Area Forecast Matrices Product Specifications Document (product category AFM)

1.0 General format

Below the product issuance time/date, the forecast date and time blocks will be displayed. The day of the week will be expressed by the standard 3-letter identifiers (SUN, MON, TUE, WED, THU, FRI, SAT) followed by the month, day and year (MM/DD/YY). The day and date labels are left justified above the 6:00 a.m. local time hour.

The following two lines provide the forecast times at 3 hour intervals (indicated by 3HRLY) out to 60 hours (2 ½ days) into the future. Listed on the far left of the time lines are the 3-letter time zone abbreviations (e.g., UTC, LST).

The second block is valid from 66 hours through Day 7. Once again, the local time zone is LST, but the forecast time intervals are at least 6 hours (indicated by 6HRLY). Some of the time intervals are 12 hours

2.0 Forecast Database Sampling

Data used to construct the AFM are sampled using a variety of statistical techniques on several gridded elements:

- MaxT, MinT, RH, Clouds are sampled using the average technique.
- Temperature, dewpoint is sampled for an average across the 3 hourly period
- Winds are sampled using the Vector average technique
- PoP is sampled using standard deviation maximum average technique (1.0 standard deviation range around sample mean)
- QPF is sampled using the time-weighted min/max/average of the multiple grids overlapping the time range.
- PTYPE: the dominant weather sampling technique is used.
- MAX HEAT and MIN CHILL are sampled using the min/max technique

3.0 Forecast parameters

The following forecast parameters are listed in order of their appearance within these products. Most elements are valid at the top of the hour indicated and then applied to the following 59 minutes. Elements valid for multiple hours (e.g., QPF, PoP, AVG CLOUDS) are referenced by the hour the forecast period ends. Precipitation Type parameters are independent and will only appear in the 3HRLY and/or 6HRLY blocks when forecast. Other elements such as Wind Chill and Heat Index are seasonal as defined by the local office. Watch, Warning, and Advisory information will also appear only when forecast.

3.1 Maximum/Minimum temperatures**:** MAX/MIN (or alternatively, MIN/MAX for afternoon issuance) is the forecast of maximum or minimum temperatures in degrees Fahrenheit (F). The nighttime MIN and daytime MAX may be displayed as single integer (e.g., -2, 8, 53, 102) , or as a range (e.g., 54 56 60) if the MAX/MIN temperatures are expected to vary across the area. This is illustrated in the AFM format documents. In AFM products, the middle

number within the range is the representative single value for that area. MAX/MIN is included through Day 7.

The effective time periods for MaxT and MinT are set as follows:

- MaxT
  - All but Alaska: 7 am to 7 pm LST
  - Alaska: 5 am to 8 pm LST
- Min T
  - All but Alaska: 7 pm to 8 am LST
  - Alaska: 5 pm to 11 am LST

Note that due to a 3-hour minimum time resolution, this element is right justified in the column beneath the *approximate* ending time of the MAX/MIN period.

Maximum and minimum temperature values are determined by sampling the MaxT and MinT grids for each of the 14 day/night periods.

3.2 Temperature: TEMP is a snapshot of the expected temperature in degrees F valid at the indicated hour. The temperature is right justified in the column below the hour to which it refers..

- Temperature is available at 3 hour projections through 60 hours, then 6-hour projections through Day 7.

3.3 Dewpoint: DEWPT is a snapshot of the expected dew point temperature in degrees F for the same time periods as its corresponding temperature forecast. DEWPT is located directly below the temperature line.

- Dewpoint is available for the same time projections as temperature.

3.4 Relative Humidity: RH is a snapshot of the expected RH for the same time periods as its corresponding temperature and dew point forecast. The RH row is located directly below the "DEWPT" row.

a. RH is calculated from 3 hourly temperature and dewpoint grids

3.5 Wind Direction: WIND DIR is a snapshot of the expected wind direction forecast to occur at the indicated hour, using the 8 points of a compass (i.e., N, NE, E, SE, S, SW, W, NW). If a calm wind is forecast, double zeros (00) will be listed in place of a wind direction. WIND DIR is located below the hour to which it refers. WIND DIR is available at 3-hour projections out to 60 hours. (Note special exception to wind direction for tropical cyclones below.)

In the 6HRLY block, PWIND DIR is the "predominant" wind direction for the area during the 12-hour period between 6:00 a.m. and 6:00 p.m., or 6:00 p.m. and 6:00 a.m. local time. PWIND DIR is available beyond 60 hours through Day 7.

3.6 Wind Speed: WIND SPD is a snapshot of the sustained wind speed in miles per hour (MPH) forecast to occur at the indicated hour. If a calm wind is forecast, double zeros (00) will

be listed in place of a wind speed. (Note special exception to wind speed for tropical cyclones below). WIND SPD is valid at 3-hour projections out to 60 hours.

3.7 Wind Character: WIND CHAR codes are used beyond 60 hours through Day 7 of the forecast and denote the character of the wind for the 12-hour period between 6:00 a.m. and 6:00 p.m., or 6:00 p.m. and 6:00 a.m. WIND CHAR is comprised of range categories used in conjunction with deterministic wind speeds. Each range category is equated to a descriptive wind term, i.e., a "wind character" to best describe the MAXIMUM SUSTAINED wind speed during the period. . See Table 1 below for the complete list of AFM wind categories.

Wind Character Codes	**Wind Character**	**12-hr Maximum Sustained Wind Speed**
LT	**L**igh**t**	< 8 mph
GN	**Gen**tle	8 - 14 mph
BZ	**B**ree**z**y	15 - 22 mph
WY	**W**ind**y**	23 - 30 mph
VW	**V**ery **W**indy	31 - 39 mph
SD	**S**trong/**D**amaging	40 mph

Table 1. AFM Wind Character Codes.

3.8 Wind gust: A WIND GUST row will appear in the 3HRLY block whenever forecasted wind gusts exceed the sustained wind speed (WIND SPD) by at least 10 MPH. WIND GUST is a snapshot valid on the hour indicated at the top of the corresponding column. WIND GUST is a snapshot of gusts of wind occurring at the indicated hour and is available at 3-hour projections through 60 hours. (Note special exception to wind gust for hurricanes below.)

3.9 Cloud Cover: The CLOUDS category provides a snapshot of sky coverage during the indicated hour. CLOUDS is divided into five category codes ranging from clear to overcast . Each code represents an equivalent percentage of opaque sky cover in percent. *CLOUDS parameter is included at 3-hour projections out to 60 hours.* In the 6HOURLY section, AVG CLOUDS *is valid for 6-hour intervals beyond 60 hours through Day 7* and denotes the average amount of all opaque clouds during the 6-hour period ending on the hour indicated at the top of the column. The complete cloud codes and sky cover definitions are shown in Table 2.

AFM Sky Cover Code	**Predominant Sky Cover (Opaque Cloud Coverage in Percent)**	**Equivalent Sky Cover Expressions**
CL	**0% to ≤ 5%**	**SUNNY or CLEAR**
FW	**> 5% and ≤ 25%**	**SUNNY or MOSTLY CLEAR**
SC	**> 25% and ≤ 50%**	**MOSTLY SUNNY or PARTLY CLOUDY**
B1	**> 50% and ≤ 69%**	**PARTLY SUNNY or MOSTLY CLOUDY**
B2	**> 69% and ≤ 87%**	**MOSTLY CLOUDY or CONSIDERABLE CLOUDINESS**
OV	**> 87% and 100%**	**CLOUDY or OVERCAST**

Table 2. AFM Sky Cover Codes.

3.10 12-hourly Probability of Precipitation (POP 12HR). Probability of Precipitation (POP), is defined as the likelihood, expressed as a percent, of a measurable precipitation event (1/100th of an inch) at any given point within the forecast area(s) covered by the AFM. The "12HR" refers to the 12-hour valid time ending at 6:00 a.m. or 6:00 p.m. local time (0600 or 1800). The POP 12HR values that may appear in the AFM are as follows: 0, 5, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100. These values are right justified in the column beneath the hour defining the ending time of the valid period.

3.11 QPF 12HR. Quantitative precipitation forecast (QPF) represents the total amount of liquid precipitation, in inches, expected during a 12-hour period ending at 6:00 a.m., or 6:00 p.m. local time. The QPF is presented in locally defined ranges, (e.g., .10-.24), or single values. The QPF 12HR value is right justified in the column beneath the hour defining the ending time of the expected precipitation. QPF 12HR is included in the AFM out to 60 hours.

3.12 MAX QPF (optional). The value for MAX QPF is the estimated maximum amount of precipitation, in inches, during the12-hour period ending at 6:00 a.m. or 6:00 p.m. local time. This amount is presented as either a single value or a range, and is based upon a 75% confidence level of the QPF forecaster(s). MAX QPF is right justified below the hour defining the ending time of the expected precipitation, and is available out to 60 hours.

3.13 SNOW 12HR. The expected range of total snowfall accumulation (in whole inches) forecast to occur in the forecast area during a 12-hour period ending at 6:00 a.m. or 6:00 p.m. local time. SNOW 12HR will only appear during the locally defined winter period. The snow parameter contains 1 to 5 alphanumeric characters which are right justified in the column below the hour defining the *ending time* of the precipitation period. SNOW 12HR may appear as a one or two digit number (1, 4, 12), or as a specified range (2-4, 8-12). When no snowfall is forecast during the locally specified winter period, double zeros (00-00) will appear in the row. Snowfall that is not measurable (less than 0.1 inch of frozen precipitation) is referred to as a trace. A trace of snow is depicted by a "T." SNOW 12HR is included out to 36 hours.

3.14 Precipitation Type (PTYPE) and Category: The AFM may list several types of precipitation. Precipitation types only appear if they are forecast to occur during the seven day forecast. Precipitation type codes are listed in the far left column of the AFM. For each type of precipitation that is forecast, an associated POP category is specified within the body of the product. During the first 60 hours, the POP category for the indicated precipitation type is a snapshot valid at the hour specified by the column header. Beyond 60 hours through Day 7, the POP category reflects the prevailing POP during the 6-hour period including and preceding the hour indicated at the top of the column. PTYPE and Category is available at 3-hr projections out to 60 hours, then for 6-hour periods beyond 60 hours through Day 7. The types of precipitation that may be included in the AFM are shown in Table 3.

AFM Code	Sensible Weather
RAIN	Rain

RAIN SHWRS	Rain Showers
SPRINKLES	Sprinkles
TSTMS	Thunderstorms
DRIZZLE	Drizzle
SNOW	Snow, Snow Grains/Pellets
SNOWSHWRS	Snow Showers
FLURRIES	Snow Flurries
SLEET	Ice Pellets
FRZG RAIN	Freezing Rain
FRZG DRZL	Freezing Drizzle

Table 3: Sensible Weather Codes.

Probability of Precipitation and Areal Coverage codes appearing in the AFM are shown in Table 4, along with their equivalent POP or areal coverage in percent.

Code	**Qualifying Term (Stratiform or Convective)**	**POP (%)**
S	Slight Chance	(> 0 and 20%)
C	Chance	(30%-50%)
L	Likely	(60%-70%)
O	Occasional/Periods of	(80%-100%)
D	None	(80%-100%)
Code	**Areal Term (Convective)**	**Areal Coverage (%)**
IS	Isolated	(20%)
SC	Scattered	(30%-50%)
NM	Numerous	(60%-70%)
EC	None (extensive coverage)	(80%-100%)
Code	**Areal Term (Non-Measurable Stratiform)**	**Areal Coverage (%)**
PA	Patchy	(<25%)
AR	Areas	(25>50%)
WD	Widespread	(>50%)

Table 4: POP and Areal Coverage Codes.

Precipitation categories are snapshots available at 3-hour projections out to 60 hours, then averaged over 6-hour intervals out to Day 7.

3.15 Obstructions to Visibility (OBVIS): If an OBVIS is predicted for the forecast area, a row labeled OBVIS will be listed underneath any forecast of precipitation. If no precipitation is forecast, then OBVIS will be listed under the row labeled CLOUDS. OBVIS is a snapshot

available at 3-hour projections through 60 hours. The complete OBVIS code list and associated definitions are shown in Table 5.

AFM Code	Obstruction to Visibility
F	Fog
PF	Patchy Fog
F+	Dense Fog
PF+	Patchy Dense Fog
H	Haze
BS	Blowing Snow
K	Smoke
BD	Blowing Dust
AF	Volcanic Ashfall

Table 5: Obstruction to Visibility Codes.

3.16 Wind Chill and Heat Index: Wind Chill and Heat Index are included seasonally based upon locally defined criteria. The decision on whether to include or exclude these parameters is determined by the local WFO criteria. Wind Chill and Heat Index are snapshots at the indicated hour and are forecast at 3-hour projections out to 60 hours.

3.17 MIN CHILL and MAX HEAT. When WIND CHILL or HEAT INDEX values appear in the AFM, a 6-hour minimum wind chill or maximum heat index may appear on the following row. These values indicate the minimum wind chill/ maximum heat index forecast to occur during the 6-hour period (inclusive of and preceding) the hour indicated at the top of the column. MIN CHILL and MAX HEAT, if included, will be at 6-hr intervals out to 60 hours.

3.18 WATCH, WARNING and ADVISORY. When Valid Time Event Codes (VTEC) as described in NWS Directive 10-1703 becomes available, long duration hazardous weather events will be included when a valid WATCH, WARNING and/or ADVISORY is issued by a WFO. The weather phenomena codes are decoded into plain language from VTEC and will appear as labels for additional rows at the bottom of the 3HRLY block. Within the text of the AFM, the VTEC codes for WATCH [A], WARNING [W], and ADVISORY [Y] will appear if the valid time of the event is in effect during the indicated hour. If valid, these codes will only appear during the first 60 hours.

4. Special Instructions for Tropical Cyclones.

Due to the uncertainty in the location and intensity of tropical cyclones, special instructions will apply to AFM entries for wind speed, wind direction and wind gusts for various time periods as described in the following sections and Table 6.

a. Zero to 24 Hours. If forecast winds for a specified land area meet or exceed hurricane force (i.e., 64 kts or 74 mph) within the first 24 hours, the AFM will portray

wind direction (WIND DIR) to the 8 points of a compass, deterministic wind speed (WIND SPD), and deterministic wind gusts (WIND GUST) as shown in Table 6

b. Beyond 24 Hours. If the potential exists for winds in a specified land area to meet or exceed hurricane force beyond 24 hours, the AFM will portray wind direction, and wind speed using the code "**HU**" in lieu of the deterministic winds (beyond 24 to 60 hours), and in lieu of the predominant wind direction (PWIND DIR) and wind character codes (beyond 60 hours to 120 hours). The code "**HG**" will appear in the AFM to indicate hurricane force wind gusts are possible. HG will be portrayed in lieu of the deterministic wind gusts beyond 24 hours to 60 hours only (see Table 6). Both the HU and HG codes indicate hurricane force winds, or wind gusts respectively, *could* occur. Users should refer to the tropical cyclone center or local WFO for the latest details concerning the storm.

Forecast Period (Hours)	**Wind Direction (8 pts. of Compass)**	**Sustained Wind Speed (MPH)**	**Wind Gusts (MPH)**
0 to 24	**N, NE, E, SE, S, SW,W,** or **NW**	Deterministic (e.g., 74 mph, 95 mph)	Deterministic (e.g., 115 mph)
> 24 to 60	HU (variable and uncertain)	HU (hurricane force possible)	HG (hurricane force possible)
>60 to 120 (Day 5)	HU (variable and uncertain)	HU (hurricane force possible)	N/A

Table 6: AFM entries for Hurricanes.