Chart

The southwestern United States section of the NWS Surface Analysis Chart for 0200 PDT is provided as figure 1 with the location of the accident site marked within the red circle. The chart identified a low pressure system near the southern end of the Sierra Nevada Mountains with a central pressure of 1010-hectopascals (hPa). Another surface low pressure system was located along the California and Arizona border with a pressure of 1010-hPa. A surface trough² stretched from the southern Sierra Nevada Mountains southward into between Los Angeles and San Diego areas. Another surface trough stretched northwestward from the southern Sierra Nevada Mountains into the Central Valley of California. Troughs can act as lifting mechanisms to help produce clouds and precipitation if sufficient moisture is present.

The station models around the accident site depicted air temperatures in the mid to upper 60's degrees Fahrenheit (°F) and dew point temperatures in the mid 60's °F with a temperature-dew point spread of 3° or less. Light and variable winds were present near shore with a 10-knot northwest wind southwest of the accident site and overcast skies with mist near the coast and clear skies over inland areas.

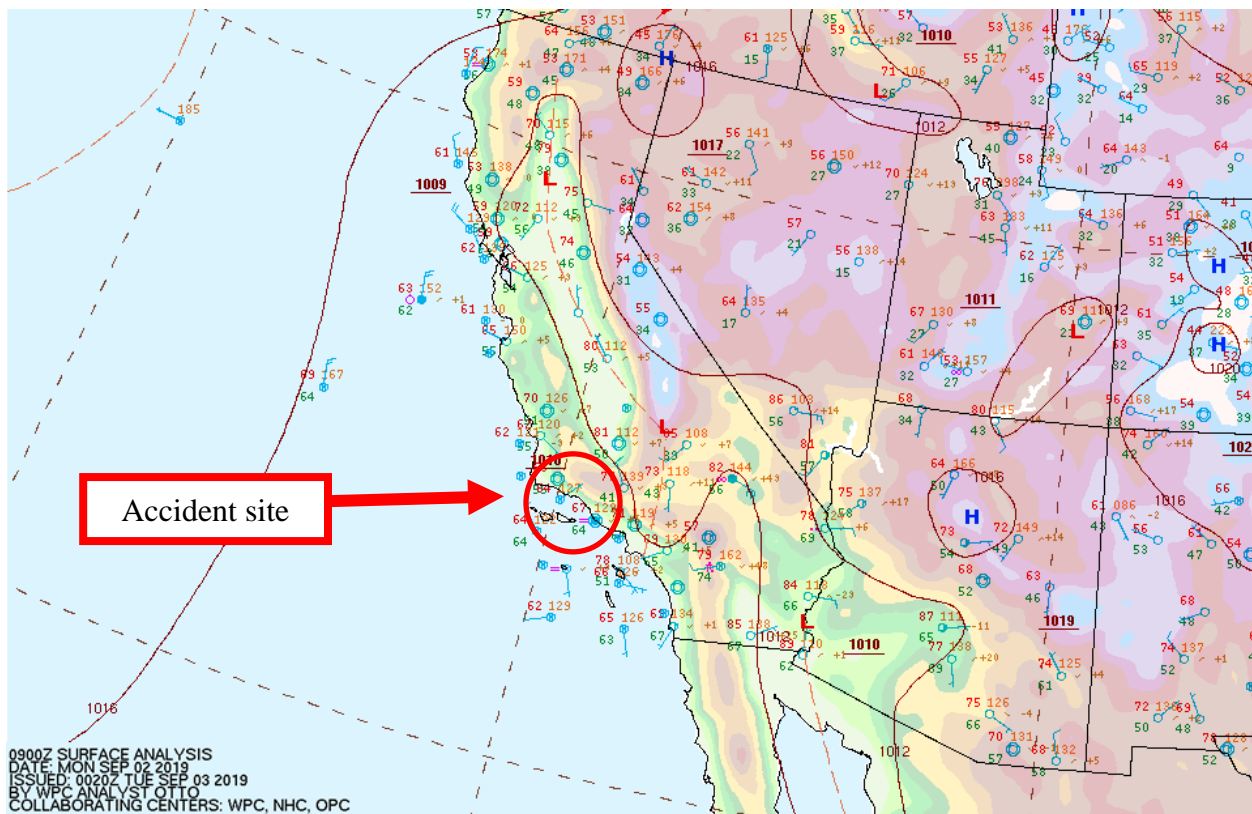


Figure 1 – NWS Surface Analysis Chart for 0200 PDT

² Trough – An elongated area of relatively low atmospheric pressure or heights.

2.0 Surface Observations

The area surrounding the accident site was documented using standard Meteorological Aerodrome Reports (METARs) and Specials (SPECIs) and additional supplemental observation sites. The following observations were taken from standard code and are provided in plain language. Figure 2 is a Google Earth map with the accident site and the closest weather reporting locations marked.

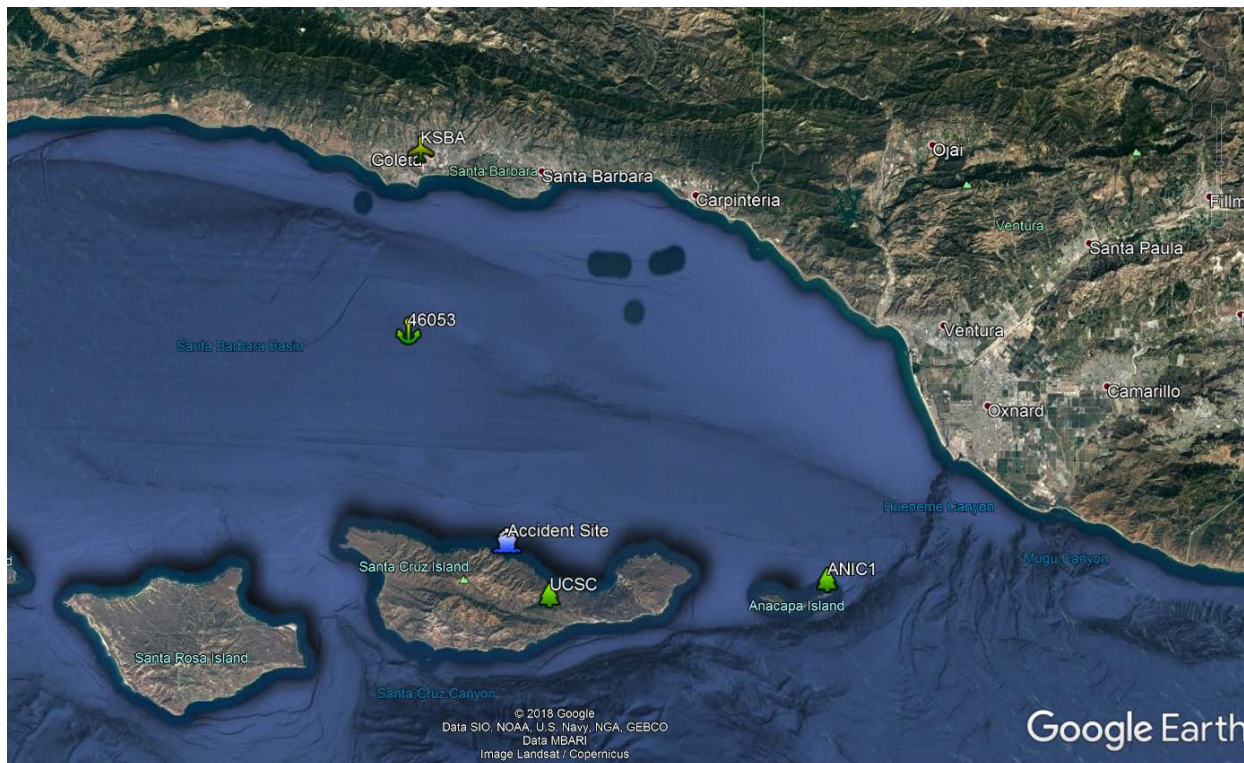


Figure 2 – Google Earth map of accident area with the location of the accident site and surface observation sites

Santa Barbara Municipal Airport (KSBA), Santa Barbara, California, was the closest official surface weather station to the accident site. KSBA had Automated Surface Observing System (ASOS³) whose reports were supplemented by the air traffic control tower when tower was in operation⁴. KSBA was located 23 miles north-northwest of the accident site at an elevation of 13 feet (ft) (figure 2). The following observations were taken and disseminated during the times surrounding the accident with observations decoded:

³ ASOS – Automated Surface Observing System is equipped with meteorological instruments to observe and report wind, visibility, present weather, cloud coverage and ceiling, temperature, dewpoint, altimeter, barometric pressure, lightning (thunderstorm, and other supplemental information).

⁴ ATC hours were from 0600 to 2300 local time.

ID	TIME	T	TD	RH	DIR	SPD	GST	ALT	SLP	VIS	CIL	COV	WX	MAX	MIN	PR6	PR24	SC
KSBA	2353	73	63	71	240	11		984	104	10		CLR		75	65			
KSBA	0053	71	63	76	240	9		984	103	10		CLR						
KSBA	0153	68	62	81	260	10		984	105	10		CLR						
KSBA	0253	68	61	78	230	3		984	106	10		CLR						
KSBA	0353	67	62	84	0	0		985	107	10		CLR						
KSBA	0453	66	62	87	0	0		987	113	10		CLR						
KSBA	0553	65	62	90	130	4		986	112	10		CLR		73	65			
KSBA	0653	65	63	93	120	6		987	115	10		CLR						
KSBA	0701	65	63	93	110	6		988		10	5	SCT						
KSBA	0713	65	63	93	100	9		988		10	5	BKN						
KSBA	0753	66	63	90	100	7		990	125	10	5	OVC		75	58			
KSBA	0841	65	64	97	120	4		991		7	4	OVC						
KSBA	0853	65	64	97	110	4		990	126	8	4	OVC						
KSBA	0920	65	63	93	100	6		990		8	5	OVC						
KSBA	0937	65	63	93	100	7		990		8	4	OVC						
KSBA	0953	65	63	93	90	7		990	125	5	4	OVC H						
KSBA	1053	66	64	93	80	3		990	123	6	3	OVC H						
KSBA	1153	66	64	93	70	8		993	136	5	4	OVC H		66	64			
KSBA	1253	66	65	96	70	3		993	135	6	4	OVC H						

The full METAR reports are below:⁵

[0153 PDT] METAR KSBA 020853Z AUTO 11004KT 8SM OVC004 18/18 A2990 RMK AO2 SLP126 T01830178 51014=

[0220 PDT] SPECI KSBA 020920Z AUTO 10006KT 8SM OVC005 18/17 A2990 RMK AO2 T01830172=

[0237 PDT] SPECI KSBA 020937Z AUTO 10007KT 8SM OVC004 18/17 A2990 RMK AO2 T01830172=

[0253 PDT] METAR KSBA 020953Z AUTO 09007KT 5SM BR OVC004 18/17 A2990 RMK AO2 SLP125 T01830172=

ACCIDENT TIME 0314 PDT

[0353 PDT] METAR KSBA 021053Z AUTO 08003KT 6SM BR OVC003 19/18 A2990 RMK AO2 SLP123 T01890178=

[0453 PDT] METAR KSBA 021153Z AUTO 07008KT 5SM BR OVC004 19/18 A2993 RMK AO2 SLP136 T01890178 10189 20178 53009=

[0553 PDT] METAR KSBA 021253Z 07003KT 6SM BR OVC004 19/18 A2993 RMK AO2 SLP135 T01890183=

⁵ The bold sections in this NWS product and the rest of products in this report are intended to highlight the sections that directly reference the weather conditions that affected the accident location around the accident time. The local times in section 2.0 next to the METARs are provided for quick reference between UTC and local times around the accident time.

KSBA weather at 0253 PDT, automated, wind from 090° at 7 knots, 5 miles visibility, mist, an overcast ceiling at 400 ft above ground level (agl), temperature of 18° Celsius (C), dew point temperature of 17°C, and an altimeter setting of 29.90 inches of mercury (inHg). Remarks: automated station with a precipitation discriminator, sea level pressure 1012.5 hPa, temperature 18.3°C, dew point temperature 17.2°C.

KSBA weather at 0353 PDT, automated, wind from 080° at 3 knots, 6 miles visibility, mist, an overcast ceiling at 300 ft agl, temperature of 19°C, dew point temperature of 18°C, and an altimeter setting of 29.90 inHg. Remarks: automated station with a precipitation discriminator, sea level pressure 1012.3 hPa, temperature 18.9°C, dew point temperature 17.8°C.

There were two additional non-NWS weather observations located closer to the accident site. The Santa Cruz Island Reserve (UCSC) had a Remote Automated Weather Station (RAWS) weather station located 4 miles southeast of the accident site at 1,335 ft (figure 2). The following observations were taken and disseminated during the times surrounding the accident (figure 3):

# STATION: UCSC													
# STATION NAME: Santa Cruz Island Reserve (UCNRS)													
# LATITUDE: 33.99944													
# LONGITUDE: -119.68556													
# ELEVATION [ft]: 1335													
# STATE: CA													
Station_ID	Date_Time	pressure	air_temp	relative_humidity	wind_speed	wind_direction	wind_gust	precip_accum_ten_minute	dew_point_temperature	sea_level_pressure	heat_index	altimeter_set_id	
		INHG	Fahrenheit	%	Miles/hour	Degrees	Miles/hour	Inches	Fahrenheit	INHG	Fahrenheit	INHG	
UCSC	09/02/2019 08:30 UTC	28.5	62.2	100	3.2	75	5.7	0	62.2	26.26		29.92	
UCSC	09/02/2019 08:40 UTC	28.5	62.2	100	4.81	69	5.61	0	62.2	26.26		29.92	
UCSC	09/02/2019 08:50 UTC	28.5	62.2	100	5.5	66	7.49	0	62.2	26.26		29.92	
UCSC	09/02/2019 09:00 UTC	28.5	62.71	100	5.99	50	8.01	0	62.71	26.19		29.92	
UCSC	09/02/2019 09:10 UTC	28.51	62.6	100	8.3	125	10.4	0	62.6	26.22		29.93	
UCSC	09/02/2019 09:20 UTC	28.5	62.4	100	7.61	107	9.48	0	62.4	26.24		29.92	
UCSC	09/02/2019 09:30 UTC	28.5	62.71	100	4.99	105	8.5	0	62.71	26.19		29.92	
UCSC	09/02/2019 09:40 UTC	28.5	63.7	90	7.49	111	9.8	0	60.69	26.39		29.92	
UCSC	09/02/2019 09:50 UTC	28.5	65.19	82	9.48	107	13.4	0	59.52	26.49		29.92	
UCSC	09/02/2019 10:00 UTC	28.5	65.5	86	6.69	121	9.4	0	61.17	26.29		29.92	
UCSC	09/02/2019 10:10 UTC	28.49	64.6	85	7.4	96	11.1	0	59.96	26.44		29.91	
UCSC	09/02/2019 10:20 UTC	28.49	65.41	81	5.3	98	8.5	0	59.39	26.48		29.91	
UCSC	09/02/2019 10:30 UTC	28.49	67.1	73	7.7	117	10.2	0	58.1	26.58		29.91	
UCSC	09/02/2019 10:40 UTC	28.5	65.89	88	6.91	126	8.19	0	62.21	26.16		29.92	
UCSC	09/02/2019 10:50 UTC	28.5	63.7	96	8.81	116	11.41	0	62.53	26.18		29.92	
UCSC	09/02/2019 11:00 UTC	28.5	63.3	99	8.99	129	12.59	0	63.01	26.14		29.92	
UCSC	09/02/2019 11:10 UTC	28.5	63.19	100	11.1	125	14.9	0	63.19	26.12		29.92	
UCSC	09/02/2019 11:20 UTC	28.5	63.3	100	11.7	134	13.89	0	63.3	26.1		29.92	
UCSC	09/02/2019 11:30 UTC	28.51	63.39	100	13.4	135	17.29	0	63.39	26.1		29.93	
UCSC	09/02/2019 11:40 UTC	28.51	63.61	100	13.6	135	17.6	0	63.61	26.07		29.93	
UCSC	09/02/2019 11:50 UTC	28.51	63.81	100	15.39	134	20.8	0	63.81	26.04		29.93	
UCSC	09/02/2019 12:00 UTC	28.51	63.9	100	14.7	132	19.6	0	63.9	26.02		29.93	
UCSC	09/02/2019 12:10 UTC	28.51	63.9	100	14	134	17.81	0	63.9	26.02		29.93	
UCSC	09/02/2019 12:20 UTC	28.51	63.9	100	14.41	132	21.61	0	63.9	26.02		29.93	

Figure 3 – UCSC observations

UCSC weather at 0310 PDT, temperature 64.6°F, dew point temperature 59.96°F, wind from 096° at 7.4 miles per hour (mph) (6.4 knots) with gusts to 11.1 mph (9.6 knots).

UCSC weather at 0320 PDT, temperature 65.41°F, dew point temperature 59.39°F, wind from 098° at 5.3 mph (4.6 knots) with gusts to 8.5 mph (7.4 knots).

The Anacapa Island (ANIC1) had a RAWS weather station located 19 miles east of the accident site at 277 ft (figure 2). The following observations were taken and disseminated during the times surrounding the accident (figure 4):

# STATION: ANIC1																	
# STATION NAME: ANACAPA ISLAND																	
# LATITUDE: 34.015056																	
# LONGITUDE: -119.363169																	
# ELEVATION [ft]: 277																	
# STATE: CA																	
Station_ID	Date_Time	altimeter	air_temp	se	relative_humidity	wind_speed	wind_direction	wind_gust	precip_accum	peak_wind_speed	peak_wind_direction	dew_point	temperature	pressure_set	sea_level	pressure_set	id
		INHG	Fahrenheit	%	Miles/hour	Degrees	Miles/hour	Inches	Miles/hour	Degrees	Fahrenheit	INHG	INHG				
ANIC1	09/01/2019 18:23 UTC	30.45	69.01		89	4.99	53	8.99	0.05	8.99		41	65.61	30.15			29.55
ANIC1	09/01/2019 19:23 UTC	30.64	72		82	2.01	324	8.01	0.05	8.01		48	66.18	30.33			29.7
ANIC1	09/01/2019 20:23 UTC	30.95	73.99		78	2.01	273	7	0.05	7		282	66.67	30.64			29.98
ANIC1	09/01/2019 21:23 UTC	31.11	73		78	4	332	8.01	0.05	8.01		324	65.71	30.8			30.18
ANIC1	09/01/2019 22:23 UTC	31.03	72		83	4.99	317	8.01	0.05	8.01		303	66.53	30.72			30.08
ANIC1	09/01/2019 23:23 UTC	30.77	69.01		88	4.99	321	8.99	0.05	8.99		328	65.29	30.46			29.87
ANIC1	09/02/2019 00:23 UTC	30.74	71.01		81	4.99	315	8.99	0.05	8.99		313	64.86	30.43			29.84
ANIC1	09/02/2019 01:23 UTC	30.64	71.01		86	4	300	8.99	0.05	8.99		313	66.59	30.33			29.69
ANIC1	09/02/2019 02:23 UTC	30.28	64.99		97	3	333	8.01	0.05	8.01		341	64.11	29.98			29.45
ANIC1	09/02/2019 03:23 UTC	30.02	64.99		98	3	5	5.99	0.05	5.99		345	64.41	29.72			29.18
ANIC1	09/02/2019 04:23 UTC	29.87	63		99	8.01	344	12.01	0.05	12.01		337	62.71	29.57			29.08
ANIC1	09/02/2019 05:23 UTC	29.76	64		98	1.01	60	10	0.05	10		338	63.42	29.46			28.95
ANIC1	09/02/2019 06:23 UTC	29.72	64		98	4	50	7	0.05	7		40	63.42	29.42			28.91
ANIC1	09/02/2019 07:23 UTC	29.84	64.99		99	4	44	8.01	0.05	8.01		54	64.7	29.54			28.99
ANIC1	09/02/2019 08:23 UTC	29.92	66.99		97	4	56	8.99	0.05	8.99		43	66.1	29.62			29.02
ANIC1	09/02/2019 09:23 UTC	30	66.99		96	4	46	11.01	0.05	11.01		64	65.8	29.7			29.11
ANIC1	09/02/2019 10:23 UTC	30	66.99		96	2.01	44	7	0.05	7		40	65.8	29.7			29.11
ANIC1	09/02/2019 11:23 UTC	30.03	68		96	7	60	11.01	0.05	11.01		62	66.81	29.73			29.1
ANIC1	09/02/2019 12:23 UTC	30.04	68		96	4	50	11.01	0.05	11.01		59	66.81	29.74			29.11
ANIC1	09/02/2019 13:23 UTC	30.06	68		96	4.99	62	7	0.05	7		65	66.81	29.76			29.13
ANIC1	09/02/2019 14:23 UTC	30.07	68		97	2.01	350	7	0.05	7		59	67.11	29.77			29.13
ANIC1	09/02/2019 15:23 UTC	30.13	70		93	2.01	71	4	0.05	4		121	67.87	29.83			29.15
ANIC1	09/02/2019 16:23 UTC	30.4	69.01		93	4	52	5.99	0.05	5.99		43	66.89	30.1			29.46
ANIC1	09/02/2019 17:23 UTC	30.56	70		91	2.01	44	7	0.05	7		31	67.24	30.26			29.61

Figure 4 – ANIC1 observations

ANIC1 weather at 0223 PDT, temperature 66.99°F, dew point temperature 65.8°F, wind from 046° at 4 mph (3.5 knots) with gusts to 11.01 mph (9.6 knots).

ANIC1 weather at 0323 PDT, temperature 66.99°F, dew point temperature 65.8°F, wind from 044° at 2.01 mph (1.7 knots) with gusts to 7 mph (6.1 knots).

2.1 Local Marine Observations

There was a National Data Buoy Center (NDBC) buoy 46053 located 13 miles north-northwest of the accident site. The following observations were taken and disseminated during the times surrounding the accident (figure 5):

#YY	MM	DD	hh	mm	WDIR	WSPD	GST	WVHT	DPD	APD	MWD	PRES	ATMP	WTMP
#yr	mo	dy	hr	mn	degT	m/s	m/s	m	sec	sec	degT	hPa	degC	degC
2019	9	2	13	0	50	4	4	MM	MM	MM	MM	1013.8	19	17.9
2019	9	2	12	50	50	3	4	0.7	10	5.6	236	1013.7	18.9	18
2019	9	2	12	40	50	3	5	0.7	MM	5.6	236	1013.7	19	18.3
2019	9	2	12	30	60	4	5	MM	MM	MM	MM	1013.6	19.1	18.3
2019	9	2	12	20	70	5	6	MM	MM	MM	MM	1013.6	19.1	17.9
2019	9	2	12	10	80	5	6	MM	MM	MM	MM	1013.5	19.1	17.9
2019	9	2	12	0	90	5	6	MM	MM	MM	MM	1013.6	19	17.9
2019	9	2	11	50	70	3	4	0.8	10	5.8	248	1013.6	18.7	17.9
2019	9	2	11	40	70	3	5	MM	MM	MM	MM	1013.4	18.6	17.9
2019	9	2	11	30	60	3	4	MM	MM	MM	MM	1013.1	18.5	17.9
2019	9	2	11	20	60	3	4	MM	MM	MM	MM	1012.9	18.6	MM
2019	9	2	11	10	60	3	4	MM	MM	MM	MM	1012.7	18.6	17.9
2019	9	2	11	0	70	3	4	MM	MM	MM	MM	1012.6	18.7	17.8
2019	9	2	10	50	70	3	4	0.7	10	6	244	1012.6	18.5	17.8
2019	9	2	10	40	70	3	4	MM	MM	MM	MM	1012.6	18.5	17.8
2019	9	2	10	30	80	4	5	MM	MM	MM	MM	1012.5	18.5	17.7
2019	9	2	10	20	90	4	5	MM	MM	MM	MM	1012.6	18.4	17.7
2019	9	2	10	10	90	4	5	MM	MM	MM	MM	1012.5	18.4	17.6
2019	9	2	10	0	80	4	6	MM	MM	MM	MM	1012.7	18.2	17.5
2019	9	2	9	50	80	5	6	0.9	10	6.1	251	1012.7	18.1	MM
2019	9	2	9	40	80	5	6	MM	MM	MM	MM	1012.7	18.3	17.2
2019	9	2	9	30	90	5	7	MM	MM	MM	MM	1012.7	18.4	17.2
2019	9	2	9	20	70	3	4	MM	MM	MM	MM	1012.8	18.3	17.1
2019	9	2	9	10	60	2	3	MM	MM	MM	MM	1012.7	18.2	17
2019	9	2	9	0	50	2	3	MM	MM	MM	MM	1012.8	18	17.1
2019	9	2	8	50	40	3	3	0.7	8	5	241	1012.7	18	17.2
2019	9	2	8	40	30	3	4	0.7	MM	5	241	1012.7	18	17.2
2019	9	2	8	30	30	3	4	MM	MM	MM	MM	1012.7	17.9	17.4
2019	9	2	8	20	10	2	3	MM	MM	MM	MM	1012.8	18	17.3
2019	9	2	8	10	10	2	3	MM	MM	MM	MM	1012.7	18.1	17.3
2019	9	2	8	0	MM	0	1	MM	MM	MM	MM	1012.6	18.1	17.3
2019	9	2	7	50	MM	0	2	0.9	10	5.1	235	1012.6	18	17.3

Figure 5 – Buoy 46053 observations

NDBC Buoy 46053 weather at 0310 PDT, temperature 65°F (18.4°C), water temperature 64°F (17.6°C), wind from 090° at 8 knots (4 m/s) with gusts to 10 knots (5 m/s), and a sea level pressure of 1012.5 hPa.

NDBC Buoy 46053 weather at 0320 PDT, temperature 65°F (18.4°C), water temperature 64°F (17.7°C), wind from 090° at 8 knots (4 m/s) with gusts to 10 knots (5 m/s), and a sea level pressure of 1012.6 hPa.

The significant wave heights observed between 0300 and 0400 PDT were between 2 to 3 ft (0.7 and 0.9 meters), with the mean wave direction between 244° and 251°, the dominant wave period of 10 seconds, and the average wave period of 6 seconds.

3.0 Significant Wave Height

The standard ocean wave forecast set forth by the World Meteorological Organization (WMO) instructs that the countries responsible for the weather forecast for the world's oceans use significant wave height for their ocean wave height forecasts. The Ocean Prediction Center and the National Hurricane Center's Tropical Analysis and Forecast Branch are responsible for the NOAA forecasts for the northern Atlantic and Pacific oceans. NWS Weather Forecast Offices (WFO)s are responsible for NOAA forecasts closer to the coastal regions (including the Bering Sea) and the NWS Los Angeles/Oxnard, California office was the responsible office for the weather forecast for the accident area.

The wavy water surface in the ocean is made up of an entire spectrum of waves and the waves can vary quite a bit for a given wind speed and fetch. Significant wave height is defined as the average height of the highest one-third of the waves in a wave spectrum. Figure 6 shows a typical wave spectrum distribution. This distribution shows that for a given wavy ocean surface the most probable wave height and mean wave height a person would encounter would be lower than the significant wave height, with statistically a much smaller chance of encountering a wave whose height is larger than the significant wave height. For example, given a significant wave height observed of 20 ft, the mean wave height encountered by a vessel for that wave spectrum would be 12.8 ft with the most probable wave height encountered of 12 ft. However, the highest 10 percent of waves within that wave spectrum would be 25.4 ft and the highest 1 percent of waves would be around 33.4 ft high. The highest wave a vessel would likely encounter within a wave spectrum whose significant wave height was 20 ft would be 40 ft.

From the NDBC buoy 46053 data for the accident site had significant wave heights of 2 to 3 ft, and the highest wave heights the accident vessel could have expected would have been 4 to 6 ft with most of the waves encountered around 1.2 to 1.8 ft high.

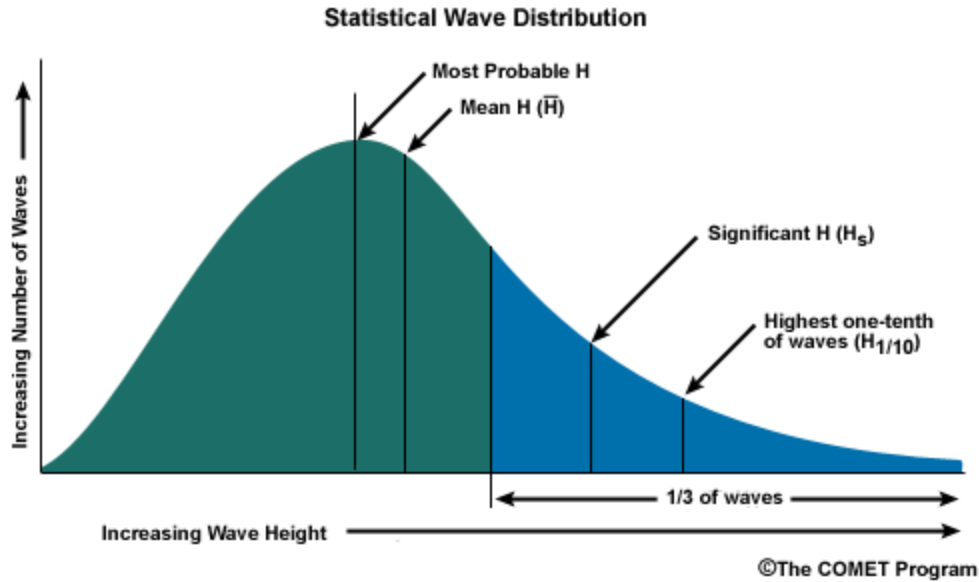


Figure 6 – Typical statistical wave distribution

4.0 Satellite Data

Data from the Geostationary Operational Environmental Satellite number 17 (GOES-17) data were obtained from an archive at the Space Science Engineering Center at the University of Wisconsin-Madison in Madison, Wisconsin, and processed using the Man-computer Interactive Data Access System software. The infrared (band 13) imagery at wavelengths of 10.3 microns (μm) were retrieved for the period. Satellite imagery surrounding the time of the accident, from 0000 PDT through 0800 PDT at approximately 5-minute intervals were reviewed, and the closest images to the time of the accident are documented here. Due to the low light conditions the visible imagery (band 2) was not conducive for viewing around 0314 PDT.

Figure 7 presents the GOES-17 infrared imagery from 0316 PDT at 6X magnification and with a temperature enhance curve applied with the accident site highlighted with a red square. Inspection of the infrared imagery indicated a mix of high and low cloud cover over the accident site at the accident time with the lowest brightness temperatures (yellow and red colors, higher clouds) located southwest and northeast of the accident site. It should be noted these figures have not been corrected for any parallax error.

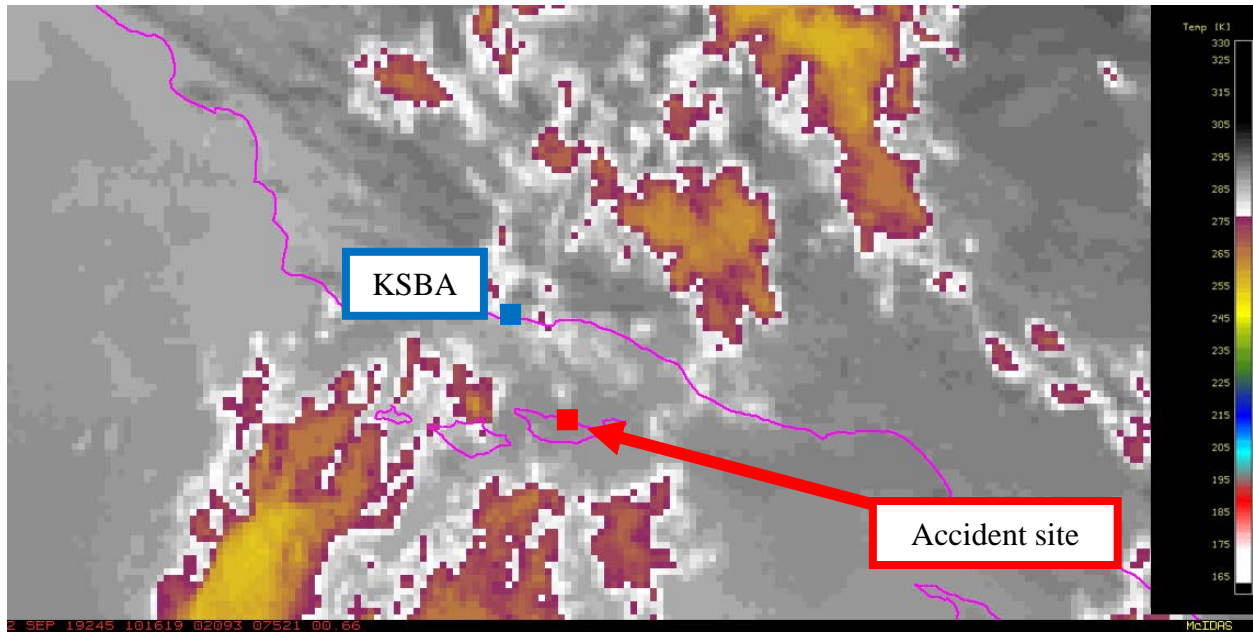


Figure 7 – GOES-17 infrared image at 0316 PDT

Attachment 1 presents the GOES-17 Nighttime Microphysics RGB (red green blue) imagery from 0201 to 0505 PDT. Inspection of the Nighttime Microphysics RGB imagery indicated 2 levels of cloud cover above the accident site at the accident time. The lower-level cloud cover was spreading from east to west (attachment 1) between the accident site and KSBA and was indicated by the light blue and green colors. The higher-level cloud cover was moving from south to north and was indicated by the dark red and yellow colors (attachment 1). The light blue and green colors on the Nighttime Microphysics RGB imagery indicate low-level cool water clouds. The dark red and yellow colors on the Nighttime Microphysics RGB imagery indicate high thick ice clouds. The low-level cool water clouds were in between Santa Cruz Island and KSBA at the accident time (attachment 1).⁶

5.0 Regional Radar Imagery Information

A regional view of the NWS National Composite Radar Mosaic is included as figure 8 for 0315 PDT with the approximate location of the accident site marked within a red circle. The image depicted no precipitation targets above the accident site at the accident time.

⁶ Also see: <https://nasasporttraining.wordpress.com/2017/02/23/nighttime-microphysics-rgb-application-aviation-module-2/>

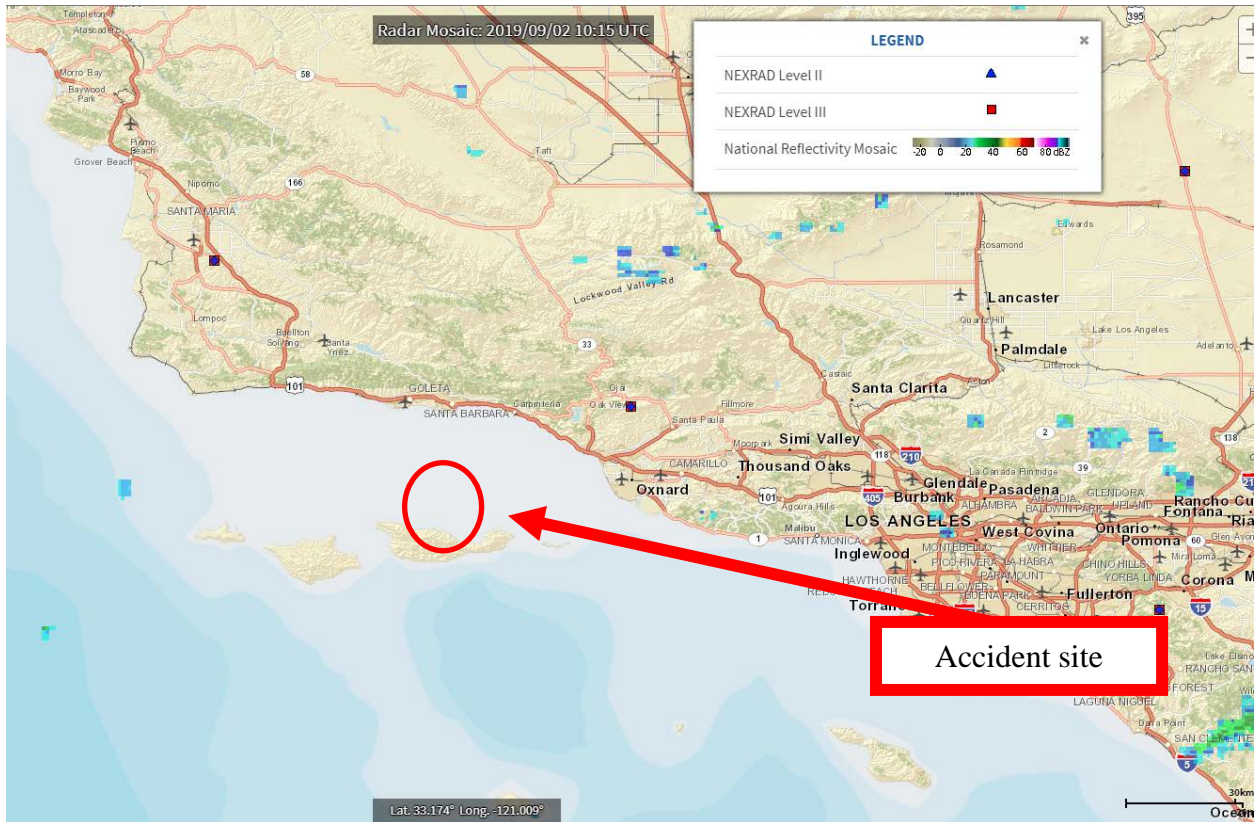
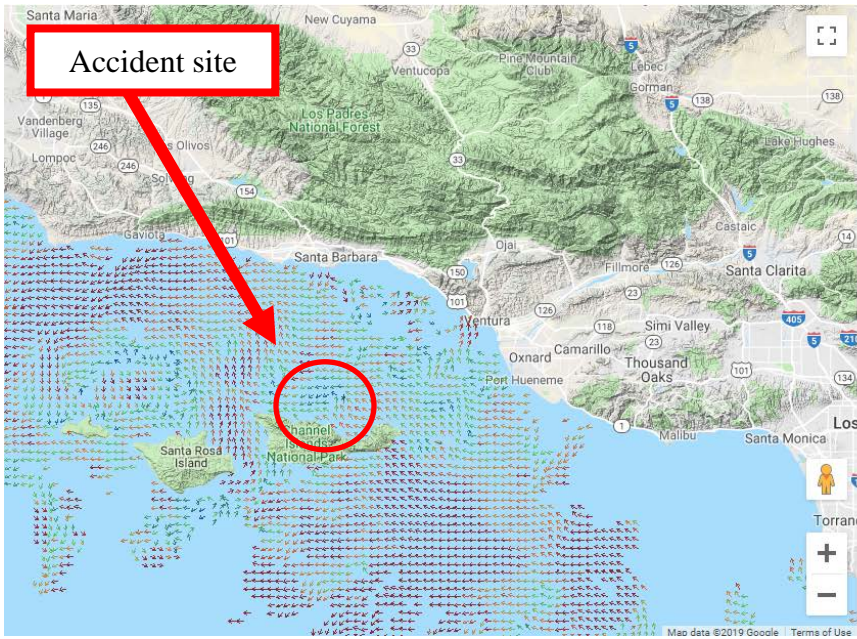


Figure 8 – Regional Composite Reflectivity image for 0315 PDT

6.0 Current Information

Data was retrieved from the Central and Northern California Ocean Observing System (CeNCOOS) with ocean current data around the accident site and southern California at the accident time.⁷ At 0200 PDT CeNCOOS current data indicated a surface sea current from the east between 5 to 15 centimeters per second (cm/s, figure 9). At 0300 PDT CeNCOOS current data indicated a surface sea current from the east between 0.2 to 0.4 knots (10 to 20 cm/s) (figure 10). At 0400 PDT CeNCOOS current data indicated a surface sea current from the east between 5 to 15 cm/s (figure 11). At 0500 PDT CeNCOOS current data indicated a surface sea current of variable direction under 10 cm/s (figure 12).

⁷ <https://www.cencoos.org/data/hfradar/rtv>



SETTINGS

25-hr Average Hourly

RESOLUTION: 2km

COLOR SCHEME: Default

COLOR BAR RANGE (cm/s):
 Min: 0 Max: 50
 Current Strength (cm/s)

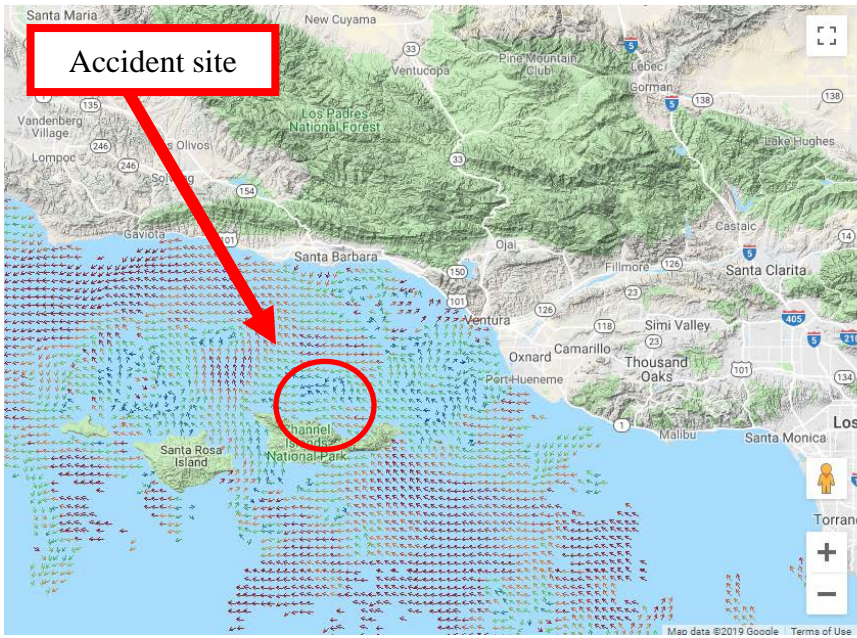
2019-09-02 09:00:00 UTC

-1 HOUR +1 HOUR

UPDATE

Station Placemarks

Figure 9 –CeNCOOS surface sea current information around the accident site from 0200 PDT



SETTINGS

25-hr Average Hourly

RESOLUTION: 2km

COLOR SCHEME: Default

COLOR BAR RANGE (cm/s):
 Min: 0 Max: 50
 Current Strength (cm/s)

2019-09-02 10:00:00 UTC

-1 HOUR +1 HOUR

UPDATE

Station Placemarks

Figure 10 –CeNCOOS surface sea current information around the accident site from 0300 PDT

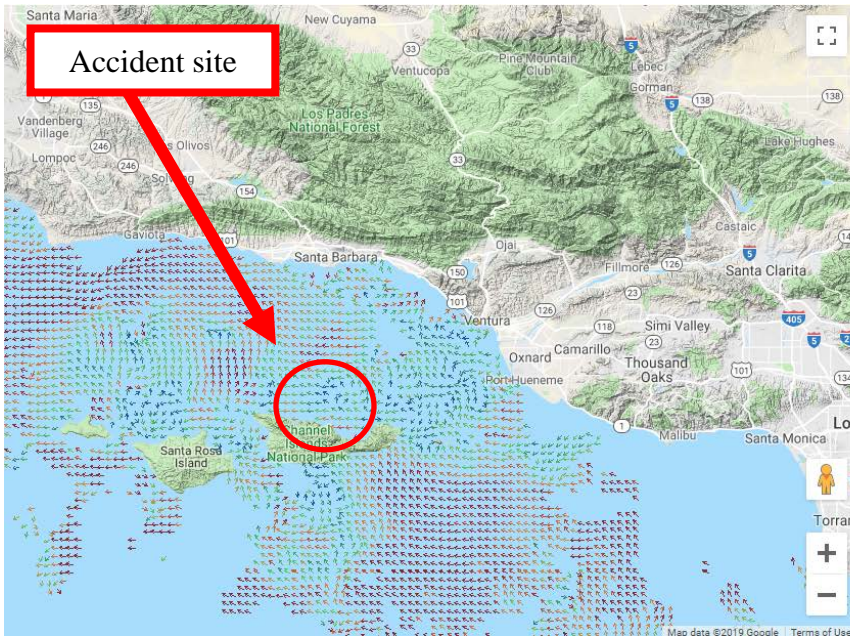


Figure 11 –CeNCOOS surface sea current information around the accident site from 0400 PDT

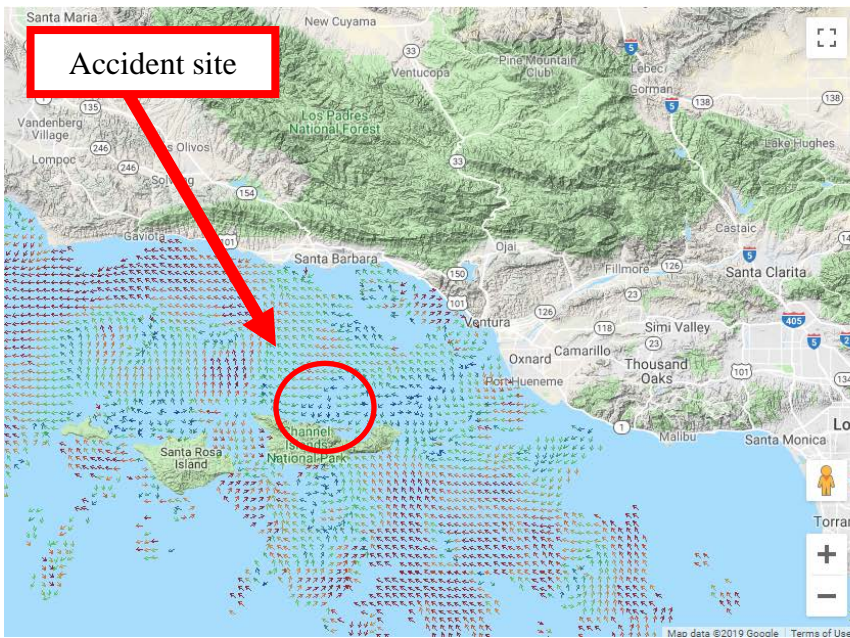


Figure 12 –CeNCOOS surface sea current information around the accident site from 0500 PDT

7.0 National Weather Service Forecast Information

The NWS office in Los Angeles/Oxnard, California, issued the following Coastal Water Forecast (CWF) at 0224 PDT and the following Area Forecast Discussion (AFD) at 2316 PDT (September 1, 2019, closest AFD to the accident time). The CWF indicated that a variable wind of 10 knots or less was forecast with an increasing southwest wind in the afternoon, with wind waves 2 ft or less and a west swell at 2 ft and a period of 9 seconds. The AFD discussed patchy dense fog development over the waters and near coastal waters:

PZZ650-021615-
East Santa Barbara Channel from Pt. Conception to Pt. Mugu CA
including Santa Cruz Island-
224 AM PDT Mon Sep 2 2019

.TODAY...Winds variable 10 kt or less, becoming SW to W 10 to 15 kt in the afternoon. Wind waves 2 ft or less. W swell 2 ft at 9 seconds.

.TONIGHT...W winds 10 to 15 kt in the evening, becoming variable 10 kt or less. Wind waves 2 ft or less. W swell 2 to 4 ft at 9 seconds.
S swell 2 ft.

.TUE...Winds variable 10 kt or less, becoming W 10 to 15 kt in the afternoon. Wind waves 2 ft or less. W swell 2 to 3 ft at 9 seconds.

.TUE NIGHT...NW winds 10 to 15 kt. Wind waves 2 ft or less. W swell 2 to 4 ft at 9 seconds.

.WED...Western portion, winds variable 10 kt or less becoming 15 to 20 kt in the afternoon. Eastern portion, winds variable 10 kt or less becoming SW around 10 kt in the afternoon. Wind waves 2 ft or less. W swell 2 to 4 ft at 8 seconds.

.WED NIGHT...W winds 10 to 15 kt, becoming NW 5 to 10 kt after midnight. Wind waves 2 ft or less. W swell 3 to 4 ft at 7 seconds.

.THU...NW winds 15 to 20 kt. Combined seas 3 to 5 ft.

.FRI...NW winds 15 to 20 kt with gusts to 25 kt. Combined seas 4 to 6 ft.

\$\$

FXUS66 KLOX 020616
AFDLOX

Area Forecast Discussion...UPDATED
National Weather Service Los Angeles/Oxnard CA
1116 PM PDT Sun Sep 1 2019

.SYNOPSIS...01/810 PM.

Afternoon temperatures will cool a few degrees each day through the week. There is a slight chance of thunderstorms over the mountains and deserts through Thursday while overnight and morning low clouds and fog persist along portions of the coast.

&&

.SHORT TERM (SUN-WED)...01/807 PM.

UPDATE

High temperatures this afternoon ranged from the mid 70s to 80s near the coast, and 90s to around 105 degrees inland. Some coastal areas were actually a bit cooler than yesterday, thanks to low clouds that hung close to the beaches through much of the afternoon. Coastal valleys south of Point Conception showed minimal changes, but further inland, and north of Point Conception, highs warmed a few degrees compared to yesterday. Lancaster and Paso Robles measured highs of 106 degrees today, with Santa Ynez 99 degrees and Hearst Castle at 93.

Warm overnight lows are expected again, except for the Central Coast. Lows in the upper 60s to mid 70s will be common for most areas.

A shallow marine layer is expected to remain in place along the coast tonight, with patchy dense fog over the waters and near-coastal areas through Monday morning. Expect to see better clearing of low clouds along the coast Monday afternoon as monsoonal moisture begins to flow over the area, producing some mid to upper level cloudiness. In addition, there will be a slight chance of thunderstorms for the L.A. and Ventura County mountains Monday afternoon and evening due to the influx of moisture and instability.

From Previous Discussion

A 595 DM H5 high centered near the Four Corners region this afternoon will remain in this general area through Tue. The center of the upper level high will then slide to the E Tue night and be over the southern Plains on Wed. Sm CA will be on the western periphery of this upper level high during the period, with a broad SE to S flow aloft. This flow will bring increasing monsoonal moisture into the forecast area during the period.

There will be enough instability for a slight chance of an afternoon thunderstorm over the eastern San Gabriel mtns on Mon, and a slight chance of afternoon and evening showers and thunderstorms for the L.A./VTU County mtns and Antelope Vly on Tue and Wed. PWAT values are forecast by the NAM to increase substantially to 1.80 inches or so along the coast by Mon afternoon and linger thru Tue before lower PWATs down to about 1.40 to 1.50 inches move in for Wed. Any thunderstorms that form will be capable of locally heavy rain and possible localized flooding, especially on Mon and Tue.

Temps across the region Mon thru Wed are expected to lower slightly from today but remain about 5-12 degrees above normal for most areas, which are close to Heat Advisory levels. Highs in the warmest vlys and lower mtns are expected to be generally in the mid 90s to around 103 each day.

.LONG TERM (THU-SUN)...01/233 PM.

The upper level high over the southern Plains will gradually build W into the southern Rockies on Thu and into the AZ and NM for Fri and

Sat, with srn CA lingering on the western periphery of the upper high. A broad SE to S flow aloft will continue to bring some monsoonal moisture into the forecast area on Thu, then the flow will turn more S to SW Fri and Sat which should push the monsoonal moisture to the N and E of the region. The EC and GFS differ on the upper level pattern next Sun, with the GFS forecasting a rather deep upper level trof for this time of year approaching the area from the eastern Pac with some pcpn over the Central Coast, while the EC has a broad upper level trof over CA with dry conditions for srn CA. Opted to lean more toward the drier pattern for now pending further model runs.

Varying amounts of night and morning coastal stratus is expected during the extended period. There should also be some afternoon clouds with a slight chance of showers and thunderstorms in the L.A. County mtns and Antelope Vly on Thu. Otherwise, mostly clear skies are expected Thu thru Sat, then some mid or hi level clouds should bring partly cloudy skies to the region next Sun.

Temps are forecast to be about 5-10 deg above normal away from the coast on Thu then gradually cool to near normal to slightly above normal across the region by next Sun.

&&

.AVIATION...02/0615Z.

At 0530Z at KLAX, the marine layer was 900 feet deep. The top of the inversion was near 2700 feet with a temperature of 29 C.

Very low confidence in coastal TAFs. There is a 40 percent chc of cigs at sites with no cigs and 30 percent chc of no cigs at sites with cigs fcst. Low cloud arrival time could be off by 2 hours and cig dissipation could be off by an hour.

High confidence in VFR conditions inland.

There is a slight chance of TSTMS for the mountains Monday afternoon/evening that could drift over the L.A. valleys or more likely the Antelope Vly.

KLAX...Low confidence in TAF. There is a 30 percent chance that the site remains VFR through the period. If cigs occur, timing may be off by at least 2 hrs from taf times. VFR transition could occur anytime between 15Z-17Z. High confidence in no east wind component.

KBUR...High confidence in CAVU TAF.

&&

.MARINE...01/709 PM.

For the Outer Waters, moderate to high confidence in current forecast. Small Craft Advisory (SCA) level winds are expected to continue over the two northern outer zones through at least

Thursday. The southern outer waters will be close to SCA levels, but for the most part will remain below criteria. Short period seas will continue.

For the Inner Waters north of Point Sal, moderate confidence in current forecast. There is a 30% chance of SCA level winds during the afternoon and evening hours through Wednesday.

For the Inner Waters south of Point Conception, high confidence in current forecast. Winds and seas are expected to remain below SCA levels through Thursday.

Short-period, choppy seas will affect the coastal waters through the forecast period. Patchy dense fog with visibility of one nautical mile or less will likely impact the coastal waters during the night to morning hours through midweek.

&&

.BEACHES...01/127 PM.

Tropical Storm Juliette is expected to move into favorable position to increase our southerly swell later this week. Elevated surf of 4-6 feet is likely beginning Wednesday night. There is even a 30 percent chance of the southerly surf reaching high surf criteria of 7 feet or more. Stay tuned.

&&

.FIRE WEATHER...01/326 PM.

A persistent upper level high pressure system over the area will continue to bring an extended period of hot temperatures to interior sections through Thursday. The hottest temperatures will likely be today when warmest valley, mountain, and desert locations are peaking around 105 degrees. The hot and unstable conditions will bring the potential for large vertical plume growth with any fire ignitions across wind sheltered interior areas during the afternoon hours, with projected mixing heights between 10,000 and 17,000 feet through Labor Day. Minimum humidities today are ranging between 8 and 20 percent across interior sections, with some increase in humidity expected across Los Angeles and Ventura counties the next few days as monsoon moisture spreads into the region.

The increase in monsoon moisture will bring a slight chance of afternoon thunderstorms to the mountains of Los Angeles and Ventura counties, as well as the Antelope Valley. The main threats will be brief heavy downpours with the potential for isolated flash flooding, as well as gusty and erratic downdraft winds. In addition, any cloud to ground lightning strikes on the periphery of storms could trigger fire ignitions, especially considering the dry fuels.

&&

.LOX WATCHES/WARNINGS/ADVISORIES...
CA...NONE.
PZ...Small Craft Advisory in effect until 3 AM PDT Tuesday for
zones 670-673. (See LAXMWWLOX).

&&

.HAZARD POTENTIAL OUTLOOK (WED-SUN).

Isolated thunderstorms are possible Wednesday and Thursday over the mountains and Antelope Valley. A large south swell generated by Tropical Cyclone Juliette may bring elevated to possibly high surf to south-facing beaches by Wednesday night and could last through late in the week.

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8.0 Witness Information⁸

Several witnesses provided insight of the wind and weather conditions at the time of the accident. The *Conception* Second Galley Hand mentioned, when asked about the wind that morning: “Wind was light...you could see the smoke was going to the bow. It was pushing -- it was going that way.” A *Conception* Deckhand when describing the conditions while they were in a skiff, having evacuated the *Conception*, making their way to the Good Samaritan vessel nearby said: “There was like no wind and no swell and no current really that I noticed at all.” A Patrol Officer from Channel Islands Harbor Patrol (responded in CIHP boat) said when describing conditions on scene, well after the fire started, while firefighting efforts were ongoing: “The sun started to come up at that point, so we started to get a visual of the island, where we were located on the island...the smoke was shifting in different directions, the wind was kind of variable coming off the island. It would come out of the canyon at Platts Harbor, and then it would kind of suck back into the canyon; so it was variable.” A Good Samaritan boat owner said when asked if there was any fog: “No. It was -- you could see from the photos. Nope, nope, nope. Not there.” For more information please see the interviews located in the docket of this accident.

9.0 Astronomical Data

The astronomical data obtained for the accident site on September 2, 2019, indicated the following:

⁸ For more information please see the witness interviews and information located in the docket for this accident.

SUN

Accident time	0314 PDT⁹
Begin civil twilight	0608 PDT
Sunrise	0633 PDT
Sun transit	1258 PDT
Sunset	1934 PDT
End civil twilight	1949 PDT

MOON

Accident time	0314 PDT¹⁰
Moonrise	1012 PDT
Moon transit	1609 PDT
Moonset	2159 PDT

The phase of the Moon was Waxing Crescent with 13.2% of the Moon's visible disk illuminated.

E. LIST OF ATTACHMENTS

Attachment 1 – GOES-17 Nighttime Microphysics RGB animation from 0201 to 0505 PDT

Submitted by:

Paul Suffern
Senior Meteorologist

⁹ Inserted accident time for reference and context.

¹⁰ Inserted accident time for reference and context.

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