1. HYDROLOGICAL DATA
   1. RAINFALL

**Figure A.2** shows the distribution of the adopted rainfall gauges and the subdivision of the study area into several rainfall zones. Mean annual isohyets are also shown on the map. Mean annual precipitation (MAP) ranges from about 600 to 700 mm over most of the catchment with some areas (especially near Johannesburg) receiving more than 700 mm.

* + 1. Selection, patching and verification of rainfall records

The Water Resources 1990 (WR90) data base on monthly rainfall was used to provide the primary source of rainfall records for the study area. The distribution of WR90 rainfall stations over the Barrage catchment proved to be adequate for the present study.

The WR90 records terminate in September 1990. It was necessary, therefore, to update all records for gauges still open at that date. Updated information was obtained from the Weather Bureau, covering the 5-year period October 1990 to September 1995.

The WR90 records are all patched, therefore it was necessary to patch only the updated portions of the rainfall records. Patching of updated record segments was accomplished with the aid of the in-house program PATCHMP, in order to be consistent with the WR90 procedures. PATCHMP patches each target station individually. The program requests a radius in which candidate stations for patching should fall (usually set at 20 km). The user is also required to input a minimum period of overlap between target and candidate records (usually set at 10 years). PATCHMP then chooses up to nine candidate stations, ranked in order of preference, to patch the target station. Ranking is done on the basis of correlation coefficient obtained by linear regression on the target station record. Each month with missing (or partial) data is patched by regression on the highest ranked candidate station with complete data for the month.

After the updated records were patched, all records were tested for stationarity by plotting residual mass curves. These curves are derived by accumulating the difference between each annual rainfall minus the mean annual rainfall (MAP) for the entire record. In addition to visual inspection, the curves were subject to a statistical analysis to establish whether trends were statistically significant. The statistical tests required the transformation (to remove skewness) and standardisation of the original data.

**Figure C.1** in **Appendix C** contains the residual mass curve of station 0475761 which failed the test for stationarity initially. Following the stationarity test, the first part of the record from 1902 to 1940 was scrapped.

**Table 3.1** contains details of all 45 rainfall records selected for further analysis.

* + 1. Catchment rainfall inputs

The Barrage catchment was subdivided into 8 subcatchments for the purpose of model calibration, as shown in **Figure A.3** . The subdivisions were made in accordance with the locations of the more important streamflow and water quality gauges. Representative groups of rainfall stations were selected for each subcatchment (or rainfall zone) and the records were input to program HDYP08 to derive monthly time series of rainfall for each zone, expressed as percent of MAP. Each time series spans the period October 1920 to September 1995, viz. hydrological years 1920 through 1994.

The 8 monthly time series are presented in **Appendix C** with lists of stations used in each zone and a plot of the residual mass curves. The mass curves were produced to check the stationarity of each time series.

The time series were also checked for consistency among the various zones by comparing statistics, namely standard deviation, minimum annual rainfall and maximum annual rainfall. The years experiencing minimum and maximum rainfall were also noted. Results of this exercise are summarised in **Table 3.2**. It is of interest to note that 1991 (hydrological year) stands out as the driest of the 75-year period in many of the zones.

**Table 3.1: List of rainfall stations**

GAUGE NO STATION NAME LATITUDE LONGITUDE RECORD USED YEARS USABLE % MONTHS MAP

D M D M HYDRO YEARS DATA PATCHED (mm)

0402 788 OORSPRONG ‑ OOS 27 08 27 57 1919 1994 76 1.5 612.2

0403 062 MIDDEN 27 02 28 03 1929 1976 48 1.6 586.5

0438 315 BARRAGE ‑ RWB 26 45 27 41 1916 1994 79 2.1 680.1

0438 514 RIETSPRUIT 26 34 27 48 1930 1977 48 5.4 579.8

0438 533 PIETERSHOOGTE 26 53 27 48 1923 1982 60 58.1 658.7 #

1986 1988 3 8.3 664.1 #

0438 550 VANDERBIJLPARK ‑ YSKOR 26 40 27 49 1942 1994 53 23.1 651.7

0438 716 RIETFONTEIN 26 56 27 54 1915 1989 75 3.3 643.3

0438 734 VILJOENSDRIFT ‑ POL 26 44 27 55 1905 1994 90 36.8 625.9

0438 744 CLYDESDALE COLLIERY 26 54 27 55 1915 1956 42 1.8 676.3 #

1972 1994 23 6.2 608.3 #

0438 750 SCHAAPPLAATS 27 00 27 55 1916 1926 11 4.5 621.3 #

1933 1980 48 3.0 670.4 #

0439 003 MEYERTON 26 33 28 01 1969 1977 9 5.6 670.4 #

1984 1994 11 5.3 755.3 #

0439 203 VAALDAM ‑ POL 26 53 28 07 1970 1994 25 11.0 660.4

0439 396 SCHIKFONTEIN 26 36 28 14 1920 1994 75 1.3 686.6

0439 755 KRAAL ‑ SAR 26 35 28 26 1905 1965 61 3.8 666.4

0439 764 VLAKFONTEIN 26 44 28 26 1904 1980 77 1.8 692.8

0439 769 BEERLAAGTE 26 49 28 26 1904 1994 91 10.4 623.2

0440 129 BALFOUR ‑ MAG 26 39 28 35 1904 1994 91 3.4 688.8

0440 157 RIETBULT 26 37 28 36 1913 1994 82 2.9 708.4

0440 637 RASRANT 26 37 28 52 1934 1976 43 1.6 730.6

0475 174 KLOOF ‑ GM 26 24 27 36 1966 1994 29 5.2 716.1

0475 477 ELDORADO 26 27 27 46 1929 1974 46 38.4 586.9

0475 528 ZUURBEKOM ‑ RWB 26 18 27 48 1899 1994 96 48.2 666.0

0475 611 DURBAN ROODEPOORT DEEP ‑ GM 26 11 27 51 1904 1994 91 4.9 780.8

0475 717 DOORNKUIL 26 27 27 54 1925 1994 70 2.6 623.8

0475 736 KLIPSPRUIT ‑ PUR 26 16 27 55 1907 1994 88 2.5 693.8

0475 761 MARAISBURG ‑ GM 26 11 27 56 1941 1979 39 3.0 787.5

0476 111 ZWARTKOPJES ‑ RWB 26 21 28 04 1906 1994 89 56.8 678.3

0476 044 JOHANNESBURG ‑ TURFFONTEIN 26 14 28 02 1913 1994 82 2.1 735.5

0476 145 KLIPRIVIER ‑ POL 26 25 28 05 1940 1994 55 44.4 624.3

0476 163 ROSHERVILLE ‑ POW 26 13 28 06 1905 1994 90 6.3 734.4

0476 283 GERMISTON ‑ F J PAYNE PARK 26 13 28 10 1908 1989 82 4.9 730.1

0476 378 RONDEBULT ‑ PUR 26 18 28 13 1936 1977 42 4.4 650.5

0476 386 TAMBOEKIESFONTEIN 26 26 28 13 1963 1981 19 7.0 666.1

0476 403 EAST RAND ‑ GM 26 13 28 14 1904 1994 91 8.7 725.0

0476 563 GLEN ROY 26 23 28 19 1905 1946 42 10.3 662.1

0476 580 BENONI ‑ COUNTRY CLUB 26 10 28 20 1965 1994 30 4.2 715.0

0476 630 HEIDELBERG I 26 30 28 21 1905 1994 90 6.3 694.2

0476 644 BRAKPAN ‑ MUN 26 14 28 22 1921 1985 65 2.1 732.3

0476 666 PETIT ‑ POL 26 06 28 23 1969 1994 26 1.6 684.2

0476 736 SPRINGS ‑ RWB 26 16 28 25 1909 1968 60 4.2 709.6 #

1971 1994 24 1.4 694.9 #

0476 766 SPRINGS ‑ OLYMPIA PARK 26 16 28 26 1919 1994 76 2.9 720.6

0476 802 SUB ‑ NIGEL ‑ GM 26 22 28 27 1910 1973 64 2.0 693.9

0476 835 NIGEL ‑ 1 26 25 28 28 1905 1977 73 40.0 705.7 #

1989 1994 6 1.4 632.1 #

0477 191 DROOGEFONTEIN 26 11 28 37 1928 1987 60 1.5 676.6

0477 501 DEVON ‑ POL 26 21 28 47 1907 1948 42 7.3 613.8 #

1956 1994 39 1.7 677.9 #

! Record rejected owing to bad mass curve, unreliable entries or too many zeroes in wet season

# Record split into blocks with different MAPs

+ Record has at least one break

**Table 3.2: Comparison of statistics of rainfall time series**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Rainfall**  **zone and quaternaries** | **Standard**  **deviation**  **(% MAP)** | **Lowest annual rainfall** | | **Highest annual rainfall** | |
| **(% MAP)** | **(Year)** | **(% MAP)** | **(Year)** |
| B01 (C21A,B&C) | 17.7 | 60 | 1991 | 141 | 1966 |
| B02 (C21D,E&F) | 19.1 | 63 | 1982 | 147 | 1986 |
| B03 (C21G&C22E) | 19.7 | 61 | 1991 | 141 | 1975 |
| B04 (C22B&C) | 18.3 | 57 | 1991 | 148 | 1986 |
| B05 (C22A&D) | 19.0 | 53 | 1991 | 138 | 1924 |
| B06 (C22H&J) | 17.9 | 61 | 1991 | 138 | 1949 |
| B07 (C22F,G&K) | 17.5 | 61 | 1932 | 141 | 1943 |
| B (Total)  (C21&C22) | 16.9 | 61 | 1991 | 136 | 1966 |

Note: The rainfall zones given are not WRSM90 rainfall zones

**APPENDIX C**

**RAINFALL**

**Page**

**Trend plot for station 0475761.mp C.1**

**Average rainfall on catchment of gauge B01 C.2**

**Average rainfall on catchment of gauge B02 C.4**

**Average rainfall on catchment of gauge B03 C.6**

**Average rainfall on catchment of gauge B04 C.8**

**Average rainfall on catchment of gauge B05 C.10**

**Average rainfall on catchment of gauge B06 C.12**

**Average rainfall on catchment of gauge B07 C.14**

**Figure C.1 Trend plot for station 0475761**



AVERAGE RAINFALL ON CATCHMENT OF GAUGE B01

DETAILS OF RAINFALL STATIONS USED

SECTION POSITION MAP(mm) PERIOD OF RECORD LATITUDE LONGITUDE

439 396 687 1920 TO 1994 26.36 28.14

439 755 666 1905 TO 1965 26.35 28.26

439 764 693 1904 TO 1980 26.44 28.26

439 769 623 1904 TO 1994 26.49 28.26

440 129 689 1904 TO 1994 26.39 28.35

440 157 708 1913 TO 1994 26.37 28.36

440 637 731 1934 TO 1976 26.37 28.52

477 501 614 1907 TO 1948 26.21 28.47

477 501 678 1956 TO 1994 26.21 28.47



RAINFALL INPUT AS PERCENT M.A.P.

NO. GAUGES OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP YEAR

1920 7 23.40 13.78 13.13 14.13 13.56 24.75 1.19 3.89 .06 .00 .00 2.89 110.77

1921 7 9.80 16.81 16.18 12.94 11.55 13.13 .54 2.07 1.17 .00 5.41 3.25 92.84

1922 7 12.33 22.54 10.39 23.87 6.01 7.17 4.38 .21 .89 3.31 .10 .91 92.10

1923 7 3.10 11.37 13.41 14.04 12.52 17.83 2.10 3.27 .13 .00 .87 9.23 87.85

1924 7 7.98 17.08 22.66 12.23 9.18 22.14 13.54 5.74 .68 .00 .00 5.26 116.49

1925 7 4.46 12.00 5.63 17.24 9.80 7.48 .51 4.04 1.43 .93 .00 3.43 66.94

1926 7 6.28 9.99 12.17 14.45 17.73 11.59 .61 .20 .00 6.69 .03 .15 79.88

1927 7 14.67 3.33 12.58 20.96 12.17 10.84 2.30 1.26 .14 .00 1.15 3.59 82.99

1928 7 6.82 16.12 6.15 23.46 22.83 13.73 3.82 2.13 6.67 .23 3.11 15.98 121.05

1929 7 15.52 17.52 18.11 16.03 14.75 10.25 3.90 1.10 .13 3.66 2.08 .06 103.12

1930 7 2.09 9.85 19.13 19.15 11.07 5.69 13.49 .00 .00 4.48 .00 .00 84.94

1931 7 5.33 15.18 10.64 8.73 14.34 14.33 2.29 4.03 .21 .00 .00 8.05 83.13

1932 7 4.07 11.02 15.66 7.08 9.43 12.97 5.98 .05 1.55 .11 .00 2.65 70.56

1933 7 2.16 40.95 17.41 29.51 6.66 9.12 4.53 9.21 2.25 2.34 2.34 1.43 127.91

1934 8 11.19 21.78 9.38 6.27 11.29 16.39 2.34 1.02 .01 .00 .46 .36 80.49

1935 8 4.41 4.29 15.19 18.68 13.83 20.59 5.42 21.16 .00 .00 .00 4.09 107.66

1936 8 7.38 30.35 10.10 25.51 18.03 7.89 2.44 .30 .00 .06 .06 .89 103.02

1937 8 5.48 5.02 20.29 18.60 8.38 2.03 11.19 .40 1.35 .82 1.83 5.33 80.71

1938 8 11.67 5.23 25.11 18.11 20.96 11.93 1.02 5.49 .00 7.79 3.73 2.73 113.78

1939 8 8.39 29.14 15.29 16.88 9.96 9.50 3.98 4.16 4.57 .00 .28 5.52 107.66

1940 8 4.06 23.10 22.23 11.29 19.53 9.76 11.03 .00 .00 .24 .00 1.90 103.14

1941 8 6.82 2.47 12.94 21.99 12.24 9.43 3.24 1.10 2.26 .00 4.84 4.46 81.80

1942 8 14.62 13.13 29.11 9.95 10.06 10.37 16.57 8.07 .29 10.11 2.97 4.96 130.20

1943 8 15.14 13.66 16.87 15.76 34.77 4.33 .48 1.75 8.53 .00 .00 8.39 119.68

1944 8 15.29 13.12 5.91 7.97 17.83 20.41 1.96 2.93 .06 .12 .00 .00 85.59

1945 8 2.35 7.45 9.53 21.48 11.14 16.26 1.52 2.89 .00 .04 .02 .03 72.69

1946 8 8.17 12.71 15.50 17.24 17.59 13.09 6.80 .03 .42 1.24 .03 .53 93.34

1947 8 5.95 10.22 18.87 19.24 5.68 14.79 8.12 1.71 .00 .07 .00 2.29 86.94

1948 8 9.77 13.75 3.12 22.18 8.75 9.04 1.47 2.05 .56 .08 .01 2.47 73.24

1949 7 16.65 30.21 26.80 8.31 7.46 19.41 4.93 8.94 1.07 .55 .65 .21 125.17

1950 7 7.63 6.43 19.98 8.32 12.14 8.92 7.52 9.03 .28 .23 2.60 1.01 84.09

1951 7 20.57 8.33 16.53 14.78 9.02 3.36 4.73 .63 1.21 7.86 .04 .08 87.14

1952 7 4.10 20.35 15.33 7.19 28.41 12.19 6.42 3.12 .26 .00 .01 .11 97.50

1953 7 4.61 20.24 9.65 22.45 11.29 13.56 6.49 2.87 .38 .01 .01 3.10 94.68

1954 7 8.25 25.45 14.72 27.81 26.39 9.56 11.33 3.46 .23 .02 .34 .00 127.56

1955 7 11.72 26.38 23.62 10.00 14.46 15.39 .85 9.19 .02 .19 .00 3.82 115.63

1956 8 15.40 14.74 17.86 11.97 10.28 12.67 6.14 .86 2.31 9.29 2.36 18.07 121.92

1957 8 16.08 9.85 10.62 19.99 4.23 10.82 17.88 .56 .11 .00 .00 12.50 102.65

1958 8 4.80 17.88 15.57 17.28 10.04 4.06 8.51 4.84 .11 1.12 .00 .81 85.00

1959 8 12.58 13.23 21.53 7.19 17.46 12.03 10.36 .10 .15 .04 2.31 .70 97.68

1960 8 11.30 11.47 25.01 18.01 10.40 9.01 19.00 2.76 1.49 .06 .03 3.80 112.33

1961 8 8.34 13.51 12.18 12.51 12.77 7.69 7.37 .00 .00 .00 .90 6.95 82.23

1962 8 6.65 25.15 8.53 23.06 7.16 9.59 8.25 2.73 8.62 4.13 .00 .57 104.42

1963 8 7.92 21.11 7.69 28.33 6.89 7.56 9.54 .67 1.32 .00 1.70 2.05 94.78

1964 8 22.60 6.64 17.52 19.74 9.90 3.12 8.04 .23 .38 3.24 .43 .32 92.15

1965 8 4.00 8.96 13.30 10.03 21.75 1.36 1.52 1.28 .76 .00 .47 2.30 65.73

1966 7 11.78 15.78 20.06 29.17 26.26 18.43 13.03 1.98 .28 .00 2.54 2.10 141.42

1967 7 10.93 10.69 19.57 10.71 7.01 15.03 8.44 1.85 .00 .00 1.05 .53 85.83

1968 7 5.98 12.43 13.10 10.53 7.09 15.07 4.56 9.60 .00 .00 .34 3.37 82.08

1969 7 19.12 15.53 17.75 13.78 16.16 5.57 2.50 3.51 2.01 1.90 1.09 2.77 101.69

1970 7 14.20 18.39 14.33 21.33 13.70 11.31 19.23 3.15 2.24 .27 .00 4.99 123.14

1971 7 10.18 19.24 18.71 28.38 8.85 16.82 3.27 1.91 .63 .00 1.24 2.01 111.25

1972 7 7.28 14.96 11.82 12.67 16.24 9.23 8.18 .56 .00 .00 3.58 9.71 94.25

1973 7 9.48 20.46 23.89 20.69 15.50 6.36 11.08 1.97 .72 .16 .20 1.44 111.96

1974 7 4.97 23.12 17.87 36.21 21.30 9.74 13.35 1.11 .91 .10 .20 2.37 131.25

1975 7 7.78 23.01 17.95 18.65 14.99 12.24 7.82 10.25 .01 .00 .03 3.23 115.96

1976 7 15.98 13.90 22.65 22.16 6.27 12.11 2.27 .27 .00 .00 .22 10.69 106.53

1977 6 13.39 10.85 20.33 32.18 15.08 8.99 5.99 .34 .04 .00 1.49 4.91 113.59

1978 6 18.94 8.67 8.47 13.28 8.66 11.55 4.16 2.07 .59 2.38 9.57 6.73 95.08

1979 6 15.05 23.53 11.30 29.52 15.48 3.25 5.17 .66 .00 .00 1.56 6.21 111.73

1980 6 4.46 23.15 20.32 19.45 23.67 14.20 4.39 .20 .71 .00 2.27 7.35 120.17

1981 5 9.14 15.99 15.12 20.33 4.59 6.07 5.34 .00 .03 1.85 .00 1.72 80.18

1982 5 14.33 10.24 11.14 19.31 6.52 6.56 3.34 1.81 4.04 1.37 2.44 1.71 82.81

1983 5 14.47 21.05 20.15 13.56 3.87 10.91 1.59 .13 .97 1.66 3.27 2.04 93.66

1984 5 10.00 15.04 11.19 18.00 11.71 11.16 .47 2.67 .01 .48 .94 2.69 84.36

1985 5 15.71 10.61 16.57 15.40 10.18 10.05 8.34 .00 3.67 .00 3.11 .22 93.86

1986 5 15.72 14.12 25.56 14.30 12.42 12.92 3.53 .63 .13 .00 1.65 20.85 121.83

1987 5 16.78 22.29 16.74 18.50 8.70 14.58 5.23 .28 2.23 1.08 .10 6.80 113.30

1988 5 22.17 13.90 7.22 17.04 27.02 3.85 4.47 2.29 5.31 .06 1.73 .44 105.51

1989 5 5.90 25.49 16.91 9.02 13.72 18.32 15.79 1.60 .06 .10 .04 .95 107.91

1990 5 5.85 6.72 14.07 20.77 14.19 16.43 .00 .03 .82 .00 .00 .97 79.86

1991 5 8.31 6.10 14.61 9.81 8.55 7.63 .48 .00 .25 .00 4.20 .09 60.03

1992 5 3.39 20.06 16.18 9.94 11.58 10.83 5.59 .80 .00 .00 .22 6.62 85.21

1993 5 31.34 12.98 13.57 12.93 12.04 9.54 6.55 1.84 .00 .00 .02 1.20 102.00

1994 5 8.30 8.78 13.97 13.47 8.03 15.34 7.09 1.94 .00 .00 1.22 .57 78.72

AVERAGE 10.44 15.47 15.60 17.11 13.08 11.22 6.09 2.60 1.04 1.07 1.14 3.63 98.48

ADJUSTED 10.60 15.70 15.84 17.37 13.28 11.39 6.19 2.64 1.05 1.09 1.16 3.69 100.00

STD.DEV. 5.77 7.20 5.35 6.56 6.10 4.80 4.67 3.38 1.79 2.22 1.64 4.13 17.73

AVERAGE RAINFALL ON CATCHMENT OF GAUGE B02

DETAILS OF RAINFALL STATIONS USED

SECTION POSITION MAP(mm) PERIOD OF RECORD LATITUDE LONGITUDE

439 396 687 1920 TO 1994 26.36 28.14

439 755 666 1905 TO 1965 26.35 28.26

476 563 662 1905 TO 1946 26.23 28.19

476 580 715 1965 TO 1994 26.10 28.20

476 630 694 1905 TO 1994 26.30 28.21

476 644 732 1921 TO 1985 26.14 28.22

476 666 684 1969 TO 1994 26.06 28.23

476 766 721 1919 TO 1994 26.16 28.26

476 802 694 1910 TO 1973 26.22 28.27

476 835 706 1905 TO 1977 26.25 28.28

476 835 632 1989 TO 1994 26.25 28.28

477 191 677 1928 TO 1987 26.11 28.37



RAINFALL INPUT AS PERCENT M.A.P.

NO. GAUGES OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP YEAR

1920 7 17.91 15.82 11.09 17.33 12.74 29.45 1.46 4.32 .16 .00 .00 2.04 112.31

1921 8 10.18 17.28 15.52 15.12 9.54 13.42 1.26 1.98 1.83 .00 4.68 3.48 94.28

1922 8 10.07 22.17 14.78 27.84 9.62 11.09 3.96 .18 1.36 2.89 .05 1.21 105.23

1923 8 2.99 11.07 8.58 16.05 12.75 20.98 1.59 3.47 .01 .00 .63 6.71 84.84

1924 8 5.45 15.61 16.81 14.62 11.70 22.22 15.78 5.37 .52 .00 .10 5.34 113.51

1925 8 4.60 11.31 10.81 19.94 11.06 8.37 .78 4.53 .47 1.21 .00 2.60 75.66

1926 8 5.73 10.50 13.77 14.52 15.07 9.40 1.81 .21 .00 6.41 .07 .09 77.59

1927 8 16.31 4.10 12.59 18.80 15.98 10.27 3.32 2.10 .10 .00 1.46 2.48 87.51

1928 9 6.49 16.17 8.05 20.30 21.09 14.83 3.79 1.72 5.73 .17 .54 14.82 113.70

1929 9 17.50 19.53 19.73 17.95 20.09 10.97 1.79 1.76 .07 2.00 2.09 .04 113.50

1930 9 2.18 8.71 16.76 20.70 11.57 5.77 11.45 .00 .00 5.81 .00 .00 82.95

1931 9 6.48 14.55 10.88 11.67 19.36 14.23 2.02 3.42 .12 .00 .02 5.83 88.57

1932 9 5.71 13.44 11.78 8.89 5.97 12.22 5.44 .05 1.33 .06 .00 1.94 66.83

1933 9 1.38 41.71 26.49 23.12 8.93 10.84 6.92 6.59 1.34 3.04 3.10 2.38 135.84

1934 9 9.08 24.23 12.16 8.43 9.11 14.30 1.96 .56 .01 .01 .77 .79 81.40

1935 9 4.20 3.70 13.89 14.09 17.33 19.78 5.69 21.18 .00 .01 .00 3.25 103.11

1936 9 5.64 26.98 6.82 19.12 19.97 5.93 3.58 .32 .00 .08 .00 1.01 89.46

1937 9 5.11 3.71 19.77 16.20 8.65 5.66 11.75 .62 1.11 1.17 1.62 3.56 78.94

1938 9 11.20 5.13 24.60 15.06 22.15 13.72 .82 5.99 .11 8.67 2.88 2.76 113.10

1939 9 8.55 33.32 15.39 11.97 10.45 9.28 5.00 3.57 4.48 .00 .23 8.22 110.45

1940 9 3.16 20.23 24.15 17.30 11.39 11.14 12.13 .01 .01 .18 .00 2.03 101.74

1941 9 5.76 2.83 14.40 22.53 12.96 11.81 5.41 1.84 2.39 .00 4.41 4.74 89.08

1942 9 15.87 14.80 31.83 7.55 9.60 10.97 16.61 7.12 .16 9.30 3.91 6.91 134.62

1943 9 11.85 11.68 23.72 19.38 42.76 4.74 2.21 1.33 8.48 .00 .00 9.15 135.30

1944 9 16.45 14.45 4.84 12.72 15.93 19.01 2.07 2.97 .00 .33 .00 .00 88.76

1945 9 3.55 8.40 9.18 26.21 13.95 12.30 2.67 2.98 .00 .02 .00 .01 79.28

1946 9 6.62 14.83 15.71 15.19 20.99 17.85 4.50 .03 .49 .11 .03 1.02 97.37

1947 8 5.11 12.67 21.01 17.00 7.69 15.82 9.25 2.93 .00 .33 .00 1.55 93.35

1948 8 10.89 13.52 5.49 25.28 11.02 7.92 4.01 .28 1.08 .01 .00 1.86 81.34

1949 8 13.72 32.61 30.65 12.02 7.30 19.25 4.89 9.07 .89 .29 .23 .15 131.08

1950 8 5.80 8.86 23.97 8.04 8.00 8.67 8.16 8.85 .06 .29 2.98 1.47 85.15

1951 8 15.16 5.18 15.38 17.71 9.74 7.43 5.39 .62 1.26 5.29 .14 .07 83.37

1952 8 3.61 22.15 19.30 8.14 25.81 13.96 5.50 2.78 .11 .00 .03 .04 101.44

1953 8 7.20 20.29 11.00 19.72 10.72 9.66 6.37 2.88 .26 .00 .03 3.13 91.27

1954 8 3.96 23.31 8.04 30.63 26.44 7.93 10.50 4.27 .33 .01 .13 .04 115.60

1955 8 8.26 20.98 23.96 7.35 17.87 14.65 1.19 11.70 .31 .24 .10 3.63 110.26

1956 8 15.05 15.19 16.62 16.72 14.13 12.13 4.10 1.90 2.76 8.32 2.41 15.31 124.66

1957 8 15.75 10.71 8.92 17.84 7.72 12.38 18.07 .62 .13 .00 .02 11.67 103.85

1958 8 5.16 16.77 16.37 16.01 8.74 6.29 8.74 3.58 .35 .94 .02 .65 83.61

1959 8 11.34 17.02 20.94 8.54 12.31 11.81 11.63 .18 .21 .00 1.46 .41 95.84

1960 8 9.11 14.06 23.04 15.38 13.61 13.81 11.79 4.63 .88 .09 .02 2.90 109.33

1961 8 8.86 13.27 12.44 10.42 16.65 7.93 8.42 .23 .06 .00 .30 4.14 82.72

1962 8 5.71 22.61 13.65 23.22 5.64 7.99 9.08 2.91 8.48 3.08 .02 .70 103.11

1963 8 10.63 22.26 10.73 28.10 7.18 6.42 8.46 .57 .97 .00 1.40 2.93 99.66

1964 8 24.87 7.44 15.05 20.89 7.98 2.59 10.74 1.61 .25 3.61 .06 .24 95.35

1965 9 3.10 8.28 13.27 12.49 19.35 1.41 2.58 1.74 .58 .00 .45 2.38 65.61

1966 8 14.33 13.67 20.02 30.82 20.29 20.55 13.67 1.90 .74 .00 1.42 1.16 138.56

1967 8 11.70 9.83 20.55 12.98 8.61 19.69 10.88 2.11 .04 .00 1.14 .14 97.67

1968 8 5.80 13.95 11.84 12.04 6.44 22.38 6.08 9.40 .05 .01 .47 3.34 91.78

1969 9 17.92 20.02 19.19 18.84 15.22 5.67 6.22 3.29 1.11 2.07 1.25 3.04 113.83

1970 9 10.67 17.50 13.79 21.32 11.95 13.02 18.06 3.32 2.22 .16 .03 5.21 117.25

1971 9 10.57 18.37 18.04 36.52 6.07 11.36 4.42 1.26 .27 .00 .44 1.57 108.89

1972 9 11.00 11.09 11.00 11.83 7.01 12.35 10.45 .02 .02 .00 2.26 10.33 87.34

1973 9 11.06 13.56 18.59 15.01 10.11 13.26 15.11 1.12 .35 .04 .13 1.53 99.86

1974 8 5.09 22.40 13.63 41.38 20.80 12.18 13.70 1.54 1.07 .12 .29 1.39 133.59

1975 8 5.32 23.51 21.01 17.95 17.02 16.70 7.62 12.48 .01 .07 .02 2.39 124.09

1976 8 15.73 11.76 12.35 19.01 8.43 15.24 3.00 .63 .01 .01 .20 8.33 94.70

1977 8 13.24 14.84 17.21 45.15 18.65 12.76 6.13 .92 .05 .01 1.44 3.78 134.18

1978 7 12.66 5.46 10.75 8.96 7.23 9.65 5.24 2.10 .64 2.47 7.55 5.07 77.78

1979 7 10.35 26.58 17.99 31.27 19.27 5.99 2.26 .37 .00 .00 1.17 9.33 124.57

1980 7 2.61 20.62 16.39 20.25 19.64 12.89 5.01 .10 .71 .00 1.42 6.88 106.51

1981 7 11.08 9.42 13.22 18.12 6.08 6.64 3.24 .23 .06 1.63 .00 1.46 71.18

1982 7 7.51 6.38 11.99 11.07 6.23 5.60 2.97 1.61 3.94 1.07 1.60 2.55 62.53

1983 7 10.45 19.05 24.05 12.78 3.62 10.86 1.67 .15 1.13 1.79 .47 1.61 87.62

1984 7 14.25 16.56 5.82 16.82 9.53 9.73 .07 1.06 .04 .52 .99 3.51 78.90

1985 7 19.22 8.86 16.13 15.15 12.18 10.44 6.03 .00 3.65 .00 1.81 .29 93.77

1986 6 18.55 17.57 26.14 16.81 15.48 24.04 2.52 .10 .00 .00 3.42 22.08 146.71

1987 6 12.80 23.22 16.17 12.30 10.14 13.99 3.81 .33 2.00 .73 .11 6.88 102.46

1988 5 15.55 8.25 9.98 17.87 26.11 5.67 6.12 1.12 4.36 .08 1.71 .33 97.13

1989 6 7.64 25.98 11.38 8.91 11.96 16.78 16.80 1.47 .11 .19 .15 .99 102.34

1990 6 5.84 4.26 17.17 19.38 14.43 27.29 .14 .15 .82 .00 .02 1.80 91.31

1991 6 8.59 8.08 12.89 11.85 12.61 6.00 1.30 .00 .30 .00 3.49 .58 65.70

1992 6 4.47 17.62 18.12 15.37 12.22 13.46 3.63 .11 .00 .00 .16 5.14 90.29

1993 6 25.34 14.21 19.60 20.53 21.53 16.14 3.21 .00 .00 .00 .27 1.13 121.96

1994 6 11.90 12.16 19.91 9.06 9.10 21.72 9.70 .87 .00 .00 1.15 1.27 96.85

AVERAGE 9.79 15.31 15.85 17.57 13.42 12.41 6.32 2.58 .97 1.00 .95 3.45 99.61

ADJUSTED 9.83 15.37 15.91 17.63 13.47 12.46 6.34 2.59 .98 1.00 .95 3.46 100.00

STD.DEV. 5.22 7.38 5.69 7.37 6.37 5.57 4.62 3.48 1.71 2.08 1.39 3.97 19.11

AVERAGE RAINFALL ON CATCHMENT OF GAUGE B03

DETAILS OF RAINFALL STATIONS USED

SECTION POSITION MAP(mm) PERIOD OF RECORD LATITUDE LONGITUDE

438 734 626 1905 TO 1994 26.44 27.55

439 3 670 1969 TO 1977 26.33 28.01

439 3 755 1984 TO 1994 26.33 28.01

439 396 687 1920 TO 1994 26.36 28.14

475 717 624 1925 TO 1994 26.27 27.54

476 145 624 1940 TO 1994 26.25 28.05



RAINFALL INPUT AS PERCENT M.A.P.

NO. GAUGES OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP YEAR

1920 2 23.22 15.17 12.65 23.97 8.68 23.99 .84 4.54 .71 .00 .00 3.58 117.35

1921 2 14.59 22.46 22.15 18.20 8.60 9.39 .73 1.82 .93 .00 3.36 4.40 106.63

1922 2 14.23 25.11 9.03 29.37 8.57 7.36 7.24 1.03 1.32 3.81 .19 1.29 108.56

1923 2 2.84 7.75 8.46 11.09 5.59 15.79 1.18 3.11 .04 .00 .71 9.76 66.32

1924 2 8.21 15.38 16.67 16.93 10.56 23.68 13.84 9.23 1.43 .00 .00 5.86 121.78

1925 3 7.21 10.16 7.14 18.09 9.31 10.93 .50 4.95 1.10 2.59 .00 5.07 77.05

1926 3 7.93 11.04 10.48 18.65 10.07 13.29 3.29 .00 .00 6.92 .07 .14 81.88

1927 3 13.49 6.71 12.52 29.16 18.51 7.34 5.77 .51 .37 .00 2.47 2.49 99.33

1928 3 10.45 17.15 7.79 20.57 23.65 13.97 7.10 4.00 11.52 .02 .67 15.99 132.87

1929 3 12.23 22.22 24.65 19.72 18.51 16.96 5.37 1.50 .27 .57 1.96 .00 123.96

1930 3 5.25 12.46 18.64 18.78 21.47 8.26 14.83 .11 .15 4.93 .00 .03 104.90

1931 3 6.17 14.66 16.22 7.20 25.98 13.52 2.21 4.56 .14 .00 .00 7.19 97.85

1932 3 6.61 11.51 16.68 5.42 4.70 9.76 5.23 .25 .85 .00 .00 2.10 63.10

1933 3 1.74 43.39 15.10 27.77 5.69 8.21 4.47 7.92 1.15 1.74 2.41 1.08 120.68

1934 3 14.23 24.85 15.32 3.76 9.85 13.17 3.17 .91 .00 .00 .21 .61 86.08

1935 3 2.13 1.95 14.74 12.38 10.83 13.50 4.76 21.53 .00 .00 .00 1.70 83.54

1936 3 8.59 33.77 6.14 21.49 16.47 10.28 9.09 .12 .00 .00 .00 .00 105.96

1937 3 3.86 4.31 18.69 18.23 10.72 2.54 8.86 .87 .95 .72 1.08 3.95 74.79

1938 3 9.20 2.58 23.13 12.75 23.86 14.20 .57 6.98 .00 9.37 3.74 3.65 110.03

1939 3 7.53 27.02 13.96 7.67 10.72 13.87 4.30 2.51 3.71 .00 .12 5.72 97.12

1940 4 3.43 12.02 22.60 12.50 15.14 10.32 7.79 .12 .01 .00 .03 1.63 85.58

1941 4 10.15 4.32 12.38 26.33 11.75 15.10 3.02 1.29 1.44 .00 3.24 2.14 91.17

1942 4 12.11 11.26 31.02 6.39 8.05 8.49 13.49 6.16 .13 8.45 3.65 8.31 117.52

1943 4 18.78 13.13 18.14 16.85 48.25 2.07 .25 1.19 11.50 .04 .06 9.76 140.03

1944 4 16.24 9.91 5.26 11.28 13.38 26.00 1.46 3.00 .01 .11 .06 .22 86.92

1945 4 3.51 5.64 7.76 24.71 15.82 13.74 3.12 4.16 .02 .04 .06 .22 78.81

1946 4 9.89 11.00 10.98 15.87 17.62 15.89 6.15 .08 .61 .14 .06 .49 88.79

1947 4 5.43 10.39 19.27 15.43 12.67 12.21 9.94 3.58 .02 .60 .06 1.78 91.39

1948 4 10.26 12.66 7.87 22.76 10.28 8.93 3.29 .27 1.87 .21 .06 2.07 80.53

1949 4 10.99 30.77 27.82 8.33 11.41 22.51 4.71 11.50 1.45 1.33 .37 .22 131.40

1950 4 10.96 11.63 23.90 8.38 9.19 11.48 6.10 10.11 .12 .58 2.64 1.35 96.44

1951 4 19.19 5.11 16.40 17.34 14.70 6.15 3.42 .87 1.23 7.90 .08 .22 92.63

1952 4 6.23 23.87 19.38 9.27 23.31 16.39 5.60 1.21 .12 .08 .11 .22 105.77

1953 4 6.56 20.14 8.22 16.45 13.54 5.93 6.59 2.20 .57 .04 .06 3.16 83.45

1954 4 6.40 21.30 9.99 29.85 28.83 11.00 14.78 3.59 .00 .21 .06 .00 126.01

1955 4 11.62 19.81 20.10 5.65 17.41 14.28 .79 8.52 .01 .08 .08 3.78 102.13

1956 4 16.44 10.76 14.63 13.40 16.78 12.57 3.74 .63 3.74 7.03 1.99 14.75 116.46

1957 4 12.55 11.76 9.17 17.11 9.00 15.30 14.60 .52 .12 .04 .08 8.97 99.22

1958 4 4.11 15.82 15.00 15.90 11.38 4.55 8.43 4.24 .20 1.21 .08 1.19 82.10

1959 4 13.78 12.93 10.32 8.25 11.95 11.44 8.69 .14 .16 .04 2.01 .76 80.49

1960 4 8.40 13.97 32.14 13.34 6.69 7.24 16.56 5.07 1.26 .15 .08 1.23 106.14

1961 4 5.09 13.40 15.04 7.87 16.99 8.77 7.80 .10 .01 .04 .78 5.24 81.12

1962 4 6.81 25.74 7.86 19.20 3.90 10.47 7.62 2.34 6.10 3.13 .08 .76 94.01

1963 4 9.88 21.10 10.29 24.25 8.09 10.86 4.52 .85 2.18 .04 .68 2.06 94.80

1964 4 18.81 6.14 14.27 18.77 8.59 1.94 14.08 .61 .13 2.81 .08 .65 86.87

1965 4 3.68 11.17 15.58 15.75 22.47 2.37 1.05 1.14 .86 .04 .41 2.56 77.07

1966 4 13.49 12.47 16.50 27.47 20.29 26.68 11.83 2.93 .01 .04 1.32 3.57 136.62

1967 4 14.61 13.46 18.05 9.42 6.17 18.30 14.22 2.27 .02 .04 .89 .45 97.89

1968 4 6.00 15.95 12.67 8.38 5.23 12.83 4.25 10.46 .00 .10 .44 2.38 78.69

1969 5 18.61 15.58 17.12 14.13 11.67 5.18 3.03 3.33 1.18 1.96 .16 2.30 94.26

1970 5 8.83 16.50 15.68 20.10 13.68 12.85 22.09 3.18 1.81 .29 .00 4.73 119.74

1971 5 7.21 20.59 13.36 21.34 7.38 19.36 6.76 3.24 .85 .00 .28 1.03 101.39

1972 5 6.60 17.48 12.62 14.09 6.51 11.04 12.49 .37 .00 .00 2.08 8.59 91.86

1973 5 6.09 17.28 20.28 18.33 19.45 6.27 12.29 2.14 .54 .18 .10 .77 103.73

1974 5 11.02 20.34 20.63 30.91 26.49 14.99 12.09 1.05 .48 .10 .58 1.59 140.27

1975 5 7.87 22.71 23.38 24.33 18.17 18.70 10.43 9.38 .00 .00 .00 5.56 140.53

1976 5 18.19 10.03 17.47 27.34 12.02 17.33 1.79 .01 .00 .00 .00 11.10 115.27

1977 5 15.07 11.15 18.62 36.66 16.93 13.51 4.23 1.08 .02 .00 1.87 6.91 126.05

1978 4 18.38 7.18 11.10 9.57 6.20 8.37 4.62 2.95 .91 2.42 9.40 7.16 88.25

1979 4 16.05 27.71 18.87 29.70 18.10 3.95 6.78 .19 .00 .00 .58 6.97 128.90

1980 4 6.38 21.81 17.13 26.61 25.03 12.61 4.19 .11 .42 .00 3.51 7.11 124.91

1981 4 7.97 13.77 16.89 21.78 5.60 7.45 3.12 .00 .00 1.82 .00 2.54 80.93

1982 4 12.86 4.78 14.73 9.10 8.45 6.81 5.73 1.97 4.69 1.60 2.61 1.71 75.05

1983 4 12.26 17.44 19.80 7.97 5.97 9.03 3.21 .68 1.18 1.61 1.49 3.18 83.82

1984 5 11.93 19.43 9.51 18.49 9.40 10.75 .41 1.90 .00 .44 .38 3.40 86.05

1985 5 11.18 7.15 15.16 13.71 8.46 9.64 5.47 .80 3.10 .00 6.14 .37 81.17

1986 5 15.70 14.88 28.66 20.51 14.83 11.65 6.11 .26 .03 .00 2.26 21.12 136.02

1987 5 12.27 22.59 13.93 14.53 9.44 19.55 4.01 .80 1.97 .55 .08 6.76 106.46

1988 5 18.61 11.25 12.29 18.43 25.75 3.98 6.78 .59 3.91 .03 1.07 .23 102.90

1989 5 5.94 22.60 14.20 13.49 12.43 18.69 15.57 .97 .14 .08 .13 .43 104.67

1990 5 5.65 6.00 9.84 25.34 12.98 16.10 .00 .01 1.21 .00 .00 1.44 78.59

1991 5 9.56 6.04 10.37 7.53 8.37 8.26 .79 .00 .83 .00 5.75 3.06 60.57

1992 5 4.33 24.34 19.55 9.19 19.07 10.68 1.94 .27 .00 .00 .00 2.42 91.80

1993 5 30.63 13.43 21.90 14.94 21.39 12.39 3.43 .00 .00 .00 .01 .03 118.15

1994 5 4.39 10.36 19.16 12.58 7.03 14.46 6.69 3.55 .00 .00 .85 .43 79.49

AVERAGE 10.38 15.20 15.67 16.91 13.76 11.97 6.34 2.73 1.09 1.02 1.01 3.54 99.61

ADJUSTED 10.42 15.26 15.73 16.98 13.81 12.01 6.36 2.74 1.10 1.02 1.02 3.56 100.00

STD.DEV. 5.38 7.64 5.73 7.28 7.32 5.40 4.71 3.56 2.09 2.10 1.66 3.99 19.74

AVERAGE RAINFALL ON CATCHMENT OF GAUGE B04

DETAILS OF RAINFALL STATIONS USED

SECTION POSITION MAP(mm) PERIOD OF RECORD LATITUDE LONGITUDE

476 44 736 1913 TO 1994 26.14 28.02

476 145 624 1940 TO 1994 26.25 28.05

476 163 734 1905 TO 1994 26.13 28.06

476 283 730 1908 TO 1989 26.13 28.10

476 378 651 1936 TO 1977 26.18 28.13

476 386 666 1963 TO 1981 26.26 28.13

476 403 725 1904 TO 1994 26.13 28.14

476 563 662 1905 TO 1946 26.23 28.19



RAINFALL INPUT AS PERCENT M.A.P.

NO. GAUGES OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP YEAR

1920 5 16.60 18.76 13.58 12.71 11.80 25.27 1.68 3.05 .08 .00 .01 2.52 106.05

1921 5 10.42 13.19 20.31 14.91 7.97 14.26 3.16 2.76 .80 .00 4.51 3.25 95.56

1922 5 11.32 23.91 15.74 28.07 13.47 11.77 3.75 .17 1.51 3.05 .02 1.35 114.12

1923 5 2.32 12.86 9.81 17.52 13.76 20.98 2.42 3.39 .02 .00 .54 6.33 89.96

1924 5 6.12 14.38 27.77 17.66 13.32 25.00 15.19 5.06 .25 .34 .18 6.70 131.96

1925 5 6.02 16.23 9.71 23.24 13.26 11.31 .41 5.50 .46 2.54 .00 2.49 91.17

1926 5 5.05 12.97 13.05 14.94 7.56 9.96 4.36 .05 .00 7.45 .22 .19 75.81

1927 5 17.39 5.23 13.49 19.67 21.67 13.67 3.71 1.50 .49 .00 1.46 3.07 101.34

1928 5 6.97 19.55 8.65 19.92 19.87 17.52 4.62 2.73 7.07 .18 .00 12.62 119.70

1929 5 19.90 14.14 15.67 19.63 15.64 11.68 2.11 2.80 .13 2.72 2.35 .04 106.80

1930 5 1.83 10.92 17.30 22.37 10.43 4.34 10.56 .00 .32 6.21 .00 .13 84.41

1931 5 4.89 13.95 12.63 11.90 23.17 12.89 3.51 2.62 .14 .00 .00 3.13 88.82

1932 5 7.27 10.39 11.08 8.91 7.26 13.89 7.92 .26 1.16 .01 .00 1.16 69.31

1933 5 1.25 36.21 21.02 27.40 9.48 9.70 3.18 5.06 .52 2.19 3.16 1.88 121.03

1934 5 7.95 24.24 15.67 8.59 12.92 15.02 2.14 .42 .00 .00 .92 .69 88.56

1935 5 3.37 3.60 14.50 12.28 14.28 18.94 2.51 19.58 .00 .05 .00 2.00 91.10

1936 6 3.32 21.99 5.87 21.31 18.95 6.06 5.07 .58 .00 .09 .00 1.35 84.60

1937 6 3.84 4.06 25.52 13.21 11.72 7.41 14.83 1.01 1.32 1.11 1.48 3.08 88.59

1938 6 8.60 5.08 28.26 11.61 17.68 11.50 .45 5.43 .14 7.96 3.74 3.18 103.61

1939 6 9.45 30.43 13.99 9.47 12.09 12.06 3.95 4.15 4.55 .00 .43 10.38 110.95

1940 7 2.64 20.81 21.65 14.07 11.00 11.97 11.52 .01 .00 .04 .00 1.58 95.28

1941 7 8.32 1.73 15.39 25.52 19.82 14.73 3.49 2.08 1.20 .00 4.06 2.99 99.32

1942 7 16.46 13.13 26.33 5.85 10.12 9.29 15.61 6.07 .27 8.55 5.08 7.24 124.01

1943 7 13.31 10.72 21.95 20.13 49.24 3.50 1.43 1.00 9.23 .02 .02 12.37 142.92

1944 7 16.79 12.00 5.57 12.92 16.42 24.77 1.65 2.72 .01 .34 .02 .14 93.33

1945 7 3.37 6.96 10.63 28.08 11.92 12.60 3.25 4.84 .01 .02 .02 .16 81.86

1946 7 6.09 11.87 17.87 17.81 15.60 19.27 4.97 .06 .03 .35 .02 1.34 95.27

1947 6 3.59 11.81 21.70 12.26 7.87 13.58 9.55 3.68 .02 .26 .02 .97 85.31

1948 6 10.74 14.11 3.24 26.84 8.22 5.67 3.31 .21 1.15 .07 .02 2.72 76.31

1949 6 10.17 24.79 34.96 11.06 7.69 23.35 5.59 8.76 1.74 .33 .02 .32 128.78

1950 6 7.69 13.71 25.49 16.93 9.76 7.92 8.05 8.60 .10 .10 3.13 1.09 102.58

1951 6 16.48 2.41 12.94 17.31 12.01 6.64 5.28 1.87 1.13 4.70 .08 .19 81.04

1952 6 3.43 24.03 18.68 9.26 16.02 15.17 6.93 1.54 .02 .03 .02 .15 95.27

1953 6 7.04 17.15 13.10 19.58 11.75 8.81 7.22 2.47 .23 .00 .01 5.08 92.46

1954 6 4.23 22.34 7.71 31.92 32.07 11.75 11.32 5.09 .22 .00 .38 .02 127.05

1955 6 9.93 19.94 19.57 5.05 16.14 14.10 .57 9.52 .43 .47 .02 4.15 99.88

1956 6 16.45 12.61 14.38 17.49 17.11 14.73 3.83 1.18 4.08 7.93 2.49 14.09 126.37

1957 6 13.68 10.15 5.29 18.78 16.26 9.10 11.69 .50 .06 .03 .02 11.68 97.24

1958 6 4.33 18.84 20.48 10.18 11.86 7.26 7.64 2.87 .56 1.45 .02 2.66 88.15

1959 6 7.84 15.60 17.77 12.48 10.45 12.66 9.97 .09 .42 .03 2.02 .94 90.27

1960 6 10.00 16.40 24.01 15.10 8.79 11.36 9.53 6.13 1.28 .45 .02 2.40 105.46

1961 6 7.55 11.99 12.76 8.49 15.48 8.32 9.25 .05 .01 .03 .78 2.97 77.66

1962 6 3.43 24.76 7.64 13.61 2.27 6.03 8.25 2.94 7.09 1.84 .02 .84 78.73

1963 7 7.54 14.07 13.69 26.04 7.53 8.75 4.70 .93 1.65 .02 1.07 2.36 88.35

1964 7 21.35 5.32 15.86 13.77 10.89 3.40 13.06 .47 .15 2.91 .04 .24 87.46

1965 7 2.48 7.41 13.30 14.46 21.42 3.69 2.29 2.59 1.81 .02 .20 2.44 72.10

1966 7 16.08 12.43 15.69 26.22 24.25 26.86 13.29 1.69 .29 .02 1.62 .92 139.37

1967 7 11.41 16.77 14.22 12.03 10.38 18.41 12.76 1.70 .03 .02 1.06 .04 98.86

1968 7 5.25 17.57 9.50 12.78 7.88 18.33 4.73 8.04 .06 .04 .47 3.36 88.00

1969 7 18.72 16.86 20.26 14.78 10.30 5.39 5.36 4.15 .67 2.09 .33 2.46 101.39

1970 7 10.67 16.90 16.08 19.45 16.43 13.11 21.73 4.26 .73 .00 .00 6.46 125.82

1971 7 8.56 22.16 15.94 28.67 4.21 11.69 4.94 2.56 .19 .00 .17 .63 99.71

1972 7 9.51 17.38 11.22 12.96 6.67 9.04 9.15 .04 .00 .00 1.27 8.84 86.09

1973 7 5.85 14.63 15.91 11.88 12.70 12.60 13.15 1.23 .32 .06 .15 1.84 90.31

1974 7 9.40 24.32 15.64 36.03 15.71 10.81 12.88 1.53 .48 .05 .24 .21 127.30

1975 7 4.38 23.24 21.08 19.33 16.20 18.38 6.89 12.13 .00 .07 .00 2.57 124.26

1976 7 17.84 8.30 15.47 24.20 8.97 17.94 3.80 .33 .00 .00 .03 10.76 107.63

1977 7 14.24 12.61 12.59 38.72 16.59 8.67 4.05 2.69 .02 .00 1.01 4.71 115.89

1978 6 9.79 12.26 10.15 10.50 8.08 7.82 5.70 2.64 .31 2.01 7.76 4.36 81.38

1979 6 12.59 32.73 12.05 32.25 15.37 5.92 2.76 .19 .00 .00 .00 7.30 121.17

1980 6 3.22 18.64 11.24 17.39 27.57 11.58 4.95 .05 .81 .00 1.93 5.92 103.31

1981 6 8.91 10.68 13.76 22.70 6.89 8.61 2.29 .00 .00 1.11 .00 1.50 76.44

1982 5 9.60 4.50 19.12 11.16 9.26 6.38 4.01 1.05 4.83 1.68 1.48 2.08 75.16

1983 5 12.44 15.88 26.77 6.98 3.21 9.32 2.69 .19 1.12 2.21 .23 1.91 82.94

1984 5 9.64 18.37 8.34 20.34 11.12 10.44 .18 1.53 .00 .84 .83 2.88 84.51

1985 5 15.86 14.41 17.26 16.74 8.11 12.24 4.00 .80 3.99 .00 2.58 .26 96.26

1986 5 17.90 19.44 24.78 18.50 20.70 23.01 2.20 .19 .04 .00 1.99 19.32 148.07

1987 5 8.47 20.57 21.95 16.84 6.83 21.01 4.52 .35 2.00 .55 .30 6.46 109.86

1988 5 12.48 6.66 13.58 12.00 29.93 3.16 7.65 .92 6.04 .00 .77 .58 93.78

1989 5 4.80 21.08 11.41 11.92 12.11 11.27 14.14 1.52 .11 .15 .09 .24 88.85

1990 4 5.43 6.29 14.64 24.60 13.39 24.40 .02 .00 .77 .00 .00 1.20 90.74

1991 4 7.08 6.75 9.66 9.75 10.82 4.67 1.61 .00 .66 .00 2.67 3.75 57.41

1992 4 3.95 17.97 17.04 11.78 12.44 15.52 4.29 .12 .00 .00 .24 3.73 87.08

1993 4 23.52 11.23 22.02 15.57 21.14 13.16 3.57 .00 .00 .00 .00 .91 111.12

1994 4 10.32 9.04 18.83 12.18 8.69 20.99 6.98 3.44 .00 .00 1.34 .99 92.79

AVERAGE 9.29 15.02 15.89 17.18 13.73 12.57 6.13 2.61 1.00 1.00 .90 3.37 98.69

ADJUSTED 9.41 15.22 16.10 17.41 13.92 12.73 6.21 2.64 1.02 1.01 .91 3.42 100.00

STD.DEV. 5.20 6.93 6.00 7.05 7.06 5.83 4.43 3.23 1.84 2.01 1.43 3.79 18.28

AVERAGE RAINFALL ON CATCHMENT OF GAUGE B05

DETAILS OF RAINFALL STATIONS USED

SECTION POSITION MAP(mm) PERIOD OF RECORD LATITUDE LONGITUDE

475 528 666 1899 TO 1994 26.18 27.48

475 611 781 1904 TO 1994 26.11 27.51

475 717 624 1925 TO 1994 26.27 27.54

475 736 694 1907 TO 1994 26.16 27.55

475 761 788 1941 TO 1979 26.11 27.56

476 44 736 1913 TO 1994 26.14 28.02

476 111 678 1906 TO 1994 26.21 28.04

476 145 624 1940 TO 1994 26.25 28.05



RAINFALL INPUT AS PERCENT M.A.P.

NO. GAUGES OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP YEAR

1920 5 18.25 12.11 11.98 11.63 8.68 23.31 2.21 1.73 .13 .05 .07 3.76 93.91

1921 5 9.69 15.29 19.13 13.27 11.25 12.63 3.47 2.59 1.18 .06 2.91 2.78 94.24

1922 5 9.04 17.51 14.30 26.73 18.56 9.50 3.61 1.13 1.37 2.76 .11 2.01 106.62

1923 5 3.51 11.45 8.05 12.20 11.51 20.39 3.01 3.97 .06 .06 .54 6.96 81.70

1924 5 6.52 16.02 29.16 14.69 18.51 23.84 12.22 6.85 .54 .31 .16 9.13 137.94

1925 6 8.87 12.52 8.64 19.96 8.14 11.51 .83 5.46 .69 1.92 .05 3.37 81.96

1926 6 4.43 10.88 14.16 15.12 8.18 14.84 7.21 .07 .03 6.14 .21 .10 81.38

1927 6 13.94 6.81 10.17 24.54 17.19 9.95 4.87 .68 .45 .11 1.95 1.49 92.14

1928 6 8.31 16.46 11.49 20.32 16.81 14.34 5.94 2.65 8.05 .13 .15 12.00 116.66

1929 6 15.61 15.12 16.14 16.96 15.49 12.11 1.63 1.58 .09 1.84 2.14 .08 98.79

1930 6 2.21 11.39 21.94 21.39 9.17 4.56 8.34 .05 .55 5.17 .05 .12 84.92

1931 6 4.85 14.07 13.22 10.04 18.82 13.87 3.42 1.93 .13 .04 .01 2.79 83.20

1932 6 6.98 8.13 10.38 6.56 6.74 10.12 10.56 .39 .66 .06 .03 1.76 62.37

1933 6 1.02 35.04 20.02 30.14 8.25 7.57 3.03 6.41 .54 1.10 3.17 2.18 118.48

1934 6 9.21 23.44 17.40 6.77 13.28 13.31 2.98 .64 .03 .09 .71 1.10 88.95

1935 6 3.84 3.46 16.55 11.85 15.66 17.15 1.54 19.25 .03 .05 .01 1.37 90.78

1936 6 5.69 27.97 8.47 29.60 18.61 7.94 10.14 .38 .03 .33 .01 2.52 111.68

1937 6 3.41 6.95 25.43 12.98 13.06 5.16 14.30 1.64 1.15 .32 1.21 3.53 89.15

1938 6 7.03 3.49 27.61 13.83 24.08 17.48 .95 6.94 .03 7.92 4.03 2.42 115.82

1939 6 8.86 24.95 17.27 7.52 11.71 11.49 6.57 5.18 3.98 .04 .48 10.56 108.61

1940 7 2.38 10.51 27.75 15.22 13.73 16.60 9.98 .05 .03 .06 .01 1.36 97.67

1941 8 10.51 2.51 16.72 24.89 16.00 20.02 2.60 1.51 .86 .07 4.81 2.89 103.40

1942 8 13.59 14.81 28.83 4.95 8.05 10.37 15.00 5.66 .14 9.56 5.63 5.92 122.51

1943 8 21.27 9.61 15.62 16.61 44.75 2.38 1.22 .61 11.69 .05 .02 10.53 134.38

1944 8 15.01 10.55 7.34 11.09 12.62 28.79 1.58 2.60 .03 .35 .02 .16 90.15

1945 8 3.87 6.95 8.70 30.68 12.88 14.07 2.92 4.86 .04 .05 .02 .16 85.20

1946 8 7.55 10.68 15.60 18.16 15.40 18.31 5.44 .03 .16 .40 .02 1.43 93.20

1947 8 3.38 8.70 22.76 12.29 11.63 16.30 8.48 4.32 .06 .25 .02 .64 88.83

1948 8 9.14 16.18 5.32 28.05 10.14 7.54 3.18 .22 1.47 .25 .02 1.84 83.36

1949 8 10.80 26.04 34.33 11.08 9.96 24.67 6.70 9.33 1.94 .50 .04 .79 136.16

1950 8 9.30 14.48 25.43 13.74 11.37 8.89 8.89 9.08 .16 .39 3.11 1.24 106.06

1951 8 15.94 2.48 12.49 17.51 14.95 6.43 4.98 .96 1.36 9.00 .02 .16 86.28

1952 8 5.29 23.68 22.20 9.89 19.32 14.08 5.65 1.30 .03 .05 .02 .16 101.69

1953 8 10.95 18.25 9.98 23.49 12.89 8.21 5.82 2.46 .22 .03 .12 3.17 95.61

1954 8 5.21 25.11 8.85 30.40 33.67 10.06 11.59 5.92 .18 .03 .26 .11 131.38

1955 8 10.56 20.68 20.10 6.71 17.49 13.57 1.75 8.68 .13 .37 .02 4.43 104.51

1956 8 17.40 13.14 14.55 14.47 19.87 15.98 5.11 .44 5.06 7.74 3.68 14.28 131.72

1957 8 14.33 9.47 8.26 21.27 15.50 11.93 12.32 .21 .07 .05 .02 9.17 102.63

1958 8 3.29 18.72 18.42 12.87 10.20 5.47 7.81 3.35 .57 1.65 .02 .59 82.97

1959 8 8.62 15.06 12.18 11.15 10.10 10.94 9.46 .31 .39 .02 2.15 .51 80.90

1960 8 9.33 18.16 25.82 11.53 8.39 7.76 13.14 6.35 1.39 .51 .02 1.89 104.29

1961 8 5.94 12.29 15.51 10.61 14.69 9.99 8.89 .08 .02 .03 .50 3.61 82.16

1962 8 4.26 23.77 7.52 17.82 3.06 7.59 8.00 2.52 5.31 1.66 .02 .67 82.20

1963 8 8.28 18.84 14.30 21.46 7.83 9.77 5.53 .88 1.93 .03 .87 1.72 91.45

1964 8 21.22 6.51 13.55 15.04 12.63 3.09 10.84 .40 .10 2.38 .03 .21 86.00

1965 8 2.76 7.99 16.69 13.41 22.42 1.46 2.60 2.10 1.30 .02 .26 1.55 72.55

1966 8 14.04 9.17 15.19 25.27 20.27 28.68 12.84 1.88 .11 .02 2.00 1.14 130.62

1967 8 11.16 16.63 15.30 9.90 10.27 15.09 11.90 1.89 .03 .02 1.21 .13 93.54

1968 8 4.87 15.99 8.60 7.76 11.93 16.34 3.56 9.79 .00 .01 .55 2.73 82.13

1969 8 21.85 13.94 16.53 14.73 7.54 6.44 5.38 4.73 .95 2.17 .11 1.92 96.29

1970 8 8.06 15.25 15.67 22.69 15.62 11.70 24.04 4.64 1.05 .06 .00 4.84 123.61

1971 8 7.34 23.84 15.03 20.27 8.49 17.56 6.22 2.92 .39 .00 .22 .65 102.93

1972 8 7.62 14.45 14.44 11.67 6.77 11.02 13.42 .05 .00 .00 .83 7.66 87.94

1973 8 7.10 12.37 12.18 14.42 16.08 9.60 11.65 1.34 .22 .18 .12 1.21 86.47

1974 8 13.20 20.90 17.84 28.13 20.96 11.06 13.11 1.67 .13 .00 .42 .39 127.84

1975 8 5.79 22.19 23.97 24.18 17.19 21.53 9.63 8.81 .00 .01 .00 4.04 137.34

1976 8 18.40 10.86 13.09 34.39 7.35 16.86 4.93 .22 .00 .00 .10 11.61 117.79

1977 8 13.57 13.47 18.22 46.63 18.93 12.59 6.29 .89 .05 .00 1.93 5.00 137.56

1978 8 10.43 7.83 10.03 9.57 9.11 6.97 4.52 2.68 .47 2.60 7.60 4.74 76.55

1979 8 14.06 30.17 16.02 24.43 17.52 5.84 4.56 .26 .00 .00 .24 6.34 119.43

1980 7 5.11 20.61 15.33 24.86 28.47 16.20 4.80 .03 .70 .00 3.32 6.04 125.47

1981 7 10.66 10.14 15.90 20.89 5.88 11.51 2.93 .00 .10 2.08 .00 1.85 81.93

1982 7 9.55 4.16 18.03 12.65 7.32 5.81 5.82 1.45 4.88 1.40 1.55 1.50 74.12

1983 7 13.22 16.38 23.36 8.41 4.66 9.32 3.23 .33 1.23 1.95 .33 2.70 85.12

1984 7 11.90 17.11 8.62 18.51 11.81 10.94 .32 1.59 .00 .62 .91 3.49 85.81

1985 7 15.60 8.57 15.89 16.38 8.21 8.36 5.79 .57 3.31 .00 4.94 .21 87.82

1986 7 16.87 15.58 21.38 20.00 12.47 16.71 1.93 .48 .02 .00 2.46 18.99 126.90

1987 7 8.06 21.16 17.75 14.87 9.10 22.39 5.35 .64 1.56 .44 .26 8.21 109.80

1988 7 13.33 7.38 14.53 16.61 27.49 4.36 7.97 .81 6.55 .00 1.03 .00 100.07

1989 7 5.07 22.78 15.48 14.28 13.10 13.22 16.31 1.02 .23 .10 .11 .38 102.07

1990 7 6.88 5.92 13.01 25.16 12.68 24.26 .01 .00 .86 .00 .03 1.65 90.46

1991 7 7.83 4.85 10.32 7.96 6.34 5.97 2.54 .21 .90 .00 2.64 3.07 52.63

1992 7 3.10 18.39 24.21 8.70 14.93 11.90 3.26 .14 .00 .00 .58 4.04 89.24

1993 7 31.11 9.71 19.53 14.22 17.78 7.28 3.50 .00 .00 .00 .00 .26 103.39

1994 7 8.82 9.95 18.44 14.13 6.88 18.36 6.16 2.44 .01 .00 .78 .87 86.84

AVERAGE 9.68 14.37 16.19 17.10 13.85 12.58 6.51 2.60 1.04 1.01 .99 3.27 99.18

ADJUSTED 9.76 14.49 16.32 17.24 13.96 12.68 6.56 2.62 1.05 1.02 1.00 3.29 100.00

STD.DEV. 5.46 6.82 5.94 7.63 6.69 5.98 4.45 3.25 2.00 2.11 1.54 3.71 18.97

AVERAGE RAINFALL ON CATCHMENT OF GAUGE B06

DETAILS OF RAINFALL STATIONS USED

SECTION POSITION MAP(mm) PERIOD OF RECORD LATITUDE LONGITUDE

475 528 666 1899 TO 1994 26.18 27.48

438 315 680 1916 TO 1994 26.45 27.41

438 514 580 1930 TO 1977 26.34 27.48

438 550 652 1942 TO 1994 26.40 27.49

475 174 716 1966 TO 1994 26.24 27.36

475 477 587 1929 TO 1974 26.27 27.46

475 717 624 1925 TO 1994 26.27 27.54



RAINFALL INPUT AS PERCENT M.A.P.

NO. GAUGES OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP YEAR

1920 2 17.90 6.36 13.46 13.69 4.99 20.78 2.93 6.30 .27 .08 .02 2.88 89.64

1921 2 9.38 21.21 20.02 13.12 8.40 10.50 2.27 3.03 1.95 .08 4.96 2.30 97.21

1922 2 11.32 22.68 12.51 24.49 11.70 6.39 5.37 .35 1.56 2.34 .06 1.36 100.14

1923 2 2.88 8.65 8.84 13.03 12.62 20.32 2.99 4.02 .13 .08 1.36 4.75 79.66

1924 2 7.70 18.75 22.04 11.00 15.03 20.83 11.54 6.36 1.43 .08 .15 6.58 121.47

1925 3 8.96 12.95 6.68 17.99 9.39 13.10 1.43 5.04 .88 2.19 .01 3.62 82.24

1926 3 7.73 12.31 14.22 15.95 11.31 14.53 5.65 .00 .05 5.09 .11 .22 87.17

1927 3 12.00 5.19 11.10 25.92 15.21 8.54 4.84 .07 .29 .11 1.43 2.75 87.46

1928 3 8.25 16.23 11.79 18.95 17.78 12.45 6.08 3.49 11.21 .10 .41 13.39 120.13

1929 4 12.32 19.69 19.30 18.41 17.99 13.24 1.95 1.53 .17 1.31 1.73 .11 107.78

1930 5 2.79 11.70 16.25 21.35 10.72 8.89 13.09 .06 .18 3.90 .01 .09 89.02

1931 5 6.40 13.35 14.87 7.94 23.21 13.80 3.28 1.65 .10 .03 .01 5.14 89.77

1932 5 5.79 10.20 15.78 7.27 6.20 8.00 9.08 .43 .64 .05 .01 2.04 65.50

1933 5 1.94 39.71 18.38 27.89 10.02 7.88 4.15 8.89 .60 1.40 2.16 1.09 124.12

1934 5 12.12 29.90 20.04 4.22 14.82 13.62 2.63 .75 .04 .05 .28 1.00 99.47

1935 5 3.49 2.14 15.91 12.75 15.07 16.05 3.13 20.30 .03 .06 .01 1.25 90.20

1936 5 6.18 32.39 8.60 20.02 23.06 5.49 10.19 .08 .03 .11 .01 .82 106.96

1937 5 3.83 6.22 25.62 15.96 14.92 4.00 13.57 1.05 1.23 .29 .73 3.00 90.41

1938 5 10.96 5.41 28.36 14.07 30.39 12.12 2.37 6.25 .04 9.15 4.14 2.79 126.05

1939 5 6.26 25.00 18.82 7.88 8.46 8.75 6.72 3.23 2.42 .05 .22 6.13 93.95

1940 5 2.38 10.38 25.60 11.04 10.02 11.57 8.42 .18 .04 .16 .02 1.85 81.67

1941 5 10.00 2.65 13.50 32.86 21.37 16.83 4.77 .71 .54 .06 4.59 2.97 110.84

1942 6 13.09 12.69 36.88 9.87 6.68 7.20 15.60 6.44 .16 12.34 2.73 7.01 130.68

1943 6 19.91 13.58 19.55 18.72 33.42 4.28 .68 .69 11.36 .03 .01 9.83 132.07

1944 6 17.10 14.01 3.58 9.73 9.32 24.02 1.22 1.98 .02 .08 .01 .07 81.12

1945 6 1.90 7.36 5.83 18.95 12.97 19.58 4.27 4.07 .03 .04 .01 .18 75.19

1946 6 12.02 17.70 9.87 14.54 14.48 16.55 7.76 .18 .46 .27 .01 .50 94.33

1947 6 3.61 10.91 22.37 19.79 9.51 16.13 6.66 3.22 .03 .46 .01 1.20 93.90

1948 6 10.93 16.44 12.71 25.67 10.96 11.49 3.79 .51 2.06 .34 .01 2.87 97.77

1949 6 8.32 30.31 27.00 9.96 13.17 26.37 8.65 12.06 1.53 .28 .18 .35 138.17

1950 6 9.99 8.86 26.76 12.15 16.42 10.85 6.78 10.88 .18 .75 1.65 .83 106.09

1951 6 12.03 3.70 15.46 20.71 17.70 5.03 2.79 .22 1.01 7.81 .03 .16 86.64

1952 6 7.82 26.45 22.91 9.80 24.34 16.23 6.49 .94 .12 .06 .04 .20 115.40

1953 6 6.58 22.06 8.02 21.53 12.07 6.04 5.47 2.64 .50 .06 .03 1.91 86.91

1954 6 4.88 26.55 10.85 26.56 26.72 6.62 14.76 6.31 .06 .06 .22 .21 123.80

1955 6 10.10 18.86 22.35 8.01 13.45 11.27 1.22 9.72 .05 .07 .03 4.04 99.17

1956 6 18.48 9.38 15.10 11.59 14.36 11.93 3.86 .56 4.06 8.01 1.74 13.12 112.19

1957 6 12.47 10.98 8.86 22.33 8.59 14.81 18.72 .39 .05 .06 .03 9.33 106.61

1958 6 3.61 16.36 11.73 19.10 10.34 6.51 7.24 4.70 .24 .71 .02 .58 81.14

1959 6 16.54 15.12 14.76 12.64 14.58 7.94 7.45 .27 .29 .02 3.38 .41 93.42

1960 6 7.69 19.45 30.36 10.65 8.00 7.19 18.29 6.03 1.79 .02 .06 1.22 110.75

1961 6 6.29 19.04 14.64 12.50 13.70 9.84 10.58 .06 .03 .03 .89 3.84 91.42

1962 6 9.46 24.63 5.01 20.92 6.94 12.58 9.22 2.58 4.74 2.06 .00 .48 98.63

1963 6 8.56 23.75 7.14 21.58 10.43 9.72 5.66 1.23 1.80 .02 1.69 2.29 93.86

1964 6 18.22 5.43 18.98 21.87 7.33 1.52 13.07 .25 .26 2.79 .08 .44 90.23

1965 6 4.09 9.36 10.51 18.88 24.15 .77 2.44 .53 .68 .02 .45 2.41 74.28

1966 7 12.68 11.57 16.80 31.33 17.90 25.35 11.93 2.65 .05 .40 .82 1.88 133.35

1967 7 10.46 13.63 16.50 11.20 10.79 19.28 12.59 2.19 .03 .01 3.61 .30 100.58

1968 7 4.45 13.70 11.08 9.12 8.40 14.02 5.28 11.02 .00 .11 .39 2.25 79.82

1969 7 20.53 13.57 18.09 11.62 8.20 4.76 4.41 2.12 .91 2.43 .06 1.99 88.68

1970 7 8.36 13.96 14.40 24.60 10.50 13.02 24.74 3.63 2.19 .11 .00 4.33 119.85

1971 7 6.23 19.82 17.14 19.84 6.50 13.04 4.81 2.74 1.36 .00 .07 1.58 93.14

1972 7 7.81 11.41 13.41 9.96 7.38 9.82 12.59 .23 .01 .01 1.59 5.48 79.71

1973 7 5.34 16.09 16.96 21.84 14.25 7.15 12.54 1.61 .23 .10 .05 .88 97.05

1974 7 10.41 16.70 18.80 21.64 20.57 11.76 11.18 1.68 .18 .01 .48 .76 114.17

1975 6 6.25 19.32 21.80 22.25 17.80 20.20 11.26 6.55 .11 .00 .00 6.62 132.17

1976 6 16.16 10.34 19.60 33.14 11.77 14.51 4.72 .13 .00 .00 .30 8.15 118.82

1977 6 12.04 13.38 23.35 33.03 16.25 12.59 6.01 1.08 .11 .01 2.51 4.67 125.03

1978 5 15.54 7.24 11.28 12.80 5.79 4.78 4.15 3.46 .68 2.05 10.74 5.01 83.51

1979 5 16.94 18.90 17.17 25.69 16.53 11.61 5.48 .47 .00 .00 .09 6.17 119.04

1980 5 6.56 23.54 14.65 30.48 21.06 10.28 3.22 .02 .46 .00 4.37 4.20 118.85

1981 5 8.58 10.89 19.66 23.81 7.32 9.90 5.03 .00 .14 3.84 .04 1.80 91.02

1982 5 12.53 3.35 14.03 9.36 6.76 3.74 6.61 2.45 5.03 2.07 1.16 1.88 68.96

1983 5 15.75 16.44 19.40 5.71 5.49 8.29 2.31 .49 1.70 2.12 1.96 2.69 82.35

1984 5 11.45 19.23 8.56 18.32 12.62 8.05 .82 1.79 .05 .55 .91 3.02 85.38

1985 5 12.29 6.83 16.88 13.72 5.64 11.22 6.17 .00 2.83 .01 6.87 1.52 83.98

1986 5 15.20 13.70 22.65 22.34 8.27 11.97 4.39 .06 .00 .03 3.06 22.24 123.90

1987 5 10.73 22.43 15.84 13.52 11.35 20.37 4.37 .63 1.30 .46 .06 7.63 108.69

1988 5 18.32 10.76 11.05 20.81 27.86 5.39 13.67 1.14 5.15 .00 .71 .00 114.86

1989 5 5.25 23.38 16.86 12.77 13.32 13.25 16.23 2.31 .14 .24 .15 1.20 105.09

1990 5 5.03 4.74 11.40 25.58 11.46 15.50 .00 .00 1.41 .00 .00 1.87 76.99

1991 5 9.36 5.37 15.34 7.81 6.39 5.19 4.36 .30 1.62 .00 4.05 1.38 61.16

1992 5 2.37 23.70 22.49 8.61 16.65 11.10 3.67 .47 .00 .00 .22 5.07 94.35

1993 5 38.04 14.30 18.02 17.54 18.12 10.17 3.24 .00 .14 .33 .06 .44 120.38

1994 5 5.96 9.75 16.78 14.37 7.30 12.94 7.28 1.30 .00 .00 .56 .98 77.22

AVERAGE 9.93 14.99 16.31 17.16 13.39 11.62 6.96 2.68 1.08 1.04 1.07 3.14 99.37

ADJUSTED 9.99 15.08 16.41 17.26 13.48 11.69 7.01 2.69 1.09 1.05 1.08 3.16 100.00

STD.DEV. 5.72 7.55 6.13 7.03 6.16 5.40 4.84 3.54 2.05 2.26 1.84 3.65 17.94

AVERAGE RAINFALL ON CATCHMENT OF GAUGE B07

DETAILS OF RAINFALL STATIONS USED

SECTION POSITION MAP(mm) PERIOD OF RECORD LATITUDE LONGITUDE

402 788 612 1919 TO 1994 27.08 27.57

403 62 587 1929 TO 1976 27.02 28.03

438 315 680 1916 TO 1994 26.45 27.41

438 533 659 1923 TO 1982 26.53 27.48

438 533 664 1986 TO 1988 26.53 27.48

438 550 652 1942 TO 1994 26.40 27.49

438 716 643 1915 TO 1989 26.56 27.54

438 734 626 1905 TO 1994 26.44 27.55

438 744 676 1915 TO 1956 26.54 27.55

438 744 608 1972 TO 1994 26.54 27.55

438 750 621 1916 TO 1926 26.60 27.55

438 750 670 1933 TO 1980 26.60 27.55

439 203 660 1970 TO 1994 26.53 28.07



RAINFALL INPUT AS PERCENT M.A.P.

NO. GAUGES OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP YEAR

1920 6 21.22 13.47 8.71 30.17 5.69 25.29 1.97 6.03 .41 .00 .37 2.91 116.23

1921 6 6.40 21.58 22.13 18.03 8.82 7.89 .17 3.60 2.09 .00 5.53 2.09 98.34

1922 6 13.46 25.97 9.91 21.89 7.71 6.20 7.55 .67 2.05 4.61 .40 .80 101.23

1923 7 2.57 8.33 8.97 13.74 7.76 19.59 1.87 2.58 .07 .00 1.38 5.37 72.24

1924 7 7.73 16.64 17.79 14.61 8.74 23.79 13.52 8.41 1.56 .00 .04 5.51 118.34

1925 7 3.92 9.43 6.69 20.38 11.06 13.90 .90 3.47 2.30 2.01 .00 4.47 78.54

1926 7 8.64 8.72 12.42 17.32 14.04 14.64 3.49 .03 .20 4.88 .53 .05 84.96

1927 6 11.90 3.79 10.43 20.22 16.95 5.98 4.09 .29 .34 .00 .92 8.03 82.95

1928 6 10.04 17.11 11.32 9.72 12.67 12.78 5.30 7.48 11.54 .29 .81 15.53 114.59

1929 7 7.17 25.24 26.41 16.95 17.03 11.07 5.40 1.36 .34 .49 2.36 .00 113.81

1930 7 3.07 6.76 12.79 18.29 12.56 11.47 16.34 .00 .00 3.50 .00 .01 84.79

1931 7 8.90 18.12 14.52 4.36 14.01 7.44 1.95 1.53 .39 .00 .00 5.58 76.81

1932 7 4.74 9.43 17.11 5.70 6.91 8.66 5.18 .29 .89 .02 .00 2.15 61.09

1933 8 2.92 37.82 17.95 22.18 9.49 8.90 5.66 10.44 1.46 1.94 5.87 .37 124.99

1934 8 11.14 34.36 18.26 2.93 10.56 21.37 5.18 2.07 .05 .00 .40 .87 107.18

1935 8 6.02 2.57 15.85 12.45 16.02 15.08 5.09 14.59 2.12 .01 .00 2.04 91.85

1936 8 7.24 45.49 9.06 17.55 18.21 7.10 7.01 .12 .00 .00 .04 .29 112.10

1937 8 7.07 4.38 22.47 21.29 10.55 4.68 16.95 .71 1.87 .35 1.46 2.67 94.45

1938 8 17.45 2.81 26.16 18.54 26.03 7.45 .99 6.25 .15 9.90 4.52 1.69 121.94

1939 8 7.85 17.12 13.39 13.24 9.31 13.76 4.68 4.09 3.81 .06 .09 8.59 95.99

1940 8 2.69 13.08 21.38 17.20 14.13 5.08 8.70 .02 .01 .33 .02 2.50 85.13

1941 8 11.57 3.68 10.38 36.49 16.71 13.95 3.99 2.39 .85 .02 3.96 4.29 108.27

1942 9 13.80 11.64 32.20 9.42 8.21 8.54 18.57 8.42 .21 12.70 2.90 4.44 131.05

1943 9 26.86 15.33 19.93 15.80 34.25 7.13 .24 2.08 10.17 .00 .01 8.84 140.65

1944 9 20.55 14.56 3.82 12.18 14.58 21.69 1.37 2.90 .04 .04 .02 .01 91.76

1945 9 1.76 5.78 11.11 17.31 15.04 18.12 2.90 3.52 .04 .02 .02 .63 76.26

1946 9 13.19 14.40 13.72 15.48 14.95 13.88 10.99 .20 .45 .31 .12 1.05 98.74

1947 9 4.28 17.23 17.10 20.39 11.95 19.64 6.67 2.76 .00 .83 .01 4.87 105.73

1948 9 10.56 13.60 7.67 21.59 6.36 12.50 1.68 .58 2.36 .32 .27 3.80 81.28

1949 9 10.67 25.52 23.15 8.22 15.21 21.77 6.77 13.19 1.59 1.50 1.06 .28 128.93

1950 9 9.82 6.85 20.42 10.62 9.63 12.78 7.80 11.55 .32 1.82 2.47 1.26 95.33

1951 9 22.19 8.44 14.16 16.36 12.62 7.05 4.26 .50 .41 5.23 .05 .06 91.33

1952 9 8.46 20.85 16.93 7.52 25.86 14.03 7.55 1.37 .11 .04 .06 .06 102.83

1953 9 5.62 18.08 8.40 18.91 11.82 7.42 6.41 1.47 .75 .04 .33 3.93 83.18

1954 9 5.70 13.35 18.07 24.71 25.28 8.92 12.79 5.18 .06 .21 .21 .06 114.52

1955 9 14.29 16.21 17.06 7.44 13.94 11.42 .45 9.72 .06 .04 .05 2.99 93.66

1956 9 16.12 7.98 18.66 14.84 9.76 16.78 3.44 .85 4.13 8.32 2.87 17.22 120.97

1957 8 13.21 8.65 13.50 19.49 3.26 12.23 10.16 .67 .06 .03 .05 9.72 91.05

1958 8 4.74 16.64 12.57 16.59 9.75 7.89 7.98 7.34 .32 1.18 .05 1.54 86.59

1959 8 16.29 15.56 20.85 9.30 13.24 11.67 7.25 .44 .09 .02 4.56 .74 100.02

1960 8 11.11 12.85 35.89 11.63 9.02 7.12 22.37 5.92 1.92 .02 .09 2.14 120.07

1961 8 2.89 18.07 10.80 8.96 13.04 12.30 11.16 .03 .06 .03 1.14 5.14 83.62

1962 8 7.41 28.01 7.39 20.39 9.10 13.12 12.75 5.45 5.45 2.16 .04 .12 111.39

1963 8 7.20 21.06 6.02 24.28 12.31 12.26 7.08 1.42 2.80 .32 1.59 4.46 100.80

1964 8 20.65 4.85 21.19 22.34 5.42 3.02 12.91 .82 1.00 2.46 .09 .73 95.48

1965 8 3.45 10.61 7.76 17.49 21.69 1.88 1.54 .20 .39 .00 .22 2.53 67.75

1966 8 10.80 12.25 10.42 34.00 21.64 24.09 13.36 5.05 .04 .07 .88 2.10 134.69

1967 8 9.84 11.42 14.09 7.24 8.72 16.68 7.89 4.01 .10 .02 1.54 1.73 83.26

1968 8 5.90 10.00 12.06 6.48 5.73 10.24 7.08 10.72 .04 .21 .84 2.96 72.26

1969 8 14.24 15.29 17.79 11.74 9.11 4.57 3.55 3.05 1.18 3.93 .10 2.56 87.12

1970 9 8.27 17.21 13.15 20.03 10.98 10.87 18.31 1.96 2.45 .18 .01 6.06 109.51

1971 9 9.52 14.59 19.94 26.49 5.40 16.36 1.61 1.65 2.23 .02 .75 1.09 99.64

1972 10 6.52 12.66 11.31 12.33 12.79 10.65 11.06 .50 .03 .01 4.32 6.85 89.05

1973 10 7.82 24.61 21.28 24.68 11.15 6.62 12.10 1.38 .60 .10 .32 1.90 112.55

1974 10 13.47 22.83 22.79 20.43 14.65 9.94 13.65 2.03 .61 .01 .14 2.23 122.78

1975 10 4.89 14.69 18.78 24.45 17.59 19.33 8.76 6.65 .11 .01 .01 6.29 121.56

1976 10 17.08 9.23 18.84 23.96 8.82 14.95 1.78 .23 .04 .01 .06 9.76 104.77

1977 9 9.88 12.19 25.64 24.47 8.23 12.39 6.73 .74 .11 .02 1.56 4.46 106.41

1978 9 20.13 4.91 12.12 14.60 5.13 6.12 2.43 3.82 .72 1.48 16.45 6.02 93.92

1979 9 16.46 20.45 14.72 26.54 15.73 10.47 5.70 .45 .04 .02 1.69 6.43 118.69

1980 9 3.66 18.44 11.74 29.18 12.16 10.00 2.81 1.07 .66 .02 4.73 4.51 98.98

1981 8 6.29 13.64 17.01 19.20 7.81 9.36 7.43 .00 .15 4.16 .34 1.82 87.21

1982 8 19.42 4.81 12.65 10.35 7.51 1.68 2.30 3.68 4.89 2.39 .79 1.46 71.94

1983 7 18.51 19.02 17.40 7.67 2.55 13.31 1.88 .54 1.60 1.63 4.28 2.56 90.95

1984 7 11.83 21.16 9.72 21.89 10.96 9.55 .58 2.50 .03 .33 .17 1.92 90.63

1985 7 11.48 5.98 15.00 15.86 5.10 17.24 10.00 .00 2.17 .01 7.68 1.14 91.66

1986 8 16.42 16.27 24.12 15.07 8.93 9.91 4.49 .03 .00 .08 2.95 25.40 123.68

1987 8 17.04 15.28 17.19 12.28 11.98 20.04 6.50 .80 2.90 .13 .10 6.98 111.23

1988 8 21.14 12.68 9.55 15.68 26.61 7.81 10.25 2.91 2.84 .00 1.23 .25 110.94

1989 7 6.50 17.36 15.00 11.90 13.49 18.52 14.27 1.76 .01 .45 .42 .48 100.16

1990 6 3.85 3.97 9.90 28.50 13.71 13.36 .00 .00 1.19 .00 .00 .76 75.24

1991 6 12.02 6.33 19.18 10.03 7.00 2.55 2.90 .00 .58 .00 6.67 1.18 68.42

1992 6 5.48 28.81 16.35 10.03 17.52 14.68 4.84 1.71 .08 .00 .06 5.74 105.30

1993 6 30.09 16.18 18.33 18.62 17.39 9.56 4.51 .00 .00 .04 .04 .37 115.13

1994 6 3.56 9.91 17.98 14.75 7.89 13.62 7.03 1.94 .00 .00 1.92 .88 79.48

AVERAGE 10.62 14.72 15.69 16.84 12.37 11.92 6.73 2.96 1.21 1.08 1.43 3.58 99.15

ADJUSTED 10.71 14.85 15.82 16.98 12.47 12.02 6.79 2.99 1.22 1.09 1.44 3.61 100.00

STD.DEV. 6.13 8.06 5.95 6.88 5.76 5.37 4.93 3.40 2.01 2.30 2.50 4.19 17.46