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SUMMARY OF REVISIONS:

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_____   Date
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6/4/03

Digital Data Products/Services Specification

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1.   Introduction. This procedural instruction provides specifications and guidelines for products and services resulting from the digital forecast database prepared by the National Weather Service. This document also describes the basic digital data infrastructure including the National Digital Forecast Database (NDFD), locally prepared digital forecast databases, and associated NWS coordination/collaboration to enable the production of a seamless suite of digital forecast data.

2.   Mission Connection. NDFD is a means to exploit technology to the fullest, and make a seamless suite of NWS information available efficiently, and in a convenient and understandable form to best meet customer and partner needs.   In support of the mission described in the *National Weather Service Strategic Plan for FY2003 - FY 2008*, the NDFD is a "...national information database and infrastructure which can be used by other governmental agencies, the private sector, the public, and the global community." Graphic forecasts of the digital data fulfill the NWS strategic plan objective of improving the accessibility and availability of weather information by posting NWS products and data on the Internet in graphic-oriented format.

3.   Preparation of the local Digital Forecast Databases. Forecasters at each WFO will use IFPS software on the Automated Weather Interactive Processing System (AWIPS) to prepare a local forecast database consisting of gridded forecast information for their geographic area of responsibility. NWS products (digital, text, and graphic) will be automatically formatted from these databases with AWIPS software.

3.1   WFO Initial Operating Capability (IOC) Grid Production. The minimum threshold for IFPS/NDFD IOC grid production throughout the conterminous United States (CONUS) includes the basic forecast fields shown in Table 1, and all additional grid fields necessary to support the production of the 10 text-based products listed in Table 2.

Maximum/Minimum Temperature
Temperature
Dewpoint
12-hr Probability of Precipitation
Weather
Sky Cover
6-hr Quantitative Precipitation Forecast
Snow Amount
Wave Height
Wind Direction and Wind Speed

Table 1. IFPS/NDFD IOC Mandatory Forecast Elements.

See Appendix A for specific definitions and minimum thresholds for temporal and spatial resolution of these forecast elements.
:

Zone Forecast Product (ZFP)
Coded Cities Forecast (CCF)
Tabular & Narrative Fire Weather Forecasts (FWF)
Coastal Waters Forecast (CWF)
Great lakes Open Lakes Forecast (GLF)
Nearshore Forecast (NSH)
Marine Verification Forecast (MVF)
Service Area Forecast (SAF)
Tabular State Forecast (SFT)

Table 2. Ten Base IFPS IOC Text Products.

See Appendix A for specific definitions and minimum thresholds for temporal and spatial resolution of the grids elements necessary to produce these 10 text products. See Table 3 in Appendix B for a listing of required grids elements to produce these products.

3.2   Local Digital Forecast Database Update Criteria. Local grids should be updated when the on-duty forecast team believes the current forecast is not representative. Reaching or exceeding collaboration trigger thresholds (shown in Appendix A) may be used as a guide to initiate updates of particular gridded fields. Well-coordinated local or regional update thresholds may be developed until standardized national update criteria are established.

3.3   Priority of Local Grids during Active Hazardous Weather. WFOs should be persistent in the maintenance of the local digital databases. However, the first priority for any WFO is to protect life and property through the issuance of hazardous weather watches, warnings, and advisories. Forecast grids should be updated during active severe weather (potentially requiring extra personnel), but not at the expense of performing warning operations.

3.4   Grids to the Central Server. Digital forecast information from local IFPS databases will be transmitted to a central server and mosaiced into regional and national grids. The central server will provide "one stop shopping" for external customers; and allow it will allow a "hot link" to WFO servers, as appropriate. The central database storing the geospatially referenced

digital forecast information is called the National Digital Forecast Database (NDFD) (See Section 5.)

4.   Intersite Coordination/Collaboration. The NWS has a goal to provide customers and partners with a seamless set of digital forecast weather parameters for the entire nation. To attain this goal, local offices and national centers will collaborate to achieve meteorological consistency among the various weather elements and along office boundaries. As a result, "ownership" of the NDFD will be shared among all local offices and national centers involved in the collaborative process.

This section contains roles, responsibilities, and guidelines for textual, audio, and video exchange of meteorological information among offices and national centers and offices for effective gridded forecast decision making. In addition, effective collaborative sessions can facilitate exchange of scientific information throughout the meteorological community. Forecasters are expected to use initiative and professional judgment in conjunction with these guidelines and convey this information through Meteorological Discussions.

4.1   Operational Collaboration Responsibilities.

4.1.1   National Centers for Environmental Prediction (NCEP). HPC will collaborate with WFOs to facilitate agreement among neighboring offices' forecast grids on the evolution of weather systems and the associated sensible weather across the conterminous U.S. beginning at 12 hours into the forecast cycle and extending out through seven days.

SPC will collaborate with WFOs concerning both science and service needed to create optimal NWS products concerning mesoscale weather hazards and in particular fire weather, thunderstorms, and severe convective storms. Focused collaboration between the SPC and WFO's will occur prior to the issuance of convective watches. TPC and SPC coordinate/collaborate on SPC's issuance of tornado watches associated with hurricanes and tropical storms.

TPC collaborates with WFOs and some U.S. Naval bases for tropical weather in the North Atlantic, Caribbean, Gulf of Mexico, and eastern North Pacific east of 140E west longitude, including the development, movement, and intensification of tropical storms and hurricanes. TPC also coordinates/collaborates with coastal forecast offices and HPC before the issuance of hurricane and tropical storm watches and warnings TPC and HPC coordinate/collaborate as necessary when issuing high seas forecasts for their areas of responsibility. TPC and SPC coordinate/collaborate on SPC's issuance of tornado watches associated with hurricanes and tropical storms.

4.1.2   Weather Forecast Offices (WFOs). Each WFO coordinates/collaborates on factors affecting their forecast area of responsibility. WFO's coordinate/collaborate with adjacent WFOs and National Centers. Forecasters at each WFO will collaborate among neighboring offices to ensure consistency on spatial and timing issues affecting their geographic area of

responsibility. WFOs will exchange preliminary Inter Site Coordination (ISC) grids to minimize discontinuities before the grids are released to customers.   Additionally, WFOs will coordinate/collaborate on regional and national scales (i.e., with NCEP) as required by the size and scope of the event being addressed. Tools, including chat rooms, voice communication, and exchange of AWIPS graphics will support the collaboration and coordination effort (see Section 4).

4.1.3   River Forecast Centers (RFCs).   RFC coordination and collaboration will occur mainly in the area of precipitation forecasts. RFCs will coordinate/collaborate with the Hydrometeorological Prediction Center (HPC) when necessary. Adjustments in QPF made by the HPC as a result of coordination with the RFCs will then be reflected in the grids received at a WFO. RFCs have access to tools, including chat rooms, voice communication, and exchange of products over AWIPS.

4.1.4   Collaboration Thresholds. WFOs should adhere to a standard set of collaboration thresholds to ensure a coherent and high quality National Digital Forecast Database. These thresholds were developed for all NWS forecast offices. Refer to Appendix A for the standardized collaboration triggers for the various weather elements.

4.1.5   Collaboration Technology. The NWS will use standardized software for the purpose of collaboration. Technical information and procedures for using the most recent software are described in detail by clicking on the following active web link below:

Collaboration Tool Tutorial

5.   National Gridded Forecast Database Description (NDFD).

5.1   Definition. The National Digital Forecast Database (NDFD) is a composite of official NWS forecasts (as distinct from guidance). It will house forecasts from all operational elements of the NWS. Initially, the NDFD will be grid-based; later, other representations will be used. Forecasts produced from individual WFOs will be mosaiced into national and regional products, forming national and regional grids. The NDFD is the primary means by which the grids will be made available to customers and partners.

5.2   NDFD Preparation. The implementation of digital forecast preparation capability at WFOs is necessary to create a National Digital Forecast Database.   The Interactive Forecast Process (IFP) represents a substantial change for forecasters. Instead of manually typing a myriad of forecast products, forecasters rely on interactive model interpretation and editing techniques to prepare gridded forecasts of weather elements in a common digital database from which forecast products will be automatically composed, formatted and transmitted. The common digital database used to generate these products will allow for more consistent forecasts over time and among products, and for easier monitoring and maintenance of those forecasts. NDFD will provide a foundation for the development of a new generation of grid-based NWS products, including the forecast digital database itself.

5.3   NDFD Contents. The NDFD will contain the official weather, water, and climate forecast digital information generated at WFOs and NCEP. NDFD will provide baseline elements that primarily serve national and regional users. In addition, NDFD will include digital watch, warning, and advisory information, and other elements that attract the private development of graphics and decision tools.

5.4   NDFD Consistency. The NDFD will include forecasts prepared at NCEP service centers and field offices nationwide. It will be a "mosaic" in the sense that the grids from individual WFOs and NCEP will appear together on a master grid; therefore, the contents of the NDFD must be consistent in time and space to be of greatest benefit to our customers and partners. In addition, the base digital data and other representations of the data should have an interface with a standardized look and fell for ease of use and understanding.

WFOs are responsible for the accuracy, timeliness and meteorological consistency of forecast data as established in Policy Directive 10-5, Public Weather Services. NDFD grid fields should not contain non-meteorological discontinuities from hour to hour or from gridpoint to gridpoint. To minimize boundary discontinuities, WFOs should follow existing collaboration guidelines and triggers. The primary means to address potential discontinuities in the NDFD is to identify them and correct them as forecasts are being prepared by forecasters. In addition to the collaboration among WFOs, NDFD software is capable of recognizing significant discontinuities and to notifying the respective WFOs of potential problems.

6.   Digital Forecast Products Specification.

6.1   Base Digital Forecast Data. Initially, as the threshold for IFPS/NDFD Initial Operating Capability (IOC), the NDFD will contain, at a minimum, WFO grids for the fields depicted in Table 1, as well as any necessary digital data to create the 10 base text products. The specific grids (and associated temporal resolutions) required for NDFD base digital data are shown in Appendix C-NDFD Weather Element Tables. Data will periodically be added to this initial database until it is fully populated. Files will eventually contain forecast data for several public, fire weather, marine, aviation, hydrologic, and climatic elements through 168 hours (Day 7).

6.1.1   Purpose. Advances in computer capabilities and web services technologies, as well as scientific advances in NWS software, have prompted the NWS to create products and services to meet new customer and partner requirements. The NDFD will allow the NWS to provide near-real time, coordinated forecasts that are widely accessible in a gridded format.

6.1.2   Audience. Base digital data is primarily provided for large volume users of forecast information.

6.1.3 Availability and Timeliness.   The NDFD is a dynamic forecast database. Forecast grids are generated and revised at the local WFOs and NCEP on an event-driven basis. The revised digital data is transferred to the NDFD server and made available at the top of each hour.   At a

minimum, the base digital data is renewed daily no later than 1800 UTC to extend the forecast database by 24 hours.

6.1.4   Format. A primary means for providing forecasts from the NDFD will be by File Transfer Protocol (FTP) in GRIB, Version 2, format.   Initially, these grids will contain surface areal dimensions plus time with sufficient temporal and spatial detail to support automatic product formatters.

6.1.5   Spatial Resolution. Spatial resolution of the NDFD grids will be at least 5 kilometers (km), but no greater than 2.5 km for CONUS, and as appropriate for OCONUS locations.

6.1.6   Temporal Resolution. Temporal resolution varies by forecast projection, but is generally 3 hours through Day 3 and every 6 to 12 hours thereafter (see Appendix C).

6.1.7   NDFD Gridded Data Access. NDFD forecast data can be obtained for the entire CONUS, or for 1 of 16 CONUS overlapping geographic sectors (See Figure 1) and the following active web link below:

NDFD Geographic Sectors Coverage
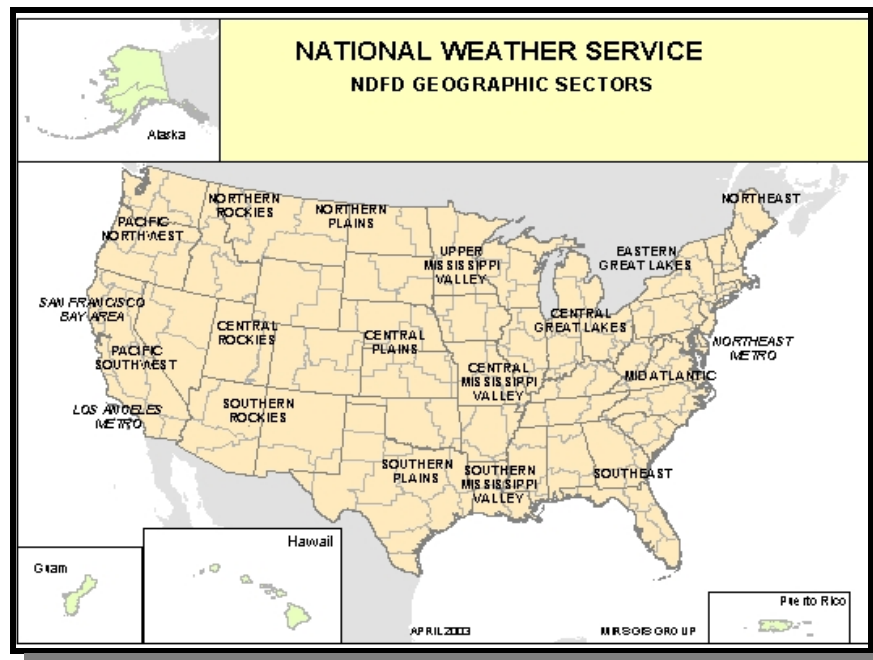
Figure 1. NDFD Geographic Sectors Map.

Sectors are also available for Alaska, Hawaii, Guam, and Puerto Rico. The data is available from the NDFD FTP server by following the instructions provided via the active web link below:

NDFD GRIB2 Data Access

7.   NDFD Graphic Forecast Displays Specification.

7.1   National and Regional Forecast Mosaics. The National Weather Service's NDFD mosaic products are a collage of a prescribed set of data contained within the NDFD. These images are the graphic representations of the official NWS digital forecast. The mosaics are created on national and regional scales and will follow a standardized format prescribed by the NWS to best meet the needs of its customers and partners. The data originate from the WFO local databases and are uploaded to the NDFD server where the mosaic is created. The mosaiced graphic images will display weather parameters for a defined temporal and spatial resolution out to a maximum projection of 72 hours. Graphic forecast displays beyond 72 hours are considered "experimental".

7.1.1   Purpose. NDFD Graphic Forecast Displays are a means to exploit technology to the fullest, and make a seamless suite of NWS information available efficiently, and in a convenient and understandable form to best meet customer and partner needs.   The NDFD graphic forecasts fulfill NWS objectives for improving the accessibility and availability of weather information. In support of the mission described in the *National Weather Service Strategic Plan for FY2003 - FY 2008*, the NDFD is a "...national information database and infrastructure which can be used by other governmental agencies, the private sector, the public, and the global community."

7.1.2   Audience. NDFD graphic mosaics satisfy a wide range of customers and partners including the general public, emergency managers, private sector and the media.

7.1.3   Availability and Timeliness.   The NDFD web-based graphic mosaics are continuously available on the NDFD web page. Forecast grids are revised at the local WFOs on an event-driven basis. The revised grids are uploaded to the NDFD server and new graphic mosaics are generated at the top of each hour.   At a minimum, revised mosaics will be refreshed daily no later than 1800 UTC.

7.1.4   Graphic Mosaic Content. The NDFD Graphic Mosaics will initially be composed of the following elements: *Maximum and Minimum Temperature; Temperature, Dew Point, Probability of Precipitation (POP 12), Weather, Sky Cover, Quantitative Precipitation Forecasts (QPF); Wave Height; Snow Amount; Wind Direction; and Wind Speed.*

7.1.5   Presentation Format. The NDFD National mosaic provides weather forecast information for the entire CONUS, while the NDFD regional mosaics provide images for 16 slightly overlapping geographic sectors throughout the CONUS.   Additionally, geographic data sectors are available for OCONUS sites including, Alaska, Hawaii, Guam and Puerto Rico. To serve users with requirements for high density population centers, graphic displays for various major metropolitan areas, e.g., San Francisco Bay Area, Los Angeles Metro, and Northeast Metro have been provided. (See Figure1).

7.1.6   Spatial Resolution. NDFD graphic mosaics will be displayed at a minimum grid resolution of 5 km, but no greater than 2.5 km for the CONUS, and as appropriate for OCONUS locations.

7.1.7   <u>Temporal Resolution</u>. Temporal resolution varies by forecast projection, but is generally 3 hours through 72 hours. Refer to appendix A- NDFD Weather Elements, for specific grid production requirements during the first 72 hours.

7.1.8   <u>NDFD Graphic Mosaic Access</u>. NDFD graphic mosaic images can be obtained for the entire CONUS, or for 1 of 16 CONUS overlapping geographic sectors (See Figure 1). In addition, sectors are also available for Alaska, Hawaii, Guam, and Puerto Rico. The data can be viewed by clicking the active web link below:

<p align="center">***[Graphic Mosaic Access](#)***</p>

8.   <u>Web-based Services Specification</u>.   TBD. This section will describe NWS interactive web access to products and services.

8.1   <u>National Web-based Services</u>. TBD. This section will describe the national web-based services.

8.2   <u>Regional Web-based Services</u>.

8.2.1   <u>Multi-Format Forecast Information Web Page</u>.   This service is an interactive forecast information web page allowing users to access forecast information that is always current with higher resolution than is possible in traditional text forecast products (which may be averaged over time and space). Customers can view forecast information retrieved directly from locally prepared forecast grids in a variety of formats, including icons, text, tabular and graphic. Data fields include, surface temperature, dewpoint, wind speed and direction, weather, sky cover, and probability of precipitation.

8.2.1.1 <u>Purpose</u>. Advances in computer capabilities and web services technologies, as well as scientific advances in National Weather Service (NWS) software, have prompted the NWS to create customer-based web services. Information dissemination via the world wide web (www) allows customers to obtain higher resolution forecast information in a variety of formats on-demand.

8.2.1.2 <u>Audience</u>. The current audience for the forecast information web page consists of the general public and partners such as emergency management, media and private companies.

8.2.1.3 <u>Availability and Timeliness</u>.   Data are extracted from WFO digital databases on a routine basis, then processed and sent to NWS regional web servers. Updates to grid point forecasts are made once an hour from the local office digital database. These updates are available at quarter past every hour.

8.2.1.4 <u>Presentation Format</u>. The web grid point forecasts are presented for display as HyperText Markup Language (HTML) in text, hourly meteogram, and digital/tabular format.

The forecasts can be viewed using a web browser, and then selected on a map location or by entering specified latitude and longitude coordinates.

8.2.1.5 Spatial Resolution.   Digital data are available at a spatial resolutions of 5 km.

8.2.1.6 Temporal Resolution and Projections. Temporal resolutions vary depending upon forecast type. Text forecasts are available out to 7 days; meteograms to 48 hours; digital/tabular forecasts to 120 hours.

8.2.1.7 Multi-Format Forecast Web Page Access. The multi-format forecasts are available on many WFO web pages in Central, Southern and Eastern regions. Access to these forecast offices' web pages can be made by navigating from the National Weather Service web page: www.nws.noaa.gov and from the regional web sites. The forecasts can be viewed using a web browser, and then selected on a map location or by entering specified latitude and longitude coordinates. A sample of this web page can be found at the following URL: http://www.crh.noaa.gov/ifps/gridpoint.php?site=eax.

8.3   Local Web-based Services. This section will describe the local web-based services.

Appendix A - NDFD Weather Elements

NDFD weather elements should be continuous in time and space:

•   All forecasts are valid at individual gridpoints.   Any necessary basin or zone averaging will be performed by product generation software. Therefore, except where zone boundaries naturally correlate to weather features, zone product boundaries should not be evident in the underlying forecast grids.

•   Local forecast grids should have full coverage in time so that grids can be sampled at any hour. At extended forecast ranges, time periods may be stretched over multiple hours from which snapshot values for any hour could be taken. Time interpolation tools may also be used for this purpose.

•   The distribution of forecast values for any NDFD element should be continuous.   It is not desirable to categorize (or round) forecasts on grids according to that element's use in NWS text products (e.g, PoPs by values of 10). If forecasts are categorized, it makes intersite coordination, forecast mosaicing, and the use of many smart tools more difficult.

•   High resolution terrain effects should be included in all grids (e.g., temperatures that reflect lapse rates).

The following list contains the definitions, **minimum** requirements for IFPS/NDFD IOC grid production, and collaboration triggers for the primary Public, Marine, Fire Weather, and Climate elements produced at NWS Weather Forecast Offices in the Coterminous United States (CONUS). However, many grids should be populated in the local database at each hour to support both UTC sampling intervals for NDFD and Local Time (LT) sampling intervals for local products.

A.   General Weather Elements.

Max/Min Temp - the daytime max or the overnight min temperature. Verifying observations are deduced via a comprehensive algorithm that examines reported max/min and hourly temperatures. Daytime is defined as **0700-1900 Local Standard Time**, and overnight as **1900-0800 Local Standard Time**. The 1 hour overlap was introduced by the NWS in the mid-1980s to include mins that occur just after sunrise.

•   ***Grid Production Requirement***: *A Maximum Temperature grid and a Minimum Temperature grid will be produced for each 24-hour period through 168 hours.*
•   ***Collaboration Trigger:*** *5 deg (7 deg in complex terrain <u>complex terrain, i.e., greater than 500 ft. differences)</u>.*

Temperature - a snapshot of the expected temperature in degrees F valid at the indicated hour. Values in the local forecast database should be populated at each hour in order to support both UTC sampling intervals for NDFD and LTC sampling intervals for local products.
*   ***Grid Production Requirement:*** *Temperature grids will be produced at a minimum every hour through 168 hours.*
*   ***Collaboration Trigger:*** *5 deg (7 deg in complex terrain).*

Dewpoint - a snapshot of the expected dew point temperature in degrees F valid at the indicated hour. Values in the local forecast database should be populated at each hour in order to support both UTC sampling intervals for NDFD and LTC sampling intervals for local products.
*   ***Grid Production Requirement:*** *Dewpoint grids will be produced at a minimum every hour through 168 hours.*
*   ***Collaboration Trigger:*** *5 deg (7 deg in complex terrain).*

Heat Index, Wind Chill, and Relative Humidity - snapshots derived from Temperature, Dewpoint, and Wind grids.
*   ***Grid Production Requirement:*** *Heat Index, Wind Chill, and Relative Humidity grids should be produced at a minimum every 3 hours through 48 hours.*
*   ***Collaboration Trigger:*** *N/A* .

12-hour Probability of Precipitation (PoP12)- The likelihood, expressed as a percent, of a measurable precipitation event (1/100th of an inch) at a gridpoint during the valid period. The 12-hour periods begin and end at 0000 and 1200 UTC. PoP12 is derived from floating PoP12 values.
*   ***Grid Production Requirement:*** *PoP 12 grids will be produced at a minimum each 12-hour period through 168 hours.*
*   ***Collaboration Trigger:*** *20%.*

Floating PoP12 - a special value from which a PoP12 for any 12-hour period can be derived by taking the maximum floating PoP12 value within the desired period. A floating PoP12 should be thought of as that hour's contribution to the PoP12, not as a 1 hour PoP, which has different statistical characteristics. Floating PoP12 values are best stretched over time ranges consistent with other precipitation related elements, and that in the end result in complete coverage at every hour.   Floating Pop12 grids support the generation of PoP12s in both UTC and LT. An associated Weather, QPF, and Snow (as appropriate) grid should be created when Floating PoP12 is at least 15% .
*   ***Grid Production Requirement:*** *Floating PoP 12 grids will be produced at a minimum every hour through 168 hours.*
*   **Collaboration Trigger:** N/A.

Sky Cover - a snapshot of the expected amount of opaque clouds (in percent) covering the sky during the indicated hour.
- ***Grid Production Requirement:** Sky Cover will be produced at a minimum every 3 hours through 72 hours, then every 6 hours through 168 hours.*
- ***Collaboration Trigger:** 25% (40% in complex terrain)*

Wind Direction - a snapshot of the expected wind direction forecast to occur during the indicated hour, using 36 points of a compass. **Wind Speed** is a snapshot of the sustained wind speed (in knots) forecast to occur during the indicated hour.
- ***Grid Production Requirement:** Wind Direction and Wind Speed grids will be produced at a minimum every 3 hours through 72 hours, then every 6 hours through 120 hours.*
- ***Collaboration Trigger (Wind Direction):** 90 degrees.*
- ***Collaboration Trigger (Wind Speed):** 10 kts (15 kts in complex terrain).*

Wind Gust - is a snapshot of the expected sustained wind speed in combination with gusts. Wind is measured at 10m. Speeds are converted to mph, as appropriate, by product generation software. Values in the local database should be populated at each hour in order to support both UTC sampling intervals for NDFD and LTC sampling intervals for local products
- ***Grid Production Requirement:** Wind Gust grids will be produced at a minimum every 3 hours through 48 hours.*
- ***Collaboration Trigger:** None.*

Weather - a snapshot of expected weather during the indicated hour. The element includes type, probability, and intensity information. In cases of convective weather, coverage may be substituted for probability. Weather should have a non-null value at any gridpoint with a corresponding floating PoP12 value of at least 15 percent.
- ***Grid Production Requirement:** Weather Grids will be produced at a minimum every hour (as necessary) through 168 hours.*
- ***Collaboration Trigger:** N/A (categorical element).*

Quantitative Precipitation Forecast (QPF) - represents the total amount of liquid precipitation (in hundreths of inches) at a gridpoint conditional on precipitation occurring and **Snow Amount** represents the total snowfall accumulation (in whole inches) expected at a gridpoint. Periods for the NDFD end and begin at 0600, 1200, 1800, and 0000 UTC. Periods for local products vary. QPF and Snow amount grids can be stretched over any length of time. Amounts for the NDFD and local products are calculated, as appropriate, from derived hourly accumulation rates. QPF should be created whenever the corresponding floating PoP12 grid is at least 15 percent.
- **Grid Production Requirement: QPF** grids will be produced at a minimum for each 6 hour period through 36 hours. **Snow Amount** grids will be produced at a minimum for each 6 hour period through 36 hours.
- ***Collaboration Trigger:*** *0.25 in/6 hr* (QPF) and 2 inches (Snow Amount--only for homogenous situations).

B. **Fire Weather Elements**.

Min/max Relative Humidity - the daytime minimum and the nighttime maximum relative humidity for the same valid times used for Max/Min temperature.
• **Grid Production Requirement:** *None (experimental grid).*
• **Collaboration Trigger:** *N/A (derived element).*

20 ft. Wind - snapshot of the 20 foot, 10 minute average wind speed.
• **Grid Production Requirement:** *20 ft. Wind will be produced at a minimum every 3 hours through 48 hours.*
• **Collaboration Trigger:** *N/A (derived element).*

LAL (Lightning Activity Level) - discrete element from 1 to 6. Value is the max during the 6 hour period.
• **Grid Production Requirement:** *None (experimental grid).*
• **Collaboration Trigger:** *2 (except for valid discrepancies between wet and dry thunderstorms).*

Mixing Height - maximum mixing height in the afternoon based on the CCL. Representative minimum mixing height in early morning hours.
• **Grid Production Requirement:** *None (experimental grid).*
• **Collaboration Trigger:** *2000 ft (3000 ft complex terrain).*

Transport Wind - average sustained wind in the mixed layer at the representative times of the mixing height grids.
• **Grid Production Requirement:** *None (experimental grid).*
• **Collaboration Trigger:** *10 kts/45 degs (10 kts/60 deg complex terrain).*

Haines Index - snapshot index based on stability and moisture according to the following formula:

$$\text{Haines Index} = \text{Stability} + \text{Moisture}$$
$$= (T_{p1} - T_{p2}) + (T_{p1} - T_{dp1})$$

where T is the temperature at two pressure surfaces (p1, p2); and T_{p1} and T_{dp1} are the dry bulb temperature (deg C) and dewpoint temperature (deg C) at a lower level. Each gridpoint would contain the low, mid or high level Haines depending on elevation.

• **Grid Production Requirement:** *None (experimental grid).*

• **Collaboration Trigger:** *2 (3 complex terrain)*

C. **Marine Elements**.

Significant Wave Height - Snapshot of the average height (trough to crest) of the one-third highest waves.

- ***Grid Production Requirement:*** *Significant Wave Height will be produced at a minimum every 12 hours through 120 hours.*

- ***Collaboration Triggers:***

  a. *For wave heights forecast to be 6 feet or less, a trigger of 2 feet*

  b. *For wave heights forecast to be greater than 6 ft, a trigger of 25% of the forecast significant wave height*

Swell Height and Direction - Snapshot of wind generated waves that have traveled out of their generating area, expressed as height in feet and compass direction of movement.

- ***Grid Production Requirement:*** *None (experimental grid).*

- ***Collaboration Triggers:***

  a. *For swell height forecast to be 6 feet or less, a trigger of 2 feet*

  b. *For swell height forecast to be greater than 6 feet, a trigger of 25% of the forecast swell height*

  c. *No trigger for swell direction*

Visibility - Snapshot of the maximum number of nautical miles an object can be seen and identified in the horizontal. The maximum distance is determined for a minimum area of one half of the horizon circle. Visibility greater than six nautical miles is unrestricted.

- ***Grid Production Requirement:*** *None (experimental grid).*

- ***Collaboration Trigger:*** *3 nautical miles*

Ice Coverage - Snapshot of percentage of water surface covered with ice. Ice coverage of less than or equal to 10% is considered to be freely navigable and open water.

- ***Grid Production Requirement:*** *None (experimental grid)*.

- ***Collaboration Trigger:*** *No trigger for Ice Coverage*

Appendix B - Grids Required for the Production of 10 NWS IOC products.

GRIDS	ZFP	CCF	SAF	SFP	FWF	FWM	CWF	GLF	NSH	MVF
max/min temp	X	X	X	X	X	X				
temperature	X		X			X				
dewpoint	X		X							
relative humidity					X	X				
max/min RH						X				
heat index	X		X							
wind chill	X		X							
floating PoP12	X				X	X				
prob of precip. (12h)	X	X	X	X	X					
sky cover	X	X	X	X	X	X			X	
wind direction and speed	X		X		X	X	X	X	X	X
wind gusts (>10 kts over sustained)	X		X		X	X				
weather (type, intnsty, prob/covrg)	X	X	X	X	X		X	X	X	
snow amount	X		X							
significant wave height							X	X	X	X

Table 3. WFO Local Grid Elements Necessary to Produce the 10 NWS base products for IOC.

Appendix C - NDFD Weather Element Tables

The following tables show the forecast times at which samples for the NDFD are taken. Derived fields are indicated by the "*" symbol. By definition, NDFD forecasts are always current and should be updated by WFOs as necessary. Forecasts for the next Day 7 are added no later than 18z each day.

General Weather Element Grid Availability   Time Projections ➡

Diurnal Day (CONUS)	0	0	0	0	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	3	3	3	3	3	3	4	4	4	4	5	5	5	5	6	6	6	6	7	7
UTC Day	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	4	4	4	4	5	5	5	5	6	6	6	6	7	7	7	7	8
UTC Hour	03	06	09	12	15	18	21	00	03	06	09	12	15	18	21	00	03	06	09	12	15	18	21	00	06	12	18	00	06	12	18	00	06	12	18	00	06	12	18	00
Hours	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72	78	84	90	96		108		120		132		144		156		168
max/min temperature				A				A				A				A				A				A		A		A		A		A		A		A		A		A
temperature	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
dewpoint	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
heat index *	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	B	B	B																
wind chill *	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	B	B	B																
relative humidity *	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	B	B	B	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
probability of precip. (12h)*				A				A				A				A				A				A		A		A		A		A		A		A		A		A
sky cover	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
wind direction and speed	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	B	B	B	B	B	B	B
wind gust	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				
weather (type, intnsty,prob/cvrg)	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
quantitative precipitation		A		A		A		A		A		A				B				B																				
snow amount		A		A		A		A		A		A																												

A - Required minimum threshold for IFPS/NDFD IOC (9/30/03)

B - Needed to support NWSI 10-503 products (NLT 12/31/03)

X - Proposed for experimental dissemination

* derived field

Fire Weather Element Grid Availability　　　　　　**Time Projections** ➤

Diurnal Day (CONUS)	0	0	0	0	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	3	3	3	3	3	3	4	4	4	4	5	5	5	5	6	6	6	6	7	7
UTC Day	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	4	4	4	5	5	5	5	6	6	6	6	7	7	7	7	8
UTC Hour	03	06	09	12	15	18	21	00	03	06	09	12	15	18	21	00	03	06	09	12	15	18	21	00	06	12	18	00	06	12	18	00	06	12	18	00	06	12	18	00
Hours	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72	78	84	90	96	108		120		132		144		156		168	
max/min relative humidity *				X				X				X				X																								
20 ft wind *	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A																								
lightning activity level		X		X		X		X		X		X		X		X																								
mixing height				X				X				X				X																								
transport wind and speed				X				X				X				X																								
Haines index		X		X		X		X		X		X		X		X																								

A - Minimum threshold for IFPS/NDFD IOC   (9/30/03)

B - Needed to support NWSI 10-503 products (NLT 12/31/03)

X - Proposed for experimental dissemination

* derived field

Marine Element Grid Availability **Time Projections** ➡

Diurnal Day (CONUS)	0	0	0	0	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	3	3	3	3	3	3	4	4	4	4	5	5	5	5	6	6	6	6	7	7
UTC Day	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	4	4	4	4	5	5	5	5	6	6	6	6	7	7	7	7	8
UTC Hour	03	06	09	12	15	18	21	00	03	06	09	12	15	18	21	00	03	06	09	12	15	18	21	00	06	12	18	00	06	12	18	00	06	12	18	00	06	12	18	00
Hours	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72	78	84	90	96	108		120		132		144		156		168	
wave height (significant)	A	A	A	A	A	A	A	A	A	A	A	A	A	A																										
visibility	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X																								
ice coverage	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X																								
swell height and direction	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X																								

A - Minimum threshold for IFPS/NDFD IOC   (9/30/03)

B - Needed to support NWSI 10-503 products (NLT 12/31/03)

X - Proposed for experimental dissemination

* derived field

Climate Weather Element Grid Availability   **Time Projections** ➤

Days	1	2	3	4	5	6	7	8	9	10	11	12	13	14	45	75	105	135	165	195	225	255	285	315	345	375
6-10 Day Temperature Outlook										X																
6-10 Day Precipitation Outlook										X																
8-14 Day Temperature Outlook														X												
8-14 Day Precipitation Outlook														X												
Monthly Temperature Outlook															X											
Monthly Precipitation Outlook															X											
Seasonal Temperature Outlook																	X			X			X			X
Seasonal Precipitation Outlook																	X			X			X			X
3-10 Day Heat Index Outlook										X																
3-10 Day Cold Index Outlook										X																
U.S. Threats Assessment			X	X	X	X	X	X	X	X	X	X	X	X												
U.S. Drought Outlook																	X									

A - Minimum threshold for IFPS/NDFD IOC   (9/30/03)

B - Needed to support NWSI 10-503 products (NLT 12/31/03)

X - Proposed for experimental dissemination

* derived field

Appendix D - Glossary of Terms

BUFR	**Binary Universal Form for the Representation of meteorological data – World Meteorological Organization standard binary code designed to represent any meteorological data.**
Digital Data	**Numerical or other information represented in a form suitable for processing by computer.**
Digital Forecast	**A forecast represented by digital data--not words, phrases, or sentences.**
Digital Forecast Database	**A database containing digital forecasts**
Digital Forecast Product	**A formatted, usually graphical, representation of digital forecasts.**
Forecast Element	**A component of a weather forecast (e.g., temperature, wind, cloud).**
Forecast Collaboration	**A partnership where NWS offices work jointly with others (both internally and externally) in a cooperative effort toward a consensus weather forecast.**
Forecast Mosaic	**A composite of gridded forecasts**
Graphical Forecast Editor (GFE)	**A component of IFPS that graphically presents gridded forecast fields to meteorologists for editing using a variety of tools.**
GRIB	**GRIdded Binary, World Meteorological Organization standard binary code to represent gridded data.**

Gridded Forecast	Forecast in numbers at regularly spaced points on a surface
Interactive Forecast Preparation (IFP)	Concept where a forecaster edits, or interacts with, forecast elements in a digital database from which user products are generated
Interactive Forecast Preparation System (IFPS)	A system that allows the thought processes of WFO forecasters to be put into digital (or numerical) form primarily through three methods (matrix entry, graphical entry, model interpretation) of interaction with forecast elements in a digital database.
IFPS Initial Operating Capability (IOC)	The condition in which all WFOs are able to produce the grids necessary to automatically compose **ten base NWS text products** and will produce those products with software (formatters).
Intersite Coordination (ISC)	A technique employed within IFPS to exchange digital forecast grids from each WFO to other WFOs for the express purpose of coordinating the forecasts.
National Digital Forecast Database (NDFD)	A composite of <u>official</u> NWS digital forecasts (as distinct from guidance). It will house these forecast grids from all operational elements of the NWS
Text Forecast Product	A forecast represented by formatted text.
Worded Forecast Product	A text forecast represented with words, phrases, or sentences, that is either prepared manually or from digital data via computer text formatters.