NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

May 11, 2021

Specialist's Factual Report

METEOROLOGY

DCA20FM027

Table Of Contents

A. ACCIDENT

Location: Ekuk Beach, Alaska
Date: August 30, 2020
Time: about 2300 Alaska daylight time (AKDT)
0700 Coordinated Universal Time (UTC) on August 31, 2020
Vessel: Fishing tender barge SM-3

B. SENIOR METEOROLOGIST

Don Eick
Senior Meteorologist
Operational Factors Division (AS-30)
National Transportation Safety Board

C. SUMMARY

On August 30, 2020 about 2300 local time, the 150-ft fishing tender barge *SM-3* was at anchor on a mooring ball buoy in Nushagak Bay, 5.9 miles near Clark's Point, Alaska. The barge had finished processing fish 10 days earlier and had been waiting shoreside availability for winter layup. While caught in heavy weather, there was a catastrophic failure of the mooring buoy assembly. The barge drifted and ran aground on Ekuk Beach at about 2330 AKDT.

This report provides a meteorological review on the weather conditions and National Weather Service (NWS) marine advisories applicable for the area around the time of the accident.

D. DETAILS OF THE INVESTIGATION

The National Transportation Safety Board's (NTSB) Senior Meteorologist was not on scene for this investigation and conducted the meteorology phase of the investigation from the Washington D.C. office, collecting data from official National Weather Service (NWS) sources. All times are Alaska daylight time (AKDT) based upon the 24 hour clock, local time is +8 hours to UTC, and UTC=Z. Directions are referenced to true north and distances in nautical miles. Heights are in feet (ft) above mean sea level (msl) unless otherwise noted. Visibility is in statute miles and fractions of statute miles.

E. WEATHER INFORMATION

1.0 Synoptic conditions

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 (NCEP) located in College Park, Maryland. These are the base products used in describing weather features

and in the creation of forecasts and warnings. Reference to these charts and other weather products documented in this report can be found in the NWS Ocean Prediction Center's Radiofacsimile Chart User's Guide[1].

1.1 Surface Analysis Chart

The NWS Weather Prediction Centers (WPC) Alaska section of the North America Surface Analysis Chart for 2200 AKDT on August 30, 2020 is included as figure 1 with the mooring location and ground sites within the red circle which encloses Nushagak Bay and Ekuk Beach. The chart depicted a deep low-pressure system at 967.0 hectopascals (hPa)[2] immediately north of the accident site associated with an occluded front, which extended across southern Alaska. The accident site was located approximately 60 miles south-southeast of the low-pressure system and in an area of the strongest pressure gradient.

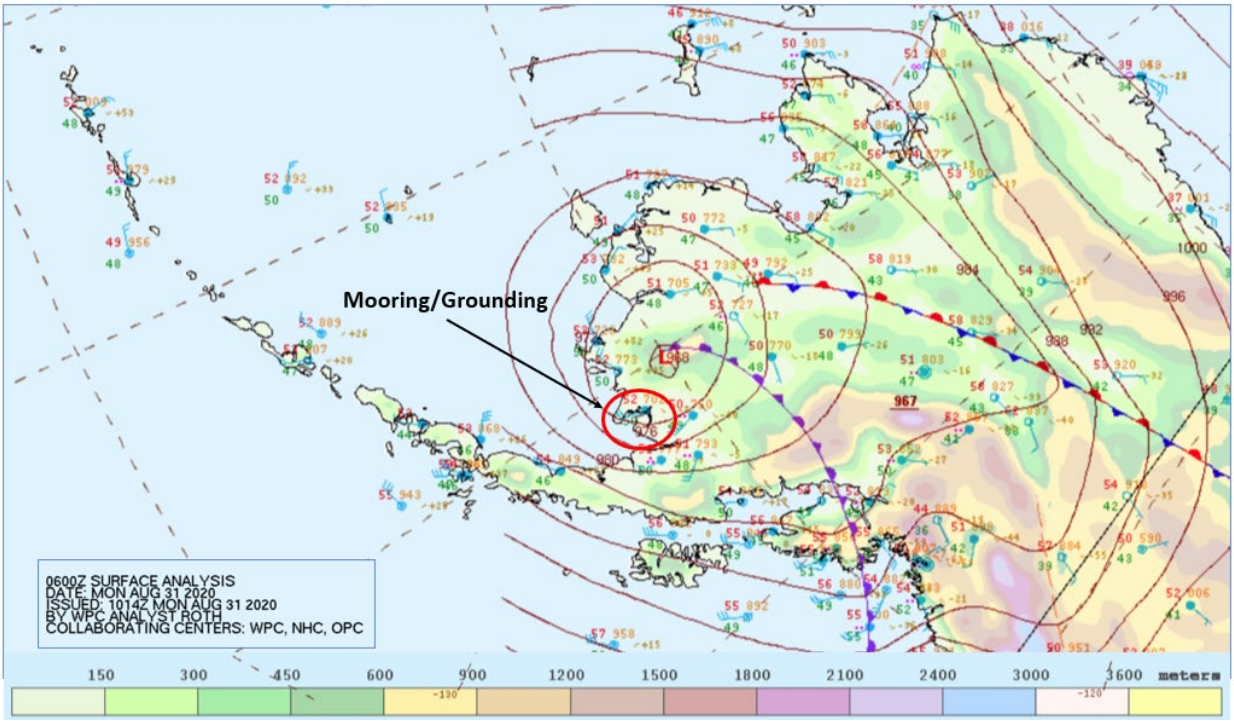

Figure 1 - Alaska section of the Surface Analysis Chart for 2200 AKDT

The station models on the chart depicted a cyclonic or counterclockwise wind flow into the low, with winds in the vicinity of the accident from the south-southwest at 30 knots, light to moderate rain, overcast skies, with a temperature near 52° Fahrenheit (F), and a dew point temperature of 50° F.

[1] https://ocean.weather.gov/UsersGuide/UGprint.php

[2] Hectopascal (hPa) is the standard unit for reporting sea-level pressure and is interchangeable with the former term millibar with the same units. Standard sea-level pressure is 1013.25-hPa at a temperature of 59° Fahrenheit (F) or 15° Celsius (C).

The NWS Ocean Prediction Centers (OPC) Pacific Surface Analysis Chart valid for 2200 AKDT for marine interests is included as figure 2. The chart depicted the same low-pressure system at 967-hPa inland over southwestern Alaska associated with the occluded front which was shown wrapping around the low and extending near the accident site. The low-pressure system was expected to move northeastward across Alaska during the next 24-hours. The chart also indicated that "storm" force conditions[3] were expected south of the low.

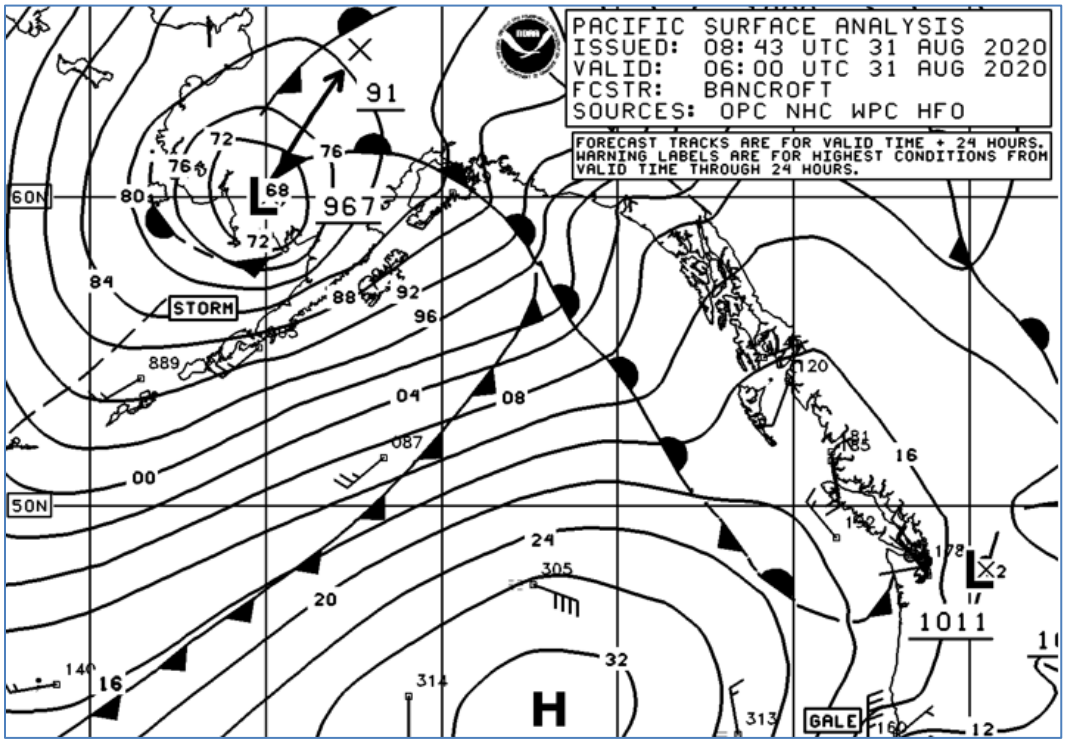

Figure 2 - NWS OPC Pacific Surface Analysis for 2200 AKDT

1.2 Anchorage Local Forecast Charts

The NWS Anchorage Weather Forecast Office (WFO) issued the following Marine Forecast Charts at 1600 AKDT on August 30, 2020 for the Alaska Peninsula and Kodiak island in Figure 3 and 4. The Sunday's weather (similar to the surface analysis in section 1.1) depicted the pressure systems, fronts and troughs, and predicted precipitation type and intensity. The chart depicted the low pressure system at 963-hPa over southwest Alaska to the north-northwest of the accident site with the associated occluded front extending across southwest Alaska. The chart depicted the cyclonic circulation of the low with south-southwest winds depicted over the accident site. An extensive area of light rain was depicted over the region. The Sunday Marine Forecast in figure 3 depicted the significant wave heights, wave direction, and temperatures. The chart depicted an area of 14 ft seas over Bristol Bay with a swell from the southwest into Nushagak and Kvichak Bays, with a maximum temperature near 55° F. The maximum significant waves heights of 26 ft were depicted south of Sand point

[3] Storm force conditions imply winds of 48 to 64 knots expected within 24-hours, or Beaufort 8 to 9 conditions.

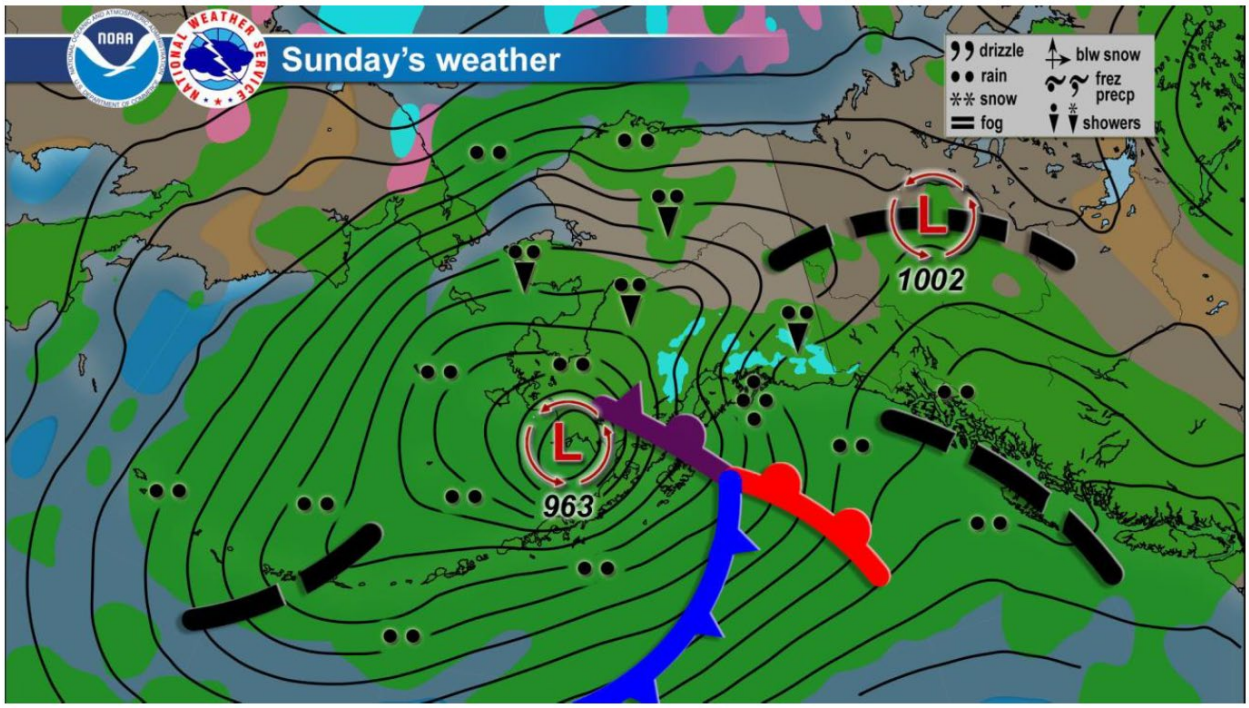

Figure 3 - NWS Anchorage Surface Forecast for August 30, 2020

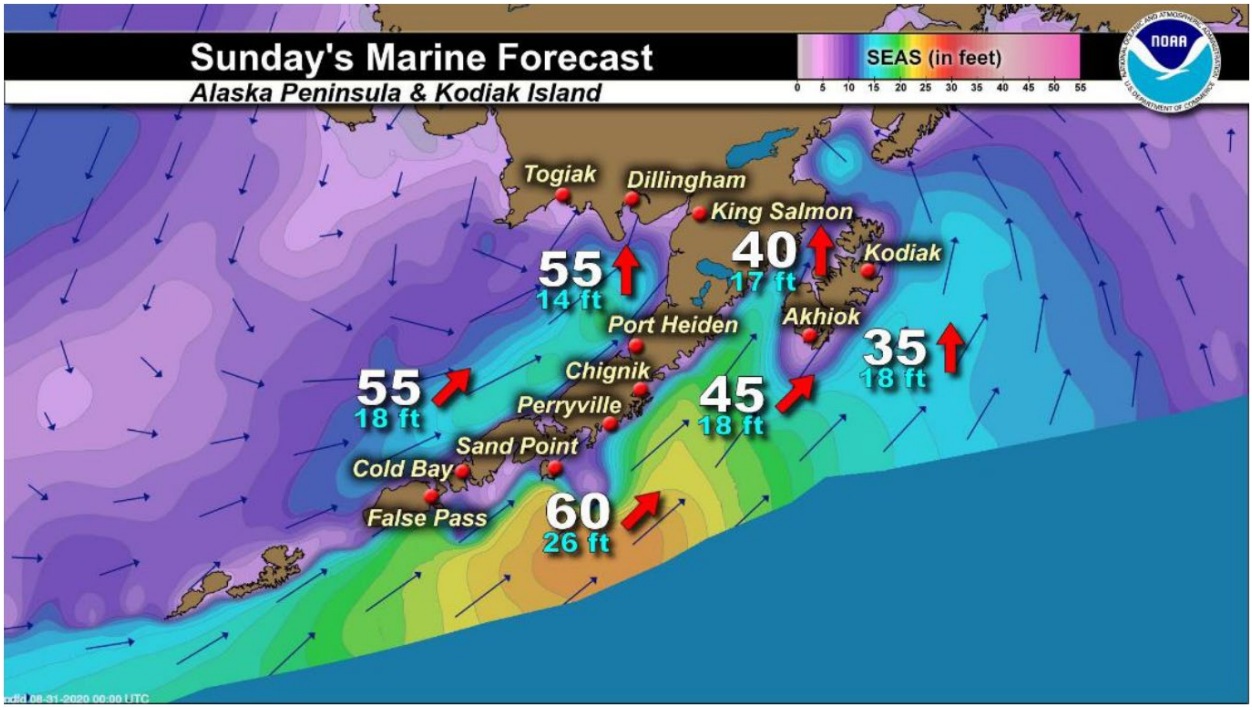

Figure 4 - NWS Anchorage Marine Forecast for August 30, 2020

2.0 Observations

The area was documented by using official Meteorological Aerodrome Reports (METARs) surrounding the area. The magnetic variation over the area was 13° E.

2.1 Clark's Point, Alaska

The closest weather reporting location was from Clark's Point Airport (CRP[4]), Clark's Point, located approximately 6 miles north-northwest (342°) of the mooring location and 4.75 miles (326°) of the grounding site, at an elevation of 80 ft. The airport had an Automated Weather Observation System (AWOS), which was not augmented during the period. At the time of the breakaway from the mooring buoy the following conditions were reported.

CPT weather observation at 2256 AKDT, wind from 210° at 33 knots gusting to 44 knots, visibility 10 miles or more, overcast at 1,200 ft agl, temperature 11.7° C (54° F), dew point temperature 10° C (50° F), altimeter 28.73 inches of mercury (Hg). Remarks: automated station with a precipitation discriminator, peak wind from 210° at 50 knots recorded at 2219 AKDT, sea-level pressure 972.4-hPa.

The observations during the period from about 0800 through 0300 AKDT in tabular format is included below. Cloud cover is defaulted to the layer of greatest coverage (FEW, SCT, BKN, OVC), temperature (T), and dew point temperature (Td) are reported in °F. The 1-hour precipitation (P01) and 6-hour precipitation total (PREC). The time of the breakaway from the mooring is in bold italic type.

STN	Time	PRES	ALTM	T	Td	DIR	SPD	GUST	VIS	CLDS	WX	P01	PREC
CPT	0756	999.0	29.26	54	52	110	15		10	OVC075			
Aug30	1156	979.6	28.95	54	50	120	34	43	10	OVC019	-RA	0.12	
	1256	976.4	28.85	54	52	130	33	46	10	OVC015		0.01	0.22
	1508		28.77	55	54	180	30	37	3	OVC029	-RA BR	0.18	
	1527		28.78	55	48	190	29	40	10	OVC040	-RA	0.18	
	1603		28.69	52	48	190	39	49	3	OVC010	-RA BR	0.00	
	1630		28.68	52	48	190	41	50	4	OVC010	-RA BR	0.01	
	1708		28.66	52	48	190	39	50	6	OVC008	-RA BR	0.00	
	2056	969.9	28.66	52	48	200	35	51	10	OVC010		0.01	
	2156	970.7	28.69	52	48	200	33	52	10	OVC010		0.01	0.19
EVENT	**2256**	**972.4**	**28.73**	**54**	**50**	**210**	**33**	**44**	**10**	**OVC012**			
	2356	974.5	28.80	54	50	220	32	45	10	OVC014	-RA	0.00	0.00
CPT	0056	977.0	28.87	54	52	230	25	40	5	OVC10	-RA	0.00	
Aug 31	0018		28.89	54	50	240	17	32	8	OVC017	-RA PRESRR	0.00	
	0156	978.5	28.92	54	50	220	27	33	10	OVC019		0.01	
	0256	979.9	28.96	54	52	230	18	32	8	OVC011	-RA	0.00	

The common abbreviations used to report current weather "WX" section were "-RA" for light rain, "RA" moderate rain, "BR" mist, "RAE" rain ended at specific time, "PRESRR" for pressure rising rapidly, and "PRESFR" pressure falling rapidly.

[4] Clark's Point Airport, AK, ICAO code PFCL, IATA code CRP

A review of the observations from CPT indicated an extended period from 1100 through 0156 AKDT on August 31, 2020, where winds from the south to southwest were sustained over 30 knots with peak gusts to 52 knots recorded prior to the accident, with a period of approximately 7 hours of wind gusts of 50 knots (1600-2300 AKDT). The strong winds also coincided with the period of lowest pressure of 969.9-hPa or 28.66 inches of Hg at 2056 AKDT. Scattered rain showers were reported through the period with approximately 0.32 inches of rain reported.

2.2 Dillingham, Alaska

The next closest official weather reporting site was from Dillingham Airport (DLG)[5], Dillingham, Alaska, located approximately 18 miles north of the mooring location at an elevation of 18 ft. The airport had an Automated Weather Observation Station (AWOS) and was augmented during the period and reported the following conditions surrounding the period.

STN	TIME	PRES	ALTM	T	Td	WIND	SPD	GUST	VIS	CLDS	WX	P01	PREC
DLG	0800		29.28	54	52	110	12		10	BKN070			
Aug30	0853	990.1	29.23	52	52	070	16	28	10	OVC075			
	0903		29.22	52	52	090	13	20	-1/4	OVC035	PRESFR		
	0956		29.17	54	50	070	17	26	10	OVC095		0.01	0.03
	1056	984.9	29.08	52	52	070	17	26	3	OVC019	-RA BR PRESFR	0.00	
	1113		29.04	52	52	100	16	24	2	OVC021	-RA BR	0.01	
	1152		29.00	54	52	090	26	36	2	OVC008	RA BR	0.01	
	1256	978.9	28.90	54	52	130	24	34	2	OVC008	RA BR	0.03	0.04
	1338		28.84	54	52	130	27	40	2	OVC009	RA BR	0.60	
	1356	976.2	28.82	54	52	130	27	39	2	OVC015	RA BR	0.98	
	1415		28.80	55	52	140	29	38	6	OVC015	-RA BR	0.25	
	1456	974.8	28.78	57	54	120	21	39	10	OVC015	-RA BR	0.25	
	1514		28.78	55	54	120	24	37	2	OVC022	RA BR	0.03	
	1538		28.78	55	52	120	24	37	3	OVC022	RA PRESFR	0.12	
	1556	974.9	28.78	55	48	160	32	42	9	OVC015	-RA	0.17	1.60
	1656		28.76	54	50	170	18	28	3	OVC025	-RA BR	0.13	
	1756	972.0	28.70	52	50	170	31	38	3	OVC025	-RA BR	0.09	
	1803		28.69	52	50	170	32	45	2	OVC055	-RA BR	0.00	
	1856	971.0	28.67	52	50	190	36	50	2	OVC011	RA BR	0.07	0.29
	1956	970.5	28.65	52	50	190	39	51	3	OVC011	RA BR	0.01	
	2056	970.2	28.65	52	50	190	32	46	5	OVC011	-RA BR	0.00	
	2156	970.2	28.65	52	50	200	20	30	10	OVC023		0.00	0.30
	2206		28.69	52	50	200	19	34	10	OVC011	-RA	0.00	
Event	**2256**	**971.7**	**28.69**	**52**	**50**	**200**	**13**	**34**	**10**	**OVC011**	**-RA**	**0.00**	
	2327		28.73	52	50	210	13	21	10	OVC015	RAE08	0.01	
	2354		28.76	52	50	200	11	26	10	OVC022	PRESRR	0.01	
	2356	974.0	28.76	52	50	210	15	25	10	OVC022	PRESRR	0.01	
Aug31	0056	974.4	28.83	52	50	210	10	22	10	OVC045			0.01
	0156	978.6	28.89	52	48	VRB	5		10	OVC080			
	0256	980.0	28.93	52	52	210	8	16	10	OVC044			

Dillingham also reported a period of sustained winds over 30 knots with gusts to 51 knots between 1556 through 2056 AKDT. The lowest sea-level pressure recorded was 970.2-hPa or

[5] Dillingham Airport ICAO code PADL, IATA code DLG.

approximately 28.65 inches of Hg at approximately 2100 AKDT and was reported within an hour of the peak winds at 51 knots.

2.3 Egegik, Alaska

Egegik Airport (EII)[6], Egegik, Alaska, was located approximately 48 miles southeast of the mooring location at an elevation of 92 ft. The airport had an AWOS and reported the following conditions surrounding the period.

STN	Time	PRES	ALTM	T	Td	DIR	SPD	GUST	VIS	CLDS	WX	P01	PREC
EII	0756	991.5	29.29	54	52	110	17	26	10	FEW008		0.01	
Aug30	0856	989.1	29.22	54	50	120	20	28	10	OVC110	-RA	0.01	
	0956	986.6	29.14	54	50	130	19	33	9	OVC090	-RA	0.01	0.02
	1007		29.14	54	50	130	20	31	4	OVC085	-RA BR	0.01	
	1047		29.08	54	50	130	24	37	10	OVC080	RAE32	0.02	
	1056	983.9	29.06	54	50	130	26	40	10	OVC075	PRESFR	0.02	
	1156	981.7	29.00	54	50	130	31	45	10	OVC070	RAB30E 56	0.01	
	1219		28.98	54	50	130	32	46	10	OVC055			
	1228		28.97	54	50	130	30	41	10	OVC055			
	1256	980.4	28.96	54	50	130	27	39	7	OVC049	-RA	0.00	0.03
	1308		28.93	54	52	120	30	39	4	OVC036	-RA BR PRESFR	0.01	
	1318		28.92	54	52	120	29	37	4	OVC035	-RA BR	0.02	
	1356	977.6	28.88	57	54	120	27	40	10	OVC017	RAE35	0.02	
	1408		28.88	57	54	130	24`	34	10	OVC014			
	1429		28.86	63	54	150	25	31	10	OVC047			
	1456	977.3	28.87	64	46	180	24	40	10	BKN045			
	1556	977.5	28.87	61	46	190	22	31	10	OVC100			0.05
	1656	977.6	28.88	57	48	170	25	30	10	OVC075	-RA	0.00	
	1756	978.6	28.91	52	48	200	20	32	5	OVC060	-RA BR	0.05	
	1856	978.6	28.91	52	48	210	19	30	4	OVC055	-RA BR	0.11	0.16
	1919		28.91	52	48	200	27	36	5	OVC049	-RA BR	0.01	
	1938		28.91	52	48	210	26	42	10	OVC055	-RA	0.01	
	1956	978.3	28.90	52	48	200	26	40	9	OVC049	-RA	0.01	
	2031		28.89	52	48	210	31	43	2.5	OVC028	-RA BR	0.04	
	2042		28.89	52	48	210	29	41	3	OVC027	-RA BR	0.05	
	2056	978.3	28.90	52	48	210	30	42	4	OVC024	-RA BR	0.07	
	2156	979.1	28.92	52	48	220	28	53	8	OVC018	-RA	0.07	0.31
	2256	**980.1**	**28.95**	**52**	**48**	**220**	**27**	**46**	**3**	**OVC014**	**-RA BR**	**0.04**	
	2304		28.96	50	48	230	27	37	2.5	OVC014	-RA BR	0.02	
	2344		28.98	50	48	230	27	45	2	OVC008	-RA BR	0.12	
	2356	981.0	28.98	50	48	230	33	44	2	OVC008	-RA BR	0.14	
Aug31	0056	982.4	29.02	50	48	230	23	38	2	OVC008	-RA BR	0.05	0.23
	0156	983.5	29.05	52	50	230	24	40	5	OVC008	-RA BR	0.05	
	0256	984.5	29.08	52	50	240	27	40	7	OVC008	-RA BR	0.01	
	0352		29.12	52	50	240	26	37	8	OVC010	RAE46	0.02	
	0356	986.0	29.12	52	50	240	26	35	7	OVC010		0.02	0.31

Egegik reported wind gusts over 40 knots between 1056 through 2300 AKDT with a peak wind gust of 53 knots, with the lowest pressure of 977.3-hPa or 29.86 inches of Hg.

[6] Egegik Airport ICAO code PAII, IATA code EII.

3.0 Sea State Analysis

The NWS OPC Sea-State Analysis for 1600 AKDT on August 30, 2020 is included as figure 5. The chart depicted a forecast significant wave heights of 8 meters or 24 ft over the southern section of Bristol Bay.

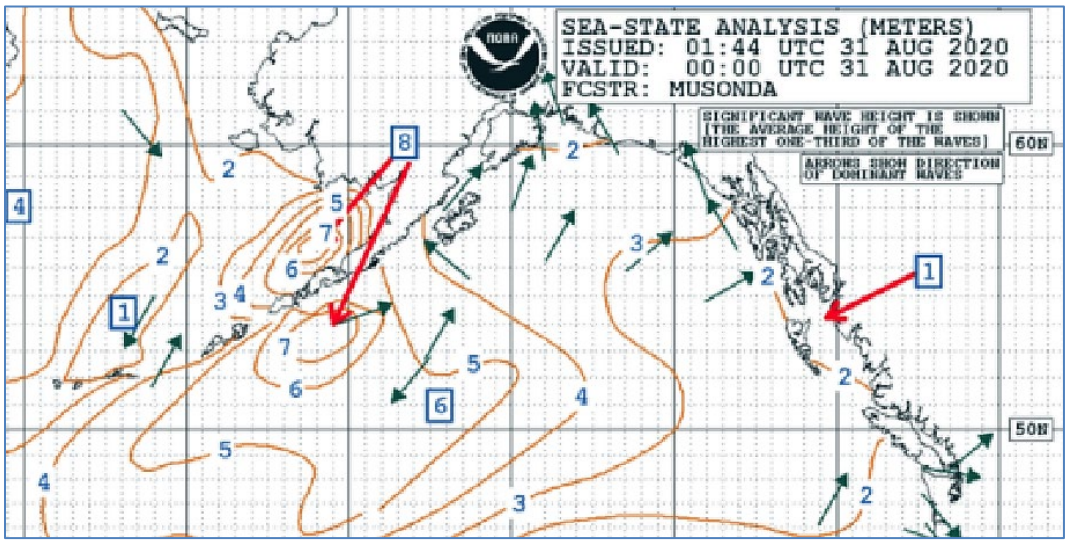

Figure 5 - NWS Sea-State Analysis for 1600 AKDT

4.0 Significant Wave Height Forecast Nomogram

There are three basic components to wave growth: wind speed, fetch length, and duration of the wind. Given a specific wind speed and given length the following nomogram in figure 6 provides an estimate of significant wave height and wave period. Assuming persistent gust to 50 knots from 190° to 200° reported between 1630 through 2300 AKDT and a fetch of approximately 20 miles or more, the nomogram estimated significant wave heights of 10 to 11 ft from the southwest.

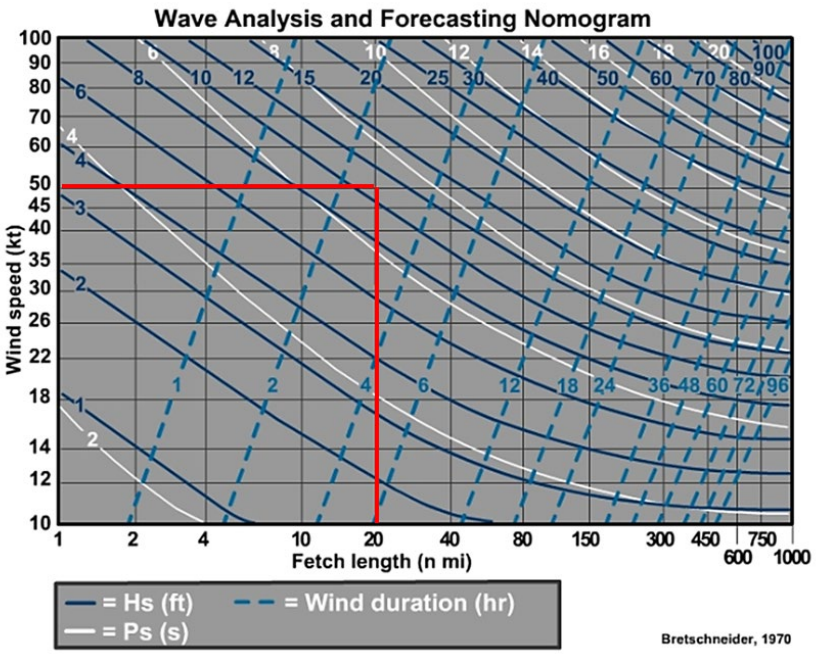

Figure 6- Significant Wave Height Nomogram

5.0 NWS Marine Forecasts

The NWS Anchorage WFO issued the following discussions and forecast during the period.

5.1 Area Forecast Discussion

The NWS Area Forecast Discussions (AFD) are issued by each WFO to describe the short term weather conditions within their region with a marine section that includes the general conditions as they relate to the creation of the zone forecast or coastal forecast. The discussion also gives some reasoning behind the forecast. These are generated roughly every 6 hours and correspond to the release of the latest forecast for that office.

The NWS Anchorage AFD issued at 1758 AKDT as strong winds had begun to impact the Clark's Point and Ekuk area.

FXAK68 PAFC 310158
AFDAFC

Southcentral and Southwest Alaska Forecast Discussion
National Weather Service Anchorage AK
558 PM AKDT Sun Aug 30 2020

.ANALYSIS AND UPPER LEVELS...
A powerful storm center, former Typhoon Bavi, was moving eastward toward Bristol Bay with the leading edge of the spreading rain across Southwest Alaska and into the western Gulf. Strong winds on the southern periphery of the storm were showing gusts in excess of 70 mph across the eastern Aleutians and portions of the Alaska Peninsula. A wind report of 120 mph was reported at Dutch Harbor as the storm

center was passing. Winds in advance of the storm along the Bristol Bay coast were increasing. *The cloud shield in advance of the front was rapidly advancing over Southcentral with some rain spreading to Cook Inlet. Gap winds we also increasing across Southcentral (Turnagain Arm, Knik River Valley, and along the Copper River to name a few).*

.SHORT TERM FORECAST SOUTHWEST ALASKA (Days 1 through 3)...

A 960 mb low pressure system is presently coming ashore over Cape Newenham. This low pressure will continue to bring the area strong winds and periods of rain through Monday morning. High wind warnings remain in effect for Southwest Alaska with the strongest winds in Bristol Bay, along the coast mainly east of Dillingham and from King Salmon and areas southward. Expect the strongest winds to occur from now through this evening. Much of Bristol Bay will see Storm Force winds continuing from now through early Monday especially in eastern portions, however Hurricane force gusts are possible across eastern Bristol Bay. Winds will gradually ease as we head into Monday morning as the low pressure moves inland and weakens.

This storm also continue to bring a good amount of rain as it has copious moisture from tropical regions with 1 to 1.5" of rain possible across the Bristol Bay region and near King Salmon and areas northward. *Less rain is expected in the YK delta region with up to a half inch in most areas. Rain will decrease Monday and Tuesday as the system moves towards the Interior of Alaska. The steadiest rainfall will occur through the remainder of today into Monday morning before becoming more showery in nature.*

Coastal flooding remains expected in Bristol Bay due to strong southwesterly onshore flow creating the potential for water levels to rise 2 to 4 feet above highest astronomical tide this evening through Monday morning. Areas with a concave coastline (where the coastline curves into the land) are the most prone to coastal flooding and erosion as the onshore flow will help funnel the water in these areas. *Areas with a convex coastline (i.e. Cape Newenham where the land points outward) are less prone to coastal flooding as the water is less likely to funnel with the onshore flow in these regions. A Coastal Flood Advisory remains in effect from 8 PM AKDT this evening through 9 AM AKDT Monday for Cape Constantine to Port Heiden.*

.SHORT TERM FORECAST BERING SEA/ALEUTIANS (Days 1 through 3)...

A 960 mb low pressure system will continue to move onshore over Cape Newenham and then inland while weakening. Storm force winds are expected across Bristol Bay and along the Bering side of the AKPEN with Hurricane force gusts possible the remainder of the afternoon and into the overnight hours. Locally higher winds and gusts are expected in the gaps due to the localized funneling of winds. A High Wind Warning remains in effect for the western Alaska Peninsula through 8pm AKDT this evening. Winds will gradually ease from west to east across the Aleutians this evening through Monday afternoon.

High seas from 18-25ft are expected south of the central Aleutians (Pacific side) due to the high end gale force southwesterly winds combined with ample fetch for these seas to build. Seas will be locally higher while wave periods will be locally shorter at times as the west-southwesterly winds and west- southwesterly primary swell direction will oppose the east- northeasterly currents and locally stack the seas. Seas will gradually abate and lengthen in period from west to east across the Bering/Aleutians Sunday evening through Monday evening.

Ample rainfall is expected from this storm in the Aleutians. The highest rainfall amounts are expected in the mountains due to upsloping. Rainfall amounts will total between 0.75" and 1.00" in those areas through Monday afternoon.

.AFC WATCHES/WARNINGS/ADVISORIES...
PUBLIC...Flood Watch 111-145. Coastal Flood Advisory 161. High Wind Warning 161 181.
MARINE...Gale 119 120 125 130 131 132 138 139 140 351 352 150 155 172 180 414.
Storm 160 165.

5.2 Zone Forecast for Bristol Bay

The NWS Zone Forecast for Bristol Bay, Alaska, including cities of King Salmon, Dillingham, Naknek, and Pilot Point issued during the morning at 0412 AKDT on August 30, 2020 was as follows.

FPAK52 PAFC 301212
ZFPALU

Alaska Zone Weather Forecasts
National Weather Service Anchorage AK
412 AM AKDT Sun Aug 30 2020

AKZ161-310030-
Bristol Bay-
Including the cities of King Salmon, Dillingham, Naknek, and Pilot Point

...HIGH WIND WARNING IN EFFECT FROM 2 PM THIS AFTERNOON TO 10 PM AKDT THIS EVENING...

...COASTAL FLOOD ADVISORY IN EFFECT FROM 8 PM THIS EVENING TO9 AM AKDT MONDAY...

.TODAY...Scattered rain showers in the morning, then widespread rain showers in the afternoon. Highs in the 50s. Southeast wind 20 to 35 mph increasing to 35 to 50 mph in the afternoon. *Along the Western Capes...southeast wind 40 to 55 mph.*

.TONIGHT...Widespread rain showers in the evening, then scattered rain showers after midnight. Lows around 50. Southwest wind 30 to 45 mph. Gusts to 75 mph decreasing to 65 mph after midnight.

.MONDAY...Scattered rain showers in the morning, then numerous rain showers in the afternoon. Highs in the mid 50s to lower 60s. Southwest wind 15 to 30 mph. Gusts to 45 mph in the morning.

.MONDAY NIGHT...Cloudy with scattered rain showers. Lows in the mid 40s to lower 50s. Southwest wind 10 to 25 mph except west 15 to 30 mph along the Western Capes.

	TEMPERATURE		/ PRECIPITATION		
King Salmon	*59*	*50*	*59 / 100*	*100*	*70*
Dillingham	*55*	*50*	*58 / 100*	*90*	*60*
Iliamna	*59*	*51*	*59 / 80*	*100*	*70*

The forecast was updated at 1600 AKDT to the following.

FPAK52 PAFC 310000
ZFPALU

Alaska Zone Weather Forecasts
National Weather Service Anchorage AK
400 PM AKDT Sun Aug 30 2020

AKZ161-311330-
Bristol Bay-
Including the cities of King Salmon, Dillingham, Naknek, and Pilot Point

400 PM AKDT Sun Aug 30 2020

...HIGH WIND WARNING REMAINS IN EFFECT UNTIL 10 PM AKDT THIS EVENING...
...COASTAL FLOOD ADVISORY REMAINS IN EFFECT FROM 8 PM THIS EVENING TO 9 AM AKDT MONDAY FROM CAPE CONSTANTINE TO PORT HEIDEN...

.TONIGHT...Rain. Lows around 50. South wind 30 to 45 mph. Gusts to 70 mph decreasing to 55 mph after midnight.
.MONDAY...Numerous rain showers. Highs in the 50s. Southwest wind 20 to 35 mph.
.MONDAY NIGHT...Cloudy with scattered rain showers. Lows in the mid 40s to lower 50s. Southwest wind 10 to 20 mph. Gusts to 35 mph in the evening.

The next update was issued at 2150 AKDT to the following.

FPAK52 PAFC 310552 AAB
ZFPALU
Alaska Zone Weather Forecasts...UPDATED
National Weather Service Anchorage AK

AKZ161-311215-
Bristol Bay-Including the cities of King Salmon, Dillingham, Naknek, and Pilot Point
952 PM AKDT Sun Aug 30 2020

...HIGH WIND WARNING WILL EXPIRE AT 10 PM AKDT THIS EVENING...
***...COASTAL FLOOD ADVISORY REMAINS IN EFFECT** UNTIL 9 AM AKDT MONDAY...*
...STRONG WIND TONIGHT THROUGH MONDAY MORNING...

.REST OF TONIGHT...Rain. Lows around 50. South wind 25 to 40 mph with gusts to 60 mph.
.MONDAY...Numerous rain showers. Highs in the 50s. Southwest wind 20 to 35 mph.
.MONDAY NIGHT...Cloudy with scattered rain showers. Lows in the mid 40s to lower 50s. Southwest wind 10 to 20 mph. Gusts to 35 mph in the evening.
.TUESDAY...Mostly cloudy with a chance of rain showers. Highs in the mid 50s to lower 60s. West wind 10 to 20 mph.

5.3 High Wind Warning

The NWS Anchorage WFO High Wind Warning current at the time of the accident was as follows.

WWAK72 PAFC 310345
NPWALU
URGENT - WEATHER MESSAGE
National Weather Service Anchorage AK
745 PM AKDT Sun Aug 30 2020

AKZ161-310600-
/O.CON.PAFC.HW.W.0010.000000T0000Z-200831T0600Z/
Bristol Bay- Including the cities of King Salmon, Dillingham, Naknek, and Pilot Point
745 PM AKDT Sun Aug 30 2020

...HIGH WIND WARNING REMAINS IN EFFECT UNTIL 10 PM AKDT THIS EVENING...
** WHAT...Southwest winds 35 to 45 mph with gusts to 75 mph.*
** WHERE...Bristol Bay. Highest winds along the coast.*

** WHEN...Until 10 PM AKDT Sunday.*
** IMPACTS...High winds may move loose debris, damage property, and cause power outages. Travel will be difficult, especially for high profile vehicles.*
** ADDITIONAL DETAILS...Strongest winds along the coast and through channeled terrain.*

PRECAUTIONARY/PREPAREDNESS ACTIONS...
People are urged to secure loose objects that could be blown around or damaged by the wind. Prepare for the possibility of widespread power outages. Use caution if you must drive.

6.0 Storm Reports

A search of the NWS storm reports provided the following high wind report.

1030 AKDT Unalaska/Dutch Harbor, AK
High wind report of winds stronger than 70 knots. At approximately 1030 AKDT an anemometer on the APL crane recorded a wind gust to 104 knots. Damage was reported across the area with the wind, and included containers flipped on their sides, and large vessels dragged anchor in Captain's Bay.

7.0 Tide Information

The tidal information for Clarks Point, Nushagak Bay obtained from the NWS[7] for the period surrounding the accident was as follows.

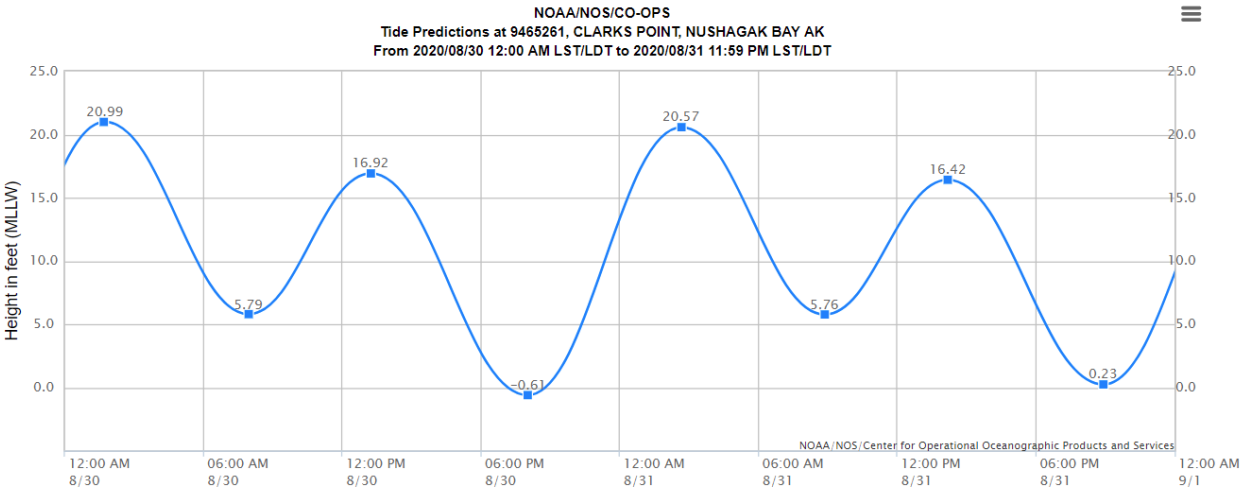

Figure 7 - Clarks Point, Nushagak Bay Tidal Information

The low tide occurred at 2001 AKDT on Sunday August 30, 2020 at a predicted -0.61 ft below mean lower-low water (MLLW)[8], with high tide at 0240 AKDT on Monday 31, 2020 at 20.57 ft. The normal diurnal range was 20.67 ft.

The estimated water temperature was 54° F.

[7] https://tidesandcurrents.noaa.gov/
[8] MLLW – is the average of the lower low water height of each tidal day observed over the National Tidal Datum Epoch.

8.0 Astronomical Conditions

The astronomical conditions over the accident site were obtained from the United States Naval Observatory's Multiyear Interactive Computer Almanac (MICA) software for the period.

SUN	TIME
Begin Nautical twilight:	0550 AKDT
Begin civil twilight:	0646 AKDT
Sunrise:	0729 AKDT
Sun culmination:	1434 AKDT
Sunset:	2138 AKDT
End civil twilight:	2221 AKDT
Break from mooring:	***2300 AKDT***
End Nautical twilight:	2317 AKDT

At the time of the break away from mooring the Sun was -10° below the horizon at an azimuth of 305°.

MOON		
Moonrise:	2137 AKDT	
Break from mooring:	***2300 AKDT***	
Culmination:	0027 AKDT	August 31, 2020
Moonset:	0347 AKDT	

At the time of the breakaway from mooring the Moon was 5.9° above the horizon at an azimuth of 148°, the phase was a waxing Gibbous with 96% of the Moon's disk illuminated.

Submitted by:

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Don Eick
Senior Meteorologist