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Monthly Station Normals of Temperature, Precipitation, and Heating and Cooling Degree Days 1961-90

PACIFIC ISLANDS

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I. INTRODUCTION

The climatological normals presented in this publication are based on monthly mean maximum and minimum temperature and monthly total precipitation records for each year in the 30-year period 1961-90, inclusive. Data are assembled by individual states. Most stations were operating as of December 1990. Some stations were closed prior to 1990, but were identified as "normals stations" for special applications. Most of the closed stations ceased operations in 1989 or 1990.

Several adjustments were made to the data before the normals were calculated. These adjustments include estimating missing data, adjusting for time of observation bias, and adjusting for exposure changes (First Order stations, as defined in Section II, only).

Data are presented in the order shown in the title. Units used in this publication are °F for temperature and inches for precipitation. Heating and cooling degree day (base 65°F) normals are derived from the monthly normal temperatures using the technique developed by Thom (1954a, 1954b, 1966). Degree day normals have also been computed to other bases and may be obtained from the National Climatic Data Center, Federal Building, 37 Battery Park Avenue, Asheville, NC 28801-2733, or by calling (704) 259-0682.

The adjustment methodology is described in greater detail in Section II of this publication. The notes in Section V refer to the normals tables, station listing, and station locator map.

II. NORMALS FOR FIRST ORDER AND COOPERATIVE STATIONS

Temperature and Precipitation Normals

First Order (Principal Climatological) Stations: First Order Stations record hourly observations and are usually staffed by professional observers. They can be identified as having WSO, WSFO, WSMO, WSCMO, or FAA in their name. For all First Order stations, any missing data for the 1961-90 period were estimated from the monthly values of neighboring stations. Time of observation adjustments were made, as necessary, to the data from the neighboring stations before these data were used to estimate the missing First Order station data (Karl, et al., 1986). Exposure change adjustments (Karl and Williams, 1987) were made to First Order stations in the Lower 48 States, but not to the stations in Alaska, Hawaii, or U.S. possessions because of the lack of a sufficient number of neighboring stations. The neighboring stations used in the adjusting procedure included stations from the Cooperative Station Network.

Cooperative Stations: Cooperative Stations usually record daily data only and are usually manned by volunteer observers. For all Cooperative Stations, any missing data for the 1961-90 period were estimated from the monthly values of neighboring First Order and

Cooperative stations. Time of observation adjustments were made to those stations in the Lower 48 States that required the adjustment. No adjustments were made to stations in Alaska, Hawaii, or U.S. possessions because of the lack of a sufficient number of neighboring stations. No exposure change adjustments were made to the Cooperative Stations due partly to a lack of adequate computerized station history information, but also because a Cooperative Station's identity changes (according to National Weather Service standards) when significant moves occur (generally at least 5 miles or 100 feet in elevation, subject to the judgement of the National Weather Service Cooperative Program Manager).

Methodology: Normals have been defined as the arithmetic mean of a climatological element computed over a long time period. International agreements eventually led to the decision that the appropriate time period would be three consecutive decades (Guttman, 1989). The data record should be consistent (have no changes in location, instruments, observation practices, etc.; these are identified here as "exposure changes") and have no missing values so a normal will reflect the actual average climatic conditions. If any significant exposure changes have occurred, the data record is said to be "inhomogeneous" and the normal may not reflect a true climatic average. Such data need to be adjusted to remove the nonclimatic inhomogeneities. The resulting (adjusted) record is then said to be "homogeneous". If no exposure changes have occurred at a station, the normal is calculated simply by averaging the appropriate 30 values from the 1961-90 record.

Since it is nearly impossible to maintain a multiple purpose network of meteorological stations without having some exposure changes, it is first necessary to identify and evaluate these changes and then make adjustments for them if necessary.

The method used to estimate missing data and adjust for inhomogeneities is based on the Historical Climatology Network (HCN) methodology outlined by Karl and Williams (1987). This technique involves comparing the record of the station for which the normals are being calculated (the candidate station) to the records of neighboring stations. This comparison is based on the following definition of relative homogeneity provided by Conrad and Pollak (1950): "A climatological series is relatively homogeneous with respect to a synchronous series at another place if the temperature differences (precipitation ratios) of pairs of homologous averages constitute a series of random numbers that satisfies the law of errors." A neighboring station was not used if its record did not cover the same time period as the candidate station (i.e., was not synchronous or homologous). The underlying assumption behind such a definition is that variations in average weather have similar tendencies over a region. For example, cold winters at a candidate station usually occur simultaneously at its neighboring stations. If this assumption is violated, then there will be a systematic difference between the stations which will show up as temperature differences (or precipitation ratios) that do not follow the expected statistical pattern (law of errors). Acceptance of the

definition of relative homogeneity allows the use of certain well-defined statistical techniques to make the adjustments.

Inhomogeneities in the candidate station's record were determined by examining the location, instrument, and observation history of the station.

After the periods of inhomogeneity were determined, adjustments were applied to remove the biases. The adjustments were determined using the following criteria. Neighboring stations were found which had homogeneous data records that covered the time period of the candidate station's inhomogeneous period. If the candidate station and a neighbor had a reasonably high correlation ($r^2>0.6$) of monthly anomalies for the period in question, then the established homogeneous neighboring station was used to assess the impact of the candidate station's discontinuity. The part of the data record before the discontinuity was statistically compared to the part after the discontinuity. The Student's t-test was used for the temperature differences, while the nonparametric Wilcoxon rank-sum test was used for the precipitation ratios. If the statistical test indicated that the two parts of the candidate station's record were significantly different, then the earlier part of the record was adjusted (further details, with examples, can be found in Karl and Williams, 1987). After all exposure changes at the candidate station were corrected, the normal was estimated by averaging the appropriate 30 values from the 1961-90 adjusted record. If none of the neighboring stations had a sufficiently high correlation, then no adjustment was made. The climatological elements (maximum temperature, minimum temperature, and precipitation) were adjusted separately.

The adjustment method for temperature works best if all of the stations involved have the same observational schedule. This is generally true for First Order Stations which use the calendar day (midnight) observation time. Unfortunately, some cooperative stations have an observation time in the morning, some in the afternoon, some in the evening, and some at midnight, and this introduces a nonclimatic bias into the record. For an explanation of this bias, see Karl et al. (1986). To make the data reflect a consistent observational schedule, the adjustment technique developed by Karl et al. (1986) was used to convert the maximum and minimum temperature data for all stations to a midnight-to-midnight schedule, thus removing the time of observation bias.

In summary, the normals methodology employed for this publication involved (1) adjusting all station data to a midnight-to-midnight observation schedule; (2) estimating missing data; (3) using the HCN method outlined above to adjust First Order stations with inhomogeneous records; (4) calculating the average monthly values; then (5) converting the temperature averages to the station's official normal, which is valid for the current (as of 1990) observation time. Due to the adjustment techniques employed, the normals published in this volume will not necessarily agree with

values calculated by simply averaging the monthly observed values from 1961-90.

It should be emphasized that the official normal temperature values printed herein are for the current (as of 1990) observation time. The station's observation time and the adjustment necessary to convert the temperature values to a midnight-to-midnight observation time are also shown in the tables. The adjustment factors should be added to the official normals to approximate a "midnight observation time average". This helps a user determine if temperature differences between nearby stations are true climate differences or if they may be caused by different observing schedules. The precipitation data were not adjusted for observation time.

The monthly normals for maximum and minimum temperature were computed as described above. The monthly average temperature normals were computed by averaging the corresponding maximum and minimum normals. The annual temperature normals were calculated by taking the average of the 12 monthly normals. The annual precipitation normals were calculated by adding the 12 monthly normals.

Degree Day Normals

Simple arithmetic procedures were not applied to obtain the heating and cooling degree day normals. Instead, the rational conversion formulae developed by Thom (1954a, 1954b, 1966) were used. These formulae allow the adjusted mean temperature normals and their standard deviations to be converted to degree day normals with uniform consistency. In some cases this procedure will yield a small number of degree days for months when degree days may not otherwise be expected. This results from statistical considerations of the formulae. The annual degree day normals were calculated by adding the corresponding monthly degree day normals.

III. SUPPLEMENTARY DATA

Individual station values (by year-month) of average (maximum, minimum, and mean) temperature and total precipitation used to calculate the normals for the 1961-90 period are available from the National Climatic Data Center, Asheville, NC, and may be obtained in either microfiche (see example at the back of this publication) or digital media (TD-9641). In addition, extremes of monthly total precipitation and mean temperature are included, along with the standard deviations of the monthly temperatures. The median (i.e., 50th percentile), 11-year and 21-year means are also provided for both temperature and precipitation.

IV. REFERENCES

1. Thom, H.C.S., 1954a: The rational relationship between heating degree days and temperature. Mon. Wea. Rev., 82, 1-6.

2. Thom, H.C.S., 1954b: Normal degree days below any base. Mon. Wea. Rev., 82, 111-115.

3. Thom, H.C.S., 1966: Normal degree days above any base by the universal truncation coefficient. Mon. Wea. Rev., 94, 461-465.

4. Guttman, N.B., 1989: Statistical descriptors of climate. Bull. Amer. Met. Soc. 70, 602-607.

5. Karl, T.R., and C.N. Williams, Jr., 1987: An approach to adjusting climatological time series for discontinuous inhomogeneities. J. Climate Appl. Meteor. 26, 1744-1763.

6. Conrad, V., and L.W. Pollak, 1950: Methods In Climatology. Harvard University Press, 459 pp.

7. Karl, T.R., C.N. Williams, Jr., P.J. Young, and W.M. Wendland, 1986: A model to estimate the time of observation bias associated with monthly mean maximum, minimum and mean temperatures for the United States. J. Climate Appl. Meteor., 25, 145-160.

V. NOTES

Precipitation normals less than .005 inch are shown as zero. Precipitation includes rainfall and the liquid water equivalent of frozen precipitation (snow, sleet, hail).

Temperature normals are provided for mean monthly maximum temperature (NORMAL MAX), mean monthly minimum temperature (NORMAL MIN), and mean monthly average temperature (NORMAL). The median (50th percentile) monthly average temperature is shown as MEDIAN. The median is the middlemost value in an ordered series of values. Half of the values are greater than the median and half are less than the median.

Monthly normals for February are based on a 28-day month.

Figures and letters following the station name generally indicate a rural location and refer to the distance and direction of the station from the nearest Post Office. WSO, WSMO, and WSFO denote a National Weather Service office, meteorological observatory, and forecast office, respectively. FAA implies a Federal Aviation Administration station with an observing capability coordinated by the National Weather Service. Station elevations are in feet above mean sea level. The most current observation time (as of December 1990) for temperature is shown on the temperature tables under the

station name. LT refers to Local Time (Standard or Daylight, as applicable).

Stations located on islands (U.S. possessions) generally have short records (i.e., less than 30 years) and do not meet the criteria for computation of normals. Short-term or period averages are given for these stations (as shown).

Maps show the locations of stations for which 1961-1990 normals have been prepared. A station listing provides additional details regarding each station's data. On the station listing pages, column "Code 1" refers to data with less than 35 months missing from 1961-90. Column "Code 2" refers to data that can have up to 20 years missing from 1961-90. The numbers (1-7) in these columns indicate the climatological elements observed and are defined in the Data Code Legend at the bottom of the page. For example, if a station had 12 months of temperature, precipitation, and snowfall data missing, a 6 would appear under column "Code 1" because 12 months is less than 35 months, and a 6 would appear under column "Code 2" because 12 months is less than 20 years. If the station had 58 months of data missing, then column "Code 1" would have a blank because 58 months is greater than 35 months, and column "Code 2" would have a 6 because 58 months is less than 20 years. Snowfall normals are not a part of this publication series, but information on the availability of snowfall data is included for user reference.

MAX is maximum, MIN is minimum, MID OBS TIME ADJ is the adjustment factor to convert a normal to midnight observation time, ANN is annual, SEQ NO is sequence number and is used to locate the station on the map. STATION NO. is the Cooperative station number.

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SEQ NO.	STATE NO.	STATION NO.	CODE 1	CODE 2	STATION NAME	LAT DEG / MIN	LON DEG / MIN	ELEV (FT)
1	91	4025	6	6	ANDERSEN AFB GUAM	1335N	14455E	624
2	91	4100	6	6	CLARK AFB LUZON	1511N	12033E	475
3	91	4185		6	FALALOP / ULITHI	1002N	13948E	6
4	91	4226	6	6	GUAM NAS	1329N	14448E	254
5	91	4229	6	6	GUAM WSMO	1333N	14450E	361
6	91	4320	6	6	JOHNSTON IS WSMO AP	1644N	16931W	10
7	91	4351	6	6	KOROR WSO	0720N	13429E	94
8	91	4375	6	6	KWAJALEIN MISSILE RNG	0844N	16744E	7
9	91	4395		6	KOSRAE	0520N	16302E	7
10	91	4460	6	6	MAJURO WSO AP	0705N	17123E	10
11	91	4490		6	MIDWAY SAND ISLAND	2813N	17721W	10
12	91	4690		6	PAGO PAGO WSO AP	1420S	17043W	10
13	91	4751	6	6	PONAPE WSO	0658N	15813E	123
14	91	4851	6	6	TRUK MOEN IS WSO AP	0727N	15150E	5
15	91	4901	6	6	WAKE ISLAND WSO AP	1917N	16639E	12
16	91	4951	6	6	YAP WSO AP	0929N	13805E	44

DATA CODE LEGEND

Blank - More than 35 months missing
- More than 20 years missing (1st order stations only)
1 - Temperature only
2 - Precipitation only
3 - Snowfall only
4 - Temperature & precipitation (no snowfall)
5 - Precipitation & snowfall (no temperature)
6 - Temperature, precipitation & snowfall
7 - Temperature & snowfall (no precipitation)

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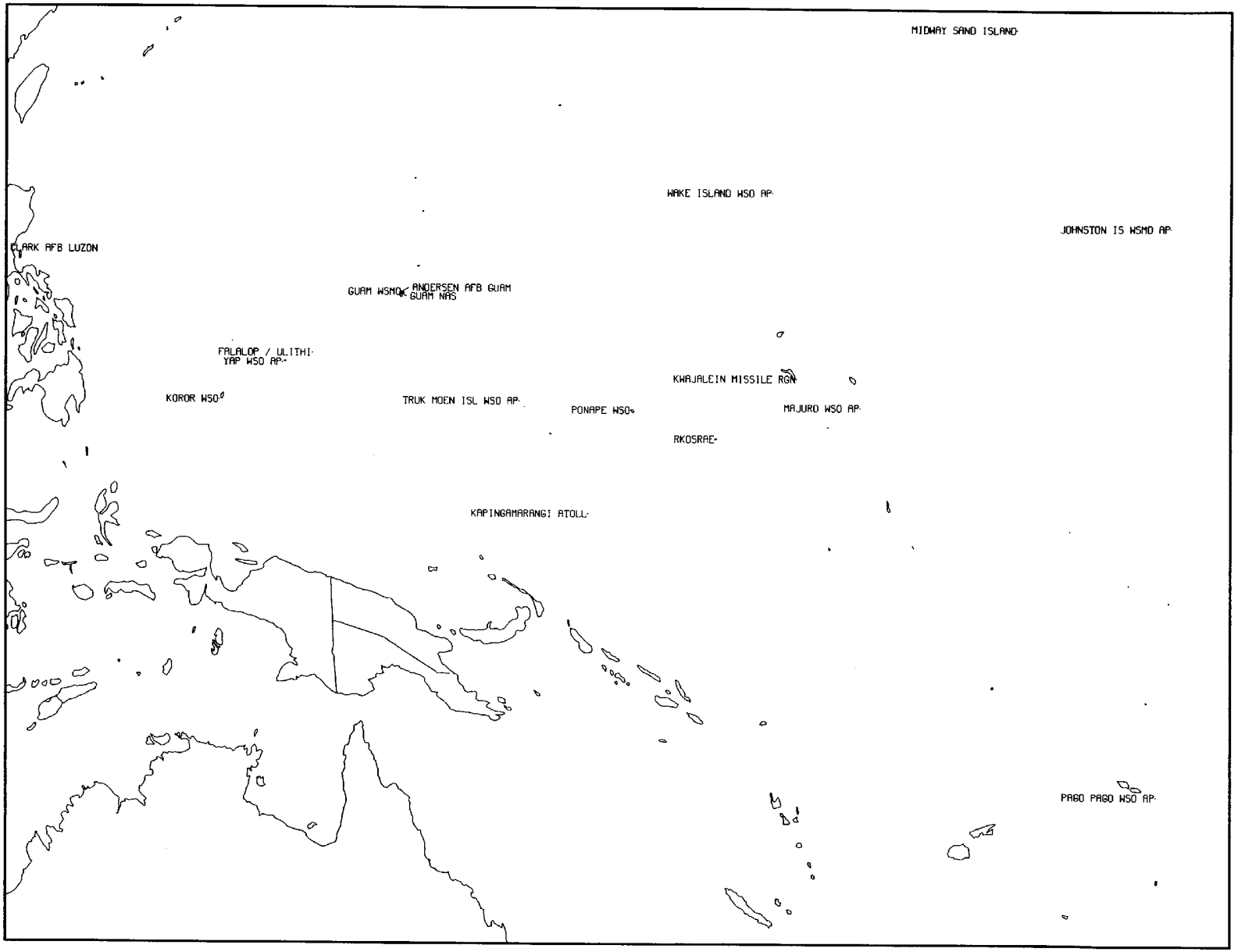

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TEMPERATURE NORMALS (DEG F)

STATION		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
ANDERSEN AFB GUAM	NORMAL MAX	81.9	81.7	82.4	83.3	84.2	84.5	84.0	83.9	84.2	84.1	83.9	82.9	83.4
2400 LT	NORMAL MIN	75.5	75.1	75.4	76.2	77.3	77.4	76.6	76.5	76.6	77.1	77.3	76.6	76.5
	NORMAL	78.7	78.5	78.9	79.8	80.8	81.0	80.4	80.2	80.4	80.6	80.6	79.7	80.0
	MEDIAN	78.7	78.6	78.6	79.8	80.6	80.7	80.4	80.1	80.2	80.5	80.6	79.7	80.0
MID OBS TIME ADJ MAX		.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	
MID OBS TIME ADJ MIN		.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	
CLARK AFB LUZON	NORMAL MAX	85.5	87.6	90.4	92.9	92.3	88.8	86.9	85.9	87.1	87.0	86.8	85.7	88.1
2400 LT	NORMAL MIN	70.3	70.7	72.3	75.2	76.3	75.5	74.7	74.4	74.7	74.7	73.4	71.6	73.7
	NORMAL	77.9	79.2	81.4	84.1	84.3	82.1	80.8	80.2	81.0	80.9	80.2	78.7	80.9
	MEDIAN	77.9	78.9	81.5	83.9	84.2	82.2	80.8	80.3	80.4	80.9	80.1	78.6	80.9
MID OBS TIME ADJ MAX		.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	
MID OBS TIME ADJ MIN		.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	
FALALOP / ULITHI	NORMAL MAX	85.6	85.3	86.7	87.1	87.5	87.4	87.0	87.3	86.9	87.0	87.2	86.6	86.8
2400 LT	NORMAL MIN	76.6	76.1	77.2	77.3	77.2	77.5	76.4	76.3	76.4	76.4	76.5	75.7	76.6
	NORMAL	81.1	80.7	82.0	82.2	82.4	82.5	81.7	81.8	81.7	81.7	81.9	81.2	81.7
	MEDIAN	81.4	81.0	82.1	81.9	82.2	82.4	81.7	81.9	81.9	81.9	81.8	81.3	81.8
MID OBS TIME ADJ MAX		.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	
MID OBS TIME ADJ MIN		.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	
GUAM NAS	NORMAL MAX	85.3	85.4	86.2	87.0	87.4	87.8	87.3	87.1	87.3	87.6	87.1	86.2	86.8
2400 LT	NORMAL MIN	75.2	74.6	74.9	75.9	76.5	77.2	76.6	76.3	76.7	76.5	76.6	76.0	76.1
	NORMAL	80.3	80.0	80.6	81.5	82.0	82.5	82.0	81.7	82.0	82.0	81.9	81.2	81.5
	MEDIAN	80.1	80.1	80.4	81.5	82.0	82.6	82.1	81.7	81.9	82.1	82.2	81.0	81.6
MID OBS TIME ADJ MAX		.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	
MID OBS TIME ADJ MIN		.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	
GUAM WSMO	NORMAL MAX	83.6	83.5	84.5	85.8	86.8	86.9	86.3	85.9	86.1	85.9	85.3	84.2	85.4
2400 LT	NORMAL MIN	71.0	70.9	71.1	72.1	72.6	72.9	72.4	72.2	72.2	72.4	73.1	72.7	72.1
	NORMAL	77.3	77.2	77.8	79.0	79.7	79.9	79.4	79.1	79.2	79.1	79.2	78.5	78.8
	MEDIAN	77.3	77.0	77.7	79.1	79.7	79.9	79.4	79.0	79.1	79.2	79.3	78.6	78.9
MID OBS TIME ADJ MAX		.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	
MID OBS TIME ADJ MIN		.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	
JOHNSTON IS WSMO AP	NORMAL MAX	81.0	80.9	81.2	81.9	82.9	84.2	84.9	85.5	85.5	84.9	83.3	81.7	83.2
2400 LT	NORMAL MIN	73.1	73.0	73.1	74.0	75.3	76.4	77.2	77.7	77.5	77.2	75.6	73.9	75.3
	NORMAL	77.1	77.0	77.2	78.0	79.2	80.3	81.1	81.6	81.5	81.1	79.4	77.8	79.3
	MEDIAN	77.1	77.2	77.1	77.9	79.2	80.6	81.5	81.8	81.3	81.1	79.4	77.8	79.2
MID OBS TIME ADJ MAX		.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	
MID OBS TIME ADJ MIN		.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	
KOROR WSO	NORMAL MAX	87.0	87.0	87.7	88.4	88.6	87.8	87.1	87.2	87.7	87.9	88.5	87.9	87.7
2400 LT	NORMAL MIN	75.1	75.0	75.3	75.9	76.1	75.5	75.4	75.7	76.1	75.9	76.0	75.6	75.6
	NORMAL	81.1	81.0	81.5	82.2	82.4	81.7	81.3	81.5	81.9	81.9	82.3	81.8	81.7
	MEDIAN	81.1	81.1	81.6	82.1	82.4	81.8	81.2	81.6	82.0	82.0	82.3	81.8	81.7
MID OBS TIME ADJ MAX		.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	
MID OBS TIME ADJ MIN		.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	
KWAJALEIN MISSILE RNG	NORMAL MAX	85.8	86.5	87.1	86.7	86.7	86.7	86.7	87.1	87.0	87.0	86.7	86.1	86.7
1200 LT	NORMAL MIN	77.0	77.1	77.4	77.4	77.3	77.2	77.1	77.2	77.1	77.3	77.3	77.3	77.2
	NORMAL	81.4	81.8	82.3	82.1	82.0	82.0	81.9	82.2	82.1	82.2	82.0	81.7	82.0
	MEDIAN	81.6	81.8	82.1	82.1	82.1	82.1	81.8	82.1	82.2	82.3	82.0	81.9	82.1
MID OBS TIME ADJ MAX		.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	
MID OBS TIME ADJ MIN		.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	
KOSRAE	NORMAL MAX	87.9	87.9	87.8	87.6	87.5	88.0	87.9	88.3	88.3	88.8	88.5	88.3	88.1
2400 LT	NORMAL MIN	75.6	74.8	74.7	75.2	74.8	74.6	74.3	74.7	74.5	74.8	74.7	75.7	74.9
	NORMAL	81.8	81.4	81.3	81.4	81.2	81.3	81.1	81.5	81.4	81.8	81.6	82.1	81.5
	MEDIAN	81.8	81.7	81.3	81.4	81.3	81.6	81.3	81.9	81.7	82.2	81.9	82.3	81.6
MID OBS TIME ADJ MAX		.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	
MID OBS TIME ADJ MIN		.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	
MAJURO WSO AP	NORMAL MAX	85.0	85.4	85.6	85.6	85.8	85.8	85.7	86.2	86.3	86.3	86.0	85.3	85.8
2400 LT	NORMAL MIN	76.5	76.7	76.6	76.5	76.6	76.3	76.1	76.3	76.2	76.3	76.3	76.3	76.4
	NORMAL	80.7	81.1	81.1	81.1	81.2	81.1	80.9	81.3	81.4	81.3	81.2	80.8	81.1
	MEDIAN	80.8	81.1	81.0	81.1	81.3	81.2	80.9	81.3	81.4	81.4	81.2	80.8	81.1
MID OBS TIME ADJ MAX		.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	
MID OBS TIME ADJ MIN		.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	
MIDWAY SAND ISLAND	NORMAL MAX	70.5	70.0	71.1	72.1	75.5	81.1	83.5	84.4	84.0	81.3	77.0	73.9	77.0
2400 LT	NORMAL MIN	62.2	62.0	62.8	63.6	67.3	72.6	74.9	75.6	75.0	72.6	69.0	64.7	68.5
	NORMAL	66.4	66.0	67.0	67.9	71.4	76.9	79.2	80.0	79.5	77.0	73.0	68.9	72.8
	MEDIAN	66.4	65.8	66.9	67.7	71.6	77.1	79.4	79.8	79.4	76.8	73.0	69.1	72.8
MID OBS TIME ADJ MAX		.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	
MID OBS TIME ADJ MIN		.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	
PAGO PAGO WSO AP	NORMAL MAX	86.4	86.6	86.8	86.3	85.1	84.2	83.1	83.3	84.4	84.8	85.3	86.0	85.2
2400 LT	NORMAL MIN	75.4	75.4	75.6	75.2	75.2	75.3	74.5	74.3	74.7	75.3	75.3	75.4	75.1
	NORMAL	80.9	81.1	81.2	80.8	80.2	79.8	78.8	78.9	79.6	80.0	80.3	80.7	80.2
	MEDIAN	80.9	81.1	81.3	80.8	80.1	79.8	78.7	78.8	79.6	80.0	80.3	80.5	80.2
MID OBS TIME ADJ MAX		.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	
MID OBS TIME ADJ MIN		.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	
PONAPE WSO	NORMAL MAX	86.6	86.7	87.2	87.4	87.6	87.6	87.8	88.2	88.1	88.2	88.1	87.2	87.6
2400 LT	NORMAL MIN	75.5	75.6	75.6	75.0	74.8	74.1	73.1	73.0	72.9	72.9	73.4	74.9	74.2
	NORMAL	81.0	81.2	81.4	81.2	81.2	80.9	80.4	80.6	80.5	80.6	80.8	81.1	80.9
	MEDIAN	81.1	81.3	81.1	81.3	81.1	81.0	80.3	80.6	80.5	80.4	80.8	81.1	80.9
MID OBS TIME ADJ MAX		.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	
MID OBS TIME ADJ MIN		.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	
TRUK MOEN IS WSO AP	NORMAL MAX	85.8	85.9	86.3	86.7	87.2	87.2	87.1	87.3	87.3	87.3	87.2	86.4	86.8
2400 LT	NORMAL MIN	76.9	77.0	77.1	77.0	76.8	76.2	75.5	75.5	75.6	75.7	76.3	77.0	76.4
	NORMAL	81.4	81.5	81.7	81.9	82.0	81.8	81.3	81.4	81.5	81.6	81.8	81.7	81.6
	MEDIAN	81.3	81.5	81.7	82.0	81.9	81.7	81.3	81.3	81.6	81.4	81.9	81.7	81.6
MID OBS TIME ADJ MAX		.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	
MID OBS TIME ADJ MIN		.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	
WAKE ISLAND WSO AP	NORMAL MAX	82.3	82.0	83.1	83.9	85.7	87.6	88.2	88.2	88.2	87.4	85.5	83.5	85.5
2400 LT	NORMAL MIN	72.7	72.1	72.9	73.4	75.1	76.7	77.3	77.4	77.7	77.2	76.1	74.2	75.2
	NORMAL	77.5	77.1	78.1	78.7	80.4	82.2	82.8	82.8	83.0	82.3	80.8	78.9	80.4
	MEDIAN	77.5	76.8	78.1	78.3	80.1	82.1	82.8	82.7	82.9	82.2	80.8	79.1	80.3
MID OBS TIME ADJ MAX		.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	
MID OBS TIME ADJ MIN		.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	

NOTE: 1. ADJUSTMENT FACTORS WILL ADJUST TEMPERATURE TO MIDNIGHT OBSERVATION TIME.
2. TIME APPEARING UNDER STATION NAME IS CURRENT OBSERVATION TIME.

PACIFIC ISLANDS

TEMPERATURE NORMALS (DEG F)

STATION		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
YAP WSO AP 2400 LT	NORMAL MAX	85.9	86.2	86.9	87.7	87.8	87.3	86.8	86.8	87.1	87.2	87.2	86.5	87.0
	NORMAL MIN	74.6	74.8	74.9	75.3	75.5	75.0	74.6	74.5	74.6	74.7	74.9	75.0	74.9
	NORMAL	80.3	80.5	80.9	81.5	81.6	81.2	80.7	80.7	80.9	81.0	81.1	80.8	80.9
	MEDIAN	80.3	80.5	80.9	81.6	81.5	81.3	80.7	80.6	80.9	81.1	81.1	80.8	80.9
	MID OBS TIME ADJ MAX	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	
	MID OBS TIME ADJ MIN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	

NOTE: 1. ADJUSTMENT FACTORS WILL ADJUST TEMPERATURE TO MIDNIGHT OBSERVATION TIME.
2. TIME APPEARING UNDER STATION NAME IS CURRENT OBSERVATION TIME.

PACIFIC ISLANDS

PRECIPITATION NORMALS (INCHES)

STATION		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
ANDERSEN AFB GUAM	NORMAL	5.70	5.22	4.09	4.87	6.60	6.34	10.92	13.42	13.32	12.89	9.09	6.27	98.73
	MEDIAN	4.77	4.03	2.83	3.30	3.32	6.42	11.42	13.45	11.86	11.81	8.28	5.73	95.74
CLARK AFB LUZON	NORMAL	.51	.68	1.07	2.28	7.82	11.76	15.87	16.04	12.44	7.29	4.04	1.54	81.34
	MEDIAN	.13	.10	.61	1.37	5.88	10.81	13.69	13.83	10.88	7.10	2.78	.91	80.49
FALALOP / ULITHI	NORMAL	6.93	5.59	4.78	4.99	8.47	11.55	13.37	13.97	13.53	12.53	9.23	9.48	114.42
	MEDIAN	6.41	4.43	2.92	3.43	7.60	10.11	11.48	13.56	11.74	12.17	8.86	8.01	110.21
GUAM NAS	NORMAL	4.45	3.74	2.98	3.91	6.05	6.47	10.53	13.73	13.49	12.08	8.20	5.39	91.02
	MEDIAN	3.53	2.38	2.38	2.66	4.08	6.07	10.06	14.04	12.73	11.30	8.35	5.09	92.67
GUAM WSMO	NORMAL	5.55	5.11	4.45	4.71	7.10	6.49	11.78	14.59	15.02	12.74	9.06	6.44	103.04
	MEDIAN	4.56	3.91	3.38	2.93	4.03	6.34	12.06	13.70	14.39	11.94	7.97	6.02	102.29
JOHNSTON IS WSMO AP	NORMAL	1.56	1.66	2.38	2.46	1.98	1.00	1.02	1.97	2.20	3.16	4.25	3.12	26.76
	MEDIAN	1.06	1.14	1.51	1.82	1.05	.90	.86	1.65	1.97	2.36	2.60	2.41	25.38
KOROR WSO	NORMAL	10.70	9.12	8.20	8.67	11.99	17.27	18.04	14.95	11.86	13.87	11.32	11.98	147.97
	MEDIAN	8.92	8.38	7.43	7.17	11.06	17.18	17.67	14.83	12.27	12.87	11.03	11.51	152.74
KWAJALEIN MISSILE RNG	NORMAL	4.56	3.23	4.10	7.55	9.98	9.62	10.44	10.11	11.83	11.91	10.66	8.10	102.09
	MEDIAN	3.68	2.95	3.88	5.78	9.13	9.44	10.59	10.02	11.98	11.31	9.91	6.24	103.00
KOSRAE	NORMAL	13.63	13.18	15.40	16.15	17.47	15.80	15.54	14.76	13.23	13.67	15.46	16.39	180.68
	MEDIAN	13.70	12.84	14.37	16.28	17.63	15.50	15.40	13.82	12.56	14.24	15.97	16.06	182.60
MAJURO WSO AP	NORMAL	8.43	6.15	8.28	10.28	11.18	11.59	13.00	11.52	12.42	13.84	12.80	11.85	131.34
	MEDIAN	8.16	5.28	7.21	9.30	10.88	11.71	13.53	11.19	11.50	13.93	12.08	10.93	131.61
MIDWAY SAND ISLAND	NORMAL	4.78	3.68	3.69	2.80	2.17	1.95	3.54	4.10	3.59	3.43	4.44	4.36	42.53
	MEDIAN	4.78	3.14	2.86	1.86	1.48	1.60	2.92	3.43	3.11	2.32	3.92	4.30	39.97
PAGO PAGO WSO AP	NORMAL	12.59	12.76	11.26	12.04	9.92	7.38	6.28	6.71	6.69	10.79	10.84	14.54	121.80
	MEDIAN	10.66	11.44	9.56	10.77	8.74	6.23	5.61	5.68	5.16	10.03	9.71	14.53	119.31
PONAPE WSO	NORMAL	12.07	10.80	13.54	16.44	19.12	17.14	18.39	16.53	16.06	16.71	15.74	15.22	187.76
	MEDIAN	11.19	11.45	13.07	16.69	18.94	17.04	16.04	16.50	15.18	16.84	15.88	15.04	191.70
TRUK MOEN IS WSO AP	NORMAL	8.98	6.42	9.05	11.46	13.94	11.84	14.37	13.77	12.07	14.23	11.10	11.55	138.78
	MEDIAN	8.89	6.51	7.76	10.86	13.55	12.21	13.66	13.08	12.14	15.52	9.28	11.15	135.45
WAKE ISLAND WSO AP	NORMAL	1.16	1.60	2.23	2.51	1.74	2.29	4.02	6.16	5.07	4.33	2.79	1.78	35.68
	MEDIAN	.94	1.42	1.48	1.78	1.60	1.82	3.13	4.97	4.28	3.22	2.66	1.37	35.38
YAP WSO AP	NORMAL	7.33	5.98	5.96	5.76	9.06	12.69	14.54	15.20	13.51	11.97	9.07	8.99	120.06
	MEDIAN	6.12	5.45	5.02	4.78	8.95	12.34	13.95	14.79	12.65	11.93	9.18	8.96	120.08

PACIFIC ISLANDS

HEATING DEGREE DAY NORMALS (BASE 65 F)

STATION	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANN
ANDERSEN AFB GUAM	0	0	0	0	0	0	0	0	0	0	0	0	0
CLARK AFB LUZON	0	0	0	0	0	0	0	0	0	0	0	0	0
FALALOP / ULITHI	0	0	0	0	0	0	0	0	0	0	0	0	0
GUAM NAS	0	0	0	0	0	0	0	0	0	0	0	0	0
GUAM WSMO	0	0	0	0	0	0	0	0	0	0	0	0	0
JOHNSTON IS WSMO AP	0	0	0	0	0	0	0	0	0	0	0	0	0
KOROR WSO	0	0	0	0	0	0	0	0	0	0	0	0	0
KWAJALEIN MISSILE RNG	0	0	0	0	0	0	0	0	0	0	0	0	0
KOSRAE	0	0	0	0	0	0	0	0	0	0	0	0	0
MAJURO WSO AP	0	0	0	0	0	0	0	0	0	0	0	0	0
MIDWAY SAND ISLAND	0	0	0	0	0	9	29	33	31	25	7	0	134
PAGO PAGO WSO AP	0	0	0	0	0	0	0	0	0	0	0	0	0
PONAPE WSO	0	0	0	0	0	0	0	0	0	0	0	0	0
TRUK MOEN IS WSO AP	0	0	0	0	0	0	0	0	0	0	0	0	0
WAKE ISLAND WSO AP	0	0	0	0	0	0	0	0	0	0	0	0	0
YAP WSO AP	0	0	0	0	0	0	0	0	0	0	0	0	0

PACIFIC ISLANDS

COOLING DEGREE DAY NORMALS (BASE 65 F)

STATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
ANDERSEN AFB GUAM	425	378	431	444	490	480	477	471	462	484	468	456	5466
CLARK AFB LUZON	400	398	508	573	598	513	490	471	480	493	456	425	5805
FALALOP / ULITHI	499	440	527	516	539	525	518	521	501	518	507	502	6113
GUAM NAS	474	420	484	495	527	525	527	518	510	527	507	502	6016
GUAM WSMO	381	342	397	420	456	447	446	437	426	437	426	419	5034
JOHNSTON IS WSMO AP	375	336	378	390	440	459	499	515	495	499	432	397	5215
KOROR WSO	499	448	512	516	539	501	505	512	507	524	519	521	6103
KWAJALEIN MISSILE RNG	508	470	536	513	527	510	524	533	513	533	510	518	6195
KOSRAE	521	459	505	492	502	489	499	512	492	521	498	530	6020
MAJURO WSO AP	487	451	499	483	502	483	493	505	492	505	486	490	5876
MIDWAY SAND ISLAND	72	61	93	112	205	357	440	465	435	372	240	130	2982
PAGO PAGO WSO AP	493	451	502	474	471	444	428	431	438	465	459	487	5543
PONAPE WSO	496	454	508	486	502	477	477	484	465	484	474	499	5806
TRUK MOEN IS WSO AP	508	462	518	507	527	504	505	508	495	515	504	518	6071
WAKE ISLAND WSO AP	388	339	406	411	477	516	552	552	540	536	474	431	5622
YAP WSO AP	474	434	493	495	515	486	487	487	477	496	483	490	5817

051440 - CEDAREDGE
LAT: 3854N LON: 10756W ELV: 6244

MEAN TEMPERATURE

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
1961	26.9	33.7	39.9	46.6	57.9	69.1	71.9	70.7	56.2	49.6	35.7	23.7	48.5
1962	22.6	35.0	35.2	50.2	55.6	64.4	69.3	69.4	62.5	52.2	41.8	30.1	49.0
1963	18.0	36.0	38.3	47.4	60.5	64.2	72.8	69.2	64.8	56.3	41.1	28.0	49.7
1964	24.2	26.8	33.5	45.1	55.9	62.9	72.6	66.6	60.5	54.0	36.2	29.7	47.3
1965	32.0	31.5	35.5	46.8	53.7	61.6	69.4	67.0	56.8	51.8	41.7	33.2	48.4
1966	25.6	28.4	41.7	47.4	59.2	65.2	72.9	69.7	63.0	50.1	42.0	28.5	49.5
1967	27.5	33.8	44.8	47.3	55.3	62.7	72.1	69.9	62.7	52.4	39.4	22.9	49.2
1968	22.2	34.1	39.5	42.8	54.7	67.3	71.2	65.0	59.8	51.6	35.6	26.7	47.5
1969	31.1	31.1	35.4	50.7	61.5	62.4	73.0	72.8	63.0	43.5	36.0	31.1	49.3
1970	28.7	37.6	35.7	41.3	58.7	64.8	71.8	72.0	58.4	44.4	38.7	30.2	48.5
1971	28.2	30.8	38.0	46.2	53.8	67.1	72.2	71.3	58.4	48.8	35.8	25.6	48.0
1972	29.3	35.1	45.0	49.4	57.4	67.6	72.8	70.6	61.5	49.7	32.1	24.1	49.4
	20.1	29.7	38.0	43.5	55.7	63	70.2	69.6	59.8	50.5	40.2	27.9	
	21.0	24.7	44.0	45.8	59.8			67.9	61.3	51.9	37.1	25	
		30.3	37.8	43.5	53			7.9	60.5	50.7	35.4		
			37.1x	47				1.8		47.1			
			36.4							52			

REQUESTS FOR MICROFICHE COPIES OF THIS REPORT, AND MICROFICHE HAVING ADDITIONAL NORMALS STATISTICS, SHOULD BE ADDRESSED TO:

NATIONAL CLIMATIC DATA CENTER
151 PATTON AVENUE RM 120
ASHEVILLE, NC 28801-5001

(828) 271-4800

THE REQUESTED MICROFICHE WILL BE PROVIDED AT COST

1988													50.3
1989						66.4	74.8						50.5
1990	25.					70.3	72.6					22.2	50.4
61-90 NORMAL	26.4	32.			56.6	66.2	72.1	69.8			38.0	28.5	49.1
61-90 MEDIAN	26.9	32.9		47.4	56.2	65.8	72.3	69.9	62.0		38.1	28.8	49.3
70-90 MEAN	26.8	32.5	40.0	47.7	56.3	66.9	72.2	70.2	61.9	50.4	37.7	28.7	49.3
70-90 MEDIAN	27.7	32.4	39.4	47.7	56.4	67.1	72.4	70.4	61.8	50.7	37.9	29.0	49.6
80-90 MEAN	28.5	33.1	40.6	48.7	56.5	67.7	72.5	70.7	62.4	50.6	38.5	29.8	50.0
80-90 MEDIAN	27.8	34.3	40.1	49.5	56.5	68.6	72.6	70.7	62.6	50.9	38.3	29.6	50.3
61-90 SD	4.229	3.255	3.407	3.075	2.395	2.837	1.324	1.875	2.595	3.093	2.550	3.691	1.155
MAXIMUM	35.1	37.6	45.8	53.9	61.5	70.9	74.6	72.8*	65.6*	56.3	42.2	38.2	51.9
YR OF MAXIMUM	1981	1970	1989	1981	1969	1977	1989	1983	1990	1963	1981	1980	1981
MINIMUM	18.0	24.7	33.5	41.3	52.7	61.6	69.3	65.0	56.2	43.5	32.1	20.4	47.0
YR OF MINIMUM	1963	1974	1964	1970	1983	1965	1962	1968	1961	1969	1972	1978	1975
ESTIMATED VALUES	0	0	1	0	0	0	1	0	0	0	0	0	2
HEATING DEG DAYS	1197	913	791	525	267	72	0	11	137	443	810	1132	6298
COOLING DEG DAYS	0	0	0	0	7	108	220	160	38	0	0	0	533

051440 - CEDAREDGE
LAT: 3854N LON: 10756W ELV: 6244

TOTAL PRECIPITATION

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
1961	.07	.31	1.80	1.04	1.06	.09	.19	1.09	3.40	1.59	.65	.95	12.24
1962	.68	1.95	.73	1.37	.69	.58	1.31	.17	1.59	1.12	.79	.88	11.86
1963	1.28	.70	1.16	.50	.48	.35	1.01	1.23	.93	1.63	.86	.32	10.45
1964	.31	.21	1.22	1.75	1.98	.70	.31	2.91	.97	.00	1.25	1.49	13.10
1965	1.04	.82	1.10	1.40	1.52	1.16	1.58	2.00	2.71	.77	2.47	1.32	17.89
1966	.31	.67	.14	.79	1.32	.41	.39	.53	.36	.55	1.02	2.47	8.96
1967	.55	.14	.50	.31	1.08	1.04	1.21	1.74	1.53	.00T	.35	1.67	10.12
1968	.21	1.99	.59	.54	.98	.04	2.28	1.48	.07	.87	1.04	.90	10.99
1969	1.88	.83	.64	.16	.52	2.99	.73	.98	1.18	2.94	.50	.63	13.98
1970	.45	.05	1.92	.99	.06	2.04	.47	.87	4.18	1.58	.93	.87	14.41
1971	.53	.78	.11	1.42	1.23	.00T	.52	1.69	1.23	2.45	1.10	1.67	12.73
1972	.01	.00T	.08	.24	.32	.36	.17	.46	2.09	4.92	1.17	1.31	11.13
	1.07	.30	1.09	.43	1.60	2.[illegible]	.50	1.19	.28	.49	.55	.88	11.[illegible]
	2.07	.27	.43	1.05	.00T			.54	.60	1.32	.86	.71	
		.92	1.54	.53	1.[illegible]			.07	.29	.45	.53		
			.68	5[illegible]					.89	.21			
			.16							[illegible]			

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ASHEVILLE, NC 28801-5001

(828) 271-4800

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1988													.85
1989						.71	2.5[illegible]						10.58
1990	.8[illegible]					.25	1.23					.71	12.61
61-90 NORMAL	.88	.7[illegible]			1.14	.75	.96	1.19			1.13	1.06	12.83
61-90 MEDIAN	.73	.68		.69	1.10	.43	.89	1.15	.8[illegible]		1.03	.89	12.67
70-90 MEAN	.96	.77	1.37	.93	1.16	.72	.95	1.13	1.31	1.64	1.18	1.01	13.13
70-90 MEDIAN	.89	.62	1.28	.64	1.13	.40	.87	1.11	.71	1.51	1.09	.87	13.52
80-90 MEAN	.98	.89	1.65	1.07	1.34	.73	1.20	1.41	1.56	1.91	1.53	1.12	15.39
80-90 MEDIAN	.95	.62	1.39	.75	1.14	.40	1.10	1.39	.75	1.78	1.50	.92	15.61
MAXIMUM	2.23	2.50	3.17	2.79	3.05	2.99	2.52	2.91	4.18	4.92	2.72	3.26	19.99
YR OF MAXIMUM	1978	1980	1985	1985	1980	1969	1989	1964	1970	1972	1986	1983	1983
MINIMUM	.01	.00	.08	.16	.00	.00	.17	.05	.03	.00+	.05	.05	7.50
YR OF MINIMUM	1972	1972	1972	1969	1974	1971	1972	1985	1979	1967	1989	1976	1977
ESTIMATED VALUES	0	0	0	0	0	0	1	0	0	0	0	0	1
10 PERCENTILE	.15	.12	.24	.24	.25	.05	.29	.27	.15	.15	.27	.23	8.56
90 PERCENTILE	1.88	1.68	2.54	1.78	2.27	1.78	1.81	2.42	3.06	3.15	2.24	2.17	17.54