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Subject:

The MRF-Based Statistical
Guidance Message

Program Requirements and Development Division, Silver Spring, MD 20910

FIRST BULLETIN ON THIS SUBJECT

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This Technical Procedures Bulletin (TPB), written by John S. Jensenius, Jr., J. Paul Dallavalle, and Stephen A. Gilbert, of the Techniques Development Laboratory, describes the Medium-Range Forecast (MRF)-based statistical weather forecast message, which was implemented on December 10, 1992. Forecasts are available for stations in the contiguous United States and in Alaska.

Included in the guidance are daily forecasts of daytime maximum (max) and nighttime minimum (min) temperature, probability of precipitation (PoP) for 12- and 24-h periods, conditional probability of snow (conditional on precipitation occurring) for 12-h periods, mean opaque cloudiness for 12-h periods, and mean wind speed for 12-h periods. This guidance is prepared daily for dissemination at approximately 0900 UTC for the 0000 UTC forecast cycle.

A sample message for the future Weather Forecast Office in Albany, New York (WFO ALY), based on the 0000 UTC cycle on December 8, 1992, is used throughout the TPB to discuss the various forecast elements in detail. Each section begins with the portion of the message being discussed, preceded by the message heading, to enhance readability. A double-sided yellow reference card for these messages is included with the TPB.



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THE MRF-BASED STATISTICAL GUIDANCE MESSAGE

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1. INTRODUCTION

During December 1992, the Techniques Development Laboratory (TDL) of the National Weather Service (NWS) implemented a new statistical weather forecast system to produce objective guidance for projections to 192 hours. These statistical forecasts are based on output from the National Meteorological Center's (NMC's) Medium-Range Forecast (MRF) model (Kanamitsu, 1989). Included in the guidance are daily forecasts of maximum (max) and minimum (min) temperature, probability of precipitation (PoP), conditional probability of snow, mean cloudiness, and mean wind speed. The forecasts are disseminated in alphanumeric messages and are distributed under many different bulletin headers (see Appendix). In general, bulletins for the NWS Eastern Region are distributed under the WMO headers FOXEnn KWBC; bulletins for the NWS Central Region are distributed under the WMO headers FOXCnn KWBC; bulletins for the NWS Southern Region are distributed under the WMO headers FOXSnn KWBC; and bulletins for the NWS Western Region are distributed under the WMO headers FOXWnn KWBC. The "nn" in these bulletin headers represents a number assigned to various collectives of stations. For NWS AFOS users, the guidance for the contiguous U.S. is distributed under the FMR category. For Alaska, the MRF-based objective guidance is transmitted in the FOUS20 KWBC message; that product is not available on AFOS.

The MRF-based messages contain forecasts of the daytime max and nighttime min temperature, the probability of precipitation for 12- and 24-h periods, the conditional probability of snow (conditional on precipitation occurring) for 12-h periods, the mean opaque cloudiness for 12-h periods, and the mean wind speed for 12-h periods. In general, forecast guidance is available for each 12-h period between 12 and 192 hours. For comparison, the normal climatic values for the 96-120 h period are included at the end of each line in the message. This allows users to determine whether the forecasts for the longer range projections are above or below normal and by how much.

The forecasts contained in the medium-range guidance messages are generated by applying statistical equations to output from the MRF model. Various techniques were used in developing these statistical equations (Jensenius et al., 1992); these techniques will be discussed in greater detail in a forthcoming Technical Procedures Bulletin (TPB). In addition, the forecasts contained in the messages are passed through a calibration procedure that minimizes the mean square error of the forecasts based on previous verification data. This procedure makes the forecasts tend toward normal climatic conditions appropriately as the skill of the objective guidance decreases. The calibration procedure also removes the systematic biases detected in the sample verification. **The overall purpose of the calibration procedure is to produce forecasts that are representative of the average values observed for similar MRF model forecasts in the past (based on the verification sample).**

Note that the forecasts included in the MRF-based objective message are generated mainly to provide guidance for the forecast period beyond 48 hours. The predictors in the equations were generally limited to those that worked best for the medium-range projections. In addition, the horizontal resolution of the MRF model data that is used to generate the forecasts is less than that used for TDL's NGM-based MOS guidance (Dallavalle et al., 1992). Consequently, the forecasts for projections of 48 hours or less generally will be less accurate than those produced from the NGM-based forecast system. The forecasts for these earlier projections are included on the message, however, for continuity.

For stations in the contiguous United States, forecasts of the conditional probability of snow (CPoS) will be issued only from September 16 through May 15; however, CPoS forecasts will never be available for certain stations in California and Florida where snow is very rare. For stations in Alaska, CPoS forecasts will be issued from September 1 through May 31. Also, note that, due to a lack of either developmental or climatic data, the messages for

some part-time stations do not contain forecasts for all weather elements and/or projections.

This TPB was written to explain the format of the medium-range message. A more detailed explanation of the techniques used to develop the forecast equations and to produce the statistical forecasts will be included in a forthcoming TPB.

2. MESSAGE FORMAT

Figure 1 shows a sample MRF-based objective forecast message for the future Weather Forecast Office in Albany, New York (WFO ALY). This message contains guidance for only one station; that is, the Albany County Airport (ALB). The number of stations included in each bulletin varies according to the forecast area. For the FOXE40 message, only ALB is included. In the discussion to follow, the FOXE40 KWBC message will be used as an example. Note that the guidance for other future WFOs is disseminated under different WMO bulletin headers (see the Appendix).

A two-page summary of the MRF-based statistical message is given at the end of this TPB. This summary is also included as a double-sided yellow reference card.

a. Message Heading

```
NMCFMRALY
FOXE40 KWBC 080000
MRF-BASED OBJECTIVE GUIDANCE 12/08/92 0000 UTC
ALB DEC 08|DEC 09|DEC 10|DEC 11|DEC 12|DEC 13|DEC 14|DEC 15|CLIMO
```

The message heading shown above (see Figure 1 also) gives the AFOS product identifier for the collective (AFOS users only) [line 1]; the World Meteorological Organization (WMO) bulletin header assigned to the collective and the bulletin creation day and cycle [line 2]; the message content identifier and the forecast date and cycle [line 3]; and the station for which the guidance is valid followed by the valid forecast dates (UTC) for each group of forecasts, and a heading for the climatic normals section of the message [line 4].

For AFOS users, the first three lines appear at the beginning of each collective, and the fourth line appears for each station in the collective. For non-AFOS users, only the second and third lines appear at the start of each message and the fourth line appears once for each station in the collective.

In the example above, the AFOS product identifier [line 1] indicates that the collective is for stations in the area of responsibility for the modernized Albany WFO (ALY). The second line gives the WMO bulletin header (FOXE40 KWBC) for the Albany collective and indicates that the bulletin was created on the 8th day of the month during the 0000 UTC cycle. The third line gives the initial date (12/08/92) and the forecast cycle (0000 UTC) of the model data on which the guidance was based. The fourth line gives the station (ALB) for which the guidance is valid, and the valid dates for each set of forecasts. Note that the valid month is indicated by a three or four letter abbreviation. In addition, on the fourth line, the heading (CLIMO) indicates the column of numbers listing the climatic normals for the 96-120 h period (in this case, December 12).

Note that the dates and times in line 4 of the heading are in terms of UTC and that all forecasts, with the exception of the min/max temperature, are valid for periods defined with respect to UTC. The min/max temperature forecasts are valid for nighttime and daytime periods, respectively, based on local standard time. Consequently, forecast values for the 0000-1200 UTC period, the 0000-0000 UTC period (see Section 2.g), and for the minimum temperature (see Section 2.b) actually span two local calendar dates.

b. MN/MX - Minimum/Maximum Temperature Forecasts

```
NMCFMRALY
FOXE40 KWBC 080000
MRF-BASED OBJECTIVE GUIDANCE 12/08/92 0000 UTC
ALB DEC 08|DEC 09|DEC 10|DEC 11|DEC 12|DEC 13|DEC 14|DEC 15|CLIMO
MN/MX 49|34 45|24 27| 2 18| 5 25|10 27|18 38|29 39|18 35
```

This row of forecasts is labeled "MN/MX" to indicate that the forecasts between any two date separators (|) are the minimum and maximum surface temperatures, respectively, expected for the nighttime and daytime periods ending during that date. Forecast values in this message are in whole degrees Fahrenheit (°F) and three characters are allowed. Missing values are indicated by 999. Although each column gives the minimum temperature followed by the maximum temperature, note that the first temperature forecast appearing in the row is the maximum temperature for the first day of the forecast. In this example, forecasts under the column labeled "DEC 09" are the minimum temperature expected for the nighttime period ending the morning of December 9 (34°F) and the maximum temperature

expected during the daytime period of December 9 (45°F). Note that the normal minimum and maximum temperatures for December 12 (as indicated in the column labeled "CLIMO") are approximately 18°F and 35°F, respectively. Although the nighttime/daytime observations used in the development of these equations are based partly on 3-hourly reports, nighttime corresponds roughly to the 7 pm to 9 am local standard time (LST) period during the cool season and to the 7 pm to 8 am LST period during the warm season. Daytime corresponds roughly to the 9 am to 7 pm LST period during the cool season and to the 8 am to 7 pm LST period during the warm season. For Alaska, nighttime and daytime correspond to roughly 6 pm to 6 am LST and 6 am to 6 pm LST, respectively.

**c. POP12 - Probability of Precipitation (PoP)
Forecasts for a 12-h Period**

```
NMCFMRALY
FOX E40 KWBC 080000
MRF-BASED OBJECTIVE GUIDANCE 12/08/92 0000 UTC
ALB DEC 08|DEC 09|DEC 10|DEC 11|DEC 12|DEC 13|DEC 14|DEC 15|CLIMO
. . . . .
POP12 32|69 100|67 58|21 8| 0 3|12 15|26 33|35 42|26 29
```

The line labeled "POP12" contains forecasts of the probability of 0.01 inches or more of liquid-equivalent precipitation during 12-h periods. These 12-h PoPs are valid for the 0000-1200 UTC and 1200-0000 UTC periods. In the message, the forecast probabilities are given to the nearest whole percent, ranging from 0 to 100%. A missing forecast is indicated by 999. In the sample message, for the set of forecasts labeled "DEC 09," the forecast PoP for the period from 0000 UTC December 9 to 1200 UTC December 9 is 69%. The forecast for the period from 1200 UTC December 9 to 0000 UTC December 10 is 100%. Note that the normal observed relative frequency of 0.01 inches or more of precipitation for December 12 (as indicated in the column labeled "CLIMO") is approximately 26% and 29% for the 0000-1200 and 1200-0000 UTC periods, respectively.

**d. CPOS - Conditional Probability of Snow
Forecasts for a 12-h Period**

```
NMCFMRALY
FOX E40 KWBC 080000
MRF-BASED OBJECTIVE GUIDANCE 12/08/92 0000 UTC
ALB DEC 08|DEC 09|DEC 10|DEC 11|DEC 12|DEC 13|DEC 14|DEC 15|CLIMO
. . . . .
CPOS 0| 2 29|75 89|100 100|100 100|100 97|85 71|83 61|88 87
```

The line labeled "CPOS" gives the conditional probability of snow--conditional on the occurrence of a "significant precipitation event" during the 12-h period. These 12-h CPoS forecasts are valid for the 0000-1200 UTC and 1200-0000 UTC periods. In the development of the forecast equations, "significant precipitation events" were defined as those in which (1) precipitation was reported in at least two of the five 3-hourly observations that span the forecast period, and (2) precipitation was observed in two reports separated by at least 6 hours. For those 12-h periods that met the criteria, the predictand was set to 1 if only snow occurred and 0 if only rain occurred. If any mixture of snow and rain occurred during the period, or if any form of transitional precipitation (freezing precipitation, ice pellets, or mixed precipitation) occurred, the predictand took on a value between 0 and 1. This will be discussed in greater detail in a forthcoming TPB. In the forecast message, the conditional probabilities are given to the nearest whole percent, ranging from 0 to 100%. A missing forecast is indicated by 999. In the sample message, for the set of forecasts labeled "DEC 09," the forecast CPoS for the period from 0000 UTC December 9 to 1200 UTC December 9 is 2%. The forecast for the period from 1200 UTC December 9 to 0000 UTC December 10 is 29%. Note that the climatic conditional relative frequency of snow for December 12 (as indicated in the column labeled "CLIMO") is approximately 68% and 67% for the 0000-1200 and 1200-0000 UTC periods, respectively.

**e. CLDS - Mean Opaque Cloudiness Forecasts
for a 12-h Period**

```
NMCFMRALY
FOX E40 KWBC 080000
MRF-BASED OBJECTIVE GUIDANCE 12/08/92 0000 UTC
ALB DEC 08|DEC 09|DEC 10|DEC 11|DEC 12|DEC 13|DEC 14|DEC 15|CLIMO
. . . . .
CLDS 62|78 97| 97 88| 52 21| 20 28| 43 55| 62 63| 60 64| 54 58
```

The line labeled "CLDS" contains forecasts of mean opaque cloudiness (in percent) for the 0000 to 1200 and 1200 to 0000 UTC periods. A missing forecast is indicated by 999. In the example, for the set of forecasts labeled "DEC 09," forecast opaque cloudiness is 76% for the 12-h period from 0000 to 1200 UTC December 9, and 97% for the 12-h period from 1200 UTC December 9 to 0000 UTC December 10. Note that the normal cloudiness for December 12 (as indicated in the column labeled

"CLIMO") is approximately 54% and 58% for the 0000-1200 and 1200-0000 UTC periods, respectively.

f. WIND - Mean Wind Speed Forecasts for a 12-h Period

```

NMC FM RALY
FOX E40 KWBC 080000
MRF-BASED OBJECTIVE GUIDANCE 12/08/92-0000 UTC
ALB DEC 08|DEC 09|DEC 10|DEC 11|DEC 12|DEC 13|DEC 14|DEC 15|CLIMO
.
.
.
WIND 12|15 21|18 19| 6 8| 2 4| 4 5| 5 7| 7 8| 5 6
  
```

The line labeled "WIND" contains forecasts of mean wind speed (in knots) for the 0000 to 1200 and 1200 to 0000 UTC periods. A missing forecast is indicated by 999. In this example, for the set of forecasts labeled "DEC 09," the forecast mean wind speed for the 12-h period from 0000 UTC December 9 to 1200 UTC December 9 is 15 knots while the forecast mean wind speed for the 12-h period from 1200 UTC December 9 to 0000 UTC December 10 is 21 knots. Note that the normal wind speed for December 12 (as indicated in the column labeled "CLIMO") is approximately 5 knots and 6 knots for the 0000-1200 and 1200-0000 UTC periods, respectively.

g. POP24 - Probability of Precipitation (PoP) Forecasts for a 24-h Period

```

NMC FM RALY
FOX E40 KWBC 080000
MRF-BASED OBJECTIVE GUIDANCE 12/08/92 0000 UTC
ALB DEC 08|DEC 09|DEC 10|DEC 11|DEC 12|DEC 13|DEC 14|DEC 15|CLIMO
.
.
.
POP24 | 100 | 81 | 25 | 3 | 21 | 46 | 55 | 41
  
```

The line labeled "POP24" contains forecasts of the probability of 0.01 inches or more of liquid-equivalent precipitation during 24-h periods from 0000 to 0000 UTC. Note that these values are derived objectively from the 12-h PoPs so that consistency is guaranteed. In the forecast message, the forecast probabilities are given to the nearest whole percent, ranging from 0 to 100%. A missing forecast is indicated by 999. In the sample message, for the set of forecasts labeled "DEC 09," the forecast PoP for the period from 0000 UTC December 9 to 0000 UTC December 10 is 100%. Note that the normal observed relative frequency of 0.01 inches or more of precipitation for December 12 (as indicated in the column labeled "CLIMO") is approximately 41% for the 0000-0000 UTC period.

3. AVAILABILITY

The MRF-based objective forecast messages are produced once daily around 0900 UTC. The guidance may be delayed substantially, however, if problems occur in NMC's production suite and the completion of the MRF model is delayed. These messages are then distributed on the AFOS network and disseminated on the Family of Service's Domestic Data Service, to the Air Force's Automated Weather Network, and to the Federal Aviation Administration's Weather Message Switching Center.

The forecasts are distributed in a series of bulletins. Each bulletin contains the stations included in the area of responsibility for one future, modernized NWS WFO. A separate bulletin will be sent for each future WFO. At this time, MRF-based objective forecast messages are available for the stations listed in the Appendix. The Appendix also gives the bulletin headers, AFOS product identifiers, regional AFOS routing, and station latitudes and longitudes for each station.

At an AFOS site, a bulletin may be displayed by typing FMRxxx and pressing "ENTER" (where the xxx represents the three letter identifier of the appropriate future WFO). Note that the bulletin header is automatically attached to the top of the bulletin and that the two product identification lines are included in each future WFO's message.

4. REFERENCES

Dallavalle, J. P., J. S. Jensenius, Jr., and S. A. Gilbert, 1992: NGM-based MOS guidance - The FOUS14/FWC message. NWS Technical Procedures Bulletin No. 408, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, 16 pp.

Jensenius, J. S., Jr., K. K. Hughes, and J. B. Settelmaier, 1992: Calibrated perfect prog temperature and probability of precipitation forecasts for medium-range projections. Preprints Twelfth Conference on Probability and Statistics in the Atmospheric Sciences, Toronto, Amer. Meteor. Soc., 213-218.

Kanamitsu, M., 1989: Description of the NMC global data assimilation and forecast system. *Wea. Forecasting*, 4, 335-342.

NMC FM RLY		FOX E40 KWBC 080000												CLIMO				
MRF-BASED OBJECTIVE GUIDANCE		12/08/92 0000 UTC												DEC 15				
ALB	DEC 08	DEC 09	DEC 10	DEC 11	DEC 12	DEC 13	DEC 14	DEC 15	DEC 16	DEC 17	DEC 18	DEC 19	DEC 20	DEC 21	DEC 22	DEC 23	DEC 24	DEC 25
MN/MX	49	34	45	24	27	58	21	8	0	3	12	15	26	33	35	42	26	29
POP12	32	69	100	67	58	100	100	100	100	100	100	97	85	71	63	61	68	67
CPOS	0	2	29	75	99	100	100	100	100	100	100	97	85	71	63	61	68	67
CLDS	62	76	97	97	88	88	52	21	20	28	43	55	62	63	60	64	54	58
WIND	12	15	21	18	19	19	6	8	2	4	4	5	5	7	7	8	5	6
POP24	100	100	81	25	3	21	46	55	41									

Figure 1. Sample FOX E40 KWBC message for the future Weather Forecast Office in Albany, New York (ALY) containing guidance for the Albany County Airport (ALB). This message is also used in the line-by-line explanation given in Section 2.

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LIST OF MRF MOS STATIONS

Call letters, name, WMO bulletin headers, AFOS product identifiers, AFOS regional routings, latitudes, and longitudes of stations for which MRF-based statistical guidance is distributed. For the AFOS regional routings, the letters "E", "S", "C", and "W" correspond to the NWS Region(s) to which the products are transmitted on the AFOS network (Eastern, Southern, Central, and Western Region, respectively). Only stations in the contiguous U.S. are distributed on AFOS. Latitudes and longitudes are given in degrees and minutes.

STATION ID	NAME	WMO BULLETIN HEADER	AFOS PRODUCT ID	AFOS REGIONAL ROUTING	LAT.	LON.
ABE	Allentown, PA	FOXES4 KWBC	FMRPHI	E	40.39	75.26
ABI	Abilene, TX	FOXES65 KWBC	FMRSJT	S	32.25	99.41
ABQ	Albuquerque, NM	FOXES40 KWBC	FMRABQ	SW	35.03	106.37
ABR	Aberdeen, SD	FOXES41 KWBC	FMRABR	C	45.27	98.26
ABY	Albany, GA	FOXES66 KWBC	FMRTLH	S	31.32	84.11
ACT	Waco, TX	FOXES48 KWBC	FMRFW5	S	31.37	97.13
ACV	Arcata, CA	FOXW42 KWBC	FMREKA	W	40.59	124.06
ACY	Atlantic City, NJ	FOXES4 KWBC	FMRPHI	E	39.27	74.34
ADQ	Kodiak, AK	FOAK20 KWBC	-----		57.45	152.31
AGS	Augusta, GA	FOXES45 KWBC	FMRCAE	ES	33.22	81.58
AHN	Athens, GA	FOXES42 KWBC	FMRFFC	ES	33.57	83.19
AKN	King Salmon, AK	FOAK20 KWBC	-----		58.41	156.39
ALB	Albany, NY	FOXES40 KWBC	FMRALY	ECS	42.45	73.48
ALO	Waterloo, IA	FOXES49 KWBC	FMRDMX	C	42.33	92.24
AMA	Amarillo, TX	FOXES41 KWBC	FMRAMA	S	35.14	101.42
ANC	Anchorage, AK	FOAK20 KWBC	-----		61.10	150.01
ANN	Annette Is, AK	FOAK20 KWBC	-----		55.02	131.34
APN	Alpena, MI	FOXES42 KWBC	FMRAPX	C	45.04	83.34
AST	Astoria, OR	FOXW54 KWBC	FMRPQR	W	46.09	123.53
ATL	Atlanta, GA	FOXES42 KWBC	FMRFFC	ES	33.39	84.26
AUS	Austin, TX	FOXES63 KWBC	FMREW5	S	30.18	97.42
AVL	Asheville, NC	FOXES60 KWBC	FMRMRX	ECS	35.26	82.33
AVP	Scranton, PA	FOXES41 KWBC	FMRBGM	E	41.20	75.44
BDL	Hartford, CT	FOXES42 KWBC	FMRBOX	E	41.56	72.41
BET	Bethel, AK	FOAK20 KWBC	-----		60.47	161.48
BFD	Bradford, PA	FOXES59 KWBC	FMRCTP	E	41.48	78.38
BFF	Scottsbluff, NE	FOXES45 KWBC	FMRCYS	CW	41.52	103.36
BFL	Bakersfield, CA	FOXW44 KWBC	FMRHNX	W	35.25	119.03
BGM	Binghamton, NY	FOXES41 KWBC	FMRBGM	E	42.13	75.59
BGR	Bangor, ME	FOXES56 KWBC	FMRGYX	E	44.48	68.49
BHM	Birmingham, AL	FOXES43 KWBC	FMRBMX	ESW	33.34	86.45
BIG	Big Delta, AK	FOAK20 KWBC	-----		64.00	145.44
BIL	Billings, MT	FOXW40 KWBC	FMRBIL	CW	45.48	108.32
BIS	Bismarck, ND	FOXES43 KWBC	FMRBIS	CW	46.46	100.45
BKW	Beckley, WV	FOXES48 KWBC	FMRRLX	ECS	37.47	81.07

LIST OF MRF MOS STATIONS (Continued)

STATION ID	NAME	WMO BULLETIN HEADER	AFOS PRODUCT ID	AFOS REGIONAL ROUTING	LAT.	LONG.
BNA	Nashville, TN	FOXS44 KWBC	FMROHX	CS	36.07	86.41
BNO	Burns, OR	FOXW41 KWBC	FMRBOI	W	43.35	118.57
BOI	Boise, ID	FOXW41 KWBC	FMRBOI	W	43.34	116.13
BOS	Boston, MA	FOX42 KWBC	FMRBOX	E	42.22	71.02
BRO	Brownsville, TX	FOXS45 KWBC	FMRBRO	SC	25.54	97.26
BRW	Barrow, AK	FOAK20 KWBC	-----		71.18	156.47
BTI	Barter Is, AK	FOAK20 KWBC	-----		70.08	143.38
BTR	Baton Rouge, LA	FOXS61 KWBC	FMRLIX	S	30.32	91.09
BTT	Bettles, AK	FOAK20 KWBC	-----		66.55	151.31
BTV	Burlington, VT	FOX43 KWBC	FMRBTV	E	44.28	73.09
BUF	Buffalo, NY	FOX44 KWBC	FMRBUF	E	42.56	78.44
BWI	Baltimore, MD	FOX60 KWBC	FMRLWX	E	39.11	76.40
CAE	Columbia, SC	FOX45 KWBC	FMRCAE	ES	33.57	81.07
CAK	Akron-Canton, OH	FOX47 KWBC	FMRCLE	ECS	40.55	81.26
CAR	Caribou, ME	FOX56 KWBC	FMRGYX	E	46.52	68.01
CDB	Cold Bay, AK	FOAK20 KWBC	-----		55.12	162.43
CDC	Cedar City, UT	FOXW62 KWBC	FMRSLC	CW	37.42	113.06
CDV	Cordova, AK	FOAK20 KWBC	-----		60.30	145.30
CHA	Chattanooga, TN	FOXS60 KWBC	FMRMRX	ECS	35.02	85.12
CHS	Charleston, SC	FOX46 KWBC	FMRCHS	ES	32.54	80.02
CLE	Cleveland, OH	FOX47 KWBC	FMRCLE	ECS	41.24	81.51
CLT	Charlotte, NC	FOX61 KWBC	FMRGSP	ES	35.13	80.56
CMH	Columbus, OH	FOX49 KWBC	FMRILN	ECS	40.00	82.53
CNK	Concordia, KS	FOXC73 KWBC	FMRTOP	CS	39.33	97.39
CON	Concord, NH	FOX56 KWBC	FMRGYX	E	43.12	71.30
COS	Colo. Springs, CO.	FOXC67 KWBC	FMRPUB	CS	38.49	104.43
COU	Columbia, MO	FOXC72 KWBC	FMRLSX	CS	38.49	92.13
CPR	Casper, WY	FOXC69 KWBC	FMRRIW	CW	42.55	106.28
CRP	Corpus Christi, TX	FOXS46 KWBC	FMRCRP	S	27.46	97.30
CRW	Charleston, WV	FOX48 KWBC	FMRRLX	ECS	38.22	81.36
CVG	Covington, KY	FOX49 KWBC	FMRILN	ECS	39.03	84.40
CXY	Harrisburg, PA	FOX59 KWBC	FMRCTP	E	40.13	76.51
CYS	Cheyenne, WY	FOXC45 KWBC	FMRCYS	CW	41.09	104.49
DAB	Daytona Beach, FL	FOXS58 KWBC	FMRMLB	S	29.11	81.03
DAY	Dayton, OH	FOX49 KWBC	FMRILN	ECS	39.54	84.12
DCA	Wash. National, VA	FOX60 KWBC	FMRLWX	E	38.51	77.02
DDC	Dodge City, KS	FOXC46 KWBC	FMRDDC	CS	37.46	99.58
DEN	Denver, CO	FOXC47 KWBC	FMRBOU	CS	39.45	104.52
DFW	Dallas-Ft.Worth, TX	FOXS48 KWBC	FMRFWS	S	32.54	97.02
DLG	Dillingham, AK	FOAK20 KWBC	-----		59.03	158.31
DLH	Duluth, MN	FOXC48 KWBC	FMRDLH	CS	46.50	92.11
DRT	Del Rio, TX	FOXS63 KWBC	FMREWX	S	29.22	100.55
DSM	Des Moines, IA	FOXC49 KWBC	FMRDMX	C	41.32	93.39
DTW	Detroit, MI	FOXC66 KWBC	FMRDTX	EC	42.14	83.20

LIST OF MRF MOS STATIONS (Continued)

STATION ID	NAME	WMO BULLETIN HEADER	AFOS PRODUCT ID	AFOS REGIONAL ROUTING	LAT.	LON.
EAU	Eau Claire, WI	FOXC64 KWBC	FMRMPX	C	44.52	91.29
EKO	Elko, NV	FOXW43 KWBC	FMRLKN	W	40.50	115.47
ELP	El Paso, TX	FOXS47 KWBC	FMREPZ	SW	31.48	106.24
ELY	Ely, NV	FOXW43 KWBC	FMRLKN	W	39.17	114.51
ENA	Kenai, AK	FOAK20 KWBC	-----		60.34	151.15
ERI	Erie, PA	FOXW47 KWBC	FMRCLC	ECS	42.05	80.11
EUG	Eugene, OR	FOXW54 KWBC	FMRPQR	W	44.07	123.13
EVV	Evansville, IN	FOXC59 KWBC	FMRIND	EC	38.03	87.32
EWR	Newark, NJ	FOXW52 KWBC	FMROKX	ES	40.42	74.10
EYW	Key West, FL	FOXS57 KWBC	FMRAMX	S	24.33	81.45
FAI	Fairbanks, AK	FOAK20 KWBC	-----		64.49	147.52
FAR	Fargo, ND	FOXC51 KWBC	FMRFGF	C	46.54	96.48
FAT	Fresno, CA	FOXW44 KWBC	FMRHNX	W	36.46	119.43
FCA	Kalispell, MT	FOXW52 KWBC	FMRMSO	W	48.18	114.16
FLG	Flagstaff, AZ	FOXW45 KWBC	FMRFGZ	SW	35.08	111.40
FMY	Ft. Myers, FL	FOXS67 KWBC	FMRTBW	S	26.35	81.52
FNT	Flint, MI	FOXC66 KWBC	FMRDTX	EC	42.58	83.44
FSD	Sioux Falls, SD	FOXC52 KWBC	FMRFSD	C	43.34	96.44
FSM	Fort Smith, AR	FOXS68 KWBC	FMRTSA	CS	35.20	94.22
FWA	Fort Wayne, IN	FOXC59 KWBC	FMRIND	EC	41.00	85.12
GEG	Spokane, WA	FOXW46 KWBC	FMROTX	W	47.38	117.32
GFK	Grand Forks, ND	FOXC51 KWBC	FMRFGF	C	47.57	97.11
GGW	Glasgow, MT	FOXW47 KWBC	FMRGGW	CW	48.13	106.37
GJT	Grand Junction, CO	FOXC53 KWBC	FMRGJT	CSW	39.07	108.32
GKN	Gulkana, AK	FOAK20 KWBC	-----		62.09	145.27
GLD	Goodland, KS	FOXC54 KWBC	FMRGLD	C	39.22	101.42
GRB	Green Bay, WI	FOXC55 KWBC	FMRGRB	C	44.29	88.08
GRI	Grand Island, NE	FOXC56 KWBC	FMRGID	C	40.58	98.19
GRR	Grand Rapids, MI	FOXC57 KWBC	FMRGRR	C	42.53	85.31
GSO	Greensboro, NC	FOXW57 KWBC	FMRRAH	ES	36.05	79.57
GSP	Greenville, SC	FOXW61 KWBC	FMRGSP	ES	34.54	82.13
GTF	Great Falls, MT	FOXW48 KWBC	FMRTFX	W	47.29	111.22
GUP	Gallup, NM	FOXS40 KWBC	FMRABQ	SW	35.31	108.47
HAT	Cape Hatteras, NC	FOXW51 KWBC	FMRMHX	E	35.16	75.33
HLN	Helena, MT	FOXW48 KWBC	FMRTFX	W	46.36	112.00
HOM	Homer, AK	FOAK20 KWBC	-----		59.38	151.30
HON	Huron, SD	FOXC52 KWBC	FMRFSD	C	44.23	98.13
HQM	Hoquiam, WA	FOXW60 KWBC	FMRSEW	W	46.58	123.58
HSV	Huntsville, AL	FOXS43 KWBC	FMRBMX	ESW	34.39	86.46
HTS	Huntington, WV	FOXW48 KWBC	FMRRLX	ECS	38.22	82.33
HVR	Havre, MT	FOXW48 KWBC	FMRTFX	W	48.33	109.46
IAD	Wash. Dulles, VA	FOXW60 KWBC	FMRLWX	E	38.57	77.27
IAH	Houston, TX	FOXS49 KWBC	FMRHGX	SW	29.58	95.21
ICT	Wichita, KS	FOXC58 KWBC	FMRICT	CS	37.39	97.25

LIST OF MRF MOS STATIONS (Continued)

STATION ID	NAME	WMO BULLETIN HEADER	AFOS PRODUCT ID	AFOS REGIONAL ROUTING	LAT.	LON.
ILG	Wilmington, DE	FOX54 KWBC	FMRPHI	E	39.40	75.36
ILM	Wilmington, NC	FOX50 KWBC	FMRILM	ES	34.16	77.55
IND	Indianapolis, IN	FOXC59 KWBC	FMRIND	EC	39.44	86.17
INL	Intl. Falls, MN	FOXC48 KWBC	FMRDLH	CS	48.34	93.23
IPT	Williamsport, PA	FOX59 KWBC	FMRCTP	E	41.15	76.55
ISN	Williston, ND	FOXC43 KWBC	FMRBIS	CW	48.11	103.38
JAN	Jackson, MS	FOX50 KWBC	FMRJAN	S	32.19	90.05
JAX	Jacksonville, FL	FOX51 KWBC	FMRJAX	ES	30.30	81.42
JFK	NYC Kennedy, NY	FOX52 KWBC	FMROKX	ES	40.39	73.47
JNU	Juneau, AK	FOAK20 KWBC	-----		58.22	134.35
KTN	Ketchikan, AK	FOAK20 KWBC	-----		55.21	131.42
LAN	Lansing, MI	FOXC57 KWBC	FMRGRR	C	42.47	84.36
LAS	Las Vegas, NV	FOXW49 KWBC	FMRVEF	W	36.05	115.10
LAX	Los Angeles, CA	FOXW50 KWBC	FMRLOX	W	33.56	118.24
LBB	Lubbock, TX	FOX52 KWBC	FMRLUB	ES	33.39	101.49
LBF	North Platte, NE	FOXC60 KWBC	FMRLBF	C	41.08	100.41
LCH	Lake Charles, LA	FOX53 KWBC	FMRLCH	S	30.07	93.13
LEX	Lexington, KY	FOXC70 KWBC	FMRLMK	ECS	38.02	84.36
LFK	Lufkin, TX	FOX56 KWBC	FMRSHV	S	31.14	94.45
LGA	NYC Laguardia, NY	FOX52 KWBC	FMROKX	ES	40.46	73.54
LGB	Long Beach, CA	FOXW50 KWBC	FMRLOX	W	33.49	118.09
LIT	Little Rock, AR	FOX54 KWBC	FMRLZK	CS	34.44	92.14
LND	Lander, WY	FOXC69 KWBC	FMRRIW	CW	42.49	108.44
LWS	Lewiston, ID	FOXW46 KWBC	FMROTX	W	46.23	117.01
LYH	Lynchburg, VA	FOX58 KWBC	FMRRNK	ES	37.20	79.12
MAF	Midland, TX	FOX55 KWBC	FMRMAF	S	31.57	102.11
MCG	McGrath, AK	FOAK20 KWBC	-----		62.58	155.37
MCI	Kansas City, MO	FOXC62 KWBC	FMREAX	CS	39.19	94.43
MCN	Macon, GA	FOX54 KWBC	FMRFFC	ES	32.42	83.39
MCO	Orlando, FL	FOX58 KWBC	FMRMLB	S	28.26	81.19
MCW	Mason City, IA	FOXC49 KWBC	FMRDMX	C	43.09	93.20
MEI	Meridian, MS	FOX50 KWBC	FMRJAN	S	32.20	88.45
MEM	Memphis, TN	FOX56 KWBC	FMRMEM	CS	35.03	90.00
MFR	Medford, OR	FOXW51 KWBC	FMRMFR	W	42.22	122.52
MGM	Montgomery, AL	FOX54 KWBC	FMRBMX	ESW	32.18	86.24
MIA	Miami, FL	FOX57 KWBC	FMRAMX	S	25.49	80.17
MKE	Milwaukee, WI	FOXC63 KWBC	FMRMKX	C	42.57	87.54
MKG	Muskegon, MI	FOXC57 KWBC	FMRGRR	C	43.10	86.14
MLI	Moline, IL	FOXC50 KWBC	FMRDVN	C	41.27	90.31
MLS	Miles City, MT	FOXW40 KWBC	FMRBIL	CW	46.25	105.54
MOB	Mobile, AL	FOX59 KWBC	FMRMOB	S	30.41	88.15
MOT	Minot, ND	FOXC43 KWBC	FMRBIS	CW	48.16	101.17
MQT	Marquette, MI	FOXC74 KWBC	FMRMQT	C	46.32	87.33
MSN	Madison, WI	FOXC63 KWBC	FMRMKX	C	43.08	89.20

LIST OF MRF MOS STATIONS (Continued)

STATION ID	NAME	WMO BULLETIN HEADER	AFOS PRODUCT ID	AFOS REGIONAL ROUTING	LAT.	LON.
MSSO	Missoula, MT	FOXW52 KWBC	FMRMSO	W	46.55	114.05
MSP	Minneapolis, MN	FOXC64 KWBC	FMRMPX	C	44.53	93.13
MSS	Massena, NY	FOXW43 KWBC	FMRBTV	E	44.56	74.51
MSY	New Orleans, LA	FOXS61 KWBC	FMRLIX	S	29.59	90.15
MYL	McCall, ID	FOXW56 KWBC	FMRPIH	CW	44.53	116.06
OKC	Oklahoma City, OK	FOXS62 KWBC	FMROUN	S	35.24	97.36
OLM	Olympia, WA	FOXW60 KWBC	FMRSEW	W	46.58	122.54
OMA	Omaha, NE	FOXC65 KWBC	FMROAX	C	41.18	95.54
OME	Nome, AK	FOAK20 KWBC	-----		64.30	165.26
ORD	Chicago O'Hare, IL	FOXC44 KWBC	FMRLOT	C	41.59	87.54
ORF	Norfolk, VA	FOXW53 KWBC	FMRKQ	E	36.54	76.12
ORT	Northway, AK	FOAK20 KWBC	-----		62.57	141.56
OTH	North Bend, OR	FOXW51 KWBC	FMRMFR	W	43.25	124.15
OTZ	Kotzebue, AK	FOAK20 KWBC	-----		66.52	162.38
PAH	Paducah, KY	FOXC75 KWBC	FMRPAH	CS	37.04	88.46
PBI	W. Palm Beach, FL	FOXS57 KWBC	FMRAMX	S	26.41	80.07
PDT	Pendleton, OR	FOXW53 KWBC	FMRPDT	W	45.41	118.51
PDX	Portland, OR	FOXW54 KWBC	FMRPQR	W	45.36	122.36
PHL	Philadelphia, PA	FOXW54 KWBC	FMRPHI	E	39.53	75.15
PHX	Phoenix, AZ	FOXW55 KWBC	FMRPSR	SW	33.26	112.01
PIA	Peoria, IL	FOXC40 KWBC	FMRILX	ECSW	40.40	89.41
PIH	Pocatello, ID	FOXW56 KWBC	FMRPIH	CW	42.55	112.36
PIR	Pierre, SD	FOXC41 KWBC	FMRABR	C	44.23	100.17
PIT	Pittsburgh, PA	FOXW55 KWBC	FMRPBZ	E	40.30	80.13
PNS	Pensacola, FL	FOXS59 KWBC	FMRMOB	S	30.28	87.12
PVD	Providence, RI	FOXW42 KWBC	FMRBOX	E	41.44	71.26
PWM	Portland, ME	FOXW56 KWBC	FMRGYX	E	43.39	70.19
RAP	Rapid City, SD	FOXC68 KWBC	FMRUNR	CSW	44.03	103.04
RDD	Redding, CA	FOXW58 KWBC	FMRSTO	W	40.30	122.18
RDM	Redmond, OR	FOXW53 KWBC	FMRPDT	W	44.16	121.09
RDU	Raleigh-Durham, NC	FOXW57 KWBC	FMRRAH	ES	35.52	78.47
RFD	Rockford, IL	FOXC44 KWBC	FMRLOT	C	42.12	89.06
RIC	Richmond, VA	FOXW53 KWBC	FMRKQ	E	37.30	77.20
RIV	Riverside, CA	FOXW50 KWBC	FMRLOX	W	33.54	117.15
RKS	Rock Springs, WY	FOXC69 KWBC	FMRRIW	CW	41.36	109.04
RNO	Reno, NV	FOXW57 KWBC	FMRREV	W	39.30	119.48
ROA	Roanoke, VA	FOXW58 KWBC	FMRRNK	ES	37.19	79.58
ROC	Rochester, NY	FOXW44 KWBC	FMRBUF	E	43.07	77.40
ROW	Roswell, NM	FOXS40 KWBC	FMRABQ	SW	33.18	104.32
RSL	Russell, KS	FOXC58 KWBC	FMRRICT	CS	38.52	98.49
RST	Rochester, MN	FOXC61 KWBC	FMRARX	C	43.55	92.30
SAC	Sacramento, CA	FOXW58 KWBC	FMRSTO	W	38.31	121.30
SAN	San Diego, CA	FOXW59 KWBC	FMRSGX	W	32.44	117.10
SAT	San Antonio, TX	FOXS63 KWBC	FMREWX	S	29.32	98.28

LIST OF MRF MOS STATIONS (Continued)

STATION ID	NAME	WMO BULLETIN HEADER	AFOS PRODUCT ID	AFOS REGIONAL ROUTING	LAT.	LON.	
SAV	Savannah, GA	FOX46	KWBC	FMRCHS	ES	32.08	81.12
SBN	South Bend, IN	FOX44	KWBC	FMRL0T	C	41.42	86.19
SCC	Deadhorse, AK	FOAK20	KWBC	-----		70.12	148.28
SDF	Louisville, KY	FOX70	KWBC	FMRLMK	ECW	38.11	85.44
SEA	Seattle-Tacoma, WA	FOXW60	KWBC	FMRSEW	W	47.27	122.18
SFO	San Francisco, CA	FOXW61	KWBC	FMRMTR	W	37.37	122.23
SGF	Springfield, MO	FOX71	KWBC	FMRSGF	CS	37.14	93.23
SHR	Sheridan, WY	FOX45	KWBC	FMRCYS	CW	44.46	106.58
SHV	Shreveport, LA	FOXS64	KWBC	FMRSHV	S	32.28	93.49
SIT	Sitka, AK	FOAK20	KWBC	-----		57.04	135.21
SJT	San Angelo, TX	FOXS65	KWBC	FMRSJT	S	31.22	100.30
SLC	Salt Lake City, UT	FOXW62	KWBC	FMRLSC	CW	40.46	111.58
SLE	Salem, OR	FOXW54	KWBC	FMRPQR	W	44.55	123.00
SNP	Saint Paul, AK	FOAK20	KWBC	-----		57.09	170.13
SPI	Springfield, IL	FOX40	KWBC	FMRILX	ECSW	39.50	89.40
SPS	Wichita Falls, TX	FOXS62	KWBC	FMROUN	S	33.58	98.29
STC	St. Cloud, MN	FOX64	KWBC	FMRMPX	C	45.33	94.04
STL	St. Louis, MO	FOX72	KWBC	FMRLSX	CS	38.45	90.23
SUX	Sioux City, IA	FOX52	KWBC	FMRFS0	C	42.24	96.23
SYR	Syracuse, NY	FOX41	KWBC	FMRBGM	E	43.07	76.07
TAD	Trinidad, CO	FOX67	KWBC	FMRPUB	CS	37.15	104.20
TCS	Truth or Cons., NM	FOXS40	KWBC	FMRABQ	SW	33.14	107.16
TKA	Talkeetna, AK	FOAK20	KWBC	-----		62.18	150.06
TLH	Tallahassee, FL	FOXS66	KWBC	FMRTLH	S	30.23	84.22
TOL	Toledo, OH	FOX47	KWBC	FMRCL0	ECS	41.36	83.48
TOP	Topeka, KS	FOX73	KWBC	FMRTOP	CS	39.04	95.38
TPA	Tampa, FL	FOXS67	KWBC	FMRTBW	S	27.58	82.32
TRI	Bristol, TN	FOXS60	KWBC	FMRMRX	ECS	36.29	82.24
TUL	Tulsa, OK	FOXS68	KWBC	FMRTSA	CS	36.12	95.54
TUS	Tucson, AZ	FOXW63	KWBC	FMRTWC	SW	32.07	110.56
TVC	Traverse City, MI	FOX42	KWBC	FMRAPX	C	44.44	85.35
TYS	Knoxville, TN	FOXS60	KWBC	FMRMRX	ECS	35.49	83.59
UIL	Quillayute, WA	FOXW60	KWBC	FMRSEW	W	47.57	124.33
VCT	Victoria, TX	FOXS46	KWBC	FMRCRP	S	28.51	96.55
VTN	Valentine, NE	FOX60	KWBC	FMRLBF	C	42.52	100.33
VWS	Valdez, AK	FOAK20	KWBC	-----		61.08	146.21
WMC	Winnemucca, NV	FOXW43	KWBC	FMRLKN	W	40.54	117.48
YAK	Yakutat, AK	FOAK20	KWBC	-----		59.31	139.40
YKM	Yakima, WA	FOXW53	KWBC	FMRPDT	W	46.34	120.32
YNG	Youngstown, OH	FOX47	KWBC	FMRCL0	ECS	41.16	80.40
YUM	Yuma, AZ	FOXW55	KWBC	FMRPSR	SW	32.40	114.36
Y62	S. Ste. Marie, MI	FOX42	KWBC	FMRAPX	C	46.28	84.22
5MK	McKinley Park, AK	FOAK20	KWBC	-----		63.44	148.55
5WT	Whittier, AK	FOAK20	KWBC	-----		60.46	148.41

INTERPRETATION OF THE MRF-BASED OBJECTIVE FORECAST MESSAGE

NMCFWRALY

FOX40 KWBC 080000

MRF-BASED OBJECTIVE GUIDANCE 12/08/91 0000 UTC

ALB	SUN	MON	TUE	WED	THU	FRI	SAT	SUN	CLIMO
MN/WX	49	34	24	27	2	18	5	25	10 27 18 38
POP12	32	69	100	67	58	21	8	0	3 12 15 26 33
CPOS	0	2	29	75	99	100	100	100	97 85 71 63 61 68 67
CLDS	62	76	97	97	88	52	21	20	28 43 55 62 63
WIND	12	15	21	18	19	6	8	2	4 4 5 5 7
POP24	100	81		25	3	21	46	55	41

- AFOS product identification (AFOS users only).

- Bulletin header. (See below for headers, AFOS PILLS, and stations).

- Forecast identification, initial date, and time (UTC).

- Station ID, valid date (UTC), and climatic normals (96-120 h period).

- Min and max temperature (°F) for LOCAL nighttime/daytime periods.

- Probability of precipitation for 0000-1200 and 1200-0000 UTC periods.

- Conditional prob. of snow for 0000-1200 and 1200-0000 UTC periods.

- Mean opaque cloudiness (%) for 0000-1200 and 1200-0000 UTC periods.

- Mean wind speed (kts) for 0000-1200 and 1200-0000 UTC periods.

- Probability of precipitation for 0000-0000 UTC period.

FO X E

FOX40KWBC (FMRALY)

ALB - Albany, NY

FOX41KWBC (FMRBGM)

AVP - Scranton, PA

BGM - Binghamton, NY

SYR - Syracuse, NY

FOX42KWBC (FMRBOX)

BDL - Hartford, CT

BOS - Boston, MA

PVD - Providence, RI

FOX43KWBC (FMRBTU)

BTU - Burlington, VT

MSS - Massena, NY

FOX44KWBC (FMRBUF)

BUF - Buffalo, NY

ROC - Rochester, NY

FOX45KWBC (FMRCAE)

AGS - Augusta, GA

CAE - Columbia, SC

FOX46KWBC (FMRCHS)

CHS - Charleston, SC

SAV - Savannah, GA

FOX47KWBC (FMRCLL)

CAK - Akron-Canton, OH

CLE - Cleveland, OH

ERI - Erie, PA

TOL - Toledo, OH

YNG - Youngstown, OH

FOX48KWBC (FMRLLX)

BKW - Beckley, WV

CRW - Charleston, WV

HTS - Huntington, WV

FO X E / FO X C

FOX58KWBC (FMRNRK)

LYH - Lynchburg, VA

ROA - Roanoke, VA

FOX59KWBC (FMRCTP)

BDP - Bradford, PA

CXY - Harrisburg, PA

IPT - Williamsport, PA

FOX60KWBC (FMRLLX)

BWI - Baltimore, MD

DCA - Wash. National, VA

IAD - Wash. Dulles, VA

FOX61KWBC (FMRGSP)

CLT - Charlotte, NC

GSP - Greenville, SC

FOX40KWBC (FMRILX)

PIA - Peoria, IL

SPI - Springfield, IL

FOX41KWBC (FMRABR)

ABR - Aberdeen, SD

PIR - Pierre, SD

FOX42KWBC (FMRAPX)

APN - Alpena, MI

TVC - Traverse City, MI

Y62 - S. Ste. Marie, MI

FOX43KWBC (FMRBIS)

BIS - Bismarck, ND

ISN - Williston, ND

MOT - Minot, ND

FOX44KWBC (FMRLOT)

ORD - Chicago, IL

RFD - Rockford, IL

SBN - South Bend, IN

FO X C

FOX45KWBC (FMRCSY)

BFF - Scottsbluff, NE

CYS - Cheyenne, WY

SHR - Sheridan, WY

FOX46KWBC (FMRDDC)

DDC - Dodge City, KS

FOX47KWBC (FMRBOU)

DEN - Denver, CO

FOX48KWBC (FMRDLH)

DLH - Duluth, MN

INL - Intl. Falls, MN

FOX49KWBC (FMRDMX)

ALO - Waterloo, IA

DSM - Des Moines, IA

MCW - Mason City, IA

FOX50KWBC (FMRDYN)

MLI - Moline, IL

FOX51KWBC (FMRFGF)

FAR - Fargo, ND

GFK - Grand Forks, ND

FOX52KWBC (FMRFSD)

FSD - Sioux Falls, SD

HON - Huron, SD

SUX - Sioux City, IA

FOX53KWBC (FMRGJT)

GJT - Grand Jct., CO

FOX54KWBC (FMRGLD)

GLD - Goodland, KS

FOX55KWBC (FMRGRB)

GRB - Green Bay, WI

FO X C

FOX56KWBC (FMRGID)

GRI - Grand Island, NE

FOX57KWBC (FMRGRR)

GRR - Grand Rapids, MI

LAN - Lansing, MI

MKG - Muskegon, MI

FOX58KWBC (FMRICT)

ICT - Wichita, KS

RSL - Russell, KS

FOX59KWBC (FMRIND)

EVV - Evansville, IN

FWA - Fort Wayne, IN

IND - Indianapolis, IN

FOX60KWBC (FMRLEB)

LEB - North Platte, NE

VTN - Valentine, NE

FOX61KWBC (FMRARX)

RST - Rochester, MN

FOX62KWBC (FMRKAX)

MCI - Kansas City, MO

FOX63KWBC (FMRMFX)

MKE - Milwaukee, WI

MSN - Madison, WI

FOX64KWBC (FMRMPX)

EAU - Eau Claire, WI

MSP - Minneapolis, MN

STC - St. Cloud, MN

FOX65KWBC (FMRROX)

OMA - Omaha, NE

REFERENCE: TECHNICAL PROCEDURES BULLETIN NO. 411: The MRF-Based Statistical Guidance Message

UPDATED 9/94

FOXC / FOXS

FOXG66KWB (FMRDXT)
 DTW - Detroit, MI
 FNT - Flint, MI
FOXG67KWB (FMRPUB)
 COS - Colo. Springs, CO
 TAD - Trinidad, CO
FOXG68KWB (FMRUNR)
 RAP - Rapid City, SD
FOXG69KWB (FMRRIW)
 CPR - Casper, WY
 LND - Lander, WY
 RKS - Rock Springs, WY
FOXG70KWB (FMRLMK)
 LEX - Lexington, KY
 SDF - Louisville, KY
FOXG71KWB (FMRSGF)
 SGF - Springfield, MO
FOXG72KWB (FMRLSX)
 COU - Columbia, MO
 STL - St. Louis, MO
FOXG73KWB (FMRTOP)
 CNK - Concordia, KS
 TOP - Topeka, KS
FOXG74KWB (FMRMQI)
 MQI - Marquette, MI
FOXG75KWB (FMRPAH)
 PAH - Paducah, KY
FOXSA0KWB (FMRABQ)
 ABQ - Albuquerque, NM
 GUP - Gallup, NM
 ROW - Roswell, NM
 TCS - Truth or Cons., NM
FOXSA1KWB (FMRAMA)
 AMA - Anarillo, TX
FOXSA2KWB (FMRFFC)
 AHN - Athens, GA
 ATL - Atlanta, GA
 MCN - Macon, GA
FOXSA3KWB (FMRBMX)
 BRM - Birmingham, AL
 HSV - Huntsville, AL
 MCM - Montgomery, AL

FOX S

FOXSA4KWB (FMRROH)
 BNA - Nashville, TN
FOXSA5KWB (FMRBRO)
 BRO - Brownsville, TX
FOXSA6KWB (FMRCRP)
 CRP - Corpus Christi, TX
 VCT - Victoria, TX
FOXSA7KWB (FMRREP)
 ELP - El Paso, TX
FOXSA8KWB (FMRFFWS)
 ACT - Waco, TX
 DFW - Dallas-Ft. Wrth, TX
FOXSA9KWB (FMRHGX)
 IAH - Houston, TX
FOXSA0KWB (FMRJAN)
 JAN - Jackson, MS
 MEI - Meridian, MS
FOXSA1KWB (FMRJAX)
 JAX - Jacksonville, FL
FOXSA2KWB (FMRLLB)
 LBB - Lubbock, TX
FOXSA3KWB (FMRLLCH)
 LCH - Lake Charles, LA
FOXSA4KWB (FMRLLZK)
 LIT - Little Rock, AR
FOXSA5KWB (FMRMEM)
 MEM - Memphis, TN
FOXSA5KWB (FMRMAF)
 MAF - Midland, TX
FOXSA5KWB (FMRAMX)
 EYW - Key West, FL
 MIA - Miami, FL
 PBI - W. Palm Beach, FL
FOXSA8KWB (FMRMLB)
 DAB - Daytona Beach, FL
 MCO - Orlando, FL
FOXSA9KWB (FMRMOB)
 MOB - Mobile, AL
 PNS - Pensacola, FL

FOX S / FOX W

FOXSA6KWB (FMRWFX)
 AVL - Asheville, NC
 CHA - Chattanooga, TN
 TRI - Bristol, TN
 TYS - Knoxville, TN
FOXSA61KWB (FMRLLX)
 BTR - Baton Rouge, LA
 MSY - New Orleans, LA
FOXSA62KWB (FMRVUN)
 OKC - Oklahoma City, OK
 SPS - Wichita Falls, TX
FOXSA63KWB (FMRWFX)
 AUS - Austin, TX
 DRT - Del Rio, TX
 SAT - San Antonio, TX
FOXSA64KWB (FMRSHV)
 LFK - Lufkin, TX
 SHV - Shreveport, LA
FOXSA65KWB (FMRSTJ)
 ABI - Abilene, TX
 SJT - San Angelo, TX
FOXSA66KWB (FMRTLH)
 ABY - Albany, GA
 TLH - Tallahassee, FL
FOXSA67KWB (FMRIBW)
 FMY - Ft. Myers, FL
 TPA - Tampa, FL
FOXSA68KWB (FMRISA)
 FSM - Fort Smith, AR
 TUL - Tulsa, OK
FOXSA40KWB (FMRBIL)
 BIL - Billings, MT
 MLS - Miles City, MT
FOXSA41KWB (FMRBOI)
 BNO - Burns, OR
 BOI - Boise, ID
FOXSA42KWB (FMRKA)
 ACV - Arcata, CA
FOXSA43KWB (FMRLLKN)
 EKO - Elko, NV
 ELY - Ely, NV
 WMC - Winnemucca, NV

FOX W

FOXWA4KWB (FMRHNX)
 BFL - Bakersfield, CA
 FAT - Fresno, CA
FOXWA5KWB (FMRFGZ)
 FLG - Flagstaff, AZ
FOXWA6KWB (FMRDXT)
 GEG - Spokane, WA
FOXWA7KWB (FMRGCV)
 GGW - Glasgow, MT
FOXWA8KWB (FMRITFX)
 GTF - Great Falls, MT
 HLN - Helena, MT
 HVR - Havre, MT
FOXWA9KWB (FMRVEFF)
 LAS - Las Vegas, NV
FOXWA0KWB (FMRLOX)
 LAX - Los Angeles, CA
 LGB - Long Beach, CA
 RIV - Riverside, CA
FOXWA1KWB (FMRWFR)
 MFR - Medford, OR
 OTH - North Bend, OR
FOXWA2KWB (FMRMSO)
 FCA - Kailispell, MT
 MSO - Missoula, MT
FOXWA3KWB (FMRPDT)
 PDT - Pendleton, OR
 RDM - Redmond, OR
 YKM - Yakima, WA
FOXWA4KWB (FMRPQR)
 AST - Astoria, OR
 EUG - Eugene, OR
 PDX - Portland, OR
 SLE - Salem, OR
FOXWA5KWB (FMRPBR)
 PHX - Phoenix, AZ
 YUM - Yuma, AZ
FOXWA6KWB (FMRPIH)
 MYL - McCall, ID
 PIH - Pocatello, ID
FOXWA7KWB (FMRVEV)
 RNO - Reno, NV

FOX W / FOAK 20

FOXW58KWB (FMRSTO)
 RDD - Redding, CA
 SAC - Sacramento, CA
FOXW59KWB (FMRSGX)
 SAN - San Diego, CA
FOXW60KWB (FMRSEW)
 HQM - Hoquiam, WA
 OLM - Olympia, WA
 SEA - Seattle-Tacoma, WA
 UIL - Quillayute, WA
FOXW61KWB (FMRMTR)
 SFO - San Francisco, CA
FOXW62KWB (FMRSLC)
 CDC - Cedar City, UT
 SLC - Salt Lake City, UT
FOXW63KWB (FMRTWC)
 TUS - Tucson, AZ
FOAK20KWB
 ADQ - Kodiak, AK
 AKN - King Salmon, AK
 ANC - Anchorage, AK
 ANN - Annette Is., AK
 BET - Bethel, AK
 BIG - Big Delta, AK
 BRW - Barrow, AK
 BTI - Barter Is., AK
 BTT - Bettles, AK
 CDB - Cold Bay, AK
 CDV - Cordova, AK
 DLG - Dillingham, AK
 ENA - Kenai, AK
 FAI - Fairbanks, AK
 GKN - Gulkana, AK
 HOM - Homer, AK
 JNU - Juneau, AK
 KTN - Ketchikan, AK
 MCG - McGrath, AK
 OME - Nome, AK
 ORT - Northway, AK
 OTZ - Kotzebue, AK
 SCC - Deadhorse, AK
 SIT - Sitka, AK
 SNP - St. Paul Is., AK
 TKA - Talkeetna, AK
 YWS - Valdez, AK
 YAK - Yakutat, AK
 5MK - McKinley Park, AK
 5WT - Whittier, AK