

National Transportation Safety Board

Office of Aviation Safety

Washington, DC 20594



WPR24FA270

METEOROLOGY

Specialist's Factual Report

September 10, 2024

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A. ACCIDENT

Location: Augusta, Montana

Date: 8 August 2024

Time: 1255 mountain daylight time (1855 UTC¹)

Aircraft: Type - Cessna 182K; Registration - N2764Q

B. METEOROLOGY INVESTIGATOR

Mike Richards

Senior Meteorologist

Office of Aviation Safety

Operational Factors Division (AS-30)

National Transportation Safety Board

C. DETAILS OF THE INVESTIGATION

The National Transportation Safety Board's meteorological specialist did not travel in support of this accident investigation and gathered all weather data remotely. Unless otherwise noted, all times are in mountain daylight time for 8 August 2024 (based upon the 24-hour clock), directions are referenced to true north, distances are in nautical miles and heights are above mean sea level (msl). The accident site was located at about: 47.369681° north latitude; 112.76608° west longitude; at an elevation of about 7,575 feet.

This report provides information on the weather conditions and forecasts applicable to the accident region at the accident time.

D. WEATHER INFORMATION

1.0 Weather Radar

WSR-88D² Level-II base reflectivity weather radar imagery from the Missoula, Montana, (site KMSX) is presented in Figure 1. KMSX was located approximately 54 miles west-southwest of the accident location with an antenna elevation of about 7,980 feet. Assuming standard refraction and considering the 0.95° beam width³ for the WSR-88D

¹ UTC - abbreviation for Coordinated Universal Time

² Weather Surveillance Radar 88 Doppler (WSR-88D)

³ Here we define the angular width of the radar beam as the region of transmitted energy that is bounded by one-half the maximum power. The maximum power lies along the beam centerline and decreases outward from the radar antenna.

radar beam, the KMSX -0.176° tilt would have “seen” altitudes above the accident location of between about 6,200 and 11,600 feet. Figure 1 depicts scattered, small areas of light reflectivity⁴ across the region. When the weather radar data are animated in time, almost all of these areas of reflectivity are seen to be “standing” (the areas of reflectivity are not moving).

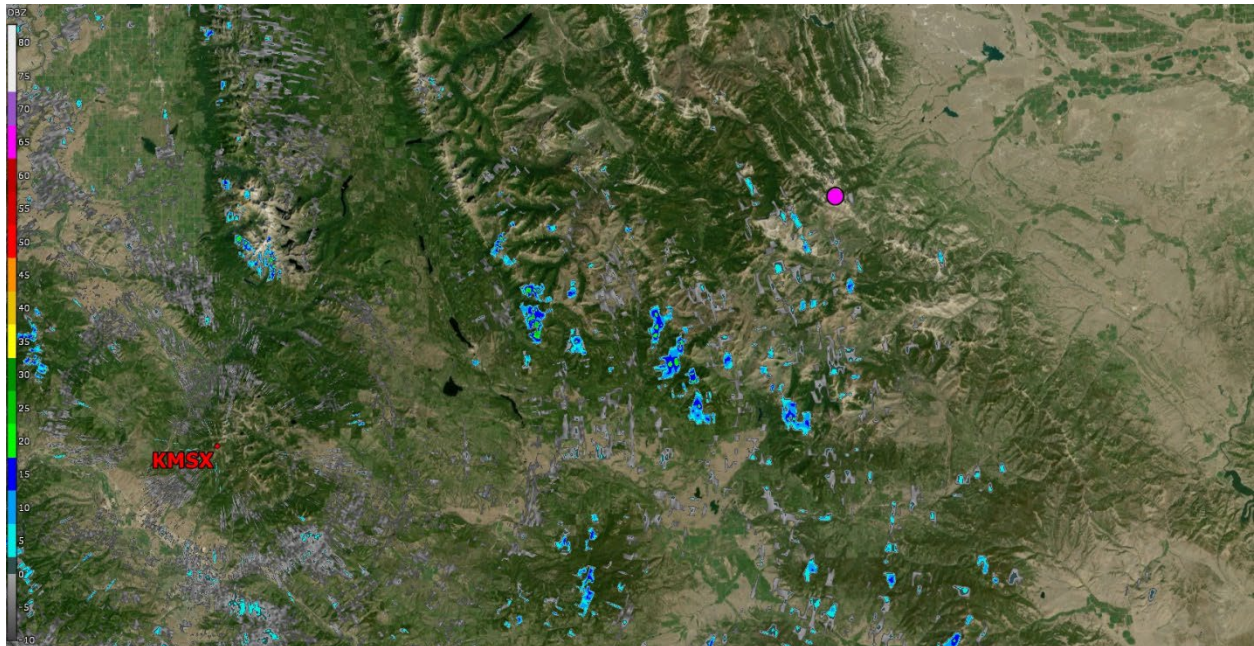


Figure 1 - KMSX -0.176° Level-II base reflectivity product from a sweep initiated at 1256:21. The accident location is denoted by the purple dot.

2.0 HRRR Model Sounding

A High-Resolution Rapid Refresh (HRRR) model⁵ sounding (Figure 2) for near the accident site⁶ at 1300 with an elevation of about 7,000 feet was retrieved from the National Oceanic and Atmospheric Administration’s (NOAA) Air Resources Laboratory and analyzed by the RAwinsonde OBservation (RAOB) program. Overcast clouds were identified by RAOB from near the surface to about 10,000 feet. The freezing level was at about 12,100 feet. From the surface to about 9,000 feet the wind was from the east

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https://www.faa.gov/sites/faa.gov/files/other_visit/aviation_industry/airline_operators/airline_safety/in_FO07008.pdf

⁵ The HRRR is a NOAA real-time three-kilometer resolution, hourly-updated, cloud-resolving, convection-allowing atmospheric model, initialized by three-kilometer grids with three-kilometer radar assimilation. Radar data is assimilated in the HRRR every 15 minutes over a one-hour period.

⁶ Coordinates used for the model were latitude: 47.37; longitude: -112.77.

at 5-10 knots. Above this level the wind veered⁷ with height to a west wind of about 10 knots at 15,000 feet. No significant layers of turbulence were noted by RAOB.

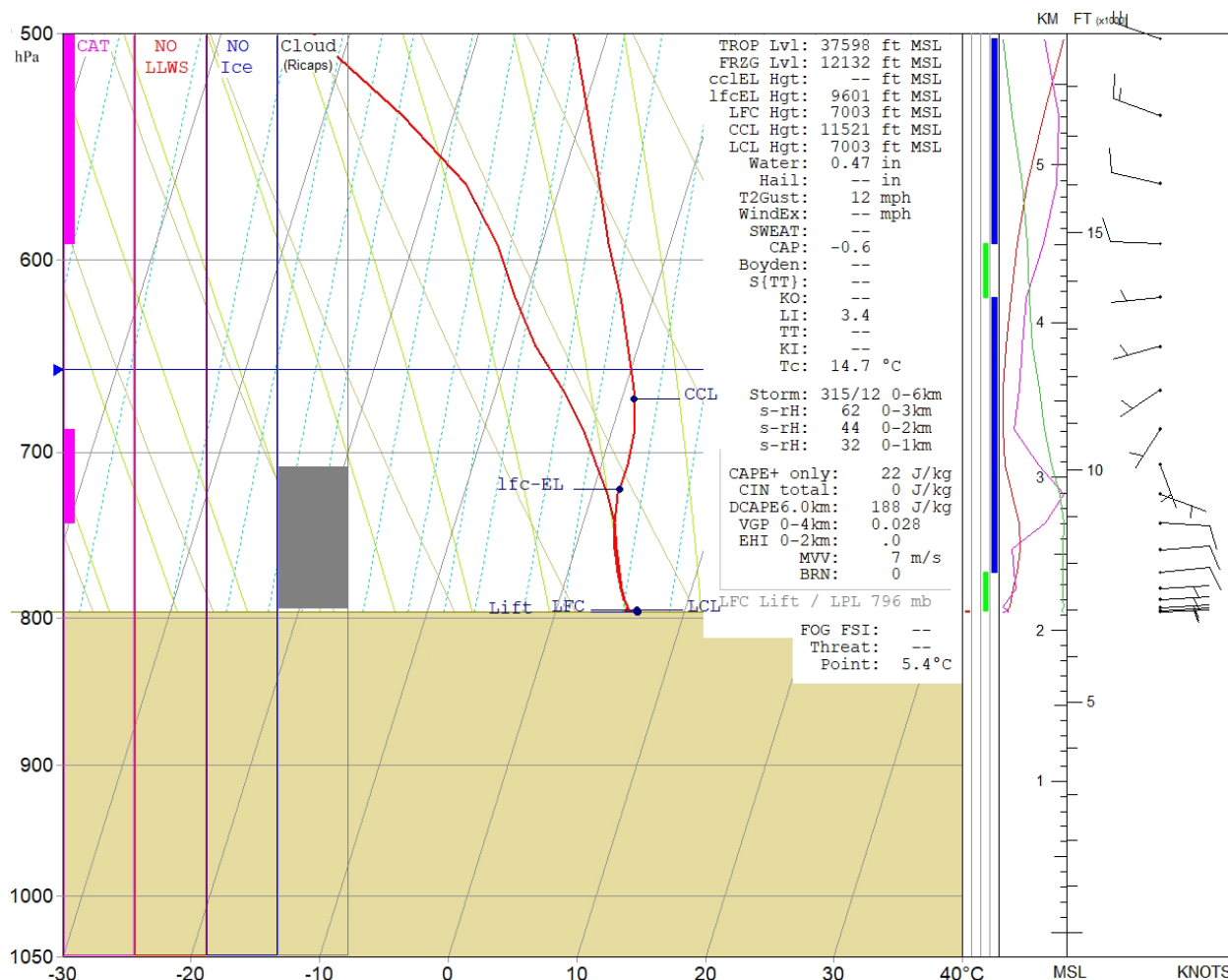


Figure 2 - HRRR model sounding data in SkewT/LogP format for 1300 near the accident site, surface to 500 hectopascals (hPa).

3.0 Satellite Imagery

Geostationary Operational Environmental Satellite (GOES)-18 infrared (10.3μm) data were obtained from an archive at the Space Science Engineering Center at the University of Wisconsin-Madison. GOES-18 infrared "window" imagery from 1256 is presented in Figure 3. Infrared brightness temperatures over the accident site were about -7°C, which, when considering the 1300 HRRR sounding, corresponded to cloud top heights of about 16,000 feet.

⁷ A veering wind's wind barbs turn clockwise with increasing height.

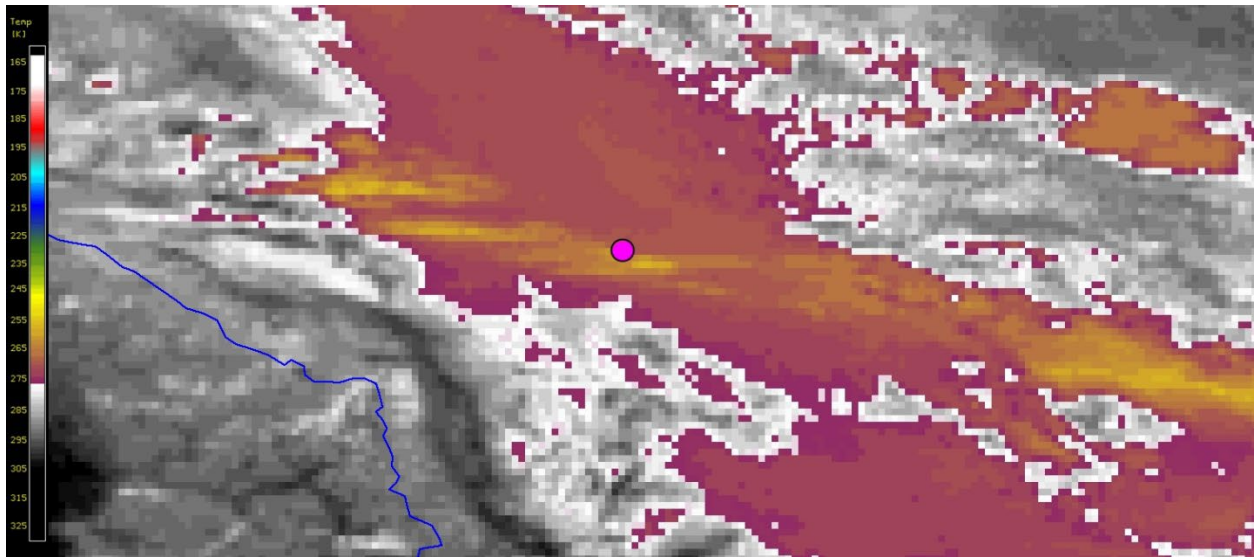


Figure 3 - GOES-18 infrared imagery from 1256. Accident location denoted by the purple dot.

"Day Cloud Phase RGB" imagery created from Geostationary Operational Environmental Satellite data valid at 1252 was obtained from the National Center for Atmospheric Research and is provided in Figure 4. The image depicts the accident site under predominantly liquid-topped cloud. Some thin, high ice cloud is overhead.

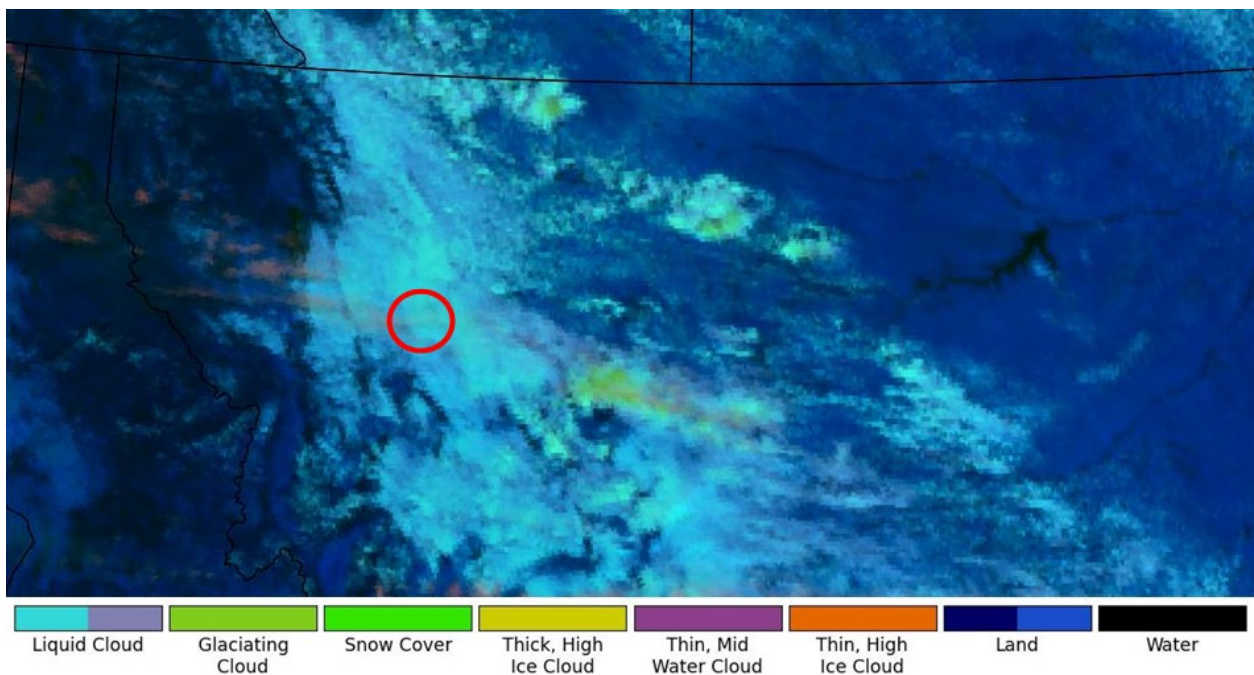


Figure 4 - GOES "Day Cloud Phase RGB" image from 1252. Accident location is identified by the red circle.

4.0 Pilot Reports

The following longline-disseminated pilot reports⁸ (PIREPs) were reported within 75 miles of the accident location between 1100 and 1500.

*ALB UA /OV HAUKY/TM 1751/FL032/TP E145/SK BASES032/WX -RA/RM
DURD RY19*

HLN UA /OV YERUT/TM 1931/FLDURD/TP E175/SK BKN098

HLN UA /OV HLN340007/TM 1940/FLDURC/TP E75L/SK BKN100

HLN UA /OV FABGO/TM 2053/FLDURD/TP E75L/SK BKN082

5.0 Surface Observations

An Automated Surface Observing Station (ASOS) was located at Great Falls International Airport (GTF⁹) in Great Falls, Montana, which was located about 57 miles west of the accident site at an elevation of 3,680 feet. This was the closest known station providing ceilometer observations whose archived data were available for the accident time. Augmented longline¹⁰ reports from the GTF ASOS during the times surrounding the accident time are presented here.

[1053] KGTF 081653Z 07007KT 10SM BKN080 17/11 A3033 RMK AO2 SLP258
T01670106

[1153] KGTF 081753Z 10007KT 10SM FEW080 17/10 A3032 RMK AO2 SLP259
T01720100 10178 20100 58001

**[1253] KGTF 081853Z VRB05G15KT 10SM FEW034 BKN080 19/09 A3031
RMK AO2 SLP254 T01940094**

[1353] KGTF 081953Z 08007G15KT 10SM FEW043 BKN060 21/09 A3030 RMK
AO2 SLP249 T02110094

⁸ These do not include pilot reports only broadcast via radio.

⁹ This report uses the 3-digit International Air Transport Association format for airport identification, which does not use the geographic designating digit (e.g., "K" for stations in the continental U.S. and "P" for U.S. stations in Alaska and the Pacific region) as found in the 4-digit International Civil Aviation Organization (ICAO) identifier format. Weather observations from airports in this report are referenced by their reporting station's identifier (using ICAO format that includes the geographic designating digit), not by the airport at which the reporting station is located.

¹⁰ "Longline" refers to the dissemination of weather observations with the intent that they are available in near-real time to national databases (effectively, the whole world) and accessible to the general global public from a large number of vendors. This does not include public accessibility to observations from a reporting station's Very High Frequency (VHF; line-of-site) or telephone broadcast, where applicable. Longline-dissemination of weather observations is the primary vehicle through which the general global public has access to surface weather observations, particularly outside of the aviation community.

At 1253, GTF reported a variable wind at 5 knots with gusts to 15 knots, visibility of 10 statute miles or greater, few clouds at 3,400 feet above ground level (agl), ceiling broken at 8,000 feet agl, temperature of 19°C and dew point temperature of 9°C, altimeter setting of 30.31 inches of mercury; Remarks: automated station with a precipitation discriminator, sea level pressure of 1025.4 hPa, temperature of 19.4°C and dew point temperature of 9.4°C.

6.0 Area Forecast Discussion

The National Weather Service's (NWS) Great Falls, Montana, Weather Forecast Office issued the following Aviation section of an Area Forecast Discussion at 1140, applicable for a region that included the accident location.

*FXUS65 KTFX 081740
AFDTFX
Area Forecast Discussion
National Weather Service Great Falls MT
1140 AM MDT Thu Aug 8 2024*

.AVIATION...

08/18Z TAF Period

Lingering low clouds will be the main concern this TAF period. Otherwise scattered showers and perhaps an isolated thunderstorm or two will be around this afternoon and evening, mostly over terrain. Mountains will be obscured where low clouds linger, primarily across Central and portions of Southwest Montana. -AM

Refer to weather.gov/zlc for more detailed regional aviation weather and hazard information.

7.0 SIGMETs

There were no non-convective or Convective Significant Meteorological Information (SIGMET) advisories active for the accident flight.

8.0 CWSU Products

There were no Center Weather Advisories or Meteorological Impact Statements issued by the Center Weather Service Unit (CWSU) at the Salt Lake City Air Route Traffic Control Center that were active for the accident flight.

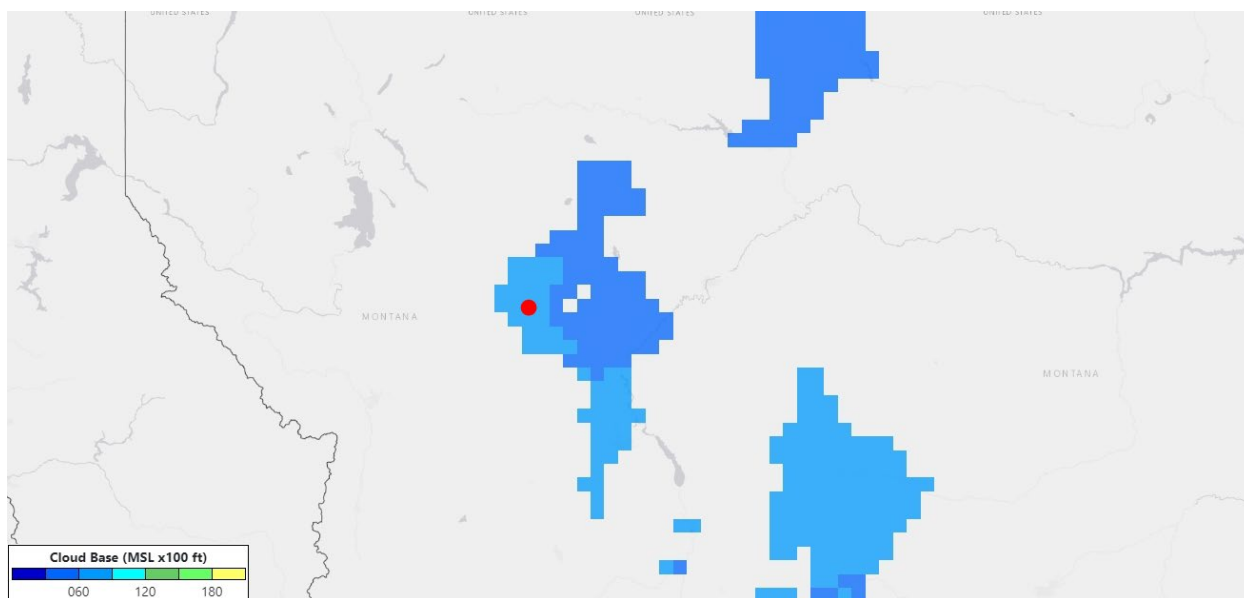
9.0 G-AIRMETs

A Graphical-Airmen's Meteorological Information (G-AIRMET) is a graphical advisory of weather that may be hazardous to aircraft but are less severe than what would be advised by a SIGMET. G-AIRMETs are only valid at discrete time "snapshots" that are three hours apart for a period of up to 12 hours into the future (i.e., 00-, 03-, 06-, 09- and 12-hour forecasts). They are issued about 0300 UTC, 0900 UTC, 1500 UTC and 2100 UTC (with updates issued as necessary).

G-AIRMETs for mountain obscuration in precipitation and mist were issued at both 0845 and 1205 that were valid at 1200 for regions that included the accident location.

10.0 Graphical Forecasts for Aviation

The Graphical Forecasts for Aviation (GFA) are intended to provide the necessary aviation weather information to give users a complete picture of the weather that might impact flight in the continental United States. The GFAs are available through the Aviation Weather Center's (AWC) website and provide hourly analyses and forecasts, including information on clouds, flight category, precipitation, icing, turbulence, wind, and other output from the NWS. The following information was retrieved from the AWC's GFA archive. Figures 5-16 present the GFA ceiling, cloud base, cloud and visibility 00-hour, 01-hour and 02-hour forecasts initiated at 1200 and valid for near the accident time.



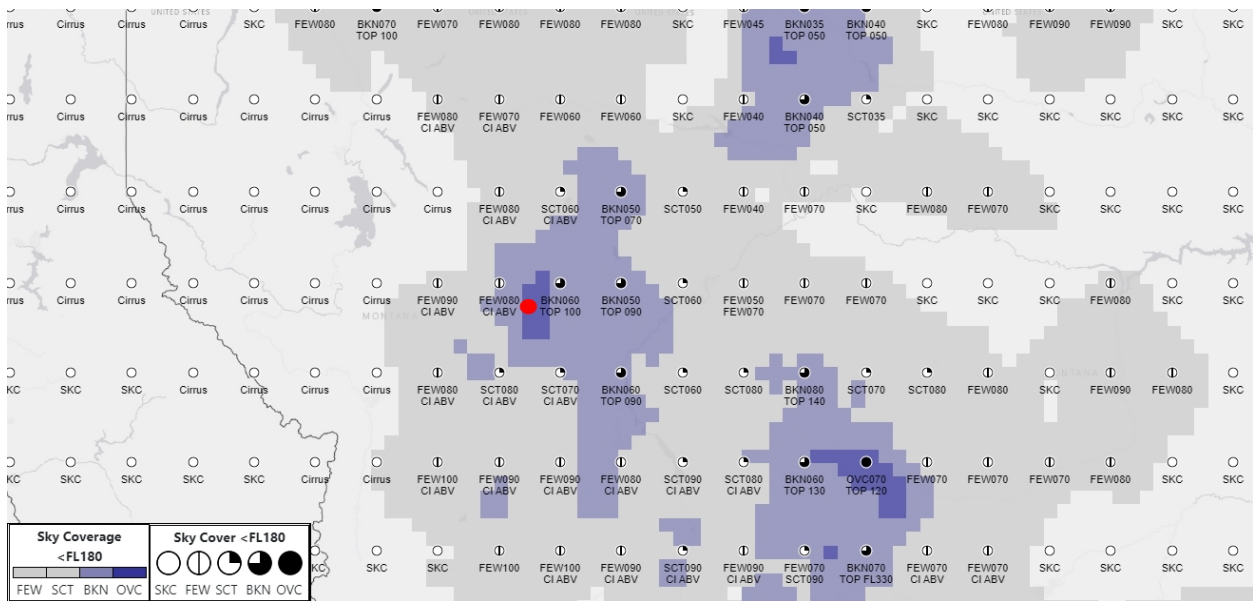


Figure 7 - GFA cloud 00-hour forecast initiated at 1200 and valid for 1245. The accident location is denoted by the red dot.

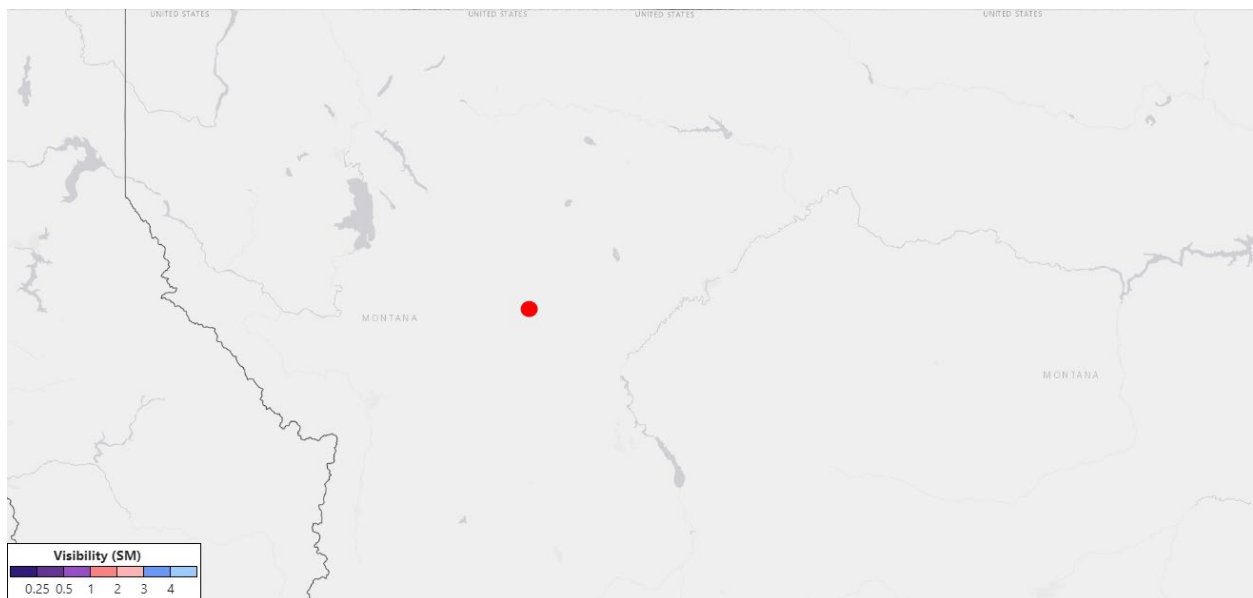


Figure 8 - GFA visibility 00-hour forecast initiated at 1200 and valid for 1245. The accident location is denoted by the red dot.

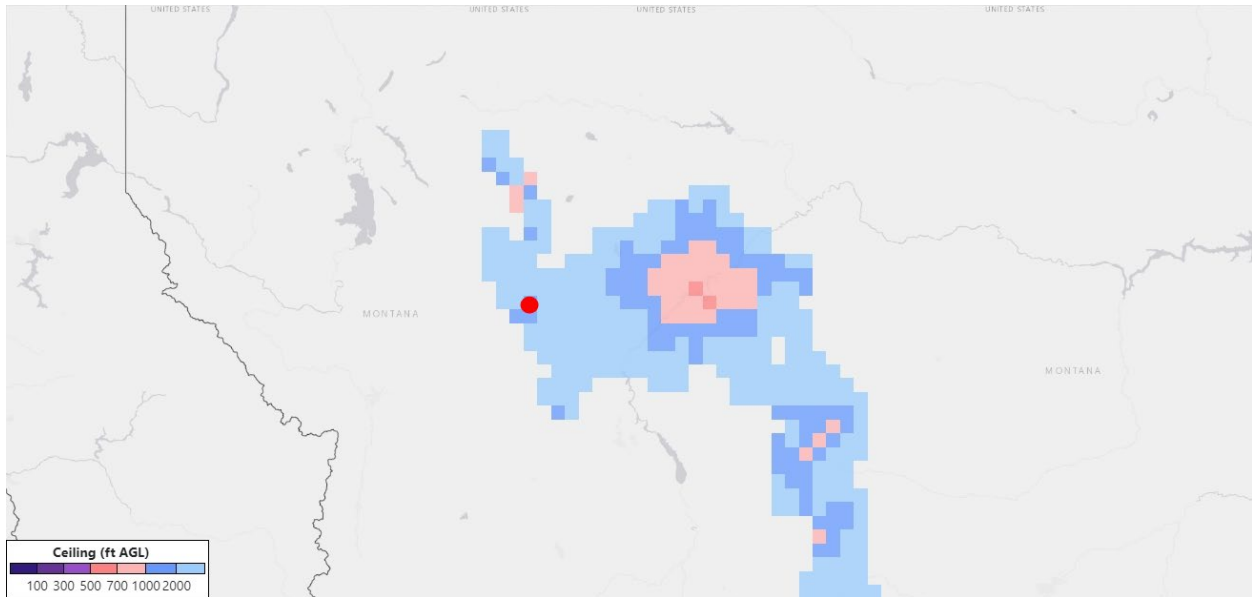


Figure 9 - GFA ceiling 01-hour forecast initiated at 1200 and valid for 1300. The accident location is denoted by the red dot.

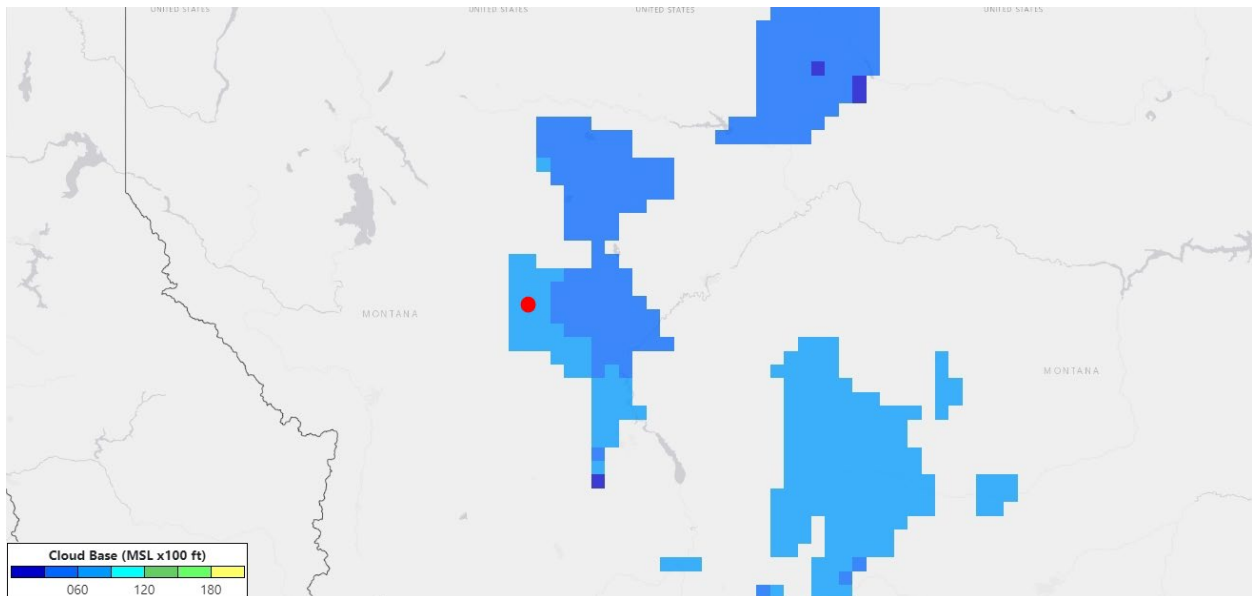


Figure 10 - GFA cloud base 01-hour forecast initiated at 1200 and valid for 1300. The accident location is denoted by the red dot.

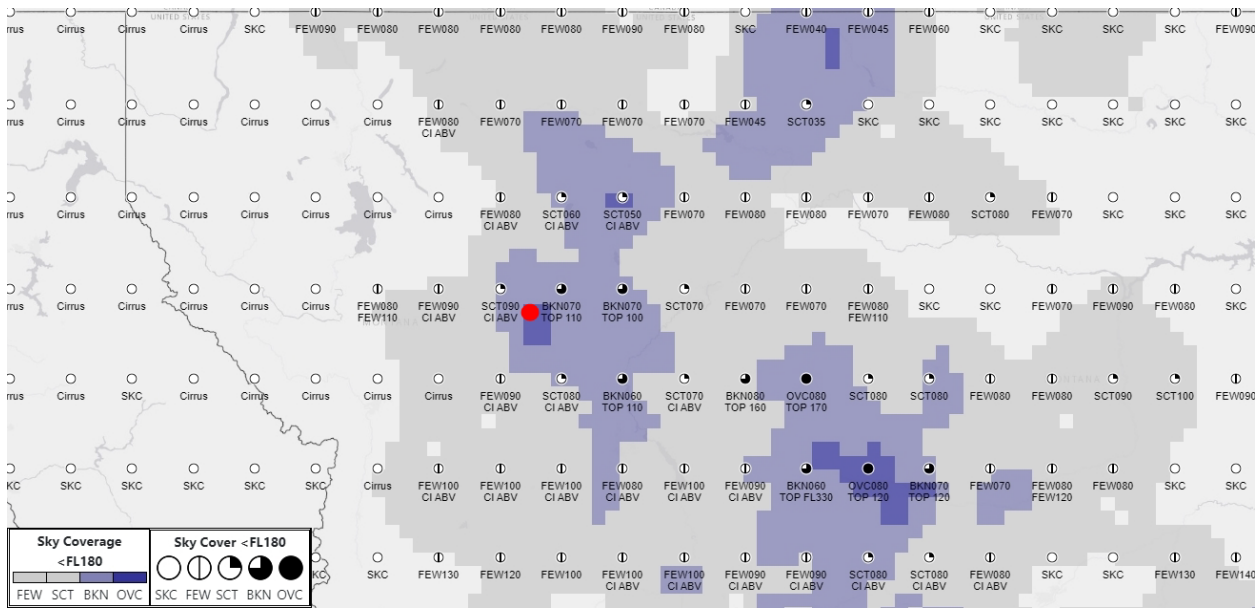


Figure 11 - GFA cloud 01-hour forecast initiated at 1200 and valid for 1300. The accident location is denoted by the red dot.

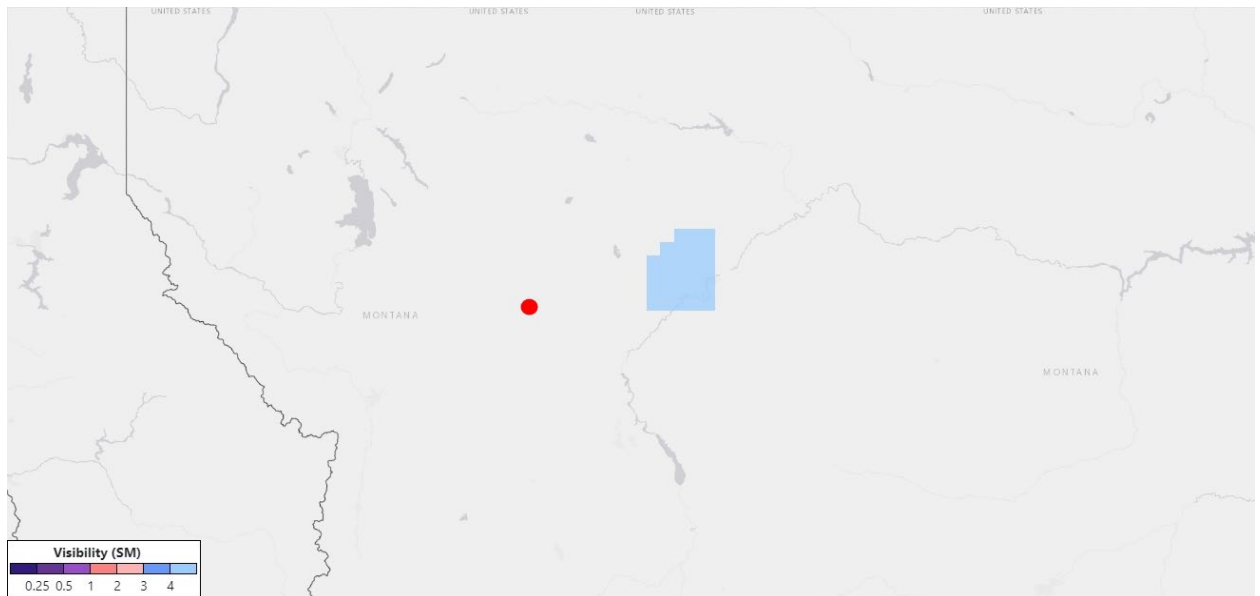
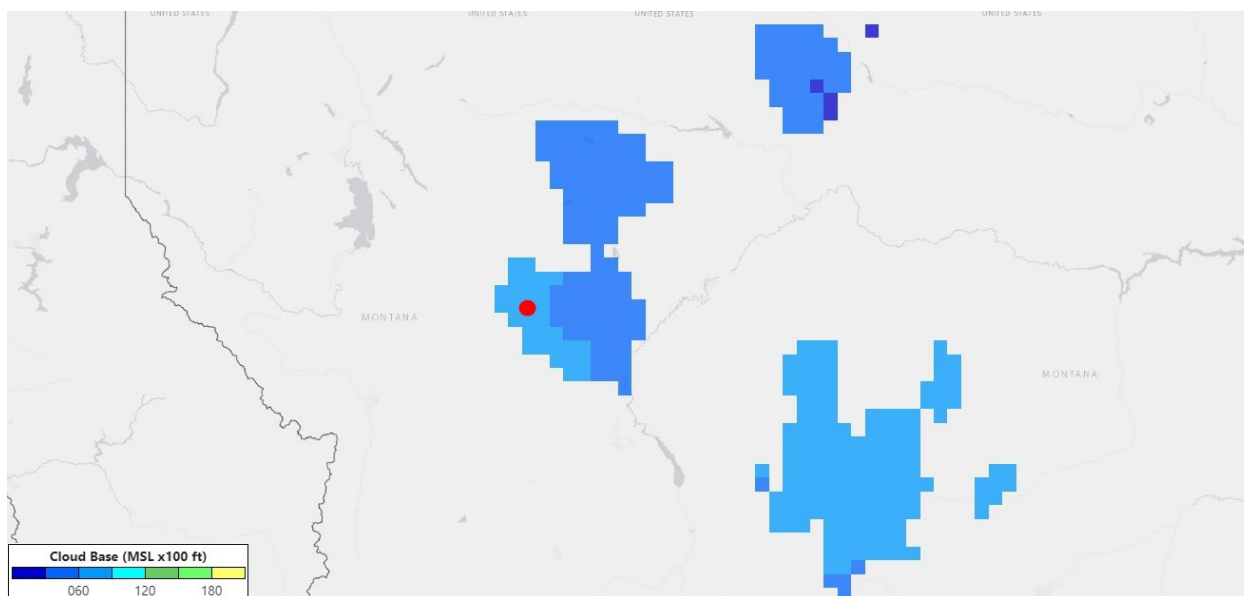
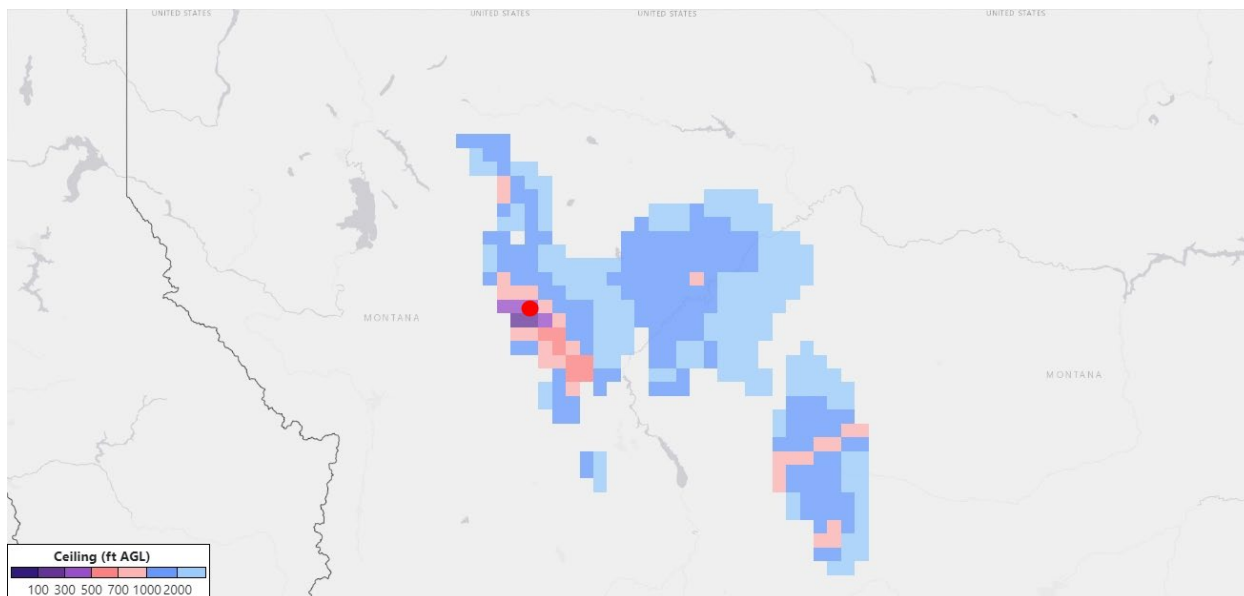


Figure 12 - GFA visibility 01-hour forecast initiated at 1200 and valid for 1300. The accident location is denoted by the red dot.



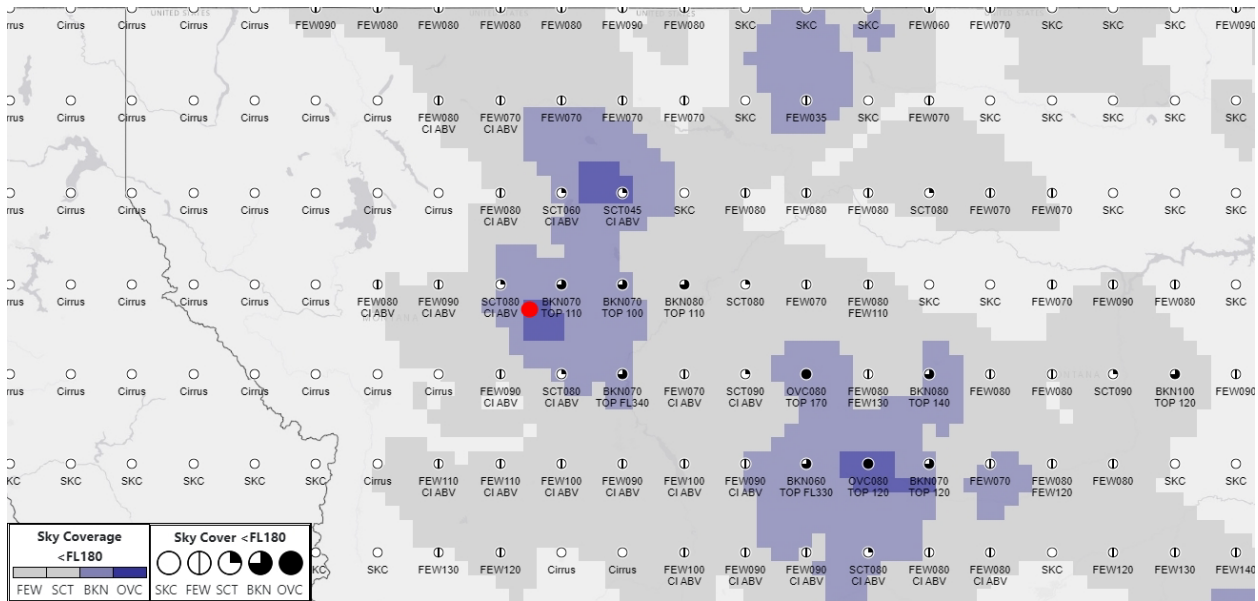


Figure 15 - GFA cloud 02-hour forecast initiated at 1200 and valid for 1300. The accident location is denoted by the red dot.

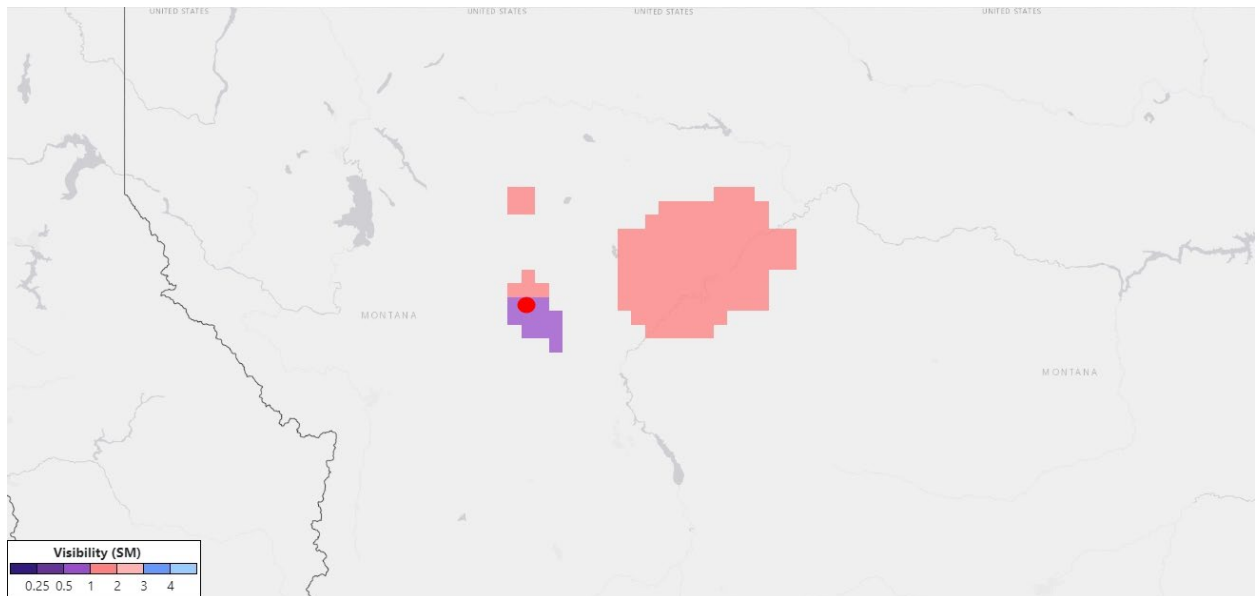


Figure 16 - GFA visibility 02-hour forecast initiated at 1200 and valid for 1300. The accident location is denoted by the red dot.

Submitted by:

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