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ANNUAL RAINFALL CHARACTERISTICS OF THE DARLING PLATEAU AND THE SWAN COASTAL PLAIN

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1. INTRODUCTION

Information on the annual rainfall characteristics of the Darling Plateau and the Swan Coastal Plain regions of Western Australia has been published by the Commonwealth Bureau of Meteorology (C.B.M.) in their climate survey series (C.B.M., 1965) and as an annual isohyetal map in 1962. More recently a metric version of the rainfall statistics for stations throughout Australia has been published (C.B.M. 1977), broad scale analysis of annual data presented in their climate review of Australia 1975-76 (C.B.M., 1976), and a broad scale map (C.B.M. 1980).

The study area covers a 160 km wide strip from the coast inland, and from Gingin to Bridgetown. Isohyets have been drawn to include the whole of the Preston, Collie, Harvey, Murray and Swan Coastal River Basins together with the central portion of the Blackwood River Basin to provide a link between the current study and a prevous study (Loh & King 1978).

The development of Bauxite Mining in the Northern Jarrah Forest portion of the study area, and the Darling Range Study Group have stimulated more detailed investigations of the Hydrology and Water Resources, Forest Silviculture and Geomorphology of the region. These studies in turn have required more detailed information on the rainfall characteristics of the region generally, and the definition of the high rainfall area above the scarp in particular. As the rainfall gradient near the scarp is known to be steep, the rainfall map needs to be on a larger scale than has previously been available.

In the early 1970's the Public Works Department Water Resources Section began collecting rainfall data on gauged catchments (catchments of streamflow measuring sites) throughout the State, to assist in hydrologic studies. A greatly improved rainfall network has resulted particularly in the more remote and sparsely populated forest zones. This report is an attempt to use the recent short term record collected by the Public Works Department in conjunction with the Bureau of Meteorology's data to provide some of the answers to the above needs. The primary aim of the investigation was to provide an updated average annual isohyetal map of the Northern Jarrah Forests and adjacent Regions in metric form at a 1:250 000 scale.

An additional statistical characteristic, the coefficient of variation was also calculated for all the stations used in the study.

2. APPROACH

All long term stations operated by the Bureau were studied for their reliability and length of record to determine an adequate coverage over the area from the same base year of 1926 as was used in the previous study (Loh & King, 1978). Some 76 stations were adopted as primary base stations and their statistics calculated for the common period from 1926 to 1979. Other stations in the area were correlated with their adjacent primary base stations to enable means for the common 1926-79 period to be calculated. Some 183 secondary stations, those with 12 or more (usually 20 or more) years of record between 1926 and 1979 were defined and a set of annual statistics were calculated for the common 54 years using correlations with nearby primary stations.

An additional 122 tertiary stations (approx. half of which were P.W.D. stations commencing in 1972) were used to obtain an estimate of the 54 year mean for areas where neither primary or secondary stations were operating. Details of the correlations and their accuracies are given in subsequent sections.

The above 381 stations formed the basis for estimating the long term annual isohyets for the Darling Plateau and the Swan Coastal Plain. Vegetation, soil and landform patterns were also considered in a qualitative way when defining the isohyets.

Extending the statistics of the secondary and tertiary stations to the common time base enabled reasonable estimates of variability to be made through the range of annual rainfalls occuring in the region.

An argument against adoption of a common period of analysis, however is that all the data from the longest operating stations are not used to define the station statistics. Consequently, for those stations, the mean is likely to have a higher standard error of estimate than if all the data were used, and may cause more inconsistencies than would be removed by using a common period of record. Comparisons of the complete length of record with data for the common period are made in the following subsections.

2.1 Primary Stations

For the 76 primary stations, Table 1 lists the period of record, the mean for both the complete period of record and the standard 54 years, other rainfall statistics, and the three closest primary stations.

Missing monthly data for each Primary Station was infilled using monthly rainfall at nearby stations. Individual estimates for each missing month were made by considering both the monthly rainfall pattern and the ratio of the monthly rainfall to the mean for the particular month in question. The characteristic which displayed the lesser variability at the nearby stations was selected for estimating the missing monthly rainfall. The method was checked for both individual months and overall result. A small sample of known monthly rainfalls was estimated using the above procedure. The estimated monthly values were generally within 5 mm of the actual value, with the highest variation being 29 mm. For checking purposes, annual means were estimated by using the method of section 2.2. Only one of these estimated annual means (Churchmans Brook, 009 010) varied by more than 5 mm from the adopted mean. The primary Stations which showed the worst correlations with other Primary Stations (Rottnest Island, 009 038; Capel. P.O., 009 516; Riverdale, 010 635; and Colorado, 010 534) were isolated stations situated at the extreme boundaries of the search area. Correlations between Primary Stations within the main area of interest varied from very good to excellent. Most stations had monthly correlation coefficients in excess of 0.9 for all months.

Of the 76 Primary Stations, Churchmans Brook had the highest average annual rainfall (1364 mm), the largest number of estimated monthly rainfall values (52), and an abnormally high coefficient of variation. The high coefficient of variation may be related to the high proportion of estimated monthly rainfall.

The primary stations with longer record than 54 years had, on average, mean rainfalls which were 4 mm greater than the 54 year mean. The 67 stations with mean rainfalls less than 1000 mm averaged 5 mm greater while the remaining 9 stations averaged the same as their 54 year means. Table 1 shows the largest variation occurs at Bunbury (009 514) with the whole period mean 46 mm (5.3%) greater than the 54 year mean. At Bunbury the variation between the 54 year mean and the full period mean was expected to be less than 4.9% (2 standard errors of estimate of the mean). A double mass curve was drawn for Bunbury and showed an anomalous slope between 1926 and 1942. This anomaly represented a deficit of some 2300 mm which changed the 1926-79 mean annual rainfall to 872 mm, and the total period rainfall to 898 mm per annum, a variation of 2.9%.

Only 5 of the primary stations have the 1926-79 mean annual rainfall sufficiently different to their full period mean to cause a significant change of isohyets.

The mean for the 54 year period is expected to be from ±4.1% to ±7.1% of the long term mean for coefficients of variation from 0.152 to 0.259 respectively.

2.2 Secondary Stations

Table 2 lists the basic statistics for both the observed and extended 54 year record for the 184 secondary stations. The data was extended by using the following procedure.

Linear regressions were made between the secondary station and the three nearest primary stations (both individually and as a group) using monthly data. The best correlation coefficient was then used to select the primary station for calculating the relevant 54 year statistics for each month. The monthly statistics were then combined to form annual statistics. Correlation coefficients for individual months were generally good to very good. Generally about 5 months had correlation coeffients greater than 0.95, and 10 months had correlation coefficients greater than 0.9.

The annual coefficients of variation were calculated assuming there was no serial correlation between successive months. The slight serial correlation (see section 5 for details) observed for the primary stations tended to increase the coefficient of variation. The values for coefficient of correlation in both Tables 2 and 3 are included to show the relative variation between stations, while their absolute values may be estimated to 2 significant figures from Figures 2 and 3.

2.3 Tertiary Stations

Table 3 lists the observed and extended means of the tertiary stations considered. The method of estimating the 54 year mean was the same as for the secondary stations.

To locate possible inconsistencies in the data, each tertiary stations long term mean was compared with the general trends of nearby primary and secondary station means, and double mass curves drawn. One station, Glenwood (009 707) showed a longer term mean that was some 40% higher than its expected value, poor correlation with nearby primary stations, and a double mass curve with a marked change between

1932 and 1935. An inspection of the original rainfall record at the Australian Archives showed a change of observer in August 1932. Consequently only the shorter period from 1926 to July 1932 was considered for the estimation of the long-term mean for the station, as that data correlated well with the nearby stations.
In this case the shorter record appeared to give the best estimate of the long term mean, and results of the shorter period are shown in Table 3.

3. ANNUAL AVERAGE ISOHYETS

Annual average isohyets are reproduced in Figure 1. Major weight was given to the primary and secondary stations' mean rainfall when the isohyets were drawn. Tertiary stations were used to assist the general interpolation of the isohyets, and to delineate the high rainfall areas.

Some tertiary and secondary stations in close proximity to each other indicated possible complex patterns of rainfall means, for example between Donnybrook and Bridgetown. The limited length of record together with limited information on local topography and site exposure caused smoothed isohyets to be drawn. These smoothed isohyets were drawn to allow for the expected accuracy of the mean values. Problems of localised rainshadow effects and site exposure condition could be considered in such areas, but a denser network of long-term raingauges would be desirable if such effects are to be adequately identified.

It is therefore considered that the isohyets in Figure 1 update and improve the previously available information. However, estimates of long-term mean rainfalls taken directly from these isohyets for individual locations must still be assigned errors between $\pm 4.1\%$ and $\pm 7.1\%$ of the 54 year mean where the Coefficient of Variation varies from 0.15 to 0.26 respectively. These expected confidence limits generally convert to ± 75 mm for the highest rainfall area, grading to ± 35mm in the lowest rainfall area. The error in the vicinity of the scarp on the western boundary of the Darling Plateau may be even higher, owing to the steep rainfall gradient and the lack of long-term raingauges on the scarp.

4. RAINFALL VARIABILITY

Tables 1, 2 and 3 list the coefficients of variation (standard deviation divided by mean) for the primary. secondary and tertiary stations respectively, while Figure 2 shows isopleths of coefficient of variation based on the primary stations.

Rainfall variability generally increases with increasing distance from the coast. A variation from the North-South isopleth trend to an East-West trend south of Collie is evident. The report by Loh and King (1978) indicated a continuation of the East-West isopleth trend for the region to the south of the current study. The area of relatively low rainfall variability near Narrogin corresponds with the bulge in the annual average isohyets over the same place. These rainfall anomalies appear to be associated with the relatively high terrain in the area.

The general variability of rainfall in the region is low to moderate. The coefficients of variation for the primary stations ranged between 0.152 and 0.259, with a mean of 0.214, which is slightly higher than the average value of 0.176 determined by Loh and King (1978) for the adjacent area to the south.

Figure 3 shows two trends of rainfall variation in the study area: for areas with less than 800 mm annual mean rainfall the variability increases as rainfall decreases; for the remainder the variability is independent of annual mean rainfall. the region of similar variability covers the Darling Plateau and the Swan Coastal Plain.

It was considered possible that rainfall magnitude may be related to the average rainfall per rainday. The data appears in Table 1. Figure 4 shows the relatiohship between average rainfall per rainday and annual mean rainfall. This relationship shows that the higher the annual mean rainfall, the higher the average rainfall intensity, with only a marginal increase in the number of raindays per year. The southern river basins studies by Loh and King (1978) show reversed characteristics: increasing annual mean rainfall being associated with an increasing number of raindays and only a marginal increase in rainfall intensity. These two sets of rainfall characteristics appear to be related to the general coastline direction. Some locations in the current study showed characteristics of both areas. For

example, Collie (009 628) has a rainfall variability which is typical of the Darling Plateau and an average rainfall per rainday which is typical of the southern river basins.

The Blackwood Plateau (adjacent to both the Swan Coastal Plain and the Donnelly River Basin) is expected to display a complex mixture of the above mentioned sets of characteristics.

5. FREQUENCY DISTRIBUTIONS AND SERIAL CORRELATION

Previous studies have shown that the annual mean rainfall in this region is normally distributed, and that there is a near zero serial correlation between successive annual rainfall totals.

The current study indicates that there are some significant serial correlations between consecutive months for stations within the study area. These serial correlations were sufficiently large to effect the conversions of monthly standard deviations to annual figures. The annual standard deviations derived from monthly values (assuming zero serial correlation, lag 1) were between 80% and 90% of the annual standard deviations derived from annual statistics for most of the primary stations. When the serial correlations for primary station annual data were mapped (figure 5), regions of relatively high serial correlation were observed in the high rainfall area near Churchmans Brook and the low rainfall area near Wagin. These areas were associated with locally high rainfall variability.

6. DISCUSSION

As noted in section 4 the Isohyetal Map (Figure 1) is based primarily on the longer term statistics of the Bureau of Meteorology and has the same general features as the previous (1980) large scale map. The major differences between the current map and the previous one are the steeper rainfall gradient along both sides of the Northern Jarrah Forest and a continuation of the 1000 mm isohyet from the Darling Plateau to the South Coast. The new isohyets generally increase the annual average rainfall over the Northern Jarrah Forest part of the Darling Plateau while leaving the 600 mm isohyet unchanged. These differences are related to additional secondary and tertiary stations in the area, to the use of the common 54 year period of record and, for the area near Greenbushes, to differences in the subjective drawing of the final isohyets.

A very steep rainfall gradient exists along the western edge of the Darling Plateau. Between Armadale (009 001) and Churchmans Brook (009 010) the mean annual rainfall increases by 85 mm per kilometre, which is one of the steepest measured in Australia. This steep rainfall gradient between primary stations is confirmed by nearby primary, secondary and tertiary stations.

The 1100 mm isohyet extends for some 170 km South from Mundaring, averages 20 km in an East-West direction, to cover an area of approximately 3 400 square kilometres. Two areas were identified with more than 1300 mm of mean annual rainfall, the smaller around Churchmans Brook, and the larger extended from Karnet (009 111) to Dwellingup (009 538). There were no stations within a mean annual rainfall greater than 1400 mm in the study area. The long term mean at Karnet is estimated to be 1394 $\pm$75 mm, so a 1400mm isohyet may be identified in this area during a later study.

The recent data collected by the Public Works Department (tertiary stations) was useful in assessing the overall rainfall patterns. Their estimated 54 year means correlated very well with the means of nearby long-term stations. Owing to the variability of rainfall in the area, some additional ten to twelve years of data are required before standard errors of estimate of the tertiary stations (for their period of record) will be less than 5% of their mean.

In addition to the 50 tertiary stations still operating at the end of 1979, a further 89 Public Works Department stations have been opened since 1975. These stations should in time (approximately 10 years) provide better definition of the high rainfall area, and the rainfall gradient on both sides of the Northern Jarrah Forest.

Analysis of all available data in some 10 years time should provide an improvement on the information presented here. Even with the current network, however, it is unlikely that local rainshadow effects (or the effects of site exposure) could be isolated on a drainage basin scale.

The study has illustrated the moderately low variability of annual rainfall in the region. The annual rainfall is dominated by reasonably reliable winter rainfall between May and October. During this period westerly winds from the Indian Ocean and frontal systems associated with extensive depressions in the Southern Ocean regularly supply abundant cold moist air over the western coastline. The pattern of annual rainfall (figure 1) is a reflection of how this moist airflow is affected by the Darling Scarp and precipitated over the area. The low rainfall in the northern coastal areas is due to the lack of relief combined with irregular frontal systems. The increase in variability as distance from the coast increases is a consequence of a more erractic moisture supply relative to that on the coast.

Rainfall Frequency distributions were not studied for this area. Some of the serial correlation which was noted for monthly data persisted to the annual data. Regions of relatively high annual serial correlation were found near Churchmans Brook and near Wagin. The significance of these relatively high annual serial correlations may be associated with the particular patterns of rainfall in these areas. For example, some wet years together and some dry years together may increase annual serial correlations. The relatively high annual serial correlations are associated with locally higher values of rainfall variability.

7. CONCLUSIONS

The general characteristics of the annual rainfalls of the Darling Plateau and the Swan Coastal Plain have been identified and an updated isohyetal map using all available data has been produced. Figures 1 and 2 summarise the mean and variability of rainfall throughout the region while other general characteristics of the data set are discussed in section 6. In addition to that discussion the following points are emphasized.

(1) The study identified long term annual mean rainfalls to within ±75 mm for the highest rainfall area, grading to ±35 mm in the lowest rainfall area.

(2) Rainfall variability in the region is generally low but increases with distance inland from the coast and tends to be higher in the northern area than in the rest of the study area.

(3) the study should be repeated in about 10 years when data from the expanded network will be more useful in assessing the long term statistics.

(4) The current network appears adequate to accurately define the major isohyets and to identify some local rainfall effects.

8. REFERENCES

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PRIMARY STATION ANNUAL STATISTICS

STATION NO.	STATION NAME	OVERALL RECORD: PERIOD OF RECORD	OVERALL RECORD: MEAN (MM)	OVERALL RECORD: AVERAGE DAILY RAINFALL (MM)	1926-1979 RECORD: MEAN OF EXISTING RECORD (MM)	1926-1979 RECORD: MEAN OF EXTENDED RECORD (MM)	1926-1979 RECORD: COEF. OF VAR.	THREE CLOSEST PRIMARY STATIONS
008 005	BARBERTON	1911-1979	452	5.13	451	451	.217	008 115 , 008 064 , 009 046 .
008 046	ELSINGTON (WONGAN H'S E.)	1906-1979	387		369	370	.224	008 137 , 008 070 , 010 134 .
008 064	INDARRIE	1923-1979	422		422	423	.226	008 115 , 008 005 , 008 070 .
008 070	LAKE HINDS	1924-1979	366	5.97	366	366	.243	008 140 , 008 064 , 008 137 .
008 115	ROUND HILL	1904-1979	409	5.64	397	396	.235	008 064 , 008 005 , 009 033 .
008 137	WONGAN HILLS P.O.	1907-1979	388	5.21	386	386	.238	008 046 , 008 140 , 009 033 .
008 140	WYE WYE	1912-1978	392	5.63	385	382	.234	008 070 , 009 033 , 008 137 .
009 001	ARMADALE	1901-1979	882	8.55	870	868	.208	009 010 , 009 044 , 009 036 .
009 002	BEERMULLAH	1916-1979	696	7.29	695	697	.199	009 018 , 009 033 , 009 046 .
009 007	CHIDLOW	1891-1979	916	9.22	899	898	.228	009 030 , 010 056 , 009 031 .
009 009	CHITTERING LOWER	1915-1979	837	8.98	826	826	.209	009 057 , 010 125 , 009 018 .
009 010	CHURCHMANS BROOK	1910-1979	1355	11.39	1388	1364	.226	009 044 , 009 001 , 009 031 .
009 018	GIN GIN	1889-1979	756	7.64	740	740	.199	009 002 , 009 009 , 009 033 .
009 023	JARRAHDALE	1882-1979	1193	10.88	1213	1212	.201	009 037 , 009 044 , 009 749 .
009 025	MIDLAND JUNCTION	1886-1979	821		821	820	.202	009 057 , 009 034 , 009 030 .
009 030	MUNDARING	1888-1979	1090	10.82	1098	1096	.212	009 031 , 009 025 , 009 007 .
009 031	MUNDARING WEIR	1900-1979	1078	10.40	1074	1074	.208	009 030 , 009 025 , 009 010 .
009 033	NEW NORCIA	1882-1979	535	6.01	525	516	.250	008 005 , 009 018 , 008 140 .
009 034	PERTH REGIONAL OFFICE	1876-1979	873	7.41	881	881	.203	009 025 , 009 001 , 009 036 .
009 036	ROCKINGHAM	1897-1979	827	7.53	833	834	.199	009 039 , 009 572 , 009 034 .
009 038	ROTTNEST ISLAND	1880-1979	724	5.98	735	735	.237	009 034 , 009 036 , 009 001 .
009 039	SERPENTINE	1905-1979	952	9.11	945	945	.191	009 023 , 009 036 , 009 572 .
009 044	WUNGONG BROOK	1911-1979	1300	11.92	1279	1279	.215	009 010 , 009 001 , 009 023 .
009 046	YATHROO	1885-1979	618	7.59	601	599	.208	008 005 , 009 002 , 009 033 .
009 057	HENLEY PARK	1913-1979	849	8.11	833	833	.215	009 025 , 009 009 , 009 034 .
009 502	BOWELLING	1919-1979	691	7.98	684	683	.207	010 542 , 009 628 , 009 504 .
009 503	BOYANUP	1897-1979	990	7.66	981	980	.180	009 534 , 009 516 , 009 514 .
009 504	BOYUP BROOK P.O.	1913-1979	680	5.61	677	677	.178	009 556 , 009 552 , 010 635 .
009 505	BALINGUP	1924-1979	877	7.60	880	876	.176	009 552 , 009 622 , 009 583 .
009 507	BANNISTER	1885-1979	660	7.46	637	637	.217	010 648 , 009 575 , 009 749 .
009 510	BRIDGETOWN	1887-1979	848	6.02	837	837	.177	009 556 , 009 552 , 009 504 .
009 513	BRUNSWICK JUNCTION	1909-1979	1017	9.37	1009	1009	.185	009 514 , 009 554 , 009 503 .
009 514	BUNBURY	1877-1979	875	7.31	829	829	.179	009 513 , 009 503 , 009 516 .
	BUNBURY * CORRECTED VALUES *		898	7.50	872	872		SEE TEXT FOR DETAILS .
009 516	CAPEL P.O.	1914-1979	855	8.60	842	842	.174	009 503 , 009 514 , 009 534 .
009 534	DONNYBROOK P.O.	1900-1979	1007	7.37	1002	1002	.172	009 503 , 009 622 , 009 516 .
009 552	GREENBUSHES	1893-1979	957	7.02	939	936	.178	009 505 , 009 510 , 009 583 .
009 553	HAMEL	1910-1979	1051	9.22	1054	1053	.203	009 554 , 009 596 , 009 575 .
009 554	HARVEY	1897-1979	1012	8.66	1015	1016	.172	009 553 , 009 513 , 009 514 .

TABLE 1 - PRIMARY STATION ANNUAL STATISTICS

PRIMARY STATION ANNUAL STATISTICS

STATION NO.	STATION NAME	OVERALL RECORD: PERIOD OF RECORD	OVERALL RECORD: MEAN (MM)	OVERALL RECORD: AVERAGE DAILY RAINFALL (MM)	1926-1979 RECORD: MEAN OF EXISTING RECORD (MM)	1926-1979 RECORD: MEAN OF EXTENDED RECORD (MM)	1926-1979 RECORD: COEF. OF VAR.	THREE CLOSEST PRIMARY STATIONS
009 556	HILTON	1903-1979	675	6.31	672	674	.189	009 510 • 009 504 • 009 552 •
009 572	MANDURAH P.O.	1889-1979	885	7.48	873	873	.200	009 [illegible] • 009 036 • 009 039 •
009 575	MARRADONG	1897-1979	747	7.02	741	759	.214	009 [illegible] • 009 553 • 010 655 •
009 583	MYLOR	1924-1979	977	6.90	977	977	.170	009 [illegible] • 009 505 • 009 622 •
009 585	NANNUP	1900-1979	974	7.76	968	965	.152	009 [illegible] • 009 552 • 009 510 •
009 596	PINJARRA P.O.	1877-1979	957	8.74	956	954	.212	009 [illegible] • 009 572 • 009 553 •
009 622	DONNYBROOK (WOODPERRY)	1913-1979	958	7.89	926	926	.187	009 534 • 009 505 • 009 583 •
009 628	COLLIE P.O.	1899-1979	974	6.81	967	967	.203	009 622 • 009 513 • 009 502 •
009 749	PINJARRA FAIRBRIDGE FS.	1921-1979	994		998	995	.211	009 [illegible] • 009 039 • 009 553 •
010 056	CRYSTAL DENE	1925-1979	656	6.86	660	662	.222	009 007 • 010 152 • 010 125 •
010 058	GOOMALLING POLICE STN	1887-1979	367	4.56	365	365	.244	010 134 • 010 150 • 008 046 •
010 091	MECKERING	1897-1979	376	5.43	361	361	.255	010 150 • 010 163 • 010 144 •
010 111	NORTHAM	1877-1979	434	4.66	437	437	.236	010 152 • 010 150 • 010 125 •
010 125	TOODYAY	1877-1979	534	5.92	532	531	.235	010 111 • 009 009 • 010 134 •
010 134	WATTENING	1913-1979	442	5.35	447	447	.240	010 125 • 009 018 • 010 058 •
010 144	YORK P.O.	1877-1979	453	5.16	460	460	.238	010 152 • 010 515 • 010 056 •
010 150	GRASS VALLEY	1887-1979	400	5.88	397	393	.252	010 111 • 010 091 • 010 058 •
010 152	MURESK AGR COLLEGE	1926-1979	460	4.87	460	460	.226	010 111 • 010 144 • 010 056 •
010 163	CUNDERDIN (JAROMA)	1922-1979	361	5.28	360	360	.243	010 091 • 010 144 • 010 152 •
010 505	ARTHUR RIVER	1891-1979	488	5.07	484	482	.229	010 542 • 010 647 • 010 510 •
010 510	BAROOGA	1911-1979	538	5.06	536	536	.224	010 655 • 010 542 • 010 505 •
010 515	BEVERLEY P.O.	1886-1979	420	4.91	415	415	.218	010 634 • 010 144 • 010 524 •
010 524	BROOKTON P.O.	1907-1979	462	5.31	470	470	.230	010 564 • 010 626 • 010 515 •
010 534	COLORADO	1913-1979	380	6.40	369	369	.252	010 654 • 010 626 • 010 538 •
010 538	CUBALLING	1912-1979	528	5.51	530	527	.210	010 614 • 010 654 • 010 658 •
010 542	DARKAN	1898-1979	573	7.11	572	571	.209	010 510 • 009 502 • 010 505 •
010 561	RUSHY POOL (VIEWLANDS)	1911-1979	414	6.30	417	416	.259	010 514 • 010 647 • 010 654 •
010 564	HILLCROFT	1915-1979	467	6.35	461	461	.243	010 524 • 010 634 • 010 648 •
010 614	NARROGIN	1891-1979	505	5.29	507	507	.219	010 538 • 010 658 • 010 561 •
010 620	OAKLAND (DALE VIEW)	1912-1979	558	6.19	556	555	.241	010 634 • 010 564 • 009 507 •
010 626	PINGELLY	1891-1979	456	5.11	470	470	.222	010 524 • 010 538 • 010 648 •
010 634	REDLANDS	1911-1979	517	6.03	509	507	.227	010 515 • 010 564 • 010 144 •
010 635	RIVERDALE	1909-1979	521	5.61	513	512	.220	009 504 • 009 502 • 010 505 •
010 647	WAGIN P.O.	1891-1979	440	5.10	439	439	.241	010 505 • 010 561 • 010 655 •
010 648	WANDERING P.O.	1887-1979	630	5.44	629	629	.237	009 507 • 009 575 • 010 658 •
010 654	WICKEPIN P.O.	1911-1979	419	5.17	422	422	.235	010 538 • 010 561 • 010 534 •
010 655	WILLIAMS	1885-1979	550	5.72	556	556	.233	010 510 • 010 658 • 010 614 •
010 658	WONNAMINTA	1904-1979	524	6.30	519	518	.220	010 538 • 010 614 • 010 655 •

NUMBER OF PRIMARY STATIONS = 76

TABLE 1 (CONCLUDED) - PRIMARY STATION ANNUAL STATISTICS

SECONDARY STATION ANNUAL STATISTICS

STATION NO.	STATION NAME	OVERALL RECORD PERIOD OF RECORD	OVERALL RECORD MEAN (MM)	1926-1979 RECORD MEAN OF EXISTING RECORD (MM)	1926-1979 RECORD MEAN OF EXTENDED RECORD (MM)	1926-1979 RECORD COEF. OF VAR.	FIVE CLOSEST PRIMARY STATIONS
008 053	GLENMORE (GRAIGHOLME)	1912-1948	332	326	315	.24	008 137 • 008 070 • 008 140 •
008 071	LAKE NINAN	1909-1951	403	406	410	.24	008 137 • 008 140 • 008 046 •
008 089	MINJA MIA	1927-1950	471	471	465	.21	009 033 • 008 140 • 010 134 •
008 108	PIAWANING	1940-1979	397	397	404	.23	008 064 • 008 140 • 009 033 •
008 122	TOOTRA	1911-1972	365	356	352	.22	008 115 • 008 064 • 008 070 •
008 151	WALEBING	1884-1979	503	500	499	.21	008 115 • 008 064 • 008 005 •
008 159	MAYSBORO (CARANI)	1951-1979	444	444	447	.22	009 033 • 008 140 • 010 134 •
008 177	LONGVIEW	1956-1977	503	503	494	.23	008 005 • 009 033 • 008 064 •
009 000	ARALUEN	1934-1979	1104	1104	1111	.18	009 010 • 009 001 • 009 031 •
009 003	BELVOIR	1885-1968	781	771	750	.19	009 057 • 009 009 • 009 025 •
009 004	BINDOON (KEANEY COLLEGE)	1949-1979	659	659	673	.20	009 018 • 009 009 • 010 134 •
009 005	CAPITELA	1934-1956	524	524	527	.21	009 046 • 008 005 • 009 002 •
009 006	CHELSEA	1930-1979	507	507	500	.21	009 046 • 008 005 • 008 115 •
009 008	CHITTERING	1951-1969	791	791	768	.19	009 009 • 009 018 • 010 125 •
009 012	MT.YOKINE RESERVOIR	1958-1979	833	833	897	.17	009 034 • 009 057 • 009 025 •
009 013	COWALLA	1908-1969	702	697	680	.19	009 046 • 009 002 • 009 033 •
009 014	DANDARAGAN W. (DANDALOO)	1951-1979	615	615	655	.20	009 046 • 008 005 • 009 002 •
009 016	FORRESTDALE	1905-1947	914	927	864	.18	009 001 • 009 034 • 009 038 •
009 017	FREMANTLE	1852-1978	771	780	775	.17	009 034 • 009 038 • 009 036 •
009 019	GLENEAGLE	1938-1968	1224	1224	1187	.19	009 023 • 009 044 • 009 010 •
009 020	GREENMOUNT HILL	1928-1973	892	892	872	.18	009 025 • 009 030 • 009 031 •
009 021	PERTH (A.M.O.-GUILDFORD)	1944-1979	814	814	835	.17	009 025 • 009 034 • 009 057 •
009 022	GUILDFORD	1877-1954	863	885	847	.18	009 034 • 009 025 • 009 057 •
009 024	CHITTERING (MARBLING)	1943-1979	806	806	814	.18	009 009 • 009 018 • 010 125 •
009 027	MOGUMBER	1916-1977	558	547	539	.20	009 033 • 009 018 • 009 046 •
009 028	MOOLIABEENEE SIDING	1912-1970	767	766	752	.20	009 018 • 009 002 • 009 009 •
009 029	MUCHEA	1911-1979	784	794	782	.19	009 009 • 009 018 • 009 057 •
009 035	UNIVERSITY OF W.A.	1940-1974	822	822	832	.17	009 034 • 009 025 • 009 057 •
009 040	WANNAMEL (COWARA)	1905-1979	605	593	592	.21	009 018 • 009 033 • 009 002 •
009 041	WANNERIE	1913-1976	762	760	720	.18	009 002 • 009 046 • 009 033 •
009 042	DANDARAGAN (WESTVALE)	1949-1979	617	617	642	.20	009 046 • 008 005 • 009 002 •
009 045	YANCHEP PARK	1934-1979	757	757	773	.17	009 018 • 009 002 • 009 009 •
009 047	YERE YERE	1931-1979	556	556	545	.21	009 046 • 008 005 • 009 002 •
009 049	GOSNELLS (2)	1950-1979	888	888	935	.18	009 001 • 009 025 • 009 031 •
009 050	CANNING RIVER WEIR	1898-1979	1247	1257	1259	.19	009 010 • 009 044 • 009 001 •
009 051	GLEN FORREST	1950-1979	924	924	980	.18	009 030 • 009 031 • 009 025 •
009 053	PEARCE(AERODROME)	1937-1979	698	698	728	.18	009 009 • 009 057 • 009 025 •

TABLE 2 - SECONDARY STATION ANNUAL STATISTICS

SECONDARY STATION ANNUAL STATISTICS

STATION NO.	STATION NAME	OVERALL RECORD PERIOD OF RECORD	OVERALL RECORD MEAN (MM)	1926-1979 RECORD MEAN OF EXISTING RECORD (MM)	1926-1979 RECORD MEAN OF EXTENDED RECORD (MM)	1926-1979 RECORD COEF. OF VAR.	THREE CLOSEST PRIMARY STATIONS
009 054	DANDARAGAN (STRATHMORE)	1938-1979	617	617	621	.20	009 046 , 008 005 , 009 002 .
009 055	DANDARAGAN	1897-1968	651	628	610	.21	009 046 , 008 005 , 009 002 .
009 056	FLOREAT PARK	1962-1979	771	771	828	.18	009 034 , 009 025 , 009 057 .
009 058	KALAMUNDA P.O.	1908-1965	1071	1076	1024	.18	009 031 , 009 025 , 009 010 .
009 059	MAIDA VALE (WINDY RIDGE)	1935-1950	873	873	853	.19	009 025 , 009 031 , 009 010 .
009 061	SWANBOURNE MILIT.	1954-1974	757	757	779	.18	009 034 , 009 038 , 009 025 .
009 062	GIDGEGANNUP (1)	1948-1975	899	899	929	.19	009 007 , 009 009 , 009 057 .
009 064	KWINANA (B.P.REFINERY)	1955-1979	783	783	817	.17	009 036 , 009 034 , 009 001 .
009 065	CARABAN	1956-1979	729	729	726	.18	009 002 , 009 018 , 009 009 .
009 066	GIDGEGANNUP (2)	1957-1979	922	922	995	.19	009 030 , 009 057 , 009 007 .
009 067	UPPER SWAN RESEARCH STN	1957-1979	734	734	774	.18	009 057 , 009 009 , 009 025 .
009 068	MELVILLE	1956-1979	808	808	870	.17	009 034 , 009 036 , 009 001 .
009 070	SPEARWOOD	1958-1979	797	797	861	.17	009 036 , 009 034 , 009 001 .
009 073	SERPENTINE PIPE HEAD DAM	1958-1979	1210	1210	1287	.17	009 023 , 009 039 , 009 749 .
009 080	CORNERS BROOK	1921-1939	1304	1341	1234	.20	009 044 , 009 010 , 009 023 .
009 094	MAYLANDS AERO	1929-1944	851	851	851	.18	009 034 , 009 025 , 009 057 .
009 096	MT. VICTORIA	1890-1938	1008	1056	997	.19	009 031 , 009 025 , 009 001 .
009 102	SUBIACO	1898-1938	845	848	812	.17	009 034 , 009 025 , 009 057 .
009 105	WANNEROO	1905-1979	858	843	839	.19	009 034 , 009 057 , 009 009 .
009 106	MADDINGTON	1961-1979	845	845	914	.19	009 001 , 009 025 , 009 034 .
009 111	KARNET	1963-1979	1293	1293	1394	.23	009 023 , 009 039 , 009 749 .
009 113	ROLEYSTONE	1964-1979	1036	1036	1249	.19	009 010 , 009 001 , 009 031 .
009 118	LEDGE PT (FORESTRY 5)	1956-1979	676	676	771	.20	009 002 , 009 046 , 009 033 .
009 119	GNANGARA FORESTRY	1950-1979	812	812	825	.18	009 057 , 009 025 , 009 009 .
009 120	WANNEROO FORESTRY	1958-1979	764	764	800	.17	009 034 , 009 057 , 009 009 .
009 121	MOORE RIVER (FORESTRY 6)	1965-1979	721	721	755	.17	009 002 , 009 018 , 009 046 .
009 125	YANCHEP EAST (FORESTRY 4)	1956-1979	774	774	846	.17	009 018 , 009 009 , 009 057 .
009 129	SCARBOROUGH BEACH P.O.	1964-1979	717	717	795	.17	009 034 , 009 038 , 009 025 .
009 163	WEST SWAN	1917-1979	806	793	791	.18	009 057 , 009 025 , 009 034 .
009 164	LONG POINT	1936-1962	812	812	810	.18	009 036 , 009 572 , 009 039 .
009 166	WHITBY FALLS	1930-1964	975	975	953	.18	009 023 , 009 044 , 009 010 .
009 167	MOGUMBER METH.MSSN.	1918-1979	536	533	523	.21	009 002 , 009 046 , 009 033 .
009 509	BOODINGTON	1915-1979	688	683	677	.21	009 575 , 009 507 , 010 648 .
009 511	BROOKDALE (ELSFIELD)	1910-1954	1286	1302	1268	.18	009 749 , 009 596 , 009 553 .
009 517	CASTLEDENE (KIRUP)	1919-1979	1030	1043	981	.17	009 622 , 009 583 , 009 505 .
009 525	KULIKUP (CULICUP)	1926-1977	575	575	568	.18	010 635 , 009 504 , 009 555 .
009 526	DANDALUP NORTH	1921-1955	1010	1009	961	.20	009 749 , 009 596 , 009 572 .

TABLE 2 (CONTINUED) - SECONDARY STATION ANNUAL STATISTICS

SECONDARY STATION ANNUAL STATISTICS

STATION NO.	STATION NAME	OVERALL RECORD PERIOD OF RECORD	OVERALL RECORD MEAN (MM)	1926-1979 RECORD MEAN OF EXISTING RECORD (MM)	1926-1979 RECORD MEAN OF EXTENDED RECORD (MM)	1926-1979 RECORD COEF. OF VAR.	THREE CLOSEST PRIMARY STATIONS
009 527	DARDANUP (BRETT)	1935-1977	965	965	968	.17	009 503 , 009 513 , 009 514 .
009 538	DWELLINGUP (FORESTRY)	1934-1979	1283	1283	1305	.18	009 749 , 009 553 , 009 596 .
009 543	FALNASH	1937-1974	717	717	706	.18	009 556 , 009 514 , 009 504 .
009 545	FERGUSON	1939-1979	1036	1036	1034	.17	009 503 , 009 514 , 009 628 .
009 546	BALINGUP (FERNDALE)	1902-1976	977	978	946	.17	009 505 , 009 552 , 009 563 .
009 562	KENINUP (BOYUP BROOK)	1911-1977	629	633	609	.18	009 556 , 009 504 , 010 635 .
009 567	KULIKUP (EULIN HOUSE)	1919-1953	611	608	594	.18	010 635 , 009 504 , 009 556 .
009 571	BRIDGETOWN (HILLSCREST)	1945-1979	805	805	810	.17	009 510 , 009 552 , 009 504 .
009 580	MORNINGTON MILLS	1911-1966	1282	1291	1244	.17	009 513 , 009 554 , 009 628 .
009 587	NEWBICUP	1918-1979	629	628	627	.18	009 556 , 009 504 , 010 635 .
009 588	NOGGERUP	1915-1977	941	913	886	.19	009 622 , 009 628 , 009 502 .
009 598	HARVEY (RADYR PARK)	1902-1977	1070	1080	1082	.18	009 554 , 009 553 , 009 513 .
009 601	ROELANDS HOMES (MISSION)	1909-1979	1085	1063	1058	.17	009 513 , 009 534 , 009 628 .
009 608	BOYUP BROOK (TOTTENUP)	1929-1969	616	616	609	.17	009 556 , 009 504 , 010 635 .
009 614	WARUONA	1935-1979	1027	1027	1061	.17	009 553 , 009 596 , 009 749 .
009 618	WILGA S.S.	1921-1945	918	917	894	.20	009 552 , 009 504 , 009 502 .
009 624	YARLOOP	1947-1979	976	976	1023	.18	009 553 , 009 554 , 009 575 .
009 629	DARDANUP (GLENBROOK)	1957-1979	943	943	973	.16	009 503 , 009 514 , 009 513 .
009 632	FERNBROOK	1915-1964	1338	1327	1276	.18	009 513 , 009 628 , 009 554 .
009 634	AUSTRALIND (PARKFIELD)	1913-1979	857	802	814	.17	009 514 , 009 513 , 009 554 .
009 640	LINGDALE (CODEEARUP)	1903-1943	901	896	857	.16	009 510 , 009 552 , 009 585 .
009 642	WOKALUP RESEARCH STN.	1951-1979	991	991	1027	.17	009 554 , 009 513 , 009 624 .
009 643	AUSTRALIND (ROSAMEL)	1919-1963	946	961	961	.17	009 514 , 009 513 , 009 554 .
009 645	WOODSOME	1929-1955	714	714	703	.20	009 057 , 009 009 , 009 025 .
009 648	ELGIN (THIRLMERE)	1954-1979	836	836	855	.16	009 503 , 009 516 , 009 514 .
009 657	BUREKUP (ROSEDALE)	1942-1979	974	974	977	.17	009 513 , 009 514 , 009 624 .
009 666	MCALINDEN	1945-1979	704	704	722	.18	009 502 , 009 504 , 009 622 .
009 668	DINNINUP (KURANDA)	1956-1979	590	590	610	.18	009 504 , 010 635 , 009 502 .
009 669	KIRUP (LILYDALE)	1956-1979	992	992	1057	.17	009 622 , 009 583 , 009 534 .
009 671	WILGA	1956-1979	783	783	834	.18	009 552 , 009 504 , 009 628 .
009 679	HAMPDEN	1960-1979	912	912	972	.16	009 554 , 009 553 , 009 513 .
009 686	BLYTHEWOOD	1905-1942	939	956	946	.19	009 596 , 009 749 , 009 553 .
009 697	DENNINUP VALE	1906-1941	653	624	640	.18	010 635 , 009 504 , 009 556 .
009 702	DWELLINGUP (GANGER RLY.)	1915-1945	1322	1328	1251	.18	009 749 , 009 553 , 009 507 .
009 705	DUNNYBROOK (GLEN MERVYN)	1900-1979	875	848	883	.18	009 628 , 009 622 , 009 502 .
009 714	KIRKUP	1911-1944	1146	1126	1043	.17	009 622 , 009 505 , 009 583 .
009 738	MUJA	1962-1979	747	747	786	.18	009 502 , 009 628 , 009 622 .

TABLE 2 (CONTINUED) - SECONDARY STATIONS ANNUAL STATISTICS

SECONDARY STATION ANNUAL STATISTICS

STATION NO.	STATION NAME	OVERALL RECORD PERIOD OF RECORD	OVERALL RECORD MEAN (MM)	1926-1979 RECORD MEAN OF EXISTING RECORD (MM)	1926-1979 RECORD MEAN OF EXTENDED RECORD (MM)	1926-1979 RECORD COEF. OF VAR.	THREE CLOSEST PRIMARY STATIONS
009 743	WAROONA WEST	1964-1979	919	919	986	.16	009 553 • 009 576 • 009 554 •
009 769	CULFORD (GILROS)	1967-1979	682	682	762	.21	009 507 • 010 648 • 009 749 •
009 830	LEWANA PARK	1960-1979	1019	1019	1042	.15	009 583 • 009 552 • 009 585 •
010 009	BOLGART	1906-1979	473	475	467	.22	010 134 • 010 056 • 009 033 •
010 015	BOLGART (BROOKLEA)	1946-1965	394	394	377	.25	010 134 • 010 056 • 009 033 •
010 020	CAMPSIDE (WONUBBING)	1912-1951	402	397	398	.22	010 144 • 010 515 • 010 091 •
010 021	ALDERSYDE (WILYAMA)	1944-1979	404	404	407	.24	010 524 • 010 626 • 010 534 •
010 023	CARTERVILLE	1913-1979	370	370	368	.23	010 091 • 010 150 • 010 056 •
010 024	CASUERINA VALE	1910-1979	384	379	377	.22	010 058 • 008 046 • 010 134 •
010 027	CLACKLINE (EADINE)	1890-1962	559	554	532	.23	010 056 • 010 111 • 010 125 •
010 062	GOOMALLING (ELY FARM)	1902-1979	390	398	398	.22	010 058 • 008 046 • 010 134 •
010 063	HAWTHORNDEN	1912-1979	520	513	498	.24	010 125 • 010 134 • 009 009 •
010 064	CHITTERING (INNAMINKA)	1912-1956	783	790	768	.18	009 009 • 009 016 • 010 125 •
010 066	JENNAPULLIN	1908-1964	384	380	375	.23	010 134 • 010 056 • 008 137 •
010 069	JOROKINE	1917-1968	407	402	402	.23	010 134 • 010 058 • 008 137 •
010 076	KONNONGORRING	1913-1979	375	362	360	.23	008 046 • 008 137 • 010 056 •
010 089	MALMALLING	1914-1948	779	782	744	.23	009 007 • 009 031 • 010 056 •
010 115	YORK (QUELLINGTON)	1909-1979	421	416	425	.24	010 144 • 010 152 • 010 091 •
010 120	GREENHILLS (SUNSET HILL)	1899-1979	456	458	453	.25	010 163 • 010 515 • 010 144 •
010 138	WOOROLOO	1917-1979	862	849	856	.21	009 007 • 010 056 • 009 030 •
010 139	WOOTTATING	1914-1946	748	733	697	.21	010 056 • 009 007 • 010 152 •
010 155	CALINGIRI	1929-1979	456	456	454	.22	009 033 • 010 134 • 008 140 •
010 159	YULGERING (WALGO)	1906-1944	413	394	401	.23	009 033 • 008 140 • 010 134 •
010 165	GREEN HILLS (KORRAIVILLA)	1956-1979	357	357	367	.23	010 144 • 010 515 • 010 091 •
010 166	BAKERS HILL (SOUTHBOURNE)	1907-1979	608	624	623	.21	010 056 • 010 152 • 010 125 •
010 211	MININGBROOK	1908-1942	371	384	366	.23	008 137 • 008 046 • 010 134 •
010 244	BAKERS HILL (C.S.I.R.O.)	1964-1979	607	607	655	.20	010 056 • 010 152 • 010 125 •
010 250	GOOMALING	1930-1979	331	331	328	.24	008 046 • 010 056 • 010 134 •
010 500	ALDERSYDE (2)	1948-1970	394	394	392	.22	010 524 • 010 626 • 010 534 •
010 501	ALDERSYDE	1909-1977	380	373	366	.25	010 524 • 010 626 • 010 534 •
010 509	BALLY BALLY	1904-1979	446	439	439	.22	010 515 • 010 524 • 010 163 •
010 511	DINNINUP (AV-A-REST)	1912-1979	618	611	603	.18	009 504 • 010 635 • 009 556 •
010 521	PINGELLY WEST(BRAESIDE 2)	1932-1976	503	503	500	.23	010 648 • 010 654 • 010 626 •
010 522	JENNACUBBINE	1918-1979	371	372	378	.25	010 058 • 010 111 • 010 125 •
010 527	BULYEE	1933-1979	408	408	413	.21	010 524 • 010 534 • 010 163 •
010 540	BROOKTON (KENILWORTH TU)	1905-1967	528	533	517	.22	010 564 • 010 626 • 010 648 •
010 544	DEELYANINE	1920-1979	466	463	459	.20	010 505 • 010 647 • 010 635 •

TABLE 2 (CONTINUED) - SECONDARY STATIONS ANNUAL STATISTICS

SECONDARY STATION ANNUAL STATISTICS

STATION NO.	STATION NAME	OVERALL RECORD PERIOD OF RECORD	OVERALL RECORD MEAN (MM)	1926-1979 RECORD MEAN OF EXISTING RECORD (MM)	1926-1979 RECORD MEAN OF EXTENDED RECORD (MM)	1926-1979 RECORD COEF. OF VAR.	THREE CLOSEST PRIMARY STATIONS
010 547	DURANILLIN	1911-1979	562	560	550	.19	010 542 , 009 502 , 010 505 .
010 553	GINGARING	1914-1952	392	380	370	.24	010 534 , 010 524 , 010 625 .
010 556	GLENORCHY	1902-1944	582	559	548	.20	010 635 , 009 504 , 009 502 .
010 563	HIGHBURY FOREST	1948-1979	462	462	452	.23	010 614 , 010 561 , 010 647 .
010 571	JALNA	1947-1979	487	487	500	.22	010 564 , 010 524 , 010 634 .
010 598	LILYDALE	1915-1979	520	513	501	.22	010 510 , 010 542 , 010 655 .
010 599	HIGHBURY (LINTON)	1911-1952	439	435	433	.21	010 561 , 010 614 , 010 647 .
010 602	MALYALLING	1909-1979	356	348	350	.24	010 654 , 010 534 , 010 538 .
010 604	MAYBROOK	1910-1952	509	526	513	.20	010 542 , 010 505 , 010 635 .
010 605	MINIGIN	1943-1979	473	473	481	.22	010 656 , 010 538 , 010 614 .
010 613	NARROGIN STATE FARM	1904-1963	537	534	531	.20	010 614 , 010 538 , 010 656 .
010 624	PINGELLY EAST (WYNROCK)	1912-1976	435	436	430	.22	010 626 , 010 534 , 010 524 .
010 631	QUINDANNING	1950-1971	640	640	631	.20	009 575 , 010 510 , 009 628 .
010 640	DINNINUP (SYLVAN LOCH)	1935-1977	622	622	623	.18	009 504 , 009 502 , 010 635 .
010 641	TACHBROOK	1914-1979	503	497	493	.21	010 505 , 010 542 , 009 502 .
010 642	TALBOT HOUSE	1904-1979	481	475	473	.22	010 634 , 010 144 , 010 515 .
010 646	TOOLIBIN (COLUNIO)	1910-1968	379	380	369	.25	010 654 , 010 614 , 010 561 .
010 651	WEST DALE (CLOUGHTON)	1912-1972	534	532	521	.22	010 634 , 010 564 , 009 507 .
010 662	YEALERING P.O.	1915-1979	378	378	370	.22	010 534 , 010 654 , 010 538 .
010 664	CROOKED POOL	1905-1979	425	417	415	.23	010 654 , 010 614 , 010 561 .
010 675	JELCOBINE	1926-1950	526	526	504	.22	010 564 , 010 626 , 010 648 .
010 677	HILLMAN	1915-1979	535	532	531	.21	010 542 , 010 510 , 010 505 .
010 678	LANDSCAPE HILL	1906-1963	431	413	403	.23	010 534 , 010 626 , 010 654 .
010 679	NALYA	1948-1972	386	386	391	.22	010 524 , 010 626 , 010 534 .
010 685	BROOKTON EAST (LAKESIDE)	1913-1979	394	392	381	.23	010 524 , 010 534 , 010 515 .
010 691	KURRARA PARK	1952-1979	417	417	420	.21	010 561 , 010 647 , 010 614 .
010 722	BOYNING	1908-1945	417	411	397	.22	010 654 , 010 614 , 010 561 .
010 743	GUNDARING	1915-1942	394	385	357	.21	010 647 , 010 505 , 010 561 .
010 751	KULYALLING	1908-1948	473	467	440	.22	010 626 , 010 564 , 010 648 .
010 767	NALLIAN	1906-1945	521	542	493	.23	010 647 , 010 561 , 010 505 .
010 793	TARWONGA	1961-1979	500	500	522	.21	010 510 , 010 505 , 010 655 .
010 795	AVONDALE RESEARCH STN	1900-1979	367	367	401	.23	010 515 , 010 634 , 010 144 .
010 801	LIGHTWOODS	1948-1979	555	555	564	.19	010 635 , 009 504 , 010 505 .
010 867	ROCKHILL (PIESSEVILLE)	1966-1979	375	375	378	.23	010 647 , 010 561 , 010 505 .
509 389	HARVEY R. (AREA OFFICE)	1966-1979	991	991	1077	.17	009 554 , 009 553 , 009 513 .

NUMBER OF SECONDARY STATIONS = 183

TABLE 2 (CONCLUDED) - SECONDARY STATION ANNUAL STATISTICS

TERTIARY STATION ANNUAL STATISTICS

STATION NO.	STATION NAME	OVERALL RECORD PERIOD OF RECORD	OVERALL RECORD MEAN (MM)	1926-1979 RECORD MEAN OF EXISTING RECORD (MM)	1926-1979 RECORD MEAN OF EXTENDED RECORD (MM)	1926-1979 RECORD COEF. OF VAR.	THREE CLOSEST PRIMARY STATIONS
008 216	PIAWANNING (ROCKY RIDGE)	1928-1935	509	509	467	.22	008 064 , 008 140 , 009 033 .
009 048	GOSNELLS	1940-1949	875	875	839	.21	009 001 , 009 034 , 009 025 .
009 060	MAIDA VALE (2)	1950-1959	894	894	856	.19	009 025 , 009 034 , 009 001 .
009 069	YEAL SWAMP EAST	1956-1979	732	732	796	.17	009 018 , 009 009 , 009 002 .
009 076	BINDOON SOUTH	1932-1938	647	647	691	.21	009 018 , 009 009 , 010 134 .
009 078	CATABY	1929-1939	706	706	652	.19	009 046 , 008 005 , 009 002 .
009 081	DALE ROAD	1923-1935	1011	1018	879	.22	009 010 , 009 044 , 010 634 .
009 090	KARRAGULLEN(KANGAROO GUL)	1908-1932	1166	1264	1045	.21	009 010 , 009 031 , 009 001 .
009 091	KELMSCOTT	1907-1935	1121	1172	1046	.20	009 001 , 009 025 , 009 010 .
009 092	MANDOGOLUP	1923-1936	913	908	831	.17	009 036 , 009 001 , 009 034 .
009 095	MAYLANDS (BAYSWATER)	1921-1933	920	959	853	.19	009 034 , 009 025 , 009 057 .
009 098	PERTH NORTH	1908-1934	941	1140	991	.17	009 034 , 009 025 , 009 001 .
009 103	SUNNY DELL	1918-1935	1056	1119	1018	.18	009 025 , 009 030 , 009 031 .
009 107	MT.LAWLEY (GOLF CLUB)	1963-1969	922	922	830	.17	009 034 , 009 025 , 009 057 .
009 112	BINDOON TOWN	1964-1979	682	682	660	.21	009 018 , 009 009 , 010 134 .
009 115	SERPENTINE DAM	1963-1979	1323	1323	1280	.18	009 023 , 009 039 , 009 749 .
009 117	WEXHAM	1964-1975	859	859	884	.18	009 025 , 009 034 , 009 001 .
009 122	YANCHEP NORTH (FOREST. 1)	1956-1979	696	696	746	.18	009 002 , 009 018 , 009 009 .
009 123	GIN GIN (FORESTRY 2)	1956-1979	696	696	754	.17	009 018 , 009 002 , 009 009 .
009 124	GIN GIN (FORESTRY 3)	1956-1979	701	701	758	.17	009 018 , 009 002 , 009 009 .
009 127	MOSMAN PARK	1968-1979	643	643	784	.22	009 034 , 009 038 , 009 036 .
009 128	YANCHEP NORTH (FOREST. 7)	1967-1979	697	697	753	.20	009 002 , 009 018 , 009 009 .
009 130	DANDARAGAN (TUYALI)	1968-1979	599	599	660	.20	009 046 , 008 005 , 009 002 .
009 133	CHIDLOW (BEAU SCOT LODGE)	1969-1979	815	815	959	.20	009 007 , 009 030 , 010 056 .
009 134	LOWER CHITTERING P.O.	1968-1979	733	733	811	.18	009 009 , 009 018 , 010 125 .
009 135	KALAMUNDA SHIRE COUNCIL	1966-1979	965	965	1124	.17	009 031 , 009 025 , 009 010 .
009 137	BYFORD	1970-1979	880	880	1070	.17	009 044 , 009 001 , 009 010 .
009 139	ALBANY HIGHWAY (47.5 M)	1923-1937	983	1046	952	.23	009 023 , 009 749 , 009 507 .
009 140	KELMSCOTT FORESTRY	1967-1979	798	798	934	.19	009 001 , 009 010 , 009 025 .
009 144	BARAMBA	1970-1979	632	632	727	.19	009 002 , 009 046 , 009 033 .
009 146	WAIKIKI	1970-1979	768	768	858	.17	009 036 , 009 572 , 009 039 .
009 148	WESTFIELD TREATMENT WKS	1968-1979	798	798	954	.19	009 001 , 009 036 , 009 010 .
009 150	WOODMANS PT. (TREAT. WKS)	1967-1979	702	702	855	.18	009 036 , 009 034 , 009 044 .
009 151	SUBIACO SEWERAGE TREAT.	1967-1979	702	702	772	.17	009 034 , 009 025 , 009 057 .
009 161	SOUTH BENTLEY (W.A.I.T.)	1971-1979	732	732	869	.17	009 034 , 009 025 , 009 001 .
009 162	UPPER CHITTERING	1971-1979	596	596	652	.17	009 009 , 009 018 , 010 134 .
009 168	KARRAGULLEN	1972-1979	999	999	1281	.19	009 010 , 009 031 , 009 044 .
009 170	UNI.MARSUPIAL BREED.STN.	1972-1979	790	790	851	.18	009 036 , 009 001 , 009 034 .
009 171	BROWNS LAKE (10 M. WELL)	1929-1935	800	800	790	.17	009 036 , 009 001 , 009 034 .
009 172	JANDAKOT AERO	1972-1979	798	798	868	.18	009 034 , 009 001 , 009 036 .
009 173	STONEVILLE (BERRIMBULLA)	1973-1979	927	927	1050	.18	009 030 , 009 025 , 009 007 .

TABLE 3 - TERTIARY STATIONS ANNUAL STATISTICS

TERTIARY STATION ANNUAL STATISTICS

STATION NO.	STATION NAME	OVERALL RECORD PERIOD OF RECORD	OVERALL RECORD MEAN (MM)	1926-1979 RECORD MEAN OF EXISTING RECORD (MM)	1926-1979 RECORD MEAN OF EXTENDED RECORD (MM)	1926-1979 RECORD COEF. OF VAR.	THREE CLOSEST PRIMARY STATIONS
009 180	CARMEL	1973-1979	989	989	1197	.17	009 031 • 009 610 • 009 001 •
009 181	SWAN VIEW	1973-1979	757	757	942	.18	009 025 • 009 057 • 009 034 •
009 548	GLEN IVUR	1951-1977	1007	1007	989	.19	009 622 • 009 505 • 009 624 •
009 610	WAGERUP	1934-1944	877	877	887	.18	009 554 • 009 513 • 009 553 •
009 659	HUNTLY	1939-1959	1310	1310	1338	.18	009 749 • 009 596 • 009 023 •
009 676	WIINIJUP (THE VALE)	1960-1977	699	699	668	.18	009 556 • 009 504 • 010 635 •
009 688	BUNBURY SOUTH (LEYLAND)	1936-1944	917	917	962	.17	009 514 • 009 513 • 009 503 •
009 690	DINNINUP (CONDINUP)	1905-1979	557	479	535	.18	009 504 • 010 635 • 009 502 •
009 701	DUNCANS MILL	1931-1943	824	824	803	.21	009 507 • 009 575 • 009 749 •
009 707	GLENWOOD	1926-1938	824	824	742	.20	009 502 • 009 628 • 010 510 •
009 731	TROY FARM (HOMEBUSH)	1924-1937	1075	1089	1010	.19	009 554 • 009 513 • 009 553 •
009 733	WARABA	1918-1940	1010	1028	960	.17	009 553 • 009 596 • 009 572 •
009 742	BANNISTER NORTH	1963-1979	749	749	743	.20	009 507 • 009 575 • 009 749 •
009 747	WARDONA DAM	1964-1979	1191	1191	1258	.18	009 553 • 009 575 • 009 749 •
009 750	WARENING HILLS	1966-1973	938	938	1018	.18	009 749 • 009 596 • 009 553 •
009 773	COOKERNUP (DARWIN ST.)	1968-1979	971	971	1040	.18	009 553 • 009 554 • 009 575 •
009 833	YARRAGIL BROOK (CURRA)	1967-1979	878	878	1014	.22	009 575 • 009 507 • 009 553 •
010 259	BOLGART (BIRAHLEE)	1968-1979	559	559	622	.20	010 134 • 010 125 • 009 013 •
010 681	CROVIE (EAST PINGELLY)	1930-1944	455	455	443	.22	010 626 • 010 538 • 010 534 •
010 713	ALADALE	1935-1944	454	454	459	.22	010 626 • 010 658 • 010 649 •
010 723	BRAEFIELD	1913-1930	553	530	485	.22	010 614 • 010 655 • 010 658 •
010 741	GLEN ORA	1908-1937	460	470	440	.24	010 534 • 010 626 • 010 654 •
010 762	MUNDEROCKING	1910-1935	435	434	382	.23	010 515 • 010 524 • 010 163 •
010 770	BARTON (PIESSEVILLE)	1909-1937	479	484	415	.20	010 647 • 010 561 • 010 505 •
010 772	POPANYINNING	1917-1941	469	458	438	.21	010 538 • 010 626 • 010 654 •
010 799	DURANILLIN (GREENHILLS)	1965-1979	563	563	583	.19	010 542 • 009 502 • 010 635 •
010 810	WICKEPIN(MALYALLING ROCK)	1968-1979	326	326	373	.24	010 654 • 010 534 • 010 538 •
010 818	KOJONUP (ILLOURA)	1968-1979	432	432	472	.21	010 635 • 009 502 • 010 505 •
010 825	TOOLIBIN (TAMBAROORA)	1969-1979	325	325	339	.23	010 654 • 010 614 • 010 561 •
010 839	TOOLIBIN (CARBINE)	1969-1979	347	347	360	.22	010 654 • 010 614 • 010 561 •
509 058	CAPEL R (KIRUP)	1972-1979	901	901	985	.15	009 622 • 009 534 • 009 553 •
509 071	PRESTON R (CHARLEYS CK)	1971-1979	774	774	856	.19	009 622 • 009 534 • 009 505 •
509 075	FERGUSON R (COOINDA)	1972-1979	950	950	1037	.16	009 503 • 009 534 • 009 513 •
509 079	HARRIS R (NALYERIN LAKE)	1965-1979	729	729	821	.20	009 628 • 009 502 • 009 575 •
509 081	HARRIS R (BALINGHALLS FM)	1965-1979	889	889	1017	.17	009 628 • 009 513 • 010 510 •
509 082	HARRIS R (SANDY RD)	1965-1979	959	959	1023	.19	009 554 • 009 628 • 009 575 •
509 097	COLLIE R (FERRARIS FM)	1970-1979	527	527	605	.20	009 502 • 010 542 • 010 635 •
509 101	COLLIE R (VALERN)	1972-1979	564	564	662	.20	010 542 • 009 502 • 010 510 •
509 102	COLLIE R (CEMENT WORKS)	1972-1977	935	935	1039	.18	009 628 • 009 534 • 009 502 •
509 103	BUSSELL BK (DONALDI)	1972-1979	955	955	1069	.17	009 628 • 009 622 • 009 534 •
509 104	STONES BK (SANDPIT RD)	1972-1979	1110	1110	1268	.17	009 628 • 009 513 • 009 622 •

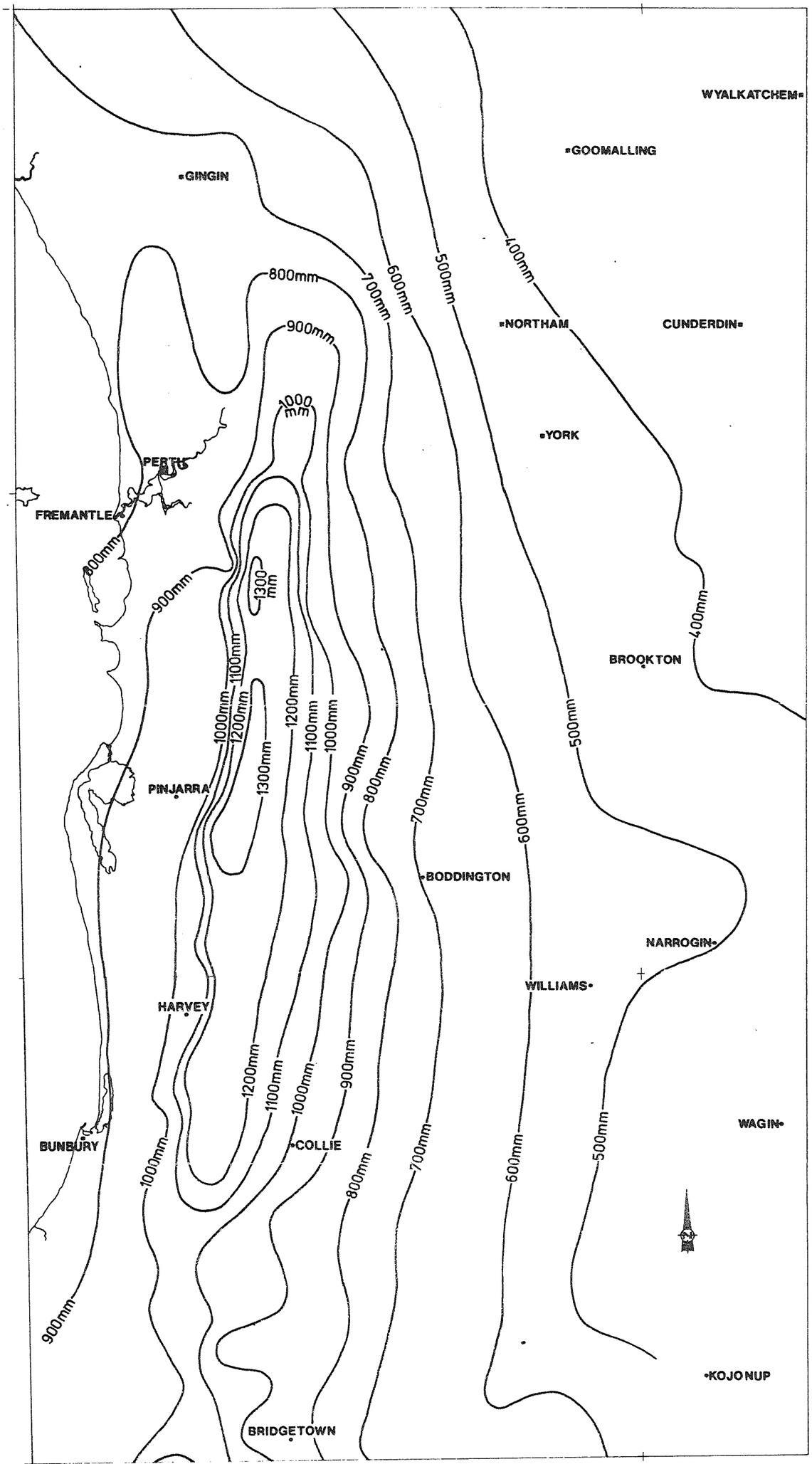
TABLE 3 (CONTINUED) - TERTIARY STATIONS ANNUAL STATISTICS

TERTIARY STATION ANNUAL STATISTICS

STATION NO.	STATION NAME	OVERALL RECORD PERIOD OF RECORD	OVERALL RECORD MEAN (MM)	1926-1979 RECORD MEAN OF EXISTING RECORD (MM)	1926-1979 RECORD MEAN OF EXTENDED RECORD (MM)	COEF. OF VAR.	THREE CLOSEST PRIMARY STATIONS
509 105	STONES BK (HAIRPIN BEND)	1972-1979	1051	1051	1188	.17	009 628 , 009 513 , 009 622 ,
509 106	HAMILTON R(MORNINGTON RD)	1972-1979	1025	1025	1151	.17	009 628 , 009 513 , 009 503 ,
509 107	BUSSELL BK(ARCADIA POWER)	1972-1979	1062	1062	1172	.18	009 628 , 009 534 , 009 622 ,
509 108	COLLIE R (JAMES CR)	1972-1979	572	572	641	.19	009 502 , 010 542 , 010 510 ,
509 109	HAMILTON R (WORSLEY)	1972-1979	1003	1003	1192	.18	009 628 , 009 513 , 009 503 ,
509 111	STONES BK (MAST VIEW)	1972-1979	1056	1056	1258	.16	009 628 , 009 503 , 009 513 ,
509 113	CLARKE BK (HILLVIEW FM)	1971-1979	953	953	1049	.16	009 554 , 009 553 , 009 513 ,
509 117	HARVEY R (HILL 60)	1972-1979	1015	1015	1157	.17	009 554 , 009 553 , 009 575 ,
509 119	HARVEY R (DINGO RD)	1972-1979	1115	1115	1212	.17	009 554 , 009 628 , 009 575 ,
509 128	CHALK BK (QUINDANNING RD)	1972-1979	836	836	994	.22	009 575 , 009 628 , 009 554 ,
509 129	MARRINUP BK (BROOKDALE S)	1972-1979	1097	1097	1310	.24	009 749 , 009 553 , 009 595 ,
509 133	DIRK BK (TRANGIE)	1970-1979	1029	1029	1188	.17	009 023 , 009 039 , 009 749 ,
509 134	DIRK BK (SPRINGDALE)	1970-1979	1022	1022	1157	.16	009 023 , 009 039 , 009 749 ,
509 135	DIRK BK (MYARA RD)	1971-1979	1060	1060	1288	.18	009 023 , 009 039 , 009 749 ,
509 136	GOORALONG BK (GOORALONG)	1972-1979	1100	1100	1293	.18	009 044 , 009 023 , 009 039 ,
509 145	JANE BK (PARKERVILLE)	1972-1979	893	893	1034	.18	009 030 , 009 025 , 009 007 ,
509 147	LENNARDS BK(EASTERN EDGE)	1972-1979	697	697	755	.20	009 018 , 009 002 , 009 009 ,
509 149	JANE BK (SAWYERS VALLEY)	1972-1979	925	925	1053	.19	009 030 , 009 007 , 009 031 ,
509 151	JANE BK (STONEVILLE RSCH)	1972-1979	916	916	1052	.18	009 030 , 009 007 , 009 025 ,
509 152	RUSHY CK (WONYIL)	1972-1979	795	795	937	.21	009 030 , 009 031 , 009 007 ,
509 153	LENNARDS BK (ECLIPSE HLL)	1972-1979	619	619	668	.17	009 018 , 009 002 , 009 009 ,
509 154	RUSHY CK (FIREWOOD RD)	1972-1979	803	803	972	.18	009 031 , 009 030 , 009 007 ,
509 156	WOOROLOO BK (KARLS RANCH)	1972-1979	822	822	912	.16	009 009 , 009 057 , 009 030 ,
509 157	HELENA BK (FREWD RD)	1972-1979	755	755	880	.20	009 007 , 009 031 , 009 030 ,
509 161	RUSHY CK (BYFIELD RD)	1972-1979	844	844	934	.19	009 031 , 009 030 , 009 007 ,
509 169	GINGIN BK-BOOKINE BOOKINE	1972-1979	706	706	756	.16	009 002 , 009 018 , 009 009 ,
509 170	CAPEL R (CRENDON)	1973-1979	875	875	965	.15	009 534 , 009 622 , 009 583 ,
509 171	CAPEL R (PERIVALE ORCH.)	1973-1979	924	924	949	.16	009 534 , 009 622 , 009 583 ,
509 172	CAPEL R (RAVENSCLIFFE)	1973-1979	949	949	1008	.18	009 583 , 009 534 , 009 503 ,
509 177	COLLIE R (MT LENNARD)	1973-1979	1075	1075	1203	.16	009 513 , 009 503 , 009 628 ,
509 187	SOUTH DANDALUP R(KENNEDY)	1973-1979	955	955	1093	.19	009 749 , 009 507 , 009 575 ,
509 206	BRUNSWICK R (VICTOR RD)	1973-1979	1152	1152	1296	.16	009 628 , 009 534 , 009 513 ,
509 214	BANCELLS BK (WATEROUS)	1974-1979	993	993	1201	.16	009 553 , 009 554 , 009 575 ,
509 231	CAPEL R (IRONSTONE GULLY)	1973-1979	896	896	1039	.15	009 534 , 009 516 , 009 583 ,
509 253	THUMPSON BK (FORSYTH)	1974-1979	808	808	929	.18	009 622 , 009 505 , 009 628 ,
509 260	PIESSE GULLY (CARILLA)	1974-1979	989	989	1220	.21	009 031 , 009 010 , 009 030 ,
510 008	HELENA R (YETA SPRINGS)	1970-1979	626	626	745	.23	009 007 , 010 056 , 009 031 ,
510 015	ENCAMPMENT BROOK TRIB	1969-1979	503	503	594	.22	010 056 , 009 007 , 010 152 ,
510 016	DALE R (THORNTON PARK)	1972-1979	516	516	582	.22	010 648 , 010 564 , 009 507 ,
510 017	HELENA R (NGANG.)	1972-1979	631	631	680	.22	010 056 , 009 031 , 010 144 ,

NUMBER OF TERTIARY STATIONS = 122

TABLE 3 (CONCLUDED) - TERTIARY STATION ANNUAL STATISTICS

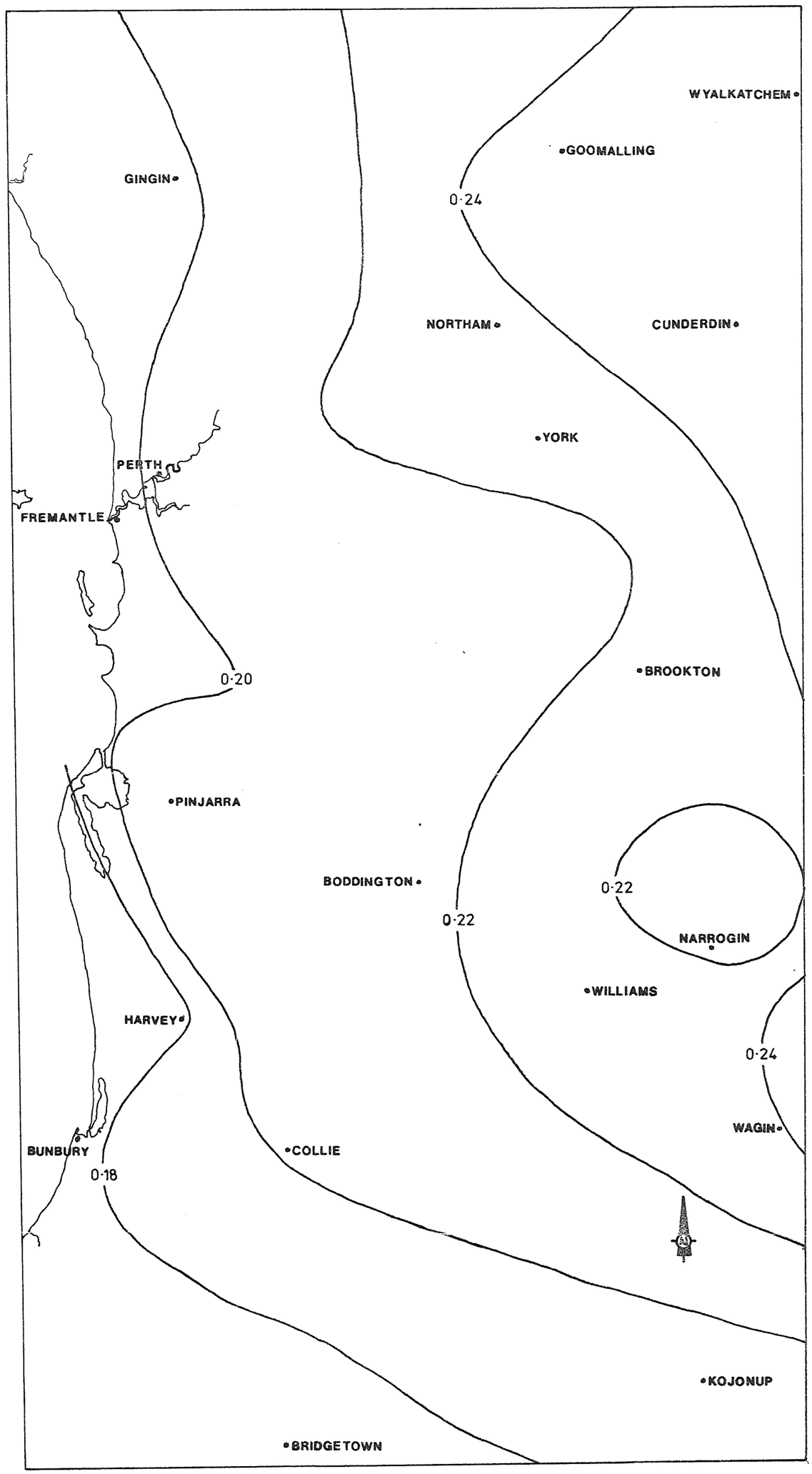


AVERAGE ANNUAL RAINFALL ISOHYETS (1926-1979)
(BASED ON WATER RESOURCES BRANCH REPORT NO. WRB3)

5 2.5 0 5 10 15
SCALE IN KILOMETRES

WATER RESOURCES BRANCH
PUBLIC WORKS DEPARTMENT
WESTERN AUSTRALIA

FIGURE 1

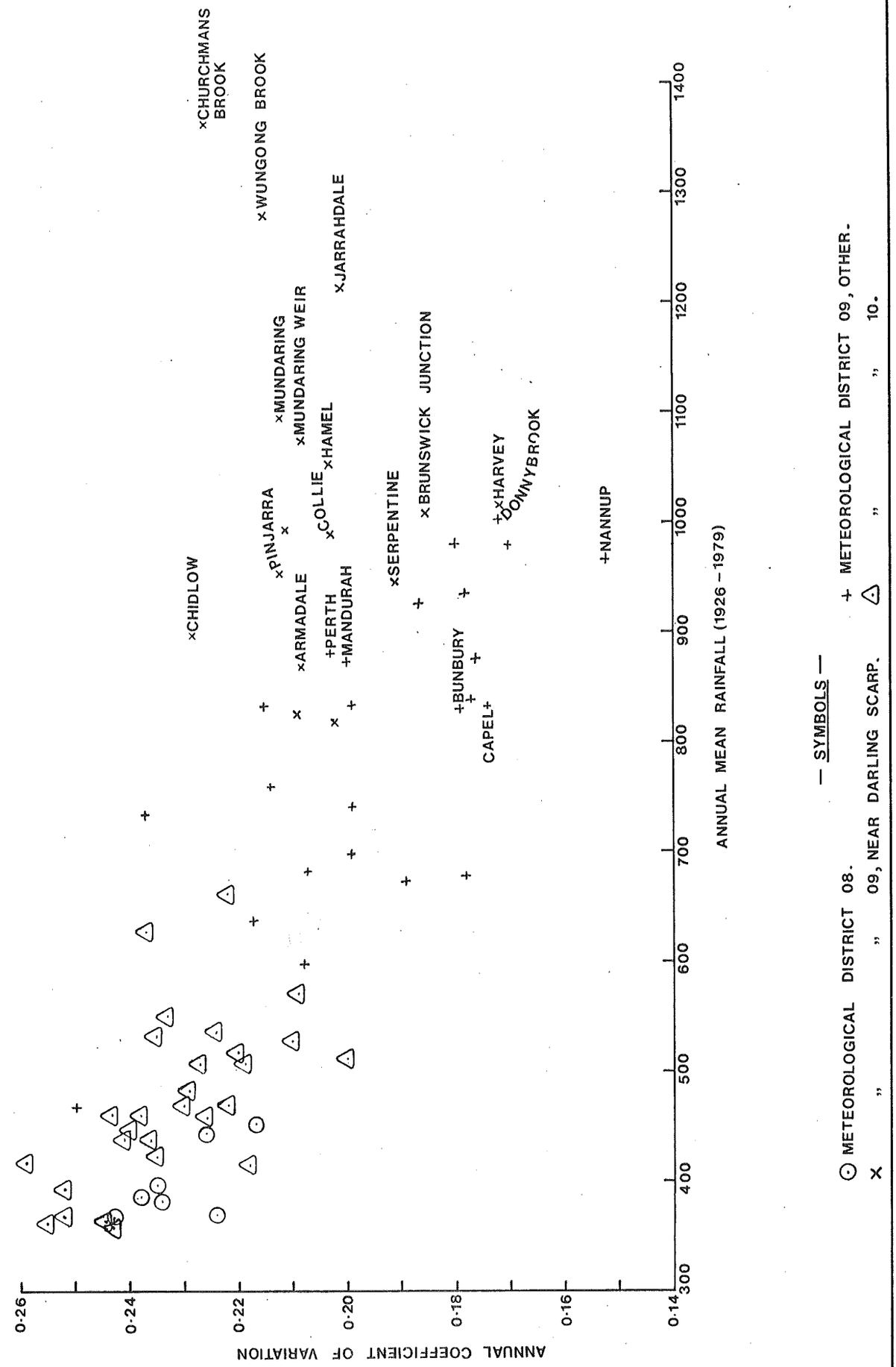


5 2 5 0 5 10 15
SCALE IN KILOMETRES
(1 : 1 000 000)

ISOPLETHS OF COEFFICIENTS OF VARIATION FOR ANNUAL RAINFALL FOR THE PERIOD 1926 — 1979

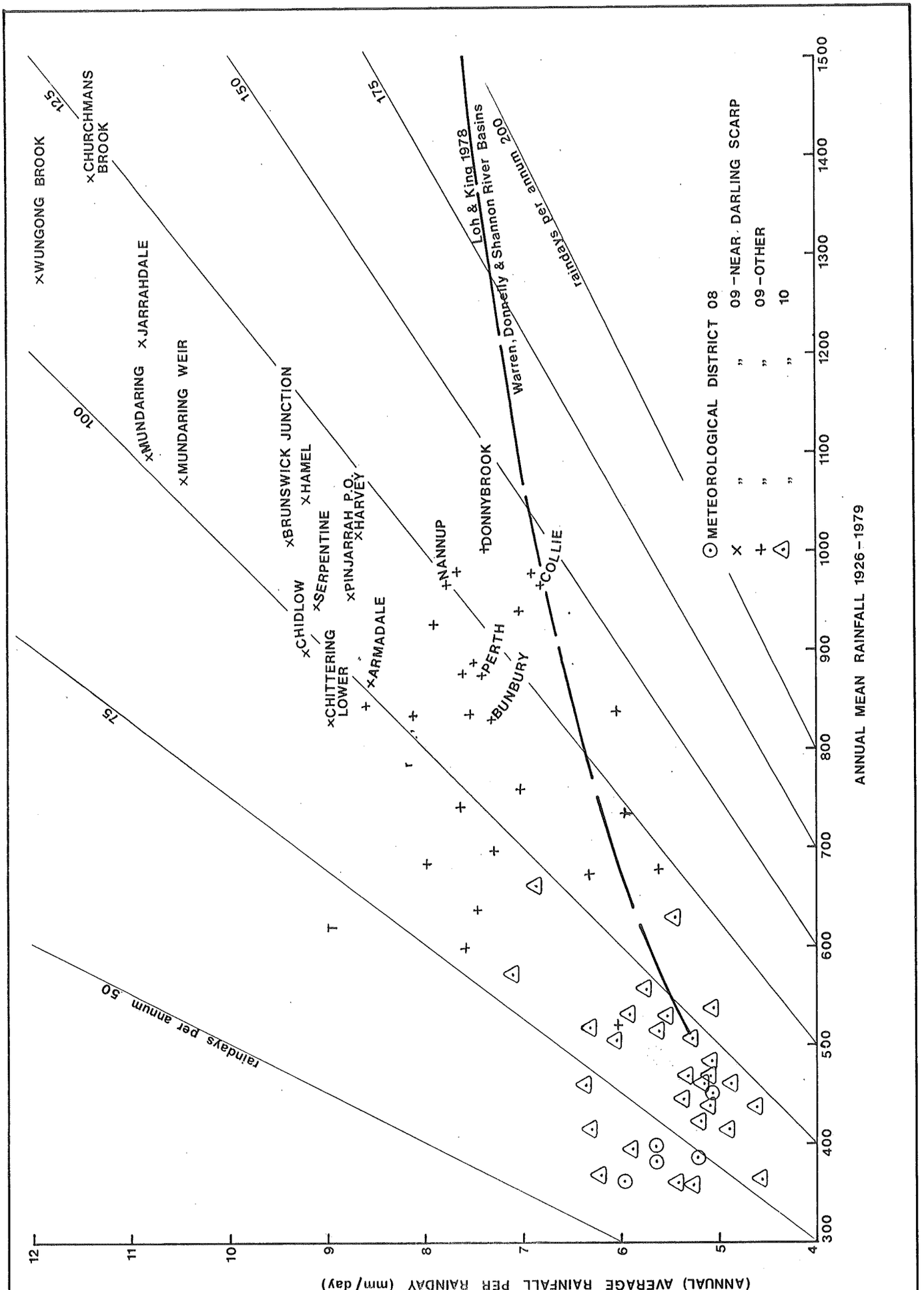
WATER RESOURCES BRANCH,
PUBLIC WORKS DEPARTMENT
WESTERN AUSTRALIA

FIGURE 2



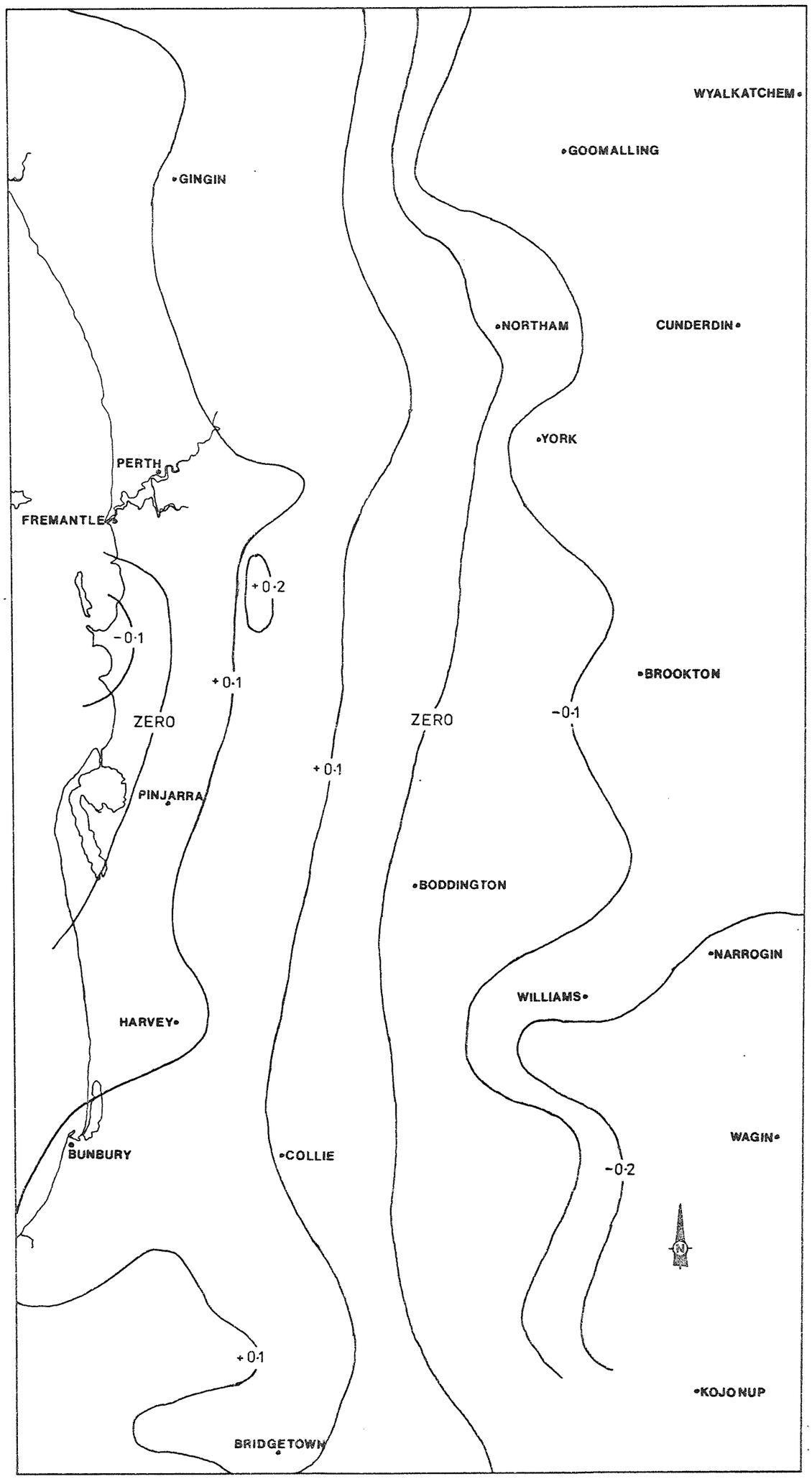
ANNUAL MEAN RAINFALL VS ANNUAL COEFFICIENTS OF VARIATION

FIGURE 3



ANNUAL MEAN RAINFALL V.S.
ANNUAL AVERAGE RAINFALL PER RAINDAY

FIGURE 4



5 2 5 0 5 10 15
SCALE IN KILOMETRES
(1:1 000 000)

ISOPLETHS OF SERIAL CORRILATION (LAG 1) OF ANNUAL RAINFALLS FOR THE PERIOD 1926 — 1979

WATER RESOURSES BRANCH
PUBLIC WORKS DEPARTMENT
WESTERN AUSTRALIA

FIGURE 5